

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 August 2020 and an ensemble of forecasts issued the last week of August 2020. 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.

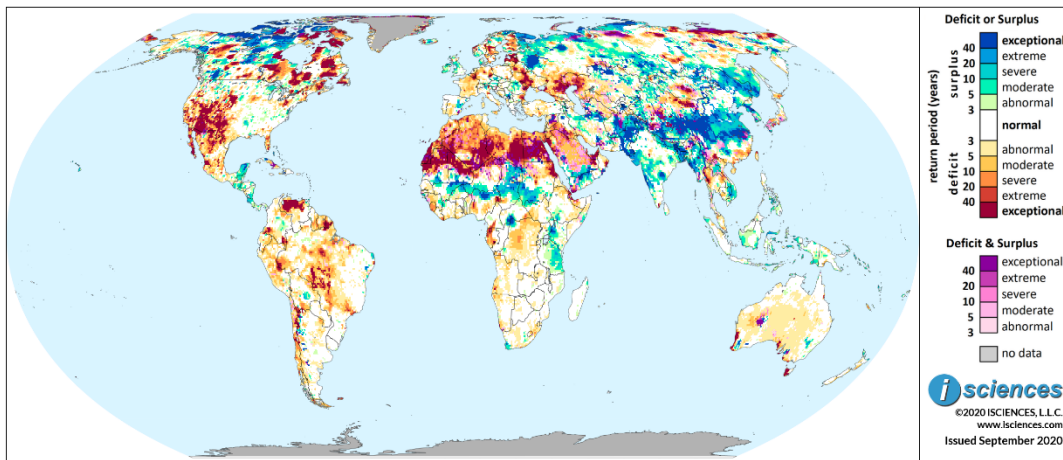
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Worldwide Water Watch List

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

ISciences Water Anomalies Forecast: June 2020 - May 2021



Based on observed data through August 2020 and forecasts through May 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 November indicates that water surpluses from the Lower Mississippi River through the Virginias will shrink considerably, as will widespread, intense deficits from Wyoming through the Southwest. Intense deficits are forecast for Florida and western Pennsylvania.

Canada: The forecast through November indicates that water deficits will shrink overall but persist in many areas, including around the Gulf of St. Lawrence, the Quebec/Ontario border, and the Middle Athabasca River in Alberta. Surpluses will increase west of the Gatineau River in Quebec.

Mexico, Central America, and the Caribbean: The forecast through November indicates that water deficits will downgrade in Mexico, but severe to extreme deficits will persist in Chihuahua. Deficits are also forecast from Nuevo Leon through Puebla. Surpluses will shrink in the Yucatán and Central America.

South America: The forecast through November indicates that water deficits will downgrade significantly and shrink. Mild to moderate deficits are forecast for Brazil. Areas of intense deficit include northwestern Venezuela and French Guiana. Exceptional deficits will retreat from the Paraguay River.

Europe: The forecast through November indicates that water deficits will shrink and downgrade but remain widespread from France through northern Germany and from the Baltic region to the Black Sea. Areas of surplus include European Russia, the U.K. and Ireland, eastern Spain, and southern Serbia.

Africa: The forecast through November indicates that water deficits will shrink and downgrade with exceptional deficits retreating. North Africa can expect generally moderate deficits. Intense pockets are forecast from southern Eritrea into Somaliland. Surpluses will persist in the Sahel and East Africa and will be intense in Tanzania.

Middle East: The forecast through November indicates that widespread water surpluses will shrink though surpluses are forecast for northwestern and southeastern Iran. Deficits will emerge from southern Syria into Iraq west of the Euphrates, through northern Saudi Arabia and parts of Yemen and Oman.

Central Asia and Russia: The forecast through November indicates that water surpluses will downgrade west of Moscow, persist in the Ob River Watershed, intensify along the Middle Yenisei River, and emerge on the Amu Darya River in Uzbekistan. Deficits will persist in the northern Caspian Basin.

South Asia: The forecast through November indicates that water surpluses will shrink slightly in western and central India but emerge in Kerala. Surpluses will moderate in Bangladesh and remain widespread and intense in Pakistan and Afghanistan. Deficits will disappear in Tamil Nadu and emerge in Assam.

Southeast Asia and the Pacific: The forecast through November indicates that water surpluses will shrink and downgrade but remain widespread. Areas of surplus include Myanmar, Laos, eastern Cambodia, southern Vietnam, and Indonesia. Deficits will nearly disappear.

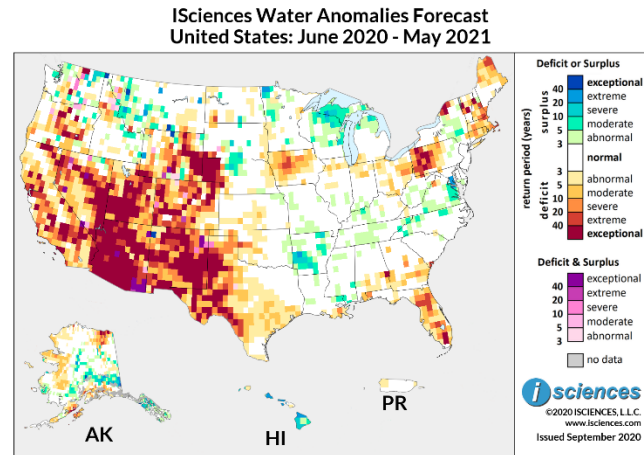
East Asia: The forecast through November indicates that water surpluses in China will shrink and downgrade but remain widespread in the Yellow and Yangtze River Watersheds, shrinking south of the Yangtze. Deficits are forecast in southern and southeastern China and Japan but will shrink in Taiwan.

Australia & New Zealand: The forecast through November indicates that widespread exceptional water deficits will retreat. Surpluses are forecast in Australia between the Macquarie and Lachlan Rivers in the Murray-Darling Basin and from Sydney to Victoria's border. Deficits in New Caledonia will be severe.

Watch List: Regional Details

United States

The 12-month forecast ending May 2021 indicates widespread water deficits in the southwest quadrant of the continental U.S. from Wyoming through West Texas and reaching west through California. Deficits will be exceptional in many areas including nearly all of Arizona and large blocks in New Mexico, Utah, and as far north as western Nebraska. Moderate deficits are forecast in southeastern Texas, and severe deficits on the Canadian River through western Oklahoma.



The Pacific Northwest can expect deficits in central Oregon and mixed conditions in Washington and northern Idaho. Pockets of surplus are forecast for western Montana.

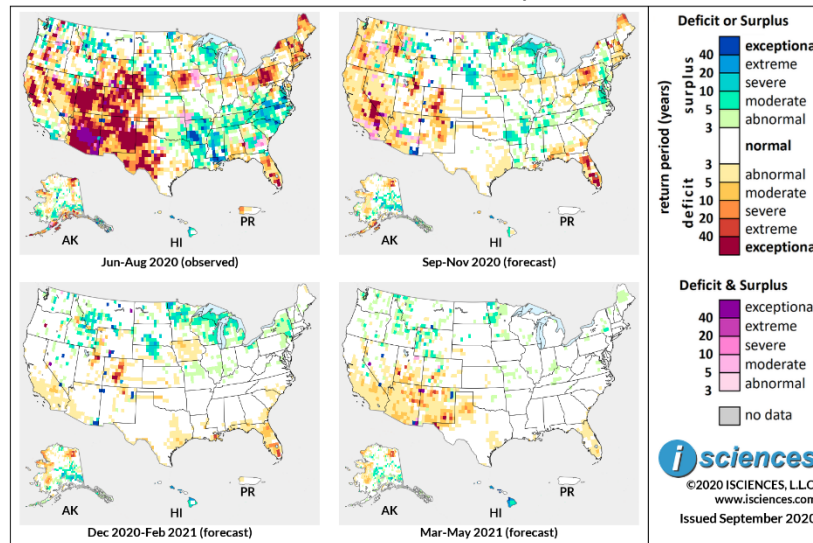
In the Upper Midwest, surpluses are expected across the central border of South Dakota into Nebraska, and pockets in northwestern Minnesota. Iowa will see deficits that will be extreme in the middle region of the Des Moines River at the West Fork. Around the Great Lakes, surpluses are forecast for northern Wisconsin and northern Michigan. Some moderate deficits are expected from northern Illinois through Ohio, but deficits will be intense and widespread in western Pennsylvania. Deficits of varying intensity are expected in the U.S. Northeast with exceptional deficits in the St. Lawrence River region of Upstate New York and pockets in Vermont.

Surpluses are forecast from D.C. to Richmond, Virginia; a few pockets of North Carolina; and in Arkansas. Deficits are expected in much of Florida outside of the Panhandle with extreme deficits northwest of Orlando and exceptional deficits in the central Everglades.

Outside the contiguous U.S., surpluses are forecast for much of Hawaii. Alaska can expect deficits from Anchorage past Valdez, on the Seward Peninsula, and in the northeast. Surpluses are forecast west of Bethel, north of Iliamna Lake, in the center of the state, from Denali east to the Canadian border, and pockets in the Panhandle.

