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Global Water Monitor & Forecast Watch List

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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 May 2022 and an ensemble of forecasts issued the last week of May 2022. 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.

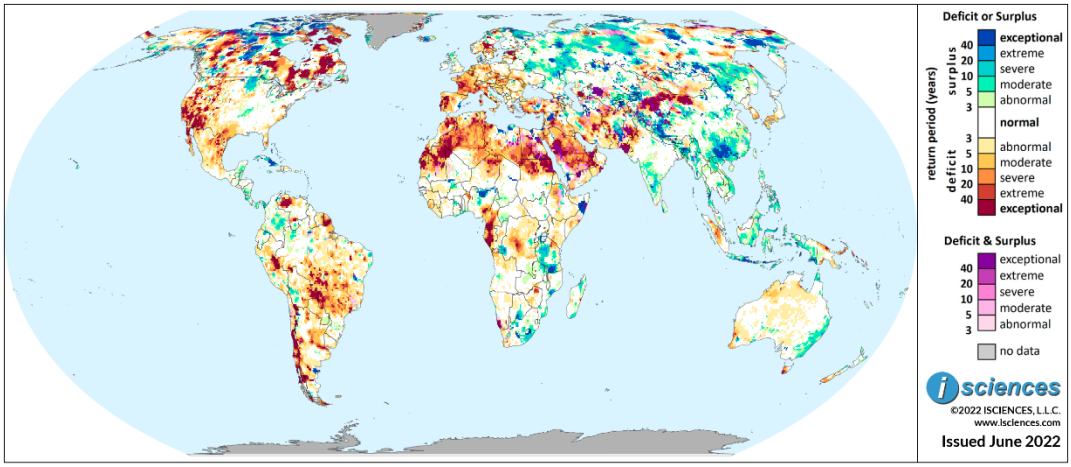
Please note that the WSIM model makes use of seasonal temperature and precipitation forecasts produced by the U.S. National Oceanic and Atmospheric Administration (NOAA) Climate Forecast System Version 2 (CFSv2). These forecasts predict broad temperature and precipitation patterns, but do not effectively 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.

Worldwide Water Watch List

This map presents a selection of regions likely to encounter significant water anomalies during the one-year period beginning in March 2022 and running through February 2023 using 3 months of observed temperature and precipitation data and 9 months of forecast data.

ISciences Water Anomalies Forecast: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

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 through August indicates water deficits of varying intensity in the West, Southwest, Rockies, parts of the Pacific Northwest, Virginia, North Carolina, and Georgia. Areas with a forecast of surplus include the Dakotas and Minnesota, and western Washington and Oregon.

Canada: The forecast through August indicates many areas of intense water deficit in Quebec, Ontario, and central and northern regions of the Prairie Provinces and British Columbia. Areas of surplus include southern Manitoba, northwestern Saskatchewan, and southeastern British Columbia.

Mexico, Central America, and the Caribbean: The forecast through August indicates moderate to severe water deficits in Chihuahua, Coahuila, Nuevo León, Tamaulipas, and Puebla. Areas with a forecast of surplus include the Yucatan and pockets throughout Central America.

South America: The forecast through August indicates widespread, exceptional water deficits across central Brazil from Mato Grosso into Minas Gerais and from Tocantins into São Paulo State. Surpluses will be widespread in Amazonas, Brazil, and in Colombia.

Europe: The forecast through August indicates that water deficits will increase, becoming widespread. Deficits will be especially pervasive in France. Other areas of intense deficit include the Rhone, Drava, and Rhine Rivers; western Spain; and Estonia.

Africa: The forecast through August indicates widespread water deficits across North Africa including intense deficits. Surpluses will be widespread in many East African nations reaching through much of eastern South Africa.

Middle East: The forecast through August indicates water deficits in many regions, moderate to severe overall but more intense in Riyadh Province, Saudi Arabia; Ankara, Turkey; and Baghdad and the lower Gharraf Canal in Iraq. Surpluses are forecast in Turkey from Konya past Lake Tuz.

Central Asia and Russia: The forecast through August indicates that water deficits will moderate in Mangystau, Kazakhstan; increase in Turkmenistan; and emerge in Irkutsk Oblast, Russia, and in Surgut on the Ob River. Surpluses will persist in the Western Siberian Plain.

South Asia: The forecast through August indicates widespread water surpluses in Andhra Pradesh, southeastern Karnataka, Tamil Nadu, Sri Lanka, and from eastern Bangladesh into Indian regions to the east. Anomalies will be exceptional in Karnataka and from Bangladesh into India.

Southeast Asia and the Pacific: The forecast through August indicates that, while water surpluses will shrink and downgrade, many areas will persist, including exceptional surpluses in central Vietnam and Java. Areas of deficit include Medan, Sumatra, and New Guinea's north coast.

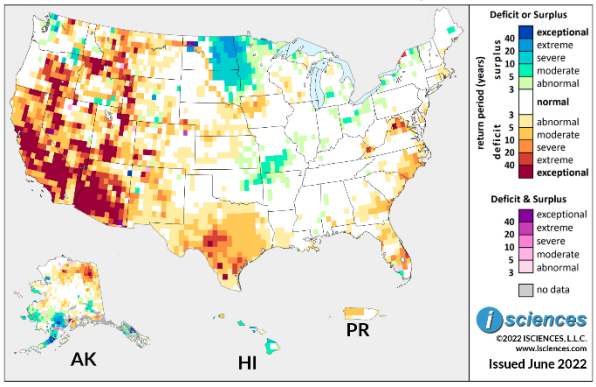
East Asia: The forecast through August indicates widespread water surpluses from the Yangtze River south, particularly intense in the Pearl River Watershed where anomalies will be exceptional throughout much of Guangxi. Deficits are forecast in South Korea and Japan.

Australia & New Zealand: The forecast through August indicates that water surpluses will downgrade but remain widespread in eastern Australia from the Wide Bay-Burnett region of Queensland through East Gippsland, Victoria. Deficits will emerge in Top End, Northern Territory and shrink in New Zealand.

Watch List: Regional Details

United States

The 12-month forecast ending February 2023 indicates widespread water deficits of varying intensity in the U.S. West, Rockies, Southwest, and Texas. Deficits are also expected in pockets on the East Coast from southern New Jersey through Florida.



Based on observed data through May 2022 and forecasts through February 2023

In the West, exceptional anomalies will be widespread in California and Arizona including the San Joaquin Valley and Lower Colorado River Basin, but exceptional deficits are also predicted for southern Utah and Nevada, the Salmon River Mountains in Idaho, and south-central Oregon. A few pockets of surplus are expected in the Pacific Northwest. Deficits of varying intensity are forecast through the Rocky Mountain States.

The forecast for Texas indicates widespread deficits in much of the state outside of the panhandle. Anomalies will be primarily severe to extreme from the Hill Country into the South Texas Plains and reaching the Gulf Coast at Corpus Christi. Moderate deficits are expected from the Dallas-Fort Worth area to Houston.

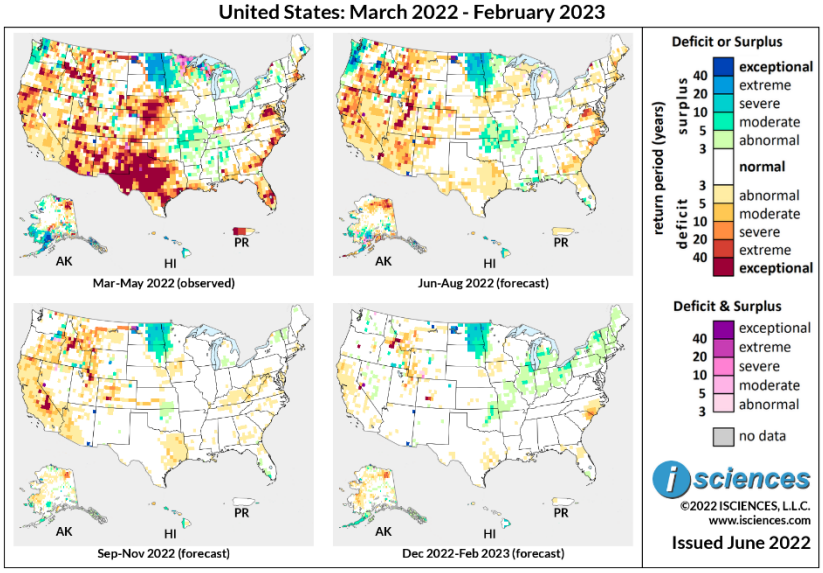
Widespread severe to extreme surpluses are forecast in the Red River Watershed of North Dakota and Minnesota reaching across the border into South Dakota. Surpluses will also be intense around International Falls, Minnesota. Moderate deficits are expected along the Missouri River and in northwestern Iowa and pockets of Nebraska. Moderate surpluses are forecast in Missouri's southwestern quadrant reaching into its southern neighbors. A few pockets of moderate surplus are also forecast in Michigan, Ohio, Upstate New York, and central Penobscot County, Maine.

On the East Coast, deficits of varying intensity are forecast in southern New Jersey and Delaware, northern Virginia and the state's western corner, eastern North Carolina and coastal pockets in South Carolina, eastern Georgia, northeastern Florida, and surrounding Lake Okeechobee. Deficits will be intense in Virginia.

Outside the contiguous U.S., Alaska can expect deficits in the northeast and central north, and near Anchorage in the south. Surpluses are expected near Juneau, Nome, Bethel, reaching from the Alaska Peninsula inland to the Kuskokwim River, and at the eastern end of the Alaska Range. Surpluses are forecast in Hawaii and moderate deficits in western Puerto Rico.

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

ISciences Water Anomalies Forecast
United States: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

The forecast through August indicates widespread deficits of varying intensity in the West, parts of the Southwest, Rockies, and some areas in the Pacific Northwest. Deficits will be exceptional through the Rockies in Utah and the Salmon River Mountains in Idaho. Deficits ranging from severe to exceptional are expected to be widespread in northern California, central and southern Oregon, and western Montana. Surpluses reaching exceptional intensity are forecast for western Washington and well into northwestern Oregon. Surpluses are also expected in a pocket of northeastern Oregon spanning the border into Washington.

