Volcanoes

Volcanic Hazards

- Lava

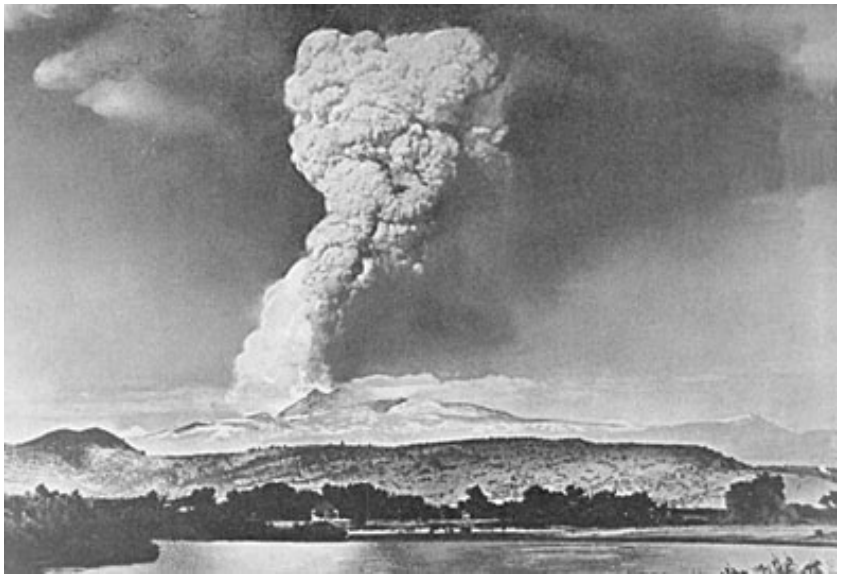
Kinds of lava

- Basalt
- Andesite
- Rhyolite

Kinds of lava

Basalt - thin,
runny,
ocean
floor

Andesite - thicker, gooier, continental. Makes lava flows and explosions



Mt. Lassen, 1915

Mt. Shasta

Rhyolite - thickest, gooiest, most explosive

Kalapana, 1990

Now lets do the chart for lava

- Nature and severity of the hazard
- How can it be avoided or mitigated?

Volcanic Hazards

- Lava
- Pyroclastics - broken fragments produced in explosive eruptions

Volcanic Hazards

- Lava
- Pyroclastics - broken fragments produced in explosive eruptions
  - Tephra: Bombs, cinders, ash

Bombs

Hardened blob of lava or a chunk of blown-out debris

Cinders

Scoria deposit at the base of Strawberry Crater, San Francisco Volcanic Field, Arizona

Hazards from large tephra (bombs, cinders)

- Impact
- Burial
- Agricultural losses

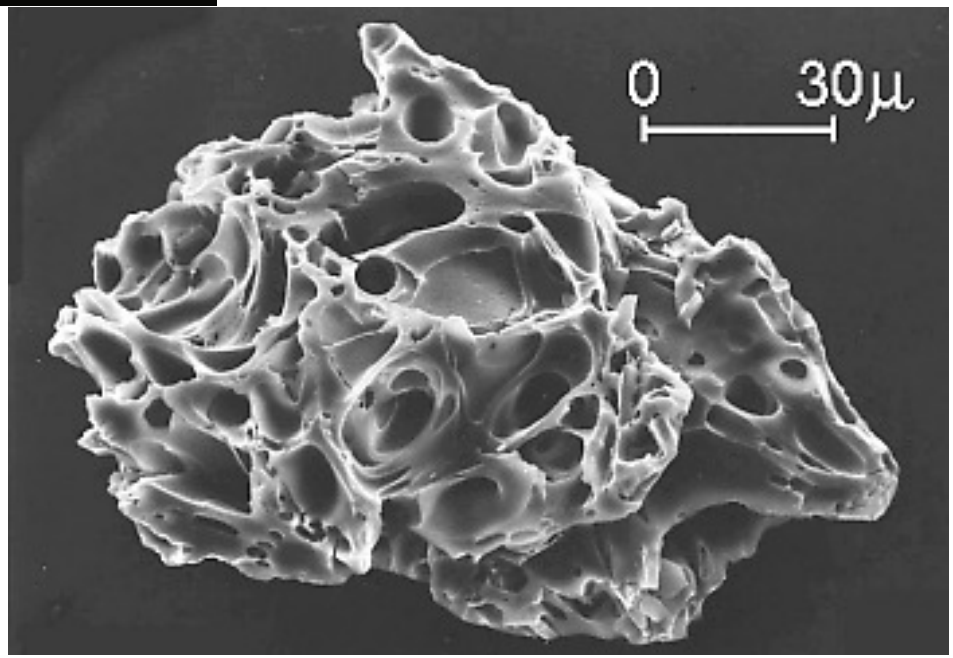
Heimaey, Iceland, 1973

Let’s do the chart for bombs and cinders

- Nature and severity of hazard?
- How can it be avoided or mitigated?

