The Role of Geospatial Data and Geographic Information Systems in a Reengineered Decennial Census

Michael Ratcliffe
Geography Division
US Census Bureau

United Nations Statistical Commission Meeting Side Event
New York, New York
March 6, 2019

United States® Census Bureau
U.S. Department of Commerce
Economics and Statistics Administration
U.S. CENSUS BUREAU
census.gov

United States® Census 2020

The Role of Geospatial Data and Geographic Information Systems in a Reengineered Decennial Census

Agenda

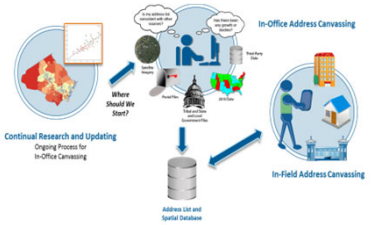
- Establishing where to count.
  - Developing and maintaining the address/housing unit frame.
  - Detecting stability and change in the address/housing landscape.
- Conducting the enumeration.
  - Delivering questionnaires.
  - Encouraging participation.
  - Nonresponse follow up.
- Tabulating and disseminating results.
  - Developing and maintaining the geographic area frame.
  - Geospatial products to support analysis and decision-making.

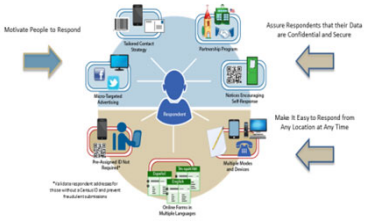
2020 Census
Goal and Key Innovation Areas

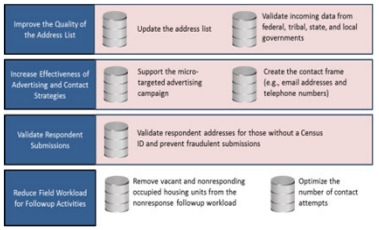
Goal: To count everyone once, only once, and in the right place.

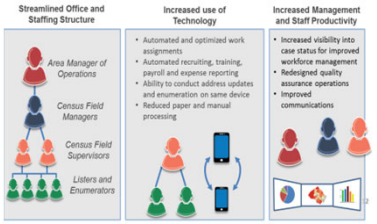
Focus on Four Key Innovation Areas

Reengineering Address Canvassing	Optimizing Self-Response	Utilizing Administrative Records and Third-Party Data	Reengineering Field Operations



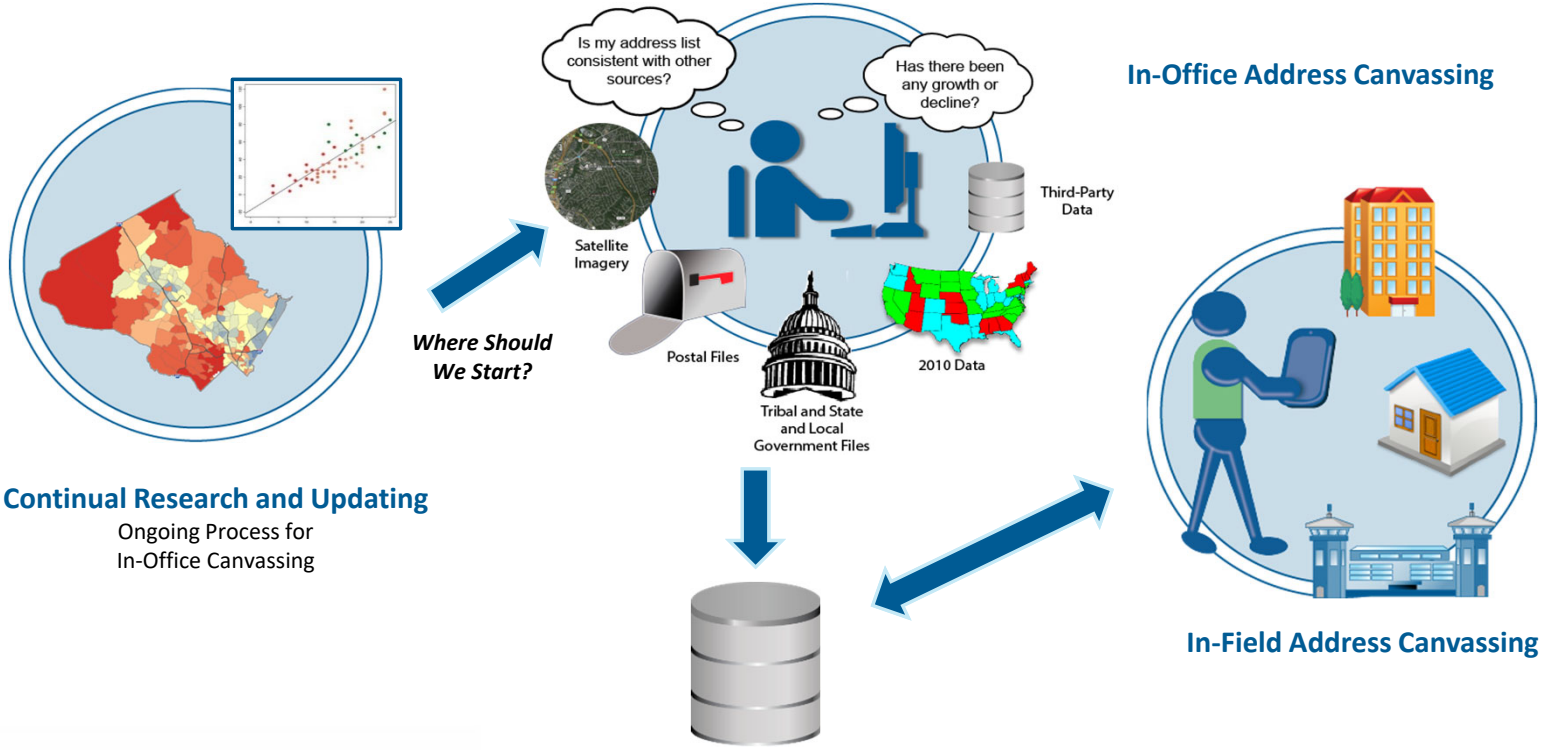






Reengineering Address Canvassing

Reduce the nationwide In-Field Address Canvassing by developing innovative methodologies for updating and maintaining the Census Bureau's address list and spatial database throughout the decade.



