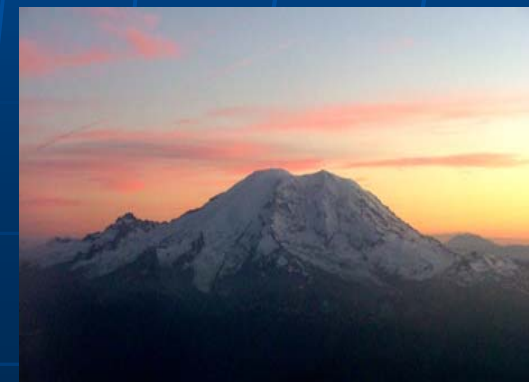


Communications Systems Used in the USA TARNs



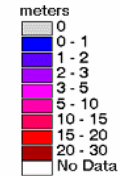
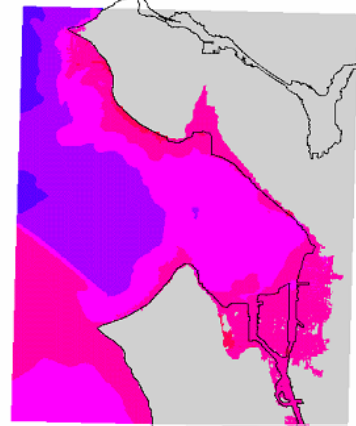
Chris Hill,
Meteorologist in Charge (ret)
National Weather Service
Seattle, Washington, USA



Washington Faces Many Non-Weather Hazards



Maximum Wave Heights (referred to Mean High Water)



Projection: State Plane Coordinate System
Zone: 5626 (Washington South)
XY Units: feet
Horizontal Datum: NAD27
Vertical Datum: Mean High Water

Tsunamis



NOAA TIME Center
Pacific Marine Environmental Laboratory
Seattle, Washington



Terrorism



Major Chemical Spills

Subduction Zone Comparison

The 2004 Indonesia Earthquake

Plate Tectonic Setting:
Subduction Zone: Indian plate
subducting beneath the Burma plate
Rate: ~ 5 cm/year
Dip of interface: ~ 10°

December 26, 2004
Magnitude 9.0
Rupture length 1200 km
Rupture width 100 km

Past earthquake history:
Most Recent Great
Earthquake before present:
1833 Magnitude 8.8 – 9.2
Approximate recurrence-
230 years

Indian plate

Tsunami characteristics
(extremely preliminary
estimates from media accounts)
Peak tsunami height in the near-
source area ~80 feet in
Indonesia

Peak tsunami height in Somalia
(8 hours travel time and 3300
miles away) ~ 10 feet
Affected the entire Indian
Ocean

Selected references:
Sieh, K. and others, JGR, v. 104, no. B1, p. 895-919,
1999
Sieh, K. and others, 2004 fall AGU abstracts T12B-04,
PA23A-1444
<http://earthquake.usgs.gov/eqinthenews/2004/usslav/>
http://www.pmel.noaa.gov/tsunami/indo_1204.html

1000 km

Rupture zone of the December 26 M 9.0 Indonesian earthquake shown in red, epicenter shown by *

The Cascadia Subduction Zone

Plate Tectonic Setting:
Subduction Zone: Juan DeFuca
and Gorda plates subducting
beneath the North American
plate
Rate: ~ 3 cm/year
Dip of interface: ~ 12°

Past earthquake history:
Most Recent Great Earthquake
1700 Magnitude ~9.0
Approximate recurrence 500
years

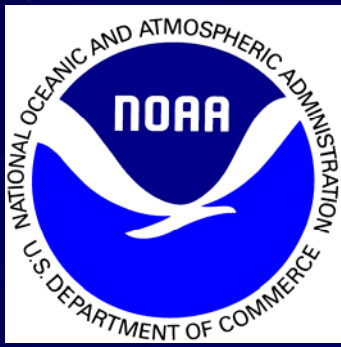
Tsunami characteristics (rough
estimates from Native
American oral history and
written records in Japan)
Peak tsunami height in the near-
source region ~60 feet at the
mouth of Redwood Creek,
northern California from Yurok
stories
Peak tsunami height in Japan (9
hours travel time and 3900
miles away) ~ 15 feet

Characteristics of Great
Cascadia earthquakes
Rupture length ~1000 km
Rupture width ~80 km

1000 km

Selected references:
Atwater, B. F. and others, 1995, Earthquake Spectra, v.
11.1, p.1-10
Satake, K., Wang, K., and Atwater, B., 2003, Journal of
Geophysical Research, vol. 108, B 11, p. 2535-2552.

Approximate rupture zone of the last great Cascadia earthquake in 1700 shown in red.



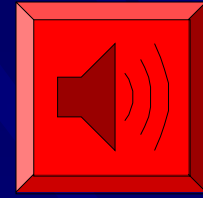
National Weather Service Mission

Serving America Since 1870



Provide Weather, Hydrologic, and Climate Forecasts and Warnings for the United States, its Territories, Adjacent Waters and Ocean Areas, for the Protection of Life and Property and Enhancement of the National Economy.

Warning System Goal:

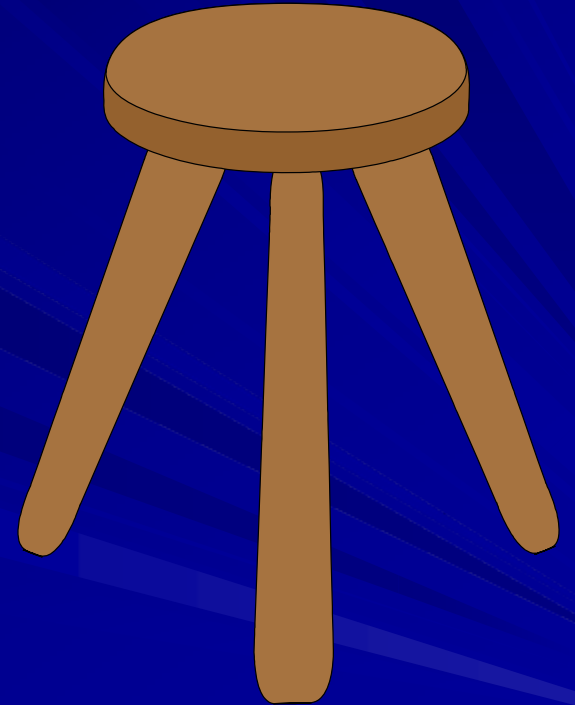


To maximize the number of people who take appropriate and timely action to minimize injury, death, and property damage due to hazardous weather and flooding.

