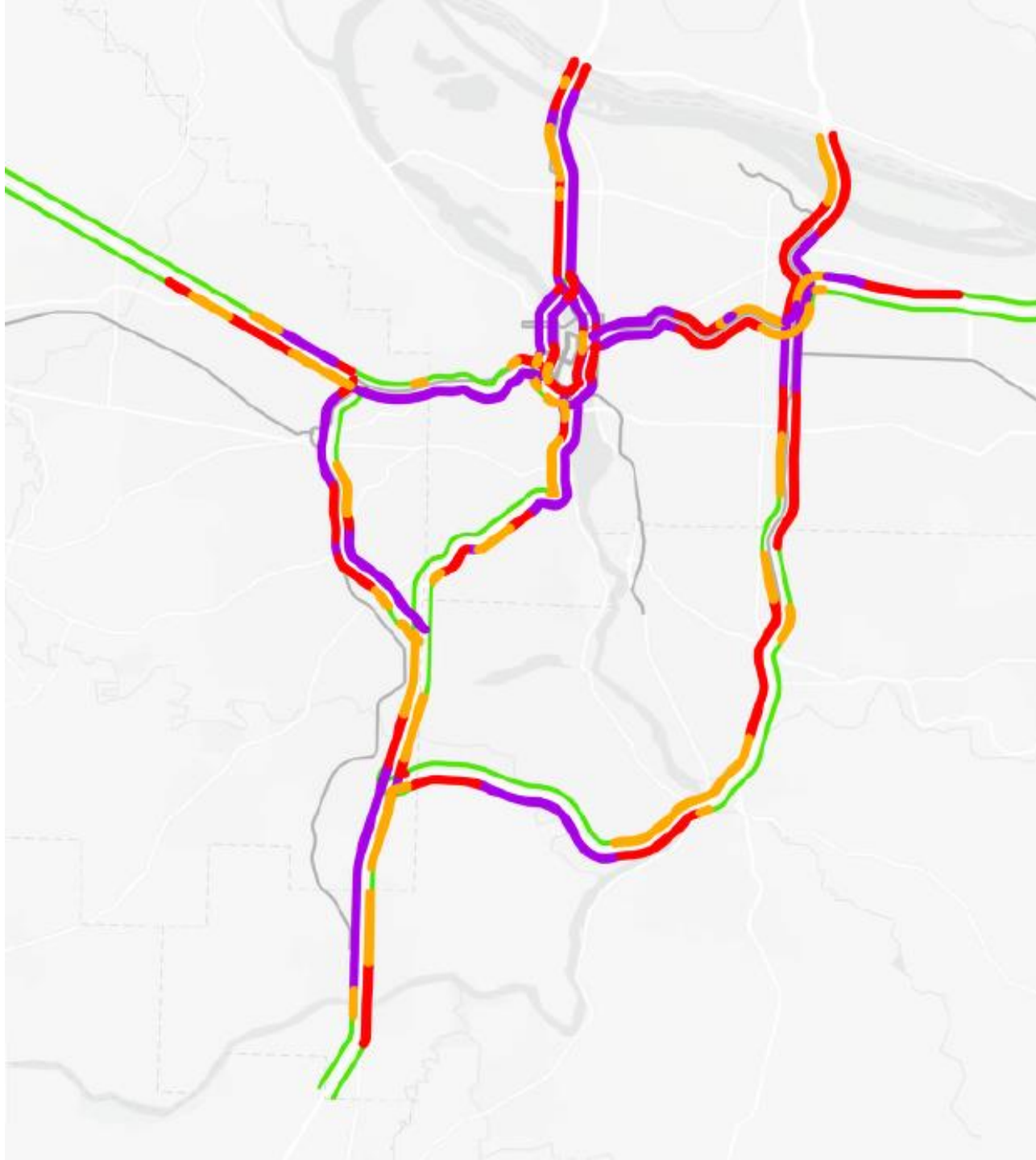
Light Rail Transit Expansion

Within the Portland Metro Urban Growth Boundary

Highways Are Over Capacity

- 8th worst congestion out of all 100 US Metro areas.
- 85% of all highway congestion in Oregon is in the Portland Metro Area.
- Because expansion was poorly managed in the past, highway projects are costly.

Data & Image: https://www.oregon.gov/odot/Planning/state-of-the-system/Pages/mobility.aspx



Public Transit Service

- 20% of Oregonians utilize public transport at least once a week.
- 52% of Oregonians would take public transit more often if service was added or improved in their area.
- Public transit expansion can be a better use of project money by providing service to more people than highway projects.

Data: https://www.oregon.gov/odot/Planning/state-of-the-system/Pages/mobility.aspx
Image: https://en.wikipedia.org/wiki/File:MAX_and_bus_side-by-side_on_Portland_Mall,_5th_%26_Yamhill.jpg

Light Rail Expansion

- Improved service access and frequency will promote increased commuter ridership.
- Increased ridership will reduce highway commuters, therefore reducing congestion.

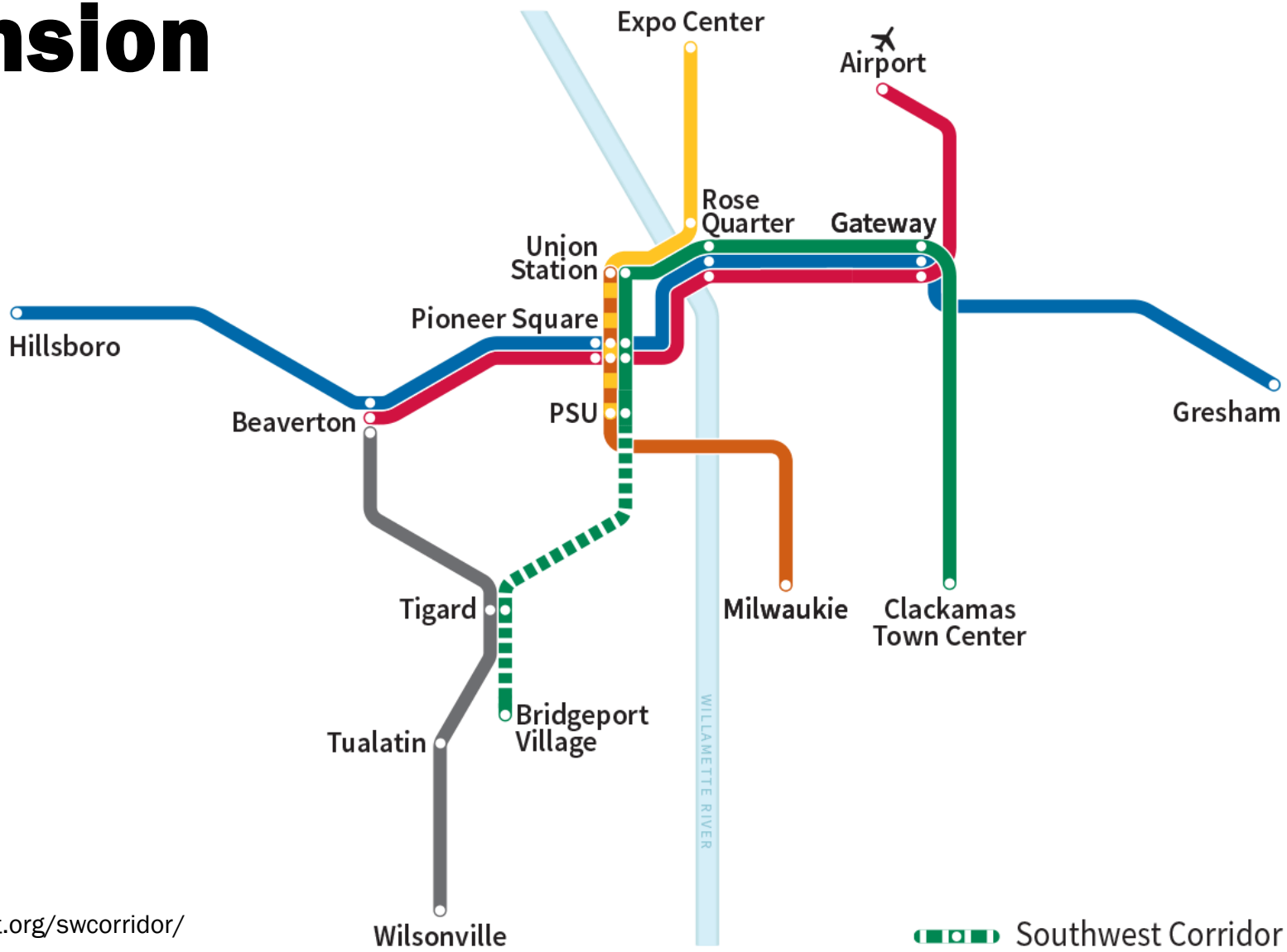
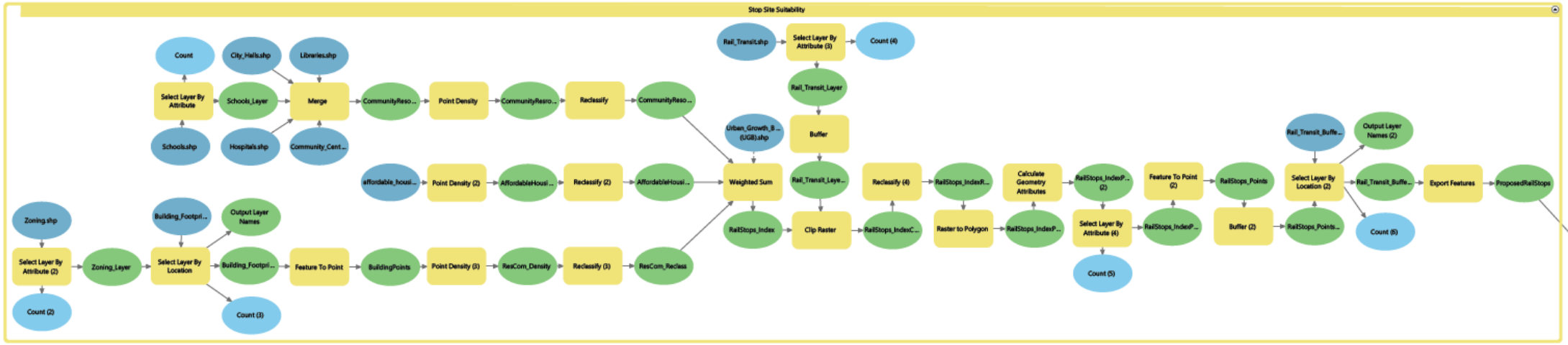


Image: https://trimet.org/swcorridor/

What service areas should be added, and what are the lest cost paths to connect them?

