



Mapping Tools: Leaflet and My Maps

Alan Ochoa Rodriguez *Integrated Report Coordinator*

Utah Division of Water Quality



UTAH DEPARTMENT of
ENVIRONMENTAL QUALITY
**WATER
QUALITY**



Usage Overview

Leaflet - R Package

- Integrated Report - site validations during assessments
- Publicly display Integrated Report results

Google My Maps

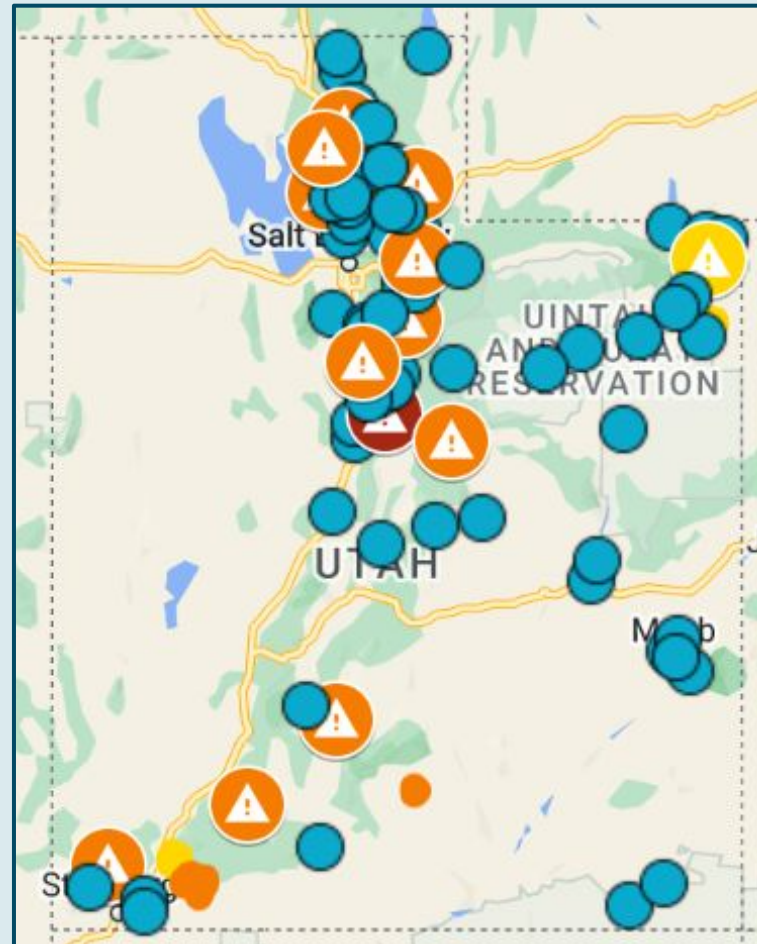
- Inform public on Harmful Algal Bloom and Waterborne Pathogens advisories