Developing and Maintaining an Accurate Address List

In-Office Processes

- US Postal Service's Delivery Sequence File (DSF).
  - 5.3 million new residential addresses added to the Master Address File (MAF) since 2010.
  - 2.3 million residential addresses that were new to the DSF matched addresses already in the MAF.

- Tribal, state, and local government address lists provided through the Geographic Support System Program.
  - 106.7 million addresses acquired between 2012 and 2018.
  - 106.2 million (99.5 percent) matched addresses already in the MAF.
  - Geospatial locations improved and/or corrected for 75.1 million addresses.

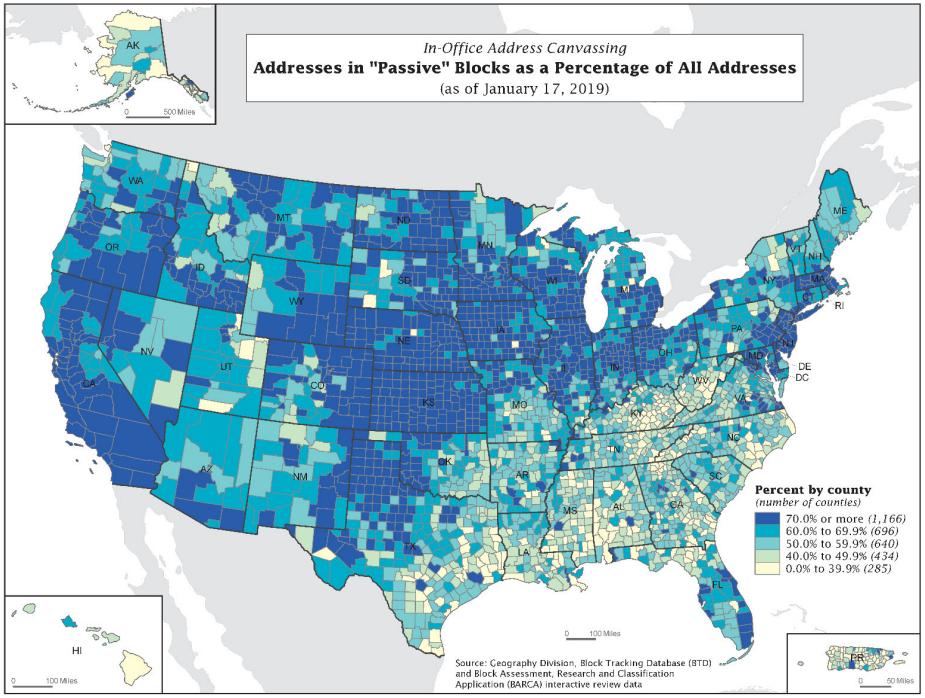
- Ungeocoded Resolution Project.
  - 812,601 addresses (72 percent of addresses reviewed) that previously were not assigned to a census block have been geocoded since 2017.

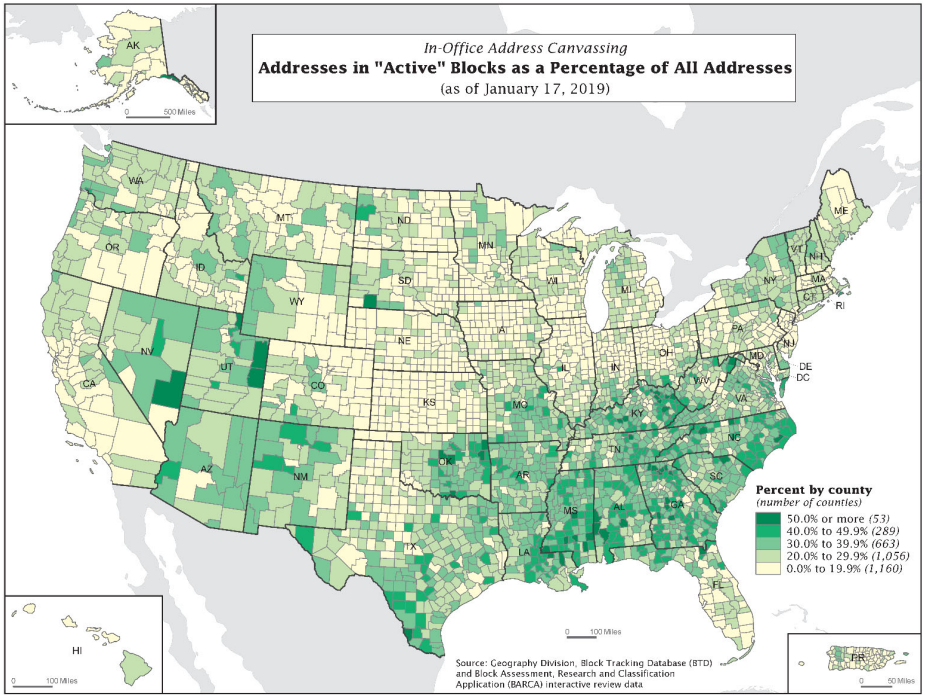
- Local Update of Census Addresses (LUCA) Program.
  - 22 million addresses received from 8,395 entities.
  - 17.9 million (81.2 percent) matched to the MAF.
  - 3.46 million unmatched addresses.

