Section 2:
Community Profile

Why Plan for Natural Hazards in Yamhill County?

In 2000, the Federal Emergency Management Agency issued the Disaster Mitigation Act of 2000, commonly known as DMA 2000. Under DMA 2000, communities, states, and tribal governments must complete FEMA-approved natural hazard mitigation plans by December 31, 2004 to be eligible for certain federal assistance programs such as the Hazard Mitigation Grant Program (HMGP).[1]

While Yamhill County is generally described as having a mild climate and a relatively flat terrain, with the exception of hills located toward the Coast Range, natural hazards do present a threat to public and private property and to the health and safety of the county's residents. The next few chapters demonstrate how natural disasters have caused major concerns related to earthquakes, floods, winter storm events, windstorms, and landslides in the Yamhill County region. The county's proximity to the banks of the Willamette River increases the threat of flood occurrences and damage. To minimize risk of harm to humans and personal property, it is vital to plan for the occurrence of potential natural hazards.

History of Natural Hazards in Yamhill County

Yamhill County is located in one of the largest agricultural income sectors in Oregon. Agricultural industry is the major user of land resources for both historic and current food and fiber production within the county. Outside the Urban Growth Boundary, over 68 percent of the drainage area in Yamhill County is in agricultural production, the U.S. Bureau of Land Management manages around nine percent (9%) of land in the county, and nearly eight percent (8%) is urbanized.[2,3] Historically, the region has experienced periodic fires, floods, windstorms, and landslides. For almost 4,000 years, the Kalapuya Native Americans and early settlers regularly burned areas of the Willamette Valley to maintain "favorable plant community characteristics".[4] Because the frequency and location of fires is not well documented, the impact on historical settlements cannot fully be assessed. Many large fires occurred in 1902 and 1910, however, which raised the public's awareness of deaths and loss of property related to fire hazards.[5] Recent research indicates the potential for fire hazards in forested areas of the county from the lack of fire breaks surrounding rural residential properties, lack of water availability, and the absence of fire over the last 100 years.[6]

With many communities located along riverbanks and near local streams, Yamhill County has always been subject to winter flooding events. Such events often begin with intense storm events that tend to increase the chance for local streams and rivers to flood. Almost a dozen historical flood events, half of which are recorded as "major floods", have been documented between 1861 and 1996. Flood severity in the county depends on the size of drainage areas, existing moisture

levels, and obstacles located within flood prone areas. The most recent high water event in the Yamhill County area was flooding in January 1997, which was rooted in the last days of December 1996. On January 1, 1997, the South Yamhill River at McMinnville crested at 55 feet – flood stage is 50 feet.

Yamhill County has also experienced severe windstorms over the years. Most of these storms resulted in building and property damage, utility failures, and in some cases injury or death. One of the strongest windstorms to hit Yamhill County occurred in 1962. The Columbus Day Storm of 1962 caused trees to blow down on the average of 80 acres per square mile.[7]

Other natural hazards that have affected the county include earthquakes, wildfires, and landslides. All have affected the County in the past.

Yamhill County's past experiences with natural hazards serve as important lessons about the potential impacts of future events. The potential threat from any one of these events points to the importance of planning for and reducing the risks posed by natural hazards.

Geography and Environment

As the oldest county in Oregon, established in 1843 as one of four original Oregon Counties, Yamhill County lies on the west side of the lower middle part of the Willamette Valley. Yamhill County is bounded by Washington, Clackamas, Polk, Marion and Tillamook Counties. The Willamette River is the eastern boundary of Yamhill County.

Although one of the smallest counties in Oregon, Yamhill County ranks tenth in population, fourteenth in taxable property value, and eighth in annual worker salary.[8] Less than ten percent (10%) of Yamhill County is state or federally owned, compared to over 50 percent for the rest of Oregon.[9]

Yamhill County extends from about fifteen (15) miles southwesterly of Portland to within eleven (11) miles of the Pacific Ocean (Coast Range). The county has an area calculated to be between 728 square miles (ODOT) to 714 square miles (older publications), with the *Oregon Bluebook* currently setting the area at 718 square miles.

