CEETEP

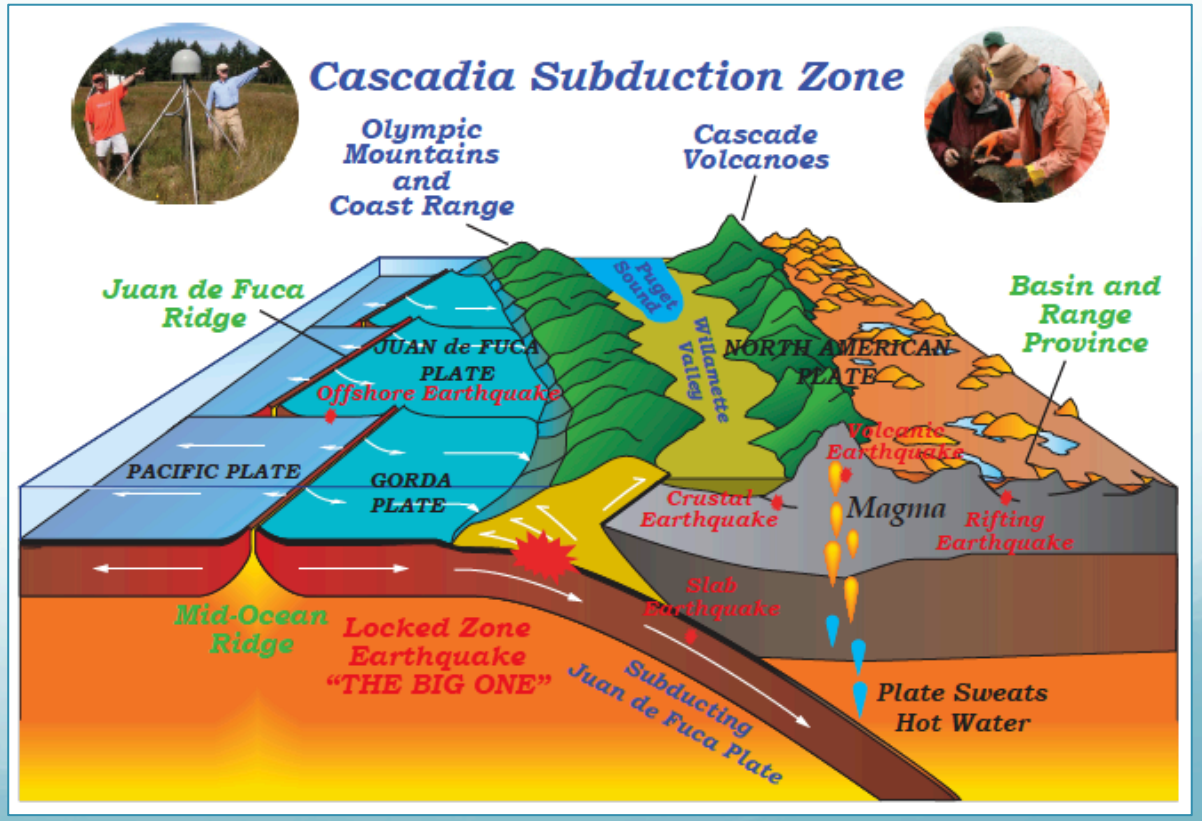
Cascadia EarthScope Earthquake and Tsunami Education Program

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

Bob Butler
University of Portland

Nancee Hunter
Oregon State University

Beth Pratt-Sitaula
Central Washington University



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

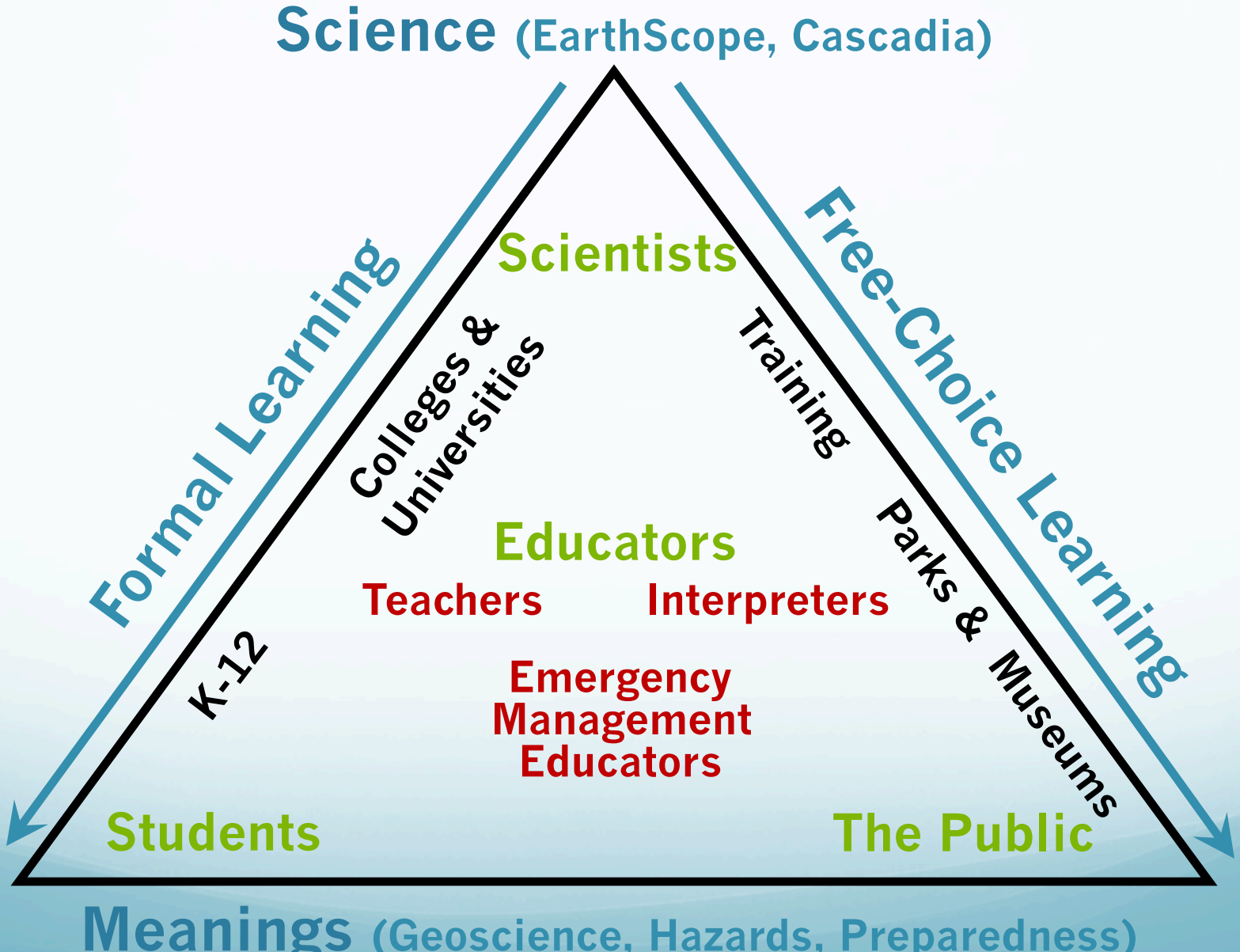
wikimedia.org

CEETEP Precursors

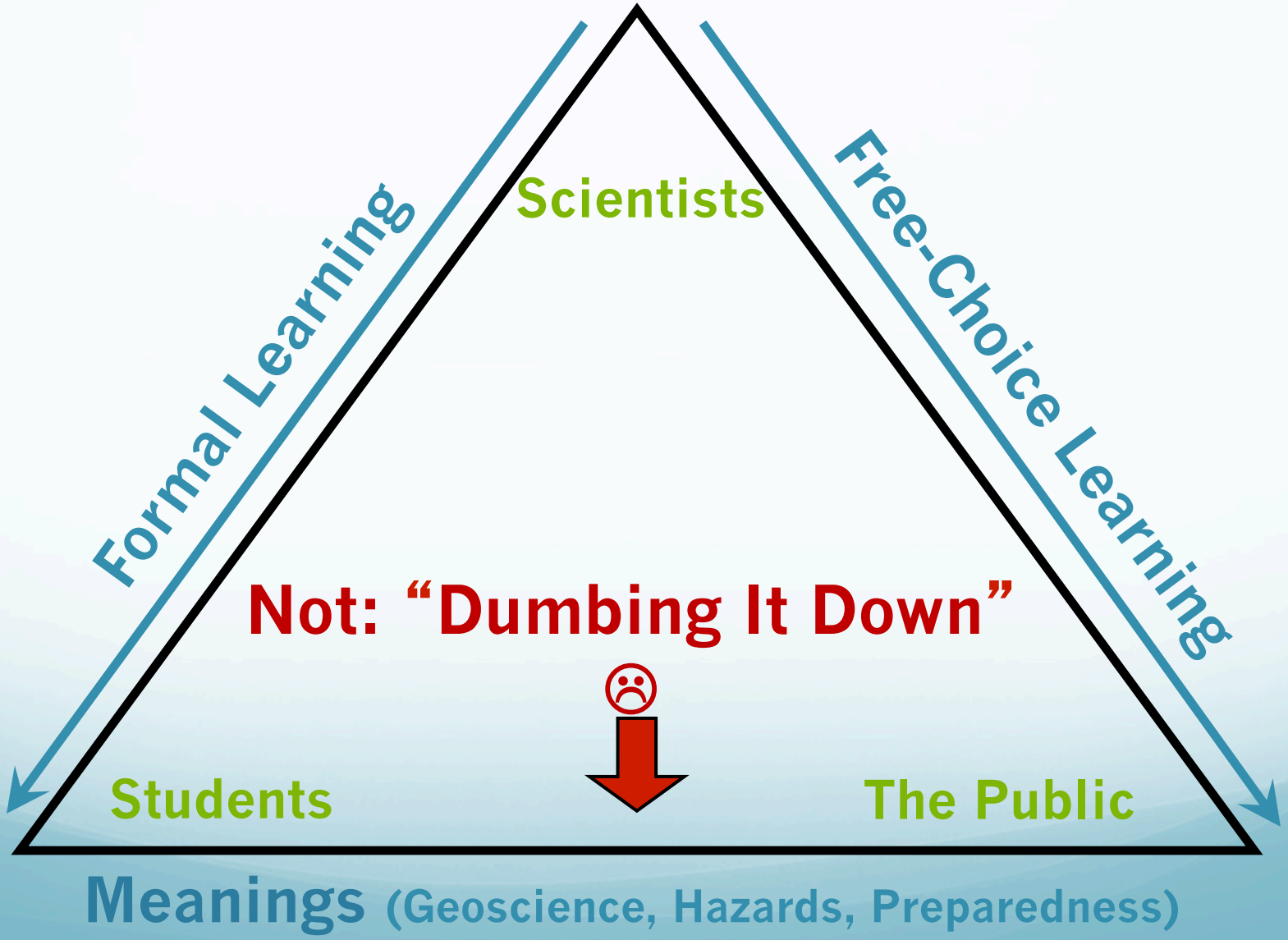
Teachers on the Leading Edge (TOTLE)
Workshops for Earth Science Teachers in Oregon and Washington (2005 - 2011)

