

Global Water Monitor & Forecast Watch List

May 15, 2023

For more information, contact:

Thomas M. Parris, President, 802-864-2999, parris@isciences.com

Table of Contents

Introduction	2
Worldwide Water Watch List.....	4
Watch List: Regional Synopsis.....	4
Watch List: Regional Details.....	6
United States.....	6
Canada	7
Mexico, Central America, and the Caribbean	10
South America.....	12
Europe.....	13
Africa	16
Middle East	18
Central Asia and Russia	20
South Asia	22
Southeast Asia and the Pacific	24
East Asia	26
Australia and New Zealand	28

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 April 2023 and an ensemble of forecasts issued the last week of April 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 report uses results from WSIM Version 2. Visit <https://wsim.isciences.com> for details.

All maps have half-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](#).

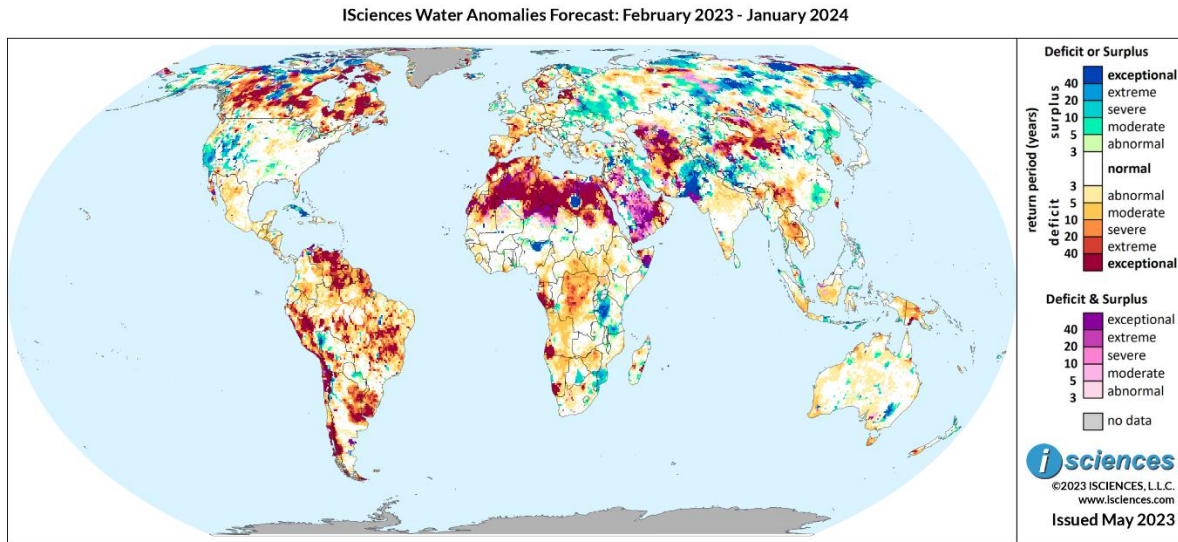
There are numerous regions around the world where country borders are contested. ISciences depicts country boundaries on these maps solely to provide some geographic context. The boundaries are nominal, not legal, descriptions of each entity. The use of these boundaries does not imply any judgement on the legal status of any territory, or any endorsement or acceptance of disputed boundaries on the part of ISciences or our data providers.

Copyright 2022 ISCIENCES, L.L.C. Global Water Monitor & Forecast Watch List is the property of ISCIENCES, L.L.C. It is protected by U.S. copyright laws and may not be reproduced in any way without the written permission of ISCIENCES, L.L.C.

The user assumes the entire risk related to user's use of information in ISCIENCES, L.L.C. Global Water Monitor & Forecast: Watch List, including information derived from Water Security Indicators Model (WSIM). This information may include forecasts, projections and other predictive statements that represent ISCIENCES, L.L.C.'s assumptions and expectations in light of currently available information and using the highest professional standards. Actual results may differ from those projected. Consequently, no guarantee is presented or implied as to the accuracy of specific forecasts, projections or predictive statements contained herein. ISCIENCES, L.L.C. provides such information "as is," and disclaims any and all warranties, whether express or implied, including (without limitation) any implied warranties of merchantability or fitness for a particular purpose. In no event will ISCIENCES, L.L.C. be liable to you or to any third party for any direct, indirect, incidental, consequential, special or exemplary damages or lost profit resulting from any use or misuse of this data.

Worldwide Water Watch List

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



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: The forecast indicates surpluses in southwestern and western states to persist throughout January 2024 or longer.

Canada: Many provinces are expected to experience widespread deficits until July 2023 or longer.

Mexico, Central America, and the Caribbean: Mild to moderate deficits are expected to persist until July, with deficits in central America expected to intensify in October 2023.

South America: Widespread deficits are expected to persist until August 2023 or longer.

Europe: Widespread deficits in Continental Europe are expected to persist until October 2023 or longer.

Africa: Moderate to severe deficits are anticipated to linger in central regions of Africa until October 2023 or longer.

Middle East: Transitional conditions in Saudi Arabia are expected to persist, which change into exceptional deficits by November 2023.

Central Asia and Russia: Widespread anomalies of varying intensity are expected to continue throughout western and central Russia throughout July 2023 or longer.

South Asia: Varying mixes of surplus and transitional conditions in Pakistan are expected to change into mostly transitional conditions during November 2023 to January 2024.

Southeast Asia and the Pacific: Mostly mild deficits are expected to linger, with moderate deficits emerge by October 2023.

East Asia: Western regions of East China are expected to experience exceptional deficits, expected to emerge November 2023 to January 2024.

Australia & New Zealand: Exceptional surpluses in southeastern Australia are expected to persist throughout January 2024 or longer.

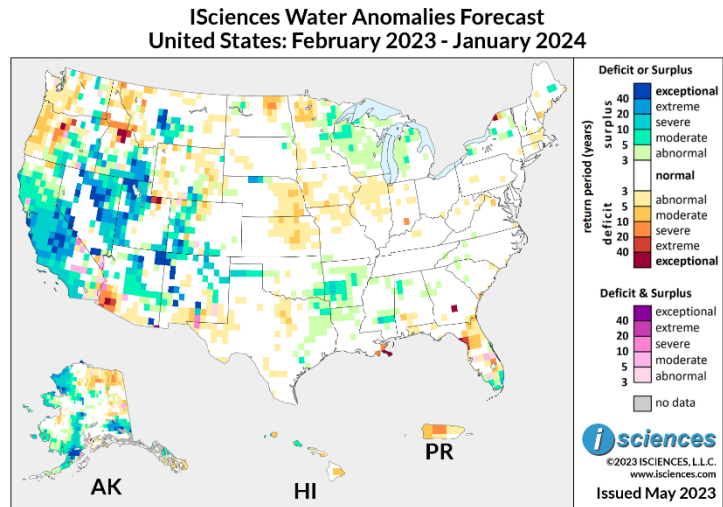
Watch List: Regional Details

United States

The 12-month forecast ending in January indicates major surpluses to persist in many of the western and southwestern continental states. Deficits of varying intensity are expected to endure in isolated pockets of the Pacific Northwest and New Mexico, as well as noncontiguous areas of the U.S.

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

- **California**, throughout much of the state. Central areas of the state are expected to experience the highest intensity anomalies, particularly in territories near the Sequoia and Sierra National Forests.
- Central to northeastern **Nevada**, appearing throughout Eureka County and continuing into Elko and Lincoln County.
- Pockets throughout western **New Mexico**, appearing throughout the Navajo Nation Off-Reservation Trust Land, McKinley County, and the Gila National Forest.
- Southeastern **Idaho**, with the highest intensity surpluses appearing in areas near and throughout Caribou County.
- Southwestern **Colorado**, throughout La Plata County.
- West-central **Montana**, in areas east of the Helena-Lewis and Clark National Forest.
- Northern and western **Utah**, widespread throughout Box Elder County and continuing further south into Salt Lake City, Iron County, and Washington County.
- Various regions of **Alaska**, with the most concentrated anomalies appearing in western coastal regions of the North Slope Borough, as well as northern regions of the Lake and Peninsula Borough.



Based on observed data through April 2023 and forecasts through January 2024

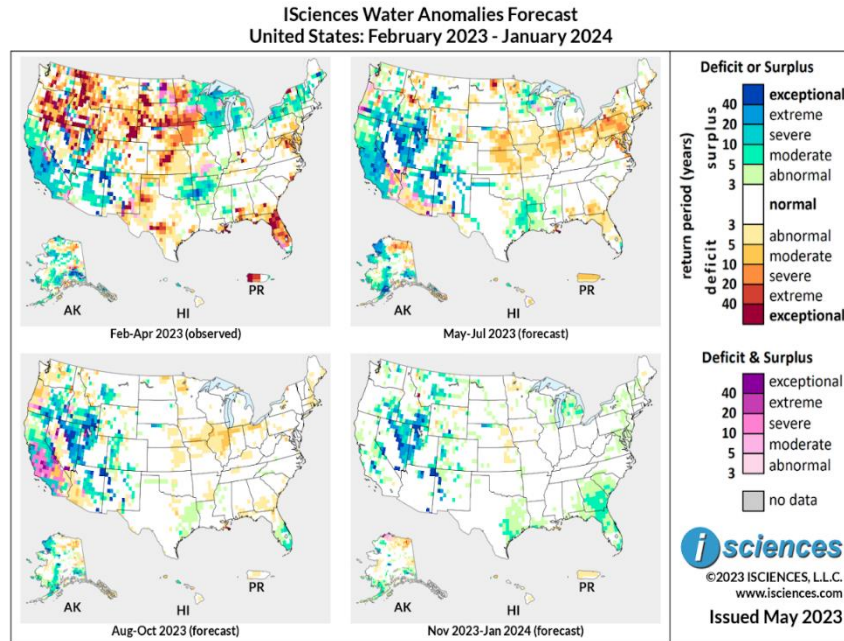
Extreme to exceptional deficits are anticipated in several areas, including:

- Central **Oregon**, in areas near Wasco County. Deficits of milder intensity, mostly moderate, are expected to continue north across central Washington through the Yakama Indian Reservation and Kittitas County.
- Central **Idaho**, near the Salmon River Mountains.
- Southwest **New Mexico**, appearing near the city of Yuma.
- Northeast **Utah**, in areas north of the Ashley National Forest.
- Southeast **Louisiana**, near the city of New Orleans and throughout the Plaquemines Parish.
- Central **Florida**, in areas within and surrounding Levy County.
- Northern **New York**, in an isolated area near the town of Massena.

