

State of Cascades Volcanoes

May 2022

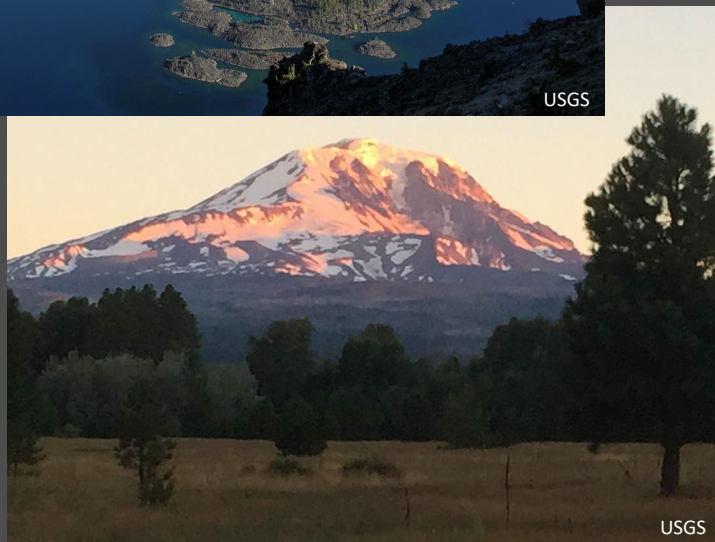
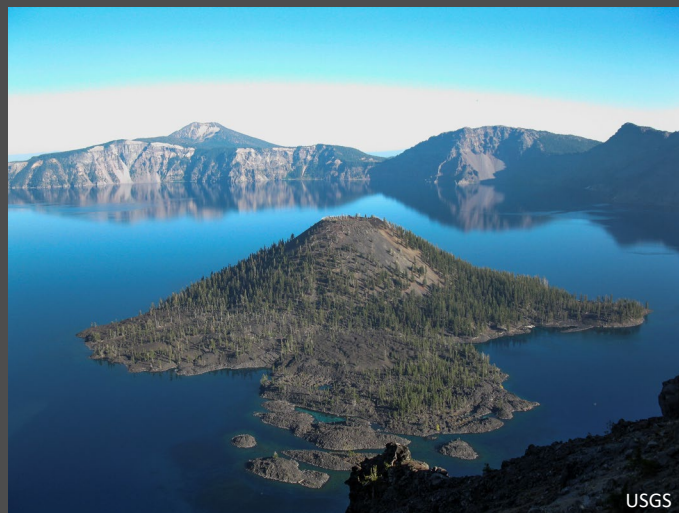
Jon J. Major

