LIVING ON THE FAULTLINE AND ALONG THE COAST — PARTICIPANT'S MANUAL

Revision 6, 10 January 2009

AN INTRODUCTION TO EARTHQUAKE AND TSUNAMI PREPAREDNESS FOR INDIVIDUALS, FAMILIES AND ORGANIZATIONS

HUMBOLDT COUNTY CHAPTER
THE AMERICAN RED CROSS
406 11TH STREET
PO BOX 3402
EUREKA, CA 95502-3402

(707) 443-4521

The "Living on the Faultline and Along the Coast" course was designed by a Humboldt County Chapter volunteer with two learning objectives. First, to teach individuals, families and organizations living in Northwest California about the threat and potential damage we can expect from earthquakes and tsunamis. And second, to identify how preparation can help us stay safe, reduce injuries, and minimize damage.

The course is intended to be an introduction to Disaster Preparedness — the Chapter hopes that you will augment this course with the other components of Red Cross Disaster Services, Red Cross First Aid and CPR courses that Red Cross provides, so that individuals, families, households, organizations and workplaces can respond to disasters in a sensible and meaningful way, helping each other, and saving lives.

All Disaster Services courses are offered online or free of charge at the Humboldt County Chapter of the American Red Cross. Please call our office, (707) 443-4521, to register.

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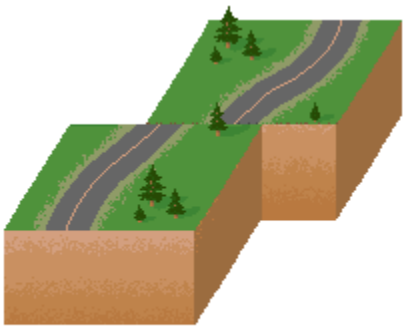
1. EARTHQUAKES

1.1 ORIENTATION

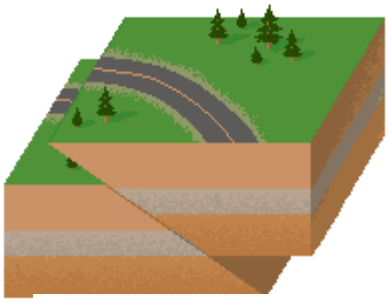
1.1.1 Know the Terms

While there is a lot of jargon associated with earthquakes, five of these terms are basic to this course, and frequently are encountered in news articles:

- **Fault.** A planar break in rock along which one side has moved relative to the other. There are two principal types of faults active in our region:



Strike Slip Fault



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Thrust Fault

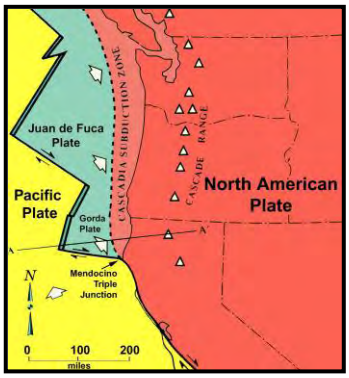
- **Earthquake.** A term used to describe both the sudden slip on a fault, and the resulting ground shaking and radiated seismic energy caused by the slip.
- **Rupture.** The instantaneous boundary between the slipping and locked parts of a fault during an earthquake.
- **Epicenter.** Point on the earth's surface vertically above the point in the crust where a seismic rupture begins.
- **Magnitude.** A number that characterizes the relative size of an earthquake, based on measurements of the maximum motion recorded by a seismograph. There are several scales used to measure magnitude, but all scales yield approximately the same value for any given earthquake.
    - Any earthquake over magnitude 6 (M6) is considered to be a "major" earthquake, while any over magnitude 8 (M8) are considered to be "great" earthquakes.
    - Each increase by one unit in magnitude corresponds to a 10-fold increase of the amplitude of the seismic wave on a seismogram, and an approximate 30-fold increase in the amount of energy released.

For further information, consult these two web sites:

http://earthquake.usgs.gov/

www.humboldt.edu/~geodept/earthquakes/eqk_info.html

1.1.2 North Coast Geologic Setting



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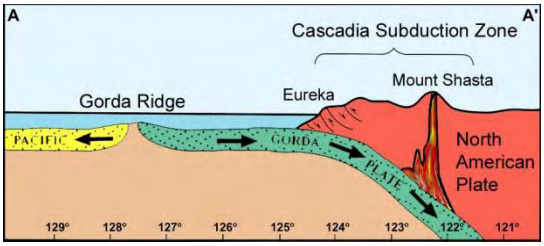
North Coast geology is distinct from that of the rest of California

- The Mendocino Triple Junction is a zone, not a point, where the Gorda Tectonic Plate, the North American Plate, and the Pacific Plate come together.
- South of the Junction, the Pacific Plate moves to the northwest along the San Andreas Fault.
- North of the Junction, the Gorda Plate and its northern extension, the Juan de Fuca Plate, move northeast along the Cascadia Subduction Zone, and plunge (or subduct) under the North American Plate.
- The Cascade volcanoes extend south only as far as the southern boundary of the Cascadia Subduction Zone. They owe their existence to the Gorda and Juan de Fuca Plates, which as they are thrust beneath the North American Plate, begin to melt when they are about 60 miles deep — under the Cascade volcanoes.

1.1.3 The Cascadia Subduction Zone

The North American Plate rides up and over the subducting Gorda Plate. The plates do not move smoothly, and so the upper North American Plate is locked, or stuck, for a time. When the pressure is sufficient for the locked plate to be released, it rebounds, suddenly slinging itself to the west with perhaps 60 feet of thrust.



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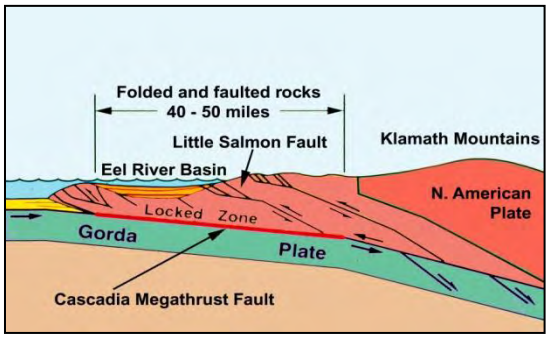
The Cascadia Subduction Zone breaks the sea floor surface about 30 miles west of Eureka, and about 50 miles west of Crescent City. It lies about eight miles below Humboldt Bay, and 15 miles beneath Willow Creek.

The upper 50 miles of contact presently is locked, with no major movement since 1700.



Gary Carver, HSU/Dept. of Geology

The April 1992 M7.1 Cape Mendocino earthquake sequence broke a small portion of the megathrust. Geologists report that a longer rupture would produce a large, M8 or greater earthquake.

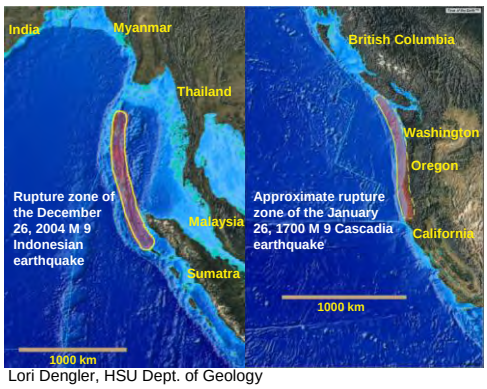
Should there be a M9 earthquake, the rupture probably would extend from Cape Mendocino to Vancouver Island, British Columbia. The earthquake likely would last for five minutes. It permanently would change the Northern California, Oregon, Washington and British Columbia coastline to the extent that the coast would have to be remapped.

1.1.4 Relevance of the December 2004 Indonesian Earthquake

The events of the December 26, 2004, earthquake in Indonesia have far-reaching significance for our region.

The Sunda Trench fault that produced the devastating earthquake and subsequent tsunamis is similar in size and movement to the Cascadia Subduction Zone.

Like the Sunda Trench earthquake, the January 26, 1700, Cascadia Subduction Zone earthquake changed the entire West Coast and produced an "orphan" tsunami that devastated Japan.



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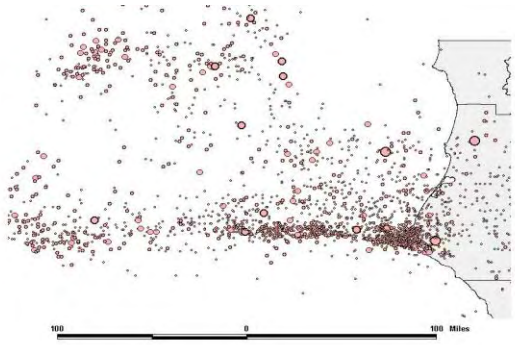
1.1.5 Regional Earthquakes

On the North Coast there are two types of regional earthquakes — offshore and onshore earthquakes.

