

Global Water Monitor & Forecast Watch List

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For more information, contact:

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

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

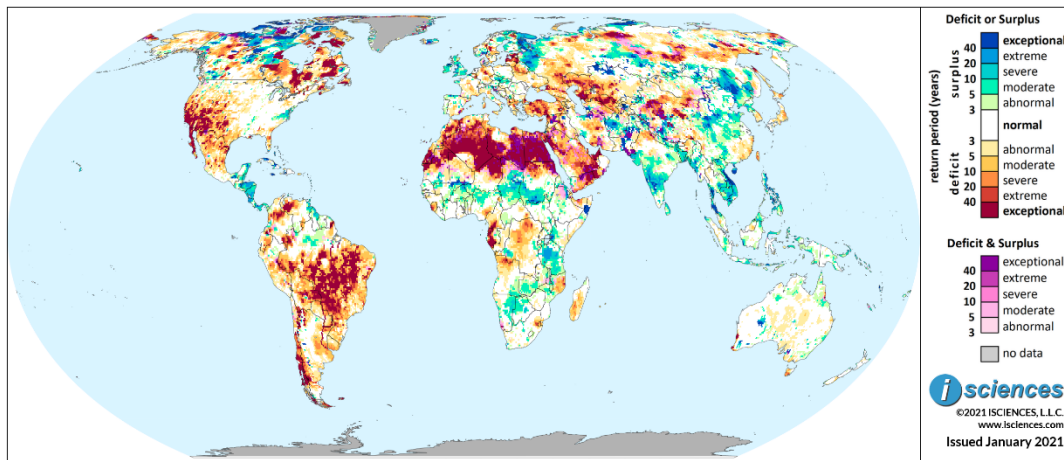
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Worldwide Water Watch List

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

ISciences Water Anomalies Forecast: October 2020 - September 2021



Based on observed data through December 2020 and forecasts through September 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: Water deficits in the West will shrink overall through March 2021, but anomalies will remain widespread and will be intense in Arizona, New Mexico, central Colorado, western Wyoming, and pockets of Southern California. Deficits in North Dakota will intensify, becoming exceptional.

Canada: The forecast through March 2021 indicates that water deficits will increase and intensify in southern Manitoba and southeastern Saskatchewan. Exceptional deficits will persist in many regions of eastern Canada. Surpluses are forecast in southern British Columbia and around Calgary, Alberta.

Mexico, Central America, and the Caribbean: The forecast through March 2021 indicates persistent water deficits of varying intensity in much of Mexico, with surpluses in the Yucatán and nearby southern states. Surpluses will persist throughout Central America, Jamaica, and the Bahamas.

South America: The forecast through March 2021 indicates that water deficits will shrink considerably but will remain widespread in Brazil and Chile, and widespread surpluses will emerge across the northern portion of the continent. Deficits will be intense in many regions of Brazil and southern Chile.

Europe: The forecast through March 2021 indicates widespread water surpluses in western European Russia, the Nordic nations, England, and from Switzerland through Romania. Deficits will persist in Estonia, Latvia, Germany, Belgium, and Macedonia.

Africa: The forecast through March 2021 indicates that water deficits will shrink and downgrade. Deficits in North Africa will be mild to moderate overall. Surpluses will continue in the eastern Sahel, but transitions will begin in the west. Surpluses will persist in East Africa and emerge in south-central Africa.

Middle East: The forecast through March 2021 indicates that widespread water anomalies will shrink. Severe to exceptional deficits will persist in western Turkey and Georgia, and surpluses will persist in Iran around Lake Urmia and along the Caspian Coast. Exceptional surpluses will re-emerge in Syria.

Central Asia and Russia: The forecast through March 2021 indicates a vast expanse of intense water deficit in Russia from the Gulf of Ob through the Central Siberian Plateau. Surpluses are forecast in the Ob River Watershed, along the Upper and Middle Yenisei River, and the Volga.

South Asia: The forecast through March 2021 indicates that widespread, intense water surpluses will persist in India's Deccan Plateau, Bangladesh, eastern Nepal, and Afghanistan. Moderate deficits will emerge in western Rajasthan. Transitional conditions are expected from Gujarat into Karnataka.

Southeast Asia and the Pacific: The forecast through March 2021 indicates widespread, intense surpluses in Vietnam, Cambodia, Laos, eastern and southern Thailand, and the Philippines. Areas of deficit include northern Thailand, central Sulawesi, and Papua New Guinea's northwestern coast.

East Asia: The forecast through March 2021 indicates that water surpluses will remain widespread in the Yellow and Yangtze River Watersheds, shrinking south of the Yangtze. Deficits are forecast for China's coastal southeast, Taiwan, Japan, and South Korea, and surpluses in North Korea.

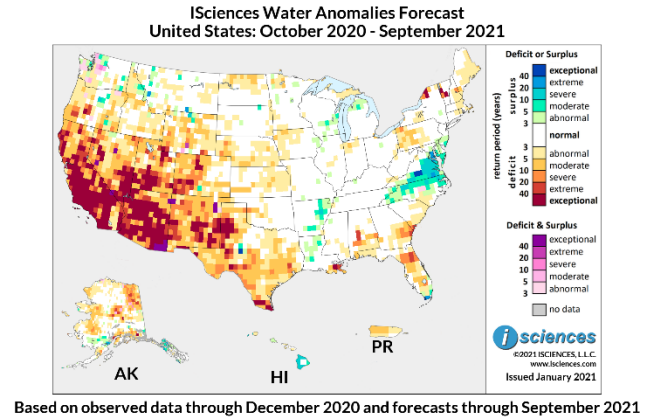
Australia & New Zealand: The forecast through March 2021 indicates that water deficits will retreat, persisting in Australia's southwestern tip and coastal Victoria. Areas of surplus include pockets in the Murray-Darling Basin and across northern Australia. Conditions in New Zealand will normalize.

Watch List: Regional Details

United States

The 12-month forecast ending September 2021 indicates widespread water deficits in the western U.S. Deficits are expected to be exceptional in many areas, especially California and Arizona.

Large pockets of intense deficit are also forecast in Nevada, Utah, Colorado, New Mexico, and northwestern Texas. Deficits of varying intensity are expected in many other regions of Texas including exceptional deficits in the state's southern tip. Generally moderate deficits are forecast in pockets throughout Wyoming, and to a lesser extent, in the Plains States.



Some small, isolated pockets of surplus are forecast from the U.S. Northwest into Montana, along with deficits in Oregon and the Salmon and Snake River regions of Idaho. Surpluses are forecast in a small central pocket on the Montana/Wyoming border.

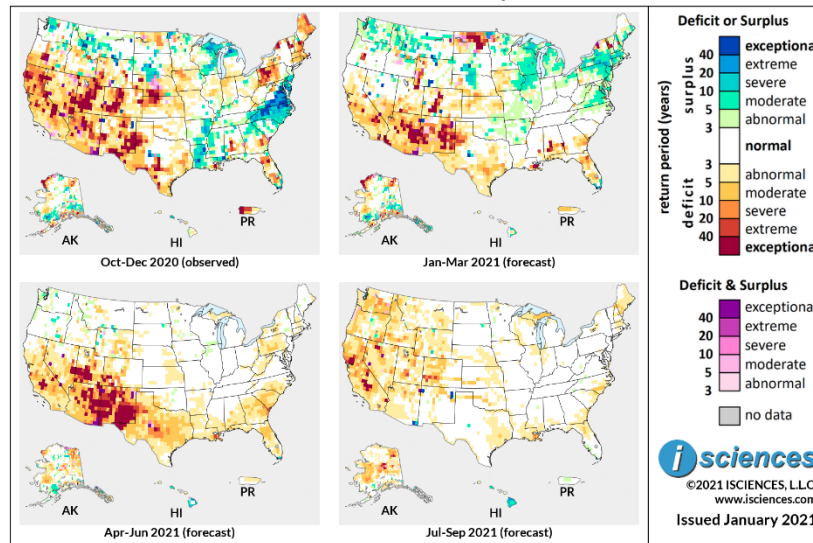
A few small pockets of surplus are expected in Wisconsin and the northern reaches of Michigan's Lower Peninsula. In Arkansas, surpluses will converge where the White and Black Rivers meet in the northeast, and a few small pockets are forecast further south and in Louisiana, though deficits are expected in the Mississippi Delta. Deficits are forecast for southern Alabama, southeastern Georgia, and Florida, and will reach extreme intensity in the Alabama River region, near Savannah, and south of Jacksonville. Generally moderate deficits will surround Lake Okeechobee, and surpluses will skirt Florida's southern coast.

In the Mid-Atlantic, surpluses are forecast from New Jersey's southern tip through northern North Carolina. Surpluses will be intense in the Roanoke River Basin in Virginia and the Delmarva Peninsula. Moderate deficits are expected in western Pennsylvania, but some small exceptional pockets are forecast in Upstate New York along the St. Lawrence River and also south of Burlington, Vermont. Severe deficits are expected in New Hampshire near Lake Winnepesaukee.

Outside the contiguous U.S., surpluses are forecast for Hawaii's Big Island. Alaska can expect deficits from Anchorage past Valdez; in the center of the state at the confluence of the Yukon and Tanana Rivers; in the northeast; and in large pockets of the west. Surpluses are forecast near Iliamna Lake and near Juneau. Moderate deficits are expected in western Puerto Rico.

