Vegetation transects at the Mill Creek Confluence in South Salt Lake.

In This Section:

- Glossary
- Engagement
- Existing Conditions
- Vision Graphics

APPENDICES

The appendices provides supplemental information for further context into the *Seven Greenways Vision Plan* process. Materials may guide additional research into the topics covered.

OUR URBAN CREEKS HAVE THE POTENTIAL TO BECOME AN EQUITABLE, INNOVATIVE, AND RESILIENT SYSTEM OF GREENWAY CORRIDORS.

GLOSSARY

Activation Point. Recreational, commercial, and/or civic locations that provide access to the greenways.

Active Transportation. Human powered forms of transportation, such as walking and biking.

Annual High Water Line. Yearly average line of intersection between land and water.

Best Management Practice. Strategies that produce effective and practical results while considering intersections of multiple disciplines.

Biodiversity. Number and variety of species found in an area.

Bioengineering. Strategy that stabilizes eroding streambanks with organic (plants, logs, etc.) and inorganic material (rocks).

Bioswale. Depression that captures runoff, traps sediment, and filters pollutants through vegetation.

Channel. Bed and banks of a waterway.

Confluence. Where two waterways join into one.

Culvert. Concrete or metal structure that allows water to flow underneath the surface.

Daylighting. Uncovering a waterway previously buried in a pipe or a culvert, bringing it back to the surface and restoring its stream channel.

Dewater. Process of removing all water from a waterway, often for irrigation or drinking water, which severely degrades the ecosystem.

Discharge. Volume of water passing through a channel, usually measured in cubic feet per second.

Diversion. Redirecting a waterway into an alternate channel or out of a stream, usually for irrigation or drinking water.

Ecosystem. Community of living organisms and nonliving components that interact as a system. They provide many benefits to humans, such as food, clean air and water, pollination, and wellbeing, known as ecosystem services.

Erosion. Process by which soil and rock are removed, transported, and deposited by water, wind, or ice.

Floodplain. Land adjacent to a waterway subject to flooding.

Green Infrastructure. Approach to water management that protects, restores, and/or mimics the natural water cycle.

Greenway. Linear corridor located around a stream and adjacent land.

Groundwater. Water held underground in the soil or rock.

Headwaters. Tributary of a waterway close to or forming part of its source.

Impervious and Pervious Surface. Impervious are non-porous surfaces, such as pavement, rooftops, or compacted soil, that prevents water from soaking into the ground, causing runoff. Pervious are porous surfaces, such as natural areas, green roofs, or permeable pavement, that allow water to soak into the ground.

Incised. Eroded stream cutting down into its streambed, which creates a narrow, deepened channel.

Noxious Species. Plant or animal that is detrimental to desirable species due to their ability to aggressive invade and outcompete for resources, usually designate by federal, state, or county authority. They are often called invasive species.

Peak Flow. Highest volume of flow in a waterway in a year.

Point and Non-Point Source Pollution. Point-source is pollution from a specific and identifiable source, such as factories or sewage treatment plants. Non-point source is pollution from runoff picking up and carrying natural and human-made pollutants.

Reach. Section of a waterway.

Restoration. Improving the flows, quality, and health of a waterway and riparian ecosystem.

Rip-rap. Human-placed stones or concrete to protect streambanks.

Riparian. Land along a waterway or lake.

Runoff. Water that flows off the surface of the ground into a storm drain and/or into a waterway.

Sedimentation. Soil particles carried by a waterway and deposited on the streambed.

Stabilization. Protecting streambanks from erosion.

Stewardship. Responsible use, protection, and improvement of resources.

Streambank. Terrain along a waterway

Total Max Daily Loads (TMDL). Measurement to determine factors impairing a waterway.

Tributary. Waterway that flows into a larger waterway or lake.

Upland. Land without water and not reached by seasonal flood waters.

Urban Forest. Trees within the urban environment, including parks, gardens, streets, waterways, and natural spaces

Urban Heat Island Effect. Increases in temperature as a result of land cover changes from natural to urban (pavement, buildings, and other surfaces) that absorb and retain heat.

Urbanization. Formation of cities.

Water Rights. Legal right of a user to use water from a specific source (waterway, lake, canal, or groundwater).

Watershed. Area of land that drains to a body of water.

Wetland. Land covered by water either saltwater, freshwater, or somewhere between.

ENGAGEMENT SUMMARY

SURVEY

The survey was launched February 17, 2021, and was active for one month. It was distributed online and promoted on social media, through email lists, by partners, and via word of mouth. University of Utah students targeted survey distribution through intercept surveying and interviews that did not rely on participants having internet access. The survey was offered in English and Spanish to accommodate the diverse presence within our communities.

Respondents

A total of 1,178 people took the survey. The majority are from Salt Lake City (46 percent) and Millcreek (23 percent). Respondents are primarily white (85 percent), which is comparable to the total percentage of white residents in Salt Lake County (87 percent). Female participation was the highest at 55 percent. There was an even distribution of age groups represented.

Table 12: Demographic data of survey respondents

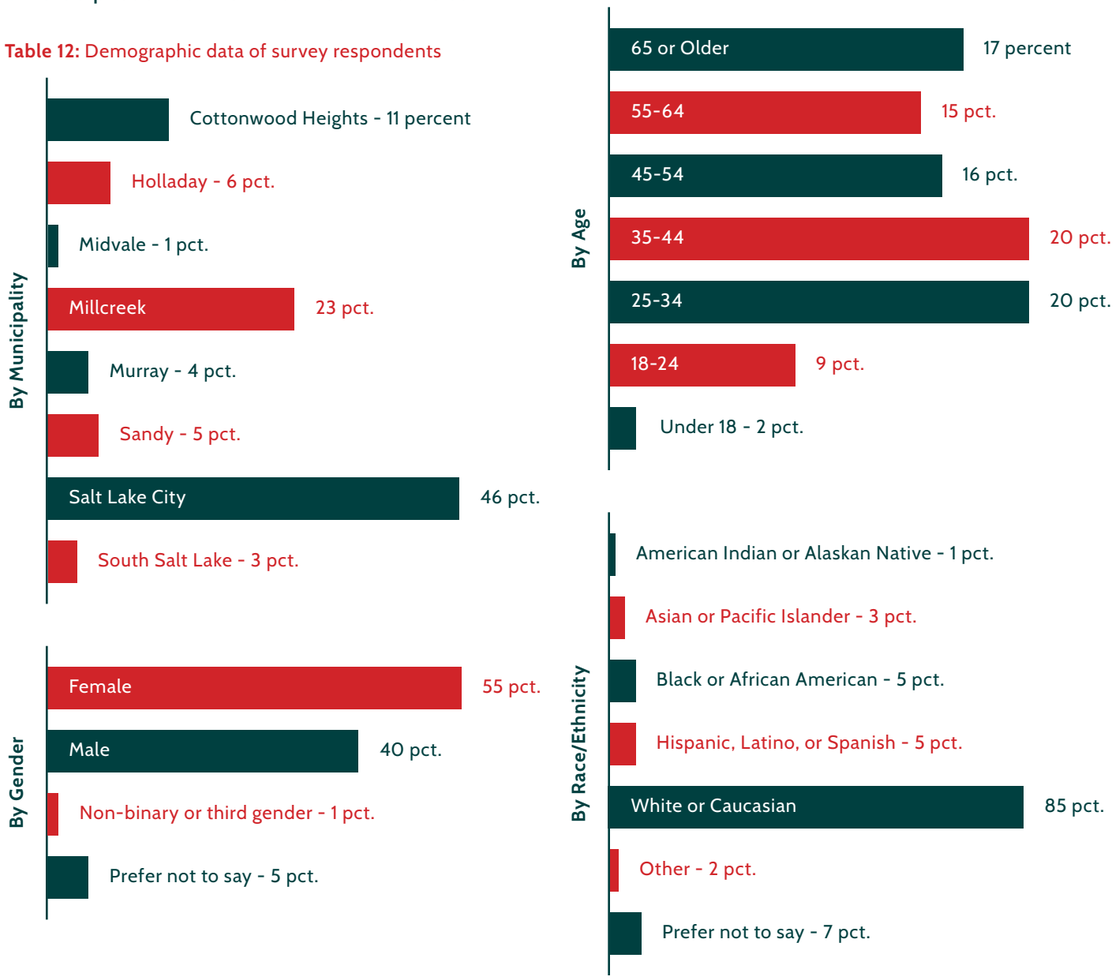


Table 13: Top creek visitation by municipality

CITY	CREEK 1	PERCENT	CREEK 2	PERCENT
Cottonwood Heights	Big Cottonwood Creek	90	Little Cottonwood Creek	67
Holladay	Big Cottonwood Creek	84	Mill Creek	79
Midvale	Big Cottonwood Creek	71	Mill Creek	68
Millcreek	Mill Creek	90	Big Cottonwood Creek	68
Murray	Big Cottonwood Creek	85	Little Cottonwood Creek	76
Sandy	Little Cottonwood Creek	92	Big Cottonwood Creek	75
Salt Lake City	City Creek	83	Mill Creek	68
South Salt Lake	Mill Creek	83	Mill Creek	71

Visitation

Mill and Big Cottonwood Creeks are indicated as the most visited creeks with 70 percent of respondents reporting they've spent time at each within the last 12 months. Interestingly, Mill Creek, in the scope area, has very little publicly accessible open space at 11 percent and is the most developed corridor at 81 percent. One possible explanation is respondents thought of the popular canyon areas when answering this question. These two creeks were followed by Little Cottonwood Creek at 62 percent and City Creek at 58.

Parleys (43 percent), Red Butte (44 percent), and Emigration (47 percent) Creeks were visited the least among respondents. Low visitation to Parleys Creek is curious due to popular regional parks, including Parleys Historic Nature Park, Tanner Park, and Sugar House Park, and the well-connected Parleys Trail. This result may show low awareness of the creek's location or name.

People tend to visit creeks near homes. Salt Lake City residents report the greatest diversity of creek visitation. Over half of respondents visited City, Red Butte, Emigration, Mill, Big Cottonwood, and Little Cottonwood Creeks. Residents of Cottonwood Heights and Millcreek report the most visitation among municipalities. Midvale residents report the least.

Creek experiences are generally positive. Between 43 and 67 percent reported a positive experience at the seven creeks. Only one to four percent reported a negative experience at any of the creeks. The most visited creeks received the highest positive ratings (62 to 67 percent positive).

