Mount Hood

COORDINATION PLAN

June 2013

Prepared by:

The Mount Hood Facilitating Committee

THIS PAGE LEFT BLANK INTENTIONALLY

PREFACE

Oregon Office of Emergency Management and Washington Emergency Management sincerely appreciate the cooperation and support from the agencies and local jurisdictions that have contributed to the development and ultimate publications of the Mount Hood Coordination Plan.

The plan provides vital Mount Hood volcanic event response information for the areas that should be most affected by a volcanic event. This should help planning efforts for several Oregon and Washington counties, multiple State and Federal agencies, and the Confederated Tribes of the Warm Springs Reservation. The plan is consistent with the National Incident Management System (NIMS), supports and complements local response plans, the National Response Framework, the Oregon State Emergency Management Plan, and the Washington State Comprehensive Emergency Management Plan.

The Mount Hood Coordination Plan is an important element in a coordinated effort to enhance our region's preparedness for emergencies and disasters. The plan embraces the philosophy and vision of a Disaster Resistant State and should empower local communities to minimize the impacts of volcanic activity on people, property, the environment and the economy of the Pacific Northwest. The plan should be updated to reflect necessary enhancements identified in exercises and real world events. These updates should not require renewal of signatures.

TABLE OF CONTENTS

PREFACE iv

TABLE OF CONTENTS v

PURPOSE 1

INTRODUCTION 1

ORGANIZATION AND RESPONSIBILITIES 3

Mount Hood Facilitating Committee (FAC) 3

Interagency Organizations 5

INCIDENT MANAGEMENT 9

NIMS Incident Command System 9

Unified Command 9

Agency Responsibilities 10

Concept of Operations 16

Volcanic Quiescence (when volcanoes are in repose) 16

Volcanic Activity 17

Subsiding Volcanic Activity 18

NOTIFICATION LIST FOR MOUNT HOOD EVENTS 19

USFS 19

National Weather Service 20

State EOC /ECC 20

County EOCs 20

Organizational Chart: Volcano Incident at Mount Hood 21

ORGANIZATION AND RESPONSIBILITIES ACCORDING TO ALERT LEVELS 22

Volcanic ADVISORY: 22

Volcano WATCH 24

Volcano WARNING 26

APPENDIX A: What Are The Volcano Hazards? 28

Definitions 28

Lava Flows and Domes 28

APPENDIX B: Volcanic Hazards at Mount Hood 29

APPENDIX C: Mount Hood—History and Hazards of Oregon's Most Recently Active Volcano 34

APPENDIX D: MONITORING VOLCANIC UNREST 37

APPENDIX E: EVENT NOTIFICATION 38

Notification of Ground-Based Hazards 39

Information Statements....39

Staged Alert Levels....40

APPENDIX F: Field Volcano Observatory Requirements....41

APPENDIX G: Glossary Of Acronyms and Abbreviations....44

APPENDIX H: Joint Information Center Purpose and Structure....46

APPENDIX I: Characteristic Challenges of Volcanic Crises....48

APPENDIX J: Authorities....51

APPENDIX K: References and Websites....53

Mount Hood....53

On Volcanic Crises and Volcanic Hazards....53

Web Sites:....55

THIS PAGE LEFT BLANK INTENTIONALLY

PURPOSE

The purpose of this plan is to coordinate the actions that various agencies must take to minimize the loss of life and damage to property before, during, and after hazardous geologic events at the Mount Hood volcano. The plan strives to ensure timely and accurate dissemination of warning products and public information. The framework provided by this plan should enable a coordinated response by the affected agencies and communities. This plan also includes the necessary legal authorities as well as statements of responsibility of County, State, Federal, and Tribal agencies.

INTRODUCTION

Volcanoes dominate the skyline in many parts of the Pacific Northwest, although their fiery past is often unrecognized. These familiar snow-clad peaks are part of a 1,000-mile-long chain of volcanoes, the Cascade Range, which extends from northern California to southern British Columbia. Seven of those volcanoes have erupted since the birth of this nation. These include Mount Baker, Glacier Peak, Mount Rainier, Mount St. Helens, Mount Hood, Mount Shasta, and Lassen Peak. These and many others could erupt again. Many people do not consider the Cascade volcanoes to be hazardous because the time between eruptions is often measured in centuries or millennia, and volcanic activity is not part of our everyday experience. However, the vast destructive power unleashed by the 1980 eruption of Mount St. Helens reminds us of what can happen when they do erupt. As populations increase in the Pacific Northwest, areas near the Cascade volcanoes are being developed and recreational use is expanding. Consequently, more and more people and property are at risk from future volcanic activity.

Mount Hood volcano is close to small but rapidly growing communities and recreation areas, and is within 70 miles of metropolitan Portland, Oregon. It has erupted intermittently for hundreds of thousands of years—its most recent major eruption occurred about 200 years ago, shortly before Lewis and Clark explored the area in 1805-1806. Because there are no written chronicles of past major eruptions, most of our information about Mount Hood's past comes from geologic study of deposits produced during those eruptions. We also use observations of recent eruptions at other similar volcanoes around the world to help us understand how future eruptions of Mount Hood may develop and to help delineate areas that are likely to be at risk during future eruptions.

Earthquake swarms beneath Mount Hood occur yearly and hot steam vents near the summit remind us that this volcano still hosts active geologic processes that present potential hazards to the region. For this reason, the Mount Hood Coordination Plan was drawn up by emergency managers from Clackamas, Multnomah, Wasco, Hood River and Clark counties, the City of Portland, the Confederated Tribes of Warm Springs, the States of Oregon and Washington, Federal Emergency Management Agency (FEMA), the U.S. Forest Service (USFS), the U.S. Geological Survey (USGS), and the National Weather Service (NWS).

ORGANIZATION AND RESPONSIBILITIES

Mount Hood Facilitating Committee (FAC)

The FAC has been established to maintain preparedness during times of volcanic quiescence and to review plan implementation after an incident has ended. It is composed of members from each jurisdiction with statutory responsibility for emergency response (Table 1). Additional agencies (Associate Members in Table 1) may also attend meetings of the FAC. The FAC may be called together by any member who identifies a need for coordinated discussions. The FAC is responsible for maintaining the plan, including exercises, as needed. Oregon Office of Emergency Management is responsible for assembling the FAC for an annual review of this plan, incorporating updates into the plan document, and disseminating the updated plan. Although agencies represented on the FAC should be involved in management of volcanic incidents on Mount Hood, the FAC itself does not have a response role. Onset of volcanic activity should trigger FAC notification and a conference call among members. If the FAC determines that a command or coordination organization needs to be established, that recommendation should be made to the USFS Supervisor and Oregon OEM. The determination to activate such an organization for a volcanic incident at Mount Hood should terminate FAC activities per se until after-action activities at the close of the response phase.

Table 1. FAC Membership

Members shall include	Associate Members may include
• Oregon Emergency Management • Oregon Department of Geology and Mineral Industries • Washington Emergency Management Division • Clackamas County Emergency Management • City of Portland • Multnomah County Division of Emergency Management • Hood River County Department of Emergency Management • Wasco County Emergency Management • Skamania County Emergency Management • Klickitat County Emergency Management • Confederated Tribes of Warm Springs • Clark Regional Emergency Services Agency • U.S. Geological Survey • U.S. Forest Service • FEMA Region X • National Weather Service	• Oregon Department of Transportation • Portland Water Bureau • US Army Corps of Engineers • Port of Portland • Oregon Department of Environmental Quality • Oregon Department of Public Health • Pacific Northwest Seismograph Network (PNSN) • Hoodland Fire Department • Businesses in the Mt. Hood impact zone • Portland Water Bureau

Interagency Organizations

The overriding principle in a volcanic emergency is that preservation of human life takes precedence over protection of property. Federal, State and/or local jurisdictional authorities may protect life and property by, among other actions, closing high-risk areas to public access, or evacuating local residents from hazard zones.

During a response, each agency and organization should provide resources and administrative support, and should conduct operations within a NIMS Incident Command System (ICS) structure. Interagency operations should be conducted under a Unified Command structure. County emergency management agencies, Oregon Office of Emergency Management (OEM), and the U.S. Department of Homeland Security's (DHS) Federal Emergency Management Agency (FEMA) have primary responsibilities for coordinating local, regional, State and Federal responses, respectively. In Washington State, the Emergency Management Division (EMD) coordinates the response for that state in a similar manner. The responsibilities of local, State and Federal agencies are summarized in Table 2. The authorities under which these agencies operate are described in Appendix J.

