

Using Crowdsourced Data for Recreational Trail and Active Transportation Planning

Presenters –

Fred Gifford, Trust For Public Land

Brian Riordan, Strava

Ryan Branciforte, Trail Head Labs

ESRI UC June 2016



Presentation agenda

1

Context: What is crowd sourced active transportation data.

2

Use Cases: How is Trust For Public Lands using Strava data?

3

Use Cases: How is Trailhead Labs using Strava data?

4

Questions and Discussion



What and Who is Strava?

STRAVA | METRO

What is Strava?

The Social Network for Cyclists and Runners

Website and mobile app track activities

Members upload and share over 7 million rides every week

Tens of millions of users

Premium & Commerce Business Model

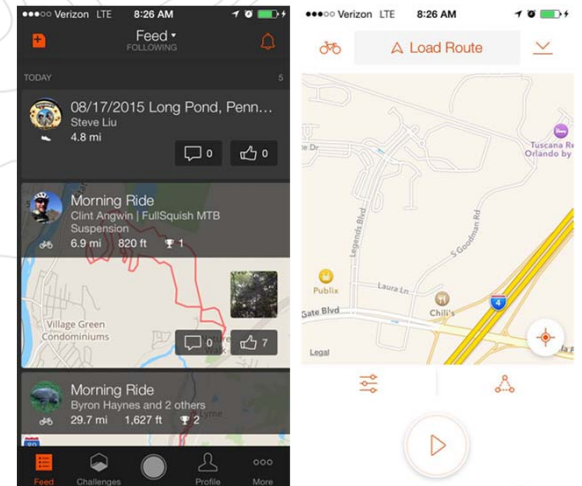
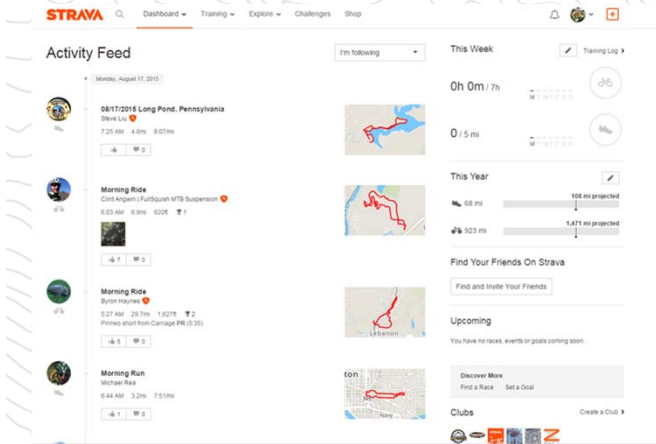
Mobile, International & Social

90% mobile, ~75% outside US

San Francisco Based

Hanover, NH and London satellite offices

125+ employees



STRAVA | METRO

The Strava Community

The background of the slide is a solid orange color with a white topographic map pattern overlaid. The map features intricate contour lines that create a sense of depth and movement, typical of a terrain map. The lines are more densely packed in some areas, suggesting steeper slopes, and more spread out in others, indicating flatter ground. The overall effect is a textured, layered appearance that complements the theme of outdoor activity and community.

STRAVA | METRO

What is Strava Metro?

Data-Driven Bike and Pedestrian Planning

Aggregated, anonymized activity data from Strava's millions of users

Analyze popular or avoided routes, peak commute times, intersection wait times, and origin/destination zones

Processed for ESRI performance and deep integration



Big Data

STRAVA | METRO

Strava by the Numbers

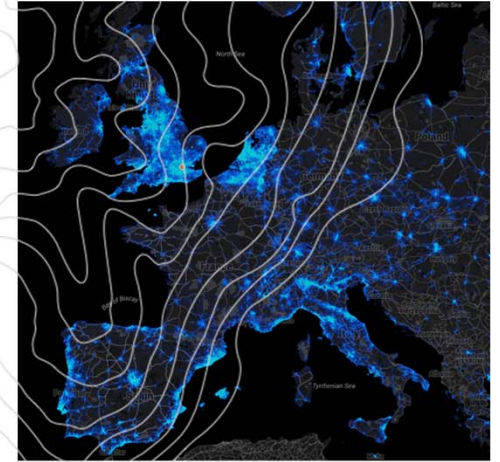
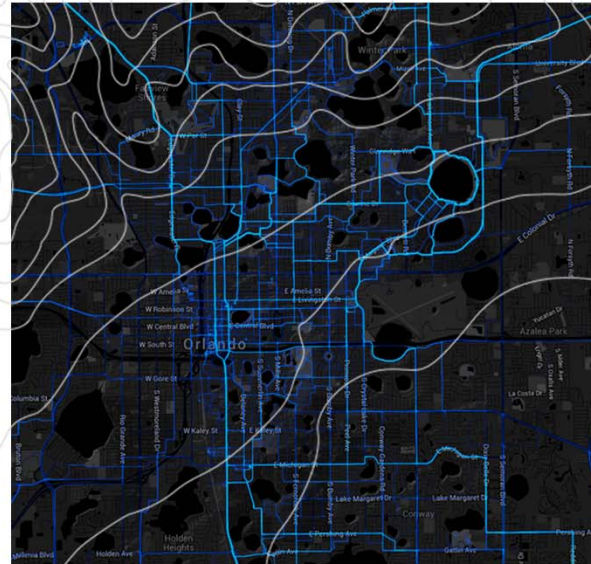
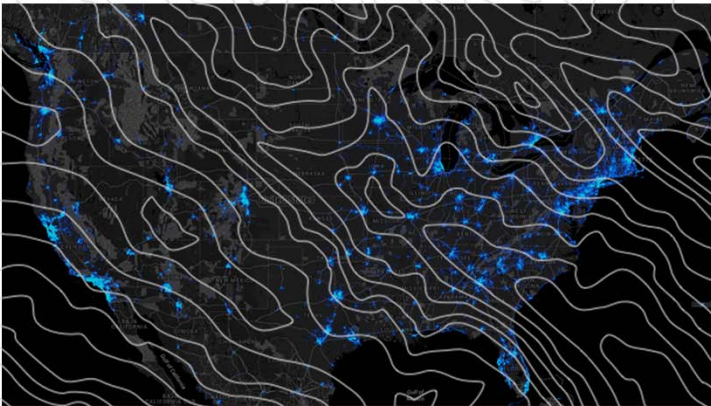
Heaps of Data

