2023 National Hydrologic Assessment

Released on March 16, 2023

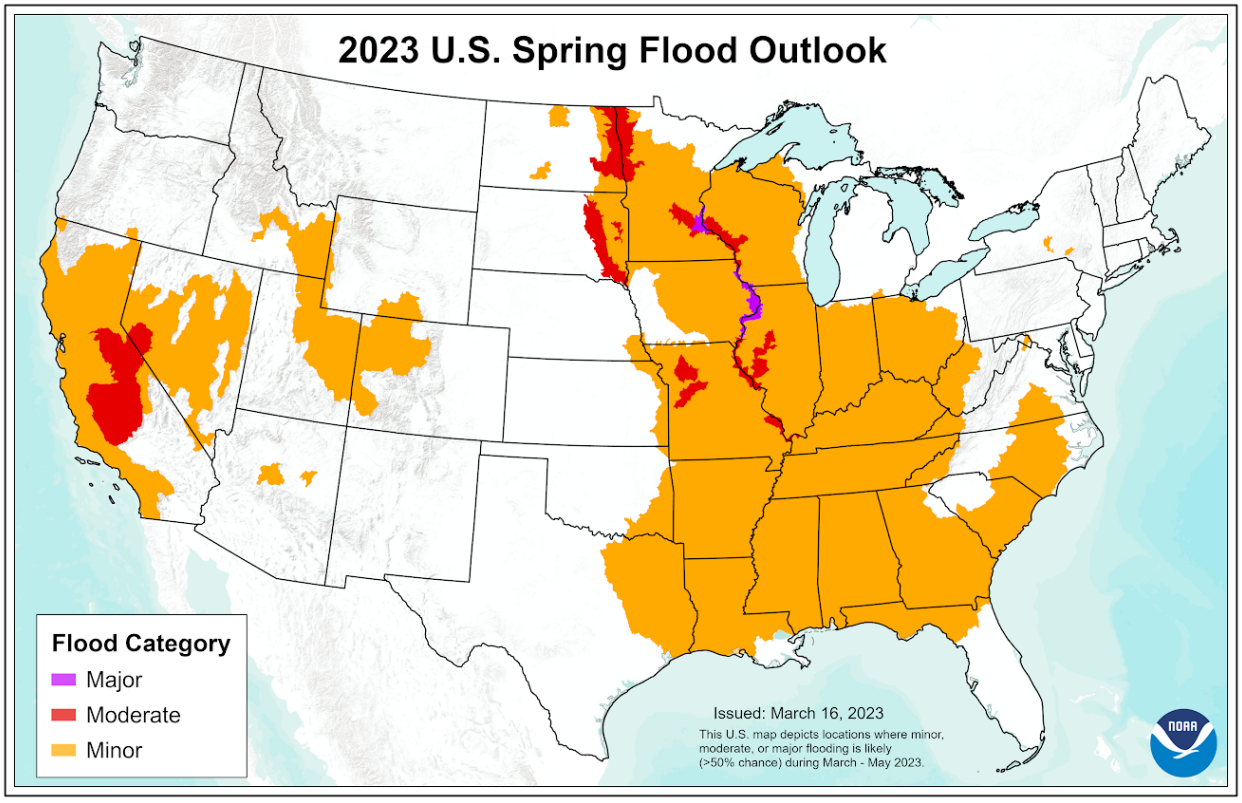

Figure 1: National Spring Flood Risk defined by risk of exceeding Minor, Moderate, and Major Flood Levels.

Executive Summary

The 2023 National Hydrologic Assessment offers an analysis of flood risk, water supply, and ice break-up and jam flooding for spring 2023 based on late summer, fall, and winter precipitation, frost depth, soil saturation levels, snowpack, current streamflow, and projected spring weather. NOAA's network of 122 Weather Forecast Offices, 13 River Forecast Centers, National Water Center, and other national centers nationwide assess this risk, summarized here at the national scale.

This spring season, approximately 146 million people are at risk for flooding in their communities, with nearly 6.4 million at risk for moderate flooding and 1.4 million at risk for major flooding.

An active winter with above normal snowpack has led to the potential for major flooding along portions of the Upper Mississippi River. Moderate flooding is expected along the Red River of the North in North Dakota and the James River in South Dakota. Numerous atmospheric river events in the west, combined with near record snowpacks, have led to recent widespread flooding throughout California, including ongoing minor to moderate river flooding. Above normal snowpacks in the Sierra Nevada, Great Basin, and portions of the Central Rockies will lead to the continued potential for minor to moderate flooding for higher elevation basins in those areas as well as portions of the Upper Snake River.