Ash

Volcanic ash - shards of glass



Hazards from Ash

- Lung damage
- Mechanical damage
  - Aircraft engines, etc.
- Burial
- Agricultural damage
- Climate change

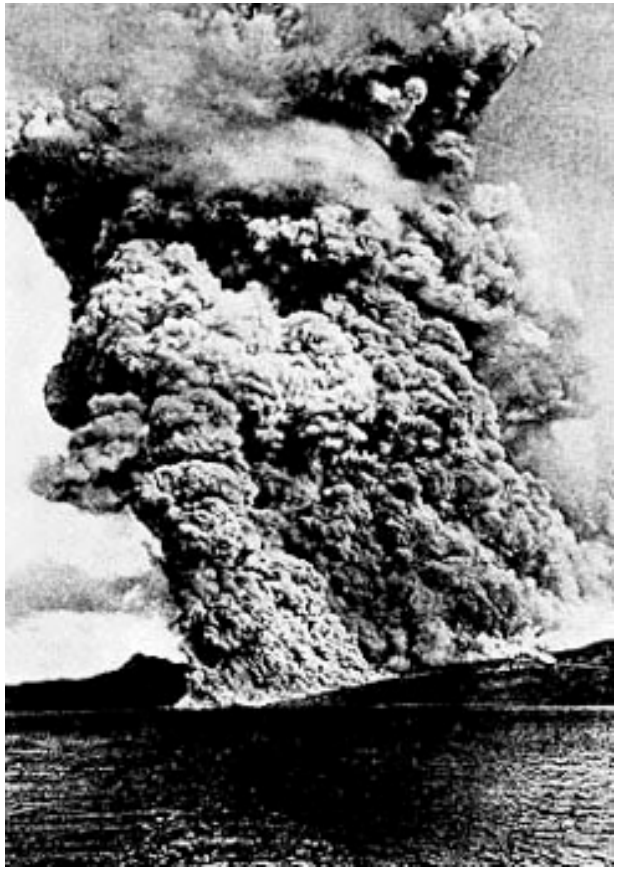
Let’s do the chart

- Nature and severity of hazard:
- Mitigation & avoidance:

Volcanic Hazards

- Lava
- Pyroclastics - broken fragments produced in explosive eruptions
  - Bombs, cinders, ash
  - Pyroclastic flows

Mont Pelee, Martinique, 1902



Pyroclastic flow

- Superheated gas and droplets of magma
- Rolls downslope as a fluid at high speed and high temperature
- Mt. Pelee, Krakatau
- Mt Unzen – killed 43 geologists and journalists
- http://www.youtube.com/watch?v=Cvjwt9nnwXY

Let’s do the chart

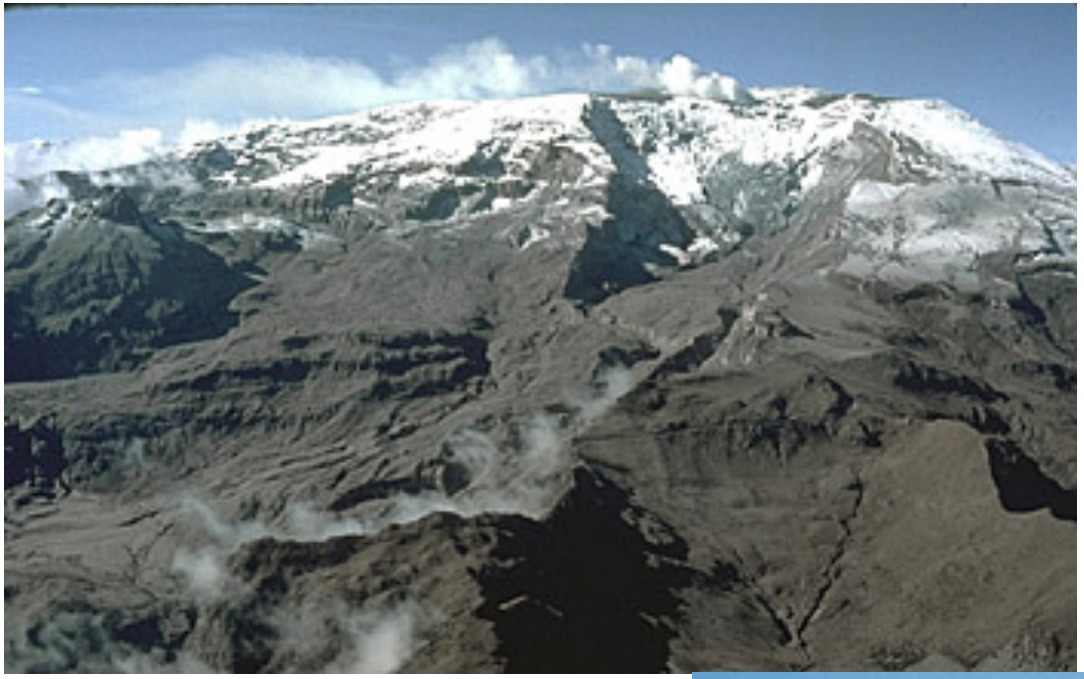
- Nature and severity of hazard?
- Avoidance or mitigation?

Volcanic Hazards

- Lava
- Pyroclastics - broken fragments produced in explosive eruptions
  - Bombs, cinders, ash
  - Pyroclastic flows
- Mudflows (lahars) - volcanic ash and water

