Cascadia EarthScope Earthquake and Tsunami Education Program (CEETEP)

Professional Development Workshop for Coastal Teachers, Interpreters, and Emergency Management Educators

Aberdeen Museum of History
Aberdeen, Washington
August 11-14, 2014

Bob Butler
University of Portland

Nancee Hunter & Bob Lillie
Oregon State University

Beth Pratt-Sitaula
Central Washington University

http://ceetep.oregonstate.edu
Cascadia EarthScope Earthquake and Tsunami Education Program (CEETEP)

Introductions

• CEETEP
• Instructors
• Participants
• EarthScope
CEETEP: Aim and Goals

**Primary Aim:** To improve disaster resilience through educator professional development.

**Goals:**

1. **Learn Geoscience** and be able to communicate about earthquake and tsunami science and research
2. **Understand Risk** and be able to communicate about Cascadia geohazards
3. **Take Action** and be able to work with students and communities to improve preparedness
4. **Exchange Pedagogy** on how to teach about geoscience, hazards/risk, and preparedness
A beautiful spot on the Oregon Coast …
Why are places like Beverly Beach so important to our discussions?

March 27, 1964
- Four children killed by tsunami spawned by Great Alaska Earthquake.

Beauty and the Beast

Beverly Beach State Park, Oregon
“The same geological forces that threaten our lives with earthquakes and tsunamis also nourish our spirits by creating the spectacular headlands and beaches of the Pacific Northwest.”

Olympic National Park, Washington

Copalis River, Washington
Cascadia EarthScope Earthquake and Tsunami Education Program (CETEEP)

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)

https://wordpress.up.edu/totle

http://ceetep.oregonstate.edu
CEETEP
Cascadia EarthScope Earthquake and Tsunami Education Program

Science (EarthScope, Cascadia)

Interpreters

Teachers

Emergency Management Educators

Students

The Public

Meanings (Geoscience, Hazards, Preparedness)
Scientists
Students The Public

Not: “Dumbing It Down” 😞

Science (EarthScope, Cascadia)

Formal Learning

Free-Choice Learning

Meanings (Geoscience, Hazards, Preparedness)

Scientists

Students The Public
Scientists  Students  The Public

Rather: “Storying It Up” 😊

Meanings (Geoscience, Hazards, Preparedness)

CEETEP
Cascadia EarthScope Earthquake and Tsunami Education Program

Science (EarthScope, Cascadia)

Formal Learning  Free-Choice Learning
Cascadia Earthquake and Tsunami EarthScope Education Program (CETEEP)

**Meanings** (Geoscience, Hazards, Preparedness)

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

**Training**

- Formal Learning
- Free-Choice Learning

- Scientists
- Colleges & Universities

- The Public
- Parks & Museums

"Storying it Up!"

Science (EarthScope, Cascadia)

Trained Together in Coastal Communities
Earthquake/Tsunami Science and Preparedness

Federal Emergency Management Agency (FEMA)¹
• Suggests that science classrooms are under-utilized for hazard and preparedness connections

Research on Behavioral Change²,³
• Simple consistent messaging on what TO DO
• From many trusted sources
• For a long long time
• Seeing others take preparedness steps


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

- **Main Room**: Exhibit Room
  - Most of the presentations.

- **Secondary Room**: Meeting Room #1 (Lower Level)
  - Drinks, snacks, lunch. Some breakout activities and team planning.

- **Water Fountains & Restrooms** – ???

[http://www.aberdeen-museum.org](http://www.aberdeen-museum.org)
CEETEP Binder

- Lots of Stuff!
- Agenda
- Contact Lists
- Participants
- Feedback
# Monday – Intro to Cascadia Science and Preparedness

**Monday, August 11 (Day 1)**

Cascadia plate tectonics, earthquakes and tsunamis; Seismic and GPS monitoring: Earthquake and distant tsunami preparedness