Located in the heart of the Mid-Willamette Valley, Yamhill County has ten (10) incorporated and 28 unincorporated communities. All ten cities are either surrounded by farmland or forest land.[10] Agriculture is the principal industry in Yamhill County, with a proportion of employment in agriculture being twice that of the average in the state.[11] The county ranks fourth out of the 36 counties in 2004 gross farm and ranch sales ($242 million).[12] Nineteen wineries lie scattered about the eastern half of the county, which is the largest concentration of any county.[13] Ninety (90) percent of the nation's hazelnuts (filberts) are grown in Yamhill County.[14]

Yamhill County has an abundance of natural resources. A third of the county is covered with commercial timber.[15] The Willamette River is the major river basin and is the county's eastern boundary. Drainage is predominantly easterly into streams and creeks feeding the Willamette River. Dozens of small creeks supply three sub-basins; North Yamhill, South Yamhill, and the Yamhill River main stem. Major waterbodies include McGuire Reservoir, Haskins Creek Reservoir, Rainbow Lake and Peavey Reservoir. Several smaller water bodies exist within the county and include (among others) but are not limited to Willamina Creek, Rock Creek, Deer Creek, Muddy Creek, Mill Creek, Salt Creek and Palmer Creek located to the south; and the headwaters of the Nestucca River, and Panther Creek and Turner Creek to the north.

Yamhill County is divided into two general geographic areas: a smooth valley area in the southern and eastern parts used for farming and containing most cities and communities, and a hilly or mountainous area in the western and northern parts used for timber. Elevations range between 150 feet on the Willamette River to 3522 (or 3422) feet at Trask Mountain, located in northwest Yamhill County.[16] Mountain ranges include Parrott, Chehalem, and the Coast Range. The Amity and Red Hills lie near Amity and Dundee, respectively. Slopes are steep and precipitous in the northwestern part of the Coast Range, and they become more rounded and moderately steep toward the eastern and southern foot slopes.

The lowest point within Yamhill County is on the bottomland east of Newberg where the Willamette River enters Clackamas County. The valley floor rises gradually from 150 feet elevation to more than 300 feet in the southwestern end of the county.[17]

Emergent Wetland and Bottomland/Wet Prairie lands were once pervasive throughout parts of Yamhill County and within the Willamette Valley region.[18] These areas were once covered mostly by native prairie grasses and characterized by an oak savanna ecosystem. Early land surveying records indicate that these scenic oak savannas and native grass prairies were a direct result of fire ecology.[19] Historical accounts of the river ecosystem indicate the primary tree species include cottonwood, alder, and other hardwoods.

Rivers and Streams

With the exception of a few small streams and the Nestucca River, which originate near the summit of the Coast Range and flow westward to the Pacific Ocean, the drainage of more than 95 percent of Yamhill County is eastward. The eastward drainage is through the forks of the Yamhill River and Chehalem Creek into the Willamette River, which flows into the Columbia River at Portland.

Willamette River

The Willamette River flows 187 miles from the Cascade Mountains in the east through northwestern Oregon to the Columbia River, which then flows into the Pacific Ocean. The Willamette River is known as the tenth largest river with respect to water volume in the continental

United States.[20] With approximately 70 percent of Oregon's population living within this basin, the Willamette River plays an integral role in the rural and urban landscapes through which it flows. The potential for natural hazards exists when the Willamette River experiences flood events within populated areas of Yamhill County. When the river rises, the extent of flooding on county roads depends on local stream flows.

Yamhill River[21]

The Yamhill River consists of three branches, south, north and mainstem. The North Yamhill runs past Yamhill and Carlton, and drains a smaller area than the South Yamhill. The two join east of McMinnville to create the mainstem Yamhill, which empties into the Willamette.

Yamhill River is twelve miles (19 km) long; formed two miles (3.2 km) east of McMinnville by the North Yamhill River and South Yamhill River. The Yamhill River rises in the Coast Range, and flows east to the Willamette River five miles (8 km) south of Newberg. The principal tributary, the South Yamhill River, is 60 miles (95 km) long.[22] The North Yamhill is approximately 29 miles (46 km) in length.[23] The entire system drains an area of 770 square miles.[24]

The Yamhill River contains winter steelhead, which use the river for juvenile rearing, and cutthroat trout, which require many of the same conditions as steelhead, but are a more dominant population. Until the 1970s, the state stocked lakes and ponds with non-native fish, among them carp, catfish, bass and coho salmon.[25]

Other fish known to be present in the Yamhill River system are: northern pike minnow, dace, sculpin, redside shiner, three-spine stickleback, pacific lamprey, brook lamprey, coarse-scaled sucker and crayfish.[2627] Nonetheless, it was stocked with several exotic species by the state. There are large and small mouth bass populations in the river, competing with the native fish, but also preying on them.

The main stem of the Yamhill River is twelve miles in length from the confluence of the North and South Yamhill Rivers downstream to the Willamette River. The basin of the Yamhill River consists of low, flat, agricultural land. This basin lies within the Willamette Valley floodplain.

