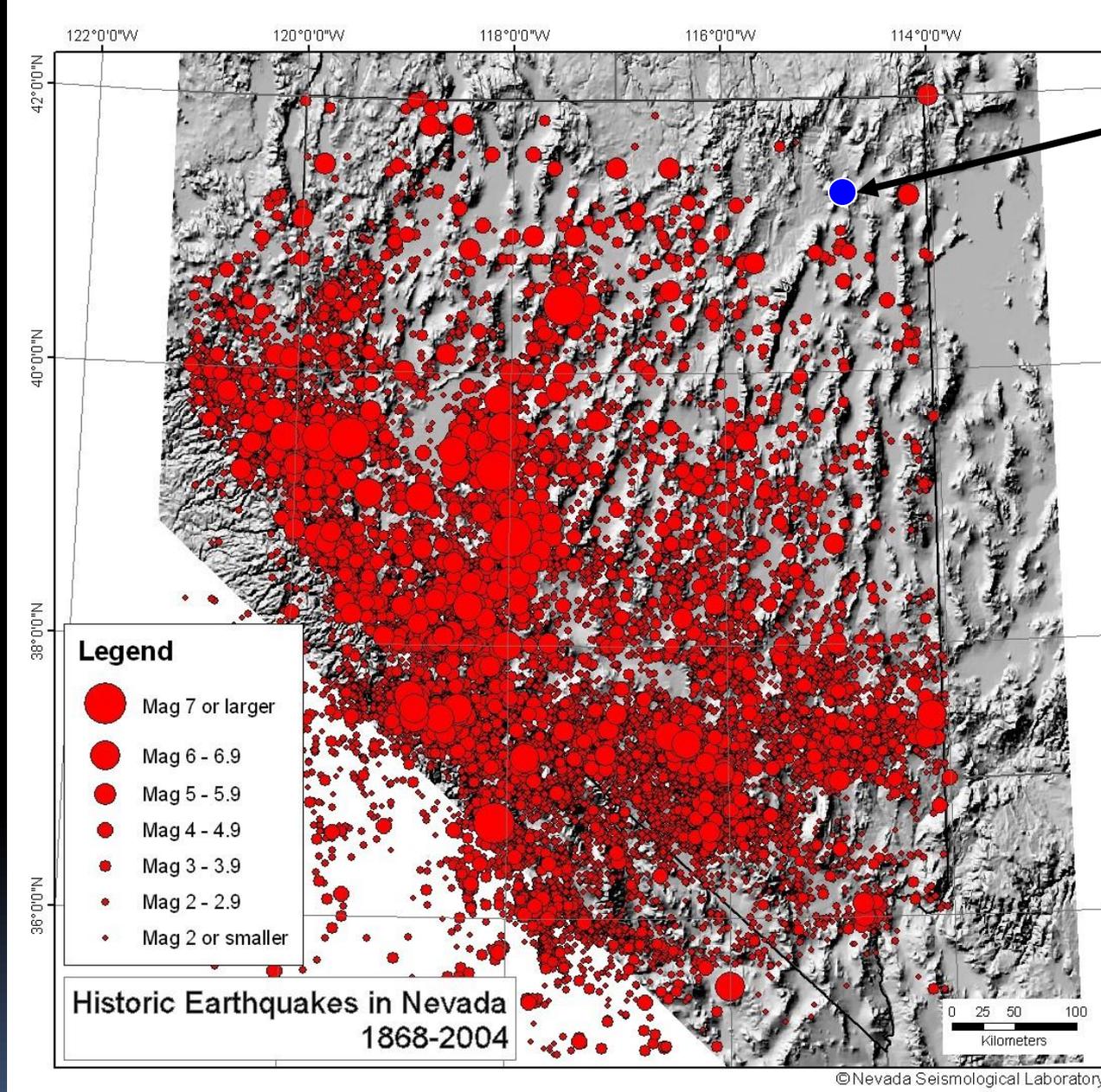


Earthquake Hazards in Nevada

Ronald L. Lynn
Director/Building & Fire Official
Clark County Department of
Building & Fire Prevention





Wells
21 Feb
08
M = 6.0

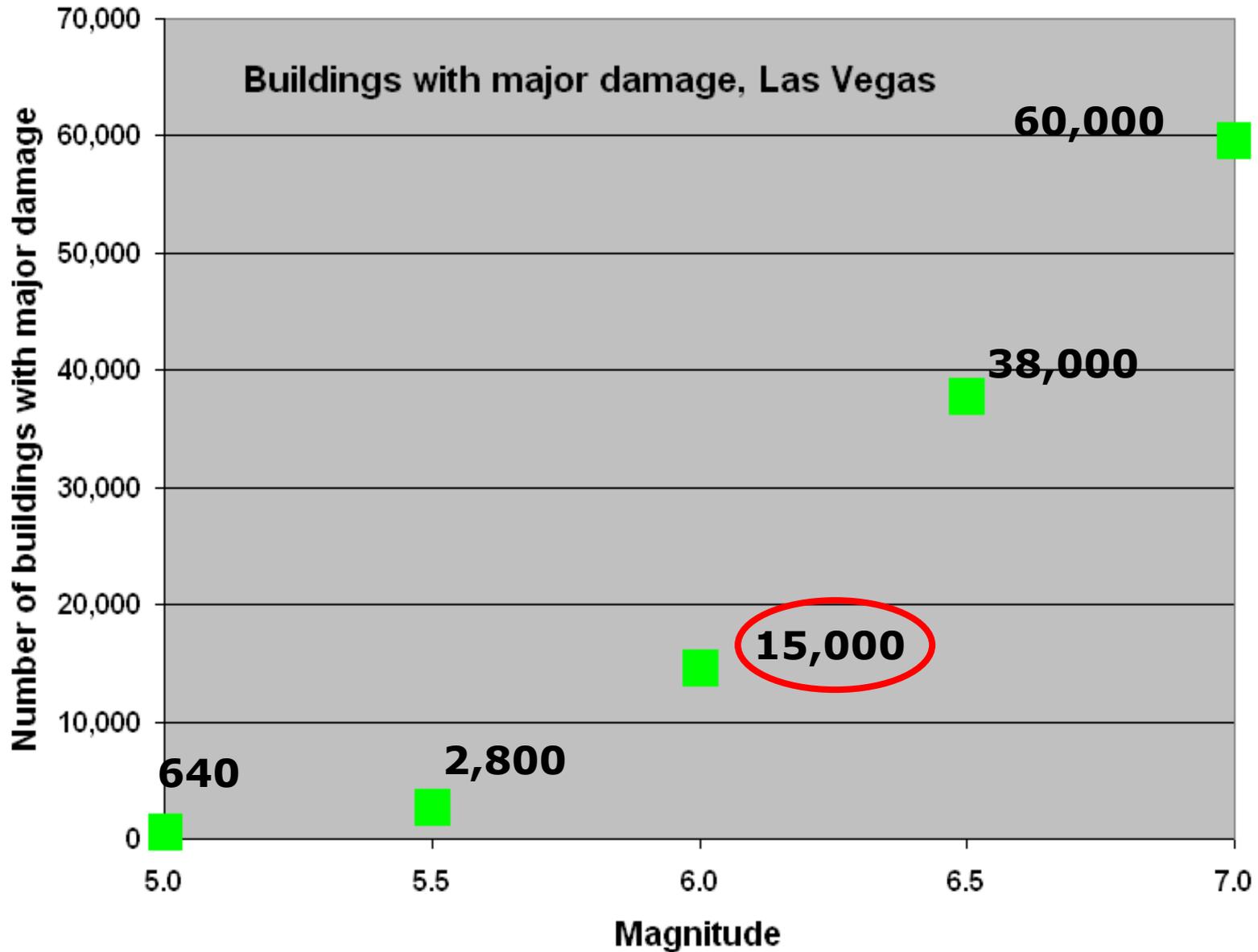
(2) Earthquakes have occurred throughout Nevada.

