



Esri Redistricting

Oregon House Redistricting Committee

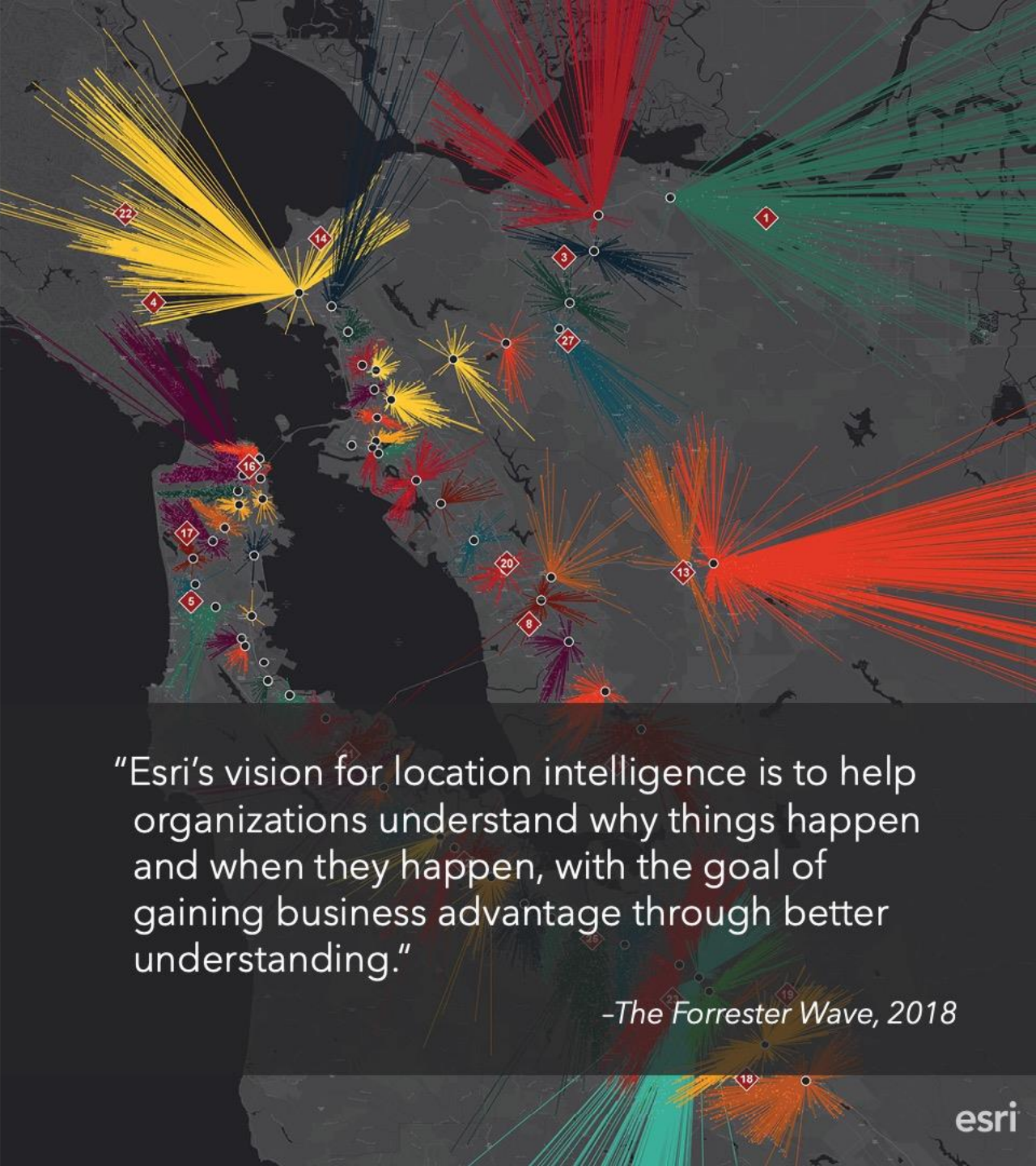
April 8, 2021



WHO WE ARE

Esri is the **global leader** in geographic information systems (GIS) software, location intelligence, and mapping.

With more than **100** offices worldwide and professionals from **67** countries, Esri provides organizations of every size and industry the tools to get deeper insights from their geographic and transactional data to improve operational and business results.



"Esri's vision for location intelligence is to help organizations understand why things happen and when they happen, with the goal of gaining business advantage through better understanding."

-The Forrester Wave, 2018

Redistricting Background

Some History:

1980's

Highly Constrained

1990's

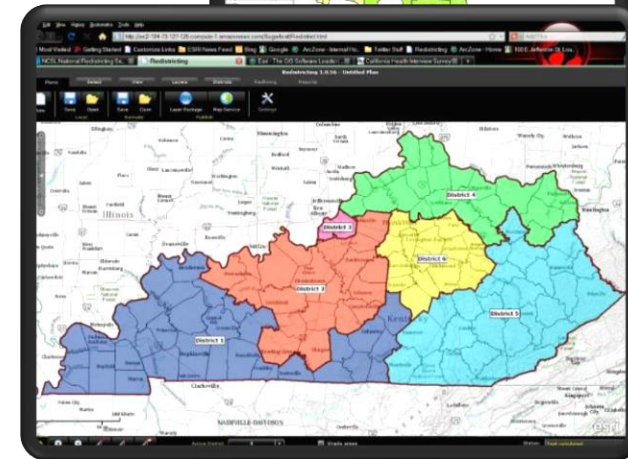
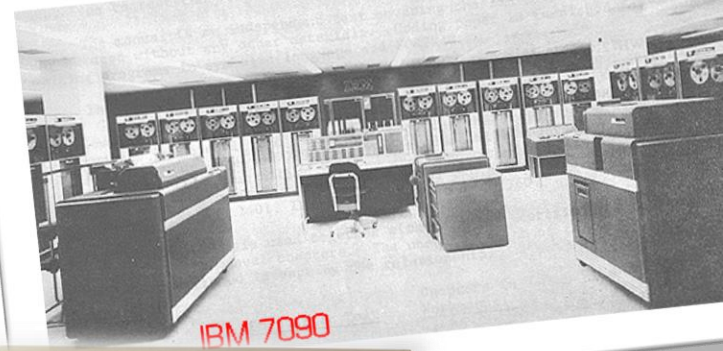
Tools available but cumbersome

