

Global Water Monitor & Forecast Watch List

September 15, 2023

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Introduction

The ISciences Water Security Indicator Model (WSIM) monitors and forecasts water anomalies on a global basis. Each month we produce data and a report that document current conditions and provide forecasts with lead times from 1 to 9 months. WSIM has been run continuously since April 2011 and has been validated against subsequently observed data. ISciences also provides assessments of the impacts of water anomalies on people, agriculture, and electricity generation. Detailed data and reports are available for purchase. Additional information and pricing are available upon request.

We have recently completed the latest Water Security Indicator Model (WSIM) analysis of global water anomalies using observed temperature and precipitation through August 2023 and an ensemble of forecasts issued the last week of August 2023. This edition of Global Water Monitor & Forecast Watch List presents a selection of regions likely to encounter significant water anomalies in the next few months.

This edition uses results from a new version of WSIM that uses temperature and precipitation data from the ECMWF Reanalysis v5 ([ERAS](#)) instead of gridded station data published by NOAA's Climate Prediction Center. Spatial resolution of the maps has sharpened from half-degree to quarter-degree and we expect higher fidelity in sparsely instrumented regions of the world. We have also changed the baseline period for computing statistical distributions from 1950-2009 (60 years) to 1981-2020 (40 years) to rely more exclusively on data from the satellite era. We will be publishing more details and some side-by-side comparisons of the two versions of WSIM in the coming days. Visit <https://wsim.isciences.com> for details.

All maps have quarter-degree resolution and depict our composite water anomaly index, which is based on WSIM estimates of soil moisture, evapotranspiration [deficit](#), runoff, and total blue water anomalies. Shades of red indicate deficits and shades of blue indicate surpluses. Since different variables are used to estimate deficits and surpluses, it is possible for a single half-degree cell to register both a [deficit](#) and a surplus. These cases are depicted on the maps in shades of purple, with the more extreme value (deficit or [surplus](#)) used to determine the shade.

Deficits and surpluses are stated in terms of return period – a measure that characterizes the rarity of an event. For example, a return period of 10 years indicates an event that would occur, on average, once every ten years. Higher return periods indicate more extreme and, therefore, more disruptive anomalies. Return period is computed by comparison to cell-specific distributions of data from 1950 through 2009. Anomaly levels correspond to return periods: abnormal=3-5 years, [moderate](#)=5-10 years, severe=10-20 years, extreme=20-40 years, and exceptional=greater than 40 years.

Please note that the WSIM model makes use of seasonal temperature and precipitation forecasts produced by the U.S. National Oceanic and Atmospheric Administration (NOAA) Climate Forecast System Version 2 (CFSv2). These forecasts predict broad temperature and precipitation patterns, but do not effectively predict singular events such as tropical storms. Detailed outlooks and analyses of tropical storms are available from the [NOAA National Hurricane Center](#).

There are numerous regions around the world where country borders are contested. ISciences depicts country boundaries on these maps solely to provide some geographic context. The boundaries are nominal, not legal, descriptions of each entity. The use of these boundaries does not imply any

judgment on the legal status of any territory, or any endorsement or acceptance of disputed boundaries on the part of ISciences or our data providers.

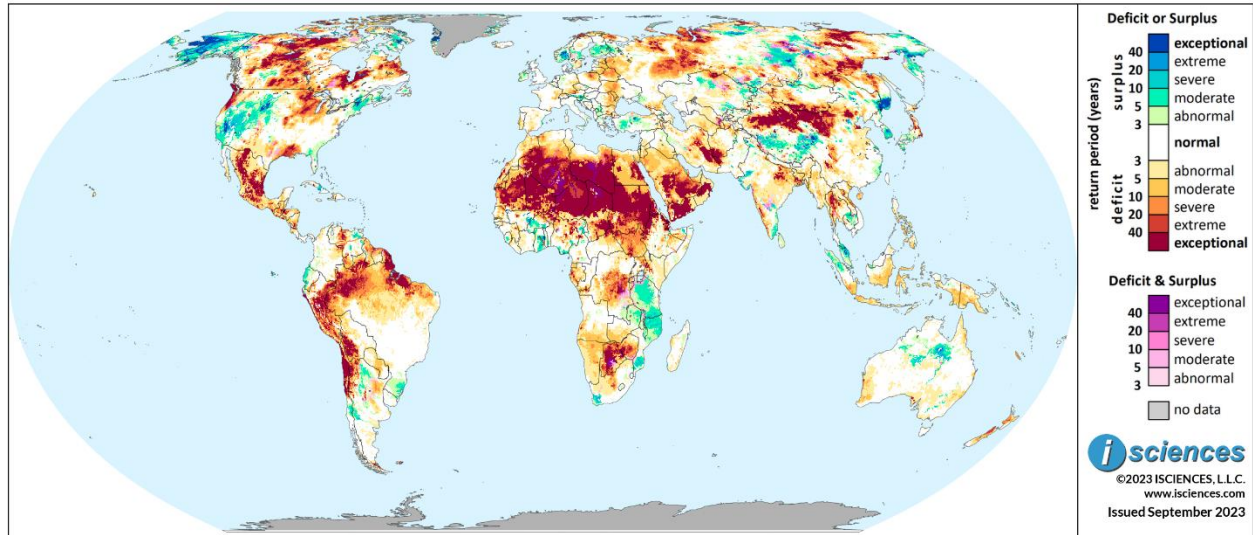
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Worldwide Water Watch List

This map presents a selection of regions likely to encounter significant water anomalies during the one-year period beginning in June 2023 and running through May 2024 using 3 months of observed temperature and precipitation data and 9 months of forecast data.

ISciences Water Anomalies Forecast: June 2023 - May 2024



Based on observed data through August 2023 and forecasts through May 2024

Watch List: Regional Synopsis

This synopsis provides highlights of regional water forecasts. More detailed analysis is available in “Watch List: Regional Details” immediately following the synopsis.

United States: Several western states are expected to endure intense surplus until November 2023 or longer, while some midwestern states are forecast to experience intense deficits until May 2024 or longer.

Canada: Most provinces are expected to observe exceptional deficits until February 2024 or longer.

Mexico, Central America, and the Caribbean: Regions in northwestern Mexico are expected to endure exceptional deficits until May 2024 or longer.

South America: Areas in northern Brazil and southern Bolivarian Nations are expected to observe exceptional deficits until May 2024 or longer.

Europe: Some regions of southern Europe are expected to observe intense surplus until November 2023.

Africa: Exceptional deficits in northern Africa are expected to continue until November 2023.

Middle East: Exceptional deficits are expected to be widespread throughout Saudi Arabia until November 2023.

Central Asia and Russia: Regions of western and northwestern Russia are expected to endure intense deficit until February 2024 or longer.

South Asia: Most regions are expected to observe near normal conditions, though areas of Pakistan and Afghanistan are expected to endure exceptional deficits until November 2023.

Southeast Asia and the Pacific: Much of Maritime Southeast Asia is forecast to endure widespread deficits until November 2023.

East Asia: Areas in western China are expected to observe surpluses which expand in magnitude throughout the Tibetan Plateau until May 2024 or longer.

Australia & New Zealand: Transitional conditions and surplus are expected to arise in eastern North Territory and western Queensland until November 2023 or longer.

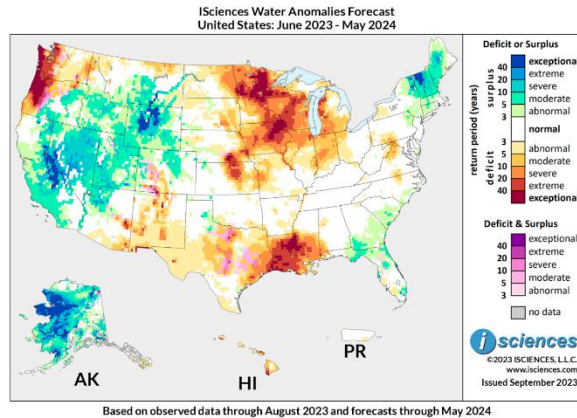
Watch List: Regional Details

United States

The 12-month forecast ending in May 2024 anticipates surpluses in western states will linger but lessen in intensity, with intense deficits occurring in some southern and northern states.