Over seven million activities a week and rapidly growing

Millions of active users

1 Trillion + GPS points

Global coverage

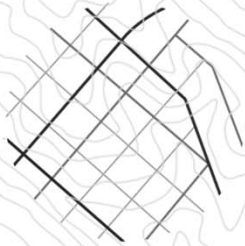


STRAVA | METRO

Metro Products

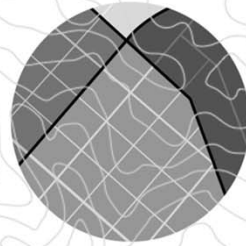
STRAVA | METRO

How it Works



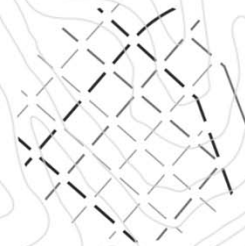
Streets

Minute-by-minute activity counts
across your entire network



Origin / Destination

Understand activity starting
and ending points, by region



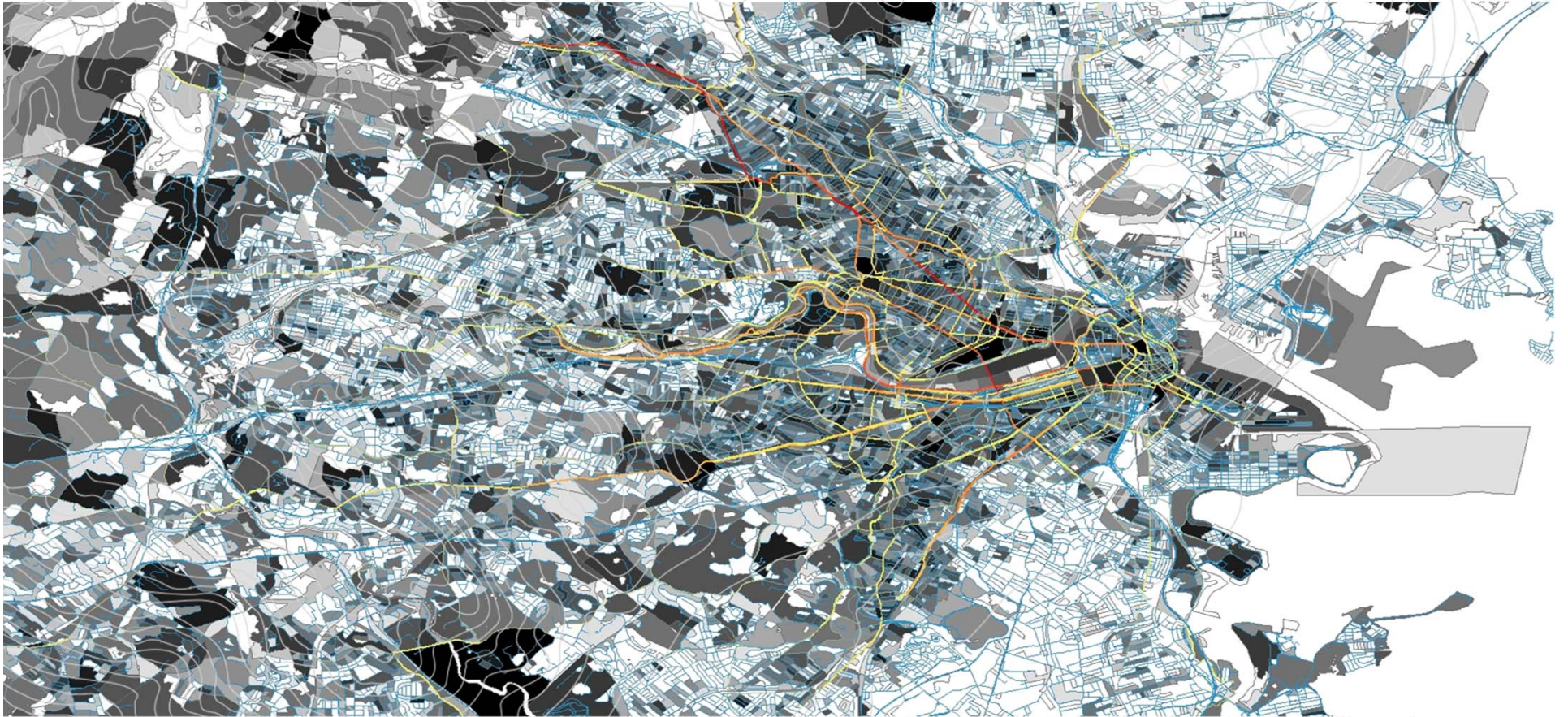
Intersections