Table 2. Responsibilities and contact information for members of the Mount Hood FAC

Jurisdiction and Responsibilities	Contact Information	Main Phone Line
LOCAL GOVERNMENT Local jurisdictions are responsible for the overall direction and control of emergency activities undertaken within their jurisdictions. Each County may activate its emergency operations center.	Hood River County	
	Clackamas County	
	Multnomah County	
	Wasco County	
	Confederated Tribes of Warm Springs	
	City of Portland	
	Clark Regional Emergency Services Agency	
	Skamania County	
	Klickitat County	

STATE GOVERNMENT The Governor, the Governor's cabinet(composed of Directors of State agencies or their representatives), and staff from the State Emergency Management Agency, are responsible for the conduct of emergency functions and should exercise overall direction and control of State government operations.	Oregon Emergency Management	
	Emergency Coordination Center (ECC) Salem	
	Washington Emergency Management Division	
	Emergency Operations Center (EOC) Camp Murray	
	Oregon Department of Geology and Mineral Industries (DOGAMI) Portland, OR	

FEDERAL GOVERNMENT		
The Federal Emergency Management Agency (FEMA; part of DHS) is responsible for Federal agency coordination and operations of the Regional Response Coordination Center (RCCC).	FEMA Region 10 Bothell, WA	
The U.S. Geological Survey (USGS) is responsible for monitoring volcanic activity and assigning alert status levels. The USGS may locate with the USFS in Sandy or with an appropriate county.	U.S. Geological Survey Cascades Volcano Observatory Vancouver, WA	
The U.S. Forest Service (USFS), Mount Hood National Forest, is responsible for management of lands within the Mount Hood National Forest.	U.S. Forest Service Mount Hood National Forest Sandy, OR	
The National Weather Service (NWS) is responsible for operational forecasting and monitoring of the atmosphere, including the presence of volcanic ash clouds injected into the atmosphere by eruptions.	National Weather Service – Portland 5241 NE 122nd Ave, Portland, OR	

INCIDENT MANAGEMENT

NIMS Incident Command System

A volcano-related incident demands coordinated response. The Incident Command System (ICS) shall be used to establish incident goals, priorities, and strategies; to coordinate incident resource management, and to provide incident support for eruptions, lahars, or other significant volcanic events. The Incident Commander (IC) should provide initial strategic guidance and decisions on emergency needs until a Unified Command organization can be established (see next section). The Incident Commander has ultimate responsibility for management of assigned resources to effectively accomplish stated objectives and strategies pertaining to a volcanic event at Mount Hood. The IC initially should report directly to the Forest Supervisor. The IC should have key positions filled as soon as possible to meet known and projected incident needs.

Unified Command

Unified Command is a multi-agency expansion of the Command function of ICS, allowing principal agencies with geographic, functional, and/or statutory responsibility to establish common incident strategy, objectives, and priorities. This process does not remove agency authority, responsibility, or accountability. As any volcanic event requiring activation of an ICS organization would involve multiple agencies, jurisdictions, and potential incident management complexities, a Unified Command organization should be established as soon as possible.

For a volcanic incident at Mount Hood, Unified Command would likely comprise the USGS, USFS, FEMA, affected local jurisdictions (i.e., one or more among Clackamas, Hood River, Multnomah, Wasco, Clark and Skamania Counties, possibly cities as well),

and the Confederated Tribes of Warm Springs. The Incident Command Post (ICP) is planned to be based out of the USFS Sandy facility due to the likelihood of volcanic activity occurring on the west/south sides of the peak. If the volcanic activity is on other flanks of the peak, alternate locations may need to be identified.

Agency Responsibilities

Local Divisions or Departments of Emergency Management

Information about the status of a volcano is normally transmitted from the USGS through OEM to county Emergency Management agencies (DEM's). As needed, the county DEM's:

- Relay the information to local jurisdictions and agencies.
- Implement Emergency Operations Plans, maintain and activate Emergency Operations Centers (EOC).
- Provide local public warnings and information.
- Activate the Emergency Alert System (EAS).
- Assist Incident Commander(s).
- Participate in establishing a unified command structure.
- Provide Public Information Officer(s) (PIOs) for a Joint Information Center (JIC.)
- Assist the USGS in establishing a temporary Volcano Observatory.
- Initiate and coordinate local declarations of emergency or requests for assistance from mutual aid partners, State and/or Federal resources.
- Implement response and recovery plans in their jurisdiction.
- Provide information and training on volcano-hazard response to emergency workers and the public.
- Assess volcanic risks as part of a comprehensive Hazard Identification and Vulnerability Analysis.
- Traffic/access control.

State Emergency Management: OEM and EMD

Oregon Office of Emergency Management (OEM), through its 24-hour Oregon Emergency Response System (OERS), is responsible for providing alert and warning to local jurisdictions within the State. Additionally, OEM/OERS should notify specific State and Federal agencies that have a response role during a volcanic event. OEM works with other entities in order to coordinate resources to support local and State agency response. The Washington Emergency Management Division (EMD) has similar responsibilities and resources for Washington State.

OEM's and EMD's responsibilities in support of this plan include:

- Coordinating the acquisition and distribution of resources to support response.
- Developing plans and procedures.
- Acting as the central point of contact for local government requests for specific State and Federal disaster related assets and services.
- Activating and staffing the State Emergency Coordination Center (ECC) /Emergency Operations Center (EOC).
- Supporting EAS activations by local jurisdictions as necessary by serving as a backup activation point.
- Supporting public information efforts, whether through an initial lead agency or a Joint Information Center (JIC).
- Coordinating with the Federal government on supplemental disaster assistance necessary to preserve life and property, and on recovery assistance.
- Activating, if necessary, the Emergency Management Assistance Compact (EMAC) for interstate assistance.
- Deploying County Liaison Officers to affected jurisdictions.
- Calling the yearly meeting of the FAC to review and update this plan.

United States Geological Survey

The Disaster Relief Act of 1974 (PL 93-288) assigns to the U. S. Geological Survey (USGS) the responsibility of providing timely warnings of volcanic eruptions and related activity. This responsibility is achieved by monitoring active and potentially active volcanoes, assessing their hazards, responding to crises, and conducting research on how volcanoes work. More specifically, these activities include:

- Issuing timely warnings of potential geologic hazards to responsible emergency management authorities and to the public via alert level notification, the media and the CVO web site.
- Supporting public information efforts, whether through an initial lead agency or a Joint Information Center (JIC).
- Monitoring volcanic unrest, tracking its development, forecasting eruptions, and evaluating the likely hazards.
- Establishing a temporary volcano observatory, if needed, in order to provide ready access to the volcano for the USGS hazard-assessment team, as well as technical assistance to the emergency managers. (See Appendix D for temporary volcano observatory requirements.)
- Coordinating ash fall and lahar warning messages with NWS.

United States Forest Service

The U.S. Forest Service (USFS) manages public lands on and around Mount Hood. Authorities include land management responsibilities related to use, management and protection of these lands. Roles and responsibilities during a disaster or emergency include protection of life, property and natural forest resources on USFS-managed lands. Control of access and use of national forest lands is regulated by the USFS in coordination with adjoining landowners and agencies.

USFS responsibilities include:

- Establishing, maintaining, and providing PIO support for a Joint Information Center (JIC).

- Restricting access to hazard areas within the Mount Hood National Forest.
- Coordinating with Oregon Department of Transportation (ODOT) on road closures.
- Establishing and maintaining an Incident Command Post for involved agencies (likely to be at the USFS Sandy Headquarters).
- Other activities necessary based on volcanic conditions.
- Request TFR (Temporary Flight Restriction) from FAA as needed.

Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) roles and responsibilities during a disaster are governed by the Robert T. Stafford Disaster Assistance and Emergency Relief Act, as amended, 42 USC 5121, et seq. The primary disaster relief responsibility of FEMA is to coordinate and deliver assistance and support to State and local governments when requested, typically through the Governor as a Request for a Presidential Disaster Declaration. A volcanic eruption would be handled in much the same way as any other natural disaster.

FEMA's responsibilities include:

- Monitoring situations with the potential for widespread impacts.
- Coordinating Federal level emergency planning, management, mitigation and assistance functions of Federal agencies in support of State and local efforts.
- Providing and maintaining the Federal and State National Warning System (NAWAS).
- Providing and maintaining the Integrated Public Alert and Warning System (IPAWS).
- Providing liaison staff to the Unified Command organization and the State ECC.
- Following a Presidential Disaster Declaration:
- Establishing a Joint Field Office (JFO).
- Coordinating State and Tribal requests for Federal assistance.
- Coordinating Federal Assistance operations and programs.

National Weather Service

NOAA's National Weather Service (NWS) is responsible for operational forecasting and monitoring of the atmosphere, including the presence of volcanic ash clouds injected into the atmosphere by eruptions. The NWS maintains the observational, analytical, and forecasting capabilities required to estimate the location and movement of volcanic ash throughout its areas of responsibility. National Weather Service responsibilities include:

Weather Forecast Office (WFO) in Portland is responsible for:

- Issuing volcanic ashfall statements, forecasts, advisories and warnings to the public, aviation and marine communities in cooperation with the USGS.
- Issuing public warnings of lahars via the flash flood program in cooperation with the USGS.
- Dissemination of warnings and advisories over various communication systems.
- In coordination with USGS Cascade Volcano Center (CVO), preparing and disseminating volcanic plume forecasts.
- Issuing aviation SIGMETs (Significant Meteorological Information) for meteorological information concerning safety for aircraft operating in the Continental U.S. (issued through the Aviation Weather Center in Kansas City, MO).
- Issuing Volcanic Ash Advisories that provide current locations and forecast movement/locations of ash clouds (issued through NOAA's Volcanic Ash Advisory Center (VAAC) in Washington D.C.).

See Appendix K: REFERENCES and WEBSITES for a reference to the Pacific Northwest Interagency Operating Plan for Volcanic Events which pertains to how the aviation sector responds to airborne ash hazards to aircraft.

Tribal Relations

During and after emergencies, OEM encourages counties to coordinate with the Tribes within their areas to ensure that responses are coordinated and that any potential damage assessment information is captured. The Tribes often rely on pre-established relationships with local governments for assistance in emergency situations.

For information on the roles and responsibilities of Federal agencies in support of tribal relations, see the **Tribal Relations Support Annex** of the **National Response Framework**.

