Center for International Earth Science Information Network

EARTH INSTITUTE | COLUMBIA UNIVERSITY

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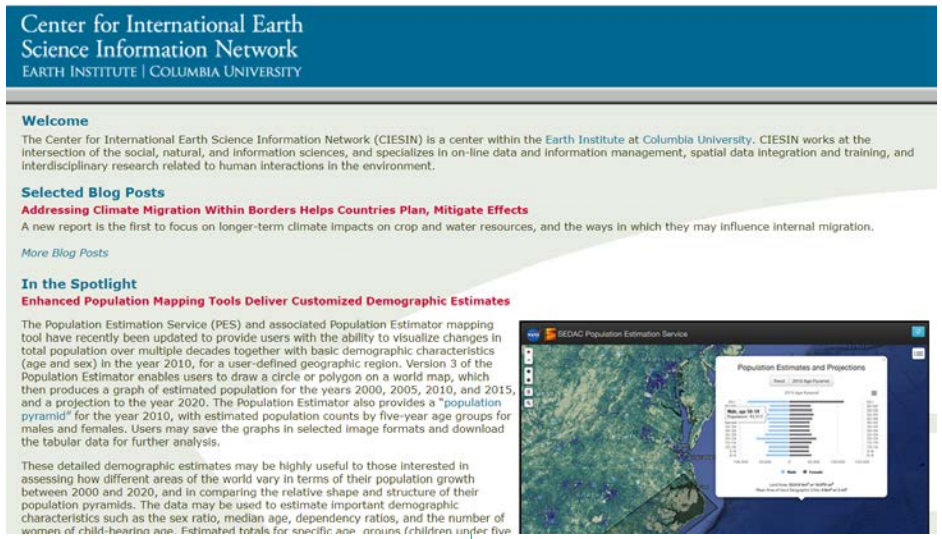
Building Data for Climate Change Adaptation

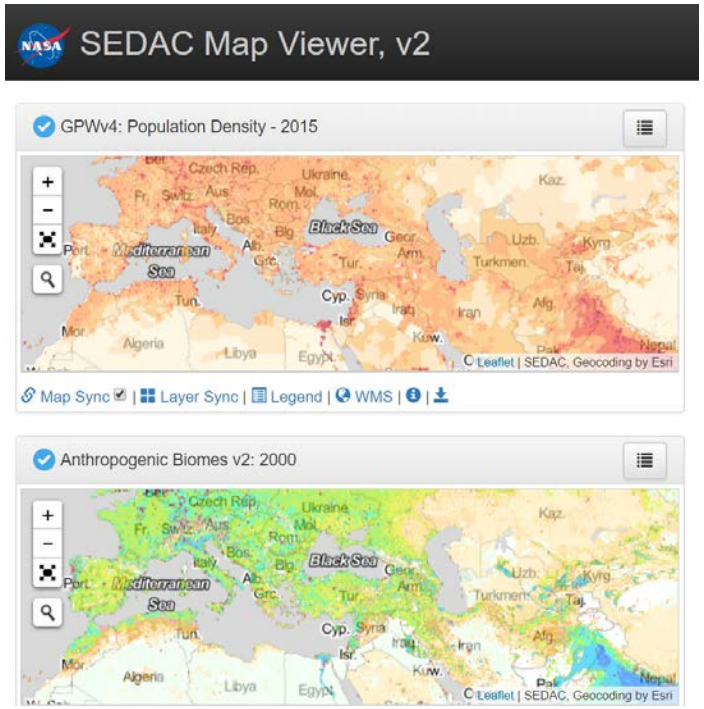
Filling data gaps and characterizing storm surge impacts for New York State

Work funded by the New York State Energy & Research Development Authority (NYSERDA)

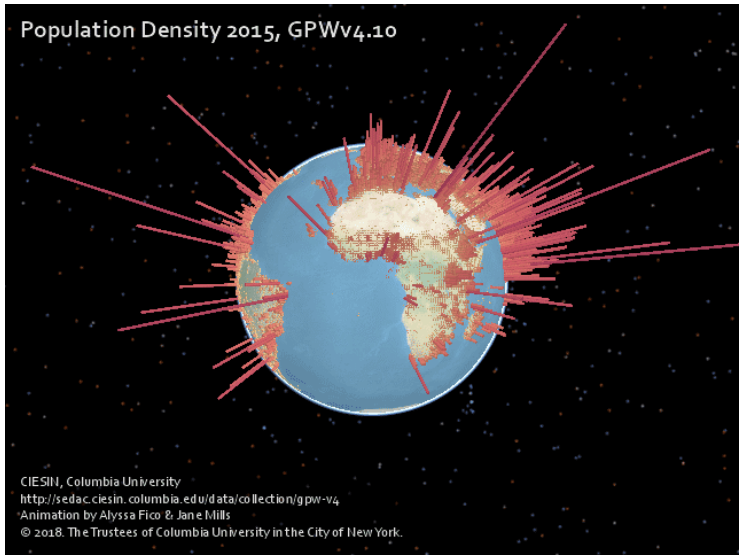
CIESIN



Non-profit research institute within Columbia University specializing in open source data production and applied research



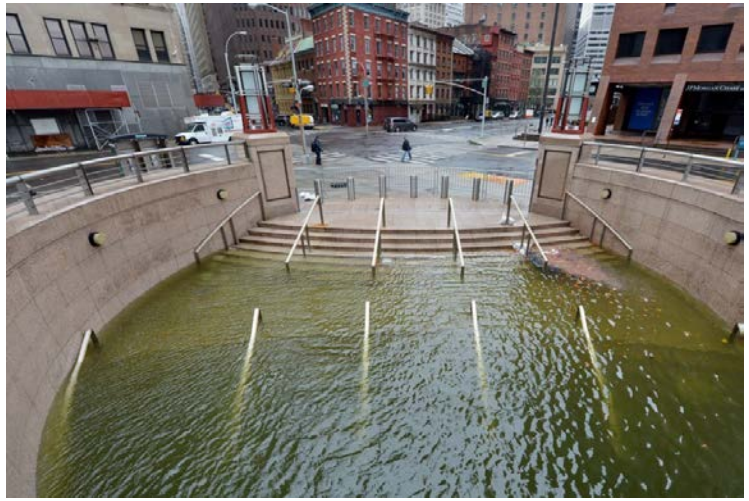
Working to advance the understanding of human interactions in the environment

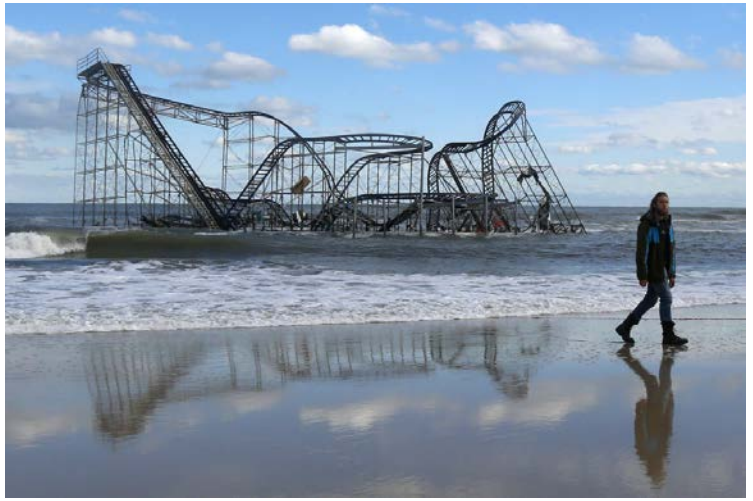


While providing access to and enhancing the use of information worldwide

October 2012

New York State and the surrounding area were rocked by Superstorm Sandy





Were we prepared enough?

What could we do differently?

What data do we need to prepare better for next time?

Determining Data Gaps

Understanding where data gaps occur and subsequently filling those gaps leads to more effective and informed decision-making.

