Professional development workshops for coastal teachers, interpreters, and emergency management educators.
Introductions

- CEETEP
- Instructors
- Participants
- EarthScope
- Quake Catcher Networks
CEETEP

• Primary Aim: Improve disaster resilience through educator professional development

• Goals – Participants will:
  • **Learn Geoscience** and be able to communicate about earthquake and tsunami science and research
  • **Understand Risk** and be able to communicate about Cascadia geohazards
  • **Take Action** and be able to work with learners to improve preparedness
  • **Exchange Pedagogy** on how to teach about EarthScope, hazards/risk, and preparedness
Beauty and the Beast

“The same geological processes that threaten our lives with earthquakes and tsunamis also nourish our spirits by creating the spectacular headlands and beaches of the Pacific Northwest.” – Dr. “Ranger” Bob Lillie

Olympic National Park
CEETEP Precursors


EarthScope Education and Outreach Workshops for Interpretive Professionals in Parks and Museums (2008 - Present)
Traditional View

Science (EarthScope, Cascadia)

Interpreters

Scientists

Teachers

Interpreters

Emergency Management Educators

Educators

Colleges & Universities

Training

Parks & Museums

Formal Learning

K-12

Free-Choice Learning

Students

The Public

Meanings (Geoscience, Hazards, Preparedness)
Rethinking the View

Science (EarthScope, Cascadia)

Not: “Dumbing It Down”

Meanings (Geoscience, Hazards, Preparedness)

Formal Learning

Scientist

Free-Choice Learning

Students

The Public
Scientists

Students

The Public

Instead: “Storying It Up” 😊

Greater resilience in Cascadia & America
Partner organizations & further dissemination
Meanings (Geoscience, Hazards, Preparedness)

CEETEP View

Formal Learning

Free-Choice Learning

Scientists

Science (EarthScope, Cascadia)

Partner organizations & further dissemination
Meanings (Geoscience, Hazards, Preparedness)

CEETEP View

Formal Learning

Free-Choice Learning

Scientists

Science (EarthScope, Cascadia)
Greater resilience in Cascadia & America
Partner organizations & further dissemination
Meanings (Geoscience, Hazards, Preparedness)

- Students
- The Public
- Scientists

- Emergency Management Educators
- Educators
- K-12 Teachers
- Park Interpreters

Joint professional development in coastal communities

Science (EarthScope, Cascadia)
Galvanizing change in preparedness

- Research on behavioral change (Wood 2012; Mileti 2011)
  - Simple consistent messaging on what TO DO
  - From many trusted sources
  - For a long long time
  - Seeing others take preparedness steps

- FEMA (2010) suggests that science classrooms are under-utilized for hazard and preparedness connections


Mileti and colleagues (National Hazards Center, University of Colorado) [http://www.colorado.edu/hazards/](http://www.colorado.edu/hazards/)

CEETEP
Cascadia EarthScope
Earthquake and Tsunami Education Program

Workshops on Cascadia Science and Preparedness:

- Washington
  August & October 2014
- North & Central Oregon
  August & October 2013
- Coos Bay, Oregon
  August 2015
- Arcata, California
  October 2015

Parks and Plates ©2005 Robert J. Lillie
Workshop space info

- Main room – Auditorium
- Food – besides coffee all food will be in the Downstairs Classroom
- Water fountain & restrooms – outside across from main door. Please use outside doors, not museum.
- Breakout sessions & team planning space – same two rooms & maybe office conference room
- Parking – NOT near the visitor building Tues-Thur

ALLERGY ALERT
Please do not wear perfumes/scents.
Please be very careful about peanuts.
CEETEP Binder

- OSU forms
- Feedback (white, front pocket)
- Contact lists
- Agenda
- Resources (thick section in the middle)
- Digital resources
- Post-it notes (use them for questions)

Cascadia EarthScope Earthquake & Tsunami Education Program (CEETEP)

Workshops for K-12 Teachers, Park/Museum Interpreters, and Emergency Management Educators

Coos Bay, Oregon, August 10-13, 2015
Arcata, California, October 9-12, 2015

Instructors:
- Bob Butler, University of Portland
- Nanee Hunter, OSU Hatfield Marine Science Center
- Beth Pratt-Sitaula, Central Washington University