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

ISciences Water Anomalies Forecast
United States: June 2020 - May 2021



Based on observed data through August 2020 and forecasts through May 2021

From September through November the overall forecast indicates that surpluses from the Lower Mississippi River through the Virginias will shrink considerably, as will widespread, intense deficits from Wyoming through the U.S. Southwest. Surpluses will persist in Arkansas, pockets to the east and north, and in eastern Virginia. In the U.S. Northeast, deficits will shrink and downgrade somewhat, but intense pockets will persist, particularly in western Pennsylvania. Moderate surpluses will emerge in eastern Pennsylvania and southeastern New York. Deficits in Florida will persist and intensify, and moderate deficits are expected in southern Alabama and southern Georgia. In the Great Lakes Region, surpluses are forecast for northern Minnesota, parts of Wisconsin, and northern Michigan. Deficits will moderate in Iowa and become merely mild through northern Illinois, Indiana, and Ohio. Surpluses will persist from central South Dakota well into central Nebraska.

Deficits in the Southern Rockies and the Southwest will shrink and downgrade though areas of intensity will persist, including Colorado. Deficits in Northern California will moderate, but deficits will emerge in the south and will be intense in some areas including the border with Nevada. Deficits will increase in the Pacific Northwest and northern Idaho, and surpluses will persist in southeastern Idaho and western Montana.

From December 2020 through February 2021, normal water conditions will return to many regions. Surpluses are forecast in the Great Lakes; from central South Dakota into Nebraska; in western Montana and pockets of Idaho and the Pacific Northwest; and a few isolated areas in the Southwest. Deficits will shrink and downgrade in Florida and persist in central Colorado and northern Utah.

The forecast for the final months – March through May 2021 – indicates nearly normal conditions from the Great Plains to the East Coast, some surpluses in Minnesota and in the northern Rocky Mountains, and deficits in the Southwest and Southern California. Please note that WSIM forecast skill declines with longer lead times.

Canada

The 12-month outlook for Canada through May 2021 indicates vast areas of water deficit in the eastern half of the nation. Exceptional deficits are forecast in a wide path on Quebec’s eastern border and into western Labrador, a large block west of Lake Mistassini in Quebec, and a column spanning the Quebec/Ontario border.

Deficits of varying intensity including exceptional deficits are forecast for

Newfoundland, New Brunswick, Quebec’s

Gaspé Peninsula and Southern Quebec, pockets of Southern Ontario, and much of Northern Ontario.

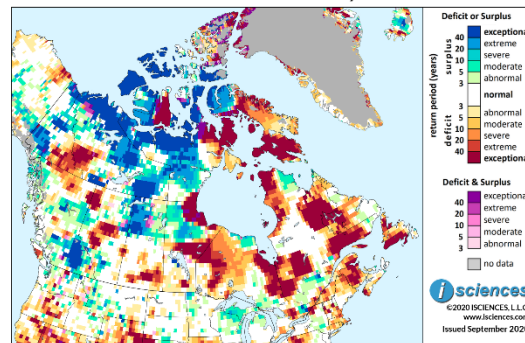
Surpluses are forecast in Quebec south of Lake Saint-Jean, and in Ontario west of Ottawa and on Hudson Bay in the northeast.

Exceptional deficits are forecast on Hudson Bay in Manitoba, a belt across the center of the province north of Lake Winnipeg reaching into Ontario, and around Winnipeg. Large pockets of surplus are forecast in north central and northwestern Manitoba. Deficits will be exceptional in other areas of the country including a belt in southern Saskatchewan reaching through Regina; the Middle Reaches of the Athabasca River Watershed in central Alberta; and Alberta’s northwest corner. Deficits are forecast for northern British Columbia, intensifying as they reach well into the Yukon and Northwest Territories.

Much of northern Saskatchewan can expect conditions of extreme to exceptional surplus leading north well past Lake Athabasca into the Northwest Territories and west to Fort McMurray, Alberta. Surpluses are also expected around Calgary, Alberta. In British Columbia, severe surpluses are expected around Fort St. John and exceptional surpluses in the southeast.

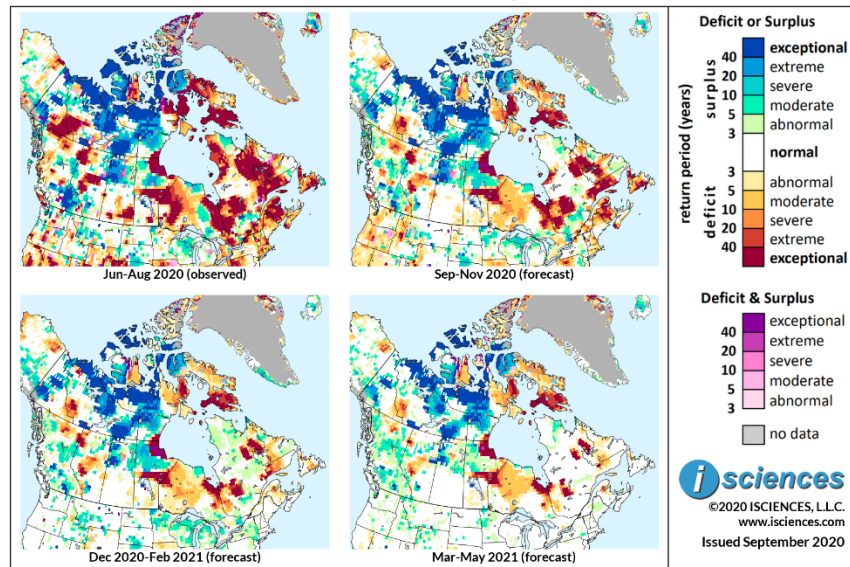
The 3-month maps (below) show the evolving conditions in more detail.

ISciences Water Anomalies Forecast
Canada: June 2020 - May 2021



Based on observed data through August 2020 and forecasts through May 2021

ISciences Water Anomalies Forecast
Canada: June 2020 - May 2021



Based on observed data through August 2020 and forecasts through May 2021

The forecast through November indicates deficits near Montreal and Winnipeg, and surpluses in Calgary and Edmonton. Though deficits will shrink overall in the nation, large areas are forecast including intense deficits along Quebec’s border into Labrador, at the mouth of the St. Lawrence River, and west of Lake Mistassini. Deficits are also forecast from Montreal through the Gaspé Peninsula, and in Newfoundland, southern Nova Scotia, and New Brunswick. Deficits will persist with intensity along the Quebec/Ontario border, shrink and moderate in Southern Ontario, and downgrade in much of Northern Ontario. Surpluses will increase west of the Gatineau River in Quebec, joining those west of Ottawa, and retreat from the Missinaibi River region of Northern Ontario.

Exceptional deficits will persist along Hudson Bay in Manitoba and across the center of the province, with surpluses increasing between. Intense deficits across southern Manitoba and Saskatchewan will retreat. Widespread surpluses will persist in northern Saskatchewan trailing into Alberta. Surpluses are forecast near Calgary, Alberta and east of Edmonton; intense deficits will persist in the Middle Athabasca River Watershed, downgrading slightly around Lesser Slave Lake and shrinking slightly in the northwest. In British Columbia, surpluses will downgrade in the southeast, persist around Fort St. John, and increase in the Upper Peace River. Deficits on Vancouver Island will shrink.

From December 2020 through February 2021, deficits will continue to decrease overall with normal conditions increasing in the Maritimes. Large blocks of deficit will persist, particularly in Quebec, Ontario, and Manitoba. Anomalies will persist in Saskatchewan and Alberta, moderate surpluses will increase along the Peace River, and conditions on Vancouver Island will normalize.

The forecast for the final three months – March through May 2021 – indicates little change in the distribution of anomalies but surpluses will shrink and moderate somewhat. Please note that WSIM forecast skill declines with longer lead times.

Mexico, Central America, and the Caribbean

The 12-month forecast ending May 2021 indicates deficits of varying severity in northern and central Mexico. Anomalies will reach exceptional intensity in many areas including the Baja Peninsula, northwestern Sonora, Chihuahua, northern Coahuila, central Durango, and Nayarit.

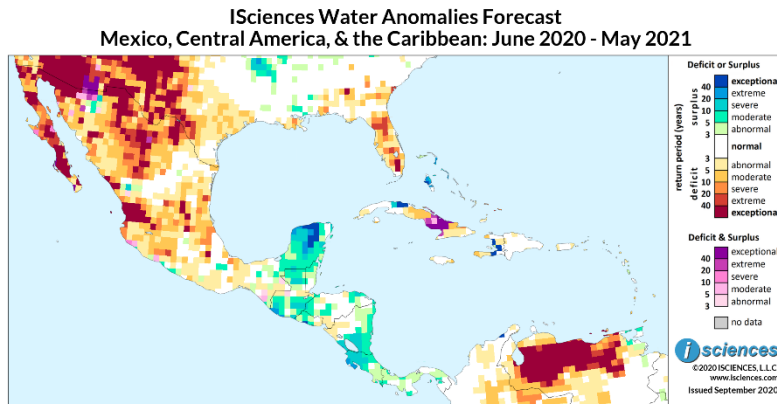
A wide belt of deficits in central Mexico will reach from Nayarit on the Pacific Coast to Tamaulipas and Veracruz on the Gulf of Mexico with some small pockets of exceptional deficit forecast in San Luis Potosi, Queretaro, Jalisco, and Puebla.

Surpluses are forecast for the Yucatán Peninsula and will be exceptional in Yucatán State. Moderate to severe surpluses are forecast in northeastern Sonora near the Bavispe and Yaqui Rivers, and conditions of both deficit and surplus (pink/purple) at their confluence with the Batepito River.

