Appendix A: Planning Area Profile

1. Introduction

A complete profile of the planning area's characteristics is important to fully understand the area's vulnerability and resilience to natural hazards. The information in this appendix, along with the hazard assessments in Volume 1, Section 2, should be used as the basis and justification for the risk reduction mitigation actions identified in Volume 1, Section 3 and participant annexes.

The planning area for this plan is for Washington County and includes the following jurisdictions and special districts:

- City of Beaverton[550]
- City of Cornelius[551, 552]
- City of Forest Grove[2, 3]
- City of Hillsboro
- City of North Plains[2]
- City of Sherwood[2]
- City of Tigard
- Clean Water Services (CWS)[2]
- Tualatin Hills Park & Recreation District (THPRD)[2]
- Tualatin Valley Water District (TVWD)[2]
- Washington County

This appendix covers the following categories and provides a broad inventory of the following attributes of the planning area:

- Natural environment characteristics
- Social and demographic information
- Economic data
- Built environment capacity
- Community connectivity capacity
- Political capacity

[550] The City of Beaverton NHMP was adopted in 2020. This plan was updated and incorporated into the 2023 Washington County plan as the City's annex.
[551] Did not participate in the 2017 Washington County NHMP.
[552] The cities of Cornelius and Forest Grove had a joint NHMP that was adopted in September 2011. The 2011 plan was updated and incorporated into this plan as separate annexes for the cities.

1.1. Natural Environment Characteristics

The natural environment includes the geography, climate, and land cover of the planning area that maintains clean water and air and a stable climate.[553] Natural resources such as wetlands and forested hill slopes play significant roles in protecting communities and the environment from weather-related hazards, such as flooding and landslides. However, natural systems are often impacted or depleted by human activities, adversely affecting community resilience.

1.1.1. Geography

Washington County is in northwestern Oregon, just west of the City of Portland. The County is primarily rural in the west and heavily developed with urban infrastructure in the east, and the central portion of the County is in the Tualatin Valley. Washington County is approximately 727 square miles and is part of the tri-County metro area comprised of Multnomah, Clackamas, and Washington Counties. It is bounded to the north by Columbia County, to the east by Multnomah and Clackamas Counties, to the south by Yamhill County, and to the west by Tillamook County. The western part of Washington County, where it meets the mountains of the Northern Oregon Coast Range, is forty miles from the Pacific Ocean. Dominant features of the County landscape are the Coast Range Mountains on the west, the Tualatin Mountains on the north, the West Hills of Portland on the east, and the Chehalem Mountains on the south. Also prominent are Cooper and Bull Mountains in the southeast and Bald Peak in the southwest. The agriculturally rich Tualatin Valley lies between the mountain ranges and hills.

The valley ranges from 120 to 300 feet above sea level. The topography is rolling and lacks dramatic changes in elevation except in the foothills and mountains surrounding the central valley. The foothills and the uplands range in elevation from 1,300 to 3,500 feet. The highest point in the County is Saddle Mountain in the Northern Oregon Coast Range near the border of Tillamook and Washington Counties, with an elevation of 3,464 feet.

[553] Mayunga, J. (2007). Understanding and Applying the Concept of Community Disaster Resilience: A capital-based approach. Summer Academy for Social Vulnerability and Resilience Building.

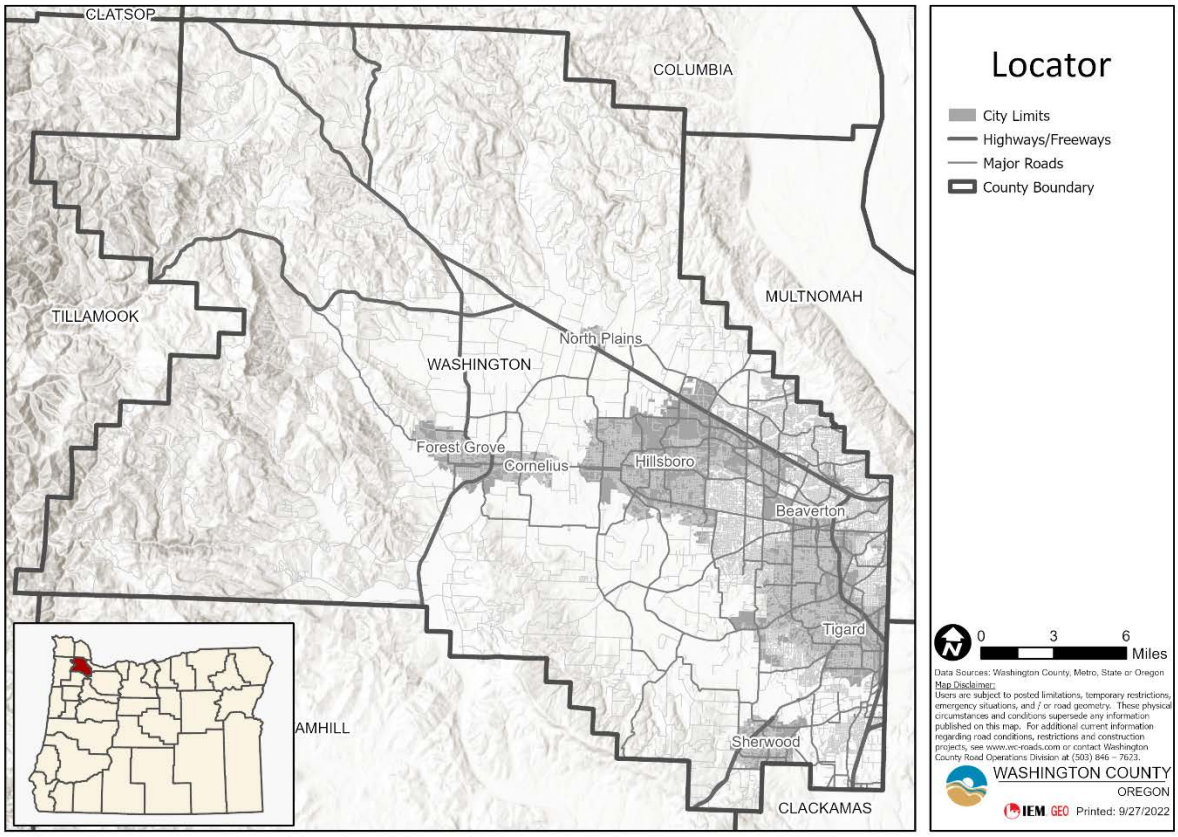

Figure 44: Washington County, Oregon

Washington County has a long growing season and mild temperatures, which lead to a wide range of agricultural activities. Seasonal flooding, high ground water, and soil erosion cause most of the non-urban drainage problems in the County. When maintained in their natural state, Washington County's wetlands control runoff and decrease soil erosion and water pollution while reducing potential damage from flooding and helping to recharge groundwater supplies.

1.1.1.1. Tualatin River

The Tualatin River, one of the many natural features of the County, starts in the northern Oregon Coast Range and flows to the Willamette River near the City of West Linn in Clackamas County. The Tualatin River is a major source of drinking water for the cities of Cornelius, Hillsboro, and Beaverton. It is also a source of irrigation water and provides aquaculture and recreation opportunities for many Washington County communities. The Tualatin River also serves as a channel for the discharge of treated wastewater.

In the southern portion of the County, Wapato Creek drains from the Chehalem Mountains. In the west, Scoggins and Gales Creeks drain part of the Coast Range; while McFee and Chicken Creeks drain the northeast slopes of the Chehalem Mountains, and Fanno Creek drains the valley floor and Portland's west hills. Dairy Creek with McKay Creek as a tributary drains portions of the Coast Range and Tualatin Mountains in the northwest of the County. In the north portion of the County, Beaverton Creek, a tributary to Rock Creek, drains a large portion of the valley and the Portland West Hills.

The Tualatin River and its tributaries flow through low foothills, terraces, and floodplains that naturally drain the area under normal circumstances. It is generally a slow-moving river draining and preventing flooding through the collection and flow of water from rain and snow melt in the Chehalem Mountains, Coast Mountain Range, Portland's West Hills, and the Tualatin Mountains.

Scoggins Dam, located near the town of Gaston in southwestern Washington County, stores runoff from the Scoggins Creek watershed upstream from its confluence with the Tualatin River. The dam forms a reservoir, Henry Hagg Lake, which provides active water storage capacity of about 59,910 acre-feet. The dam and reservoir are owned by the Bureau of Reclamation and operated by the Tualatin Valley Irrigation District. The facility provides flood control, irrigation water, municipal water supply, water quality benefits, and recreation.

1.1.1.2. Minerals and Soils

The characteristics of the minerals and soils present in Washington County indicate the potential types of hazards that may occur. Rock hardness and soil characteristics can determine if an area will be prone to geologic hazards such as landslides. The four mineral and soil types in Washington County are valley fill and semi-consolidated sedimentary rocks, basaltic lavas, marine sedimentary rocks, and Eocene age volcanic and sedimentary rocks.

The surface material includes unconsolidated, fine-grained deposits of Willamette silt, sand, and gravel, and recent floodplain deposits. Torrential flood events can lay down large deposits of sand and gravel. Sandy silt and silt containing clay are moderately dense and firm, and are primarily considered to be prone to liquefaction, an earthquake-related hazard. Basaltic lava consists mainly of weathered and non-weathered, dense, fine-grained basalt. Though the characteristic of this lava may offer solid foundation support, landslides are common in many of these areas where weathered residual soil overlies the basalt. Understanding the geologic characteristics of Washington County is an important step in hazard mitigation and avoiding at-risk development.

1.1.1.3. Geologic Faults

Washington County, like most of the Pacific Northwest, is within the shake zone of the Cascadia Subduction Zone (CSZ), where the Juan de Fuca and North American Plates meet under the earth's crust. The presence of crustal faults within Washington County also indicates potential seismic activity within the County. In addition to the CSZ, the Portland Hills and Gales Creek Fault Zones also run through the County. There are active volcanoes in the vicinity of the County, including Mount St. Helens in the south of Washington State, and Mount Hood, southeast of Portland.

Identifying risks posed by natural hazards and developing strategies to reduce the impact of a hazard event can assist in protecting the life and property of citizens and communities. Residents and businesses can work together with the County to create a natural hazards mitigation plan that addresses the potential impacts of hazard events.

1.1.2. Climate

Washington County's climate is moderate year-round. The western edge of the County is only 40 miles from the Pacific Ocean, which provides a modified marine climate. Extreme summer and winter temperatures are moderated by the airflow moving across the County from the Pacific Ocean. The Cascade Mountains to the east of the County act as a barrier that prevents the colder continental air masses originating in the artic areas of Canada from reaching the County. Occasionally, extreme temperatures can occur when the airflow comes in from the east flowing west through the Columbia Gorge and across the Cascade Mountains. If the east winds occur when rain is falling, the result can be freezing rain and snow in the County.

Much of Washington County is protected from severe wind and weather conditions by the surrounding mountain ranges. Snowfall is relatively rare, with only about five days of measurable snowfall each year. The few times that snow falls each year, it generally melts off within one to three days. Ice can occur more frequently in higher elevations in the County.

Washington County's rainy season happens between October and April. The County has an average annual precipitation of 47 inches, including 44 inches of rain and 3 inches of snow. Strong storm systems can develop at higher altitudes in the upper-level flow over the Pacific Ocean during the rainy season and bring rain to the lower elevations and snow to the higher elevations.

1.1.2.1. Climate Change

Washington County is experiencing a change in climate that is expected to continue for the foreseeable future. Observed and projected trends in climate include an increase in average temperature, increases in precipitation during the wet season and a decrease in precipitation during the summer, and decreased snow cover and snowpack.[554] Potential impacts of climate change on the frequency and magnitude of each hazard are in the hazard profiles in Volume 1, Section 2.

Established and emerging understanding of observed and projected climate change in the County, and knowledge of the opportunities and risks that climate change poses to natural and human systems, may serve as a resource for actions, including, but not limited to, planning for mitigation of climate-related natural hazards and implementation of Oregon's 2021 Climate Change Adaptation Framework.[555]

1.1.2.2. Environmental Assets

Planning participants identified the following areas as important environmental and natural resources and assets:

- 114th Avenue Wetlands Natural Area
- 155th Avenue Wetlands Natural Area
- A.M. Kennedy Park
- Adams Wetlands Natural Area
- Aspen Wetlands Natural Area
- Bales Wetlands Natural Area
- Bannister Creek Greenway
- Barney Reservoir
- Barsotti Park
- Bauman Woods Natural Area
- Beacon Hill Wetlands Natural Area
- Beaverton Creek Greenway
- Beaverton Creek Wetlands Natural Area

[554] Dalton, M., & Fleishman, E. (Eds.). (2021). Fifth Oregon Climate Assessment. Oregon Climate Change Research Institute, Oregon State University, Corvallis, Oregon. https://blogs.oregonstate.edu/occri/oregon-climate-assessments/
[555] Dalton, M., & Fleishman, E. (Eds.). (2021). Fifth Oregon Climate Assessment. Oregon Climate Change Research Institute, Oregon State University, Corvallis, Oregon. https://blogs.oregonstate.edu/occri/oregon-climate-assessments/

- Ben Graf Greenway
- Bethany Creek Greenway
- Bethany Creek Park
- Bethany Lake Park
- Bethany Wetlands Natural Area
- Bonny Slope Park
- Bronson Creek Greenway
- Bronson Creek Park
- Brookhaven Woods Natural Area
- Brookview Wetlands Natural Area
- Burton Wetlands Natural Area
- C.E. Mason Wetlands Natural Area
- Cedar Mill Creek Greenway
- Cedar Mill Woods Natural Area
- Cedars Wetlands Natural Area
- Center Street Wetlands
- Chehalem Ridge Nature Park
- City of Beaverton tree corridors and groves
- City of Beaverton Wetlands
- Cooper Mountain Nature Park
- David’s Windsor Wetlands Natural Area
- Deerfield Woods Natural Area
- Dirksen Nature Park
- Downing Greenway
- Dwight S. Parr Woods Natural Area
- Eagle Landing Park
- Elizabeth Meadows Wetlands Natural Area
- Fanno Creek Greenway
- Fernhill Wetlands
- Five Oaks Historic Site in the City of Hillsboro
- Forest Glen Woods Natural Area
- Forest Grove Watershed
- Future Park South Cooper Mountain – Gorman
- Gales Creek

