

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 1-9 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 February 2021 and an ensemble of forecasts issued the last week of February 2021. 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 in a given month. 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 anomaly. For example, a return period of 10 years indicates an anomaly that would occur, on average, once every ten years. Higher return periods indicate more extreme and, therefore, more disruptive anomalies. 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. Return period is computed by comparison to cell-specific distributions of data from 1950 through 2009.

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.

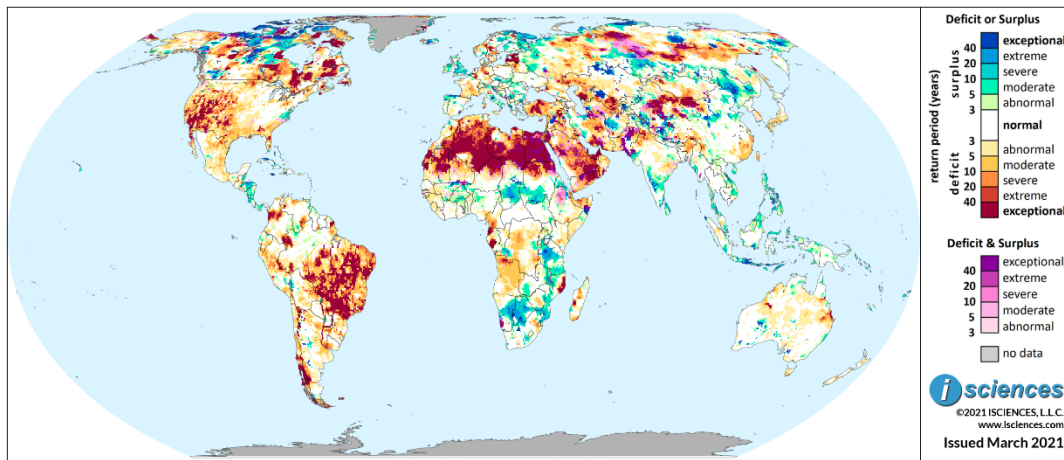
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Worldwide Water Watch List

This map presents a selection of regions likely to encounter significant water anomalies during the one-year period beginning in December 2020 and running through January 2021 using 3 months of observed temperature and precipitation data and 9 months of forecast data.

ISciences Water Anomalies Forecast: December 2020 - November 2021



Based on observed data through February 2021 and forecasts through November 2021

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 May indicates that water deficits of varying intensity will increase, blanketing much of the West, Southwest, Rockies, Texas, the Deep South, and Florida. Anomalies will be exceptional in Utah, Arizona, and New Mexico. Intense deficits are also forecast in North Dakota.

Canada: The forecast through May indicates that exceptional water deficits will persist in large pockets in the east. Deficits of varying intensity are forecast from north of Lake Ontario through Ottawa, Montreal, and Quebec City. Deficits are expected to persist from southern Manitoba into Saskatchewan.

Mexico, Central America, and the Caribbean: The forecast through May indicates that water deficits will increase in Mexico with exceptional deficits in Baja, Sonora, Chihuahua, and from Sinaloa through Nayarit. Surpluses will moderate in southern Mexico but remain widespread in Central America.

South America: The forecast through May indicates that water deficits will shrink and downgrade overall but remain widespread in Brazil with exceptional anomalies in Mato Grosso do Sul and São Paulo State. Areas of surplus include eastern Colombia and pockets in the Guianas region.

Europe: The forecast through May indicates that water surpluses will shrink considerably but will persist in western European Russia and pockets in the land-locked countries of Central Europe and in the Balkans. Intense deficits will persist in Estonia, Latvia, and north-central Germany.

Africa: The forecast through May indicates that water deficits will shrink and downgrade though exceptional deficits will persist in the north. Surpluses are forecast across the Sahel, exceptional in southern Chad. Surpluses will shrink in East Africa but remain widespread from Botswana into Namibia.

Middle East: The forecast through May indicates that water surpluses will shrink, persisting in north-central Syria and in pockets of western Iran. Widespread, intense deficits are forecast for western Turkey, from western Oman into Yemen, and in Riyadh, Saudi Arabia.

Central Asia and Russia: The forecast through May indicates a vast expanse of water surplus from the eastern Ob River Watershed in Russia through the Middle and Upper portions of the Yenisei Watershed, and the Tom River Watershed. TransVolga will transition from surplus to intense deficit.

South Asia: The forecast through May indicates that a vast extent of exceptional water deficit will emerge in Rajasthan and nearby Indian states. Moderate to extreme deficits are expected in India's Far Northeast. Widespread surpluses will persist in southern India and Bangladesh.

Southeast Asia and the Pacific: The forecast through May indicates widespread water surpluses in the Philippines, Vietnam, Cambodia, Laos, Thailand, and eastern Java, with extreme anomalies in the central Philippines. Areas of deficit include Kuala Lumpur and southwestern Borneo.

East Asia: The forecast through May indicates that water surpluses will remain widespread in Northeast China and the Yellow River Basin but will shrink in the southern Yangtze Basin. Widespread deficits will persist in Southeast China, shrinking in Guangdong. Deficits in Taiwan will moderate.

Australia & New Zealand: The forecast through May indicates water deficits near Rockhampton, Queensland and pockets in New Zealand. Surpluses are forecast near Armidale on Australia's southeast coast, in the Lower Murray River region, and in the Avon River Basin in Western Australia.

Watch List: Regional Details

United States

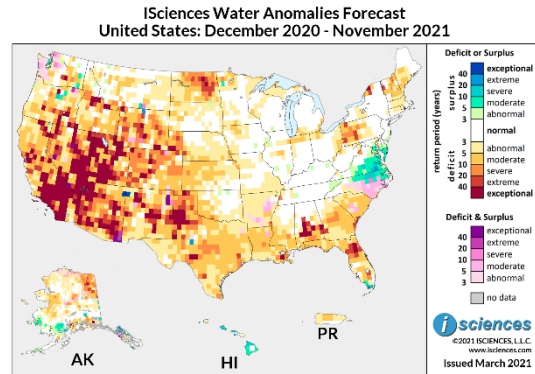
The 12-month forecast ending November 2021 indicates widespread water deficits of varying intensity in the U.S. West, Pacific Northwest, Southwest, Rocky Mountain States, and Texas with anomalies bleeding into the Plains region. Deficits are expected to be exceptional in Southern California, Nevada, Utah, Arizona, New Mexico, and northern Texas. Moderate to exceptional deficits are forecast for North Dakota.

Deficits are forecast in the Deep South from Louisiana through southern Mississippi, Alabama, Georgia, and South Carolina. Anomalies will be intense in the Mississippi Delta and central Alabama. Deficits will cover much of Florida, moderate in the Panhandle but severe to exceptional between Jacksonville and Orlando. Surpluses are forecast near the Keys.

In the Mid-Atlantic, surpluses are forecast from Chesapeake Bay through much of Virginia and into North Carolina. In the U.S. Northeast, western Pennsylvania can expect deficits ranging from moderate to extreme, and intense deficits are forecast near the St. Lawrence River in Upstate New York. Deficits are also forecast for Vermont, New Hampshire, and southern Maine. In the Great Lakes Region, moderate deficits will follow the Kankakee River in northern Indiana and will skirt Michigan's southern border and reach into Ohio.

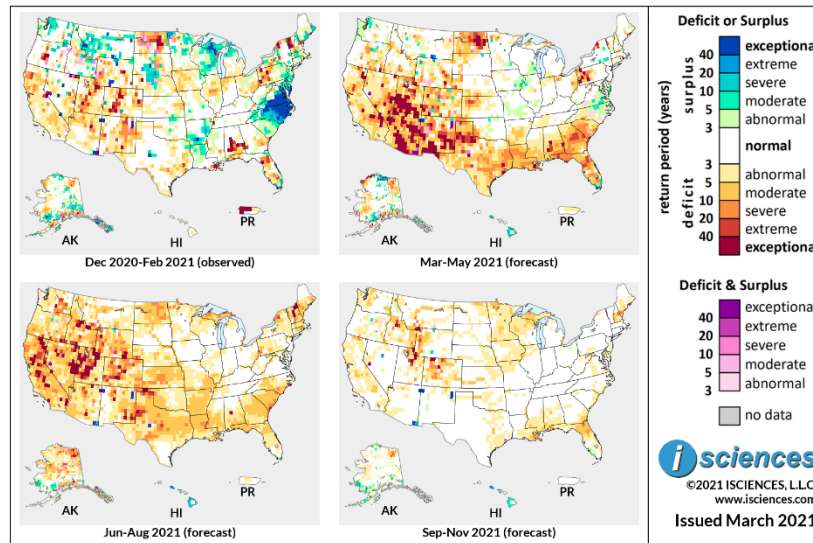
Outside the contiguous U.S., surpluses are forecast for most of the Hawaiian Islands. Alaska can expect deficits in its northeast quadrant; in the center of the state at the confluence of the Yukon and Tanana Rivers; in a large block east of Norton Sound; and around Anchorage and Valdez. Surpluses are forecast west of Bethel, near Iliamna Lake, and near Juneau. In Puerto Rico, moderate deficits are expected in the central north region.