>M3.0 Earthquakes, 1974-2004



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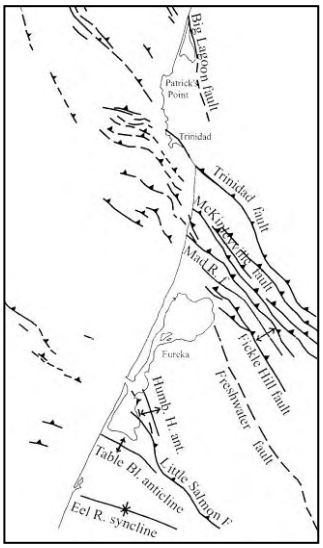
Most historic earthquakes have occurred offshore, primarily along the Mendocino Fault and within the Gorda Plate. They have been the strongest earthquakes in historic times, typically M5 to M7.5, and occur on an average of about every 2.5 years.

Along most of the Cascadia Subduction Zone there is a region of folded and faulted crustal rocks offshore. Near the Zone's southern end, the region of folded and faulted rocks curves on shore, exposing nine major thrust faults along the Humboldt County coastline.

Six of those faults are in the Humboldt Bay Region, and have not been active in historic times, but are designated as active under the state's Alquist-Priolo legislation:

- **Little Salmon Fault** — most active thrust fault in the state, with three critical features located on it: Humboldt Bay Power Plant, College of the Redwoods, and the high pressure natural gas pipeline from the Table Bluff gas field.
- **Fickle Hill Fault** — branches run through Humboldt State University and Arcata
- **Mad River Fault**
- **McKinleyville Fault** — adjacent to Eureka/Arcata Airport
- **Blue Lake Fault**
- **Trinidad Fault**



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Recent studies of faulting along the Humboldt County coastline have confirmed at least seven great earthquakes on these faults during the past 2,000 years. Each of these earthquakes changed the elevation of large parts of the coast by several feet or more.

1.2 WHAT TO EXPECT

1.2.1 What to Expect — the Land

There are two noteworthy aspects of most North Coast earthquakes — soil amplification and liquefaction.

Soil amplification means that ground shaking is stronger than expected for the distance from the earthquake's epicenter. Shaking is enhanced by certain soil types, especially soft muds, unconsolidated marshlands and sand. Soil amplification can be expected in all low lying areas adjacent to Humboldt Bay and along river banks.

Liquefaction is the loss of soil strength because pore water is forced upwards while unconsolidated materials are compacted during the shaking. As the earth shakes, fill soils, ancient river or lakebeds, tidelands, and areas with poorly compacted soils begin to behave like a liquid, and are unable to support the weight of any structure. Bridges and buildings may lose their footings even though the structures were designed to withstand strong ground motion.

1.2.2 What to Expect — Injuries and Deaths

Most injuries incurred during earthquakes are caused by flying glass, falling objects and other debris, the result of ground shaking, or by people trying to move during the shaking. Statistics show that persons moving more than five feet during an earthquake's shaking are most likely to be injured. Of particular note is that objects falling from buildings may be flung out to a distance of 1.5 times the height of the building.

In contrast to the causes of most injuries, most deaths are caused by building collapse.

1.2.3 What to Expect — Effects on Homes and Mobile Homes

Single family homes rarely collapse because of the wood frame construction. However, they may fall off their foundation if they are not bolted to the foundation. Masonry chimneys and glass are the most serious internal home hazard.

The greatest hazards to mobile homes are ruptured gas lines, the homes falling off their foundations, and support piers penetrating the floor. Nonstructural damage is greater because mobile homes often are less securely tied to foundations, and shaking is enhanced. New building codes address these issues, and reduce risk.

1.2.4 What to Expect — Effects on Infrastructure

Beyond what happens to structures during an earthquake, depending on the magnitude of the quake, there often is a failure in our basic infrastructure.

- **Water Supplies.** Water supplies may be interrupted for perhaps 30 days. Suspect water quality any time there is an earthquake in excess of M5.5.
- **Roads.** Roads may be impassible due to slides, surface failures, and downed bridges.
- **Electric Power.** Power supplies may be out for weeks, and downed power lines present an additional hazard.
- **Natural Gas.** Natural gas lines may be ruptured.
- **Sewage and garbage.** Sewage and garbage service may be interrupted.
- **Financial Institutions.** Failed electrical supplies, road closures and damaged buildings, may interrupt financial operations, limiting access to cash, ATMs or online banking.
- **Retail Businesses.** Damaged buildings, failed electrical supplies, and road closures may force retail businesses to close or be unable to restock supplies.

- **Communications**. Telephone service will be restored on a priority basis: first government and emergency services, then long distance and pay phones, and finally business and residential customers. Cellular phones may work because they are radios, but cell tower battery back-up usually is good only for 6-8 hours if the tower itself survives a large quake.

1.2.5 What to Expect — Other Effects

Other effects to expect after a large earthquake include the following:

- The 911 emergency system will be overloaded.
- Hospitals and other medical facilities may be so damaged that they cannot take care of their current patients, let alone those injured during the earthquake.
- Emergency rooms and trauma centers may be overwhelmed.
- Firefighters will only be able to suppress major fires, and may have difficulty even suppressing major fires if several break out, or if there is damage to roads and bridges so that equipment can't be mobilized.
- Assisted living, critical care, and other health services, such as dialysis, may not be operational due to damaged facilities or lack of electricity.
- Family members may be dispersed at school, day care, activities or work. Many people work or go to school in areas separated from home by rivers and bridges.
- Pets may run away or be injured.

- **Police will address incidences of grave public safety**
- **Firefighters will suppress major fires**
- **EMS personnel will handle life-threatening injuries**
- **Lower priority needs will have to be met in other ways**

1.2.6 What to Expect — Unsecured Hazards

Besides what may happen to our physical structures and our communities' infrastructures, we also should consider nonstructural hazards caused by unsecured furniture, appliances, cabinet doors, items on walls and shelves, office equipment and wood stoves.

1.2.7 What to Expect — Other Disasters May Follow

Other disasters may follow: tsunamis, landslides, strong aftershocks that may further weaken already damaged buildings, floods due to dam failures, firestorms due to broken water lines, toxic chemical spills.

1.3 SEVEN-STEP PLAN FOR EARTHQUAKE SAFETY

Here is an easy-to-implement disaster preparedness plan that addresses what to do before, during and after an earthquake. The plan is summarized below and discussed in detail on the following pages.

- **Before an earthquake**
    1. Identify and mitigate potential hazards
    2. Create a disaster preparedness plan

3. Organize disaster kits
4. Identify building's potential weaknesses and correct them

- **During the earthquake**

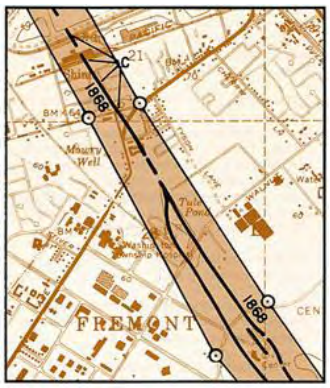
5. Protect yourself

- **After the earthquake**

6. Check for injuries and damage
7. When safe, continue to follow disaster preparedness plan

STEP 1 — IDENTIFY AND MITIGATE POTENTIAL HAZARDS

❑ **Learn where faults are located.** The first step in identifying and mitigating potential hazards is to learn where faults are located in relation to your home, place of business and children's schools. The Alquist-Priolo Seismic Hazards Zone maps show regulatory zones defined by the California Geological Survey for seismic hazards — earthquake-induced landsliding, liquefaction, and surface ruptures. The maps have been drawn for portions of Shelter Cove, Fortuna, Hydesville, the area near College of the Redwoods and Humboldt Hill, Arcata, Blue Lake, McKinleyville and Trinidad. The maps are available from the California Geological Survey, and may be reviewed at the County's Planning Department.



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Another excellent source of information is the maps and material found in the Humboldt Earthquake Education Center's publication, "On Shaky Ground." See their website for further details:

http://www.humboldt.edu/~geodept/earthquakes/shaky2.html

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❑ **Identify and mitigate nonstructural hazards**

❑ Hanging objects
- Place only soft art above beds and sofas.
- Hang mirrors and pictures on closed hooks.
- Brace overhead light fixtures — during earthquakes they are the most common items to fall, causing damage or injury.

