

EarthScope Cascadia Interpretive Workshop

What?

Earthquakes, volcanoes, and tsunamis reveal the power of Earth's forces that form the spectacular landscape of the Pacific Northwest. EarthScope is a nationwide effort that applies the latest science and technology to explore the structure and evolution of the North American continent and understand processes that cause earthquakes and volcanic eruptions (www.earthscope.org). Interpretive professionals in the Pacific Northwest have the unique opportunity to engage the public on the relevance of EarthScope discoveries as they are being made. This 3-day workshop will combine presentations by EarthScope scientists with interpretive methods to convey the story of the ongoing deformation of the edge of the North American continent. Participants will learn how to use EarthScope data and science results, and will develop and present actual programs and exhibits during the workshop. The goal is to help interpreters create opportunities for the public to form their own intellectual and emotional connections to the dynamic landscape of the Pacific Northwest.

When?

April 7–10, 2008.

Where?

Mount Rainier National Park Education Center, Tahoma Woods, Washington.

Sponsored by:

EarthScope National Office.

Who should attend?

Interpretive professionals from the National Park Service, U. S. Forest Service, Bureau of Land Management, state parks, museums, state geological surveys, and other agencies that engage the public on geological features and processes in the Pacific Northwest. Participants do not have to be geologists, but they should have some knowledge of the geology and tectonics of the Pacific Northwest and experience incorporating geological information into interpretive programs or exhibits. There is also room for a few K-12 Earth science teachers who interact with interpretive specialists in parks or museums.

Funding:

Participants' organizations provide travel costs to and from the workshop. The EarthScope National Office (ESNO) provides food, lodging, materials, and field trip travel while at the workshop. ESNO will cover accommodation in Mt. Rainier National Park housing. Housing is apartment-style with bedrooms. Participants must bring their own sheets, blankets, towels, sleeping bags, or other bedding. Arrangements can be made if this is a problem for any participants. CD's, printed handouts, and other workshop materials will be provided by the ESNO at no cost to participants.

Commitment:

Participants are required to attend the full three days of the workshop (from 6:00 PM Monday, April 7 to 1:00 PM Thursday, April 10). Each participant and their supervisor must commit to providing follow-up training to their staff members on how EarthScope data, scientific results, and societal implications can be incorporated into interpretive programs at their site.

Application:

An online application form is available at http://www.earthscope.org/workshops/mt_rainier/apply. Space is limited to 25 participants. One to three participants per park/museum may attend. Applicants must include statements of education and experience in geology, background in interpretation (informal education), and vision for incorporating EarthScope into park/museum interpretive programs or exhibits.

Instructors, Presenters, and Facilitators:

Dr. Bob Lillie (Professor of Geology at Oregon State University and EarthScope Education/Outreach Manager).

Dr. Anne Trehu (Professor of Geophysics at Oregon State University and Director of the EarthScope National Office).

Anne Doherty (Education Program Manager, Mt. Rainier National Park).

Dr. Bob Butler (Professor of Geology, University of Portland and geoscience education expert).

Carolyn Driedger (Education/Outreach Specialists, USGS Cascades Volcano Observatory).

Dr. John Lahr (Emeritus Seismologist, U.S. Geological Survey and developer of hands-on teaching materials on seismology).

Dr. Tim Melbourne (Associate Professor of Geology, Central Washington Univ. and Director, PANGA Geodesy Laboratory).

Dr. Seth Moran (Geophysicist, U. S. Geological Survey and specialist on volcano monitoring).

Dr. Steve Malone (Professor, University of Washington and researcher on earthquake hazards in the Pacific Northwest).

Dr. Charlotte Goddard (Research Associate, Oregon State Univ. and Education/Outreach Specialist for EarthScope Nat. Office).

Agenda: EarthScope Cascadia Interpretive Workshop
(Presentations will be available online upon the conclusion of the workshop)

Monday, April 7, 2008

Afternoon:

- 1:00 Instructors meet at Mt. Rainier National Park Education Center (MREC) to review workshop goals, agenda, and evaluation plan.
- 6:00 Participants and instructors meet for dinner and orientation.** (Personal introductions; workshop overview).

Tuesday, April 8, 2008

Morning:

- 8:00 Convene at MREC for coffee, juice, bagels, fruit, muffins, etc.**
- 8:15 Welcoming remarks and discussion of workshop goals and agenda. (Anne Doherty, Anne Trehu, Bob Lillie)
- 8:30 "Overview of EarthScope: USArray and the Plate Boundary Observatory." (Anne Trehu and Bob Lillie)
- 9:00 "Scientific Observations of EarthScope bearing on the Cascadia Subduction Zone." (Tim Melbourne)
- 10:00 Break.**
- 10:15 "USArray and other seismic measurements of earthquakes and volcanoes in the Pacific Northwest." (Steve Malone)
- 11:15 "Seismic and geodetic monitoring of active volcanoes." (Seth Moran)
- 12:00 Lunch.**

Afternoon:

- 1:00 "Understanding the Cascadia Subduction Zone – From scientists, to teachers, to interpreters." (Bob Butler)
- 2:00 "Presenting EarthScope to the public in parks and museums: Interpretive themes and strategies for the Cascadia Subduction Zone." (Bob Lillie)
- 3:00 Break.**
- 3:15 Brainstorming activities: Developing site-specific interpretive themes based on today's presentations.
- Participants divide into five teams.
 - Discuss Cascadia-specific topics and EarthScope materials to incorporate into programs and exhibits.
 - Each team generates an outline with content, data needs, and a theme statement for their program.
- 4:45 Questions and announcements.
- 5:00 Adjourn.**
- 6:30 Dinner.**
- 7:30 Groups meet to develop theme and outline for their presentation.