HAZUS estimates for total economic loss from a magnitude 6.0 earthquake and probability of an earthquake of this magnitude or greater occurring within 50 years and within 50 km of the community.

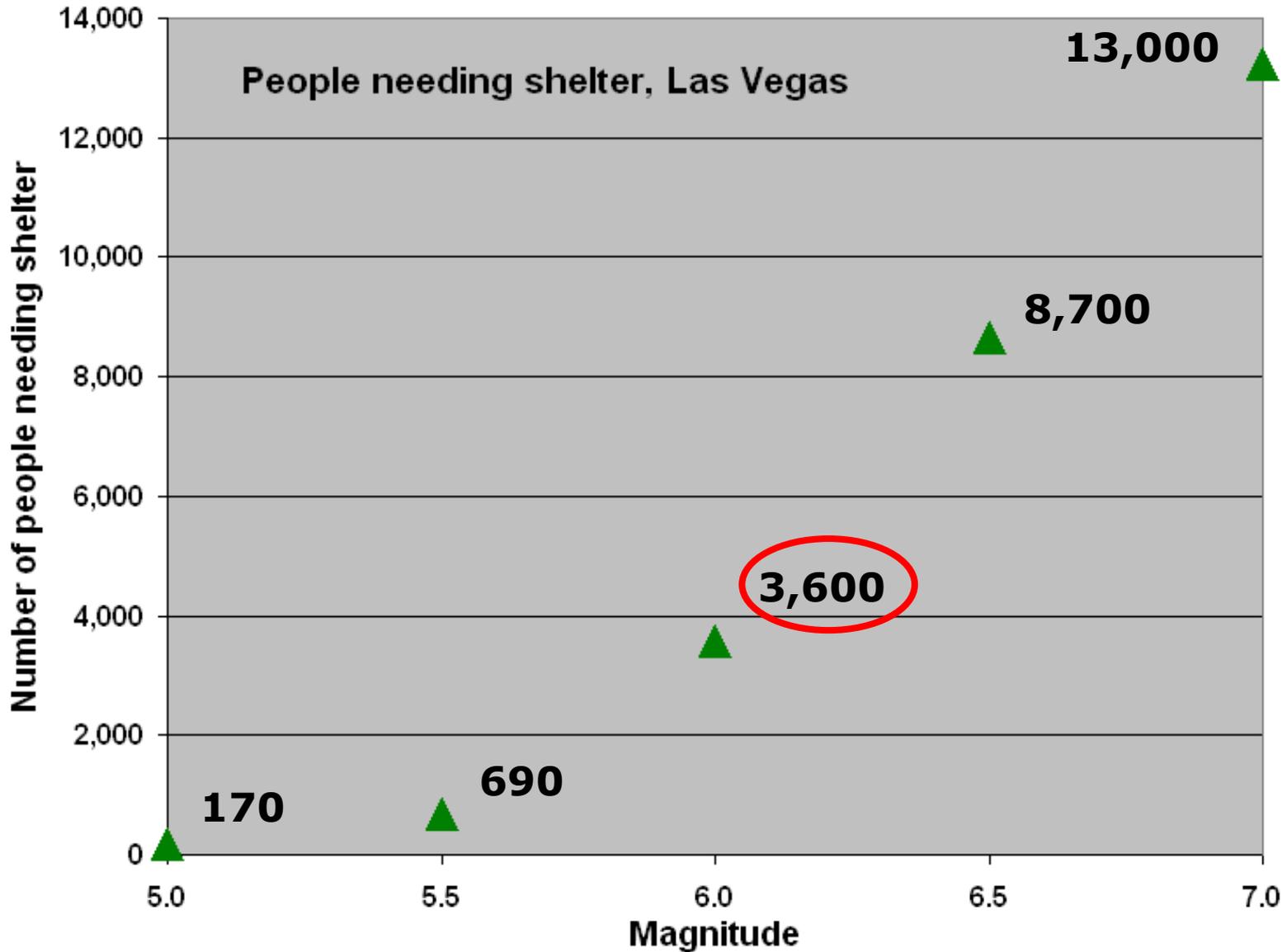
Community within 50 km	Total Economic Loss	Probability in 50 years
Las Vegas	\$7.2 billion	12%
Reno	\$1.9 billion	67%
Carson City	\$650 million	70%
Elko	\$160 million	10 to 15%
Fallon	\$110 million	35%
Wells	\$30 million	9%

Total economic loss is from HAZUS. Probabilities are from the USGS at <http://eqint.cr.usgs.gov/eqprob/2002/index.php> .

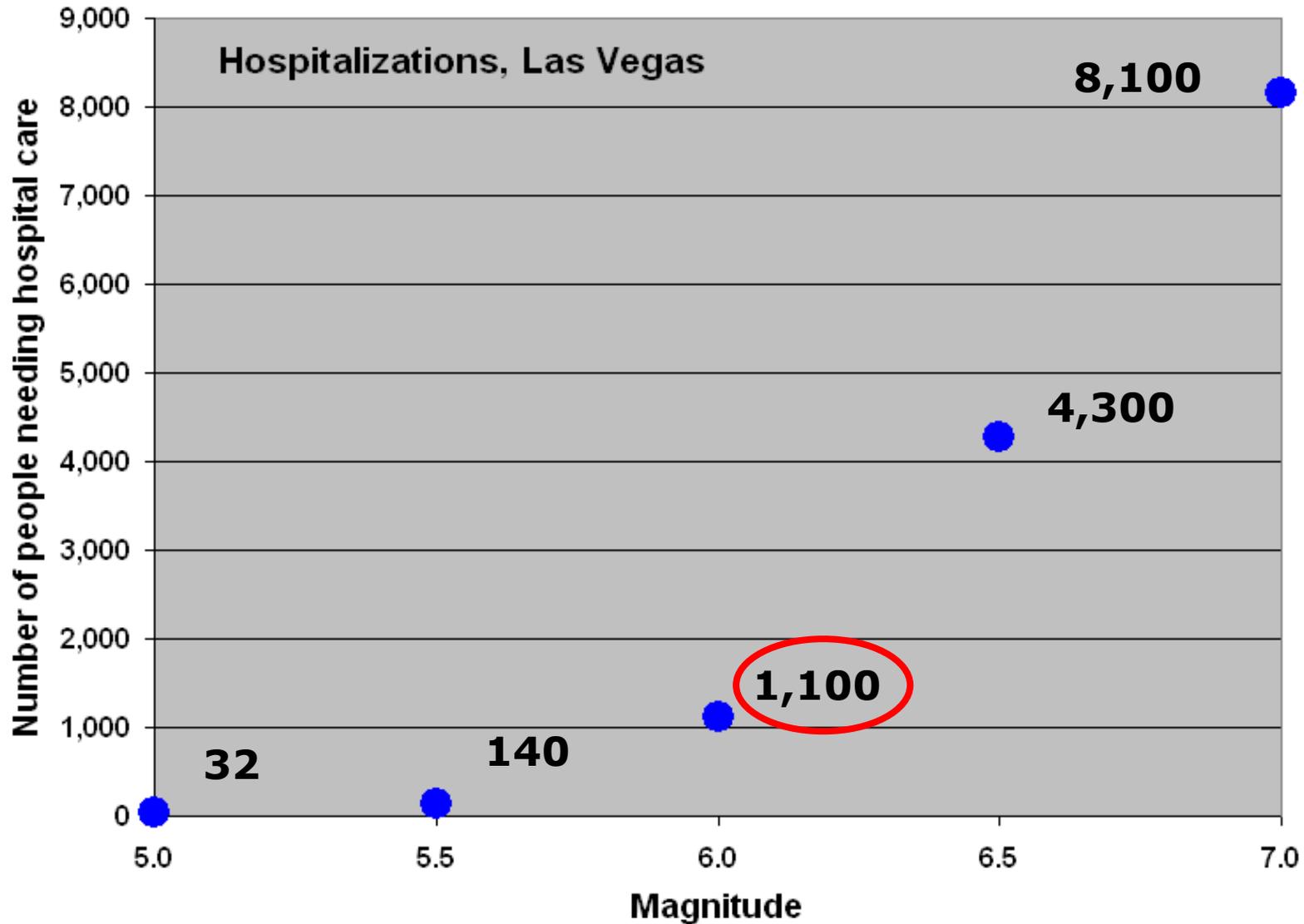
HAZUS estimates building damage:



