

# Global Water Monitor & Forecast Watch List

May 14, 2021

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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 April 2021 and an ensemble of forecasts issued the last week of April 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.

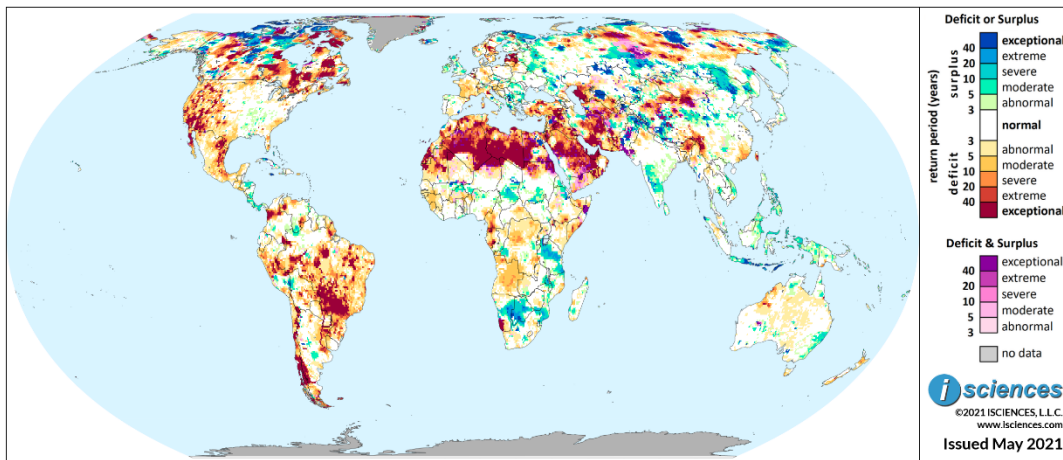
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## Worldwide Water Watch List

This map presents a selection of regions likely to encounter significant water anomalies during the one-year period beginning in February 2021 and running through January 2022 using 3 months of observed temperature and precipitation data and 9 months of forecast data.

ISciences Water Anomalies Forecast: February 2021 - January 2022



Based on observed data through April 2021 and forecasts through January 2022

### 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 July indicates widespread water deficits of varying intensity in the West, Southwest, Pacific Northwest, Rockies, and Texas. Other areas of deficit include North Dakota, Michigan, New England, and the South Atlantic. Surpluses are forecast in Louisiana and Mississippi.

**Canada:** The forecast through July indicates that water deficits will increase in the east as surpluses shrink, and vast areas of exceptional deficit will persist. Deficits in southern Manitoba will be severe. Deficits will shrink and moderate in southern Saskatchewan and remain intense on Vancouver Island.

**Mexico, Central America, and the Caribbean:** The forecast through July indicates moderate to severe water deficits in north-central Mexico and in a wide arc through the Gulf Coast states and land-locked neighbors. Surpluses will shrink and downgrade in Central America but remain widespread.

**South America:** The forecast through July indicates widespread water deficits in Brazil south of the Amazon, exceptional in many regions. Exceptional deficits are also forecast along the Paraguay River through its namesake and along the Paraná River through Brazil, Paraguay, and Argentina.

**Europe:** The forecast through July indicates that water surpluses will decrease in Eastern Europe and the Balkans and shrink but remain widespread in Western European Russia. Deficits will increase in central Europe and will be particularly widespread and severe in France.

**Africa:** The forecast through July indicates that water deficits will increase across North Africa as exceptional deficits emerge in the east, but deficits will downgrade in the Horn, around the Gulf of Guinea, Angola, and southwestern Namibia. Areas of surplus include the Sahel and Botswana.

**Middle East:** The forecast through July indicates that water deficits will increase though the extent of exceptional deficit will diminish. Areas of intense deficit include many pockets throughout Turkey, Riyadh Province in Saudi Arabia, and Fars Province in southern Iran.

**Central Asia and Russia:** The forecast through July indicates water deficits in Russia's Pechora River region, on the Gulf of Ob, the Lower Yenisei River area, and the Central Siberian Plateau. Surpluses in the Lower Ob Watershed will shrink. Deficits on the Caspian Sea in Kazakhstan will moderate.

**South Asia:** The forecast through July indicates near-normal conditions in central India, but intense water deficits in the Far Northeast. Surpluses will retreat from the Western Ghats but persist in much of the Deccan Plateau and to the east coast. Bangladesh will return to near-normal conditions.

**Southeast Asia and the Pacific:** The forecast through July indicates that water surpluses will shrink considerably. Surpluses are forecast for Thailand, Cambodia, Vietnam, the Philippines, and the Lesser Sunda Islands where anomalies will be intense. Deficits will emerge northwest of Mandalay, Myanmar.

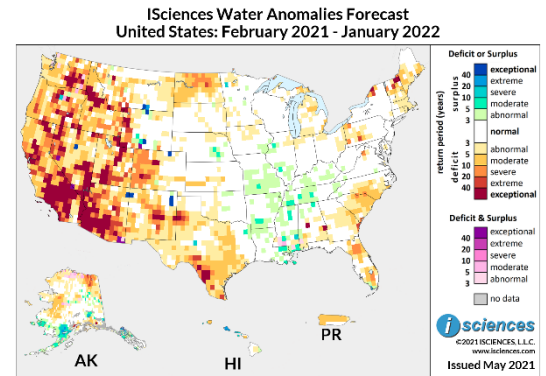
**East Asia:** The forecast through July indicates that water surpluses will persist in Northeast China and the Yellow River Watershed but shrink considerably in the Yangtze region. Deficits in Southeast China will shrink and downgrade. Mild surpluses are forecast in Japan and normal conditions in Korea.

**Australia & New Zealand:** The forecast through July indicates that water surpluses in southeastern Australia will shrink, retreating from the Upper Murray River region but persisting in northeastern New South Wales. Deficits are forecast for many regions of New Zealand.

## Watch List: Regional Details

### United States

The 12-month forecast ending January 2022 indicates widespread water deficits of varying intensity in the U.S. West, Pacific Northwest, Southwest, Rocky Mountains, North Dakota, and Texas. Exceptional deficits are expected in many pockets and will be especially pervasive in Southern California and Arizona. Deficits on the Colorado River will be exceptional surrounding Lake Mead and severe in the river's upper basin. Moderate to severe deficits are forecast for North Dakota, and moderate deficits will follow the Arkansas River through western Kansas into Colorado.



Based on observed data through April 2021 and forecasts through January 2022

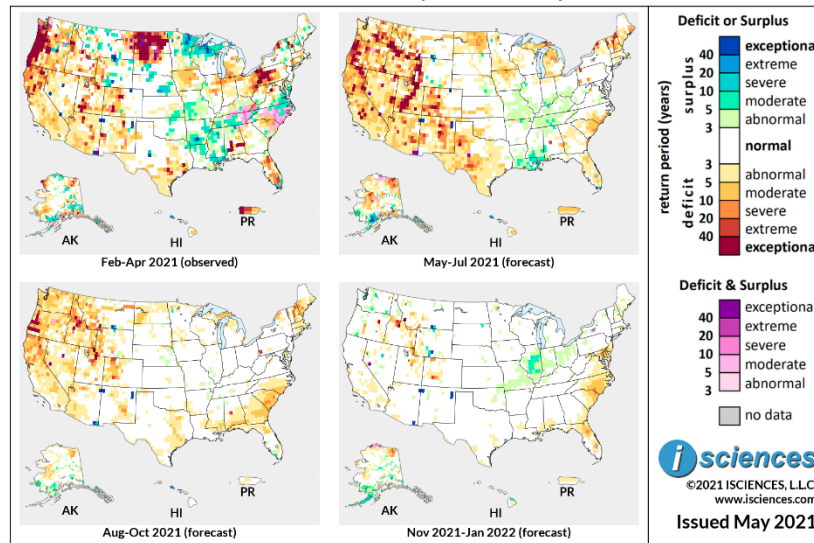
A few small, isolated pockets of surplus are expected in the Rockies including exceptional anomalies along the Bighorn River as it crosses from Montana into Wyoming. Small, isolated pockets of moderate surplus are forecast in the Lower Ohio and Lower Mississippi River regions. The South Atlantic States can also expect deficit conditions, primarily moderate but anomalies will be extreme near Savannah, Georgia, and severe in Florida between Jacksonville and Orlando and south of Lake Okeechobee. A few small, isolated pockets of exceptional deficit are forecast in Alabama.

Michigan can expect some pockets of moderate deficit, but anomalies will be somewhat more intense in western Pennsylvania. Deficits will also be intense along the St. Lawrence River in Upstate New York as well as in the northern regions of Vermont and New Hampshire, while moderate deficits are expected in Maine's southern half.

Outside the contiguous U.S., moderate deficits are forecast for Puerto Rico. In Hawaii, surpluses are expected in Oahu and Molokai and deficits in Maui. Alaska can expect deficits in the northeast, a large block east of Norton Sound, and near Valdez and Anchorage. Surpluses are forecast west of Bethel, near Iliamna Lake, and near Juneau.

