Health Trends

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Chief Medical Officer & Health Solutions Director

Agenda

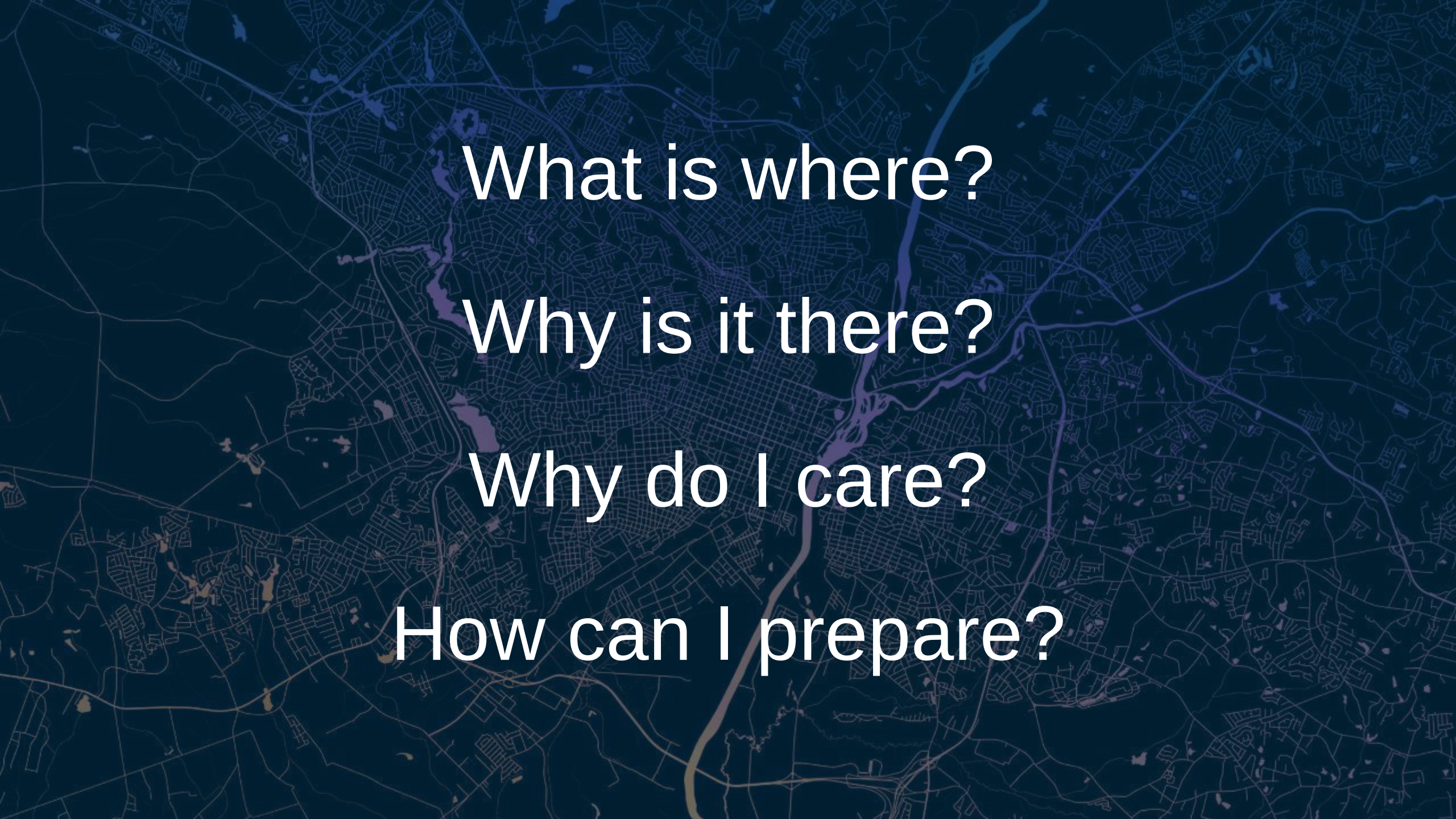
Intro	The Trends	Q&A


THE
SCIENCE
OF
WHERE

The Science of Where

Helps us to answer the fundamental questions of where . . .

- Where is it
- How do I get there
- What's nearby
- Where are we going
- Where's the problem
- Where is it changing
- Where is the issue
- Where is it suitable
- Where should we locate


What is where?
Why is it there?
Why do I care?
How can I prepare?

Data Visualization

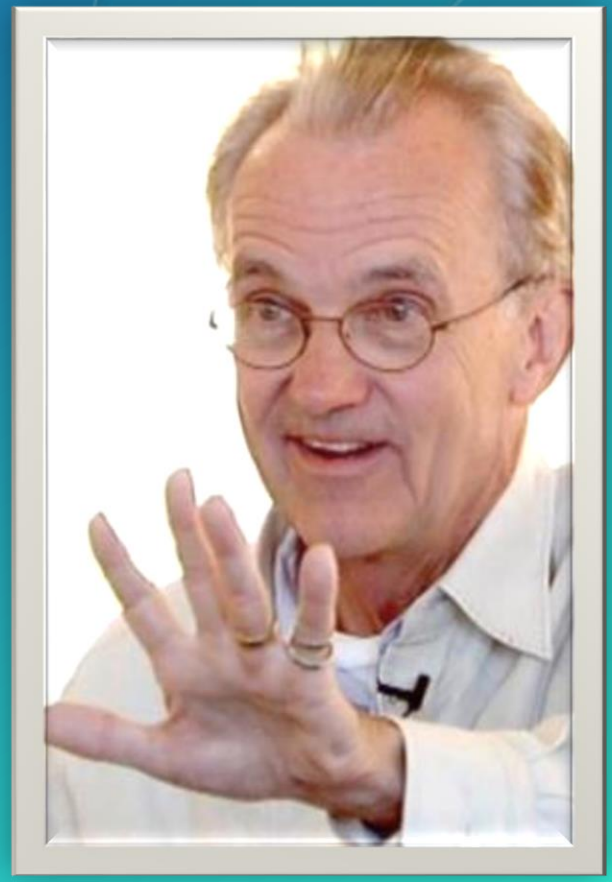
Data Visualization is a blend of Science and Art

The commonality between science and art is in trying to see profoundly - to develop strategies of seeing and showing.

Clutter and confusion are not attributes of data - they are shortcomings of design.

Good design is a lot like clear thinking made visual.

A metaphor for good information design is a map. Hold any diagram against a map and see how it compares.



Edward Tufte

Common Operational Picture

Common Operational Picture

The Common Operational Picture is a configuration for the Maps and Apps Gallery group application template that can be used to access a collection of maps, apps, and other content cataloged in an ArcGIS Online group.

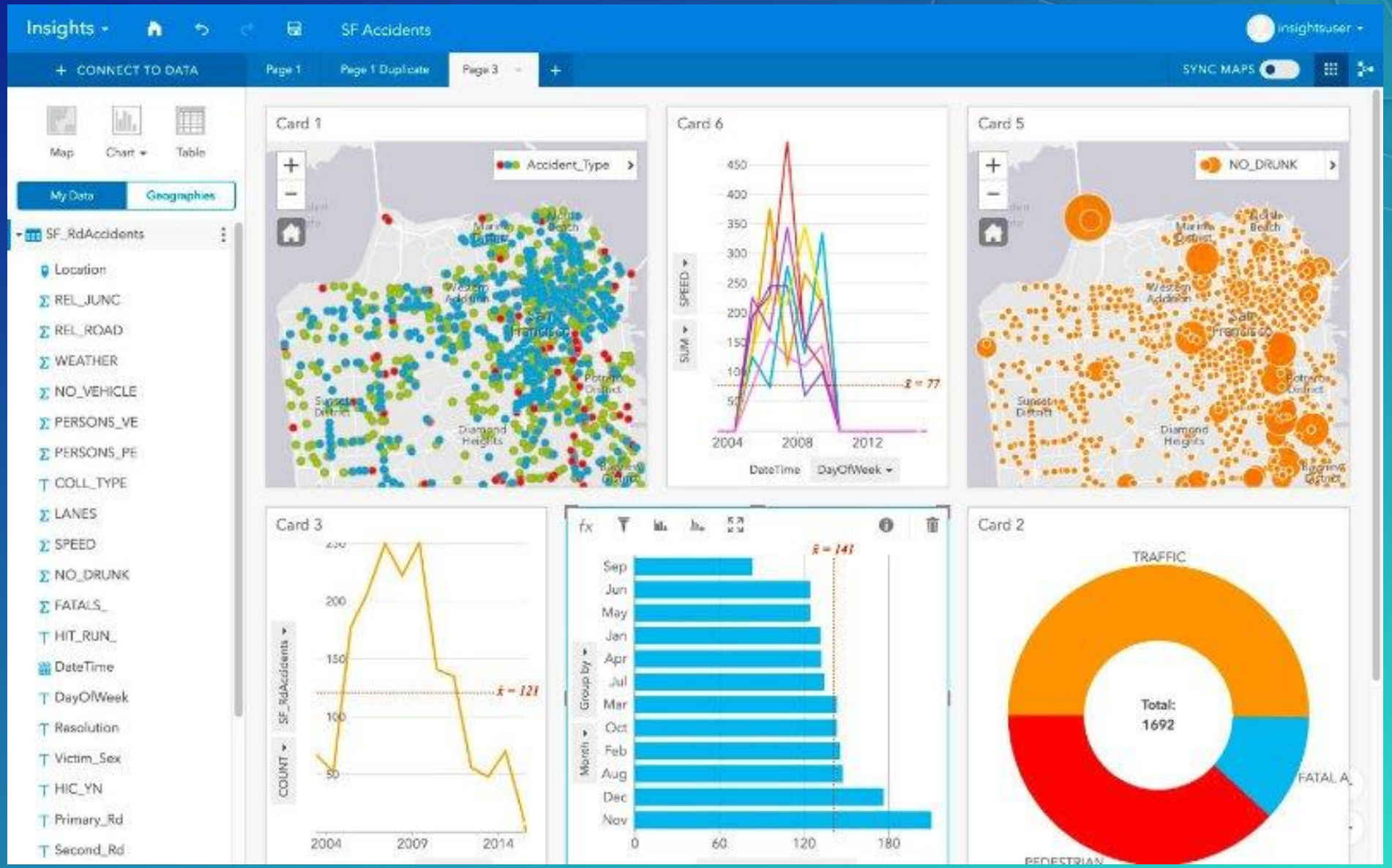
1. Situational Awareness Viewer
Web Mapping Application

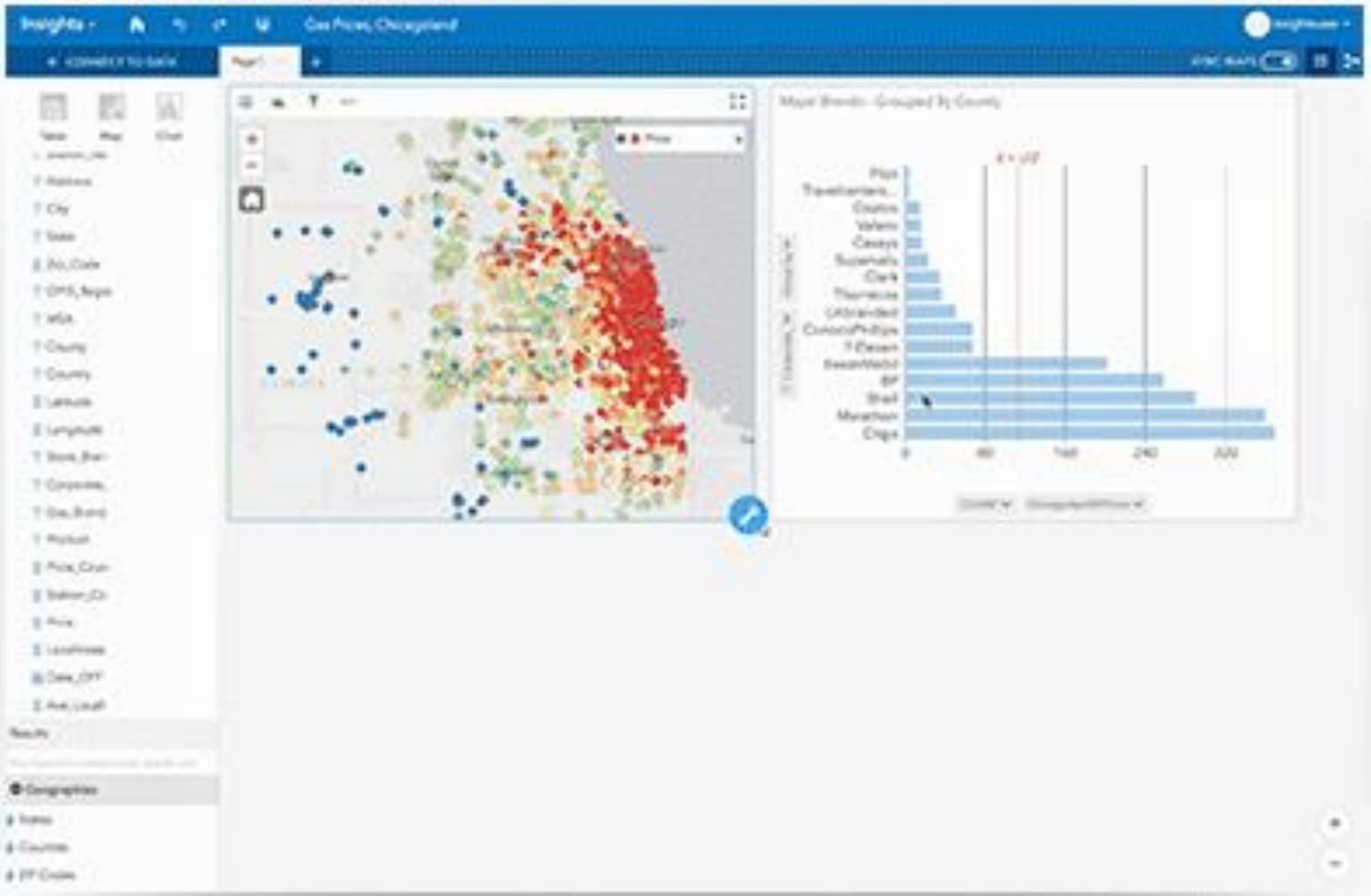
2. Operations Response
Web Mapping Application

3. Logistics Planning
Web Mapping Application

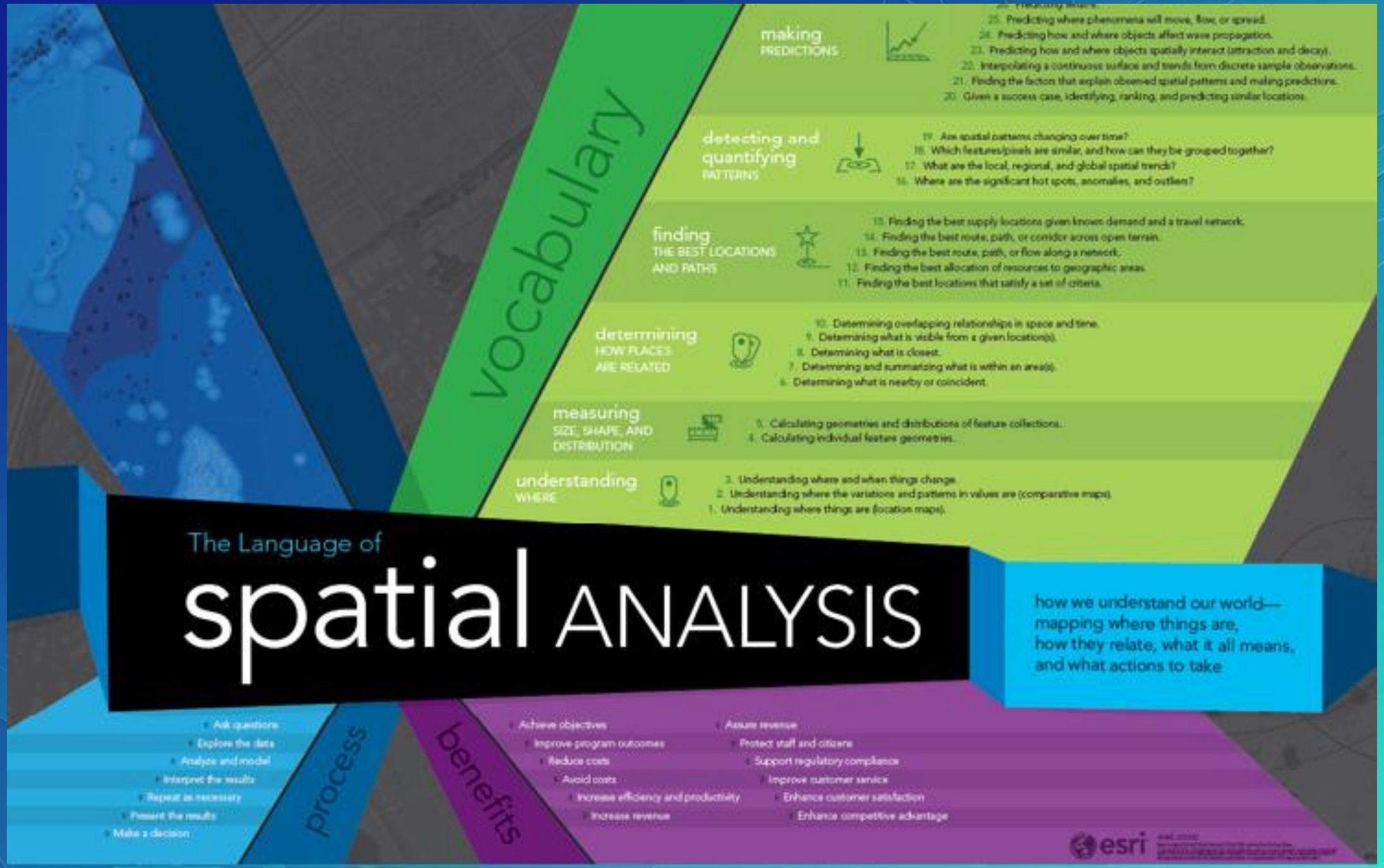
4. Incident Status Dashboard
Operation View