Block Assessment, Research, and Classification Application (BARCA)

In-Office Address Canvassing

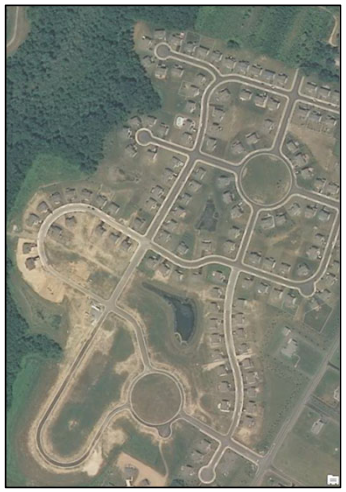
Analysis of Results



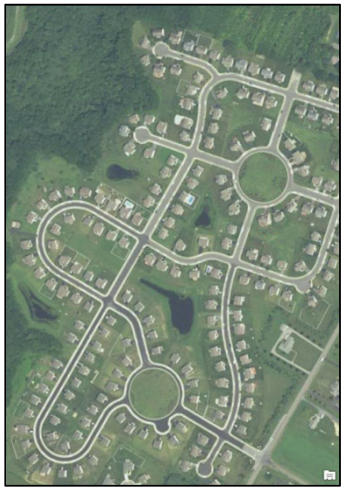


Future Innovation: Validating inputs through increased use of imagery and LiDAR

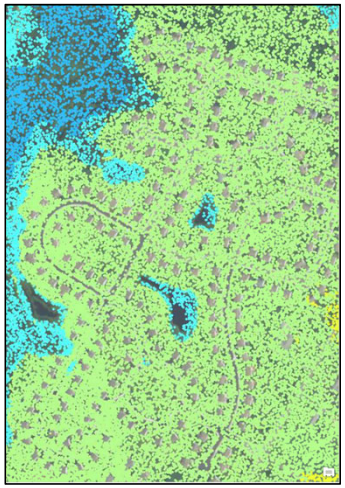
LiDAR + Imagery = Change Detection



2011 NAIP Imagery



2016 NAIP Imagery



2016 LiDAR Point Cloud

Building footprints created and compared to address database

Non Title 13 information

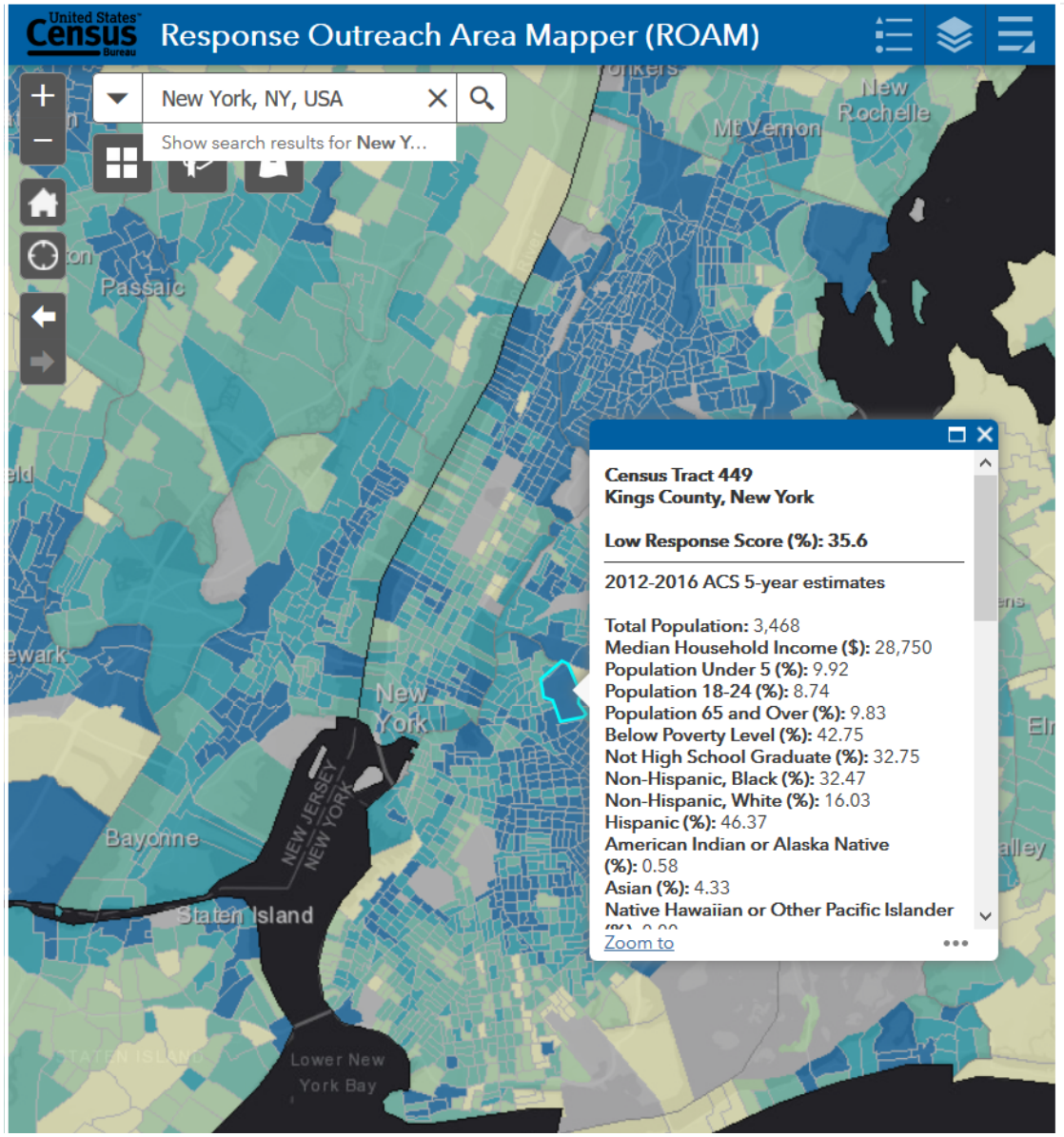
Future Innovation: Validating inputs using imagery, LiDAR, and parcel data

