

EMERGENCY WARNING SYSTEM PROCEDURES FOR DEBRIS FLOWS IN WESTERN OREGON

Updated: 12/03/2007 by the Oregon Department of Forestry and the Oregon Department of Geology and Mineral Industries

The Oregon Department of Forestry website for official warnings can be found at: http://www.odf.state.or.us/DIVISIONS/protection/fire_protection/daily/debris.asp

The official warning statement from the National Weather Service can be found at: <http://www.wrh.noaa.gov/pqr>

Debris flows are a particular type of landslide: the dangerous, rapidly moving landslides that have been responsible for several deaths in Oregon in the past few years. In 1996, a series of debris flows resulted in the deaths of five people and damage to many homes, roads, and bridges. A debris flow near Florence in 1999 killed two loggers.

The purpose of the EMERGENCY WARNING SYSTEM FOR DEBRIS FLOWS IN WESTERN OREGON is to inform local residents, landowners, drivers, road managers, and emergency planners during weather events when debris flows are expected and where they are expected to occur.

BACKGROUND

The U.S Geological Survey (USGS) developed a landslide warning system based on rainfall thresholds for the Bay area of California, which functioned from 1985 until 1995.

Since then, the USGS has developed rainfall thresholds for similar purposes in several other locations, including the Puget Sound area of Washington. The USGS is currently working on a project in Oregon to help assess and possibly refine the rainfall thresholds used for our debris flow warning system.

The Department of Forestry (ODF) has provided storm messages for road management purposes and quantitative precipitation forecasts since the mid- 1980's and in March 1997, the Governor's Debris Avalanche Action Plan called for development of a more comprehensive warning system. ODF worked with the Department of Geology and Mineral Industries (DOGAMI), the National Weather Service (NWS), Oregon Department of Transportation (ODOT) and Oregon Emergency Management (OEM) to develop the current debris flow warning system.

The warning system relies on ODF meteorologists to monitor rainfall, develop and provide weather forecasts, consult with ODF geotechnical specialists, and issue warnings when appropriate. ODF notifies Forestry staff, other state agencies as well as the NWS

when warnings are issued and subsequently cancelled. Warnings are also distributed through the Law Enforcement Data System (LEDS). The NWS disseminates the State developed emergency messages via NOAA Weather Radio, Weather Wire, LEDS, and internet. Warnings are also displayed on the ODF and DOGAMI web sites.

The system was used for the first time during the winter of 1997-98. One advisory and no warnings were issued during that winter. Advisories were dropped from the system in the fall of 2004 and only warnings are being issued based on the previously adopted warning criteria.

A list of debris flow advisories and warning issued through December 2007 is shown below.

Date	Type	Area
16-Dec-97	Advisory	Clatsop, Tillamook, western Yamhill Counties
24-Nov-98	Advisory	Clatsop to Coos Counties
23-Feb-99	Advisory	Western Oregon north of Highway 20
26-Nov-01	Advisory	Clatsop to Coos Counties
15-Dec-01	Advisory	Northwest Oregon West of the Cascade crest and North of Highway 20
13-Dec-02	Advisory	Curry County and Josephine County west of Hwy 199 and south of the Rogue River
31-Jan-03	Advisory	Clatsop, Columbia, Tillamook, and Yamhill Counties
13-Dec-03	Advisory	Southern Lincoln, Western Lane, Western Douglas, Coos and Curry Counties
29-Jan-04	Warning	Clatsop, Tillamook, Lincoln, Columbia, Washington, Yamhill, and Multnomah County east of Troutdale 30-30-
Dec-05	Warning	Coos and Douglas Counties west of I-5
Date	Type	Area
10-Jan-06	Warning	Clatsop, Tillamook, Lincoln, Washington, Yamhill, Polk, and western Lane Counties
06-Nov-06	Warning	Western Columbia Gorge, north Oregon Cascade foothills, Clackamas and Marion Counties

The Oregon Department of Forestry website for official warnings can be found at: http://www.odf.state.or.us/DIVISIONS/protection/fire_protection/daily/debris.asp

The official warning statement from the National Weather Service can be found at: <http://www.wrh.noaa.gov/pqr>

DEBRIS FLOW WARNING SYSTEM DESCRIPTION

Warnings

The purpose of a debris flow warning is to let people know that debris flows are very likely to occur, and to provide this information as close to the critical rainfall period as possible in order that the information is useful to persons in affected

locations. Warnings are intended to provide time to prepare for an emergency period.