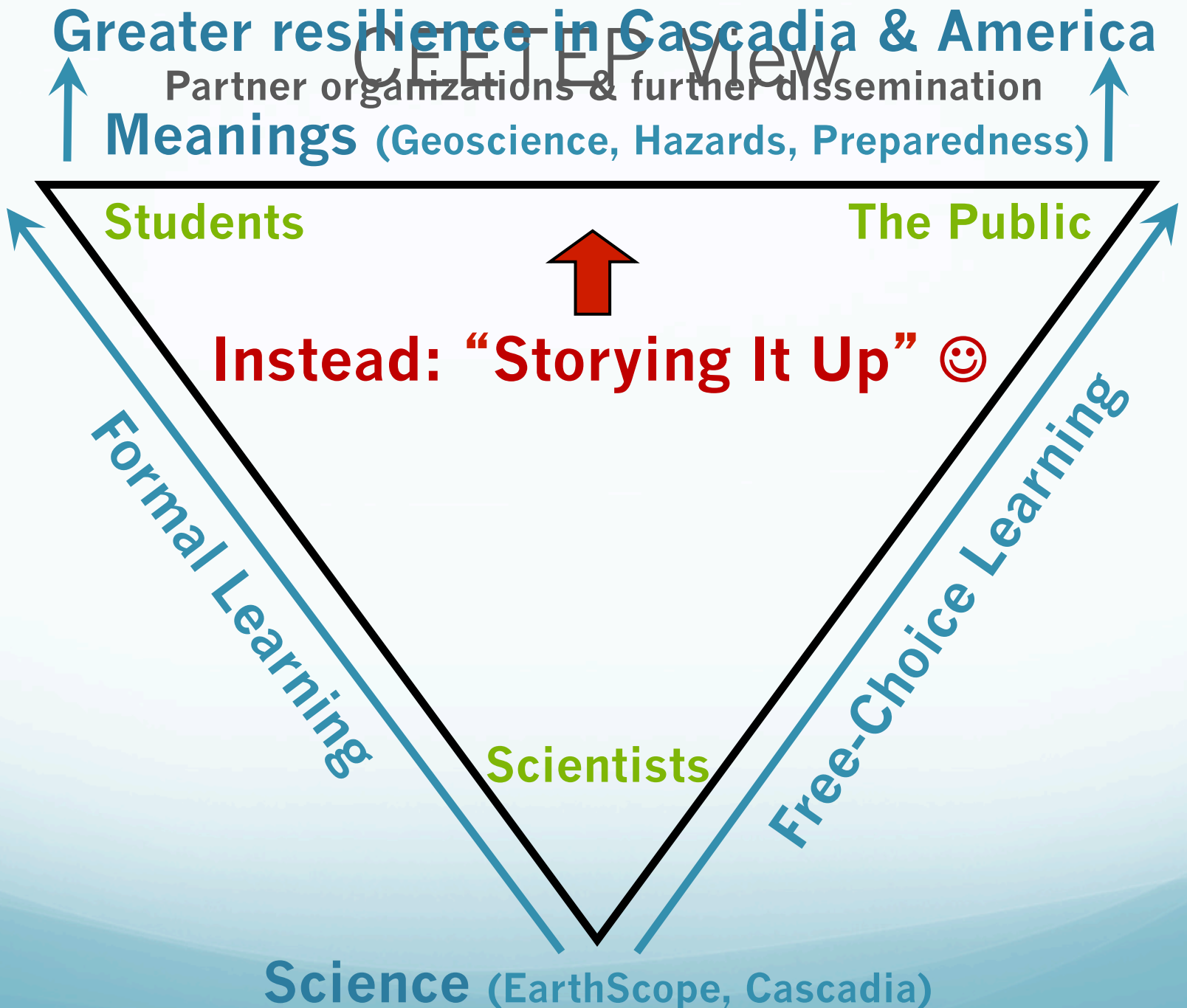
EarthScope Education and Outreach
Workshops for Interpretive Professionals in Parks and Museums (2008 - Present)

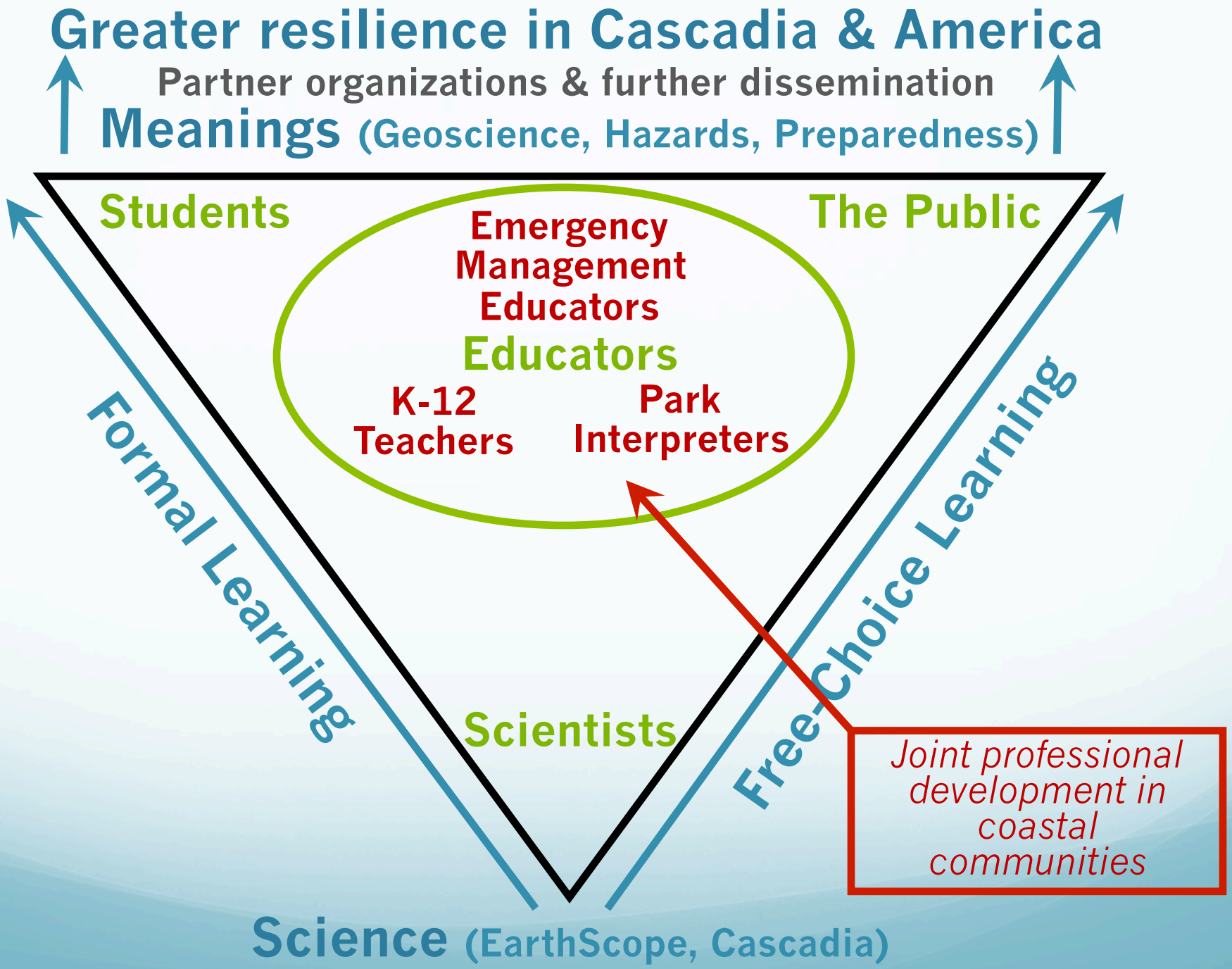
Traditional View



Rethinking the View




Greater resilience in Cascadia & America
CEETEP View
Partner organizations & further dissemination
Meanings (Geoscience, Hazards, Preparedness)
Students
The Public
Instead: "Storying It Up" ☺
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
Emergency Management Educators
Educators
K-12 Teachers
Park Interpreters
Formal Learning
Free-Choice Learning
Scientists
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

FEMA, Bringing Youth Preparedness Education to the Forefront: A Literature Review and Recommendations, Federal Emergency Management Administration. 21 pp., 2010. Available from: http://www.citizencorps.gov/resources/research/prepresearch.shtm

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

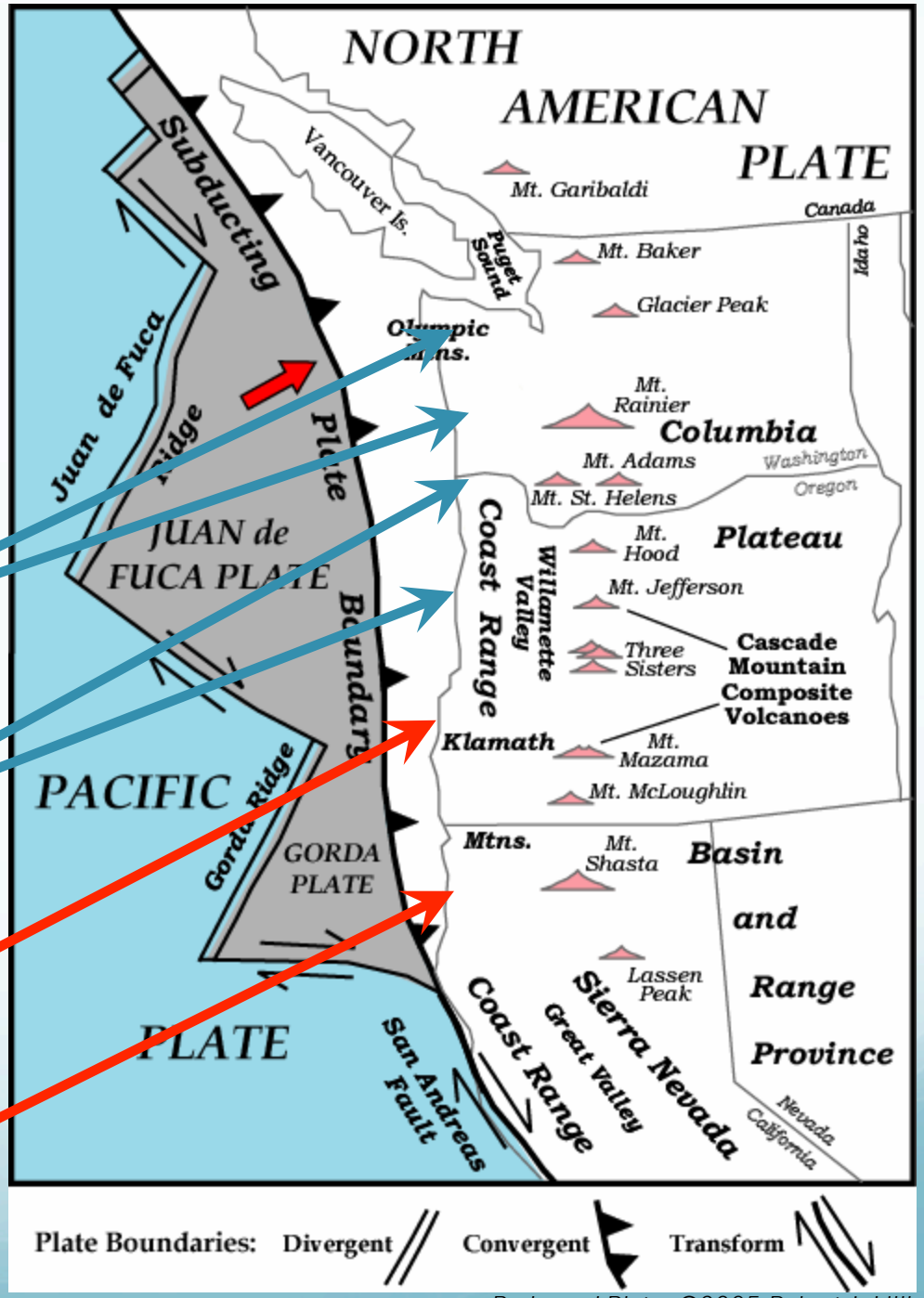
Wood, M. M., D. S. Mileti, M. Kano, M. M. Kelley, R. Regan, & L. B. Bourque, Communicating Actionable Risk for Terrorism and Other Hazards, Risk Analysis, v. 32, 601–615, 2012.

