

Section 10 Severe Weather

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This chapter is concerned with extreme and severe weather events and focuses on severe winter storms and windstorms. Flooding and landslides are not included in this chapter but are covered separately in Section 7 and 8.

Why is Severe Weather a Threat to Portland?

Severe storms can produce rain, freezing rain, ice, snow, cold temperatures, and high winds. High winds, especially when accompanied by ice storms, can destroy trees and power lines and potentially interrupt utility services. Because it can disrupt essential regional services such as public utilities, telecommunications, and transportation routes, severe weather events pose a significant threat to life, property, and the local economy in City of Portland.

Historical Extreme and Severe Weather

Regional Severe Weather Events

Destructive storms that produce heavy snow, ice, and high winds have a long history in northwestern Oregon. The region's largest winter storms occurred in 1937 and 1950, and the most destructive windstorm occurred in 1962.

The Columbus Day storm in 1962 was the most destructive windstorm ever recorded in Oregon in terms of both loss of life and property damage.¹ Damage was the most severe in the Willamette Valley.² The storm killed thirty-eight people and imposed more than \$200 million in damages. Hundreds of thousands of homes were without power for short periods, while others were without power for two to three weeks. The storm left more than 50,000 homes damaged and nearly 100 destroyed. Entire fruit and nut orchards were destroyed and livestock killed as barns collapsed and trees blew over. Intense wind speeds were recorded in the metropolitan areas with gusts of 116 mph on the Portland Morrison Bridge and 90 mph peak gusts in Hillsboro.

While relatively rare, tornados can and do occur in the Portland metropolitan area. A small, short-lived tornado near Forest Grove in June 1966 moved from the southwest to the northwest through a corn field and prune orchard, uprooting 20 to 25 prune trees. The tornado occurred during the late afternoon, had a path length of one-fourth mile, and was 60 yards in width at the widest point. There was no other significant damage reported with the tornado. Heavy rain occurred at the same time, but no hail or lightning was reported.³

Three back-to-back storms in January 1950 severely affected infrastructure, residents, and businesses across the State. Deep snow drifts closed all highways west of the Cascades and through the Columbia River Gorge. Sleet that turned to freezing rain caused unsafe conditions on highways and damaged trees and power lines. During a severe sleet event on January 18, hundreds of motorists were stranded in the Columbia River Gorge. Freezing rain downed many trees and power lines, creating widespread power outages across northwestern

Oregon. Hillsboro reported 42.4 inches of snowfall during this event.⁴ Ultimately, hundreds of thousands of dollars worth of public and private property was damaged.

A serious storm in February 1937 resulted in the death of five people in the Portland area. Record snowfalls in Portland created snowdrifts up to 25 feet in height and a low temperature of 17 degrees Fahrenheit. Schools and businesses were closed and flood damage was reported in downtown Portland basements as the snow melted.⁵ All major highways were closed, shutting off the main transportation arteries for travel and business.

A December 1919 snowstorm was the third heaviest snowfall-producing storm to hit Oregon. The Columbia River froze over, closing the river to navigation from the confluence with the Willamette River upstream. The snowstorm affected nearly every part of the State as heavy snow fell over a widespread area.⁶

A six-day storm in January 1909 brought many locations more snow than is normally accumulated in an entire year.⁷ Finally, a storm between December 20 and 23 of 1892 produced substantial snowfall across most of northern Oregon. The greatest snowfall amounts were reported in northwestern Oregon where storm totals ranged from 15 to 30 inches.⁸

City Severe Weather Storms

Historically, Portland has been affected by severe weather including snow, ice, and high winds. The Columbus Day Storm of 1962 brought extensive damage to Portland and the rest of the State. The storm significantly damaged many other structures throughout the City and caused multiple injuries.

Another storm hit Portland on October 2, 1967. Again, this storm caused significant damage in the City due to high winds much like those of the Columbus Day Storm. Many of the same victims of the Columbus Day Storm were once again affected by the 1967 storm.

In January 1969 one of the fiercest winter storms in recent history caused heavy icing on Portland streets and sidewalks. Yet another major winter storm occurred in 2003. December 26 of that year began a 19-day cold snap that brought as much as 19 inches of snow in the Columbia Gorge. In the City of Portland, eight inches of snow followed and three inches of freezing rain covered the City. County personnel worked 24 hours a day in 12-hour shifts for 11 days de-icing, sanding, and plowing the roads of the area. A total of 11 county employees maintained the many moveable bridges in the City until accumulated snow and ice rendered the drawbridges inoperable.

The governor declared the storm a “significant event;” the county subsequently received \$452,000 from FEMA, most of which was used to cover overtime costs for county employees.

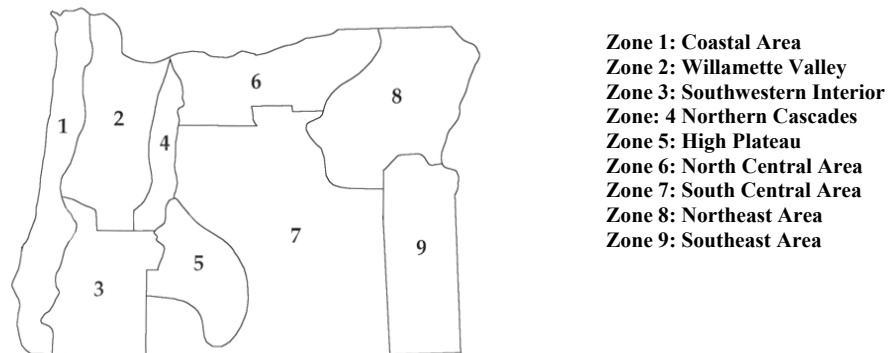
Characteristics of Severe Winter and Windstorms in Portland

Weather patterns

Severe storms affecting Portland with snow and ice typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March.⁹ A majority of the destructive surface winds in Oregon and, specifically, Portland, are from the southwest.¹⁰ Some winds blow from the east but most often do not carry the same destructive force as those from the Pacific Ocean.