Current water supply forecasts in the western United States indicate above normal water supply conditions over California, Nevada, the Great Basin, and the Colorado River due to well above normal snowpacks. Over the Northwestern United States as well as the Upper Missouri, Arkansas, and Rio Grande basins, normal to below normal water supply volumes are expected. This is due to a combination of near to below normal snowpack.

In Alaska, spring ice breakup and snowmelt flood potential is forecasted to be normal for the majority of the state with some exceptions. The flood potential is expected to be above normal for the Upper Yukon, Upper Tanana, and portions of the Copper River basins.

Based on the expected spring flood outlook, average hypoxia zones are expected for the Gulf of Mexico and for the Chesapeake Bay.

Heavy, Convective Rainfall and Flooding

The information presented in this report focuses on spring flood potential, using evaluation methods analyzed on the timescale of weeks to months, not days or hours. Heavy rainfall at any time can lead to flooding, even in areas where the overall risk is considered low. Rainfall intensity and location can only be accurately forecast days in the future; therefore, flood risk can change rapidly. Stay current with flood risk in your area with the latest official watches and warnings at weather.gov. For detailed hydrologic conditions and forecasts, go to water.weather.gov.

NOAA's Experimental Long Range River Flood Risk Assessment

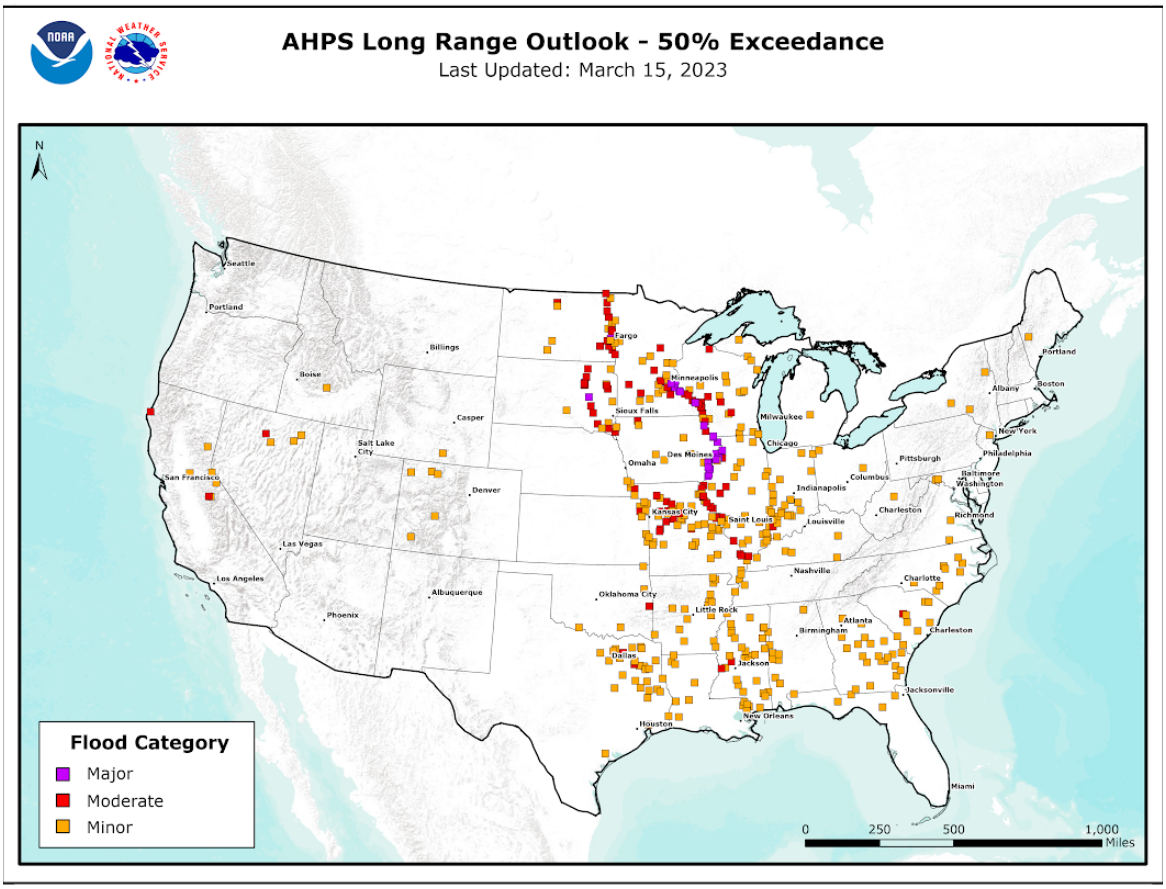

Figure 2: Greater than 50% chance of exceeding minor, moderate, and major river flood levels during April through June, 2023

At the request of national partners, including the Federal Emergency Management Agency (FEMA) and the US Army Corps of Engineers (USACE), the National Oceanic and Atmospheric Administration (NOAA) continues its improved decision support services with the "Long Range

River Flood Risk" web page available at: https://water.weather.gov/ahps/long_range.php. Here, stakeholders can access a single, nationally consistent map depicting the 3-month risk of minor, moderate, and major river flooding as shown in Figure 2. This risk information is based on NOAA's Ensemble Streamflow Prediction (ESP) forecasts which are generated for approximately 2,600 river and stream forecast locations across the nation. With this capability, stakeholders can quickly view flood risk predicted to affect their specific area of concern. The Long-Range River Flood Risk improves the value of the National Hydrologic Assessment by clearly and objectively communicating flood risk at the local level.

