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WATER QUALITY

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Use of Wastewater Surveillance in the Coordinated Response to COVID-19 in Utah, USA

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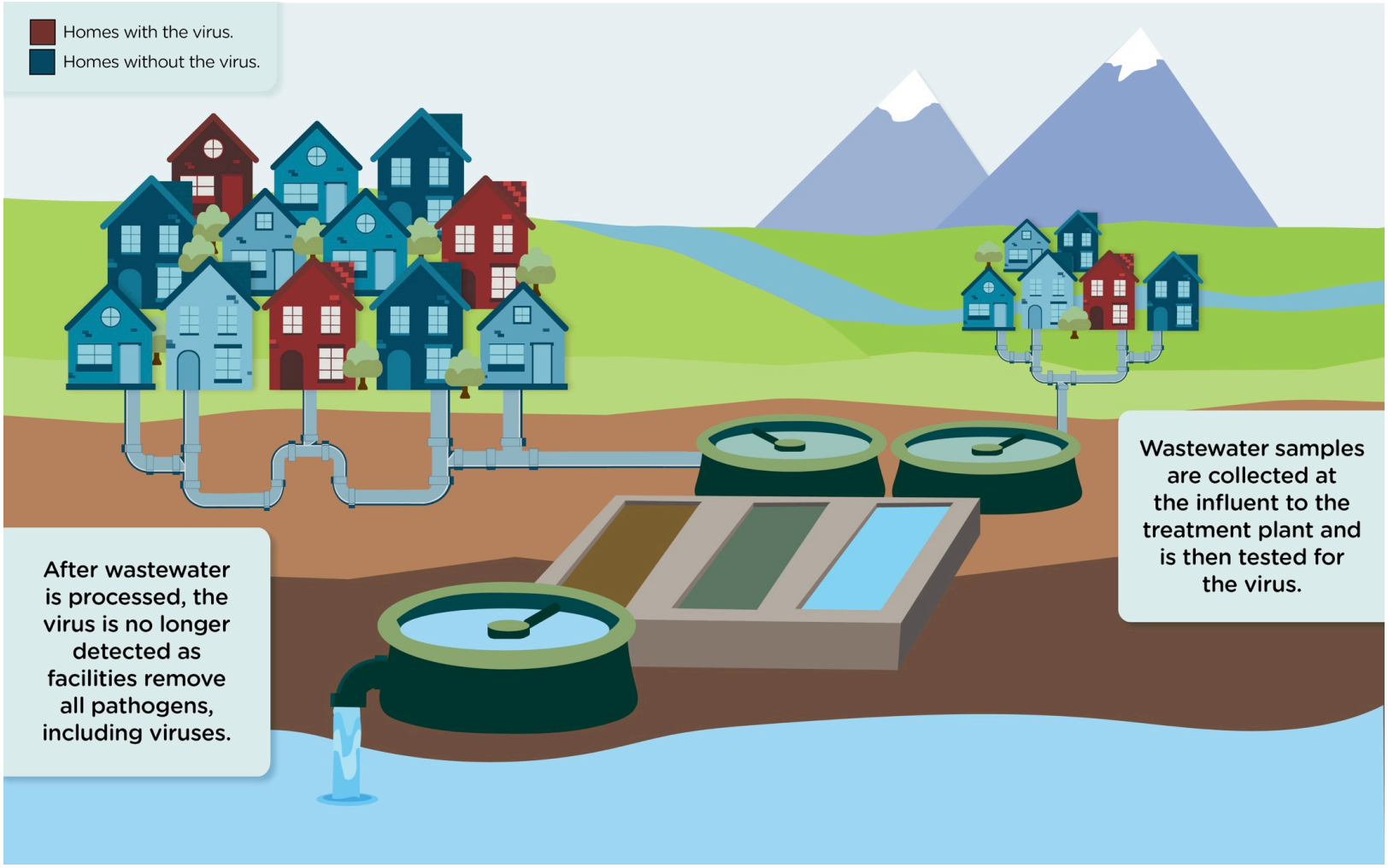
CVWRF · SNYDERVILLE BASIN · LOGAN CITY UNITED IN SERVICE · OREM · TIMPANOGOS SPECIAL SERVICE DISTRICT · PRWID PRICE RIVER WATER IMPROVEMENT DISTRICT · TREMONTON · CITY OF MOAB · SPANISH FORK CITY