Notable deficits are anticipated outside of the Continental U.S., mostly of severe intensity. Affected areas include:

- Northeast **Alaska**, near the Arctic National Wildlife Refuge and east of the Chalkyitsik area.
- **Puerto Rico**, widespread throughout the island.

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



Based on observed data through April 2023 and forecasts through January 2024

The forecast through July 2023 indicates existing surpluses in the western and southwestern states to persist, specifically in California, Nevada, southern Idaho, and western Colorado. Moderate to severe deficits are expected to appear in central states, such as Nebraska and Kansas, which spread further into northeastern states including Illinois, Indiana, and much of Pennsylvania.

Outside of the Continental U.S., surpluses are expected to persist in Alaska’s western coastal regions of the North Slope Borough, as well as northern regions of the Lake and Peninsula Borough. Severe deficits are expected to continue in northeast Alaska, near the Arctic National Wildlife Refuge and east of the Chalkyitsik area, as well as throughout Puerto Rico.

From August through October 2023, intense surpluses in Nevada, Utah, Idaho, and California are expected to continue, with transitional conditions appearing in southern California, throughout the counties of Santa Barbara and San Luis Obispo.

The forecast for the final months – November 2023 through January 2024 – predicts intense surpluses in Nevada, Utah, Idaho, and California to persist, with mild surpluses appearing in southeastern states such as southern regions of Georgia and northern Florida.

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

Canada

The 12-month forecast ending in January anticipates widespread deficits throughout many of Canada’s provinces, as well as pockets of intense surplus in its northern and some central areas.

Extreme to exceptional deficits are forecast in:

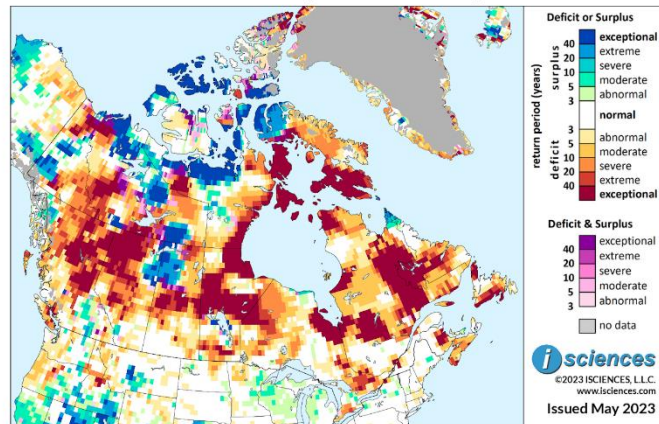
- Central to northeastern **British Columbia**, in northern and eastern regions of Thompson–Nicola and Fraser–Fort George Regional District, and northeast into the North Rockies regions.
- Northwestern **Alberta**, throughout Mackenzie County. Further southwest, areas near The Municipal District of Greenview No. 16 can expect similarly intense deficits.
- Central **Saskatchewan**, in areas throughout and directly south of Lac La Ronge.
- Central and northern **Manitoba**, appearing in areas north of Lake Winnipeg and into northeastern coastal regions of the Hudson Bay.
- Southern **Manitoba**, near the city of Winnipeg.
- Western **Northwest Territories**, appearing in southwestern areas of the Inuvik Region, as well as coastal regions of the Inuvialuit Lands. In southern regions of the province, areas south of Great Slave Lake can expect deficits of similar intensity.
- Western **Ontario**, in areas near Sachigo Lake First Nation, as well as northeastern areas along the coast of the Hudson Bay.
- **Quebec**, appearing in pockets across coastal regions along the Hudson Bay, throughout areas near and southwest of Lake Mistassini, northern coastal regions of the Baie-d’Hudson, and across much of the Rivière-Koksoak. These anomalies continue into western Newfoundland.
- Southeastern **Nunavut**, spanning the province’s eastern coastal regions along the Hudson Bay.
- The Baffin and Southampton islands, with the most intense deficits occurring in the southern regions of Baffin Island, throughout Southampton, and further north within the Inuit Owned Lands.

Extreme to exceptional surplus is expected in:

- Northwest **Saskatchewan**, surrounding areas north and south of Lake Athabasca.
- Southeast **Northwest Territories**, within the Fort Smith region, southeast of Great Slave Lake.
- Western **Yukon**, northeast of the Kluane National Park and Reserve, as well as areas near Dawson City.
- Northern areas of **Nunavut**, throughout most coastal regions along the Northwestern Passage and the Queen Elizabeth Islands.

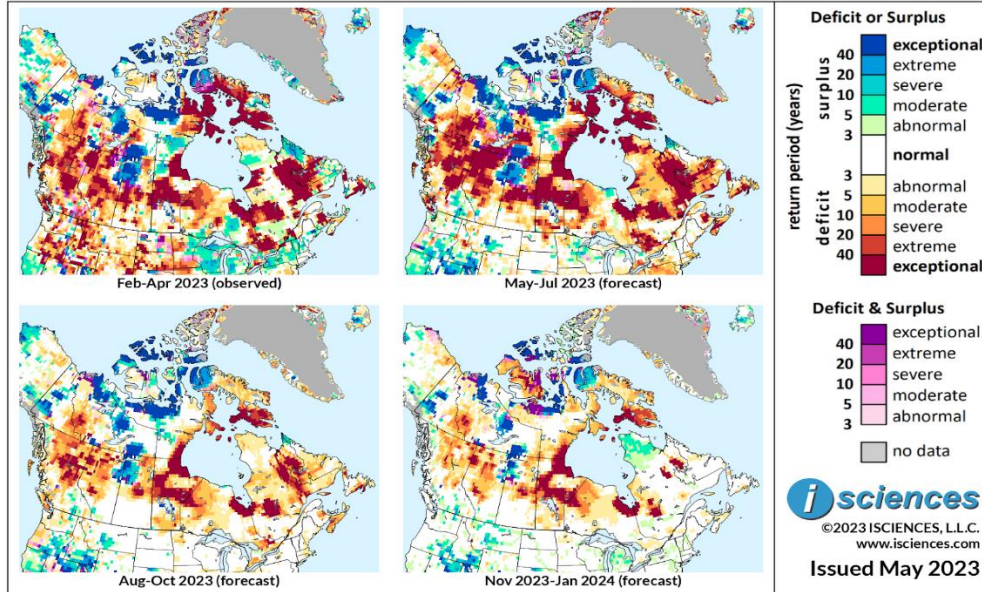
The 3-month maps (below) show the evolving conditions in more detail.

ISciences Water Anomalies Forecast
Canada: February 2023 - January 2024



Based on observed data through April 2023 and forecasts through January 2024

**ISciences Water Anomalies Forecast
Canada: February 2023 - January 2024**



Based on observed data through April 2023 and forecasts through January 2024

The forecast through July 2023 predicts that deficits will remain widespread throughout the majority of Canada. Exceptional deficits are expected to persist in central to northeastern British Columbia, northwestern to central Saskatchewan, and central to northeast Manitoba. Similar deficits are also expected to continue throughout western and eastern Ontario, Quebec, and western areas of Newfoundland. Extreme to exceptional surpluses are expected to continue in northwest Saskatchewan, western areas of Northwest Territories northwest of Great Bear Lake, northern coastal regions of Nunavut along its northern coast, and the Queen Elizabeth Islands.

From August through October 2023, widespread exceptional deficits are expected to linger in much of the provinces, though decrease in size. Eastern British Columbia, northwestern Manitoba, central Saskatchewan, and central to northern Manitoba can expect most existing exceptional deficits to persist. Western and eastern Ontario, as well as south-central and eastern Quebec can expect similar deficits to remain, with the latter's continuing to expand east into Newfoundland. Lingering surpluses can be expected in northwest Saskatchewan, southwest Yukon, northern coastal regions of Nunavut, and areas throughout the Queen Elizabeth Islands.

The forecast for the final months – November through January 2024 – indicates that most deficits throughout the continent will downgrade to normal conditions or mild anomalies, with the exception of small areas of exceptional deficits lingering in central and northeastern Alberta, central and northeastern Manitoba, and northeastern Quebec. Northeastern areas of Victoria Island can expect similarly intense persistent deficits. Exceptional surpluses are expected to linger in northwestern Saskatchewan, northern to central areas of Northwest Territories, central Yukon, northern coastal regions of Nunavut, and throughout various territories of the Queen Elizabeth Islands.

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

Mexico, Central America, and the Caribbean

The 12-month forecast ending in January indicates widespread deficits across much of Mexico and Central America, mostly of mild to moderate intensity. However, intense surpluses are expected to emerge in the Caribbean.