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



Based on observed data through February 2021 and forecasts through November 2021

**ISciences Water Anomalies Forecast
United States: December 2020 - November 2021**



Based on observed data through February 2021 and forecasts through November 2021

The forecast through May indicates that deficits of varying intensity will increase, blanketing much of the West, Southwest, Rockies, Texas, the Deep South, and Florida. Anomalies will be exceptional in many regions including Utah, Arizona, and New Mexico. Deficits in North Dakota will increase, covering much of the state and will be exceptional in the James River Watershed. Deficits will seep into other states in the Plains, emerging in western South Dakota, western and southern Nebraska, and northern Kansas. Nearly all of Texas can expect deficits, and Arkansas will transition from surplus to moderate deficit.

Surpluses in the Mid-Atlantic States will nearly disappear. Intense deficits will persist in western Pennsylvania, but anomalies elsewhere in the Northeast will shrink, leaving small pockets of surplus and of deficit, primarily in New York.

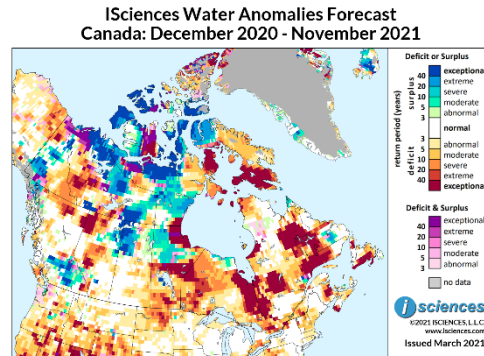
From June through August, nearly normal conditions are forecast for the Upper Mississippi River and Ohio River Basins, but much of the rest of the nation can expect some degree of deficit. Intense deficits will shrink in the Southwest, increase in Northern California, and persist in Nevada and Utah. Deficits will increase in the Pacific Northwest and Central Plains; downgrade though be severe in North Dakota's James River region; moderate in the Deep South and Florida; and emerge in North Carolina, in more areas of New England, and in Michigan's Upper Peninsula.

The forecast for the final months – September through November – indicates that deficits will shrink and downgrade considerably. Pockets of deficit ranging in intensity are forecast for the Rockies, and moderate deficits along rivers in the Plains. Mild to moderate deficits are expected in pockets of the Pacific Northwest and California, in the Upper Midwest, along the Gulf Coast from Louisiana through northern Florida, and in New Hampshire.

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

Canada

The 12-month outlook for Canada through November 2021 indicates vast areas of water deficit in the eastern half of the nation. Areas of exceptional deficit include southern Newfoundland, eastern New Brunswick, Nova Scotia's southern tip, northeastern Quebec into western Labrador and along the Gulf of St. Lawrence, west of Lake Mistassini in Quebec, and spanning the northern Quebec/Ontario border.



Based on observed data through February 2021 and forecasts through November 2021

Deficits of varying intensity are expected in Southern Ontario reaching east through Ottawa, Montreal, and Québec City. Likewise, deficits will be widespread and of varying intensity in Northern Ontario's Kenora District. Exceptional deficits are forecast on Hudson Bay in Manitoba and in a belt across the center of the province north of Lake Winnipeg, with surpluses elsewhere in the north reaching west into Saskatchewan. Severe deficits are forecast in southern Manitoba with exceptional anomalies around Winnipeg.

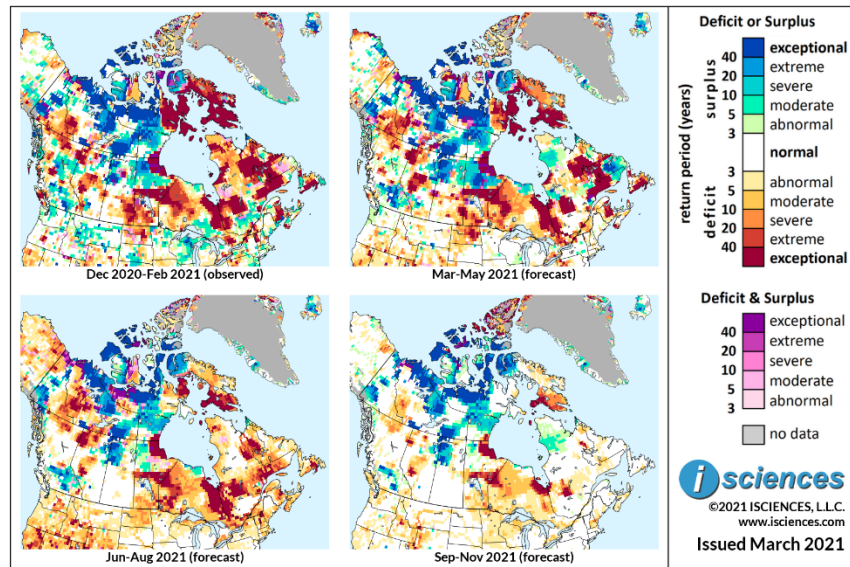
Northwestern Saskatchewan can expect conditions of severe to exceptional surplus leading north well past Lake Athabasca into the Northwest Territories and west into Alberta. Some moderate deficits are expected in the southeast.

Surpluses are expected in a pocket east of Calgary, Alberta. Deficits will be intense in central Alberta in the Middle Reaches of the Athabasca River Watershed and in the province's northwest corner spanning the border with British Columbia.

Deficits are forecast near British Columbia's northern border, expanding as they reach well into the Yukon and the Northwest Territories. Deficits are also forecast southeast of Prince George, on Vancouver Island, and in the province's southeast corner. Surpluses of varying intensity are expected in the Fraser River Watershed of the south where anomalies will be exceptional near Kelowna.

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

**ISciences Water Anomalies Forecast
Canada: December 2020 - November 2021**



Based on observed data through February 2021 and forecasts through November 2021

The forecast through May indicates that exceptional deficits will persist in southern Newfoundland, eastern New Brunswick, and Nova Scotia’s southern tip; on the Quebec/Labrador border; along the Gulf of St. Lawrence and west of Lake Mistassini; and spanning much of the Ontario/Quebec border. Surpluses will emerge in the easternmost reaches of Labrador and Quebec but will retreat south of the Gouin Reservoir. Deficits of varying intensity are forecast north of Lake Erie and from north of Lake Ontario through Ottawa, Montreal, and Quebec City. Surpluses will retreat in Ontario northeast of Lake Superior, transitioning to moderate deficit in some regions, and increase near Hudson Bay. Widespread, intense deficits will persist in Northern Ontario’s Kenora District.

Deficits will persist in southern Manitoba reaching exceptional intensity near Winnipeg. Deficits in southern Saskatchewan will shrink, persisting in the southeast including Regina. Deficits in the Middle Athabasca River region of Alberta will intensify, surpluses will persist near Calgary, and some areas of deficit will emerge in the south. In British Columbia, surpluses will increase in the Fraser River Watershed, shrink around Lake Williston in the north, and deficits will shrink on Vancouver Island.

From June through August, surpluses in Canada’s east will nearly disappear and the extent of exceptional deficit will shrink though vast pockets will persist, including a wide corridor spanning the Quebec/Ontario border. Deficits will moderate in southern Manitoba and nearly disappear in southern Saskatchewan and Alberta. Surpluses will persist in the Fraser River Watershed in British Columbia, and near-normal conditions will return to Vancouver Island.

The forecast for the final months – September through November – indicates that conditions in much of the east will normalize, deficits in southern Manitoba will moderate, and surpluses in southern British Columbia will shrink somewhat. Please note that WSIM forecast skill declines with longer lead times.

Mexico, Central America, and the Caribbean

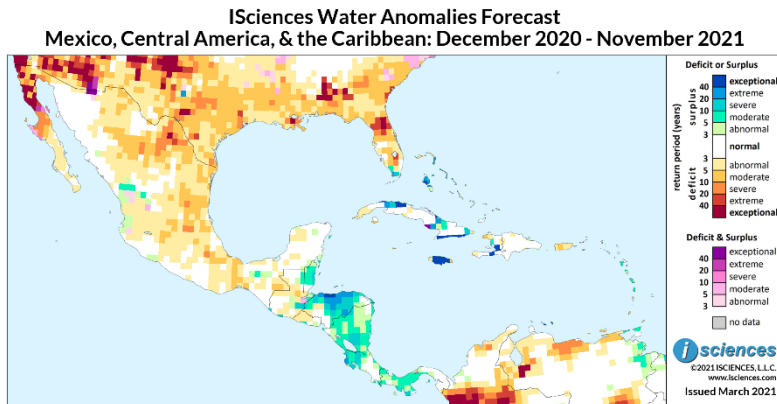
The 12-month forecast ending November 2021 indicates deficits in many regions of northern and central Mexico. Deficits will be mild to moderate overall but exceptional anomalies are expected in northern Baja and severe anomalies in Coahuila.

Generally moderate deficits are forecast in southern Chihuahua, Nuevo León, Tamaulipas, San Luis Potosí, and in pockets of southern Mexico between the Gulf of Mexico and the Gulf of Tehuantepec.