Severe to extreme deficits are anticipated in several areas, including:

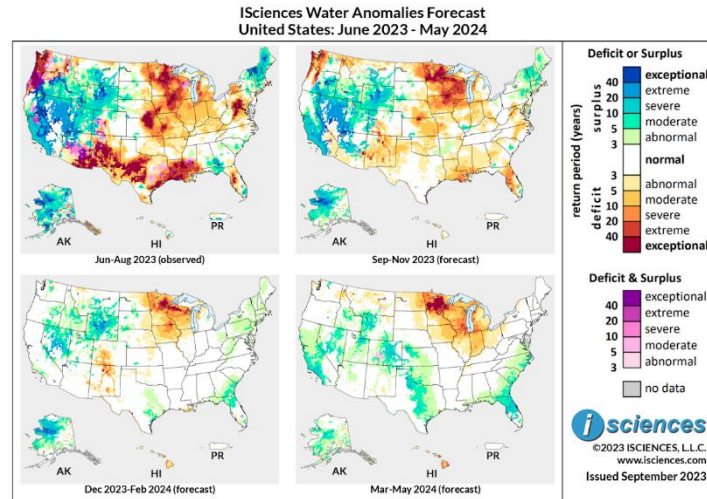
- **Louisiana**, throughout most of the state, spreading into southwestern **Mississippi**.
- Northeastern **Iowa**, continuing in pockets across central to northern **Minnesota** and throughout **Wisconsin**. Regions of western Michigan along the coast of Lake Michigan can anticipate similarly intense deficits.
- Coastal regions of the Pacific Northwest, spreading along western **Oregon** and **Washington**.
- East-central **Kansas**, in regions west of the Marais Des Cygnes River, spreading further north into southeastern **Nebraska**, in areas north of the Republican River.



Extreme to exceptional surpluses are expected to occur in the following areas:

- Central **Wyoming**, appearing in most regions along the Bighorn River.
- Northern **Vermont**, throughout most northern regions. Small areas of extreme surpluses continue into central **New Hampshire** and central **Maine**.
- Eastern **California**, across the Sierra Nevada.
- **Nevada**, with extreme surpluses covering much of the state. These surpluses continue into southwestern **Utah** and into northwestern **Arizona**.
- **Alaska**, widespread throughout the state, with the heaviest concentrations appearing in the Seward Peninsula, the Northwest Arctic Borough, and the Bristol Bay Borough.

The 3-month maps (below) show the evolving conditions in more detail.



The forecast through November 2023 anticipates surplus in western states to further decrease in magnitude and intensity, though much of Nevada will continue to observe extreme surpluses, as well as areas in southern California and the Sierra Nevada. Areas along the Bighorn River in central Wyoming can expect extreme to exceptional surpluses to continue, along with areas along Lake Roosevelt National Recreation Area in Washington. Outside of the Continental U.S., exceptional surplus is expected to continue in Seward Peninsula of Alaska.

Exceptional deficits are expected to persist in western coastal regions of the Pacific Northwest, as well as concentrations in Minnesota, Wisconsin, and northeastern Iowa. Deficits in Louisiana are expected to downgrade, with some moderate to severe deficits appearing in southeastern regions of the state. Similar conditions are expected across Florida.

From December through February 2024, most anomalies are expected to continue downgrading across the Continental U.S., as deficits in Minnesota and Wisconsin are expected to continue decreasing in extent. Extreme to exceptional deficits in Iowa are expected to become mild to moderate deficits. Further west, surplus in Nevada is expected to continue but lessen in magnitude and severity, though surpluses in central Wyoming are expected to continue at the same intensity. Northern New Mexico and portions of central Colorado are expected to observe severe to extreme deficits.

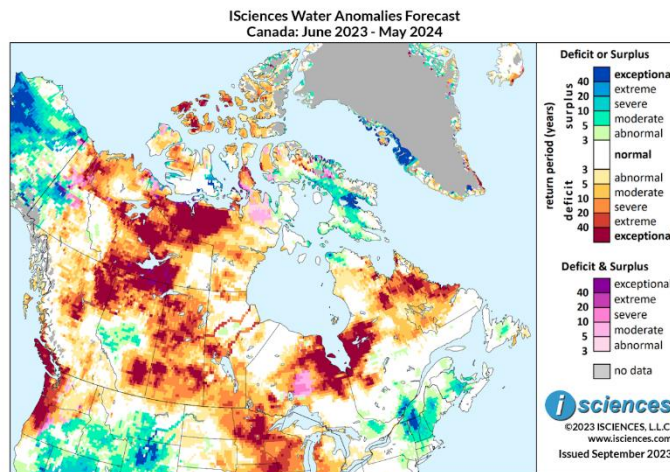
The forecast for the final months – March through May 2024 – anticipates exceptional deficits in Minnesota to increase in magnitude, while Wisconsin can expect severe to extreme deficits across the state, spreading into some northern regions of Illinois. Severe to extreme deficits are expected to reemerge in western coastal regions of Michigan. While most extreme to exceptional surpluses are expected to disappear, severe surpluses are expected throughout Florida, central Texas, eastern Colorado, western Wyoming, central Nevada, and southern California. Surpluses in Alaska are expected to similarly dissipate, with small pockets of moderate surplus appearing in central regions.

Please note that WSIM forecast skill declines with longer lead times.

Canada

The 12-month forecast ending in May 2024 anticipates widespread deficits to persist throughout most provinces, with isolated pockets of surplus appearing in areas of Yukon and Nunavut.

Extreme to exceptional deficits are anticipated in several areas, including:



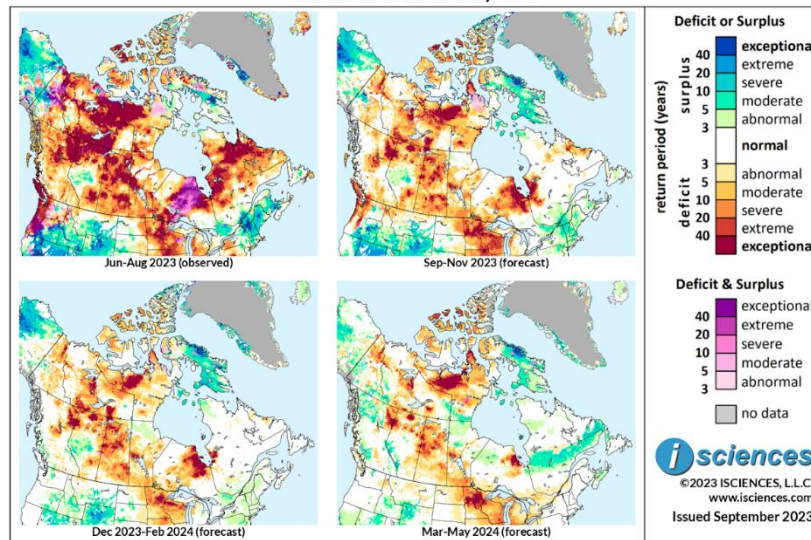
- Central to northeastern **British Columbia**, in regions south of the Peace River and in the Northern Rockies region.
- Northern and southern **Alberta**, throughout the Caribou Mountains, and in areas south of Bistcho Lake and east of the South Saskatchewan River.
- **Saskatchewan**, appearing in regions southwest of Reindeer Lake, southeast of Lake Athabasca, and north of Lake Diefenbaker. These deficits continue east into western **Manitoba**, as well as along the Churchill and Nelson rivers.
- Northeastern coastal regions of **Ontario** along the Hudson Bay, along the coast into northwestern **Quebec**. Northeastern **Quebec** can expect similar deficits which continue east into northern **Newfoundland**.
- **Northwest Territories**, throughout the region, particularly in areas surrounding Great Slave Lake and southeast of Great Bear Lake. These deficits continue into northeastern **Yukon**, in areas north of Lapierre House, and **Nunavut**, widespread throughout southern portions of the Kitikmeot Region and in Prince Patrick Island, Mackenzie King Island, and the Inuvik Region.

Severe to exceptional surpluses are expected in the following regions:

- Western **Yukon**, in areas west of Tombstone Territorial Park.
- **Nunavut**, specifically in the Clyde River Inuit Owned Land.

The 3-month maps (below) show the evolving conditions in more detail.

ISciences Water Anomalies Forecast
Canada: June 2023 - May 2024



Based on observed data through August 2023 and forecasts through May 2024

The forecast through November 2023 anticipates deficits to continue in central and northeastern British Columbia, specifically in the Northern Rockies region. These deficits continue east into northwestern Alberta, into areas in Mackenzie County and the Wood Buffalo National Park of Canada. Severe to exceptional deficits will continue throughout Saskatchewan and northwest of Lake Winnipeg in central Manitoba. Northeastern coastal regions of Ontario bordering the Hudson Bay can expect similar deficits to persist, which continue along the coast into northwestern Quebec. Further north, deficits are expected to linger in areas south of Great Bear Lake in Northwest Territories, as well as areas southeast of Great Slave Lake. Exceptional deficits are expected to persist in Nunavut’s Inuvik and Qikiqtaaluk regions, as are exceptional surpluses in the Clyde River Inuit Owned Land.

