



**Introduction**  
to the  
**State of Alaska's**  
**Seismic Hazards Safety**  
**Commission**  
And  
**Ocean Fury Tsunami Discussion**

April 16, 2011





# **The Alaska Seismic Hazards Safety Commission (ASHSC)**

**Laura Kelly, PE**

- **Vice Chair, Federal Agency Rep., ASHSC (Active member 2005 – present)**
- **Civil Engineer, US Coast Guard (Fed. Employee) , Kodiak, AK (2000 – present)**

## **Discussion Topics**

- **Purpose/ Vision of the ASHSC**
- **Tsunamis & Earthquakes in Kodiak**
- **Active Seismic Regions of Alaska & Associated Tectonics**
- **How to Plan/Respond**



# Commission Mission

Why does this Governor's Commission exist?

***Advise the public and private sectors on approaches for mitigating earthquake and tsunami risk. Make recommendations to the governor and legislature for reducing the State's vulnerability to these seismic hazards.***



Western States Seismic Policy Council

# WSSPC

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[About WSSPC](#) [WSSPC Members](#) [Publications](#) [Newsletters](#) [Awards Program](#) [Public Policy Center](#) [WSSPC Events](#)

## WSSPC Members

The WSSPC membership is comprised of **two groups** -- State Agencies and Affiliate Members.

### Member Agencies

WSSPC members are the Directors of the geological surveys and emergency management agencies from each state, territory, or province in the western region, and a representative from each State that has a Seismic Safety Council or Commission.

### Emergency Management and Geological Surveys

**13 States:**

- [Alaska](#)
- [Arizona](#)
- [California](#)
- [Colorado](#)
- [Hawaii](#)
- [Idaho](#)
- [Montana](#)
- [Nevada](#)
- [New Mexico](#)
- [Oregon](#)
- [Utah](#)
- [Washington](#)
- [Wyoming](#)

**3 U.S. Territories:**

- [American Samoa](#)
- [Guam](#)
- [N. Mariana Islands](#)

**1 Canadian Province:**

- [British Columbia](#)

**1 Canadian Territory:**

- [Yukon](#)

### State Seismic Safety Councils and Commissions

[Alaska Seismic Hazards Safety Commission Annual Report](#)

[State of California Alfred E. Alquist Seismic Safety Commission Annual Report](#)

[Colorado Earthquake Hazard Mitigation Council](#)

Hawaii State Earthquake Advisory Committee

[Nevada Earthquake Safety Council](#)

[Oregon Seismic Safety Policy Advisory Commission](#)

[Utah Seismic Safety Commission](#)

[Washington State Seismic Safety Council](#)

[Wyoming Seismic Safety Council](#)

[British Columbia Seismic Safety Council](#)

[Yukon Seismic Safety Council](#)

- California Seismic Safety Commission
- Cascadia Region Earthquake Workgroup (CREW)
- Oregon Seismic Safety Policy Advisory Commission
- Utah Seismic Safety Commission
- See: Western States Seismic Policy Council ([www.wsspc.org](http://www.wsspc.org))

# 11 Members of the ASHC

- **John Aho**-Public/Restricted (Chair)
- **Laura Kelly**-Federal Agency (Vice Chair)
- **Rich Koehler**-DNR Representative
- **\*Roger Hansen**-UAF Representative
- **Mark Roberts**-DMVA Representative
- **\*Gary Carver**-Public/Restricted
- **Robert (Buzz) Scher**-Public/Restricted
- **Gay Dunham**-Local Government Representative
- **Dan Mahalak**-Local Government Representative
- **Dave Miller**-Local Government Representative
- **Gayle White**-Insurance Representative
- **Plus: April Woolery**- DNR Assistant
- **\*Linda Freed** – Former Commission Member- Local Govt. Rep.

**\*(Appearance in Ocean Fury, 2004 – 40<sup>th</sup> Anniversary of 1964 Earthquake and Tsunami)**



# Commission Committees

- Insurance - White
- Schools - Kelly
- Earthquake Scenario - Koehler
- Education & Outreach - Aho
- Hazards Identification - Carver
- Response & Recovery - Roberts
- Post Earthquake Planning - Roberts
- Partnership – Aho
- Tsunamis

Please visit our website: <http://www.seismic.alaska.gov>



The screenshot shows a web browser window displaying the Alaska Seismic Hazards Safety Commission (ASHSC) website. The browser's address bar shows the URL <http://www.seismic.alaska.gov/>. The website features a navigation menu with links to DNR, DGGS, DHS&EM, SERC, and Natural Resources. A large banner image of Anchorage, Alaska, is at the top, with the text "Alaska Seismic Hazards Safety Commission" overlaid. Below the banner, the page is organized into several sections: "MISSION", "EARTHQUAKE RISK IN ALASKA", "ALASKA EARTHQUAKE STATISTICS", "2011 REPORT TO THE GOVERNOR AND STATE LEGISLATURE", and "MEDIA RELEASES AND ANNOUNCEMENTS". A sidebar on the right contains "Upcoming" events, "Meeting Agendas", "Meeting Minutes", and "More Information". The browser's status bar at the bottom indicates "Internet | Protected Mode: On" and "100%" zoom.

Alaska Seismic Hazards Safety Commission

State of Alaska > Office of the Governor > Boards and Commissions

**MISSION**  
The Alaska Seismic Hazards Safety Commission is charged by statute (AS 44.37.067) to recommend goals and priorities for seismic risk mitigation to the public and private sectors and to recommend policies to the governor and legislature to reduce the state's vulnerability to earthquakes. The Commission consists of eleven [members](#) appointed by the Governor from the public and private sectors for three-year terms. It is administered by the Department of Natural Resources, Division of Geological & Geophysical Surveys (DGGS).