Wastewater Monitoring of Virus



Utah's Pilot Study

Study design

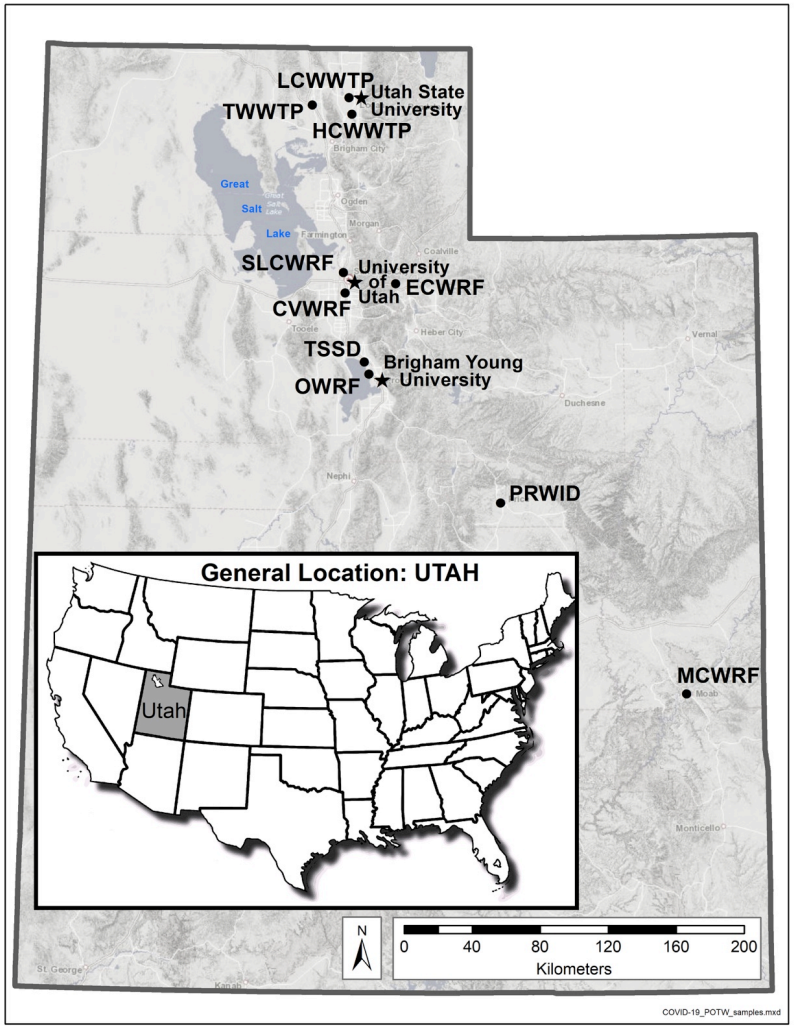
- 10 wastewater treatment plants (~40% of population)
- Composite samples
- 2x week (April 20 – May 21)
- Weekly since May 21
- 2 samples each of sewer line samples for subareas of districts

Laboratory methods

- RT-qPCR
- Standardized across 3 Utah university labs
- 48 hour turn-around-time (24 hrs rush)

Data management and analysis

- Corrected for flow and population
- Averaged to generate daily value per facility
- Dashboard to display and communicate findings