Volcanic ash and hot water run downhill as a mudflow

Lahar



Nevado Del Ruiz, November 1985

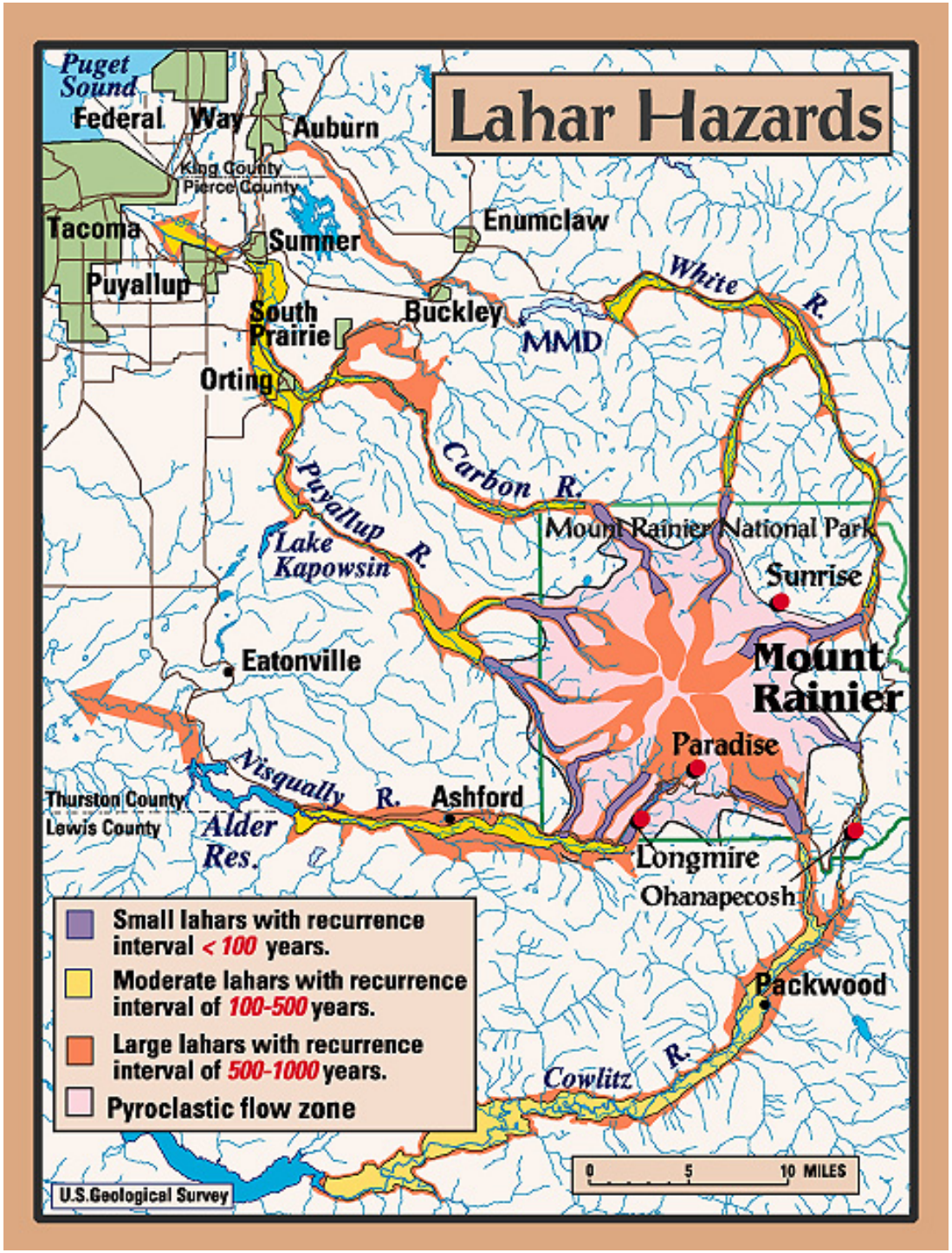
Eruption melts glacier, generates lahars

Lahar runs down canyon

Village on high ground was spared

23,000 dead as
lahar hits Armero,
a downstream
market town

Mt. Rainier: Volcano has significant weathering of large ash deposits, making lahars possible without eruption

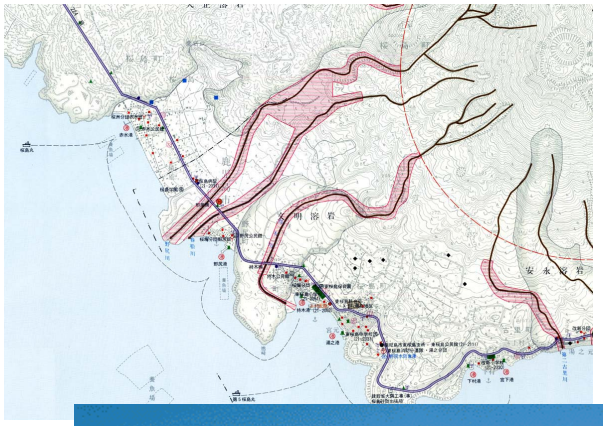


Some Sirens Fail, Students Straggle In Lahar Test

POSTED: 9:08 am PDT October 4, 2006**TACOMA, Wash. --** Two of Pierce County's emergency sirens in Puyallup failed and some Orting students straggled during Tuesday's test for a possible mudflow from Mount Rainier. The system of 25 sirens is tested twice a year. Officials also tested a new automated phone-calling system yesterday and found that it reached more than one-thousand homes and businesses in Puyallup. In Orting, some of the children evacuating schools wouldn't have escaped a 30-foot wall of mud. School officials say it took 45 minutes for them to walk to safe ground -- about five minutes too long. The hike was especially hard on students younger than second graders.