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

**ISciences Water Anomalies Forecast  
United States: February 2021 - January 2022**



Based on observed data through April 2021 and forecasts through January 2022

The forecast through July indicates widespread deficits of varying intensity in the West, Southwest, Pacific Northwest, Rockies, and Texas. Anomalies will be exceptional in some regions, notably western Oregon, the Salmon River Mountains in Idaho, around Lake Tahoe, Utah’s Rocky Mountain region, and western Wyoming. Deficits in North Dakota will downgrade from exceptional to moderate or severe. Moderate deficits will trace the Missouri River through Montana and the Arkansas River through Kansas into Colorado. A small pocket of intense surplus is expected along the Bighorn River as it crosses from Montana into Wyoming.

The Upper Midwest will see deficits spanning the Minnesota-Iowa border and in Michigan. Deficits in the U.S. Northeast will reach exceptional intensity in a few small pockets. Primarily moderate deficits are forecast in the South Atlantic states and northern Florida. Moderate surpluses are forecast for southern Louisiana and Mississippi and a few pockets in the Lower Ohio River Basin.

From August through October, surpluses will nearly disappear and deficits will shrink considerably and downgrade. Conditions in much of the Plains, Midwest, and Ohio River region are forecast to be normal. Deficits will persist in the Pacific Northwest, Rockies, Northern California, and pockets of the Southwest. Anomalies will be exceptional in western Oregon, the Salmon River Mountains, and the Bear River region in northeastern Utah. Moderate deficits are forecast in the eastern half of Michigan’s Upper Peninsula. Deficits will shrink and downgrade in New England but will increase somewhat in the South Atlantic and South as moderate deficits emerge in Georgia and southern Mississippi and Alabama.

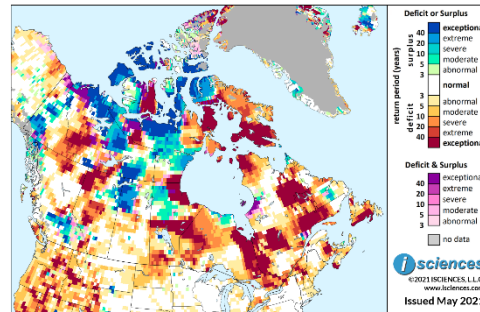
The forecast for the final months – November 2021 through January 2022 – indicates normal conditions overall with deficits in the Middle and South Atlantic regions and pockets of the Rockies, and surpluses in Illinois.

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

## Canada

The 12-month outlook for Canada through January 2022 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.

ISciences Water Anomalies Forecast  
Canada: February 2021 - January 2022



Based on observed data through April 2021 and forecasts through January 2022

Deficits of varying intensity are expected in Southern Ontario reaching east through Ottawa, Montreal, and Québec City. Likewise, deficits will be widespread in Northern Ontario's Kenora District though surpluses are forecast on Hudson Bay. In Manitoba, deficits are expected in the south that will be extreme to exceptional from Winnipeg and following the Assiniboine River west of the city. Exceptional deficits are also forecast in a belt across the center of the province north of Lake Winnipeg and on Hudson Bay, with surpluses elsewhere in the north reaching west into Saskatchewan.

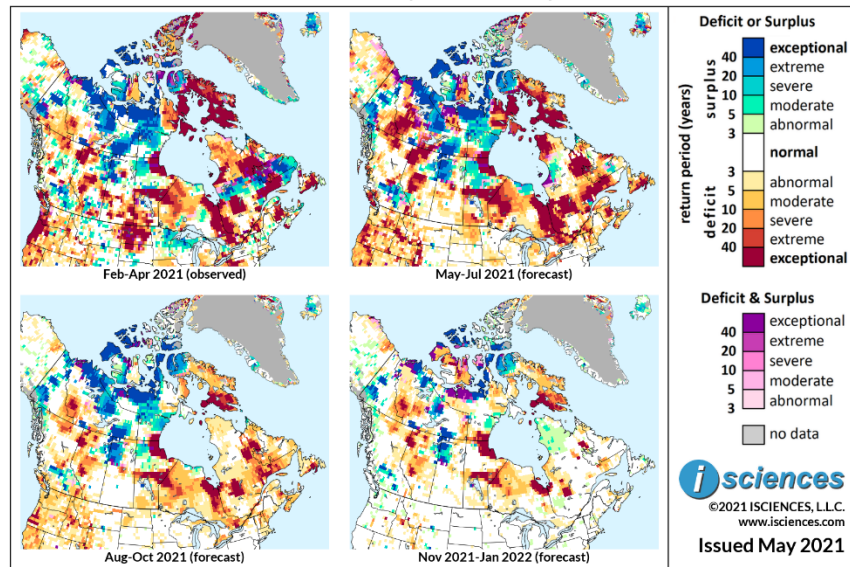
Moderate deficits are forecast in Saskatchewan's southeastern corner and deficits are also expected in a belt across the center of the province, while the northwest can expect severe to exceptional surplus leading north well past Lake Athabasca into the Northwest Territories and west into Alberta. Surpluses are expected in a pocket east of Calgary, Alberta, and some deficits in the south. 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.

British Columbia's Vancouver Island will see deficits as will the province's southeastern corner. Surpluses of varying intensity are expected in much of the Fraser River Watershed though intense deficits are forecast near Prince George in the north. Deficits will also be intense near British Columbia's northern border, expanding as they reach well into the Yukon and the Northwest Territories.

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



**ISciences Water Anomalies Forecast  
Canada: February 2021 - January 2022**



Based on observed data through April 2021 and forecasts through January 2022

The forecast through July indicates that, in Quebec and regions east, deficits will increase as surpluses retreat. Many vast regions of exceptional deficit will persist in Quebec, and deficits in the Ungava Peninsula will become exceptional while moderate surpluses emerge to the south on Hudson Bay. Exceptional deficits will remain widespread southwest of Lake Mistassini and in a broad column along the Quebec-Ontario border. Deficits will persist in much of Ontario except in the northeast along Hudson Bay where surpluses will increase.

In Manitoba, severe deficits are forecast in the south, exceptional deficits across the center of the province and on Hudson Bay, and surpluses elsewhere in the north. Deficits in Saskatchewan’s southern half will shrink and moderate; surpluses in the northeast will increase and intensify. Alberta can expect some pockets of deficit in the south, exceptional deficits in the Middle Athabasca River Watershed and surpluses in the river’s upper basin, and exceptional deficits in the northwest. In British Columbia, surpluses will persist in much of the Fraser River watershed. Intense deficits are forecast on Vancouver Island, the province’s southeast corner, near Prince George, and along the northern border.

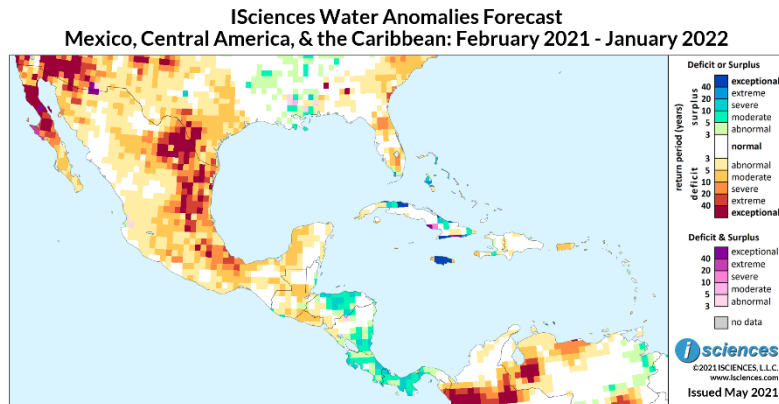
From August through October, surpluses will nearly disappear in the eastern half of the country and deficits will shrink, though vast regions of exceptional deficit will persist. Deficits will moderate in southern Manitoba, retreat from southern Saskatchewan, and downgrade somewhat in Alberta. In British Columbia, surpluses in the south will shrink and deficits will downgrade.

The forecast for the final months – November 2021 through January 2022 – indicates that deficits will continue to shrink in the eastern half of the nation. Surpluses will retreat from northern Manitoba and deficits will retreat from 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 January 2022 indicates water deficits in many regions of Mexico. Deficits ranging from moderate to exceptional are forecast in the northeastern states of Coahuila, Nuevo León, and Tamaulipas, and south following the Gulf through Veracruz and smaller inland neighbors. Exceptional deficits are expected in many small pockets but will be widespread in Coahuila.