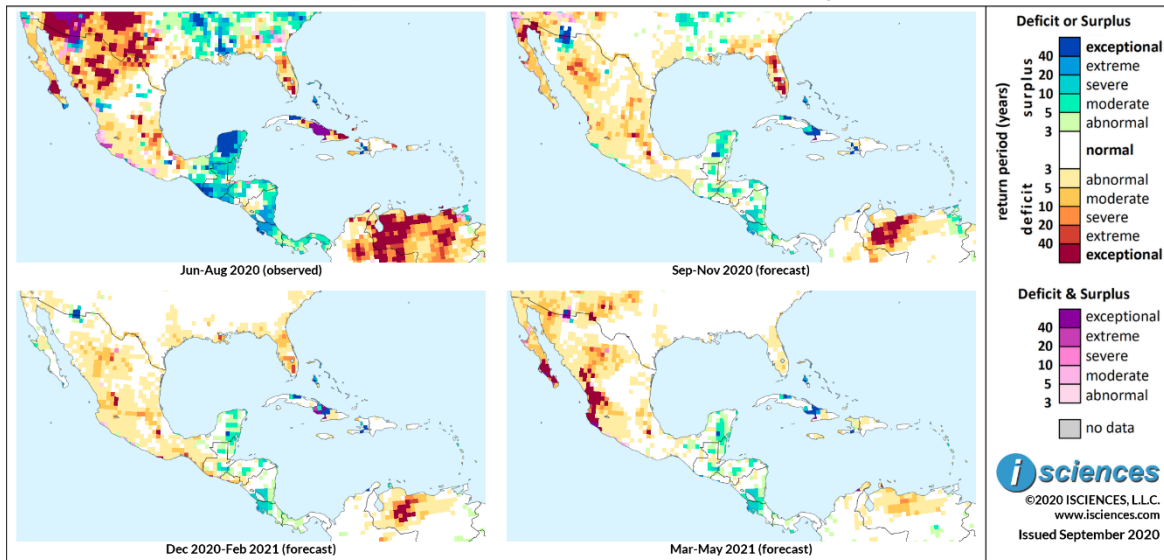
In Central America, surpluses, primarily moderate to severe, are expected in Guatemala, El Salvador, pockets of Honduras, southern Nicaragua, northern Costa Rica, and a few small coastal pockets in Panama.

In Cuba, moderate deficits are expected in Sancti Spiritus, Ciego de Ávila, and Holguín Provinces. Deficits will be more intense in Turks and Caicos Islands, and surpluses are forecast for the Bahamas.

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



ISciences Water Anomalies Forecast
Mexico, Central America, & the Caribbean: June 2020 - May 2021



Based on observed data through August 2020 and forecasts through May 2021

The forecast through November indicates that water deficits will downgrade in Mexico, but severe to extreme deficits will persist in southern Chihuahua. Deficits of varying intensity will form path from southern Nuevo Leon, through San Luis Potosi, Guanajuato, Hidalgo, and Puebla. Exceptional deficits will increase along the northern Gulf of California reaching into northern Baja while moderate deficits are forecast for Baja’s southern half. Surpluses are expected to re-emerge in northeastern Sonora in the region of the Batepito, Bavispe, and Yaqui Rivers, as well as in a few small pockets on Mexico’s central Pacific Coast. Surpluses will shrink and downgrade on the Yucatán Peninsula.

In Central America, surpluses will also shrink and downgrade, leaving nearly normal conditions in Belize and Panama, and pockets elsewhere in the region, with severe surpluses from southern Nicaragua into northern Costa Rica. Deficits in the Caribbean will nearly disappear, and some surpluses are forecast.

From December 2020 through February 2021, normal conditions or mild deficits are forecast for much of Mexico but deficits of greater intensity are expected in some regions, including southern Chihuahua into northwestern Durango, and from Nayarit trailing into the central states and then south to Puebla. Deficits will be intense in some small pockets. Surpluses will shrink in northern Sonora and the Yucatán, and pockets of surplus will persist in Central America, particularly from southern Nicaragua into Costa Rica.

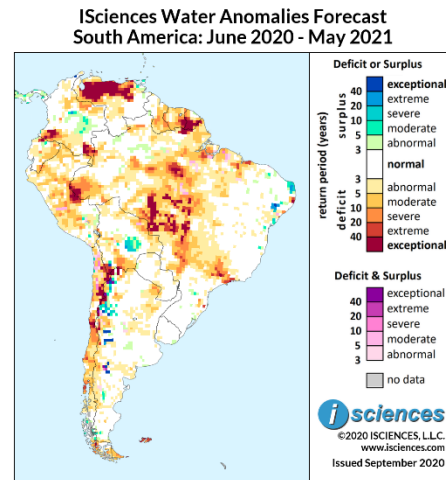
The forecast for the final three months – March through May 2021 – indicates that exceptional deficits will emerge along Mexico’s central Pacific Coast and southern Baja and deficits will intensify in the north-central states. Pockets of surplus are forecast for the Yucatán, Central America, and the Caribbean.

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

South America

The 12-month forecast through May 2021 indicates nearly normal water conditions in roughly half of the continent's extent though deficits of varying intensity are expected in nearly every nation.

Pockets of deficit are forecast across the northern arc and will be exceptional in Colombia's southwestern and southeastern corners, a broad band across northern Venezuela, and French Guiana's southern half leading into Suriname. Deficits of lesser intensity are expected in Ecuador, northern Columbia, Guyana, and Suriname, and some surpluses are forecast for central Colombia.



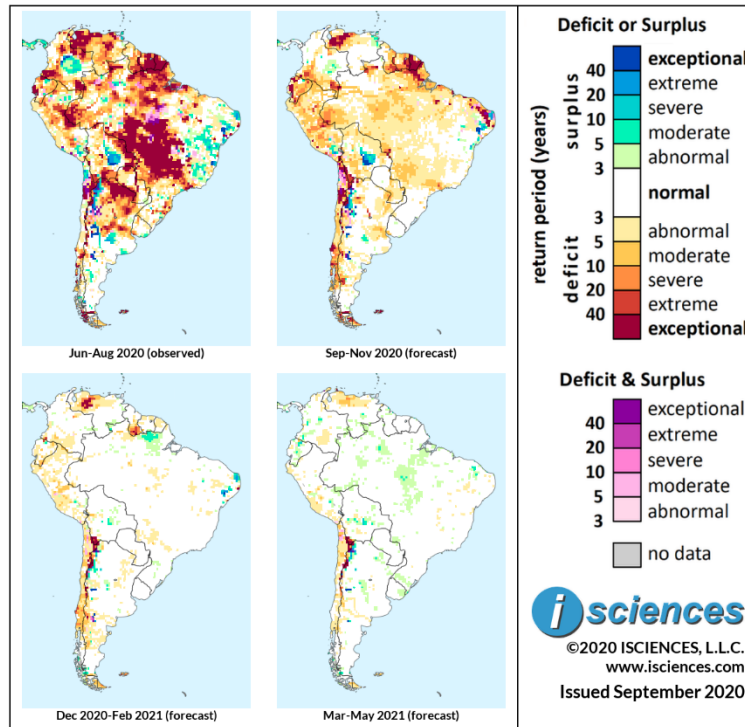
Deficits of varying intensity will dominate Brazil's vast central bulk from Amapá in the north through Mato Grosso do Sul in the south and will extend east to the Atlantic Coast through the state of São Paulo. Exceptional anomalies will be especially widespread in Mato Grosso and are also expected in Pará. Deficits will be moderate to extreme in São Paulo State. The western state of Acre will also see intense deficits, particularly in the region of the Juruá River and across the border into neighboring Peru. Some pockets of surplus are expected in Brazil's eastern tip in Rio Grande do Norte and Bahia.

In Peru, moderate to severe deficits are forecast for many regions. And in Bolivia, surpluses are expected in the center of the country with deficits along the Brazilian border and in the south where anomalies will be intense.

In the southern portion of the continent, deficits are forecast throughout much of Chile reaching across the northern border into Argentina. Anomalies will be severe in Santiago and exceptional in pockets along Chile's northeastern border. The forecast for Argentina includes pockets of surplus in the west in the provinces of La Rioja, Mendoza, and Río Negro. Deficits are expected in the Gran Chaco area of northeastern Argentina and in the continent's southernmost regions.

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

ISciences Water Anomalies Forecast
South America: June 2020 - May 2021



Based on observed data through August 2020 and forecasts through May 2021

The forecast through November indicates that deficits will shrink and downgrade significantly. While intense deficits remain in the forecast for pockets across the northern arc of the continent in Ecuador, northwestern Venezuela, and from Guyana through French Guyana, deficits in Brazil will downgrade, becoming mild to moderate overall. Deficits will be moderate along the Amazon River and in eastern Amazonas, Pará, Mato Grosso do Sul, and São Paulo State; moderate to severe in western Amazonas and Acre; and exceptional in Amapá. Exceptional deficits will emerge in Brazil's easternmost states, though surpluses will persist in other parts of the region. Surpluses will shrink and downgrade in central Colombia, and moderate surpluses will emerge in the Orinoco Delta of northeastern Venezuela.

Deficits will continue to be widespread in Peru - primarily moderate to severe with intense deficits retreating - and moderate surpluses will persist in a pocket of southern Peru. Surpluses in central Bolivia will intensify with exceptional anomalies expected, while moderate to mild deficits are forecast elsewhere in the nation. Exceptional deficits along the Paraguay River through its namesake will downgrade with mild to moderate anomalies forecast on the river and in eastern Paraguay. Deficits of varying intensity are forecast for most of Chile, but deficits in Argentina will shrink and downgrade, leaving primarily moderate deficits in the northeast and in northern Buenos Aires Province. Surpluses will persist in the northwest but will shrink in the Pampas.