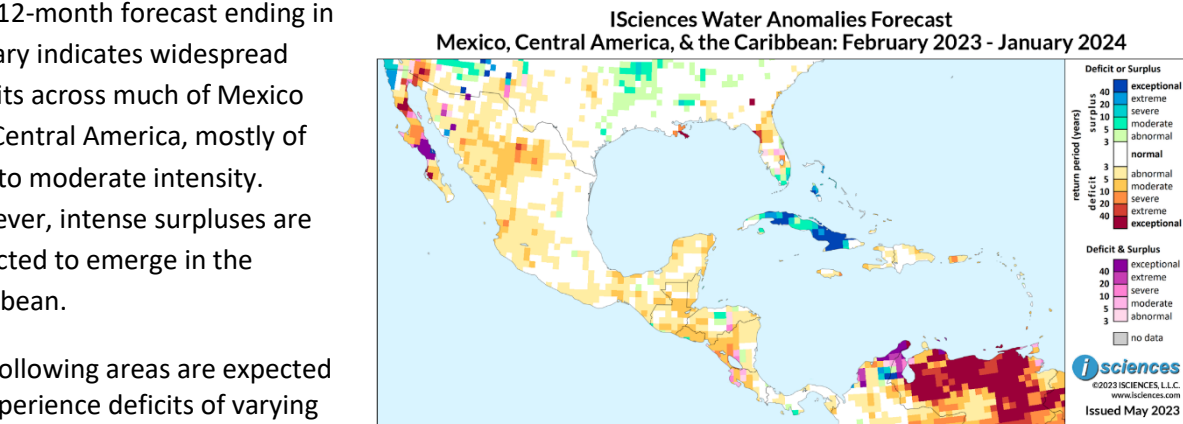
The following areas are expected to experience deficits of varying intensity:

- **Mexico**, with mild to moderate deficits widespread throughout the country. In north-central Mexico, within the states of Chihuahua and Coahuila, pockets of severe to extreme deficits are expected to occur. Similarly intense deficits with a mixture of exceptional transitional conditions are anticipated to appear in northern Baja California Sur.
- **Guatemala**, with the moderate deficits occurring throughout the San Luis municipality.
- **El Salvador**, with moderate deficits throughout much of the country.
- Western **Nicaragua**, throughout the Chinandega department.
- Southern **Belize**, with moderate deficits appearing in the Toledo district.
- Western **Costa Rica**, throughout the Guanacaste Province.

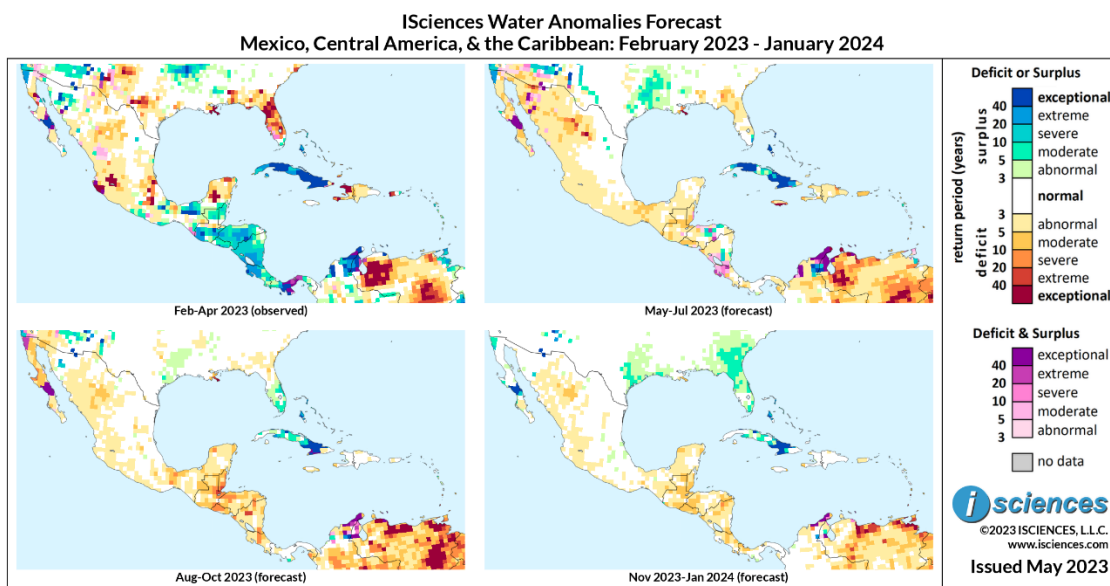
Areas forecast to experience extreme to exceptional surpluses include:

- Most islands of the **Bahamas**.

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



Based on observed data through April 2023 and forecasts through January 2024



Based on observed data through April 2023 and forecasts through January 2024

The forecast through July 2023 anticipates mild to moderate deficits to continue throughout Mexico, as well as most of Central America. Isolated areas of severe to extreme deficits are expected to continue in the Mexican states of Chihuahua and Coahuila, as well as further south in eastern areas of the state of Veracruz. In the Caribbean, southern Jamaica is expected to endure exceptional deficits, while much of the Bahamas can expect extreme to exceptional surpluses throughout the majority of both regions. Western Costa Rica is expected to observe moderate to severe transitional conditions, with central Baja California Sur experiencing exceptional transitional conditions.

From August through October 2023 expects existing deficits in Central America to intensify, reaching severe to extreme levels in eastern Guatemala, Belize, western Honduras, and west-central Nicaragua. Transitional conditions in central Baja California Sur are expected to continue.

The forecast for the final months – November 2023 through January 2024 – indicates that deficits throughout Central America will mostly downgrade, returning to mild to moderate levels. Transitional conditions in Baja California Sur are expected to change into exceptional surpluses.

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

South America

The 12-month forecast ending in January anticipates widespread, intense deficits in almost every region of South America. Additionally, small areas of notable surpluses are expected in isolated areas in the Bolivarian Nations.

Exceptional deficits are expected to occur in:

- **Peru**, widespread throughout the country. Areas throughout the region of Ucayali, the city of Lima, and southern territories of the Zona Reservada Santiago-Comaina can anticipate the most intense deficits.
- **Venezuela**, spanning much of the country, with the exception of areas near the regions of Medio Ventuari and Yacapaca, as well as Serranía La Neblina National Park.
- **The Guianas**, with exceptional deficits occurring in western to central **French Guiana**. The Tapanahony region of Suriname can expect similarly intense deficits, as well as northern, central, and southeast Guyana.
- **Brazil**, covering the vast majority of the country. The regions of Minas Gerais, northeastern Para, Rondonia, and Bahia are expected to experience the most dense areas of deficit.
- **Uruguay**, throughout the entire country.
- Northern and southern **Chile**, covering much of both regions, with the exception of the Aysén Region, which can anticipate moderate to severe deficits.
- Northeast **Argentina**, throughout northern areas of the Buenos Aires province.

Moderate to severe deficits are anticipated in the following areas:

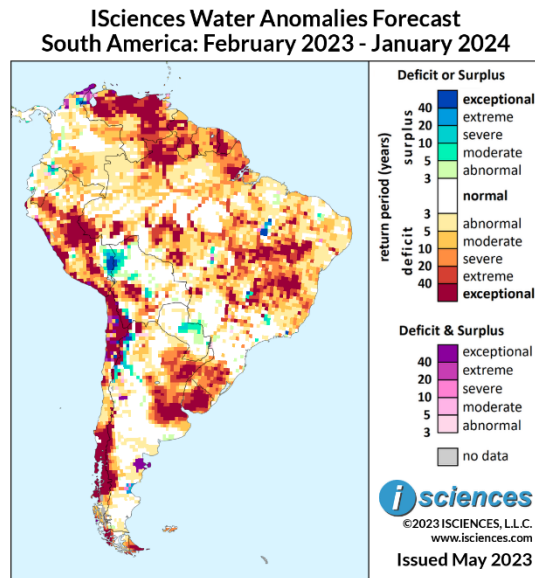
- Northern **Brazil**, in the state of Amapá.
- Southern **Brazil**, throughout the state of Rio Grande do Sul.
- Northeast **Argentina**, in the Santa Fe Province.
- Eastern **French Guiana**, near the commune of Regina.

Areas expected to observe extreme to exceptional surplus include:

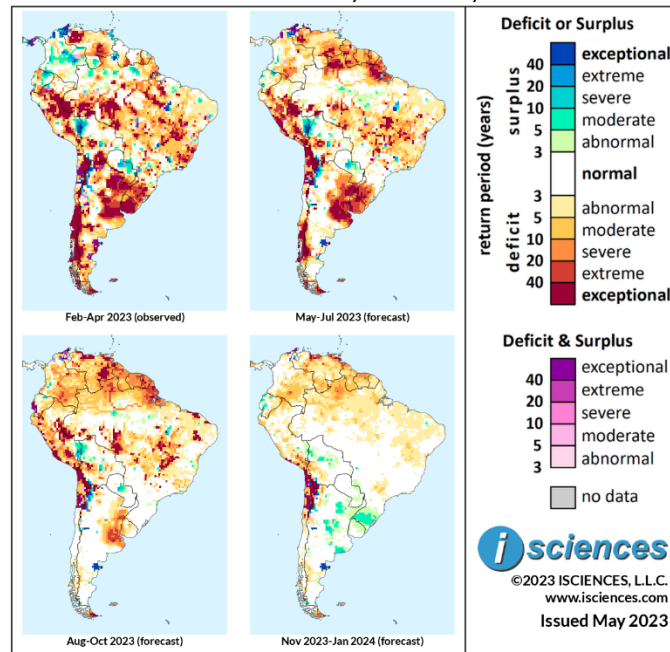
- Southeast **Peru**, in areas north of Lake Titicaca. These surpluses continue further east into Bolivia's Madidi National Park.
- Northwestern **Argentina**, along western regions of the Catamarca Province bordering Chile.