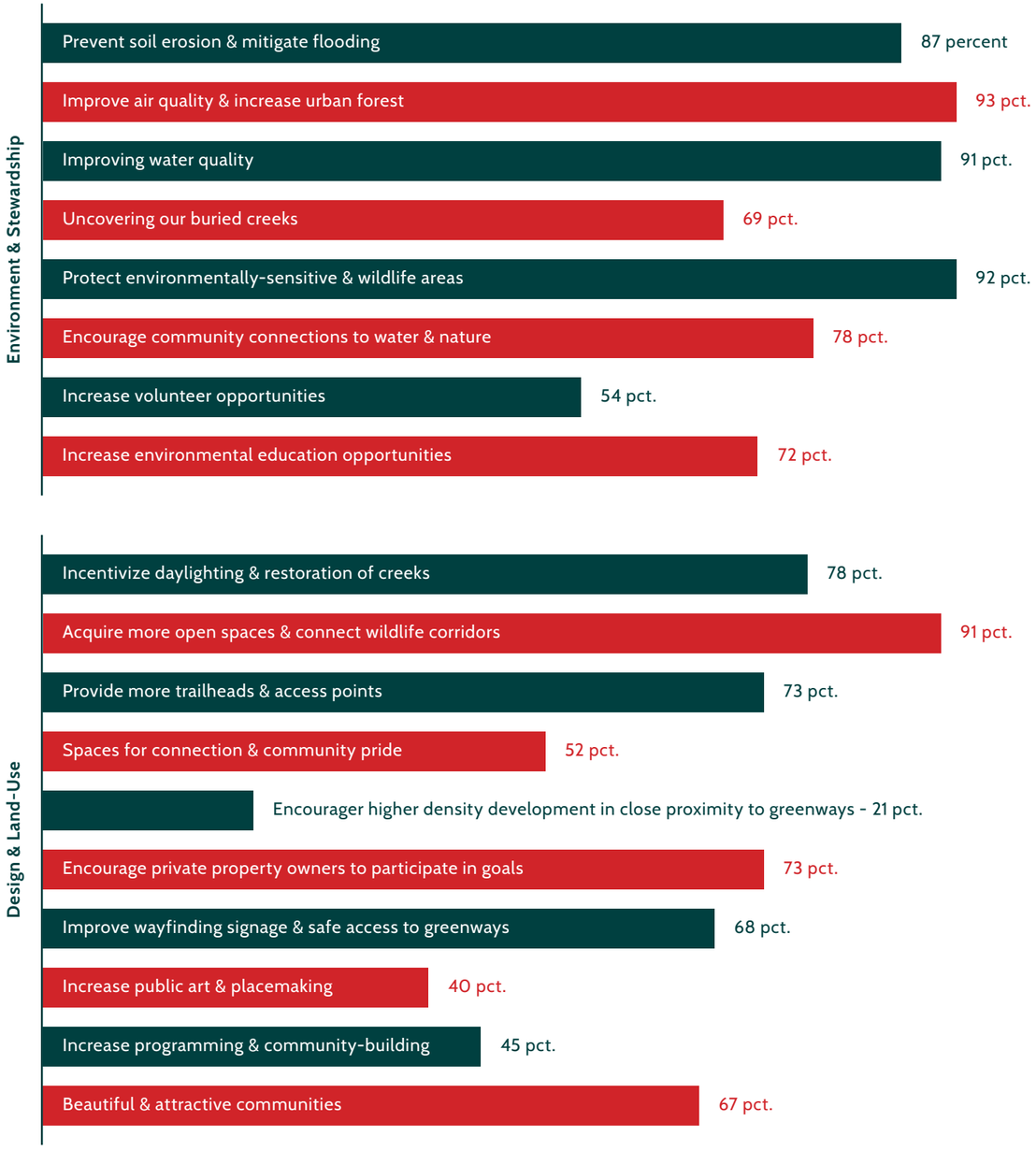
Values

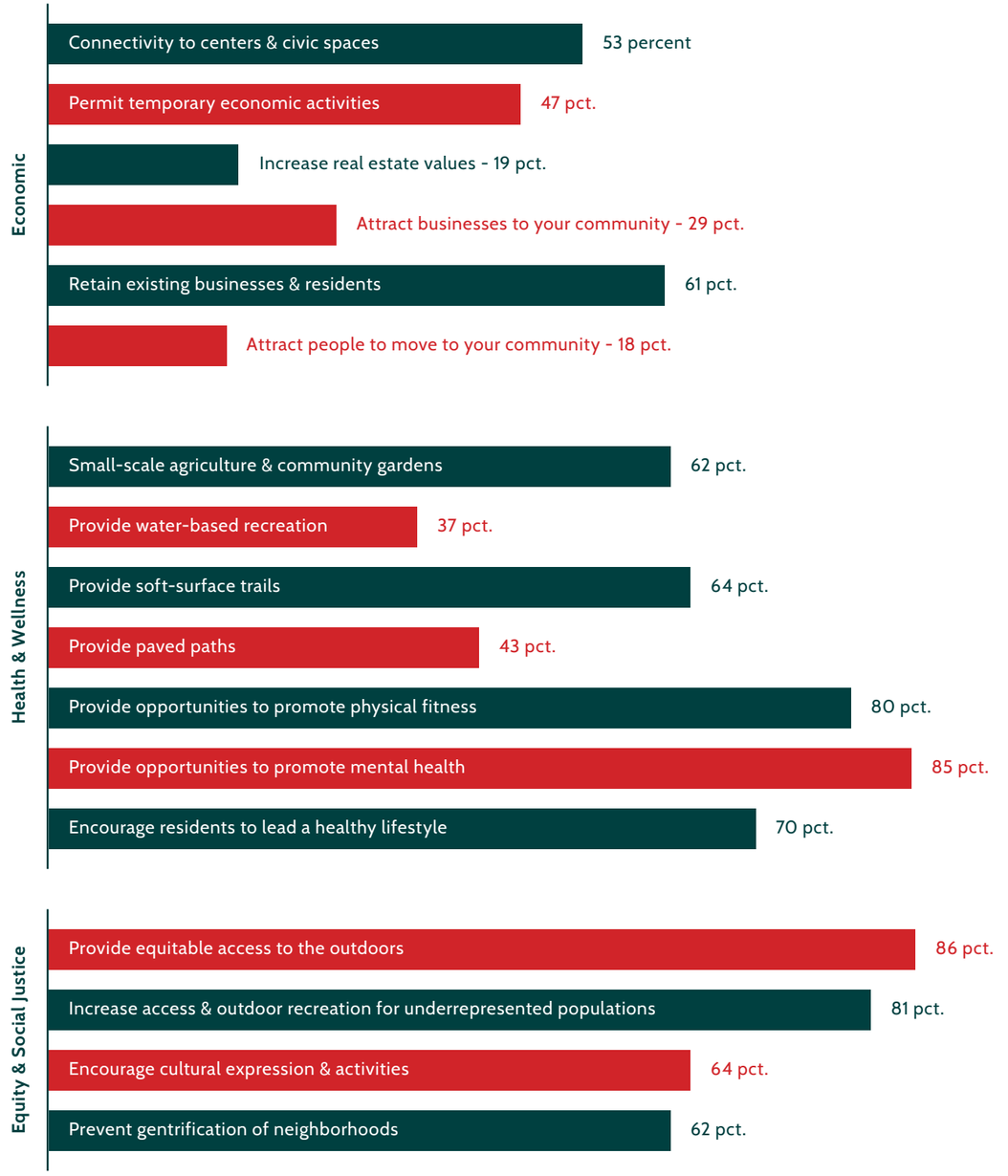
Respondents indicated the environment was most important when spending time outdoors, choosing nature, wildlife, water quality, and access as top priorities. Wildlife watching and escape from urban life was extremely important to 75 percent. Access to water and water quality was extremely important to 54 percent. These were followed by aesthetic qualities at 45 percent and recreation opportunities at 44 percent. Less important were connecting with friends and family, safety, and being close by or easy to get to.

Access

Respondents report room for improvement of information on creek access. Most respondents were relatively neutral on this—32 percent felt it was somewhat easy to find, 31 percent felt it was neither easy nor difficult, and 22 percent felt it was somewhat difficult.

Table 14: Extremely and very important topics by theme of survey





Barriers

The top three reasons preventing access were not having enough information, not within walking or biking distance, and no adequate access. This contradicts the neutral responses in a previous question about information on creek access. However, corridors can be improved through increased access points and connectivity. In the other section, comments most commonly referenced private property, underground creeks, and lack of access.

Environment & Stewardship

Respondents prioritized habitat and natural systems over human interactions with the environment. Improving air quality and increasing urban forest was extremely or very important to 93 percent. Protecting environmentally sensitive wildlife habitat was nearly the same level of interest at 92 percent. Other important topics were protecting and enhancing soil and water and air quality. Lower importance was given to community connections and volunteer and educational opportunities.

Design & Land Use

High importance was placed on acquisitions of open spaces and connecting wildlife corridors. Approximately 91 percent indicated this was extremely or very important. Additional extremely or very important topics included incentivizing daylighting and/or restoration of creeks (78 percent), encouraging private property owners to participate in goals (73), and providing more trailheads and access points (73). Low on the list were items related to human activity, including encouraging higher density development close to the greenways and increasing programming and public art.

Economy

Topics about economy were the least important among all topics. Increasing real estate values and attracting people to move to your community were not at all important to many respondents (30 and 31 percent, respectively). Though, retaining existing businesses and residents was extremely or very important to 61 percent. There is room to increase awareness of the economic benefits of greenways. On the other hand, there is a necessity to address gentrification, displacement, and loss of serenity and ecological health when developing greenways. In the equity and social justice topic, preventing gentrification was extremely or very important to 62 percent.

Health & Wellness

Opportunities to promote mental health emerged as the most important topic. Approximately 85 percent indicated it was extremely or very important. Next were opportunities for physical fitness (77 percent) and encouraging healthy lifestyles (70). Soft-surface trails were the top amenity for health and wellness (64 percent important). Paved trails were only selected important by 43 percent. Conversely, 11 percent indicated they are not at all important. Water-based recreation was low in priority with 37 percent selecting extremely or very important. Small-scale agriculture and community gardens ranked higher (62 percent extremely or very important).

Students taking survey at the Three Creeks Confluence.

Equity & Social Justice

Providing equitable access to the outdoors and increasing access and outdoor recreation for underrepresented populations were highly important topics (86 and 81 percent extremely or very important, respectively). Lower on the scale was encouraging cultural expression and preventing gentrification. However, they were still extremely important to the majority of respondents.

Other Topics

Approximately 218 comments were submitted on topics not addressed in the survey. Popular topics included restoration and daylighting (14 percent), wildlife and habitat preservation (11), dog areas (10), and alternative transportation (8). Although many of these suggestions were covered in the existing topics and survey, it will be important to specifically identify and address many of these in the Plan.

Several comments focused on climate change resiliency. This will be an important topic to address in further engagement. Climate change guides future protection, management, and maintenance of the greenways.

100-Year Visions

Approximately 548 comments imagined the greenways 100 years from now—their dreams and big ideas. Five themes emerged. The first was the creation of protected natural areas with little adjacent commercial or residential development. Although, there were differing opinions. Some imagined adjacent areas bustling with shops, restaurants, street vendors, community gardens, and art.

Next theme was complete east-west connectivity for active transportation and recreation, as well as for riparian habitat corridors along our creeks, including the full daylighting of underground portions. The third focused on equitable access for all residents and visitors. The fourth was programming education and stewardship opportunities for communities to engage with our creeks. The final theme focused on maintenance of the greenways.

10-Year Visions

Approximately 1,065 comments imagined the greenways 10 years from now—change that would make an immediate impact. Respondents touched on improving access and connectivity of existing greenways, while providing more information on how to access (such as parking information, trails locations, amenities provided, etc.). Additionally, some suggested increasing parking, while others thought connectivity would facilitate more active transportation and, thus, less parking. Signage and wayfinding was an important consideration, especially how it relates to safety.

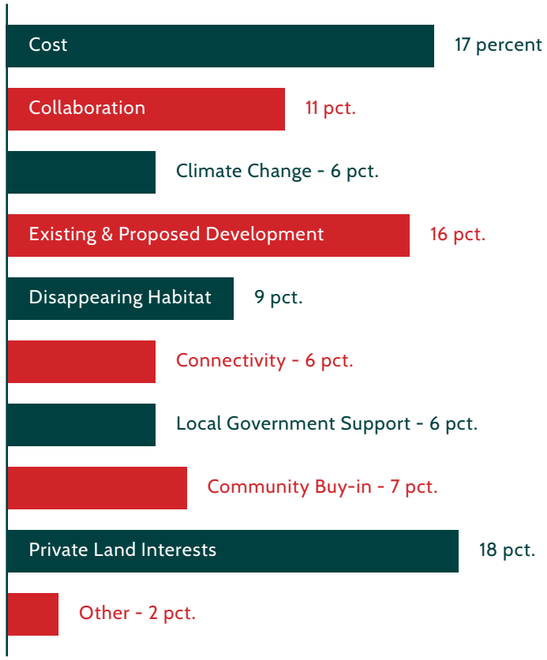
Suggestions included increasing bike lanes, trails, and paths and site-specific stream restoration and daylighting. Specific amenities to include in greenways: water fountains, bathrooms, dog waste management, and trash bins. Many desired more on and off-leash dog areas. However, enforcement of animal ordinances, including leash rules, was a key consideration. Many respondents suggested community events and environmental education programming. Others recommended volunteer clean ups to increase stewardship and maintenance.

Focus Groups

Five focus group meetings, organized around the core elements, brought together 123 technical experts, stakeholders, and community members. Questions asked attendees about past or present efforts, dreams, big ideas, obstacles, data, and key metrics. Discussions were used to guide the framework of the Seven Greenways Vision Plan.

Discussion during the Nature meeting focused on habitat protection and creation, greenway trends, environmental education programming, data, partnerships, and funding opportunities. During the Water meeting, discussion focused on water quality conditions and data, public access to water recreation and angling, stream-road crossings, resiliency and flood control, partnerships, and funding opportunities. Discussion during the Community meeting focused on barriers to equity and access, unsheltered folks, and stewardship. The Recreation meeting discussion focused on connectivity, recreation trends and user groups, equity and access, stewardship and volunteering, partnerships, and funding opportunities. Discussion during the Urban meeting focused on development considerations, private property interests, economic and community benefits, plans and policy, partnerships, and funding opportunities.

Table 15: Biggest obstacles to vision from focus groups



Community design workshop for Herman Franks Park in Salt Lake City.

VISION WORKSHOPS

The second engagement, the vision workshop, was launched July 1, 2021 and was active throughout the month. It included both online and in-person activities. Participants were asked to provide feedback on identified opportunity areas, map opportunity areas of their own, and provide 10-year and 100-year visions for the seven greenways. Engagement was promoted through 104 posted yard signs throughout the Salt Lake Valley, a series of social media posts, an email blast, by partners through an outreach toolkit, and via word of mouth.

Social Pinpoint was used for the online mapping platform and was offered in English and Spanish to better represent our diverse communities. The map shared core element themes, goals, and case studies, opportunity areas identified by municipalities and stakeholders, and a comment wall.

Participants were asked to share feedback on identified opportunity areas and map opportunity areas of their own. They used pins, organized by the core elements, to highlight locations for improvements. Corresponding comments were used to share more information about the opportunity. Participants could also like, dislike, or comment on other opportunity areas.

A series of 15 pop-up workshops were hosted in parks and open spaces throughout the Salt Lake Valley. In-person activities mirrored online methods, including a printed map with core element stickers and post-it notes, vision boards with core element themes, goals, and case studies, and a chalkboard comment wall to capture 10-year and 100-year visions for the seven greenways.

Respondents

Approximately 298 people were engaged across the 15 pop-up workshops. In addition, there were 811 views of the online platform, spending an average of over three minutes browsing.

Activities were designed to be approachable. Participants were not required to provide personal information. Pop-up workshop participation was highest at existing community events, including the Three Creeks Confluence Opening Celebration (150 participants) and Little City Beer Garden (35 participants). Beyond those, the next three highest were: Miller Park in Salt Lake City (24 contributors), Memory Grove in Salt Lake City (20 participants), and Crestwood Park in Cottonwood Heights (15 participants). Additional events were held at Scott Avenue Park, Knudsen Park, Parleys Historic Nature Park, City Creek Canyon Trailhead, Sunnyside Park, Allen Park, the Shops at Fort Union, Birkhill Apartments, Hidden Hollow, and Fitts Park.