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)

Agenda Day 1- Getting started

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

Agenda Day 2- Field Trip

Day 2	
7:30	**Coffee, tea, juice, snacks for those who arrive early**
8:00	Depart
8:10	**Stop 1:** Tsunami Geology
11:20	**Stop 2:** Interpreting Geohazards
12:20	**Lunch**
1:45	**Stop 3:** Tsunami Evacuation Walk
3:15	**Stop 4:** GPS Station
4:30	**Adjourn**

Agenda Day 3 – Cascadia

Day 3	
8:30	**Coffee, tea, juice, snacks for those who arrive early**
9:00	Cascadia Earthquakes and Tsunami and Related Teaching Activities
10:30	**Break (Coffee, tea, juice, snacks)**
10:45	Cascadia Earthquakes and Tsunami and Related Teaching Activities
12:00	Thoughts/questions/reflection
12:15	**Lunch**
1:00	Tsunami: Are You Ready?
1:45	Native American & Indigenous Oral Histories
2:30	Birds-of-a-Feather Breakout Session
3:15	**Break (Coffee, tea, juice, snacks)**
3:30	Science Storytelling through Interpretation
3:45	Exchange of Pedagogies: Working together in Coastal Cascadia to engage students, visitors, and residents
4:15	Action Teams: Action Plan Development. Teams work on post-workshop plans (also prep 10-minute presentation for Day 4)
5:30	**Adjourn**
+6:00	**Barbeque at Ron Metzger's house – North Bend --fresh tuna, libations, great company**

Agenda Day 4 – Bringing it together

Day 4			
8:30	**Coffee, tea, juice, snacks for those who arrive early**		
9:00	Digital Resources		
9:55	Preparedness for Post-event Personal and Community Survival		
10:40	**Break (Coffee, tea, juice, snacks)**		
10:55	Break Out Sessions	Tsunami Vertical Evacuation Structures **Teachers**	Hazard Inventory **Interpreters & EM Educators**
11:45	Break Out Sessions	Tsunami Vertical Evacuation Structures **Interpreters & EM Educators**	Hazard Inventory **Teachers**
12:30	**Lunch**		
1:15	Action Teams: Final preparations for Action Plan and 10-minute presentation		
2:30	Action Teams: Presentations of plans		
3:45	**Break (Coffee, tea, juice, snacks)**		
4:15	Post-Workshop Assessment. Survey and focus groups.		
5:30	**Adjourn**		

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

CEETEP

Coos Bay, OR
August 10-13, 2015

CEETEP 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

Action Team 1– mostly northern

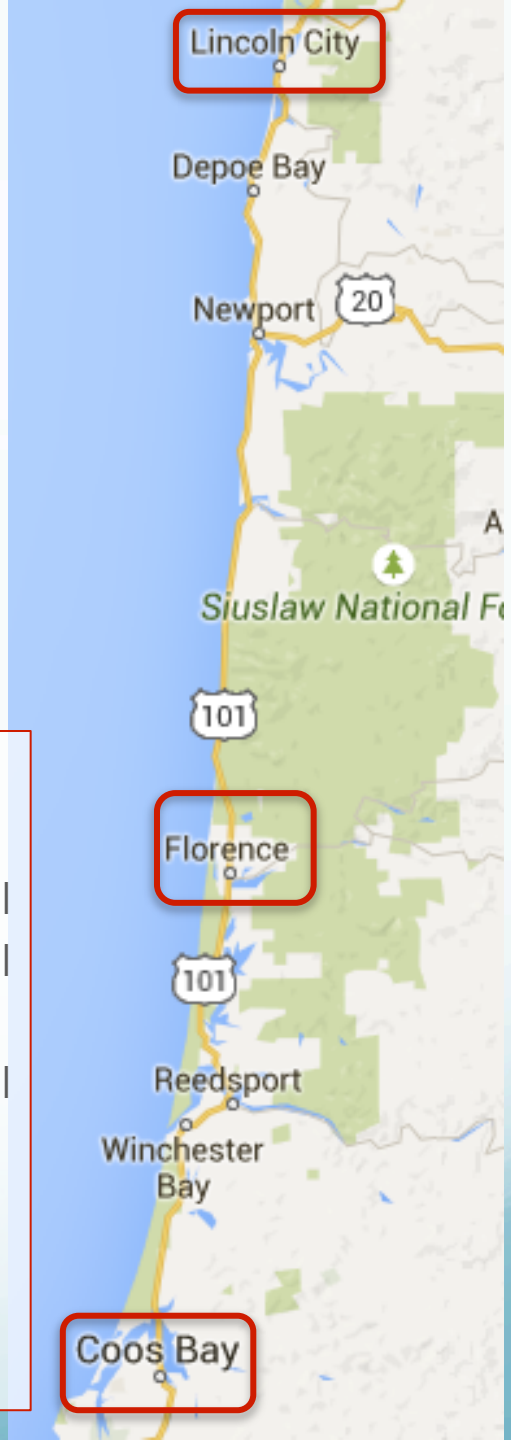
20-second Intro

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



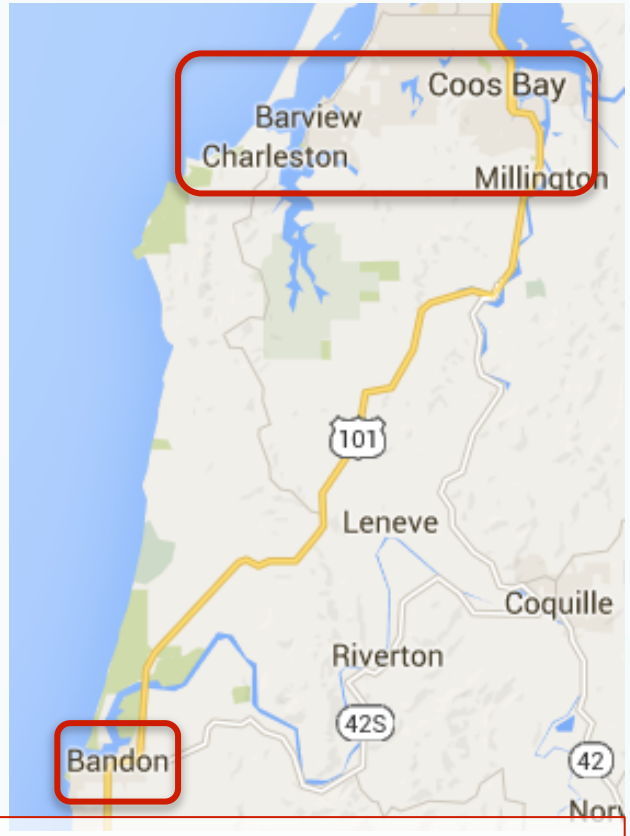
Action Team 2 – Coos Bay Bandon

20-second Intro

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

Optional:

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



K-12 Teacher		
Trent Hatfield	Bandon	Bandon High School
Jonathon Hill	Coos Bay	Marshfield High School
Lynda Sanders	Coos Bay	Marshfield High School
Park/Museum Interpreter		
Joy Tally	Charleston	South Slough NERR
Emergency Management Educator		
Donald Marr	Coos County	Coos County Health & Wellness

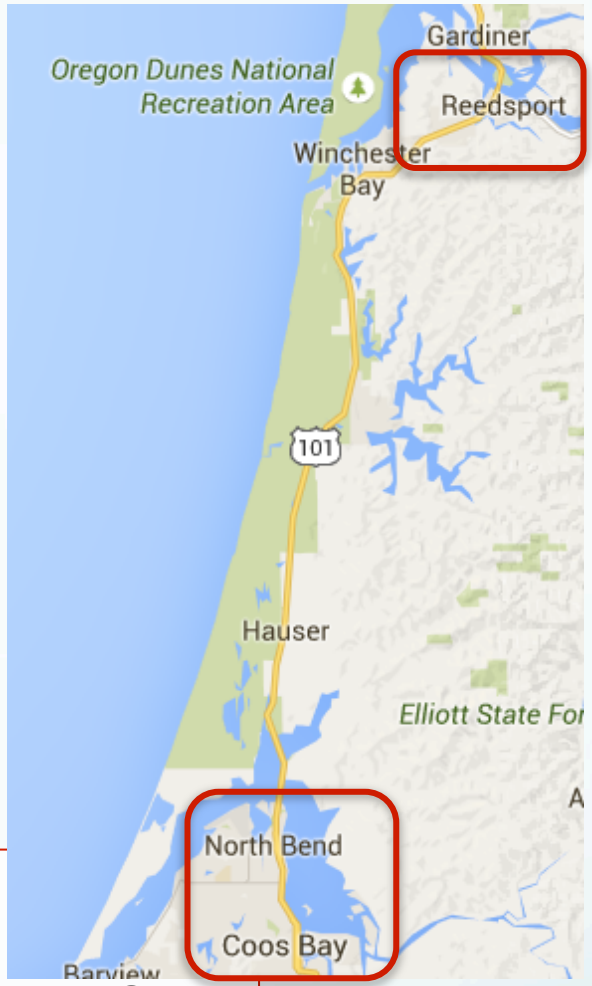
Action Team 3 – North Bend Reedport Coos Bay

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
Thomas Wright	Reedsport	Reedsport Comm. Charter Sch.

