Use of Parcel Data to Update and Enhance Census Bureau Geospatial Data

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Summer at the Census – August 4, 2011

Credits and Disclaimers

- This presentation was prepared under the Summer at the Census Program
- Thanks to:
  - Mike Ratcliffe
  - Matt Jennings
  - Valerie Beaudin
  - Frank Ussher
- Data provided by
  - South Carolina GIS Council
  - Core Logic
  - Loudoun County VA Office of Mapping and Geographic Information
- All Census geospatial data was retrieved from public websites
- No data with Title 13 restrictions was used

The Cadastre is the Critical Form of Geospatial Data in Society

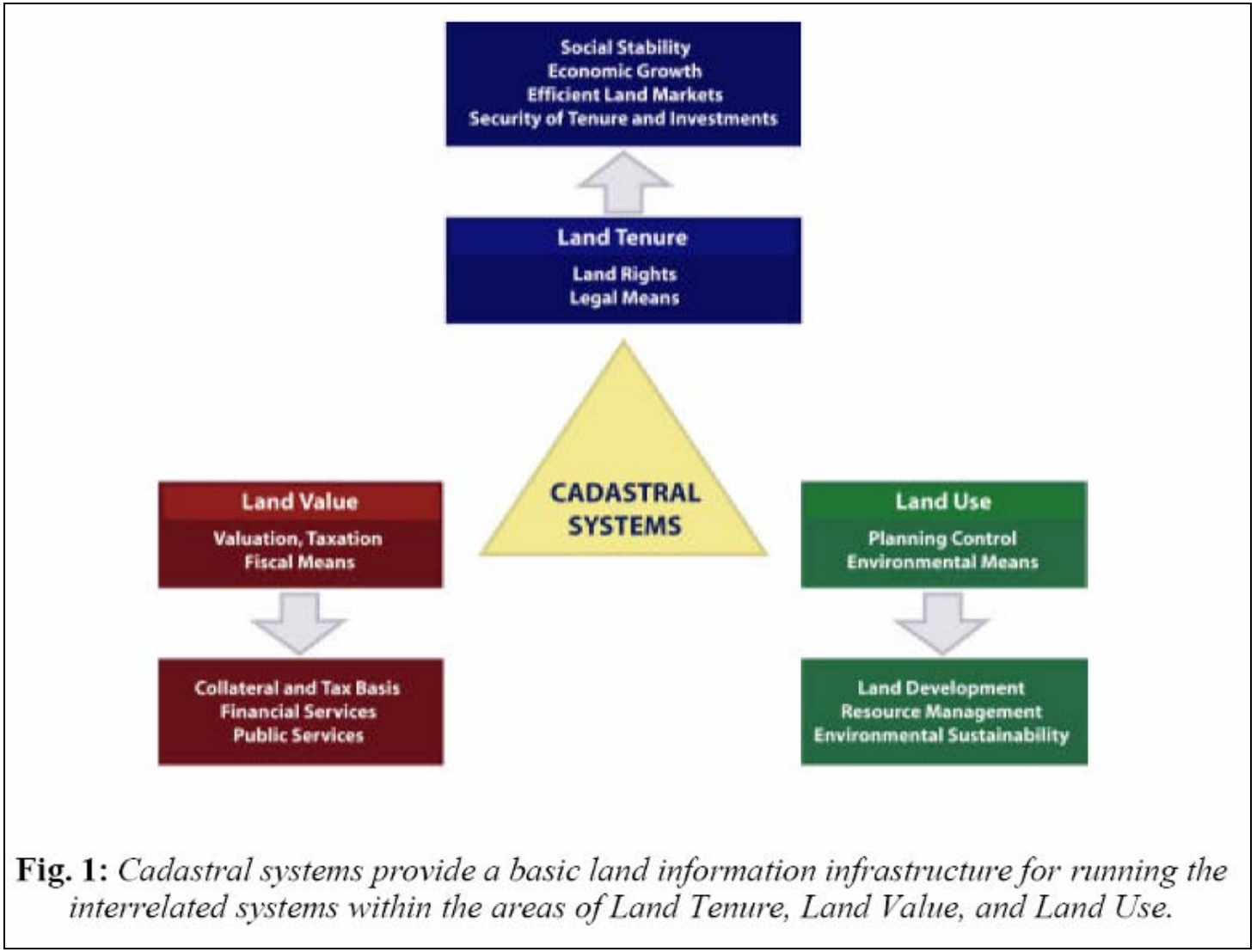


Fig. 1: *Cadastral systems provide a basic land information infrastructure for running the interrelated systems within the areas of Land Tenure, Land Value, and Land Use.*

Enemark, S. 2004. Building land information policies. Inter-Regional Special Forum on the Building of Land Information Policies in the Americas

Parcels are linked to many operations of Government

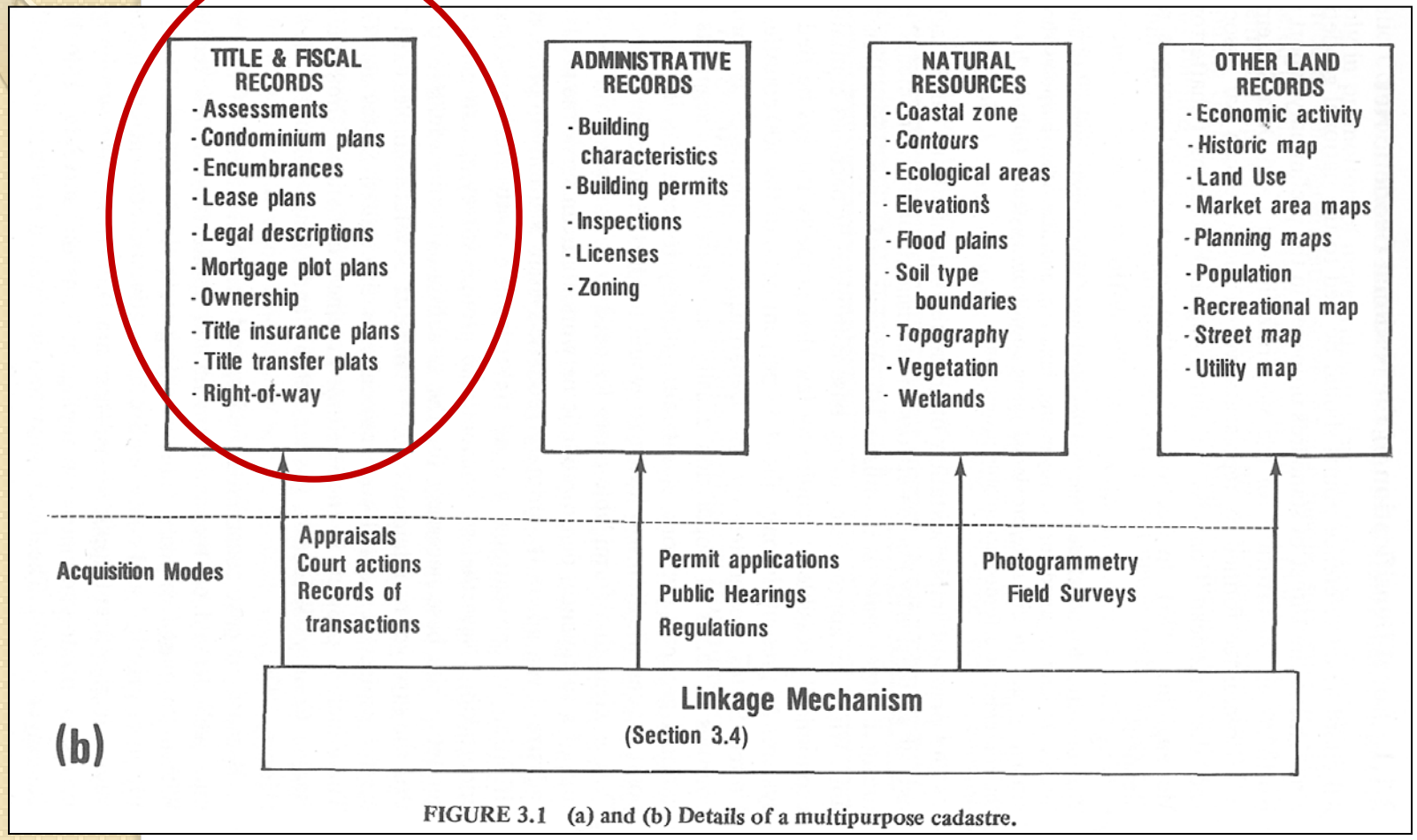
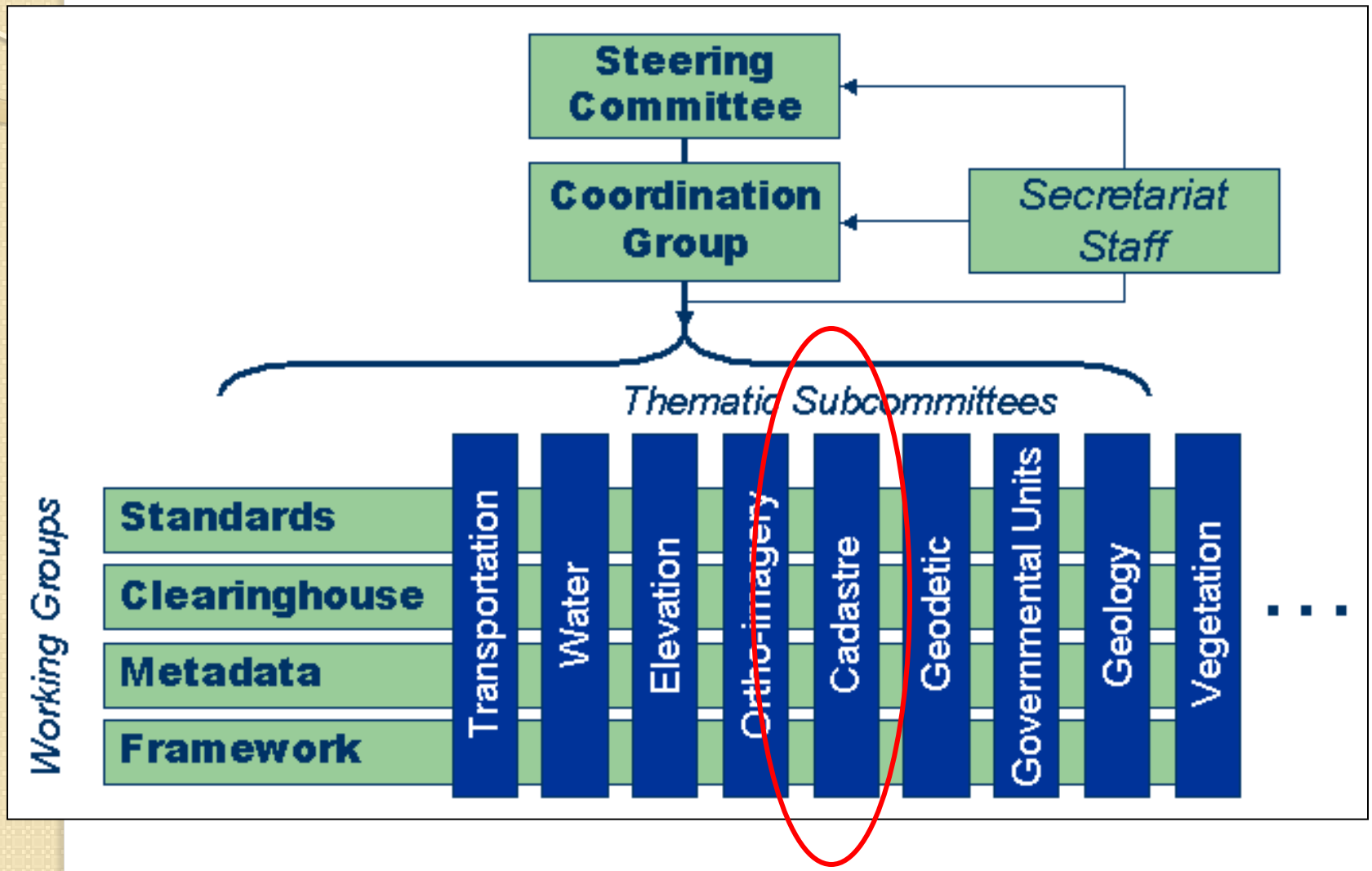


FIGURE 3.1 (a) and (b) Details of a multipurpose cadastre.

The Cadastre is Critical to the Federal Geospatial Community



Technology

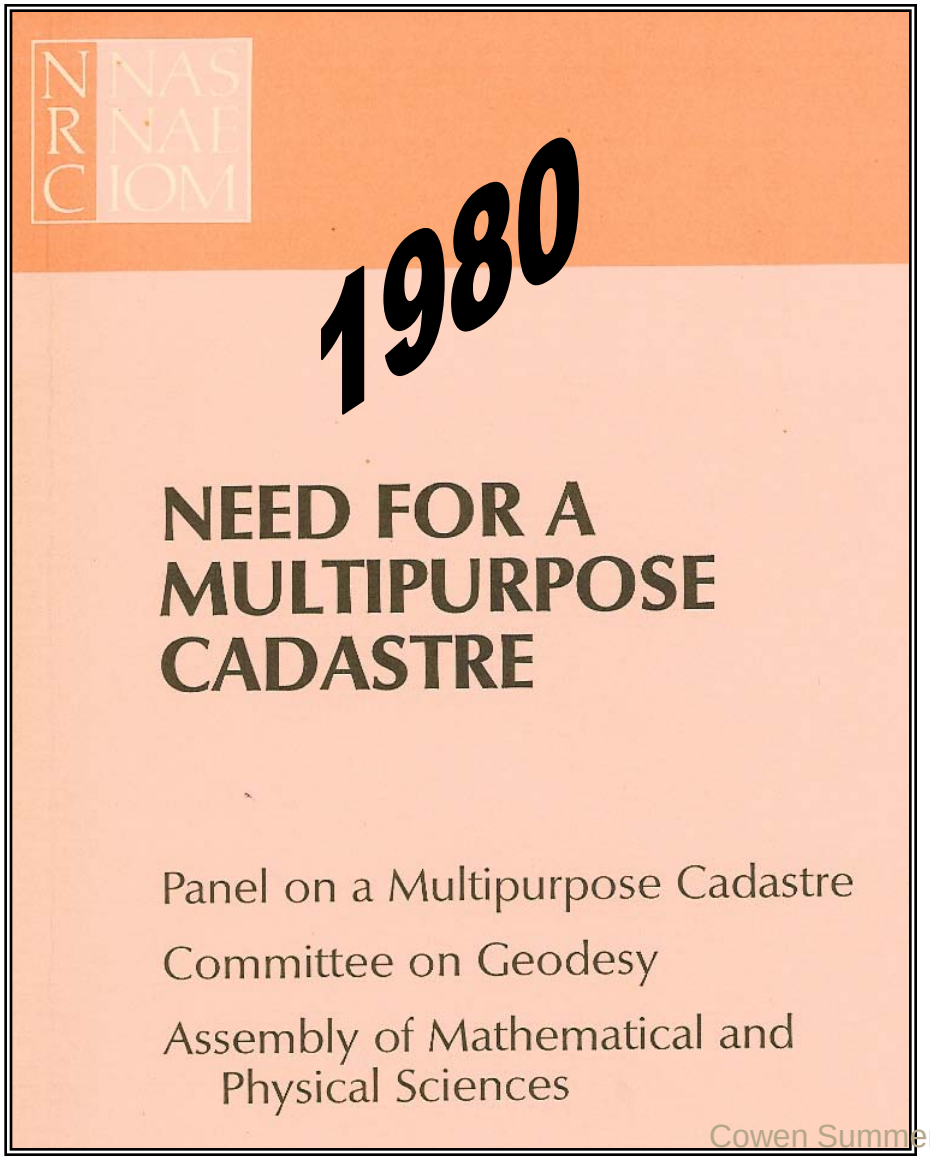
- "***Current technology is adequate*** in most cases for the surveying, mapping, data collecting, filing and dissemination of information.

- Advancement in computer applications, communication ***networks*** and copying processes promise of more-efficient use of the multipurpose cadastre."

Obstacles

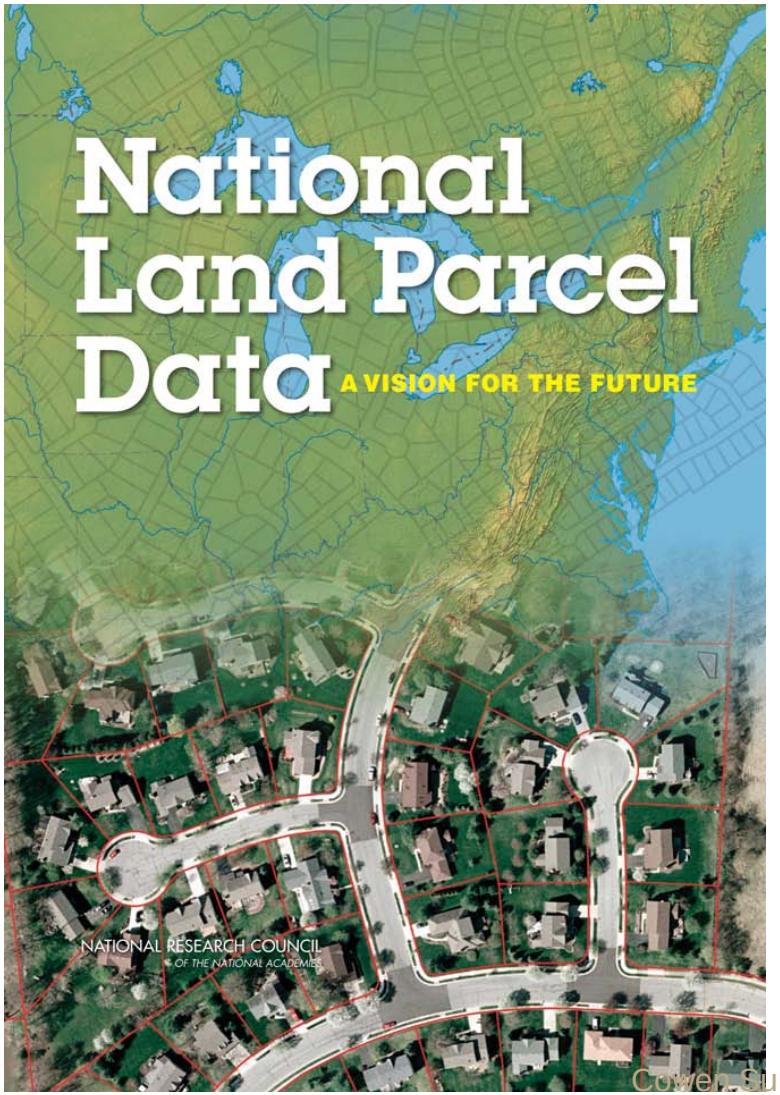
- The major ***obstacles*** in the development of a multipurpose cadastre are the ***organizational*** and ***institutional*** requirements.

But, of course, we knew that in 1980



2007 – National Research Council Report

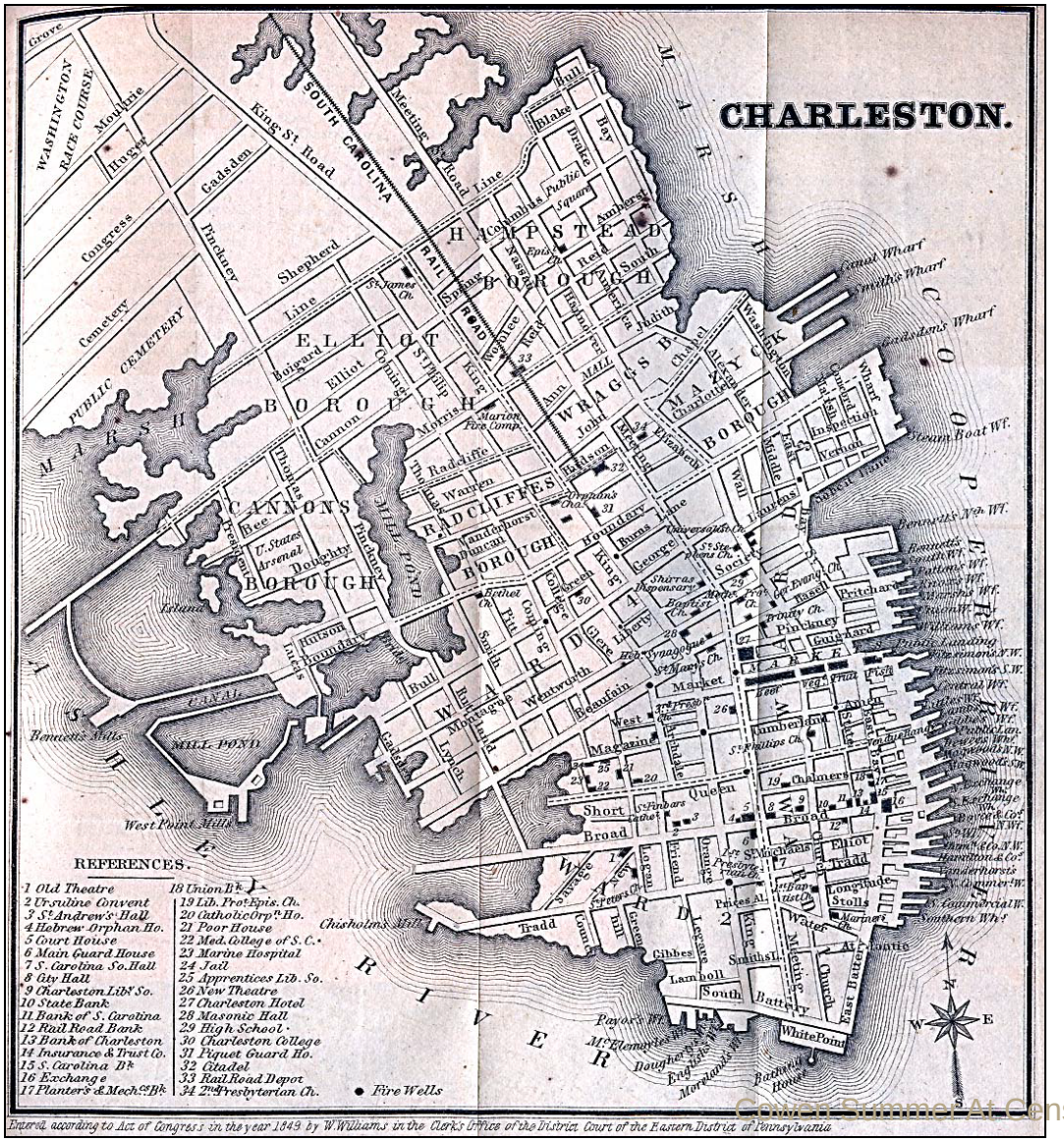
Nine Recommendations Including one on Title 13



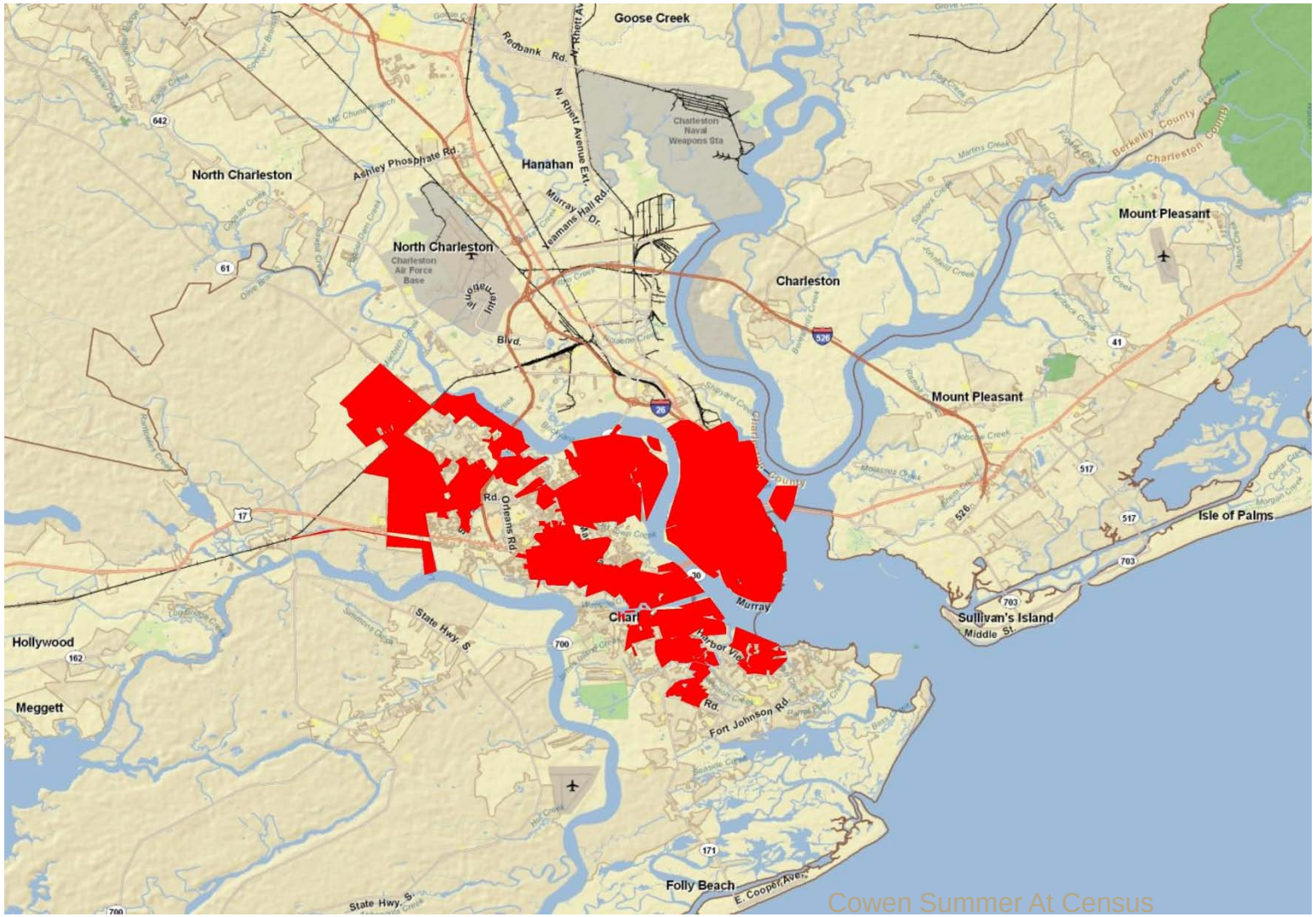
Working Hypotheses That are of Interest to the Geography Division

- Parcels:
  - ***are required to accurately represent many municipal boundaries***
  - can generate centroids that are a excellent representation of many structure points
  - can be used to separate public and private land which is important for validation
  - can be used to generate road centerlines
  - can be dissolved to create many meaningful polygons