Opportunity Areas

There were 46 pinned locations for community-suggested greenway improvements across the five core elements. Recreation was the most selected (17 pins). This was followed by Nature (11 pins), Water (9 pins), and Community (8 pins). Last was Urban (1 pins). This topic may be less relatable, unclear, or of little priority.

By creek, City Creek had 4 pins including:

- Café at the canyon mouth
- Fishing infrastructure
- Enhanced creek accessibility
- More trees for wildlife habitat

Red Butte Creek had 6 pins including:

- Trail from the canyon to Sunnyside Park
- Underpass at Foothill Boulevard and a light rail station at the intersection
- Collaboration with the University of Utah

Emigration Creek had 4 pins including:

- Riparian restoration at Rotary Park
- Integration of the California, Mormon Pioneer, and Pony Express National Historic Trails
- Trail from Blaine Natural Area to Allen Park

Parleys Creek had 11 pins including:

- Creek restoration at Suicide Rock
- Daylighting between Hidden Hollow and Three Creeks Confluence
- Naturalizing the creek and pond at Sugar House Park
- Maintaining creek flow
- Trash receptacles at Hidden Hollow
- Trail into Parleys Canyon

There were 4 pins where Red Butte, Emigration, and Parleys Creeks flow together. Ideas included:

- Daylighting upstream of the Three Creeks Confluence
- Boat access on a daylighted channel along 1300 South
- Celebrating the confluence of Red Butte and Emigration Creeks at Liberty Park

Mill Creek had 9 pins including:

- Park at the Mill Creek Confluence
- Public access to the detention pond east of 500 East
- Creek daylighting at the proposed 700 East and 3300 South development
- Urban fishery and wetland restoration at Scott Avenue Park
- Trail from Evergreen Park to Scott Avenue Park
- Public access and creek restoration at Mill Creek Gardens

Big Cottonwood Creek had 4 pins including:

- Environmental education at the Old Mill Open Space
- Creek restoration and trails at the Holladay Hills development and Big Cottonwood Regional Park – Creekside Park
- Community gardens along the creek near Main Street

Little Cottonwood Creek had 4 pins including:

- Celebrating the creek at the old Paper Mill
- Trail from Crestwood Park to Bingham High
- Boat ramp on the creek near its confluence

Table 16: Opportunity area pins by theme

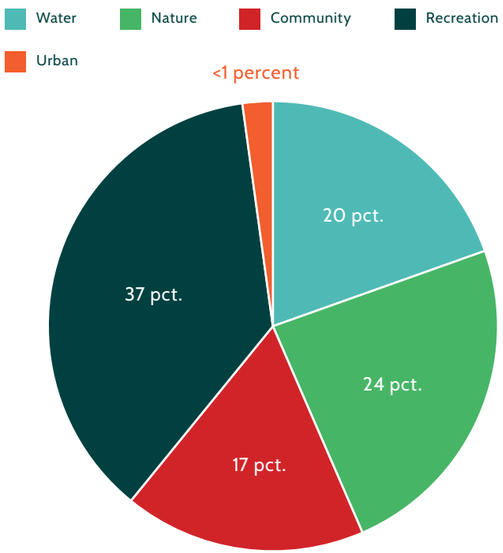
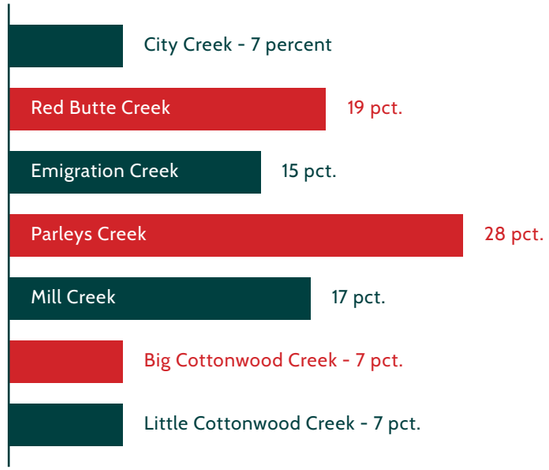


Table 17: Opportunity area pins by creek



Comment Wall

The online and in-person comment wall captured general 10-year and 100-year ideas for the seven greenways. Approximately 94 comments were given.

By core element, ideas for Recreation included:

- Trail connectivity
- Fishing infrastructure
- Gathering spaces
- Places to wade and swim
- Bike racks
- Safe boat passages
- Water fountains
- Trash receptacles
- Better access
- Playgrounds
- Wildlife viewing opportunities.

Nature ideas:

- Natural and open space preservation
- Reduction of chemical vegetation treatments
- More biodiversity
- Urban forests to improve air quality
- Riparian buffers
- Noxious weed removal

Water ideas:

- Maintaining creek flows
- Reducing erosion
- Stormwater best management practices
- Daylighting creeks

Community ideas:

- Community gardens and food forests
- Educational signage and information
- Yearly cleanups
- Addressing environmental injustices
- Community art spaces

Urban ideas:

- Less development

On the online platform, participants had the option to like or dislike opportunity areas identified by municipalities and stakeholders. Overall, the opportunity areas received 65 likes and no dislikes. The three most popular ideas included: Herman Franks Park – Daylight Emigration Creek to activate and enhance the park space (10 likes), Wasatch Hollow to Westminster – Create a trail connection between public spaces along Emigration Creek, restore riparian habitat, and stabilize streambanks (10 likes), and Red Butte Garden to Miller Park – Create a trail connection along public spaces on Red Butte Creek and partner with University of Utah to research creek health (7 likes).

The distribution of likes reflects support for Recreation along the greenways. Many of the opportunity areas also referenced Nature and

Table 18: Top 10 municipal/stakeholder-identified opportunity areas by likes

	NAME	CREEK	LIKES	DESCRIPTION
1	Herman Franks Park	Emigration Creek	10	Daylight the creek to activate and enhance the park space.
2	Wasatch Hollow to Westminster	Emigration Creek	10	Create a trail connection between public spaces along the creek, restore riparian habitat, and stabilize streambanks.
3	Red Butte Gardens to Miller Park	Red Butte Creek	7	Create a trail connection between public spaces along the creek and form partnerships with University of Utah to research creek health.
4	Bonneville Golf Course	Emigration Creek	5	Create a protected trail connection along the creek, restore riparian habitat, and stabilize streambanks.
5	North Temple	City Creek	4	As Salt Lake City develops, daylight the creek and create a trail connection to the Folsom Corridor between West Temple and 400 West.
5	Folsom Corridor	City Creek	4	Revitalizing a rail corridor into a multi-use trail and daylight the creek, connecting east and west-side neighborhoods.
7	Ballpark	Red Butte, Emigration, & Parleys Creeks	3	Daylight the creeks as the neighborhood experiences growth and redevelopment.
7	Sugar House	Parleys Creek	3	Culturally daylight the creek through signage and art.
9	Shops at Fort Union	Little Cottonwood Creek	2	Create a trail connection to the creek, reduce impervious surfaces, and implement green infrastructure to improve water quality.
9	Ivy Place Shopping Village	Big Cottonwood Creek	2	Create a trail connection along the creek, transform abandoned parking lot into green space, restore riparian habitat, create a floodplain, and add a seasonal boat ramp for paddling.

Water, highlighting community support for these elements as well. While likes may indicate some projects are more popular than others, it is important to note top-rated projects were mostly in Salt Lake City. It may be the case that participation was greater in Salt Lake City than other cities.

DRAFT PLAN REVIEW

The final public engagement opportunity was a thorough review of the draft plan document. The 90% draft was published on January 25, 2022 and was available for two weeks. The plan was distributed online and promoted through the Technical Committee, Focus Groups, social media, email lists, partners, and word of mouth.

Respondents

The Technical Committee was given a one-month period to comment on the 70% draft document. Approximately 193 comments were collected. Feedback was used to produce the 90% draft document.

The Technical Committee, Focus Groups, and the general public were given a two-week period to comment on the 90% draft. Approximately 34 comments were collected and 295 users viewed the draft plan. Feedback was used to produce the final document.

Engagement signage along City Creek in Salt Lake City.

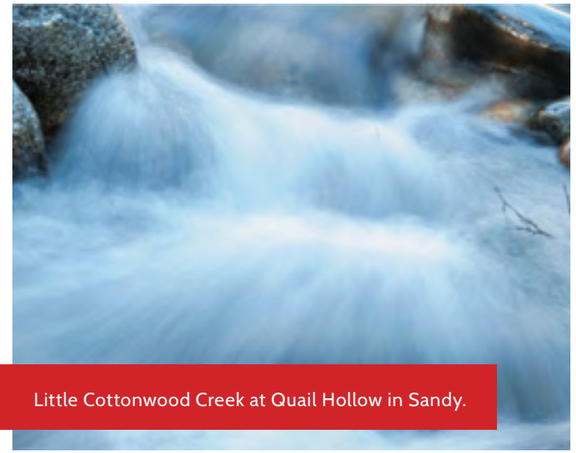
EXISTING CONDITIONS

WATER

Values

In the 2014 "Your Utah, Your Future" survey, residents ranked water as the second-highest priority and level of concern for the future. Of 100 points available, Utahns allocated 37 points to ensure there is enough water in our streams and lakes for wildlife and recreation. This was the highest allocation of all water categories. Farms and food production were allocated at 30 points. One of the recommendations was to: "Ensure water quality and quantity to adequately sustain and maintain the environment by improving watershed management and preserving natural systems."[98]

In the ten big ideas identified in *Reimagine Nature*, the "From the Mountains to the Lake" idea proposes increasing connectivity among Salt Lake City's parks and open spaces. Efforts would identify and invest in corridor alignments that connect the Wasatch Range to the Jordan River, especially along our creeks. Additionally, they would identify priority daylighting projects on City, Red Butte, Emigration, and Parleys Creeks.[99]



Little Cottonwood Creek at Quail Hollow in Sandy.

According to the *Watershed Public Opinion Survey*, Salt Lake County residents valued water quality the most—more than recreation, scenery, habitat, and the economy combined. Of eight concerns surveyed, an adequate supply of good drinking water, industrial pollution, and litter problems were the top choices. Respondents had varied impressions on the health of the stream closest to them and whether their actions affect water quality. Importantly, four of five residents support more public funding to improve our waterways. Finally, they strongly support four public policies to improve water quality that require:

- Landowners to leave vegetation in place near waterways
- Landowners to plant new vegetation along waterways
- New developments to set aside natural open space
- New developments create green infrastructure[100]

Water Quality & Quantity

Our creeks are critical to the Salt Lake Valley's drinking water supply. Four of our creeks—City, Parleys, Big Cottonwood, and Little Cottonwood Creeks—supply the majority of our water. In the project area, there are nine community water systems: Salt Lake City Water System, Veterans Affairs Medical Center Salt Lake City, South Salt Lake City Water System, Cottonwood Coves Incorporated, Jordan Valley Water Conservation District, Holliday Water Company, Murray City Water System, Midvale City Water System, and Sandy City Water System.

In total, the Jordan River Basin provides 234,795 acre-feet of potable water to approximately 1,111,606 people. An additional 30,699 acre-feet were supplied to users by various canals.[101] Average peak and annual flows are strongly influenced by the melting and size of our snowpack. Additionally, flows are influenced by precipitation, runoff, tributaries, groundwater, and inputs from canals.

Our water supply is unique because consumers are so close to the source waters. It takes an estimated 24 hours or less for a drop of water in one of the creeks, at the top of the Wasatch, to reach a faucet in the Valley.[102] In other areas, water sources must travel hundreds of miles through aqueducts to large population centers.

Water quality is heavily monitored and controlled in the protected upper watershed areas in City Creek, Parleys Creek, Big Cottonwood Creek, and Little Cottonwood Creek. Dogs and horses are prohibited in these protected areas. Water treatment plants are located at the mouth of each of these canyons. Even with these protections and treatment, the most economic water quality improvement comes from protecting and restoring our headwaters, according to the Center for Watershed Protection.

Protections diminish as creeks flow into the urbanized valley, and historic modification has left them in a degraded condition. As the Salt Lake Valley urbanized, riparian ecosystems gave way to concrete and asphalt, bricks and mortar. Portions of our creeks were diverted from aboveground channels into storm water pipes underneath our neighborhoods. Others were channelized to control flooding. Banks steepened and eroded. Dams and aging infrastructure eliminated fish passage, disjoined wildlife corridors, and reduced access.

Table 19: Annual acre-feet of water into the Jordan River[257]

CREEK	ACRE-FEET
City	11,750
Red Butte	2,450
Emigration	4,440
Parleys	18,130
Mill	10,760
Big Cottonwood	51,240
Little Cottonwood	46,190

According to the Utah Division of Water Quality, the lower watersheds of all seven creeks support the following beneficial use classes: 2B – Secondary contact recreation (such as wading, fishing, or hunting) and 3A – Cold-water fishery. Lower Red Butte, Emigration, Mill, Big Cottonwood, and Little Cottonwood watersheds support: 4 – Irrigation; Emigration and Parleys support: 1C – Drinking water; and only Mill supports: 3C – Non-game fishery.

Beneficial use classes determine water quality standards necessary to meet uses. Creek segments that are not able to meet the standards are placed on the Clean Water Act's Section 303(d) List of Impaired Waters. They are then prioritized for developing total maximum daily loads (TMDLs) to determine the factors contributing to the impairment and solutions to the issue. TMDLs for Emigration Creek (*E. coli*) and Little Cottonwood Creek (zinc) have been developed, approved, and are being implemented.[103]

Water quality impairments in the seven creeks include:

- Cadmium
- Copper
- pH
- Zinc
- Temperature
- Total dissolved solids
- *E. coli*
- Macroinvertebrates

Climate Change

Climate change is contributing to snowpack loss all over the western United States. Predictions estimate a 60 percent loss of snowpack water storage within the next three decades.[104] Moreover, expected population growth, longer growing seasons, and hotter temperatures in the Salt Lake Valley may increase water demand.

