



Los Angeles County
Enterprise GIS

GIS, Location Data, Imagery and Machine Learning

Applications and Opportunities using Geospatial
Information in Local Government

Steven J. Steinberg, Ph.D., MPA, GISP
Geographic Information Officer
County of Los Angeles, California

GIS, Location Data, Imagery and Machine Learning:

Applications and Opportunities using Geospatial Information in Local Government

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ACM Orange County - 21 July 2021

Consolidated list of links from presentation:

- Countywide Addressing: <https://cams-lacounty.hub.arcgis.com/>
- COVID-19 Public Applications: <https://covid19.lacounty.gov/dashboards>
- Public WiFi Locator: findwifi.lacounty.gov
- LARIAC: <https://lariac-lacounty.hub.arcgis.com/>
- Open Data Portal: <https://data.lacounty.gov/>
- GIS Data Portal and Apps: <http://gis.lacounty.gov/>
- Homeless Initiative StoryMap: <https://storymaps.arcgis.com/stories/400d7b75f18747c4ae1ad22d662781a3>
- Delete the Divide: <https://www.deletethedivide.org>
- Books:
 - [GIS Research Methods](#) (2015)
 - [Resilient Communities across Geographies](#) (2021)



You've heard about me, what about you?

What sector do you work in?

- Private Industry - Software
- Private Industry - Hardware
- Academia
- Government
- Non-Profit
- Other





Presentation Overview

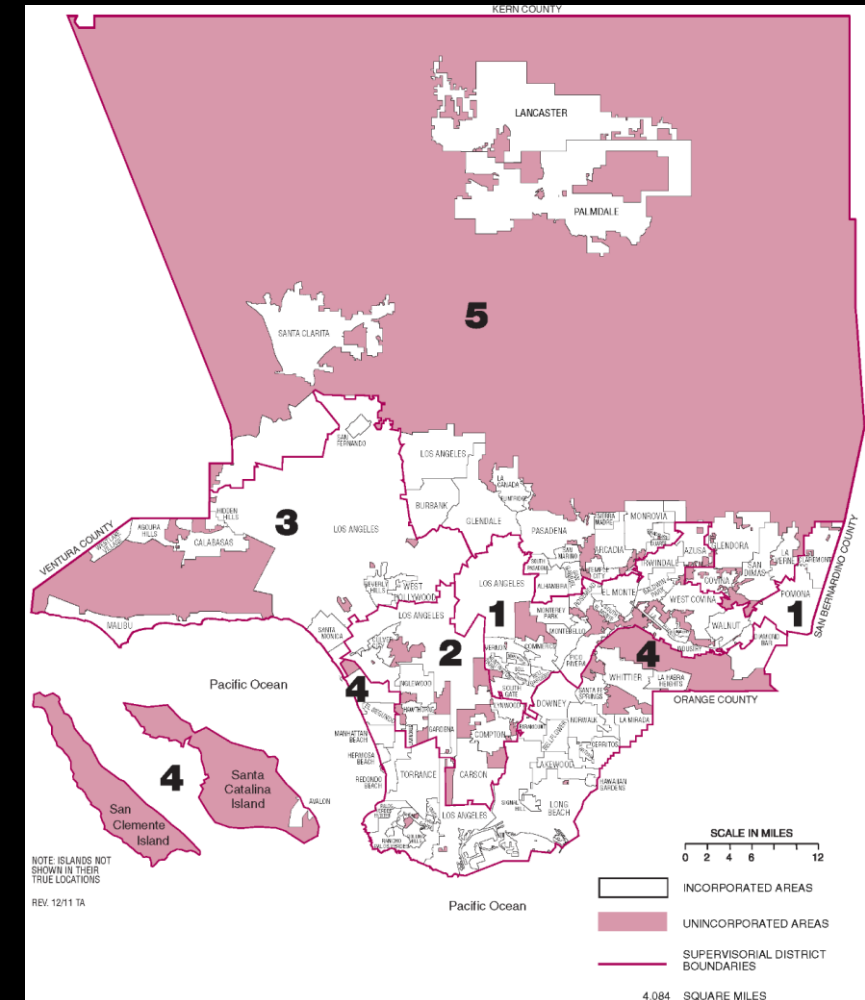
- Los Angeles County Background
- Why and how local government uses spatial information
- Geospatial data and use cases
 - Ground-based data
 - Aerial imagery
- Leveraging and supporting government use of spatial data
 - Sharing data (Open Data Portals)
 - Where we need help (in partnerships, and/or from industry/academia, or on your own)





Los Angeles County Snapshot

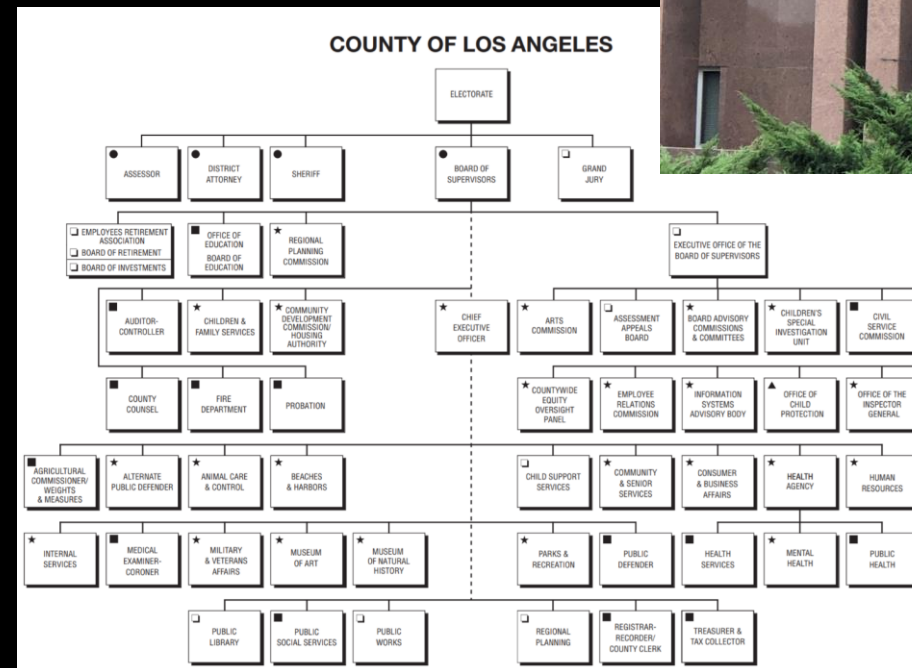
- Population of over ~10 million residents.
 - Largest county, **by population**.
 - If it were a state, would be one of the 10 largest.
- Land area of over 4000 square miles.
 - Over 65 % of this area is unincorporated.
- County is responsible for all government services in unincorporated areas.
 - County provides contract services to more than 50 cities.





The county is **big** and **complex**!

- **37** County Departments; **~200** committees & commissions; over 500 school, sanitation and water districts.
- **~110,000** employees.
- **> 4,000** public buildings.
- **~63,000 acres** of parks, natural areas, and gardens.
- 2021-2022 operating budget **> \$36 Billion**.





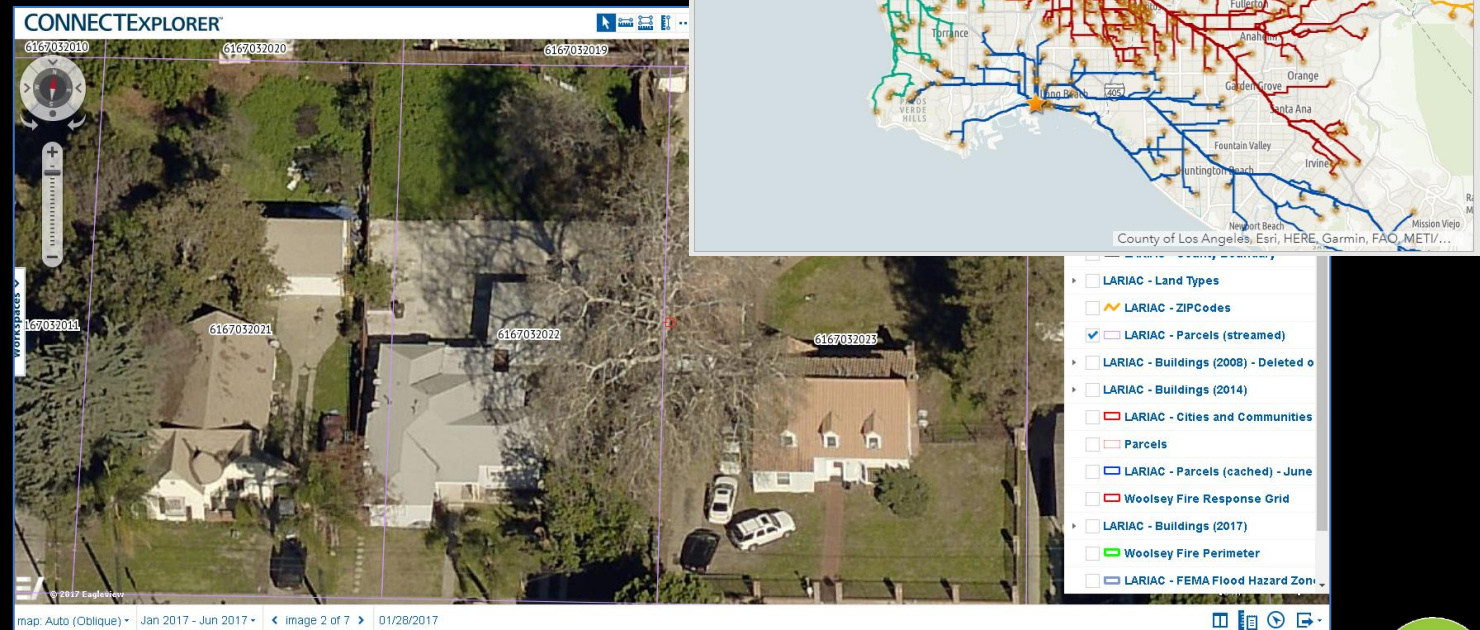
A GIO is different than a CIO

- Serve as an advocate for geospatial methods, applications, and tools.
 - Direct the county-wide geospatial strategy and vision.
 - Guide innovation around geospatial applications and opportunities.
 - Coordinate geospatial needs of county departments.