Simple Data Visualization and Exploration




Insights
Gas Prices, Chicagoland
Price
Major Brands - Grouped By County
Plot
Travelcenters...
Costco
Valero
Casey's
Superhalls
Clark
Thornacre
Unbranded
ConocoPhillips
7-Eleven
Sweetwater
BP
Shell
Marathon
Citgo
Geographies
States
Counties
ZIP Codes

Analytics


vocabulary
making
PREDICTIONS
25. Predicting where phenomena will move, flow, or spread.
24. Predicting how and where objects affect wave propagation.
23. Predicting how and where objects spatially interact (attraction and decay).
22. Interpolating a continuous surface and trends from discrete sample observations.
21. Finding the factors that explain observed spatial patterns and making predictions.
20. Given a success case, identifying, ranking, and predicting similar locations.
detecting and quantifying
PATTERNS
19. Are spatial patterns changing over time?
18. Which features/pixels are similar, and how can they be grouped together?
17. What are the local, regional, and global spatial trends?
16. Where are the significant hot spots, anomalies, and outliers?
finding
THE BEST LOCATIONS AND PATHS
15. Finding the best supply locations given known demand and a travel network.
14. Finding the best route, path, or corridor across open terrain.
13. Finding the best route, path, or flow along a network.
12. Finding the best allocation of resources to geographic areas.
11. Finding the best locations that satisfy a set of criteria.
determining
HOW PLACES ARE RELATED
10. Determining overlapping relationships in space and time.
9. Determining what is visible from a given location(s).
8. Determining what is closest.
7. Determining and summarizing what is within an area(s).
6. Determining what is nearby or coincident.
measuring
SIZE, SHAPE, AND DISTRIBUTION
5. Calculating geometries and distributions of feature collections.
4. Calculating individual feature geometries.
understanding
WHERE
3. Understanding where and when things change.
2. Understanding where the variations and patterns in values are (comparative maps).
1. Understanding where things are (location maps).
The Language of
spatial ANALYSIS
how we understand our world—
mapping where things are,
how they relate, what it all means,
and what actions to take
process
Ask questions
Explore the data
Analyze and model
Interpret the results
Repeat as necessary
Present the results
Make a decision
benefits
Achieve objectives
Improve program outcomes
Reduce costs
Avoid costs
Increase efficiency and productivity
Increase revenue
Assure revenue
Protect staff and citizens
Support regulatory compliance
Improve customer service
Enhance customer satisfaction
Enhance competitive advantage
esri

Graduating to Better Health

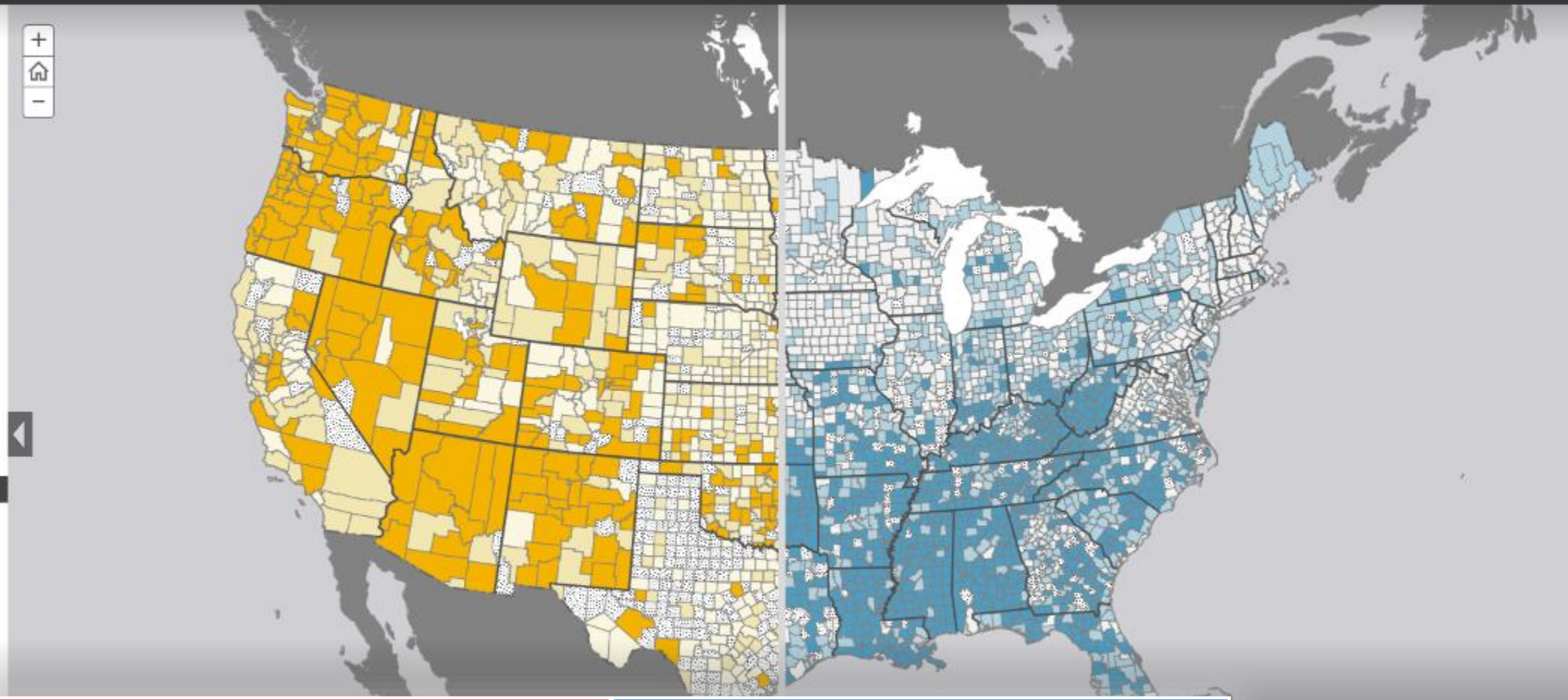
The Impact of High School Graduation on Health Quality

A story map

esri

The map on the left shows the percentage of adults who did not complete high school (i.e. dropped out). The map on the right shows the percentage of adults who reported that their health is fair or poor. If the claim that graduating from high school improves health quality is true, then counties with:

- low dropout rates should occur where there are low percentages of people with poor health (areas should both be in a lighter color)
- medium dropout rates should occur where there are medium percentages of people with poor health (areas should both appear in a moderate color)
- high dropout rates should occur where there are high percentages of people reporting fair or poor health (areas should both be in a darker color).



▲ Understanding the variations and patterns in values.

◆ Determining overlapping relationships in space and time.

● Predicting how objects spatially interact (attraction and decay).

■ Finding the best locations that satisfy a set of criteria.

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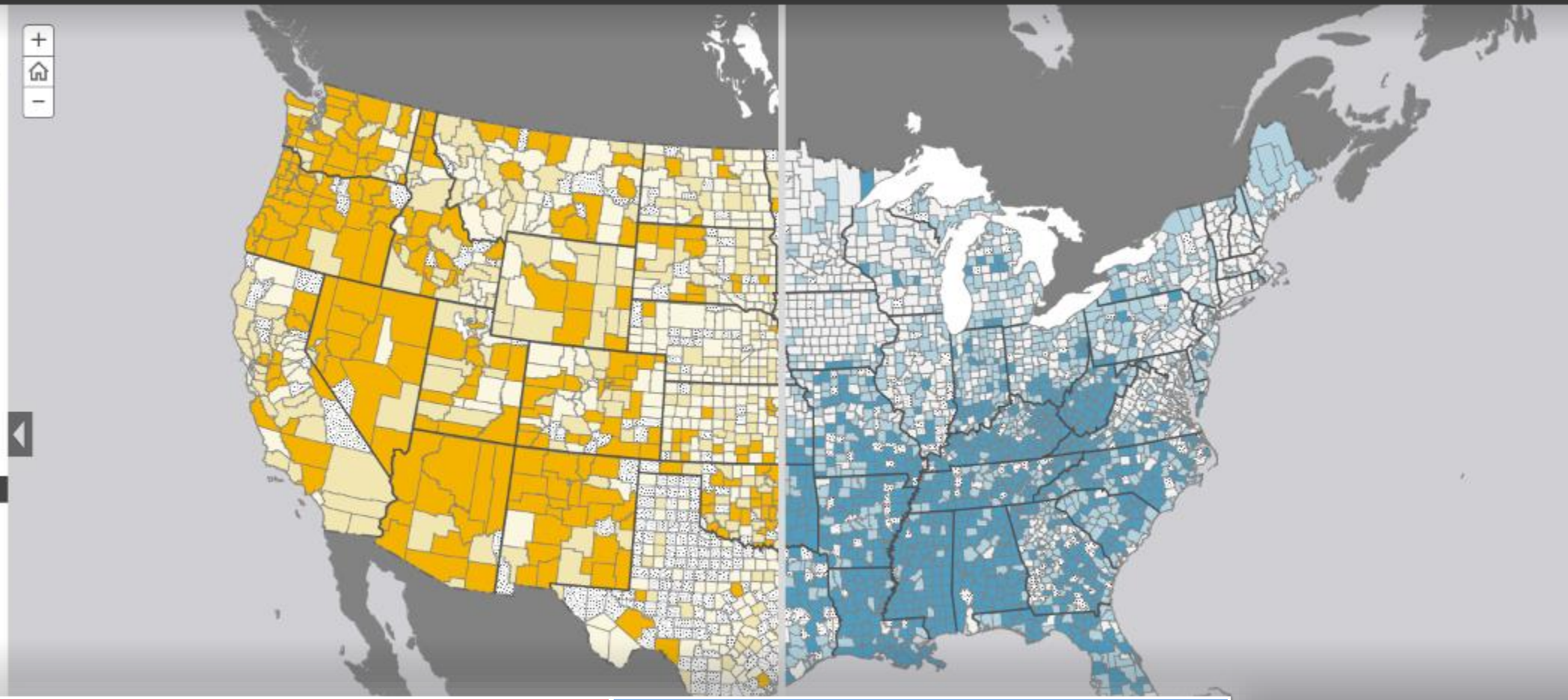


Legend

Dropout (%)

Dropouts

- 20.5 - 83.0
- 12.9 - 20.4
- 0.8 - 12.8

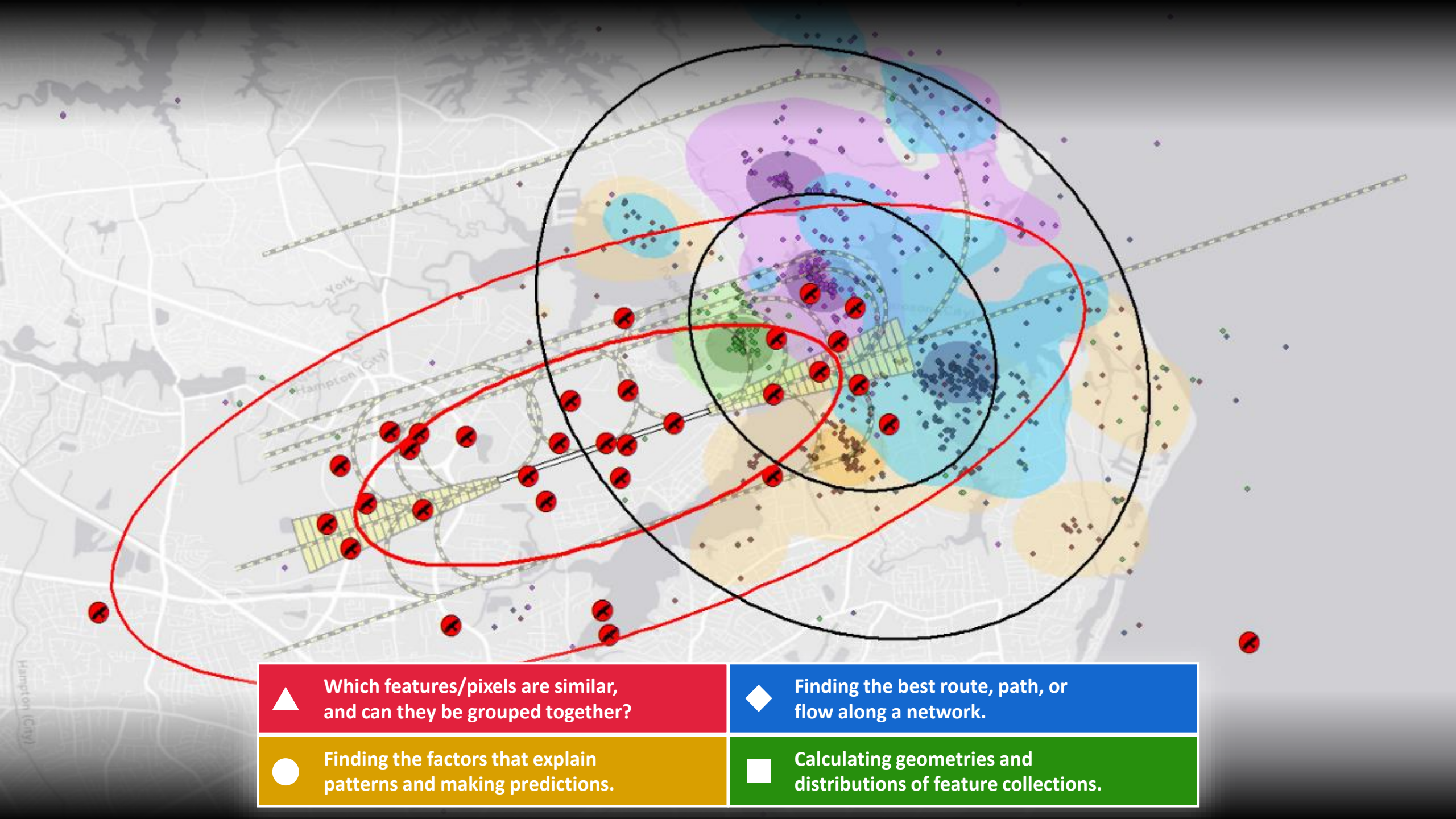
Fair or Poor Health (%)