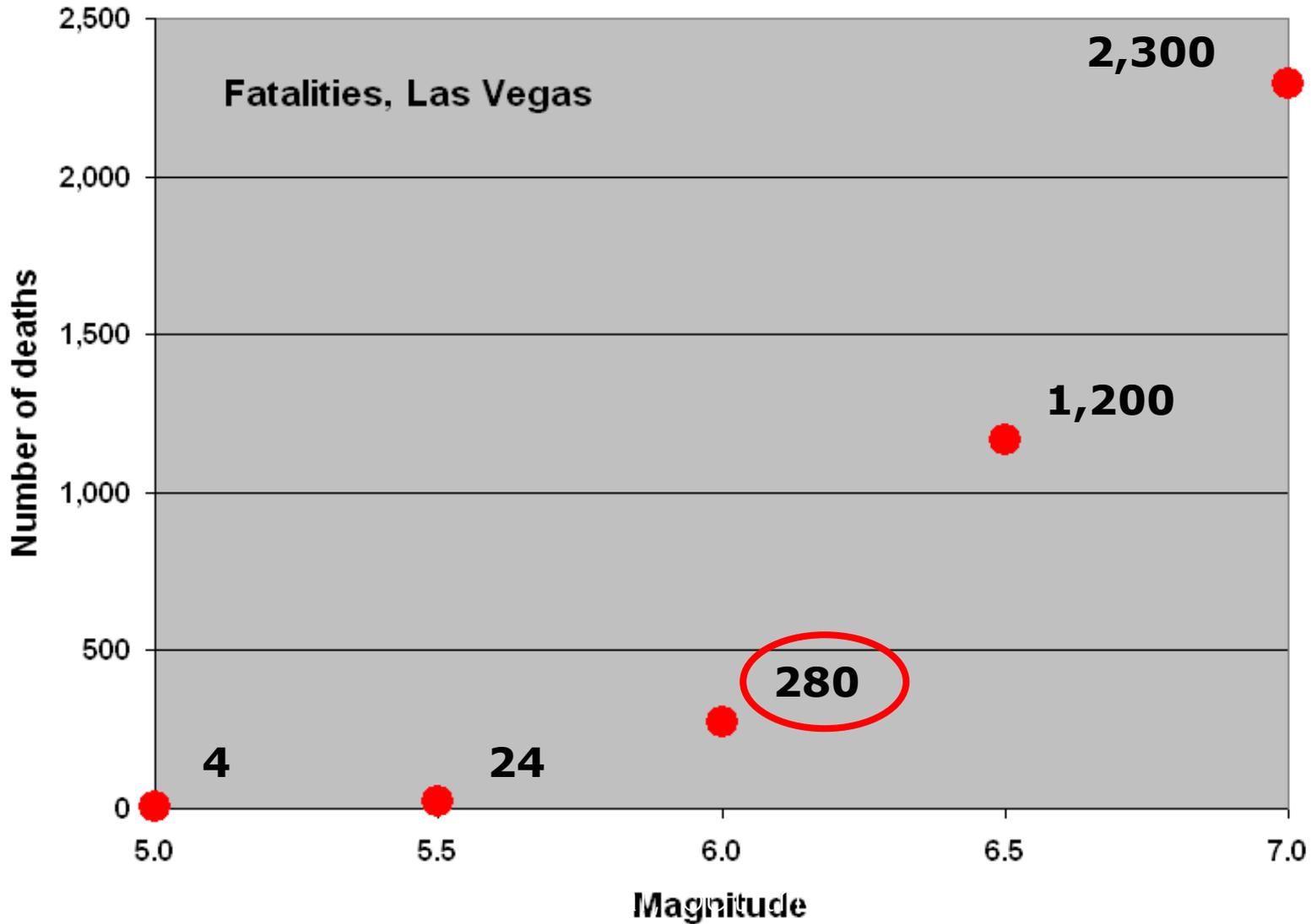
HAZUS estimates public shelter needs:



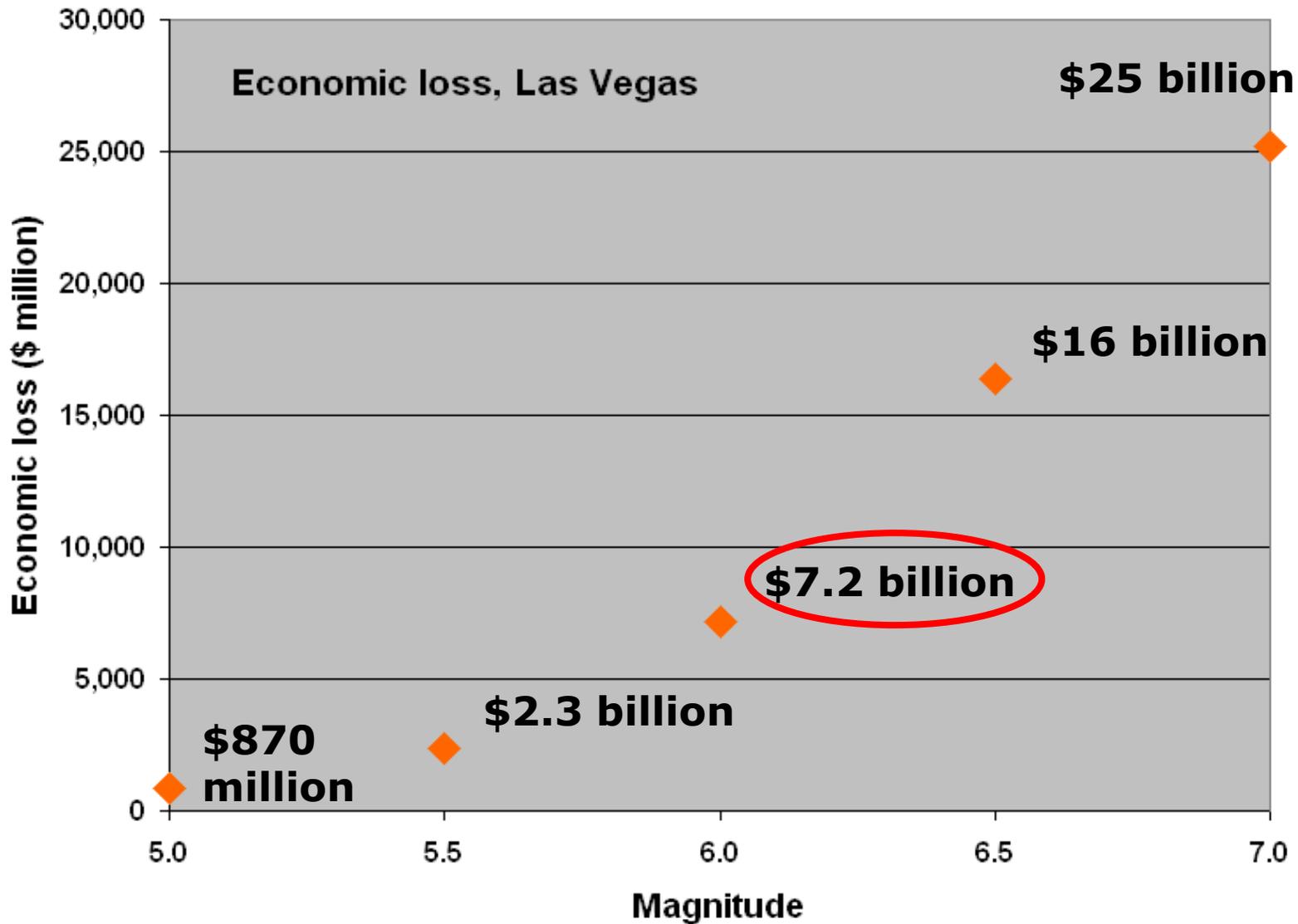
HAZUS estimates hospital needs:



HAZUS estimates fatalities:



HAZUS estimates (total) economic loss:

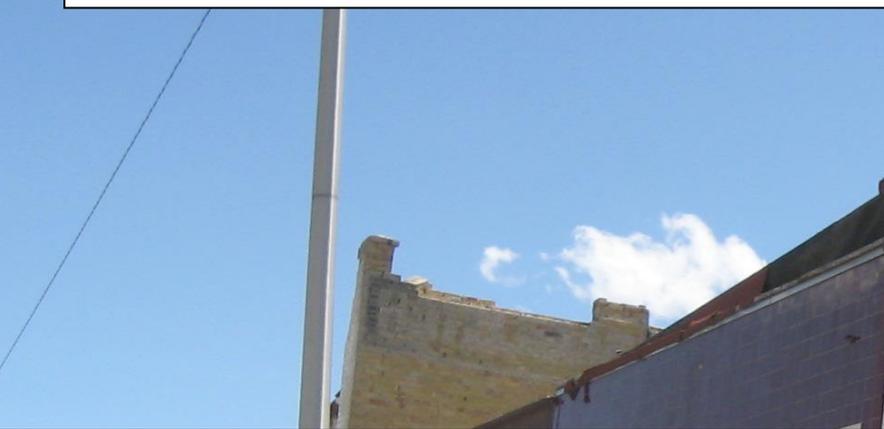


The hazard: probability of an earthquake of a given magnitude occurring within 50 years and within 50 km of the community.

% Probability of magnitude greater than or equal to magnitude

Community	5.0	5.5	6.0	6.5	7.0
Dayton	>90	~80	70-75	50-55	12-15
Carson City	>90	~80	70	50-55	12-15
Reno	>90	~80	67	50	12-15
Incline	>90	~80	60-70	40-50	10-12
Stateline	>90	~80	60-70	40-50	10
Fallon	80-90	~60	35	20-25	6-8
Las Vegas	40-50	~30	12	4-5	<0.5
Elko	30-40	~25	10-15	6-8	0.5-1
Wells	30-40	~20	9	6	0.5-1
Laughlin	10-20	~5	2-3	0.5-1	<0.5

Unreinforced masonry building (URM)
that collapsed during the Wells
earthquake on 21 February 2008



View from back, 20 May

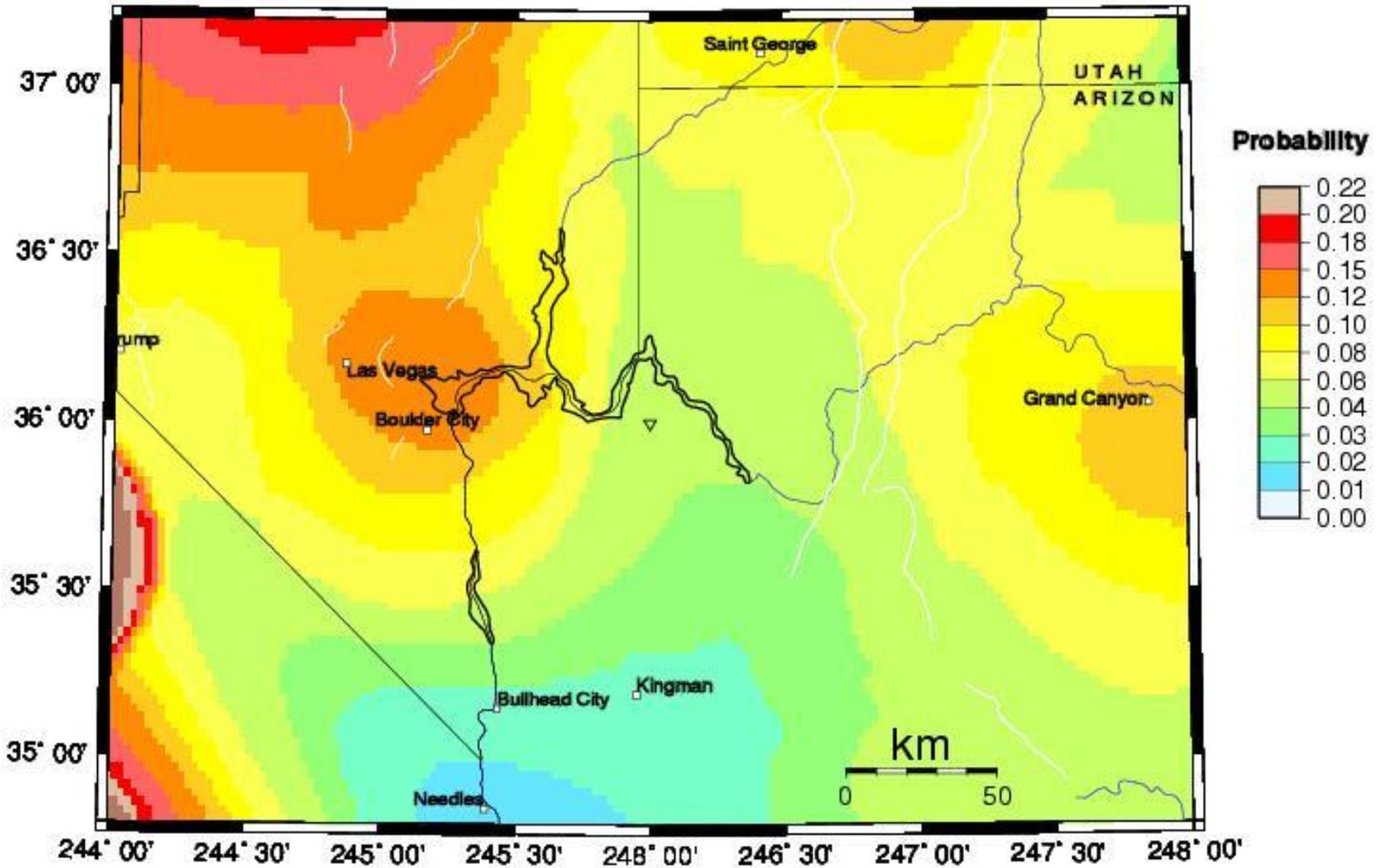


View from front, 20 May

The probability of a magnitude 6.0 earthquake occurring within 50 km of Las Vegas within the next 50 years is approximately 12%, 1.3 times higher than for Wells.

U.S. Geological Survey PSHA Model

Site: -114 d_E 36 d_N







Earthquakes are inevitable, but the damage from earthquakes is not.