Activity counts and wait
times at every intersection

Metro Use Cases

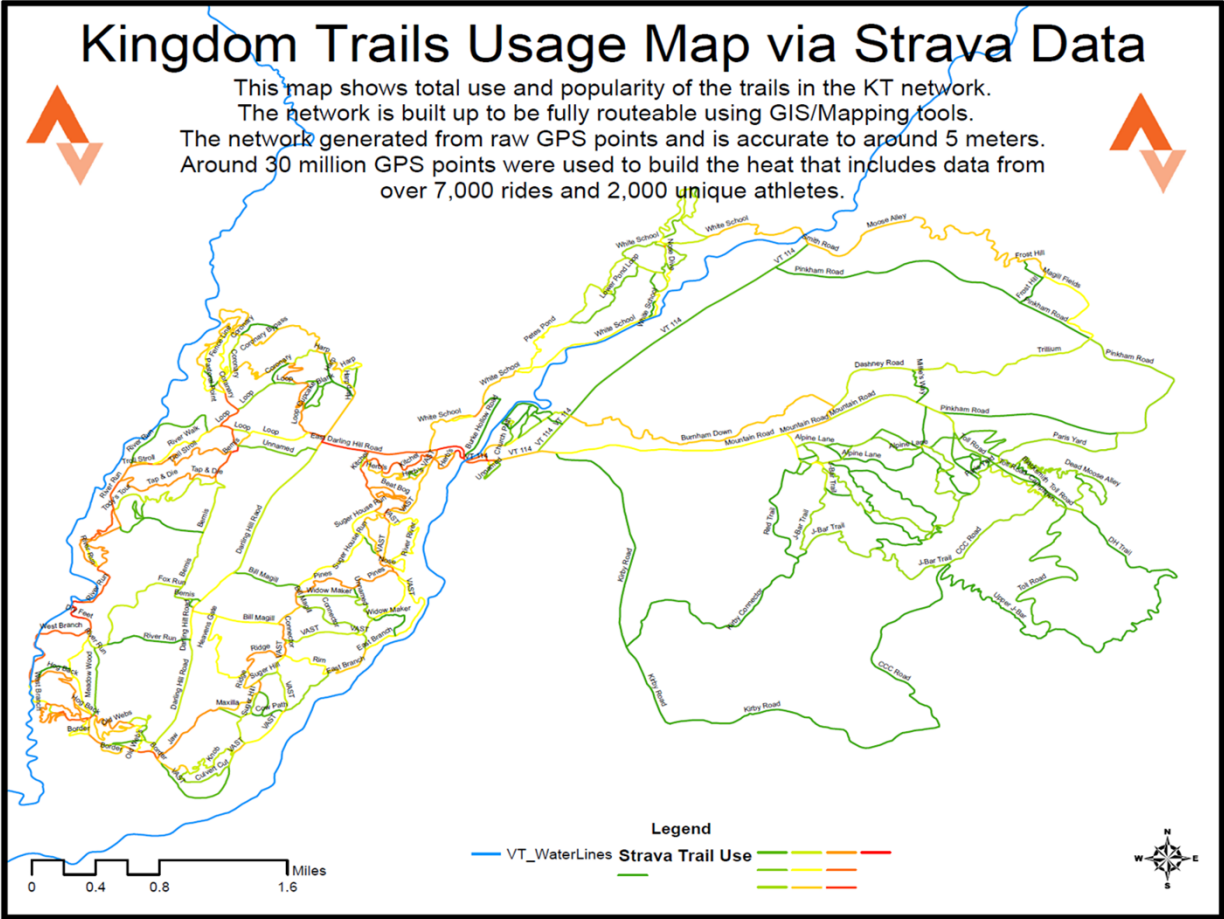
STRAVA | METRO

Strava Metro Bringing Data Layers Together



Metro is custom designed to be merged with local datasets: traffic, crashes, proposed bike paths, etc.

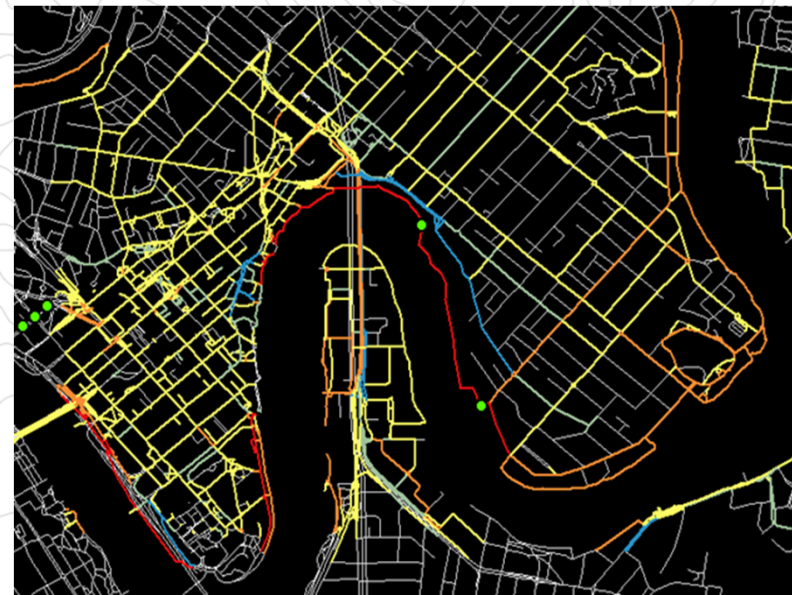
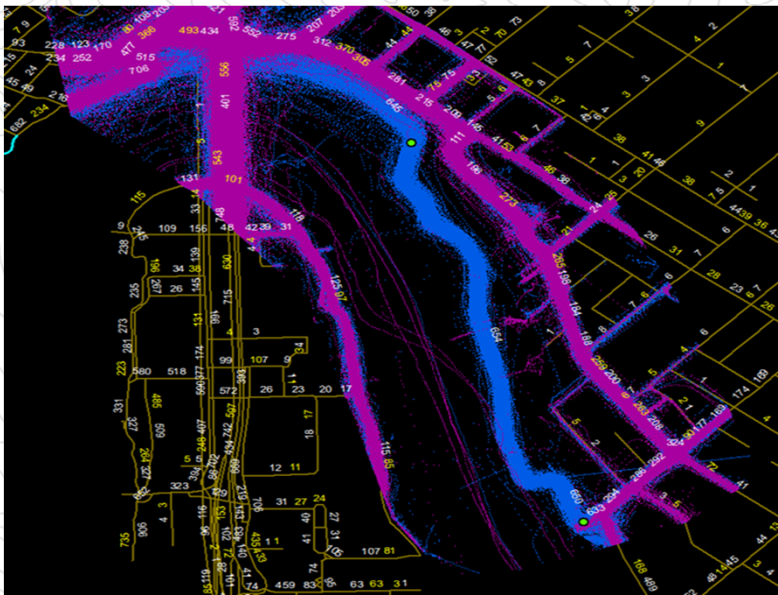
Strava Metro Mapping Network Flow



Strava Metro Mapping Network Flow

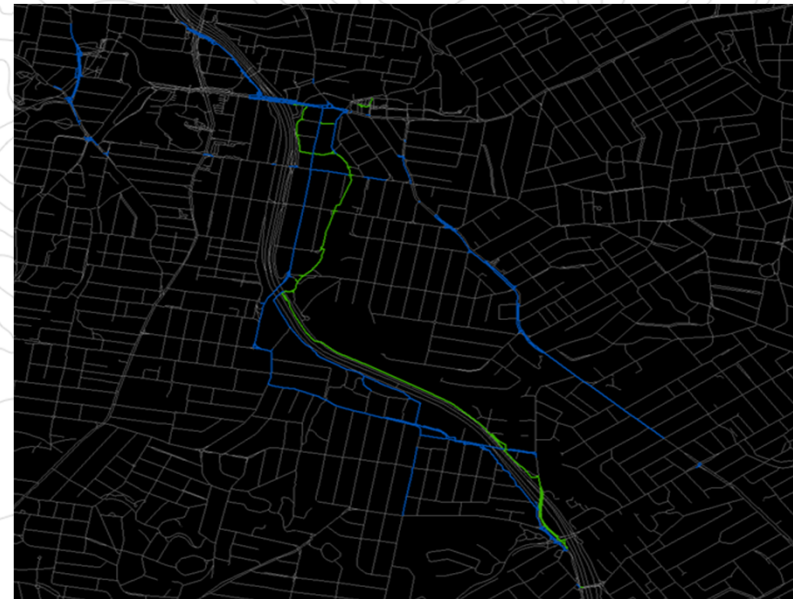
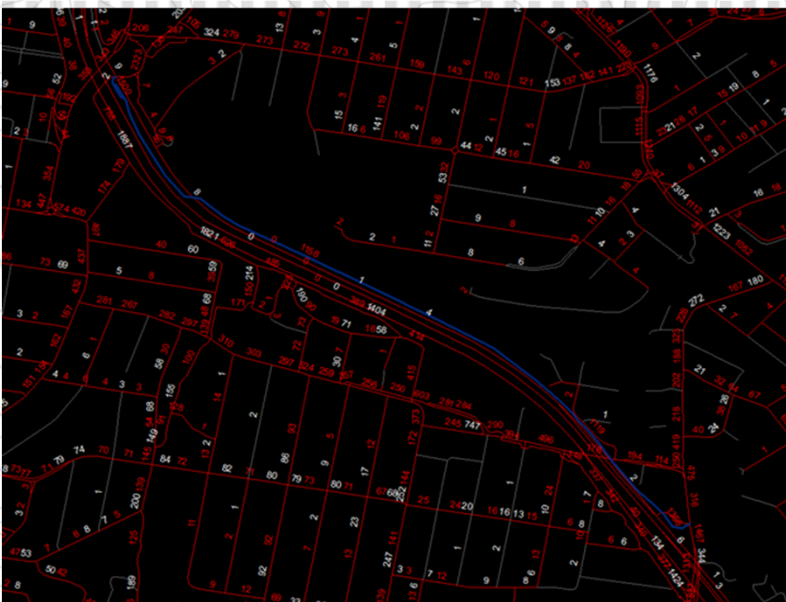