Channel 7, Tacoma

Sakurajima



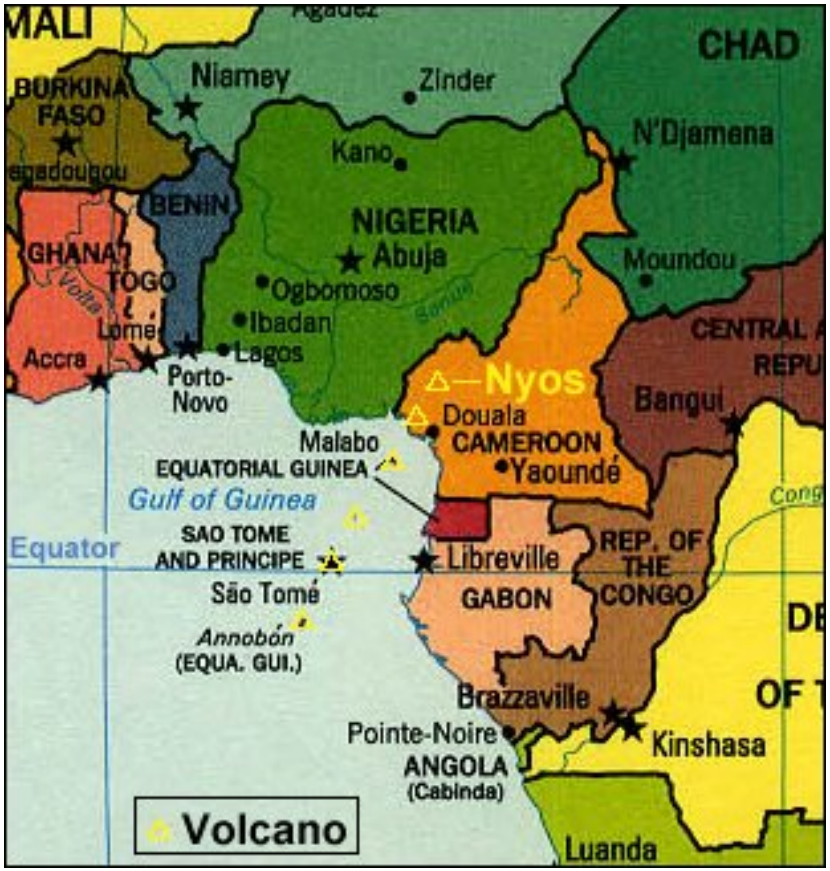
Let’s do the chart

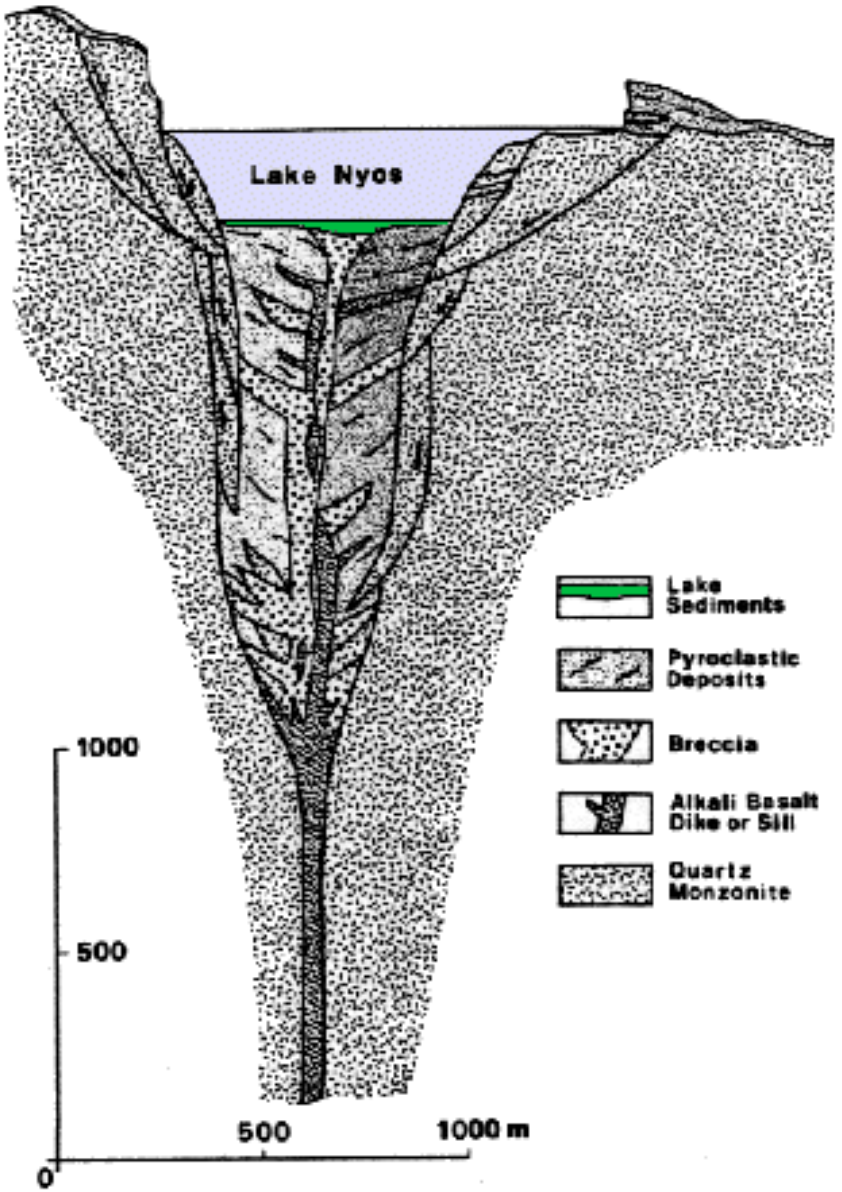
- Nature and severity of hazard?
- Avoidance and mitigation?

Volcanic Hazards

- Lava
- Pyroclastics - broken fragments produced in explosive eruptions
  - Bombs, cinders, ash
  - Pyroclastic flows
- Mudflows (lahars) - volcanic ash and water
- Gases - CO_2, sulfur gases

Lake Nyos, Cameroon





CO_2 release

Water pumped up from bottom - spray lets CO_2 release into air

One last time to the chart

- Nature and severity?
- Avoidance and mitigation?

Types of volcanoes

- Shield
- Composite (stratovolcano)
- Cinder Cone

Shield

Mauna Loa, Hawaii, seen from Kilauea

Shield volcanoes

- Basaltic lava
- Broad, gentle slope
- Quiet lava eruptions

http://stardoves.com/U.S._World-Volcano-map_Hot_Spots.gif

EXPL

Divergent plate boundaries—Where new crust is generated as the plates pull away from each other.

Convergent plate boundaries—Where crust is consumed in the Earth's interior as one plate dives under another.

Transform plate boundaries—Where crust is neither produced nor destroyed as plates slide horizontally past each other.

Plate boundary zones—Broad belts in which deformation is diffuse and boundaries are not well defined.