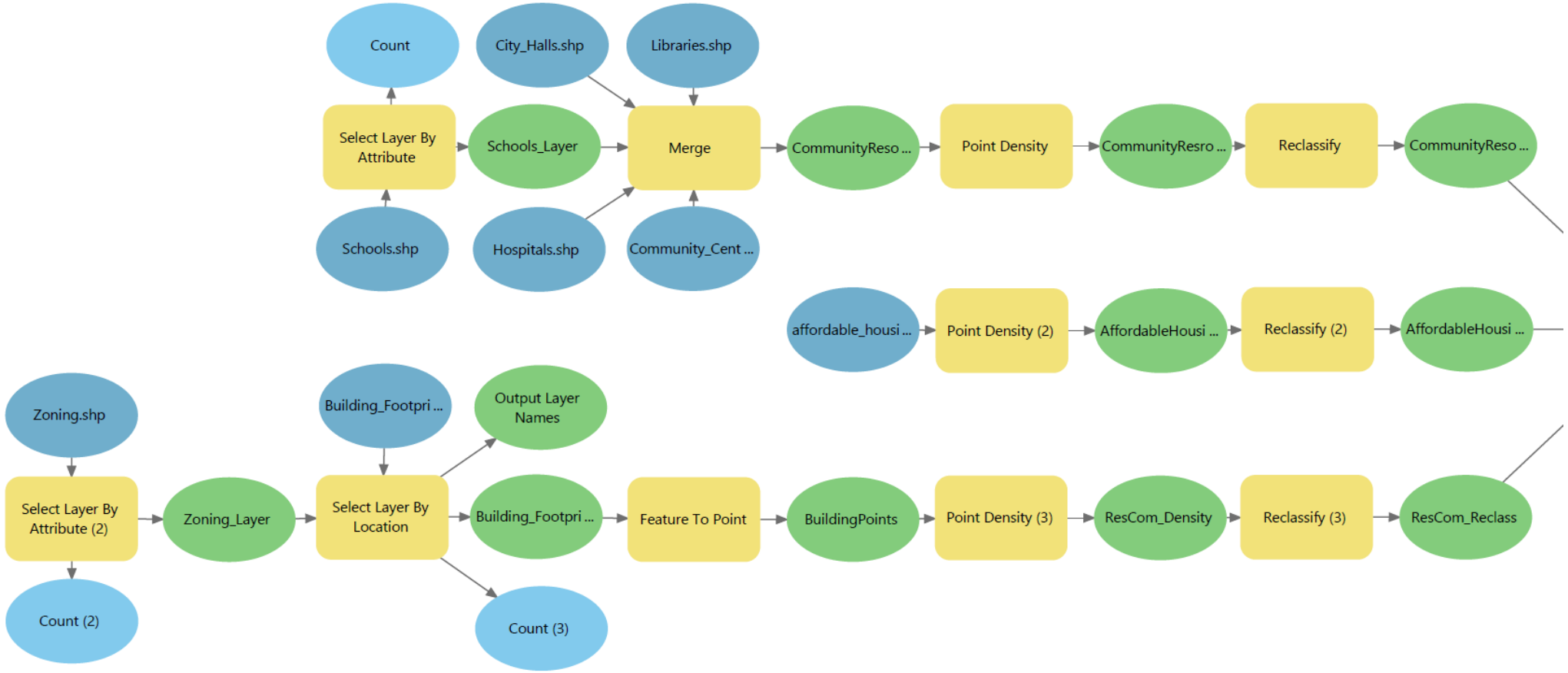


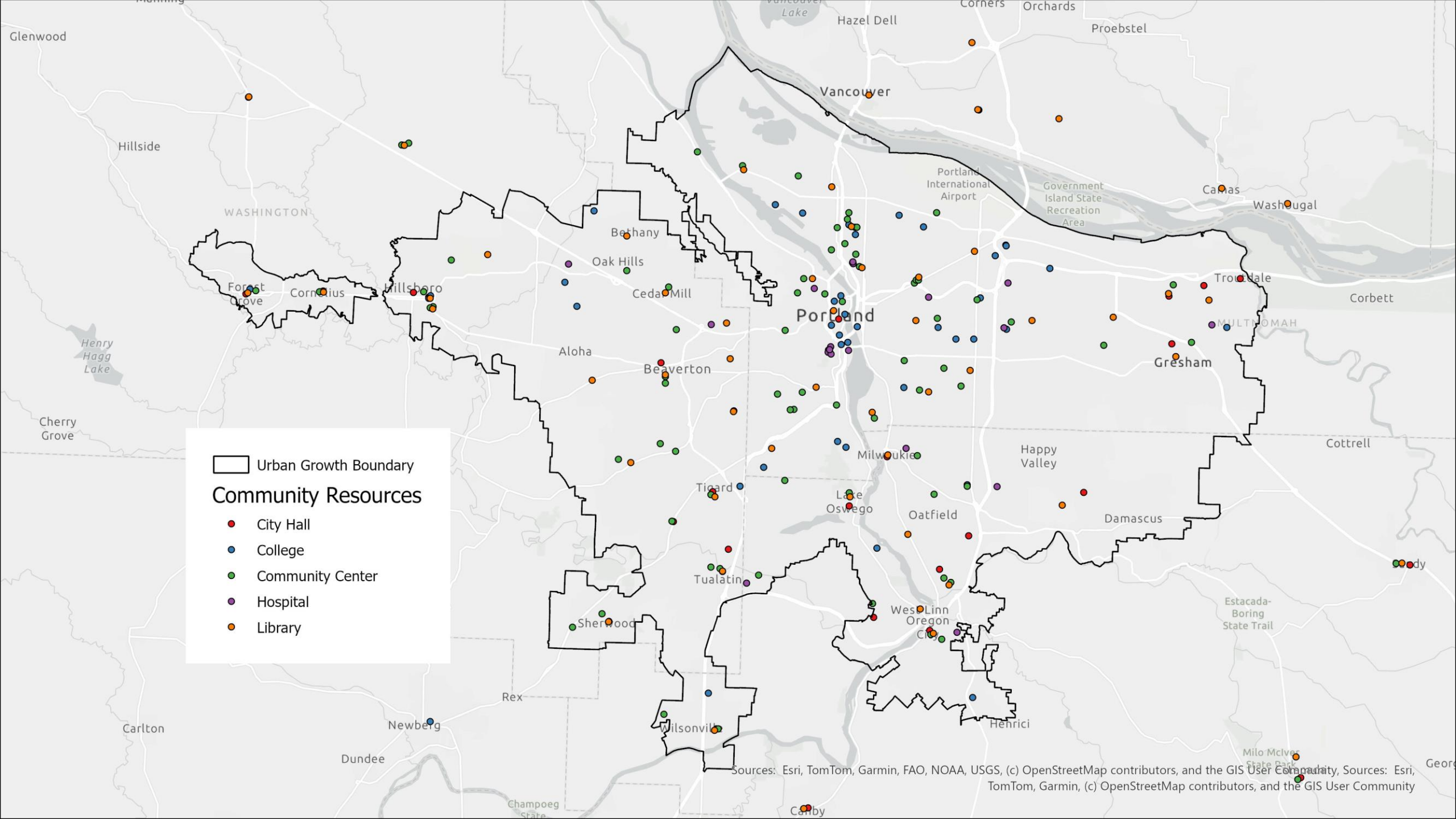
Dataset Sources

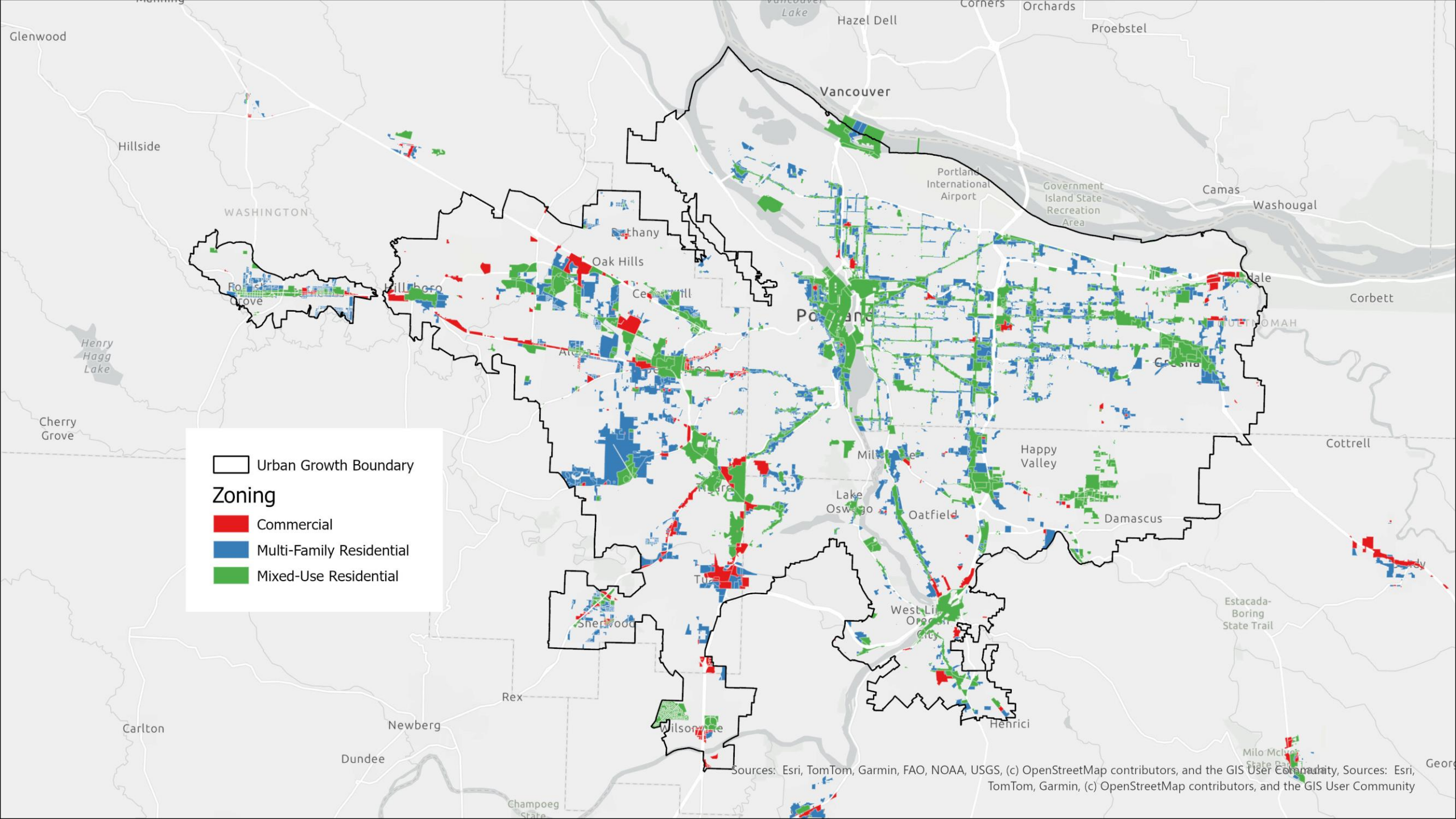
Oregon State – DEM

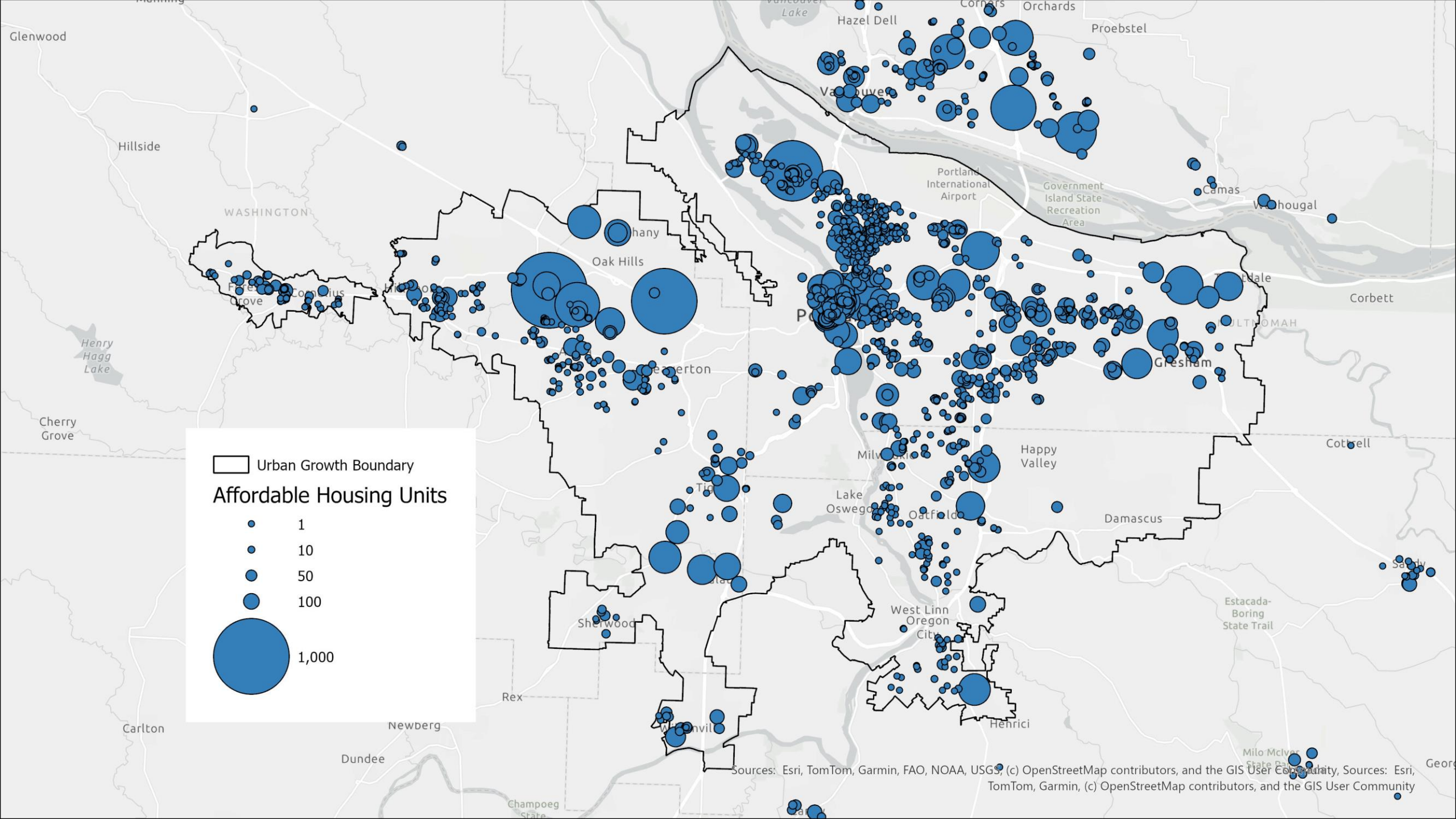
Metro RLIS – All Others

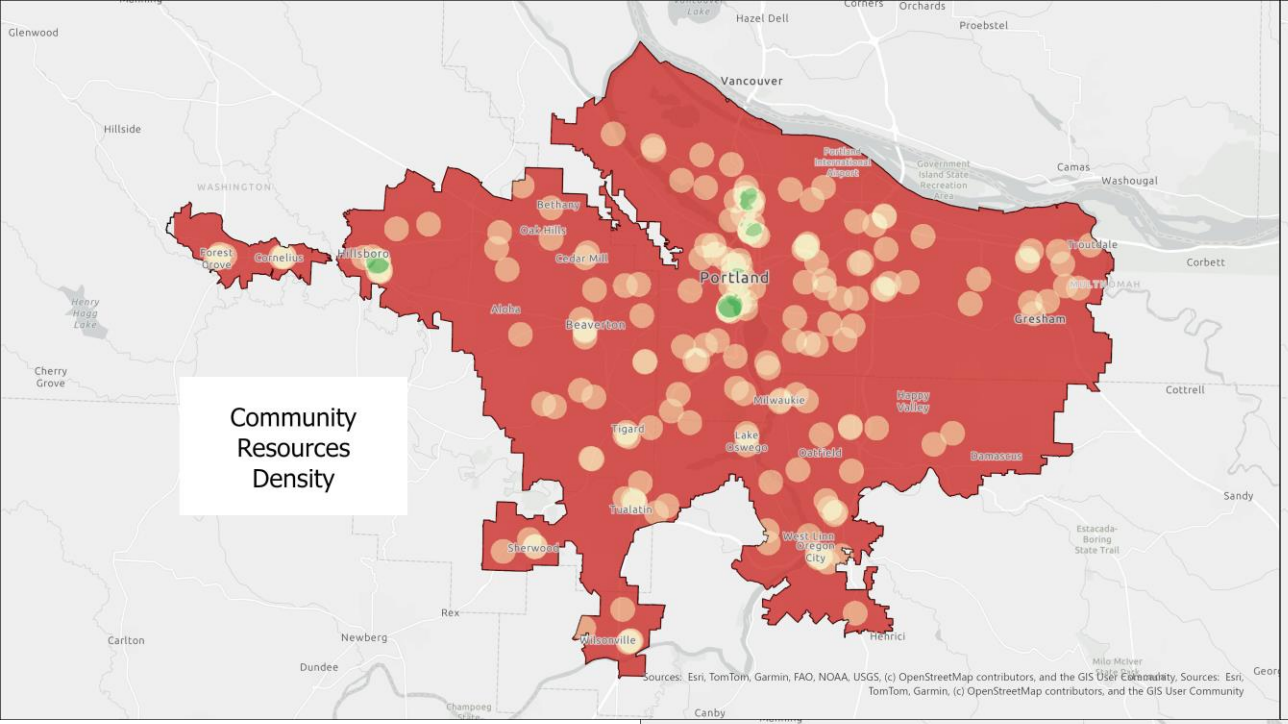
Prepare Site Suitability Criteria

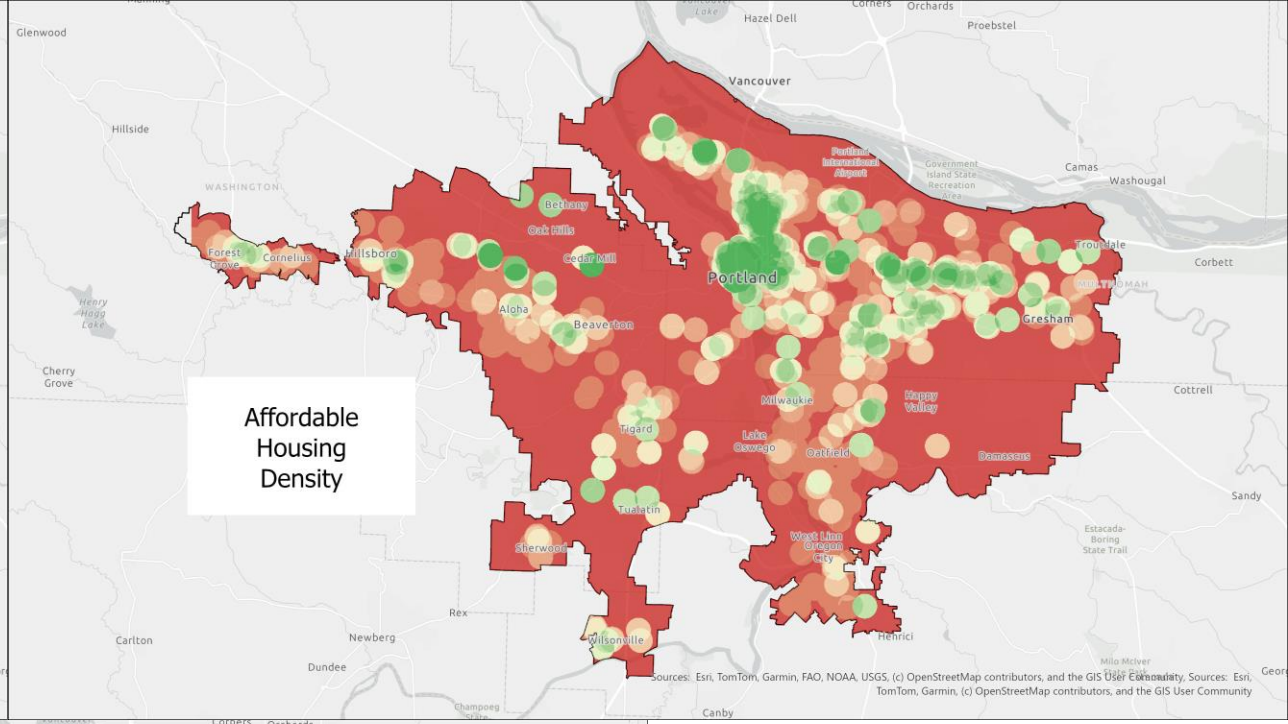


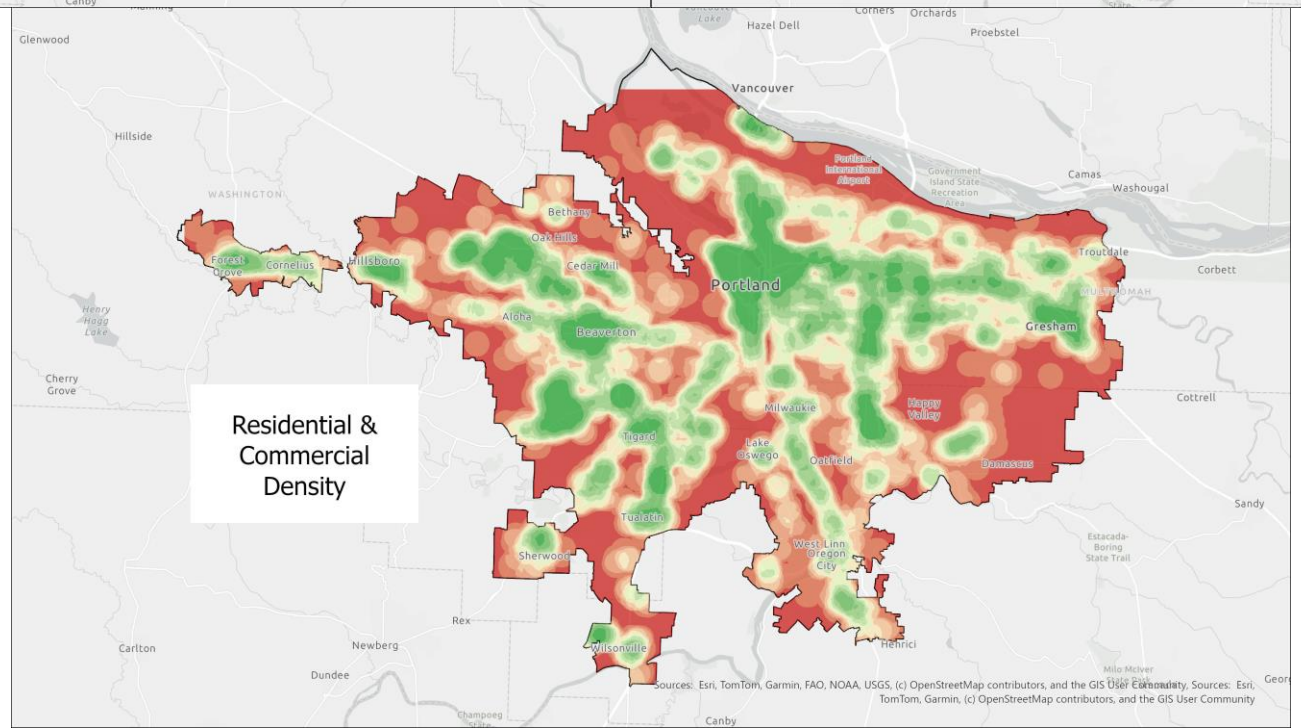

Urban Growth Boundary
Community Resources
City Hall
College
Community Center
Hospital
Library
Glenwood
Hillside
WASHINGTON
Vancouver
Hazel Dell
Corners
Orchards
Proebstel
Portland International Airport
Government Island State Recreation Area
Camas
Washougal
Bethany
Oak Hills
Cedar Mill
Forest Grove
Cornelius
Hillsboro
Portland
Troutdale
Corbett
MULTNOMAH
Henry Hagg Lake
Aloha
Beaverton
Gresham
Cherry Grove
Milwaukie
Happy Valley
Cottrell
Tigard
Lake Oswego
Oatfield
Damascus
Tualatin
Sherwood
West Linn
Oregon City
Estacada-Boring State Trail
Rex
Newberg
Carlton
Dundee
Wilsonville
Henrici
Milo McIver State Park
Champoeg State
Canby