Strava Metro Validating Investment in Cycling Infrastructure



Metro provides key insight into how the cycling population is adapting to new cycleways, protected lanes and surging car populations. The left image shows the GPS points pre (pink), post (blue) after a new cycleway was opened. The Metro data on the right shows the actual change in percent with blue losing trips and red gaining trips.

Strava Metro Validating Investment in Cycling Infrastructure



Impact can be felt 10 - 20 blocks away from the point where the infrastructure was enhanced. Blue areas on the right lost over 100 bike trips while the green gained 100+.

Strava Metro Correlation to Counting Programs

Metro's use and impact is multiplied when the data is used in conjunction with an established counting program.

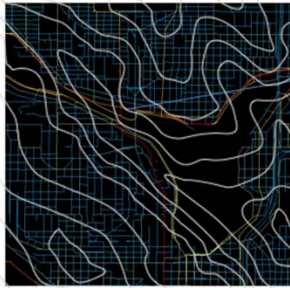
Counting programs only show saturation at a single point and dilute from there.

Metro shows the rest of the network – it is like a counter on every corner.

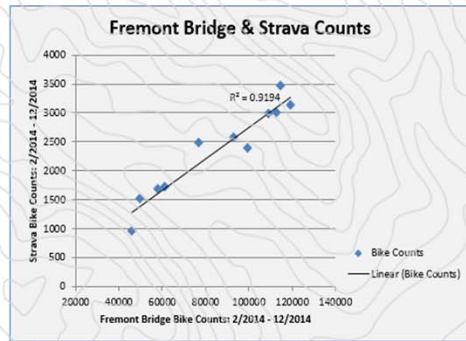


Correlating Strava to Counting Programs

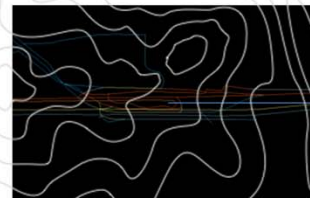
Fremont Bridge Bike Counts



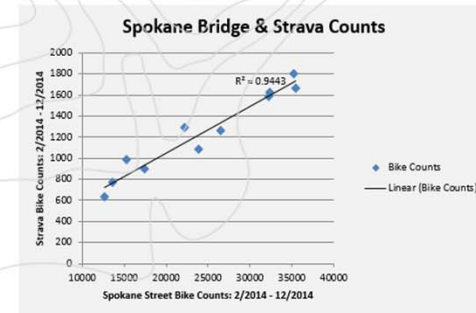
Strava: 25,980
Fremont Counter: 939,386
Percent of Strava to Population: 2.77%
R2: 0.9194



Spokane Bridge Bike Counts



Strava: 13,602
Fremont Counter: 266,850
Percent of Strava to Population: 5.10%
R2: 0.9443



Using counting programs with the Metro data allows the data to become even more useful. Strava correlation with counting programs is statistically amazing, with r-squared values typically around 0.8.

The Trust For Public Land - Our Mission

The Trust for Public Land creates parks and protects land for people, ensuring healthy, livable communities for generations to come.

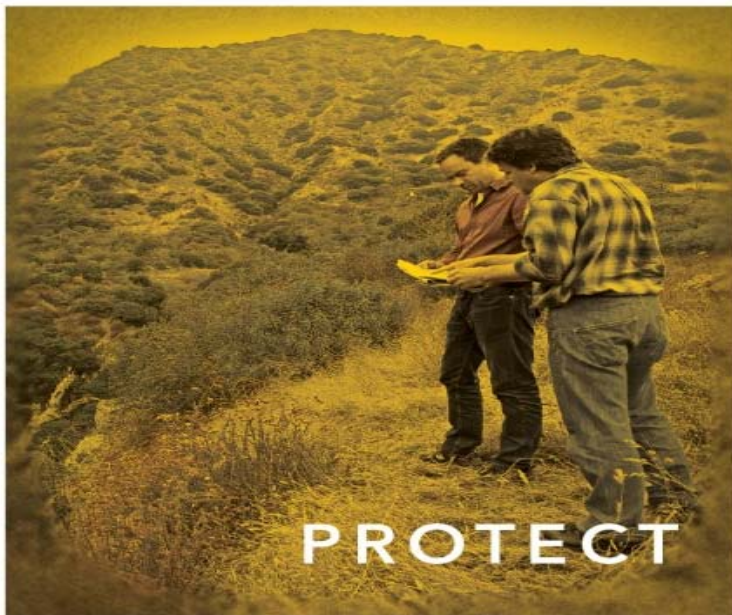




PLAN



FUND



PROTECT



CREATE

Trail Planning – What We Are Finding

- Communities Want Help With Trail Planning
- Enthusiasm High
- Methods and Data Evolving

Trail Planning – How We Do It

- Community Based Planning
- Feasibility Assessment
- Action Plan

Trail Planning – How We Do It

- Metrics
 - Multi Criteria Assessment Methodology
 - How hard to develop
 - Expected user base