Widespread severe to extreme surpluses will persist in the Red and James River Watersheds and beyond in North and South Dakota and well into Minnesota. Severe deficits will trace the Missouri River, but surpluses are expected on the river in a pocket west of Lake Sakakawea. A sprinkling of moderate deficits is forecast in Iowa, Wisconsin, Nebraska, and parts of the Arkansas River in Kansas. Moderate surpluses will be widespread spanning the conjoined regions of Kansas, Missouri, Arkansas, and Oklahoma, and surpluses are also forecast for coastal Mississippi. Some pockets of moderate deficit will linger in northeastern and Big Bend Country in Texas. On the East Coast, pockets of deficit are expected in the coastal Northeast, Virginia, the eastern regions of the Carolinas, and southern Georgia. Anomalies will be extreme in northern Virginia and severe in eastern North Carolina.

From September through November, deficits will shrink and downgrade overall, persisting in California, Oregon, the northern Rockies, Upper Colorado River, parts of the Arkansas River, and the Missouri River. Exceptional deficits will persist in the Salmon River Mountains of Idaho and the Upper Bear River region in Utah and will emerge in the central Mojave Desert in California. Deficits will be severe on the Missouri River through Montana. Widespread severe surpluses will persist in the Red and James River regions of North Dakota and Minnesota, moderating in South Dakota.

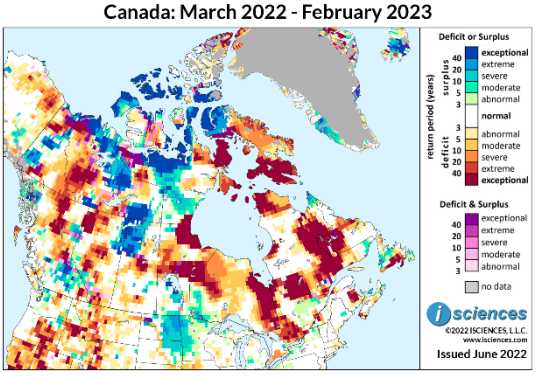
The forecast for the final months – December 2022 through February 2023 – indicates persistent severe surpluses from the Dakotas into Minnesota and increasing surpluses in a pocket on the Missouri River west of Lake Sakakawea. Pockets of moderate surplus will emerge in northeastern Oklahoma, the Upper Ohio River Watershed, Michigan, and the St. Lawrence River region. Deficits are forecast in the northern Rockies and a pocket in the eastern Carolinas.

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

Canada

The 12-month outlook for Canada through February 2023 indicates vast areas of exceptional water deficit in the eastern half of the nation.

ISciences Water Anomalies Forecast
Canada: March 2022 - February 2023



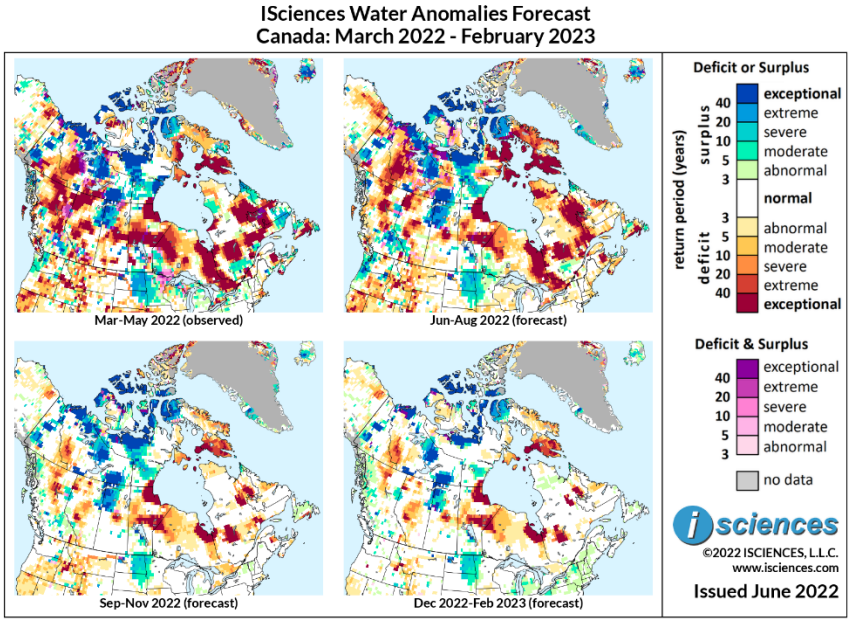
Based on observed data through May 2022 and forecasts through February 2023

Deficits will be exceptional in many regions including southern Newfoundland, the Miramichi River watershed in east-central New Brunswick, the Smallwood Reservoir region in Labrador, the Manicouagan Reservoir region in Quebec, and a vast area near Lake Mistassini. Deficits will be somewhat less intense in Southern Ontario east of Georgian Bay, while a small pocket of surplus is forecast west of Toronto. Exceptional deficits are expected in a broad column along Ontario's eastern border reaching James Bay. Deficits will be widespread in Northern Ontario and will include exceptional anomalies in northern Kenora District though surpluses are forecast for southern Kenora.

Widespread exceptional deficits will belt central Manitoba and are also forecast in the province's northeast reaching Hudson Bay. Surpluses are forecast south of Lake Winnipeg and near the U.S. border. Elsewhere in the Prairie Provinces, deficits are forecast in a path across southern Saskatchewan leading to Regina and also in the center of the province, but widespread surpluses are forecast in the northwest leading west past Fort McMurray, Alberta. In Alberta, intense deficits are expected in the south, the Middle Athabasca River region, and the northwest, and surpluses north of Banff.

Surpluses are forecast in the Thompson River Watershed of southern British Columbia leading east into the Columbia Watershed, but exceptional deficits are expected in East Kootenay in the province's southeast corner. Exceptional deficits are also forecast in the Upper Fraser Watershed and severe deficits in the Nechako River Watershed. In British Columbia's central far north, exceptional deficits will lead from Williston Lake well into Yukon and Northwest Territories.

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



Based on observed data through May 2022 and forecasts through February 2023

The forecast through August indicates that vast areas of deficit will persist from Quebec into Labrador and surrounding Lake Mistassini and will increase in the Ungava Peninsula. Deficits will increase in Nova Scotia, persist in the Miramichi River region of New Brunswick, and emerge in the Gaspé Peninsula. Surpluses will linger between the Upper Gatineau and St. Maurice Rivers in Quebec. In Ontario, deficits will be intense along the province's eastern border and east of Georgian Bay and will increase north of Lake Erie as surpluses retreat. Much of Northern Ontario will also see deficits though moderate surpluses will persist in pockets of southern Kenora.

Surpluses are forecast in Manitoba south of Lake Winnipeg and along the U.S. border. Widespread, intense surpluses will persist from northwestern Saskatchewan into Alberta, and surpluses of varying intensity will increase in southern British Columbia from the North Thompson and Quesnel River Basins through the northern Columbia River Basin into Alberta. Deficits will moderate in a pocket of south-central Saskatchewan approaching Regina but will be intense in the center of the province. In Alberta, deficits are forecast in the south, the Middle Athabasca River, and far northwest. Areas of deficit in British Columbia include Vancouver Island, the Nechako River, Lake Williston, and the far north.

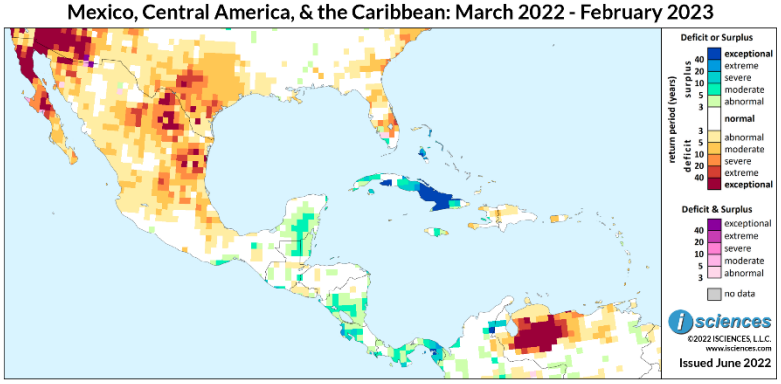
From September through November, deficits will shrink and downgrade considerably though large pockets will persist. Surpluses will nearly disappear in much of the nation's eastern half, will shrink in southern British Columbia but emerge in the Skeena River region as deficits recede. Southern Saskatchewan will normalize.

The forecast for the final months – December 2022 through February 2023 – indicates a pattern of anomalies like the prior three-months though deficits will shrink in Quebec and surpluses will shrink in southern British Columbia. Please note that WSIM forecast skill declines with longer lead times.

Mexico, Central America, and the Caribbean

The 12-month forecast ending February 2023 indicates widespread water deficits of varying intensity in the Baja Peninsula, across the Gulf of California in Sonora, and in Mexico's north-central and eastern states.

