TODAY’S WEBINAR AGENDA

- 3:00 pm: Introduction
- 3:05 pm: Presentation
- 3:45 pm: Questions
- 4:00 pm: Webinar Ends

For technical assistance during the webinar:

1-800-263-6317

Choose these prompts: 1, 1, 1

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LINEWORK, MODELS, COUNTERS... OH MY:
A UTAH STORY OF MULTI-AGENCY COLLABORATION TO DEVELOP ACTIVE TRANSPORTATION DATA AND TOOLS

SEPTEMBER 15, 2021

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TODAY'S WEBINAR PRESENTERS

Stephanie Tomlin
Utah Department of Transportation (UDOT)

Stephanie Tomlin is the GIS, Data, and Modeling Program Manager for the central planning group at the Utah Department of Transportation (UDOT). Stephanie specializes in active transportation data analytics, multi-modal transportation planning and the integration of big data in planning initiatives. Stephanie also manages the UDOT Transportation Investment Fund program models. These models are used to prioritize projects for funding throughout the state annually. Stephanie is the current Board Chair of Bike Utah.

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TODAY'S WEBINAR PRESENTERS

Bert Granberg
Wasatch Front Regional Council (MPO)

Bert Granberg leads the Analytics Group at Wasatch Front Regional Council, the metropolitan planning organization (MPO) for the Salt Lake City, Ogden Layton urban area. Previous appointments include directing Utah's state GIS office (UGRC) and serving on the National Geospatial Advisory Committee.

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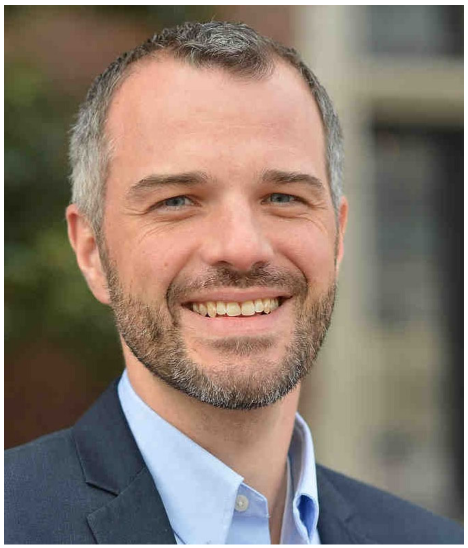
TODAY'S WEBINAR PRESENTERS



Ben Stabler
RGS

Ben Stabler is a Senior Director at RSG and specializes in transportation modeling and software development. He has 20 years of industry experience and previously worked in software development for PTV and in transport modeling for the Oregon Department of Transportation.

Linework, Models, Counters... OH MY

A Utah Story of Multi-Agency Collaboration to Develop Active Transportation Data and Tools

Association of Pedestrian and Bicycle Professionals
Webinar Series
September 15th, 2021

Bert Granberg | Wasatch Front Regional Council

WASATCH FRONT REGIONAL COUNCIL

Stephanie Tomlin | Utah Department of Transportation

UDOT Keeping Utah Moving

Ben Stabler | Resource Systems Group

RSG

Presenters

Stephanie Tomlin
UDOT

Data, Modeling, and GIS Program Manager

Ben Stabler
RSG, Inc.

Senior Director

Bert Granberg,
WFRC

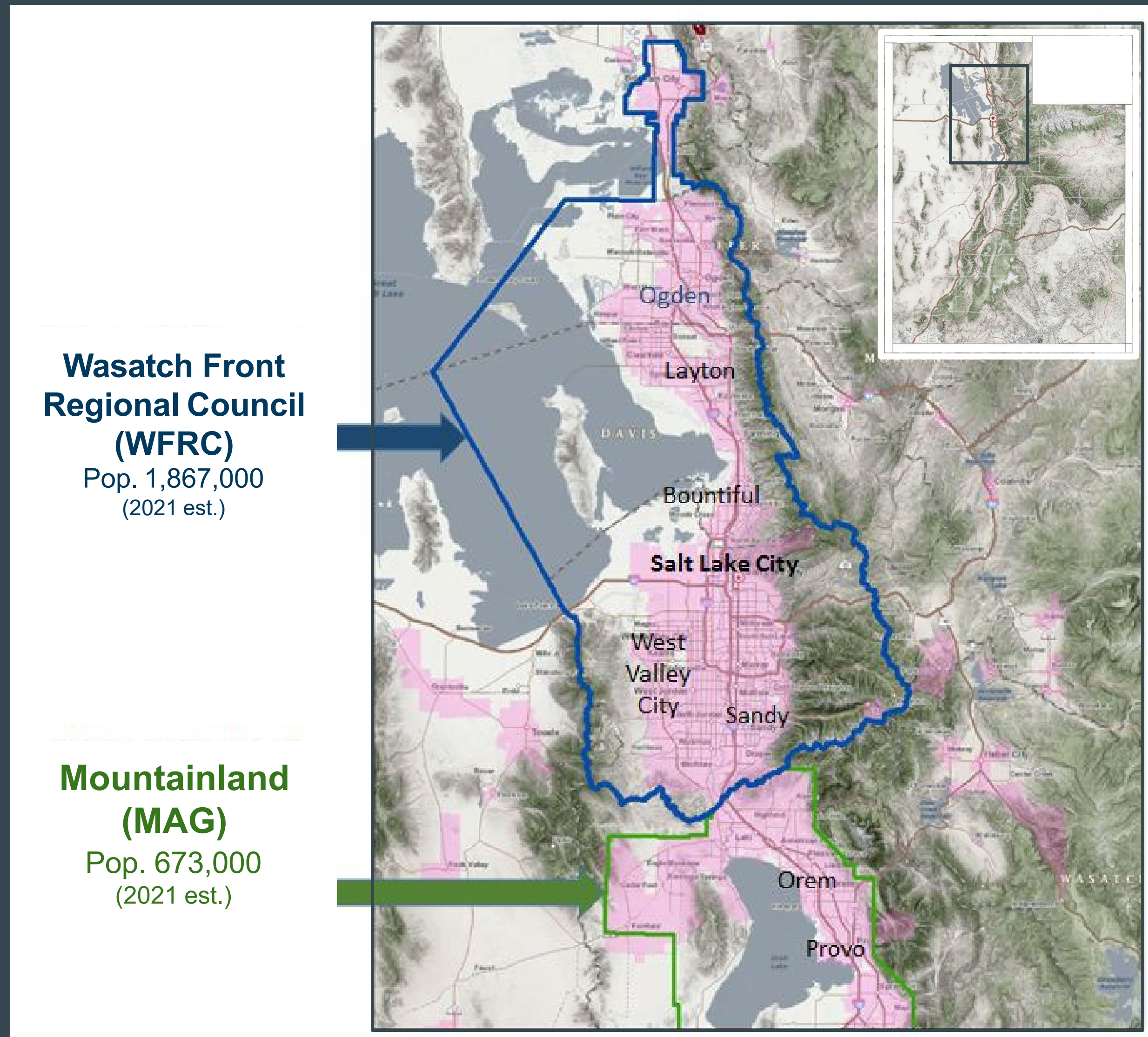
Analytics Director

Geographic Context:

Wasatch Front Metropolitan Planning Organizations:

- WFRC
  Salt Lake City - Ogden area
  ~55% of Utahns

- MAG
  Provo - Orem area
  ~20% of Utahns



The Story:

Good data =

Good planning =

Funding for projects

The Story:

The subject of today's presentation

Good data =

TLC / Local AT Plans

Good planning =

Funding for projects

TIF/T
TIF
$35M

Starting in 2016 Roughly $150,000 and 1,500 hours annually invested between agencies on AT data the work we are going to highlight

Linework
Utah Bike
Demand Model
Observed Data

Learning Objectives

- **Innovative active transportation data developments and tools that are happening in the state of Utah**
- **Agency collaboration is critical in data and tool development**
- **Utah has leveraged these data and tools to fund and construct projects**

Linework.

Challenge: Inventorying Active Transportation System

- Partial network, maturing quickly
- Regional network, but tracked only at local level, and only by some
- Presenting existing and planned networks
- Identifying gaps and projects
- Prioritizing, phasing, and funding projects
- Bike focus, pedestrian, or multi-use?

Challenge: Inventorying Active Transportation System

- Partial network, maturing quickly
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- Presenting existing and planned networks
- Identifying gaps and projects
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- Bike focus, pedestrian, or multi-use?

-- AT is real infrastructure, we should map it and plan for it like we do other modes

Key Linework Decision Points

Stewardship: authoritative or shared?

Who’s in the partnership for collaboration and funding?

Standardized data structure?

Access to data: who, when?

Types of users?

Overlapping & conflicting plans

Bike or pedestrian focus?

Data management platform?

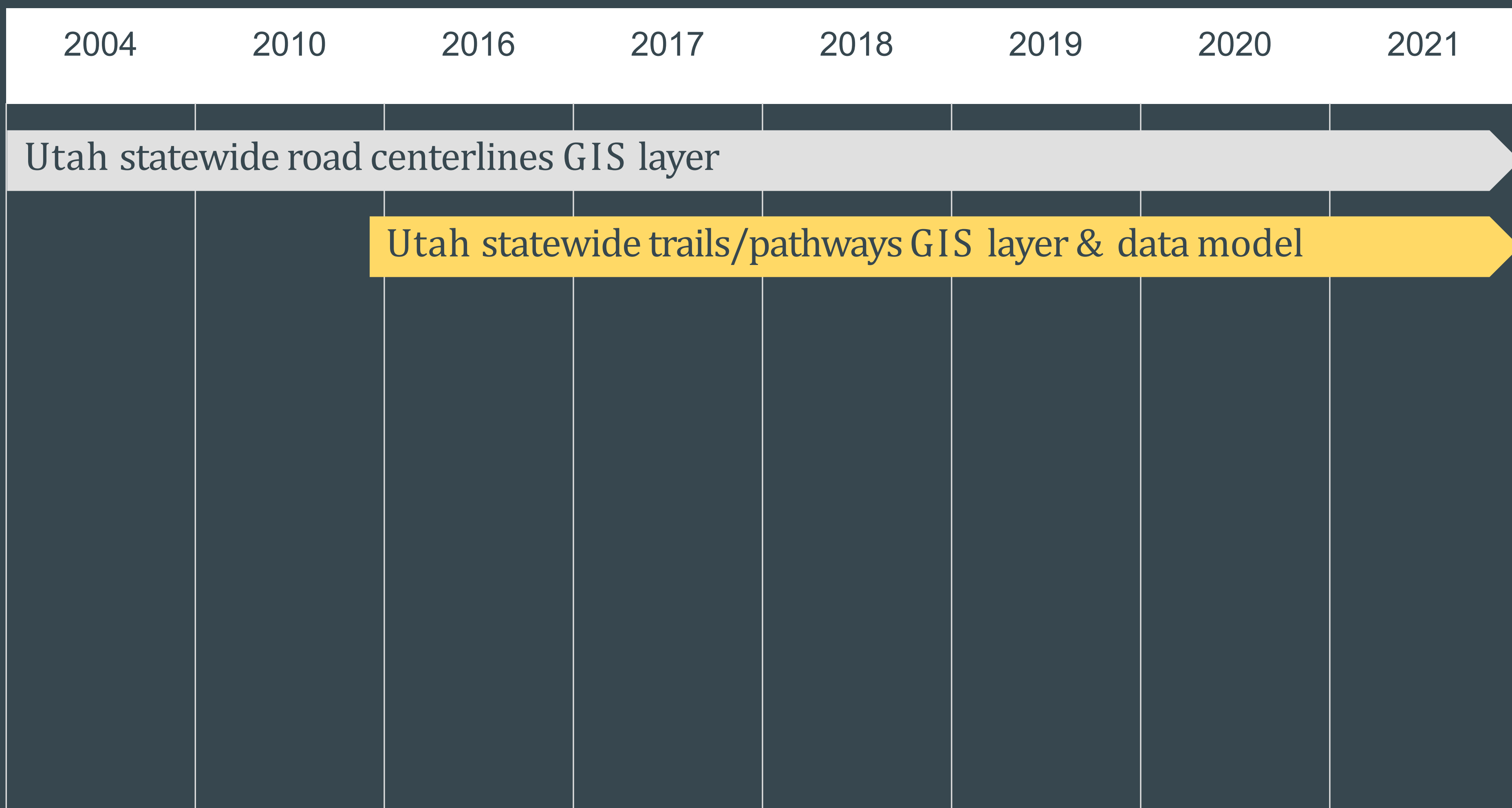
Investment path: existing inventory? planned projects? observed travel behavior? travel models?

Data refresh cycle?

Notable GIS Linework Development Milestones

2004	2010	2016	2017	2018	2019	2020	2021
Utah statewide road centerlines GIS layer							

Notable GIS Linework Development Milestones



Notable GIS Linework Development Milestones

2004	2010	2016	2017	2018	2019	2020	2021

Utah statewide road centerlines GIS layer

Utah statewide trails/pathways GIS layer & data model

20	Category/Grouping	Field Definitions			
21		FieldName	Type	Length	AliasName
22	High Utility General	STATUS	String	15	ConstructedStatus
23		CARTOCODE	String	10	CartographicCode
24	Addressing	FULLNAME	String	50	FullName
47	Placename/Area	STATE_L	String	2	StateLeft
63	Legacy 911 Coding (optional)	*ER_CAD_ZONES*	*TBD*	*TBD*	*TBD*
68	Routing	ONEWAY	String	1	OneWayCode
74	DOT/FHWA	DOT_HWYNAM	String	15	DOTHighwayName
87	Alternate Use	BIKE_L	String	4	ExistingBikeFeatureLeft
88		BIKE_R	String	4	ExistingBikeFeatureRight
89		BIKE_PLN_L	String	4	BikePlanLeft
90		BIKE_PLN_R	String	4	BikePlanRight
91		BIKE_REGPR	String	5	BikeRegionalPriority
92		BIKE_NOTES	String	50	BikeNotes
93		PED_L	String	25	Pedestrian Left
94		PED_R	String	25	Pedestrian Right
95	Data Lineage	UNIQUE_ID	String	75	UniqueID

Coded Values	
Code	Name
1A	1A Cycle track, at-grade, protected with parking
1B	1B Cycle track, protected with barrier
1C	1C Cycle track, raised and curb separated (may be m
2A	2A Buffered bike lane
2B	2B Bike lane
3A	3A Shoulder bikeway
3B	3B Marked shared roadway
3C	3C Signed shared roadway
1	1 Cycle track, unspecified
2	2 Bike lane, unspecified
3	3 Other bike route, unspecified
PP	Parallel Bike Path, Paved
PU	Parallel Bike Path, Unpaved
UN	Unknown Category

