

This map shows peak ground accelerations for a subduction zone earthquake. Higher PGAs mean more damage.

Using the CREW scenario

The overwhelming problem with a Cascadia earthquake is that it will cause massive regional damage that will leave us isolated. Coastal areas will be devastated, inland areas will suffer major damage to buildings and infrastructure. The number of casualties will be high. To help the region prepare, CREW (the Cascadia Region Earthquake Workgroup) published a scenario in 2005 that summarized what might happen to northwestern California, western Oregon and Washington, and southwestern British Columbia if we make no further preparations.

Three organizations used that scenario as a basis for their tabletop emergency exercises in 2005-06. Some of the lessons observed in these exercises are summarized here.

Blue Cascades III

- One participant said, “We just don’t get it. There was a lot of denial about just how bad the scenario would be or how long the recovery will take.”
- With the scale of damage, existing individual business and jurisdiction contingency plans cannot be implemented.
- There needs to be a systematic way to prioritize based on the needs of critical infrastructures and essential service providers. No such system exists.

Pacific Peril 2006

- There is a need to recognize that life has a new reality, that the magnitude 9 earthquake and resulting tsunami have breached a threshold, and things will not be the same as they were before. Mid-term recovery includes planning for social recovery, community housing, legislative interests, and business recovery.
- Some of the items that point to the beginning of long-term recovery are the loss of federal assets and the transition from emergency funding to long-term funding, shifting the focus from the past to future, and the standing down of emergency organizational structures.

Cannon Beach

The City of Cannon Beach, Oregon was the pilot community for a study in post-disaster, long-term recovery planning.

- Long-term recovery planning is a blueprint for how a community can be restored after a major disaster. It incorporates both long- and short-term strategies, including land use planning, business continuity planning, and other programs.
- Recovery planning is a shared responsibility between individuals, private businesses and industries, state and local governments, and the federal government.

Designing your own scenario exercise

Planning for a regional, catastrophic event is a different discipline than emergency management organizations and business continuity planners are used to, or responsible for. Though police, fire, and other responders must be prepared, they are not responsible for the long-term rebuilding that must take place. It is crucial to involve all affected parties: government agencies, not-for-profit organizations, residents, and businesses.

Key steps in designing your own exercise include having:

- Specific objectives
- A scenario of the incident and timeline
- What information is already known about the effects of the quake
- A comprehensive list of people, businesses, and agencies that need to be involved
- Communications plans
- Physical logistics of the exercise worked out
- Ground rules for working out the exercise (for example, can you use telephones and electricity?)
- Preparing injects (hypothetical events to add to the scenario as the exercise proceeds)
- Good note taking to incorporate lessons learned into changes in procedures or training.

Introduction

The last Cascadia subduction zone earthquake was in the year 1700, before modern cities, infrastructure, and utility systems. A similar magnitude 9 earthquake today would be catastrophic. To help the region prepare, CREW (the Cascadia Region Earthquake Workgroup) published a scenario in 2005 that summarized what might happen to northwestern California, western Oregon and Washington, and southwestern British Columbia if we make no further preparations. The scenario was a harsh one, from complete devastation in some coastal areas to the loss of electricity for extended periods of time for the urbanized I-5/Hwy 99 corridor.

Several organizations took that scenario and used it as the basis for a more comprehensive look at what might happen when the next earthquake

and resulting tsunami strike. This report is intended to help you prepare your own exercise by presenting lessons already learned by others. Included are three case studies from those earlier events and some key findings from each:

1. Blue Cascades III, summarizing its findings about regional interdependencies in an extreme disaster.
2. Pacific Peril 2006, summarizing its findings about mid- and long-term recovery issues.
3. Cannon Beach long-term recovery planning, summarizing its action recommendations.

Also included is a section on using existing material to build a scenario and run a tabletop exercise, to help you use the CREW scenario for your own local or regional planning.

Earthquake and tsunami scenario

The following is a compilation of major points used in the three tabletop exercises. Though each had a different focus, the basic science remains the same.