ISciences Water Anomalies Forecast
Mexico, Central America, & the Caribbean: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

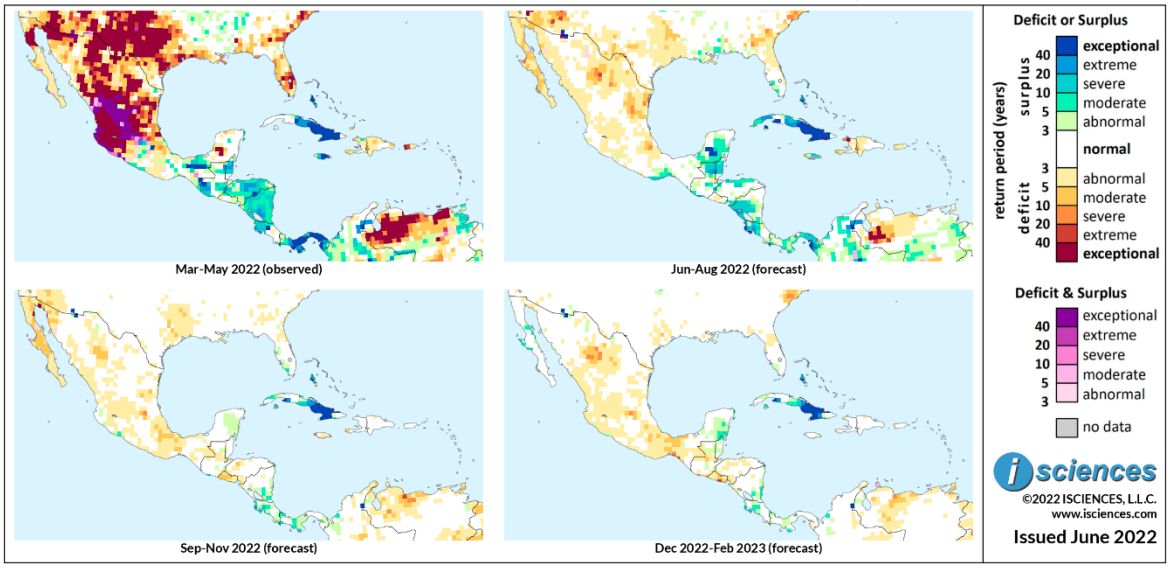
Anomalies will be severe to exceptional in much of Baja and exceptional in the Colorado River Delta. Severe to exceptional deficits are also forecast in Coahuila, framed by severe to extreme deficits in eastern Chihuahua and Nuevo León.

Deficits of varying intensity, including pockets of exceptional anomalies, are forecast for Tamaulipas on the Gulf of Mexico, downgrading as they reach through the smaller land-locked states to the south and Veracruz. Some isolated pockets of moderate deficit are expected on the west coast in Sinaloa and Nayarit. In the Yucatan Peninsula, moderate surpluses are forecast in central regions.

Moderate surpluses are also expected in pockets of Central America with more intense anomalies in Panama. Jamaica, Cuba, and the central Bahamas can expect surpluses.

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

ISciences Water Anomalies Forecast
Mexico, Central America, & the Caribbean: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

The forecast through August indicates that deficits in Mexico will shrink and downgrade considerably. Moderate deficits are forecast in Baja, and generally moderate to severe deficits in southeastern Chihuahua, pockets of Coahuila, southern Nuevo León, Tamaulipas, and Puebla. Surpluses are predicted for the Yucatan Peninsula and coastal Oaxaca. Anomalies will be moderate overall but exceptional in central Campeche. In Central America, surpluses of varying intensity are expected in Belize, Guatemala, coastal Honduras, western Nicaragua and Costa Rica, and Panama. Surpluses are also forecast in Jamaica, Cuba, and the central Bahamas, and some deficits in Hispaniola.

From September through November, moderate deficits will linger in Baja, northwestern Sonora, and southeastern Chihuahua. Moderate to severe deficits are expected in land-locked Hidalgo, and moderate deficits trailing from Puebla into Veracruz and Oaxaca. Moderate deficits are also forecast in El Salvador, but pockets of moderate surplus are forecast from southern Nicaragua into Panama. Cuba and the Bahamas can expect surpluses; Jamaica will transition out of surplus with pockets of deficit emerging; and near-normal conditions are forecast for Hispaniola.

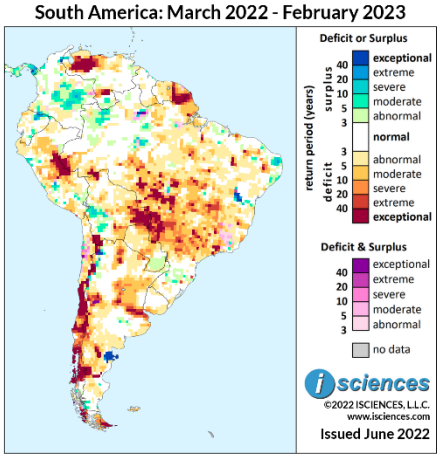
The forecast for the final three months – December 2022 through January 2023 – indicates that deficits in southeastern Chihuahua will increase and intensify somewhat, becoming severe. Deficits are also forecast for Hidalgo, between the Gulf of Mexico and Gulf of Tehuantepec, and in El Salvador. Small pockets of moderate surplus are forecast in Baja, Quintana Roo, Nicaragua, and Costa Rica. Surpluses are expected in Cuba and the Bahamas.

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

South America

The 12-month forecast through February 2023 indicates widespread water deficits of varying intensity in Brazil's Central West region through the Southeast, as well as pockets of deficit elsewhere. Deficits will be exceptional in several areas including Mato Grosso and Mato Grosso do Sul. Intense deficits are also expected on the Paraná River between the Ilha Solteira Reservoir and the Itaipu Reservoir. Some pockets of deficit are expected in the Northeast region including Piauí as well as pockets of surplus in Rio Grande do Norte, Alagoas, and central Bahia. Surpluses are also forecast in pockets of Amazonas.

ISciences Water Anomalies Forecast
South America: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

Across the northern arc of the continent exceptional deficits are forecast from Merida, Venezuela to Caracas; in a belt between the Ventuari and Upper Orinoco Rivers in southern Venezuela; and in French Guiana, moderating as they reach into nearby regions across the borders. Surpluses are forecast in much of central Colombia and a pocket northeast of Quito, Ecuador.

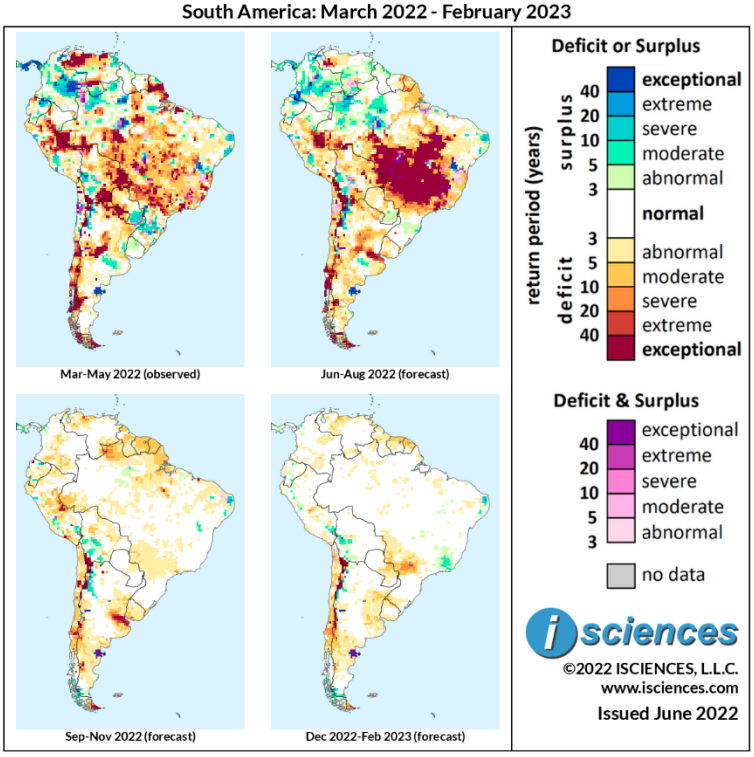
In Peru, exceptional deficits are forecast in the middle reaches of the Ucayali River Watershed, moderate deficits in Loreto in the north and Arequipa in the south, and deficits of varying intensity in much of central Peru. A pocket of surplus is predicted near Trujillo on the north coast and surrounding Huancayo in the central Peruvian Andes. Surpluses are also forecast from Lake Titicaca through La Paz, Bolivia and in the Upper Pilcomayo and Upper Grande River regions of southwestern Bolivia. Deficits are forecast in several other regions of the nation, particularly in the east where anomalies will be exceptional.

Deficits are forecast through central Paraguay and pockets of the Chaco region in Argentina. The northern and eastern Pampas can also expect deficits, severe to exceptional from the Upper Tercero River to Buenos Aires. Exceptional surpluses are forecast in coastal Chubut Province, but areas of exceptional deficit are also expected in Patagonia including along the Chico River.

Mixed conditions are predicted for northern Chile, but exceptional deficits will reach from La Serena through Valparaiso, Santiago, and most of the nation's southern extent. Exceptional deficits are forecast in Tierra del Fuego and moderate to severe deficits in the Falklands.

The 3-month maps (below) for the same 12-month period show the evolving conditions in greater detail.

ISciences Water Anomalies Forecast
South America: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

The forecast through August indicates widespread, exceptional deficits across central Brazil from Mato Grosso into Minas Gerais and from Tocantins in the north into São Paulo State, downgrading as they reach beyond those regions. A pocket of exceptional surplus is forecast in central Bahia and surpluses of lesser intensity are expected in pockets of Brazil's eastern tip and in much of Amazonas. Surpluses of varying intensity are expected from Ecuador though much of Colombia, parts of southern and eastern Venezuela, and coastal Guyana. Deficits will be intense surrounding Merida, Venezuela and moderate to severe in French Guiana, moderating through Amapá, Brazil. Mixed conditions are forecast in Peru, including deficits in the center of the country, exceptional from Ucayali into Brazil, and in Arequipa in the south. Areas with a forecast of surplus include central Loreto in the north and Huancayo in the south. Moderate surpluses are forecast from Lake Titicaca past La Paz, Bolivia, and south of Lake Poopó. Deficits are forecast in many other areas of the country.

Severe deficits will trace the path of the Bermejo River in northern Argentina and mixed conditions are expected in the northwest. Severe to exceptional deficits are expected in the northern and eastern Pampas, intense in Buenos Aires but downgrading in southern Uruguay. A pocket of moderate surplus is forecast in the central Pampas. Generally moderate deficits are expected in Patagonian Argentina though intense surpluses are forecast in coastal Chubut. Deficits are forecast throughout much of Chile, moderate in the north but exceptional in the south. Deficits will be intense in Tierra del Fuego and severe in the Falklands.