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?**

K-12 Teacher		
Debra Blanda	Gold Beach	Riley Creek School
Lani Martin	Gold Beach	Riley Creek School
Park/Museum Interpreter		
Mario Scarpino	Charleston	South Slough NERR
Emergency Management Educator		
Avery Horton Jr	Bandon	Southwest Oregon Preppers

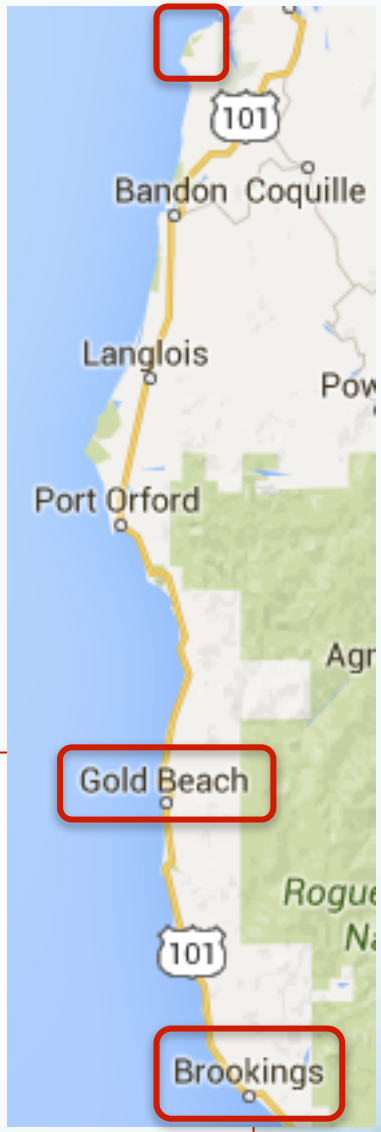
Action Team 5 – Mostly southern

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	Brookings	Kalmiopsis Elem. Sch.
Amy Garnier	Brookings	Azalea Elem. School
Haley Fleshman	Brookings	Kalmiopsis Elem. Sch.
Christine Zellmer	Brookings	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

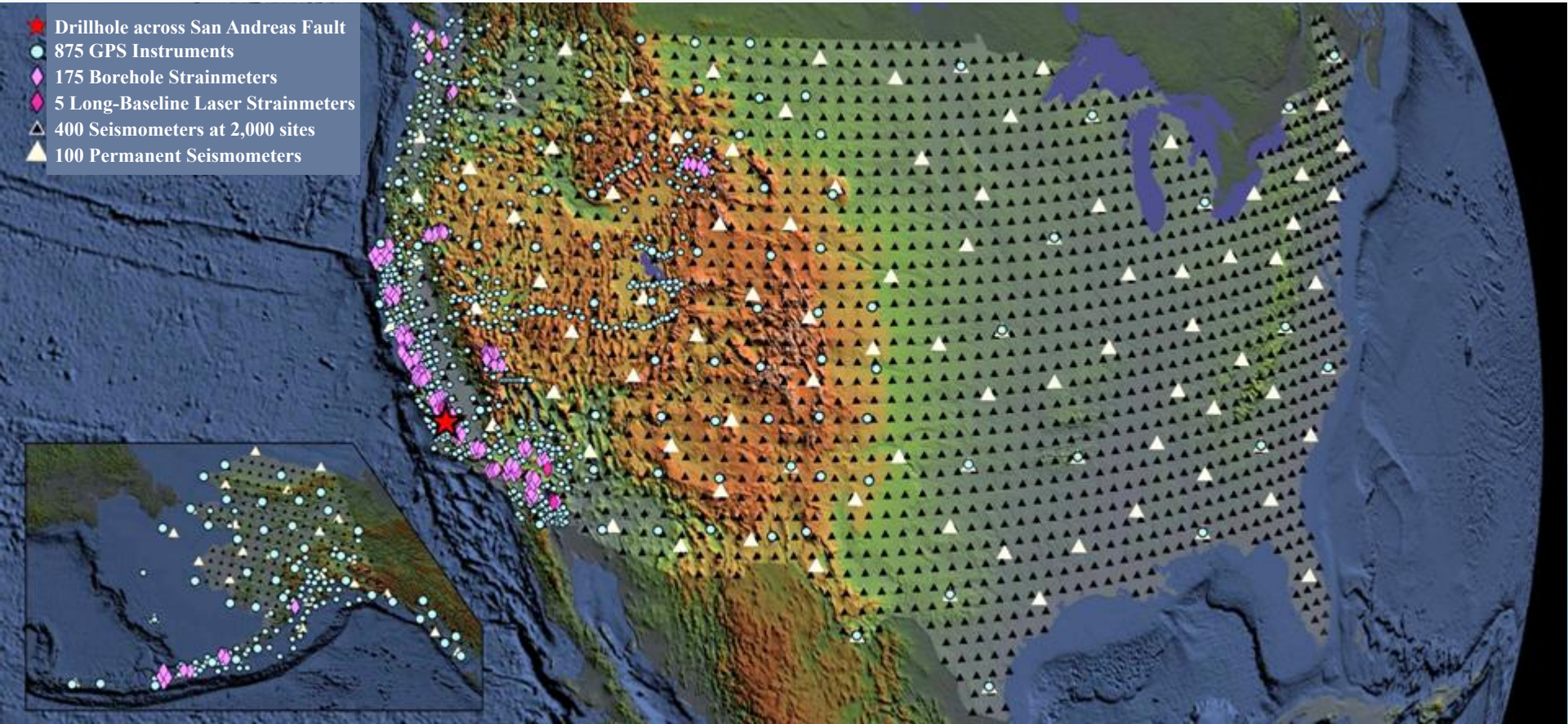
- Several minute intro – Each member of the team should share a little more details about their:
  - Teaching setting and audience
  - Existing strengths or experience with geoscience and preparedness
  - Goals for gaining knowledge and abilities in teaching tsunami and earthquake education

EarthScope

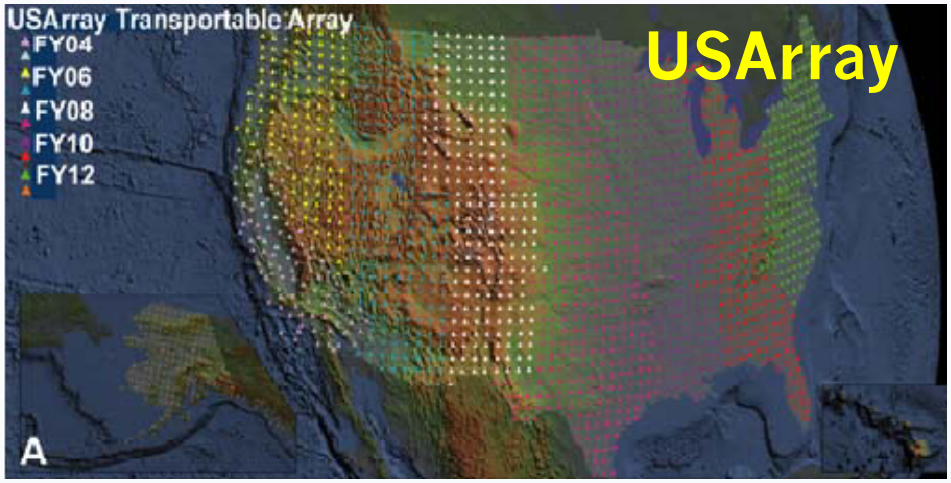
A National Science Foundation (NSF) effort to .....

- Explore the structure and evolution of North American continent
- Study processes that cause earthquakes and volcanic eruptions

EarthScope has three main "observatories"