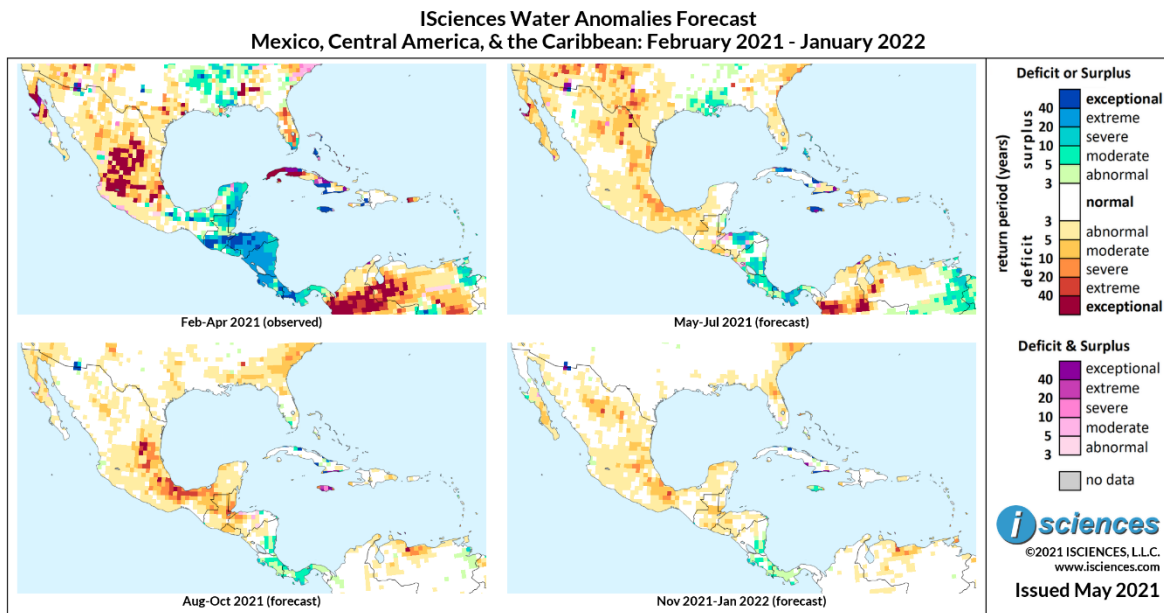


Exceptional deficits are also forecast for northern Baja, moderating in the south. Across the Gulf of California, the state of Sonora can expect deficits of varying intensity. Generally mild to moderate deficits are forecast for many other regions of the nation including Chihuahua in the north, states along the central Pacific Coast, and the western half of the Yucatán Peninsula.

In Central America, moderate deficits are forecast for central Guatemala and El Salvador. Moderate to severe surpluses are predicted for northern Honduras, southern Nicaragua, Costa Rica, and Panama.

In the Caribbean, intense surpluses are expected in Jamaica, and surpluses of varying intensity in pockets of Cuba and the Bahamas.

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



Based on observed data through April 2021 and forecasts through January 2022

The forecast through July indicates that prior widespread exceptional deficits across central Mexico will retreat as will surpluses in the south and the Yucatán, transitioning to normal conditions or mild deficit. Moderate to severe deficits are forecast for Coahuila in the north, along with a few small pockets of greater intensity. Deficits will also be moderate to severe in the southeast corner of Chihuahua, Coahuila's western neighbor, and in pockets forming a long arc through the Gulf states from Tamaulipas through Tabasco and into land-locked neighboring states. Deficits are forecast for the Baja Peninsula as well, moderate overall. In Central America, surpluses will shrink and downgrade and moderate deficits will emerge in El Salvador. Intense surpluses will persist in Jamaica, pockets of surplus in Cuba and the Bahamas, and some moderate deficits will emerge in Hispaniola.

From August through October, nearly normal conditions will return to northern Mexico with some moderate deficits lingering in northern Baja and southeastern Chihuahua. Deficits will intensify, however, in a wide arc on the Gulf side of the nation from Tamaulipas past Tabasco and will include exceptional anomalies in San Luis Potosí. A pocket of exceptional surplus will persist on the northeastern border of Sonora in the region of the Rio Batepito. Deficits are forecast for Belize, Guatemala, El Salvador, and western Honduras. Moderate surpluses will linger in southern Nicaragua, Costa Rica, and Panama. Transitions are forecast in Jamaica and nearly normal conditions in the rest of the Caribbean.

The forecast for the final three months – November 2021 through January 2022 – indicates mild deficits and normal conditions for much of Mexico, but moderate to severe anomalies in southern Baja, the central north, and in an arc through the Gulf Coast states and small inland neighbors. A few pockets of moderate deficit are forecast in northern Central American nations, and pockets of moderate surplus in the south. Moderate surpluses will emerge in Jamaica.

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## South America

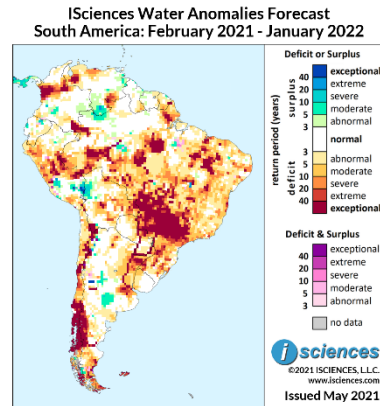
The 12-month forecast through January 2022 indicates water deficits in much of Brazil south of the Amazon River. Deficits will be exceptional in many states including southern Amazonas, Pará, Mato Grosso, Mato Grosso do Sul, and São Paulo. Exceptional deficits are also forecast along the Paraguay River through its namesake and along the Paraná River through Brazil, Paraguay, and Argentina.

Across the northern arc of the continent, intense deficits are expected in a path from Colombia's northern Pacific Coast through Medellin and into northwestern Venezuela. Deficits will also be intense in Colombia's southeastern corner reaching into Brazil, and in southern Bolívar State in Venezuela. Severe deficits are predicted for Venezuela's central coast, and surpluses for a pocket in the nation's south and near the mouth of the Orinoco River. Deficits are expected in Guyana's southeastern corner and in French Guiana.

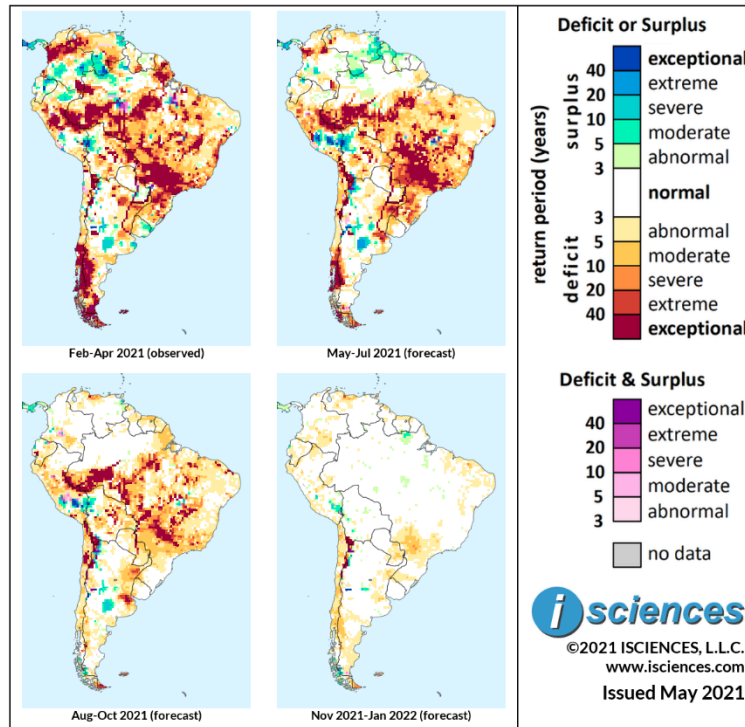
Much of central Peru will be dominated by deficits and anomalies will be exceptional in the middle portion of the Ucayali River Watershed. Moderate deficits are expected in the nation's southern corner. Surpluses are forecast for a pocket in the central Peruvian Andes and from Cusco in the southeast into Bolivia. Central and eastern Bolivia can expect deficits of varying intensity. Deficits of varying intensity are also forecast in nearly all of Chile with exceptional anomalies in pockets of the north and around the Gulf of Corcovado in the south reaching into Argentina. Near Santiago and Valparaiso deficits will be severe to exceptional.

In Argentina, deficits are forecast in pockets of the Chaco in the north, in Buenos Aires Province north of the Salado River, and in Tierra del Fuego and the Falklands. Surpluses are forecast in northern San Luis Province and northern La Pampa Province. Moderate deficits are expected in western Uruguay.

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



ISciences Water Anomalies Forecast  
South America: February 2021 - January 2022



Based on observed data through April 2021 and forecasts through January 2022

The forecast through July indicates that deficits of varying intensity will remain widespread in Brazil south of the Amazon while the region to the north normalizes. Deficits will be exceptional in many pockets but will be especially widespread in the Purus River Watershed in the west, Mato Grosso, Mato Grosso do Sul, Goiás, and São Paulo States. Notably, exceptional deficits are also forecast along the Paraguay River through its namesake and along the Paraná River through Brazil, Paraguay, and Argentina. Deficits across the northern arc of the continent will shrink though intense anomalies will persist from Colombia's northwestern coast through Medellín and into Venezuela, and in a pocket of southeastern Colombia. Moderate deficits will persist on Venezuela's central coast. Surpluses are forecast for southern and eastern Venezuela, the northern reaches of the Guianas, and a few pockets in western Colombia and Ecuador.

Surpluses will nearly disappear from Loreto in northern Peru but will increase from Huancayo past Cusco into Bolivia. Deficits will continue to dominate central Peru though the extent of exceptional anomalies will shrink, and deficits will persist in many regions of Bolivia. Likewise, deficits are expected throughout much of Chile, moderate overall in the north, mild in central Chile, and exceptional near the Gulf of Corcovado in the south. In Argentina, deficits will remain intense in the northeast and in northern Buenos Aires Province. Surpluses will increase somewhat in the Andes of northwestern Argentina and in pockets in the center of the country, intensifying in La Pampa Province. While shrinking and downgrading, deficits will remain intense in Tierra del Fuego and the Falklands.