There is only one tributary of note entering the main stem below the junction of the North and South Yamhill Rivers. This tributary is Palmer Creek, which joins the Yamhill River about five miles above its mouth. Palmer Creek, nine miles long, flows through flat, agricultural lands and has a slight gradient.28

North Yamhill River Main Stem

The North Yamhill River originates on the eastern slopes of the Coast Range and flows in an easterly then southerly direction. It joins the

South Yamhill to from the main stem of the Yamhill two miles northeast of McMinnville. The North Yamhill main stem is approximately 29 miles long. The four larger tributaries (Panther, Turner, Haskins, and Fairchild Creeks) vary in length from six to thirteen miles.

Panther Creek

Panther Creek is the only tributary that enters the North Yamhill below Carlton Dam. Panther Creek, around thirteen miles long, contains two falls about eleven miles above the mouth, approximately 3.7 miles above the confluence of Kane Creek. Baker Creek and Fall Creek enter Panther Creek – two miles and eleven miles above the mouth, respectively. The City of Carlton receives their domestic water from Panther Creek.

Turner Creek

Turner Creek enters the North Yamhill River about fifteen miles above the mouth or four miles northwest of the town of Yamhill. The stream is about seven miles in length. The Yamhill city water supply dam is located three miles above the mouth of Turner Creek. There is a high potential for landslides along Turner Creek.

Haskins Creek

Haskins Creek enters the North Yamhill River about 20 miles above the mouth, or one mile east of Fairdale. The stream is approximately ten miles long. One of the sources for domestic water for the City of McMinnville comes from Haskins Creek and is stored in Haskins Reservoir. The City of McMinnville also receives domestic water from McGuire Reservoir, which is on the Nestucca River, within the Wilson-Trask-Nestucca Subbasin of the North Oregon Coastal Basin.

Fairchild Creek

Fairchild Creek enters the North Yamhill River about 21 miles above the mouth or ten miles northwest of the town of Yamhill. The stream basin is a steep, narrow canyon in the Coast Range foothills and vegetation is largely second-growth firs and alders. Fairchild Creek is six miles in length and eleven miles above the mouth, respectively.

South Yamhill River Main Stem

The South Yamhill River originates in the low foothills on the east slope of the Coast Range. The river flows in a westerly direction and joins the North Yamhill River to form the Yamhill River about two miles northeast of the town of McMinnville. The South Yamhill main stem is approximately 60 miles in length. The basin is extensively used as agricultural and pastureland. The Cities of Amity and Sheridan receive their domestic water from the South Yamhill River. The four major tributaries of the South Yamhill are Mill, Willamina, Rock and Agency Creeks.

Mill Creek

Mill Creek enters the South Yamhill River about 35 miles above the mouth and three miles above Sheridan. The stream is approximately 20 miles in length and drains more than 34 miles of tributary streams. Tributaries of Mill Creek include Gooseneck and Cedar Creeks.

Willamina Creek

Willamina Creek enters the South Yamhill River approximately 37 miles above the mouth. The stream is 20 miles long and drains over 53 miles of tributary streams. The City of Willamina receives its domestic water from Willamina Creek. Willamina Creek has two major tributaries – Coast and East Fork Willamina Creeks.

Coast Creek enters Willamina Creek around eight miles above the mouth. The stream is nine miles in length and drains more than fifteen miles of tributary streams. The three large tributaries are Gilbert, Canada, and Burton Creeks. East Fork Willamina Creek, about eight miles long, has its origin on the eastern slope of the Coast Range. The stream flows in a southwesterly direction to enter Willamina Creek, about nine miles above the mouth.

Rock Creek

Rock Creek joins the South Yamhill River approximately 46 miles above the mouth. The stream is approximately twelve miles in length and drains over thirteen miles of tributary streams. Rock Creek has two named tributaries – Joe Day and Cow Creeks.

Agency Creek

Agency Creek enters the South Yamhill River about 48 miles above the mouth. The stream is about twelve miles in length and drains over seventeen miles of tributary streams. Larger tributaries are Wind River, and Joe and Yoncalla Creeks. Joe Creek enters Agency Creek a little more than three miles above the mouth. The stream is about two miles in length. Wind River, which is really a creek but is labeled 'Wind River' on the USGS topographic quadrangle map, enters Agency Creek about four miles above the mouth. The stream is about four miles long. Yoncalla Creek is steep and boulder strewn.

Climate

Yamhill County, in common with all of western Oregon, has a modified marine climate. Yamhill County has three climate zones, distinguished mainly by elevation: the valley floor, the foothills of the Coast Range, and the Coast Range.

In Yamhill County, rain falls mostly in winter. Approximately 70 percent of the annual total falls in the period November through March and only five to ten percent in the period June to August.[29] In the main agricultural areas, nearly all precipitation falling in winter falls as rain.

