

Western Oregon University

Digital Commons@WOU

Academic Excellence Showcase Proceedings

Student Scholarship

2020-05-28

Preparation and Mitigation Efforts for Volcanic Hazards in the Pacific Northwest

Nick Griffith

ngriffith17@mail.wou.edu

Follow this and additional works at: <https://digitalcommons.wou.edu/aes>



Part of the [Geophysics and Seismology Commons](#)

Recommended Citation

Griffith, Nick, "Preparation and Mitigation Efforts for Volcanic Hazards in the Pacific Northwest" (2020). *Academic Excellence Showcase Proceedings*. 253.

<https://digitalcommons.wou.edu/aes/253>

This Poster is brought to you for free and open access by the Student Scholarship at Digital Commons@WOU. It has been accepted for inclusion in Academic Excellence Showcase Proceedings by an authorized administrator of Digital Commons@WOU. For more information, please contact digitalcommons@wou.edu, kundas@mail.wou.edu, bakersc@mail.wou.edu.

Preparation and Mitigation Efforts for Volcanic Hazards in the Pacific Northwest

Nick Griffith,
Department of Earth and Physical Science, Western Oregon University



Introduction

One of the most important things to consider involving volcanic eruptions in the Pacific Northwest is how to mitigate and prepare for the hazards that are presented by these volcanoes. The hazards can affect a very large area, anywhere from several hundred meters to many hundreds or even thousands of kilometers. This presentation is based on the data collected over the years during numerous studies conducted by organizations including the United States Geological Survey, the U.S. Geodynamics Committee and the University of Washington. One noticeable aspect of communities in the Pacific Northwest, especially those within close proximity of volcanic systems, lack the knowledge of what actions to take in the event of an eruption. This presentation is meant to discuss the preparation and mitigation efforts of volcanic hazards in the Pacific Northwest region.

Overview: Volcanic Hazards in the Pacific Northwest

Common hazards of volcanic systems in the Cascade range include (Figure 1a):

- **Tephra (ash) falls**, causing shut-downs in travel routes, damage to machinery, health problems for many people and damage to vegetation.
- **Pyroclastic falls/flows/surges**, capable of destroying entire forests and most standing structures for kilometers around the eruptive epicenter due to the intense heat, pressure and high travel speed.
- **Lahars** - high risk in Pacific NW (figure 1b) due to high amount of glacial ice on Cascade volcanoes (Wolfe & Pierson, 1995).
- **Lava flows**, not as high of a risk as previous hazards due to usually being highly proximal to eruptive epicenter in stratovolcanoes. While uncommon, less-viscous basaltic flows can occur and travel farther from the origin point.
- **Wasting events (landslides)**, higher velocity mass-movement events triggered by eruption or seismic events under the volcano, which cause extensive destruction to vegetation and infrastructure.