2000's

Usability and some public involvement

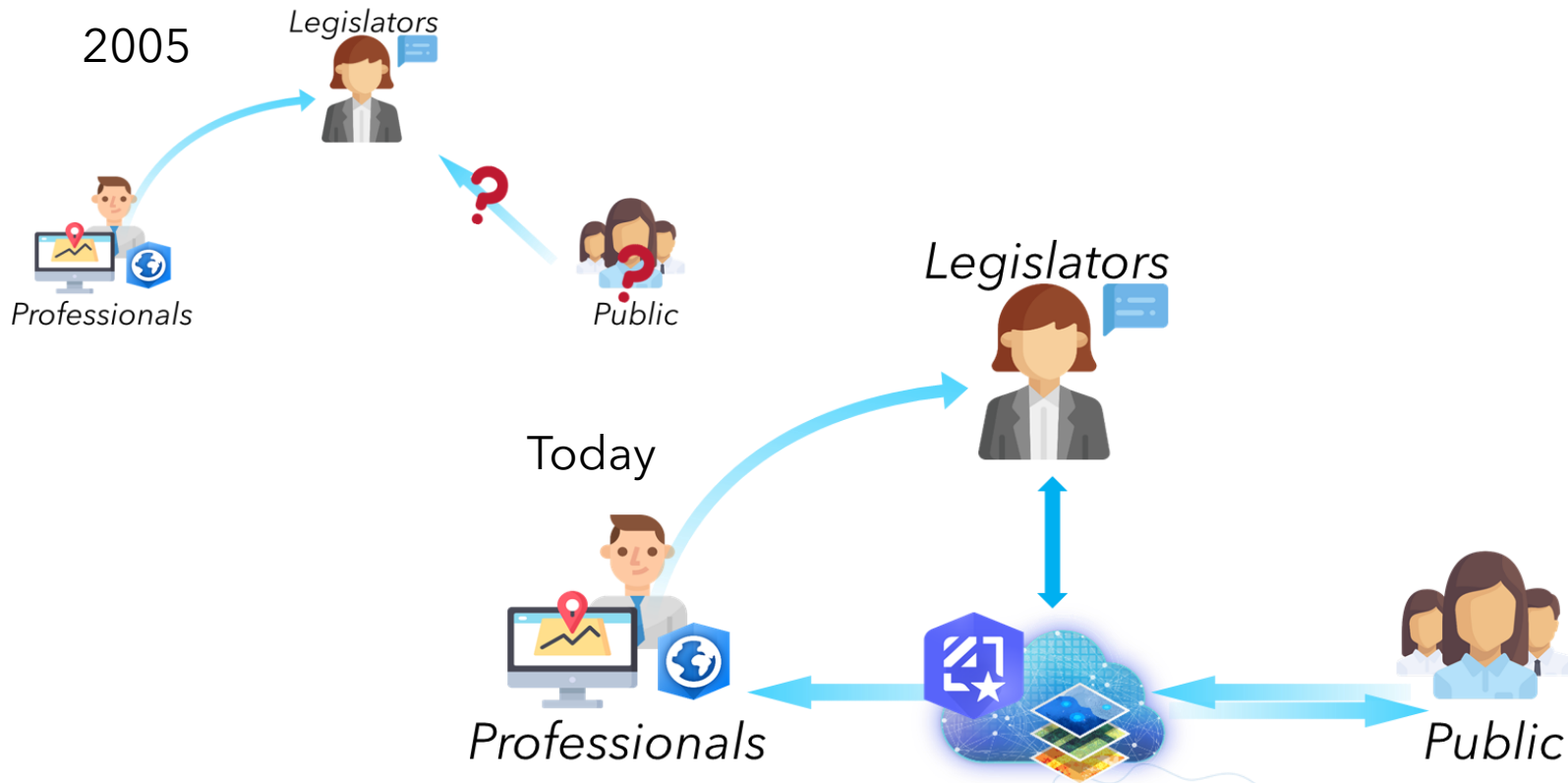
2010's

Almost consumer-level



A Vision for 2010 Redistricting

Esri Redistricting Story



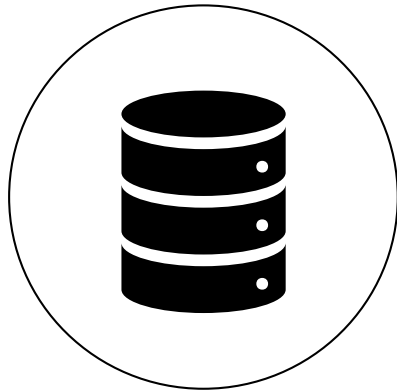
A browser approach would increase collaboration within the legislature and between citizens

- Provided via web browser
- Facilitates collaboration, sharing, and community building
- Easy to use interface reduces costs associated with training
- Minimal GIS experience required
- Centralized IT
- Cost effective way to provide access to citizens

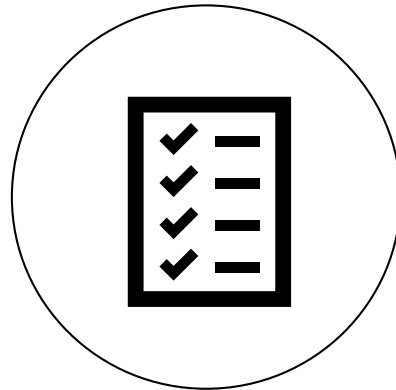
Features Overview



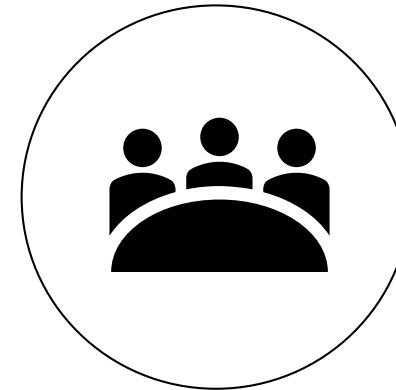
Esri Redistricting



Data
Sources



Plan
Management



Collaboration



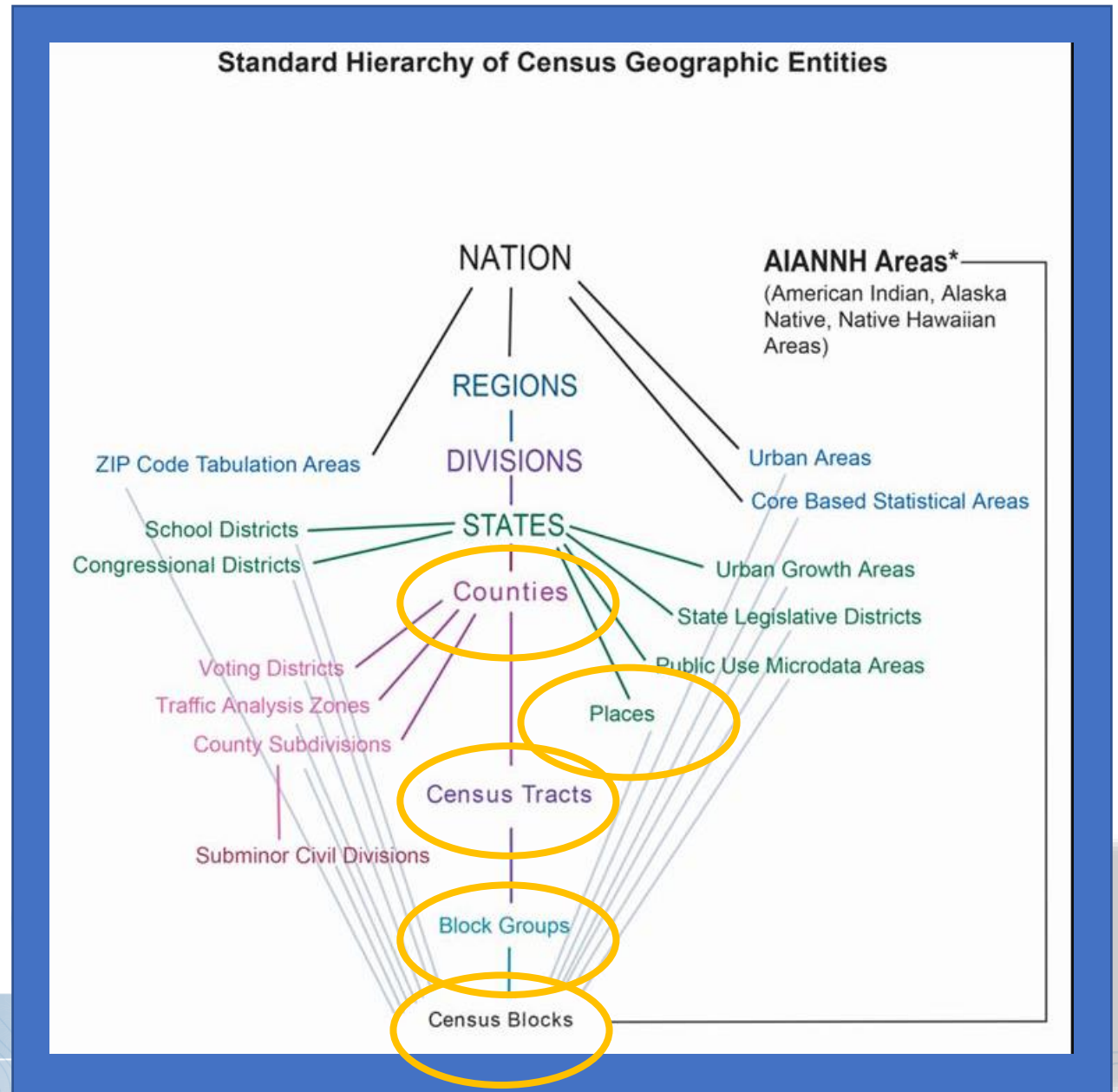
Census Data—The P.L. Story

Public Law (P.L.) 94-171

...enacted by Congress in December 1975, requires the Census Bureau to provide states the opportunity to identify the small area geography for which they need data in order to conduct legislative redistricting. The law also requires the U.S. Census Bureau to deliver this data no later than one year from Census day.