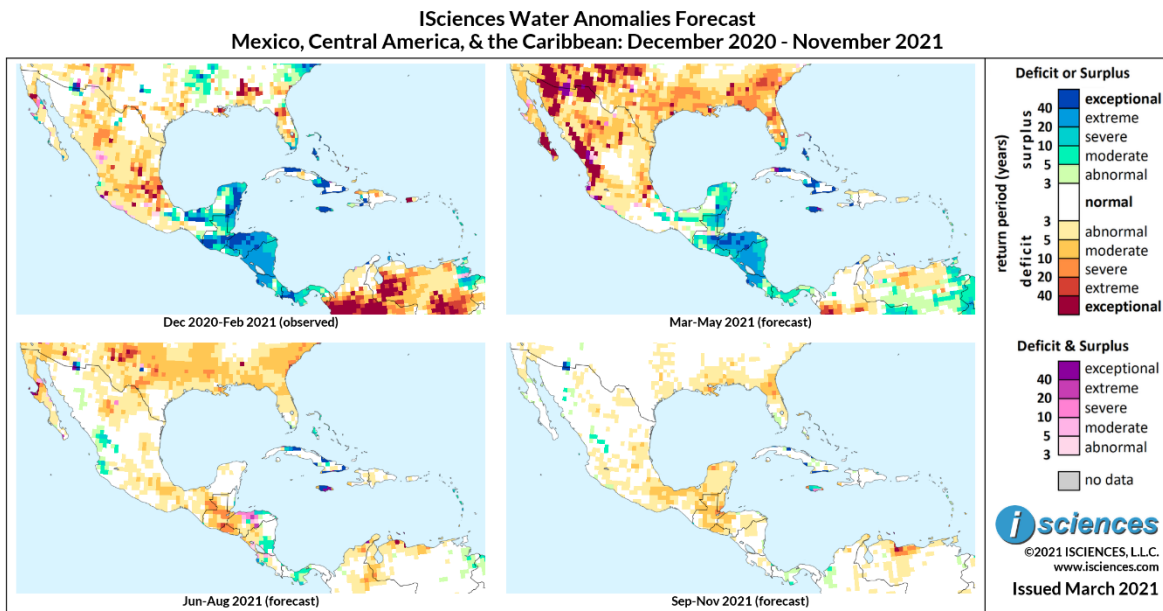
Surpluses are forecast in several regions of Central America. Anomalies will reach extreme intensity in Honduras, but will be generally moderate in Belize, Nicaragua, northern Costa Rica, and Panama's western half.

In the Caribbean, intense surpluses are forecast in Jamaica, pockets of Cuba, and Port-au-Prince (Haiti). Surpluses of varying intensity are forecast for the Bahamas.

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



Based on observed data through February 2021 and forecasts through November 2021



Based on observed data through February 2021 and forecasts through November 2021

The forecast through May indicates that deficits will increase in northern Mexico, intensifying as exceptional deficits emerge in southern Baja, northern Sonora, northern Chihuahua, and through the

Sierra Madre Occidental Mountains in the west from Sinaloa through Nayarit. Deficits will increase as well in southern Chihuahua, Durango, and Coahuila, but will downgrade from the central states on the Gulf of Mexico reaching inland. Surpluses will shrink in pockets of southern Mexico and downgrade in the Yucatan Peninsula. In Central America, surpluses will remain widespread with extreme to exceptional anomalies in Honduras, extreme anomalies in Nicaragua and northern Costa Rica, and generally moderate anomalies elsewhere. Jamaica can expect exceptional surpluses to persist. Pockets of intense surplus are expected in Cuba and the Bahamas.

From June through August, anomalies in the region will decrease considerably as deficits retreat from much of Mexico and surpluses retreat from much of Central America. Moderate to severe deficits will persist in southeastern Chihuahua. In Baja, deficits in the south will become merely mild, while some generally moderate anomalies linger in the north. Moderate surpluses are expected to emerge in southern Durango and in Jalisco in the west where prior deficits had prevailed. Surpluses will disappear from the Yucatan and pockets of the south, moderate deficits will emerge in Oaxaca, and severe deficits in eastern Chiapas. In Central America, deficits will replace surpluses in Guatemala, El Salvador, and parts of western Honduras and Nicaragua. Some pockets of moderate surplus are expected to persist along the northeastern coast of Honduras, in southern Nicaragua, and pockets in Costa Rica and western Panama. Intense surpluses will persist in Jamaica though transitions will begin. Surpluses are also forecast to continue in pockets of Cuba but will shrink in the Bahamas.

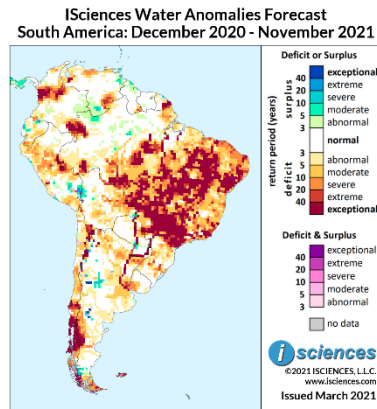
The forecast for the final three months – September through November– indicates nearly normal conditions for northern Mexico; pockets of moderate surplus from southern Durango into Zacatecas; and moderate deficits in Mexico's southern states. Moderate deficits are also forecast for Belize, Guatemala, El Salvador, and western Honduras, with near-normal water conditions in the remainder of Central America. Surpluses in Jamaica will moderate, and some small pockets of surplus are forecast in Cuba and the Bahamas.

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

South America

The 12-month forecast through November 2021 indicates water deficits in much of Brazil south of the Amazon River from Rondônia in the west through the nation's eastern tip, and from Amapá in the north through Rio Grande do Sul. Deficits will be exceptional in many areas and along many rivers.

Exceptional deficits are also forecast along the Paraguay River through its namesake and along the Paraná River through Brazil, Paraguay, and Argentina.



Based on observed data through February 2021 and forecasts through November 2021

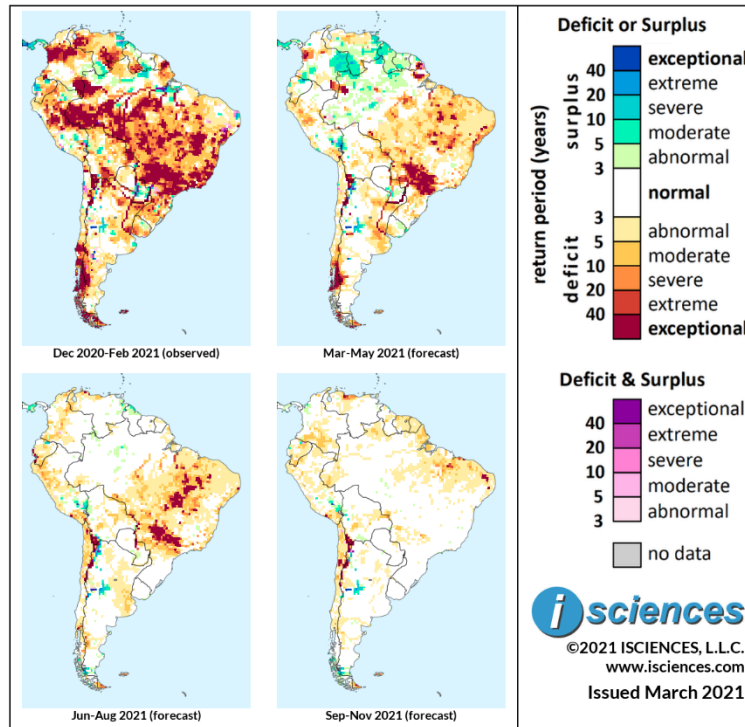
Across the northern arc of the continent, intense deficits are expected in a belt from Colombia's northern Pacific Coast to the Venezuelan border, and in the southeast reaching into Brazil. Deficits will be severe along Venezuela's central coast, and intense around Merida in the northwest and in southern Bolívar State. Moderate surpluses are forecast in a pocket of southern Venezuela and in the Orinoco Delta. In Guyana, deficits are expected in the southeast; exceptional deficits are forecast for eastern French Guiana.

On the Pacific Coast, moderate to severe deficits are forecast for central Peru, moderating as they reach north into Ecuador but becoming exceptional near the Brazilian border. Surpluses are expected east of Cusco and moderate deficits in the far south. Bolivia, too, will experience deficits, severe in the east and moderate near Sucre. In Chile, deficits will be mild in the north, moderate to severe in central regions including Santiago, and exceptional in the south around the Gulf of Corcovado.

In Argentina, deficits are forecast in the Chaco Austral in the north, in the eastern Pampas, along the border with Chile, and in Tierra del Fuego and the Falklands. Surpluses are forecast in northern San Luis Province. Severe deficits are expected in southwestern Uruguay near the Rio de la Plata.