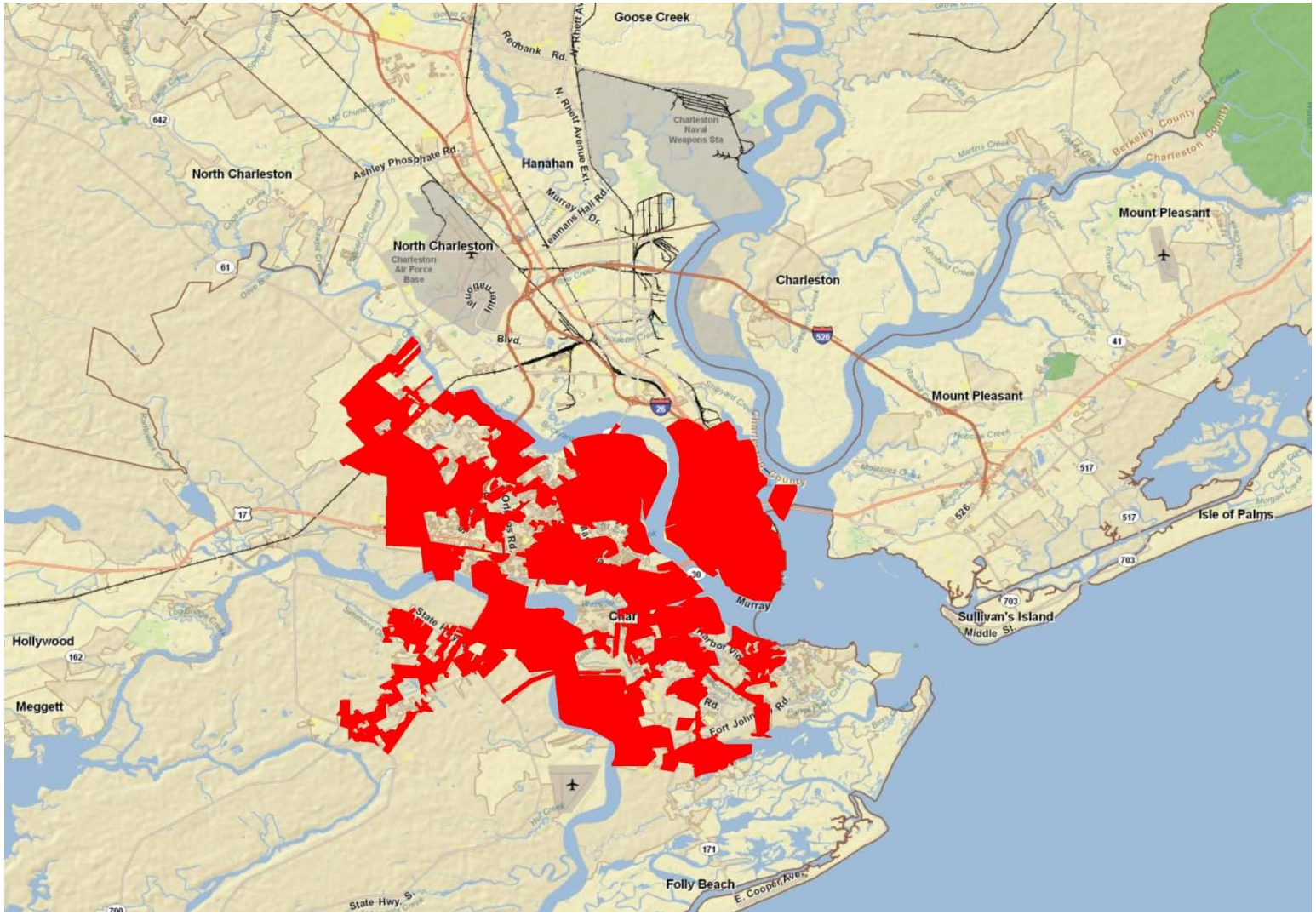
1849


CHARLESTON.
REFERENCES.
1 Old Theatre
2 Ursuline Convent
3 St. Andrew's Hall
4 Hebrew Orphan Ho.
5 Court House
6 Main Guard House
7 S. Carolina So. Hall
8 City Hall
9 Charleston Lib.y So.
10 State Bank
11 Bank of S. Carolina
12 Rail Road Bank
13 Bank of Charleston
14 Insurance & Trust Co.
15 S. Carolina Bk
16 Exchange
17 Planter's & Mech.cs Bk.
18 Union Bk.
19 Lib. Prot. Epis. Ch.
20 Catholic Orp.n Ho.
21 Poor House
22 Med. College of S. C.
23 Marine Hospital
24 Jail
25 Apprentices Lib. So.
26 New Theatre
27 Charleston Hotel
28 Masonic Hall
29 High School
30 Charleston College
31 Piquet Guard Ho.
32 Citadel
33 Rail Road Depot
34 2nd Presbyterian Ch.
Fire Wells
Entered according to Act of Congress in the year 1849 by W. Williams in the Clerk's Office of the District Court of the Eastern District of Pennsylvania

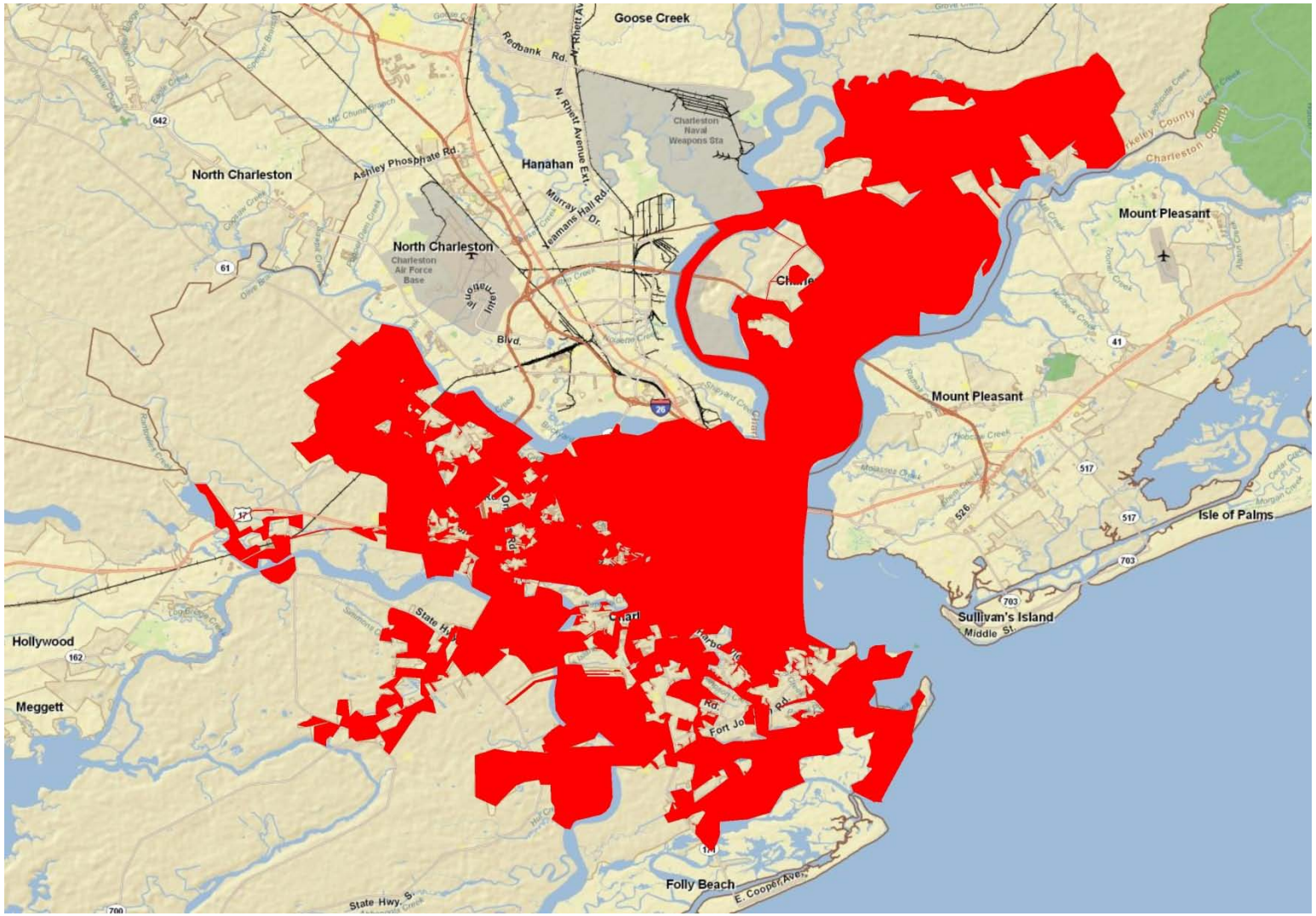
1980 Census Bureau City Boundaries



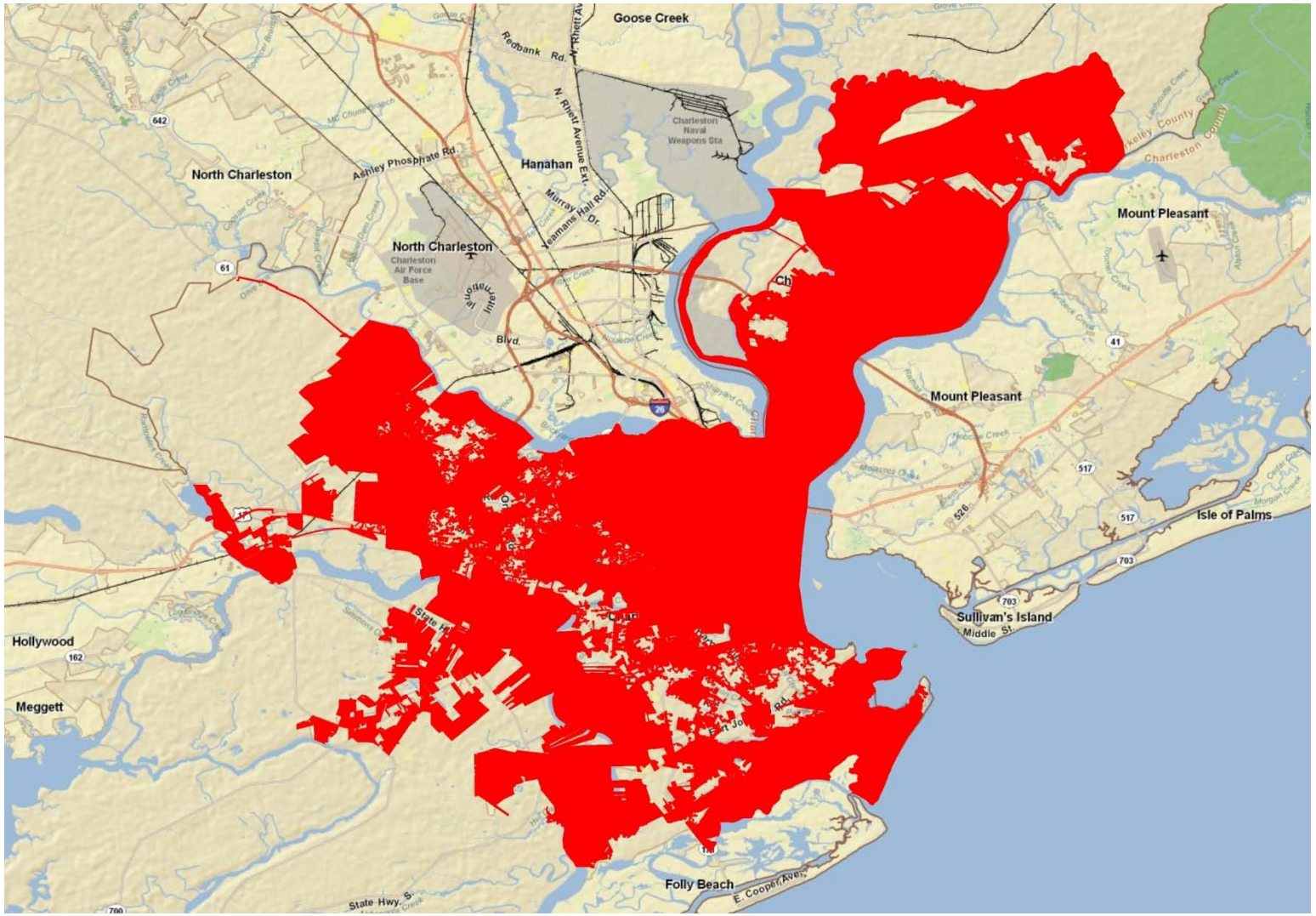
1990 Census Bureau City Boundaries



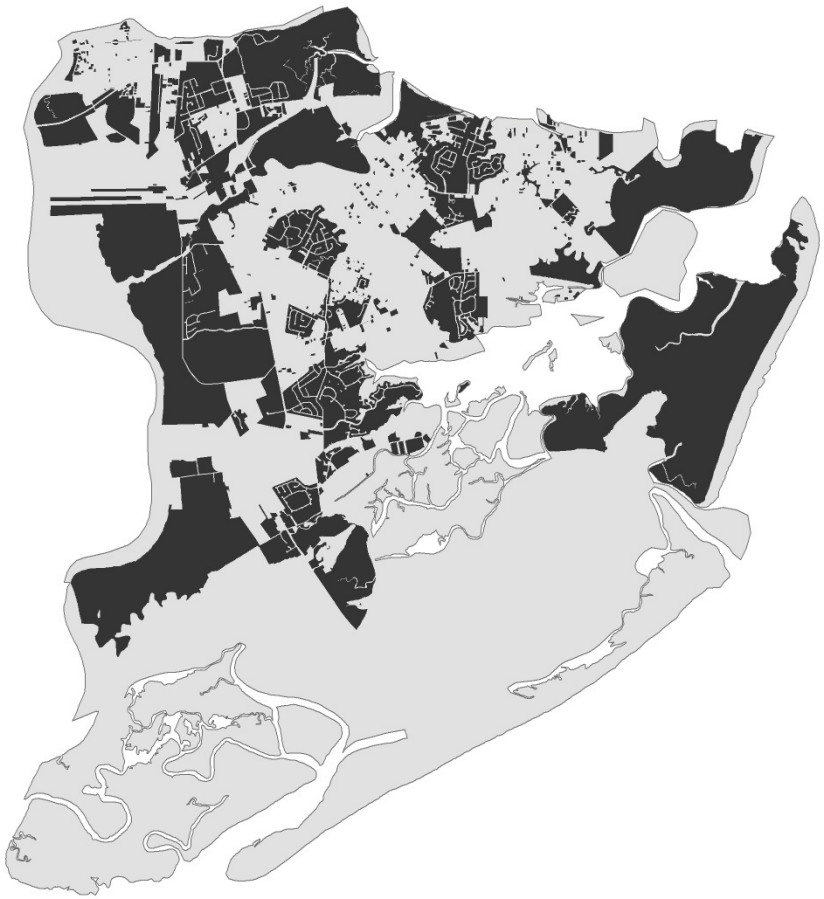
2000 Census Bureau City Boundaries



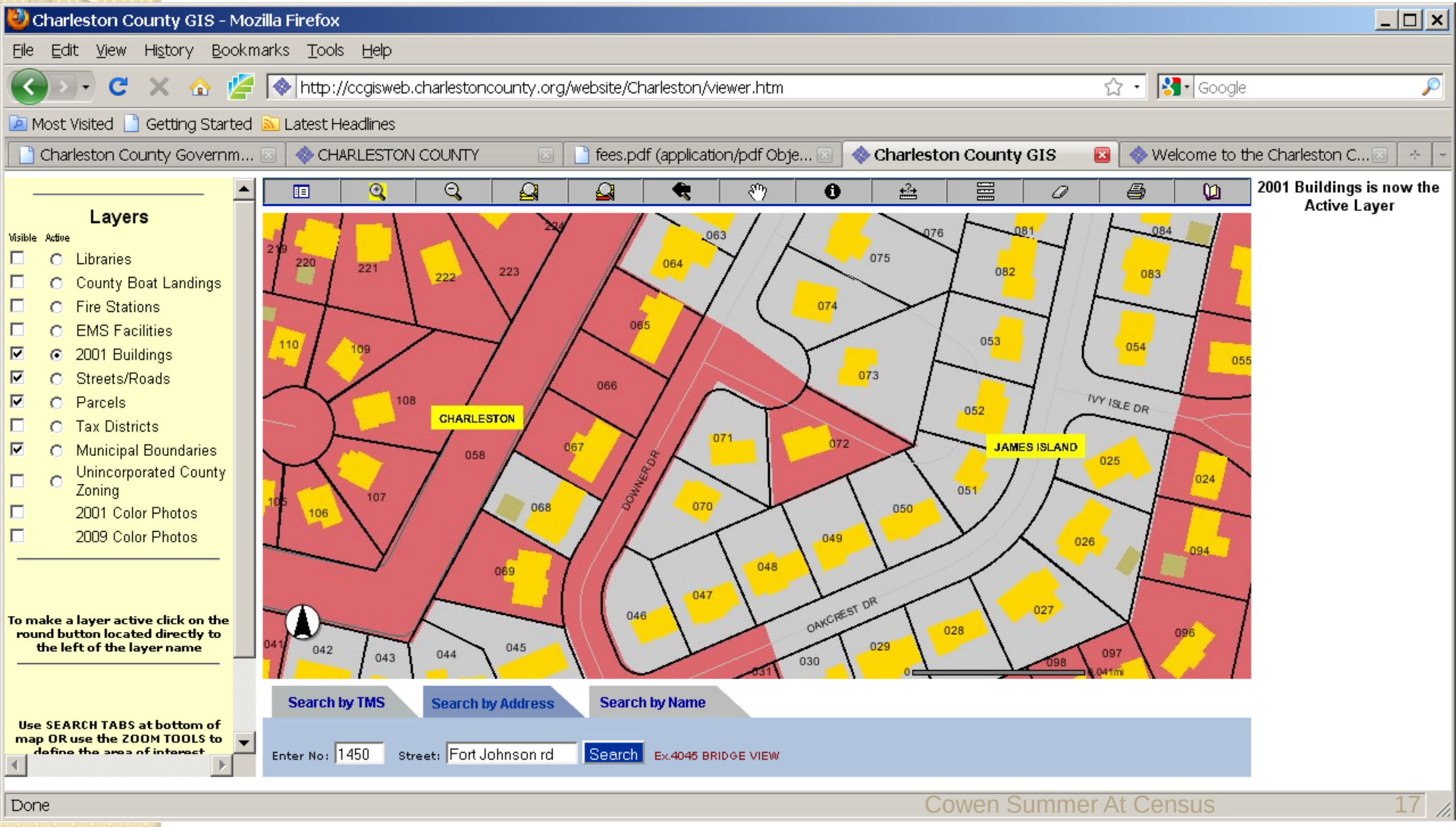
2007 City of Charleston City Boundaries



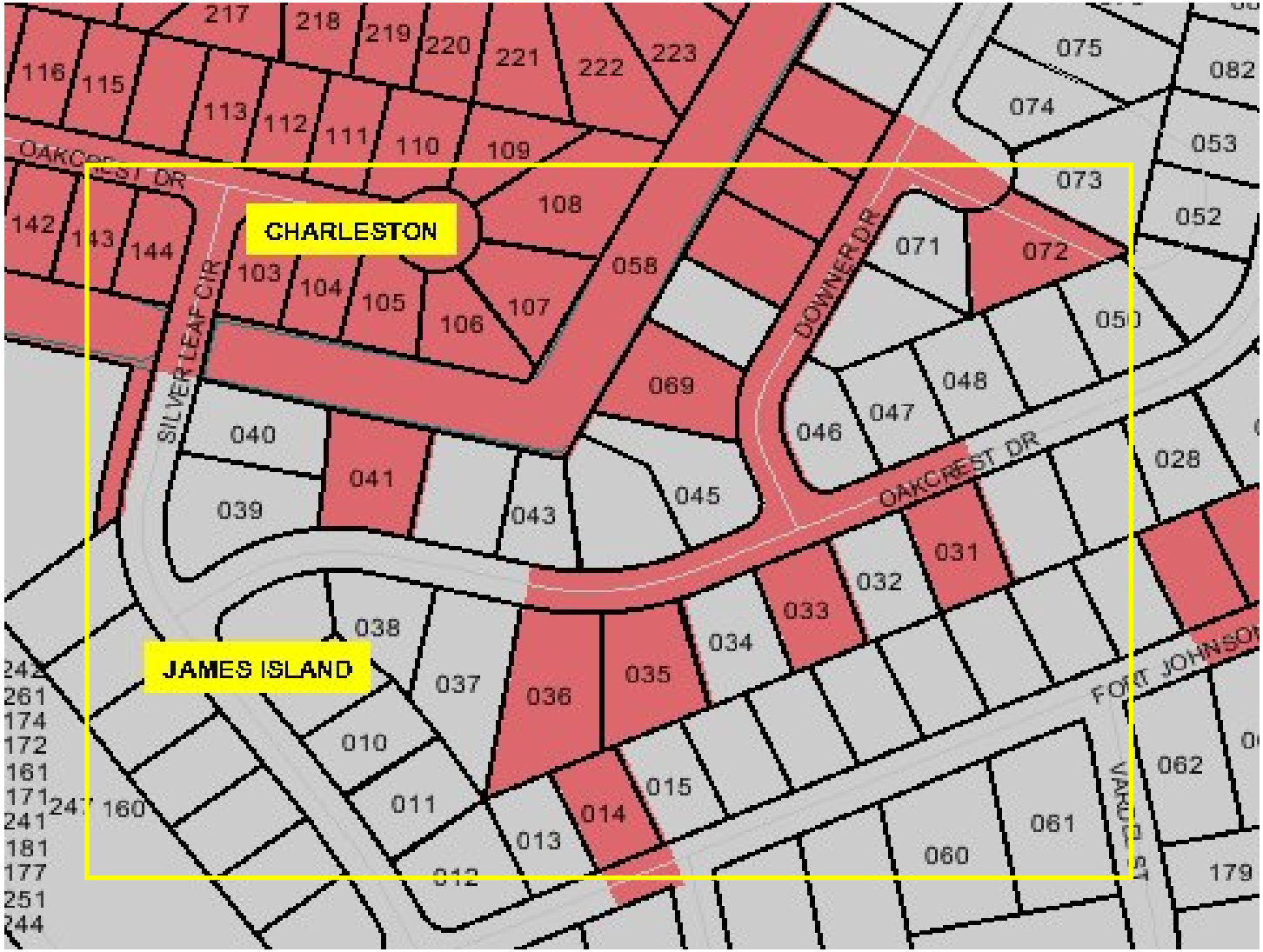
City of Charleston
788 Separate Non Contiguous Clusters
of Parcels On James Island



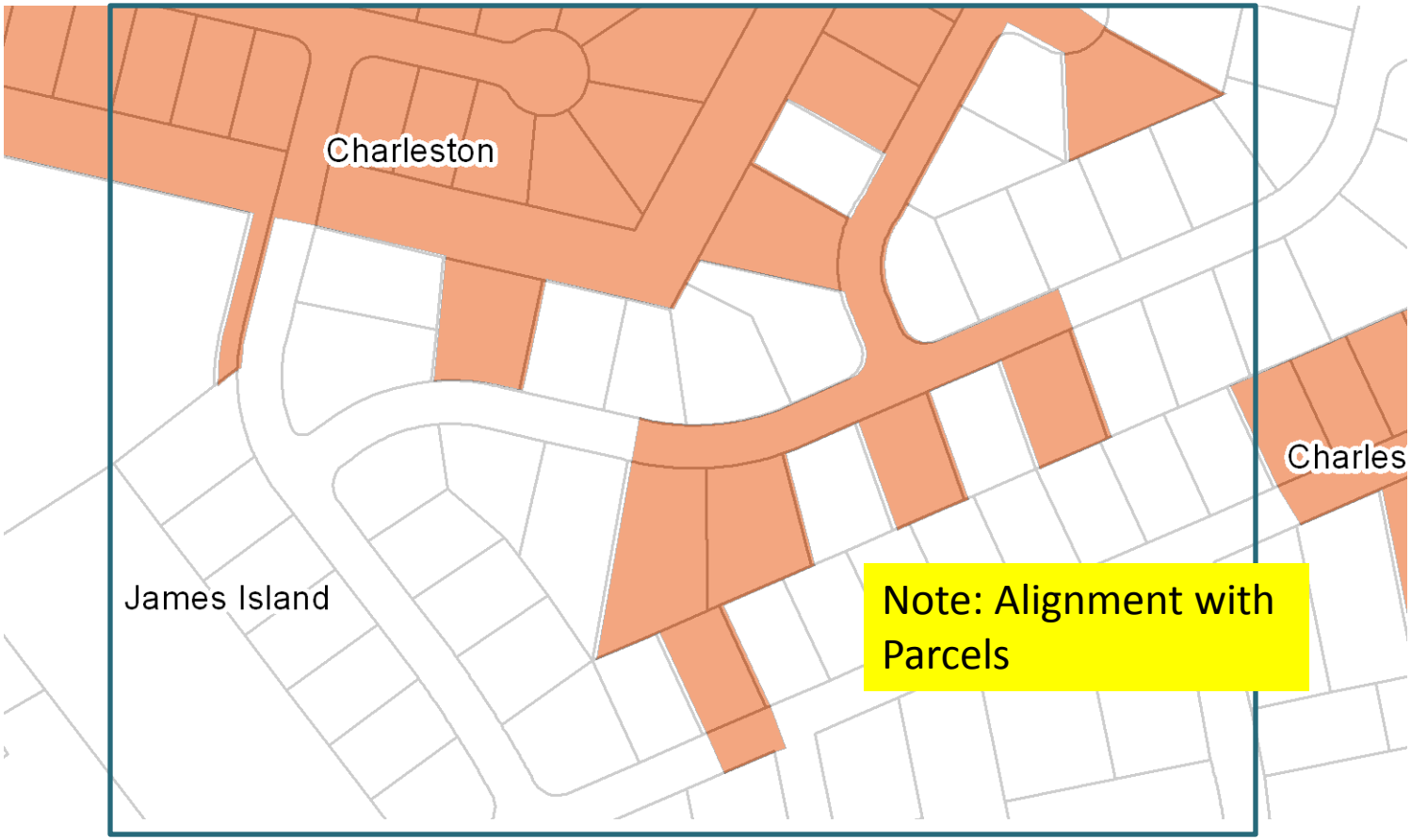
Charleston County GIS
"Authoritative Source"