Key Findings

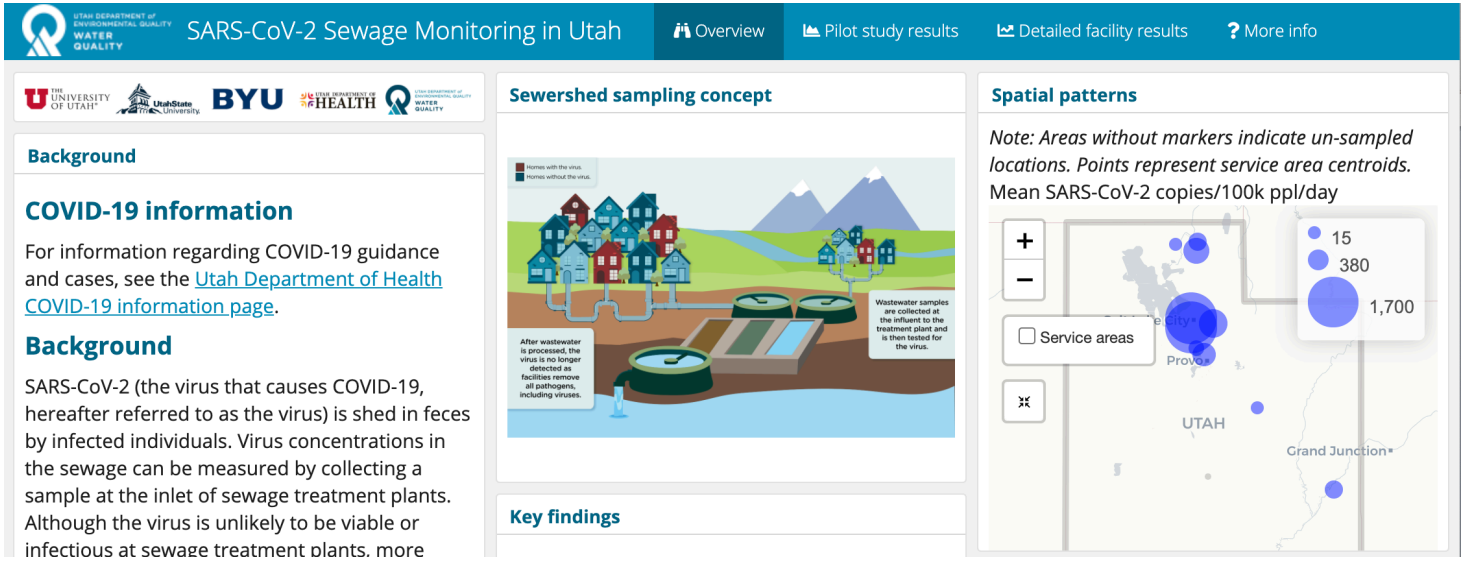
Virus was found in the influent of all ten facilities (64% of all samples).

Large increases of virus were measured at the Logan and Hyrum facilities in late May.

Highest concentrations of virus were found in urban areas.

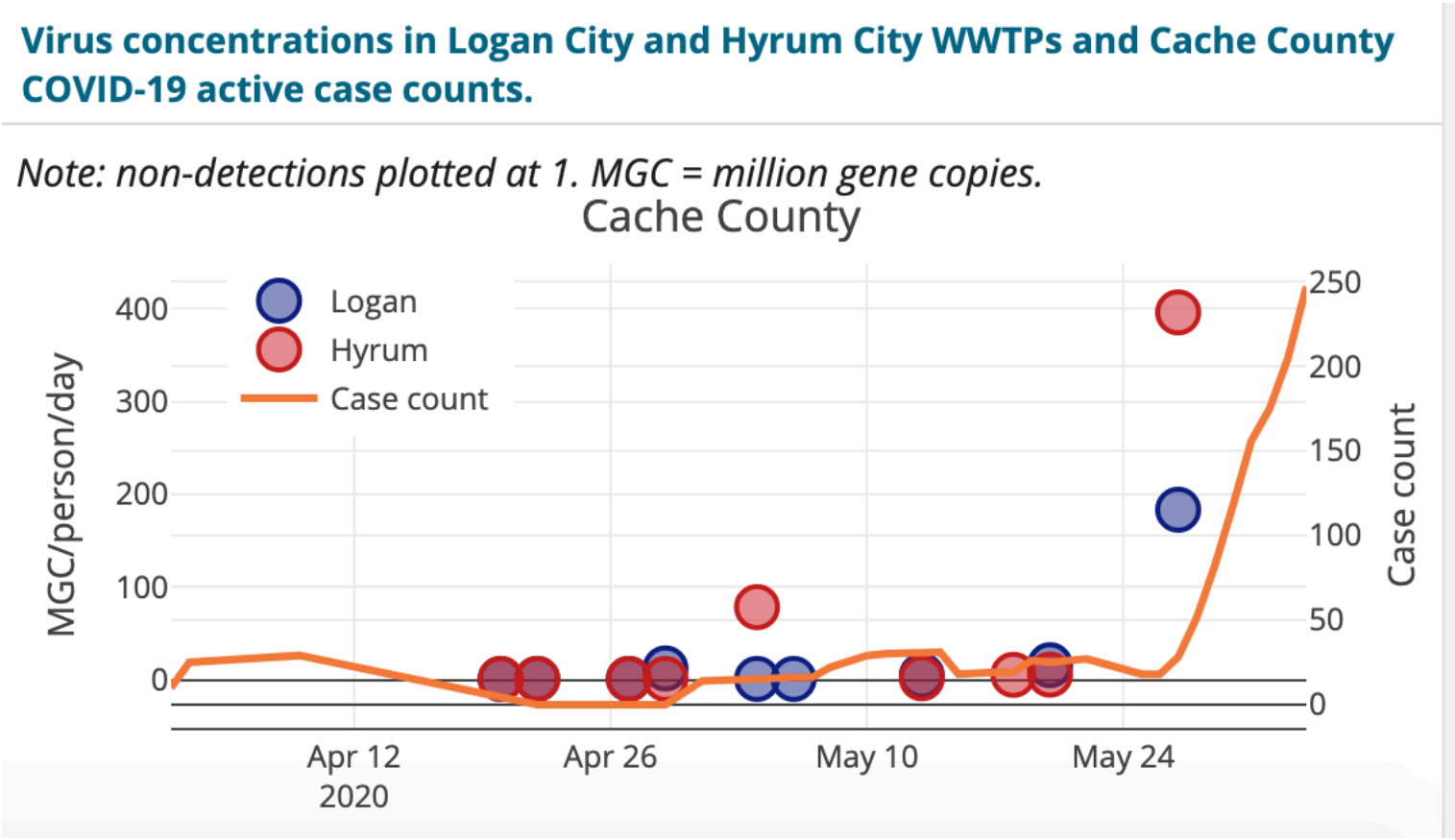
Tourist communities showed higher concentrations than others of similar size.