CVDomain_OnStreetBike

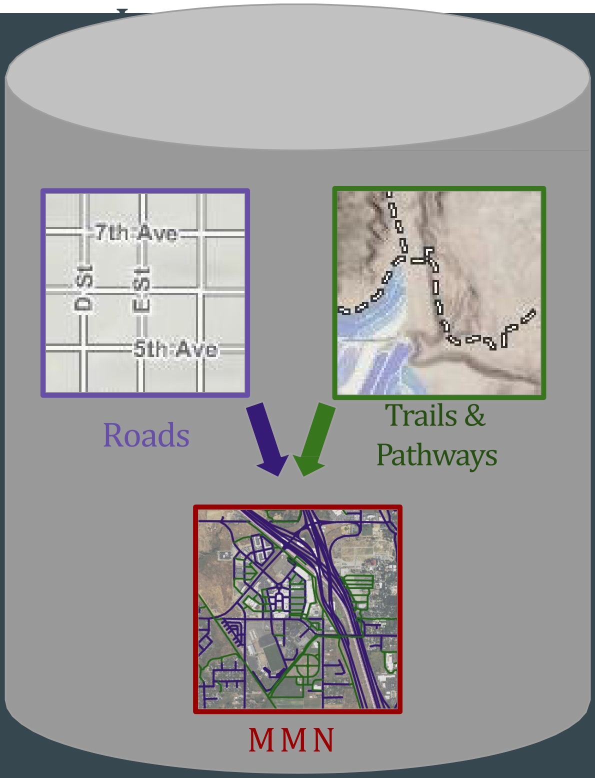
roads data model link

trails/pathways data model link

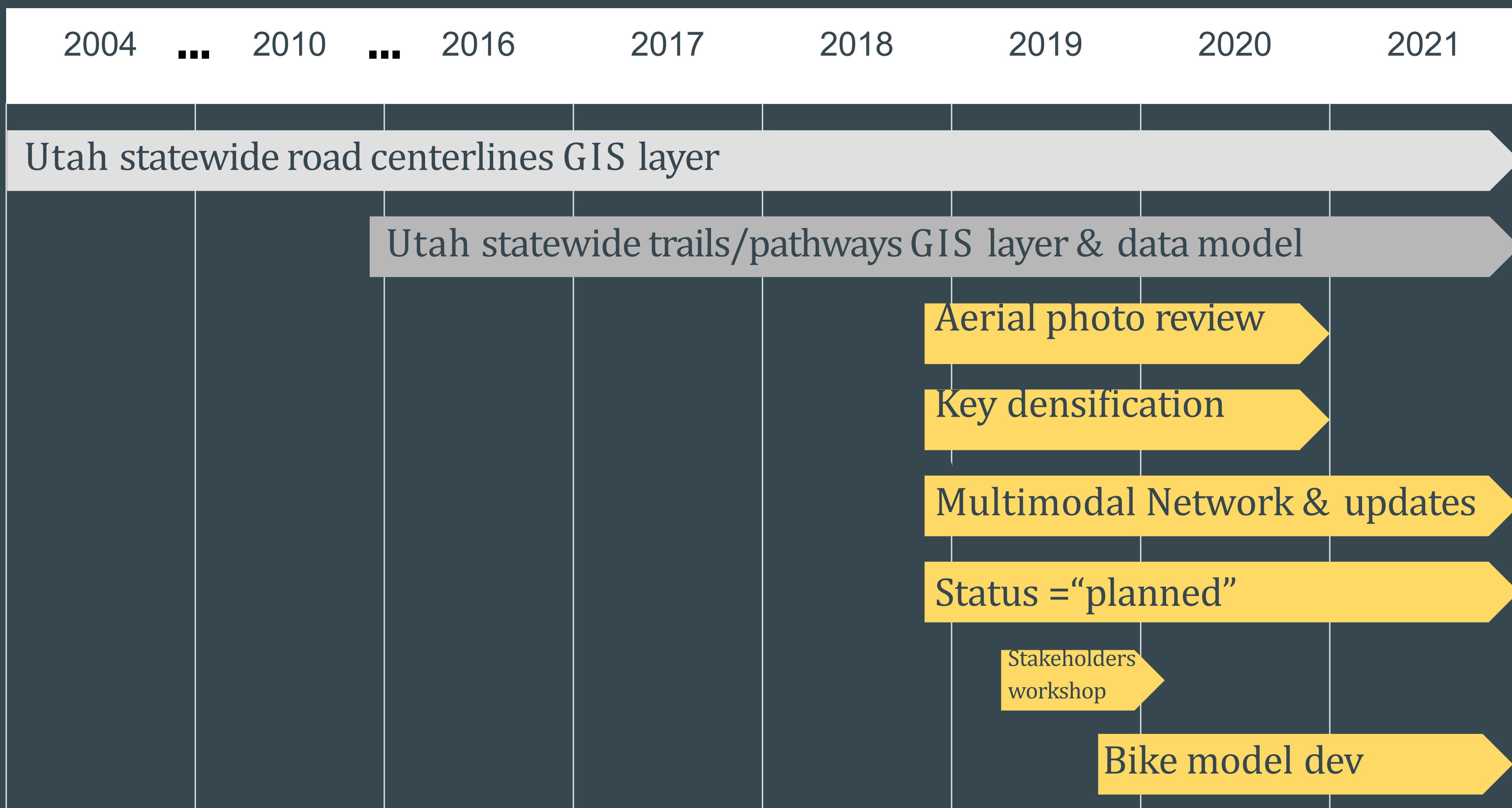
Active Transportation GIS Layers

UTRANS GIS Database

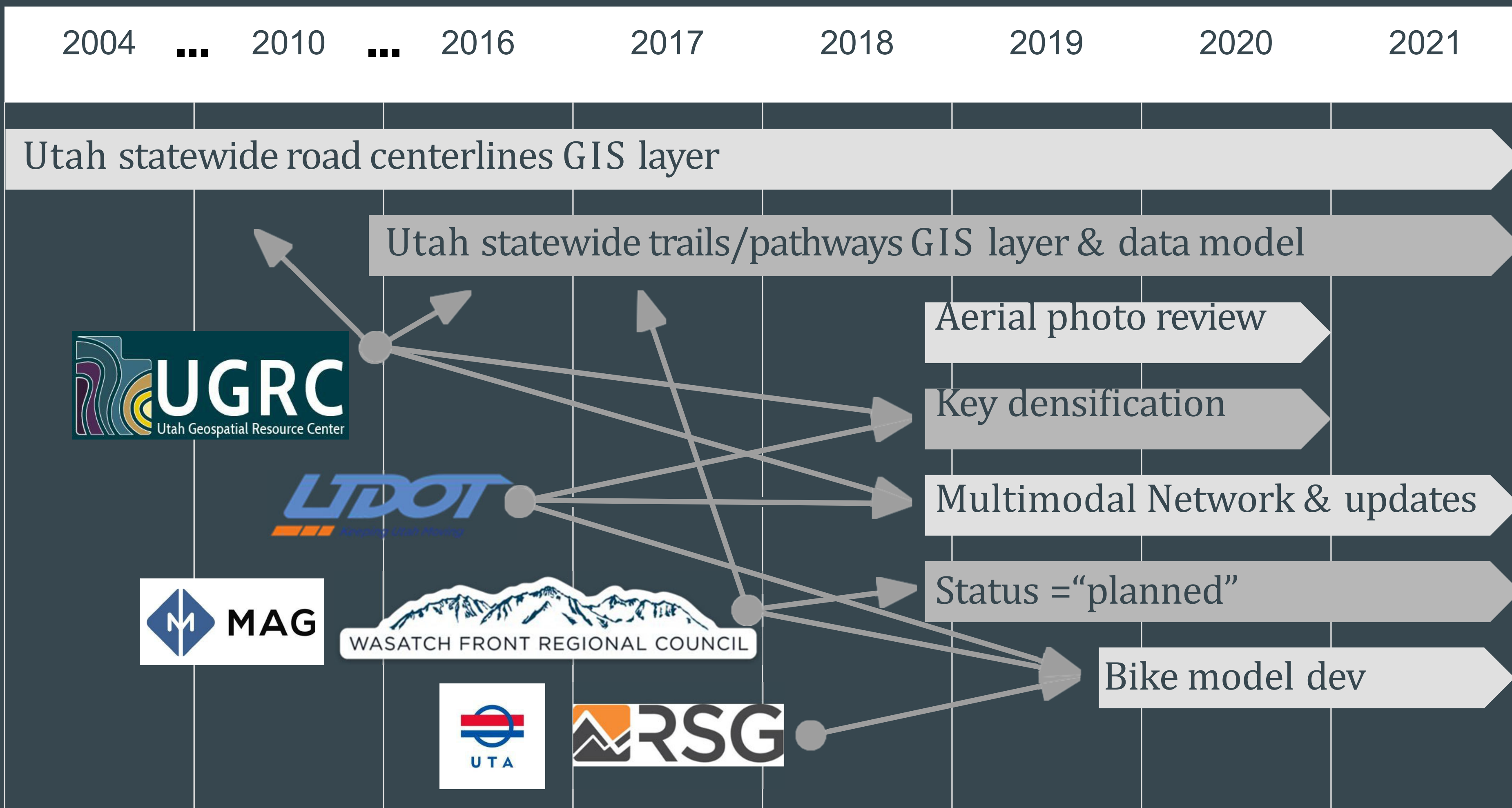
- Hosted by UGRC (state GIS office)
- Multiuser editing using Esri AGS/SDE
  - County road updates
  - UDOT updates
  - MPO updates
- Layers updated & published monthly
- Monthly rebuild of Multimodal Network analysis dataset



Notable GIS Linework Development Milestones

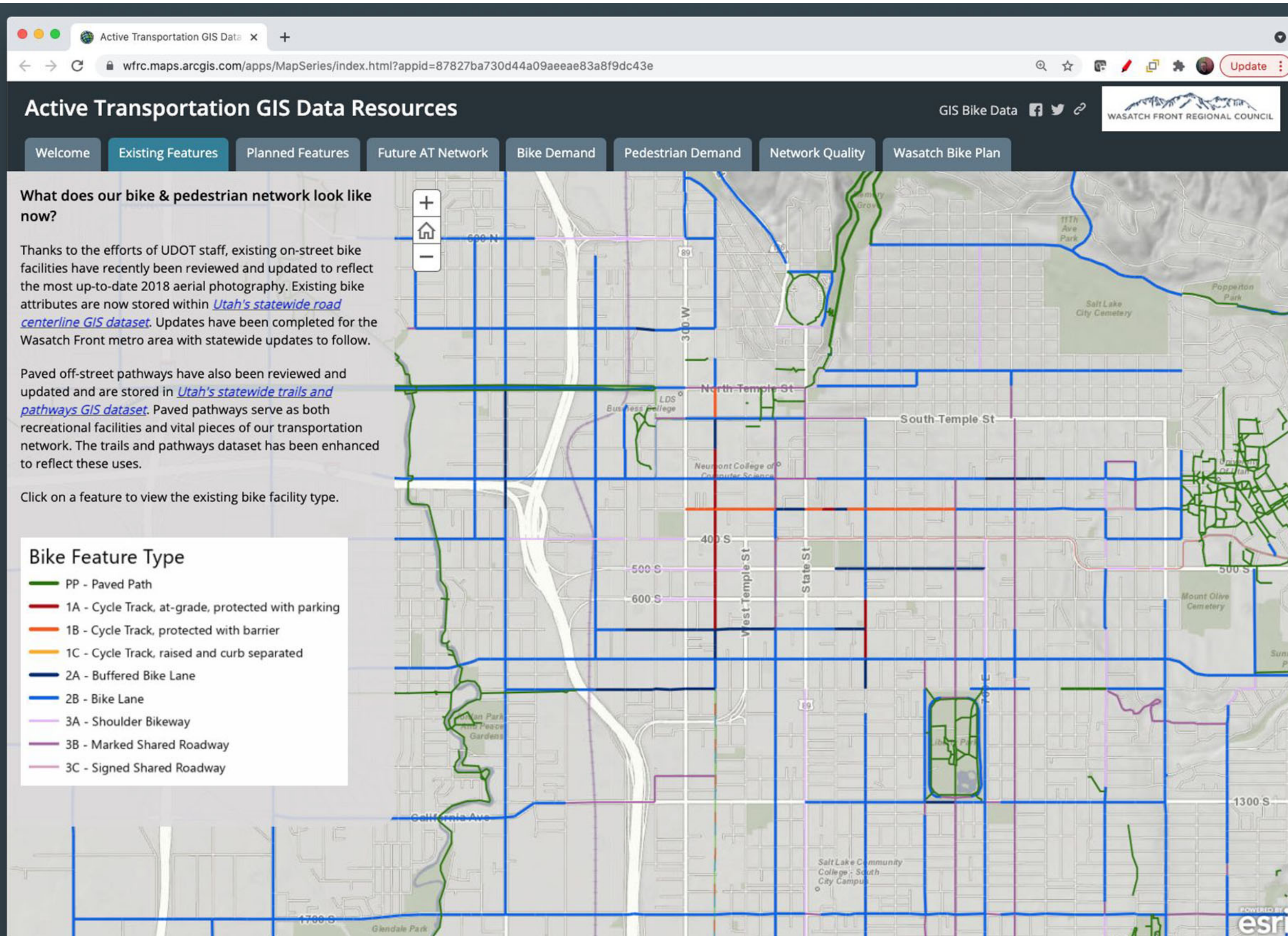


Notable GIS Linework Development Milestones



ATGIS Dataset

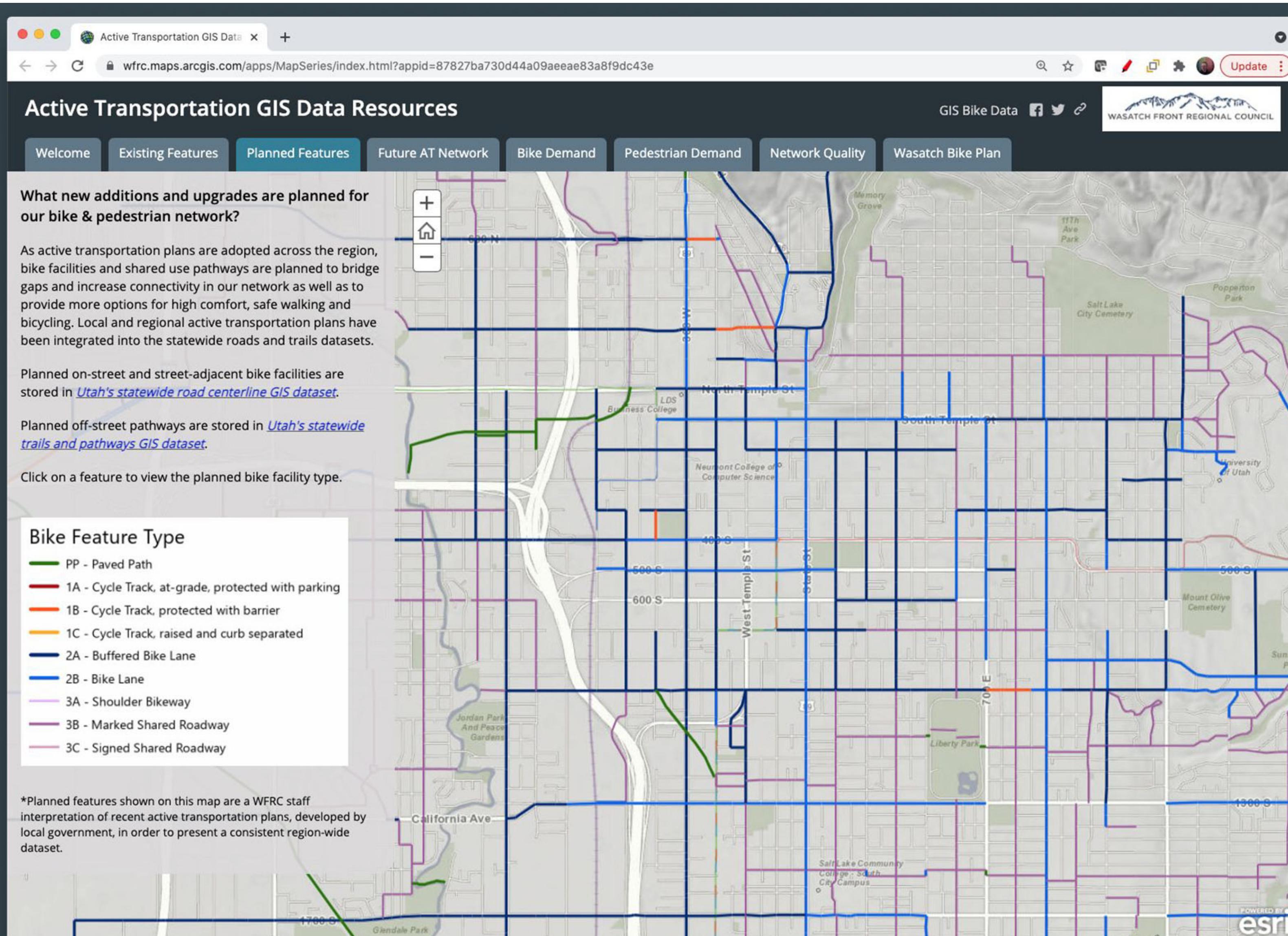
- Bike & pedestrian facilities
- Onstreet & multiuse pathways
- Existing network