The sections below quantify river flood risk based on the river location having a 50% or more likelihood of exceeding minor, moderate, or major flood levels. The National Weather Service (NWS), in coordination with local officials, defines flood levels for each of its river forecast locations, based on the impact over a given area. The flood categories are defined as follows:

- Minor Flooding: Minimal or no property damage, but possibly some public threat (e.g., inundation of roads).
- Moderate Flooding: Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations.
- Major Flooding: Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.
- Record Flooding: Flooding which equals or exceeds the highest stage or discharge observed at a given site during the period of record. The highest stage on record is not necessarily above the other three flood categories – it may be within any of them or even less than the lowest, particularly if the period of record is short (e.g., a few years).

Upper Mississippi River, the Red River of the North Basins, and the Great Lakes Region

Minor river flooding is currently ongoing or forecast across portions of northern Illinois and northern Indiana due to recent rainfall and snowmelt across the region. Moderate to major flooding is possible this spring along the mainstem of the Mississippi River from the Twin Cities, Minnesota to Keokuk, Iowa. Minor to moderate flooding is possible along portions of the Mississippi River mainstem from Keokuk, Iowa to St. Louis, Missouri, and the Red River of the North, Souris, and Illinois River basins. Minor river flooding is possible in basins draining into Lake Superior, Wisconsin River, Rock River in Illinois, and Meramec River Basin in southeast Missouri. Widespread ice jam flooding is not anticipated due to rivers having generally less ice than normal this winter.

Drought conditions prevailed over much of the region through summer and fall of 2022, which led to decreased soil moisture values heading into winter freeze up. Temperatures have fluctuated between above and well below normal through the winter; therefore, when combined with early season snowfall which provided insulation to the ground, frost depth values are less than normal over most of the region. Streamflows are generally above normal across portions of Iowa, northern Illinois, northern Indiana, southern Michigan, and extreme southern Wisconsin with generally normal streamflows elsewhere across the region. Recent storms have resulted in above normal snowpack over North Dakota, Minnesota, northern Wisconsin, and portions of the Michigan Upper Peninsula with near normal to below normal snowpack elsewhere. Above normal soil moisture is present across these same areas with the exception for portions of North Dakota and northwest Minnesota. Looking forward, any potential flooding will be highly dependent on how quickly the snowpack will melt out as well as future rainfall trends over the next several weeks.

Ohio, Cumberland, and Tennessee River Valleys

Minor river flooding is ongoing in the Wabash River Basin in the Lower Ohio Valley. There is potential for minor river flooding for much of the combined Ohio, Cumberland, and Tennessee valleys including the mainstem of the Lower Ohio River and the Wabash and White River basins. Streamflows are generally below normal in upper portions of the Ohio River Valley and near normal in portions of the Lower Ohio, Cumberland, and Tennessee River Valleys. Soil moisture is generally normal across most of the region. There is currently no significant snowpack or river ice in place. An active rainfall period is expected with above normal precipitation possible over the next several months; however, some uncertainty remains with the recent ending of the La Niña pattern that was in place over the winter. Typically, convective storms are the main drivers of spring flooding in the area.

Missouri River Basin

Minor to moderate flooding will be possible along several of the tributaries to the Missouri River in the lower third of the basin this spring. Minor flooding is possible along the Missouri River mainstem downstream of Nebraska City, Nebraska. Flooding in the lower third of the Missouri River Basin is mainly driven by springtime thunderstorm activity. A delayed melt of the abundant snowpack in portions of the upper basin has increased the flooding concerns this spring in portions of the mountainous west and Northern Plains. Minor to moderate flooding along the James, Big Sioux, and Vermillion Rivers in the Plains is possible due to above normal snowpack. There is also the potential for minor flooding in the North Platte River Basin in Colorado and Wyoming.

Although streamflows have been below normal, periods of significantly cold temperatures have allowed for river ice development throughout the basin. This has resulted in minor, localized impacts. However, a low potential for ice jam flooding is present for this spring.