From December 2020 through February 2021, nearly normal conditions are forecast for most of the continent. Intense deficits will persist in northwestern Venezuela, southern Guyana, and pockets from Bolivia's southern tip into the northern border of Chile and Argentina. Some moderate deficits are

forecast for central Peru and deficits will shrink and downgrade in Chile. Pockets of surplus will persist in Brazil's eastern tip and moderate surpluses will emerge in northern Pará.

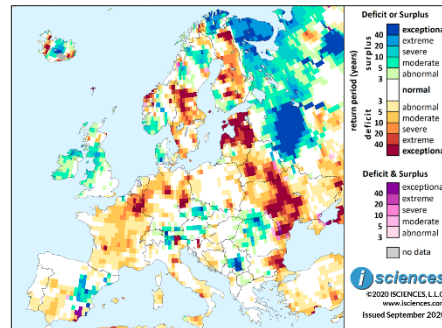
In the final quarter – March through May 2021 – normal conditions will continue in most regions, with some deficits in northern Venezuela and from Bolivia's southern tip into the northern border of Chile and Argentina. Surpluses will nearly disappear in Brazil's eastern tip, but mild anomalies will emerge in central Brazil and some moderate pockets are forecast elsewhere, including Ecuador and Bolivia.

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

Europe

The 12-month forecast through May 2021 indicates water deficits of varying intensity in many regions of Europe. Deficits will be especially intense in Estonia, Latvia, and central Ukraine. Widespread deficits are forecast for much of Finland and central Sweden; from France through northern Germany; and from southern Lithuania through Belarus, Ukraine, Moldova, eastern Romania, and eastern Bulgaria.

ISciences Water Anomalies Forecast
Europe: June 2020 - May 2021



Based on observed data through August 2020 and forecasts through May 2021

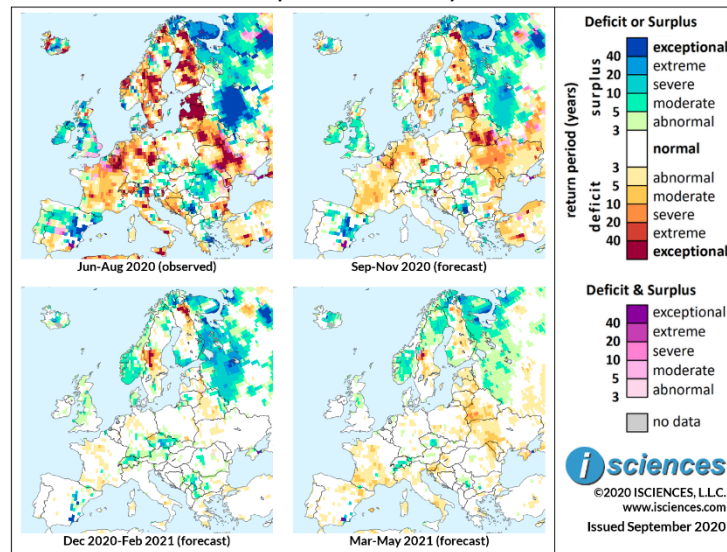
The vast path from the Baltics through Bulgaria includes many areas of exceptional deficit including the capital cities of Riga (Latvia) and Kiev (Ukraine), and extreme deficits near Chisinau (Moldova). In Central Europe, deficits will be especially intense in Belgium and Luxembourg, and pockets of eastern Germany. Deficits will be extreme to exceptional near Dresden (Germany) and severe near Brussels (Belgium).

Moderate deficits are expected throughout much of France. In Italy, pockets of deficit are expected including exceptional deficits in the Dolomite Mountains and extreme deficits near Bologna and south of Naples. Intense deficits are forecast for eastern Slovenia. Some areas of moderate deficit are forecast for southwestern Spain including Seville, while surpluses are expected in east-central Spain.

Widespread surpluses are expected in European Russia including a vast area of exceptional surplus west of Moscow. Other areas of surplus include Ireland and the U.K., Denmark, Czech Republic, Austria, southern Serbia into Kosovo, Romania, and pockets of Scandinavia.

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

ISciences Water Anomalies Forecast
Europe: June 2020 - May 2021



Based on observed data through August 2020 and forecasts through May 2021

The forecast through November indicates that deficits will shrink and downgrade but remain widespread. Areas of intense deficit include southern Belarus and pockets in the Baltics. While downgrading from exceptional to severe, deficits will increase in Ukraine, leading through Moldova and pockets of eastern Romania and Bulgaria. From France through northern Germany moderate deficits are expected with a few areas of greater intensity including southern Belgium. In France, deficits will shrink in the north but moderate deficits will increase in the southwest. Deficits in southern Spain and around the Adriatic Sea will nearly disappear.

Surpluses will persist in European Russia, but the extent of exceptional anomalies will diminish considerably. Deficits will increase in the Don River Watershed of southern Russia. Surpluses will also persist in Spain, intense in the east-central region but less so in the northwest. Moderate surpluses are expected in Ireland and the U.K., Denmark, Czech Republic, Austria, western Romania, and pockets around the Aegean Sea. Intense surpluses will persist in southern Serbia.

From December 2020 through February 2021 deficits will nearly disappear but intense deficits are forecast for central Sweden and Finland's Lapland. Surpluses are forecast in European Russia, Czech Republic, Switzerland, western Romania, western Bulgaria, Serbia, Kosovo, and North Macedonia. Surpluses will increase in southern Finland, southern Sweden, pockets in the Baltics, and rivers in eastern Belarus; shrink in Denmark and eastern Spain; and nearly disappear in the U.K. and Ireland.

The forecast for the remaining months – March through May 2021 – indicates nearly normal conditions in many regions. Surpluses will shrink and downgrade in Russia. Other areas of surplus include Norway, northern Sweden, Russia, Czech Republic, and Switzerland. Areas of deficit include central Sweden, Eastern Europe, and France. Please note that WSIM forecast skill declines with longer lead times.

Africa

The 12-month forecast through May 2021 indicates widespread, intense water deficits across North Africa including many areas with exceptional anomalies. Mixed conditions of both deficit and surplus are also forecast as transitions occur (pink/purple).

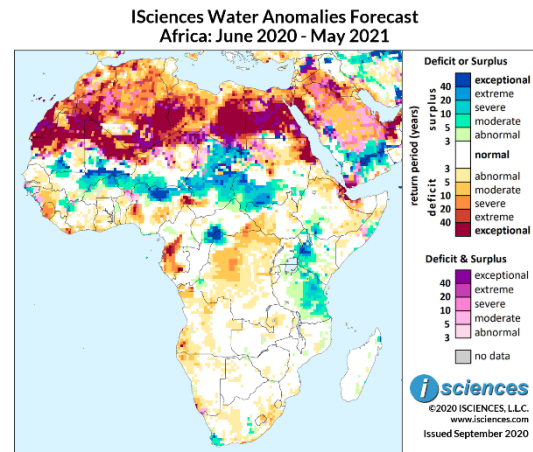
Surpluses of varying intensity are forecast across the Sahel, reaching south into northern Nigeria where anomalies will be exceptional and southern Sudan where surpluses will be extreme.

Intense surpluses are forecast in Central African Republic in a large pocket surrounding the capital city

of Bangui reaching into Democratic Republic of the Congo. In East Africa, surpluses are forecast from south central Ethiopia through western Kenya and eastern Uganda and eastern Tanzania. Anomalies will be exceptional in western Kenya and severe in Dodoma, Tanzania. Other areas with a forecast of surplus include central Somalia, coastal Guinea Bissau and eastern Guinea, and South Africa's southwest coast.

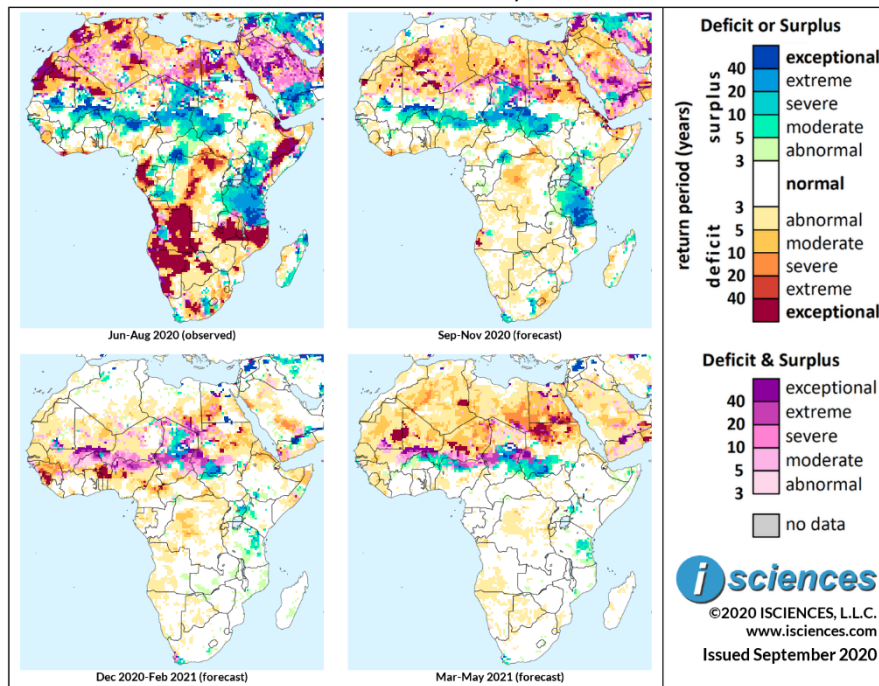
Scattered deficits are expected in West Africa from western Guinea around the Gulf of Guinea. Deficits will be intense from south central Cameroon through Equatorial Guinea and western Gabon, and in southwestern Nigeria and Liberia's southern tip. Severe deficits are forecast for Sierra Leone. On the other side of the continent along the southern Red Sea, deficits will reach exceptional intensity from southern Eritrea through Djibouti into Somaliland. Other areas of deficit include the central Congo River Basin, northern Ethiopia, pockets in the western corners of Angola and Namibia, and from northern Lesotho through South Africa to the Swaziland border.