[map link](#)

ATGIS Dataset

- Bike & pedestrian facilities
- Onstreet & multiuse pathways
- Existing network
- Planned network

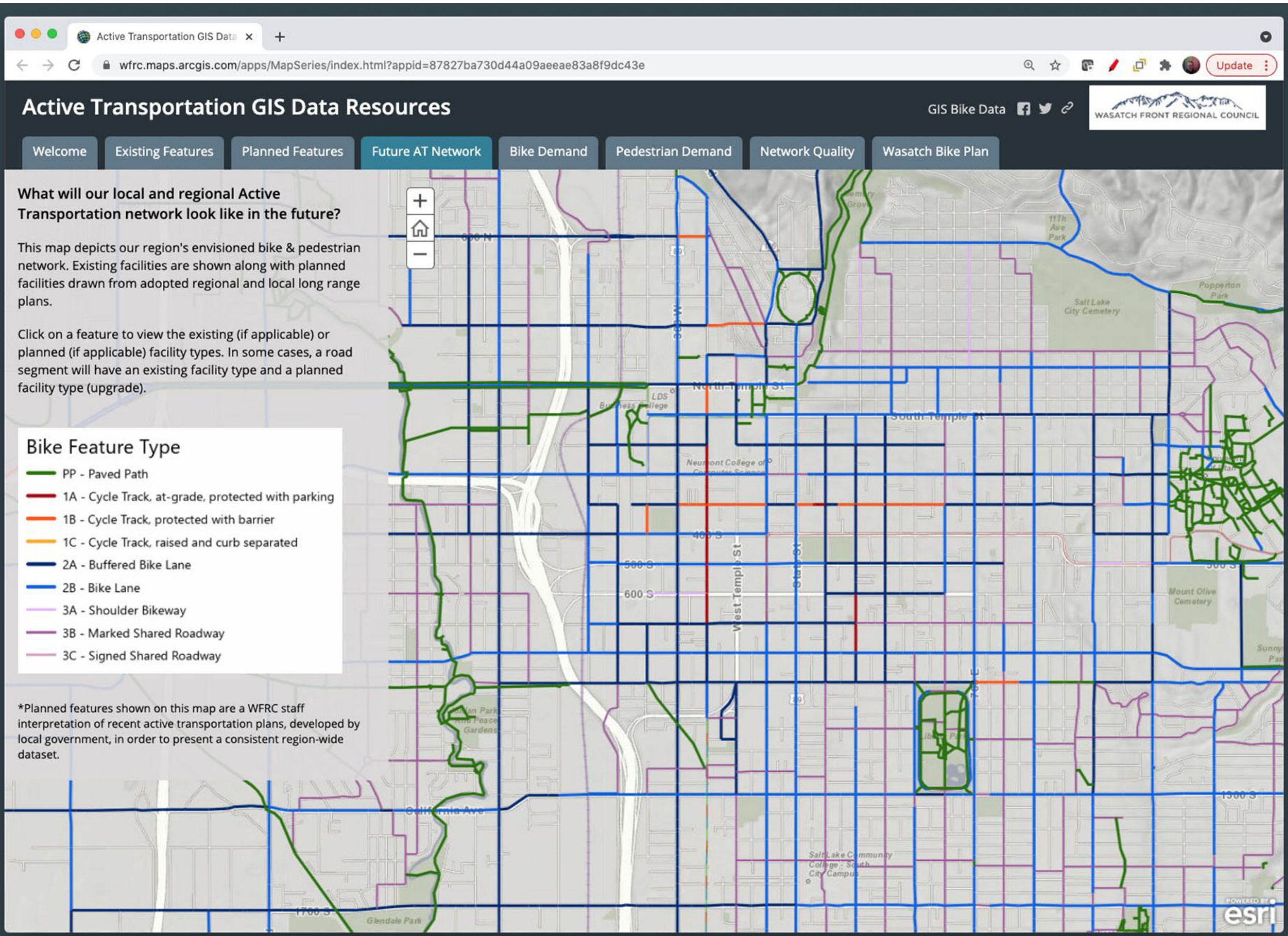


map link

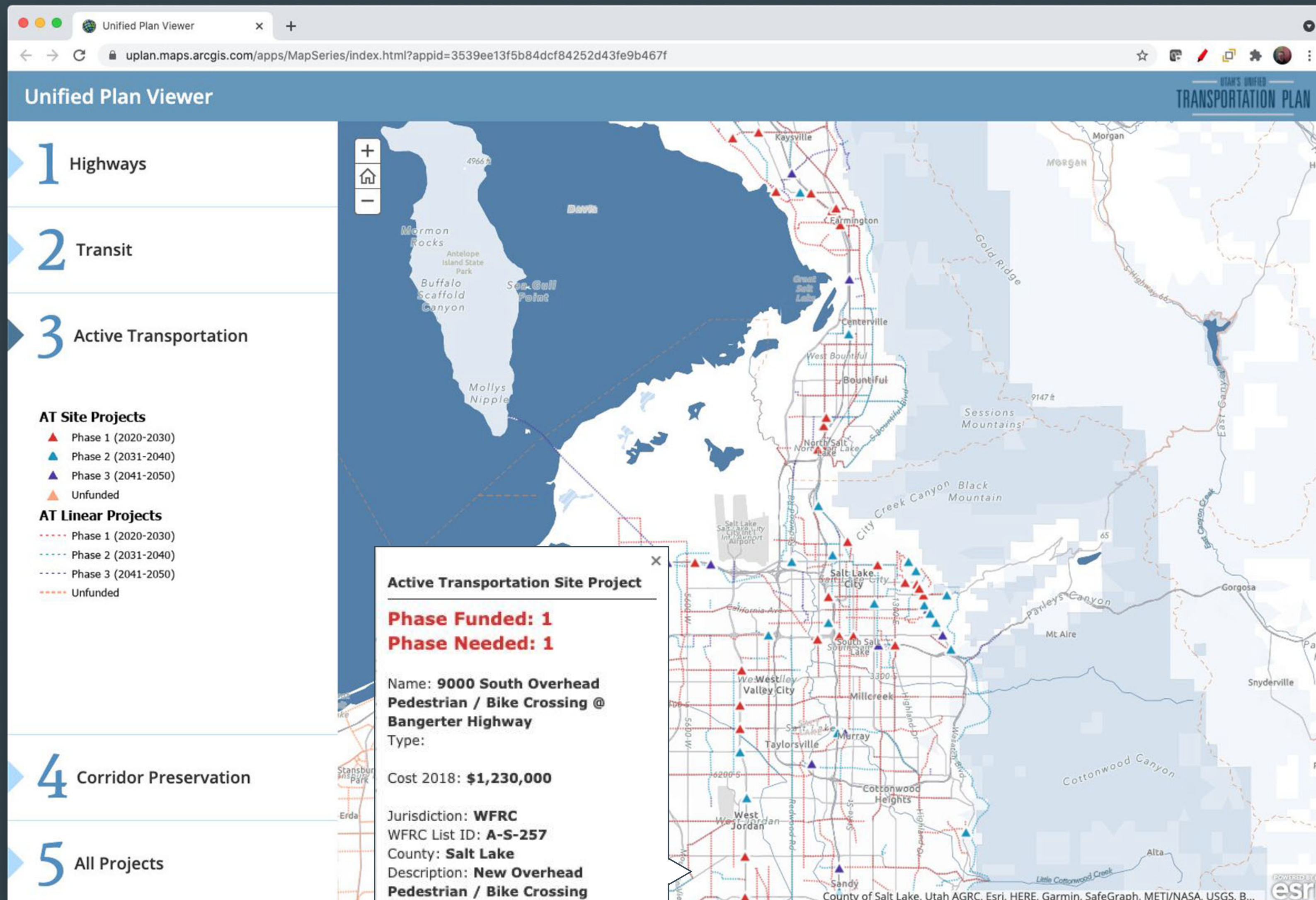
ATGIS Dataset

- Bike & pedestrian facilities
- Onstreet & multiuse pathways
- Existing network
- Planned network
- Existing + planned *future network*

map link



Utah's Unified Transportation Plan



- Phased AT project linework rolls up from MPO and UDOT long range plans

[Utah's Unified Plan link]

Utah Bike Demand Model.

Micromobility Model Kickoff Survey, Workshop & Work Plan

- Bike mode focus
- Estimate present usage,by trip type
- Compare project set scenarios
- Custom, open source platform, *informed by others' work*

workshop summary link

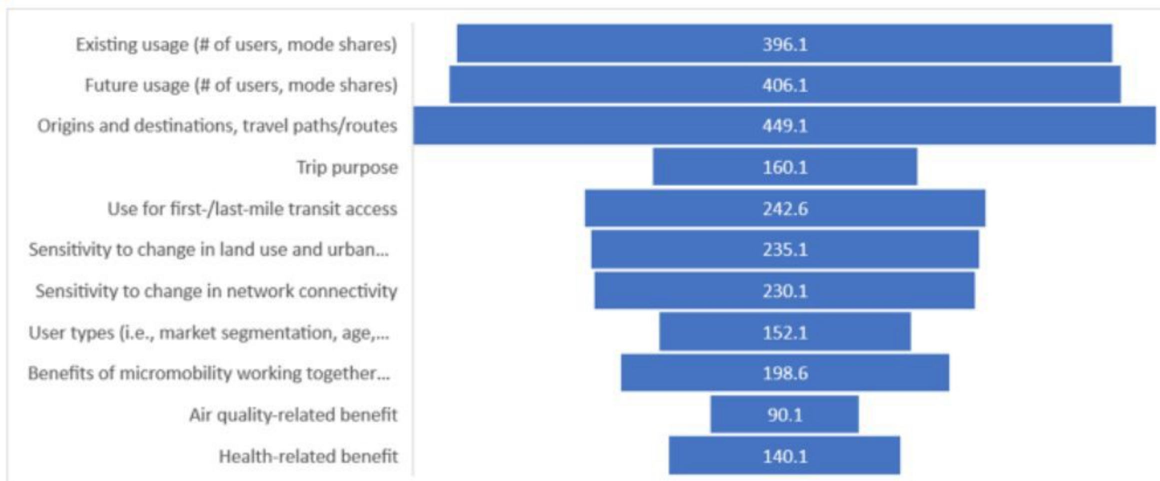
model dev work plan link

Key takeaways from the stakeholder survey include:

Toolset should provide micromobility demand estimates/forecast to assist with:

- Project prioritization
- First mile/last mile transit analysis
- Understanding network- and land use-related impacts

Survey Summary: Information the Toolset Should Provide



WASATCH FRONT REGIONAL COUNCIL UDOT UTA MAG

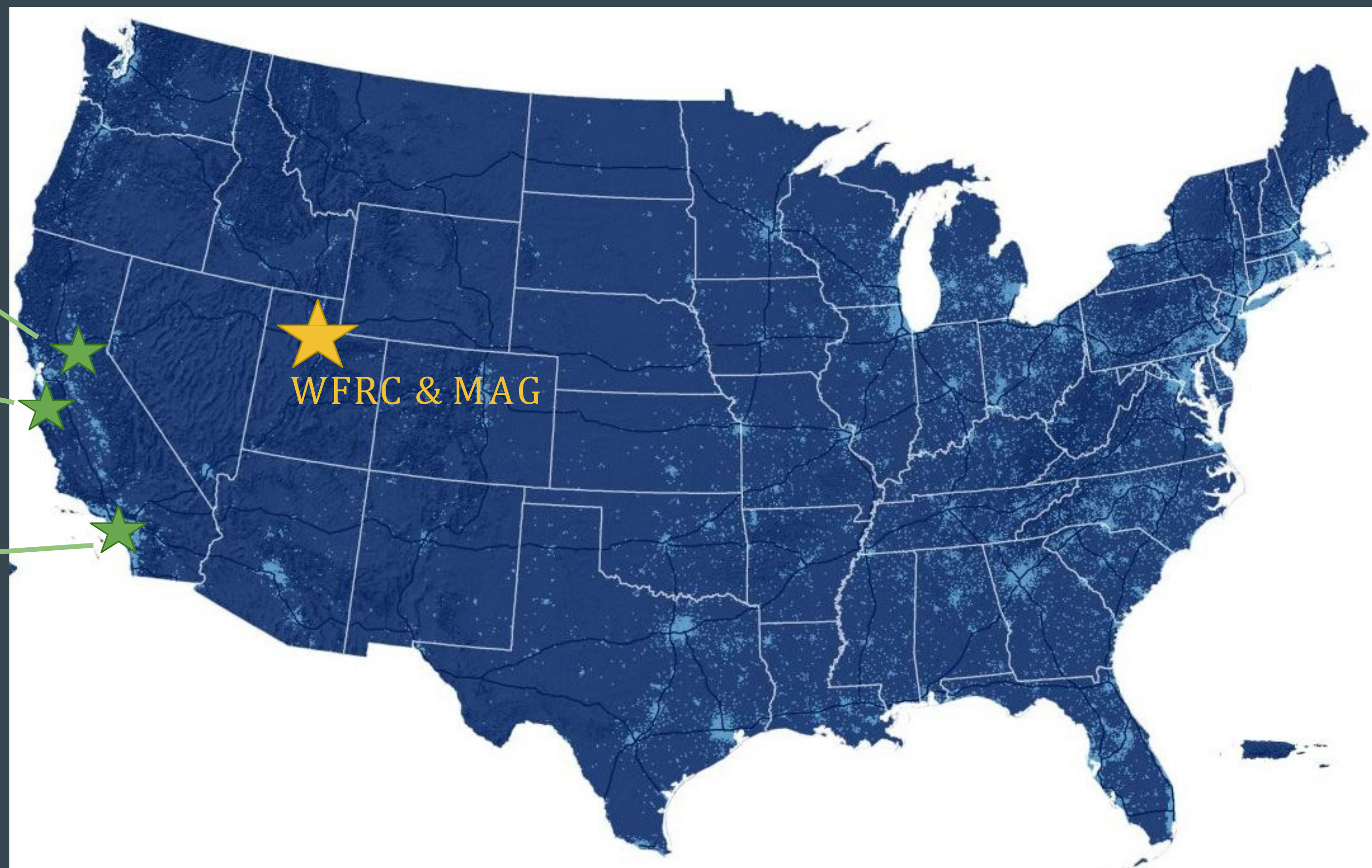
Acknowledgements - Valuable Starting Points

Initial model estimation HTS
(SACOG, Sacramento MPO)

Bike model base code
(AMBAG, Monterey MPO)

Generalized bike
travel costs (LA DOT)

Thank you !!!