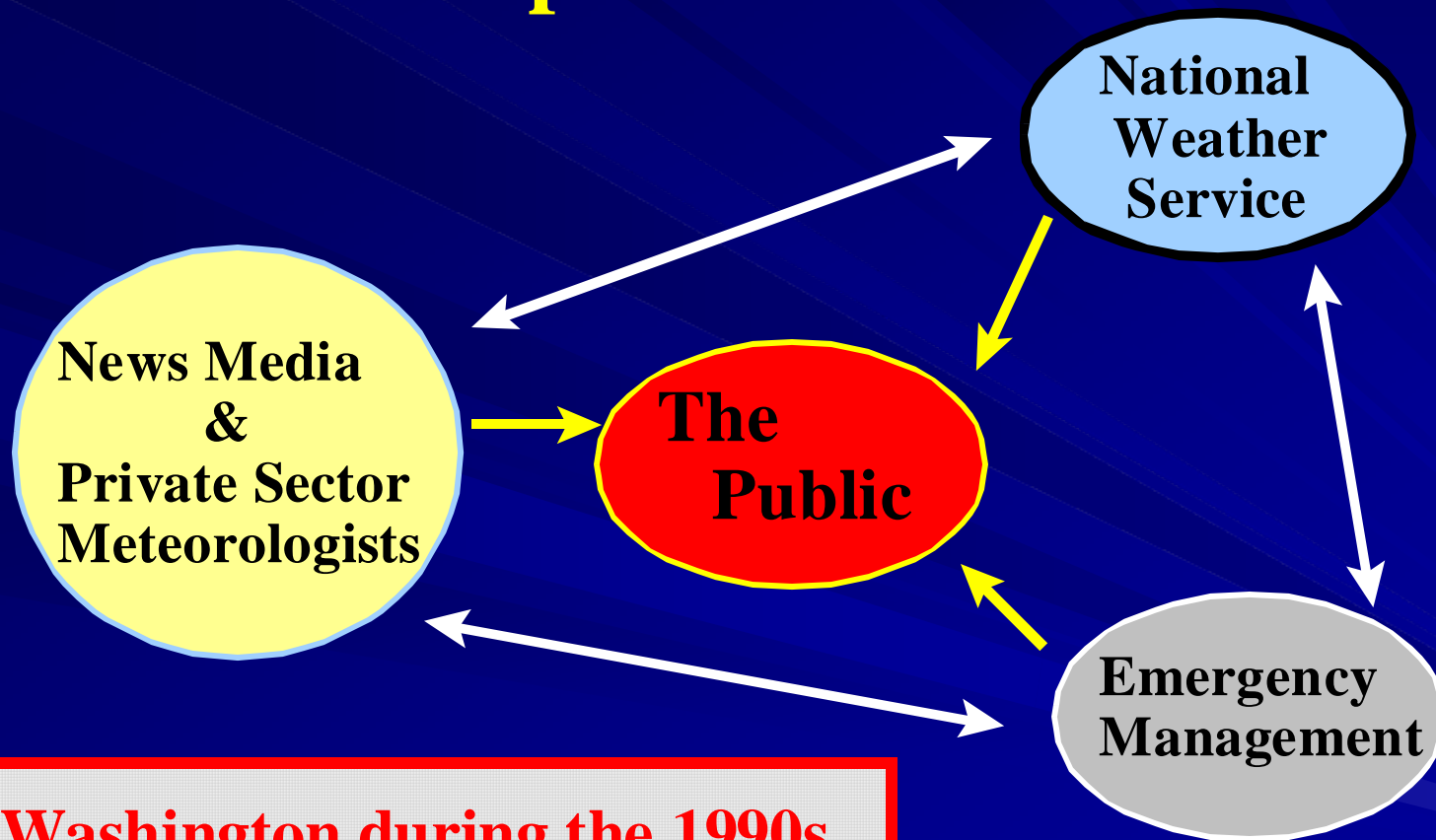


The Warning System

- Detection / Warning
- Dissemination
- Response

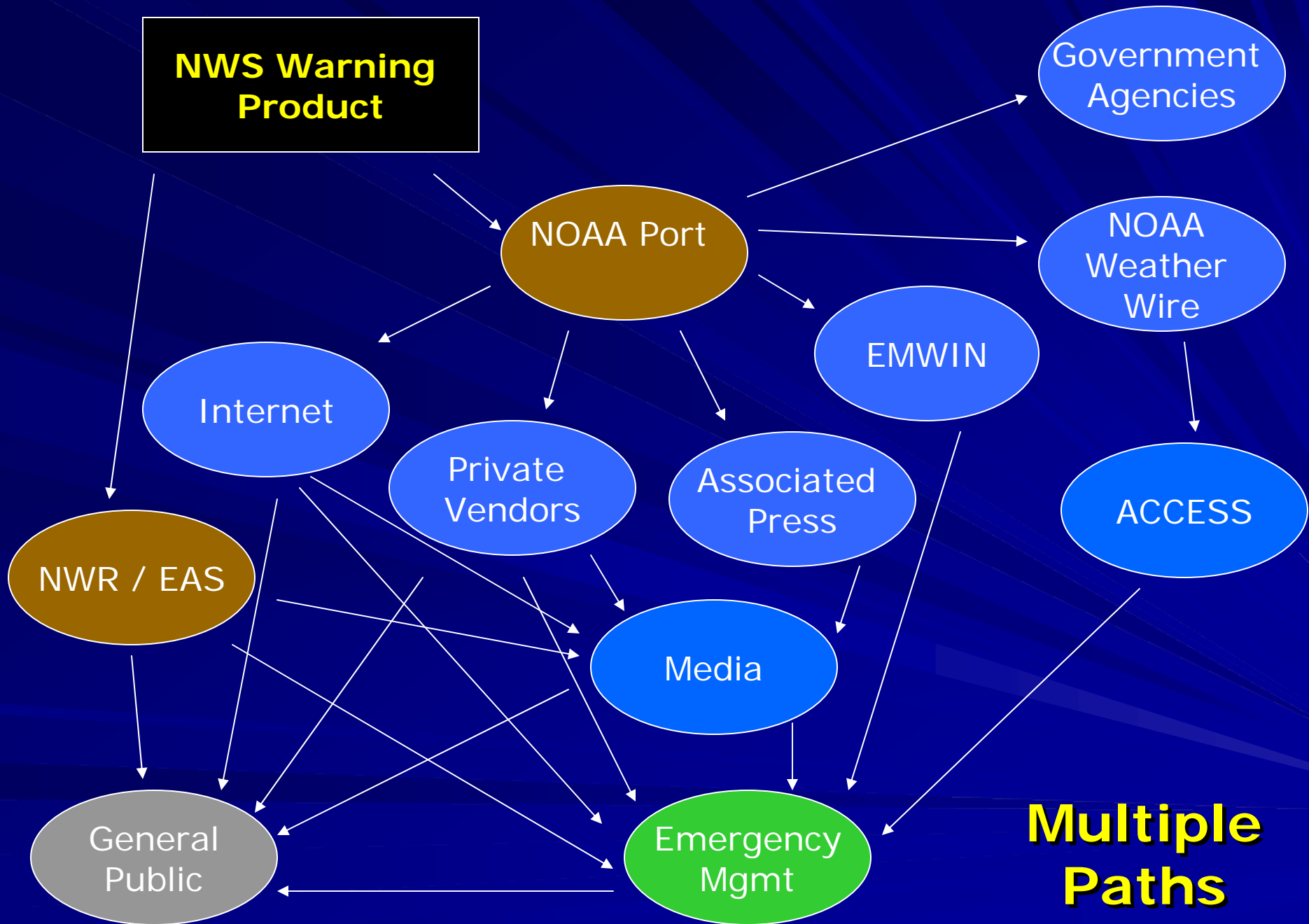


The Weather Warning Partnership:

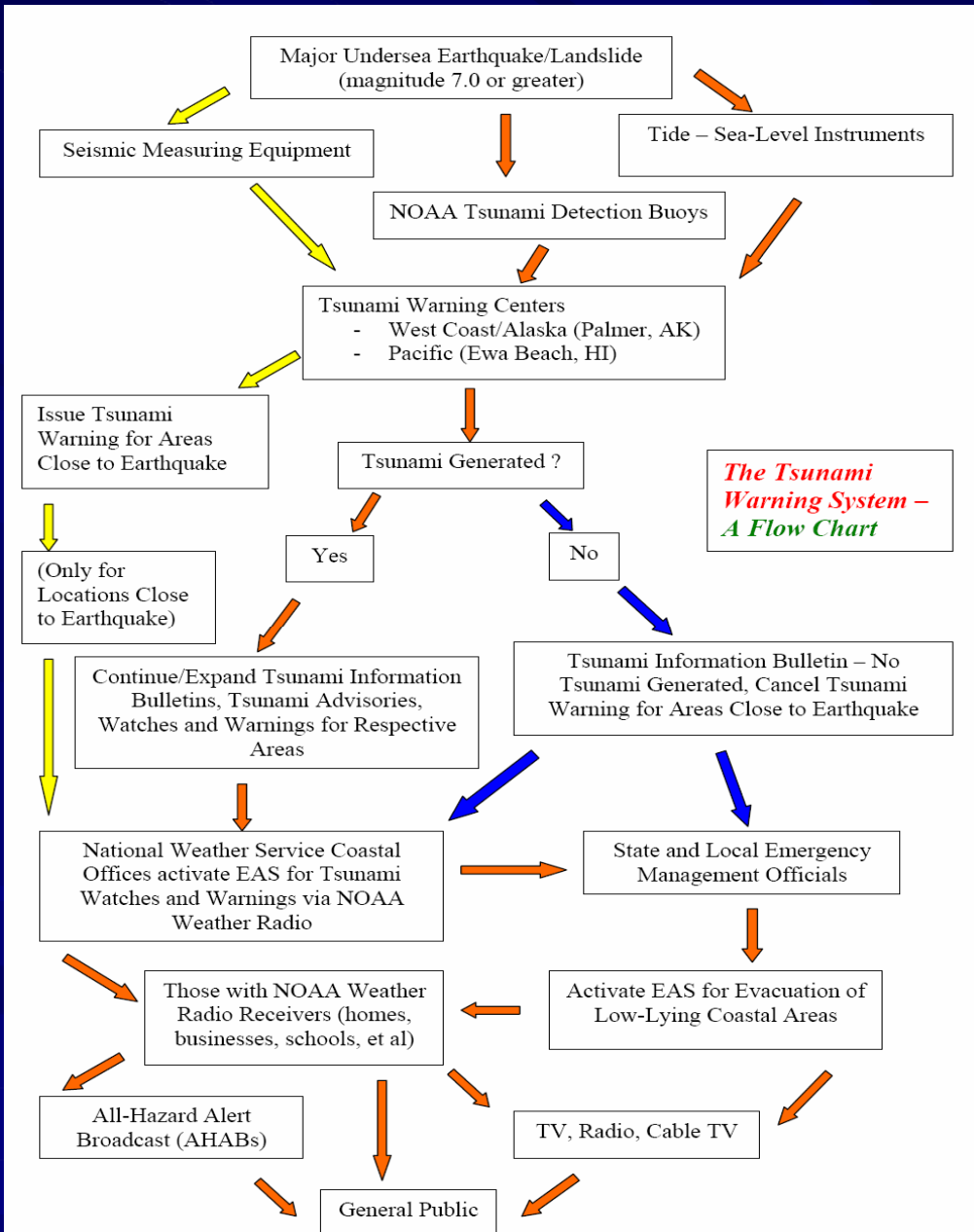


In Washington during the 1990s

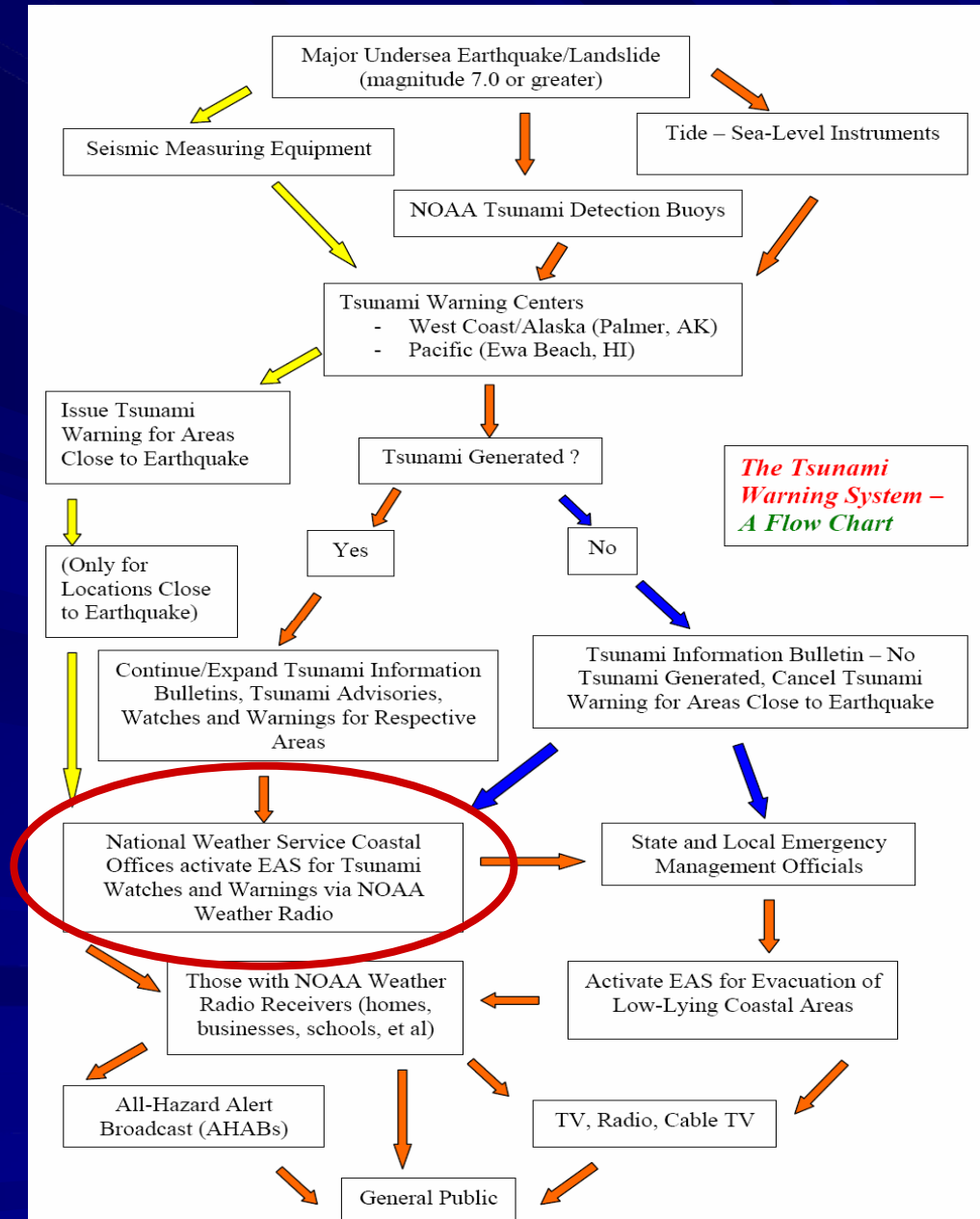
- Nearly 100 Fatalities,
- Hundreds Injured,
- Over \$1 Billion in Property Damage