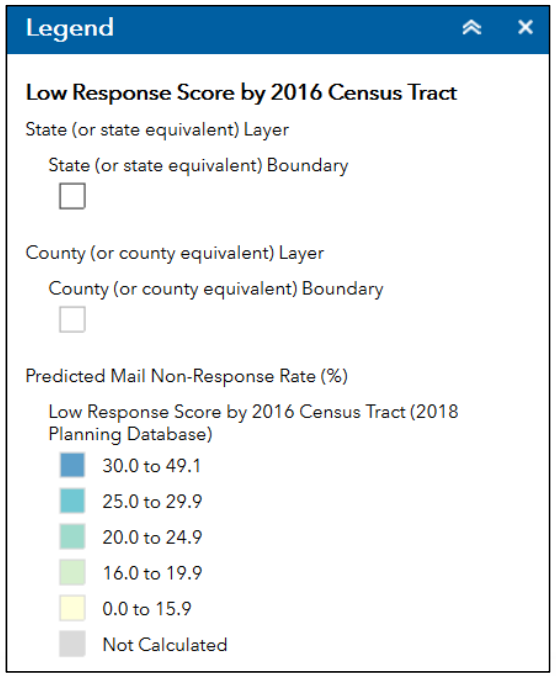
Address with Coordinates

Parcel linked to Address via Coordinates

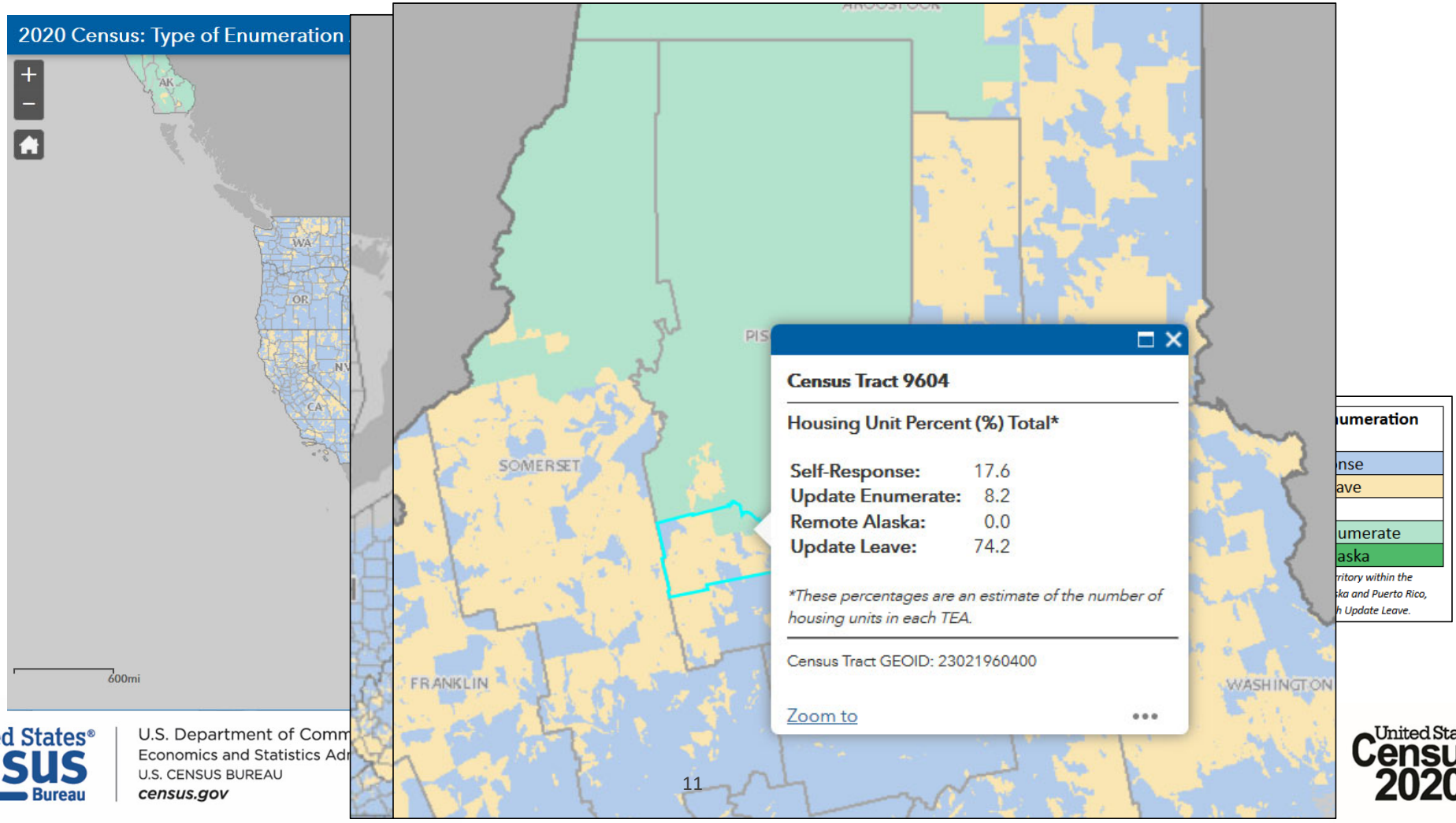
Address from Parcel is transferred to Structure

Conducting the Enumeration: Identifying Low-Response Neighborhoods and Encouraging Participation





