Chapter 2 – Community Profile

The purpose of the community profile is to collect different characteristics of Multnomah County that help define who and what is at risk from natural hazards. Impacts from natural hazards will differ depending on where they occur and the ability residents and visitors to the county have to withstand and recover from them. Mitigation investments should be made with the knowledge of how people, property, infrastructure and natural resources will be impacted differently by future disasters.

Descriptions of the community do not necessarily capture every element of risk and vulnerability faced, but information has been collected from a number of sources to provide a detailed overview. Work will continue to further refine how the community should best be defined for future planning.

Data for boundaries, demographics and hazard information is based on the boundaries of Multnomah County as established 168 years ago. It should be acknowledged that the area now known as Multnomah County has been inhabited for thousands of years, and that residents of this area have been greatly impacted by major natural disasters long before colonial expansion or Oregon statehood. Evidence of pre-Statehood major hazard events exists primarily through geological records, but also from recounts from the original residents of this land.

2.1 Political and Physical Geography

2.1.1 Political Boundaries

Multnomah County was created on December 24, 1854, from an eastern portion of Washington County and a northern portion of Clackamas County. Multnomah County is bordered by Columbia County and the Columbia River on the north, Hood River County on the east, Clackamas County on the south, and Washington County on the west. Multnomah County is the smallest county by area in Oregon at about 465 square miles. Despite its small size, Multnomah County is Oregon's most populous county, making it, by far, the most densely populated county in Oregon[9]. Population density has implications for natural hazard mitigation - the total number of people threatened by natural disasters are the highest of any Oregon county in nearly every dimension of risk, and urban areas have risks associated with multi-story buildings and urban heat islands.

[9] Multnomah County is more than twice as densely populated as the next most dense county in Oregon, Washington County. Multnomah County has a little over 1,600 people per square mile.

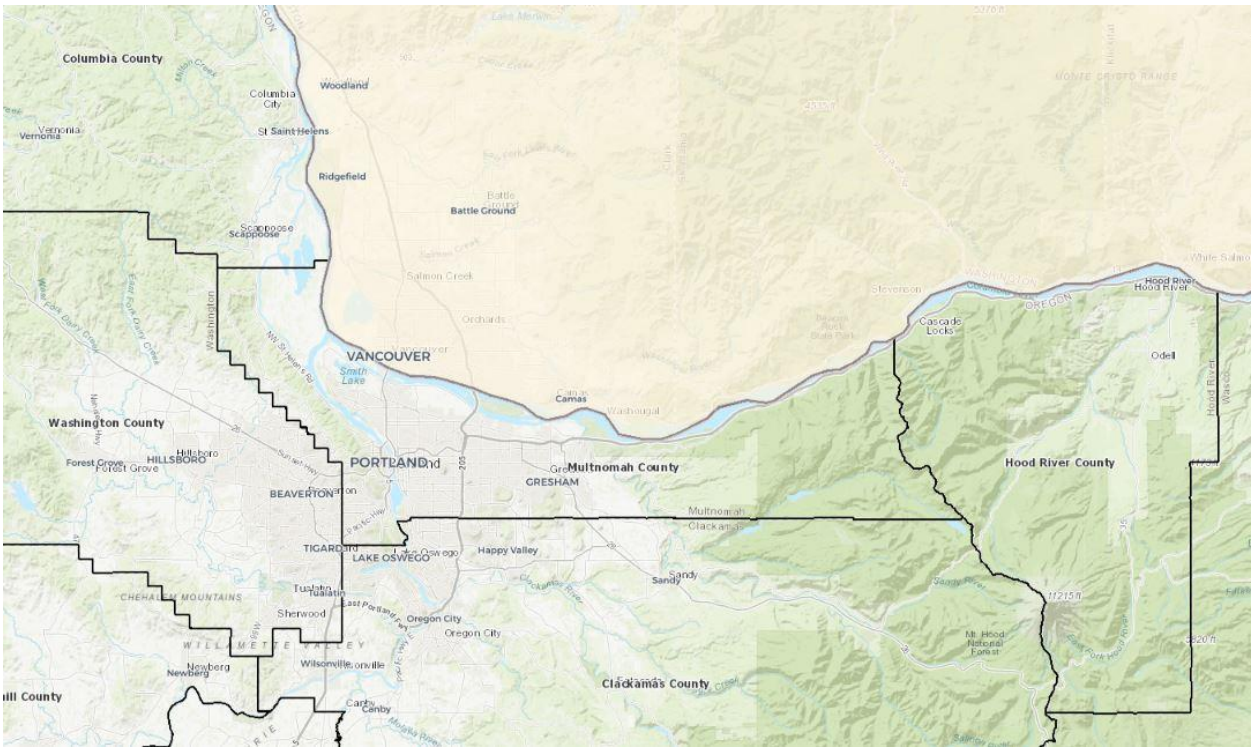

Figure 4 - Multnomah County Boundaries

2.1.2 Cities and Unincorporated Areas

Multnomah County has six incorporated cities—Fairview, Gresham, Maywood Park, Portland, Troutdale and Wood Village. The City of Portland also extends into Washington County. The City of Lake Oswego has around 2,500 residents inside Multnomah County, but is primarily located in Clackamas County and mitigation planning for Lake Oswego has only been conducted through that county. Outside of the central core of cities are large unincorporated areas, including rural communities with varying populations. The county has a number of Special Districts across the county, which overlap city and county boundaries.

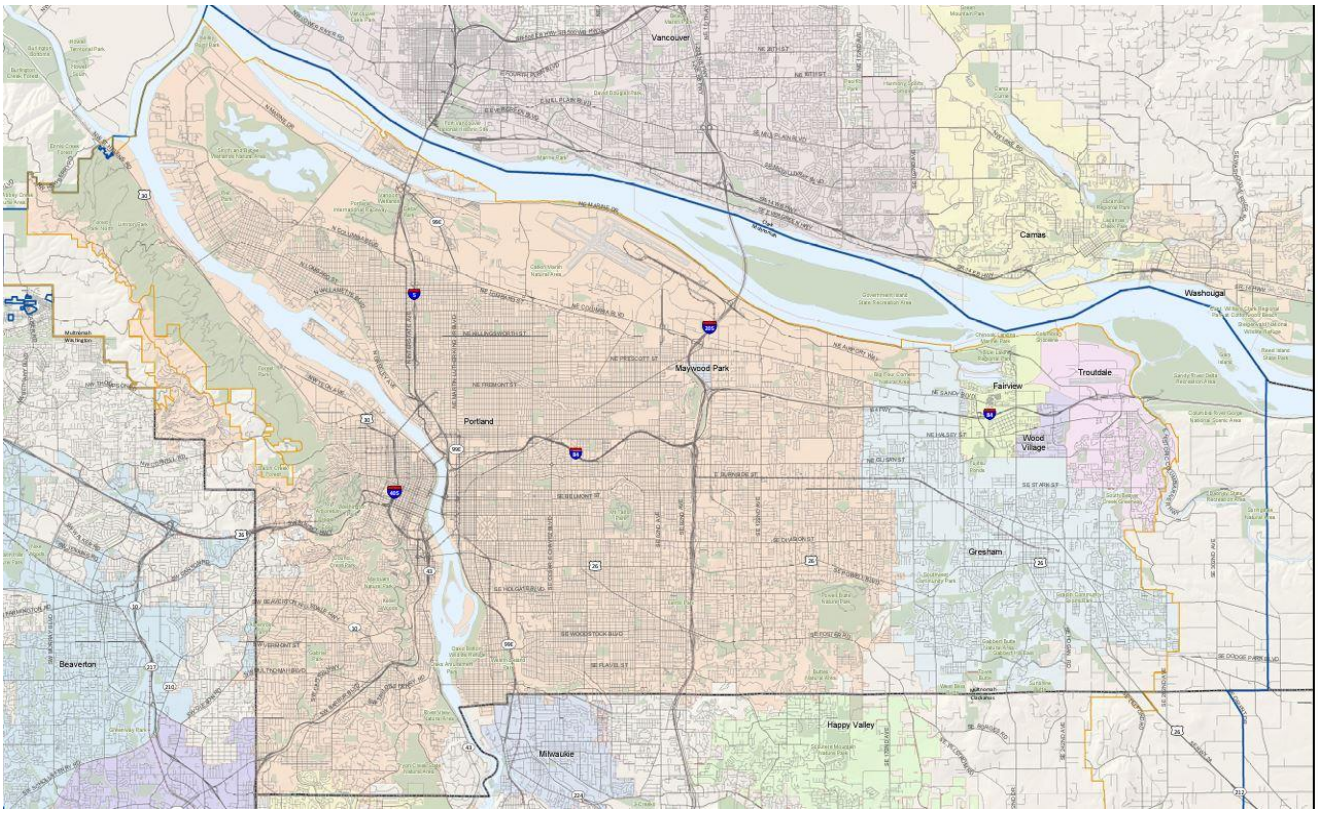

Figure 5 - Metro Map showing boundaries of the Cities of Portland (Orange), Fairview (Yellow), Gresham (Light Blue). Troutdale (Pink), and Wood Village (Light Purple).

The City of Portland is located centrally and makes up about 80% of Multnomah County's population and about 30% of the county's land area. This creates distinct western and eastern portions of the county. All of the participating cities in this plan are located east of Portland, and unincorporated areas span eastward from the eastern boundaries of those cities to the county line. All county areas to the west and northwest of Portland are unincorporated.

2.1.3 Columbia Corridor Drainage Districts

The participating Columbia Corridor Drainage Districts serve a long stretch of land along the Columbia River and, as a group, overlap the city boundaries of Fairview, Gresham, Portland and Troutdale, as well as portions of unincorporated Multnomah County. The combined Urban Flood Safety & Water Quality District (UFSWQD), expected in the next few years, will be a single district combining all of the boundaries shown in the map below.

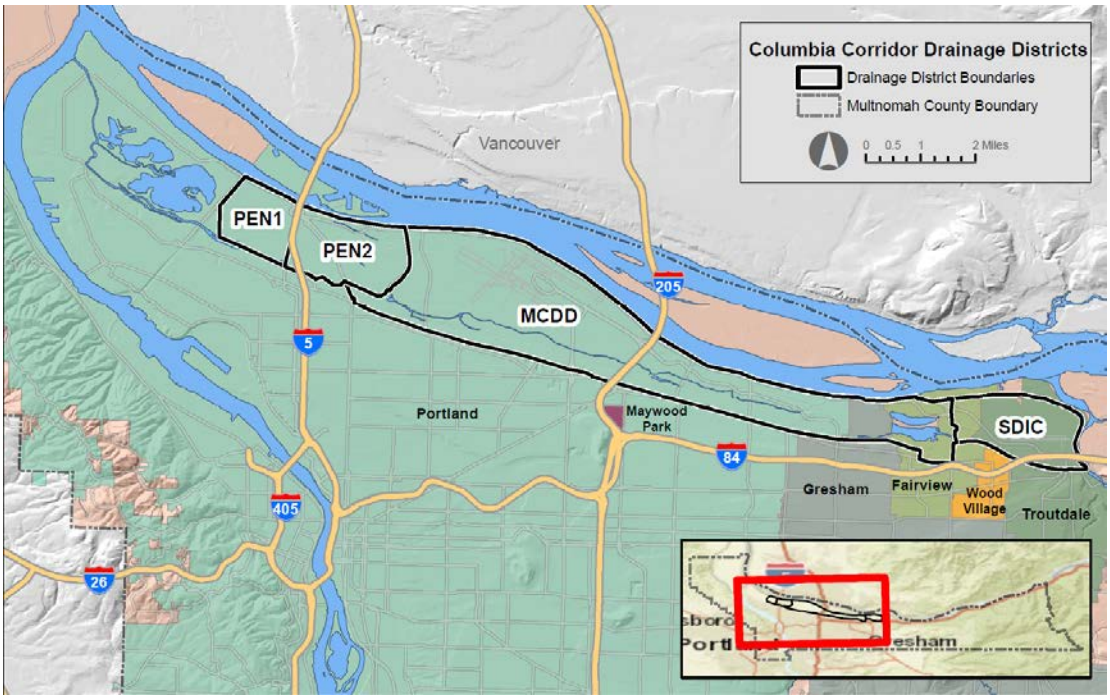

Figure 6 - Columbia Corridor Drainage District Boundaries. From left to right – Peninsula 1, Peninsula 2, Multnomah County Drainage District, Sandy Drainage Improvement Company

2.1.4 Port of Portland

The Port of Portland owns and operates the Portland International Airport (PDX), Oregon's major commercial airport, including significant air cargo operations, and owns the largest container shipping terminal serving the Portland Metropolitan region and much of Oregon. Mitigation efforts identified in this plan are for facilities located within Multnomah County only, but the mitigation efforts themselves support the region and the State.

The Port of Portland's two airports in Multnomah County also lie close to the Columbia River and are within the service areas of Columbia Corridor Drainage Districts. Marine Terminal 6, is on the Columbia River but is not within Drainage District boundaries. PDX and Terminal 6 are also located entirely within the City of Portland.

2.1.5 Other Land Management Areas

The eastern portion of Multnomah County includes extensive areas of state and federal lands, including the Mount Hood National Forest and other United States Forest Service lands. Tracts of managed timberland owned by the Federal Bureau of Land Management exist on both sides of the county. State lands are primary managed by Oregon State Parks or Oregon Fish and Wildlife. Large areas managed by the City of Portland include Forest Park on the west side of the county and the Bull Run Watershed on the east side.

An interactive version of this map can be found here (Administrative Boundaries – Land Management/Ownership)

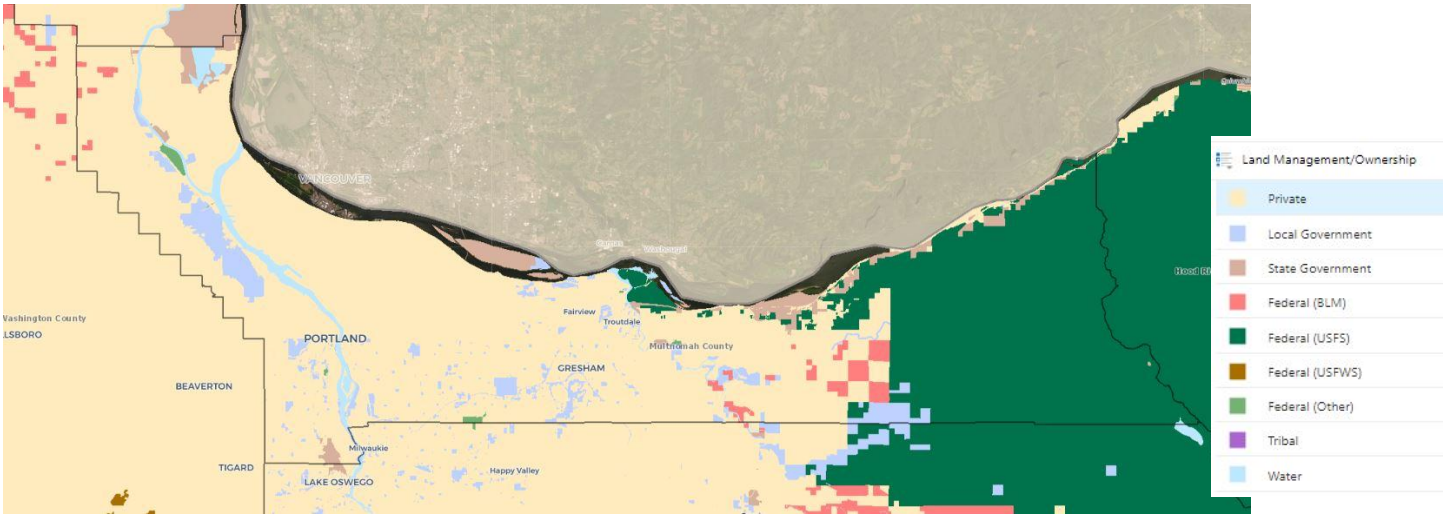

Figure 7 - Local, state and federal land management areas. Map from Oregon Wildfire Explorer, data from Bureau of Land Management (2015)

2.1.6 Geological and Geographical Features

The topography of Multnomah County varies from extremely flat to mountainous. The flattest areas are those in the historical floodplains of the Columbia and Willamette Rivers. Steep forested slopes exist in the Columbia River Gorge, Mount Hood National Forest and Gresham's East Buttes in the eastern portion of the county and in Forest Park and the Tualatin Mountains in the western portion. The highest point in Multnomah County is Buck's Peak at an elevation of 4,751 feet, located on the county's eastern boundary with Hood River County.