The snowpack is the most important feature of our drinking water conveyance system. It acts as a reservoir and provides drinkable water as the snow melts. Snow often totals over 500 inches in Little Cottonwood Canyon.[105] Most known for its renowned ski conditions, the "Greatest Snow on Earth" has provided a reliable water source for thousands of years of habitation in our Valley.

However, climate change is impacting the amount of water we have, when snow melts, and its quality. With every degree Fahrenheit increase in temperature, a 3.8 percent decrease in overall water volume is expected in our creeks.[106] 2018 was Utah's driest on record and only one other year was warmer.[107] In response, Salt Lake City issued a Stage 1 Drought Advisory.

Climate models show precipitation more frequently arriving in the form of rain, rather than snow.[108] Additionally, smaller snow packs are forecasted to melt earlier, while demand will increase. Climate-driven drought and changes in the hydrologic cycle will challenge the water resource redundancies in our water system.

Summertime algal blooms in Utah Lake and the Jordan River, due increases in temperature, are the new norm. In 2016, an algal bloom on Utah Lake made over 100 people sick. Farmers had to find alternative water sources and mad difficult decisions regarding their crops.[109] Conditions are forecasted to continue, threatening all our reservoirs, like Sugar House Pond and Liberty Lake, and our high-alpine lakes critical to drinking water quality.[110]

Seasonal Dewatering

Many water rights claims from mining operations and farmers predate the formation of cities along the Wasatch Front. This has led to intricate and complex exchange agreements. Cities get high-quality drinking water at the water treatment plants in exchange for rights to lower quality Utah Lake water through canals.

Big Cottonwood Creek is seasonally dewatered for four miles between the canyon mouth and Cottonwood Lane. From November to March, an estimated 50 percent of the creek runs dry within the scope area. Between April and October, Utah Lake water is pumped into the creek to satisfy water rights. This has seriously degraded water quality and the riparian ecosystem.[111]

Little Cottonwood Creek has little to no flow in the scope area from July to March due to culinary and hydropower diversions. To supplement, Jordan River water is brought in, via a canal, at Fort Union Boulevard. This stretch from canyon mouth to Fort Union is seriously impacted.[112]

Water Banking

In 2020, the Utah State Legislature approved the Utah Water Banking Strategy, a three-year pilot program to study alternatives to water transfers. Utah is a "use-it-or-lose-it" state. If water rights are not put to beneficial use over a certain period, the right may be forfeited. Through the water banking program, rights holders can temporarily sell water rights without risk of losing this water permanently. This program could be critical to securing water for instream flows (such as in Big Cottonwood and Little Cottonwood Creeks to prevent seasonal dewatering) to improve water quality, recreation, and habitat.

Flooding & Urbanization

Urbanization markedly increased flooding during the 20th century. Imperviousness is categorized by changes in land-use that do not allow for precipitation to soak into the ground, such as roads, sidewalks, and buildings. Rather, water runs off the surface of our cities and into the storm water system.

Historic 100-year floods double in size with 30 percent imperviousness.[113] Salt Lake County's average impervious area is estimated at 33 percent.[114] Channeling and piping streams transferred impacts downstream, increasing flooding and erosion in our west-side communities along the Jordan River. Smooth concrete pipes and straightened, deepened streams speed up water velocity.

In 1983, a large snowpack and fast spring melt caused historic flooding "termed the worst in Salt Lake County history," according to the Deseret News. Over 1,000 homes were flooded and an estimated 400 people were forced to evacuate. Mud and rockslides closed Big and Little Cottonwood Canyons. The water treatment plant at the mouth of Big Cottonwood was forced to shut down as four feet of mud inundated the area. Famously, City Creek overtopped its banks and ran down State Street in a sandbagged channel. Kayakers were photographed in the new "State Street River," and cutthroat trout were caught in the channel. Similarly, Red Butte, Emigration, and Parleys Creeks were sandbagged down 1300 South.

Although, it wasn't all fun and games. The estimated cost of the three-mile Red Butte, Emigration, and Parleys canal was over $500,000. The combined flow of the creeks was 736 cubic feet per second. Approximately $2 million was spent repairing City Creek, which peaked at 305 cubic feet per second (nearly double the record from 1921). Over 2.6 million sandbags were filled and placed throughout Salt Lake County. Damages were estimated at $34 million across 1,500 identified sites.[115]

In 2017, a 200-year precipitation event overwhelmed Salt Lake City's storm water system in areas surrounding our underground creeks, primarily the Ballpark and Sugar House neighborhoods, as well as across the Jordan River corridor. Parleys Creek overtopped its culvert at Hidden Hollow, leaving five feet of water in the basement of the historic Sprague Library. Over 1,000 books ended up in the dumpster. Damage was estimated at $1.5 to $2 million, and the branch was closed for four months.[116] The Salt Lake City Fire Department estimated 100 homes were flooded. Over 5,000 customers in Salt Lake County experienced power outages. Utah Transit Authority reported delays as tracks and roads were submerged.[117] Salt Lake City School District estimated $2 to $3 million worth of damage at four schools.[118]

Utah Hazard Mitigation is evaluating the Salt Lake County Flood Insurance Rate Maps for accuracy. These maps identify the flood risk and areas where flood insurance is required for property owners. It is important development occurs away from the floodplain and in safe areas as deemed by the flood mapping. Otherwise, property owners may be required to pay for flood insurance.

Insurance costs can burden low-income residents living in flood hazard areas. Additionally, they are often less able to rebuild or relocate after disasters. Residents that rent properties within hazard areas are not required to buy flood insurance, but are at no less risk. The Federal Emergency Management Agency determined that 51 percent of the non-policyholder households in flood hazard areas are low-income.[119] Flooding can spell tragedy for tenants as belongings are destroyed, and they are forced to move from homes.

NATURE

Values

Utahns want to maintain and improve ecosystem and watershed health and ensure access to low-impact recreation, like wildlife watching, hiking, and biking. They allocated 39 points of 100 to these topics. These improvements were two of the three highest public lands categories in the "Your Utah, Your Future" survey.

The *Reimagine Nature* survey further highlights the desire for additional riparian and natural areas in Salt Lake City and beyond. Approximately 65 percent of respondents wanted to increase the size of existing habitats and connect wildlife corridors. Over half wanted to acquire lands adjacent to our creeks to support riparian health and reduce flooding.[120]

According to the *Watershed Public Opinion Survey*, six times more Salt Lake County residents felt an above-average commitment, compared to a below-average commitment, to conservation of the natural environment. Residents would like to see more wildlife habitat, natural stream corridors, and protection of open space. They strongly supported public policies that would require landowners to preserve and restore vegetation along waterways and require new developments to preserve habitat and create green infrastructure. Finally, there was overwhelming support for four strategies to increase public funding for these efforts:

- Fees for canyon and trail usage
- A small property or sales tax increase
- Bonding
- A small household fee[121]

Habitat

The Wasatch Range hosts the most frequented national forest in the United States, receiving nine million visitors per year. This equates to the visitation rate of all five of Utah's national parks combined.[122] Our creeks flow through this wildland-urban interface, connecting the Wasatch Range to the Jordan River. They act as key wildlife corridors connecting habitats along the Wasatch and Oquirrh Mountains to the Jordan River and Great Salt Lake.

In 1848, to reduce predators and pests, a hunt in the Salt Lake Valley included, "two bears, two wolverines, two wildcats, 783 wolves, 409 foxes, 31 minks, nine eagles, 530 magpies, hawks, and owls, and 1,026 ravens." This was one of the only inventories of wildlife in early colonial settlement of the Valley. These larger mammals and predators could freely travel from the mountains to the valley along with the seasons. Additionally, the Salt Lake Valley was a seasonal or year-round home to bighorn sheep, mule deer, coyote, beaver, muskrat, jackrabbits, rodents, waterfowl, wading birds, shorebirds, and various migratory birds. Many of the animals found in the Salt Lake Valley have changed as a result of hunting, habitat fragmentation, and predation by domestic pets.[123]

Riparian areas, such as those along our creeks, are habitat located along the banks of a waterway. In the western United States, riparian areas occupy less than two percent of the landscape.[124] In Salt Lake City, they represent only 1.2 percent of land cover. However, they provide critical ecosystem services for human and wildlife populations. An estimated 80 percent of Utah species rely on riparian areas for a portion of their lifecycle.[125] There are an estimated 114 acres of riparian habitat and 777 acres of wetlands within ¼ mile of the seven creeks.

The Salt Lake Valley features hemispherically significant habitat for neotropical migratory birds.

The Great Salt Lake, along with the seven creeks and Jordan River corridor, is an important piece of the Central Flyway, connecting ecosystems between South America and Canada. The area is important for breeding, migration, and wintering. Birds utilized the area to molt, fatten, court, and stage for migration.

Raptors take the opportunity to forage on high concentrations of migrant birds. Over 257 bird species utilize these ecosystems—over 7.5 million individual birds. They feature the largest staging concentration of phalaropes, approximately 1/3 of the world population, and over half the North American population of eared grebes (over 2.5 million birds).[126]

It is not uncommon to see wildlife in our cities—many of which have adapted to our urban ecosystems. However, the 2014 Mountain Accord identified a lack of baseline data describing existing habitat and ecosystem function in the area.[127] Key indicators of a healthy wildlife population include:

- Herd size and demographics
- Recruitment
- Range trend
- Roadkill/human conflicts
- Active territories
- Habitat condition
- Population estimates

Sensitive Species

Utah ranks 10th in biological diversity and 5th in species only found in the state, when compared to all 50 states. However, it also ranks 5th in species extinction risk and 17th in actual extinctions.[128] The Salt Lake Valley's wildlife diversity comes from its various biomes from high alpine mountains to our wooded foothills and beyond to broad grasslands.

Parks & Natural Areas

Parks and natural areas are important infrastructure for the flora, fauna, and people that call the Salt Lake Valley home. The seven creeks flow through 29 parks and 3 golf courses. They provide varying levels of significance from turf grass with little habitat value to healthy riparian forests with high value.

Public lands play an important role in achieving numerous community goals, such as opportunities for outdoor recreation, enjoyment and relaxation, water quality protection, and wildlife habitat. The 2015 Integrated Watershed Plan states, "Recognizing and managing for residents' desire for open space, and the recreation that goes along with it, can also provide opportunities for water quality protection... undeveloped open space provides areas that can naturally filter more storm water and reduce more runoff compared to more-developed areas."[129] There are an estimated 280,000 acres of natural areas in Salt Lake County—55 percent of the total land area.[130] However, urbanization continues to encroach on natural areas, and past disturbances impact the health of our ecological systems.

Wasatch Hollow provides an example of protecting our creeks and achieving conservation goals. The 13-acre nature preserve features a half-mile of Emigration Creek, wildflower meadows, towering Fremont cottonwoods, trails, and a spring-fed wetland. Parts of the area had been privately-owned for 45 years and, over the years, a handful of multi-unit development projects were proposed.

In 2009, community advocates, Salt Lake County, Utah Open Lands, and The Church of Jesus Christ of Latter-day Saints worked to purchase and protect this area in perpetuity through a conservation easement. In 2015, Salt Lake City underwent a restoration project to develop pathways, re-establish riparian function, restore habitat value, and reconnect Hodgson's Spring to Emigration Creek. "It's a little oasis on a creek in the city," said Lewis Kogan, Salt Lake City Trails and Natural Lands Division Director. "It's a remnant ecosystem that still looks like it did back when the pioneers entered the valley."[131]

Urban Forest

Urban forests come in many different forms. They include trees in and along urban parks and natural spaces, waterways, streets, landscaping, and on our buildings. Our urban forest helps filter pollutants, especially important with the Salt Lake Valley's poor air quality—often some of the worst in the United States.[132] In the "Your Utah, Your Future" survey, residents ranked air quality as the third-highest priority and level of concern for the future.[133]

Poor air quality impacts our residents. Asthma incidents increase in neighborhoods with fewer trees.[134] The urban forest can help. A single tree absorbs ten pounds of air pollutants yearly.[135] The total value of air pollution reduction by Sacramento's 6 million trees is estimated at almost $30 million.[136]

The urban forest provides shade, reducing the urban heat island effect and protecting us from harmful ultra-violet radiation. Trees sequester carbon and provide oxygen. A single tree produces nearly 260 pounds of oxygen—enough to support two individuals.[137]

Research shows that trees near roads slow down traffic, making our streets safer.[138] Trees create jobs, from entry-level landscaping and nursery work to skilled arborists. An additional 100 million trees in the United States could save $2 billion in energy costs annually—that's three additional trees per building.[139] Trees on the west side of a building reduce electric bills by an average of $47 a year.[140] Urban forests create a sound buffer, reducing noise pollution. Moreover, the urban forest provides a buffer for our creeks to filter pollutants in urban runoff.[141]

One 20-year old tree can:

- Remove 3,100 pounds of carbon dioxide from the atmosphere
- Save 570 kWh of electricity
- Intercept 27,000 gallons of rainfall
- Filter 15 pounds of air pollution[142]

In Salt Lake City, the urban forest consists of an estimated 85,000 public trees—63,000 on streets and 22,000 in parks and open spaces.[143] Holladay implemented a tree preservation ordinance to protect the existing urban forest and require replacement of protected trees that are removed.[144] Holladay, Murray, Sandy, Salt Lake City, and South Salt Lake are designated on the Tree City USA list.[145]

Climate Change

The Salt Lake Valley is already experiencing impacts of climate change. Increases in frequency and severity of extreme weather events have significant costs to governments, community members, and our ecosystems.