Google My Maps

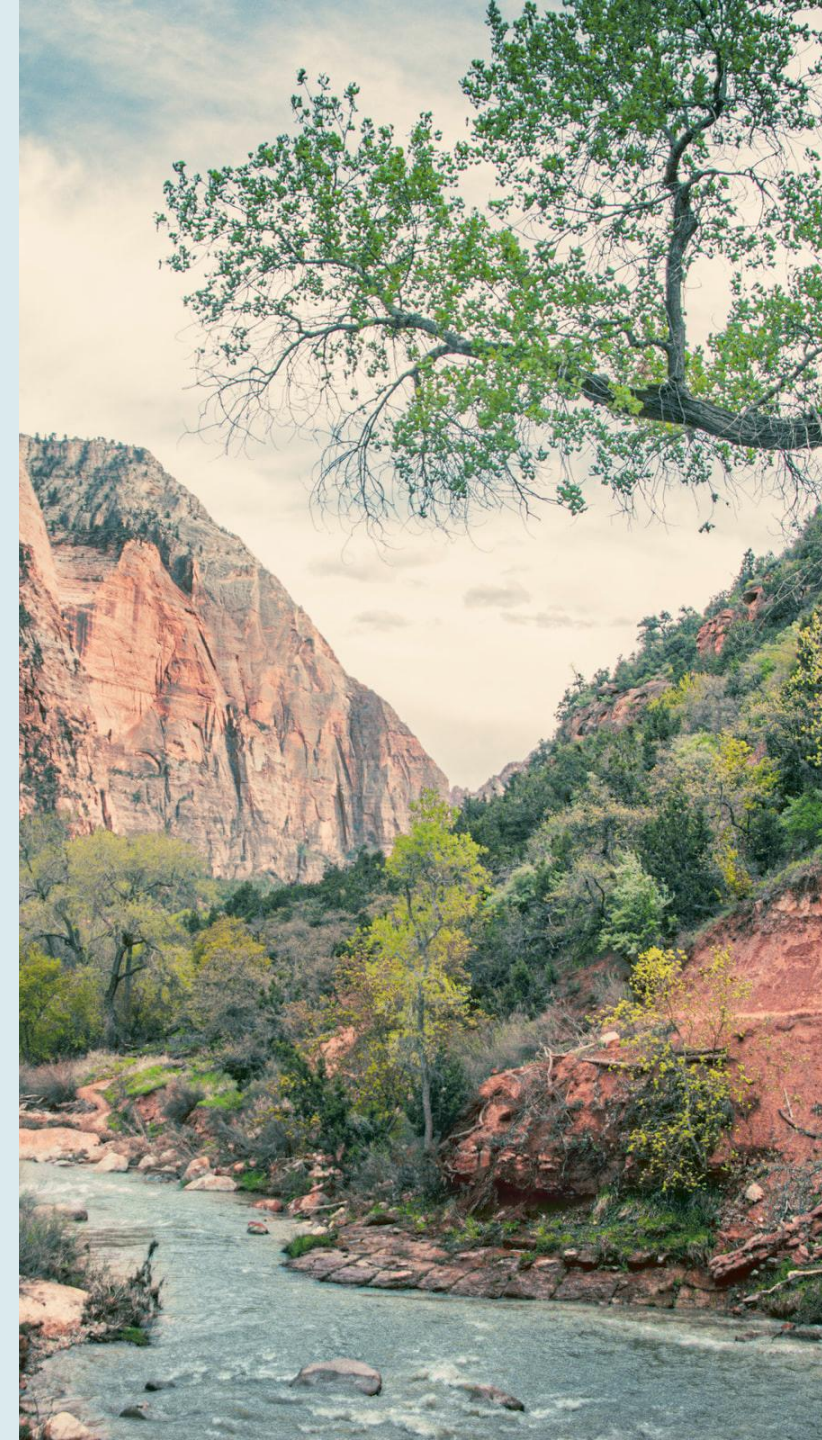
HABs and Waterborne Pathogens Advisories

MyMaps

- Web based interactive mapping tool
- Customize points, lines and shapes
- Easy for public to use



habs.utah.gov



Google My Maps

- Waterbody/Advisory details
- Create quickly
- Map manually updated on daily basis

Current Conditions

What are HABs?

What is E. coli?

Response Agencies

🔍 Select a Waterbody

← Blackridge Reservoir

Waterbody

Blackridge Reservoir

Health advisory

Monitoring at this site will resume in summer 2023.

Monitored for

HABS & waterborne pathogens

Local health department

Salt Lake County

For more information

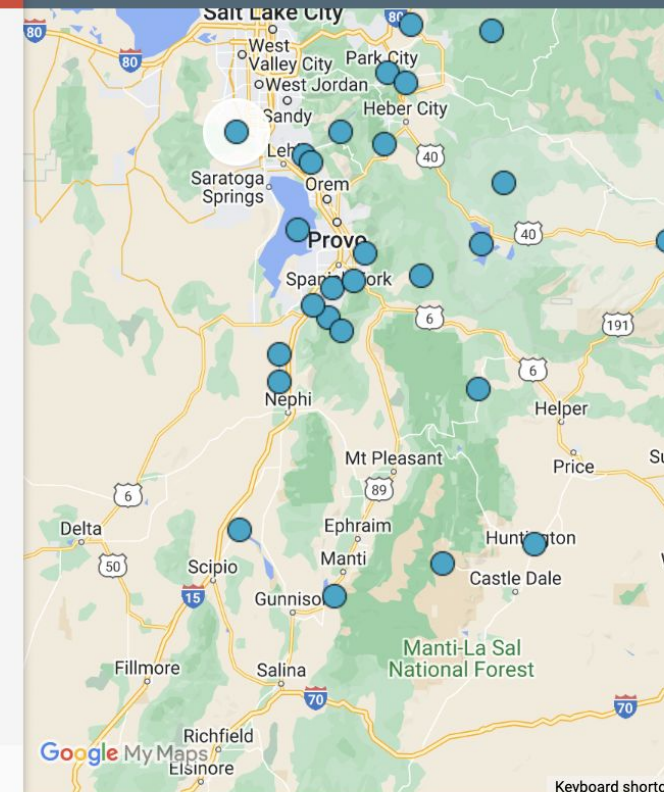
<https://deq.utah.gov/health-advisory-panel/blackridge-reservoir-recreational-monitoring-2022>