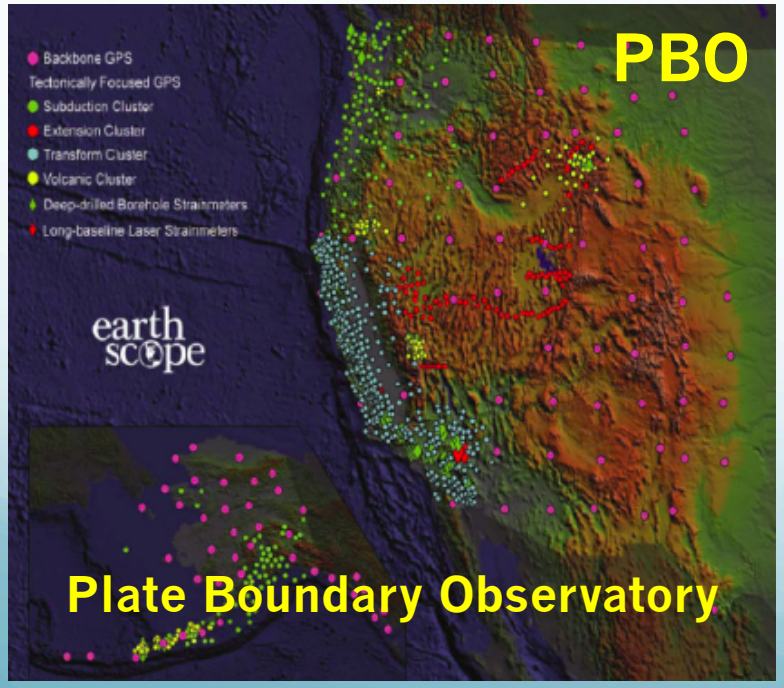
EarthScope Observatories

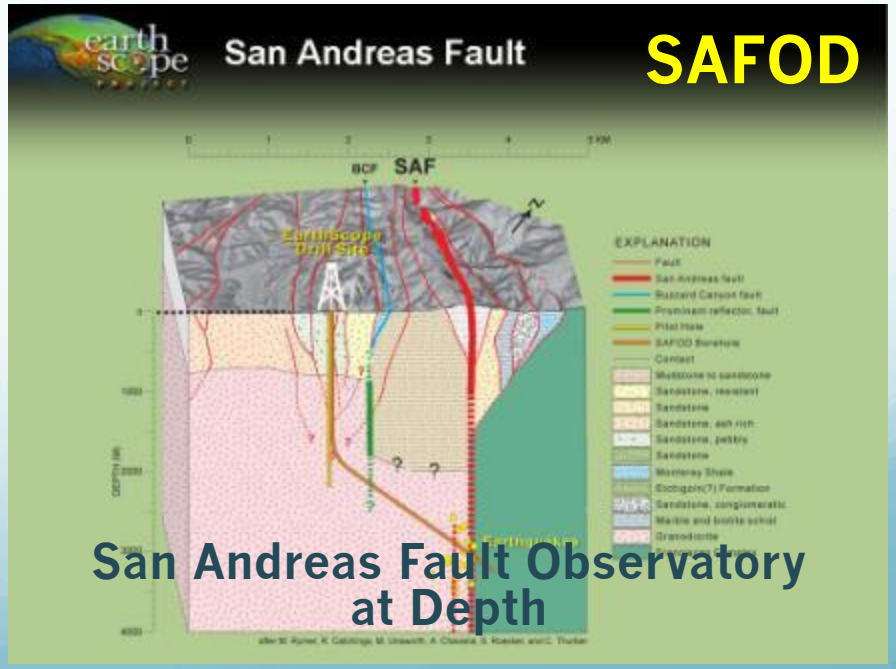


Seismometers

Geodetic Instruments

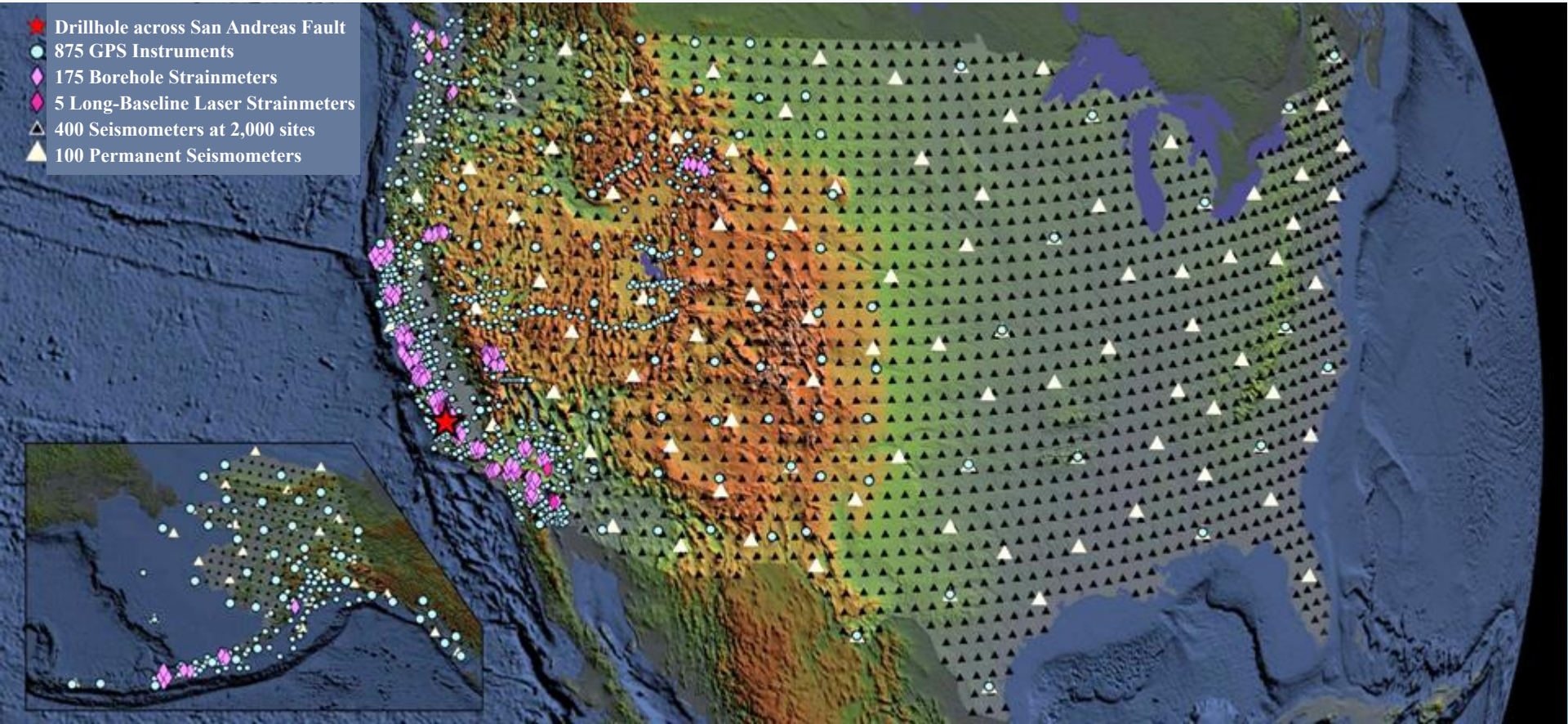
Deep Drillhole





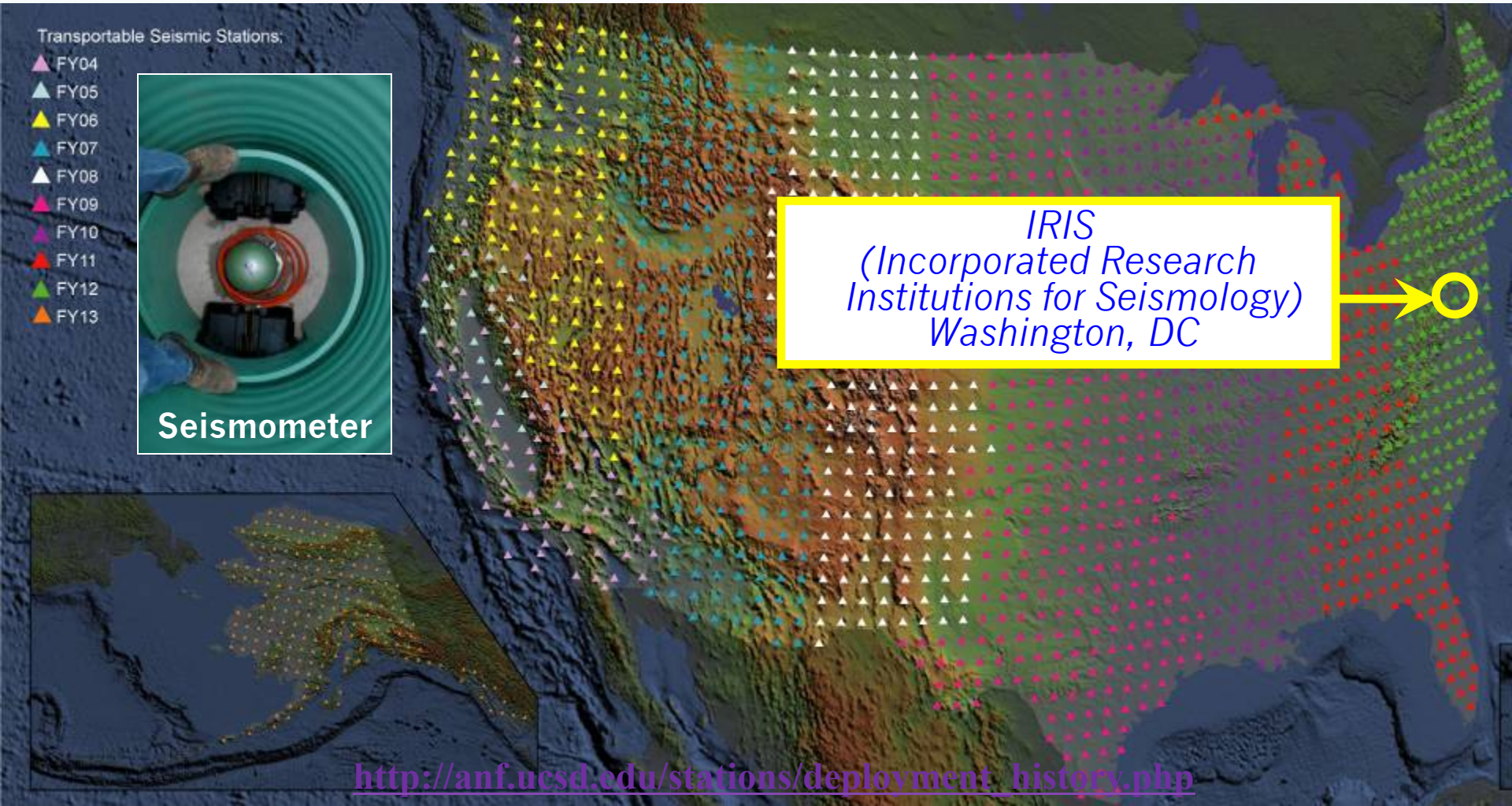
EarthScope

"Like a Hubble Telescope aimed into the Earth"