Conducting the Enumeration: Type of Enumeration Area



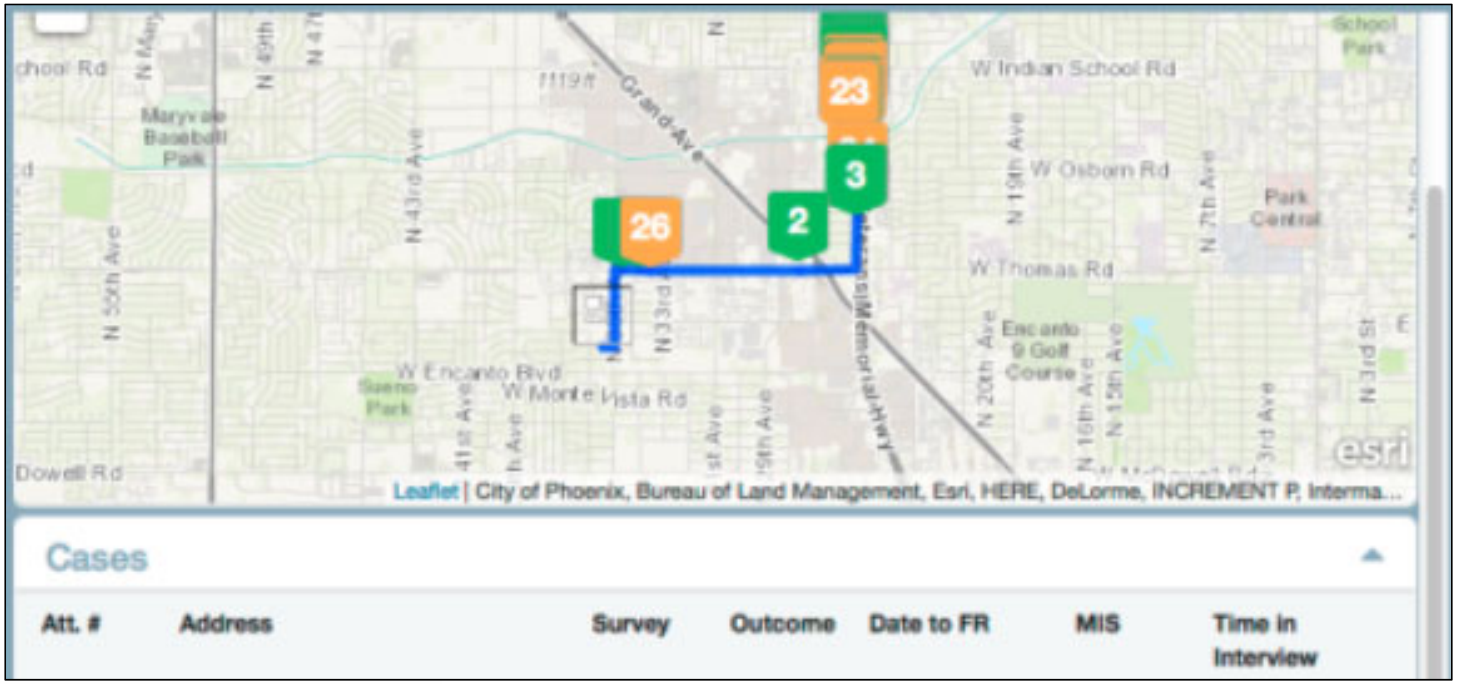
United States® Census Bureau

U.S. Department of Comm
Economics and Statistics Ad
U.S. CENSUS BUREAU
census.gov

United States® Census 2020

Conducting the Enumeration: Identifying Optimal Routing for Enumerators

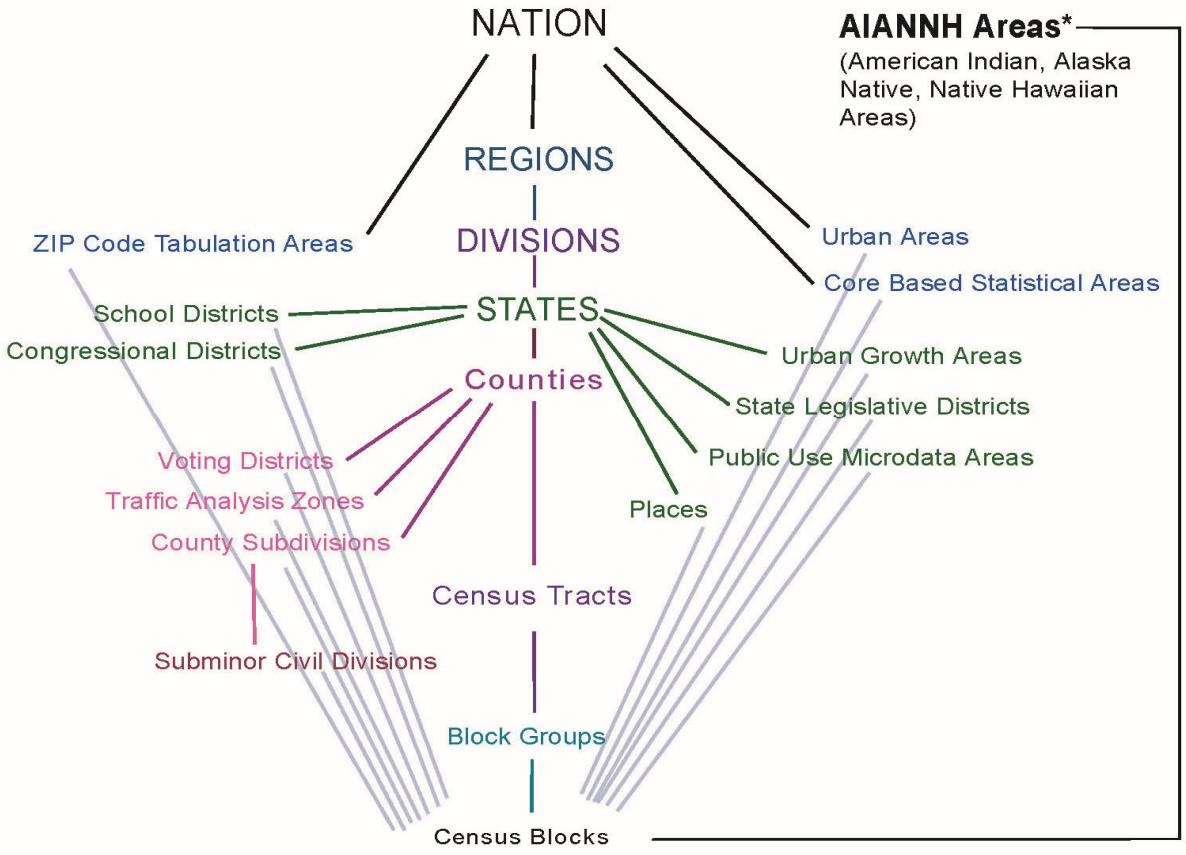
- Using demographic and geospatial data and geospatial technologies to assign workloads, determine best time to visit, and identify optimal routing to carry out work.