Critical Infrastructure

Building Footprints

Flood Grids

STEPS TO FILL GAPS:

1. Download data that already exists and create data where there is none
2. Clean and validate the data
3. Run the flood impact assessment
4. Visualize data and results in one place and make it publically available

Critical Infrastructure

Compiling locations of bridges, hospitals, and EMS stations in one location can lead to better planning during emergency situations

STEPS

1. Collect local and national infrastructure datasets (fire stations, hospitals, schools etc.)
2. Standardize attribute tables

CHALLENGES

- Multiple sources of data to pick from
- Properly validating the data

Building Footprints

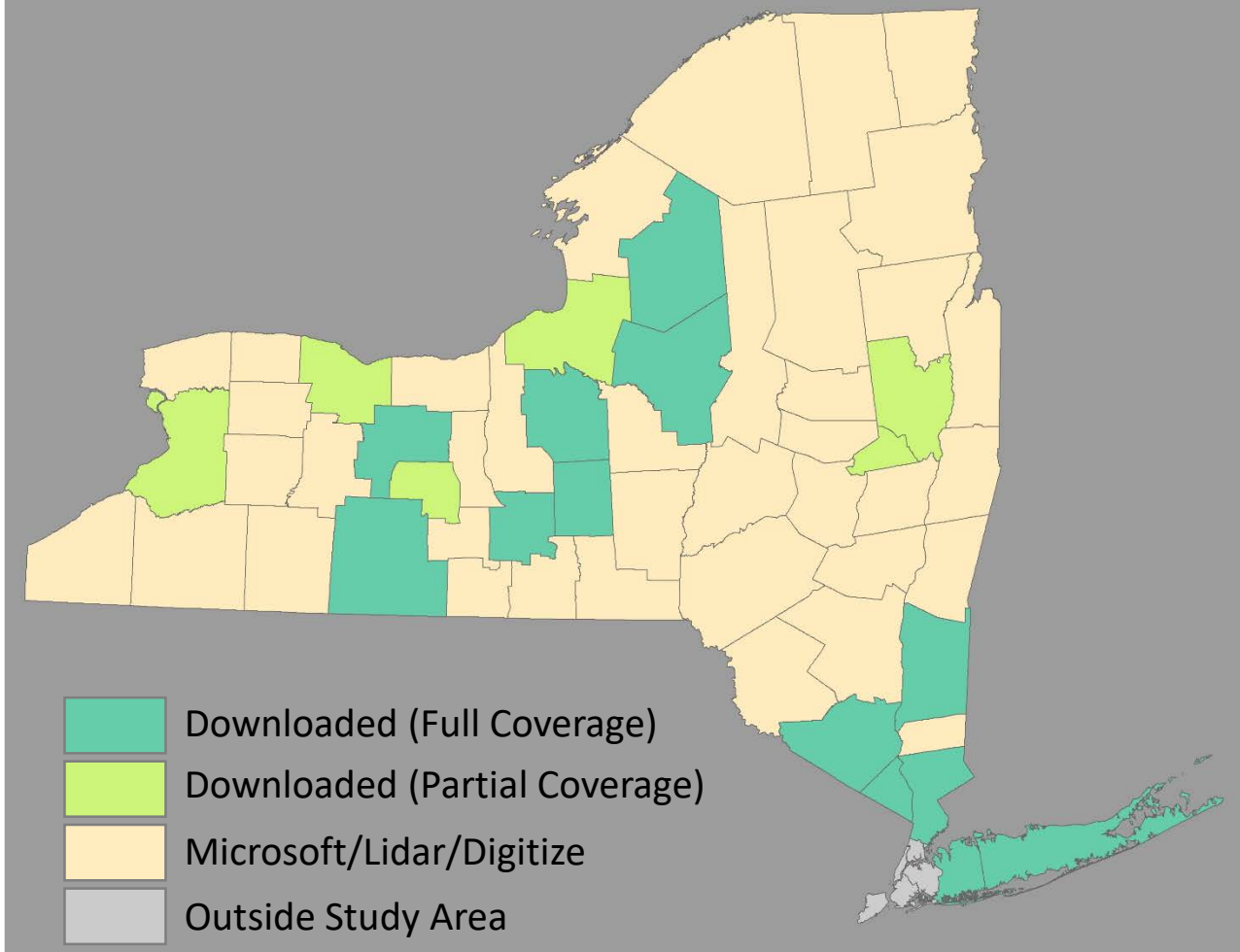
Creating a state-wide database of building footprints allows for a more detailed flood impact assessment

STEPS

1. **Download local data sets**
2. Incorporate Microsoft data
3. Extract from LiDAR
4. Manually Digitize
5. Compile into a state-wide database

CHALLENGES

- Some data sets are outdated or geographically incomplete



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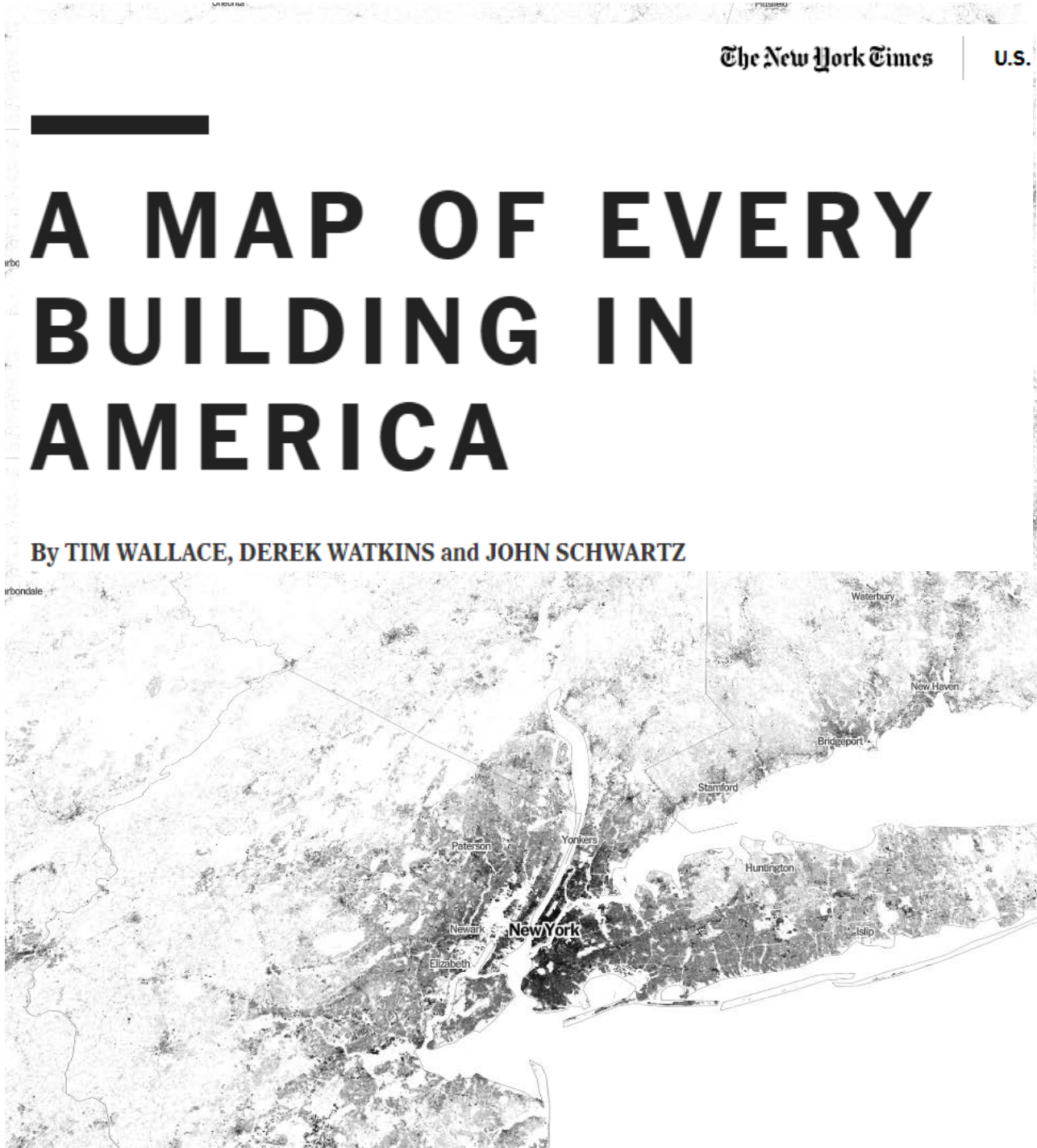
CHALLENGES

