Heavy Rain and its Impacts

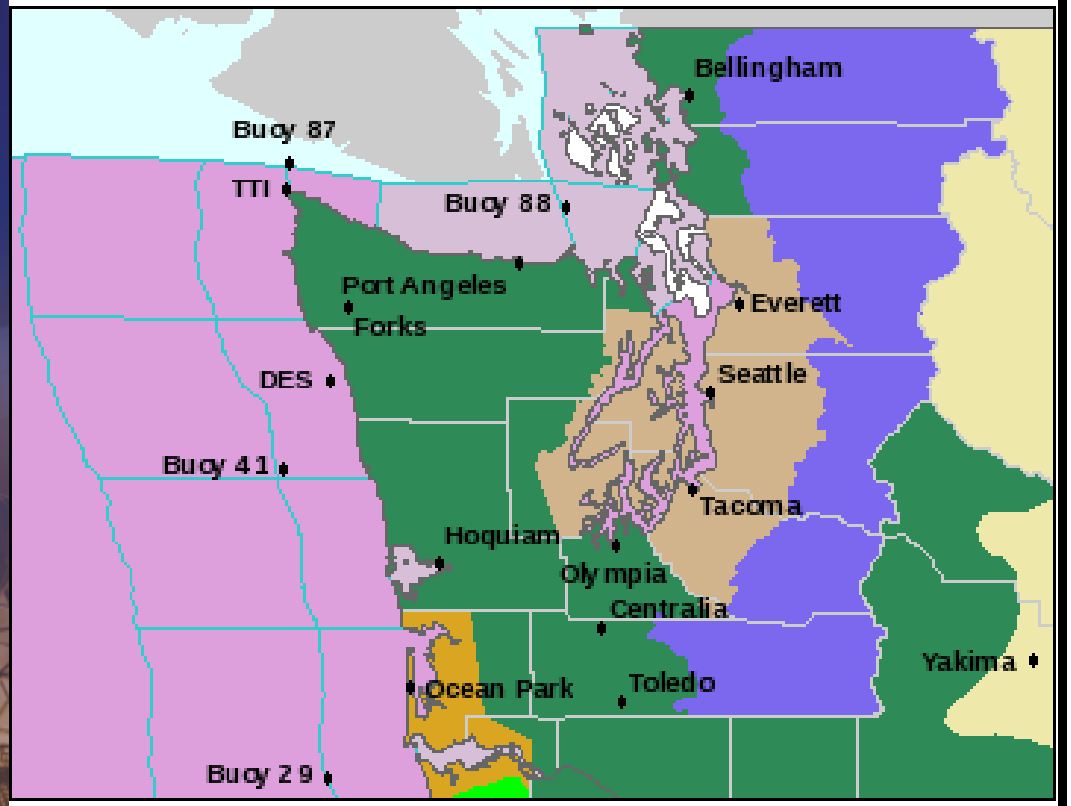
6 January 2009

National Weather Service – Seattle/Tacoma

Overview

- Warm moist Pacific air mass coupled with strong westerly flow will bring significant precipitation to Western Washington over the next 24 to 36 hours
- How do things look now:
  - Rising snow levels (7000-8000 ft) overnight through Wednesday
  - Heaviest precipitation rates over the Olympics and Cascades through Wednesday
  - Flood threat for nearly all Western Washington rivers and streams
  - Urban/Small Stream flood threat
  - Extreme Avalanche danger for the Olympics and Cascades
  - Landslide threat into the weekend
  - Coastal wind
  - Initial increase of snow load on structures