- Damage may be limited by preparation
 - Secure your building & its contents
 - Learn more about earthquakes now
 - Less frightening
 - Increases our safety
 - Reduces our losses
- 



Your Personal Safety

- Prepare an earthquake plan and practice it
 - Know what to do during an earthquake, and
 - Store supplies to make life more comfortable after the earthquake.
- 



PREPARE A PLAN

- “Drop, cover and hold”
- Identify safe spots in every room
- Teach everyone how to turn off the gas-but only if they smell, hear, or see a leak
- Establish an out-of-area contact person who can be called by all family members to relay information
- Store supplies and prepare a personal earthquake bag.



PRACTICE YOUR PLAN

- Habit can overcome fear
 - Work with neighbors to prepare a neighborhood plan
 - Support of friends and neighbors can reduce the stress for everyone.
- 



DROP, COVER and HOLD

- Drop under a sturdy desk or table if possible, or crouch near an inside wall
 - Cover your head and eyes, and turn away from breaking glass or falling objects
 - Hold onto the desk or table so that it doesn't move away from you
- 



REMEMBER...

- Exterior walls of buildings are the most dangerous place to be.
 - Stay inside a building and outside if you are outside during the earthquake.
 - Do not try to run outside or to another room – severe shaking will make it difficult to move.
 - Doorways are no safer than elsewhere in the home.
- 



REMEMBER (cont'd)...

- If your building begins to collapse, you are safest under a sturdy piece of furniture that can shield you from falling debris.
- Focus on personal safety when covering yourself.
- Turn away from potential flying hazards.



WHAT TO DO DURING AN EARTHQUAKE

■ INDOORS

- Drop, cover and hold. If not near a desk or table, drop to the floor against an interior wall and protect your head and neck with your arms. Avoid exterior walls, windows, hanging objects, mirrors, and tall furniture.
- 



WHAT TO DO DURING AN EARTHQUAKE

- In a kitchen:
 - Get away from the stove, refrigerator, and cabinets with heavy objects.
 - Leave the kitchen if necessary.
 - Get under a table.
 - Drop, cover and hold.

WHAT TO DO DURING AN EARTHQUAKE

- In a high-rise:
 - Drop, cover and hold.
 - Avoid windows and other hazards.
 - Do not use elevators.
 - Do not be surprised if sprinkler systems or fire alarms activate.



WHAT TO DO DURING AN EARTHQUAKE

- Outdoors:
 - Move to a clear area if you can safely do so.
 - Avoid power lines, trees, signs, buildings, vehicles, and other hazards.

WHAT TO DO DURING AN EARTHQUAKE

- Driving:
 - Pull over to the side of the road, if safe to do so, stop, and set the parking brake.
 - Avoid overpasses, bridges, power lines, signs and other hazards.
 - Stay inside the vehicle until the shaking is over.
 - If a power line falls on the car, stay inside until a trained person removes the wire.



WHAT TO DO DURING AN EARTHQUAKE

- In a mall:
 - Move away from display shelves.
 - Look for sturdy furniture or an interior wall.
 - Drop, cover and hold.
- 



WHAT TO DO DURING AN EARTHQUAKE

- In a theater or stadium:
 - Stay at your seat and crouch on the floor.
 - Protect your head and neck with your arms.
 - Don't try to leave until the shaking is over.
 - Then walk out slowly watching for anything that could fall from aftershocks.
- 

Life With Aftershocks

- Risk of fire, potential lack of utilities and basic services, and the certainty of aftershocks.
- Electrical, water, transportation, and other vital systems can be disrupted for several days after a large quake.



Life With Aftershocks

- Emergency response agencies and hospitals could be overwhelmed and may be unable to provide immediate assistance.
 - Be prepared to be on your own for 5 days or more. Knowing first aid and having supplies will make life more comfortable and help you keep your sanity after the next earthquake.
- 



WHAT YOU WILL NEED

- Disaster kits:
 - Keep where they can be reached even if building is damaged badly
 - Take them with you if you evacuate.



Disaster Kit

- Medications and medical consent forms for dependents
- First aid kit and book
- Emergency cash
- Copies of vital documents
- Spare eyeglasses and shoes
- Snack foods, high in water and sugar
- Working Flashlights, radio and extra batteries



Disaster Kit

- Lightsticks
- Personal hygiene supplies
- Plastic bags for tarps, waste, rain ponchos, and other uses
- Comfort items such as games, crayons, writing materials, outgrown teddy bears (children regress under stress)
- Tools (a crescent wrench for example)

Maintain a Pantry

- Drinking water (minimum one gallon per person, per day)(water heaters can have 30 to 50 gallons)
- Food that is nutritious, liked by family members, and requires no refrigeration

Keep in garage or closet:

- Charcoal or gas grill
- Cooking utensils, including a manual can opener
- Extra food for pets, pet restraints (in case the fence is down)
- Sturdy shoes, work gloves, and comfortable clothing
- Blankets
- Camping equipment and sleeping bags

- 
- Store these supplies in easily accessible locations such as hallway closets.
 - Change stored water every 3 months.
 - Check and rotate food every 6 months.
 - Rethink your kit once a year.



THE HAZARD HUNT

- Secure belongings and fixtures in homes, schools, and workplaces.
 - Walk through and look for things that could fall when shaken and think of ways to secure them.
 - Also think about your furnace, pipes, and water heaters.
 - The building itself should be secured to the ground.
- 

Structural versus
Non structural versus
Contents hazards.



Nonstructural damage often can be easily prevented.