Charleston County

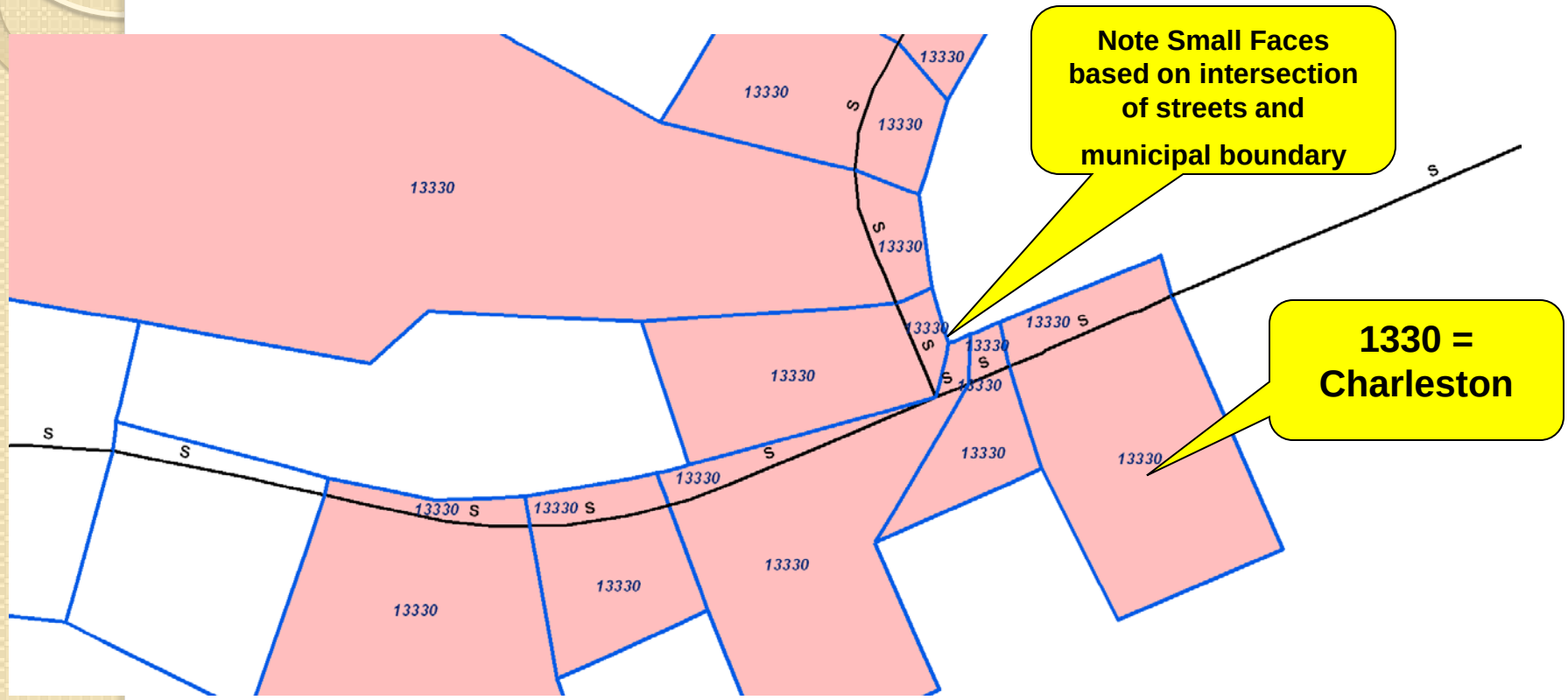


Core Logic Municipal Boundary View With Parcels

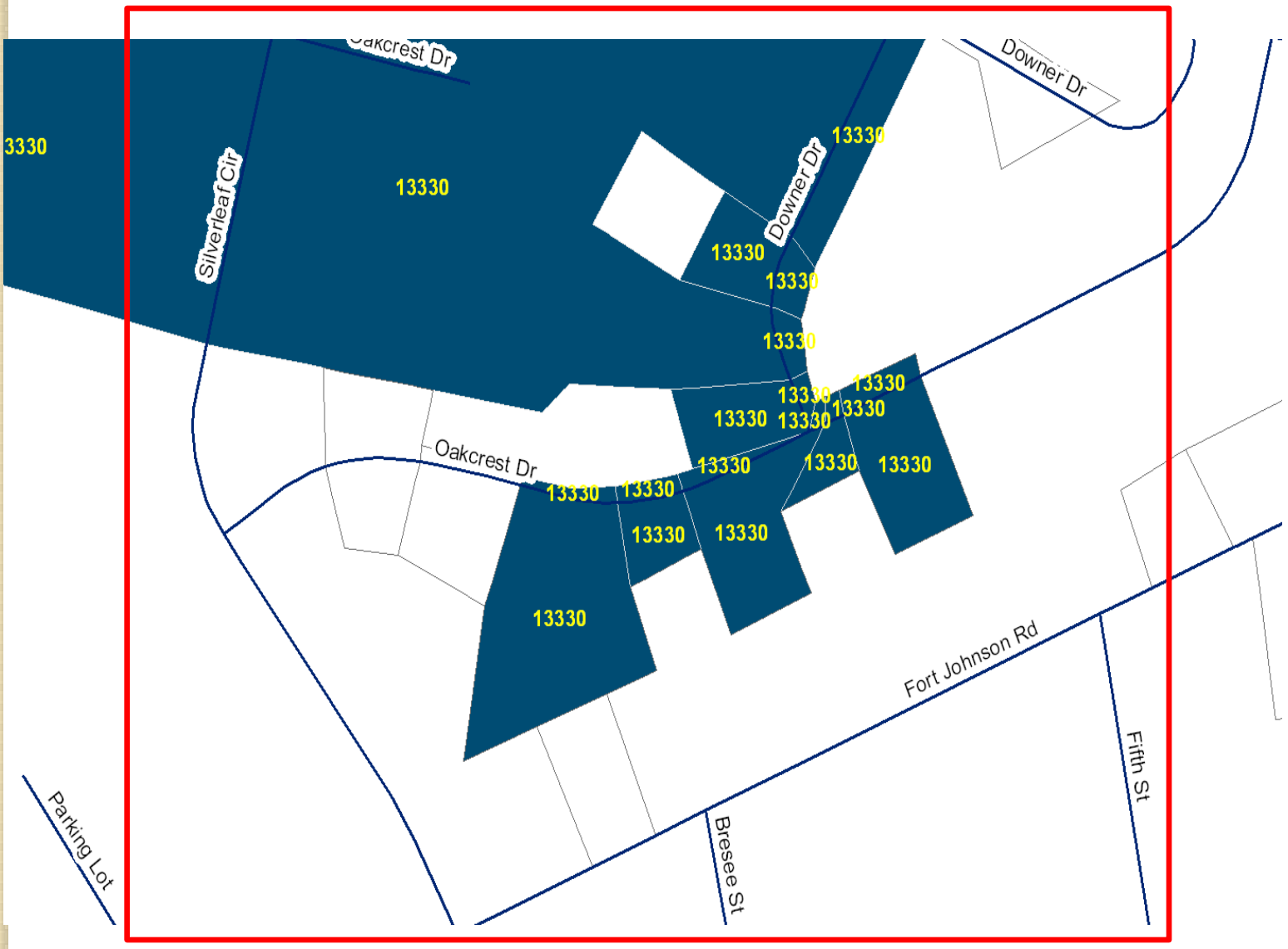


TIGER FACES
Charleston = 13330

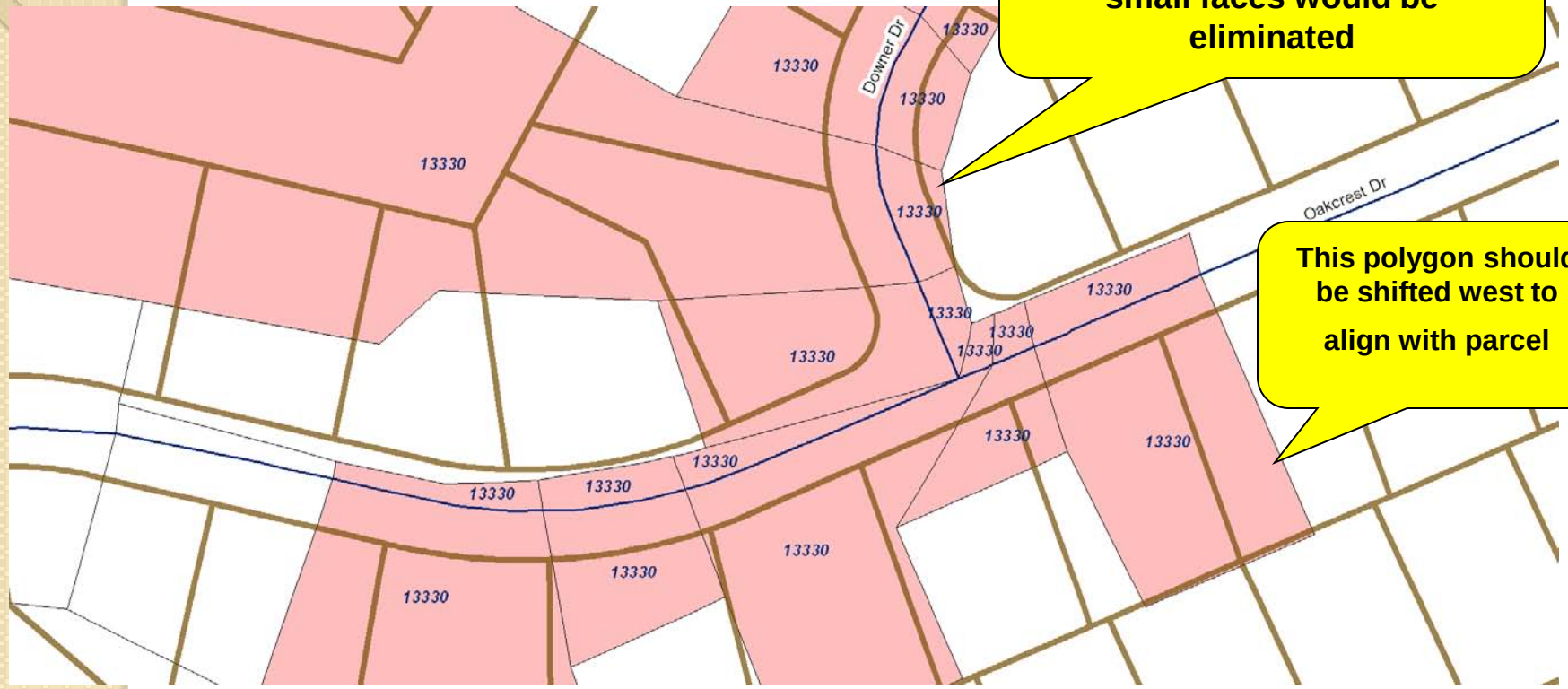
TIGER Faces Based on Charleston Municipal Boundary



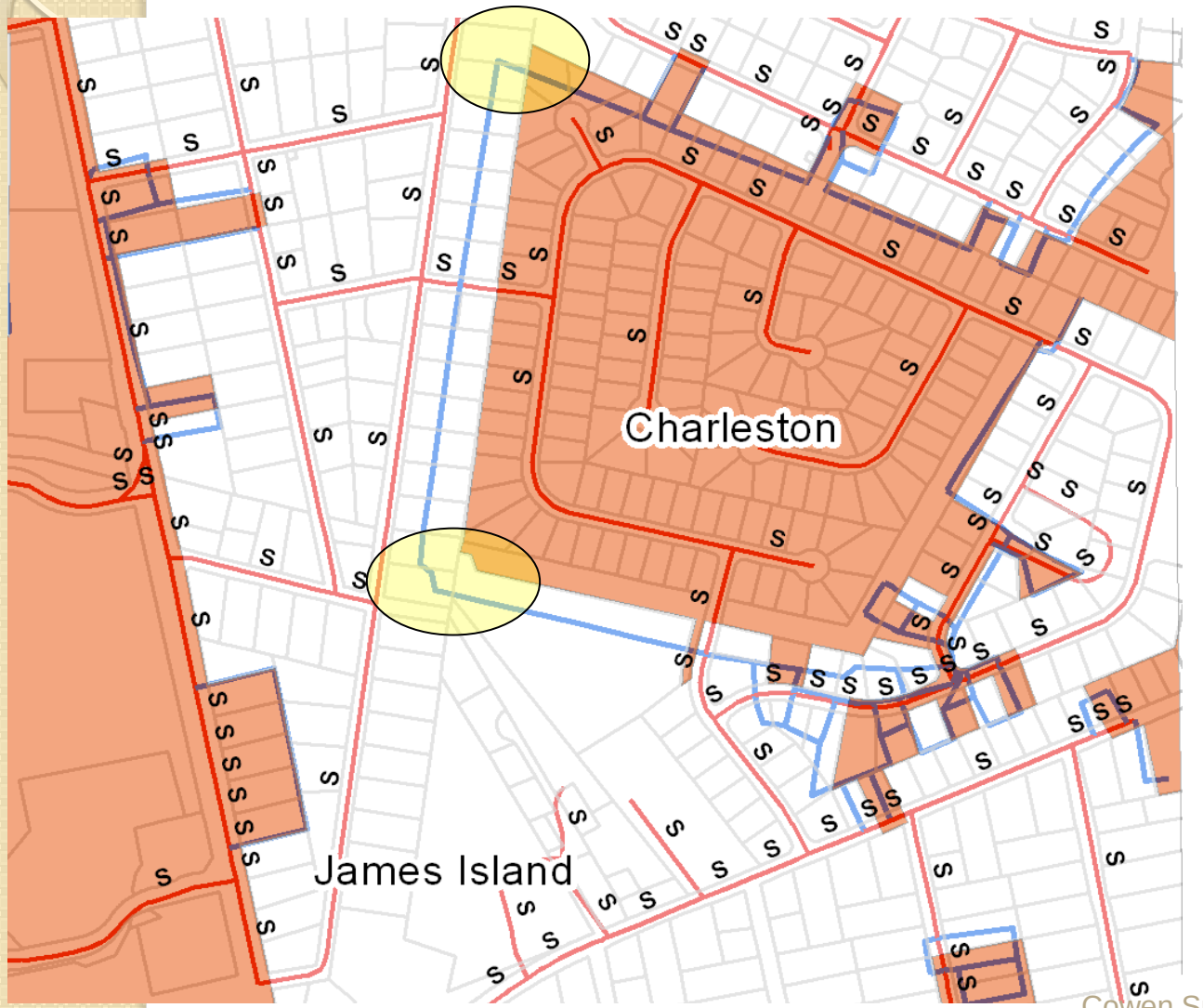
Census View – From TIGER Faces



TIGER Faces & Parcels

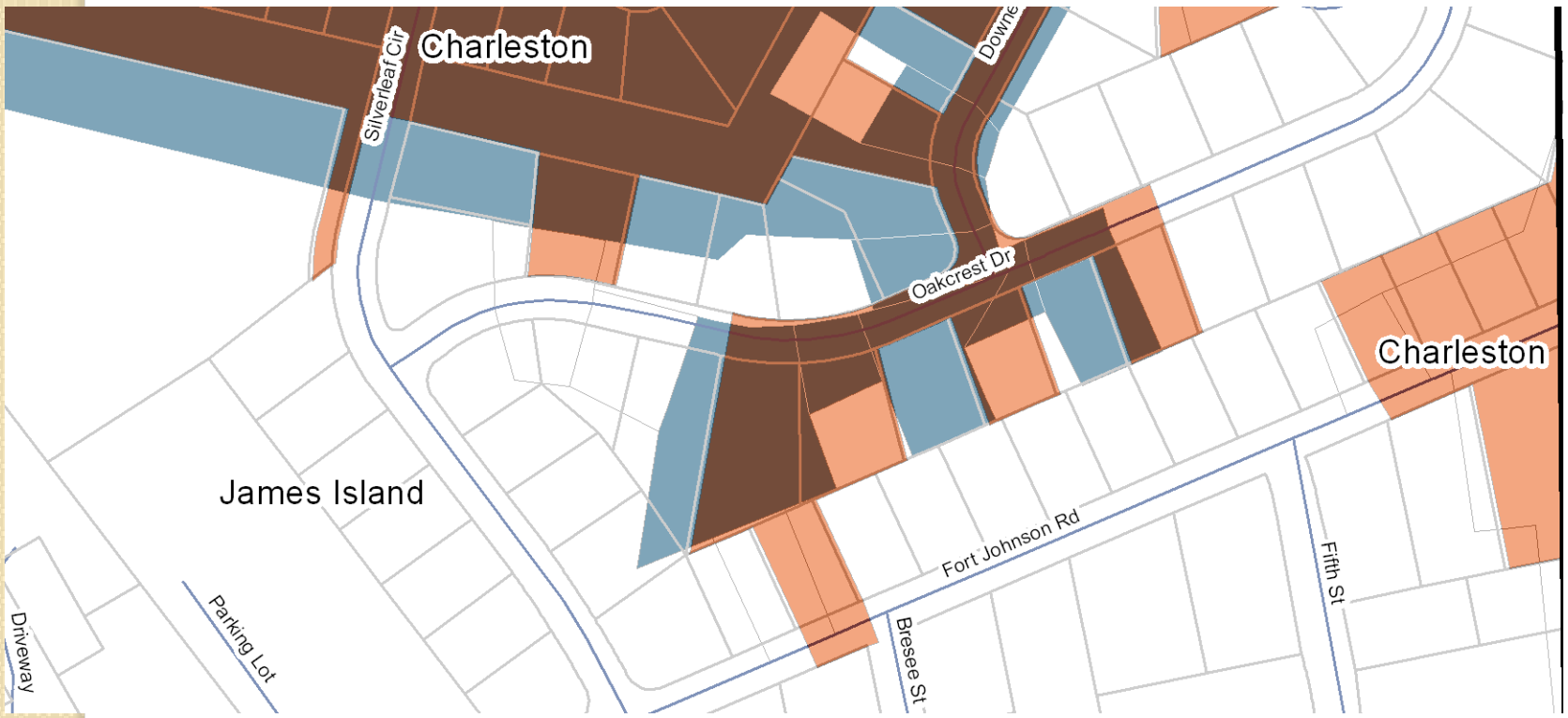


Potential Source Of Problem



Mis-matches due to rotation, translation, and scaling errors?

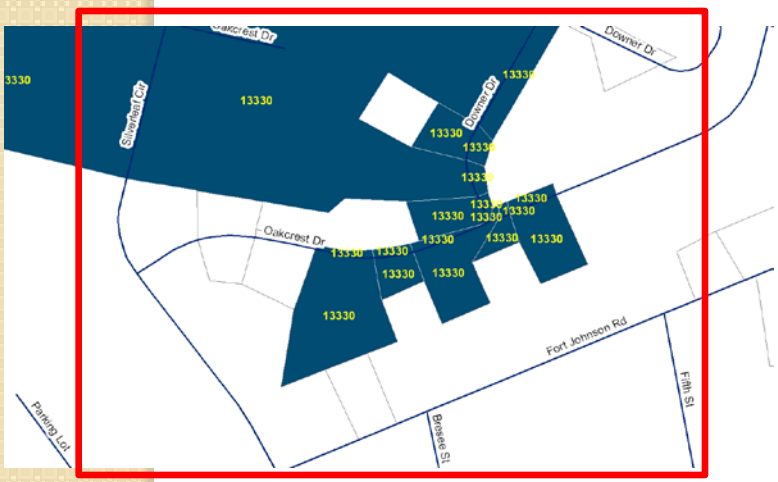
Polygon Overlay to Find Errors



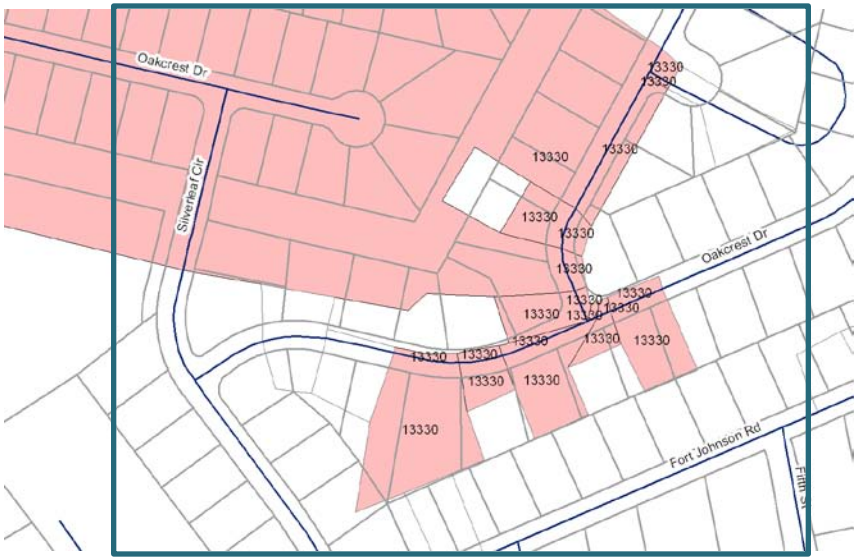
Comparison – Core Logic matches County

County Official

Core Logic – with Parcels



Census



Census with Parcels

Working Hypotheses That are of Interest to the Geography Division

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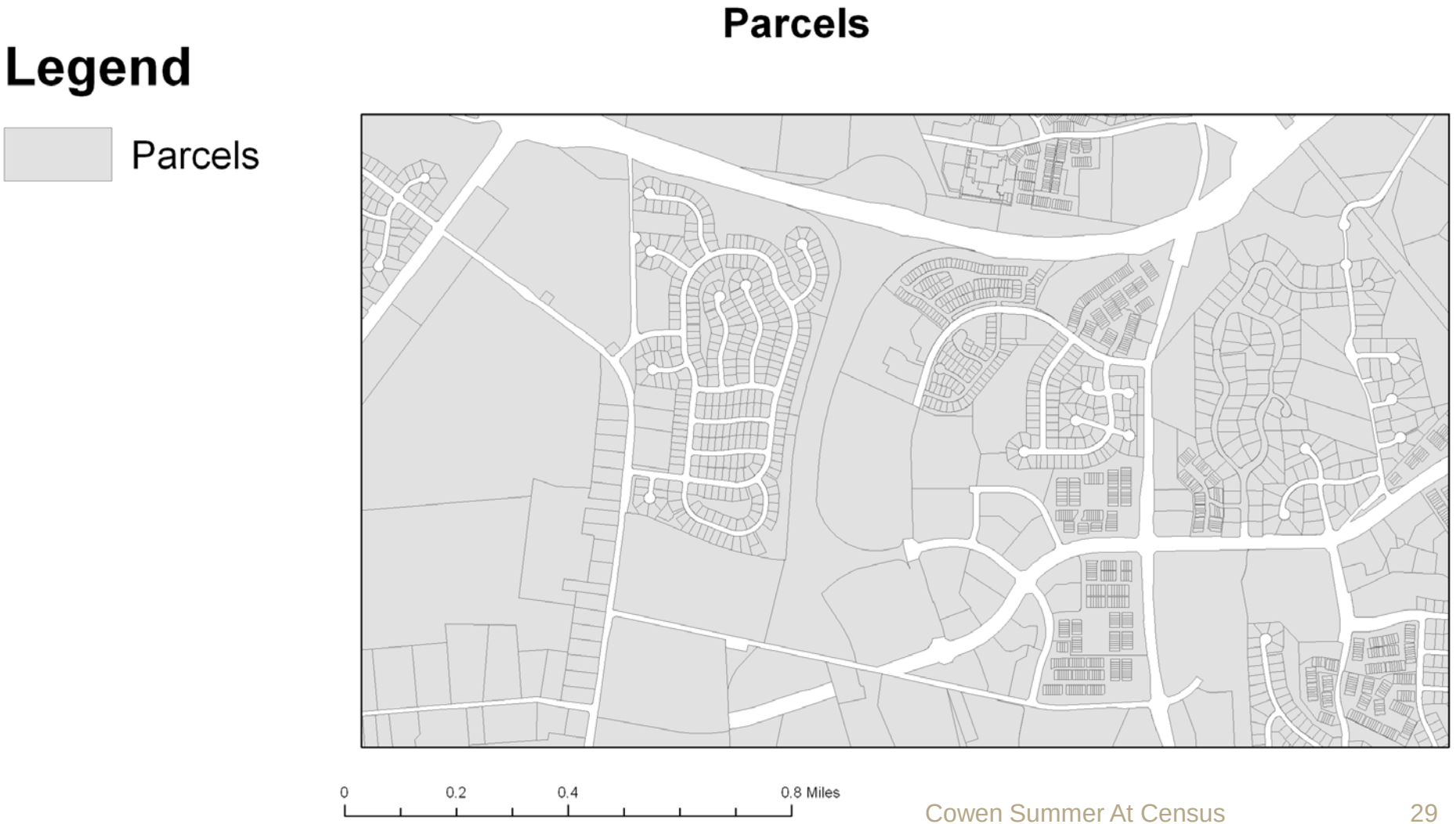
  - can be dissolved to create many meaningful polygons

Advantages

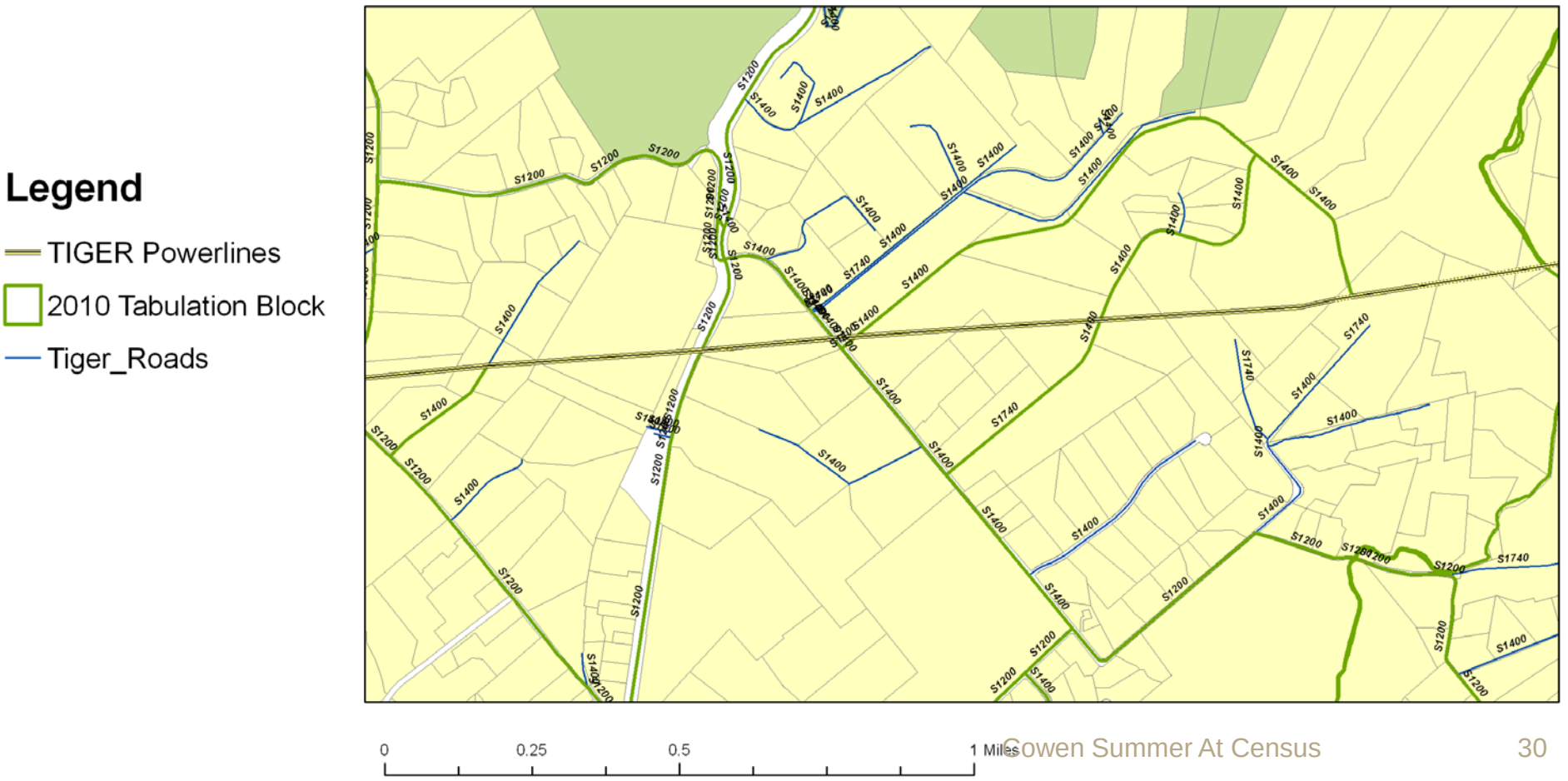
- Can be generated automatically
- Ensure that the point actually falls inside the correct property containing the dwelling
- Ensure that the points have maximum separation