From December through February 2024, exceptional deficits are expected to linger in northeastern British Columbia and northern Alberta. Extreme to exceptional deficits are also expected to linger throughout Saskatchewan. Northeastern regions in Ontario are expected to observe continued deficits along the coast of the Hudson Bay, though northwestern coastal regions of Quebec are expected to see a decrease in magnitude of persisting deficits. Further north, deficits in Northwest Territories are expected to persist in areas southeast of Great Slave Lake and south of Great Bear Lake. In Nunavut, exceptional deficits are forecast to continue in the Inuvik Region and in areas of the Qikiqtaaluk Region. Exceptional surplus will linger in the Clyde River Inuit Owned Land.

The forecast for the final months – March through May 2024 – anticipates deficits to further decrease in magnitude, with exceptional deficits still persisting in Nunavut’s Inuvik Region, northeastern British Columbia, northern Alberta, and northeastern coastal regions of Ontario. Central to northern Saskatchewan can expect severe to extreme deficits to continue. Moderate to severe surplus is expected to emerge in central to eastern Quebec. Further north, exceptional surplus in the Clyde River Inuit Owned Land is expected to persist.

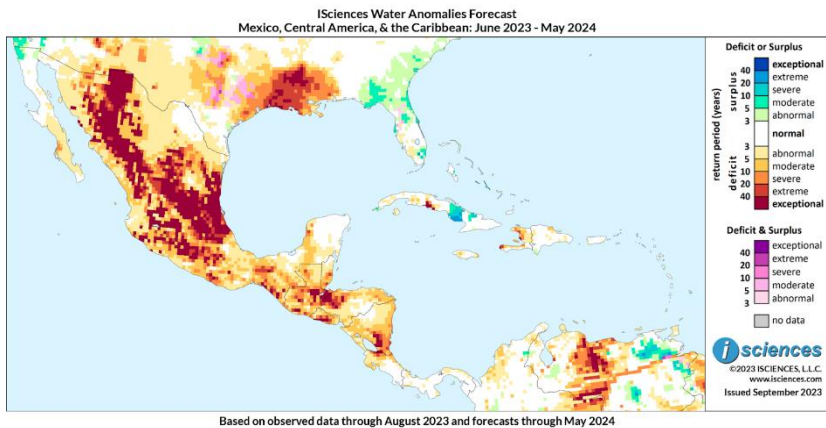
Please note that WSIM forecast skill declines with longer lead times.

Mexico, Central America, and the Caribbean

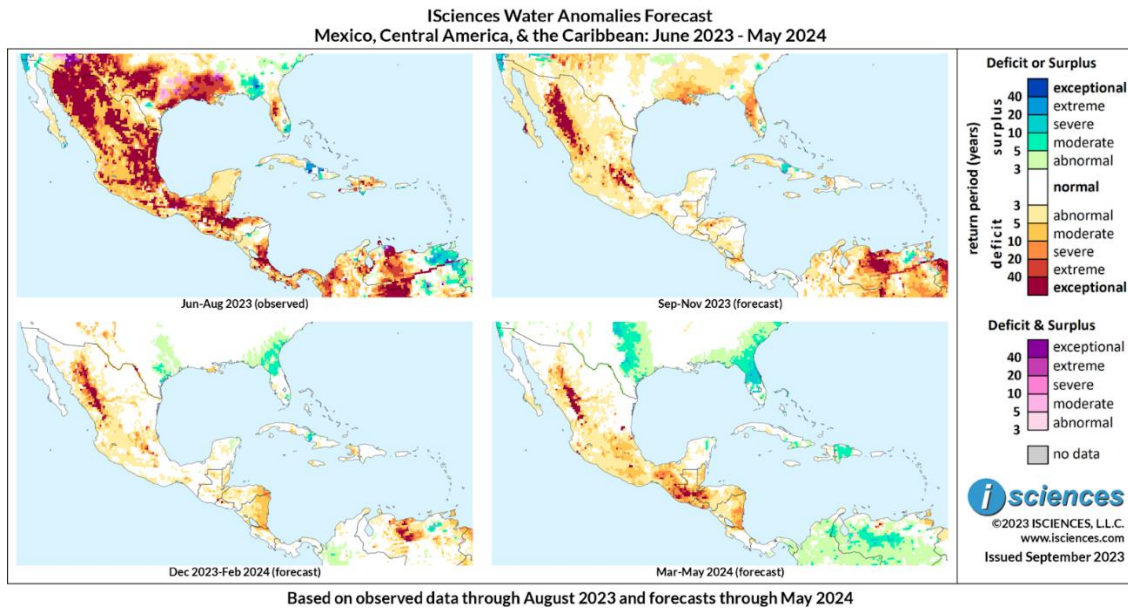
The 12-month forecast ending in May 2024 anticipates widespread exceptional deficits throughout most of Mexico, with similar deficits continuing further south in pockets across Central America.

Exceptional deficits are anticipated in several areas, including:

- Northern to central **Mexico**, throughout the Chihuahuan Desert, into areas near Mexico City and across the Sierra Madre Oriental. These deficits continue further south into the Sierra Madre Del Sur.
- Central **Guatemala**, in areas west of Lake Izabal.
- Western **Honduras**, across the Santa Barbara Department.
- Southern coastal regions of **El Salvador**, with the most intense deficits occurring in the La Paz Department.
- Southern **Nicaragua**, in areas east of Lake Cocibolca.



The 3-month maps (below) show the evolving conditions in more detail.



The forecast through November 2023, exceptional deficits are expected to appear across the states of Sonora and Sinaloa, as well as near Mexico City and the state of Puebla. In Baja California Sur, small areas of exceptional deficit will occur in Puerto San Carlos in Magdalena Bay. Most of Central America is expected to observe near-normal conditions with some moderate to severe deficits continuing in western Honduras and southern Nicaragua.

From December through February 2024, deficits across Sonora and Sinaloa are expected to continue, as well as deficits near Mexico City, though the latter are expected to decrease in magnitude. Deficits in western Honduras are expected to dissipate, but eastern Honduras is expected to observe moderate to severe deficits, which continue south throughout Nicaragua. Areas along the northern border of Costa Rica can also expect moderate to severe deficits.

The forecast for the final months – March through May 2024 – anticipates that deficits in Sonora and Sinaloa will continue, but more exceptional deficits will appear in southern Mexico, as well as near Guatemala and western Honduras. Moderate to severe deficits are expected to continue in Nicaragua, though these will occur in eastern areas of the country, east of Lake Cocibolca.

Please note that WSIM forecast skill declines with longer lead times.

South America

The 12-month forecast ending in May 2024 anticipates intense deficits across central and western regions of the continent, primarily in northern Brazil and in the southern Bolivarian Nations.

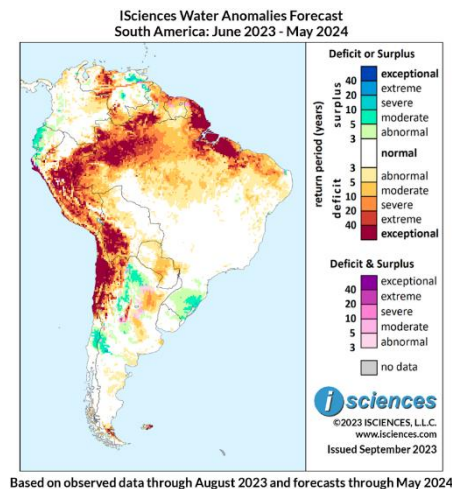
Extreme to exceptional deficits are anticipated in several areas, including:

- **Venezuela**, widespread throughout regions near the city of Valencia, continuing further south into areas near the Capanaparo-Cinaruco National Park.
- The **Guianas**, appearing primarily in central to eastern regions of **French Guiana**, which spread into northern **Brazil**, in the states of Amazonas and Roraima, as well as in northern coastal regions of the states of Para and Maranhão.
- **Peru**, widespread throughout central and southern regions of the country, spanning most areas south of the Marañón River. These deficits continue into southwestern **Bolivia**, throughout areas surrounding the city of Uyuni.
- Northern **Chile**, throughout the regions of Tarapacá, Arica y Parinacota, and Antofagasta.

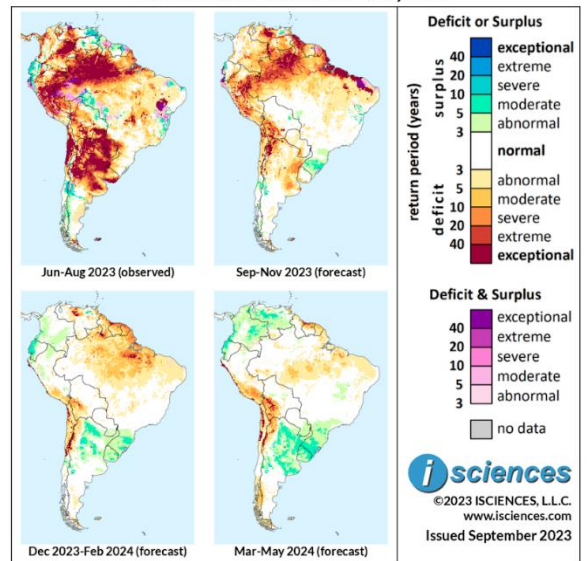
Moderate to severe surpluses are expected in the following regions:

- Southern **Brazil**, in southeastern coastal regions of the state of Rio Grande do Sul.
- Western coastal regions of **Ecuador**.
- Northern **Argentina**, appearing mainly in the Salta Province.
- South-central **Chile**, in the Linares Province, spreading east into western Argentina in the Neuquén Province.