Virus was not detected in the effluent leaving the sewage treatment plants.



Use Case: Early detection of rising infections

Virus concentrations in Logan City and Hyrum City WWTPs and Cache County COVID-19 active case counts.



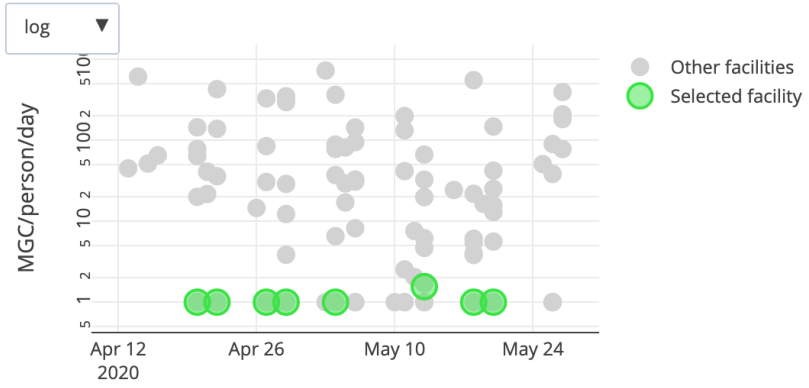
Use Case: Confirmation of low infection rates

Tremonton WWTP

Estimated population served: 12,451

Time series

Note: non-detections plotted at 1. MGC = million gene copies.