1. USArray

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

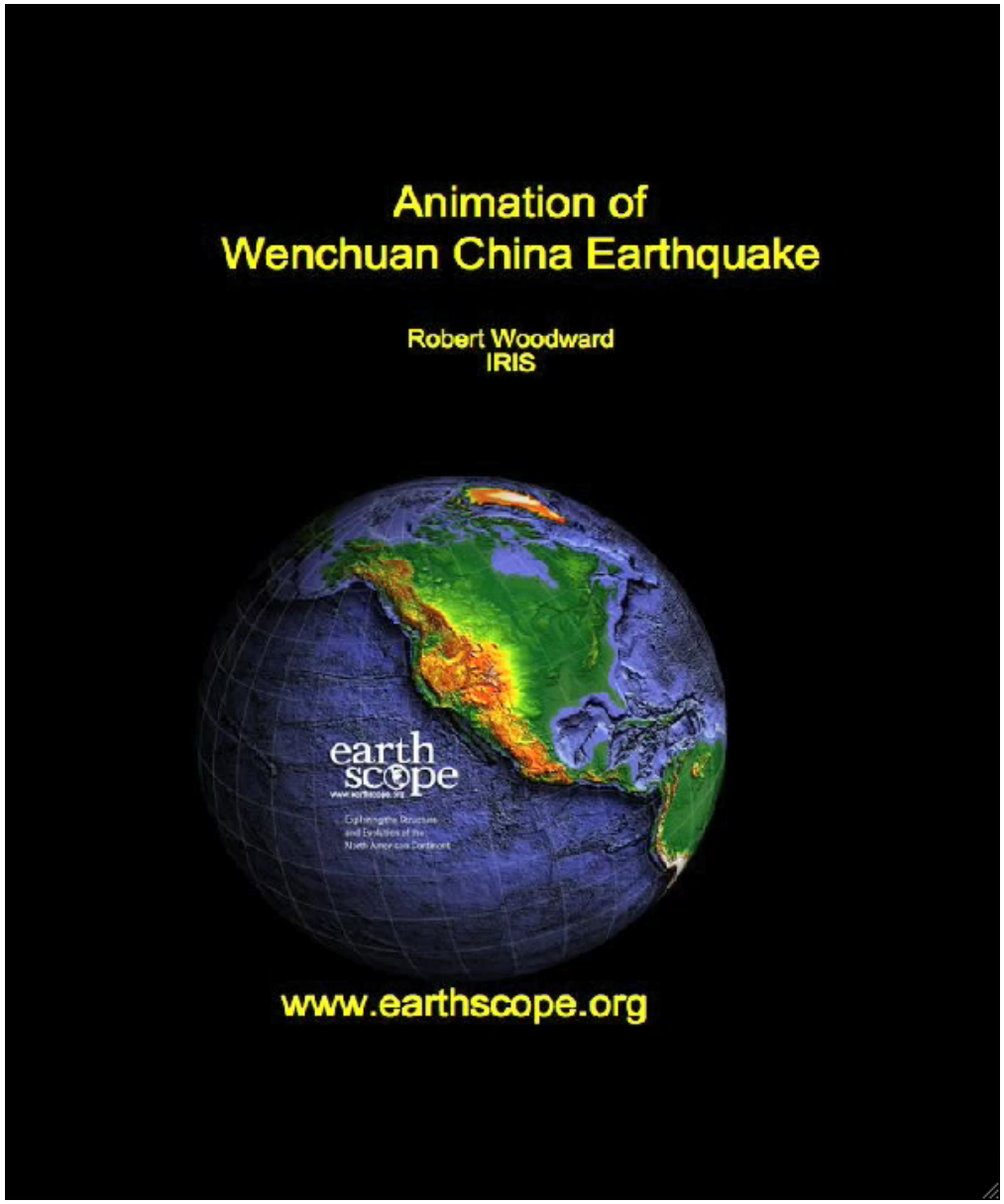


Visualizations

Seismic Waves Moving Across USArray

China, 2008

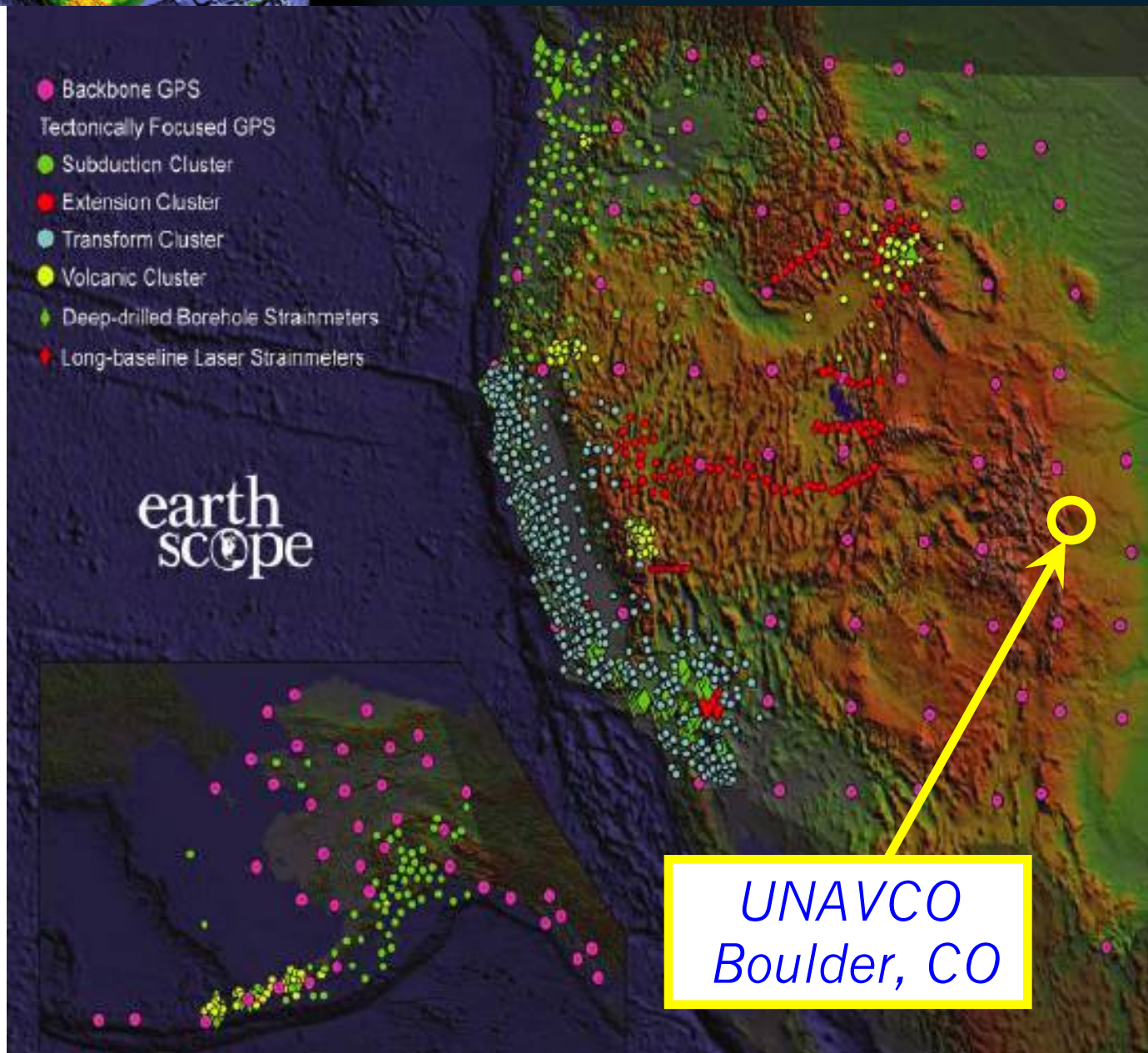
Bob Woodward - IRIS



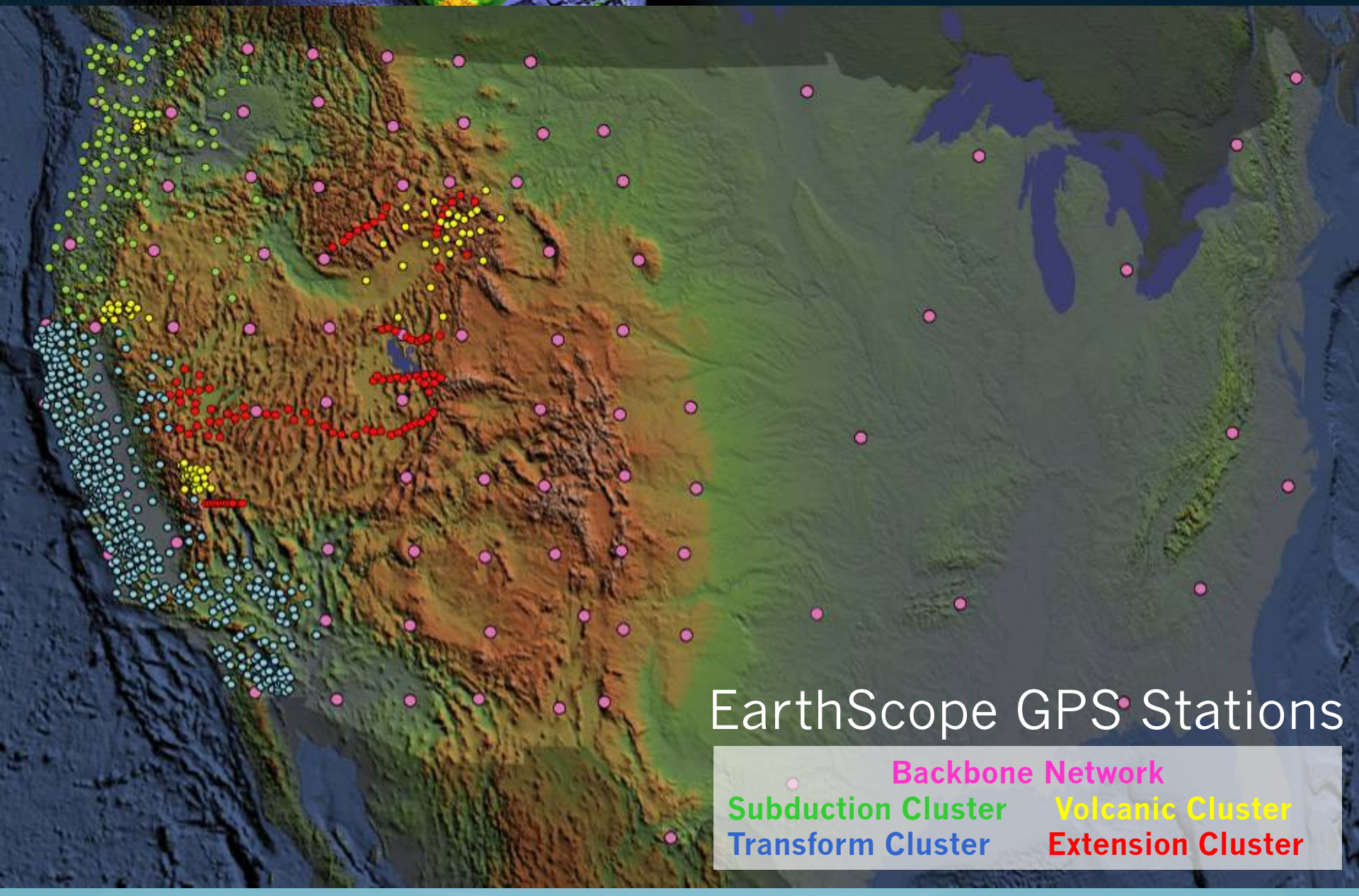
2. PBO
Plate Boundary Observatory

- High precision GPS
- Strainmeters

GSP Station



2. PBO
Plate Boundary Observatory



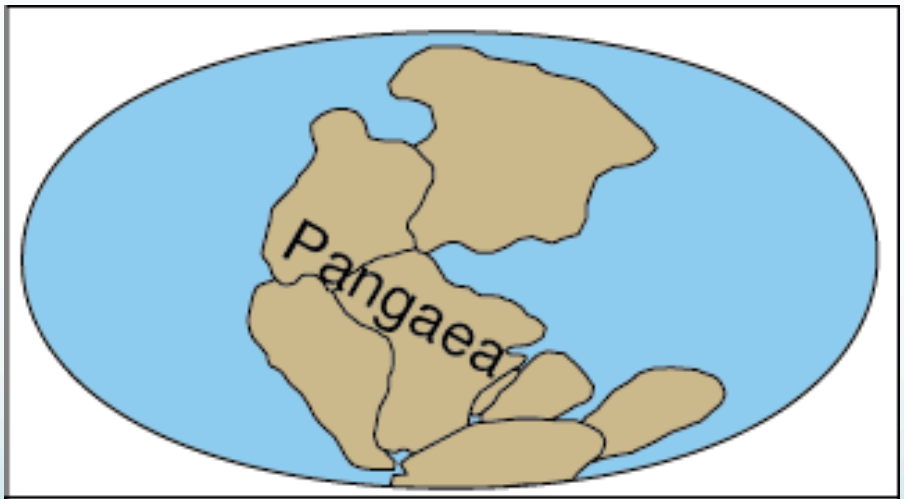
2. PBO
Plate Boundary Observatory

Plate Boundary Observatory Status Page
http://www.unavco.org/instrumentation/networks/status/pbo