LA County Enterprise GIS

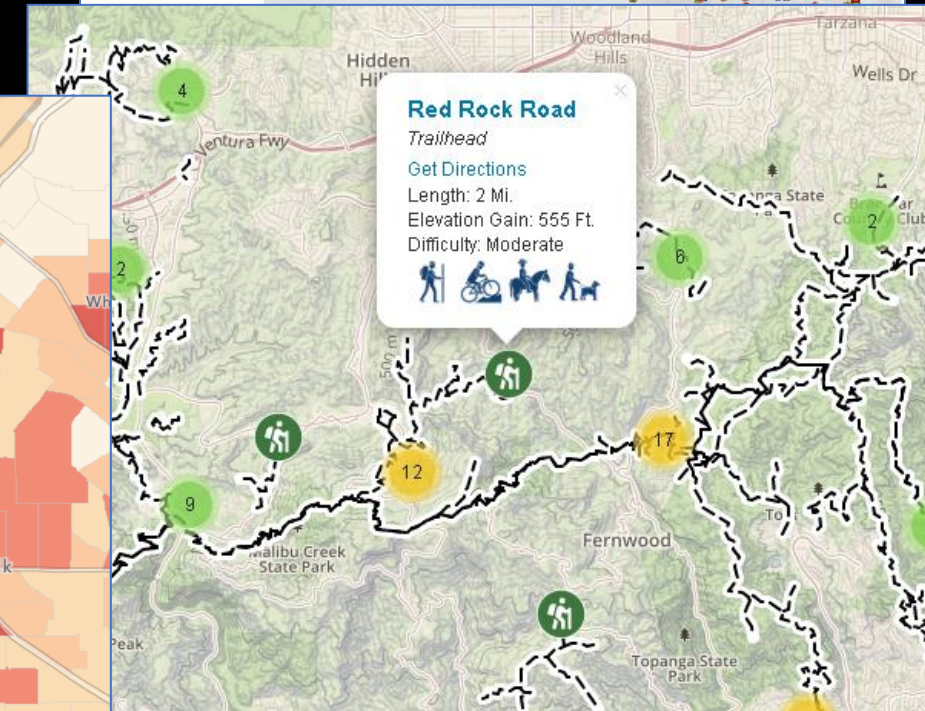
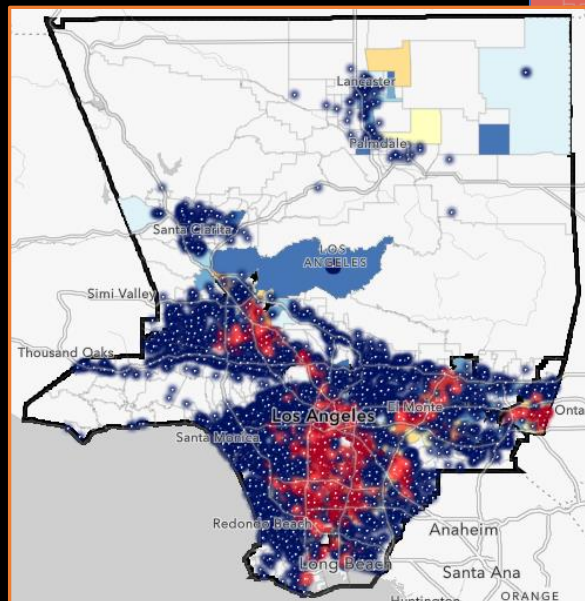
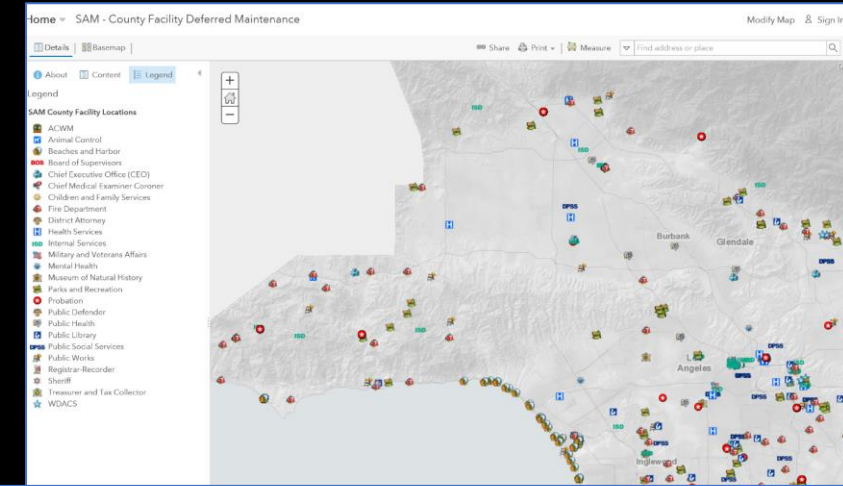
- Provides for centralized, efficient service provision
 - Common/shared infrastructure, software, workflows, and data
- Many functions have migrated from the field to the desktop (esp. during COVID-19).
- Those that must be field based can be better optimized.





Why does government care about maps?

- Service provision (parks, clinics, schools, grants and funding, etc.)
- Public Participation (e.g., voting, census, community meetings...)
- Tax and fee assessments
- And much more...





The business of government **IS** location-based.

- This includes location-based information from a variety of sources.
 - Databases, imagery, etc.
- Some of these data are collected explicitly with mapping and spatial analysis in mind.
- Many of these data are not, but still *include* location in some form
 - APN, address, jurisdictional area, service area, facility name, census block, etc...





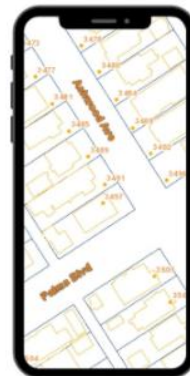
Addressing (CAMS)

What is the Countywide Address Management System (CAMS)?

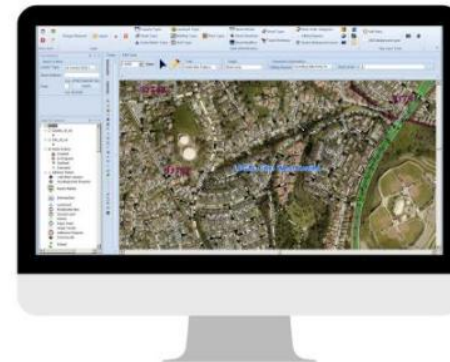
Los Angeles County established the Countywide Address Management System (CAMS) as a centralized repository of authoritative physical (situs) addresses. The Internal Services Department (ISD) Enterprise GIS Program (eGIS) manages and maintains the infrastructure behind the successful program. CAMS is critical for effectively providing services used by many departments in Los Angeles County. When used in tandem with other essential County data systems, CAMS helps support the health, safety and welfare of those who live and work in the County of Los Angeles.

CAMS includes three component parts Data, Applications, and GeoSearch functionality.

CAMS Data



CAMS Applications



CAMS GeoSearch



<https://cams-lacounty.hub.arcgis.com/>

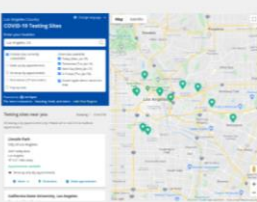
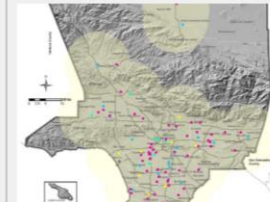
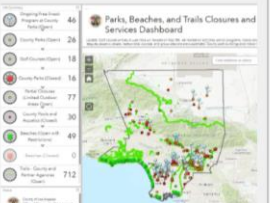
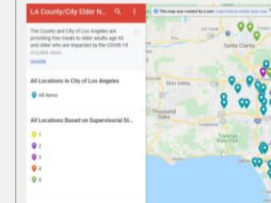
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COVID-19 Public Applications

 Los Angeles County Free COVID-19 Testing Sites Free COVID-19 Testing Sites in Los Angeles County. Find a testing site near you. View the App	 County of Los Angeles COVID-19 Dashboard Application by County Department of Public Health providing case counts and rates by community. View the Site	 County of Los Angeles COVID-19 Community Testing Dashboard Dashboard providing Los Angeles County Community Testing information, updated weekly. View the Page	 Food Resources for Los Angeles County COVID-19 Response Important sources of food assistance include: Download this information LA County DPSS: If you have food or cash, we can help you get more. Please apply for CalFresh or other assistance. For more information, please visit www.cdss.ca.gov or call 800-374-2736. Find food resources near you in LA County by exploring the information below View the Site	 County of Los Angeles COVID-19 Local Emergency Proclamations Dashboard Dashboard providing local emergency proclamations for Los Angeles County. View the App
 County of Los Angeles COVID-19 Parks, Beaches, and Trails Closures and Services Dashboard Application providing areas to stay active. View the App	 County of Los Angeles Cooling Centers Stay Cool Find Your Local Cooling Center in LA County View the App	 County of Los Angeles COVID-19 LA City/County Elder Application providing meal information for older adults. View the App		