Parcel Geometry

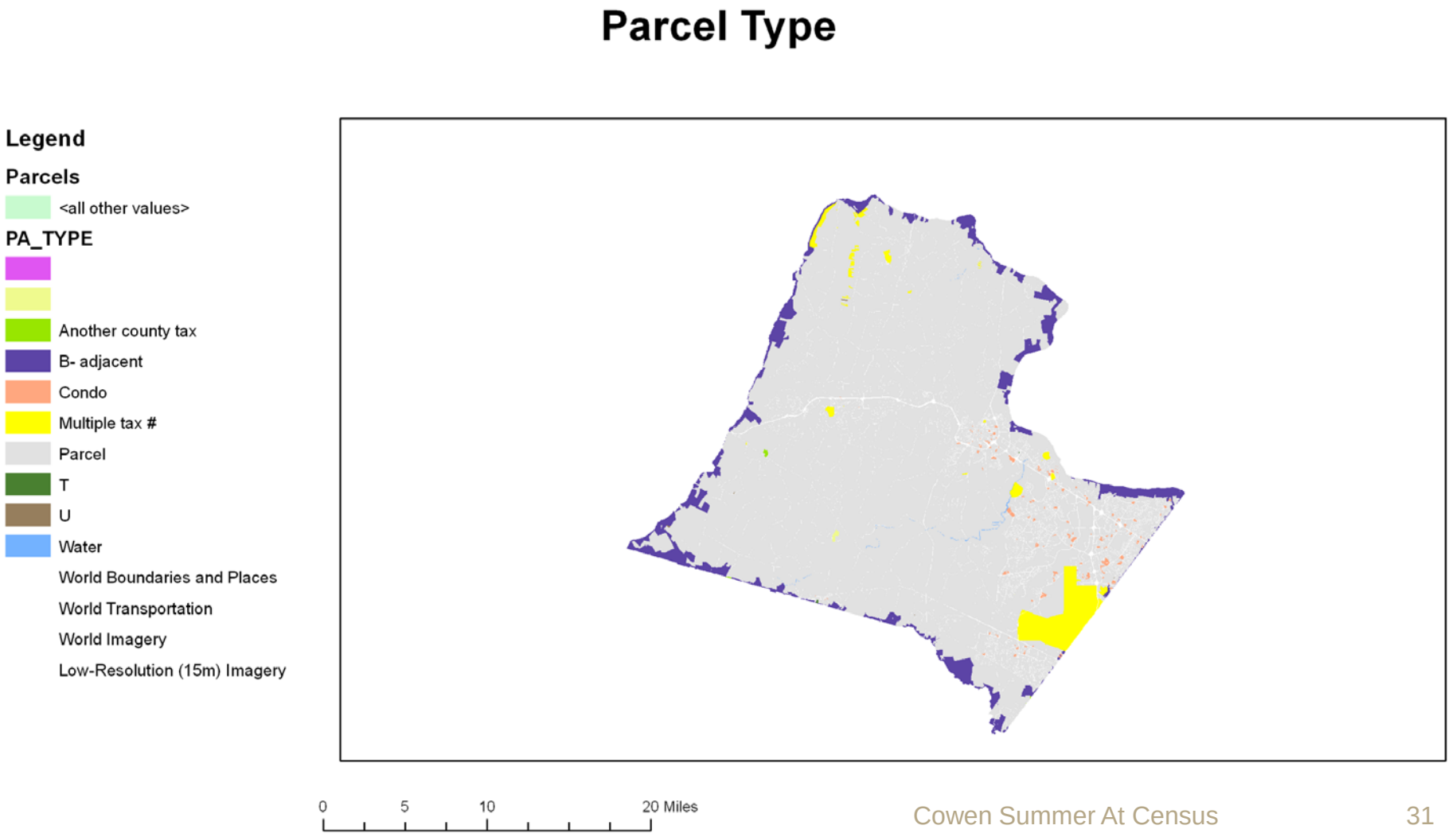


Parcels Provide a Good Background for Examination of Many TIGER Features

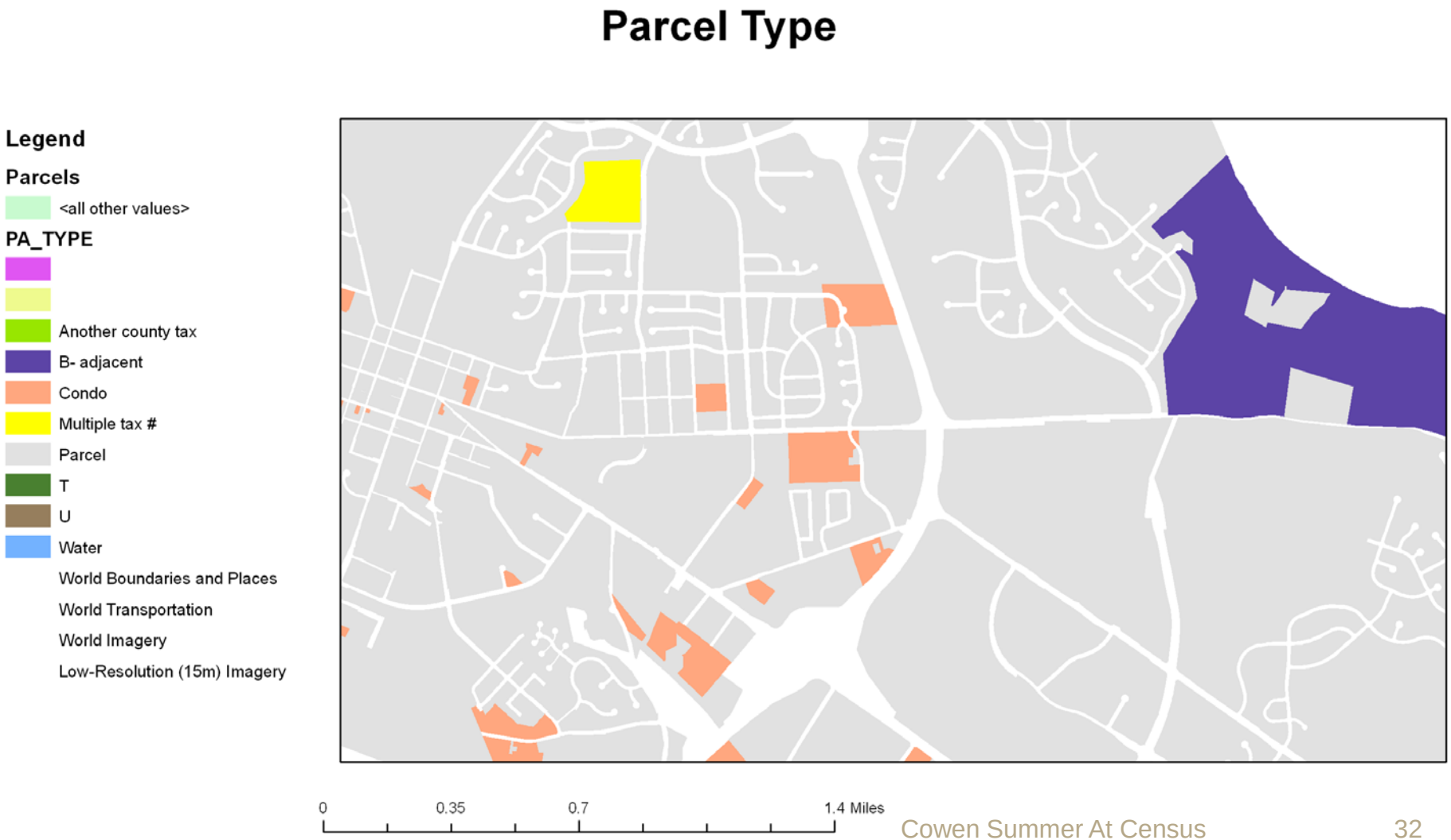
TIGER Powerlines, Roads, Tabulation Blocks With Parcels



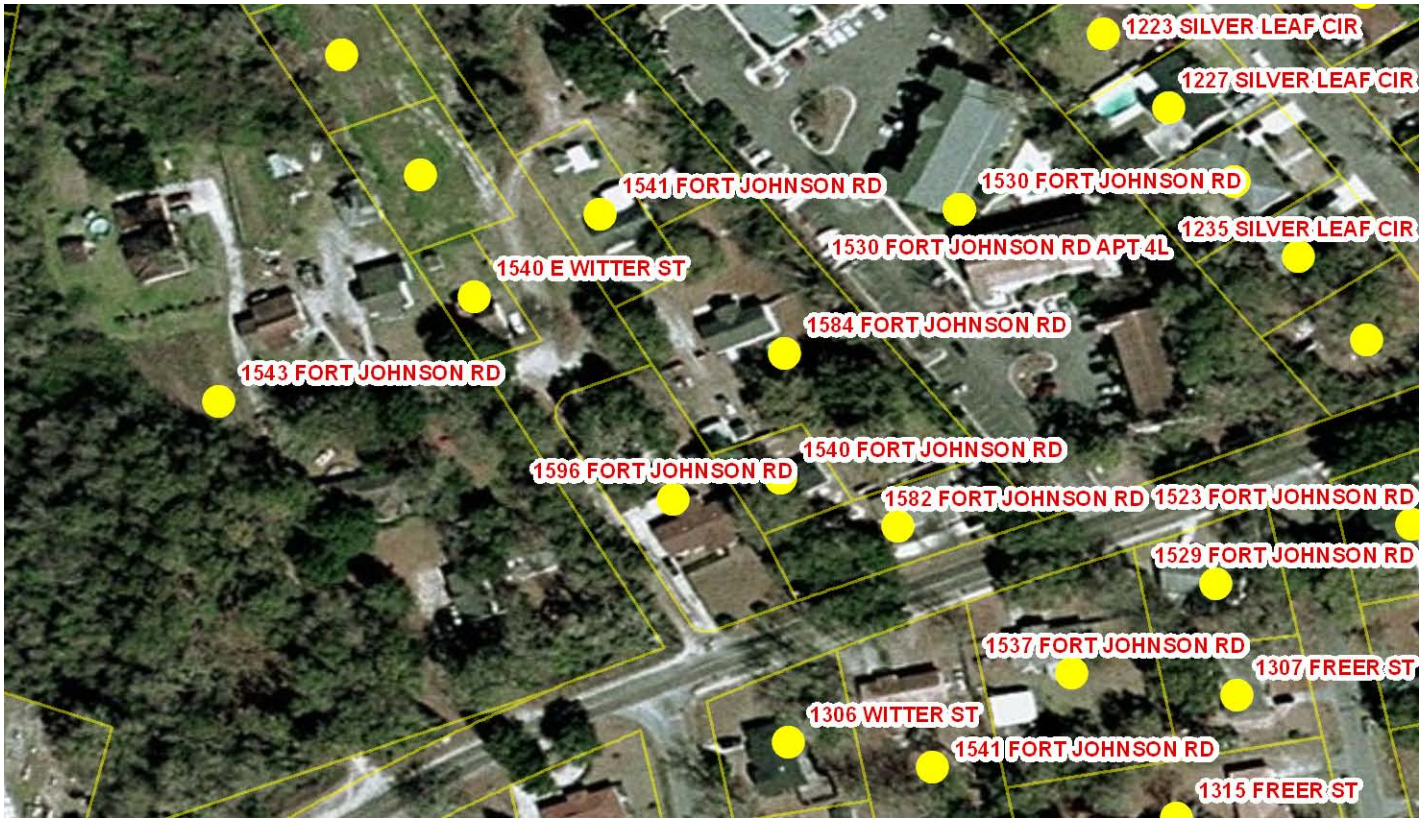
Loudoun County VA Parcel Types
NB: Few water, couple Multiple tax #, many adjacent



Zoom of Loudoun County Parcel Types



Core Logic Provided Address Points – Parcel Centroids



* No U.S. Census Bureau Title 13 data was used in this slide

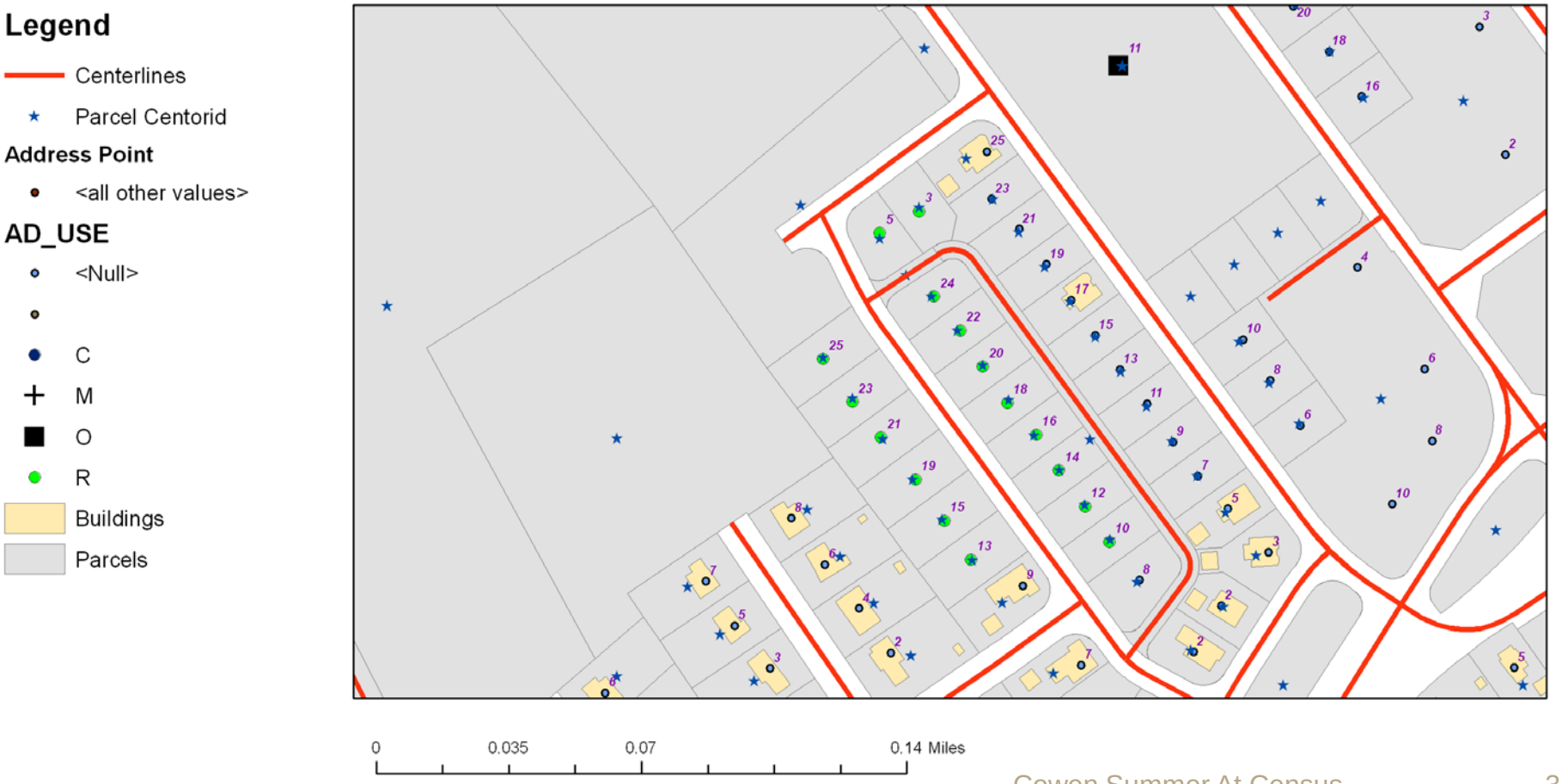
Core Logic Provided Addresses
49 Apartment addresses in parcel

* No U.S. Census Bureau Title 13 data was used in this slide

Parcel Centoids Generated by Polygon to Point Feature – NB: for undeveloped parcels matches with address point (Loudoun County provided data)

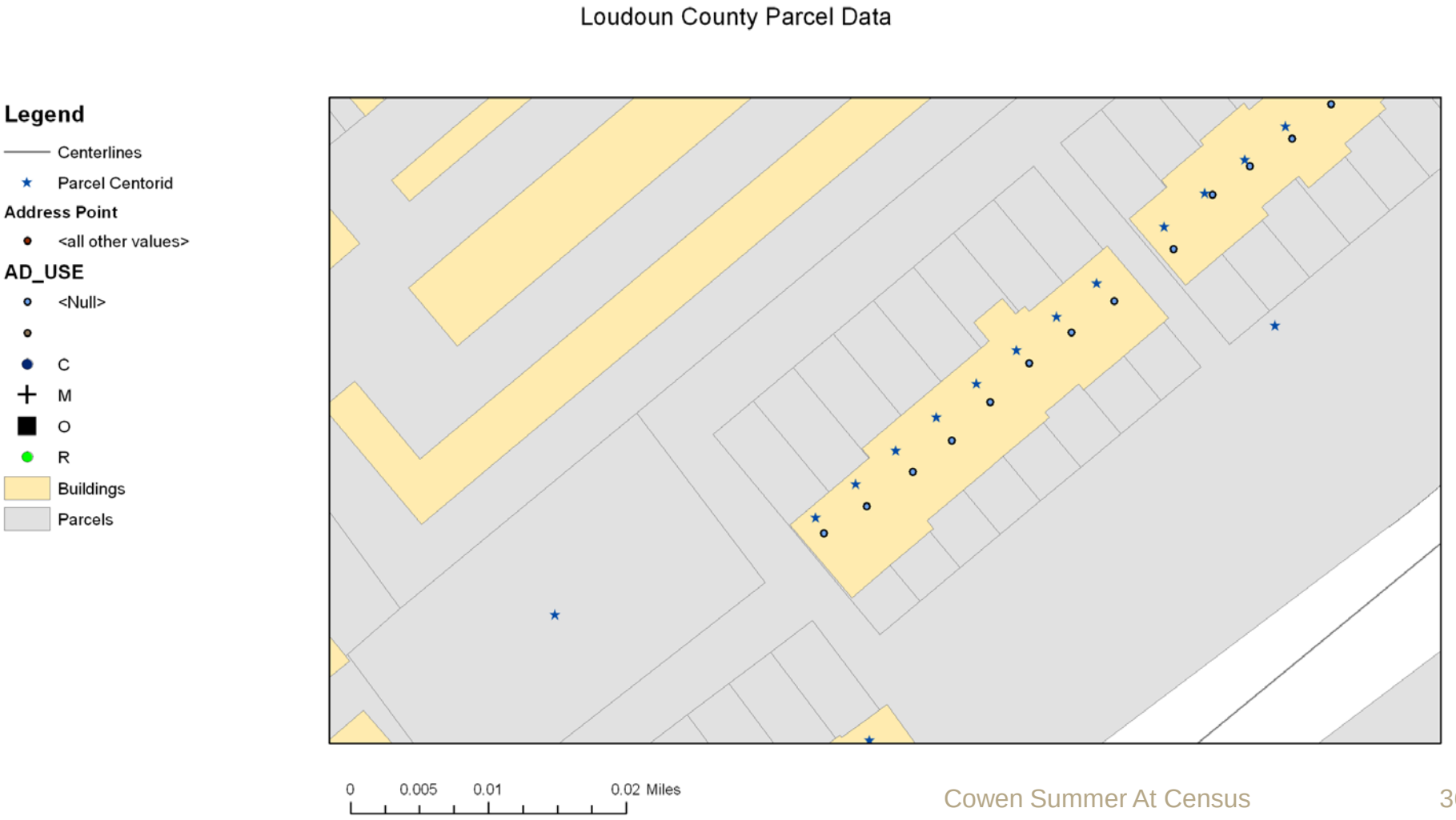
* No U.S. Census Bureau Title 13 data was used in this slide

Parcel Centroid = Address Point for Undeveloped

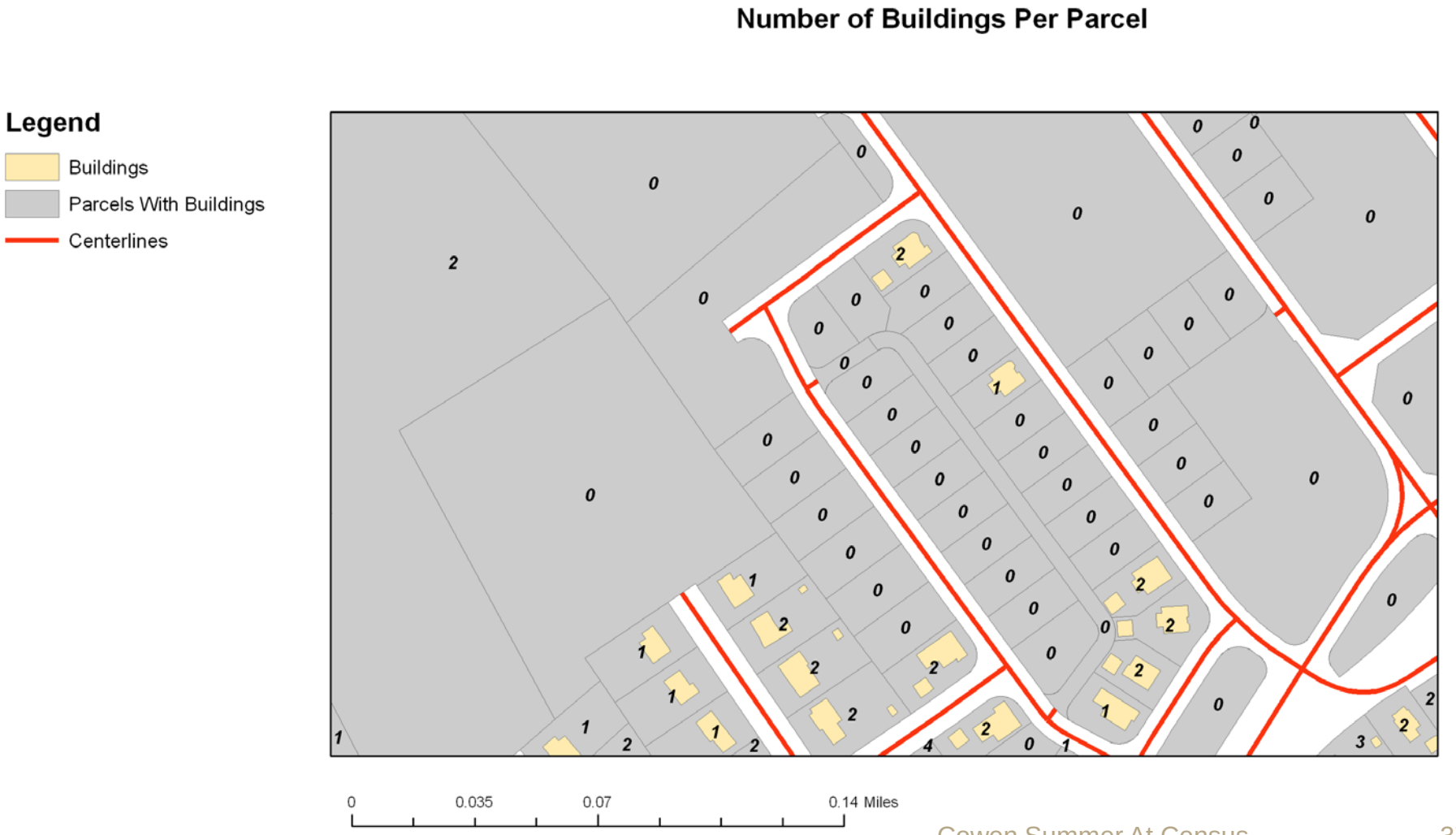


Example of a Single Building with multiple tax parcels – e.g. Row houses (Loudoun County Provided Data)

* No U.S. Census Bureau Title 13 data was used in this slide



Spatial Join of Building Polygons to Parcels Count is Automatically Generated – Should be surrogate for "improved"



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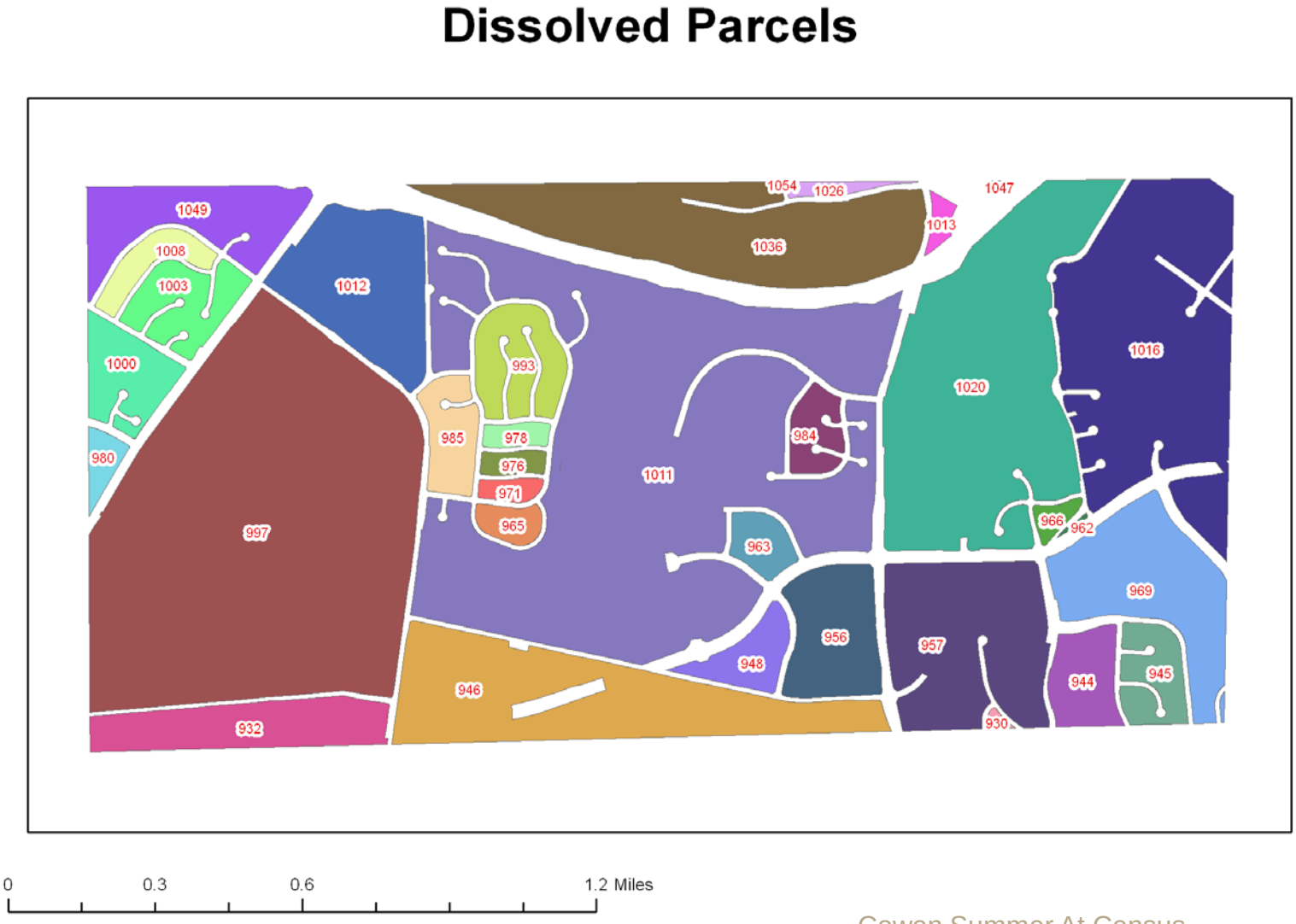
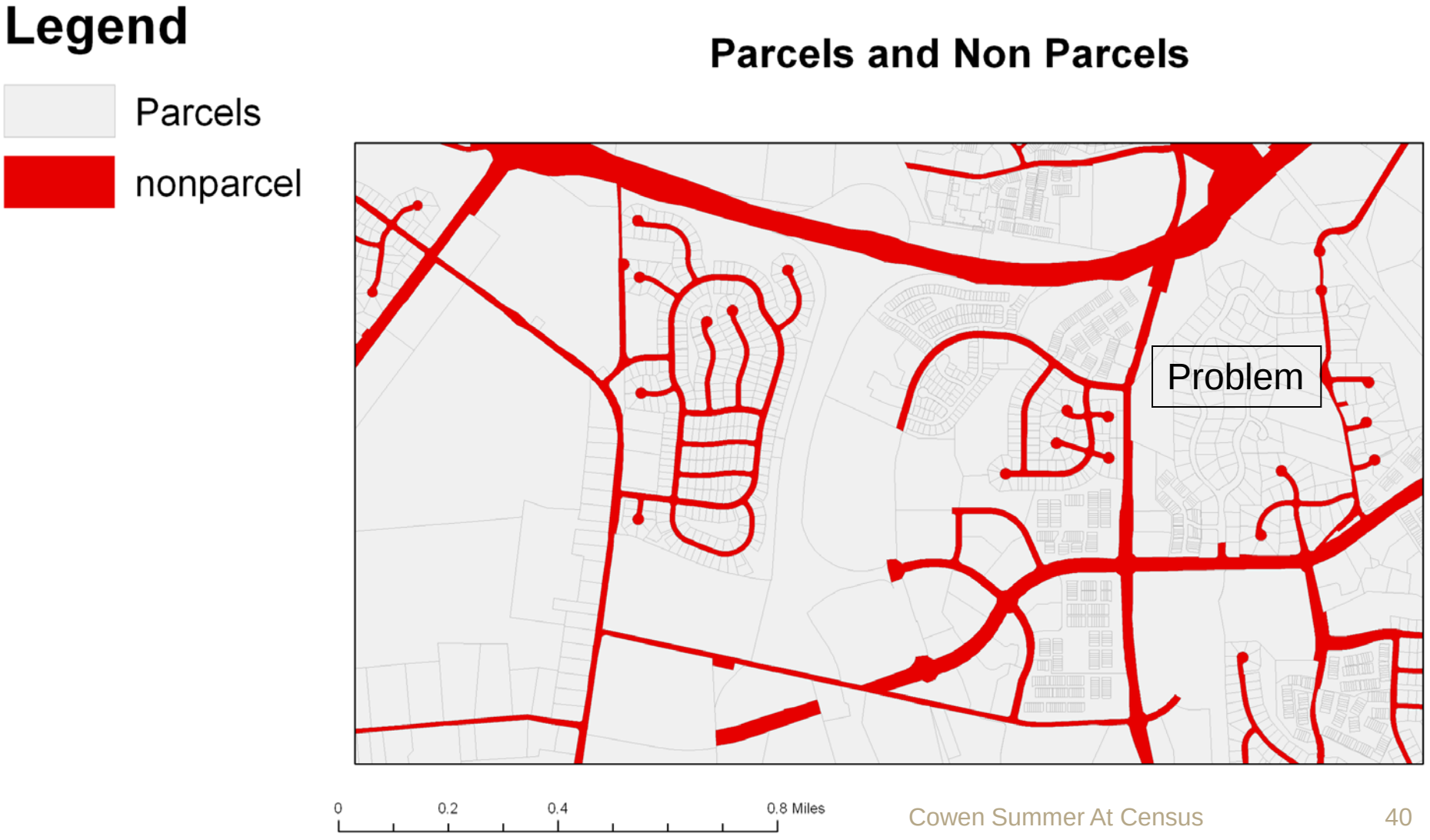
Dissolved Parcels With Unique Number Generated by Creating a New Field and copying the FID

