

# Tillamook County MJNHMP Update

## Risk Assessment

FEMA developed a hazard analysis methodology in the early 1980's which was gradually refined by Oregon's Office of Emergency Management (OEM) over the years. Communities throughout Oregon use this "OEM Methodology" to get a sense of the relative risk of their local hazards. Because criteria for assigning points are not predetermined and therefore not consistent among communities, the resulting values are relative and meaningful only within a single community.

The methodology produces scores that range from 24 to 240. Vulnerability and probability are the two key components of the methodology. Vulnerability examines both typical and maximum credible events, and probability endeavors to reflect how physical changes in the jurisdiction and scientific research modify the historical record for each hazard. Vulnerability accounts for approximately 60% of the total score, and probability approximately 40%.

Conducting this risk assessment is a useful early step in planning for hazard mitigation, response, and recovery. While it does not predict the occurrence of a particular hazard, it does gauge the risk of one hazard compared with another. The results can help a community focus its resources on mitigating its greatest risks.

## Completing the Risk Assessment Worksheet

In this assessment, four measures characterizing risk – history, vulnerability, maximum threat, and probability – are assessed as to severity, weighted, and added together to derive a relative risk score for each hazard.

Within the severity designations of low, medium, and high, there is room for subjectivity in selecting the severity rating. We will attempt to come to consensus on how to select severity ratings for each of the four measures for each hazard to establish consistency among the jurisdictions in Tillamook County, making the final assessments useful for comparison.

<b>SEVERITY</b>	
<b>DESIGNATION</b>	<b>RATING</b>
Low	0-3
Medium	4-7
High	8-10

Next, representatives of each jurisdiction will work through the risk assessment matrix, assigning ratings and calculating scores using the following definitions. In addition, they will provide notes on the reasons for their ratings from which a brief description of the local understanding of relative risk among hazards countywide and for each jurisdiction can be developed.

<b>DEFINITIONS</b>				
	<b>History</b>	<b>Vulnerability</b>	<b>Maximum Threat</b>	<b>Probability</b>
	Record of previous hazard events requiring a response	Percentage of population and property likely to be impacted by an “average” hazard event scenario	The greatest percentage of population and property that could be impacted in a worst-case hazard event scenario	The likelihood of future hazard event occurring within a specified period of time
<b>Low</b>	0-1 events in the past 10 years	< 1% impacted	< 5% impacted	≥ 1 event in ≥ 10 years
<b>Medium</b>	2-3 events in the past 10 years	1-10% impacted	5-25% impacted	≥ 1 event in 6-9 years
<b>High</b>	≥ 4 events in the past 10 years	> 10% impacted	> 25% impacted	≥ 1 event in ≤ 5 years





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## Historic Tillamook County Hazard Events

*Excerpted from Oregon Natural Hazards Mitigation Plan (2015) and Augmented with December 2015 Storms*

**Table XX. Historic Coastal Erosion and Flood Hazard Events in Tillamook County**

Date	Location	Description
1931	Rockaway Beach	coastal damage from December storm
Oct–Dec. 1934	Rockaway Beach	coastal damage
Dec. 1935	Rockaway Beach	coastal damage
Jan. 1939	coastwide	severe gale; damage coastwide severe flooding due to breach of southern portion of Netarts spit
Jan. 1953	Rockaway Beach	70-ft dune retreat; one home removed
Dec. 1967	Netarts Spit	damage: coastwide State constructed wood bulkhead to protect foredune along 600 ft section (Cape Lookout State Park campground)
1997–98	Tillamook County	El Niño winter (second strongest on record); erosion: considerable
Jan–Mar. 1999	coastwide	five storms; coastal erosion extensive, including: <ul style="list-style-type: none"> <li>• significant erosion (Neskowin, Netarts Spit, Oceanside, Rockaway beach)</li> <li>• overtopping and flooding (Cape Meares)</li> </ul>
Dec. 2007	Tillamook County	wind storm
Dec. 2015	coastwide; most of western Oregon	severe winter storm; coastal erosion and coastal flooding

Sources: Schlicker et al. (1972, 1973); Stembridge (1975); Komar and McKinney (1977); Komar (1986, 1987, 1997, 1998); Allan et al. (2003, 2009), and many others; FEMA <https://www.fema.gov/disaster/4258> accessed 09/2016; Julie Slevin, OEM, personal contact 09/162016.