<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 (Bob Lillie). Please sit with your Action Team. Tables will be marked.</td>
</tr>
<tr>
<td>10:15</td>
<td>Break (Coffee, tea, juice, snacks)</td>
</tr>
<tr>
<td>10:30</td>
<td>Beauty and the Beast: Plate Tectonics and Geological Hazards of the Pacific Northwest (Bob Lillie)</td>
</tr>
<tr>
<td>12:00</td>
<td>Thoughts/questions/reflection (Bob Lillie, Nancee Hunter, Beth Pratt-Sitaula, Bob Butler)</td>
</tr>
<tr>
<td>12:15</td>
<td>Lunch (Served in Entry Area)</td>
</tr>
<tr>
<td>1:00</td>
<td>Basics of Earthquake and Tsunami Science and Hazards and Related Teaching Activities (Bob Butler, Bonnie Magura, Roger Groom)</td>
</tr>
<tr>
<td>3:15</td>
<td>Break (Coffee, tea, juice, snacks)</td>
</tr>
<tr>
<td>3:30</td>
<td>Surviving a Cascadia Subduction Zone Earthquake (Brynné Walker, Bob DeGroot)</td>
</tr>
<tr>
<td>4:30</td>
<td>Forms: Reimbursements; Stipends; Photo Permissions; Logistics for Day 2 Field Trip (Nancee Hunter, Beth Pratt-Sitaula)</td>
</tr>
<tr>
<td>4:45</td>
<td>Reflection, Questions, Implications (Bob Butler, Bonnie Magura, Roger Groom, Brynné Walker, Bob de Groot)</td>
</tr>
<tr>
<td>5:30</td>
<td>Adjourn</td>
</tr>
<tr>
<td>Time</td>
<td>Field Trip Activities</td>
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<tr>
<td>-------</td>
<td>-----------------------</td>
</tr>
<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 Aberdeen Museum of History for Field Trip (designated car pools will be arranged Day 1)</td>
</tr>
<tr>
<td>8:30</td>
<td><strong>Stop 1: Elk River Estuary (Brian Atwater, Bob Butler)</strong> Tsunami Geology Core for Tsunami sand and discuss the varied evidence used to determine Cascadia's Great Quake and tsunami history.</td>
</tr>
<tr>
<td>11:00</td>
<td>Drive to Ocosta Elementary School</td>
</tr>
<tr>
<td>12:00</td>
<td>Drive to Grayland Fire Hall, Intersection of Hwy 105 &amp; Grayland Beach Access Rd.</td>
</tr>
<tr>
<td>12:15</td>
<td>Lunch, Grayland Fire Hall</td>
</tr>
<tr>
<td>1:00</td>
<td><strong>Stop 3: Grayland Beach (Bob Lillie; Brynné Walker)</strong> Beauty and the Beast; Extreme Evacuation Challenges Brainstorm about interpretive opportunities and overcoming challenging tsunami evacuation sites.</td>
</tr>
<tr>
<td>1:45</td>
<td>Grayland Beach Evacuation Walk (Brynné Walker) Tsunami Evacuation Route Walk from Grayland Beach to Turkey Road Assembly Area. Includes time to think about and discuss hazards, infrastructure, solutions.</td>
</tr>
<tr>
<td>2:30</td>
<td>Drive to Stafford Prison off Hwy 105 between Aberdeen and Westport</td>
</tr>
<tr>
<td>3:00</td>
<td><strong>Stop 4: GPS Station P398. (Beth Pratt-Sitaula)</strong> GPS Station Visit component of EarthScope Plate Boundary Observatory (PBO) and discuss how movements of Earth's surface tell us about earthquake hazard.</td>
</tr>
<tr>
<td>4:15</td>
<td>Drive back to Aberdeen Museum of History</td>
</tr>
<tr>
<td>4:30</td>
<td>Adjourn</td>
</tr>
</tbody>
</table>
### Wednesday, August 13 (Day 3)