Only on the higher slopes of the Coast Range can significant amounts of snow normally be expected.

Since Yamhill County spans a wide range of physiographic regions, there is considerable variation in precipitation, with elevations as the largest factor in precipitation totals. The higher elevations receive up to 60 inches of precipitation annually, while the bottomlands receive about 40 inches annually. Precipitation is not spread evenly over the calendar year but rather falls during the winter and spring months in a water year, that runs from October to April.30
Snow and ice do not accumulate often, even at the higher elevations of the county. As a result, "rain on snow events"[31] are rare. During the 1964 and 1996 winter storms, however, enough snow accumulated in the Coast Range to contribute to the record flooding that occurred in those years.

Minerals and Soils

Soil types in the Mid-Willamette Valley are valuable for land use practices that involve human, agricultural or forestry activities and urban development. Land capability classes consist of broad groupings of soils based on the risk of soil damage if mismanaged (e.g., loss of topsoil from erosion or sediment deposition) and whether soil limitations prevent the sustained cultivation of crops, pasture and rangeland vegetation.[32] In general, Class I through IV soils can be used for crop production with Class IV soil requiring conservation efforts such as erosion control terraces, grassed waterways, or tillage and residue management.[33] Class VI and VII are typically reserved for hay, pasture, and rangeland grazing activities.

According to the Soil Survey of Yamhill Area, Oregon,[34] soils in Yamhill County primarily are Class III and range from Class I through VI.

Several common natural hazards are related to soil stability and water retention. Hazards include landslides, erosion, flooding, and liquefaction resulting from an earthquake. Mineral and soil compositions are important factors for determining whether Yamhill County is prone to hazards such as landslides.

Significant Geological Factors

Figure 1 shows how most of the Pacific Northwest lies within the Cascadia Subduction Zone, where the Juan de Fuca and North American plates meet. The convergence of these tectonic plates puts most areas of western Oregon and Washington at risk for a catastrophic earthquake with a magnitude of 8.0 or higher. Yamhill County lies in this area

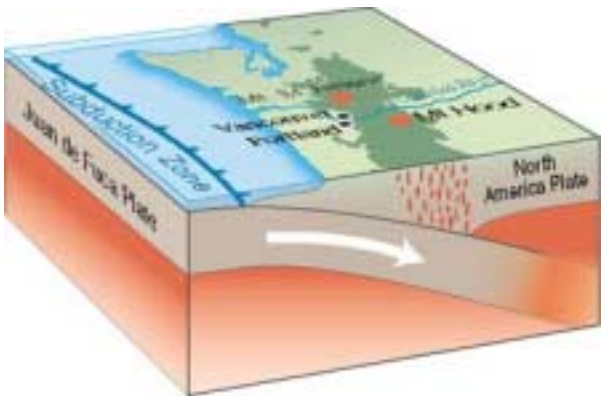

Figure 1 Cascadia Region Subduction Zone

of risk. As an inland valley, the Willamette Valley was once a part of a broad continental shelf. The Red Hills of Dundee, Parrett and Chehalem Mountains, and the tops of Amity-Eola Hills are examples of Columbia River Basalts or volcanic rocks uplifted along faults.[35] In a feature unique to this area, the Willamette River flows not along wide stretches of flat floodplain, but rather converges between the bedrock hills of South Salem and Eola Hills.

Population and Demographics

In 2000, the population of Yamhill County was 84,992, representing an increase of almost 30 percent during the last ten years. Table 1 shows that growth for Yamhill County is almost ten percent above the State of Oregon.

Table 1. Population Trends in Yamhill County and Oregon, 1990-2000

Area	1990 Population	2000 Population	% Change, 1990-2000
Yamhill County	65,551	84,992	29.7
Oregon	2,842,321	3,421,399	20.4

Source: U.S. Bureau of Census

The percentage of Oregon's total population is 2.5 percent for Yamhill County, which ranks it as the state's tenth largest county.[37] Table 2 illustrates the populations living in incorporated and unincorporated areas of Yamhill County. In 2000, the ten incorporated cities within the county comprise about 72 percent of the county population, with the remaining 28 percent of the population in unincorporated areas. The largest cities include McMinnville, Newberg, and Sheridan.