The 3-month maps (below) show the evolving conditions in more detail.



ISciences Water Anomalies Forecast
South America: June 2023 - May 2024



Based on observed data through August 2023 and forecasts through May 2024

The forecast through November 2023 anticipates deficits in northwestern Brazil to persist, but will decrease in severity and magnitude in northern regions of the state of Amazonas. However, deficits will remain exceptional in the state of Roraima. Deficits will also remain exceptional along northern coastal regions of the states of Para and Maranhão, with some instances of exceptional transitional conditions within the state of Piauí. In the Guianas, exceptional deficits will arise in northern Guyana, with similar deficits arising in Venezuela, near the Aguaro-Guariquito National Park. Deficits will continue across Peru in most areas south of the Marañón River, though they will downgrade to severe to extreme levels, as will deficits in northern Chile.

From December through February 2024, deficits in the Guianas are expected to downgrade in intensity, with most exceptional deficits in Brazil transitioning into mild to moderate deficits. However, small areas of exceptional deficit will continue in northeastern Para and southeastern Roraima. Northern coastal regions of Suriname will also see continued exceptional deficits, along with northern regions of the state of Apure in Venezuela. Moderate surplus will continue in western coastal regions of Ecuador, northern to central Argentina, and southern Brazil, in the state of Rio Grande do Sul. Further south, regions of northern Chile, north of the city of Santiago, can expect exceptional deficits along the shared border with western Argentina.

The forecast for the final months – March through May 2024 – anticipates that deficits in southwestern Bolivia and northern Chile will increase slightly in magnitude, as well as surpluses across northern and eastern Argentina. These surpluses continue across Uruguay and southern Brazil, specifically in the state of Rio Grande do Sul. Moderate to severe surpluses in western coastal regions of Ecuador are expected to continue, with similarly intense surpluses appearing nearby in east-central Colombia, as well as along its western coast. Areas near the Aguaro-Guariquito National Park in central Venezuela can also expect moderate surplus. Deficits in the Guianas are expected to mostly disappear, with some persisting in northern coastal regions of Suriname.

Please note that WSIM forecast skill declines with longer lead times.

Europe

The 12-month forecast ending in May 2024 anticipates that while many regions of European countries will observe near-normal conditions, much of eastern European countries can expect deficits ranging from moderate to extreme intensity. Small areas of surplus are also expected to occur in southern and northern Europe.

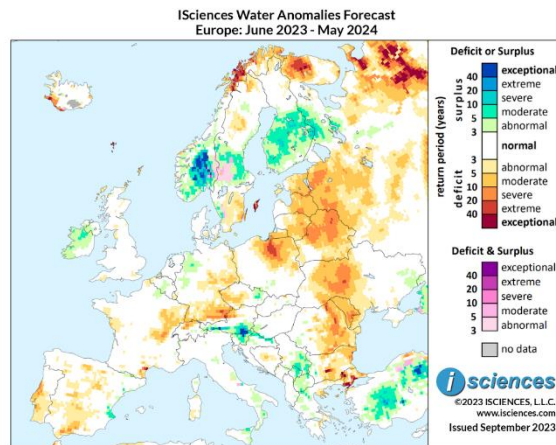
Severe to extreme deficits are anticipated in several areas, including:

- Southern **Germany**, appearing along the Inn River. These deficits continue into **Switzerland**, in the canton of Zurich, and eastern **France** in the Jura department.
- Northern **Poland**, in areas within the Warmian-Masurian Voivodeship province.
- Northern **Sweden**, in western regions of the Troms og Finnmark.
- Northern **Belarus**, across the Vitebsk region, which moves further south into west-central **Ukraine**, in areas near the Khmelnytskyi Oblast.
- The **Balkans**, with severe deficits appearing in northeastern **Romania**, and exceptional deficits appearing in southern **Bulgaria** near Plovdiv. Nearby in eastern **Greece**, small regions north of Orestias will experience similar deficits.

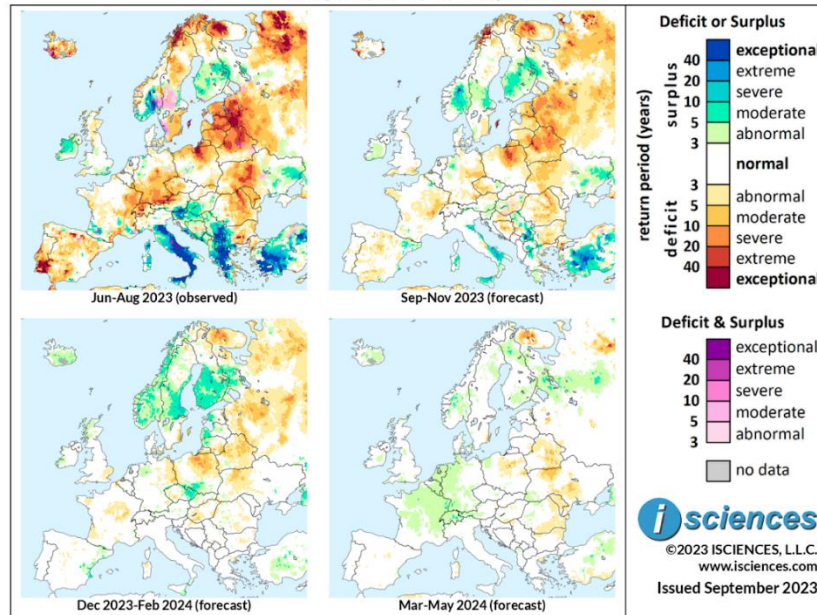
Surpluses of varying intensity are expected in the following countries:

- **Norway**, with exceptional surpluses widespread in regions near the Valdres Nature and Culture Park.
- Southern **Austria**, with exceptional surpluses appearing throughout the Klagenfurt-Land District, which continue further south into northern **Slovenia** near the town of Tržič.
- **Finland**, with moderate to severe surpluses throughout most of the country's central region.

The 3-month maps (below) show the evolving conditions in more detail.



ISciences Water Anomalies Forecast
Europe: June 2023 - May 2024



Based on observed data through August 2023 and forecasts through May 2024

The forecast through November 2023 anticipates exceptional deficits to linger in northern Norway, as well as extreme surplus in southern Norway. Severe to extreme deficits will continue in northern Poland, in areas within the Warmian-Masurian Voivodeship province. Belarus is expected to experience severe deficits, though they are expected to decrease in magnitude. Extreme to exceptional surplus is expected to persist in eastern coastal regions of Italy, as well as across Sicily. Nearby, Serbia and Kosovo are expected to experience surpluses of similar intensity.

From December through February 2024, widespread moderate to severe surpluses are expected throughout Norway, central Sweden, and central Finland. Western regions of Estonia and Latvia can expect surpluses of similar intensity. Further south, areas in northeastern Poland, north of Warsaw, can expect moderate to severe deficits. Nearby, eastern regions of the Czech Republic can expect moderate surplus.

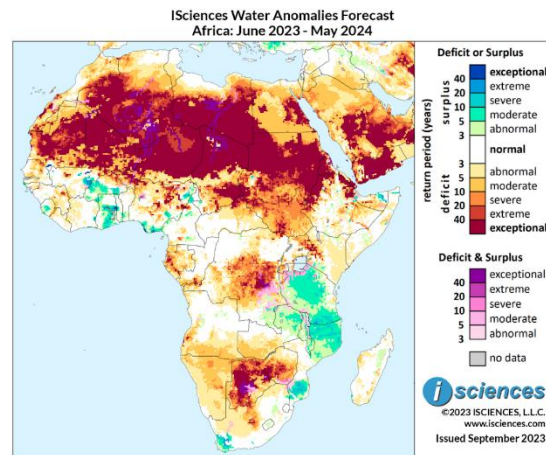
The forecast for the final months – March through May 2024 – anticipates that nearly all European countries will observe near-normal conditions, with some instances of mild surplus in France, Belgium, the Netherlands, and Germany, and mild deficits in Belarus and western Ukraine.

Please note that WSIM forecast skill declines with longer lead times.

Africa

The 12-month forecast ending in May 2024 anticipates widespread exceptional deficits across much of northern Africa, with some similarly intense deficits appearing in southern regions of the continent. Areas of surplus are expected in southeastern countries.