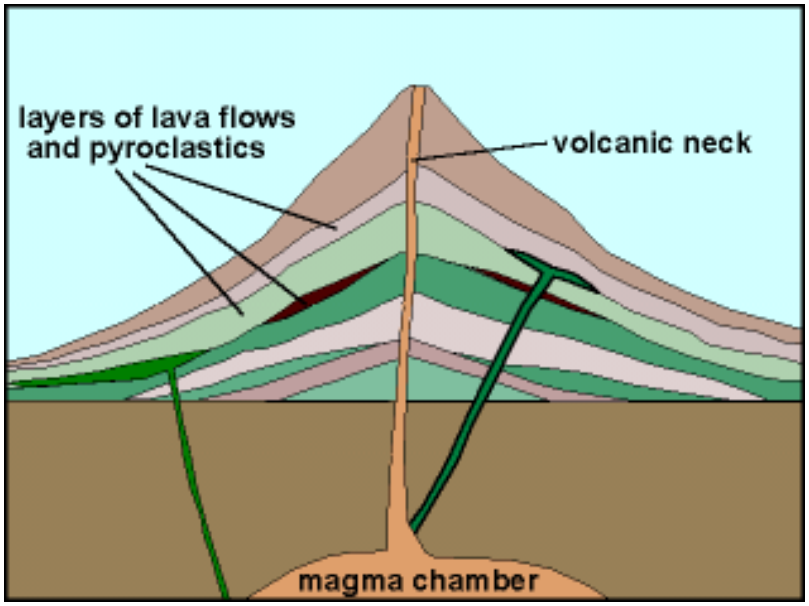
Selected prominent hotspots

http://en.wikipedia.org/wiki/Template:Shield_volcano_location_map

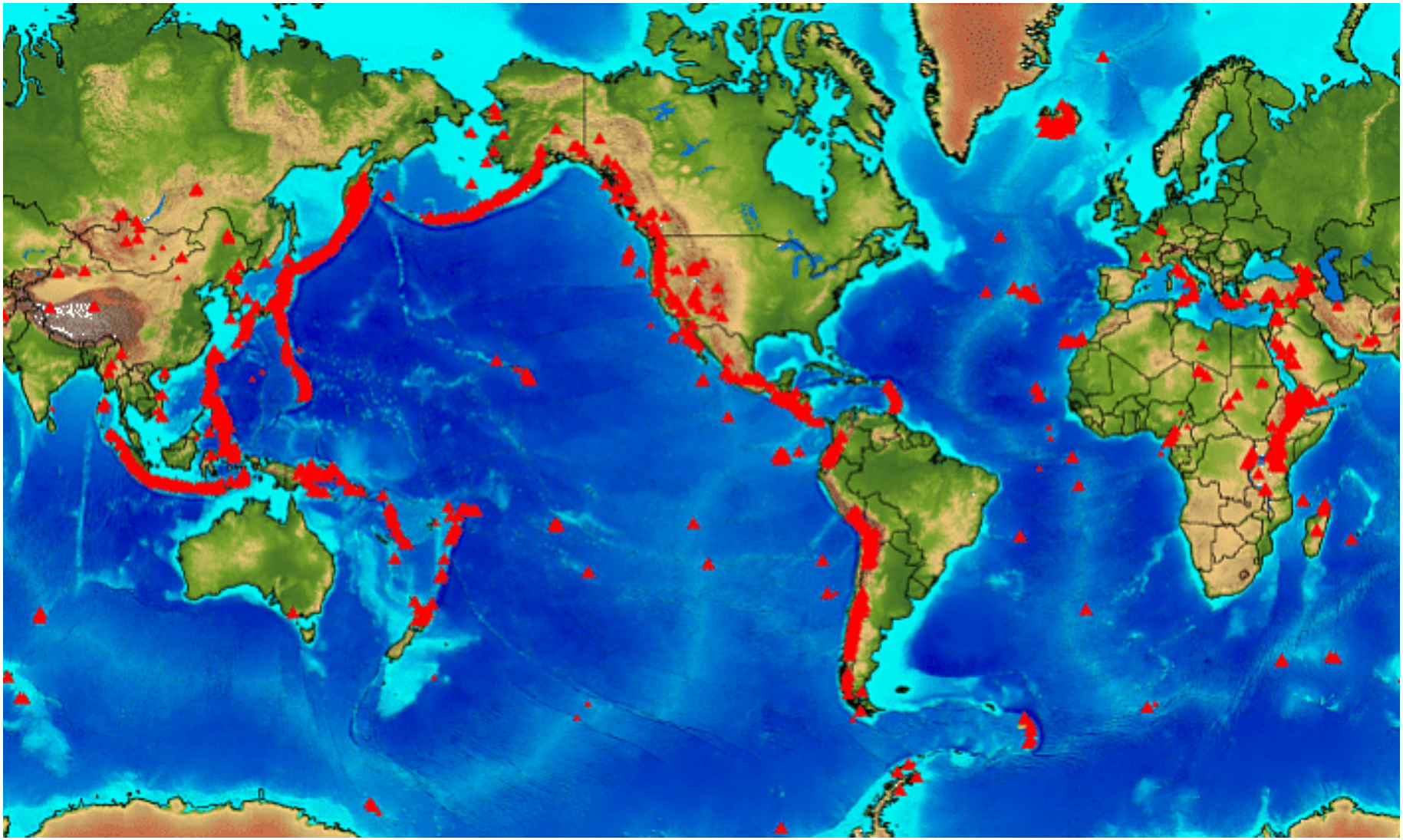
Stratovolcanoes

Fuji, Rainier, Hood, Vesuvius

Stratovolcano hazards

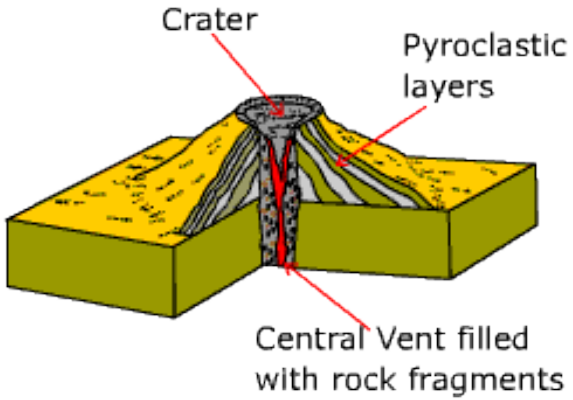


- Lava - andesite/ rhyolite
- Pyroclastics
  - Tephra
  - Ash
  - Pyroclastic flows
- Mudflows
- Gases



http://www.volcano.si.edu/world/find_regions.cfm

This is ALL the major volcanoes in the world, so we have to subtract out our hot-spot shield volcanoes to recognize where stratovolcanoes happen.