Geographic Areas for Data Tabulation and Dissemination

Geographic Hierarchy

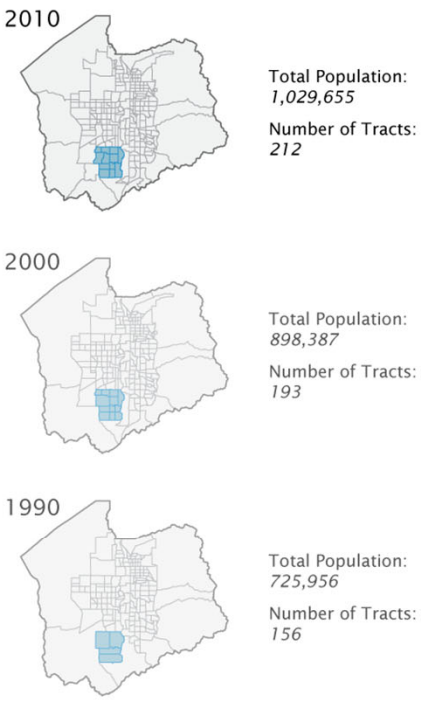
- The Census Bureau maintains boundaries and attributes for over 40 types of geographic areas.
- The Census Bureau's geographic database contains over 12 million individual geographic units for which census and survey data are produced.