From September through November, anomalies will shrink and downgrade considerably, leaving nearly normal conditions in many regions, notably Brazil. Moderate to severe deficits are forecast in Roraima and moderate deficits from the Guianas through Amapá. Pockets of deficit are expected in northwestern Venezuela, central and southern Colombia, central Peru into Brazil, and from Arequipa through most of Chile to the Gulf of Corcovado. Some moderate deficits will linger in Bolivia and surpluses in the west. In Argentina, mixed conditions will persist in the northwest, intense deficits in Buenos Aires Province between the Paraná and Salado Rivers, and deficits in pockets of Patagonia. Intense deficits will persist in Tierra del Fuego and the Falklands. Surpluses will emerge west of the South Patagonian Ice Field.

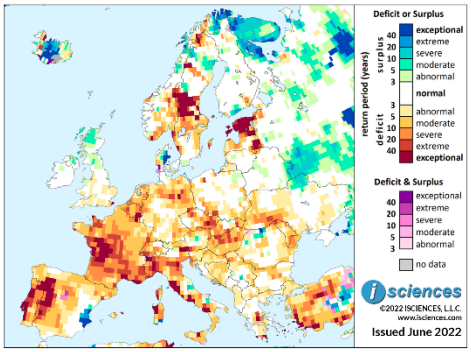
The final quarter – December 2022 through February 2023 – deficits are forecast in the Guianas; Mato Grosso do Sul, São Paulo, and Paraná, Brazil; central Paraguay; Chile; and pockets in eastern and Patagonian Argentina. Surpluses are forecast in pockets of northeastern Brazil, from southern Minas Gerais into Rio De Janeiro, and from Cusco, Peru past La Paz, Bolivia.

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

Europe

The 12-month forecast through February 2023 indicates water deficits of varying intensity in many regions of Europe. Anomalies will be particularly widespread in France and Portugal and will include exceptional deficits along parts of the Middle Loire River and the Vienne River region, a tributary of the Loire, and in Marseille and pockets of Portugal, notably the Lower Tagus River into Lisbon. Deficits are forecast in many regions of western and northern Spain, intense in the west. Exceptional surpluses are expected on the Mediterranean Coast in the Valencia region.

ISciences Water Anomalies Forecast
Europe: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

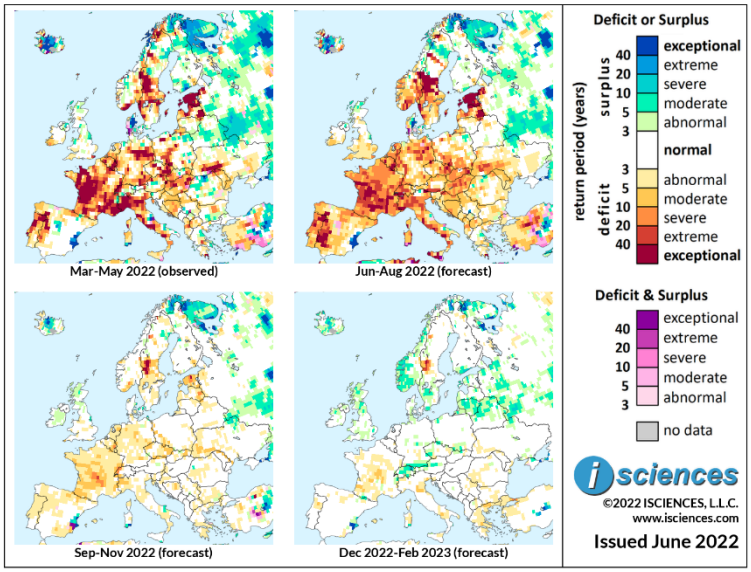
Deficits of varying intensity are forecast for many regions of northern Italy and along its Tyrrhenian Coast where anomalies will be exceptional. Deficits will be severe to extreme on the Po River. A pocket of surplus is expected from eastern Umbria to the Adriatic Coast. Deficits of varying intensity and extent are predicted in Central and Eastern Europe and pockets in the Balkans. Anomalies will be especially widespread in Belgium, Netherlands, Czech Republic, and Hungary, and will be severe in southwestern Ukraine.

Moderate surpluses are forecast in the Scottish Highlands, but surpluses will be more intense in eastern Denmark, a pocket on the north-central border of Romania, and Ukraine's northern tip. In Northern Europe and European Russia, areas with a forecast of surplus include central Iceland; Arctic Norway; southern Norbotten, Sweden; Helsinki, Finland; and Murmansk, the Vychegda Lowland, and Svernaya Dvina, Desna, and Volga River Watersheds in Russia.

Exceptional water deficits are forecast in central Sweden's Dalälven River Watershed, downgrading somewhat as they extend south and across the border into Norway and along coastal regions of Norway and Sweden on the Skagerrak Strait. In the Baltics, deficits will be exceptional in Estonia and of varying intensity in Latvia.

The 3-month composites (below) for the same 12-month period show the evolving conditions.

ISciences Water Anomalies Forecast
Europe: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

The forecast through August indicates that water deficits will increase, becoming widespread in Western and Central Europe and reaching into Eastern Europe and the Balkans as surpluses shrink. Deficits will be severe to exceptional in several regions including much of west-central France from the Bay of Biscay past the Rhone River. Anomalies will be exceptional along the Rhone. Other areas with a forecast of intense deficit include western Spain; Vatican City and northern Italy; the Drava, Rhine, and Oder Rivers; eastern Czech Republic; and southern Belgium into Luxembourg. Deficits will increase on the Iberian Peninsula, but intense surpluses will persist in Valencia. Pockets of moderate deficit will emerge in England and in Cork County, Ireland, and moderate surpluses in the far Scottish Highlands. Surpluses will persist in Ukraine's northern tip.

Northern Europe can expect widespread deficits in the southern halves of Norway and Sweden, including intense deficits in the Dalälven River region of central Sweden and the Vasterbotten region farther north. In the Baltics, deficits will be exceptional in Estonia and of varying intensity in Latvia. Surpluses are forecast in central Iceland, eastern Denmark, Sweden's Norbotten County, Arctic Norway, and many regions in European Russia.

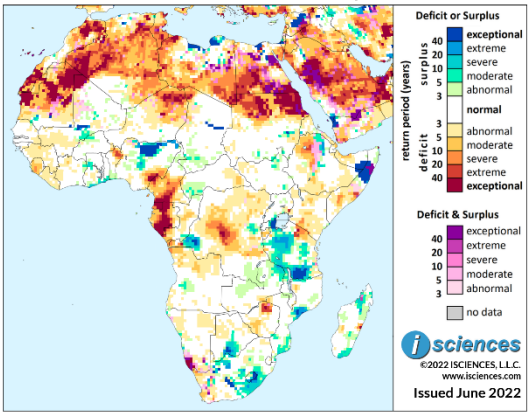
From September through November, deficits will shrink and moderate considerably, leaving lingering anomalies primarily in France, Czech Republic, central Sweden, and the Baltics. Surpluses will persist in Iceland, Arctic Norway, Murmansk, northernmost Ukraine, and pockets in Russia including the Vychegda Lowland and much of the Volga River Watershed.

The forecast for December 2022 through February 2023 indicates some pockets of deficit in France, Italy, Greece, and central Sweden. Areas of surplus include Switzerland, Lithuania, Belarus, western Russia and Murmansk, and southern Norway.

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

Africa

The 12-month forecast through February 2023 indicates widespread water deficits, including many areas of intense deficit, across much of North Africa and into South Sudan and northern Niger. Intense surpluses are expected in pockets of coastal Libya including Benghazi, and mixed conditions in Egypt. In West Africa, moderate to severe deficits are forecast for Sierra Leone.



Based on observed data through May 2022 and forecasts through February 2023

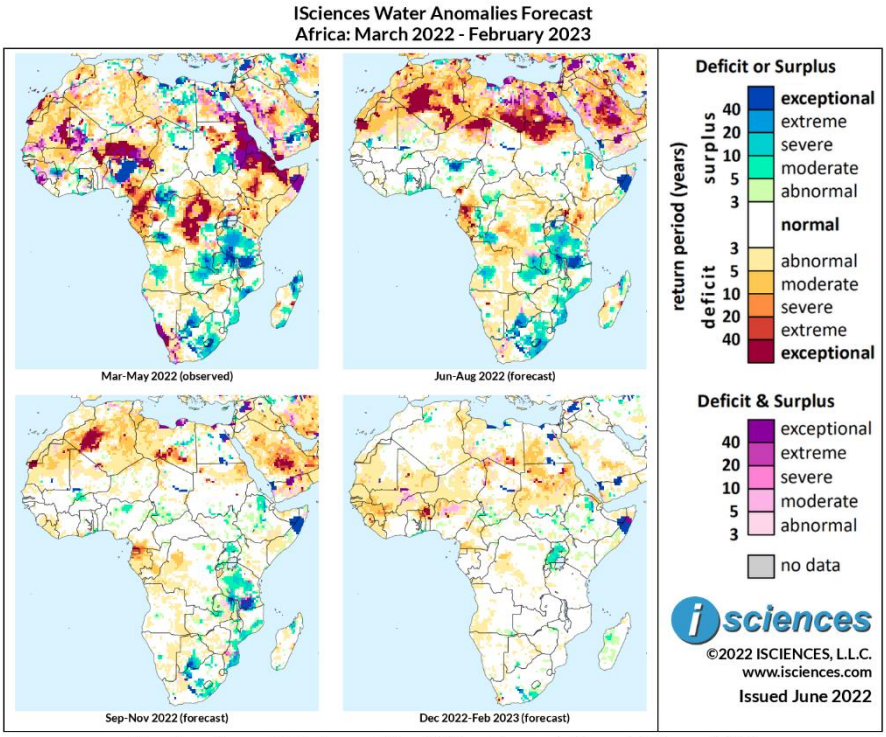
In nations around the Gulf of Guinea, intense deficits are forecast in northern Benin and from southeastern Nigeria through Gabon. Surpluses are forecast in the Inner Niger Delta of central Mali; coastal Ghana and Togo and the Black Volta River region in west-central Ghana; and from Kano State in northern Nigeria reaching east along the Yobe River and south past the capital, Abuja.