**Table XX. Historic Coastal Landslide Hazards in Tillamook County**

Date	Location	Description
Ongoing	Tillamook County	several large landslides exist along the Tillamook County coastline; these include: <ul style="list-style-type: none"> <li>• The Capes development on the north side of Netarts Bay and south of Oceanside</li> <li>• a large active landslide exists on the north side of Cape Meares and affects the southern portion of the community of Cape Meares</li> <li>• the Three Capes landslide, located to the south of Tierra del Mar, occurred during the 1997-98 El Niño and affected the Three Capes Scenic byway road; this landslide has been remediated</li> <li>• a small landslide failure developed on Aug. 21, 2011, above Happy Camp in Netarts; this landslide has been remediated</li> </ul>

Sources: Schlicker et al. (1961, 1972, 1973); Komar (1997); Allan and Hart (2009); Witter et al. (2009); SLIDO web database (<http://www.oregongeology.org/slido/index.html>)

**Table XX. Historic Droughts in Tillamook County**

Date	Location	Description
1924	statewide	prolonged statewide drought that caused major problems for agriculture
1930	statewide, except southeastern Oregon	the 1920s and 1930s, known more commonly as the Dust Bowl, were a period of prolonged mostly drier than normal conditions across much of the state and country; moderate to severe drought affected much of the state
1939	statewide	Water Year 1939 was one of the more significant drought years in Region 1 during that period; the second of the three Tillamook Burns started in 1939
1992	statewide	1992 fell toward the end of a generally dry period, which caused problems throughout the state; the 1992 drought was most intense in eastern Oregon, with severe drought occurring in Region 1; the winter of 1991-1992 was a moderate El Niño event, which can manifest itself in warmer and drier winters in Oregon; Governor declared a drought for all 36 counties in September 1992
2001-02	statewide, except Portland metro area and Willamette Valley	the second most intense drought in Oregon's history; 18 counties with state drought declaration (2001); 23 counties state-declared drought (2002); some of the 2001 and 2002 drought declarations were in effect through June or December 2003; Coos and Curry Counties in Region 1 were not under a drought declaration until December of 2002

Sources: Taylor and Hatton (1999); NOAA's Climate at a Glance. Western Regional Climate Center's Westwide Drought Tracker, <http://www.wrcc.dri.edu/wwdt>; personal communication, Kathie Dello, Oregon Climate Service, Oregon State University

**Table XX. Significant Earthquakes Affecting Tillamook County**

Date	Location	Magnitude (M)	Comments
Approximate Years: 1400 BCE*, 1050 BCE, 600 BCE, 400, 750, 900	offshore, Cascadia Subduction Zone	probably 8-9	these are the mid-points of the age ranges for these six events
Jan. 1700	offshore, Cascadia Subduction Zone	about 9.0	generated a tsunami that struck Oregon, Washington, and Japan; destroyed Native American villages along the coast
Nov. 1962	Portland, Oregon	5.2 to 5.5	crustal event; damage to many homes (chimneys, windows, etc.)
Mar. 1993	Scotts Mills, Oregon	5.6	crustal event; FEMA-985-DR-OR; damage: \$28 million (homes, schools, businesses, state buildings [Salem])

\*BCE: Before Common Era.

Source: Wong and Bolt (1995)