- Granada Woods Natural Area
- Hagg Lake and Scoggins Valley Park
- Hartwood Hylands Woods Natural Area
- Hiteon Wetlands Natural Area
- Hubert Lee Cain Wetlands Natural Area
- Hyland Woods Natural Area
- Jackson Bottom Wetlands Preserve
- Jordan Woods Natural Area
- Kaiser Woods Natural Area
- Koll Center Wetlands Natural Area
- Lilly K. Johnson Woods Natural Area
- Lowami Hart Woods Natural Area
- Madrona Woods Natural Area
- Matrix Hill Woods Natural Area
- Merritt Woods Natural Area
- Metzger Park
- Millikan Wetlands Natural Area
- Moonshadow Woods Natural Area
- Morrison Woods Natural Area
- Moshofsky Woods Natural Area
- Mt. Williams Park
- Mullerleile Pond
- NE Neighborhood Park
- North Bethany Greenway
- Northridge Woods Natural Area
- Orenco Woods Nature Park
- Peppertree Wetlands Natural Area
- Porter Sequoias in the City of Hillsboro
- Quarry Woods Natural Area
- Raleighwood Wetlands Natural Area
- Ravine Woods Natural Area
- Rock Creek Greenway
- Roxie’s Wetlands Natural Area
- Scholls Wetlands Natural Area

- Scott Wetlands Natural Area
- Shadow Creek Wetlands Natural Area
- Shaughnessey Wetlands Natural Area
- Snyder Reservoir
- Starks Reservoir
- Steele Wetlands Natural Area
- Stoller Creek Greenway
- Summercrest Woods Natural Area
- Taylors Creek Wetlands Natural Area
- Tenax Woods Natural Area
- Thornbrook Woods Natural Area
- Tualatin Hills Nature Park
- Tualatin River
- Tualatin River Wildlife Refuge
- Vale Greenway
- Wake Robin Wetlands Natural Area
- Wapato Lake and Wetlands
- Warren Oak Trees in the City of Hillsboro
- West Fork Dairy Creek
- Whispering Woods Natural Area
- White Fox Wetlands Natural Area
- Williams DLC Oak Tree in the City of Hillsboro
- Willow Creek Greenway

1.2. Social and Demographic Information

Social and demographic capacity is a significant indicator of community hazard resilience. The characteristics and qualities of the community population, such as language, race and ethnicity, age, income, educational attainment, and health, are significant factors that can influence the community's ability to cope, adapt to, and recover from natural disasters. Population vulnerabilities can be reduced or eliminated with proper outreach and community mitigation planning.

1.2.1. Population

The County has experienced population growth since the adoption of the 2017 NHMP, with the cities of North Plains, Cornelius, and Forest Grove experiencing the largest percentage of population change. An increase in population can also bring an increase in the built environment and require additional infrastructure. Increases in the number of residents, the built environment footprint, and infrastructure can increase vulnerability to natural hazard events.

Table 343: Certified Population Estimates of Jurisdictions Participating in the NHMP[556]

Jurisdiction	2017 Population	2021 Population	Percentage of Population Change
City of Beaverton	95,685	97,782	2.19%
City of Cornelius	11,915	13,498	13.3%
City of Forest Grove	23,555	26,242	11.4%
City of Hillsboro	101,540	108,154	6.5%
City of North Plains	2,980	3,446	15.6%
City of Sherwood	19,350	20,496	5.9%
City of Tigard	50,985	55,854	9.6%
Washington County*	595,860	605,036	1.5%

*Includes all of Washington County, not only the unincorporated portion

Special districts participating in this NHMP have well-defined areas for which they provide water resource management and park and recreation facilities, programs, services, and natural areas. These agencies, except for THPRD, also serve populations outside of Washington County; however, many of the residents served are within the County.

Table 344: Service Area Populations of Special Districts Participating in the NHMP

Jurisdiction	Service Area Population
Clean Water Services	620,000*
Tualatin Hills Park & Recreation District	270,297
Tualatin Valley Water District	218,400

* Incudes entire Clean Water Services service area

1.2.1.1. Population Forecast

The Portland State University Population Research Center forecasts that Washington County will continue its strong and steady growth pattern, gaining over 200,000 residents by 2045.[557] The population will likely grow fastest in the City of North Plains due to its proximity to Washington County job centers.[558]

Specific forecasted service area populations for special district participants were not available; however, if the overall resident population in the County increases as projected, the service area population will also increase.

[556] Portland State University College of Urban and Public Affairs Population Research Center. (2021, December 15). https://www.pdx.edu/population-research/population-estimate-reports
[557] Portland State University College of Urban and Public Affairs Population Research Center. (2020, June 30). *Coordinated Population Forecast for Washington County, Its Urban Growth Boundaries (UBG), and Area Outside UGBs 2020–2070.* https://ondeck.pdx.edu/population-research/sites/g/files/znldhr3261/files/2020-07/Washington_Report_Final_2020.pdf
[558] Portland State University College of Urban and Public Affairs Population Research Center. (2020, June 30). *Coordinated Population Forecast for Washington County, Its Urban Growth Boundaries (UBG), and Area Outside UGBs 2020–2070.* https://ondeck.pdx.edu/population-research/sites/g/files/znldhr3261/files/2020-07/Washington_Report_Final_2020.pdf

Table 345: 2030 Forecasted Population Estimates of Jurisdictions Participating in the NHMP[559]

Jurisdiction	2021 Population	2030 Population Forecast*	Forecasted Percentage of Population Change
City of Beaverton	97,782	114,525	17.1%
City of Cornelius	13,498	14,606	8.2%
City of Forest Grove	26,242	30,702	17%
City of Hillsboro	108,154	122,598	13.4%
City of North Plains	3,446	5,194	50.7%
City of Sherwood	20,496	20,118	-1.8%
City of Tigard	55,854	63,813	14.3%
Washington County	605,036	718,412	18.9%

*Notes: 2020 city limits; all forecast figures prepared pre-COVID-19 pandemic; all forecast figures were prepared pre-2020 Census vintage population program release and include all of Washington County, not only the unincorporated portion

Table 346: 2045 Forecasted Population Estimates of Jurisdictions Participating in the NHMP[560]

Jurisdiction	2030 Population Forecast*	2045 Population Forecast*	Forecasted Percentage of Population Change
City of Beaverton	114,525	119,156	4%
City of Cornelius	14,606	17,322	18.6%
City of Forest Grove	30,702	33,592	9.4%
City of Hillsboro	122,598	128,270	4.6%
City of North Plains	5,194	5,860	12.8%
City of Sherwood	20,118	20,662	2.7%
City of Tigard	63,813	71,611	12.2%
Washington County	718,412	809,312	12.7%

*Notes: 2020 city limits; all forecast figures prepared pre-COVID-19 pandemic; all forecast figures were prepared pre-2020 Census vintage population program release and include all of Washington County, not only the unincorporated portion

[559] Metro. (2021, February 25). Portland-Area 2045 Population and Housing Forecasts by City and County. https://www.oregonmetro.gov/sites/default/files/2021/03/26/2045-regional-population-housing-forecast-by-city-County.pdf

[560] Metro. (2021, February 25). Portland-Area 2045 Population and Housing Forecasts by City and County. https://www.oregonmetro.gov/sites/default/files/2021/03/26/2045-regional-population-housing-forecast-by-city-County.pdf

Table 347: Forecasted Change in Population for Jurisdictions Participating in the NHMP, 2021–2045[561]

Jurisdiction	2021 Population	2045 Population Forecast*	Forecasted Percentage of Population Change
City of Beaverton	97,782	119,156	21.9%
City of Cornelius	13,498	17,322	28.3%
City of Forest Grove	26,242	33,592	28%
City of Hillsboro	108,154	128,270	18.6%
City of North Plains	3,446	5,860	70.1%
City of Sherwood	20,496	20,662	0.8%
City of Tigard	55,854	71,611	28.2%
Washington County	605,036	809,312	33.8%

*Notes: 2020 city limits; all forecast figures prepared pre-COVID-19 pandemic; all forecast figures were prepared pre-2020 Census vintage population program release and include all of Washington County, not only the unincorporated portion

1.2.1.2. Forecasted Age of Future Populations

Like most areas across Oregon, Washington County's population is aging. This means people 64 and older are an increasing share of the County's total population, as discussed in Section 1.2.7. The average age of the population should be considered when analyzing the population's overall vulnerability, because older adults may require an increased amount of support before, during, and after a natural hazard event.

1.2.1.3. Forecasted Race and Ethnicity of Future Populations

Racial and ethnic diversity is increasing within the County, as further discussed in section 1.2.4 and 1.2.5. The Latino/a/x population is growing, as are the Black, Asian, Pacific Islander populations, and individuals who identify as two or more races. Latino is often the preferred noun or adjective for a person who is from or whose family origins are from a Latin American country. Latina is the feminine form. The gender-neutral term is Latinx or Latine.[562] The increasing diversity among residents highlights the importance of equity and inclusion, including incorporating languages other than English in communications and warnings about natural hazards and mitigation strategies.

1.2.2. Tourists

Tourists are not counted in population statistics and are therefore considered separately in this analysis. The table below shows the estimated number of person-nights in private homes, hotels and motels, and other types of accommodations for the Portland Region, which includes Washington County. Statistics solely for the County were not available.

Tourists' lodging in private homes suggests these visitors are staying with family and friends. For hazard preparedness and mitigation purposes, outreach to residents in Washington County will likely be

[561] Metro. (2021, February 25). Portland-Area 2045 Population and Housing Forecasts by City and County. https://www.oregonmetro.gov/sites/default/files/2021/03/26/2045-regional-population-housing-forecast-by-city-County.pdf

[562] City of Portland Office of Equity and Human Rights. (October 2022). Inclusive Writing Guide. Inclusive Writing Guide (portland.gov)

transferred to these visitors in some capacity. Visitors staying at hotel or motels are less likely to benefit from local preparedness outreach efforts aimed at residents.

Table 348: Overnight Visitor Volume for the Portland Region, 2018–2020[563]

Lodging Type	Person-Nights		
	2018	2019	2020*
Hotel, Motel, or Short-Term Rental	9,948,490	10,193,430	5,685,240
Private Home	15,847,900	15,977,970	11,638,660
Other	790,620	805,040	548,560
Total	**26,587,010**	**26,976,440**	**17,872,460**

*2020 data shows COVID-19 pandemic impacts on travel.

Tourists are especially vulnerable due to the difficulty of locating or accounting for travelers within the County. Tourists are often at greater risk during a natural disaster because of unfamiliarity with evacuation routes, communication outlets, or even the types of hazards that may occur. Knowing whether the County's visitors are staying in friends' and relatives' homes, in hotels and motels, or elsewhere can be instructive when developing outreach efforts.[564]

1.2.3. Populations That May Be at Higher Risk

Populations that may need extra assistance before, during, and after a natural hazard event include, but are not limited to, older adults, children, people with disabilities, people with lower incomes, individuals who are undocumented, and unhoused populations. These people often experience the impacts of natural hazards and disasters more acutely.

Hazard mitigation efforts that target the specific needs of these and other higher risk populations has the potential to greatly reduce vulnerability. Examining the reach of hazard mitigation policies to certain populations may assist in increasing access to services and programs. FEMA's Office of Equal Rights addresses this need by suggesting that agencies and organizations planning for natural hazards identify populations that may be more susceptible, make evacuation operations, shelters, and recovery centers more accessible, and review practices and procedures to remedy any discrimination or bias in relief application or assistance.

Population size alone is not an indicator of vulnerability to natural hazards. More important is the location, composition, and capacity of the population within the community. Social science research demonstrates that human capital indices such as language, race, ethnicity, gender, age, income, education, and access to healthcare can affect a community's resilience. Therefore, these factors can impact community resilience to natural hazards.

1.2.4. Language

Special consideration should be given to populations who do not speak English as their primary language. When disseminating hazard planning and mitigation resources to the public, language barriers can be a challenge unless special attention is given to language and culturally appropriate outreach

[563] Travel Oregon. (2021, April 17). *The Economic Impact of Travel in Oregon.* https://industry.traveloregon.com/wp-content/uploads/2021/06/OR_2020_Final.pdf
[564] MDC Consultants. (n.d.). When Disaster Strikes – Promising Practices. https://www.mdcinc.org/wp-content/uploads/2017/11/When-Disaster-Strikes-Promising-Practices-Toursts-and-Newcomers.pdf

techniques. Outreach materials used to communicate with, plan for, and support non-English speaking populations should take the language needs of these populations into consideration.

There are various languages spoken across Washington County and the primary language is English. Overall, 5% of the total population in Washington County is not proficient in English.[565] The largest populations of residents who do not speak English "very well" include:[566]

- City of Cornelius: 19%
- City of Hillsboro: 7%
- City of Forest Grove: 6%
- City of Beaverton: 5%

Table 349: Languages Spoken in Washington County[567]

Language Spoken	Estimated Percent of Population Aged 5 Years and Over
English	75.2%
Spanish	11.9%
Asian and Pacific Island Language	6.8%
Indo-European Language	4.7%
Other	1.4%

1.2.5. Race and Ethnicity

The impact in terms of property and economic loss and the ability to recover from natural hazard events may also vary among population groups following a disaster. Studies have shown that racial and ethnic minorities can be more vulnerable to the negative impacts of natural disaster events. This is not reflective of individual characteristics; instead, historic patterns of inequality along racial or ethnic divides have often resulted in minority communities that are more likely to have less sturdy building stock, older infrastructure, or less access to public services.