- Clusters buildings in urban area
- Misses some buildings
- Artifacts left over from national integration



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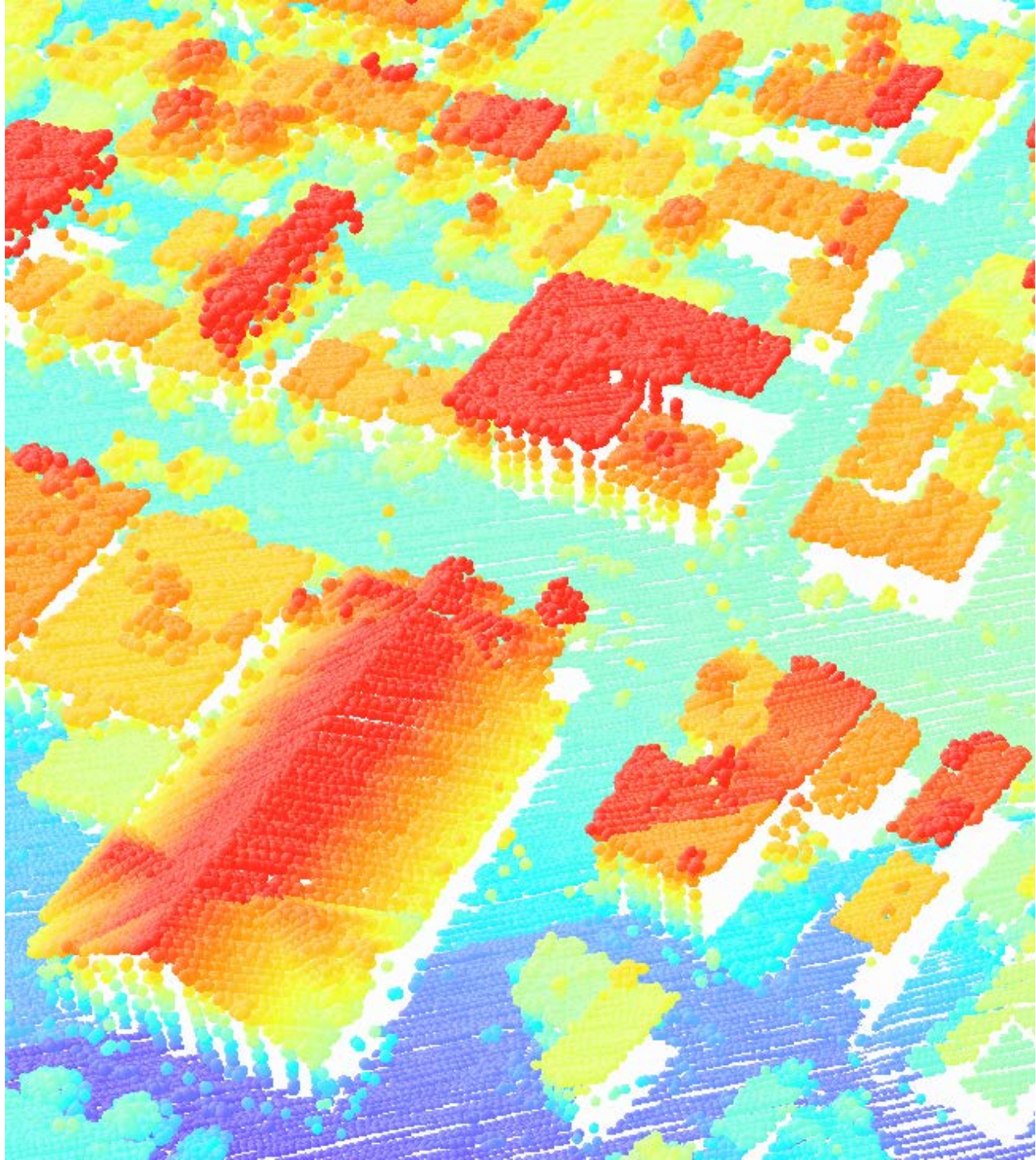
CHALLENGES

- Incomplete coverage
- LiDAR point spacing from older data not adequate for building extraction
- Requires some manual editing



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CHALLENGES

- Time required for large scale digitizing
- Inconsistent detail in open-source imagery
- Creating consistent guidelines/best practices

Flood Grids

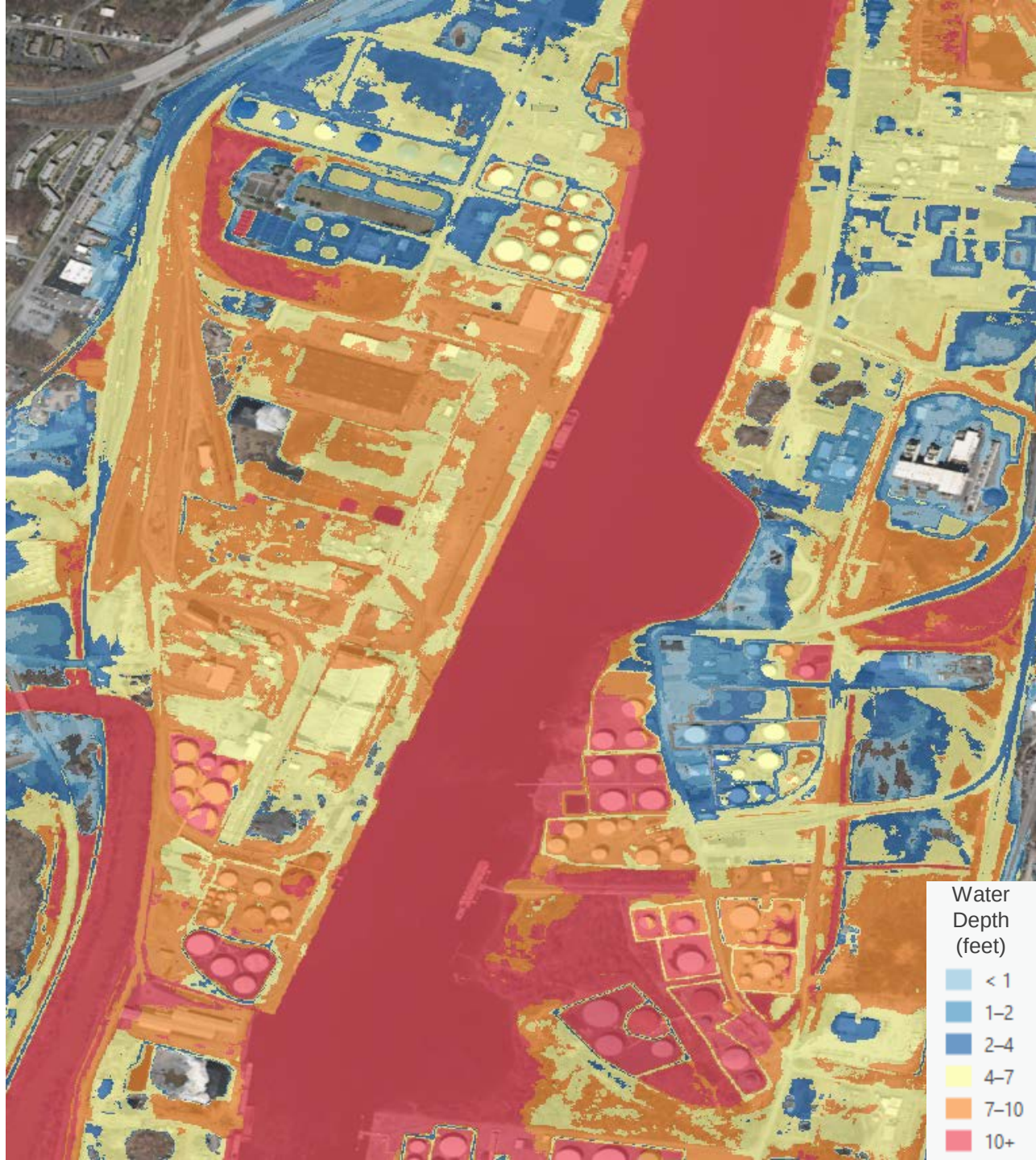
Creating a variety of flood scenarios allows for a range of possible results to be produced