Current Watch/Warning Map



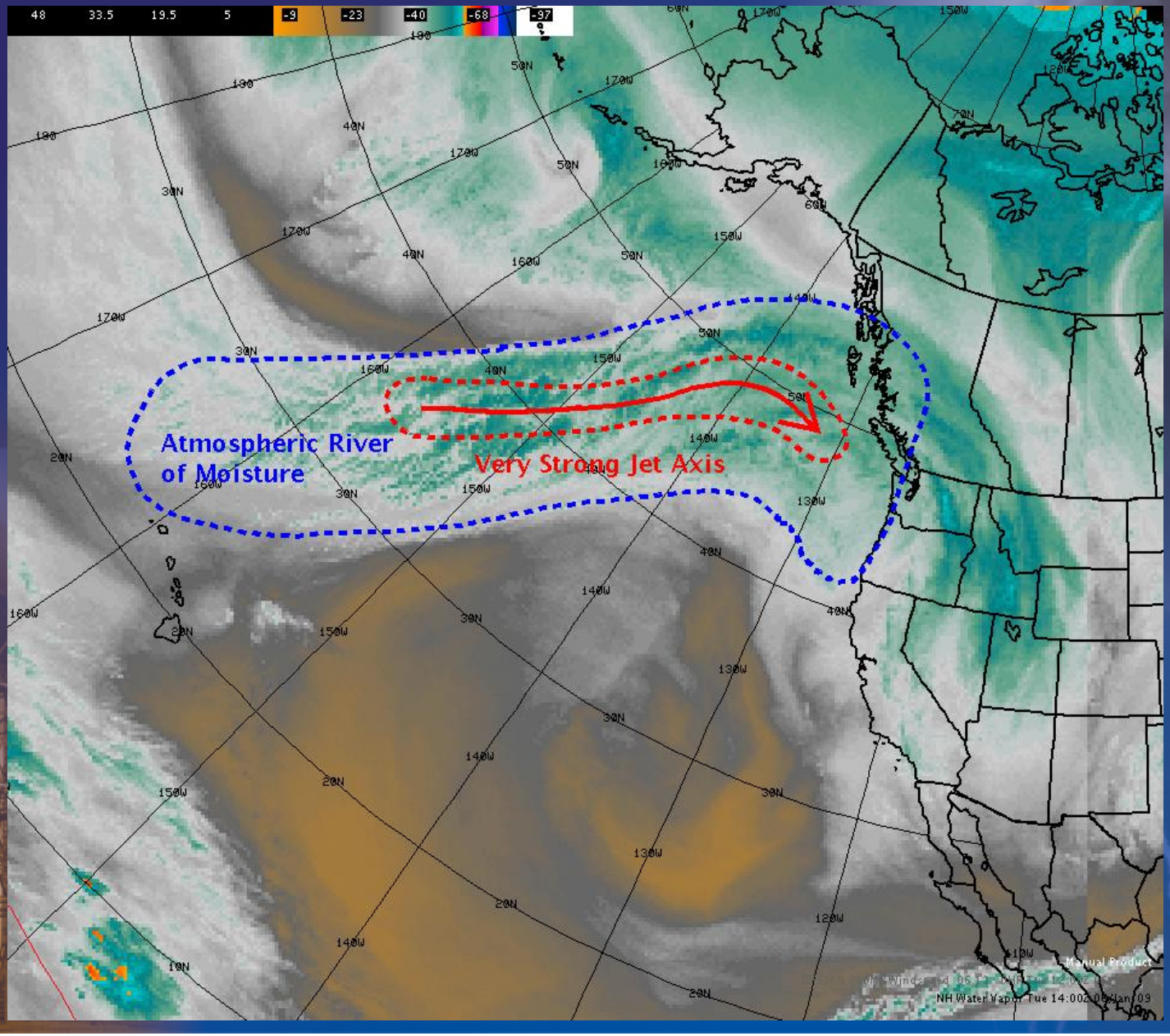
Read watches, warnings & advisories

Zoom Out

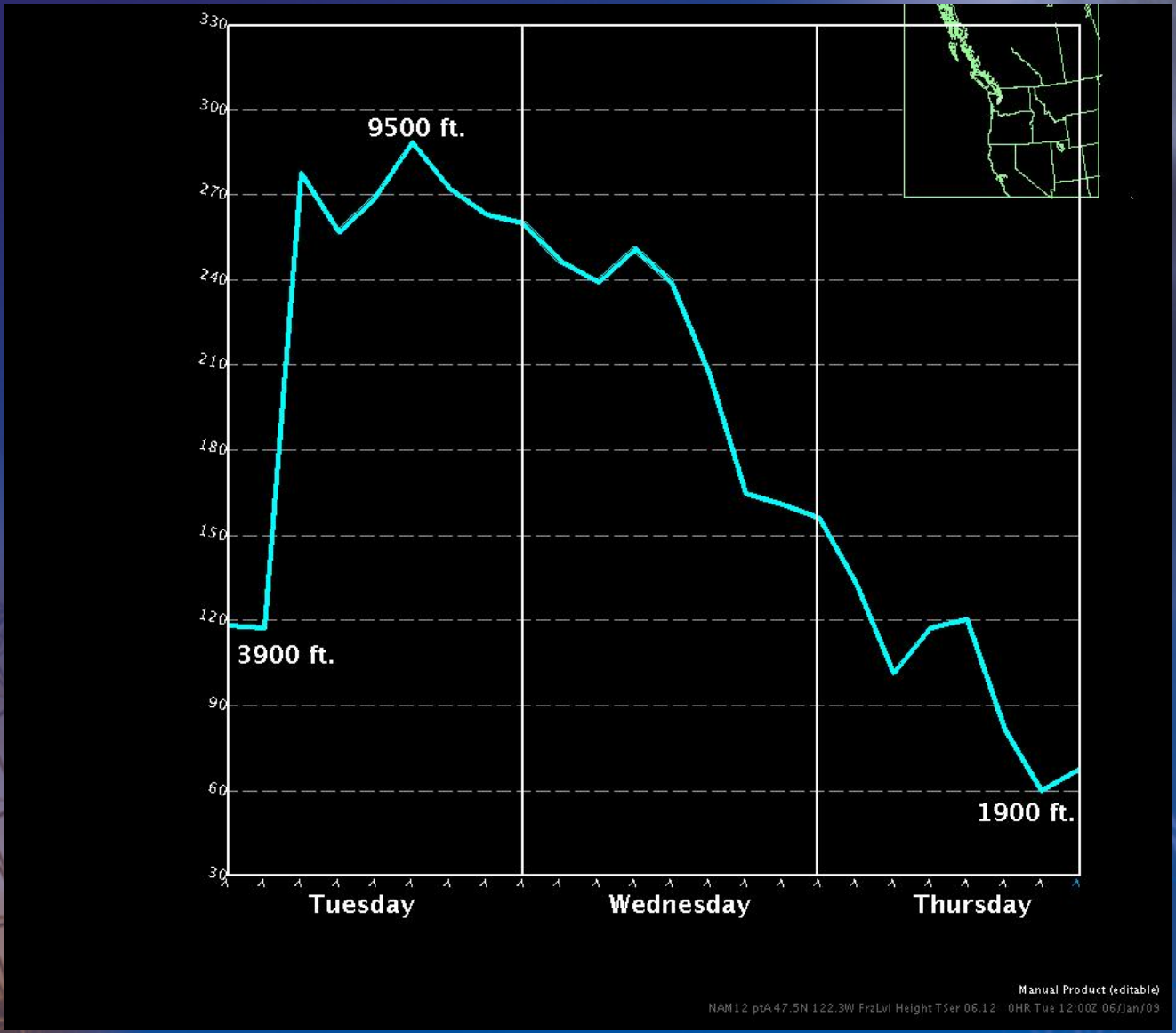
- High Wind Warning
- Flood Warning
- Gale Warning
- Winter Weather Advisory
- Small Craft Advisory
- Wind Advisory
- Flood Watch
- High Wind Watch
- Special Weather Statement
- Hazardous Weather Outlook
- Short Term Forecast