According to the United States Census American Community Survey, 61% of respondents identified as White and Non-Hispanic, 18% of respondents identified as Hispanic or Latino/a/x of any race, and 11% of respondents identified as Asian and Non-Hispanic. The cities of Cornelius, Forest Grove, and Hillsboro had higher percentages of their populations report Hispanic or Latino/a/x ethnicity, compared to the County as a whole. The cities of Beaverton and Hillsboro and unincorporated Washington County had higher proportions of their populations report their race as Asian and Non-Hispanic, compared to the County as a whole.

The tables below describe Washington County's population by race and ethnicity. Due to how respondents identified and answered 2020 Census questions, there may be overlapping responses, and results may equal greater than 100% of the population.

[565] Washington County Oregon NHMP planning documentation.
[566] Washington County Oregon NHMP planning documentation.
[567] United States Census American Community Survey. (2015-2020). Language Spoken at Home. Accessed April 15, 2022, from https://data.census.gov/cedsci/table?q=language%20washington%20County%20oregon&tid=ACSST5Y2020.S1601

Table 350: Race Demographics in Washington County[568]

Race	Estimated Percent of Population
White Alone	60.8%
Asian	11.4%
Two or More Races	6.3%
Black or African American	2.1%
Native Hawaiian and Other Pacific Islander Alone	0.54%
Some Other Race Alone	0.52%
American Indian and Alaska Native Alone	0.40%

Table 351: Ethnicity Demographics in Washington County[569]

Ethnicity	Estimated Percent of Population
Not Hispanic or Latino/a/x	82.1%
Hispanic or Latino/a/x	17.9%

Identifying specific ways to support all portions of the community through hazard mitigation, preparedness, and response is important. Culturally appropriate and effective outreach can include methods and messaging that are targeted to diverse audiences. Connecting to historically disenfranchised populations through already trusted sources or providing preparedness materials and presentations in the languages spoken by the population will go a long way to increasing overall community resilience.

1.2.6. Gender

Washington County has slightly more people who identify as female than male (Female: 50.1%, Male: 49.9%).[570] The available data does not include information on other gender identities. It is important to recognize that people who identify as a gender other than cisgender male tend to have more institutionalized obstacles during natural hazard event recovery due to sector-specific employment, lower wages, and family care responsibilities.

[568] United States Census Decennial Census. (2020). Hispanic or Latino, and Not Hispanic or Latino by Race. Accessed April 15, 2022 from https://data.census.gov/cedsci/table?q=washington%20County%20oregon%20ethnicity&tid=DECENNIALPL2020.P2
[569] United States Census Decennial Census. (2020). Hispanic or Latino, and Not Hispanic or Latino by Race. Accessed April 15, 2022, from https://data.census.gov/cedsci/table?q=washington%20County%20oregon%20ethnicity&tid=DECENNIALPL2020.P2
[570] United States Census Bureau. (2021, July 1). QuickFacts Washington County, Oregon. Accessed April 15, 2022, from https://www.census.gov/quickfacts/washingtonCountyoregon

1.2.7. Age

Of the Washington County demographic factors influencing resilience ability, the most significant indicator may be age of the population. As of 2020, 18.5% of the County population is over the age of 65,[571] a percentage that is projected to rise to 18.9% by 2045.[572] The median age in the County is 36.9 years.[573]

Age dependency ratio (ADR) is a metric that compares the typically non-working population ages of 0–15 years and 65 years and older to the typically working population aged 16–64 years. Higher ADRs indicate higher numbers of younger and older residents, relative to the total population. The Washington County overall ADR is 56.7. This ADR indicates a higher percentage of dependent-aged (non-working) people to that of working age people.

The ratio is included in the U.S. Census Bureau's American Community Survey and is derived by dividing the population of under 15 years old and the population of those 65 years and older by the 15- to 64-year-old population and multiplying by 100. A ratio close to 50 indicates approximately twice as many people are of working age than non-working age. A ratio closer to 100 implies an equal number of working age population as non-working age population. A higher number indicates greater sensitivity to the impact of natural hazards.

Table 352: Age Demographics in Washington County

Age	Estimated Percent of Population[574]	Age Dependency Ratio[575]
Younger Than 15 Years Old	13%	35.8
65 Years Old and Older	18.5%	20.9

[571] United States Census American Community Survey. (2015–2020). Age and Sex. Accessed April 15, 2022, from https://data.census.gov/cedsci/table?q=Washington%20County,%20Oregon&tid=ACSST5Y2020.S0101
[572] Portland State University College of Urban and Public Affairs Population Research Center. (2020, June 30). *Coordinated Population Forecast for Washington County, Its Urban Growth Boundaries (UBG), and Area Outside UGBs 2020–2070.* https://ondeck.pdx.edu/population-research/sites/g/files/znldhr3261/files/2020-07/Washington_Report_Final_2020.pdf
[573] United States Census American Community Survey. (2015-2020). Age and Sex. Accessed April 15, 2022, from https://data.census.gov/cedsci/table?q=Washington%20County,%20Oregon&tid=ACSST5Y2020.S0101
[574] United States Census American Community Survey. (2015-2020). Age and Sex. Accessed April 15, 2022, from https://data.census.gov/cedsci/table?q=Washington%20County,%20Oregon&tid=ACSST5Y2020.S0101
[575] United States Census American Community Survey. (2015-2020). Age and Sex. Accessed April 15, 2022, from https://data.census.gov/cedsci/table?q=Washington%20County,%20Oregon&tid=ACSST5Y2020.S0101

Table 353: Age Demographic Projections for Washington County

Age	2025 Estimated Percent of Population[576] and Age Dependency Ratio	2030 Estimated Percent of Population[577] and Age Dependency Ratio	2035 Estimated Percent of Population[578] and Age Dependency Ratio	2040 Estimated Percent of Population[579] and Age Dependency Ratio	2045 Estimated Percent of Population[580] and Age Dependency Ratio
Younger Than 15 Years Old	16.9% 25.4	16.6% 25.2	16.9% 28.5	17% 29.2	16.8% 26
65 Years Old and Older	16.4% 24.7	17.8% 27	18.4% 28.5	18.8% 29.2	18.9% 29.2

The County's population forecast shows a steady increase in residents that are older than 64 years old. As the population ages, the County may need to consider different mitigation and preparedness actions to address the specific needs of this group. The age-dependent population is expected to consist of a greater share of older adults in the future. The overall age dependency ratio is expected to be 55.2 in 2045, however the ratio for adults 65 and older is expected to increase from 20.9 to 29.2.

An area's age profile has a direct impact on both what mitigation actions are prioritized and how responses to hazard incidents are carried out. People who are younger than 18 years of age rarely make decisions about mitigation and preparedness. Therefore, a larger youth population in an area will increase the importance of outreach to schools and parents on effective ways to teach children about fire safety, earthquake response, and evacuation plans. Furthermore, children are more vulnerable to the heat and cold, have few transportation options, and require assistance to access medical facilities. Older populations may also have special needs prior to, during, and after a natural disaster. Older populations may require assistance in evacuation due to limited mobility or health issues. Additionally, older populations may require special medical equipment or medications, and can lack the social and economic resources needed for post-disaster recovery.[581]

[576] Portland State University College of Urban and Public Affairs Population Research Center. (2020, June 30). *Coordinated Population Forecast for Washington County, Its Urban Growth Boundaries (UBG), and Area Outside UGBs 2020–2070.* https://ondeck.pdx.edu/population-research/sites/g/files/znldhr3261/files/2020-07/Washington_Report_Final_2020.pdf

[577] Portland State University College of Urban and Public Affairs Population Research Center. (2020, June 30). *Coordinated Population Forecast for Washington County, Its Urban Growth Boundaries (UBG), and Area Outside UGBs 2020–2070.* https://ondeck.pdx.edu/population-research/sites/g/files/znldhr3261/files/2020-07/Washington_Report_Final_2020.pdf

[578] Portland State University College of Urban and Public Affairs Population Research Center. (2020, June 30). *Coordinated Population Forecast for Washington County, Its Urban Growth Boundaries (UBG), and Area Outside UGBs 2020–2070.* https://ondeck.pdx.edu/population-research/sites/g/files/znldhr3261/files/2020-07/Washington_Report_Final_2020.pdf

[579] Portland State University College of Urban and Public Affairs Population Research Center. (2020, June 30). *Coordinated Population Forecast for Washington County, Its Urban Growth Boundaries (UBG), and Area Outside UGBs 2020–2070.* https://ondeck.pdx.edu/population-research/sites/g/files/znldhr3261/files/2020-07/Washington_Report_Final_2020.pdf

[580] Portland State University College of Urban and Public Affairs Population Research Center. (2020, June 30). *Coordinated Population Forecast for Washington County, Its Urban Growth Boundaries (UBG), and Area Outside UGBs 2020–2070.* https://ondeck.pdx.edu/population-research/sites/g/files/znldhr3261/files/2020-07/Washington_Report_Final_2020.pdf

[581] Wood, Nathan. Variations in City Exposure and Sensitivity to Tsunami Hazards in Oregon. U.S. Geological Survey, Reston, Virginia, 2007.

1.2.8. Households and Families

Two ways the Census defines households are by type of living arrangement and family structure. There are 223,040 total households in the County, with an average household size of 2.64 people.[582] People 65 years old and over account for 9.7% of householders living alone.[583]

Table 354: Household Types in Washington County[584]

Household Type	Estimated Percent of Population
Married Couple Household	53%
Householder Living Alone	23.8%
Cohabiting Couple Household	8.2%
Households with one or more people aged under 18 years	33.4%
Households with one or more people aged 65 years and over	25.4%

The table below shows the demographics of households with children. The category married couple includes opposite sex couples, same sex couples, and couples in common-law marriages. The male and female householder only categories include single parent households. Single parents may have a harder time gathering and accessing the resources to rebuild after a disaster.[585] These households may need additional support to mitigate, prepare, and recover.

Table 355: Demographics of Families with Children in Washington County[586]

Age of Children	Estimated Percent of Married Couple Households	Estimated Percent of Male Householder Only	Estimated Percent of Female Householder Only
Under 6 Years of Age Only	23.7%	23.5%	14.6%
Under 6 Years of Age and 6 to 17 Years Old	20.5%	11.2%	18.4%
6 to 17 Years Old Only	55.8%	65.3%	67%

[582] United States Census American Community Survey. (2015-2020). Selected Social Characteristics in the United States. Accessed April 15, 2022, from https://data.census.gov/cedsci/table?q=Washington%20County,%20Oregon%20dp02&tid=ACSDP5Y2020.DP02
[583] United States Census American Community Survey. (2015-2020). Selected Social Characteristics in the United States. Accessed April 15, 2022, from https://data.census.gov/cedsci/table?q=Washington%20County,%20Oregon%20dp02&tid=ACSDP5Y2020.DP02
[584] United States Census American Community Survey. (2015-2020). Selected Social Characteristics in the United States. Accessed April 15, 2022, from https://data.census.gov/cedsci/table?q=Washington%20County,%20Oregon%20dp02&tid=ACSDP5Y2020.DP02
[585] Center for Disaster Philanthropy. (2021, August 3). Parenting Alone – Single Parents in Disasters. https://disasterphilanthropy.org/blog/parenting-alone-single-parents-in-disasters/
[586] United States Census American Community Survey. (2015-2020). Family Type by Presence and Age of Own Children Under 18 Years. Accessed April 15, 2022, from https://data.census.gov/table?q=Washington+County,+Oregon+b11003&tid=ACSDT5Y2020.B11003&moe=false

1.2.8.1. Unhoused Populations

Unhoused and unsheltered populations have few resources to rely on, especially during an emergency. It will likely be the responsibility of the County, cities, and local nongovernmental entities to provide services such as shelter, food, and medical support. Therefore, it is critical to foster collaborative relationships with agencies that will provide additional relief, such as the American Red Cross and sheltering organizations. It is also important to identify how best to communicate with these populations, since traditional means of communication may not be appropriate or available.

The 2022 Point-in-Time Sheltered and Unsheltered Count in Washington County identified 808 people in this population.[587] This included 171 children under the age of 18, 44 people aged 18 to 24, and 593 people over the age of 24.[588]

1.2.9. Income

Household income and poverty status are indicators of resilience ability and the stability of the local economy. Household income can be used to compare the economic strength of areas at a high level.

Between 2010 and 2020 the share of households making more than $150,000 increased more than other income groups; the next largest group gain was for households earning between $100,000 and $149,999. Although the absolute number of households earning less than $25,000 increased, as a share of the population, it went down. The share of households making $25,000-$49,999 decreased in absolute and relative terms, as did the share making $50,000-$74,999.

Table 356: Household Income Change from 2010-2020 in Washington County*

Household Income	Estimated Percent of Households in 2010[589]	Estimated Percent of Households in 2020[590]	Percent Change Between 2010-2020
Less than $25,000	16%	10%	-6%
$25,000 to $49,999	23%	16%	-7%
$50,000 to $74,999	20%	17%	-3%
$75,000 to $99,999	14%	14%	0%
$100,000 to $149,999	16%	21%	5%
$150,000 to $199,999	11%	22%	11%

***Numbers are rounded to account for the margin of error. Incomes are in nominal dollars not adjusted for inflation.

[587] Washington County Housing Services. (2022, April 11). 2022 Point-in-Time Summary for OR-506CoC (Federal Only). https://www.co.washington.or.us/Housing/EndHomelessness/upload/01-26-2022-PIT-Final-Data-Submitted-to-HUD-04-11-2022.pdf
[588] Washington County Housing Services. (2022, April 11). 2022 Point-in-Time Summary for OR-506CoC (Federal Only). https://www.co.washington.or.us/Housing/EndHomelessness/upload/01-26-2022-PIT-Final-Data-Submitted-to-HUD-04-11-2022.pdf
[589] United States Census American Community Survey. (2006-2010). Financial Characteristics, Table S2503. Accessed April 15, 2022.
[590] United States Census American Community Survey. (2015-2020). Financial Characteristics, Table S2503. Accessed April 15, 2022.