**EARTHQUAKE RISK IN ALASKA**  
[Scientists have long recognized that Alaska has more earthquakes than any other region of the United States ...\[more\]](#)

**ALASKA EARTHQUAKE STATISTICS**  
[Alaska is the home of the second largest earthquake ever recorded \(1964 Great Alaska Earthquake, magnitude 9.2\)...\[more\]](#)

**2011 REPORT TO THE GOVERNOR AND STATE LEGISLATURE**  
[Government Hill School in Anchorage was destroyed by a landslide triggered by the 1964 great Alaska earthquake...\[more\]](#)

**MEDIA RELEASES AND ANNOUNCEMENTS**  
[Tsunami Mitigation PSA by Governor Parnell and links to information about tsunamis](#)  
[Hometown, Alaska: Earthquakes and Tsunamis in Alaska](#)  
[The Japan Earthquake & Tsunami and What They Mean for the U.S.](#)  
[Governor Parnell declares March 20-26, 2011 as Tsunami Awareness Week in Alaska](#)  
[Alaska Geologist to Join Fault Evaluation Team in Haiti](#)  
[Recommendation for Evaluating Existing Public Schools for Seismic Safety](#)  
[Map - Public Schools and Earthquake Hazard in Alaska](#)  
[Table - Alaska Public Schools Sorted by Probabilistic Peak Ground Accelerations](#)

**Upcoming**  
**Meeting May 5 and 6, 2011; Atwood Building, Anchorage**

**Meeting Agendas**  
[April 7, 2011](#)  
[March 3, 2011](#)  
[February 3, 2011](#)  
[January 6, 2011](#)  
[November 12, 2010](#)  
[Agenda archive](#)

**Meeting Minutes**  
[March 3, 2011](#)  
[February 3, 2011](#)  
[January 6, 2011](#)  
[November 12, 2010](#)  
[September 29 & 30, 2010](#)  
[Minutes archive](#)

**More Information**  
[Reports/Presentations](#)  
[Resolutions](#)  
[Rules of Procedure](#)  
[ASHSC Charter](#)

## USCG – Kodiak, AK: Tsunami Hazard



Figure 9. Maximum run-up limit at Womens Bay (red line) for tsunamis modeled in the Tsunami Hazard Mapping Project, Alaska Division of Geological Surveys (Suleimani and others, 2002)



### CITY OF KODIAK

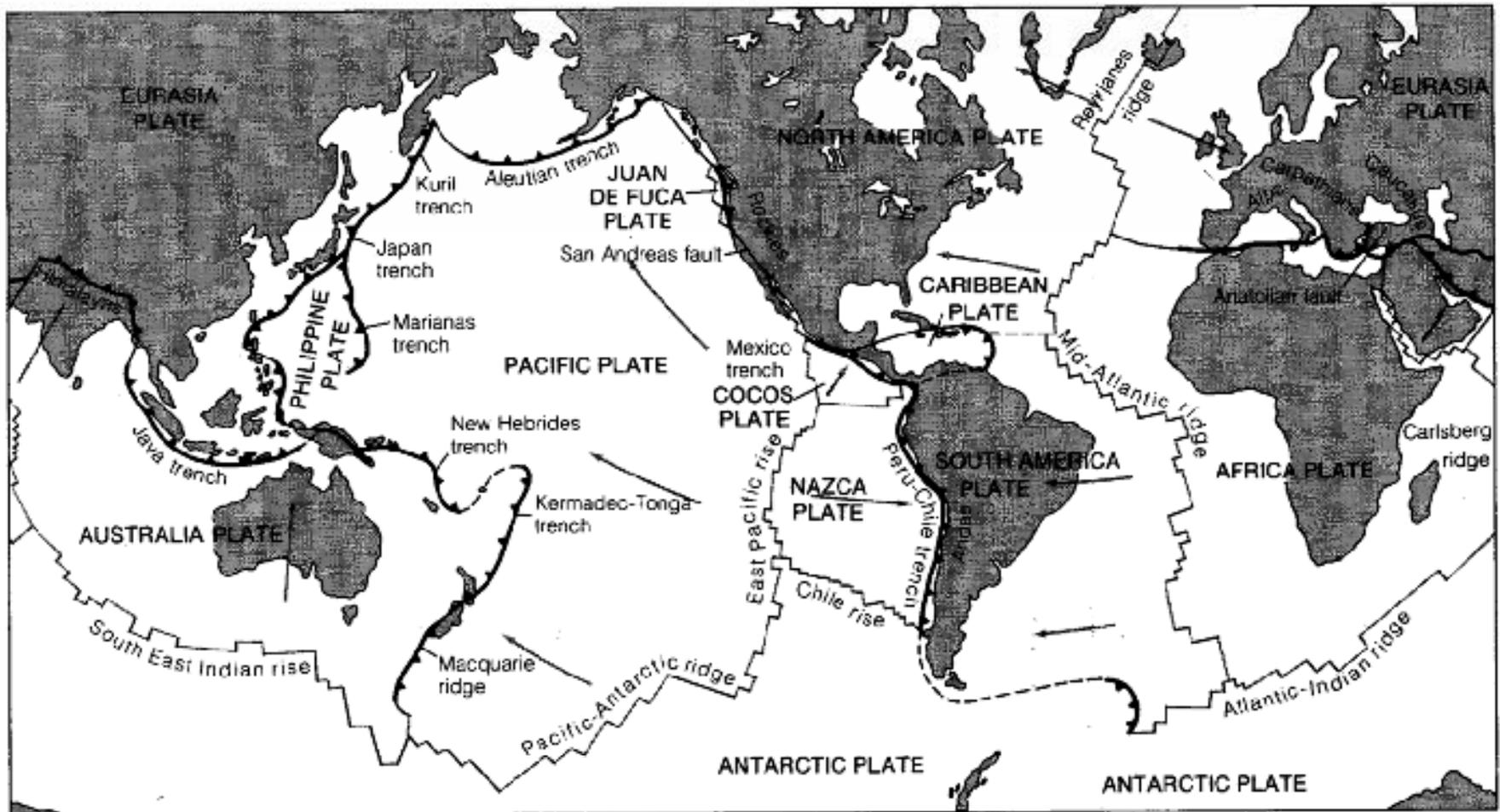
**50% LOSS OF FISHING INDUSTRY**

**75% LOSS OF CITY BUSINESS, BUILDINGS.**

**NO WATER, NO POWER**

**75% FOOD SUPPLIES DESTROYED.**





**Key**

- |  |   |
|--|---|
|  Subduction zone                |  Uncertain plate boundary  |
|  Strike-slip (transform) faults |  Direction of plate motion |
|  Ridge axis                     |   |