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

ISciences Water Anomalies Forecast
South America: December 2020 - November 2021



Based on observed data through February 2021 and forecasts through November 2021

The forecast through May indicates that deficits will shrink and downgrade, persisting primarily in Brazil. While much of central and eastern Brazil can expect mild to moderate deficits, widespread exceptional anomalies will persist in Mato Grosso do Sul and São Paulo State, and small intense pockets in Pará, Maranhão, Tocantins, Piauí, Bahia, Amapá, and western Amazonas into Venezuela. Surpluses, primarily moderate, are forecast for southwestern and eastern Colombia, southern Venezuela and the Orinoco Delta, and pockets in the Guianas and northern Amazon regions. Other areas with a forecast of surplus include north-central Ecuador, southeastern Peru, and San Luis Province, Argentina. Extreme to exceptional deficits are expected on the Paraná River and extreme deficits on the Paraguay River. Deficits elsewhere include the Marañón River Watershed in northern Peru, the Gulf of Corcovado region in Chile, and the Chaco Austral and eastern Pampas of Argentina. Anomalies will be exceptional near the Gulf of Corcovado.

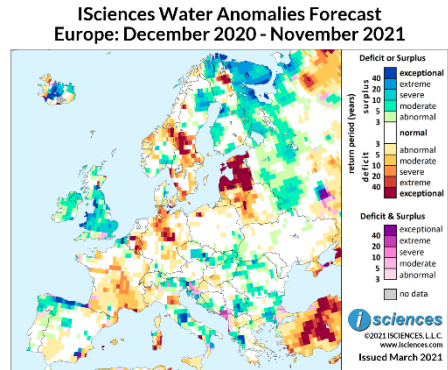
From June through August, normal water conditions will return to many regions of the continent. However, intense deficits will persist in Mato Grosso do Sul and São Paulo State in Brazil, shrinking somewhat, and deficits will intensify in pockets of central Brazil. Some moderate deficits are forecast for coastal Venezuela, a path through central Colombia, pockets of Ecuador, north-central Peru and the nation's southern extreme, a few pockets in central Bolivia, northern Chile, and the eastern Argentine Pampas. Exceptional deficits will continue to skirt the shared northern border of Chile and Argentina, reaching into southern Bolivia, along with some surpluses. Surpluses are also forecast for southeastern Peru and San Luis Province in Argentina.

In the final quarter – September through November – deficits will shrink considerably. Pockets of deficit are forecast for northeastern Brazil; near Caracas, Venezuela; and in southern Colombia and northern Chile. Surpluses are forecast in Peru from Cusco to Lake Titicaca, and in northern San Luis Province, Argentina.

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

Europe

The 12-month forecast through November 2021 indicates exceptional water deficits in Estonia and Latvia with deficits of lesser intensity in Lithuania and into western Belarus. Deficits of varying intensity are forecast in Sweden's southern half and will be especially widespread and intense in central Sweden's Dalälven River Watershed, reaching across the border into Norway. Finnish Lapland can expect exceptional deficits.

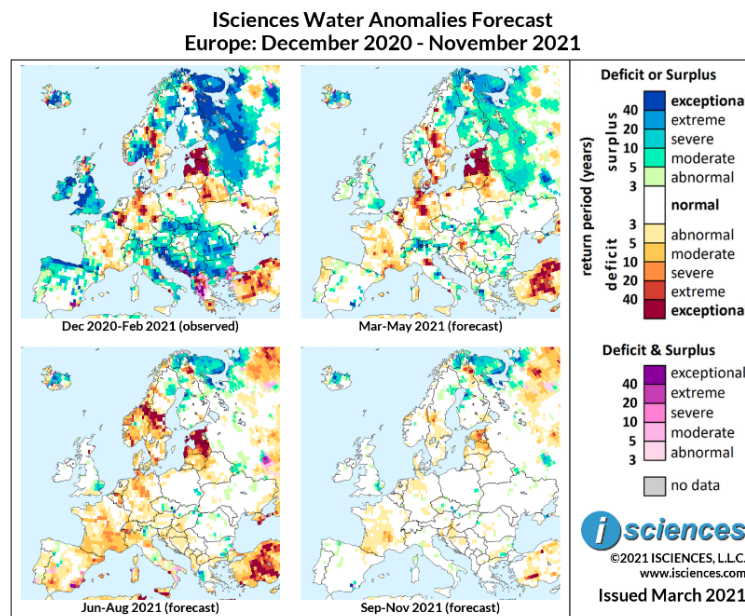


Based on observed data through February 2021 and forecasts through November 2021

Surpluses are forecast in Iceland, northern Norway and Finland, and in western European Russia where anomalies will be extreme in Murmansk. Deficits are expected in the Upper Mezen River region of northern Russia, and the Lower Volga River and TransVolga regions (not shown).

Ireland and the United Kingdom can expect surpluses and anomalies will reach across the Strait of Dover into France. Deficits are forecast for Belgium, north-central Germany, central and southern France, and Sardinia and Bologna in Italy. Areas with intense anomalies include the Ardennes region of Belgium and Germany's Harz Mountains. In France, deficits will be moderate to severe along the Loire River and extreme near Marseille. Surpluses are forecast for Czech Republic, Slovakia, many pockets throughout the Balkans, central and southern Italy, and northern Spain along the Bay of Biscay and a pocket north of Madrid.

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



Based on observed data through February 2021 and forecasts through November 2021

The forecast through May indicates that surpluses will shrink and downgrade considerably. However, widespread surpluses will persist in western European Russia and surpluses will increase in Finland. Many pockets of surplus will persist in Czech Republic, Slovakia, the Alps, throughout the Balkans, and a few pockets in Italy. Some surpluses will linger in East Anglia, England, and small pockets in Spain.

Deficits will remain exceptional in Estonia and Latvia and severe in Lithuania and western Belarus; increase in southern Sweden; persist in Germany and Belgium; and emerge in Denmark. Extreme deficits will emerge in Hungary east of Lake Balaton, and deficits will increase in central and southern France. Deficits surrounding Bologna, Italy will intensify, becoming exceptional.

From June through August, surpluses will continue to shrink, persisting primarily in Murmansk, Iceland, a few pockets around the Gulf of Bothnia, and East Anglia. Deficits will persist in the Baltics though the extent of exceptional anomalies will shrink slightly. Deficits will persist in Sweden's southern half and will emerge throughout much of Norway. In Germany and Belgium, deficits are expected to downgrade somewhat, while increasing in France, and emerging in Switzerland and the Piedmont region of northern Italy. Deficits in Bologna will downgrade but Sicily can expect intense deficits. In Spain, some moderate to severe deficits will emerge in Catalonia, western Andalusia, and along the coast near Valencia.

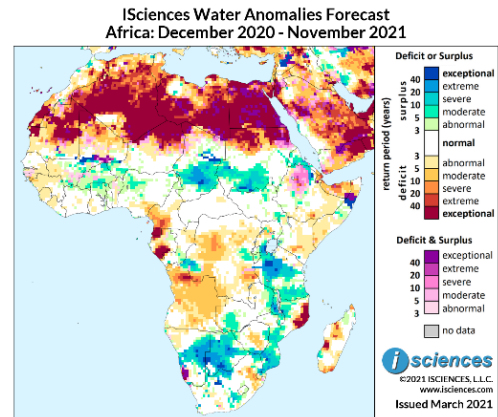
The forecast for the remaining months – September through November – indicates nearly normal water conditions overall, with persistent surpluses in Murmansk, and downgraded deficits in Estonia and Latvia. A pocket of moderate to severe deficit will persist in Auvergne, France.

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

Africa

The 12-month forecast through November 2021 indicates intense water deficits across North Africa including widespread exceptional anomalies. Pockets of mixed conditions are also forecast (pink/purple).

Surpluses reaches extreme intensity are expected in the eastern Sahel, and some pockets of lesser intensity in the west. Eritrea will see surpluses in the north, but deficits in the south and into Somaliland. Elsewhere in the Horn of Africa, intense surpluses are forecast in the Nugaal region of northern Somalia along with transitional conditions.



Based on observed data through February 2021 and forecasts through November 2021

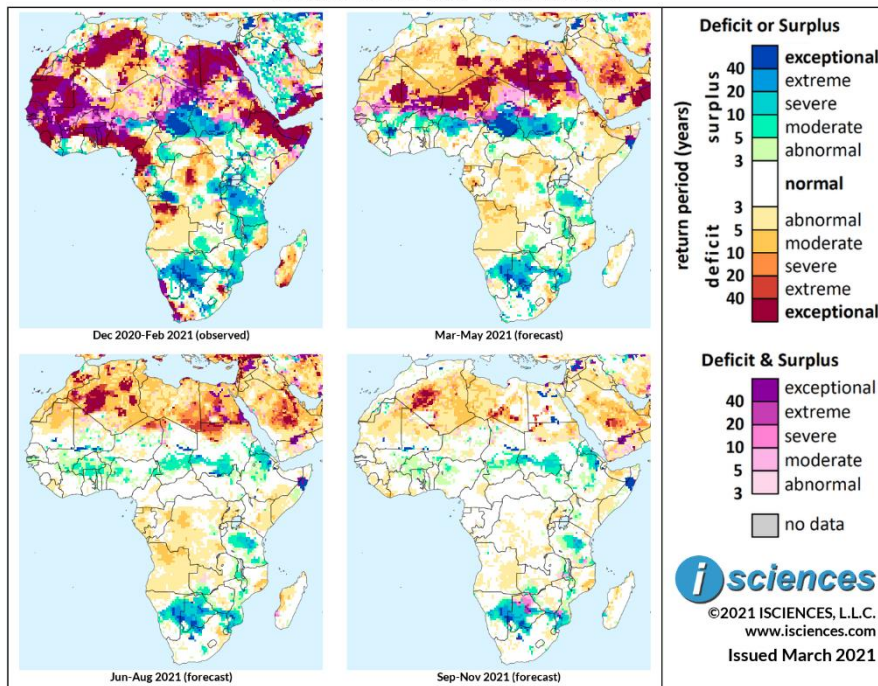
Around the southern Gulf of Guinea, extreme deficits are forecast in southeastern Cameroon, and exceptional deficits in Equatorial Guinea and southwestern Gabon. In the Democratic Republic of the Congo, moderate to severe deficits are expected in the central Congo River Basin and in the southeast near Lake Tanganyika, but surpluses are forecast near Kinshasa. Angola can expect deficits, moderate overall but more intense in the northwest.