Table 2. Incorporated and Unincorporated Communities in Yamhill County, Oregon

Incorporated Cities	Population	Unincorporated	Communities	
Amity	1,478	Bellevue	Fairdale	Springbrook
Carlton	1,514	Briedwell	Gopher	
Dayton	2,119	Camp Smith	Grande Ronde	Sunnycrest
Dundee	2,598	Camp Yamhill	Hopewell	Tompkins Landing
Lafayette	2,586	Cove Orchard	Lunville	Unionvale
McMinnville	26,499	Dellwood	Midway	Weston Landing
Newberg	18,064	Dewey	Orchard View	Whites Landing
Sheridan	3,570	Dukes Landing	Pike	Whiteston
Willamina	1,844	Eola Crest	Pleasantdale	Woods Landing
Yamhill	794	Eola Village	Saint Joseph	

Source: U.S. Bureau of Census

Yamhill County has an incorporated population of 61,066, while the unincorporated population is 23,926. Table 3 demonstrates the percent change in Yamhill County's incorporated cities from 1990 to 2000. Population in incorporated areas has increased 27.1 percent during this time frame, while population has increased by twelve (12) percent in unincorporated areas.

Table 3. Yamhill County Population, Incorporated and Unincorporated Areas

Area	1990	2000	Percent Change 1990-2000
Incorporated Areas	44,488	61,066	+27.1
Unincorporated Areas	21,063	23,926	+12.0

Source: US Bureau of Census

This urban and rural growth pattern determines how agencies prepare to handle emergencies, as changes in population and development can increase risks associated with hazards.[38] For example, more people living on the urban fringe can increase their risk of fire. Wildfire has an increased chance of starting due to human activities in the urban/rural interface, and has the potential to injure more people and cause more property damage.[39]

While natural hazards do not discriminate, the impacts in terms of risk of vulnerability and the ability to recover differ among the population.[40] According to a representative of the Federal Emergency Management Agency (FEMA), 80 percent of the disaster burden falls on the public, with a disproportionate burden placed upon special needs groups: women, children, minorities, and the poor.[41]

According to the 2000 census, approximately 10.6 percent of current residents in Yamhill County are Hispanics or Latinos. The 2000 US Census reports that 1.5 percent of the County's residents are American Indian or Alaskan Native, 1.1 percent are Asian, 0.8 percent are Black or African American, and 5.2 percent of the county's residents are "some other race."[42] Such ethnic diversity suggests a need to address multicultural needs and services.

Approximately 9.2 percent of individuals live in poverty in Yamhill County, of whom 7.5 percent are over 65. Approximately six percent are families and of that, 8.9 percent include children under 18 years old.[43] Vulnerable populations, including children, women, seniors, disabled citizens, as well as people living in poverty, may be disproportionately impacted by natural hazards in Yamhill County. To increase access to services and programs, hazard mitigation policies must reflect such special needs populations. FEMA addresses such needs by encouraging agencies and organizations planning for natural disasters to identify special needs populations, make recovery centers more accessible, and review practices and procedures to resolve any discrimination in disaster relief or assistance.[44]

A sense of inequity emerges when the financial responsibility of natural hazards recovery is placed on the general population, even though only a small proportion may benefit from governmental funds to rebuild private structures.[45] To ensure all members of the population are included in the decision making process, a natural hazards dialogue in Yamhill County should include local citizen groups, insurance companies, and other public and private sector organizations.

Land and Development

Prior to early settlement of Yamhill County, the area was home to a scenic oak savanna, tall grassy prairies, and colorful wildflowers. During early settlement, the alluvial valley of the Willamette River was one of the first areas to use waterways as arterials for commerce and to be cleared for agriculture. Over time, an increase in awareness regarding the benefits of land use and development regulations is corresponding with an increase in awareness of the county's land and water resource limitations.

Today, Yamhill County is a community of residential, commercial, and agricultural land uses. As noted above, one main basin is found within Yamhill County. The Yamhill Basin is the largest drainage basin in the county and includes all of the communities within Yamhill County. There are seven sub-basins within the Yamhill Basin, four of which include portions of Polk County.[4647]

With increased development and population growth, Yamhill County has lost many of the ecosystems that existed prior to early European settlement. Such historical ecosystems not only were home to rare plant and animal species, they also served to control flooding, recharge groundwater, and stabilize riverbanks. The problems associated with urbanization of rural land resources is especially important in Yamhill

County with the importance of its land resources to the local economy. Yamhill County ranks third in the state for farm and ranch sales in 2003 - $225,001,000.[48]

Table 5 shows the acres by various land use designations within Yamhill County. Land within incorporated city limits is designated as urban in the table. More than 97 percent of the land within Yamhill County is zoned for agricultural or forest (timber) uses.