## Top Priorities

### **Completed:**

Kodiak  
Homer/Seldovia  
Seward

### **In Progress:**

Whittier (close)  
Cordova  
Valdez  
Tatitlek  
Chenega Bay

### **Next:**

Sitka  
Sand Point  
Unalaska  
Juneau/Douglas  
Akutan  
Yakutat

Link to tsunami hazard maps from Alaska Earthquake Information Center  
<http://www.aeic.alaska.edu/tsunami/kodiak.html>

Kodiak Inundation Mapping - Windows Internet Explorer provided by U. S. Coast Guard

http://www.aeic.alaska.edu/tsunami/kodiak.html

USCG Web Search

Kodiak Inundation Mapping

**AEIC** Alaska Earthquake Information Center  
Geophysical Institute, UAF

Home General Info Earthquake Info Activities Tsunami Outreach Seismology Contact

RECENT EARTHQUAKES EQ INFO RELEASES SEISMICITY REPORTS NOTABLE EARTHQUAKES EQ MOMENT TENSORS SHAKE MAPS EARTHQUAKE DATA MAPS

### Kodiak Tsunami Inundation Mapping

The full version of the report and tsunami hazard maps that we have prepared for the Kodiak area is the downloadable [DGGs Report of Investigations 2002-1](#). Two 1:12,500-scale maps show inundation lines calculated for seven different tsunami scenarios, one map for the city of Kodiak and the other for US Coast Guard Reservation and Womens Bay. Two corresponding maps show the estimated extent of inundation in the same communities resulting from the "worst case scenario", which is the maximum inundation of all modeled scenarios as well as areas of observed 1964 tsunami effects that extended farther inland than all of the modeled inundations.

The [Kodiak area](#) was identified as a high-priority region for Alaska inundation mapping. Kodiak's vulnerability to tsunamis was demonstrated by the [27 March 1964 earthquake](#) (moment magnitude 9.2). In the [city of Kodiak](#), the tsunami caused 6 fatalities and about \$30 million in damage. Since then, the harbor and waterfront area of the city that was destroyed by the 1964 tsunami has been rebuilt and significantly expanded, and substantial additional growth of the city of Kodiak and other nearby communities has occurred.

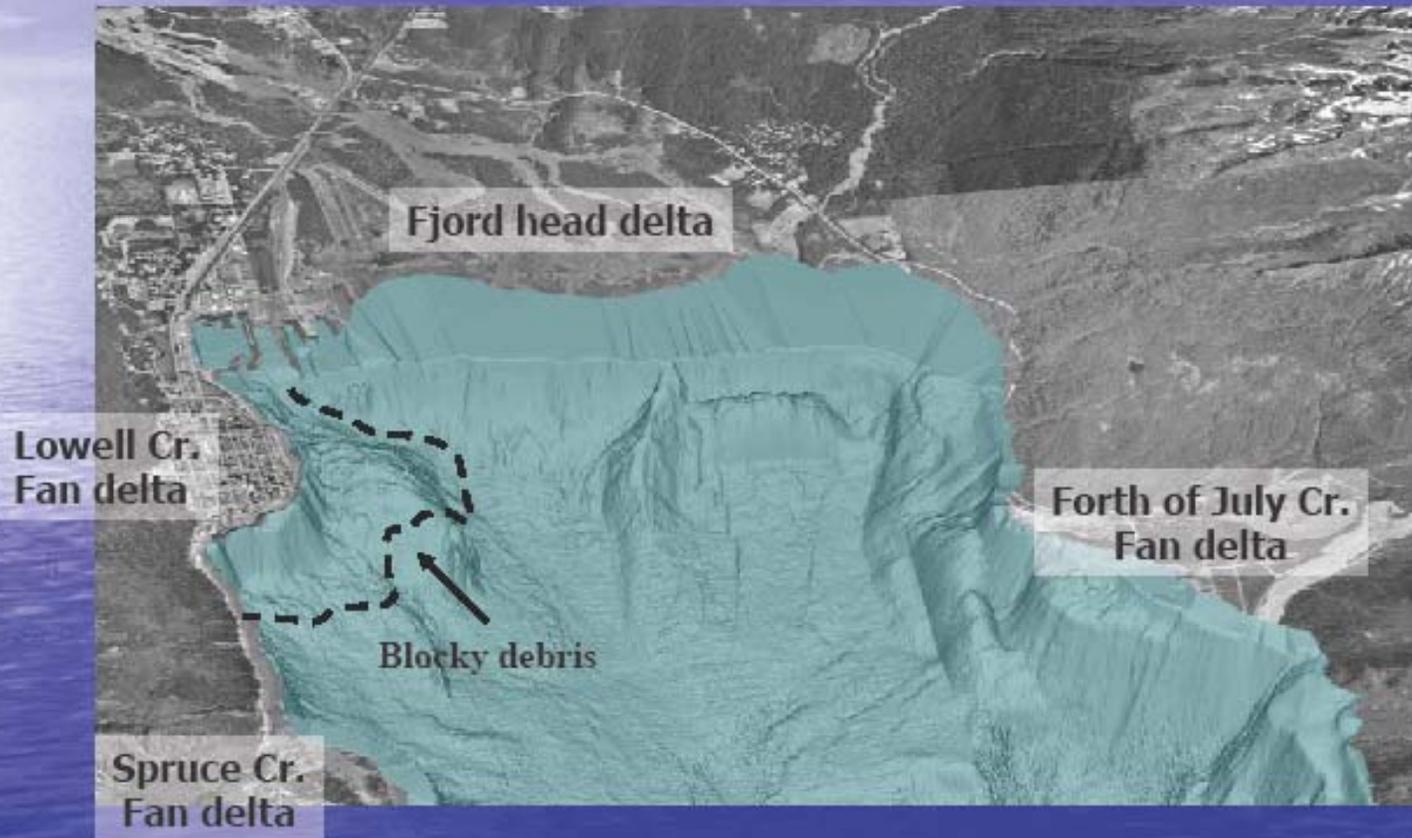
The preferred sites for rumup modeling were determined by [ADHS&EM](#) and Kodiak local government officials to be the three communities of metropolitan Kodiak: the city of Kodiak, U.S. Coast Guard Reservation, and Womens Bay. Local and state emergency managers have requested maps showing the extent of inundation with respect to human and cultural features as a basis for preparing evacuation maps for these communities.