P.L. 94-171 requires the U.S. Census Bureau to furnish "basic tabulations of population" to each state, including for those small areas the states have identified.

[Understanding Geographic Relationships: Counties, Places, Tracts and More \(census.gov\)](https://www.census.gov/geo/www/understanding-geographic-relationships-counties-places-tracts-and-more)



The P.L. table as a Data Model.

FIGURE 1-5. GEOGRAPHIC HEADER RECORD

Field	Data dictionary reference	Field size	Starting position	Data type	Summary levels										
					040	050	060	067	140	150	155				
Record Codes															
File Identification	FILEID	6	1	A/N	X										
State/US-Abbreviation (USPS)	STUSAB	2	7	A	X										
Summary Level	SUMLEV	7	4	A/N	X										
Geographic Variant	GEONAV	2	12	A/N	X										
Geographic Component	GEOCOMP	2	14	A/N	X										
Characteristic Iteration	CHARITER	3	16	A/N	X										
Characteristic Iteration File Sequence Number	CIFS	2	19	A/N	X										
Logical Record Number	LOGRECO	7	21	N	X										
Geographic Area Codes															
Geographic Record Identifier	GEOD	60	28	A/N	X										
Geographic Code Identifier	GEOCODE	61	88	A/N	X										
Region	REGION	1	139	A/N	X										
Division	DIVISION	1	140	A/N	X										
State (FIPS)	STATE	2	141	A/N	X										
State (NS)	STATENS	8	143	A/N	X										
County (FIPS)	COUNTY	3	151	A/N	X										
FIPS County Class Code	COUNTFCC	2	154	A/N	X										
County (NS)	COUNTYNS	8	156	A/N	X										
County Subdivision (FIPS)	COUNSUB	5	164	A/N	X										
FIPS County Subdivision Class Code	COUNSUBCC	2	169	A/N	X										
County Subdivision (NS)	COUNSUBNS	8	171	A/N	X										
Subminor Civil Division (FIPS)	SUBMCD	5	179	A/N	X										
FIPS Subminor Civil Division Class Code	SUBMCDCC	2	184	A/N	X										
Subminor Civil Division (NS)	SUBMCDNS	8	186	A/N	X										
Estate (FIPS)	ESTATE	5	184	A/N	X										
FIPS Estate Class Code	ESTATECC	2	199	A/N	X										
Estate (NS)	ESTATENNS	8	201	A/N	X										
Consolidated City (FIPS)	CONCIT	6	209	A/N	X										
FIPS Consolidated City Class Code	CONCITCC	2	214	A/N	X										
Consolidated City (NS)	CONCITNS	8	216	A/N	X										
		6	224	A/N	X										
		5	224	A/N	X										
		2	229	A/N	X										
		8	231	A/N	X										
		8	239	A/N	X										
		8	242	A/N	X										

FIGURE 1-5. GEOGRAPHIC HEADER RECORD—Con.

Field	Data dictionary reference	Field size	Starting position	Data type	Summary levels										
					040	050	060	067	140	150	155				
Block	BLOCK	4	246	A/N											
American Indian Area/Alaska Native Area/Hawaiian Home Land (Census)	AIANNH	4	250	A/N											
American Indian Trust Land/Hawaiian Home Land Indicator	AHNHILI	1	254	A/N											
American Indian Area/Alaska Native Area/Hawaiian Home Land (FIPS)	AIANNHFP	5	255	A/N											
FIPS American Indian Area/Alaska Native Area/Hawaiian Home Land Class Code	AIANNHCC	2	260	A/N											
American Indian Area/Alaska Native Area/Hawaiian Home Land (NS)	AIANNHNS	8	262	A/N											
American Indian Tribal Subdivision (Census)	AITS	3	270	A/N											
American Indian Tribal Subdivision (FIPS)	AITSP	5	273	A/N											
FIPS American Indian Tribal Subdivision Class Code	AITSCC	2	278	A/N											
American Indian Tribal Subdivision (NS)	AITSNS	8	280	A/N											
Tribal Census Tract	TTRACT	6	288	A/N											
Tribal Block Group	TBLKGRP	1	294	A/N											
Alaska Native Regional Corporation (FIPS)	ANRC	5	295	A/N											
FIPS Alaska Native Regional Corporation Class Code	ANRCCC	2	300	A/N											
Alaska Native Regional Corporation (NS)	ANRCS	8	302	A/N											
Metropolitan Statistical Area/Micropolitan Statistical Area	CESA	5	320	A/N											
Metropolitan/Micropolitan Indicator	MEMI	1	315	A/N											
Combined Statistical Area	CSA	3	316	A/N											
Metropolitan Division	METDIV	5	319	A/N											
New England City and Town Area	NECTA	5	324	A/N											
NECTA Metropolitan/Micropolitan Indicator	NMEMI	1	329	A/N											
Combined New England City and Town Area	CNECTA	3	330	A/N											
New England City and Town Area Division	NECTADIV	5	333	A/N											

FIGURE 1-5. GEOGRAPHIC HEADER RECORD—Con.

Field	Data dictionary reference	Field size	Starting position	Data type	Summary levels										
					040	050	060	067	140	150	155				
Metropolitan Statistical Area/Micropolitan Statistical Area Principal City Indicator	CBSAPCI	1	338	A/N											
New England City and Town Area Principal City Indicator	NECTAPCI	1	339	A/N											
Urban Area	UA	6	340	A/N											
Urban Area Type	UATYPE	1	345	A/N											
Urban/Rural	UR	1	346	A/N											
Congressional District (116th)	CD116	2	347	A/N											
Congressional District (118th)	CD118	2	349	A/N											
Congressional District (119th)	CD119	2	351	A/N											
Congressional District (120th)	CD120	2	353	A/N											
Congressional District (121st)	CD121	2	355	A/N											
State Legislative District (Upper Chamber) (2018)	SLDU18	3	357	A/N											
State Legislative District (Upper Chamber) (2022)	SLDU22	3	360	A/N											
State Legislative District (Upper Chamber) (2024)	SLDU24	3	363	A/N											
State Legislative District (Upper Chamber) (2026)	SLDU26	3	366	A/N											
State Legislative District (Upper Chamber) (2018)	SLDU18	3	369	A/N											
State Legislative District (Lower Chamber) (2018)	SLDL18	3	372	A/N											
State Legislative District (Lower Chamber) (2022)	SLDL22	3	375	A/N											
State Legislative District (Lower Chamber) (2024)	SLDL24	3	378	A/N											
State Legislative District (Lower Chamber) (2026)	SLDL26	3	381	A/N											
State Legislative District (Lower Chamber) (2018)	SLDL18	3	384	A/N											
Voting District	VTD	4	387	A/N											
Voting District Indicator	VTDI	1	393	A/N											
ZIP Code Tabulation Area (5-Digit)	ZCTA	5	394	A/N											
School District (Elementary)	SDLEM	5	399	A/N											
School District (Secondary)	SDSEC	5	404	A/N											
School District (Unified)	SDUNI	5	409	A/N											
Public Use Microdata Area	PUMA	5	414	A/N											

FIGURE 1-5. GEOGRAPHIC HEADER RECORD—Con.