In East Africa, surpluses are forecast for Kenya and Malawi. Surpluses are also forecast for many regions in southern Africa including central Namibia, throughout Botswana and into southern Zambia and South Africa, southern Mozambique and its northwestern corner, and surrounding the Gariiep Dam in South Africa.

Exceptional deficits are forecast for northeastern Mozambique, moderate to severe deficits in the Upper Vaal River region of South Africa, and moderate deficits in central Zimbabwe. In Madagascar, exceptional deficits are expected in the Lower Tsiribihina River region, and deficits of lesser intensity in the Betsiboka River region in the central-north and in the island's southern extreme.

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

ISciences Water Anomalies Forecast
Africa: December 2020 - November 2021



Based on observed data through February 2021 and forecasts through November 2021

The forecast through May indicates that deficits in Africa will shrink and downgrade. Across the north, deficits will moderate in western nations, but exceptional deficits will be particularly widespread in northern Niger, southeastern Libya, Egypt, and northern Sudan. Surpluses are forecast across the Sahel and will be exceptional in southern Chad. Intense deficits will persist in central Eritrea. Pockets of generally moderate deficit are expected in Somaliland, Sierra Leone, Democratic Republic of the Congo, Equatorial Guinea, southern Gabon, northern Angola, northeastern Mozambique, and the Upper Vaal River region in South Africa. Surpluses will shrink in East Africa, persisting primarily in Tanzania and Malawi, but will remain widespread in Botswana and central Namibia. Surpluses in southern Mozambique and around the Gariiep Dam in South Africa will shrink.

From June through August, deficits in North Africa will shrink and downgrade, as will surpluses in the Sahel. Moderate surpluses will emerge from northern Ethiopia into Eritrea, and intense surpluses will persist in Nugaal, Somalia, along with transitional conditions. Some pockets of moderate deficit will linger in Gabon, Democratic Republic of the Congo, northern Angola, and a few other areas. Moderate surpluses will persist in central Tanzania and Malawi, and surpluses of greater intensity in Botswana, central Namibia, and southern Mozambique, with anomalies seeping into neighboring regions.

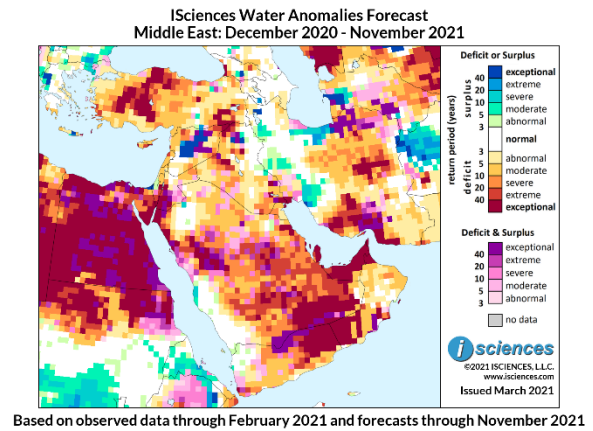
The forecast for the final quarter – September through November – indicates that deficits will shrink somewhat, particularly in Egypt, but conditions overall will be similar to the forecast for the prior three months.

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

Middle East

The forecast for the 12-month period ending November 2021 indicates water deficits of varying intensity in many regions of the Arabian Peninsula, interspersed with transitional conditions. Areas with exceptional deficits include Bahrain, Qatar, the United Arab Emirates, southeastern Saudi Arabia, and spanning the border of Yemen and Oman.

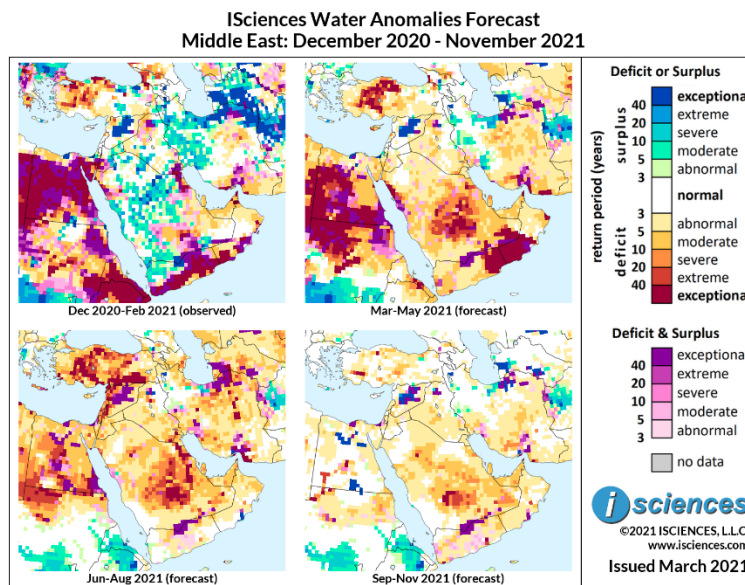
Deficits of varying intensity are forecast in much of Turkey with exceptional anomalies along the central Black Sea Coast, west of Lake Tuz in Central Anatolia, and southwest of Lake Van in the east. Deficits will also be intense in coastal Georgia.



Exceptional surpluses and transitional conditions (pink/purple) are forecast for north-central Syria, but deficits are expected around Aleppo. In Iraq, deficits are forecast west of the Euphrates River, and surpluses and transitional conditions around Mosul.

Surpluses will follow Iran's central Caspian Coast reaching inland to Tehran with transitional conditions near Turkmenistan. Surpluses are also forecast near Lake Urmia, in Lorestan Province, and in a large pocket on the northeastern end of the Persian Gulf. Deficits will be widespread and intense in the Iranian provinces near the southern Persian Gulf, mixed with transitional conditions near the Strait of Hormuz. Widespread deficits of varying intensity are also forecast for central Iran.

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



The forecast through May indicates that surpluses will shrink in the region though intense anomalies will persist in north-central Syria, and moderate to extreme anomalies in Iran along the central Caspian Coast, near Lake Urmia, in Lorestan Province, and at the northeast end of the Persian Gulf.

Deficits will be widespread in western Turkey and will intensify. Widespread deficits will emerge in Saudi Arabia transitioning from prior surplus, and anomalies will be severe to exceptional in Riyadh Province. In Yemen, moderate deficits are expected in the west and exceptional deficits on its eastern border reaching well into Oman. Moderate deficits will persist in Qatar and United Arab Emirates, and will emerge in much of central and southern Iran with more intense anomalies along with transitional conditions near the Strait of Hormuz.

From June through August, surpluses will nearly disappear. Deficits will increase in Turkey and will emerge in the Levant along the Mediterranean Coast where anomalies will be severe to exceptional. Deficits will persist in much of Saudi Arabia, especially Riyadh, but will retreat from Yemen and Oman. Moderate deficits will persist around the Persian Gulf and in the bulk of Iran, intensifying in some pockets of Yazd Province in the center of the country. Exceptional deficits and transitional conditions will persist near the Strait of Hormuz.

In the final quarter – September through November – deficits will shrink and downgrade, persisting primarily in Saudi Arabia. Surpluses will re-emerge in north-central Syria and some pockets of Iran along its eastern Caspian Coast.

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

Central Asia and Russia

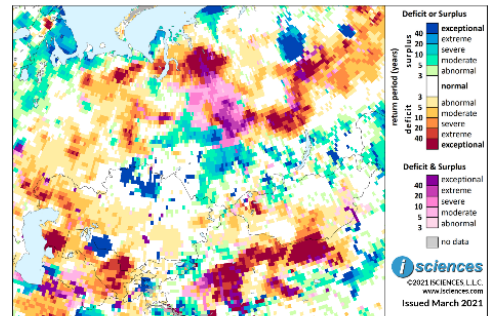
The 12-month forecast through November 2021 indicates widespread deficits in much of the Caspian Basin, moderating as they reach into central Kazakhstan. Deficits are forecast for most of Uzbekistan and will reach exceptional intensity in the east, downgrading as they trail into eastern Turkmenistan.