The first minutes

Four minutes or more of shaking from the earthquake is felt by the millions of people from mid-Vancouver Island, British Columbia south to Redding, California. All critical infrastructure and essential services are disrupted. In most areas, there is some damage to power substations and transmission/distribution lines; bridges, interstate highways, railings; microwave, electrical and water towers; tunnels; and underground cables for water, sewer, gas and fuel.

Within 30 minutes of the quake, the entire coastline is inundated by the first in a series of tsunami waves. Coastal communities are hit hard, with tsunami surge heights on the open coast averaging 30 feet.

Transportation

I-5 is blocked from Medford to the Canadian border due to collapsed bridges, traffic accidents, and



After a major earthquake, most rescue and many medical services will be done by the public, not professional emergency responders. Training done through neighborhood groups or businesses can be vital. Photo: Virginia Mason Medical Center (VMMC)

hazardous materials spills. Thousands of vehicles are abandoned along the roads and bridges, leaving I-5 and other interstates turned into parking lots. Ferries stop operating in Puget Sound, and airports close until inspected for damage.

Throughout the region, emergency responders, utility maintenance, healthcare and other essential personnel that are not assisting their families or trying to get their stranded children from school are impeded by traffic gridlock and streets blocked by rubble.

Utilities

Several transmission and power distribution lines and substations located along the I-5 corridor from southwestern British Columbia to Northern California are damaged, resulting in massive electrical outages. All forms of utilities (telephone, electric, gas, water, and sewer) are disrupted. Many fires start due to natural gas leaks and hazardous material spills. In Mist, Oregon, natural gas fields



This powerhouse on the Truckee River has a nine foot hole caused by a boulder falling into it after an earthquake. Landslides and rockfalls will be a substantial problem after a Cascadia earthquake. Photo: Federal Emergency Management Agency (FEMA)

go offline due to landslides. Several hazardous material incidents (gas and sewer) occur. The gas pipeline parallel to I-5 in Kelso is ruptured. Cellular phone and telephone company sites are inoperable in some locations. Water treatment systems are significantly affected, and water distribution is limited. There continues to be concern about the potability of water due to flooding and debris within the water intake systems. Wells are also affected, and pumps to wells do not work

Severe ground shaking damages several Bonneville Power Administration high voltage transmission substations along the I-5 corridor. Cross-Cascade transmission lines and structures leading into the Puget Sound and Portland areas are damaged by landslides. Major hydro generation at Bonneville and The Dalles Dam is disrupted. The DC and AC interties into California are also disrupted. Repair crews are too few to address all suspected damage areas. Routes to many damaged facilities are impassable, and this causes significant delays in repairs.

Emergency power and communications capabilities are increasingly lost due to lack of batteries and depletion of fuel for generators.

Coastal damage

The coastline suffers extensive damage. Buildings, bridges, over/underpasses and tunnels on US 101 and other state highway bridges in the Coast Ranges and coastal areas have various degrees of damage, some of it extreme. Numerous major landslides in the Coast Range in various locations block essentially all state highways that traverse the Coast Range.

Federal efforts

The US National Response Plan officially goes into effect. Military resources from the Air Force, Army, Navy and Coast Guard are put on alert for



Educating the public to drop, cover, and hold will save lives in a major earthquake. Photo: VMMC



Emergency responders like Oregon DEQ have a variety of resources to call on for response and recovery. Photo: British Columbia Provincial Emergency Program (BCPEP)

support to relief efforts. Significant damage occurs at Puget Sound Navy Shipyard and McChord Air Force Base.

Cities

Many tall buildings suffer some damage, as do most unreinforced brick or masonry buildings. Tilt-up warehouses are also disproportionately damaged. One- or two-story wood-built homes survive well, except where they are damaged by landslides, tsunami waves, or other localized events. Most buildings and homes have some nonstructural damage: items flying off shelves, overhead lights falling, etc.