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

**ISciences Water Anomalies Forecast
United States: October 2020 - September 2021**



Based on observed data through December 2020 and forecasts through September 2021

Though deficits in the West will shrink overall through March 2021, anomalies will remain widespread from California’s southern half through the Southwest and southern Rocky Mountain States. Deficits will be intense in Arizona, New Mexico, central Colorado, western Wyoming, and pockets of Southern California. In Texas, deficits are forecast west of Lubbock, from San Antonio to Houston, and in the Rio Grande region from Big Bend past Amistad Reservoir. Deficits will shrink and downgrade in Nebraska, Kansas, and Iowa, but will become exceptional in North Dakota. In the U.S. South, deficits are forecast for the Mississippi Delta, southern Alabama, southeastern Georgia, northern Florida and around Lake Okeechobee in the south. Surpluses will persist from Miami through the Keys.

Surpluses will increase somewhat from the Pacific Northwest through western Montana and on the Missouri River, and will persist from Nebraska into South Dakota. Generally moderate surpluses will increase in Wisconsin, Michigan, and pockets of Minnesota, and will emerge in eastern Iowa, northern Illinois, northeastern Ohio, and Oklahoma. Pockets will persist in Arkansas. Deficits will recede in the Northeast, persisting in northwestern Vermont and northern New York, as surpluses emerge in Pennsylvania, New York, New Jersey, Connecticut, Massachusetts, Vermont, New Hampshire, and Maine. Surpluses in the Mid-Atlantic states will shrink and moderate, persisting in Virginia.

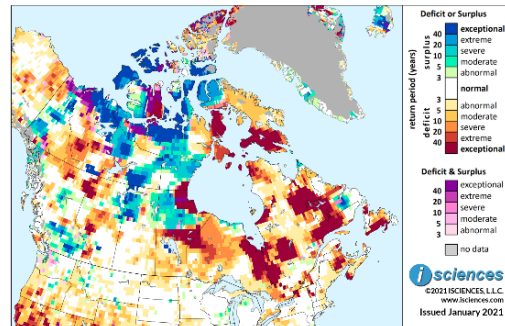
From April through June 2021, normal water conditions will return to many regions as surpluses nearly disappear. However, deficits will persist in the West and Southwest and exceptional deficits will increase in the Southwest. Deficits will increase in Texas; emerge in Pennsylvania, southern North Carolina, and South Carolina; and generally downgrade in Georgia, Florida, Alabama, and the Mississippi Delta.

The forecast for the final months – July through September 2021 – indicates that deficits will shrink and downgrade in the Southwest but increase in the Northwest and Rockies. Moderate deficits are forecast for the Arkansas and Canadian Rivers, Mississippi Delta, northern Michigan, and pockets in Maine, North Carolina, and Florida. Please note that WSIM forecast skill declines with longer lead times.

Canada

The 12-month outlook for Canada through September 2021 indicates vast areas of water deficit in the eastern half of the nation. Areas of exceptional deficit include southern Newfoundland, New Brunswick, 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. Surpluses are forecast in Labrador south of Lake Melville.

ISciences Water Anomalies Forecast
Canada: October 2020 - September 2021



Based on observed data through December 2020 and forecasts through September 2021

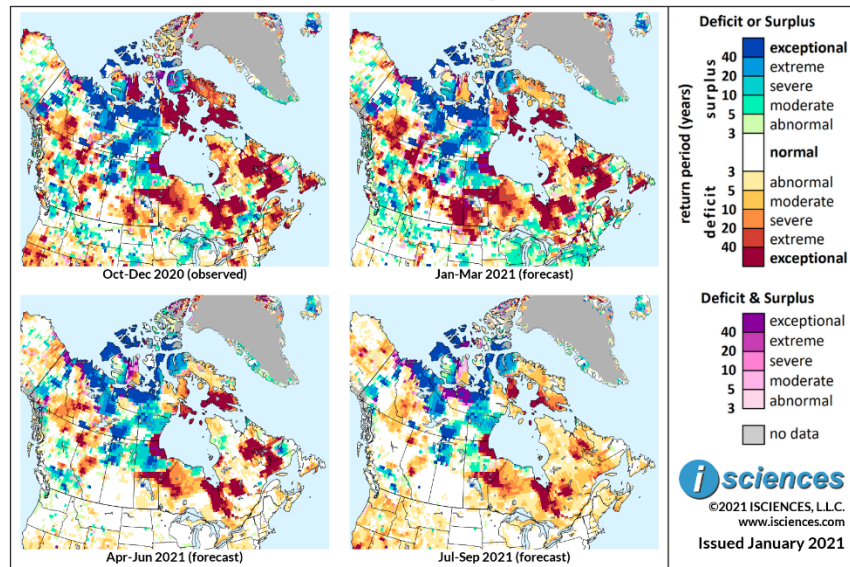
Deficits will be widespread in Northern Ontario, intense in Kenora District. Exceptional deficits are forecast on Hudson Bay in Manitoba and in a belt across the center of the province north of Lake Winnipeg with surpluses elsewhere in the north reaching west into Saskatchewan. Moderate deficits are forecast in southern Manitoba, but anomalies will be severe around Winnipeg.

Northwestern Saskatchewan can expect conditions of severe to exceptional surplus leading north well past Lake Athabasca into the Northwest Territories and west into Alberta. Surpluses are also expected in a pocket east of Calgary, Alberta. Deficits will reach exceptional intensity 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. A pocket of extreme deficit is forecast where the North Saskatchewan River crosses the central Alberta/Saskatchewan border.

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

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

**ISciences Water Anomalies Forecast
Canada: October 2020 - September 2021**



Based on observed data through December 2020 and forecasts through September 2021

The forecast through March 2021 indicates that exceptional deficits will persist in southern Newfoundland and eastern New Brunswick, on the Quebec/Labrador border and along the Gulf of St. Lawrence, west of Lake Mistassini, and spanning much of the Ontario/Quebec border. Surpluses will persist in a wide band south of Quebec’s Gouin Reservoir reaching the mouth of the St. Lawrence River. Deficits will persist east of Georgian Bay and along the St. Lawrence past Montreal. Surpluses will increase in Ontario northeast of Lake Superior and near Hudson Bay. Widespread, intense deficits will persist in Northern Ontario, particularly Kenora District.

Deficits will intensify across southern Manitoba into Saskatchewan’s southeastern quarter and will persist in a belt across central Manitoba in the northeast on Hudson Bay. Surpluses will persist in the rest of northern Manitoba, moderating as they reach into Saskatchewan. Intense deficits will increase along the North Saskatchewan River through its namesake and between the river’s north and south branches. Intense surpluses will persist in the northwest. Anomalies in Alberta and British Columbia will be much like those observed in the preceding months, though deficits on Vancouver Island will shrink.

From April through June 2021, deficits will retreat from New Brunswick and Newfoundland, but will persist in large blocks in the eastern half of the nation while surpluses shrink. Conditions in the southern portion of the Prairie Provinces will become nearly normal though surpluses will persist around Calgary. Deficits will shrink in Alberta but will continue to be widespread in the Middle Athabasca River region and in the northwest. In British Columbia, deficits will retreat from Vancouver Island and shrink elsewhere. Surpluses will shrink as well but remain widespread in the south.

The forecast for the final months – July through September 2021 – indicates widespread deficits in the east though exceptional deficits will shrink. Anomalies elsewhere will persist overall, shrinking in some regions. Please note that WSIM forecast skill declines with longer lead times.

Mexico, Central America, and the Caribbean

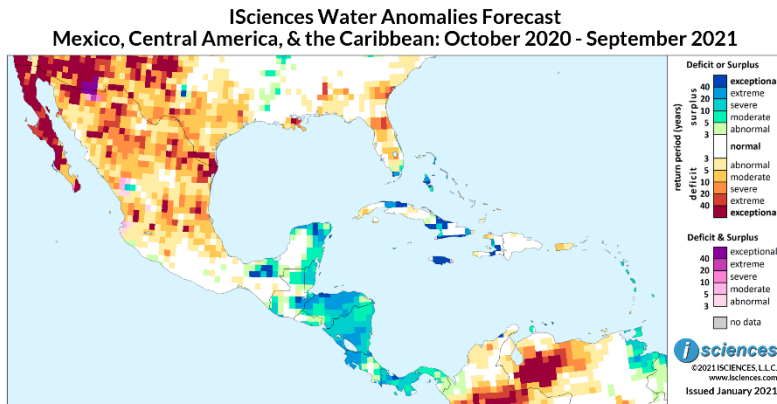
The 12-month forecast ending September 2021 indicates deficits of varying severity throughout northern and central Mexico. Anomalies will be exceptional in the Baja Peninsula and pockets across the north.

In central Mexico, deficits of varying intensity will reach from Nayarit on the Pacific through northern Veracruz State. In the south, surpluses are forecast in Tabasco, northern Chiapas, Yucatán, and Quintana Roo. Surpluses will be exceptional in Chiapas.