Co-Instructors:
- Bob de Groot, Southern California Earthquake Center
- Lori Dengler, Humboldt State University
- Sue Graves, Lincoln County School District
- Roger Groom, Portland Public Schools
- Bonnie Magura, Portland Public Schools (Retired)
- Troy Nicollini, NOAA’s National Weather Service
- Vioki Ozaki, Redwood National and State Parks

http://ceetep.oregonstate.edu
**Agenda Day 1 - Getting started**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30</td>
<td>Coffee, tea, juice, snacks for those who arrive early</td>
</tr>
<tr>
<td>9:00</td>
<td>Introductions: CEETEP, EarthScope, Participants, Instructors, Quake Catcher Network. Please sit with your Action Team</td>
</tr>
<tr>
<td>10:15</td>
<td>Break <em>(Coffee, tea, juice, snacks)</em></td>
</tr>
<tr>
<td>10:30</td>
<td>Beauty and the Beast: Plate Tectonics and Geological Hazards of the Pacific Northwest</td>
</tr>
<tr>
<td>12:00</td>
<td>Thoughts/questions/reflection</td>
</tr>
<tr>
<td>12:15</td>
<td>Lunch</td>
</tr>
<tr>
<td>1:00</td>
<td>Basics of Earthquake and Tsunami Science and Hazards and Related Teaching Activities</td>
</tr>
<tr>
<td>3:15</td>
<td>Break <em>(Coffee, tea, juice, snacks)</em></td>
</tr>
<tr>
<td>3:30</td>
<td>Surviving a Cascadia Subduction Zone Earthquake</td>
</tr>
<tr>
<td>4:30</td>
<td>Reflection, Questions, Implications</td>
</tr>
<tr>
<td>5:10</td>
<td>Forms: Reimbursements; Stipends; Photo Permissions; Logistics for Day 2 Field Trip</td>
</tr>
<tr>
<td>5:30</td>
<td>Adjourn</td>
</tr>
</tbody>
</table>
## Agenda Day 2 - Field Trip

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30</td>
<td><strong>Coffee, tea, juice, snacks for those who arrive early</strong></td>
</tr>
<tr>
<td>8:00</td>
<td>Depart</td>
</tr>
<tr>
<td>8:10</td>
<td><strong>Stop 1:</strong> Tsunami Geology</td>
</tr>
<tr>
<td>11:20</td>
<td><strong>Stop 2:</strong> Interpreting Geohazards</td>
</tr>
<tr>
<td>12:20</td>
<td>Lunch</td>
</tr>
<tr>
<td>1:45</td>
<td><strong>Stop 3:</strong> Tsunami Evacuation Walk</td>
</tr>
<tr>
<td>3:15</td>
<td><strong>Stop 4:</strong> GPS Station</td>
</tr>
<tr>
<td>4:30</td>
<td>Adjourn</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>8:30</td>
<td>Coffee, tea, juice, snacks for those who arrive early</td>
</tr>
<tr>
<td>9:00</td>
<td>Cascadia Earthquakes and Tsunami and Related Teaching Activities</td>
</tr>
<tr>
<td>10:30</td>
<td>Break (Coffee, tea, juice, snacks)</td>
</tr>
<tr>
<td>10:45</td>
<td>Cascadia Earthquakes and Tsunami and Related Teaching Activities</td>
</tr>
<tr>
<td>12:00</td>
<td>Thoughts/questions/reflection</td>
</tr>
<tr>
<td>12:15</td>
<td>Lunch</td>
</tr>
<tr>
<td>1:00</td>
<td>Tsunami: Are You Ready?</td>
</tr>
<tr>
<td>1:45</td>
<td>Native American &amp; Indigenous Oral Histories</td>
</tr>
<tr>
<td>2:30</td>
<td>Birds-of-a-Feather Breakout Session</td>
</tr>
<tr>
<td>3:15</td>
<td>Break (Coffee, tea, juice, snacks)</td>
</tr>
<tr>
<td>3:30</td>
<td>Science Storytelling through Interpretation</td>
</tr>
<tr>
<td>3:45</td>
<td>Exchange of Pedagogies: Working together in Coastal Cascadia to engage students, visitors, and residents</td>
</tr>
<tr>
<td>4:15</td>
<td>Action Teams: Action Plan Development. Teams work on post-workshop plans (also prep 10-minute presentation for Day 4)</td>
</tr>
<tr>
<td>5:30</td>
<td>Adjourn</td>
</tr>
<tr>
<td>+6:00</td>
<td>Barbeque at Ron Metzger’s house – North Bend – fresh tuna, libations, great company</td>
</tr>
</tbody>
</table>
### Agenda Day 4 – Bringing it together