An interactive version of this map can be found here (Slope – Slope Steepness)

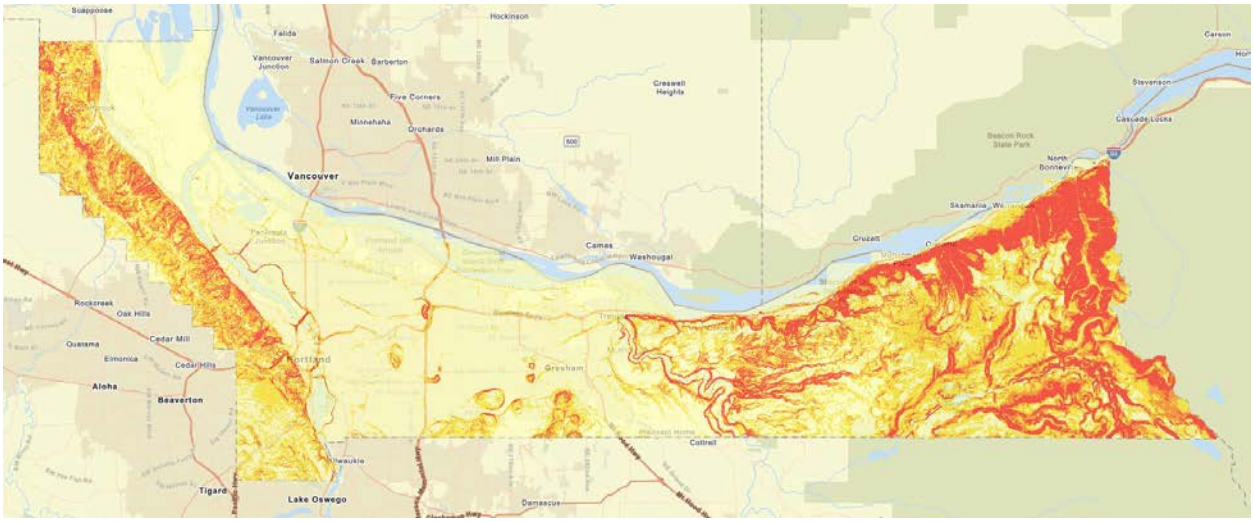

Figure 8 - Map showing Multnomah County slopes, with the darker colors being the steeper grades. Map from Multnomah County Land Use Planning Reference Map

Areas with slopes are primarily forest. Developed land is the dominant land cover in the center of the county. The largest agricultural areas lie in areas immediately east of Troutdale and Gresham, and on Sauvie Island in the northwestern part of the county.

[An interactive version of this map can be found here]

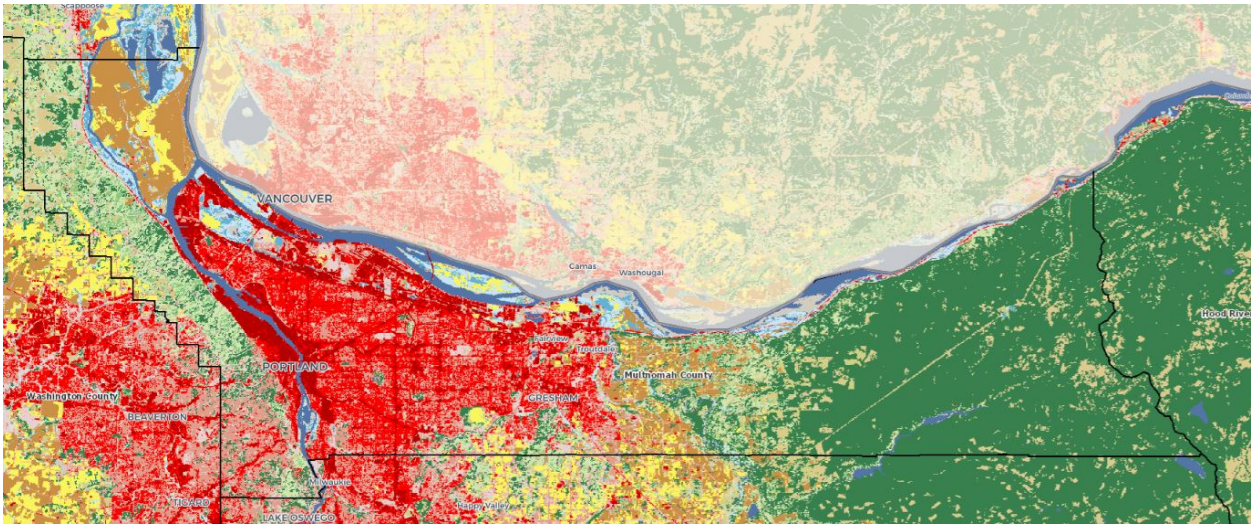

Figure 9 - Multnomah County land cover showing areas of urban development (red), agriculture (cultivated crops in brown and pasture in yellow), evergreen forest (dark green) and mixed conifer-deciduous forest (light green). Map from the 2019 National Land Cover Database.

Multnomah County is located in a highly geologically active area. There are several active earthquake faults within the county and other regional faults that could cause damage. The County is also expected to be impacted by the Cascadia Subduction Zone, a major offshore meeting of continental plates. A Cascadia Subduction Zone earthquake is the most likely earthquake scenario predicted to reoccur and will have major impacts across the Pacific Northwest. The county also is close to active volcanoes, including Mount Hood in Clackamas County, Oregon, and Mount St. Helens in Washington State. Maps of subduction zone and crustal faults are found in the Earthquake chapter, and the Volcano chapter has data about nearby eruption risk.

The two largest rivers in Multnomah County are the Columbia River, which forms the northern boundary of the county, and the Willamette River, which flows through the center of Portland until reaching a confluence with the Columbia River at Kelley Point. The natural floodplain of the Columbia River is flat and low-lying, and contains a number of wetlands, sloughs, side channels, and other areas prone to ponding during rain events. Man-made levees and embankments are prevalent in this area.

An interactive version of this map can be found here (Water – Rivers and Streams)

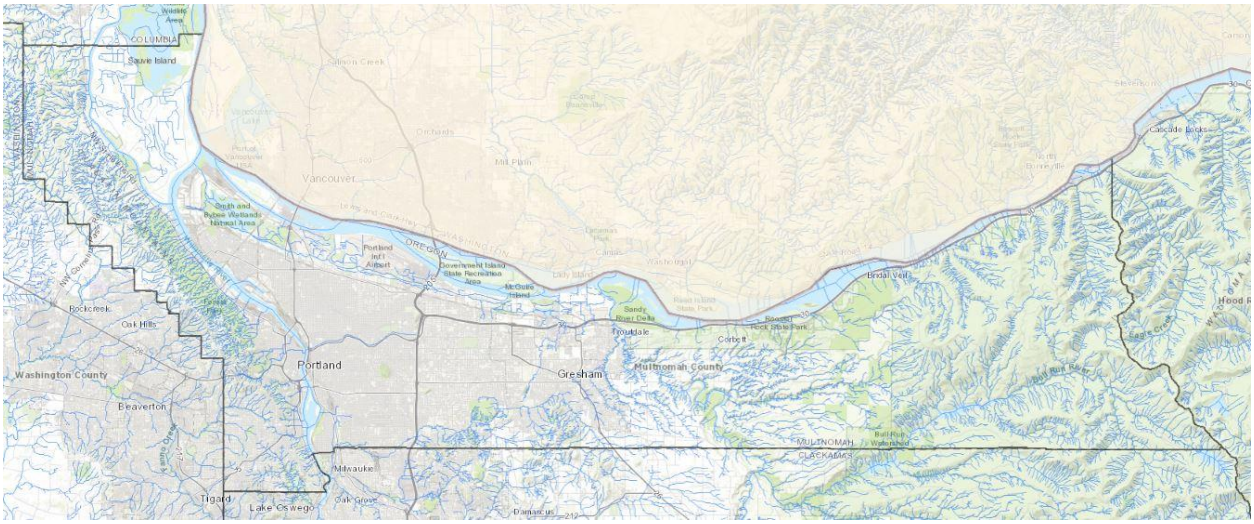

Figure 10 - Map showing mapped rivers and streams in Multnomah County, shown in blue. Map hosted by the Oregon Wildfire Explorer, with data from the 2017 USGS National Hydrography Dataset.

The Willamette River is constrained by urban development through much of its route through Multnomah County, although its natural floodplain also remains present in some locations with associated lakes and wetlands. Flood controls, including flood walls and engineered embankments are present, narrowing the channel as it passes through Portland.

The Sandy River, also a tributary of the Columbia River, is another important county river with high recreational and ecological value. The Sandy River is notable for being part of a volcanically active sediment transport system coming from the highlands of Mount Hood, making it extremely prone to flooding and erosion. Levee systems occur at the confluence of the Sandy and Columbia Rivers.

Floodplains on these rivers are mapped by the Federal Emergency Management Agency (FEMA) as part of the National Flood Insurance Program. Many other tributaries, streams, creeks and wetlands are also mapped through this program, and these smaller flooding sources can be prone to flash flooding or ponding. Additional creeks and ponding areas exist in the county, but have not been mapped for flood risk by FEMA because of their remoteness or small drainage area. The Flood Chapter has specific locations where mapped streams intersect with development and create flood risk.

An interactive version of this map can be found at this link (Flood Hazard – Effective FEMA Flood Data)

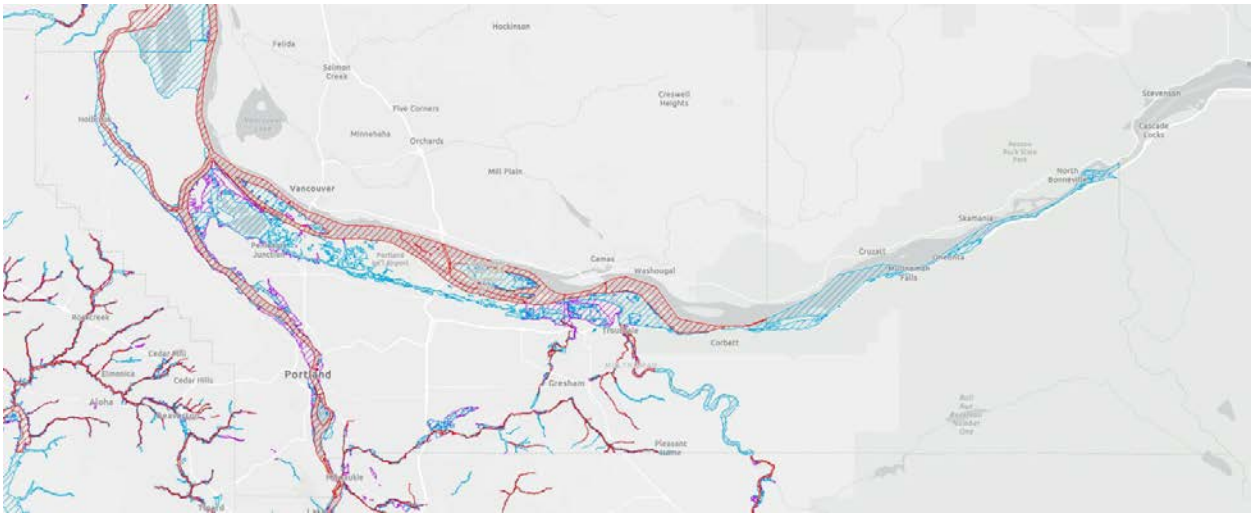

Figure 11 - Map showing areas mapped by FEMA's National Flood Insurance Program (NFIP). Areas in red hatching are the regulatory floodway, areas with the fastest and most dangerous floodwaters during a flood. The blue areas are those predicted to flood in a 1% annual chance (100 year) flood. Purple areas are those predicted to flood in a 0.2% annual chance (500 year) flood. Map from DOGAM's HazVu website, with information from FEMA's National Flood Hazard Layer (NFHL).

There are several small lakes and ponds in the county, including Blue Lake, Fairview Lake, Fairview Creek and its tributaries, Salish Ponds, Sturgeon, Bybee and Smith Lakes, Force Lake, Whitaker Ponds and Johnson Lake. Many of these county lakes are remnants of old channels of the Columbia River and located within the Columbia Slough, a 60-mile waterway that drains the Columbia River watershed in the interior portion of the levee drainage system.

2.2 Climate

The climate across Multnomah County is generally moderate, with wet winters and dry summers. Several climatic factors contribute to hazard vulnerability in Multnomah County. Heavy winter and spring rains can result in flooding and cause landslides. Cold winter snaps result in short duration sub-freezing temperatures, ice, snow and high winds most years. Summers can be mild, but are also increasingly likely to have high-heat events, which may be especially dangerous because of a lack of residential air conditioning and sudden temperature increases that can occur in late spring or early summer before peoples' bodies have adjusted to withstand hot weather.

Nearly all of the county's major climatic disasters have been regional in nature, affecting the entire county at once with minor variations in intensity and duration. Variations of impact may be based on location or elevation but perhaps are most significantly determined by effects caused by urban development and where those most at risk from harm are more likely to live.

2.2.1 Temperature and Precipitation

On average, December and January are the coldest and wettest months, and January has historically had the most snowfall. Temperatures begin to warm significantly by March, and snow later than that is very unusual. Rain amounts slowly drop off until July and August, when there is usually little precipitation. July and August are also the hottest months. Cooling down

usually begins in mid to late September or early October and significant rains typically begin to return in October.

The eastern side of the county has slightly colder winters with more snow and slightly warmer summers, caused by weather impacts of the Columbia River Gorge. The tables below show differences between Portland and Troutdale–with Troutdale located at low elevation at the mouth of the Gorge. Communities in the Gorge itself see these variations much more strongly.

Table 1 – Annual weather averages, observed at Troutdale Airport (National Weather Service)

Troutdale	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average High Temperature (F)	45.0	50.2	55.8	61.8	68.3	74.4	81.4	81.2	76.0	64.4	52.9	45.9	63.1
Average Low Temperature (F)	33.7	35.7	38.1	41.2	45.9	50.9	54.0	54.1	49.9	44.4	39.3	34.9	43.5
Average Total Precipitation (Inches)	6.32	4.88	4.52	3.53	2.69	1.99	0.71	1.05	1.95	3.72	6.45	7.09	44.90
Average Total Snowfall (Inches)	2.2	0.8	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.8	4.7

Table 2 – Annual weather averages, observed at Portland International Airport (National Weather Service)

Portland	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average High Temperature (F)	46.6	50.6	55.9	61.1	67.1	73.0	79.2	79.7	75.0	63.2	52.1	46.1	62.5
Average Low Temperature (F)	37.0	38.4	40.8	43.8	48.4	53.2	57.1	57.6	54.3	47.7	41.3	36.9	46.4
Average Total Precipitation (Inches)	6.17	4.83	4.66	3.35	2.61	1.66	0.70	0.92	1.67	3.36	6.69	6.76	43.37
Average Total Snowfall (Inches)	1.1	0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.9	3.1

Precipitation is significantly higher in the West Hills and Tualatin Mountains in western Multnomah County and high elevation areas in eastern Multnomah County than in the valley. Parts of the West Hills and Tualatin Mountains may average 70 inches of annual precipitation and high elevations in eastern Multnomah County may average 150 inches. Risks of rain-triggered landslides are much higher in these locations.

On average, the northern Willamette region experiences only five days per year of measurable snow, and some years have none at all at low elevation. Cold air from east of the Cascade Mountains often moves westward through the Columbia River Gorge and funnels into the Portland Metropolitan Region. If a wet Pacific storm reaches the area at the same time as cold westward winds from the Gorge, significant snow or ice storms can result. Ice storms can take the form of freezing rain, sleet, and hail.