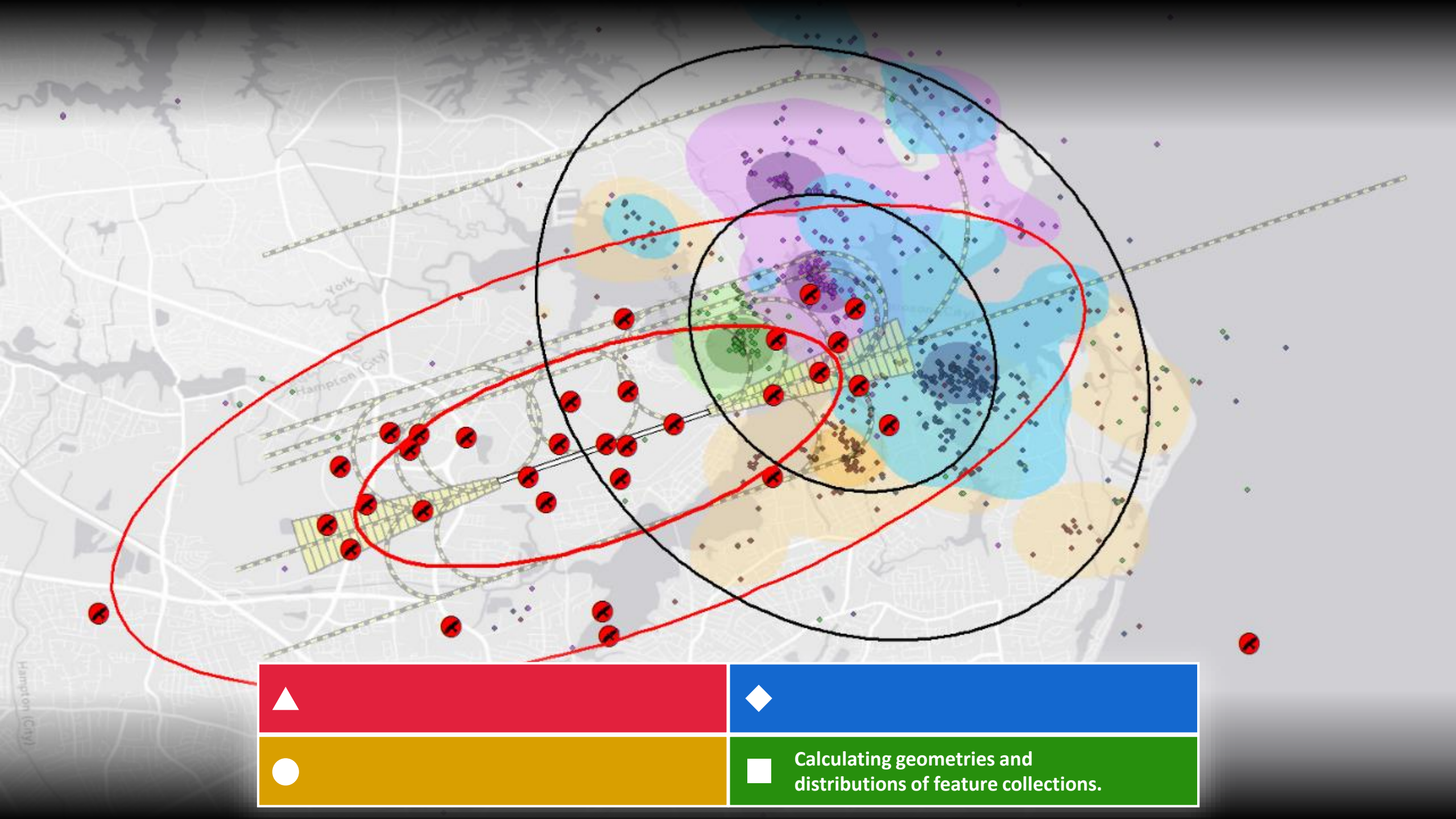
Fair or Poor Health

- 18.8 - 40.8
- 13.7 - 18.7
- 2.4 - 13.6

No Data

▲ **Understanding the variations and patterns in values.**	◆
●	■

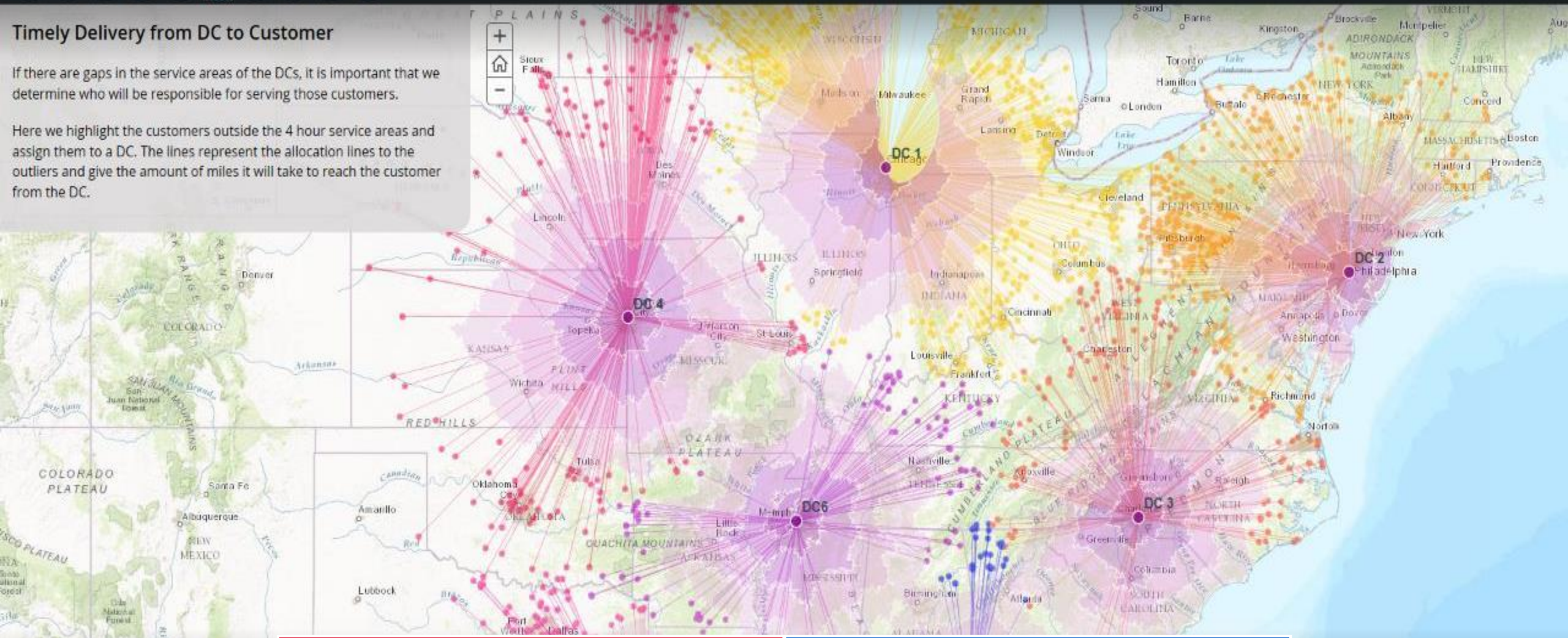

Which features/pixels are similar, and can they be grouped together?
Finding the best route, path, or flow along a network.
Finding the factors that explain patterns and making predictions.
Calculating geometries and distributions of feature collections.


Calculating geometries and
distributions of feature collections.

Timely Delivery from DC to Customer

If there are gaps in the service areas of the DCs, it is important that we determine who will be responsible for serving those customers.

Here we highlight the customers outside the 4 hour service areas and assign them to a DC. The lines represent the allocation lines to the outliers and give the amount of miles it will take to reach the customer from the DC.



▲ Given a success case, predict similar locations.	◆ Are spatial patterns changing over time?
● Predicting where phenomena will move, flow, or spread.	■ Finding the best allocation of resources to geographic areas.

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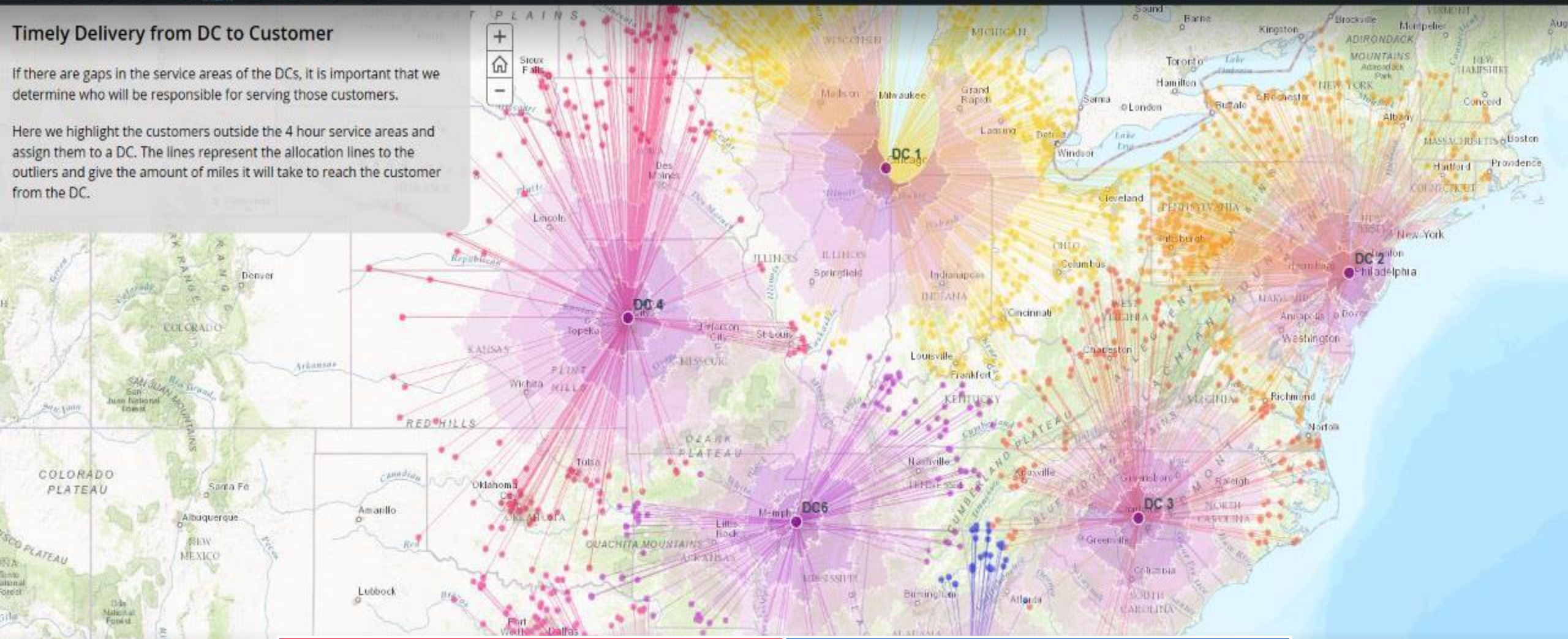

▲ ◆

● ■ **Finding the best allocation of resources to geographic areas.**

A story map

esri

Optimizing Home Delivery with Location Services

Using a Delivery Truck from Each Distribution Center

The company wants to avoid rush hour traffic delays and so plans to schedule deliveries after 9am, using one truck from each center, 5 in total, while working a standard 8 hour day. This allows trucks to make deliveries and return to the DC before the peak of rush hour evening traffic.

This strategy makes optimum use of the 40 hour working day (5 vehicles working 8 hours each) and provides for only 32 lost minutes. However 100 customers cannot be reached, leaving 189 deliveries but this scenario ensures that all trucks are optimally used and will return to the base within 9 minutes of 5:00 PM; the end of the working day.

DC	Stops	Work Hours	Minutes Driving	Miles Driven	Start Time	End Time
DC1	36	7:55	115.30	29.75	9:00 AM	4:55 PM
DC2	37	7:53	103.30	31.94	9:00 AM	4:53 PM
DC3	40	7:56	75.99	16.83	9:00 AM	4:56 PM
DC4	41	7:53	63.53	14.05	9:00 AM	4:53 PM
DC5	35	7:51	121.32	54.77	9:00 AM	4:51 PM
Totals	**189**	**39:28**	**479.44**	**147.34**		

While the workload is reasonably well balanced in terms of stops, there are significant variations in the minutes and miles driven. DC3 and DC4 support local deliveries with short routes but reduced road speed increases total time. Some DCs are most productively used to deliver to far away customers. Notice how DC5 can take advantage of the freeway to deliver to San Mateo customers (blue lines/dots) rather than those in the Downtown area. This however adds extra miles and minutes getting to the start of the deliveries.

Understanding Unserved

There are 100 customers which cannot

Bellingame and San Bruno, Pacifica, Fo

▲ **Finding the best route, path, or flow along a network.**

◆ **Finding the best route, path, or corridor across open terrain.**

● **Given a success case, predict similar locations.**

■ **Are spatial patterns changing over time?**

esri

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Finding the best route, path, or flow along a network.

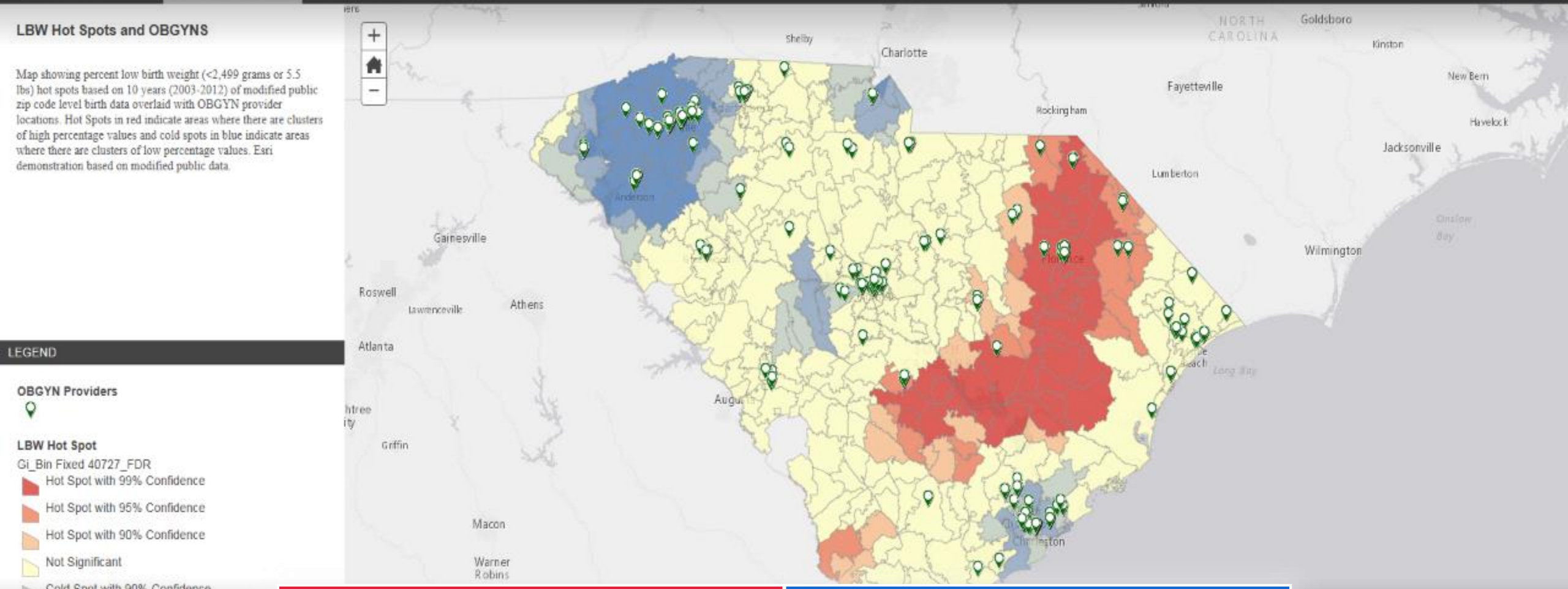
South Carolina Low Birth Weight Analysis

A Community Story Map

LBW Percent | LBW Hot Spots | Service Areas | Gaps

LBW Hot Spots and OBGYNS

Map showing percent low birth weight (<2,499 grams or 5.5 lbs) hot spots based on 10 years (2003-2012) of modified public zip code level birth data overlaid with OBGYN provider locations. Hot Spots in red indicate areas where there are clusters of high percentage values and cold spots in blue indicate areas where there are clusters of low percentage values. Esri demonstration based on modified public data.



▲ **Where are the significant hot spots, anomalies, and outliers?**

◆ **Predicting where phenomena will move, flow, or spread.**

● **Understanding where the variations and patterns in values are.**

■ **Which features/pixels are similar, and can they be grouped together?**

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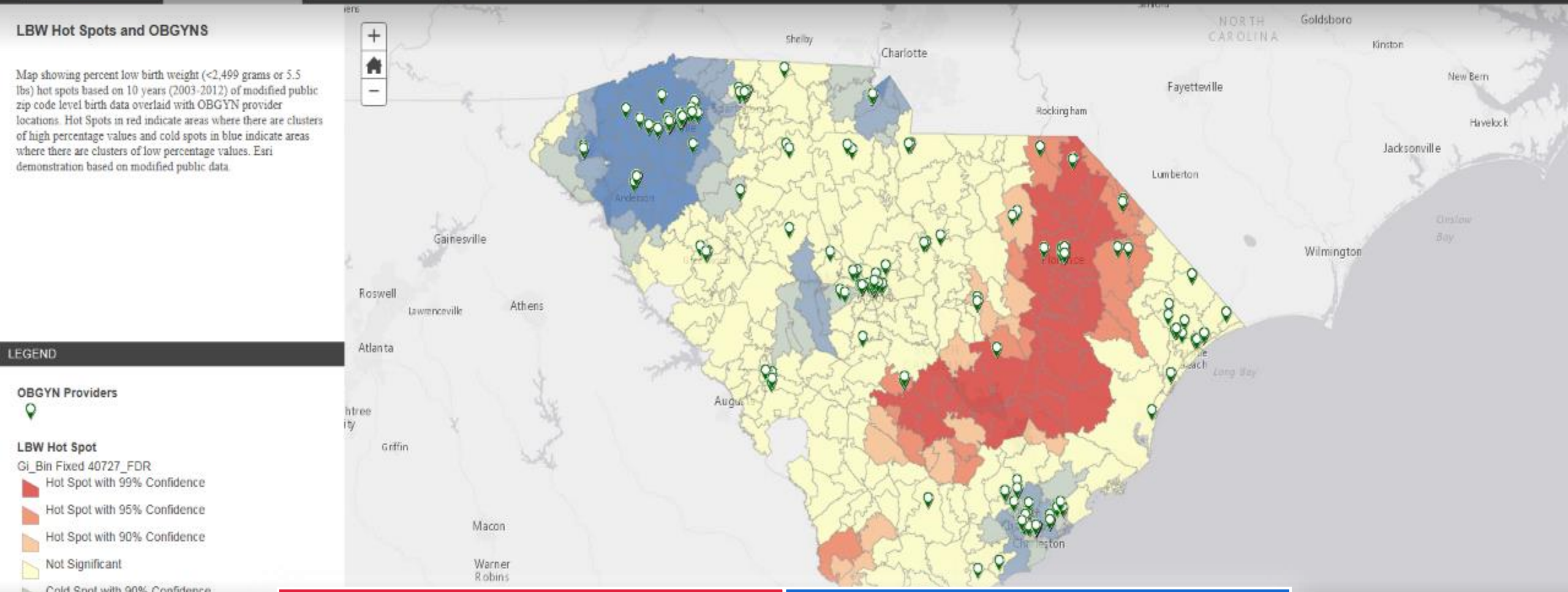