The Tsunami Warning System



The Tsunami Warning System



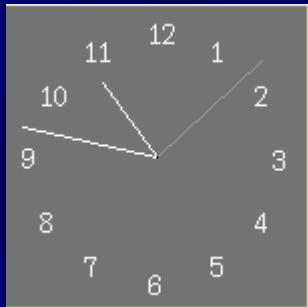
Dissemination Methods

- NOAA Weather Radio – radio broadcast
- EMWIN – satellite/radio
- NOAA Weather Wire – satellite/land lines
- RANET – radio internet



NOAA Weather Radio

A Life Saver for the Cost of a Pair of Shoes



Direct from the NWS 24 hours a day

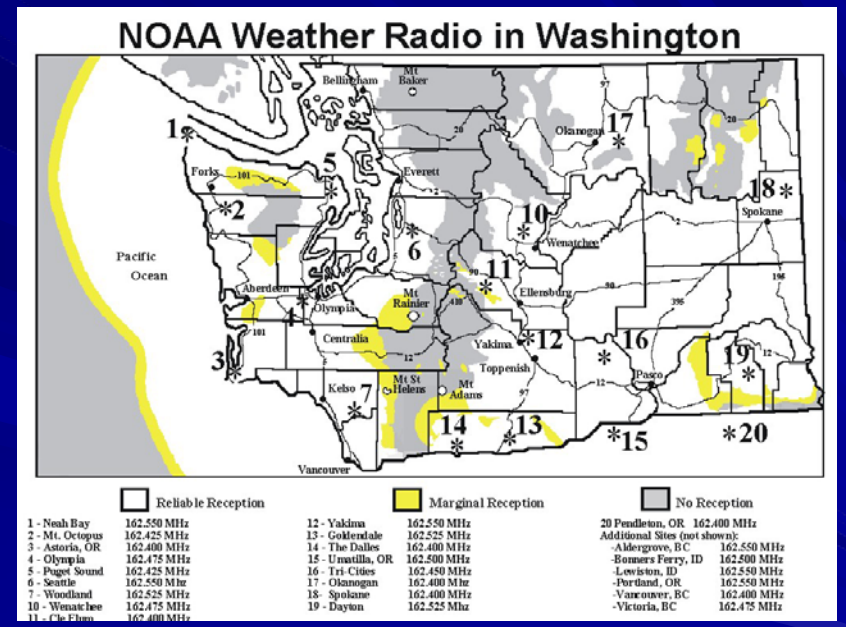


Latest Area Forecasts and Conditions

NOAA Weather Radio

A Life Saver for the Cost of a Pair of Shoes

Over 900 Stations Across the U.S.

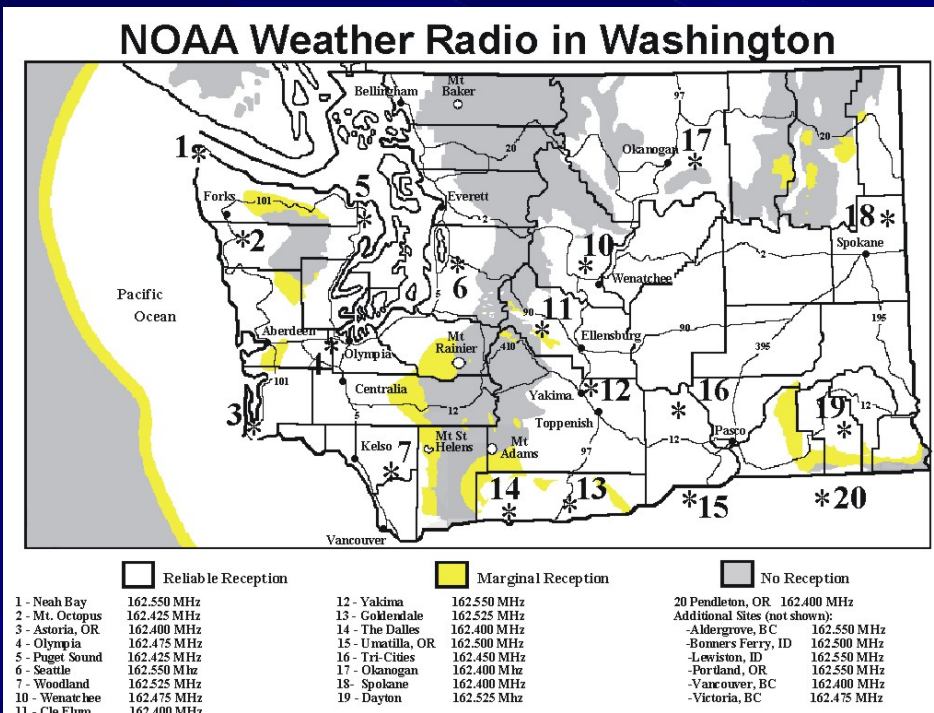


21 Stations Serve Washington

NOAA Weather Radio

A Life Saver for the Cost of a Pair of Shoes

Has a **Warning Alarm Feature**



NOAA Weather Radio

A Life Saver for the Cost of a Pair of Shoes

Key Element in Emergency Alert System (EAS)

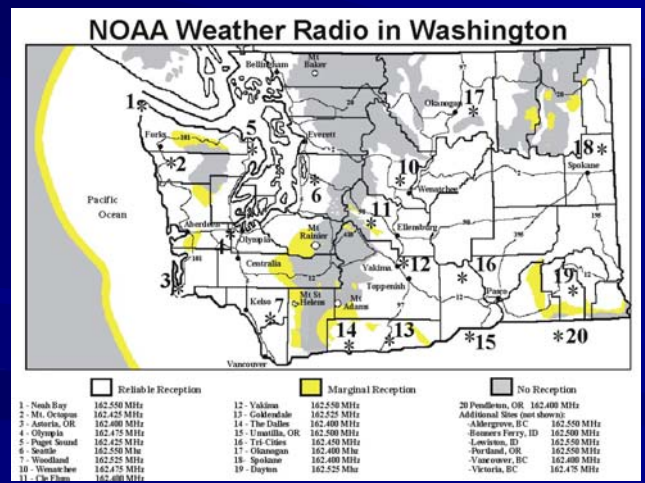
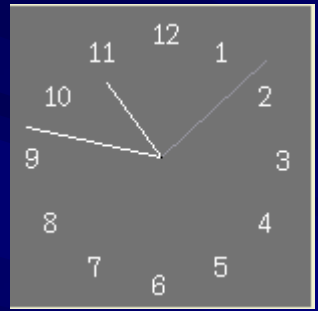


"All-Hazards" Warning System

NOAA Weather Radio

A Life Saver for the Cost of a Pair of Shoes

Receivers Available at Most Radio Electronic Retailers and via the Internet



Not All Weather Radios Receivers Are Alike

■ Key Features To Have

- Warning Alarm
- SAME (Specific Area Message Encoding)
- Event Selection
- External Antenna Jack
- Others

■ Best Reception

■ Programming Capabilities and Ease

■ Terrain Challenges

NWS Messages to EAS



- * **Tornado Watch or Warning**
- * **Severe Thunderstorm Watch or Warning**
- * **Flash Flood Watch or Warning**
- * **Flood Warning**
- * **High Wind Warning**
- * **Winter Storm / Heavy Snow / Blizzard Warning**
- * **Tsunami Watch or Warning**
- * **Civil Emergency Message**

Non -NWS Messages on NOAA Weather Radio

Examples include:

- * Civil Emergency Warning**
- * Evacuation Immediate**
- * Shelter in Place Warning**
- * Volcano Warning**
- * Child Abduction Emergency (AMBER)**

The State of Washington



Proclamation

WHEREAS, the state of Washington has experienced natural and man-made disasters in the past, and scientific evidence indicates Washington remains vulnerable to natural and man-made disasters in the future; and

WHEREAS, the loss of life and property can be greatly reduced if citizens have available information provided over the National Oceanic and Atmospheric Association (NOAA) weather radio; and

WHEREAS, state agencies, schools, hospitals, businesses and the general public should have weather radios equipped with a special alarm tone feature that can sound an alert and give immediate information about a life threatening situation; and

WHEREAS, the importance of listening to the NOAA Weather Radio will be highlighted during the month of September by NOAA, the city, county and state emergency management agencies, and schools, hospitals and businesses throughout the state; and

WHEREAS, the citizens of Washington need to prepare themselves to be self-sufficient for at least three days following a natural or man-made disaster;

NOW, THEREFORE, I, Gary Locke, governor of the state of Washington, do hereby proclaim September, 2001, as

NOAA Weather Radio Month

in Washington State, and I encourage all citizens to increase their knowledge and awareness of the benefit and use of the NOAA weather radio before, during, and after a natural or man-made disaster.



Signed this 21st day of June, 2001

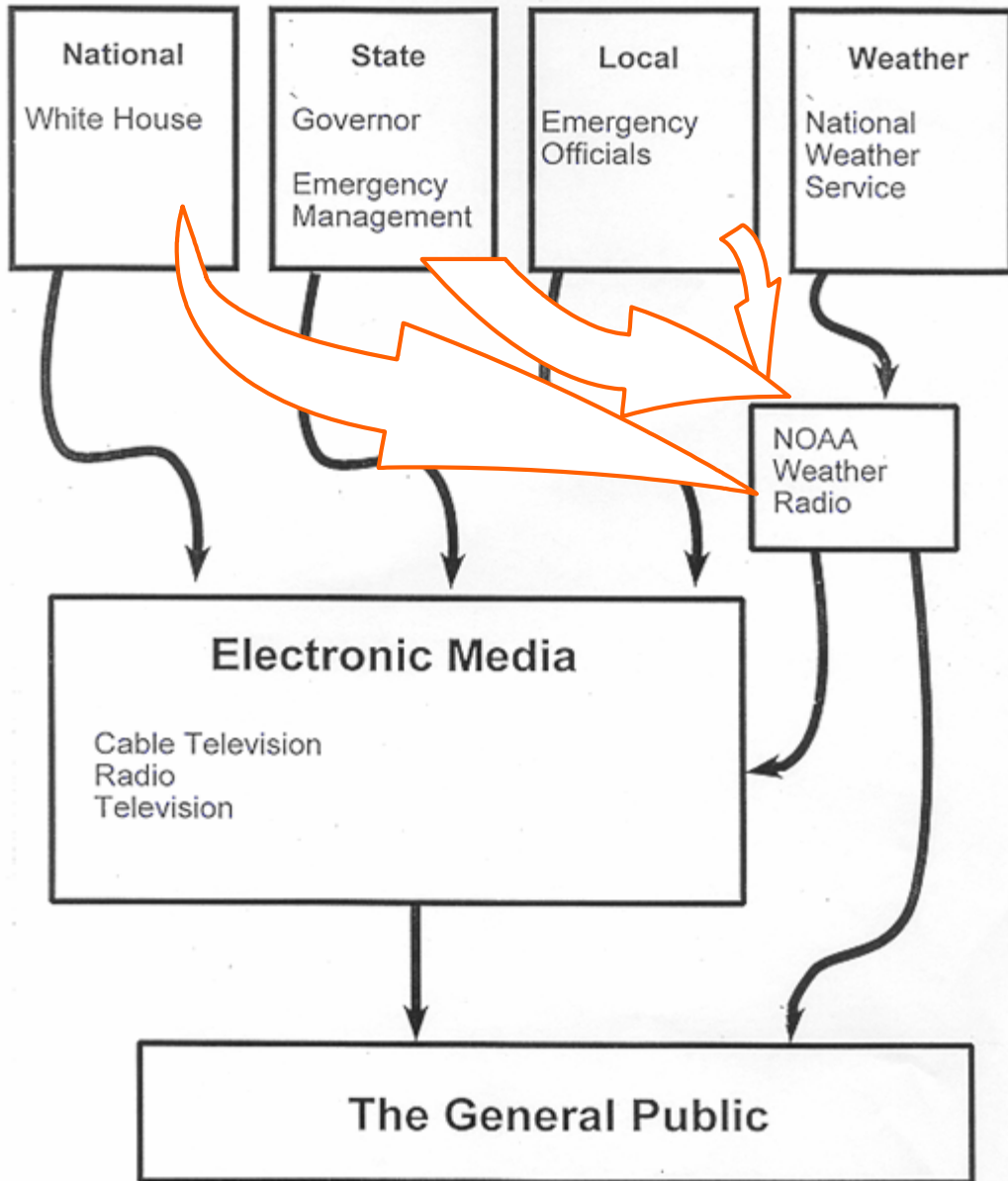

Governor Gary Locke

NOAA Weather Radio is Washington's "All-Hazards" Warning System



Ocean Shores "AHAB"