Field	Data dictionary reference	Field size	Starting position	Data type	Summary levels										
					040	050	060	067	140	150	155				
Area Characteristics															
Area (Land)	AREALAND	14	419	N	X	X	X	X	X	X	X	X	X	X	X
Area (Water)	AREAWATR	14	433	N	X	X	X	X	X	X	X	X	X	X	X
Area Base Name	BASENAME	100	447	A/N	X	X	X	X	X	X	X	X	X	X	X
Area Name—Legal/Statistical Area Description (LSAD)	NAME	125	547	A/N	X	X	X	X	X	X	X	X	X	X	X
Functional Status Code	FUNCTSTAT	1	672	A/N	X	X	X	X	X	X	X	X	X	X	X
Geographic Change User Note Indicator	GCUNI	1	673	A/N											
Population Count (1000)	POP100	9	674	N	X	X	X	X	X	X	X	X	X	X	X
Housing Unit Count (1000)	HCU100	9	683	N	X	X	X	X	X	X	X	X	X	X	X
Internal Point (Latitude)	INTPTLAT	11	692	A/N	X	X	X	X	X	X	X	X	X	X	X
Internal Point (Longitude)	INTPTLON	12	703	A/N	X	X	X	X	X	X	X	X	X	X	X
Legal/Statistical Area Description Code	LSADC	2	715	A/N	X	X	X	X	X	X	X	X	X	X	X
Part Flag	PARTFLAG	1	717	A/N	X	X	X	X	X	X	X	X	X	X	X
Special Area Codes															
Urban Growth Area	UGA	5	718	A/N											

How to Use This Product

2023 Redistricting Data (Preliminary) (PL) (LAW 34) Summary File
U.S. Census Bureau

1-11

An ArcGIS Census Data Model

The diagram illustrates a geospatial data model for census data, organized into several hierarchical layers:

- Census Feature Dataset:** The root container for all data.
- Feature Classes:**
 - Geographic:** Includes Point, Polygon, and Line classes for various geographic entities.
 - Administrative:** Includes classes for Census Tracts, Precincts, and Voting Districts.
 - Demographic:** Includes classes for Population, Housing, and Income data.
 - Geographic Area Codes:** Includes classes for Metropolitan Statistical Areas, Micropolitan Statistical Areas, and Consolidated Statistical Areas.
- Relationship Classes:** Define spatial and logical relationships between different feature classes.

The interface also shows a legend, a map view, and a table of attributes for selected features.

The diagram illustrates a geospatial data model that can be integrated by Census respondents across the globe. A key feature of the design is the ability to maintain or modify the design to reflect the most recent feature classes that are pertinent to their country. In addition, the addition of specific census demographic information could be readily added.

2023 Redistricting Data

How to Use This Product
2023 Redistricting Data (Preliminary) (PL) (LAW 34) Summary File
U.S. Census Bureau

1-12

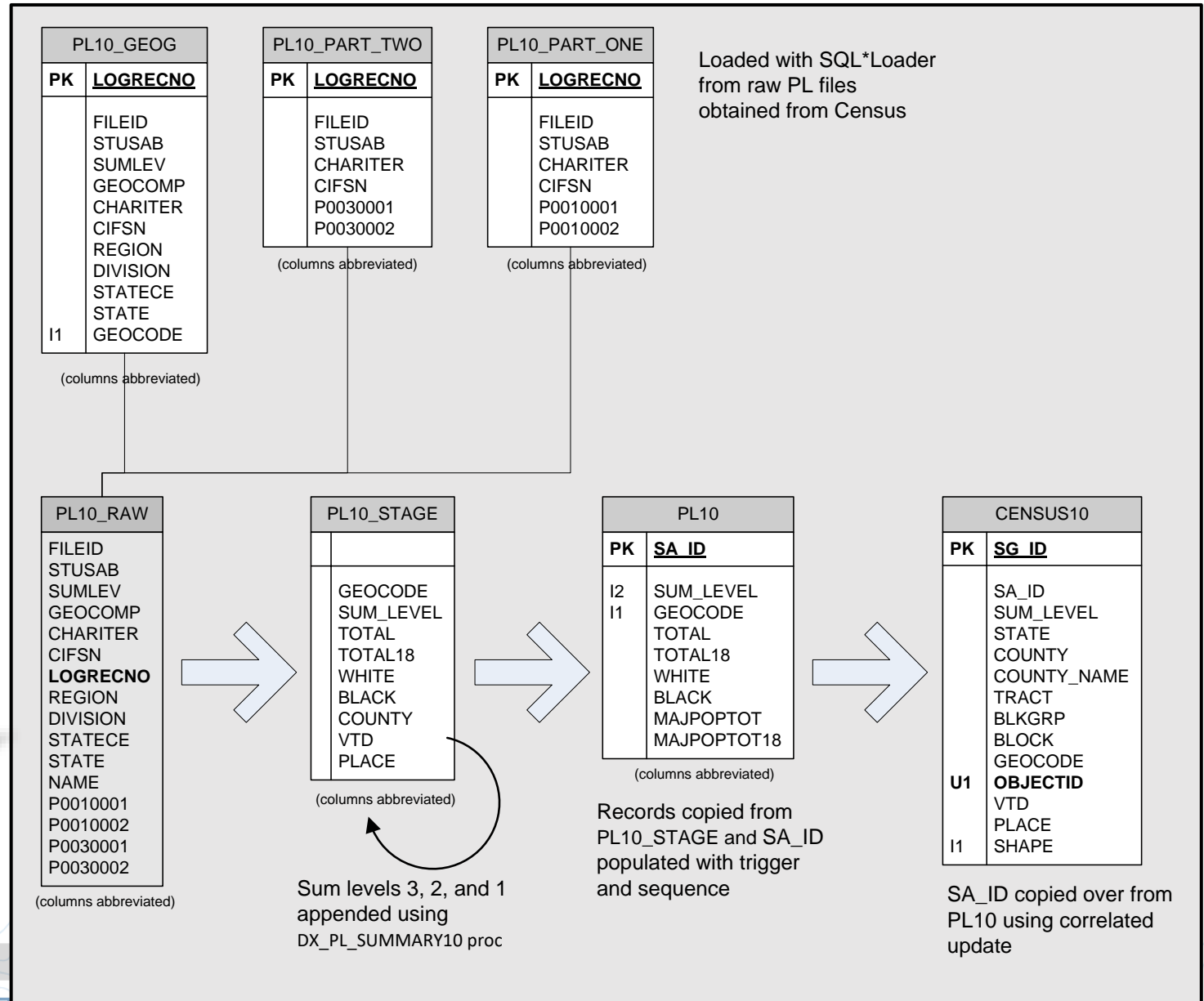
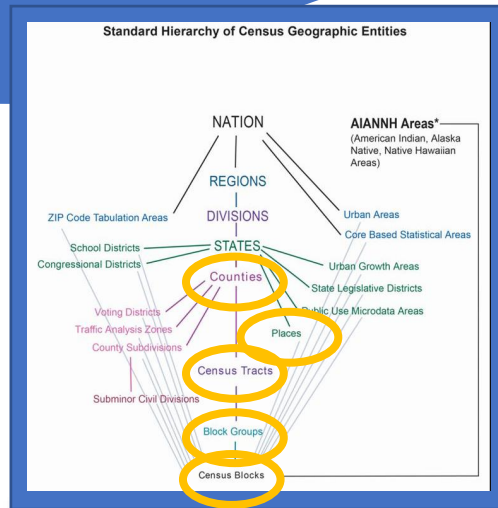
2023 Redistricting Data

How the P.L.
table is
populated.

