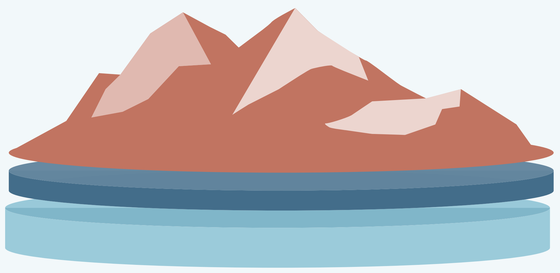


Salt Lake Valley Water Quality

Below the Surface

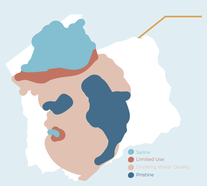
This project aims to raise awareness of water sources in the Salt Lake Valley. By getting the context of what water sources are specific to the area, as well as challenges that affect water quality, a VR experience was created to help the general public explore this information and perhaps have a better understanding of water quality in the Salt Lake Valley area. This VR environment uses a scale comparison of what is "above the surface" and "below the surface" to help the user understand that water is a precious source of life that needs to be considered and conserved.

Water Quality

The biggest threats to drinking water quality in Salt Lake Valley are pollution, drought, and climate change.5 Water demand from population growth in conjunction with changes in the hydrologic cycle from climate change affects drinking water availability.5 Contaminates on the surface are also a threat to the water quality. Excessive amounts of Arsenic, Chromium (hexavalent), Fluoride, and Radiological Contaminants have been found in Salt Lake City's water supply.2 Aging infrastructure can also affect drinking water systems but repairs and replacement of infrastructure in the valley have the potential to change outcomes.5 Groundwater can be directly and indirectly affected by water and land use.

URBANIZATION

In a recent study, urbanization was found to have impact on water quality. Physical and chemical aspects as well as structure and function of the water source ecosystem are altered by this. Physical changes can be seen in the way water flows within a stream. Changes in the streamflow can affect the "[…] exchanges between the surface and groundwater." Decreased water quality results as these changes alter the hydrologic connectivity and interaction of the surface and subsurface water sources. Urbanization introduces nutrients and other solutes that the watershed cannot reduce. An example of the way urbanization can alter the ecosystem is river salination from road salt runoff. The salination limits vegetation and freshwater species because of the decreased water quality in drinking and irrigation water.7 Another major issue is intense water pumping. It not only effects water source by dropping the water table and introducting saline into fresh aquifers, it can also cause sinking the land on the land above.1



A growing population in combination with increasing land use and development make the basin and valley recharge more vulnerable to surface contamination.6 Groundwater does not usually need to be treated because of the natural purification system it goes through as it seeps through the soil and rocks.1 The cost of treating drinking water is determined by the "cleanness" of the water in streams and wells.4

Development on the surface can change the quality of groundwater because more pollutants are put into the environment. These pollutants include municipal and industrial waste, chemical fertilizers, pesticides, and herbicides. When these pollutants seep into the soil, eventually finding their way to aquifers, it degrades the water quality.1 Sources of water contamination can include organic chemicals, inorganic contaminants, as well as microbial contaminants.1

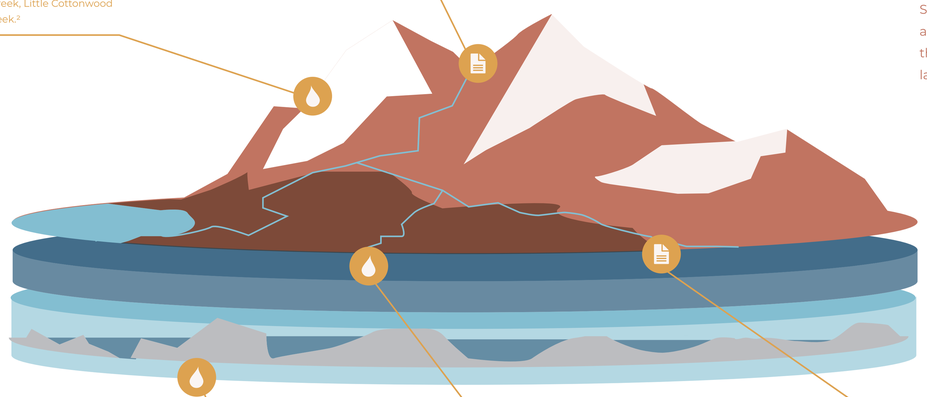
A drop of water from the Wasatch Mountains takes less than 24 hours to reach a tap in Salt Lake City. 5

Salt Lake City's water sources are unique in that it is in close proximity to the people that consume it. The Wasatch Mountains and groundwater are typical sources of water for the area but the ratio between them depends on the system in place for specific areas.5 The Salt Lake area mostly gets depend on surface water from reservoirs and mountain streams, as well as groundwater sources like springs and wells.2 Drinking water is mostly sourced from the same places.3 Water souring is determined by supply and demand at different times during the year. During summer months, water is mostly sourced from wells to meet high water demand.2 During the summer seasons public water systems use surface water sources and groundwater.6 Spike in water demand usually occurs from July- through August due to rising temperatures. The continuing growth of water-demand, industry, technology, and pollution puts more stress on the surface affecting water resources above and below.1