Last map update: Jan, 6th 2009 at 2:07:28 pm PST

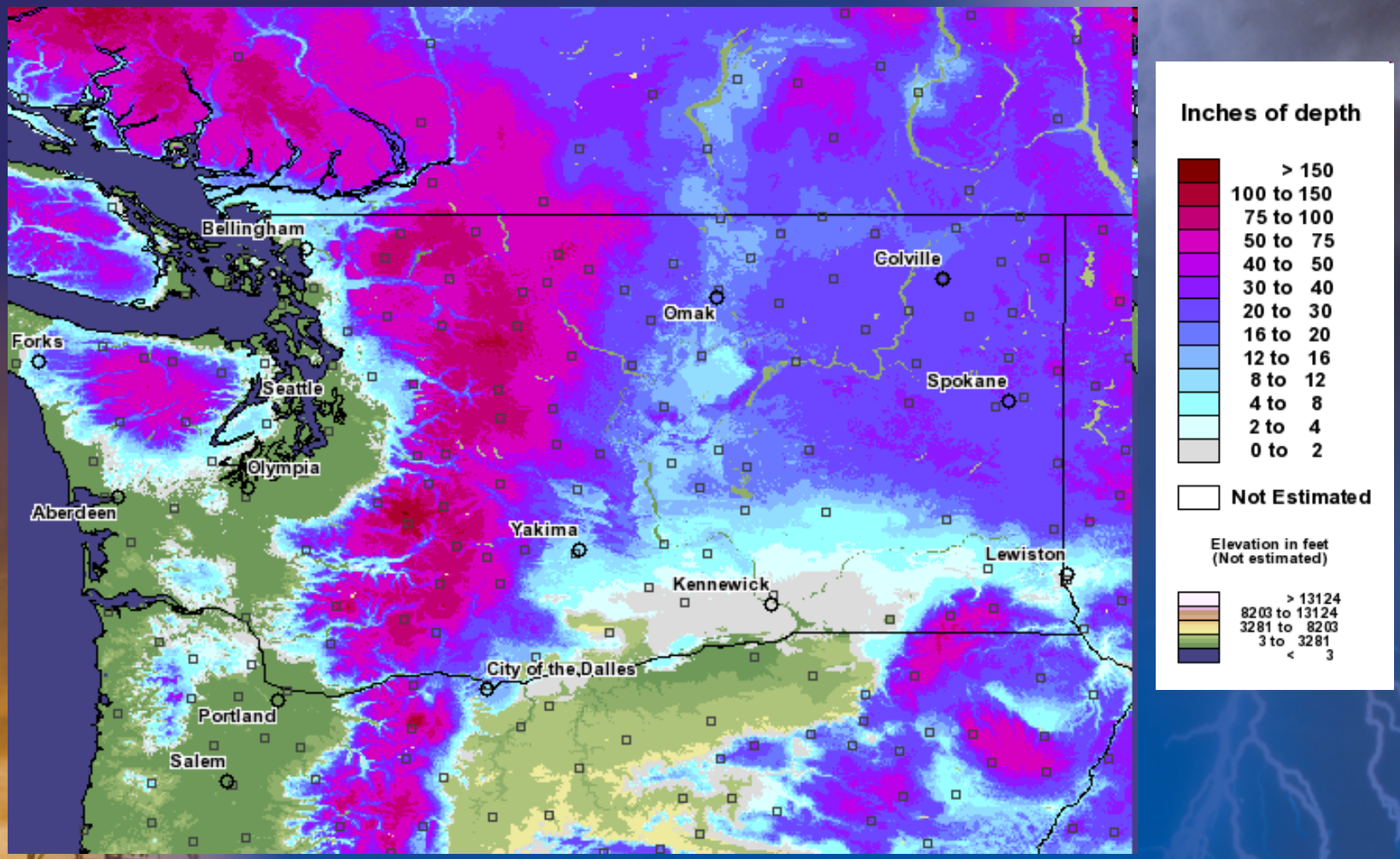
The Weather Picture



Freezing Level Trend

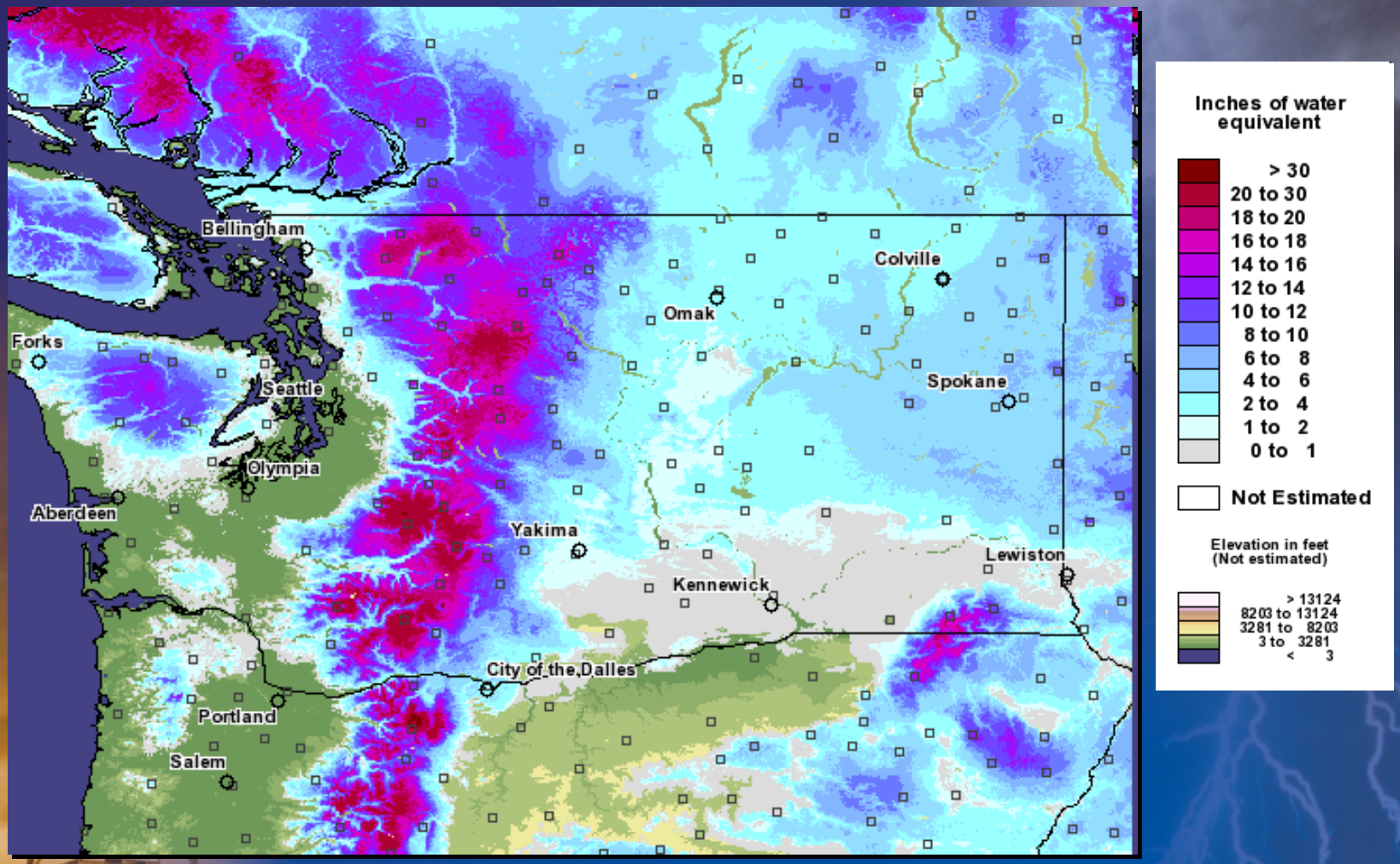


Current Snow Depth