Over 100 homes were flooded and 5,000 customers in Salt Lake County experienced power outages during a 200-year precipitation event in 2017.[146] The storm overwhelmed Salt Lake City's storm water system in areas surrounding our underground creeks, primarily the Ballpark and Sugar House neighborhoods, as well as across the Jordan River corridor. Damages required costly stream restoration efforts, as well as repair of a public library and two schools, estimated at $5 million.[147]

By 2050, Salt Lake City's temperatures are predicted to rise ten degrees—what Las Vegas feels like today.[148] This will severely impact our flora and fauna species as air and water temperatures increase, precipitation regimes

change, and drought is extended. Roughly half of the species on the plant are on the move—those on land at an average of 10 miles per decade.[149]

The Salt Lake Valley's ecosystems will shift over time as new species colonize, while other species may not be able to adapt in time. New arrivals can outcompete indigenous flora and fauna. Pests and diseases are also migrating, moving into new areas, and impacting natural ecosystems and agriculture.[150]

Pests also impact humans. According to the Centers for Disease Control and Prevention, Lyme disease is trending upward in Utah due to the warming climate. Confirmed cases jumped from three in 2000 to 19 in 2016. West Nile Virus and other mosquito-borne illnesses are also on the rise.[151]

Wildfires are predicted to increase with climate change. In 2020, over 1,500 fires burned over 300,000 acres, the worst on record for human-caused fire starts.[152] The forest area susceptible to wildfire has doubled since 1984 due to higher temperatures and less rainfall. Furthermore, the fire season has been extended by six weeks, compared to a few decades ago.[153] Hospital visits spike as air pollution from smoke gets trapped in the Salt Lake Valley.[154]

Wildfires in our natural areas in the Salt Lake Valley are especially dangerous and costly with development and infrastructure nearby. In 2020, the 13,000-acre Knolls Fire spread into residential areas in Saratoga Springs, destroying a home and displacing many. In 2018, wildfires burned 500,000 acres across Utah at a cost of $150 million in suppression.[155]

Challenges

By the 1980s, the Utah Division of Wildlife Resources estimates approximately 30 percent of Utah's riparian, wetland, and aquatic habitats were destroyed.[156] As the Salt Lake Valley's population grows an additional 600,000 people by 2065, wildlife habitat impacts will be further compounded.[157] Water consumption and the subsequent alteration of aquatic habitats are the most significant source of stress for wildlife in Utah, according to the *Utah Wildlife Action Plan*.

Introduced species pose the second largest threat to indigenous wildlife. Introduced species become noxious when they out-compete indigenous species. Their populations often explode when there are no natural predators to keep populations in check. There are 54 species on the Salt Lake County Noxious Weed List. Many are found along our creeks.

More wildfires due to climate change increase the impact on wildlife habitat. An acre of a restoration project at the Mill Creek Confluence burned in 2017 and 2020. Desirable vegetation, such as Woods' rose and coyote willow, was burned in the fire. In addition to the fires themselves, the loss of habitat impacted a skulk of red fox at the site.[158] Urbanization further threatens our wildlife habitat as natural, open spaces are replaced with development.

Barriers

Our creeks are wildlife corridors. Species use them to navigate from one patch of habitat to another in the Salt Lake Valley between the Wasatch and Oquirrh Mountains to the Jordan River and Great Salt Lake. Along our open creeks, they are less likely to encounter hazards, such as roads, fences, pets, and people. These corridors are vital to the long-term health of wildlife.

However, hazards create dangerous encounters between wildlife and development. Wildlife may be forced to cross busy roads, jump over fences, and travel through human developments. Automobile collisions are often deadly for wildlife and dangerous for humans. Scared wildlife can become aggressive, as humans and wildlife compete for space in the urban environment.

Fremont cottonwood along Big Cottonwood Creek in Holladay.

Fragmentation is the primary threat for aquatic species. Many need connected streams to migrate and complete their lifecycle. Barriers jeopardize their survival. They may be natural, like waterfalls. . Others are anthropogenic—culverts, buried streams, dams, or physio-chemical (temperature or toxicity). [159]

According to the *Utah Fish Passage Barrier Assessment and Inventory*, there is one barrier on City Creek, two on Red Butte, one on Emigration, nine on Parleys, eight on Mill, six on Big Cottonwood, and 11 on Little Cottonwood. In an analysis of land cover within 1/4 mile of our creeks, Little Cottonwood Creek has the most intact wildlife habitat with the most open space adjacent. Mill Creek is the worst with over 80 percent of its land cover developed. As the Salt Lake Valley continues to increase in population, along with a rise in popularity of outdoor recreation, conflicts may increase if space is not provided for wildlife.

Wasatch Wildlife Watch

The Wasatch Wildlife Watch program seeks to fill our data gap in understanding urban wildlife populations, habitats, and responses to urban development. Over 1,000 camera traps are scattered throughout the Wasatch Range and Salt Lake Valley green spaces. Volunteers pour over thousands of images to identify wildlife captured.

Thus far, almost two million individual wildlife have been photographed across 46 different species. The top wildlife species detected are mule deer, northern raccoon, wild turkey, elk, red fox, moose, and rock squirrel.[160] Camera trapping identifies key habitat for future restoration and identifies important corridors for migration and movement. Additionally, efforts monitor trends in populations of urban wildlife species to make recommendations for future management.

COMMUNITY

Values

According to the "Your Utah, Your Future" survey, Utahns want their communities to be:

- Safe, secure and resilient
- Prosperous
- Neighborly, Fair and Caring
- Healthy, Beautiful and Clean

Respondents want communities that provide convenient access to nature and recreation. Furthermore, they want these destinations to be accessible by walking, biking, and transit, rather than driving alone. Of 100 points available, 23 were allocated to improving alternative transportation systems without a vehicle. To do so, a key strategy is to "connect communities with a system of trails and parks." It is particularly important to integrate trails into regional systems and provide access to destinations and transit. The *Transportation & Communities Vision Book* suggests cooperatively planning networks at both the community and regional levels before significant population growth.[161]

Demographics

Approximately 388,908 residents live within one mile of the seven creeks. The total population of Salt Lake County is 1,204,222. The population living within one-mile of the creeks grew by one percent between 2010 and 2020. For comparison, the population in Salt Lake County, as a whole, grew by 1.5 percent between these ten years.[162]

The population within one-mile of the creeks is 50-50 male and female. The median age is 35. The gender distribution is the same county-wide and the median age is similar at 33. The majority of the population is 82 percent white, compared to 87 percent in Salt Lake County. Table 4 shows the population by race within one mile of the creek corridors.

There are 155,329 households within one-mile of the seven creeks, compared to 397,918 in Salt Lake County. The average household size is 2.47—2.99 in Salt Lake County. Nearly 80 percent of homes within one-mile of the creeks were constructed before 1990. County-wide, 65 percent of homes were constructed before 1990. Median price of homes within one mile of the seven creeks is $374,384, compared to $345,284 County-wide.[163]

According to membership figures provided by The Church of Jesus Christ of Latter-day Saints, approximately 49 percent of Salt Lake County residents are Mormon, which includes active and nonactive members. The number of devout Mormons is lower. It is estimated about 40 percent of Mormons are active—24 percent of Salt Lake County residents as a whole.[164] This dichotomy plays into the cultural narrative of the Salt Lake Valley between religious folks and the counterculture.

Indigenous Peoples

The Salt Lake Valley includes the ancestral lands of the Eastern Shoshone Tribe, Goshute Indian Tribe, Northwestern Band of the Shoshone Nation, Ute Indian Tribe, and Shoshone-Bannock Tribes. These communities stewarded our creeks for centuries—hunting, fishing, and gathering along their banks. Each creek tells a story that makes up the cultural narrative of tribes in the Salt Lake Valley.[165]

As Mormon settlers moved into the Salt Lake Valley and spread along the Wasatch Front, native peoples were displaced and conflicts arose. Many tribes were pushed to the eight reservations in Utah. However, not all live on reservations. Approximately 46 percent of the total population of indigenous peoples in Utah live in Salt Lake County.[166]

Underrepresented Populations

In the Salt Lake Valley, there is a divide between east and west-side communities. The north-south Interstate-15 and railroad tracks create a barrier to connectivity and cultural exchange between these communities. This limits mobility, decreases access to jobs, creates dangerous encounters between people, cars, and trains, and silos communities.

Examples of underrepresented groups include: people of racial and ethnic minorities, people that are 65 years or older, people with physical or cognitive disabilities, people with housing insecurity or experiencing unsheltered homelessness, and people with low income (below twice the official poverty threshold or $38,000 for a family of four). Western and central areas of Salt Lake City, South Salt Lake, and western areas of Millcreek have higher concentrations of underrepresented groups. The poverty rate in these communities ranged from 11 to 31 percent, compared 2 to 16 percent in other Salt Lake County communities. Of the 12 census tracts that border the western edge of the creek corridors, racial and ethnic minorities make up an average of 59 percent of the population.[167]

Environmental Justice

Our creeks slip underground as they flow west, passing unseen through west-side neighborhoods until spilling into the Jordan River within buried culverts. Three of the top five most diverse cities in Utah fall within the project area: South Salt Lake, Midvale, and Salt Lake City.[168]

In South Salt Lake, Mill Creek is impaired for *E. coli*, dissolved oxygen, and degraded aquatic habitat condition (observed-to-expected bioassessments). In Salt Lake City, City, Red Butte, Emigration, and Parleys Creeks flow underground as they pass underneath Interstate-15 and the central city core. Additionally, the lower watersheds of the creeks are impaired for *E. coli* and degraded aquatic habitat condition (observed-to-expected bioassessments). Midvale features only a small portion of Little Cottonwood Creek, which is impaired for *E. coli*, cadmium, temperature, total dissolved solids, and degraded aquatic habitat condition (observed-to-expected bioassessments).[169] Loss of green space due to creek burial and water quality impairments have left many residents on the west-side without access to nature or connectivity via riparian corridors and pathways.

According to the Environmental Protection Agency, environmental justice is "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." In the United States, communities of color are three times more likely than white communities to live in a place that is nature deprived. An estimated seventy percent of low-income communities live in nature-deprived areas.[170]

Put simply, the conditions of our creeks that flow through wealthy areas should be the same as those that flow through our lower-income communities. That is not the case in Salt Lake County. According to the Environmental Justice Screening and Mapping Tool, many of the environmental justice parameters—particulate matter 2.5, ozone, traffic, Superfund sites, hazardous waste, and wastewater—are concentrated along western stretches of the creeks, particularly along the Interstate-15 corridor and west.[171]

Air quality is the Salt Lake Valley's biggest environmental injustice. Atmospheric inversions cause acute air pollution days, and limit urban outdoor activity. Travel east to higher elevations and one can see the thick layer of pollution in the western part of Salt Lake County. In December 2019, a red-level day registered particulate levels nine times greater than Los Angeles.[172]

Pollution is the leading cause of disease and death in the world, contributing to nine million deaths in 2015 alone. Health effects caused by pollution are most severe among low-income and underrepresented communities.[173] The Utah Society for Environmental Education conducted a study asking west-side residents about problematic issues in their community. The most noted problem was air quality.[174]

Geography plays a role as pollution settles in the lower parts of the Salt Lake Valley. Additionally, the largest emitters are located in west-side neighborhoods—factories, highways, and refineries. A 2014 study found higher pollution days increase school absenteeism. By cutting pollution in half, the Salt Lake City School District would save $426,000 per year. Benefits would be greatest in schools located in underrepresented areas. [175]

Nearly nine percent of Utah adults and six percent of children have asthma. During air pollution days, more emergency room visits and hospital admissions occur.[176] Climate change threatens to make pollution worse. Higher temperatures due to climate change will increase extreme heat events and wildfires. Summertime PM 2.5, created by wildfire smoke, decreases air quality and the health of residents. In some cases, it can lead to premature death.[177]

The urban forest plays a key role in improving air quality. Yet, tree coverage in Salt Lake County declines in neighborhoods with higher percentages of underrepresented populations—residents who are most impacted by poor air quality.[178] In new neighborhoods, there is no relationship between household income and vegetation abundance. However, as neighborhoods age, time strengthens the relationship as low-income residents do not have the financial resources or social capital to replace trees after their natural life span.[179]

According to the *Parks & Public Lands Needs Assessment*, the Central, Northwest, and West Salt Lake communities, in Salt Lake City, are the highest need planning areas. These are Salt Lake City's most diverse and lowest income. The Central Community has the least access to parks and trails, and is slated for the most future growth. An estimated 94 acres of new green space, throughout Salt Lake City, is required to meet future needs at the same level of service.[180]

Communities on the west-side have high numbers of park acres and amenities due to the Jordan River corridor. However, west-side residents are less likely to visit parks. When they do, they are more likely to travel and use east-side parks.[181] Many west-side residents feel their parks and open spaces do not get the same level of maintenance. In *Reimagine Nature*, Salt Lake City is committed to investments in capital improvements and maintenance on the Jordan River Trail that matches Liberty Park, acre for acre.[182]

Unsheltered Homelessness

According to 2019's Point-in-Time count, approximately 1,844 people are experiencing unsheltered homelessness on any given night in Salt Lake County. Public parks and open spaces sometimes provide more comfortable spaces for those experiencing homelessness than resource centers. In our greenways, evidence of homelessness can be seen as unsanctioned encampments.