❑ Objects on open shelves and tabletops
- Hold in place with removable putty, museum wax or quake gel.

- ❑ Furniture
  - Store heavy and breakable items on lower shelves.
  - Secure tall furniture to wall studs.
- ❑ Water and gas pipes
  - Evaluate, replace and properly secure rusted or worn pipes.
  - Replace rigid gas connections with flexible stainless steel gas connections.
- ❑ Water heaters
  - Anchor to wall studs or masonry with metal straps and lag screws.
- ❑ Kitchens
  - Install strong latches on cabinet doors.
  - Secure refrigerators and major appliances.
- ❑ Garages and utility rooms
  - Move flammable or hazardous materials (like weed killers and pesticides) to low cabinets that are securely latched.
  - Ensure that items stored above or beside vehicles cannot fall.
- ❑ Home electronics
  - Secure with flexible nylon straps and buckles.
- ❑ Wood stoves
  - Seismic anchors or braces must not conduct heat from the stove.
  - Stoves resting on a brick hearth can be anchored using bricks and mortar.

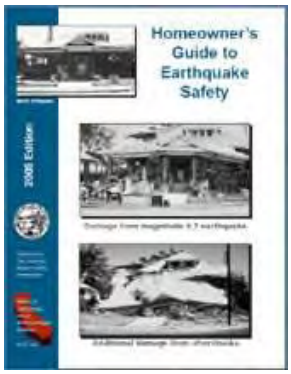
For further information consult the following websites:

- **Humboldt Earthquake Education Center:**

  http://sorrel.humboldt.edu/~geodept/earthquakes/shake2_belongings.html

- **California Seismic Safety Commission:**

  http://www.seismic.ca.gov/pub/CSSC_2005-01_HOG.pdf



STEP 2 — CREATE A DISASTER PREPAREDNESS PLAN

A disaster preparedness plan consists of three parts: life-critical actions, life-saving training, and advanced plans.

- ❑ **Life-Critical Actions.** In a strong earthquake, your life-critical skills will be crucial.
  - ❑ The first step is to TALK — discuss disaster preparedness plans with your family and fellow workers.
  - ❑ Practice "drop, cover and hold" (see pages 18 and 19 for instructions).
  - ❑ Learn how to protect yourself no matter where you are.

- ❑ Teach children and other adults in your household or workplace to use emergency whistles and/or knock three times if trapped.
- ❑ Teach children how and when to use 911.
- ❑ Install smoke detectors on each level of your home, especially near the bedrooms. Individuals with sensory disabilities should consider installing smoke alarms that have strobe lights and vibrating pads. Also consider installing a carbon monoxide alarm in your home.
- ❑ Learn about your community's warning signals — what they sound like and what you should do when you hear them.

❑ **Life-Saving Training.**

- ❑ Take a Red Cross First Aid and CPR (cardiopulmonary resuscitation) training course, and keep your certification current. Learn who in your neighborhood and at work is trained in CPR and first aid.
- ❑ Learn where gas, electricity and water shut-offs are located — and how and when to use the needed tools.
  - Gas should only be turned off if the odorized gas is smelled, since it will take a licensed plumber or PG&E personnel to turn it back on safely.
  - Show each responsible family member how and when to turn off utilities.
  - Keep any tools you will need near the gas and water shut-off valves.
- ❑ Know how to use a fire extinguisher properly.
  - Contact your local fire department for instruction.
  - Teach household members how to use the fire extinguisher, and show them where it is kept.

❑ **Advanced Plans**

- ❑ Keep shoes and a working flashlight next to each person's bed.
- ❑ Identify safe spots in the home, such as under sturdy tables and desks — and ensure that all family members know where the safe spots are located.
- ❑ Determine the best escape routes from your home. Find two ways out of each room.
- ❑ Locate safe places to meet outside the home.
  - Establish one spot to meet immediately outside the home, to be used in a sudden emergency, such as a fire.
  - Establish another place in your community, in case you are away from home and cannot return to your home.
- ❑ Establish an out-of-area contact, and an alternate.
  - Frequently after a disaster, local telephone calls cannot be completed, but calls made to phones outside the disaster area go through. By establishing an out-of-area contact, if your family members are separated at the time of the disaster, each person can call the contact, report his/her whereabouts, and exchange messages.
- ❑ Provide all family members with an Emergency Reference Card, so they will know who to call, and where to meet. The FEMA website has a handy card that can be downloaded:

Other Important Phone Numbers & Information:

Family Communications Plan

Contact Name:
Telephone:

Out-of-Town Contact Name
Telephone:

Neighborhood Meeting Place:
Meeting Place Telephone:

Dial 9–1–1 for Emergencies!

http://www.ready.gov/america/_downloads/family_communications_plan.pdf

- ❑ Plan for those with disabilities and other special needs.
  - Keep support items in a designated place, so they can be found quickly.
  - For those who have home-health caregivers, particularly for those who are bed-bound, it is essential to have an alternate plan if the home-health caregiver cannot make it to you.
  - In advance provide PG&E with a list of all power-dependent life support equipment required by family members. Develop a contingency plan that includes an alternate power source for the equipment or relocates the person.
- ❑ Learn about the emergency plan developed by your children's schools or day care.
  - Have you made provisions for another responsible person to pick up your children if you are unable to do so?
  - What is the school's plan for holding the children if parents are unable to come?
- ❑ Keep copies of essential documents in a secure location..
- ❑ Test smoke alarms and change batteries regularly.
- ❑ Conduct occasional disaster "drills" to practice your plan.
  - Discuss your plan and other essential information with those who need to know, like your guests, babysitters, house sitters, and neighbors.
  - Quiz your children every six months so they remember what to do.
- ❑ Learn about animal care after a disaster. Animals may not be allowed inside emergency shelters due to health regulations. Prepare a list of family, friends, boarding facilities, veterinarians, and "pet-friendly" hotels that could shelter your pets in an emergency.
- ❑ Check if you have adequate insurance coverage
- ❑ Inventory home possessions.
  - Make a record of you possessions to help you claim reimbursement in case of loss or damage. Store this information in a safe deposit box or other secure (flood/fire safe) location to ensure the records survive a disaster. Include photographs or videos of the interior and exterior of your home as well as cars, boats and recreational vehicles.

- Have photos of durable medical equipment and record the make and model number for each item.
- Get professional appraisals of jewelry, collectibles, artwork, or other items that may be difficult to evaluate.
- Make copies of receipts and cancelled checks showing the cost for valuable items.

❑ Vital records and other important documents, such as birth and marriage certificates, social security cards, passports, wills, deeds, and financial, insurance and immunization records, should be kept in a safe deposit box or other safe location.

STEP 3 — CREATE DISASTER KITS

Keep enough supplies in your home to meet your needs for **at least a week**. Assemble a Disaster Supplies Kit with items you may need in an evacuation. Store these supplies in a sturdy, easy-to-carry container, such as a backpack, duffle bag, or covered trash container.

❑ **Personal Disaster Kits**

Everyone in your family should have their own personal disaster kit, including children. The kits are collections of supplies that may be needed when a disaster strikes. Personalize the kits and keep them where they can be easily reached — at home, in the car, at work or school.

- ❑ Bottled water
- ❑ Food — minimum three day supply of food that won't spoil
- ❑ Medical and health items
  - ❑ Medications and medical consent forms for dependents
  - ❑ Written list of medications
  - ❑ Written list of allergies
  - ❑ Written list of other special needs/medical conditions
  - ❑ Extra oxygen, if needed
  - ❑ If equipped with pacemaker or other medical device, list of styles and model numbers
  - ❑ First aid kit and handbook
  - ❑ Personal hygiene supplies, such as hand sanitizer, moist towelettes, toilet paper
  - ❑ Special needs supplies — spare eye glasses, contact lens solution, hearing aid batteries
  - ❑ Copies of medical insurance and MediCare cards
  - ❑ Copy of Durable Power of Attorney for Health Care
  - ❑ If you are in a wheelchair, have extra batteries
- ❑ Items for infants, such as formula, diapers, bottles and pacifiers
- ❑ One change of clothes and footwear
- ❑ Blanket or sleeping bag
- ❑ Whistle (to alert rescuers to your location)
- ❑ Emergency cash, traveler's checks, coins for pay phone
- ❑ Extra set of car keys
- ❑ List of emergency contact phone numbers

- ❑ Hand-cranked or battery-powered radio with extra batteries
- ❑ Dust mask
- ❑ Emergency lighting — light sticks and/or hand-cranked flashlight, or flashlight with extra batteries and light bulbs
- ❑ Map of the local area
- ❑ Comfort items (games, crayons, writing materials, teddy bears, etc.)

