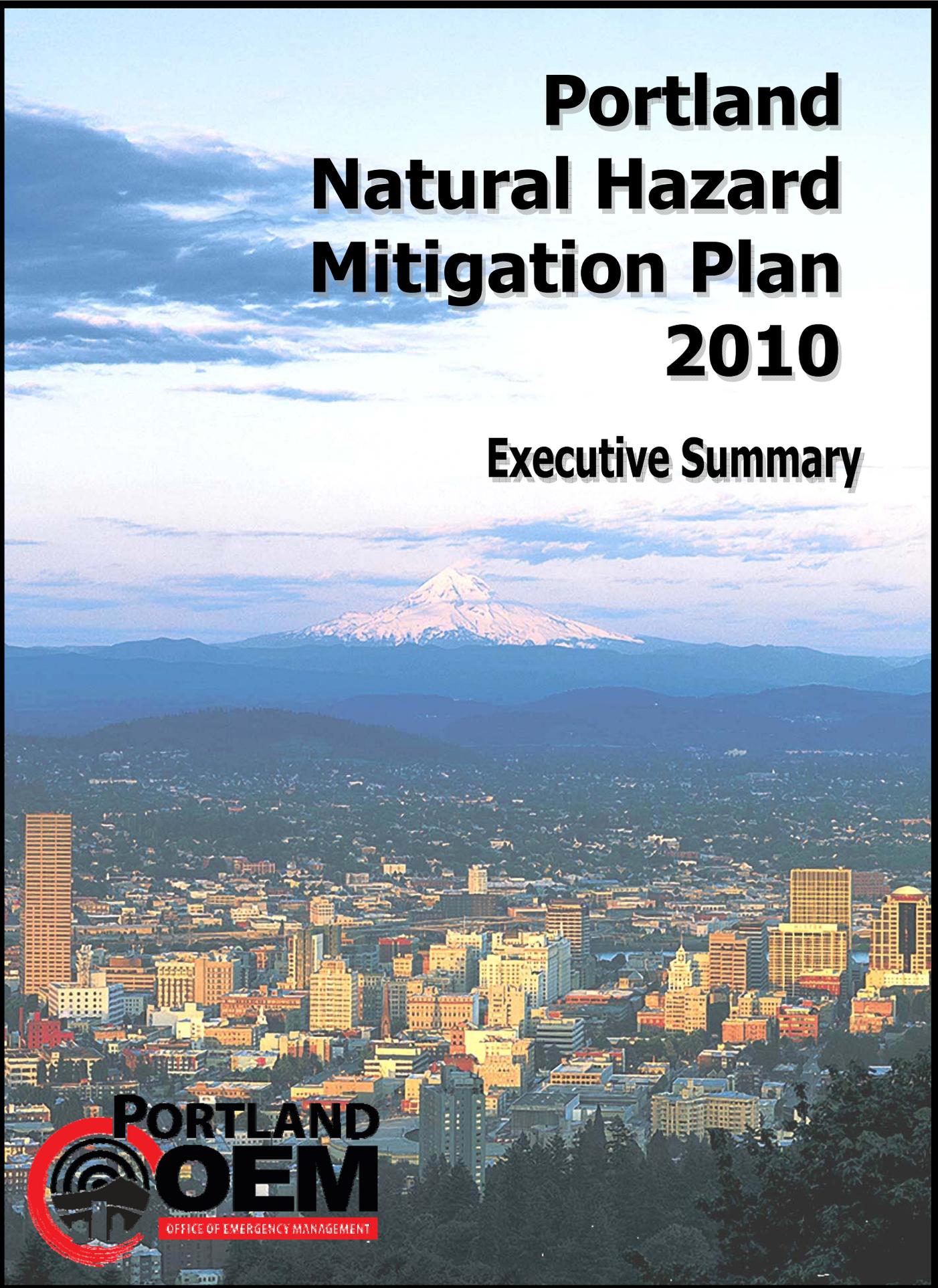


Portland Natural Hazard Mitigation Plan 2010

Executive Summary



EXECUTIVE SUMMARY

Hazard mitigation planning is a process in which hazards are identified and profiled, people and facilities at risk are assessed for threat and vulnerability then mitigation actions are developed. The result of the process is an integrated and coordinated effort to mitigate hazards. The expected outcome of all actions of the City of Portland 2010 Natural Hazard Mitigation Plan (NHMP) is to lessen the impact of damage caused by natural hazards to life, the economy, infrastructure or our ability to continue to operate as a community and city. The purpose of the 2010 NHMP is to document these actions and determine priorities and implementation efforts.