Exceptional surpluses are forecast in a pocket along Turkmenistan’s central Caspian Coast; a large pocket east of the Aral Sea in the northern Kyzylkum Desert spanning Uzbekistan and Kazakhstan; and in the Ishim River Watershed of northern Kazakhstan. Intense surpluses are also forecast for central Tajikistan and the southern portion of the Fergana Valley. Eastern Kyrgyzstan can expect surpluses of lesser intensity.

In Russia, deficits are forecast in: TransVolga; the northern portion of the Vychedga Lowland; parts of the tundra region in the Northern European Plain; the central banks of the Gulf of Ob and the western reaches of the Ob River Watershed; the Lower Yenisei and Taz River regions; the Lena River Watershed from Yakutsk to the region north of Lake Baikal; and a vast stretch from the Alden River (an eastern tributary of the Lena) to the Sea of Okhotsk (not shown). Deficits will be exceptional in many areas.

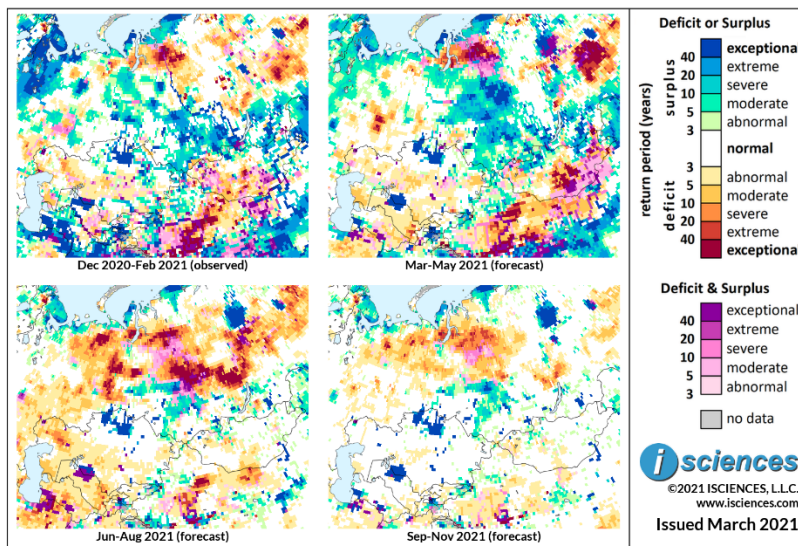
Surpluses are forecast in coastal Arctic Russia, the eastern reaches of the Ob River Watershed, much of the Tom River Watershed, around Irkutsk west of Lake Baikal, and between the Olenyok and Markha Rivers near the Lower Lena River Watershed where anomalies will be exceptional. The 3-month composites (below) for the same 12-month period show the evolving conditions in more detail.

ISciences Water Anomalies Forecast
Central Asia: December 2020 - November 2021



Based on observed data through February 2021 and forecasts through November 2021

ISciences Water Anomalies Forecast
Central Asia: December 2020 - November 2021



Based on observed data through February 2021 and forecasts through November 2021

The forecast through May indicates a vast expanse of water surplus from the eastern Ob River Watershed through the Middle and Upper portions of the Yenisei Watershed, and the Tom River Watershed to the south. The TranVolga region will transition from surplus to intense deficit. Intense deficits are also forecast on the middle banks of the Gulf of Ob and through the region of the Lower Yenisei River where transitional conditions are also expected (pink/purple). Deficits will intensify in a large pocket in the Lena River Watershed around Yakutsk, becoming exceptional. Surpluses are forecast in the coastal Arctic.

In Central Asia, exceptional surpluses are expected in the Ishim River region in northern Kazakhstan including Nur-Sultan; in the Kyzylkum Desert spanning Uzbekistan and Kazakhstan; in a pocket on Turkmenistan's central Caspian Coast; and in central Tajikistan. Surpluses of lesser intensity are forecast for eastern Kyrgyzstan. Surpluses in Turkmenistan will shrink and moderate deficits will emerge in the east. Extreme deficits will emerge in far eastern Uzbekistan; deficits in the Pamir River Watershed of eastern Tajikistan will intensify, becoming exceptional; and several pockets of moderate deficit are forecast in Kazakhstan.

From June through August, surpluses will shrink as deficits emerge. Widespread intense deficits will emerge in the Pechora River Watershed in Russia, and, transitioning from surplus, in the region past the Urals reaching along the eastern arm of the Ob River. Intense deficits will increase in the Yenisei River Watershed. Deficits in TransVolga will downgrade as will deficits around Yakutsk in the Lena River Watershed. Surpluses in the Northern European Plain will shrink, and exceptional surpluses will re-emerge near the Lower Lena River Watershed between the Olenyok and Markha Rivers.

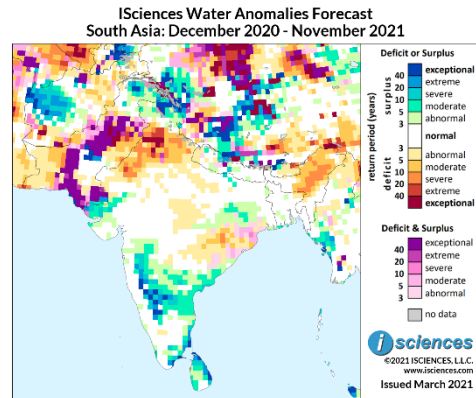
In Kazakhstan, near-normal water conditions are expected in the east, intense surpluses and transitional conditions in the north, and deficits in the west. Deficits are forecast for Turkmenistan and Uzbekistan, and surpluses in central Tajikistan and far eastern Kyrgyzstan.

The forecast for the final months – September through November – indicates that deficits will shrink, persisting mainly in the Yenisei River Watershed.

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

South Asia

The 12-month forecast through November 2021 indicates water surpluses in the southern Deccan Plateau of India, coastal Tamil Nadu, northern Gujarat, Jharkhand, and Jammu and Kashmir in the far north. Anomalies will be exceptional in pockets of Karnataka, Tamil Nadu, and Jammu and Kashmir. Deficits of varying intensity are forecast in northern India reaching exceptional intensity in Punjab. India's Far Northeast can expect widespread moderate to severe deficits, conditions also forecast for the shared border of Chhattisgarh and Odisha.

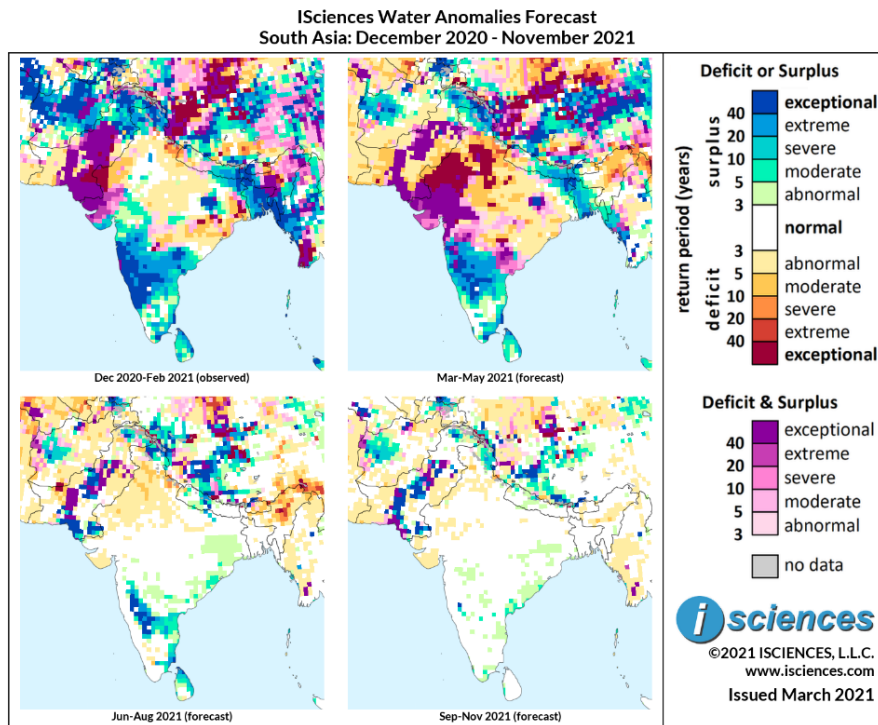


Based on observed data through February 2021 and forecasts through November 2021

Surpluses are expected in Sri Lanka and along the Gandaki River through Nepal and into India. In Pakistan, surpluses are forecast in the Hindu Kush; deficits east of the northern Indus River and also in much of Baluchistan Province in the southwest; and, a wide, winding path of transitional conditions (purple/pink) down the center of the nation and along the coast through Karachi.

In Afghanistan, widespread, intense surpluses are expected in the west encompassing Herat and the Harirud River region. Intense deficits are forecast in a pocket of the Lower Helmand River Basin, and moderate deficits in pockets north of Kabul.

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



Based on observed data through February 2021 and forecasts through November 2021

The forecast through May indicates that water deficits will increase and intensify in northern India, creating a vast block of exceptional deficit in Rajasthan and deficits of similar intensity in Haryana and nearby states in the north, moderating as they reach south into Madhya Pradesh. Moderate to extreme deficits are expected in India's Far Northeast. Widespread surpluses will persist in the southern Deccan Plateau along with areas of transition. Surpluses will also persist in coastal Tamil Nadu and eastern Bihar, but transitions are forecast in a pocket of western Jharkhand where exceptional surpluses have persisted. Transitional conditions are also forecast from Gujarat into neighboring states.