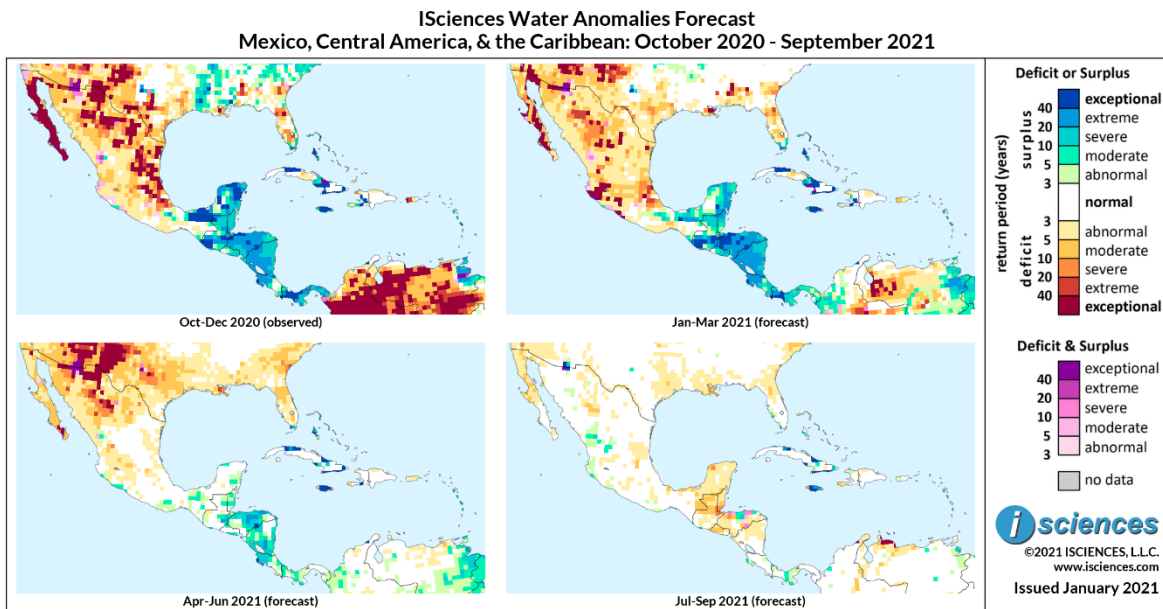
Surpluses are also forecast throughout much of Central America and will be extreme in northern Honduras and around Lake Nicaragua.

In the Caribbean, intense surpluses are forecast in Jamaica, pockets of Cuba, Port-au-Prince (Haiti), and the Bahamas. Deficits are expected in Turks and Caicos Islands.

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



Based on observed data through December 2020 and forecasts through September 2021



Based on observed data through December 2020 and forecasts through September 2021

The forecast through March 2021 indicates that water deficits of varying intensity will persist in the bulk of Mexico though the extent of exceptional deficits will shrink. Deficits will be mild to moderate in many

regions, but several large areas will experience more intense anomalies: deficits will be exceptional in pockets of central and southern Baja, and in much of Jalisco and Colima on the west coast; moderate to exceptional in Chihuahua, Durango, and Coahuila in the north; and extreme to exceptional in Veracruz and its inland neighbors. Surpluses in the Yucatán Peninsula and nearby southern states will shrink and downgrade somewhat.

Widespread surpluses will persist throughout Central America and will include extreme to exceptional anomalies. Intense surpluses will also persist in Jamaica, pockets of Cuba, Port-au-Prince, and the Bahamas.

From April through June 2021, deficits and surpluses in Mexico will shrink considerably, leaving many regions with normal conditions. Deficits will persist across the northern states and while moderating in Baja will intensify in Chihuahua, becoming exceptional in the north. Surpluses in Central America will shrink and downgrade, persisting primarily in Honduras, Nicaragua, and northern Costa Rica. In the Caribbean, exceptional surpluses will persist in Jamaica, and surpluses of varying intensity in pockets of Cuba and in the Bahamas.

The forecast for the final three months – July through September 2021 – indicates nearly normal conditions for much of Mexico with some mild to moderate deficits in northern Baja, southern Chihuahua, and the Yucatán. Surpluses are forecast in northern Sonora in the Rio Batepito region and in southern Durango. Surpluses will recede in Central America as moderate deficits emerge, and intense surpluses will persist in Jamaica and other pockets in the Caribbean.

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

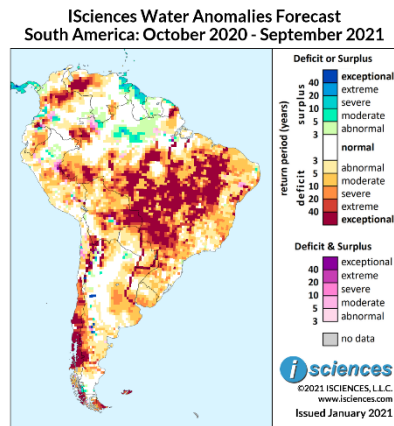
South America

The 12-month forecast through September 2021 indicates water deficits in much of Brazil south of the Amazon River including a vast region of intense deficit from Rondônia in the west into Bahia in the east and from Pará in the north through Paraná in the south. Deficits will be exceptional in many areas and along many rivers. Surpluses, primarily moderate, are forecast in northeastern Amazonas.

Northern Guyana and coastal French Guiana can expect surpluses, though southeastern French

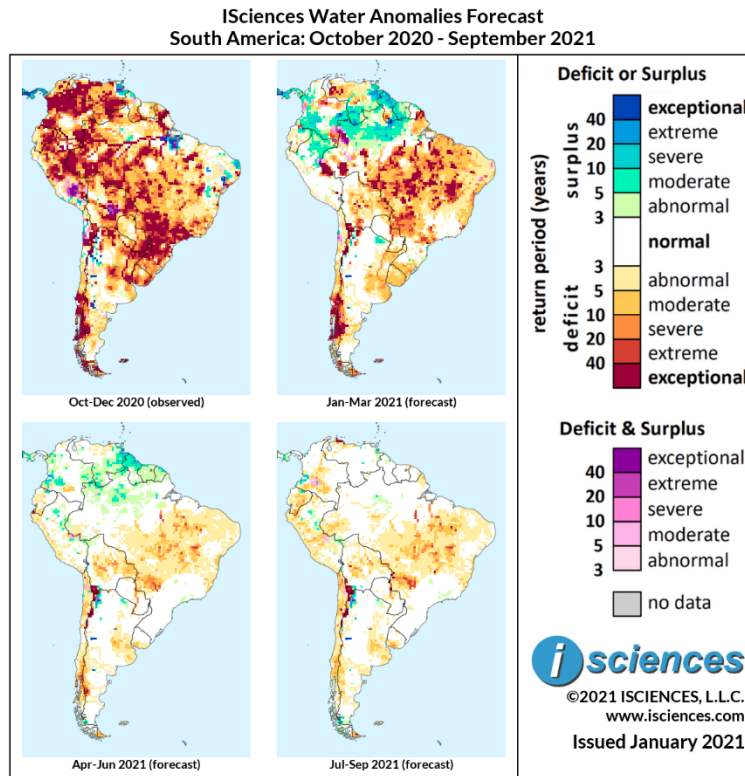
Guiana will experience intense deficits. Surpluses in the Orinoco Delta of Venezuela will be severe, but exceptional deficits are forecast in the northwest in the watershed of the Orinoco's western tributaries, and will reach well into Colombia north of Bogota, downgrading slightly. Colombia's western reaches will see mixed conditions and intense deficits are forecast in the southeast. Severe deficits are expected in eastern Ecuador and deficits of varying intensity in central Peru.

Bolivia, too, will experience deficits, with intense anomalies in central and eastern regions and moderate deficits near La Paz. Exceptional deficits will trace the Paraguay River through the center of its namesake and will also follow the Paraná River along the nation's eastern boundary and through Argentina. Argentina can expect pockets of intense deficit in the northeast and severe deficits in Córdoba Province, moderating as they reach through Buenos Aires Province to the Atlantic. Deficits are forecast along rivers in Patagonia and exceptional deficits in Tierra del Fuego and the Falkland Islands. Deficits are forecast for many regions of Chile including exceptional anomalies throughout much of the nation's southern half.



Based on observed data through December 2020 and forecasts through September 2021

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



Based on observed data through December 2020 and forecasts through September 2021

The forecast through March 2021 indicates that deficits will shrink considerably overall but will remain widespread in Brazil and Chile, and widespread surpluses will emerge across the northern portion of the continent. Surpluses of varying intensity are forecast in northern Peru, western and far eastern Colombia, southern Venezuela, most Brazilian regions north of the Amazon, and from eastern Venezuela through northern Guyana, Suriname, and coastal French Guiana. Deficits are forecast in western Venezuela, northern Colombia, southwestern Guyana, and eastern Guiana into Brazil.

Widespread deficits of varying intensity are forecast for much of Brazil south of the Amazon, though normal conditions are expected in some southeastern states. Regions with a forecast of exceptional deficit include Acre, southern Rondônia, Mato Grosso, and western Bahia. Deficits in Acre will reach across the border into Ucayali, Peru. Deficit of generally lesser intensity are forecast for Bolivia. In Paraguay, deficits will be extreme along the Paraguay River, downgrading to severe through Argentina. Moderate deficits are expected on the Paraná River, and in northeastern Argentina, northern Buenos Aires Province, Uruguay, and southern Rio Grande do Sul, Brazil. A pocket of surplus is expected in northern Argentina's Chaco Austral region. Intense deficits will persist in southern Chile, reaching into Argentina; moderate deficits in central Chile; and mixed conditions in the north.