❑ **Household Disaster Kit with Seven (or More) Days' Supplies.** Store in an accessible location, preferably outdoors. This kit, which complements your personal disaster kits, should be in a large watertight container that can be easily moved.

- ❑ Drinking water (one gallon per person per day) — store at the bottom of the container in case of leaks. Replace every three months or by the expiration date on the container.
- ❑ Food that won't spoil, and that needs minimal preparation — canned and packaged foods and preparation utensils, including a manual can opener. Replace by expiration date on package.
- ❑ Medications and medical consent forms for dependents
- ❑ First aid kit and handbook
- ❑ Essential hygiene and special needs items, such as toothbrushes, toothpaste, soap and toilet paper, contact lens solution, hearing aid batteries, etc.
- ❑ Emergency lighting — light sticks and/or hand-cranked flashlight or flashlight with extra batteries and light bulbs.
- ❑ Radio — hand-cranked or battery-powered with extra batteries
- ❑ Items to protect you from the elements, such as warm clothing, sturdy shoes, extra socks, blankets, tent
- ❑ Heavy-duty plastic bags for waste and to serve as tarps and rain ponchos
- ❑ Work gloves and protective goggles
- ❑ Pet food and pet restraints
- ❑ Copies of vital documents — insurance policies, insurance agent's name and phone number, and your family members' personal identification
- ❑ Regular phone (that does not require electricity)
- ❑ Disposable flash camera to document damage to property

❑ **Office Kit.** If you work some distance from your home, you may be stranded at work for some time. Include simple change of clothes, shoes, gloves, medicines, etc.

❑ **Car Disaster Supplies Kit.** Your car disaster supplies kit should be a smaller version of home and personal kits. Include absolute necessities, and consider "what if" scenarios. Include the following additional items:

- ❑ Water. Include an extra 6-pack of water — it can be shared with others and is less likely to leak than larger containers
- ❑ Food — high protein, high-energy (preferably food that does not require cooking)
- ❑ First aid kit
- ❑ Blankets — especially emergency blankets that are water- and wind-proof and reflect back 90% of body heat
- ❑ Flashlight — crank-style or extra batteries

- ❑ Radio — battery-powered or wind-up radio; don't deplete car's battery listening to the news
- ❑ Water filter/purifier
- ❑ Water-proof matches or fire-starter kit
- ❑ Small camp stove and cooking kit (or Sierra cup and a tablet-fuel folding stove)
- ❑ Sturdy shoes and socks — in case you need to walk anywhere. Also plastic produce bags to put over your feet, inside your shoes, if you have to walk out in the wet and don't have boots.
- ❑ Raingear, hat and gloves
- ❑ Post-It Notes for note-leaving kit — to tell those who find your car where you have gone and how you are (write on the back of the Post-It and stick note to inside of window)
- ❑ Compass and local maps
- ❑ Daypack to carry your belongings and supplies if you set out on foot
- ❑ Seasonal supplies
  - ❑ Winter: blanket, hat, mittens
  - ❑ Summer: sunscreen lotion (SPF 15 or greater), shade items (umbrella, wide-brimmed hat, etc.)

- ❑ **Include the following additional items for your car's emergencies:**
  - ❑ Fire extinguisher
  - ❑ Bungee cords or rope to tie down trunk if necessary
  - ❑ Shovel
  - ❑ Tow rope
  - ❑ Emergency roadside assistance plan/phone number
  - ❑ Extra coolant, and windshield-washer fluid
  - ❑ Flares and/or reflectors
  - ❑ White distress flag
  - ❑ Tire repair kit and pressure gauge
  - ❑ Hand wipes to clean hands after roadside repair
  - ❑ Hose tape
  - ❑ Jack and fully-inflated spare, pump
  - ❑ Booster/jumper cables
  - ❑ Lug wrench
  - ❑ Owner's manual
  - ❑ Quart of oil and quart of transmission fluid
  - ❑ Spare fan belt
  - ❑ Spare fuses
  - ❑ Traction mats or chains
  - ❑ Shovel and efficient hand-saw

Be sure to check your car kit supplies at least twice a year, since variations in heat and cold shorten the life of stored food, first aid items and other material, like plastic and rubber.

Maintain Your Kits. Check batteries, food and water supplies for expiration dates and discard or replace every six months. Review your kits' contents as your household circumstances change.

STEP 4 — IDENTIFY YOUR BUILDING'S POTENTIAL WEAKNESSES, BEGIN TO FIX

The fourth step is to identify your home's and work environment's potential weaknesses, and to begin to fix them.

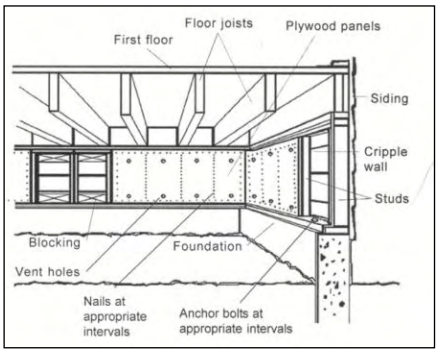
- ❑ **If you live in a single-family home or duplex in Humboldt County.** The strength of a single-family home or duplex depends on its age, construction style and location. Take the Structural Safety Quiz, and add up your points as you answer these two questions:

  1. When was your home built?
     - ❑ Before 1960 = 5 points
     - ❑ 1961-1978 = 3 points
     - ❑ After 1978 = 1 point
  2. How tall is your home?
     - ❑ Two or more stories with living area above garage = 5 points
     - ❑ Split level, on a hillside or gentle slope = 6 points
     - ❑ One story, three or more steps up to the front door = 4 points
     - ❑ One story, less than three steps up to the front door = 1 point

  Total Points: _____

  If your home scored six or more points, and if it has not been retrofitted recently, you should consider having an engineer, architect or contractor conduct an evaluation. The evaluation should review the following:

  - Are there sufficient bolts connecting the sill plate to the foundation?
  - Are metal brackets connecting the rim joists to the top plate?
  - Is the ground floor a large open space lacking interior walls?
  - Are there large, unbraced openings in the lower story walls?
  - If your home is a hillside house, was it adequately designed to withstand strong earthquake shaking?
  - Are there adequate cripple walls?



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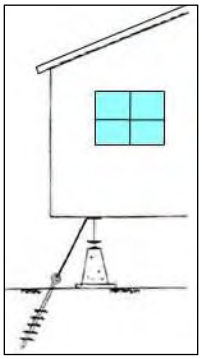
  - For the latest recommendations of structural engineers, contractors, and city building officials who are experts on retrofitting, see the Association of Bay Area Governments (ABAG) website: **http://quake.abag.ca.gov/fixit/**

- ❑ **If you live in a condominium or apartment house** —
  - If there is a ground floor parking area, that open space may lean or collapse in a large earthquake.
  - If the building was constructed of concrete or brick before 1972 building codes, it may be inadequately reinforced.

- Ask your landlord these questions:
  - What measures have been taken to ensure seismic safety of the building?
  - Have water heaters been strapped to wall studs?
  - May I secure bookshelves and tall furniture to wall studs?

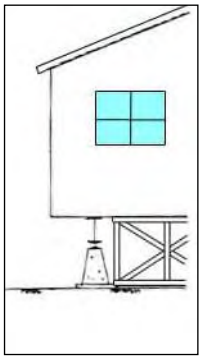
❑ **If you live in a mobile home —**

- If there is only a metal or wood "skirt" on the outside with concrete blocks or steel tripods or jacks supporting the home, the home should be secured by either an "Engineered Tie-Down System," or an "Earthquake-Resistant Bracing System" —



(ABAG)

"Engineered Tie-Down System"



(ABAG)

"Earthquake-Resistant Bracing System"

- If you use an Earthquake-Resistant Bracing System, it should have a label on the bracing that reads "complies with the California Administrative Code, Title 25, Chapter 2, Article 7.5."

❑ **If you have a brick chimney —**

- Install plywood above the ceiling framing.
- Retrofitting a masonry chimney with bracing or strapping is not an effective safety measure — it still may fall as a unit.
- Don't locate children's playground equipment near the chimney.