Concept of Operations

This plan is based on the premise that each agency with responsibility for preparedness, response or recovery activities has, or should develop, an operations plan or Standard Operating Guidelines that covers its organization and emergency operations. Since Mount Hood is located within the Mount Hood National Forest, under the management of the USFS, the Forest Supervisor for the Mount Hood National Forest is the official responsible for managing the lands surrounding Mount Hood, including during times of emergency. The USFS practices coordinated management of incidents with surrounding landowners and expects to do so in a volcanic event as well, consistent with the Unified Command discussion above. This plan establishes a mechanism for coordination of each agency's efforts.

The Concept of Operations can be defined with respect to the three phases of volcanic activity: 1). Volcanic Quiescence, 2). Volcanic Activity, 3). Subsiding Volcanic Activity.

Volcanic Quiescence (when volcanoes are in repose)

Members of the FAC should:

- Develop local and agency hazard mitigation plans that include the volcano hazard.
- Prepare emergency plans and programs to ensure continuous readiness and response capabilities.
- Meet yearly to: coordinate, revise, and exercise this plan.
- Develop and evaluate alert and warning capabilities for the volcanic hazard risk areas.
- Continue research on the volcano and associated hazards.
- Review public education and awareness requirements and implement an outreach program on volcano hazards.
- Educate public officials and local response agencies.

Volcanic Activity

Members of the FAC should:

- Confer whenever any member deems it necessary.
- Share information on the current activity of Mount Hood and coordinate data relating to hazard assessment, evaluation and analysis.
- Coordinate any needed public information and/or establish a JIC for this purpose.
- Assess the need for an ICS organization and activate one as necessary.

Upon activation, members of the Unified Command team should:

- Facilitate accurate and timely collection and exchange of regional incident information.
- Coordinate regional objectives, priorities and resources.
- Analyze and anticipate future agency/regional resource needs.
- Coordinate regional information through a JIC.
- Communicate decisions to jurisdictions/agencies.
- Review need for other agency involvement in the command team.
- Provide necessary liaison with out-of-region facilities and agencies as appropriate.
- Designate regional mobilization centers as needed.
- Coordinate damage assessment and evaluation.
- Evaluate disaster magnitude and local disaster assistance and recovery needs.
- Obtain detailed data on casualties, property damage and resource status.

Subsiding Volcanic Activity

When hazardous geologic activity has subsided to a point where reconstruction and restoration activities may be initiated, even if the mountain is still in an eruptive state and response activities continue, recovery efforts may be initiated and carried out. In addition to the functions previously noted, the Unified Command team shall:

- Assist Incident Commander(s) in demobilization.
- Continue to coordinate the collection and dissemination of disaster information including informing the public about hazardous conditions, health, sanitation, and welfare problems, recovery services and the need for volunteers.
- Determine when to terminate Unified Command operations.
-

The FAC should:

- Conduct an After Action Review of the event and make changes to this plan as necessary.

NOTIFICATION LIST FOR MOUNT HOOD EVENTS

The USGS has the responsibility to issue timely and effective warnings of potential volcanic activity. The USGS' Cascades Volcano Observatory (CVO) has that responsibility for the Mount Hood volcano as well as other volcanoes in Washington, Oregon, and Idaho. Although CVO has the sole responsibility to issue volcano alert levels, it will do so to the best of their ability in coordination with the USFS' Mount Hood National Forest and with Oregon Emergency Management. Prior to changing an alert level, CVO will notify both the USFS and OEM by phone for a brief consultation regarding wording of the alert level change. Because time can be important in issuing an alert level change, this call is for brief consultation only. The USGS will reserve the right to make any final changes to wording prior to sending the alert level change. Once the wording is finalized, CVO will commence with its call down procedure and send the alert level change out via FAX, e-mail, RSS feed, the web, and other social media outlets.

- USFS – Mount Hood Supervisor's Office
- University of Washington's Pacific Northwest Seismic Network
- Oregon Emergency Management
- Federal Aviation Administration (FAA) ARTCC center in Seattle
- National Weather Service Forecast Office – Portland
- Washington Volcano Ash Advisory Center
- FAA HQ Com Center
- Air Force Weather Agency

USFS

- Internal Notifications (Special Agent, Unit Managers)
- Northwest Interagency Coordination Center (NWCC)
- Confederated Tribes of Warm Springs

- U.S. Coast Guard
- U.S. Army Corps of Engineers (Portland District)
- Bonneville Power Administration (BPA)
- Others as appropriate

National Weather Service

- NWS Aviation Weather Center
- NWS Center Weather Service Unit – Auburn, WA
- Portland International Airport Control Tower
- FAA Flight Service Station – Prescott, AZ
- NOAA's Volcanic Ash Advisory Center – Washington, DC
- Air Force Weather Agency – Omaha, NE
- Neighboring NWS Offices

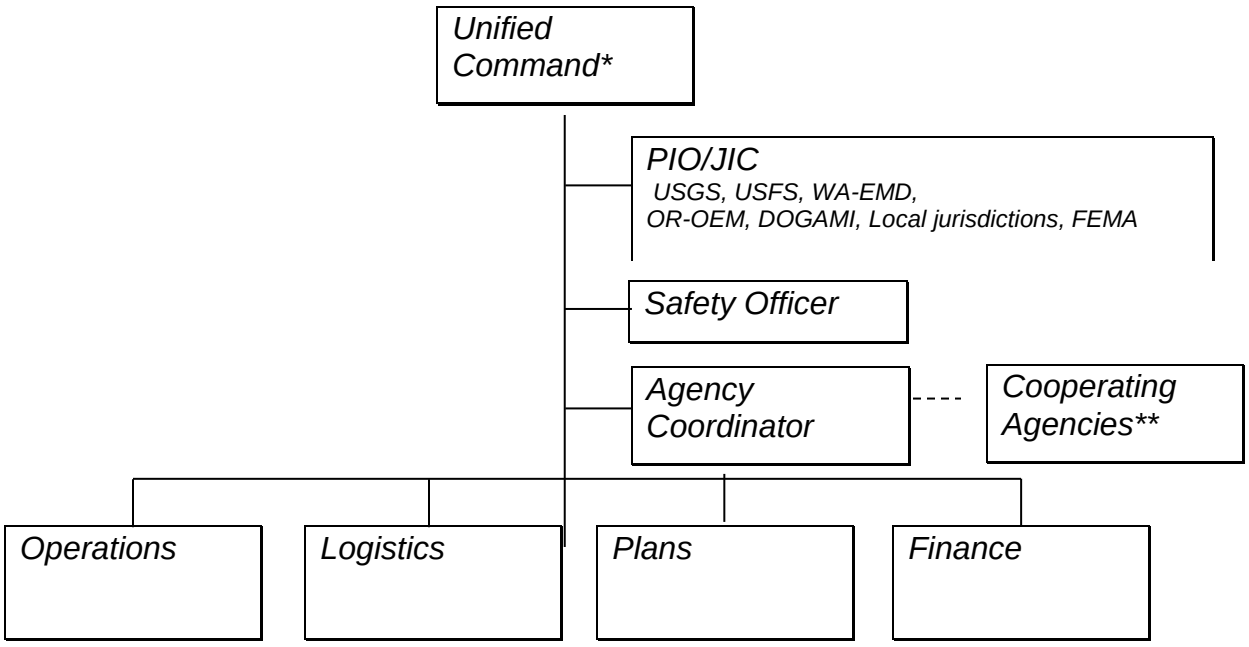
State EOC /ECC

- State agencies
- Counties
- FEMA Region 10
- Neighboring states
- Others as appropriate

County EOCs

- Internal agencies as appropriate
- Cities, school and special service districts
- Others as appropriate

Organizational Chart: Volcano Incident at Mount Hood



* Unified Command: USGS, USFS, FEMA, impacted local jurisdiction (e.g., Clackamas/Hood River/Multnomah/Wasco/Clark/Skamania Counties), Confederated Tribes of Warm Springs.

**Cooperating Agencies: FAA (Seattle, Portland), NWS (Portland), U.S. Army Corps of Engineers, U.S. Coast Guard (Portland), Northwest Coordination Center (NWCC), ODOT/WSDOT, DOGAMI, OSP/WSP, OR-OEM, WA-EMD and local jurisdictions. Other entities could be included depending on the circumstances of the incident.

ORGANIZATION AND RESPONSIBILITIES ACCORDING TO ALERT LEVELS

Following are the detailed responsibilities and tasks of jurisdictions and agencies at the various volcano alert levels.

Volcanic ADVISORY:

FAC

- Discuss and evaluate developing events and information.
- Review this plan.
- Disseminate public information through the JIC.
- Consider recommending the USFS implement an Incident Command System organization.

Local jurisdictions and agencies:

- Convene the FAC.
- Review plans and procedures for response to the volcanic hazard threat.
- Designate staff that should be responsible for filling positions in the local ICS and/or Unified Command Structure as requested, including a JIC.
- Provide orientation sessions on current plans and organizational structure.
- Update call-up procedures and listings for response staff.
- Conduct briefings as needed.

Oregon OEM and Washington EMD

- Convene the FAC.
- Review internal plans and procedures.
- Implement notifications.

- Provide technical assistance to local jurisdictions.
- Coordinate with Emergency Support Function agencies that may be called upon to provide assistance.
- Coordinate mutual aid agreements with neighboring states.
- Evaluate the need for assistance from additional agencies.
- Evaluate resource requirements.
- Issue advisories and state-level policies in consultation with the FAC.
- Conduct hazard specific training.
- Conduct briefings as necessary.
- Provide staff to the JIC.