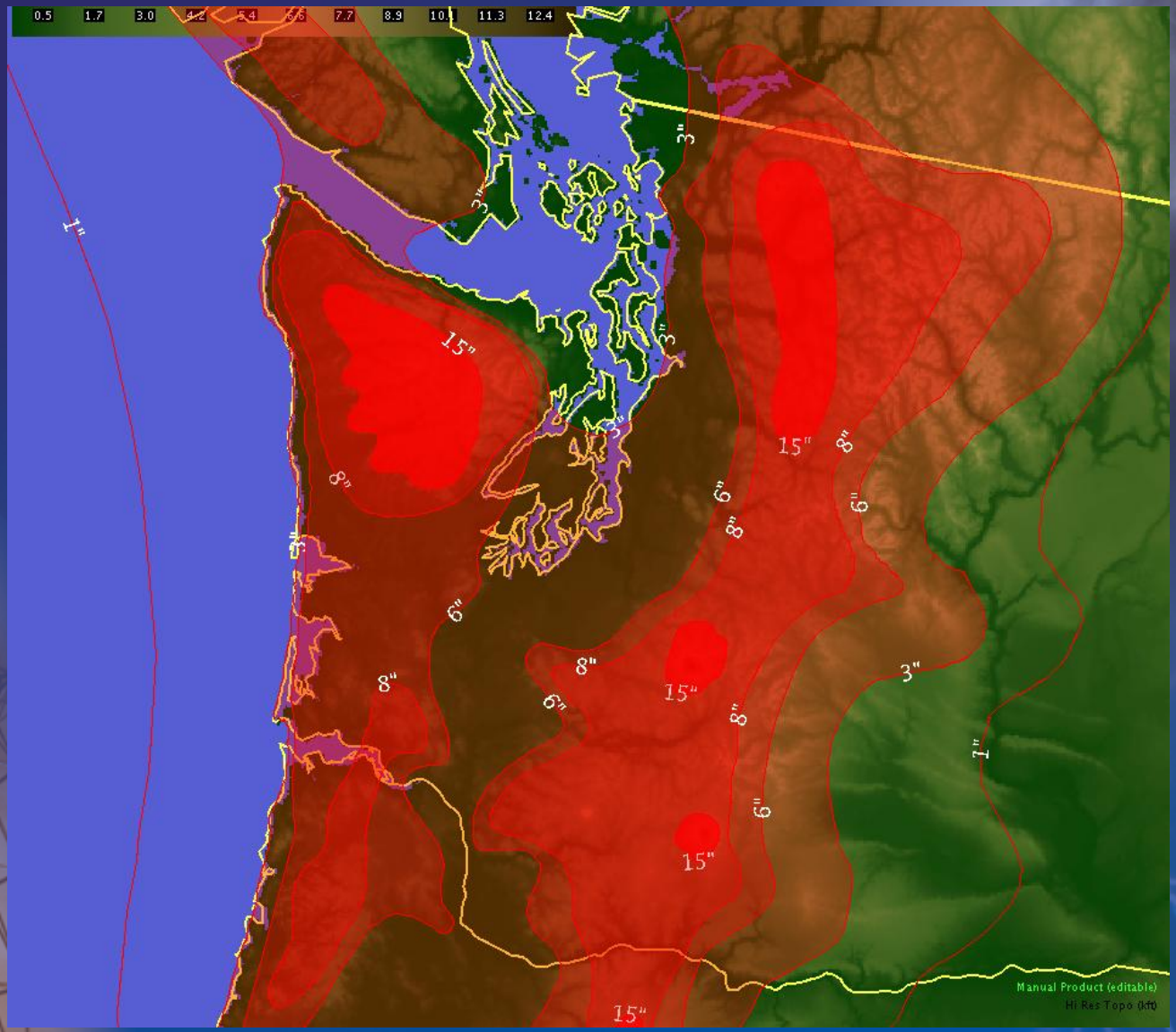


http://www.nohrsc.noaa.gov/

Current Snow Water Equivalent



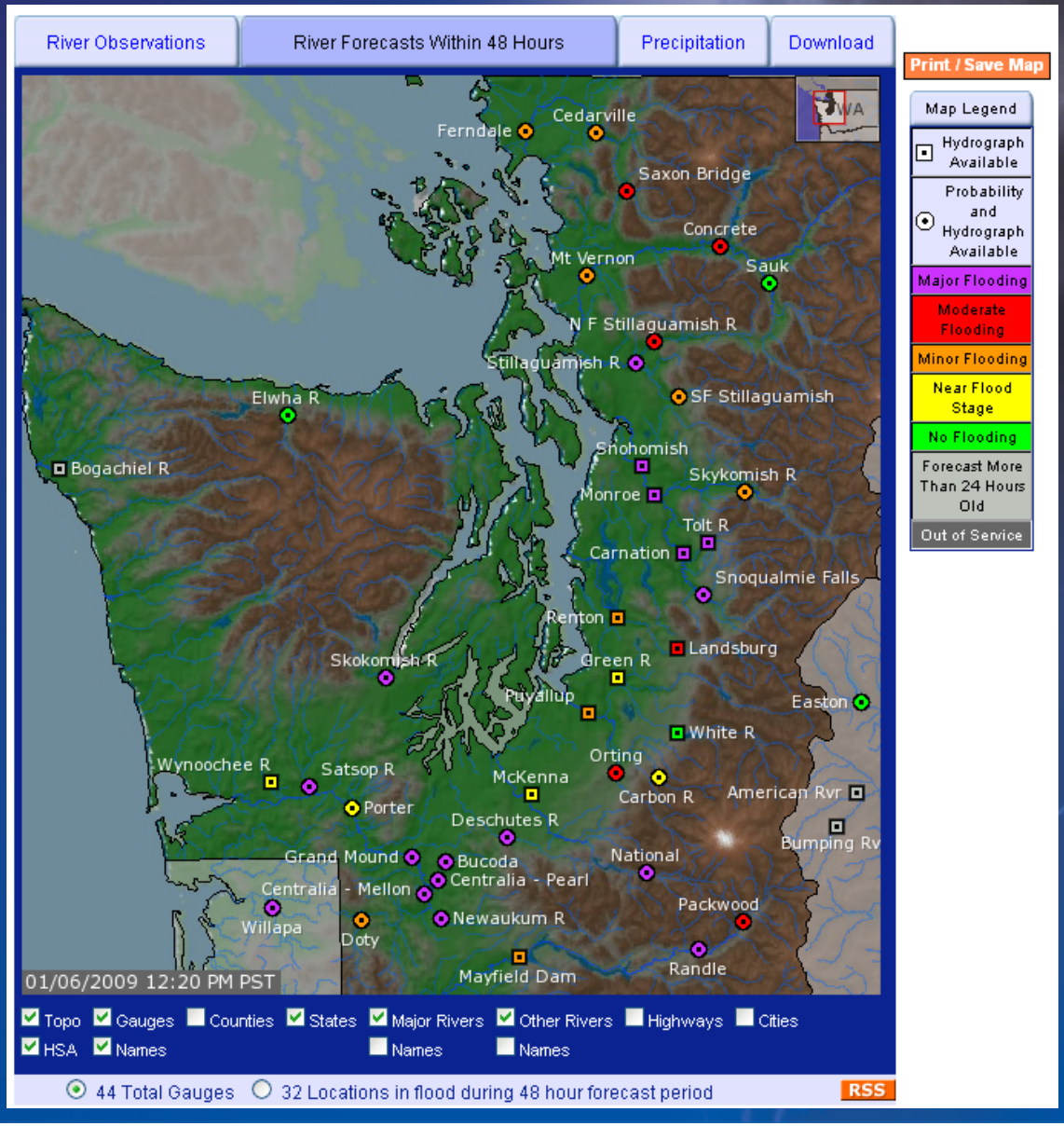
Forecast Precipitation



Storm Total through Thursday Morning

Flood/Landslide Situation