From August through October, deficits will remain widespread in Brazil south of the Amazon, downgrading overall though exceptional deficits will persist, especially in the Purus Watershed, Mato Grosso, Mato Grosso do Sul, and São Paulo States. Conditions in much of the continent's northern third will normalize with pockets of moderate deficit in southern Columbia and the northern portion of the Guianas and severe deficits on Venezuela's central coast. Deficits in central Peru will shrink and moderate and surpluses from Huancayo into Bolivia will shrink somewhat. Elsewhere in Bolivia, many pockets of deficit will persist, moderate overall but more intense in the center of the nation. Deficits will retreat from the Paraná River but will be extreme to exceptional on the Paraguay River through Paraguay. Deficits will persist in northeastern Argentina and northern Buenos Aires Province and surpluses in the country will shrink and downgrade slightly. Mild deficits are expected in Chile's southern half and more intense pockets in the north.

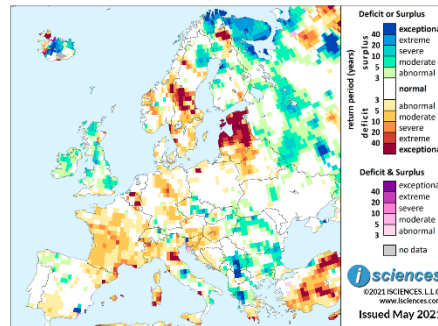
In the final quarter – November 2021 through January 2022 – mild to moderate deficits are forecast throughout most of Chile but pockets of exceptional deficit are expected across its northern border into Argentina and Bolivia. Moderate deficits are also forecast for southern Brazil and deficits will persist on Venezuela's central coast. Surpluses are forecast for a pocket in northern Pará, Brazil, and southeast of Cusco, Peru.

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

## Europe

The 12-month forecast through January 2022 indicates exceptional water deficits in Estonia and Latvia with deficits of lesser intensity in Lithuania and into western Belarus. Across the Baltic Sea, intense deficits will be widespread in central Sweden's Dalälven River Watershed, reaching across the border into Norway. Generally moderate deficits are forecast in pockets of southern Sweden and Norway. Finnish Lapland can expect exceptional deficits.

ISciences Water Anomalies Forecast  
Europe: February 2021 - January 2022



Based on observed data through April 2021 and forecasts through January 2022

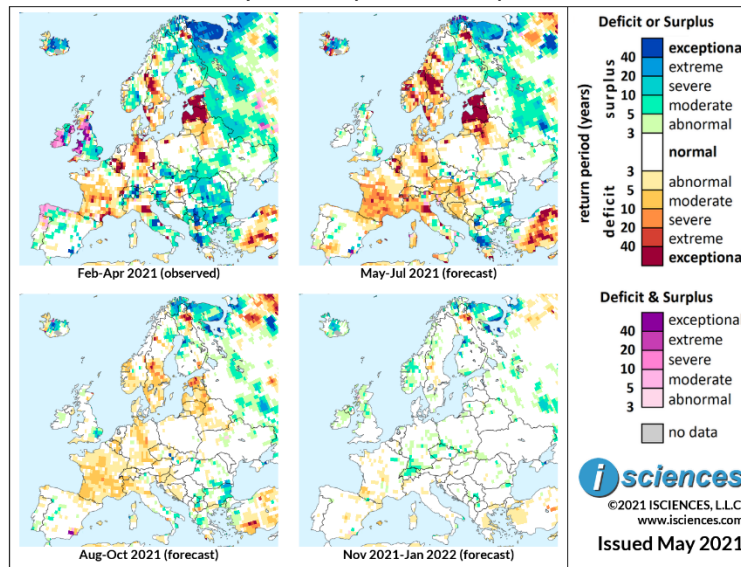
Widespread surpluses reaching extreme to exceptional intensity are forecast in Murmansk, Russia, and northern Norway. Surpluses are also expected in pockets around the Gulf of Bothnia and in Western European Russia in the Upper Volga River Watershed, the Upper Desna River Watershed (a tributary of the Dnieper), and the Don River Watershed where anomalies will be exceptional. Deficits are forecast in the Upper Mezen River region of northern Russia.

Ireland and the United Kingdom can expect pockets of surplus. Deficits are forecast for Belgium, north central and southern Germany, around Lake Balaton in western Hungary, southern Austria, and Slovenia. Widespread deficits are forecast for France leading into Spain past Barcelona, and deficits are also forecast for much of northern Italy, Sardinia, and Corsica. Anomalies will be exceptional in the Upper Schelte River and northern Ardennes regions of Belgium, surrounding Bologna, and pockets in Sardinia.

Surpluses are forecast for many regions in the Balkans with exceptional anomalies in southern Serbia, Kosovo, North Macedonia, and the Pindus Mountains in northern Greece. Other regions with a forecast of surplus include Czech Republic, central Italy, and a pocket near Spain's southeastern coast.

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

**ISciences Water Anomalies Forecast  
Europe: February 2021 - January 2022**



Based on observed data through April 2021 and forecasts through January 2022

The forecast through July indicates that surpluses will decrease in Eastern Europe and the Balkans and, while shrinking in Western European Russia will remain widespread. Pockets of surplus will persist around the Gulf of Bothnia and in Romania, Bulgaria, Kosovo, North Macedonia, and northern Greece into Albania. A few pockets will also persist in the U.K., particularly East Anglia and the Scottish Highlands, and in central Italy. Deficits will remain exceptional in Estonia and Latvia, intensify in Lithuania and western Belarus, and increase in southern Sweden and southern Norway. Deficits will also increase in many areas of Central Europe including Germany, France, Switzerland, Austria, western Hungary, and northern Italy. Anomalies will be severe and widespread in France, moderating as they reach across the border into Spain. Deficits will emerge from Seville to Cordoba and on many Mediterranean islands. Moderate deficits will emerge in Bosnia and Herzegovina and mild deficits in nearby nations.

From August through October, anomalies will shrink and downgrade. Surpluses are forecast for Murmansk, pockets around the Gulf of Bothnia, the Upper Volga and Don River Watersheds, East Anglia, and pockets in the Balkans including southern Romania, eastern Bulgaria, and the Pindus Mountains in Greece. Deficits will downgrade in the Baltics and southern Sweden, shrink in southern Norway, and shrink but remain intense in Finnish Lapland. Deficits will remain widespread in France but will moderate. Moderate deficits are also forecast for Germany, Belgium, and a few pockets in northern Italy.

The forecast for the remaining months – November 2021 through January 2022 – indicates nearly normal water conditions overall with deficits in Finnish Lapland and surpluses in a few regions including Murmansk, pockets in the Nordic nations, the Don River Watershed in Russia, and Switzerland.

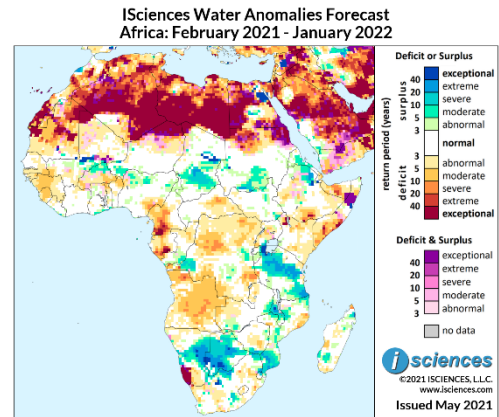
Please note that WSIM forecast skill declines with longer lead times.



## Africa

The 12-month forecast through January 2022 indicates exceptional water deficits across North Africa along with some areas of transitional conditions (pink/purple). Surpluses are expected in pockets across the Sahel, particularly in Chad.

In the Horn of Africa, deficits are forecast in Somaliland and southeastern Somalia, and the Nugaal region of northern Somalia will see transitional conditions. Some surpluses are expected in northern Ethiopia and deficits in the central south.



Based on observed data through April 2021 and forecasts through January 2022

In West Africa, moderate deficits are forecast for Guinea and Sierra Leone. Around the Gulf of Guinea extreme deficits are predicted for southwestern Cameroon and exceptional deficits for Equatorial Guinea and southern Gabon. In the heart of the continent, deficits are expected in a pocket of Central African Republic, in the northern half of the Democratic Republic of the Congo (DRC), near the southern half of Lake Tanganyika, and spanning DRC's border with Angola. Surpluses are forecast around Kinshasa. Angola can expect deficits throughout nearly all the country, moderate overall but with some severe pockets.