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30</td>
<td>Coffee, tea, juice, snacks for those who arrive early</td>
</tr>
<tr>
<td>9:00</td>
<td>Digital Resources</td>
</tr>
<tr>
<td>9:55</td>
<td>Preparedness for Post-event Personal and Community Survival</td>
</tr>
<tr>
<td>10:40</td>
<td>Break (Coffee, tea, juice, snacks)</td>
</tr>
<tr>
<td>10:55</td>
<td>Break Out Sessions</td>
</tr>
<tr>
<td></td>
<td>Tsunami Vertical Evacuation Structures <strong>Teachers</strong></td>
</tr>
<tr>
<td></td>
<td>Hazard Inventory <strong>Interpreters &amp; EM Educators</strong></td>
</tr>
<tr>
<td></td>
<td>Teachers</td>
</tr>
<tr>
<td>11:45</td>
<td>Break Out Sessions</td>
</tr>
<tr>
<td></td>
<td>Tsunami Vertical Evacuation Structures <strong>Interpreters &amp; EM Educators</strong></td>
</tr>
<tr>
<td></td>
<td>Hazard Inventory <strong>Teachers</strong></td>
</tr>
<tr>
<td>12:30</td>
<td>Lunch</td>
</tr>
<tr>
<td>1:15</td>
<td>Action Teams: Final preparations for Action Plan and 10-minute presentation</td>
</tr>
<tr>
<td>2:30</td>
<td>Action Teams: Presentations of plans</td>
</tr>
<tr>
<td>3:45</td>
<td>Break (Coffee, tea, juice, snacks)</td>
</tr>
<tr>
<td>4:15</td>
<td>Post-Workshop Assessment. Survey and focus groups.</td>
</tr>
<tr>
<td>5:30</td>
<td>Adjourn</td>
</tr>
</tbody>
</table>
Share-a-thon

- Expected: Brookings, OR
- Saturday March 5, 2015 9:30 am-3 pm
- Participants from Coos Bay and Arcata workshops
- Present on activities under taken related to CEETEP topics
- Action team members will support each other
  - Can do collaborative project as a whole team
  - Communicate as work separately as individuals or sub-groups
CEETEP
Coos Bay, OR
August 10-13, 2015

CEETEP Principal Investigators and Instructors
1. Bob Butler, University of Portland, Portland
2. Nancee Hunter, OSU Hatfield Marine Science Center, Newport
3. Beth Pratt-Sitaula, Central Washington University, Ellensburg & UNAVCO, Boulder, CO

Master Teachers and Co-Instructors
4. Roger Groom, Mt. Tabor Middle School, Portland
5. Bonnie Magura, Portland Public Schools (retired), Portland
6. Sue Graves, Lincoln County Schools
7. Ron Metzger, Southern Oregon Community College, Coos Bay
8. Adam Wollace, UNAVCO, Arcata, CA
CEEETEP Partner Organizations
11. Bob de Groot, Southern California Earthquake Center, Los Angeles, CA

External Evaluator
12. Michael Coe, Cedar Lake Research, Portland

Animator/Videographer
13. Jenda Johnson, Portland
14. Patrick Fox, Portland

Student Assistant
15. Lisa Akers, Oregon State University, Corvallis
20-second Intro
1. Who are you?
2. Your organization and/or educational setting?

Optional:
3. What you particularly hope to get from CEETEP?