**Table XX. Historic Floods in Tillamook County**

Date	Location	Description	Type of Flood
1813	NW Oregon	said to exceed "Great Flood" of 1861 (source: Native Americans)	unknown
Feb. 1890	coastal rivers	widespread flooding	rain on snow
Mar. 1931	western Oregon	extremely wet and mild; saturated ground	rain on snow
Dec. 1933	northern Oregon	intense warm rains; Clatskanie River set record	rain on snow
Dec. 1937	western Oregon	heavy coastal rain; large number of debris flows	rain on snow
Dec. 1953	western Oregon	heavy rain accompanied major windstorm; serious log hazards on Columbia	rain on snow
Dec. 1955	Columbia and coastal streams	series of storms; heavy, wet snow; many homes and roads damaged	rain on snow
Mar. 1964	coast and Columbia River estuary	Ocean flooding	tsunami
Dec. 1964	entire state	two storms; intense rain on frozen ground	rain on snow
Jan. 1972	northern coast	severe flooding and mudslides; 104 evacuated from Tillamook	rain on snow
Jan. 1974	western Oregon	series of storms with mild temperatures; large snowmelt; rapid runoff	rain on snow
Dec. 1978	coastal streams	Intense warm rain; widespread flooding	rain on snow
Feb. 1986	entire state	warm rain and melting snow; numerous homes evacuated	rain on snow
Feb. 1987	western Oregon	heavy rain; mudslides; flooded highways; damaged homes	rain on snow
Dec. 1989	Clatsop, Tillamook and Lincoln	warm Pacific storm system; high winds; fatalities; mudslides	rain on snow
Jan. 1990	W. Oregon	significant damage in Tillamook County; many streams had all-time records	rain on snow
Apr. 1991	Tillamook County	48-hour rainstorm. Wilson River 5 ft. above flood stage; businesses closed	rain on snow
Feb. 1996	NW Oregon	deep snow pack; warm temperatures; record-breaking rains	rain on snow
Nov. 1996	W. Oregon	record-breaking precipitation; flooding; landslides (FEMA-1149-DR-Oregon)	rain on snow
Nov. 2006	Tillamook County	heavy rains caused major flooding in Nehalem and Tillamook, causing \$1 million in damage in Nehalem and \$15 million in Tillamook	riverine
Dec. 2007	Tillamook County	heavy rains led to flooding in Tillamook along the Wilson River damaging businesses, homes, the railroad to the Port; county-wide damages total 26 million	riverine
Dec. 2008	Tillamook County	heavy rainfall caused flooding in downtown Tillamook; estimate of \$3.8 million in damages throughout Tillamook County	riverine
Jan. 2012	Coos, Curry, Lincoln, and Tillamook Counties	a severe winter storm including flooding, landslides, and mudslides affected mostly the southern Oregon coastal counties	riverine
Sep. 2013	Tillamook County	heavy rain caused flooding at the Wilson River	riverine
Dec. 2015	W. Oregon	severe winter storm; Rockaway Beach flooded on the east side of Hwy 101 due to a combination of sand blocking outlets and high tides meeting large volumes of runoff from higher ground. The Hwy 101 corridor north of the City of Tillamook flooded causing a number of long-duration road closures. Previous mitigation projects minimized losses.	riverine

Source: Taylor and Hannan (1999), Source: Hazards and Vulnerability Research Institute (2007). The Spatial Hazard Events and Losses Database for the United States, Version 5.1 [Online Database]. Columbia, SC: University of South Carolina. Available from <http://hvri.geog.sc.edu/SHELDUS/index.cfm?page=faq>. National Climatic Data Center, Storm Events, <http://www4.ncdc.noaa.gov/cgi-win/wwwcgi.dll?wwEvent~Storms;> ; FEMA <https://www.fema.gov/disaster/4258> accessed 09/2016; Julie Slevin, OEM, personal contact 09/16/2016; Chris Shirley, DLCD personal contact 09/16/2016.

**Table XX. Historic Landslides in Tillamook County**

Date	Location	Description
Feb. 1996		FEMA-1099-DR-Oregon; heavy rains and rapidly melting snow contributed to hundreds of landslides and debris flows across the state, many on clear cuts that damaged logging roads
Dec. 2007	Clatsop and Tillamook	property damage: \$300,000
Dec. 2015	most of western Oregon	severe winter storm; 4 landslides in Tillamook County that closed a portion of Hwy 101 between Wheeler and Rockaway Beach and destroyed a road south of the City of Tillamook. No deaths caused by these landslides.

Sources: Taylor and Hatton (1999); and FEMA After-Action Report, 1996 events; and interviews, Oregon Department of Transportation representatives.

Hazards and Vulnerability Research Institute (2007). The Spatial Hazard Events and Losses Database for the United States, Version 5.1 [Online Database]. Columbia, SC: University of South Carolina. Available from: <http://www.sheldus.org>; FEMA <https://www.fema.gov/disaster/4258> accessed 09/2016; Julie Slevin, OEM, personal contact 09/16/2016; Bill Burns, DOGAMI, personal contact 09/16/2016.