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30</td>
<td><strong>Coffee, tea, juice, snacks for those who arrive early</strong></td>
</tr>
</tbody>
</table>
| 9:00  | Cascadia Earthquakes and Tsunami and Related Teaching Activities (Bob Butler, Bonnie Magura, Roger Groom)  
Please sit with your Action Team. Tables will be marked |
<p>| 10:30 | <strong>Break (Coffee, tea, juice, snacks)</strong>                                                   |
| 10:45 | Cascadia Earthquakes and Tsunami and Related Teaching Activities (Bob Butler, Bonnie Magura, Roger Groom) |
| 12:00 | Thoughts/questions/reflection (Bob Butler, Bonnie Magura, Roger Groom)                   |
| 12:15 | <strong>Lunch (Served in Entry Area)</strong>                                                         |
| 1:00  | Science Storytelling through Interpretation: CEETEP team presents example of &quot;Group Interpretive Program&quot; from 2013 Workshop. |
| 1:15  | Tsunami: Are You Ready? (Brynne Walker)                                                  |
| 2:00  | Native American Oral Histories (Beth Pratt Sitaula)                                      |
| 2:45  | Exchange of Pedagogies: Working Together in Coastal Communities to Engage Students, Visitors and Residents on Earthquake and Tsunami Science and Preparedness (Bob Lillie) |
| 3:15  | <strong>Break (Coffee, tea, juice, snacks)</strong>                                                   |
| 4:15  | Action Teams: Teams work on Community Educational Project on earthquake and tsunami science and preparedness. They will present their project plan during Day 4 of this workshop, and the results of implementation at the March 7, 2015 Share-A-Thon in Quinault, WA. |
| 5:30  | <strong>Adjourn</strong>                                                                             |</p>
<table>
<thead>
<tr>
<th>Time</th>
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</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 (Beth Pratt-Sitaula, Bob DeGroot)</td>
</tr>
<tr>
<td>9:45</td>
<td>Preparedness for Post-Event Personal and Community Survival (Brynné Walker)</td>
</tr>
<tr>
<td>10:30</td>
<td>Break (Coffee, tea, juice, snacks)</td>
</tr>
<tr>
<td>10:45</td>
<td>Break Out Sessions Room 221 (small room) Tsunami Vertical Evacuation Structures (Roger Groom) <strong>Teachers</strong> Room 219 (big room) Hazard Inventory (Bonnie Magura, Brynné Walker) <strong>Interpreters &amp; EM Educators</strong></td>
</tr>
<tr>
<td>11:35</td>
<td>Break Out Sessions Room 221 Tsunami Vertical Evacuation Structures (Roger Groom) <strong>Interpreters &amp; EM Educators</strong> Room 219 Hazard Inventory (Bonnie Magura, Brynné Walker) <strong>Teachers</strong></td>
</tr>
<tr>
<td>12:15</td>
<td>Lunch (Served in Entry Area)</td>
</tr>
<tr>
<td>1:00</td>
<td>Action Teams: Final preparations for presentations and discussion about the task, schedule, and logistics for each Action Team to develop their March 7, 2015 Share-a-Thon products.</td>
</tr>
<tr>
<td>1:45</td>
<td>Action Teams: Groups 1, 2, and 3 present their ideas for development of Community Educational Programs on earthquake/tsunami science and preparedness. 20 minutes total per group (2 minutes prelude; 10 minutes presentation; 8 minutes discussion). Groups are encouraged to model how they will present specific concepts in different educational settings.</td>
</tr>
<tr>
<td>2:45</td>
<td>Break (Coffee, tea, juice, snacks)</td>
</tr>
<tr>
<td>3:00</td>
<td>Action Teams (continued): Groups 4 and 5 presentations.</td>
</tr>
<tr>
<td>3:40</td>
<td>Action Teams debrief and further develop their Project Plan, including tasks, schedule, and logistics for completing and implementing their project and reporting results at March 7, 2015 Share-a-Thon.</td>
</tr>
<tr>
<td>4:15</td>
<td>Post-Workshop Assessment (Michael Coe, Beth Pratt-Sitaula). Focus groups will be held by educator type (teachers, interpreters, EM educators). When you are not in a focus group, you will be taking the post-workshop survey.</td>
</tr>
<tr>
<td>5:30</td>
<td>Adjourn</td>
</tr>
</tbody>
</table>
**CEEDEP Workshop**  
**OSU Hatfield Marine Science Center**  
**Newport, Oregon**  
**August 12-15, 2013**

**CEEDEP Principle Investigators and Instructors**
1. Bob Butler, University of Portland, Portland, OR  
2. Nancee Hunter, OSU Hatfield Marine Science Center, Newport, OR  
3. Bob Lillie, Oregon State University, Corvallis, OR  
4. Beth Pratt-Sitaula, Central Washington University, Ellensburg, WA and UNAVCO, Boulder, CO