<https://covid19.lacounty.gov/dashboards>

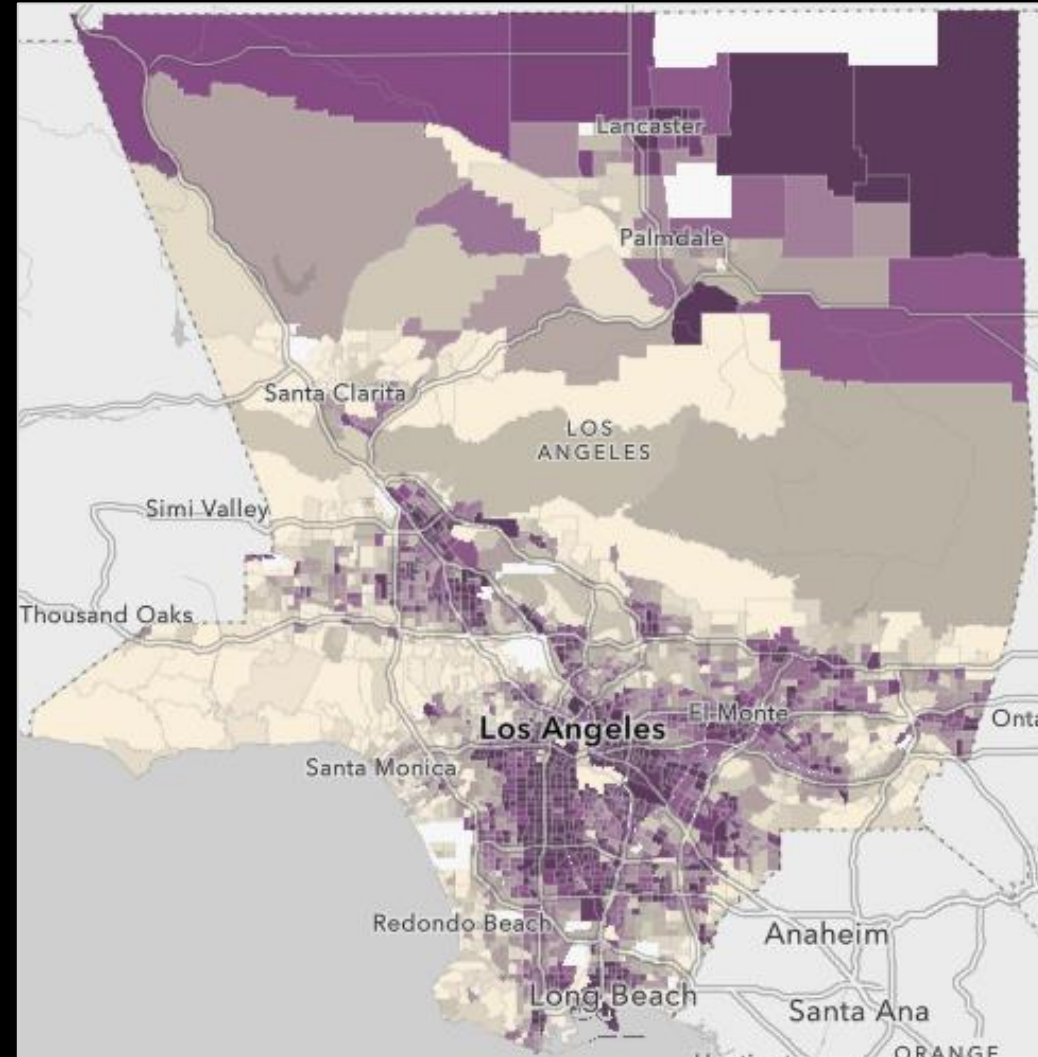
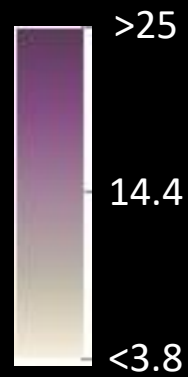
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Deleting the Digital Divide

Percent of Households
with No Internet Access





Public WiFi Locator

LA County Hotspot Locator ...locate wifi near you

About

Welcome to the LA County Hotspot locator

There are three ways to search for WiFi hotspots:

- Enter an address in the search box.
Search for an address or locate on map
- Click on the icon to search based on your current location using GPS in your phone or tablet.
- Select the location pin icon and then click a location on the map
- The initial search distance is 1 mile. You may expand the search radius with the distance slider:
Show results within 1 Miles

Find WiFi

Search for an address or locate on map

Find address or pla

Show results within 1 Miles

0 5

Select filters to apply

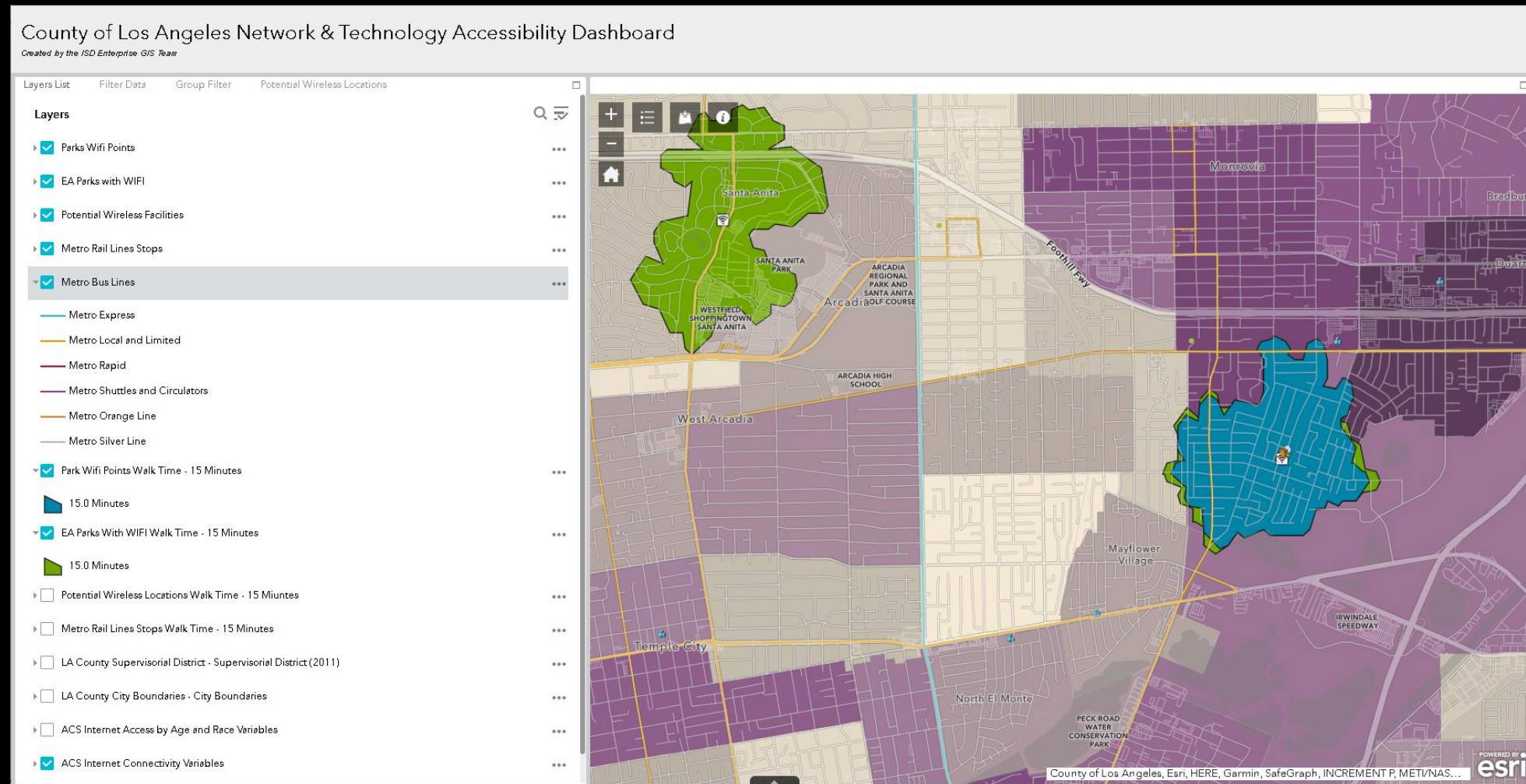
10mi
-117.031 33.919 Degrees

County of Los Angeles, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau





Location Analytics

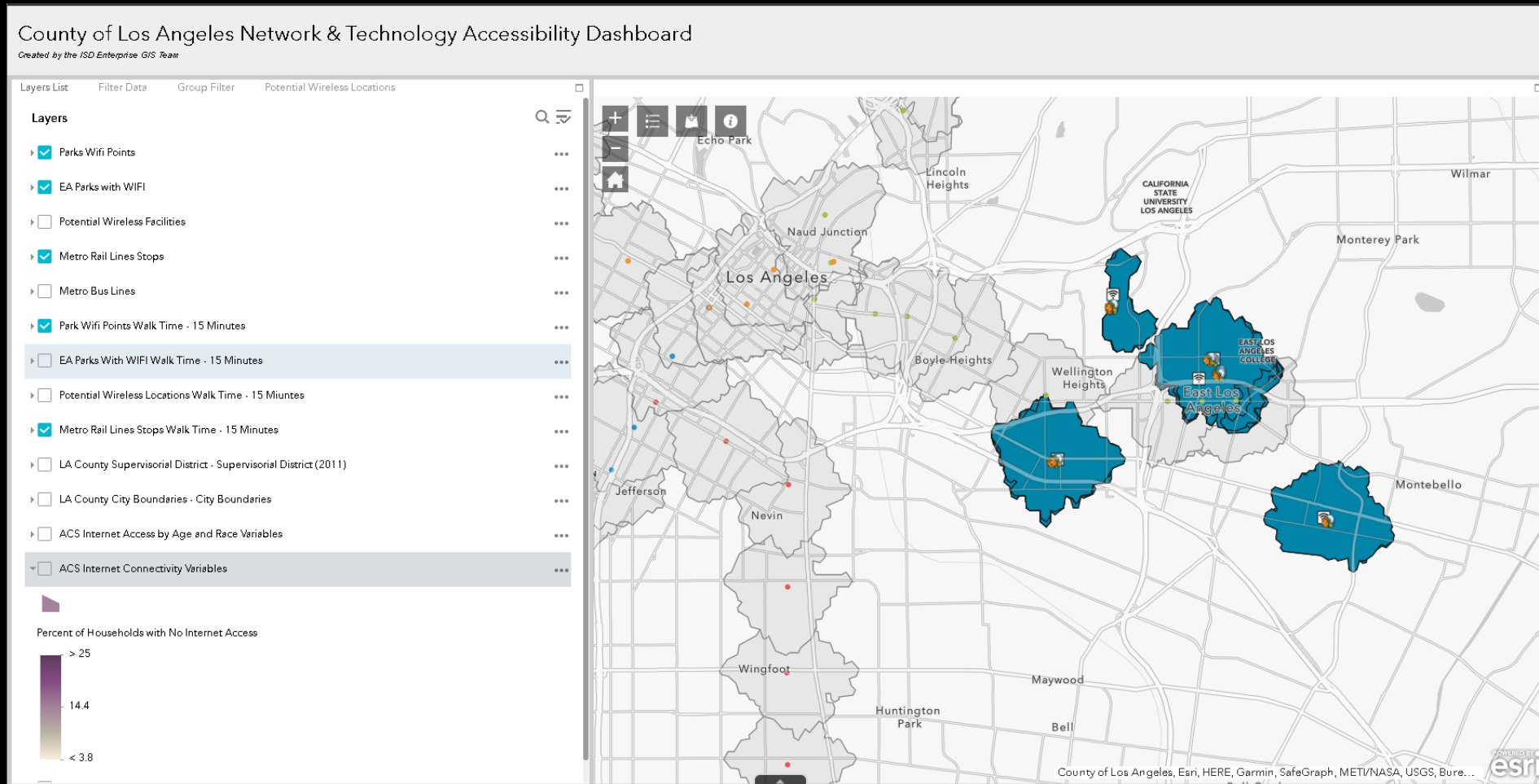


15-minute walk time from parks/libraries with public WiFi (green and blue polygons) to communities with low internet connectivity (darker purple = less connected)





Location Analytics



Intersection of 15-minute walk time from parks/libraries with public WiFi (blue polygons) with Metro stations (grey polygons)





And many, many more uses...

