STORM

HAZARD DESCRIPTION

Thurston County is subject to a variety of storms that deliver wind, rain, snow, and ice — often in successive events, and sometimes in combination. Nearly all destructive storms that affect Thurston County generally occur from November through April when the jet stream and low-pressure systems are more prevalent over the Northwest.

Between 1965 and 2016, 18 of 22 Presidential Disaster Declarations involving Thurston County were attributed to damage resulting from winter storms (principally flood damage). Storms cause significant property damage, disrupt utilities and transportation, and frequently cause injuries and sometimes death. Between 2010 and 2015, severe storms killed 77, injured 75, and caused $430.6 billion in damages statewide in Washington (43 of the deaths were caused by the 2014 Oso mudslide.)

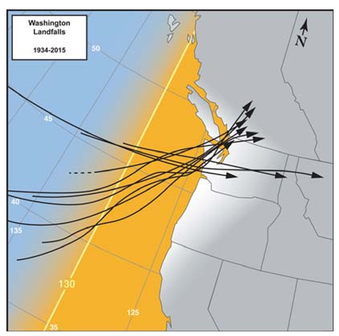
Hazardous Weather Fatalities, Injuries, and Damage Costs in Washington State, 2010 – 2015

Year	Fatalities	Injuries	Damage (millions $)		
			Property	Crops	Total
2010	3	8	$11	$0.09	$11.09
2011	6	5	$18.82	$0.68	$19.49
2012	6	5	$27.32	$1.13	$28.45
2013	4	16	$12.84	$0.5	$13.33
2014	50	34	$328.16	$1.12	$329.28
2015	8	7	$28.94	$0.02	$28.96
Total	**77**	**75**	**$427.08**	**$3.54**	**$430.6**

Storm Elements

1. High Winds/Windstorms

Trajectories of Washington's Strongest Storms



The National Weather Service defines high winds as "sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration." Generally, winds above 30 mph can cause widespread damage and those above 50 mph can lead to more serious disasters. Most large windstorms that affect the region are delivered by mid-latitude Pacific cyclones. While not as powerful as tropical hurricanes, these cyclones can generate wind speeds in excess of 100 mph and can maintain their strength farther inland.

2. Heavy Rain

Heavy rainfall is any amount of rain produced in a relatively short period that exceeds the capacity of natural systems' or stormwater infrastructures' ability to effectively and safely convey the flow of stormwater. The most common impacts from heavy rainfall are flooding and erosion. Prolonged rain delivered by weather systems north of the Hawaiian Islands dubbed atmospheric rivers, can rapidly melt snow in the Cascade Mountains and lowlands. This precipitation causes: rivers to rise quickly; cause flooding downstream in valleys; and widespread landslides both in the uplands and the lowlands. Local rainfall also swells local creeks and streams, exacerbating local flood potential.

3. Freezing Rain

Freezing rain occurs when rain descends through a cold air mass, cools, and subsequently freezes on contact with cold surfaces. An ice coat will continue to accumulate on surfaces as long as conditions exist. Ice can accumulate to thicknesses greater than one inch.

4. Heavy Snow

The Washington State Hazard Mitigation Plan defines heavy snow as four inches of snowfall in 12 hours or six inches in 24 hours for non-mountainous areas. This amount is sufficient to disrupt activities in Thurston County.

Falling snow mixed with high winds produces a blizzard. The National Weather Service defines a blizzard as, "... [three hours or more of] sustained wind or frequent gusts to 35 miles an hour or greater; and considerable falling and/or blowing snow (i.e., reducing visibility frequently to less than ¼ mile)."

Total days with 12 inches or greater of snow on the ground in Thurston County, 1948 to 2015

Year	12-inch Snow Days
1950	7
1954	4
1969	7
1972	8
1980	3
2008	10
2012	4

The average annual snowfall for Thurston County is approximately 17 inches (average maximum of all weather stations in Thurston County, 1948-2015). Most snow events are less than six inches within a 24-hour period. However, local weather station records indicate that local heavy snowfall events have occurred 39 times since 1948.

5. Tornado

The National Weather Service defines a tornado as "a violently rotating column of air, usually pendant to a cumulonimbus [cloud], with circulation reaching the ground. It nearly always starts as a funnel cloud and may be accompanied by a loud roaring noise. On a local scale, it is the most destructive of all atmospheric phenomena."

EF1 Tornado near Gig Harbor, WA on January 19, 2015

In western Washington, tornados have occurred during the months of January, March, April, May, June, August, September, October, November, and December. A total of 94 tornados have been documented in Washington State between 1950 and 2005. Of these, 46 were F0, 29 were F1, 12 were F2, and 3 were F3. Damaging tornados are rare in Thurston County, and none have adversely affected densely populated areas. Between 1950 and 2008, four small tornados (three F0, and one F1) occurred in Thurston County near Bucoda, Tenino, Yelm and Lacey in 1994, 2003, 2004, and 2006 respectively.

6. Hail

Hail is precipitation that takes the form of ice balls or clusters of ice clumps, ranging from two-tenths of an inch to several inches in diameter. Hail forms in cumulonimbus or thunderstorm clouds that have strong updrafts.

Most hail storms in Thurston County produce small non-destructive hail. The records of damaging hail storms are scant and suggest limited damage from these events with only small geographical areas likely affected. Hail storms may damage crops, but the extent of hail damage to agriculture within Thurston County is unknown.

7. Lightning

Lightning is an atmospheric discharge of electricity that occurs with thunderstorms. A lightning bolt can travel at 60,000 meters per second and reach temperatures of 54,000°F.

Lightning storms in Thurston County are short lived and generally only affect a small area. Historically, lightning has not caused widespread damage locally. Since 1960, at least 11 lightning storms have caused $207,808 in property damage in Thurston County. Since 1972, lightning ignited at least 28 wildland fires. A total of 28 acres are known to have burned. The largest fire burned 15 acres on private timberland in a remote area of southeast Thurston County in June 2004.

Major Historic Storms in Thurston County

- January 14-23, 2012, Federal Disaster 4056: Severe Winter Storm, Flooding, Landslides, and Mudslides
- December 12-27, 2008, Federal Disaster 1825: Severe Winter Storm
- December 1-7, 2007 Federal Disaster 1734: Severe Winter Storm, Landslides, and Flooding
- October 18, 2007 Windstorm
- January 5, 2007 Windstorm
- December 14-15, 2006 "The Hanukkah Eve Storm" Federal Disaster 1682: Severe Winter Storm, Landslides, and Mudslides
- November 2-11, 2006 Federal Disaster 1671: Severe Winter Storm, Flooding, Landslides, and Mudslides
- May 27, 2004 F1 Tornado
- January 6, 2004 Snow Storm
- May 17, 2003 Lightning Strike
- October 15-23, 2003 Federal Disaster 1499: Severe Storms and Flooding
- June 17, 2002 Lightning Strike
- September 5, 2002 Lightning Strike
- December/January 1996/1997 Federal Disaster 1159: Ice, Wind, Snow, Landslides, and Flooding
- September 1, 1997 Hail Storm.
- December 12, 1995 Windstorm
- April 6, 1994 F0 Tornado
- January 20, 1993 Inaugural Day Windstorm, Federal Disaster 981: Windstorm.
- January 1986 Strong Winds and Rain

VULNERABILITY

Severe storms have a **high probability of occurrence.** Historical damage and cumulative costs of destructive storms suggest **high vulnerability**. Accordingly, a **high risk** rating is assigned.

Probability of Occurrence	Vulnerability	Risk
High	High	High