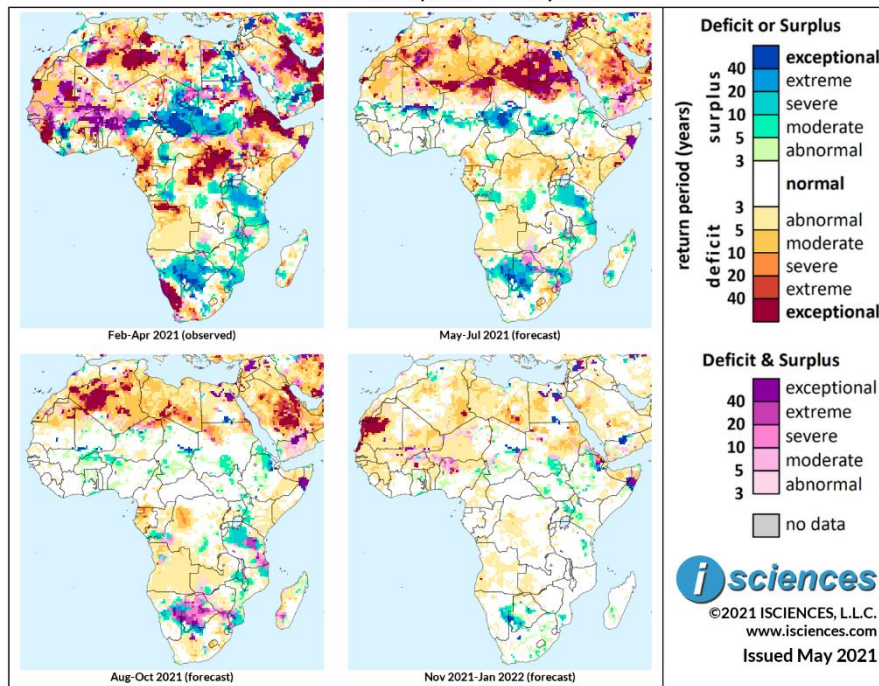
In East Africa, severe to extreme surpluses are forecast for central Tanzania and the southeast, but anomalies will be exceptional in a pocket west of Lake Victoria in the north. Surpluses are also forecast for central Malawi.

Widespread surpluses are forecast in a broad belt across Namibia, nearly all of Botswana, and reaching south into South Africa and east through Zimbabwe's southern border into southern Mozambique. Anomalies will be extreme to exceptional in eastern Namibia and southern Botswana, while exceptional deficits are forecast for southwestern Namibia. Severe surpluses will surround the Gariep Dam in South Africa.

In Mozambique, deficits are forecast in the east at the narrowest point near the Mozambique Channel and across the Channel in the Lower Tsiribihina River region in Madagascar. Intense deficits are expected in Madagascar's northernmost tip and a few pockets of surpluses in the northeast and southwest.

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

ISciences Water Anomalies Forecast  
Africa: February 2021 - January 2022



Based on observed data through April 2021 and forecasts through January 2022

The forecast through July indicates that deficits will increase across North Africa as exceptional deficits emerge from Egypt into southeastern Libya and northern Sudan. Surpluses will persist in the Sahel, shrinking in the east while re-emerging in the west. Deficits around the Gulf of Guinea, in the heart of the continent, and in the Horn of Africa will shrink and downgrade. However, deficits are forecast for Cameroon, Equatorial Guinea, southern Gabon, northern DRC, Uganda, Kenya, southern Ethiopia, and Somalia. Anomalies will be severe in several regions, notably Uganda.

Areas with a forecast of surplus include central and southeastern Tanzania into Mozambique, south-central DRC, surrounding Kinshasa and Brazzaville, and the Lucala River Watershed in northern Angola. Prior areas of exceptional deficit in northern Angola will normalize as will conditions in southwestern Namibia. Surpluses will remain widespread in a belt across Namibia and throughout much of Botswana, though transitions (pink/purple) will begin in the northeast. Surpluses are also forecast to persist in Mozambique's southernmost extent. Deficits will retreat from South Africa's western provinces but increase somewhat east of Johannesburg and in Lesotho.

From August through October, deficits will shrink in the southern Sahara and downgrade considerably in Egypt and neighboring nations. Conditions across the Sahel will become more normal with some lingering pockets of moderate surplus. Deficits will shrink coast-to-coast from the Gulf of Guinea through the Horn of Africa. Moderate to severe deficits are forecast for Equatorial Guinea, Gabon, and a large pocket in the Congo Basin in DRC. Surpluses will shrink and downgrade in East Africa and in Namibia and Botswana, with many areas in transition. Deficits will nearly disappear in South Africa and will moderate in Lesotho.

The forecast for the final quarter – November 2021 through January 2022 – indicates generally mild to moderate deficits in pockets of North Africa though exceptional deficits will emerge in western Mauritania. Areas with a forecast of surplus include Namibia, Botswana, southern Sudan, South Sudan, and Uganda.

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

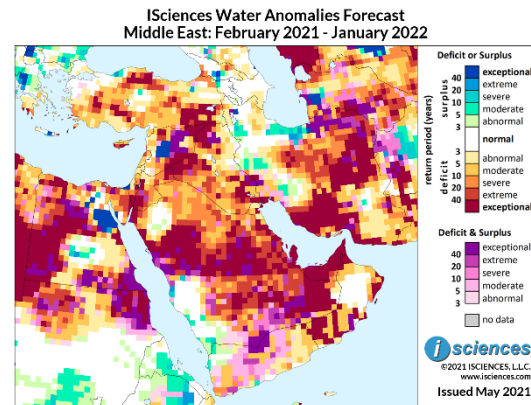
## Middle East

The forecast for the 12-month period ending January 2022 indicates widespread, intense water deficits on the Arabian Peninsula and in central and southern Iran. Areas with a forecast of exceptional deficit include Bahrain, Qatar, the United Arab Emirates, and central and southeastern Saudi Arabia. In Iran, deficits will be exceptional in Fars, Yazd, and South Khorasan Provinces, and along the Strait of Hormuz.

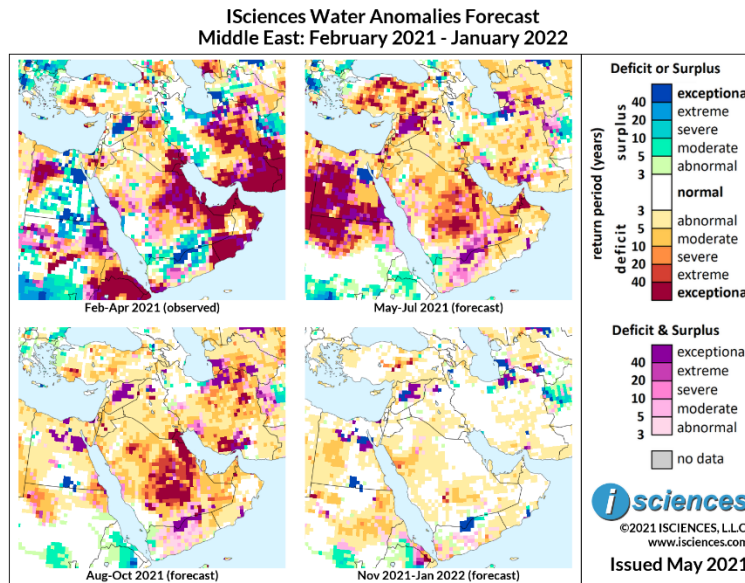
Deficits of varying intensity are expected in many regions of Turkey, throughout Cyprus, and in the Levant. Exceptional surpluses and transitional conditions (pink/purple) are forecast for north-central Syria, but intense deficits are expected around Aleppo. In Iraq, deficits are forecast for much of the nation, particularly west of the Tigris River. Anomalies will be exceptional near the Syrian border and around Basra in the south. Surpluses and transitional conditions are forecast near Mosul.

Surpluses are expected on 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 pocket on the northeastern end of the Persian Gulf.

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



Based on observed data through April 2021 and forecasts through January 2022



Based on observed data through April 2021 and forecasts through January 2022

The forecast through July indicates that deficits will increase as surpluses shrink, though the extent of exceptional deficit will diminish considerably. Deficits of varying intensity will increase throughout much

of Turkey and will include pockets of exceptional deficit. Deficits in the Levant will be primarily mild to moderate and transitional conditions are forecast in northern Syria. On the Arabian Peninsula, deficits will cover much of Saudi Arabia with anomalies reaching exceptional intensity in Riyadh Province. Transitional conditions are expected from southern Saudi Arabia through central Yemen and generally moderate deficits in Oman. In Iran, surpluses will linger along the central Caspian Coast and a few pockets in the west, but deficits will cover much of the remaining area of the county. Anomalies will be severe in Fars Province in the south with some small pockets of even greater intensity.

From August through October, surpluses will nearly disappear as transitions occur. On the Arabian Peninsula, deficits will intensify in central Saudi Arabia and along the northern Persian Gulf, becoming exceptional. Deficits in the Levant will be mild to moderate overall. In Turkey, deficits will shrink and downgrade but anomalies ranging from severe to exceptional will persist in a pocket of the southwest. Moderate deficits are forecast in central Iran, but anomalies of greater intensity are expected in pockets throughout the northeastern provinces and in the south near the Persian Gulf. Areas of former surplus will begin to transition.

In the final quarter – November 2021 through January 2022 – some pockets of deficit are forecast in south-central and northwestern Saudi Arabia and central Turkey. A few pockets of surpluses will re-emerge, including in central Syria and on the central Saudi-Yemen border.

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

## Central Asia and Russia

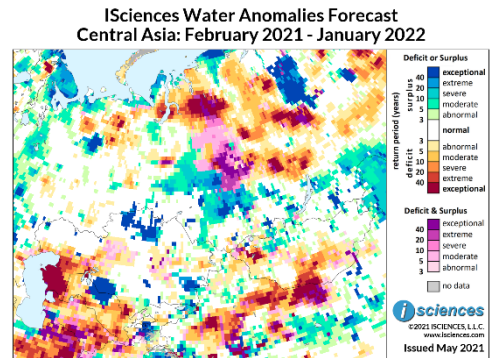
The 12-month forecast through January 2022 indicates exceptional water deficits in southwestern Kazakhstan on the Caspian Sea. Deficits of varying intensity are forecast for much of Uzbekistan and Turkmenistan.