Cinder Cones

Cinder cones

- Can be small independent volcanoes, or found on larger volcanoes
- Pockets of gas cause small explosions
- Basalt, andesite, less frequently rhyolite

Now let's do the chart

Type of volcano	Lava?
Shield	
Stratovolcano	
Cinder cone	

Now let's do the chart

Type of volcano	Size and shape?
Shield	
Stratovolcano	
Cinder cone	

Now let's do the chart

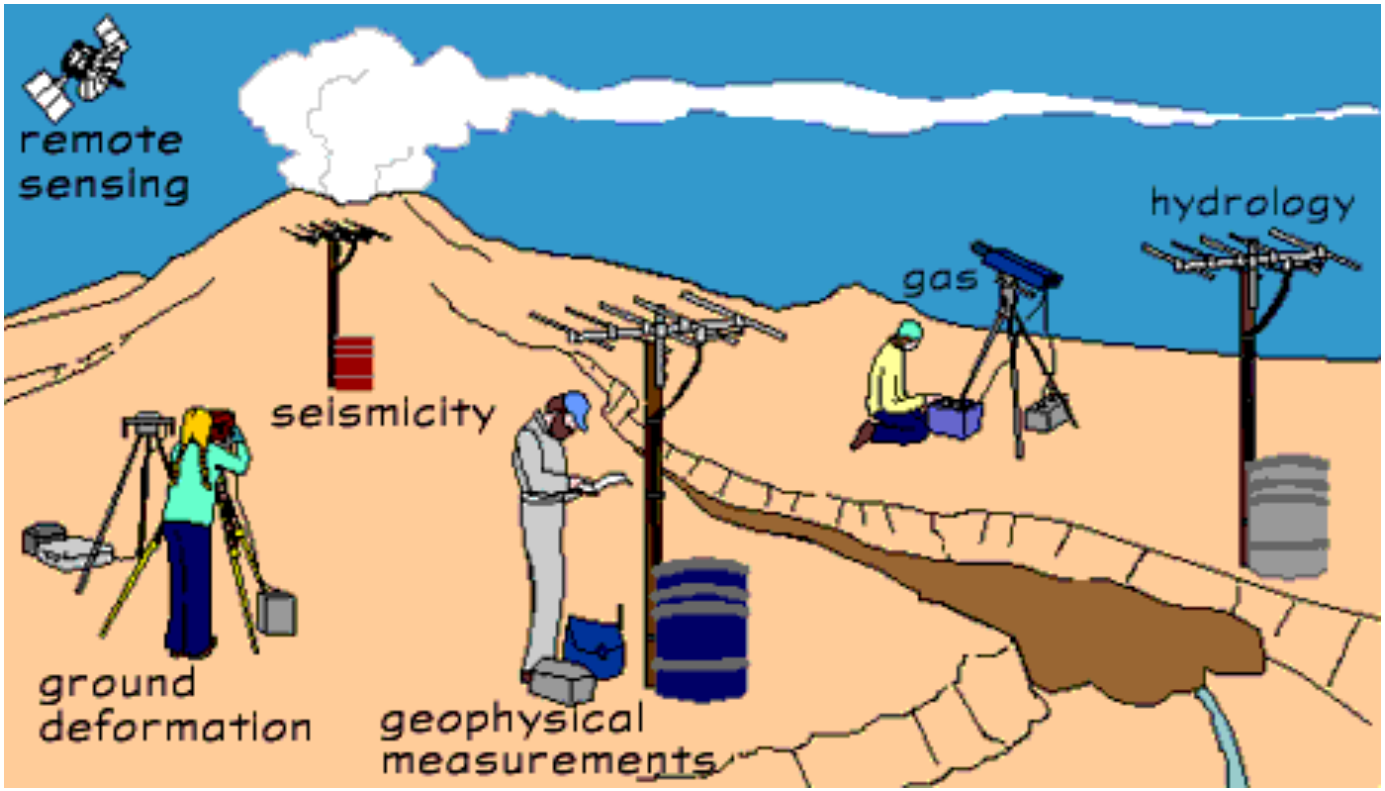
Type of volcano	Plate setting?
Shield	
Stratovolcano	
Cinder cone	