STEP 5 — PROTECT YOURSELF DURING EARTHQUAKE SHAKING

❑ **If you are indoors — duck, cover and hold on**

- Duck or drop down to the floor and take cover under a sturdy desk, table or other furniture.
- Cover your eyes by pressing your face against your arm. Cover the back of your neck with your hand and arm.
- Hold on to the table or desk and be prepared to move with it — hold the position until the ground stops shaking and it is safe to move.
- If there is no nearby table or desk —
  - Sit on the floor against an inside wall, away from windows, tall furniture or bookcases.
  - Duck head, cover neck and eyes.
- If you are elderly or have mobility impairment, remain where you are, bracing yourself in place

- Taking shelter in a doorway is a myth that started in the early days of California when many homes were constructed of adobe with wooden door frames. Today with more modern buildings, few people live in adobe homes, but door frames often are not built in load-bearing walls, and so they are no stronger than any other part of the house, and do not provide protection.
- Stay clear of windows, fireplaces, wood stoves and heavy furniture or appliances.
- Stay inside until the shaking stops — outside you may be injured by falling glass or building parts.
- If you are in a crowded area, take cover and stay where you are — stay calm and encourage others to do likewise.
- If you are in bed, stay there, hold on and protect your head with a pillow.
- Do not use elevators.

"Triangle of Life" — WRONG

The "Triangle of Life" concept by Doug Copp recommends curling up in a fetal position next to your bed or chair, rather than assuming the "duck, cover, and hold" position under a sturdy desk, table or other furniture.

- The California Office of Emergency Services, California Seismic Safety Commission, professional and academic research organizations, and emergency management agencies have conducted extensive research on the duck, cover and hold recommendation.
- Studies of recent earthquakes confirm that the use of the "duck, cover and hold" procedure "reduces the likelihood of serious injury from a collapsing building and falling objects."
- See investigative articles about Doug Copp in the Albuquerque Journal, available at **www.abqjournal.com/terror/** and American Red Cross response to "Triangle of Life at the following URL:

http://www2.bpaonline.org/emergencyprep/arc-on-doug-copp.html

- ❑ **If you are in a public building, theater, church, or stadium** —
  - Stay at your seat.
  - Duck down, and protect your head and neck with your arms. If you can't duck under the seat, at least put your head and upper body under the seat.
  - Don't try to leave until the shaking stops, then exit slowly, watching for fallen debris or for anything that could fall on you in the aftershocks.
- ❑ **If you are outside** —
  - Get into the open, away from buildings, bridges, power lines and trees.
- ❑ **If you are driving** —
  - Stop if it is safe to do so, but stay inside your car.
  - Stay away from bridges, overpasses and tunnels.
  - Avoid stopping under trees, light posts, power lines or signs, if possible.
  - If power lines fall on your vehicle, stay inside until a trained person removes them.

- ❑ **If you are below a dam** —
  - Prepare ahead of time by learning about flood-zone information and by preparing an evacuation plan.
- ❑ **If you are in the mountains** —
  - Avoid unstable slopes or cliffs.
  - Watch for falling rock and debris.
- ❑ **If you are trapped under debris** —
  - Do not light a match, since that could cause an explosion if there is gas present.
  - Try not to move about if it kicks up dust.
  - Cover your mouth and nose with a handkerchief or clothing.
  - Tap on a pipe or wall so rescuers can locate you.
  - Use a whistle if one is available.
  - Shout only as a last resort — shouting can cause you to inhale dangerous amounts of dust.

STEP 6 — AFTER THE QUAKE, CHECK FOR INJURIES AND DAMAGE

If you have been in an earthquake, the most important thing to do first is to check for injuries and damage:

- If you are at the beach, immediately move to higher ground or inland.
- Check yourself for injuries — take care of yourself so you can take care of others.
- Check others for injuries — do not move seriously injured persons unless they are in immediate danger of further injuries.
- Put on protective clothing: long pants, a long-sleeved shirt, sturdy shoes, and work gloves to protect yourself from injury by broken objects.
- Check quickly for hazards and damage in and around your home or office, and get everyone out if your building is unsafe.
  - ◆ Fires or fire hazards — the most common hazard following earthquakes
  - ◆ Gas leaks — shut off the main gas valve only if a leak is suspected or identified by the odor of natural gas
  - ◆ Damaged electrical wiring — shut off power at the breaker box
  - ◆ Downed or damaged utility lines
  - ◆ Spilled medications, gasoline and other flammable liquids — avoid the hazard of a chemical emergency
  - ◆ Fallen objects in closets and cupboards
  - ◆ Downed or damaged chimneys
  - ◆ Telephone — make sure each phone handset is on its cradle. Use phone only in the event of a life-threatening emergency.
- Expect aftershocks — each time you feel one, drop, cover and hold.
- Listen to a NOAA Weather Radio or other reliable source for emergency information.
- Watch animals closely, and keep all your animals under your direct control. Be aware of hazards at nose and paw level, particularly debris, spilled chemicals, fertilizers, etc.
- If your home appears undamaged, stay in your home even if the power is out and some items have been damaged. Shelters may be overcrowded and initially lack many services.

- If home is structurally unsafe, threatened by fire or secondary disaster — evacuate.
    - Tell a neighbor and your point-of-contact where you are going.
    - Bring the following to a shelter:
        - Your personal disaster supply kit
        - Supply of water, food and snacks
        - Change of clothing, jacket, towel, soap and washcloth
        - Supplies for infants and elders
        - Medicine
        - Personal identification
        - Copies of household and insurance information
        - Books and games
    - Do not bring unnecessary clothing, or valuables that may be lost, stolen or take up needed space.
    - If you evacuate your home, do not leave your pets behind. For additional information see **www.fema.gov/plan/prepare/animals.shtm**

STEP 7 — WHEN SAFE, CONTINUE TO FOLLOW DISASTER PREPAREDNESS PLAN

- Be in communication
    - Listen to a NOAA Weather Radio or other reliable source for emergency information.
    - Call your out-of-area contact, then stay off the phone.
- Check your food and water supplies. The following URLs provide helpful resources:
    - "Eating Nutritiously When the Lights Are Out"
        - **http://ohioline.osu.edu/hyg-fact/pdf/emergency_food_pyramid.pdf**
    - "A Consumer's Guide to Food Safety"
        - **http://www.fsis.usda.gov/PDF/Severe_Storms_and_Hurricanes_Guide.pdf**
    - "Keeping Food Safe During an Emergency"
        - **http://www.fsis.usda.gov/Fact_Sheets/Keeping_Food_Safe_During_an_Emergency**
- If gas was turned off, arrange for PG&E or a licensed plumber to turn it on when needed repairs have been made.
- Check for water and power interruption damage.
- Contact insurance agent to begin claims process.
- Contact FEMA to find out about financial assistance.
- If you cannot live at home, set up alternative mailing address with Postal Service.

1.4 SPECIAL NOTES ABOUT CHILDREN

1.4.1 Before the Next Earthquake

There are three practical things you can do with your children before the next earthquake to help them prepare for the next earthquake:

- Spend time with your children to discuss what might occur.
- Involve your children when you develop your disaster plan, and prepare disaster supplies kits (ask them what game or toy they want to include).
- Practice "drop, cover and hold on."

1.4.2 After the Next Earthquake

In the days after a large earthquake, children need extra contact with you, and support from you. Their persistent fears may cause disruptive behavior.

- Children may be frightened and under great stress, and continuing aftershocks won't let them forget the experience.
- If you have to leave your children with others in order to deal with the emergency, this can be scary for your children — whenever possible, include your children in the earthquake recovery process.
- Use words of reassurance, such as "You don't have to worry, we will look after you," as well as reassuring actions.
- Encourage your children to talk about their reactions to the disaster.

1.4.3 Resources for Children to Learn about Disaster Preparedness

The following websites are good resources for your children to learn about disaster preparedness:

http://www.abag.ca.gov/bayarea/eqmaps/kids.html

www.fema.gov/kids/

http://earthquake.usgs.gov/4kids/

2. TSUNAMIS

2.1 ORIENTATION TO THE TSUNAMI THREAT

2.1.1 Types of Waves

Key to understanding tsunamis is a clear understanding of the difference between regular storm waves and tsunamis:

Storm Waves. Storm waves only extend down a short distance in the water column. They have been clocked traveling at 70 mph in deep water, and at about 10 mph at the coast. They may be 80 feet tall in the open ocean, with up to 25 seconds between crests.