Utah Bike Demand Model *Components*

Prepare Network

GIS Road Centerlines with Left/Right Bike Facilities

GIS Multi-use Pathways

Key Attributes:

- *Bike Facility Types*
- *Comfort Levels (traffic volumes)*
- *Elevation Change*
- *Signal Intersections*

Prepare Microzones

Create 'Blocks' from Roads

Key Attributes:

- *Demographics, Income*
- *Job Count By Sector*
- *Park Score, Trailhead, & Transit station presence*
- *School & College Enrollment, Dorms*
- *Jobs/Housing Mix*

Trip-based Model*

3 Step Model

- Trip Generation
- Destination Choice
- Network Assignment

→ Segment Volumes
→ Trip Production & Attraction (Origins & Destinations)

*a.k.a. Micormobility Toolset

Output Processing

Total trips, BMT

GIS Polylines
→ Segment-level Volumes

GIS Polygons
→ Origin/Destination
by trip purpose type
- Trips Production
- Trips Attracted

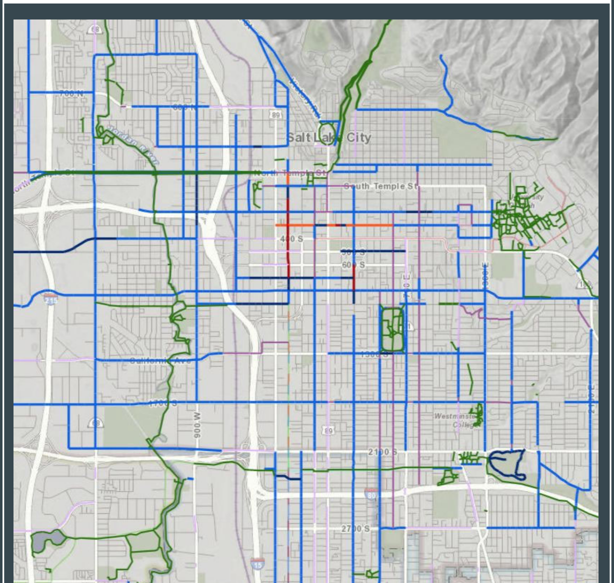
Esri arcpy | python only

Input Prep & Config GitHub Code Repository

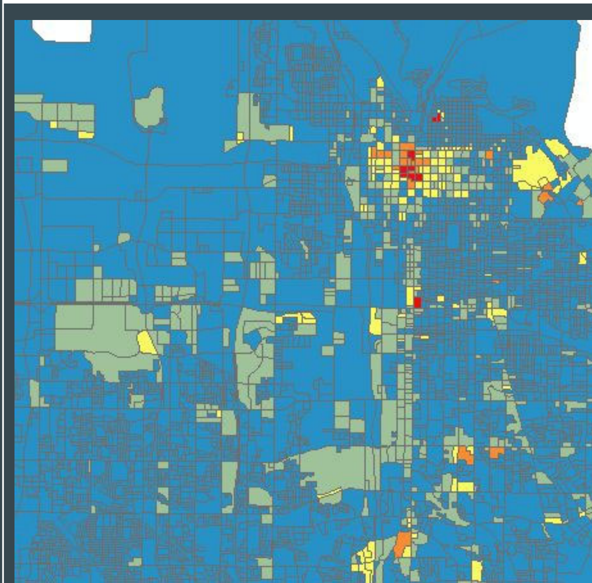
Trip-Based Model GitHub Code Repository

Utah Bike Demand Model *Input Examples*

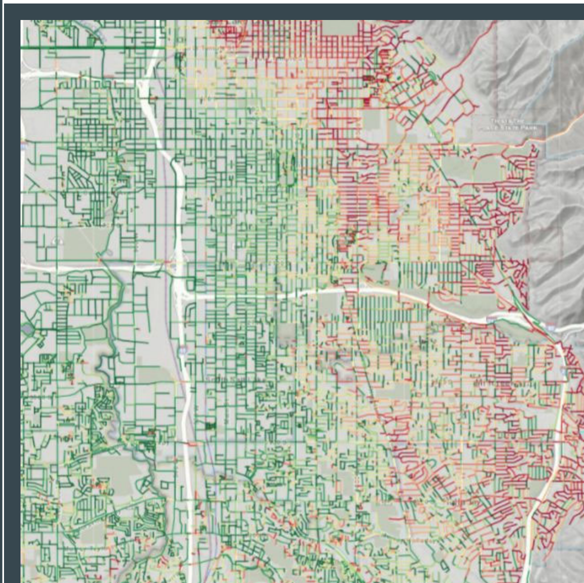
Bike & Roadway Facilities



Job Density *(by microzone)*

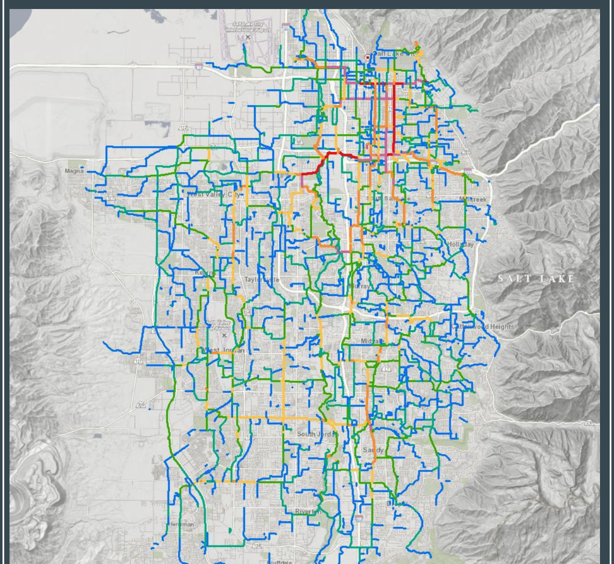


Average Slope *(directional)*

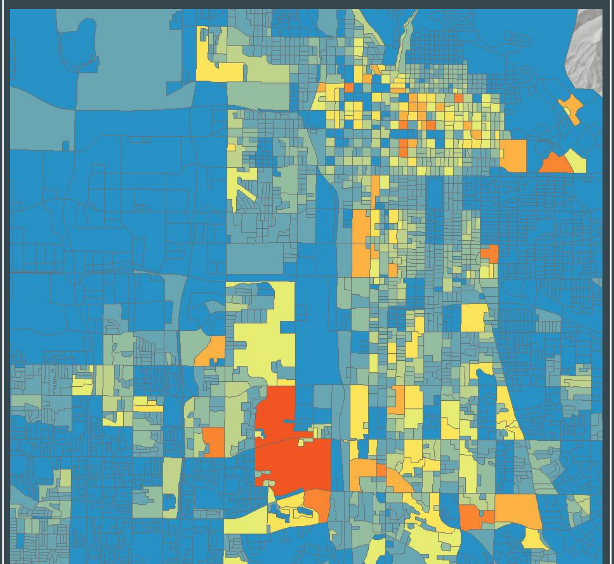


Utah Bike Demand Model *Result Examples*

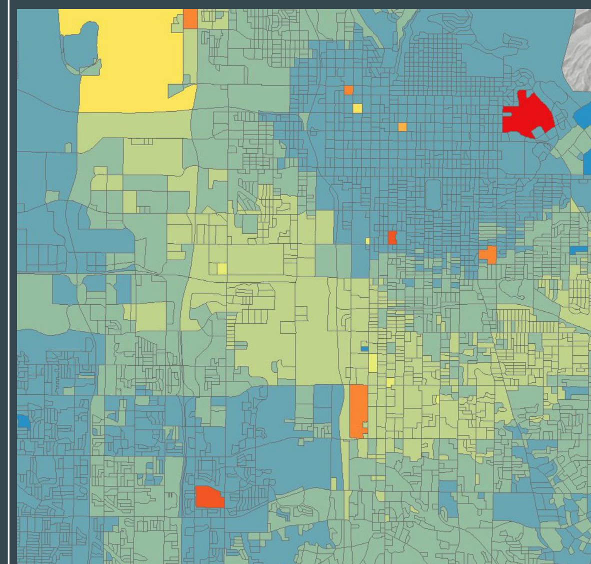
Segment Volumes



Trips Produced - College

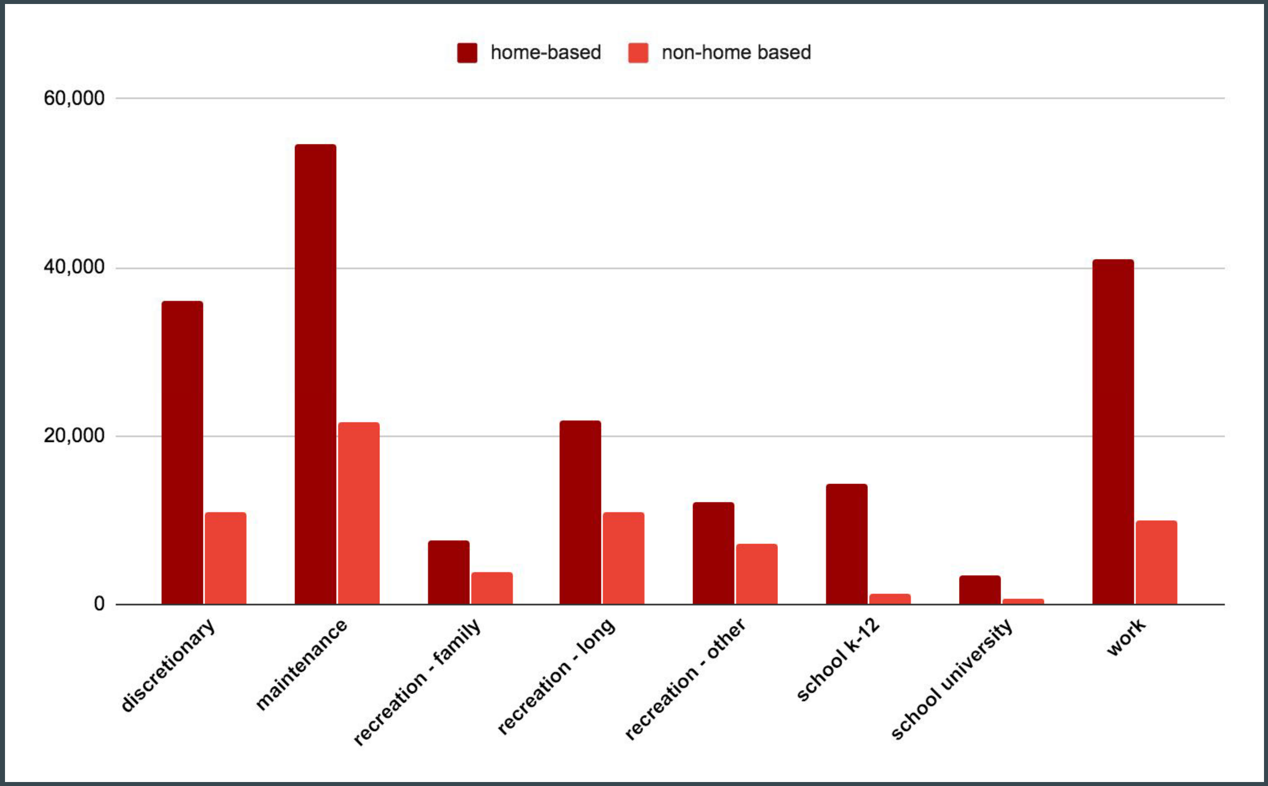


Trips Attracted - College



- est. 1,395,766 daily bike miles (~0.6 mi /person)

Utah Bike Demand Model *Result Examples*



- daily trip sum: 256,689 trips (~0.1 /person) *round trip = 2 trips*

Trip Purposes -- and Parameters Used

	Discretionary	Maintenance	Rec- Family	Rec- Long Dist	Rec- Other	School K-12	College	Work
Trip Generation - Zone Attributes	Income 75-100 Income 0-25 Age Group 1 Age Group 3	Income 75-100 Income 0-25 Age Group 1 Age Group 3	Income 75-100 Income 0-25	Income 75-100 Income 0-25	Income 75-100 Income 0-25 Pop Life Cycle 2	Income 75-100 Income 0-25	Income 75-100 Income 0-25 Age Group 1 Age Group 3	Income 75-100 Income 0-25 Age Group 1 Age Group 3
Trip Generation - Buffer Attributes	Mixed Use Score	College Enrollment Mixed Use Score	Enrollment Elem Enrollment Middle Enrollment High	Households Trailhead Score	Park Score	Enrollment Elem Enrollment Middle Enrollment High	College Enroll	Job Sector 3 Job Sector 4 Job Sector 5 Job Sector 6
Destination Choice - Zone Attributes	Households Job Sector 3 Job Sector 7 Job Sector 9	Job Sector 4 Job Sector 7 Job Sector 6 Job Sector 9 Households Enrollment Elem Enrollment Middle Enrollment High	Households Enrollment Elem Enrollment Middle Enrollment High Park Score	Trailhead Score Park Size	Park Score	Jobs Sector 3 Enrollment Elem Enrollment Middle Enrollment High	College Enroll	Total Jobs Job Sector 3

