

WEBINAR THE CHEHALIS RIVER BASIN FLOOD WARNING SYSTEM

DECEMBER 5, 2017

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WEST CONSULTANTS

Chehalis River Basin

Miles

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5 9

 2,660 square miles

Seattle

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Tacoma

Olympia

Centralia



2007 0

Recent major flood events





2009 0

Recent major flood events



CHEHALIS RIVER BASIN FLOOD AUTHORITY

- LEWIS COUNTY
- GRAYS HARBOR
- THURSTON COUNTY
- CITY OF ABERDEEN
- CITY OF CENTRALIA
- CITY OF CHEHALIS
- CITY OF COSMOPOLIS

- CITY HOQUIAM
- CITY OF MONTESANO
- CITY OF NAPAVINE
- CITY OF OAKVILLE
- TOWN OF BUCODA
- TOWN OF PE EL

FLOOD WARNING SYSTEM 2009

- PHASE I CONCEPTUAL DESIGN
 - UNDERSTAND THE "NEEDS" OF THE AUTHORITY
 - IMPROVE EXISTING FLOOD WARNING PROGRAMS
 - TECHNICAL AND INFORMATIONAL
 - CONSIDER ADDITIONAL FUNDING SOURCES
 - PRESENT INFORMATION TO FLOOD AUTHORITY
 - DISCUSS PATH FORWARD (PHASES 2 AND 3)



IMPROVE FLOOD WARNING

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NEEDS ASSESSMENT

- IMPROVE RIVER FORECAST
 - PRECIPITATION MONITORING
 - SNOW PACK MONITORING
 - IMPROVE STREAM GAGING
 - RESERVOIR LEVELS & RELEASE PLANS
 - DAM FAILURE WARNING
- IMPROVE COMMUNICATION
 - WEB-BASED DATA AND WARNING



DESIGN/BUILD FLOOD WARNING SYSTEM

- IMPROVE MONITORING NETWORK
 - 8 RAIN/TEMPERATURE STATIONS
 - 2 RAIN/TEMPERATURE/STREAM STATIONS
- INTERNET DATA AND WARNING
- INUNDATION MAPPING

Guiding Principles

- •Cost effective
- •Leverage existing resources
- •Immediate benefits

EXISTING GAGING STATIONS







DATA COLLECTION/MANAGEMENT





RAINFALL FORECAST



Northwest River Forecast Center 10 Day Meteorological Forecasts

Home Previous Page Detailed Graphical Display (5 Day) Text Forecasts Verification Description Choose Date: Convert

Click on Image to Display Larger Plot. Note: Displayed images include the latest issuance for the selected day.







Raymond

South

Bend



Traffic & Cameras Projects Business Environment

Westport

Long Beach

Ilwaco

Maps & Data

Additional slowdowns: zoom in to view details

Email/text updates \sim

You are Here: Home > Traffic > Traffic Alerts > SouthWest

Traffic

Cameras

Mountain Passes

Traffic Home

Travel Alerts

Weather

Mobile Traffic Site

State Travel Info

Cross-state Routes

Map Archives

Travel Times

Winter Driving Tips

Additional Info

Disclaimer

Bordering State Travel

Other Traffic Products



beep, beep i'm here to save you money START QUOTE GEICO ADVERTISEMENT Southwest Washington Travel Alerts Travel Alerts View All Alerts For Area (Printer friendly version) HIGHEST IMPACT entraliz SR 123 Both Directions - SR 123 Cayuse Pass **Norton** (elev. 4,675 feet) is closed for the season within the boundaries of Mount Rainier National Park between Crystal Mountain Boulevard and the Stevens Canyon Road entrance. Last Updated: 11/17/2017 10:27 AM Cathlamet From milepost 3 to milepost 17 More Longv **HIGH IMPACT** SR 105 Both Directions - Beginning Monday, Sept. 18, until further notice: A single lane of the highway is closed between Eagle Hill Road and Panoramic Lane, around-the-clock, for erosion Stevenson protection work. Vancouv ١đ NOTE: The speed limit has been reduced to 25 mph through this area. Last Updated: 11/21/2017 2:12 PM From milepost 19 to milepost 21 More **HIGH IMPACT** SR 504 Both Directions - Beginning Monday, Oct. Zoom Out [1]2[3] Zoom In 30, until further notice: Traffic on both directions of SR 504, near Wooster Creek at milepost 17.0. IMPACT LEVEL/TYPE will be shifted to a temporary single-lane, by-pass route, controlled by an automated traffic signal, ACCIDENT/ALERT HIGHEST around-the-clock. during construction. NOTE: Users of the highway will need to watch for HIGH CONSTRUCTION advanced signs notifying them of the single-lane MODERATE detour ahead. WEATHER NOTE: All work is weather dependent. LOW ROAD CLOSURE Last Updated: 10/27/2017 12:30 PM From milepost 17 to milepost 18 More

