



stream care guide

a handbook for residents of salt lake county



Big Cottonwood Canyon
upper Big Cottonwood Creek

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*creeks are listed in geographic order,
from north to south



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Introduction

Clean, clear, free-flowing streams are something we all cherish in the Intermountain West, especially in highly urbanized areas such as Salt Lake County. Approximately 900 miles of streams, including the Jordan River, flow through Salt Lake County, providing water resources, floodwater pathways, wildlife habitat, and numerous recreational opportunities.

Many of our daily activities can affect water quality, locally and far downstream. As a result, part of the responsibility of protecting our streams lies with you, the Salt Lake County resident. And, with much of the County's streamside acreage in private ownership, streamside residents can play an even bigger part in protecting stream health.

In this guide you'll find out how you and your neighbors can:

- Prevent or minimize erosion problems
- Avoid flood losses
- Protect property values
- Preserve water quality
- Contribute to the survival of fish and wildlife

The basics of stream care are straightforward, but they do require active participation. Every bit of stream care helps.

Thank you!



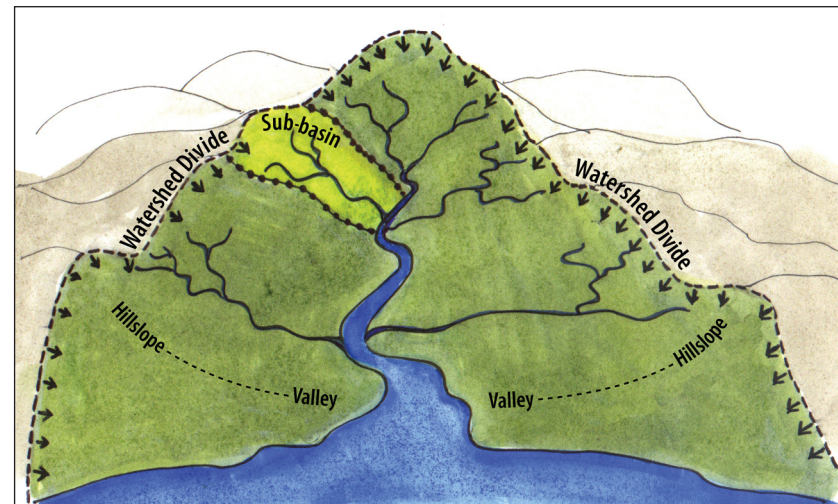
Little Cottonwood Canyon
upper Little Cottonwood Creek

streams 101

We all live in a watershed

A water what? A **watershed**, or **drainage basin**, is the area of land that drains to a particular body of water, such as a stream, river, lake or ocean. The topography of the landscape determines where the water flows with surrounding ridgelines defining the boundaries of the basin.

Larger watersheds contain many smaller watersheds. For instance, each mountain stream that flows into Big Cottonwood Creek has its own watershed, and when combined these streams are all part of the larger basin that drains to Big Cottonwood Creek. In turn, the watersheds for Mill Creek, Big Cottonwood Creek, Rose Creek, etc. are all part of the greater Jordan River Watershed. At an even larger scale, the Jordan River Watershed is part of the Great Salt Lake Basin. The



A tributary creek which joins a small stream, which is tributary of a larger river, is thus part of a series of successively smaller area but higher elevation “nested” basins. Arrows indicate the direction of waterflow into the basin.

Great Salt Lake is a closed basin; the lake is the lowest point in the landscape and does not have an outlet. Many regional scale watersheds in the United States will ultimately drain to the ocean.

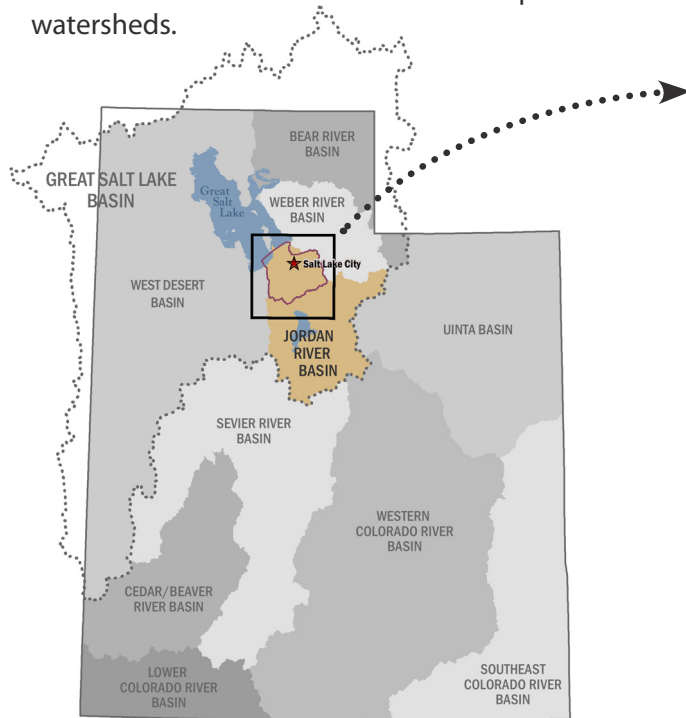
Bottom line—no matter where you live, you live in a watershed!

When it comes to protecting nature and controlling pollution, it’s beneficial to think in terms of watershed-scale planning. That’s because everything that happens within a watershed may ultimately affect the water quality of the stream, river or lake at the bottom of the basin. Pollutants on the ground are picked up by storm runoff and make their way into our streams and rivers.

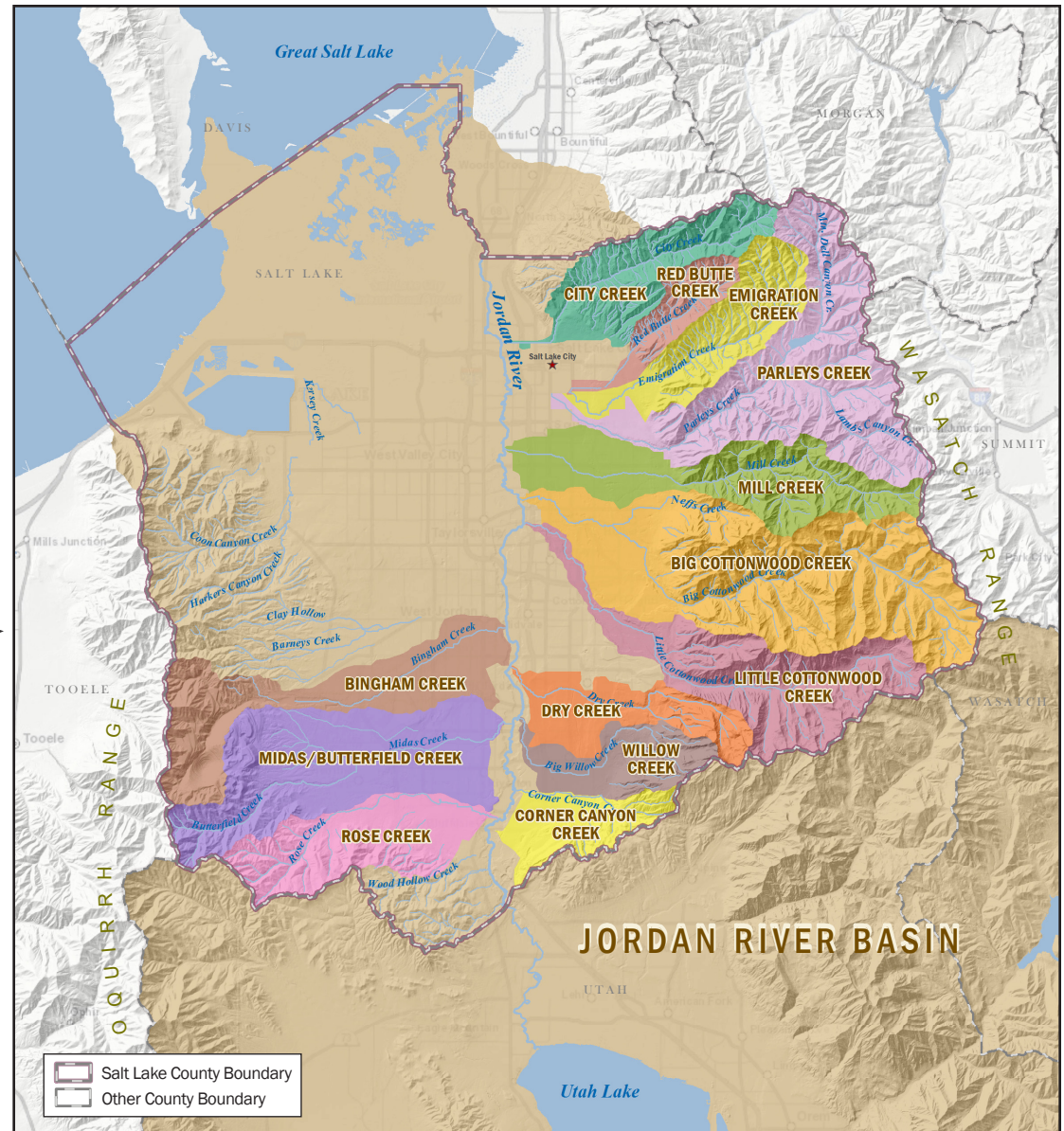
Salt Lake Valley and Wasatch Range, looking southeast over City Creek Canyon.

Runoff in developed areas, where there are many more impervious (non-porous) surfaces like rooftops and pavement, will flow faster and pick up more pollutants as compared with precipitation that falls on undeveloped land. As urbanization continues, more impervious surfaces lead to ever growing volumes of runoff dumping into our streams and rivers. This results in a higher probability of erosion, degraded water quality, impacts on fish and wildlife, flooding, and property damage.

Watersheds often cross city, county, and state boundaries, posing challenges to watershed planning and protection. Stream restoration, educational outreach, use of best management practices (BMPs), and collaboration across watershed boundaries are tools used to protect watersheds.



Regional-scale watersheds in Utah



Subwatersheds of the Jordan River Basin Most surface waters in Salt Lake County drain to the Jordan River, which flows north to the Great Salt Lake. Some surface waters in the County flow directly into the lake or filter down to recharge groundwater resources in the basin. The watersheds (or drainage basins) for the Jordan River's thirteen tributaries are all found in Salt Lake County, and are subwatersheds of the larger Jordan River Basin.



The amazing Great Salt Lake

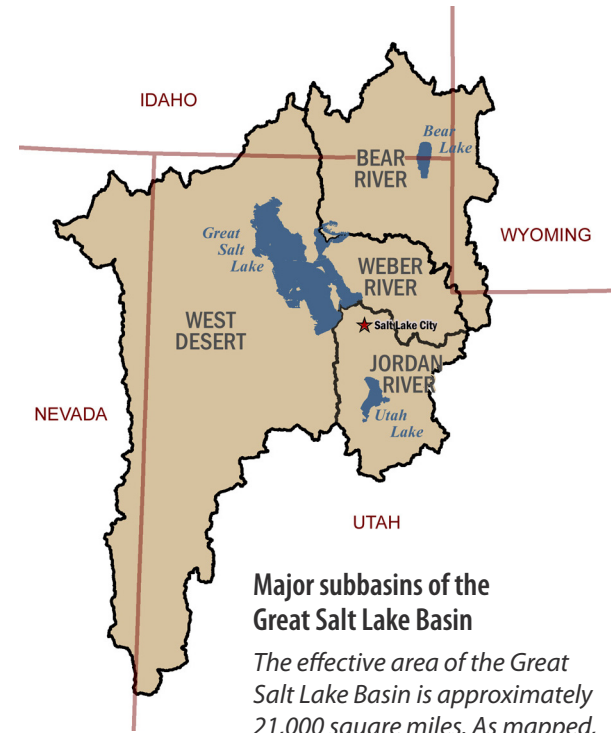
It's salty. It's stinky. It's buggy. Many people think that the water that ends up in the lake has simply gone to waste. Actually, that couldn't be further from the truth. Great Salt Lake supports a rich and dynamic biological system of regional, national, and global significance. The amazing abundance of bird life at Great Salt Lake has earned it the designation as a "Western Hemisphere Shorebird Reserve." Each year over seven million birds from 257 different species rely on the lake during their thousand-mile or more migrations. Remote islands, shorelines, and about 400,000 acres of wetlands provide safe sanctuary for migratory birds to feed, nest, and rest. These diverse water environments are connected to expansive playas and uplands that create excellent habitats for innumerable plants, invertebrates, reptiles, amphibians, mammals and birds.

Great Salt Lake sits at the bottom of a closed basin. It is a terminal lake with no outlet, so the only way water can leave is by evaporation. For the most part, what goes into the lake, stays in the lake. The vast majority of water flowing into the lake comes from the Bear, Weber and Jordan Rivers. This fresh water contains naturally occurring dissolved minerals and salts, which get left behind during evaporation. Over many thousands of years this has created a salty inland sea.

Of course, minerals and salts aren't the only things that never leave the lake. Chronic levels of heavy metals, such as mercury, and excess nutrients from human activities are among the pollutants of concern. Our place in the Great Salt Lake Watershed means that Salt Lake County residents can help protect the health of the lake ecosystem.

Learn more at:

- Friends of Great Salt Lake, fogsl.org
- Great Salt Lake Ecosystem Program wildlife.utah.gov/gsl/index.php
- Great Salt Lake Information System www.greatsaltlakeinfo.org



Major subbasins of the Great Salt Lake Basin

The effective area of the Great Salt Lake Basin is approximately 21,000 square miles. As mapped, its four major subbasins actually encompass 34,363 square miles, but the far West Desert Basin yields only small amounts of groundwater to the lake.

Lake Facts:

- On average Great Salt Lake (GSL) covers 1,700 square miles, with a maximum depth of 33 feet and a surface elevation at 4,200 ft.
- The Great Salt Lake Watershed is over 21,000 square miles. It is a “closed basin” where no water flows out. The lake is the lowest point in the landscape.
- Fresh water enters Great Salt Lake via direct precipitation, three rivers (the Bear, Weber and Jordan River) and internal springs.
- Water entering Great Salt Lake carries dissolved minerals. Evaporation leaves the minerals and salts behind.
- Salinity varies across the lake and is typically 3 to 5 times saltier than the ocean. The saltiest regions are almost 9 times saltier!
- The notorious “lake stink” is most noticeable to residents of Salt Lake County when northwest winds blow across the lake and stir up shallow sediments. Decaying organic matter is the culprit, and is largely attributed to human-caused excess nutrients in Farmington Bay.
- 75% of Utah’s wetlands are located in the Great Salt Lake Ecosystem.
- Over 7 million migratory birds stop at the lake each year to feed, nest, and rest.
- The lake is alive! Bacteria, algae, zooplankton, brine shrimp, and brine flies form an important food web.
- The Union Pacific Railroad Causeway divides the lake into the North and South Arms with vastly different ecosystems on either side.
- The North Arm of the lake is currently so salty that only two known types of bacteria can live there.
- Brine shrimp harvest and mineral extraction industries are worth millions of dollars.
- You probably eat Great Salt Lake every day! One of Morton Salts biggest plants is in Salt Lake City.
- Great Salt Lake is popular for wildlife viewing, boating, swimming, and hiking. It attracts visitors from around the world.

Photo ©TheAccidentalBirder.com

The Great Salt Lake is an ecosystem of regional, national and global importance for migratory birds. Over 7 million birds, of 257 species, stop at the lake each year!



Photo ©U.S. Fish and Wildlife Service

American avocets take flight in a cloud of brine flies.



Our local streams

Today, more than a million people call Salt Lake County home. In addition to being Utah's population center, Salt Lake County is also an economic center for the entire Intermountain West. With increasing development, substantial stream alterations, and a population that is expected to reach 1.6 million by the year 2050, the watershed issues in Salt Lake County are complex and evolving.

For the most part, the mountainous areas of the County are uninhabited and forested public lands cover nearly half of Salt Lake County. These undeveloped lands are a great benefit to the health of our watersheds, and streams in most areas of the upper canyons remain in a relatively natural state. Extensive recreation activities in the canyons do, however, contribute to stream impacts, and mining activities (both historic and existing) have severely degraded water quality in localized areas throughout the canyons.

Development has been, and continues to be, concentrated in the foothills and valley floor. In fact, foothills are the zone of greatest urbanization throughout the Intermountain West. As a result, all waterways in these lower elevation areas of Salt Lake County have been degraded to some degree by human activities, some quite dramatically.

Life of an urban stream

There have been numerous changes to streams in urban settings over time with increasing development and changes in the landscape. The first usually comes in the form of irrigation diversions, where "first in time, first in right" water law philosophy has **dewatered** (water completely removed) many a stream in the American West. Of the fourteen major creeks in Salt Lake County, several have sections that are seasonally dewatered for irrigation and culinary water use.

The second major change from urbanization comes from land use encroachment of the stream channel and floodplain. The width of the creek is usually decreased, but the most dramatic impact is often to streamside vegetation—called **riparian vegetation**. The entire ecology of the stream environment changes when native shrub and tree species are removed, and with this change goes the wildlife and a stream's ability to control pollutants. Some of the most devastating habitat loss occurs where buildings, paved surfaces, and manicured lawns extend right up to the water's edge.

riparian

Of, pertaining to, or situated along the banks of a river or other body of water. [Riparian trees provide shade that keeps stream water cool.]

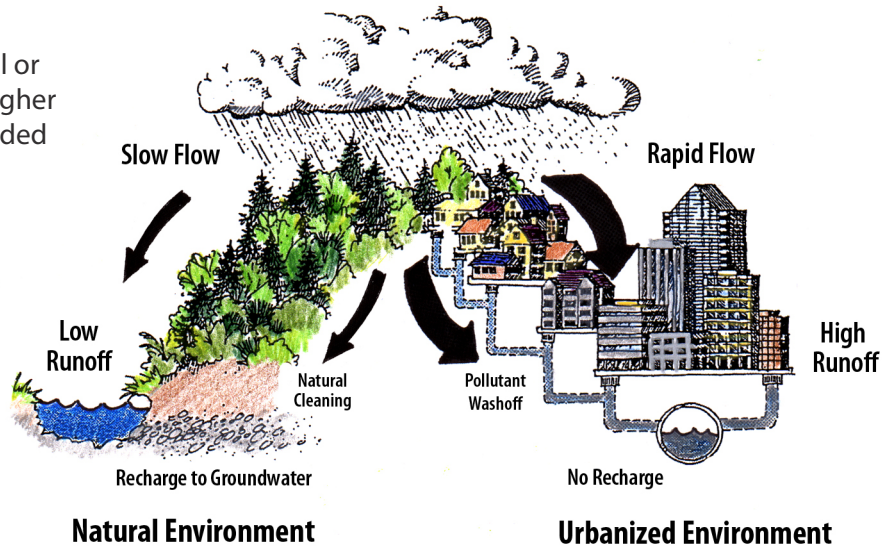
The final dramatic change can occur years later when stream waters flow faster, volumes grow larger (with increased runoff from impermeable urban surfaces), and flooding increases at virtually every

Dense stands of native vegetation along Big Cottonwood Creek are critical to the health of this natural stream ecosystem.

constriction, whether natural or man-made. This leads to a higher probability of erosion, degraded water quality, flooding, and property damage.

As development pressure continues to put any remaining riparian habitat at risk, a greater understanding and appreciation of the value of native vegetation and working with the natural functions of streams can lead to creative solutions

for homeowners, developers and landscapers. This guide explores a variety of ways to help protect against and reverse the stresses that human activities put on stream ecosystems.



Common stream threats

- **Stream channel alterations** reduce or eliminate streamside vegetation, and increase flooding and erosion potential.
- **Stream diversions** reduce instream flows and can completely dewater streams.
- **Loss of native vegetation** impacts food and shelter for wildlife, and reduces shade on the stream. Cool water is necessary to the survival of many fish and aquatic insects. Warm water also contributes to excess algae growth.
- **Bare stream banks** are prone to erosion.
- **Increased storm runoff** caused by impervious surfaces (pavement, rooftops, etc.) that prevent water from soaking into soils.
- **Excess soil erosion** impacts water quality, degrades aquatic habitat, and damages property. It also creates incised channels that disconnect a stream from its floodplain and affect ground water levels, reducing a stream's ability to carry flood waters and degrading riparian vegetation.
- **Increased pollutants** in storm runoff (oil, gasoline, fertilizer, pet waste, household toxics, trash, etc.) degrade water quality.
- **Excess nutrients** (from fertilizers, pet and yard waste, and leaky septic systems) cause algae overgrowth, which uses up oxygen in water and impacts aquatic life.



Development leads to drastic effects on streamside vegetation, habitat, and ultimately water quality (lower Bingham Creek).



Trout in Emigration Creek

Anatomy of a stream system

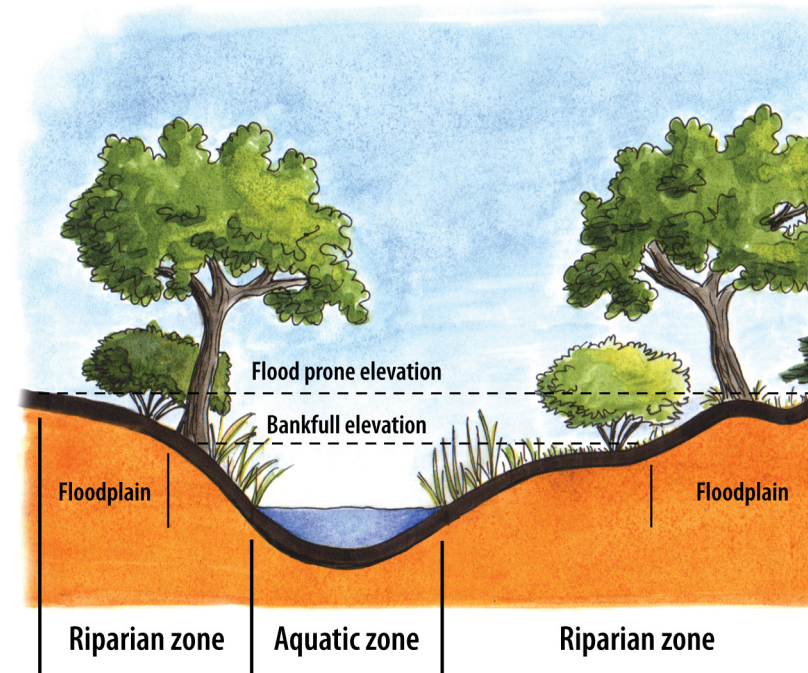
A stream is a complex living system where the physical characteristics of the stream bed and the valley it's contained within—including its shape, elevation drop, and soil types—interact with dissolved nutrients and organic matter in the water to create an environment rich with life.

Too often, streams are treated as drainage channels, with no other purpose than to move storm runoff (and all its associated pollutants) downstream as efficiently as possible. Understanding and respecting streams as dynamic ecosystems will go a long way towards protecting water quality and stream health. In fact, streams do a better job of protecting us and our property during flood events when they're healthy.

Components of a healthy stream include:

- Cool, clear, oxygen-rich water that is free of pollutants and excess algae.
- Gravel and cobble, without too much sand and silt, for aquatic insects and fish spawning.
- Presence of both slow **pools** to provide cover and refuge, and **riffles** (fast water running over shallow rocks) to support aquatic insects, fish spawning and feeding.
- Adequate amounts of water flowing in the stream during summer.
- Fallen logs, branches and other natural debris to provide habitat and cover for aquatic and riparian species.
- Abundant, native **riparian** (streamside) vegetation to stabilize banks and provide shade, food and shelter for wildlife.

bankfull High water that occurs every 1.5 years on average in a natural stream. Stream water volumes above bankfull will overflow into the floodplain.



The riparian zone

Often referred to as a green ribbon of life along streams and rivers, the **riparian zone** is the transitional area of land that connects the aquatic (wet) ecosystem to the drier uplands that are not reached by flood waters. Due to the regular presence of water and periodic flooding, riparian areas support a great variety of plant and animal species. As a result, they are among the most productive and valuable of all landscapes, especially in arid climates.

Healthy riparian areas are vital to the health of stream ecosystems and the entire watershed as well. Many of the threats to our urban streams are directly related to physical changes to these areas and loss of vegetation. Riparian zones provide the following important benefits:

Erosion and flood protection

- Extensive root systems of riparian shrubs and trees stabilize streambank soils.
- Floodplains allow a stream system to store and absorb floodwaters, dissipating their destructive energy. High waters overflow out of the channel onto the floodplain.
- Vegetation slows down instream flows and helps to dissipate floodwater energy.

Water quality protection

- Plants slow runoff as it flows over the land, allowing pollutants to drop out before entering the stream.
- Root systems of riparian plants filter pollutants.