Model Design Technical Document

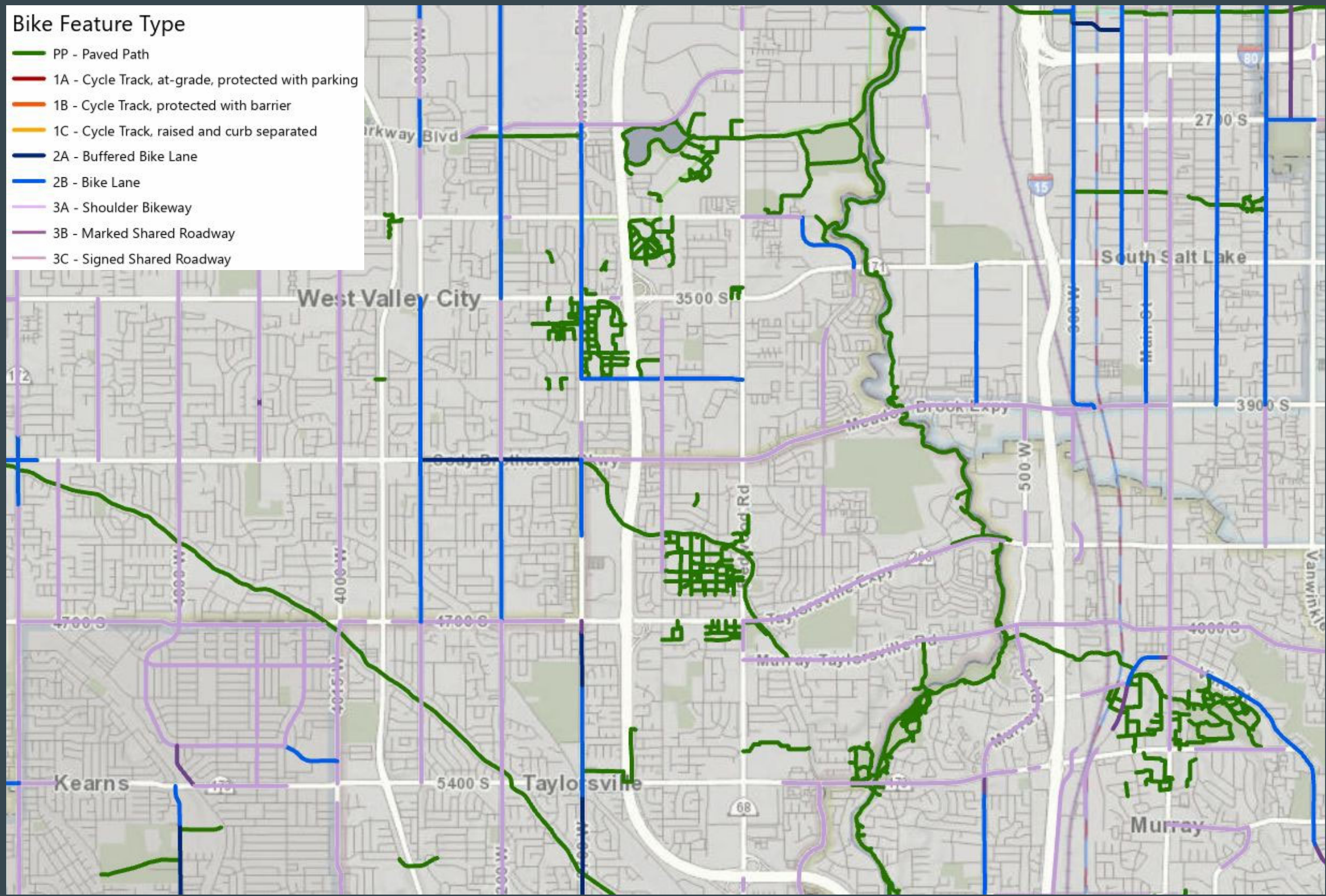
Bike Network Cost Coefficients

Variable	Additional Distance (miles)	Notes
Turn	0.034	Presence of a turn
Stop sign	0.0037	Presence of a stop sign
Traffic Signal	0.017	Presence of a traffic signal
Parallel traffic L heavy	0.18	left turn parallel to heavy traffic; 20k+ AADT
Cross Traffic LS med	0.05	left turn or straight across medium traffic; 10-20k AADT

Variable	Length Multiplier	Notes
distance	1	default
Bike blvd	-0.108	Bike class = 3b, 3c
Bike path	-0.16	Bike class = 1a, 1b, 1c, 1
Bike lane light	0	Bike class = 2a, 2b, 2, 3a and light traffic
Bike lane heavy	1.65	Bike class = 2a, 2b, 2, 3a and heavy traffic
No Bike lane heavy	7.157	Heavy traffic
Slope 2-4 percent	0.371	Percent slope (moderate hill)
Slope > 6 percent	3.239	Percent slope (steep hill)

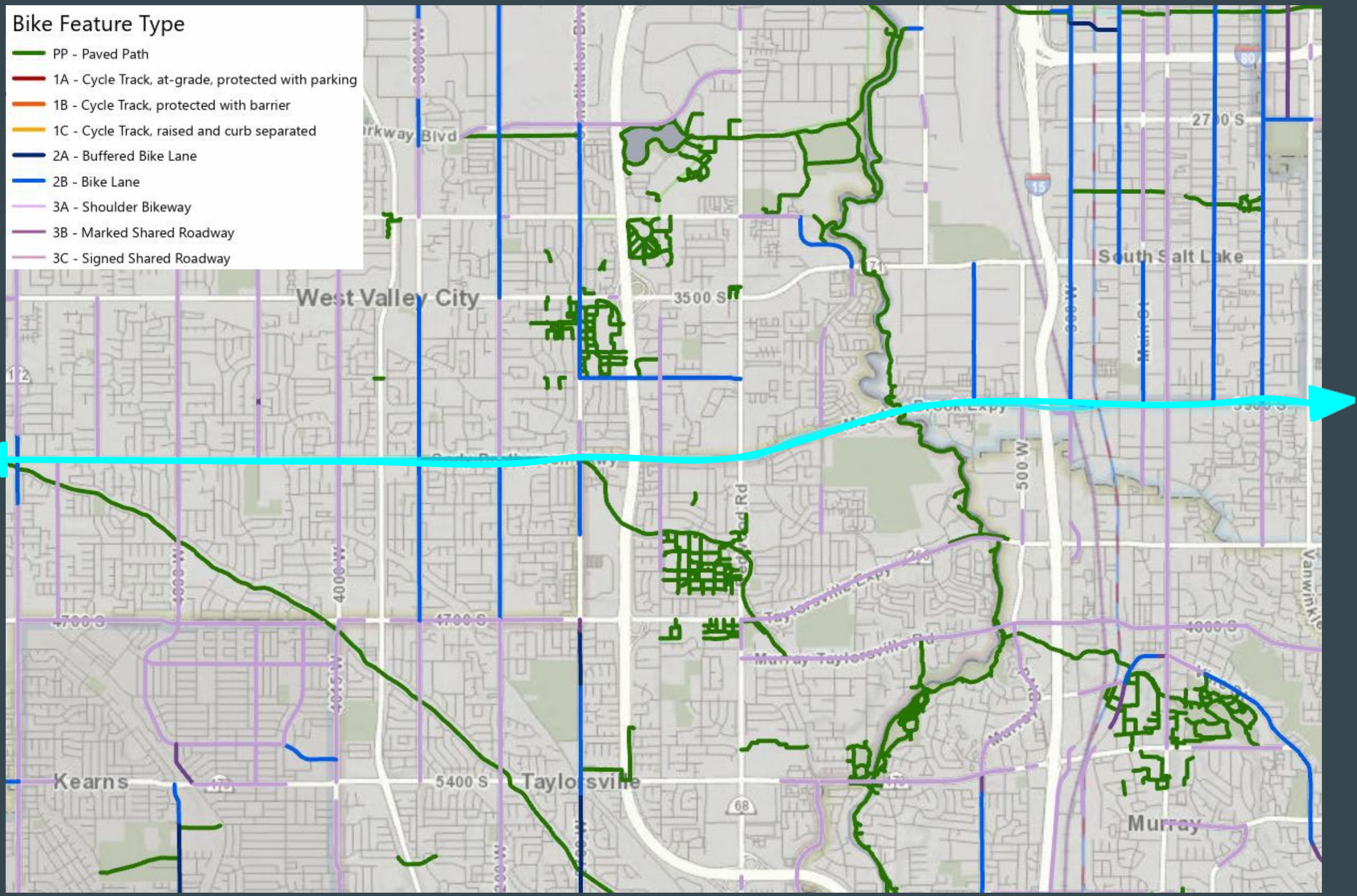
Scenario Comparison - 3900 South Bike Facility Upgrade

the Project Area



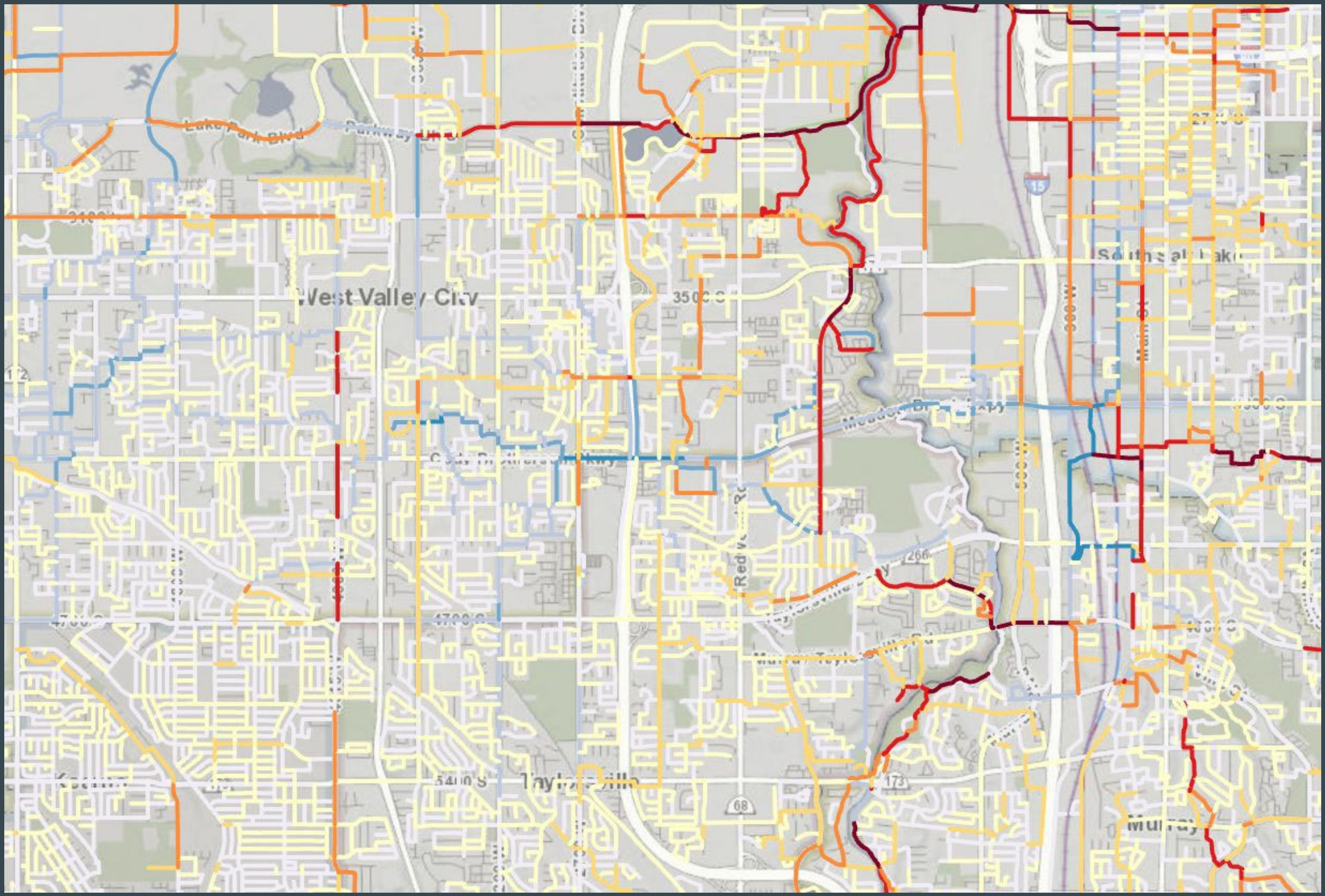
Scenario Comparison - 3900 South Bike Facility Upgrade

the Project Area



Scenario Comparison - 3900 South Bike Facility Upgrade

Winner and Losers



Bike Model v1.0 -- Now What?

- Continue to explore model use for :
  - Volume estimates
  - Project scenarios
- 2021-22 model enhancements
- Incorporate “Bike-ability” into main Travel Demand Model
- Re-estimate and calibrate with Wasatch Front behavioral data
  - 2022-2023 household travel survey
  - Observed count program
- Seek additional collaborators

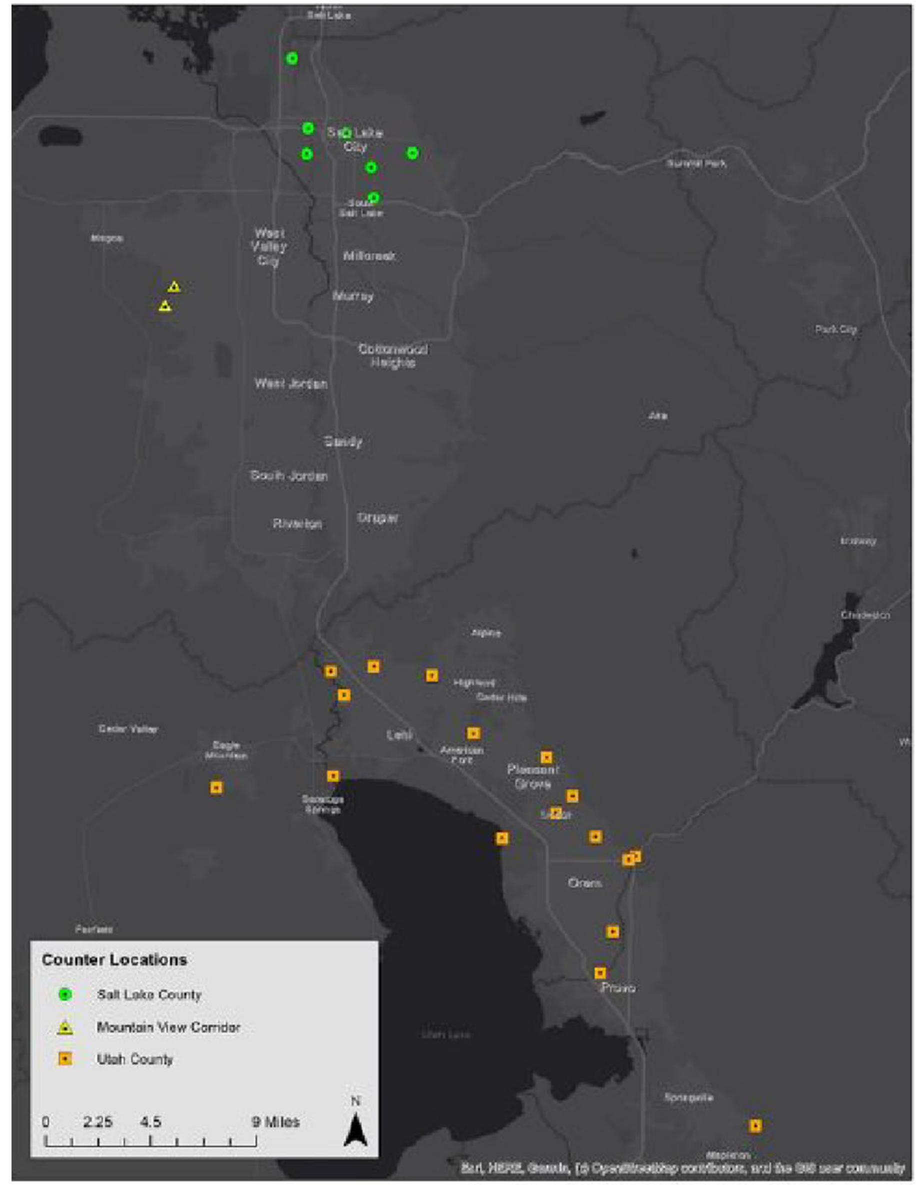
Observed Data.

Counter Data
Strava Data
Expansion
What’s Next...