Water Sources

Salt Lake City Ordinances 17.04 and 17.08 are enforced to keep mountain streams protected from pollution.2

Salt Lake's primary water source comes from mountain streams located in the Wasatch mountains like City Creek, Little Cottonwood Creek and Parley's Creek.2



of Salt Lake City's water supply comes from the Wasatch Mountain snowpack.5

of Salt Lake's water supply is water s groundwater.5

GROUNDWATER

As the groundwater moves slowly through layers of buried lava flow, sandstone or limestone, and gravel or sand it can dissolve minerals and gases from the rocks giving it a "tangy" taste.1 Some of the minerals found in groundwater include bicarbonate, calcium, chloride, magnesium, potassium, and sulfate.1 Deep wells supply drinking water to the Salt Lake Valley during summer months and tend to have a tangier taste because of its mineral dissolved through the purification process.4 Aquifers are permeable rock layers that store ground water.1

SURFACE WATER

These sources tend to be more susceptible to pollution because they can easily come into contact with pollutants and contaminants.1 Water has to travel through more than 1,300 miles of pipe from surface water treatment plants before it gets to residents.2 Salt Lake also uses treated water from the Provo River watershed.2 Wells and springs that are part of the Salt Lake area main water sources, are located all over then valley.2

SLC Public Utilities implements zoning ordinance 21A.34.060 to ensuring groundwater sources are protected, as they can be contaminated by what occurs on the surface above.2

Groundwater close to the surface can take just a couple of hours to reach.1It can also be several thousand years old depending on the depth of the source.1

The groundwater system is primarily replenished by spring mountain snowmelt runoff. Recharge sources include excess irrigation from croplands, lawns, gardens, as well as seepage from canals.6

Sources

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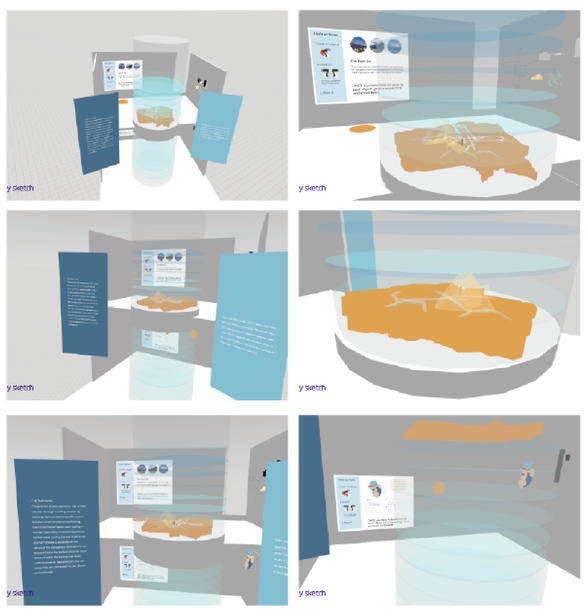
VR Environment

This structure has a more open approach with the way I structured it. I was hoping to address most of the concerns/comments from previous critiques to get my purpose across. I kept the two-level concept with the squat/kneel part because I like that the user could simultaneously move to the below the surface level and then back to the surface level. I also included instruction guides withe the control reminders to aide the user's experience. The text on these instructions was also limited to avoid reading sickness.

Instead of having a 2D scale reference, I liked the idea from previous iterations that changed the scale reference from a linear image to a more comprehensive scale measurement. The ending panels were added to the purpose of the experience. Also giving the user a quote that explains this further.

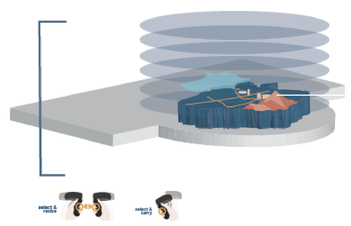
Insights

The purpose of this experience was to take the user through a scaling exercise by allowing them to explore specific control functions while simultaneously feeding them information about water quality in the Salt Lake Valley. To tie this experience back to water quality, the user reads a "disclaimer" of sorts to understand that although the comparison between the surface and below the surface shows an abundance of water, the truth is that these water sources do have a bottom and because they are connected the can also be contaminated.



Level 1: Surface

As the user enters the Surface level, they are asked to resize and place iconic Salt Lake Valley landmarks that include roads, buildings as well as natural landmarks. The purpose of this level is to get the user familiar with the resizing and selection controls.



Level 2: "Below the Surface"

The user is then prompted to physically drop down to enter the underground area. The user will look at quick information about groundwater classification. They are then instructed to resize and place waterways, wells and groundwater classifications.