STEPS

1. Create flood grids for various sea level rise and storm return scenarios for the Hudson River and Westchester coast of the Long Island Sound
2. Create state-wide 100- and 500- year flood grids for all inland and coastal areas

CHALLENGES

- Methodology to produce accurate flood grids using available data



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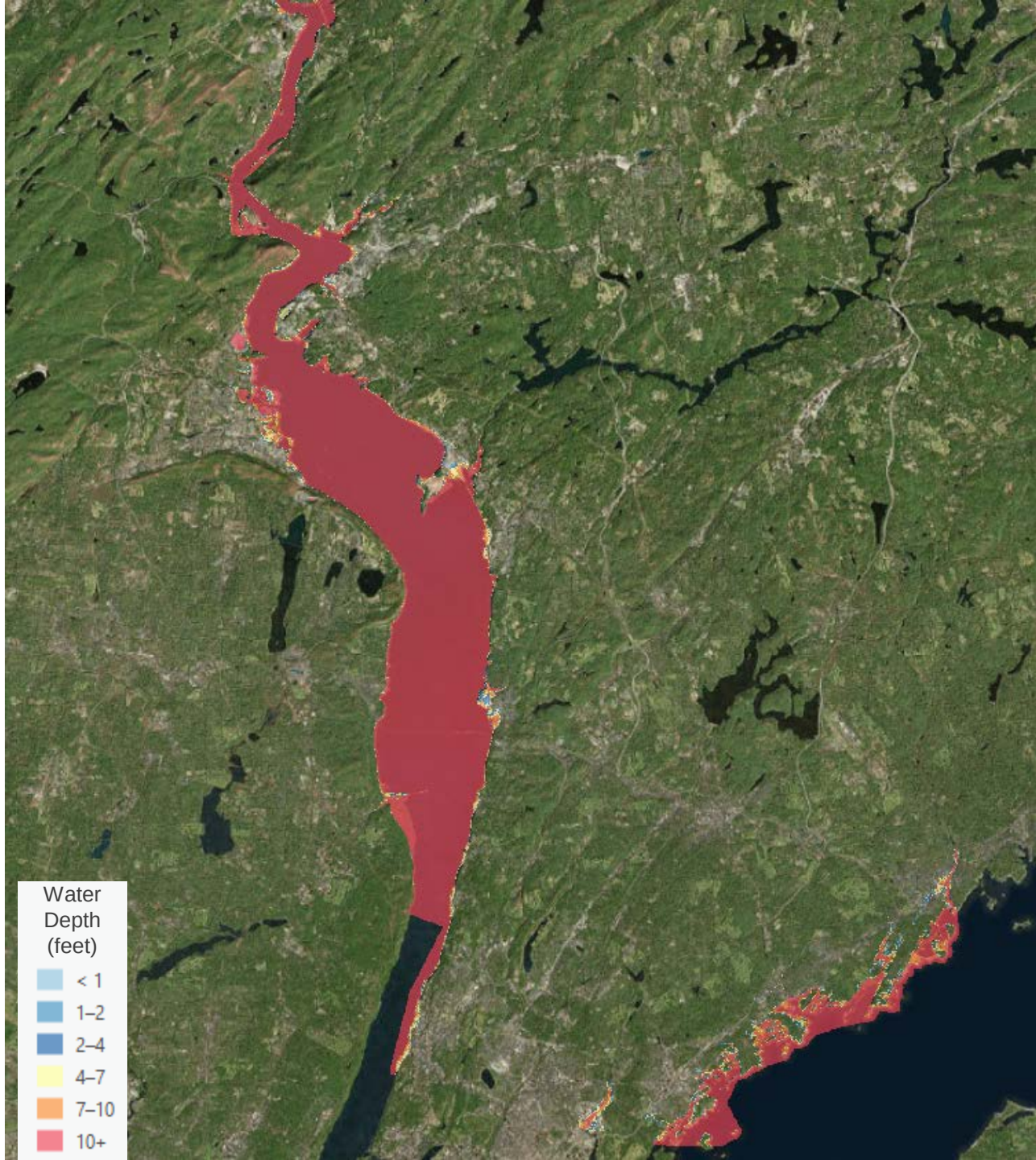

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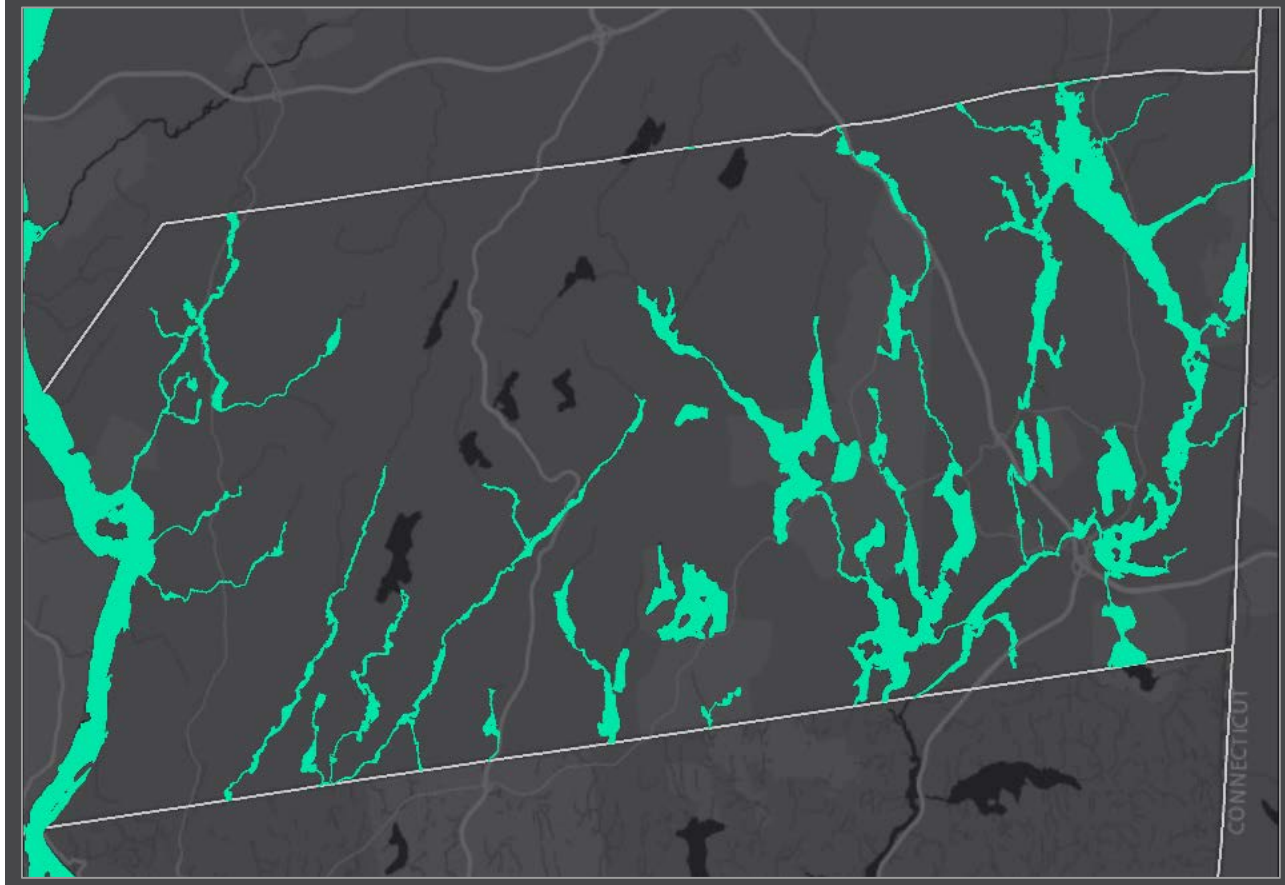
FEMA 100-year floodplain