The most immediate impact can be belongings within encampments. While the belongings do not present an ecological impact, the visual impact can affect user experience. Public complaints to park managers, health departments, and police enforcement lead to costly clean-up and removal of camps, belongings, and waste left behind. However, for individuals living on as little as $11 a day, belongings are not easily replaced.[183]

Additional ecological impacts from encampments may include bank erosion when regrading or digging into the creek bank is involved, trampling of sensitive habitat areas, and water quality issues related to microplastics and *E. coli* from feces running into waterways. According to researchers, these impacts may be overstated to justify removal and clean-up mitigation efforts. Drug paraphernalia presents a safety hazard for volunteer groups without experience handling sharp materials.

Wildfires are possibly the largest risk of encampments in natural areas. Fires easily get out of hand in the summertime when vegetation is dry. Natural areas frequently burn along the Jordan River, jeopardizing habitat, utilities, and other infrastructure. For example, an acre of wildlife habitat, in a restoration project at the Mill Creek Confluence, burned in 2017 and then again in 2020. Fires were linked to campfires in encampments at the site.[184]

Safety

Our communities are grappling with designing parks and open space for safety, while balancing goals for access, wildlife habitat, and water quality.

Utah's violent crime rate of 2.3 residents per 1,000 is lower than the national average. The national average is 3.7. South Salt Lake reports 9.6, Salt Lake City: 7.3, Murray: 4.3, Sandy: 1.6, and Cottonwood Heights: 1.3. Holladay, Millcreek, and Midvale were not reported. Being assaulted by a stranger is the number one violent crime concern in Utah, and it's the crime most people feel is most likely to happen.[185]

According to *Blueprint Jordan River Refresh Survey Findings*, 24 percent said they don't feel safe visiting the Jordan River Trail. When surveying by gender, females' concern for safety went up to 35 percent. Out of 100 points, females spent 17 points on safety, the highest of their allocation to improve the Jordan River corridor. Most did not feel safety prevented them from using the river corridor.[186]

The *Parks & Public Lands Needs Assessment* shows some inconsistencies. Most respondents felt safe alone in their neighborhood parks during the day and at night. When asked about the two major trail networks in Salt Lake City, 73 percent felt safe alone during the day and 44 at night on the Bonneville Shoreline Trail. On the Jordan River Trail, 43 percent felt safe alone during the day and 16 at night.[187]

According to the National Recreation and Park Association, "keeping park and recreation facilities safe is a key to community wellness and has a direct relationship to their usage rate." Integrated approaches are required to create and maintain safer parks and open spaces, including design, programming, maintenance, and engagement.[188] Efforts should address safety equally in all genders and cultures.

Community Institutions

An estimated 20 commercial activation points, 80 civic activation points, and 116 recreation activation points are located within 1/2 mile of the seven creeks. Currently, access to our greenways is focused at existing public lands, such as parks, natural areas, and open space. Private property complicates access. However, through partnerships with landowners, especially near commercial and civic activation points, access has been granted in formal or informal agreements.

For example, a trail winds along Big Cottonwood Creek through the Cottonwood and Old Mill Corporate Centers. The landowner donated rights-of-way as a means for tenants to access the creek and recreation opportunities.[189] The trail connects the city of Cottonwood Heights, the Old Mill Open Space, and the mouth of the Big Cottonwood Canyon underneath Interstate-215 to Knudsen Park and the rest of the city of Holladay.

Access agreements and partnerships with schools, churches, and other community institutions create quasi-public private space for the greenways. At the Bonneville First Ward in Salt Lake City, access agreements have extended the Miller Bird Refugee and Nature Park into The Bonneville Glen along Red Butte Creek. The connection creates access from 1500 E and 1000 S up to 900 S and 1700 E.

Our creeks flow within 1/4 miles of 40 schools and universities, 90 churches and other religious institutions, 11 community centers, and 10 other anchor community institutions.

Programming

Activation is one of the key ways to improve safety. Programs, events, maintained landscaping, infrastructure, and facilities, particularly in low-income and diverse neighborhoods, draw more users to green spaces.[190] Events bring positive activity.

Through programming, participants interact with and learn about our creeks and the surrounding riparian environment. Environmental education teaches about ecosystems, issues they face, and ways humans cause harm. Participants are empowered through teachings to take action, become stewards, and improve ecosystems around them.

The Seven Creeks | Walk Series is a program to observe and share stories, insights, and visions

Walk along Emigration Creek with Westminster.

to better manage, restore, and love our creeks. Participants engage in on-the-ground actions to build community connection and improve their local ecosystems. After programming, 90 percent of participants reported they understood why creeks are important and 90 percent understood the issues they face. Approximately, 64 percent felt they made a different during programming and 65 wanted to participate in stewardship actions again.[191]

Creeks function as living laboratories for nearby schools and institutions. For example, Westminster College students in the Environmental Studies program survey the hydrology of Emigration Creek, through the Seven Creeks | Walk Series. Students follow the creek as it goes below ground outside of campus, tracing it underneath houses, parking lots, and roads, to Liberty Park. They learn about opportunities to uncover the creek and actions they can take to improve its health. Students take this knowledge back to campus and use it to frame water quality testing on the creek and further education on its hydrology.

Programming improves inclusion. Events can express community identity, promote shared values, and create a sense of place. They can showcase underrepresented voices and be a format for public discourse. Parks and open spaces provide residents with gathering space to celebrate diverse traditions.

RECREATION

Values

Based on response in the 2014 “Your Utah, Your Future” survey, Utahns want to provide outdoor recreation opportunities close to home. To do this, they want a connected and expanded network of trails, parks, and bike infrastructure through our cities to promote healthier living, personal enjoyment, and happiness. Approximately 67 percent support more funding, even if it meant a small tax increase, to establish interconnected parks and trails.[192]

In the ten big ideas identified in *Reimagine Nature*, the “From the Mountains to the Lake” idea proposes increased connectivity among Salt Lake City’s parks and open spaces. Efforts would identify and invest in recreation opportunities that connect the Wasatch Range to the Jordan River, especially along our creeks.[193] Salt Lake City residents particularly enjoy parks and open spaces that support hiking, walking, running, and non-programmed activities.[194]

In the *Blueprint Jordan River Refresh Survey Findings*, over 60 percent thought an expanded trail network along the Jordan River and connections to regional trails, like the greenways, was extremely or very important. Connections to regional trails were ranked third on improvements to travel along the Jordan River corridor, just after improved crossings and a wider trail.[195]

Canoer on the Jordan River in Salt Lake City.

More than 75 percent of Salt Lake County residents enjoy parks at least monthly. Large numbers accessed wilder areas regularly. Nearly two-thirds of residents in Salt Lake County report time spent outdoors as very important to their overall satisfaction and happiness. They would like to see more recreational opportunities available to them.[196]

Outdoor Recreation

Outdoor recreation can take on many different forms. It can be as simple as walking a neighborhood trail, a bike ride around the block, or a child playing along a creek that flows through their neighborhood. Alternatively, it can be as time and monetary intensive as skiers flocking to Big Cottonwood and Little Cottonwood Canyons for the “Greatest Snow on Earth” and the four world-class ski resorts.

Outdoor recreation opportunities are ample in the Salt Lake Valley. A fact which, according to a Gallup study, makes Utah one of the best states to live in due to our proximity to clean water and exercise, low obesity rates, and optimism that our cities are “getting better.”[197] Outdoor recreation also strengthens Utah’s economy. In 2019, it generated an estimated $6.4 billion and 83,000 jobs.[198]

The Coronavirus (COVID-19) pandemic underscores the need for parks and recreational facilities, especially those close to home. They provide a way to get outdoors and exercise while protecting yourself and others. Greenways should focus on equitable access, especially for residents without the means to travel to canyons

for outdoor recreation and exercise. They can connect communities, and ecosystems, from the Wasatch Range to the Jordan River—a range to river connection.

Existing Facilities

Along City Creek, soft-surface trails and a paved road extend between the upper canyon, Memory Grove, along Canyon Road, City Creek Park, and along North Temple. In 1995, City Creek was daylighted through the grassy median on Canyon Road and in the former surface parking lot at City Creek Park. Benches, green space, and a stone-lined creek create an oasis in the heart of downtown Salt Lake City. Hundreds of visitors can be seen enjoying the solace of the flowing water.

Along Red Butte Creek, a paved road extends from the mouth of the canyon to the base of Red Butte Reservoir. Soft-surface trails wind around the Miller Bird Refuge and Nature Park and Bonneville Glen. Soft-surface and paved trails surround Liberty Pond, the confluence of Red Butte and Emigration Creeks. The Three Creeks Confluence provides a trailhead to the Jordan River Trail at the confluence of Red Butte, Emigration, and Parleys Creeks, where they flow into the Jordan River.

Along Emigration Creek, soft-surface and paved trails wind through parks and open spaces along the creek, including Rotary Glen Park, Donner Trail Park, Wasatch Hollow, and Blaine Natural Area. Salt Lake City recently acquired Allen Park for $7.5 million. Allen Park Drive serves as a pedestrian-only road to view the eclectic mix of historic homes, works of art, and the natural beauty of the creek. On Westminster College's campus, paved and soft-surface trails parallel the creek.

Along Parleys Creek, the Parleys Trail closely parallels the length of the creek as it flows on the east-side of Salt Lake City from the mouth of the canyon through Parleys Historic Nature Park, Sugar House Park, and Hidden Hollow. From there, the trail goes down a rail right-of-way paralleling the Utah Transit Authority's S Line Streetcar and existing tracks on the west-side. At this point, the creek goes underground into the storm water system. A trail gap exists at 900 West to the Jordan River Trail. The Parleys Trail is the most complete greenway of the seven.

Along Mill Creek, trails exist in Evergreen Park and Scott Avenue Park. The Mill Creek Trail, in South Salt Lake, begins at 500 East in Monarch Park and parallels the creek through Fitts Park. The Mill Creek Trail picks back up at the Utah Transit Authority's Millcreek Station on 3300 South and extends, as a widened sidewalk, to the Jordan River Trail. The Mill Creek Confluence provides an existing trailhead to the Jordan River Trail, where the creek flows into the Jordan River.

Along Big Cottonwood Creek, the Big Cottonwood Trail begins at the mouth of the canyon and parallels the creek through the Old Mill Open Space to Knudsen Park. Soft-surface and paved trails wind through parks and developments along the creek, including Big Cottonwood Regional Park, KPC Promise Hospital of Salt Lake, and the Birkhill Apartments.

Along Little Cottonwood Creek, the Little Cottonwood Trail extends from the canyon mouth to the Temple Quarry Ruins within the canyon. A soft-surface trail parallels the creek in Quail Hollow Park until it flows to the water treatment plant. Additional soft-surface and paved trails wind along the creek in Crestwood Park, Wheeler Historic Farm, Murray Park, and the Intermountain Medical Center. Arrowhead Park and the Little Confluence Trailhead provide access to the Jordan River Trail, where the creek flows into the Jordan River.

The seven greenways feed into the Golden Spoke trail system, which includes over 100 miles of safe and nearly-connected multi-use trails from Provo to Ogden along the Wasatch Front, including the Provo River Parkway, Murdock Canal Trail, Jordan River Trail, Legacy Trail, Denver and Rio Grande Western Rail Trail, and Ogden River Parkway. The greenways also provide connectivity between existing or proposed sections of the Bonneville Shoreline Trail to the east.

Planned Facilities

Along City Creek, the Folsom Trail will connect Utah Transit Authority's North Temple Station to the Jordan River Trail through an abandoned railroad corridor. The corridor will improve access from west-side neighborhoods to employment, services, and entertainment in Downtown Salt Lake City. Construction is expected to begin Spring 2021. Adjacent to the trail, City Creek is proposed to be uncovered and restored. In 1992's *Open Space Plan*, City Creek was proposed to be uncovered along North Temple, around the Jazz Arena, flow through the Gateway Redevelopment Area, and connect into the Folsom Corridor.[199]

Along Red Butte Creek, efforts are underway at the University of Utah to create a trail adjacent to the creek from Red Butte Garden, through Research Park, to Foothill Boulevard.[200] According to Salt Lake City Transportation, Utah Department of Transportation has tentatively agreed to a below-grade crossing for the trail underneath Foothill Boulevard. The *Pedestrian & Bicycle Master Plan* proposes to extend the trail through the United States Department of Veterans Affairs campus and Sunnyside Park to Sunnyside Avenue.[201] This would nearly bring the trail to existing pathways at Miller Park and beyond.

Along Emigration Creek, a paved trail is proposed through Bonneville Golf Course. The 1992 *Open Space Plan* imagined a paved trail extending from the golf course, through Westminster College, and connecting into the McClelland Trail. With Salt Lake City's recent acquisition of Allen Park, this vision is possible. There are two miles of contiguous, accessible, and preserved riparian ecosystem between Wasatch Hollow, Blaine Natural Area, Allen Park, and Westminster College. Some private property still exists along this stretch. However, through access agreements, this corridor could have a trail soon.

Along Parleys Creek, partners are working to complete the major gap on the Parleys Trail between 900 West and the Jordan River Trail and to create more formal connections in the Sugar House Business District and between State Street and 300 West.

Along Mill Creek, South Salt Lake has plans to extend the Mill Creek Trail from Fitts Park, through a Utah Transit Authority right-of-way along the creek, then south to the existing trail at the Utah Transit Authority's Millcreek Station. Further proposals suggest a trail through the Central Valley Wastewater Treatment Plant property to the Mill Creek Confluence, connecting to the Jordan River Trail.[202] Interstate-15 and several large swathes of railroad tracks create a formidable barrier for the Mill Creek Trail in South Salt Lake.