Exceptional surpluses are forecast in a pocket on Turkmenistan's central Caspian Coast; a large pocket in the northern Kyzylkum Desert from Uzbekistan into Kazakhstan; the Ishim River Watershed of northern Kazakhstan; and south of Lake Balkhash. Intense surpluses are also forecast for central Tajikistan and the southern portion of the Fergana Valley. Kyrgyzstan can expect surpluses of lesser intensity east of Lake Issyk-Kul.

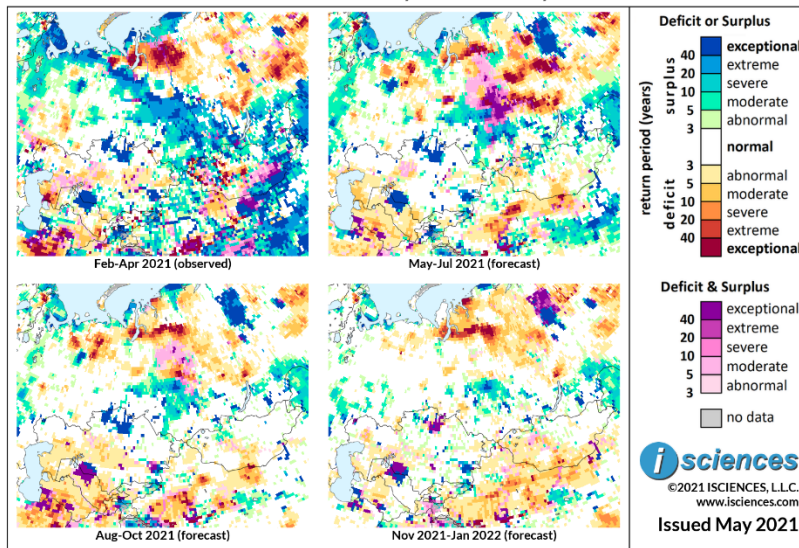
West of the Ural Mountains in Russia, surpluses are forecast in the coastal Arctic and the Vychegda Lowlands, but deficits are expected in the Upper Mezen River region and much of the Pechora River Watershed. East of the Urals, intense deficits are forecast on the central banks of the Gulf of Ob, in the Taz River region, and the Lower Yenisei area and upper reaches of its eastern tributaries. Much of the Central Siberian Plateau will experience deficits though exceptional surpluses are forecast at the eastern edge between the Olenyok and Markha Rivers. Widespread surpluses are expected in the Upper Ob River region, much of the Tom River Watershed, and around Irkutsk west of Lake Baikal.

Deficits of varying intensity are forecast from the Alden River Watershed (an eastern tributary of the Lena River) to the Sea of Okhotsk (not shown).

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



ISciences Water Anomalies Forecast  
Central Asia: February 2021 - January 2022



Based on observed data through April 2021 and forecasts through January 2022

The forecast through July indicates that deficits will emerge in Russia’s Pechora River Watershed in the northwest and in a pocket near Tyumen. Deficits will shrink somewhat on the middle banks of the Gulf of Ob and in the Lower Yenisei River region but will increase in the Central Siberian Plateau. Surpluses will shrink overall in the Ob River Watershed and intense deficits will emerge in a pocket of the Middle Ob surrounding Surgut. A large block of exceptional surplus is expected to emerge at the eastern edge of the Central Siberian Plateau between the Olenek and Markha Rivers. Deficits in the Alden River region (not shown) will moderate.

Deficits will also moderate in western Kazakhstan on the Caspian Sea, and generally mild to moderate deficits will increase in Turkmenistan and Uzbekistan. Surpluses will persist in northern and southeastern Kazakhstan, central Tajikistan, and the Kyzylkum Desert, but will shrink in eastern Kyrgyzstan.

From August through October, deficits will shrink in the Central Siberian Plateau; persist in the Pechora and Mezen Watersheds, across the Gulf of Ob and the Taz and Lower Yenisei River regions; and moderate in the Yenisei’s eastern tributaries. Transitional conditions are forecast for the Kyzylkum Desert and near Lake Balkhash. A few pockets of moderate deficit will persist in southwestern Kazakhstan near the Caspian, and deficits in eastern Uzbekistan will intensify, becoming severe to extreme.

The forecast for the final months – November 2021 through January 2022 – indicates that intense deficits will persist near the Gulf of Ob and the Lower Taz and Yenisei River regions and will increase in the Central Siberian Plateau and in the Lower Lena River area. Surpluses will shrink in the Olenek River region nearby as transitions occur. Deficits in Central Asia will nearly disappear and surpluses will shrink.

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

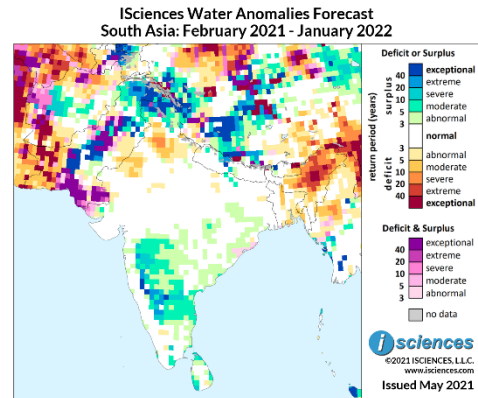
## South Asia

The 12-month forecast through January 2022 indicates moderate to exceptional water deficits in India's Far Northeast. Deficits of lesser intensity are expected in Punjab and Haryana in the north and in northwestern Rajasthan. Exceptional surpluses are forecast in Jammu and Kashmir and widespread surpluses of varying intensity in Maharashtra, Karnataka, and Andhra Pradesh.

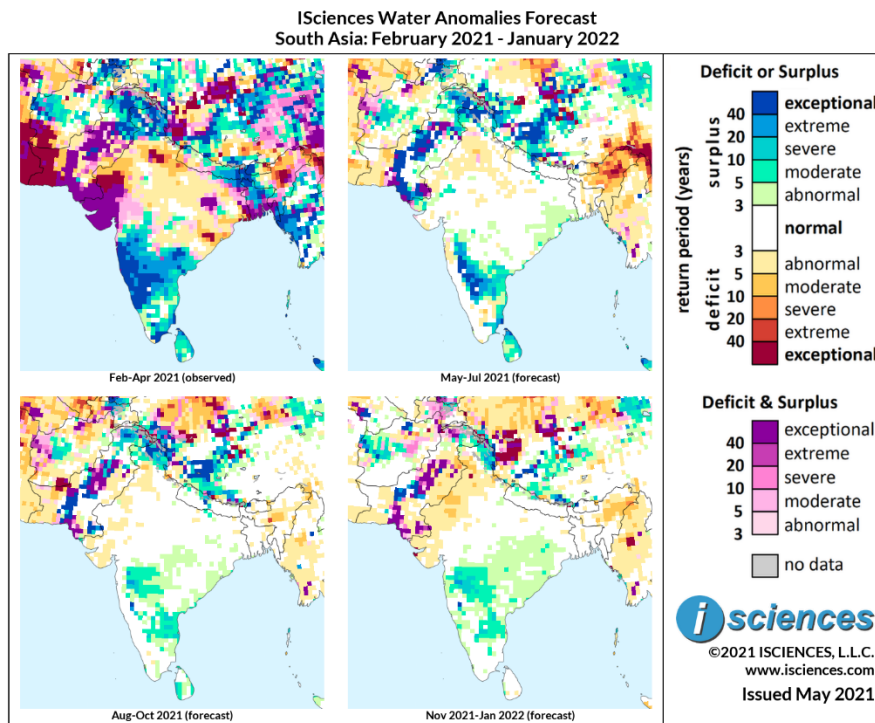
A few pockets of moderate surplus are expected in Sri Lanka's coastal corners and surpluses will trace the Gandaki River through central Nepal and into India. In Bhutan, however, deficits are forecast in the east, and moderate deficits will follow the Jamuna River (lower Brahmaputra) in Bangladesh.

Intense surpluses are expected in Pakistan's northern provinces; transitional conditions and surpluses in the center of the nation; and moderate to exceptional deficits in southwestern Baluchistan Province. In Afghanistan, deficits reaching exceptional intensity are forecast for the Lower Helmand River region of the south; moderate to severe deficits on either side of Mazar-e Sharif in the north; and surpluses in the west between the Helmand and Harirud Rivers.

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



Based on observed data through April 2021 and forecasts through January 2022



Based on observed data through April 2021 and forecasts through January 2022



The forecast through July indicates that near-normal conditions will return to the breadth of central India as deficits retreat. However, deficits will increase in India's Far Northeast, reaching into Bhutan, and will include extreme to exceptional anomalies in Assam. Water surpluses in India will retreat from the Western Ghats but persist in much of the Deccan Plateau, Andhra Pradesh, and south along Tamil Nadu's east coast. Surpluses will also persist in Sri Lanka. Anomalies in India will be exceptional in pockets along the western edge of the Deccan Plateau. A band of mild to moderate surplus will re-emerge in Gujarat leading into Rajasthan, and surpluses will persist with intensity in Jammu and Kashmir.