2.2.2 Climate Change

Changes in temperature and precipitation from climate change in Multnomah County are expected to be severe, with summer temperatures becoming more extreme and winter precipitation having increased periods of intense rain. Extreme weather of all types is expected to become more unpredictable.

Potential effects of climate change are detailed for each hazard in their specific chapters. The hazards included in this plan that are expected to be the most impacted by a warming climate are extreme heat, wildfire and drought. Flooding is also expected to become more common and intense because of altered winter weather patterns, which will also increase the risk of landslides. The general disruption of weather patterns may also impact the severity of windstorms and snow or ice storms.

The predominant climate change scenario used in this plan is RCP (Representative Concentration Pathway) 8.5. This scenario is a conservative estimate of future conditions, where there is not significant change to the current trend of emissions and warming. This scenario is one of the primary models used by the Fifth Oregon Climate Assessment, the main source for climate change information in this plan.

2.3 Demographics

Population demographics for city and county jurisdictions are based on incorporated limits at the time of data collection – note that not all demographic totals are from the same census or year of estimation. The most recent available data was used for each statistical subset.

The Columbia Corridor Drainage Districts serve populations that are protected from flood by the levee systems that these districts manage. This population is also part of different city and unincorporated area populations. In most cases, federal census tracts that come closest to the district boundaries have been used, but those totals will be slightly oversampled and have some internal duplication. To give demographic context to the future Urban Flood Safety and Water Quality District (UFSWQD), totals for the MCDD are equivalent, as MCDD already includes all of the census tracts used in individual district counts.

- PEN 1 and PEN 2 – Tract 72.02 (tract boundary is the closest geographical reference for both districts)
- MCDD – Tracts 72.02, 73, 102
- SDIC – Tract 102

Population demographics are not provided for the Port of Portland which has no residential population. Information is provided for those traveling through or working at Port facilities.

For demographic statistics relating to unincorporated Multnomah County, census tracts have also been used to estimate populations. These tracts are also not perfect matches to the areas described, but provide the best available estimate for demographic purposes. The tracts may include small areas that overlap with city counts. Unincorporated enclaves inside the Urban Growth Boundary are not included in counts. The four areas used for unincorporated Multnomah County are:

- The West Hills - Tract 70.02
- The West Hills and Sauvie Island - Tract 71
- West of the Sandy River - Tract 104.02
- East of the Sandy River - Tract 105

Figure 12 - Map showing census tracts used for demographic estimations in unincorporated Multnomah County. Map from Multnomah County Comprehensive Plan with data from the US Census Bureau.

2.3.1 Population

Multnomah County's population as of the United States 2020 Census is 815,428[10] people. This represents a 4.9% increase since the 2014/2015 estimates used in 2017 NHMP. In that time, the county's population has grown at a slightly more rapid rate than Oregon as a whole. Growth has principally occurred in cities, while unincorporated areas have grown more slowly, or declined in population due to annexations by neighboring cities.

To count those served by the Columbia Corridor Drainage Districts, population estimates from a 2018 flood study conducted by the Oregon Department of Geology and Mineral Industries (DOGAMI) are used. The DOGAMI study estimated population based on the number of residential structures within each district boundary. These totals still overlap with those of cities and the unincorporated County and are estimates, but are more accurate than using tract boundaries. Note that the population for the SDIC is much lower than population used from census tract estimation in other demographic categories, because of this refinement.

[10] US Census 2020, in 2021 the Census estimated a County population of 803,377, a decline of over 12,000 people. Portland State Population Center data is used for population estimates in this plan. Their 2022 estimate for Multnomah County is 810,242 people.

Table 3 – Population Totals and Change Since 2017 NHMP Totals (US Census, 2020)

	2020		2014/2015		Population Change 2014/2015-2020	
	Population	% of County	Population	% of County	Population Change	Percent Change
Oregon	4,237,256	-	4,013,845	-	182,771	4.6%
Multnomah County	815,428	100%	777,490	100%	37,938	4.9%
Incorporated Areas	798,698	98.0%	750,040	96.5%	48,650	6.5%
Fairview	10,424	1.3%	8,940	1.1%	584	6.5%
Gresham	114,247	14.0%	107,065	13.8%	7,182	6.7%
Maywood Park	829	0.1%	750	0.1%	79	10.5%
Portland	652,503	80.0%	613,355	78.9%	39,148	6.4%
Troutdale	16,300	2.0%	16,020	2.1%	280	1.7%
Wood Village	4,387	0.5%	3,910	0.5%	477	12.2%
Unincorporated Areas	16,738	2.0%	27,450	3.5%	-10,712	-39.0%
West Hills	2,857	0.4%	8,104	1.0%	-5,247	-64.7%
Sauvie Island & West Hills	2,771	0.3%	2,650	0.3%	121	4.4%
West of Sandy River	6,298	0.8%	6,181	0.8%	117	1.9%
East of Sandy River	3,947	0.5%	4,308	0.6%	-361	-0.1%
Columbia Corridor Drainage Districts (UFSWQD)	7,436					
PEN 1 (2018 DOGAMI est.)	15					
PEN 2 (2018 DOGAMI est.)	2,480					
MCDD (2018 DOGAMI est.)	4,927					
SDIC (2018 DOGAMI est.)	14					

2.3.2 Population Distribution

98% of Multnomah County residents live in incorporated cities, and 94% of county residents live in either Portland or Gresham. Population is highly concentrated in the center of the county. The cities in this plan and unincorporated areas make up about 20% of the total population, but services provided by Multnomah County and the Special Districts in this plan affect the entire county, making the scope of hazard mitigation strategy extensive.

The region's Urban Growth Boundary (UGB) restricts high-density development outside of pre-defined growth limits, creating areas where current and future development are expected to occur most intensely now and in the future.

The map below shows the distribution of housing units in the county, indicating the extreme difference between central city areas, suburban edges, and rural portions of the county. This difference requires mitigation that is reflective of the different needs of urban and rural residents.

An interactive version of this map can be found at this link (Planning and Cadastral – Estimated Housing Density)

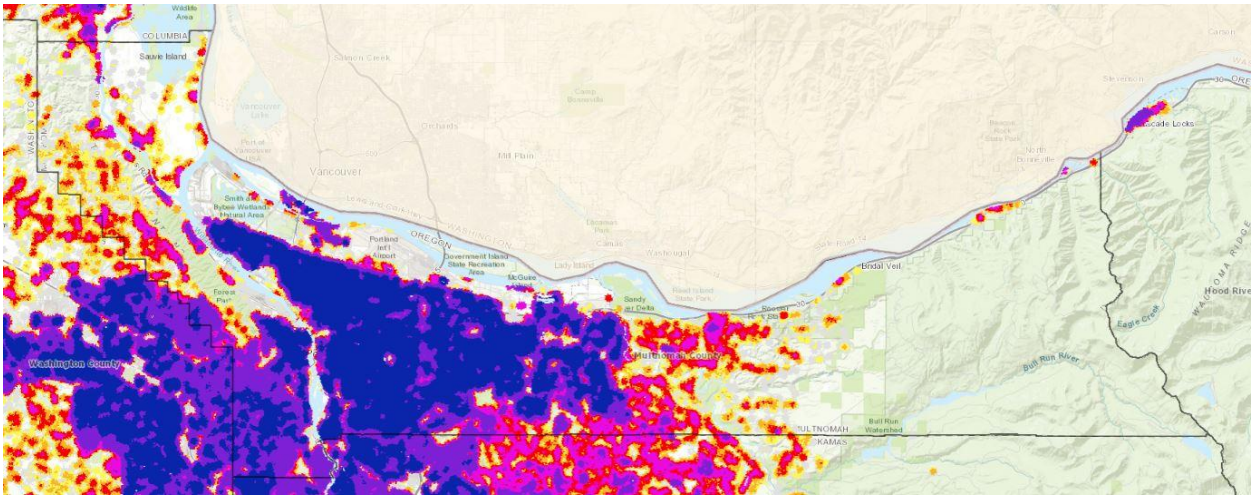

Figure 13 - Map showing housing density in Multnomah County, via the Oregon Wildfire Explorer with data from the 2013 ORNL Landscan analysis. The darkest color represents more than 3 houses per acre. Lighter colored areas in orange or yellow represent locations with one house per 10-40 acres and area with no overlying color have less than one house per 40 acres.

Development density can have positive or negative ramifications on natural hazard resilience, with differences caused by social conditions and the built and natural environment. Those living in multi-story buildings are typically more at risk from structural earthquake damage. Densely developed areas with limited tree canopy see higher temperatures and more risk to health from heat, and that effect is increased even more for those living on higher apartment floors. Those in low-density parts of the county are more likely to be at risk from landslide and wildfire, as those hazards correspond with land characteristics such as steep slopes that make them less likely to be compatible with dense development.

When a localized disaster occurs in a dense area, it will impact many more people and the need for shelter, evacuation and other support may be overwhelming. Urban residents may be less prepared for the long-term loss of power and municipal water and sewer systems. However urban areas also have more redundancies – a greater variety of ways to access transportation routes, health care, food, power and other necessities when large-scale damage or disruption occurs[11]. Parts of rural Multnomah County may be heavily reliant on a single transportation route to get to resource sites in spread out locations, and those routes may become impassable during disasters.

[11] How Density Makes Us Safer During Natural Disasters, *Bloomberg*, Vishaan Chakrabarti, September 19, 2013

Unincorporated areas have a higher proportion of older adults than cities, and those older adults may be at greater risk from harm due to that lack of readily accessible resources. Some higher density areas have the highest rates of poverty, with the most residents who lack resources to evacuate before or after a disaster, or to stockpile supplies. Denser areas are also likely to have higher proportions of people who speak languages other than English and who may be less likely to receive emergency warnings, alerts and pre-disaster messaging. Those in rural areas may also be less likely to get emergency information, because of less reliable communications infrastructure.

2.3.3 Population Projection

Growth projections for Multnomah County are conducted by Metro, as part of its 50-year growth plan. Estimates were developed in 2016 with projections at five-year intervals until 2060. This most recent estimate put the population of Multnomah County, depending on scenarios, at roughly between 1 million to 1.3 million people by 2060. This would represent a continuing slowing of growth from the previous 35 years due to trends in birth rates, immigration, housing, and other economic factors. Estimates are not provided on the municipal level. Within the Portland Metropolitan Area, Hispanic populations are predicted to grow the most, and the population of all races and genders is expected to continue to become older on average. Growth is expected to continue to occur mostly within cities.

Additional growth will add to risk in all the dimensions described in this plan, including new housing or commercial development in areas with known natural hazard risks and a subsequent increased population of people at high risk from future events.

2.3.4 Daytime Population

Disaster resilience is also influenced by those who are in Multnomah County temporarily, because they are less likely to have disaster preparedness awareness and vulnerability information for the locations where they are working or visiting.

Estimates of earthquake vulnerability performed by the Oregon Department of Geology and Mineral Industries (DOGAMI) make separate casualty estimates for day and night. The county's populations swells during the day, and those present in the day are more likely to be located in multi-story buildings that are more likely to be built of masonry and therefore at higher risk of damage or collapse. Daytime populations may also be more likely to be trapped away from home and require transport, shelter, and reunification services. In DOGAMI's earthquake analysis, daytime vulnerability of injury and death is increased by three to four times compared to a nighttime event[12].

2.3.5 Migrant and Seasonal Farmworkers

In 2018, the Oregon Health Authority published estimates of the population of those in migrant or seasonal farmworker households. Multnomah County's estimate was 3,173 people[13], about

[12] Data from DOGAMI report O-18-02, Earthquake regional impact analysis for Clackamas, Multnomah, and Washington counties, Oregon. The report quantifies total casualties (defined as minor injuries, injuries requiring hospitalization, and fatalities) at 11,400-16,700 in the day and 2,800-5,600 at night. The lower and upper totals are dependent on another factor, whether the event happens when soils are wet or dry.

[13] Estimates of Migrant and Seasonal Farmworkers in Agriculture, 2018 Update, Oregon Health Authority, Mallory Rahe, June 2018, Table 1, County level migrant and seasonal farmworked estimates, p.8

2% of the Oregon total. This total is a slightly increase from the previous 2013 estimate. Migrant and seasonal farmworkers face increased direct risk from hazards, especially when working outdoors or living in unweatherized housing during high heat or wildfire smoke events. Other disasters may pose high risk for harm as well, as these workers and their families may not be aware of local hazard risks and may be harder to reach with preparation, evacuation or response messaging because of temporary living locations and limited English proficiency.

2.3.6 Tourists and Other Visitors

Approximately 5.4 million overnight visitors came to Multnomah County in 2019[14]. While this number presumably declined after the onset of COVID-19, a return to pre-pandemic numbers would mean millions of people per year in temporary stays roughly split between hotels/motels and private homes. Summer is the high season for visitors, creating potential for health effects from extreme heat and wildfire smoke. In general, tourists may not be aware of natural hazard risks or emergency notification or response procedures and lack emergency supplies. Tourists across Multnomah County may quickly become vulnerable during a disaster.

The Portland International Airport is Oregon's largest airport, with nearly 20,000,000 travelers passing through in 2019 for personal or business travel. The number of passengers dropped sharply during the peak of the COVID-19 pandemic, and is now returning to pre-pandemic levels. The large number of people using the airport at a given time will require a large safety and sheltering response in a major natural disaster. The airport is also one of the county's largest job sites, employing about 10,000 people.

2.3.7 Population by Age

Children and older adults are often among the most vulnerable age groups in a natural disaster. Older adults may have more difficulty evacuating from acute danger and be more likely to have health conditions that may increase their vulnerability to disaster, especially during extreme heat, cold, hazardous air quality and long-term power loss. There may also be a need for specific strategies to assist older adults in hazard preparation, risk awareness, and safety during emergencies. Children may have difficulty coping with disasters and become extremely vulnerable when separated from caregivers. Children are also at greater risk from climate-related health hazards, especially unhealthy air.

Compared to data used in the 2017 version of this plan, Multnomah County has seen a significant increase in older adults, defined here as those age 65 and over. This trend is mirrored across Oregon. The total number of children under the age of 18 has dropped in Multnomah County since 2015. However, there are still more children than older adults in Multnomah County in all participating entities except for the City of Fairview. The unincorporated area of Sauvie Island and the West Hills, and some areas served by the Columbia Corridor Drainage Districts also have more older adults than children.

Of participants in this plan, Troutdale, Wood Village and Gresham have the highest percentages of children. The unincorporated areas on the west side of the county have the highest proportion of those over the age of 65.

[14] Oregon Travel Impacts, Statewide Impacts 1992-2019p, Dean Runyan Associates for the Oregon Tourism Commission, April 2020, p.161

Table 4 – Population by Age and Change Since 2017 NHMP Totals (US Census American Community Survey, 2019 – Table S1601)

Community	Under 18 years	Percent of Total Population	Change Since 2014/15	65 or Over	Percent of Total Population	Change Since 2014/15
Oregon	862,816	20.4%	+0.3%	767,496	18.1%	+24.1%
Multnomah County	149,667	18.4%	-1.6%	113,135	13.9%	+24.9%
Fairview	1,549	14.9%	-31.2%	1,740	16.7%	+34.5%
Gresham	26,359	23.1%	-4.5%	15,572	13.6%	+18.2%
Maywood Park	273	32.9%	+34.8%	142	17.1%	+1.4%
Portland	113,464	17.4%	+0.2%	85,802	13.1%	+23.0%
Troutdale	4,760	29.2%	+5.9%	1,493	9.2%	+8.0%
Wood Village	1,440	32.8%	+15.8%	322	7.3%	+4.7%
Unincorporated Areas						
West Hills	679	23.8%		636	22.2%	
Sauvie Island & West Hills	338	12.2%		686	24.8%	
West of Sandy River	1,706	27.1%		978	15.5%	
East of Sandy River	924	23.4%		723	18.3%	
Columbia Corridor Drainage District Areas (UFSWQD)						
MCDD	1,689	13.4%		1,975	15.6%	
PEN1 and PEN2	541	14.5%		529	14.2%	
SDIC	1,088	15.3%		1,360	19.1%	

2.3.8 Population with Disability

Hazard planning for those with disabilities is an essential requirement for equitable mitigation. There is a large diversity of types of disabilities, each of which requires analysis as to what mitigation strategies will be most beneficial for those groups in disasters. Most importantly, it is essential to consider how natural disasters impact people differently and how mitigation strategies may support or leave out different disabled populations in their implementation.