Portland average rainfall is approximately 37 inches a year.¹¹ The National Climatic Data Center has established climate zones in the US for areas that have similar temperature and precipitation characteristics. Oregon’s latitude, topography, and proximity to the Pacific Ocean give the State diverse climates. Portland is in Zone 2 (see Figure 10-1). The climate in Zone 2, including Portland and surrounding areas, generally consists of wet winters and dry summers. In 2001, 89 percent of the precipitation occurred between October and May; 11 percent of the annual rainfall occurred between June and September, and 4 percent occurred in July and August.¹² There is an average of only five days per year of measurable snow with accumulations rarely measuring more than two inches.¹³

Figure 10-1. Oregon Climate Zones



Source: Taylor, George H. and Hannan, Chris, *The Oregon Weather Book*, OSU Press (1999)

Snow

While snow is relatively rare in western Oregon, the Columbia Gorge provides a low-level passage through the mountains. Cold air lying east of the Cascades often moves westward through the Gorge and funnels cold air into the Portland Area. If a wet Pacific storm happens to reach

the area at the same time, larger than average snow events may result.¹⁴

An example of this type of snowstorm is the previously described storm of January 1980 where snow, ice, wind, and freezing rain hit Oregon statewide. In the Portland area alone, 200,000 customers were left without power or phone service for several days. More than 100 boats with a combined value in excess of \$3 million sunk in the Gorge and Portland, resulting in one fatality.

Ice

Ice storms occasionally occur in northern areas of Oregon when cold air flows westward through the Columbia Gorge.¹⁵ Like snow storms, ice storms are comprised of cold temperatures and moisture, but subtle changes can result in varying types of ice formation including freezing rain, sleet, and hail.¹⁶

Freezing rain can be the most damaging of ice formations. While sleet and hail can create hazards for motorists when they accumulate, freezing rain can cause the most dangerous conditions within a community. As described earlier, ice buildup can bring down trees, communication towers, and wires and create hazards for property owners, motorists, and pedestrians alike. The most common freezing rain problems occur near the Columbia Gorge. As noted above, the Gorge is the most significant east-west air passage through the Cascades. Rain arriving from the west can fall on frozen streets, cars, and other sub-freezing surfaces and create dangerous conditions.¹⁷ Much of the damage from ice storms occurs when the ice thaws: although some tree limbs fall from the weight of the ice, many broken tree limbs are held in place by the frozen ice structure. Water lines that have frozen in the storm will begin to leak as the ice melts. As a result, storm emergency periods often extend beyond the freeze to include the thaw.

Many of the natural hazards definitions found in this plan come from existing state resources, including the *Planning for Natural Hazards: Technical Resource Guide*, the *Oregon State Natural Hazards Plan*, and FEMA-adopted local plans. For more information on existing resources for natural hazards and mitigation planning in the state of Oregon, please visit www.OregonShowcase.org.

Wind

A windstorm is generally a short duration event involving straight-line winds and/or gusts in excess of 50 mph. Most of the winds that come from the west are subdued by the time they reach the Portland area because of the influence of the Coast Range. The most destructive winds are those which blow from the south, parallel to the major mountain ranges.¹⁸ Windstorms affect areas of Portland with significant tree stands as well as areas with exposed property, major infrastructure, and above ground utility lines. The lower wind speeds typical in the valleys are still high enough to knock down trees, bring down power lines, and cause other property damage. The Columbus Day Storm of 1962 was a classic example of a southerly windstorm. The storm developed well off the coast of California and moved from the

southwest, then turned and came directly from the south toward the Oregon Coast. Atmospheric pressure fell rapidly ahead of the storm center and rose rapidly once the storm center passed, creating very tight and sharp pressure gradients. When strong surface winds are further reinforced by upper airflow in the same direction (as was the case in the Columbus Day Storm), the surface wind speed is enhanced.¹⁹

Severe Summer Heatstorms

Portland occasionally experiences heatstorms, defined as periods where temperature exceeds 90 degrees Fahrenheit for more than three days, 6-day strings.²⁰ The severity of the storm increases when high temperatures are accompanied by warm winds. These conditions cause the tissue in trees to shrink and contract. The wood in trees twists and cracks, causing limb failures that damage property, disable systems, and cause personal injuries. In addition to tree failures, extreme summer heat causes pressure on the electrical system as people increase their use of air conditioners. Water supply systems can also become stressed. Older citizens and others who are medically compromised can experience increased rates of heat exhaustion and stroke. Heat storms usually result in stagnant air and air quality alert days.

Severe Weather Community Issues

Life and Property

Severe weather can be a deceptive killer. Storms—which bring snow, ice, and high winds—can have a significant impact on life and property. Many severe winter storm deaths occur as a result of traffic accidents on icy roads, heart attacks while shoveling snow, and hypothermia from prolonged exposure to the cold. Debris carried along by extreme winds can contribute directly to loss of life and indirectly through the failure of protective structures (i.e., buildings) and infrastructure.