Bangladesh will return to nearly normal conditions and water anomalies will retreat from Nepal, though surpluses will persist on the Gandaki River and emerge on the river's path into India. In Pakistan, surpluses will persist in the north, shrinking somewhat, and will re-emerge in the center of the country west of the Indus River trailing southeast to Karachi on the coast. Conditions will normalize east of the Indus and deficits in the southwest will moderate. Severe surpluses will continue in Afghanistan between the Helmand and Harirud Rivers and exceptional deficits in the Lower Harirud will disappear.

From August through October, anomalies downgrade leaving generally moderate surpluses in Maharashtra, pockets of Karnataka, and southern Andhra Pradesh, and surpluses of greater intensity in Jammu and Kashmir. A pocket of moderate deficit will linger in Assam. Surpluses are forecast on the Gandaki River from Nepal into India and a few coastal regions of Sri Lanka. In Pakistan, surpluses will remain fairly intense in the north and severe surpluses will emerge on the Indus River. Surpluses and transitional conditions are expected west of the Indus leading to the southeast. Deficits in the southwest will be mild overall. Conditions in Afghanistan will be similar to the forecast for the prior three months though surpluses will shrink and a pocket of exceptional deficit will emerge in the southeast.

The forecast for the final months – November 2021 through January 2022 – indicates persistent surpluses in Maharashtra and Andhra Pradesh. Surpluses are also forecast in Jammu and Kashmir, pockets of central and northern Pakistan, and western Afghanistan. Moderate deficits will increase in India's Far Northeast and will emerge in northern Rajasthan.

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

## Southeast Asia and the Pacific

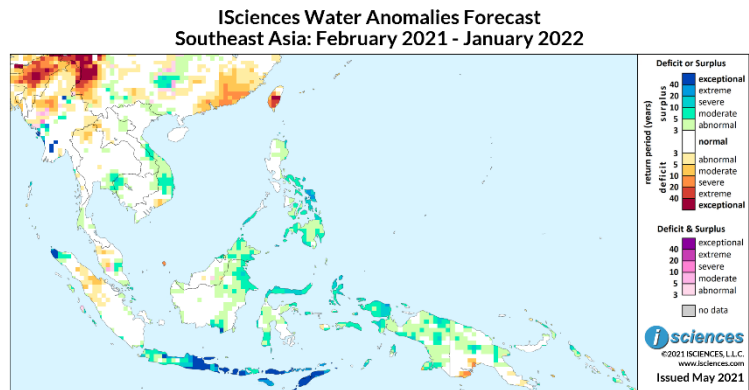
The 12-month forecast through January 2022 indicates intense surpluses in Java and through the Lesser Sunda Islands. Surpluses will be exceptional in eastern Java, Bali, Flores Island, Timor, and Banda Aceh in Sumatra's northern tip.

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, the Bird's Head Peninsula (Doberai Peninsula) in New Guinea and many pockets of the island. Deficits are expected along the western Gulf of Papua and pockets in Sumatra's northern half.

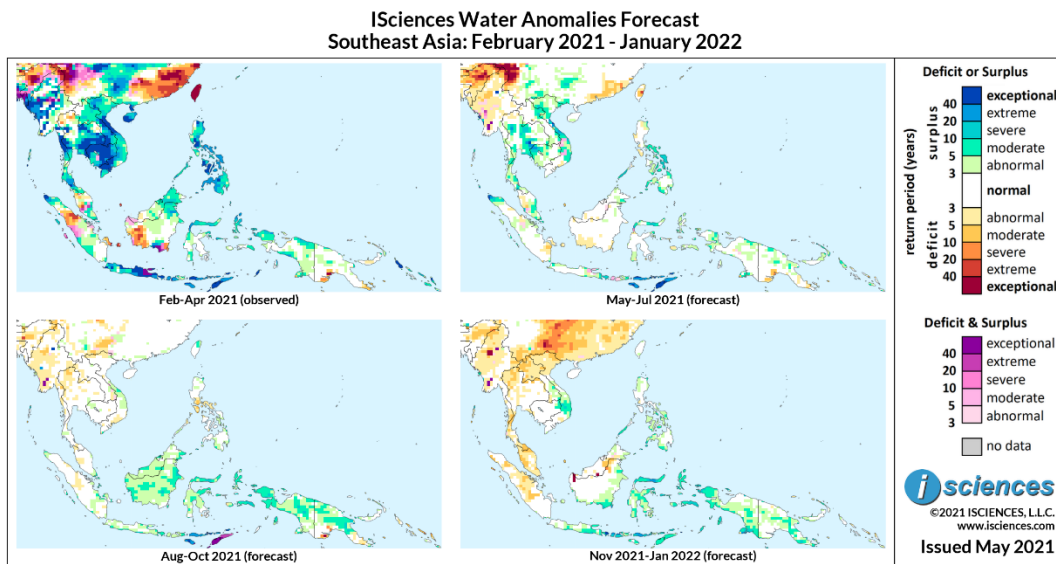
Surpluses are forecast for the central and southern Philippines, severe to extreme in the center of the country.

Normal water conditions are expected in much of Southeast Asia. Moderate surpluses are forecast in Vietnam's narrow neck and in the Central Highlands and spanning the southeastern Thai border into Cambodia. A pocket of moderate deficit is forecast in northwestern Thailand and east of Ho Chi Minh City in Vietnam. Myanmar can expect deficits northwest of Mandalay and small pockets of surplus along the southwest coast and in the Lower Irrawaddy region.

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



Based on observed data through April 2021 and forecasts through January 2022



Based on observed data through April 2021 and forecasts through January 2022

The forecast through July indicates that surpluses will shrink and downgrade considerably. Extreme to exceptional anomalies will persist in the Lesser Sunda Islands and severe anomalies in the central Philippines. Isolated pockets will persist throughout Indonesia, notably in Banda Aceh in Sumatra's northern tip. Some moderate deficits will persist on the western Gulf of Papua. In Southeast Asia, surpluses will persist in many regions of Thailand, Cambodia, Vietnam. Anomalies will be moderate overall but more intense in Vietnam's narrow neck and from northwestern Cambodia into Thailand. Surpluses are also expected in eastern Peninsular Malaysia and Laos' northeastern spur. In Myanmar, moderate deficits will emerge in a pocket northwest of Mandalay.

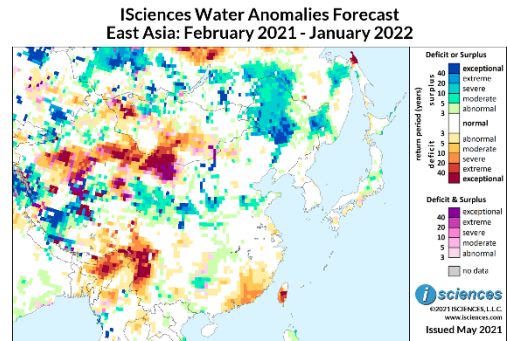
From August through October, water conditions in Southeast Asia will be relatively normal though moderate deficits will linger northwest of Mandalay and will emerge in a pocket of northwestern Thailand. The Philippines will normalize as well overall with moderate deficits emerging south of Manila. Many pockets of moderate surplus are expected to emerge in Borneo, Sulawesi, the Maluku Islands, and New Guinea. Extreme surpluses are forecast for Flores Island, but transitional conditions are expected on Timor. Deficits on the Gulf of Papua will intensify south of the Fly River Delta.

The forecast for the final months – November 2021 through January 2022 – indicates moderate deficits in northern and peninsular Southeast Asia and moderate surpluses in the Central Highlands of Vietnam. Surpluses are also forecast for many pockets throughout the smaller islands of Indonesia and on New Guinea, as well as small pockets in the Philippines. Deficits are forecast for pockets of Sumatra and Malaysian Borneo.

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

## East Asia

The 12-month forecast for East Asia through January 2022 indicates widespread water surpluses in Northeast China with exceptional anomalies from northwest Jilin into Heilongjiang in the Songhua River Watershed. Surpluses of varying intensity are expected in large pockets of the Yellow (Huang He) River Watershed and moderate surpluses in eastern Qinghai. Conditions will be relatively normal in the Yangtze Watershed.

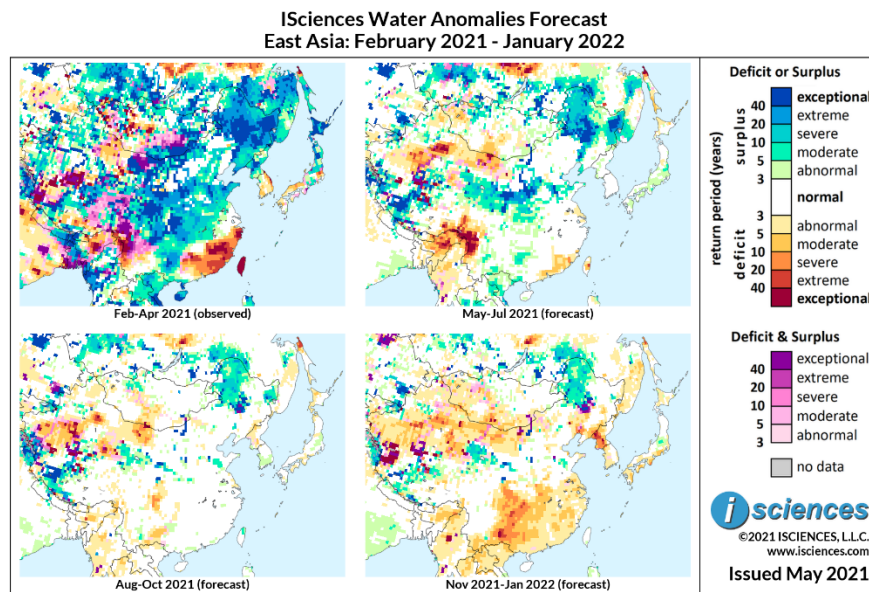


Based on observed data through April 2021 and forecasts through January 2022

In Southeast China, moderate to severe deficits are forecast in Guangdong, Fujian, and Jiangxi but deficits in Taiwan will reach exceptional intensity. Deficits will also be intense from western Yunnan into eastern Tibet (Xizang) and in western Sichuan. Mixed conditions are forecast for western Tibet including exceptional surpluses. In northwestern China, intense deficits along with transitional conditions (pink/purple) are expected in western Inner Mongolia, and deficits will form a wide band leading into Xinjiang Uygur and through the Taklimakan Desert. Deficits are also forecast for the Qaidam Basin in Qinghai.