In the Horn of Africa, mixed conditions are expected in northern and central Ethiopia including surpluses in the Afar region and transitions and deficits in nearby Tigray and Amhara reaching south to Addis Ababa. Transitional conditions along with exceptional surpluses are forecast for the Nugaal Valley and pockets of deficit in southern Somalia.

In the heart of the continent, severe to exceptional deficits are expected in the central Congo Basin in Democratic Republic of the Congo (DRC), moderating as they reach outward. Intense surpluses are forecast at the western edge of the basin near Kinshasa and Brazzaville, and deficits at the river's mouth and nearby in Angola. Moderate surpluses are forecast in a pocket of DRC west of Rwanda. Surpluses are expected in eastern Rwanda and moderate deficits in Burundi. Many regions of Tanzania are forecast to experience surpluses, intense in the west and south, reaching into northeastern Zambia and northern Malawi. Deficits are expected in the central cross-border region of Tanzania and Kenya as well as in a few other pockets of Kenya.

In southern Africa, intense deficits are forecast in a pocket north of Harare, Zimbabwe, and moderate deficits in the nation's southwest. Intense surpluses are forecast near the coastal city of Quelimane in central Mozambique and moderate surpluses in the south. Surpluses are also predicted from south-central Botswana into South Africa, and widespread surpluses are expected in Eastern Cape, southern KwaZulu-Natal, Free State, Lesotho, and the Upper Karoo region of Northern Cape. Some moderate deficits are forecast north of Cape Town. In Madagascar, surpluses are forecast in the northwest and southeast, and a few pockets of deficit near the central west and east coasts.

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



Based on observed data through May 2022 and forecasts through February 2023

The forecast through August indicates widespread deficits across North Africa including intense deficits in western Algeria, northern Niger, and southeastern Libya into Sudan. Deficits and transitional conditions are forecast in Egypt. Surpluses will be widespread in many East African nations reaching through much of eastern South Africa and southern Botswana. Mixed conditions are expected in the Horn, with surpluses in Afar, Ethiopia and deficits in south-central Ethiopia, Kenya, and Uganda. Around the Gulf of Guinea, surpluses are expected in northern Nigeria, and pockets from Ghana into Benin. Deficits reaching exceptional intensity are forecast from southeastern Nigeria through western Republic of the Congo. In the heart of the continent, moderate to severe deficits are forecast in the central Congo Basin, moderate deficits in northeastern DRC, and surpluses near Kinshasa. In Angola, moderate deficits are forecast in the northeast and surpluses surrounding Huambo in the central west. In Madagascar, surpluses are forecast in the northwest and southeast, deficits in pockets on the central coasts.

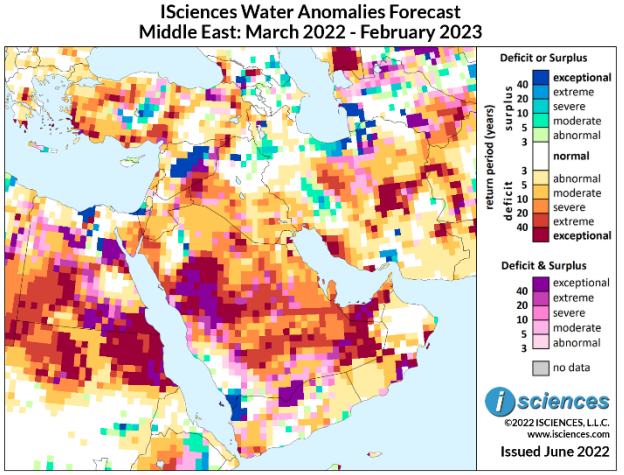
From September through November, deficits will shrink considerably, persisting from Mauritania through Algeria, southern Tunisia, and western and southern Liberia. Deficits will also persist in northeastern Sudan, Equatorial Guinea, Gabon, but emerge in Équateur Province in northwestern DRC as deficits elsewhere in the nation retreat. Surpluses will shrink overall but many regions of surplus will persist in eastern and southern Africa, particularly Tanzania.

In the final quarter – December 2022 through February 2023 – generally moderate deficits are forecast in pockets of West Africa, Sudan, Egypt, and southern Libya. Surpluses are expected throughout Uganda and in pockets of northern Ethiopia, Egypt, and Eastern and Northern Cape, South Africa.

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

Middle East

The forecast for the 12-month period ending February 2023 indicates widespread water deficits of varying intensity in Saudi Arabia and the small Persian Gulf nations, over half of Iraq, and many regions of Iran and Turkey.



Based on observed data through May 2022 and forecasts through February 2023

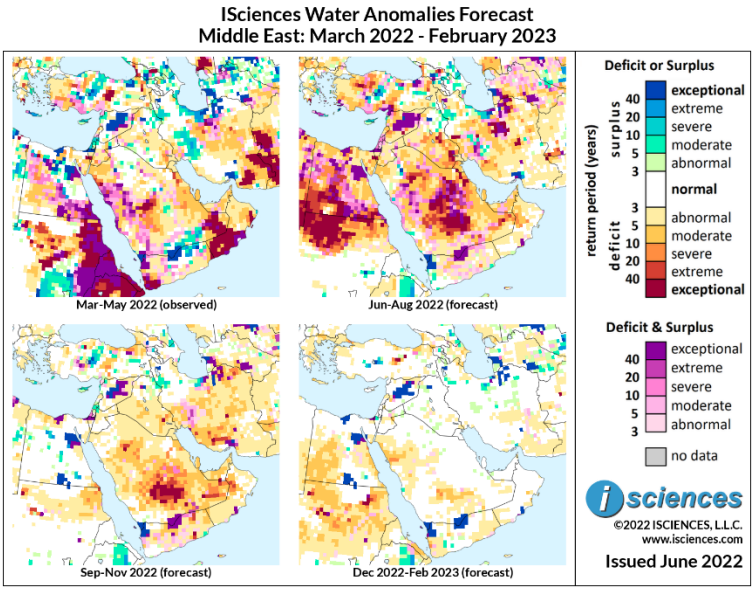
On the Arabian Peninsula, severe to exceptional deficits are forecast throughout much of Saudi Arabia with extreme anomalies in Riyadh Province and exceptional anomalies in the metropolis of Medina. In Yemen, exceptional surpluses are forecast northeast of Sanaa and pockets of deficit elsewhere in Yemen and Oman. Deficits will be exceptional in United Arab Emirates and severe in Qatar.

In Iraq, deficits ranging from moderate to extreme are forecast west of the Euphrates and in the Lower Tigris River region as well as in Kuwait. Pockets of surplus are forecast around Kirkuk. Iran can expect exceptional deficits in the central provinces and in Bushehr Province on the Persian Gulf, and severe to extreme deficits in much of Isfahan Province. Surpluses are expected on the central Caspian Sea Coast, in a pocket south of Lake Urmia, in the central Zagros Mountains, and near the Strait of Hormuz.

Mixed conditions are forecast in the Levant including surpluses in central Israel and central Syria with deficits elsewhere. In Turkey, deficits of varying intensity are forecast in the west, surpluses from Konya past Lake Tuz, and intense deficits in the Ceyhan River Watershed in southern Turkey and the Upper Murat River region in the east.

Mixed conditions are forecast in Georgia.

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



Based on observed data through May 2022 and forecasts through February 2023

The forecast through August indicates deficits in many regions, moderate to severe overall but more intense and widespread in Saudi Arabia. Anomalies will be exceptional in central Saudi Arabia, but transitional conditions (pink/purple) are also expected. Deficits, generally moderate, are forecast in Qatar, UAE, and northwestern Oman. Surpluses are forecast in Yemen's northwestern corner. In the Levant, mild to moderate deficits are expected along with transitions. Deficits are forecast west of the Euphrates and in the southern Tigris Basin. Anomalies will be intense in Baghdad and the lower Gharraf Canal. Some pockets of surplus are forecast in the northeast leading into Iran. Central Iran can expect generally moderate deficits and transitional conditions. In Fars Province near the Persian Gulf deficits will be moderate overall but more intense near the city of Shiraz. Surpluses are forecast on the Caspian Coast, south of Lake Urmia, and near the Strait of Hormuz. Deficits are forecast in western Turkey, extreme near Ankara, and in the south in the Ceyhan River Basin. Surpluses are forecast from Konya past Lake Tuz, and in Cyprus and Azerbaijan. Eastern Turkey and Georgia will experience mixed conditions.

From September through November, deficits will shrink and downgrade overall, but exceptional anomalies will persist in Riyadh Province, Saudi Arabia. Moderate deficits will persist in many pockets of central Iran and will increase in Fars Province, becoming extreme in the south. Severe deficits will emerge in the Upper Atrak River region in northeastern Iran. Surpluses will persist near Tehran and Lake Urmia; in Cyprus; and near Lake Tuz in Turkey, increasing in the Kizilirmak River Watershed. Surpluses will emerge in northern Israel. Deficits will persist in Turkey's Upper Ceyhan River region.

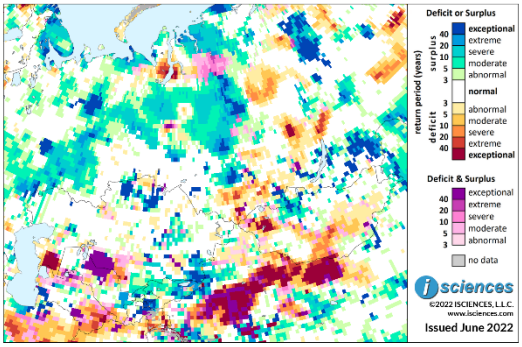
In the final quarter – December 2022 through February 2023 – near-normal conditions are forecast overall with deficits in Riyadh and along the northern Red Sea in Saudi Arabia and a pocket in the Upper Ceyhan River in Turkey. Surpluses are forecast in central Syria, near Turkey's Lake Tuz, pockets in northern Iran and in northern Yemen.