Scientist-in-Charge

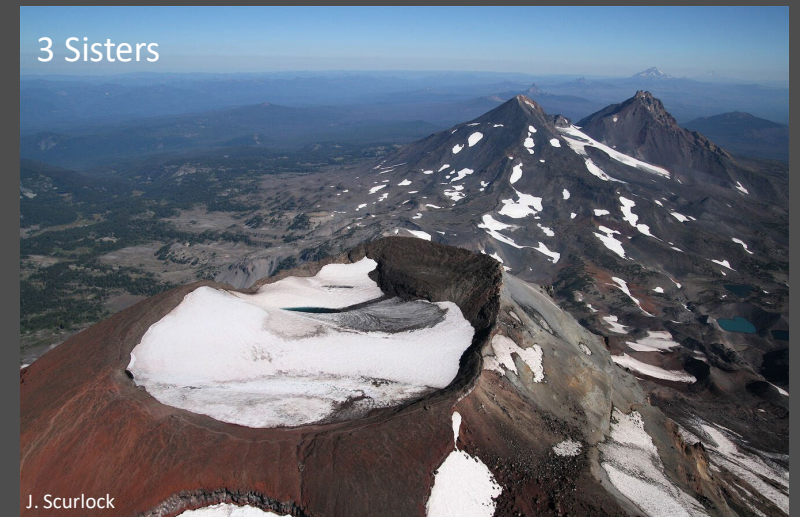
U.S. Geological Survey

Cascades Volcano Observatory

Vancouver, Washington

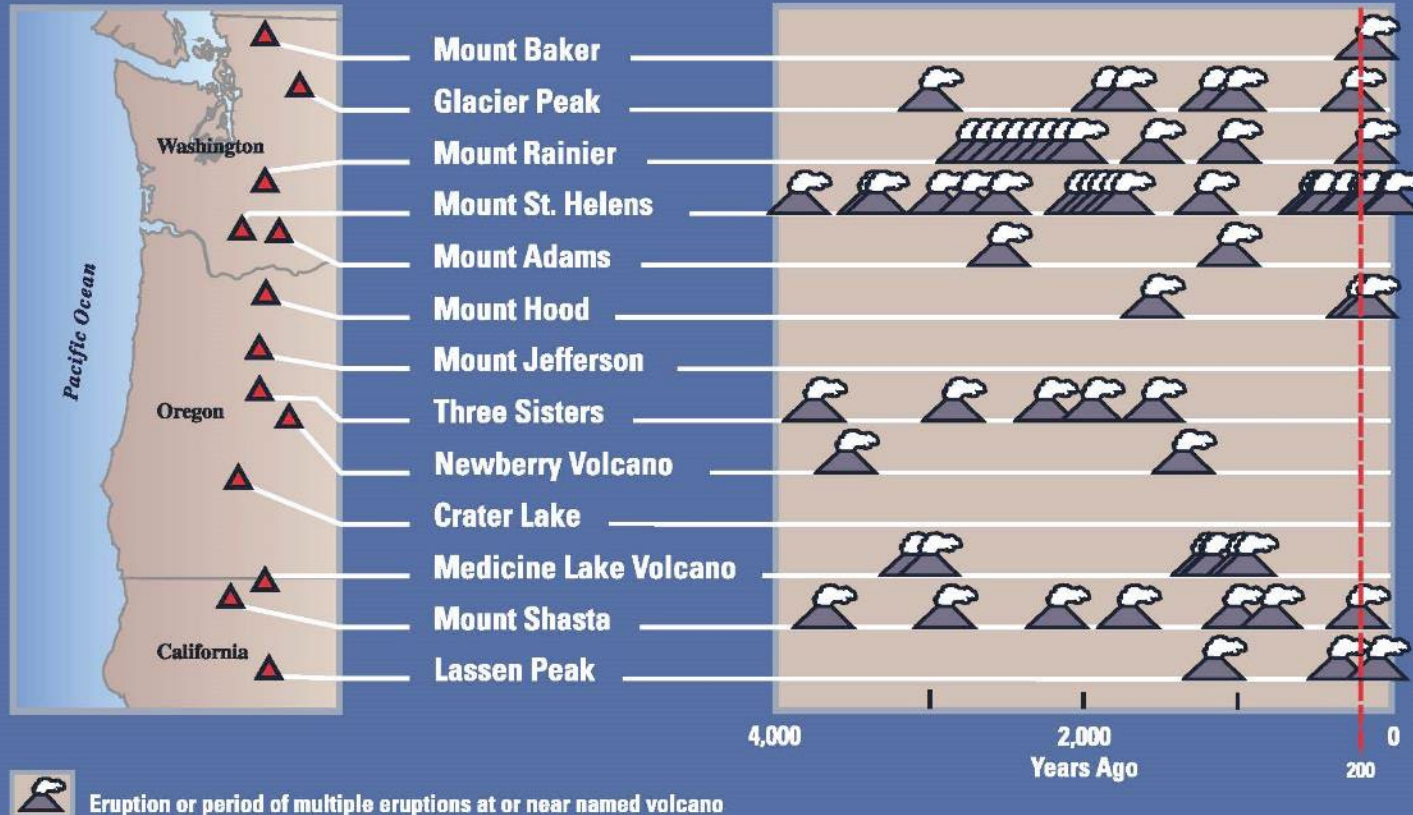


Cascade Range is home to many volcanoes and volcanic fields—charismatic landforms...