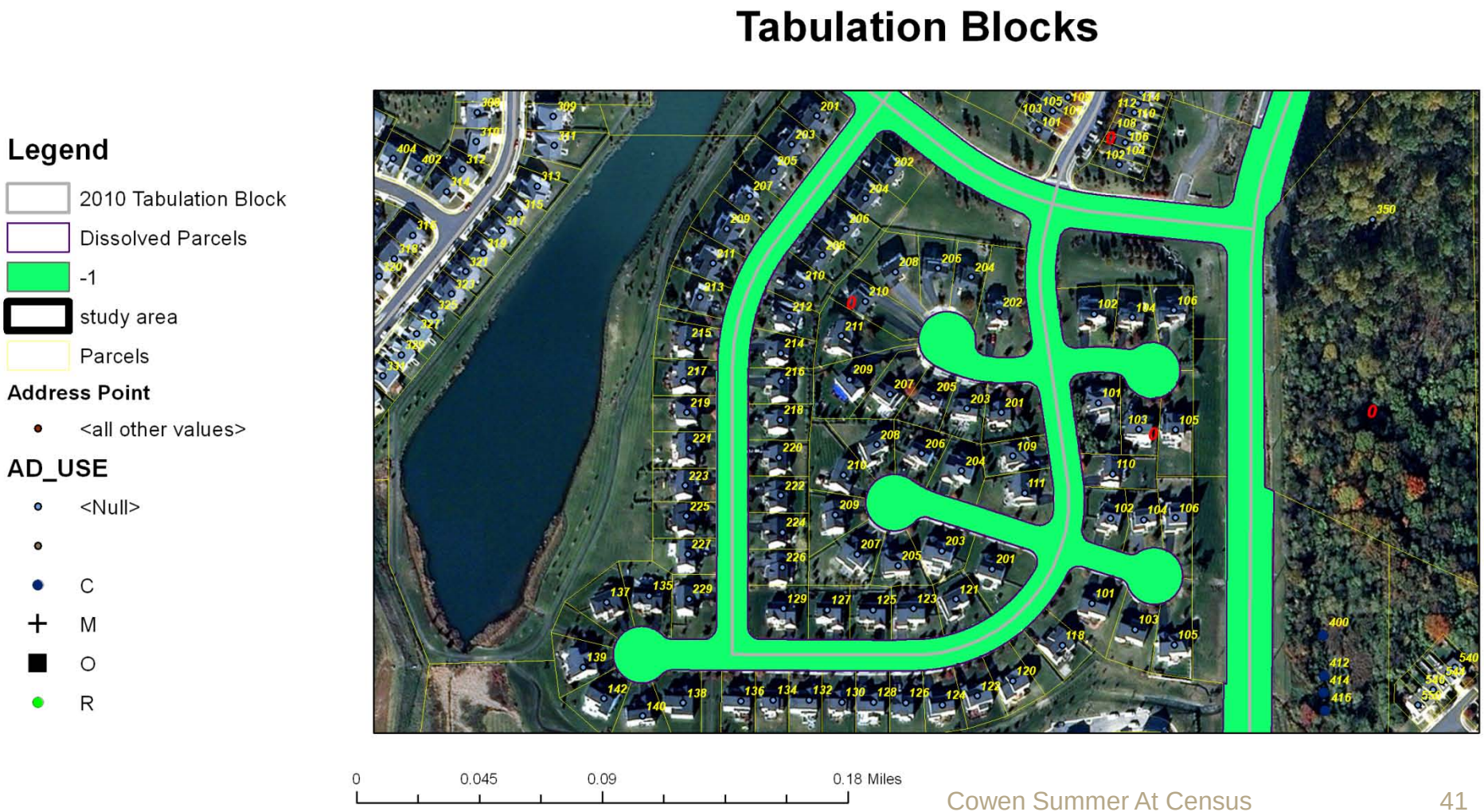


Non Parcel Areas
Union of A Single County Polygon used to generate attributes for these null areas



Comparison of 2010 Tabulation Blocks with Dissolved Parcels and "non parcel areas" (Loudoun County Provided Data)

* No U.S. Census Bureau Title 13 data was used in this slide



Zoom of Tabulation Blocks compared to "non parcel" areas (Loudoun County Provided Data)

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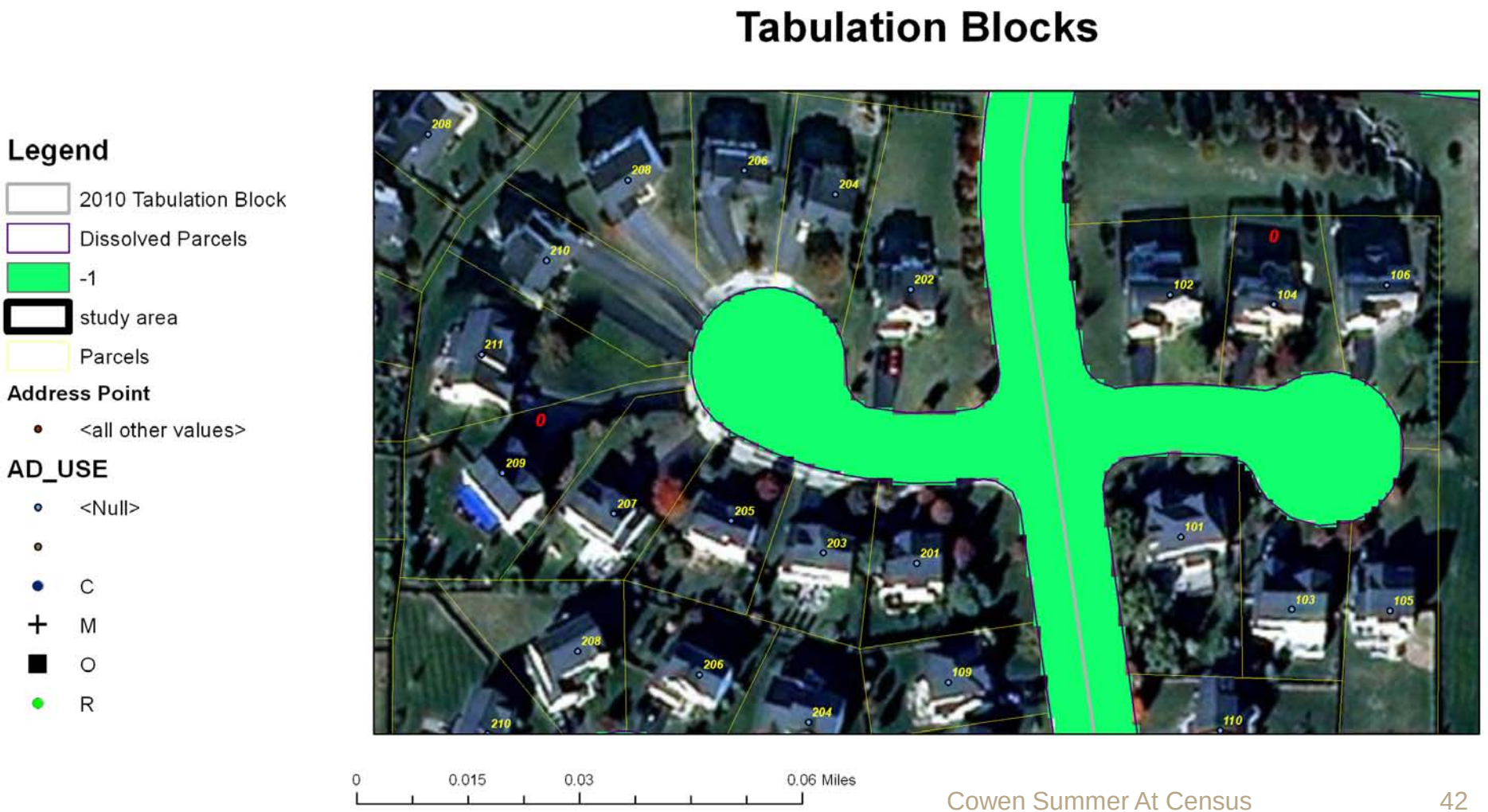

Tabulation Blocks Compared with Dissolved parcels and Non Parcel polygons (Loudoun County Provided Data)

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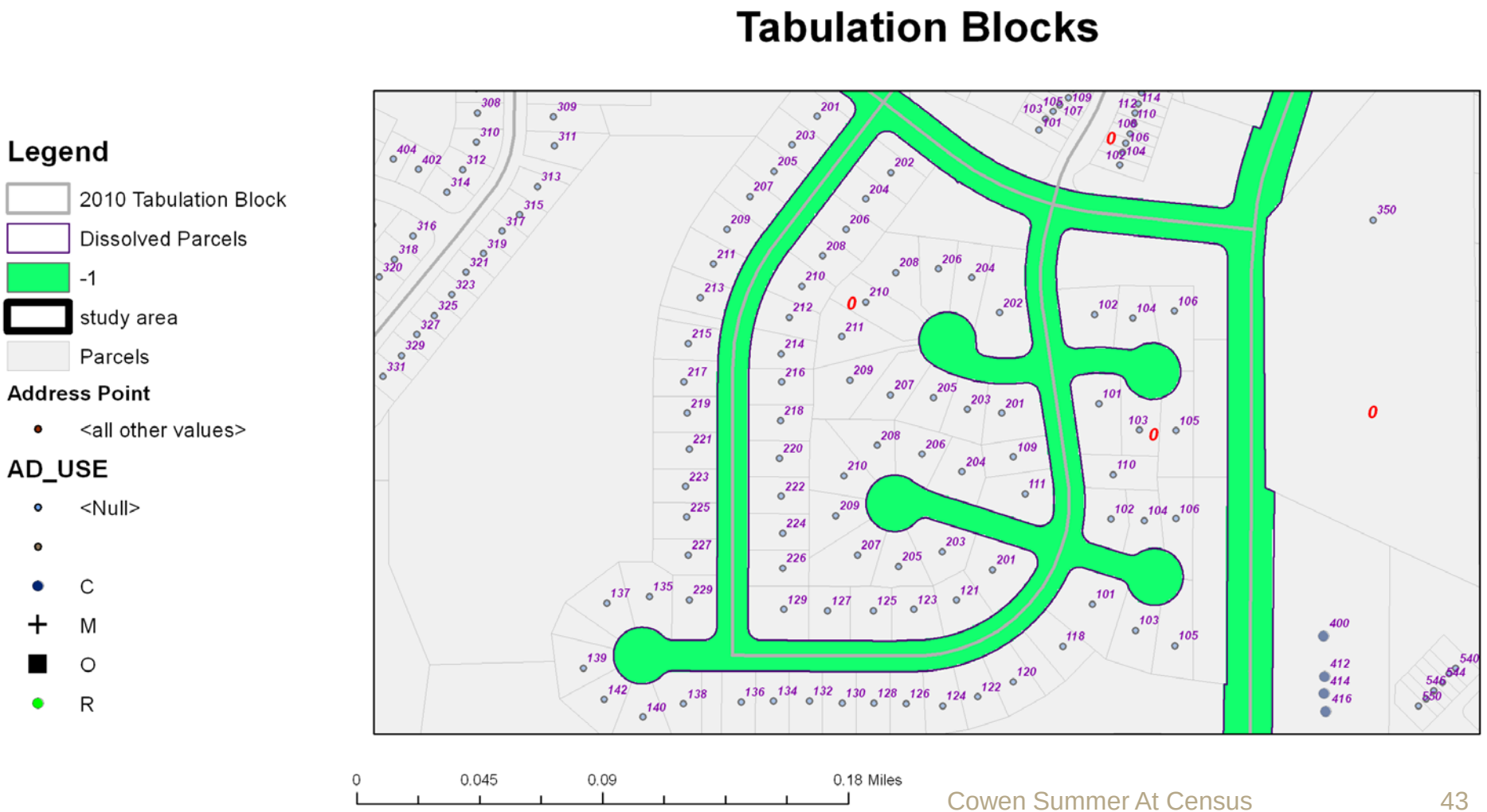

TIGER Roads that intersect parcels with address points (Loudoun County Provided Data)

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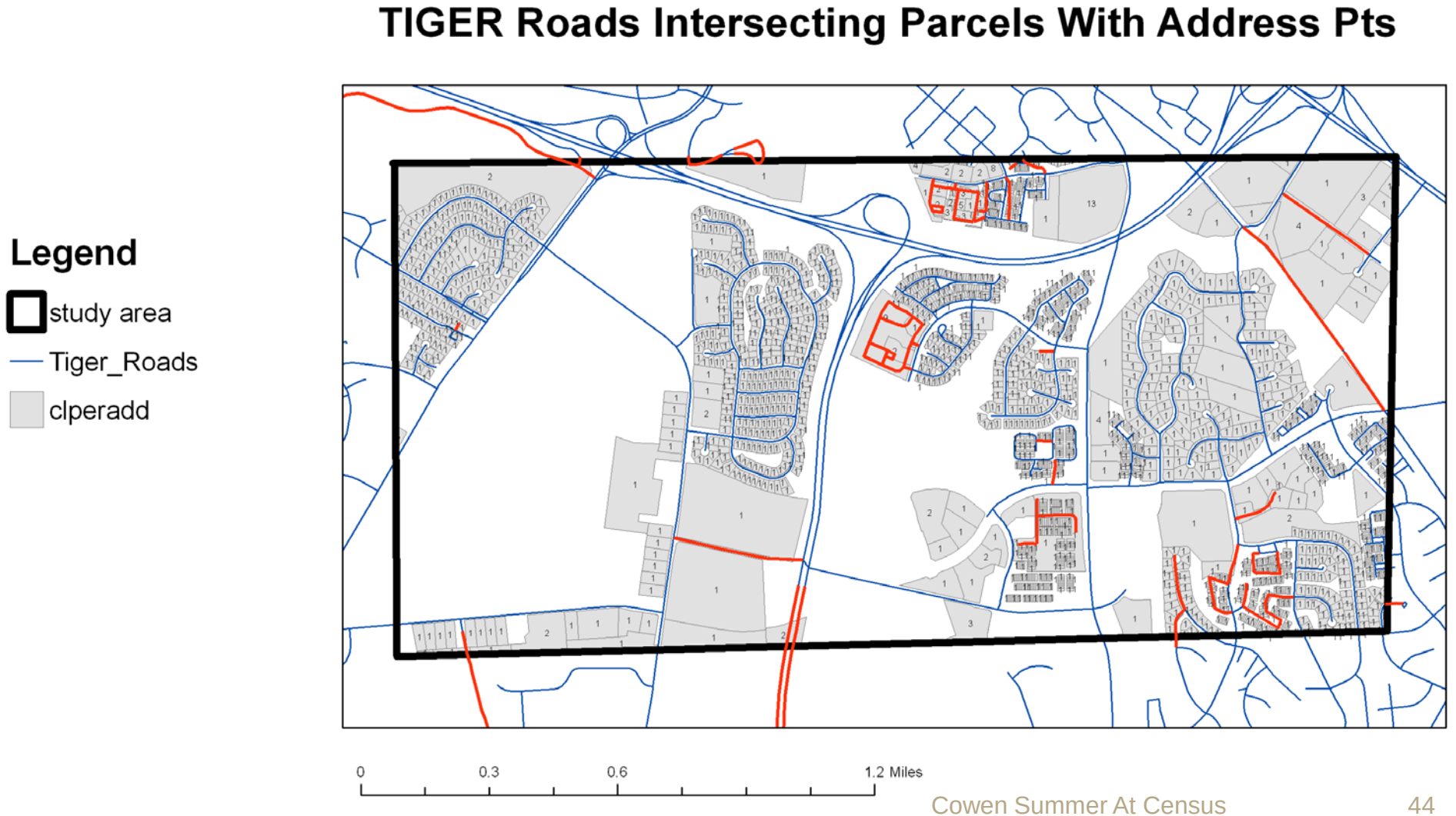
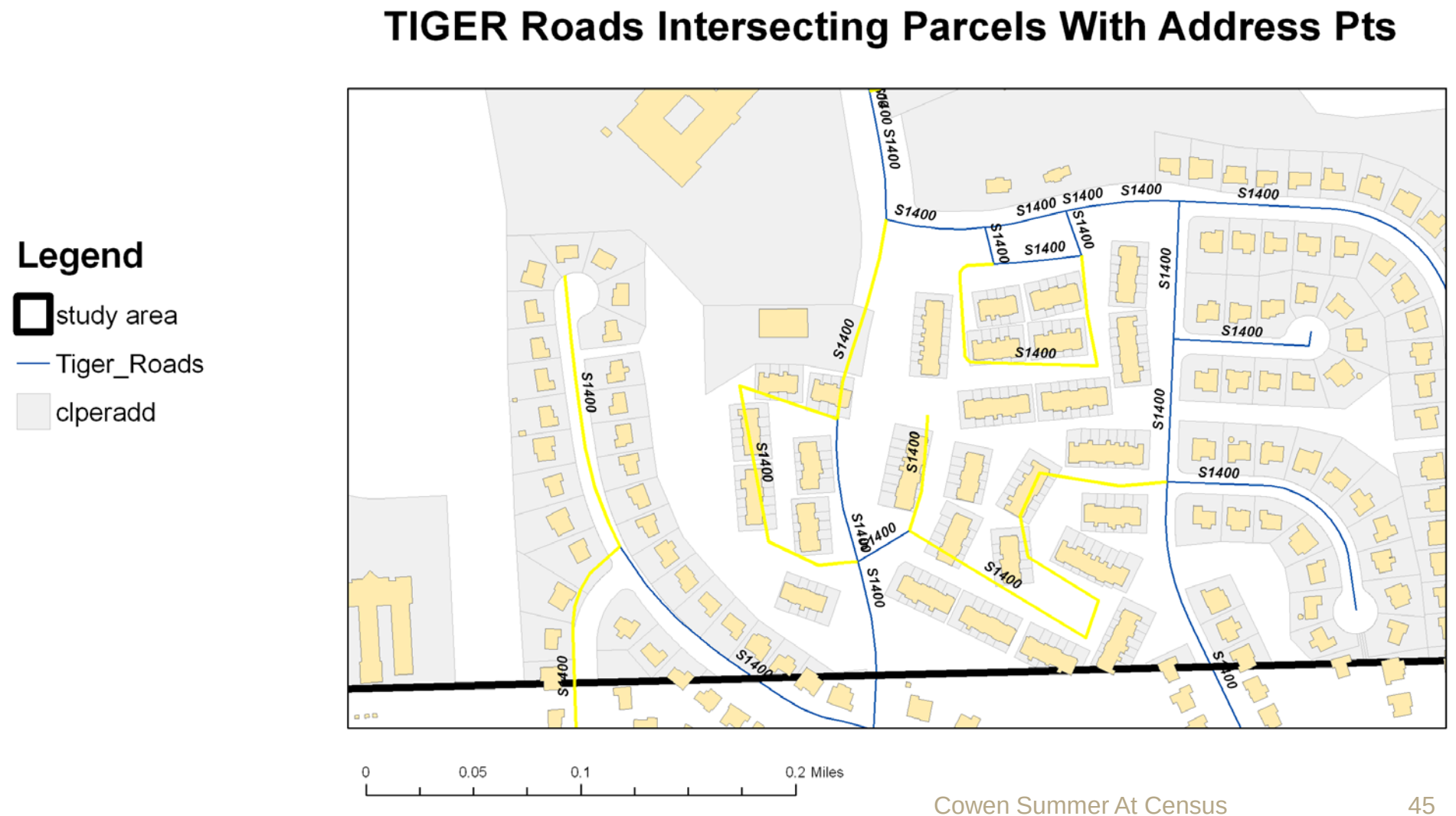


TIGER Roads that intersect parcels with address points – These are errors that should be corrected



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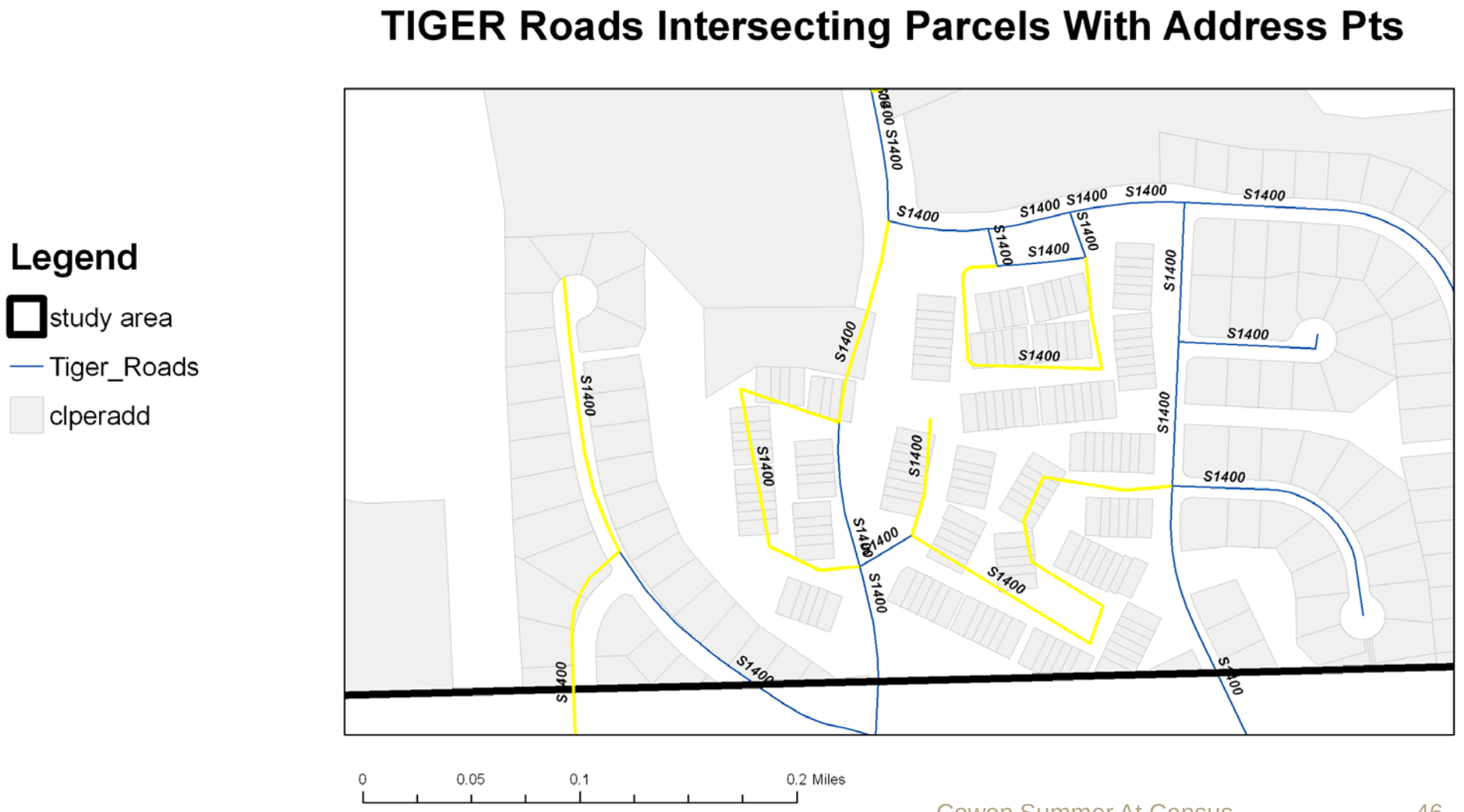