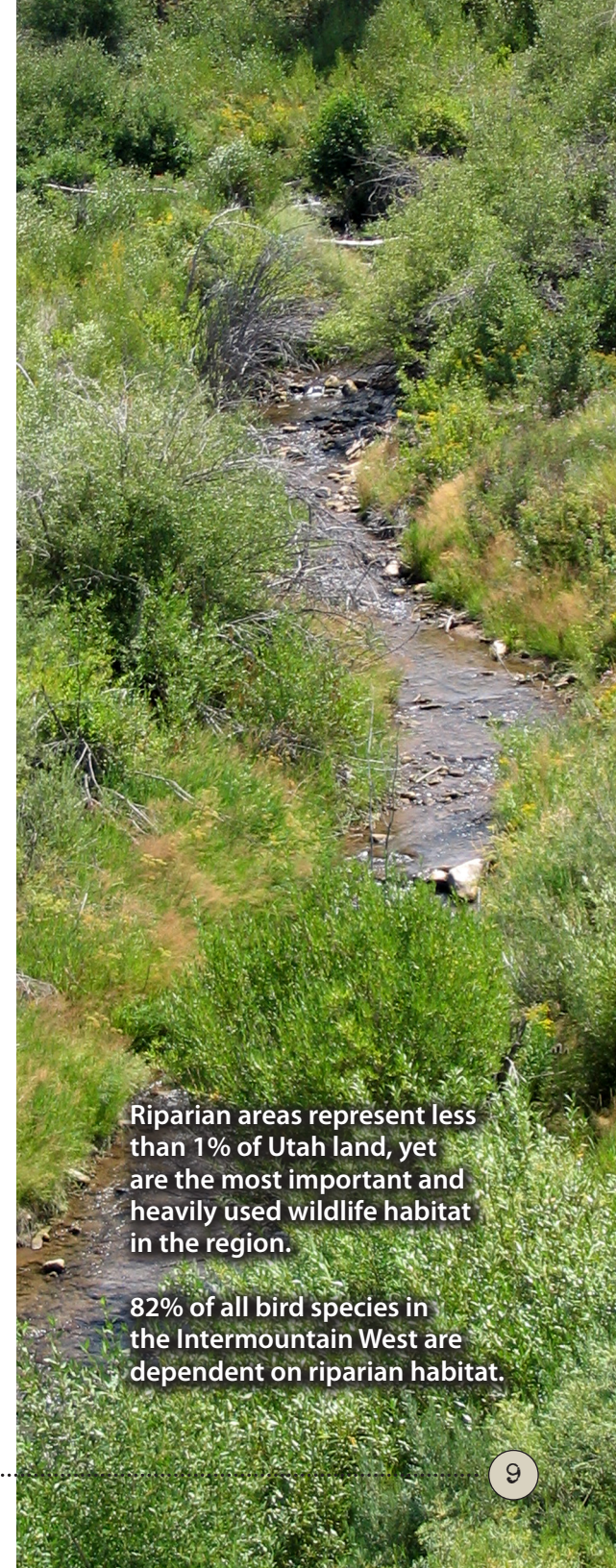
Food and shelter

- Streams provide much needed wildlife corridors, especially in urban areas where habitat is highly fragmented.
- Multi-story layers of vegetation (trees, shrubs, ground layer) provide habitat and shelter for a diverse array of species. This structurally complex arrangement is often unique to stream corridors in arid lands.
- Tree shade helps to cool stream waters, which is critical for many aquatic species. Roots create stable overhanging banks, providing places for fish to hide and rest.

Naturally occurring riparian plants in Salt Lake County include grasses, sedges, willows, dogwood, wild rose, sumac, birch, maple, cottonwood, and much more (see NATIVE PLANT LISTS).



Uplands



Riparian areas represent less than 1% of Utah land, yet are the most important and heavily used wildlife habitat in the region.

82% of all bird species in the Intermountain West are dependent on riparian habitat.



in your backyard

In this section, we discuss the many ways you can help improve natural stream functions, streambank stability, and native plant diversity in your own backyard. You and your neighbors can play a key role in preventing and reducing harm to the stream ecosystem, even if the overall health of the stream is tied to activities far beyond your property.

Several of the stream care practices discussed here are specific to streamside landscapes, but most are relevant to every landscape. We can all help prevent flood damage, protect wildlife habitat, and minimize pollution. If you are a streamside resident, some, if not all, of your property falls within the **riparian zone**. Consequently, your landscape and homesite planning choices have significant and more immediate effects on stream health and water quality. The goal is to balance the needs of your landscape with the needs of the larger ecosystem. A little stream care goes a long way.

Create a riparian wildscape

Maintaining a robust buffer of native riparian vegetation is one of the best things you can do to care for your stream. Diversity is key—in plant species types and structural diversity (different layers of vegetation, including trees, shrubs, and ground layers)—to achieve the many environmental benefits of riparian vegetation, as well as a beautiful landscape!

Areas closest to the water's edge will experience periodic flooding and more of the stresses associated with higher flows. The native riparian shrubs that grow nearest to the water, along with sedges and rushes (grass-like plants) provide stable banks and healthy riparian habitat. Transitioning from the flood-prone areas at the streambank into the upland areas of your property provides many opportunities for more diverse plantings in your landscape.

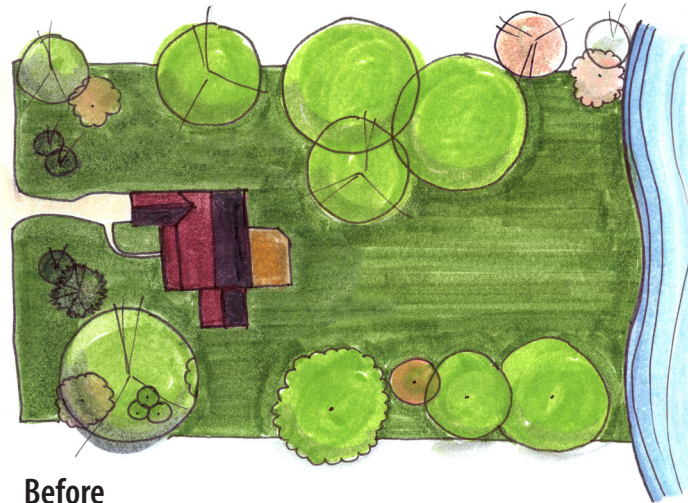
Plan your riparian area as a “wildscape” to provide habitat for wildlife, both large and small. Multiple layers of vegetation mean more choices of habitat and shelter for mammals, birds, insects, etc. Use native plants whenever possible to provide the preferred food and cover for wildlife and reduce maintenance costs (see CHOOSING NATIVE PLANTS). As a general rule, once established native plants need less maintenance to thrive because they are adapted to the local conditions, having evolved with the climate, light, and soil types that characterize their local ecosystems. This reduces the need for irrigation, fertilizer and other yard care chemicals.

When it comes to riparian buffers, *size matters*. Scientific studies recommend a minimum 100-foot buffer of riparian vegetation to protect water quality, as well as fish and aquatic habitat. To protect wildlife and wildlife habitat a minimum 300-foot buffer is recommended, although certain species (many birds and larger mammals) require larger buffers. Of course, 100-300 feet may not be practical or even possible in many urban landscapes. Smaller buffers, in the 50-100 foot range can help protect certain aspects of water quality and offer considerable habitat benefits to many wildlife species. Whenever possible aim to meet the minimums and remember, bigger is always better!

Rethink your lawn

One of the best improvements you can make to protect water quality and improve habitat is to reduce your total area of lawn, especially if it extends into the riparian zone.

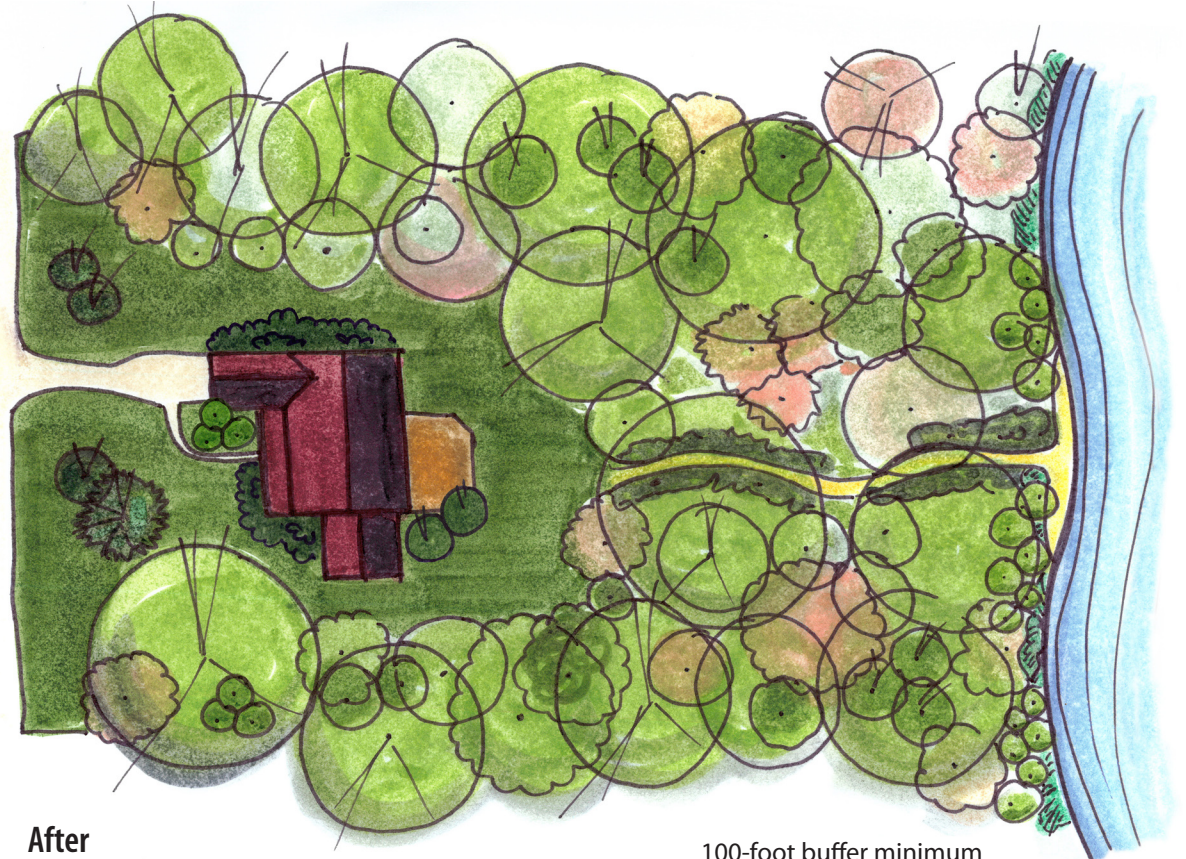
In our arid climate a typical Kentucky bluegrass lawn requires a whole lot of water (and fertilizer, and other lawn care chemicals) to stay green and healthy throughout the growing season. A 1,000 square foot lawn (0.02 acres) needs approximately 15,000 gallons of water per year to keep it green! And that's a conservative estimate. Cool-season bluegrasses have shallow root systems that are not very effective at using and absorbing water. In comparison, the deep roots of native plants utilize water much more effectively, which saves water and decreases runoff.



Before

Streamside landscaping tips:

- Retain existing native plants
- Reduce lawn
- Plant native trees, shrubs, grasses, and wildflowers to enhance your riparian buffer (100-foot minimum)
- Multiple vegetation layers are better habitat and more attractive
- Use paths to direct access and minimize impacts in the riparian zone
- Consider water needs and shade tolerance of species planted



After

100-foot buffer minimum



nice buffer!

Photo © Lisa Hollingsworth-Segedy



hmmm...

From a habitat perspective, a typical bluegrass lawn offers very little in terms of shelter, cover, or food. Reduce your total area of lawn and try replacing thirsty bluegrasses with drought tolerant native turf grasses such as Blue grama grass (*Bouteloua gracilis*) or Buffalo grass (*Buchloe dactyloides*). Blue grama requires about 70% less water than Kentucky bluegrass! The native turf grasses can be left unmowed to create a low meadow that complements natural plantings and creates more structural diversity. They can also be mowed if you prefer a more manicured look. You can save money, save time, and protect the environment with a sustainable lawn.

Regardless of what type of grass you have, the following tips will help you conserve water and create a healthier landscape:

- **Mow high** Longer grass means deeper roots, hardier plants, and a reduced need for water. Go 3" or higher.
- **Water deeply** Reduce the number of times you water and water more deeply each time to encourage robust rooting.

Learn more about sustainable landscapes at waterwiseutah.org and www.conservewater.utah.gov.



This attractive blue grama grass lawn will need about **70% less water** than Kentucky bluegrass to keep it green and healthy throughout our local growing season.

Photo © C. Wood

Oh dear, the deer...

Plant selection is critical when deer are an issue. According to the Utah Division of Wildlife Resources, almost all foothill bench areas and many valley floors are traditional wintering and foraging areas for mule deer. Streamside ecosystems are excellent deer habitat and will therefore be the most heavily browsed. Luckily, many native plants are ecologically adapted to prefer the annual "pruning" provided by our antlered friends, and will bounce back vigorously. Other plants are naturally deer resistant.

For more information visit wildlife.utah.gov/habitat/deer-browse.php.

Don't dump debris

Keep it off the banks Anything stored on streambanks will eventually smother and kill existing riparian vegetation, whether it is trash or green waste such as grass clippings, branch prunings, and leaf piles. Hopefully by now we have impressed upon you the importance of healthy vegetation in the riparian zone. Loss of riparian plants degrades wildlife habitat and accelerates bank erosion when there are no longer plant roots helping to stabilize the banks. Excess erosion, in turn, leads to property damage and potential property loss. It also impacts aquatic habitat. When excess sediment flushes downstream it reduces the sunlight available to aquatic plants and smothers fish eggs.

Keep it out of the stream Serious problems also arise when debris gets into the stream. Stream levels can rise dramatically during storm events and spring runoff, and any debris on the banks will get carried downstream. Grass clippings, tree branches, construction materials, etc. blocks culvert openings and gets hung up on bridges. This can cause flooding and property damage for you and/or your downstream neighbors. In addition, excess amounts of organic matter (grass, leaves, etc.) depletes dissolved oxygen in water because organic matter uses oxygen as it decomposes. This can have serious impacts on fish, insects and other aquatic life that need oxygen to survive.

County Flood Control is here to help Trash grates help prevent the damage that can be caused by debris in urban streams. Salt Lake County Flood Control crews check and clean the grates before, during, and after storms. Approximately 70% of all the debris removed from the grates is “manmade”, including things such as pruned tree branches and cut tree trunks. This can get as high as 90% in the spring. In addition to debris removal during storms, the crews walk every stream that is considered a “flood control facility” (which is just about all of them) to survey and remove problem trees, branches, and trash. Maintenance of flood control facilities is mandated per Title 17 of the Salt Lake County Code of Ordinances.

Bottom line, be a good stream steward and properly dispose of your debris. Don't dump it in the creek. Don't store it on the streambank. This will go a long way toward protecting stream health and preventing property damage.

For a list of yard waste disposal resources in Salt Lake County, see [FOR MORE INFO](#).



Before you start

Before beginning any stream enhancement, bank stabilization, landscaping or building project, be sure to check with the various agencies that regulate work in and around streams.

See **PLAN APPROVAL AND PERMITS** for more information.

Erosion prevention

Erosion is a natural stream process. When left to its own devices, a stream channel is a dynamic thing. Banks move and erosive forces shape, and reshape, the channel and floodplain. Soils scour out here and deposit there in a healthy balance. Sediments deliver nutrients that support aquatic life. But when development and urbanization put stresses on natural stream systems, erosion can accelerate beyond the norm. This leads to decreased bank stability, a diminished capacity to handle flood waters, and excess sediment clouding of the stream. In other words, excess erosion can cause property damage and degrade water quality and habitat.

One of your best defenses against eroding streambanks is to maintain and protect existing vegetation in the riparian zone along your stream. Here are some additional erosion control strategies:

- Enhance your riparian buffer with more native trees, shrubs, and ground story plants.
- Protect bare and disturbed soils during construction, especially on steeper slopes. Use erosion control fabrics and replant as quickly as possible.
- Assess activities that can degrade vegetation, such as trampling by animals and humans.
- Homesite and landscape planning should always respect the riparian zone and the floodplain. Don't encroach!

Stream restoration

A healthy buffer of plants in the riparian zone may not always be enough to prevent damage to streambanks. In some cases there is simply not enough land to work with. Perhaps the bank instability is too severe, or the stream conditions too challenging. In these instances more engineered restoration techniques may be needed—both on the banks and in the stream. Incorrect installations can aggravate problems or cause new problems downstream. See **PLAN APPROVAL AND PERMITS** for more information.

Natural channel design uses the principles of fluvial geomorphology (the processes and pressures that shape river systems) to evaluate the potential for a degraded stream to be restored to its historic stable form. The end result is a self-sustaining stream system that provides valuable hydraulic (water transport), geomorphic (sediment erosion and transport) and ecological (habitat, water quality) functions. In a healthy system, a stream will overflow its base flow channel every 1.5 years (on average). This allows pollutants to be processed on the floodplain, riparian plants to flourish, the flowing stream to be flushed of organic materials, and most stream functions of value to humans to be performed. In a degraded system, the channel has often eroded down so deeply that the stream is no longer connected to its

Flood damage in Little Cottonwood Creek, June 2010

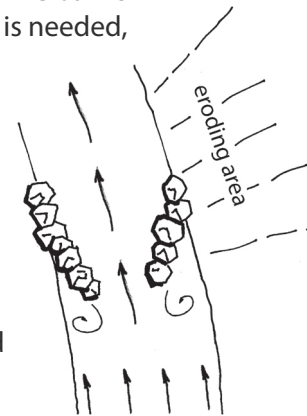
floodplain, except during the most extreme flood events. This limits stream functions and exacerbates bank erosion problems. Urban streams are commonly channelized and armored with rock or concrete to protect infrastructure built in the floodplain. While this is an effective local flood control method, it does not allow the stream to function as a natural system, and often increases problems downstream. Natural channel design techniques will vary depending on whether there is space adjacent to the channel to allow for increased water on the floodplain without damaging nearby infrastructure.

Streambank bioengineering is a restoration method that integrates living plants in bank stabilization, as opposed to using strictly inert materials (logs, rocks, etc). With their flexible stems and dense roots, the native willows and dogwoods that grow right at the water's edge are invaluable to help stabilize stream banks. The roots hold the soil together while above ground vegetation protects against flood damage by dissipating energy and acting as a buffer against the abrasive effects of sand, silt and rocks carried in the stream. These riparian shrubs thrive on the periodic "pruning" caused by seasonal high flows and browsing and will resprout vigorously. Branches that are broken off and carried downstream can take root anywhere along the stem, a feature that makes willows, dogwoods and cottonwoods an important component of streambank bioengineering projects. Cuttings can be harvested in large quantities and then installed in a variety of bioengineering applications, per site-specific needs.



Cuttings from dormant riparian shrubs are planted deep enough in streambank soils to reach the dry season water table. These "live stakes" are used in a variety of bioengineering techniques. Stem nodes underground will take root; nodes above ground will leaf out.

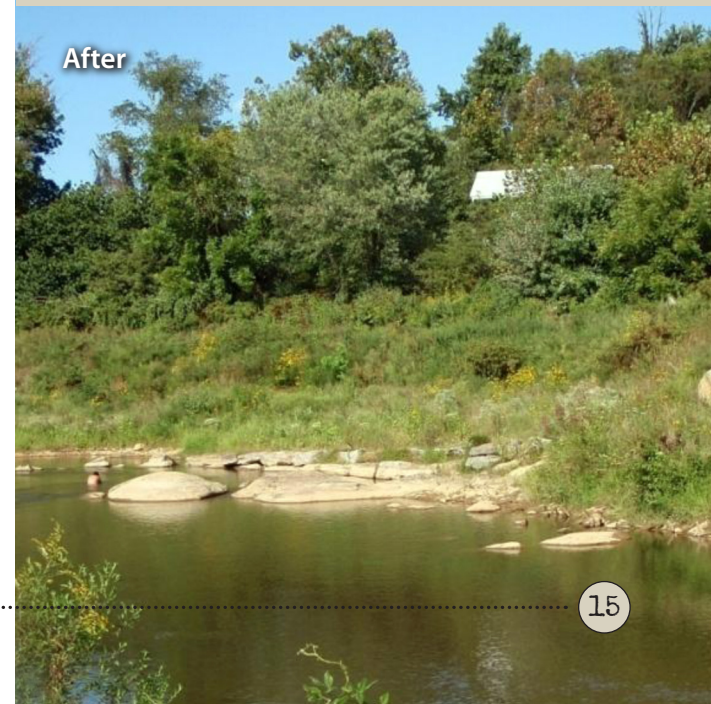
Rock is used in conjunction with plants to stabilize banks where velocities are high, long term durability is needed, immediate stabilization is needed, or there is significant threat to life or property. Rock is often used to protect the toe of the bank (where the stream bed meets the stream bank), which is the area of highest stress in the stream channel. Instream rock structures are used to deflect flow away from eroding streambanks, concentrate flow in the center of the channel, create pool habitat for fish, and encourage sediment deposition and scour.



When designed correctly, natural channel design and bioengineering projects require less maintenance, blend into and become part of the natural landscape over time, and ultimately reduce overall costs.



Bare and eroding banks are reshaped and revegetated in this stream restoration project that utilizes natural channel design techniques. (Photos: San Antonio River Authority)





Choosing native plants

Plants have evolved over the centuries to adapt to climate, elevation, soils, water and sunlight availability. Different species that are uniquely suited to similar conditions will form a distinct “community” of plants. With so much variation in elevation, temperature, and water availability, there are a great variety of plant communities in the Intermountain West.

The dominant plant communities found in Salt Lake County can be more or less roughly correlated with elevation, as follows:

- Subalpine and Alpine: 10,000 feet and higher
- Upper Montane: 9,000-10,000 feet
- Mid-Montane: 6,000-9,000 feet
- Foothill: 4,800-6,000 feet
- Valley: 4,200-4,800 feet

While elevation is a good climate predictor—lower elevations are generally hotter and drier, higher elevations are cooler and moister—other factors play a role in creating microclimates within the elevation zones. The north-facing slope of a canyon will support plants that prefer cooler and moister conditions, while the south-facing slope at the same elevation will support plants that favor warmer, drier conditions. Stream corridors are another type of microclimate, given the regular presence of water and a greater abundance of shade. This allows plants found along streams to transcend some of the boundaries dictated by climate and elevation. This is particularly true in the hottest and driest areas of the watershed, where the riparian corridor is visibly obvious as a “green ribbon” of trees and shrubs. Native plants of the Intermountain West occupy an amazing range of microhabitats.

Use the map of elevation zones in Salt Lake County (opposite) and the NATIVE PLANT LISTS (on the following pages) as a guide to determine which plants could be best suited for improving native plant diversity in your landscape. Use what you know about the unique microclimate of your property—sun, shade, water availability (do you have irrigation for the drier upper slopes?), soil type, etc.—to select plants that will thrive in your landscape.

Let’s say, for example, you live at the lower edge of the Foothill Zone (at approximately 4,900 feet) on a north-facing slope and you have a nice canopy of big shade trees along your stream. Your shady streamside microclimate may support plants that occur naturally at higher elevations (cooler, moister) in the Mid-Montane Zone.

Woods Rose (*Rosa woodsii*)

Photo ©Clinton Shock



Selecting Plants by Elevation Zone

The dominant plant communities found in Salt Lake County can be more or less roughly correlated with elevation. Use this map, and the native plant lists on the following pages, to identify the best plants for your landscape.

- Boundaries**
- Creek Watershed
 - Salt Lake County
 - Other County
- Elevation Zones**
- Subalpine & Alpine 10,000+ ft
 - Upper Montane 9,000-10,000 ft
 - Mid-Montane 6,000-9,000 ft
 - Foothill 4,800-6,000 ft
 - Valley 4,200-4,800 ft

See CREEK CLOSEUPS for detail maps of these creek watersheds.



Native plant lists

The following plant lists provide recommended native tree, small tree/shrub, and ground cover species for planting efforts in the riparian corridor. Included to help further refine your plant selections are: preferred sun, preferred moisture, tolerance to saline and/or alkaline soils, and the elevation zone(s) in which plants are naturally occurring in Salt Lake County. See CHOOSING NATIVE PLANTS for a discussion on how this can help with plant selection.

These plant lists are adapted from those included in the Salt Lake City Riparian Corridor Study Management Plans. Additional sources include Flora of the Central Wasatch Front; Waterwise-Native Plants for Intermountain Landscapes; Landscaping on the New Frontier-Waterwise Design for the Intermountain West; and the USDA PLANTS Database.

Note: Plants from the Subalpine and Alpine elevation zones are not included, given that no streamside residential properties are found in these zones.