...that are geologically active

Eruptions in the Cascade Range During the Past 4,000 Years

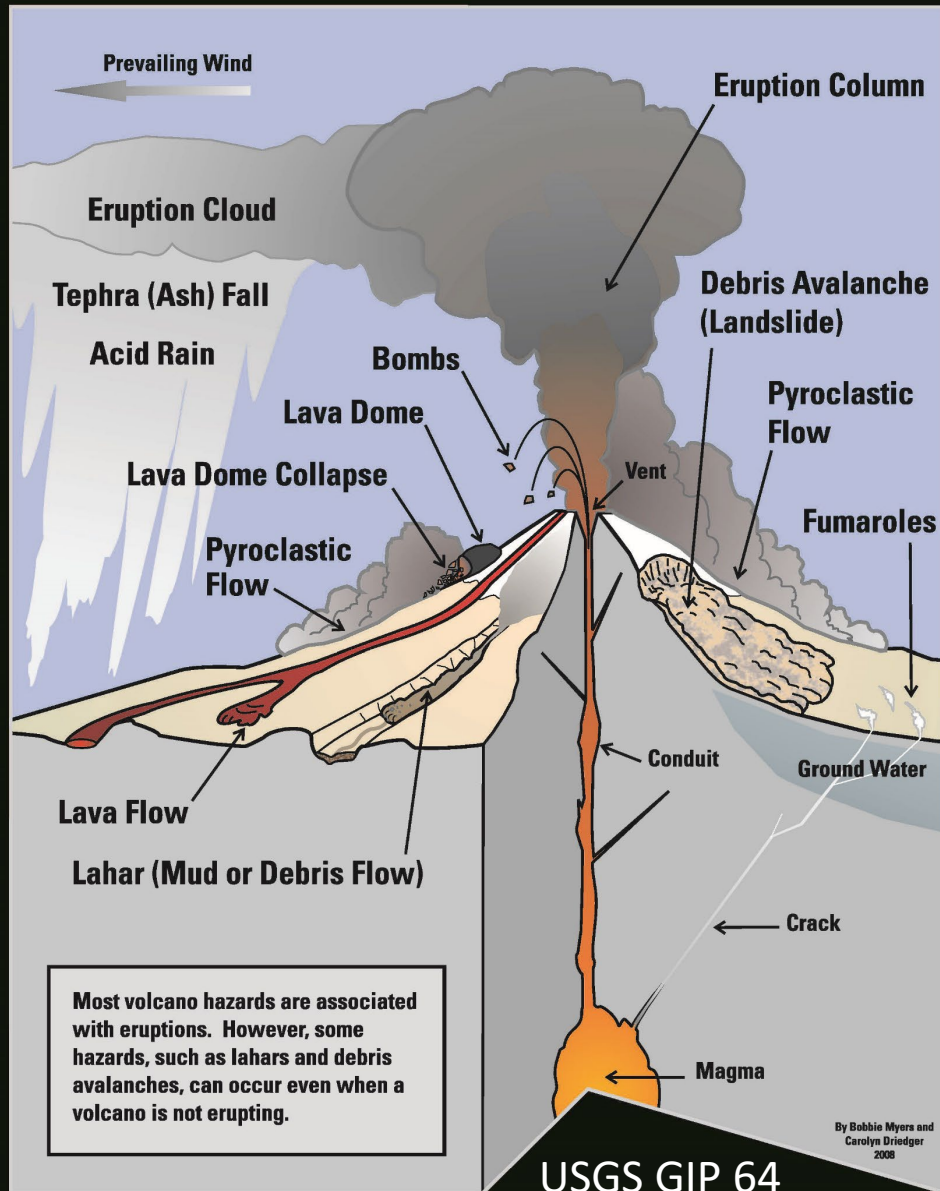


Cascade Volcano Stats:

When averaged over the last 12,000 years, the Cascades experience about two eruptions per century

This may not appear significant over a single human lifetime, but *frequency is significant over generational timeframes and planning horizons*