- **Main Stem Flooding**
  - *16 Major Category*
  - *6 Moderate*
  - *9 Minor*
  - *5 Near Flood Stage*
- **Areal Flooding of smaller streams**
- **Urban/Small Stream Flooding**
- **Landslide Risk**
  - *Saturated Soil*
  - *Heavy Rainfall*
  - *USGS Partner*
  - *Special Weather Statement*



AVALANCHE DANGER

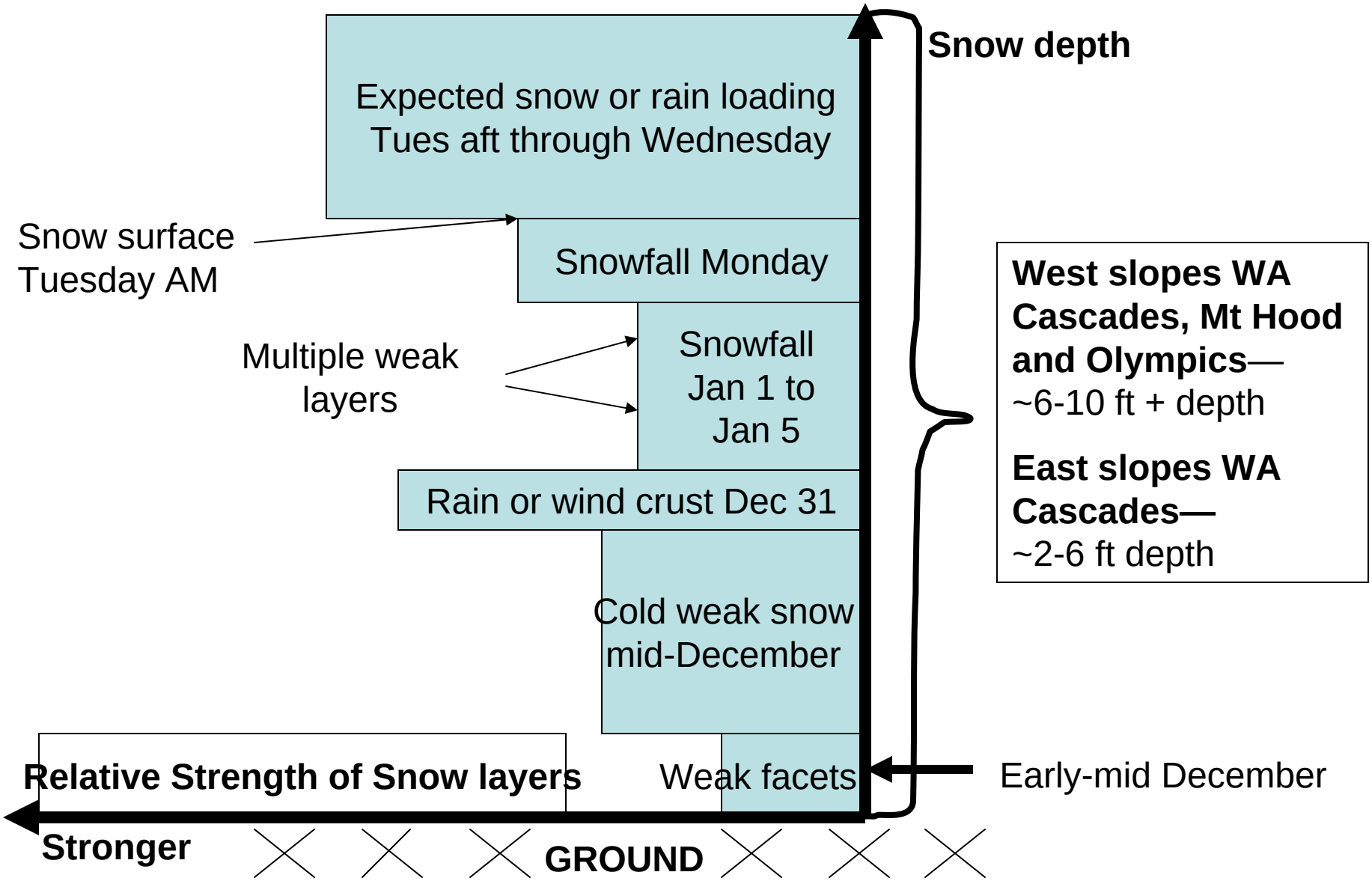
- BURIED WEAK LAYERS (in recent snow & at bottom of snowpack)