Some broad risks to disabled groups from hazards are less accessibility to disaster messaging, physical barriers to evacuation, interruption of caregiver support, long-term loss of power (preventing use of powered medical devices and maintaining refrigerated medication), and heightened risk from climate impacts such as heat and unhealthy air because of existing health conditions.

The US Census uses federally-designated disability categories, which may not fully align with categories and terminologies used by disability communities themselves or in other government service contexts. Some non-visible disabilities are not captured by these categories and respondents who feel their disability does not fit in this classification may not be counted as disabled. The census categories are:

- **Hearing difficulty:** Deaf or having serious difficulty hearing.
- **Vision difficulty**: Blind or having serious difficulty seeing, even when wearing glasses.
- **Cognitive difficulty:** Because of a physical, mental or emotional problem, having difficulty remembering, concentrating or making decisions.
- **Ambulatory difficulty:** Having serious difficulty walking or climbing stairs.
- **Self-care difficulty:** Having difficulty bathing or dressing.
- **Independent living difficulty:** Because of a physical, mental or emotional problem, having difficulty doing errands alone such as visiting a doctor's office or shopping.

Census data of persons with disabilities has other limitations that may also lead to undercounting that then creates barriers to resources[15]. Census disability data is self-reported through surveys, and not collected during Decennial Censuses. Respondents may under-report their symptoms or not answer because of societal stigma toward disability[16]. Census processes are also believed to undercount those with disabilities because of insufficient accessible technology for internet response. The intersection of disability with other undercounted demographic groups, such as people of color, non-English speaking communities, and those with housing instability may also contribute to undercounting.

The most recent Federal survey count shows that Multnomah County as a whole has a slightly smaller percentage of those reporting disability than Oregon as a whole. Rural communities generally have higher reported levels of disability however many of the groups that are habitually undercounted in census surveys are also those with higher rates of disability and are more likely to live in metropolitan areas. Rural areas of Multnomah County have a similar or lower rate of reported disability than incorporated areas.

Of those communities participating in this plan, the Cities of Fairview and Gresham have the largest proportion of disability populations, both slightly higher than the state average. Nearly 100,000 people in Multnomah County reported having one or more of the disabilities tracked by the census in the most recent count.

The most important strategy for understanding risk to disability communities remains disability community engagement and inclusivity in pre-disaster planning.

[15] Count Everyone, Include Everyone, *National Disability Rights Network* , October 2021, p. 13

[16] The Census Bureau and Disability Data, *TheRespectAbility Report*, Ian Malesiewski, July 13, 2021

Table 5 – Population by Type of Disability (US Census American Community Survey, 2020 – Table S1810)

Community	Persons with a Disability	% of Total	Hearing Difficulty	Vision Difficulty	Cognitive Disability	Ambulatory Difficulty	Self-Care Difficulty	Independent Living Difficulty
Oregon	592,689	14.0%	190,325 (4.6% of all people)	97,777 (2.4% of all people)	241,437 (6.2% of all people)	274,925 (7.0% of all people)	105,663 (2.7% of all people)	200,719 (6.1% of all people)
Multnomah County	98,985	12.1%	26,660 (3.3%)	17,327 (2.2%)	45,826 (6.0%)	41.996 (5.5%)	18,459 (2.4%)	34,900 (5.3%)
Incorporated Cities								
Fairview	1,498	14.4%	466 (5.0%)	296 (3.2%)	656 (7.0%)	770 (8.2%)	204 (2.2%)	628 (6.7%)
Gresham	16,778	14.9%	4,406 (4.0%)	2,743 (2.5%)	7,723 (7.0%)	7,540 (6.9%)	3,786 (3.4%)	6,226 (5.7%)
Maywood Park	232	28.0%	48 (3.9%)	10 (0.8%)	68 (5.6%)	126 (10.3%)	83 (6.8%)	105 (8.6%)
Portland	76.620	11.7%	20,662 (3.2%)	13,473 (2.1%)	35,850 (5.6%)	31,836 (4.9%)	13,773 (2.1%)	26,688 (4.1%)
Troutdale	1,486	9.1%	373 (2.3%)	266 (1.6%)	623 (3.8%)	777 (4.7%)	223 (1.4%)	544 (3.3%)
Wood Village	350	8.0%	102 (2.5%)	67 (1.7%)	171 (4.2%)	136 (3.4%)	84 (2.1%)	194 (4.8%)
Unincorporated Planning Areas								
West Hills	204	7.1%	74 (2.6%)	20 (0.7%)	34 (1.2%)	96 (3.4%)	0 (0.0%)	37 (1.3%)
Sauvie Island & West Hills	472	17.0%	258 (9.3%)	61 (2.2%)	213 (7.7%)	170 (6.1%)	8 (0.3%)	77 (2.8%)
West of Sandy River	555	8.8%	121 (1.9%)	94 (1.5%)	202 (3.2%)	218 (3.5%)	100 (1.6%)	203 (3.2%)
East of Sandy River	447	11.3%	162 (4.1%)	63 (1.6%)	202 (5.1%)	111 (2.8%)	98 (2.5%)	86 (2.2%)
Columbia Corridor Drainage District Areas (UFSWQD)								
PEN 1 and PEN 2	341	9.1%	101 (2.7%)	40 (1.1%)	149 (4.0%)	117 (3.1%)	37 (1.0%)	61 (1.6%)
MCDD	1,525	12.1%	441 (3.5%)	171 (1.4%)	682 (5.4%)	675 (5.3%)	206 (1.6%)	517 (4.1%)
SDIC	1,031	14.5%	294 (4.1%)	108 (1.5%)	409 (5.7%)	494 (6.9%)	142 (2.0%)	387 (5.4%)

Residential Care Homes

Care homes for adults and children are key critical facilities for the care of at-risk residents, many of whom are disabled.

Multnomah County's Department of Human Services (DCHS) provides licensing and oversight of care homes through its Aging, Disability, and Veterans Services Division (ADVSD) and Intellectual and Developmental Disabilities Division (IDD). DCHS maintains mapping of these facilities as a way to understand their risks, monitor their resilience to hazards, and ensure response support is provided during disasters. Care facilities are a priority for long-term resilience evaluation and support.

Pre-Existing Health Conditions

Those with pre-existing health conditions are mentioned throughout this plan as being at high risk, especially from climate-related hazards. Some existing respiratory conditions such as asthma and chronic obstructive pulmonary disease (COPD) are not expressly included in disability census rates, but are a high risk factor for harm from heat and unhealthy air. Cardiovascular disease and other conditions can also raise risks. A more complete list of risk factors is located in the chapters for Severe Weather and Wildfire and Wildfire Smoke.

DCHS and the Multnomah County Health Department (MCHD) have the ability to provide case manager support, health resources, and specific safety messaging to clients based on their health risk factors.

2.3.9 Population by Race or Ethnicity

Multnomah County is considerably more racially diverse than Oregon as a whole, with a higher proportion of Black and African-American, Asian, Native Hawaiian and Pacific Islander and multi-racial populations. Multnomah County has, overall, a lower proportion of Hispanic and Latino residents than the state, but that statistic is skewed by the size and demographics of the City of Portland. Every participating city in this plan has a higher than state average proportion of Hispanic or Latino residents, and it is the fastest growing ethnic demographic in those communities as well.

It is necessary to recognize the distribution of residents by race and ethnicity, because communities of color face increased risk from natural hazards, due to historical and ongoing social and economic discrimination. Historic and current community investment decisions have affected where people live and what governmental services and resources have been made available. The physical locations of communities of color have been at higher risk of hazards such as flood, and characteristics of the built environment such as housing without seismic safety retrofitting and less tree canopy increase the potential severity of earthquake and heat hazards respectively in neighborhoods with a high proportion of residents of color.

Hazard resilience has also been diminished in communities of color by inequitable distribution of post-disaster support. Recent research has shown that FEMA has provided more support to white disaster victims than people of color, and less support to communities with a higher percentage of non-white residents[17]. These disparities may reflect a correlation with existing inequality, such as in lowered real estate values, which are then used to determine how much aid is provided after a disaster. The effect has been that white residents have seen wealth increase after disasters because of governmental support while non-white residents have lost wealth in the same incidents.

In order to prevent these race-based disparities from being continued or increased, it is necessary to maintain awareness of where communities of color are most likely to live in Multnomah County and which disasters are most likely to impact those communities. Mitigation resources can then be prioritized to those who will face the largest challenges to accessing resilience resources and sharing in equitable recovery.

[17] Why Does Disaster Aid Often Favor White People?, *New York Times*, Christopher Flavelle, June 7, 2021.

Table 5 – Population by Race and Ethnicity (US Census, 2020 – Table P2)

Community	Race							Ethnicity
	African American	American Indian & Alaskan Native	Asian	Native Hawaiian & Pacific Islander	Other Race	Two or More Races	White	Hispanic or Latino
Oregon	1.9%	1.0%	4.5%	0.4%	0.5%	6.1%	71.7%	13.9%
Multnomah County	5.4%	0.7%	7.5%	0.6%	0.6%	6.8%	65.9%	12.7%
Incorporated Cities								
Fairview	5.4%	0.9%	6.3%	1.1%	0.4%	6.8%	58.9%	20.3%
Gresham	5.0%	0.8%	5.9%	1.1%	0.5%	6.1%	59.6%	21.0%
Maywood Park	2.7%	0.0%	7.0%	0.0%	0.6%	4.8%	76.1%	8.8%
Portland	5.7%	0.7%	8.0%	0.6%	0.6%	7.0%	66.4%	11.1%
Troutdale	2.2%	0.6%	5.4%	0.6%	0.5%	6.1%	69.9%	14.7%
Wood Village	1.8%	0.6%	3.9%	0.8%	0.2%	5.0%	45.0%	42.8%
Unincorporated Areas								
West Hills	0.8%	0.4%	9.5%	0.1%	2.4%	9.5%	77.1%	5.4%
Sauvie Island & West Hills	0.3%	1.2%	2.5%	0.3%	2.3%	9.4%	83.4%	6.4%
West of Sandy River	1.4%	0.9%	3.7%	0.2%	3.4%	9.6%	80.8%	8.2%
East of Sandy River	0.5%	0.3%	1.4%	0.3%	1.5%	7.4%	88.5%	4.5%
Columbia Corridor Drainage District Areas (UFSWQD)								
PEN 1 and PEN 2	11.8%	2.9%	5.9%	1.4%	0.8%	6.4%	56.6%	19.6%
MCDD	7.8%	2.4%	6.9%	0.1%	0.5%	5.8%	62.2%	22.1%
SDIC	5.0%	2.1%	8.1%	0.7%	0.4%	5.6%	56.4%	25.4%

Wood Village, Fairview, and Gresham have the largest non-white populations. Wood Village has the largest Hispanic/Latino population, while Fairview and Gresham have the largest proportions of African-American/Black, American Indian/Alaskan Native, and Pacific Islander populations. Areas served by the Columbia Corridor Drainage Districts are also more racially and ethnically diverse than the county as a whole. The unincorporated areas on both sides of the county have the lowest proportions of non-white residents.

2.3.10 Population by Primary Language Spoken

Nearly 20% of Multnomah County residents over the age of five do not speak English as their primary language at home and almost 8% speak English less than ‘very well’ as recorded by the

United States Census. These numbers are both higher than the Oregon average, reflecting the racial, ethnic, and linguistic diversity of Multnomah County. This also indicates a higher percentage of immigrants and refugees, who face additional barriers to mitigation resources beyond language access.

In Multnomah County, over 150,000 people do not speak English at home and about 60,000 have limited English proficiency. It is essential that communities and districts provide multilingual communication relating to natural hazard risks. Multnomah County has about 28% of Oregon's total population of people with limited English proficiency.

Table 6 – Population By English-language proficiency and language other than English spoken at home (US Census American Community Survey, 2019 – Table S1601)

Community	Population 5 years & over	Speak English only at home	% of total	Speak a language other than English at home	% of total	Speak English less than 'very well'	% of total
Oregon	3,948,032	3,354,986	84.7%	603,049	15.3%	216,654	5.5%
Multnomah County	767,016	614,476	80.1%	152,540	19.9%	60,019	7.8%
Incorporated Cities	749,936	599,025	79.9%	150,911	20.1%	59,611	8.0%
Fairview	9,033	7,216	79.9%	1,817	20.1%	601	6.7%
Gresham	103,168	75,743	73.4%	27,425	26.6%	11,445	11.1%
Maywood Park	1,160	1,113	95.9%	47	4.1%	16	1.4%
Portland	618,217	501,662	81.1%	116,555	18.9%	45,119	7.3%
Troutdale	14,801	11,744	79.3%	3,057	20.7%	1,261	8.5%
Wood Village	3,557	1,547	43.5%	2,010	56.5%	1,169	32.9%
Unincorporated Areas	17,080	15,451	90.5%	1,629	9.5%	408	2.4%
West Hills	3,137	2,610	83.2%	527	16.8%	133	4.2%
Sauvie Island & West Hills	2,432	2,181	89.7%	251	10.3%	97	4.0%
West of Sandy River	6,305	5,458	86.7%	847	13.4%	240	3.8%
East of Sandy River	3,880	3,439	88.6%	441	11.4%	100	2.6%
Columbia Corridor Drainage District Areas (UFSWQD)							
PEN 1 and PEN 2	3,055	2,136	70.0%	919	30.1%	268	8.8%
MCDD	10,321	6,853	66.4%	3,468	33.6%	1,361	13.2%
SDIC	6,178	3,783	61.2%	2,395	38.8%	1,054	17.1%

Not only does Multnomah County have a large proportion of residents with limited English proficiency, it also has a wide variety of represented native languages, making simple translation and outreach planning insufficient. In the 2014 5-year American Community Survey

Estimate, 30 separate languages or language groups were identified[18] as having at least 70 speakers with limited English proficiency.

Communities which do not speak English or Spanish may lack reliable access to documents and messages translated into their native language, and need additional resources for natural hazard risk communication. All residents with limited English proficiency may especially rely on relatives and social networks for information.

Of the participating communities to this plan, Wood Village has by far the highest proportion of residents not speaking English at home, as the only community with a majority of residents speaking a language other than English at home. Wood Village also has the highest proportion of residents with limited English proficiency. Gresham has the second highest proportion of each category. The City of Portland has low proportions of residents with limited English proficiency in Downtown and the Central City, but levels in Southeast Portland are similar to that in Gresham and Wood Village, making that area of East Multnomah County a particular focus area for multilingual communication and outreach.

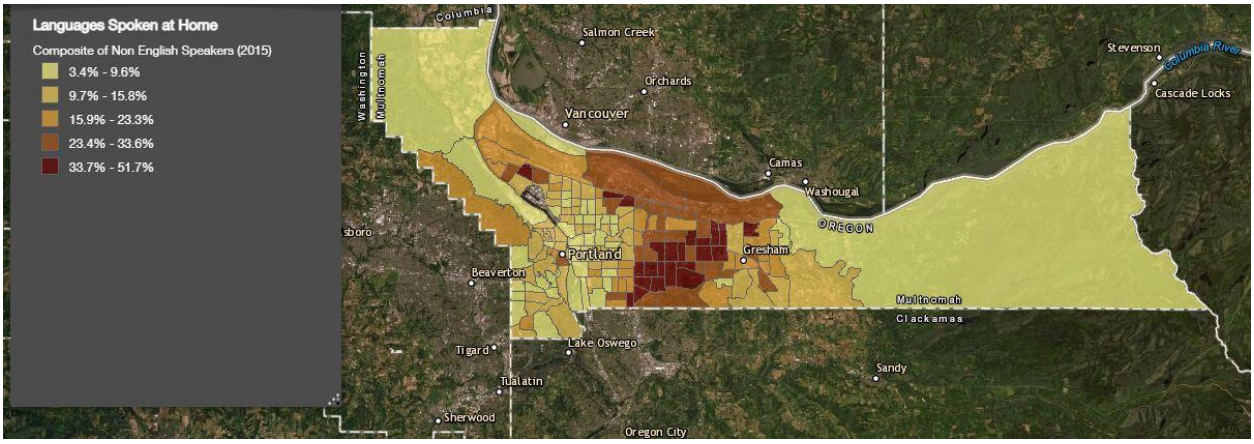

Figure 14 - Map showing frequency of non-English speaking household by census tract. Data from 2015 American Community Survey.