EAS Message Originating Sources





Who Receives EAS Messages via NOAA Weather Radio

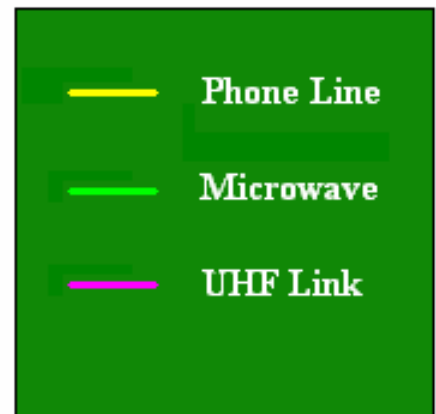
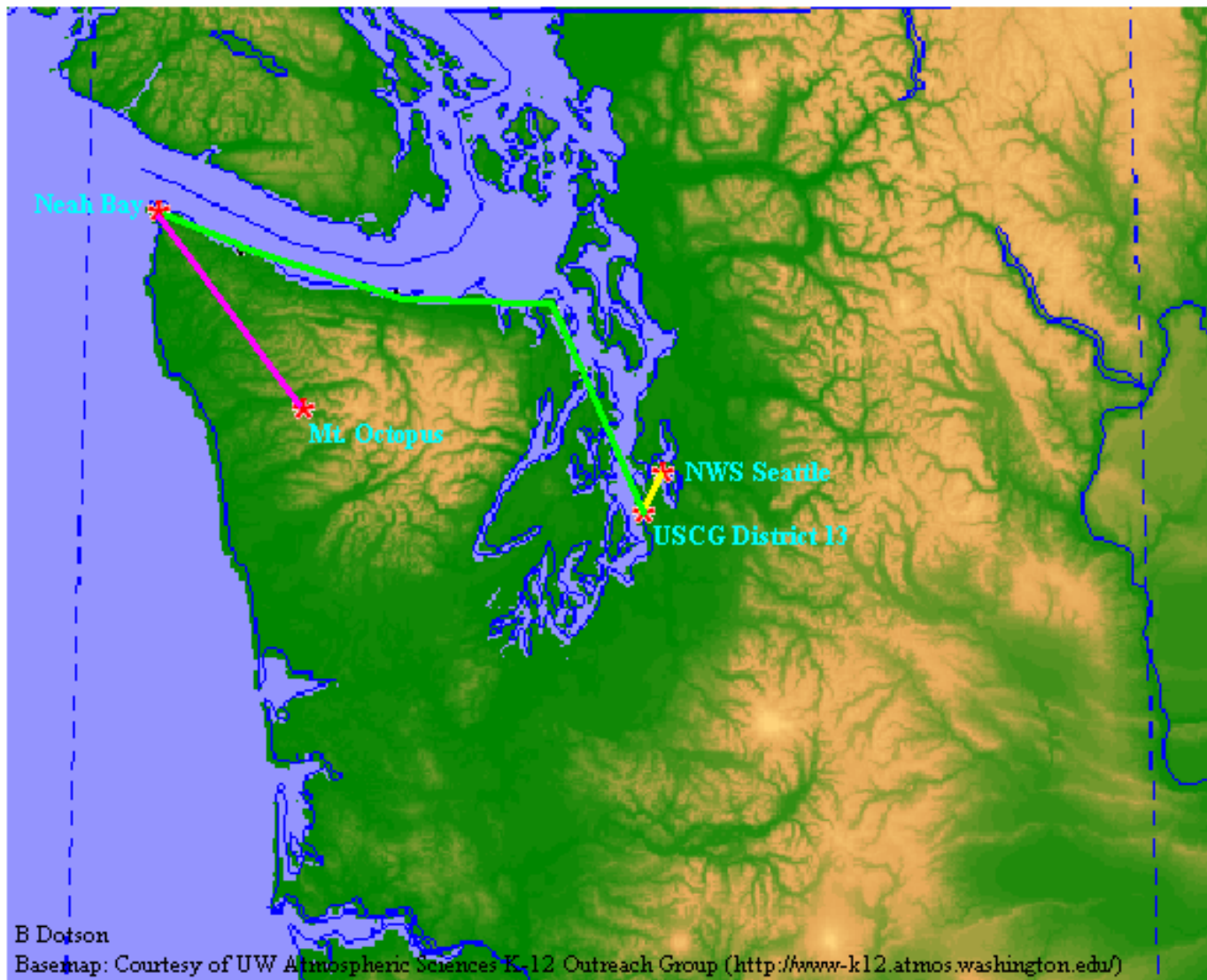


- **All Broadcasters**
 - TV
 - Radio
 - Cable TV
- **Weather Radio Receivers**
 - Homes
 - Businesses
 - Schools
 - Health Care Facilities
 - All-Hazards Alert Broadcast (AHAB) Units
 - Any With Receivers



**Ocean Shores
"AHAB"**

Communication Lines in Western Washington



B Dotson

Basemap: Courtesy of UW Atmospheric Sciences K-12 Outreach Group (<http://www-k12.atmos.washington.edu/>)

Satellite Delivery - EMWIN

■ Emergency Manager's Weather Information Network

- GOES East, at 75 degrees West
- GOES West, at 135 degrees West.
- Telstar 5 Satellite, at 97 degrees West.
- The GOES downlink frequency used for the 9600 baud EMWIN datastream is 1690.725 MHz



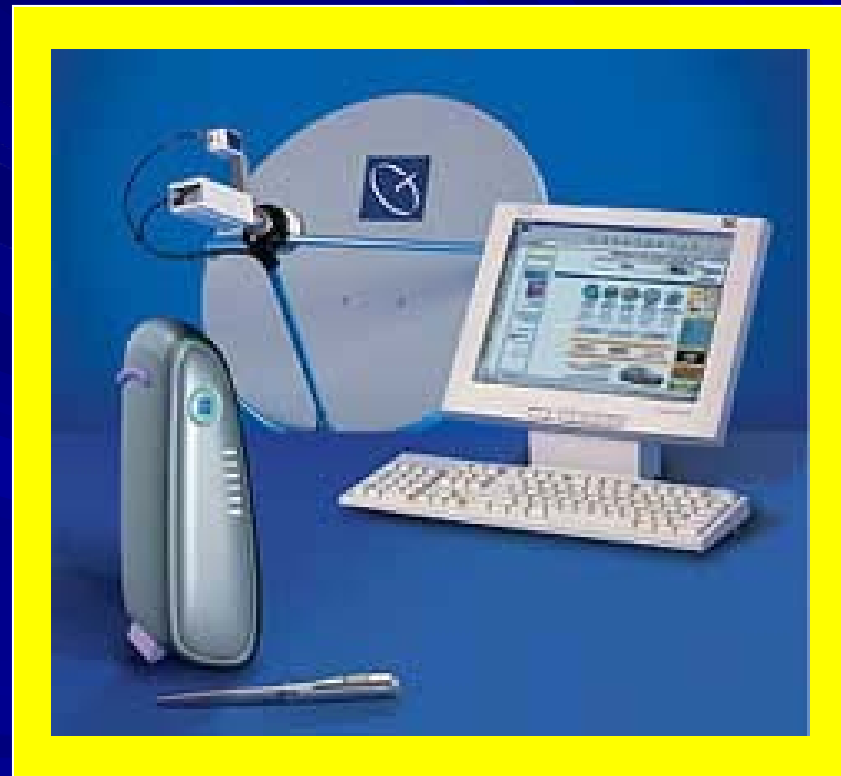
Satellite Delivery - EMWIN

- **EMWIN** is a nonproprietary operational dissemination system, primarily for the emergency management community. It provides a continuous, dedicated low speed data broadcast of up to 5,000 pages per day using an audio signal from the **GOES satellite** or terrestrial retransmitter.
- The EMWIN datastream consists of:
 - real-time weather warnings, watches, advisories, forecasts,
 - a subset of alphanumeric products for each state,
 - a limited suite of non-value added graphical products, and some **satellite imagery**



Satellite Delivery - EMWIN

- The EMWIN datastream was designed to run at minimal cost to the NWS and at no recurring costs to users in range of the signal. Basic software developed, but unsupported, by the NWS to meet minimum needs of users is available for free, and can be **downloaded from the Internet**. Low cost, supported commercial software with more features is available.



Radio Rebroadcast of EMWIN

- To receive and make use of the EMWIN datastream, a user must be in acceptable signal range and have:
 - at a minimum, a 80386 or 80486 personal computer with DOS 5.0 or greater and Windows 3.1 or greater;
 - a relatively inexpensive portable receiver with antenna based on [NOAA Weather Radio](#) modified to receive the transmitted frequency; and
 - a custom built, but inexpensive demodulator that receives the signal from the receiver and feeds it to the serial port of the user's computer system.