Northern **Colombia**, in southern regions of the La Guajira department. The same region can also expect small pockets of extreme to exceptional transitional conditions.

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



ISciences Water Anomalies Forecast
South America: February 2023 - January 2024



Based on observed data through April 2023 and forecasts through January 2024

The forecast through July 2023 anticipates intense deficits to continue throughout the continent. In Venezuela, areas near the western city of Barinas can anticipate exceptional deficits, as well as places nearby the Canaima National Park. These deficits continue southeast into northern Brazil, as well as throughout the Guianas. Central and eastern Brazil will continue to experience deficits of varying intensity throughout the regions, as well as southernmost Brazil, which can anticipate exceptional deficits in the state of Rio Grande do Sul. Similarly intense deficits are forecast throughout Uruguay, as well as eastern areas of Argentina.

From August through October 2023, exceptional deficits in eastern Argentina are expected to linger but lessen in intensity, becoming extreme to severe. Similar deficits are expected to continue throughout the Guianas, as well as northern Brazil. Further west, a mixture of moderate and exceptional deficits are anticipated to occur throughout southern and central Peru. These anomalies continue north, moving into southern and central Colombia.

The forecast for the final months – November 2023 through January 2024 – anticipates most anomalies to downgrade in intensity to mild or moderate, with the exception of exceptional deficits occurring in north Chile. Moderate to severe deficits are also expected to continue throughout northern Brazil and the Guianas.

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

Europe

The 12-month forecast indicates widespread deficits of varying intensity will occur throughout Continental Europe, with other noncontiguous areas experiencing surpluses, including Ireland and the United Kingdom.

Deficits of varying intensity are expected to occur in:

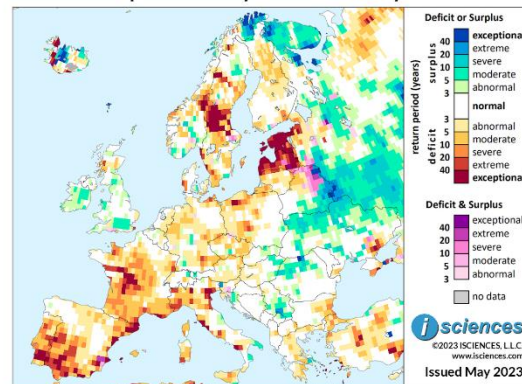
- Western to central **France**, with exceptional deficits along the Loire River, as well as near the city of Nantes. Moderate to severe deficits cover much of the rest of the country.
- Southwestern **Spain**, widespread throughout the province of Girona, as well as regions near the cities of Huelva and Seville. These deficits span across Spain's western border into southern **Portugal**.
- Northern **Italy**, with exceptional deficits appearing in coastal regions of the Province of Imperia, as well as near the city of Venice. Similar deficits continue further south, in small pockets, along the country's western coast into areas near the cities of Rome and Naples.
- Southeast **Germany**, with severe deficits occurring near the city of Munich.
- Western areas of **Poland**, near Świdwin and Kępno County.
- The **Baltics**, with exceptional deficits widespread throughout the region.
- The **Balkans**, with severe occurring along bordering areas of the Black Sea's western coast.
- Central **Sweden**, throughout Jamtland County.

Areas expected to observe extreme to exceptional surplus include:

- Northern areas of **Norway**, throughout the county of Troms og Finnmark.
- Eastern **Belarus**, throughout the Mogilev Region.
- Northern **Ukraine**, covering most areas near the country's northern border.
- Northwestern **Romania**, throughout the region of Maramureș.

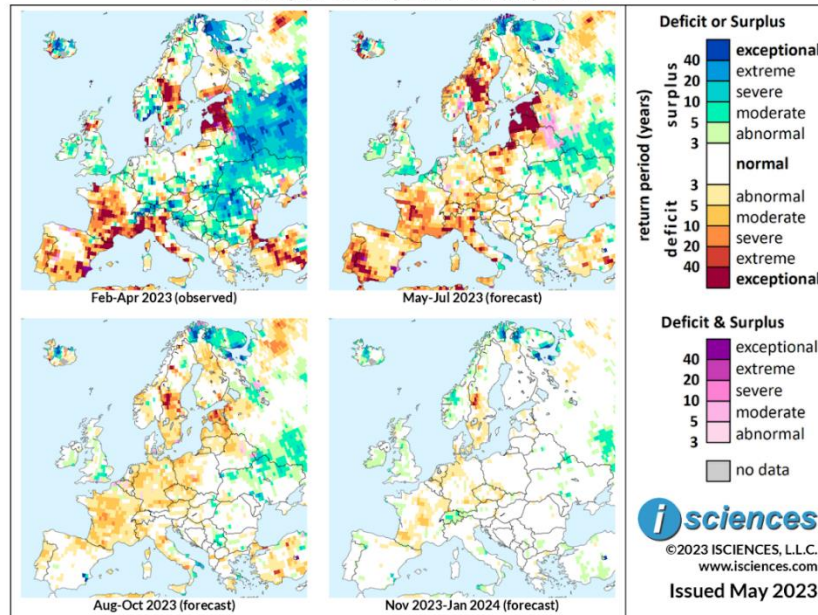
The 3-month maps (below) show the evolving conditions in more detail.

ISciences Water Anomalies Forecast
Europe: February 2023 - January 2024



Based on observed data through April 2023 and forecasts through January 2024

ISciences Water Anomalies Forecast
Europe: February 2023 - January 2024



Based on observed data through April 2023 and forecasts through January 2024

The forecast through July 2023 anticipates exceptional surpluses to linger in the Baltics, central Sweden, southwestern Spain, Portugal, and western areas of France. Deficits of similar intensity are expected to remain throughout Italy, as well as Poland. Surpluses, mostly of mild to moderate intensity, are expected to linger in Ireland, southern United Kingdom, northern Ukraine, and Belarus.

From August through October 2023, most anomalies with a severe intensity and over are expected to downgrade, becoming mostly mild to moderate across most contiguous areas. Some areas are expected to endure lingering exceptional anomalies, including central Sweden and the Baltics, both expected to observe severe deficits. Troms og Finnmark County in northern Norway is also expected to endure persisting extreme to exceptional surpluses.

The forecast for the final months – November 2023 through January 2024 – anticipates most intense anomalies to disappear, becoming normal conditions and mild anomalies throughout Continental Europe. Some areas expected to experience more intense anomalies include central Sweden and northern areas of Norway, throughout the county of Troms og Finnmark.

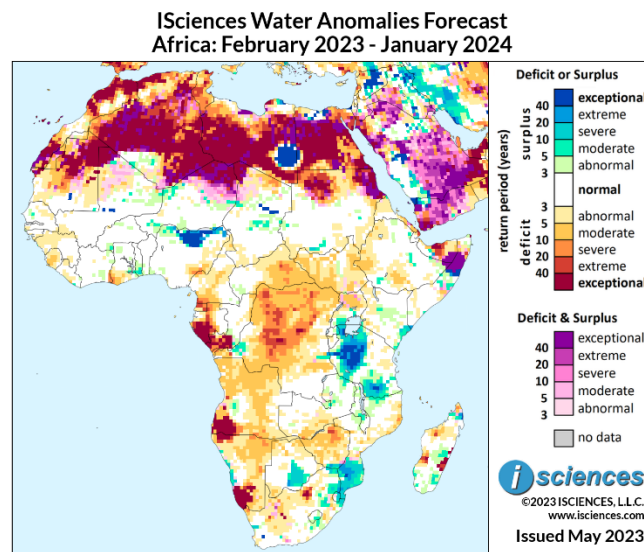
Please note that WSIM forecast skill declines with longer lead times.

Africa

The 12-month forecast anticipates widespread deficits throughout much of Africa, with intense deficits throughout central and southern regions. Some pockets of intense deficits, as well as transitional conditions, are strewn throughout the continent's southern regions.

Deficits of varying intensity are expected to occur in:

- Central to northern **Mauritania**, throughout the Fderik and Bir Moghrein Department into northern regions of **Mali's** Salam area.
- Northern and southern **Morocco**, in the Rabat-Salé-Kénitra province and coastal regions of the Essaouira province.
- **Western Sahara**, throughout much of the country's central and southern regions.
- Northern **Somalia**, throughout the Berbera District.
- Southwestern **Gabon**, throughout the Ogooue-Maritime province.
- Southwestern **Angola**, covering southwestern areas of the city of Tombua.
- Southwestern **Namibia**, in southern areas of the Karas Region.
- **Democratic Republic of the Congo (DRC)**, appearing in pockets throughout the central and northern areas of the country.
- Southwestern **Republic of Congo**, throughout the Zanaga department and southern regions of the Djambala District.
- Northwestern **Sudan**, near the Laqiya Arba'in area.