Damage at Kodiak from the March 27, 1964, tsunami. Photo credit: NOAA

Page created by E. Suleimani.  
Updated: October 2006

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## Geological setting



## Major slide complexes and their volumes ( $\times 10^6 \text{ m}^3$ )

1. Seward downtown	27.5
2. Lowell Point	18.1
3. Resurrection river delta	2.9
4. 4 <sup>th</sup> of July Point	35.0
5. Middle bay	40.7
6. Tonsina Point	16.8
7. West shore	15.3
8. East shore	4.5
9. Thumb Cove	16.5
10. South slope	33.3

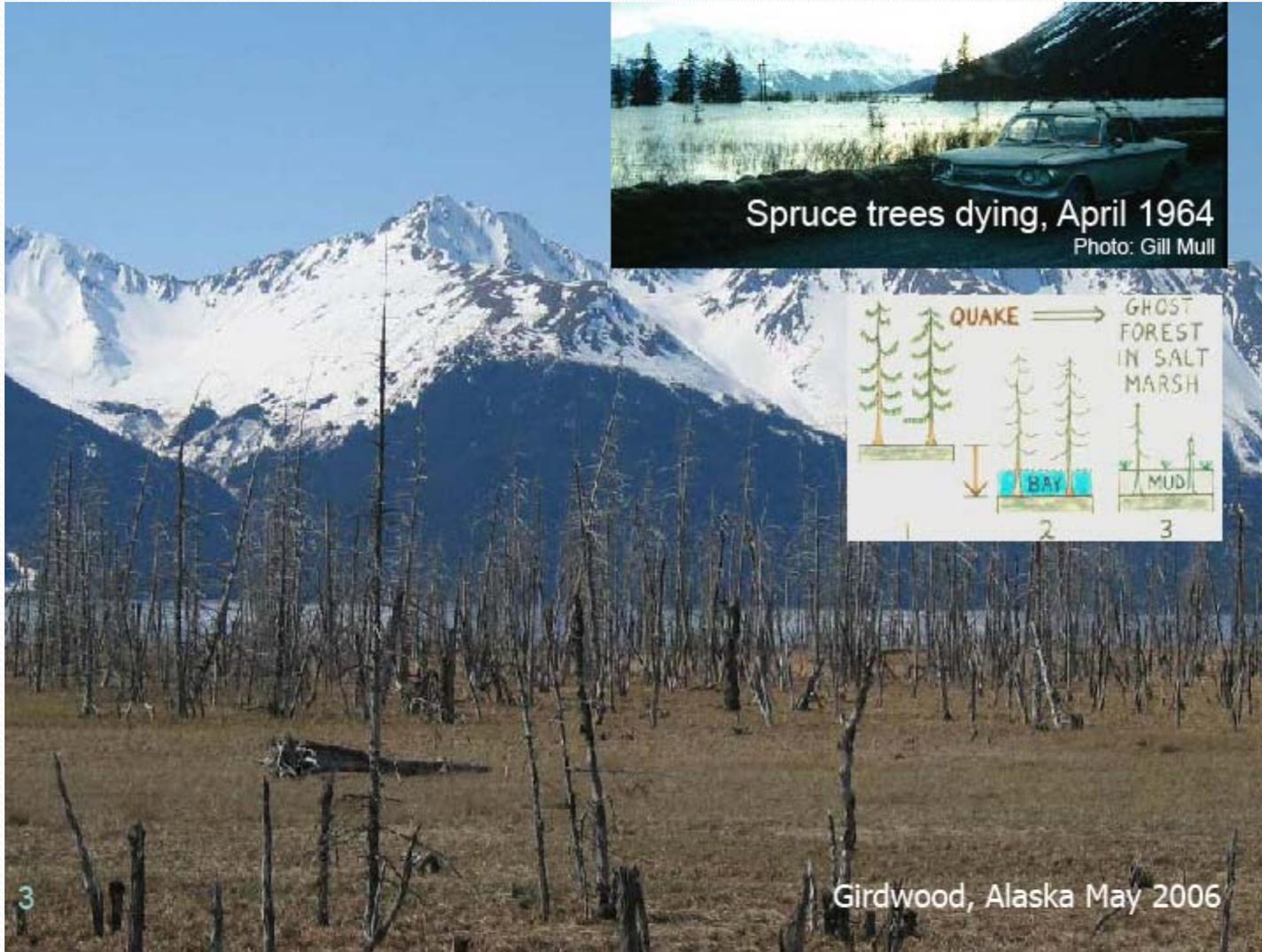
**Total: 210.6**

slides

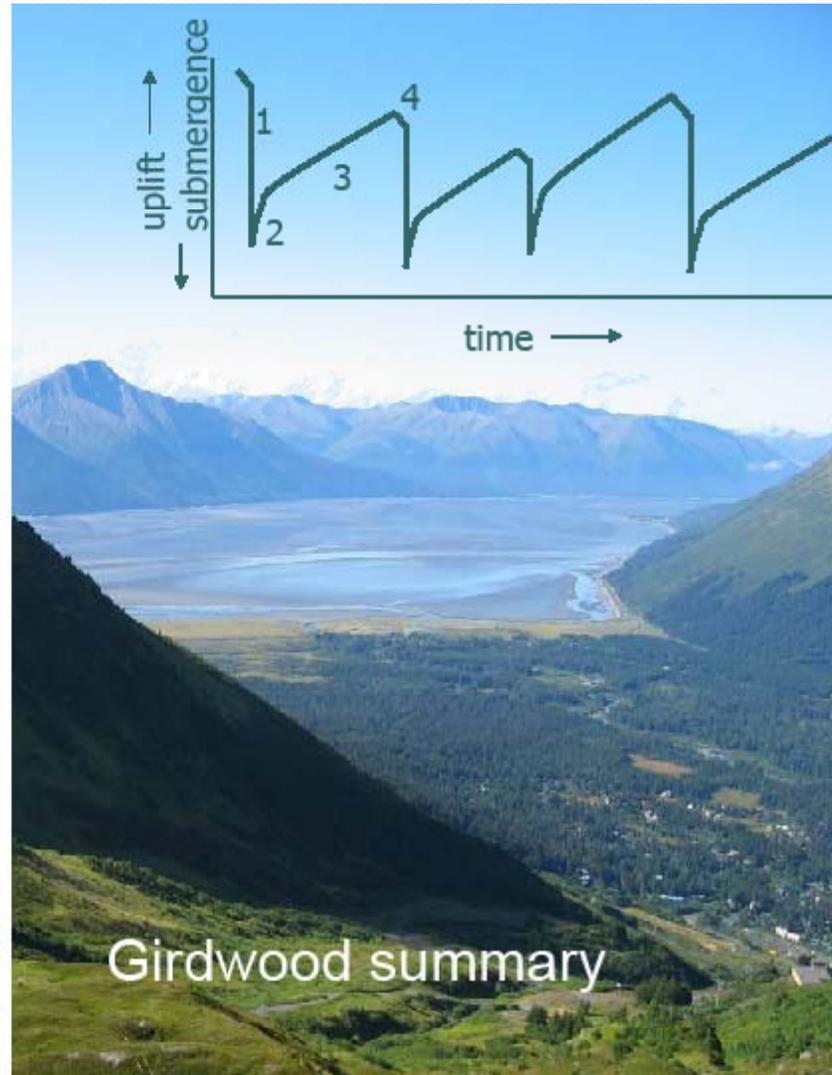
waves



2007 Presentation by Dr. Ian Shennan, Durham Univ., to ASHSC -Tsunami Cycles

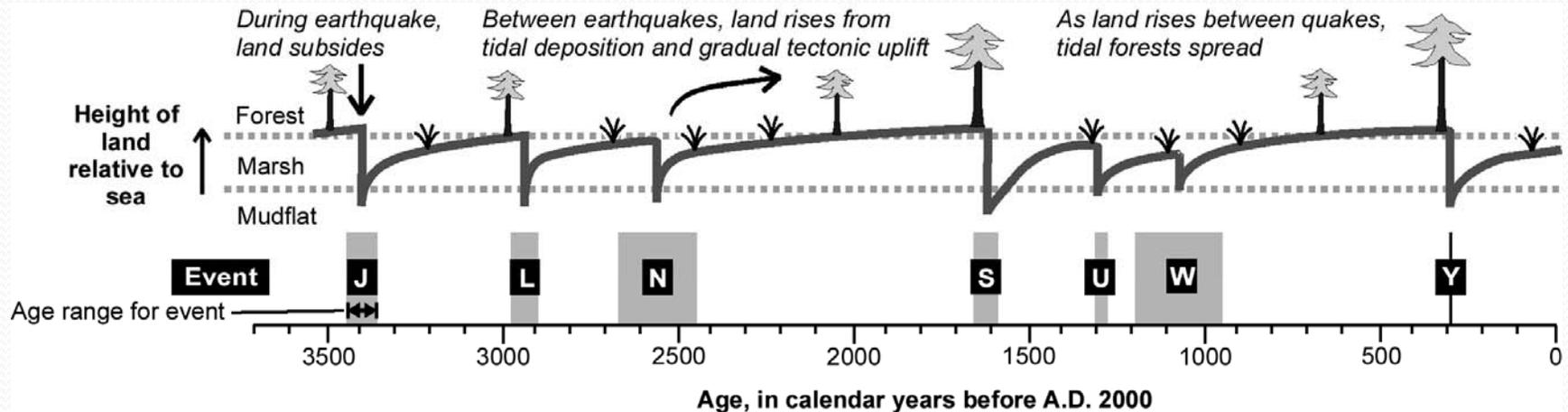
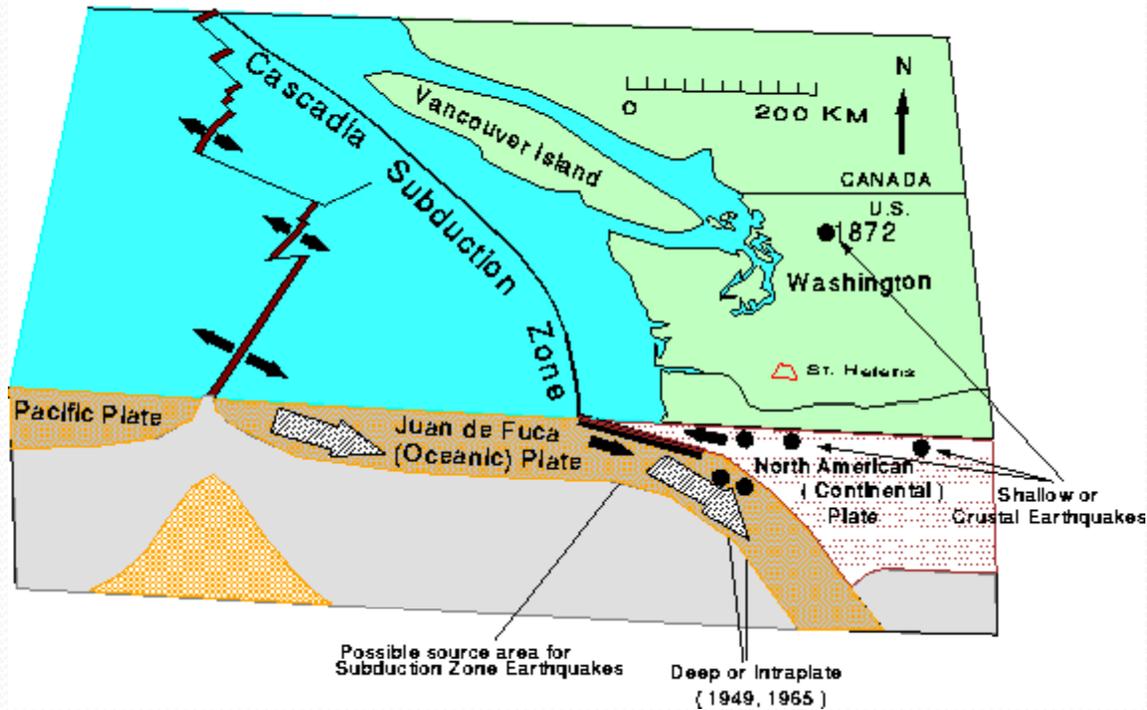