Table 5. Acres by Land Use Designation Yamhill County

Land Use Designation	Acres	Percent of Total Acres
Forest	353,714	64.6
Agriculture	178,447	32.6
Urban	7,444	1.4
Public	2,967	0.5
Residential	2,744	0.5
Industrial	1,447	0.3
Commercial	706	0.1
Total	547,469	100.0

Source: Yamhill County GIS, 2004

Rural development is the conversion of land outside all urban growth boundaries to a more intensive non-resource oriented use such as residential structures. Existing rural development in Yamhill County is predominately scattered single-family residences and a few rural communities that include a mix of rural residential, commercial, industrial, and public uses.

Yamhill County adopted revised goals and policies for the Yamhill Comprehensive Plan in 1996 to ensure that rural development occurs in a way that will help protect agricultural land and other natural lands from premature development. For example, Goal Statement 2 of Section 1.B., "Rural Area Development" states:

> To accommodate the demand for rural residential development at very low densities and in areas which are not amenable to integrated neighborhood designs, provided such areas are suited to the uses intended and exhibit high amenity value, and such developments do not preempt farm or forest lands, or generate inordinate service demands of their own.[49]

Development Regulations

There are a number of current regulations and Comprehensive Plan policies regarding development in areas subject to natural hazards. Policy C.2 for Rural Area Development states that all proposed rural area development and facilities "[s]hall not be located in any natural hazard area, such as a floodplain or area of geologic hazard, steep slope, severe drainage problems or soil limitations for building or sub-surface sewage disposal, if relevant."[50] The Floodplain Overlay District included in the Yamhill County Zoning Ordinance requires developers to

obtain a "Floodplain Development Permit" application before any construction or development occurs within the Floodplain Overlay District.[51]

Housing and Community Development

Gaining an understanding of the County's current housing stock, as well as trends in community development, is important when planning for natural hazards. To accommodate rapid growth, communities engaging in mitigation planning should evaluate the following: infrastructure and service needs, specific engineering standards and building codes.[52] Discontinuing or decreasing development in floodplains may potentially reduce an area's vulnerability to hazards. While Oregon has land use goals that address mitigation planning in rural and urban areas, communities must make sure these goals are being met when developing land for housing and industry.

According to the 2000 US Census, around 8,790 housing structures were built in Yamhill County over the last decade as shown in Table 6.

Table 6. Housing Age-Structure in Yamhill County

Year	Number	Percent
1999 – March 2000	840	2.8
1995 to 1998	4,142	13.7
1990 to 1994	3,808	12.6
1980 to 1989	4,112	13.6
1970 to 1979	6,944	22.9
1960 to 1969	2,435	8.0
1940 to 1959	4,014	13.3
1939 or earlier	3,975	13.1

Source: U.S. Bureau of Census, Census 2000

Between 1970 and 1989, roughly 37 percent of Yamhill County's houses were built, followed by another 24 percent between 1990 and March 2000.[53]

The year-built date is important for mitigation because the older the home, the greater risk of damage from natural disaster. For example, structures built after the late 1960's in the Northwest and California used earthquake resistant designs and construction techniques.[54] Likewise, FEMA began assisting communities with floodplain mapping during the 1970's, and communities developed ordinances that required homes in the floodplain to be elevated at least one foot over Base Flood Elevation.

Employment and History

According to the Oregon Department of Employment, the Central Willamette Region added approximately 68,400 jobs during the 1990s. Historically, the region relied on the lumber industry for jobs and income. According to the recently completed statewide hazard plan for the Central Willamette Valley, the sectors expected to grow in this region include industrial, high tech, healthcare, administrative, tourism

and retail trade. Table 7 describes the county's employment by industry for the year 2000. It appears the highest percentage of workers in Yamhill County is employed in the educational/ health/social services, manufacturing and retail trade sectors.

Table 7. Employment by Industry for Yamhill County

Industry	Number	Percent
Agriculture/Fishing/Forestry	1,782	4.5
Construction	2,832	7.2
Manufacturing	7,600	19.4
Wholesale Trade	1,695	4.3
Retail Trade	4,488	11.5
Transportation/Warehousing	1,778	4.5
Information	740	1.9
Finance/Insurance/Real Estate	1,896	4.8
Mgmt/Scientific/Waste	2,530	6.5
Education/Health/Social Services	7,279	18.6
Arts/Entertainment/Recreation/ Accommodation & Food Service	2,866	7.3
Misc.	1,777	4.5
Public Administration	1,933	4.9

Source: U.S. Bureau of the Census, Census 2000.

Median household income can be used as an indicator for the strength of the region's economic stability. It can also be used to compare economic areas as a whole, yet does not reflect how the income is divided among area residents. The 2000 Census indicates that the median household income for Yamhill County was $44,111. This is slightly higher than the national average of $41,433 and the state's average of $40,916.