Based on observed data through April 2023 and forecasts through January 2024

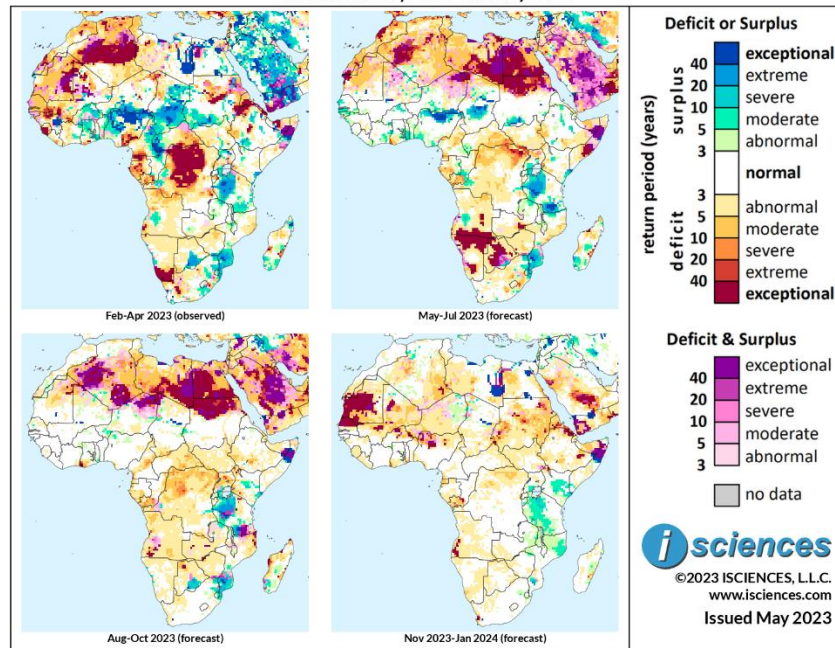
Areas expected to observe extreme to exceptional surplus include:

- Northern **Nigeria**, spreading along the country's northern border shared with Niger.
- Western and southern **Tanzania**, throughout the Tabora region and further southwest into areas near Lake Malawi.
- Southeastern **Botswana**, in regions west of the city of Gaborone.
- Southern **Mozambique**, throughout the Maputo Province.
- Southeastern **Libya**, near the Kufra District.

NOTE: The bullseye-shaped surplus anomaly in Southeastern Libya is reflective of an unusual amount of rainfall in the area according to data collected by NOAA. However, discrepancies exist from different precipitation datasets of this area of the world, as this anomaly is not shown in CHIRPS.

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

ISciences Water Anomalies Forecast
Africa: February 2023 - January 2024



Based on observed data through April 2023 and forecasts through January 2024

The forecast through July 2023 anticipates exceptional deficits in most of Morocco and Mauritania to downgrade, becoming moderate to severe deficits, but will persist in northern Morocco and southern portions of Western Sahara. Northeastern areas of the DRC near the town of Niangara can expect extreme to exceptional deficits to emerge, as well as in southern Somalia, west of the city of Mogadishu. In southern Angola and northern Namibia, intense deficits are forecast to appear along the country's shared border, extending further south into areas near Namibia's Etosha National Park. The forecast predicts similarly intense deficits to develop in central to southern Botswana. Extreme to exceptional surplus is expected along the northern border of Nigeria, as well as central Chad, western and southern Tanzania, and southern Mozambique.

From August through October 2023, intense deficits are expected to disappear from much of the continent, with some moderate to severe deficits appearing in west-central DRC, Uganda, and Republic of Congo. Areas expected to observe extreme to exceptional surplus include western Tanzania, south-central Botswana, eastern South Africa, and Eswatini.

The forecast for the final months – November 2023 through January 2024 – anticipates most intense anomalies to subside, becoming normal conditions or mild deficits across much of the country. Some intense anomalies are expected to continue, particularly exceptional deficits in central to southwestern Mauritania, north-central Nigeria, and pockets throughout Sudan. Much of western Tanzania, central Kenya, and pockets within and the Moma District of Mozambique can expect moderate surplus.

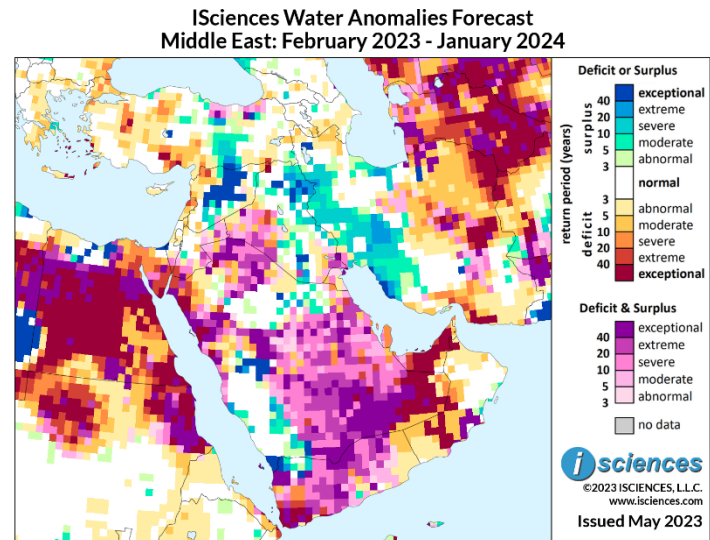
Please note that WSIM forecast skill declines with longer lead times.

Middle East

The 12-month forecast ending in January indicates that much of the Middle East will experience extreme to exceptional transitional conditions, as well as pockets of exceptional deficits in Saudi Arabia, Yemen, and Oman. Surpluses of similar intensity are expected to emerge in areas within Syria, Iraq, and Iran.

Extreme to exceptional transitional conditions are expected in the following areas:

- Western **Iraq**, throughout the Ar-Rutba District.
- **Saudi Arabia**, widespread throughout the country. Similarly intense anomalies also cover nearby **Yemen**.
- Central **Oman**, in coastal regions of the Al Wusta Governorate.
- Northeastern coastal regions of **Turkey**.



Deficits of varying intensity are expected to occur in:

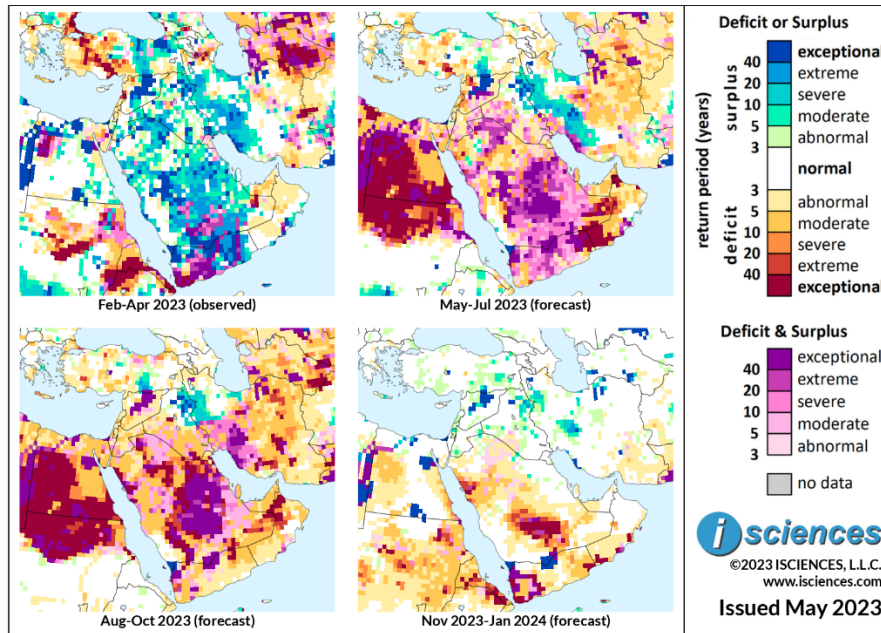
- **United Arab Emirates**, with exceptional deficits covering most of the country.
- Southeast **Saudi Arabia**, with exceptional deficits throughout the Al Udayd region.
- Eastern **Iran**, with exceptional deficits in the southeast regions of Nehbandan County. Similarly intense deficits can be found further north near the city of Mashad, as well as in southeastern coastal regions along the Gulf of Oman.
- **Qatar**, which is expected to experience widespread severe deficits throughout the country.
- Western **Turkey**, with severe to exceptional deficits occurring near the Mersin region. Similar deficits can be expected further northwest near the city of Eskişehir.

Areas expected to observe extreme to exceptional surplus include:

- Northern **Iraq**, in areas near the city of Kirkuk.
- Western **Iran**, throughout the Ilam Province and along the country's shared border with Iraq.
- Central **Syria**, in northern areas of the Tadmur district.
- East-central **Turkey**, near the city of Şanlıurfa.

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

**ISciences Water Anomalies Forecast
Middle East: February 2023 - January 2024**



Based on observed data through April 2023 and forecasts through January 2024

The forecast through July 2023 anticipates widespread transitional conditions in Saudi Arabia and Yemen to continue, with exceptional deficits occurring in western Oman and small southeastern areas of Saudi Arabia. Transitional conditions in northern Saudi Arabia are also expected to persist. Exceptional surpluses in central Syria, northern Iraq, and western Iran are expected to continue, with eastern Iran forecast to endure mild to moderate deficits.

From August through October 2023 expects transitional conditions to linger in south-central to northeastern Saudi Arabia, which will also experience pockets of exceptional deficits through the Najran province and into Wadi Ad Dawasir. In northern Saudi Arabia, the Hail region is expected to endure similarly intense deficits with a mixture of mild transitional conditions. Exceptional surpluses in central Syria are expected to change, becoming transitional conditions. However, extreme to exceptional surpluses in northern Iraq and eastern Iran are expected to continue.

The forecast for the final months – November 2023 through January 2024 – indicates that transitional conditions in Saudi Arabia will mostly disappear, with exceptional deficits emerging in south-central regions of the country, as well as the governorate of Umluj. Similarly intense deficits are expected in southern coastal regions of Oman, with transitional conditions continuing in western Yemen.

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

Central Asia and Russia

The 12-month forecast ending in January indicates intense anomalies will be present throughout Russia, with intense surpluses in its eastern and central regions, and notable deficits throughout its northern and southern regions.