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

Central Asia and Russia

The 12-month forecast through February 2023 indicates exceptional water deficits in western Kazakhstan's Mangystau Region and severe deficits in the Middle Reaches of the Syr Darya River in the south. Exceptional surpluses are expected in Akmola and Kostanay Regions in far northern Kazakhstan, extreme to exceptional surpluses in the Alataw Mountains and Lower Ile River region in the southeast, and surpluses of generally lesser intensity in the eastern Kazakh Upland, the far south, and pockets in the west.

ISciences Water Anomalies Forecast
Central Asia: March 2022 - February 2023



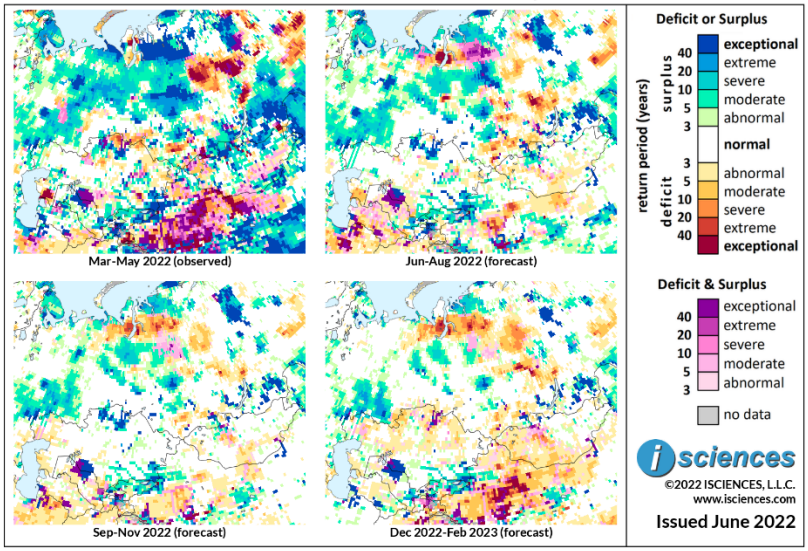
Based on observed data through May 2022 and forecasts through February 2023

Severe to extreme deficits are expected in eastern Turkmenistan and eastern Tajikistan. Surpluses are forecast throughout much of Kyrgyzstan and in western Tajikistan, around Lake Aydar in southeastern Uzbekistan, and a pocket of coastal Turkmenistan.

In Asian Russia, intense deficits will span the Gulf of Ob, but widespread surpluses are forecast from the central Ural Mountains through much of the Western Siberian Plain. Deficits are expected in the Central Siberian Plateau and Siberia's far south. Deficits are also forecast in Irkutsk Oblast north of Lake Baikal, but exceptional surpluses are expected in Transbaikal's Zabaykalsky Krai. Surpluses will also be exceptional in the Tyung River Watershed of northern Sakha Republic. Deficits are forecast in the Lena River Delta and west of the Sea of Okhotsk.

The 3-month composites (below) for the same 12-month period show the evolving conditions in more detail.

ISciences Water Anomalies Forecast
Central Asia: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

The forecast through August indicates that deficits spanning the Gulf of Ob in Russia will increase and intensify. Widespread surpluses, while shrinking and downgrading, will persist from the central Ural Mountains through the Western Siberian Plain, and a pocket of intense deficit will emerge around the city of Surgut on the Middle Ob River. Deficits in the Central Siberian Plateau will shrink and downgrade, but deficits will increase in southern Siberia and emerge in Irkutsk Oblast. Exceptional surpluses will persist in the Tyung River area of northern Sakha Republic. Surpluses in Transbaikal will shrink but remain exceptional in central Zabaykalsky Krai. Deficits in the Lena Delta and west of the Sea of Okhotsk will shrink and moderate.

In Central Asia, deficits in Mangystau, Kazakhstan, will moderate and moderate deficits will emerge in Turkmenistan as transitions occur. Surpluses are forecast near Lake Aydar in Uzbekistan and south of the Zarafshon River. Surpluses are expected in many regions of Kyrgyzstan and intense surpluses will persist in central Tajikistan as some moderate deficits linger in the east. In Kazakhstan, intense surpluses are forecast in Akmola and Kostanay Regions in the north, along the Ile River and in the Alataw Mountains in the southeast, and in pockets of the south and west.

From September through November, extreme deficits will persist spanning the Gulf of Ob and will increase in nearby regions to the west and east. Surpluses in the Western Siberian Plain will downgrade and deficits near Surgut will nearly disappear. Deficits will moderate in the Central Siberian Plateau and west of the Sea of Okhotsk and will shrink in Irkutsk and southern Siberia. In Central Asia, deficits will nearly disappear. Surpluses are forecast in northern and southeastern Kazakhstan, and in Kyrgyzstan, central Tajikistan, and the Kyzylkum Desert.

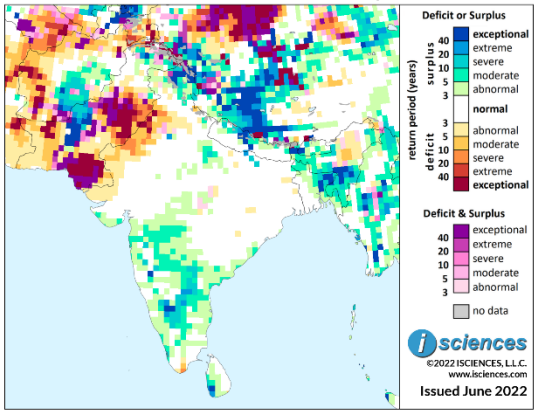
The forecast for the final months – December 2022 through February 2023 – indicates that deficits will increase in the Central Siberian Plateau and Irkutsk, and emerge in the Upper Tobal River Watershed and other pockets across northern Kazakhstan. Surpluses in the Western Siberian Plain will shrink.

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

South Asia

The 12-month forecast through February 2023 indicates water surpluses in India from Maharashtra south into Tamil Nadu. Surpluses will be moderate in Maharashtra but will be severe to extreme in Andhra Pradesh and reach exceptional intensity in the Vedavathi River Basin in central Karnataka. Surpluses are also forecast in Jammu and Kashmir, in a pocket northwest of Lucknow in Uttar Pradesh, on the Gandak River in Bihar, and in regions of Northeast India nearest Bangladesh. In the Northeast, anomalies will be exceptional from southernmost Assam into Manipur.

ISciences Water Anomalies Forecast
South Asia: March 2022 - February 2023



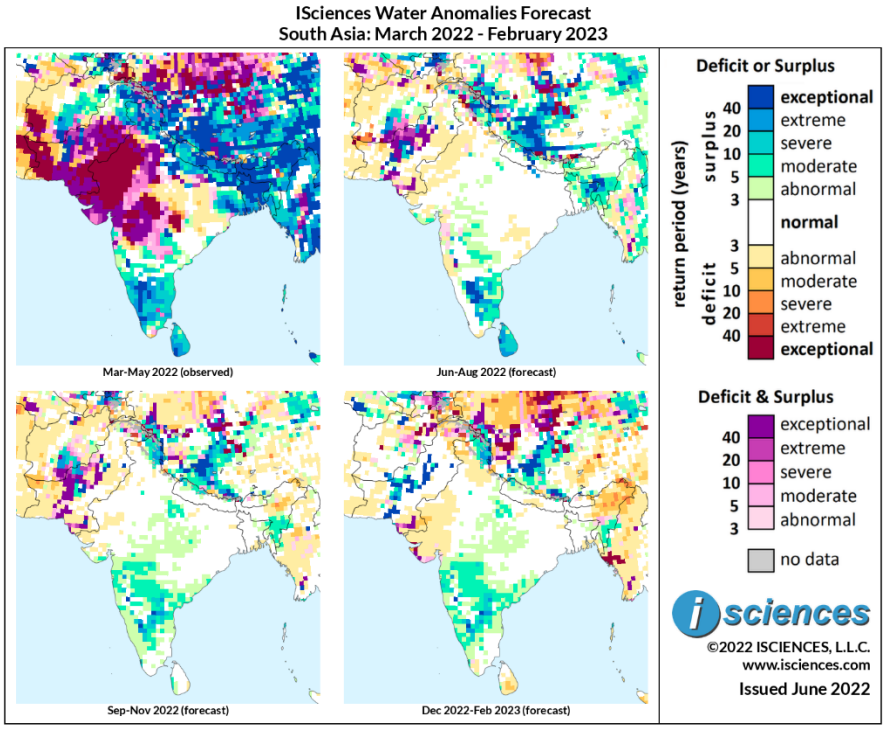
Based on observed data through May 2022 and forecasts through February 2023

Widespread deficits of varying intensity are forecast from western Rajasthan through Punjab. A pocket of moderate deficit is expected in central Assam.

Deficits in western India will lead to widespread deficits through Punjab and Sind in Pakistan and extensive areas of exceptional anomalies are expected in both provinces and will include the cities of Hyderabad and Multan. Deficits are also forecast in western Balochistan Province, but intense surpluses are expected in the province's central region, leading to surpluses across the border in Afghanistan from Kandahar Province into the center of the nation and in Kabul. Deficits of varying intensity will be widespread in southwestern Afghanistan and will follow border regions from the far north through the southwest.

Surpluses are forecast on the Gandak River through central Nepal and into the Himalayas and Bhutan. In Bangladesh, surpluses will be intense from Dhaka into the northeast but moderate in the far northwest. Surpluses reaching exceptional intensity are expected in southwestern Sri Lanka.

The 3-month composites (below) show the evolving conditions in greater detail.