Arkansas and Red River Basins

Widespread drought is in place over the area, with approximately 70% of the combined Arkansas and Red River basins currently experiencing drought. Accordingly, soil moisture values over most of the basins are below normal, with the driest soils over the Oklahoma and Texas Panhandles, western Kansas, northeast New Mexico, and southeast Colorado. Streamflows are generally well below normal in upper portions of the basins and normal to above normal in lower portions of the basins including eastern Oklahoma, extreme southwest Missouri, and western Arkansas. These factors combined suggest minor flooding will be possible along tributaries of both the Lower Red and Lower Arkansas Rivers in eastern Oklahoma and western Arkansas. Flooding in the Colorado Rocky Mountains is typically driven by rapid snowmelt or isolated, high-intensity rainfall. Flooding elsewhere in the Arkansas and Red River basins are typically related to spring rainfall events.

Lower Mississippi River Basin and its Tributaries

Minor river flooding is ongoing over tributaries of the Mississippi River including the Lower Ouachita River in Arkansas. Minor to moderate river flooding is ongoing in the White River basin in Arkansas. Minor to moderate flooding is possible this spring for the Lower Ohio mainstem and Lower Mississippi mainstem above the Ohio River. Minor flooding is possible along the mainstem of the Mississippi River south of the Ohio River and along tributaries throughout the region. This is based on the current near to above normal soil moisture and streamflows, along with predicted precipitation patterns through the remainder of spring.

Texas and Southwest Louisiana

Minor river flooding is ongoing along the Angelina River in East Texas. Minor flooding is possible this spring across portions of eastern Texas and southwest Louisiana where January through April is the typical period for high streamflows for this region. Soil moisture and streamflow conditions are also generally wetter in eastern Texas and southwest Louisiana with drier conditions including drought across much of the remainder of Texas. These factors combined, indicate typical minor flooding in East Texas and southwest Louisiana this spring.

Southeastern United States

Minor flooding will be possible across the Coastal Plain and interior portions of the Southeast and northern Florida through early April with a diminishing chance of flooding late April into May. Recent below normal precipitation has led to below normal streamflows and soil moisture across southern Alabama, southern Georgia, and northern Florida. Precipitation over the next three months is expected to be normal across interior portions of the region. Further south across the Florida Peninsula, precipitation has been below normal resulting in below normal soil moisture, below normal streamflows, and expansion of drought. Precipitation over the next three months is expected to have equal chances of above normal or below normal, and drought is expected to improve. River flooding in late spring is minimal for the Florida Peninsula.

Northeast

Minor flooding is ongoing in eastern Massachusetts due to recent heavy rainfall and snowmelt. For the remainder of the spring, widespread flooding is not anticipated in any specific basins at this time; however, recent storms have left an above-normal snowpack for much of the region for this time of year. Soil saturation and streamflows are near to above normal in the same areas. Given this, flood concerns will be highly dependent on how quickly melt occurs. There is also a normal to above normal potential for ice jams in extreme northern New York, Vermont, New Hampshire, and interior Maine. Heavy rainfall at any time can lead to flooding regardless of ice or snowmelt; however, with no near term large scale runoff events forecast, expected cooler temperatures favor a more orderly melt at this time.

Middle Atlantic Region: Virginia, Maryland, Washington D.C., Pennsylvania, Delaware, and south-central New York

Minor flooding will be possible across portions of the Upper Potomac, Upper Susquehanna, and Upper Delaware River basins. Overall, winter precipitation has trended below normal, with areas of near to above normal precipitation scattered through the region. Streamflows are generally near to below normal for this time of year with soil moisture near to below normal with the exception of northeast and northcentral Pennsylvania and southcentral New York where soils are wetter. There is currently little or no snow cover and no river ice with the exception of northeast Pennsylvania and southcentral New York. Snow cover is above normal across the northern portions of the region with no snow cover further south which is normal for this time of year. In the Mid-Atlantic region, heavy rainfall is the primary factor which leads to river flooding.

Western U.S.

California

Minor flooding is ongoing along the Sacramento, Salinas, Merced, and San Joaquin Rivers due to a recent atmospheric river. Many rivers and streams along the Sierra Nevada foothills, especially in the San Joaquin Valley, will continue to run high through the next week from a combination of heavy rainfall and snowmelt.

Minor to moderate flooding will be possible across the Sierra Nevada foothills and the upper San Joaquin Valley with minor flooding possible elsewhere including portions of northern California, coastal areas of the state, and the lower San Joaquin Valley. Record to near-record snowpacks are in place in the Sierra Nevada. Soil moisture and streamflows are above normal across most of the state due to multiple atmospheric rivers this winter, leaving many areas vulnerable to flooding. Probabilities exist for normal precipitation through spring; however, given the remaining snowpack, minor to moderate flooding will be possible along rivers and streams within headwaters in the Sierra Nevadas. Many basins in the Sierra Nevada do not typically flood from snowmelt alone; however, late season snowmelt driven flooding is possible in some higher elevation headwaters.