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community


Urban Growth Boundary
Zoning
Commercial
Multi-Family Residential
Mixed-Use Residential
Glenwood
Hillside
WASHINGTON
Hazel Dell
Orchards
Proebstel
Vancouver
Portland International Airport
Government Island State Recreation Area
Camas
Washougal
Bethany
Oak Hills
Corbett
Henry Hagg Lake
Cherry Grove
Happy Valley
Cottrell
Lake Oswego
Oatfield
Damascus
Sherwood
Estacada-Boring State Trail
Rex
Carlton
Newberg
Dundee
Wilsonville
Henrici
Champoeg State
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community

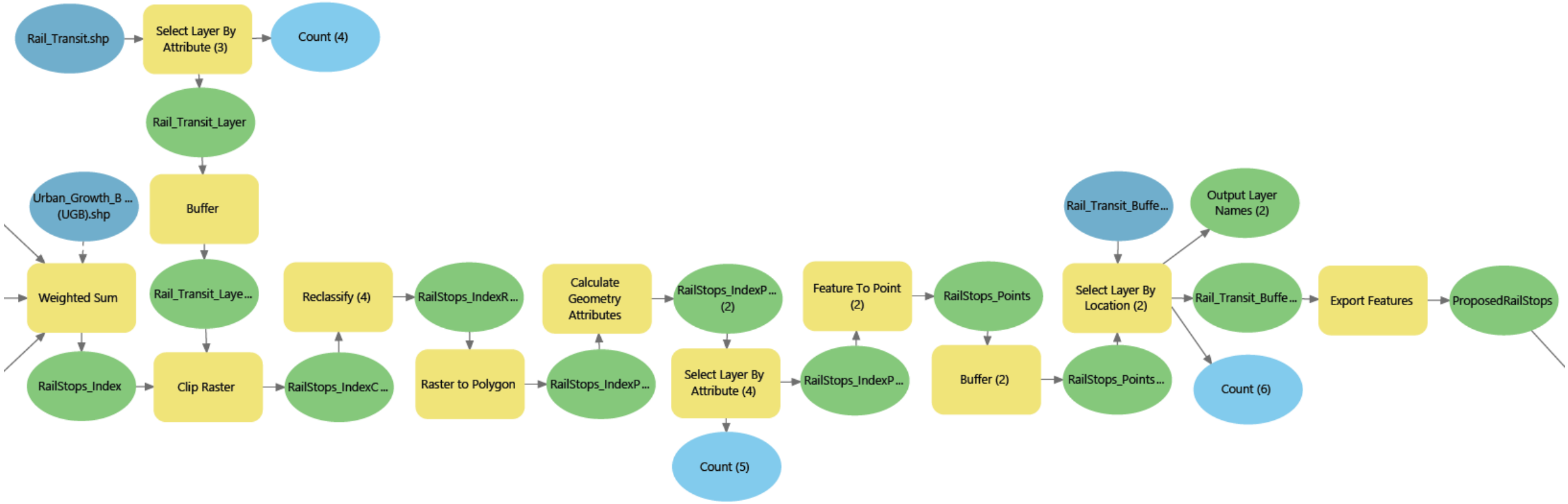

Urban Growth Boundary
Affordable Housing Units
1
10
50
100
1,000
Glenwood
Hillside
WASHINGTON
Hazel Dell
Orchards
Proebstel
Portland International Airport
Government Island State Recreation Area
Camas
Washougal
Oak Hills
Corbett
Gresham
Henry Hagg Lake
Cherry Grove
Happy Valley
Cottrell
Lake Oswego
Damascus
Sherwood
West Linn
Oregon City
Estacada-Boring State Trail
Rex
Carlton
Newberg
Dundee
Henrici
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community

