Introduction

has been identifying and mapping the tsunami inundation hazard along the Oregon coast since 1994. In Oregon, DOGAMI manages the National Tsunami Hazard Mitigation Program, which has been administered by the National Oceanic and Atmospheric Administration (NOAA) since in coastal areas reduce the potential for disastrous tsunami-related consequences by understanding and mitigating this geologic hazard. Using federal funding awarded by NOAA, DOGAMI has developed a new generation of tsunami inundation maps to help residents and visitors along the entire Oregon coast prepare for the next Cascadia Subduction Zone (CSZ) earthquake and tsunami.

The CSZ is the tectonic plate boundary between the North American the splay fault. Each scenario assumes that a tsunami occurs at Mean Plate and the Juan de Fuca Plate (Figure 1). These plates are converging at a rate of about 1.5 inches per year, but the movement is not smooth and continuous. Rather, the plates lock in place, and unreleased energy builds over time. At intervals, this accumulated energy is violently understand this scientific material and to enhance the educational released in the form of a megathrust earthquake rupture, where the aspects of hazard mitigation and response, the five scenarios are labeled North American Plate suddenly slips westward over the Juan de Fuca as "T-shirt sizes" ranging from Small, Medium, Large, Extra Large, to Plate. This rupture causes a vertical displacement of water that creates a Extra Extra Large (S, M, L, XXL). The map legend depicts the tsunami (Figure 2). Similar rupture processes and tsunamis have respective amounts of slip, the frequency of occurrence, and the occurred elsewhere on the planet where subduction zones exist: for earthquake magnitude for these five scenarios. Figure 4 shows the example, offshore Chile in 1960 and 2010, offshore Alaska in 1964, near cumulative number of buildings inundated within the map area. Sumatra in 2004, and offshore Japan in March 2011.

indicates that at least 19 major ruptures of the full length of the CSZ have point is wet or dry. These points are converted to wet and dry contour occurred off the Oregon coast over the past 10,000 years (Figure 3). All 19 of these full-rupture CSZ events were likely magnitude 8.9 to 9.2 wet and dry contour lines is termed the Wet/Dry Zone, which equates to deposits carried onshore and left by the 1700 event have been found 1.2 miles inland; older tsunami sand deposits have also been discovered in estuaries 6 miles inland. As shown in Figure 3, the range in time between these 19 events varies from 110 to 1,150 years, with a median time interval of 490 years. In 2008 the United States Geological Survey (USGS) released the results of a study announcing that the probability of area of expected tsunami inundation based on scientific evidence and a magnitude 8-9 CSZ earthquake occurring over the next 30 years is tsunami modeling in order to prohibit the construction of new essential 10% and that such earthquakes occur about every 500 years (WGCEP, and special occupancy structures in this tsunami inundation zone

CSZ Model Specifications. The sizes of the earthquake and its resultant tsunami are primarily driven by the amount and geometry of the slip that takes place when the North American Plate snaps westward over range of earthquake and tsunami sizes that take into account different fault geometries that could amplify the amount of seawater displacement and increase tsunami inundation. Seismic geophysical Ocean, resulting in an increase of the tsunami inundation onshore in

The Oregon Department of Geology and Mineral Industries (DOGAMI)

Oregon. DOGAMI has also incorporated physical evidence that suggests that portions of the coast may drop 4 to 10 feet during the earthquake; this effect is known as subsidence. Detailed information on fault geometries, subsidence, computer models, and the methodology used to create the tsunami scenarios presented on this map can be found in 1995. DOGAMI's work is designed to help cities, counties, and other sites DOGAMI Special Papers 41 (Priest and others, 2009) and 43 (Witter and

This tsunami inundation map displays the output of computer models representing five selected tsunami scenarios, all of which include the earthquake-produced subsidence and the tsunami-amplifying effects of Higher High Water (MHHW) tide; MHHW is defined as the average height of the higher high tides observed over an 18-year period at the Yaquina Bay (Central Coast Model) tide gauge. To make it easier to

The computer simulation model output is provided to DOGAMI as CSZ Frequency. Comprehensive research of the offshore geologic record millions of points with values that indicate whether the location of each lines that form the extent of inundation. The transition area between the earthquakes (Witter and others, 2011). The most recent CSZ event the amount of error in the model when determining the maximum happened approximately 300 years ago on January 26, 1700. Sand inundation for each scenario. Only the XXL Wet/Dry Zone is shown on

> This map also shows the regulatory tsunami inundation line (Oregon Revised Statutes 455.446 and 455.447), commonly known as the Senate Bill 379 line. Senate Bill 379 (1995) instructed DOGAMI to establish the (Priest, 1995).