USGS

- Convene the FAC.
- Monitor the status of the volcano and determine the need for additional instrumentation and/or other resources.
- Issue alert-level notifications and updates.
- Consider establishing a temporary field observatory.
- Conduct briefings as necessary.
- Assign liaison(s) to the JIC as needed.
- Assign liaison(s) to the Incident or Unified Command if needed.
- Coordinate with NWS on volcanic ash (steam and ash explosions) and lahar (volcanic mudflows) warning messages.

USFS

- Convene the FAC.
- Convene the JIC, if necessary.
- Evaluate need for access control and implement as needed.
- Consider requesting a Temporary Flight Restriction (TFR) over the volcano.
- Authorize placement of additional instrumentation as needed.

NWS

- Convene the FAC.

- Coordinate with USGS CVO on types of products to provide such as volcanic ash forecasts (steam and ash explosions), winds aloft forecasts, and lahar (volcanic mudflows) messages.

Volcano WATCH

(During a period of increased volcanic unrest or eruption that poses limited ground-based hazards):

Local jurisdictions and agencies:

- Establish local Incident Command and consider the possible need for Unified Command with other jurisdictions.
- Conduct surveys on resource availability and reaffirm prior commitments.
- Test communications systems and assess communications needs.
- Begin procurement of needed resources.
- Assign PIO's to the JIC as needed.
- Provide briefings and direction to all response personnel.
- Request all assigned personnel to stand by for orders to activate the jurisdiction's emergency plan.
- Coordinate support requirements for USGS Field Observatory if USFS offices unavailable.
- Take readiness and precautionary actions to compress response time and to safeguard lives, equipment and supplies.

Oregon OEM and Washington EMD

- Convene the FAC.
- Implement plans for State level communications support for the affected area.
- Coordinate joint public education programs.
- Increase, as needed, the staffing at the ECC.
- Support local governments with PIO information.
- Ensure State agencies are alerted to potential problems and review their operational responsibilities.
- Assign liaison(s) to local Incident Command and/or Unified Command organization upon request.

USGS

- Establish field observatory if not already established.
- Monitor the status of the volcano and determine the need for additional instrumentation and/or other resources.
- Issue alert-level notifications and updates.
- Conduct briefings as necessary.
- Assign liaison(s) to the JIC as needed.
- Assign liaison(s) to the Incident or Unified Command if needed.
- Coordinate with NWS on volcanic ash (steam and ash explosions) and lahar (volcanic mudflows) warning messages.

USFS

- Provide space for the Unified Command structure.
- Identify staff to support Unified Command structure.
- Consider requesting a Temporary Flight Restriction (TFR) over the volcano.
- Evaluate need for access control and implement as needed.

FAC

- Consider recommending USFS implement a JIC organization if not already established.
- Consider requesting the participation of the Mobilization Incident Commander (MIC) of the Incident Management Team (IMT).

NWS

- Coordinate with USGS CVO on the type and frequency of guidance products to provide on a routine basis such as ashfall forecasts, winds aloft forecasts, and lahar information.
- Begin Volcanic Decision Support Activities to provide information to various customers.

Volcano WARNING

(Following a notice that an eruption is imminent or occurring):

Local jurisdictions and agencies:

- Fully mobilize all assigned personnel and activate all or part of the Mount Hood Coordination Plan.
- Activate Comprehensive Emergency Management Plans.
- Continually broadcast emergency public information.
- Direct and control emergency response activities in each jurisdiction in accordance with ICS procedures.
- Ensure Incident Command Post (ICP) is adequately staffed and equipped.
- Consider requesting state mobilization and possible activation of an IMT.
- Provide staff to the JIC.

Oregon OEM and Washington EMD

- Convene the FAC.
- Activate the State of Oregon Office of Emergency Management Plan (Volume II Emergency Operations Plan) and Washington State Comprehensive Emergency Management Plan.
- Coordinate interstate mutual aid.
- Coordinate Federal response.
- Provide staff to the JIC.

USGS

- Monitor status of volcanic activity in the hazard area.
- Issue alert-level notifications and updates.
- Provide Liaison to the Unified Command Structure to provide on-going information and advice.
- Coordinate with NWS on volcanic ash (steam and ash explosions) and lahar (volcanic mudflows) warning messages.
- Assign liaison(s) to the JIC as needed.

USFS

- Implement plans to participate directly in the following coordinated response operations within the affected areas:
    - Fire
    - Evacuation
    - Security
    - Access Control
    - Search and Rescue
    - Alert and Notification
- Provide personnel for Unified Command Structure.
- Support operations, logistics and planning functions with personnel and resources.
- If necessary, request FAA restrict airspace.
- Evaluate need for access control and implement as needed.

FEMA

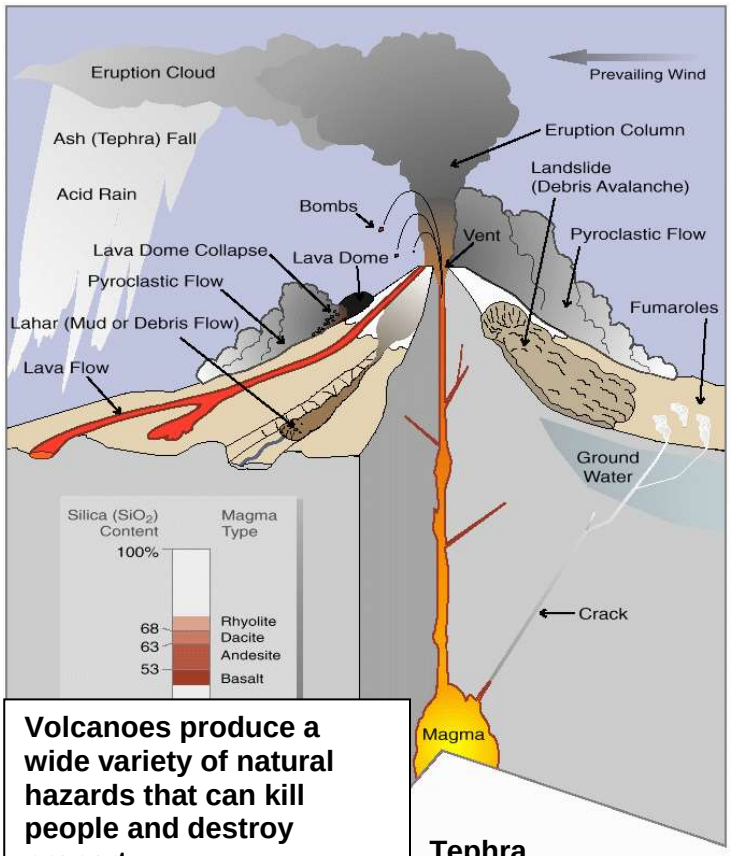
- Activate the National Response Plan.
- Administer disaster relief programs following declaration of Emergency or Major Disaster by the President.
- Coordinate Federal response efforts.

NWS

- Issue Volcanic Ash advisories or warnings in coordination with USGS CVO.
- Issue public warning for lahar via Flash Flood Warning, if needed, in coordination with the USGS CVO.
- Other Volcanic Decision Support Activities to provide information to various customers.
- Issue other statements as needed for volcanic activity that poses a threat to the public, marine or aviation communities, in coordination with the USGS CVO.

APPENDIX A: What Are The Volcano Hazards?

Selection from U.S. Geological Survey Fact Sheet 002-97 http://pubs.usgs.gov/fs/fs002-97



Volcanoes produce a wide variety of natural hazards that can kill people and destroy property.

This simplified sketch shows a volcano typical of those found in the Western United States and Alaska, but many of these hazards also pose risks at other volcanoes, such as those in Hawai`i.

Some hazards, such as lahars and landslides, can occur even when a volcano is not erupting.

Definitions

Lava Flows and Domes

Lava is molten rock that flows onto the earth's surface.

Lava flows move downslope away from a vent and bury or burn everything in their paths.

Lava domes form when lava piles up over a vent.

Pyroclastic Flows

Pyroclastic flows are high-speed avalanches of hot rock, gas,, and ash that are formed by the collapse of lava domes or eruption columns. They can move up to 100 miles per hour and have temperatures up to 1500°F. They are lethal, burning, burying, or asphyxiating all in their paths.

Tephra

Explosive eruptions blast lava fragments (**tephra**) and gas into the air. Tephra can also be carried aloft in billowing ash clouds above pyroclastic flows. Large fragments fall to the ground close to the volcano, but smaller fragments (**ash**) can travel hundreds to thousands of miles downwind.

Debris Avalanches and Lahars

Debris avalanches are rapid landslides of rock, soil and overlying vegetation, snow or ice. **Lahars** are fast-moving slurries of rock, mud, and water that move down river valley. Lahars form when pyroclastic flows melt snow or ice, or by the mobilization of loose debris on the flanks of volcanoes. Both lahars and debris avalanches can bury, move, or smash objects in their path.

APPENDIX B: Volcanic Hazards at Mount Hood

The eroded snow- and ice-covered cone of Mount Hood is composed primarily of andesitic lava flows and fragmental rock debris. The present cone started growing about half a million years ago, although its size and shape have changed through time as eruptions and erosion have alternately added and subtracted material. Since glacial times (about 15,000 years ago) there have been three major periods of eruptive activity at Mount Hood.