Geologic Hazards at Volcanoes

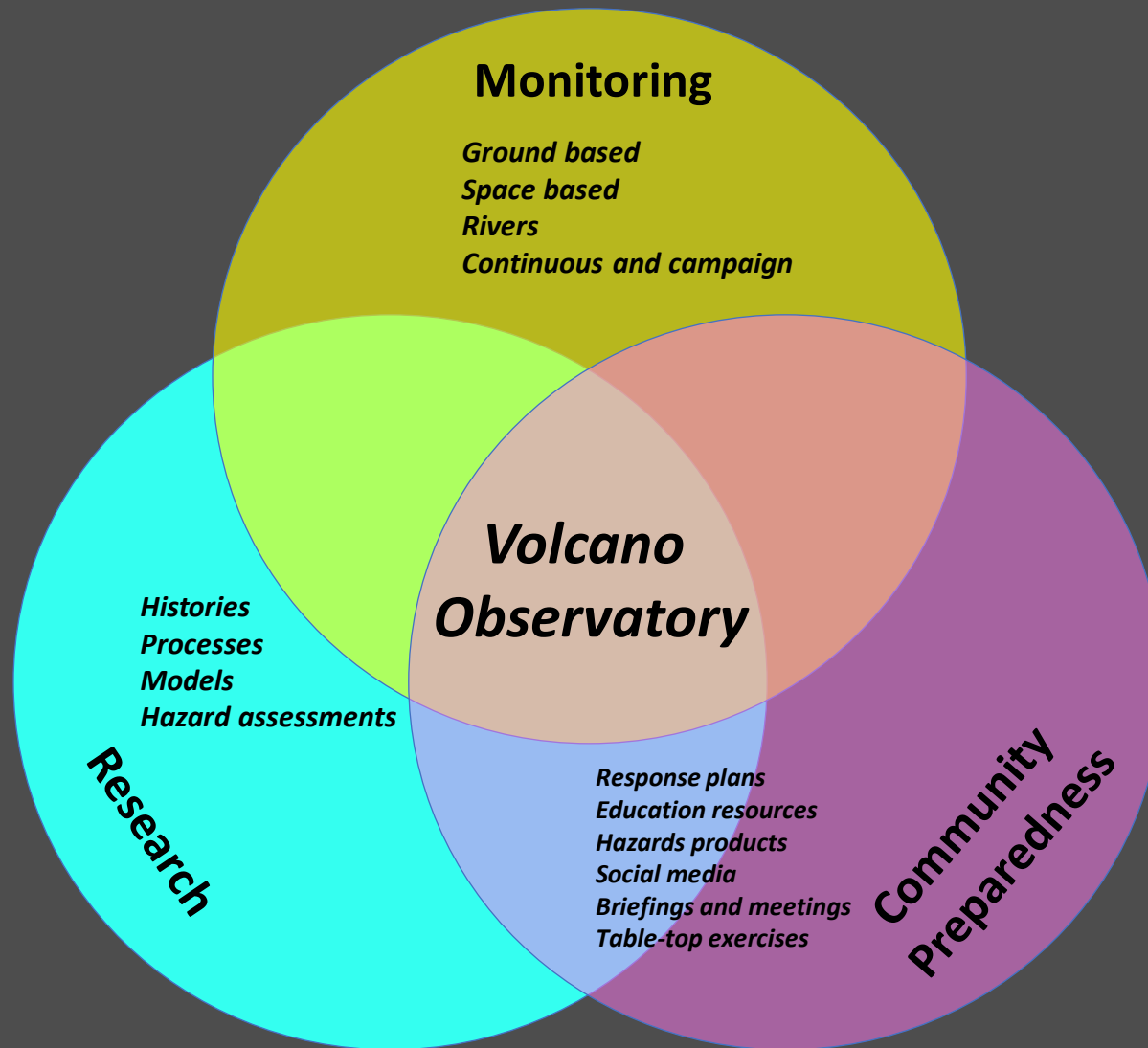


Major volcano hazards flow and fall

(Near source, far reaching, long duration)

- Near source (to ~15 mi) subject to multiple hazards
- Volcanic debris flows (lahars) can affect valleys for many tens of miles downstream
- Volcanic ashfall (tephra fall) affects areas tens to hundreds of miles, or more, downwind
- Excess sediment in watersheds makes channels unstable, sometimes for years to decades