Recommended native tree (canopy) species for planting within the riparian zone

Latin Name	Common Name(s)	Sun			Moisture			Tolerant of		Elev. Zones Where Naturally Occurring in Salt Lake County				Suitable as live cutting
		Full	Part Sun	Shade	Dry Upper Slopes	Seasonally Moist	Spring or Seep	Saline Soils	Alkaline Soils	Valley 4200-4800 ft	Foothill 4800-6000 ft	Mid-Montane 6000-9000 ft	UpperMontane 9000-10,000 ft	
<i>Abies concolor</i>	White fir	○	◐			✓						✓	✓	
<i>Acer glabrum</i>	Rocky Mountain maple	○	◐			✓						✓	✓	
<i>Acer grandidentatum</i>	Bigtooth maple	○	◐			✓					✓	✓	✓	
<i>Alnus incana</i>	Gray alder, Thinleaf alder	○				✓					✓	✓		
<i>Betula occidentalis</i>	Water birch	○	◐			✓					✓	✓		
<i>Celtis reticulata</i>	Netleaf hackberry	○	◐		✓	✓				✓	✓			
<i>Juniperus osteosperma</i>	Utah juniper	○			✓	✓					✓			
<i>Juniperus scopulorum</i>	Rocky Mountain juniper	○	◐		✓						✓	✓		
<i>Picea pungens</i>	Colorado blue spruce	○	◐			✓						✓		
<i>Pinus edulis</i>	Pinyon pine, Twoneedle pine	○			✓						✓	✓		
<i>Populus angustifolia</i>	Narrowleaf cottonwood	○				✓		✓		✓	✓	✓		✓
<i>Populus fremontii</i>	Fremont cottonwood	○				✓				✓	✓	✓		✓
<i>Populus tremuloides</i>	Quaking aspen	○				✓					✓	✓	✓	
<i>Prunus virginiana var. melanocarpa</i>	Black chokecherry	○	◐			✓		✓			✓	✓	✓	
<i>Pseudotsuga menziesii</i>	Douglas fir	○			✓						✓	✓	✓	
<i>Quercus gambelii</i>	Gambel oak	○	◐		✓			✓			✓	✓		
<i>Salix amygdaloides</i>	Peachleaf willow	○				✓				✓	✓			✓

Scarlet paintbrush
(*Castilleja miniata*)

Recommended native small tree, shrub, vine species for planting within the riparian zone

Latin Name	Common Name(s)	Sun			Moisture			Tolerant of		Elev. Zones Where Naturally Occuring in Salt Lake County				Suitable as live cutting
		Full	Part Sun	Shade	Dry Upper Slopes	Seasonally Moist	Spring or Seep	Saline Soils	Alkaline Soils	Valley 4200-4800 ft	Foothill 4800-6000 ft	Mid-Montane 6000-9000 ft	UpperMontane 9000-10,000 ft	
<i>Amelanchier alnifolia</i>	Saskatoon serviceberry		☉			✓				✓	✓	✓		
<i>Amelanchier utahensis</i>	Utah serviceberry	○	☉		✓	✓				✓	✓	✓		
<i>Artemisia tridentata</i>	Big sagebrush	○			✓	✓				✓	✓	✓		
<i>Atriplex confertifolia</i>	Shadscale	○			✓			✓	✓	✓				
<i>Ceanothus martinii</i>	Utah mountain-lilac	○	☉		✓	✓				✓	✓	✓		
<i>Ceanothus velutinus</i>	Snowbrush ceanothus	○			✓	✓				✓	✓			
<i>Cercocarpus ledifolius</i>	Curl-leaf mountain mahogany	○			✓					✓	✓	✓		
<i>Cercocarpus montanus</i>	Alderleaf mountain mahogany	○	☉		✓					✓	✓	✓		
<i>Chrysothamnus viscidiflorus</i>	Yellow rabbitbrush	○			✓					✓	✓	✓		
<i>Clematis ligusticifolia</i>	VINE Western virgin's bower	○	☉		✓	✓				✓	✓			
<i>Cornus sericea</i>	Red-osier dogwood	○	☉	●		✓	✓			✓	✓	✓		✓
<i>Crataegus douglasii</i>	Douglas hawthorn	○	☉			✓				✓	✓			
<i>Crataegus douglasii</i> var. <i>rivularis</i>	River hawthorn	○	☉			✓				✓	✓			
<i>Ericameria nauseosa</i> *	Rubber rabbitbrush	○			✓				✓	✓				
<i>Fallugia paradoxa</i>	Apache plume	○			✓					✓	✓	✓		
<i>Forestiera pubescens</i>	Stretchberry, New Mexico privet	○	☉		✓	✓				✓	✓			
<i>Lonicera involucrata</i>	Twinberry honeysuckle			●		✓					✓	✓		✓
<i>Lonicera utahensis</i>	Utah honeysuckle			●		✓					✓	✓		
<i>Mahonia repens</i>	Creeping oregon grape	○	☉	●	✓	✓				✓	✓	✓		
<i>Pachystima myrsinites</i>	Mountain lover, Oregon boxleaf		☉	●	✓	✓					✓	✓		
<i>Physocarpus malvaceus</i>	Mallowleaf ninebark		☉	●		✓				✓	✓	✓		
<i>Potentilla fruticosa</i>	Shrubby cinquefoil	○	☉		✓	✓				✓	✓	✓		
<i>Purshia tridentata</i>	Antelope bitterbrush	○			✓					✓	✓	✓		
<i>Rhus trilobata</i>	Skunkbush sumac, Oakleaf sumac	○	☉		✓	✓				✓	✓			
<i>Ribes aureum</i>	Golden currant	○	☉	●	✓	✓	✓			✓	✓			
<i>Ribes cereum</i>	Wax currant, Squaw currant	○	☉		✓	✓					✓	✓		
<i>Ribes inerme</i>	Whitestem gooseberry	○	☉		✓	✓			✓	✓	✓			
<i>Rosa woodsii</i>	Woods' rose		☉		✓	✓			✓	✓	✓			
<i>Rubus parviflorus</i>	Thimbleberry	○	☉	●	✓	✓				✓	✓	✓		
<i>Salix exigua</i>	Coyote willow, Narrowleaf willow	○	☉			✓	✓	✓	✓	✓	✓	✓		✓
<i>Salix lucida</i> ssp. <i>lasiandra</i>	Whiplash willow, Pacific willow	○	☉			✓				✓	✓	✓		✓
<i>Salix lutea</i> (also <i>Salix rigida</i>)	Yellow willow		☉			✓	✓		✓	✓	✓			✓
<i>Sambucus caerulea</i>	Blue elderberry	○	☉		✓	✓				✓	✓			
<i>Sambucus racemosa</i>	Red-berried elderberry	○	☉			✓					✓	✓		✓
<i>Sarcobatus vermiculatus</i>	Black greasewood	○			✓			✓	✓	✓				
<i>Shepherdia argentea</i>	Silver buffaloberry	○			✓	✓			✓	✓	✓			
<i>Sorbus scopulina</i>	Western mountain ash	○	☉			✓					✓	✓		
<i>Symphoricarpos oreophilus</i>	Mountain snowberry		☉		✓	✓				✓	✓	✓		

* formerly *Chrysothamnus nauseosus*

Recommended native ground story species (grasses, wildflowers) for planting within the riparian zone

Latin Name	Common Name(s)	Sun			Moisture			Tolerant of		Elev. Zones Where Naturally Occurring in Salt Lake County			
		Full	Part Sun	Shade	Dry Upper Slopes	Seasonally Moist	Spring or Seep	Saline Soils	Alkaline Soils	Valley 4200-4800 ft	Foothill 4800-6000 ft	Mid-Montane 6000-9000 ft	UpperMontane 9000-10,000 ft
<i>Anaphalis margaritacea</i>	Pearly everlasting	○	◐		✓	✓				✓	✓	✓	
<i>Apocynum cannabinum</i>	Indianhemp		◐			✓				✓	✓		
<i>Aquilegia coerulea</i>	Rocky Mountain columbine	○	◐			✓						✓	✓
<i>Aquilegia flavescens</i>	Yellow columbine	○	◐			✓					✓	✓	✓
<i>Aquilegia formosa</i>	Western columbine		◐	●		✓	✓						
<i>Artemisia ludoviciana</i>	White sagebrush, Prairie sage	○			✓					✓	✓	✓	✓
<i>Asclepias incarnata</i>	Swamp milkweed	○				✓				✓			
<i>Asclepias tuberosa</i>	Butterfly milkweed	○	◐		✓					✓	✓		
<i>Balsamorhiza sagittata</i>	Arrowleaf balsamroot	○			✓						✓	✓	✓
<i>Castilleja chromosa</i>	Desert paintbrush	○			✓					✓	✓		
<i>Castilleja miniata</i>	Scarlet paintbrush	○				✓					✓	✓	✓
<i>Erigeron speciosus</i>	Aspen fleabane, Showy daisy	○	◐		✓	✓						✓	✓
<i>Geranium richardsonii</i>	Richardson geranium		◐			✓					✓	✓	✓
<i>Geranium viscosissimum</i>	Sticky geranium	○	◐		✓	✓					✓	✓	✓
<i>Heterotheca villosa</i>	Hairy false goldenaster	○			✓	✓				✓	✓	✓	
<i>Linum lewisii</i>	Prairie flax, Lewis flax	○			✓	✓					✓	✓	✓
<i>Lupinus argenteus</i>	Silvery lupine	○	◐		✓	✓				✓	✓	✓	✓
<i>Maianthemum racemosum</i>	Feathery false lily-of-the-valley			●		✓				✓	✓	✓	✓
<i>Maianthemum stellatum</i>	Starry false lily-of-the-valley			●		✓					✓	✓	✓
<i>Monardella odoratissima</i>	Mountain beebalm	○	◐		✓	✓						✓	✓
<i>Osmorhiza occidentalis</i>	Western sweetroot		◐	●	✓	✓				✓	✓	✓	
<i>Penstemon cyananthus</i>	Wasatch penstemon	○	◐		✓	✓					✓	✓	✓
<i>Penstemon procerus</i>	Littleflower penstemon	○	◐		✓	✓						✓	✓
<i>Penstemon strictus</i>	Rocky Mountain penstemon	○			✓	✓						✓	✓
<i>Phlox longifolia</i>	Longleaf phlox	○	◐		✓					✓	✓		
<i>Polemonium foliosissimum</i>	Towering Jacob's ladder		◐			✓					✓	✓	✓
<i>Potentilla gracilis</i>	Showy cinquefoil	○	◐		✓	✓		✓		✓	✓	✓	✓
<i>Sphaeralcea coccinea</i>	Scarlet globemallow	○			✓			✓		✓	✓		
<i>Sphaeralcea grossulariaefolia</i>	Gooseberry globemallow	○			✓			✓		✓	✓		
<i>Thalictrum fendleri</i>	Fendler's meadow-rue	○	◐			✓						✓	✓
GRASSES & GRASS-LIKE:													
<i>Achnatherum hymenoides</i>	Indian ricegrass	○			✓				✓	✓	✓	✓	
<i>Aristida purpurea</i>	Purple threeawn	○			✓	✓		✓	✓	✓	✓		
<i>Bolboschoenus maritimus</i>	Alkali bulrush	○	◐	●		✓	✓	✓	✓	✓	✓		
<i>Carex nebrascensis</i>	Nebraska sedge	○	◐	●		✓	✓	✓	✓	✓	✓	✓	✓
<i>Distichlis stricta</i>	Desert saltgrass	○	◐			✓	✓	✓	✓	✓	✓		
<i>Elymus glaucus</i>	Blue wildrye		◐			✓				✓	✓	✓	✓
<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	Slender wheatgrass	○						✓		✓	✓	✓	✓
<i>Juncus arcticus</i>	Arctic rush, Baltic rush	○					✓	✓	✓	✓	✓	✓	✓
<i>Juncus torreyi</i>	Torrey's rush	○					✓	✓		✓	✓	✓	
<i>Leymus cinereus</i>	Great Basin wildrye	○			✓	✓		✓	✓	✓	✓	✓	
<i>Poa fendleriana</i>	Muttongrass	○	◐		✓						✓	✓	✓
<i>Poa secunda</i>	Sandberg bluegrass	○	◐		✓	✓		✓	✓	✓	✓	✓	✓
<i>Pseudoroegneria spicata</i>	Bluebunch wheatgrass	○			✓						✓	✓	✓
<i>Sporobolus airoides</i>	Alkali sacaton	○			✓	✓		✓	✓	✓			
<i>Sporobolus cryptandrus</i>	Sand dropseed	○			✓	✓		✓	✓	✓	✓		

A word about weeds

There are a number of aggressive weeds that have invaded the landscapes of Salt Lake County. Most are non-native plant species that were originally planted for ornamental or agricultural uses. As these plants naturalize into local ecosystems, their seeds move up and down stream corridors carried by water, wind, and wildlife. With a lack of native controls (insects, disease, etc.), the most successful invasive weeds will ultimately displace native plants to become the dominant vegetation. This has serious impacts on ecosystem health by decreasing biodiversity and ultimately contributing to increased erosion potential.

Many invasives are listed as **noxious weeds**, a legal designation by federal, state, or county governments for plants that are considered injurious to public health, agriculture, recreation, wildlife, or property. Many of the worst invaders are listed as noxious, but not all. Regardless of their classification, *please* don't plant or maintain invasive plants. Get to know their identifying features and eradicate them from your landscape!

Learn more about weed identification and control methods from the Salt Lake County Weed Control Program, weeds.slco.org.

Common riparian invasives (photo credits on pag 57)

Latin Name(s)	Common Name(s)	Listed Noxious Weeds		
		State of Utah	Salt Lake County	Other Species to Avoid
<i>Cardaria draba</i>	Hoary cress, Whitetop	✓	✓	
<i>Carduus nutans</i>	Musk thistle	✓	✓	
<i>Chrysanthemum leucanthemum</i>	Oxeye daisy	✓	✓	
<i>Cirsium arvense</i>	Canada thistle	✓	✓	
<i>Conium maculatum</i>	Poison Hemlock	✓	✓	
<i>Convolvulus spp.</i>	Field bindweed	✓	✓	
<i>Cynoglossum officinale</i>	Houndstongue	✓	✓	
<i>Euphorbia esula</i>	Leafy spurge	✓	✓	
<i>Hypericum perforatum</i>	St. Johnswort	✓	✓	
<i>Isatis tinctoria</i>	Dyer's woad	✓	✓	
<i>Lepidium latifolium</i>	Perennial pepperweed, Tall whitetop	✓	✓	
<i>Linaria dalmatica</i>	Dalmation toadflax	✓	✓	
<i>Linaria vulgaris</i>	Yellow toadflax	✓	✓	
<i>Lythrum salicaria</i>	Purple loosestrife	✓	✓	
<i>Onopordum acanthium</i>	Scotch thistle	✓	✓	
<i>Potentilla recta</i>	Sulfur cinquefoil	✓	✓	
<i>Tamarix ramosissima</i>	Saltcedar, Tamarisk (Tree/Shrub)	✓	✓	
<i>Alliaria petiolata</i>	Garlic mustard		✓	
<i>Euphorbia myrsinites</i>	Myrtle spurge		✓	
<i>Ailanthus altissima</i>	Tree of heaven (Tree)			✓
<i>Arctium minus</i>	Common burdock			✓
<i>Cirsium vulgare</i>	Bull thistle			✓
<i>Elaeagnus angustifolia</i>	Russian olive (Tree/Shrub)			✓
<i>Galega officinalis</i>	Goatsrue			✓
<i>Hedera helix</i>	English ivy			✓
<i>Phragmites australis</i>	Common reed			✓
<i>Robinia pseudoacacia</i>	Black locust (Tree)			✓
<i>Solanum dulcamara</i>	Bittersweet nightshade			✓
<i>Ulmus parvifolia</i>	Chinese elm (Tree)			✓
<i>Ulmus pumila</i>	Siberian elm (Tree)			✓
<i>Vinca minor, Vinca major</i>	Periwinkle			✓



Garlic mustard



Saltcedar



Phragmites



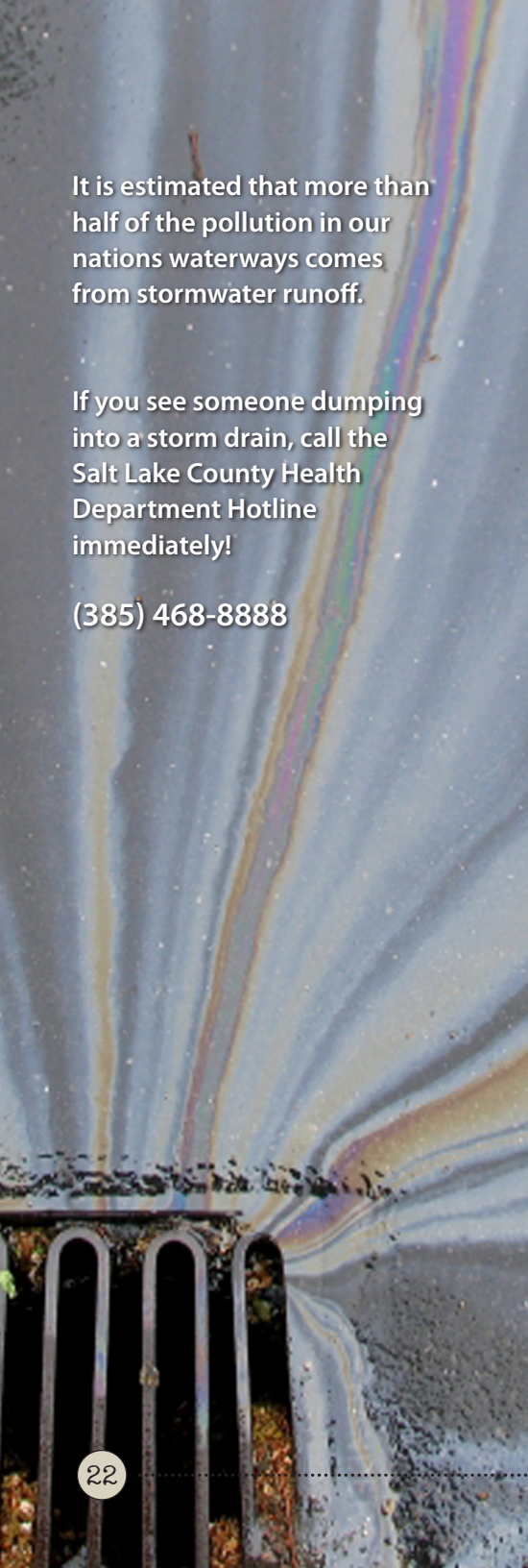
Bittersweet nightshade



Purple loosestrife



Hoary cress, Whitetop



It is estimated that more than half of the pollution in our nations waterways comes from stormwater runoff.

If you see someone dumping into a storm drain, call the Salt Lake County Health Department Hotline immediately!

(385) 468-8888

The storm drain connection

When water flows across our lawns, driveways, and roads (rain, melting snow, etc.) it picks up fertilizers, pet waste, engine oil, and more. It's called **stormwater runoff** and the pollutants it carries are transported straight to our streams, rivers, and lakes. No filters. No treatment. The storm drain system flows *directly* to our local waterways. This differs from the sanitary sewer system that your house is connected to, where wastewater is sent to a treatment plant. Even soil can be considered a pollutant when excess sediment washes into the storm drain and clouds up our waterways.

Stormwater runoff is a major cause of water pollution in our nation's waterways, and one that is extremely difficult to regulate. We all contribute to pollutants in runoff, and we can all help protect our water quality.

Tips for keeping pollution out of the storm drain:

Landscape

- Adjust sprinkler heads to spray only lawn and garden areas, not onto driveways and roads.
- Keep fertilizers and other garden chemicals off driveways and sidewalks. Sweep up any excess.
- Use only as much fertilizer as needed, preferably natural/biodegradable products.
- Use natural/non-toxic methods to control garden pests. If pesticides or herbicides are needed, check with local nurseries for products that are registered for use near water.
- Use native and drought-tolerant plants to reduce the need for fertilizer and watering.
- Mow lawns at least 3" high for deeper and healthier roots that reduce irrigation needs and runoff potential.
- Mulch or compost yard debris (grass, leaves, etc.) and keep them out of the storm drain.

Household

- Pick up after your pet. Their poop is not a natural fertilizer, it's bad for water quality and human health. Bag & trash it!
- Never dump household toxics (paint, cleaning products, engine oil, antifreeze, pesticides, medications etc.) down the storm drain.
- Wash your car on the lawn to keep soapy water out of the storm drain and give your lawn a nice soak! Even better, use a commercial carwash.
- Sweep dirt into the garden (don't wash down the storm drain); put debris in the trash.
- Minimize impervious surfaces on your property.
- Drain pool or spa water onto a lawn that can absorb it *without* runoff. To drain into your sewer clean-out (not storm drain!), contact your local sewer district for regulations. Or call a professional.
- Use sediment controls during construction, such as silt fences or straw bales, to keep soils onsite and out of the storm drain.

The real scoop on dog poop

No one likes seeing, smelling, or stepping in dog poop, but did you know that unscooped poop presents serious issues for water quality and human health?

The facts

- Pet waste is raw sewage. It can transmit bacteria, viruses, and other pathogens to humans and other animals, including tapeworm, roundworm, *E. Coli*, giardia, salmonella, and more.
- Four out of ten U.S. households have at least one dog, and four out of ten of those dog owners don't pick up after their dogs.
- Unscooped poop in yards, parks, and sidewalks gets into our lakes, streams and rivers, even into groundwater.
- Nutrients in pet waste cause excess algae in lakes and streams. This limits the light available to aquatic plants. Also, as algae decays it uses up oxygen needed by fish.
- Nine waterways in Salt Lake County have unhealthy levels of *E. Coli*: Emigration Creek, Parleys Creek, lower Mill Creek, lower Big Cottonwood Creek, lower Little Cottonwood Creek, Rose Creek, Bingham Creek, Midas Creek, and the Jordan River.*

What you can do

- Scoop weekly to keep your yard clean. Backyard poop is a big problem.
- Keep your dog on leash. Then stoop and scoop that poop. Every time.
- Bring baggies when you walk your dog, plus extras to share.
- Seal the bags and toss them in the trash.
- Never use pet waste in your garden or compost. It is not a natural fertilizer.

To all dog owners who keep their dogs on leash and scoop the poop, we say "thank you"! You are protecting water quality, wildlife, and the well-being of your fellow humans. Keep up the good work and give yourself a nice pat. You deserve it.

*per Salt Lake County Watershed Planning & Restoration water quality sampling program, samples collected monthly since 2010



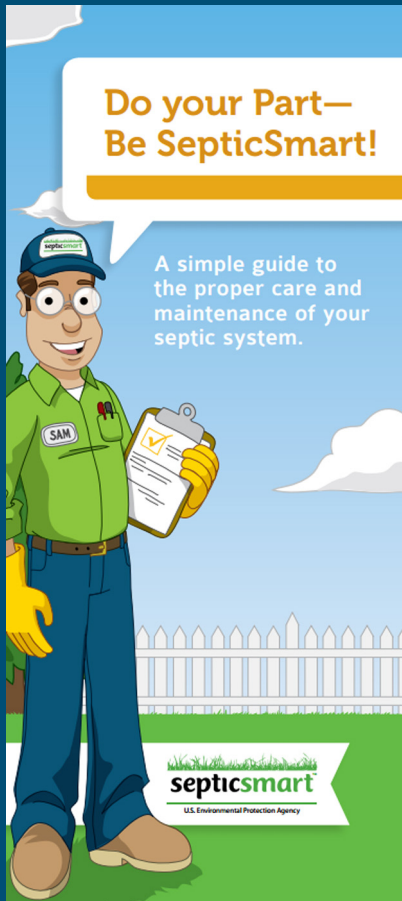
**I POOP.
You pick it up.
Any questions?**

Photo ©thepaperlesspages.com



**ummm...
anybody?**

Photo ©gospelofgoose.blogspot.com



Source: U.S. Environmental Protection Agency

For more information:

U.S. Environmental Protection Agency
SepticSmart Initiative
[water.epa.gov/infrastructure/septic/
septicSMART.cfm](http://water.epa.gov/infrastructure/septic/septicSMART.cfm)

Salt Lake County Health Department
www.water.slcohealth.org

Be smart about septic

Septic systems (also called onsite wastewater systems) are underground wastewater treatment structures used to treat household wastewater in areas without centralized sanitary sewer systems. A typical onsite system consists of a **septic tank** and a **drainfield** (or leachfield). Solids settle-out in the tank and liquid wastewater (effluent) flows to the drainfield where it percolates into the soil. The soil absorption process naturally removes harmful coliform bacteria, viruses, and nutrients.