Emergency managers search for viable shelters for people unable to go back into their homes. Industrial and commercial businesses in the area shut down. Disruption of wastewater lift stations causes sewage backup on streets. Banks shut down and ATMs do not function. After a few days, growing concern about civil disorder and looting becomes a major issue for law enforcement and emergency responders.

People with battery powered radios or backup power generators turn to the broadcast media for information or call stations because they cannot get through on 911.

After the first week

In most regions, severe communication breakdowns make coordination and obtaining essential resources and supplies difficult. Major long-term economic impacts are expected through losses of jobs and dollars. Damage assessments are still underway in many locations for bridges and rail

lines. Rail lines, trucking, and air traffic are overburdened by extra demands for products needed to rebuild. Debris removal and disposal is a huge challenge and is expected to last for months.

Government at all levels continues planning for longer-term restoration activities while thousands of people are homeless or still in shelters. While some electricity is restored, large segments of Vancouver, BC, Seattle, and Portland are still without power because of damage to critical components. Some restoration delays are caused by the lack of spare equipment, as well as the shortage of special handling equipment and damage to overpasses, roads, bridges, and rail lines.

Despite major damage to key facilities, the US Postal Service is crucial to providing a government presence and serving small companies and people who depend on receiving Social Security, payroll and other checks.

Communities in lower priority areas find they need to be self-sustaining for weeks. Some businesses and government agencies cannot operate their offices and reconstitute themselves in temporary quarters east of Cascadia.

Casualties

The number of dead and injured were not estimated, but are expected to be high. Medical facilities in some areas are quickly overwhelmed, and burial of the dead is a substantial problem, especially in coastal areas.



The brick wall anchoring this fire escape failed during an earthquake, blocking this as a means of escape. Photo: FEMA

Three case studies

In every tabletop exercise, lessons are observed. They are not truly learned until the information is put to use in an update of training, planning, and response tactics. Exercises can show the strengths and weaknesses of many points along the earthquake and tsunami continuum from first days to long-term recovery. Three separate scenario exercises show these phases.

A. Blue Cascades III

Blue Cascades III was intended to test how well we can adapt when our intricately related, interdependent infrastructure is out of commission. What

“[Even areas where power] was restored could experience brownouts for some period of time that would impede the start up of certain industries and businesses.”

from Blue Cascades III report

happens when utilities and transportation lines are disrupted? How can businesses and communities cope? In such a situation, who is responsible for what, and have we set up the means of cooperation between public jurisdictions, businesses, the nonprofit sector, and residents?

The answers to all these questions point to one conclusion: we don't yet have a sufficient understanding of the interdependencies in our infrastructure to prepare for an extreme disaster.

Blue Cascades III: Managing Extreme Disasters, was hosted by the Pacific NorthWest Economic Region (www.pnwer.org), a state-chartered consortium of five states (Washington, Oregon, Alaska, Idaho, and Montana) and three Canadian jurisdictions (British Columbia, Alberta, and The



Maps are an important source of information about sites of potential earthquake or tsunami damage. They can also be used to chart damage such as bridge failures, landslides, and other problems. Photo: Oregon Department of Transportation (ODOT)

Yukon Territory). More than 330 representatives from 150 organizations participated. It was the third in a series of regional exercises; Blue Cascades III was the first to deal with earthquakes.

Findings from Blue Cascades III exercise

Several dozen findings and recommendations were made from the Blue Cascades III event. Perhaps the most important were about the lack of understanding of the depth and breadth of a Cascadia earthquake, even among participants who have known, researched, or been part of other earthquake simulations.

Some of the findings from that scenario exercise include:

Scope of damage

1. Understanding the scope of damage from the

earthquake was challenging, even for participants who had been through earlier Blue Cascades exercises. One participant said, “We just don’t get it. There was a lot of denial about just how bad the scenario would be or how long the recovery will take.”