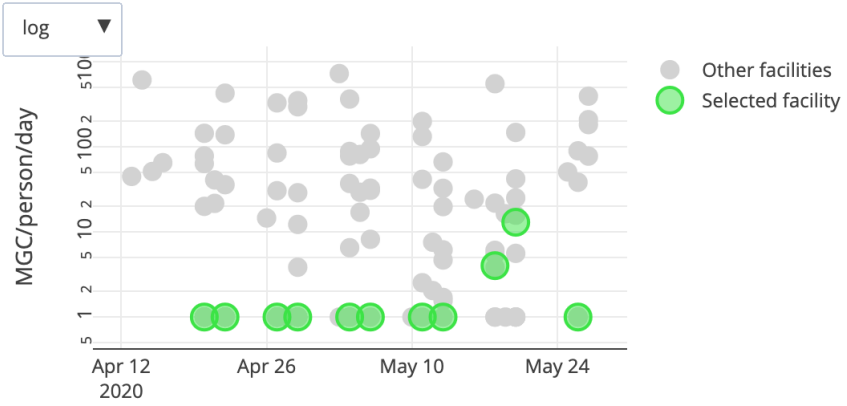


Price River WID

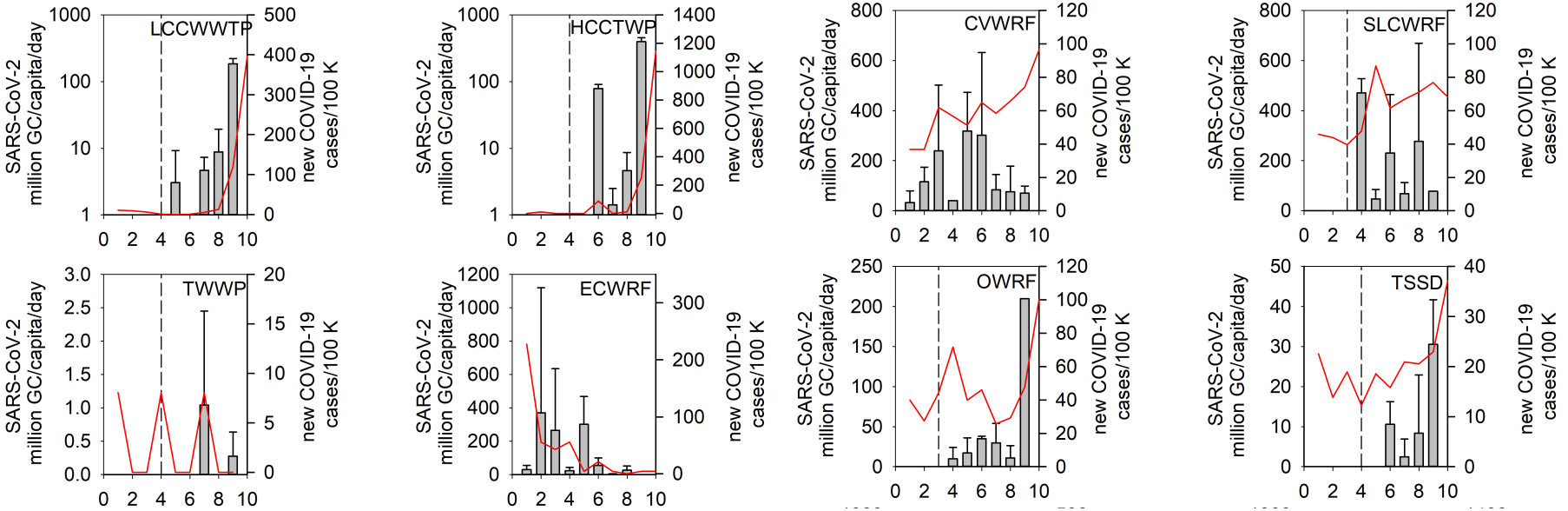
Estimated population served: 17,312

Time series

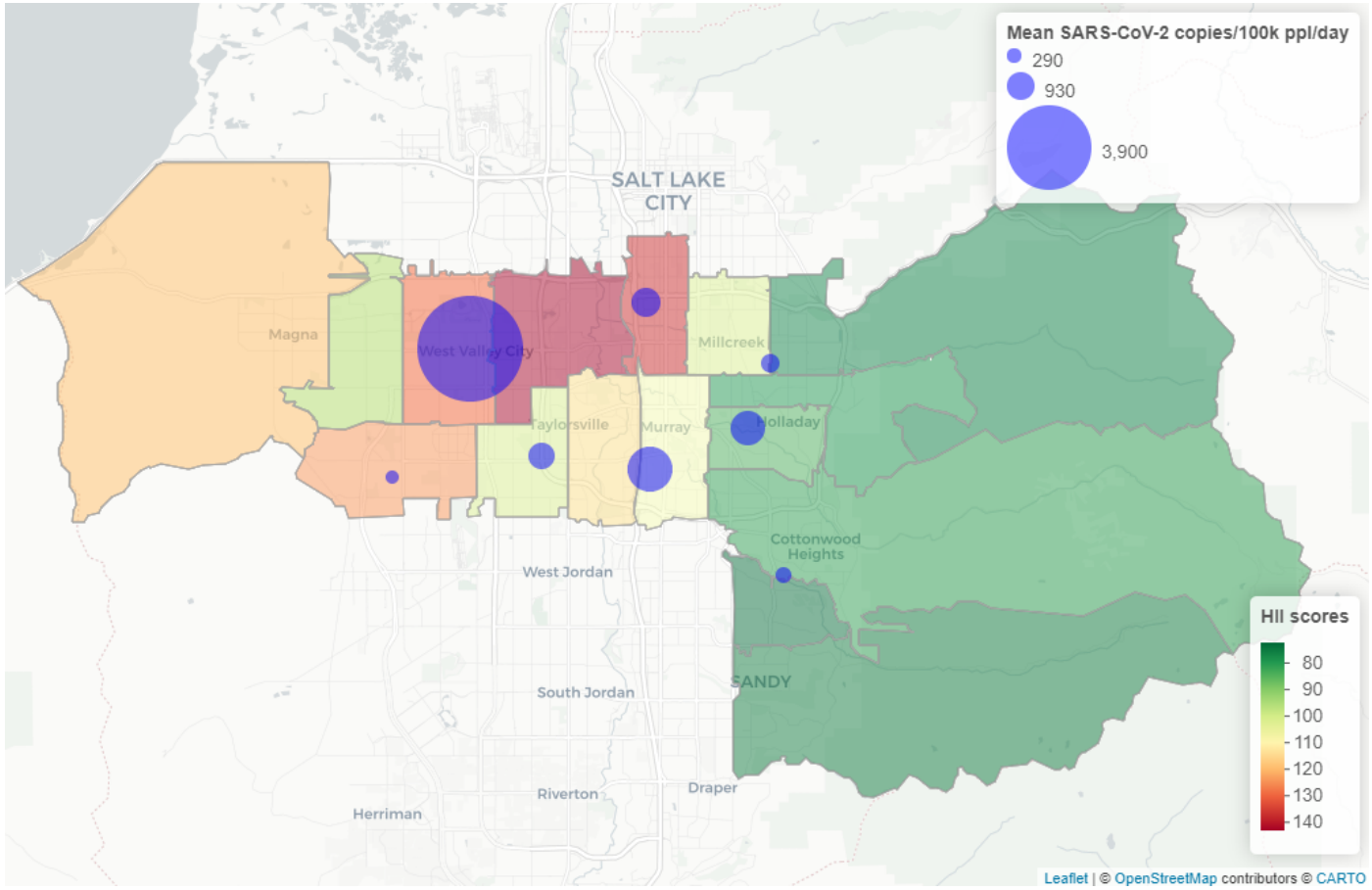
Note: non-detections plotted at 1. MGC = million gene copies.