If you have a septic system, it's extremely important to keep up with its proper care and maintenance. This is especially true for streamside properties where proximity to the stream and potential for periodic flooding must be carefully considered. There are concerns with water quality anytime onsite wastewater systems are less than 150 feet from waterways, especially with regard to aging systems and those built before stricter regulations about drainfield sizing and placement were put into place.

Here are four great reasons to ensure that your system is operating reliably:

It keeps your water clean and safe. A properly designed and maintained system helps keep your family's drinking water pure and reduces the risk of contaminating community, local, and regional waters.

It protects the environment. Malfunctioning septic systems release bacteria, viruses, and excess nutrients to local waterways, degrading local ecosystems and harming native plants and aquatic wildlife.

It saves you money. Malfunctioning systems can cost thousands of dollars to repair or replace, as compared with maintenance costs of only hundreds of dollars. A typical septic system should be inspected at least every three years by a licensed contractor and your tank pumped as recommended (generally every three to five years).

It protects the value of your home. Malfunctioning septic systems can drastically reduce property values, hamper the sale of your home, and even pose a legal liability.

Livestock keeping

If not managed properly livestock can cause serious damage to stream ecosystems trampling vegetation and destroying streambanks. In addition, animal waste degrades water quality by adding excessive nutrients and bacterial pollution.

Protect sensitive areas

- Minimize trampling damage with designated stream access points and crossings, created with wildlife-sensitive fencing and appropriate streambank and streambed hardening measures. Also, incorporate the use of off-stream watering troughs.
- Plant and maintain a riparian buffer between streams and all livestock keeping activities—including pastures, barnyards, paddocks, and manure storage areas. This vegetated buffer will help to filter and minimize nutrient-rich runoff, while providing wildlife habitat and all the other wonderful benefits of a healthy riparian area!
- Don't ride horses up and down stream beds, keep them off streambanks, and use designated crossings whenever possible.
- When a designated stream crossing is not available, ride straight across to minimize trampling of streambanks. Avoid crossing at shallow riffles in spring and early summer to avoid trampling fish nests.

Manage manure piles

- Keep manure piles at least 100 feet away from streams and other waterways, and make sure they do not drain towards waterways.
- Collect and compost stockpiled manure on a regular basis.

Manage grazing

- Use cross-fencing and pasture rotation to prevent overgrazing, soil compaction, and soil erosion during wet weather.
- Use fencing to prevent animals from grazing in riparian corridors

Contact the Salt Lake County Conservation District for more information on livestock keeping practices (see RESOURCES). To learn more about repairing damaged streambanks, see STREAMBANK RESTORATION.



riparian
buffer

Photo © Southern Appalachian Highlands Conservancy

creek closeups



In this section we take a closer look at the Jordan River and its thirteen tributary streams. Detail maps, creek facts, and watershed facts provide interesting background information to help you get to know your creek a little better.

Photos from upper (canyon) and lower (valley) sections of the creeks clearly illustrate the difference between relatively undisturbed stream ecosystems and ones that have been impacted (quite drastically in most cases) by development.

A profile graph for each stream illustrates the change in elevation along the stream bed, from the Jordan River up to its origin. Local landmarks are included on the profile graphs and the creek maps for reference. The profiles highlight the differences in stream gradient between streams in Salt Lake County, especially when comparing the east and westside streams.

The stream flow measurements used to compile the Average Peak and Average Low Flows, are taken from Salt Lake County stream gages located near the mouths of the canyons.

Elevation zones are included on the maps as a guide to help select native plants that would be found naturally along your stream. Protecting existing native vegetation and improving native plant diversity in the riparian zone are two of the best things you can do to care for your stream. Selecting the right plants for the right place is a great way to ensure a healthy and thriving riparian buffer in your backyard. See CHOOSING NATIVE PLANTS for more information on this topic.

Eastside Creeks* 28

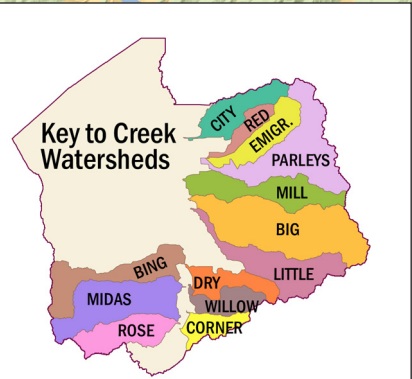
City Creek.....	28
Red Butte Creek	30
Emigration Creek.....	32
Parleys Creek.....	34
Mill Creek	36
Big Cottonwood Creek.....	38
Little Cottonwood Creek	40
Dry Creek.....	42
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Westside Creeks* 46

Bingham Creek.....	46
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Rose Creek	48

Jordan River 50

**creeks are listed in geographic order, from north to south*



- #### Boundaries
- Creek Watershed
 - Salt Lake County
 - Other County
 - Salt Lake City Drinking Water Source Protection Area
- #### Elevation Zones
- Subalpine & Alpine 10,000+ ft
 - Upper Montane 9,000-10,000 ft
 - Mid-Montane 6,000-9,000 ft
 - Foothill 4,800-6,000 ft
 - Valley 4,200-4,800 ft

Salt Lake City regulates several canyons in the Wasatch Range as **Drinking Water Source Protection Areas**. Dogs and horses are strictly forbidden in these areas. The protected canyons include: City Creek (upper canyon), Parleys Creek (upper), Big Cottonwood, Little Cottonwood, and Bells Canyon.



City Creek Canyon Nature Preserve
upper City Creek



Memory Grove Park
lower City Creek

Eastside creeks

Streams of the Wasatch Front have their headwaters high in the Wasatch Range. The upper sections of the creek watersheds, generally from the canyon mouth up, are characterized by open spaces that are managed for forest land, recreation, and protection of water supply resources. Steep mountain canyons set the stage for high flows during the spring snowmelt season, which ranges from April through July depending on elevation and snowpack.

City Creek

The City Creek Watershed is located in the northeast corner of Salt Lake County in the Wasatch Mountains. The upper portion of City Creek Canyon has changed little since when the first pioneers arrived in 1847. City Creek was Salt Lake City's first drinking water source, and remains a major source of potable water. The canyon is a protected watershed and is managed according to guidelines designed to protect and sustain water quality. Therefore no dwellings or overnight camping are allowed in City Creek Canyon.

The City Creek watershed is a highly used and coveted recreational area. In 1985, the Salt Lake City Council adopted the City Creek Canyon Master Plan, which led to its designation as a Nature Preserve and annexation of the entire Canyon into the City. In City Creek Canyon, people enjoy recreational activities such as picnicking, hiking, biking, and wildlife observation. Dogs are permitted below the City's water treatment plant in the City Creek Canyon Nature Preserve; however, they must be on leash due to the high level of multiple uses in the canyon and the protective management of the Nature Preserve.

In addition to City Creek Canyon, the lower City Creek watershed includes several undeveloped gulches and an urbanized residential neighborhood on the lower mountain/valley interface. City Creek enters a pipe below Memory Grove Park that has open channel sections in the median between Canyon Road and Canyon Side Road, as well as through City Park. City Creek then enters the North Temple Conduit to the Jordan River.



WATERSHED FACTS

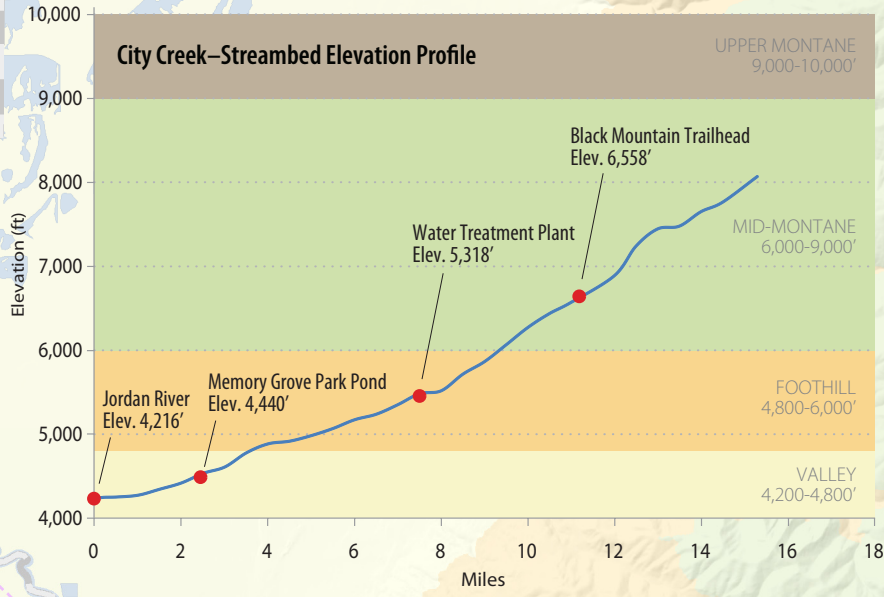
Basin Size: 24.7 sq. miles
Elevation Change: 3,500 feet

CREEK FACTS

Stream Length: 15.3 miles
Average Peak Flow: 45 cfs (late spring)
Average Low Flow: 3 cfs (winter)

cfs = cubic feet per second

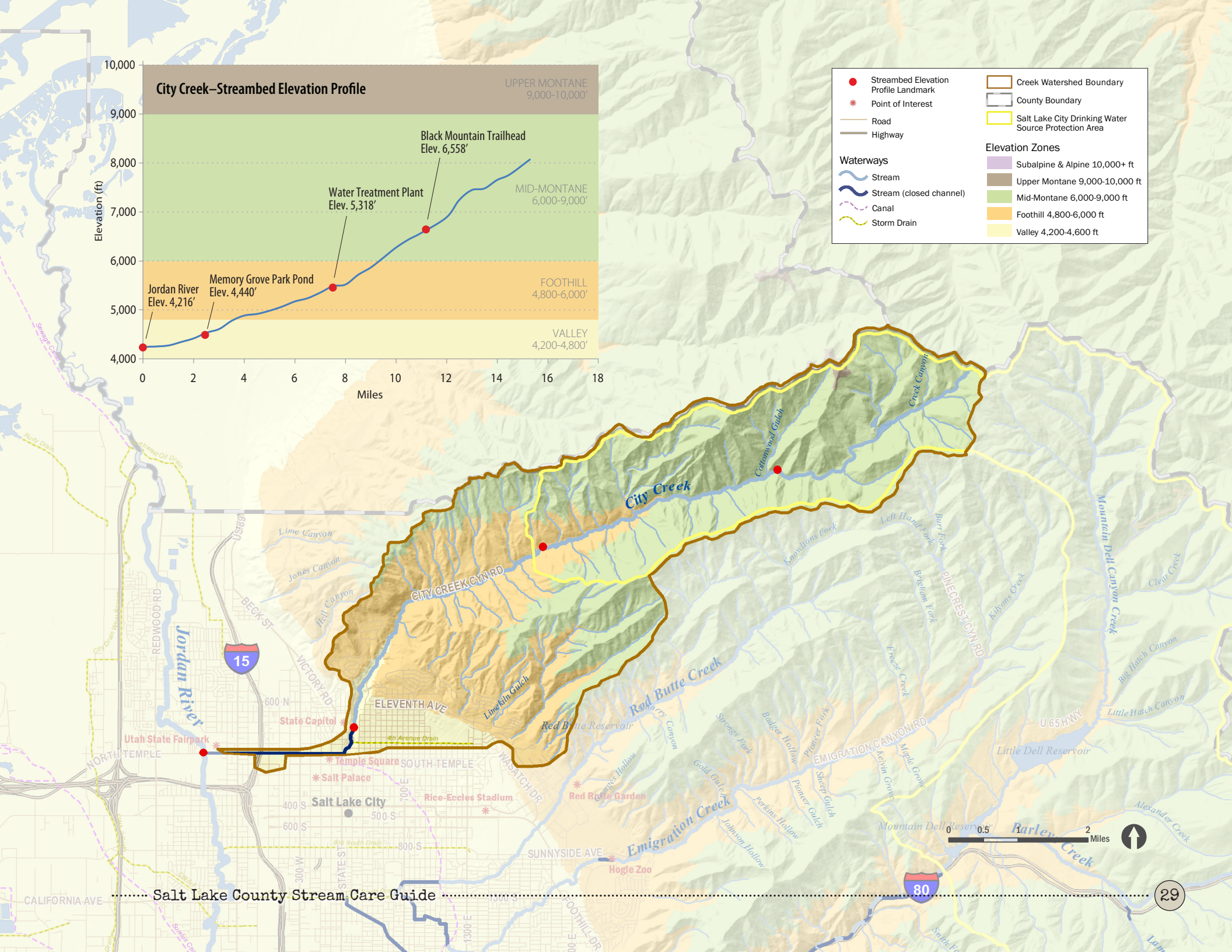
City Creek—Streambed Elevation Profile



● Streambed Elevation Profile Landmark	Creek Watershed Boundary
* Point of Interest	County Boundary
Road	Salt Lake City Drinking Water Source Protection Area
Highway	

Elevation Zones	
	Subalpine & Alpine 10,000+ ft
	Upper Montane 9,000-10,000 ft
	Mid-Montane 6,000-9,000 ft
	Foothill 4,800-6,000 ft
	Valley 4,200-4,600 ft

Waterways	
	Stream
	Stream (closed channel)
	Canal
	Storm Drain





Red Butte Natural Research Area
upper Red Butte Creek



Residential encroachment
lower Red Butte Creek

Red Butte Creek

In 1862, the United States Army established Fort Douglas at the mouth of Red Butte Canyon and utilized water from the creek. The canyon was also a source of red sandstone for building construction, and some of the historic sandstone buildings can still be seen today in the canyon and at Fort Douglas.

Red Butte Creek's **upper watershed** has remained mostly undeveloped over time. This 8.4 square mile area is comprised of moderately steep mountain slopes ranging from 5,000 to 8,200 feet in elevation. Since the creek was the primary water source for Fort Douglas, development and use was limited in the canyon to preserve water quality. The Red Butte Reservoir was built in 1930 as a water supply for Fort Douglas. Fort Douglas eventually switched to the Salt Lake City municipal water supply in 1991. Ownership and management for the reservoir was transferred to the Central Utah Water Conservancy District in 2004, which has focused on providing a long-term refuge for the June Sucker, an endangered fish. In 1969, the United States Forest Service assumed responsibility for approximately 83 percent of Red Butte Canyon with the remainder owned by Salt Lake City, University of Utah, and private individuals. The Forest Service designated much of upper Red Butte Canyon (5,370 acres) as the Red Butte Research Natural Area (RNA) in 1971, which is managed for research, observation, and study with public access limited to these purposes. In 1983, the University dedicated 150 acres at the mouth of the canyon as a regional botanical garden, the Red Butte Garden & Arboretum.

From the canyon mouth down to the Jordan River, the **lower watershed** drains 2.6 square miles comprised of the mountain/valley interface area from the Wasatch Mountains. University of Utah Campus and Research Park and residential properties are the primary land uses. At approximately 1100 East, the stream known as Red Butte Creek ceases to exist. It flows into an underground closed channel system, daylights briefly in the Liberty Park Lake and then continues to the Jordan River via the 1300 South Storm Drain.

In June 2010, 35,000 barrels of crude oil were released into Red Butte Creek from a quarter-sized break in Chevron Pipeline Company's crude oil line near Red Butte Garden & Arboretum and the Bonneville Shoreline trail. The riparian ecosystem of lower Red Butte Creek sustained serious damage, from both direct contact with toxic substances and disturbances caused by the subsequent cleanup. Restoration activities included revegetation and bank stabilization.



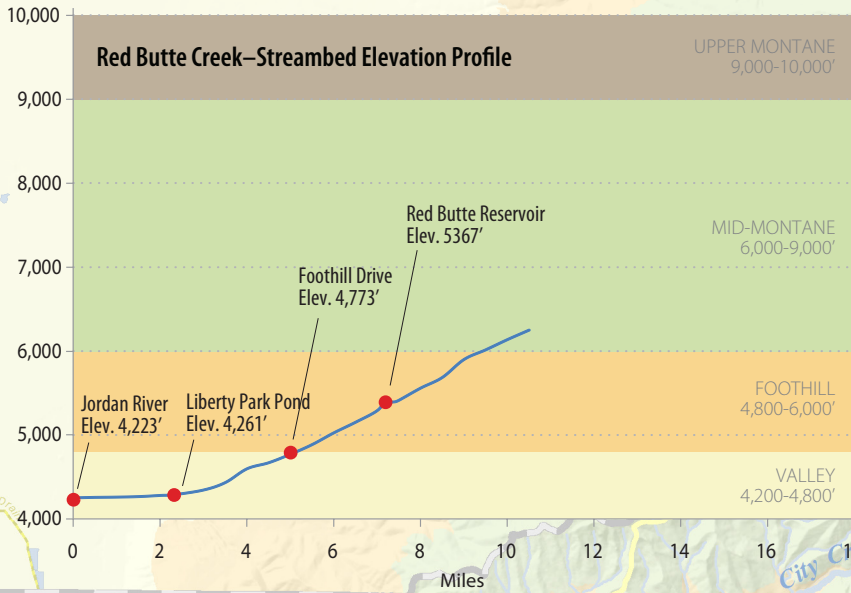
WATERSHED FACTS

Basin Size: 11.0 sq. miles
Elevation Change: 3,970 feet

CREEK FACTS

Stream Length: 10.5 miles
Average Peak Flow: 25 cfs (Apr)
Average Low Flow: 0-0.5 cfs (Aug)

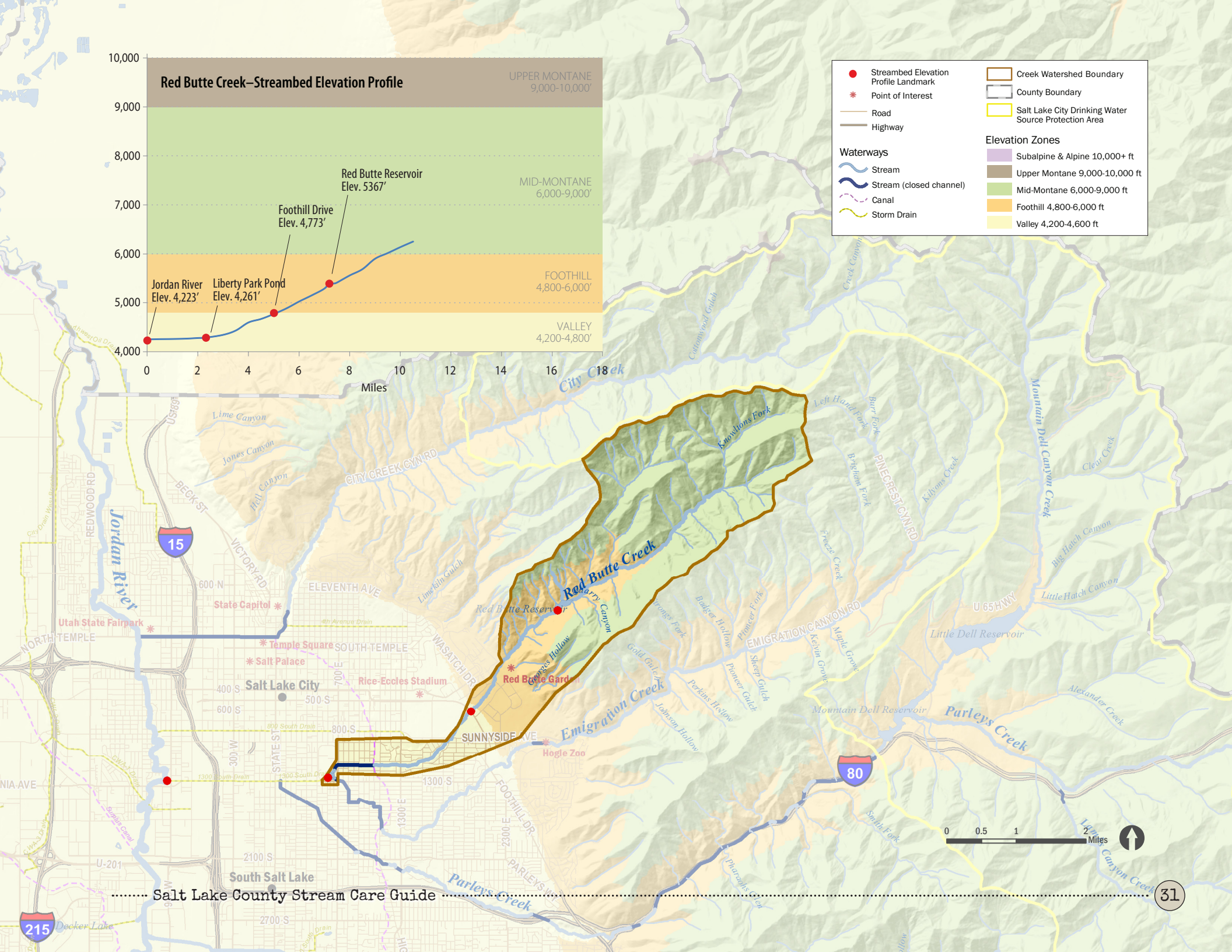
cfs = cubic feet per second



● Streambed Elevation Profile Landmark	▭ Creek Watershed Boundary
* Point of Interest	▭ County Boundary
— Road	▭ Salt Lake City Drinking Water Source Protection Area
— Highway	

Waterways	
	Stream
	Stream (closed channel)
	Canal
	Storm Drain

Elevation Zones	
	Subalpine & Alpine 10,000+ ft
	Upper Montane 9,000-10,000 ft
	Mid-Montane 6,000-9,000 ft
	Foothill 4,800-6,000 ft
	Valley 4,200-4,600 ft





Emigration Canyon
upper Emigration Creek



Residential encroachment
lower Emigration Creek

Emigration Creek

In 1846, the Donner-Reed Party cleared a trail in Emigration Canyon on its way to California. This was the primary route used by Mormon Pioneers to enter the Salt Lake Valley in 1847. The canyon was also part of the Federal Sheep Driveway used to drive sheep through to the Rio Grande Railroad station in Salt Lake City. A railroad line ran up the canyon, built in 1907, and was used for quarrying and transportation purposes until its closure in 1917. Today, the canyon is designated as a National Historic Place.

Emigration Creek is a perennial stream located in the northeast corner of Salt Lake County in the Wasatch Mountains. Headwaters commence in a small open valley at an elevation of approximately 6,000 feet. The creek receives tributary flow from Kilyons and Burr Fork canyons along with several mountain springs.

The **upper watershed** (from the canyon mouth upstream) drains 18.2 square miles with moderately steep mountain slopes ranging from 5,000 to 8,900 feet. Land use in the canyon includes primarily residential property, some National Forest land, Salt Lake County Open Space lands protected for high quality habitat (Kilyons Canyon and Perkins Flat properties), and limited commercial properties. Unlike other Wasatch Front canyons in Salt Lake County, Emigration Canyon maintains a large residential population. The highway through the canyon carries considerable traffic and provides access to Parleys and East Canyons. The upper end of the canyon above Burr Fork is protected for drinking water by Salt Lake City's Department of Public Utilities. Residential development is primarily serviced by private wells and septic systems and the canyon contains a groundwater recharge zone. The Utah Division of Wildlife Resources lists the creek as a good trout fishery, with native species including Bonneville cutthroat trout and introduced rainbow trout, although it is common for the creek to run dry between Camp Kostopolous and the Emigration Drain in Rotary Glen Park during certain times of the year. Streamside vegetation includes box elder, cottonwood, maple, scrub oak, dogwood, alder, river birch, willow, grasses, mustard, clover and serviceberry.

The **lower watershed** is primarily of residential and commercial development. Consistent with other highly urbanized areas, much of the native vegetation has been displaced due to encroachment into the floodplain and riparian zone, although in some areas box elder, gambel oak, willows, and june grass can be seen. Just west of the Westminster College campus (at approximately 1100 East) the stream flows underground into a closed channel, daylights briefly in Liberty Park Pond and then continues down to the Jordan River via the 1300 South storm drain.