**Table XX. Historic Tsunamis affecting Tillamook County**

Date	Origin of Event	Affected Community	Damage	Remarks
05/1960		Netarts, Oregon	some damage observed	
10/1994	Japan	Oregon Coast		tsunami warning issued, but no tsunami observed
3/2011	Japan	Oregon Coast		tsunami warning issued, observed ocean waves

Sources: NOAA, 1993, Tsunamis Affecting the West Coast of the United States: 1806-1992; FEMA, 2011, Federal Disaster Declaration

**Table XX. Historic Wildfires in Tillamook County**

Date	Name of Fire	Location	Characteristics	Remarks
1853	Nestucca		> 320,000 acres	
1933	Tillamook		240,000 acres	the Tillamook Forest burned every 6 years between 1933 and 1951; total acreage burned was over 350,000 acres; together, the four events are called the Tillamook Burn; dry forest conditions seems to have been a major factor (Taylor)
1945	Wilson River / Salmonberry	Tillamook County	173,000 acres	
1951	North Fork / Elkhorn	Tillamook County	33,000 acres	

Source: Brian Ballou, 2002, A Short History of Oregon Wildfires, Oregon Department of Forestry, unpublished; unknown sources from previous versions of the Oregon NHMP

**Table XX. Historic Windstorms in Tillamook County**

<b>Date</b>	<b>Location</b>	<b>Description</b>	<b>Remarks</b>
Jan. 1880	western Oregon	very high winds, 65-80 mph near Portland	flying debris; fallen trees
Apr. 1931	western Oregon	unofficial reports of wind speeds up to 78 mph	widespread damage
Nov. 1951	most of Oregon	winds 40–60 mph with 75–80 mph gusts	widespread damage, especially to transmission lines
Dec. 1951	most of Oregon	winds, 60–100 mph, strongest along coast	many damaged buildings; telephone/power lines down
Dec. 1955	western Oregon	wind gusts at North Bend 90 mph	significant damage to buildings and farms
Jan. 1956	western Oregon	heavy rains, high winds, mud slides	estimated damage: \$95,000 (1956 dollars)
Nov. 1958	most of Oregon	wind gusts to 75 mph at Astoria; gusts to 131 mph at Hebo	damage to buildings and utility lines
Nov. 1962	statewide	wind speeds of 131 mph on the Oregon coast (Columbus Day Windstorm Event)	Oregon’s most destructive storm: 23 fatalities; damage at \$170 million
Mar. 1963	Coast and NW Oregon	100 mph gusts (unofficial)	widespread damage
Oct. 1967	western and N. Oregon	winds on Oregon Coast 100–115 mph	significant damage to buildings, agriculture, and timber
Mar. 1971	most of Oregon	notable damage in Newport	falling trees took out power lines; building damage
Jan. 1986	N and central Oregon coast	75 mph winds	damaged trees, buildings, power lines
Jan. 1987	Oregon coast	wind gusts to 96 mph at Cape Blanco	significant erosion (highways and beaches); several injuries
Dec. 1987	Oregon coast / NW Oregon	winds on coast 60 mph	saturated ground enabled winds to uproot trees
Mar. 1988	N. and central coast	wind gusts 55–75 mph	one fatality near Ecola State Park; uprooted trees
Jan. 1990	statewide	100 mph winds in Netarts and Oceanside	one fatality; damaged buildings; falling trees (FEMA-853-DR-Oregon)
Feb. 1990	Oregon coast	wind gusts of 53 mph at Netarts	damage to docks, piers, boats
Jan. 1991	most of Oregon	winds of 63 mph at Netarts; 57 at Seaside	75-foot trawler sank NW of Astoria
Nov. 1991	Oregon coast	slow-moving storm; 25-foot waves off shore	buildings, boats, damaged; transmission lines down
Jan. 1993	Oregon coast / N. Oregon	Tillamook wind gusts at 98 mph	widespread damage, esp. Nehalem Valley
Dec. 1995	statewide	wind gusts over 100 mph; Sea Lion Caves: 119 mph; followed path of Columbus Day Storm (Dec. 1962)	four fatalities; many injuries; widespread damage (FEMA-1107-DR-Oregon)
Nov. 1997	western Oregon	winds of 89 mph at Florence; 80 mph at Netarts and Newport	severe beach erosion; trees toppled
Dec. 2004	Tillamook County		\$6,250 in property damage (figure includes damages outside of Tillamook County)
Jan. 2006	Clatsop, Tillamook, Lincoln, Lane Counties	two storm events with high winds of 86 mph and 103 mph	\$244,444 and \$144,444 in estimated property damage among all four coastal counties; the storm also impacted 5 other counties outside Region 1; total damages equal \$300,000 and \$200,000, respectively
Feb. 2006	Clatsop, Tillamook, Lincoln, Lane Counties	wind storm event with winds measured at 77 mph	\$150,000 and \$91,600 in estimated property damage among all four coastal counties; the storm also impacted nine other counties outside of Region 1; total damages equal \$300,000 and \$275,000
Mar. 2006	Clatsop, Tillamook, Lincoln, Lane Counties	two wind storm events with winds measured at 60 mph and 75 mph	\$75,000 and \$211,000 in estimated property damage among all four coastal counties; the storms also impacted 10 other counties outside of Region 1; total damages equal \$75,000 and \$475,000