Extreme to exceptional deficits are anticipated in several areas, including:

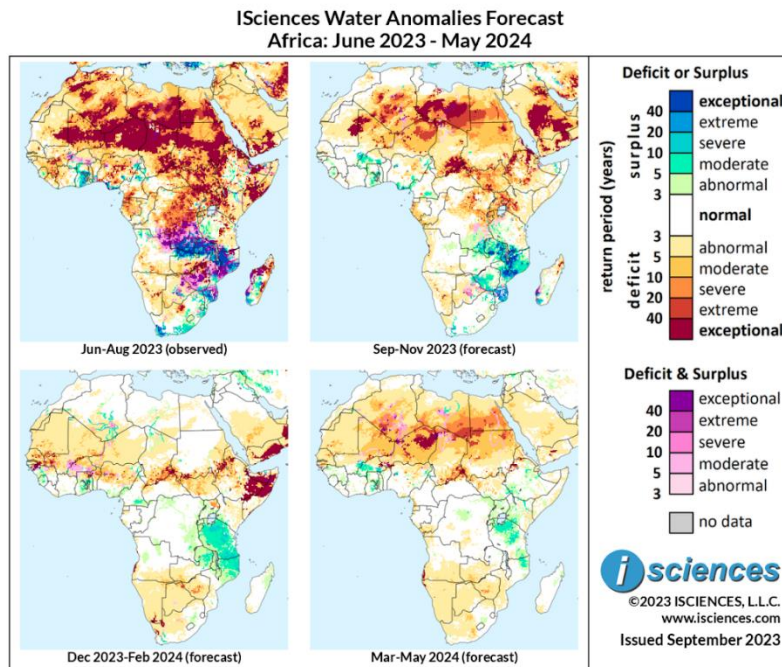


- **Mauritania**, widespread throughout most of the country, continuing into northern to central **Mali**, throughout most of the Salam region.
- **Niger**, throughout much of the Agadez, Zinder, Diffa, and Tchín-Tabaraden regions. **Algeria** can anticipate similarly widespread exceptional deficits across most of the country, with some transitional conditions appearing in pockets near the city of Tamanrasset.
- **Libya**, throughout most of its central and southern regions. Transitional conditions are also expected in the Jufra District. These deficits continue throughout northern and central **Chad**, western to eastern **Sudan**, and eastern regions of **Egypt**.
- **Democratic Republic of Congo**, primarily in the Kasongo and Lubao regions. Nearby, similar deficits appear in an arc in **Gabon**, appearing near Libreville and moving southeast into Tchibanga.
- **Botswana**, widespread throughout most of the country, with some transitional conditions appearing in western regions of the Jwaneng District. These deficits continue into **Zimbabwe**, primarily appearing in western areas of the Bulilimangwe District and throughout the Midlands Province.

Moderate to severe surpluses are expected in the following regions:

- Northern and southern **Mozambique**, across the Niassa Reserve and in areas north of the Banhine National Park.
- **Tanzania**, across most areas of the country.
- **Ghana**, in areas near Lake Volta, moving further into **Burkina Faso**, across its Boucle du Mouhoun and Centre-Est Regions.
- **South Africa**, in southwestern coastal regions near Cape Town.
- Southern coastal regions of **Nigeria**.

The 3-month maps (below) show the evolving conditions in more detail.



The forecast through November 2023 anticipates that the exceptional deficits in northern Africa will lessen in magnitude, though will remain in eastern Mauritania, northern Mali, and central Algeria. Exceptional deficits will also continue to be widespread across much of Libya and southeastern Chad. Severe to extreme deficits are expected to linger in Uganda and South Sudan, as well as areas along the western border of Ethiopia, of which can expect some areas of continued exceptional deficit. Intense surplus is expected to linger in eastern Zambia, as well as across Mozambique and southwestern Zimbabwe.

From December through February 2024, most exceptional deficits in northern Africa are expected to disappear, though a small band of exceptional deficits is expected to appear in pockets across western Mali, northern Niger, southern Chad, and southern Sudan. Most regions in the Horn of Africa are also expected to observe exceptional deficits. Moderate to severe surplus is also expected in central to southern Algeria.

The forecast for the final months – March through May 2024 – most areas will observe near normal conditions, though moderate to severe surplus will persist in Tanzania, south of Lake Victoria. Similar surpluses will persist in Burkina Faso. Deficits ranging from extreme to exceptional will reemerge in northeastern Niger and continue east into southeastern Libya and southern Egypt. Isolated pockets of extreme to exceptional deficits are also expected to persist on the southeastern border of Chad.

Please note that WSIM forecast skill declines with longer lead times.

Middle East

The 12-month forecast ending in May 2024 anticipates widespread deficits of varying intensity to occur across most of the region. Areas of surplus are expected to persist in Turkey.

Extreme to exceptional deficits are anticipated in several areas, including:

- **Yemen**, widespread throughout the country.
- **Oman**, primarily across the Al Wusta, Ad Dakhiliyah, and Ad Dhahirah Governorates.
- **Saudi Arabia**, widespread throughout central and southern regions. The most intense concentrations appear across the Tuwayq Mountains, west of Riyadh, and across the Rub' al Khali desert.
- Eastern **Iran**, with deficits appearing across the Kerman, northern Sistan and Baluchestan, and South Khorasan provinces.

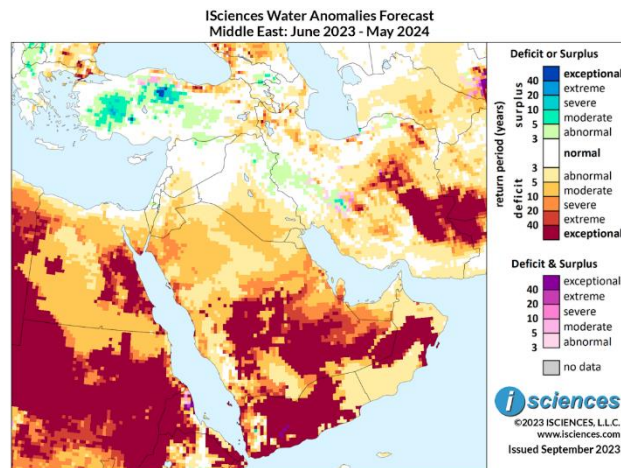
Moderate to severe deficits are forecast in:

- Western **United Arab Emirates**, in most of the western regions of the Emirate of Abu Dhabi.
- Southeastern **Saudi Arabia**, throughout the Al Udeid region.

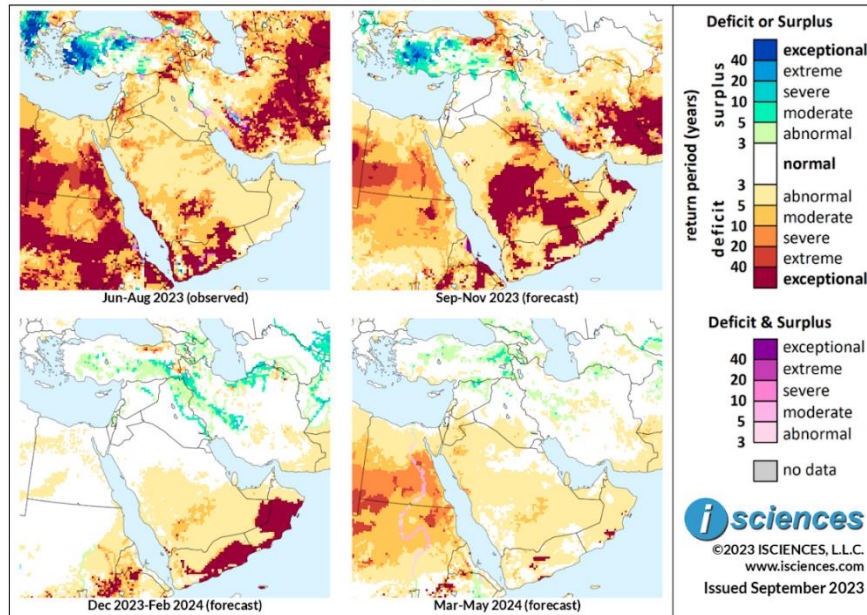
Surpluses of varying intensity are expected in the following countries:

- Northern regions of **Turkey** near the city of Çorum. Similarly intense surplus is expected in southwestern regions of the country, near the city of Denizli.

The 3-month maps (below) show the evolving conditions in more detail.



**ISciences Water Anomalies Forecast
Middle East: June 2023 - May 2024**



Based on observed data through August 2023 and forecasts through May 2024

The forecast through November 2023 predicts that exceptional deficits will continue to be widespread in Saudi Arabia, affecting most central regions of the country near Riyadh, as well as southern portions of Al Ahsa. These deficits continue north into regions near the city of Hafar Al Batin, much of Kuwait, and southern regions of Iraq’s Al-Salman District. Deficits in eastern Iran are expected to continue across the Kerman, northern Sistan and Baluchestan, and South Khorasan provinces. Surpluses in western Turkey are expected to persist but slightly downgrade in magnitude.