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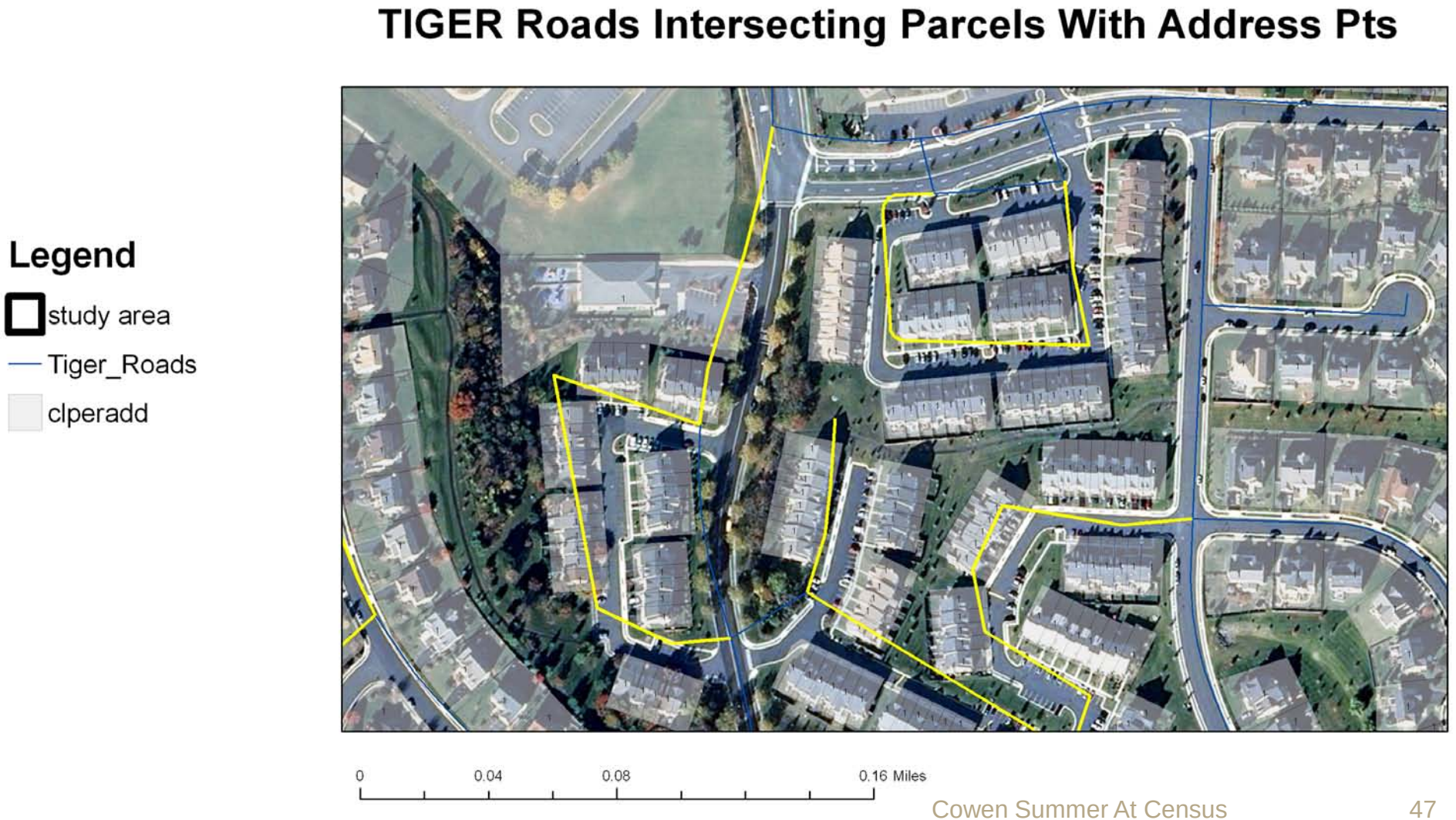
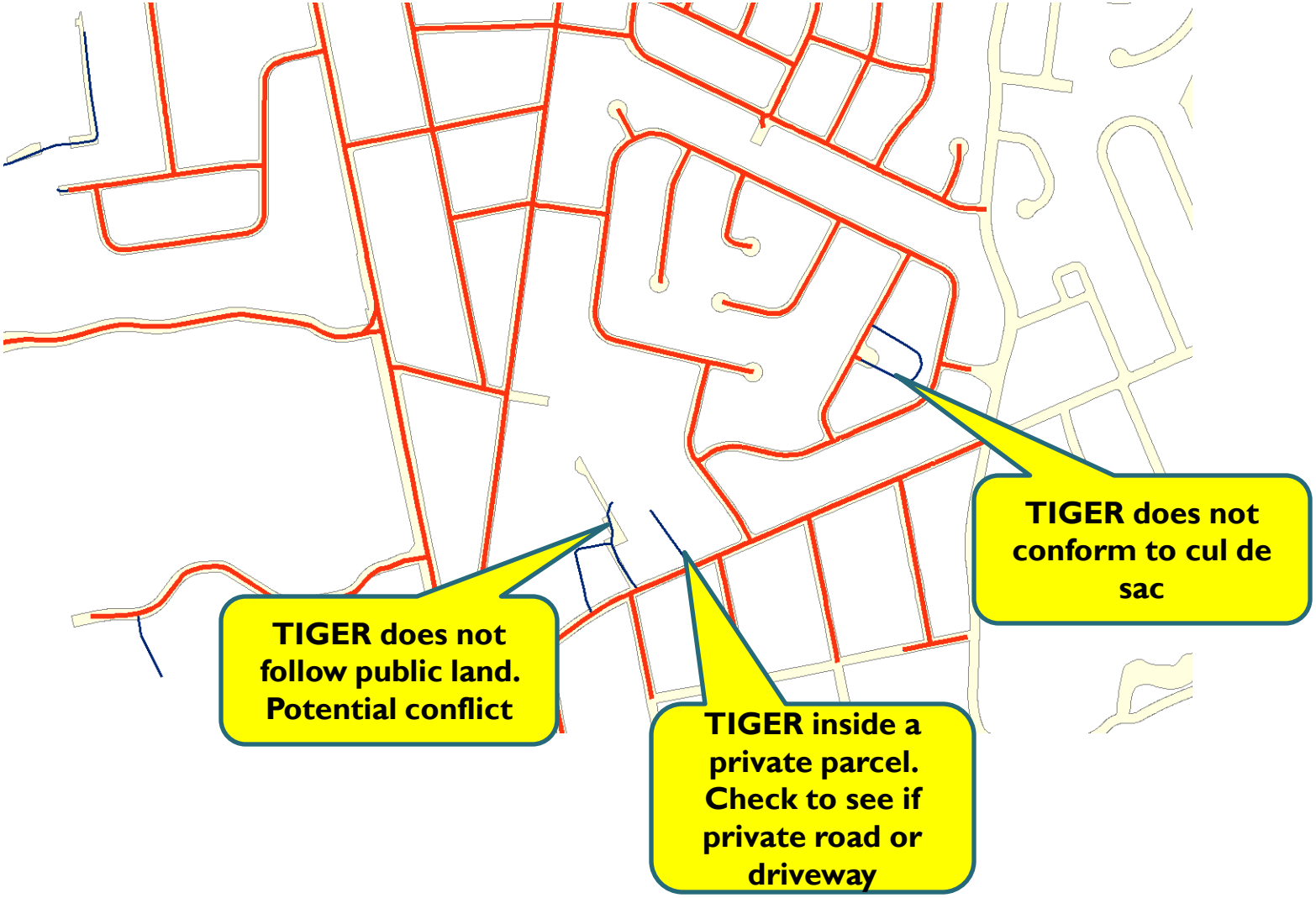
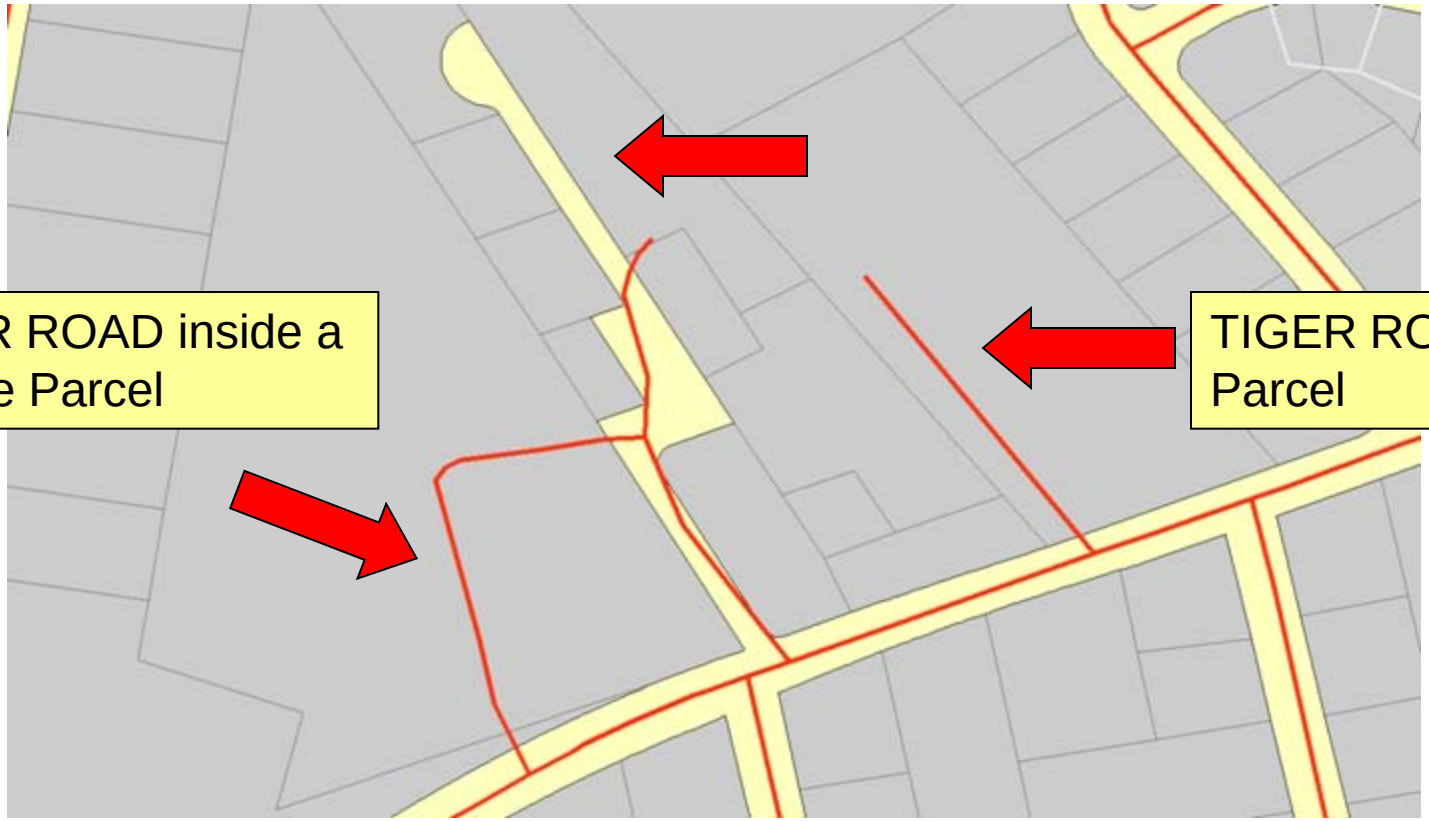


TIGER Segments not in agreement with public

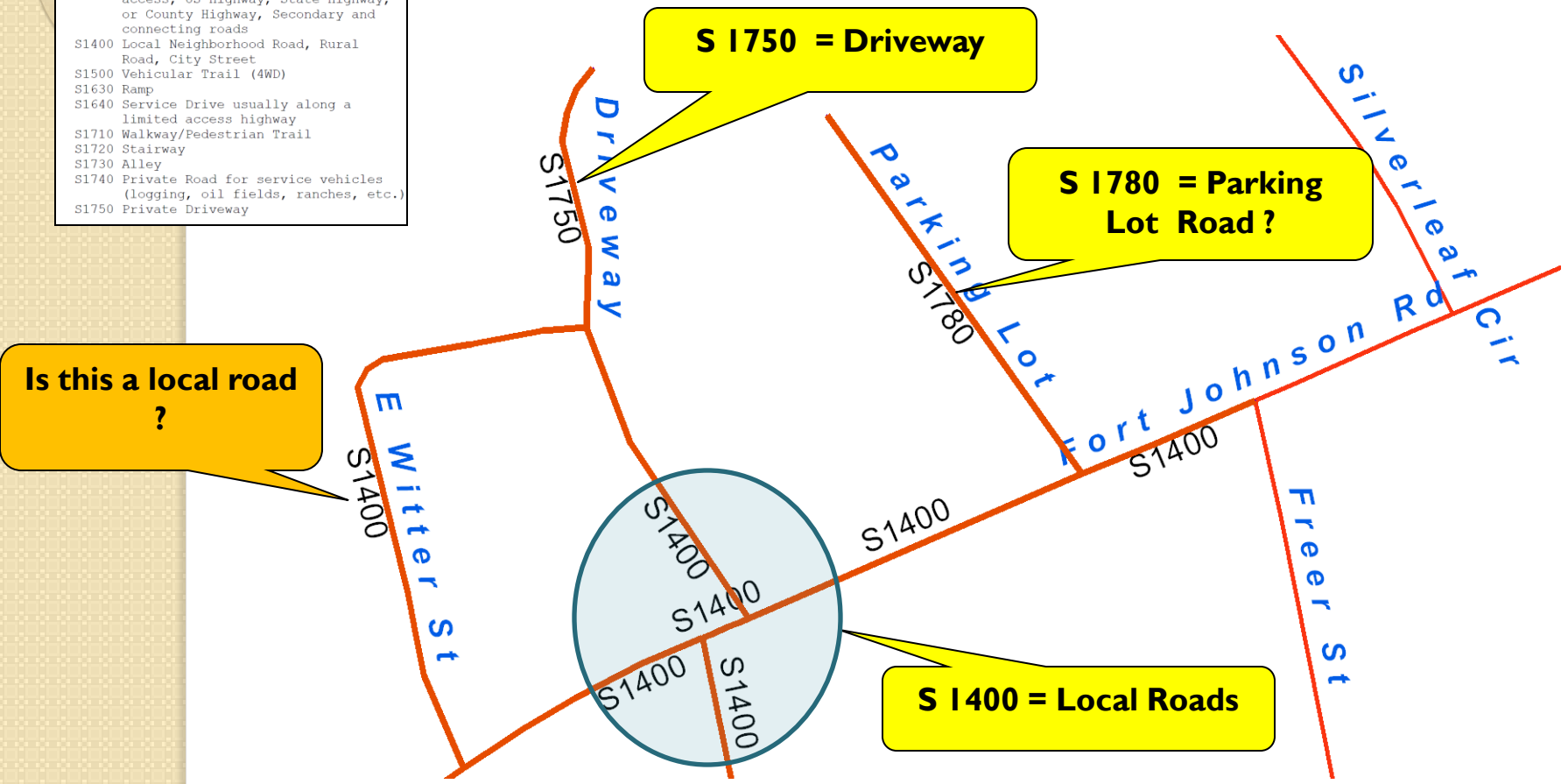


Problem 1


TIGER ROAD inside a Private Parcel
TIGER ROAD inside a Parcel

Is this a local road?

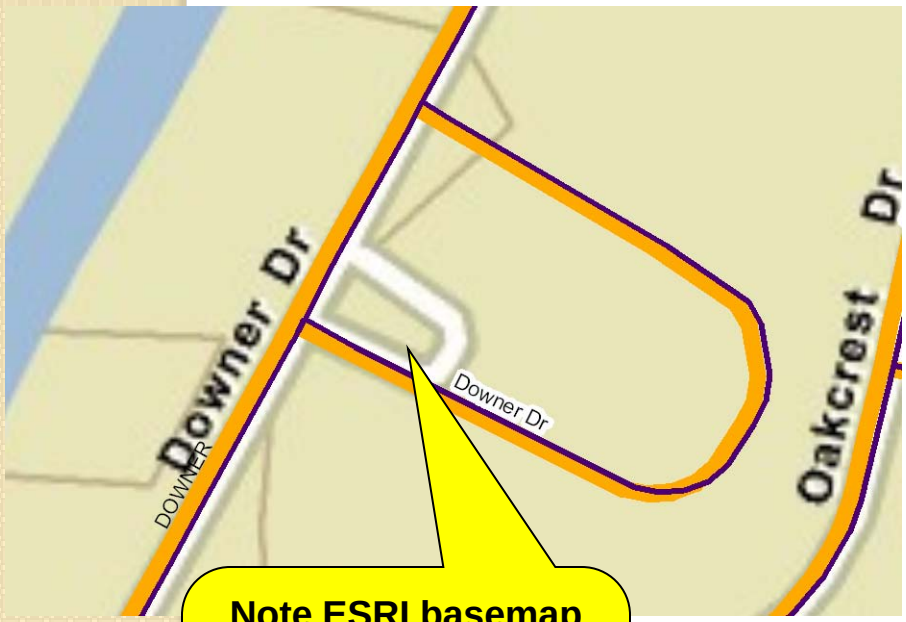
```
ROAD FEATURES

MTFCC FEATURE NAME
S1100 Interstate Highway or Primary Road
      with limited access
S1200 Primary Road without limited
      access, US Highway, State Highway,
      or County Highway, Secondary and
      connecting roads
S1400 Local Neighborhood Road, Rural
      Road, City Street
S1500 Vehicular Trail (4WD)
S1630 Ramp
S1640 Service Drive usually along a
      limited access highway
S1710 Walkway/Pedestrian Trail
S1720 Stairway
S1730 Alley
S1740 Private Road for service vehicles
      (logging, oil fields, ranches, etc.)
S1750 Private Driveway
```



Questionable TIGER segments

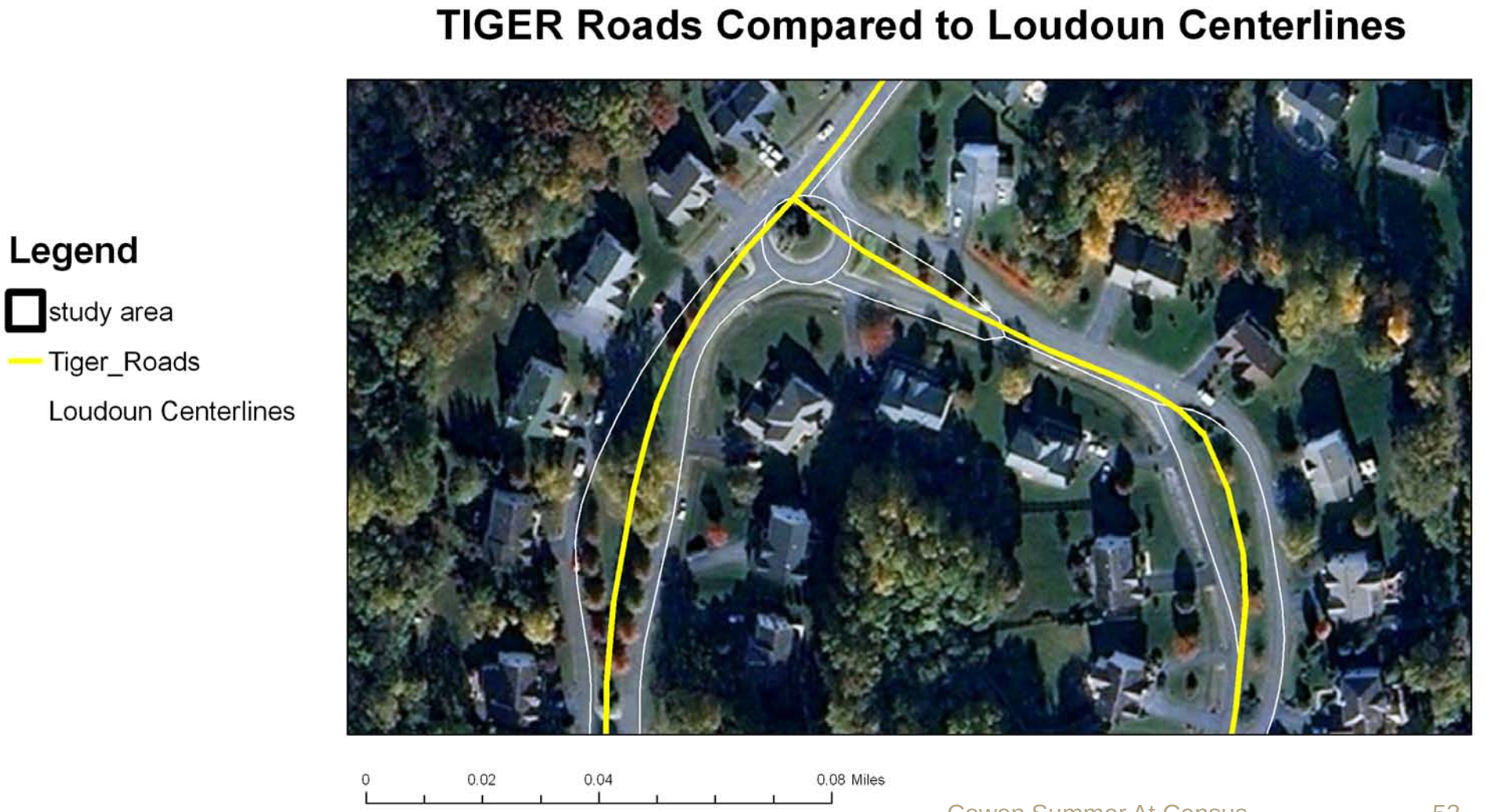
Problem 2: Cul de Sac

Charleston 911 – Orange
TIGER - Navy



Note ESRI basemap is correct. Charleston 911 and TIGER are wrong and from the same base

Example of How TIGER Requirements Differ from Navigation Requirements



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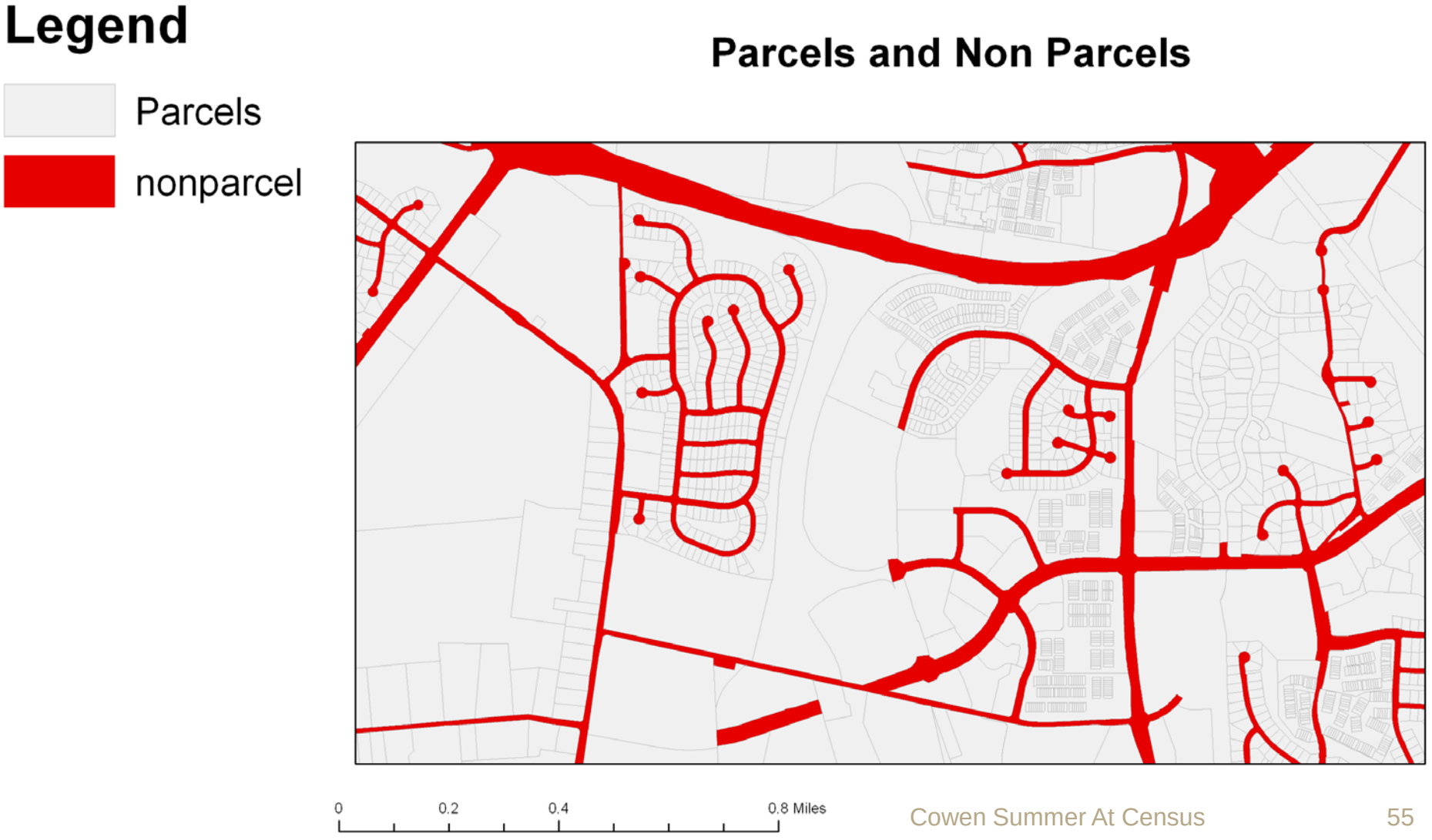
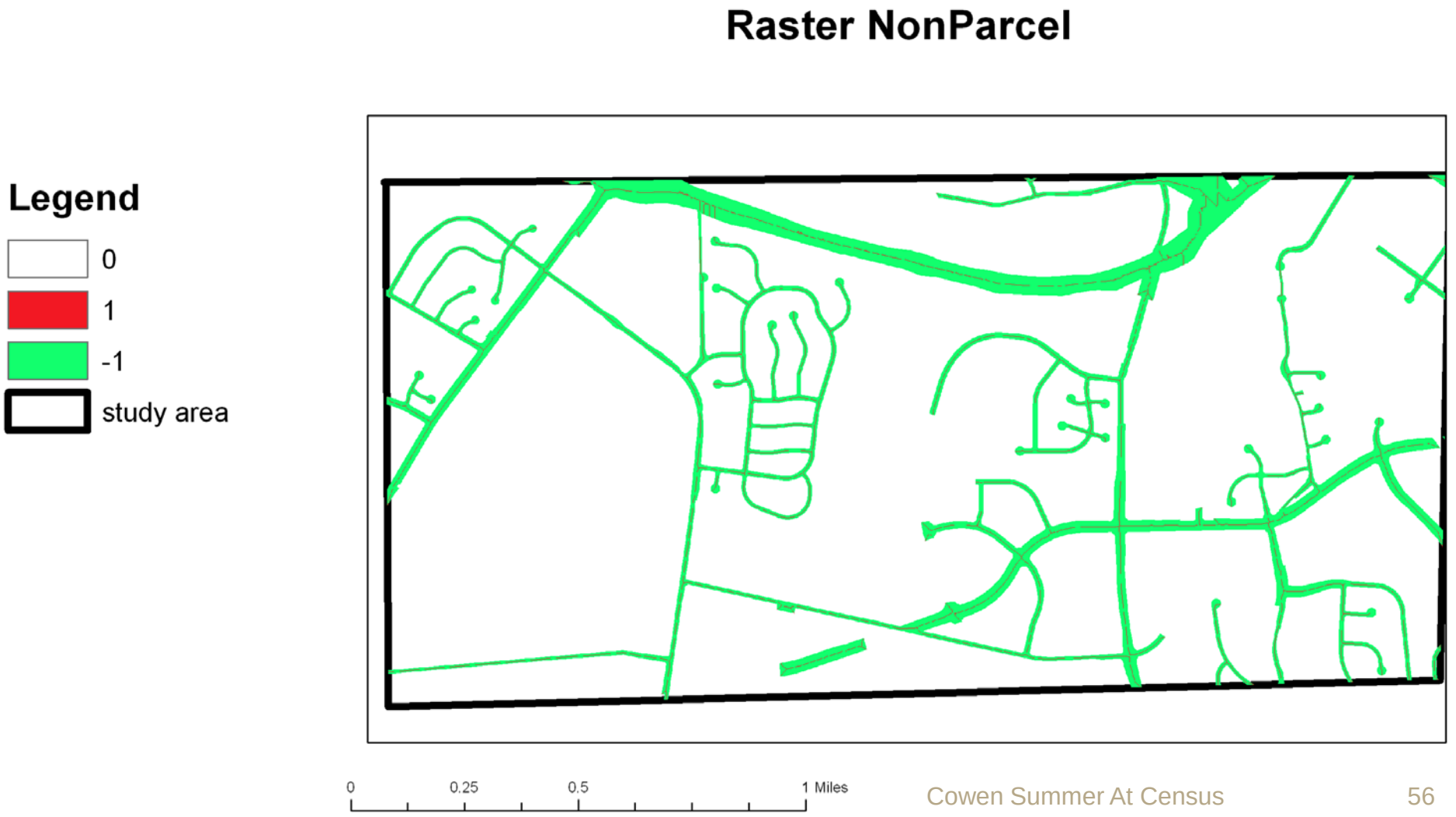
Union of A Single County Polygon used to generate attributes for these null areas