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



Based on observed data through August 2020 and forecasts through May 2021

ISciences Water Anomalies Forecast
Africa: June 2020 - May 2021



Based on observed data through August 2020 and forecasts through May 2021

The forecast through November indicates that deficits will shrink and downgrade considerably with exceptional deficits retreating overall. Deficits in North Africa will moderate with some scattered, intense pockets and transitional conditions. Deficits will be intense in pockets from southern Eritrea through Djibouti into Somaliland and on Angola's southwestern coast. Areas with a forecast of moderate to severe deficit include southern Liberia, the central Congo River Basin, and northern Lesotho into South Africa.

Surpluses of varying intensity will persist across the Sahel. While shrinking, surpluses will remain widespread in East Africa from south central Ethiopia through western Kenya, eastern Uganda, and Tanzania. Anomalies will be extreme to exceptional in Tanzania's eastern half. Other areas of surplus include a pocket on the southern border of Central African Republic; South Africa's southwestern coast and from Eastern Cape into Orange Free State; and Madagascar's northern tip.

From December 2020 through February 2021, anomalies throughout most of the continent will shrink, leaving nearly normal conditions in much of North Africa and also south of the Sahel. Moderate deficits will persist in the eastern Sahara, and exceptional deficits will emerge in Sierra Leone and northern Togo and Benin. In the Sahel, surpluses will persist in Chad and southern Sudan, but many areas will be in transition (pink/purple). Surpluses in East Africa will shrink considerably, leaving moderate pockets.

The forecast for the final quarter – March through May 2021 – indicates moderate deficits across North Africa with some more intense regions, particularly in eastern nations; surpluses and transitional conditions in the Sahel; and lingering surpluses in East Africa. Please note that WSIM forecast skill declines with longer lead times.

Middle East

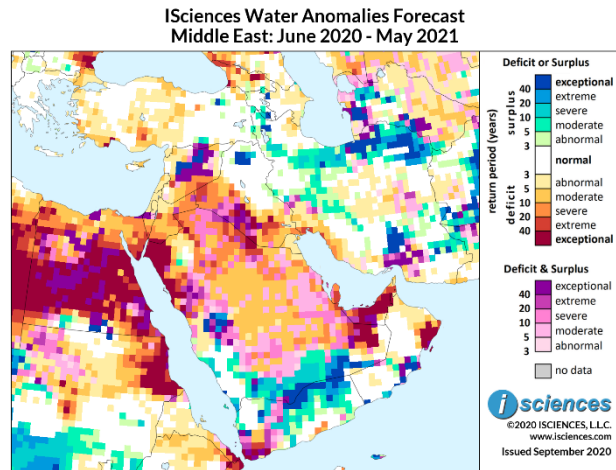
The forecast for the 12-month period ending May 2021 indicates water deficits from southern Syria through Jordan and much of Iraq west of the Euphrates River, and well into Saudi Arabia, Oman, and the United Arab Emirates. Deficits will be exceptional in Saudi Arabia along the northern Red Sea and in the United Arab Emirates. Areas of both deficit and surplus are also forecast (pink/purple) as transitions occur in western Iraq and pockets of Saudi Arabia.

In the southern portion of the Arabian Peninsula, surpluses of varying intensity are expected in pockets of southwestern Saudi Arabia and in southern Saudi Arabia reaching well across the border into Yemen. Mixed conditions and deficits are forecast for Yemen's southwestern tip. Intense deficits are expected in southeastern Oman.

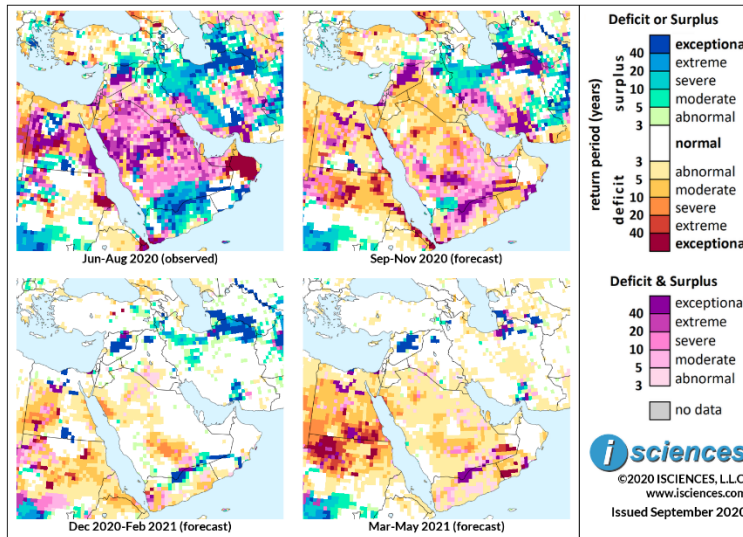
Transitional conditions are forecast for northern Syria along with some areas of exceptional surplus. Intense surpluses are also forecast for a pocket of northern Iraq around Mosul. Primarily moderate to severe surpluses are expected in northwestern Iran from Lake Urmia curving east through Tehran, becoming intense through the northeast along the Turkmen border. Moderate surpluses will form a path leading south from Tehran. Surpluses are also forecast in pockets of southern Iran including exceptional anomalies in southern Kerman. Deficits are expected on the northern stretch of Iran's Persian Gulf coast.

Some deficits are forecast in central Turkey and in the southwest, and intense deficits in Georgia north of Tbilisi and along the Black Sea.

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



ISciences Water Anomalies Forecast
Middle East: June 2020 - May 2021



Based on observed data through August 2020 and forecasts through May 2021

The forecast through November indicates that widespread surpluses in the region will shrink as transitions occur and deficits emerge. Surpluses of varying intensity are forecast from northeastern Iraq through much of northwestern Iran, and transitional conditions near the Iran-Turkmen border. Surpluses are also forecast in southeastern Iran including the Hamoun (Helmand) Wetlands region. Some deficits will emerge in central Iran and on the southern coast near border with Pakistan.

Deficits will emerge from southern Syria through eastern Jordan and Iraq west of the Euphrates and through the northern half of Saudi Arabia. Anomalies will be moderate overall but more intense in some pockets including Riyadh Province, Saudi Arabia. Transitional conditions will replace most areas of surplus in southern Saudi Arabia and Yemen and deficits will also emerge. Deficits will retreat from northern Oman but emerge in the south. In Georgia, deficits are expected to increase, and in Turkey, deficits will increase in the west and along the central Black Sea coast.

From December 2020 through February 2021, deficits will shrink considerably leaving normal conditions in many parts of the region but will persist in southern Riyadh Province, Saudi Arabia, and Tabuk Province on the northern Red Sea. Surpluses will re-emerge in central Syria, in Iraq surrounding Mosul, and along the Iran-Turkmen border. Surpluses will shrink in northwestern Iran and will re-emerge in the south near the Strait of Hormuz. Surpluses will also re-emerge along Saudi Arabia's southern border reaching into Yemen and Oman. Deficits are expected in Yemen near Sanaa.

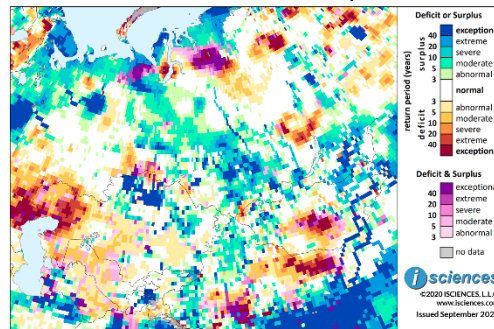
In the final quarter – March through May 2021 – surpluses are forecast for northern Syria, around Mosul, in pockets of northeastern Iran and in the south reaching from the Strait of Hormuz into Kerman Province. Deficits are forecast for the Arabian Peninsula, mild overall but intense in pockets of the south.

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

Central Asia and Russia

The 12-month forecast through May 2021 indicates surpluses in northern European Russia that will be exceptional along the Upper Volga River and a vast pocket west of Moscow, and in the Vychedga Lowlands and along the Severnaya Dvina River. Surpluses are also expected in the Ob River Watershed and the Middle and Upper Yenisei River.