In response to Federal Emergency Management Agency (FEMA) Disaster Mitigation Act of 2000 (DMA2000) requirements, Portland submitted their first Natural Hazard Mitigation Plan in 2005. The DMA2000 required every state, county and city receiving federal mitigation funds to have a NHMP. FEMA guidelines for developing plans were established in September of 2002 and Portland's process began in early 2004.

The 2010 update to the 2005 NHMP, identifies eight natural hazards and 102 action items. The hazard analysis used in the 2005 plan was last updated in 2006 and will be updated again in 2011 by Portland Office of Emergency Management. The natural hazards that this plan will address over the next five years are (listed in order of impact and then frequency of occurrence):

- Earthquake
- Severe weather
- Flood
- Landslide
- Erosion
- Wildland urban interface fire
- Invasive plant species
- Volcanic activity

Public Involvement and Inter-Bureau Coordination

The highest priority of the 2010 NHMP list of actions is to "Continue to involve the public in updating the Natural Hazard Mitigation Plan". City mitigation projects implemented during the past five years engaged public involvement as a part of their work plans. The Johnson Creek East Lents Floodplain Restoration Project, the Portland Wildfire Fuel Reduction Project Wildfire Readiness Assessment and Gap Analysis and the Water Bureau's Conduit Trestle project all had significant public involvement in the implementation of their projects. Each public involvement process identified how actions will mitigate the impact of the hazard.

The 2010 NHMP public involvement process began by involving subject matter experts from Department of Geology and Mineral Industries (DOGAMI), National Weather Service (NWS), Portland State University (PSU) Geology Department, interns from the PSU Masters Program, and the Oregon Climate Change Institute.

A benefit of the 2010 NHMP is the identification of bureau projects and plans that already address mitigation as a part of their efforts. Plans that intersect the 2010 NHMP and through their existence strengthen the effort of lowering risk due to hazards include:

- Portland Plan
- 2009 Climate Action Plan
- Park Natural Vegetation Surveys (2004 – 2006)

- Wildfire Risk Assessment and Gap Analysis Plan (2009)
- Portland Asset Status and Conditions Report (2007 and 2008)
- Portland Urban Forestry Management Plan (2004)
- Portland Invasive Plants Strategy Report (2008)
- City of Portland Erosion and Sediment Control Manual (2008)

Identifying action items within these plans that are also mitigation strategies aligns funding opportunities and introduces new disciplines to emergency management preparedness and hazard mitigation.

Hazard Profiles

Creating a Community Mitigation Action Plan is just one of the multi-hazard action items identified in the 2010 NHMP. Other items are to identify critical transportation infrastructure and create a risk assessment tool that uses the scientific mapping of Light Detection and Ranging (LiDAR) to further verify the natural hazard areas of Portland. Partnering with utilities, the development of education materials and revising the Comprehensive Plan to implement citywide hazard mitigation policies are additional actions that, when implemented, would address many of the eight natural hazards and lessen the hazard impact on our assets.

Listed in order of impact and then frequency of occurrence, the 2010 NHMP committee determined that the number one threat to the Portland area was earthquake.

Earthquake

Key strategies focused on critical infrastructure strengthening of water, sewer and energy facilities:

- Update vulnerability analysis of Columbia Boulevard Wastewater Treatment Plant.
- Prioritize the return of power to treatment plants.
- Assess the vulnerability of the water distribution system to seismic events.