Property is at risk due to flooding (see Section 7) and landslides (see Section 8) that result from heavy snowmelt. Additionally, ice, wind, and snow can affect the stability of trees, power lines, telephone lines, and television and radio antennas. Falling trees and limbs affected by these events and saturated soils can become hazards for houses, cars, utilities, and other property. These conditions can be major hindrances to emergency response and disaster recovery.

Windstorms have the ability to cause damage more than 100 miles from the center of storm activity. Wind pressure can create a direct frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift and suction forces that act to pull building components and surfaces outward. The effects of winds are magnified in the upper levels of multi-story structures. The forces applied by the wind to the building's protective envelope (doors, windows, and walls) can cause failure of some of the building's

components and considerable structural damage. The effects of wind speed are shown in Table 10-1.

Table 10-1 Effects of Wind Speed

WIND SPEED (MPH)	WIND EFFECTS
25-31	Large branches will be in motion.
32-38	Whole trees in motion; inconvenience felt walking against the wind.
39-54	Twigs and small branches may break off of trees; wind generally impedes progress when walking; high profile vehicles such as trucks and motor homes may be difficult to control.
55-74	Potential damage to TV antennas; may push over shallow rooted trees especially if the soil is saturated.
75-95	Potential for minimal structural damage, particularly to unanchored mobile homes; power lines, signs, and tree branches may be blown down.
96-110	Moderate structural damage to walls, roofs and windows; large signs and tree branches blown down; moving vehicles pushed off roads.
111-130	Extensive structural damage to walls, roofs, and windows; trees blown down; mobile homes may be destroyed.
131-155	Extreme damage to structures and roofs; trees uprooted or snapped.
Greater than 155	Catastrophic damage; structures destroyed.

Source: Washington County Office of Consolidated Emergency Management

Infrastructure

Traffic

Severe weather can cause prolonged and extreme traffic disruptions. The importance of transportation is never more noticeable than in situations where travel is difficult or dangerous. Both property damage and loss of life are risks to those who must drive. Additionally, traffic delays or blockages can seriously hinder the ability of emergency service providers.

Economic concerns rise during storms that cause dangerous road conditions since many people choose to stay home in these situations. To address these concerns, Portland has participated in the designation of emergency transportation routes with Multnomah, Washington, Clackamas, and Columbia Counties as well as Clark County in

Washington State. These emergency transportation routes will receive high priority for assessment, clearance, and restoration following a natural hazard event. These routes will be used to move personnel and supplies throughout the region and to bring in support from outside the area.

Many of Portland's citizens rely on alternative modes of transportation such as public transit, biking, or walking for their daily commutes. During winter storms, buses will travel on designated snow routes, leaving portions of the City without access to public transit. Portland's light rail system can also be impacted; during the most recent ice storm, the rails were frozen and trains could not travel. Winter storms are dangerous for pedestrians as well. Sidewalks are not always prioritized for snow clearance, a situation that is worsened when snow plows clear snow and ice from the streets and push it onto sidewalks. Pedestrians are hereby forced to walk in the icy streets with traffic.

Utilities

Historically, falling trees have been the major cause of power outages resulting in interruption of services and damaged property. The issue of weather related power outages should be addressed as many Portland residents rely on electricity for heat. Even homes using natural gas typically require electricity for the system to operate and run circulation fans and thermostats. Natural gas distribution systems also rely to some degree on electrical service to keep the system operational and widespread power outages, can interrupt that service.

Power loss is also a concern economically as businesses may have to close during power outages. In a business survey completed in 2002 for the City of Beaverton, 78% of the City's business owners indicated that loss of electricity would have a serious or moderate impact on their business, and 92% claimed electricity was critical or very important to their business. There is no reason to believe that City of Portland business owners would respond differently.

Many overhead wires are at risk from snow and ice accumulations that are beyond the design specifications. High winds can create flying debris and down utility lines. For example, tree limbs breaking in winds of only 45 mph can be thrown more than 75 feet. As such, overhead power lines can be damaged even in relatively minor windstorm events.

Increasing population and new infrastructure in the City mean that more lives and property are exposed to risk; this situation creates a higher probability that damage will occur from severe weather events.

Water Lines

The most frequent water system problem related to cold weather is a break in cast iron mainlines. Breaks frequently occur during severe freeze events as well as during extreme cooling periods through the months of October, November, and December. In almost every severe winter storm previously described, broken pipes led to the closures of schools and business throughout Portland. In normal weather years, 15

and 30 breaks in main lines occur annually. Extended cold snaps can produce large numbers of breaks; for example, the January 2004 storm produced 2 main breaks in the water system in less than one week. During freezes, the broken mains not only result in lost water service to customers but also cause extensive property damage from spilled water.

Severe weather can also affect the water system in other ways. In September 2000, the Bureau of Water Works completed a System Vulnerability Assessment (SVA) of the water system. One of the “Very High Risk” hazards identified was loss of power from ice and wind storms. The Bull Run Headworks, distribution pump stations, and groundwater wells are among the most vulnerable facilities. Power interruptions at these facilities can have dramatic negative consequences to the water system.

Another common problem during severe freeze events is the failure of commercial and residential water lines. Inadequately insulated potable water and fire sprinkler pipes can rupture and cause extensive damage to property.