Use Case: Monitoring overall infection trends



Use Case: Targeting community level monitoring



Ongoing Wastewater Monitoring in Utah

Sample locations

- 30 treatment plants > 1 MGD (~10,000 people)
- 10 rural treatment plants based on health improvement index, meat packing industries, and tourism communities
- ~80% of Utah's population

Frequency

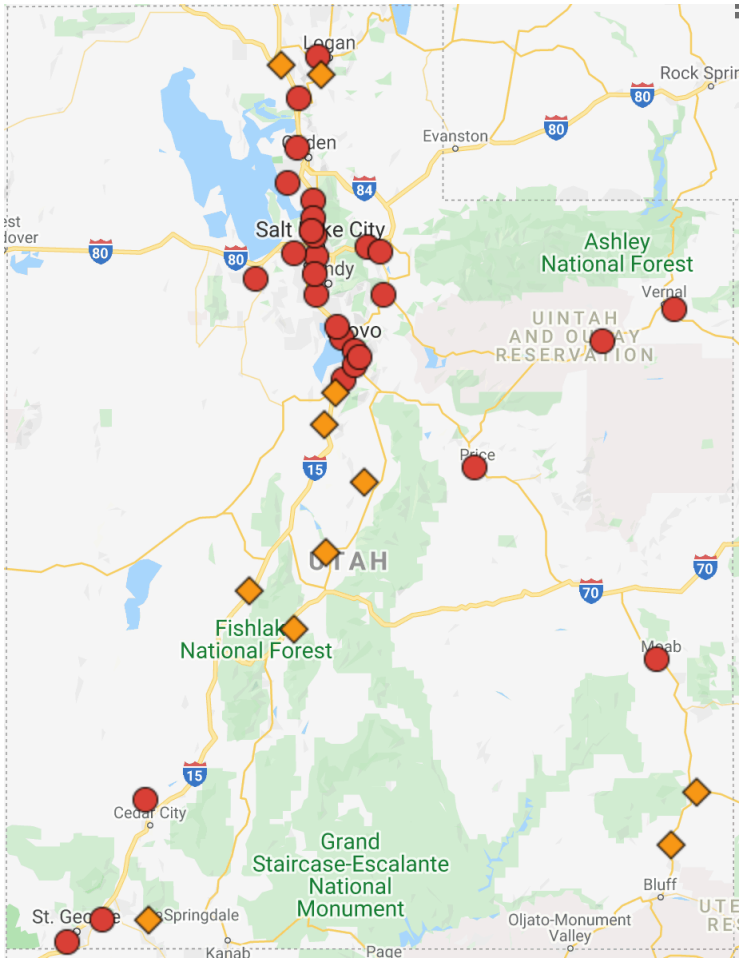
- Weekly samples July – September at 40 sites
- Capacity for 20 additional samples as needed by public health
- Surge sampling available if needed