2.4 Socioeconomics

2.4.1 Poverty

Research indicates that poverty is a driver of risk from natural hazards[19]. There are a number of reasons why a household experiencing poverty may be more at risk from harm in a natural hazard event. Some of these reasons are that lower-income individuals and families may be:

- more likely to live in high-hazard areas due to historic and current housing market outcomes;

[18] The most common languages recorded, in order of frequency, were Spanish, Vietnamese, Chinese, Russian, Tagalog, Korean, Japanese, Arabic, Khmer, Serbo-Croatian, Laotian, Hmong, French, Thai, Persian, German, Hindi, Portuguese, Italian, Greek, Hungarian, Urdu, and French Creole. A number of other languages were classified into broader language groups.

[19] From Poverty to Disaster and Back: a Review of the Literature, *Economics of Disasters and Climate Change*, S. Hallegatte, A. Vogt-Schilb, J. Rozenberg, M. Bangalore, C. Beaudet, Issue 4 (2020), ps. 223-247

- less able to prepare for disasters because of the cost of purchasing and maintaining supplies;
- more likely to have employment that puts them more at risk from natural hazards due to requiring working outside or in unreinforced buildings;
- less able to evacuate before or during a disaster and relocate temporarily or permanently after a disaster; and
- more likely to have difficulty rebuilding after a disaster.

The official poverty rate is a federally designated calculation. In the 2020 Census, poverty rates were found to have declined in Multnomah County over the last five years due to economic growth, demographic changes, and displacement of low-income residents from the county. Gresham and Portland still have higher poverty rates than Oregon as a whole. Gresham and Fairview have higher rates of child poverty, while Portland has the highest rate of poverty among older residents. Unincorporated areas have the lowest poverty rates in the county.

Table 7 – Population by poverty rate and poverty rate by age (US Census American Community Survey, 2020 – Table S1701)

Community	Total Population	People in Poverty	Poverty Rate	Change Since 2014	Under 18 Poverty Rate	65 and Over Poverty Rate
Oregon	4,096,744	506,588	12.4%	-4.3%	15.0%	8.0%
Multnomah County	795,408	104,861	13.2%	-5.3%	16.8%	10.3%
Fairview	9,382	830	8.8%	-8.2%	27.4%	4.3%
Gresham	109,322	17,568	16.1%	-7.5%	26.2%	8.0%
Maywood Park	1.224	99	8.1%	+3.3%	7.3%	0.7%
Portland	637,260	83,223	13.1%	-5.2%	15.1%	11.1%
Troutdale	16,348	1,418	8.7%	-7.7%	11.2%	4.0%
Wood Village	4,013	501	12.5%	-17.8%	16.6%	0.0%
Unincorporated						
West Hills	3,364	130	3.9%		0.0%	1.6%
Sauvie Island & West Hills	2,460	177	7.2%		0.6%	2.1%
West of Sandy River	6,657	364	5.5%		0.4%	0.9%
East of Sandy River	4,140	285	6.9%		1.2%	0.8%
Columbia Corridor Drainage District Areas (UFSWQD)						
PEN1 and PEN2	3,155	363	11.5%		2.8%	1.6%
MCDD	9,951	892	9.0%		1.6%	0.7%
SDIC	6,362	367	5.8%		2.6%	1.0%

In 2019, Multnomah County released a report on poverty in the county. The report noted that the Federal designation of poverty undercounts those who are unable to meet basic needs and lack resources to participate as full and equal members in society. While the Federal poverty rate (from the earlier estimate) found Multnomah County to have a 16% poverty rate, the 2019 study found 34% of County residents met that threshold. The study also identified 8% of county residents in deep poverty, and therefore most vulnerable to the risk factors described above.

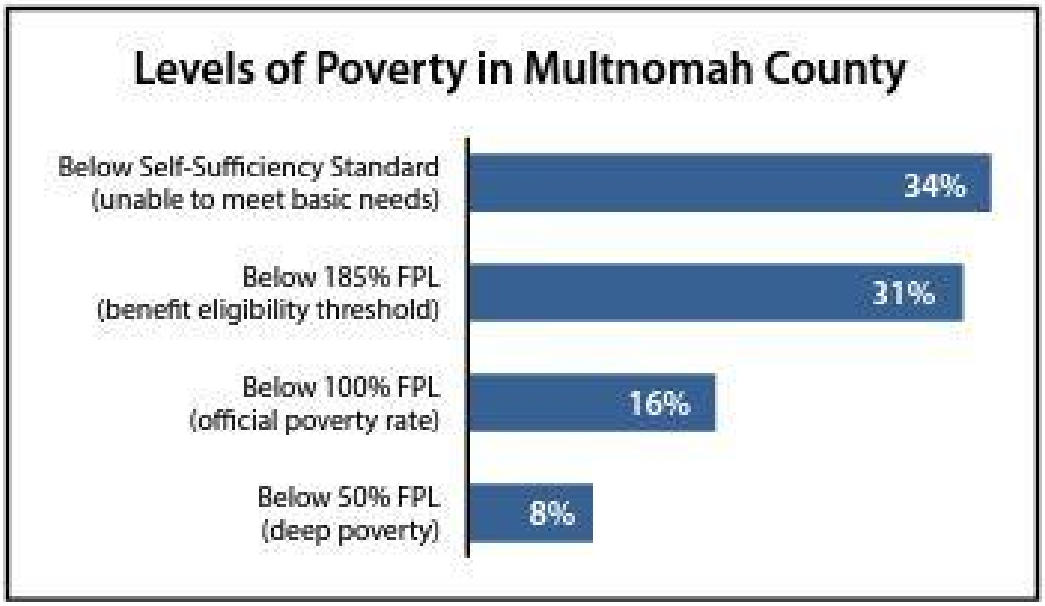

Figure 15 - Poverty rates in Multnomah County. FPL is the Federal Poverty Rate used in Census poverty counts. Data from the 2019 Poverty in Multnomah County report.

2.4.2 Economic Sectors

The largest employment sectors in Multnomah County are[20]:

- Trade, Transportation and Utilities (18.2%)
- Professional and Business Services (16.3%)
- Education and Health Services (15.4%)
- Government (14.1%)
- Leisure and Hospitality (11.4%)

Vulnerability based on employment type is hard to forecast, although Multnomah County has a large percentage of office sectors that may increase the impacts of seismic hazard because of workplace risk. The sectors themselves are subject to disruption from damaged or disrupted transportation systems. Leisure and hospitality is a key sector in Multnomah County, and is more significant than in other regional counties. A significant disaster that interrupted tourism could reduce economic resilience in much the same manner as has happened throughout the COVID-19 pandemic[21]. Services, private education, and retailing were the other sectors most disrupted by the pandemic.

The construction sector is slightly smaller than that of regional neighbors. Despite being a highly urbanized county, Multnomah County does have agricultural and forestry sectors that could be harmed by wildfire, landslide, and other hazards and pose specific hazards from heat and smoke to outdoor workers.

[20] United States Bureau of Labor Statistics, Occupational Employment and Wage Statistics, May 2021.

[21] State of Oregon Employment Department, Portland Metropolitan Area's Economic Recovery Successes and Ongoing Challenges, May 9, 2022, Amy Vander Vliet

2.5 Housing

2.5.1 Unhoused Residents

Not all residents of Multnomah County have fixed addresses, and Census data does not effectively capture numbers of people without stable housing. Multnomah County's unhoused population, especially those who are unsheltered, face some of the most severe and repeated risks from natural hazards.

Multnomah County conducts a Point In Time (PIT) census of unhoused residents approximately every two years. The most recent PIT census found 5,228 people experiencing homelessness on January 26, 2022. This was a 23% increase from the 2019 census, when 4,015 people were counted.

3,057 people in the 2022 count (about 59%) were unsheltered, meaning they lived outdoors and did not have access to emergency shelter or transitional housing. The proportion of those unsheltered while experiencing homelessness has increased since 2019 by about 1,000 additional unsheltered residents in the previous three years.

Those considered to be experiencing chronic homelessness–with a disabling condition and having been homeless for a year or more–made up 66.5% of those unsheltered in 2019[22], a sharp increase from 2017. 72% of people counted in 2019 identified at least one disability, with 25% having a chronic health condition and/or physical disability. Unsheltered residents were primarily located in Portland, but about 5% were located in Gresham and another 4% in 'East County', an area including the other cities in this plan and unincorporated areas stretching to the eastern county line. People of color were overrepresented in 2022, making up about 40% of the total count.

The high proportion of chronic health conditions among unhoused residents indicates acute risks from heat and smoke, especially considering the difficulty these residents have in evacuating dangerous areas or creating spaces with climate control or filtered air. Emergency severe weather shelters have been used to provide safer spaces during climate disasters.

Climate hazards have been the most deadly natural hazard[23] for unsheltered residents, with winter storms and extreme heat causing the greatest loss of life over the last five years. Hazards requiring evacuation may also present greater risk to the unhoused, as they may live in areas out of sight to responders and have less ability to receive warnings and evacuation alerts.

Risk to unsheltered residents from wildfire may be high in forests, along grassy levees, and other areas of the county with wildfire fuel, especially since unsheltered residents may increase fire risk due to the use of open cooking or warming fires. In the 2022 count, 10% of unsheltered residents were identified as living in woods or other open space. Flooding is also a major concern for unsheltered residents, with heightened risk along the Columbia Corridor levee system, the Sandy River Delta (also known as Thousand Acres), the Springwater Corridor along Johnson Creek, and other locations.

[22] At the time of writing, some details from the 2022 count had not yet been released.

[23] COVID-19 is not considered a natural hazard for the purpose of this plan.

Those living in temporary or emergency shelters or transitional housing rely on those facilities being resilient to seismic and climate hazards and having plans in place for evacuation or relocation.

2.5.2 Population by Housing Type

The type and quality of permanent housing makes a big difference in terms of impacts from different natural hazards.

Multi-family residences can be at higher risk from damage in earthquakes because older masonry buildings fare worse in seismic events than wood-framed homes. Collapse of multi-story buildings can lead to higher casualties, and evacuation of multi-family housing can be more difficult, especially when combined with power loss, building damage or poor visibility.

Those living on higher floors of uncooled spaces will experience greater risk during extreme heat events, as heat rises through the day and holds higher temperatures over warm nights. A correlation in deaths was found in the July 2021 Heat Dome event for those living on the third floor or higher of non-climate controlled spaces and readings have shown ambient temperatures as much as 30 degrees higher at that height than ground floor spaces outside of urban heat island areas.

Mobile homes also carry different levels of risk as compared to site-built housing. Mobile homes can be moved off their foundations by earthquake or wind if not tied down adequately, suffer more damage from floods, and may lack equivalent levels of weatherization or central climate control.

Multi-family dwellings and mobile homes make up a larger share of lower cost housing as well, so residents may already have fewer resources to prepare and more barriers to recovery. These dwellings are also more likely to be rental housing, which adds additional risk, as noted in the Housing Tenure section below.

Multnomah County has a larger proportion of multi-family housing than the State of Oregon as a whole. Troutdale and unincorporated portions of the county are the only locations with more single-family housing than the state average. The county has a much smaller rate of mobile homes than the rest of the state, except in Wood Village where they make up nearly a third of total housing units. Fairview, the areas served by the Columbia Corridor Drainage Districts, and some unincorporated portions of the county also have a rate of mobile homes at or above the state average.

Table 8 – Housing units by housing type (US Census American Community Survey, 2020 – Table DP04)

Community	Total Housing Units	Single-Family (detached or attached, not including Mobile Homes)		Multi-Family (two or more units)		Mobile Homes	
		Number	% of Total	Number	% of Total	Number	% of Total
Oregon	1,788,855	1,217,191	68.0%	427,380	23.9%	138,033	7.8%
Multnomah County	368,041	220,144	59.8%	140,515	38.2%	6,315	1.7%
Incorporated Cities							
Fairview	4,325	2,287	52.9%	1,724	39.9%	314	7.3%
Gresham	41,866	24,948	59.6%	15,689	37.5%	1,172	2.8%
Maywood Park	449	420	93.5%	29	6.5%	0	0
Portland	293,208	172,767	58.9%	116,683	39.8%	3,271	1.1%
Troutdale	5,467	4,108	75.1%	1,126	20.6%	216	4.0%
Wood Village	1,201	585	48.7%	227	18.9%	389	32.4%
Unincorporated Areas							
West Hills	1,243	1,225	98.6%	18	1.4%	0	0.0%
Sauvie Island & West Hills	1,213	1,063	87.6%	18	1.5%	97	8.0%
West of Sandy River	2,230	2,108	94.5%	87	3.9%	35	1.6%
East of Sandy River	1,602	1,432	89.4%	12	0.7%	124	7.7%
Columbia Corridor Drainage District Areas (UFSWQD)							
PEN 1 and PEN 2	1,404	767	54.6%	419	29.8%	153	10.9%
MCDD	4,321	2,716	62.9%	731	16.9%	759	17.6%
SDIC	2,737	1,808	66.1%	273	10.0%	606	22.1%

2.5.3 Housing Age

The age of a structure can be a good indicator of its ability to withstand hazard events. Seismic building standards were not introduced into the Oregon Building Code until 1974 and standards were increased again in 1995 to protect against shaking from a modeled 9.0 Cascadia Subduction Zone earthquake[24]. Buildings built these years which have not been retrofitted will be particularly susceptible to ground shaking and liquefaction from a large earthquake.

[24] Earthquake Design History, A Summary of Requirements in the State of Oregon, State of Oregon Building Codes Division, February 7, 2012

Other building code updates in high risk locations have included higher wind load standards or promotion of wildfire-resilient building materials. Older homes are also more likely to have been built in high-risk areas before some hazards were well understood or mapped.

Risk from older housing slowly lessens over time as it is retrofitted or replaced by new construction. However, census estimates do not indicate much change in housing age in Multnomah County since the last version of the plan, as numbers are also affected by annexations and variation in data estimates.

Multnomah County has a large portion of pre-1970 housing, but this is dominated by the City of Portland's many old neighborhoods. The cities included in this plan have more development built from 1970 through 1989 than before 1970, representing their rapid growth during that time span and indicating a likely higher level of seismic resilience. Unincorporated areas have a mix of pre-1970 and newer construction, depending on the location.

Table 9 – Housing units by housing age (US Census American Community Survey, 2020 – Table DP04)

Community	Total Housing Units	Pre 1970		1970 to 1989	
		Number	Percent of Total	Number	Percent of Total
Oregon	1,788,855	596,222	33.3%	529,262	29.6%
Multnomah	368,041	177,685	48.3%	77,996	21.2%
Incorporated Cities					
Fairview	4,325	571	13.2%	964	22.3%
Gresham	41,866	9,288	22.2%	18,622	44.5%
Maywood Park	449	406	90.4%	9	2.0%
Portland	293,208	165,756	56.5%	51,209	17.5%
Troutdale	5,467	444	8.1%	2,326	42.5%
Wood Village	1,201	344	28.6%	417	34.7%
Unincorporated Areas					
West Hills	1,243	449	36.1%	80	6.4%
Sauvie Island & West Hills	1,213	421	34.7%	435	35.9%
West of Sandy River	2,230	578	25.9%	898	40.3%
East of Sandy River	1,602	726	45.3%	560	35.0%
Columbia Corridor Drainage District Areas (UFSWQD)					
PEN 1 and PEN 2	1,404	233	16.6%	156	11.1%
MCDD	4,321	578	13.4%	847	19.6%
SDIC	2,737	197	7.2%	691	25.2%

2.5.4 Housing Tenure

The percentage of residents living in rental units has been slowly declining in Multnomah County, except in the City of Portland where there has been a slight increase. Unincorporated Multnomah County has a very small percentage of renters, while Fairview and Gresham have similar proportions to Portland.