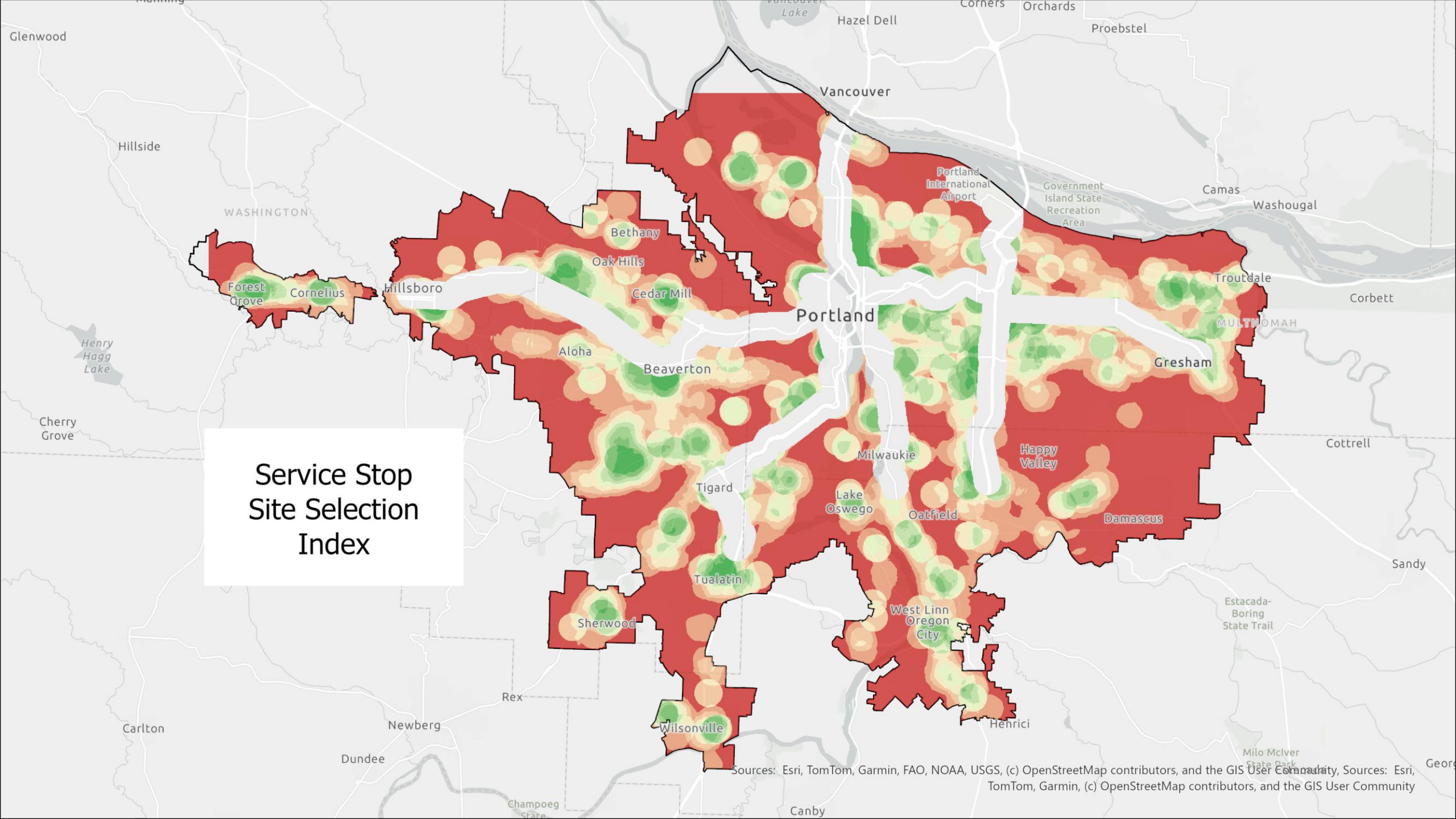

Community Resources Density
Vancouver
Portland
Beaverton
Gresham
Hillsboro
Tigard
Lake Oswego
Tualatin
Sherwood
Milwaukie
Oregon City
Wilsonville
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community

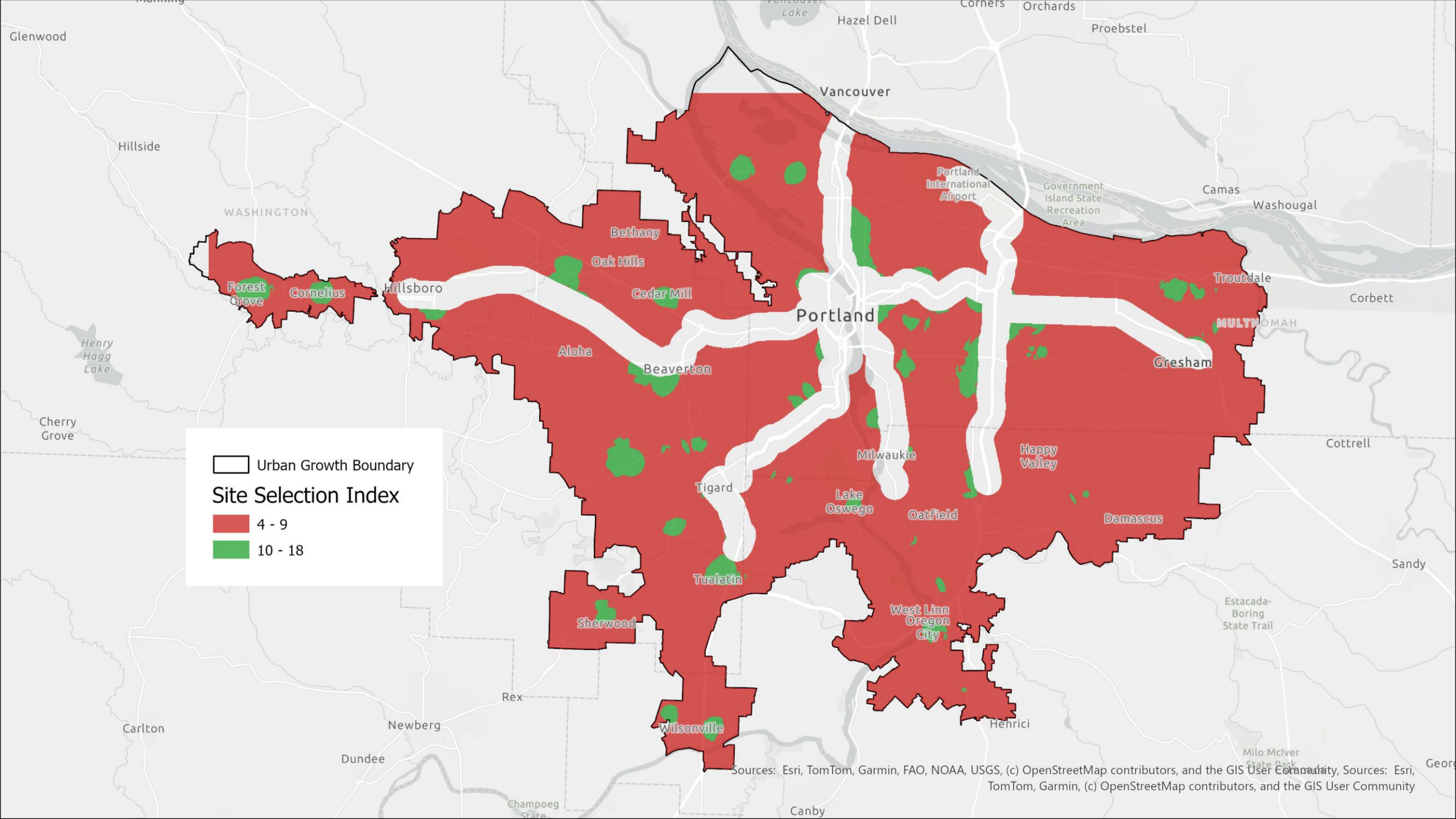

Affordable Housing Density
Vancouver
Portland
Beaverton
Gresham
Hillsboro
Tigard
Lake Oswego
Tualatin
Sherwood
Milwaukie
Oregon City
Wilsonville
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community

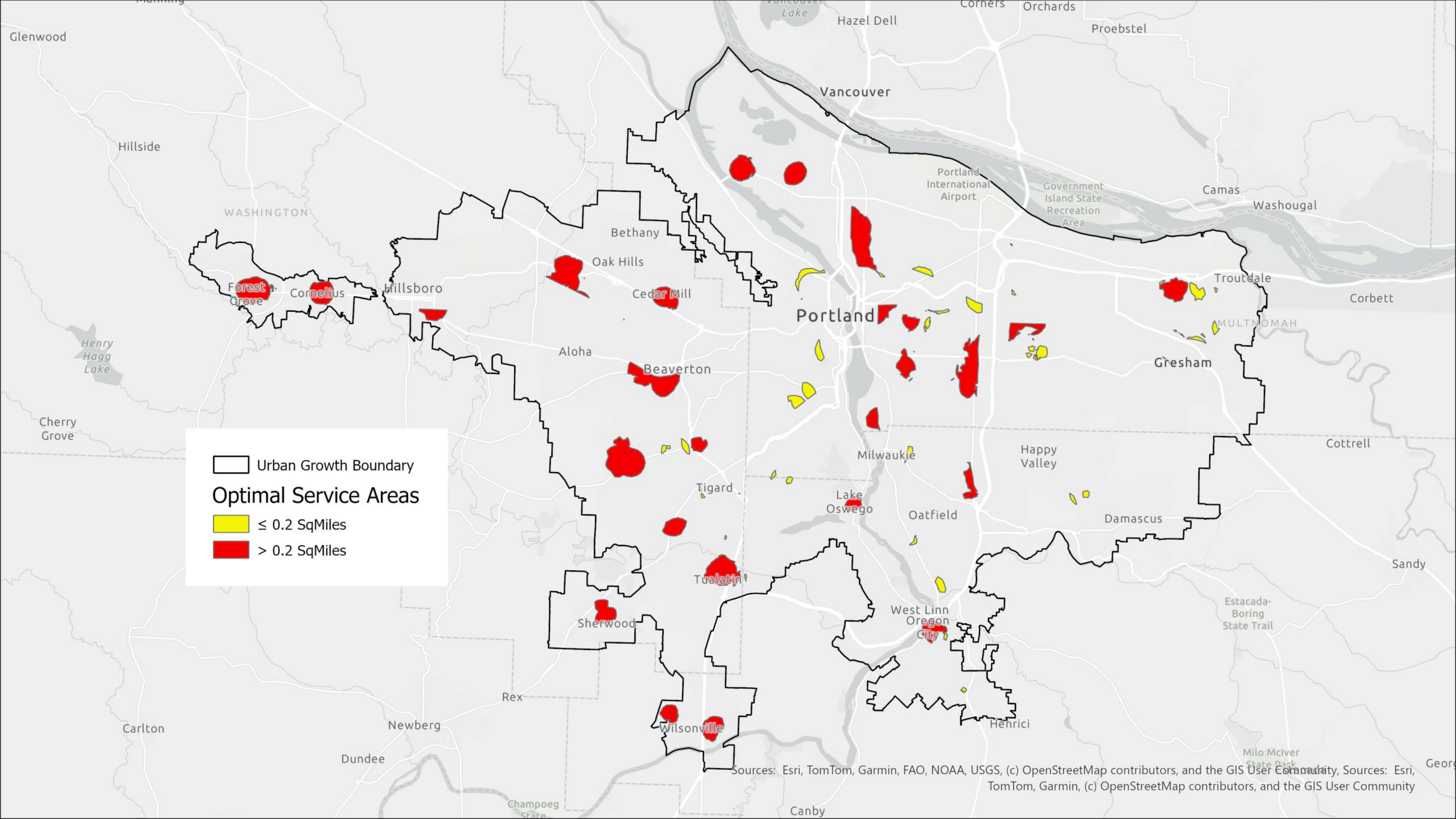

Residential & Commercial Density
Vancouver
Portland
Beaverton
Gresham
Hillsboro
Tigard
Lake Oswego
Tualatin
Sherwood
Milwaukie
Oregon City
Wilsonville
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community

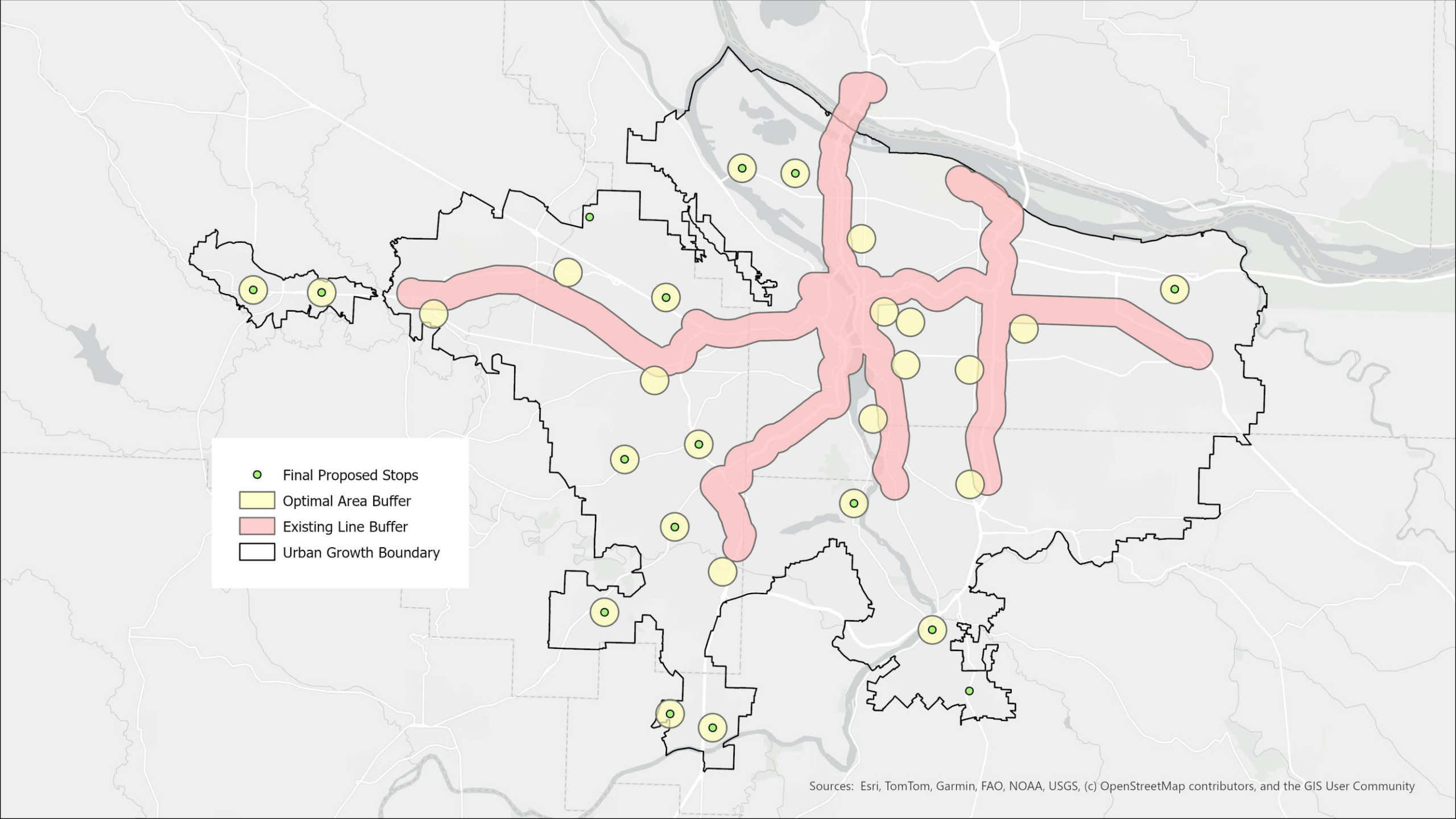
Create Site Suitability Index and Extract Optimal Points