Table 357: Estimated Median Household Income[591]*

Jurisdiction	Estimated Household Income
City of Beaverton	$78,000
City of Cornelius	$73,000
City of Forest Grove	$70,000
City of Hillsboro	$86,000
City of North Plains	$96,000
City of Sherwood	$108,000
City of Tigard	$87,000
Washington County	$87,000

*Numbers rounded to account for the margin of error.

The 2020 median household income across Washington County was $86,626; however, this does not reflect potential impact of the COVID-19 pandemic. Sherwood's median household income in 2020 was higher than in the County, while incomes in Beaverton and Forest Grove were lower. Median incomes have risen in all jurisdictions since 2010.

The table below identifies the percentage of individuals and cohort groups that were below the poverty level in 2020. It is estimated that 9% of individuals and 10% of children under 18 live below the poverty level across the County. While most cities have poverty rates similar to that of the County overall, the cities of North Plains and Sherwood have lower rates of poverty for the overall population and among children. The City of Forest Grove may have a higher rate of poverty among adults aged 65 or older, but this cannot be shown with full confidence, given the sampling variability.

Table 358: Poverty Status in the Past 12 Months[592]*

Jurisdiction	Total Population in Poverty		Children Under the Age of 18 in Poverty		Adults Aged 18 to 64 in Poverty		Adults 65 Years Old or Older in Poverty	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
City of Beaverton	10,000	10%	2,000	13%	6,000	10%	1,000	8%
City of Cornelius	13,000	10%	<1,000	6%	1,000	12%	<1,000	7%
City of Forest Grove	3,000	11%	1,000	12%	2,000	10%	<1,000	11%
City of Hillsboro	10,000	9%	3,000	13%	6,000	8%	1,000	9%
City of North Plains	<1,000	4%	<1,000	8%	<1,000	4%	<1,000	1%

[591] United States Census American Community Survey. (2015-2020). Financial Characteristics, Table S2503. Accessed April 15, 2022.
[592] United States Census American Community Survey. (2015-2020). Poverty Status in the Past 12 Months, Table S1701. Accessed April 15, 2022.

Jurisdiction	Total Population in Poverty		Children Under the Age of 18 in Poverty		Adults Aged 18 to 64 in Poverty		Adults 65 Years Old or Older in Poverty	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
City of Sherwood	1,000	4%	<1,000	3%	<1,000	3%	<1,000	8%
City of Tigard	4,000	8%	1,000	10%	3,000	8%	1,000	6%
Washington County	50,000	9%	14,000	10%	31,000	8%	5,000	7%

* Numbers rounded to account for sampling errors.

Research shows a lack of wealth contributes to social vulnerability because individual and community resources are not as readily available. Affluent communities are more likely to have the collective and individual capacity to rebound from a hazard event more quickly, while less wealthy communities and individuals may not have this capacity, leading to increased vulnerability. Wealthier individuals and communities may also have more resources to invest in mitigation activities, preventing or lessening impacts from hazards. Conversely, poverty, at both an individual and community level, can drastically alter recovery time and quality.[593]

Utilization of assistance programs are another indicator of poverty or lack of resource access in communities and among individuals. Statewide social assistance programs like the Supplemental Nutritional Assistance Program (SNAP) provide assistance to individuals and families. In Washington County, SNAP serves an average of 51,621 people in 28,243 households a month.[594] Yearly, an average of 620,000 people in 340,000 households have an approximant available allotment of $109,000,000 of SNAP.[595] Those who use assistance programs are more vulnerable in the wake of disaster because of a lack of personal financial resources and reserves, increasing reliance on government support.

1.2.10. Education

Educational attainment of community residents is also identified as an influencing factor in resiliency. Educational attainment often reflects higher income and therefore higher self-reliance. Widespread educational attainment is also beneficial for the County's economy and employment sectors as there are potential employees for workforces. An oversaturation of either high educational attainment or low educational attainment can have negative effects on the resiliency of the community.

According to the U.S. Census Bureau, approximately 93.0% of the Washington County population over 25 years of age has graduated from high school or received a high school equivalency, with around 45% going on to earn a bachelor's degree.[596] Cornelius has the highest share of population that has less than a high school diploma and the smallest share with an advanced college degree.

[593] Cutter, S. L. (2003, May 19). Social Vulnerability to Environmental Hazards. *Social Science Quarterly.* https://doi.org/10.1111/1540-6237.8402002
[594] Washington County NHMP planning documentation, SNAP County Tables by FIPS January 2020–December 2020.
[595] Washington County NHMP planning documentation, SNAP County Tables by FIPS January 2020–December 2020.
[596] United States Census. (2020). Educational Attainment, Table S1501. Accessed April 15, 2022.

Table 359: Highest Level of Educational Attainment, Population 25 Years and Older[597*]

Highest Level of Educational Attainment	City of Beaverton	City of Cornelius	City of Forest Grove	City of Hillsboro	City of North Plains	City of Sherwood	City of Tigard	Washington County
Less Than 9th Grade	3%	16%	4%	5%	1%	1%	3%	4%
Some High School, No Diploma	4%	9%	5%	5%	4%	2%	3%	4%
High School Graduate or GED	17%	23%	26%	19%	19%	13%	16%	18%
Some College, No Degree	22%	21%	28%	21%	28%	25%	24%	21%
Associate's Degree	8%	12%	6%	9%	8%	8%	10%	9%
Bachelor's Degree	31%	15%	19%	24%	25%	32%	29%	28%
Graduate or Professional Degree	17%	4%	12%	18%	15%	19%	15%	17%

* Numbers rounded to account for the margin of error.

[597] United States Census. (2020). Educational Attainment, Table S1501. Accessed April 15, 2022.

1.2.11. Disability Characteristics

The Resilience Capacity Index recognizes those with disabilities have higher vulnerability to hazards and will likely require additional community support and resources.

As of 2020, 11% of the total Washington County non-institutionalized population identifies as having one or more disabilities. Forest Grove has the highest percentage of its total population with a disability (17%). Forest Grove also has the highest percentage of individuals under 18 (10%) and 65 years and over with a disability (58%). The cites of Cornelius and Forest Grove have the highest percentage of adults aged 18 to 64 with one or more disabilities at 13%. Data was not available for the City of North Plains.

The table below describes the disability status of the civilian noninstitutionalized population.

Table 360: Disability Characteristics of the Civilian Noninstitutionalized Population[598]*

Jurisdiction	Civilian Noninstitutionalized Population with a Disability							
	Total		Children Under the Age of 18		Adults Aged 18 to 64		Adults 65 Years Old or Older	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
City of Beaverton	11,000	11%	1,000	6%	6,000	10%	2,000	35%
City of Cornelius	2,000	16%	<1,000	4%	1,000	13%	1,000	60%
City of Forest Grove	4,000	17%	<1,000	10%	2,000	13%	2,000	58%
City of Hillsboro	11,000	11%	1,000	7%	6,000	9%	4,000	40%
City of Sherwood	2,000	11%	<1,000	6%	1,000	10%	1,000	43%
City of Tigard	6,000	13%	1,000	8%	3,000	10%	2,000	34%
Washington County	61,000	11%	5,000	3%	30,000	8%	25,400	34%

* Numbers rounded to account for the margin of error. Data not available for the City of North Plains.

1.2.12. Access to Healthcare

Individual and community health play an integral role in community resiliency, as indicators such as health insurance, people with disabilities, and houselessness paint an overall picture of a community's well-being. These factors translate to a community's ability to prepare, respond to, and cope with the impacts of a disaster.

Of the larger cities in Washington County, Cornelius has the highest percentage of population without health insurance. Countywide, 88% of the people who lack health insurance are between the ages of 19

[598] United States Census 2015–2020 American Community Survey. (2021). Table DP02 for each jurisdiction. Accessed April 15, 2022.

and 64, 11% are children aged 18 and younger, and 1% are adults age 65 and older. The ability to provide services to uninsured populations may burden local providers following a natural disaster.

Table 361: Population Without Health Insurance[599]

Jurisdiction	Population Without Health Insurance							
	Total		Children Under the Age of 19		Adults Aged 19 to 64		Adults 65 Years Old or Older	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
City of Beaverton	7,000	8%	1,000	6%	6,000	11%	<1,000	1%
City of Cornelius	2,000	18%	<1,000	12%	1,000	13%	<1,000	2%
City of Forest Grove	1,000	6%	<1,000	2%	1,000	9%	<1,000	1%
City of Hillsboro	7,000	7%	1,000	4%	6,000	10%	<1,000	1%
City of North Plains	<1,000	4%	<1,000	4%	<1,000	5%	0	0%
City of Sherwood	<1,000	2%	<1,000	2%	<1,000	3%	<1,000	2%
City of Tigard	3,000	7%	<1,000	4%	3,000	9%	<1,000	1%
Washington County	33,000	5%	3,000	3%	29,000	8%	<1,000	1%

* Numbers rounded to account for the margin of error.

1.3. Economic Data

Economic capacity refers to the financial resources present, and revenue generated in the community to achieve a higher quality of life. Income equality, housing affordability, economic diversification, employment, and industry are measures of economic capacity. However, economic resilience to natural disasters is far more complex than merely restoring employment or income in the local community. Building a resilient economy requires an understanding of how the component parts of employment sectors, workforce, resources, and infrastructure are interconnected in the existing economic picture. Once any inherent strengths or systematic vulnerabilities become apparent, both the public and private sectors can take action to increase the resilience of the local economy.

1.3.1. Income Equality

Income equality is a measure of the distribution of economic resources, as measured by income, across a population. It is a statistic defining the degree to which all persons have a similar income. Income inequality is the difference in the distribution of income between individuals or populations.

The table below illustrates the County and cities' level of income equality. The Gini Index is a summary measure of income equality as is used by the United States Census Bureau. The Gini coefficient incorporates the detailed shares data into a single statistic, which summarizes the dispersion of income across the entire income distribution. The Gini coefficient ranges from 0, indicating perfect equality (where

[599] United States Census 2015–2020 American Community Survey. (2021). Tables S2701 and S2702. Accessed April 15, 2022.

everyone receives an equal share), to 1, perfect inequality (where only one recipient or group of recipients receives all the income).[600]

Table 362: Income Equality Coefficient in Washington County[601]*

Jurisdiction	Income Equality Coefficient
City of Beaverton	0.40–0.43%
City of Cornelius	0.34–0.43%
City of Forest Grove	0.39–0.44%
City of Hillsboro	0.38–0.41%
City of North Plains	0.30–0.36%
City of Sherwood	0.36–0.42%
City of Tigard	0.39–0.42%
Washington County	0.41–0.42%

* Gini Index; includes margin of error

The cities within the County have similar income equality scores. Smaller cities, including North Plains and Cornelius, have slightly greater income equality than do the larger cities and the County overall. Based on social science research, the region's cohesive response to a hazard event may be affected by the distribution of wealth in communities that have less income equality.[602]

1.3.2. Regional Affordability

The evaluation of regional affordability supplements the identification of social and demographic capacity indicators and is a critical analysis tool to understanding the economic status of a community. This information can capture the likelihood of an individuals' ability to prepare for hazards, through retrofitting homes or purchasing insurance. If the community reflects a high level of income inequality or housing cost burden, the potential for homeowners and renters to implement mitigation can be drastically reduced. Therefore, regional affordability is a mechanism for generalizing the abilities of community residents to get back on their feet without federal, state, or local assistance.

1.3.3. Housing Affordability

Housing affordability is a measure of economic security gauged by the percentage of an area's households paying less than 30% of their income on housing. Households spending more than 30% are considered housing cost burdened.[603] The table below displays the percentage of homeowners and renters reflecting housing cost burden in the County. Data was not available for the City of North Plains.

[600] United States Census Bureau. (2021, October 8). Gini Index. https://www.census.gov/topics/income-poverty/income-inequality/about/metrics/gini-index.html
[601] United States Census Bureau. (2020). 2016–2020 American Community Survey 5-Year Estimates, Gini Index of Income Inequality, Table B19083. Accessed April 15, 2022.
[602] Cutter, S., Burton, C.G., & Emrich, C.T. (2010, August 4). Disaster Resilience Indicators for Benchmarking Baseline Conditions. *Journal of Homeland Security and Emergency Management.* https://doi.org/10.2202/1547-7355.1732
[603] U.S. Department of Housing and Urban Development's Office of Policy Development and Research. (n.d.). Rental Burdens: Rethinking Affordability Measures. https://www.huduser.gov/portal/pdredge/pdr_edge_featd_article_092214.html#:~:text=HUD%20defines%20cost%2Dburdened%20families,of%20one's%20income%20on%20rent

Table 363: Percentage of Cost-Burdened Households in Washington County[604]

Jurisdiction	Owners		Renters
	With Mortgage	Without Mortgage	
City of Beaverton	24%–28%	14%–16%	42%–51%
City of Cornelius	22%–36%	18%–28%	46%–76%
City of Forest Grove	20%–32%	7%–10%	46%–59%
City of Hillsboro	22%–27%	12%–14%	37%–47%
City of North Plains			
City of Sherwood	23%–34%	4%–6%	42%–54%
City of Tigard	21%–27%	13%–16%	49%–54%
Washington County*	25%–27%	12%–14%	45%–48%

The City of Cornelius has the highest percentage of residents with a housing cost burden across all categories measured. In general, the population that spends more of their income on housing has proportionally fewer resources and less flexibility for alternative investments in times of crisis.[605] This disparity imposes challenges for a community recovering from a disaster as housing costs may exceed the ability of residents to repair property or move to a new location.