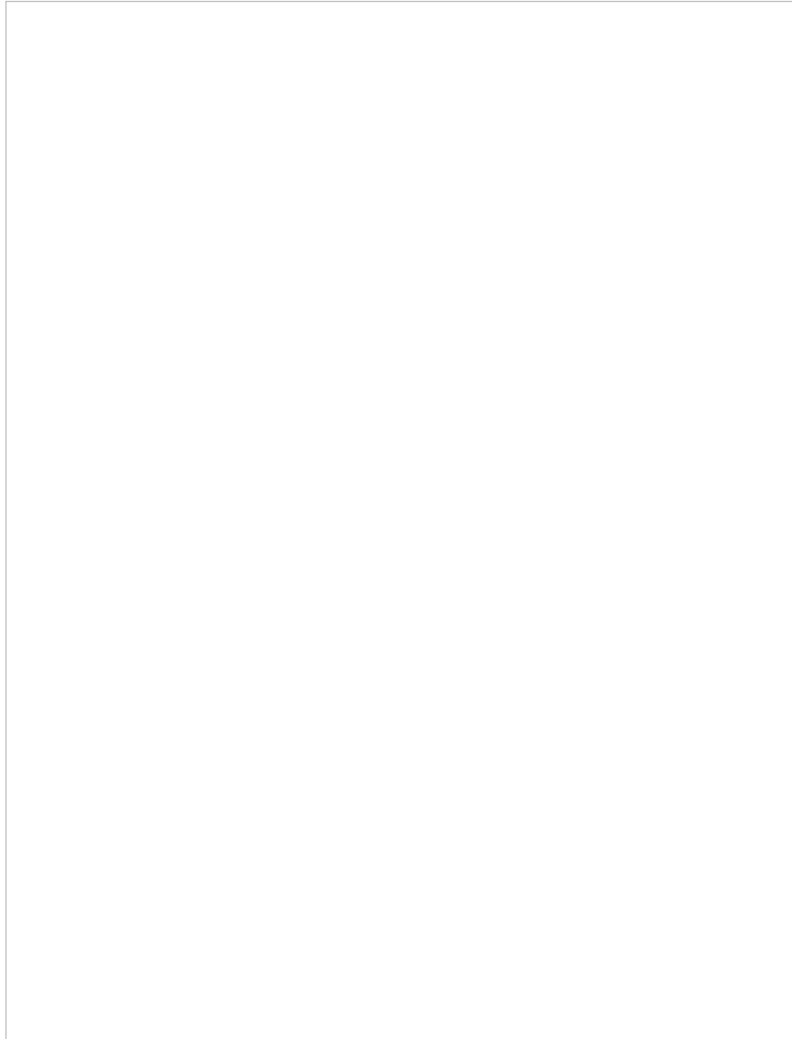
Trail Planning – Strava

- What is It
 - Crowdsourced activity tracking
- Strava Data
 - People voting with their feet and wheels
- What you can see
 - Location of use
 - Level of use
 - Type of use
 - Recreation vs Commuter
 - Seasonality of use

Trail Planning – What we are looking for

- Find existing trails
 - System vs social
- High demand areas
- Need for new connections
- Need for improvements
- Answer questions from the office
 - Where are the high use “social” trails on private land
 - Where is the highest demand for bike lanes where no infrastructure currently exists
 - Where are the highest use commuter trails
 - Where do we predict high use commuter trails but they don't exist

Title, image and content



Somewhere not far from where you live, The Trust for Public Land is working to conserve the beautiful places that make your community special.



Image with text/caption



Image with text/caption



Image with text/caption



Image with text/caption



Image with text/caption



HIKE IT, BIKE IT, MAP IT!



A photograph of two hikers on a rocky trail. The hiker in the foreground is wearing a white shirt with red accents, dark shorts, and colorful sneakers, and is using a trekking pole. The hiker in the background is wearing a white shirt and dark pants. The trail is rocky and surrounded by green foliage. A semi-transparent dark blue banner is overlaid on the image, containing white text.

MILLIONS OF TRAIL
MAPPERS OUT
HERE HAVING A
LAST!

WHY NOT

LEVERAGE THE CROWD?

TRAVA

EAT MAPS

ATA IMPROVEMENT

ETRO - VISITOR

NALYTICS

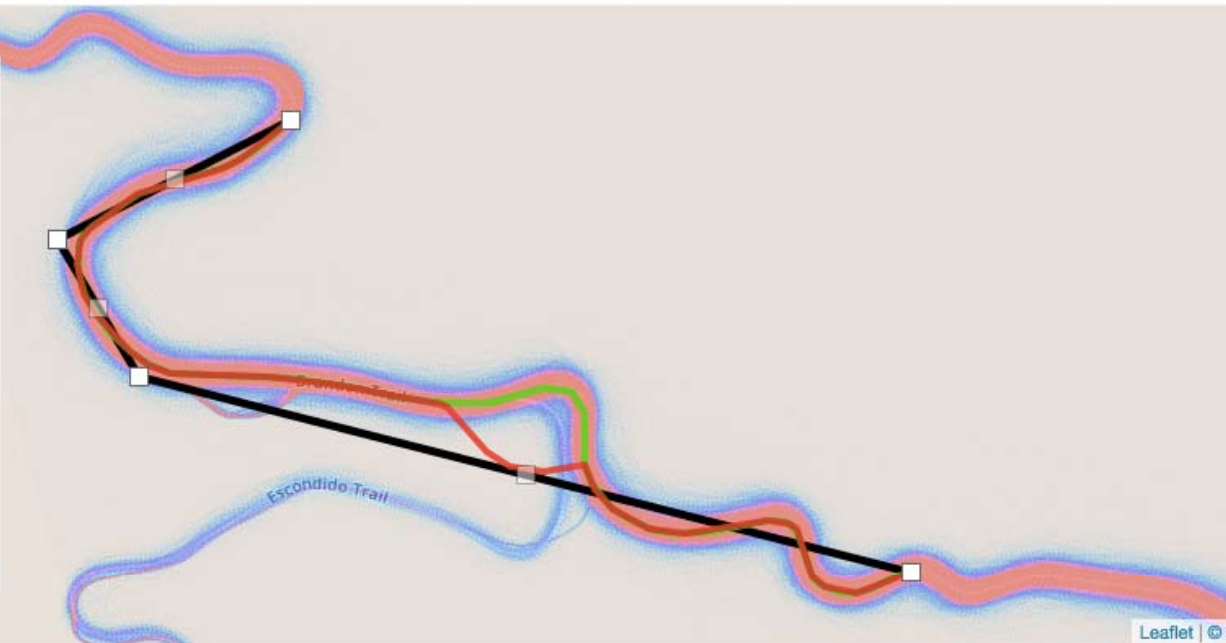
ILLIONS OF GPS
POINTS

Slide to GPS data

Slide is based on the principles of [Mathematical optimization](#). A coarse input line is iteratively refined to optimize its alignment with the GPS heat data.

The result is a smooth, properly sampled path representing the true path of travel.

The black polyline has been "slided" to the green path, matching the global [heatmap data](#). Red lines are the intermediate steps of the refinement.



Leaflet | © M

Quick facts

- Improves the path one step at a time
- Leverages the Strava [global heatmap](#)
- Runs server side and is written in Go
- Most slides complete in under 0.3 seconds



[View Interactive Demo](#)



[iD Editor Integration](#)

DATA CLEAN UP

The screenshot displays a GIS application interface for data cleanup. The central map shows a topographic view with contour lines and a blue road network. A path is highlighted with a dashed line and white circular markers, starting from a green location pin and ending at a red square marker. The map includes a scale bar (100 m / 500 ft) and a small inset map in the bottom left corner.

On the left side, there is a control panel with a dropdown menu at the top, followed by buttons for "Simplify", "Undo", "Save", and "Cancel". Below this, another dropdown menu is visible, and at the bottom left, there are "Save" and "Cancel" buttons.