2. Throughout the region, there are pockets of soil that may liquefy during the shaking of an earthquake. Underground transmission lines for water, sewer, and other utilities may shift and break because of this soil liquefaction, leading to widespread systemic damage. Even if a home or office has no structural damage it may not be usable because it is left without utilities

Infrastructure destruction

1. The region should expect extensive long term power outage; absence of most communications capabilities; major transportation constraints from damaged bridges, tunnels and roads; water disruption; sewer backup; shutdown of fuel and natural gas distribution; and fires around the region caused by ruptured gas pipelines. With this scale of damage, existing individual business and jurisdiction contingency plans cannot be implemented.
2. It was difficult to comprehend the effects of long-term regional power outage. Many people didn’t understand how cascading and simultaneous infrastructure failures and physical destruction of critical assets could paralyze portions of the region for weeks or even months.
3. There was a good deal of discussion among participants, including the many electric power representatives present, about whether there would be “pockets of darkness” or a broader regional outage with “pockets of light,” and the length of time needed to restore much of the region’s power. One person observed that locations where power was restored could experience brownouts for some period of time that would impede the start up of some industries and businesses.
4. The interdependency of our infrastructure could greatly exacerbate the effects of the quake. If bridges are not passable, for example, then repair crews cannot get to substa-

tions to make repairs for electrical service. Localized damage to, or destruction of, critical infrastructure assets (for example, electric power substations, dams, and bridges essential to regional transportation) could lead to catastrophic consequences and long-term curtailment of essential services.

5. Utility managers will have difficulty locating and transporting needed materials to rebuild their systems and will be competing with other sectors for limited heavy equipment and operators.

Long-term efforts

1. There was general recognition that in an extreme disaster there needs to be a systematic way to prioritize based on the needs of critical infrastructures and essential service providers. No such system exists. Who establishes restoration priorities, and who resolves the conflict over competing priorities?
2. There will be the monumental issue of rescuing thousands of individuals either injured or trapped in buildings, the need to provide shelter to, or resettle tens of thousands of others, and deal with the dead in the middle of chaos and regional paralysis.
3. There will be a need to for staging and relocation areas in the eastern part of Oregon and Washington, as well as southeastern British Columbia and northeastern California.



Satellite phones and ham radios may be needed for communication after a major earthquake. Photo: ODOT



Pacific Peril 2006 brought together more than 400 people from federal, state, local, tribal, Canadian, and private sector organizations. After an actual subduction zone quake, military assets will be needed to work with civilian authorities to carry out rescue, response, and some long-term projects. Photo: BCPEP

B. Pacific Peril 2006

Pacific Peril 2006 was designed to assess the capability of county, state and federal jurisdictions to provide needed disaster response services in the aftermath of a catastrophic earthquake and tsunami. Participants looked at short-term, mid-term, and long-term response and recovery efforts.

Pacific Peril was sponsored by the US Department of Transportation (www.dot.gov), involving more than 400 response professionals, including state and county transportation and emergency management agencies from Oregon, Washington, Alaska, Idaho and California. Federal involvement came from the Department of Homeland Security, Department of Transportation, and Department of Defense agencies, and the participation of several Canadian agencies made Pacific Peril 2006 an international exercise.

Many exercises and discussions revolve around initial response and the first few days after a disaster. Pacific Peril placed a considerable emphasis on recovery. In a major disaster, life is changed for significant periods of time, and after catastrophic

damage life can be permanently altered. During the exercise, participants carefully considered the issues involved in mid-term and long-term recovery.

The problems for local communities across Cascadia will vary widely. A coastal city that has seen the majority of its people lost and buildings destroyed will face a significantly different recovery than an inland city with minimal casualties, but massive infrastructure damage. Still, there will be regional challenges that will affect the recovery of all of

Cascadia. Some of these are summarized below.

Issues for mid-term recovery

There is a need to recognize that life has a new reality, that the magnitude 9 earthquake and resulting tsunami have

breached a threshold, and things will not be the same as they were before. During the mid-term recovery, consideration must be given to long-term recovery: social recovery, community housing, legislative interests, and business recovery.