Recent research shows the Cascadia Subduction Zone is capable of producing a Magnitude (M) 9.0 earthquake. The risk of damage to structures and human life is greater today because of the increase and concentration of the population. Portland's proximity to the Pacific Coast (within 70-90 miles) makes a Cascadia generated Subduction Zone earthquake a great concern to geologists. DOGAMI experts have stated that the probability of a subduction zone earthquake occurring is greater than those potentially generated by more localized faults. There are three localized faults in the Portland area which have the potential of generating a M 6.5 earthquake.

The largest recorded earthquake epicenter within 100 miles of Portland occurred in Scotts Mills on March 25, 1993, which measured M 5.6 and caused sporadic minor damage to buildings. The ground shaking was intense enough to require the deployment of damage assessment teams to perform bridge and key infrastructure inspections.

During strong ground shaking events, unreinforced masonry (URM) facade construction (found throughout the city) poses extreme hazards, debris management issues and reconstruction concerns. The seismic stability of Portland's buildings will be an important part of the hazard analysis as 60% of Portland buildings were constructed before earthquake retrofit building codes were instituted in 1978. Not all facilities will be impacted the same. The City of Portland

has been seismically strengthening fire stations and police precincts, City Hall, the 1900 Building and utility facilities.

Recent regional transportation system analysis outlined which roadways will be cleared first to allow for emergency vehicle response. City owned overpass and bridge ramps have been assessed and prioritized for retrofit projects. Additional studies will be conducted to identify vulnerable infrastructure and potential resources to improve their resiliency.

Severe Weather

Key strategies to protect the population during severe weather:

- Acquire additional storage for anti-icing materials.
- Insulate residential buildings that house at risk populations.

Climate change influences create increased weather volatility such as hotter summers (drought), colder winters, intense thunderstorms, lightning, hail, snow storms, freezing rain/ice storms, high winds and tornadoes within and around the city. Climate change will impact more than just the weather and is referenced many times in the mitigation plan. The actions that reduce the effects of climate change are also lowering the impact of flooding, landslide and wildfire; such as promoting the increase and protection of the tree canopy and planting indigenous plants with deep root systems.

The city is subject to severe weather pattern shifts. Several historic events have affected the city, such as severe thunderstorms and periods of below freezing temperatures. In the last week of July 2009, a heat wave occurred in Portland and broke several heat records for the area. Just seven months earlier, in December of 2008, the City experienced three major snowstorms that produced historically significant snowfall amounts. This series of winter storms is described as one of the worst and most severe in the last 60 years and resulted in 18.9 inches of snow by the end of December 2008.

Climate change experts project that temperatures will increase 6 degrees by 2080. Precipitation is also projected to increase, though less substantially than temperature, at an average rate of 3.8 percent by 2080. The actual magnitude of these increases is dependent on future greenhouse gas emissions. More frequent periods of drought due to climate change are of particular concern for the Pacific Northwest. This region relies on a robust winter snowpack for water storage during the summer months. Projected changes in temperature will likely reduce the winter snowpack and cause more snow to fall as rain, subsequently affecting April to September stream flow. Flood risk is greatest in systems where more wintertime precipitation falls as rain rather than snow. Precipitation is predicted to increase in winter and decrease in summer. For the Portland area our once year round moderate climate will become more severe in its changes from season to season.

The most vulnerable citizens of Portland are those that have limitations in their accessibility to services or those dependent on others to provide for them. This could include the elderly, young, poor, homeless and those with physical limitations. Severe weather has the greatest impact on the most vulnerable citizens so mitigation actions address their needs first. Such strategies are to insulate the residential buildings that house at-risk populations and prioritize existing building stock for review against the dangerous building code (Title 29). Through

improving the programs and services for the most vulnerable so they can sustain through severe weather, less costs will be incurred in sheltering, health care and emergency response.

Flood

Key strategies to mitigate flooding:

- Ensure space below the base flood elevation is not converted to habitable space.
- Apply for Community Rating System Class 5 recertification.

The City is an active National Flood Insurance Program (NFIP) participant and has pursued the Community Rating System (CRS) classification since 2001. The city's current rating of 5 allows subscribers of flood insurance policies to receive a 25% reduction to their insurance premiums. A rating of 5 is one of the highest in the nation and validates Portland's flood management program as going beyond the minimum requirements for flood insurance standards.

