

Vulcanicity

*"Live long and
prosper"*



Introduction

Where are the volcanoes?

- Mapping exercise
- Why this pattern?
- [National Geographic Introduction](#)

What has been the impact on humans over time?

What has been the impact on the natural world over time

- E.g. Galapagos 2005
- <http://www.youtube.com/watch?v=jRfEGvp6wDU>



Extrusive landforms

Fluid

Acid

Viscous

Basalt

Andesite

Rhyolitic



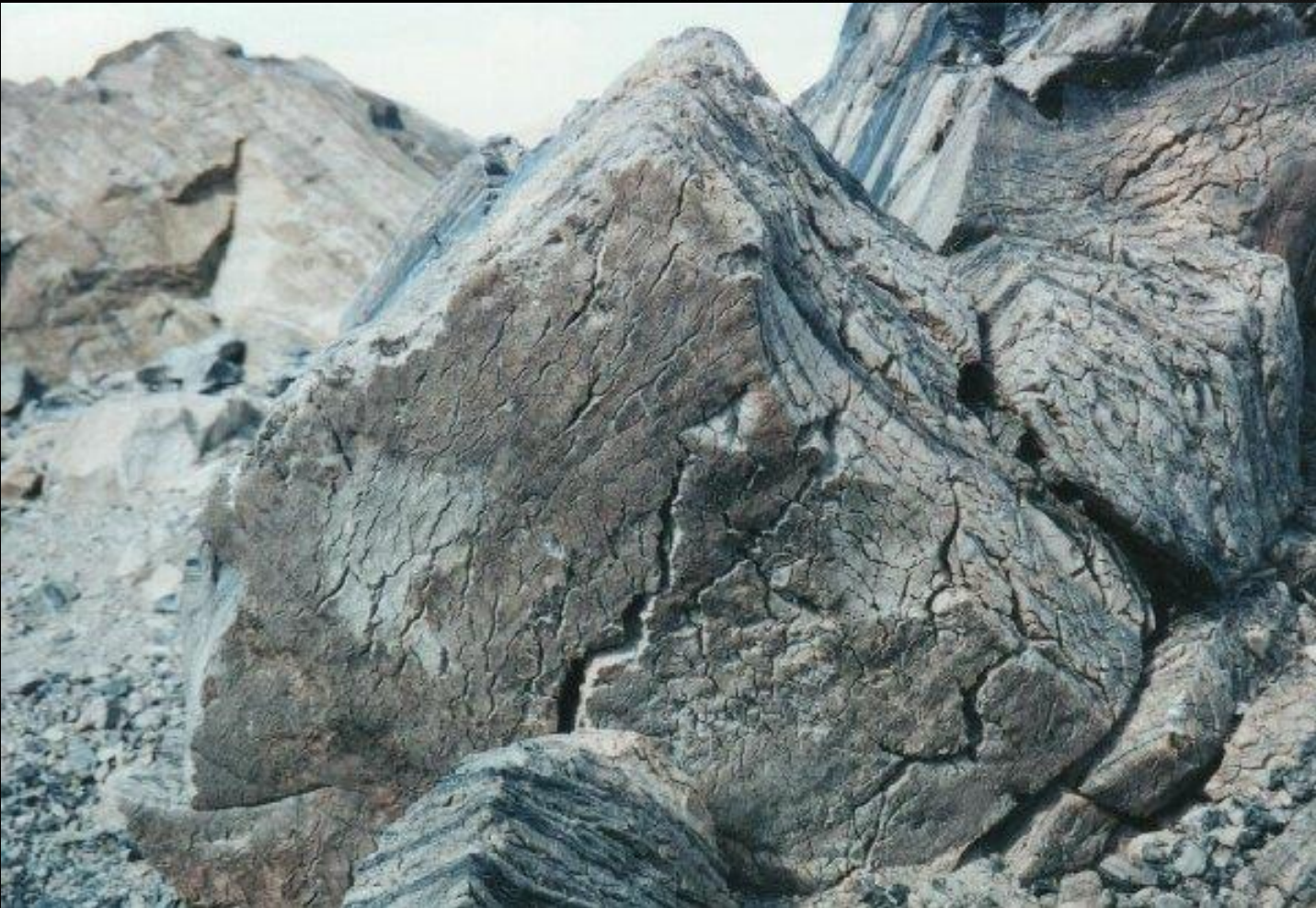
A dark volcanic rock rich in iron and magnesium minerals. Basalt is the most common volcanic rock on earth.



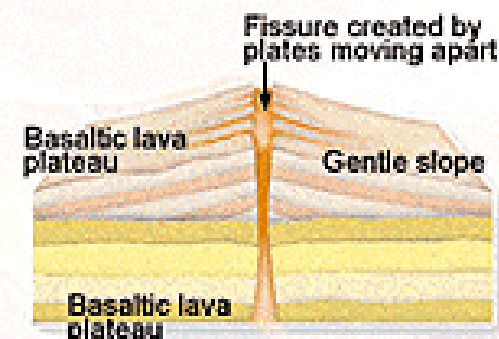
Andesite



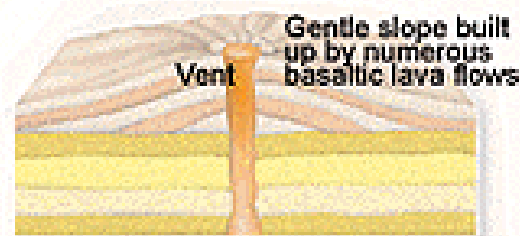
Rhyolitic



Extrusive: Types of Volcano/eruption



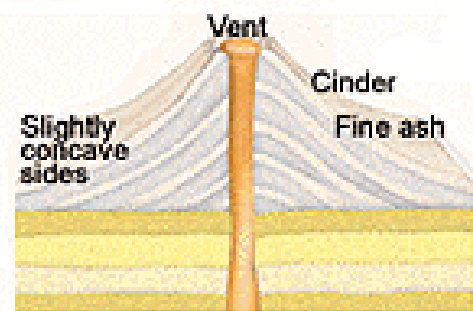
Fissure Volcano



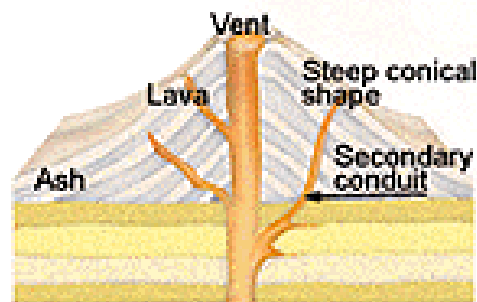
Basic Shield Volcano



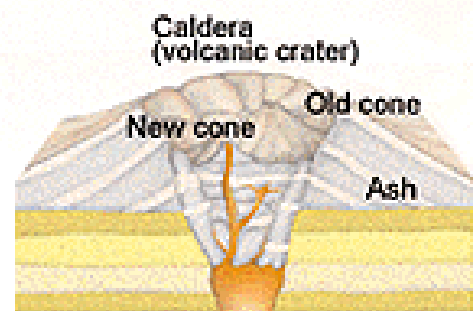
Dome Volcano



Ash-Cinder Volcano



Composite Volcano



Caldera Volcano



Extrusive Landforms: Types of volcanoes

In the surroundings of boundaries of tectonic plates the following types of volcanoes occur:

Fissure	<i>Is a long crack in the earth's surface through which magma erupts. These cracks may form as two tectonic plates pull apart. You'll find them mainly near mid-ocean ridges.</i>
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The ordinary volcanoes can be divided in different types, relating to their forms:

Shield	<i>This is a broad, shallow volcanic cone, which arises because the running lava, which is fluid and hot, cools slowly.</i>
Dome	<i>This one has a steep, convex slope from thick, fast-cooling lava</i>
Ash-cinder	<i>Throws out - besides lava - much ash into the air. Through this the volcanic cone is built up from alternate layers of ash and cinder.</i>
Composite	<i>These are also built up from alternate layers of lava and ash but, besides its main crater, it has many little craters on its slope.</i>
Caldera	<i>An older volcano with a large crater which can be 62 miles(100km) wide. In this crater many little new craters are formed.</i>

National Geographic

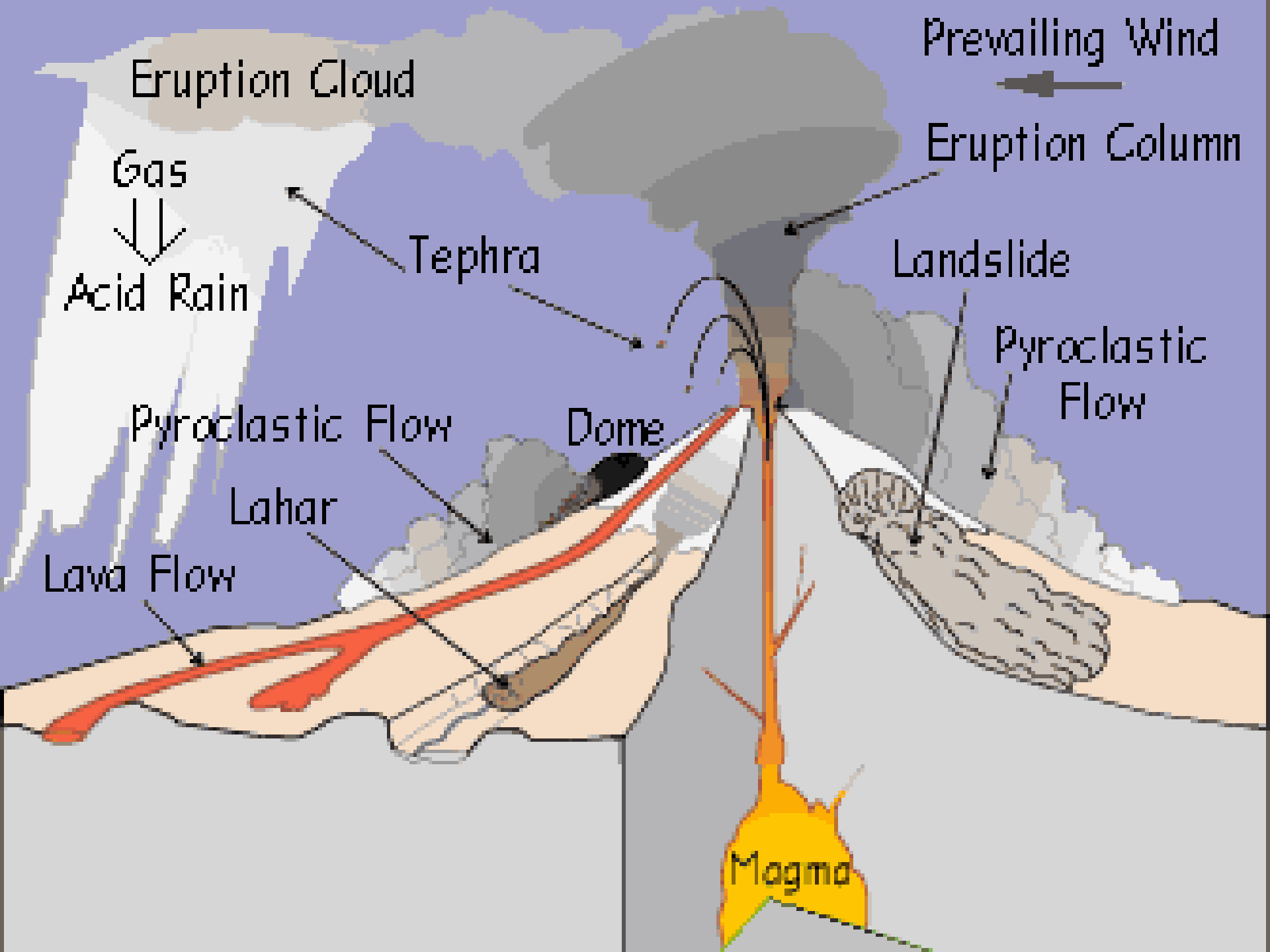
Types

Some types of volcano





Surtsey, Iceland Surtsey, Iceland; 63.30 N 20.62 W; 170 m elevation. This photo, taken on November 30, 1963, shows the sixteen- day-old cone which became the Island of Surtsey, off the southern coast of Iceland. The island's north shore touches the Arctic Circle. Born from the sea, it has provided scientists a laboratory to observe how plants and animals establish themselves in new territory. The eruption began 130 m below sea level, where it proceeded quietly until the height of the volcano approached the sea surface. Then the explosive activity could no longer be quenched by the sea. A black column of volcanic ash announced the island's birth on November 14, 1963. Jets of dense black ash shot skyward and the towering eruption cloud rose to a height of 9 km. By April of 1965, ash had blocked sea water from the crater area. Lava flows became prominent, forming a hard cap of solid rocks over the lower slopes of Surtsey. This prevented the waves from washing away the island. The three and one- half year eruption was over in June 1967.