BUT...

...where do these **data** come from?

Geospatial applications

and the answers they provide



are only as good as the data behind them!





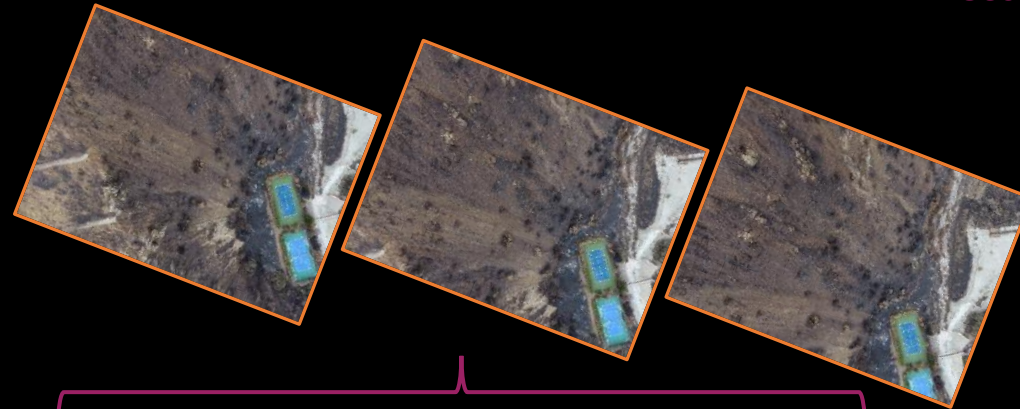
Some data we collect directly

- ▶ Data ingested through regular county business processes
 - ▶ Taxation and property records
 - ▶ Building permits
 - ▶ Business licenses
 - ▶ (New) parcel/street name assignments
 - ▶ County services (Health clinics, Social Services, etc.)
 - ▶ Internal planning/infrastructure data
 - ▶ Field surveys and mapping (e.g., public works, parks, agriculture)
 - ▶ And many more...





UAS mapping



~30 min and 200 of these images give a 3D model.



Woolsey fire
damage assessment
w/ LA County Fire



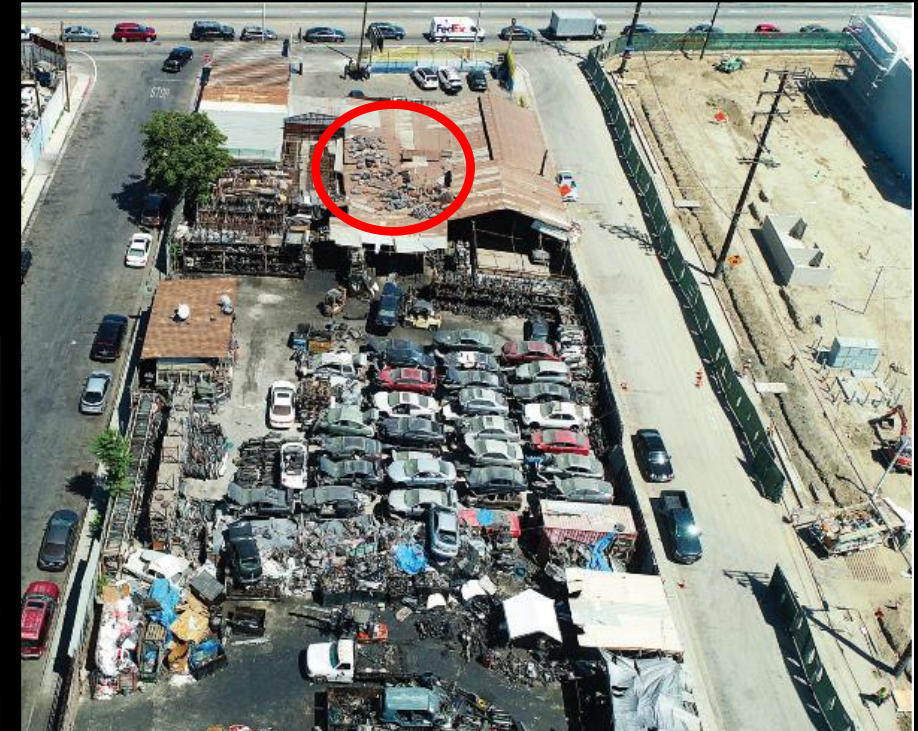
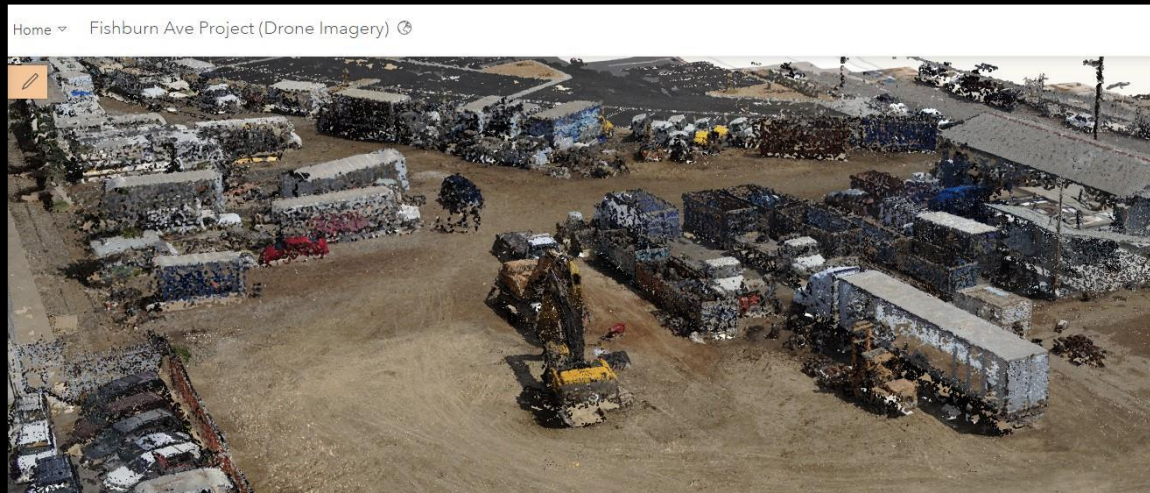
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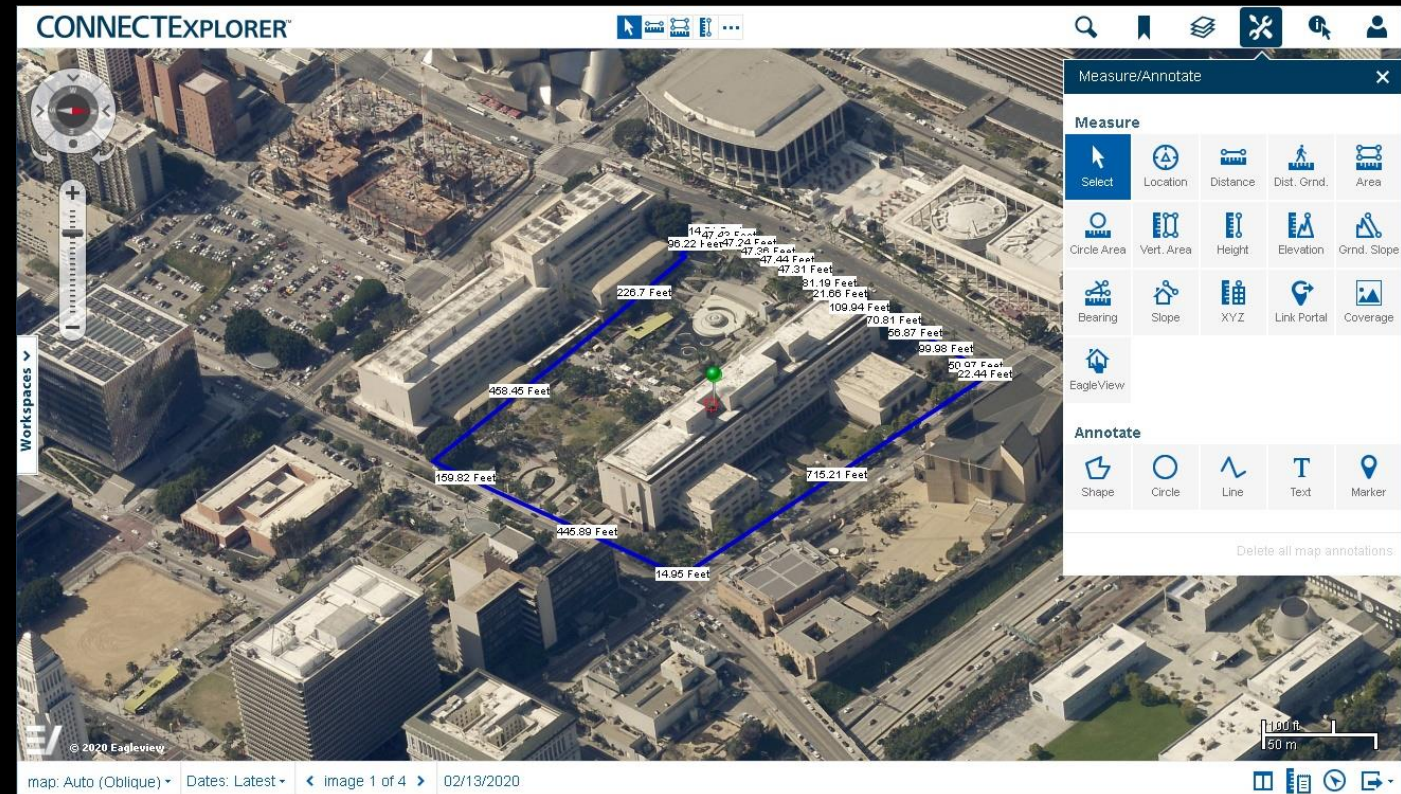