From December through February 2024 anticipates most regions to experience near-normal conditions, with the exception of exceptional deficits continuing throughout much of Yemen and Oman. Further north, central Iraq, western Iran, and southeastern Turkey can expect mild to moderate surplus.

The forecast for the final months – March through May 2024 – expects deficits in Yemen and Oman to shrink dramatically, only lingering in areas near the region of Zamakh and the cities of Al Mukalla and Ash Shuwaymiyah.

Please note that WSIM forecast skill declines with longer lead times.

Central Asia and Russia

The 12-month forecast ending in May 2024 anticipates intense deficits to appear in western and eastern Russia, with some surplus and transitional conditions appearing in central regions of the country. Central Asia is expected to observe mostly normal conditions, with some deficits in northern Kazakhstan.

Extreme to exceptional deficits are anticipated in several areas, including:

- Northern **Russia**, widespread throughout the Yamalo-Nenets Autonomous Okrug, the region of Komi, and Sverdlovsk. These deficits continue west along the Ob River.
- Southern to central **Russia**, in regions north of the Zeya Reservoir, continuing into the Zeysky District, across southern regions of the Sakha Republic, and into the Okhotsk District.
- Northeastern **Russia**, in northern regions of the Sakha Republic, in areas south of the Adycha River and surrounding the Selenyakh River.
- Northern **Kazakhstan**, in areas north of the Akmola Region.

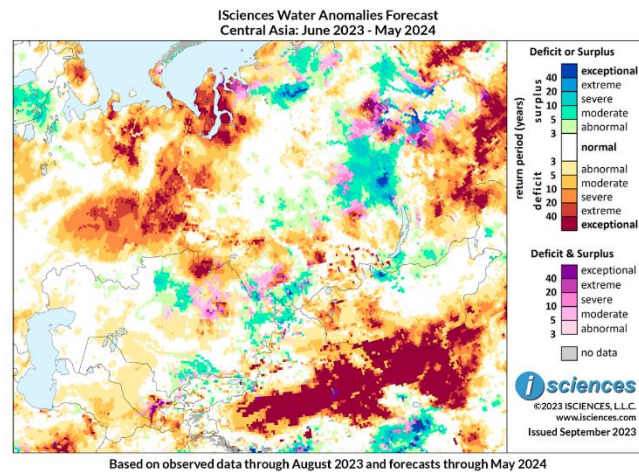
Severe to exceptional surpluses are expected in the following regions:

- Southern **Russia**, in the Kazachinsko-Lensky Municipal District and southern regions of the Kirensky District.
- East-central **Russia**, in areas southeast of the Vilyuy River.
- Northern **Russia**, in areas surrounding the Kotuy River.

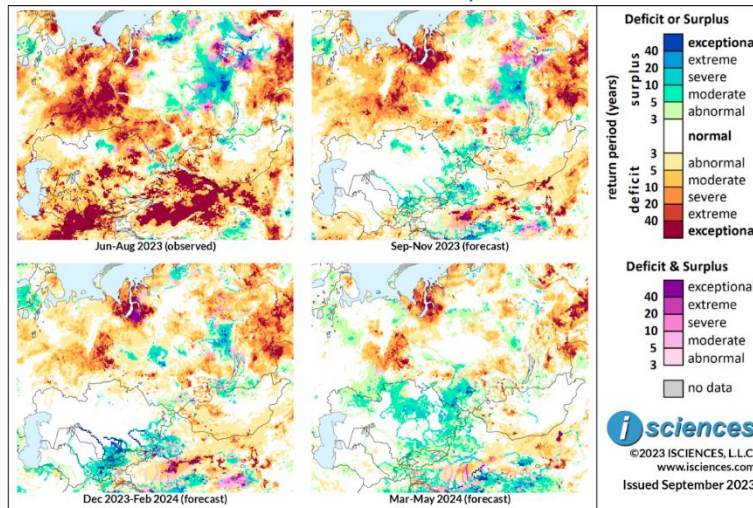
Transitional conditions are expected in:

- Central **Russia**, throughout the Mirninsky District and west of the Markha River.
- Northwestern **Russia**, in northern coastal regions of the Tavozsky District and nearby coastal regions of the Taymyrsky Dolgano-Nenetsky District.

The 3-month maps (below) show the evolving conditions in more detail.



ISciences Water Anomalies Forecast
Central Asia: June 2023 - May 2024



Based on observed data through August 2023 and forecasts through May 2024

The forecast through November 2023, regions of the Yamalo-Nenets Autonomous Okrug near the Novy Port Settlement and nearby coastal regions of the Taymyrsky Dolgano-Nenetsky District are expected to endure continued exceptional deficits. Deficits in the regions of Komi and Sverdlovsk are expected to decrease significantly in magnitude. Areas in east-central Russia northeast of Lake Baikal are expected to observe continued severe to exceptional surplus. Some regions of the Eastern Kazakhstan Region can expect moderate to severe surplus, which continues north into Russia’s Kosh-Agachsky District, as well as southwest into Uzbekistan.

From December through February 2024, exceptional surpluses are expected to persist in the Yamalo-Nenets Autonomous Okrug, with similarly intense transitional conditions appearing along the western coast of the Nadymsky District. Moderate to extreme deficits in the regions of Komi and Sverdlovsk are expected to persist. In eastern Russia, regions northeast of Lake Baikal are expected to observe persisting severe to extreme surpluses. Nearby regions of the Sakha Republic are also expected to experience persisting extreme to exceptional deficits. Further south, surpluses in Kazakhstan are expected to intensify, becoming extreme to exceptional and covering the Turkestan region. These surpluses continue further south into eastern Turkmenistan, eastern Uzbekistan, and western Tajikistan.

The forecast for the final months – March through May 2024 – anticipates deficits in Yamalo-Nenets Autonomous Okrug to continue decreasing in magnitude, with transitional conditions disappearing. Areas in southwestern Khanty-Mansi Autonomous Okrug can anticipate severe to extreme deficits to persist. Surplus is expected to continue in southern areas of Russia’s Kosh-Agachsky District, while deficits in the Sakha Republic are likely to lessen in magnitude. Surplus in Kazakhstan is expected to become moderate to severe, but cover most north-central areas of the country, as well as southern regions, continuing into Tajikistan and Kyrgyzstan.

Please note that WSIM forecast skill declines with longer lead times.

South Asia

The 12-month forecast ending in May 2024 anticipates intense deficits and surpluses in isolated areas of India, with most other countries experiencing near normal conditions.

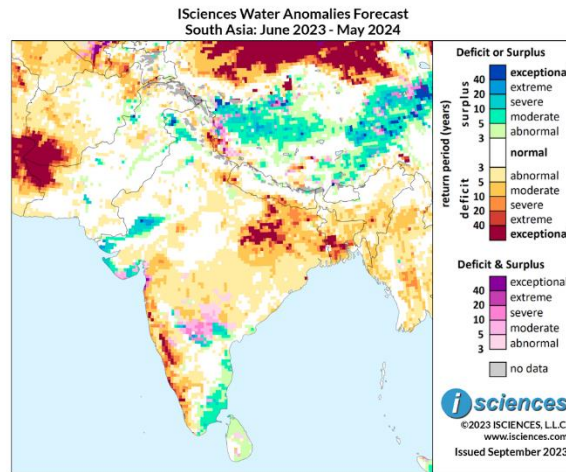
Extreme to exceptional deficits are anticipated in several areas, including:

- East-central **India**, throughout the Chota Nagpur Plateau and the Ganges Plain.
- Southwestern **India**, in the state of Karnataka near the Western Ghats mountain range.
- **Bangladesh**, throughout the Khulna Division.
- Western **Pakistan**, in northwestern regions of Balochistan.
- Southern **Afghanistan**, in the Nimroz and Helmand provinces.

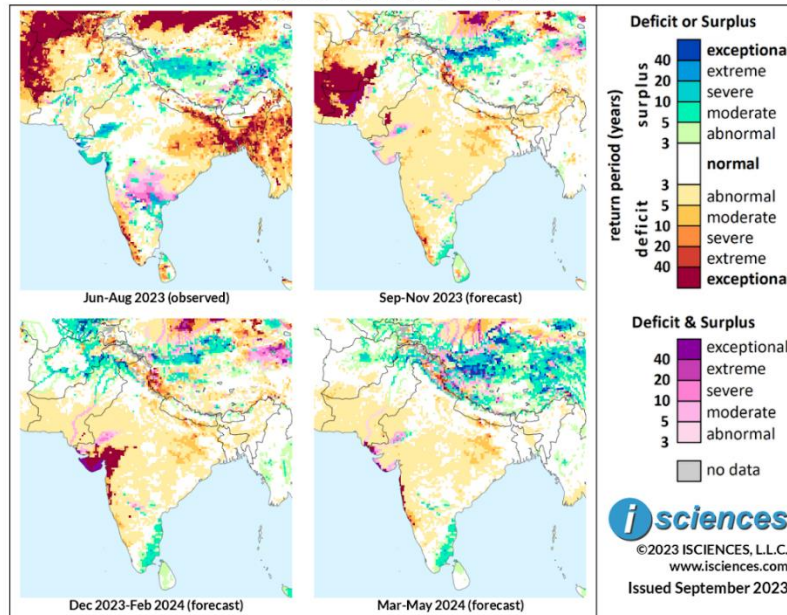
Moderate to severe surpluses are expected in the following regions:

- North **India**, in regions north of the Ravi River.
- Western **India**, near the Aravalli Range and in western coastal regions of the state of Gujarat.
- Southeastern **India**, along the Coromandel Coast.