Significant historic flooding has been recorded for both the Willamette and Columbia River basins in 1861, 1880, 1881, 1909, 1913, 1927, 1928, 1942, 1946, 1948, 1961, 1964/65, 1996 and 2007. On Memorial Day of 1948, the dike system along the Columbia River was breached resulting in a catastrophic flood covering the city of Vanport with 10 to 20 feet of water and displacing 18,500 residents. In 1996, Portland received 24 hours of rainfall resulting in 3.04 inches of rain melting accumulated snow and causing all creeks to surpass flood stage. This flood was ranked the third largest flood on Johnson Creek in terms of stream flow.

The city typically experiences flooding after more than three days of heavy rainfall or when saturated conditions combine with significant rainfall or storms over short periods of time. These conditions continually place the city's floodplain developments at risk. The city has experienced more than \$200 million in flood damage to both private and public property in the past three decades.

Areas vulnerable to flood in Portland are at low elevation along streams and rivers. The Columbia River and Lower Columbia Slough also pose a potential threat to the floodplain. Properties protected by the Multnomah County Drainage Districts system of dikes are valued at \$20 billion and include the Portland Expo Center, Portland International Airport, Portland International Raceway and 8,000 to 10,000 jobs in transportation and warehousing. Any new development along a river's edge needs to be assessed against the risk of flood.

Landslide

Key strategies to mitigate landslides:

- Continue to maintain and improve City communications to facilitate coordination of mitigation activities.
- Mitigate Portland's water supply infrastructure from landslide hazards.
- Develop a comprehensive landslide map for the City.

Landslides have created a number of problems in and around Portland's hills. Landslides result in private property damage, many impact transportation corridors, fuel and energy conduits and communication facilities. The impact of landslides on property and life safety will only increase as population increases and development advances into more landslide-prone urban areas.

Landslides can be triggered by earthquakes, prolonged or intense precipitation, as a result of vegetation removal, construction projects or volcanic eruptions.

Steep slopes, abundant precipitation and in some areas weak soils make Portland susceptible to landslides. Landslides occur primarily in four areas. More than half of the 700 slides that occurred during 1996 were in the Portland West Hills where weak, silt-rich soils become easily saturated and fail. A second area of concern includes the steep slopes along the Willamette River such as Oaks Bottom and Swan Island. In SE Portland, reactivation of ancient landslides is a large problem on deposits of fine-grained Troutdale Formation sediments. The fourth landslide prone area includes the steep creeks along the Columbia and Willamette Rivers where debris flows occur.

Erosion

Key strategies to mitigate erosion:

- Develop recommendations for streamside plants that provide erosion control.
- Implement projects that retain native vegetation and increase vegetation diversity.

During severe storm events riverine erosion is magnified due to increased volume and velocity of water flow. All rivers and creeks are subject to erosion. The city has two rivers and multiple streams and creeks that are potentially threatened. Erosion occurrences are typically secondary events that are directly linked to other hazard events such as flood, severe weather, landslide and wildland urban interface fires.

The 2008 Erosion and Sediment Control Manual is a key reference for actions to be taken to mitigate erosion in development and maintenance situations. This plan extends the vulnerability to not only riverine areas, but any location where land is being moved and impacting natural areas.

Erosion is a newly listed hazard in the 2010 NHMP. New data and mitigation strategies will be a part of the multi-bureau coordinated effort over the next five years. Most items in the current 2010 NHMP strategy relate to river and stream bank vegetation and careful management of steep sloped areas.

Wildland Urban Interface Fire

Key strategies to mitigate wildland urban interface fire:

- Review feasibility of adopting nationally recognized codes to strengthen building standards in wildfire risk areas.
- Complete an assessment to characterize high priority wildfire risk areas.