On the right side, there is a vertical sidebar with several layers and tools:

- Strava**: A layer showing orange lines representing Strava routes, with a checkmark and a full-screen icon.
- Strava Running**: A layer showing orange lines representing Strava running routes, with a checkmark and a zoom-in icon.
- Strava Cycling**: A layer showing blue lines representing Strava cycling routes, with a checkmark and a zoom-in icon.
- OpenStreetMap Parks**: A layer showing green outlines representing parks, with a checkmark and a layer management icon.
- OpenStreetMap Trails**: A layer showing yellow dashed lines representing trails, with a checkmark and a zoom-in icon.
- Transit Stops**: A layer showing black icons representing transit stops, with a checkmark and a zoom-in icon.

At the bottom right of the sidebar, there are icons for a location pin, a person, and a search icon.

DATA CLEAN UP

The screenshot displays a GIS application interface for data cleanup. The central map shows a blue line representing a path or boundary, with a green circle and a red square marking specific points. The map includes contour lines and labels for "Sinmonds Rd".

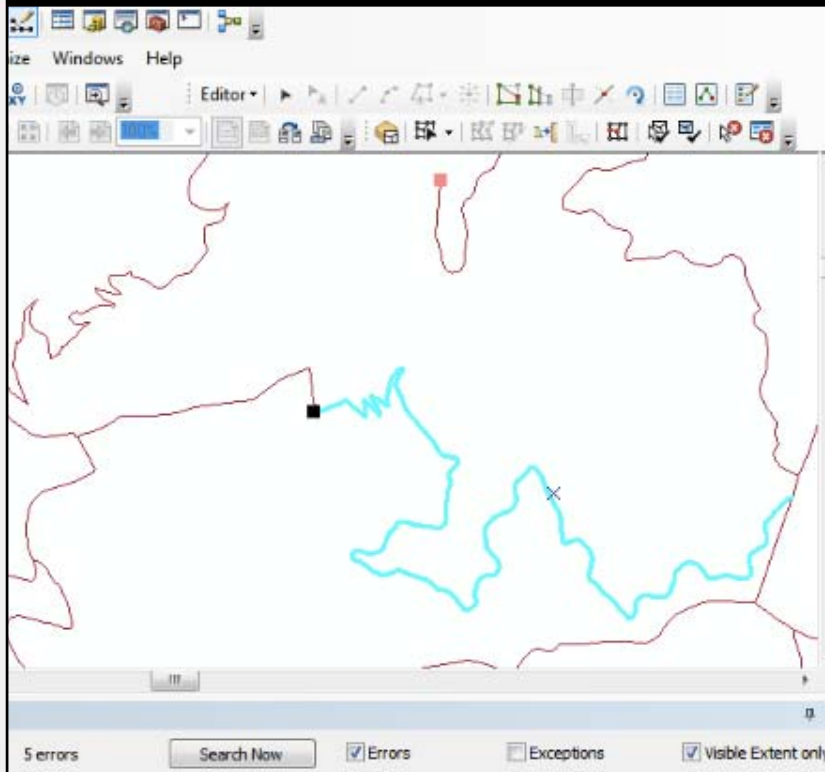
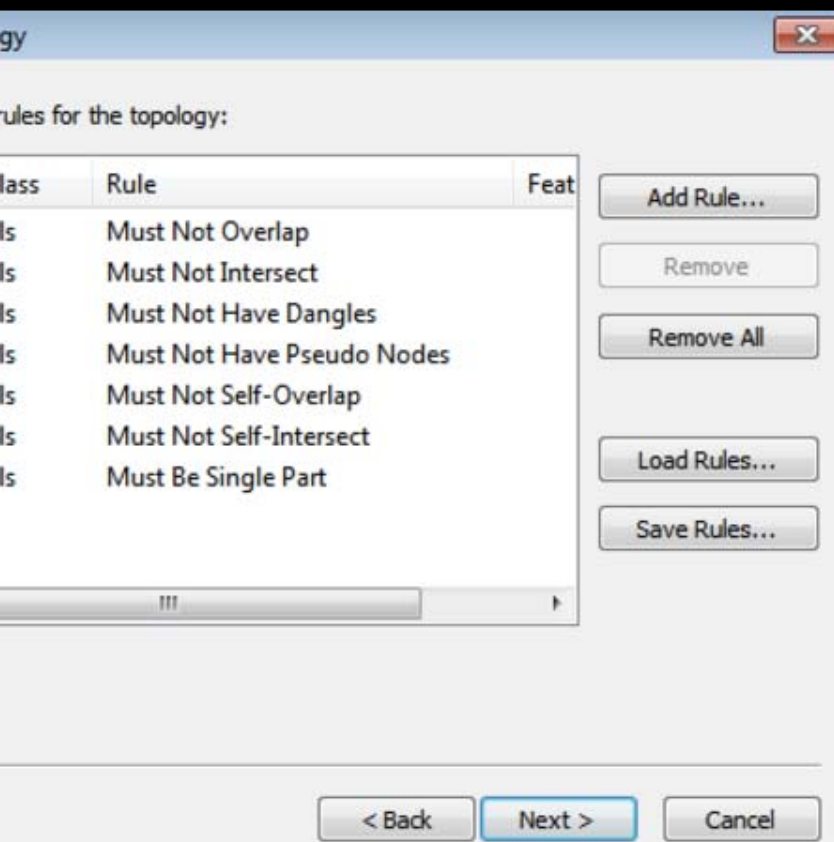
On the left side, there is a control panel with a dropdown menu at the top, a scale bar showing "100 m" and "500 ft", and a row of buttons: "Simplify" (orange), "Undo" (orange), "Save" (blue), and "Cancel" (white). Below this, another dropdown menu is visible, and at the bottom left, there are "Save" and "Cancel" buttons.

On the right side, a vertical sidebar contains several data layers, each with a checkmark and a close icon:

- Strava
- Strava Running
- Strava Cycling
- OpenStreetMap Parks
- OpenStreetMap Trails
- Transit Stops

At the bottom of the sidebar, there are icons for map navigation: a compass, a plus sign, a minus sign, a magnifying glass, a layer stack icon, a location pin, and a person icon.