Time Series Graphs and Wave Elevation Profiles. In addition to the tsunami scenarios, the computer model produces time series data for "gauge" locations in the area. These points are simulated gauge stations the Juan de Fuca Plate during a CSZ event. DOGAMI has modeled a wide that record the time, in seconds, of the tsunami wave arrival and the wave height observed. It is especially noteworthy that the greatest wave height and velocity observed are not necessarily associated with the first tsunami wave to arrive onshore. Therefore evacuees should not assume profiles show that there may be a steep splay fault running nearly that the tsunami event is over until the proper authorities have sounded parallel to the CSZ but closer to the Oregon coastline (Figure 1). The the all-clear signal at the end of the evacuation. Figure 5 depicts the effect of this splay fault moving during a full-rupture CSZ event would be tsunami waves as they arrive at a simulated gauge station. Figure 6 scenarios at the profile locations shown on this map.

Cascadia Subduction Zone Setting

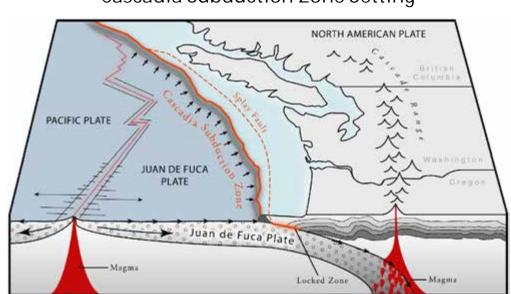
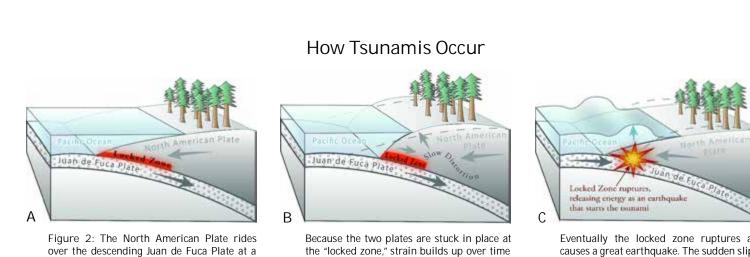
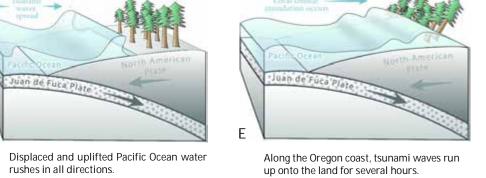


Figure 1: This block diagram depicts the tectonic setting of the region. See Figure 2 for the sequence of events that occur during a Cascadia Subduction Zone megathrust earthquake and tsunami.

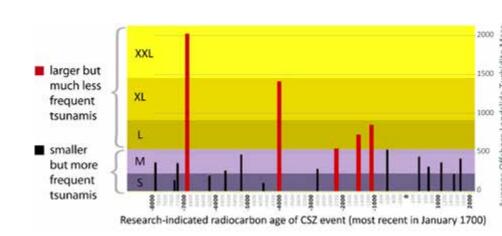


and the North American Plate bulges up.

rate of approximately 1.5 inches per year.