U.S. National Weather Service
High Speed Users try out the new Animated IWIN

IWIN

INFO

CENTER

Local Weather

National Warnings

World Weather

About IWIN

National Items

Graphics

Audio Video

Great Links

Active Warnings: Flash Flood, Flood, Special Marine, Severe Thunderstorm

This page will "REFRESH" itself every 5 minutes to keep you up to date

Washington State Information

Satellite Radar Weather Offices



Hourly Report

Public Information

State Forecast

Climatic Data

Zone Forecast

Hydro Products

Short Term Forecast

Aviation Products

Forecast Discussion

Watches

Weather Summary

Special Weather

Warnings and Advisories

Back to Main Lvl

Click on the above map for current site specific weather observations

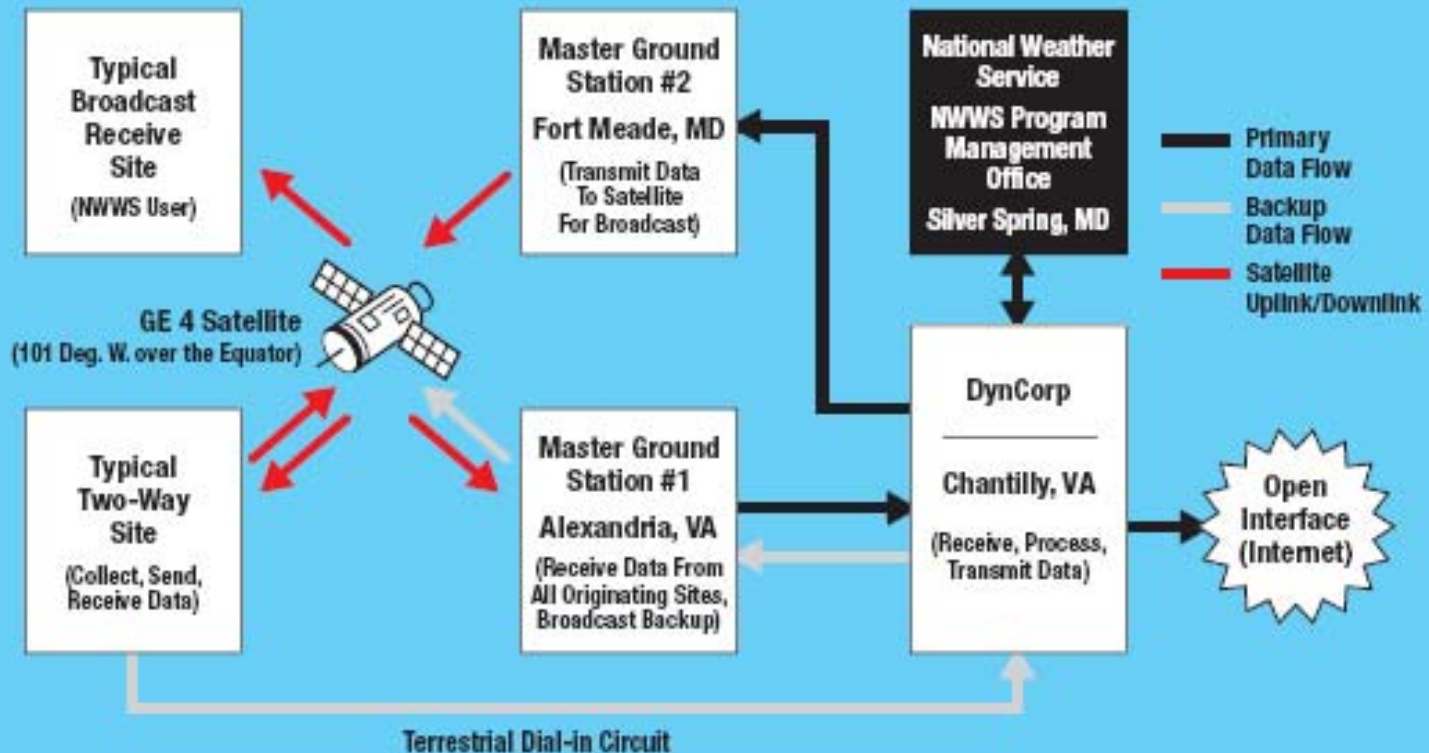
Anywhere/Anytime Weather Forecasts

You can now receive your weather forecast from the National Weather Service any where/anytime using your wireless device. All you need is a wireless device that can surf the Internet along with a wireless Internet service provider.

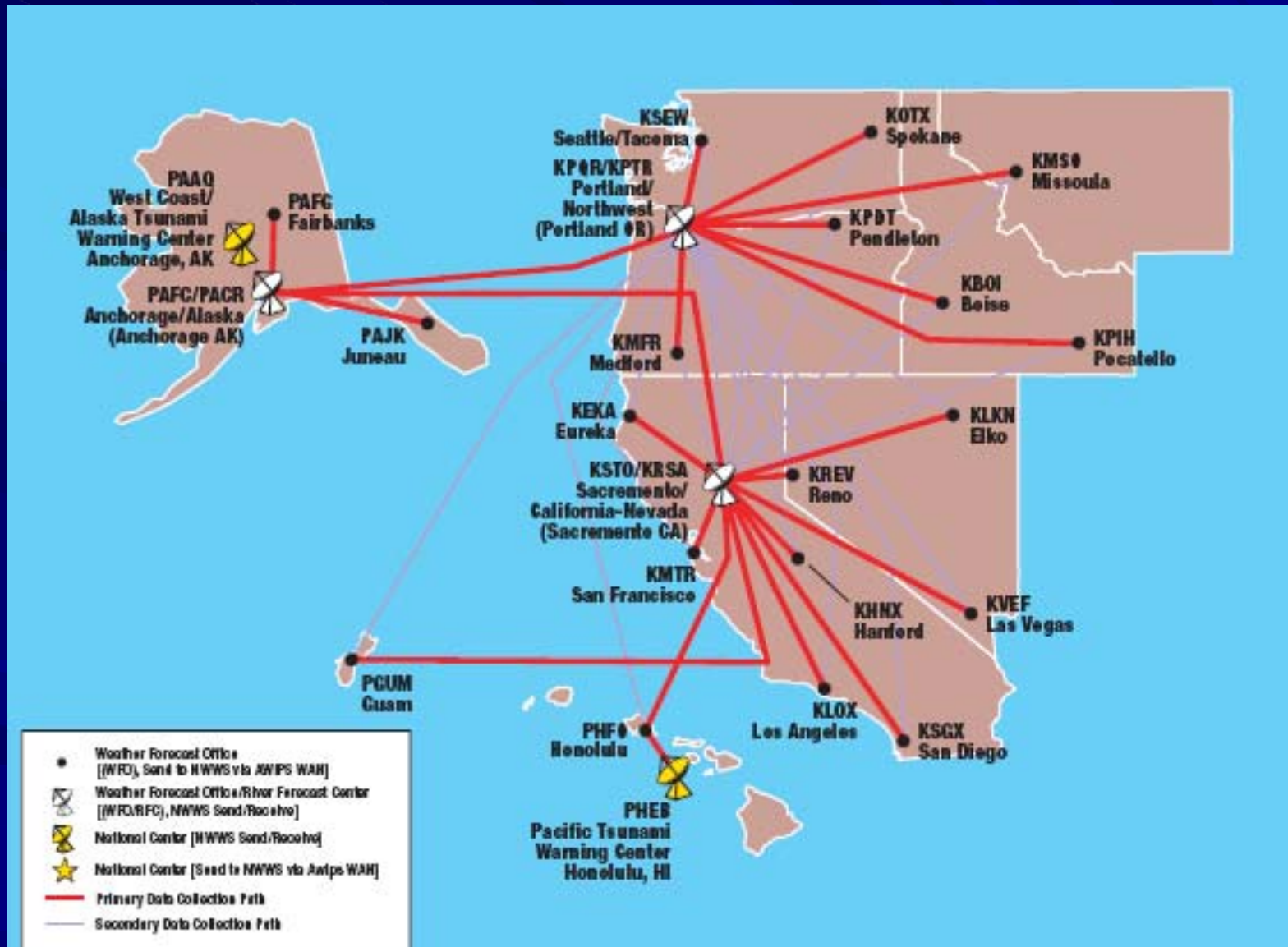


NOAA Weather Wire Service

NWWS System Overview



NOAA Weather Wire Service



RANET – RAdio and interNET

- RANET is an international collaboration to make weather, climate, and related information more accessible to remote and resource poor populations.
- RANET undertakes this mission in order to aid day-to-day resource decisions and prepare against natural hazards.
- The program combines innovative technologies with appropriate applications and partnerships at the community level in order to ensure that the networks it creates serve the entirety of community information needs.
- Community ownership and partnership is the core principle of RANET's sustainability strategy.

