Overview

Almost all monthly rainfall totals were below average compared to their long-term averages for November, and particularly dry spells were observed in the east of the country. This is reflected in the river flows with all monitored rivers observing below the long-term average throughout November. Two-thirds of river monitoring stations were in the 'below normal' category for this time of year. Similarly, for lake level monitoring stations, 59% were in the 'normal' and 30% in the 'below normal' category for average lake levels in November across the country.

Albeit average groundwater levels increased at 60% of groundwater monitoring stations between October and November 2021 across the country, the largest proportion (43%) of station observed levels 'below normal' for November averages. 'Particularly low' groundwater levels for this time of year correspond largely to the eastern half of the country. Most of the monitored spring flows were also below average monthly flows for November.

Rainfall

Nearly all rainfall totals were below their Long-Term Average (LTA) for the month. Percentage of monthly rainfall values ranged from 16% (the month's lowest monthly rainfall total of 11.9 mm) at Dublin Airport, Co Dublin (its driest November since 1942) to 108% (the month's highest monthly rainfall total of 183.3 mm) at Newport, Co Mayo. The month's wettest day was also recorded at Newport, Co Mayo with 30.5 mm on Tuesday 30th. The number of rain days ranged from 9 days at Dublin Airport, Co Dublin to 28 days at both Belmullet, Co Mayo and Knock Airport, Co Mayo. The number of wet days ranged from 4 days at Dublin Airport, Co Dublin to 24 days at Newport, Co Mayo. The number of very wet days ranged from zero days at a few stations to 5 days at Newport, Co Mayo. Three stations had their driest November on record. These were Oak Park, Co Carlow with 20.9 mm (24% of its LTA) (record length 17 years), Mount Dillon, Co Roscommon with 49.6 mm (48% of its LTA) (record length 17 years) and Finner, Co Donegal with 74.8 mm (58% of its LTA) (record length 10 years).

Along with Dublin Airport, Johnstown Castle, Co Wexford also had its driest November since 1942 with 27.9 mm (24% of its LTA). Phoenix Park, Co Dublin had its driest November since 1945 with 17.5 mm (23% of its LTA). Gurteen, Co Tipperary had its driest November since 1957 with 34.3 mm (38% of its LTA). Both Dunsany, Co Meath with 30.2 mm (36% of its LTA) and Casement Aerodrome, Co Dublin with 16.4 mm (22% of its LTA) had their driest November since 1983 and Mullingar, Co Westmeath had its driest November since 1989 with 41.6 mm (47% of its LTA). Two stations had dry spells between Friday 12th and Monday 29th. These were Roches Point, Co Cork (lasting 15 days) and Dublin Airport, Co Dublin (lasting 18 days).

River Flows

November river flows remained similar at most monitoring stations compared to average flows observed in October 2021. However, the monthly average flows are below the long-term monthly average for November for all main rivers across the country. Analysis of monthly average flows at 164 river monitoring sites across the country identified; 1 (1%) 'above normal', 44 (27%) were 'normal', 102 (62%) were 'below normal' and 17 (10%) were classed as 'particularly low' for this time of year. The Glenaddragh River (37020 Valley Br. monitoring station) in Co. Donegal is the only station with flows observed as 'above normal' where the highest total monthly rainfalls for November 2021 were recorded.

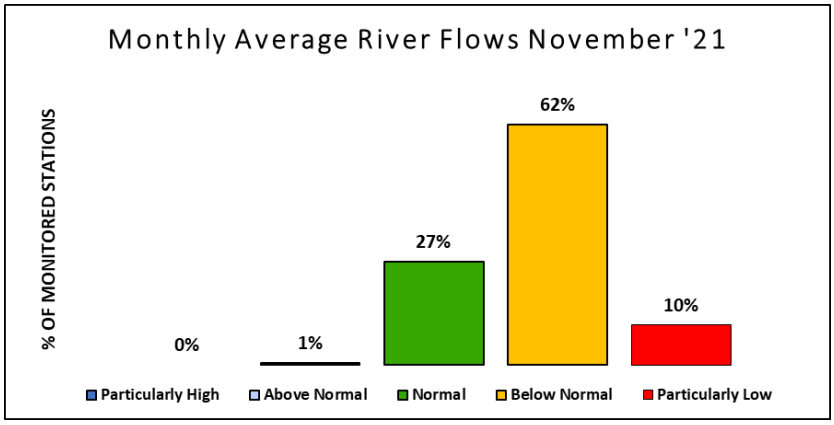


Figure 1: Percentage distribution of river flow monitoring sites within each of the percentile flow categories for November 2021