From April through June 2021, normal water conditions will return to many regions of the continent as both deficits and surpluses recede. Pockets of moderate surplus are forecast in the north, including

western Colombia, eastern Venezuela, and northern Guyana. Mild deficits are expected in central Brazil overall, pocked with severe to extreme anomalies, particularly in Mato Grosso do Sul. Deficits will shrink in Bolivia, disappear on the Paraná River, and downgrade to severe on the Paraguay River, normalizing in its path through Argentina. Deficits will shrink and downgrade in Argentina and Chile, leaving some moderate deficits in eastern Argentina and northern Chile, deficits of varying intensity around the Gulf of Corcovado, and mixed conditions in northwestern Argentina.

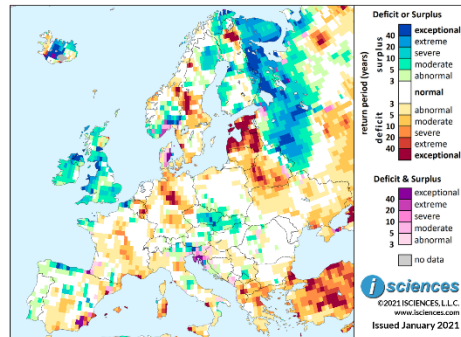
In the final quarter – July through September 2021 – surpluses in the north will nearly disappear, and conditions elsewhere will remain much the same as forecast through June, with some increase in moderate deficits in western nations.

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

Europe

The 12-month forecast through September 2021 indicates widespread water surpluses in western European Russia with anomalies reaching exceptional intensity. Surpluses are also forecast for the United Kingdom, Ireland, Czech Republic, Slovakia, and scattered pockets in nearby nations of Central Europe. Other areas of surplus include Spain's northern coast and pockets in its interior, coastal Belgium, Oslo (Norway), pockets around the Gulf of Bothnia and eastern Baltic Sea, Umbria in central Italy and the Alps in the northeast.

ISciences Water Anomalies Forecast
Europe: October 2020 - September 2021



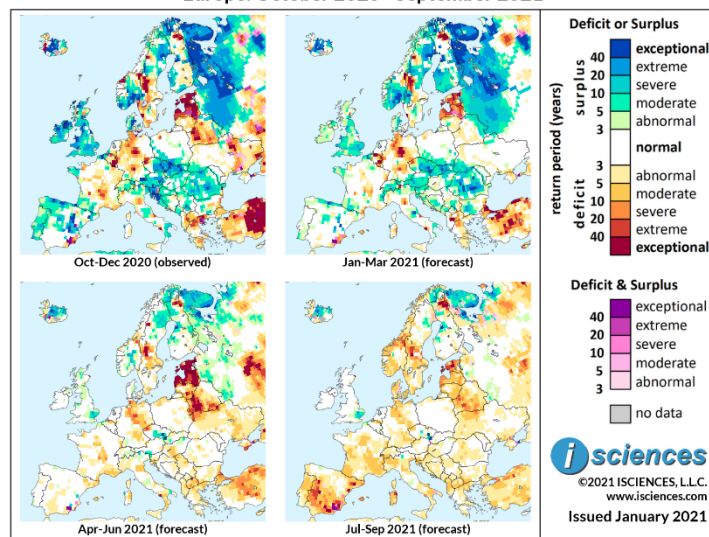
Based on observed data through December 2020 and forecasts through September 2021

Deficits are expected from the Baltics through Belarus and several regions in Ukraine. Anomalies will be exceptional in Estonia and Latvia. In European Russia, deficits are forecast in the Volga River Basin, the eastern portion of the Don River Basin, and the Upper Mezen River region in the north. Exceptional deficits are forecast for Finnish Lapland and deficits reaching exceptional intensity in the Dalälven River Watershed in central Sweden.

Deficits are expected in pockets of Germany, Belgium, France, Italy, Spain and in many regions of the Balkans. Areas with intense anomalies include southern Belgium, Germany's Harz Mountains, and Serbia. In France, deficits will be severe along parts of the Loire River and extreme near Marseille. Italy can expect deficits in Bologna, Sardinia, and Sicily.

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

ISciences Water Anomalies Forecast
Europe: October 2020 - September 2021



Based on observed data through December 2020 and forecasts through September 2021

The forecast through March 2021 indicates that deficits will shrink, returning Ukraine and much of Belarus and southern European Russia to near-normal conditions. Deficits will remain exceptional in Finnish Lapland and central Sweden, downgrading somewhat in Estonia and Latvia. Deficits will also persist in Germany, Belgium, Auvergne (France), central Albania, from Macedonia into Greece, and several pockets in Italy including Bologna. Areas with a forecast of intense deficit include Estonia, Latvia, Belgium, and the Harz Mountains in Germany. Deficits will intensify in coastal Bulgaria.

Widespread surpluses will persist in western European Russia and will be extreme to exceptional. In Central Europe, surpluses will remain widespread in a vast arc from Switzerland through Romania, reaching north into Germany and southwestern Ukraine. Anomalies will be severe to extreme in Czech Republic, Slovakia, and Romania. Pockets of surplus are also forecast in northern Balkan nations, but deficits will persist in Macedonia and nearby regions. Though surpluses will shrink and downgrade in Ireland and the U.K. they will remain widespread in England and Wales. Pockets of surplus will persist in France, Italy, and on the Iberian Peninsula, intensifying in central Italy.

From April through June 2021, surpluses will shrink considerably. In Western and Central Europe, pockets will persist in Czech Republic, along the Drau River (Drava) in Austria, and the East of England region. Some areas of generally moderate surplus will persist in the Nordic nations and western European Russia, but anomalies will be more intense and widespread in the Kola Peninsula. Deficits in Estonia and Latvia will elevate, becoming exceptional, and deficits will emerge in Lithuania. Intense deficits will emerge in western and southern Belarus and in the Upper Volga River Basin. Moderate deficits will emerge in the Dnieper River Watershed (Dnipro) of central Ukraine. Deficits will downgrade in Germany but will be severe, and deficits will nearly disappear in Belgium. Deficits, generally moderate, are forecast for central and southern France, a few pockets in Italy including Bologna, pockets of Hungary, Serbia, Macedonia, northern Greece, and Bulgaria's southern coast.

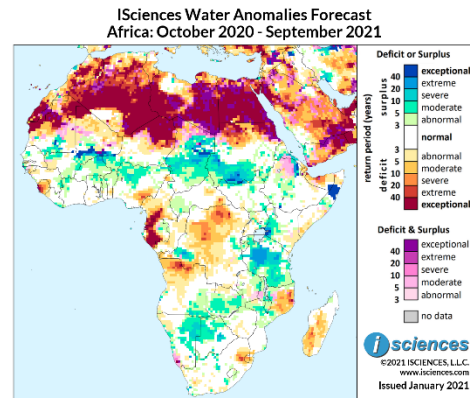
The forecast for the remaining months – July through September 2021 – indicates that surpluses will shrink, persisting primarily in the Kola Peninsula. Deficits will downgrade in the Baltics, Belarus, and the Upper Volga region, but will increase in Scandinavia, northern Russia, France, Italy, and the Iberian Peninsula.

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

Africa

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

Surpluses of varying intensity are expected across the Sahel, dipping into northern Nigeria, and in Eritrea and northeastern and central Ethiopia. Surpluses will be extreme to exceptional in central Mali, central Chad, southern Sudan, and northeastern Ethiopia. In Africa's Horn, surpluses will be exceptional in the Nugaal region of northern Somalia, but intense deficits are forecast in a pocket of Somaliland.



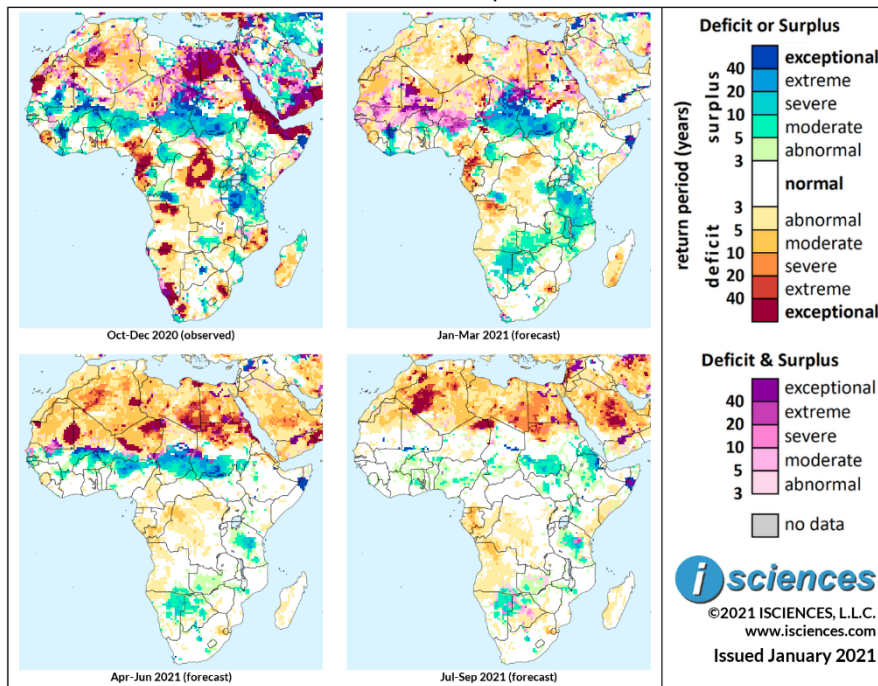
Based on observed data through December 2020 and forecasts through September 2021

Intense deficits are also forecast in Sierra Leone and from southern Cameroon through Equatorial Guinea into western Gabon. Areas of moderate to extreme deficit include southeastern Nigeria, the northern portion of the Congo River Basin, northern Angola, northeastern Mozambique, Swaziland and nearby in South Africa's Upper Vaal River region. Moderate to severe deficits are forecast for central and southwestern Madagascar.

