Census Geography, Geographic Standards, and Geographic Information

Michael Ratcliffe
Geography Division
US Census Bureau

New Mexico State Data Center
Data Users Conference

November 19, 2015
Today’s Presentation…

• A brief look at the history of the Census Bureau’s development of geography standards and current GIS developments

• Focus on changes to:
  – Geographic area concepts and criteria
    • Examples: urban areas, census designated places, census tracts
  – Measuring geospatial data accuracy and quality
The use of geographic information has a long history at the Census Bureau.

The 1874 Statistical Atlas was a landmark publication, mapping a variety of demographic and economic topics, using innovative mapping techniques. Creation detailed and accurate geographic information made this possible.
Uses of GIS at the Census Bureau

• Management of field data collection operations.
• Geographic area delineation.
• Review of address, spatial data, and boundary updates from tribal, state, and local governments and other organizations.
• Review of statistical data prior to dissemination.
• Analysis of statistical data for use in research and reports.
• Map production, including development of online mapping applications.
Changes to Census Geography

• Over the past century, the number and types of census geographic areas, and the criteria used to define areas, have changed in response to:
  – Changes in technology (i.e., GIS, databases) providing for more efficient exchange, collection, management, and dissemination of data.
  – Changes in user needs and expectations.
  – Improvements in spatial resolution of data.
  – Changes in theoretical approaches to interpreting and understanding geographic concepts.
Census Bureau’s urban/rural classification

- **1880-1940**: incorporated places meeting specified minimum population thresholds
  - Close relationship between urban population and city and town boundaries
- **1950-1990**: urbanized areas of 50,000 or more population based partly on population density
  - 1950: applied only to cities of 50,000 or more
  - Interactive GIS-based delineation in 1990
- **2000-2010**: density-based urbanized areas and urban clusters
  - Automated, GIS-based delineation
  - Use of National Land Cover Dataset impervious surface layer
Urbanized Areas, 1950-1990

- Adoption of concept to account for increased suburban growth around large cities.
- Adherence to place boundaries.
- Delineated manually/interactively.
- Delineation built from previous decade’s boundary.
Changes to the Urban Area Concept and Criteria for Census 2000

- Urban clusters adopted, extending the urbanized area concept to smaller places.
- Place boundaries not considered when delineating areas.
- Automated delineation to improve efficiency and consistency.
Starting with Census 2000, place boundaries are no longer taken into account when delineating urban areas.

As a result, incorporated places and CDPs may be split between urban and rural components.
Non-residential urban land use located on the edge of an urban area, adjacent to low density rural territory.

2010 Census: Use of National Land Cover Dataset impervious surface layer to identify non-residential land uses

Non-residential urban land use bridging the gap between residential areas.
2010 Census
Distribution of Places

- Incorporated Place (19,540)
- Census Designated Place (9,974)
Unincorporated/Census Designated Places

• 1940: Supplementary report for unincorporated places. Minimum population: 500.
  – New Mexico: 35 unincorporated places.

• 1950: unincorporated places only defined outside urbanized areas. Minimum population: 1,000.
  – New Mexico: 16 unincorporated places.

• 1960 through 1990: Minimum population: 2,500 inside urbanized areas. 1,000: outside urbanized areas.

• 2000 to present: no minimum population threshold.
  – New Mexico, 2000: 133 CDPs
  – New Mexico, 2010: 341 CDPs
### 1940 Census Supplementary Report: Population in Unincorporated Communities