Along Big Cottonwood Creek, Murray's 2003 *General Plan* suggests a trail through the city, but the alignment was not determined.[203]

Along Little Cottonwood Creek, the 2021 *Cottonwood Heights Parks, Trails, & Open Space Master Plan* envisions a 6-mile trail from the canyon mouth to Wheeler Farm in Murray. There are two possible alignments: one closely following the creek and the other following the hillside between Crestwood Park and Brighton High School. The trail would extend through multiple municipalities and across mostly privately-owned property, requiring additional research, planning, and public outreach.[204] The *East West Recreation Trails Master Plan* suggests a trail along Vine Street, which closely follows the

creek at 900 East. It continues through Murray Park, across State Street, and connecting to the Jordan River Trail at Arrowhead Park and the Little Confluence Trailhead.[205]

Dog Parks

Demand for dog parks has dramatically increased in our cities over the last decade. Since 2009, there has been a 40 percent increase in dog parks across the United States.[206] In Utah, 36 percent of households own dogs.[207]

Salt Lake County and many municipalities are rapidly developing plans for more dog parks. However, they are a relatively new phenomenon in parks and open spaces. Best management practices are slow to follow. Design, operation, and maintenance are still evolving through trial and error, creating issues with water quality, erosion, and user conflicts.

In areas with high dog use, streambank erosion is often evident and ground vegetation trampled. This can jeopardize larger vegetation along banks—shrubs and trees. Increased sedimentation loads, due to erosion, affect water quality for Bonneville cutthroat trout downstream. Dogs also carry harmful bacteria and pathogens, like Escherichia coli. Dog feces left near our creeks wash into the water and create impairments harmful to humans and pets alike. Finally, dogs discourage wildlife from remaining in or returning to a natural area.

The *Parleys Historic Nature Park Comprehensive Use and Management Plan* points out, "While most dog walkers are responsible, some of the problems pointed out are a lack of understanding on the boundary, little enforcement of the leash policy in on-leash areas, violators of the two dog limit (often professional dog-walking services), and leaving dog waste behind."[208]

In the *Parks & Public Lands Needs Assessment*, Salt Lake City residents were split on whether dogs create conflicts with other trail users. Approximately 30 percent of respondents agree dogs cause conflicts. Yet, 17 percent of those, who agreed are dog owners. This suggests issues could escalate as population increases and more conflicts occur.[209]

In identifying strategies, almost half of respondents agree with more enforcement and fines for not following off-leash regulations. Approximately 36 percent wanted more off-leash dog areas to lessen conflicts.[210] Salt Lake County's *Off-Leash Dog Park Master Plan* suggests protecting environmentally sensitive areas and improving enforcement. High dog use areas should be constructed away from areas and buffer zones used to protect sensitive and erodible areas. Access should only be given at controlled points. Seasonal closures should be considered for nesting, breeding, and rearing of wildlife.[211]

For enforcement, regulations should be posted prominently at dog parks and on applicable websites. Phone numbers of enforcement should be posted prominently underneath regulations. Volunteer groups could assist with clean-up of dog parks and education around regulations. Finally, a fee forfeiture schedule, similar to parking tickets, could offer an alternative to criminal prosecution when taking enforcement action.[212]

There are four dog parks along our creeks: Memory Grove (City Creek), Herman Franks Park (Emigration Creek), Rotary Glen (Emigration Creek), and Parleys Historic Nature Park (Parleys Creek).

At Parleys Historic Nature Park, restoration efforts worked to mitigate the impacts of dogs and protect Parleys Creek. The riparian corridor was closed off except at designated access points. Education signage and periodic enforcement further decrease impacts. [213]

Health & Wellness

Physical activity is critical to our mental and physical well-being. The annual cost of obesity-related illness in the United States was $190.2 billion—21 percent of all medical spending.[214] The Centers for Disease Control and Prevention recommends 2.5 hours of moderate exercise each week.

Nearly half of Salt Lake County residents do not meet recommendations for physical activity. Lack of physical activity increases risk of many health problems, particularly obesity, diabetes, and heart disease.[215] In Salt Lake County, 29 percent of residents are obese. Table 3 shows the breakdown of behavioral risk factors by City.

Walking and bicycling are basic forms of physical activity and recreation. They link with daily commuting, running errands, or leisure to connect residents with convenient exercise options. Residents are more likely to recreate and exercise in natural surroundings.[216] Outdoor recreation provides greater social interaction and reduces stress levels. Merely the sight of trees improves recovery from stress by reducing blood pressure and muscle tension.[217]

Residents in Salt Lake County experience particularly high rates of asthma due to poor air quality. Red air quality days prevent outdoor recreation and active transportation, impacting underrepresented populations disproportionately. Additionally, low incomes undermine public health. Low-income communities often have a lack of access to fresh, healthy foods, a lack of time or resources for exercise or recreation, and lack of access to affordable healthcare options.[218]

Programmed Recreation

Many children are introduced to the outdoors through youth programs, such as soccer teams and baseball leagues. Where adequate space is available, programmed recreation can be offered. These large fields can also mitigate flooding by acting as flood detention and retention areas in high flows.

In Holladay, Big Cottonwood Regional Park features a disc golf course that winds its way through riparian forests and wetlands along Big Cottonwood Creek. The surrounding area acts as a detention area in the event of flooding. The surrounding vegetation makes for a more interesting and enjoyable course while adding important wildlife habitat value.

Golf courses provide recreational opportunities along our creeks while preserving green, open space and wildlife habitat. The Bonneville Golf Course in Salt Lake City features a natural stretch of Emigration Creek, winding through several of the holes. The creek creates an interesting water hazard for golfers and provides vital habitat value. Deer and other wildlife frequent the course. On the other hand, courses privatize portions of our creek and make access and enjoyment of them expensive.

Murray Park serves as a recreation hub along Little Cottonwood Creek. The park features an outdoor swimming pool, an outdoor ice rink, a rugby field, a softball field, a soccer field, and multi-purpose fields. After programming at the park, youth and families can explore the natural wonders of Little Cottonwood Creek and enjoy its flowing solace.

There are 34 soccer or multi-purpose fields, 47 basketball, tennis, or multi-purpose courts, eight golf courses, and 24 baseball diamonds within 1/4 miles of our creeks.

Active Transportation

Walking, biking, rolling, and even boating (where feasible) are affordable transportation options available to all ages and abilities. Active transportation is any human-powered mode of travel in our communities. It can be a passive form of recreation as activity is combined with a commute to work or running errands. Greenways strengthen active transportation networks by providing buffered, safe, and beautiful space.

Active transportation improves air quality by reducing the reliance on personal automobiles. It diminishes costs associated with the purchase, maintenance, and fuel of vehicles. In 2020, the cost to own and operate a car in the United States was $9,561.[219] Bicycles cost an estimated $350 per year.[220] Walking is virtually free. Businesses often situate themselves along waterways, trails, and other amenities. Increasingly relocation decisions for professionals are based on quality of life considerations, such as robust active transportation networks and greenways.

Angling & Water Recreation

Our creeks provide unique opportunities for swimming, wading, fishing, paddling, and floating, where feasible. Long-time residents of the Salt Lake Valley have fond memories of visiting swimming holes along our creeks to escape the summertime heat. Channelization, lack of access, and water quality concerns have diminished the safety and interest in these activities.

However, water-based recreation is growing. Nearly 90 percent of respondents report being very or somewhat interested in paddling opportunities in the *Blueprint Jordan River Refresh Survey Findings*.[221] Several informal boat ramps exist along the Jordan River with plans to improve them for the future, legitimize access, and create new ramps into a formal water trail.

At the Little Confluence Trailhead in Taylorsville, where Little Cottonwood Creek meets the Jordan River, a boat ramp was constructed with a turnaround for vehicles pulling trailers. Paddlers can travel upstream on Little Cottonwood Creek until culverts, street crossings, or dams turn them around. Elsewhere at the site, a soft-surface trail winds through a restored cottonwood grove, one of the last remaining along the Jordan River—perfect for wildlife viewing.

Navigational hazards, like dams, culverts, grates, pipes, and other debris, present dangerous conditions for boaters. In the Jordan River, partners are mapping and mitigating the significant hazards. The deadly "Winchester Hazard," a pipe-river crossing that claimed a life in 2010, was re-engineered in 2015. The resulting rapid is now a safe and fun feature for boaters.

Recreational fishing is growing. In 2019, 17 percent tried fishing in the United States. According to the Outdoor Industry Association, fishing is one of the most popular "gateway" activities—accessible activities that lead to other forms of outdoor recreation.[222] Our creeks provide accessible angling opportunities in our backyards.

The Utah Division of Wildlife Resources is committed to creating more community fisheries; places where youth, families, and community members can walk, bike, or ride transit to catch a fish. For example, Fairmont Pond, in Salt Lake City, was dredged and turned into a community fishery in 2018. Rainbow trout were stocked, and elevated boardwalks and walkways circle the pond. Several of the springs feeding the pond were uncovered and restored. New vegetation along the pond and streams provides wildlife habitat and improves water quality. Additional community fisheries dot the Jordan River corridor.

URBAN

Values

The Coronavirus (COVID-19) pandemic underscores the need for parks and recreational facilities, especially those close to home. They provide a way to get outdoors and exercise while protecting yourself and others. Salt Lake City's parks and public lands have seen an estimated 25 percent increase in visitation. Increases in visitation result in more user conflicts for pedestrians, cyclists, and other users. Conflicts lead to a perception of a diminished outdoor experience and view of our parks and open spaces.[223]

Respondents to the 2014 "Your Utah, Your Future" survey want communities that provide convenient access to nature and recreation by walking, biking, and transit. They want to "connect communities with a system of trails and parks," especially those that integrate into other regional trail systems and provide access to destinations and public transit. Cooperatively planning networks at both the community and regional levels should be completed before significant population growth, according to the *Transportation & Communities Vision Book*.[224]

In the ten big ideas identified in *Reimagine Nature*, an urban green space network was selected by 43 percent. It proposes developing a connected system of urban public space assets with a robust urban forest and diverse activities.[225] Approximately 65 percent supported acquiring additional natural lands to connect wildlife habitat, and 55 percent supported acquiring additional riparian lands next to our creeks.

According to the *Watershed Public Opinion Survey*, Salt Lake County residents do not believe water quality should be impacted to facilitate development. Furthermore, they strongly support policies that require landowners to leave vegetation in place and plant new vegetation along waterways. In addition, policies that require new developments to set aside natural open space and create green infrastructure are strongly supported.[226]

History

Some 60 to 90 million years ago, rock layers folded, compressed, and thrusted along the Wasatch Front. Erosion from glaciers and rivers further cut the seven major canyons in Salt Lake County. Out of each canyon flows melted snow and runoff to the Jordan River and onto the Great Salt Lake.

In 1852, Captain Stansbury came to the Salt Lake Valley to survey the land for the United States. Of the Valley, he said, "The site for the city is most beautiful: it lies at the western base of the [Wasatch] mountains... for twenty-five miles extends a broad level plain, watered by several little streams, which, flowing down from the eastern hills, form the great element of fertility and wealth to the community."[227]

Our creeks have sustained human settlement of the Salt Lake Valley for thousands of years. The Valley was of the ancestral lands of the Eastern Shoshone Tribe, Goshute Indian Tribe, Northwestern Band of the Shoshone Nation, Ute Indian Tribe, and Shoshone-Bannock Tribes. These communities stewarded our creeks for centuries—hunting, fishing, and gathering along their banks.

Mormon settlers came to the Salt Lake Valley in 1847, looking for religious freedom. Within the first day, the new inhabitants began to impact our hydrology. City Creek in Salt Lake City was dammed for five acres of potatoes within the first two hours of arrival.[228]

Mills along the creeks put the waters to use. There were as many as 20 mills along Mill Creek at one point.[229] Mining and logging in the canyons impacted water quality and laid creek banks bare, leaving wildlife without food or shelter.[230]

Waterways became the early sewer system due to their hydrology, flowing east-west out of our cities. Pollution from sewage, agriculture, and industry degraded water quality. Many of the early canals, diversions, and dams left channels devoid of water.

As our cities grew, white settlers imposed the Plat of Zion on the geography of the Wasatch Front. Houses were concentrated along creeks for its water source and cooling in the summertime. However, spring brought snowmelt and, with it, flooding. Floodwaters ravaged fields and houses along the banks.

Instead of moving houses out of the floodplain to prevent damage, creeks were channelized as they entered the broad valley bottom, straightening the previously meandering channel. This caused banks to steepen and erode, creating a safety issue for early residents.[231] Pedestrians found a solution by building makeshift bridges spanning the nearly ten to 20-foot vertical banks.

This led to the burial of some creeks, which were dubbed a nuisance, in the early 20th Century. The green veins that once transported clean water, fish, and wildlife from the Wasatch Mountains downstream were replaced with bricks and mortar, concrete and asphalt. Even then, residents saw the damaging outcome.

A 1921 article from the Deseret News explains, "To cover City creek from Main to Third West streets and make of North Temple just an ordinary down-town thoroughfare, would be a desecration... In that open stream, with all its historic significance, in addition to its possibilities for beauty and attractiveness, the city has an asset of great value. To hide completely the flowing water within a conduit and to make of the street a stretch of ordinary pavement would be to throw away opportunity for which many cities would gladly pay a million dollars."[232]

Connectivity

An activation point is a node at which users can access the system of greenways. They can be recreational—parks, natural areas, and open spaces, commercial—shopping centers, retail areas, and restaurants, and civic—schools, churches, and community institutions. Activation points provide community members access to the various amenities greenways can provide, and connectivity between them.