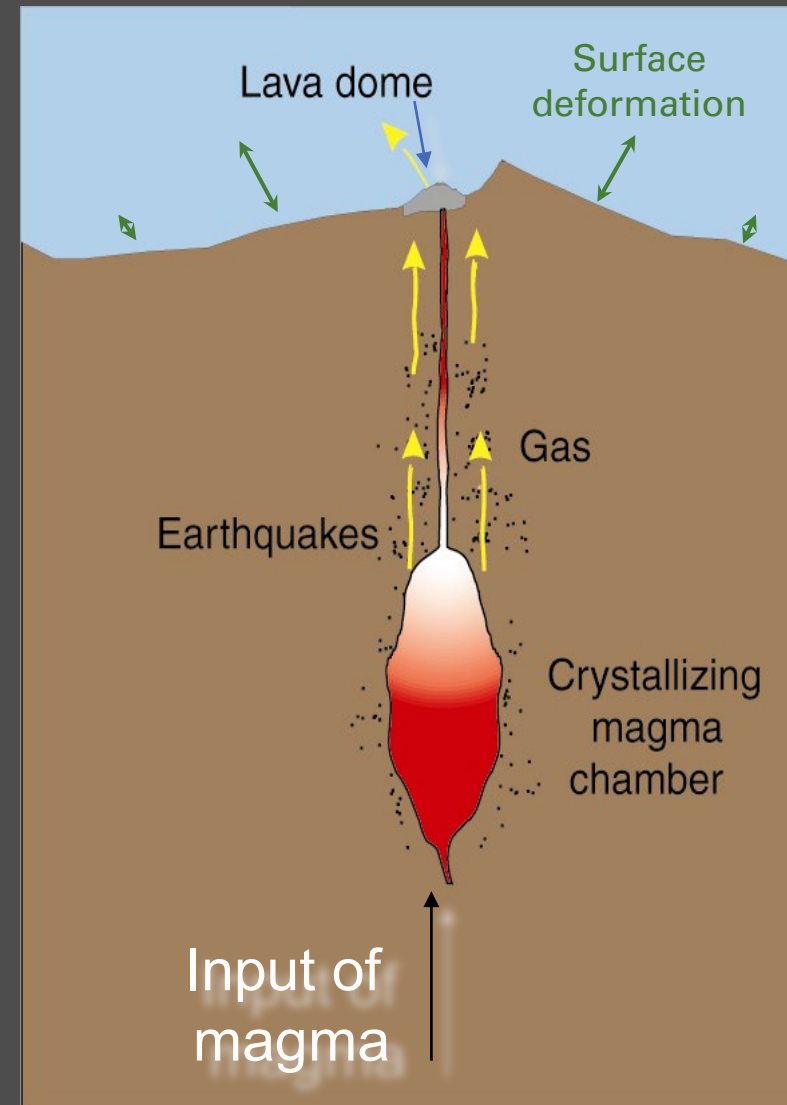
CVO: Core Functions



Volcano Monitoring

As magma moves to the surface:

- It breaks a pathway (earthquakes)
- It releases gases (CO_2 , SO_2)
- The chamber may increase or decrease in volume (surface deformation)



Mount Baker

- No unusual activity—sometimes steam
- New lahar hazard assessments are underway using next gen assessment tools
- Inadequately monitored
- In 2021, identified several sites for monitoring network expansion; presently preparing permit application package (6-8 sites)