Budget: $275,000

- ~ $220/sample for urban samples ($0.005/person)
- ~ $525/samples for rural samples ($0.10/person

Future work

- Increase sample frequency at sentinel sites
- University campuses
- Long-term care facilities
- Neighborhoods

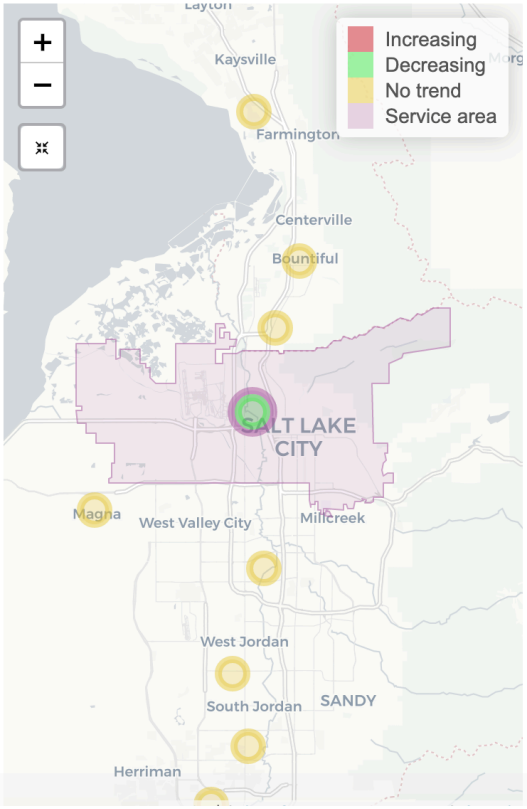


Data Dashboard

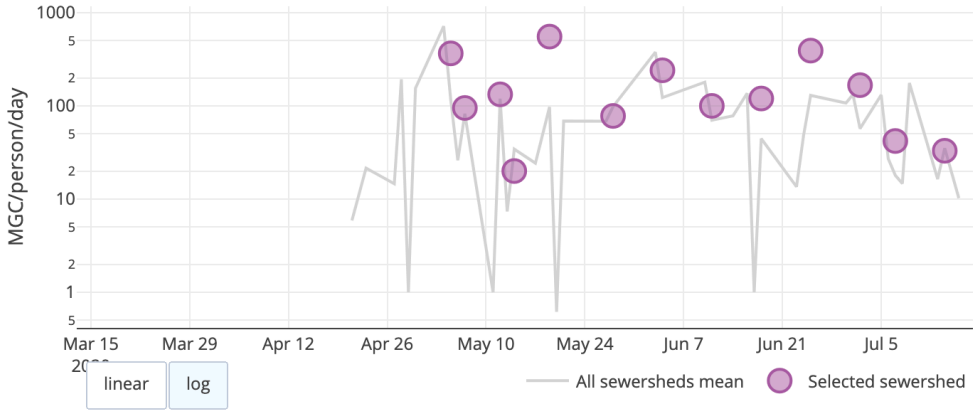
Salt Lake City WRF

Estimated population served: 209,645

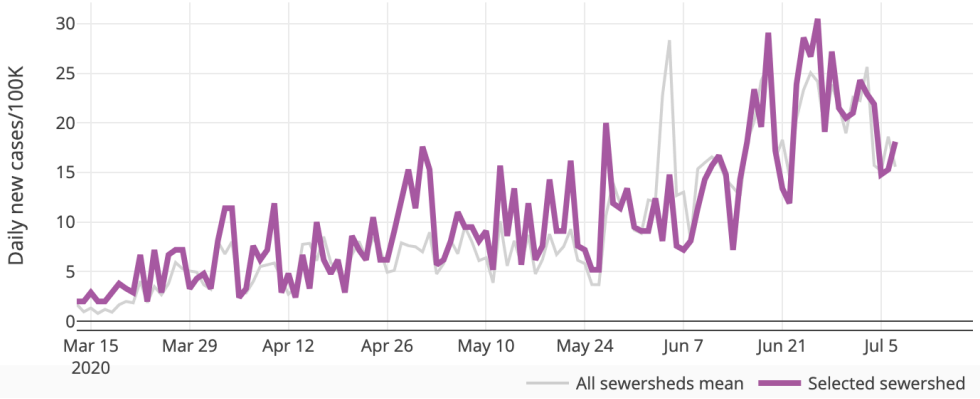
Select a location



Sewage monitoring *Non-detections plotted at 1. MGC = million gene copies.*



Daily new cases *Sewersheds with <5 cases plotted at 2.*



Planning considerations

Planning and logistics of expanding effort

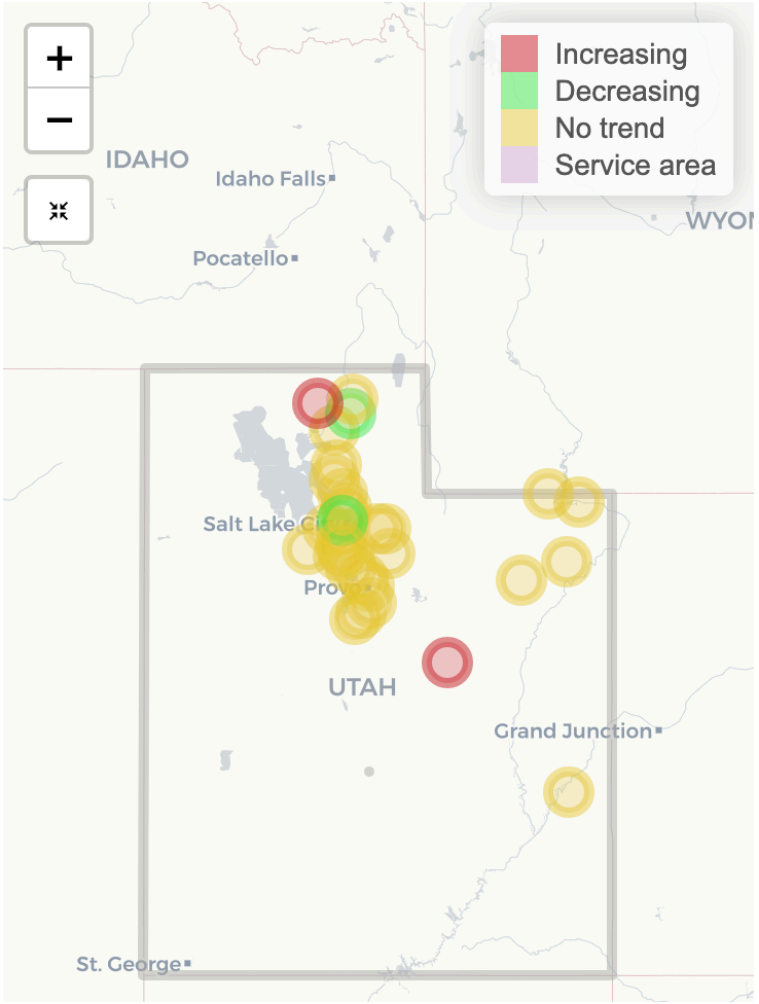
- 40 facilities more than 600 km apart
- Composite v. grab sampling
- Holding time considerations
- Laboratory capacity was an key constraint to sample design

Identifying triggers for more monitoring/actions

- Increase, decrease, and plateau statistics
- Percent versus absolute change
- Interpreting data in urban, rural, and tourism based communities

Data management and dashboard

- Concentrations converted to per capita units to account for infiltration and inflow at wastewater facilities
- Mapping of sewersheds is necessary to relate data to population and correlation with recorded case counts
- Online data spreadsheet increases efficiency and minimizes errors
- Data dashboard provides seamless display of new information to public and health officials



Lessons learned

A pilot study can effectively demonstrate the utility of the tool and work out logistical and method issues at relatively low cost.

Public health partners should be included in the design of the surveillance plan
!! Minimize demands on public health time !!

Consider partnering with wastewater regulatory agency to assist with coordination of facilities, universities, and public health.

Laboratory methods should focus on delivering consistent and comparable data to track trends and broad patterns.

Communication is KEY.

- Facilities, scientists, sampling staff, and health officials must coordinate frequently.
- Data dashboard can be valuable to both public and health officials

Be prepared to adapt to new requests and new science – but don't let perfection be the enemy of the really good

Partners and Collaborators

Research Partners

Jennifer Weidhaas, PhD, P.E., University of Utah
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Jeff Richens, Price River WID
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