An estimated 20 commercial activation points, 80 civic activation points, and 116 recreation activation points are located within 1/2 mile of the seven creeks. Currently, access to our greenways is focused at existing public lands, such as parks, natural areas, and open space. Private property complicates access. However, through partnerships with landowners, especially near commercial and civic activation points, access has been granted in formal or informal agreements.

For example, a trail winds along Big Cottonwood Creek through the Cottonwood and Old Mill Corporate Centers. The landowner donated rights-of-way as a means for tenants to access the creek and recreation opportunities.[233] The trail connects the city of Cottonwood Heights, the Old Mill Open Space, and the mouth of the Big Cottonwood Canyon underneath Interstate-215 to Knudsen Park and the rest of the city of Holladay.

Schools, churches, and other community institutions can create additional quasi-public private space for the greenways. Access agreements, with Bonneville First Ward, have extended the Miller Bird Refugee and Nature Park into Bonneville Glen along Red Butte Creek to create access on both sides of the park to the surrounding neighborhood.

According to the *Parks and Recreation Mail-in Needs Assessment Survey*, 75 percent of respondents are within a 15-minute walk to a park. However, 89 percent said they travel by car.[234] In Salt Lake City, most parks are easily accessible by car. According to the Parks and Public Lands Needs Assessment, pedestrian and bicycle access needs improvement through added bike lanes and trail connections.[235] In the *Blueprint Jordan River Refresh Survey Findings*, most drive to the Jordan River—approximately 55 percent. However, those that live in northern communities of Salt Lake County and those that visit the corridor weekly more frequently walk, run, or bike.[236]

In the *Blueprint Jordan River Refresh Survey Findings*, those with incomes less than $40,000 were more likely to choose public transportation improvements as their first or second choice when asked what would enhance access to the Jordan River corridor.[237] This underscores the need to provide plentiful and diverse connections to the greenways for lower-income residents, including regional public transit connections on buses, trains, and other forms of transit.

Community members may not have regular access to a personal automobile for recreation or are unwilling to drive to recreation opportunities. When asked about actions to improve livability in Salt Lake City, 46 percent responded improving networks for active transportation.[238]

There are 1 commuter rail stops, 10 light rail stops, and 1,049 bus stops within 1/4 miles of our creeks.

Old Paper Mill Building along Big Cottonwood Creek in Cottonwood Heights.

Infrastructure & Economics

Many communities are finding cheaper alternatives to traditional methods of storm water management. As defined by the Clean Water Act, green infrastructure is "the range of measures that use plant or soil systems, permeable pavement or other permeable surfaces or substrates, storm water harvest and reuse, or landscaping to store, infiltrate, or evapotranspirate storm water and reduce flows to sewer systems or to surface waters."[239] It can be a cost-effective, resilient tool to manage water in our cities. Conventional approaches, or "grey" infrastructure, utilize pipes to convey water away from the built environment as fast as possible. This has led to the degradation of our creeks—erosion, water quality impairments, and outright burial. Green infrastructure reduces and treats water at its source while improving the health of our creeks and delivering additional benefits.

Green infrastructure reduces the need for costly grey infrastructure.[240] In Kalamazoo, Michigan, city engineers found uncovering the creek would be cheaper than excavating, replacing, and reburying the deteriorating culvert.[241] The life cycle costs associated with the construction, maintenance, and replacement of underground culverted systems often prove more expensive, or only marginally less, than uncovering the stream (without the additional benefits of daylighting).

By reducing the amount of runoff, green infrastructure reduces the frequency and severity of flooding.[242] Historic flooding, in 1983, resulted in an estimated $34 million in damages through Salt Lake County.[243] In 2017, a 200-year precipitation event, in Salt Lake City, resulted in $1.5 to $2 million in damages to the historic Sprague Library and $2 to $3 million in damages to four schools. One hundred homes were flooded and over 5,000 customers experienced power outages.[244]

Creek-side properties are desirable areas to live, work, and play. The $8.4 million restoration project along the Ogden River, in 2011, has seen a significant return on investment. Between 2000 and 2017, the number of housing units around the project area increased by 37 percent, the number of jobs increased by 36 percent, and the area's median income increased by 34 percent. This is compared to increases across the entire city of 21, 16, and 28 percent, respectively.[245]

The 60-acre River Bend Redevelopment Project Area plans to channel the momentum from the restoration project to create a mixed-use and mixed-income urban riverfront neighborhood. Residential developments, such as The Meadows at Riverbend and The View on 20th, have popped along the restored Ogden River, as well as retail spaces, like Gear:30, Ogden River Brewing, Slackwater, and others.[246]

In Salt Lake City, Hidden Hollow is a serene, natural oasis within the bustle of the Sugar House neighborhood. In 1990, a group of elementary kids from Hawthorne Elementary cleaned up around Parleys Creek in this area, and successfully protected it through a conservation easement. Wilmington Flats and other dense urban apartment buildings have been constructed near this area, advertising "as a gateway to Hidden Hollow and Sugar House Park."[247]

Recreation, along greenways, also generates economic value. In Utah, anglers contributed $259 million in direct spending to fish in 2011. Overall, the industry output was $460 million with $50 million in state and local tax revenue.[248] In Jackson Hole, Wyoming, increased recreational trails generated over $18 million in economic activity in 2010. The original investment, over ten years, is estimated at $1.7 million. Local businesses agree sales and rentals increased as trails increased.[249]

Active Transportation

Walking, biking, rolling, and even boating (where feasible) are affordable transportation options available to all ages and abilities. Active transportation is any human-powered mode of travel in our communities. It increases physical activity levels and improves air quality by reducing reliance on personal automobiles. It diminishes costs associated with the purchase, maintenance, and fuel of vehicles. In 2020, the cost to own and operate a car in the United States was $9,561.[250] For comparison, bicycles cost an estimated $350 per year.[251] Walking is virtually free.

In 2014, Utah ranked 15th in bicycle commuting by state. [252] Along the Wasatch Front, walking represents 7.8 percent and biking: 1.7, of all trips taken.[253] In Salt Lake City, an estimated 2.5 percent commuted by bicycle in 2014.[254] Due to the 27 increase in bicycling in 2011, Salt Lake City jumped from 43rd (2010) to 26th (2012) in the "America's Most Bicycle-Friendly Cities" ranking.[255]

Gentrification

The phenomenon of green gentrification can be an unfortunate impact of investments in our urban ecosystems, such as greenway creation, stream restoration, and daylighting. Efforts create desirable places to live, work, and play that attract wealthier, and often white, populations. Without comprehensive strategies in place to prevent displacement, the residents these strategies are designed to benefit can be excluded.[256]

Policy strategies at the city, county, or state-level are needed to prevent displacement due to gentrification. In redevelopment projects adjacent to greenways, efforts should ensure the same amount of housing stock, based on income level. Put simply, if replacing low-income housing, the same amount of low-income housing should be provided in the redevelopment. Additional affordable housing stock should be a critical part of any creek-side development. Rent subsidies, well-devised forms of rent control, and community land trusts to protect low-income and affordable housing are important city-wide tools to prevent displacement.

Bicyclist over City Creek on North Temple in the Range 2 River Relay.

EXISTING WALKABILITY TO SEVEN CREEKS[258]

MILL

EMIGRATION

RED BUTTE

BIG COTTONWOOD

PARLEYS

LITTLE COTTONWOOD

CITY

AREA OF INTEREST

AREA OF INTEREST

Uintah-Wasatch-Cache National Forest

Uintah-Wasatch-Cache National Forest

Uintah-Wasatch-Cache National Forest

Holladay

Cottonwood Heights

Millcreek

Sandy

Salt Lake City

South Salt Lake

Murray

Midvale

West Valley

Taylorsville

West Jordan

WASATCH BLVD.

HOLLADAY BLVD.

FOOTHILL BLVD.

HIGHLAND DR.

VAN WINKLE

FT UNION BLVD.

BENGAL BLVD.

STATE ST.

REDWOOD RD.

MEADOWBROOK EXPY.

I-15

I-80

I-215

OPEN CHANNEL

BURIED CHANNEL

POTENTIAL ACCESS POINT

5-MINUTE WALK

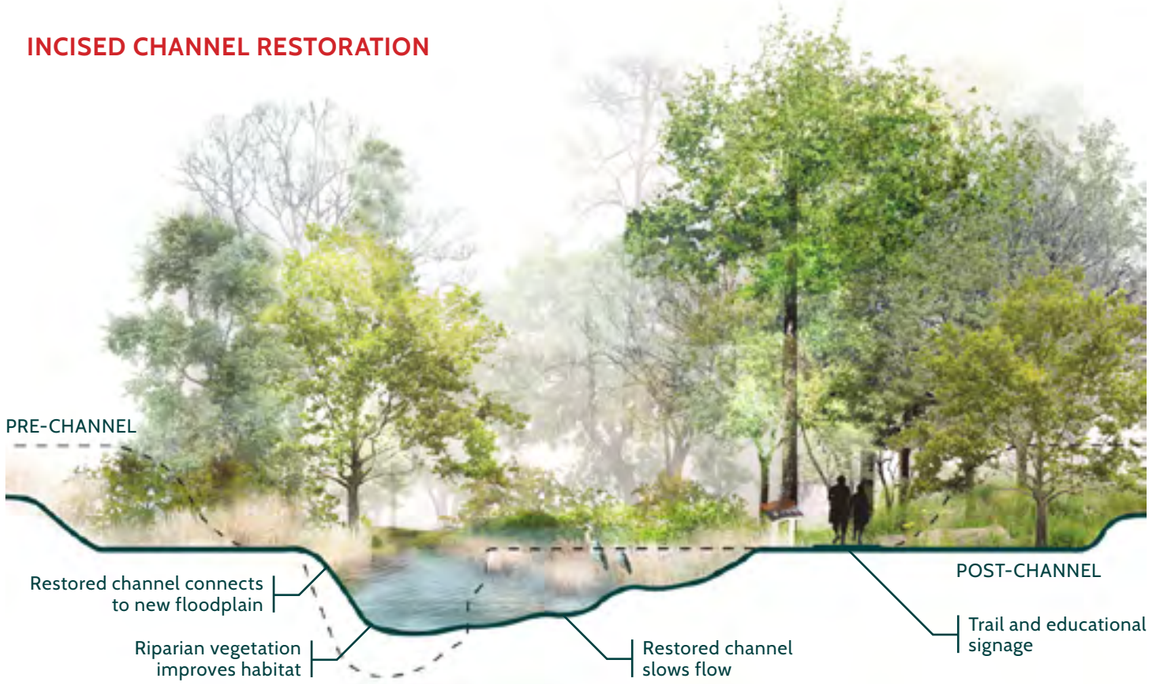
10-MINUTE WALK

15-MINUTE WALK

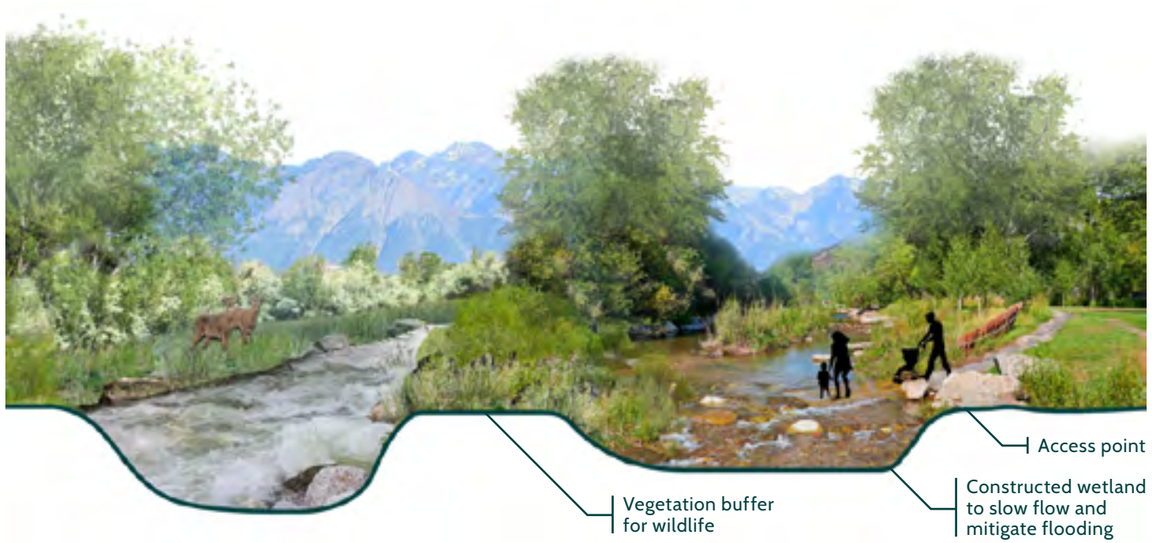
N

VISION GRAPHICS

INCISED CHANNEL RESTORATION



FLOOD CONTROL CONSTRUCTED WETLAND



Big Cottonwood Creek at Old Mill in Cottonwood Heights.

WATER BIG IDEA – NORTH TEMPLE RENDERING

URBAN FOREST

INFILL DEVELOPMENT

EDUCATIONAL SIGNAGE

STREAM DAYLIGHTING

PAVED TRAIL

STORMDRAIN MURAL

GREEN INFRASTRUCTURE

COMMUNITY BIG IDEA – 200 EAST TO 200 WEST RENDERING

URBAN BIG IDEA – FORT UNION TO WHEELER FARM RENDERING

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