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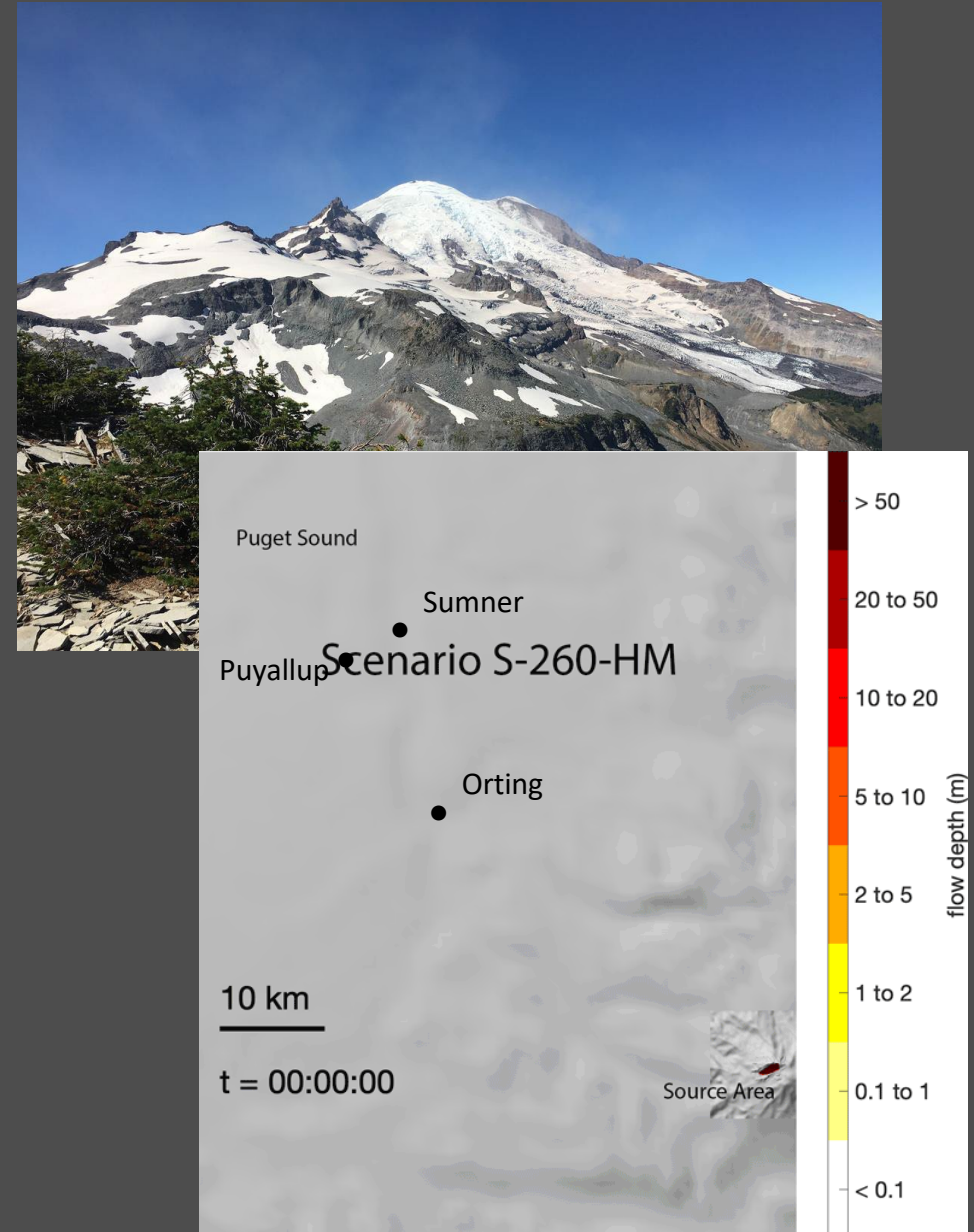
Glacier Peak

- No unusual activity
- Inadequately monitored
- USFS recently completed permit process and signed off on 4 new station installs in wilderness area.
- Currently planning to begin those installs in 2023



Mount Rainier

- **Earthquake swarms**
 - Common occurrence
 - Magnitudes $< M2.5$
 - Depths 0–2 km below sea level
- **New Puyallup/Nisqually lahar-hazard model report released**
 - George, D.L., Iverson, R.M., and Cannon, C.M., 2022, Modeling the dynamics of lahars that originate at landslides on the west side of Mount Rainier, Washington. U.S. Geological Survey Open-File Report 2021-1118. <https://doi.org/10.3133/ofr20211118>
- Supplements existing hazards assessment; provides finer scale details of lahars in some valleys
- Complementary YouTube video also produced: <https://www.youtube.com/watch?v=RYTbfySHSxU>



Mount Rainier Lahar Detection

- Planning significant field campaigns in coming months to install several sites within and outside Park
- With both seismic and infrasound data, we can provide more precise information about the location, timing, and relative vigor of an event
- This leads to improved early hazard warnings



J. Major

Mount Adams

- No unusual activity
- Lahars are a concern
- Inadequately monitored
- New station sites have been identified
- Targeting install of 5 sites, likely in 2023–2024



USGS

Mount St. Helens

- Station maintenance and upgrades
- Working with USFS and COE to establish new, temp lake-level station on Spirit Lake
- Spirit Lake breach assessment report in progress



Mount Hood

Earthquake swarm

- June 2021 M3.9 [\[Info statement\]](#)
- Several foreshocks and aftershocks
- 4 km south of summit
- 4.3 km depth below sea level
- Such EQs have occurred before
- No associated deformation
- Likely related to movement of fluids along existing faults