Moving people out of shelters and into temporary housing is a priority, to rebuild the concept of community.

“There is a need to recognize that life has a new reality . . . that things will not be the same as they were before.”

from Pacific Peril report

At this point, regulatory issues become more important, as short-term response issues are over. Land use and economic plans that existed before the quake are once again the basis for rebuilding and moving forward. Critical infrastructure and essential services are restored, if not fully, then at least on a workable basis (for example, there may be brownouts).

Cleaning up debris is a crucial and ongoing task. Debris can delay everything from the rebuilding of utility systems to rebuilding neighborhoods. The environmental effects of the earthquake will become clearer and will likely require extraordinary cleanup efforts.

Disaster funding becomes critical, and the questions of who will pay for the response, rebuilding, and other recovery needs are raised. The need for ongoing social and financial assistance is crucial because the region will be besieged with unemployment, businesses closing, and loss of tax revenues.

Additionally, there will be a need to manage the outpouring of donations and volunteers from around the country, perhaps around the world, as the scope of the devastation unfolds.

Just as in New Orleans after Hurricane Katrina, there will be a demographic shift. Many coastal communities will simply be uninhabitable and residents of Cascadia may choose to move rather than endure the lengthy rebuilding process, exacerbated by months of aftershocks.

What are the priorities?

1. Set long-term goals
2. Replace infrastructure
3. Find residential housing, return displaced persons
4. Employment
5. Public health
6. Mental health
7. Local governmental reorganization, especially in areas with high casualty rates and infrastructure damage

What political issues will there be at this phase?

1. Funding accountability
2. How to prioritize restoration projects
3. Discussions of decisions made earlier (“the blame game”)
4. Political vacancies
5. Reconcile public expectation with the reality of the new normal
6. Engage and educate media
7. Property rights issues
8. Coastal subsidence and changes in coastline
9. Environmental issues
10. Impoverished people & minority groups, dealing with perception of inequities



At Pacific Peril 2006, the Joint Information Center simulated media interaction. Being prepared for media questions and knowing how to use them as information partners will be vital after an earthquake. Photo: ODOT

11. Letting the public know what's going on

Long-term recovery

The transition to long-term recovery does not come at a specified point. Some of the items that may point to the beginning of this phase, however, include the loss of federal assets and the transition from emergency funding to long-term funding, shifting the focus from the past to future, and the standing down of emergency organizational structures.

Long-term recovery starts as plans agreed on during the mid-term are implemented, while federal government involvement appears less visible, the pace of progress slows, and local political structures will take on a renewed role. Some emergency organizational structures remain but there's a shift back to normal government processes.

What are the priorities?

1. Adjust to the new normal
2. Auditing
3. Public education
4. Economic revitalization
5. Community marketing



Long-term recovery will depend on how quickly debris removal, resettling families, and rebuilding projects commence. Photo: FEMA



This house moved two feet off its foundation, breaking all utility lines, causing serious structural damage, and making it uninhabitable. Photo: FEMA

6. Continued focus on building codes, land use and mitigation
7. Issues of new development vs. recovering neighborhoods

What political issues will there be at this phase?

1. Unfunded mandates
2. New land use and building codes
3. New jurisdictional boundaries
4. Changing direction of projects because of the political environment
5. Managing expectations for repair vs. improvement
6. Restoring public confidence
7. Continued need for money

Because of the widespread nature of damage with a regional disaster, some communities may make major changes. For example, some coastal communities will have new shorelines because some of coastline will permanently rise or fall after the earthquake. Instead of using this land for development, it might be used as parks.

Inland, there could be blocks of damage in older, central cities areas where most buildings are damaged. Rather than repair individual buildings, cities might choose to designate these as urban renewal areas and develop new neighborhoods.

C. Cannon Beach

The City of Cannon Beach, Oregon was the pilot community for a study in post-disaster, long-term recovery planning.