**Master Teachers and Co-Instructors**
6. Bonnie Magura, Portland Public Schools (retired), Portland, OR  
7. Roger Groom, Mt. Tabor Middle School, Portland, OR  
CEETEP Workshop
OSU Hatfield Marine Science Center
Newport, Oregon
August 12-15, 2013

CEETEP Partner Organizations
9. Ken Austin, UNAVCO, Boulder, CO
10. Bob de Groot, Southern California Earthquake Center, Los Angeles, CA

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

Animator/Videographer
12. Jenda Johnson, Portland

Student Assistant
13. Lisa Akers, Oregon State University, Corvallis
Action Team 1:
Grays Harbor County

20-Second Intro:

1. Who are you?

2. Your organization and/or educational setting?

Optional:

3. What do you hope to get from CEETEP training?

<table>
<thead>
<tr>
<th>K-12 Teachers</th>
<th>Taholah</th>
<th>Taholah School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kelly Bonnelle</td>
<td>Taholah</td>
<td>Taholah School</td>
</tr>
<tr>
<td>Curtis Leitch</td>
<td>Pacific Beach</td>
<td>Pacific Beach Elementary School</td>
</tr>
<tr>
<td>Lynette Reime</td>
<td>Pacific Beach</td>
<td>Pacific Beach Elementary School</td>
</tr>
<tr>
<td>Shani Wood</td>
<td>Pacific Beach</td>
<td>Pacific Beach Elementary School</td>
</tr>
<tr>
<td>Rhonda Adams</td>
<td>Pacific Beach</td>
<td>Pacific Beach Elementary School</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Park/Museum Interpreter</th>
<th>Seattle</th>
<th>Pacific Science Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Felicia Maffia</td>
<td>Seattle</td>
<td>Pacific Science Center</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Lois Guthrie</td>
<td>Aberdeen</td>
<td>Grays Harbor Co. Emer. Management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical Advisor</th>
<th>Denver, CO</th>
<th>CWU and UNAVCO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beth Pratt-Sitaula</td>
<td>Denver, CO</td>
<td>CWU and UNAVCO</td>
</tr>
</tbody>
</table>
Action Team 2: Ocean Shores

20-Second Intro:

1. Who are you?
2. Your organization and/or educational setting?
   Optional:
3. What do you hope to get from CEETEP training?

K-12 Teachers
Kelly Eddy  Ocean Shores  Ocean Shores Elementary School
Rhonda Ham  Ocean Shores  Ocean Shores Elementary School
Mercedes Lamphier  Ocean Shores  Ocean Shores Elementary School
Penny Reither  Ocean Shores  North Beach Jr/Sr High School

Park/Museum Interpreter
Bob Barack  Ocean Shores  Coastal Interpretive Center

Emergency Management Educator
David Wayman  Ocean Shores  North Beach Sch. Dist. Safety Coor.

Technical Advisor
Bob Butler  Portland, OR  University of Portland
# Action Team 3:
## Aberdeen

## 20-Second Intro:

1. Who are you?

2. Your organization and/or educational setting?

   **Optional:**

3. What do you hope to get from CEETEP training?

<table>
<thead>
<tr>
<th>K-12 Teachers</th>
<th>Aberdeen</th>
<th>St Mary School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diane Burns</td>
<td>Aberdeen</td>
<td>Aberdeen School District</td>
</tr>
<tr>
<td>Randy Cole</td>
<td>Aberdeen</td>
<td>Miller Junior High School</td>
</tr>
<tr>
<td>Barbara Good</td>
<td>Aberdeen</td>
<td>Miller Junior High School</td>
</tr>
<tr>
<td>Sally Holt</td>
<td>Aberdeen</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Park/Museum Interpreters</th>
<th>Aberdeen</th>
<th>Aberdeen Museum of History</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dann Sears</td>
<td>Aberdeen</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergency Management Educator</th>
<th>Tokeland</th>
<th>Shoalwater Bay Indian Tribe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jamie Judkins</td>
<td>Tokeland</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical Advisor</th>
<th>Portland, OR</th>
<th>Mt. Tabor Middle School</th>
</tr>
</thead>
</table>
**20-Second Intro:**

