

Product Description Document (PDD): 8- to 14-day Hazards Outlook (Contiguous U.S. and Alaska) with Experimental Rapid Onset Drought
December 2022

Part I – Mission Connection:

a. Product/Service Description – This product is a set of outlook maps and associated composite highlighting potential hazards during the Days 8 – 14 (“Week 2”) period related to precipitation, temperature, wind, drought, and other weather, water, and climate hazards. The five categories of hazards are temperature, precipitation, snow, wind, and soils. Areas of potentially hazardous weather, water, and climate events related to temperature, wind, precipitation, rapid onset drought (experimental), and other hazardous conditions are depicted when necessary and appropriate based on the technical description below using the included baseline definitions of hazardous conditions.

Changes for the extension of the experimental comment period for the Rapid Onset Drought hazard type: The Rapid Onset Drought hazard type ***will be issued and updated only on Thursdays*** when applicable, to coincide with the issuance of the U.S. Drought Monitor that serves as the starting point for subsequent verification. In cases where there is a large change in the Week-2 forecast, adjustments to the shapes may be made at other times to ensure consistent messaging.

b. Purpose/Intended Use – The purpose of this product is to provide advanced notice of potential high impact hazards related to extended-range weather and short term climate and water related events. The product fits within the National Weather Service (NWS) mission as the goal is to mitigate impacts to life and property as well as the national economy.

c. Audience – In addition to the general public, the audience includes decision makers for a number of sectors of the U.S. economy including the agriculture, water resources, energy, health sectors as well as the emergency management community.

d. Presentation Format – The product is presented as static graphic maps as noted above, but a Geographic Information System (GIS) display interface is also included so that users can scroll and zoom in if necessary to better understand the potential threats and their geographic location. GIS shapefiles and Keyhole Markup Language (KML) files are available for download from the official product webpage.

e. Feedback Method – Feedback can be provided on the product by contacting jon.gottschalck@noaa.gov and scott.handel@noaa.gov within the Operational Prediction Branch of the NWS Climate Prediction Center (CPC). For the experimental rapid onset drought hazard type, please provide feedback at:

https://www.surveymonkey.com/r/RapidOnsetDrought_ExpExt2022

Part II – Technical Description:

a. Format and Science Basis – See above for product format. ArcGIS software is used to prepare the outlook maps by the forecaster and PNG images are created for the CPC web page. The outlook maps are also made available in GIS shapefile and Google Earth KML formats. The outlook maps are only disseminated via the web at the URL below:

<https://www.cpc.ncep.noaa.gov/products/predictions/threats/threats.php>

The primary driver of the outlook maps is a host of post-processed (bias corrected and reforecast calibrated) ensemble forecast systems from NCEP Global Ensemble Forecast System (GEFS), Environment Climate Change Canada (ECCC) Global Ensemble Prediction System (GEPS) and European Centre for Medium Range Weather Forecasts (ECMWF). In addition to favored temperature and precipitation anomalies, antecedent conditions such as anomalous soil moisture and snow water equivalent impact the Week-2 Hazards Outlook (i.e., rapid drought onset potential or ongoing / persisting or potential developing flooding concerns).

Given the forecast time frame, the outlook maps are informed by calibrated probabilities due to the inherent increase in uncertainty in the Week-2 forecast period. In general, probabilities exceeding 40% warrant hazard depiction. The calibrated probabilities for various hazards related to precipitation, temperature, and winds are linked to known important criteria for hazardous conditions and vary across the forecast domain – in consultation with the NWS regional field structure.

Rapid onset drought is a newly available experimental variable that uses initial conditions, such as antecedent dryness, and skillful temperature and precipitation outlooks during the next two weeks to communicate the risk of rapidly developing drought during the next 2-3 weeks. The primary tools used to define areas at risk for rapid onset drought development include: (1) abnormal dryness (D0) in the current U.S. Drought Monitor, (2) soil moisture below the 30th percentile, (3) 7-day positive temperature anomalies from the National Digital Forecast Database (NDFD), especially if a period of extreme heat is possible (4) no precipitation forecast or forecast negative precipitation anomalies from the Weather Prediction Center (WPC) and the CPC's 8-14 day outlooks. Given the relatively low frequency of even rapid onset drought, this hazard **will be issued and updated on Thursdays** when applicable, to coincide with the issuance of the U.S. Drought Monitor that serves as the starting point for subsequent verification. In cases where there is a large change in the Week-2 forecast, adjustments to the shapes may be made at other times to ensure consistent messaging.