Small Scale Extrusive Landforms

Fumaroles

Geysers



Mud pots



Formation



Examples



- Mammoth hot springs:
Yellowstone National Park
- Rotorua: New Zealand

Geothermal uses: Iceland



Tourism





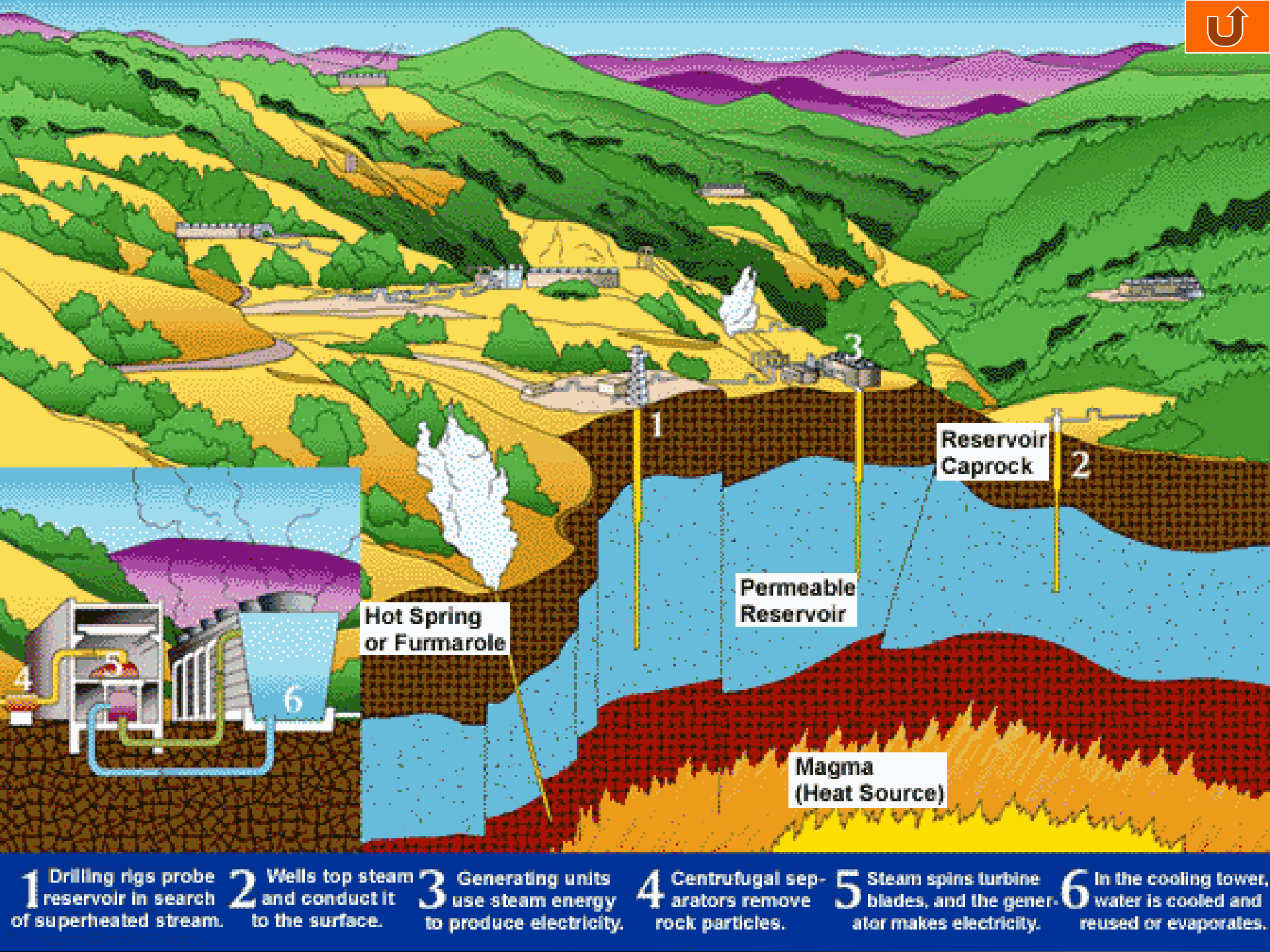
Fumaroles

Tongariro National Park

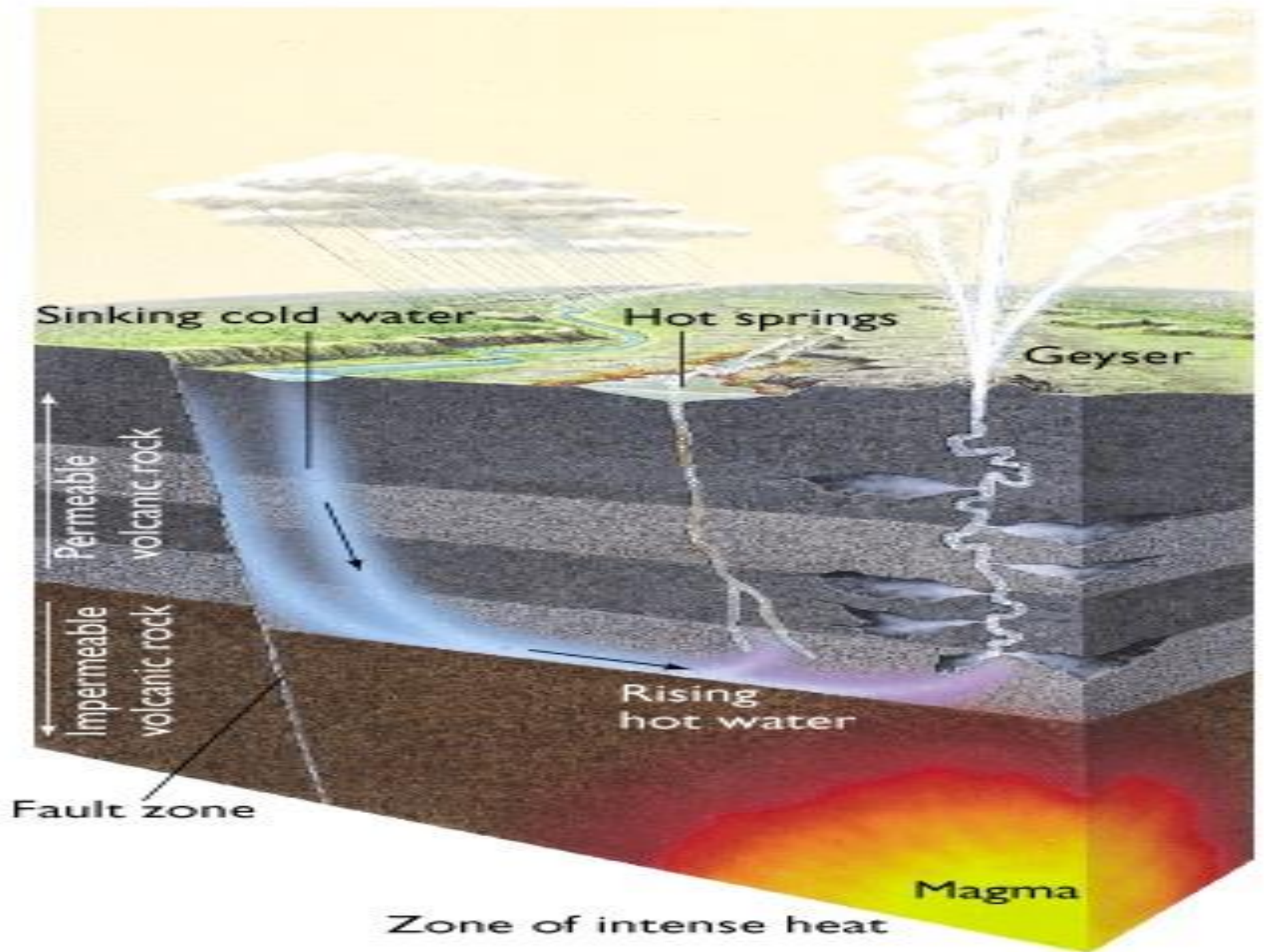


Geysers: Rotorua New Zealand





- 1 Drilling rigs probe reservoir in search of superheated steam.
- 2 Wells tap steam and conduct it to the surface.
- 3 Generating units use steam energy to produce electricity.
- 4 Centrifugal separators remove rock particles.
- 5 Steam spins turbine blades, and the generator makes electricity.
- 6 In the cooling tower, water is cooled and reused or evaporates.