- Polallie eruptive period – approximately 12,000 to 15,000 years ago
- Timberline eruptive period – approximately 1,500 years ago (possibly several centuries in length)
- Old Maid eruptive period – approximately 200 years ago (several decades in length)

In addition to activity on the volcano, a basaltic andesite eruption produced a rubbly lava flow called the Parkdale lava flow about 7,500 years ago north of Mount Hood in the Hood River valley.

Eruptions during Timberline and Old Maid times originated at a vent beneath the current position of Crater Rock. Crater Rock is, in fact, the remnant of a **lava dome** (see Appendix A for definitions of terms in bold) that grew and collapsed during the Old Maid eruptive period.

The past three eruptive periods were in many ways very similar. Lava erupted relatively slowly and non-explosively to form lava domes. These lava domes collapsed repeatedly to form fast-moving, extremely hot **pyroclastic flows** and **ash clouds**. The ash clouds were carried downwind and formed ash-fall deposits that in places on the east flank of the volcano accumulated to over three feet thick. The hot pyroclastic flows

eroded and melted large quantities of snow and ice to form **lahars** that flowed down river valleys, in some cases all the way to the Columbia River. Erosion of the fresh pyroclastic-flow deposits following the eruptions resulted in enormous quantities of sand and gravel being washed downriver. In the Sandy River during the Timberline and Old Maid times, this resulted in lateral channel shifting and burial of the valley floor in sediment up to 75 feet thick at least two separate times.

The Polallie eruptive period lasted for a few thousand years and consisted of several domes that grew and collapsed on all flanks of the volcano. This dome growth and collapse generated lahars that affected all the major river channels around Mount Hood. In addition, the Mississippi Head lava flow on the southwest flank was extruded at this time. In contrast, the Timberline and Old Maid eruptive periods lasted a much shorter period of time and consisted solely of lava dome growth and collapse from a single vent location.

At the beginning of the Timberline eruptive period, a large flank failure (**debris avalanche**) from the area above present day Crater Rock on the volcano's southwest side catastrophically affected the entire Sandy River valley to the Columbia River. An even larger flank failure on the north side of the volcano on the order of 100,000 years ago affected the entire length of the Hood River valley to the Columbia River.

Because of the volcano's present-day geometry and because the vent for the last two eruptive periods has been on the south side of the volcano, we feel that the areas and river valleys (Sandy, Salmon and White) on the south side of the volcano are at greater risk from eruptive activity than areas and river valleys on the north side. This assessment could change, however, if monitoring data were to indicate a shift in vent location to another flank or on the summit of the volcano. Based on the history of the volcano, hazardous processes and the areas that they could affect are the following:

- **Pyroclastic flows** from dome collapse could extend 5-6 miles down the south flank of the cone. These could reach the base of the volcano in about 10

minutes and would burn (temperatures to 1100°F) and bury objects in their path and potentially cause forest fires.

- **Lahars**, in places up to 100 feet deep, could flow down the Sandy River to the Columbia and down the White River to (and part way down) the Deschutes River. How fast the lahars should flow depends on many parameters, but in the Sandy River it likely would take at least 3 hours to reach the Columbia River. Lahars bury or smash objects in their paths and could damage or affect:

    - Communities along the rivers
    - Transportation corridors along Interstate 84, and Highways 26 and 35
    - Conduit from Bull Run watershed that crosses Sandy River and delivers about one-quarter of the total water output
    - Hydropower facilities on the Columbia River
    - Shorefront property on the Washington side of Columbia River (from increased erosion by the Columbia River as additional sedimentation at the mouth of the Sandy River forces the Columbia River current northward)
    - River traffic on the Columbia River by filling the channel with sediment
    - Fisheries on the Columbia River

- **Ash clouds** would drift downwind (most likely northeast) and cause ash falls miles from the volcano. Even minor ash fall can be a nuisance and make driving treacherous by reducing visibility and making roads slippery if wet. Ash is especially damaging to jet airplanes and could affect air traffic at distances of more than 100 miles or more from the volcano and at Portland International Airport and other area airports. Fortunately, there is no geologic evidence for large explosive eruptions at Mount Hood, such as those witnessed in 1980 at Mount St. Helens, which sent large amount of ash and pumice for hundreds of miles downwind.

- **Lava flows** could generate small-scale pyroclastic flows and, if they occur during the summer or fall, cause forest fires. In general though, lava flows move too slowly to be an immediate hazard to humans or animal life, but they should bury and burn everything in their path.

- Small **debris avalanches** can generate lahars that could affect people and infrastructure for many miles downstream of the volcano. Debris avalanches of the size that preceded the Timberline eruptive period are unlikely, owing to the volcano's present geometry.

- **Riverbed aggradation**—the gradual process of channel shifting (including pronounced bank erosion) and burial of river valley floors with volcanic sediment can occur years to decades following an eruption. The entire length of the Sandy, Zigzag, Salmon and White Rivers would be susceptible to this long-term hazard.

Not all hazardous events around volcanoes occur during eruptions. Intense rain-on-snow events, glacial outbursts, and landslides can all generate lahars that cause local damage to infrastructure. In the past two decades, such events have caused millions of dollars of damage to State Highway 35 in the areas around Polallie Creek, Newton Creek and White River and the death of one camper at the mouth of Polallie Creek. Small lahars in Eliot Branch have destroyed local bridges and roads. Although such events can be costly, most are small compared to eruption-induced events. More information regarding hazardous events at Mount Hood can be found in Scott and others, 1997, Volcano Hazards in the Mount Hood Region, Oregon: U.S. Geological Survey Open-File Report 97-89; (http://volcanoes.usgs.gov/volcanoes/mount_hood/mount_hood_publications.html).

A generalized hazard map and other information about hazards Mount Hood poses to downstream areas is summarized in the USGS Mount Hood Fact Sheet which is included in this plan as Appendix B.

NOTE: **The USGS-Cascade Volcano Observatory (CVO) maintains summary volcano information on its public website** http:\\volcanoes.usgs.gov\observatories\cvo

Warning time and duration of eruption--long or short?

At volcanoes around the world, the amount of warning time between the first appearance of volcanic unrest and the onset of a hazardous eruption has ranged from about one day to several years. At Redoubt Volcano in Alaska, increased steaming was noted in early November 1989; but seismic activity remained low until December 13, about 25 hours before the onset of a major explosive eruption. Three more explosive events on December 15 were followed by six months of dome growth and dome collapse until activity ceased in early summer of 1990. At Soufriere Hills Volcano on the island of Montserrat, British West Indies, the initial seismic unrest in January 1992 preceded the first eruption by three years. The first small steam explosion in July 1995 was followed by the appearance of a lava dome in September of that year. Pyroclastic flows from the growing dome began spilling into surrounding valleys in March 1996, leading to the gradual destruction of Plymouth, the capital city, and surrounding towns and farmland over the next two years. Dome growth and periodic explosions continue at Montserrat today (2012).

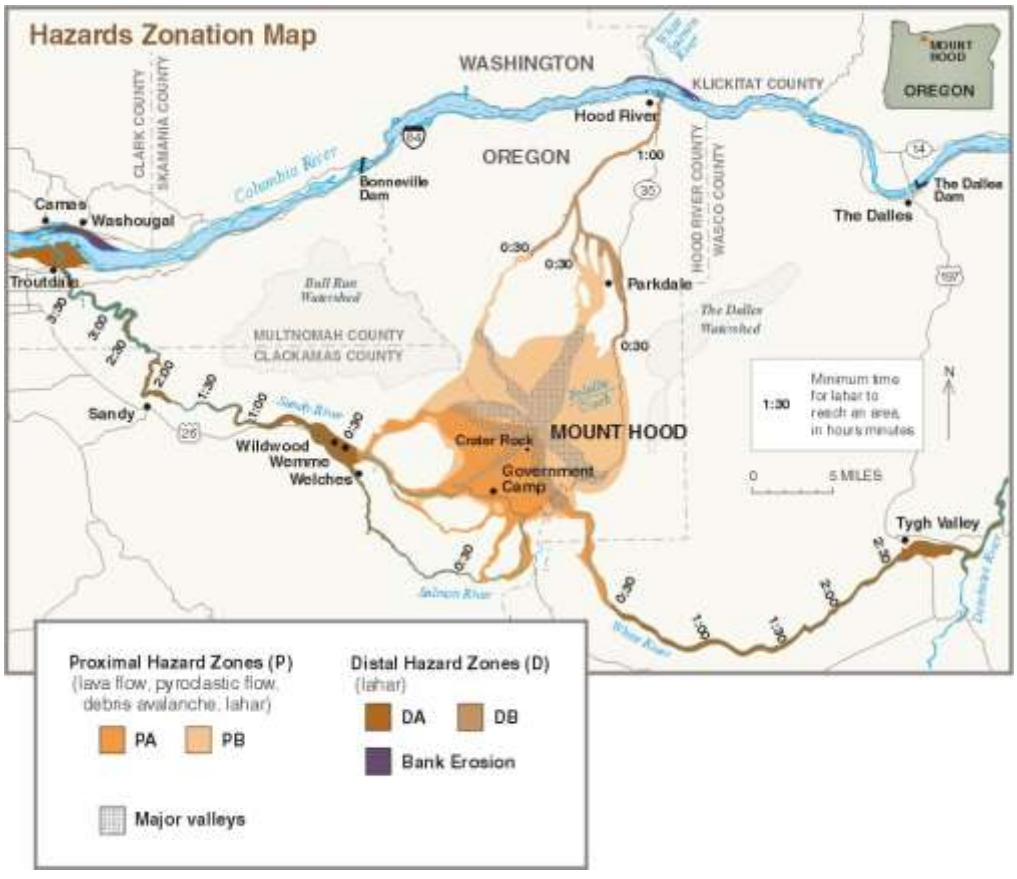
For a variety of reasons, hazardous magmatic eruptions at Mount Hood should probably be preceded by weeks or more of unrest. Chief among those reasons is that Mount Hood has been dormant for more than a century; the conduit system that conveys magma to the surface has solidified and should have to be fractured and reopened for the next magma to reach the surface. In the Cascade Range, two volcanoes have produced magmatic eruptions during the twentieth century. At Mount St. Helens, the climactic eruption of May 18, 1980, was preceded by increased seismicity, ground deformation and steam eruptions that began in late March of that year. At Lassen Peak in California, small steam and ash explosions began on June 30, 1914, and continued sporadically for almost a year before the onset of large magmatic eruptions in May 1915.