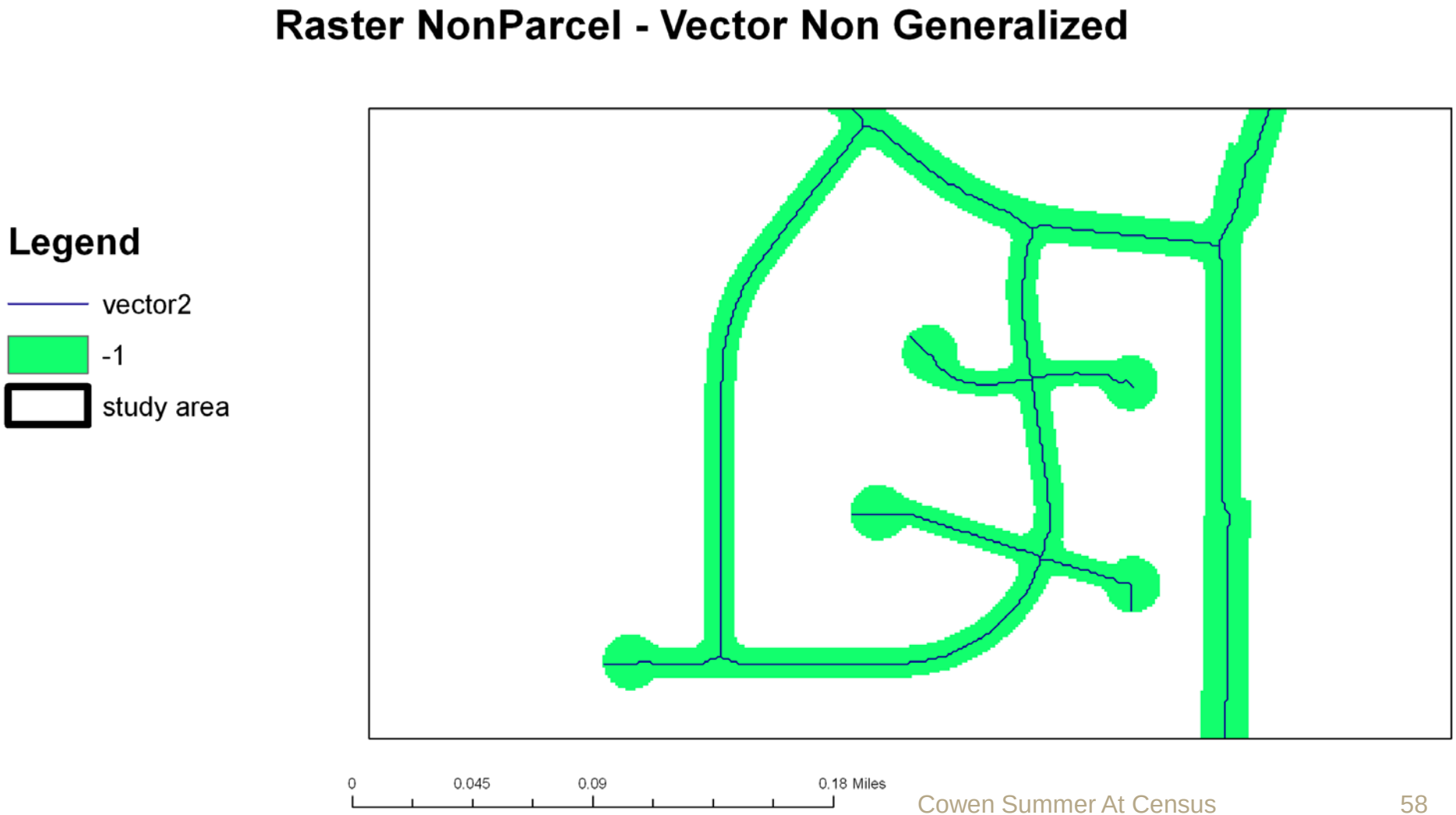


Raster Version of Non Parcel areas



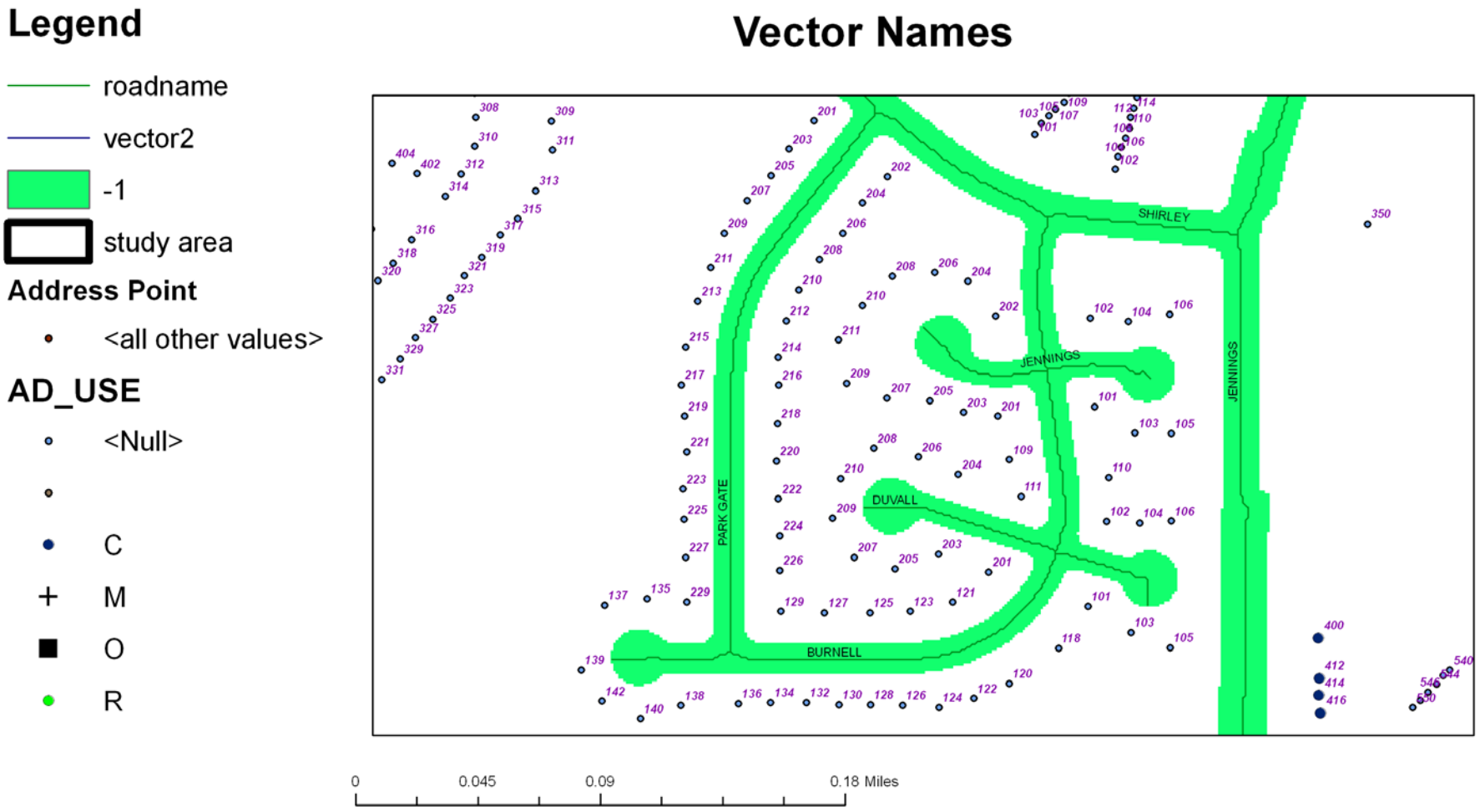
Zoom of Raster of "non parcel" areas with Thinned Raster

Raster to Vector – Non Generalized

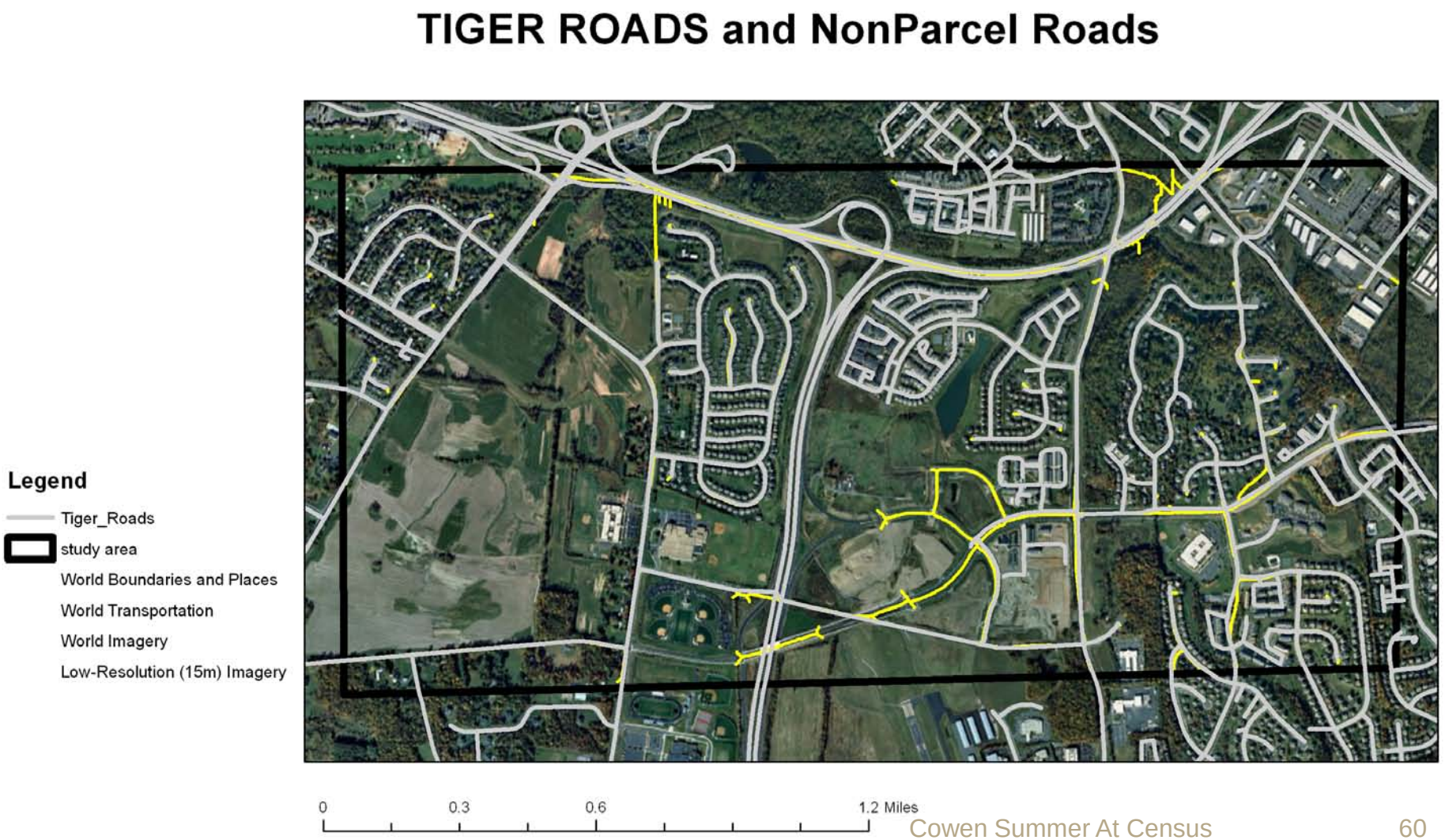


Vector Names Assigned by Spatial Join to Closest Address Point (Loudoun County Provided Data)