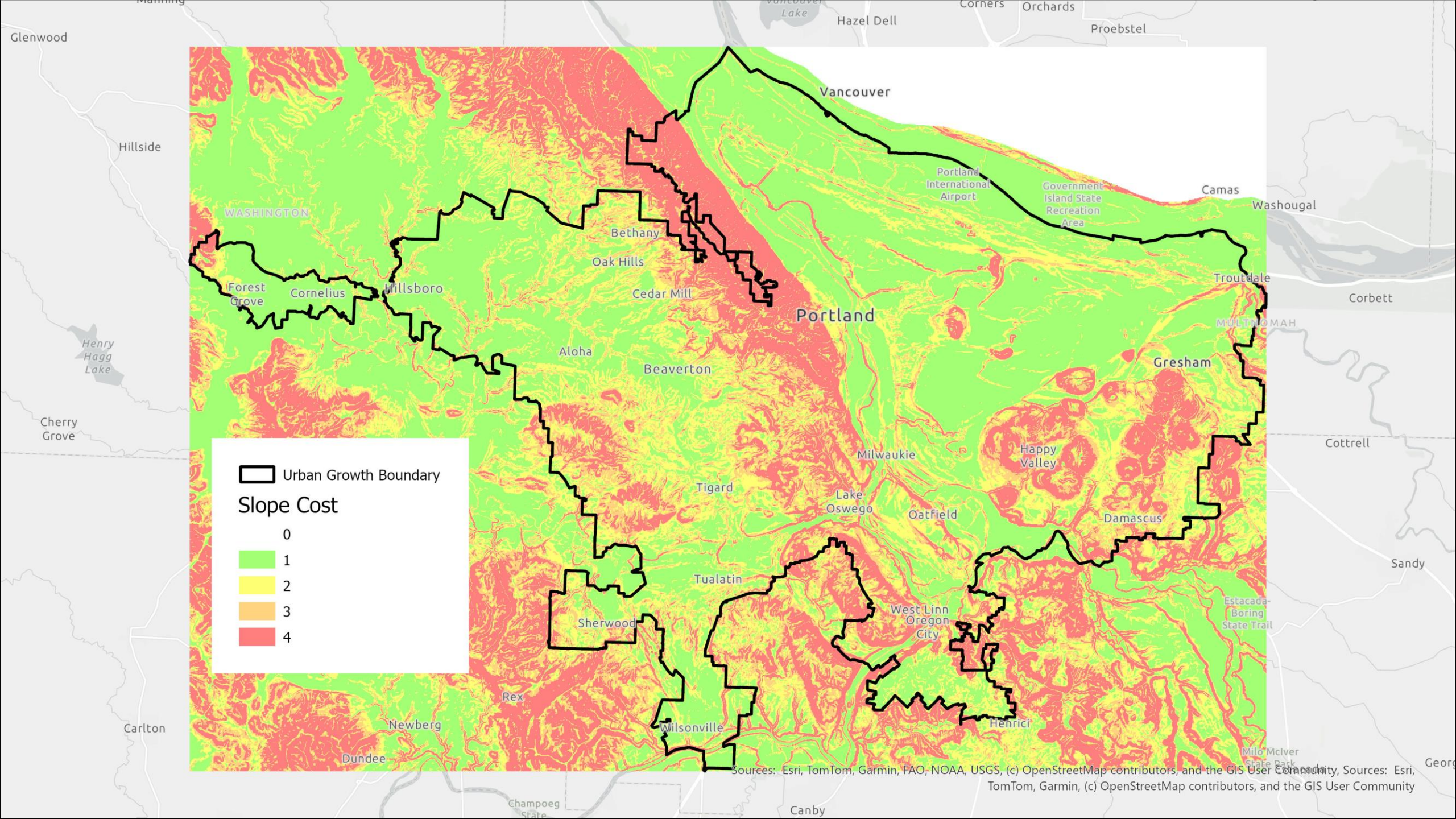

Service Stop Site Selection Index
Glenwood
Hillside
WASHINGTON
Vancouver
Hazel Dell
Corners
Orchards
Proebstel
Portland International Airport
Government Island State Recreation Area
Camas
Washougal
Troutdale
Corbett
MULTNOMAH
Bethany
Oak Hills
Cedar Mill
Forest Grove
Cornelius
Hillsboro
Portland
Aloha
Beaverton
Gresham
Henry Hagg Lake
Cherry Grove
Milwaukie
Happy Valley
Cottrell
Tigard
Lake Oswego
Oatfield
Damascus
Tualatin
Sandy
Sherwood
West Linn
Oregon City
Estacada-Boring State Trail
Rex
Newberg
Carlton
Wilsonville
Henrici
Dundee
Champoeg State
Canby
Milo McIver State Park
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community

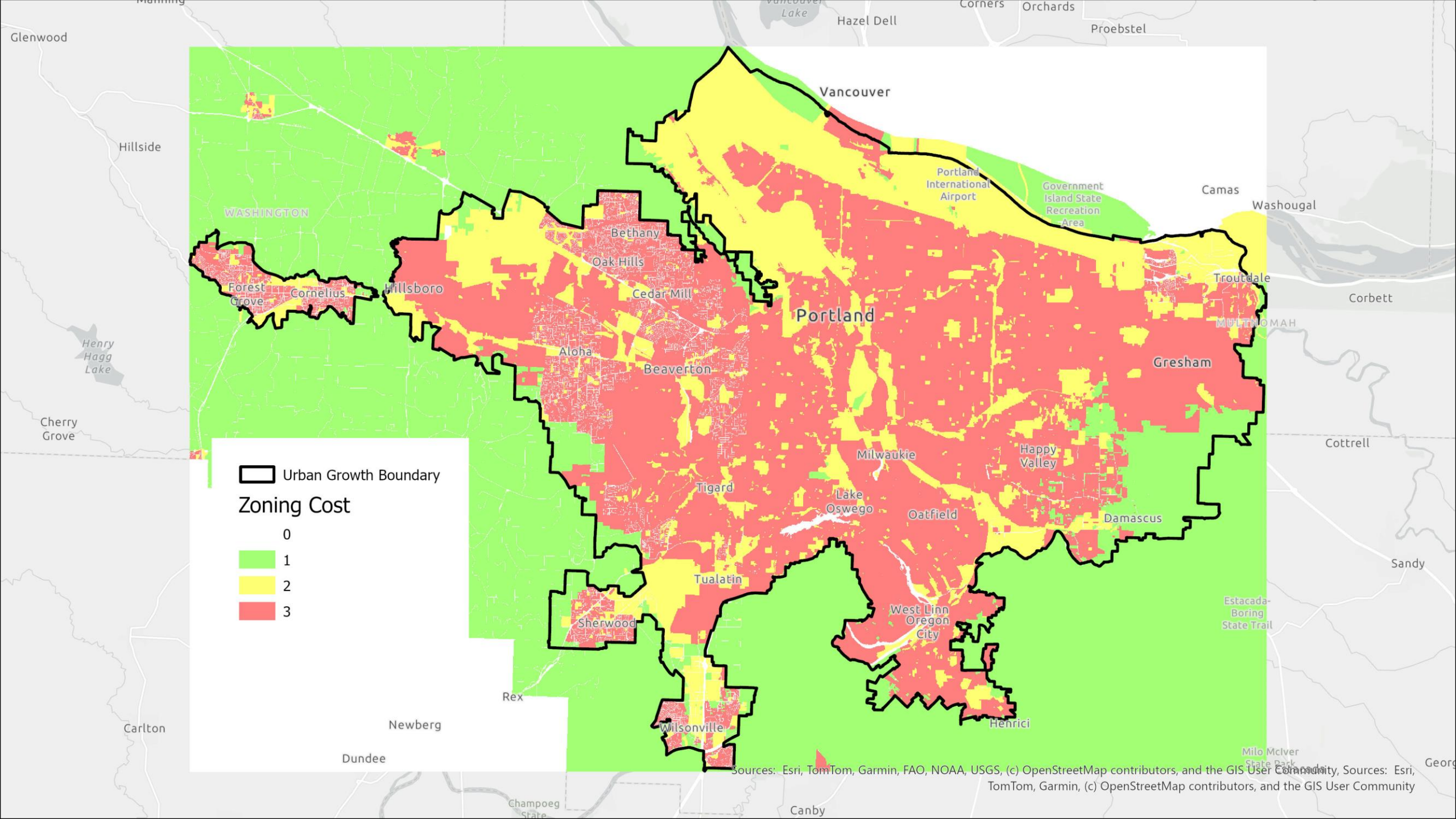

Urban Growth Boundary
Site Selection Index
4 - 9
10 - 18
Vancouver
Portland
Hillsboro
Beaverton
Gresham
Tigard
Lake Oswego
Tualatin
Sherwood
West Linn
Oregon City
Milwaukie
Happy Valley
Damascus
Oatfield
Aloha
Bethany
Oak Hills
Cedar Mill
Forest Grove
Cornelius
Troutdale
Camas
Washougal
Corbett
Cottrell
Sandy
Estacada-Boring State Trail
Henrici
Wilsonville
Rex
Newberg
Dundee
Carlton
Canby
Cherry Grove
Hillside
Glenwood
Hazel Dell
Orchards
Proebstel
Portland International Airport
Government Island State Recreation Area
WASHINGTON
Henry Hagg Lake
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community