K-12 Teacher
Kara Allan  Lincoln City  Taft Elementary School
Terah Cleveland  Florence  Siuslaw Elementary School
Greg Jorgenson  Florence  Siuslaw Elementary School
Benjamin Wells  Florence  Siuslaw School District
John Whisler  Florence  Siuslaw Elementary School

Park/Museum Interpreter
Jim Grano  Florence/Reedsp.  Oregon Coast STEM-Hub

Emergency Management Educator
Deborah Simon  Coos County  Coos County EM
## 20-second Intro

1. **Who are you?**
2. **Your organization and/or educational setting?**

Optional:

3. **What you particularly hope to get from CEETEP?**

<table>
<thead>
<tr>
<th>Role</th>
<th>Location</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>K-12 Teacher</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trent Hatfield</td>
<td>Bandon</td>
<td>Bandon High School</td>
</tr>
<tr>
<td>Jonathon Hill</td>
<td>Coos Bay</td>
<td>Marshfield High School</td>
</tr>
<tr>
<td>Lynda Sanders</td>
<td>Coos Bay</td>
<td>Marshfield High School</td>
</tr>
<tr>
<td><strong>Park/Museum Interpreter</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joy Tally</td>
<td>Charleston</td>
<td>South Slough NERR</td>
</tr>
<tr>
<td><strong>Emergency Management Educator</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donald Marr</td>
<td>Coos County</td>
<td>Coos County Health &amp; Wellness</td>
</tr>
</tbody>
</table>
Action Team 3 – North Bend
Reedport
Coos Bay

20-second Intro
1. Who are you?
2. Your organization and/or educational setting?

Optional:
3. What you particularly hope to get from CEETEP?

K-12 Teacher
Tami Timm       North Bend       Hillcrest Elem. School

Park/Museum Interpreter
Mike Mueller    Coos County     South Slough NERR

Emergency Management Educator
Michael Murphy  Coos County     Coos County Emergency Man.
# Action Team 4 – Gold Beach

## Bandon

### 20-second Intro
1. Who are you?
2. Your organization and/or educational setting?

Optional:
3. What you particularly hope to get from CEETEP?

### Team Members

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Location</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-12 Teacher</td>
<td>Debra Blanda</td>
<td>Gold Beach</td>
<td>Riley Creek School</td>
</tr>
<tr>
<td></td>
<td>Lani Martin</td>
<td>Gold Beach</td>
<td>Riley Creek School</td>
</tr>
<tr>
<td>Park/Museum Interpreter</td>
<td>Mario Scarpino</td>
<td>Charleston</td>
<td>South Slough NERR</td>
</tr>
<tr>
<td>Emergency Management Educator</td>
<td>Avery Horton Jr</td>
<td>Bandon</td>
<td>Southwest Oregon Preppers</td>
</tr>
</tbody>
</table>
Action Team 5 – Mostly southern

20-second Intro
1. Who are you?
2. Your organization and/or educational setting?

Optional:
3. What you particularly hope to get from CEETEP?

K-12 Teacher
Matthew Bennett  Brooking  Kalmiopsis Elem. Sch.
Amy Garnier      Brooking  Azalea Elem. School
Haley Fleshman   Brooking  Kalmiopsis Elem. Sch.
Christine Zellmer Brooking  Kalmiopsis Elem. Sch.

Park/Museum Interpreter
Kristen Hovenkotter-Greco  Coos Bay  Oregon Parks – Sunset Bay

Emergency Management Educator
Steven Martin  Curry County  Riley Creek School
Get to know your team

- Several minute intro – Each member of the team should share a little more details about their:
  - Teaching setting and audience
  - Existing strengths or experience with geoscience and preparedness
  - Goals for gaining knowledge and abilities in teaching tsunami and earthquake education
A National Science Foundation (NSF) effort to ..... 
• Explore the structure and evolution of North American continent 
• Study processes that cause earthquakes and volcanic eruptions

EarthScope has three main “observatories”

- Drillhole across San Andreas Fault
- 875 GPS Instruments
- 175 Borehole Strainmeters
- 5 Long-Baseline Laser Strainmeters
- 400 Seismometers at 2,000 sites
- 100 Permanent Seismometers
EarthScope Observatories

USArray

Seismometers

Geodetic Instruments

Deep Drillhole

PBO

San Andreas Fault Observatory at Depth

Plate Boundary Observatory

SAFOD
“Like a Hubble Telescope aimed into the Earth”
IRIS (Incorporated Research Institutions for Seismology) Washington, DC