Tsunamis. Tsunamis are a series of rapidly rising, debris-laden wave surges. They always "feel" the sea floor — that is, the surge extends all the way down the column of water.

- The entire column of water moves in reaction to the sea floor disturbance.
- Tsunamis travel around 500 mph in deep water, and have been clocked at over 700 mph over the Marianas Trench, the deepest part of the Pacific Ocean. At the coast their speed is around 25-35 mph.
- Tsunamis are imperceptible at sea, but may exceed 200 feet in height at the coast. In the peculiar confines of fiords, their height has exceeded 1000 feet. The interval between tsunami crests can exceed 500 miles, and often the surge waves are separated by 30 minutes or more.
- Tsunamis are not V-shaped or rolling waves, and have no curling front — they are not "surfable."

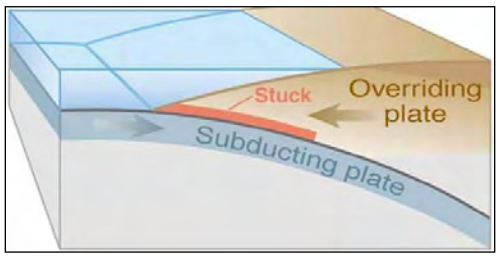
2.1.2 Other Tsunami Facts and Features

Here are some other important facts and features of tsunamis:

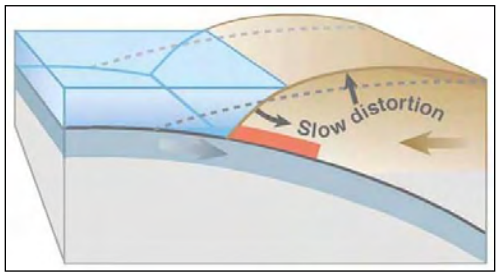
- **Causes.** Tsunamis most commonly are caused by earthquakes, but also may be caused by landslides, volcanic eruptions and meteor impacts.
- **Surge Heights.** The first tsunami surge usually is not the highest.
- **Duration.** Surge waves may continue to arrive for eight hours or longer. It is not safe to approach the coast until there has been no tsunamis for at least two hours.
- **Areas at Risk.** The areas at greatest risk are on the beach — it is rare for tsunamis to penetrate farther than two miles inland.
- **Wave Speed.** Wave speed is determined by water depth. As the waves approach the shore, water depth decreases, the front of the wave slows down, but water behind it still is traveling faster — this causes the wave to increase in height.
- **Drawdown.** Often the first sign of a tsunami is an unusual drawdown of water, exposing the sea bed that normally is under water even at low tide. This phenomena is an indicator of an approaching tsunami around 70%-80% of the time — but drawdowns do not always occur!

2.1.3 How Tsunamis Are Formed

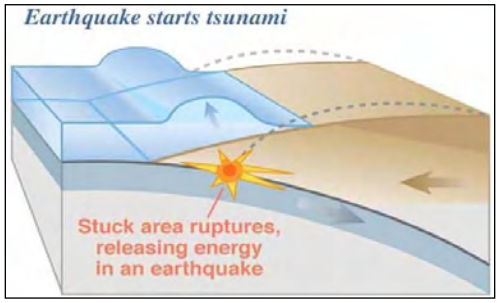
Tsunamis usually are formed by thrust faulting in a subduction zone, but also may be caused by landslides, volcanic eruptions, or meteor impact. These diagrams depict a subduction zone produced tsunami, such as would occur in the Cascadia Subduction Zone off our coast:



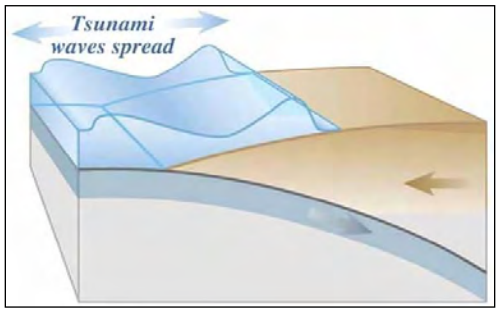
1. The subduction tectonic plate, the offshore Gorda Plate, is being pulled under the overriding North American Plate. A portion of the plane along which the plates move is stuck.



2. Over time, the overriding plate is distorted or bulged up as the subducting plate continues to plunge beneath it.



3. Eventually the stuck area ruptures, releasing energy in the form of an earthquake. As the overriding North American Plate is released, it springs upward. In that instant the column of water above it exactly mirrors its upward movement, creating a bulge in the water that is parallel to the fault's movement.



4. An instant later the bulge divides into two waves. One wave moves toward the land, the other heads out to open sea.

(USGS)

Locally-Generated Tsunami. The first waves of a locally-generated tsunami may arrive within minutes, so there is no time to issue an official warning. For example, the April 1992 Cape Mendocino earthquake generated a one-foot tsunami that reached the mouth of Humboldt Bay 20 minutes after the earthquake struck. The wave reached Crescent City in 50 minutes. A large Cascadia Subduction Zone event may generate a tsunami that reaches the coast within five minutes.

Around 95% of all tsunamis are confined to the local or regional area in which they occurred — that is, their sources aren't big enough to generate significant waves more than a few hundred miles away.

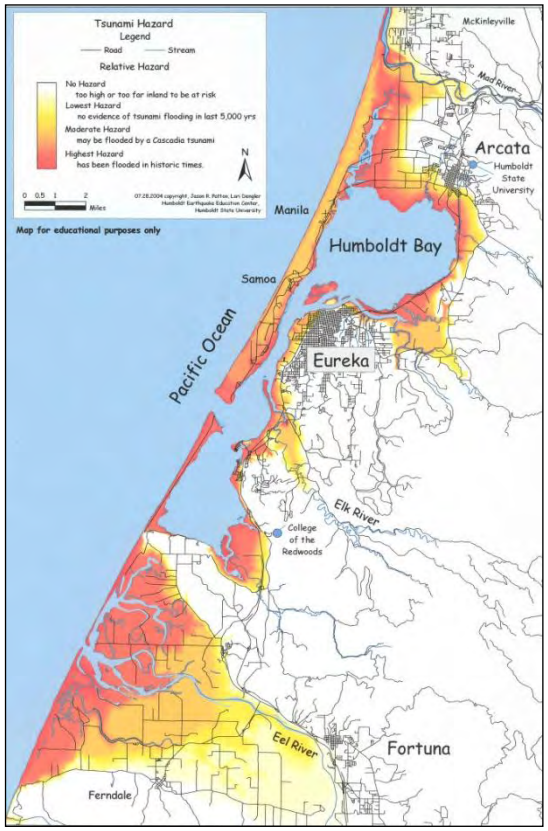
Distant-Source Tsunami. Tsunamis generated by very large earthquakes in other areas of the Pacific may reach our coastline many hours after the earthquake. Tsunami Warning Centers were established following some disastrous tsunamis that devastated Hawaii in the 1940s. Today the two centers in Alaska and Hawaii alert local officials when there is a likelihood of a tsunami.

However, people in an isolated coastal area may not hear the official warning, and need to be aware of tsunami warning signs — a sudden drop or rise in sea level, a roaring sound, means move to high ground or inland immediately.

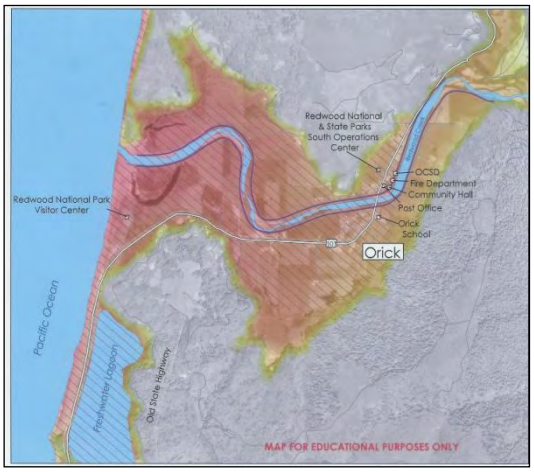
2.2 TSUNAMIS HAZARD ZONES

Recent investigative work by HSU faculty and students have allowed them to depict tsunamis hazard zones along the central coastline of Humboldt County and near Orick. There is evidence to suggest that past Cascadia event tsunamis have produced 25-45 foot waves in the Humboldt Bay area:

- **Dark red areas** have been flooded by tsunamis in historic times.
- **Orange areas** are at risk of flooding from a Cascadia tsunami.
- **Yellow areas** show no evidence of having been flooded by tsunamis, and should be safe in all but the most extreme tsunami events.
- **White areas** are too high or too far inland to be at risk.