Wednesday, April 9, 2008

Morning:

- 8:00 Meet at MREC for coffee, juice, bagels, fruit, muffins, etc.**
- 8:15 Field excursion. (Bus or vans).
- Observe geological features and visit PBO and USArray instrument sites.
 - Discuss landscape features and processes that can be presented to the public.
 - Relate each group's interpretive theme to EarthScope and Cascadia.
- 12:00 Return to MREC. Working lunch with your group to continue developing interpretive programs.**

Afternoon:

- 1:00 "Seismographs and other teaching devices in classrooms, museums, and visitor centers." (John Lahr)
- 2:00 "EarthScope web site and IRIS "Active Earth" kiosk: Accessing and using EarthScope data in interpretive programs and exhibits." (Charlotte Goddard)
- 3:00 Break.**
- 3:15 Continue working in groups to design 15-minute interpretive programs based on EarthScope Cascadia themes.
- 4:45 Questions and announcements.
- 5:00 Adjourn.**
- 6:30 Dinner.**
- 7:30 First group presentation, followed by discussion.
- 8:00 Groups continue to work on presentations.

Thursday, April 10, 2008

Morning:

- 8:00 Meet at MREC for coffee, juice, bagels, fruit, muffins, etc.**
- 8:15 More discussion about initial presentation and presentations in general.
- 8:30 Group presentations and discussions.
- 11:45 Workshop evaluation.
- 12:00 Lunch and adjourn.**
- Participants depart after lunch.
 - Organizers and instructors meet in the afternoon to discuss workshop and follow-up activities.

Details: EarthScope Cascadia Interpretive Workshop

Purpose of Workshop

This is the first in a series of workshops organized by the EarthScope National Office (ESNO) to train interpreters¹ in parks and museums to incorporate EarthScope into programs that engage the public in landscape-forming processes and natural hazards. EarthScope employs advanced geophysical sensors and high-performance computing to measure signals generated by earthquakes and volcanic events. The program is deploying hundreds of seismometers and GPS devices, and drilling a borehole across the San Andreas Fault, to observe the inner-workings of the continent. Many of the instruments are permanently-based in the western United States. Other instruments are being gradually moved across the country from west to east over the next decade. The resulting EarthScope images provide a record of how the continent has evolved over millions of years, enabling scientists, students, and the public to appreciate how the North American continent deforms in ways that affect our lives.

One of the fundamental aspects of EarthScope is the integration of many types of observations to study the structure and evolution of the continent. Two challenges facing the EarthScope community include providing the public with access to timely EarthScope science and presenting complex data and related principles in language and formats accessible to varied audiences. This workshop will show how incorporating EarthScope data and scientific results into interpretive programs and exhibits can enhance the “sense of place” represented by the dynamic landscape of the Pacific Northwest. Presentations and activities will focus on engaging visitors on not only how and why science is important, but also that it is understandable and meaningful. A variety of educational tools and materials currently exist that address the major scientific issues specific to Cascadia: volcanoes, earthquakes, and tsunamis at a subduction zone. The workshop will bring together individuals from the scientific and interpretive communities to learn about EarthScope and develop interpretive programs to engage park and museum visitors on how advanced geophysical instrumentation enhances our understanding of landscape formation and geological hazards in the Pacific Northwest.

EarthScope Primary Interpretive Themes

Workshops were held in 2003 and 2004 to develop a comprehensive interpretive plan involving EarthScope and the National Park Service (NPS; see www.ees.nmt.edu/RME/fall2004.html). The primary interpretive themes developed in the workshops are key ideas through which EarthScope’s nationally-significant values can be conveyed to the public. Two of the overall NPS/EarthScope themes are particularly applicable to interpretation in the Pacific Northwest:

- *The EarthScope experiment – the most comprehensive exploration to date of the structure, dynamics, and geologic history of the North American continent – exemplifies the insatiable human drive to learn.*
- *EarthScope encourages a feeling of national interconnectedness – a continental sense of place – by openly inviting communities to actively participate in the experiment, and by fostering an understanding that their local environment and culture interact with other components within the larger, dynamic Earth system.*

During the Cascadia Workshop, participants will work with scientists to develop themes specific to parks and museums in the region. By the end of the workshop, participants will develop and present interpretive programs that provide opportunities for visitors to connect EarthScope data and science to the physical and cultural aspects of their site. Here’s an example of a specific theme that might link EarthScope observations to dynamic Earth processes in the Cascadia Subduction Zone:

- *The same earthquake and volcanic activity that threatens our lives also nourishes our spirits by creating the tranquil mountains and coastlines of the Pacific Northwest.*

Workshop Goals

EarthScope consists of three observatories: USArray, a system of seismometers managed by the Incorporated Research Institutions for Seismology (IRIS, www.iris.edu); Plate Boundary Observatory (PBO), an array of GPS, strainmeter, and other geodetic instruments managed by UNAVCO, Inc. (www.unavco.org); and San Andreas Fault Observatory at Depth (SAFOD), managed by Stanford University. The goals of the Cascadia workshop are consistent with those of EarthScope and these collaborative institutions.