The 3-month maps (below) show the evolving conditions in more detail.



ISciences Water Anomalies Forecast
South Asia: June 2023 - May 2024



Based on observed data through August 2023 and forecasts through May 2024

The forecast through November 2023 exceptional deficits in southern Afghanistan and western Pakistan are expected to increase in magnitude, while most anomalies in India are expected to disappear, becoming abnormal conditions throughout most of the country. Some severe to extreme deficits are expected in northeastern regions of Uttarakhand and along the southeastern border of Nepal.

From December through February 2024, exceptional deficits are likely to appear in west India, particularly in the Kathiawar Peninsula and in eastern Gujarat. Severe to extreme surplus is anticipated in western areas of the Jammu and Kashmir region, as well as further south in the Coromandel Coast.

The forecast for the final months – March through May 2024 – expects deficits in the Kathiawar Peninsula and eastern Gujarat to disappear, with some intense deficits appearing along India’s western coast. Surplus along the Coromandel Coast is expected to continue.

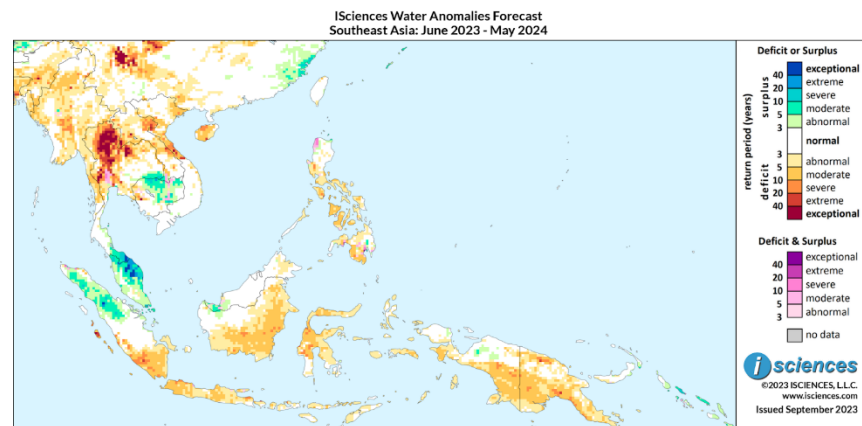
Please note that WSIM forecast skill declines with longer lead times.

Southeast Asia and the Pacific

The 12-month forecast ending in May 2024 anticipates intense deficits to occur in central areas of Mainland Southeast Asia, and widespread moderate deficits throughout most of Maritime Southeast Asia.

Extreme to exceptional deficits are anticipated in several areas, including:

- **Thailand**, throughout most of the country's northern provinces. These deficits continue spreading southwest into the province of Kanchanaburi, as well as into the northeastern province of Loei.
- Central **Vietnam**, across the entirety of the Quảng Bình Province.
- Eastern **Laos**, in eastern regions of the Houaphanh Province.



Moderate to severe deficits are forecast in:

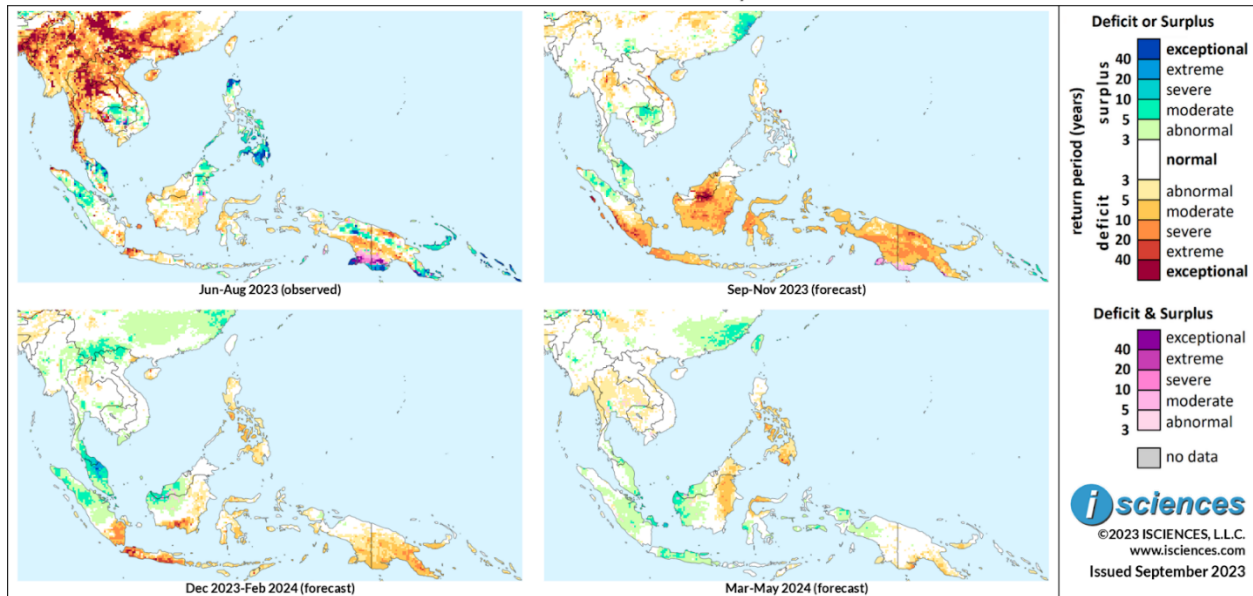
- **Indonesia**, throughout southern Sumatra, western Java, Sulawesi, and Kalimantan.
- The **Philippines**, throughout most of the country's islands.
- South-central **Myanmar**, in regions near the city of Naypyidaw. Mostly moderate deficits continue further north into areas near the city of Mandalay.
- **Papua New Guinea**, across most of the Gulf and Western Province, as well as further north near the April Salome Forest Management Area.

Surpluses of varying intensity are expected in the following countries:

- **Malaysia**, with extreme to exceptional surpluses occurring throughout the states of Terengganu, Kelantan, and Pahang.
- Southern **Thailand**, with extreme to exceptional surpluses appearing in southernmost regions of the Yala and Narathiwat provinces.
- **Indonesia**, with moderate surpluses appearing in the North Sumatra province.
- Northern **Cambodia**, in regions near the Kulen Prum Tep Wildlife Sanctuary.

The 3-month maps (below) show the evolving conditions in more detail.

ISciences Water Anomalies Forecast
Southeast Asia: June 2023 - May 2024



Based on observed data through August 2023 and forecasts through May 2024

The forecast through November 2023 expects deficits in Mainland Southeast Asia to mostly resolve to near normal conditions. However, widespread deficits are expected to appear across most of Maritime Southeast Asia, with the highest concentrations appearing in southern Sumatra, western Java, north-central Kalimantan, Sulawesi, and across Papua and Papua New Guinea. Small areas of moderate surplus are expected in northern Cambodia, as well as eastern Malaysia and northern Sumatra.

From December through February 2024, severe to extreme deficits are expected to continue in southern Sumatra, western Java, and southern Kalimantan. Deficits across Papua New Guinea are expected to remain but lessen in intensity and magnitude, but continue throughout most of its eastern provinces. Surpluses are expected to emerge in Malaysia, with severe to extreme surpluses occurring primarily in the Kelantan province. Coastal regions in northwestern Kalimantan and northern Sumatra can also expect moderate to severe surpluses to emerge.

The forecast for the final months – March through May 2024 – anticipates that most regions will observe near-normal conditions, with some moderate to severe deficits occurring in eastern Kalimantan, southern Philippines, northern Sulawesi, and southern coastal regions of Papua New Guinea near the town of Daru. Surpluses of moderate to severe intensity are expected to linger in northwestern Kalimantan, spreading further down the coast of West Kalimantan. Surpluses of similar intensity are expected in the Bangka Belitung Islands, as well as western and central regions of Java.

Please note that WSIM forecast skill declines with longer lead times.

East Asia

The 12-month forecast ending in May 2024 anticipates widespread deficits in northern China, and intense pockets of surplus to occur in southwestern regions of the country, particularly in the Tibetan Plateau.