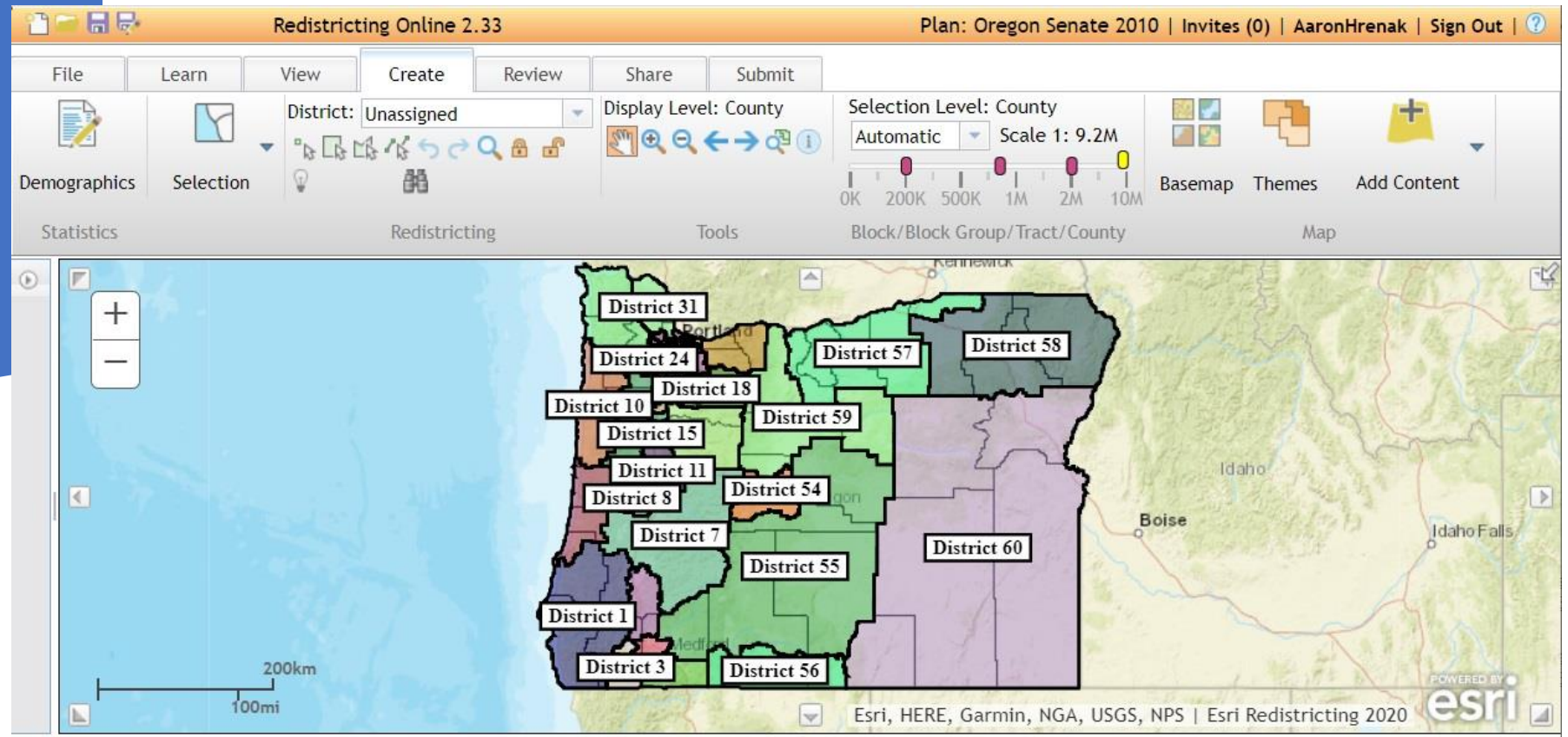
Steps for processing 2020 Census P.L. data

1. Download 2020 Census PL94-171 data from Census Bureau
2. PL data is loaded into staging database, the separate parts are joined into a singular table
3. Summarization of all relevant attributes is performed per hierarchy (block, block group, tract, county, place, voting district)
4. Summary data is joined to corresponding geography
5. Data is exported to file geodatabase for delivery to Product Team
6. Modified Edges feature class added to each state file geodatabase
7. ArcGIS Pro document created for each state
8. Map Service published for each state
9. App configuration file updated to include new service
10. Software updated to latest build
11. Regression testing performed
12. Implementation coordination with customer

2020 Census P.L. data workflow



Oregon Senate Districts



District	Color	Hide	Lock	TOTAL	TARGET_DEV	TOTALHISP	TOTALNH	WHITENH	BLACKNH	AIANNH	Districts
Unassigned		<input type="checkbox"/>	<input type="checkbox"/>	0	0	0	0	0	0		Proposed
District 1		<input type="checkbox"/>	<input type="checkbox"/>	64,053	202	2,851	61,202	57,461	265	2,1	Assigned
District 2		<input type="checkbox"/>	<input type="checkbox"/>	63,235	-616	3,052	60,183	56,224	350	2,2	Comparison
District 3		<input type="checkbox"/>	<input type="checkbox"/>	64,835	984	4,460	60,375	57,021	406	1,0	Attributes


1 - 10 of 61 results

< 1 2 3 ... 7 > 10

What does 2020 look like?