In East Africa, moderate to extreme surpluses will dominate Tanzania, and surpluses are also forecast for western Kenya and along the Victoria Nile through Uganda. Some pockets of moderate surplus are expected in Malawi; western Mozambique; western Zambia; southeastern Angola; eastern Namibia, the Auob River, and the central coast; and northern Botswana and the Molopo River in the south. Other areas of surplus include the region east of Kinshasa in Democratic Republic of the Congo and a few isolated pockets in South Africa.

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

ISciences Water Anomalies Forecast
Africa: October 2020 - September 2021



Based on observed data through December 2020 and forecasts through September 2021

The forecast through March 2021 indicates that deficits in Africa will shrink and downgrade. Deficits in North Africa will be mild to moderate overall, and surpluses will emerge along the Nile River in southern Egypt. Moderate deficits will increase in the west as the Sahel transitions, but intense surpluses will persist in the eastern Sahel. Surpluses will also persist in western Central African Republic, the Nile through South Sudan, pockets of southern Ethiopia, and the Nugaal Region of Somalia.

Around the Gulf of Guinea, surpluses will persist in western Ghana and smaller pockets in northern Gulf nations; deficits will persist in southeastern Nigeria, Cameroon, Equatorial Guinea, and Gabon, downgrading somewhat. In Democratic Republic of the Congo, deficits will moderate and surpluses will persist east of Kinshasa. Surpluses will persist in western Kenya, Burundi, and throughout Tanzania, and will emerge in Malawi and northern Mozambique. Surpluses will also emerge in southeastern Angola, and eastern Namibia, and will increase in Zambia and Botswana. Deficits are forecast for northern Angola, Swaziland and nearby in South Africa, and in central and southern Madagascar.

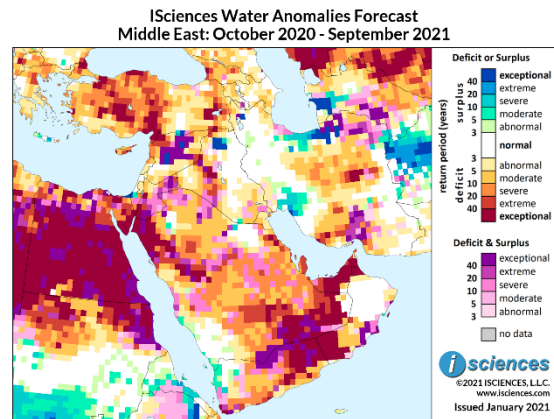
From April through June 2021, large pockets of exceptional deficit will emerge across North Africa, and surpluses will re-emerge in the western Sahel and shrink somewhat in the east. Conditions around the Gulf of Guinea will generally normalize. Surpluses will continue in Nugaal, Somalia but will shrink in East Africa, persisting in central Tanzania. Moderate surpluses will persist in Namibia and Botswana.

The forecast for the final quarter – July through September 2021 – indicates that deficits will remain widespread across northern Africa but will shrink in the southern Sahara. Surpluses will shrink considerably in the Sahel; persist in Tanzania and eastern Namibia; and emerge in Ethiopia and Eritrea. Please note that WSIM forecast skill declines with longer lead times.

Middle East

The forecast for the 12-month period ending September 2021 indicates water deficits of varying intensity in Turkey, the Caucasus region, pockets in the Levant, much of the Arabian Peninsula, and central and southern Iran.

Deficits will be exceptional in the United Arab Emirates, from eastern Yemen into western Oman and southeastern Saudi Arabia, Arabian regions along the northern Red Sea, and many pockets in Turkey, including around Lake Van in the east and west of Lake Tuz in Central Anatolia.



Extreme deficits are expected in Qatar and Bahrain. Severe to exceptional anomalies will blanket much of central Saudi Arabia, including Riyadh Province, moderating in the northeastern region of the country. Transitional conditions are forecast spanning the southern Saudi border. Some small pockets of moderate surplus are forecast west of Sanaa in Yemen, but deficits will cover much of the remaining area of the nation and into Oman.

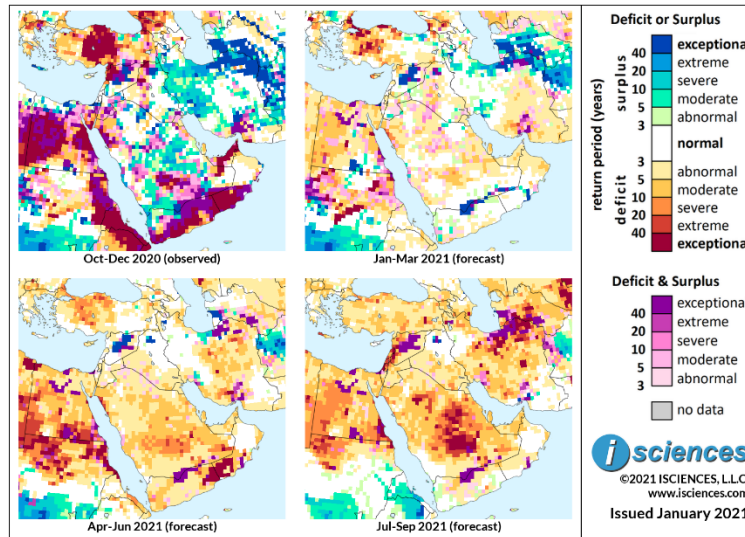
In the Levant, transitional conditions (pink/purple) are forecast for northern Syria and much of Jordan, but intense deficits are expected in Aleppo. Exceptional surpluses will surround Mosul, Iraq, but deficits are forecast west of the Euphrates River.

In Iran, surpluses will follow much of the Caspian Coast reaching inland to Tehran, intensifying near Turkmenistan with transitional conditions as well. Surpluses are also forecast in a pocket on the northern Persian Gulf; deficits and transitional conditions are expected in the southern Persian Gulf region and around the Strait of Hormuz; and widespread deficits of varying intensity are expected in central Iran.

Deficits of varying intensity are forecast for Georgia. Moderate deficits are predicted in pockets of Armenia and Azerbaijan.

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

**ISciences Water Anomalies Forecast
Middle East: October 2020 - September 2021**



Based on observed data through December 2020 and forecasts through September 2021

The forecast through March 2021 indicates that widespread water anomalies - deficits and surpluses - will shrink in the region. However, severe to exceptional deficits will persist in western Turkey and in Georgia. Surpluses are forecast in small pockets of northeastern Turkey. Exceptional surpluses will re-emerge in central and northern Syria. Mild deficits will emerge in central Iraq and transitional conditions are forecast around Mosul. In Iran, moderate to extreme surpluses will persist in the north around Lake Urmia and along the Caspian Coast with exceptional surpluses and transitional conditions near Turkmenistan. Moderate surpluses will persist at the northern end of the Persian Gulf, but deficits and transitional conditions are forecast in the south reaching from the Strait of Hormuz. Generally mild deficits are forecast to emerge in central Iran.

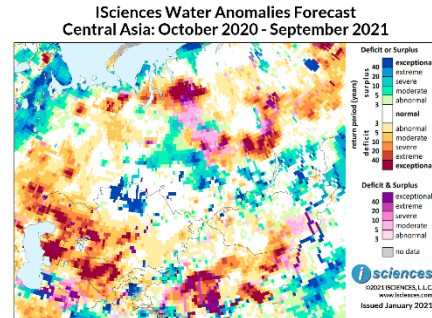
Surpluses will nearly disappear in Saudi Arabia as pockets of mild to moderate deficit emerge, but exceptional surpluses will emerge along the southern border. Mild to moderate deficits are forecast in Qatar, UAE, and northern Oman.

From April through June 2021, surpluses will continue to shrink, leaving a few persistent pockets, and deficits will increase. Intense surpluses along with transitional conditions are forecast for northern Syria, and exceptional surpluses will re-emerge around Mosul, Iraq. Moderate surpluses and transitional conditions will linger along Iran's Caspian Coast and in pockets near the northern end of the Red Sea. Deficits will persist in Turkey's western half, downgrading from exceptional, and the Caucasus region will normalize overall. Moderate to severe deficits will increase in central and southern Saudi Arabia, covering a vast region. Exceptional deficits will emerge spanning the Yemen/Oman border. Deficits will increase in central Iran.

In the final quarter – July through September 2021 – surpluses will nearly disappear, persisting near Mosul. Deficits will emerge in the Levant, intensify in central Saudi Arabia and Iran, and retreat from Yemen and Oman. Please note that WSIM forecast skill declines with longer lead times.

Central Asia and Russia

The 12-month forecast through September 2021 indicates widespread deficits in much of the Caspian Basin and well into central Kazakhstan and through Uzbekistan. Deficits will be exceptional in many areas. Widespread deficits are also forecast for the Volga River Watershed in Russia, the tundra region in the Northern European Plain, the central banks of the Gulf of Ob, the region of the Lower Yenisei and Taz Rivers, the Lena River Watershed north of Lake Baikal, and a vast stretch from the Alden River (an eastern tributary of the Lena) to the Sea of Okhotsk (not shown).