- ~7m net subsidence superimposed on seven earthquake cycles in the past 4000 years.
- EDC model for the Girdwood area with coseismic subsidence (1), followed by rapid post-seismic uplift in the decades after the earthquake (2). This merges into centuries of slower inter-seismic uplift (3) before a period of pre-seismic subsidence (4).
- Great earthquakes: no fixed recurrence interval between great. The shortest interval is between ~180 and 720 years. The longest interval is 790 – 920 years, which is between the penultimate earthquake and the Mw9.2 Alaska earthquake of March 1964.

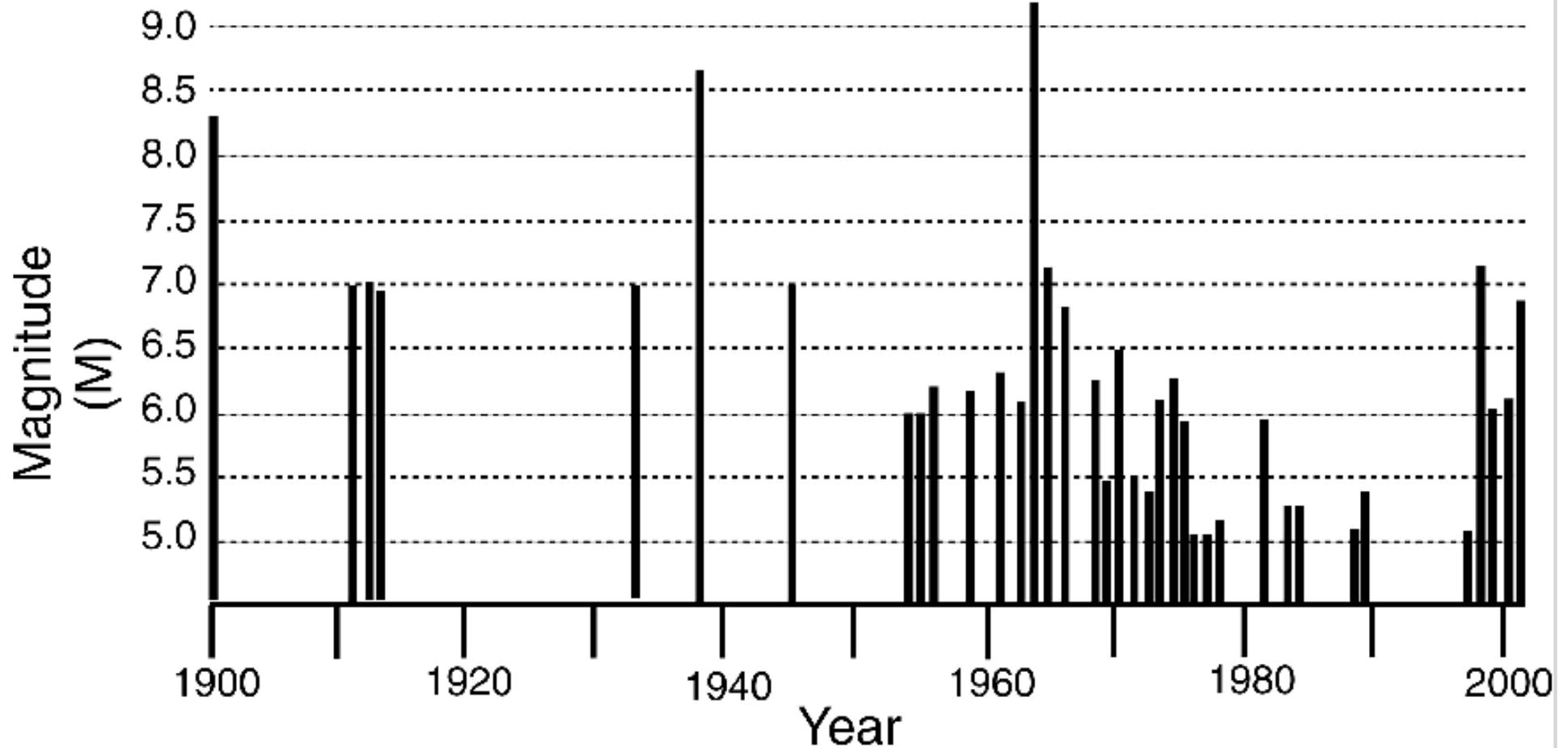