Lori Dengler, HSU Dept. of Geology



Jay Patton, Cascadia Geosciences Corp.

Detailed tsunami hazard zone maps are available at —

http://www.humboldt.edu/~geodept/earthquakes/rctwg/toc.html

2.3 HISTORIC TSUNAMIS

Some 26 tsunamis have been observed or recorded on the North Coast since 1855. All but four were distant source tsunamis. Crescent City has suffered more tsunami damage in the past 150 years than any other area of the U.S. West Coast outside Alaska.

Besides the empirical evidence gathered by Prof. Lori Dengler and her HSU students, Yurok oral history relates 60-foot waves near the mouth of Redwood Creek from the 1700 Cascadia event.

2.4 TYPES OF TSUNAMI WARNINGS

There are two types of tsunami warnings, both of which are equally important. Respond to whatever you hear or observe first:

- **Natural Warnings.** We need to heed natural warnings when there is no time to issue an official warning after a large nearby earthquake or submarine landslide. There are three natural warnings: if you are at the beach or in other low-lying coastal areas, and you —
    - feel strong ground shaking, and/or
    - see the water recede unusually far, exposing the sea floor, and/or
    - hear a loud roar from the ocean

  immediately move to higher ground or inland. Stay away from low areas along the coast until you are told by emergency personnel that the danger has passed.

- **Official Warnings.** These occur when there is a distant-source tsunami that gives officials time enough to issue the warning.
    - Official warnings may be delivered by
        - television and radio emergency announcements
        - door-to-door contact by law enforcement officials
        - NOAA Weather Radio alerts
        - outdoor sirens
    - Move away from the beach and seek more information without using a phone.
    - After you evacuate, you should seek more information by tuning in to local radio or television stations, or listening to your NOAA Weather Radio. In any event follow the directions of local emergency personnel, which may include evacuating low-lying areas.

2.5 TSUNAMI WARNING SIRENS

Tsunami sirens will be deployed for distant-source tsunamis. Recent tests show they are effective for nearby residents if they are outside or have their windows open. They are not effective in noisy environments or during stormy weather.

2.6 REDUNDANT NOTIFICATION SYSTEM

Disaster preparedness experts recommend a redundant notification system that includes the following:

- NOAA Weather Radio with automatic alert feature
- Listen for the tsunami siren if you are in an area that has sirens
- Pay attention to natural tsunami warning signs
    - Earthquake that lasts longer than 20 seconds
    - Unusual rise or fall of ocean water
    - Unusually loud roar or rumbling noise at the seashore

Evacuate only if you are in a vulnerable area.

2.7 SEVEN-STEP TSUNAMI DISASTER PREPAREDNESS PLAN

Here is an easy-to-implement disaster preparedness plan that addresses what to do before, during and after a tsunami. The plan is summarized below and discussed in detail on the following pages.

- **Before a Tsunami**
  1. Identify potential hazards
  2. Make a tsunami disaster preparedness plan
  3. Assemble disaster kits
  4. Identify weaknesses, begin to fix them
- **During a Strong Coastal Earthquake**
  5. Protect yourself during earthquake shaking
- **After the Tsunami**
  6. Evacuate only if necessary, check for injuries
  7. Follow disaster preparedness plan

STEP 1 — IDENTIFY POTENTIAL HAZARDS

- ❑ **Educate yourself about the local tsunami situation.** Determine if your home, office, school, or where you play is in a danger zone. Also consider other places where you spend time. Go to the Humboldt Earthquake Education Center's website for detailed maps:
  - **http://www.humboldt.edu/~geodept/earthquakes**

  Review the handout, "Tsunami Hazard Map" for general information on the extent of past tsunami inundation.
- ❑ **Familiarize yourself about events that may produce or foretell a tsunami.** Become familiar with events that may produce or foretell a tsunami.
  - An earthquake that lasts longer than 20 seconds. Such an earthquake will be so strong that you probably will not be able to remain on your feet.
  - An unusually loud roar or rumbling noise at the seashore
  - An unusual rise or fall in coastal waters
- ❑ **In an area that has a tsunami warning system, familiarize yourself with the warning signal**

STEP 2 — MAKE A TSUNAMI DISASTER PREPAREDNESS PLAN

- ❑ **Plan an evacuation route.** If you determine that you are in a potential tsunami hazard zone, plan an evacuation route to an evacuation area that is in a white zone on the Tsunami Hazards Map, or if you are outside the mapped area, one that is at least 100 feet above sea level, or two miles inland. Roads may be blocked by the devastating earthquake, or by people attempting to flee the approaching tsunami by vehicle, so plan reaching your safe location on foot within 15 minutes or less. Plan out more than one evacuation route.
- ❑ **Test your evacuation plan.** To ensure that you can reach your safe location in adverse conditions, practice your route at night and during inclement weather.
- ❑ **Discuss your plan with your family.** Ensure that everyone knows what to do if you are not there.

STEP 3 — ORGANIZE YOUR DISASTER KITS

If you already have organized your personal disaster kit (see pages 15-16) as part of your earthquake preparedness program, you already are set. If not, organize your kits now.

STEP 4 — IDENTIFY WEAKNESSES, BEGIN TO FIX THEM

If you live, work of play in a tsunami hazard zone:

- Learn how to evacuate to safe areas
- Obtain evacuation maps
- Familiarize yourself with evacuation signs

- Contact your local government to learn what planning is being done in your community.

If you visit an area that is at risk for tsunamis, check with your hotel or campground operator to learn about the designated tsunami escape route and how you will be warned. A NOAA Weather Radio with a tone alert feature provides timely warnings for distant tsunamis. If the locale you visit is part of a TsunamiReady community, you will see the notification signs, and will receive information at your accommodations.

STEP 5 — PROTECT YOURSELF DURING EARTHQUAKE SHAKING

- If you are inside, duck, cover and hold on.
- If you are outside, watch for falling objects.

STEP 6 — EVACUATE ONLY IF NECESSARY, CHECK FOR INJURIES

If you are at the beach and feel an earthquake, no matter how small —

- Immediately move inland or to higher ground
    - If you are in a mapped tsunami hazard area, evacuate on foot to a yellow or white zone. Yellow areas are safe in all but the most extreme tsunami events.
    - In Manila, seek refuge in the high dunes, outlined in green on the tsunami hazard maps
- Evacuate no matter how small the earthquake

In other low lying areas, **COUNT** how long the earthquake lasts. If you count 20 seconds or more of very strong ground shaking and you are in a tsunami hazard zone —

- Move to higher ground or away from the coast **as soon as it is safe to do so** — do not wait for an official warning
    - Gather your family members
    - Grab your personal kits
    - Abandon belongings — go on foot to a safe area in a yellow or white zone

        - Roads and bridges may be damaged by strong ground shaking
        - If your only evacuation route is blocked by downed power lines, carefully cross without touching the lines
    - If evacuation is impossible
        - Go to the upper floor or roof of a sturdy building
        - Climb a tree as a last resort
- Help injured or trapped persons — give first aid where appropriate
- Help neighbors who may require special assistance — infants, elderly people, and those with disabilities
- Stay away from the coast. A later wave may be higher than the first wave, and damaging waves may continue to arrive for up to eight hours.
- Listen to your radio. Wait until an official "all clear" signal has been given before returning to low-lying areas.

Remember if you are not in a tsunami hazard zone, you should stay put — evacuation may be hazardous because of strong aftershocks, debris in the streets, and power lines may be downed.