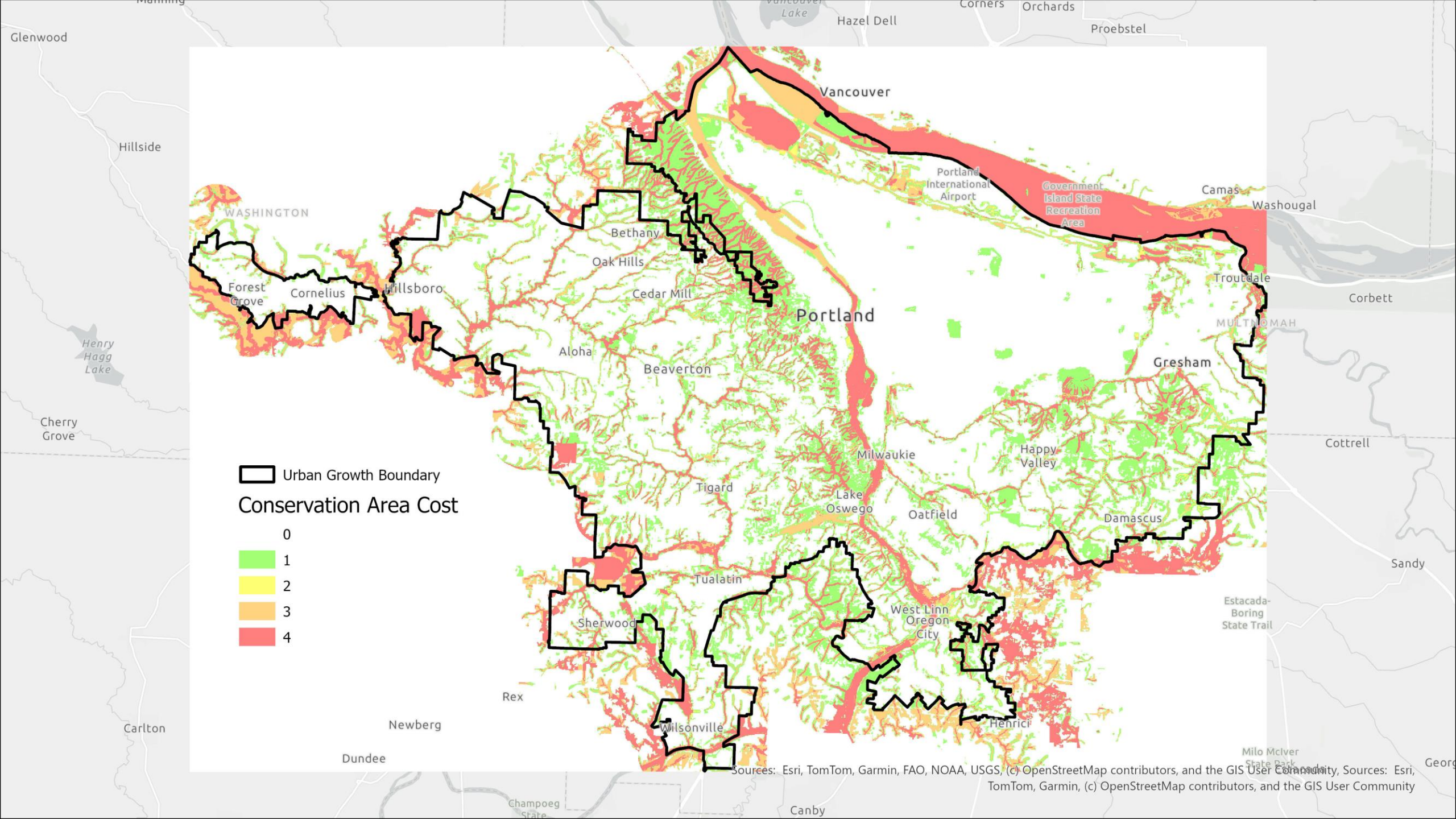

Urban Growth Boundary
Optimal Service Areas
≤ 0.2 SqMiles
> 0.2 SqMiles
Portland
Vancouver
Hazel Dell
Orchards
Proebstel
Glenwood
Hillside
WASHINGTON
Bethany
Oak Hills
Cedar Mill
Forest Grove
Cornelius
Hillsboro
Aloha
Beaverton
Henry Hagg Lake
Cherry Grove
Tigard
Lake Oswego
Milwaukie
Oatfield
Happy Valley
Damascus
Gresham
Troutdale
MULTNOMAH
Corbett
Camas
Washougal
Portland International Airport
Government Island State Recreation Area
Cottrell
Sandy
Estacada-Boring State Trail
Tualatin
Sherwood
West Linn
Oregon City
Wilsonville
Rex
Newberg
Carlton
Dundee
Henrici
Canby
Champoeg State
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community

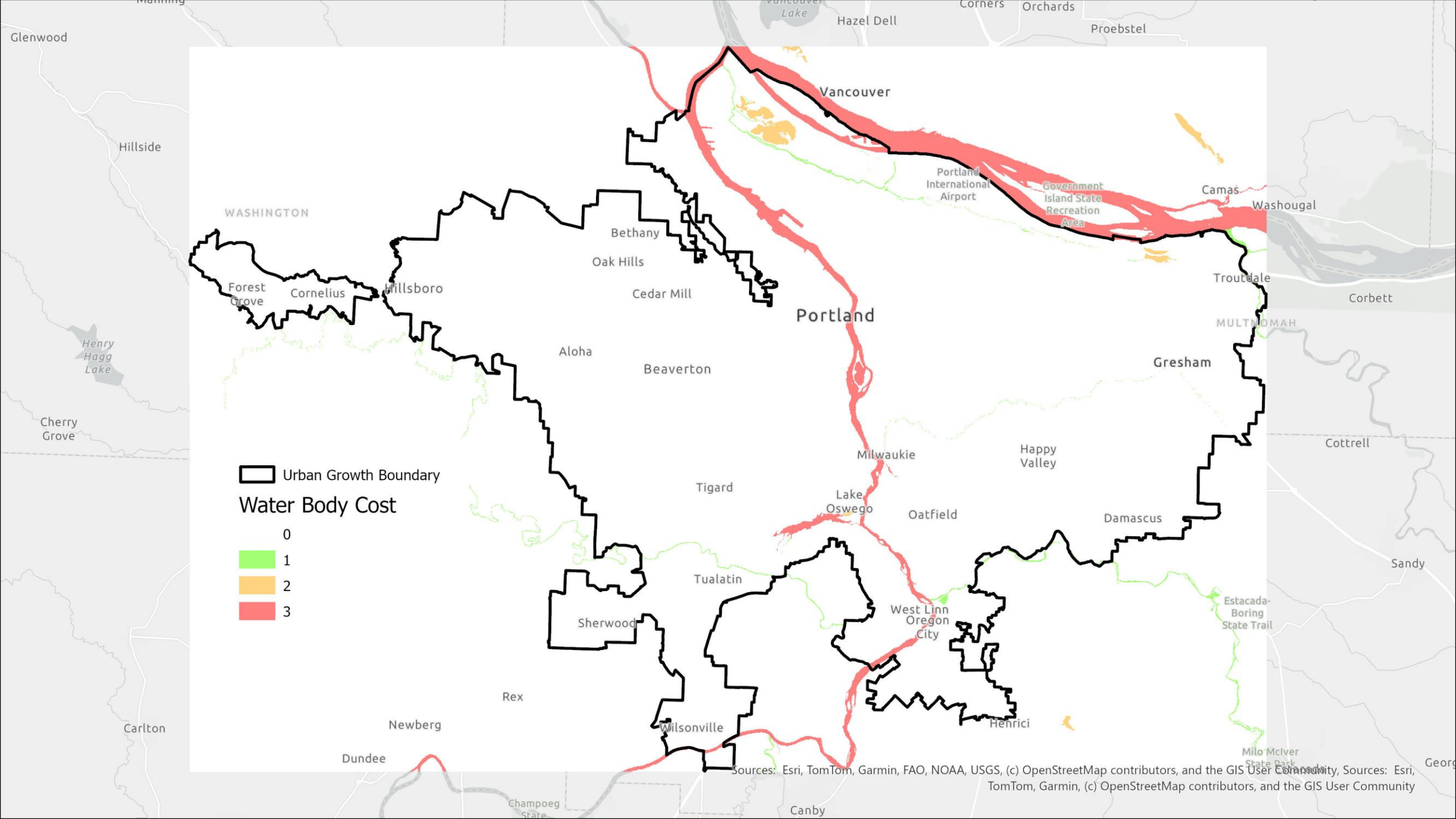

Final Proposed Stops
Optimal Area Buffer
Existing Line Buffer
Urban Growth Boundary
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community

Create Cost Surface


Urban Growth Boundary
Slope Cost
0
1
2
3
4
Vancouver
Portland
Gresham
Beaverton
Hillsboro
Tigard
Lake Oswego
Tualatin
Sherwood
West Linn
Oregon City
Wilsonville
Milwaukie
Happy Valley
Damascus
Troutdale
Camas
Washougal
Corbett
Cottrell
Sandy
Forest Grove
Cornelius
Bethany
Oak Hills
Cedar Mill
Aloha
Oatfield
Rex
Newberg
Dundee
Carlton
Cherry Grove
Hillside
Glenwood
Hazel Dell
Orchards
Proebstel
Canby
WASHINGTON
MULTNOMAH
Portland International Airport
Government Island State Recreation Area
Estacada-Boring State Trail
Henrici
Milo McIver State Park
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community


Urban Growth Boundary
Zoning Cost
0
1
2
3
Vancouver
Portland
Gresham
Hillsboro
Beaverton
Tigard
Lake Oswego
Milwaukie
Oregon City
West Linn
Tualatin
Sherwood
Wilsonville
Newberg
Rex
Dundee
Carlton
Cherry Grove
Forest Grove
Cornelius
Aloha
Bethany
Oak Hills
Cedar Mill
Hillside
Glenwood
Hazel Dell
Proebstel
Orchards
Camas
Washougal
Troutdale
Corbett
Cottrell
Sandy
Damascus
Happy Valley
Oatfield
Henrici
Canby
Portland International Airport
Government Island State Recreation Area
Estacada-Boring State Trail
Milo McIver State Park
Henry Hagg Lake
WASHINGTON
MULTNOMAH
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community


Urban Growth Boundary
Conservation Area Cost
0
1
2
3
4
Vancouver
Portland
Beaverton
Hillsboro
Gresham
Tigard
Lake Oswego
Milwaukie
Oregon City
West Linn
Tualatin
Sherwood
Wilsonville
Newberg
Rex
Dundee
Carlton
Cherry Grove
Forest Grove
Cornelius
Bethany
Oak Hills
Cedar Mill
Aloha
Happy Valley
Damascus
Oatfield
Troutdale
Camas
Washougal
Corbett
Cottrell
Sandy
Estacada-Boring State Trail
Henrici
Canby
Champoeg State
Hillside
Glenwood
Hazel Dell
Orchards
Proebstel
Portland International Airport
Government Island State Recreation Area
WASHINGTON
MULTNOMAH
Henry Hagg Lake
Milo McIver State Park
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community