Extreme to exceptional surplus is forecast in:

- Eastern **Russia**, throughout central and northern regions of the Sakha Republic, particularly in central regions of the Olenyoksky District, and throughout central areas of the federal subject Zabaykalsky Krai.
- Central and northern **Russia**, in southern regions of the federal subject Krasnoyarsk Krai, as well as throughout northern and central regions of the Taymyrsky Dolgano-Nenetsky District.
- Southern **Russia**, near the cities of Omsk and throughout the federal subject of Altai Krai.
- Southeastern **Kazakhstan**, in areas east of Lake Balkhash.
- Southwestern **Kazakhstan**, throughout the Karakiya District.

Deficits of varying intensity are expected in:

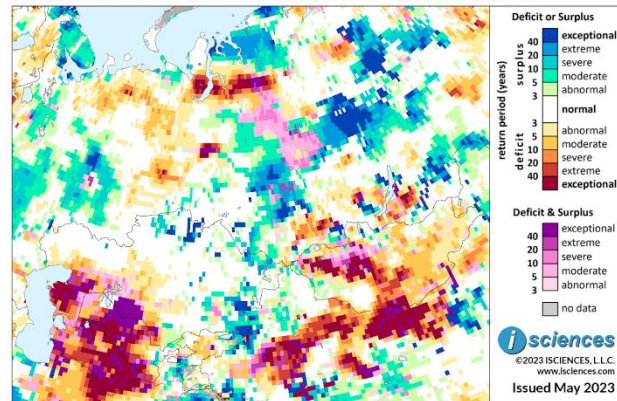
- Northwest **Russia**, with exceptional deficits near the settlement of Novy Port, and northern areas of the Nadymy and Purovsky districts.
- Eastern **Russia**, in western areas of Zabaykalsky Krai.
- **Turkmenistan**, widespread throughout the country.

Transitional conditions are anticipated in:

- Eastern **Russia**, throughout the Evenkiysky District.
- North-central **Uzbekistan**, throughout the Uchkuduk District.

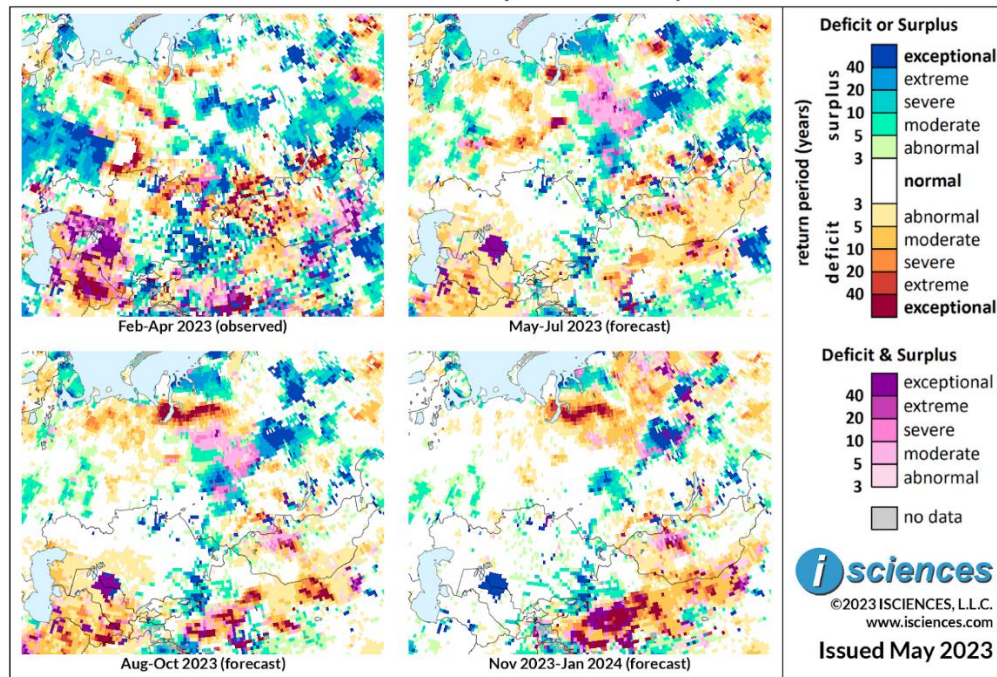
The 3-month maps (below) show the evolving conditions in more detail.

ISciences Water Anomalies Forecast
Central Asia: February 2023 - January 2024



Based on observed data through April 2023 and forecasts through January 2024

**ISciences Water Anomalies Forecast
Central Asia: February 2023 - January 2024**



Based on observed data through April 2023 and forecasts through January 2024

The forecast throughout July predicts small areas of moderate to severe transitional conditions in the Central Siberian Plateau, with exceptional surpluses persisting further north in the Taymyrsky Dolgano-Nenetsky District, as well as east in the Evenkiysky District. Severe to exceptional surpluses will also persist in areas near the city of Omsk. Pockets of similarly intense transitional conditions are expected to appear in southern Kazakhstan and north-central Uzbekistan.

From July through September 2023, transitional conditions within the central regions of the Central Siberian Plateau are expected to persist, with areas farther northeast experiencing lingering exceptional surplus. Regions within the Narymsky District can expect surpluses of similar intensity, while areas in the Tazovsky locality can expect extreme to exceptional surplus.

The forecast for the final months – November to January 2024 – predicts most intense anomalies throughout the region to dissipate, with exceptional deficits continuing near the settlement of Novy Port and the Tazovsky locality. Extreme surpluses are forecast in Taymyrsky Dolgano-Nenetsky District, as well as northern areas of the Evenkiysky District.

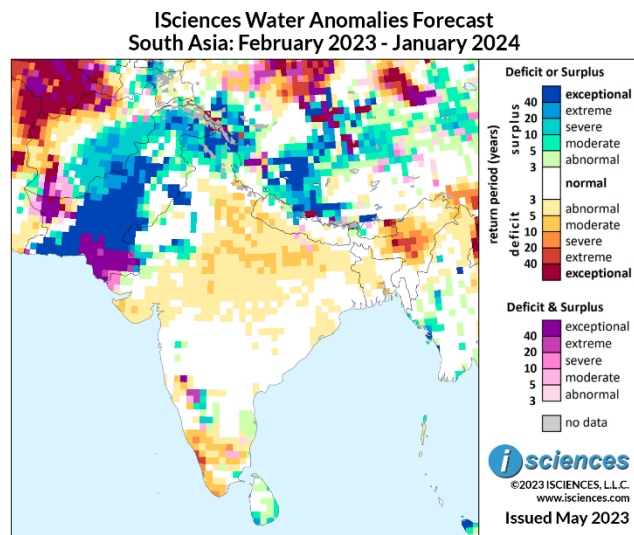
Please note that WSIM forecast skill declines with longer lead times.

South Asia

The 12-month forecast ending in January 2024 indicates major water surpluses to continue in Pakistan and regions of Afghanistan, which reach into smaller areas of India. Other regions including India, Bangladesh, and western Afghanistan can anticipate deficits of varying intensity.

Extreme to exceptional surplus is anticipated in the following areas:

- **Pakistan**, spanning the vast majority of the country. Southern and central regions are expected to endure the most dense areas of anomalies.
- Eastern **Afghanistan**, with anomalies spanning areas of most eastern provinces, from the southeastern province of Kandahar into Konar, located in the east.
- Northernmost **India**, throughout the region of Ladakh.
- Southern coastal regions of **Sri Lanka**.
- Central **Nepal**, in areas near the municipality of Lo Manthang.



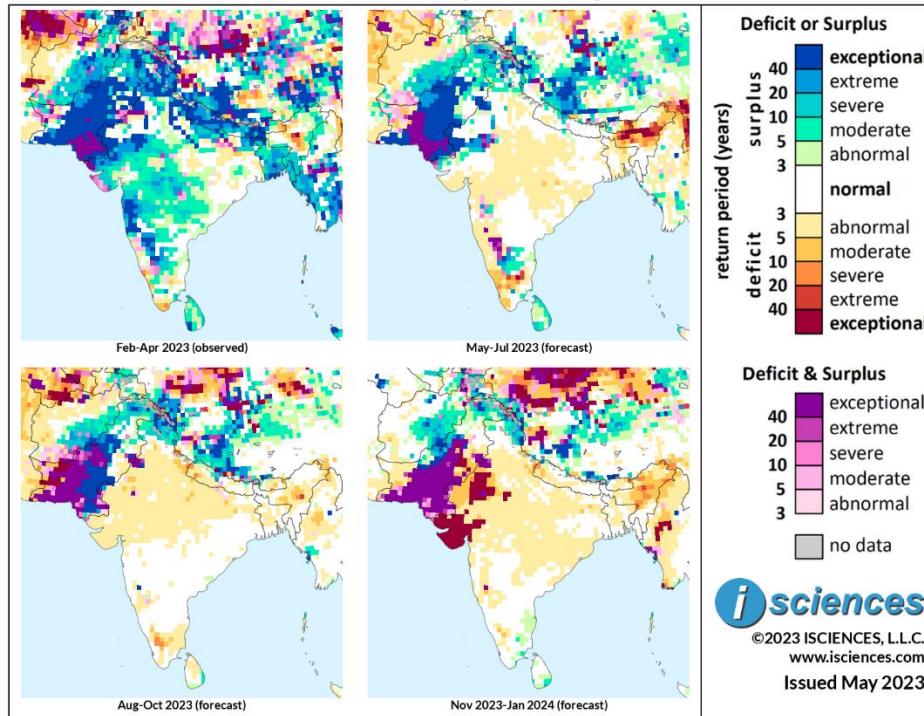
Based on observed data through April 2023 and forecasts through January 2024

Several areas can expect deficits of varying intensity, including:

- Western to northwestern **Afghanistan**, with moderate deficits expected near western regions of the Nimruz province, into eastern regions of the Farah, Herat, Badghis, and Faryab provinces. Deficits of exceptional intensity are expected in each of the provinces' western areas.
- Northeastern **India**, throughout eastern areas of the state of Meghalaya, as well as western to central Manipur.
- Southern **India**, throughout the state of Kerala and spread further east, into western Tamil Nadu and near the coastal town of Kanyakumari.