1.3.4. Economic Diversity

Economic diversity is a general indicator of an area's fitness for weathering difficult financial times. Business activity in the Willamette Valley region is mostly homogeneous in that it consists mainly of small businesses.

While illustrative, economic diversity is not a guarantor of economic vitality or resilience. As of 2022, Washington County is classified as non-distressed by Business Oregon, the state's economic development agency.[606] The index used to determine whether an area is distressed or non-distressed includes relative unemployment rate, relative per capital personal income, average wage change, and employment change.[607]

As prescribed by State of Oregon law, Business Oregon gives priority when funding technical assistance, programs, and projects to geographic areas determined to be economically distressed.

[604] United States Census Bureau. (2020). American Community Survey, Table DP04. Accessed April 15, 2022.
[605] 2020–2023 Washington County Community Health Improvement Plan. (2021, March). Neighborhood and Built Environment – Housing. https://www.co.washington.or.us/HHS/upload/Washington-County-CHIP-2020-2023.pdf
[606] Business Oregon. (2022, March 31). Distressed Areas in Oregon. https://www.oregon.gov/biz/reports/Pages/DistressedAreas.aspx
[607] Business Oregon. (2022, March 31). Distressed Areas in Oregon. https://www.oregon.gov/biz/reports/Pages/DistressedAreas.aspx

1.3.5. Employment and Wages

According to the Oregon Employment Department, unemployment has been declining since 2006, except for the increases associated with the Great Recession and the COVID-19 pandemic. The County's unemployment rate is typically lower than the rate for Oregon.

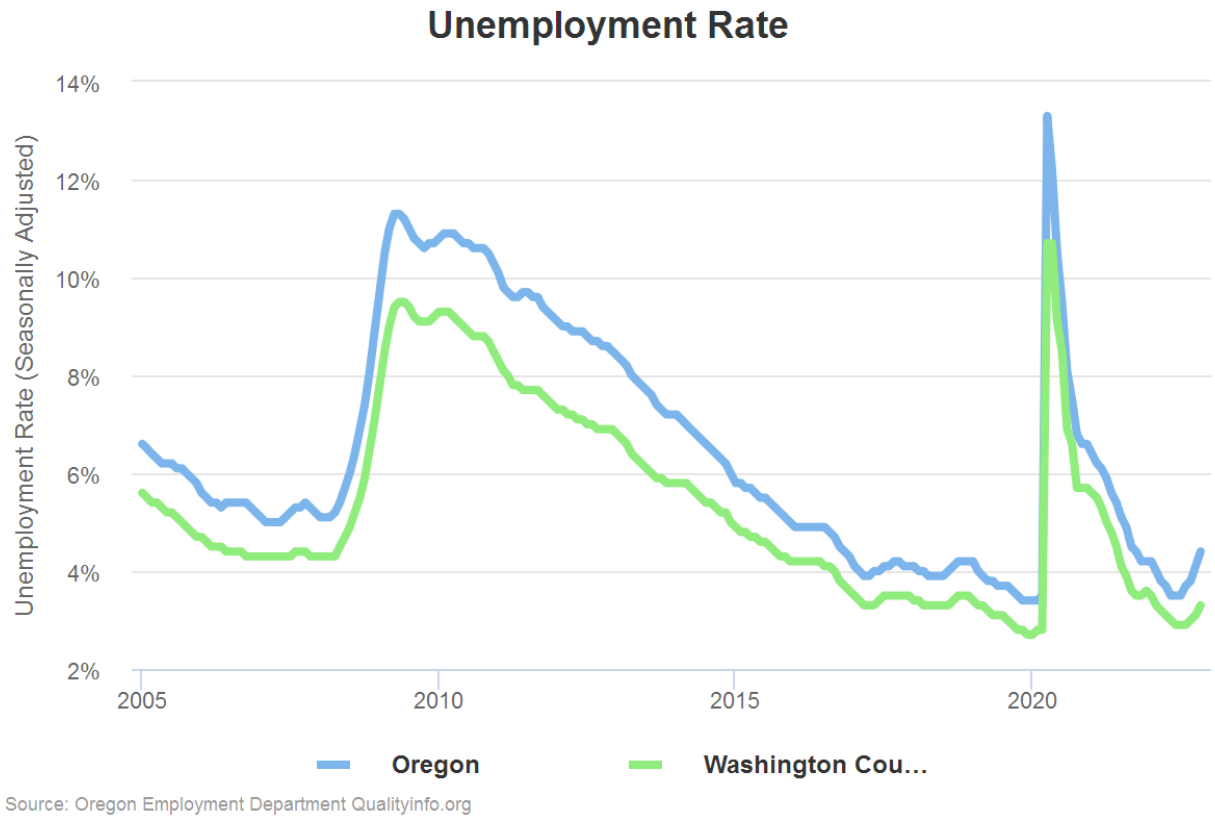

Figure 45: Seasonally Adjusted Unemployment Rate in Oregon and Washington County[608]

The median earnings for workers in Washington County are $42,586, with median earnings for full-time, year-round workers who identify as male being $67,505 and median earnings for full-time, year-round workers who identify as female being $51,768.[609] In June 2022, there were a total of 303,800 employees in the County.[610]

Washington County employers drew in 49% of their workers from outside the County, as of the 2019 data. The Washington County economy is a cornerstone of regional economic vitality. According to the Census Bureau's 2019 Longitudinal Employer-Household Dynamics dataset, 152,000 of the 314,000 jobs in Washington County are held by people commuting in from another county, and 161,000 are held by

[608] State of Oregon Employment Department. (July, 2022). Local Areas, Portland-Metro, Unemployment Rate. https://www.qualityinfo.org/portland-metro?region=4117000001~ces~00000000~false~true~true~false~true~false?region=4117000001~laus~false~true~true~false~true~false

[609] United States Census Bureau. (2020). Selected Economic Characteristics. Accessed April 15, 2022, from https://data.census.gov/cedsci/table?q=washington%20County%20oregon%20employment

[610] State of Oregon Employment Department. (2022, June). Washington County Economic Indicators July 2022. https://data.census.gov/cedsci/table?q=washington%20County%20oregon%20employment

people living in Washington County. Of the 297,000 employees living in Washington County, 136,000, or 46%, commute out of the County.[611]

Approximately 81% of commuters travel by car; 8 out of 9 of these individuals commute alone and 1 in 9 carpool.[612] Around 5% of commuters travel via public transportation and 2.5% walk. Ten percent of people worked from home; however, this percentage could be inflated due to modified work environments in response to the COVID-19 pandemic.

Increased commuting creates a greater dependency on roads, communications, accessibility, and, in the event of a hazard incident, emergency evacuation routes to reunite people with their families. Before a natural hazard event, large or small businesses can develop strategies to prepare for natural hazards, respond efficiently, and prevent loss of life and property.

Mitigation activities are needed at the business level to ensure the health and safety of workers and limit damage to industrial infrastructure. Employees are highly mobile, commuting from all over the surrounding area to industrial and business centers. As daily transit rises, there is an increased risk that a natural hazard event will disrupt the travel plans of residents across the County and seriously hinder the ability of the economy to meet the needs of Washington County residents and businesses.

1.3.6. Industry

Key industries are those that represent major employers and are significant revenue generators. Different industries face distinct vulnerabilities to natural hazards, as illustrated by the industry-specific discussions below. Identifying key industries in the County enables communities to target mitigation activities towards those industries' specific sensitivities. It is important to recognize that the impact a natural hazard event has on one industry can reverberate throughout the County's economy.

This is of specific concern when the businesses belong to the basic sector industry. Basic sector industries are those that are dependent on sales outside of the local community and bring money into a local community via employment. The farm and ranch, information, and wholesale trade industries are all examples of basic industries. Non-basic sector industries are those that are dependent on local sales for their business, such as retail trade, construction, and health services.

1.3.7. Employment by Industry

Economic resilience to natural disasters is particularly important for the major employment industries in the County. If these industries are negatively impacted by a natural hazard, such that employment is affected, the impact will be felt throughout the regional economy. Thus, understanding and addressing the sensitivities of these industries is a strategic way to increase the resiliency of the entire regional economy.

The table below identifies employment by industry. The top five industry sectors in Washington County with the most employees, as of 2021, are professional and business services, trade, transportation and utilities, manufacturing, education and health services, and healthcare and social assistance. While Washington County has some basic industries, such as manufacturing, four out of their five largest industrial sectors are of the non-basic nature and thus they rely on local sales and services. Trending towards basic industries can lead to higher community resilience.

[611] United States Census. (2019). Longitudinal Employer-Household Dynamics. Accessed April 15, 2022, from https://lehd.ces.census.gov/data/
[612] United States Census. (2019). Longitudinal Employer-Household Dynamics. Accessed April 15, 2022, from https://lehd.ces.census.gov/data/

Table 364: Seasonally Adjusted Unemployment Rate in Oregon and Washington County[613]

Industry Description*	2021				Change in Jobs from 2015–2021	Employment Forecast Growth from 2020–2030
	Firms or Units	Total Employees	Percent of Employees	Average Wage		
Total Payroll Employment	21,616	294,276	100%	$90,708	7%	17%
Total Private Employment	21,313	274,116	93%	$92,244	9%	18%
Natural Resources and Mining	230	3,667	1%	$42,512	17%	9%
Construction	1,856	18,159	6%	$79,908	38%	13%
Manufacturing	858	51,694	18%	$108,328	10%	11%
Trade, Transportation, and Utilities	3,315	52,713	18%	$61,216	10%	12%
Wholesale Trade	1,441	13,846	5%	$108,544	8%	11%
Retail Trade	1,548	31,549	11%	$42,924	2%	10%
Information	687	7,392	3%	$124,560	0%	15%
Financial Activities	1,913	14,824	5%	$77,768	6%	8%
Professional and Business Services	4,221	53,821	18%	$173,712	2%	19%
Education and Health Services	3,465	36,822	13%	$57,808	11%	19%
Healthcare and Social Assistance	3,137	31,778	11%	$59,992	14%	19%
Leisure and Hospitality	1,597	24,735	8%	$27,736	3%	46%
Accommodations and Food Services	1,348	21,035	7%	$27,780	4%	44%
Other Services	1,806	9,286	3%	$58,560	0%	20%

[613] State of Oregon Employment Department. (2022, July). Local Areas, Portland-Metro, Unemployment Rate. https://www.qualityinfo.org/portland-metro?region=4117000001~ces~00000000~false~true~true~false~true~false?region=4117000001~laus~false~true~true~false~true~false

Industry Description*	2021				Change in Jobs from 2015–2021	Employment Forecast Growth from 2020–2030
	Firms or Units	Total Employees	Percent of Employees	Average Wage		
Government	303	20,160	7%	$69,824	-11%	9%
Federal	27	896	<1%	$77,572	18%	1%
State	33	2,169	1%	$73,868	-33%	8%
Local	243	17,095	6%	$68,904	-8%	11%

* The sectors with the largest number of employees are in bold.

1.3.8. Key Resources

- **Commercial Facilities:** The Washington County Visitors Association boasts shopping as a major attraction. Oregon has no sales tax and the Metro Region is easily accessible by residents of Washington State. There are several well-developed shopping destinations in the County, including Washington Square Mall, Tanasbourne Town Center, Bridgeport Village Mall, and Cedar Hills Crossing.
- **Critical Manufacturing:** Washington County is home to a number of large technology companies, including Intel, Tektronix, and LAM Research. These campuses have both software development and manufacturing components.
- **Large Retail Employers:** The 400-acre world headquarters campus for Nike, Inc. is in unincorporated Washington County and employs over 11,000 people. Additionally, the headquarters for Columbia Sportswear Company is also in the unincorporated area of the County and employs approximately 9,000 people.

1.3.9. High Revenue Sectors

In 2017, the most recent year for which data is available, the three sectors with the highest revenue were manufacturing, wholesale trade, and retail trade.[614] The table below shows the revenue generated by each reported economic sector. In 2017, industries located in Washington County generated a total of almost $58 billion in revenue.

Table 365: Revenue of Top Economic Sectors in Washington County[615]

Economic Sector	Sector Revenue	Percent of Total Revenue
Manufacturing	$19,630,000,000	34%
Wholesale Trade	$12,095,000,000	21%
Retail Trade	$11,938,000,000	21%
Healthcare and Social Assistance	$4,422,000,000	8%
Professional, Scientific, and Technical Services	$2,523,000,000	4%
Administrative and Support, and Waste Management and Remediation Services	$2,332,000,000	4%
Accommodation and Food Services	$1,417,000,000	2%
Real Estate, Rental, and Leasing	$1,268,000,000	2%
Other Services (Except Public Administration)	$1,136,000,000	2%
Transportation and Warehousing	$808,000,000	1%
Arts, Entertainment, and Recreation	$248,000,000	0%
Educational Services	$133,000,000	0%
Total	**$57,950,000,000**	**100%**

Washington County relies on both basic and non-basic sector industries and it is important to consider the effects each may have on the economy following a disaster. Basic sector businesses have a multiplier effect on a local economy that can spur the creation of new jobs, some of which may be non-basic. The presence of basic sector jobs can help speed the local recovery; however, if basic sector production is hampered by a natural hazard event, the multiplier effect could be experienced in reverse. In this case, a decrease in basic sector purchasing power results in lower profits and potential job losses for the non-basic businesses that are dependent on them.

The manufacturing sector was the largest revenue generator, generating $19.6 billion in revenue in 2017, the most recent year for which data is available. It is highly dependent upon the transportation network in order to access supplies and send finished products to outside markets. As a base industry, manufacturers are not dependent on local markets for sales, which contribute to the economic resilience of this sector.

[614] United States Census Bureau. (2017). 2017 Economic Census Survey, Table EC1700BASIC. Accessed April 15, 2022.
[615] United States Census Bureau. (2017). 2017 Economic Census Survey, Table EC1700BASIC. Accessed April 15, 2022.