State of the Counters Across the Wasatch Front

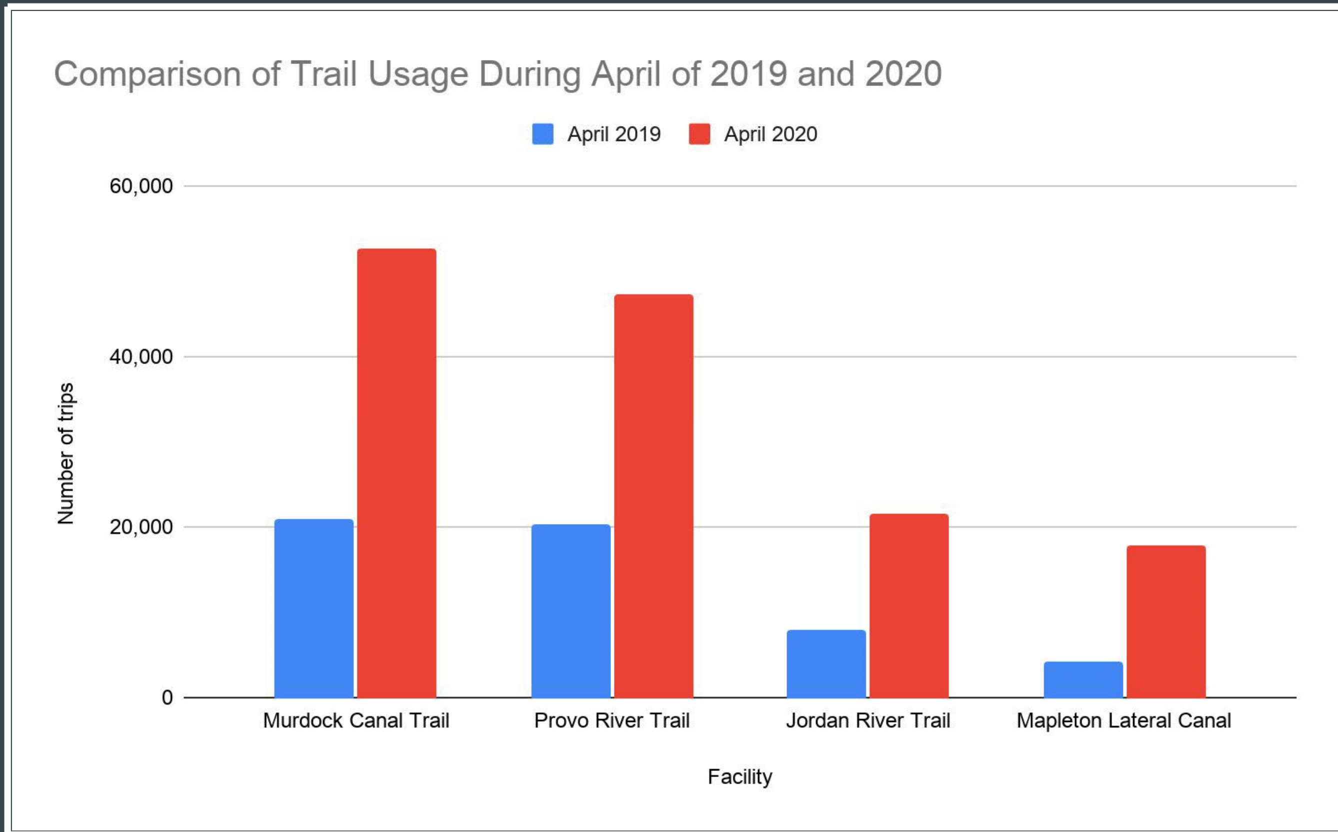
- Agency/Jurisdiction led
- Initial effort to work together but ran into funding difficulties
- Partial picture is valuable but we know it's flawed

Wasatch Front Counter Locations



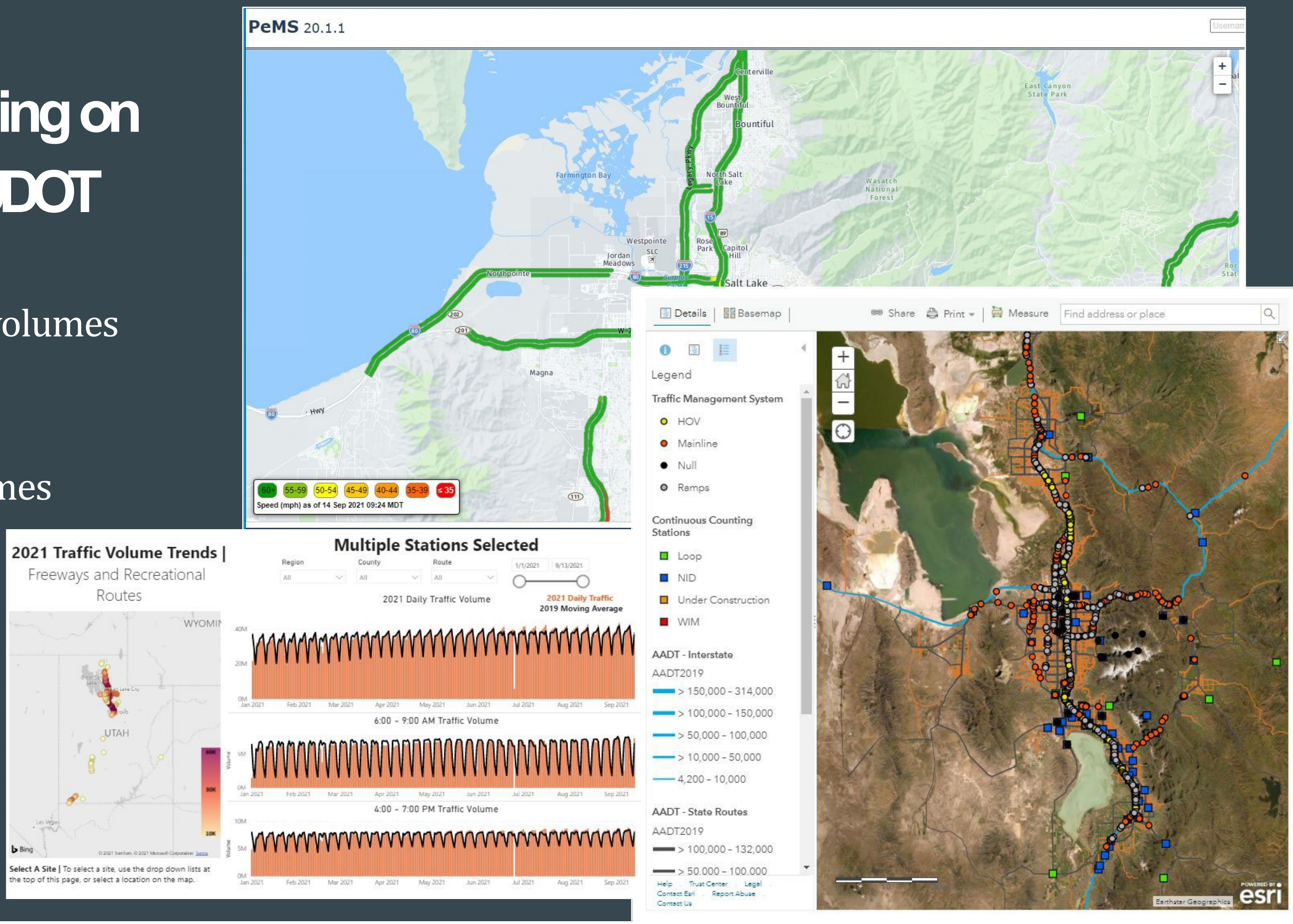
State of the Counters Across the Wasatch Front

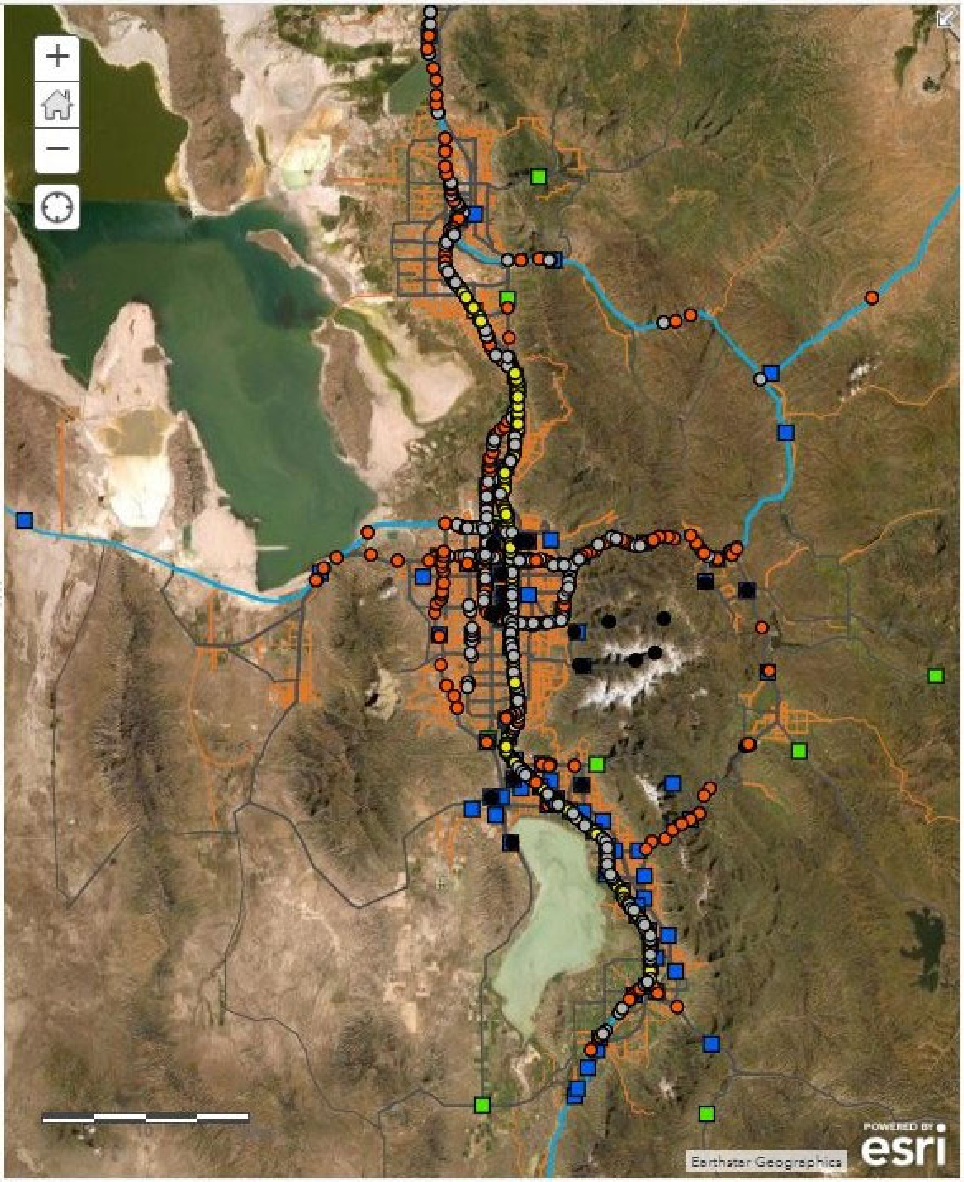
- Snapshots in time at specific locations
- Good for making a high level assessment of AT usage at specific locations
- Don't necessarily show trends on the <u>whole system</u>



Meanwhile, going on elsewhere at UDOT

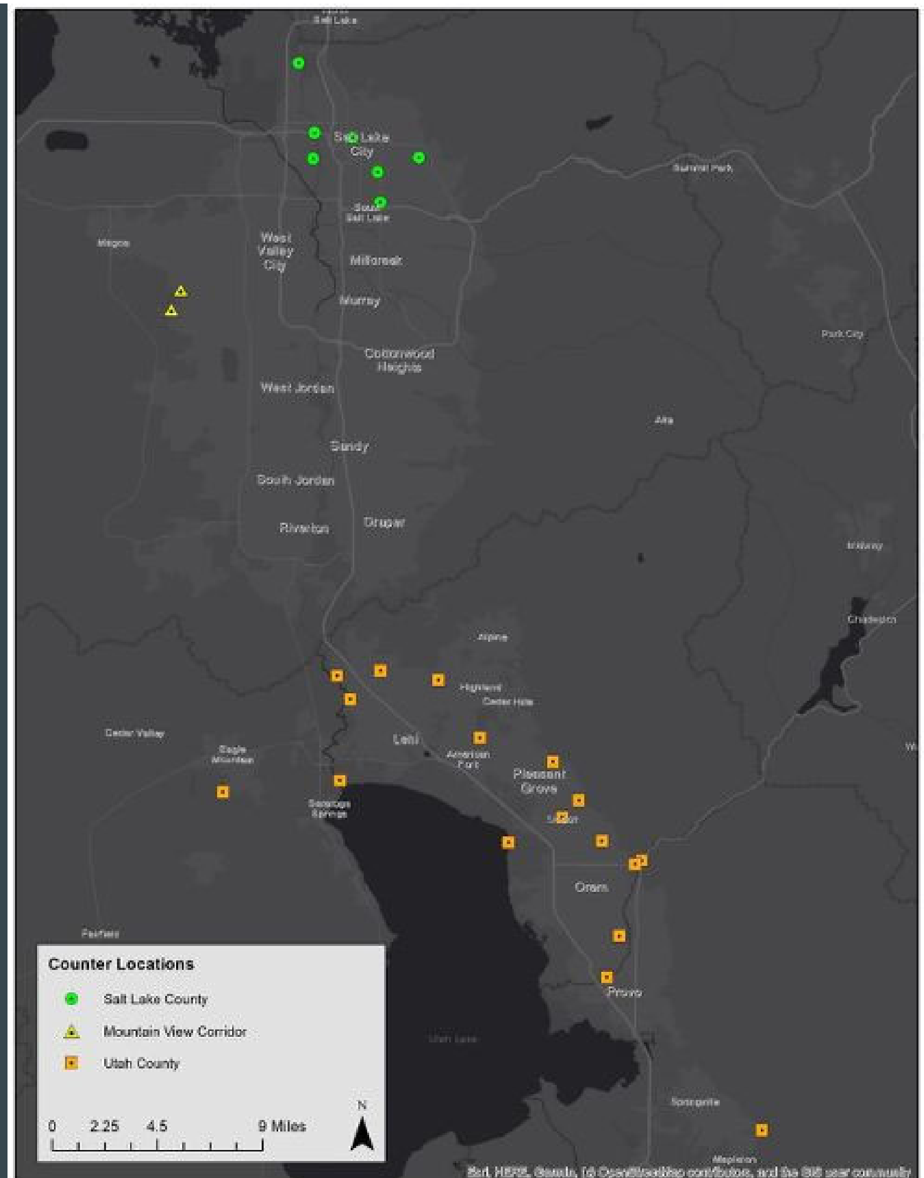
- Hourly traffic volumes
- AADT
- Speed
- Peak hour volumes
- Collisions
- Forecasts
- Etc....





Earthstar Geographics

VS.