Urban Growth Boundary
Water Body Cost
0
1
2
3
Vancouver
Portland
Beaverton
Hillsboro
Gresham
Tigard
Lake Oswego
Milwaukie
Happy Valley
Damascus
Oatfield
Tualatin
Sherwood
West Linn
Oregon City
Wilsonville
Rex
Newberg
Dundee
Carlton
Canby
Cornelius
Forest Grove
Bethany
Oak Hills
Cedar Mill
Aloha
Hillside
Glenwood
Cherry Grove
Henry Hagg Lake
Hazel Dell
Orchards
Proebstel
Portland International Airport
Government Island State Recreation Area
Camas
Washougal
Troutdale
Corbett
Cottrell
Sandy
Estacada-Boring State Trail
Henrici
Milo McIver State Park
WASHINGTON
MULTNOMAH
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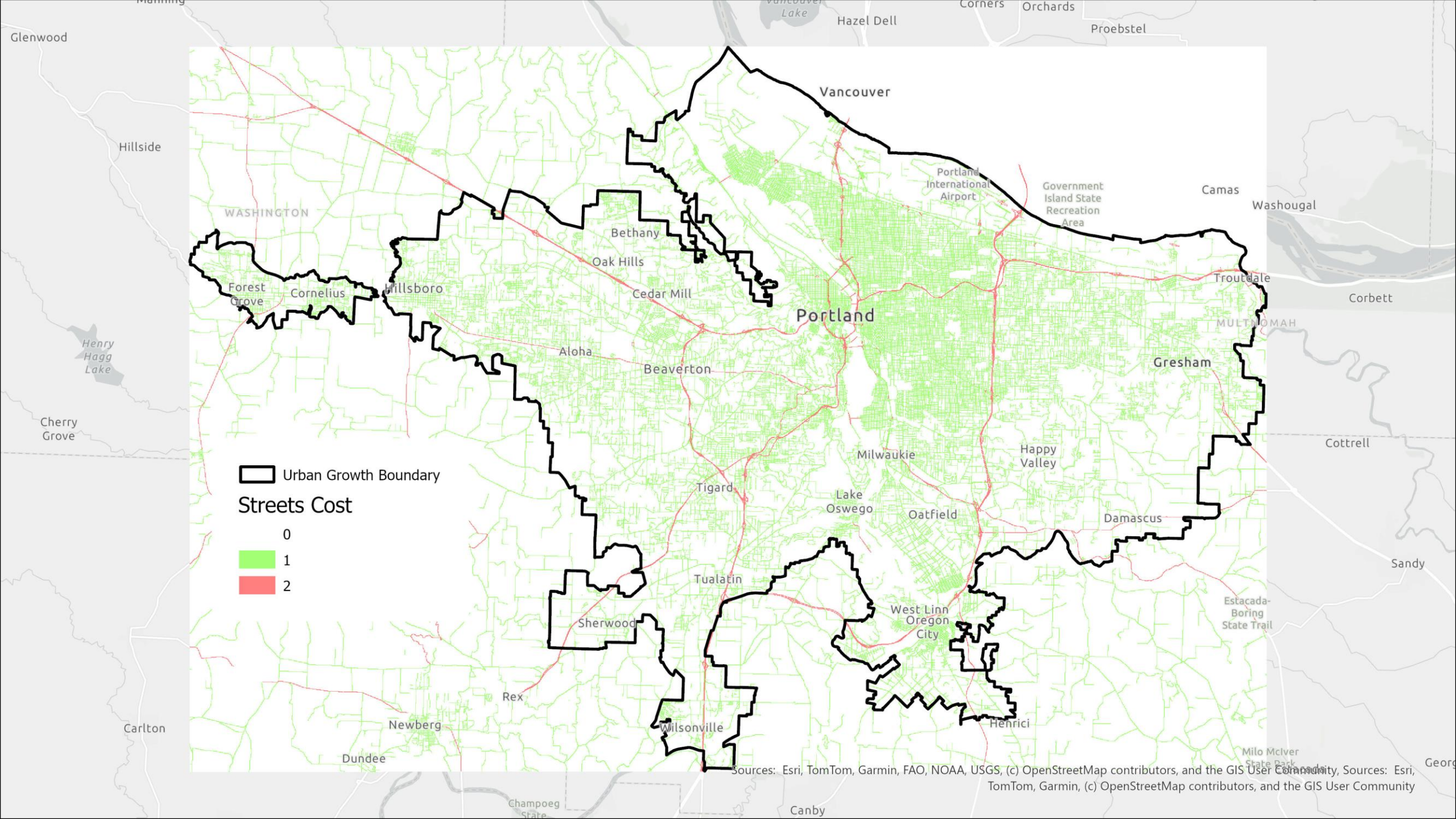
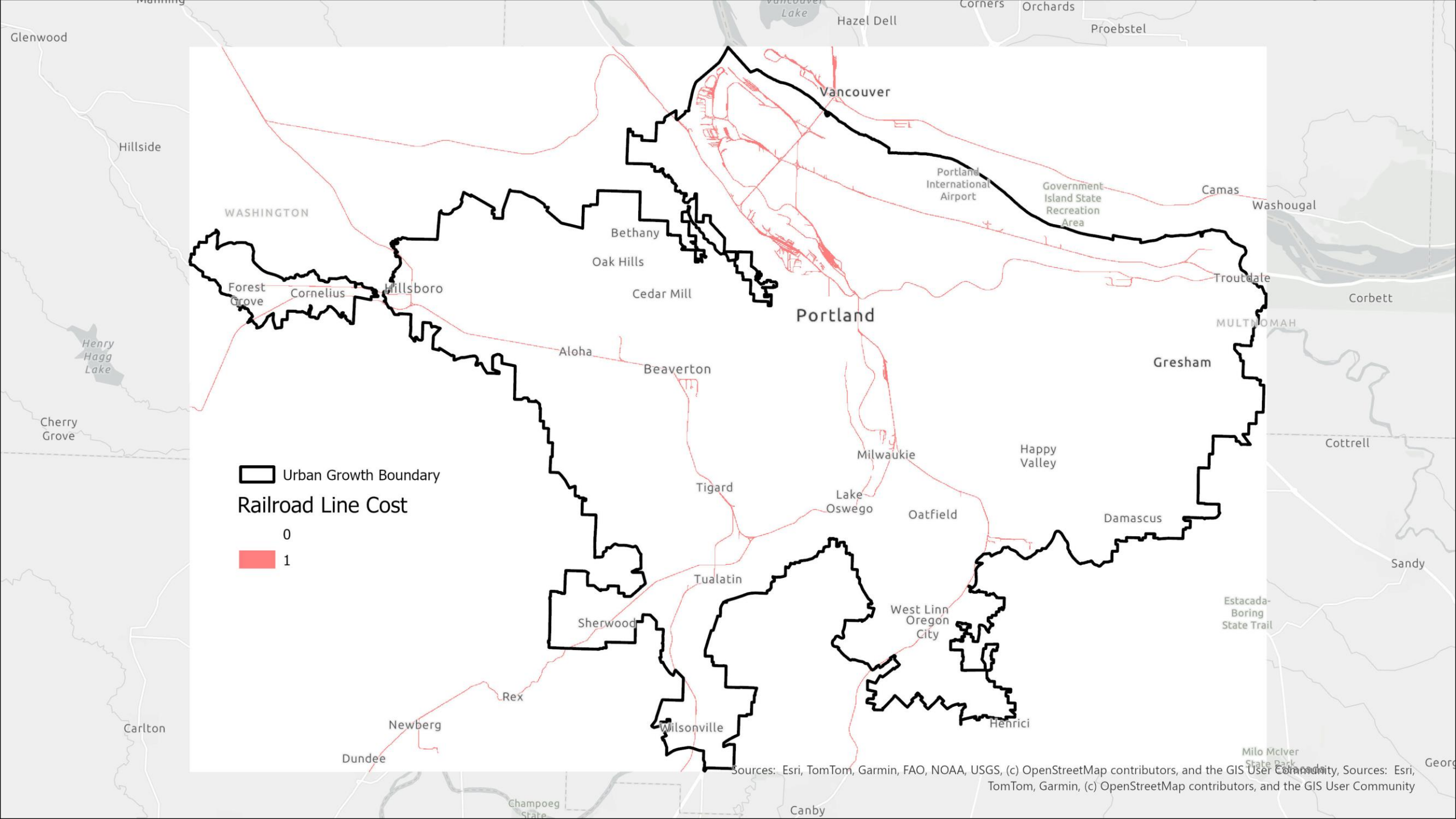
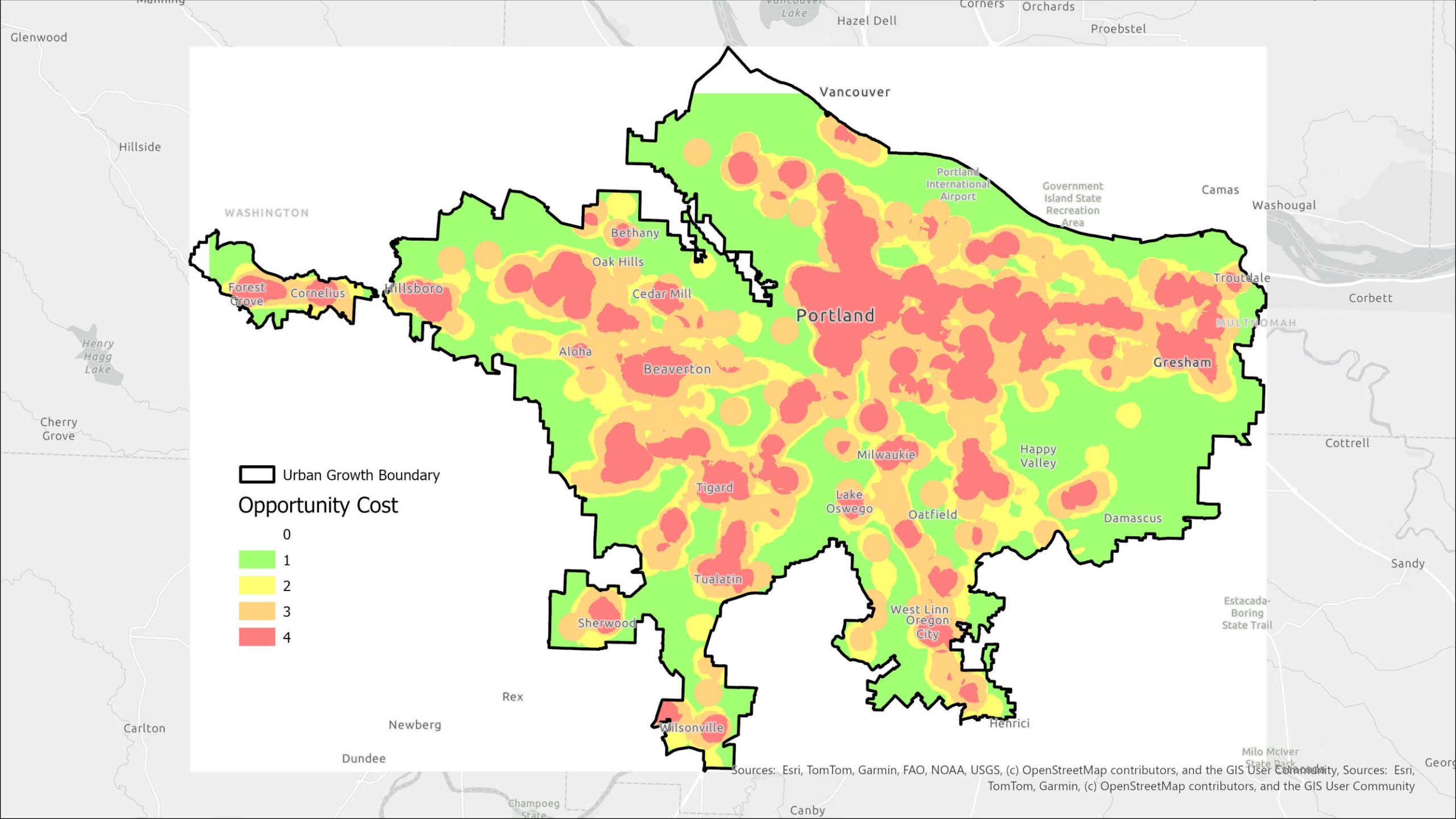
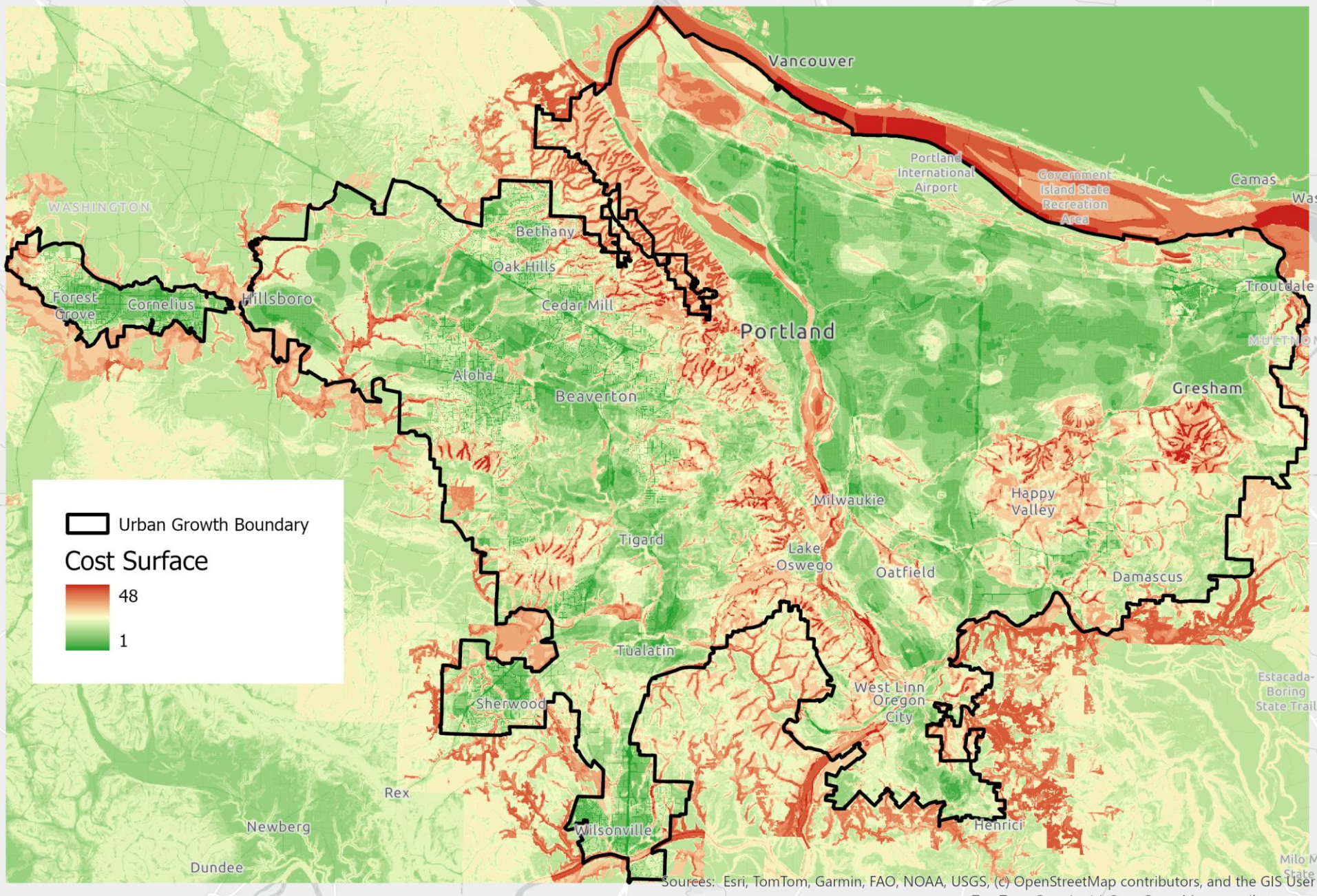

Urban Growth Boundary
Streets Cost
0
1
2
Vancouver
Portland
Beaverton
Hillsboro
Gresham
Tigard
Lake Oswego
Tualatin
Sherwood
West Linn
Oregon City
Wilsonville
Milwaukie
Happy Valley
Damascus
Troutdale
Camas
Washougal
Corbett
Cottrell
Sandy
Forest Grove
Cornelius
Bethany
Oak Hills
Cedar Mill
Aloha
Oatfield
Rex
Newberg
Dundee
Carlton
Canby
Hillside
Glenwood
Cherry Grove
Henry Hagg Lake
Hazel Dell
Orchards
Proebstel
Portland International Airport
Government Island State Recreation Area
Estacada-Boring State Trail
Milo McIver State Park
WASHINGTON
MULTNOMAH
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community