WATERSHED FACTS

Basin Size: 24.0 sq. miles
Elevation Change: 4,670 feet

CREEK FACTS

Stream Length: 16.6 miles
Average Peak Flow: 30 cfs (late Apr)
Average Low Flow: dry-0.5 cfs (Aug)

cfs = cubic feet per second

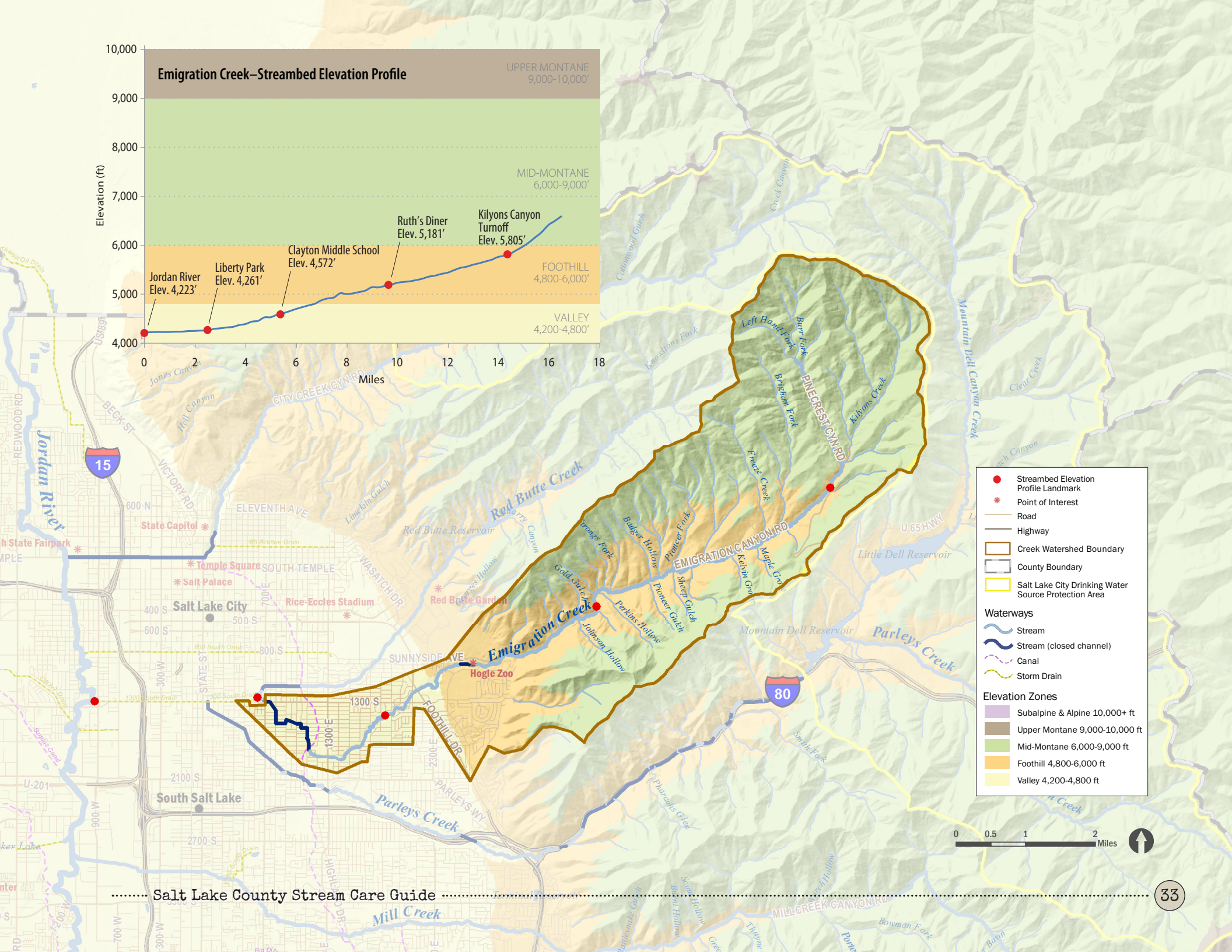
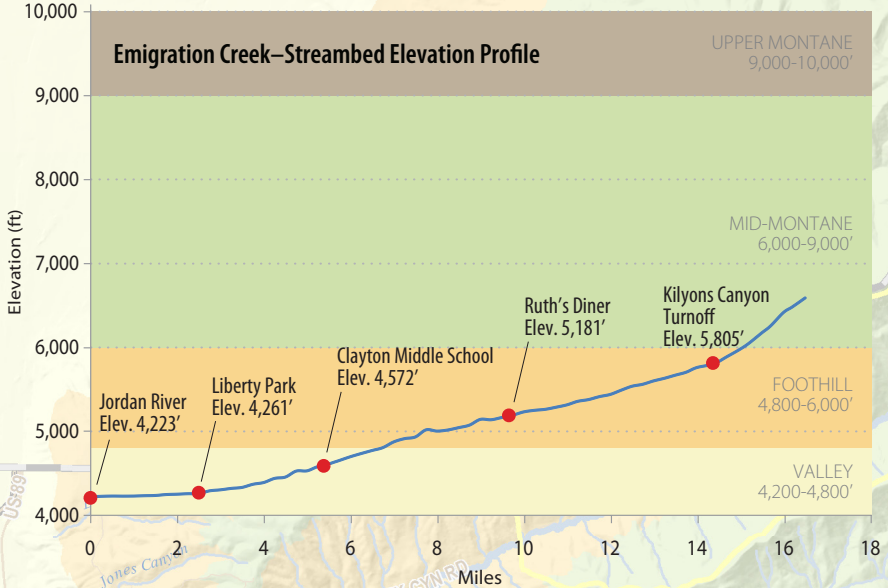
Emigration Creek—Streambed Elevation Profile

UPPER MONTANE
9,000-10,000'

MID-MONTANE
6,000-9,000'

FOOTHILL
4,800-6,000'

VALLEY
4,200-4,800'



- Streambed Elevation Profile Landmark
- * Point of Interest
- Road
- Highway
- ▭ Creek Watershed Boundary
- ▭ County Boundary
- ▭ Salt Lake City Drinking Water Source Protection Area

Waterways

- Stream
- Stream (closed channel)
- Canal
- Storm Drain

Elevation Zones

- Subalpine & Alpine 10,000+ ft
- Upper Montane 9,000-10,000 ft
- Mid-Montane 6,000-9,000 ft
- Foothill 4,800-6,000 ft
- Valley 4,200-4,800 ft





Near Summit Park
upper Parleys Creek



Sugarhouse Park
lower Parleys Creek

Parleys Creek

The Parleys Creek watershed is located in the northeast corner of the Wasatch Mountains and is the largest mountain drainage area near Salt Lake City. The watershed contains a total of 58.4 square miles. Initially named Big Canyon Creek by Brigham Young, the creek was renamed after Parley P. Pratt who explored the canyon for the purpose of building a toll road. Today, the canyon continues to be a major route into the Salt Lake Valley via Interstate 80.

The majority (89%) of the Parleys Creek watershed is upstream from the mouth of the canyon. This **upper watershed** covers 51.9 square miles and is comprised of moderate to steep mountain slopes ranging from 4,800 to 9,400 feet in elevation. The headwaters are subdivided into Mountain Dell Canyon and Lambs Canyon. Much of the water from Parleys Creek is diverted and stored in Little Dell and Mountain Dell Reservoirs. These structures were initially constructed for water supply and flood control purposes and are currently managed by the Salt Lake City Department of Public Utilities. Stored water is utilized to meet potable water and recreation needs as well as coldwater fishery habitat. Land in the upper watershed is a mix of private ownership and National Forest land, and is primarily used as a transportation corridor for I-80, with homes in Mount Aire (Smith Fork) and Lambs Canyon and developed recreational facilities for golf, cross country skiing, and picnicking. R.J. Harper has operated a quarry in the lower end of the canyon, adjacent to I-80, since the early 20th century. Parleys Creek water is used primarily for culinary purposes, and a large part of the upper Parleys Creek watershed is a protected drinking water source area for Salt Lake City. The treatment plant is located below Mountain Dell Reservoir. The dam is adjacent to Mountain Dell Golf Course, which is owned and operated by Salt Lake City.

The **lower watershed** (the portion of the watershed downstream from the canyon mouth) is 6.4 square miles of commercial development and residential neighborhoods, along with several local parks including Parleys Nature Park and Sugarhouse Park.



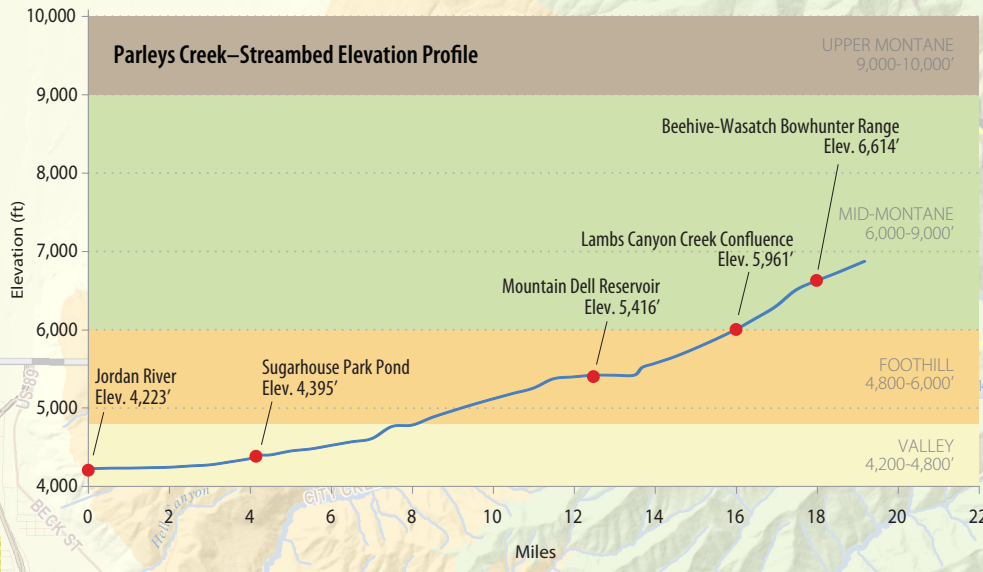
WATERSHED FACTS

Basin Size: 58.4 sq.miles
Elevation Change: 5,177 feet

CREEK FACTS

Stream Length: 19.2 miles
Average Peak Flow: 35 cfs (early May)
Average Low Flow: 1.5 cfs (Aug)

cfs = cubic feet per second



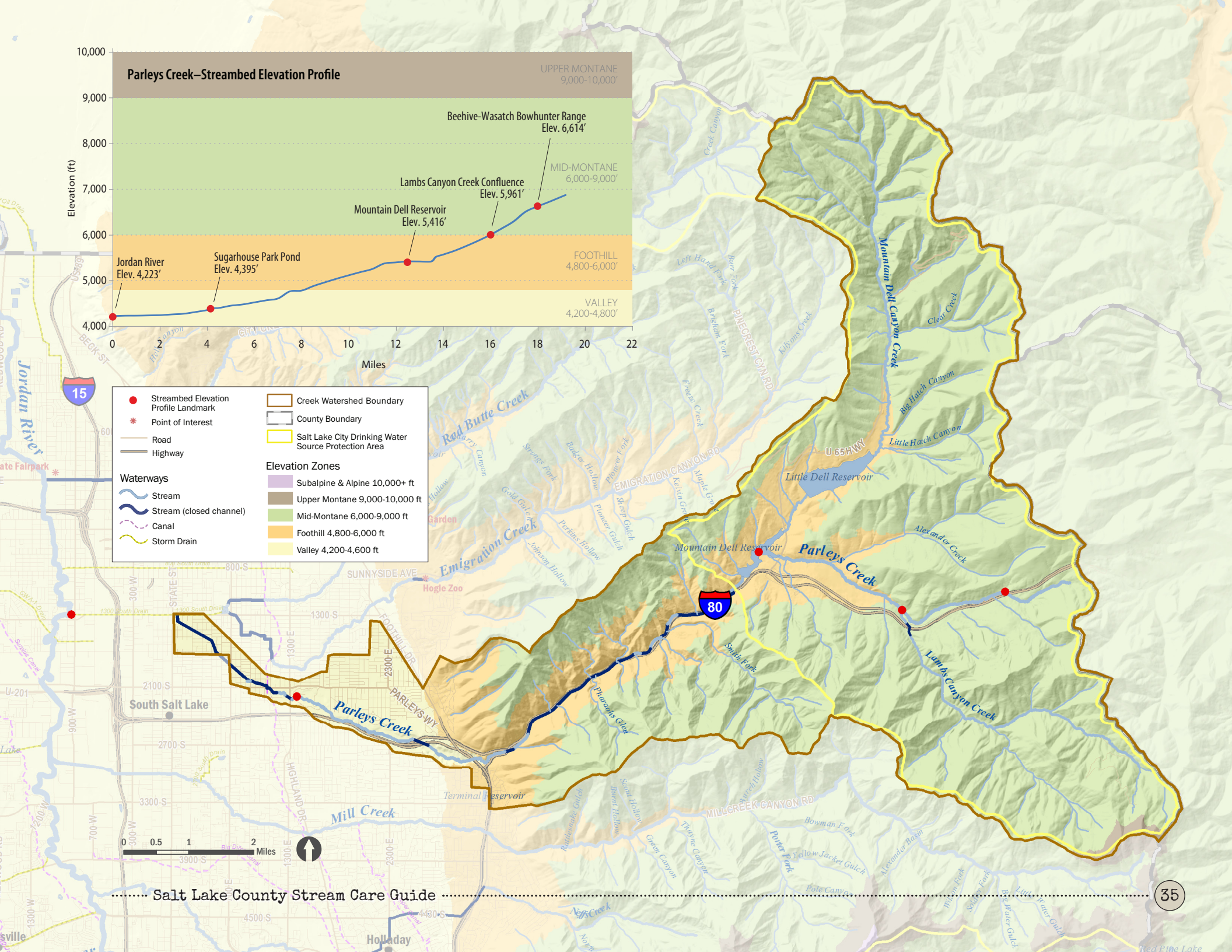
● Streambed Elevation Profile Landmark	▭ Creek Watershed Boundary
* Point of Interest	▭ County Boundary
— Road	▭ Salt Lake City Drinking Water Source Protection Area
— Highway	

Waterways

- Stream
- Stream (closed channel)
- Canal
- Storm Drain

Elevation Zones

- Subalpine & Alpine 10,000+ ft
- Upper Montane 9,000-10,000 ft
- Mid-Montane 6,000-9,000 ft
- Foothill 4,800-6,000 ft
- Valley 4,200-4,600 ft





Mill Creek Canyon
upper Mill Creek

Mill Creek

At one time Mill Creek had as many as 20 mills in operation. Today the canyon is a popular recreational destination for Salt Lake Valley residents including skiing, biking, hiking, and picnicking.

From the canyon mouth upstream, the **upper watershed** is 21.7 square miles of steep canyon slopes ranging in elevation from 5,100 to 10,200 feet in the Wasatch Mountain Range. Millcreek Canyon is managed forest land for recreational use such as hiking, biking, picnicking, camping, fishing and cross-country-skiing. In fact, more U.S. Forest Service picnic areas are found in this canyon than any other in the Salt Lake Valley. Currently, stream water is used for irrigation and not for culinary purposes, and is therefore not regulated as a drinking water source protection area by Salt Lake City. As a result, dogs are allowed in the canyon.

Prior to the 1990s, much of the canyon and the stream channel had been degraded, largely due to human activities. To address the damage from popular use, the U.S. Forest Service and Salt Lake County entered into an agreement to collect a fee for facilities repair and environmental improvement. Remediation has since been completed at several campground facilities and a fee station was installed. User fee revenues have been used for restoration and continued maintenance of the canyon and the creek's riparian zone.

Porter Fork and Church Fork are the two major tributaries of Mill Creek. Porter Fork is likely named for long time farmer and logger Porter Rockwell. This narrow, north-facing canyon includes a neighborhood of private homes and an exceptional diversity of native riparian plants. Other development includes cabins above the Firs Picnic Area, two restaurants, and a Boy Scout camp. Otherwise, there is little commercial development in the canyon.

The **lower watershed** drains 15.2 square miles of highly urbanized landscape. Increased commercial and industrial land uses are anticipated to occur on the east bench and closer to the Jordan River. High flows on Mill Creek usually come near the end of May through mid-June and rise six to 18 inches above base flow.



WATERSHED FACTS

Basin Size: 36.9 sq. miles
Elevation Change: 5,970 feet

CREEK FACTS

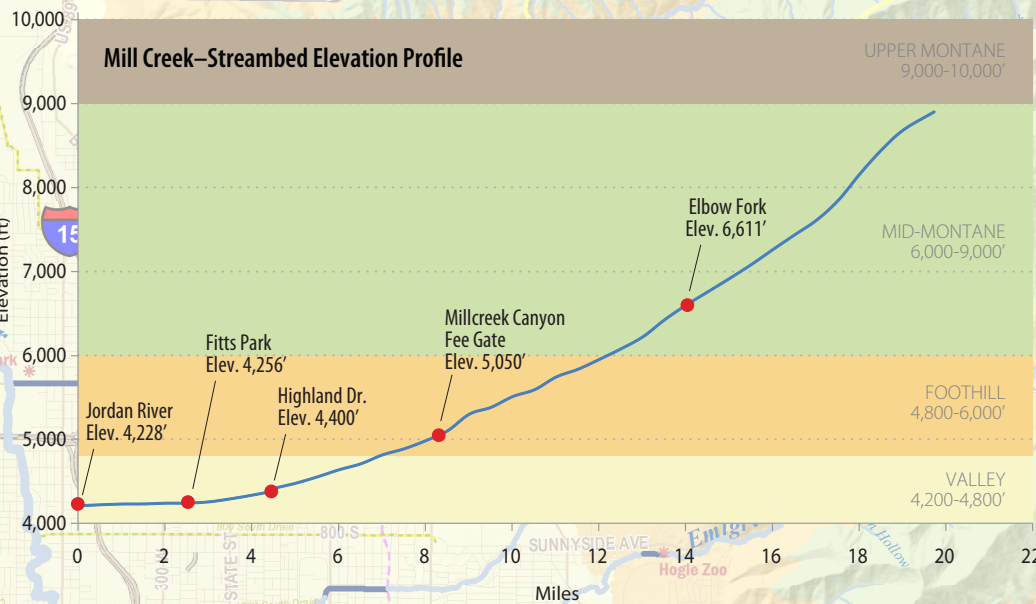
Stream Length: 19.7 miles
Average Peak Flow: 50 cfs (late May)
Average Low Flow: 5 cfs (Aug)

cfs = cubic feet per second



State Street
lower Mill Creek

Mill Creek—Streambed Elevation Profile



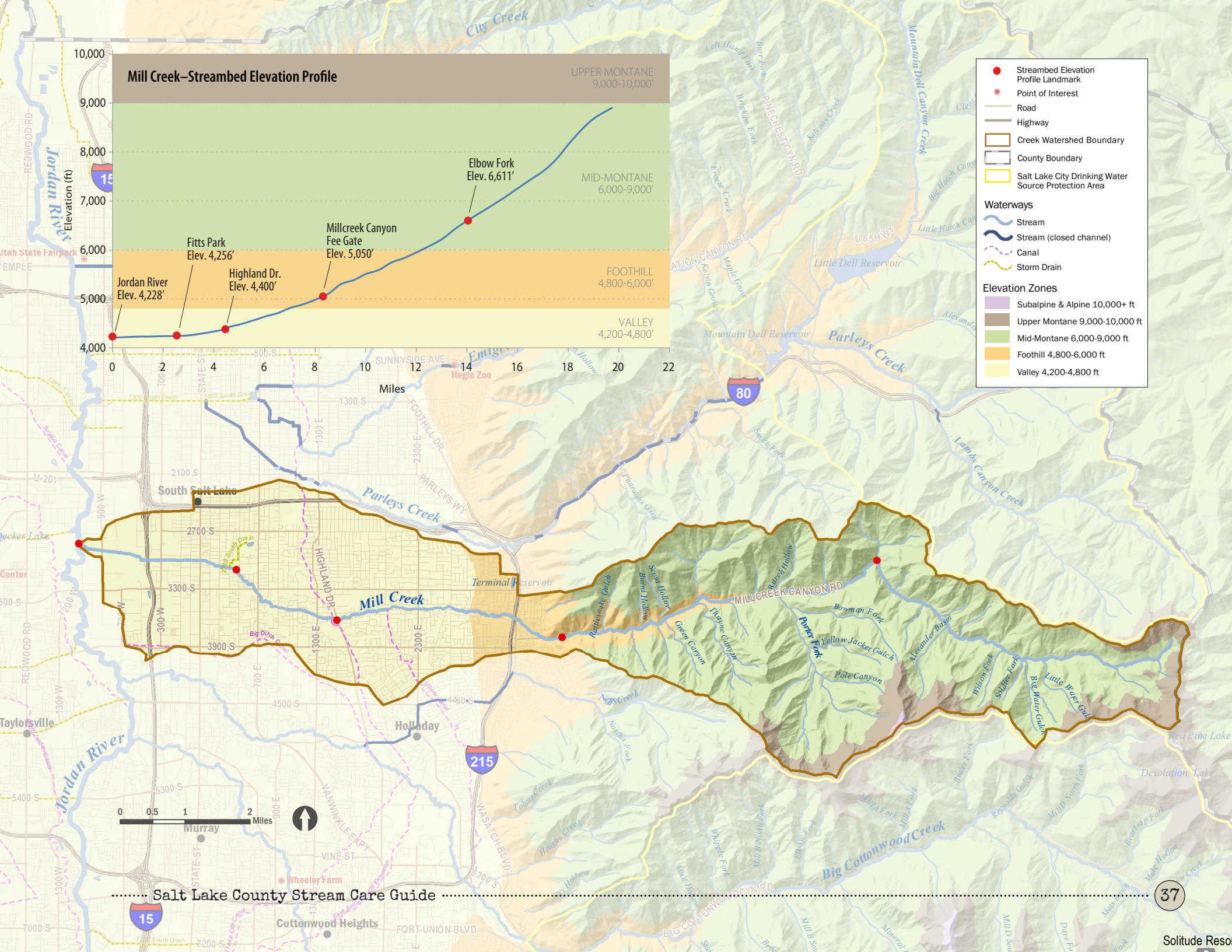
- Streambed Elevation Profile Landmark
- * Point of Interest
- Road
- Highway
- Creek Watershed Boundary
- County Boundary
- Salt Lake City Drinking Water Source Protection Area

Waterways

- Stream
- Stream (closed channel)
- Canal
- Storm Drain

Elevation Zones

- Subalpine & Alpine 10,000+ ft
- Upper Montane 9,000-10,000 ft
- Mid-Montane 6,000-9,000 ft
- Foothill 4,800-6,000 ft
- Valley 4,200-4,800 ft



..... Salt Lake County Stream Care Guide



Big Cottonwood Creek Canyon
upper Big Cottonwood Creek



Industrial park near State Street
lower Big Cottonwood Creek

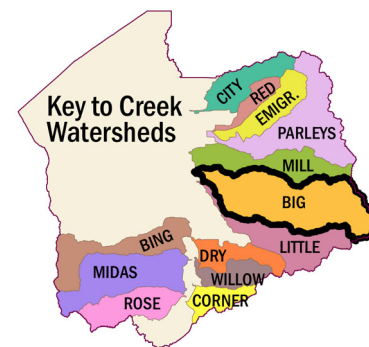
Big Cottonwood Creek

Big Cottonwood Creek Watershed is located between Mill Creek and Little Cottonwood Creek canyons and is highly used for recreational and culinary water purposes. The vast majority of upper Big Cottonwood Creek lies in unincorporated Salt Lake County, while much of the lower, urbanized stream runs through Cottonwood Heights, Murray, and Holladay cities.

The **upper watershed** is 50 square miles with elevations ranging from 5,000 to 10,500 feet. The headwaters of the creek is located at approximately 9,600 feet in a broad, glaciated basin and the creek descends 24.3 miles before emptying into the Jordan River. With the largest flow of any adjacent Wasatch canyon stream, Big Cottonwood Creek provides the largest source of drinking water to Salt Lake City, which owns 99% of the water rights. As a result, the canyon is a regulated as a drinking water source protection area. Dogs and horses are strictly forbidden in protected watershed areas. Although most of the canyon is owned and managed by the U.S. Forest Service, significant private land-holdings exist near the headwaters. In addition to the Brighton and Solitude Ski areas, there are roughly 600 private residences in the Silver Fork area.

The **lower watershed** drains 31.6 square miles with elevations ranging from 4,200 to 5,000 feet. In the urban environment of the valley portion of the watershed, the stream ecosystem has been degraded by runoff from urban land uses, illegal discharges, and hydrologic modification. Increased recreation and urban development pressures stress the stream with higher levels of storm water pollution and have resulted in a reduced ability to recharge groundwater. Development is primarily residential with some commercial and industrial development.

Early claims to Big Cottonwood Creek water predate the growth of cities. Managing the water for modern needs has led to intricate exchange agreements between cities with junior rights and irrigators with senior rights. In exchange for its rights to lower quality Utah Lake water, Salt Lake City treats the higher quality stream water at a treatment plant at the mouth of the canyon for culinary use. This diversion seasonally dewater four miles of the creek between the Canyon mouth downstream to Cottonwood Lane. The City makes up the diverted flow with canal exchanges between April and October, but from November through March, 50% of the valley creek segment is dry. From Cottonwood Lane downstream, late Autumn-Winter instream flow originates, supporting a reproducing brown trout fishery. The source of this small flow is likely groundwater discharge.