Surpluses will shrink somewhat in Sri Lanka, and downgrade but remain widespread in Bangladesh and eastern Nepal. The forecast for Pakistan indicates that surpluses will shrink in the north, persisting in the Hindu Kush. Moderate deficits are forecast east of the Indus River and in nation's southwest. Transitional conditions will dominate a path down the center of the country and along the coast through Karachi. In Afghanistan, surpluses will shrink and downgrade, persisting in the west.

From June through August, anomalies will shrink and downgrade considerably, leaving nearly normal conditions in many regions. Surpluses will persist in a wide path from south-central Maharashtra through Karnataka and Andhra Pradesh, and in eastern Tamil Nadu and a pocket in Jammu and Kashmir. Moderate surpluses are expected to emerge along Odisha's southern coast. Pockets of deficit will persist in India's Far Northeast and some moderate deficits in northern states. Conditions in Bangladesh will return to normal; surpluses will persist in northern and eastern Sri Lanka and along the Gandaki River through Nepal. Deficits will recede in Pakistan and intense surpluses will re-emerge in some areas of former transition including around Karachi and pockets in the center of the country. Moderate surpluses are forecast in western Afghanistan.

The forecast for the final months – September through November – indicates surpluses in central and southern Pakistan, western Afghanistan, and eastern Jammu and Kashmir.

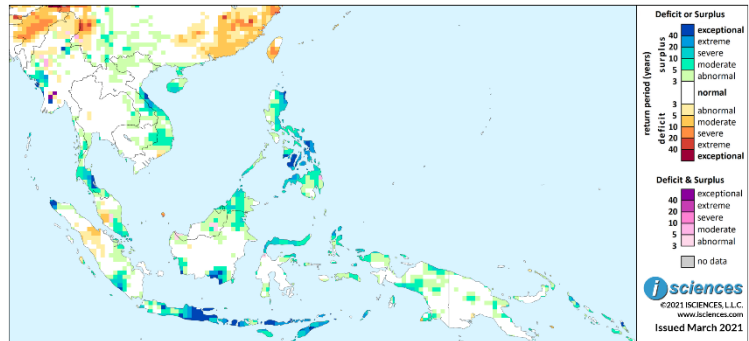
Please note that WSIM forecast skill declines with longer lead times.

Southeast Asia and the Pacific

The 12-month forecast through November 2021 indicates widespread surpluses of varying intensity throughout the Philippines, including exceptional surpluses in Negros.

Normal water conditions are expected in much of Southeast Asia. However, surpluses reaching exceptional intensity are forecast in Vietnam's narrow neck with moderate anomalies bleeding into Laos. Moderate anomalies are also forecast in the Central Highlands. Rakhine State in western Myanmar can expect surpluses as can Peninsular Thailand, Malaysia's peninsular tip, and nearby Singapore. Moderate deficits are forecast for Kuala Lumpur.

ISciences Water Anomalies Forecast
Southeast Asia: December 2020 - November 2021

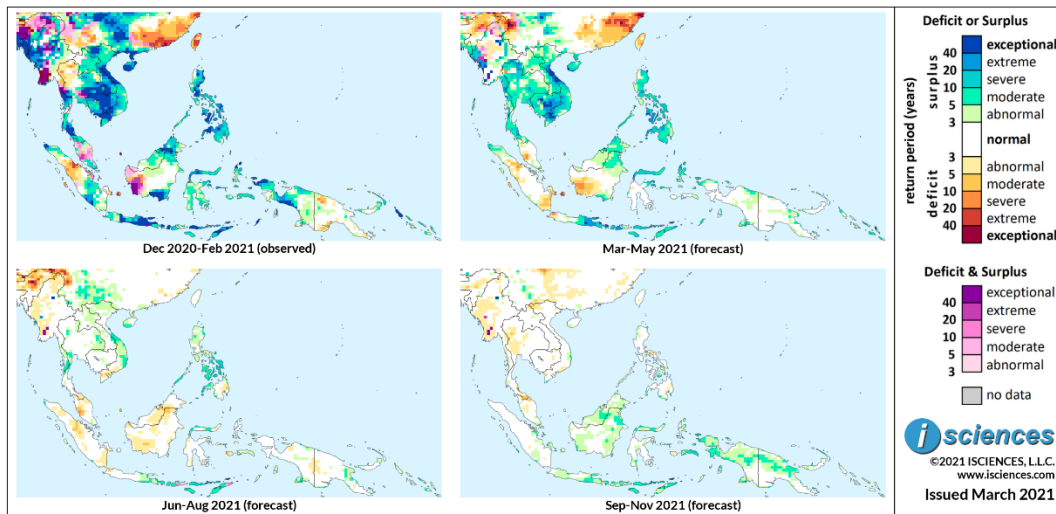


Based on observed data through February 2021 and forecasts through November 2021

Deficits will reach across the Malacca Strait into Sumatra, Indonesia, but surpluses are forecast for Banda Aceh in the island's northern tip and in the southwest. Surpluses will be intense in eastern Java and the Lesser Sunda Islands. Moderate surpluses are forecast for Borneo's northern reaches, but anomalies will be more intense in the delta area of the south around the city of Banjarmasin. Elsewhere in the region surpluses are forecast for Sulawesi's northern arm, the Maluku Islands, and pockets in New Guinea.

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

ISciences Water Anomalies Forecast
Southeast Asia: December 2020 - November 2021



Based on observed data through February 2021 and forecasts through November 2021

The forecast through May indicates widespread surpluses throughout the Philippines with extreme anomalies in the central islands. Widespread surpluses are also forecast in Vietnam, Cambodia, Laos,

and Thailand. Anomalies will be exceptional in Vietnam's narrow neck, central Cambodia, and the Mekong Delta. A patchwork of water conditions is forecast in Myanmar including deficits and transitional conditions in the north, and surpluses in its narrow southern extent, west of the Irrawaddy River and in the delta, and near the Salween River in the east.

Deficits are forecast in Kuala Lumpur and across the Malacca Strait into Sumatra. Moderate surpluses are expected in Banda Aceh in Sumatra's northern tip, and moderate deficits in the south. Deficits are also forecast for southwestern Borneo, and surpluses in the island's northern region and a pocket of the south around Banjarmasin. Surpluses will stretch from Java through the Lesser Sunda Islands, and other areas of surplus include northern Sulawesi, the Maluku Islands, and small pockets in New Guinea.

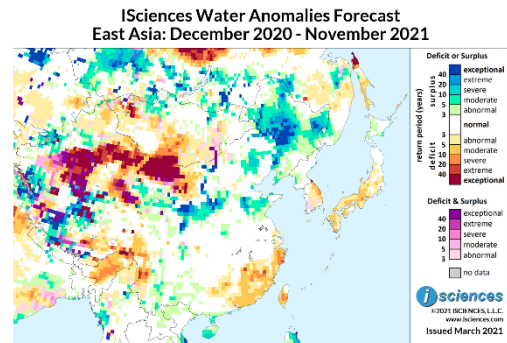
From June through August, surpluses will shrink considerably returning many areas to near-normal water conditions. Severe surpluses will persist in the central Philippines, and moderate surpluses in central Vietnam, peninsular Myanmar, and a few small pockets in Thailand. Surpluses will shrink and moderate in northern Sulawesi, eastern Java and the Lesser Sunda Islands. Some areas of deficit, primarily small and moderate, will persist in Kuala Lumpur and Sumatra and will emerge in northern Indonesian Borneo.

The forecast for the final months – September through November – indicates nearly normal water conditions in Southeast Asia and the Philippines. Surpluses will persist in Java and the Lesser Sunda Islands and northern Sulawesi, and will emerge in northern Borneo, the Maluku Islands, and the Bird's Head and Fakfak Peninsulas of western New Guinea and in the island's Central Highlands.

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

East Asia

The 12-month forecast for East Asia through November 2021 indicates widespread surpluses in Northeast China that will reach exceptional intensity in some areas including western Jilin. Surpluses of varying intensity are expected in the Yellow (Huang He) River Basin, moderate to extreme in the river's lower reaches but reaching exceptional intensity in Shanxi, Shaanxi, and Gansu at the base of the Ordos Loop.



Based on observed data through February 2021 and forecasts through November 2021

Water conditions are expected to be relatively normal in much of the Yangtze River Basin. Moderate to severe deficits are forecast for a vast region of Southeast China from just south of Shanghai to Hong Kong and reaching through southern Taiwan. Farther south, moderate surpluses are forecast in Guangdong's Leizhou Peninsula and nearby in Hainan.

In the northwest, deficits will be extreme to exceptional from western Inner Mongolia well into the Tarim Basin in Xinjiang where transitional conditions are also forecast.