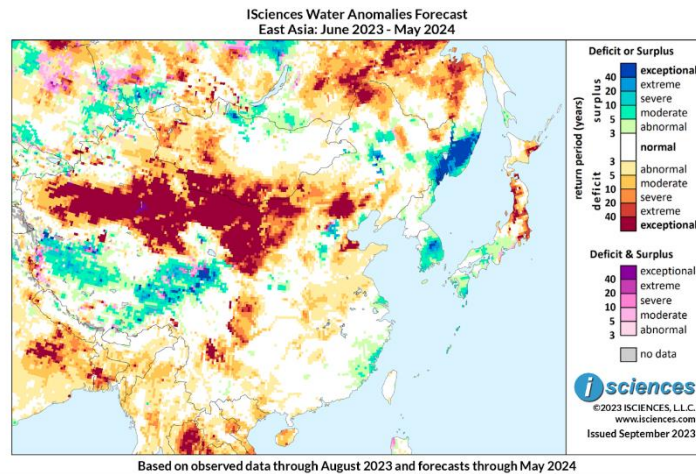
Extreme to exceptional deficits are anticipated in several areas, including:

- **Northern China**, widespread throughout central to western Inner Mongolia, Gansu, and southern regions of Xinjiang Uygur. These deficits also continue further south into western regions of the Loess Plateau.
- Eastern **China**, in areas north of Yongding River and throughout the Hebei province.
- Southern **China**, west of the Jialang River in the Sichuan Basin.
- **Japan**, throughout eastern and northwestern coastal regions of Honshu. On the island of Hokkaido, similarly intense deficits are expected in eastern coastal regions.

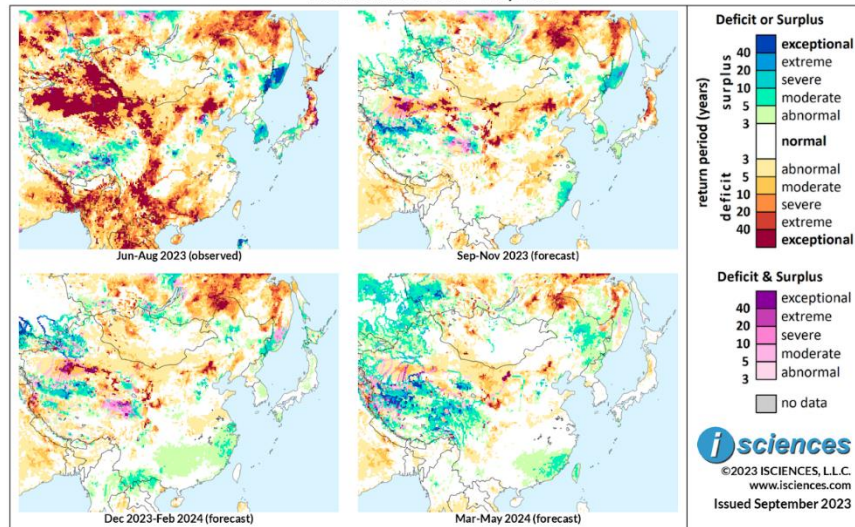
Severe to exceptional surpluses are expected in the following regions:

- Southwestern **China**, throughout the Tibetan Plateau and in southeastern Qinghai.
 - Northeastern **China**, in southern regions of the Eastern Manchurian Plain, and widespread in areas along the Ussuri River.
- South Korea**, primarily in areas south of the Namham River.

The 3-month maps (below) show the evolving conditions in more detail.



ISciences Water Anomalies Forecast
East Asia: June 2023 - May 2024



Based on observed data through August 2023 and forecasts through May 2024

The forecast through November 2023, most intense anomalies are expected to dissipate throughout China, leaving some small areas of extreme to exceptional surplus in western China, near the shared border of northern Tibet and southern Xinjiang. Pockets of exceptional deficits are expected to persist in central Xinjiang, which continue into southern Qinghai and central Inner Mongolia. Severe to extreme surplus is expected to continue in southeastern Jilin and in eastern Heilongjiang. In Japan, deficits in Honshu and Hokkaido are expected to persist but lessen in magnitude.

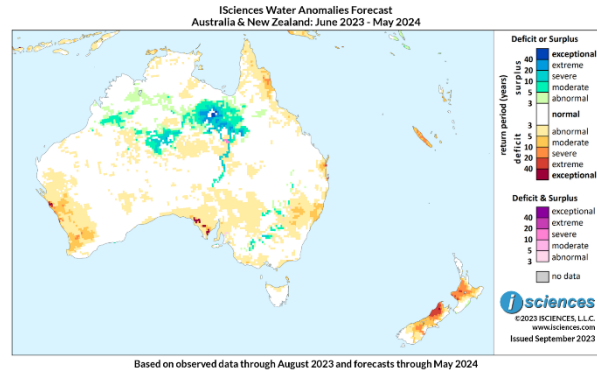
From December through February 2024, surplus anomalies in western China are expected to continue, with deficits in southern Qinghai and Inner Mongolia mostly disappearing, becoming abnormal deficit conditions. Small areas of southernmost Yunnan are expected to see an emergence of moderate to severe surplus. Exceptional deficits are expected to continue in Jilin, but disappear in Japan.

The forecast for the final months – March through May 2024 – surplus is expected to increase in magnitude throughout the Tibetan Plateau, spreading throughout most of southwestern China. Deficits in Inner Mongolia are expected to continue decreasing in magnitude, as well as similar deficits in Jilin. Moderate surplus is expected to disappear in southern Yunnan, but emerge in southwestern coastal regions near Hong Kong.

Please note that WSIM forecast skill declines with longer lead times.

Australia and New Zealand

The 12-month forecast ending in May 2024 anticipates near-normal conditions in most areas of the country, with the exception of persisting surplus in north-central Australia. Widespread deficits of varying intensity are expected to emerge in New Zealand.



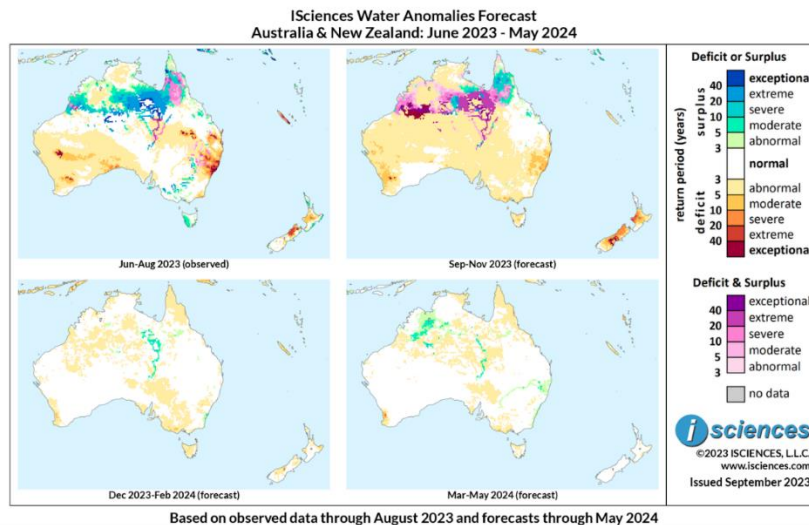
Severe to extreme surpluses are expected in the following regions:

- Eastern **Northern Territory**, in areas surrounding the town of Nicholson and through the locality of Ranken.
- Western **Queensland**, throughout Selwyn Range and into areas near the Camooweal locality.

Deficits of varying intensity are expected in the following areas:

- **Western Australia**, in western coastal regions near the city of Geraldton.
- **South Australia**, in southern coastal regions near Port Lincoln.
- Southern **New Zealand**, with the most intense anomalies occurring in the northern regions of the South Island, near Kahurangi National Park.
- Northern **New Zealand**, in most areas west of Lake Taupo.

The 3-month maps (below) show the evolving conditions in more detail.



The forecast through November 2023 anticipates most surplus in western Queensland and eastern Northern Territory to shift into transitional conditions, with some surplus appearing in southern and central portions of the Yorke Peninsula. These transitional conditions continue further west into areas near the Dampier Peninsula. Nearby, regions near the town of Telfer can anticipate exceptional deficits to appear. In New Zealand, exceptional deficits are expected to arise in central regions of the country, near the Waimate District, with severe to extreme deficits appearing further north along the West Coast region, as well as western coastal areas of the North Island in the region of Taranaki.

From December through February 2024, near-normal conditions are expected in nearly all regions of Australia, with the exception of areas east of the Simpson Desert in western Queensland forecast to observe moderate surplus.

The forecast for the final months – March through May 2024 – expects most areas to observe near-normal conditions, with some moderate surpluses appearing in northern Western Australia in areas south of Lake Argyle.

Please note that WSIM forecast skill declines with longer lead times.