<table>
<thead>
<tr>
<th>Unincorporated Community</th>
<th>Minor Civil Division in which located</th>
<th>County</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alameda</td>
<td>3, Alameda</td>
<td>Bernalillo</td>
<td>1,238</td>
</tr>
<tr>
<td></td>
<td>18, Anthony</td>
<td>Dona Ana Co., New Mexico</td>
<td>1,028</td>
</tr>
<tr>
<td>Anthony</td>
<td>Justice precinct 6</td>
<td>El Paso Co., Texas</td>
<td>1,028</td>
</tr>
<tr>
<td>Arroyo Hondo</td>
<td>6, Arroyo Hondo</td>
<td>Taos</td>
<td>541</td>
</tr>
<tr>
<td>Arroyo Seco</td>
<td>5, Arroyo Seco</td>
<td>Taos</td>
<td>727</td>
</tr>
<tr>
<td>Bernalillo</td>
<td>23, Bernalillo, 24</td>
<td>Bernalillo</td>
<td>2,943</td>
</tr>
<tr>
<td>Bloomfield</td>
<td>6, Bloomfield</td>
<td>San Juan</td>
<td>619</td>
</tr>
<tr>
<td>Central</td>
<td>1, Central</td>
<td>Grant</td>
<td>1,764</td>
</tr>
<tr>
<td>Cerrillos</td>
<td>7, Cerrillos</td>
<td>Santa Fe</td>
<td>680</td>
</tr>
<tr>
<td>Chama</td>
<td>19, Chama</td>
<td>Rio Arriba</td>
<td>919</td>
</tr>
<tr>
<td>Costilla</td>
<td>12, Costilla</td>
<td>Taos</td>
<td>971</td>
</tr>
<tr>
<td>Cuba</td>
<td>6, Cuba</td>
<td>Sandoval</td>
<td>733</td>
</tr>
<tr>
<td>El Rito</td>
<td>10, El Rito</td>
<td>Rio Arriba</td>
<td>707</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unincorporated Community</th>
<th>Minor Civil Division in which located</th>
<th>County</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. Mexico—Con.</td>
<td>23, Grants</td>
<td>Valencia</td>
<td>1,487</td>
</tr>
<tr>
<td>Hurley</td>
<td>12, Hurley</td>
<td>Grant</td>
<td>1,784</td>
</tr>
<tr>
<td>Los Padillas</td>
<td>6, Los Padillas</td>
<td>Bernalillo</td>
<td>804</td>
</tr>
<tr>
<td>Jaraíta</td>
<td>3, Jaraíta</td>
<td>Valencia</td>
<td>1,050</td>
</tr>
<tr>
<td>Vallecitos</td>
<td>19, Vallecitos</td>
<td>Sandoval</td>
<td>740</td>
</tr>
<tr>
<td>La Mesa</td>
<td>8, La Mesa</td>
<td>Dona Ana</td>
<td>601</td>
</tr>
<tr>
<td>Lyden-Velarde</td>
<td>22, Velarde</td>
<td>Río Arriba</td>
<td>685</td>
</tr>
<tr>
<td>Mesilla</td>
<td>4, 5</td>
<td>Dona Ana</td>
<td>1,170</td>
</tr>
<tr>
<td>Nambe</td>
<td>22, Nambe</td>
<td>Santa Fe</td>
<td>879</td>
</tr>
<tr>
<td>Old Albuquerque</td>
<td>13, Old Albuquerque</td>
<td>Bernalillo</td>
<td>1,119</td>
</tr>
<tr>
<td>Paguntas</td>
<td>6, Seboyeta</td>
<td>Valencia</td>
<td>520</td>
</tr>
<tr>
<td>Park View-Brazos</td>
<td>18, Park View</td>
<td>Río Arriba</td>
<td>795</td>
</tr>
<tr>
<td>Peña Blanca</td>
<td>12, Peña Blanca</td>
<td>Sandoval</td>
<td>508</td>
</tr>
<tr>
<td>Pesasco</td>
<td>10, Pesasco</td>
<td>Taos</td>
<td>527</td>
</tr>
<tr>
<td>Peralta-Velencia</td>
<td>11, Peralta-Velencia</td>
<td>Valencia</td>
<td>1,299</td>
</tr>
<tr>
<td>Questa</td>
<td>7, Questa</td>
<td>Taos</td>
<td>1,541</td>
</tr>
<tr>
<td>Santa Rita</td>
<td>13, Santa Rita</td>
<td>Grant</td>
<td>2,588</td>
</tr>
<tr>
<td>Santo Domingo</td>
<td>13, Santo Domingo</td>
<td>Sandoval</td>
<td>970</td>
</tr>
<tr>
<td>Tierra Amarilla</td>
<td>17, Tierra Amarilla</td>
<td>Río Arriba</td>
<td>787</td>
</tr>
<tr>
<td>Torreon</td>
<td>2, Torreon</td>
<td>Torreon</td>
<td>615</td>
</tr>
<tr>
<td>Tortugas</td>
<td>6, Mazilla Park</td>
<td>Dona Ana</td>
<td>546</td>
</tr>
<tr>
<td>Truchas</td>
<td>5, Truchas</td>
<td>Río Arriba</td>
<td>694</td>
</tr>
<tr>
<td>Van Houten</td>
<td>5, Van Houten</td>
<td>Colfax</td>
<td>542</td>
</tr>
<tr>
<td>Villanueva</td>
<td>2, La Cuesta</td>
<td>San Miguel</td>
<td>560</td>
</tr>
</tbody>
</table>
CDPs/Colonias, Doña Ana County
La Mesa CDP, Doña Ana County
Census 2000: Minimum population requirements for Census Designated Places were eliminated to support identification of colonias and other small, unincorporated communities to improve access to data about demographic characteristics.
The 1960 Census was the first census for which census tracts were defined in New Mexico. Census tracts were limited to Bernalillo County.
For the 1970 Census, tracts were defined in Bernalillo, Santa Fe, Los Alamos, Doña Ana, and Otero Counties. For 1980, 15 additional counties were tracted. Census tracts and block numbering areas covered the entire state in 1990.