Remainder of the Western US

Minor to moderate flooding is forecast or occuring in portions of central Arizona, far eastern Nevada, and in western Nevada along eastern slopes of the Sierra Nevada to due a combination of rain and snowmelt.

Minor river flooding is possible across the Truckee, Carson, Humboldt River basins in Nevada and the Central Nevada Desert basins, with moderate flooding possible in the Walker River basin of Nevada. Minor flooding is also possible in basins across northeast Utah, western Colorado, and southcentral Wyoming including the Lower Green, Dolores, headwaters of the Upper Colorado, and White-Yampa basins. Minor river flooding is possible across portions of the Upper Snake River Basin in eastern Idaho including the Willow Creek, Bear, Big Wood, Big Lost, and Blackfoot basins as well as low-lying areas in the eastern Snake River Plain. Minor river flooding is also possible in the Upper Verde and Middle Little Colorado River basins in central Arizona.

Generally, mid-March is usually too early to determine spring flooding potential with any confidence due to snowmelt across the western United States, since snowpacks at higher elevations may continue to build through the spring. However, above-normal snowpacks are already in place in portions of the Great Basin including eastern Idaho, northern Nevada, northeast Utah,northwest Colorado, the Cascade Ranges, portions of the Northern and Central

Rockies, and portions of Arizona which will increase flooding potential in the longer term. Streamflows are generally below normal across most of the region with the exception of Arizona where streamflows are above normal. Soil moisture tends to follow a similar trend with more saturated soils across Arizona, Utah, and western New Mexico. Many parts of Arizona typically do not flood from snowmelt alone.

Water Supply

Western U.S.

Water supply forecasts are produced by the River Forecast Centers in the western United States. Forecasts are impacted by current and antecedent hydrologic conditions including snowpack, soil moisture, weather forecasts, and climate information. As these conditions change, especially over the next couple months, forecasts will be updated to reflect these changes at the Western Water Supply Forecasts page. For detailed information on current drought conditions, please see the US Drought Monitor website. Drought and climate outlook information can be found on the NOAA's Climate Prediction Center's website.

Northwest

Most basins through the Northwest are forecast to experience normal to below normal water supply for April through September due to overall mix of above to below normal snowpack and below normal precipitation. Portions of the Upper Snake River basin will see normal to above normal water supply through September. Higher elevation mountain snowpack is normal to above normal over much of the Northwest, with below normal snowpack over the Upper Columbia basin as well as over many lower elevations. However, recent precipitation has been near to below normal, with some basins as a whole running behind their typical seasonal peak snowpack values. Water supply forecasts driven by runoff volume for April through September across the Northwest are summarized below:

- Upper Columbia basin: 80 to 100% of normal
- Snake River basin: 80 to 175% of normal
- Columbia River at The Dalles (a good index of conditions across the Columbia Basin): 85% of normal
- Northeast Oregon basins: 80 to 100% of normal
- Northwest Oregon basins: 90 to 100% of normal
- Southern and central Oregon basins: 50 to 90% of normal
- Northwestern Washington basins: 80 to 115% of normal

- Southwestern Washington basins: 90 to 115% of normal
- Eastern Washington and northern Idaho: 90 to 100% of normal
- Western Montana basins: 65 to 95% of normal

California

Normal to well above normal water supply runoff volumes are forecast in California for April through July this year. The overall mountain snowpack is well above normal to record values throughout the state, with northern areas at 170% of normal, the central Sierra Mountains at 210% of normal, and the southern Sierra Mountains at 250% of normal. A multi-year, statewide meteorological drought continues; however, there has been significant improvements in drought conditions this winter due to multiple atmospheric river events. Runoff volumes are forecast for April through July throughout the state as summarized below:

- Lower Klamath River Basin: 100 to 130% of normal
- Sacramento River Basin: 100 to 200% of normal
- San Joaquin River Basin: Greater than 200% of normal
- Northern California Coast: 90 to 120% of normal

Nevada

Normal to well above normal water supply runoff volumes are forecast for April through July in Nevada due to well above normal snowpack. Snowpack across the state ranges from 150% to over 200% of normal over almost all basins. As we enter the spring snowmelt season, above normal streamflow conditions are present along the lee side of the Sierra Nevada range due to winter precipitation events. The April through September runoff forecasts in Nevada are as follows:

- Rivers and streams of the eastern Sierra: Greater than 200% of normal
- Humboldt Basin: 120 to 200% of normal

Colorado River and Great Basin

Near normal to above normal water supply runoff volumes are expected across the Upper Colorado River Basin and Great Basin. Water year precipitation to date has been above normal over most of the region, with snowpacks generally well above normal with many basins reporting 150% or more of normal snowpack. Drought remains over the basins; however most

basins are expected to have normal or above normal runoff. The April through July water supply forecasts for the Upper Colorado River Basin are listed below:

- Yampa and White Basin: 120 to 150% of normal
- Upper Colorado Mainstem: 130% of normal
- Gunnison Basin: 95 to 140% of normal
- Upper Green Basin: 80 to 105% of normal
- Dolores and San Miguel Basin: 120 to 160% of normal
- San Juan Basin: 95 to 130% of normal

Unregulated seasonal inflow forecasts between April and July for some of the major reservoirs in the Upper Colorado River Basin include the following:

- Flaming Gorge: 105% of normal
- Blue Mesa Reservoir: 120% of normal
- McPhee Reservoir: 160% of normal
- Navajo Reservoir: 125% of normal
- Lake Powell: 140% of normal

Through the Eastern Great basin and the Lower Colorado River basin, snowpack values are generally well above normal, with values in excess of 150% of normal. The April through July water supply forecasts for the eastern Great Basin and the January through May forecasts for the Lower Colorado River basins, which includes the January through June water supply forecast for the Little Colorado basin, are listed below:

- Eastern Great Basin
    - Bear: 130 to 200% of normal
    - Weber: 120 to 150% of normal
    - Six Creeks: 130 to 200% of normal
    - Provo/Utah Lake: 150 to 200% of normal
    - Virgin: 120 to 155% of normal
    - Sevier: 180 to 250% or more of normal
- Lower Colorado River Basin

    - Little Colorado and Upper Gila: 70 to 180% of normal
    - Salt: 150 to 200% of normal
    - Verde: 180% of normal

Water Resources East of the Rockies

Seasonal temperature outlooks favor a chance for overall warmer than normal conditions across the Southern Rockies and Southern Plains into the South and along the East Coast for spring into the summer months. Cooler than normal temperatures are expected over the Upper Missouri and Upper Mississippi basin. Precipitation outlooks suggest normal to below normal probabilities over the Southern Rockies and portions of the Southern Plains through spring, with normal to above normal precipitation probabilities indicated over portions of the Middle Mississippi River and Ohio Valleys and into the Great Lakes and Mid-Atlantic.

Across the Southern Rockies into the Southern Plains, drier than normal conditions are expected to lead to drought persistence and expansion over those regions. Drought conditions are expected to improve over portions of the Central to High Plains as well as Florida through the spring with the expectation of an equal chance of precipitation over the region.

Upper Missouri River Basin

Water supply runoff volumes are generally forecast to be below normal across the Upper Missouri River Basin through September, with some higher elevation basins expected to have above normal runoff volumes. Snowpack values are normal to above normal through the region; however, the ongoing drought conditions over much of the Upper Missouri basin has resulted in below normal soil moisture conditions, which are expected to persist through the spring. The April through September water supply runoff forecasts for the Upper Missouri River Basin are listed below:

- Upper Missouri River Basin
    - St. Mary & Milk River: 30 to 45% of normal
    - Upper Missouri Basin above Fort Peck, Montana: 60 to 90% of normal
- Yellowstone Basin
    - Yellowstone River above Sidney, Montana: 70 to 110% of normal
    - Tongue Basin: 70 to 80% of normal
    - Powder River: 60 to 70% of normal

- Platte Basin
    - North Platte River at Seminoe Reservoir: 125% of normal
    - South Platte Basin at South Platte: 60% of normal
    - Remainder of the South Platte Basin: 50 to 100% of normal

Upper Arkansas River Basin

Normal to below normal water supply runoff volumes are forecast across the headwaters of the Upper Arkansas River Basin due to below normal winter precipitation. Snowpack through the region is below normal, and combined with ongoing, widespread drought. Increased chances for normal to below normal precipitation are predicted to continue through the spring along with persisting drought, little improvement is expected. The April through September water supply runoff forecasts for the Upper Arkansas River Basin are listed below:

- Arkansas River at Salida: 90% of normal
- Arkansas River above Pueblo Reservoir: 80% of normal
- Cucharas River near La Veta: 60% of normal
- Huerfano River near Redwing: 70% of normal
- Purgatoire River at Trinidad: 40% of normal

Upper Rio Grande Basin

Normal water supply runoff volumes are forecast for the Upper Rio Grande and Pecos Basin headwaters. Snowpack, streamflows, and soil moisture conditions are near normal over the Upper Rio Grande basin; however, widespread drought is in place over the Pecos Basin, which is predicted to persist through the spring. This has resulted in below normal soil moisture conditions going into spring runoff. Selected seasonal water supply forecasts from April through September are listed below:

- Rio Grande Headwaters: 100 to 115% of normal
- Pecos River near Santa Rosa: 95% of normal

Northeast

No widespread water supply issues are predicted over the Northeast this spring. Reservoir and groundwater levels are generally near to above normal across the region with no known large

scale deficits. Early snowmelt has provided reservoirs and streams with recharge and probabilities exist for above normal precipitation through the remainder of March across the region; hence, no widespread water supply shortage is predicted this spring.