RANET – RAdio and interNET

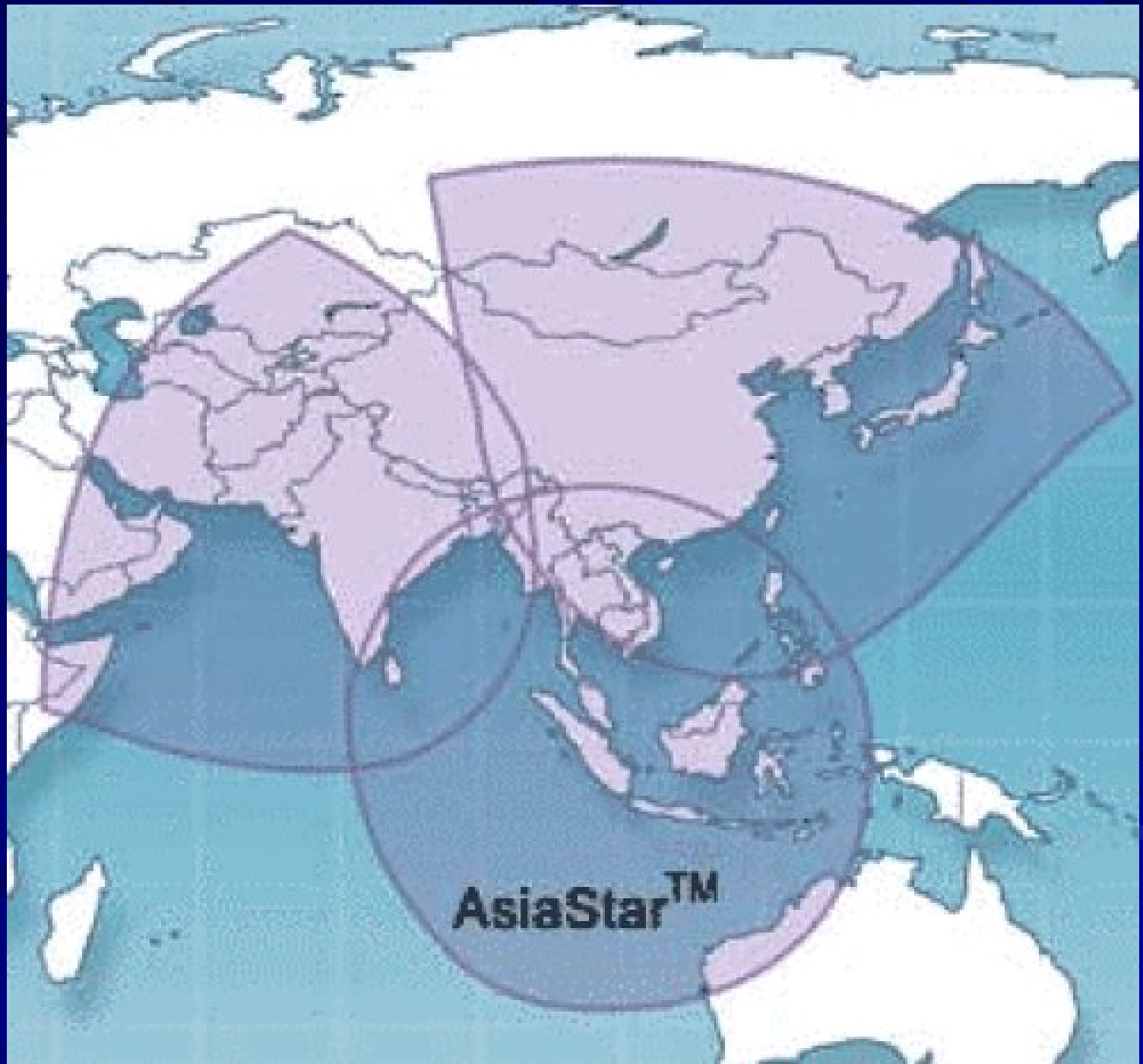
- In co-operation with its partners, [RANET](#) is now able to make observations, forecasts, and bulletins more readily available to hydro-meteorological and extension services in Africa.
- The satellite bandwidth is made available by the [WorldSpace Foundation](#).
- With an appropriate receiver and adapter, a digital radio, this information can be easily accessed:

RANET – RAdio and interNET

- the radio picks-up information from the satellite using only a small antenna.
- From the radio, the signal passes through a modem to a computer on which the information can be seen as text, illustrations and pictures.
- In this way the limitations of internet connectivity or bandwidth and speed are no longer a barrier to critical information access.
- The information broadcast by RANET can also be seen via the Internet, on a [NOAA mirror site](#).

RANET – RADio and interNET

- The networks RANET develops, however, are not limited solely to satellite systems.
- The program works with a variety of partners to standardize appropriate FM community radio station equipment, HF systems, and even energy solutions such as solar and wind.
-
- By bringing together various appropriate and sustainable technologies, RANET supports 'human networks' of dialogue and partnership that serve as the basis for sharing knowledge to improve the lives of communities in remote areas.



WorldSpace RANET Product Delivery



3) At the top of nearly every hour the uplink station sends the uploaded information to the satellite for broadcast over all of Asia and parts of the Pacific.

2) Presentation sent via Internet to a satellite uplink station (Singapore or Melbourne). Some information



4) The broadcast is then received by digital radios that are hooked into computers.



5) The broadcast can be used by meteorological services, extension agencies, or even local communities who might use the content to improve their own products or to translate information into the local language and according to local interest.



1) Global, regional, national and local information from various producers blended into single presentation, compatible with satellite broadcast



6) Technologies, such as HF and VHF radio, telephone and Internet, allow rural communities and extension agencies to send information requests, provide feedback



StormReady / TsunamiReady

Working Together to Save
Lives



Ocean Shores



Long Beach

What is Storm/TsunamiReady?

- A voluntary community preparedness program that promotes weather and tsunami hazard readiness.
- Primary goal to improve public safety during emergencies.
- A collaborative effort between federal, state, and local agencies, and the public.



Most important -

■ **REDUNDANCY**

■ **REDUNDANCY!**

TsunamiReady Community Components

■ StormReady Elements

- Emergency Operations Center
- Multiple Ways to Receive NWS Warnings
- Multiple Ways to Disseminate Warnings
- Multiple Ways to Monitor Conditions
- Hazardous Weather Plan
- Community Preparedness Education



■ TsunamiReady Elements

- Identify Hazard Zones
- Map Evacuation Routes and Assembly Areas
- Install Evacuation and Assembly Signage
- Educate Community on Tsunami Hazard and Safety Plans



StormReady / TsunamiReady

■ Who

- Counties
- Communities
- Cities
- Indian Nations
- Supporters
 - Businesses
 - Schools



Questions ??



1/21/1998