Tree Failure and Resulting Power Line Outages

According to Portland General Electric (PGE), trees are the leading cause of storm-related power outages in PGE’s service area.²¹ Tables 10-2 and 10-3 contain Tree Failure Profiles developed by PGE for two of the most common tree failures in the PGE service territory. The profiles are developed from the data collected and used by PGE foresters in targeting “at-risk” trees during routine vegetation maintenance cycles.

Table 10-2. Tree Failure Profile - Species: Douglas fir (*Psuedotsuga menziesii*)

Failed Part	Description of failure/ Tree characteristics	Associated defects/ Indicators	Environment	Management History
BRANCH Frequency: High	Small dia. branches from mature trees; can sail up to 75 ft & wrap lines. Overhanging branch failure from snow/ice loading.	Evidence of previous branch failures.	Exposure to winds/gusts greater than 40 mph. Line downwind.	Side trimmed trees.
TRUNK Frequency: Low	Failure of multiple tops.	Old topping cut, previous break, decay present.	Wind or ice storms.	Previous topping.
	Interior trees, 3-8" dia.	Intermediate/suppressed trees.	Wind, snow/ice loading, recent exposure.	Thinning of stand, exposure as edge tree.
	Dead tree of any size in close proximity to line.	Entire tree dead for some time.	Line downwind.	
ROOT Frequency: High	Trees of all ages.	Evidence of other root failures.	Slight to moderate wind.	Site disturbance; leave trees from logging or development.
	Small, interior trees.	Poor taper, low live crown ratio, aggravating site characteristics.	Slight to moderate wind.	Thinning of stand; overstocked, unmanaged stands.

Source: Portland General Electric, Forester's Office, 2001; © Portland General Electric Co.

Table 10-3. Tree Failure Profile - Species: Bigleaf Maple (*Acer macrophyllum*)

Failed	Description failure/characteristi	Associate defects/Indicator	Environme	Manageme Histor
BRANCH Frequency High	Mature scaffold or during full out.	Decay present multiple attachment. dominant with included	Heavy rains after out in spring; heavy rains. Exposure winds/gusts than 30 mph. downwind, ivy	Natural previously pruned; history side
TRUNK Frequency: Low	Trunk failure base of tree up 12	Decay present trunk or at	On a slope, downwind, or covered	In unmanaged natural

Source: Portland General Electric, Forester's Office, 2001; © Portland General Electric Co.

Severe Weather Hazard Assessment

Severe Weather Hazard Identification

Severe weather is generally a prolonged event involving snow, ice, or wind. The characteristics of severe weather are determined by a number of meteorological factors including the amount and extent of snow or ice, air temperature, wind speed, and event duration. The severe weather events that affect the City most typically come from the northwest, the southeast, and through the Columbia River Gorge.

Precipitation, an additional element of severe weather, is measured in addition to wind speed by gauging stations. The Portland Bureau of the National Weather Service monitors the stations and provides public warnings on storm, snow, ice, and wind events as appropriate. The HYDRA rainfall network (maintained by the City of Portland Bureau of Environmental Services) collects information from a total of 38 stations within Portland's city limits. This information is updated hourly and is accessible to the public on-line at: <http://or.water.usgs.gov/non-usgs/bes/>.

Vulnerability Assessment

Vulnerability assessment is the second phase of a hazard assessment. It combines the information generated through severe weather identification with an inventory of the existing development exposed to this hazard to assess potential property and personal impacts. ²² Data including the areas exposed to severe weather in Portland can be used

to assess the population and total value of property at risk from severe storms.

While a quantitative vulnerability assessment (an assessment that describes number of lives or amount of property exposed to the hazard) has not yet been conducted for Portland's severe weather storm events, there are many qualitative factors (issues relating to what is in danger within a community) that point to potential vulnerability. Severe weather can cause power outages and transportation and economic disruptions and pose a high risk for injuries and loss of life. The events can also be typified by a need to shelter and care for adversely impacted individuals. Portland has suffered severe weather in the past that brought economic hardship and affected the life safety of City residents. Future severe weather events may cause similar impacts citywide.

Risk Analysis

Risk analysis is the third and most advanced phase of a hazard assessment. The analysis is conducted using mathematical models and relies on information compiled during hazard identification and vulnerability assessments. Factors included in assessing severe weather risk include population and property distribution in the hazard area, the frequency of severe weather storm events, and information on trees, utilities, and infrastructure that may be impacted by severe weather. When sufficient data is collected for hazard identification and vulnerability assessment, a risk analysis can be completed. Insufficient data currently exists to complete a thorough risk analysis, but some areas of risk are well known. A brief summary follows.

In Portland, the infrastructure and population at risk from severe weather events varies depending on the type of storm. In a heatstorm, those without air conditioning are most likely to be impacted. Older citizens and others who are medically compromised experience increased rates of heat exhaustion and stroke. Ice storms can severely impact transportation networks and public transit. Commuters may experience difficulties getting to work and commerce might slow as trucks and trains are impacted. Traffic accidents also increase when ice and snow cover the roadways. Hypothermia is also an associated risk. Ice storms and windstorms can impact power lines, disrupting electricity to businesses and residents. Areas with significant tree stands are most likely to experience electrical outages as a result of ice or windstorms.