1 – Turn the extent into points

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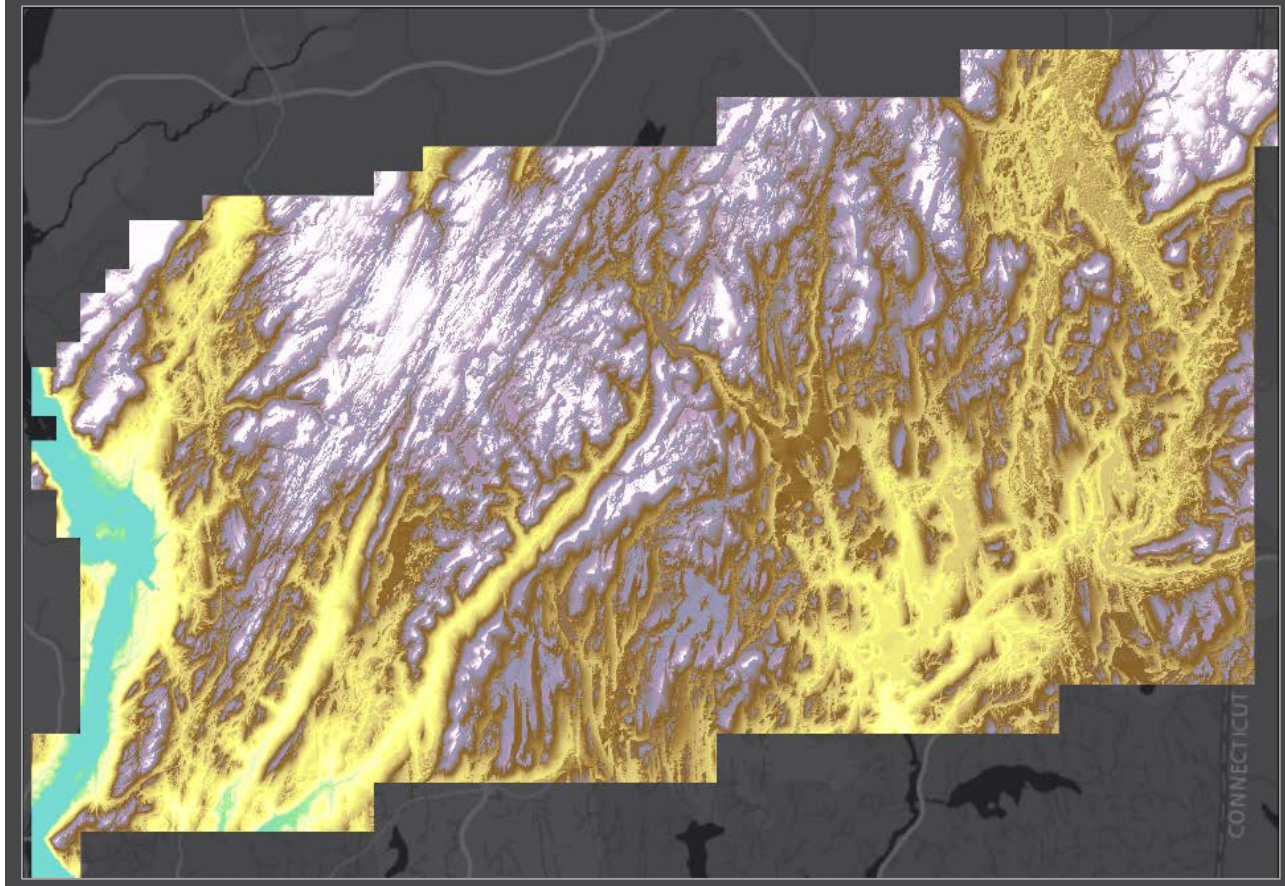
NYS 2 meter DEM



2 – Extract the elevation at the points

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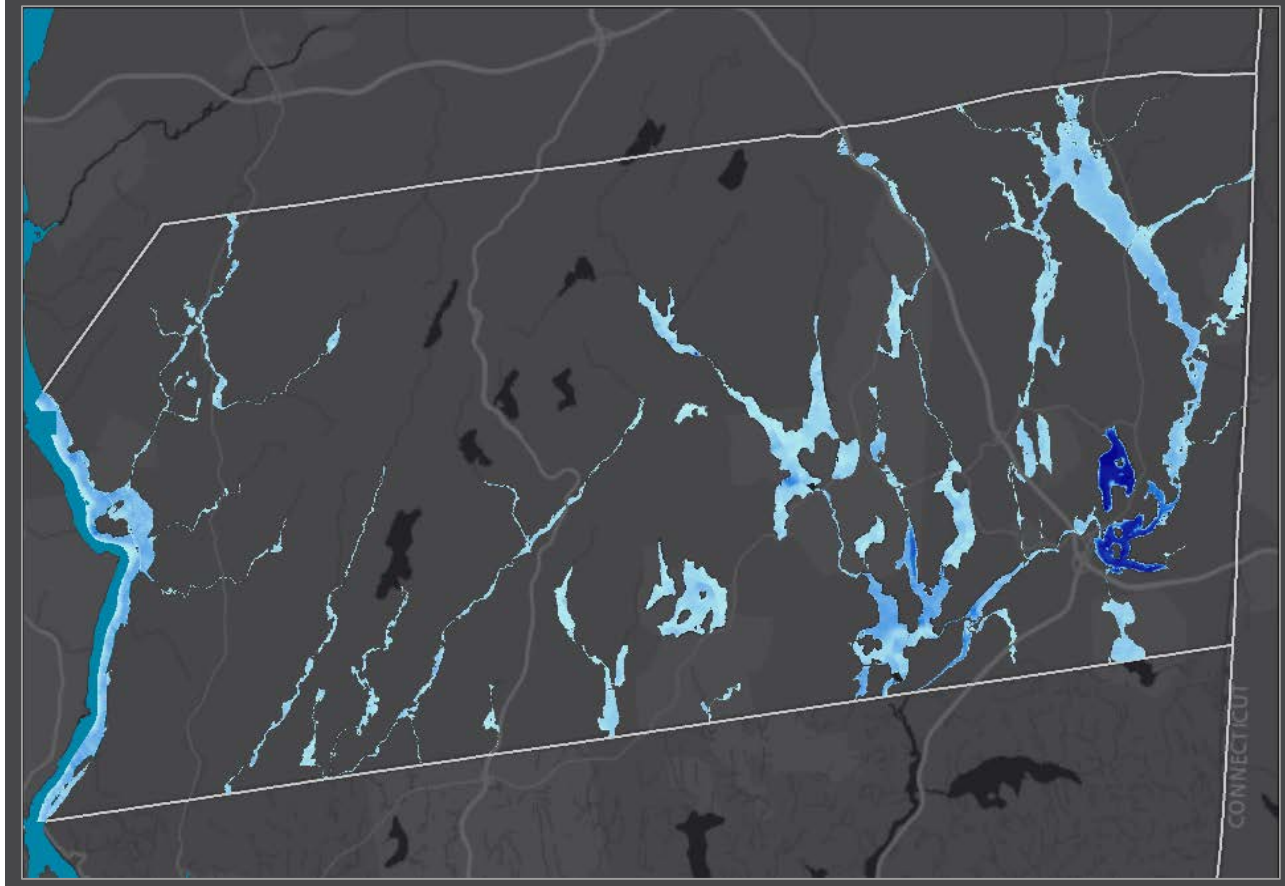
CIESIN 100 year flood grid