LEGEND

OBGYN Providers

LBW Hot Spot

Gi_Bin Fixed 40727_FDR

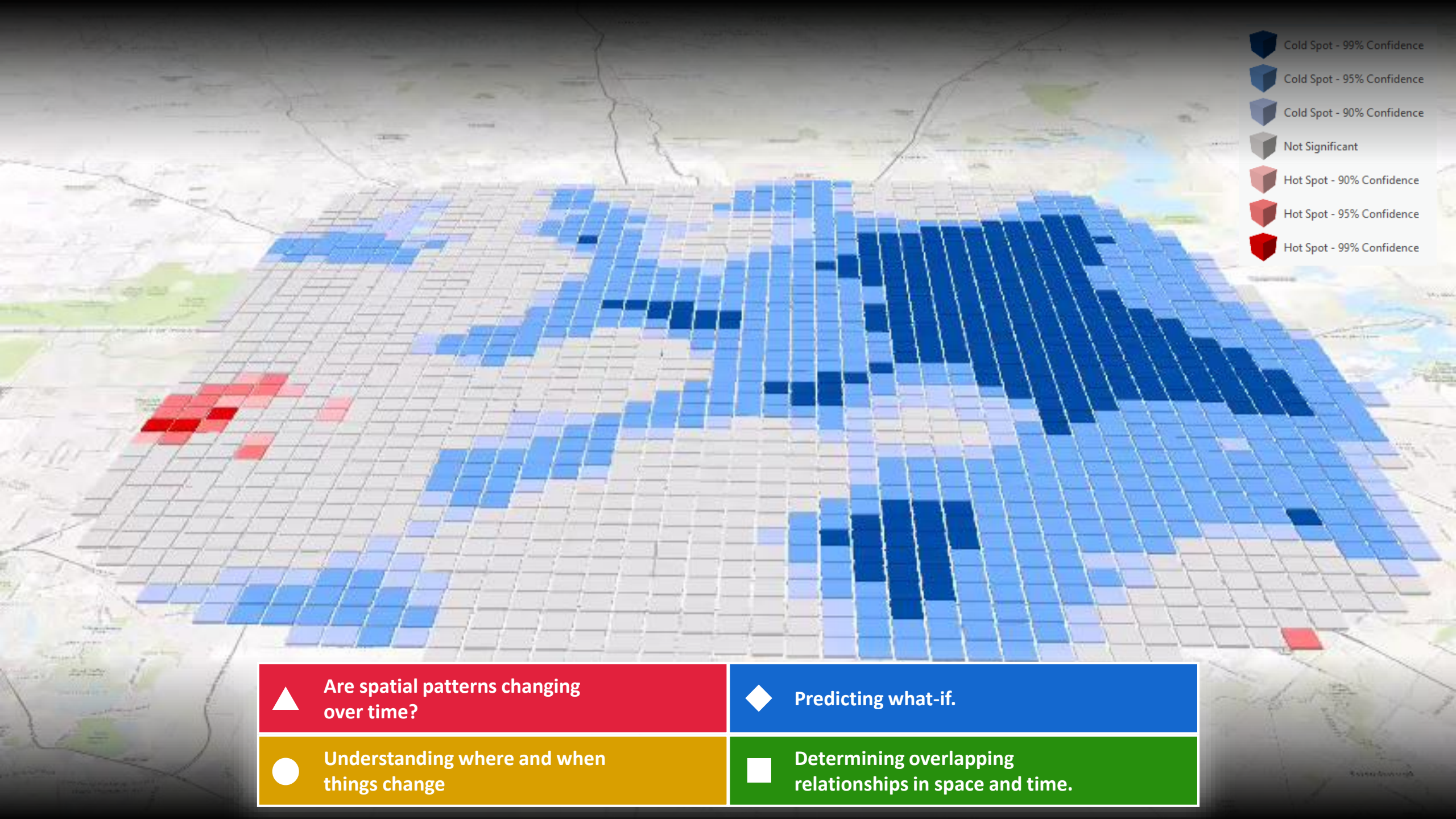
- Hot Spot with 99% Confidence
- Hot Spot with 95% Confidence
- Hot Spot with 90% Confidence
- Not Significant
- Cold Spot with 90% Confidence
- Cold Spot with 95% Confidence
- Cold Spot with 99% Confidence

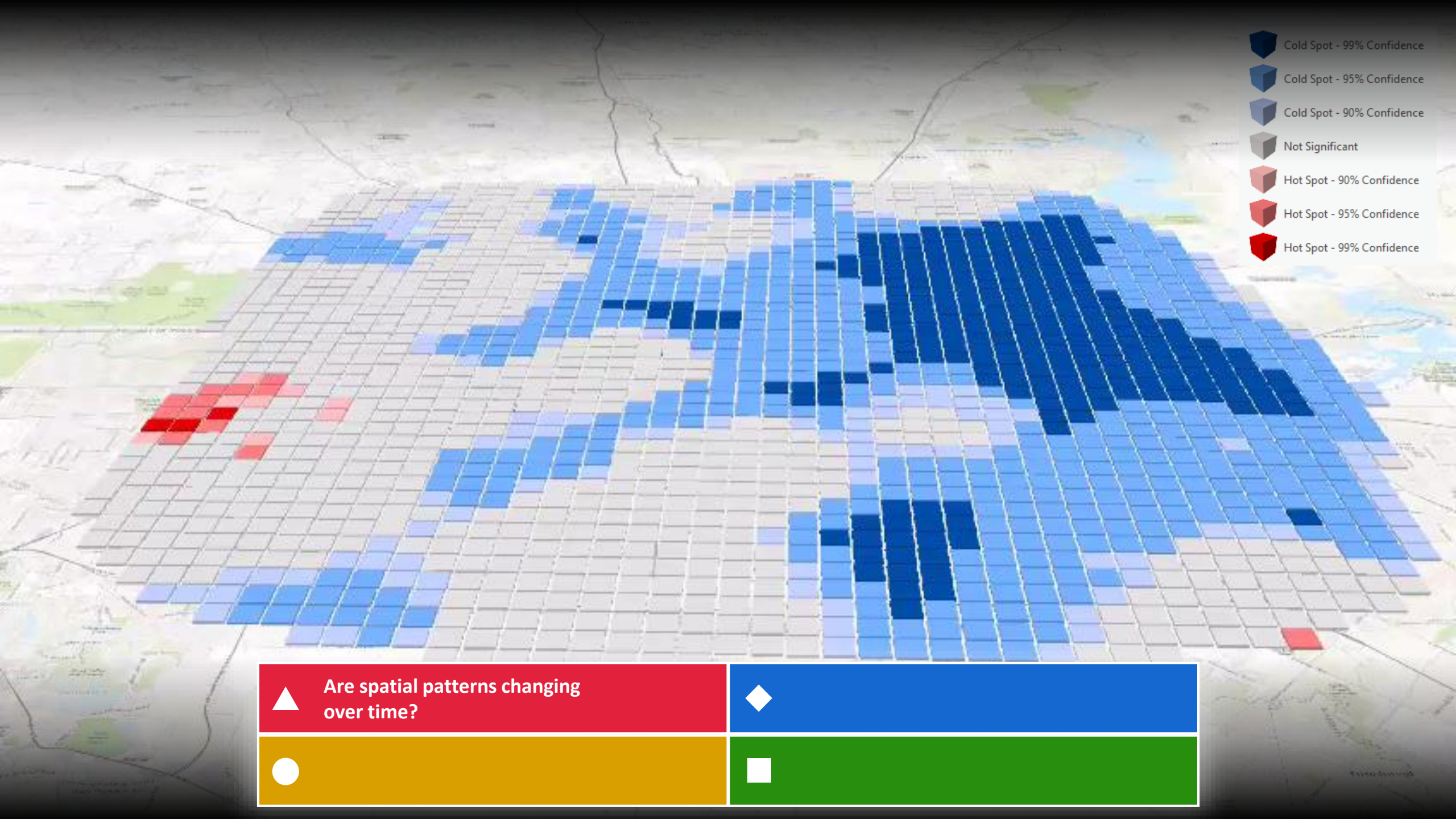
▲ **Where are the significant hot spots, anomalies, and outliers?**

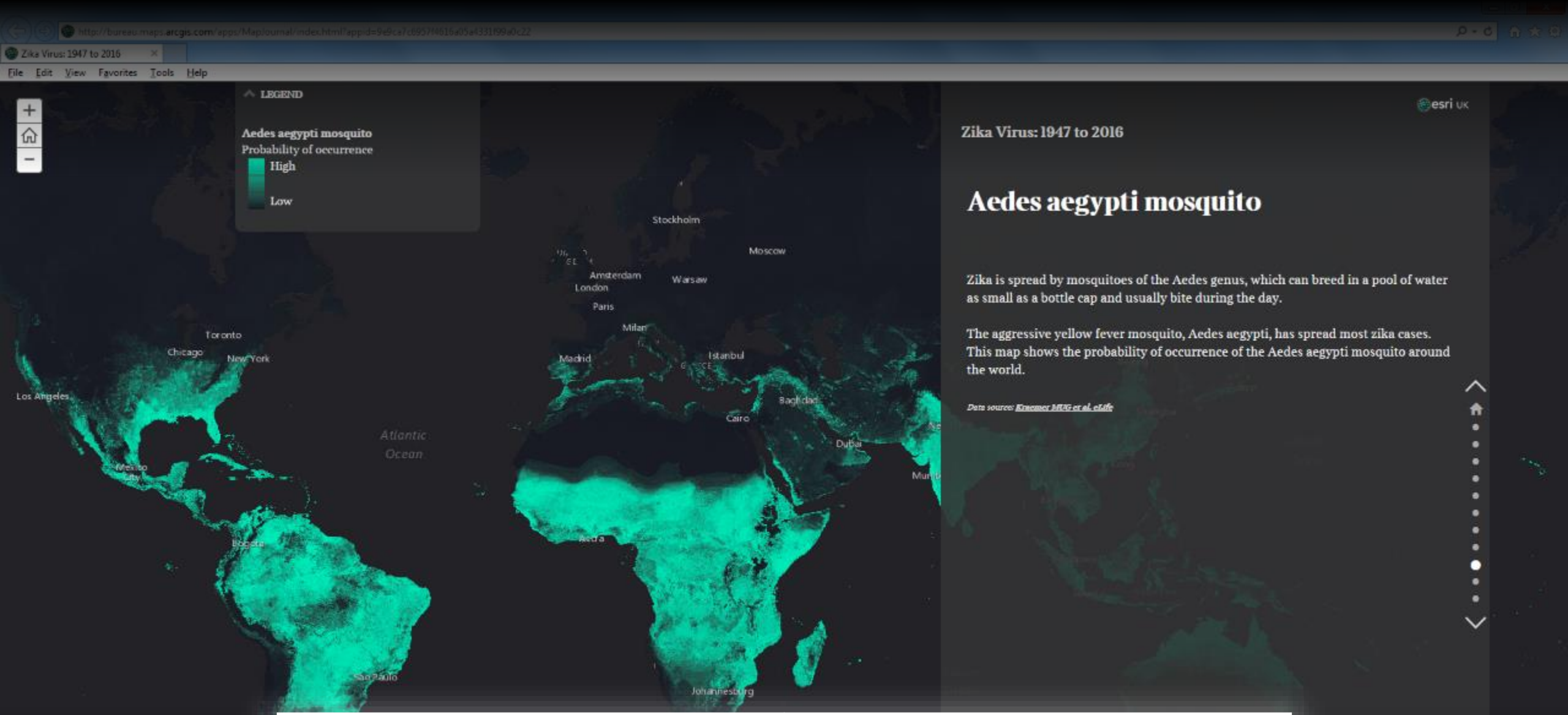
◆

●

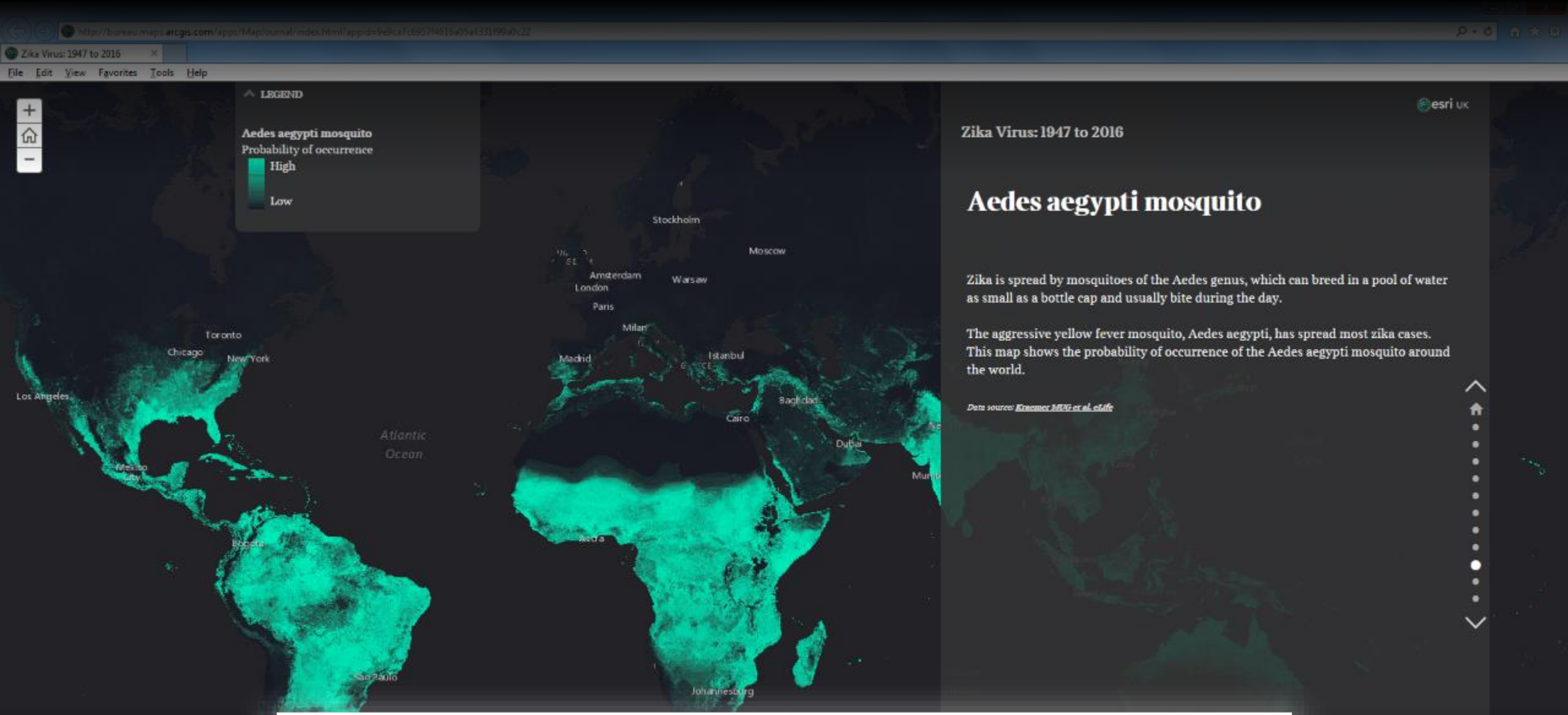
■


Cold Spot - 99% Confidence
Cold Spot - 95% Confidence
Cold Spot - 90% Confidence
Not Significant
Hot Spot - 90% Confidence
Hot Spot - 95% Confidence
Hot Spot - 99% Confidence
Are spatial patterns changing over time?
Predicting what-if.
Understanding where and when things change
Determining overlapping relationships in space and time.


Cold Spot - 99% Confidence
Cold Spot - 95% Confidence
Cold Spot - 90% Confidence
Not Significant
Hot Spot - 90% Confidence
Hot Spot - 95% Confidence
Hot Spot - 99% Confidence
Are spatial patterns changing over time?



▲ Determining and summarizing what is within an area(s).	◆ Given a success case, predict similar locations.
● Finding the best supply locations given demand and a network.	■ Calculating geometries and distributions of feature collections.