Lat

40.48057

Long

-112.021



Monitoring
Locations



Health
Watch



Warning
Advisory



Danger
Advisory

Site

Validations:

Leaflet & Shiny

Leaflet R Package

- Customize map - Layers, shapefiles, basemaps
- Overlay data

Shiny R Package

- Create interactive web applications
- Respond to user input
- Build dashboards, visualize, explore and interact with data



Internal App for Site Validations

siteValApp

- Import csv file that with flagged sites
- uses Leaflet to visualize site data flags

The screenshot shows a web browser window displaying the siteValApp interface. The browser's address bar shows the URL `http://127.0.0.1:6048` and includes an "Open in Browser" button and a refresh icon. The application header features the logo of the Utah Department of Environmental Quality, which consists of a stylized mountain and water icon, followed by the text "UTAH DEPARTMENT of ENVIRONMENTAL QUALITY" and "WATER QUALITY". Below the header, the interface is organized into several sections: a "Start" button with a right-pointing arrow icon; a "Reviewer" section with a text input field containing "Alan O"; an "Import site file" section with a "Browse..." button and a blue "Use demo input" button with an upload icon and a question mark; a "Review map" section with a location pin icon; and a "Review selected features" section with an edit icon.

siteValApp - Filtering

- Prepped the data with flags
- Simplified Data Exploration
 - minimize data
 - focus on relevant parameters
 - focus on specific areas of interest

The screenshot displays the 'siteValApp' interface. At the top left is the 'WATER QUALITY' logo. Below it is a 'Start' button with a right-pointing arrow icon. The 'Reviewer' section contains a text input field with the name 'Alan O'. The 'Import site file' section features a 'Browse...' button, a file name 'site_review', a 'Use demo input' button with an upload icon, and a help icon '?'. A blue 'Upload complete' button is positioned below the file name. The 'Review map' section shows a map of North America with a 'Site types to map:' dropdown menu. The dropdown is currently set to 'Nothing selected' and is open, showing options: 'Select All', 'Deselect All', 'Review needed', 'Accepted', 'Rejected', and 'Further review'. The map includes zoom controls (+, -, layers) and labels for various geographical features like the Gulf of Alaska, Columbia Mountains, and Great Plains.

Leaflet/Shiny - Filtering

- Prepped data were run through R function that flagged sites based on attribute/spatial/duplicate checks
- Flag reasons
- Customize filtering columns
- Dynamically changes filtering options
- Compare different subsets