ISciences Water Anomalies Forecast
Central Asia: June 2020 - May 2021



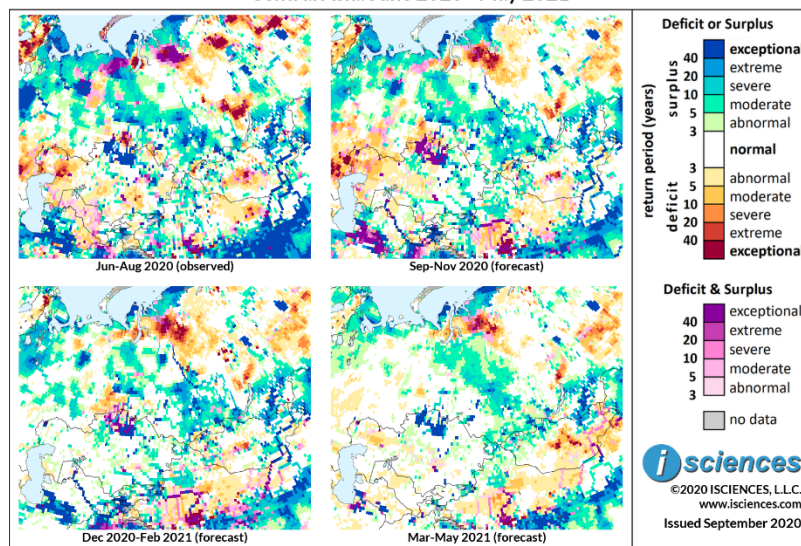
Based on observed data through August 2020 and forecasts through May 2021

Intense deficits are forecast in the northern Caspian Sea Basin; the central banks of the Gulf of Ob; the eastern Yenisei River Basin; between the Bolshaya Kuonamka and Olenyok Rivers in northern Siberia; the Upper Lena River region north of Lake Baikal; the Lena River Delta (not shown); and along the East Siberian Sea (not shown).

In Kazakhstan, intense surpluses are expected in the north and intense deficits in the west around the Caspian Sea. Moderate deficits are expected in western Uzbekistan, eastern Turkmenistan, and eastern Tajikistan. Surpluses and transitional conditions are forecast for western and southern Turkmenistan. Intense surpluses are expected in the Fergana Valley and central Tajikistan. Eastern Kyrgyzstan can expect surpluses of lesser intensity.

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

ISciences Water Anomalies Forecast
Central Asia: June 2020 - May 2021



Based on observed data through August 2020 and forecasts through May 2021

The forecast through November indicates that exceptional surpluses west of Moscow will downgrade while those in the Vychedga Lowlands will shrink but remain exceptional. Widespread surpluses will

persist in the Ob River Watershed and surpluses along the Middle Yenisei River will intensify, becoming exceptional. Intense deficits will re-emerge in the region of the Lower Yenisei and in the northeastern portion of the river's basin. Intense deficits will downgrade in the Lena River Delta (not shown) and persist in the Upper Lena River region north of Lake Baikal, shrinking somewhat. Deficits across the central banks of the Gulf of Ob will downgrade but will be severe. Deficits of varying intensity are expected to emerge in the Alden River Watershed, a right tributary of the Lena River in southern Sakha Republic in eastern Siberia. Intense deficits will persist in Southern Russia and moderate deficits will begin to emerge in Trans Volga.

In Kazakhstan, surpluses in the north will begin to transition as deficits emerge; surpluses are expected in the east and along portions of the Ile and Syr Darya Rivers; and deficits will increase in the west. Intense surpluses are expected on the Amu Darya River in Uzbekistan, the Fergana Valley and central Tajikistan, and pockets along Turkmenistan's southern border, though transitional conditions are also expected. Surpluses of varying intensity are forecast in Kyrgyzstan, including along the Naryn River, and in western Turkmenistan.

From December 2020 through February 2021, deficits in Southern Russia and the Caspian Basin will nearly disappear. Deficits will persist across the central shores of the Gulf of Ob, the eastern Yenisei River Basin, north of Lake Baikal, around Tyumen in Russia, and in southern Sakha Republic. Surpluses will persist west of Moscow and in Vychehda, and will increase in the Volga River region. Surpluses will shrink somewhat in the Ob River Watershed and will persist in the Upper Yenisei River Basin and along the middle reaches of the river itself.

Exceptional surpluses will persist on the Amu Darya River and will increase along Turkmenistan's southern border. Surpluses of varying intensity are forecast for eastern Uzbekistan, central and western Tajikistan, many regions of Kyrgyzstan, and pockets of northern and eastern Kazakhstan. Some areas of moderate deficit are expected in eastern Tajikistan.

The forecast for the final months – March through May 2021 – indicates that surpluses will shrink in European Russia, increase in the Ob River Watershed, and moderate on the Middle Yenisei. Normal conditions are forecast for much of Central Asia along with pockets of surplus.

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

South Asia

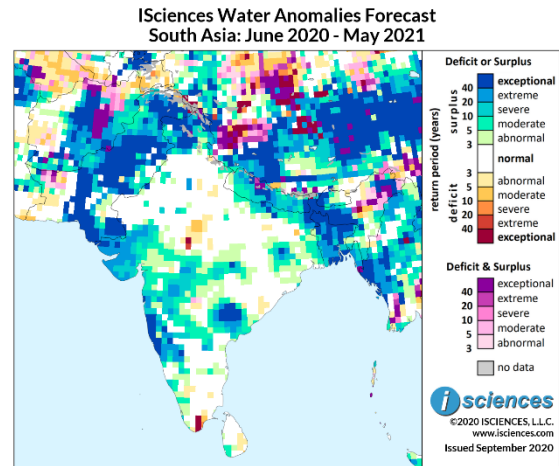
The 12-month forecast through May 2021 indicates widespread water surpluses in Bangladesh, Nepal, Pakistan, Afghanistan, and western and central India.

Surplus conditions will dominate all of Bangladesh with extreme to exceptional anomalies in most regions. Exceptional anomalies will prevail in Pakistan in the Hindu Kush, the Indus River Basin, and in a column from Quetta past Karachi in the south. Much of the remainder of the nation outside of the southwest can expect surpluses of varying intensity. Afghanistan, too, will see surpluses of varying intensity, with extreme anomalies in Kandahar and severe anomalies in Kabul. Conditions of both deficit and surplus (pink/purple) are forecast in the Upper Helmand River region as transitions occur.

In India, surpluses will be exceptional in the Far North, along the western coast from Maharashtra through Goa, and in northern Telangana. Severe to extreme surpluses are forecast for Gujarat, and surpluses of varying intensity from there into the center of the country in southern Madhya Pradesh, Maharashtra, and Andhra Pradesh, and in Karnataka in the southwest. Surpluses are also forecast in regions bordering Nepal, and in Jharkhand, West Bengal, and Arunachal Pradesh in the Far Northeast. Deficits are expected in the center of the country in northern Madhya Pradesh and in the nation's southern tip in Tamil Nadu. Moderate surpluses are forecast for Sri Lanka's southwest corner.

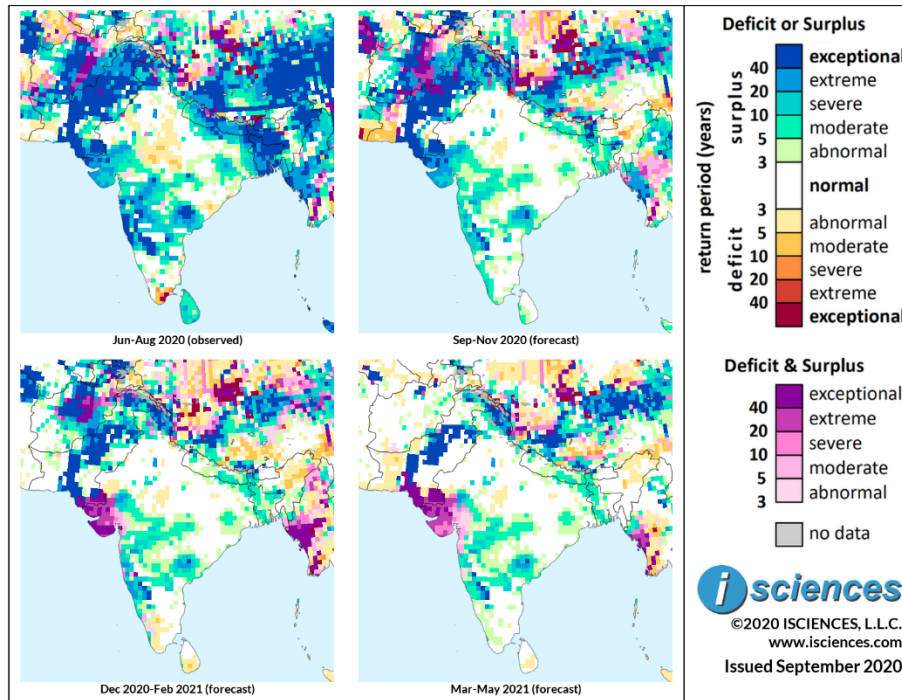
In Nepal, surpluses are expected throughout the country, severe in Kathmandu and exceptional along the Gandak River through the center of the nation and into India. Western Bhutan can also expect surpluses.

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



Based on observed data through August 2020 and forecasts through May 2021

ISciences Water Anomalies Forecast
South Asia: June 2020 - May 2021



Based on observed data through August 2020 and forecasts through May 2021

The forecast through November indicates that surpluses will moderate in Bangladesh, shrink and moderate in Nepal, but remain widespread and intense in Pakistan and Afghanistan. Conditions of both deficit and surplus (pink/purple) are also forecast in Afghanistan, and moderate deficits will emerge in southwestern Pakistan. In India, the distribution pattern of surplus will be much like that of the prior three months' observed conditions, but anomalies will shrink and downgrade somewhat. Moderate surpluses will emerge in Kerala; deficits in Tamil Nadu will disappear; and widespread surpluses in Sri Lanka will shrink considerably. Surpluses will also shrink considerably in India's Far Northeast and deficits will emerge in central Assam.