A debris flow warning may be issued at the time of, or between 3 and 48 hours prior to, the anticipated arrival of precipitation significant enough to trigger debris flows. During the warning period, people in vulnerable locations may be in imminent threat of serious injury or death, and should take immediate precautionary actions. Warnings will be issued when periods of measured rainfall reach the threshold that typically results in many debris flows or when the thresholds are expected to be reached.

Warnings especially will be issued when such precipitation is expected during periods of darkness. This is expected to provide at least a couple of hours warning in advance of the most dangerous periods. Warnings will include locations of expected or measured high precipitation, by county or region of the state (often using a county line or highway as the demarcation line).

Forecasting Criteria

Preliminary evaluation of debris flow potential will normally be based on forecasted rainfall at four key locations: Cascade Locks (the ODF remote automatic weather station (RAWS) site), Charlotte Ridge, North Bend and Tillamook. These sites are near and west of areas of high debris flow hazard.

ODF research indicates these sites should provide some advance signal of rain at the most critical locations. The warning threshold for these sites is based on the following precipitation values:

Inches in Hours

3	12
4	24
5.5	36
7	48

These values are based on ODF experience with emergency road forecasts and with storm events that have in the past initiated significant numbers of debris flows. Warnings are issued by the ODF meteorologists after consultation with ODF geotechs.

In some cases the geotechnical specialists may modify the threshold criteria (e.g. low elevation snow with warm rain expected or heavy rain after a hard freeze). Geotechnical specialists will provide advance notice of this change to the meteorologists, and will provide specific updated warning threshold criteria. At their discretion, meteorologists may use other coastal sites from Bandon to Seaside for forecasting threshold precipitation (using the same values above), except for Reedsport, which may need a lower threshold.

The rainfall values above are for sites immediately adjacent to the coast and not inland mountain or valley locations. For storms that track from the south (not over the ocean) a criteria of 2.5 inches in 24 hours for Ashland will be used.

Issuance of Warning

Warnings will be issued after heavy rain has been measured at a key rainfall location or if heavy rain is expected. Key locations where hourly rainfall data is available include: North Bend, Charlotte Ridge, Reedsport, Tillamook, and the ODF RAWS site at Cascade Locks. Ashland, Florence, Newport and Roseburg are also key locations. Data from weather stations near these communities may be used where real-time data is available. A geotechnical specialist should be consulted prior to issuing a warning.

1) Warnings will be issued after threshold rainfall has occurred in any critical location (including inland, debris flow prone areas) or if the threshold amount is expected. A warning will be issued after 5 inches of rain is recorded in 24 hours at any coastal site north of Florence. A warning will be issued after 4 inches of rain in 24 hours for coastal sites from Florence to Bandon (see #2, below). Warning criteria for inland sites will be higher, and will depend on orographic and other influences. Slopes must also contain some antecedent water from either a) at least 1 inch of rain in the 24 hours prior to the 6, 12, or 24 hour period, or b) relatively warm rain falling on at least 1 foot of snow at 1000-foot elevation (i.e. a rain on snow event).

2) A lower warning threshold will be used for the Tyee Core area (where studies indicate a higher susceptibility to rapidly moving landslides). The Tyee Core Area is found in parts of ODF's Coos, Western Lane, and Douglas districts. It includes coastal watersheds beginning with the Siuslaw watershed south to, and including, the Coquille watershed and also includes that portion of the Umpqua watershed north of Highway 42 and west of Interstate 5. Coastal rain gauges from Florence to Bandon should be used to evaluate potential precipitation in this area. Warnings may be issued after as little as 4 inches of rain in 24 hours at these locations.

3) Warnings may also be issued if threshold precipitation is deemed likely (but prior to actually occurring) during periods of darkness at critical locations (populated areas). There is the special concern for periods of darkness as people may be in their most vulnerable condition (sleeping).

4) During warning periods, a geotechnical specialist will be in an alert mode. If available, the ODF staff geotechnical specialist will advise the meteorologist on appropriate precipitation thresholds for a warning. The geotechnical specialist will also provide consultation on the warning location and concur with the warning language prior to warnings being issued. When the staff geotechnical specialist is not available, the appropriate area geotechnical specialist should be

consulted (John Seward for Lane County and south, Dave Michael for Lincoln County and north).