APPENDIX C: Mount Hood—History and Hazards of Oregon's Most Recently Active Volcano

Selections from Mount Hood Fact Sheet http://pubs.usgs.gov/fs/2000/fs060-00/

Hazardous Areas

Hazard zones shown on the map were determined on the basis of distance from the volcano, vent location, and type of hazardous events. Proximal hazard zones (P) are areas subject to rapidly moving debris avalanches, pyroclastic flows, and lahars that can reach the hazard boundary in less than 30 minutes, as well as to slow-moving lava flows. Areas within proximal hazard zones should be evacuated before an eruption begins, because there is little time to get people out of harm's



way once an eruption starts. Most pyroclastic flows, lava flows, and debris avalanches should stop within the proximal hazard zone, but lahars can travel much farther.

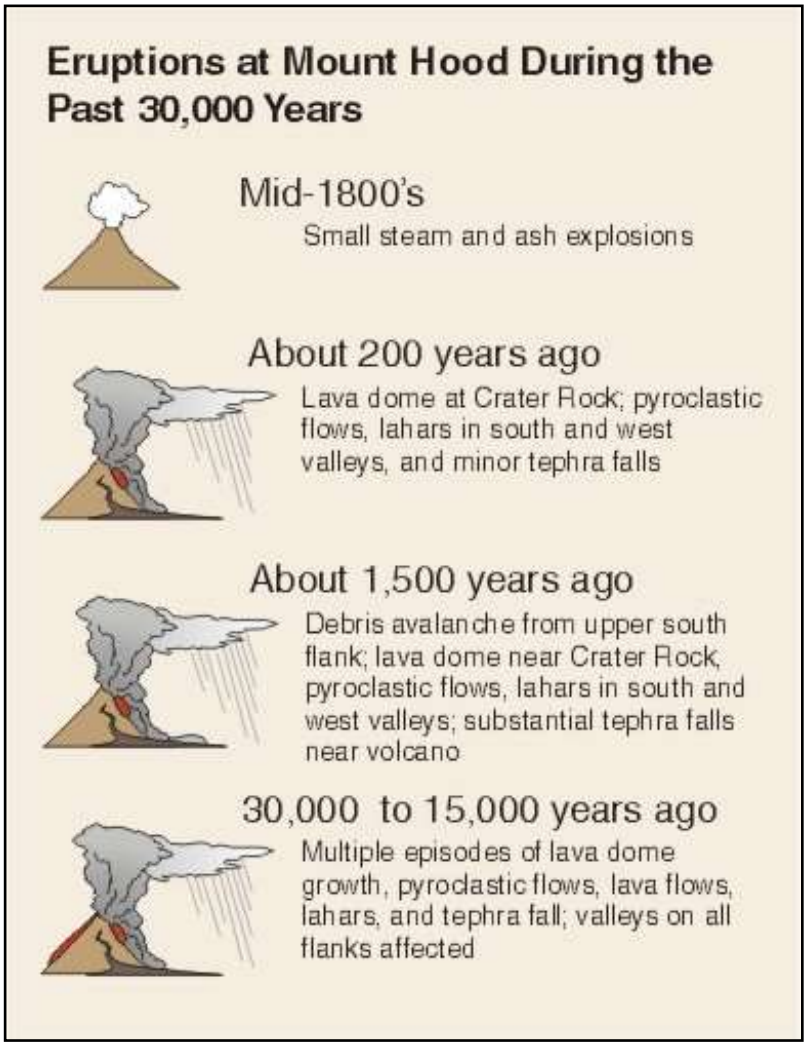
Distal hazard zones (D) are areas adjacent to rivers that are pathways for lahars. Estimated travel time for lahars to reach these zones is more than 30 minutes, which may allow individuals time to move to higher ground and greater safety if given warning. Shown are inundation areas for lahars of a size similar to lahars that swept through the Sandy River 1,500 year ago. Smaller or larger lahars would affect smaller or larger areas, respectively. Lahars could affect transportation corridors by damaging or destroying bridges and roads. Some water from the Bull Run Watershed, vital to Portland, is transported in a conduit that crosses distal hazard zones along the Sandy River; the majority flows through a tunnel deep below Sandy River..

Proximal and distal hazard zones are subdivided into zones A and B on the basis of the vent location during the next eruption. During the past two eruptive episodes, the vent was located near Crater Rock. Scientists anticipate that the vent for the next eruption should most likely be in the same area. Thus, areas within hazard zones PA and DA have a higher probability of being affected during the next eruption than do areas within hazard zones PB and DB, which reflect a vent located on the volcano's west, north, or east flank.

During and after an eruption, large amounts of sediment could be carried by rivers and discharged into the Columbia River. This sediment could narrow the Columbia's channel, forcing it to the north and potentially causing bank erosion along the river's north bank.

HAZARDS CAN OCCUR EVEN WITHOUT ERUPTIVE ACTIVITY

Lahars are often associated with eruptive activity, but they can also be generated by rapid erosion of loose rock during heavy rains or by sudden outbursts of glacial water. On Christmas Day 1980, an intense rainstorm rapidly melted snow and triggered a small landslide in fragmental debris in upper Polallie Creek. The resulting lahar moved down valley at 25 to 35 miles per hour. At the mouth of Polallie Creek, the lahar spread out, killing a camper and temporarily damming the East Fork Hood River. Flooding after failure of this temporary dam destroyed 5 miles of highway, three bridges, and a state park—at a cost of at least $13 million. Small lahars such as this occur every few years at Mount Hood, but few have been as destructive.

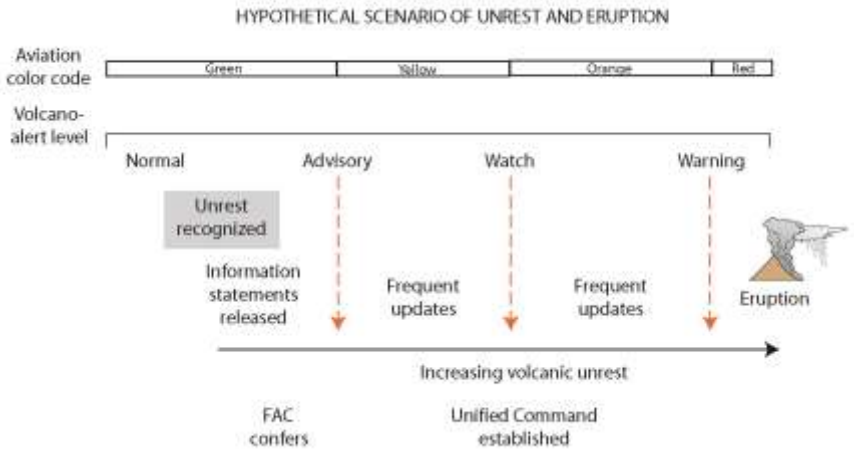


APPENDIX D: MONITORING VOLCANIC UNREST

In response to developing volcanic unrest at Mount Hood, a USGS response team expects to:

- Install additional monitoring instruments to collect and analyze visual, seismic, lahar-detection, deformation, and gas-emission data. As an important element of redundancy, critical seismic data should be received and analyzed at the Pacific Northwest Seismograph Network at the University of Washington, the USGS Cascades Volcano Observatory, and the local temporary volcano observatory.

- Establish a temporary volcano observatory with the USFS, most likely at their headquarters in Sandy, Oregon. The observatory should maintain close contact with emergency managers and should be sited to allow efficient daily helicopter access to the volcano. The primary function of the USGS response team is to monitor all volcanic developments and to provide eruption-forecasting and hazard-assessment information to support decisions by public officials. If the volcanic activity is on other flanks of the peak than anticipated, alternate locations should likely be identified.



This figure is intended to provide perspective on how a volcanic crisis might unfold. Many other potential scenarios exist. The first sign of significant earthquake activity or other signs of unusual unrest should prompt the USGS to issue an Information Statement. If significant unrest continues, then eventually a Notice of Unrest may be issued, etc.

APPENDIX E: EVENT NOTIFICATION

Please see: USGS Fact Sheet 2006-3139

Http://pubs.usgs.gov/fs/2006/3139/fs2006-3139.pdf

The consequences of an eruption can vary and are dependent upon the eruption type, size, and directions in which the hazards (lahar, tephra plumes, pyroclastic flows, etc.) are transported. Local agencies require information on hazards that affect nearby areas, whereas airlines and the Federal Aviation Administration (FAA) require information on tephra plumes that can be hazardous to aircraft hundreds of miles from source. The information required by these two groups is not always the same and therefore the Volcano Science Center, in cooperation with various agencies, has developed two hierarchies of alert levels; one directed toward emergency response on the ground and the other toward ash hazards to aircraft. These two hierarchies are described below.