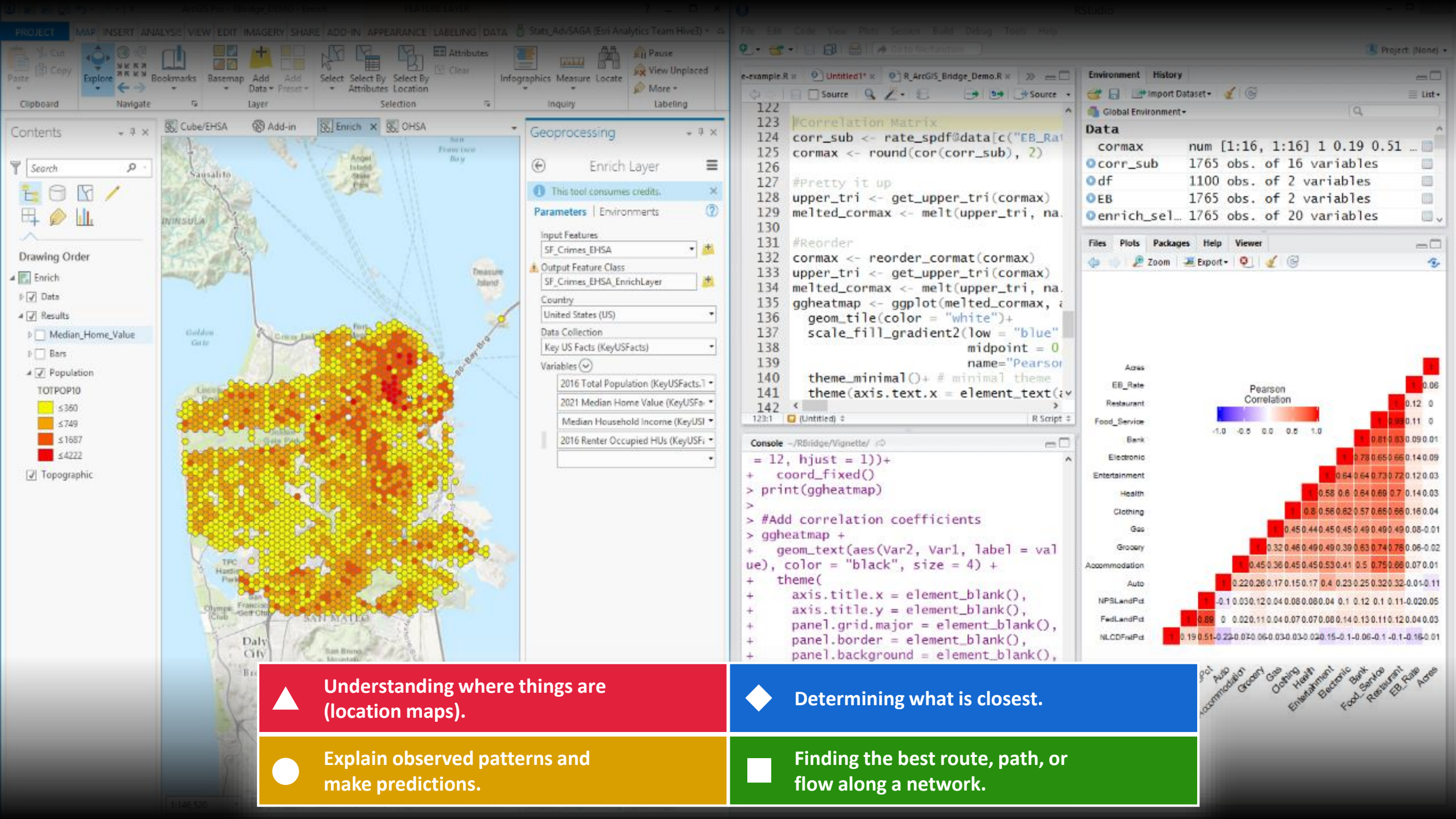


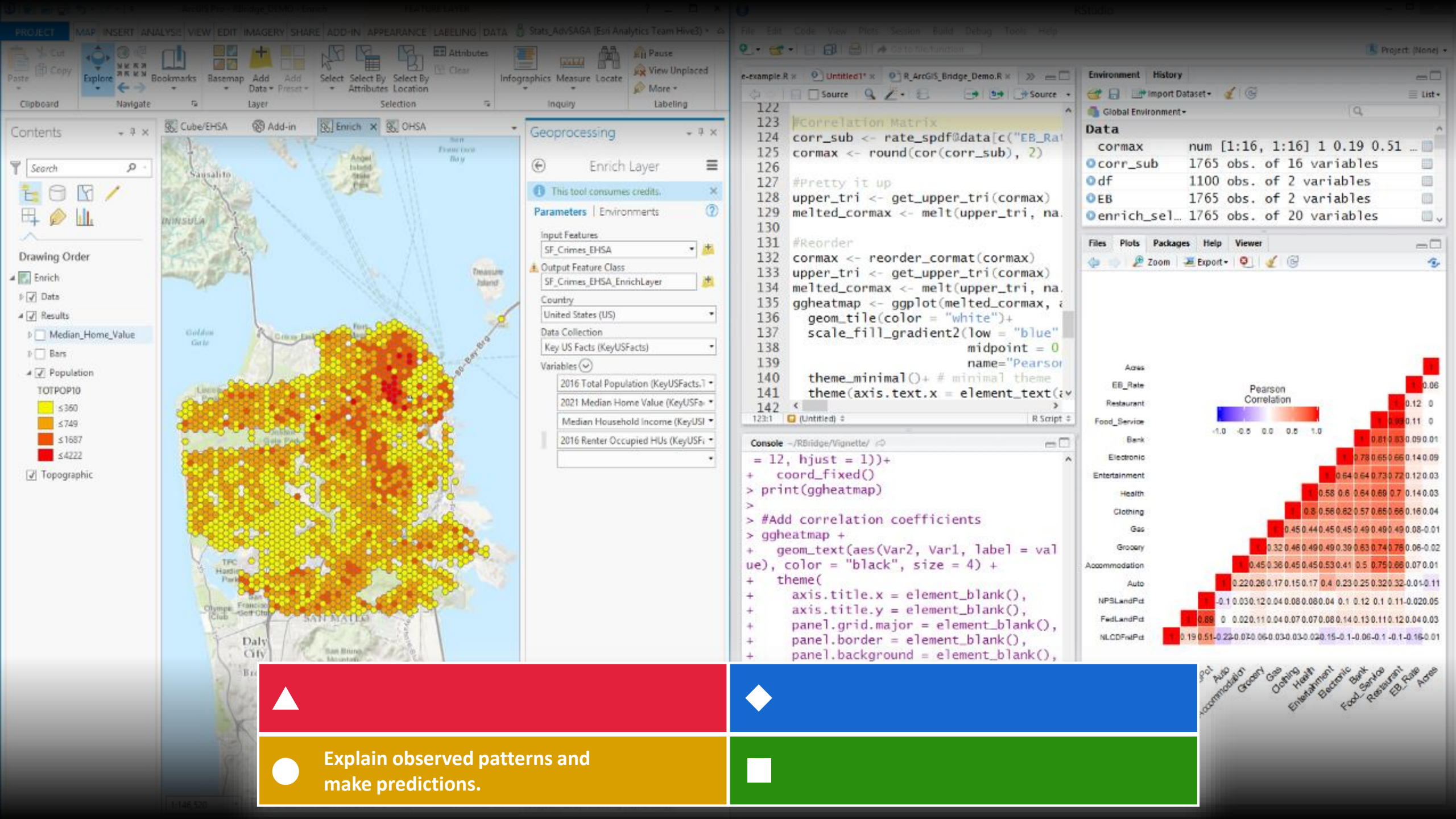
▲

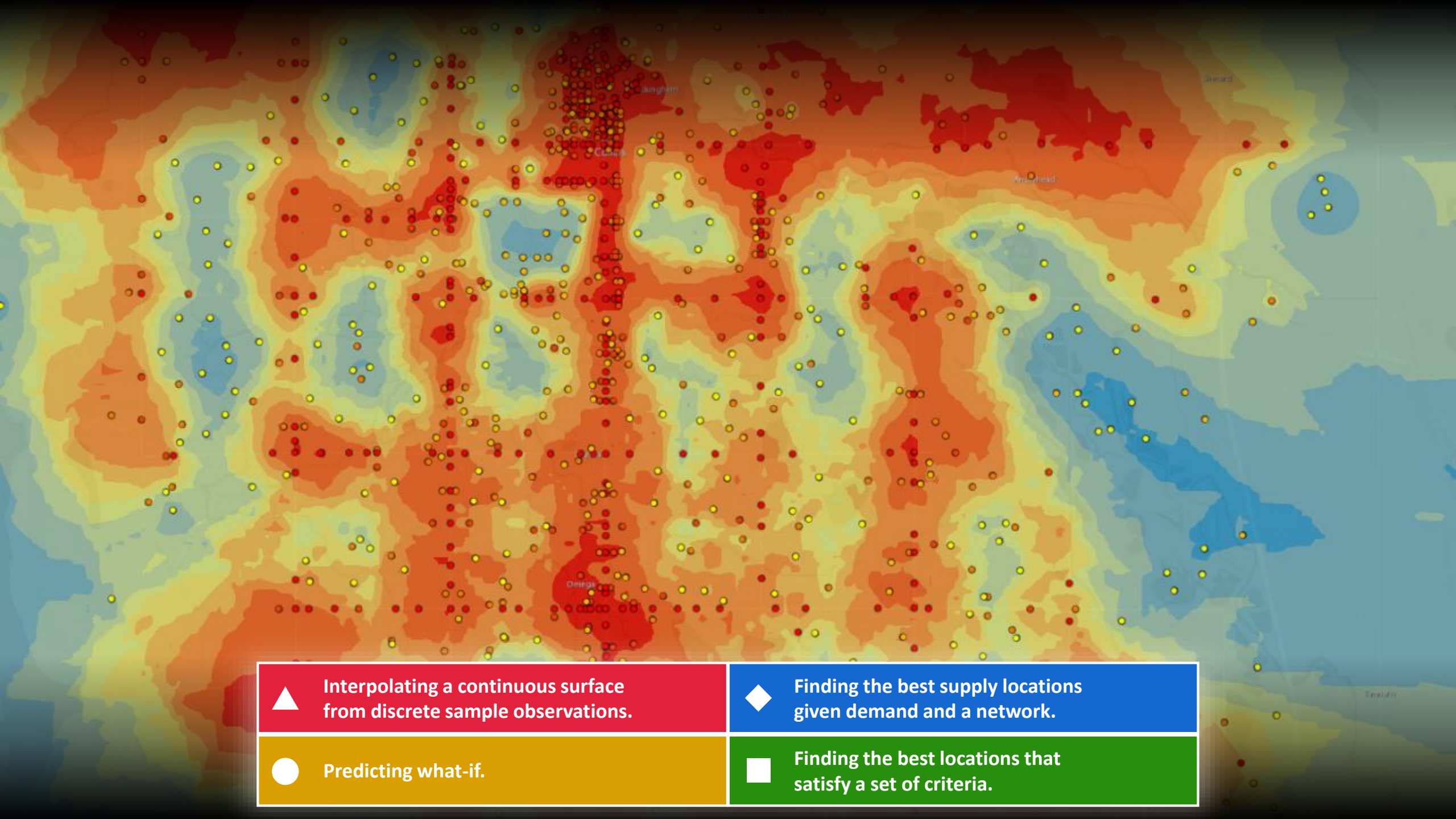
◆ Given a success case, predict similar locations.

●

■


Understanding where things are (location maps).
Determining what is closest.
Explain observed patterns and make predictions.
Finding the best route, path, or flow along a network.


Contents
Drawing Order
Enrich
Data
Results
Median_Home_Value
Bars
Population
TOTPOP10
≤360
≤749
≤1687
≤4222
Topographic
Cube/EHSA
Add-in
Enrich
OHSA
Geoprocessing
Enrich Layer
This tool consumes credits.
Parameters
Environments
Input Features
SF_Crimes_EHSA
Output Feature Class
SF_Crimes_EHSA_EnrichLayer
Country
United States (US)
Data Collection
Key US Facts (KeyUSFacts)
Variables
2016 Total Population (KeyUSFacts.T
2021 Median Home Value (KeyUSFa
Median Household Income (KeyUSI
2016 Renter Occupied HUs (KeyUSFa
#Correlation Matrix
corr_sub <- rate_spdf@data[c("EB_Ra
cormax <- round(cor(corr_sub), 2)
#Pretty it up
upper_tri <- get_upper_tri(cormax)
melted_cormax <- melt(upper_tri, na.
#Reorder
cormax <- reorder_cormat(cormax)
upper_tri <- get_upper_tri(cormax)
melted_cormax <- melt(upper_tri, na.
ggheatmap <- ggplot(melted_cormax, a
geom_tile(color = "white")+
scale_fill_gradient2(low = "blue"
midpoint = 0
name="Pearso
theme_minimal()+ # minimal theme
theme(axis.text.x = element_text(a
Environment
History
Import Dataset
Global Environment
Data
cormax num [1:16, 1:16] 1 0.19 0.51 ...
corr_sub 1765 obs. of 16 variables
df 1100 obs. of 2 variables
EB 1765 obs. of 2 variables
enrich_sel... 1765 obs. of 20 variables
Files
Plots
Packages
Help
Viewer
Zoom
Export
Pearson Correlation
Acres
EB_Rate
Restaurant
Food_Service
Bank
Electronic
Entertainment
Health
Clothing
Gas
Grocery
Accommodation
Auto
NPSLandPct
FedLandPct
NLCDFmlPct
= 12, hjust = 1))+
coord_fixed()
print(ggheatmap)
#Add correlation coefficients
ggheatmap +
geom_text(aes(Var2, Var1, label = val
ue), color = "black", size = 4) +
theme(
axis.title.x = element_blank(),
axis.title.y = element_blank(),
panel.grid.major = element_blank(),
panel.border = element_blank(),
panel.background = element_blank(),
Explain observed patterns and
make predictions.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Finding the best supply locations given demand and a network.
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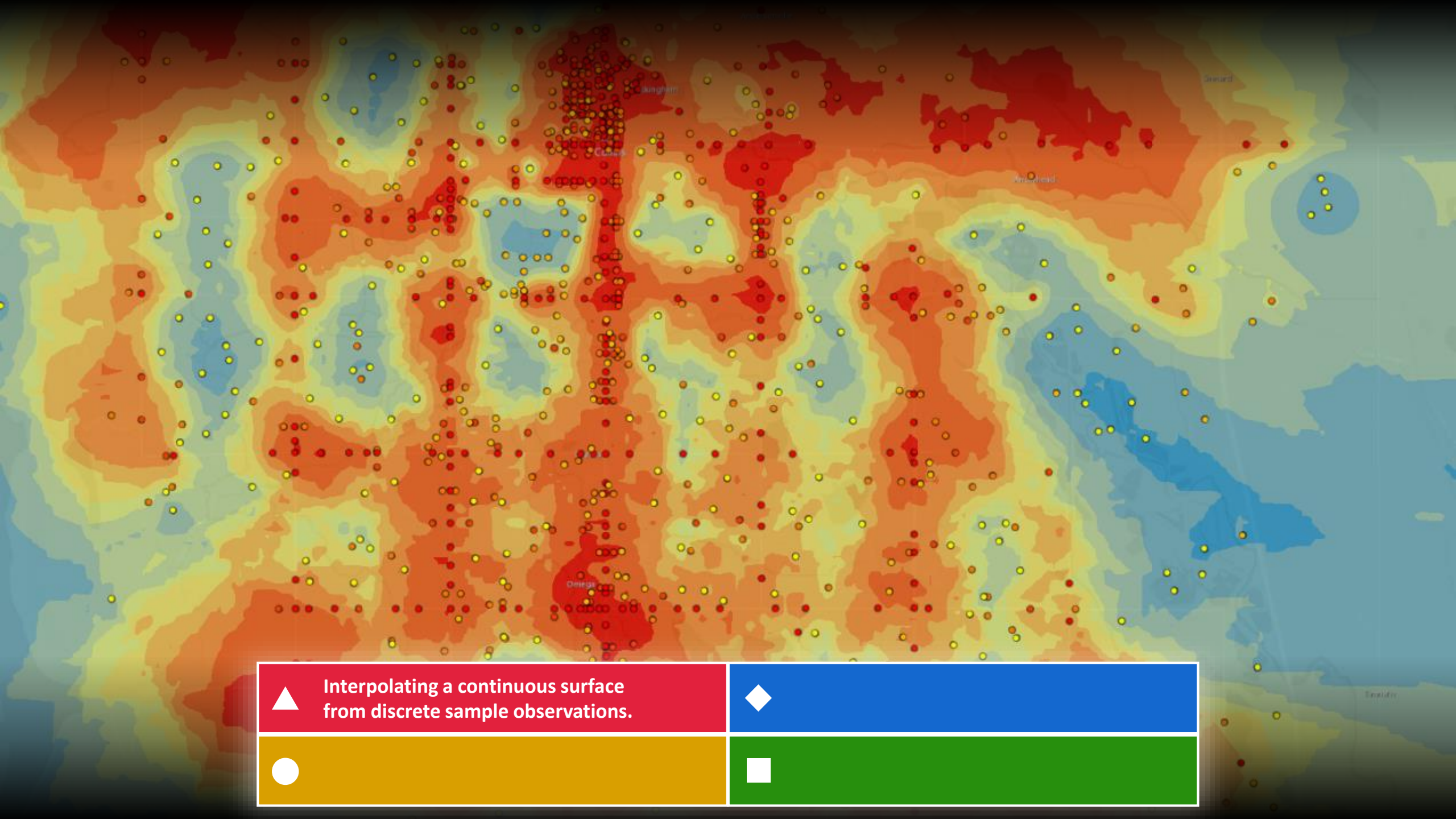

Interpolating a continuous surface
from discrete sample observations.

Take an Esri MOOC - www.esri.com/mooc

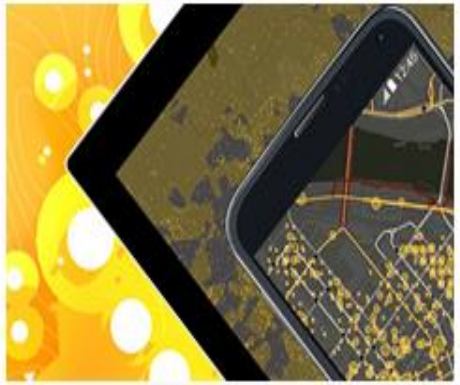
These free online classes offer a convenient, effective, and fun way to keep up with the fast-paced developments in the ArcGIS platform. Classes are open day and night and require only a couple of hours of study per week. A certificate is available upon completion.

Going Places with Spatial Analysis

Gain a deeper understanding of spatial data analysis.