Warnings will be available on the web at ODF's website as well as on the NWS web site (listed as a NWS Civil Emergency Message.) Warnings may also be shown on the DOGAMI web site (via links to ODF or the NWS.)

Cancellation (termination) of Warning

The warnings will be cancelled (terminated) after:

- 1) The expected heavy rainfall has not materialized and is unlikely to materialize, or;
- 2) The rainfall has ceased or dropped to light intensity (less than 0.1 inch per hour) for a period of over two hours (over the entire warning area).

The Oregon Department of Forestry website for official warnings can be found at: http://www.odf.state.or.us/DIVISIONS/protection/fire_protection/daily/debris.asp

The official warning statement from the National Weather Service can be found at: <http://www.wrh.noaa.gov/pqr>

System Resources Staff support for these activities will be provided during normal working hours, and will be provided outside normal working hours during periods when the forecast indicates heavy rain is possible.

Communication Overview Procedures

- 1) ODF will communicate warnings to the Oregon Emergency Response System, the National Weather Service in Portland, Oregon Emergency Management in Salem, the Department of Transportation, and the Department of Geology and Mineral Industries.
- 2) ODF will call the NWS Portland lead forecaster to verify the receipt of the warning message by the NWS. The NWS Portland lead forecaster will contact the Medford NWS office to coordinate the dissemination of messages in the Medford Warning Area.
- 3) Oregon Emergency Response System (OERS) will notify ODOT and DOGAMI immediately upon receipt.
- 4) The National Weather Service will broadcast warnings over NOAA Weather Radio and NOAA Weather Wire services.
- 5) OERS will follow established notification procedures per the OERS Natural Hazards - Incident Notification Matrix

WARNING STATEMENTS

Note: the bold and italicized text shown below is modified to include the specific information required for each warning, extension or cancellation.

Typical Warning Language

THE STATE OF OREGON HAS ISSUED A DEBRIS FLOW WARNING FOR *[AFFECTED COUNTIES OR REGIONS]* EFFECTIVE BETWEEN *[DATE(S) AND TIMES]*. THE WARNING MEANS THAT INTENSE RAINFALL WHICH MAY INITIATE DEBRIS FLOWS IS EXPECTED WITHIN THE NEXT *[XX]* HOURS. DEBRIS FLOWS ARE DANGEROUS, RAPIDLY MOVING LANDSLIDES. STEEP SLOPES, CANYONS, GORGES AND THE MOUTHS OF MOUNTAIN STREAMS ARE THE LOCATIONS AT GREATEST RISK. PERSONS IN HOMES OR VEHICLES ARE AT RISK OF SERIOUS INJURY WHEN IN THESE LOCATIONS.

Typical Extension Language

THE DEBRIS FLOW WARNING ISSUED BY THE STATE OF OREGON FOR *[AFFECTED COUNTIES OR REGIONS]* HAS BEEN EXTENDED UNTIL *[DATE AND TIME]*. *[THEN FOLLOW WITH STANDARD LANGUAGE FOR THE WARNING]*.

Typical Termination Language

THE STATE OF OREGON HAS TERMINATED THE DEBRIS FLOW WARNING THAT WAS IN EFFECT FOR *[AFFECTED AREA]*. RAINFALL HAS ABATED AND NEW DEBRIS FLOWS ARE LESS LIKELY, ALTHOUGH UNSTABLE SLOPES MAY CONTINUE TO EXPERIENCE MOVEMENT OVER THE NEXT SEVERAL DAYS.

The Oregon Department of Forestry website for official warnings can be found at: http://www.odf.state.or.us/DIVISIONS/protection/fire_protection/daily/debris.asp

The official warning statement from the National Weather Service can be found at: <http://www.wrh.noaa.gov/pqr>

For more information, contact James Roddey at 800 NE Oregon St., Portland, OR 97232, (971) 673-1543 or on cell phone at (503) 807-8343.

James Roddey

Earth Sciences Information Officer

Oregon Dept. of Geology and Mineral Industries

800 NE Oregon Street, Suite 965, Portland, OR 97232

(971) 673-1543 (direct line) / (503) 807-8343 (cell)

james.roddey@dogami.state.or.us

<http://www.oregongeology.com>