In 1964, a tsunami from an Alaska subduction zone earthquake destroyed part of the town. Perhaps because of this event, Cannon Beach has a long history of preparing for the risks a Cascadia

“Although Cannon Beach’s permanent population is small. . . more than 400,000 tourists visit each year.”

from Cannon Beach report

earthquake and tsunami will pose for the small city. There are fewer than 2,000 permanent residents, but each year more than 400,000 tourists visit. This pattern of a small town hosting enormous numbers of visitors is common in Cascadia beach towns.

The Cannon Beach Post-Disaster Recovery Forum provided an opportunity for a variety of stakeholders to assess the community’s current ability to recover from the disaster, and to develop strategies to increase the city’s ability to recover. Forty-two stakeholders attended the forum sponsored by the Oregon Natural Hazards Workgroup (ONHW), the United States Geological Survey (USGS), CREW, and Oregon Emergency Management.

Long-term recovery planning is a blueprint for how a community can be restored after a major disaster. It incorporates both long- and short-term strategies, including land use planning, business continuity planning, and other programs. Recovery planning is a shared responsibility between individuals, private businesses and industries, state and

local governments, and the federal government.

Results of Cannon Beach forum

The full report by ONHW is available at www.OregonShowcase.com

The planning forum resulted in a number of recommendations for action. These include:

Oversight related activities

1. Establish a Disaster Resilience Committee
2. Develop a Cannon Beach Post-Disaster Recovery Ordinance
3. Establish comprehensive disaster communication strategies to address both the response and long-term recovery needs of Cannon Beach
4. Develop a funding matrix that provides a list of potential funding mechanisms for disaster recovery and mitigation activities
5. Coordinate outreach and education programs related to disaster response, recovery, preparedness, and mitigation planning

Critical facilities and infrastructure-related activities

1. Conduct a study to determine priorities for post-disaster utility restoration



When doing community planning, it is important to include a variety of stakeholders, including residents, businesses, and government agencies. Photo: Oregon Natural Hazards Workgroup (ONHW)



So that you don't lose time recreating existing information, be sure to gather material that is already available, in the form of maps, reports, and expert help. Photo: ONHW

2. Develop long-term strategies for restoring local transportation networks
3. Assist the Oregon Department of Geology and Mineral Industries to develop and enhance Cannon Beach's seismic needs assessment of critical emergency response buildings and public schools
4. Develop a proposal to relocate or retrofit important buildings that are critical to post-disaster recovery efforts

Land and development related activities

1. Complete a Buildable Lands Inventory that takes the tsunami inundation zone into account.
2. Establish a debris management plan

Economy related activities

1. Assist businesses in developing business continuity plans
2. Create a list of qualified local and regional contractors to perform recovery work post-disaster
3. Prepare a City Continuity of Operations Plan for the City of Cannon Beach

Population related activities

1. Create a post-disaster housing plan that includes a vacant home database
2. Increase communication and outreach through citizen-to-citizen networks that address post-disaster isolation and mental health of elderly, sick, and handicapped populations



Increasing communication across organizational boundaries can be one of the most important results of a tabletop scenario exercise. Photo: ONHW

Designing a tabletop exercise using the CREW scenario

Planning for a regional catastrophic event is a different discipline than emergency response organizations and business continuity planners are used to, or responsible for. Though police, fire, and other responders must be prepared for such an event, they will not be responsible for the long-term rebuilding that must take place. It is crucial to involve all affected parties: government agencies, not-for-profit organizations, residents, and businesses.

The key to designing a successful disaster exercise is specifically identify what you want to test. If you have two hours, for example, you won't have enough time to adequately test your plan for long-term recovery. However, you might be able to test whether you can organize and staff a joint information center with a number of other agencies. Or you could test how long it takes to get information to key members of your staff.

You also need as much information as possible before the exercise begins. If you want to test your agency's ability to react to an earthquake, you need to know what a potential earthquake might look like. In a Cascadia subduction zone quake, that means there will be major damage to infrastructure, extensive building damage, and major casualties.