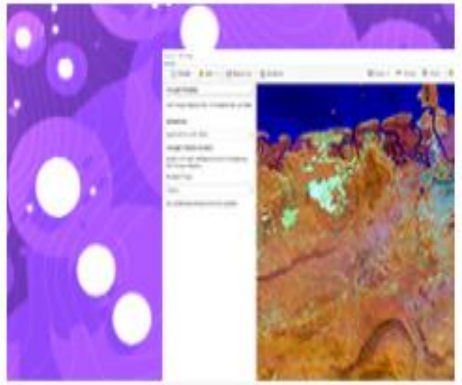
The Location Advantage

Explore how location analytics can be used in business.



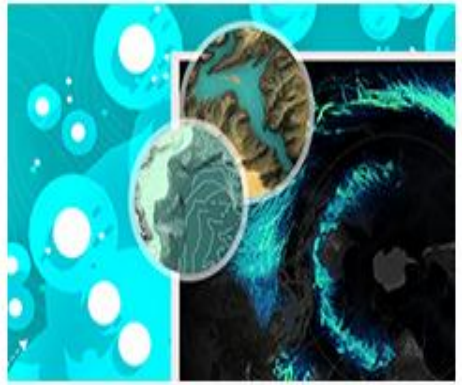
Do-It-Yourself Geo Apps

Learn how to develop your own geospatial tools.



Earth Imagery at Work

See why imagery is information.

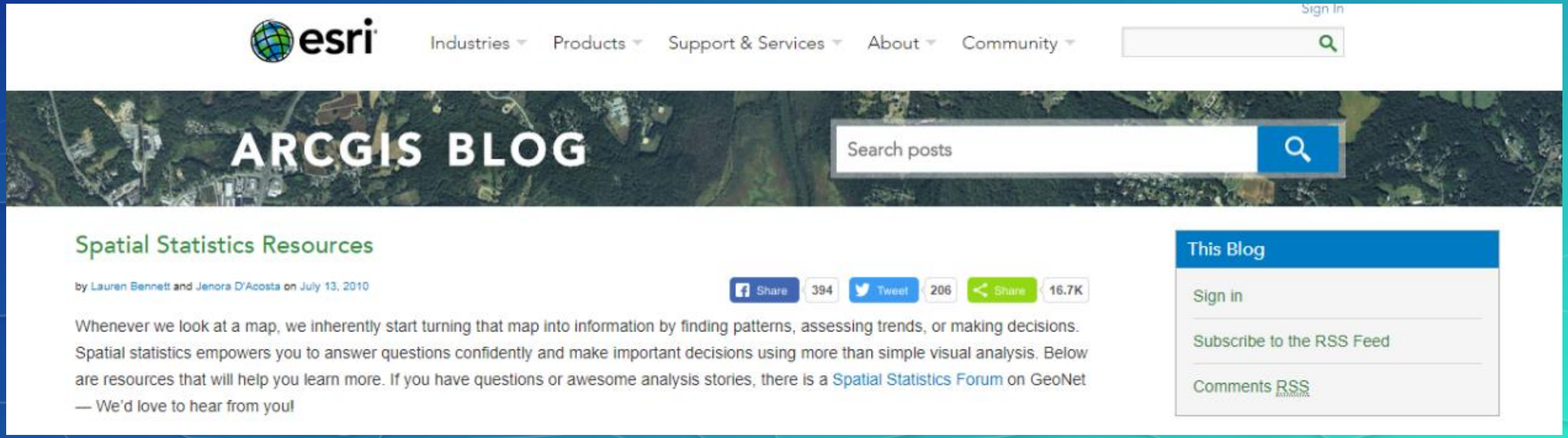


Cartography.

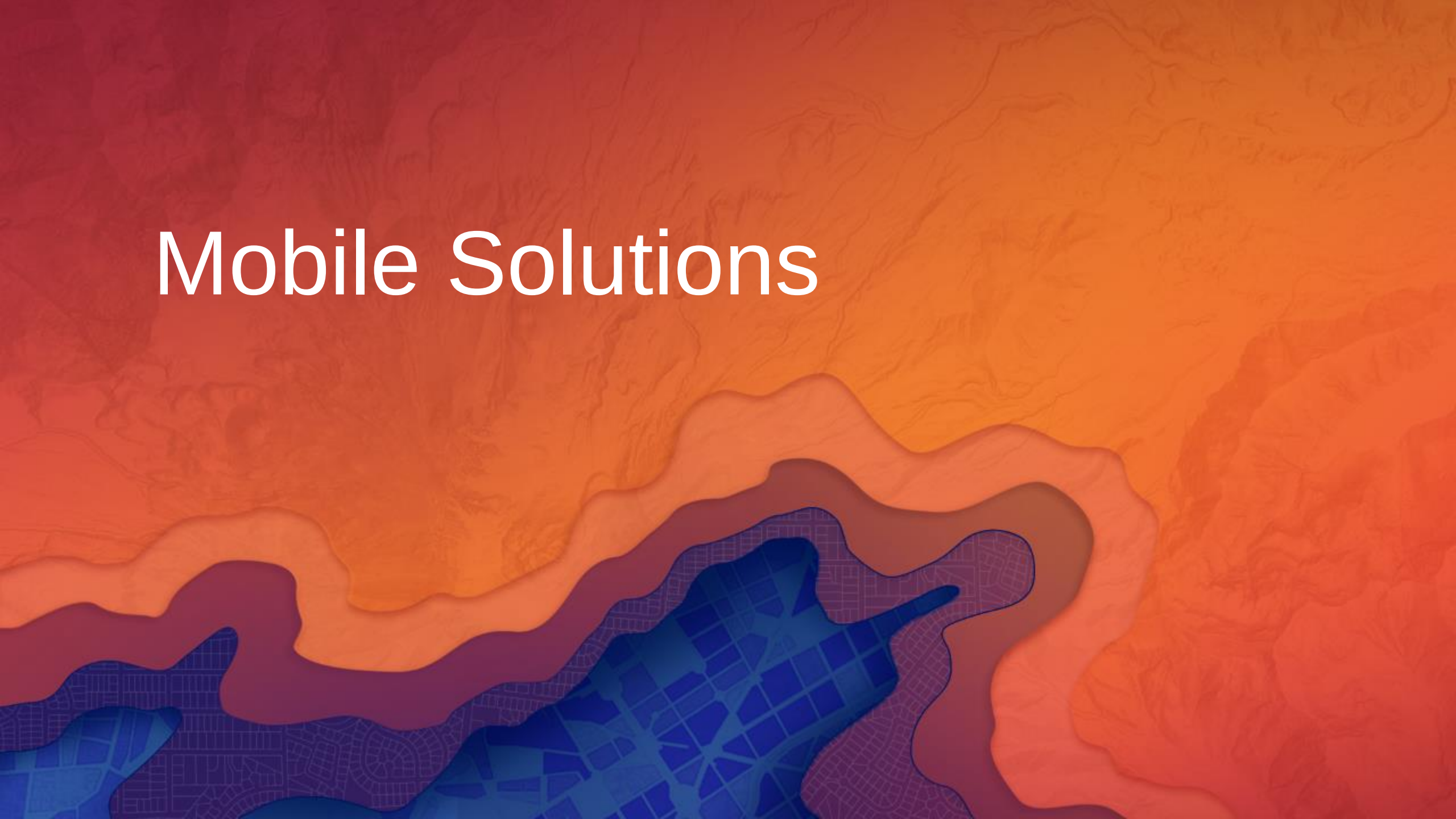
Become a smarter mapmaker.

Other Resources

- Your Esri online training
- Learn.ArcGIS.com
- Spatial Statistics Resources



Mobile Solutions



Why It’s Trending

Increased

- Productivity
- Customer satisfaction
- Data accuracy
- Technology flexibility
- Economic responsibility

Decreased

- Turnaround time
- Operating costs
- Unnecessary labor
- Materials waste
- Input errors

A Top Priority

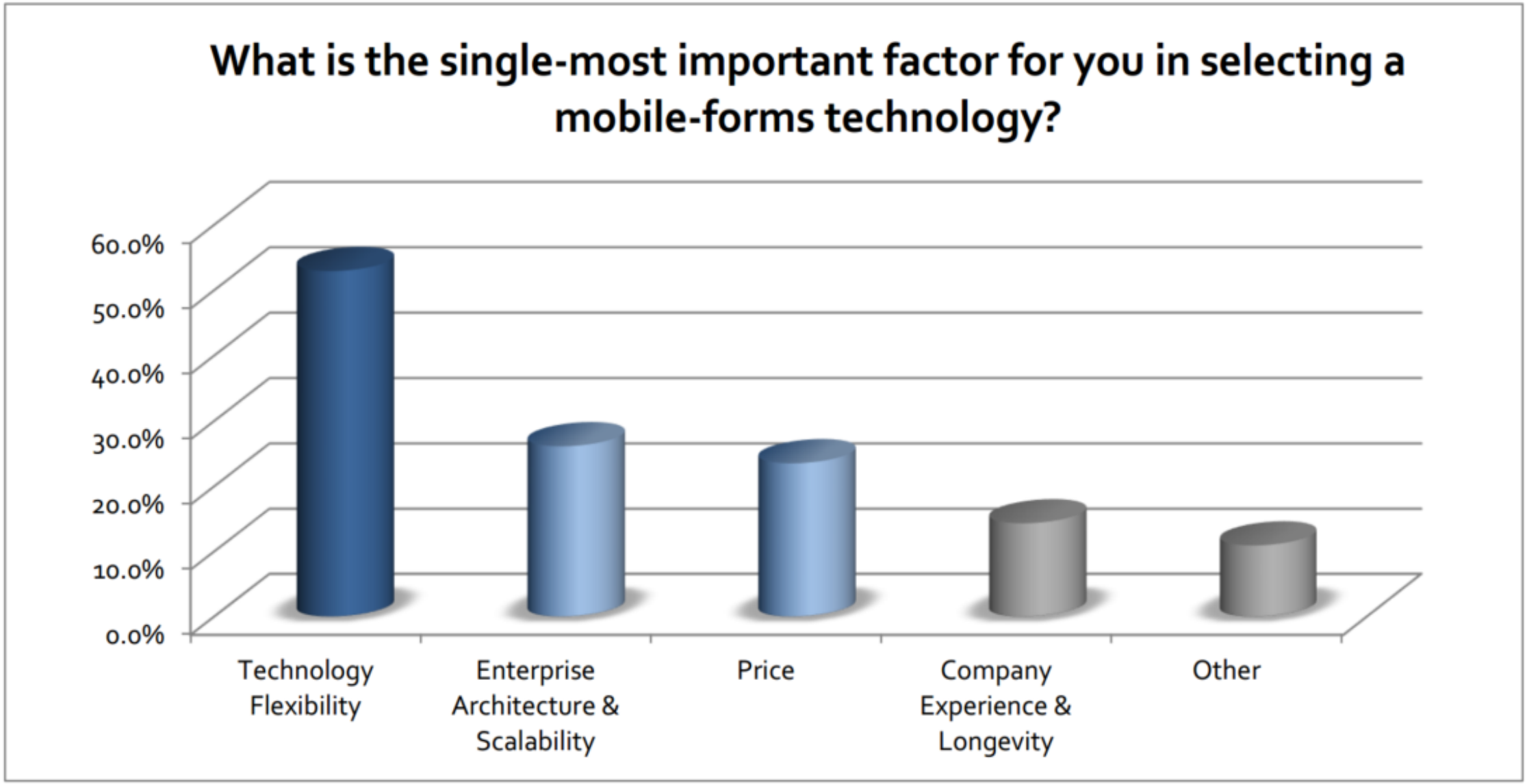
Industries that Benefit from Mobile Data Capture	
Healthcare	Financial Services
Field Inspections	Government
Manufacturing	Real Estate
Education	Publishing
Nonprofit	Insurance

Looking Forward

Gartner forecasts:

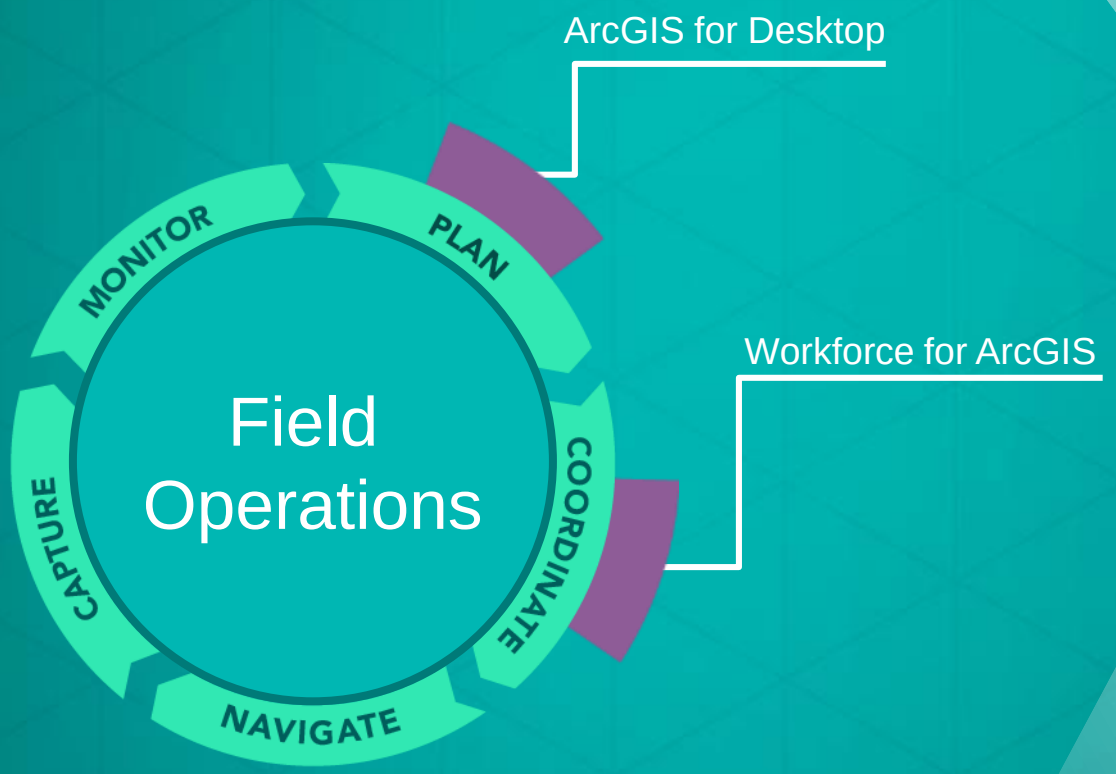
- Field worker mobility will increase
- The workforce will be 40%-50% mobile
- >66% of mobile workers will have a smartphone
- The rate of mobile devices is growing faster than the rate of PCs

2016 Forecast: Mobile trends that will impact field workers, 12/15/16 blog by Chris Ramey


What is the single-most important factor for you in selecting a mobile-forms technology?
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Technology Flexibility
Enterprise Architecture & Scalability
Price
Company Experience & Longevity
Other