Table 10 – Housing units by housing tenure (US Census American Community Survey, 2020 – Table DP04)

Community	Renter Occupied Housing Units	Renter Occupied Percent of Total	Renter Occupied Percent of Total - 2013	Owner Occupied Housing Units	Owner Occupied Percent of Total
Oregon	611,573	37.2%	38.0%	1,031,006	62.8%
Multnomah County	152,777	45.6%	45.8%	182,072	54.4%
Fairview	1,954	45.6%	48.1%	2,328	54.4%
Gresham	17,988	45.0%	47.5%	21,944	55.0%
Maywood Park	39	9.2%	14.1%	387	90.8%
Portland	129,967	46.9%	46.6%	147,175	53.1%
Troutdale	1,734	32.6%	34.0%	3,584	67.4%
Wood Village	347	31.3%	40.1%	761	68.7%
Unincorporated Areas					
West Hills	93	7.5%	14.7%	1,150	92.5%
Sauvie Island & West Hills	195	18.7%	13.1%	846	81.3%
West of Sandy River	387	19.3%	20.7%	1,617	80.7%
East of Sandy River	180	12.5%	21.4%	1,256	87.5%
Columbia Corridor Drainage District Areas (UFSWQD)					
PEN1 and PEN2	524	40.6%	-	766	59.4%
MCDD	1,123	27.4%	-	2,979	72.6%
SDIC	519	19.5%	-	2,138	80.5%

Those living in rental housing may be at higher risk from natural hazards because of relationships between rental housing and income and housing quality. In past earthquakes in other locations, rental housing has been found to be disproportionately damaged, and in the 2021 Heat Dome, those living in rental apartments without air conditioning made up a high proportion of hyperthermia deaths.

Renters are also likely to have less control in making their homes more disaster resilient and are less likely to have insurance or financial resources to allow them to recover from disaster.

Demographics of renters are also likely to intersect with traditionally underserved communities. For example, in the City of Portland's 2021 State of Housing report[25], rentership rates were found to be above 70% for Black and Hawaiian/Pacific Islander residents and above 60% for Hispanic/Latinx and Native American residents, while the rate for the city as a whole was below 50%.

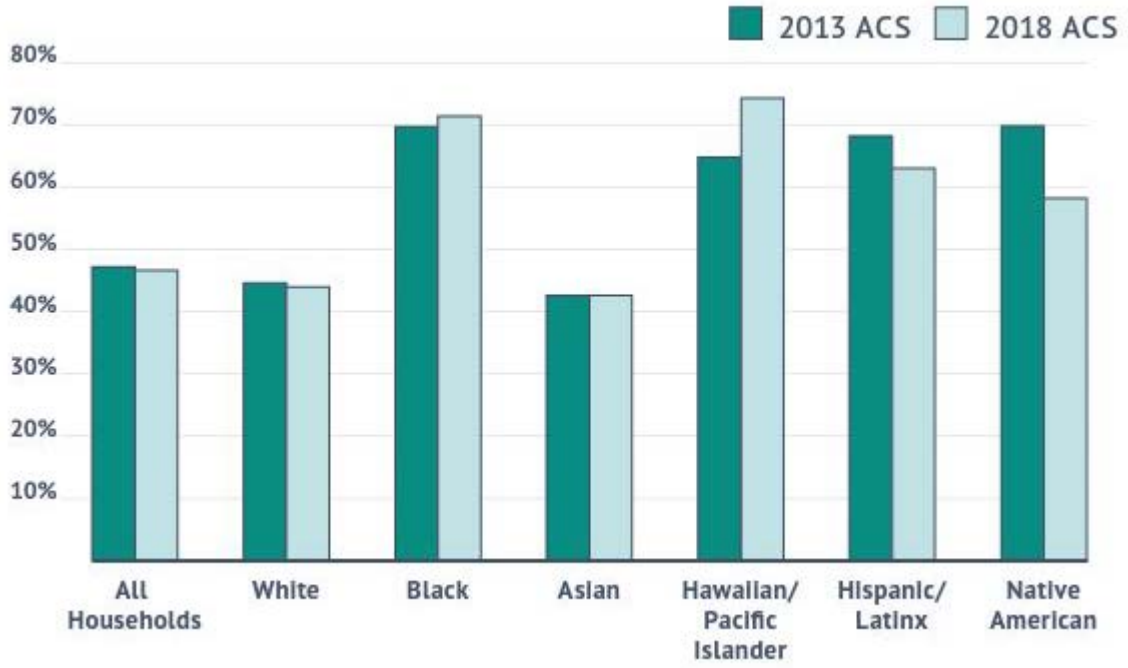

Figure 16 - Table showing rentership rates by race or ethnicity in the City of Portland. Data from the US Census American Community Surveys of 2013 and 2018

2.6 Land Use and Development

As noted in the population distribution section, urban land uses (dark gray below) are most prevalent in the center of the county.

An interactive version of this map can be found here (Land Use and Land Cover – Existing Vegetation Type)

[25] 2021 State of Housing Report, Portland Housing Bureau, p. 23

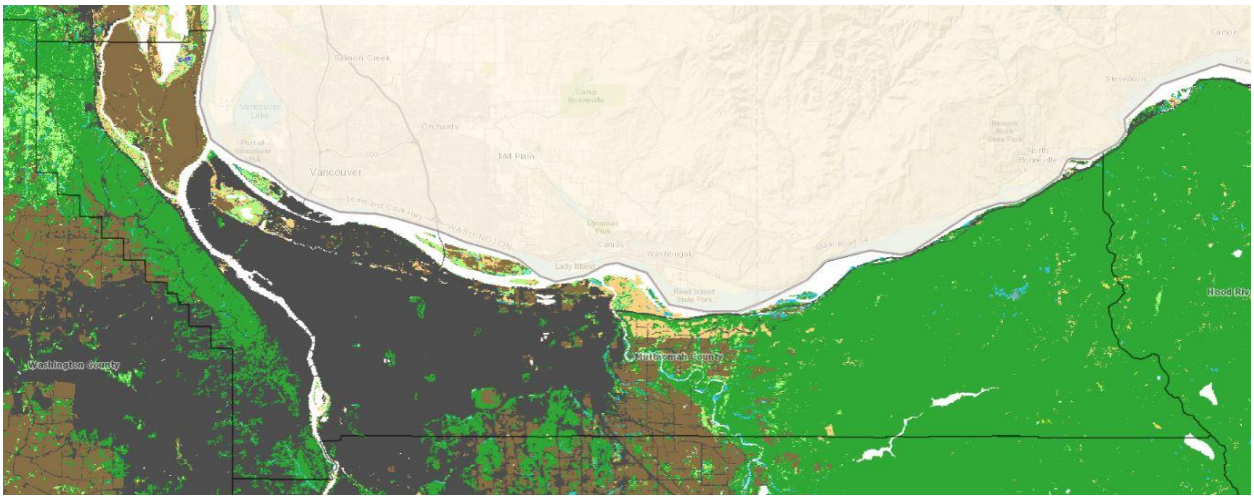

Figure 17 - Map showing vegetation types in Multnomah County. Dark grey is developed land, green is forest, brown is agricultural, and orange is grassland. Map from Oregon Wildfire Explorer via data from LANDFIRE.

The Urban Growth Boundary (UGB) identifies specific parts of the county for development to accommodate housing for the following 20 years, based on detailed growth projections. The UGB has not been expanded in Multnomah County for over 20 years, indicating the boundaries established at that time have been considered sufficient to accommodate future urban growth. Areas outside of the UGB are reserved for low-density development and the maintenance of farming, forestry, and recreational open space.

Figure 18 - Portland Metropolitan Area Urban Growth Boundary shown as a pink outline.

Areas outside of the UGB may be classified as Urban and Rural Reserves. Urban reserves are areas considered to be suitable for longer-term expansion of urban growth and would likely be the next location for expansion of the UGB. Rural reserves are those areas with high-value working farms or forests or important natural features, and are designated to remain in those uses for at least 50 years. The only Urban Reserve as of 2022 in Multnomah County is an area called East of Gresham on the Urban/Rural Reserves map. Rural Reserves cover nearly the entirety of the western unincorporated portion of the county and much of the area east of Gresham and south of the Sandy River. Areas outside of the UGB may still add low-density

development which may become threatened by all hazards, but especially those most likely to occur in rural areas, such as wildfire and landslide.

An interactive version of this map can be found at this link – (Urban Growth Boundary + Urban and Rural Reserves)

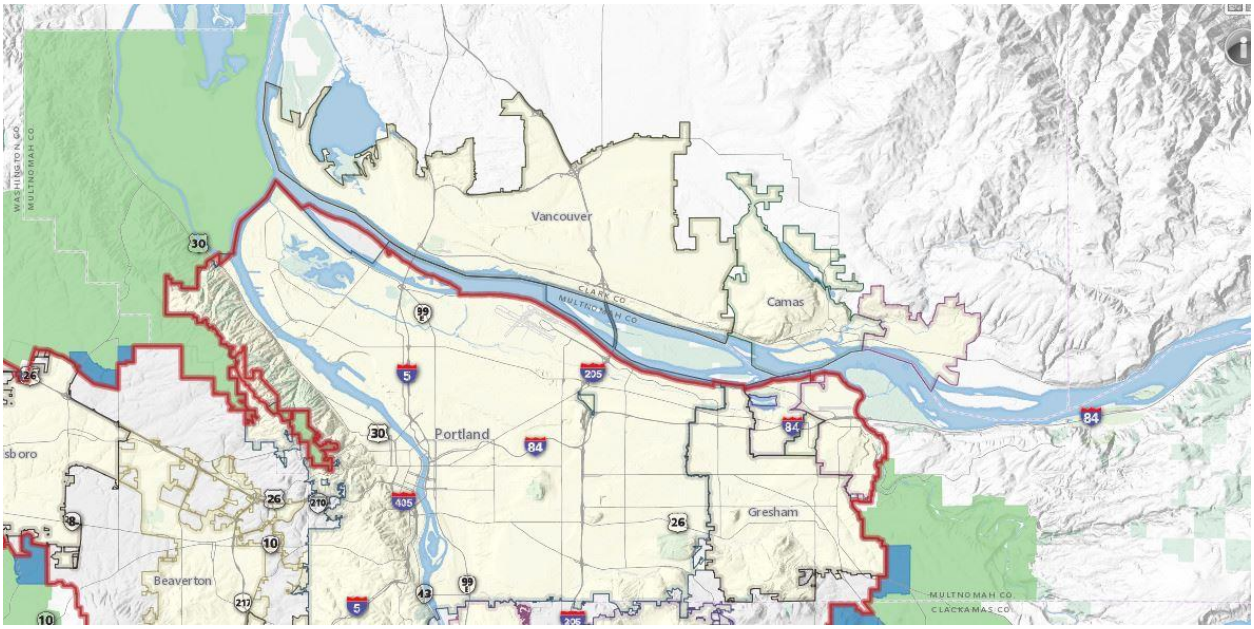

Figure 19 - Map showing the Portland Metropolitan Area Urban Growth Boundary (outlined in red), Urban Reserves (blue), and Rural Reserves (green). Data from Metro.

2.6.1 Comprehensive Plans and Zoning/Building Codes

Oregon cities and counties are required to have a comprehensive plan that is consistent with State Planning Goals and outlines long-term strategies for sustainable development. Oregon's State Planning Goal 7 refers to Areas Subject to Natural Hazards, so long-term growth strategies relating to hazards and corresponding growth management issues can be found in each jurisdictional comprehensive plan. Local zoning and land development codes are the short-term mechanisms for implementing comprehensive plan goals.

The Columbia Corridor Drainage Districts and Port of Portland have different strategic planning processes that outline how future development and capital investments will consider natural hazard resilience. The special districts are subject to land use and zoning ordinances in the jurisdictions where they operate.

The northeastern portion of the county lies in the Columbia River Gorge National Scenic Area, which has a Management Plan and set of code requirements developed by the Columbia River Gorge Commission and the U.S. Forest Service. The most recent plan was issued in 2020 and includes management strategies relating to climate action and wildfire risk reduction.

Each city in this plan and the county has a Floodplain Development Ordinance in their code as a requirement of their participation in the National Flood Insurance Program. This ordinance specifies locally-enforced requirements for flood-resilient development.

Construction standards for new or substantially rebuilt structures can be an important factor in natural hazard resilience. Building codes in Oregon are administered locally, but set at the state

level. Oregon uses the 2019 Oregon Structural Specialty Code (OSSC) for commercial buildings, the 2021 Oregon Residential Specialty Code (ORSC) for stick-built residential buildings and the 2010 Oregon Manufactured Dwelling Installation Specialty Code (OMDISC) for manufactured homes.

Generally, state building codes are min/max codes, meaning they are not allowed to be strengthened or weakened at the local level. But there are some predefined higher building standards that can be accessed by local communities with particular natural hazard risks. For example, the City of Troutdale has a stronger code for wind resistance because of persistent high winds from the Columbia River Gorge, and the State of Oregon has recently passed legislation for communities to strengthen fire codes in locations with extremely high wildfire risk.

2.7 Natural Resources

Multnomah County's rich natural resources are a major factor in its livability and economy. Despite the county's dense population, open space and urban nature has been reserved for natural resource economies and recreation. While natural resources are vulnerable in their own right to the hazards in this plan and create hazard, they also contribute to community resilience.

2.7.1 Tree Canopy

Trees in both urban and rural locations can be a risk factor to life and property when they fall during winter storms and windstorms, and trees, especially when dead or weakened by disease or pests, are a wildfire risk. But trees also play a crucial role in mitigating climate-change driven hazards, and increasing tree canopy levels is a goal among communities across the region.

Urban neighborhoods with low amounts of trees suffer significantly increased temperatures during heat waves because of lack of shade and the urban heat island effect—sunlight being absorbed and reflected by pavement and roofs. Urban street trees absorb and hold heat and filter pollutants from the air. Across the county, trees are also important in absorbing flood runoff and holding slopes in place during periods of heavy precipitation.

In urban residential areas, a lack of street trees is most common in neighborhoods with more residents of color and higher rates of poverty, which exacerbates risk for those residents with pre-existing health conditions. The Rockwood neighborhood in Gresham is an example of a high-risk area where a lack of trees and social inequality have combined to create higher levels of vulnerability to heat events.