- **Build networks of scientists and interpreters.** EarthScope scientists will present overviews of their research and work with participants to develop interpretive programs on the Cascadia Subduction Zone.
- **Produce interpretive programs and displays targeting specific audiences.** Teams of participants will work with the scientists to develop Cascadia-specific interpretive materials on earthquakes, volcanoes, and tsunamis targeting visitors to Pacific Northwest parks and museums.
- **Collaborate with EarthScope organizations to produce and disseminate data and products to interpretive professionals.** The workshop will foster collaboration between interpreters and IRIS, UNAVCO, the U. S. Geological Survey, and other organizations to expand the EarthScope education and outreach network. Workshop products will be disseminated via print materials and the EarthScope, UNAVCO, and IRIS education and outreach web pages.
- **Target diverse audiences to engage in interpretive programs and exhibits.** Diverse backgrounds, learning styles and gender equity will be built explicitly into interpretive programs.

¹ The term “informal educator” is commonly used in museums, while parks typically use “interpreter.” Other terms such as “resource educator” are used by various organizations. The term “interpreter” in this document is meant to encompass all the professionals who engage the public in informal education.

Interpretive Program Development

Participants will work in teams to assemble EarthScope and other content for interpretive programs focused on Cascadia-specific topics. Interpretive programs developed during the workshop might focus on the following topics.

1. **Integration of Cascadia Earthquakes, Tsunamis and Volcanoes into Tectonic Setting.** Because of EarthScope's goal to study North America in an integrative way, interpretive programs should not "stand alone" as individual topics, but should feed into an integrative approach. This Cascadia EarthScope program might be the "big picture" program which provides the plate-tectonic context for other programs. Interpretive opportunities can also be developed by incorporating Native American accounts that appear to depict past earthquakes, tsunamis, and volcanic eruptions.
2. **Earthquakes.** Integration of geological, geophysical, and historical data over the last few decades reveals that great earthquakes occur along the Cascadia Subduction Zone every few centuries. EarthScope is advancing understanding of how and why earthquakes occur by measuring small-to-moderate sized earthquakes in the region, imaging the deep structure of the crust and mantle by studying how seismic waves from distant earthquakes travel to USArray seismometers, and mapping the movement of Earth's surface with PBO strainmeters and GPS instruments. One group could develop a program emphasizing how advancement in knowledge about Cascadia earthquakes impacts the safety, economy, history, and other aspects of society in the Pacific Northwest and beyond.
3. **Tsunamis.** The tsunami that devastated the Indian Ocean region in 2004 has heightened awareness that the Cascadia Subduction Zone presents a similar natural hazard. The 1964 Alaska Earthquake resulted in a tsunami that killed 11 people in Crescent City, California, and four along the Oregon Coast. A group could work on how integration of EarthScope seismometer, GPS, and strainmeter data can help us appreciate how and when earthquakes from the Cascadia Subduction Zone and elsewhere might result in tsunamis along coastlines in the Pacific Northwest, and how society can best prepare for natural hazards.
4. **Volcanoes.** Ground deformation in volcanic systems measured by GPS has important implications for regional tectonics, magma recharge, and volcanic hazard mitigation. Integrating GPS observations from PBO stations, seismic data from USArray and other networks, and digital maps illustrating the relationship between the locations of volcanoes and the plate boundary represent potential activities with strong quantitative components. Crafting a Cascadia-specific volcano activity will create the potential for collaboration with the USGS Cascades Volcano Observatory and the development of interpretive programs and displays at Mt. St. Helens National Monument, Mt. Rainier National Park, Crater Lake National Park, Lassen Volcano National Park, and other facilities that interpret volcanic processes.
5. **"Active Earth" Kiosk.** An interactive interpretive display focused on EarthScope has been developed by IRIS. It includes a computer and screen, with general content on dynamic Earth processes and EarthScope. It is designed to be complemented with material focused on the visitor center or museum hosting the kiosk. Preliminary modules focused on topics such as those described in programs 1-4 above will be developed prior to the workshop. One of the participant groups may choose to work on a thematic interpretive program incorporating the kiosk.

More on "Active Earth" Kiosk

Funds are available to supply two to four sites participating in the workshop with their own "Active Earth" kiosk. After the workshop, sites will be invited to submit proposals outlining how they would use the kiosk to complement their overall interpretive program, and how they plan to maintain it. The EarthScope National Office will work with each site selected to further develop content for the kiosk.

Contact Information: EarthScope Cascadia Interpretive Workshop

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