Based on observed data through May 2022 and forecasts through February 2023

The forecast through August indicates near-normal water conditions across India's breadth. Surpluses will be widespread in much of Andhra Pradesh, southeastern Karnataka, and Tamil Nadu and will be exceptional in Karnataka. Moderate surpluses are expected from northeastern Karnataka into Telangana, and in pockets of Maharashtra and southern Gujarat. In Northeast India, moderate to exceptional surpluses will persist in regions near and well into Bangladesh. Surpluses will also persist on the Gandak River from Bihar through Nepal, in parts of India's far north, and throughout Sri Lanka. In Pakistan, transitional conditions (pink/purple) and surpluses are forecast west of the Indus River and into Kandahar Province in Afghanistan with pockets of surplus reaching Kabul. Deficits are forecast in the southwest from the Helmand River into Pakistan.

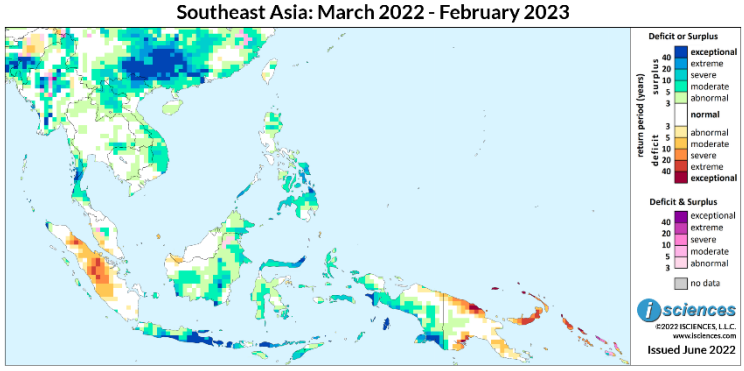
From September through November, moderate surpluses will increase in Maharashtra and coastal Andhra Pradesh. Surpluses farther south will be more intense but exceptional surpluses will shrink. In Sri Lanka, surpluses will nearly disappear, as will those in Bangladesh, while Indian regions to the east can expect moderate surpluses. Moderate surpluses will increase in central Uttar Pradesh, and surpluses in Nepal will retreat to the north. In India's Far Northeast, deficits will emerge in central Assam. In Pakistan and Afghanistan, surpluses and transitional conditions will continue though surpluses west of Kabul will shrink. Deficits spanning Afghanistan's southwest border will increase but moderate.

The forecast for the final months – December 2022 through February 2023 – indicates that surpluses will persist in India, re-emerge in Pakistan, and nearly disappear in Afghanistan. Deficits will increase in Far Northeast India, emerge in northeastern Afghanistan and Sri Lanka, and normalize in southwestern Afghanistan. Please note that WSIM forecast skill declines with longer lead times.

Southeast Asia and the Pacific

The 12-month forecast through February 2023 indicates surpluses of varying intensity in several regions of Southeast Asia and many regions of the Pacific, though deficits are forecast in Sumatra and Papua New Guinea.

ISciences Water Anomalies Forecast
Southeast Asia: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

In Myanmar, surpluses of varying intensity are forecast throughout the Irrawaddy River Basin and in Peninsular Myanmar, with some transitional conditions (pink/purple) in the center of the nation near Mandalay. Near-normal water conditions are forecast for most of Thailand though surpluses are expected south of the Mun River along the Cambodian border and in much of Peninsular Thailand. Surpluses will be widespread in northern Laos and northern Vietnam, reaching extreme to exceptional intensity in Vietnam's northeast near the Chinese border. Moderate surpluses are expected in the South Central Coast region and Central Highlands, leading into Cambodia.

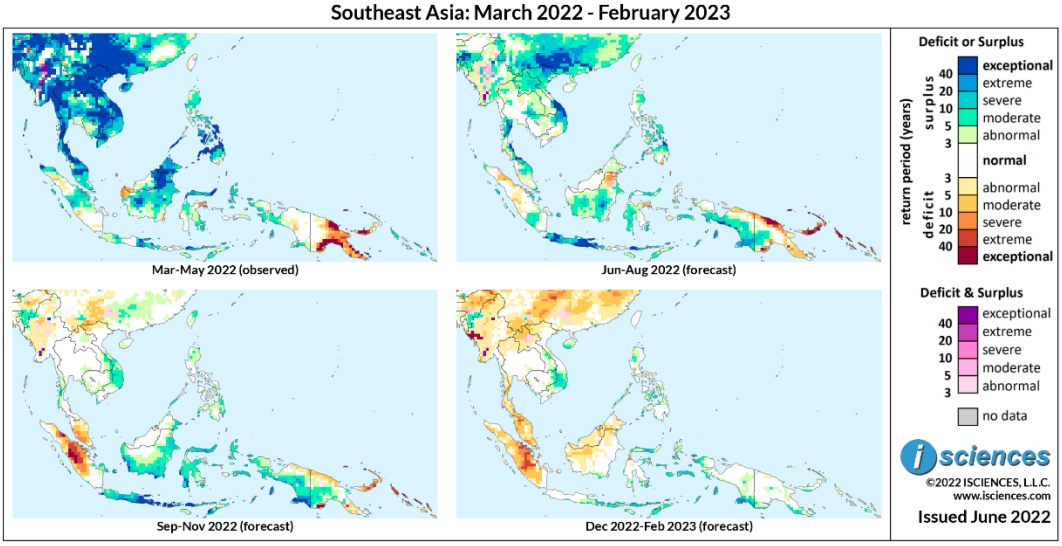
In the Philippines, moderate surpluses are predicted for northern Luzon, but more intense anomalies are expected in the central islands, Mindanao's northern half, and much of Palawan.

Though normal water conditions are forecast for most of Malaysian Borneo, moderate deficits are expected south of the Kuching metropolitan area and surpluses are expected in the northeast. The remainder of Borneo can expect surpluses as well. Surpluses are also forecast throughout much of Indonesia and the small island nations in the region. Anomalies will be exceptional in Java, Flores Island, the tip of Sulawesi's northern arm, and several regions along Papua, Indonesia's south coast. Sumatra is forecast to experience moderate to extreme deficits from Medan in the north through the center of the island.

Deficits are also forecast in Papua New Guinea along its north coast, in western coastal regions on the Gulf of Papua, and in the Owen Stanley Range in the Bird's Tail Peninsula (Papuan Peninsula). Anomalies will be intense on the north shore and along the Gulf. Intense deficits are also forecast for New Britain and the Solomon Islands.

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

ISciences Water Anomalies Forecast
Southeast Asia: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

The forecast through August indicates that surpluses will shrink and downgrade in Southeast Asia but remain widespread, particularly in Vietnam. Anomalies are forecast from northern Vietnam well into the South Central Coast region with extreme to exceptional surpluses north of Hanoi and exceptional surpluses around Da Nang. Surpluses will persist in northern Laos; and in Thailand's northwest, from the Mun River into Cambodia, and from Peninsular Thailand into Malaysia. In Myanmar, mixed conditions are forecast in the Irrawaddy Watershed with surpluses more prevalent in the nation's far north and east. Surpluses are expected in the Philippines. Deficits are forecast around Medan, Sumatra and in the southwest; in Indonesian Borneo's northern tip; and in New Guinea along the north coast, in New Britain, the Papuan Peninsula, and pockets on the west coast of the Gulf of Papua. Anomalies will be intense on Papua New Guinea's (PNG) central north coast and in New Britain and the Solomons. Elsewhere in Indonesia and the Pacific, surpluses are expected in southwestern Sumatra, Java, much of Indonesian Borneo, the Lesser Sundas and Sulawesi, and from Papua, Indonesia's Arafura Sea Coast well inland and into PNG. Anomalies will be exceptional in Java and Flores Island.

From September through November, surpluses will shrink considerably in Southeast Asia with moderate anomalies persisting in Vietnam's South Central Coast and Central Highlands. Moderate deficits are expected in northwestern Myanmar and Vietnam's northwestern tip, and severe deficits in Peninsular Malaysia. Deficits in Sumatra will increase and become intense while those in New Guinea downgrade. A few pockets of surplus are forecast in the Philippines, and widespread surpluses of varying intensity in Indonesian Borneo, Java and the Lesser Sunda Islands, Sulawesi, the Malukus, and Papua into PNG.

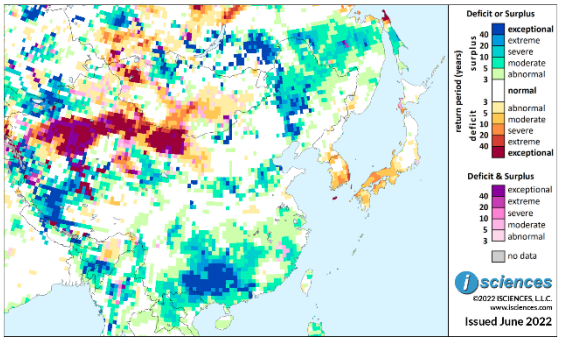
The forecast for the final months – December 2022 through February 2023 – indicates deficits in Sumatra, the Malay Peninsula, pockets of Borneo and Myanmar, and northern Laos. Surpluses are forecast in the Central Highlands of Vietnam, a few pockets in the Philippines, the Lesser Sundas and Malukus, and pockets in coastal New Guinea.

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

East Asia

The 12-month forecast for East Asia through February 2023 indicates widespread, intense water surpluses in southern China throughout the Pearl River Basin (Zhujiang River) with exceptional anomalies dominating much of Guangxi. Surpluses of lesser intensity are forecast for central Sichuan and the coastal southeast.