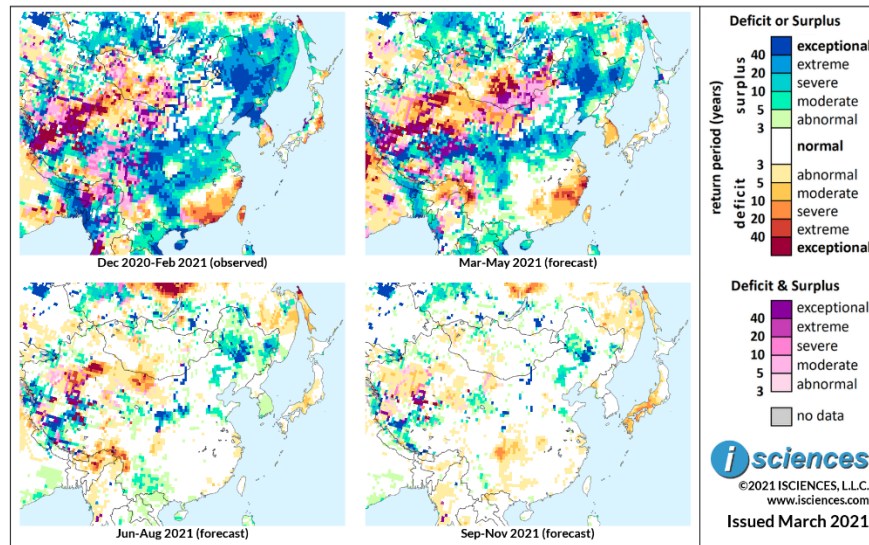
Tibet (Xizang) can expect a complicated patchwork of water conditions including mixed and transitional conditions in the west, surpluses in the center, and deficits in the east. Deficits will reach into northwestern Yunnan, but some isolated pockets of moderate surplus are forecast elsewhere in the province.

In Mongolia, moderate to exceptional deficits are forecast in the nation's south-central region, and deficits of lesser intensity will trail from there through the Hangayn (Khangai) Mountains leading to intense deficits in the northwest around Lake Uvs. Surpluses are forecast along the northern border near Lake Khövsgöl and a pocket in the northeast in the Upper Kherlen River region.

On the Korean Peninsula, moderate surpluses are expected on the coast west of Pyongyang, and deficits in coastal South Korea on the Sea of Japan. In Japan, moderate deficits are forecast for Honshu's southern half and into Shikoku and Kyushu.

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

**ISciences Water Anomalies Forecast
East Asia: December 2020 - November 2021**



Based on observed data through February 2021 and forecasts through November 2021

The forecast through May indicates that surpluses will remain widespread and intense in Northeast China from the Russian border to the Bohai Sea. Surpluses will also be widespread in the Yellow River Watershed but will shrink and downgrade in the southern portion of the Yangtze Basin. In the south, surpluses in Guizhou, Guangdong’s Leizhou Peninsula, and Hainan will moderate.

Widespread deficits will persist in Southeast China, shrinking and moderating in Guangdong but intensifying in Fujian, Jiangxi, and Zhejiang. Deficits in Taiwan will moderate. In western Inner Mongolia, deficits will increase, and intense deficits and transitional conditions will persist in central Xinjiang. Mixed conditions are forecast in Tibet. In Yunnan, deficits will recede in the east while intense deficits emerge in the northwest.

From June through August, surpluses will shrink in Northeast China and the Yellow River Watershed and disappear from the Yangtze region. Deficits in the southeast and Taiwan will disappear as well. Deficits will persist in northwestern Yunnan, but moderate surpluses will emerge in central and eastern regions. Anomalies elsewhere in China and Mongolia will shrink as well, but deficits will persist in western Inner Mongolia and central Xinjiang. Normal water conditions are forecast for North Korea while the south transitions from moderate deficit to mild surplus. In Japan, some moderate deficits are expected on Honshu east of Kyoto.

The forecast for the final three months – September through November – indicates that surpluses will continue to shrink in Northeast China but remain intense in western Jilin. Moderate to severe surpluses will persist north of Beijing. Pockets of surplus will persist in the Yellow River Watershed and western Tibet. Deficits will recede in Yunnan, emerge in eastern Sichuan, and increase in southern Japan.

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

Australia & New Zealand

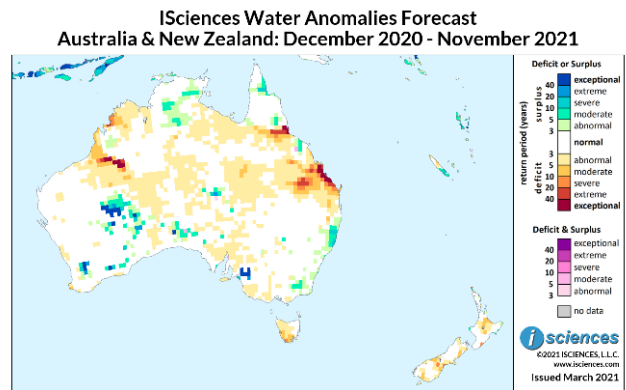
The 12-month forecast through November 2021 indicates moderate to exceptional deficits in Queensland along the coast north of Townsville and farther south near Rockhampton, downgrading somewhat as they reach inland into the Buckland Tableland.

Also in the east, surpluses are expected in some pockets of Cape York Peninsula in the north, along the nation's southeast coast near Armidale in New South Wales, in the Upper Murray River region of Victoria, and approaching the mouth of the river in South Australia where anomalies will be exceptional. In Tasmania, however, deficits are forecast in the south, moderate near Hobart and in the Derwent Estuary but severe south of Lakes Pedder and Gordon.

In Australia's western half, deficits will be intense in the Great Sandy Desert and a pocket along the northwestern coast in the Kimberley region. Surpluses are forecast in the southern Avon River Basin east of Perth; a pocket north of Esperance; between the Gibson and Great Victoria Deserts; the Victoria River region of Northern Territory; scattered pockets in South Australia; and a pocket in the Simpson Desert in the center of the nation.

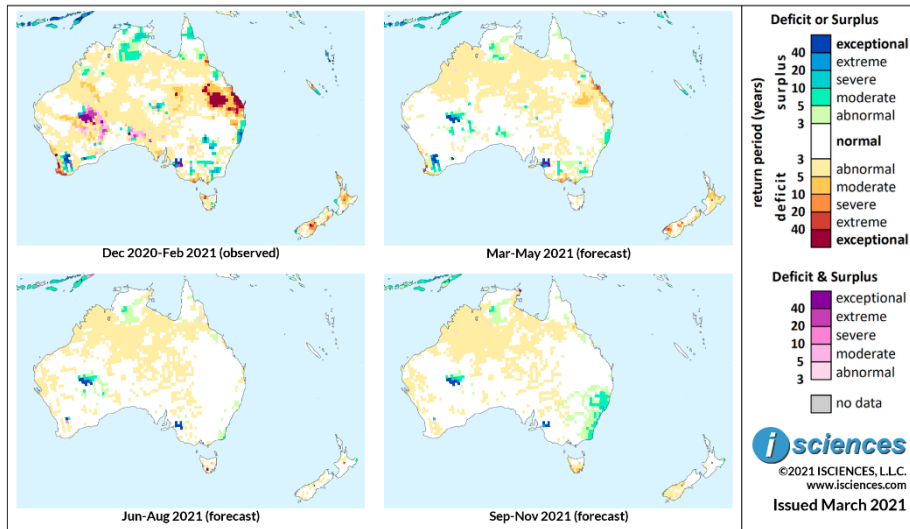
In New Zealand, scattered deficits are forecast, primarily moderate but severe near South Island's three glacial lakes, Pukaki, Tekapo, and Ōhau. Surpluses are expected in eastern New Caledonia.

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



Based on observed data through February 2021 and forecasts through November 2021

**ISciences Water Anomalies Forecast
Australia & New Zealand: December 2020 - November 2021**



Based on observed data through February 2021 and forecasts through November 2021

The forecast through May indicates that deficits will shrink and downgrade, persisting near Rockhampton in coastal Queensland and in the Buckland Tableland nearby; west of Melbourne; and between Perth and Busselton. Surpluses will shrink across the northern reaches of the nation and in the southeast, with moderate anomalies in the Victoria River region of Northern Territory, on the southeast coast near Armidale, and in Victoria’s Australian Alps in the east and Yarriambiack Shire in the west. Intense surpluses and transitional conditions will persist in the Lower Murray River in South Australia.

In the nation’s west, surpluses reaching exceptional intensity will persist in the Avon River Basin and will re-emerge at the western edge of the Gibson Desert. Some pockets of moderate surplus will re-emerge in the Great Victorian Desert and in South Australia.

In New Zealand, scattered deficits are forecast. Moderate surpluses are expected in southern New Caledonia while the north normalizes from prior deficit.

From June through August, conditions will normalize overall. Surpluses will persist in a few pockets of Australia including the Lower Murray River region and the western edge of the Gibson Desert. Exceptional deficits are expected in Tasmania surrounding Lakes Pedder and Gordon. Nearly normal water conditions are forecast for New Zealand and New Caledonia.

The forecast for the final months – September through November – indicates that surpluses persist near the Gibson Desert and the Lower Murray River and moderate surpluses will emerge along Australia’s southeast coast.

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