1. **USAArray**

- Includes 400 Transportable Seismometers
- Each station occupies a site for 1½ to 2 years
- 10 years to leap-frog across the country
Seismic Waves Moving Across USArray

China, 2008

Bob Woodward - IRIS
2. PBO Plate Boundary Observatory

- High precision GPS
- Strainmeters
2. PBO
Plate Boundary Observatory

EarthScope GPS Stations

- Backbone Network
- Subduction Cluster
- Volcanic Cluster
- Transform Cluster
- Extension Cluster
Plate Boundary Observatory Status Page
http://www.unavco.org/instrumentation/networks/status/pbo
Wegener's Dream

"This [direct measurement of continental drift] must be left to the geodesists. I have no doubt that in the not too distant future we will be successful in making a precise measurement of the drift of North America relative to Europe." -- Alfred Wegener, 1929

200 million years ago all of the present-day continents combined to form a single supercontinent called Pangaea.
Geologically-measured spreading rates

20-30 kilometers/million years
20-30 millimeters/year
~1 inch/year
GPS Measurements:
Motion of North America relative to Europe.
Wegener’s Dream come true!

~1 inch/year
Bandon Airport, Oregon GPS Station
Yearly Movement, 2008 - 2014
(Referenced to North America's stable east)

North Movement (inches)

North cm

East cm

East Movement (inches)

2008
2009
2010
2011
2012
2013
2014
Cascadia Initiative

New seismometers were deployed offshore and onshore to complement existing onshore seismometers and GPS instruments

Four year project:
   2011 - 2014

Onshore:
   232 GPS stations
   27 seismometers

Offshore:
   60 ocean-floor seismometers
EarthScope is a ~15 year long geophysics initiative to study the crust of North America—what it is made of, how it was assembled, and the geohazards it has. Funded by National Science Foundation.

EarthScope Facility has 3 Parts:

- Plate Boundary Observatory (PBO) — >1100 GPS stations and strainmeters to measure crustal movements
- USArry — 400 Transportable Array seismic stations that have been stepping across lower-48 and now Alaska for last 10 years.
- San Andreas Fault Observatory at Depth (SAFOD) — drilling to San Andreas fault at 3-4 km

EarthScope also funds science and education projects like CEETEP

Cascadia EarthScope Earthquake and Tsunami Education Program has 3 collaborating universities:
- Oregon State Univ.
- Univ. of Portland
- Central WA Univ.
Earth Science Literacy Principles

**Big Ideas:**

1. Earth scientists use repeatable observations and testable ideas to understand and explain our planet.
2. Earth is 4.6 billion years old.
3. Earth is a complex system of interacting rock, water, air, and life.
4. Earth is continuously changing.
5. Earth is the water planet.
6. Life evolves on a dynamic Earth and continuously modifies Earth.
7. Humans depend on Earth for resources.
8. Natural hazards pose risks to humans.
9. Humans significantly alter the Earth.
Education and Outreach Goals

1. Create high profile **EarthScope identity**
2. Promote science literacy through **informal education**
3. Advance **formal education** in the classroom
4. Foster use of **data, discoveries, technology**
5. Establish sense of **community ownership**
Sense of Place ..... 

• Our hometowns and other special places are part of exciting new exploration and discovery. 
• Our communities are not standing still—they are moving!
At the motel

- Tuesday – Meet 7:15 am by OSU vans for ride to South Slough NERR
- Wednesday – Meet 8:15 am by OSU vans
- Thursday – Check out and drive self (but park away from South Slough Visitor Center)
- Tsunami evacuation
  - Look for the tsunami evacuation signs
  - Up the hill on the main road (back towards South Slough)
Field Trip Logistics

- Backpack or bag
- Layered clothes/jacket
- Sunscreen/sunglasses
- Water bottles
- Field Trip Guide (NOT your binder)
- Mud boots
- Extra clean shoes

Optional
- Notebook
- Camera
- Favorite snack
- Bug repellent
Field Trip Logistics

- OSU Van – Nancee
  - Team 1
  - Joy, Beth, Sue, BobdG

- OSU Van – Lisa
  - Team 3 (except Eric)
  - Team 4
  - BobB

- South Slough Van – Eric
  - Team 2 (except Joy)

- Ron’s truck – Ron & Bonnie

- Roger’s truck – Roger & Patrick