Mud pots: New Zealand Rotarura



Intrusive Landforms

Dykes: Magma forces upwards between fissures



Sills: Magma forced between rock layers



Batholith: Large underground magma reservoir

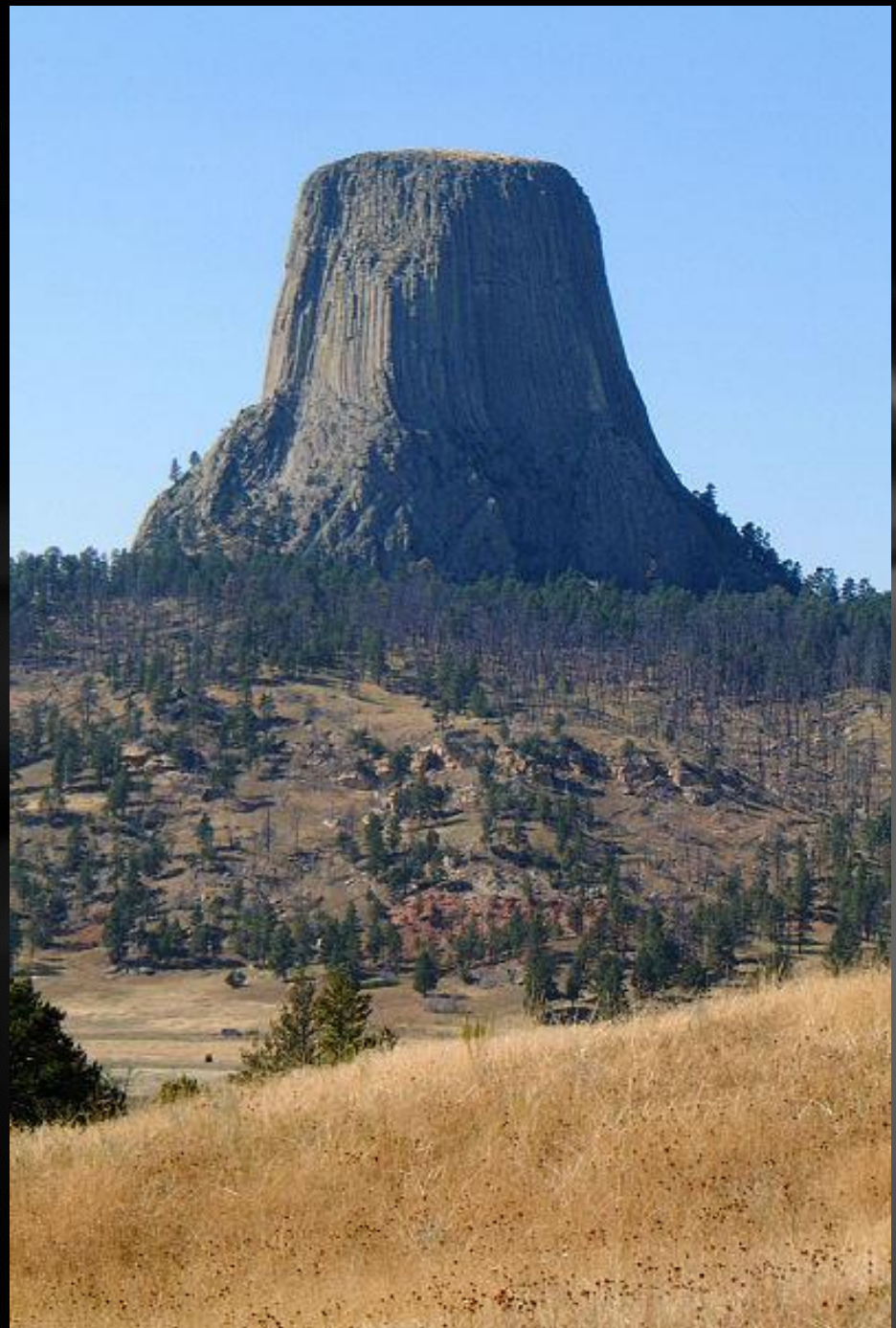


Examples

- Island of Aaron dykes, Great Dyke of Zimbabwe several miles wide and 312 miles long
- Great Whin Sill (Hadrian's Wall) Robin Hood
- Dartmoor, Devon, Yosemite



Devils Tower, an igneous intrusion exposed when the surrounding softer rock eroded away



Dykes cross cutting bedding: Greece



Dyke





Devin Kouts stands next to the igneous dyke in Five Springs cave. The small black flecks are mica (USA)