Mitigation plans and activities are essential at the business level to ensure the safety and welfare of workers and limit damage to industrial infrastructure. Employees are highly mobile, commuting from the surrounding areas to industrial and business centers within the county. The result is greater dependency on roads, communications, accessibility and emergency plans to reunite people with their families. Before a natural hazard event occurs, small and large businesses can develop strategies to prepare for and respond to natural hazards. Planning ahead in this manner can prevent the loss of life and property.

Transportation and Commuting

Rapid growth in an area contributes to local road traffic from workers commuting, trucks on the road, and an increase in general automobile traffic. A high percentage of commuters driving alone to work can cause traffic congestion and accidents.[55] The large increase in automobiles can place stress on roads, bridges, and infrastructure within the cities, and also in rural areas where you find fewer transit roads. During an emergency, local transit systems can be shut down, affecting evacuations. In addition, roads may become unusable from localized flooding and severe winter storms can potentially disrupt the daily driving routine of county residents.

According to the 2000 Census data, the average commute time for commuting workers in the Central Willamette Region is 22 minutes each way. In Yamhill County, approximately 75 percent of workers over the age of 16 commute to work alone by automobile and less than one-half (O.4) percent use public transportation.[56] Other modes of transportation in Yamhill County include carpooling (14 percent), working at home (4.7 percent), walking (4.4 percent), and using other means (1.4 percent).

Historic and Cultural Resources

As an important historical and cultural resource, the Willamette River and North and South main stems of the Yamhill River offer natural beauty, abundant wildlife, and diverse recreational opportunities. In addition to natural resources, Yamhill County also has 78 structures on the national historic register.[57] The County is forming the Yamhill County Cultural Trust Coalition Planning Committee in November 2002 with the intent to develop a cultural plan to guide the coalition in its efforts to protect the culture, arts, and heritage of Yamhill County.[58]

Critical Facilities and Infrastructure

Critical and essential facilities are those facilities vital to the continued delivery of key governmental services that may significantly impact the public's ability to recover from the emergency. These involve local police and fire stations, public works facilities, sewer and water facilities, hospitals, bridges, roads, and shelters. Map 2 and Table 8 shows critical facilities in Yamhill County. Map 3 shows essential facilities in Yamhill County.

Table 8. Critical Facilities in Yamhill County

	Numbe
Hospitals	
Number of hospitals	2
Number of beds	424
Police Stations	17
Fire and Rescue Stations	18
School Districts & Colleges	6 districts -2 Universities
Power Plants	0
Dams	
Number of dams	40
Significant Hazard	7

Source: Newberg Community Hospital, Willamette Valley Medical Center, Yamhill County Sheriff Office, Oregon Department of Education, Oregon Department of Energy, Oregon Water Resources Department.

At any time, dam failures can occur and are recorded quite often. While most result in minor damage and pose little threat, some have the potential for severe damage where fatalities exist. There are many more unregistered dams in Yamhill County. According to Jon Falk, Dam Safety Coordinator for the Oregon Water Resources Department (WRD), only those dams that are ten feet or greater in height and that store more than 9.2 acre feet are required to be engineered and recorded in a dam safety database. Smaller structures are not recorded although all storage projects require a reservoir permit. Mr. Falk notes that a structure less than ten feet high could have a storage pond of 9.2 acre-feet or approximately three million gallons of water.

Jon Falk stated that within the WRD dam database, "significant hazard" is often confused with 'risk.' Significant hazard does not speak to the condition of the dam. Significant hazard indicates a direct loss of human life if a dam were to suddenly fail.[59] Dam types, purposes, and sizes are available from the Water Resources Department web site.

Other critical and necessary facilities vital to the efficient delivery of key governmental services, or that may significantly impact the public's ability to recover from emergencies, include correctional institutions, public services buildings, law enforcement centers, courthouses, and juvenile service buildings. These and other public facilities are detailed in the local and regional mitigation plans.

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[1] DMA 2000, State and Local Plan Criteria: Mitigation Planning Workshop for Local Governments,
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[2] U.S. Department of Agriculture, Natural Resources Conservation Service, in cooperation with Oregon Agricultural Experiment Station. January 1974. *Soil Survey of Yamhill Area, Oregon*.
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[4] Lower South Yamhill-Deer Creek Watershed Assessment. Yamhill Basin Council, September 2000.
[5] Id.
[6] Id.
[7] Lower South Yamhill-Deer Creek Watershed Assessment. Yamhill Basin Council, September 2000.
[8] Yamhill Soil & Water Conservation District website, accessed August 9, 2004, available from the World Wide Web (http://www.yamhillswcd.org/).
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[10] Yamhill County Comprehensive Plan.
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[14] Greater Yamhill County Telephone Directory, 2001.