An interactive version of this map can be found at this link

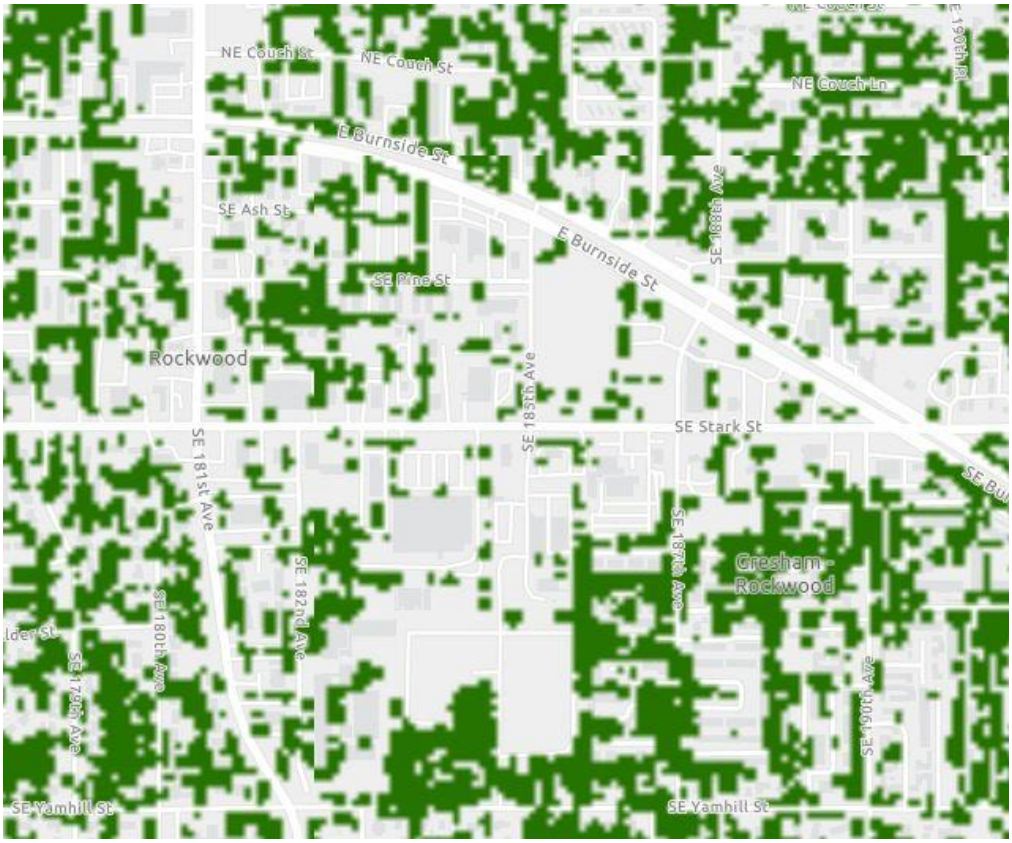

Figure 20 - A map showing locations of trees in the Rockwood neighborhood of Gresham. The triangular area bounded by E Burnside Street, SE Stark Street, and SE 181st Avenue has been identified as a high-priority area for tree planting to reduce urban heat island impacts. Map data comes from Metro and is available for all areas within the Urban Growth Boundary for comparison.

A recent study in the City of Portland found a loss of 823 acres of tree canopy between 2015 and 2020[26]. This finding is considered to be within the study margin of error and would be a change from a significant increase in the city's tree canopy over the previous fifteen years. No reasons are yet known for the decline or if the decline is statistically significant, but some possibilities are tree loss from storms, increased development, and increased tree mortality caused by climate change. The City of Portland will conduct its next count in 2025 to assess if these losses are a new trend. It is currently unknown if this effect is being repeated in other Multnomah County cities.

[26] Tree Canopy Monitoring: Protocol and Monitoring from 2000-2020; Portland Parks and Recreation, A. DiSalvo, J. Ramsey, N. Rossmiller, February 2022

2.7.2 Parks and Natural Areas

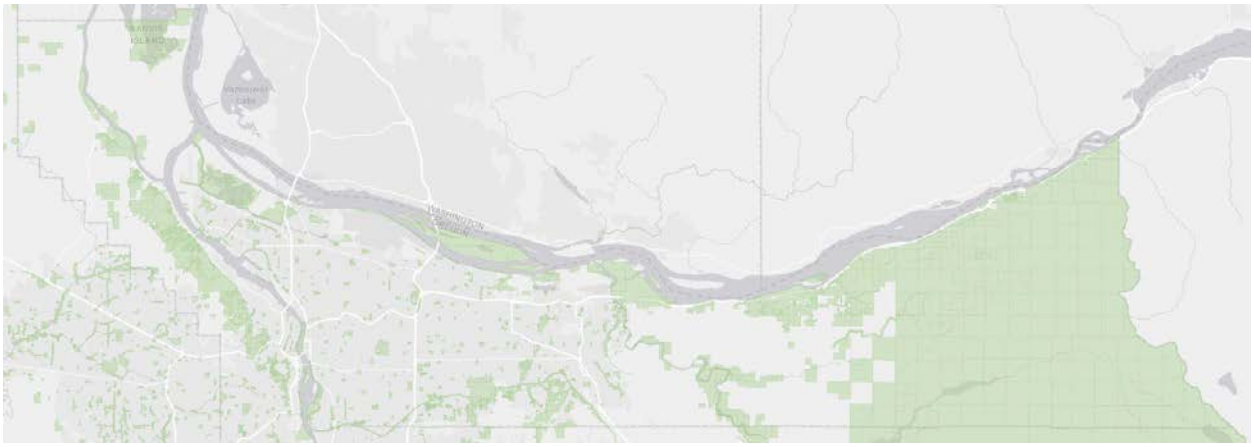

Figure 21 - Map showing location of public parks and other publicly-owned open space in Multnomah County, shown in green. Not all areas shown in green are publically accessible.

Parks in Multnomah County are operated by its cities, Metro, and State and Federal agencies. Some of the most notable parks are Forest Park (City of Portland), the Mount Hood National Forest (U.S. Forest Service), Sauvie Island Wildlife Refuge (Oregon Fish and Wildlife), Government Island (Oregon Parks and Recreation/Metro), and Oxbow Park (Metro). All of the cities included in this plan have multiple city parks. Multnomah County does not operate parks. Some publicly accessible open space is maintained for the operations of the Columbia Corridor Drainage Districts. The Port of Portland also owns natural areas in Multnomah County, with public access varying according to site.

Parks are maintained as an important public amenity, to support habitat resilience, and provide resilience to natural hazards especially when used to maintain floodplains and steep slopes. Parks are vulnerable to acute damage from extreme weather and longer-term risk from climate change that promotes invasive species and causes increased tree death.

2.8 Historic and Cultural Resources

Historic and cultural resources—which may include structures, objects, sites, and districts– provide unique insight into Multnomah County's past. Examples of these resources are unique architecture, pre-colonial artifacts, burial sites, roads and bridges, earthworks, artwork, landforms, and battlefields. These types of resources are vulnerable to many of the natural hazards cited in this plan as of particular concern in Multnomah County.

The National Register of Historic Places is an official registry for these resources. There are over 7,000 properties in Multnomah County listed individually or as part of Historic Districts. While most of those are in the City of Portland, the Cities of Fairview, Gresham, and Troutdale and unincorporated Multnomah County all have one or more listed properties.

2.9 Infrastructure and Community Lifelines

Infrastructure is the basic physical and organizational structures and facilities needed for the day-to-day operation of the entities that make up this plan.

Community lifelines include physical infrastructure for transportation energy, water, wastewater and communications – and also include public safety, health care, food systems and other services that have physical locations but are also direct human services that are essential to hazard resilience. Mitigating impacts to lifelines are a key strategy of FEMA's National Response Framework.

Work on this plan has included local public works and facilities stakeholders, and used input and published materials from infrastructure partners to help identify system vulnerabilities.

Many elements of lifelines and physical infrastructure are also included in this plan as critical facilities, a list which fills in the remaining gaps of service types not included in this section.

2.9.1 Transportation

Roads

Multnomah County is served by an extensive network of interstate highways, state highways, and locally maintained roads and streets. Key roads are essential infrastructure for mitigating disaster, as their resilience will define the ability for evacuation, movement of emergency vehicles, and transport for disaster support. Roads are also a major disaster vulnerability.

The Regional Disaster Preparedness Organization (RDPO) and Metro partnered to update an inventory of Regional Emergency Transportation Routes in 2021. The next phase of the project in 2023 will be to prioritize the routes and develop operational guidance.

The Oregon Department of Transportation (ODOT) maintains a 2012 report on Seismic Lifeline resiliency during a Cascadia Subduction Zone earthquake. ODOT has more recently worked toward developing a statewide inventory of emergency triage routes to prioritize future state road resilience investments.

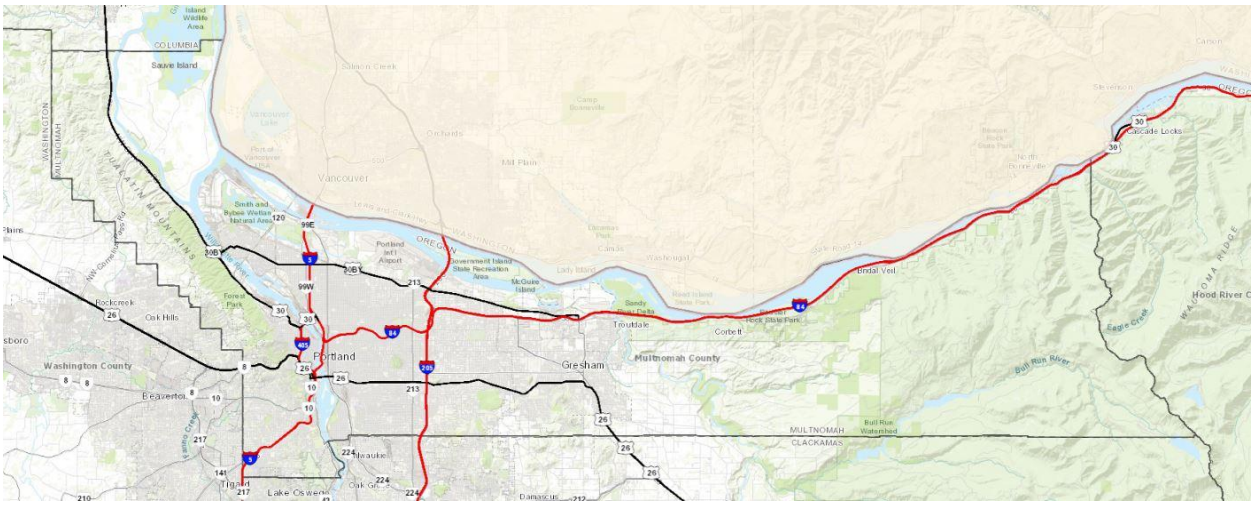

Figure 22 - Map showing the locations of major interstate (red) and state (black) highways in Multnomah County.

Interstate 5 runs north-south through the county and is the major route connecting Oregon with Washington and California. Interstate 84 originates on its western boundary in Multnomah County and travels eastwards through the Columbia River Gorge to Eastern Oregon, Idaho and Utah. Interstate 205 is a bypass highway that routes traffic through the eastside of Portland and

connects with I-5 both south and north of Multnomah County. Interstate 405 is a short bypass highway that routes traffic from I-5 through downtown Portland and connects to State Highway 26 going west.

State Highway 26 is the most used state route, connecting Multnomah County to the Oregon Coast to the west and to Mount Hood and Central Oregon to the east. Highway 30 connects Multnomah County to Columbia County and the Oregon Coast from the northwest. State Highway 99 runs north-south into Clackamas County on the south.

A key local road outside of Portland is NW Cornelius Pass Road, which cuts across the West Hills and is an important commuting route between Multnomah County and Washington County. Other key routes are listed by community or district in their respective chapters.

Bridges

The Multnomah County landscape is crisscrossed by bridges across major rivers, gorges and canyons. There are around 500 bridges in Multnomah County, including highway bridges, rail bridges and city and county bridges. The number of bridges creates natural hazard vulnerabilities, as they operate as essential transportation lifelines in disasters. Not only do bridges allow safe river crossings, many of them also carry critical infrastructure, such as water and sewer distribution lines. If bridges fail during disaster, it will create cascading impacts to response and recovery.

Of the eleven major Willamette River crossings that link the east and west sides of the county, six are operated by Multnomah County, three by the Oregon Department of Transportation (ODOT), one by Union Pacific, and one by Metro. The Sellwood Bridge (Multnomah County) was replaced in 2016 and a project is currently underway to replace the Burnside Bridge (Multnomah County) with a more seismically stable span. A new seismically-stable transit and pedestrian bridge, the Tilikum Crossing (TriMet), was completed in 2015 and is also designed to provide river crossing by emergency vehicles in a disaster. The Hawthorne Bridge (Multnomah County), Broadway Bridge (Multnomah County), Steel Bridge (Union Pacific) and St. John's Bridge (ODOT) continue to have major vulnerability to earthquakes.

There are three major bridge spans across the Sandy River in Multnomah County. The Highway 84 Sandy River Bridge was replaced in 2004. The Troutdale Bridge, an ODOT crossing built in 1912, is planned for repairs beginning in 2024 that will reduce potential flood damage. The Stark Street Bridge (Multnomah County) was built in 1914 and retains significant vulnerability.

The Sauvie Island Bridge (Multnomah County) spans the Multnomah Channel, and is the only connection between the Sauvie Island community and the rest of the county. The bridge was rebuilt in 2008 to withstand a seismic event.

Public Transportation

TriMet is the regional body that administers light rail, streetcar and bus service across much of Multnomah County, connecting internal locations as well as to locations in Washington and Clackamas Counties. The public transportation system is another key method of movement of people across the county, and faces similar vulnerabilities as road and bridge systems that it shares.

Public transportation has developed some unique resilience components and vulnerabilities as well. Bus and train service has become an essential piece of movement to and from emergency shelters, especially for those without housing. Conversely, extreme weather can cause system delays and stoppages during periods where personal transportation may be disrupted and need for emergency shelter is highest.

Air and Marine Transportation Facilities

Significant air and marine facilities are operated by the Port of Portland in the region. Within Multnomah County, Port facilities include the Portland International Airport (PDX), the Troutdale Airport, and marine terminals along the Columbia and Willamette Rivers. As the Port of Portland is a participant in this plan, detailed information about air and marine core capacities and vulnerabilities can be found in its district chapter.

Rail

Significant amount of freight rail service passes through Multnomah County. Nearly all Class I rail routes are operated by Burlington Northern and Santa Fe (BNSF) or Union Pacific (UP). These two companies also operate a number of important rail yards and terminals to manage freight and equipment. Rail networks are important connectors for economic activity and are also vulnerable to impact from earthquakes, landslides, wildfires and floods. Some important infrastructure is under private rail company ownership, including bridges and embankments in flood-prone areas.

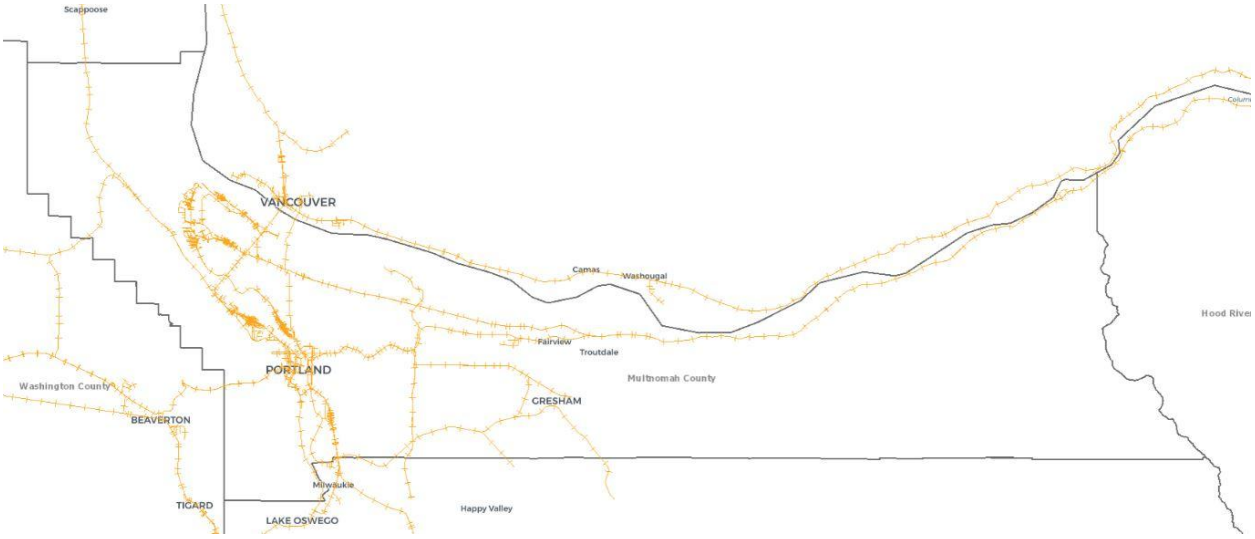

Figure 23 - Map showing location of rail routes in Multnomah County (orange).

Passenger rail is served by Amtrak, using the rail infrastructure owned by the above-mentioned freight companies.

2.9.2 Utilities

Water

Drinking water systems in Multnomah County are subject to threat from seismic events that could damage infrastructure. Landslides, floods and fires could impact water quality due to sedimentation of surface waters. Most Multnomah County residents get water from either the

Bull Run Watershed or from aquifer wells located in the historic Columbia River floodplain. These water sources have created resilience to drought, as both sources recharge year-round, and are not reliant on melting snowpack to maintain water levels during the summer.