Dyke cross-cutting other igneous rocks
Whitsunday Islands
Queensland

Sill: Colorado United states & Salisbury Crag, Edinburgh

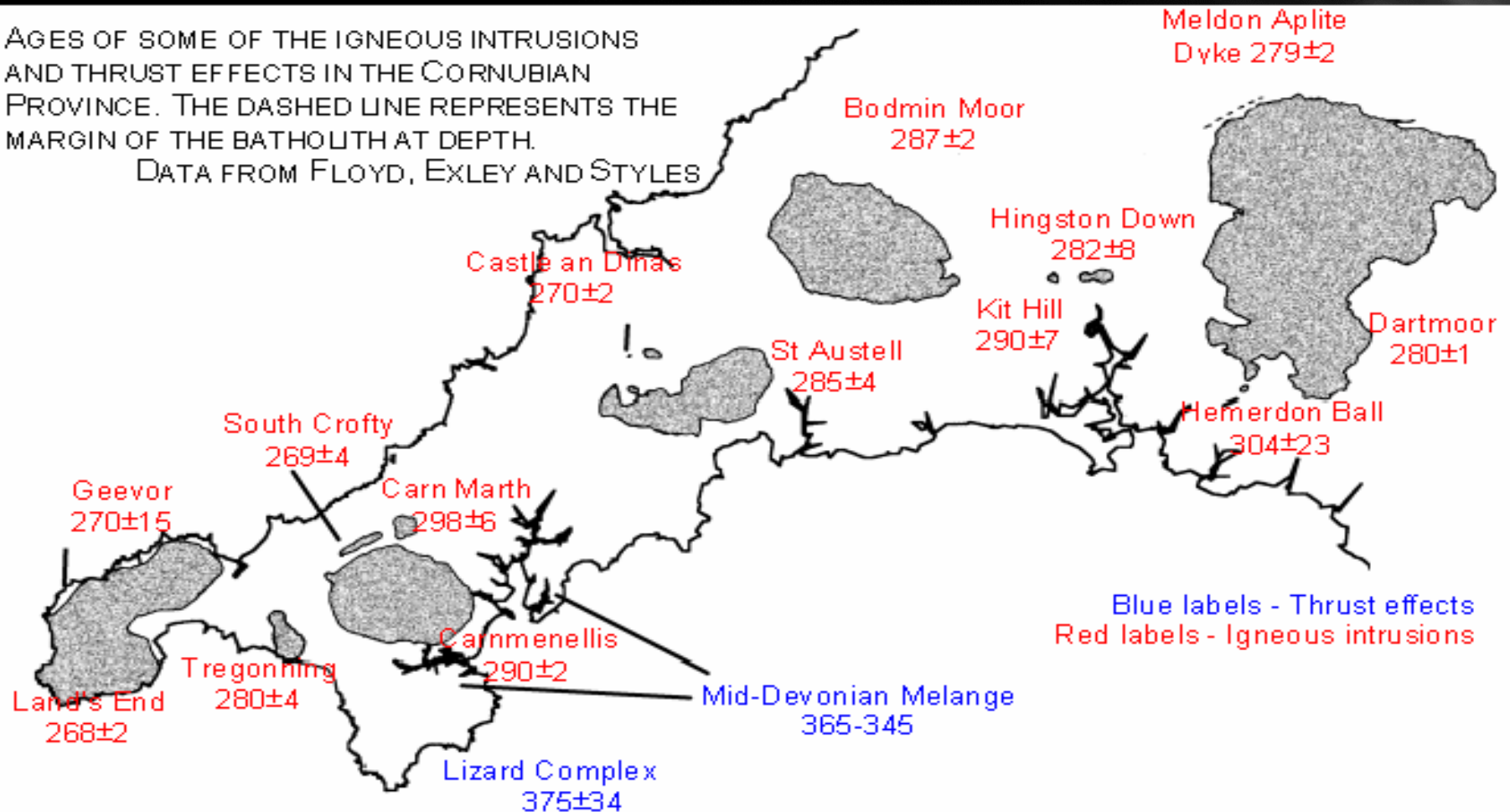


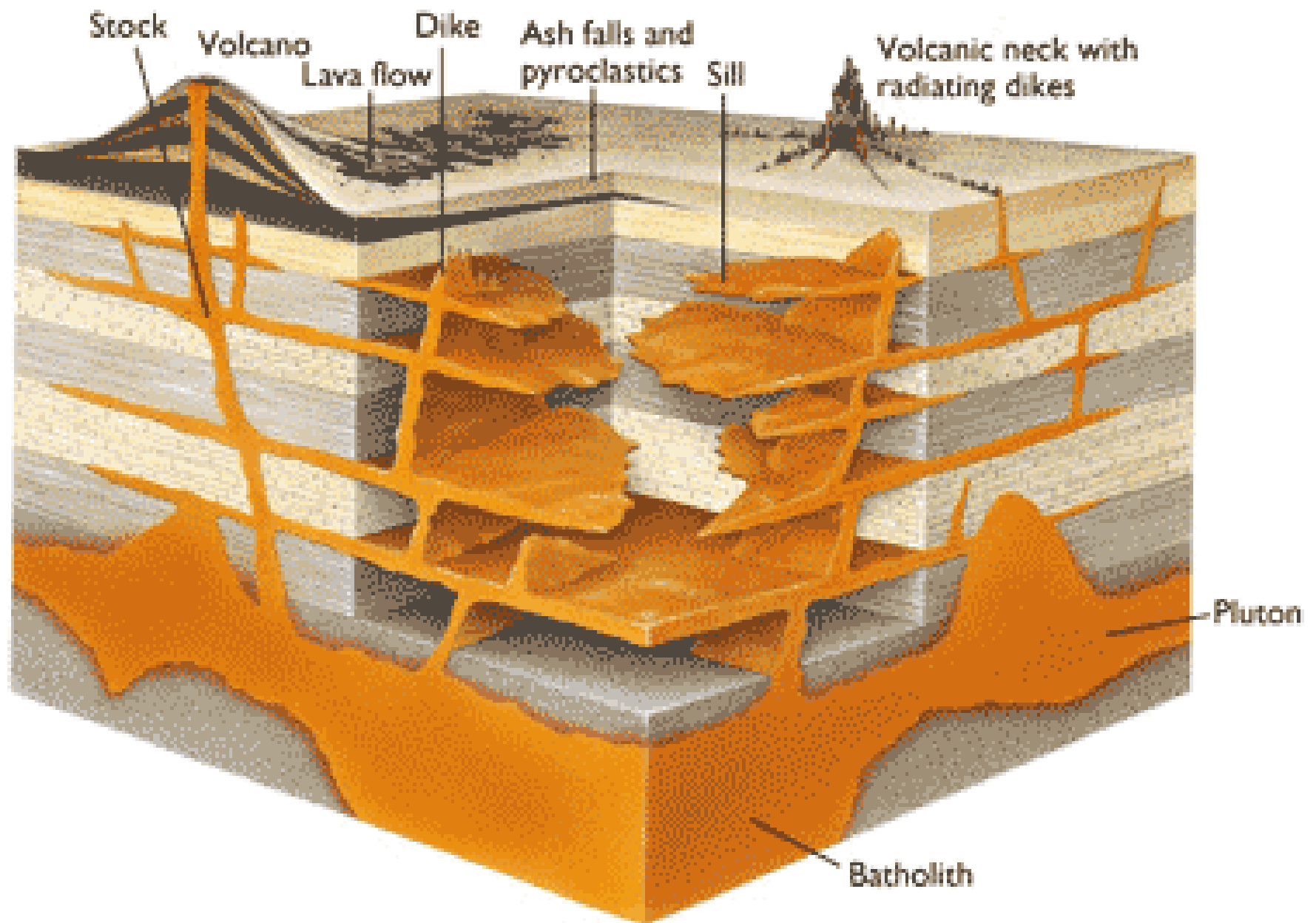
Sill



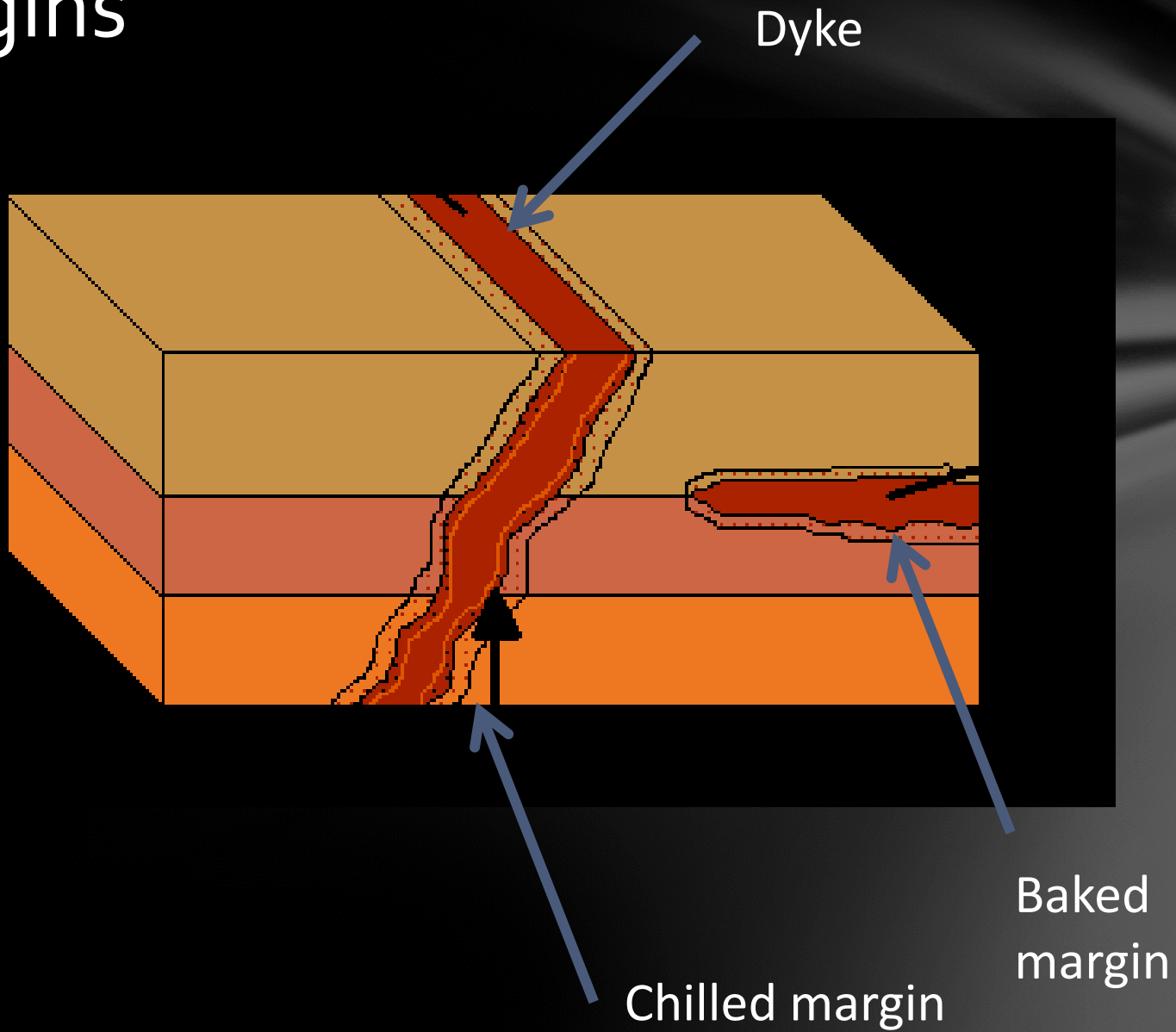
A BATHOLITH is an irregular mass of coarse-grained, intrusive igneous rock that has an exposed surface of more than a hundred square kilometres. Batholiths form deep within the Earth's crust, many kilometres beneath the surface. With time, the overlying rocks erode, exposing the rock of the batholith.

AGES OF SOME OF THE IGNEOUS INTRUSIONS
AND THRUST EFFECTS IN THE CORNUBIAN
PROVINCE. THE DASHED LINE REPRESENTS THE
MARGIN OF THE BATHOLITH AT DEPTH.
DATA FROM FLOYD, EXLEY AND STYLES





Margins



Half Dome Batholith: Yosemite, California

Former land surface



Human Impact

Benefits	Hazards
Weather	Earthquakes
Minerals	Gases
Building Material	Mudflows
Defence	Waves
Geothermal	Ash
Tourism	Climatic change
Sunsets	Global warming
Respect	Communications

How do volcanoes and earthquakes influence humans?