3 – Interpolate and subtract DEM

Impact Assessment

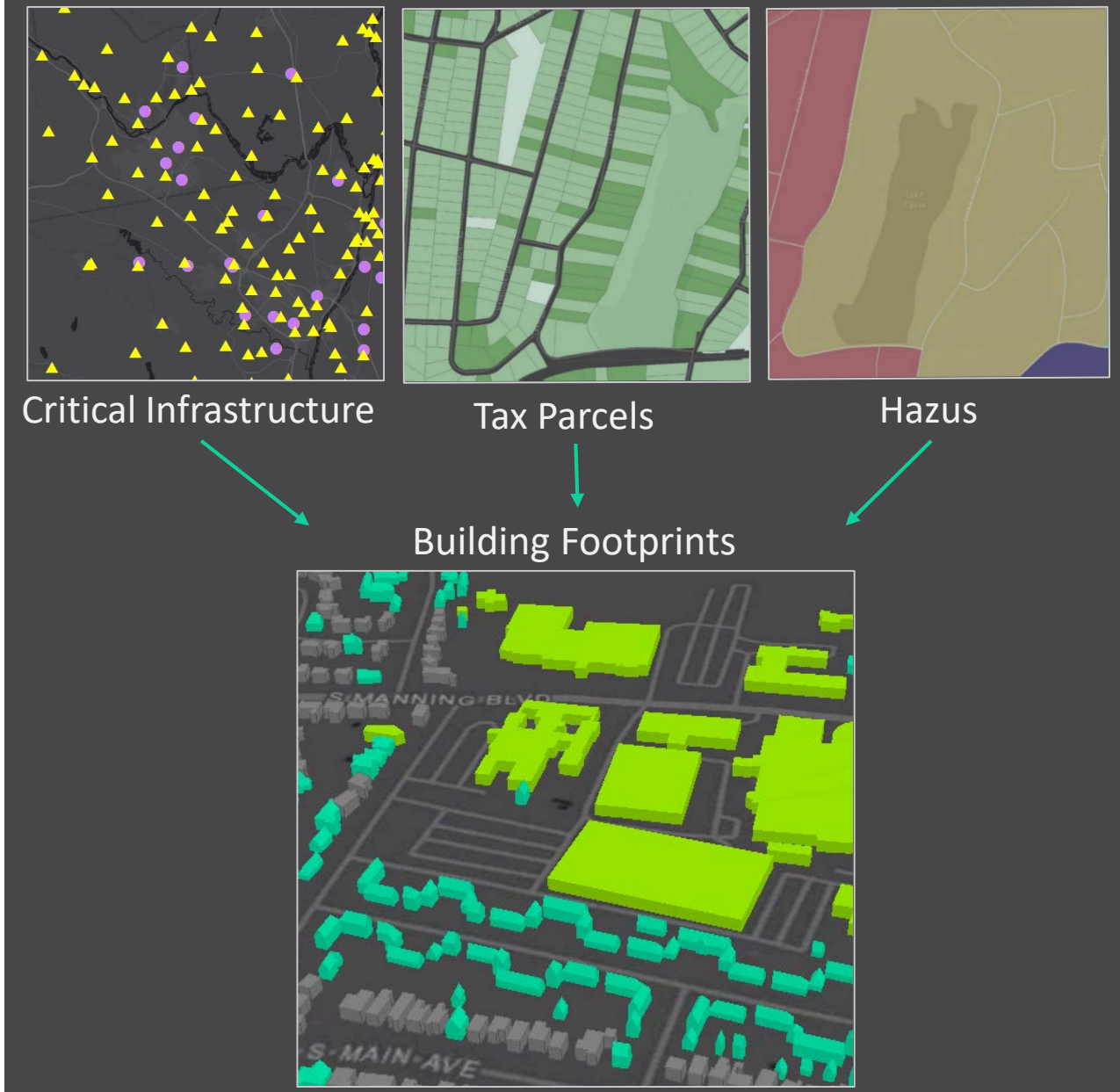
Once all the data is compiled, a comprehensive and detailed flood impact assessment is produced

STEPS

1. **Attach critical infrastructure, Hazus provided attributes, and tax parcel information to building footprints**
2. Assign flood depth value to each building footprint
3. Apply modified depth-damage function from Hazus model
4. Aggregate financial damages to the municipality level

CHALLENGES

Still includes assumptions from Hazus model (first floor elevation)



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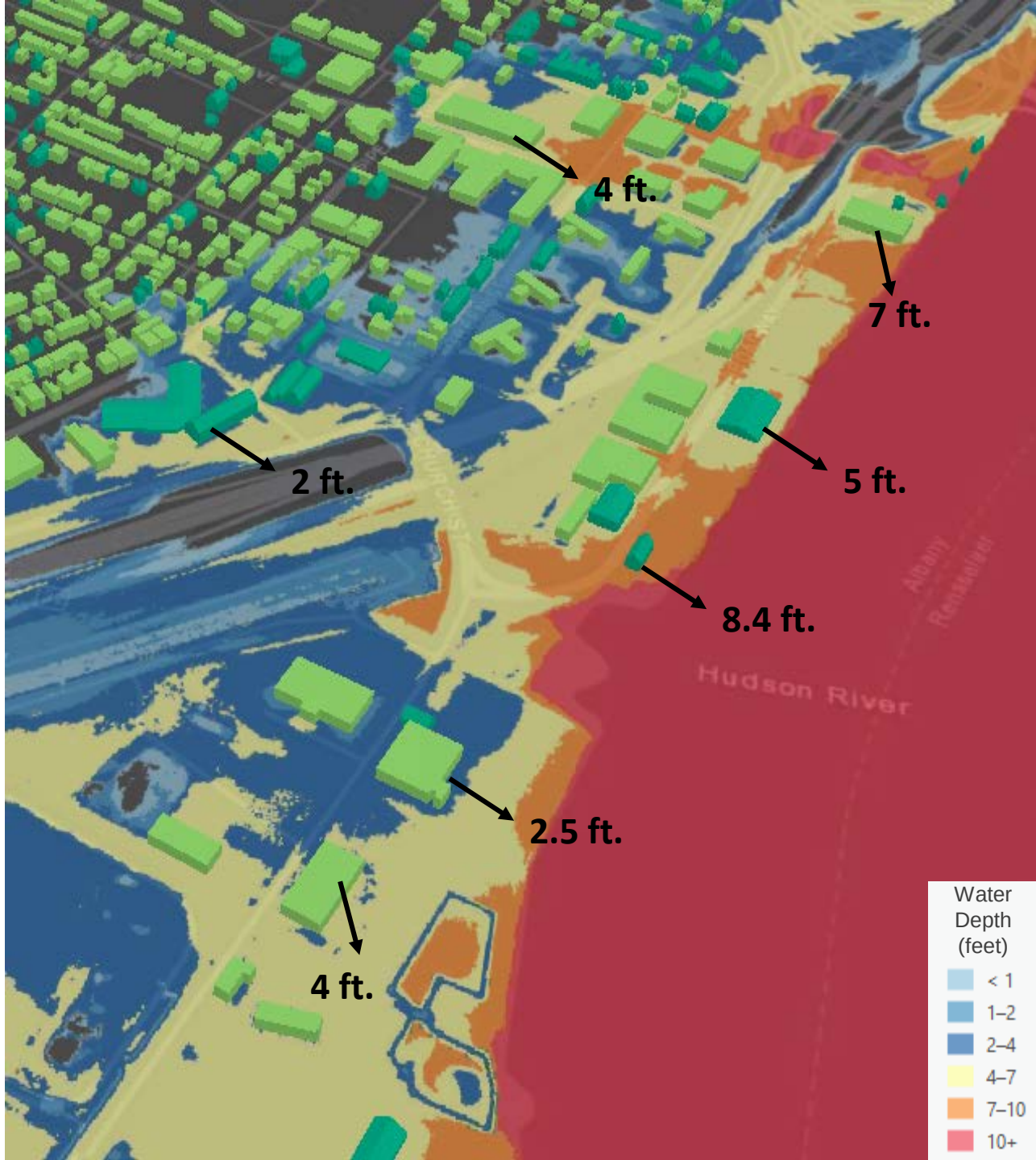