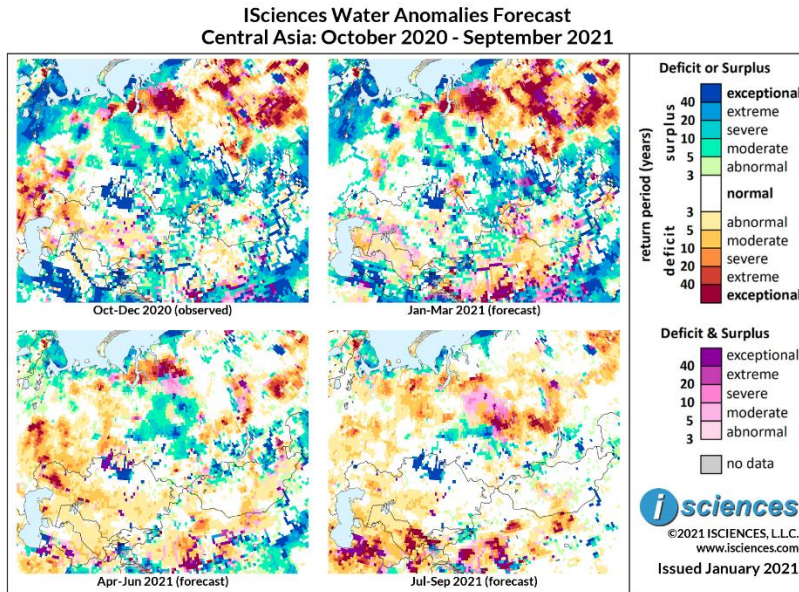


Based on observed data through December 2020 and forecasts through September 2021

Surpluses are forecast in coastal Arctic Russia, the region of the Middle Ob River and its right tributary, the Vakh River, much of the Tom River Watershed, and around Irkutsk west of Lake Baikal.

In Kazakhstan, exceptional surpluses are expected in the north in the Ishim River Watershed including the capital Nur-Sultan (Astana). In addition to widespread deficits in Uzbekistan, deficits will also reach south into Turkmenistan though intense surpluses are expected near Turkmenistan's Caspian Coast. Intense surpluses are also forecast for central Tajikistan and the southern portion of the Fergana Valley. Eastern Kyrgyzstan can expect surpluses of lesser intensity and some moderate deficits in the west.

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



Based on observed data through December 2020 and forecasts through September 2021

The forecast through March 2021 indicates a vast expanse of intense water deficit in Russian from the central banks of the Gulf of Ob through much of the vast Central Siberian Plateau. Surpluses are forecast

in the coastal Arctic and the Ob River Watershed. Exceptional surpluses are expected along the Upper and Middle Yenisei River but deficits will prevail in the river's lower region. Moderate surpluses will emerge on the Volga River.

In Kazakhstan, surpluses will remain exceptional in the Ishim River region in the north, including in Nur-Sultan. Deficits in the northwest will shrink and some areas of surplus will emerge north of the Caspian Sea while moderate deficits increase further south between the Caspian and Uzbekistan. Many scattered pockets of surplus are forecast throughout the country especially in the eastern half of the Kazakh Upland. Surpluses will increase in Turkmenistan and will include exceptional anomalies. Intense surpluses are also forecast for central Tajikistan though deficits are forecast in the east. Mixed conditions are expected in Kyrgyzstan but surpluses will dominate the east.

From April through June 2021, widespread deficits in Russia from the Gulf of Ob through Siberia will shrink. However, intense deficits will persist across the Gulf of Ob, and in the Lower Yenisei River region, the Middle Lena River Watershed (Alden River), the Lena region north of Lake Baikal, and the Lena Delta (not shown). Surpluses will shrink in the Lower Ob region; a vast expanse of surpluses will consolidate from the eastern Ob Watershed into the eastern Yenisei Watershed; and exceptional surpluses will retreat from the Middle Yenisei and Angara Rivers. Deficits will emerge between the Ural Mountains and the Ob River and in the Volga River Watershed.

In Kazakhstan, intense deficits will emerge north of the Caspian Sea, leading to moderate deficits in the central west. Exceptional surpluses will persist near Nur-Sultan in the north. Surpluses will shrink in Turkmenistan, and moderate deficits will emerge in pockets of the east. Surpluses will shrink but persist in central Tajikistan and eastern Kyrgyzstan.

The forecast for the final months – July through September 2021 – indicates that surpluses will shrink in Russia and deficits will shrink and moderate in the Volga region but increase and intensify in the Yenisei Watershed. Intense deficits will emerge in Turkmenistan and eastern Uzbekistan.

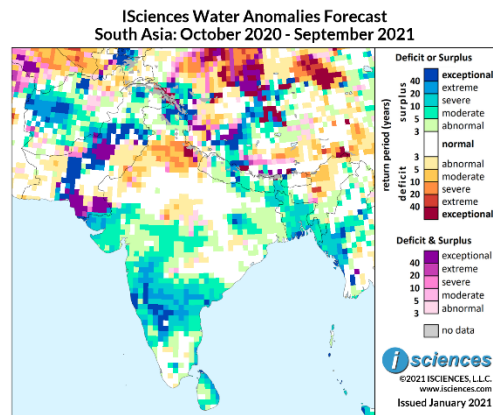
Please note that WSIM forecast skill declines with longer lead times.

South Asia

The 12-month forecast through September 2021 indicates widespread surpluses of varying intensity in western India and the Deccan Plateau from Gujarat through Maharashtra, southern Madhya Pradesh, Goa, Karnataka, Telangana, and Andhra Pradesh. Surpluses will be exceptional along Maharashtra's southern coast and the Tungabhadra River Basin in Karnataka. Surpluses are also forecast for Jammu and Kashmir, Jharkhand, and Bihar.

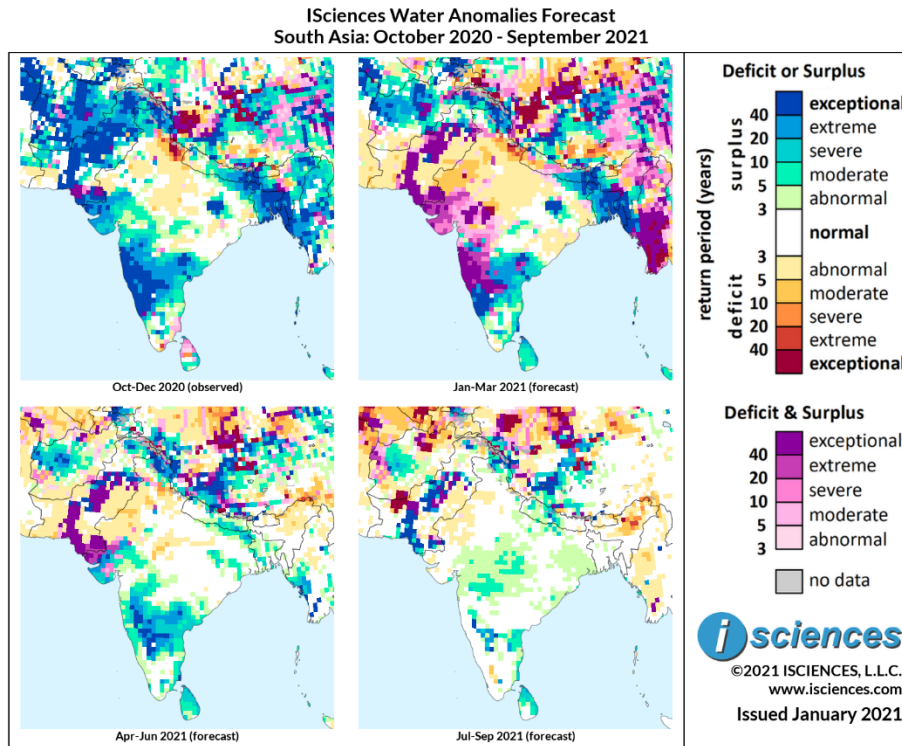
Moderate deficits are forecast in western Rajasthan and the Far Northeast, and severe deficits in the north from Punjab through Uttaranchal.

Sri Lanka can expect surpluses, and surpluses will dominate all of Bangladesh, reaching exceptional intensity in the Ganges Delta. Surpluses are expected in many regions of Nepal and into Bhutan and will be exceptional along the Gandaki River. Intense surpluses will prevail in much of Pakistan west of the Indus River and in northern tributaries along with transitional conditions (pink/purple) in central and southern Pakistan. In Afghanistan, surpluses are expected across the breadth of the nation and surrounding Mazar-e Sharif in the northwest. Anomalies will be intense in the Harirud River region and Mazar-e Sharif.



Based on observed data through December 2020 and forecasts through September 2021

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



Based on observed data through December 2020 and forecasts through September 2021

The forecast through March 2021 indicates that intense water surpluses will persist in many parts of the region, but transitions are also forecast as deficits emerge. Surpluses will persist in southern India in Telangana, Andhra Pradesh, and southern Karnataka, and will emerge in pockets of Tamil Nadu and throughout Sri Lanka. Anomalies will be exceptional in Karnataka. Surpluses will also persist in some regions in the east including Jharkhand, Bihar, Tripura, and Mizoram, and surpluses in the far north will shrink somewhat. In the west, a vast region from Gujarat through northern Karnataka will be in transition (pink/purple). Moderate deficits will emerge in western Rajasthan and deficits of greater intensity will persist in the northern state of Uttarakhand. Transitional conditions are expected in the Far Northeast.