* No U.S. Census Bureau Title 13 data was used in this slide

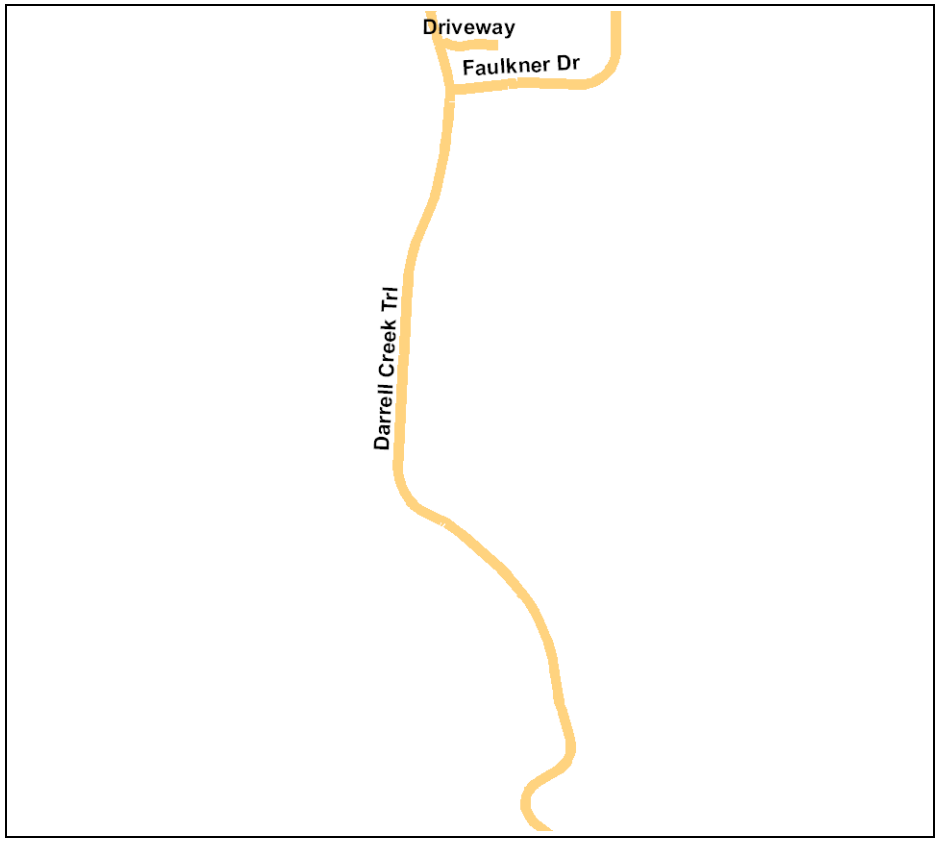


Comparison of TIGER Road Features with non-parcel roads – With Image Service

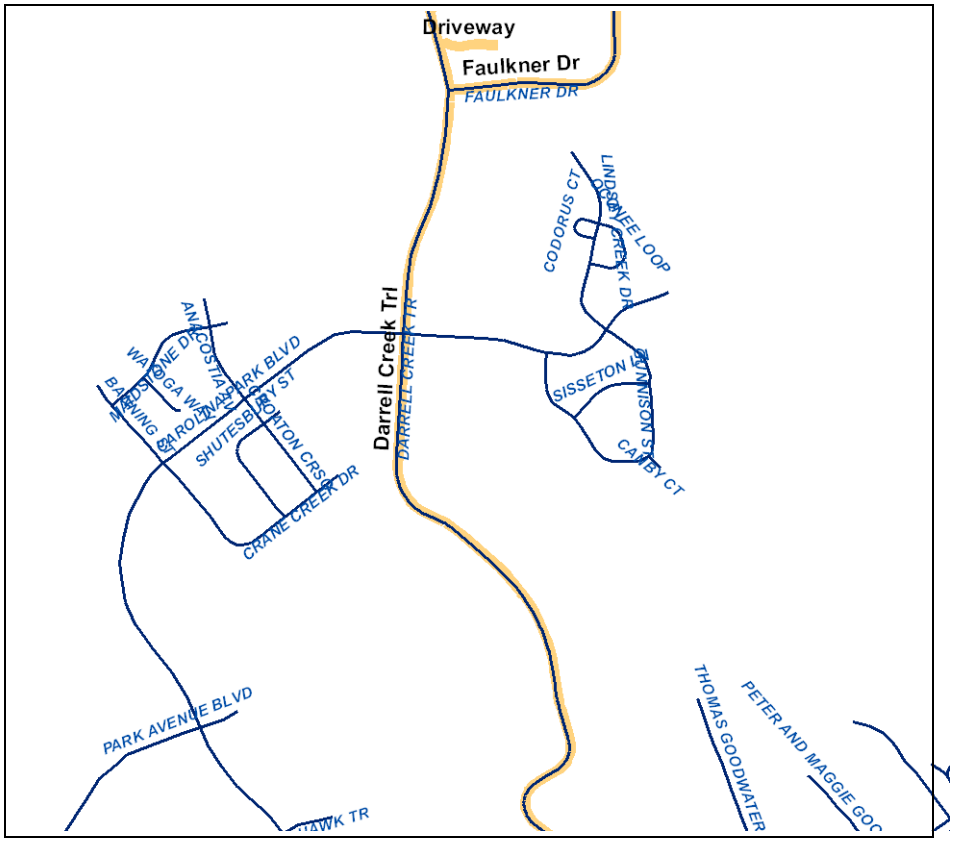


Discover and Append New Roads

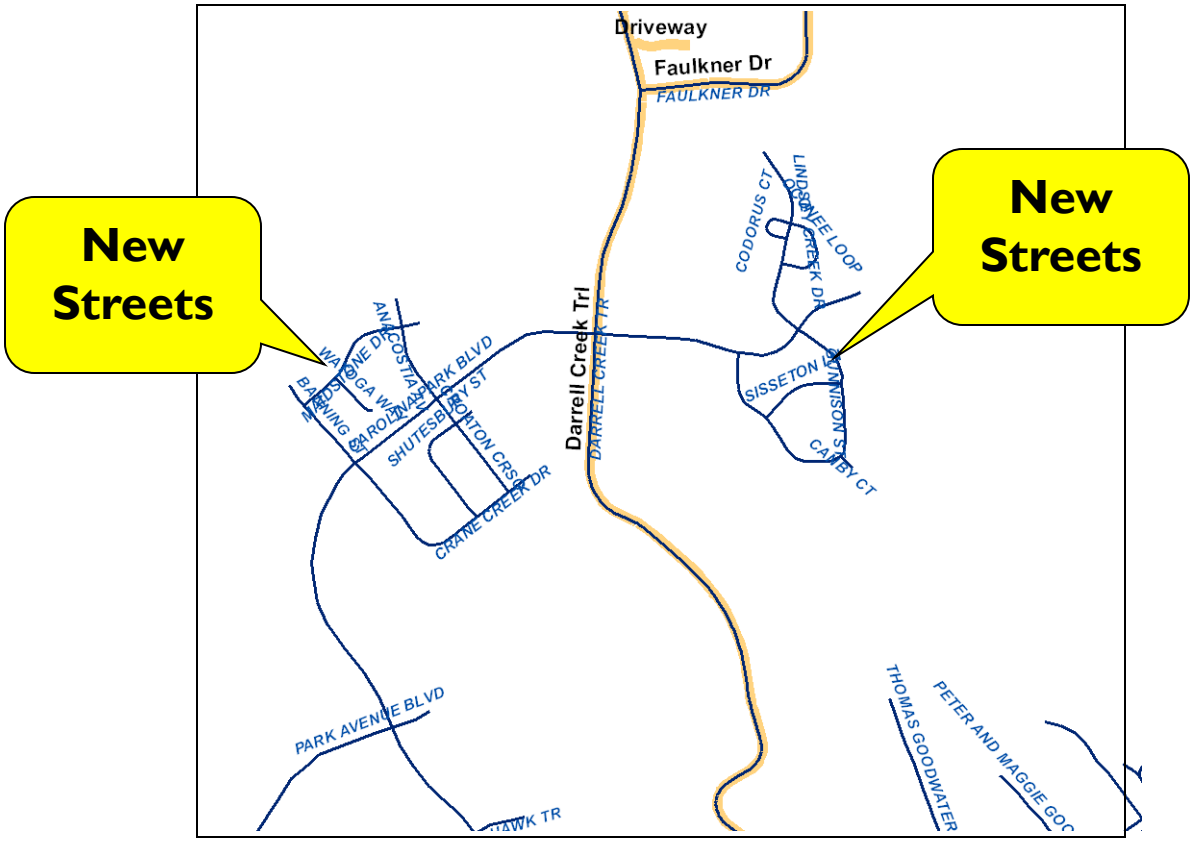
TIGER



TIGER & E911 Roads

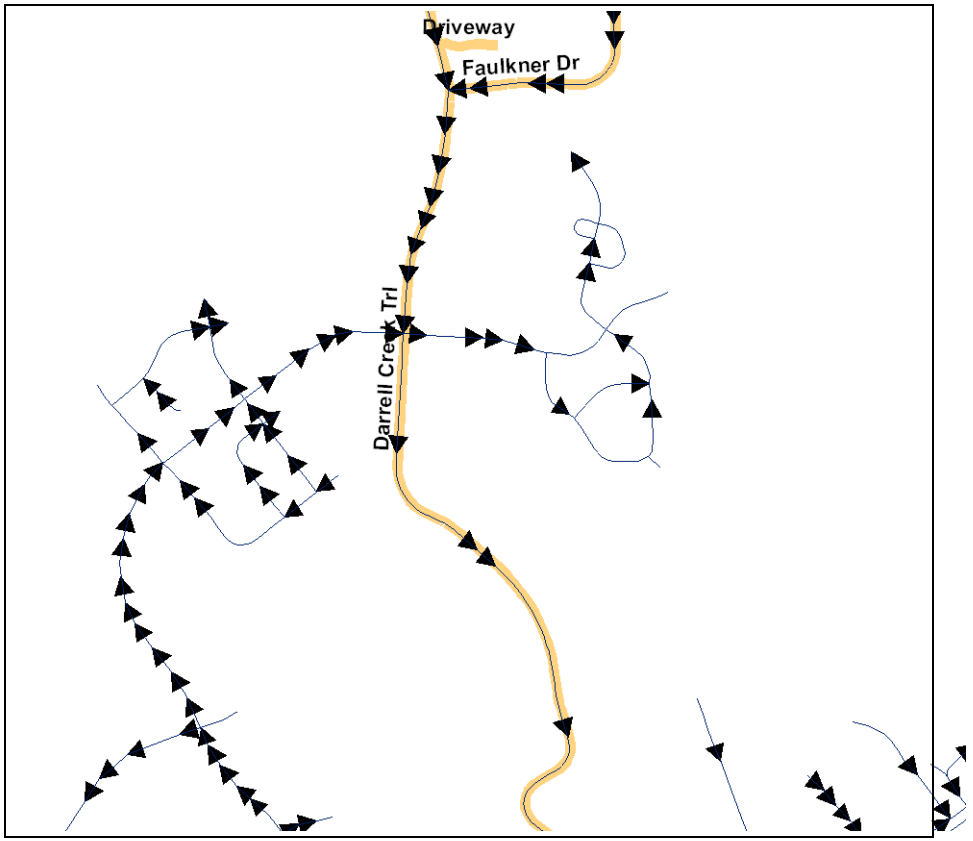


TIGER & E911 Roads
Used for accuracy improvement program

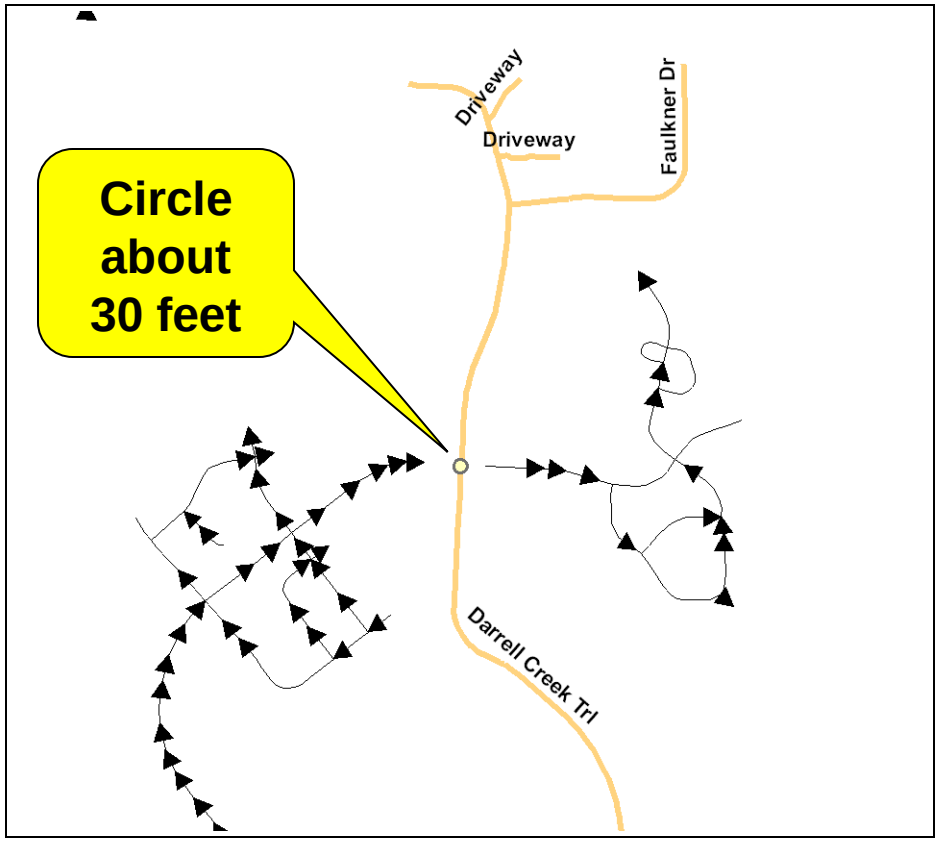


E911 Decomposed to Vertices

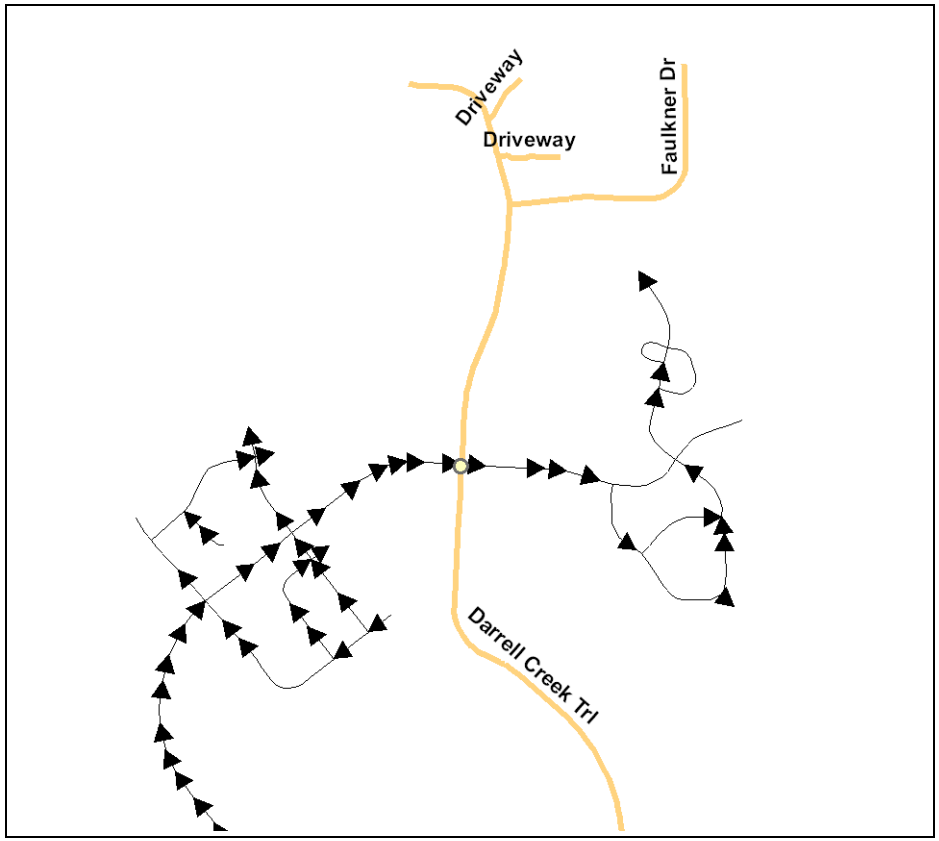
E911 Segments



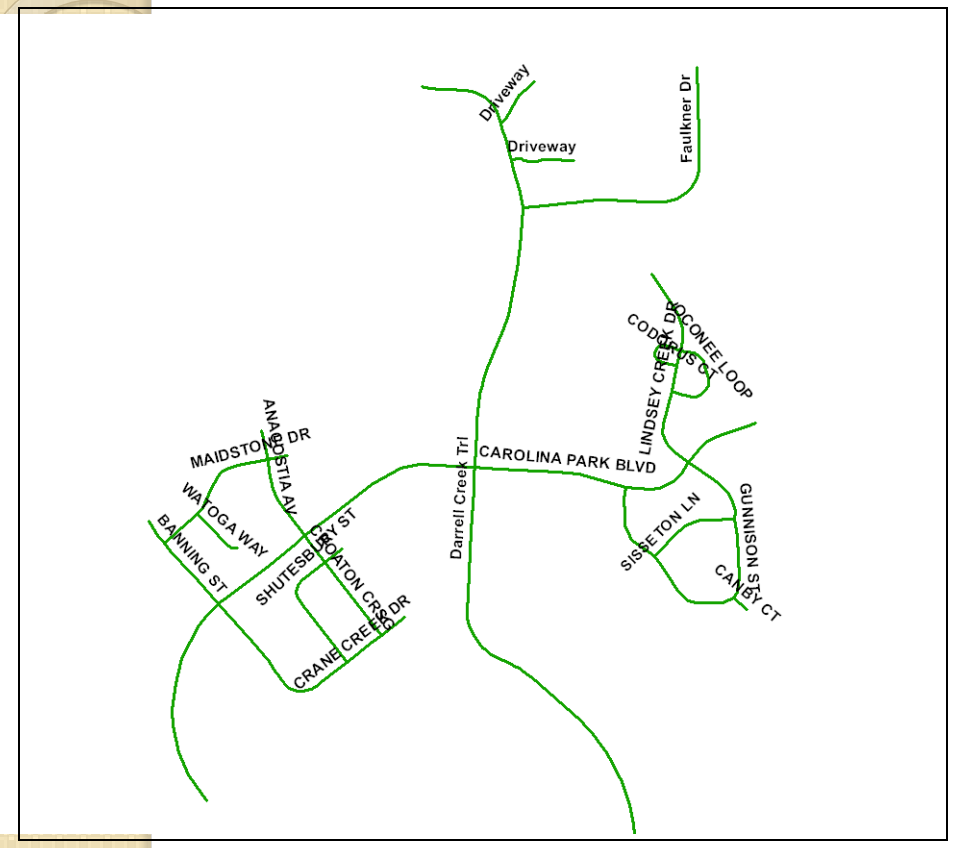
Segments > 30 Feet From TIGER



Segments added that touch those > 30 feet to complete the new roads



Appended TIGER



Attributes Also Appended

Table

appendedx

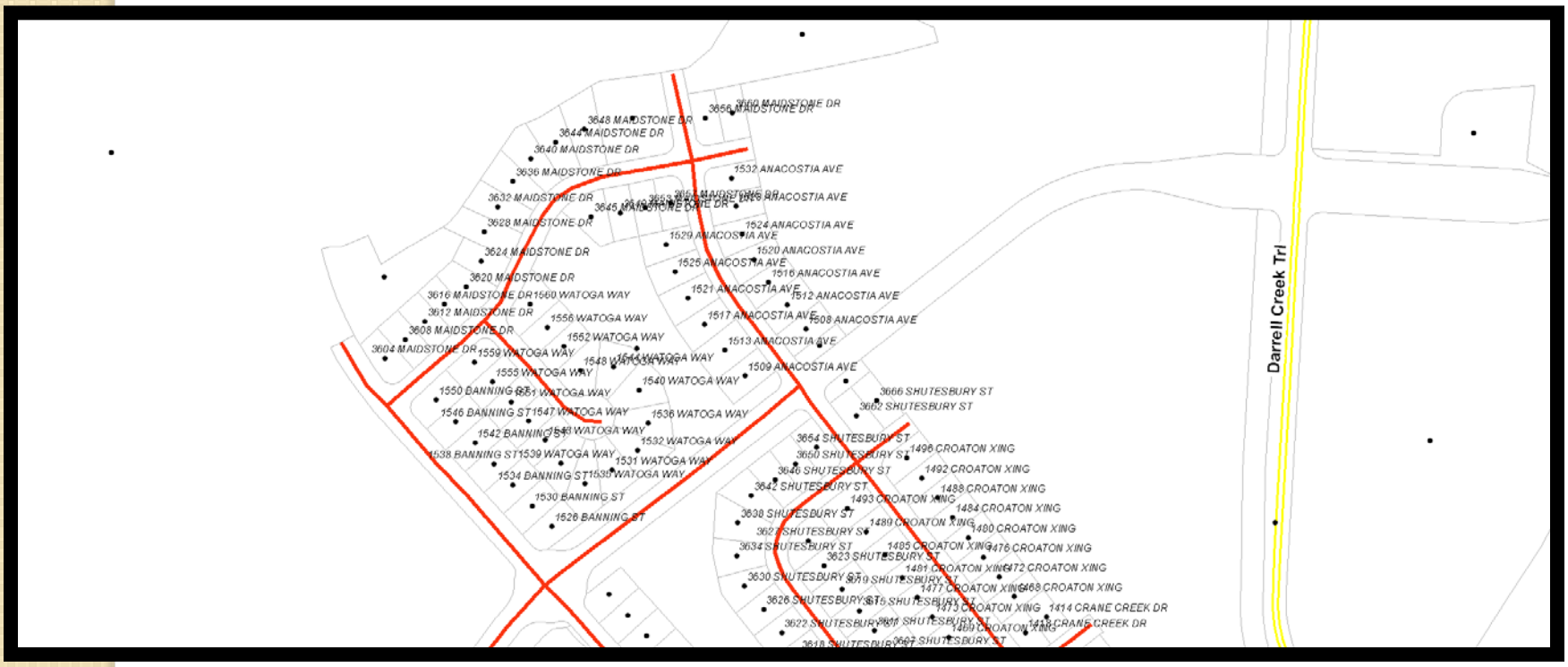
FID	Shape *	FULLNAME	LFROMADD	LTOADD	RFROMADD	RTOADD
21	Polyline	BANNING ST	0	0	1526	1550
22	Polyline	BANNING ST	0	0	1526	1550
23	Polyline	BANNING ST	0	0	1526	1550
24	Polyline	BANNING ST	0	0	1526	1550
25	Polyline	MAIDSTONE DR	3604	3616	3605	3615
26	Polyline	MAIDSTONE DR	3604	3616	3605	3615
27	Polyline	MAIDSTONE DR	3604	3616	3605	3615
28	Polyline	MAIDSTONE DR	3604	3616	3605	3615
29	Polyline	CRANE CREEK DR	1421	1439	1420	1438
30	Polyline	CRANE CREEK DR	1421	1439	1420	1438
31	Polyline	MAIDSTONE DR	3618	3648	3617	3657
32	Polyline	MAIDSTONE DR	3618	3648	3617	3657
33	Polyline	MAIDSTONE DR	3618	3648	3617	3657
34	Polyline	MAIDSTONE DR	3618	3648	3617	3657
35	Polyline	MAIDSTONE DR	3618	3648	3617	3657
36	Polyline	MAIDSTONE DR	3618	3648	3617	3657
37	Polyline	MAIDSTONE DR	3618	3648	3617	3657

1 (0 out of 202 Selected)

appendedx

Parcel Centroids as Address Points (Core Logic Provided Data)

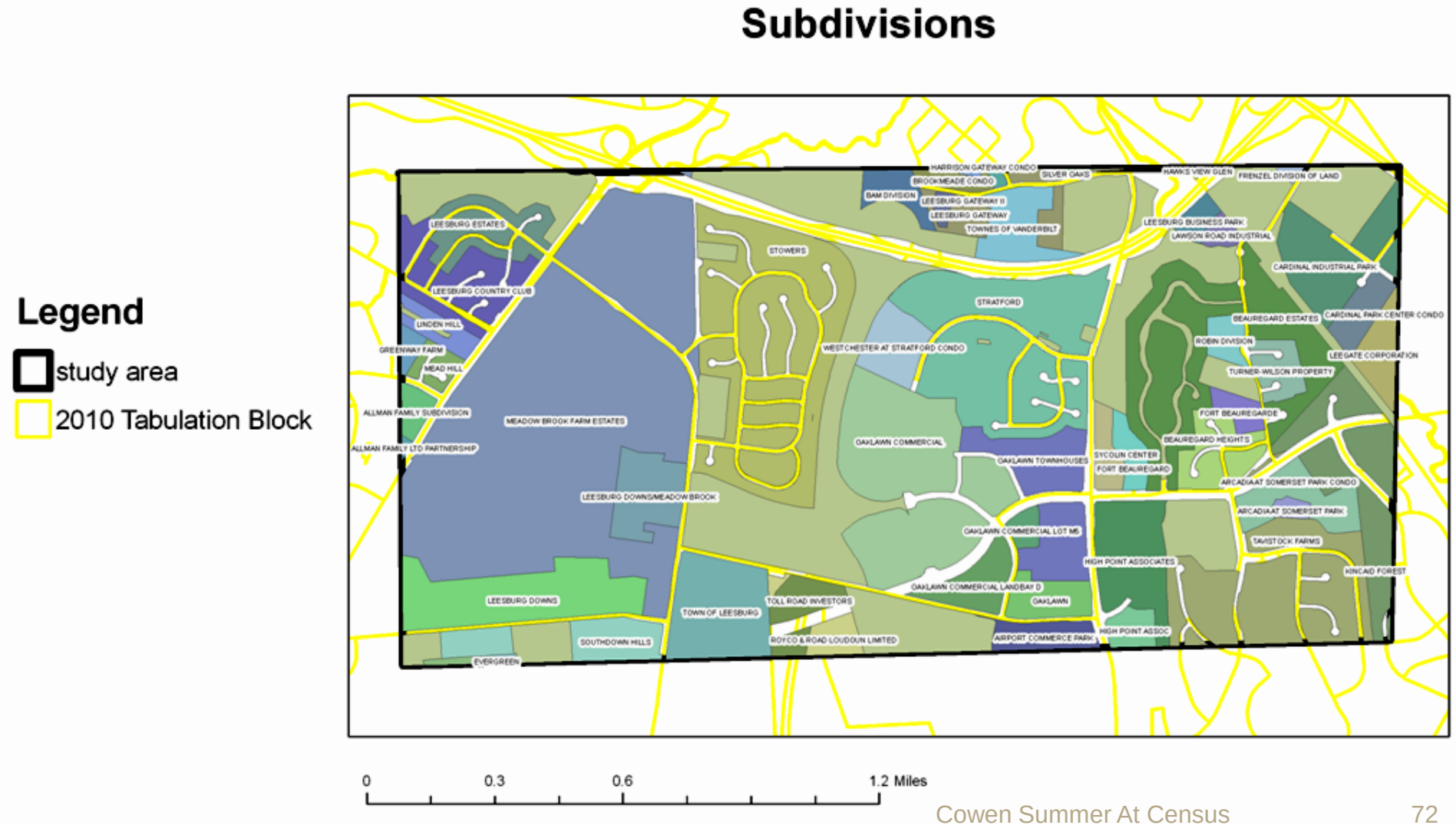
* No U.S. Census Bureau Title 13 data was used in this slide



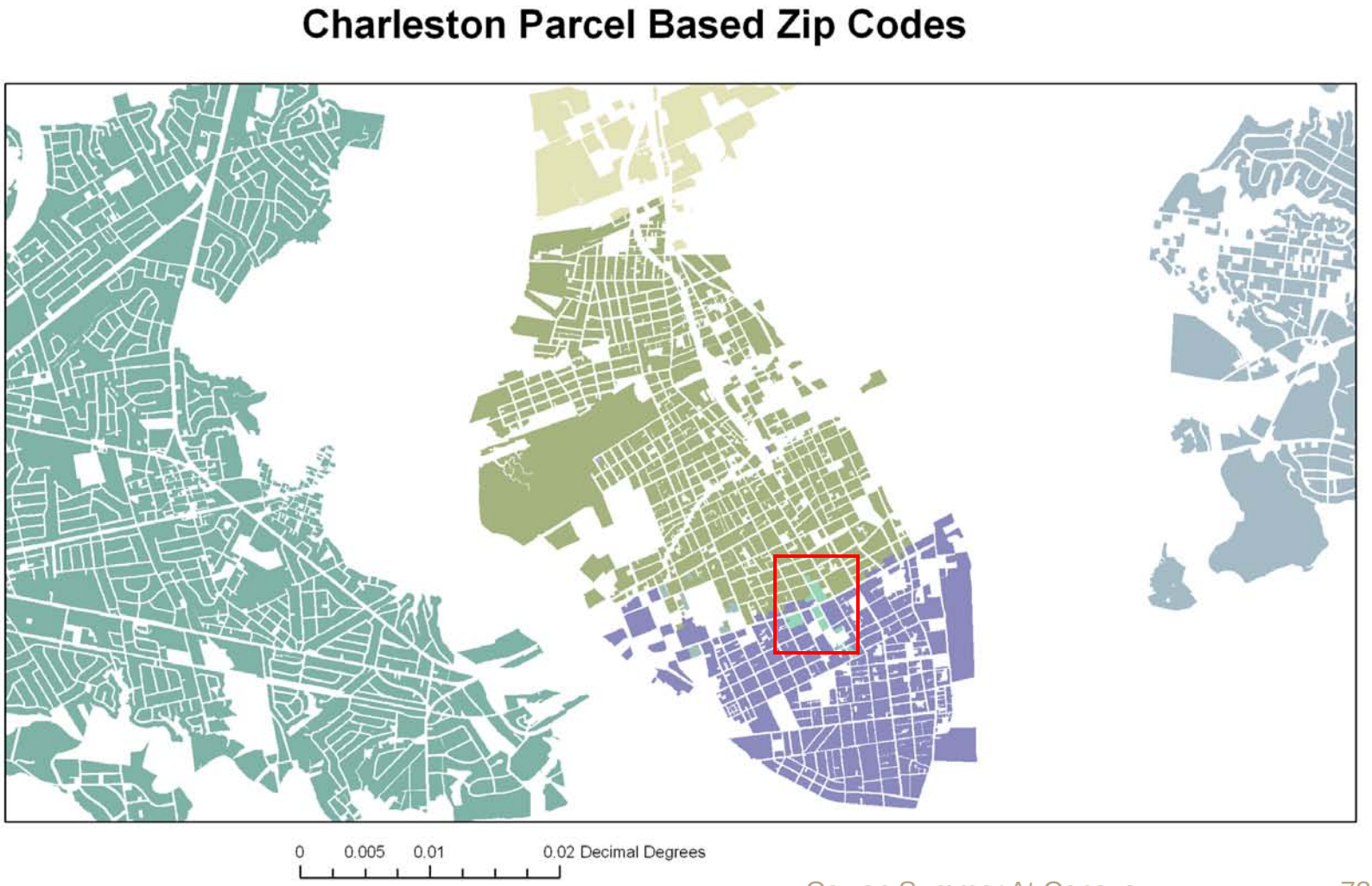
Working Hypotheses That are of Interest to the Geography Division

- Parcels:
  - are required to accurately represent many municipal boundaries
  - can generate centroids that are a excellent representation of many structure points
  - can be used to separate public and private land which is important for validation
  - **can be used to generate road centerlines**
  - ***can be dissolved to create many meaningful polygons***

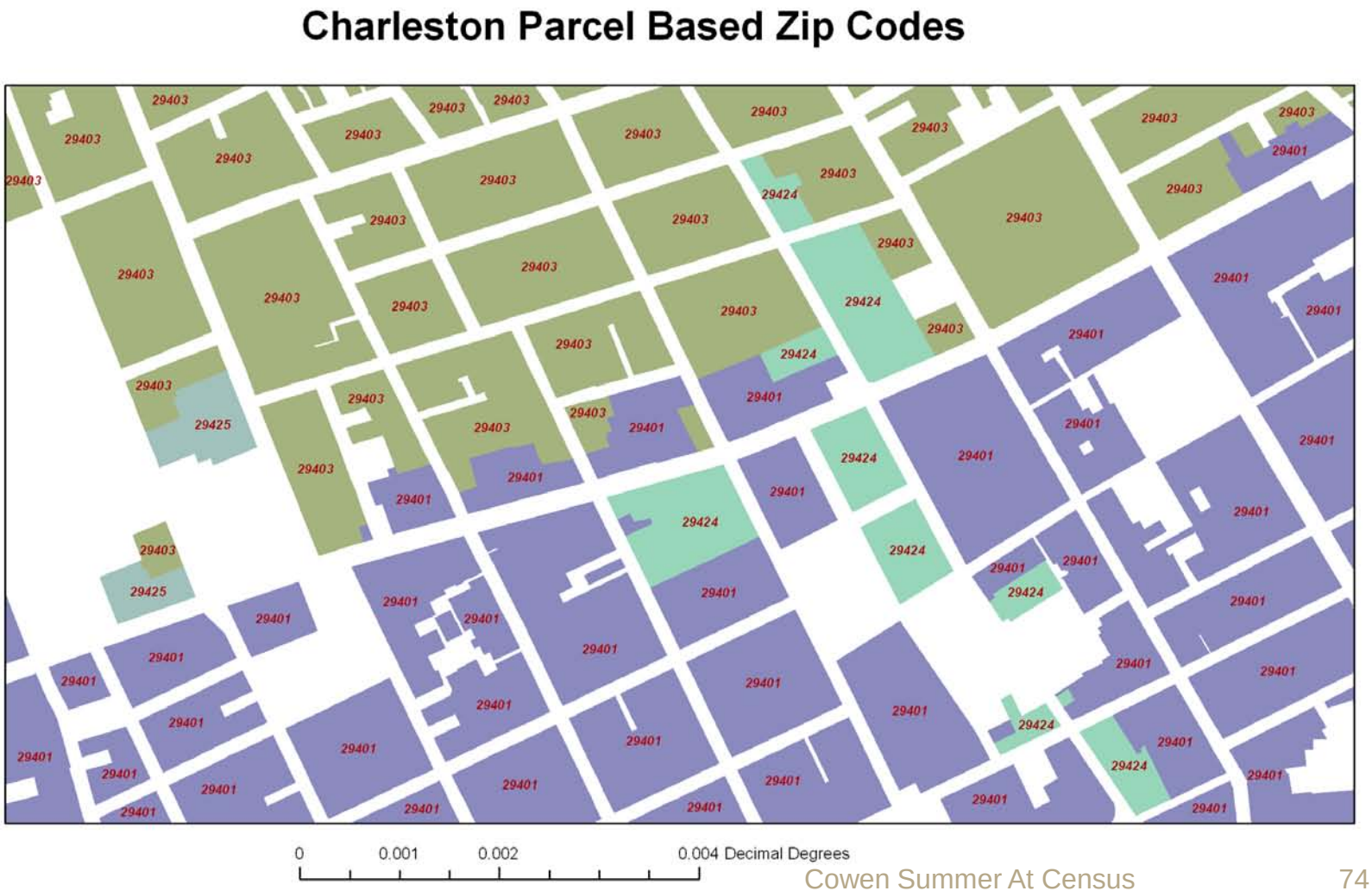
Subdivisions Generated By Dissolving Parcels



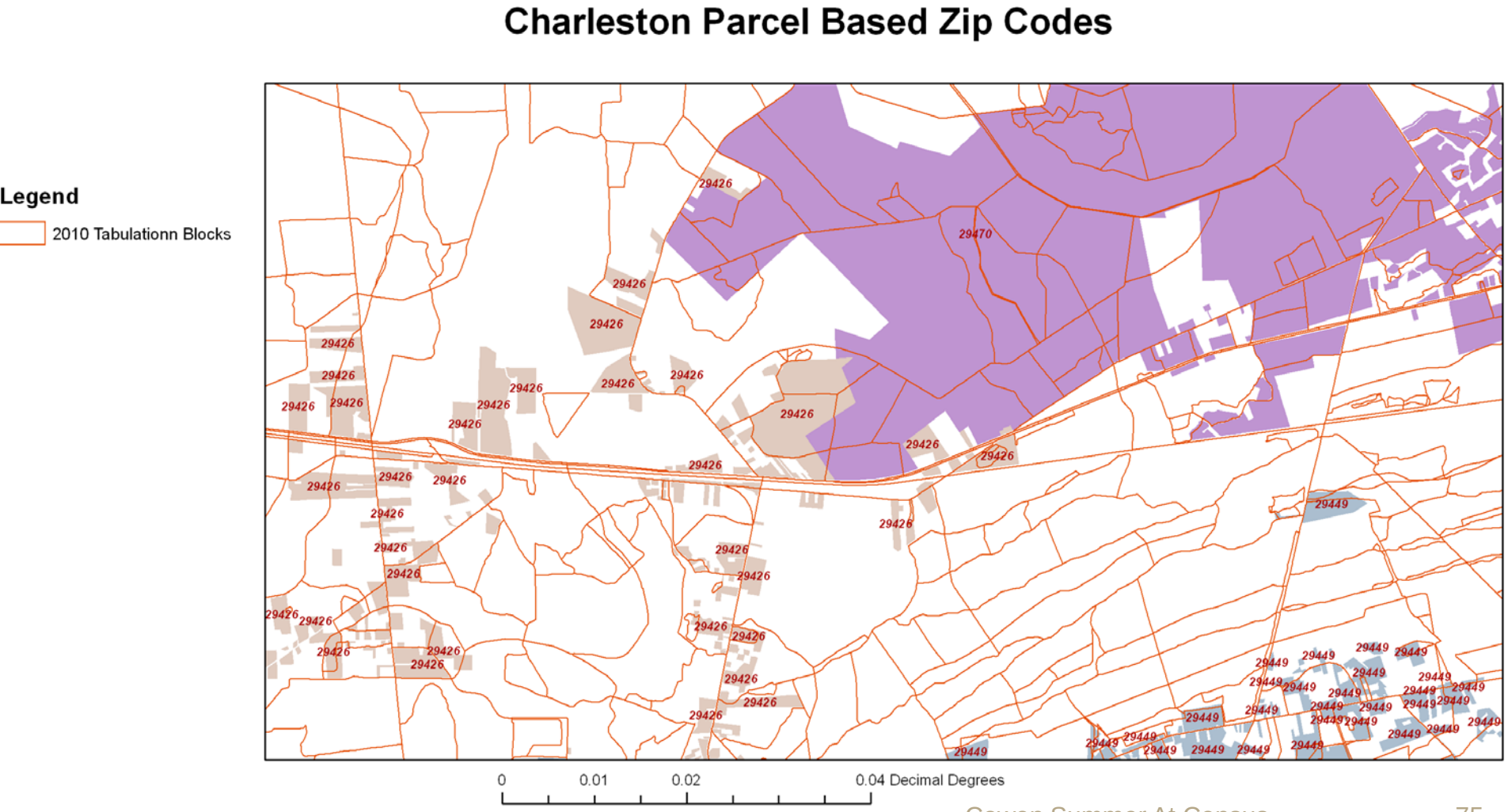
Charleston County Zip code Areas Generated by dissolving parcels



Some Non Contiguous Areas

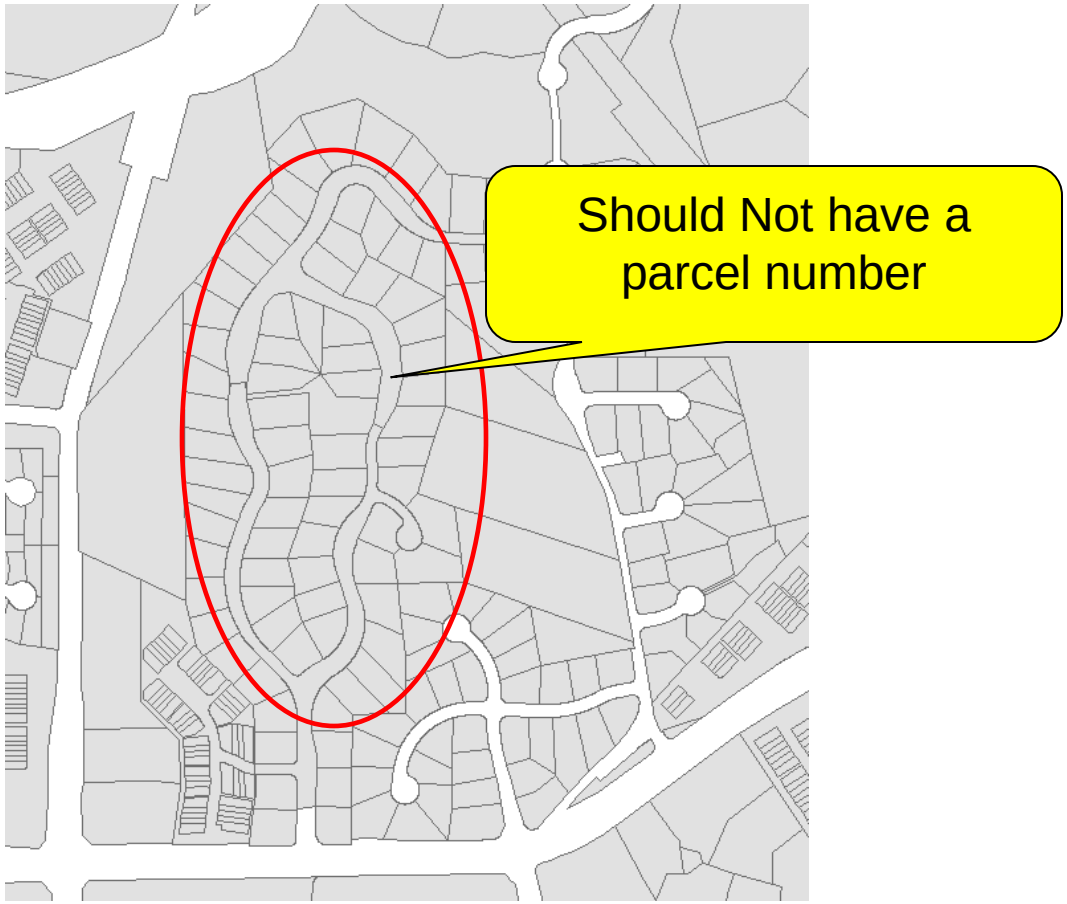


Rural Section of Charleston – Parcel Based Zip Code Areas

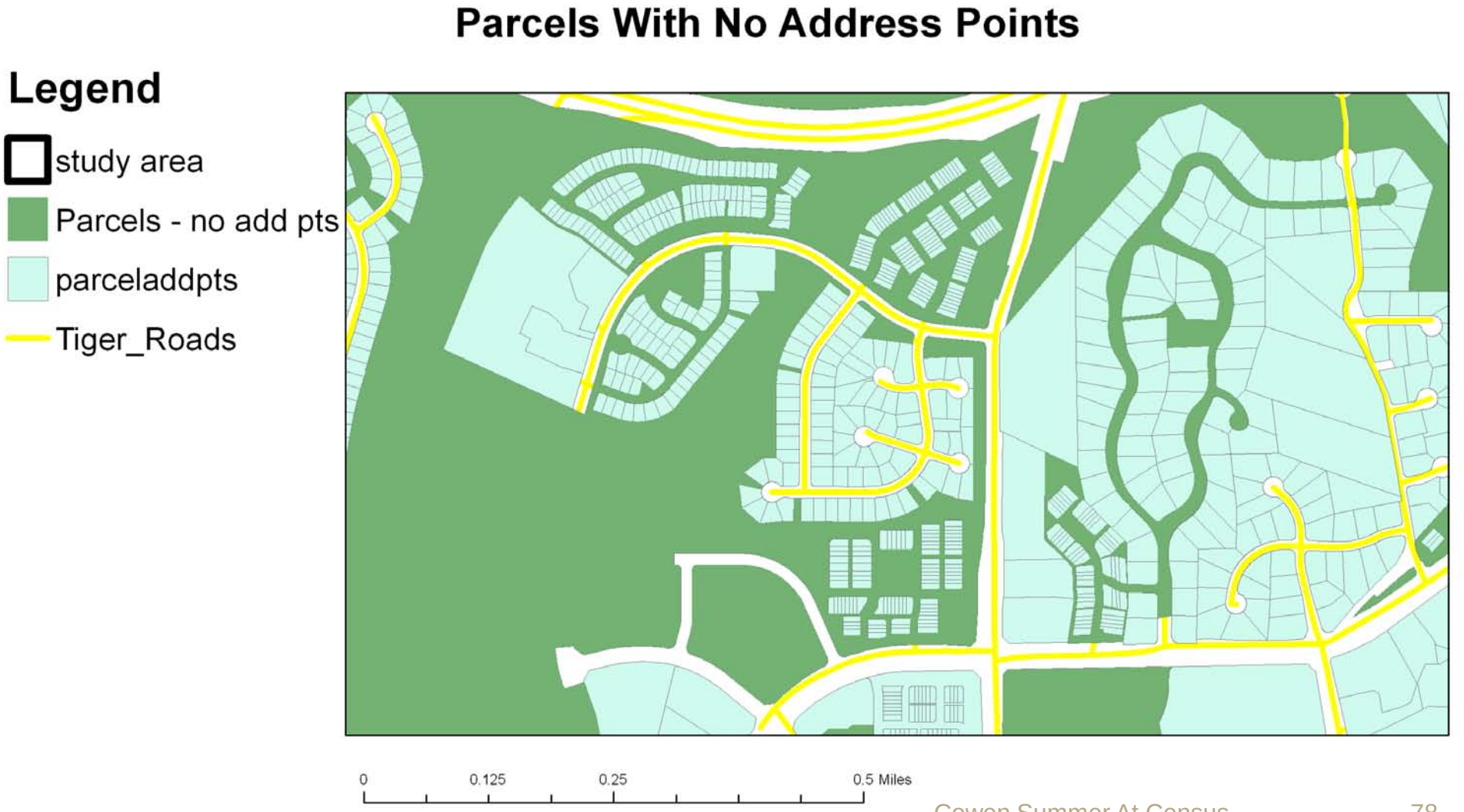


Problems

Problem Area
Obvious Case of Roads With Parcel Numbers



Surrogate – No Address Points But too inclusive



Conclusions

- It is possible to quickly generate several useful products from county level parcel data
- These products provide useful geospatial data for validation, representation and update
- Tax parcels are most useful – they deal with areas with existing or potential dwellings
- The Federal Government should explore a license for commercial parcel data – rather than the numerous ones it now purchases