Wholesale trade generated nearly $12.1 billion. Wholesale Trade is closely linked with retail trade but it has a broader client base, with local and non-local businesses as the typical clientele. Local business spending will be likely to diminish after a natural disaster, as businesses repair their properties and wait for their own retail trades to increase. Distanced clients may have difficulty reaching the local wholesalers due to transportation disruptions from a natural disaster.

The Retail trade sector generated $11.9 billion, making it the third largest earning sector in Washington County. The Retail trade sector typically relies on local residents and tourists and their discretionary spending ability. Residents' discretionary spending diminishes after a natural disaster when they must pay to repair their homes and properties. In this situation, residents will likely concentrate their spending on essential items that would benefit some types of retail (e.g., grocery) but hurt others (e.g., gift shops). The potential income from tourists also diminishes after a natural disaster as people are deterred from visiting the impacted area. Retail trade is also largely dependent on wholesale trade and the transportation network for the delivery of goods for sale. Disruption of the transportation system could have severe consequences for retail businesses. In summary, depending on the type and scale, a disaster could affect specific segments of retail trade, or all segments.

In the event that any of these primary sectors are impacted by a disaster, Washington County may experience a significant disruption of economic productivity.

1.3.10. Future Employment in Industry

Between 2015 and 2021 the sector that experienced the largest percent growth was Construction, which was rebounding from the Great Recession. Other key growth sectors were federal government and natural resource and mining, though each of these were starting from relatively small bases. Education and health services—led by the healthcare and social assistance subsector—was the other sector with large growth over the last six years. The Manufacturing and Trade, transportation and utilities, sectors also grew by 10%. Some of these sectors often require more training and education, while others require less education and have lower wages.

Sectors that are anticipated to be major employers in the future also warrant special attention in the hazard mitigation planning process. Between 2020 and 2030, the largest employment growth is anticipated within leisure and hospitality, accommodations and food services, other services, healthcare and social assistance, education and health services, and professional and business services.

1.4. Built Environment Capacity

The built environment refers to the physical features that provide spaces for living, working and recreating in a community, such as buildings, roads, parks and open spaces, and utilities. The amount and quality of the built environment contributes significantly to the resiliency of the community to withstand and respond to hazards. Physical infrastructures, including utility and transportation lifelines, are critical during a disaster and are essential for proper functioning and response. The lack or poor condition of infrastructure can negatively affect a community's ability to cope, respond, and recover from a natural disaster. Following a disaster, communities may experience isolation from surrounding cities and counties due to infrastructure failure. These conditions force communities to rely on local and immediately available resources.

1.4.1. Land Use and Development Patterns

One significant way in which Washington County residents can increase or decrease their vulnerability to natural hazards is through development patterns. The way in which land is used (e.g., is it a parking lot or maintained as an open space?) will determine how closely the man-made systems of transportation, economy, etc., interact with the natural environment. All patterns of development, density as well as sprawl, bring separate sets of challenges for hazard mitigation. Current land use in unincorporated

Washington County includes urban development, high-tech industries, agriculture and farming activities, forests, rural residential, and recreational uses.

1.4.1.1. Regulatory Context

Since 1973, Oregon has maintained a strong statewide program for land use planning. The foundation of that program is a set of 19 statewide planning goals that express the state's policies on land use and on related topics, such as citizen involvement, land use planning, and natural resources.

Oregon's statewide planning goals are achieved through local comprehensive planning. State law requires each city and county to adopt a comprehensive plan and the zoning and land division ordinances needed to put the plan into effect. The local comprehensive plans must be consistent with the statewide planning goals. Plans are reviewed for such consistency by the state's Land Conservation and Development Commission (LCDC).

Oregon's statewide planning goals and land use laws require the majority of rural land outside Urban Growth Boundaries (UGBs) to be protected for farm, forest, and aggregate resource values. State and local policies currently direct growth away from rural lands into UGBs, and, to a lesser extent, into rural communities.

If development follows historical development trends, urban areas will expand their UGBs, rural unincorporated communities will continue to grow, and overall rural residential density will increase slightly with the bulk of rural lands kept in farm and forest use. The existing pattern of development in the rural areas, that of radiating out from the urban areas along rivers and streams, is likely to continue. Most of the "easy to develop" land in unincorporated Washington County is already developed, in general leaving more constrained land, such as land in the floodplains or on steep slopes, for potential development in the future, perhaps increasing the rate at which development occurs in natural hazard-prone areas.

1.4.1.2. Statewide Planning Goal 7

Statewide Planning Goal 7, Areas Subject to Natural Disasters and Hazards, has the overriding purpose to "protect people and property from natural hazards." Goal 7 states "local governments shall adopt comprehensive plans (inventories, policies, and implementing measures) to reduce risk to people and property from natural hazards."[616] Natural hazards include floods, landslides, earthquakes, tsunamis, coastal erosion, and wildfires.

When federal or state agencies provide new natural hazard information, the state's Department of Land Conservation and Development (DLCD) directs local jurisdictions to evaluate the hazard risk and assess the:

- Frequency, severity, and location of the hazard;
- Effects of the hazard on existing and future development;
- Potential for development in the hazard area to increase the frequency and severity of the hazard; and
- Types and intensities of land uses to be allowed in the hazard area.

Based on the evaluation of risk, local governments must adopt or amend plan policies and implementing measures consistent with the following principles:

[616] Oregon Department of Land Conservation and Development. (2001 September 28). Oregon's Statewide Planning Goals and Guidelines Goal 7: Areas Subject to Natural Hazards. https://www.oregon.gov/lcd/OP/Documents/goal7.pdf

- Avoiding development in hazard areas where the risk to people and property cannot be mitigated
- Prohibiting the siting of essential facilities, major structures, hazardous facilities, and special occupancy structures in identified hazard areas where the risk to public safety cannot be mitigated

Local governments will be in compliance with State requirements with Goal 7 for coastal and riverine hazards through the adoption and implementation of local floodplain regulations meeting minimum National Flood Insurance Program (NFIP) requirements. Local jurisdictions adopting plan policies and implementing measures to protect people and property from natural hazards should consider:

- The benefits of maintaining natural hazard areas as open space, recreation, and other low density uses;
- The beneficial effects that natural hazards can have on natural resources and the environment; and
- The effects of development and mitigation measures in identified hazard areas on the management of natural resources.

Local governments should coordinate their land use plans and decisions with emergency preparedness, response, recovery, and mitigation programs.

Goal 7 recommends that local governments follow these implementation guidelines:

- Give special attention to emergency access when considering development in identified hazard areas.
- Consider programs to manage stormwater runoff as a means to address flood and landslide hazards.
- Consider non-regulatory approaches to help implement the goal.
- When reviewing development requests in high hazard areas, require site specific reports, appropriate for the level and type of hazards. Site specific reports should evaluate the risk to the site, as well as the risk the proposed development may pose to other properties.
- Consider measures exceeding the National Flood Insurance Program.

1.4.1.3. Metro Regional Planning

Urban development in the County is not only regulated by state law and County ordinance, but also by the long-range planning conducted at the regional level by the elected regional government, Metro. Metro manages the regional tri-County Urban Growth Boundary (UGB) that separates urban development in Washington County from rural resource land in the western portions of the County. (Note: the cities of North Plains, Banks, and Gaston in western Washington County maintain their own individual UGBs and are not subject to Metro oversight.) Metro's regional UGB is expanded periodically to provide a 20-year supply of employment, industrial, and residential land based on population and employment projections.

1.4.2. Future Development Areas

The most recent expansions of the Metro regional UGB in Washington County occurred in 2018. These recent expansion areas are Witch Hazel Village South (being master planned by City of Hillsboro), Cooper Mountain (being master planned by City of Beaverton), and Beef Bend South (being master planned by City of King City).

Current and future residential development in unincorporated Washington County will be largely contained in two 2002 additions to the regional UGB: North Bethany and Bonny Slope West. The County

has completed master plans, including development code standards, for these two areas. While the areas remain in unincorporated Washington County and are not likely to incorporate in the foreseeable future, they will house a large portion of the County's future growth in mixed-use communities as the population grows. The County proactively addressed natural hazard risk in these planning processes and identified steep slopes, floodplains, and other risks. Concept planning accounted for these risks and restricted development from occurring in areas of known risk. More detail on areas likely to experience future growth follows:

- **North Bethany** was added into the regional UGB in 2002. The area underwent concept planning and in 2009, the County began developing ordinances and identifying funding strategies to implement the plans for parks, open space, schools, infrastructure, and neighborhood services. The North Bethany Subarea Plan was adopted in 2010. As of 2022, the majority of the developable area in North Bethany has received development entitlements and/or has been built out.
- **Bonny Slope West** was added into the regional UGB in 2002 and was transferred from Multnomah County to Washington County in 2013. The area underwent concept planning starting in 2014, and the Bonny Slope West Subarea Plan was adopted in 2015. As of 2022, approximately half of the developable area in Bonny Slope West has received development entitlements and/or has been built out.
- **Urban and Rural Reserves** have been designated throughout the Metro region. The three County governments and the Metro Regional government agreed to set aside land for either: (1) incorporation into the UGB in the future, or (2) preservation as agricultural, forest, or natural land. The areas are shown in Figure 46.
    - **Urban reserve** means lands outside a UGB that will provide for: (a) future expansion over a long-term period; and (b) the cost-effective provision of public facilities and services within the area when the lands are included within the UGB.
    - **Rural reserve** means land reserved to provide long-term protection for agriculture, forestry, or important natural landscape features that limit urban development or help define appropriate natural boundaries of urbanization, including plant, fish and wildlife habitat, steep slopes, and floodplains.

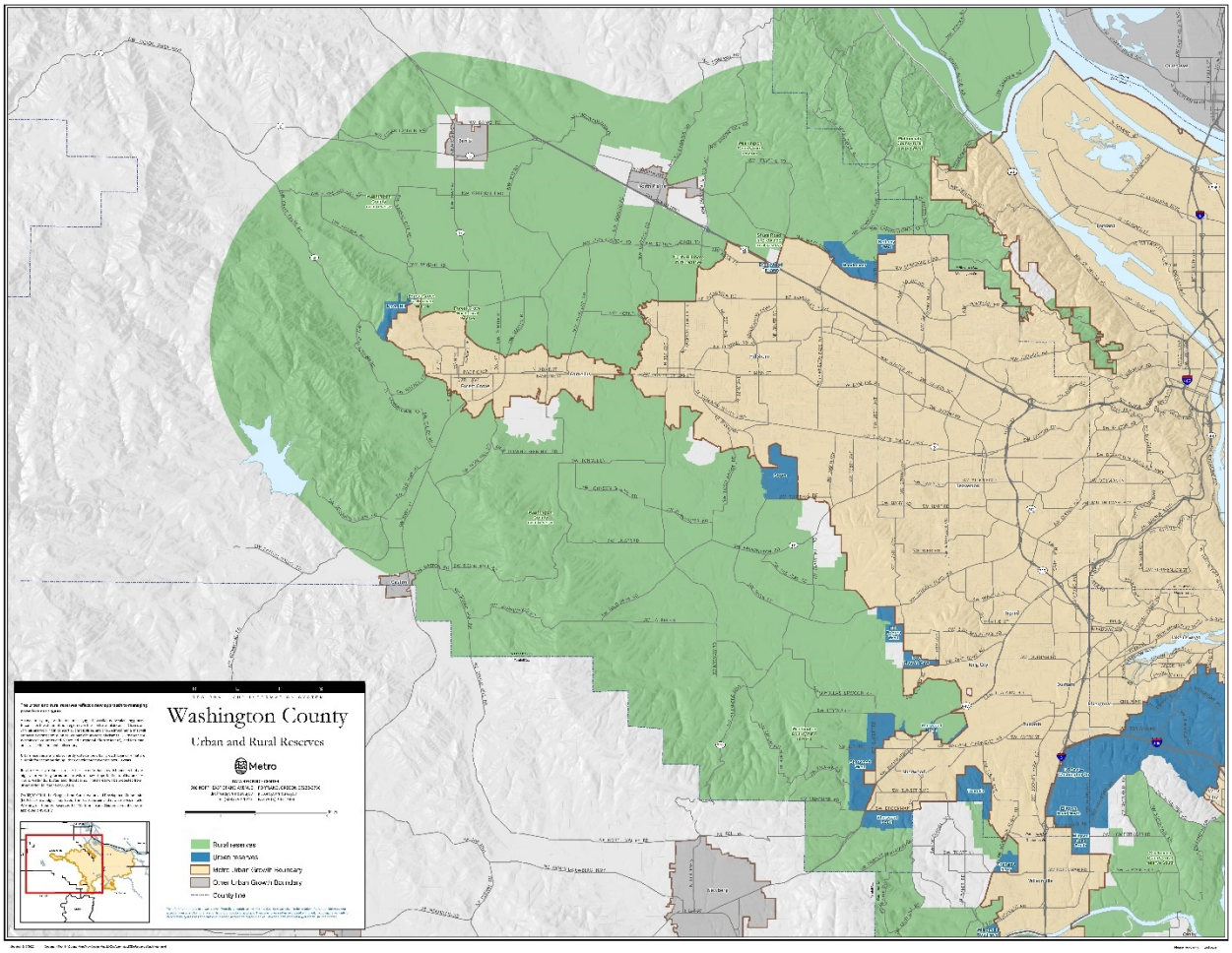

Figure 46: Urban and Rural Reserves in Washington County[617]

1.4.3. Housing

In addition to location, the characteristics of the housing stock affect the level of risk posed by natural hazards. The table below identifies the types of housing most common throughout the County. Of particular interest are manufactured homes, which account for about 2% of the housing in Washington County. Manufactured homes are particularly vulnerable to certain natural hazards, such as windstorms, and special attention should be given to securing the structures because they are more prone to wind damage than wood-frame construction. In other natural hazard events, such as earthquakes and floods, moveable structures like manufactured homes are more likely to shift on their foundations and create hazardous conditions for occupants.