Mitigation Plan Goals and Existing Activities

The mitigation plan goals and action items are derived from a review of city, county, regional, state, and national natural hazards mitigation plans and planning literature and guidance from the Portland Natural Hazards Mitigation Steering Committee. Goals for this mitigation plan address five categories:

1. Identify risk level and evaluate Portland's vulnerability to natural hazards.

2. Implement activities to protect human life, property and natural systems.
3. Promote public awareness, engage public participation, and enhance partnerships through education, outreach, and coordination of a diverse and representative group of the City's population.
4. Establish a disaster resilient economy.
5. Build and support the capacity and commitment to continuously become less vulnerable to hazards.

Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by city, county, regional, state, federal agencies, utilities, or other organizations

City Programs

Capital Improvement Plan

The City of Portland's Capital Improvements Plan (CIP) is a dynamic document that lists and prioritizes improvements and expansions of the City's infrastructure necessary to maintain adequate service levels to existing City residents and businesses and to accommodate population growth and land development. The CIP reflects the needs and priorities established by the City and the resources available to the City. The CIP can be modified during the fiscal year (through the supplemental budget process) as needs, priorities, and resources change. The CIP can assist the City of Portland in mitigating against severe weather events by improving infrastructure most prone to damage.

Urban Forestry Program

Portland's Department of Parks and Recreation Urban Forestry Program has a number of ongoing educational efforts designed to mitigate damage from downed trees during storms. The Program also has authority to identify and eliminate known hazards. The following is a brief summary of related activities.

Portland's municipal code gives the City Forester authority to require permits for planting of trees on public rights of way. The permitting system provides an opportunity to specify failure resistant species of trees and to set standards that reduce losses from tree failure. The City Forester has the authority to remove trees that threaten public safety and to require property owners to perform street tree maintenance activities to correct hazardous situations.

The Urban Forestry Program also provides a free inspection service for public street trees. Property owners who request this service are visited by an Urban Forestry Inspector who is trained to pre-identify many tree related hazards and advise property owners. The Neighborhood Tree Liaison program recruits and educates interested citizens in each of

Portland's 96 neighborhoods. These trained citizens educate their neighbors in proper tree care and report hazards in the community. Additionally, the program has created a number of brochures and other educational materials designed for property owners.

The Department of Parks and Recreation also has an Urban Forestry Response Team and a plan for responding to down trees on an individual or large scale.

Portland General Electric

Through the Right Tree-Right Place program, Portland General Electric (PGE) educates homeowners, landscapers, and tree propagators on tree species that will not be subject to ongoing stress by constant trimming. PGE distributes brochures that list low-growing trees that fit within the utility right-of-way and are compatible with small urban planting strips. The brochure includes information on how to select the correct tree, the energy-saving benefits of trees, and proper planting and pruning techniques. PGE offers tree owners a certificate to help defray the cost of a new tree that replaces one that is inappropriate.

PGE also runs a tree-trimming program and keeps a database of information in order to build profiles of trees that cause power line outages. PGE foresters work with local government and the public to assess and identify situations in which trees or power lines put life and property at risk. Calls and faxes to PGE's tree-trimming program result in immediate response by PGE to clear roads of fallen trees. PGE's database of tree failures intends to identify those trees that are at an above average risk.

Portland Water Bureau

The Water Bureau reviewed and identified facilities at risk of winter storms and identified power outages as the highest threat. This System Vulnerability Assessment (SVA) made recommendations for improvements to Bureau facilities to mitigate snow/ice accumulations from winter storm events. Much has been done to date and further activities are scheduled in the Bureau's Capital Improvement Plan. Thus far,

- Four mobile power generators have been added and some existing generators have been upgraded to keep the system moving when power failures occur.
- Standards for new pump stations and other key bureau facilities now include back-up power supply.
- Pipe standards now provide freeze protection, and the distribution system includes redundancies that assure water will flow even in the even of a break.
- An emergency operations plan has been developed, and emergency crews are quickly activated when needed.

Portland Bureau of Maintenance

Portland's Bureau of Maintenance maintains several plans designed to reduce losses from severe weather. These include:

- **Public Works Emergency Plan.** This plan contains debris management elements related to wind events as well as surface transportation route planning elements designed to reduce the potential impacts of weather events.
- **Portland Flood Plan.** This plan contains some mitigation elements relevant to wind and snow events and flooding.
- **Snow and ice Operations Plans.** This plan addresses facilities and locations to help lessen impacts through preparedness; the Plans also contain emergency transportation routes.

Bureau of Environmental Services

Portland's Bureau of Environmental Services maintains several plans and programs that reduce the impacts of heavy rain on the stormwater management system. The Combined Sewer Overflow Program mitigates the environmental damage that can occur when rains cause untreated sewage to run into waterways. The Stormwater Management Plan minimizes the impact that storm run-off has on the stormwater management system and the street infrastructure.

Bureau of Development Services

BDS maintains and implements the International Building Code which includes minimum standards for weather-resistant construction.

Bureau of Planning

The Bureau of Planning maintains and regularly updates Portland's Comprehensive Plan which addresses land use elements relevant to severe weather mitigation.

Office of Sustainable Development

The Office of Sustainable Development's Multifamily Assistance Program works with property owners and managers to market the benefits of energy efficiency and simplify the process of weatherizing rental properties. OSD provides technical information on insulation and high-efficiency windows, maintains a list of qualified contractors, and assists property owners in applying for rebates, state tax credits, and low-interest financing that may be available for energy-efficiency projects. The resulting energy-efficiency projects increase the value of the property, reduce tenants' energy bills, and improve indoor comfort. During an extreme winter storm event, residents in weatherized properties have additional protection against cold if there is an electricity blackout, since most local multifamily properties have electric space heat.