Intense surpluses will persist throughout Bangladesh and from Nepal's eastern half well into Bhutan, but deficits will emerge in western Nepal. Surpluses of varying intensity will continue in northern Pakistan, but many areas of former surplus elsewhere will be in transition as deficits begin to emerge. In Afghanistan, surpluses will shrink in the south but remain widespread and intense in much of the rest of the nation. Anomalies will be exceptional around Mazar-e Sharif in the north and extreme near Herat in the west.

From April through June 2021, surpluses will shrink and downgrade considerably in Bangladesh, Nepal, and Bhutan but will remain widespread in India's Deccan Plateau and will re-emerge in Gujarat and on the west coast. Surpluses will shrink and moderate in western Jharkhand but will emerge along the

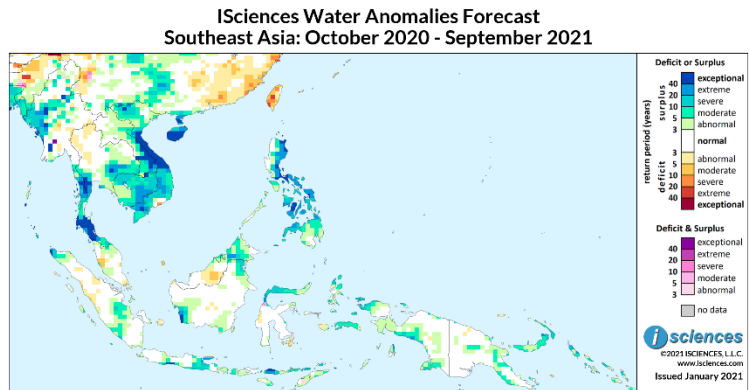
Subarnarekha River in the east. Deficits in India will downgrade, becoming mild overall. Surpluses in Afghanistan will shrink somewhat and moderate but will remain widespread in the west. Transitional conditions will persist in Pakistan with surpluses in the north.

The forecast for the final months – July through September 2021 – indicates that surpluses will shrink but linger in the Deccan Plateau and Afghanistan, emerge in central India, and re-emerge in Pakistan. Deficits are forecast in Afghanistan's northern and southern extremes and in India's Far Northeast.

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

Southeast Asia and the Pacific

The 12-month forecast through September 2021 indicates surpluses in Southeast Asia, the Philippines, and pockets throughout Indonesia. Anomalies will be particularly widespread and intense in Vietnam with exceptional surpluses in Vietnam’s narrow neck, extreme surpluses in the Central Highlands, and moderate to exceptional surpluses in the Mekong Delta.



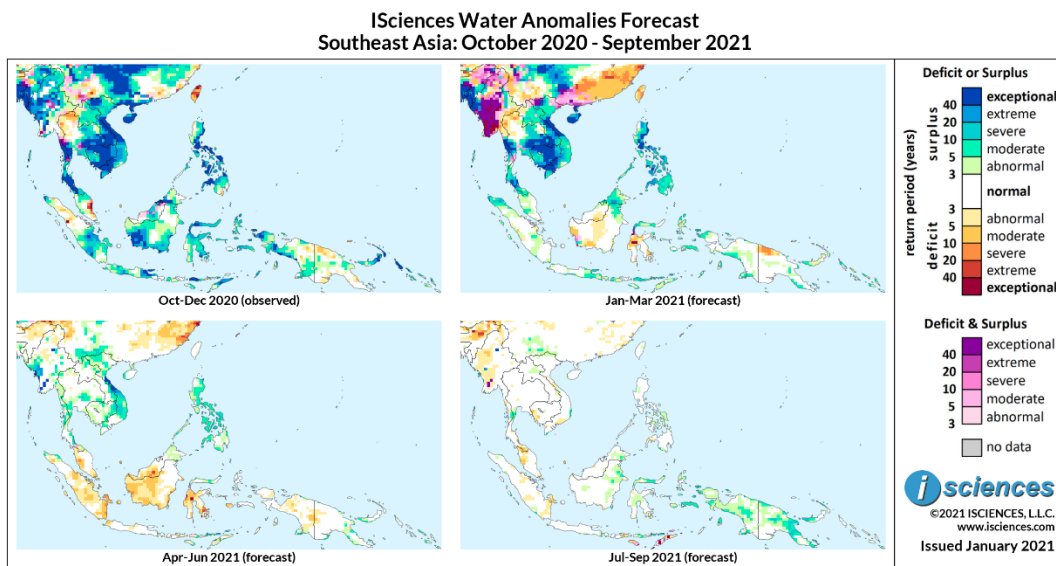
Based on observed data through December 2020 and forecasts through September 2021

In Laos, surpluses are expected to be intense in the south but milder in the north. Surpluses ranging from moderate to extreme are forecast from southeastern Thailand through Cambodia, and anomalies will be exceptional in Peninsular Thailand. Myanmar, too, can expect surpluses, intense in its narrow southern extent; of varying intensity in the center of the nation; and severe west of the Irrawaddy River.

Surpluses are also forecast for much of the Philippines where anomalies will be extreme to exceptional in eastern Luzon and the central Philippines.

Pockets of surplus are expected throughout Indonesia and island nations in the region. Areas of surplus include pockets in Sumatra and Java, northeastern Borneo, northern Sulawesi, the Lesser Sunda and Maluku Islands, and New Guinea. Anomalies will be especially intense on Flores Island. A few isolated pockets of moderate deficit are forecast north of Kuala Lumpur in Peninsular Malaysia and in the region of the Upper Rajang River in Malaysian Borneo.

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



Based on observed data through December 2020 and forecasts through September 2021

The forecast through March 2021 indicates widespread, intense surpluses in Vietnam, Cambodia, and Laos and will include exceptional anomalies. Intense surpluses are forecast in Thailand's eastern and southern regions, while pockets of deficit are expected in the north. Myanmar can expect complicated water conditions including transitions in the center of the country combined with exceptional deficits, particularly in the Irrawaddy Delta; exceptional surpluses in the nation's far west and narrow southern reaches; and moderate deficits near the Thai border. Surpluses are expected throughout much of the Philippines and will include exceptional anomalies in eastern Luzon. Surpluses will shrink in Indonesia and New Guinea, but many pockets will persist. Deficits will become severe on Papua New Guinea's northwestern coast and will emerge in central Sulawesi and pockets of Indonesian Borneo.

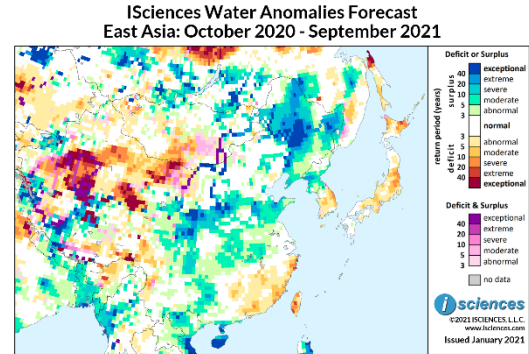
From April through June 2021, surpluses will shrink and downgrade in Southeast Asia and the Philippines though anomalies will remain widespread in Vietnam and the central and northern Philippines. Surpluses will nearly disappear in Malaysia, Indonesia, and New Guinea. Deficits are forecast for pockets of Malaysia, Sumatra, western Borneo, Sulawesi, and central New Guinea.

The forecast for the final months – July through September 2021 – indicates near-normal water conditions in many parts of the region with pockets of surplus in New Guinea and pockets of exceptional deficit in Timor.

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

East Asia

The 12-month forecast for East Asia through September 2021 indicates widespread water surpluses of varying intensity in the Yellow (Huang He) River Basin, reaching exceptional intensity in parts of Shaanxi and Gansu. In the Yangtze Basin, primarily moderate surpluses are forecast for the river's middle and upper regions, with some deficits in the far reaches of the upper basin.



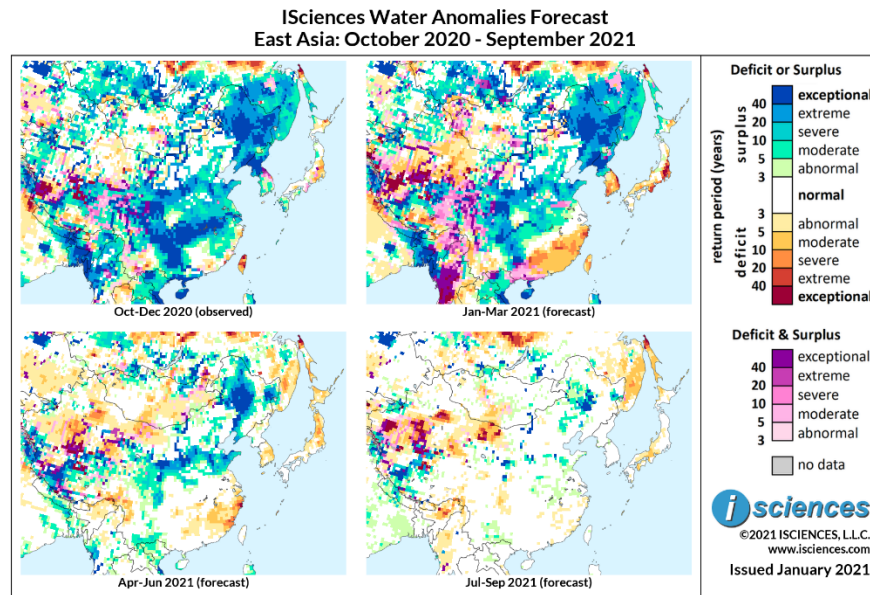
Based on observed data through December 2020 and forecasts through September 2021

Northeast China can expect widespread extreme to exceptional surpluses, and surpluses are expected on the Liaodong Peninsula in the northern Bohai Sea reaching well into Liaoning Province. In Southeast China, deficits are expected, mild to moderate overall but more intense along the coast and in Taiwan. Moderate to severe surpluses are forecast in the central Pearl River Basin between the Hongshui and Rong tributaries. On the southern coast, surpluses will be extreme to exceptional in Guangdong's Leizhou Peninsula and nearby in Hainan.