Bull Run Watershed

The Bull Run Watershed provides drinking water for nearly the entire City of Portland, and drinking water is also purchased by a number of other water districts. Runoff in the 102 square-mile watershed is collected in reservoirs, treated and then piped throughout the county.

Figure 24 - Photo of Bull Run Reservoir, from the City of Portland's About the Bull Run Watershed webpage.

A major risk to the Bull Run watershed is wildfire, which could result in landslide and slope erosion and subsequent sedimentation of the water supply. Water infrastructure could also be damaged by an earthquake, although the watershed is located in a less susceptible earthquake risk area than the Columbia River Aquifer wellfield.

Columbia River Aquifer Wells

The second-largest source of water are the aquifers located on the south side of the Columbia River.

This water source is not quite as plentiful as the Bull Run Watershed, but is resilient to drought and also to sedimentation, since the water source is located below ground. Wells, pipes, reservoirs, treatment facilities and other infrastructure are still vulnerable, especially to seismic risk. The well field is located within soil liquefaction areas with high risk from seismic damage.

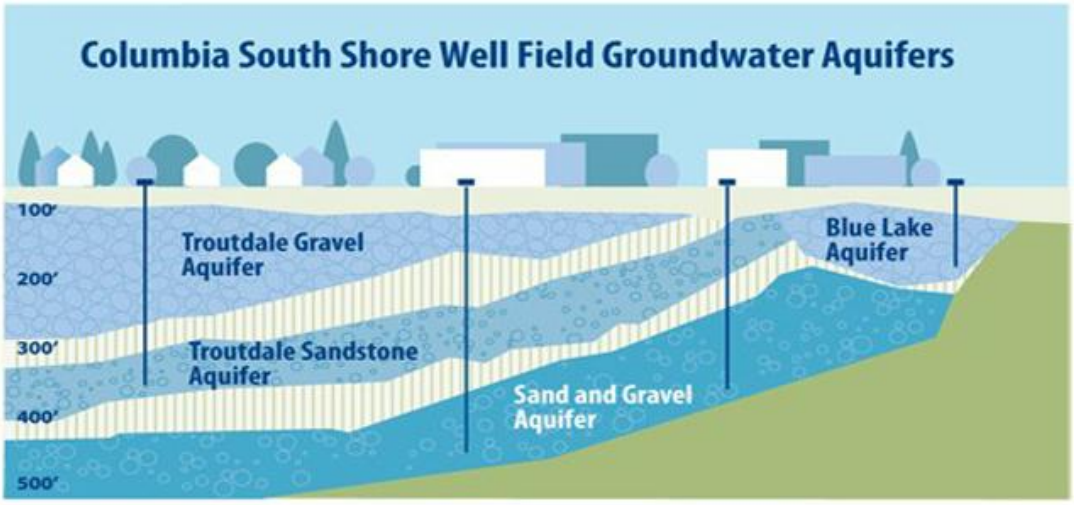

Figure 25 - Graphic showing operation of Columbia South Shore aquifer wells. Figure from the Portland Water Bureau's About the Columbia South Shore Well Field webpage

Water Utilities

The following utilities serve residents of Multnomah County. The source of water as of 2022 is included.

- Burlington Water District – Serves 280 people as of June 2020 in the unincorporated community of Burlington in the Northwest portion of Multnomah County. Water comes from the Portland Water Bureau's Bull Run Reservoir, supplemented by the Columbia South Shore Well Field.

- City of Fairview – Serves most of the City of Fairview (a small portion of the city is served by the Rockwood Water People's Utility District) via wells located within the municipal limits.

- City of Gresham – Has served the City of Gresham with water mostly from the City of Portland's Bull Run Reservoir and supplemented by the Columbia South Shore Well Field. As part of a partnership with the Rockwood People's Utility District, Gresham will fully replace that water supply with water from local aquifer wells by 2026.

- City of Troutdale – Troutdale serves 15,000 residents and 200 businesses with potable water. The water is drawn from six aquifer wells in the city and is stored in four reservoirs.

- City of Wood Village – Wood Village provides water to residents from three independent wells in the Troutdale Aquifer. The city maintains three reservoirs for storage.

- Corbett Water District – Provides water to 1,100 addresses via 65 miles of pipe over 11,000 acres centered in the unincorporated community of Corbett. Water comes from

the North Fork and South Fork of Gordon Creek[27], making this district one of the only ones in Multnomah County that uses surface water.

- Lusted Water District – Serves about 1,200 people east of and adjacent to the City of Gresham. Water is purchased from the City of Portland and comes from the Bull Run Reservoir, supplemented by the Columbia South Shore Well Field.

- Palatine Hill Water District – Serves about 1,580 people in Multnomah (80%) and Clackamas County (20%) on the west bank of the Willamette River. Water is purchased from the City of Portland, coming from the Bull Run Reservoir and supplemented by the Columbia South Shore Well Field.

- Pleasant Home Water District – Serves about 1,415 people in unincorporated Multnomah County southeast of Gresham. Water is purchased from the City of Portland, and comes from the Bull Run Reservoir and supplemented by the Columbia South Shore Well Field.

- Portland Water Bureau – The Portland Water Bureau is the largest water provider in Multnomah County and the region, serving nearly one million people from the Bull Run Watershed and Columbia South Shore Well Field. The Portland Water Bureau has more than 2,200 miles of water mains and delivers about 100 million gallons of water daily.

- Rockwood Water People's Utility District (RWPUD) – Serves about 66,000 people in Portland, Gresham and Fairview. Water has historically mostly come from the Portland Water Bureau's Bull Run Reservoir, supplemented by the Columbia South Shore Well Field. Increasingly, RWPUD has been developing its own aquifer wells and is partnering with Gresham Water as part of the Cascade Groundwater Alliance.

- Sunrise Water Authority – Service area is primarily in Clackamas County around Happy Valley, with a very small area in Multnomah County north of SE Clatsop Street. Water is taken from the Clackamas River and groundwater wells.

- Valley View Water District – Serves about 400 customers in unincorporated southwestern Multnomah County. Water is purchased from the Portland Water Bureau, coming from the Bull Run Reservoir and supplemented by the Columbia South Shore Well Field.

- West Slope Water District – Serves 10,300 people almost entirely in Washington County, but with a small service area in southwestern Multnomah County adjacent to the Valley View Water District. Water is purchased from the City of Portland and comes from the Bull Run Reservoir and supplemented by the Columbia South Shore Well Field.

Wastewater and Stormwater Management

Sewer infrastructure is at risk from seismic events which can damage underground and aboveground conveyance pipes and treatment facilities. Flood, landslides and wildfire can also

[27] 2021 Corbett Water District Annual Water Quality Report

damage aboveground infrastructure. Each city in the plan maintains wastewater systems as part of city utility programs:

- City of Fairview – Maintains sewer conveyance infrastructure, with sewage treatment performed via contract by the City of Gresham.
- City of Gresham – Treats 13 million gallons of sewage daily for 114,000 residents, including residents of Fairview and Wood Village.
- City of Troutdale – Treats 1.4 million gallons of sewage daily, via 50 miles of sewer lines and eight pump stations.
- City of Wood Village – maintains sewer conveyance lines, with 13 miles of gravity sewer, 300 manholes and three pumping stations. Sewage treatment is performed via contract by the City of Gresham.

The Port of Portland and Columbia Corridor Drainage Districts are served by municipal providers, consistent with utility service boundaries at each location.

Multnomah County does not provide wastewater services. Residents outside of municipal treatment areas get septic system permits through the City of Portland. Two additional wastewater service providers operate in Multnomah County. Clean Water Services, the primary wastewater utility in Washington County, serves a small number of customers in western unincorporated Multnomah County between the City of Portland and Washington County. The Dunthorpe-Riverdale Sanitary Sewer District serves 571 residents in the unincorporated Dunthorpe neighborhood in southwest Multnomah County. The district is managed by Multnomah County with service contracted through the City of Portland.

In areas with impervious surfaces, management of stormwater is important to prevent flooding and erosion during heavy rain and snow events. Stormwater runoff can also damage water quality and habitats. Improving the resilience of stormwater systems can be a mitigation strategy to reduce flooding or to make the systems, which are often combined with wastewater systems, more resilient to seismic damage or flood overflow.

Each of the participating cities in the plan provide stormwater services within their municipal boundaries by having storm sewer infrastructure and management plans. Multnomah County provides stormwater services along county roads inside city limits and in unincorporated areas that are dense enough to require stormwater management planning. The Columbia Corridor Drainage Districts have stormwater management as a primary function, and operate pumping stations to manage stormwater in the internal wetlands behind the levees. The Port of Portland has its own storm sewer and stormwater management plan, which includes the treatment of deicing solution before it is carried into local watercourses.

Electricity

The Oregon Public Utility Commission regulates electric utilities to manage risk statewide from earthquake and wildfire. Power infrastructure is at risk from a seismic event, and can cause or be damaged by wildfire. Long-term power outages are a major vulnerability for some of Multnomah County's most at-risk residents, and local power utilities participate in hazard mitigation planning to reduce risk of fire and share strategies for supporting customers during outages.

The Bonneville Power Administration (BPA) provides wholesale electricity to local providers from the Bonneville Dam in eastern Multnomah County, the only major power generation facility in the county. The dam also provides flood protection during high water events. BPA operates high-tension power lines in Multnomah County and coordinates in wildfire mitigation efforts.

Four electricity providers provide services directly to residences and businesses in Multnomah County:

- Portland General Electric (PGE) – A private utility which is the largest power provider in Oregon and the primary electric utility in Multnomah County, completely serving all cities other than Portland as well as most unincorporated areas.
- PacifiCorp (Pacific Power) – A private utility which is the second-largest electricity provider in Oregon. Service in Multnomah County is located in Central and North/Northeast Portland, including the Portland International Airport and part of the Multnomah County Drainage District.
- Cascade Locks City Electric – A city utility provided by the City of Cascade Locks in Hood River County. Service extends across the county line into Multnomah County through the Columbia River Gorge ending roughly at NE Henderson Road.
- Columbia River Public Utility District (Columbia River PUD) – A community owned utility that serves 19,000 meters, almost entirely in Columbia County. A small service area in Multnomah County extends along State Highway 30 to the northern county line.

Liquid Fuel

Multnomah County includes the Critical Energy Infrastructure (CEI) hub, Oregon's largest liquid fuel terminal. The CEI Hub is located in the City of Portland along the Willamette River in an area with wet soils and high seismic risk.

The terminal holds about 90% of Oregon's refined gasoline, making it a critical piece of statewide infrastructure that is essential to day-to-day economic activity and disaster response and recovery. Increasing the resilience of the facility to earthquakes is an urgent mitigation need that is being pursued, but is complex because of the size, importance, and vulnerability of the terminal.

Oregon Senate Bill 1567 was passed in 2022, and gives the Oregon Department of Environmental Quality the authority to evaluate the seismic vulnerability of fuel tanks and require facilities to develop a risk minimization plan. A rules advisory committee is currently working on implementation policy, with an aim to have new rules completed by Fall 2023 and perform facility assessments by Summer 2024.

In addition to gasoline, the CEI hub also holds and transfers jet fuel, natural gas, and many other liquid fuels. Other infrastructure at risk beyond the tanks themselves at the facility are electrical substations, pipelines and transmission lines.

Delivery of natural gas to homes and businesses is provided by NW Natural, a private utility based in Portland, to all of Multnomah County. NW Natural coordinates with regional bodies in emergency management and hazard mitigation work. Increasing the resilience of major transmission mains to seismic risk is a priority, with flexible piping a key strategy. NW Natural also promotes the installation of excess flow valves to restrict the flow of gas to a meter if a main is damaged.

Communications

Several providers of telecommunications services operate in Multnomah County, providing phone and internet service. Landline phone service continues to be especially important in rural areas, with older populations and locations where cellular service may not be reliable because of mountainous topography.

Communications resilience is essential for messaging during disasters. Loss of power to cell towers because of fire or earthquake damage can be mitigated through redundancies and power backup systems. Messaging before or during disasters is guided by the Oregon State Emergency Alert System Plan and through coordination of regional emergency management partners, using opt-in or universal alert tools.

211 is a non-profit organization funded by state and municipal contracts to connect residents with governmental resources and help identify which resources can support them. 211 is a key partner in directing response resources but also supports at-risk communities to become more familiar with governmental resources and programs that may increase disaster resilience.

Television and radio stations, newspapers, and other news websites also play an essential role in risk messaging.

2.9.3 Emergency Services

Fire Services

Nine fire departments serve locations across Multnomah County, including through contract agreements with cities and Rural Fire Protection Districts. Fire services are critical hazard mitigation partners.

- *Cascade Locks Fire* (responds to calls by opt-in residents in a structurally unprotected area in the northeastern corner of the county, near the border with Hood River County)
- *Corbett Fire*
- *Gresham Fire* (also provides contracted fire service to the Cities of Fairview, Troutdale, and Wood Village, and to Rural Fire District 10 in unincorporated Multnomah County)
- *Lake Oswego Fire* (serves areas in the City of Lake Oswego located in Multnomah County and provides contracted fire service to Riverdale Rural Fire District 11)
- *Port of Portland Fire and Rescue* (responds to the Portland International Airport and surrounding properties through mutual aid agreements and to other jurisdictions when requested)
- *Portland Fire and Rescue*
- *Sauvie Island Fire*
- *Scappoose Fire*
- *Tualatin Valley Fire and Rescue*

Wildland fire response is coordinated through the Oregon Department of Forestry (ODF) and the U.S. Forest Service (USFS). ODF serves rural portions of the county through offices in Molalla (east) and Forest Grove and Columbia City (west). USFS supports firefighting response in the Mount Hood National Forest and the Columbia River Scenic Area. ODF also provides wildfire protection for State Parks.

More detailed wildfire information can be accessed in the 2011 Multnomah County Wildfire Protection Plan, which is currently in an update process.

Law Enforcement

Four police agencies provide police service to Multnomah County. These resources are crucial public safety partners during response, and can serve as partners in mitigation planning by assisting in the identification of response gaps and community-based vulnerability.

- *Gresham Police*
- *Multnomah County Sheriff's Office* (provides service in unincorporated Multnomah County and contracted service to the Cities of Fairview, Troutdale, and Wood Village)
- *Port of Portland Police* (responds to the Portland International Airport and surrounding properties through mutual aid agreements and to other jurisdictions when requested)
- *Portland Police Bureau*

2.9.4 Critical Facilities

A 2017 inventory of Critical Facilities is contained in Annex F- Human-Caused and Technological Hazard Identification and Risk Assessment. Critical facilities among partners are divided into three categories.

Emergency Services Critical Facility Inventory

- Ambulance Services
- Fire Stations
- Hospitals
- Licensed Medical Facilities
- Law Enforcement Facilities
- Urgent Care Centers

Administrative Critical Facility Inventory

- Airports
- City Halls
- Community Centers
- County Assets
- Libraries
- Marine Terminals (newly added)
- Pump Stations (newly added)

Special Population Critical Facilities

- Childcare Facilities
- Homeless Shelters
- Jails
- Residential Care Facilities
- Schools

New Critical Facility Data

In this update, the Critical Facility data has been largely maintained from the 2017 plan, with two new categories of critical facility—pump stations and marine terminals—added to reflect the inclusion of the Columbia Corridor Drainage Districts and Port of Portland into this plan. A more thorough update of specific critical facility locations and types is a priority action put forth in this plan, and is hoped to be undertaken before the next required NHMP update. A challenge for maintaining a critical facility inventory is that some types of facilities included are numerous and are constantly changing. For those types of facilities, it is essential that current risk mapping is available and used when siting new facilities that will become essential post-disaster lifelines. Upcoming recovery planning will also work to provide additional stakeholder input into post-disaster lifeline identification.

Other important changes to Critical Facility analysis are:

- Increasing the City of Troutdale's City Hall locations from one to three after the closure of the previous City Hall and the dispersal of city administration to three separate sites.
- Adding the overpass bridge at NE 238th Avenue and Interstate 84 to the City of Wood Village.