Now let's do the chart

Type of volcano	hazards??
Shield	
Stratovolcano	
Cinder cone	

Social Policy and Volcanoes

- Monitoring and managing evacuations



Monitor -ing issues

USGS, http://volcanoes.usgs.gov/activity/methods/index.php

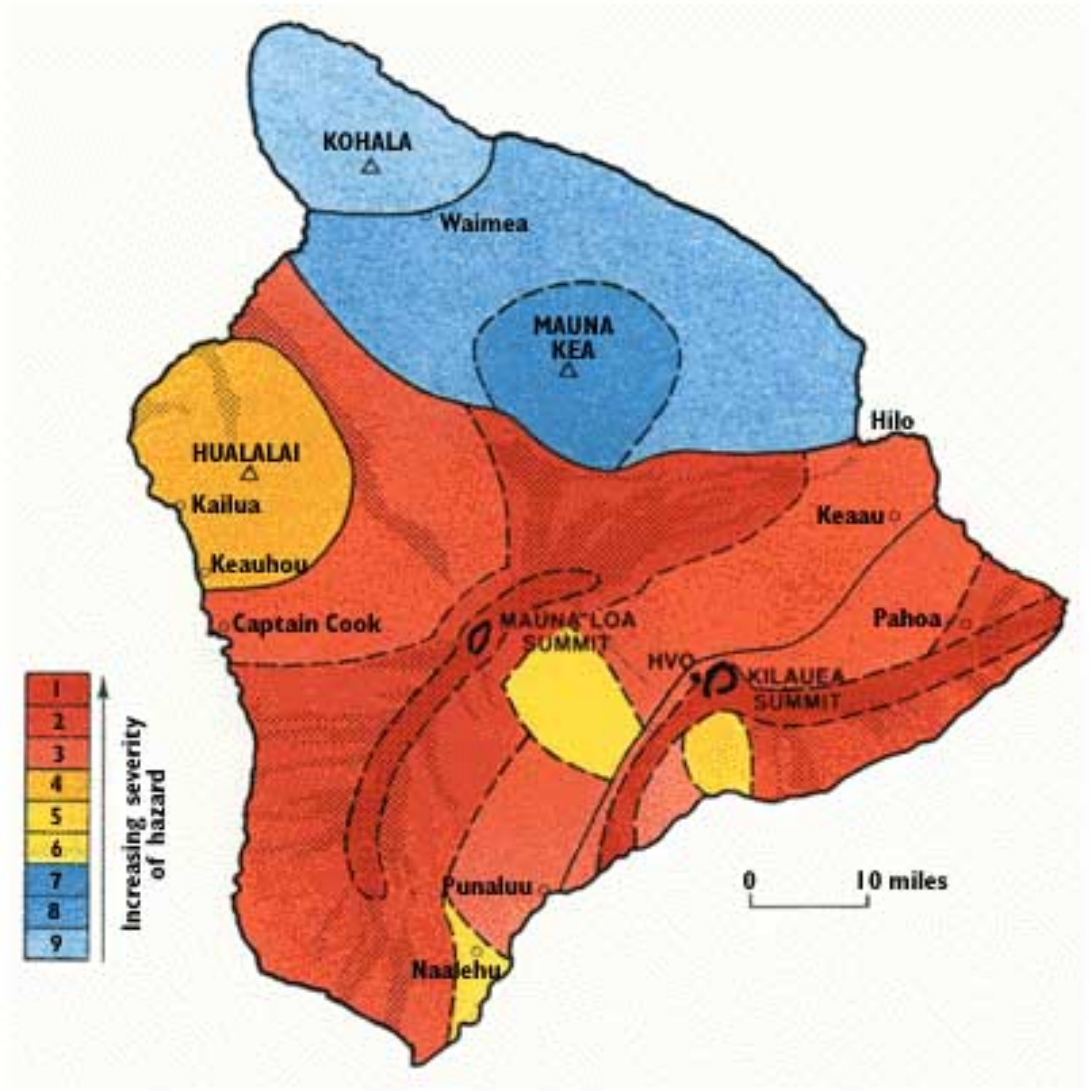
U.S. Volcano Disaster Assistance Program