1. Construct a table of benefits and hazards
2. Discuss

Prediction and Location of Volcanic activity, including earthquakes

Why is it important? Discuss

Science



Human considerations

Developed world

- Building design
- Management



Developing world

- Building design
- Management



Future



Richter Scale / Case studies

Amplitude

Seismograph

- epicentre

Logarithmic: Times stronger

1,10,100,1000,10000,100,000 etc

1 2 3 4 5 6

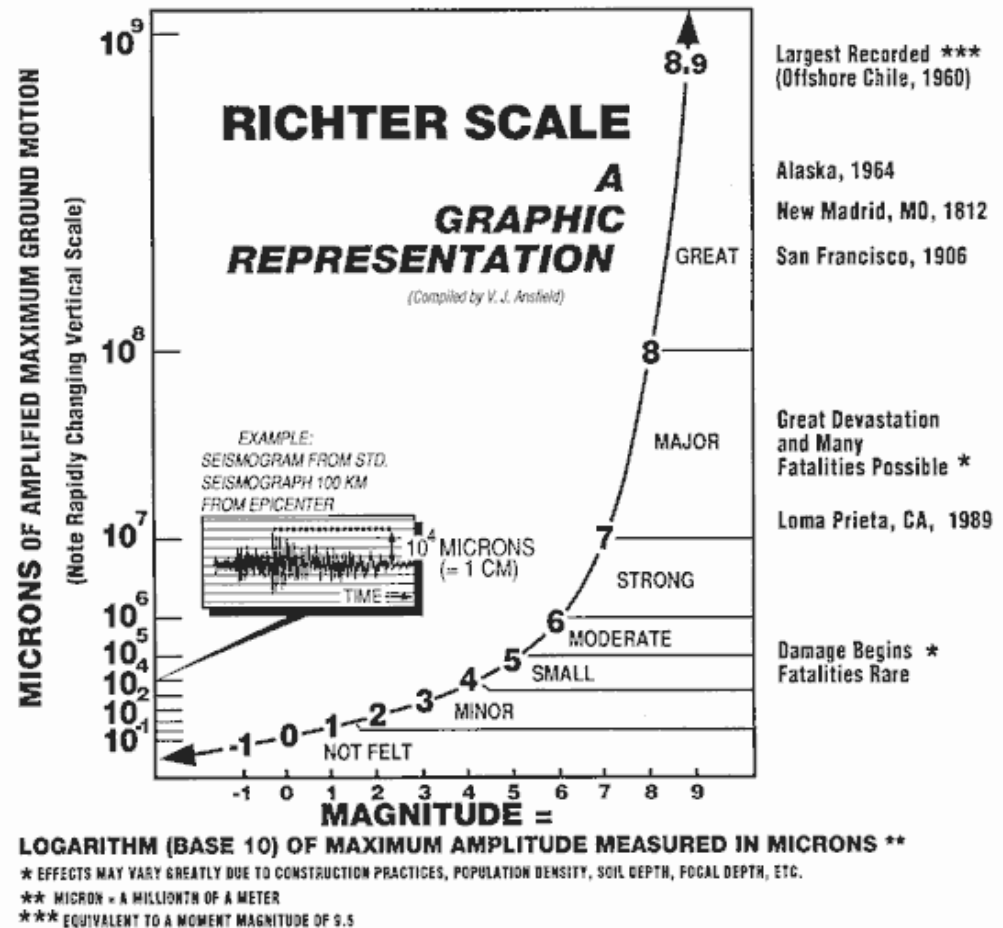
3 =only detectable with seismograph

5= trees sway, minor damage

7=some houses collapse, ground breaks

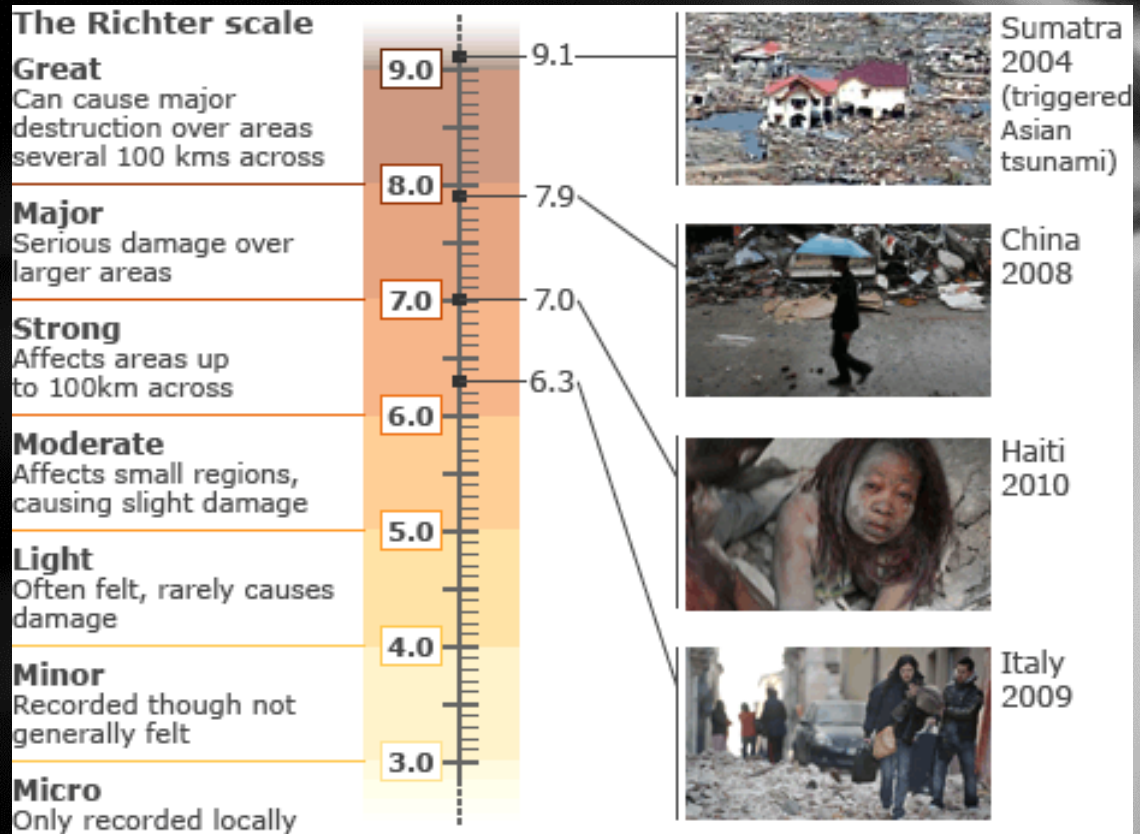
8=total destruction, landslides, tsunami