Start

Reviewer
Alan O

Import site file
Browse... site_review Use demo input ?
Upload complete

Review map

Site types to map: Review needed

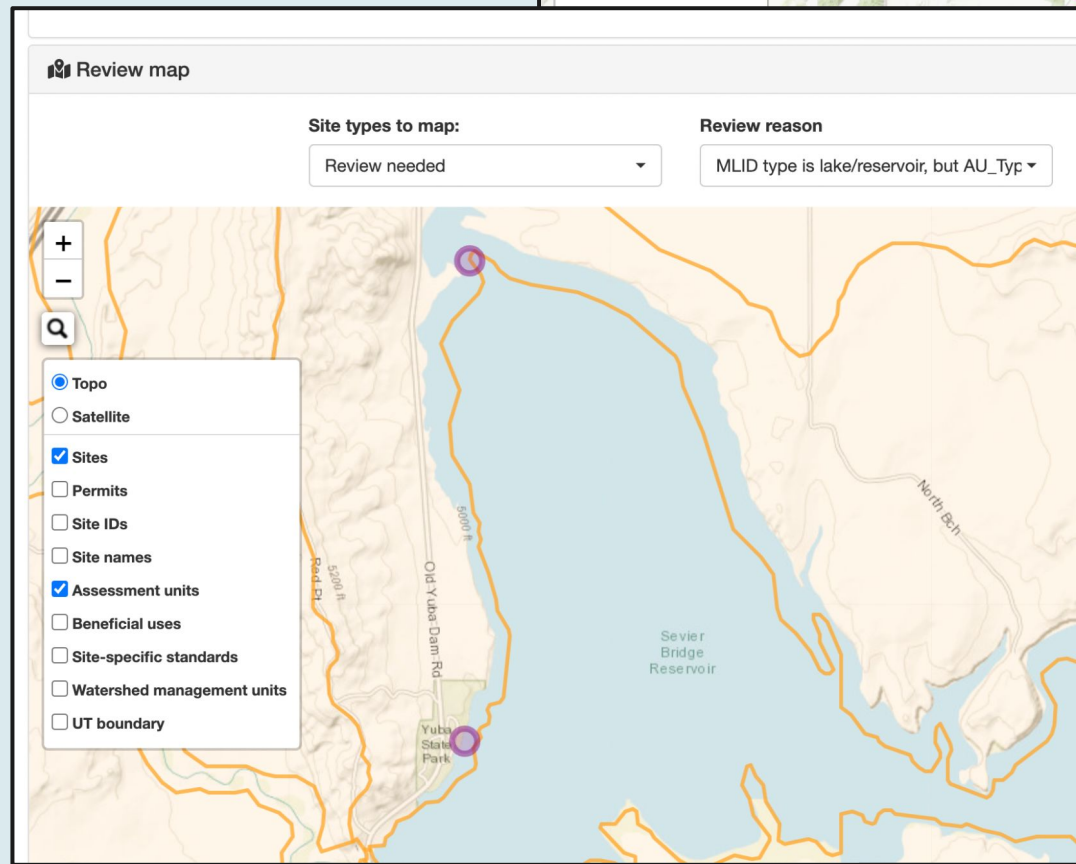
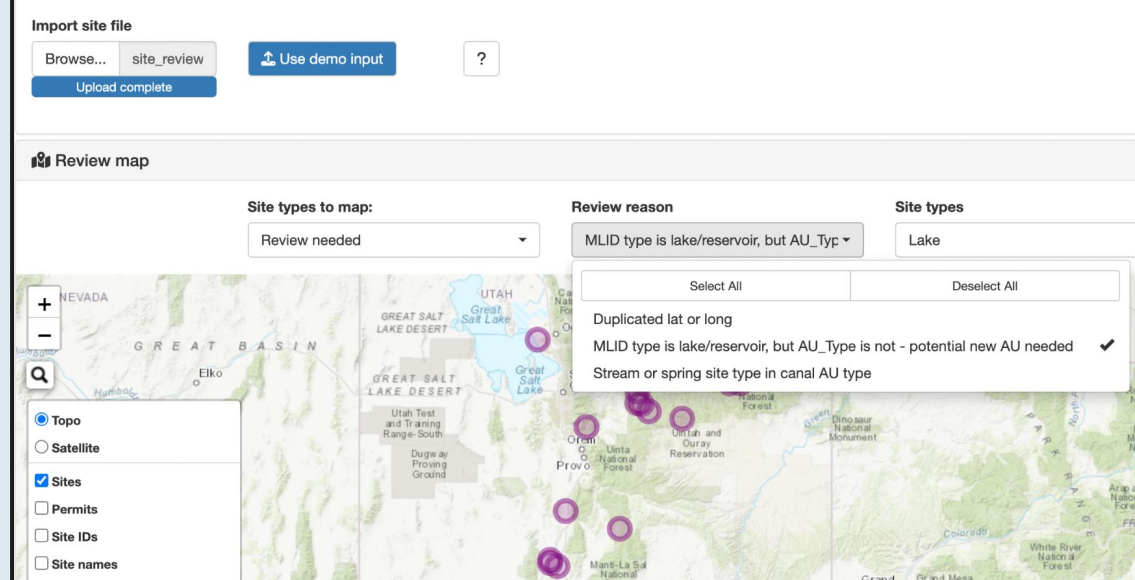
Review reason: Nothing selected