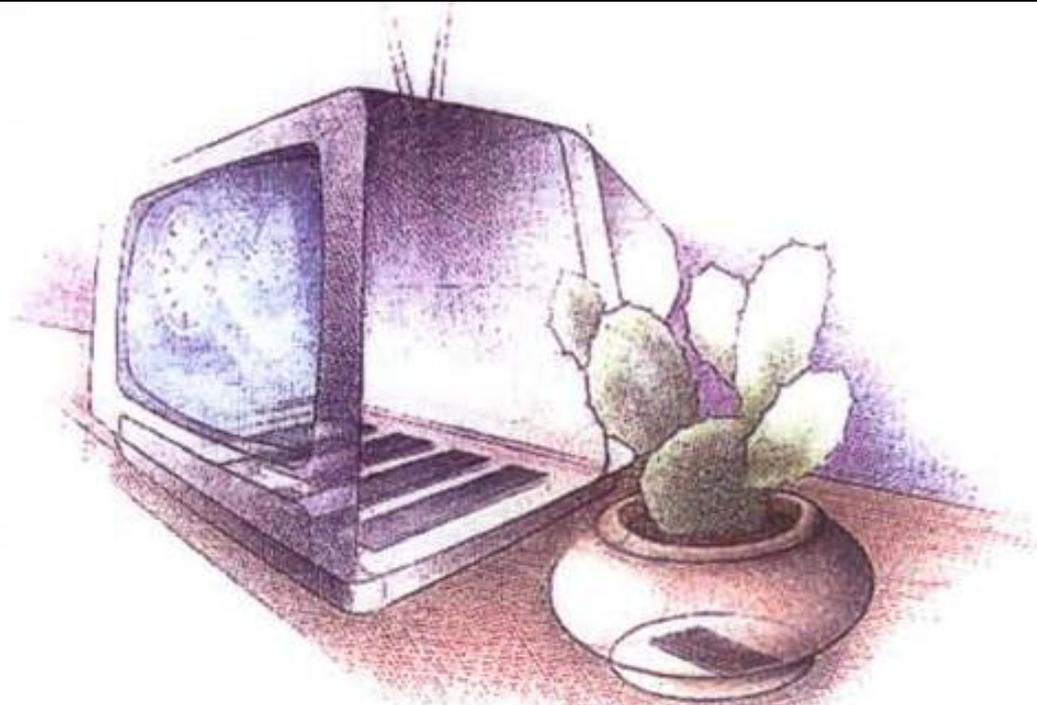


Earthquake-secure bookshelves in the office of the State Geologist



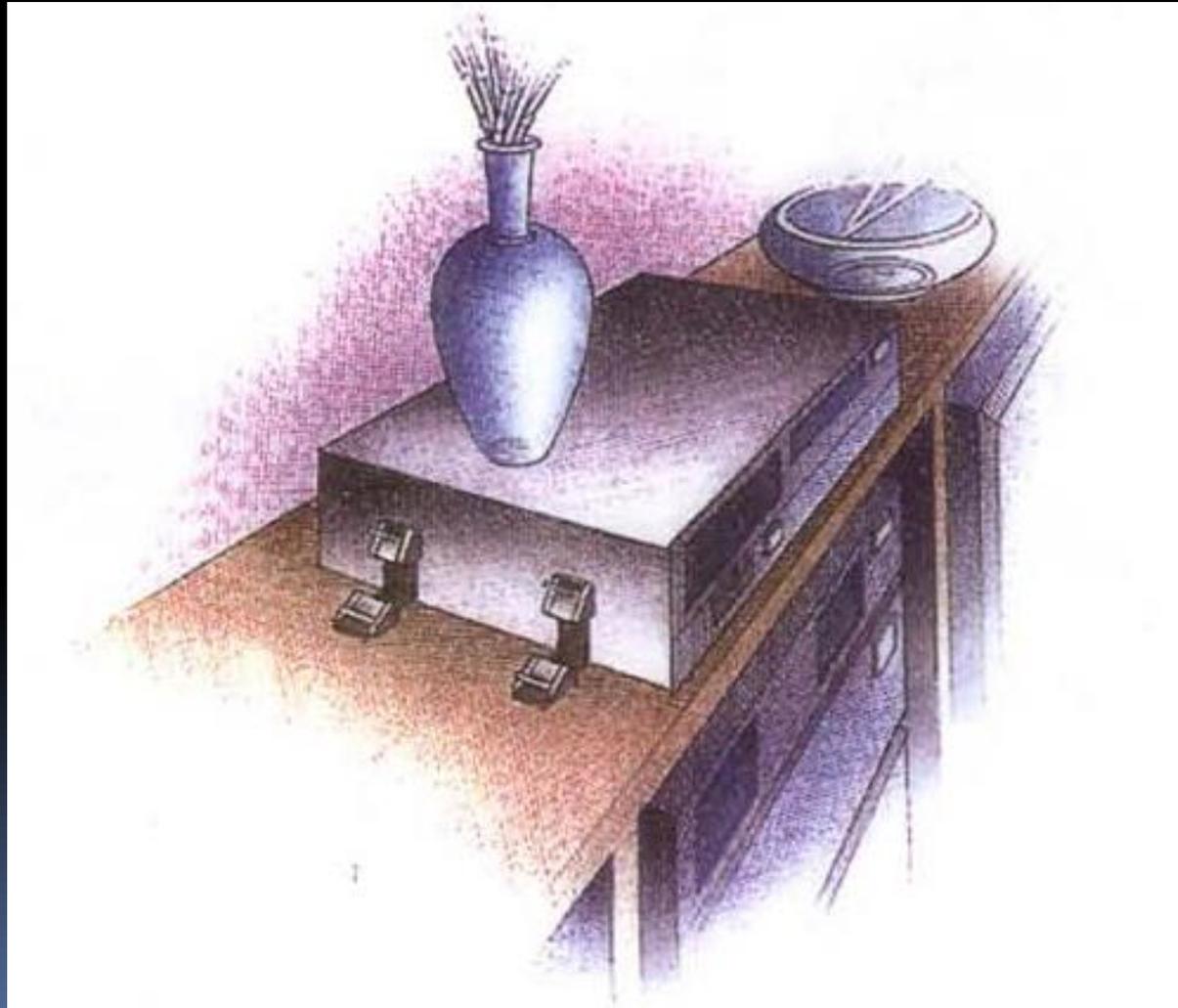
**Secured computers at the
Clark County Building Department**

Velcro fasteners are glued to the tabletop.