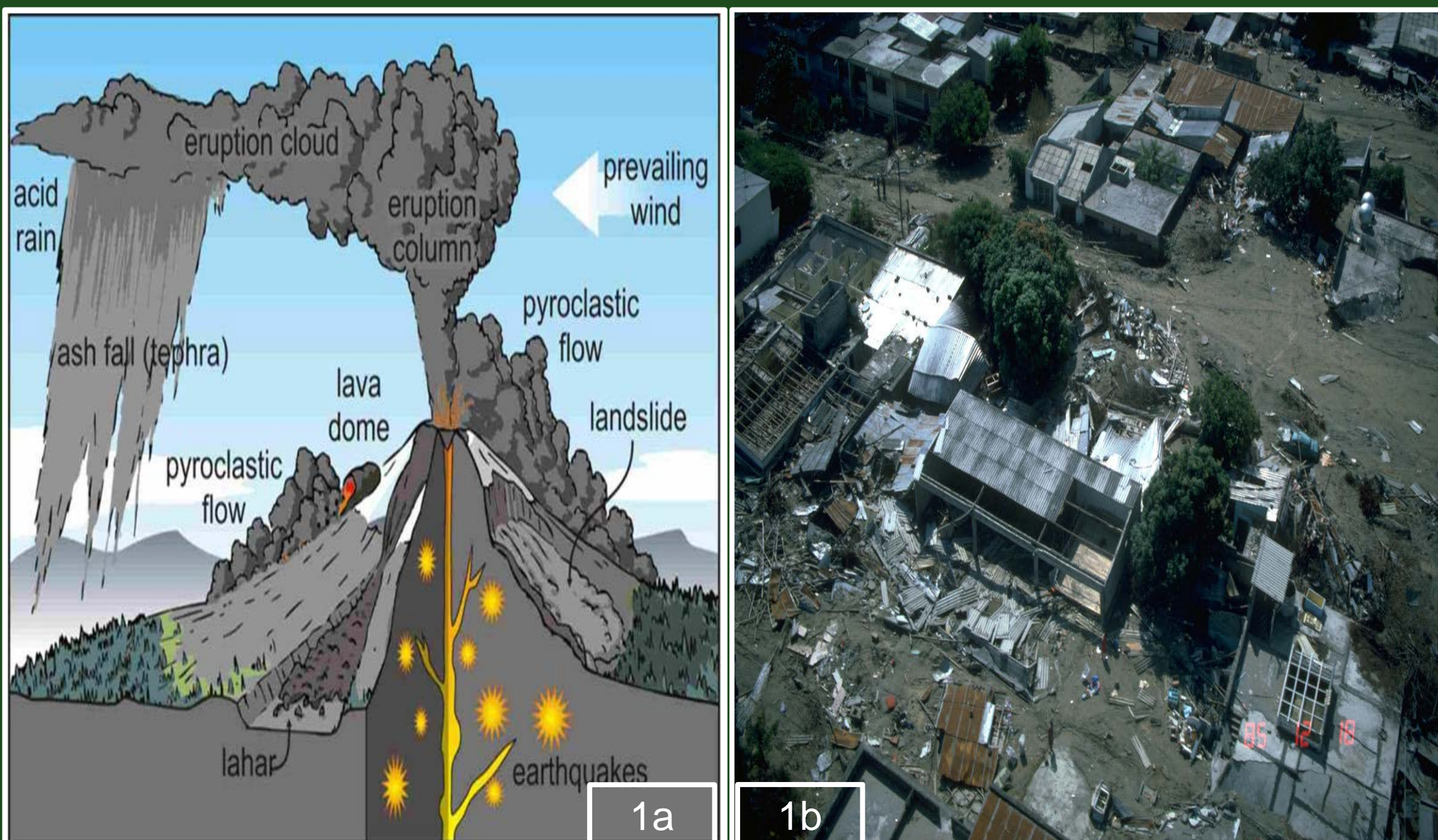


Figure 1a – Hazards commonly associated with volcanic systems in the Pacific Northwest. (Source: <http://www.geo.mtu.edu/volcanoes/hazards/primer/>)

Figure 1b – Damage caused by lahars in the town of Armero as a result of the 1985 eruption of Nevado Del Ruiz in Columbia. (Source: Wilkins, Alezea, November, 2016).

Problem

In terms of monitoring volcanic systems in the Cascade range, several problems involving the efforts of preparation and mitigation of volcanic hazards

- *Lack of action taken by government/community*
- Lack of resources for preparation/mitigation efforts
- Volcanoes are not being sufficiently monitored
- Ineffective/inefficient evacuation plans
- Current mitigation measures in place - ineffective



Figure 2 – Aftermath of the 2018 Volcán de Fuego eruption in the Guatemalan village of San Miguel Los Lotes.

Data & Analysis

As shown in figure 3 below, one of the most effective mitigation methods to reduce the risk of volcanic hazards in the Pacific Northwest involves the following (Brett et al., 1992):

- The hazards are well understood by both the local government as well as the majority of the community.
- They can be recognized before they reach critical level and become a substantially greater risk to life and infrastructure.
- Warning of their occurrence can be communicated quickly, clearly and accurately to public officials in order for preparation and mitigation plans to be efficiently set into motion.
- *Public officials will understand the significance of such warnings and know to initiate appropriate preparation and mitigation measures.*

While volcanically active systems in the Pacific Northwest are being effectively monitored (figures 4a & b), it has been indicated that certain measures for hazard mitigation and preparation are not being taken, which include:

- Effectively monitoring volcanic systems which are currently showing little to no activity while still being designated as an active system.
- Educating local government officials as well as members of the communities in the region on the correct measures to take in preparation and mitigation of volcanic hazards.
- Effective early warning systems + effective/efficient evacuation plans in the event of an eruption.