MONITOR
PLAN
COORDINATE
NAVIGATE
CAPTURE
Field Operations

Workforce for ArcGIS



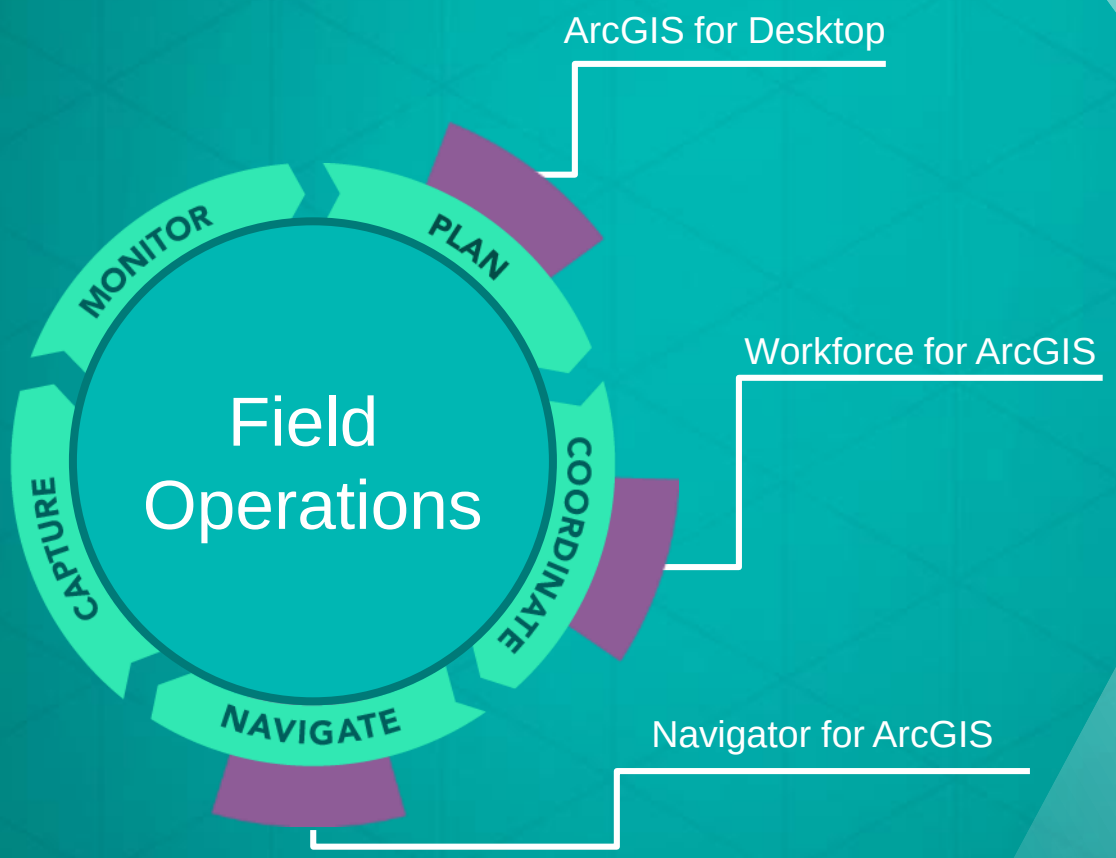
Dispatcher
Assigns Work

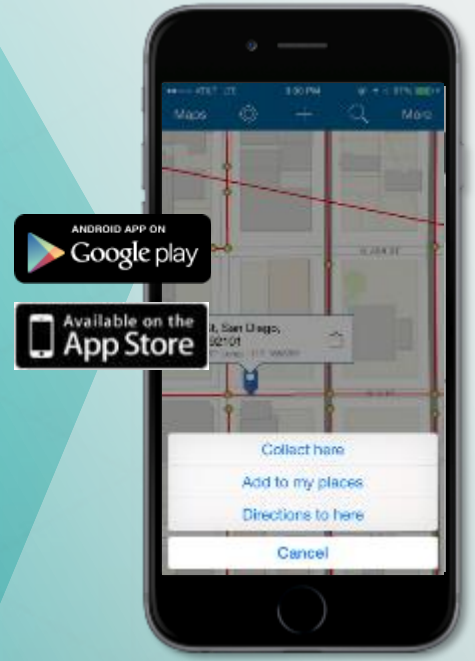
Field Workers
Receive Assignments

Work as a Team

Now in Beta

Navigator for ArcGIS





App-Link API

Your Own Maps

Collector for ArcGIS

Map Centric Data Collection

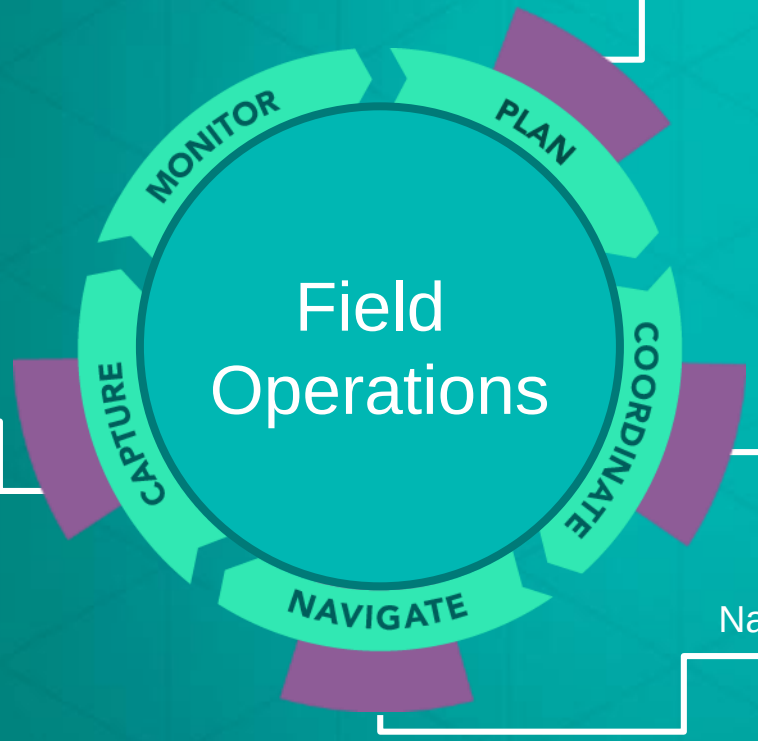
Windows Support

High Precision

Survey123 for ArcGIS

Survey123 for ArcGIS

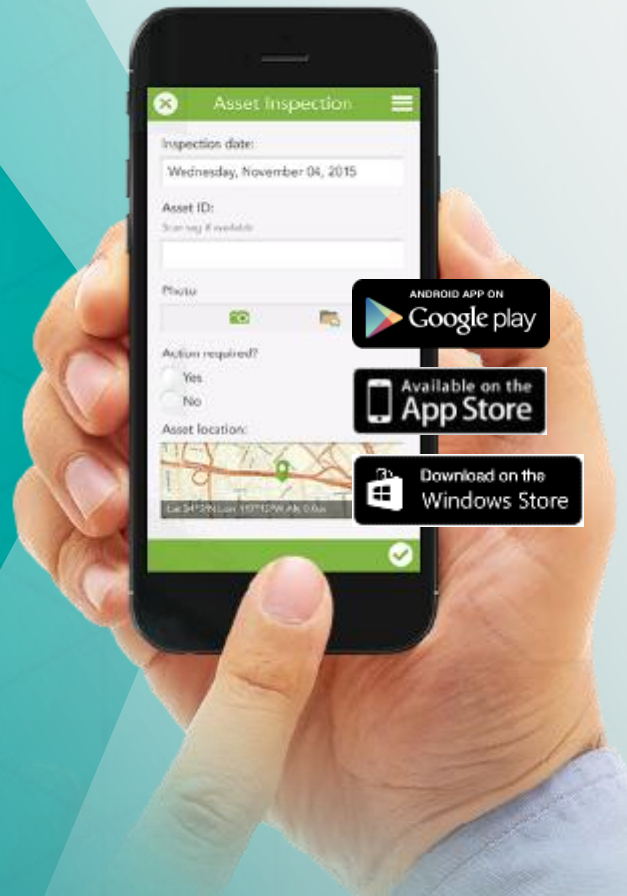
Collector for ArcGIS



ArcGIS for Desktop

Workforce for ArcGIS

Navigator for ArcGIS

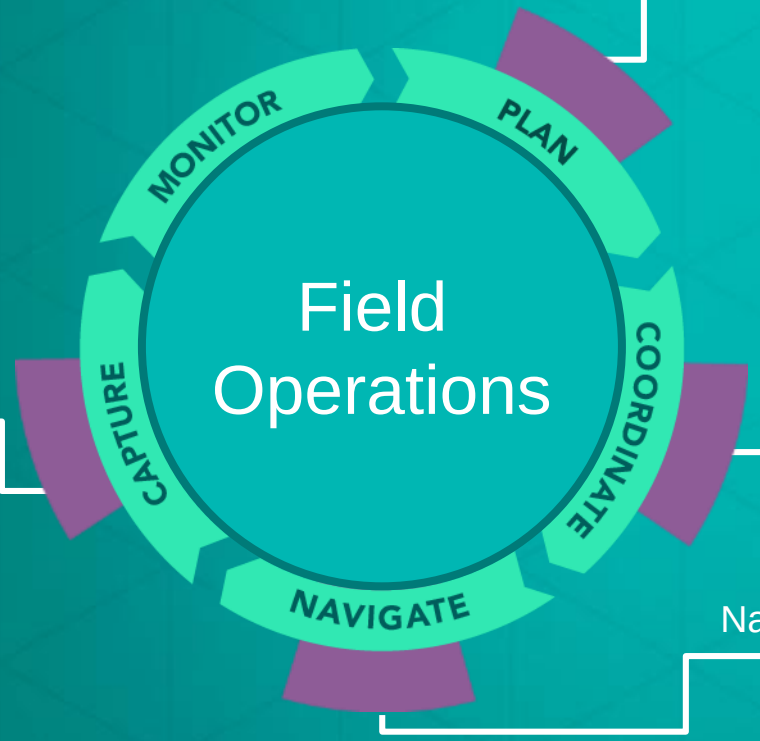


Smart Forms

Now in Beta

Source Code Available

Drone2Map for ArcGIS



ArcGIS for Desktop

Workforce for ArcGIS

Navigator for ArcGIS

Drone2Map for ArcGIS

Survey123 for ArcGIS

Collector for ArcGIS

2D Imagery, Point Clouds,

3D Meshes

Now in Beta

Operations Dashboard

Operations Dashboard

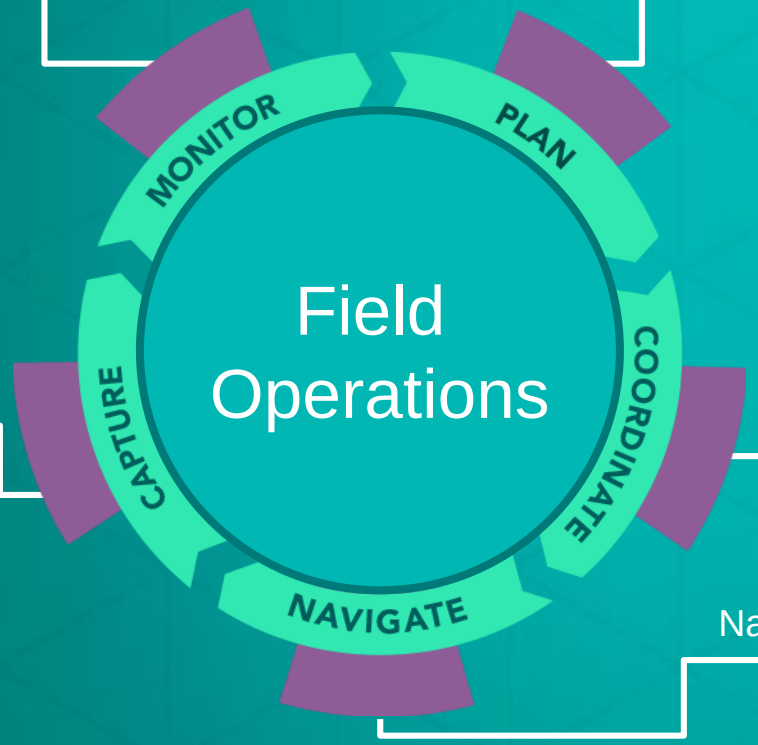
ArcGIS for Desktop

Drone2Map for ArcGIS

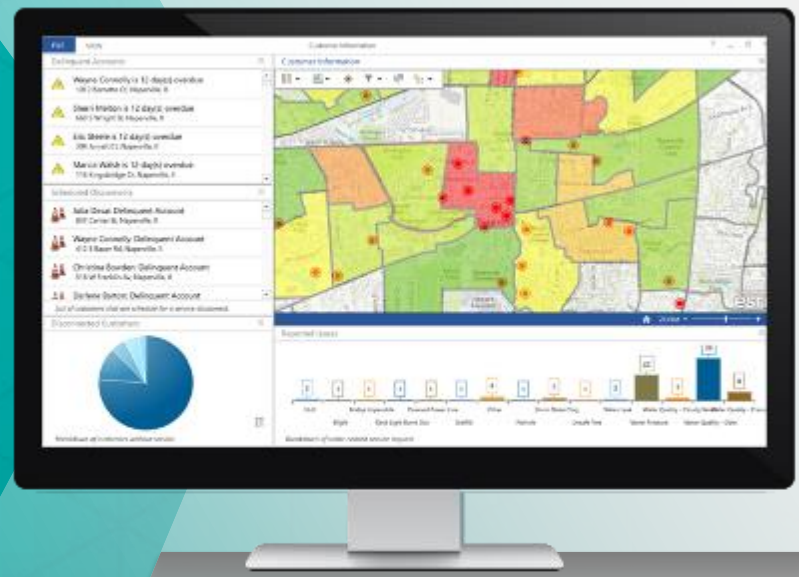
Survey123 for ArcGIS

Collector for ArcGIS

Workforce for ArcGIS



Navigator for ArcGIS



Real-Time Monitoring

Key Performance Indicators

Next Generation

Use Cases

Homeless Point in Time Counts

Every year the Department of Housing and Urban Development (HUD) requires communities to conduct sheltered counts of people living in emergency shelter or transitional housing. Every other year, HUD requires communities to conduct unsheltered counts of people living in a place unfit for human habitation (such as in an abandoned building or in a park).