The Week-2 U.S. Hazards Outlook contains human drawn delineations of where various variables are expected to have the potential of posing a hazard to life or property. The forecasters do apply a subjective decision factor when delineating a hazard area. A cold snap in the winter or a heatwave in the summer are likely threats to life and property, while a cool period in July is not.

The definitions of the hazards follow. Because prior conditions play a role in impacts of the hazards, the following definitions are only guidelines:

Hazard	Nominal Threshold	Lower Threshold
Heavy Precipitation	Heavy precipitation - 3-day total precipitation exceeding the 85th climatological percentile and >1"	Flooding Saturated Soils
Heavy Snow	3-day accumulated precipitation exceeding the 85th climatological percentile and >0.5" and temperatures falling to values conducive to snow. It	

	<p>should be noted that at the current time, the hazards forecasters do not base the risk levels on a probabilistic model guidance tool of snowfall amounts since there is not one available yet. The forecaster uses the probabilities from the heavy precipitation (liquid equivalent) and temperature tools to determine a risk level. The CPC is currently developing an objective probabilistic snowfall tool to assist in these situations.</p>	
Frozen Precipitation	<p>Identifies any potential risk of frozen precipitation that is not necessarily classified as heavy snow. This may include, e.g., icing, wintry mix, sleet. There may or may not be an associated highlighted possibility of heavy precipitation for an overlapping frozen precipitation area.</p>	
Much below normal minimum temperatures	<p>Daily minimum temperatures less than the 15th percentile and near freezing or sub-freezing (or other temperature deemed hazardous) temperatures.</p>	<p>Predicted temperatures are likely to cross a physically significant value*</p>
Much above normal maximum temperatures	<p>Daily maximum temperatures greater than the 85th percentile and temperatures reaching 90F or greater, or night time lows above 80F.</p>	<p>Predicted temperatures are likely to cross a physically significant value*</p>
High winds	<p>Sustained wind speeds reaching the 85th percentile as well as reaching 25 to 50 miles per hour, at any time over a 3-day period.</p>	
Flooding	<p>Highlights possible flooding that may extend into the Week-2 period based on current conditions and favored Week-1 precipitation and temperature outlooks. Specific information is outlined in the text discussion as each case in these situations often requires additional context.</p>	<p>CPC coordinates with the relevant area River Forecast Center (RFC) and the National Water Center (NWC) on these cases. CPC is working to formalize this protocol now.</p>
Rapid Onset Drought *Experimental* *Updated Thursday*	<p>(1) abnormal dryness (D0) in the current U.S. Drought Monitor (2) soil moisture below the 30th percentile (3) 7-day positive temperature anomalies from the NDFD, especially if a period of</p>	

	<p>extreme heat is possible (4) no precipitation forecast or negative precipitation anomalies from the WPC (5) Warm and/or dry conditions favored in the Week-2 outlook</p> <p>These conditions are markers for potential degradation of two categories or more in a four-week period based on the U.S. Drought Monitor.</p>	
Excessive Heat	<p>Heat Index values (summer season) >100°F northern tier >105°F southern tier >115°F southwest</p>	<p>Predicted temperatures are likely to cross a physically significant value* First heat wave of the warm season.</p>
Enhanced Fire Weather Conditions	<p>Subjective evaluation of antecedent conditions and threat of high winds and low relative humidity; coordinate postings with the Storm Prediction Center (SPC).</p>	
Significant Waves	<p>Significant wave heights greater than 20 feet.</p> <p>Subjective evaluation of the intensity and duration of sustained onshore flow, high winds, likelihood of coastal flooding / erosion</p>	

*Temperatures above freezing in Alaska, during the winter, can pose a hazard to travel on ice roads, and cause icing on highways. An early frost or freeze over agriculturally sensitive areas.

b. Availability – The CPC Week-2 U.S. Hazards Outlook is released daily Monday through Friday typically between 2:30 – 4:00 PM ET, but always before 5 PM ET.

c. Additional Information – None additional at this time.