Tibet (Xizang) can expect a complicated patchwork of water conditions including surpluses in the center of the region, pockets of deficit in the east and west, and some areas in transition. In China's vast northwest, intense deficits will dominate Xinjiang Province along with some transitional conditions. Deficits will reach into Qinghai, northern Gansu, and western Inner Mongolia.

Deficits are forecast in south-central and northwestern Mongolia, surpluses in the east and far north. Surpluses are expected in North Korea and will be extreme in the region north of Pyongyang. Moderate deficits are forecast for South Korea, and moderate to severe deficits for Hokkaido and central Honshu, Japan.

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



The forecast through March 2021 indicates that surpluses will remain widespread and intense in Northeast China dominating a vast area from the Russian border to the Bohai Sea. Surpluses will also remain widespread in the Yellow and Yangtze River Watersheds. However, surpluses will shrink south of the Yangtze in the middle portion of its basin, and the extent of exceptional deficits will shrink overall. Exceptional surpluses are forecast between the Hongshui and Rong Rivers, tributaries of the Pearl River, with transitional conditions to the south and exceptional surpluses picking up again in Guangdong’s Leizhou Peninsula and nearby Hainan.

Widespread moderate to severe deficits will emerge in southeastern China while deficits in Taiwan moderate. Some pockets of moderate deficit are forecast in Yunnan. In Tibet, surpluses are forecast south of the Yarlung River (Brahmaputra) topped by a layer of deficits north of the river. Deficits are also forecast in western Tibet, surpluses in the central region, and transitions in the east. Widespread deficits will dominate much of Xinjiang in northwestern China and will be particularly intense in the Kunlun Mountains, but surpluses are forecast in the province’s northern regions. On the Korean Peninsula, exceptional surpluses will persist in the north and intense deficits will emerge in the south. In Japan, surpluses will retreat from Shikoku and deficits will intensify in eastern Honshu.

From April through June 2021, surpluses will persist in the Yellow River Basin and retreat from the Yangtze Basin. Surpluses in Northeast China will shrink but remain widespread and intense. Deficits in southeastern China will shrink but persist with intensity on the coast, retreating altogether from Taiwan. Deficits will also retreat from Yunnan and moderate surpluses will emerge. Anomalies in Tibet and in northwestern China will shrink. Surpluses will nearly disappear in North Korea and deficits in South Korea will shrink and moderate. In Japan, moderate to severe deficits are forecast for northern Honshu and Hokkaido.

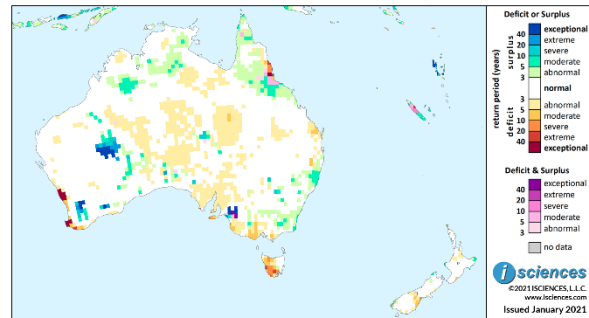
The forecast for the final three months – July through September 2021 – indicates normal conditions in many areas of East Asia with surpluses in Northeast China and scattered pockets in the Yellow River Watershed. Deficits are forecast in northwestern China and surpluses in western Tibet.

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

Australia & New Zealand

The 12-month forecast through September 2021 indicates severe deficits in western Tasmania, Australia and near Hobart, and deficits of extreme intensity in the Derwent Estuary. Some moderate deficits are expected in mainland Australia in pockets along the southern coast from Melbourne past Adelaide, with severe deficits in western Kangaroo Island. At the mouth of the Murray River in South Australia, however, surpluses and transitional conditions are expected.

ISciences Water Anomalies Forecast
Australia & New Zealand: October 2020 - September 2021



Based on observed data through December 2020 and forecasts through September 2021

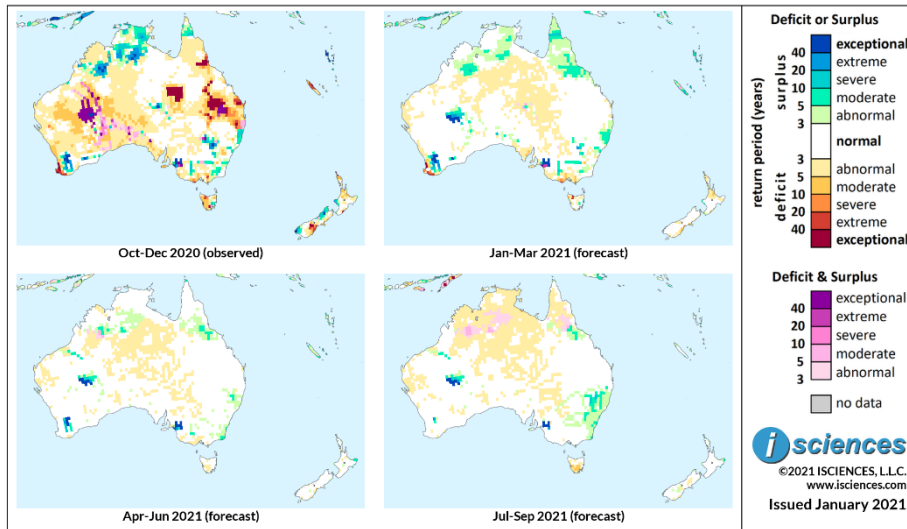
Pockets of surplus are forecast west of Dubbo in the central Murray-Darling Basin of southeastern Australia, in the Australian Alps, and along the nation's southeastern coast, particularly near Armidale. Some areas of moderate deficit are expected in coastal Queensland near Brisbane and on the Burnett River. In northern Queensland, moderate surpluses are forecast west of Townsville and in some pockets of Cape York Peninsula, but intense deficits are expected along the coast near Cairns. Elsewhere in Australia's north, moderate surpluses are forecast south of the Kimberley Plateau in the west and pockets in Northern Territory's Daly Waters area.

In the nation's west, exceptional deficits are forecast along the southwestern coast between Geraldton and Perth, moderating near Perth, becoming exceptional again in Busselton and the Blackwood River region, then downgrading along a small stretch of the southern coast towards Albany. Intense surpluses are forecast in the southern Avon River Basin, a pocket north of Esperance, and a large pocket spanning the western edge of the Gibson Desert. Surpluses of lesser intensity are expected in a path north of the Gibson Desert, a path through the western region of the Great Victoria Desert, and a pocket in the Simpson Desert in the center of the nation.

In New Zealand, deficits are forecast along the east coast between Christchurch and Dunedin. Surpluses and transitional conditions are forecast in New Caledonia.

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

**iSciences Water Anomalies Forecast
Australia & New Zealand: October 2020 - September 2021**



Based on observed data through December 2020 and forecasts through September 2021

The forecast through March 2021 indicates that deficits will retreat, persisting in southwestern Australia from south of Perth to Albany. Surpluses will persist in the Avon River Basin and a pocket north of Esperance. Intense surpluses will re-emerge at the western edge of the Gibson Desert. In the north, surpluses will shrink and moderate south of the Kimberley and in Top End. In northern Queensland, intense deficits near Cairns will retreat. Surpluses will emerge in the Burdekin River Basin and in Cape York. In New South Wales, moderate surpluses will increase around Armidale, but will shrink somewhat in the Murray-Darling Basin. Surpluses and transitional conditions will persist near the mouth of the Murray, and deficits will persist on the southern coast through Melbourne. Anomalies in Tasmania will shrink considerably. Nearly normal conditions are forecast for New Zealand with some deficits persisting from Christchurch to Dunedin and a few areas of North Island. New Caledonia will be in transition from intense deficit to surplus.

From April through June 2021, surpluses will nearly disappear from southeastern Australia, persisting near the mouth of the Murray. Surpluses will shrink slightly but persist in Western Australia southwest of the Gibson Desert and in the southern Avon River Basin. Australia's northern reaches will normalize, with a few lingering pockets of surplus. Areas of prior deficit in Australia's southwestern tip and coastal Victoria will become nearly normal as will conditions in Tasmania and New Zealand. Surpluses in New Caledonia will diminish.

The forecast for the final months – July through September 2021 – indicates that surpluses will persist at the mouth of the Murray River, southwest of the Gibson Desert and a few other pockets in the west, and in coastal Queensland near Cairns. Surpluses will emerge in the eastern Murray-Darling Basin, and pockets along the southeastern coast. Moderate deficits will emerge in southern Tasmania. Near-normal conditions are expected in New Zealand and New Caledonia.

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