1. **Who are you?**

2. **Your organization and/or educational setting?**

**Optional:**

3. **What do you hope to get from CEETEP training?**

---

**K-12 Teachers**

<table>
<thead>
<tr>
<th>Name</th>
<th>Hoquiam</th>
<th>School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary Groves</td>
<td>Hoquiam</td>
<td>Hoquiam Middle School</td>
</tr>
<tr>
<td>Jody Harris</td>
<td>Hoquiam</td>
<td>Hoquiam Middle School</td>
</tr>
<tr>
<td>Kerry Marl</td>
<td>Hoquiam</td>
<td>Hoquiam Middle School</td>
</tr>
<tr>
<td>Stan Severson</td>
<td>Hoquiam</td>
<td>Hoquiam High School</td>
</tr>
<tr>
<td>Leslie Stump</td>
<td>Hoquiam</td>
<td>Hoquiam School District</td>
</tr>
</tbody>
</table>

**Park/Museum Interpreter**

<table>
<thead>
<tr>
<th>Name</th>
<th>Seattle</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maureen Carlisle</td>
<td>Seattle</td>
<td>Burke Museum</td>
</tr>
</tbody>
</table>

**Emergency Management Educator**

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonnie Magura</td>
<td>Portland, OR</td>
<td>Portland School District</td>
</tr>
</tbody>
</table>

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Action Team 5:
Westport

20-Second Intro:

1. Who are you?

2. Your organization and/or educational setting?

Optional:

3. What do you hope to get from CEETEP training?

K-12 Teachers
Melanie Garrett  Westport  Ocosta Jr/Sr High School
Jon Harwood       Westport  Ocosta Jr/Sr High School
Marina Smith      Naselle  Naselle-Grays River Valley School

Park/Museum Interpreter
Stephen Armes  Westport
Aleksandr Robbins  Seattle  Pacific Science Center

Emergency Management Educator
Scott McDougall  South Bend  Pacific Co. Emergency Management

Technical Advisor
Bob deGroot  Los Angeles, CA  Southern Calif. Earthquake Center
Get to Know Your Team
Spend a Few Minutes Together 😊

Each member of the team should share a little more details about their:

1. Educational setting and audience.

2. Strengths or experience with geoscience and preparedness.

3. Goals for gaining knowledge and abilities in earthquake and tsunami 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
Like a “Hubble Telescope” aimed into the Earth

“EarthScope Overview” Movie (0:00 – 4:30)
EarthScope Station Status
July, 2014

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

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.

**UNAVCO** (NSF’s Geodetic Facility) runs PBO

**IRIS** (NSF’s Seismic Facility) runs USArray
“EarthScope in Cascadia”
Movie
(0:24 – 5:07)

http://www.earthscope.org/current_status/showstatus.php?
map=NW&Facility=All&Instrument=All&StartDate=2000-01-01&Display=Instru
ments
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**

*Niawiakum River, Washington*  
*Ilwaco, Washington*
Earth Science Literacy Principles

http://www.earthscienceliteracy.org

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.
Aberdeen, Washington GPS Station
Yearly Movement, 2006 - 2014
(Referenced to Stable North America)

The dots on this card show motion of the Aberdeen GPS station over the past nine years. Because the station is anchored into hard rock beneath the soil, the dots represent the year-to-year movement of the Aberdeen region toward the northeast.

Orient this graph toward the north, tape it to the floor, and think about the questions below.

1. How far has the Aberdeen region moved since the year 2004? At what rate (inches per year) is the region moving? At that rate, how far has the region moved since the year 1700?

2. Why is the region moving toward the northeast?

3. The last big earthquake in the Pacific Northwest occurred in the year 1700. What will happen to the Aberdeen region when the next big earthquake occurs?


Card developed by the Cascadia EarthScope Earthquake and Tsunami Education Program (http://ceetep.oregonstate.edu). CEETEP is sponsored by a grant from the EarthScope Program of the National Science Foundation (http://www.earthscope.org) to Oregon State University, the University of Portland, and Central Washington University.
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!

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