UAS for site inspections

- Useful in a variety of code enforcement applications
 - Permit Inspections
 - Illegal dumping
 - Rooftop equipment
 - Industrial properties
 - Encroachments

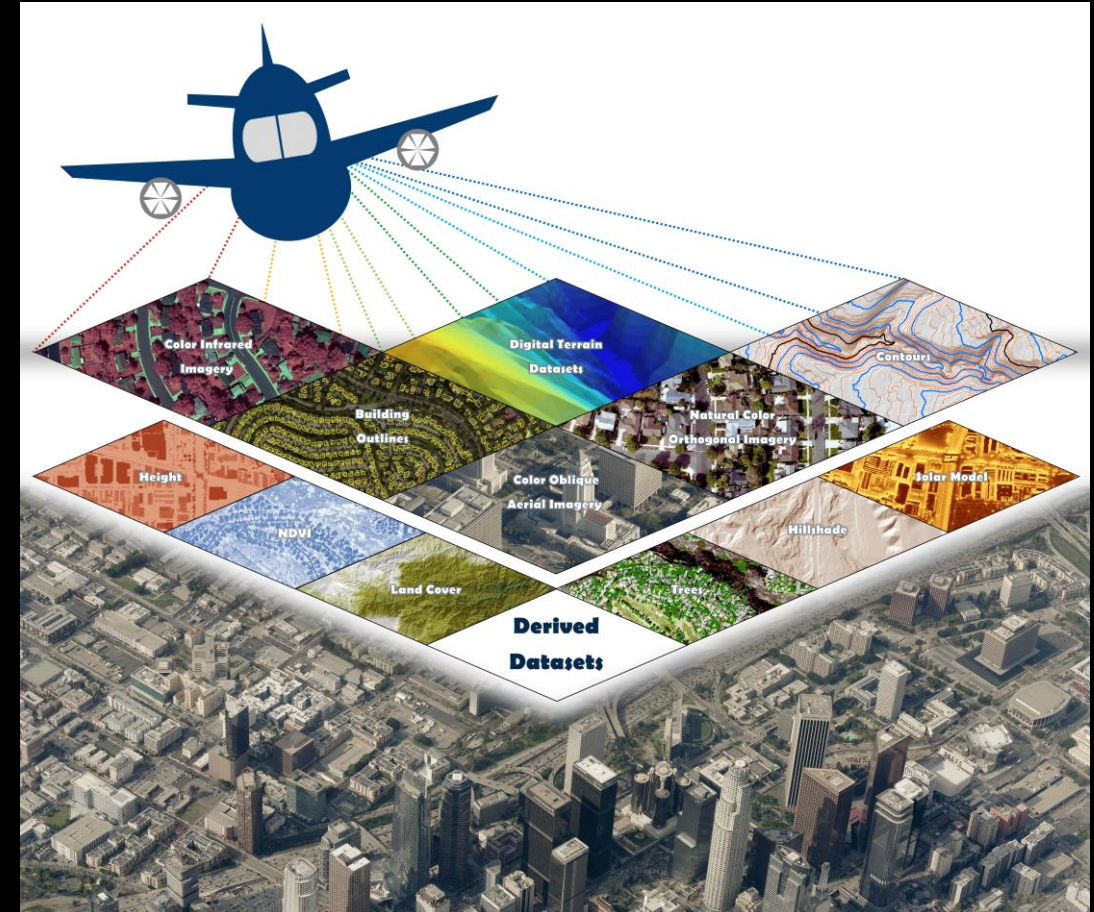


- Local governments have a long history of using aerial imagery





- Established in 2005.
- Each cycle is three years.
 - We're in our 6th cycle (2020-2022)
- Members “buy in” each cycle (typically around 40 members)
- Resources are leveraged and optimized through collaboration
 - 30-40% saving vs. purchase from vendors
 - Overhead cost savings of 60-80%
 - Shared best practices/technical knowledge
 - Consistent dataset across jurisdictions
 - Derived data products



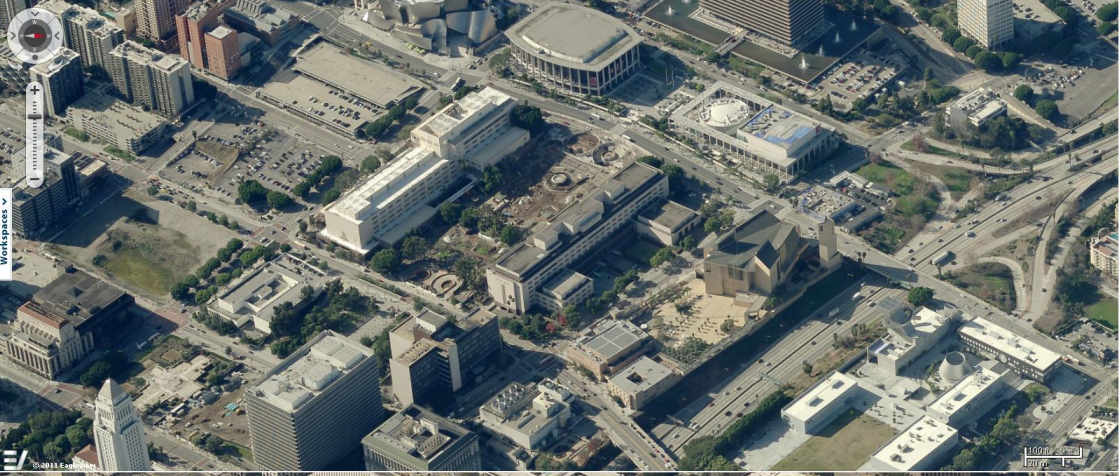
Products

- Topographic mapping (surface model) and 2ft contours
- Building footprints and change (new, modified, replaced) 3yr cycle
- Land cover (once 😞)