Date	Location	Description	Remarks
Dec. 2006	Clatsop, Tillamook Counties	storm with high winds	total of \$10,000 in damages
Nov. 2007	Clatsop, Tillamook Counties	storm with high winds	total of \$10,000 in damages
Dec. 2007	Clatsop, Tillamook Counties	series of powerful Pacific storms	resulted in Presidential Disaster Declaration; \$180 million in damage in the state, power outages for several days, and five deaths attributed to the storm
Dec. 2008	Clatsop, Lane, Tillamook, Lincoln Counties	intense wind and rain events	resulted in nearly \$8 million in estimated property and crop damages for Clatsop, Lane, Tillamook, and Lincoln Counties
Dec. 2015	most of western Oregon	severe winter storm with straight-line winds.	

Sources: Taylor and Hatton (1999); Hazards and Vulnerability Research Institute (2007); Spatial Hazard Events and Losses Database for the United States, Version 5.1 [Online Database]. Columbia, SC: University of South Carolina. Available from <http://www.sheldus.org>; FEMA <https://www.fema.gov/disaster/4258> accessed 09/2016.

**Table XX. Tornadoes Recorded in Region 1**

Date	Location	Remarks
June 1897	Bay City, Oregon	observed, but no damage recorded
Dec. 1975	Tillamook, Oregon	90 mph wind speed; damage to several buildings

Sources: National Weather Service, Portland; Taylor and Hatton (1999); National Climatic Data Center (2013) Storm Events Database, <http://www.ncdc.noaa.gov/stormevents/>; Hazards and Vulnerability Research Institute (2007); the Spatial Hazard Events and Losses Database for the United States, Version 5.1 [Online Database]. Columbia, SC: University of South Carolina. Available from <http://www.sheldus.org>; National Climatic Data Center (2013); U.S. Tornado Climatology, <http://www.ncdc.noaa.gov/oa/climate/severeweather/tornadoes.html>

**Table XX. Historic Winter Storms in Region 1**

Date	Location	Description
Jan. 2002	statewide	strong winter storm with high winds at coast and heavy snows to the inland areas of Northwest Oregon; Florence had 46 mph sustained winds and 36 mph gusts to 63 mph, Newport Jetty 39 mph with gusts to 53 mph, and Garibaldi 42 mph; 32 inches of snow at Timberline Lodge on Mount Hood and 30 inches at Santiam Pass
Jan. 2004	statewide	frigid arctic air mass, heavy snow, sleet and freezing rain; weight from the snow and ice buildup resulted in widespread downed trees and power lines, leaving 46,000 customers without power, and collapsed roofs; Oregon Governor Kulongoski estimated cost of damages to public property at \$16 million
Dec. 2008	northern Oregon coast	third unusually cold storm system that season with heavy snow in northwest Oregon; heavy snowfall across northwest Oregon; 11–24 inches of snow in the north Oregon Coast Range
Dec. 2015	most of western Oregon	severe winter storm; straight-line winds; El Nino compounded with near record rainfall and saturated ground conditions caused near-record flooding as well as landslides and mudslides. Tillamook County suffered long-duration road closures along portions of Hwy 101 and Hwy 6. Many other roads, culverts, bridges and parks were damaged beyond use. Goods and services from local businesses were either undeliverable or unavailable. Neighborhoods in Rockaway Beach were isolated due to flooded access. Emergency services could not be provided in a timely manner.

Source: National Weather Service; FEMA <https://www.fema.gov/disaster/4258> accessed 09/2016; Julie Slevin, OEM, personal contact 09/16/2016; Excerpt from Declaration Request Letter from Governor Kate Brown to President Obama, 01/28/2016.