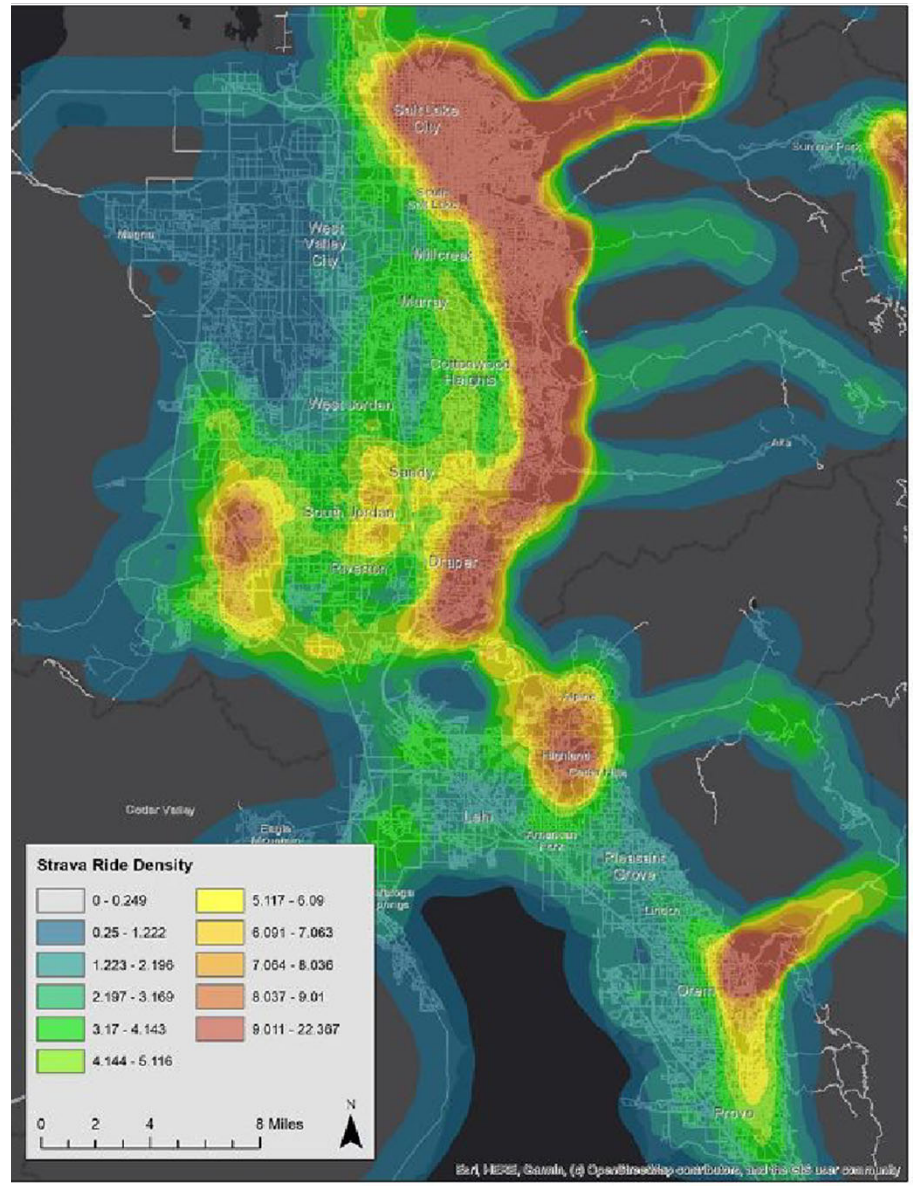


Salt Lake City
West Valley City
Millcreek
Murray
Cottonwood Heights
West Jordan
Sandy
South Jordan
Riverton
Draper
Lehi
Pleasant Grove
Orem
Provo
Counter Locations
Salt Lake County
Mountain View Corridor
Utah County
0 2.25 4.5 9 Miles
N

Strava Data

- Strava data purchase starting in 2016 - 4 agencies paying in
- Volumes everywhere - limited sample size

2017 - 2021 Strava Ride Trips; Utah



2020 Strava Data - Ride Heatmap

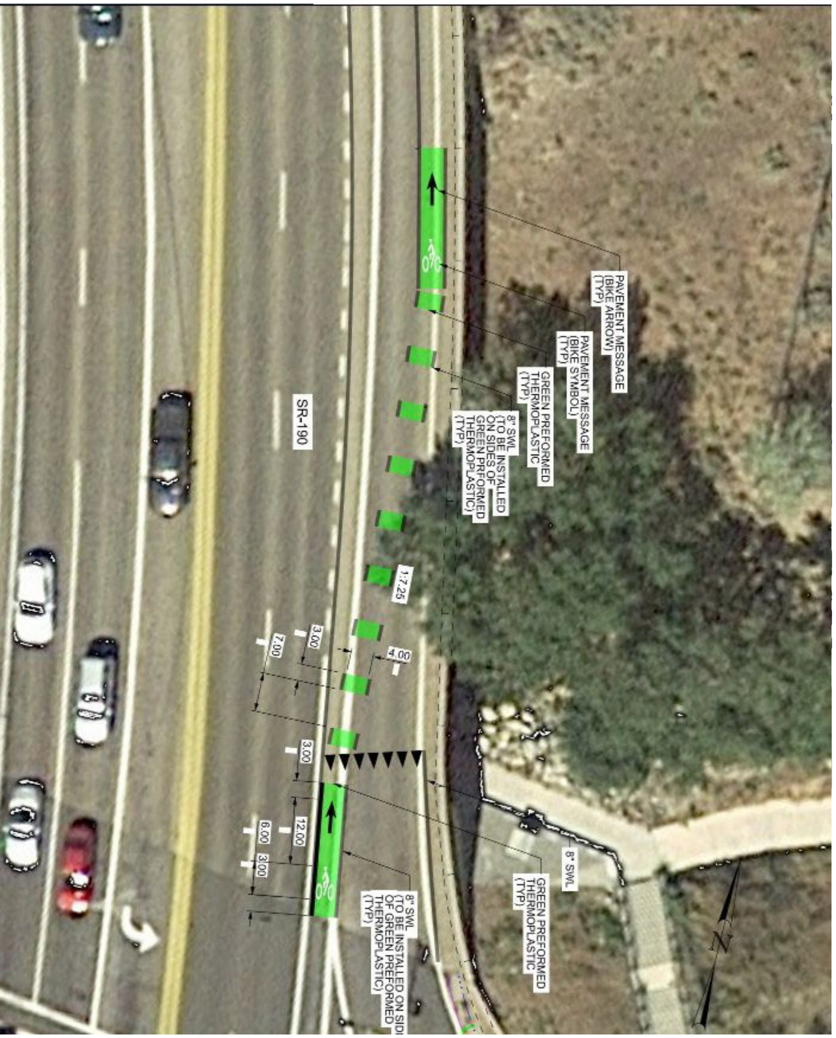
Strava in Action

Cottonwood Heights; Utah

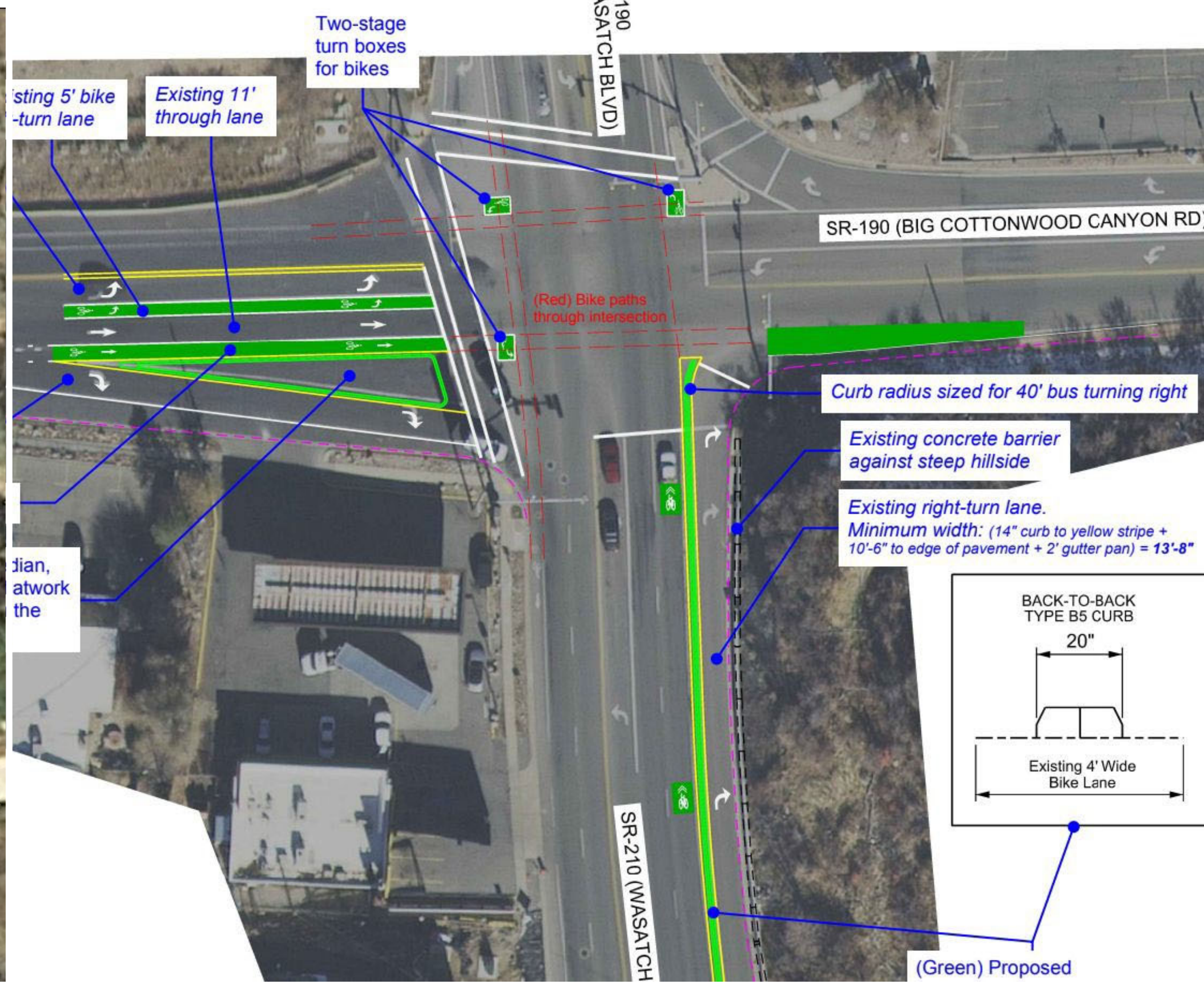
- High recreation area
- High strava recorded volumes
- UDOT roadway

BEFORE

AFTER



SR-190
PAVEMENT MESSAGE (BIKE ARROW) (TYP)
PAVEMENT MESSAGE (BIKE SYMBOL) (TYP)
GREEN PREFORMED THERMOPLASTIC (TYP)
8" SWL (TO BE INSTALLED ON SIDES OF GREEN PREFORMED THERMOPLASTIC) (TYP)
GREEN PREFORMED THERMOPLASTIC (TYP)
8" SWL



Two-stage turn boxes for bikes
Existing 11' through lane
SR-190 (BIG COTTONWOOD CANYON RD)
(Red) Bike paths through intersection
Curb radius sized for 40' bus turning right
Existing concrete barrier against steep hillside
Existing right-turn lane.
Minimum width: (14" curb to yellow stripe + 10'-6" to edge of pavement + 2' gutter pan) = 13'-8"
BACK-TO-BACK TYPE B5 CURB
20"
Existing 4' Wide Bike Lane
SR-210 (WASATCH
(Green) Proposed

But we knew that we still weren’t seeing the whole story...

Expansion Effort

COUNTER Data:
Counts EVERYONE, but only have the counters in very limited locations

+

Strava Data:
Have the data for all roadway segments, but only for a "small" portion of total users

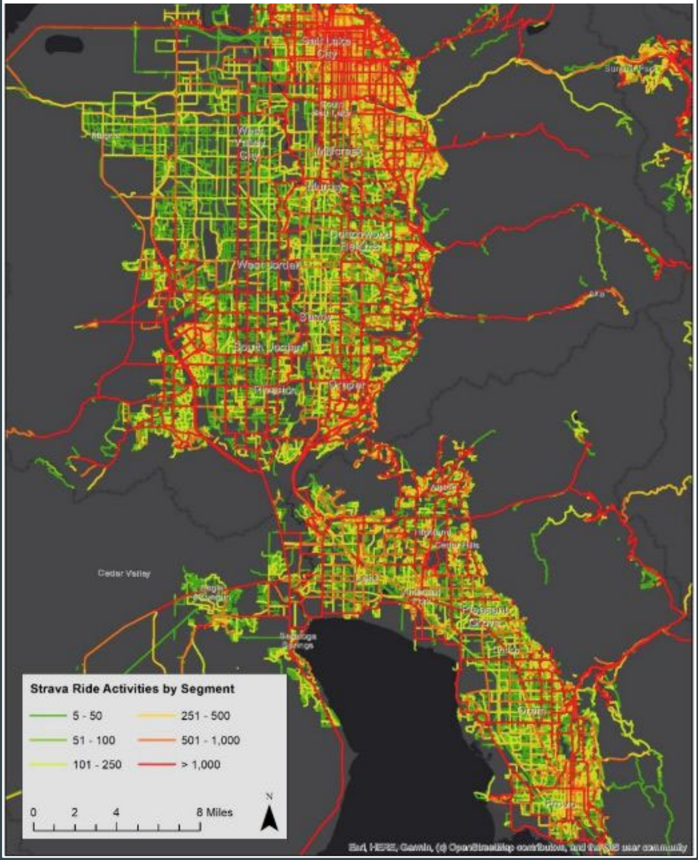
=

TOTAL USERS on the ENTIRE network

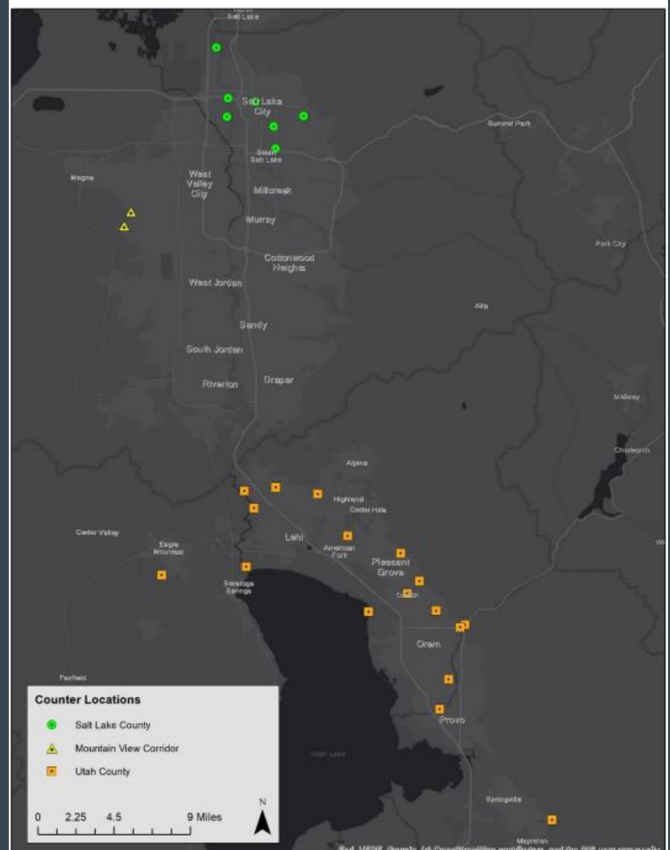
This is really about figuring this proportion: Strava Users /Total Cyclists