Three Sisters

Earthquake swarms

- October 2021
- December 2021
- January 2022

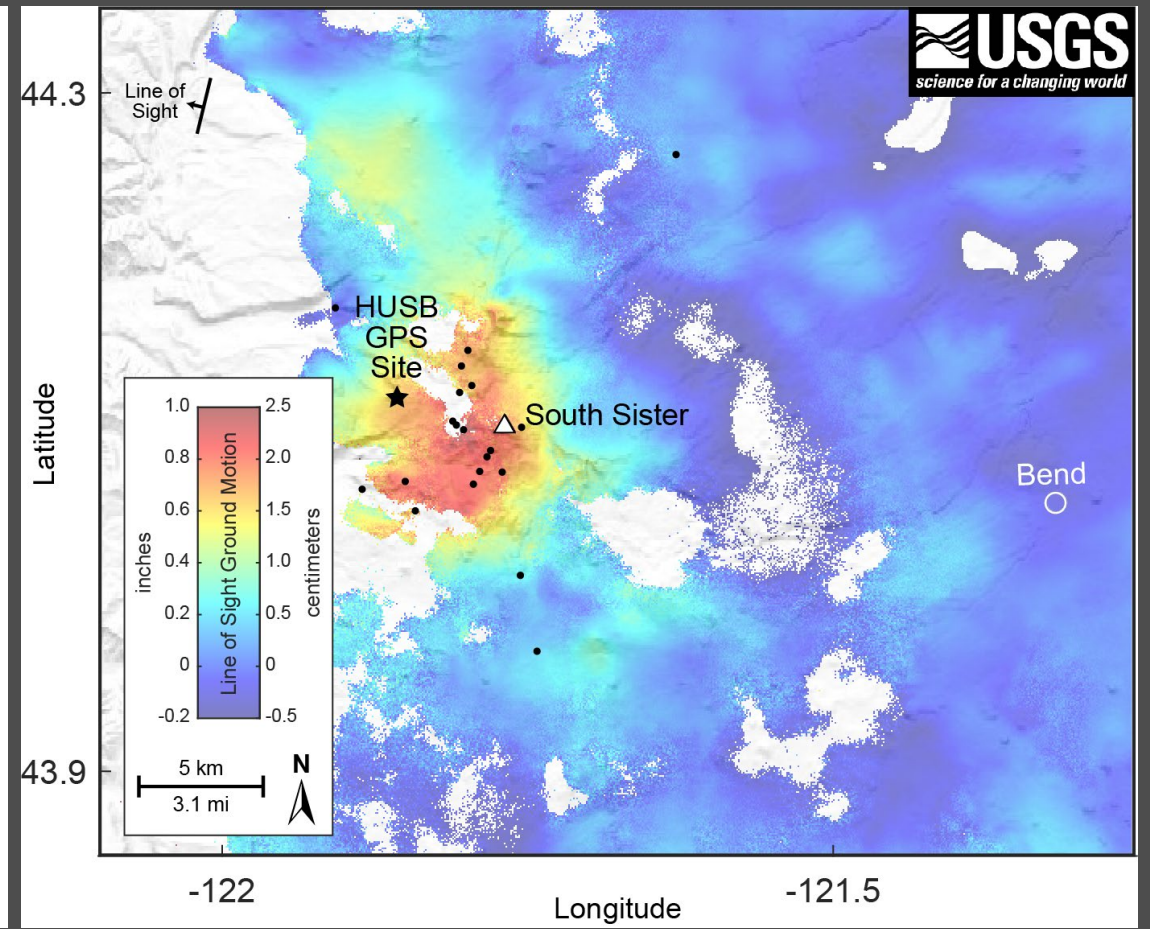
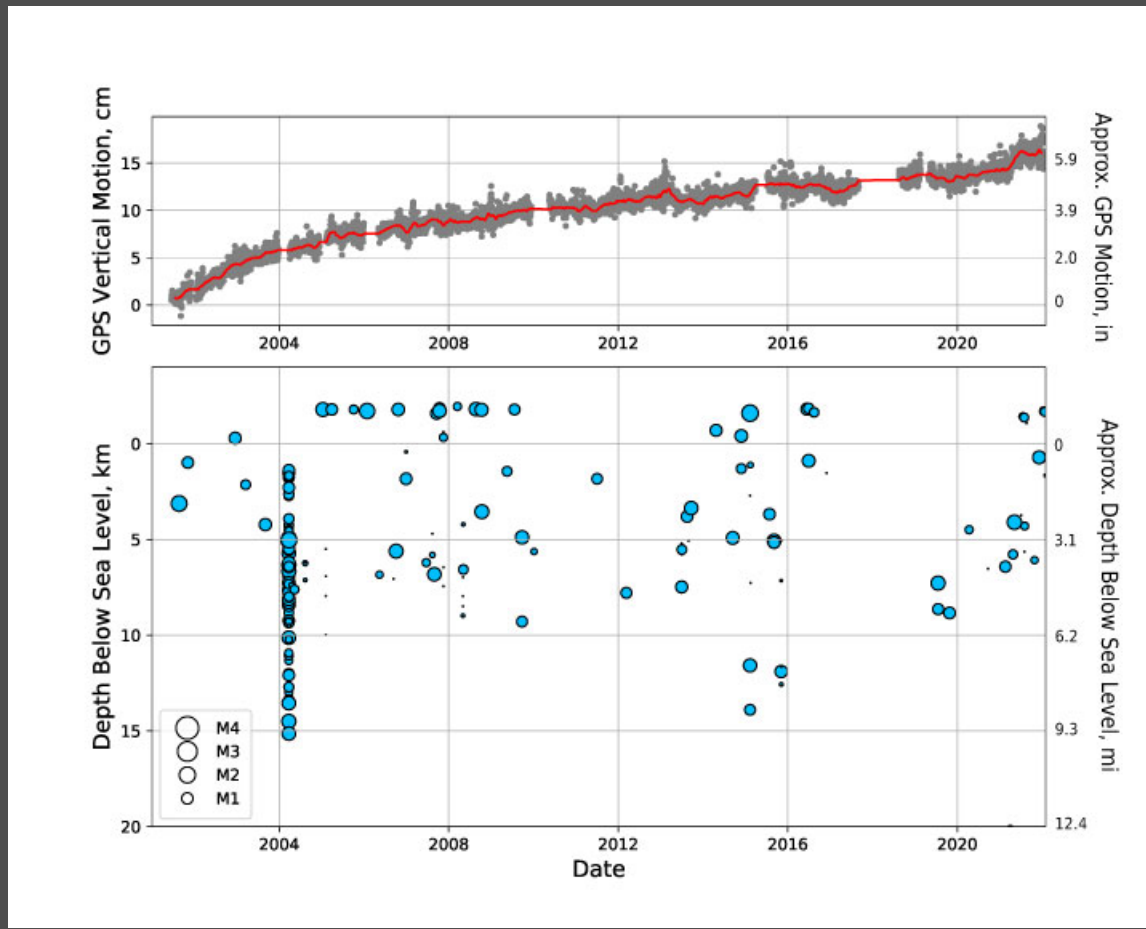
Deformation