[15] Id.
[16] Id.
[17] U.S. Department of Agriculture, Natural Resources Conservation Service, in cooperation with Oregon Agricultural Experiment Station. January 1974. *Soil Survey of Yamhill Area, Oregon*.
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[19] Boyd, R., ed. 1999. *Indians, Fire, and Land in the Pacific Northwest*. Corvallis, OR: Oregon State University Press.
[20] American Heritage Rivers Progress Report. 2000. Federal EPA Interagency Task Force.
[21] The majority of the following information on streams within the Yamhill Subbasin to the Willamette Basin is provided from Robert N. Thompson and James B. Haas, "Environmental Survey Report Pertaining to Salmon and Steelhead in Certain Rivers of Eastern Oregon and the Willamette River and Its Tributaries." (Thompson & Haas) June 1960. Available on the World Wide Web (http://www.fishlib.org/Subbasins/envsurvey.html) (StreamNet Library), accessed August 9, 2004.
[22] Thompson & Haas.
[23] Id.
[24] Id.
[25] Nicole Montesano, "Yamhill River System in Bad Shape." September 27, 2001. Accessed August 9, 2004. Available from World Wide Web (http://www.newsregister.com/news/story.dfm?story_no=136831)
[26] Thompson & Haas.
[27] N. Montesano, "Yamhill River System in Bad Shape." September 27, 2001.
[28] Thompson & Haas.
[29] USDA, NRCS, in cooperation with Oregon Agricultural Experiment Station. January 1974. *Soil Survey of Yamhill Area, Oregon*.
[30] Lower Yamhill Watershed Assessment. The Yamhill Basin Council. February 2001.
[31] "Rain on snow events" occur when intensive rains follow heavy snow accumulation. They can greatly increase the volume of runoff and may cause flooding.
[32] Atlas of Oregon, 2002. University of Oregon Press
[33] Ibid
[34] USDA, NRCS, January 1974.
[35] Chehalem Watershed Assessment, June 2001; and Lower Yamhill Watershed Assessment, February 2001. The Yamhill Basin Council, Yamhill and Polk Counties, Oregon.
[36] Pringle, Glenn-Gibson, Claggett, and Mill Creeks Watershed Assessment. January 2002.
[37] Atlas of Oregon, 2002. University of Oregon Press
[38] Region 3 Profile of Central/Southern Willamette Valley (2003)
[39] Clackamas County Mitigation Plan, September 2002. INFO SHOULD COME FROM A 'BETTER' CITE. I'VE READ IT ELSEWHERE MORE THAN ONCE.
[40] Ibid
[41] http://www.fema.gov/(Accessed 8/4/03)
[42] U.S. Bureau of Census, Census 2000.
[43] Ibid.
[44] Hazards Workshop Session summary #16, Disasters, Diversity, and Equity. Annual Hazards Workshop (July 12, 2000) University of Colorado, Boulder
[45] Ibid
[46] The seven sub-basins are, from north to south: North Yamhill River, Chehalem Valley, Lower Yamhill, Willamina Creek, Lower South Yamhill/Deer Creek, Upper South Yamhill, Salt Creek, and Mill Creek.
[47] Sub-basins with portions within Polk County: Lower South Yamhill-Deer Creek Watershed (17%), Upper South Yamhill Watershed (55.75%), Salt Creek Watershed (78%), and Mill Creek Watershed (almost all of the watershed is within Polk County, but flows north towards the South Yamhill River).
[48] Oregon Agriculture Facts and Figures, available on the World Wide Web (http://www.nass.usda.gov/or/factsfigures04.pdf). Accessed September 30, 2004.
[49] *Yamhill County Comprehensive Land Use Plan*. December 30, 1996. Department of Planning and Development, Yamhill County.

[50] *Id.*
[51] Section 901, Yamhill County Zoning Ordinance. Revised June 1998. Available on the World Wide Web (http://www.co.yamhill.or.us/plan/planning/ordinance/zoning_0901.asp)
[52] Region 3 Profile of Central/Southern Willamette Valley (2003)
[53] U.S. Bureau of the Census, Census 2000.
[54] Clackamas County Mitigation Plan, September 2002
[55] Ibid
[56] US Bureau of the Census, Census 2000.
[57] http://www.nr.nps.gov/iwisapi/explorer. (Accessed 8/12/04)
[58] http://yamhillcountyculture.org (Accessed 8/12/04)
[59] Telephone conversation with John Falk, September 24, 2004.