WATERSHED FACTS

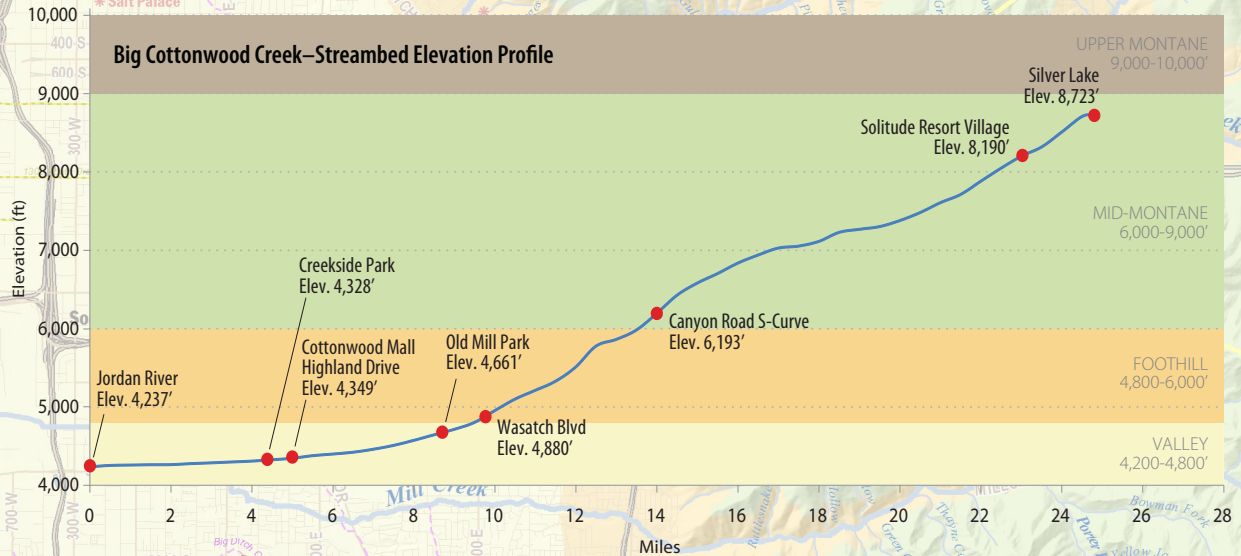
Basin Size: 81.6 sq. miles
Elevation Change: 6,263 feet

CREEK FACTS

Stream Miles: 24.8 miles
Average Peak Flow: 61-350 cfs (Jun)
Average Low Flow: 13-31 cfs (Dec)

cfs = cubic feet per second

Big Cottonwood Creek—Streambed Elevation Profile



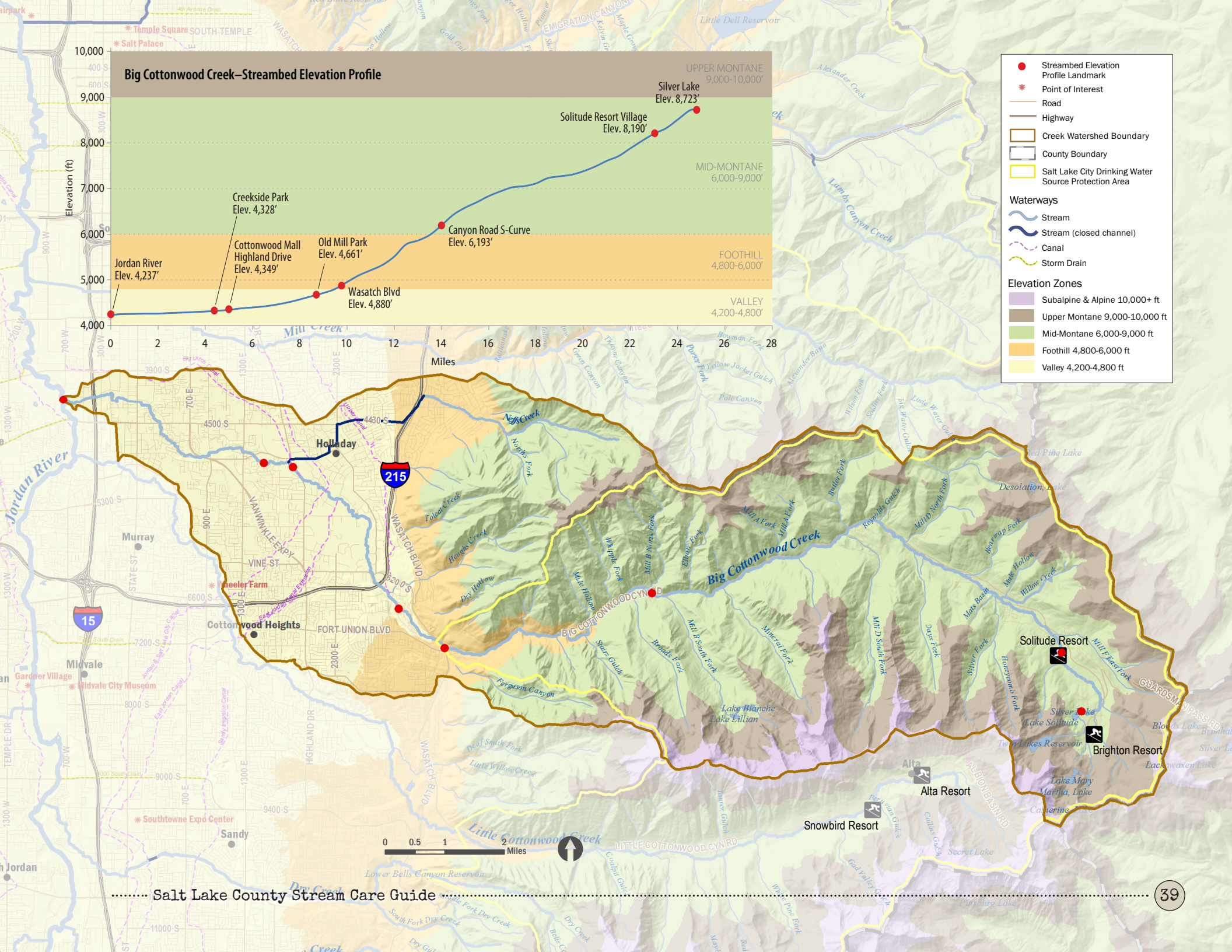
- Streambed Elevation Profile Landmark
- * Point of Interest
- Road
- Highway
- ▭ Creek Watershed Boundary
- ▭ County Boundary
- ▭ Salt Lake City Drinking Water Source Protection Area

Waterways

- Stream
- Stream (closed channel)
- Canal
- Storm Drain

Elevation Zones

- Subalpine & Alpine 10,000+ ft
- Upper Montane 9,000-10,000 ft
- Mid-Montane 6,000-9,000 ft
- Foothill 4,800-6,000 ft
- Valley 4,200-4,800 ft





Little Cottonwood Canyon
upper Little Cottonwood Creek



Creek in a culvert over I-215
lower Little Cottonwood Creek

Little Cottonwood Creek

Little Cottonwood Creek is the second largest surface water source used by Salt Lake City for culinary purposes. As a result, the canyon is protected and managed according to city guidelines designed to protect and sustain water quality, and no dogs or horses are allowed in the canyon. Historically, sustaining water quality was not such a high priority. Mining and smelting activities occurred along Little Cottonwood Creek, historic activities that continue to impact water quality of the creek to this day. There were several hydropower operations over the years, and the stream still generates power for Murray City. Land and water managers deal with the historic mining and water rights legacies to this day.

The **upper watershed** drains 27.2 square miles of steep canyon slopes with elevations ranging from 5,200 to 11,200 feet. The headwaters of the creek gather in Albion Basin at 9,800 feet, formed from intermittent creeks and outflow from Cecret Lake. From there the stream drops approximately 5,400 feet over 22 miles to its confluence with the Jordan River, a larger drop than any other Wasatch Front stream. It follows the canyon course carved by glaciers. Today, the primary land use is managed forest land for recreation—skiing, hiking, biking, climbing, camping, picnicking, fishing, and more. Other land uses include seasonal and year-round residences, the Town of Alta, two ski resorts, and resort-related commercial development.

The **lower watershed** drains 12.7 square miles of a highly urbanized land, comprised of primarily residential and commercial development with increased commercial and industrial densities in the I-15 and I-215 corridors. Not unlike our other urban streams, little, if any, of the natural channel remains as Little Cottonwood Creek makes its way down to the Jordan River. In fact, when the creek crosses I-215, it is carried high above the highway in a concrete box culvert! From July through March the creek has little to no flow in the valley, due primarily to a stream diversion above the canyon mouth that pipes water out for culinary and hydropower uses. When flows are low enough, the diversion takes all of the water. Some water is brought back into the stream in the Fort Union area (upper Jordan River water brought in via canal). Groundwater and storm drains also add to streamflow, but for the most part the aquatic ecosystem in the nine-mile stretch from the diversion to the Fort Union canal is seriously impacted.



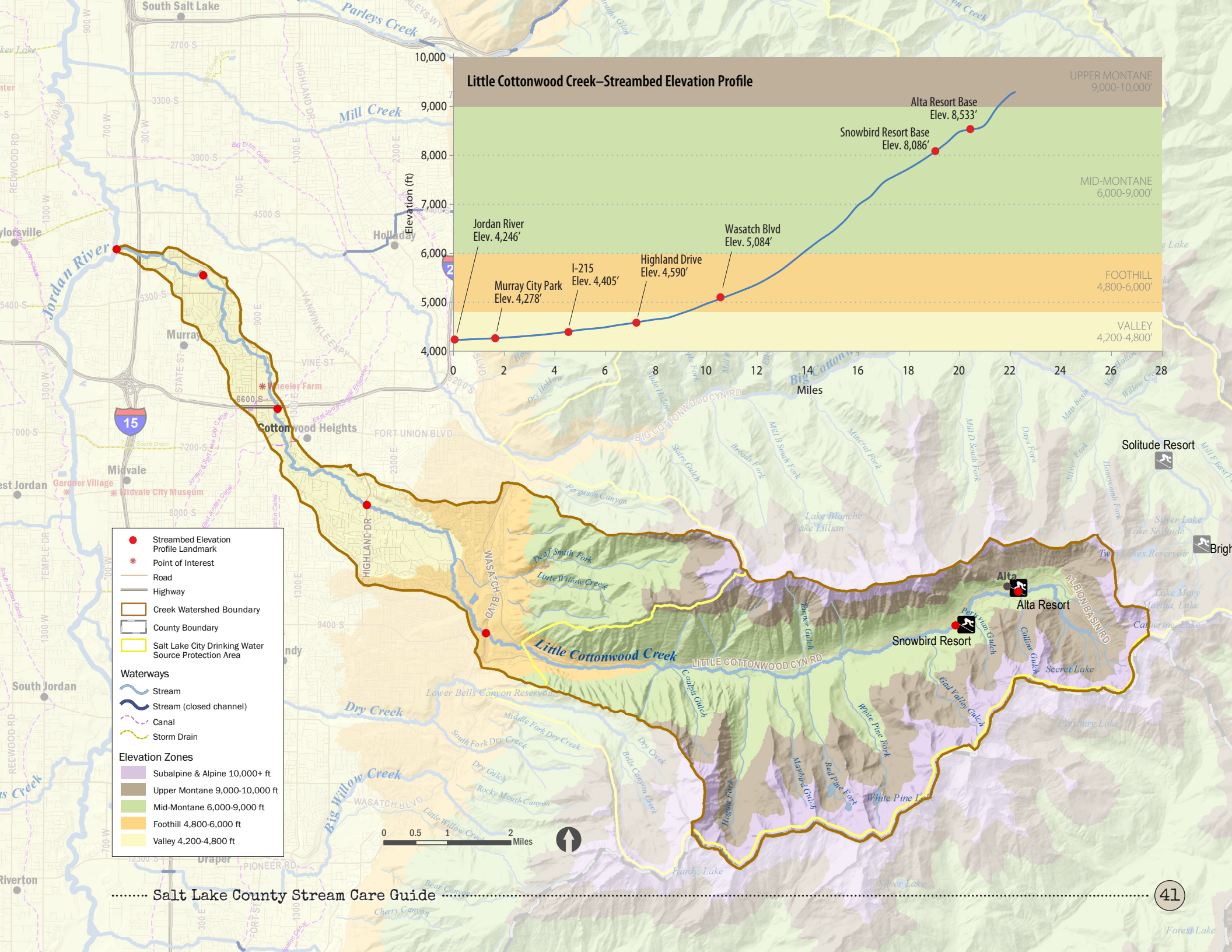
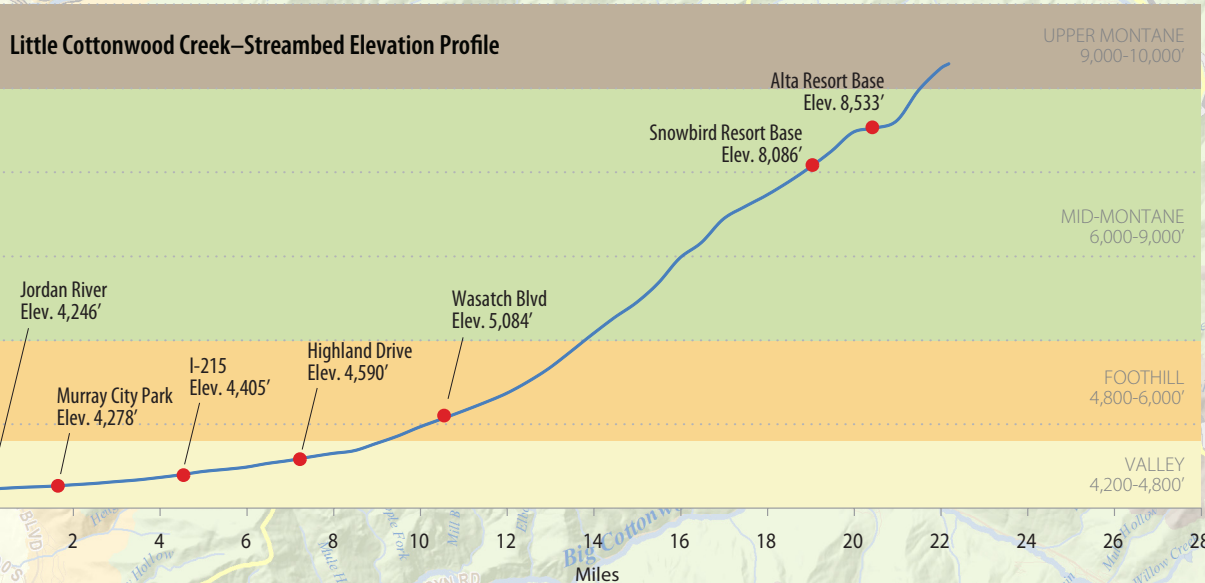
WATERSHED FACTS

Basin Size: 39.9 sq. miles
Elevation Change: 6,950 feet

CREEK FACTS

Stream Length: 22.2 miles
Average Peak Flow: 350 cfs (late May/Jun)
Average Low Flow: 8 cfs (Aug)

cfs = cubic feet per second



- Streambed Elevation Profile Landmark
 - * Point of Interest
 - Road
 - Highway
 - Creek Watershed Boundary
 - County Boundary
 - Salt Lake City Drinking Water Source Protection Area
- Waterways**
- Stream
 - Stream (closed channel)
 - Canal
 - Storm Drain
- Elevation Zones**
- Subalpine & Alpine 10,000+ ft
 - Upper Montane 9,000-10,000 ft
 - Mid-Montane 6,000-9,000 ft
 - Foothill 4,800-6,000 ft
 - Valley 4,200-4,800 ft



Near Lower Bells Canyon Reservoir
upper Dry Creek



Dry stream bed in Dimple Dell Park
lower Dry Creek

Photo©Summitpost.org

Dry Creek

Dry Creek is located in the southeast corner of the Wasatch Range. It flows 12.8 miles to its confluence with the Jordan River at 9400 South, draining a total of 19.4 square miles.

The **upper watershed** drains 6.0 square miles with elevations ranging from 5,262 to 11,203 feet, and includes three canyon drainages: Bells Canyon, Middle Fork Dry Creek and South Fork Dry Creek. Bells Canyon is the largest of the three and one of the steepest drainages in the Wasatch Front. Bells Canyon Creek, one of four streams that drain off Lone Peak, plummets quickly with several waterfalls and cascades along the stream course. Primary land use in the upper Dry Creek watershed is managed forest land with limited recreational use, including hiking, biking, camping and fishing. Bells Canyon is one of Salt Lake City's protected drinking water source areas. There are two reservoirs in the canyon, one high in the drainage (which has been breached) and Lower Bells Canyon Reservoir at the mouth of the canyon.

The **lower watershed** (lower foothills and valley) is primarily highly urbanized residential and commercial development, but it does also include the 650-acre Dimple Dell Regional Park. Dry Creek is aptly named as it spends much of the year as a dry stream bed, due to water diverted out of the Lower Bells Canyon Reservoir for culinary use. Storm drains and groundwater return some flows to the stream channel as it makes its way down to the Jordan River.

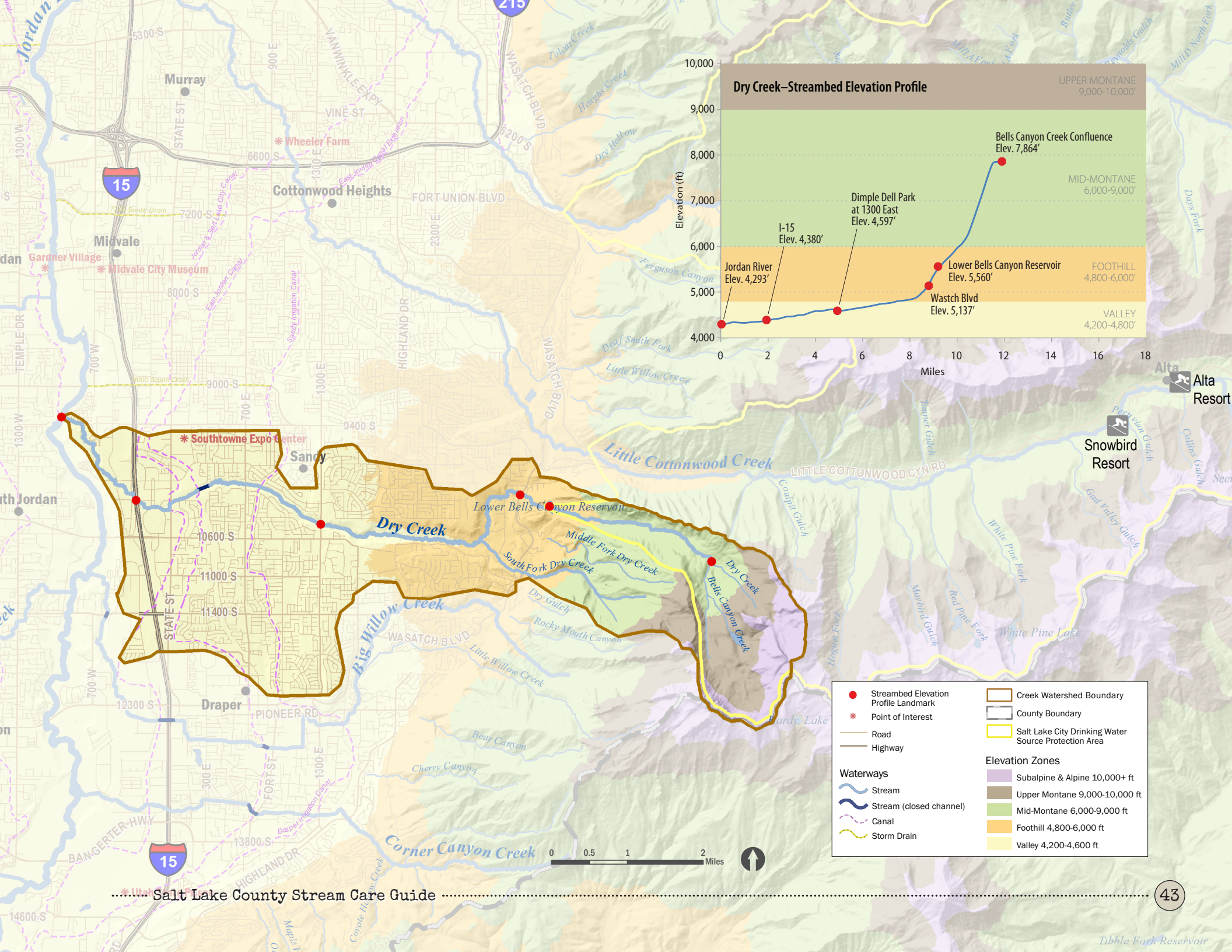


WATERSHED FACTS

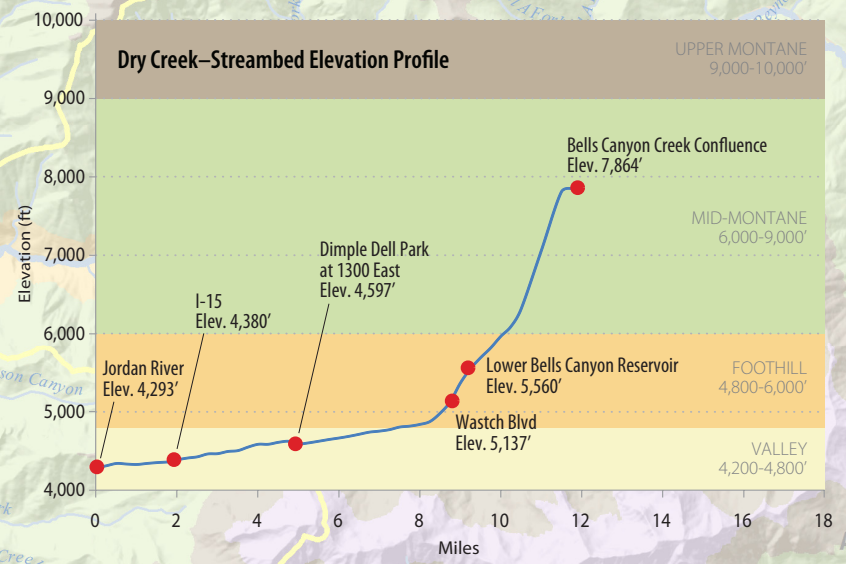
Basin Size: 19.4 sq. miles
Elevation Change: 6,910 feet

CREEK FACTS

Stream Length: 11.8 miles
Average Peak Flow: 10 cfs (late May)
Average Low Flow: dry-dewatered
cfs=cubic feet per second



Dry Creek—Streambed Elevation Profile



● Streambed Elevation Profile Landmark	▭ Creek Watershed Boundary
* Point of Interest	▭ County Boundary
— Road	▭ Salt Lake City Drinking Water Source Protection Area
— Highway	
Waterways	Elevation Zones
~ Stream	Subalpine & Alpine 10,000+ ft
~ Stream (closed channel)	Upper Montane 9,000-10,000 ft
~ Canal	Mid-Montane 6,000-9,000 ft
~ Storm Drain	Foothill 4,800-6,000 ft
	Valley 4,200-4,600 ft



Corner Canyon
upper Corner Canyon Creek



Eroding streambanks
lower Corner Canyon Creek

Big Willow Creek

Big Willow Creek drains a total of 16.3 square miles in southeastern Salt Lake County. The headwaters drain west off Lone Peak and the creek flows 11.0 miles to its confluence with the Jordan River at approximately 11000 South.

The **upper watershed** elevations range from 5,400 to 11,072 feet, and includes five canyon drainages: Rocky Mouth, Big Willow, Little Willow, Bear and Cherry Canyons. The upper watershed is 6.9 square miles and includes forest land managed for irrigation and water supply.

The **lower watershed** is 9.4 square miles of highly urbanized landscapes which are primarily residential and commercial development. Little Willow Creek is a primary tributary and converges with Big Willow Creek at approximately 1700 East 12000 South. Portions of flow are diverted from Big and Little Willow creeks to provide irrigation water.



WATERSHED FACTS

Basin Size: 16.3 sq.miles
Elevation Change: 6,759 feet

CREEK FACTS

Stream Length: Big Willow, 11.0 miles
Little Willow, 4.9 miles
Average Peak Flow: 5 cfs (late May)
Average Low Flow: dry-0.3 cfs (Aug/Sep)

Corner Canyon Creek

Corner Canyon Creek is the southernmost stream in Salt Lake County, running through Draper and emptying into the Jordan River after it crosses the Jordan River Parkway.

The **upper watershed** is managed for forest and for water supply, with an elevation range from 4,800 to 9,000 feet. It contains four canyon drainages: Maple Hollow, Oak Hollow, and Corner canyons. A jewel in Draper's recreational development efforts, Corner Canyon has a well-developed and managed system of trails that provides opportunities for hikers, mountain bikers, birders and horseback riders. In 2005, 1,021 acres was acquired as Corner Canyon Regional Park.