For ground-based hazards, the USGS issues statements in coordination with the appropriate land management agency (in this case USFS) and to Oregon Office of Emergency Management (OEM). OEM transmits the statements, as appropriate, to other state agencies, counties, and adjacent states. The counties then transmit the notifications, as appropriate, to their own emergency management agencies, cities, city-government organizations, special purpose districts, and citizens.

For aviation hazards, the USGS issues statements to the Seattle Center of the Federal Aviation Administration (FAA), the Washington D.C. Volcano Ash Advisory Center (WVACC), and the National Weather Service (NWS). The Interagency Operating Plan for Volcanic Ash Events was developed in 2011 to coordinate actions by the USGS, FAA, and NWS to mitigate the threat of volcanic ash in Washington and Oregon to the nation's aviation system.

A copy of the plan is found at:

http://www.ofcm.gov/p35-nvaopa/fcm-p35.htmregional_plans/PNW%20VA%20wo.pdf

Notification of Ground-Based Hazards

Event notification by the USGS may occur under two distinctly different circumstances:

(1) In response to unexpected short-lived events;

(2) In response to developing volcanic unrest that may culminate in eruptive activity with attendant volcanic and hydrologic hazards.

The former is handled through information statements, the latter through Staged Alert Levels. Both are issued by the USGS.

Information Statements

Events such as steam bursts (with or without minor ashfall), small avalanches, or rock falls often attract media and public-interest inquiry. This type of event is short-lived, usually concluding within minutes. Since this type of event almost always occurs without specifically recognized precursors, there is no opportunity to provide warning or evacuation. Thus, persons in proximity to such an event are at some personal risk and should need to make their own safety decisions.

Information about a discrete natural event may come from a variety of sources. Owing to frequent public and media inquiries that result from such events, USGS-CVO should attempt to verify the nature and extent of the event, issuing commentary as appropriate in “Information Statements”. Information Statements may also be issued to provide commentary about notable events occurring within any alert level during volcanic unrest. The USGS should convene the Facilitating Committee (FAC) prior to issuing a second Information Statement due to an event that may signify increasing volcanic unrest. Depending on the situation, this may be a conference call rather than a face-to-face meeting.

Staged Alert Levels

A system of staged alert levels ("**Normal**", "**Advisory**", "**Watch**", and "**Warning**') indicates the activity at the volcano from quiescence to hazardous eruptive activity. Alert-level notifications (USGS' Volcano Activity Notices or VANs), are accompanied by brief explanatory text to clarify hazard implications as fully as possible. Updates may be issued to supplement any alert-level statement.

Alert-level assignments are based on a volcano's level of activity. Alert levels are not always issued sequentially. The highest two alert levels (**Watch** and **Warning**) use National Weather Service (NWS) terms for notification of hazardous meteorological events, terms already familiar to emergency managers and the public; however, unlike the NWS terms, volcanic alert levels of **Watch** and **Warning** do not signify the time frame in which an event may occur.

See Appendix J or USGS Fact Sheet 2006-3139 on the USGS Alert Notification System for Volcanic Activity.) http://pubs.usgs.gov/fs/2006/3139/

APPENDIX F: Field Volcano Observatory Requirements

The following is a rough guide to USGS requirements for a field observatory in, or close to, an established EOC. There is flexibility in these requirements. For example, if necessary, the USGS could set up operations in a temporary structure (e.g., trailer in the parking lot) if government owned or leased office space is not available. The bottom line is: The USGS can probably adapt to most situations, especially for the first few weeks of an incident. If an Incident/Unified Command structure has been established, USGS staff would work with the Logistics Section for facilities, supplies, and other support needed to establish a field observatory.

Space Requirements:

Space requirements can be separated into five areas; (1) Roof or tower space for mounting radio communications antennas; (2) an "operations" room that would be the focus of the real-time monitoring activities and coordination of field work; (3) an area where staff could set up desks and computers for data analysis, preparations for field activities, and hold staff meetings; (4) storage space for items such as batteries, spare parts and helicopter sling equipment; and (5) a media area separate from the other work areas.

- **Antennas:** Real-time data from the volcano should be radio-telemetered to our field observatory. We should need space to mount approximately ten (10) yagi antennas, with a minimum of four feet separation between antennas. Line-of-sight access to the volcano is necessary as well as being within 100-foot proximity of the Operations room.

- **Operations Room:** Approximately 300 sq. ft of space required. All data are funneled into the Operation room for coordination and display. Voice radios for communication with field crews as well as telephones for both voice and data are necessary in the Operations room. Space requirements should also take into account that it should be available to the media for photo opportunities and backdrops for interviews during slow periods of activity.

- **Staff Office Area:** Approximately 400 sq. ft. of space required. Staff should use this area not only for office functions but also to store limited field supplies, rock samples, equipment, etc. The Staff area should be sufficiently large so as to contain some chairs, desks, tables and still have room to hold a meeting of 15-20 people. Close proximity to Operations Room desirable and phones desirable.

- **Storage Space:** Approximately 300 sq. ft. of space required. A secure area for field equipment, supplies (batteries, concrete mix, water jugs, spare parts, etc.) and materials that is separate from the Operations Room and Staff Office Area. This could be commercial leased space but would need to be in close proximity to Operations.

- **Media Area:** It is anticipated that a suitable media briefing area at the proximal EOC should already be in place. If none exists, the more physically separated from the Operations and Staff offices, the better.

Communication requirements:

Six (6) standard voice phone lines (1 for fax, 2 ‘hot’ lines, 1 for recorded volcano information, and 2 for normal use).

Two (2) standard lines for data communications. Either dial-up access to the USGS computer network or remote colleagues dialing into the temporary observatory’s computer network.

Concurrent with setting up the observatory, USGS should negotiate the installation of a dedicated relatively high-speed data link between the observatory and the nearest Department of Interior facility.

Power requirements:

Observatory equipment does not draw large current loads, but does require reliable power. Approximately 15 computers (approx. 5kW), Doppler radar (1kW), plus radio and other equipment should be supported. If reliable commercial AC power is not available, it should be necessary to obtain an emergency generator and quality uninterruptible power supply(s) (UPS).

Doppler radar:

Doppler radar may be deployed to support operations. It requires a 6' x 6' secure roof area capable of supporting about 300 lbs. Line-of-sight access to the volcano is essential for proper operation of the system. Ideally, the radar would be located within a few hundred feet of the Operations room. The radar requires about 1kw of power.

Parking:

Workers should travel frequently between the volcano, a local heli-pad, motel rooms, etc. Convenient parking for 8-10 vehicles should support efficient operations.

APPENDIX G: Glossary Of Acronyms and Abbreviations

CVO:	Cascades Volcano Observatory
DEM:	(Local) Department (or Division) of Emergency Management
DFO:	(FEMA/State) Disaster Field Office
DoD:	Department of Defense
DOGAMI:	(Oregon) Department of Geology and Mineral Industries
EAS:	Emergency Alert System
ECC:	Emergency Coordination Center
EMAC:	Emergency Management Assistance Compact
EMD:	(Washington) Emergency Management Division
EOC:	Emergency Operations Center
ERT:	Emergency Response Team
ESF:	Emergency Support Function
FAA:	Federal Aviation Administration
FAC:	(Mount Hood) Facilitating Committee
FEMA:	Federal Emergency Management Agency
HIVA:	Hazard Identification Vulnerability Assessment
IC:	Incident Commander
ICS:	Incident Command System
IMT:	Incident Management Team
ICP:	Incident Command Post
JFO:	(FEMA/State) Joint Field Office
JIC:	Joint Information Center
NAWAS:	(FEMA's) NAtional WArning System
NIMS:	National Incident Management System

NOAA:	National Oceanic and Atmospheric Administration
NRF:	National Response Framework
NWCC:	Northwest Coordination Center
NWS:	National Weather Service
ODOT:	Oregon Department of Transportation
OEM:	Oregon Emergency Management
OERS:	Oregon Emergency Response System
OSP:	Oregon State Police
PIO:	Public Information Officer
PNSN:	Pacific Northwest Seismograph Network
RRCC:	(FEMA) Regional Response Coordination Center
UPS:	Uninterruptible Power Supply
USFS:	United States Forest Service
USGS:	United States Geological Survey
VAAC:	(NOAA) Volcanic Ash Advisory Center
WFO:	Weather Forecast Office
WSDOT:	Washington State Department of Transportation
WSP:	Washington State Patrol

APPENDIX H: Joint Information Center Purpose and Structure

Coordination of Information Flow

The purpose of the Joint Information Center (JIC) is to coordinate the flow of information about volcanic activity and related response issues among agencies, and to provide a single information source for the media, general public and businesses. The JIC is an element of the Emergency Operations Center(s) (EOC) where the emergency response is being coordinated. Communications between agencies and to the media/public must be rapid, accurate and effective. A JIC provides a forum for the necessary information exchange. Public information between and from all responding agencies, EOCs, political jurisdictions, and the media is handled through this one center, thereby allowing the coordination of information from all sources, and reducing or eliminating conflicting information and rumors. Temporary and alternate media offices should be identified. All participants should be encouraged to facilitate an efficient flow of information from the JIC.

A JIC may be necessary in one or more of the following circumstances:

- Multiple local, State and/or Federal agencies are involved in an incident.
- The volume of media inquiries overwhelms the capacities of the Public Information Officer(s) (PIOs) within the EOC.
- A large-scale public phone team effort must be mounted over an extended period of time.