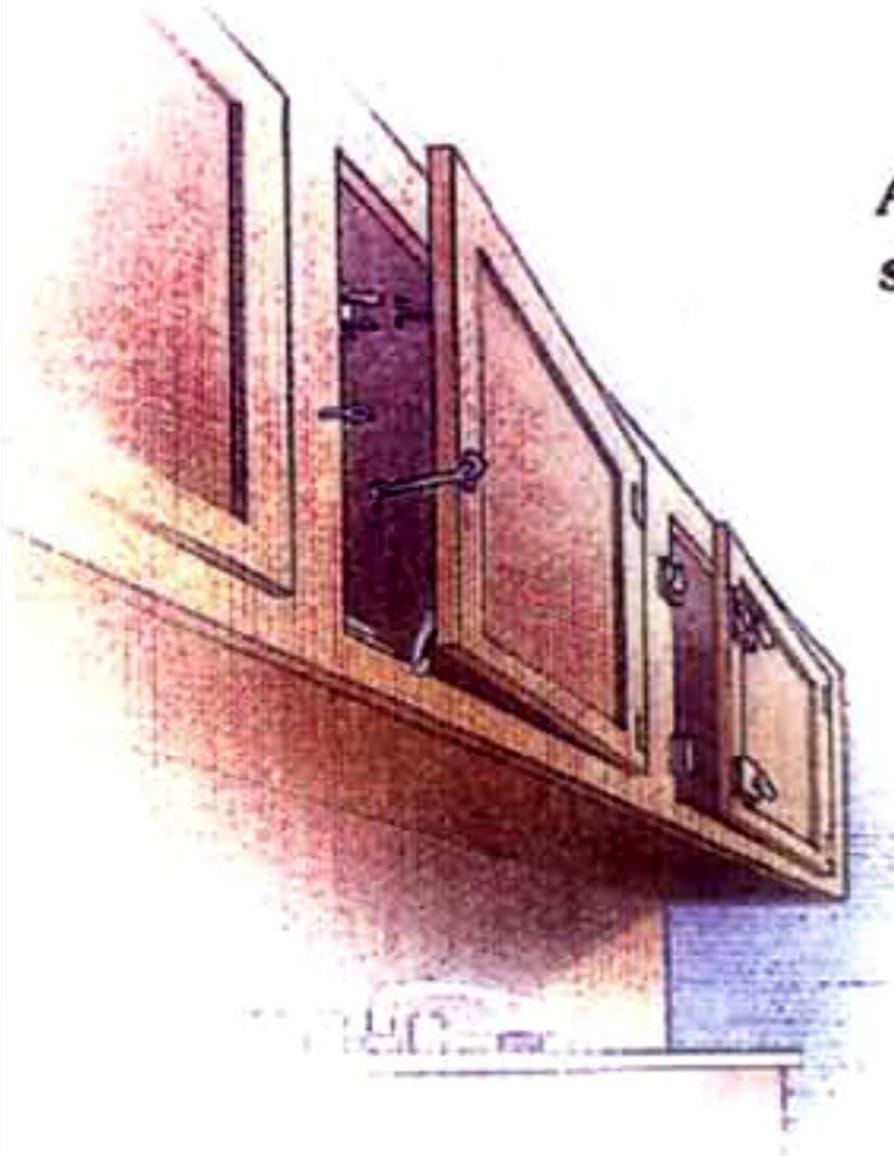


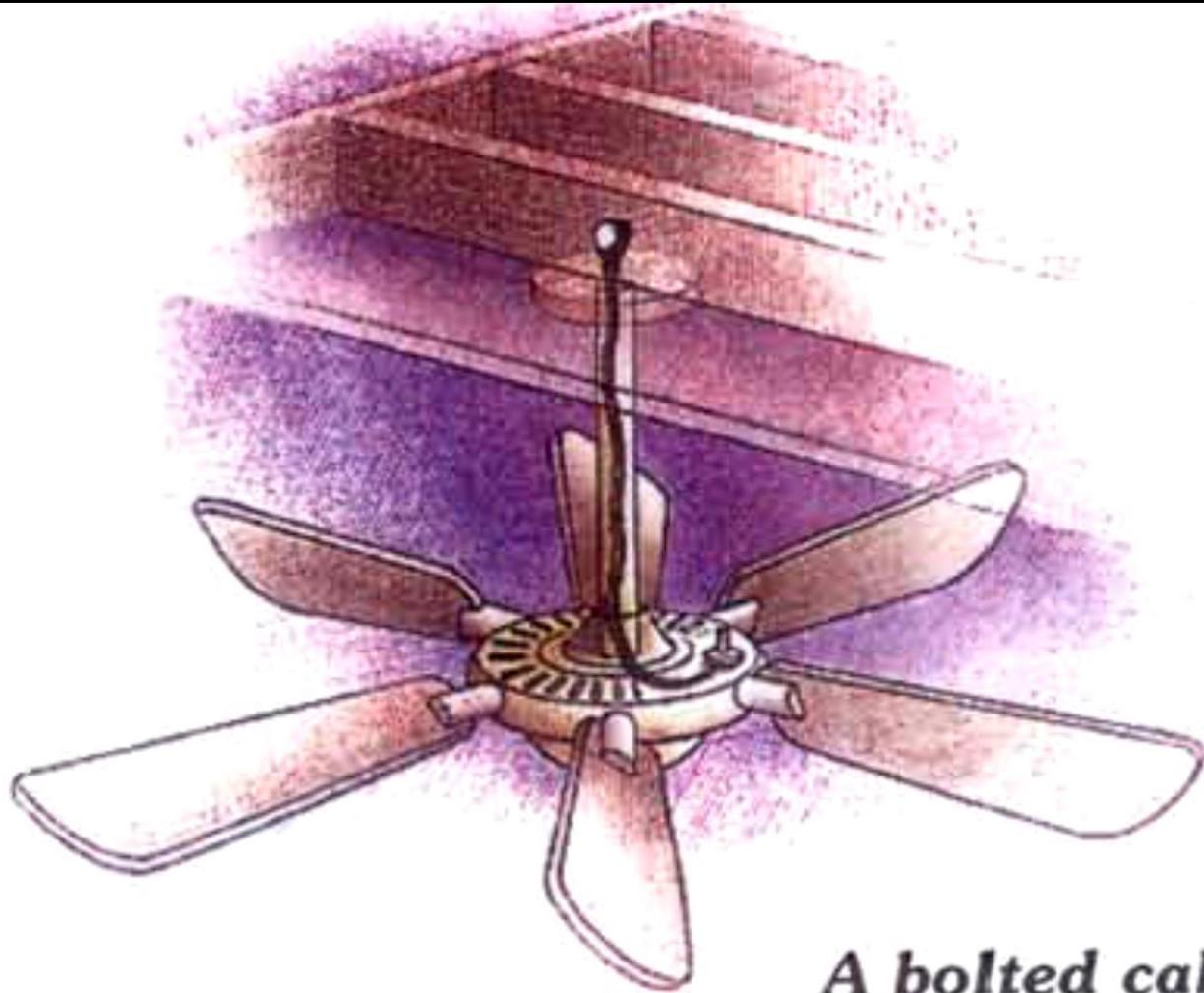
Securing tabletop objects

Anchor tabletop objects with straps and nondrying putty.



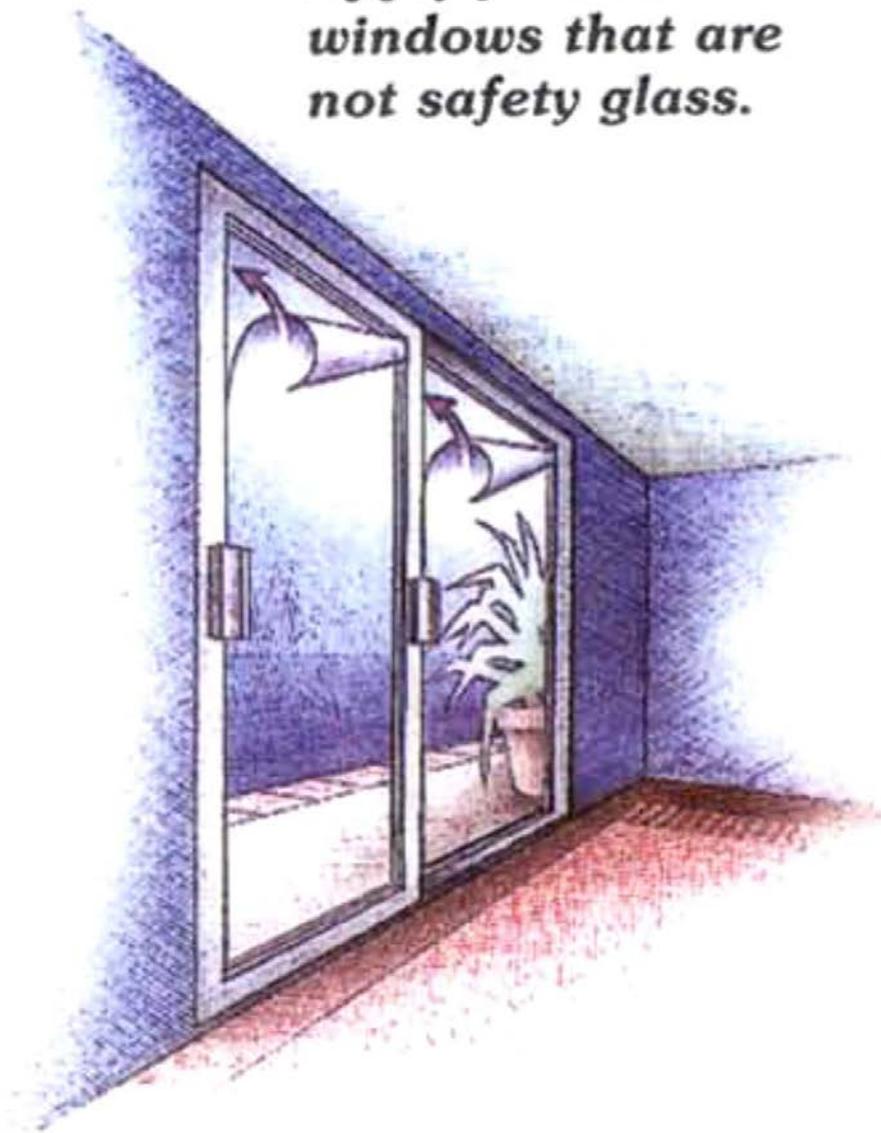
A variety of latch systems can be used.