# Cascadia Subduction Zone

Earthquake Source Cross-sectional Map



# HISTORIC SEISMICITY - KODIAK REGION - 1900-2001



## Data Base:

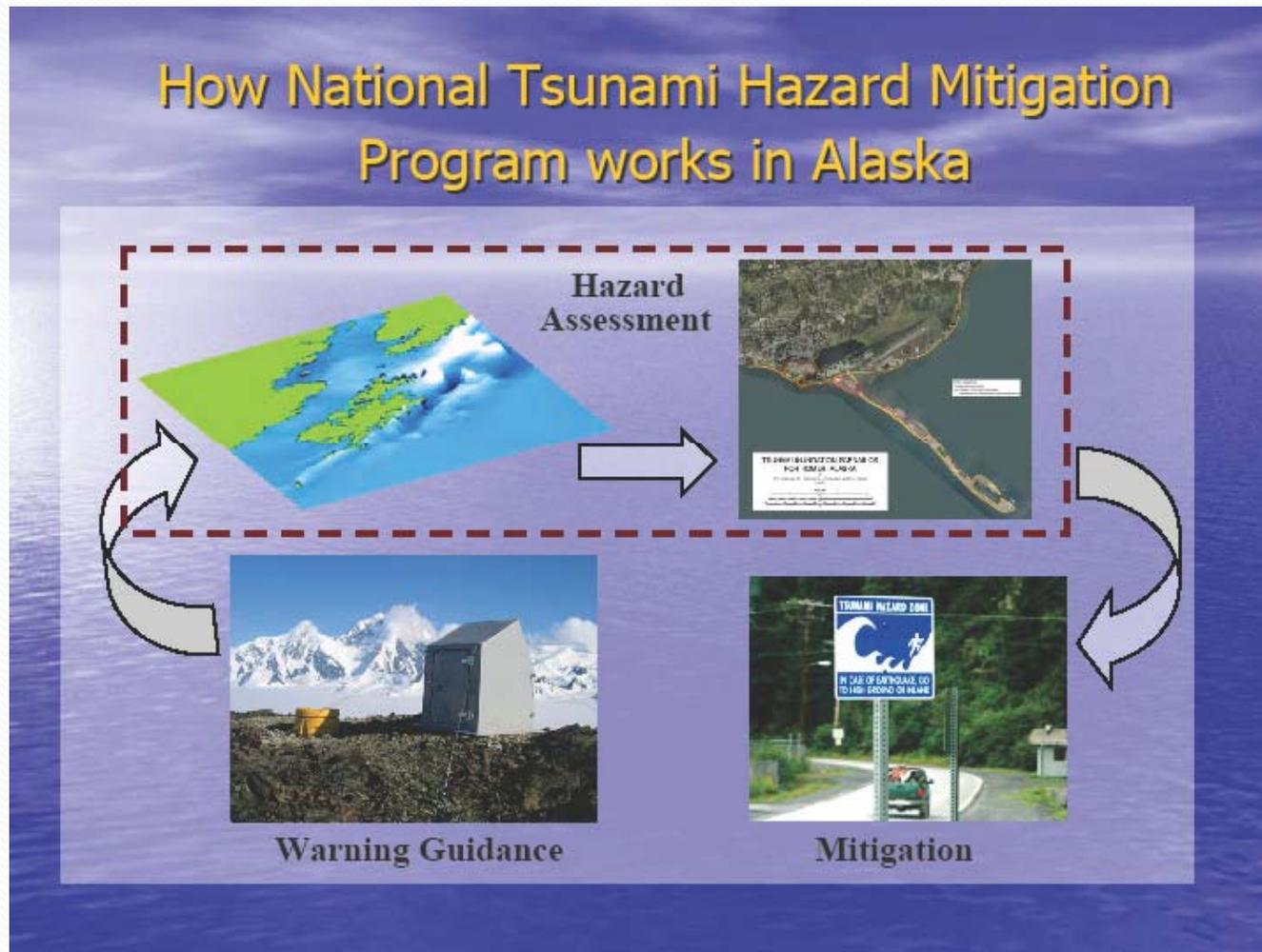
$M \geq 7.0$ : 1900 - 2001:  $R = 150$  km  
 $M \geq 6.0$ : 1950 - 2001:  $R = 100$  km  
 $M \geq 5.0$ : 1970 - 2000:  $R = 50$  km

Center of  $R$  - Kodiak City

## Recurrence:

$M \geq 7.0$  - 10.0 yrs  
 $M \geq 8.0$  - 33.3 yrs

## How to Plan and Respond?



# USCG – Kodiak, AK: Earthquake Induced Landslides

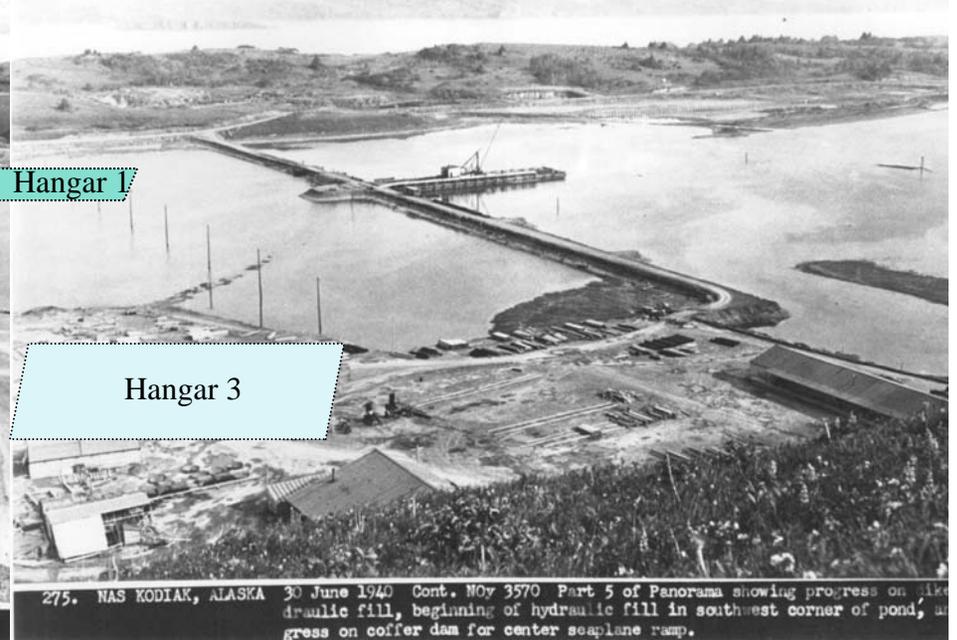


SLIDE AREA & ROAD THAT FAILED IN 1964 EARTHQUAKE. SLIDE AREA WILL PROBABLY ONCE AGAIN PREVENT TRAVEL BETWEEN TOWN AND USCG BASE