January 2003



January 2011



March 2017

Imagery is crucial in change assessment

February 2006



March 2014



February 2020





Bobcat Fire Damage Assessment

Bobcat Fire Post-Disaster Imagery provided by GIC/Vexcel Imaging

Find address or place

1 layer(s) selected

Angeles National Forest

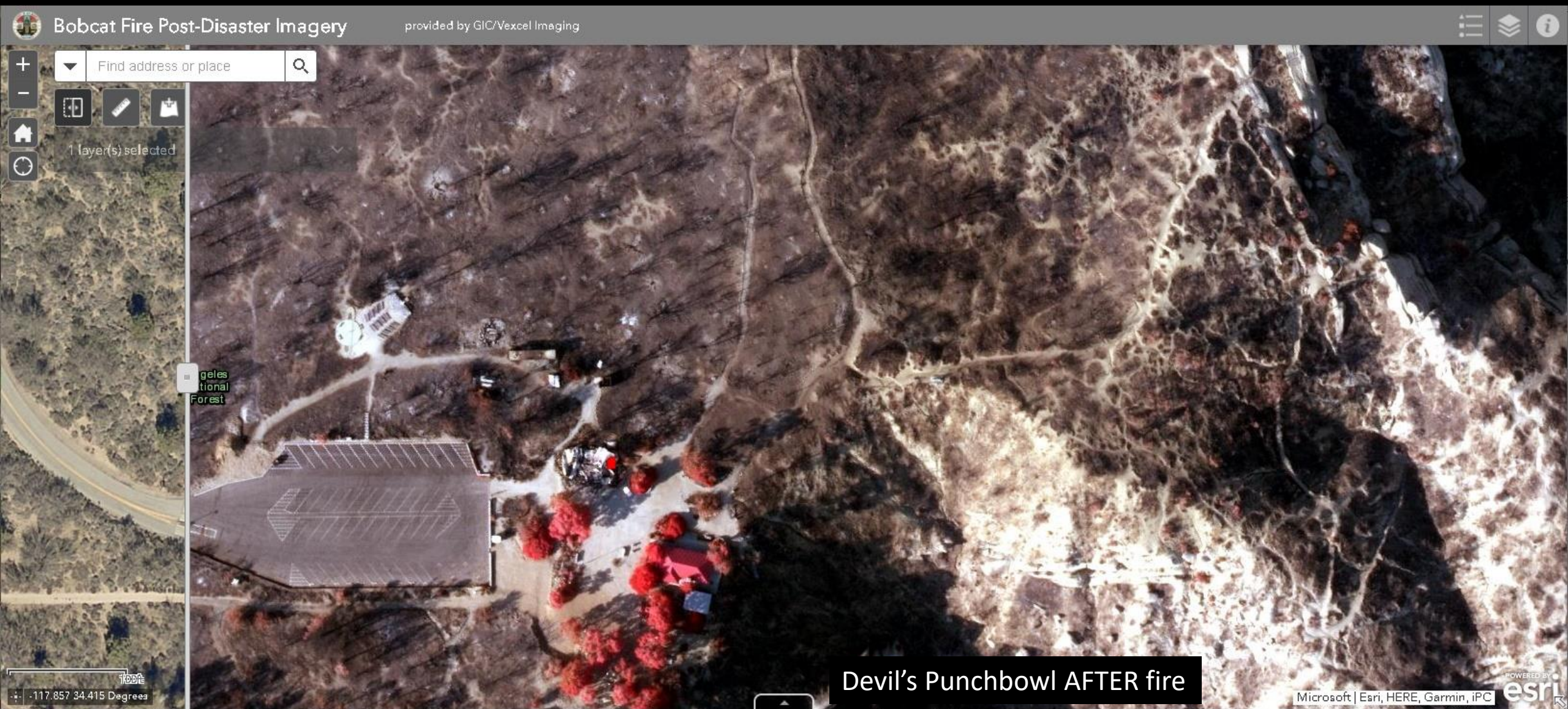
Devil's Punchbowl BEFORE fire

Microsoft | Esri, HERE, Garmin, iPC

esri



Bobcat Fire Damage Assessment



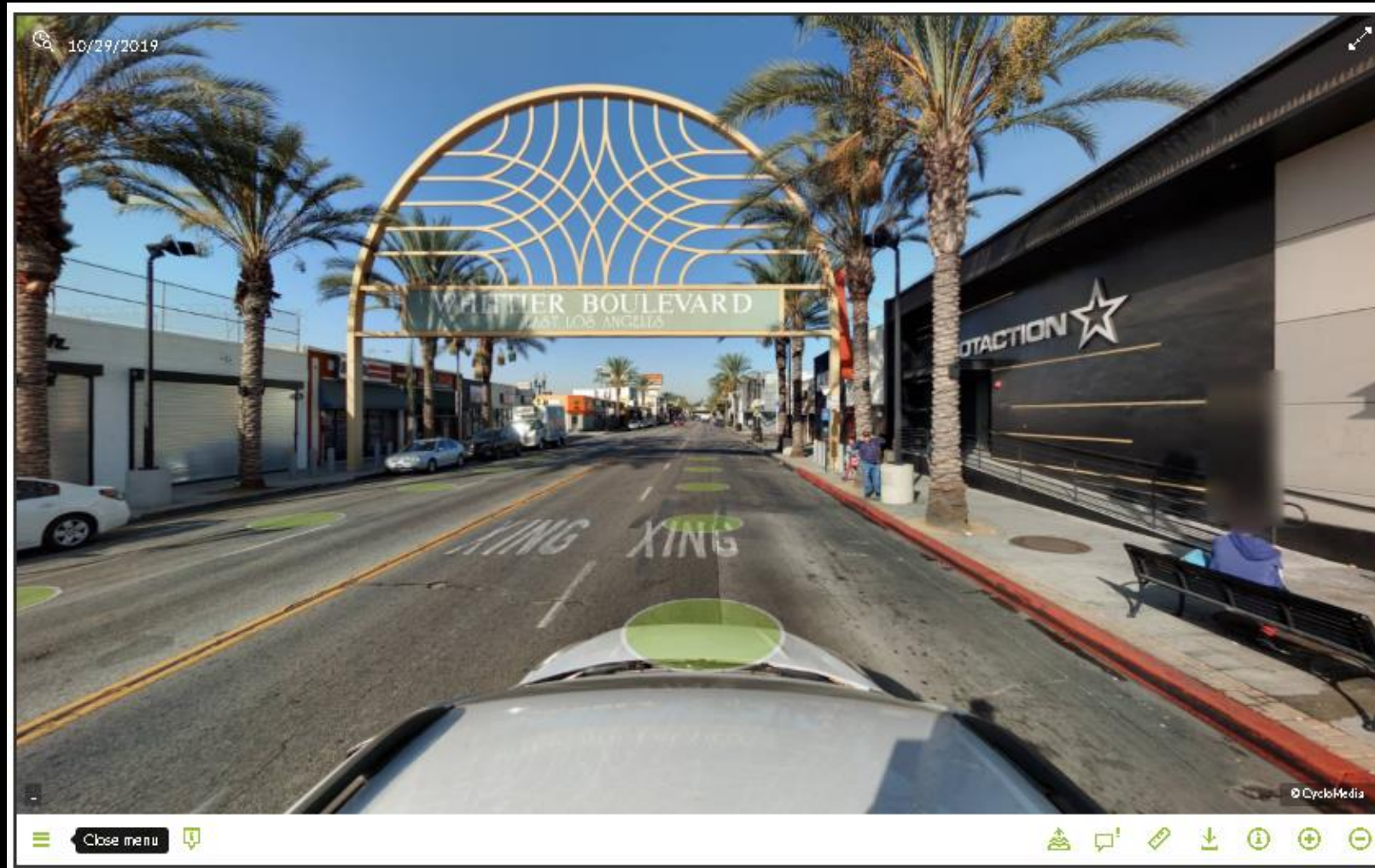


Bobcat Fire Damage





Street-level imagery and LiDAR data





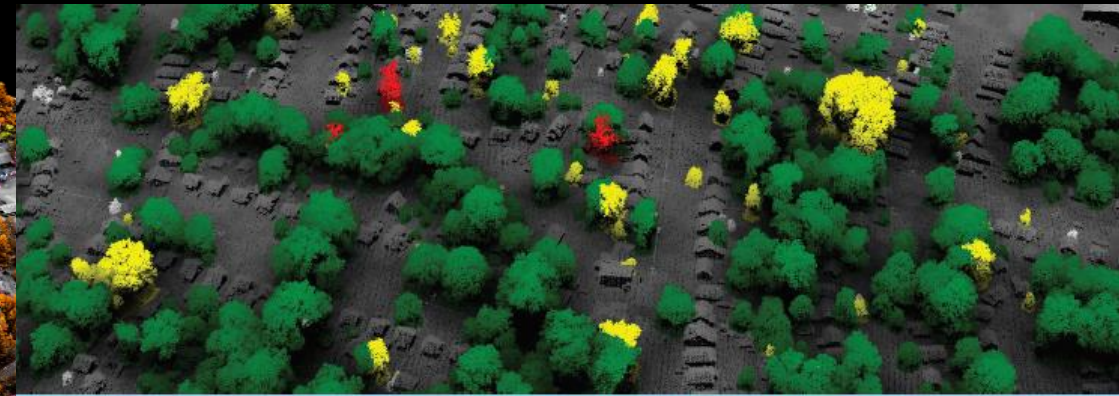
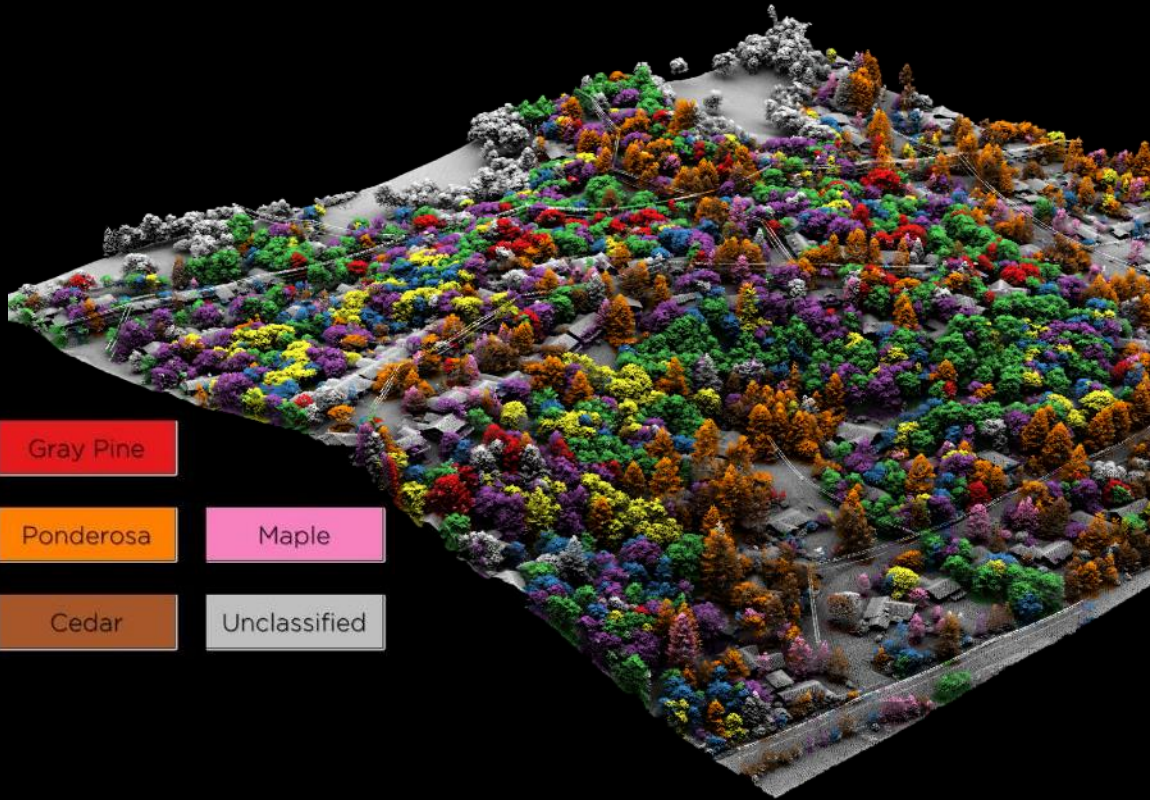
Feature Extractions



- ▶ Assets (signs, lights, manholes, etc.)
- ▶ ADA ramps and clearances
- ▶ Paint markings
- ▶ Pavement, curbs and sidewalks;
- ▶ Street slope and crown
- ▶ Bridge clearances
- ▶ etc...



Our Future Geospatial Data Efforts (Machine Learning/Automation)



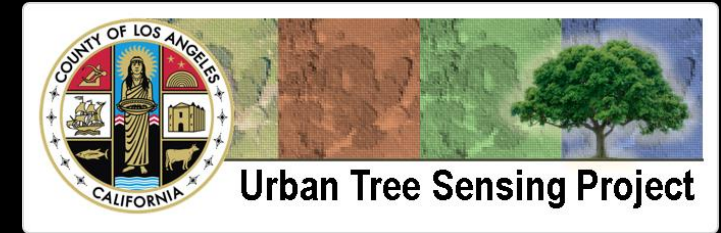
Category	Class Description Interpretation
0	Not Assessed - typically small trees with relatively low canopy area
1	Fair to Healthy - nearly full canopies, potentially some dieback
2	Stressed - dieback and discoloration common
3	Very Stressed - significantly less canopy foliage present, leaves/needles are severely discolored

Emerging use case – how do know our trees?

- Local governments know about their “public trees” (somewhat).
- Data are infrequently updated and expensive to collect.
- We know little to nothing about the rest (majority) of the trees.
- (In concept) we know trees can be mapped using remote sensing.
- Desired information: species, size, and condition.



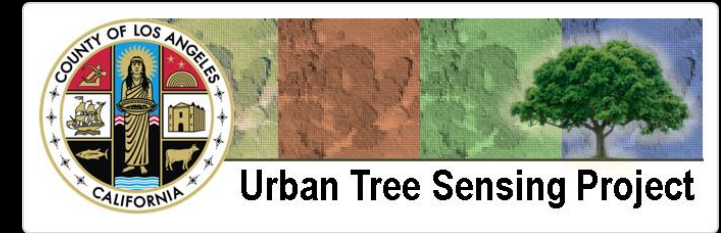
Project Goals



- Identify individual urban tree species from remotely sensed imagery and derive canopy metrics over time across three pilot study sites
 - Using these results, determining a plant's health status becomes a welcomed future application
- Assist stakeholders, who are often burdened with managing urban forest stock manually, to deploy their expertise more efficiently and save time.