Expansion Effort - Data Inputs

2019 Strava Ride Activity by Segment



Counter Locations

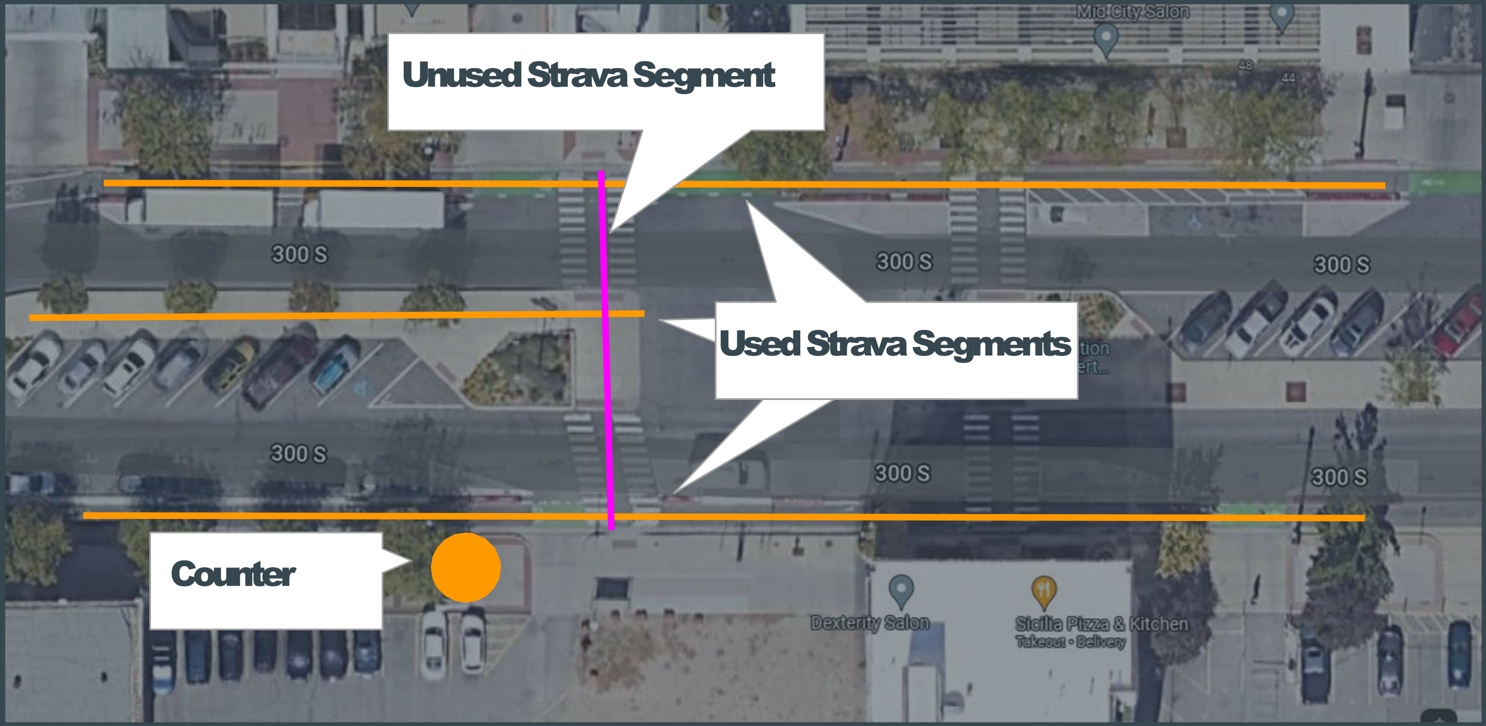


Additional Data:

- Literature review
- Counter user group
- Bike Demand Model

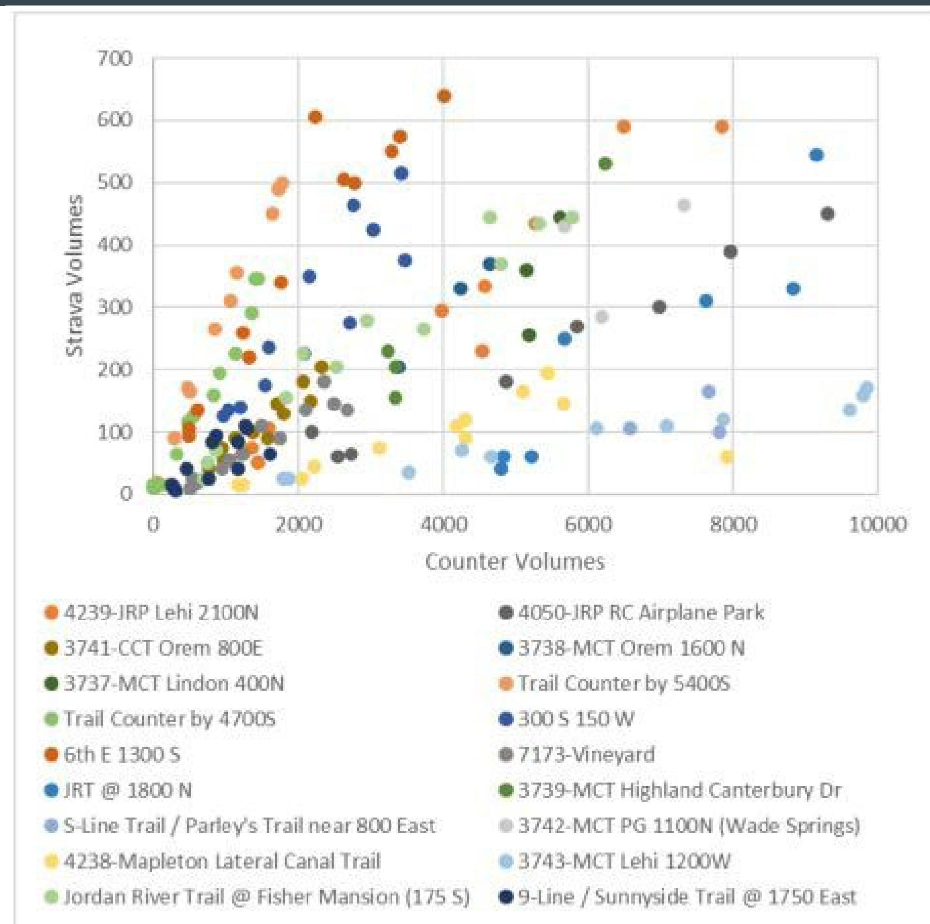
Expansion Effort - Data Processing

- Counter data were summarized by daily average by month for each location
- The Strava data were similarly summarized by monthly count totals for each location



Expansion Effort - Data Analysis

- Most – but not all – of the locations have a linear relationship, indicating a consistent percent of Strava users on a given facility



Count Volume Compared to Strava Volumes, By Month for Each Location

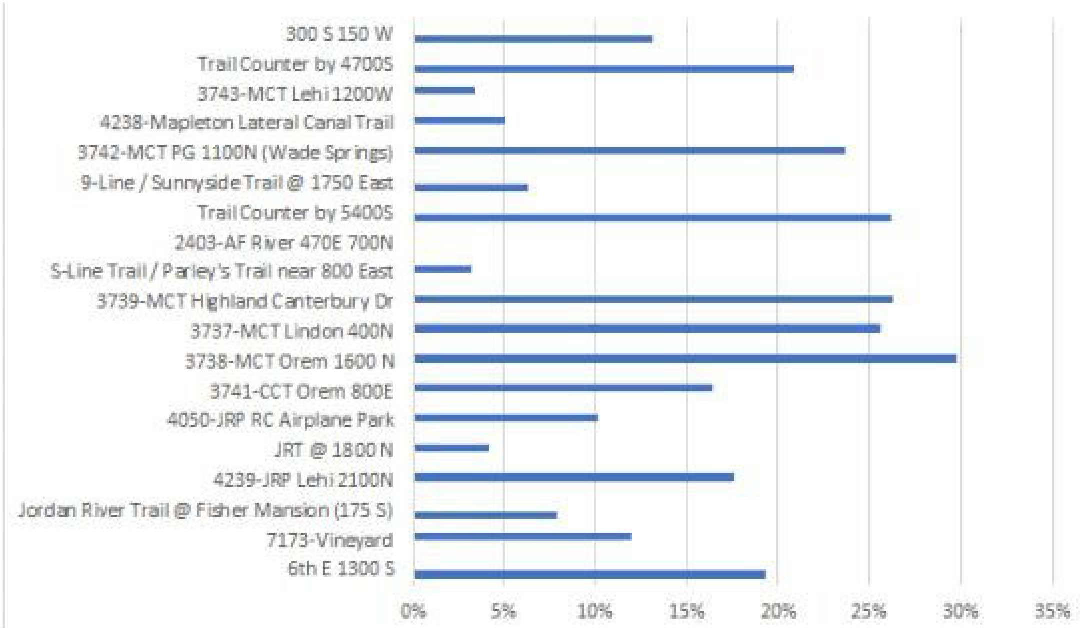
Expansion Effort - Data Analysis

- Most locations have very high correlation coefficients when looking at the variation by month between the count data and the Strava data.
- The percent of Strava users at each location varies considerably.

Count Locations and Correlation Coefficients

COUNT LOCATION	CORRELATION	
	Monthly Total	Daily Average by Month
6th E 1300 S	95%	95%
7173-Vineyard	95%	92%
Jordan River Trail @ Fisher Mansion (175 S)	98%	98%
4239-JRP Lehi 2100N	96%	96%
JRT @ 1800 N	93%	93%
4050-JRP RC Airplane Park	93%	93%
3741-CCT Orem 800E	95%	95%
3738-MCT Orem 1600 N	99%	99%
3737-MCT Lindon 400N	97%	97%
3739-MCT Highland Canterbury Dr	97%	97%
S-Line Trail / Parley's Trail near 800 East	97%	97%
Trail Counter by 5400S	93%	94%
9-Line / Sunnyside Trail @ 1750 East	99%	99%
3742-MCT PG 1100N (Wade Springs)	73%	68%
4238-Mapleton Lateral Canal Trail	99%	99%
3743-MCT Lehi 1200W	64%	67%
Trail Counter by 4700S	98%	96%
300 S 150 W	99%	98%

Average Monthly Percentage of Strava Users at Each Location



Expansion Effort - Results

- Average percent of bicyclists at each count location using Strava varied considerably = limited predictive value

- A simple method to extrapolate the Strava data broadly is not yet identified
  - The close relationship between Strava volumes and observed counts = Noteworthy!

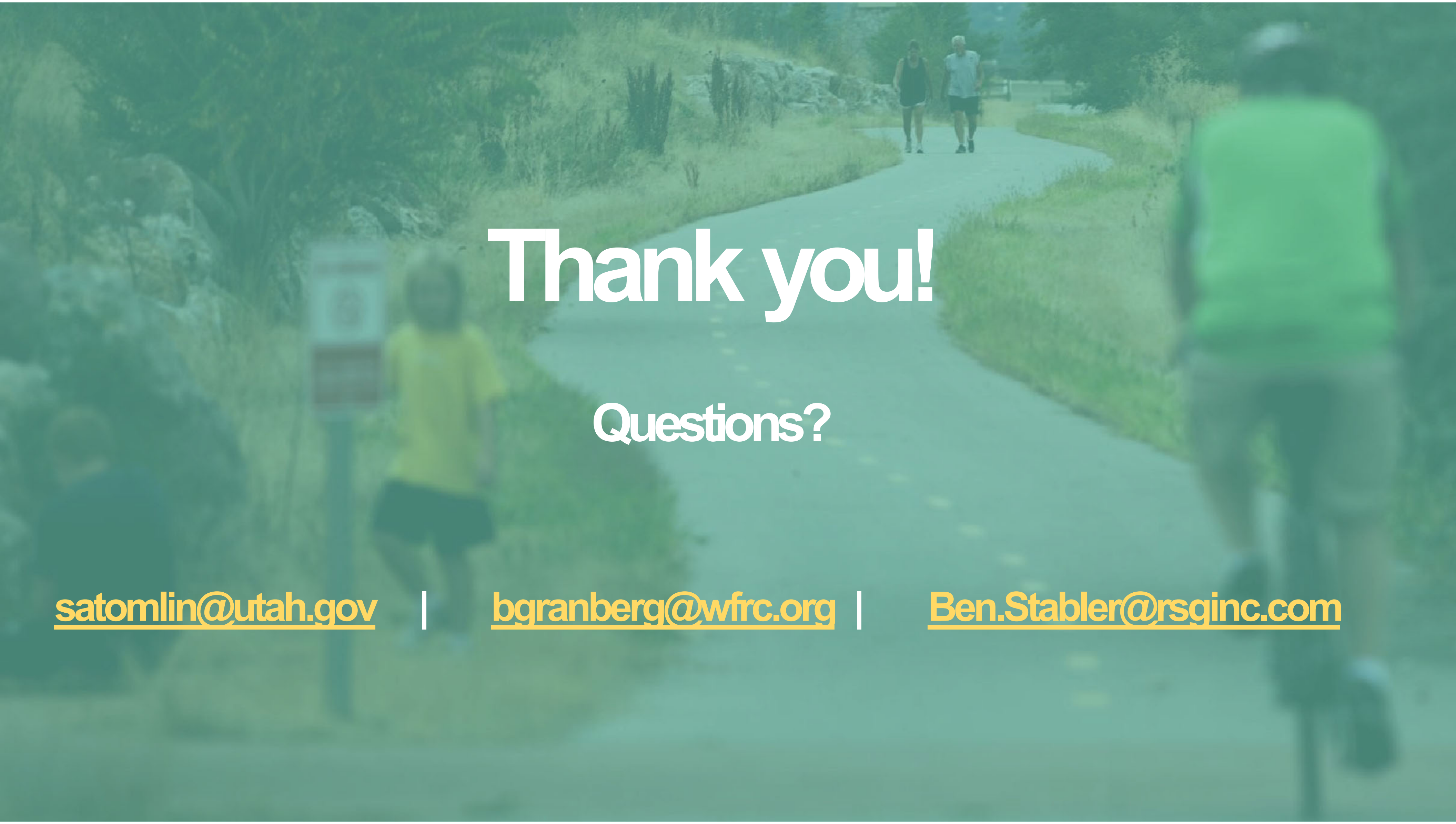
- Significantly more count locations are needed to derive reliable estimates of usage patterns

What’s Next

- Collaboration to understand regional cross agency biking patterns
- Central repository of comprehensive, good observed AT volumes estimates
- Located where we need them - not based on jurisdiction or where it’s easy
- Now also investigating StreetLight active transportation modes offering

Takeaways.

- AT is real infrastructure, we should map it, and plan for it like we do other modes.
- Mature AT resources – many in GIS – facilitate discussion and agreement on existing conditions, needs, and priorities.
- Good data doesn't happen by accident!
- When we work together our collective investment goes further.



Thank you!

Questions?

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