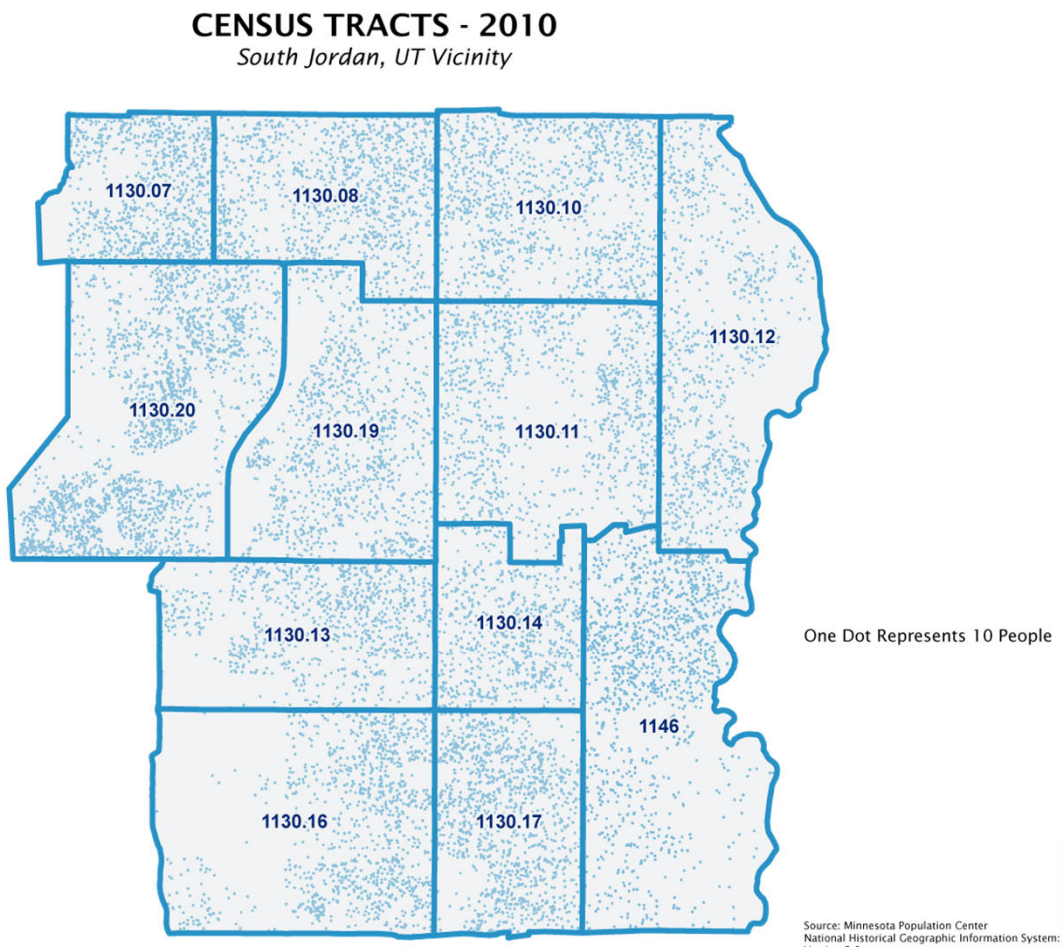


Geographic Areas for Data Tabulation and Dissemination

Small area data to facilitate neighborhood-level planning and decision making

Salt Lake County, Utah





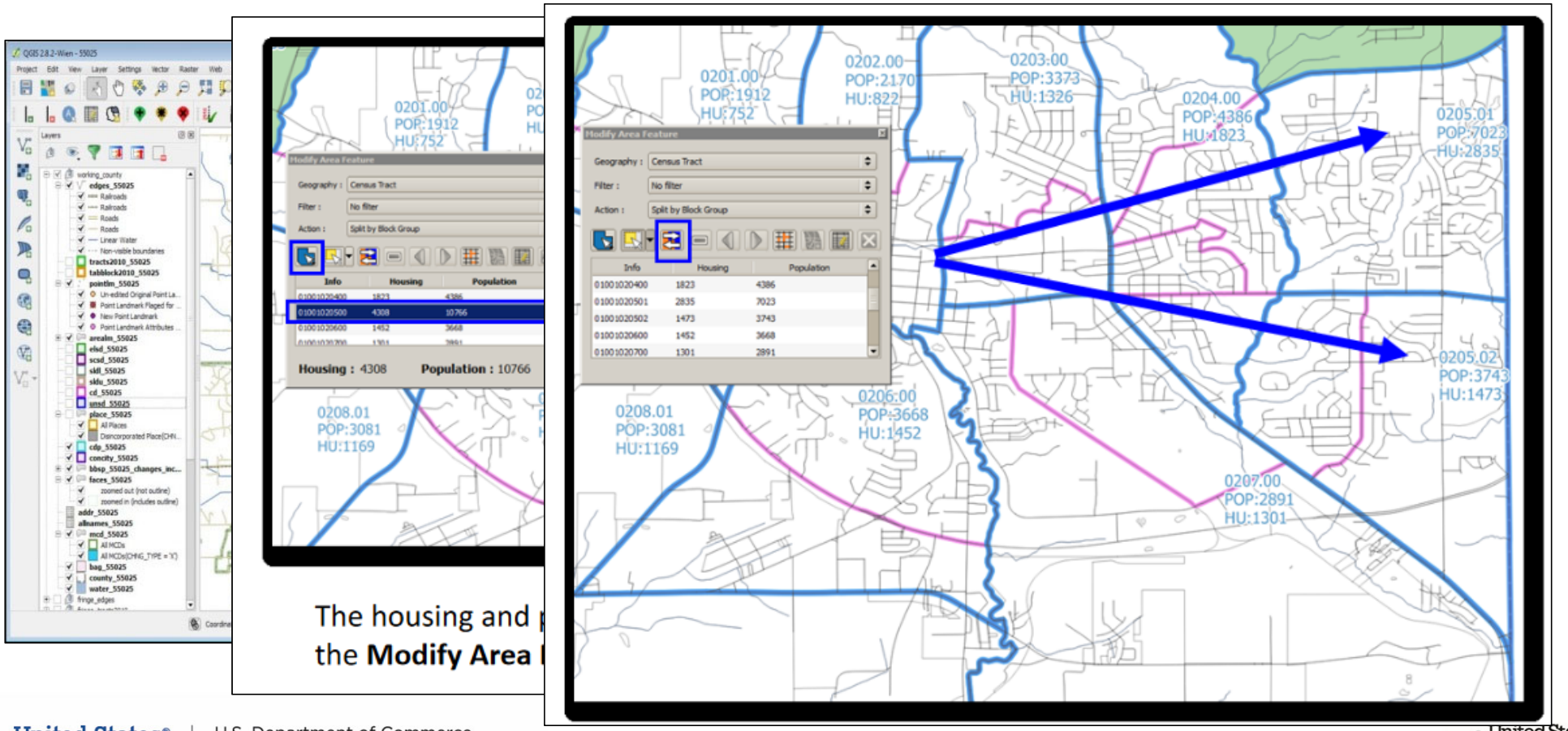
United States® Census Bureau

U.S. Department of Commerce
Economics and Statistics Administration
U.S. CENSUS BUREAU
census.gov

United States® Census 2020

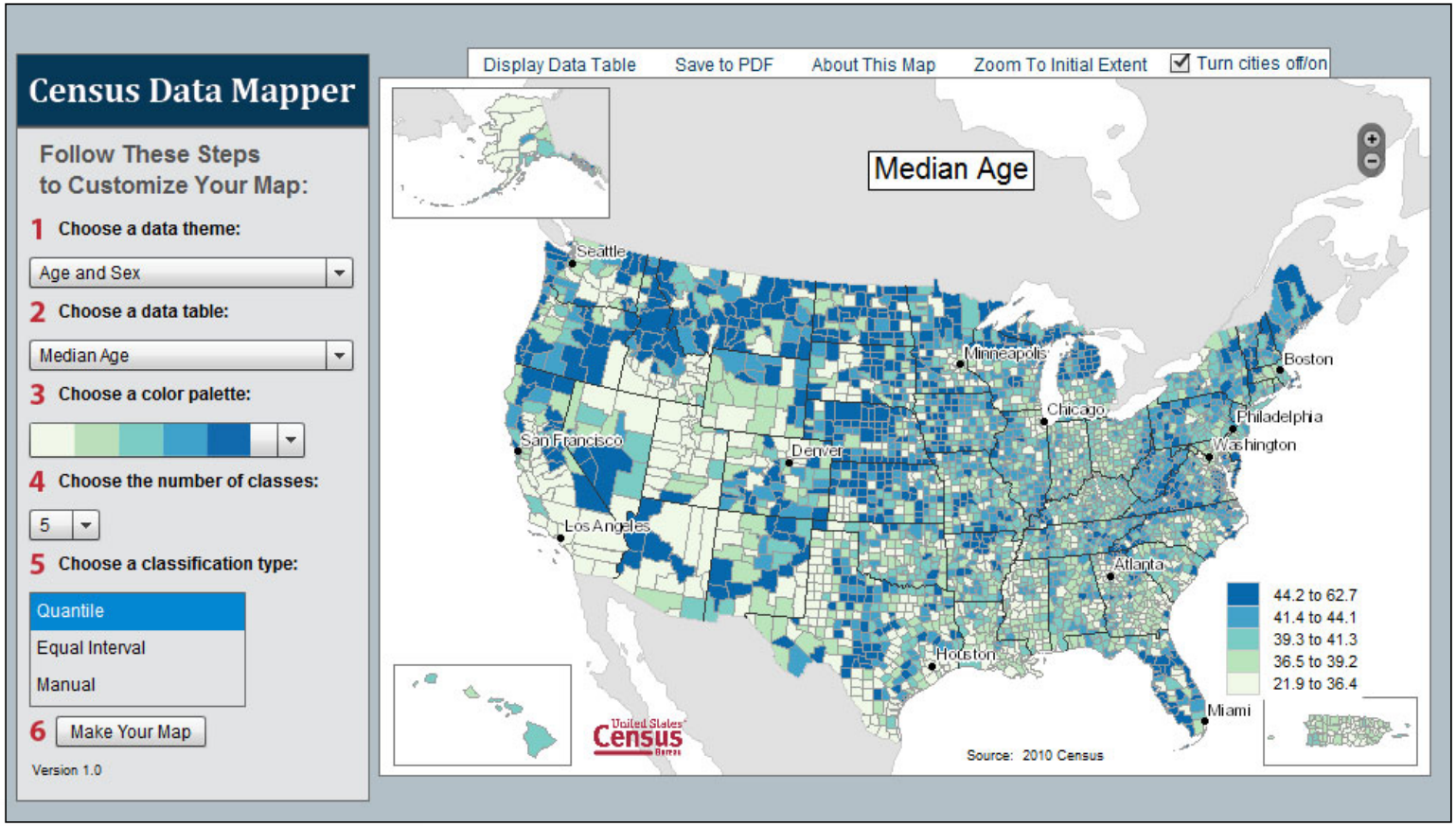
Geographic Areas for Data Tabulation and Dissemination