Legend ✕

2010 Congress Districts








Population Change 2010-2020



Predominant category

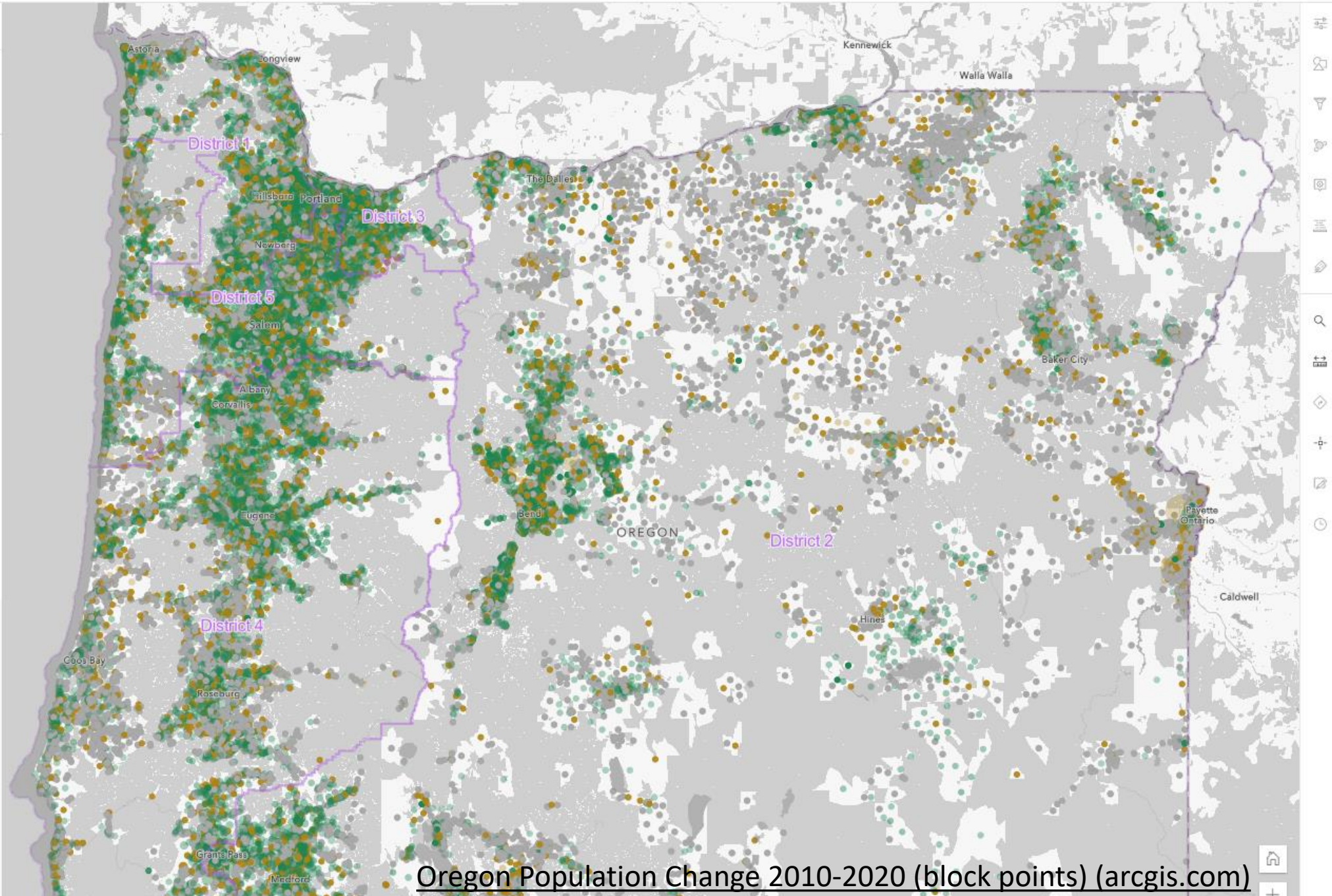
-  Growing
-  Declining
-  Other

Sum of categories

-  > 5,000
-  4,000
-  2,500
-  1,000
-  < 1

Strength of predominance

-  > 71
-  < 50



Legend

2010 Congress Districts

Population Change 2010-2020

Predominant category

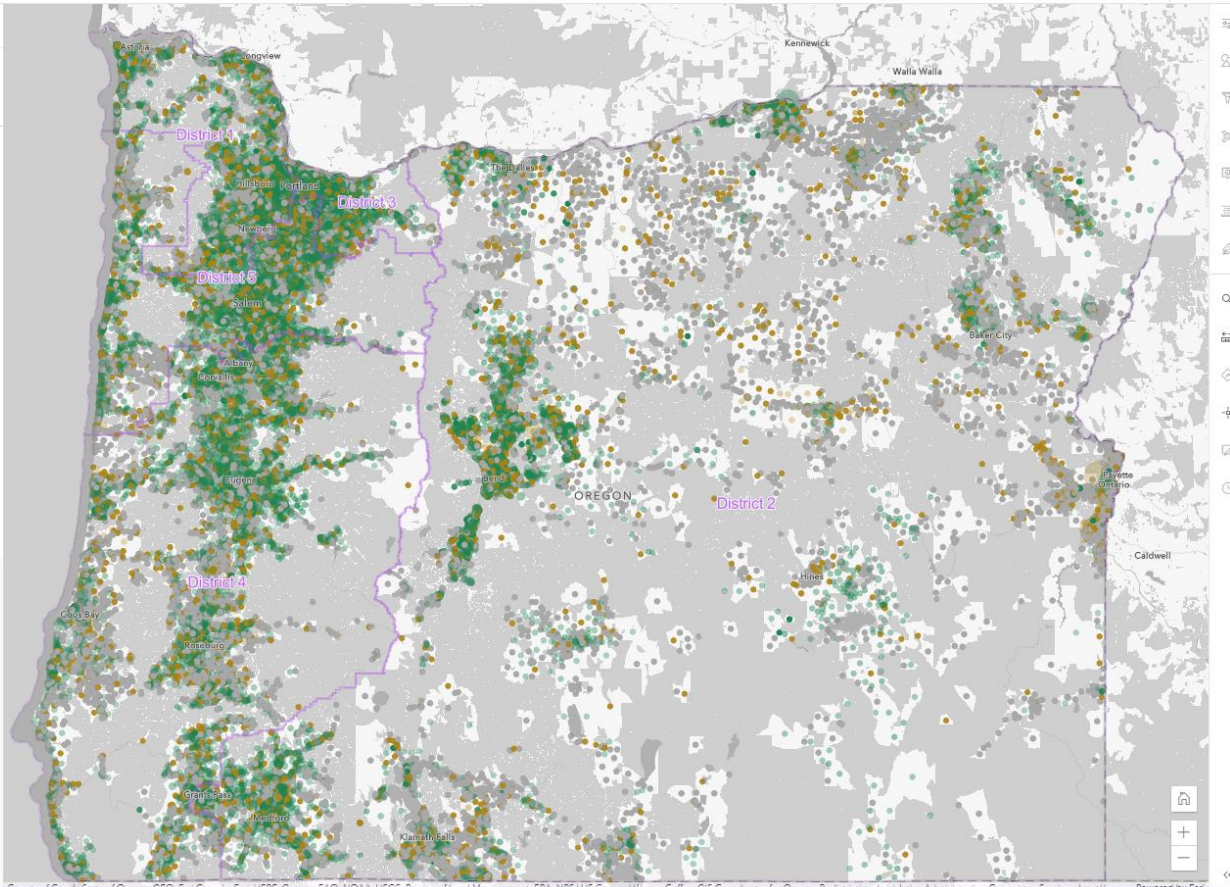
- Growing
- Declining
- Other

Sum of categories

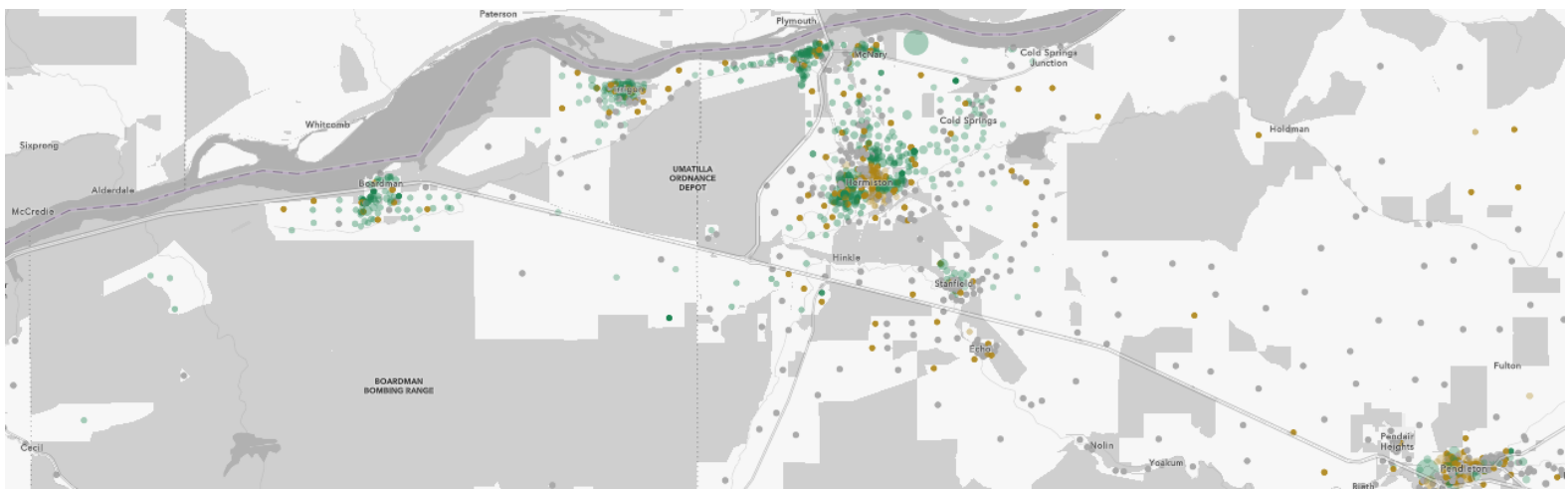
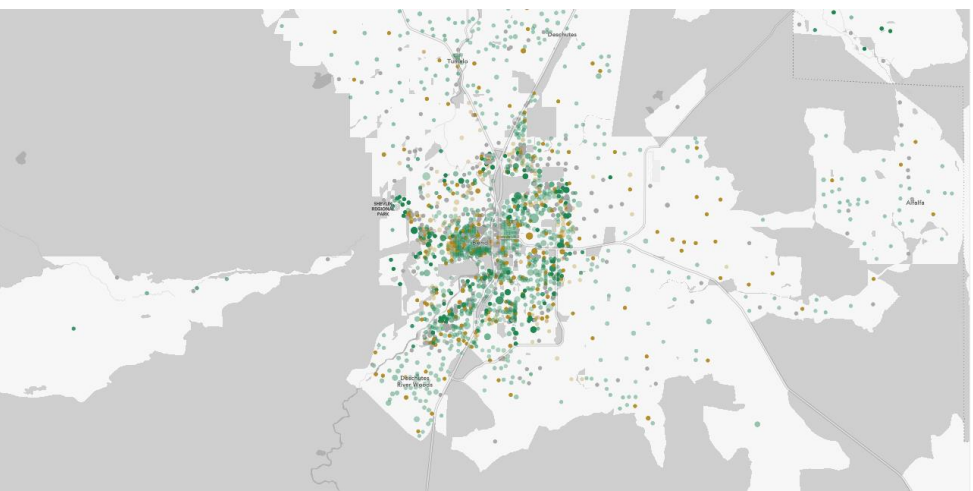
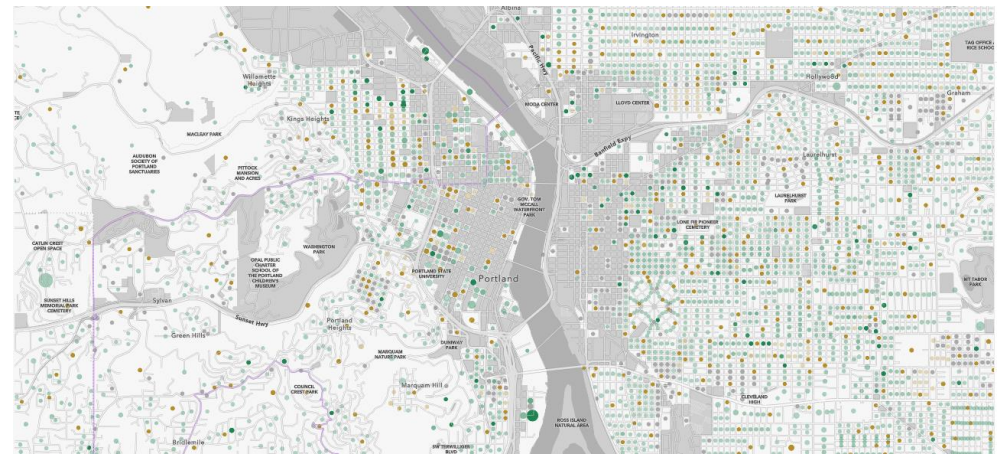
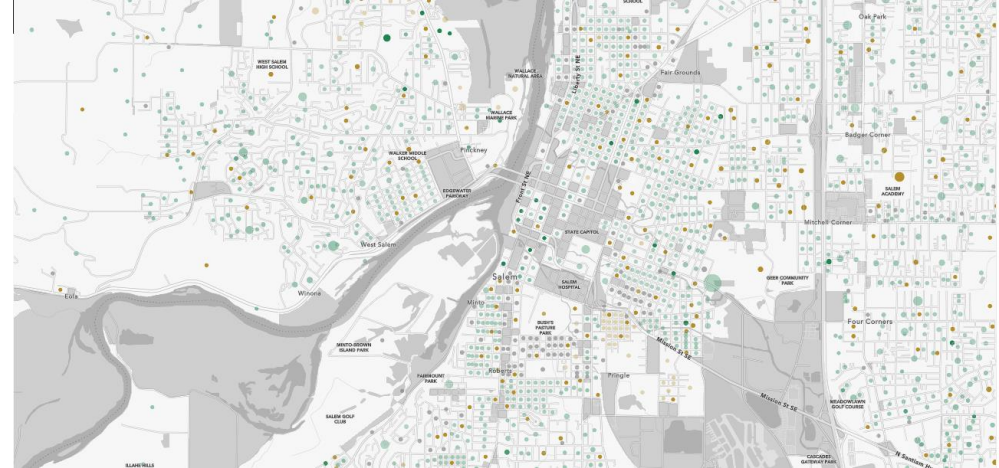
- > 5,000
- 4,000
- 2,500
- 1,000
- < 1