Source: Social Explorer
Tribal tracts and tribal block groups added as new types of statistical geographic areas for the 2000 Census within Federally-recognized American Indian Reservations and allowed to cross county and state boundaries. Tribal tracts and block groups formed the framework for standard, county-based tracts and block groups. For the 2010 Census, tribal tracts/block groups were defined as completely separate areas from standard tracts/block groups; that is, no relationship between tribal tracts/block groups and county-based tracts/block groups.
MAF/TIGER Accuracy Improvement

• MAF/TIGER Accuracy Improvement Project (MTAIP): 2002 – 2008

• Emphasis on **positional** accuracy. 7.2 meters or better accuracy for street centerlines.

• Post-2010: continue improving address and spatial data accuracy and completeness. Develop measures of quality, consistency, and completeness.
TIGER features – Relative Accuracy
TIGER Features – Positional Accuracy
Quality Indicators

• **Address**
  – Name/Attribute
  – Mailability
  – Deliverability
  – Locatability
  – Geocode Accuracy

• **Feature**
  – Spatial accuracy of features
  – Number of driveways within geographic unit
  – Address range parity, accuracy, and consistency
Address Sub-QI Scores by Tract
Ungeocoded Residential DSF Addresses as a Percentage of Total

Percent (%) Geocoded by County
- 10.01 - 16.79
- 5.01 - 10.0
- 2.51 - 5.0
- 1.01 - 2.5
- 0.01 - 1.0
- No Data

Criteria Used:
- The MAF Unit has Residential Status Flag = "Y" (MAF Unit Table)
- The MAF Unit has at least one address that meets ALL of the following conditions:
  - The address is a city-style address (MTFCC = "10000")
  - The address is on the most recent DSF
  - The address is not an Excluded from Delivery Service (X Type) record
  - The address has Residential Status Flag = "Y" (Address Table)

Source: Master Address File

Currently there is no DSF Address Data available for Puerto Rico

United States Census Bureau
Economics and Statistics Administration
U.S. CENSUS BUREAU
## TIGER/Line Geodatabases with Selected Demographic and Economic Data

A limited set of TIGER/Line Shapefiles are available pre-joined with data in geodatabase and shapefile format.

We continue to work with our data providers to ensure there are easy links between the geographic products and the data products.

### American Community Survey 5-Year Estimates — Geodatabase Format
- 2009 - 2013 Detailed Tables
- 2008 - 2012 Detailed Tables
- 2007 - 2011 Block Group Data
- 2007 - 2011 Data Profiles
- 2006 - 2010 Block Group Data
- 2006 - 2010 Data Profiles

### 2010 Census
- Demographic Profile 1 — Shapefile Format
- Demographic Profile 1 — Geodatabase Format
- Island Areas Demographic Profiles - Geodatabase Format
- Population & Housing Unit Counts — Blocks

### County Business Patterns — Geodatabase Format
- 2012
Interactive Mapping Tools

Interactive Maps
Work with interactive mapping tools from across the Census Bureau:

- Data Visualization Gallery
- TIGERweb
- Census Flows Mapper
- Census Data Mapper
- Interactive Population Map
- Metro/Micro Thematic Map Viewer
- County Business and Demographics Map
- SAHIE Interactive Data Tool (Health Insurance)
- SAIFP Interactive Data Tool (Poverty)
- OnTheMap (Employment)
- OnTheMap for Emergency Management
- Census Business Builder
Concluding thoughts…

• The history of Census Bureau geography has been one of increasing numbers and types of geographic areas, at increasing levels of spatial resolution, in response to data users’ needs.

• For the future, do we continue to add new and different types of geographic areas to Census Bureau databases?

• Or, do we develop processes and applications that allow data users to use geographic areas from one source to aggregate data from a different source?
Questions? Comments?

Contact information:

Michael Ratcliffe,
Geography Division
U.S. Census Bureau
Michael.r.ratcliffe@census.gov