Implementation Mechanism	Mitigation Measure	Lead Jurisdiction(s) / Department(s)	Timeline (years)	Plan Goals Addressed					
				Life and Property	Emergency Services	Public Preparedness	Partnerships for Implementation	Natural Resources	Sustainable Economy
Volcanic Hazard									
Hazard Mitigation Forum: Multi-jurisdictional implementation mechanism	Evacuation Planning: New Roads and Development	PC DEM; Transportation Division (PC PWU)	1-2	✓	✓	✓			
	Mount Rainier Closure Zones	PC DEM; USGS; CVO; Mount Rainier National Park	5	✓	✓	✓			
	Bridge for Kids	B4Ks; PC DEM; WA EMD; Orting School District; City of Orting	5	✓	✓				
	Dam Draw Down Agreements	PC DEM; Facility Owners	5	✓			✓	✓	
Hazard Mitigation Committee: County-wide implementation mechanism	Lahar Flow Control	PC DEM	5	✓				✓	✓
	17th Street East Extension	PC PWU	5	✓					
Public Education	Tax or Insurance Disincentives	PC PALS	5	✓		✓		✓	
	Public Education: Lahar	PC DEM	Ongoing	✓		✓			
	Public Education: Volcanic Ashfall	PC DEM	5	✓		✓			
	Public Education: Education for Self Warning and Evacuation Routes	PC DEM	5	✓		✓			
	Public Education: Evacuation Routes	PC DEM	1-2	✓	✓	✓	✓	✓	✓
	Public Education: Bus Driver Evacuation Training Program	PC DEM; Valley School Districts	5	✓	✓				✓

Figure 3 – Mitigation measures for Mt. Rainier volcanic hazards. (Source: Pierce County Department of Emergency Management, October, 2008).