Strength of predominance

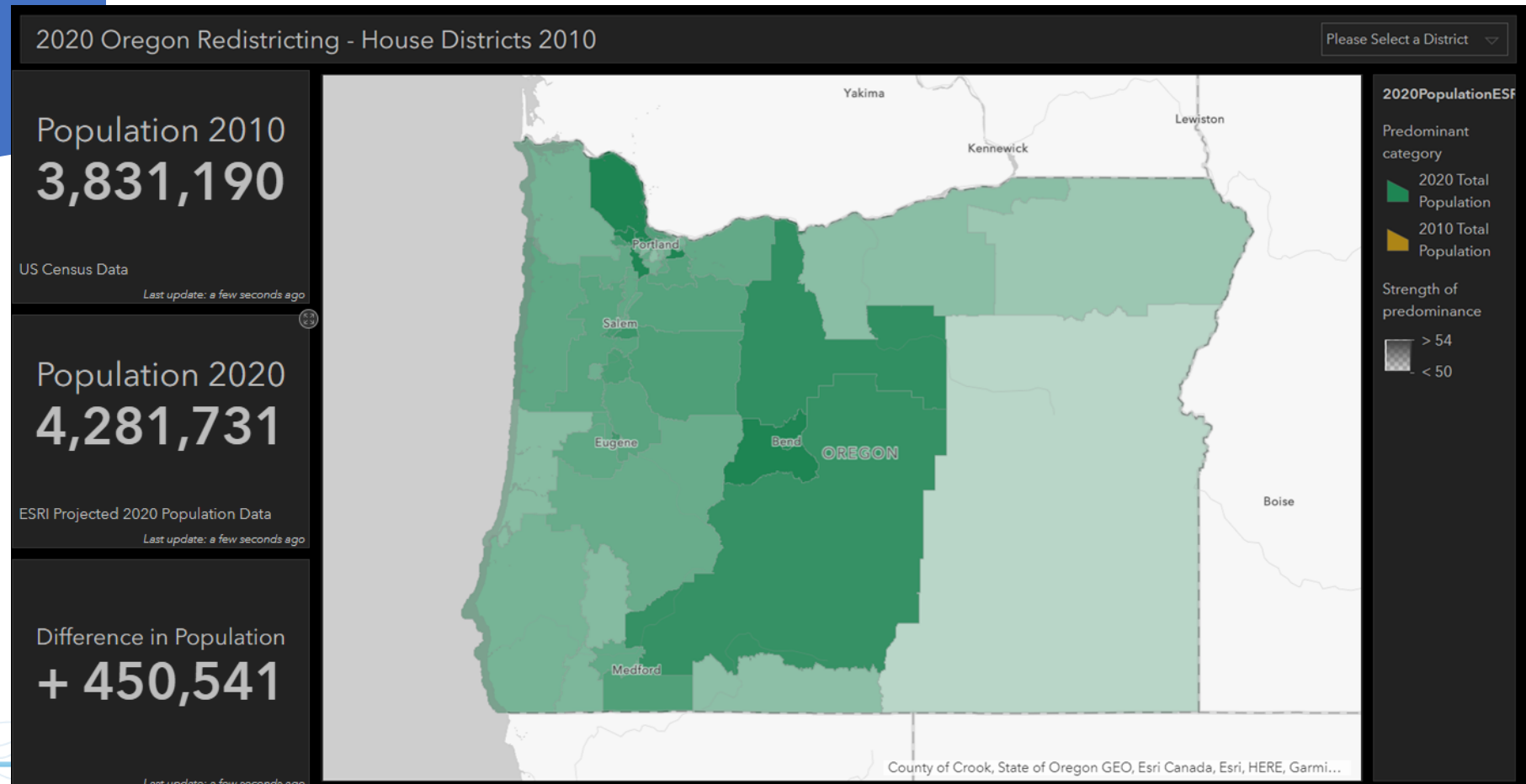
- > 71
- < 50



County of Crook, State of Oregon GEO, Esri, Canada, Esri, HERE, Garmin, FAO, NOAA, USGS, Bureau of Land Management, EPA, NPS | US Census | Wayne Coffey, GIS Coordinator for Oregon Redistricting, Legislative Administration Committee Services. <http://www...> Powered by Esri



Oregon House Districts



Esri 2020 Demographics vs Census ACS

Illinois State Senate District 1 ACS vs ESRI Block Group Pop Comparison

Population of all Block Groups that center within district (not 100% comparable to blocks)
 ESRI (2020) - 222,553 population
 ACS (2015-2019) - 211,230 population

ESRI has 5.4% more population than ACS

134 Address Points
 Esri = 9.5 pop per point
 ACS = 2.25 pop per point



Inset B - ESRI is 204% larger than ACS



210 Address Points
 Esri = 5.9 pop per point
 ACS = 2 pop per point

Inset A - ACS 44% larger than ESRI



106 Address Points in left BG.
 Esri = 2.5 pop per point
 ACS = 3 pop per point

320 Address Points
 Esri = 4.3 pop per point
 ACS = 6.5 pop per point



Inset F - ACS 51% larger than ESRI

Inset D - ACS 56% larger than ESRI



196 Address Points
 Esri = 4.5 pop per point
 ACS = 7.1 pop per point

Inset E - ESRI 47% larger than ACS



749 Address Points
 Esri = 5.9 pop per point
 ACS = 4 pop per point

- ESRI POP Compared to ACS
- Under 75% (8)
 - 75 to 90% (32)
 - 90 to 100% (23)
 - 100 to 110% (21)
 - 110 to 125% (32)
 - 125 to 423% (36)