The **lower watershed** is primarily residential and commercial land use with numerous canals and significant residential encroachment.

WATERSHED FACTS

Basin Size: 14.6 sq.miles
Elevation Change: 2,525 feet

CREEK FACTS

Stream Length: 7.9 miles
Average Peak Flow: n/a
Average Low Flow: n/a

West Jordan

Big Willow Creek—Streambed Elevation Profile

UPPER MONTANE
9,000-10,000'

Elevation (ft)

Distance (Miles)

Hidden Valley Country Club
at Wasatch Blvd & 1700 E
Elev. 4,661'

Draper Park
Elev. 4,521'

Jordan River
Elev. 4,313'

Wasatch Blvd
Elev. 5,126'

FOOTHILL
4,800-6,000'

VALLEY
4,200-4,800'

Corner Canyon Creek—Streambed Elevation Profile

UPPER MONTANE
9,000-10,000'

Elevation (ft)

Distance (Miles)

Lynn Ballard Ball Park
at Highland Drive
Elev. 4,654'

Draper Canal Trail
Elev. 4,558'

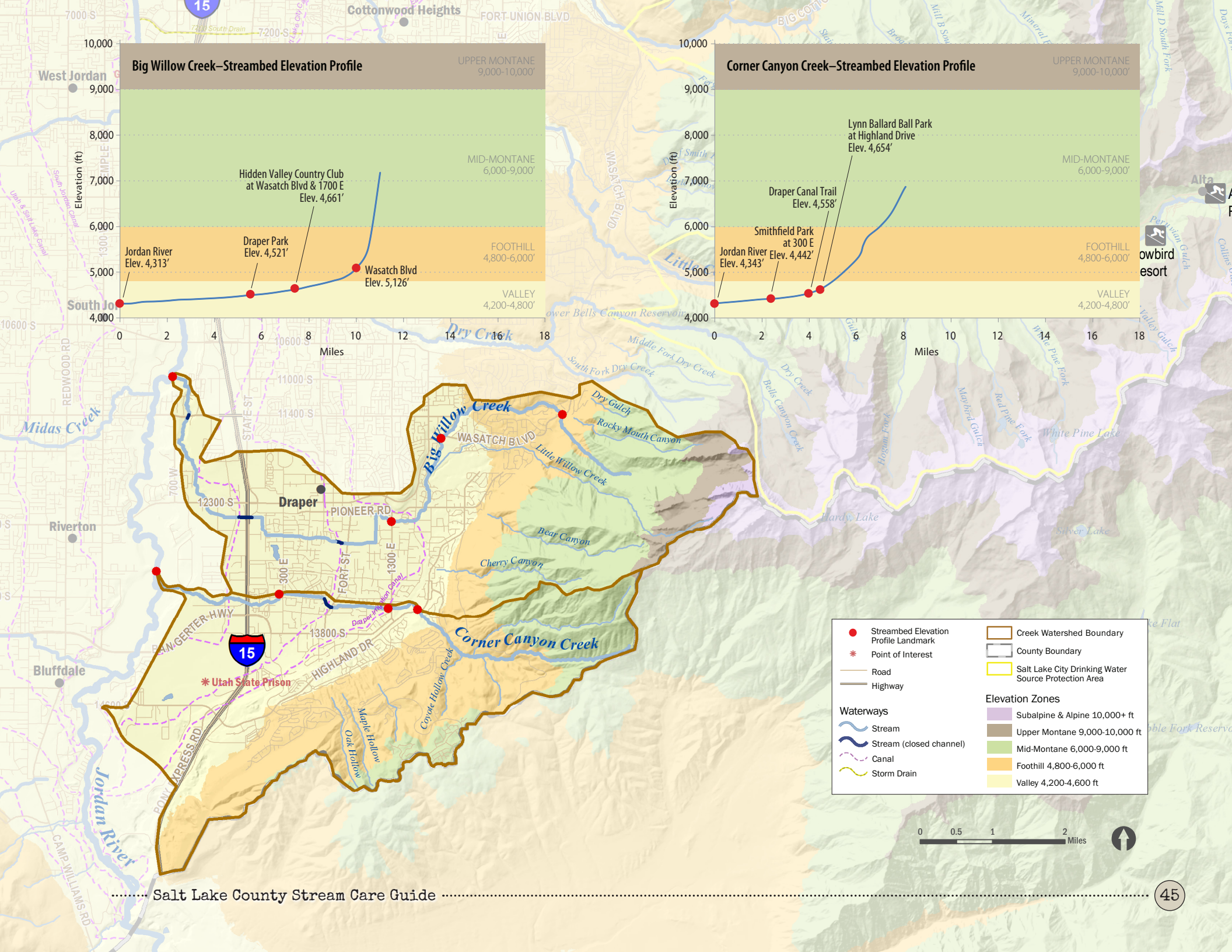
Smithfield Park
at 300 E
Elev. 4,442'

Jordan River
Elev. 4,343'

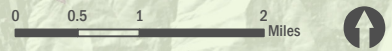
MID-MONTANE
6,000-9,000'

FOOTHILL
4,800-6,000'

VALLEY
4,200-4,800'



● Streambed Elevation Profile Landmark	 Creek Watershed Boundary
* Point of Interest	 County Boundary
— Road	 Salt Lake City Drinking Water Source Protection Area
— Highway	
Waterways	
~ Stream	
~ Stream (closed channel)	
~ Canal	
~ Storm Drain	
Elevation Zones	
 Subalpine & Alpine 10,000+ ft	
 Upper Montane 9,000-10,000 ft	
 Mid-Montane 6,000-9,000 ft	
 Foothill 4,800-6,000 ft	
 Valley 4,200-4,600 ft	



Westside creeks

Originating in the Oquirrh Range, the three westside creeks featured here provide year-round flow (for the most part) to the Jordan River, but they are not entirely natural stream channels. Rather, they are historic drainage ditches that have dramatically increased in size, flow, and flow duration from human activities. These include conveyance of canal overflow and irrigation water to downstream water rights holders, and higher volumes of storm runoff from impervious surfaces (pavement, rooftops, etc.) as development continues. As a result, westside stream flows do not reflect the typical spring runoff/high flow scenario observed in streams of the Wasatch Range. Rather, they flow during irrigation season (mid-April through mid-October) and storm events, with peak flows occurring during summer downpours, not spring snow melt. Barneys, Coon, and Harkers Creeks are also found on the westside of Salt Lake County. None are tributaries of the Jordan River but are, of course, all part of the larger watershed.



upper Bingham Creek



Near Jordan River confluence
lower Bingham Creek

Bingham Creek

Bingham Creek drains a 36.2-square mile basin, in which much of the Kennecott Copper Mine (also known as the Bingham Canyon Mine) can be found. As one of the largest open-pit mines in the world, radical modifications to the natural drainage patterns have occurred in the upper portion of the creek watershed. What once flowed from high in the Oquirrh Mountains is now little more than a drainage ditch with highly intermittent flow. It is not until the creek reaches the Utah Distributing Canal, which crosses over the creek at approximately 3300 West 11800 South, that more regular flows are introduced into the channel. From there down to the Jordan River, canal exchange flows provide year-round water in the creek. The highest flows are seen when canal overflow reaches seasonal maximums, but this does not generally increase the creek water levels more than six inches.

High levels of lead and arsenic have been found in Bingham and Butterfield Creeks due to historic mining activities. The Environmental Protection Agency and Kennecott have participated in cleanup of contaminated soils along the creeks.



WATERSHED FACTS

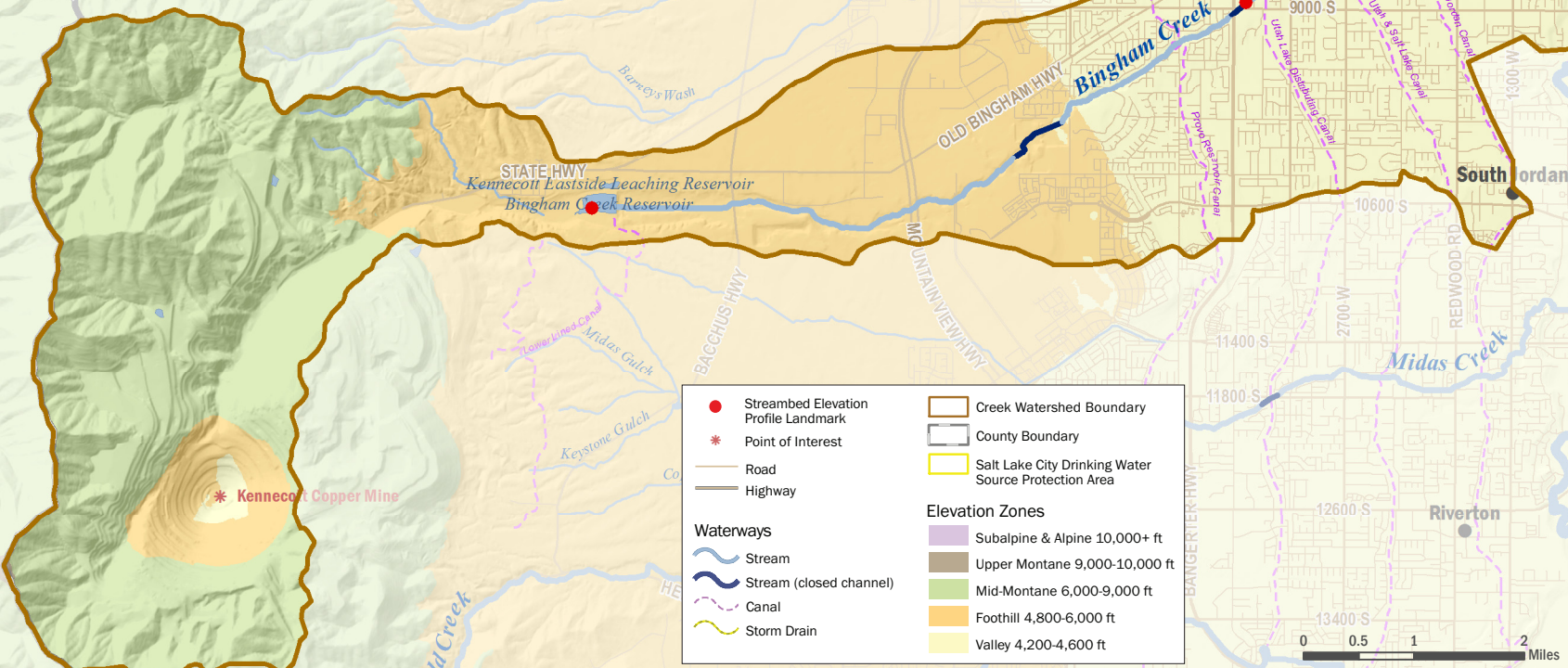
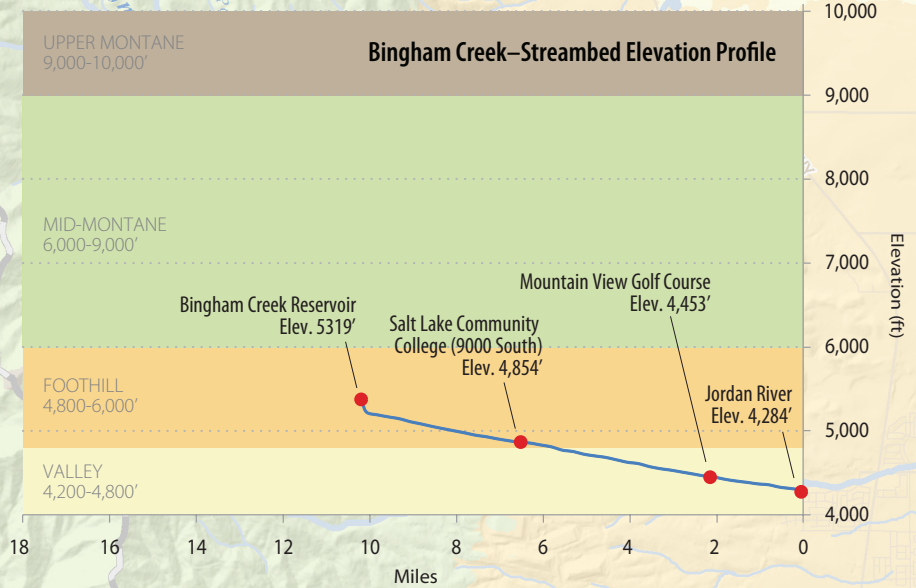
Basin Size: 36.2 sq. miles
Elevation Change: 4,918 feet

CREEK FACTS

Stream Length: 10.2 miles
Average Peak Flow: 30 cfs (runoff)
Average Low Flow: 0 cfs

cfs = cubic feet per second

Bingham Creek–Streambed Elevation Profile



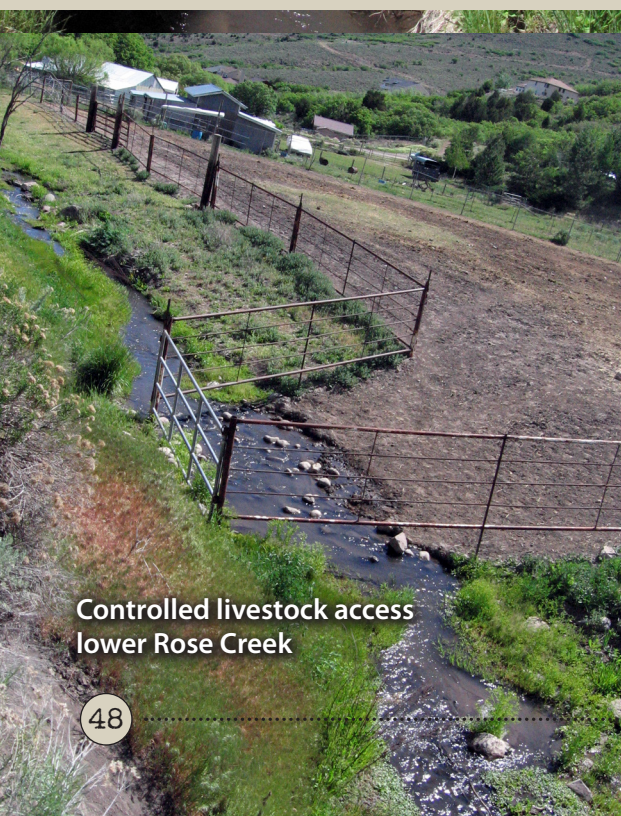
● Streambed Elevation Profile Landmark	▭ Creek Watershed Boundary
★ Point of Interest	▭ County Boundary
— Road	▭ Salt Lake City Drinking Water Source Protection Area
— Highway	

Waterways	Elevation Zones
— Stream	Subalpine & Alpine 10,000+ ft
— Stream (closed channel)	Upper Montane 9,000-10,000 ft
— Canal	Mid-Montane 6,000-9,000 ft
— Storm Drain	Foothill 4,800-6,000 ft
	Valley 4,200-4,600 ft





Yellow Fork Canyon
upper Rose Creek

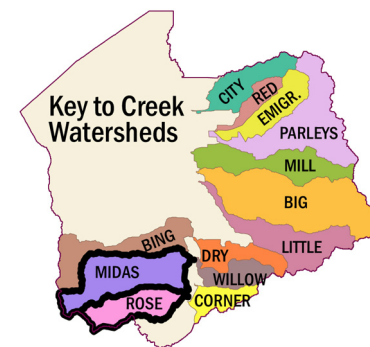


Controlled livestock access
lower Rose Creek

Midas/Butterfield Creeks

Midas Creek drains a 50.3-square mile basin, which includes Butterfield Creek and several gulches. Butterfield Creek originates in the Oquirrh Mountains and converges with Midas Creek at approximately 5100 West 12120 South. Midas Creek once drained a larger basin. Prior to excavation of the Kennecott Copper Mine, the eastern portion of the mine originally had slopes that drained into Midas Creek. As the land surface has changed, drainage patterns have changed, resulting in tributary area being routed to Bingham Creek.

High levels of lead and arsenic have been found in Bingham and Butterfield Creeks due to historic mining activities. The Environmental Protection Agency and Kennecott have participated in cleanup of contaminated soils along the creeks.



WATERSHED FACTS

Basin Size: 50.3 sq. miles
Elevation Change: 5,044 feet

CREEK FACTS

Stream Length: Midas 10.1 miles
Butterfield 8.1 miles
Average Peak Flow: 30 cfs
Average Low Flow: 2 cfs

Rose Creek

Rose Creek drains a 27.58-square mile basin with its headwaters flowing from the Oquirrh Mountains. The creek has year-round flows in the **upper watershed** where the land is managed for irrigation, water supply, wildlife and military use. Rose Canyon and Yellow Fork Canyon have long been recreation destinations for hikers, runners, mountain bikers, equestrian riders and birders. The 1,681-acre Rose Canyon Ranch is protected open space in the foothills of the Oquirrhrs, and Yellow Fork Canyon Park offers 800 acres of parkland.

WATERSHED FACTS

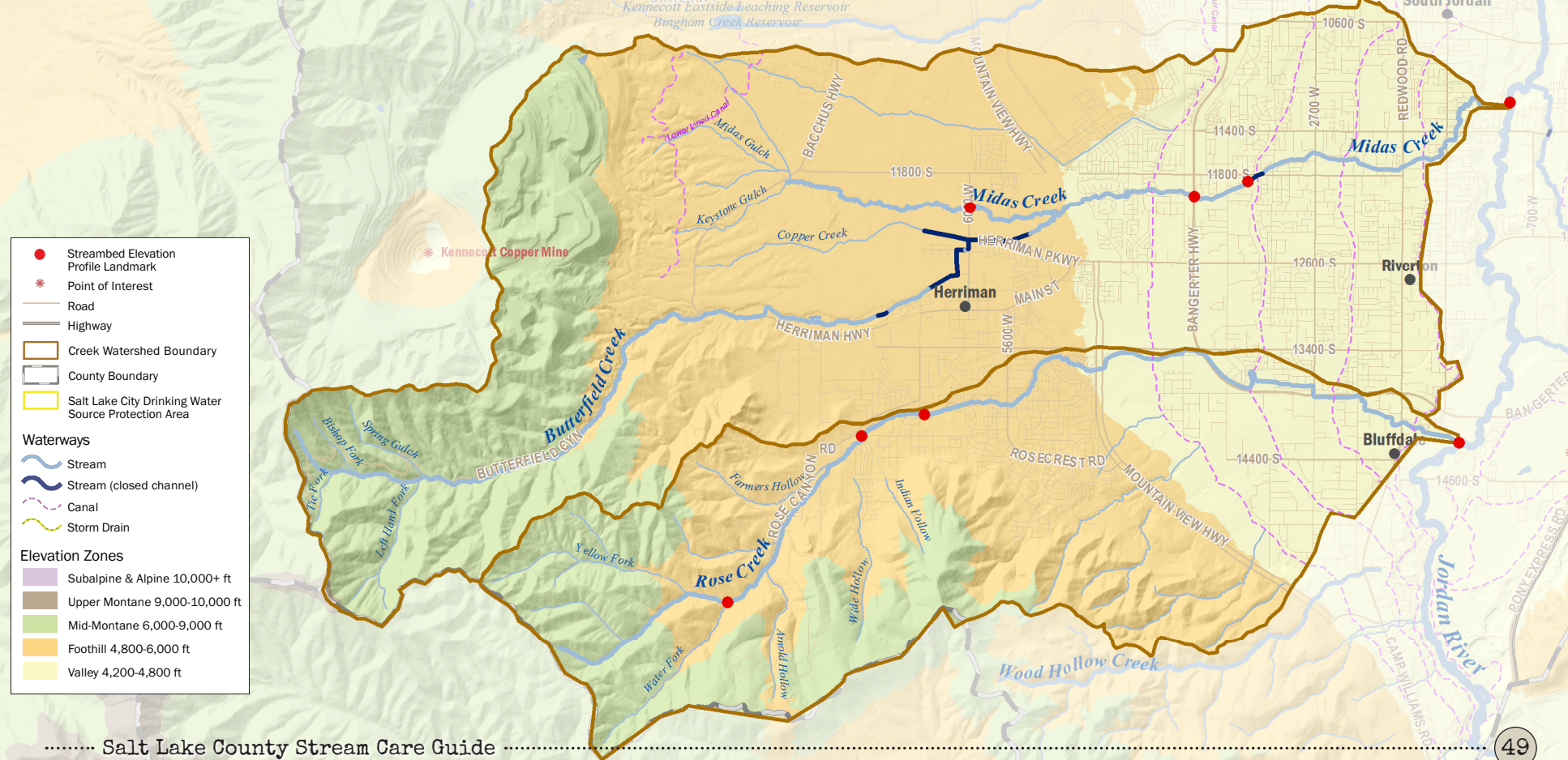
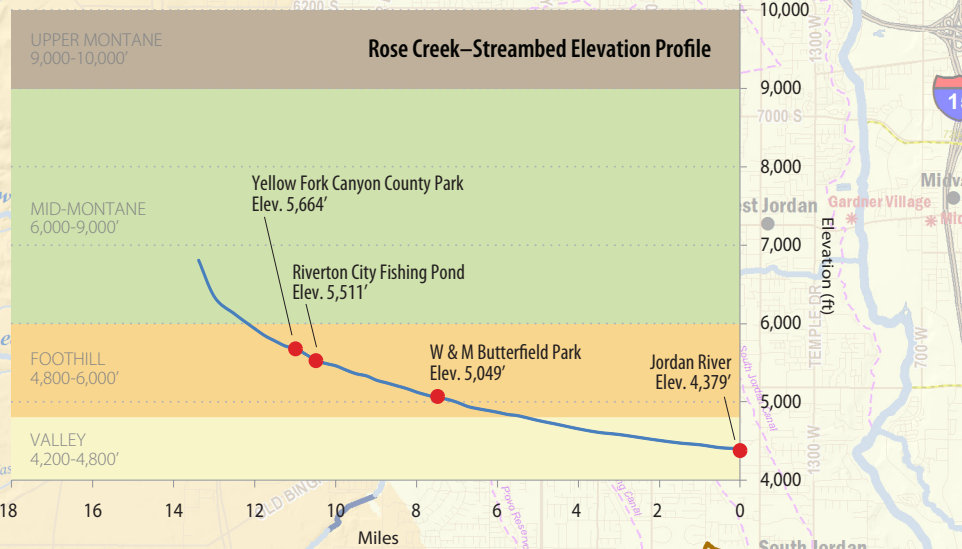
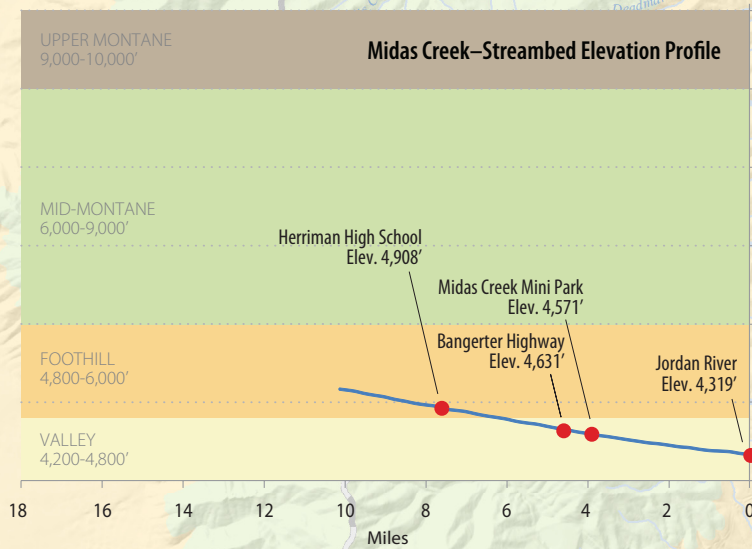
Basin Size: 27.6 sq. miles
Elevation Change: 3,163 feet

CREEK FACTS

Stream Length: 13.4 miles
Average Peak Flow: 12 cfs
Average Low Flow: 0 cfs

cfs = cubic feet per second

The **lower watershed** is rapidly urbanizing, transitioning from primarily agricultural land use to residential and commercial land uses. Creek flow is intermittent in the valley section of the creek.