- Who pays?
- Who initiates?
- Geopolitical stability

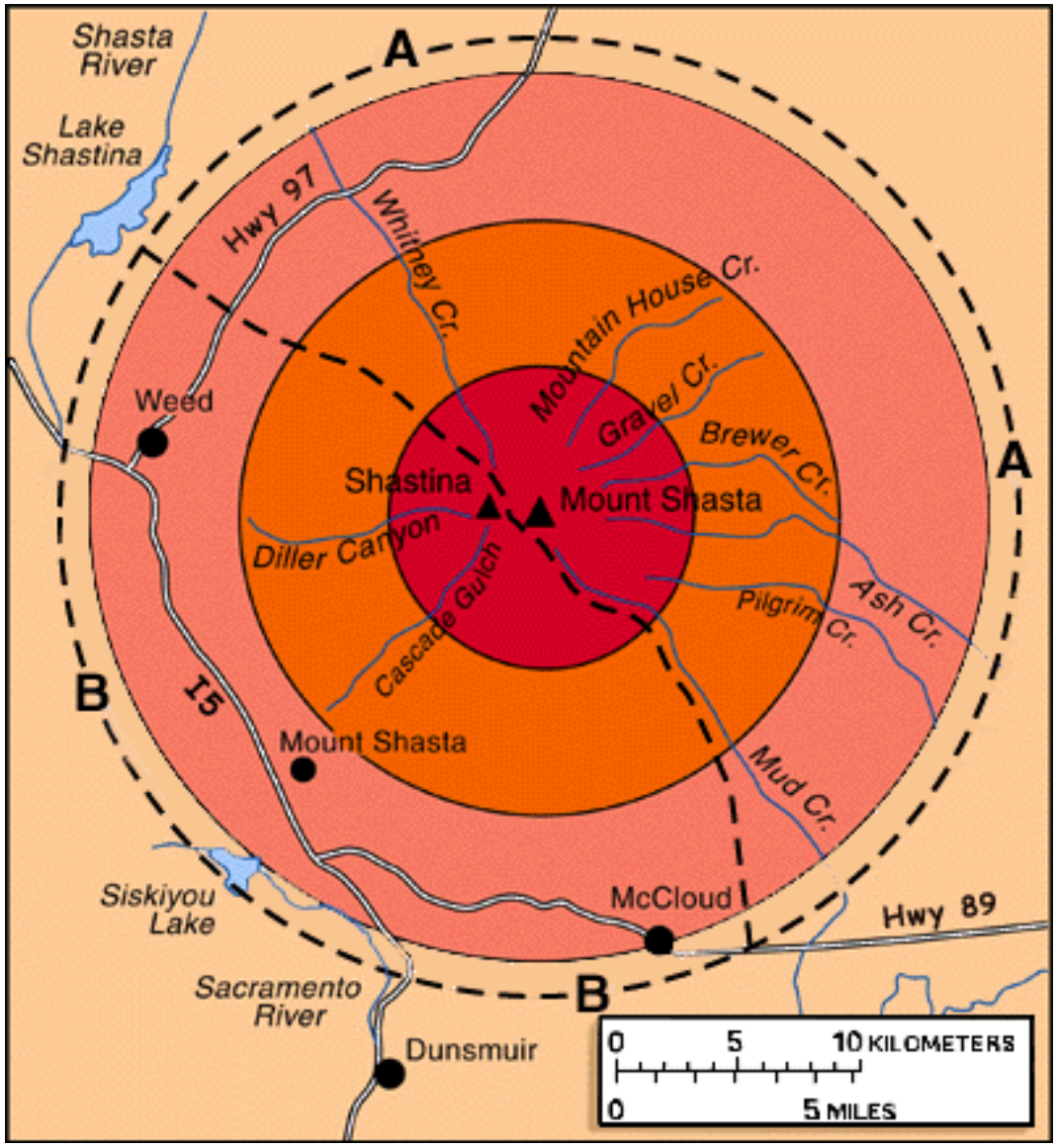
Social Policy and Volcanoes

- Monitoring and managing evacuations
- Managing property loss - volcanic zoning

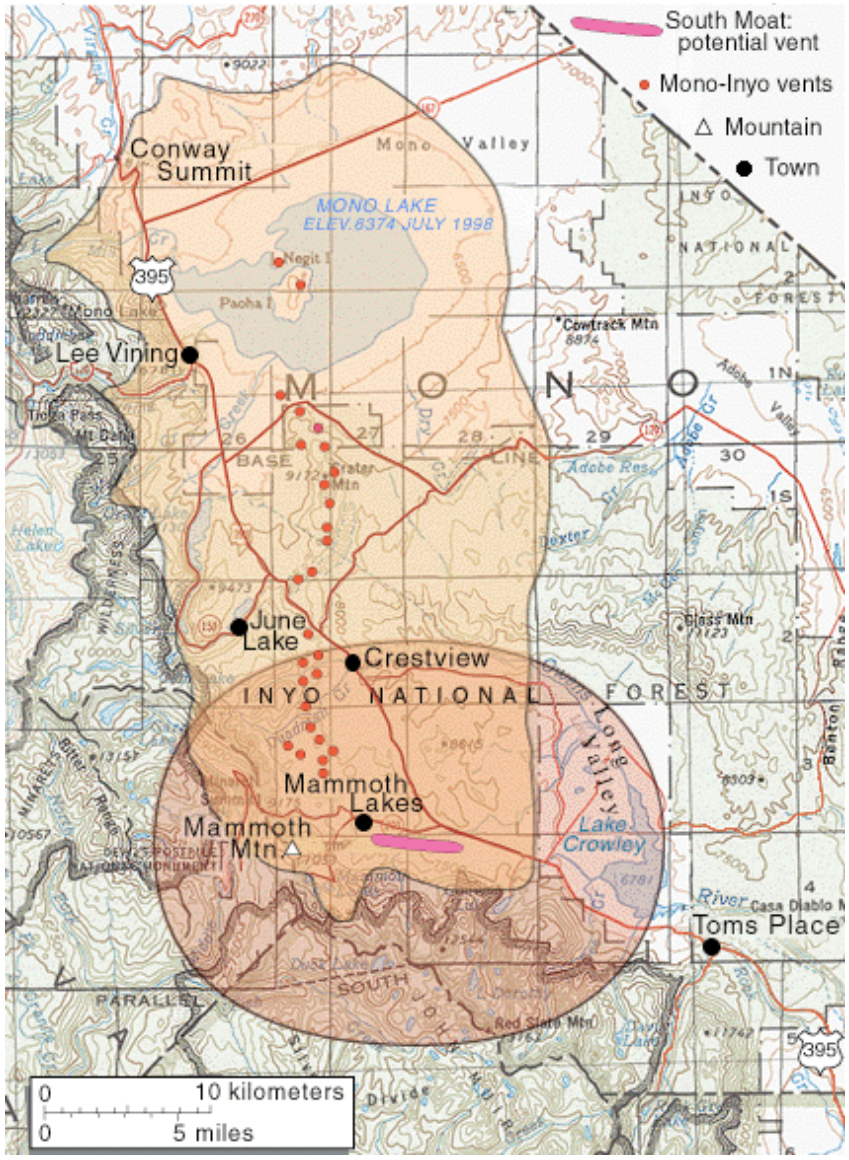
Map of the Big Island showing the volcanic hazards from lava flows. Severity of the hazard increases from zone 9 to zone 1. Shaded areas show land covered by historic flows from three of Hawaii's five volcanoes (Hualalai, Mauna Loa, and Kilauea).



USGS, http://pubs.usgs.gov/gip/hazards/maps.html



Miller, 1980, USGS Bulletin 1503



USGS http://volcanoes.usgs.gov/lvo/hazards/pfzone_both.php

Social Policy and Volcanoes

- Monitoring and managing evacuations
- Managing property loss - volcanic zoning
- Prediction