[617] Metro. (2020, February 24). Regional Urban and Rural Reserves Map. https://www.oregonmetro.gov/urban-and-rural-reserves

Table 366: Housing Profile of Washington County[618]

Jurisdiction	Total Housing Units	Single Family		Multi-Family		Manufactured Homes	
		Number	Percent	Number	Percent	Number	Percent
City of Beaverton	42,000	23,000	56%	19,000	32%	1,000	1%
City of Cornelius	4,000	3,000	90%	1,000	17%	<1,000	10%
City of Forest Grove	9,000	6,000	68%	3,000	35%	<1,000	6%
City of Hillsboro	41,000	25,000	64%	15,000	38%	1,000	2%
City of Sherwood	7,000	6,000	84%	1,000	23%	<1,000	2%
City of Tigard	22,000	15,000	68%	7,000	37%	<1,000	2%
Washington County	232,000	155,000	68%	71,000	32%	5,000	2%

* Numbers rounded to account for the margin of error.

The percentages listed in the table above are total units counts. This table does not evaluate how many of these housing units might be located within special flood hazard areas, or that are at increased risk of seismic damage. Data was not available for the City of North Plains.

Aside from location and type of housing, the year structures were built has implications. Seismic building standards were codified in Oregon building code starting in 1974; more rigorous building code standards were passed in 1993 that accounted for the Cascadia earthquake fault.[619] Therefore, homes built before 1993 are more vulnerable to seismic events. Also in the 1970s, FEMA began assisting communities with floodplain mapping as a response to administer the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Upon receipt of floodplain maps, communities started to develop floodplain management ordinances to protect people and property from flood loss and damage.

Roughly 16%–18% of the housing stock in Washington County was built prior to 1970, before the implementation of floodplain management ordinances; however, Forest Grove has between 28% and 36% of its housing units built prior to 1970. Countywide, about 50%–52% of the housing stock was built before 1993 and the codification of seismic building standards. Approximately half of the County's housing stock was built after 1990; Hillsboro (61%–66%) and Sherwood (76%–87%) have the highest percentage of housing units built after 1990. Data was not available for the City of North Plains.

Table 367: Year Housing Structures Built[620]

Jurisdiction	Total Housing Units	Built Prior to 1970		Built Between 1970 to 1989		Built 1990 or Later	
		Number	Percent	Number	Percent	Number	Percent
City of Beaverton	42,000	8,000	20%	19,000	42%	18,000	44%
City of Cornelius	4,000	<1,000	17%	1,000	49%	2,000	58%

[618] United States Census Bureau. (2020). American Community Survey, Table DP04. Accessed April 15, 2022.
[619] State of Oregon Building Codes Division. *Earthquake Design History: A Summary of Requirements in the State of Oregon*, February 7, 2012. http://www.oregon.gov/OMD/OEM/osspac/docs/history_seismic_codes_or.pdf
[620] United States Census Bureau. (2020). American Community Survey, Table DP04. Accessed April 15, 2022.

Jurisdiction	Total Housing Units	Built Prior to 1970		Built Between 1970 to 1989		Built 1990 or Later	
		Number	Percent	Number	Percent	Number	Percent
City of Forest Grove	9,000	3,000	36%	3,000	30%	4,000	46%
City of Hillsboro	41,000	5,000	14%	15,000	26%	26,000	66%
City of Sherwood	7,000	<1,000	7%	1,000	18%	6,000	87%
City of Tigard	22,000	4,000	18%	7,000	45%	9,000	45
Washington County	232,000	41,000	18%	71,000	34%	114,000	50%

* Numbers rounded to account for the margin of error.

1.4.4. Infrastructure Profile

Infrastructure and critical facilities are vital to the continued delivery of key governmental and private services as well as recovery efforts. The loss of these services may cause serious secondary impact as well as significantly hamper the public's ability to recover from a disaster event. Homeland Security Presidential Directive 7 calls out sixteen sectors as Critical Infrastructure and Key Resources that are "essential to the nation's security, public health and safety, economic vitality, and way of life." This section identifies critical infrastructure and key resources in Washington County and includes resources emphasized in the survey of County residents. The sectors include:

Agriculture and Food

This is a primarily private sector industry but includes both imported/exported food as well and what is grown in the County.

Banking and Finance

For Washington County, this sector would include not only accounts payable/receivable and payroll, but social services provided to residents through community welfare programs.

Chemical

Manufacturing and agricultural processes can often require the use of chemicals and substances that could harm residents if air or water resources were to become contaminated.

Communications and Information Technology

Phone lines, cell towers, broadcast internet, and radio and television signals are mediums for interpersonal connection, economic vitality, and emergency communications in the County. Survey respondents highlighted TV and radio as primary modes of communication. Additionally, and of importance to the region as much as to the County, weather stations, such as the Doppler Radar site near the northern County border, can be quickly cut off by fire or earthquake. In the case of a crisis, the ability to transmit information between responders and to residents can mean the difference between life and death.

Defense Industrial Base

The Oregon Military Department maintains armories in Washington County, and the Oregon Army National Guard has units based in Tigard, Hillsboro, and Forest Grove.

Emergency Services

911 call centers and police and fire stations dispatch first responders for most hazard events and often become the base of response operations during prolonged hazard events. Population distribution and

service areas as well as the availability and duplication of resources at each station can play a role in determining how, where, and when response and recovery are effective.

- **911 Call Center**
  - Washington County Consolidated Communications Agency (WCCCA)
- **Law Enforcement**
  - Washington County Sheriff's Office Headquarters, jail, and youth detention facilities
  - Sheriff's Office – East Precinct
  - Sheriff's Office – City of Cornelius
  - Hillsboro Police Department
  - Beaverton Police Department
  - Tigard Police Department
- **Fire Districts**
  - Tualatin Valley Fire and Rescue: 29 stations
  - Banks Fire District: 3 stations
  - Cornelius Fire District: 1 station
  - Forest Grove Fire and Rescue: 2 stations
  - Gaston Rural Fire District: 1 station
  - Hillsboro Fire and Rescue: 5 stations

Energy

In Washington County, electrical and gas utilities are provided by both private companies and some smaller cooperatives. Coordinating mitigation across these diverse organizational structures and philosophies will ensure that services are provided equitably, even if a hazard incident stresses the supply or demand. Critical infrastructure includes power substations, gas lines, and both underground and aboveground transmission lines.

Utility Lifelines

Utility lifelines are the resources that the public relies on daily, (i.e., fuel and communication lines). If these lines fail or are disrupted, the essential functions of the community can become severely impaired. Utility lifelines are closely related to physical infrastructure, (i.e., dams and power plants) as they transmit the power generated from these facilities.

Washington County receives oil and gas from Alaska by way of the Puget Sound through pipelines and tankers. Most of the natural gas Oregon uses originates in Alberta, Canada. Northwest Natural Gas owns the main natural gas transmission pipeline. The network of transmission lines running through the County may be vulnerable to severe but infrequent natural hazards, such as windstorm, winter storms, and earthquakes.

Governmental Facilities

Every day, community leaders and residents rely on the buildings that house essential governmental functions: City Halls, Court Houses, public works buildings, and more. Protecting and reinforcing these facilities will facilitate the return to "business as usual" after a hazard event.

Schools

Schools are occupied by vulnerable younger populations and may also be used as emergency shelters during hazard events. The following school districts are within the County:

- Banks School District: 3 schools
- Beaverton School District: 53 schools
- Forest Grove School District: 12 schools
- Gaston School District: 2 schools
- Hillsboro School District: 37 schools
- Portland Public Schools: 2 schools
- Sherwood School District: 6 schools
- Tigard–Tualatin School District: 16 schools
- Northwest Regional Educational Service District: 1 school
- 47 private schools

Healthcare and Public Health

Hospitals, clinics, and shelters often play a critical role in the immediate aftermath of a hazard incident in saving lives and keeping residents safe. Additionally, satellite clinics, doctors' offices, and urgent care facilities are vital components of a healthcare system.

- **Hospitals**
  - Cedar Hills Hospital (10300 SW Eastridge Street, Portland)
  - Kaiser Westside Medical Center (19301 NW Venetian Drive, Hillsboro)
  - Legacy Meridian Park Hospital (19300 SW 65th Avenue, Tualatin)
  - Providence St. Vincent Medical Center (9205 SW Barnes Road, Beaverton)
  - Primary Care Forest Grove (1825 Maple Street, Forest Grove)
  - Oregon Health & Science University Hillsboro Medical Center (335 SE 8th Avenue, Hillsboro)
- **Medical Transport**
  - Metro West Ambulance
- **Assisted Living Facilities**
  - Beaverton: 11 facilities
  - Forest Grove: 8 facilities (1 memory care facility)
  - Hillsboro: 9 facilities
  - Sherwood: 3 facilities
  - Tigard: 6 facilities
  - Tualatin: 5 facilities
  - Wilsonville: 4 facilities

Transportation Systems

Urban Washington County meets its current transportation needs through a mixture of municipal road systems, County roads, state and federal highways, and a regional transit system (TriMet). Major highways in the County include Interstate 5, State Highway 26, which runs from southeast to northwest, linking Portland to the coast, and State Highway 6, which branches off 26 and runs west to the coast. State Highway 217 is a bypass route that links Interstate 5 to Highway 26. State Highway 47 runs north–south and links the western cities of Banks, Forest Grove, and Gaston to Columbia and Yamhill Counties. TriMet provides both bus and light rail service to the County and to the larger Portland metropolitan area. Cycling and pedestrian paths are used both for commuting and recreation and their bridges and overpasses connect communities in crucial ways.

The Washington County MAX (Metropolitan Area Express) Light Rail provides rail transit connections between Hillsboro and the east Portland suburb of Gresham and is aligned in an east and west direction following Highways 26, 217, and 8. TriMet's WES (Westside Express Service) is a commuter rail line oriented north–south and serves Beaverton, Tigard, Tualatin, and Wilsonville.

- It is important to identify bottleneck points or parts of the transportation system that are more vulnerable to failure than others. Survey respondents voiced a concern about limited egress and access in some more rural parts of the County that could be cut off from emergency services with the loss of a single road or bridge.
- In Washington County, rail lines and bridges are more vulnerable to impacts from flood and earthquake as even minor shifts in their alignment can render them unusable and stop the flow of civilian and emergency service traffic on either side of the affected area.

Seismic lifeline routes help maintain transportation facilities for public safety and resilience in the case of natural disasters. Following a major earthquake, it is important for response and recovery agencies to know which roadways are most prepared for a major seismic event. The Oregon Department of Transportation has identified lifeline routes to provide a secure lifeline network of streets, highways, and bridges to facilitate emergency services response after a disaster.[621]

System connectivity and key geographical features were used to identify a three-tiered seismic lifeline system. Routes identified as Tier 1 are considered to be the most significant and necessary to ensure a functioning statewide transportation network. The Tier 2 system provides additional connectivity to the Tier 1 system; it allows for direct access to more locations and increased traffic volume capacity. The Tier 3 lifeline routes provide additional connectivity to the systems provided by Tiers 1 and 2.

The Lifeline Routes in the Portland Metro Geographic Zone consist of the following:

- Tier I: Interstate 5 (excluding the section between the northern and southern I-405 interchanges), I-405, I-205, and OR 99W from I-5 to OR 217
- Tier II: I-84, I-5 between the northern and southern I-405 interchanges, US 26 from OR 217 to I-405
- Tier III: OR 217, US 26 from I-5 to I-205, OR 43

Bridges

Because of earthquake risk, the seismic vulnerability of the County's bridges is an important issue. Non-functional bridges can disrupt emergency operations, sever lifelines, and disrupt local and freight traffic. These disruptions may exacerbate local economic losses if industries are unable to transport goods. The County's bridges are part of the state and interstate highway system that is maintained by the Oregon Department of Transportation (ODOT) or that are part of regional and local systems that are maintained by the region's counties and cities.

[621] CH2MHILL, Prepared for Oregon Department of Transportation. (2012, May 15). Oregon Seismic Lifeline Routes Identification Project, *Lifeline Selection Summary Report*.

The bridges in Washington County require ongoing management and maintenance due to the age and types of bridges. Modern bridges, which require minimum maintenance and are designed to withstand earthquakes, consist of pre-stressed reinforced concrete structures set on deep steel piling foundations. ODOT has identified seismically vulnerable bridges across Oregon. Records indicate that there are two seismically vulnerable County-owned bridges: #1211 and #1331.[622] Bridge # 1211 is on SW 65th Avenue, crossing Nyberg Creek, and is on a primary access to Meridian Park Hospital. Bridge #1331 is on SW 185th Avenue crossing Beaverton Creek, which is a major north-south transportation route.

Airports

The Port of Portland operates the Hillsboro Airport, which is the second busiest airport in Oregon and the busiest "general aviation" airport in Oregon. It is a 900-acre executive airport with three runways (6,600 feet, 3,821 feet, and 3,600 feet) and four full-service fixed-base operators, and it provides all the facilities necessary to support jet and propeller-driven aircraft and helicopters. The airport is home to local corporate flight departments, aircraft charter services, air ambulance services, flight schools, aircraft maintenance and repair operations, corporate air shuttle service, and a U.S. Customs and Border Protection office for international flights. In all, more than 25 businesses operate on-airport.

Water

In Washington County, water resources are abundant yet fragile and can even be dangerous. Water resources are susceptible to pollution from runoff or toxic spills. Low rain years can increase the risk of drought in the summer while intense periods of rain can bring floods or landslides. Rivers and their tributaries can only be managed so much by dams and culverts. Responsible development in the floodplain and throughout the County that maintains and supports natural drainage systems can help protect water resources.