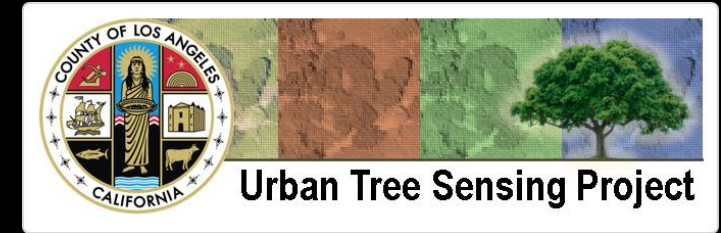
Objectives



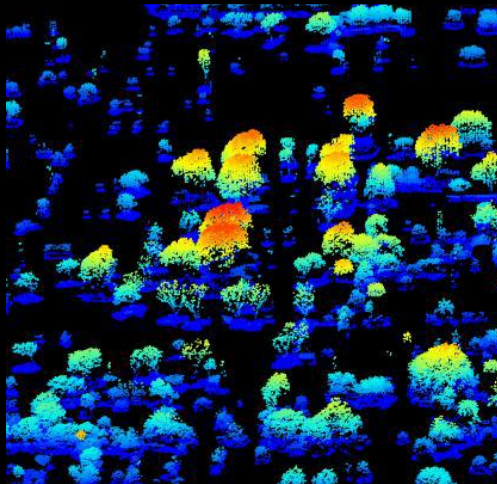
- Priorities for the pilot project:
 - Individual tree **species** identification
 - Canopy cover metrics
 - **Health assessment**
- Technology objectives:
 - Use data that is readily available and frequently updated
 - Use open-source software tools
 - Leverage/build on peer-reviewed methods



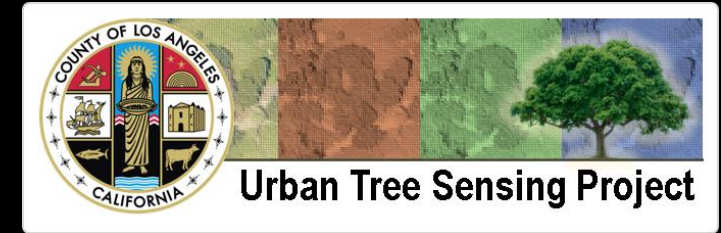
Data sources



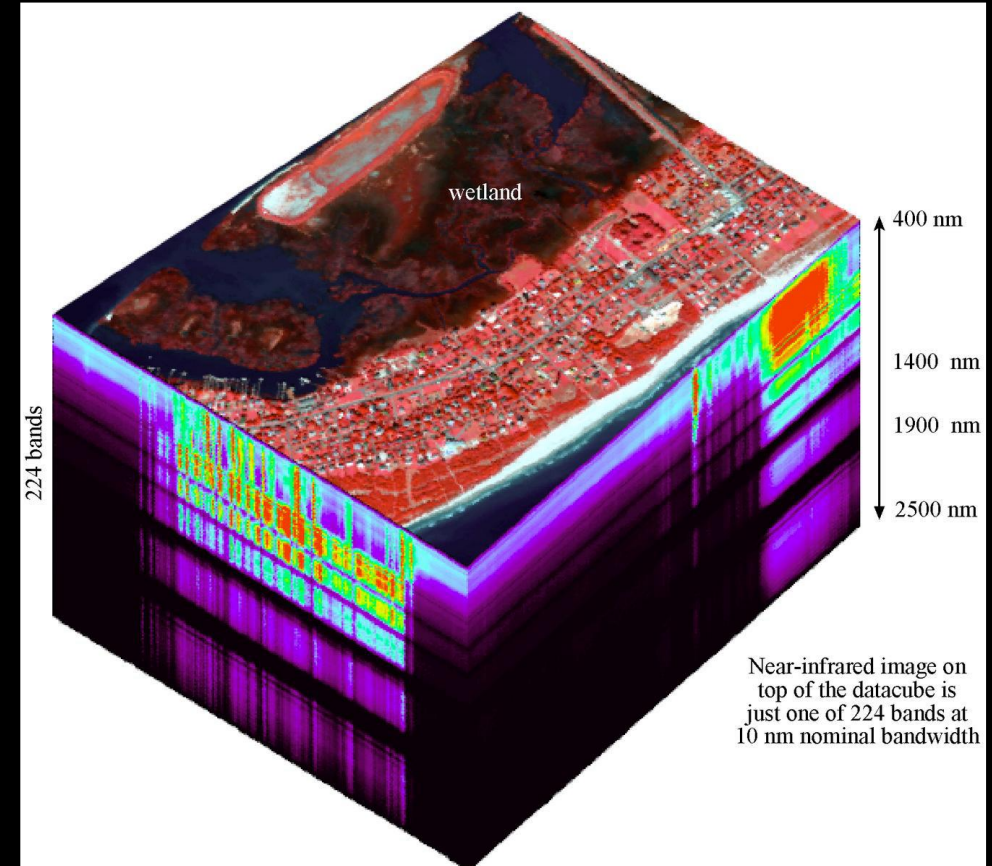
- LARIAC Data:
 - LiDAR, collected on an eight to 10-year cycle, (10.2cm h-res, 27.7 cm v-res)
 - 4-band high resolution (3-4 in²) orthophotos (collected ~ annually)
 - Land cover map (tree canopy) 2017



Airborne Visible / Infrared Imaging Spectrometer (AVRIS)



- NASA JPL sensor
 - Currently limited to an airborne sensor system
 - LA County imagery available since 1994
 - 224 contiguous spectral bands
 - Spatial resolution of 20 m²
- Orbital hyperspectral sensors have been tested and future missions are anticipated to provide frequent coverage.



Workflow for Tree ID



1) Hyperspectral Transforms

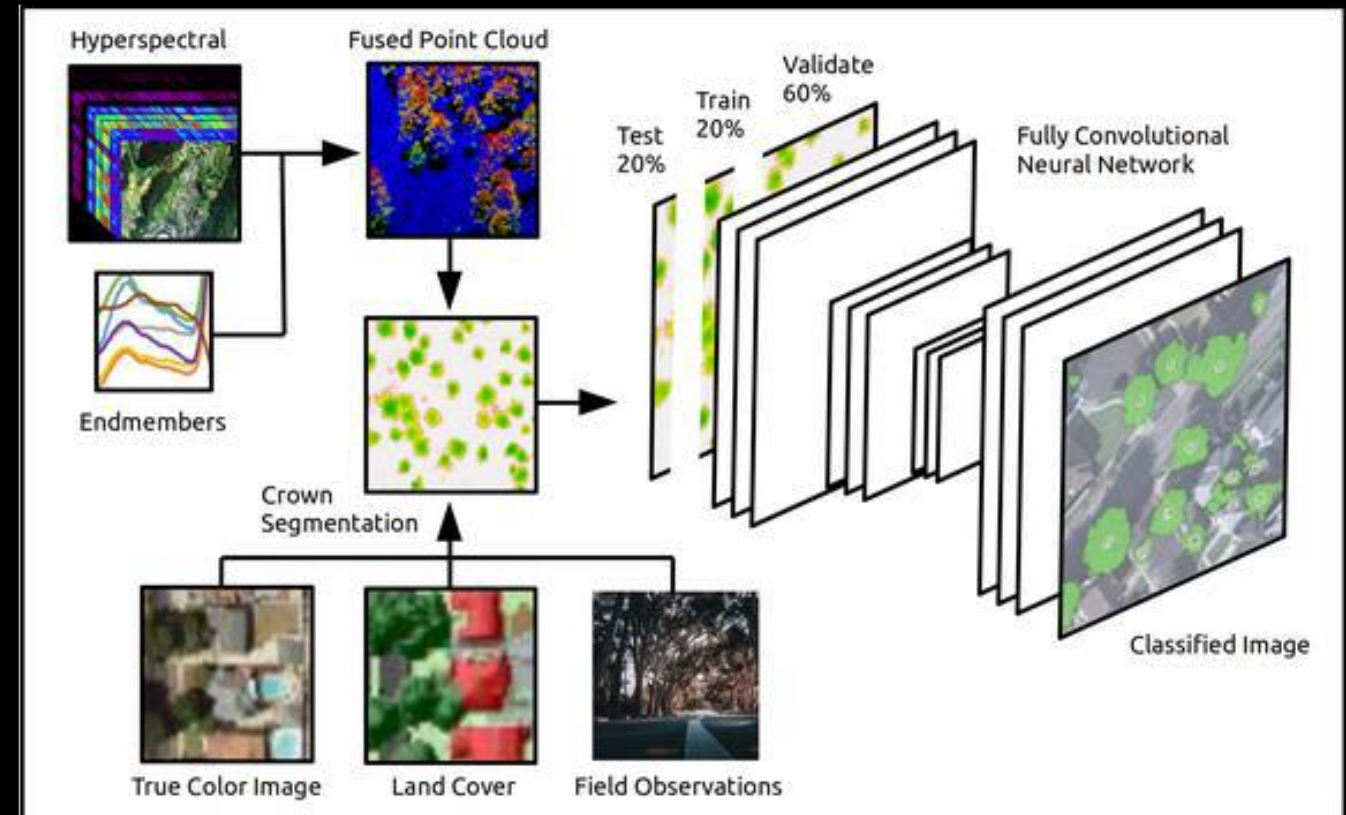
- Probabilistic tree crowns in mixed pixels

2) Fused LiDAR point cloud

- Crown segmentation
- HSI + LiDAR

3) Faster R-CNN for species ID

- Explore application of 1 & 2 from pixel / object-level to species level?





Observations on local govt. use of geospatial

- There are MANY opportunities to use ML/AI and other computational methods to fully leverage our investments in our imagery – this is one area where YOU can help.
- Work-from-home has significantly raised the profile of geospatial analysis and applications in local government:
 - Desktop assessments and analysis vs. field work
 - The ability to use analytics to make more effective, data driven decisions (stop our history of $\div 5$)
 - Opportunities to turn around data and decisions faster
 - Removal of human inconsistency and error
 - Plus: maps are great communication tools!