RIVER FORECAST



Flood Categories (in feet)

Major Flood Stage:	72
Moderate Flood Stage:	68.5
Flood Stage:	65

Historic Crests

74.78 ft on 12/04/2007
74.31 ft on 02/09/1996
73.50 ft on 01/10/1990
72.40 ft on 01/08/2009
71.99 ft on 11/25/1986
Show More Historic Crests

(P): Preliminary values subject to further review.

Recent Crests

(1) 65.07 ft on 02/10/2017
(2) 65.07 ft on 02/10/2017
(3) 67.86 ft on 12/10/2015 (P)
(4) 62.25 ft on 01/08/2015 (P)
(5) 62.46 ft on 02/18/2014 (P)
Show More Recent Crests

(P): Preliminary values subject to further review.



CGMW1(plotting HGIRG) "Gage 0" Datum: 123.65'

Observations courtesy of US Geological Survey



CGMW1(plotting HGIRG) "Gage 0" Datum: 123.65'

Observations courtesy of US Geological Survey

CHEHALIS RIVER NEAR GRAND MOUND

Universal Time (UTC)



CGMW1(plotting HGIRG) "Gage 0" Datum: 123.65'

Observations courtesy of US Geological Survey

FLOOD IMPACTS CHEHALIS RIVER AT GRAND MOUND

If you notice any errors in the below information, please contact our Webmaster

- 19 the Chehalis River in Thurston County will cause severe near record flooding...with deep and swift flood waters inundating the Independence Valley. Flooding will occur all along the river including headwaters...tributaries...and other streams within and near the Chehalis River Basin.
- 17.5 the Chehalis River in Thurston County will cause major flooding...inundating roads and farm lands in Independence Valley. Deep and swift flood waters will cover SR-12 and James...Independence and Moon Roads. Flooding will occur all along the river including headwaters...tributaries...and other streams within and near the Chehalis River Basin.
- 15.5 the Chehalis River in Thurston County will flood several roads in Independence Valley with swiftly moving water including SR-12 and James...Independence...Moon and Anderson Roads. Flood waters will cut off access to and from Chehalis Reservation and inundate nearby farm lands. Some residential structures may be threatened.
- 14 the Chehalis River in Thurston County will flood several roads in Independence Valley including James Road...Independence Road and Moon road. Flood waters will also cover nearby farm lands.
- 12.5 the Chehalis River in Thurston County will locally spill out of its banks into nearby fields and over a few roads.

CHEHALIS RIVER BASIN

Flood Inundation Maps

Select a gage location: Base Map

V

Chehalis River Flood Base Map



Chehalis River Basin Early Warning System



Flood Inundation Maps

Select a gage location: Base Map

V

Chehalis River at Centralia, WA

Current NWS Forecast	
< 56.09 ft >	
11/27/2017 6:00:00 PM	
(observed value)	
River Stage (ft) Hover mouse over river stage to show corresponding flood map	A Street
61.0	
61.6	
62.6	
63.6	
64.6	
Minor Flood Stage	
65.6	
66.6	
67.6	
Moderate Flood Stage	
68.6	
69.6	
70.6	
71.6	
Major Flood Stage	
72.0	
73.6	
74.0	
76.1	
isclaimer: Inundation maps show	

Disclammer, indication maps show estimated areas of flooding associated with river stages reported or forecast at National Weather Service forecast points. These maps are prepared in advance using assumed storm conditions. The exact extent of flooding during an actual event for an observed or forecast elevation may vary due to specific local storm conditions.



Chehalis River at Centralia, WA

1917

Multaning

MILENA

ProvidencelLn

Current NWS Forecast				
< 53.27 ft >				
5/6/2014 11:30 AM				
(observed value)				
River Stage (ft) Hover mouse over river stage to show corresponding flood map				
61.0				
61.6				
62.6				
63.6				
64.6				
Minor Flood Stage				
65.6				
66.6				
67.6				
Moderate Flood Stage				
68.6				
69.6				
70.6				
71.6				
Major Flood Stage				
72.6				
73.6				
74.6				
76.1				

+ -

Inundated area at

river stage 69.6 ft.