You'll need to know how it might affect transportation and utilities, what type and number of casualties there might be, etc. In most cases, this means you need partners in your planning. Emergency managers and responders, business continuity planners, utility staff, government personnel from local, state, and federal agencies are just a few of the types of people who can help you plan and execute a successful exercise. Perhaps most importantly, find out what other people have already learned, so you don't waste your most precious resource — your time. CREW can be a resource in helping you get started.

Successful emergency response requires coordination in two directions: horizontal and vertical. Horizontal information is that which flows between organizations at a similar level. State agencies are on a horizontal flow, because one does not control another. Vertical integration may also be important if there is a chain of command involved. For state agencies, vertical flow would involve the Governor's office and might also include federal, regional, and local agencies.

As an example, here's a summary of some key questions raised before the Blue Cascades III exercise. Yours might not be on such a large scale, but the essential elements remain the same.

Blue Cascades III exercise development

The scenario was developed over five months of biweekly conference calls and four planning meetings. Engineers and seismologists from CREW were available to explain and interpret information from the CREW Report. Members submitted



Scenario exercises can be tabletops (run in an office with action simulated) or can involve hundreds of participants practicing their emergency response roles. Photo: VMMC

“injects” (hypothetical events) that reflected primary areas of concern to their organization. These injects were not part of the original background given to participants, but were announced as incoming news during the tabletop exercise, to simulate the ongoing information that comes into an organization during real events.

Your scenario

The question the Blue Cascades III scenario was designed to answer was, “How well is the region prepared to deal with an extreme disaster like a magnitude 9 earthquake?” The scope of the question demanded a large pool of resources,

“An extreme disaster is typified by chaos and confusion . . .”

from Blue Cascades report

organizations, agencies, and private businesses be involved because of the level of interdependency involved in our highly developed society. Ultimately they had more than 300 participants over two days.

Your question might not be as large. You might want to ask, “How well do the departments of my organization react in an emergency?” To answer that question, you’ll need:

1. Specific objectives. The more specific you are, the more you’ll achieve from the exercise. As an example, in 2000 the US Army Corps of Engineers (the Corps) hosted federal, state, and local officials at a highly successful exercise to enhance response planning and readiness in the Puget Sound area. Their primary objectives included:
 - **Identify the potential hazard** posed by a Cascadia subduction zone earthquake.
 - **Provide a platform** for participating agencies to share their organizational structure, level of preparedness, and response procedures.

- **Examine the Corps’ role** in support of the Federal Response Plan.
 - Provide a platform to **discuss the relationship** between federal, state, and local governments in response to a Cascadia event.
 - **Conduct a roundtable discussion** of expected response using scenario snapshots and questions provided to participants.
 - **Familiarize participants** with FEMA’s HAZUS earthquake modeling software and discuss possible future applications.
 - **Identify** planning, preparedness, and response **shortfalls for remedial action.**
2. A scenario of the incident and expected damage, including a time line. You’ll need to decide if you want to exercise the first few minutes or hours, or a longer time. The more accurate the scenario is, the more useful your exercise will be. Include scientists or technicians in your scenario development, if needed.
 3. What is already known. Gather materials such as earthquake (and if appropriate tsunami) hazard maps, to know what areas are most at risk. Have local utility managers gone through an exercise that will give you information about your area? The same can be asked of emergency managers at other government agencies, local businesses (especially large corporations), and local not-for-profits like the Red Cross, hospitals, etc.
 4. A list of who should be involved. Do you need



For a successful scenario exercise, each participant should know what the ground rules are and be able to foresee how earthquake or tsunami damage will affect their operations. Photo: ODOT

department heads or just representatives from different sections (horizontal coordination)? Is there a chain of command (either up or down) that needs to be used (vertical coordination)? Do you need to include people from outside your organization? Don't forget to include someone (or several people, depending on the size of your event) to work with the media (even though you probably won't involve the media, be sure to practice what messages you would release if the media was there).