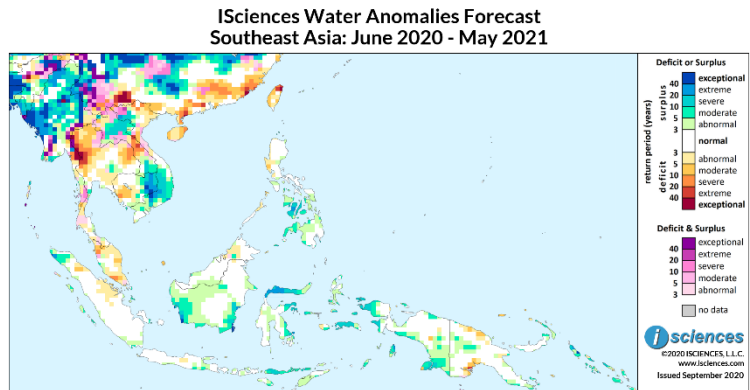
From December 2020 through February 2021, surpluses will remain fairly intense in Goa, Karnataka, and Telangana, but primarily moderate in southern Madhya Pradesh and northern Maharashtra. Conditions of both deficit and surplus are forecast for Gujarat. Surpluses will downgrade in the Far North, and shrink and moderate in Nepal, regions of India near Nepal, and in Jharkhand and Bangladesh. Moderate deficits are expected in India's Far Northeast. Surpluses in Pakistan and Afghanistan will shrink but remain intense, particularly in Pakistan where exceptional anomalies will continue to be widespread. Conditions in southwestern Pakistan will normalize.

The forecast for the final months – March through May 2021 – indicates intense surpluses in Pakistan; generally moderate surpluses in the same regions of India as in the prior three months, and in Nepal and Bangladesh; and nearly normal conditions in Afghanistan.

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

Southeast Asia and the Pacific

The 12-month forecast through May 2021 indicates moderate to exceptional deficits in western Thailand, and moderate to severe deficits in the northeast crossing the Mekong River into central Laos. Deficits are also forecast in western Cambodia from Tonlé Sap Lake to the coast, and in a few pockets of northeastern Vietnam and peninsular Malaysia.

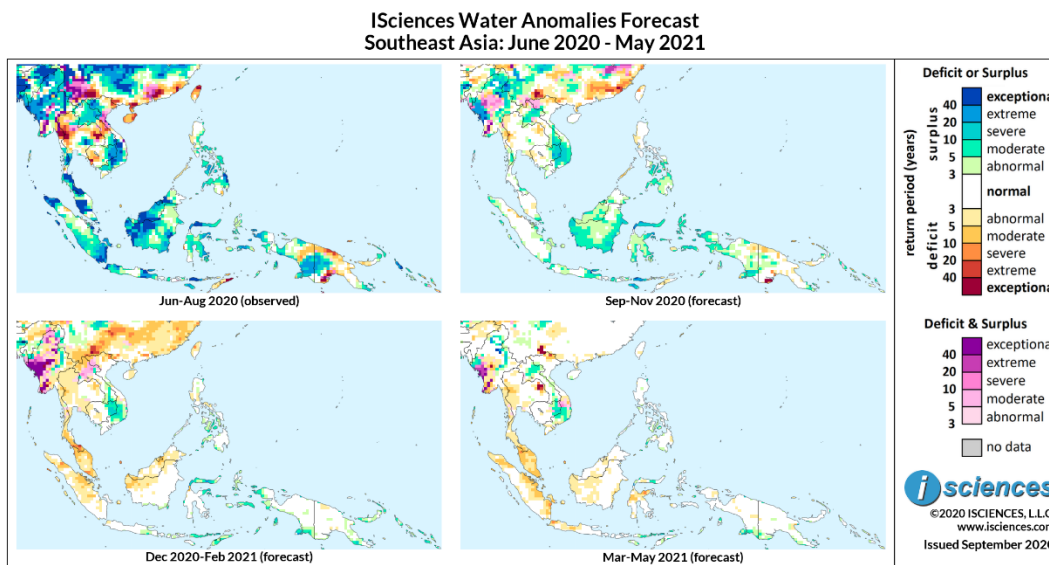


Based on observed data through August 2020 and forecasts through May 2021

Surpluses of varying intensity are forecast for many regions in Myanmar and will be particularly intense along much of the Salween River and west of the Irrawaddy River. Surpluses, primarily severe, are expected in north central Laos reaching into Vietnam. In southern Laos anomalies could reach greater intensity reaching through Cambodia's eastern half well into Vietnam and south to Ho Chi Minh City.

In Indonesia, surpluses are forecast for Sumatra's northern tip, western Borneo and coastal regions in the south and southeast, northern and eastern Sulawesi, Flores Island, many small Indonesian islands, the Bird's Head Peninsula (Doberai Peninsula), and other pockets in Papua, Indonesia. In Papua New Guinea, some deficits are expected along the western shore of the Gulf of Papua and on the nation's north central coast. Moderate surpluses are forecast for the central Highlands. In the Philippines, surpluses are forecast in the central region and western Mindanao.

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



Based on observed data through August 2020 and forecasts through May 2021

The forecast through November indicates that surpluses will shrink and downgrade overall but persist in many areas, particularly Indonesia. Surpluses are forecast in Myanmar west of the Irrawaddy River, where anomalies will be extreme, and in the north and east, with conditions of both deficit and surplus (pink/purple) in the center of the nation as transitions occur. Moderate surpluses are expected in northern Laos and severe surpluses in the south leading through Cambodia's eastern half and well into Vietnam to Ho Chi Min City. Deficits will nearly disappear, with some moderate pockets lingering in northeastern Vietnam and northeastern and western Thailand.

Surpluses are forecast for many regions of Borneo, some coastal pockets in Sumatra, eastern Java, Sulawesi, Flores and Sumba Islands, the Maluka Islands, and several regions of Papua Indonesia, including the Bird's Head Peninsula. Anomalies will be extreme in northern Sulawesi, and Flores and Sumba Islands. In Papua New Guinea, exceptional deficits are forecast on the western shore of the Gulf of Papua, some moderate deficits on the nation's northern coast, and a few pockets of moderate surplus in the center and far east of the country. In the Philippines, surpluses are expected in the central islands and into Mindanao.

From December 2020 through February 2021, surpluses will shrink considerably, persisting primarily from southern Laos through eastern Cambodia into southern Vietnam. Former areas of surplus in Myanmar will become transitional, though moderate surpluses are forecast near the northern path of the Salween River. Some deficits will persist in northeastern Vietnam and a few pockets in mainland Thailand. Deficits will emerge in the Malay Peninsula and pockets of northern Borneo and Sumatra. Surpluses are forecast for many small Indonesian islands and pockets of Sulawesi and New Guinea. Surpluses in the Philippines will shrink.

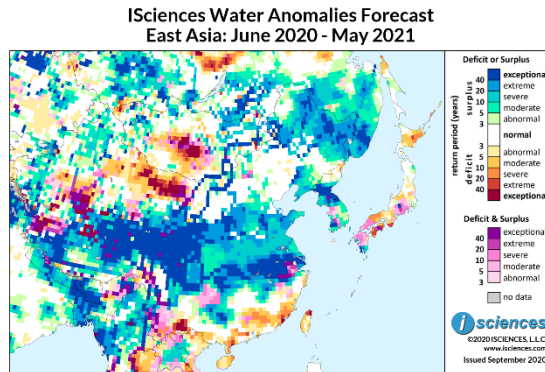
The forecast for the final months – March through May 2021 – indicates surpluses in north central Laos and from eastern Cambodia into Vietnam. In Myanmar, surpluses are expected in the far west, in the north, and near the northern Salween River. Intense deficits will emerge in northeastern Thailand. Moderate deficits are forecast for the Malay Peninsula and pockets in Sumatra, Java, and Sulawesi. A few small areas of surplus will persist in Indonesia's small islands and in New Guinea.

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

East Asia

The 12-month forecast for East Asia through May 2021 indicates widespread, intense surpluses in the Yellow (Huang He) and Yangtze River Basins. Conditions will include exceptional anomalies in the upper basin of the Yellow River and severe to extreme surpluses in the river's lower and middle basin.

In the Yangtze Basin, exceptional surpluses will dominate the lower and upper regions and much of the middle as well. Surpluses of varying intensity are expected between the Yellow and Yangtze Rivers.



Based on observed data through August 2020 and forecasts through May 2021

Northeast China can also expect widespread surpluses of varying intensity including exceptional anomalies, and surpluses are expected on the Liaodong Peninsula in the northern Bohai Sea reaching well into Liaoning Province.

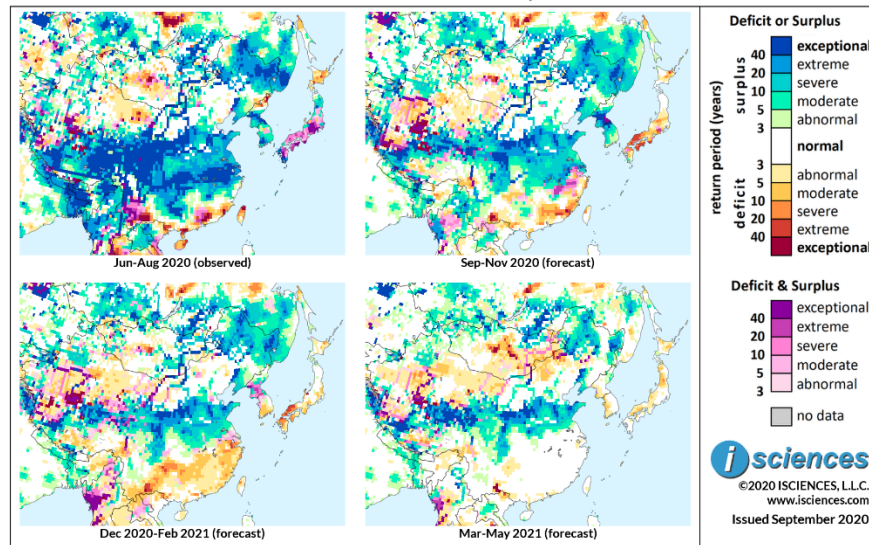
In southern China, deficits are forecast reaching from southern Yunnan through southern Guangxi, Guangdong, Hainan, Fujian, and Taiwan. Deficits will be intense in Yunnan and northern Taiwan. Surpluses are expected in northern Guangxi in the region of the Rong River, a northern tributary of the Pearl River.