International Building Code

The City of Portland and the State of Oregon have adopted the International Building Code which includes specifications for new development to withstand snow and wind loads.

Dangerous Building Code

Title 29.40.020 of Portland’s Municipal Code defines “Dangerous Buildings” and requires abatement for them. Dangerous buildings are those with structures that are overstressed because of snow or wind loading or because they require maintenance.

Seismic Design Requirements for Existing Buildings

Title 24.85 of Portland’s Municipal Code includes requirements for existing buildings to be retrofitted for earthquake resilience. By strengthening a building for seismic forces, the building is also strengthened for lateral wind forces and will be more resilient in severe weather.

Regional Programs

Emergency Transportation Routes Plan

Metro, in conjunction with the Regional Emergency Management Technical Committee, is currently writing an Emergency Transportation Routes Plan that identifies critical transportation networks to improve efficiency of response and reduce impacts on public safety and commercial traffic following a disaster. Severe weather frequently impacts the transportation system on a regional scale.

Federal Programs

National Weather Service

The Portland Office of the National Weather Service issues severe weather watches and warnings when appropriate to alert government agencies and the public of possible or impending weather events. The watches and warnings are broadcast over NOAA weather radio and are forwarded to the local media for retransmission using the Emergency Alert System.

Severe Weather Mitigation Action Items

The severe weather mitigation action items provide direction on specific activities that the City, organizations, and residents can undertake to reduce risk and prevent loss from severe weather events. There are two short-term and five long-term severe weather action items described below. Each action item is followed by ideas for implementation that can be used by the steering committee and local decision makers in pursuing implementation strategies. This section does not include action items related to flood.

Short-term Action Items

ST-SW#1: Develop an education/outreach program in collaboration with other bureaus regarding winter preparedness that targets Portland's neighborhoods.

Key Issues Addressed

- Individuals and businesses need to be prepared to reach defined snow routes, protect utilities, and care for themselves with limited City assistance during snow and ice events.

Ideas for Implementation

- Compile a list of contractors willing to undertake snow removal from residential streets and driveways compiled in current City snow plan and provided to neighborhood associations.
- Hold community meetings held to clarify expectations for City snow removal and private responsibilities for preparedness.
- Create a media packet for use during annual snow and ice dry run.
- Create an educational flyer for inclusion in utility (water/sewer) bills and/or City Bureau newsletters.
- Coordinate with Multnomah County social services and participate in the NET program to reach citizens.
- Coordinate with related efforts in an all-hazard program with seasonal shifts in emphasis.

General Comments

- Partially implemented already in City Emergency Operations Plan, Snow and Ice Annex.
- Education/outreach program needs development with additional internal and external partners, but substantial elements of it already exist or can be developed and implemented with little additional time and cost.

Coordinating Organization:	Bureau of Maintenance
Internal Partners:	Portland Office of Emergency Management, Water Bureau, Bureau of Environmental Services , Office of Neighborhood Involvement
External Partners:	none
Level of Immediate Capability:	Medium
Estimated Timeline:	1 year
Plan Goals Addressed:	Promote public awareness, engage public participation, and enhance partnerships through education, outreach and coordination of a diverse and representative group of the City's population.

ST-SW#2: Acquire an additional facility for storage of anti-icing materials and expand anti-icing vehicle inventory

Key Issues Addressed

- There is a need to expand Portland's capability to pretreat key streets with an environmentally acceptable anti-icing agent. The expanded program would handle all critical routes for most minor snow/ice events without need for additional treatment after snow/ice formation, and would significantly reduce time to clear critical routes in more significant events.

Ideas for Implementation

- A facility has been identified for the storage of 40,000+ gallons of CMA, but the facility has not been acquired or put in use.
- Expansion of the application vehicle inventory is planned for a future budget cycle; it is important to assure that these plans are carried out.

General Comments

- An anti-icing (pretreatment) strategy is already in place using existing equipment. Storage expansion to be done over the next few months and fleet expansion to be phased in over several plan years.

Coordinating Organization:	Bureau of Maintenance
Internal Partners:	BGS/Facilities, Vehicle Services
External Partners:	none
Level of Immediate Capability:	Medium
Estimated Timeline:	3 months -- storage facility online 1- 3 yrs -- fleet expansion
Plan Goals Addressed:	Implement activities to protect human life, property and natural systems.

ST-SW#3: Manage the planting and maintenance of trees in the public right of way to minimize risk.

Key Issues Addressed

- Failing street trees and branches are a major contributor to power outages during storms and also contribute to street/road hazards. Assuring that appropriate species of trees are planted beneath electrical lines and in the right of way can minimize damage. Trees selected for planting beneath electrical lines should mature at a height that is below the level of the primary electrical lines. All street trees should be selected for their structural strength and durability.
- All street trees should be properly maintained to arboricultural standards to promote structural integrity and minimize failure.

Ideas for Implementation

- Control all planting and maintenance of trees in the right-of-way by City Ordinance and permit.
- Provide education, advice and free inspections to property owners to assure appropriate planting and maintenance of street trees.
- Provide for correction of violations and non-conforming situations through negotiations with property owner, penalties, and nuisance abatement procedures.

General Comments

- Implemented under Portland City Code, Urban Forestry Management Plan and Urban Forestry Emergency Response Plan.
- See narrative comments in framework draft.