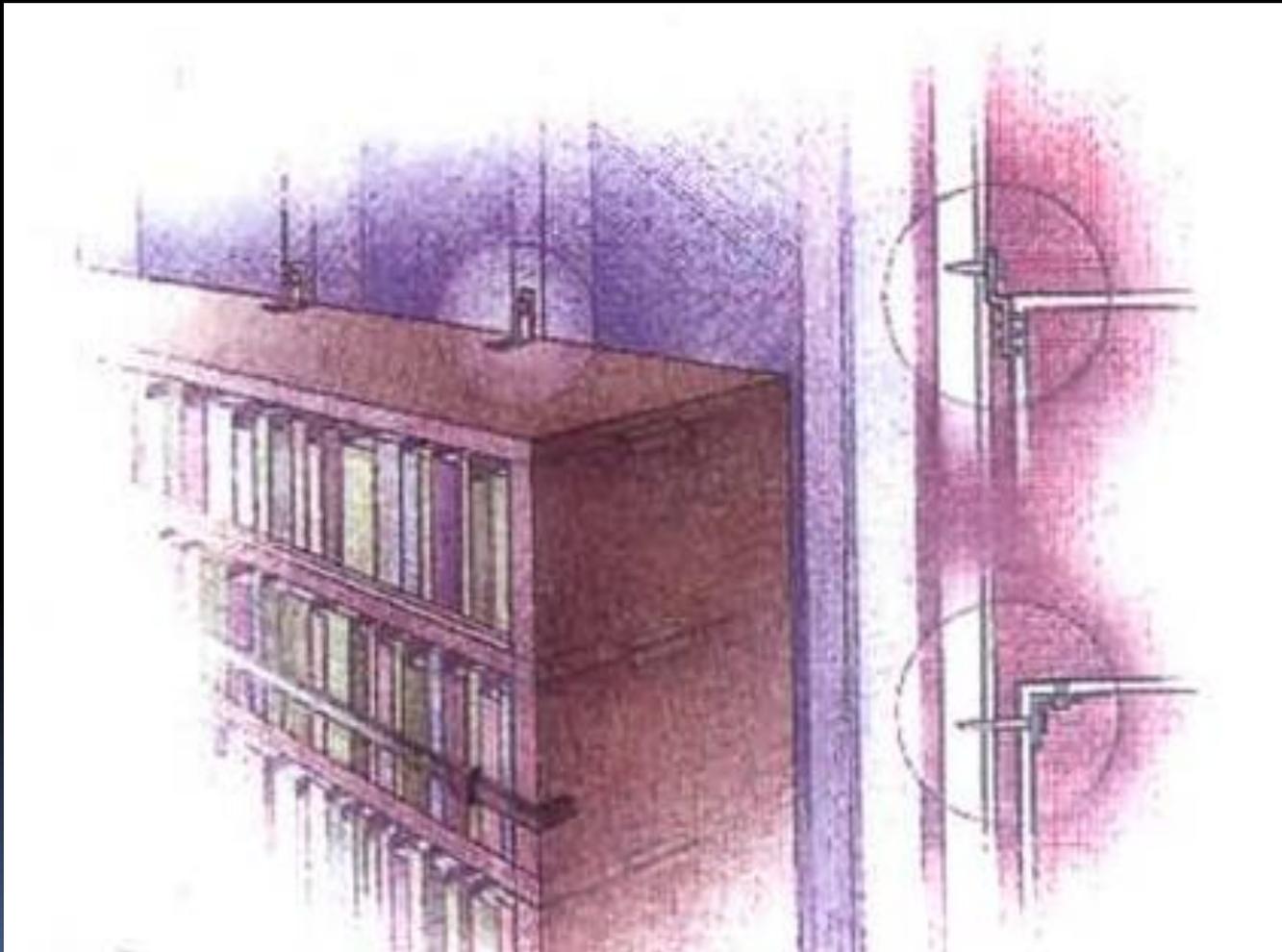


***A bolted cable
attaches fan to
ceiling joist.***

*Apply film to
windows that are
not safety glass.*



Use nylon straps or L-braces for tall furniture.



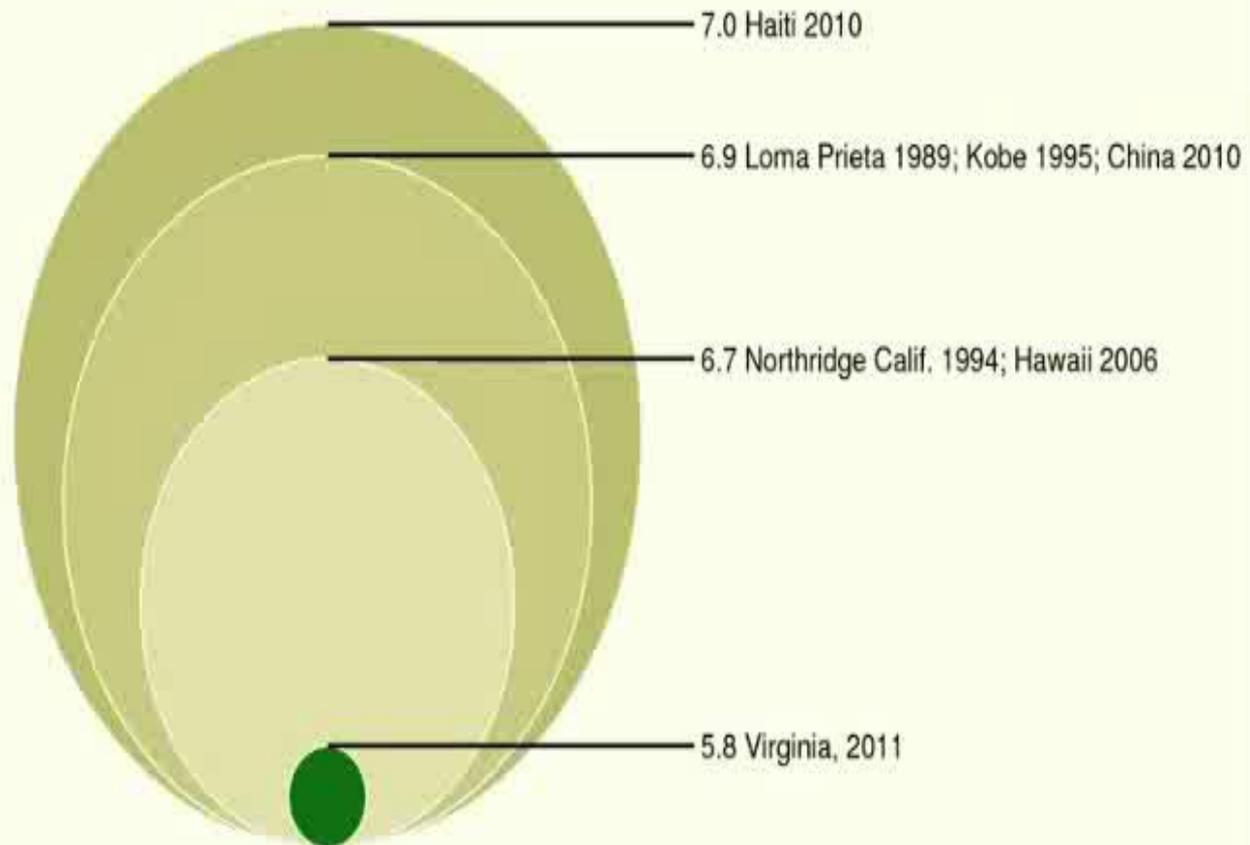
The consequences of earthquakes can be huge in Nevada, particularly if individuals are not prepared.

A. Be prepared to respond.

B. Mitigate structural risks, largely through building codes and avoiding faults and areas of liquefaction – more to do with URMs.

C. Mitigate nonstructural risks – more to do.

Comparison of Recent and Historic Earthquakes by Energy Release



Earthquake Awareness
and
Preparedness Week

- http://www.clarkcountynv.gov/depts/development_services/Pages/default.aspx
- <http://www.seismo.unr.edu/>
- <http://www.nbmgs.unr.edu/>
- <http://www.nbmgs.unr.edu/nesc/index.html>
- <http://www.usgs.gov/>
- <http://www.fema.gov/>



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of Mines and Geology