Governments have LOTS of (spatial) data! [Please use it!]

COUNTY OF LOS ANGELES OPEN DATA

Welcome!

This website represents Los Angeles County's commitment to transparency. Here, you'll find a wide array of information to help you explore the work of the county and its impact on residents. You can conduct research, build apps, create visualizations and much more. Keep coming back as we add to the data now!

Community, Arts & Culture | County Administration | Health | Homeless Initiative | Property and Planning | Public Safety | Services | Sustainability Plan

Addressing	Addressing	Zipcode Points	Zipcode Points
Administrative Boundaries	Administrative Boundaries	School Attendance Areas: Elementary	School Attendance Areas: Elementary
Administrative Boundaries	Administrative Boundaries	School Attendance Areas: High School	School Attendance Areas: High School
Administrative Boundaries	Administrative Boundaries	School Attendance Areas: Middle School	School Attendance Areas: Middle School
Administrative Boundaries	Administrative Boundaries	School Districts	School Districts
Administrative Boundaries	Administrative Boundaries	SEA (state responsibility area)	SEA (state responsibility area)
Administrative Boundaries	Administrative Boundaries	California Coastal Commission Zone	California Coastal Commission Zone
Administrative Boundaries	Administrative Boundaries	Enterprise Zones	Enterprise Zones
Administrative Boundaries	Administrative Boundaries	Project Area Boundaries	Project Area Boundaries
Administrative Boundaries	Administrative Boundaries	Office Service Areas	Office Service Areas
Administrative Boundaries	Administrative Boundaries	Office Service Areas by Zipcode	Office Service Areas by Zipcode
Administrative Boundaries	Administrative Boundaries	Medical Service Study Areas (MSSA)	Medical Service Study Areas (MSSA)
Administrative Boundaries	Administrative Boundaries	Health Districts (1990)	Health Districts (1990)
Administrative Boundaries	Administrative Boundaries	Health Districts (2002)	Health Districts (2002)
Administrative Boundaries	Administrative Boundaries	Health Districts (2012)	Health Districts (2012)
Administrative Boundaries	Administrative Boundaries	Service Planning Areas (SPA) - 1994	Service Planning Areas (SPA) - 1994

<https://data.lacounty.gov/>

eGIS Homepage | GIO Blog & Announcements | CAMS | LARIAC | GIS Day | About eGIS | Terms of Use

County of Los Angeles

Enterprise Geographic Information Systems

The LA County eGIS Program is committed to promoting the efficiency, acquisition, and dissemination of GIS data and technology.

Use this site to visualize spatial information, and discover new tools and innovative projects leading to improved outcomes and public services for the citizens of LA County.

Enter a keyword to search...

Data

Please Take Our Open Data Survey
The survey will open in a new window/tab

Addressing | Boundaries | Basemaps & Grids | Cadastral

<http://gis.lacounty.gov/>



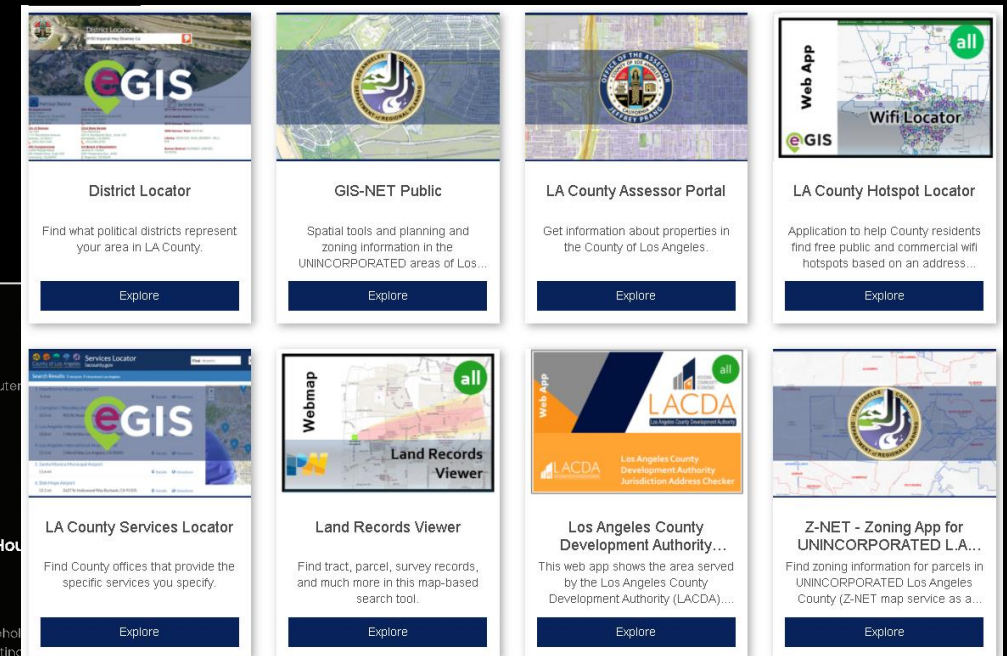
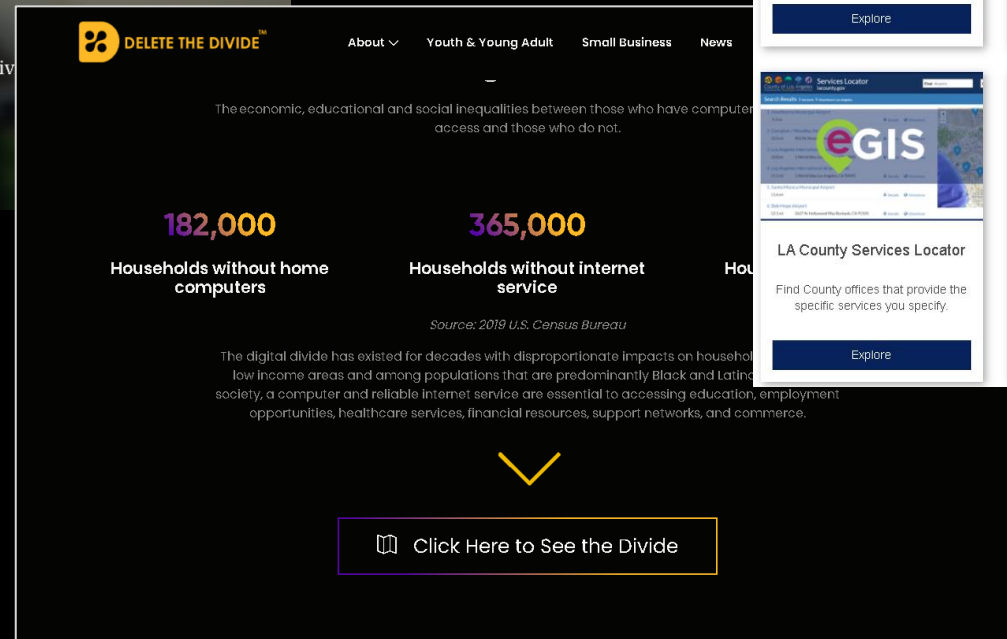


Turning Data into Information [we do, but you can too!]

<https://storymaps.arcgis.com/stories/400d7b75f18747c4ae1ad22d662781a3>



<https://www.deletethedivide.org>

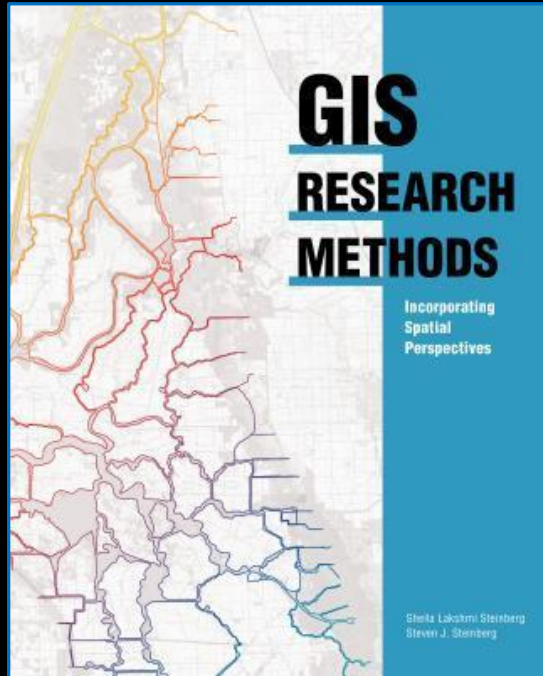


<http://gis.lacounty.gov>

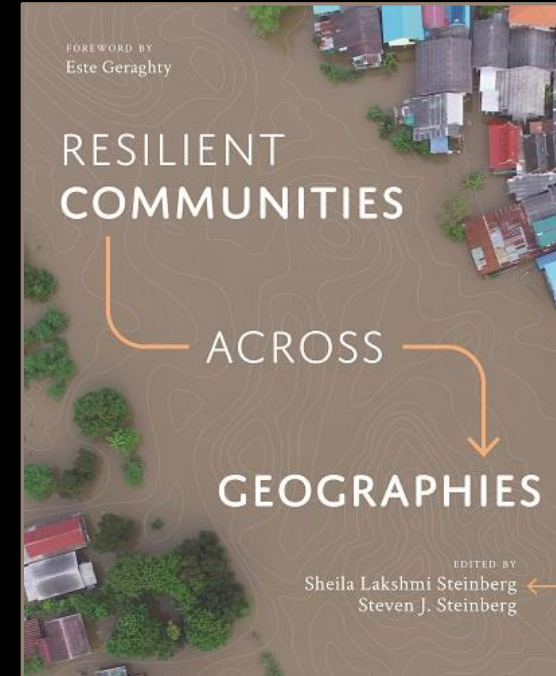




I'd be remiss not to pitch some books! 😊



S.L. Steinberg and S.J. Steinberg (2015)
[GIS Research Methods](#)
Esri Press, Redlands, CA., ISBN: 9781589483781



S.L. Steinberg and S.J. Steinberg , eds (2021)
[Resilient Communities across Geographies](#)
Esri Press, Redlands, CA., ISBN: 9781589484818



Thank you for your attention!

County of Los Angeles

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Steven J. Steinberg, Ph.D., MPA, GISP
Geographic Information Officer
County of Los Angeles, California