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

ISciences Water Anomalies Forecast
South Asia: February 2023 - January 2024



Based on observed data through April 2023 and forecasts through January 2024

The forecast through July 2023 anticipates intense surplus and transitional conditions in Pakistan to persist. These surpluses continue north, persisting in eastern regions of Afghanistan. Surplus in the northernmost Indian region of Ladakh is expected to continue, moving further north across the Pakistani border into areas near the city of Skardu. Exceptional deficits are expected to continue in northeastern India in eastern Meghalaya and western to central Manipur. In southern India, extreme to exceptional deficits are expected in northern Tamil Nadu, with extreme to exceptional surpluses appearing further north, near the city of Bengaluru.

From August through October 2023, surpluses in southern and central India will disappear, with small areas of severe deficits emerging in south-central India. Exceptional surpluses will continue in eastern Pakistan, with transitional conditions spreading throughout western Pakistan. In addition to nearby, intense transitional conditions, eastern areas of Pakistan's Chagai district can anticipate exceptional deficits.

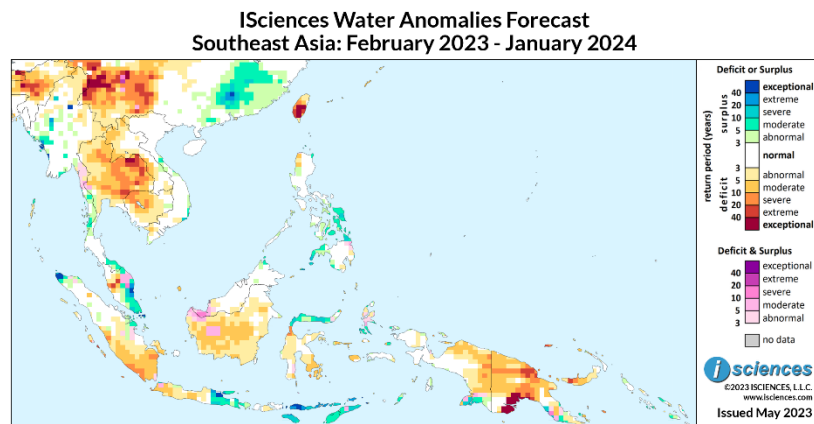
The forecast for the final months – November 2023 through January 2024 – anticipates exceptional deficits to emerge in western and northwestern India, with existing deficits persisting in northeastern India. Extreme to exceptional transitional conditions, along with similarly intense surpluses, are expected to continue in Pakistan, eastern Afghanistan, and northern India.

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

Southeast Asia and the Pacific

The 12-month forecast for Southeast Asia indicates that intense deficits will cover much of Thailand, Indonesia, Papua, and Papua New Guinea. Surpluses are anticipated in the Philippines, southern Malaysia, and some southern, noncontiguous territories of the Lesser Sunda Islands.

Deficits of varying intensity are expected to occur in:



Based on observed data through April 2023 and forecasts through January 2024

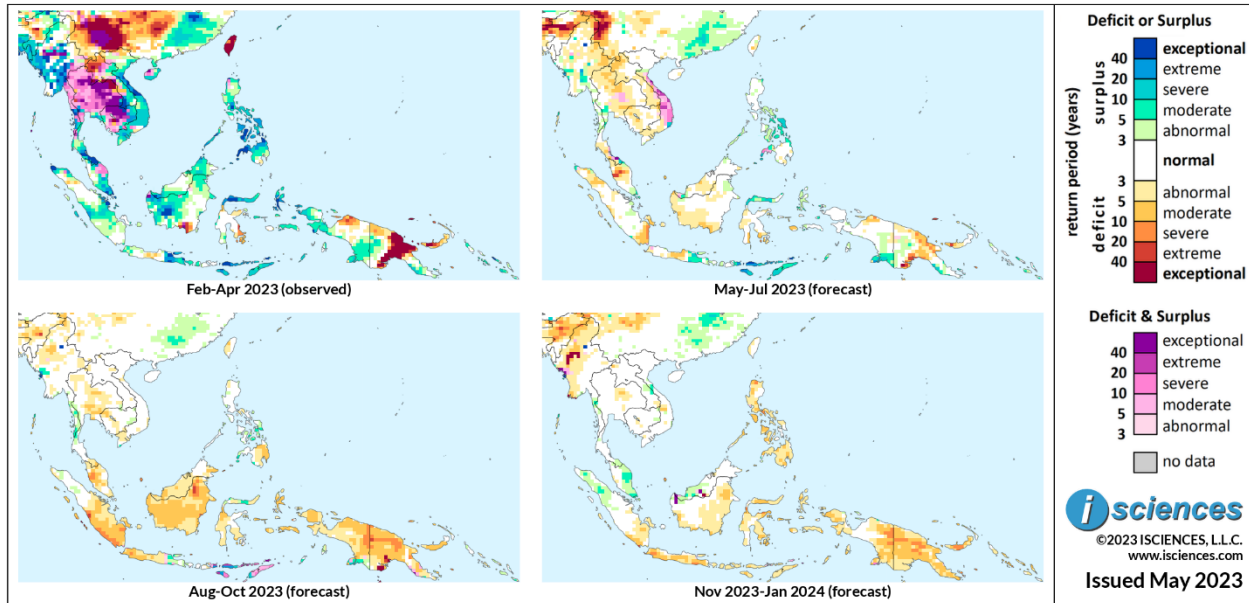
- Northeastern **Thailand**, with exceptional deficits occurring throughout the Nong Khai, Bueng Jan, and Udon Thani provinces. These anomalies continue further north into **Laos**, into regions near the city of Vientiane. Deficits of lesser intensity are expected to cover the rest of the country.
- Northwestern **Cambodia**, with severe deficits appearing in regions northwest of the Tonlé Sap.
- West-central **Malaysia**, throughout the state of Selangor and near the Federal Territory of Kuala Lumpur.
- **Indonesia**, widespread across the island of Kalimantan, as well as western Java and southern Sumatra.
- **Papua**, throughout much of the country. Severe deficits are expected to occur in areas near the Pegunungan Bintang Regency.
- **Papua New Guinea**, with exceptional deficits appearing in southeastern coastal regions bordering the Coral Sea. Further northeast, extreme deficits are expected in central regions of the Madang Province, as well as western areas of the West New Britain Province.

Areas expected to observe extreme to exceptional surplus include:

- Southeastern coastal regions of the state of Pahang in **Malaysia**.
- Southern **Indonesia**, throughout eastern Java and the Lesser Sunda Islands.
- The **Philippines**, throughout the islands consisting of the Eastern Samar region.

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

**ISciences Water Anomalies Forecast
Southeast Asia: February 2023 - January 2024**



Based on observed data through April 2023 and forecasts through January 2024

The forecast through July 2023 anticipates severe to extreme transitional conditions to appear in central and northern Vietnam. Much of the surplus seen in the Philippines, Malaysia, Indonesia, and Cambodia is expected to dissipate, becoming either normal conditions or mild to moderate deficits, primarily in central Malaysia and southern regions of the Indonesian province of Lampung. Surplus in eastern Java and the Lesser Sunda Islands are expected to persist. In Papua New Guinea, exceptional deficits in southeastern coastal regions bordering the Coral Sea are expected to continue, along with deficits in western areas of the West New Britain Province.

From August through October 2023, deficits throughout Indonesia are expected to broaden and intensify, upgrading to moderate to severe deficits across much of Kalimantan, southern Sumatra, and western Java. The states of Sarawak, Sabah, and the island of Brunei can expect similar deficits. Further east, Papua and Papua New Guinea are each expected to experience widespread deficits of moderate to severe intensity, with some exceptional deficits persisting along southern coastal regions of Papua New Guinea bordering the Coral Sea.

The forecast for the final months – November 2023 through January 2024 – expects deficits to persist throughout Papua and Papua New Guinea, as well as the island of Java. Mild deficits are expected to continue in Kalimantan, Sulawesi, and throughout the Philippines, and similarly intense surpluses in Malaysia and northern Sumatra.

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

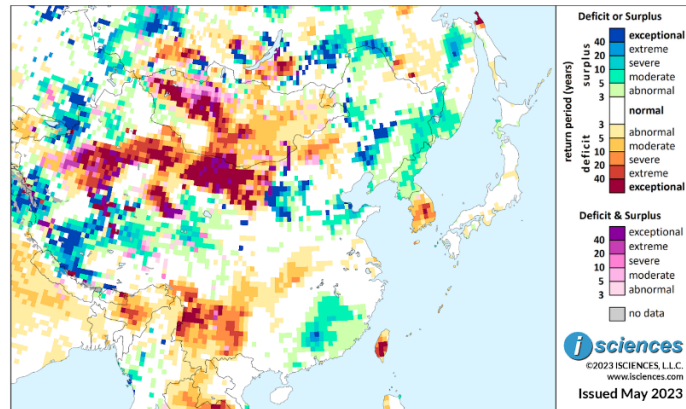
East Asia

The 12-month forecast ending in January 2024 indicates pockets of exceptional anomalies throughout East Asia, with intense deficits occurring in northern and southern regions of China, and notable surpluses in its southwestern and northeastern regions.

Extreme to exceptional deficits are anticipated in the following regions:

- Northern and northwest **China**, throughout western Inner Mongolia and central southeastern Xinjiang.
- Northwestern **Mongolia**, in northern regions of the Govi-Altai aimag, moving further northwest into areas near the city of Ulaangom.
- Southern **China**, throughout western regions of the Yunnan province, into southwestern areas of the Sichuan province.
- **South Korea**, with the most intense deficits occurring in central areas of the country.
- **Taiwan**, throughout much of the country's southern and central regions.