When conditions warrant, or when a Volcano Advisory (or Alert) is declared, a JIC should be activated by the FAC or Unified Command. A JIC must have:

- Office space for the PIOs
- Facilities for communication by phone, fax and email
- Briefing rooms
- Easy access for the media
- Proximity to restaurants or available food service
- Security

Recommended Structure of JIC during Volcanic Incidents

A. Potential Participants:

- Oregon Emergency Management
- U.S. Geological Survey
- U.S. Forest Service
- Counties on the FAC
- City of Portland
- DOGAMI
- FEMA
- Tribes
- Others as required or conditions dictate

B. Operating Assumptions:

All information should be coordinated among the JIC staff in order to ensure timely and accurate information flow to the public, to quell rumors and to prevent impediments to the response effort.

The JIC should operate under the Incident Command System.

The JIC should adjust its size and scope to match the size and complexity of the incident.

State and local agencies may be requested to provide staff for the JIC, including augmentation.

The JIC should be established (at least via conference call) prior to the issuance of a second Information Statement by USGS on an incident.

APPENDIX I: Characteristic Challenges of Volcanic Crises

Controlling access

During the crisis at Mount St. Helens in March and April, 1980, volcano-watchers bypassed road blocks to view the volcano, staged illegal climbs to the summit, and even landed helicopters at the summit. The difficulty of controlling access to the mountain was compounded by the checkerboard pattern of public and private land ownership, and the network of logging roads. Much of this has been alleviated by the creation of the Mount St. Helens National Volcanic Monument. Unlike at Mount St. Helens, however, access control around Mount Hood would necessitate traffic restriction on major regional thoroughfares, US Highway 26, Oregon Highway 35, and possibly Interstate-84.

Uncertainty: Restless volcanoes can challenge public officials more than most other natural hazards because they present multiple uncertainties about when eruptive or other hazardous activity will begin, how long it will last, and who will be affected. Unlike floods and earthquakes, volcanic eruptions are seldom singular events; unrest is often prolonged over a period of months to years with no predictable end. Periods of intermittent volcanic eruptions can continue for decades.

Volcanoes commonly produce multiple hazards, each of which requires vigilant attention of authorities and the public. For example, volcanic ash can fall over vast areas and disturb the routines of people living even at great distances from the volcano. The paths of lahars can be more closely estimated, but their timing and size remain unpredictable. At Mount Hood, the risk of annual small debris flows in river valleys adds uncertainty, even when the volcano is quiet.

Mount Hood could be in an *Advisory* phase of unrest for a protracted period of time. Officials will need to give all response measures careful consideration. Some measures might be difficult to maintain over long durations in the absence of an emergency declaration. The disquieting effects of eruption uncertainty may be reduced by pre-crisis education and honest dialogue with the public, and with frequent planning and plan exercising by the Mount Hood FAC, but those involved in an actual event should anticipate the need to, and the challenges associated with, such uncertainty.

Consider these case studies. In 1975, Mount Baker, Washington, increased steam output for a few months, and then subsided with no indication of magma movement. Since 1993, Popocatepetl Volcano near Mexico City has periodically threatened nearby communities, causing multiple evacuations of villagers, despite failures of the volcano to erupt. In 1902, local authorities at St. Pierre in Martinique (French West Indies, opted not to evacuate in spite of four months of seismicity and steam explosions at Mont Pelee, five miles to the north. On May 8, a major eruption produced a pyroclastic flow that destroyed the town and killed 29,000 residents. In 1982, in response to earthquake swarms and uplift at Long Valley, California, the USGS issued a notice of potential volcanic hazard. Activity subsided, frustrating citizens and the scientists who felt that they were providing the best information available.

While these examples portray frustrating circumstances for officials and communities, there are many examples of successful evacuations where tens to tens of thousands of lives were saved due to pre-crisis education and careful official planning (Mount Philippine's Pinatubo, 1991; Mount St. Helens, 2004; Colombia's Nevado del Huila during 2007-08; Indonesia's Merapi volcano during 2010).

APPENDIX J: Authorities

Federal – United States

Public Law 93-288 Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1974 as amended

Public Law 920 Federal Civil Defense Act of 1950 as amended

Public Law 96-342 The Improved Civil Defense Act of 1980

Public Law 84-99 Flood Control and Coastal Emergencies

Federal Response Plan 1999

Flood Control Act of 1950

Department of Transportation Act of 1966

Federal Aviation Administration Act of 1958

Federal Energy Regulation Commission Order 122

USFS Incident Management Team Delegation of Authority Letter

State of Oregon

Oregon Revised Statute Chapter 401

Oregon Administrative Rules Chapter 104

Oregon Office of Emergency Management Plan, Volume II, 2001

Emergency Management Assistance Compact (EMAC)

State of Washington

RCW 38.08 Powers and Duties of the Governor

RCW 38.52 Emergency Management

RCW 38.54 State Fire Service Mobilization

RCW 43.06 Governor's Emergency Powers Act

WAC 118 Emergency Management

WAC 296 Washington Industrial Safety and Health Act

Washington State Comprehensive Emergency Management Plan

Emergency Management Assistance Compact (EMAC)

Local Government

Each of the counties has established authorities governing emergency management and operations.

APPENDIX K: References and Websites

Mount Hood

Gardner, C.A., Scott, W.E., Major , J.J., and Pierson, T.C., Mount Hood – History and Hazards of Oregon's Most Recently Active Volcano: U.S. Geological Survey, Mount Hood Fact Sheet 060-00, August 2000 (see Appendix B)

Brantley, S. R. & Scott, W. E. (1993). The Danger of Collapsing Lava Domes: Lessons for Mount Hood, Oregon. Earthquakes & Volcanoes , 24, 244-269.

http://volcanoes.usgs.gov/vsc/file_mngr/file-66/Hood_lava%20domes_E&V%201993.pdf

Schilling, S. P., Doelger, S., Scott, W. E., Pierson, T., Costa, J., Gardner, C., Vallance, J. W. & Major, J. (2008). Digital Data for Volcano Hazards of the Mount Hood Region, Oregon. U.S. Geological Survey Open-File Report , 2007-1222

Scott, W. E., Pierson, T., Schilling, S. P., Costa, J., Gardner, C., Vallance, J. W. & Major, J. (1997). Volcano hazards in the Mount Hood region, Oregon. U.S. Geological Survey Open-File Report , 97-89, 14 p.

USGS, NWS and FAA Pacific Northwest Interagency Operating Plan for Volcanic Ash Events, issued May 9, 2011: url: http://www.ofcm.gov/p35-nvaopa/fcm-35.htm
http://www.ofcm.gov/p35-nvaopa/regional_plans/PNW%20VA%20wo.pdf

On Volcanic Crises and Volcanic Hazards

Blong, R.J., 1984, Volcanic Hazards: New York, Academic Press, 424p.

Foxworthy, B.L., and Hill, M., 1982, Volcanic eruptions of 1980 at Mount St. Helens: The first 100 days. USGS Prof. Paper 1249: Washington, DC, U.S. Government Printing Office.

International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI), 1995, Understanding Volcanic Hazards [video], Distributed by Northwest Interpretive Association, (360) 274-2127

Mader, G.G., Blair, M.L., and Olson, R.A., 1987, Living with a volcano threat: Response to volcanic hazards, Long Valley, California, Shouldiam Spangle and Associates, Inc., 105p.

Newhall, C.G., and Punongbayan, eds., 1996, Fire and Mud: eruptions and Lahars of Mount Pinatubo, Philippines, 1126 p.

Tilling, R.I., ed., 1989, Volcanic Hazards. American Geophysical Union Short Course In Geology: Volume 1, American Geophysical Union, Washington, D.C., 123 p.

U.S. Geological Survey, 2000, What Are Volcano Hazards? Fact Sheet, 2 pgs. (see Appendix A)

U.S. Geological Survey, 2006, U.S. Geological Survey's Alert-Notification System for Volcanic Activity, Fact Sheet, 4 pgs. (see Appendix C)

Web Sites:

American Red Cross	http://www.redcross.org
FEMA	http://www.fema.gov
Clark Regional Emergency Services Agency	http://www.co.clark.wa.us/emergency/index.htm
Clackamas County Emergency Management	http://www. clackamas.us/emergency/
Confederated Tribes of Warm Springs	http://www.warmsprings.com/
DOGAMI	http://www.oregongeology.com/
Hood River County	http://www.co.hood-river.or.us/
Multnomah County Emergency Management	http://web.multco.us/em/
Oregon Department of Transportation	http://www.odot.state.or.us/home/
Oregon Emergency Management	http://www.oregon.gov/OMD/OEM/Pages/index.aspx
City of Portland	www.portlandoregon.gov/pbem

Skamania County Emergency Management	http://www.skamania-dem.org/
USFS-Mount Hood National Forest	http://www.fs.fed.us/r6/mthood/
USGS Volcano Hazards Program	http://volcanoes.usgs.gov/
USGS-Cascades Volcano Observatory (CVO)	http://vulcan.wr.usgs.gov/
Wasco County	http://www.co.wasco.or.us/
Washington Emergency Management Division	http://emd.wa.gov/
National Weather Service	http: //weather.gov
NWS Aviation Weather Center	http://aviationweather.gov/
NOAA's Volcanic Ash Advisory Center	http://www.ssd.noaa.gov/VAAC/