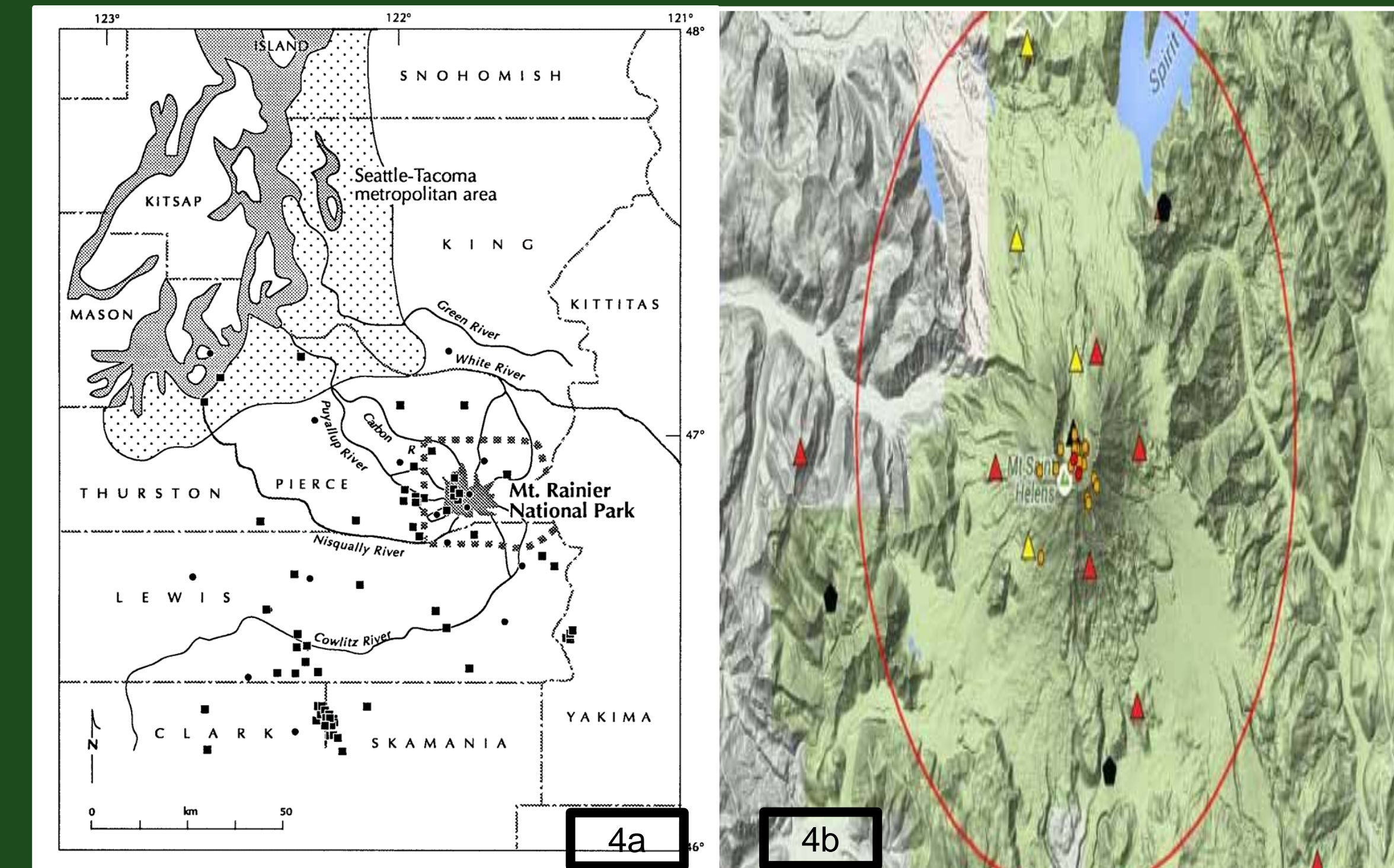


Figure 4a – distribution of seismic stations (circles) and earthquakes with a magnitude >3 (squares) over the past 25 years at Mt. Rainier. (Source: Brett et al., 1992).

Figure 4b – Distribution of seismic stations (triangles; color just indicates label of station) and earthquakes (circles; size indicates magnitude, color indicates age [R = last 2 hrs., O = last 2 days and Y = last 2 weeks]) at Mt. St. Helens

Conclusions

From this study, a number of problems have been discussed, which are capable of being addressed in the foreseeable future in the Pacific Northwest region of the United States. These include:

- The local government and the communities' unwillingness or lack of action in the regard of preparation and mitigation of volcanic hazards.
- The lack of communication between experts and community officials.
- Insufficient monitoring of volcanic systems that currently show little activity or few signs of future activity.
- As mentioned before, ineffective/inefficient evacuation plans in place for future emergency situations.

Some possible methods in which the afore-mentioned problems can be improved include, starting with the most important and effective method:

- *Having experts in the field of geology/volcanology conduct public meetings in attempt to educate community members and city officials about the threats volcanoes in the Pacific Northwest pose.*
- Improving the implementation of instruments to more effectively monitor volcanic systems, such as seismicity and ground displacement.
- Conducting meetings between volcanology experts and community officials in attempts to devise effective evacuation plans for the future as well as quick and efficient responses for the aftermath of future volcanic events in the region.

References Cited

- Brett, Robin et al., *Mount Rainier, Active Cascade Volcano*, US Geodynamics Committee, University of Washington, 18-20, September, 1992.
- Pierce County Department of Emergency Management, *Mount Rainier Volcanic Hazards Plan*, Pierce County Emergency Management, Working Draft, October 2008.
- Pacific Northwest Seismic Network, *Mount St. Helens*, University of Washington, <https://pnsn.org/volcanoes/mount-st-helens>
- Wilkins, Alezea, *International Volcano Scientists Unite: Observatories Meet in the US to Establish Best Practices*, United States Geological Survey, 9 November, 2016, <https://www.usgs.gov/news/international-volcano-scientists-unite>
- Wolfe, Edward, W. & Pierson, Thomas, C., *Volcanic Hazard Zonation for Mount St. Helens, Washington, 1995*, Cascades Volcano Observatory, United States Geological Survey, 1995.