ISciences Water Anomalies Forecast
East Asia: February 2023 - January 2024



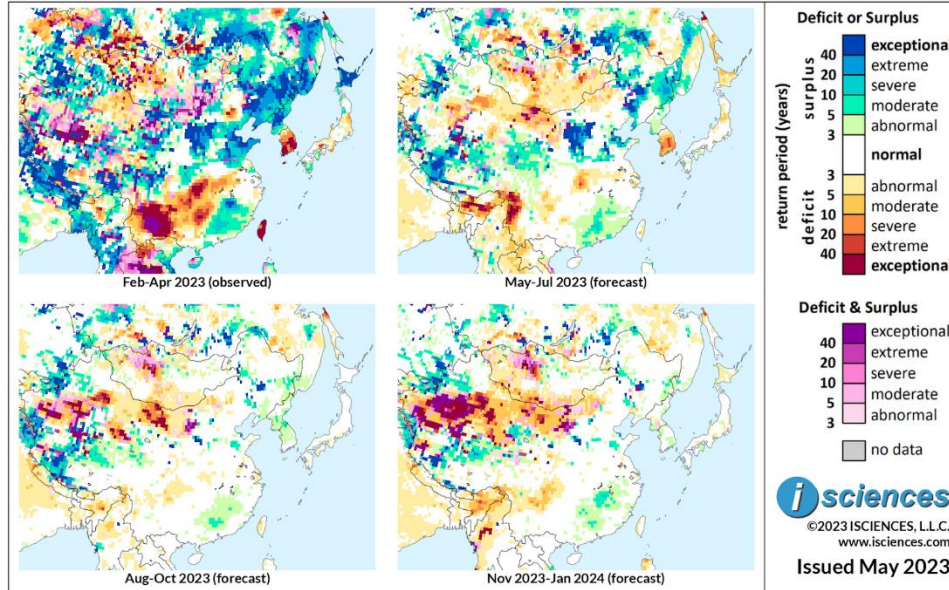
Based on observed data through April 2023 and forecasts through January 2024

The following regions can expect extreme to exceptional surplus:

- Northeast **China**, throughout the Shandong Peninsula, as well as western regions of the Liaoning, Jilin, and Heilongjiang provinces.
- Northwest **China**, in northwestern Xinjiang throughout the Aksu Prefecture.
- Southwestern **China**, spanning across much of the southwestern border of Tibet, as well as areas of the Ngari Prefecture.
- Central regions of **Inner Mongolia**, near the Xiangguang Banner.

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

**ISciences Water Anomalies Forecast
East Asia: February 2023 - January 2024**



Based on observed data through April 2023 and forecasts through January 2024

The forecast through July 2023 anticipates intense surpluses in central Inner Mongolia to persist, as well as in regions of the Liaoning, Jilin, and Heilongjiang provinces. Deficits in western Inner Mongolia are expected to mostly dissipate, becoming moderate deficits in most areas of the region. Extreme to exceptional surpluses will persist throughout Tibet, as well as in western Xinjiang. Further south, northern regions of Yunnan can expect exceptional deficits. In South Korea, extreme deficits are expected to continue.

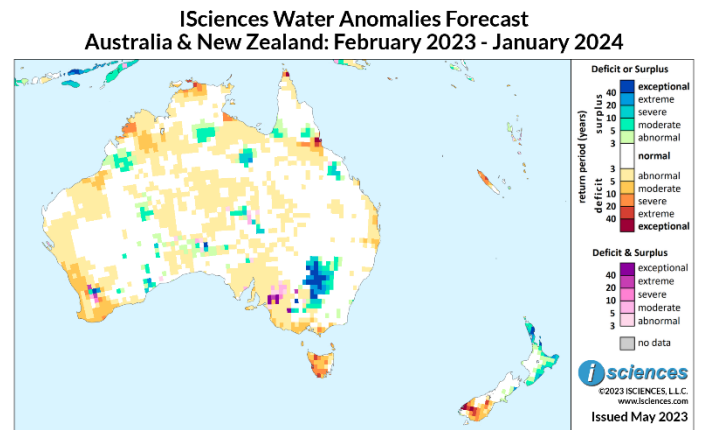
From August to October 2023, most anomalies throughout China are expected to subside, though exceptional deficits can be expected to continue in western Inner Mongolia and eastern Xinjiang. In southwest China, exceptional surpluses are expected to persist throughout Tibet, as well as western to southwestern regions along the border of Xinjiang.

The forecast for the final months – November through January 2024 – predicts exceptional deficits and transitional conditions to re-emerge in central Xinjiang and western Inner Mongolia. Exceptional surpluses are expected to continue throughout Tibet, with mild to moderate transitional conditions in northwestern Mongolia.

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

Australia and New Zealand

The 12-month forecast ending in January indicates that much of Australia will experience mild to moderate water deficits, with some pockets of intense deficits and surpluses appearing throughout the continent. Similarly intense deficits are expected to emerge in Tasmania and New Zealand. Existing surpluses in the continent's southeastern regions are expected to continue, as well as in the northern island of New Zealand.



Areas forecast to experience intense deficits include:

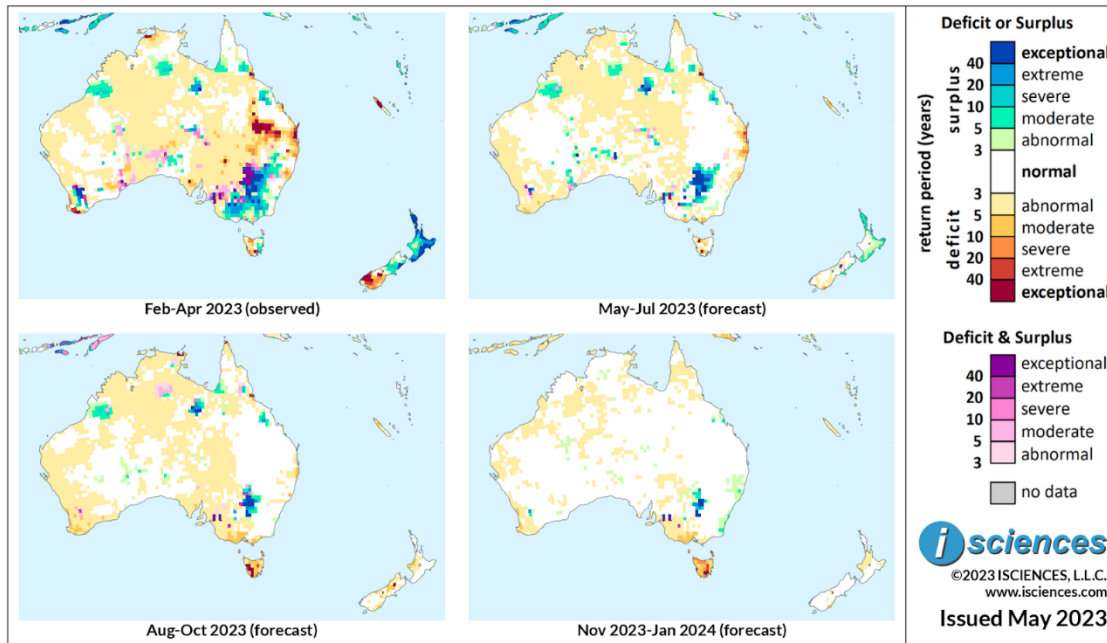
- Southwestern **Western Australia**, near the Shire of Boddington.
- Northern **Western Australia**, near the Prince Regent National Park.
- Northeastern coastal regions of **Queensland**, near the city of Cairns. Similarly intense deficits are anticipated further north, near the town of Bamaga.
- **Tasmania**, widespread across much of the island.
- Southern **New Zealand**, throughout the Southland, Central Otago, and Clutha districts.

The following regions are expected to be experiencing extreme to exceptional surplus:

- Central **New South Wales**, in areas near the town of Griffith.
- Northern and northwestern areas in the **Northern Territory**, in areas northwest of the Limmen National Forest, as well as near the Pamayu locality. Nearby, the city of Darwin and nearby communities can anticipate deficits of similar intensity.
- Southwestern **Western Australia**, in the Wheatbelt region, near the Muja State Forest. Regions along the coast of the Indian Ocean can expect moderate deficits.
- Northern **New Zealand**, throughout the Northland region and along eastern coastal regions of the North Island.

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

ISciences Water Anomalies Forecast Australia & New Zealand: February 2023 - January 2024



Based on observed data through April 2023 and forecasts through January 2024

The forecast through July 2023 anticipates surpluses in southwestern Australia to persist, with some deficits appearing in coastal regions of eastern Queensland, near the Gold and Sunshine coasts. Surpluses of similar intensity are expected to linger in the Northern Territory near the Pamayu locality. Some exceptional deficits in Tasmania are expected to persist, though are expected to shrink in size. In New Zealand, surpluses throughout the North Island are expected to decrease in severity, becoming mild to moderate along the island's coastal regions, while exceptional deficits in the South Island's Southland region are expected to dissipate, becoming mostly normal conditions.

From August through October 2023, surpluses in southeastern Australia are expected to continue, though will decrease in size. Existing surpluses in the Northern Territory, near the Pamayu locality, are also forecast to continue. In Tasmania, exceptional deficits are expected to reemerge along the island's western coast.

The forecast for the final months – November 2023 through January 2024 – expects major surpluses to continue in southeastern Australia but shrink, while intense deficits in Tasmania are also expected to persist.

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