- Streambed Elevation Profile Landmark
 - * Point of Interest
 - Road
 - Highway
 - ▭ Creek Watershed Boundary
 - ▭ County Boundary
 - ▭ Salt Lake City Drinking Water Source Protection Area
- Waterways**
- Stream
 - Stream (closed channel)
 - Canal
 - Storm Drain
- Elevation Zones**
- Subalpine & Alpine 10,000+ ft
 - Upper Montane 9,000-10,000 ft
 - Mid-Montane 6,000-9,000 ft
 - Foothill 4,800-6,000 ft
 - Valley 4,200-4,800 ft



Jordan River Narrows, Bluffdale
upper Jordan River



North Temple, Salt Lake City
lower Jordan River

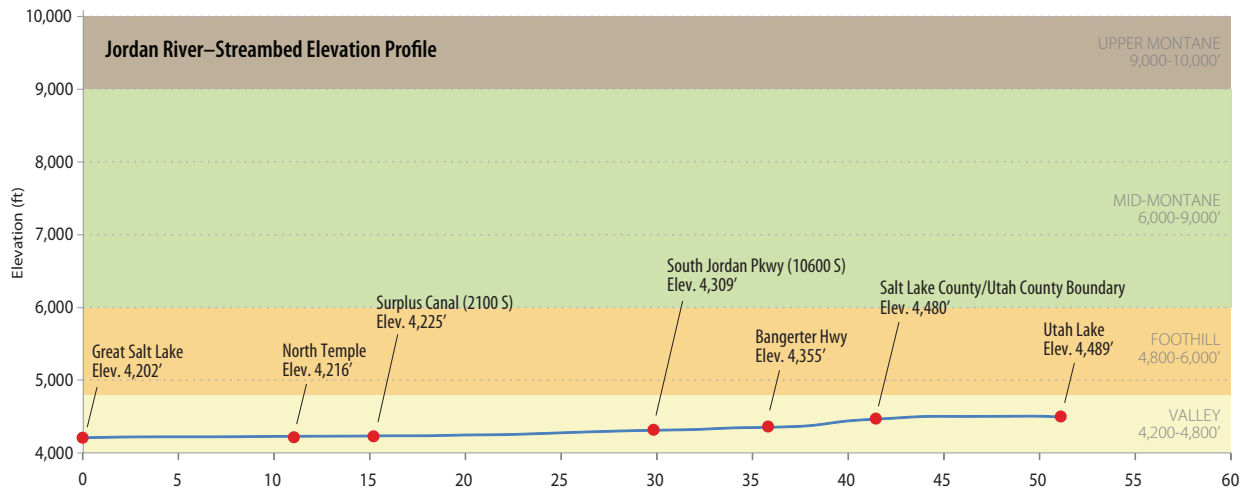
Jordan River

The Jordan River is the main water artery for the Salt Lake Valley. It flows 51 miles northward from Utah Lake to the Great Salt Lake through three counties and fifteen cities, including four of Utah's largest cities. The river drains a 3,805 square-mile basin that is one of ten regional scale watersheds in Utah, which includes the Provo River, Spanish Fork River, and Utah Lake basins. The fourteen major tributaries of the Jordan River, originating from both the Wasatch and Oquirrh mountain ranges, are all found within Salt Lake County.

The Jordan River was once a meandering river with a lush ecosystem that supported a diversity of terrestrial and aquatic wildlife. It provided a source of livelihood for Native Americans and early settlers who established farms and settlements along the river. As the population of the valley increased, so did the demands on the river's water and impacts to the health of the river corridor. Dams and canals were built to satisfy increasing needs for irrigation and drinking water. Increasing development led to the river being straightened and channelized, ultimately causing it to become disconnected from its floodplain and vital wetlands. The river was heavily polluted for many years by raw sewage, agricultural runoff, and mining wastes. It was the focus of environmental legislation in the 1970s and there are two Superfund sites adjacent to its banks. Although much cleaner than it once was, the Jordan River water is currently classified as "impaired" by the Utah Division of Water Quality per the Clean Water Act.

Due to the highly managed nature of the water in the Jordan River, flows vary widely throughout the year. While shallow groundwater and the tributaries do ensure some year round flow, average high and low flows are controlled by the release of water through the gates at Utah Lake. The gates are opened when the elevation of Utah Lake exceeds 4,489 feet above sea level, as per a lawsuit settled in 1985. This is known as the lake "compromise level". When the gates are closed flows range from 15-90 cubic feet per second (cfs). When the gates are open the flow can surge up to 750-2300 cfs in a matter of minutes. That's a rise of up to 5-6 feet! Dams at or near the Jordan Narrows (upper Jordan River) divert water to seven canals that are used for irrigation and secondary water systems in Salt Lake County. To reduce floodwaters in Salt Lake City, the Surplus Canal at 2100 South (lower Jordan River) was built in 1885. Approximately 70% of Jordan River water can be diverted to the Surplus Canal at any given time, which flows directly to the Great Salt Lake.

The health of the Jordan River ecosystem is greatly impacted by urbanization. Residential and commercial development built within the floodplain, often right up to the river's edge, has eliminated or severely impacted much of the riparian habitat along the Jordan River. Development in the flood plain also prevents the river from meandering naturally as it once did, resulting



in riverbanks that are deeply cut and subject to excessive erosion. As a result of the unnatural variability in the river’s flow regime, much of the native riparian vegetation has been replaced by exotic species including aggressive invasive plant species such as Phragmites, Russian olive, and Tamarisk. Erratic flows make restoration work on the Jordan River extremely challenging, particularly native vegetation establishment. Despite the many stressors on the environmental health of the Jordan River, there is much to celebrate and protect. As part of the larger Great Salt Lake Watershed, the Jordan River corridor remains an important part of the Central North American Migratory Flyway, offering birds a place to rest and forage during their long migrations. It is one of three rivers providing inflows of fresh water to the Great Salt Lake, playing an important role in the Great Salt Lake ecosystem. The river corridor is also a year-round home to wildlife including deer, beaver, fox, and a variety of amphibians, birds and fish.

The Jordan River provides a myriad of social and economic benefits to our region as well. Residents enjoy walking, cycling, running, fishing, bird watching, boating, golfing, horseback riding and many other recreational activities. The 45-mile Jordan River Parkway Trail connects cities and neighborhoods to one another through the river corridor. In 2008 Envision Utah completed the Blueprint Jordan River visioning process, which was intended to capture the collaborative imagination of residents and build an appreciation for the river. In 2010 the Jordan River Commission was created to facilitate the implementation of the Blueprint and provide a forum for coordination of planning, restoration, and responsible development in the river corridor.

Communities along the river are recognizing the benefits of incorporating and celebrating the Jordan River as a quality of life amenity. Neighborhoods and commercial areas located near preserved and restored open space in the river corridor are some of the most sought-after places in the region. As a result, local governments are seeing new investments in their communities.

WATERSHED FACTS

Basin Size:
 Jordan River Basin: 3,805 sq. miles
 Lower Jordan River Basin*: 805 sq. miles

**coincides very closely with the Salt Lake County boundary*

RIVER FACTS

River Length: 51 miles
 Average Peak Flow: 70 cfs (Mar)
 Average Low Flow: 20 cfs (Dec)
 cfs = cubic feet per second

Learn more at:

Jordan River Parkway Trail Map
slco.org/recreation/parks/jordanRiverParkway/index.html

Blueprint Jordan River
slco.org/blueprint

Jordan River Commission
jordanrivercommission.com

Photo©Adriaan Boogaard

for more info

Before you start

A number of local, state, and federal agencies regulate work in and around streams.

Before beginning any stream enhancement, bank stabilization, landscaping or building project, be sure to check with these agencies for guidance and permits that will be needed.



Plan approval & permits

Project planning assistance

Technical information and assistance to ensure that riparian and streambank stabilization projects are designed properly. Incorrect installations can aggravate existing problems, or cause new problems downstream.

Salt Lake County Watershed Planning & Restoration
watershed.slco.org, (385) 468-6600

Salt Lake County Flood Control Permit

Work that occurs within 20 ft (6.1 meters) of the top of the channel bank of flood control facilities (this includes most streams in the county) will require a Flood Control Permit, per Title 17 of the Salt Lake County Code of Ordinances.

Salt Lake County Engineering and Flood Control
pweng.slco.org, (385) 468-6600

State Stream Alteration Permit

Any work that will alter the bed or banks of a natural stream in Utah must obtain written authorization from the State Engineer. Projects may also require additional permitting from the U.S. Army Corps of Engineers.

Utah Division of Water Rights
www.waterrights.utah.gov/strmalt, (801) 538-7404

Salt Lake City Riparian Permit

Salt Lake City residents may need a Riparian Permit, as per Salt Lake City Ordinance Riparian Corridor Overlay District (RCO).

Salt Lake City Public Utilities Department
www.slco.gov/utilities/public-utilities-ripariancorridor
(801) 483-6727

Sovereign Lands General Permit

Work along the banks of the Jordan River may require a Sovereign Lands General Permit.

Utah Division of Forestry, Fire & State Lands
www.ffsl.utah.gov/sovlands/leases/leaseinfo.php
(801) 538-5540

Regulatory agencies

Report water pollution to:

Salt Lake County Health Department
Bureau of Water Quality and Hazardous Waste
water.slcohealth.org
(385) 468-3862
(385) 468-8888 **24hr HOTLINE**

Utah Division of Water Quality
waterquality.utah.gov, (801) 536-4123

Recycling & disposal

Recycling info

Your first stop for all recycling related info:

recycle.slco.org, (385) 468-6370

Household hazardous waste

Safe disposal of household toxics is free for Salt Lake County residents. Never dump in the toilet, down the drain, or in the trash.

Bring antifreeze, auto or rechargeable batteries, motor oil, paints, pesticides, fertilizers, household cleaners, other chemicals, fluorescent light bulbs, and electronics to the following:

One-day local collection events:

Contact the Salt Lake County Health department or check their website for the schedule:

hhw.slcohealth.org, (385) 468-3862

Permanent collection facilities:

Salt Lake Valley Solid Waste Facility
6030 West California Avenue
(801) 541-4078; Mon-Sat, 8am-5pm

Trans-Jordan Landfill
10873 South Bacchus Hwy (U-111)
(801) 569-8994; Mon-Sat, 8am-5pm

Murray ABOP Center **ONLY Antifreeze, Batteries, Oil and Paint**
4646 South 500 West
Mon-Fri, 7am- 3:30pm

Sandy ABOP Center **ONLY Antifreeze, Batteries, Oil and Paint**
8775 South 700 West
Mon-Fri, 8am- 4pm

Prescription medication

Old or used medications must be dropped off at police stations. For locations around the county, contact:

Salt Lake County Health Department
hhw.slcohealth.org, (385) 468-3862

Never dump medications down the toilet, down the drain, or in the trash.

Yard waste

Salt Lake County residents can bring green waste (untreated wood scraps, trees, branches, leaves, grass clippings) to be composted at the following facilities:

Salt Lake Valley Solid Waste Facility
Trans-Jordan Landfill
(see locations and details at left)

Salt Lake City has a year round curbside compost pickup program:

www.slco.gov/slco/slcgreen/recyclingwaste
(801) 535-6999

For other city yard waste collection programs, visit recycle.slco.org.

Resources

Jordan River Commission A partnership of cities, counties, and communities working to improve and protect the Jordan River

corridor. The JRC's *Best Practices for Riverfront Communities* is a valuable resource for all streamside residents. jordanrivercommission.com

Salt Lake City Riparian Corridor Stream Study Management Plans Great tools for stream improvement project planning, regardless of where you live! www.slco.gov/utilities/public-utilities-ripariancorridor

Salt Lake County Conservation District Agricultural and rangeland planning, conservation and education programs. saltlakeconservation.org

Salt Lake County Health Department Bureau of Water Quality and Hazardous Waste
water.slcohealth.org

Salt Lake County Stormwater Coalition Educating Salt Lake County residents about stormwater. www.stormwatercoalition.org

Salt Lake County Watershed Planning & Restoration Program Streambank stabilization project planning assistance and technical review. watershed.slco.org

Salt Lake County Weed Control Program Assists homeowners with identification, prevention, and suppression of noxious weeds. www.slco.org/weeds

Salt Lake Countywide Water Quality Stewardship Plan Framework of goals and policies to improve watershed functions. watershed.slco.org

Utah State University Cooperative Extension Water quality, yard & garden, reference books. extension.usu.edu



Native plants & landscape supplies*

Utah retailers & suppliers

Cactus & Tropicals
Salt Lake City, (801) 485-2542
Draper, (801) 676-0935
www.cactusandtropicals.com

Dryland Horticulture
Salt Lake City, (801) 597-6051
www.drylandhorticulture.com

Glover Nursery
West Jordan, (801) 562-5496
www.glovernursery.com

Granite Seed
Lehi, (801) 768-4422
www.graniteseed.com

Great Basin Natives
Holden, (435) 795-2303
www.greatbasinnatives.com

Grow Wild Nursery
Salt Lake City, (801) 467-8660
www.growwildnursery.com

Growing Empire Nursery
Salt Lake City, (801) 685-7099
www.growingempire.net

High Mountain Nursery
Draper, (435) 731-0107
www.highmtnnursery.com

Millcreek Gardens
Salt Lake City, (801) 487-4131
www.millcreekgardens.com

New Horizons Nursery
Erda, (435) 840-0888
www.newhorizonsnursery.com

Smith's Marketplace
Garden Centers
Millcreek Twp, (801) 468-7514
Salt Lake City, (801) 328-6000

Sun Mountain Growers
Fruit Heights, (801) 941-5535
www.sunmtngrowers.com

Wildland Nursery
Joseph, (435) 527-1234
www.wildlandnursery.com

Willard Bay Gardens
Willard, (435) 723-1834
www.willardbaygardens.com

Mail order

High Country Gardens
www.highcountrygardens.com

Other resources

Conservation Garden Park Sustainable landscaping, demonstration gardens.
West Jordan UT, (801) 256-4400
conservationgardenpark.org

Red Butte Garden & Arboretum
Salt Lake City UT, (801) 585-0556
www.redbuttegarden.org

Utah House Sustainable landscaping, demonstration gardens.
Kaysville UT, (801) 256-4400, theutahhouse.org

Utah Native Plant Society
www.unps.org

Landscaping on the New Frontier: Waterwise Design for the Intermountain West. 2009.
Utah State University Press

Waterwise: Native Plants for Intermountain Landscapes. 2003. Utah State University Press

Glossary

Aquatic Of or relating to water.

Aquatic insects Insects that complete some portion of their life cycle in the water.

Bankfull Flow condition when the stream fills the channel to the top of the bank before overflowing onto the floodplain. Referred to as the “channel forming discharge”, it is responsible for the active channel that erodes and deposits sediment, and creates pools, riffles, and meanders. Occurs every 1.5 years on average in a natural channel.

Basin [see **Watershed**]

Bed [see **Stream bed**]

Best management practices (BMPs) In this context, referring to a type of control to prevent and or minimize the amount of pollution in stormwater runoff. Stormwater BMPs include structural and nonstructural controls (sediment catch basins, filter strips, rain gardens, etc.).

Biodiversity The number and variety of organisms found within a specific region, area, or habitat.

Bioengineering [see **Streambank bioengineering**]

Canyon mouth The opening or entrance to a canyon.

Confluence The point where a tributary stream joins a larger river, or where two streams meet to become the source of a river with a new name.

cfs Cubic feet per second, see **Discharge**.

Culinary water Drinking water.

Culvert A structure (tunnel, pipe, etc.) that allows water to flow under a road, railroad, trail, or similar obstruction. Usually concrete or metal.

Daylight Restore a stream that has been diverted underground into a culvert or pipe, back to an above-ground channel.

Dewater To remove all water from a stream, usually for irrigation or drinking water purposes. Stream water is diverted into an alternate channel (often a canal), or piped out of the stream, severely degrading the stream ecosystem.

Discharge The volume of water passing through a channel during a given time, usually measured in cubic feet per second (cfs).

Diversión Where stream water is redirected into an alternate channel (often a canal) or piped out of the stream, usually for irrigation or drinking water purposes. See **Dewater**.

Drainage basin [see **Watershed**]

Drought-tolerant A plant that is adapted to low- or no-water conditions.

Downcutting A geological process that deepens the channel of a stream or valley by removing material from the stream's bed or the valley's floor.

Ecosystem A community of living organisms (plants, animals, microbes) in conjunction with the nonliving components of their environment (air, water, soil), interacting as a system.

Encroachment Development or construction that occurs within the floodplain of a stream or other waterway.

Entrenched [see **Incised channel**]

Ephemeral A stream in which flow only occurs during and immediately after precipitation.

Erosion The process by which soil and rock are removed from the Earth's surface by water, wind, or ice and then transported and deposited in other locations.

Excess nutrients High levels of nitrogen or phosphorus in a waterbody, which stimulates algae growth and decreases dissolved oxygen. Sources include fertilizer, human and animal waste (in runoff from farm fields and pastures, and discharges from septic tanks and feedlots).

Floodplain Land adjacent to the stream that is subject to flooding when a stream overflows its banks.

Fluvial geomorphology A science devoted to understanding rivers, both in their natural setting as well as how they respond to human-induced changes in a watershed. Includes the related disciplines of geology, hydrology, hydraulics, sediment transport, soil mechanics, and the effects of vegetation.

Gulch A narrow and steep-sided ravine marking the course of a small stream or dry creek bed.

Gradient Steepness of stream bed (ratio of elevation and distance).

Groundwater recharge zone An area of land in which water infiltrates and moves through soils to replenish groundwater sources.

Habitat The natural home or environment of an animal, plant, or other organism.

Headwaters A tributary stream of a river close to or forming part of its source.

Herbaceous A plant that has leaves and stems that die down at the end of the growing season to the soil level, with no persistent woody stem.

Hydraulics The study of the dynamics of water, the physical principles that govern flowing water.

Impervious surface A non-porous surface that slows or prevents water from soaking into the soil, causing water to run off the surface more rapidly or in greater quantities than under natural conditions. Includes pavement, rooftops, and gravel/soil compacted by development.

Incised channel A stream that has degraded and cut its bed into the valley bottom. Indicates accelerated and often destructive erosion.

Instream flow The flow of water in streams, rivers, and other channels.

Intermittent A seasonal stream that only flows for part of the year.

Interrupted flow Instream flow that is reduced or completely removed from the stream via diversion.

Invasive species Non-native species that naturalize into local ecosystems and adversely affect the habitats they invade—economically, environmentally, and/or ecologically. Also called invasive exotics. Native (indigenous) species can also become invasive when a disruption to the ecosystem results in the loss of natural controls (predators, herbivores).

Irrigation diversion [see **Diversión**]

Low flow The flow that a perennially flowing stream reduces to during the dry season, in a given year.

Microclimate A local atmospheric zone where the climate differs from the surrounding area

Native plant Endemic (indigenous) or naturalized to a given area in geologic time. This includes plants that have developed, occur naturally, or existed for many years in an area (e.g. trees, flowers, grasses, etc.). In North America a plant is often deemed native if it was present before colonization.

Naturalize Process by which a non-native organism spreads into the wild and its reproduction is sufficient to maintain its population, becoming part of the local ecosystem.

Non-native species A species living outside its native distributional range, which has arrived there by human activity, either deliberate or accidental. Some are damaging to the ecosystem they are introduced into, others have no negative effect and can, in fact, be beneficial.

Noxious weed A plant species that has been designated by federal, state, or county authority as injurious to agricultural and/or horticultural crops, natural habitats and/or ecosystems, and/or humans or livestock. Most are introduced (non-native) species. Subject to regulation by State law under the Utah Noxious Weed Act.

Glossary (continued)

Nutrients [see **Excess nutrients**]

Peak flow Highest volume of streamflow in a perennially flowing stream in a given year.

Perennial A stream that has water flowing all year, every year.

Plant community A collection of plant species that are adapted to climate, elevation, soils, water and sunlight availability within a designated geographical area. The dominant plant communities (and their associated sub-communities) in the Intermountain West include: LOWLAND DESERT (Cool Desert Shrub, Salt Desert Shrub, Sand Desert), Foothills (Mountain Brush, Pinyon-Juniper, Mountain Mahogany Forest), MONTANE (Montane Parkland, Montane Coniferous Forest, Montane Meadow), SUBALPINE, and ALPINE.

Playa A flat-bottomed depression that is periodically covered by water; especially a desert basin from which water evaporates quickly.

Pool A segment of a stream where the water is deeper and slower moving, typically on the inside of a bend or behind instream debris where fish gather.

Reach A section of a stream's length.

Riprap Heavy stones used to protect streambank soils from the action of fast-moving water.

Riffle A segment of a stream where the flow is shallow and turbulent; a stretch of choppy water caused by rocks, gravel or sandbars, just below the surface.

Riparian Of, on or pertaining to the area of land along a stream, river, pond or lake. Also referred to as streamside.

Riparian vegetation Plant species found along streams, rivers, lakes and other waterways.

Riparian zone The transitional area of land that connects the aquatic (wet) ecosystem to the uplands (drier areas not reached by seasonal flood waters). A regular presence of water and periodic flooding makes riparian areas the most productive

and valuable of all landscapes, supporting a great variety of plant and animal species.

Runoff [see **Stormwater runoff**]

Scour The erosive action of the flowing water in streams that removes and carries away material from the bed and banks.

Sediment Soil particles in a stream that are either carried in the water or deposited on the stream bed.

Stewardship Responsible use and protection of the natural environment through conservation and sustainable practices.

Stormwater runoff Rain and snow melt that runs off surfaces such as rooftops, paved streets, highways, and parking lots. As water runs off these surfaces, it can pick up pollution such as: oil, fertilizers, pesticides, soil, trash, and animal waste. From here, the water might flow directly into a local stream or lake. Or, it may go into a storm drain and continue through storm pipes until it is released untreated into a local waterway.

Streambank Consists of the terrain alongside the bed of a river, creek, or stream. The steepness of the bank can vary from vertical to a more shallow slope.

Streambank bioengineering Integrates living plants with inert (non-living) organic and inorganic materials (rocks, logs, etc.) to rebuild and stabilize eroding stream banks, as opposed to traditional methods of using strictly inorganic/constructed materials (rock, concrete). The dense roots of the vegetation provides much of the necessary stabilization. Also referred to as Soil bioengineering.

Stream bed The channel bottom of a stream.

Stream channel The physical landform of a stream consisting of a bed and stream banks.

Stream corridor The area of land that includes the stream channel, floodplains, and the transitional upland fringe.

Subwatershed or Subbasin Drainage basin that is contained within a larger basin.

Tributary A stream that flows to a larger stream or other body of water.

Uplands The drier areas of land in a watershed that are not reached by seasonal flood waters.

Urbanization The process by which towns and cities are formed and become larger as more and more people begin living and working in centralized areas.

Water rights In water law, refers to the right of a user to use water from a water source, e.g., a river, stream, pond or source of groundwater. In arid areas where irrigation is practiced, such systems are often the source of conflict, both legal and physical.

Watershed The area of land that drains to a particular body of water, such as a stream, river, lake or ocean. The topography of the landscape determines where the water flows, with the surrounding ridgelines defining watershed boundaries. Also referred to as a drainage basin.

Waterway A river, stream canal or other route for travel by water.

Woody material Logs, tree branches in the stream channel that create instream habitat for aquatic organisms.

Credits

Photos

All photos were taken by Salt Lake County (in Salt Lake County) with the exception of the following:

Pages 4-5: "Great Salt Lake shoreline", Brigitte Werner; "Flock of birds", theaccidentalbirder.com; "Avocets in flight", U.S. Fish & Wildlife Service

Page 10: "Streamside flowers", Linda's Lens, photomomlinda.blogspot.com

Page 12: "nice buffer!", Lisa Hollingsworth-Segedy; "Blue-grama grass lawn", C. Wood

Page 15: "Stream restoration Before & After", San Antonio River Authority

Page 16: "Woods' rose", Clinton Shock, Oregon State University

Page 18: "Scarlet paintbrush", Linda's Lens

Page 21: "Saltcedar", Steve Dewey; "Bittersweet nightshade", Bruce A. Conti; "Garlic mustard" & "Purple loosestrife", King County Weed Control; "Phragmites" & "Hoary cress", Wikimedia Commons

Page 22-23: "Oil in stormwater", Colorado Department of Transportation; "'I POOP' dog", thepaperlesspages.com; "Unscoped poop in snow", gospelofgoose.blogspot.com

Page 25: "Cows along stream", Southern Appalachian Highlands Conservancy

Page 51: "Jordan River scene", Adriaan Boogaard

Maps

All maps were created by Salt Lake County for use in this guide. Data sources: Salt Lake County; Utah's State Geographic Information Database; U.S. Geological Survey.

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Since 1997 the Salt Lake County Watershed Planning & Restoration Program has engaged in assessment and restoration of waterways, stewardship planning, and educational outreach. Assessments include data collection which provides valuable information for ongoing and future planning. The data is used by regulatory agencies at the federal, state and local levels. Restoration objectives include streambank stabilization, water quality protection, and improvement of native plant diversity and habitat. Projects are carried out on a cooperative partnership basis with local municipalities, service districts, state and federal agencies, local conservation districts, and private landowners.

*Many thanks to **everyone** who contributed to and reviewed this Stream Care Guide!*

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