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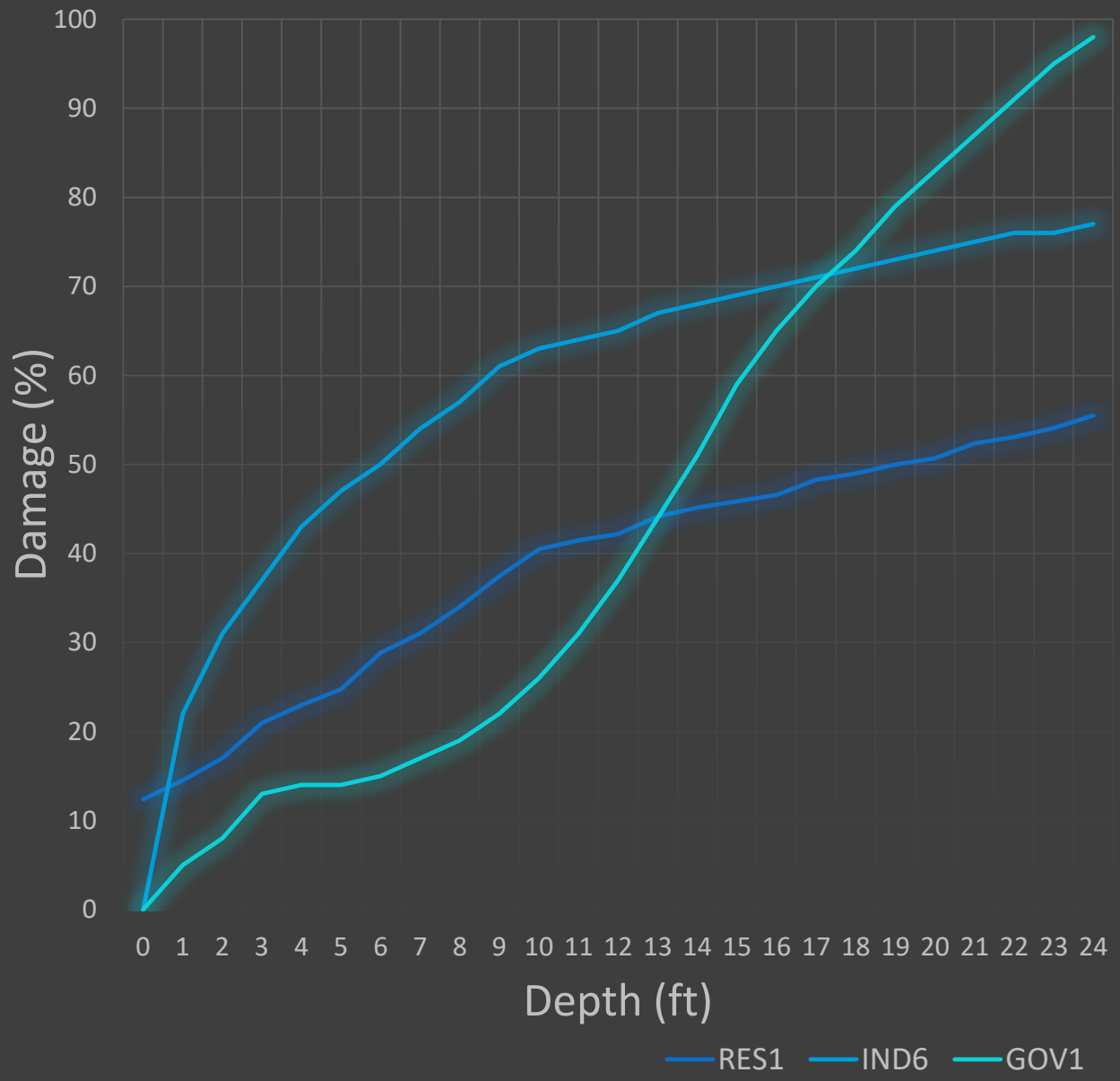

Damage = % Damage x Value

% Damage = f(flood depth, occupancy class)

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County	Municipality	Return Period (years)	Building and Contents loss ($)	Number of buildings damaged
Dutchess	Fishkill	100	3,803,235	93
Dutchess	Fishkill	500	9,679,156	367
Dutchess	Pleasant Valley	100	1,590,441	93
Dutchess	Pleasant Valley	500	10,912,804	276

Damages are aggregated to the municipality level and are attached to the buildings as FEMA loss categories

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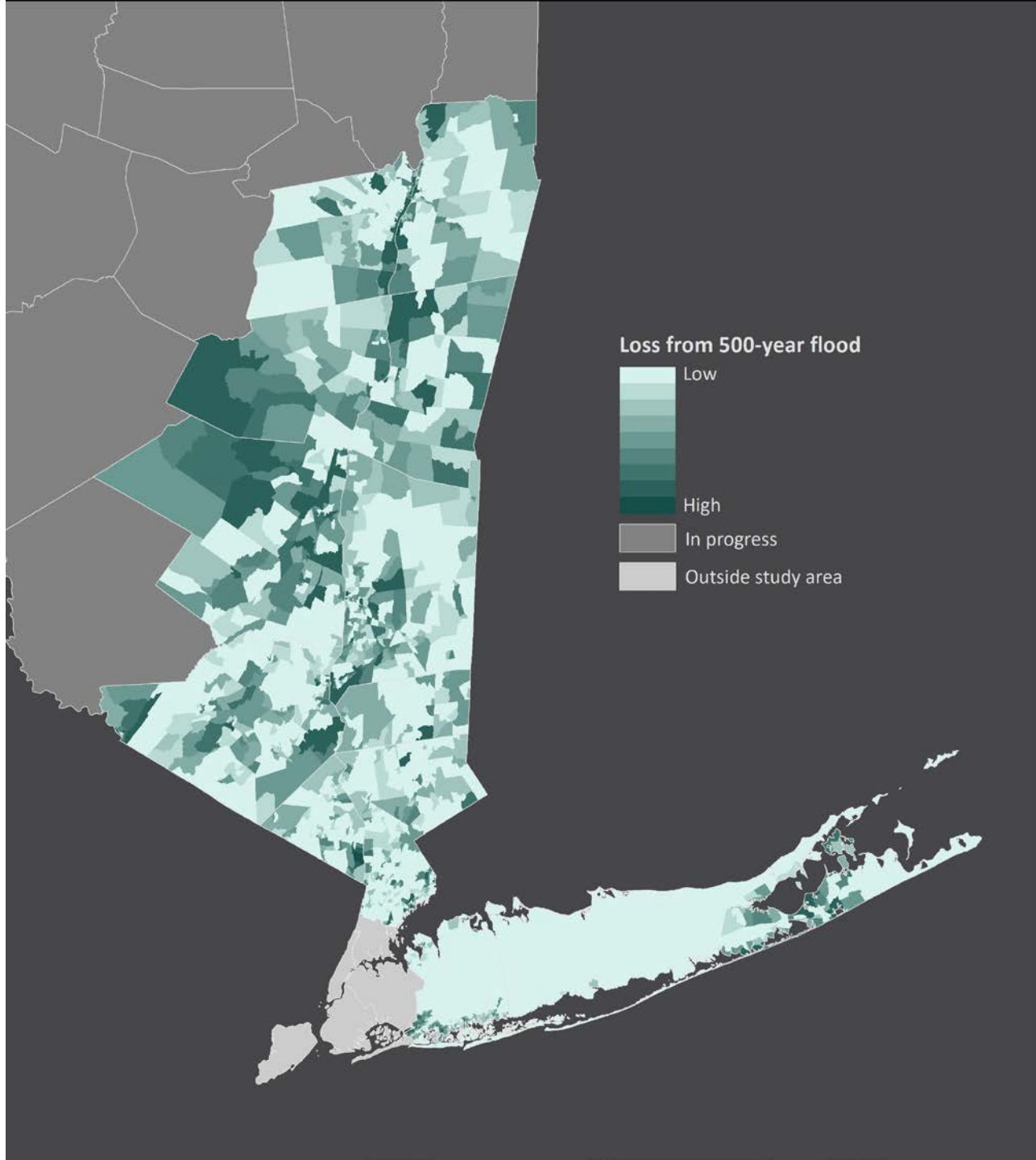