Select All Deselect All

Duplicated lat or long
MLID type is lake/reservoir, but AU_Type is not - potential new AU needed
Stream or spring site type in canal AU type

Leaflet: Features

- Basemaps
- Layers
- Visualizing unique scenarios



Shiny and Leaflet: Updating Tables

Leaflet | Tiles © Esri — Esri, DeLorme, NAVTEQ, TomTom, Intermap, IPC, USGS, FAO, NPS, NRCAN, GeoBase, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

Review selected features

Permits
 Site IDs
 Site names
 Assessment units
 Beneficial uses
 Site-specific standards
 Watershed management units
 UT boundary

| MonitoringLocationIdentifier | OrganizationIdentifier | MonitoringLocationName | MonitoringLocationTypeName | IR_FLAG_REASONS | IR_FLAG | OrganizationFormalName | ProviderName | IR_MLID | IR_MLNAME |
|------------------------------|------------------------|---|----------------------------|------------------------|---------|--|--------------|---------|-----------|
| SLOOWS-MC_12.41 | SLOOWS | MC_12.41 | River/Stream | Duplicated lat or long | REVIEW | Salt Lake County Watershed | STORET | | REVIEW |
| UTAHDQWQ_WQX-4992727 | UTAHDQWQ_WQX | Mill Creek above confluence with Potter Fork MC_12.41 | River/Stream | Duplicated lat or long | REVIEW | Utah Department Of Environmental Quality | STORET | | REVIEW |

Showing 1 to 2 of 2 entries

Leaflet | Tiles © Esri — Esri, DeLorme, NAVTEQ, TomTom, Intermap, IPC, USGS, FAO, NPS, NRCAN, GeoBase, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

Review selected features

Beneficial uses
 Site-specific standards
 Watershed management units
 UT boundary

| MonitoringLocationIdentifier | OrganizationIdentifier | MonitoringLocationName | MonitoringLocationTypeName | IR_FLAG_REASONS | IR_FLAG | OrganizationFormalName | ProviderName | IR_MLID | IR_MLNAME |
|------------------------------|------------------------|---|----------------------------|------------------------|---------|--|--------------|---------|-----------|
| UTAHDQWQ_WQX-4993793 | UTAHDQWQ_WQX | LITTLE COTTONWOOD CK AT WHITE PINE TRAIL BRIDGE (LC17.93) | River/Stream | Duplicated lat or long | REVIEW | Utah Department Of Environmental Quality | STORET | | REVIEW |
| UTAHDQWQ_WQX-4993795 | UTAHDQWQ_WQX | LITTLE COTTONWOOD CK AS WHITE PINE TRAIL BRIDGE XING | River/Stream | Duplicated lat or long | REVIEW | Utah Department Of Environmental Quality | STORET | | REVIEW |

Showing 1 to 2 of 2 entries

Leaflet - Publicly Display Integrated Report Results

- Static public map
- Filters
- Sharing results
- Easily updated
- Visualizing results

perform the assessments below.

Final 2022 Integrated Report (PDF 5 MB)

Data Files (ZIP 215 MB)

EPA Approval Letter (PDF 329 KB)

Public Comment Files (ZIP 15 MB)

Assessment Category

- Cat 1: Fully Supporting
- Cat 2: No evidence of impairment
- Cat 3: Insufficient data
- Cat 4A: Approved TMDL
- Cat 5: Not supporting, TMDL required

AU name: Desert Seep Wash
AU ID: UT14060007-011_00
Numeric category: 5
DWQ category: Not Supporting
Parameters:
BENTHIC MACROINVERTEBRATES
BIOASSESSMENTS: Not meeting criteria, TMDL Needed

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[Give Feedback](#)

<https://deq.utah.gov/water-quality/most-recent-approved-integrated-report>



Challenges & Lessons Learned

My Maps

- Created quickly
- Intuitive design
- Limited to points, and lines
- No filtering
- Smaller datasets
- Manually updated
- Great for simple static maps

Leaflet

- Pairing with other R tools/Packages
- Filtering data
- Large amounts of data
- Open source/plenty of resources
- Longer development time
- R Knowledge

Thank you



Alan Ochoa
Environmental
Scientist



EMAIL

aocchoa@utah.gov

ir.utah.gov