An alternative measurement is the Mercalli Scale



Case Study

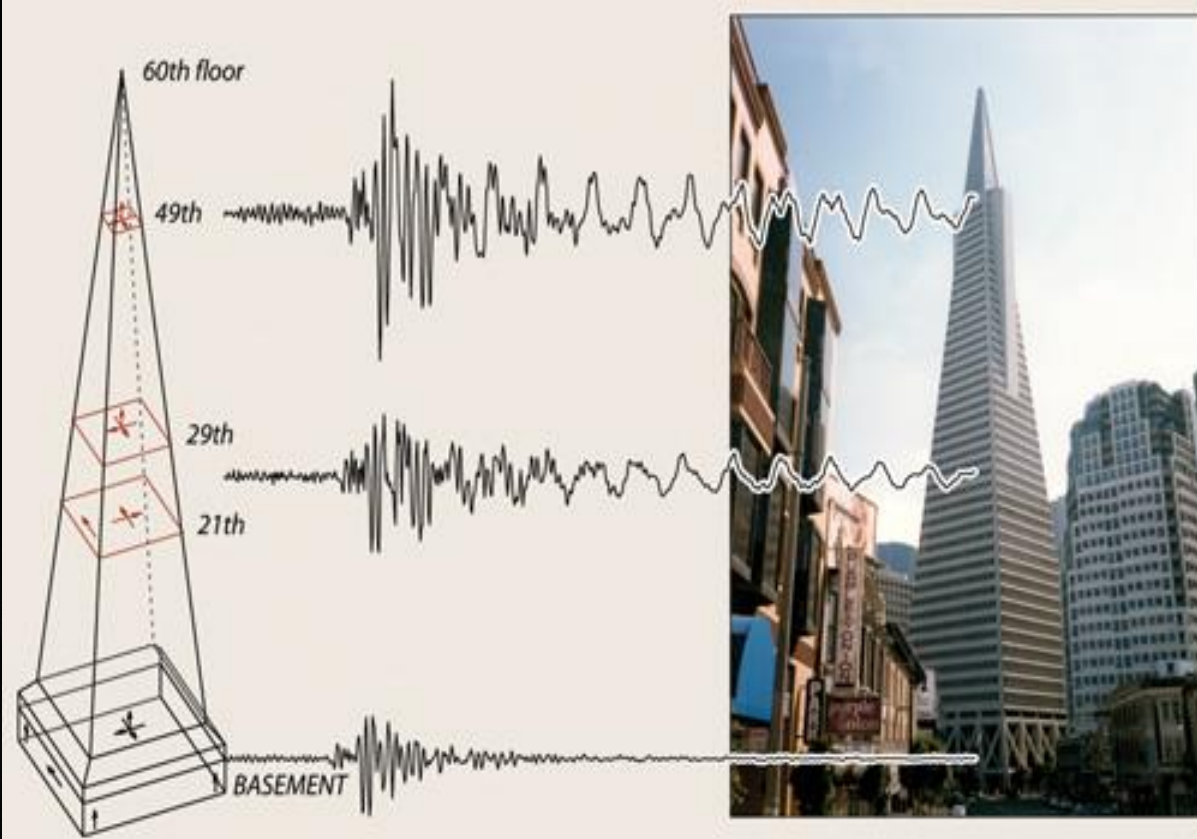
- **Rocky Mt Colorado** decided to dump waste water under ground from 1962
- Increase in earth quake activity 700 minor in 3 yrs
- Directly related to amount of liquid
- Injection lubricated faults
- Stopped in 1965 and no more earthquakes
- **Nevada nuclear test site** 1968
- Result: earthquakes
- **1995 Pacific France Nuclear test programme**





Earthquake Research

Parkfield, (Cal.)
Earthquake capital
of the world and
high tech
monitoring and
research systems



In 1977, Congress authorized the creation of the National Earthquake Hazards Reduction Program (NEHRP) to improve the Nation's understanding of earthquake hazards and to mitigate their effects. Earthquakes are the most costly natural hazard faced by the United States. Twenty-five years of work by the U.S. Geological Survey (USGS), in close cooperation with the three other NEHRP agencies, has yielded major advances in earthquake preparedness and monitoring, as well as a vastly improved understanding of earthquake hazards, processes, and effects. The USGS is poised to build on these accomplishments, helping through NEHRP to protect lives and property in the future earthquakes that are certain to strike the United States.

Kobe, Japan, 1995, 80,000 buildings damaged

<http://www.5min.com/Video/Disaster-Management-in-Kobe-Japan-416310413>

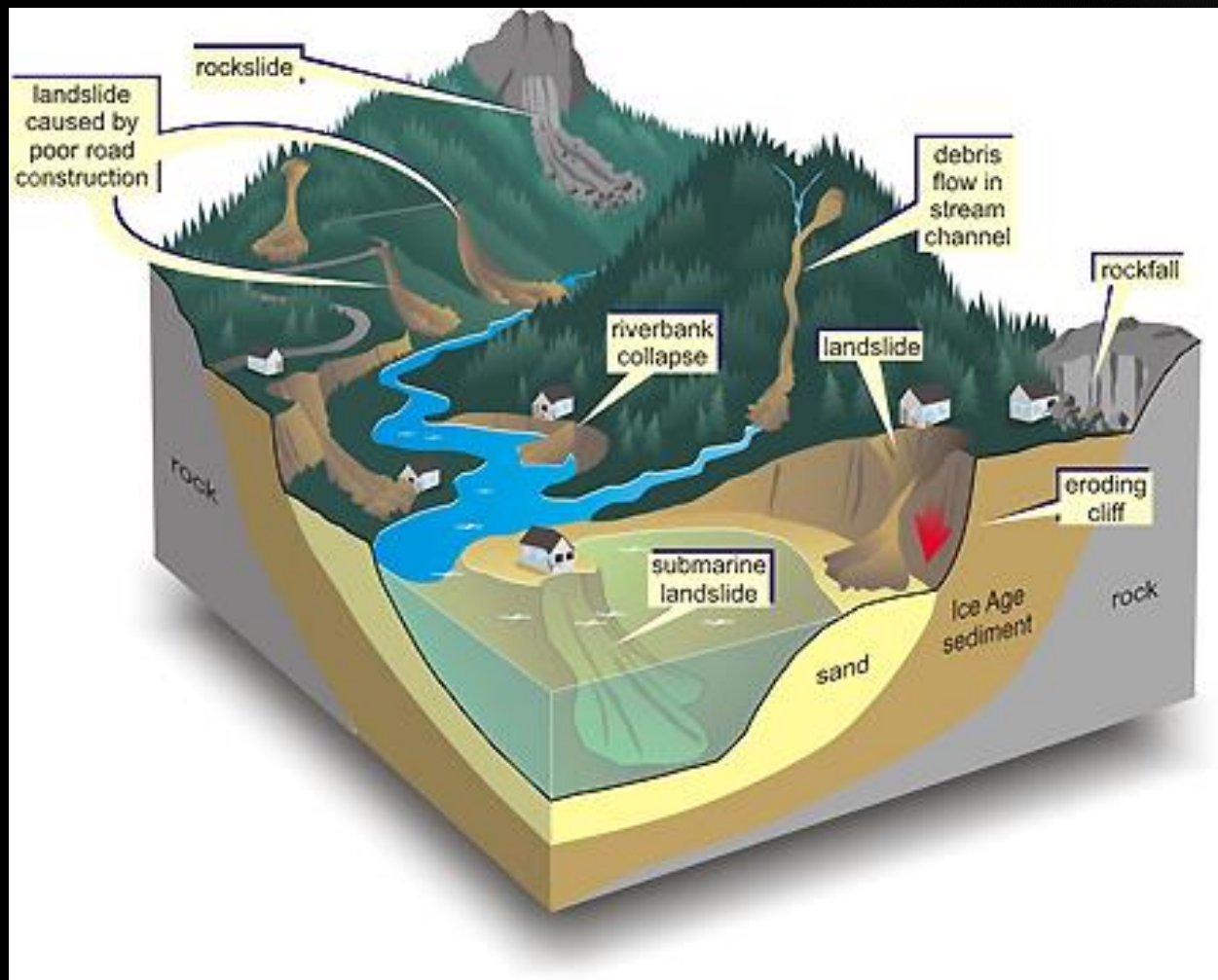


China

The Eastern Himalayan Mountain Range is possibly the world's most seismically active area. Tibet and China have recorded massive earthquakes. In the 1900's, twelve earthquakes with magnitudes greater than 8.0 have occurred. In Tangshan, China, an 8.2 earthquake shook the region on July 28, 1976 and claimed the lives of 240,000. In Gansu, China on Dec. 16, 1920, an 8.6 quake killed 100,000.