- Detected slight uptick in inflation rate west side ~2.7 cm June 2020–January 2022; ongoing since 1990s
- Small inputs magma ~7 km below surface
- [\[Info statement\]](#)



Three Sisters

Ongoing uplift west of crest



CVO website: <https://www.usgs.gov/observatories/cvo>

Newberry Volcano

Earthquake swarm

- March-April 2022 [\[Info statement\]](#)
- Shallow depth (<2 km deep)
- Largest was M1.7
- 29 located, >100 too small to locate
- Largest swarm since robust monitoring network installed in 2012
- No associated deformation
- Newberry has high background rate of seismicity
- Gas emissions with low lake levels



Crater Lake

- No unusual activity
- Routine maintenance to keep monitoring sites functional
- Ongoing research into regional fault history and volcanic system



In summary

We have a good handle on hazards at each volcano

Most of our volcanoes are remote

Some volcano processes expose large populations to hazard

We continue to vigilantly monitor our volcanoes, are expanding our monitoring footprint, enhancing our modeling capabilities, and gaining better knowledge about nuances of volcanic histories and behaviors

Where to get information

Volcano Notification Service: <https://volcanoes.usgs.gov/vns2/>
CVO website: <https://www.usgs.gov/observatories/cvo>
Facebook: <https://www.facebook.com/USGSVolcanoes>
Twitter: <https://twitter.com/USGSVolcanoes>
Instagram: <https://www.instagram.com/USGSVolcanoes/>