- Physical infrastructure such as dams, levees, roads, bridges, railways and airports support Washington County communities and economies. Due to the fundamental role that physical infrastructure plays both in pre- and post-disaster, they deserve special attention in the context of creating resilient communities.
- Utility systems such as potable water, wastewater, natural gas, telecommunications, and electric power are all networked systems. That is, they consist of nodes and links. Nodes are centers where something happens–such as a pumping plant, a treatment plant, a substation, a switching office, and the like. Links are the connections (pipes or lines) between nodes.

Dams

Oregon follows national guidance for assigning hazard ratings to dams and for the contents of Emergency Action Plans, which are now required for all dams rated as "high hazard." Each dam is rated according to the anticipated impacts of its potential failure. The state has adopted these definitions for state-regulated dams:

- **High hazard:** Loss of life is expected if the dam fails.
- **Significant Hazard: L**oss of life is not expected if the dam fails, but extensive damage to property or public infrastructure is.
- **Low hazard: A**ssigned to all other state-regulated dams.

There are 3 high hazard, 15 significant hazard, and 59 low hazard dams in Washington County.[623]

[622] Oregon Department of Transportation. (2021). Bridge Condition Report 2021 Dashboard Interactive Report. Accessed November 18, 2022, from https://www.oregon.gov/ODOT/Bridge/Pages/BCR.aspx
[623] U.S. Army Corps of Engineers. (2022). National Inventory of Dams. https://nid.sec.usace.army.mil/#/

Table 368: Dams Located in Washington County[624]

Name	Classification	Regulator
Scoggins Dam	High	Federal
Barney Dam	High	State
Kay Lake Dam	High	State
Burkhalter #2 Dam	Significant	State
Cook Reservoir Dam	Significant	State
Raymond Dierickx Dam	Significant	State
Dober Reservoir Dam	Significant	State
Ettinger Pond Dam	Significant	State
Hoefer–Pierson Reservoir Dam	Significant	State
Jesse Enlargement Dam	Significant	State
Lind Reservoir Dam	Significant	State
Maple Headquarters Reservoir Dam	Significant	State
Paul Chobin Dam	Significant	State
Pierson–Upper Dam	Significant	State
Tualatin Park Dam	Significant	State
Unger–Bill Dam	Significant	State
Walters, Glenn #1 - Large Dam	Significant	State
Walters, Glenn #5 Dam	Significant	State

This hazard classification is solely a measure of the probable impacts if a dam fails. Thus, a dam classified as high hazard does not mean that the dam is unsafe or likely to fail. The level of risk, or probability of failure, of a given dam is not even considered in this classification scheme. Rather, the high hazard classification simply means that there are people at risk downstream from the dam in the inundation area if the dam were to fail.

Dams assigned to the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life. Failure of dams in the high classification will generally also result in economic, environmental, or lifeline losses, but the classification is based solely on probable loss of life.

Dams assigned to the significant hazard classification are those where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, or disruption of lifeline facilities. Significant hazard potential dams are often located in predominantly rural or agricultural areas.

Dam failures can occur at any time in a dam's life; however, failures are most common when water storage for the dam is at or near design capacity. At high water levels, the water force on the dam is higher and several of the most common failure modes are more likely to occur. Correspondingly, for any dam, the probability of failure is much lower when water levels are substantially below the design capacity for the reservoir.

[624] U.S. Army Corps of Engineers. (2022). National Inventory of Dams. https://nid.sec.usace.army.mil/#/

1.5. Community Connectivity

Community connectivity is the interaction of human, organizational, and social connections existing within a community that can be used to solve collective problems and improve or maintain the well-being of the community. It may operate through informal social processes and/or organized efforts by individuals and organizations.

Community connectivity places strong emphasis on social structure, trust, norms, and cultural resources within a community. In terms of community resilience, these connections and networks can be drawn upon to stabilize recovery of the community. These elements of social and cultural capital are present in all communities; however, they may be dramatically different from one community to the next as these elements reflect the specific needs and composition of the community residents.

Social Systems and Service Providers

Social systems include community organizations, service providers and programs that provide social and community-based services, such as employment, health, senior, and disabled services, professional associations, and veterans' affairs for the public. In planning for natural hazard mitigation, it is important to know what social systems and service providers exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g., elderly, children, low income, etc.). Since existing social systems and service providers already work directly with the public on a number of issues, the County could use them to communicate with the public about natural hazard preparedness and mitigation. These service providers are predominantly located in urbanized areas of the County.

Principles of effective communication to a target audience are outlined below and illustrated in Figure 47. The community's existing social service providers could use these communication principles to provide natural hazard related messages to their clients.

The five essential elements for communicating effectively to a target audience are:

- The source of the message must be credible.
- The message must be appropriately designed.
- The channel for communicating the message must be carefully selected.
- The audience must be clearly defined.
- The recommended action must be clearly stated and a feedback channel established for questions, comments, and suggestions.

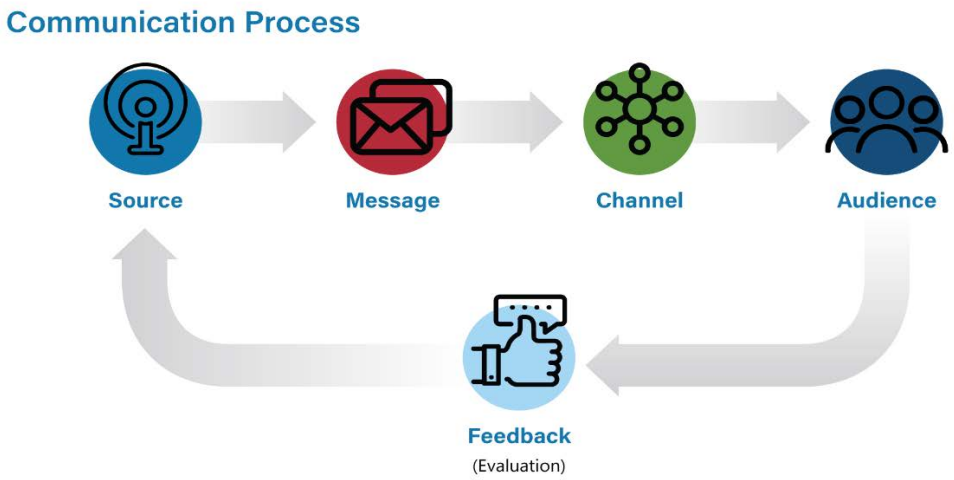

Figure 47: Communication Process[625]

1.5.1. Community Engagement

Communities have a vital role to play in managing the risks associated with natural hazards. As such, their strengths, opportunities for mitigation, and priority concerns should be factored into policy decisions to ensure local recovery efforts reflect community needs. Regular engagement with community members provides opportunities for the county, cities, and special districts to tap into a reservoir of local knowledge to build a shared understanding of how to foster local preparedness and help communities reduce the impact of natural hazards. Not all communities are alike. Needs can differ for a variety of reasons and can help determine the best ways to inspire a response from each specific community. The methods of engagement should be tailored to ensure communities are willing and able to participate in the types of interactions plan participants wish to initiate.[626]

Civic engagement and involvement in local, state, and national politics are important indicators of community connectivity and engagement. Civic engagement is a key ingredient to success when facing issues like hazard mitigation that can have a large-scale impact on communities. In addition, leveraging inclusive resident engagement could lead to a greater social network of creativity and innovation and to the adoption of ideas and solutions for mitigating the common problems presented by natural hazards. This could increase resilience and perhaps help craft policy priorities to mitigate the funding gap that can hinder implementation of mitigation strategies, particularly in the most vulnerable areas.[627]

1.5.2. Cultural Resources

The cultural and historic heritage of a community is more than just tourist charm. For families that have lived in the County for generations and new residents alike, it is the unique places, stories, and annual events that make Washington County an appealing place to live.

[625] Source: Adapted from the U.S. Environmental Protection Agency Radon Division's outreach program
[626] Saum-Manning, L. (2021). Best Practices and Lessons Learned from Community Engagement and Data Collection Strategies in Post-Hurricane Maria Puerto Rico. *Journal of Homeland Security and Emergency Management*, *18*(3), 225-250. https://doi.org/10.1515/jhsem-2020-0075
[627] Inguane, A. (2019, December 13). Opinion: Civic Engagement, Innovation Needed in Disaster-Recovery and Reconstruction Process. Devex. https://www.devex.com/news/opinion-civic-engagement-innovation-needed-in-disaster-recovery-and-reconstruction-process-96188

The cultural and historic assets in the County are both intangible benefits and obvious quality-of-life-enhancing amenities. Mitigation actions to protect these assets span many of the other systems already discussed. Some examples of that overlap could be seismic retrofit (preserving historic buildings and ensuring safety) or expanding protection of wetlands (protect water resources and beautify the County).

1.5.3. Community Stability

1.5.3.1. Residential Geographic Stability

Community stability is a measure of rootedness in place. It is hypothesized that resilience to disasters stem in part from familiarity with place, not only for navigating the community during a crisis, but also accessing services and other supports for economic or social challenges.[628] The table below estimates residential stability across the region. It is calculated by the number of people who have lived in the same house and those who have moved within the same County a year ago, compared to the percentage of people who have migrated into the region. Washington County overall has a geographic stability rating of about 93% (i.e., 93% of the population lived in the same house or moved within the County). The figures of community stability are relatively consistent across the region, with the smaller cities having generally greater geographic stability. Countywide 4% of residents in 2019 lived in a different Oregon County one year before; 5% lived outside of Oregon one year before. Data was not available for the City of North Plains.

[628] Cutter, S.L., Burton, C.G., and Emrich, C.T. (2010). Disaster Resilience Indicators for Benchmarking Baseline Conditions. *Journal of Homeland Security and Emergency Management*. https://www.researchgate.net/publication/250147250_Disaster_Resilience_Indicators_for_Benchmarking_Baseline_Conditions

Table 369: Population by Residence a Year Ago[629]

Jurisdiction	Population Aged 1 and Older	Same House as Last Year	Elsewhere in Washington County	Other County in Oregon	Another State	Another Nation
City of Beaverton	41,000	83%	12%	4%	5%	1%
City of Cornelius	4,000	93%	13%	2%	3%	2%
City of Forest Grove	9,000	87%	12%	4%	3%	1%
City of Hillsboro	39,000	83%	13%	2%	6%	1%
City of Sherwood	7,000	89%	9%	4%	3%	1%
City of Tigard	21,000	88%	9%	4%	3%	1%
Washington County	223,000	84%	9%	4%	4%	1%

1.5.3.2. Homeownership

Housing tenure describes whether residents rent or own the housing units they occupy. Homeowners are typically more financially stable but are at risk of greater property loss in a post-disaster situation. People may rent because they choose not to own, they do not have the financial resources for home ownership, or they are transient.

Collectively, about 60% of the occupied housing units in Washington County are owner-occupied; about 38% are renter-occupied. Beaverton and Hillsboro have the highest rate of renter-occupied households. Forest Grove has the highest vacancy rates within the County. Data was not available for the City of North Plains.

Table 370: Housing Tenure and Vacancy[630]

Jurisdiction	Total Housing Units	Owner-Occupied Units		Renter-Occupied Units		Vacant Units	
		Number	Percent	Number	Percent	Number	Percent
City of Beaverton	42,000	21,000	51%	20,000	50%	1,000	4%
City of Cornelius	4,000	3,000	83%	1,000	31%	<1,000	3%
City of Forest Grove	9,000	5,000	62%	3,000	41%	<1,000	6%

[629] United States Census Bureau. (2015-2020). American Community Survey, Table DP02. Accessed April 15, 2022.
[630] United States Census Bureau. (2015-2020). American Community Survey, Table DP04. Accessed April 15, 2022.

Jurisdiction	Total Housing Units	Owner-Occupied Units		Renter-Occupied Units		Vacant Units	
		Number	Percent	Number	Percent	Number	Percent
City of Hillsboro	41,000	20,000	52%	18,000	47%	2,000	5%
City of Sherwood	7,000	5,000	76%	2,000	28%	<1,000	5%
City of Tigard	22,000	13,000	63%	8,000	38%	1,000	5%
Washington County	232,000	137,000	60%	86,000	38%	9,000	4%

* Numbers rounded to account for the margin of error.

Wealth typically increases resiliency and recovery from disasters. Renters often do not have personal financial resources or insurance to assist them post-disaster. On the other hand, renters tend to be more mobile and have fewer assets at risk of natural hazards. In some cases, renters lack sufficient shelter options when lodging becomes uninhabitable or unaffordable post-disaster.

1.6. Political Capacity

Political capacity is recognized as the government and planning structures established within the community. In terms of hazard resilience, it is essential for political capacity to encompass diverse government and non-government entities in collaboration, as disaster losses stem from a predictable result of interactions between the physical environment, social and demographic characteristics, and the built environment.[631] Resilient political capacity seeks to involve various stakeholders in hazard planning. It also aims to integrate the Natural Hazard Mitigation Plan with other community plans, so that all planning approaches are consistent.

1.6.1. Existing Plans and Policies

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and policies already in existence have support from local residents, businesses and policy makers. Updates to these plans provide an opportunity to adapt to changing conditions and needs.

The Washington County NHMP includes a range of recommended action items that, when implemented, will reduce vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives in plans and policies already adopted by Plan participants. Linking existing plans and policies to the NHMP helps identify what resources already exist within each participating jurisdiction or special district that can be used to implement the action items identified in the Plan. Implementing the natural hazards mitigation plan's action items through existing plans and policies increases their likelihood of being supported and getting updated and maximizes the resources of Plan participants.

In addition to the plans listed below, the County and incorporated cities also have zoning ordinances (including floodplain development regulations) and building regulations.

Existing plans that can incorporate mitigation actions include:

- Comprehensive Land Use Plans
- Transportation System Plans

[631] Mileti, D. (1999). *Disaster by Design: A Reassessment of Natural Hazards in the United States.* Washington D.C.: Joseph Henry Press.

- Facility Plans
- Emergency Operations Plans