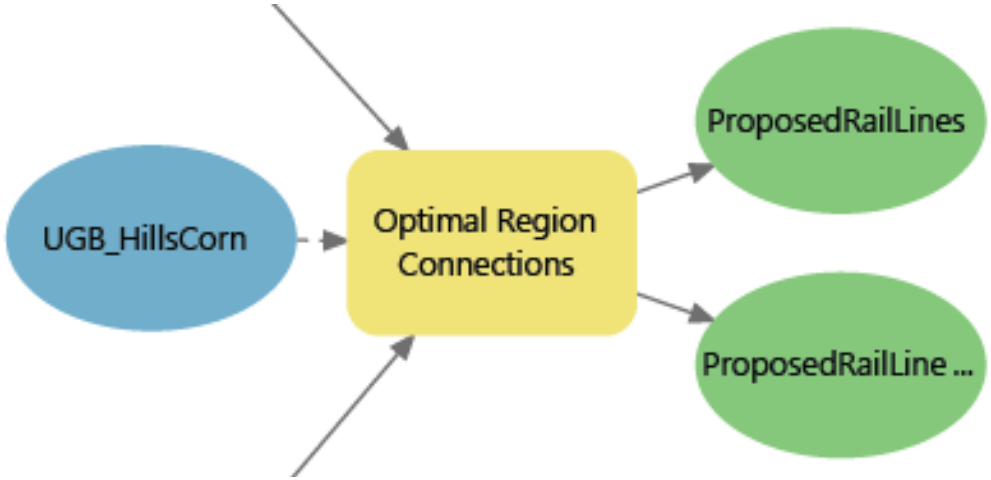

Urban Growth Boundary
Railroad Line Cost
0
1
Vancouver
Portland
Gresham
Beaverton
Hillsboro
Tigard
Lake Oswego
Milwaukie
Oregon City
West Linn
Tualatin
Sherwood
Wilsonville
Newberg
Forest Grove
Cornelius
Bethany
Oak Hills
Cedar Mill
Aloha
Happy Valley
Damascus
Troutdale
Camas
Washougal
Corbett
Oatfield
Henrici
Rex
Dundee
Carlton
Cherry Grove
Hillside
Glenwood
Hazel Dell
Proebstel
Orchards
Cottrell
Sandy
Canby
WASHINGTON
MULTNOMAH
Portland International Airport
Government Island State Recreation Area
Estacada-Boring State Trail
Henry Hagg Lake
Milo McIver State Park
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community

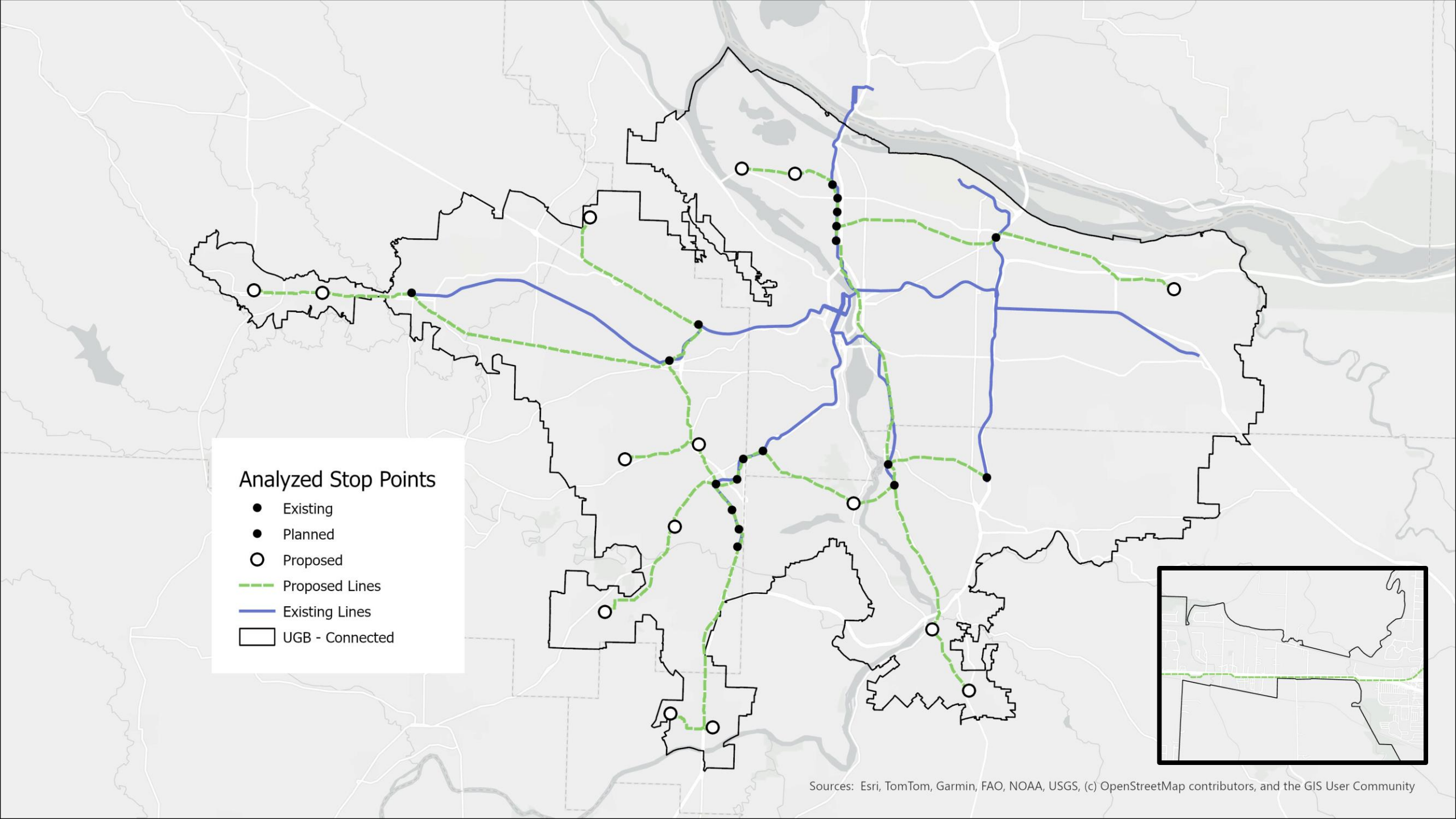

Urban Growth Boundary
Opportunity Cost
0
1
2
3
4
Vancouver
Portland
Gresham
Beaverton
Hillsboro
Tigard
Lake Oswego
Milwaukie
Oregon City
West Linn
Tualatin
Sherwood
Wilsonville
Newberg
Dundee
Rex
Henrici
Oatfield
Happy Valley
Damascus
Troutdale
Camas
Washougal
Corbett
Cottrell
Sandy
Estacada-Boring State Trail
Government Island State Recreation Area
Portland International Airport
Bethany
Oak Hills
Cedar Mill
Aloha
Forest Grove
Cornelius
WASHINGTON
MULTNOMAH
Hillside
Glenwood
Hazel Dell
Orchards
Proebstel
Henry Hagg Lake
Cherry Grove
Carlton
Canby
Champoeg State
Milo McIver State Park
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community

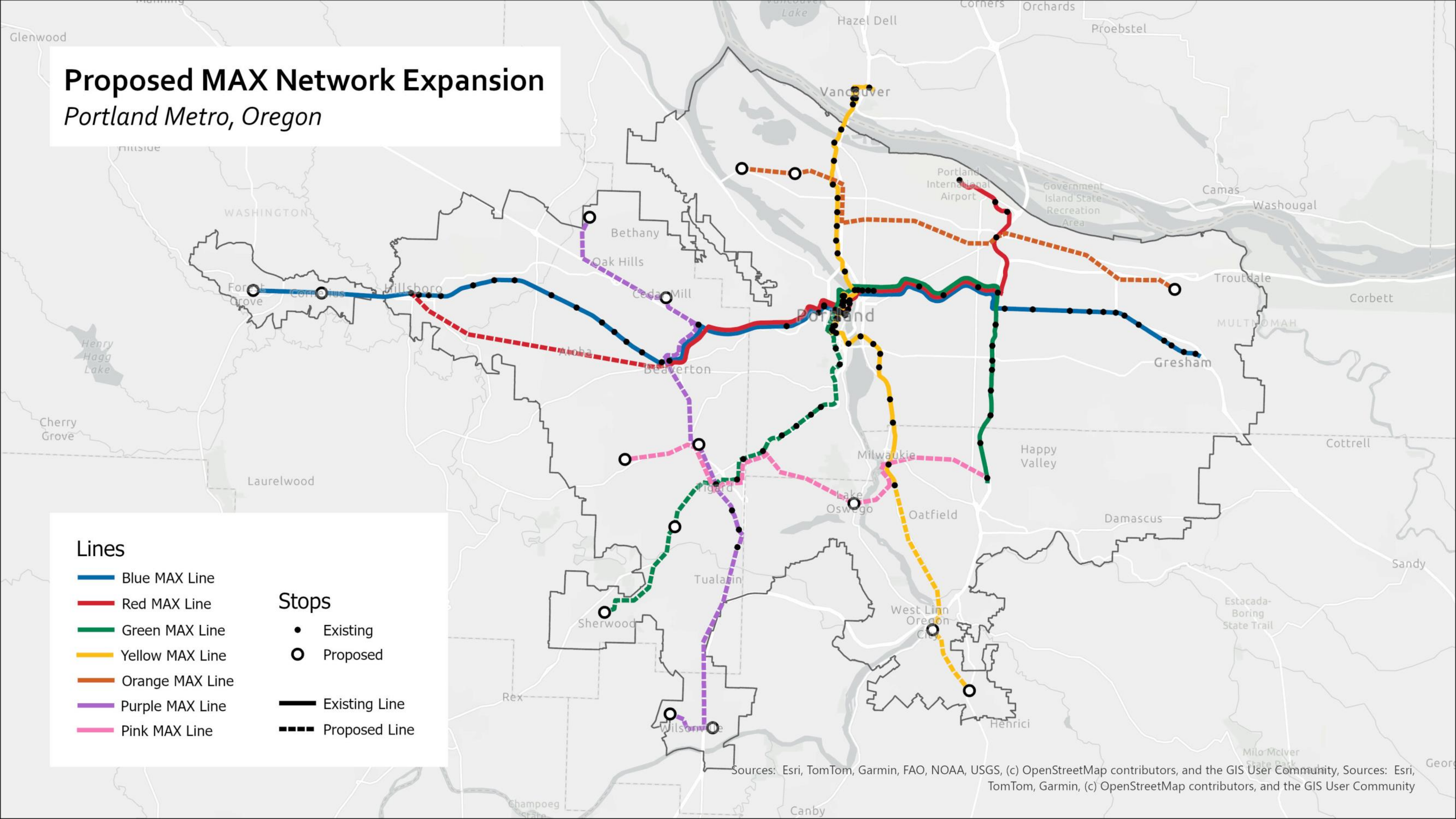


Raster	SlopeCost2
Field	Value
Weight	2
Raster	ZoneCost2
Field	Value
Weight	3
Raster	ConservationCost2
Field	Value
Weight	3
Raster	StreetsCost2
Field	Value
Weight	-1
Raster	WaterCost2
Field	Value
Weight	2
Raster	RailroadsCost2
Field	Value
Weight	-1
Raster	ProposedStops_Index2_(
Field	Value
Weight	-3

Create Least Cost Paths



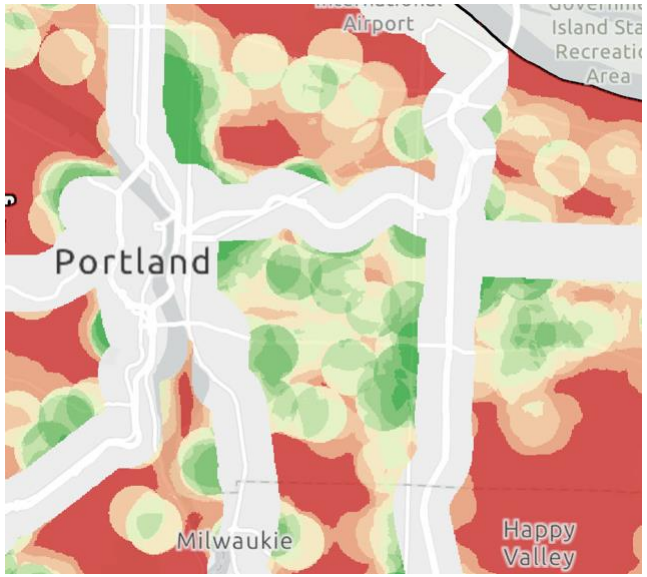

Analyzed Stop Points
Existing
Planned
Proposed
Proposed Lines
Existing Lines
UGB - Connected
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community



Proposed MAX Network Expansion
Portland Metro, Oregon
Lines
Blue MAX Line
Red MAX Line
Green MAX Line
Yellow MAX Line
Orange MAX Line
Purple MAX Line
Pink MAX Line
Stops
Existing
Proposed
Existing Line
Proposed Line
Glenwood
Hazel Dell
Orchards
Proebstel
Vancouver
Portland International Airport
Government Island State Recreation Area
Camas
Washougal
WASHINGTON
Bethany
Oak Hills
Cedar Mill
Forest Grove
Cornelius
Hillsboro
Aloha
Beaverton
Portland
Troutdale
Corbett
MULTNOMAH
Gresham
Henry Hagg Lake
Cherry Grove
Laurelwood
Happy Valley
Cottrell
Milwaukie
Tigard
Lake Oswego
Oatfield
Damascus
Sandy
Tualatin
Sherwood
West Linn
Oregon City
Estacada-Boring State Trail
Rex
Wilsonville
Henrici
Milo McIver State Park
Champoeg
Canby
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Sources: Esri, TomTom, Garmin, (c) OpenStreetMap contributors, and the GIS User Community

Further Analysis

- Areas within buffer of proposed lines for additional stops along the lines.
- Areas between all lines that still have high service area potential for streetcar service.
- Areas within buffer of proposed lines/stops to compare the population in the new service areas and their demographics.



Thank you!

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PCC GEO 266 Spring 2025