Esri 2020 Demographics vs Census ACS

Inset A - ACS 44% larger than ESRI



100 Address Points in left BG.
Esri = 2.5 pop per point
ACS = 3 pop per point

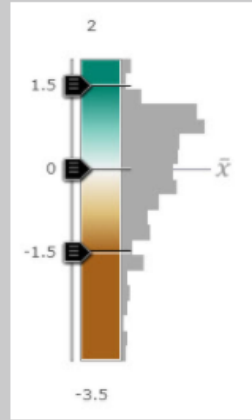
Inset B - ESRI is 204% larger than ACS



210 Address Points
Esri = 5.9 pop per point
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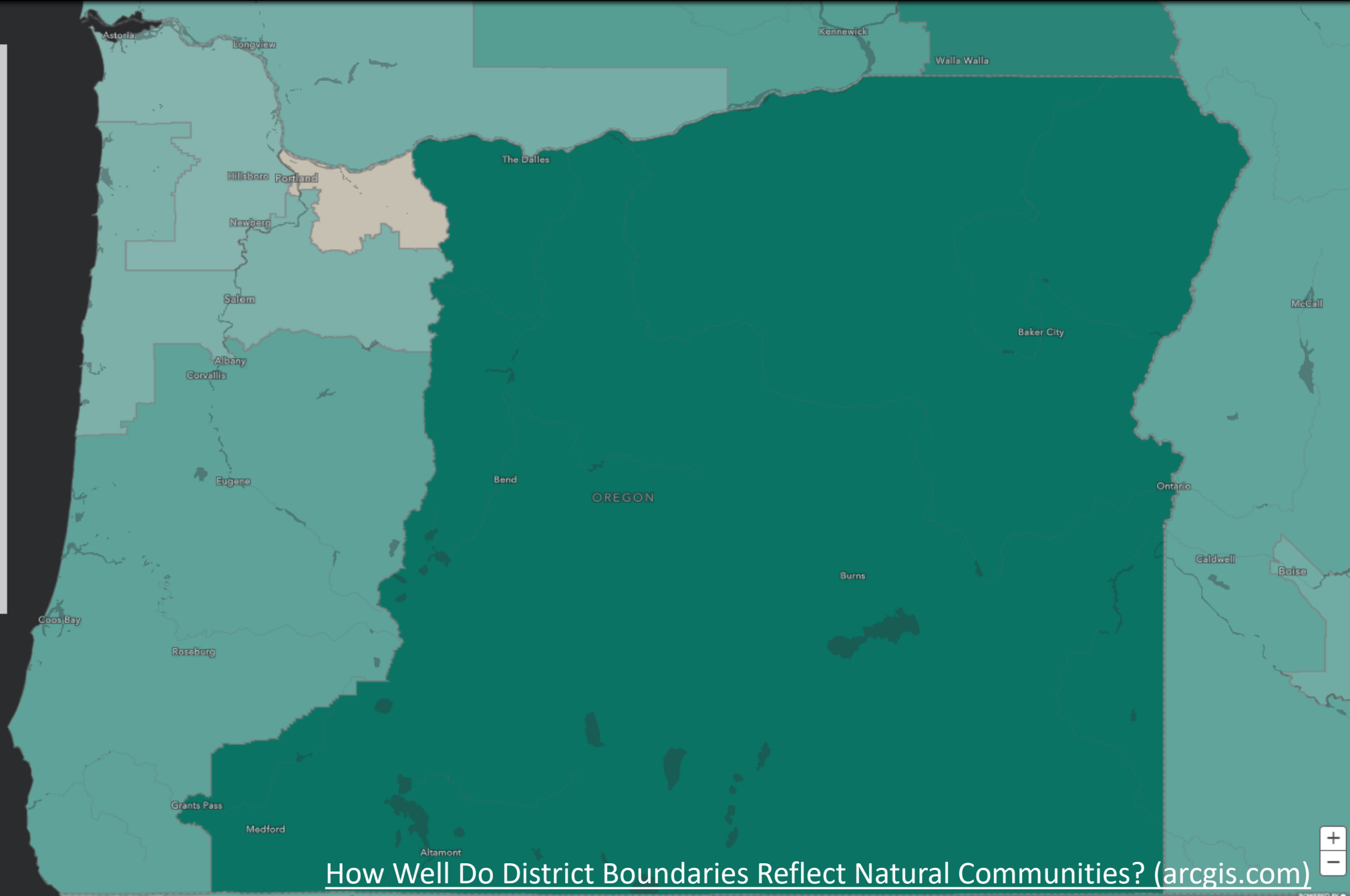


Natural Communities Score



Click on a district in the map to see the "Natural Communities" score along with all the components that went into it.

Observation: urban areas tend to be brown (indicating a low natural communities score) - perhaps urban areas are more divided by infrastructure than the non-urban areas. Infrastructure as a boundary works against a district in this index since both infrastructure variables had negative loadings.



How Well Do District Boundaries Reflect Natural Communities? (arcgis.com)

Introductions



Richard Leadbeater, Global Manager State Government Industry Solutions

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Office: 909-369-4448

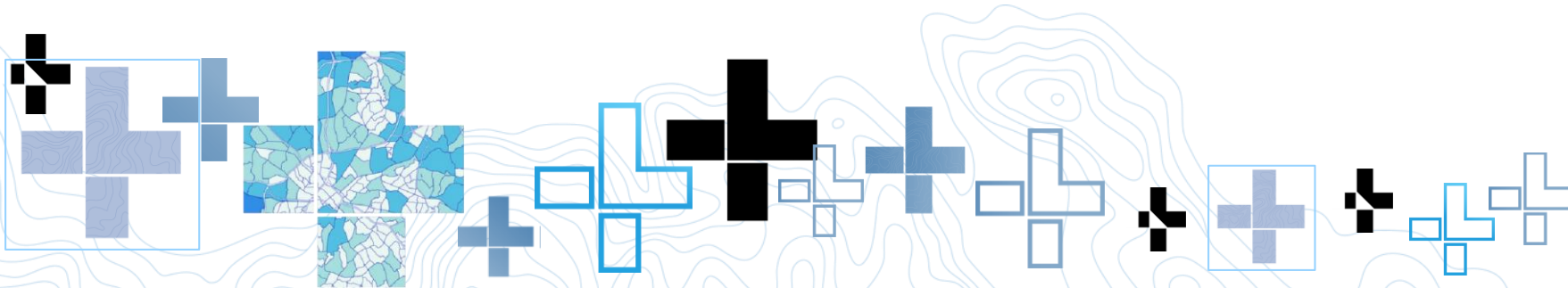
Twitter: @PolicyMapper

Joined Esri in 1997. Mr. Leadbeater's focus is on developing tools and solutions addressing government administrative functions with attention towards the use of GIS in support of policy development, elections, redistricting, and government administrative processes.

Before Esri, Mr. Leadbeater worked as the Geographic Information Project Manager developing and implementing GIS, CADD, and Document Imaging technologies at the Washington Suburban Sanitary Commission. The WSSC is one of the largest public Water and Wastewater Utilities in the United States.

Mr. Leadbeater received a BS in Social Science and Geographic Arts from the University of Maryland in 1983.

"My goal is to move the application of GIS and geographic analysis further, from its present use by technology professionals, into the conversations that define government policy and its operations. The data governments generate must be thought of as a resource, a valued resource, that wants exploitation. I believe that data in the 21st century is what timber, iron, and coal were to the 19th century. More importantly, this resource needs proper crafting. Today, we talk about producing and mining data, but the real value is in the creation of finished goods."





esri

THE
SCIENCE
OF
WHERE

Thank you