In Tibet (Xizang), intense surpluses are forecast in many regions including along the Yarlung River (Brahmaputra), while some areas of intense deficit are expected in the northwest. Western Inner Mongolia will see moderate to exceptional deficits, conditions that will reach west through northern Gansu into southern Xinjiang. Some areas of both deficit and surplus (pink/purple) are also expected in Xinjiang as transitions occur and surpluses are forecast in the northern reaches of the province.

Intense deficits are forecast for central Mongolia and pockets of surplus in the east and west. On the Korean Peninsula, a small pocket of deficit is expected in the northeast, but exceptional surpluses will dominate the southern half of North Korea, generally moderating through South Korea. In Japan, deficits are predicted for Hokkaido, southern Honshu, and Shikoku, and surpluses and mixed conditions in Kyushu. Deficits will be intense in Shikoku.

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

ISciences Water Anomalies Forecast
East Asia: June 2020 - May 2021



Based on observed data through August 2020 and forecasts through May 2021

The forecast through November indicates that surpluses in China will shrink and downgrade overall but will remain widespread in the Yellow and Yangtze River Watersheds, while shrinking south of the Yangtze. The extent of exceptional surplus will shrink considerably though large pockets are forecast in Shaanxi and southern Gansu. In southern China, deficits of varying intensity are forecast from southeastern Yunnan through southern Guangxi and reaching through the southeastern provinces of Guangdong, Fujian, and Zhejiang. Moderate deficits will emerge in central Guizhou. Deficits in Taiwan will shrink considerably. Surpluses will remain widespread in northeastern China and north of the Bohai Sea. In the west, deficits will increase from southern Xinjiang into northern Tibet.

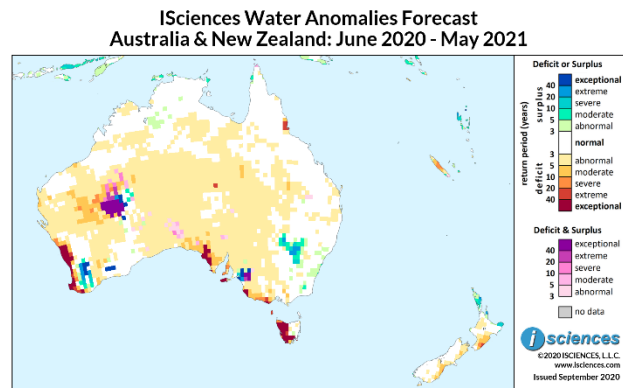
Widespread surpluses will persist on the Korean Peninsula, moderating in the south, and deficits in the northeast will disappear. In Japan, deficits are expected to shrink in Hokkaido but will emerge throughout much of the rest of the nation, transitioning from surplus. Deficits will be extreme in southern Honshu. In Mongolia, deficits in the center of the nation will shrink but remain intense; surpluses will persist in the west and east.

From December 2020 through February 2021, surpluses in China will continue to shrink and downgrade but will remain widespread in much of the Yellow River Watershed and north of the Yangtze River. Deficits will increase in the south, particularly in Yunnan, Guizhou, northern Guangxi, and Hunan; moderate in the southeast; and intensify near Shanghai. Surpluses will persist in Northeast China; South Korea will transition to moderate deficit; and surpluses along with transitional conditions are forecast for North Korea. Deficits will shrink in Japan but remain extreme in the south.

The forecast for the final three months – March through May 2021 – indicates normal conditions in southern China, intense surpluses in the Yellow River Watershed, and deficits in Yunnan, Mongolia, and Japan. Please note that WSIM forecast skill declines with longer lead times.

Australia & New Zealand

The 12-month forecast through May 2021 indicates surpluses in the central region of the Murray-Darling Basin in southeastern Australia and at the mouth of the Murray. Surpluses will be moderate to extreme in New South Wales between the Lachlan and Macquarie Rivers and exceptional in South Australia between the mouth of the Murray and the Victoria border, along with transitional conditions.

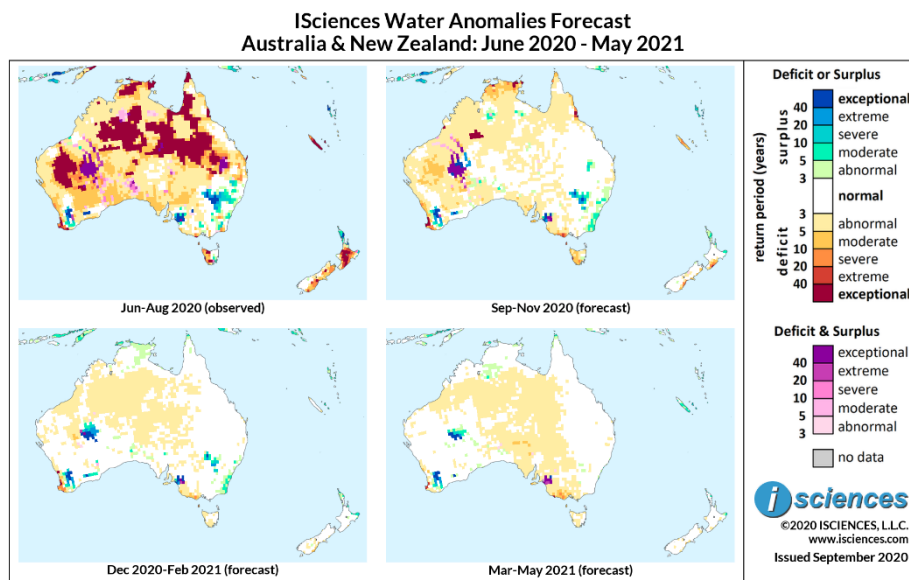


Based on observed data through August 2020 and forecasts through May 2021

Tasmania can expect exceptional deficits in the west and from Hobart along the Derwent Estuary. Some pockets of intense deficit are also forecast on Victoria's western coast and on Kangaroo Island in South Australia and along that state's coast. In northern Queensland, a small pocket of intense deficit is expected on the northeast coast south of Cairns. At the opposite corner of the nation, severe to exceptional deficits are forecast on Western Australia's southwest coast, including in the region's capital, Perth. Intense surpluses are forecast for the Upper Swan River region east of Perth. Transitional conditions are expected spanning the western edge of the Gibson Desert leading to moderate deficits.

In New Zealand, surpluses are expected north of Auckland and on the points framing the Bay of Plenty. Deficits are forecast from northeast of Wellington to Hawke's Bay. On South Island, some deficits are expected along the east coast between Christchurch and Dunedin. Severe deficits are forecast for New Caledonia.

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



Based on observed data through August 2020 and forecasts through May 2021

The forecast through November indicates that widespread exceptional deficits in Australia and New Zealand will retreat, leaving a few pockets. Eastern Australia can expect primarily normal water conditions with surpluses of varying intensity in the central Murray-Darling Basin between the Macquarie and Lachlan Rivers and moderate surpluses along the southeast coast in New South Wales from Sydney to Victoria's border. Deficits are forecast along Victoria's western coast, and deficits in Tasmania will moderate. At the mouth of the Murray River in South Australia, surpluses will be intense though transitional conditions are forecast further inland. In Queensland, moderate surpluses will re-emerge at the northwestern edge of the Darling Downs and a pocket of intense deficit will persist on the northeast coast near Cairns.

Deficits are forecast in Top End, Northern Territory, primarily moderate, and some areas of moderate surplus are expected in the Upper Victoria River region and the central Barkly Tableland. In Western Australia, exceptional deficits are forecast at the eastern edge of the Great Sandy Desert, and some paths of surplus in the Gibson Desert along with mixed conditions, with moderate deficits farther west. In the southwest corner of the state, deficits are forecast on the coast, moderate near Perth but exceptional farther south near Busselton. Surpluses are forecast for the Upper Swan River region nearby.

In New Zealand, deficits and surpluses will shrink considerably, leaving deficits along the eastern coasts from Hawke's Bay in the north to Dunedin in the south, and some surpluses primarily north of Auckland. Though downgrading, deficits in New Caledonia will be extreme.

From December 2020 through February 2021 much of Australia will return to normal conditions. Surpluses will persist between the Macquarie and Lachlan River, downgrading somewhat; moderate surpluses in the coastal southeast will shrink; and surpluses and transitional conditions are forecast at the mouth of the Murray. Deficits will nearly disappear in Tasmania and will downgrade in coastal Victoria. Deficits will shrink slightly in Australia's southwestern tip and surpluses will persist in the Upper Swan River. Intense surpluses will re-emerge across the western edge of the Gibson Desert. Nearly normal conditions are forecast for New Zealand and New Caledonia.

The forecast for the final months – March through May 2021 – indicates surpluses in the west near the Gibson Desert and in the Upper Swan River region, and deficits near Busselton. Deficits will increase slightly on Victoria's coast west of Melbourne and moderate surpluses will emerge in New Caledonia.

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