Facility Inspections

Food Safety

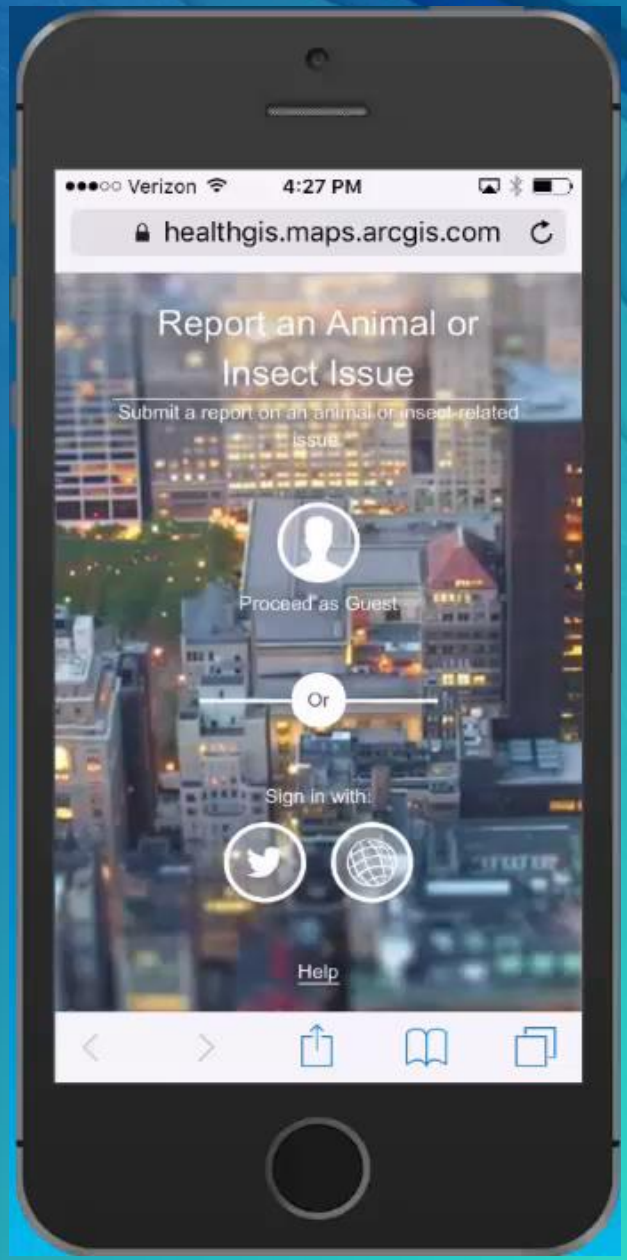
Defeating Polio in Iraq

Post-immunization Campaign Surveys Use Real-Time Data Collection

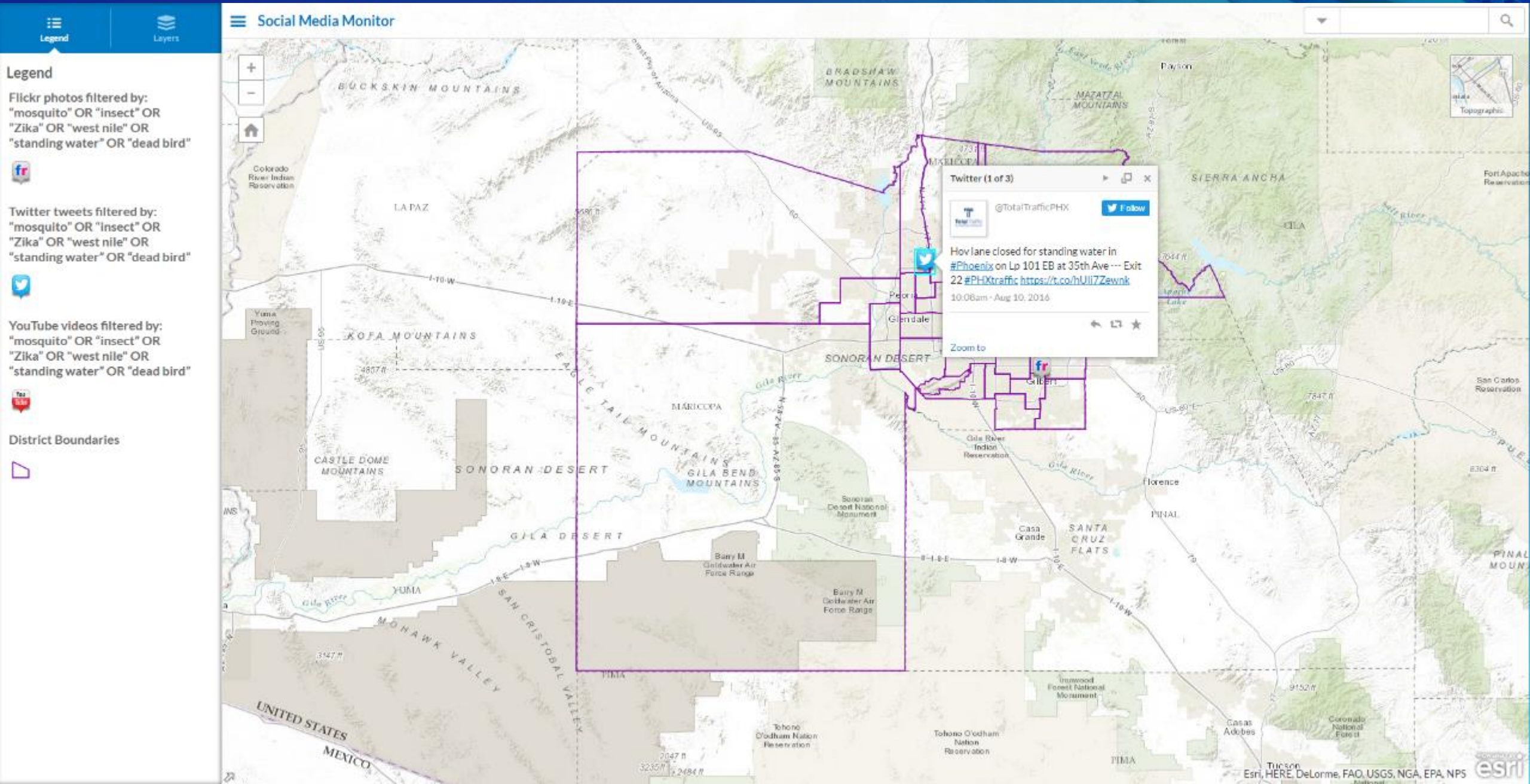
Community Engagement & Participation

Crowdsourcing for Vector Control

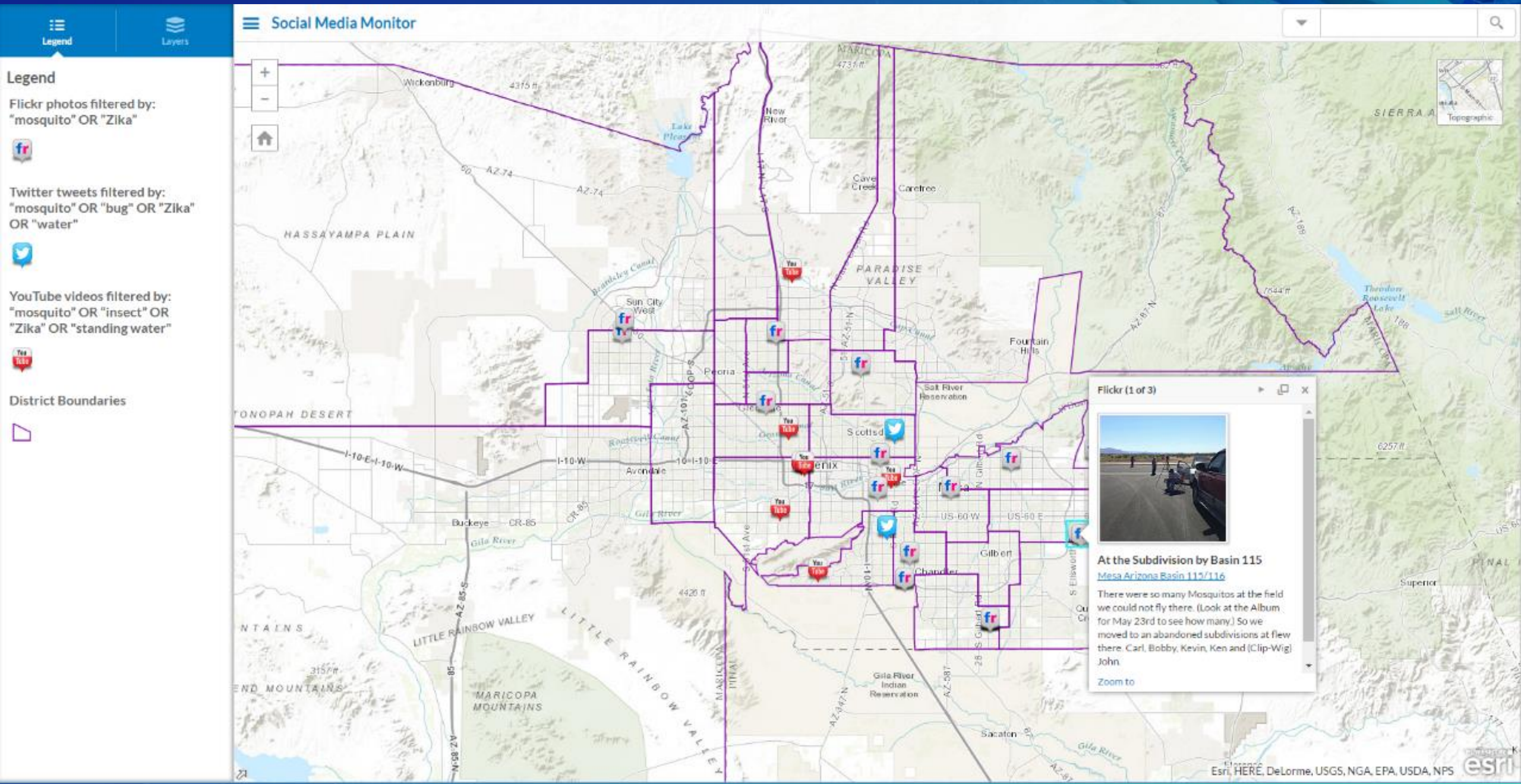
- Any mobile device
- View other reports
- Easily create a report



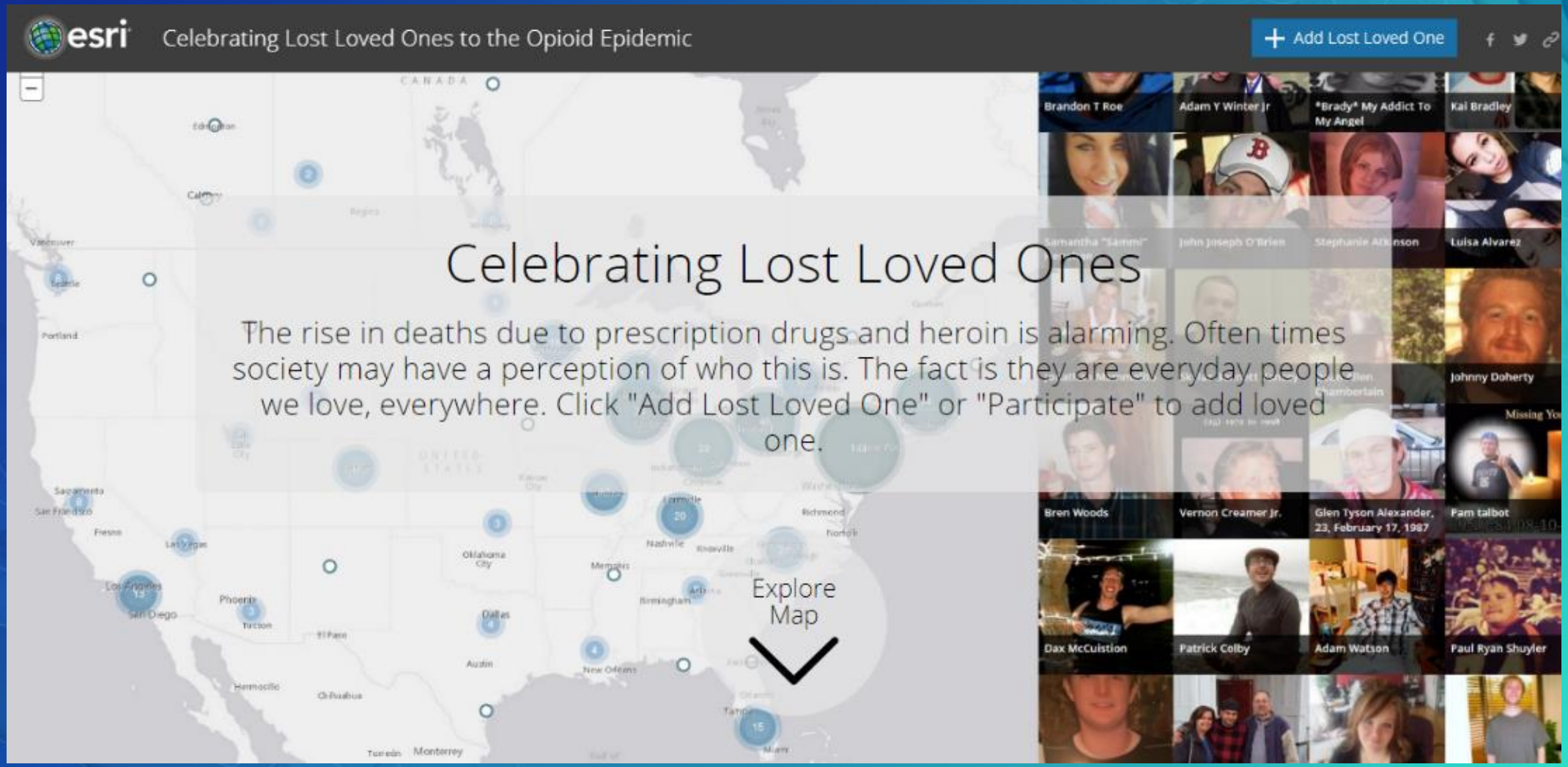
Passive Crowdsourcing through Social Media



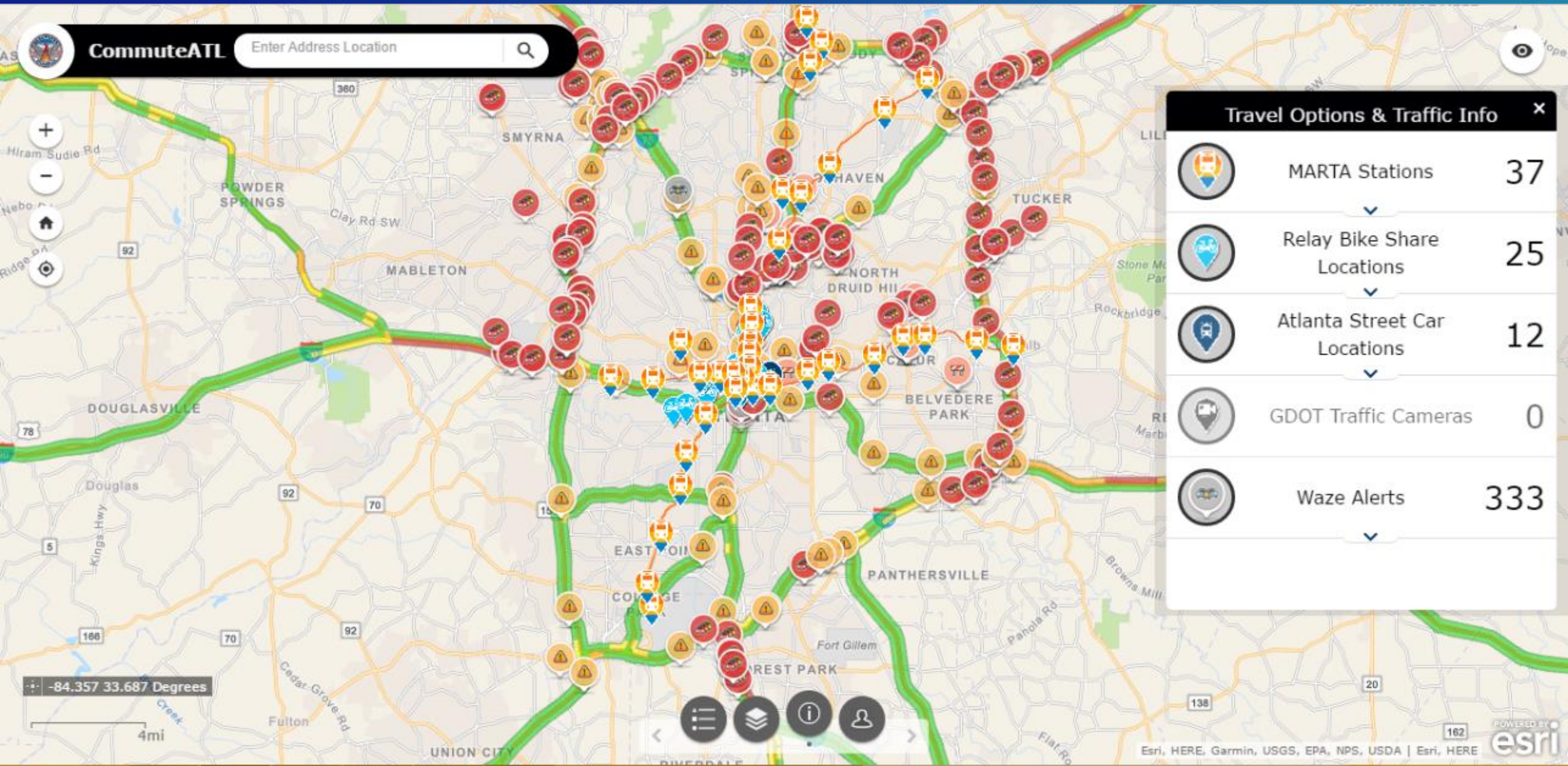
Social Media Monitoring



Supporting Citizens



Crowdsourcing & Data Integration, www.commuteatl.com



Other Trends Worth Noting

Drone Technology

- Situational Awareness
- Search and Rescue
- Transport Medical and Health Supplies
  - Blood Products
  - Vaccines
  - Food, Water
  - Lab Samples, Medicines
- Defibrillate

Royal Netherlands Army

And also watch for….

- Virtual and Augmented reality
- Internet of things – and all of the connected medical and health oriented devices we use (like wearable fitness monitors)
- Artificial intelligence
- Business operations

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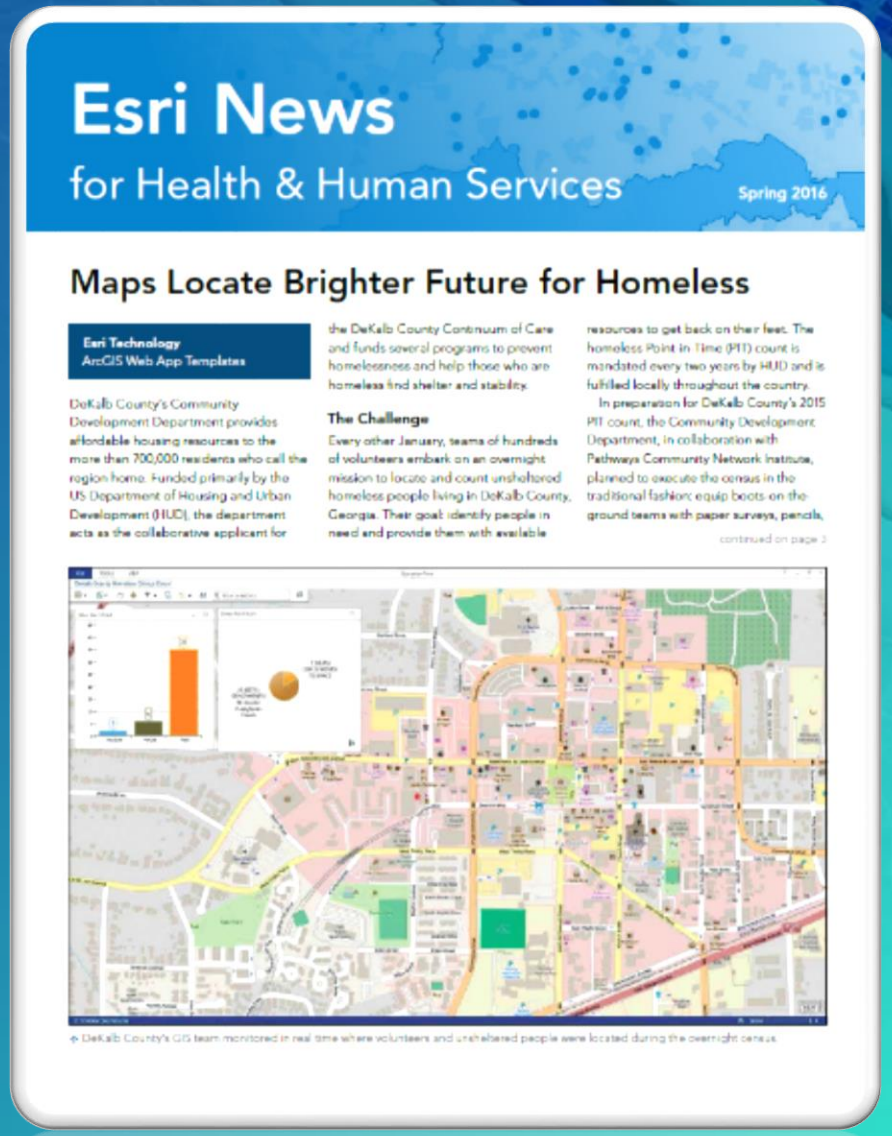

Esri News
for Health & Human Services
Spring 2016

Maps Locate Brighter Future for Homeless

Esri Technology
ArcGIS Web App Templates

DeKalb County's Community Development Department provides affordable housing resources to the more than 700,000 residents who call the region home. Funded primarily by the US Department of Housing and Urban Development (HUD), the department acts as the collaborative applicant for the DeKalb County Continuum of Care and funds several programs to prevent homelessness and help those who are homeless find shelter and stability.

The Challenge

Every other January, teams of hundreds of volunteers embark on an overnight mission to locate and count unsheltered homeless people living in DeKalb County, Georgia. Their goal: identify people in need and provide them with available resources to get back on their feet. The homeless Point in Time (PIT) count is mandated every two years by HUD and is fulfilled locally throughout the country.

In preparation for DeKalb County's 2015 PIT count, the Community Development Department, in collaboration with Pathways Community Network Institute, planned to execute the census in the traditional fashion: equip boots-on-the-ground teams with paper surveys, pencils,

continued on page 2

DeKalb County's GIS team monitored in real time where volunteers and unsheltered people were located during the overnight census.