Coordinating Organization:	City Forester (Parks and Recreation)
Internal Partners:	Bureau of Maintenance, City Attorney
External Partners:	Urban Forestry Commission, property owners, electrical utility companies, Friends of Trees (non-profit)
Level of Immediate Capability:	High
Estimated Timeline:	Immediate
Plan Goals Addressed:	Implement activities to protect human life, property and natural systems.

ST-SW#4: Visually assess overhead hazards during development permit reviews.

Key Issues Addressed

- Trees that show signs of structural defects, genetic defects, or deterioration are more likely to fail and cause damage to persons or property during severe weather events. Failing trees may also block roads impeding emergency vehicles and snow removal/sanding equipment.
- Many street tree defects and decay problems can be identified by a professional arborist's visual inspection.

Ideas for Implementation

- When urban forestry tree inspectors review remodeling and development projects for required street trees, they should also conduct a visual inspection of existing street trees. The urban forestry inspector can require defective trees to be repaired or removed and replaced.

Coordinating Organization:	Parks and Recreation, City Forester
Internal Partners:	Bureau of Maintenance, Bureau of Development Services
External Partners:	Permittee, Property owners
Level of Immediate Capability:	High
Estimated Timeline:	Immediate
Plan Goals Addressed:	Implement activities to protect human life, property and natural systems.

ST-SW#5: Develop, implement, and/or enhance strategies for debris management for severe winter storm events.

Key Issues Addressed

- During severe storms, downed trees and other debris can block roads that are crucial for emergency response. Debris removal is an important step in responding to a severe weather event and in recovering from one.

Ideas for Implementation

- Develop a coordinated management strategy for de-icing roads, plowing snow, clearing roads of fallen trees, and clearing debris from public and private property.

Coordinating Organization: Bureau of Maintenance

Internal Partners: Fire Bureau

External Partners: Portland Office of Emergency Management

Level of Immediate Capability: Medium

Estimated Timeline: 1-3 years

Plan Goals Addressed: Implement activities to protect human life, property and natural systems.

Long-term Action Items

LT-SW#6: Insulate residential buildings that house at-risk populations.

Key Issues Addressed

- Many at-risk populations (such as the elderly poor) are more susceptible to severe weather events because they live in poorly insulated housing. During severe weather events, these residents may suffer greater impacts than those who live in weatherized properties.

Ideas for Implementation

- Install insulation and other weatherization measures in single-family housing occupied by at-risk residents
- Minimize utility shut-offs by improving access to bill-paying assistance programs and providing self-help energy education to low-income and at-risk residents. In the past, the City has organized Energy Fairs and Fix-It Fairs, neighborhood-based events that connect residents with resource-conservation assistance, including weatherization and bill-paying assistance.

Participants are provided with technical information on insulation and energy-efficiency measures to lower energy bills, improve indoor comfort, and reduce the likelihood of losing utility service because of the inability to pay bills.

General Comments

- The existing Multifamily Assistance Program (implemented by the Office of Sustainable Development) could serve as a model for program development. Between 1987 and 2003, the City weatherized 2,800 homes through a similar program, Block-By-Block, that targeted low-income residents in single-family homes.

Coordinating Organization: Office of Sustainable Development

Internal Partners: none

External Partners: Multnomah County, Energy Trust of Oregon

Level of Immediate Capability: Low, no funding currently identified

Estimated Timeline: 1-2 years once funding is available

Plan Goals Addressed: Implement activities to protect human life, property and natural systems.

LT-SW#7: Prioritize existing building stock for active review of Title 29 (Dangerous Building Code).

Key Issues Addressed

- Some buildings, especially older ones, may be “overstressed” and may be more severely impacted by severe weather events that include high winds or heavy snows. Portland’s municipal code provides a definition of “overstressed” and requires retrofit or repair. However, buildings are not actively reviewed for compliance with municipal code; some buildings that are dangerous may not be identified.

Ideas for Implementation

- Actively review existing building stock and require retrofit.

Coordinating Organization: Bureau of Development Services

Internal Partners: Fire Bureau

External Partners: none

Level of Immediate Capability: Low

Estimated Timeline: 3-5 years

Plan Goals Addressed: Implement activities to protect human life, property and natural systems.

Severe Weather Resource Directory

State Resources

Department of Land Conservation and Development (DLCD)

DLCD administers the State's Land Use Planning Program. The program is based on 19 statewide planning goals including Goal 7, the goal related to floods and other natural hazards. In order to help local governments address natural hazards effectively, DLCD provides technical assistance and conducts workshops, reviews local land use plan amendments, and works interactively with other agencies.

Contact: Natural Hazards Program Manager, DLCD
Address: 635 Capitol St. NE, Suite 200, Salem, OR 97301-2540
Phone: (503) 373-0050
Fax: (503) 378-6033
Website: <http://www.lcd.state.or.us/hazards.html>

Oregon Department of Consumer and Business Services

The Building Codes Division of Oregon's Department of Consumer and Business Services is responsible for administering statewide building codes. Its responsibilities include adoption of statewide construction standards that help create buildings able to resist flood, wildfire, wind, foundation stability, and seismic hazards.

Contact: Building Codes Division
Address: 1535 Edgewater St. NW, P.O. Box 14470, Salem, OR 97309
Phone: (503) 373-4133
Fax: (503) 378-2322
Website: <http://www.cbs.state.or.us/external/bcd>

Oregon Climate Service

The Oregon Climate Service collects, manages, and maintains Oregon weather and climate data. OCS provides weather and climate information to those within and outside the State of Oregon and educates the citizens of Oregon on current and emerging climate issues. OCS also performs independent research related to weather and climate issues.