Portland covers 87,040 acres. Of these, 14,500 acres are categorized as natural areas and stream corridors. The city's natural areas designated as wildfire hazard areas include Powell Butte, the Willamette Bluffs, Marquam Nature Park, Terwilliger Wildlands, Kelly Butte, Rocky Butte and Mt. Tabor. The two largest areas are Forest Park and Powell Butte. These natural areas have been identified as high risk by the Oregon Department of Forestry and Portland Fire and Rescue because high-density commercial and residential development immediately surround the natural area parks and open spaces.

Forest Park had major fires in 1889, 1940 and 1951. In August of 2000 the Willamette Bluffs fire started when a two-mile section of grass and brush ignited along the railroad tracks at the base of a bluff. The fire grew quickly in the grasses and invasive Himalayan blackberry, threatening homes at the top of the bluff and engaging a five-alarm response from Portland Fire and Rescue.

Since 2006, Portland Parks and Recreation, Bureau of Environmental Services and Portland Fire and Rescue have begun work to reduce hazardous wildfire fuels by removing non-native and invasive vegetation in the most highly threatened natural areas and adjacent open space areas. In the fall of 2009 the Portland City Council approved the formation of a City/County Wildfire Technical Committee and subsequently began the development of a Community Wildfire Protection Plan which focuses on community involvement for wildfire protection.

Invasive Plant Species

Key strategies to mitigate the impact of invasive plants:

- Clarify zoning regulations to require removal of plants on the Nuisance Plan List.
- Initiate a process to ensure the Erosion Control Manual is consistent with City goals to control and eradicate invasive plants.

Invasive plants, though not a hazard event, are a current environmental condition that imposes greater vulnerability and greater loss on the natural environment because of their presence. Removing invasive plants strengthens the environment and mitigates the impact of landslide, erosion, wildland urban interface fire and flood.

Invasive plants are plants introduced into an environment in which they did not originate. They lack natural enemies, grow and reproduce quickly and are able to thrive in a wide variety of conditions. These characteristics allow plants to invade new habitats and out-compete native plants resulting in dense thickets of a single plant species. Dense thickets of invasive plants limit native plant diversity which in turn reduces food and shelter for wildlife. Invasive plants are the second leading cause of species extinction. Many invasive plants have shallow root systems that provide limited erosion control. Invasive plants also shade out native seedlings resulting in fewer trees. Less shade creates higher water temperatures, reducing oxygen for fish and other aquatic animals. Reduced tree cover decreases storm water interception and absorption of carbon dioxide (CO²) which interferes with the stabilization of the earth's temperature.

Invasive plants cover 13 to 40% of the 7,800 acres surveyed by Portland Parks and Recreation which extrapolates out to 4,181 to 12,864 acres of invasive plants within the city limits. In a national study of 12 different invasive plant species, the median cost of early detection, control and eradication was \$1 for every \$17 of future potential damage caused by the species. Mitigation actions identify the connection between invasive plant management and the impacts on climate change which is a major cause of severe weather.

Volcanic Activity

The four closest volcanoes to the city are Mt. Adams, Mt. Hood, Mt. St. Helens and Mt. Jefferson. Each of these mountains is part of an extensive chain of volcanoes formed by earthquakes from the Cascadia Subduction Zone. Mt. St. Helens is believed to be the volcano with the greatest potential to have a near-term impact on the region because of its ongoing activity since the cataclysmic event in May 1980. A large eruption of Mt. St. Helens can eject ash over an area of 40,000 square miles or more. Wind direction and velocity, along with the vigor and direction of the eruption will control the location, size and shape of the area affected by ash fall.

The most predominate threat to the city is volcanic ash fall. Events can vary from minor to heavy with minor events reducing visibility and increasing respiratory and breathing difficulty. Driving can become potentially treacherous from reduced visibility and particulate ingested engine damage.

Summary

Actions of the 2010 NHMP identify the work that needs to involve community and multiple bureaus to reduce the City's vulnerability and risk to natural hazards. The city cannot eliminate the hazards but it can work to educate and elevate awareness of what individuals, business and organizations can do to protect their lives and livelihood through proactive planning. City policies for development and asset management, including risk of natural hazards, assure the time and energy investments build a resilient city.