STEP 7 — FOLLOW YOUR DISASTER PLAN

- Call your out-of-area contact, then stay off the phone except for emergency calls.
- Stay out of buildings if water remains around them — the tsunami danger period may last for eight hours or more.
- When reentering buildings or homes, use extreme caution.
    - Check for fire hazards, gas leaks, electrical system damage, sewage and water line damage.
    - Inspect walls, floors, doors, staircases, windows and foundations. Ensure the building is not in danger of collapsing.
    - Wear sturdy shoes, use battery-powered lanterns or flashlights.
- Watch out for animals that may have come into buildings with the water — use a stick to poke through debris.
- Take pictures of the damage, both of the building and its contents, for insurance claims.
- Open the windows and doors to help dry the building.
- Shovel mud while it still is moist to give walls and floors an opportunity to dry.
- Check food supplies — any food that has come into contact with flood water may be contaminated. Undamaged, commercially prepared foods in all-metal cans and retort pouches (i.e., flexible, shelf-stable juice or seafood pouches) can be saved if you do the following:
    - Remove the labels, if they are the removable kind
    - Thoroughly wash the cans or retort pouches with soap and water, using hot water if it is available. Brush or wipe away any dirt or silt.
    - Rinse cans or retort pouches with water that is safe for drinking, if available, since dirt or residual soap will reduce the effectiveness of chlorine sanitation.
    - Sanitize them by immersion in one of the two following ways:
        - Place in water and allow the water to come to a boil and continue boiling for two minutes, or

        - Place in a freshly made solution consisting of one tablespoon of unscented liquid chlorine bleach per gallon of drinking water (or the cleanest, clearest water available) for 15 minutes.
    - Air-dry cans or retort pouches for a minimum of one hour before opening or storing.
    - If the labels were removed, then re-label your cans or retort pouches, including the expiration date (if available) with a marker.
    - Food in reconditioned cans or retort pouches should be used as soon as possible.
- Contact insurance agent to begin claims process.
- Contact FEMA to find out about financial assistance.
- If you cannot live at home, set up an alternative address with the Postal Service.

2.8 LESSONS LEARNED FROM TSUNAMIS SPAWNED BY THE LARGEST EARTHQUAKE EVER MEASURED

The largest earthquake ever measured — the magnitude 9.5 Chilean earthquake that occurred when the South American Plate lurched as much as 60 feet over the subducting Nazca Plate on May 22, 1960 — spawned tsunamis that devastated parts of Hawaii, Chile and Japan. Tsunami experts examined the devastating tsunamis that affected their countries, interviewed survivors, and reconfirmed what actions saved lives and what actions cost lives. Their findings are relevant for West Coast residents affected by the Cascadia Subduction Zone region. See also "Surviving a Tsunami — Lessons from Chile, Hawaii, and Japan" (**http://pubs.usgs.gov/circ/c1187/**). The following points are excerpts from that document:

- In coastal areas, the largest subduction zone earthquake may kill fewer people than the tsunamis that follow.
- Heed natural warnings — an earthquake that lasts 20 seconds or more, and/or an unusual, rapid fall or rise in coastal waters.
- Heed official warnings — play it safe, even if warnings seem ambiguous or you think the danger has passed.
- The next wave may be bigger, and the tsunami may last for hours.
- Head for high ground and stay there.
- Abandon belongings — save your life, not your possessions.
- When fleeing a tsunami caused by a nearby earthquake, you may find roads broken or blocked.
- If trapped and unable to reach high ground, go to an upper story of a sturdy building or get on its roof.
- As a last resort, climb up a strong tree if trapped on low ground
- If swept up by a tsunami, look for something to use as a raft.
- Expect the waves to leave debris — sand and mud, the remains of houses, and bodies.
- Expect quakes to lower coastal land — a large earthquake can leave nearby coastal areas lowered, allowing tidal water to flood them.
- Expect company — shelter your neighbors.

> "The most accurate and timely forecast or information can be provided, but it is useless — unless some can take the appropriate actions."
>
> Nancy Dean, Meteorologist in Charge, NOAA/National Weather Service, Eureka

3. SOME FURTHER THOUGHTS

3.1 PUTTING THE RISKS INTO CONTEXT

Having reviewed our earthquake and tsunami risks, we need to put the risks into context. Here are some thoughts by Prof. Lori Dengler, Geology Department, Humboldt State University:

- Earthquakes and tsunamis are rare events.
- You are at more risk of personal injury during your drive to and from this course.
- Don't let concerns about earthquakes and tsunamis prevent your enjoyment of the coast and our area.
- Becoming aware and prepared will give you and your family peace of mind and can make a community stronger in other ways.

3.2 RED CROSS DISASTER ASSISTANCE ROLES

The Congressionally-chartered role of the American Red Cross is very specifically mandated:

- Open and operate emergency shelters.
- Provide food at shelter and feeding locations, and through mobile distribution.
- Obtain and deliver other needed items such as water, baby supplies, and blankets.
- Assist with immediate mental health needs.
- Provide for basic health needs at shelters and other locations.
- Help with initial recovery through casework and referrals to other agencies and partners.
- Provide blood and blood products — here in Humboldt County that means collaborating with the Northern California Community Blood Bank to ensure delivery of blood and blood products.

3.3 SOURCES OF POST-DISASTER ASSISTANCE

Here are some sources of post-disaster assistance in the first week following a disaster:

- **American Red Cross**
  - (707) 443-4521
  - (866) GET-INFO
    - **http://www.redcross.org/services/disaster/0,1082,0_319_,00.html**
- **County Office of Emergency Services**
  - (707) 268-2500
- **Federal Emergency Management Agency (FEMA)**
    - **http://www.fema.gov**
- **Governor's Office of Emergency Services**
    - **http://www.oes.ca.gov**

3.4 FINANCIAL IMPACTS

From past disasters we know that disaster aid may not be available immediately. Those who have prepared a financial disaster recovery plan are more likely to recover successfully. Here are some sources of information that will help you prepare a financial disaster recovery plan:

- **American Red Cross — Disaster Recovery: A Guide to Financial Issues**
  - **http://www.redcross.org/services/disaster/beprepared/FinRecovery/FinPlan/index.html**
- **Federal Emergency Management Agency (FEMA)**
  - **http://www.fema.gov/assistance/index.shtm**
- **Operation Hope Emergency Financial First Aid Kit**
  - **http://www.ncua.gov/publications/brochures/EmergencyFinancialFirstAidKit.pdf**
- **Small Business Administration**
  - **http://www.sba.gov/disaster_recov/index.html**

3.5 WHAT WILL THE GOVERNMENT DO FOR YOU?

One of the great myths in disaster preparedness is that the Government will take care of citizens' financial needs if they suffer losses. You should know that the Federal disaster relief programs are designed to help you get partly back on your feet, but not to replace everything you lose.

The primary form of disaster relief is low-interest loans to repair or replace damaged property and personal belongings not covered by insurance:

- Maximum Small Business Administration (SBA) personal property loan is $40,000
- Maximum SBA real property loan for primary home repair is $200,000

FEMA disaster grants for emergency home repairs and temporary rental assistance are only available to individuals and households who do not qualify for loans. The average FEMA grant is less than $15,000; the maximum is $26,200.

The California Earthquake Authority was established by the California Legislature in 1995-96. It is offered through residential insurers to homeowners, condominium owners, mobile home owners, and renters. It carries a 10%-15% deductible based on the home's insured value. There is no detached structure coverage.

3.6 SOME STATISTICS TO PONDER

- Fewer than 10% of households have disaster plans.
- Fewer than 10% of homeowners have taken steps to retrofit their homes.
- Fewer than 50% of households have disaster supply kits.
- 86% of California homeowners do not yet have earthquake insurance.
- Most homeowner's and renter's insurance policies do not cover losses related to earthquakes.
- Earthquake insurance also helps with additional living expenses.

3.7 Other Information Sources

The Humboldt County Chapter of the American Red Cross hopes that you will consider this course just the beginning. Here are some more sources of information:

- **Federal Emergency Management Agency (FEMA)**
  - **http://www.ready.gov**
- **Humboldt State University Geology Department website**
  - **http://www.humboldt.edu/~geodept/earthquakes**
- **National Oceanic and Atmospheric Administration**
  - **http://www.noaa.gov/tsunamis.html**
- **PrepareNow.Org — for individuals with special needs**
  - **www.preparenow.org**
- **Red Cross classes — learn and volunteer to help others**
  - CPR and First Aid classes — fee
  - Disaster Services classes — no charge
  - **http://www.redcross.org/services/prepare/0,1082,0_239_,00.html**
  - **http://humboldtredcross.org/**
- **US Geological Survey**
  - **http://earthquake.usgs.gov/hazards/prepare.html**

3.8 Special Thanks

Special thanks and appreciation go to the following persons who provided critical and invaluable information and technical assistance, and reviewed the "Living on the Faultline and Along the Coast" presentations:

- Nancy Dean, Meteorologist-in-Charge, NOAA/National Weather Service, Eureka
- Prof. Lori Dengler, Dept. of Geology, Humboldt State University, Arcata

Funding for the printing of the Participant's Manual is provided through the generous support of

CALIFORNIA REDWOOD COMPANY
P.O. Box 1089
Arcata, CA 95518
Tel: (707) 268-3000
Fax: (707) 268-3071
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