Contact: Oregon Climate Service
Address: Oregon Climate Service, Oregon State University
Strand Ag Hall Room 316, Corvallis, OR 97331-2209
Phone: (541) 737-5705
Website: <http://www.ocs.orst.edu>
Email: oregon@oce.orst.edu

Oregon State Police (OSP)-Office of Emergency Management (OEM)

The purpose of OEM is to execute the Governor's responsibilities to maintain an emergency services system as prescribed in Oregon Revised Statutes Chapter 401 by planning, preparing, and providing for the prevention, mitigation, and management of emergencies or

disasters that present a threat to the lives and property of citizens of and visitors to the State of Oregon.

Contact: Office of Emergency Management
Address: 595 Cottage Street NE, Salem, OR 97310
Phone: (503) 378-2911
Fax: (503) 588-1378
Website: <http://www.osp.state.or.us/oem>

Federal Resources

Federal Emergency Management Agency (FEMA)

FEMA's mission is "to reduce loss of life and property and protect our nation's critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery." FEMA Region X serves the northwestern states of Alaska, Idaho, Oregon, and Washington.

Contact: FEMA, Federal Regional Center, Region 10
Address: 130-228th St. SW, Bothell, WA 98021-9796
Phone: (425) 487-4678
Website: <http://www.fema.gov/Reg-X/index.htm>

National Oceanic and Atmospheric Administration (NOAA)

NOAA's historical role has been to predict environmental changes, protect life and property, provide decision makers with reliable scientific information, and foster global environmental stewardship.

Contact: National Oceanic and Atmospheric Administration
Address: 14th Street & Constitution Avenue, NW, Room 6013, Washington, DC 20230
Phone: (202) 482-6090
Fax: (202) 482-3154
Website: <http://www.noaa.gov>
Email: answers@noaa.gov

National Weather Service, Portland Bureau

The National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, and adjacent waters for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure that can be used by other governmental agencies, the private sector, the public, and the global community.

Contact: National Weather Service
Address: 5241 NE 122nd Ave, Portland, Oregon 97230
Phone: (503) 326-2340
Website: <http://nimbo.wrh.noaa.gov/Portland>
Email: clinton.rockey@noaa.gov

Additional Resources

American Red Cross

The American Red Cross is a volunteer-led humanitarian organization that provides relief to victims of disasters and helps people prevent, prepare for, and respond to emergencies. The Oregon Trail Chapter was chartered as a Red Cross unit in 1917. The Chapter serves the residents of Clackamas, Columbia, Multnomah, Washington, Yamhill, and Tillamook counties. The Oregon Trail Chapter provides a variety of community services which are consistent with the Red Cross mission and meet the specific needs of this area including disaster planning, preparedness, and education.

Contact: American Red Cross, Oregon Trail Chapter
Address: P.O. Box 3200, Portland, OR 97208-3200
Phone: (503) 284-1234
Fax: (503) 284-4247
Website: <http://www.redcross-pdx.org>
<http://www.redcross.org/services/disaster>
Email: info@redcross-pdx.org

Institute for Business & Home Safety (IBHS)

IBHS was created by the insurance industry to reduce damage and losses caused by natural disasters. The IBHS website provides educational resources and on-line publications for insurers, businesses, and homeowners who are interested in taking the initiative to minimize future damages and losses.

Contact: Institute for Business and Home Safety
Address: 1408 North Westshore Boulevard - Suite 208 - Tampa, FL 33607
Phone: (813) 286-3400
Fax: (813) 286-9960
E-mail: info@ibhs.org
Website: <http://www.ibhs.org/ibhs2>

Publications

Public Assistance Debris Management Guide, Federal Emergency Management Agency (July 2000).

The Debris Management Guide was developed to assist local officials in planning, mobilizing, organizing, and controlling large-scale debris clearance, removal, and disposal operations. Debris management is generally associated with post-disaster recovery. While it should be compliant with local and county emergency operations plans, strong debris management should also be incorporated into mitigation activities. The Public Assistance Debris Management Guide is available in hard copy or on the FEMA website.

Contact: FEMA Distribution Center
Address: 130 228th Street, SW, Bothell, WA 98021-9796
Phone: (800) 480-2520
Fax: (425) 487-4622
Website: <http://www.fema.gov/rrr/pa/dmgtoc.shtm>

Endnotes

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- ⁹ Interagency Hazard Mitigation Team, *State Hazard Mitigation Plan* (2000)
Oregon State Police – Office of Emergency Management.
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<http://www.wrh.noaa.gov/pqr/pdxclimate/index.php>. (Accessed October 20, 2004.
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- ¹⁴ Taylor, George H. and Hannan, Chris, *The Oregon Weather Book*, (1999)
Oregon State University Press.
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- ²⁰ National Weather Service Web-Page, (October 2004).
<http://www.wrh.noaa.gov/pqr/pdxclimate/PG21.html>
- ²¹ Portland General Electric Web Page,
http://www.portlandgeneral.com/safety_and_outage/tree_maint/trees_and_outages.asp (October 2004)
- ²² Burby, R. (Ed.) *Cooperating with Nature: Confronting Natural Hazards with Land Use Planning for Sustainable Communities*. Washington D.C. (1998),
Joseph Henry Press.