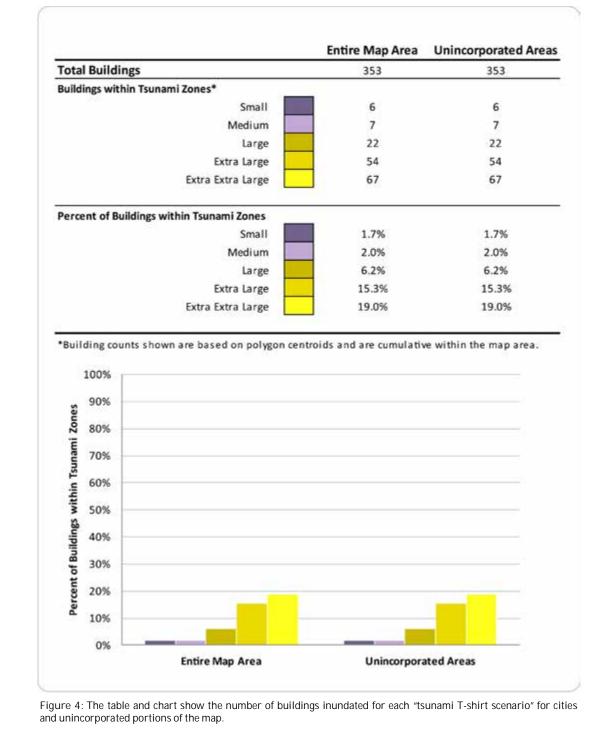


Occurrence and Relative Size of Cascadia Subduction Zone Megathrust Earthquakes



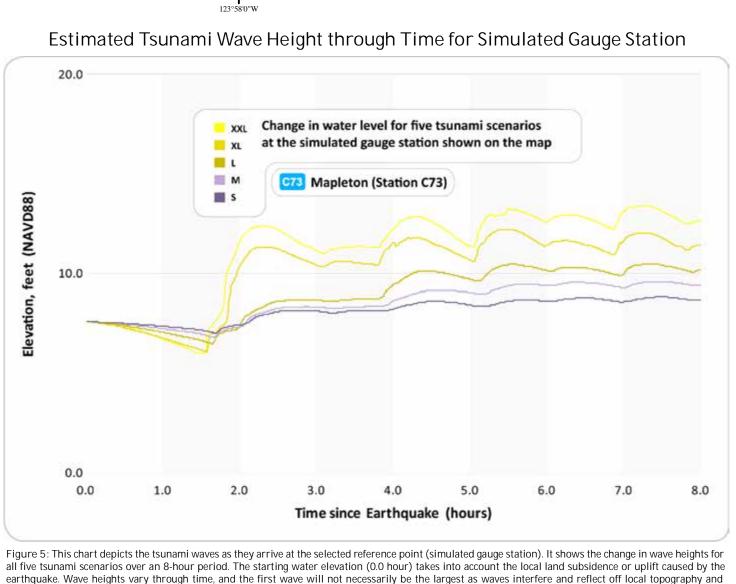
frequency, and magnitude of the last 19 great Cascadia Subduction Zone events over the past 10,000 years. The most recent event occurred on January 26, 1700. The 1700 event is considered to be a "medium sized" event. The data used to create this chart came from research that examined the many submarine landslides, known as "turbidites," that are triggered only by these great earthquakes (Witter and others, 2011). The loose correlation is "the bigger the turbidite, the bigger the earthquake."