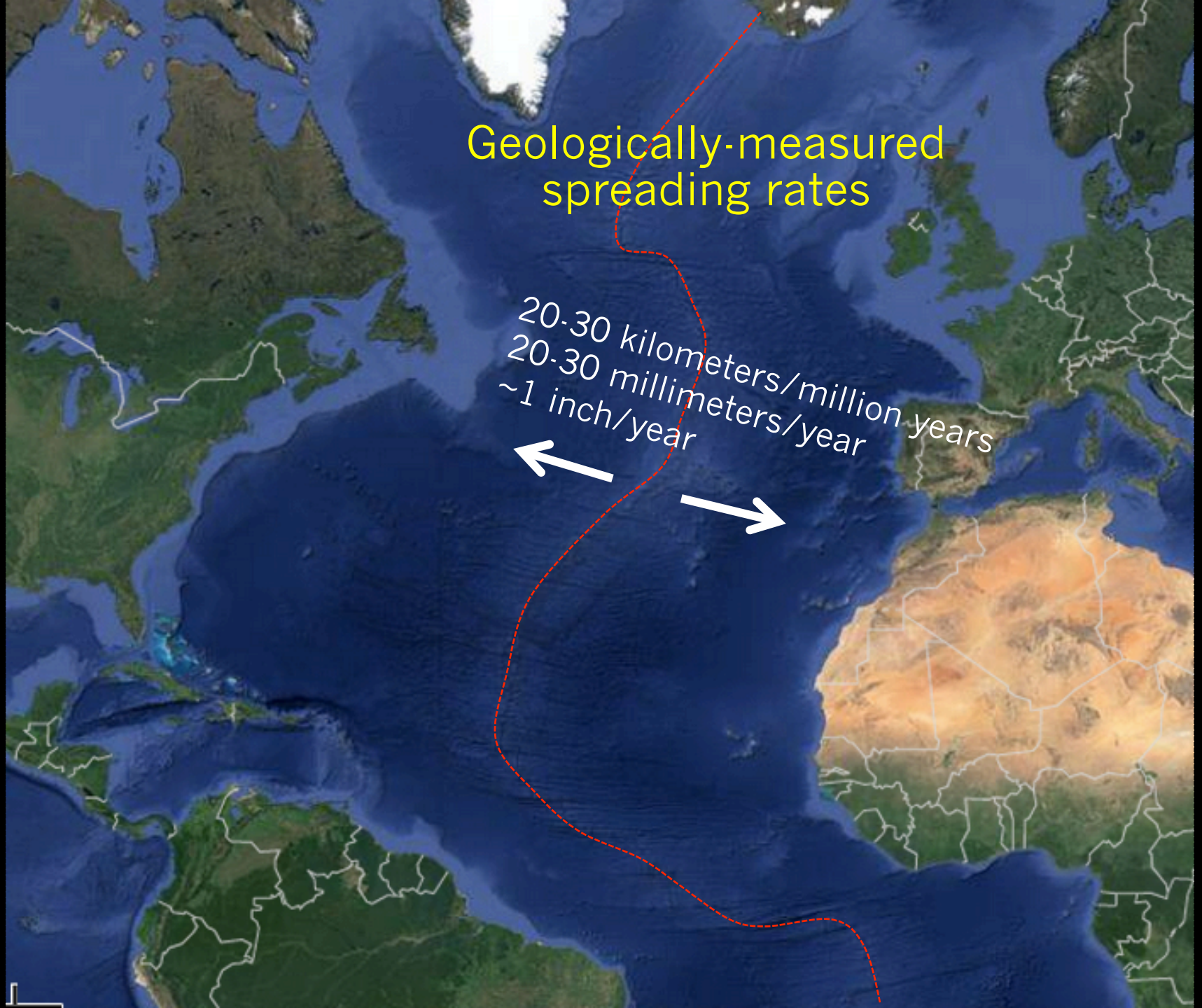
Visionary

Wegener's Dream

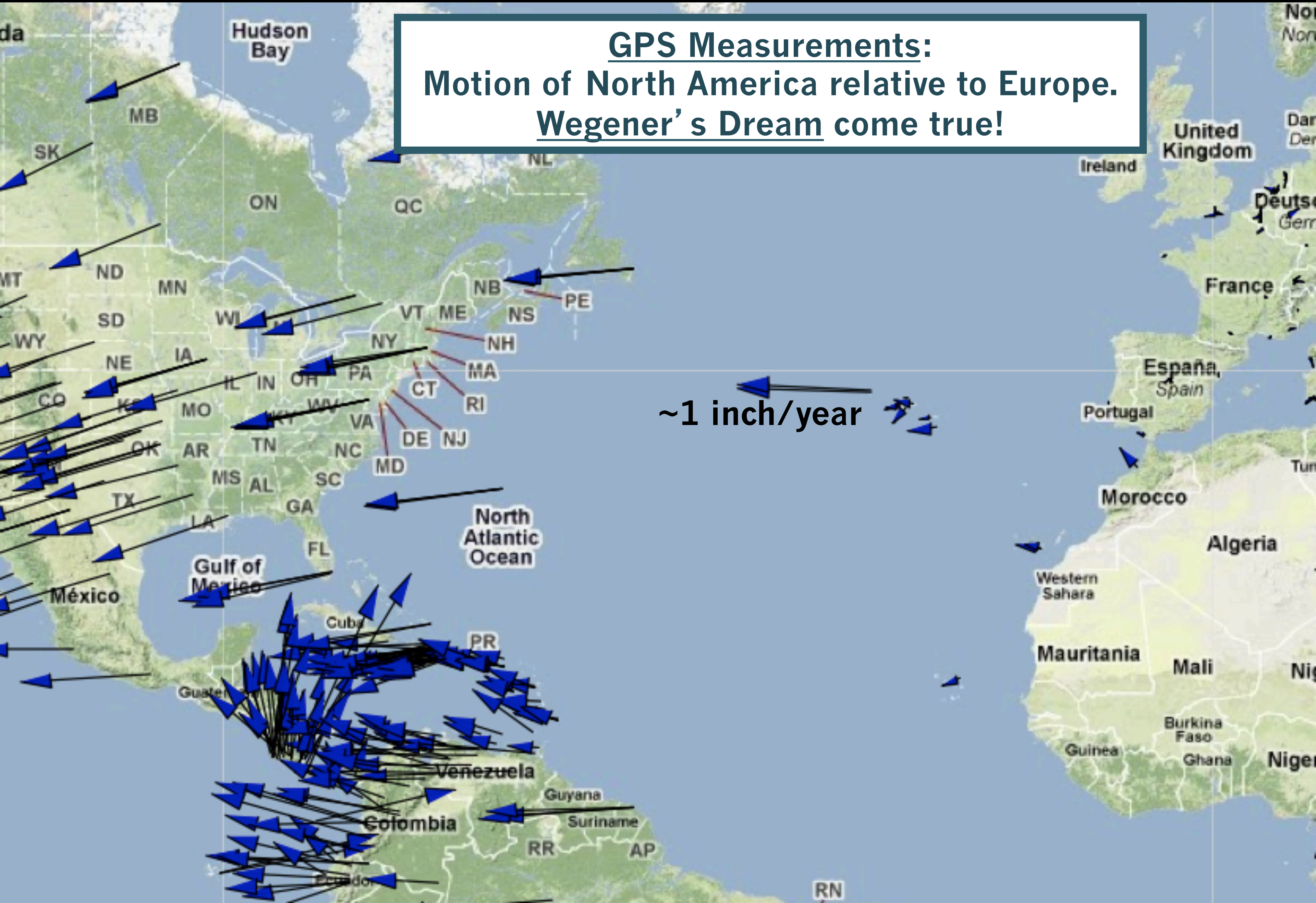
"This [direct measurement of continental drift] ***must be left to the geodesists****. I have no doubt that in the not too distant future we will be successful in making a precise measurement of the drift of North America relative to Europe."* **-- Alfred Wegener, 1929**



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!

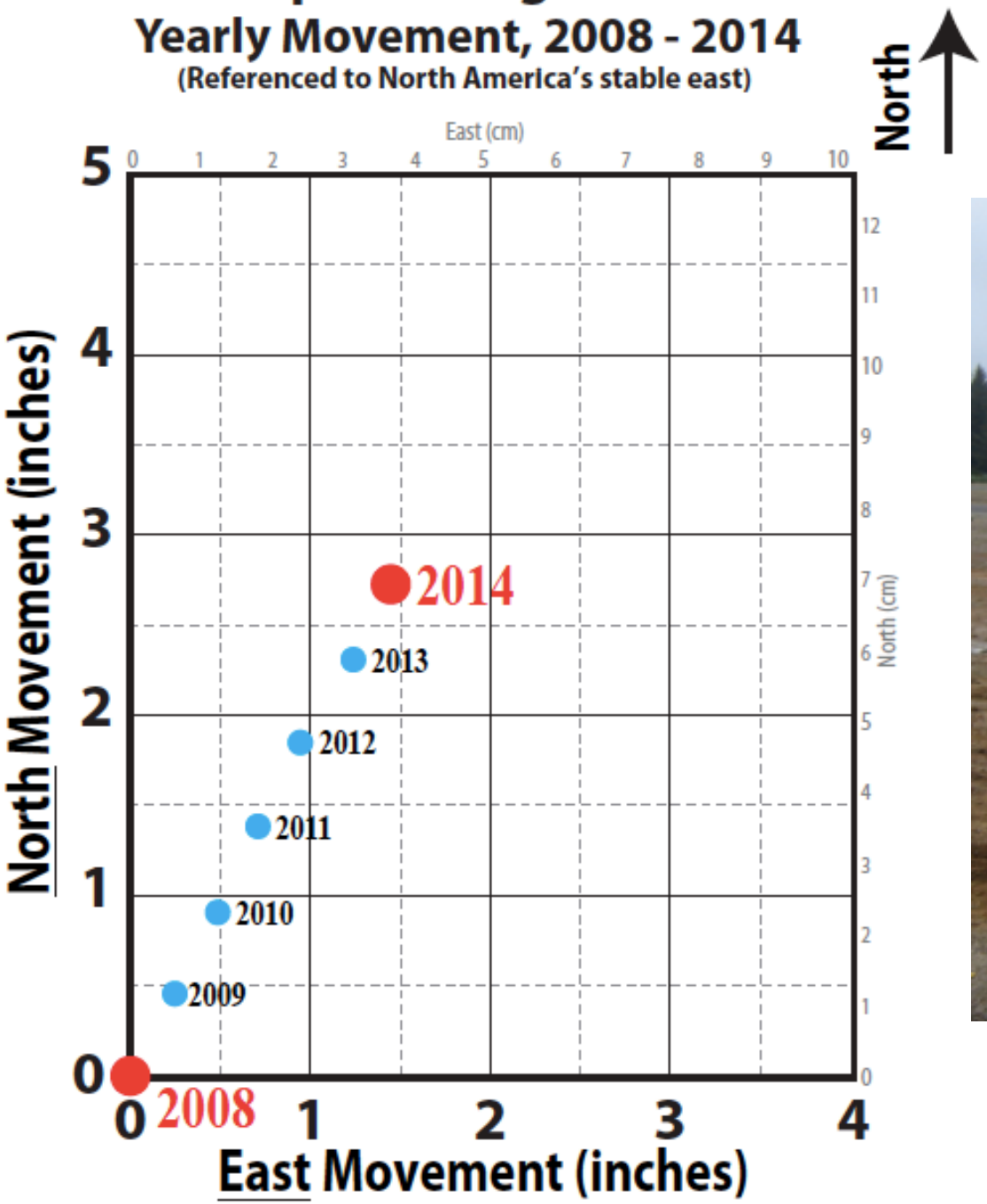


Illinois EarthScope 2010

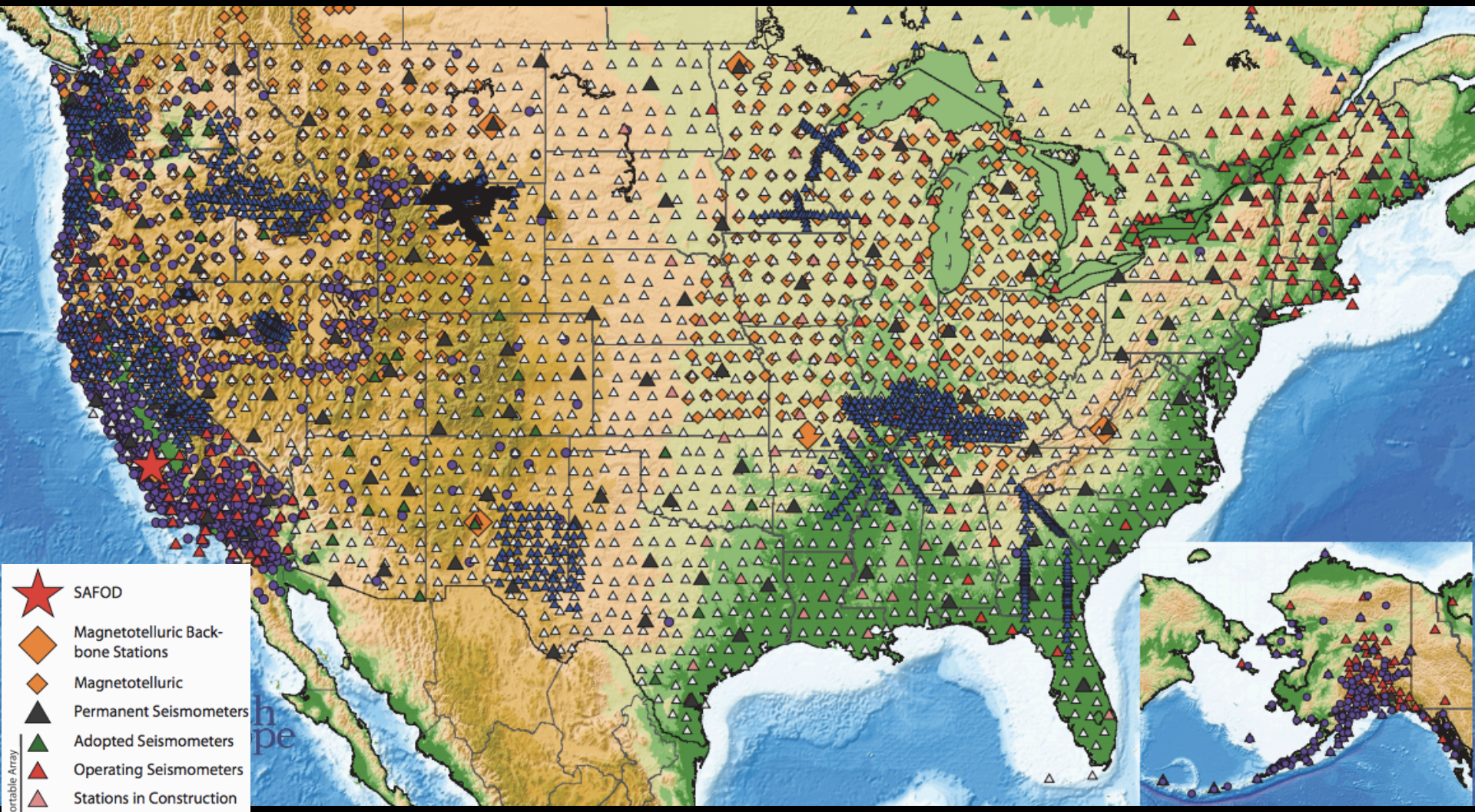
Bandon Airport, Oregon GPS Station

Yearly Movement, 2008 - 2014

(Referenced to North America's stable east)