- **VERY HEAVY LOAD & WARMING**

- **HIGH DENSITY SNOW & RAIN (natural triggers—stress and weaken)**

- **SIGNIFICANT DANGER INCREASE ⇨ EXTREME**

General Snowpack Structure—1-6-09



Avalanche Summary

- Stressing and loading a continental type snowpack (deeply buried weak layers) with an increasingly maritime weather regime

- 6 inches of water = 60-90 inches of snowpack

AVALANCHE DANGER

–***EXTREME HAZARD THIS AFTERNOON AND TONIGHT***

- **High freezing levels, heavy snow or rain, & strong winds**
- **Natural / human triggered slides are certain (2-4 ft +)**
- **Large destructive avalanche are possible (6-10 ft +)**

Snow Loading Is a Danger !

+

1 cubic foot of water weighs 62.4 lbs!

1 foot of snow is equivalent to about 1 to 3 inches of rain. Roughly, equal to about 15 pounds per square foot of horizontal roof surface.

The existing snow acts as a sponge and soaks up much of the rain and adds to the weight of the snow.

EXAMPLE IMPACT: A roof with two feet of snow (33.2 psf) and two inches of rain (10.4 psf) gives a total load of 43.6 pounds per square foot!! (King County urban design spec is 25 pounds per square foot.)

Cycle of High Tides – River Runoff

- **Aberdeen**
  - *Wed….11.0’ near 9 AM*
  - *Thu….11.5’ near 10 AM*
  - *Fri….11.9’ near 11 AM*
  - *Sat….12.1’ near noon*
- **tidesonline.com (National Ocean Service)**

- **Seattle**
  - *Wed….11.7’ near noon*
  - *Thu….11.8’ near 1 PM*
  - *Fri….11.9’ near 430 AM*
  - *Fri….11.8’ near 2 PM*
  - *Sat….12.8’ near 515 AM*
  - *Sat….11.8’ near 4 PM*

Timing and Impacts

Tonight

- *Increasing Rain*
- *Rising Snow Levels (5000 – 8000 ft)*
- *Flood Watch in effect*
- *Extreme avalanche hazard*
- *Snow/Rain Roof Load Hazard*

Timing and Impacts

- **Wednesday**
  - ***Flooding to begin***
    - **Main Stem Rivers**
    - **Areal / Urban/Small Stream Flooding**
  - ***Extreme Avalanche Hazard***
  - ***Landslide risk increases***
  - ***Snow/Rain Roof Load Hazard Decreases (snow melts)***

Timing and Impacts

- **Wednesday Night**
  - ***Flooding Continues***
    - **Main Stem Rivers**
    - **Areal / Urban/Small Stream Flooding**
  - ***Extreme Avalanche Hazard***
  - ***Landslide Risk Continues***

Timing and Impacts

- **Thursday**
  - ***Heavy Rainfall Ends***
  - ***Snow Levels Fall (below pass levels)***
  - ***Flooding Continues***
    - **Main Stem Rivers**
    - **Areal / Urban/Small Stream Flooding Decreasing**
    - **High Tide Interaction**
  - ***Avalanche Hazard Eases***
  - ***Landslide Risk Decreases***

Timing and Impacts

- **Thursday Night and Friday**
  - *Dry weather begins*
  - *Flooding Continues*
    - Lower Main Stem Rivers
    - High Tide Interaction
  - *Avalanche Hazard Eases*
  - *Landslide Risk Slowly Decreasing*

A Look Ahead

- **The Weekend and into next week**
  - ***Finally…… a break in the action !!***
  - ***Generally Dry***
  - ***Seasonable Weather***

Resources

- weather.gov/seattle/ – NWS Seattle web site
  - Area Forecast Discussions (Text and new Graphical)
  - Doppler weather radar and satellite imagery loops
  - Latest forecasts and warning statements
- nwac.us – Northwest Weather and Avalanche Center
- wsdot.wa.gov – Washington State Dept. of Transportation
- wwc.nrcs.usda.gov/snotel – Natural Resources Conservation Service (snow data)
- tidesonline.com – National Ocean Service tide data

Questions?