Publishing the Results

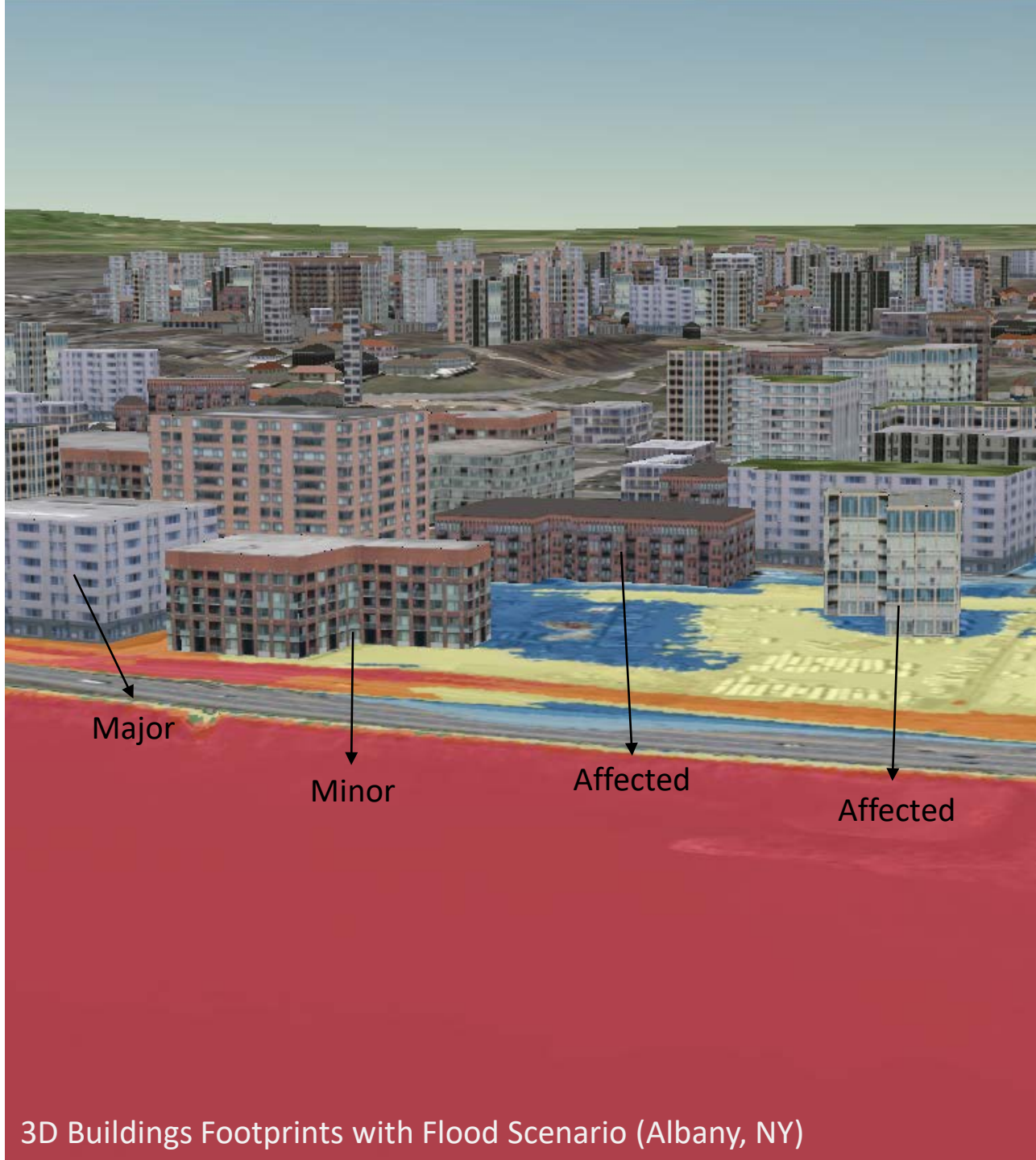
The building footprints, flood scenarios, and flood impact results will be published and available for download

STEPS

1. Data documentation
2. Publication of web services (ArcGIS Server / OGC services)

CHALLENGES

Data volume for publishing



3D Buildings Footprints with Flood Scenario (Albany, NY)

Questions?

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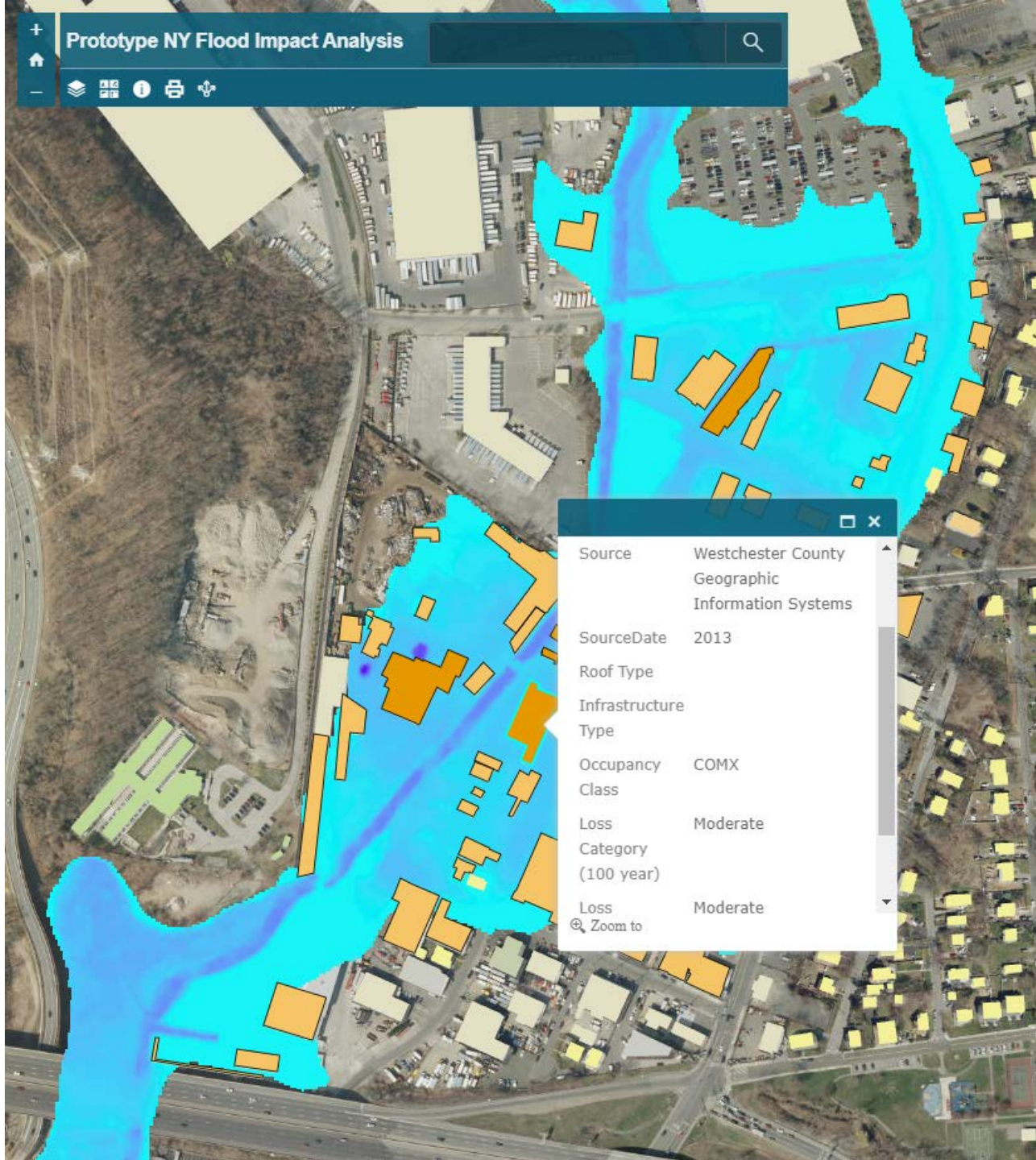

Prototype Application

Release Pending

- ArcGIS Online