In Mongolia, moderate to exceptional deficits are forecast in the south-central region, primarily the western Gobi Desert, and in the northern Altay Mountains and lakes region in the nation's northwest. Surpluses are forecast nearby in the Ider River region of the northwest and in a pocket of the northeast in the Upper Kherlen River region. Normal conditions are forecast for the Korean Peninsula. In Japan, a few pockets of moderate surplus are expected near Nagano.

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



Based on observed data through April 2021 and forecasts through January 2022

The forecast through July indicates that surpluses of varying intensity will persist in the Yellow River Watershed but will shrink and downgrade considerably in the Yangtze. Surpluses will persist in Northeast China, and while shrinking and downgrading overall will remain exceptional in northwestern Jilin and in Heilongjiang.

Deficits in Southeast China will shrink and downgrade with moderate deficits lingering in Fujian, Guangdong, and southern Jiangxi, though deficits may be severe on the Jiulong River in Fujian. Deficits will moderate in Taiwan as well, but an exceptional pocket will persist in the central east.

In the south, surpluses will retreat from Guangdong's Leizhou Peninsula and Hainan and will moderate in Guangxi. Surpluses will emerge in eastern Yunnan while intense deficits persist in the province's northwest region and emerge in eastern Tibet. Intense surpluses are forecast for western Tibet.

In northwestern China, deficits of varying intensity are expected from western Inner Mongolia into the Taklimakan Desert in Xinjiang, but surpluses are forecast near the region's capital city of Ürümqi.

Moderate deficits will emerge in south-central Mongolia and in the northwest. Surpluses are expected in the northwest between Khyargas Lake and Khovsgol Lake, and in the northeast in the Upper Kherlen River region. Near-normal conditions are expected on the Korean Peninsula and some generally mild surpluses in central Japan.

From August through October, anomalies will shrink and downgrade considerably overall. Surpluses in Northeast China will shrink and moderate overall but exceptional anomalies will persist in northwestern Jilin and nearby regions, and widespread surpluses will persist in northern Inner Mongolia. Surpluses will shrink in the Yellow River Watershed leaving a few lingering pockets. Moderate surpluses will persist in eastern Qinghai and intense surpluses in western Tibet. Conditions in southeastern China will normalize from former deficit, and moderate surpluses will emerge in northern Taiwan. Yunnan and eastern Tibet will also transition to normalcy from deficit, but deficits will emerge in eastern Sichuan and southern Guizhou. Western Tibet will continue to see surpluses and deficits will persist in western Inner Mongolia and Xinjiang. Anomalies in Mongolia, Korea, and Japan will be primarily mild.

The forecast for the final three months – November 2021 through January 2022 – indicates the emergence of widespread deficits south of the Yangtze River and in North Korea. Deficits are also forecast for northwestern China while surpluses will persist in the northeast from northern Inner Mongolia to the Russian border. Some deficits will skirt Honshu's southeastern coast.

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

## Australia & New Zealand

The 12-month forecast through January 2022 indicates surpluses, primarily moderate, in southeastern Australia from the eastern Murray-Darling Basin to the coast. Near the mouth of the Murray River, however, surpluses will be intense.

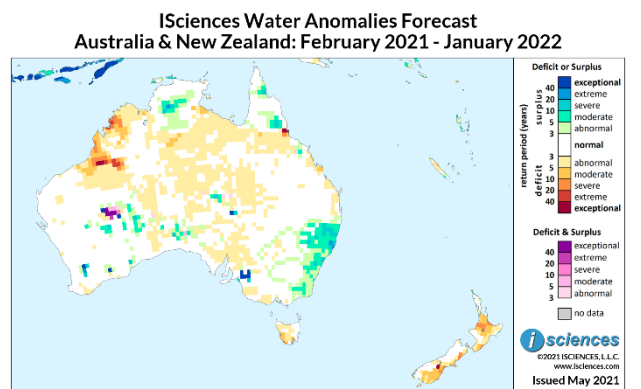
In Queensland, a small pocket of intense deficit is expected on the coast north of Townsville, but a few pockets of moderate surplus are forecast in the Cape York Peninsula of the Far North.

Surpluses are also forecast in Top End, Northern Territory in the region of the Daly and Katherine Rivers.

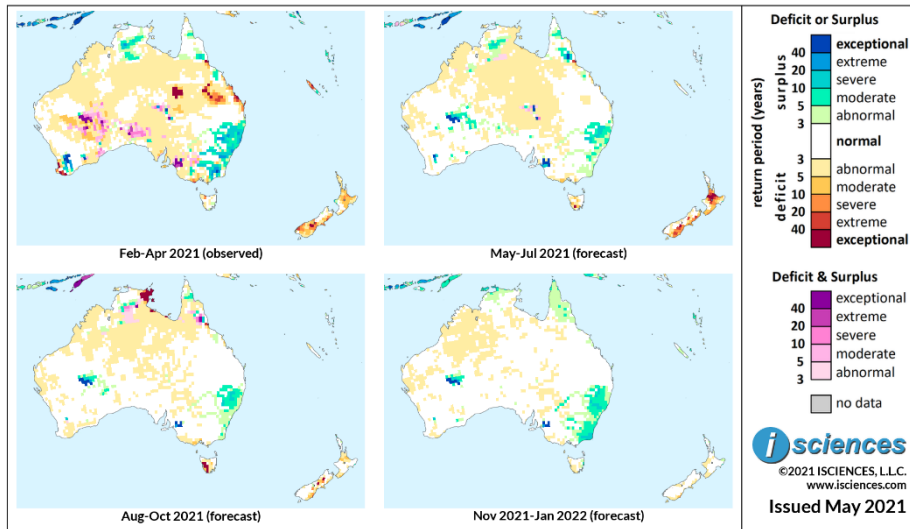
In Western Australia, deficits are expected on the coast in the Kimberley region and from the Great Sandy Desert to the coast near Broome. Transitional conditions are forecast southwest of the Gibson Desert and pockets of surplus in the Great Victoria Desert. In the state's southwestern corner, surpluses are forecast in the Avon River Basin east of Perth. Some surpluses are expected in the center of the Australia in the Simpson Desert and in western South Australia. Tasmania can expect deficits near Hobart and in the southwest.

Deficits are also forecast for many regions of New Zealand including moderate to severe anomalies near Lake Taupo and the Waikato River area on North Island, and along South Island's east coast and through the southeast. Anomalies will be exceptional near the three glacial lakes - Pukaki, Tekapo, and Ōhau - in the Waitaki River Watershed of South Island.

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



**ISciences Water Anomalies Forecast  
Australia & New Zealand: February 2021 - January 2022**



Based on observed data through April 2021 and forecasts through January 2022

The forecast through July indicates that surpluses in southeastern Australia will shrink, retreating from the Upper Murray River region but persisting in northeastern New South Wales. Intense surpluses will persist near the mouth of the Murray in South Australia. In Tasmania, exceptional deficits will emerge surrounding Lakes Pedder and Gordon and moderate deficits in the Derwent Estuary near Hobart. Back in mainland Australia, surpluses will increase in the Atherton Tableland in northern Queensland and persist in a pocket in eastern Cape York. Surpluses will also persist near Katherine in Top End, Northern Territory, will re-emerge in West Australia between the Great Victoria Desert and the Gibson Desert, and will shrink in the Avon River Watershed east of Perth.

Deficits are forecast in New Zealand, becoming exceptional on North Island in the Waikato River Watershed. On South Island, deficits are forecast along the island's eastern shore and well inland in the south, with exceptional anomalies in the glacial lakes. Anomalies in New Caledonia will downgrade, becoming mild.

From August through October, surpluses will persist in southeastern Australia from the Macquarie River to the Macintyre, and near the mouth of the Murray. Surpluses in Far North Queensland and Top End, Northern Territory will begin to transition, and exceptional deficits will emerge in Arnhem Land, Top End. In Western Australia, surpluses will retreat from the Avon River region but persist southwest of the Gibson Desert. Exceptional deficits will emerge in western Tasmania, but deficits in New Zealand will shrink considerably.

The forecast for the final months – November 2021 through January 2022 – indicates that deficits will retreat in the region and surpluses, primarily moderate, will increase in southeastern Australia as anomalies emerge from Canberra through eastern Victoria.

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