DATA PREPARATION

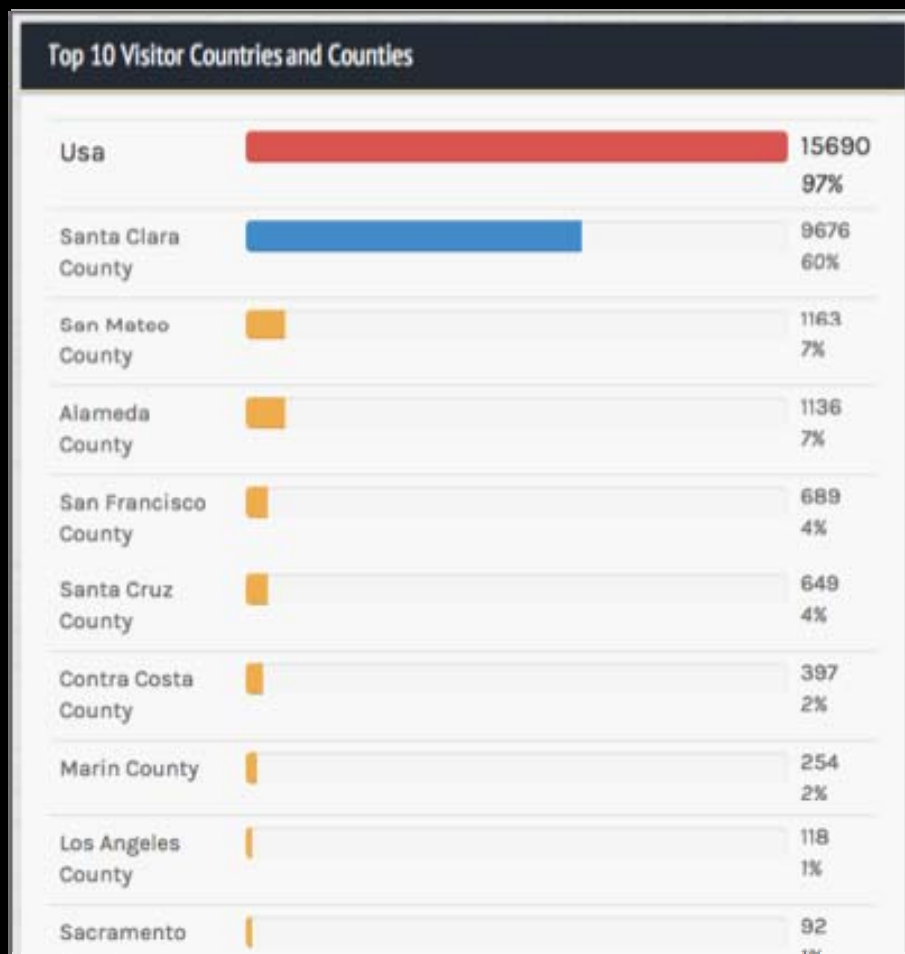
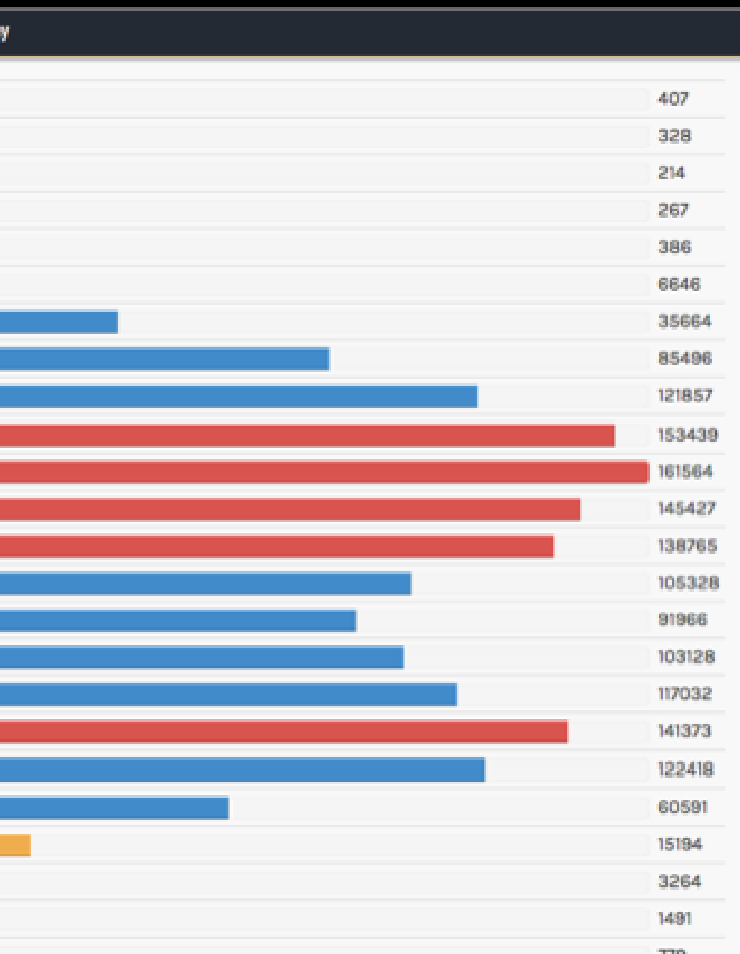


Rule Type	Class 1	Class 2	Shape	Feature 1	Feature 2	Exception
Must Not Have Pseudo ...	trails_prep		Point	213	214	False
Must Not Have Pseudo ...	trails_prep		Point	530	531	False
Must Not Have Pseudo ...	trails_prep		Point	532	546	False

VISITOR ANALYTICS

The screenshot displays a web-based trail mapping application. At the top, a dark navigation bar contains a dropdown arrow on the left and a vertical toolbar on the right with icons for home, zoom in (+), zoom out (-), search (magnifying glass), overlays (stack of layers), location (pin), and user profile. Below the navigation bar, the main map area shows a topographic map with a blue river and a green-outlined polygon. A trail is plotted as a dashed green line with red circular markers. A scale bar in the top-left corner of the map indicates 500 meters and 2000 feet. On the right side of the map, a black tooltip labeled 'Overlays' is visible. On the left, a sidebar lists trail management options: 'ge Trail' with a dropdown arrow, 'orral de Tierra' with 'Edit', 'New Segment', and 'Delete' buttons, and 'C Trails Strava' with a 'Remove' button. At the bottom left, there is an inset map showing the current location on a larger regional map.