Natural Disaster Management

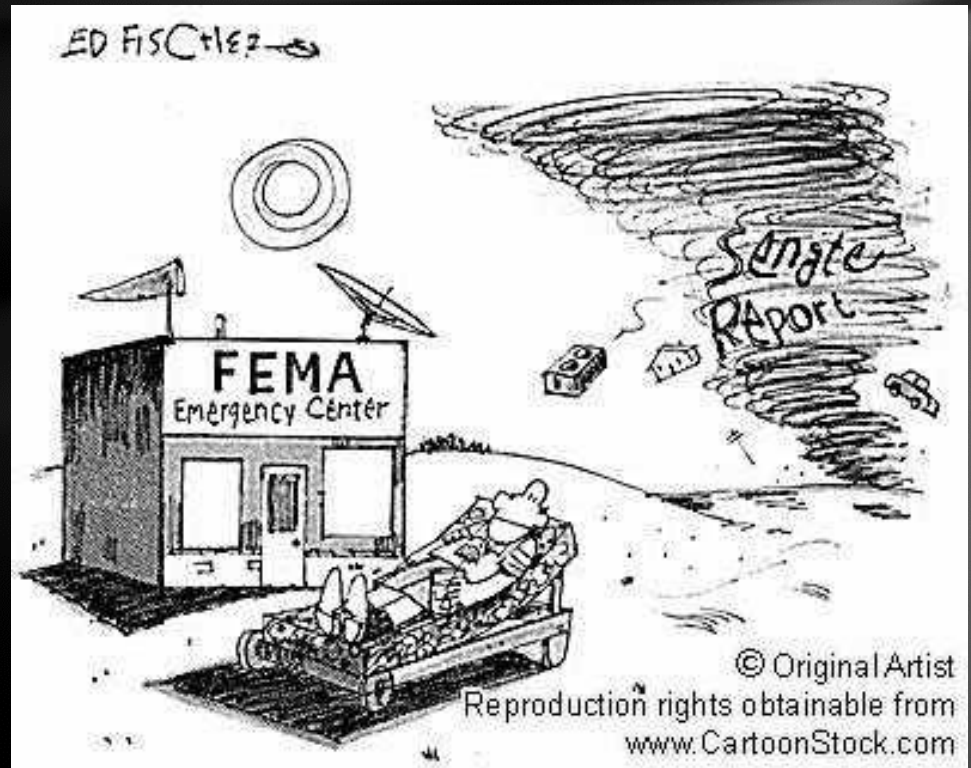


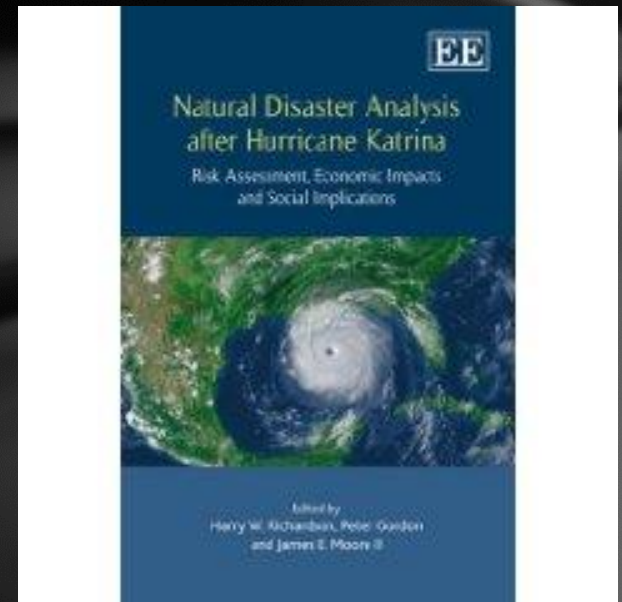
How do we manage disasters?

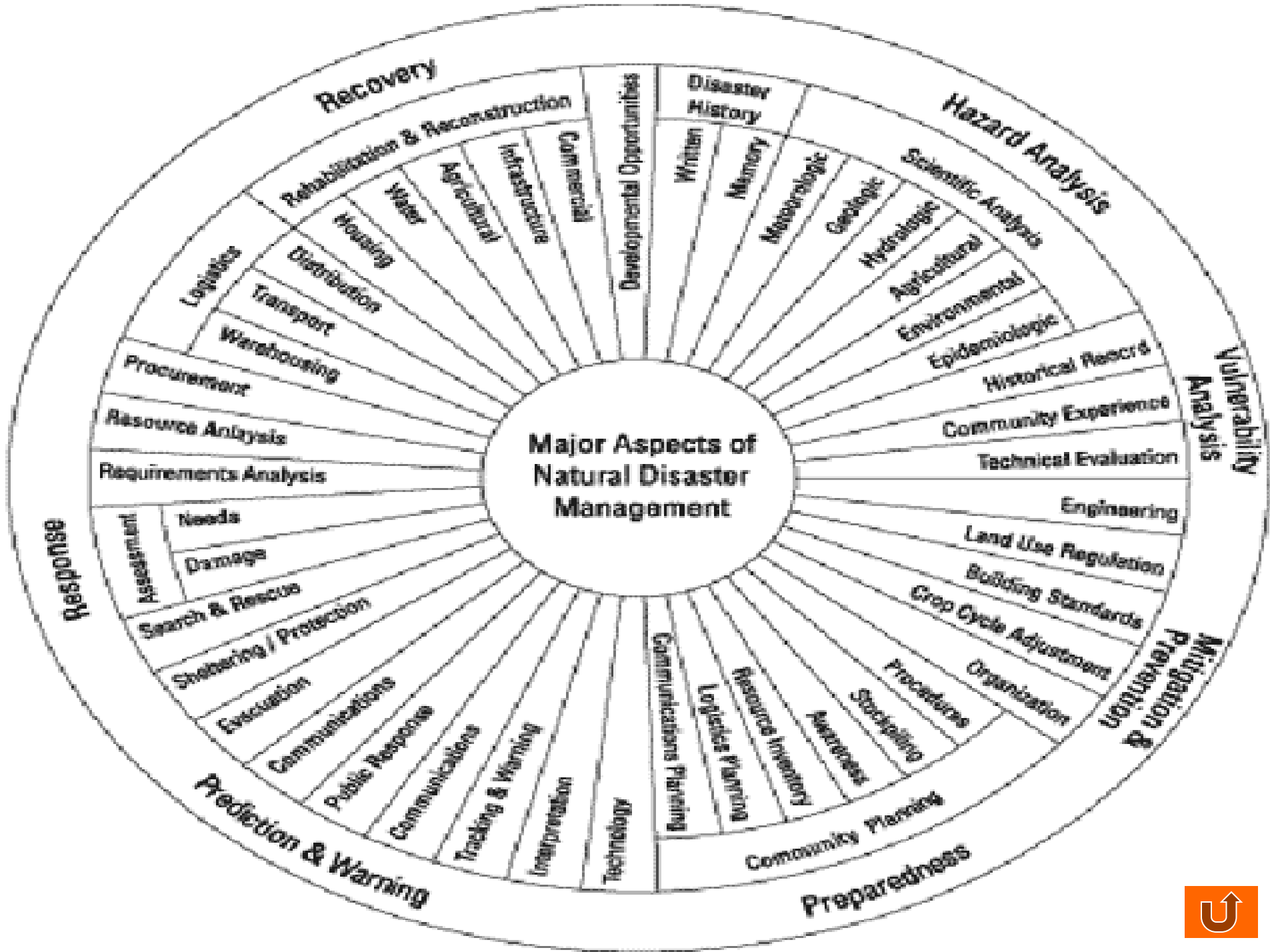
1. Spider diagram to answer the question.
2. What is the probability of the disaster happening?
3. What is the cost if it happens?
4. What is the cost of solving the problem?
5. Who, what, how?



1. Developed
2. Developing







Conclusion

- Geological conservation
- Important research tool in conservation e.g. Surtsey
- Important for human conservation