5. Testing communications. Do you have the capability of communicating within your organization? How about outside your organization, across sectors (horizontally)?
6. Logistics. Do you want everyone in one large room, or divided into smaller sections? How much time will you need and will you break into shorter sessions or bring food in to keep people working (or debriefing) over breaks and lunch?
7. Ground rules. For example, we know that a major earthquake will likely knock out telephones and electricity. However, for purposes of your exercise, you may decide to use telephones. Remember, no exercise is a final event. Each one should be debriefed and questions raised should be incorporated into a future exercise. Otherwise, the lessons will be lost. If you are doing an exercise for the first time, it's better not to go to the worst case scenario, be overwhelmed, and feel defeated. Start simple and build to the more complex.
8. Preparing injects is an important step. In a real disaster, you don't have all the information before the emergency starts. To truly test your capabilities, you should have everyone start with the same script, but add injects that only the Planning Team knows about ahead of time.

9. Keep good notes of what happens during the exercise. It is very unlikely that when a real disaster hits, all of the staff who has been through an exercise and learned those lessons will be available. Clear records will help with three things:

- They will give direction to your staff for a real emergency, especially if they are used as training documents to potential backup staff, or incorporated into emergency operation manuals. Assume that during a true emergency, all your assigned staff will not be available to you.



After a scenario exercise, you should update training and procedure manuals to reflect lessons learned. Assume that during a real emergency, not all your personnel will be available. Photo: ODOT

- Potential strengths and weaknesses in your organization should become evident during an exercise. This will give you a list of potential mitigation opportunities: problems to work on, strengths to maintain, and programs to enhance before the next emergency.
- Exercises should be run periodically as training. What is learned at each exercise should be applied to the organization, then a new exercise should be run annually. Without this loop, most of the lessons learned during an exercise are lost and your efficiency during an actual emergency will suffer.

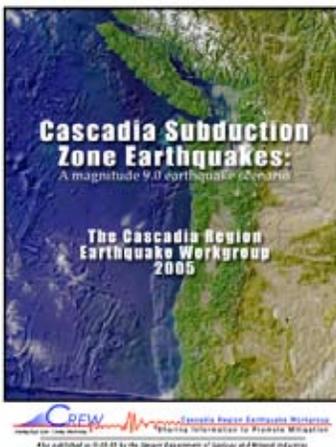
CREW

CREW (the Cascadia Region Earthquake Workgroup) is a partnership of the private

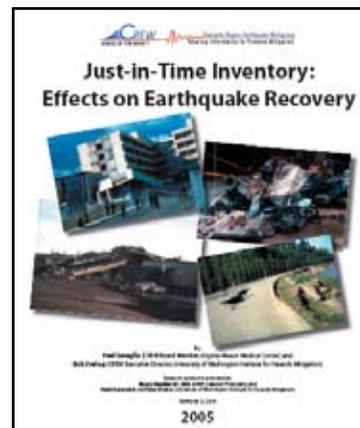
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Vaughn Mason	Work Safe Technologies	
Michael Park	Intel Corporation	
Ines Pearce	Seattle Emergency Management	
Gerry Peters	Canada Emergency Management and National Security	
Patricia Reuter	Portland Emergency Management	
Woody Savage	USGS	
Fredrick Savaglio	Virginia Mason Medical Center	
Joan Scofield	Washington Office of the Insurance Commissioner	
Dave Spicer	US Army Corps of Engineers	
William Steele	University of Washington	
Chris Trisler	Department of Homeland Security	
Judi Vanswieten	University of British Columbia	
Craig Weaver	USGS	
James Whyte	British Columbia Emergency Management	
Jay Wilson	Oregon Emergency Management	

Here are two products that are available as .pdf files on our website (www.crew.org).



This 24-page report gives background information on earthquakes in Cascadia and presents a scenario of what a magnitude 9 earthquake would look like.



This 12-page report is an important resource for businesses who use just-in-time inventory and how that may affect their ability to function after a major earthquake.