EarthScope Station Status June 2015

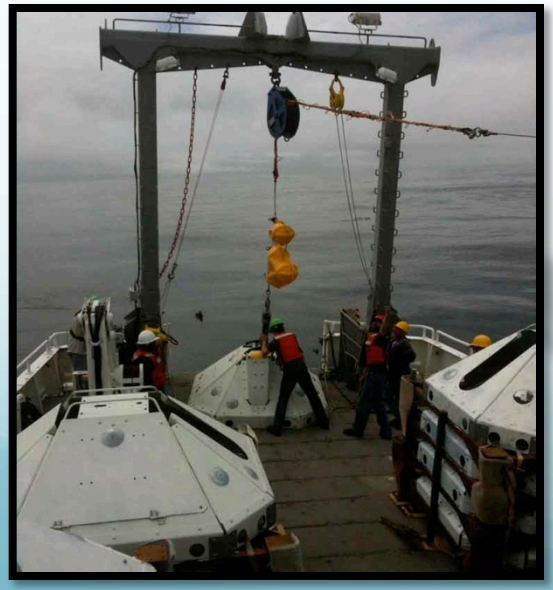


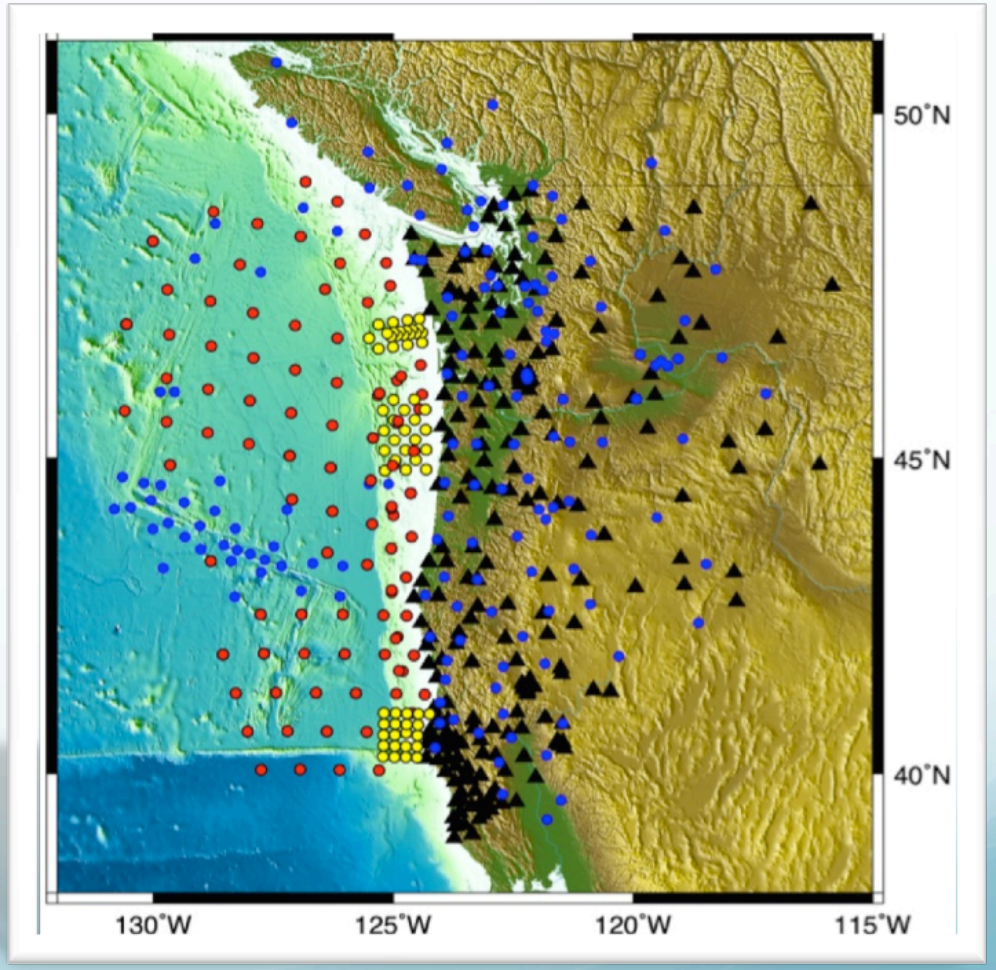
http://www.earthscope.org/science/maps/current-status-map/

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 Cheat Sheet

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 also funds science and education projects like CEETEP

EarthScope Facility has 3 Parts

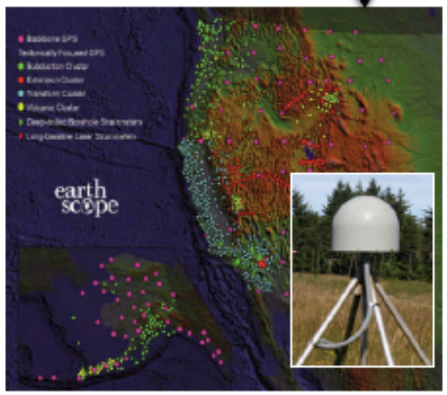
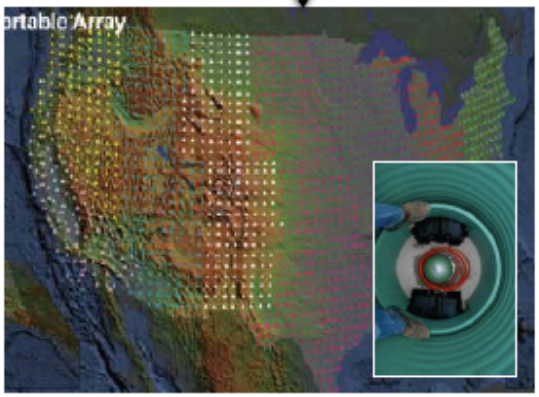
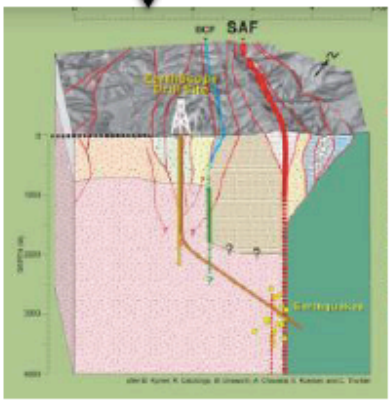


Plate Boundary Observatory (PBO) – >1100 GPS stations and strainmeters to measure crustal movements



USArray – 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

UNAVCO

(NSF's Geodetic Facility) runs PBO

IRIS

(NSF's Seismic Facility) runs USArray

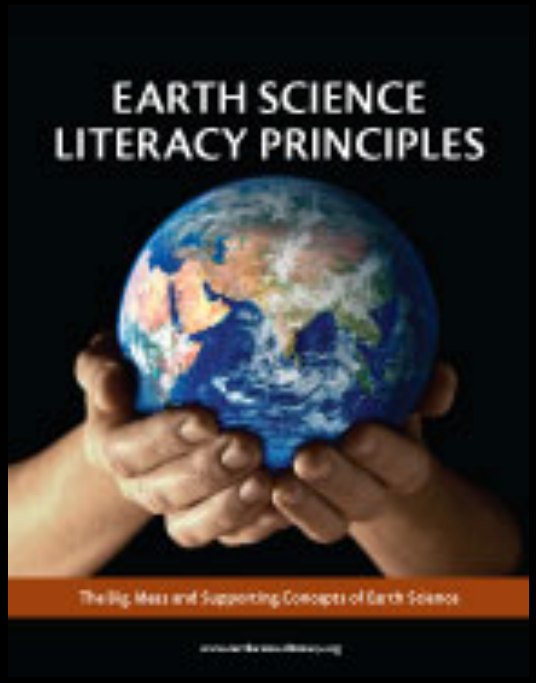
CEETEP

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.

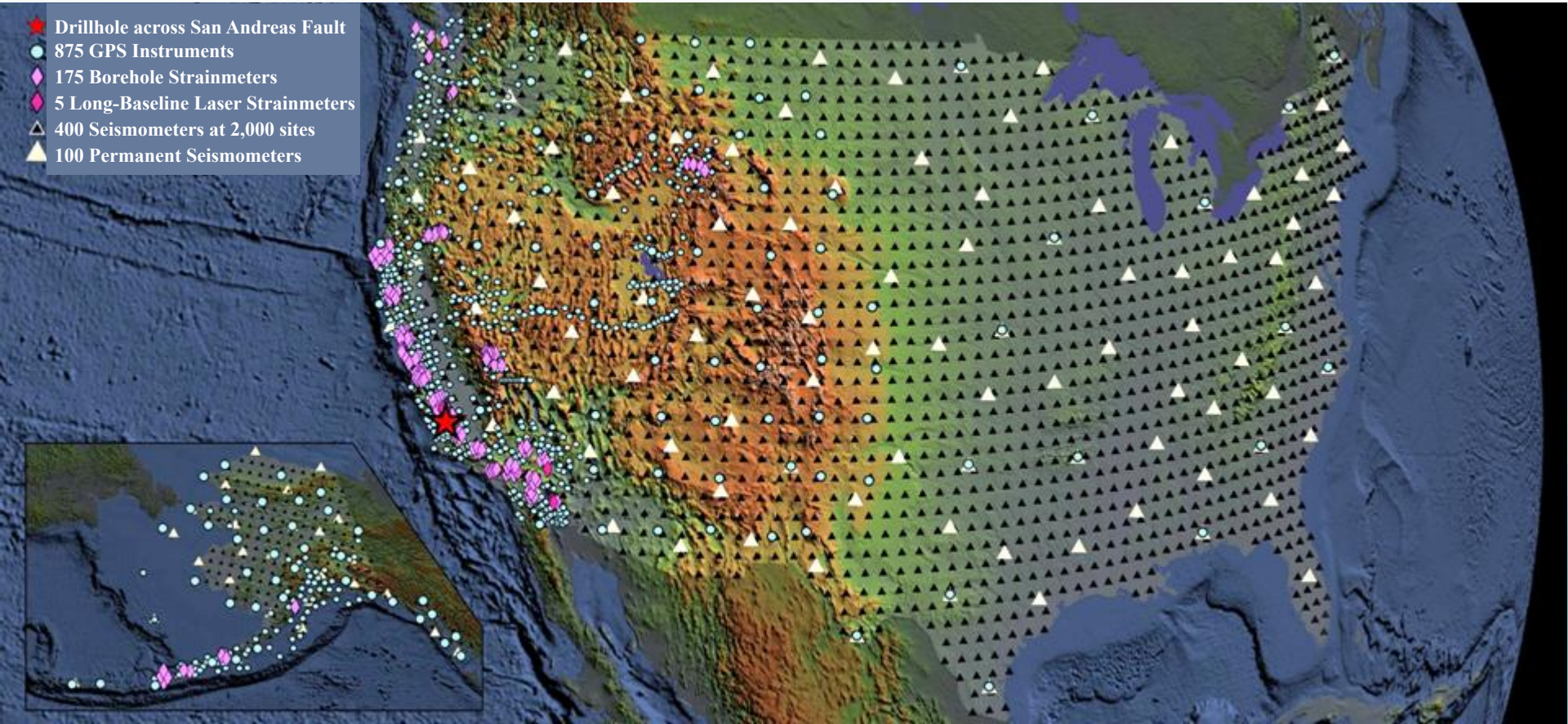
Education and Outreach Goals

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**

EarthScope

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