Buildings within Tsunami Inundation Zones

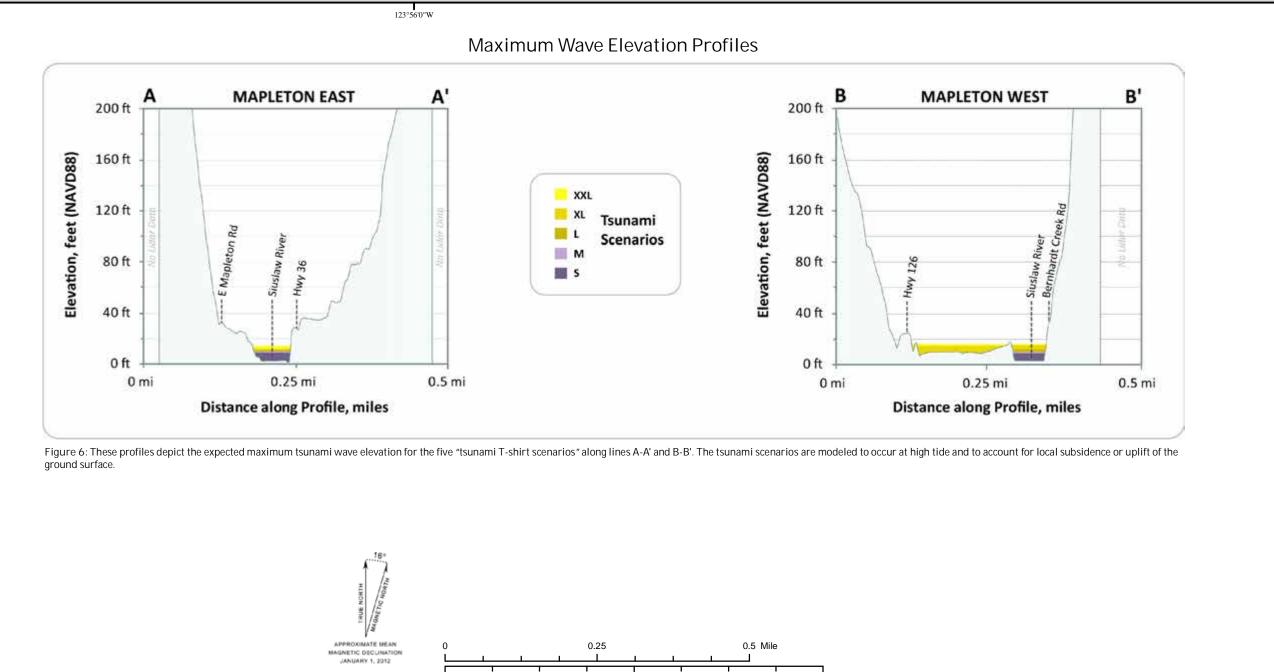


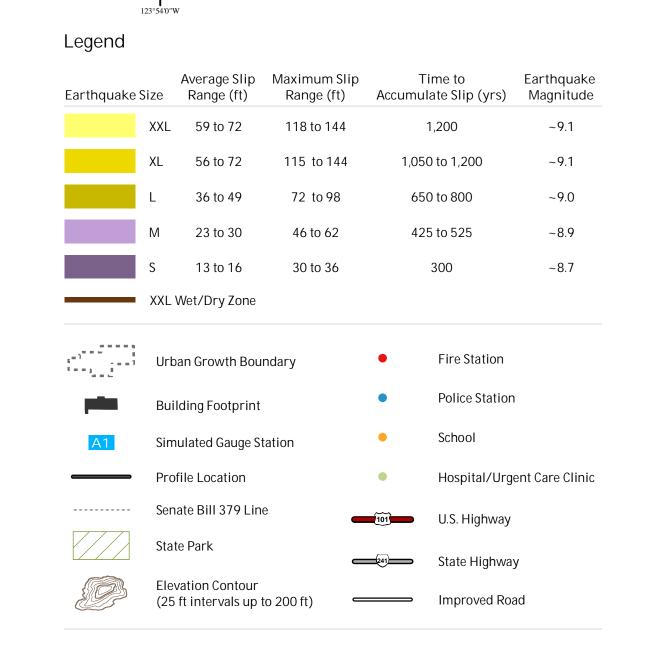
Local Source (Cascadia Subduction Zone) Tsunami Inundation Map Tiernan - Mapleton, Oregon

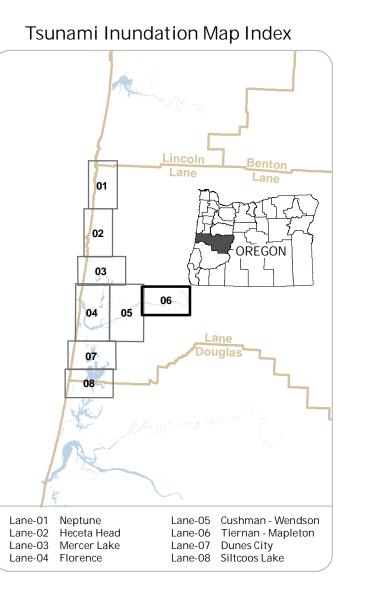


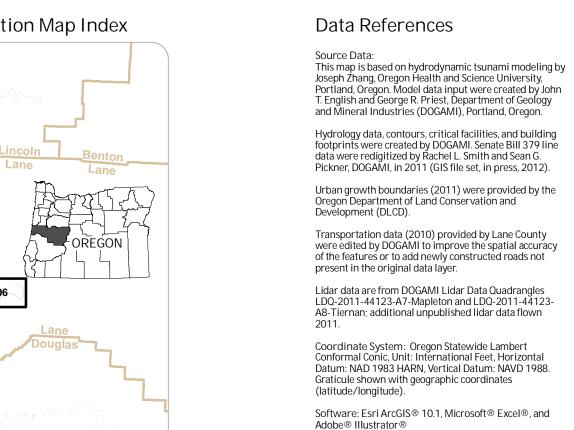


bathymetry. Any absence of data indicates periods for which tsunami inundation has not yet reached or has receded from the station location and dry land is











Text: Don W.T. Lewis, Rachel L. Smith Editing: Don W.T. Lewis, Rachel L. Smith

Publication. Deborah A. Schueller Map Date. 03/04/2013



2007 Working Group on California Earthquake Probabilities (WGCEP), 2008, The Uniform California

California Geological Survey Special Report 203 [http://pubs.usgs.gov/of/2007/1437/].

Open-File Report 0-95-67, 95 p.

use of the tsunami hazard maps of the Oregon coast,

Priest, G.R., Goldfinger, C., Wang, K., Witter, R.C., Zhang, Y.,

and Baptista, A.M., 2009, Tsunami hazard assessment of

Witter, R.C., Zhang, Y., Wang, K., Priest, G.R., Goldfinger, C., Stimely, L.L., English, J.T., and Ferro, P.A., 2011, Simulating tsunami inundation at Bandon, Coos County, Oregon,

using hypothetical Cascadia and Alaska earthquake scenarios: Oregon Department of Geology and Mineral

he northern Oregon coast: a multi-deterministic

approach tested at Cannon Beach, Clatsop County, Oregon: Oregon Department of Geology and Mineral

Earthquake Rupture Forecast, Version 2 (UCERF 2): U.S. Geological Survey Open-File Report 2007-1437 and