Chehalis River (and tributaries)

River Gages



 $oldsymbol{\mathcal{C}}$ Reload

RainTiles



OUTREACH

WEBSITE

BROCHURES

ANNUAL PREPAREDNESS MEETINGS

NEWSPAPER ARTICLES

COUNTY FAIRS

SOCIAL MEDIA

AUTOMATED HIGH WATER ALERTS

High Water Alerts

Be aware, be prepared – The Chehalis River Basin Flood Warning System (www.chehalisriverflood.com) has the capability to send email alerts to anyone interested in receiving notification about rising river levels from key river gages in the Chehalis Basin. Please click here to learn more about how to sign up to receive email gage alerts. To see gage alert sign-up activity across the basin, click here. Comments or questions can be directed to Scott Boettcher, Chehalis River Basin Flood Authority, 360/480-6600, scottb@sbgh-partners.com. Thank you.

High Water Alerts - 11/30/2017 16:19:44

Chehalis River Basin Flood Warning System







Rainfall Forecast



River Forecast



Flood Maps



Gage Data Graphs





Chehalis Flood Authority



Road Conditions



USGS Gages



Question?

Gage Data Maps

Distribution of Requested Flood Alerts





FARM PADS



HIGH WATER ALARM USER SURVEY



KEY BENEFITS

35

- SITUATIONAL AWARENESS
- EMPLOYEE/STAFF SAFETY
- RESIDENCE SAFETY
- TRAVEL PLANNING
- INCREASED WEBSITE USAGE
- INCREASE VISIBILITY OF THE FLOOD AUTHORITY

CURRENT DEVELOPMENTS 2017

SYSTEM REVIEW

- GAGE INVENTORY
- GAGE DATUM UPGRADE
- GOES RADIO UPGRADE
- RIVER GAGE TECHNOLOGY UPGRADE
 - o SENSORS
 - o COMMUNICATION
 - o RATING CURVES

Current Database





POTENTIAL SENSOR DATABASE

Gage Type	Professional Near-Real-Time with	Professional	Citizen	Total
	Systems Available In Contrail	Not-Real-Time	Scientist	Total
Precipitation	67	265	541	873
Discharge	40	1	0	41
Stage	52	10	0	62
Air Temperature	97	40	615	752
Dew Point	1	0	0	1
Pressure	26	7	608	641
Relative Humidity	47	1	616	664
Solar Radiation	17	1	33	51
Tide	2	0	0	2
Ocean Temperature	2	0	0	2
Wind Speed	70	4	616	690
Wind Direction	70	4	616	690
Wind Gust	48	1	111	160
Snow Depth	4	17	0	21
Other	63	107	0	170
Total	606	458	3756	4820





ATMOSPHERIC RIVERS (WATER VAPOR TRANSPORT)



ATMOSPHERIC RIVERS PRODUCE THE BIG FLOODS



Figure S1. Fraction of years that annual maximum daily streamflow occurred during an atmospheric river at 5477 US Geological Survey streamflow gaging stations for available records from water years 1949 though 2015.

WATER VAPOR









CHEHALIS RIVER NEAR CENTRALIA RATING CURVE



Discharge



NWS GAGE UPGRADE - CHEHALIS RIVER AT CENTRALIA, WA - 12025500



WEST

Consultants, Inc.





KEY POINTS

- Flood Warning System (<u>www.chehalisriverflood.com</u>) is a portal website, <u>and much more</u>!
- Flood Warning System is a "<u>system</u>" of:
 - Web Technology
 - Field Instrumentation
 - Calibrated, Validated Data/Information
- Flood Warning System, to be effective, requires shared-commitment.
 - Maintenance
 - Upgrades
 - Outreach
 - Partnerships
- Taken together, and attended to, Flood Warning System delivers <u>accurate</u>, <u>early-warning and more time to plan and act</u>.

ACKNOWLEDGEMENTS

- Chehalis River Basin Flood Authority
- Scott Boettcher, CRBFA Staff
- Stakeholders
 - NWS, USGS, USACE
 - WA DOT, WA DOE
 - Weyerhaeuser, TransAlta
 - Gage Network Advisory Group
 - Many others

CONTACT

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<u>www.chehalisriverflood.com</u> Sign up for high water alerts: <u>https://goo.gl/N9dfJ9</u>

QUESTIONS?