Mid-Atlantic

Water supply shortages are not anticipated this spring in most locations, assuming near normal to above normal precipitation through April. Small pockets of abnormally dry conditions exist over portions of the region and a small area of drought is present over the Delmarva peninsula. Reservoir storage is generally near normal across the region (including the Delaware River Basin that supplies New York City water) except in southern areas where near to below normal reservoir levels are being observed.

Alaska Spring Ice Breakup Outlook

There is an average potential for spring ice breakup and snowmelt flood for most of the state with a few exceptions. The potential for ice jam flooding along the Upper Yukon River is above average due to freeze up ice jams which resulted in jumbled ice that is likely thicker than average. The ice jam and snowmelt flooding potential in the Upper Tanana River Basin and areas of the Copper River Basin is above average due to a well above normal snowpack. This outlook is based on observed snowpack, ice thickness reports, and seasonal temperature outlooks.

River Ice

River ice observations are available for a limited number of observing sites in Alaska. Late February and early March measurements and reports indicate that ice thickness is slightly thinner than average. Ice measurements in the Interior are generally 70 - 90% of average, with one site reporting 130% of average. On the Kuskokwim River, observers reported thinner than average ice due to early season snow and a mild start to the winter with one localized freeze up jam and thicker ice reported near Aniak. A series of freeze up jams on the Upper Yukon River resulted in high water levels during freeze up with rough ice that is likely thicker than average.

Cumulative freezing degree days (FDD), which can serve as an indicator of ice thickness, are generally near normal statewide. FDD are 80 - 90% of normal on the North Slope and 90 - 100% of normal for the rest of mainland Alaska.

Snowpack

Analysis of the March 1st snowpack by the Natural Resources Conservation Service (NRCS) indicates an above normal snowpack for the majority of the state.

The snowpack in the Upper Yukon (largely in Canada) is above normal; snow surveys reported 100 - 150% of normal. Near the US/Canadian Border, stations reported 150% of normal at the Boundary and Chicken sites, decreasing to 90 - 120% of normal further east, with Mayo at 122%, Burns Lake at 114% and Edwards Lake at 96%. The FortyMile River, which flows into the Yukon River upstream of Eagle is at 150% of normal, with Mt Fairplay at 165% of normal, and Chicken, Boundary, and Three Fingers sites all near 150% of normal. The Tanana River basin average is approximately 140% of normal, with the outliers of Tok and Chisana near the Canadian border at 200% and 175% of normal, respectively. The Middle Yukon River basin, from Fort Yukon to Galena, is at approximately 130% of normal as reported by nine stations. Data are available for two stations in the Koyukuk basin; Bettles in the southern Brooks Range and Coldfoot to the northeast reported 120% and 84% of normal, respectively. Four sites on the Lower Yukon, downstream of Galena, reported approximately 120% of normal.

The Kuskokwim Basin in southwest Alaska is likely above normal. Telaquana Lake in the headwaters of the basin recorded the fourth highest value in twenty five years of operation and sites in McGrath reported considerably above average snowpack.

For the Arctic, the snowpack ranges from slightly below normal along the western North Slope to slightly above normal to the east of the Dalton Highway.

In Southcentral Alaska, the Copper Basin reported approximately 140% of normal, with the highest snowpack in the northern portion of the basin at 200% of normal. For the Susitna River, the basin average is 125% of normal, with Talkeetna and Susitna Valley High at 140% and 146% of normal, Skwentna at 101% of normal, and the East Fork of the Chulitna at 90% of normal.

Stations on the Kenai Peninsula are reporting a range of values, with the headwaters of the Kenai River at near normal snowpack, and Port Graham on the southern tip of the peninsula at 180% of normal.

Climate Outlook

The most important factor determining the severity of ice breakup remains the weather during April and May. Dynamic breakups with a high potential for ice jam flooding typically require cooler than average temperatures for most of April followed by an abrupt transition to warm, summer-like temperatures in late April to early May.

The Climate Prediction Center (CPC) outlook for April suggests increased chances of above average temperatures for the northeast portions of the state and chances of below average

temperatures for the southwest areas of Alaska including the lower reaches of the Kuskokwim and Yukon Rivers. The longer Three Month Outlook, which includes March, April and May, indicates increased chances for above average temperatures across the North Slope.

This temperature paradigm for April would increase the overall flood potential along the lower Kuskokwim and Yukon Rivers. These larger rivers in Alaska are westward flowing, and cooler temperatures on the west coast would keep stronger ice in place while warmer temperatures to the northeast could accelerate snowmelt, increasing the chances for a dynamic breakup and ice jams.