ISciences Water Anomalies Forecast
East Asia: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

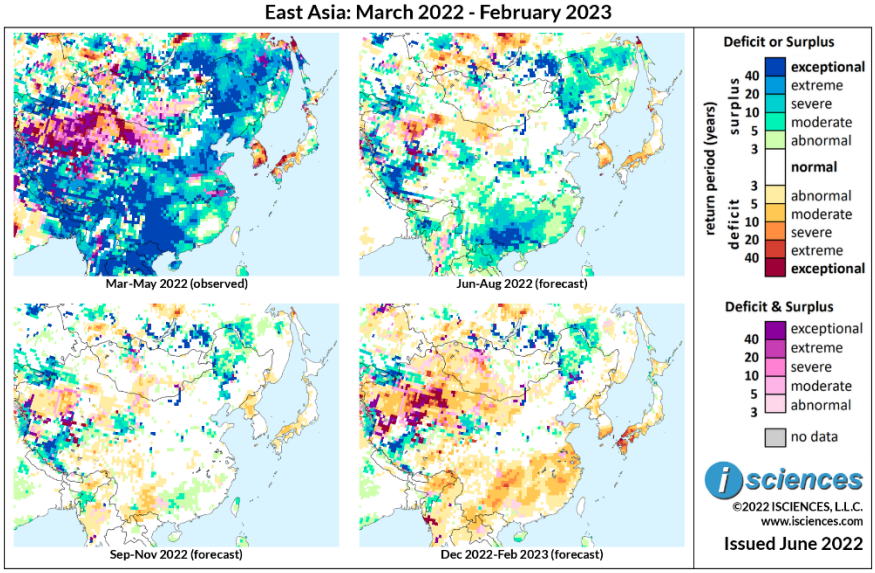
Surpluses of varying intensity are expected in the Yellow River Watershed (Huang He River) and North China Plain. Northeast China, too, can expect surpluses in a vast area from Liaoning past the Chinese border. Anomalies will be severe to exceptional through western regions of Liaoning, Jilin, and Heilongjiang and eastern Inner Mongolia.

Widespread, exceptional deficits will reach from western Inner Mongolia across a vast belt in Xinjiang Uygur through the city of Hami and the Taklimakan Desert with pockets of transitional conditions (pink/purple) as well. In Tibet (Xizang), intense surpluses will dominate many areas in the western half of the region and will include exceptional anomalies along the Yarlung (Brahmaputra) River.

Moderate to severe deficits will be widespread across South Korea's southern half and will span the DMZ. Deficits of similar intensity are forecast in Kyushu, Shikoku, and southern Honshu, Japan. In Mongolia, deficits will be extreme in the western Gobi Desert and exceptional in the lakes region in the nation's northwest. Surpluses are forecast from the Ider River region in the north to Lake Khovsgol.

The 3-month time series maps below show the evolving conditions in more detail.

ISciences Water Anomalies Forecast
East Asia: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

The forecast through August indicates widespread surpluses from the Yangtze River south, particularly intense in the Pearl River Watershed. Surpluses are also forecast for Northeast China, the North China Plain, the Loess Plateau region of the Yellow River Watershed, east-central Qinghai, and western Tibet (Xizang). In southern China, anomalies will be exceptional throughout much of Guangxi, severe to exceptional in southern Yunnan, and severe in Guizhou and southern Hunan. Intense surpluses are forecast in western Tibet and along the Yarlung River. In western Inner Mongolia, moderate deficits are forecast but deficits will be more intense in large pockets across central Xinjiang.

On the Korean Peninsula, moderate to severe deficits are expected in South Korea and the DMZ. Similar anomalies are forecast for Shikoku and southern Honshu, Japan, and coastal pockets in Hokkaido. In Mongolia, surpluses are predicted from the Ider River region in the north to Lake Khovsgol. Some pockets of moderate deficit will trail from the western Gobi Desert to the Khovd River Basin in the northwest.

From September to November, anomalies will shrink considerably though widespread surpluses will persist in Northeast China, the Qilian Mountains in Qinghai, and central Tibet. Pockets of moderate surplus will linger in Shandong Province in the east and Guangxi in the south and will emerge in northern Taiwan. Moderate deficits will emerge in eastern Yunnan, central Sichuan, and North Korea, and deficits in southern Honshu will moderate.

The forecast for the final three months – December 2022 through February 2023 – indicates widespread deficits in China south of the Yangtze River and into the eastern provinces, and from western Inner Mongolia through Xinjiang. Deficits are also expected in Korea, southern Japan, and western Mongolia. Surpluses will persist in Northeast China, Qinghai, and central Tibet.

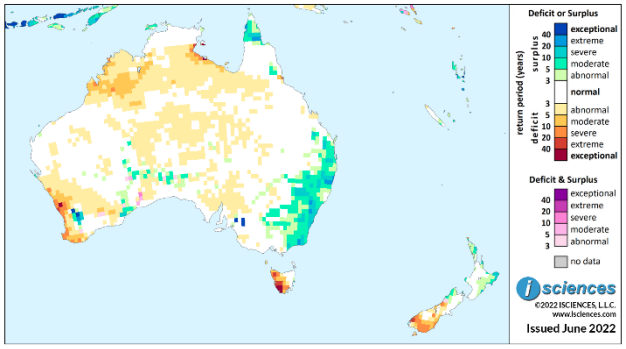
Please note that WSIM forecast skill declines with longer lead times.

Australia & New Zealand

The 12-month forecast through February 2023 indicates widespread water surpluses in eastern Australia from the Wide Bay-Burnett region of Queensland through East Gippsland, Victoria.

Anomalies will be moderate to severe overall but more widespread in New South Wales where surpluses will reach extreme intensity in a pocket of the North Coast. Surpluses will extend inland to the Macquarie and Lachlan Rivers. In Queensland's Far North, surpluses are expected north of the Holroyd River in Cape York Peninsula.

ISciences Water Anomalies Forecast
Australia & New Zealand: March 2022 - February 2023



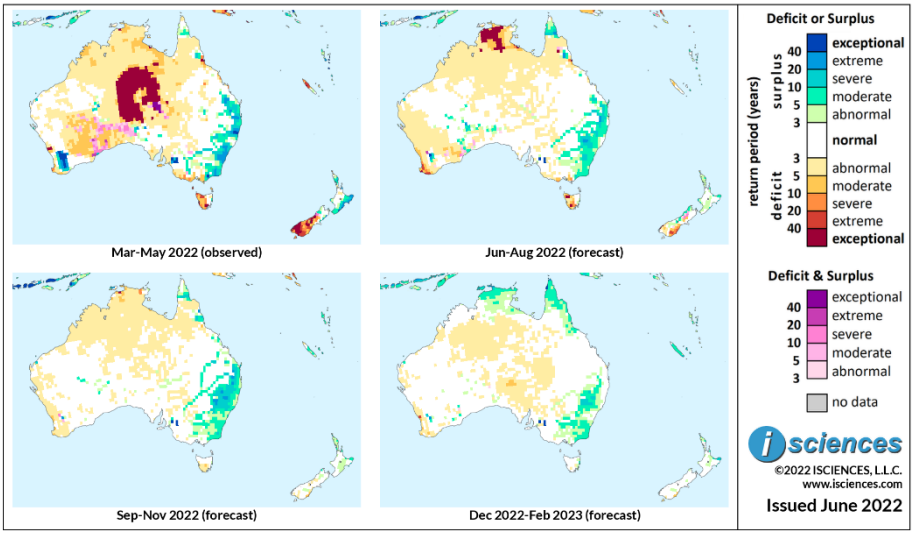
Based on observed data through May 2022 and forecasts through February 2023

Deficits are expected in northern Australia along the Gulf of Carpentaria in Northern Territory and in the Fitzroy and Ord River regions in the Kimberley of Western Australia. In the nation's southwest corner, generally moderate to severe deficits are forecast from Geraldton past Perth and Busselton to Albany. Moderate to exceptional surpluses are forecast in the Upper Avon River catchment. Some pockets of surplus are expected in the Great Victoria Desert and near the central coast of Western Australia. Severe to exceptional deficits will dominate western Tasmania, the Derwent Estuary, and Hobart.

In New Zealand, extreme deficits are predicted for Southland, Otago, and a few other pockets in South Island. Surpluses are forecast in coastal Butler in the northwest and coastal points on North Island, including East Cape.

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

ISciences Water Anomalies Forecast
Australia & New Zealand: March 2022 - February 2023



Based on observed data through May 2022 and forecasts through February 2023

The forecast through August indicates that while downgrading, surpluses will remain widespread in eastern Australia from the Wide Bay-Burnett region of Queensland (QLD), through the Murray-Darling Basin into East Gippsland, Victoria. Anomalies will be moderate to severe overall but extreme in a pocket north of Dubbo, New South Wales (NSW), and a pocket in the Southern Downs area of QLD. Surpluses in the Cape York Peninsula will increase, as will those in a pocket of the Atherton Tableland in Far North, QLD. Exceptional deficits will emerge in Top End, Northern Territory (NT). In Western Australia (WA), surpluses will shrink in the Avon River region and deficits north of Perth will moderate while those along the southwestern coast from Mandurah to Albany intensify. Pockets of moderate surplus will re-emerge in the Great Victorian Desert and western Nullarbor Plain, and some moderate deficits will linger south of Kalgoorlie. In coastal Victoria, pockets of deficits are forecast on either side of Melbourne. And in Tasmania, deficits in the west and south will downgrade slightly but severe deficits are forecast for Hobart and the Derwent Estuary.

Anomalies in New Zealand will shrink but intense deficits are forecast in the southeast in Canterbury and Otago, and surpluses will increase somewhat along South Island's northwest coast while nearly disappearing from North Island. Moderate deficits are expected in northern New Caledonia.

From September through November, widespread surpluses will persist in eastern Australia with severe anomalies increasing between the Macquarie and Macintyre Rivers in NSW. Surpluses will emerge in the Maranoa/Balonne area of QLD's South West Region and the Buckland Tableland; increase in the Atherton Tableland in the north; and shrink in the Cape York Peninsula. A few pockets of deficit will linger in Top End, NT, but deficits elsewhere in mainland Australia, Tasmania, and New Zealand will nearly disappear. Some surpluses will linger in coastal points of North Island, New Zealand, and moderate surpluses will emerge in New Caledonia as deficits retreat.

The forecast for the final months – December 2022 through February 2023 – indicates that surpluses in eastern Australia will shrink but remain widespread. Surpluses will increase in Far North QLD and emerge in Top End, NT.

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