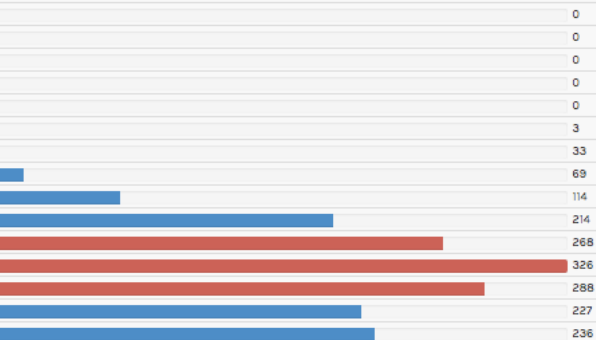
VISITOR ANALYTICS



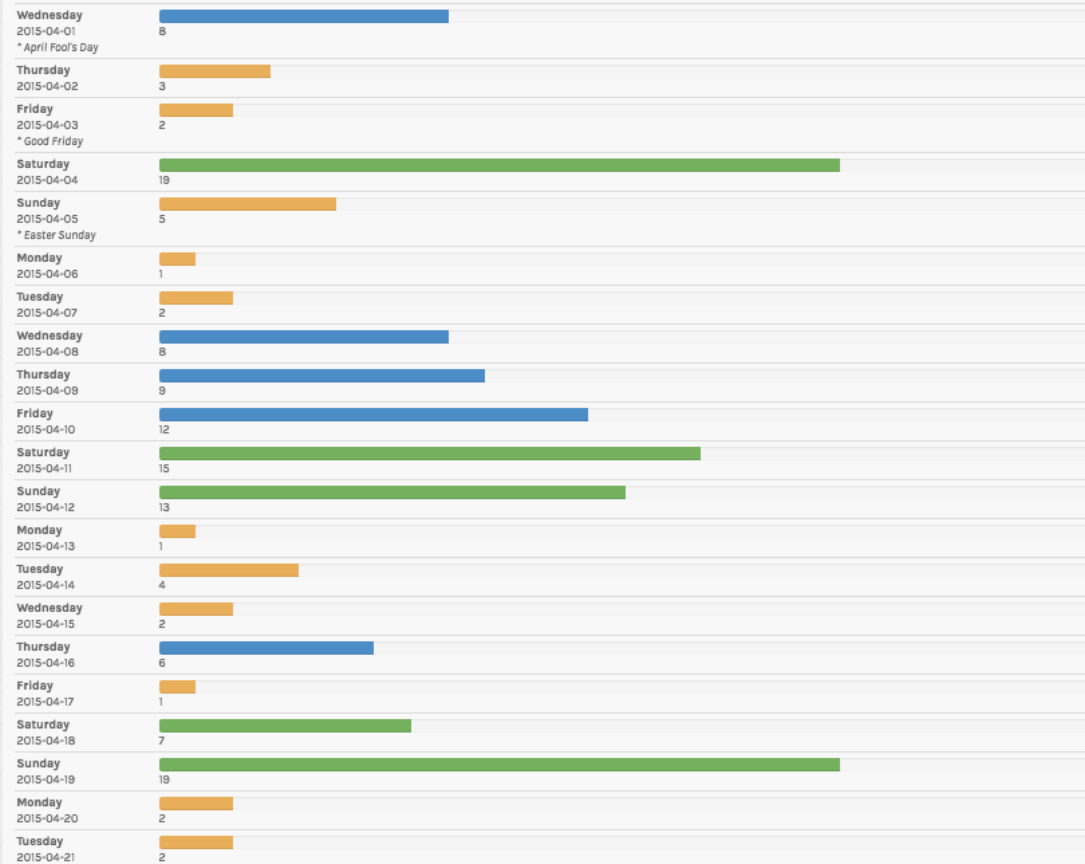
VISITOR ANALYTICS

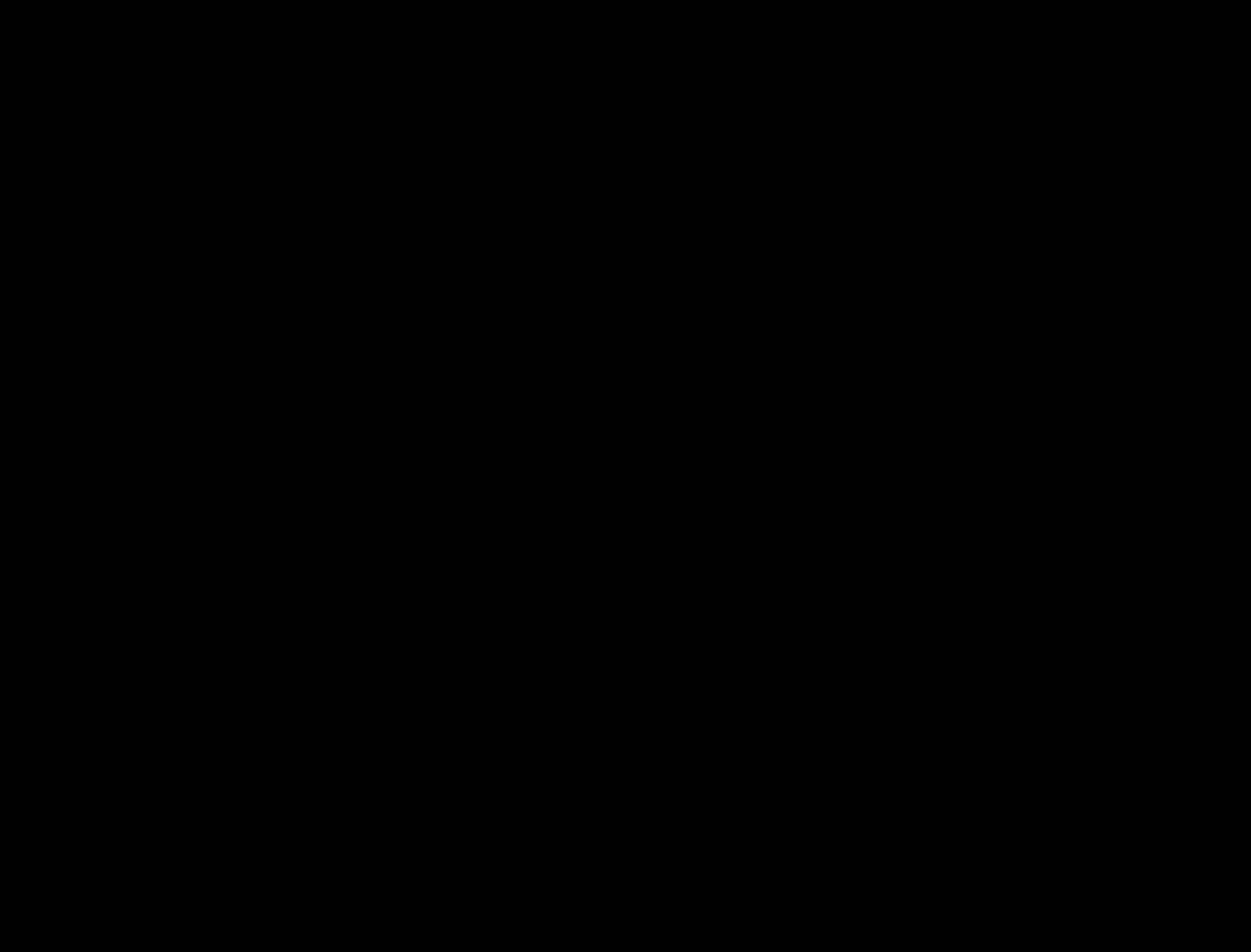


Details Clear



By Day







Trailhead Labs

Thank you!