Spring Flood Outlook and Implications for Gulf of Mexico and Chesapeake Bay Hypoxia

In the northern Gulf of Mexico, a large area of low-oxygen forms in the bottom waters during the summer months, often reaching in excess of 5,000 square miles. This area of low-oxygen, otherwise known as the “dead zone”, is strongly influenced by precipitation patterns in the Mississippi-Atchafalaya River Basin (MARB), which drains over 41% of the contiguous United States. Changes in precipitation influence river discharges into the Gulf, which carry the majority of nutrients fueling the annual dead zone, so examining spring flood risk in the basin can provide a useful indicator of the possible size of the dead zone during the summer.

The predicted spring flood risk across the MARB will likely lead to average or normal hypoxic conditions in the northern Gulf of Mexico this summer. Large portions of the basin are predicted to have a normal risk of flooding this spring. Absent major flooding, normal springtime discharges of nutrients and freshwater from the Mississippi River are predicted.

In the Chesapeake Bay, recurring summer hypoxia has also been linked to nutrient loading and river discharge, especially from the Susquehanna and Potomac rivers. The spring flood outlook for these basins does not indicate an elevated risk of flooding. As a result, an average hypoxia zone for the Chesapeake Bay under typical summer conditions is expected.

Flood conditions, should they occur in the Mississippi-Atchafalaya, Susquehanna, and Potomac rivers, may lead to higher than normal springtime discharges and promote formation of a larger hypoxia area. This cause and effect relationship can be confounded by weather events, such as tropical storms and hurricanes, which can locally disrupt hypoxia formation and maintenance, like what has happened in previous years in the Gulf of Mexico.

The spring flood outlook provides an important first look at some of the major drivers influencing summer hypoxia in the Gulf of Mexico and Chesapeake Bay. In early June, NOAA and others utilize measured river discharge amounts and nutrient concentrations from the U.S. Geological Survey to release annual dead zone forecasts for the Gulf of Mexico and

Chesapeake Bay. The forecasts are then compared to the measured size to help the Gulf of Mexico/Mississippi River Watershed Nutrient Task Force and Chesapeake Bay Program evaluate the role that factors such as watershed nutrient loading have on the size of dead zones in these regions. The National Weather Service and Ocean Service continue to work with States to develop new tools to forecast runoff risk which help limit nutrient runoff to waterways by identifying the optimal times for fertilizer application within these and other watersheds.

NOAA's Role in Flood Awareness and Public Safety

Floods kill an average of 90 people each year in the US. The majority of these cases could have been easily prevented by staying informed of the flood threat and following the direction of local emergency management officials.

To help people and communities prepare, NOAA offers the following flood safety tips:

- Determine whether your community is in a flood-risk area and continue monitoring local flood conditions at https://water.weather.gov.
- Learn what actions to take to stay safe before, during and after a flood at https://www.weather.gov/safety/flood and https://www.ready.gov/floods.
- Visit https://www.floodsmart.gov to learn about FEMA's National Flood Insurance Program and for flood preparedness advice to safeguard your family, home and possessions.
- Purchase a NOAA Weather Radio All- Hazards receiver with battery power option to stay informed of quickly changing weather information.
- Study evacuation routes in advance and heed evacuation orders.
- Turn Around, Don't Drown – never cross flooded roads, no matter how well you know the area or how shallow you believe the water to be.

NOAA's National Weather Service is the primary source of weather data, forecasts, and warnings for the United States and its territories. It operates the most advanced weather and flood warning and forecast system in the world, helping to protect lives and property and enhance the national economy. Visit us online or on Facebook and Twitter.

NOAA's mission is to understand and predict changes in the Earth's environment, from the depths of the ocean to the surface of the sun, and to conserve and manage our coastal and marine resources. Visit us online or on Facebook and Twitter.

About This Product

The National Hydrologic Assessment is a report issued each spring by the NWS that provides an outlook on U.S. spring flood potential, river ice jam flood potential, and water supply. Analysis of flood risk integrates late summer, fall, and winter precipitation, frost depth, soil saturation levels, streamflow, snowpack, temperatures, and rate of snowmelt. A network of 122 Weather Forecast Offices and 13 River Forecast Centers nationwide assess the risk summarized here at the national scale. The National Hydrologic Assessment depicts flood risk over large areas, and is not intended to be used for any specific location. Moreover, this assessment displays river and overland flood threat on the scale of weeks or months. Flash flooding or debris flow, which accounts for the majority of flood deaths, is a different phenomenon associated with weather patterns that are only predictable days in advance. To stay current on flood risk in your area, go to water.weather.gov for the latest local forecasts, warnings, and weather information 24 hours a day.