Geographic Update Partnership Software



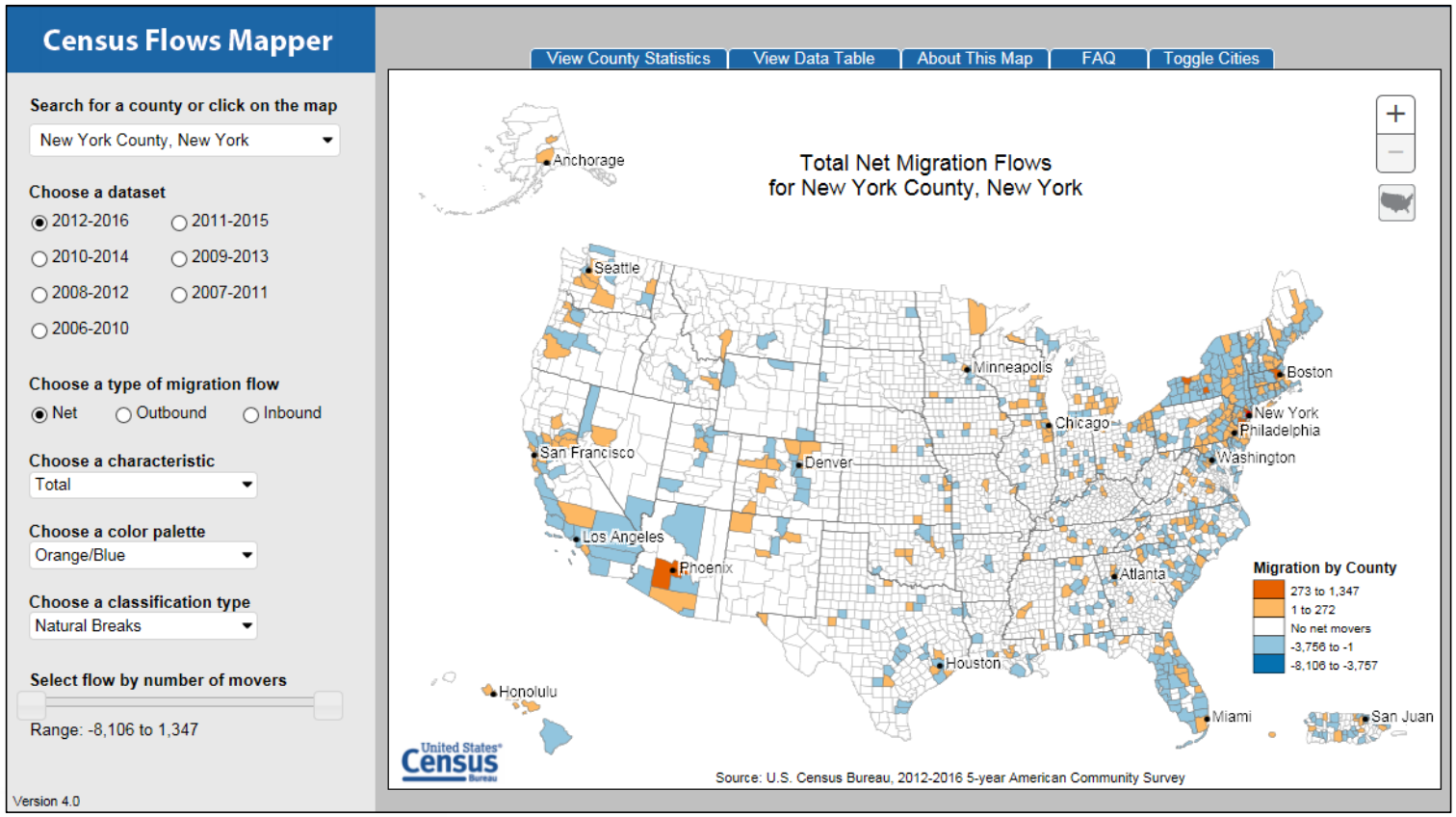
Geospatial products to support analysis and decision-making

Census Data Mapper https://datamapper.geo.census.gov/map.html



Geospatial products to support analysis and decision-making

Census Flows Mapper: https://flowsmapper.geo.census.gov/map.html



Thank You

Michael Ratcliffe

Assistant Division Chief for Geographic Standards, Criteria, Research, and Quality

Geography Division

US Census Bureau

michael.r.ratcliffe@census.gov