KODIAK'S PRIMARY FACILITY USED TO LOAD/OFF-LOAD CONTAINER VESSELS

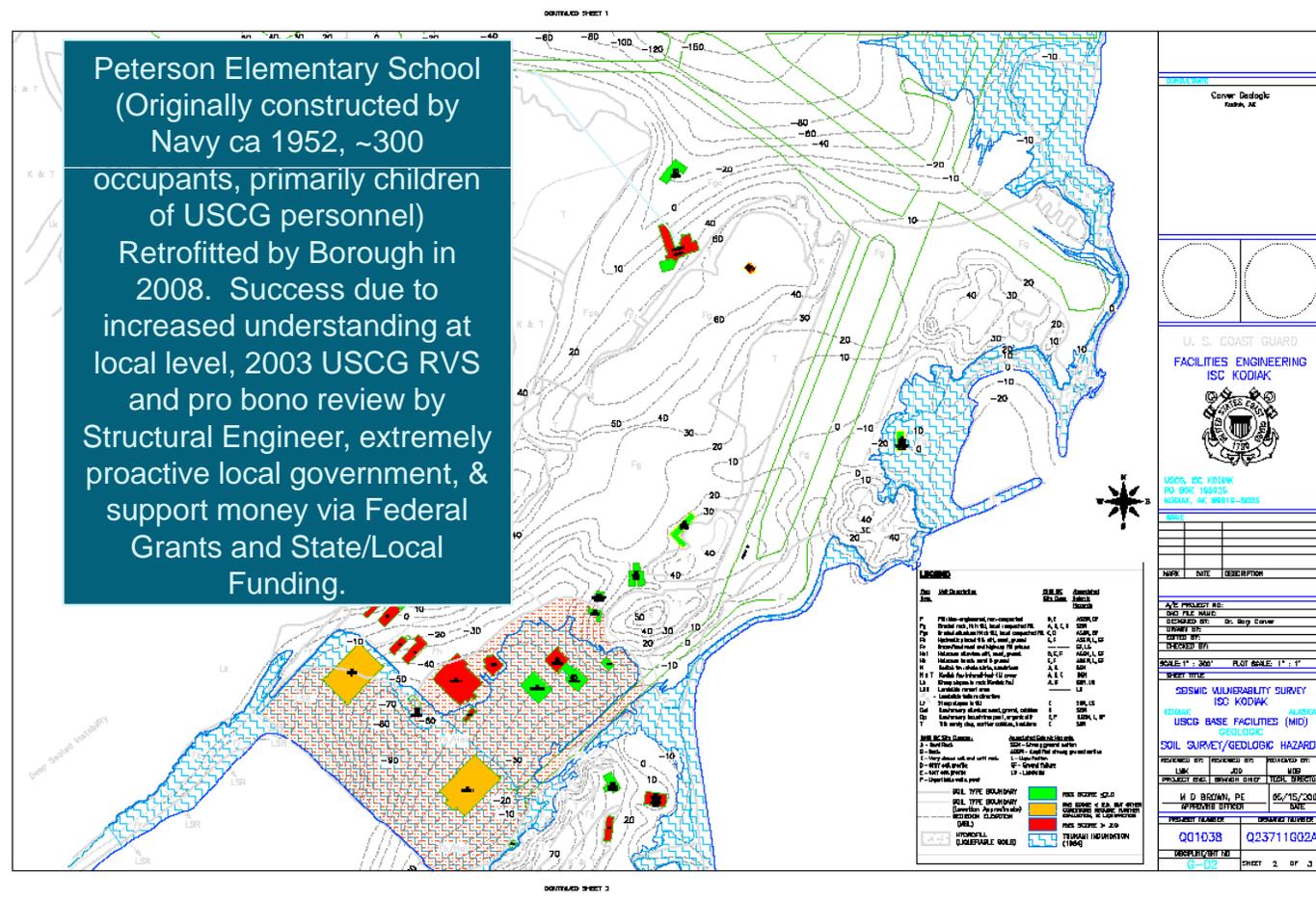
# USCG – Kodiak, AK: Liquefaction

## Historical Panoramic Photograph of Womens Bay, June 1940.



# Final Results Mapped & Prioritized Action Taken

Peterson Elementary School (Originally constructed by Navy ca 1952, ~300 occupants, primarily children of USCG personnel) Retrofitted by Borough in 2008. Success due to increased understanding at local level, 2003 USCG RVS and pro bono review by Structural Engineer, extremely proactive local government, & support money via Federal Grants and State/Local Funding.





"High dwellings are the peace and harmony of our descendants," the stone slab reads. "Remember the calamity of the great tsunamis. Do not build any homes below this point." - 600+ year old marker, ANEYOSHI, JAPAN

Through history, this community elected to not allow construction below this marker. Consequently, their homes were spared by the March 11 tsunami.

In a neighboring community, a school had been constructed 500 feet from the ocean's edge... the children attending that school have not been found.

NOTE: In some communities these markers were submerged.

# Thank You!



“Beach Seiners”

by Eustace Ziegler, Alaskan Frontier Artist (My great grandfather’s brother)

Note: Numerous pieces of his artwork were lost in the 1964 Valdez tsunami. Some of his surviving works can be seen at the Anchorage Museum.

Questions? E-mail: [Laura.W.Kelly@uscg.mil](mailto:Laura.W.Kelly@uscg.mil)