Lake Levels

Average lake levels were higher at 57% of monitored lakes compared to levels observed in October. Average lake levels at 44 lakes were classified as 'particularly high' at 1 (2%) [L. Muckno, Co. Monaghan {2}] , 'above normal' at 2 (5%), 'normal' at 26 (59%), 'below normal' at 13 (30%) lakes and 'particularly low' at 2 (5%) [L. Skeagh, Co. Cavan and L. Bane, Co. Meath/Westmeath], for the month of November.

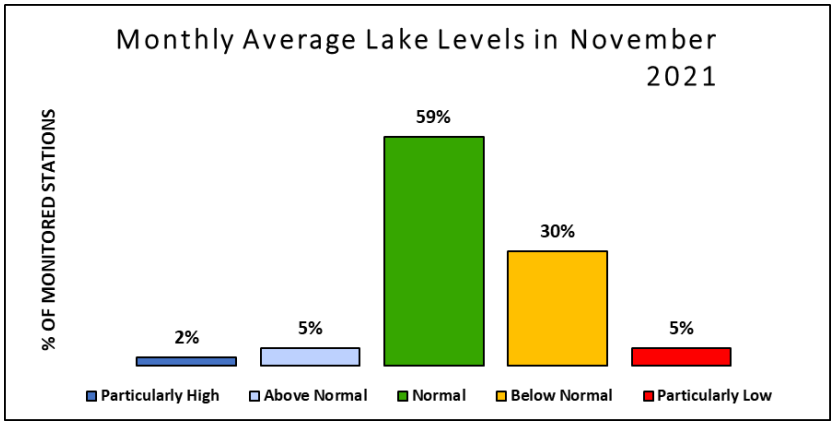


Figure 2: Percentage distribution of lake level monitoring sites within each of the percentile flow categories for November 2021

Groundwater Levels and Spring Flows

Average groundwater levels increased between October and November at 60% monitoring wells analysed. November groundwater levels were classified as 'particularly high' at 5 (13%), 'normal' at 8 (20%), 'below normal' at 17 (43%) and 'particularly low' at 10 (25%) monitoring wells across the country. 'Particularly low' groundwater levels are observed in the eastern half of the country.

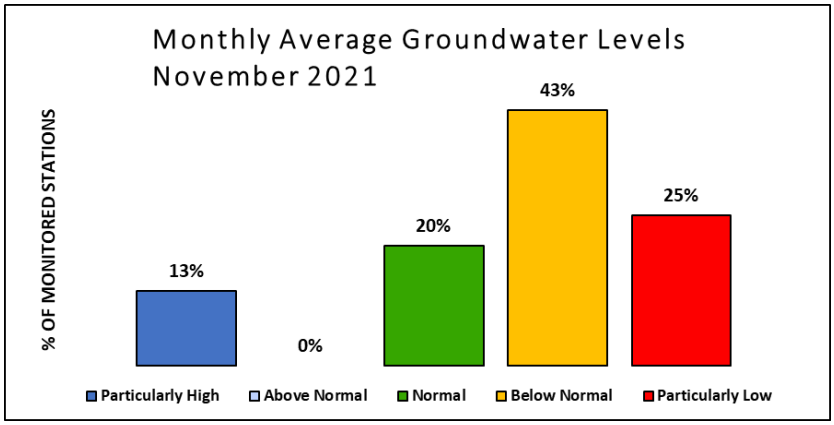


Figure 3: Percentage distribution of groundwater level sites within each of the percentile flow categories for November 2021

Spring outflows were also monitored at 10 EPA monitoring sites. The outflows from these springs were compared to previously recorded flows for November, and 3 springs were 'normal', 6 were 'below normal' and 2 springs were 'particularly low' for this time of year.

Rainfall

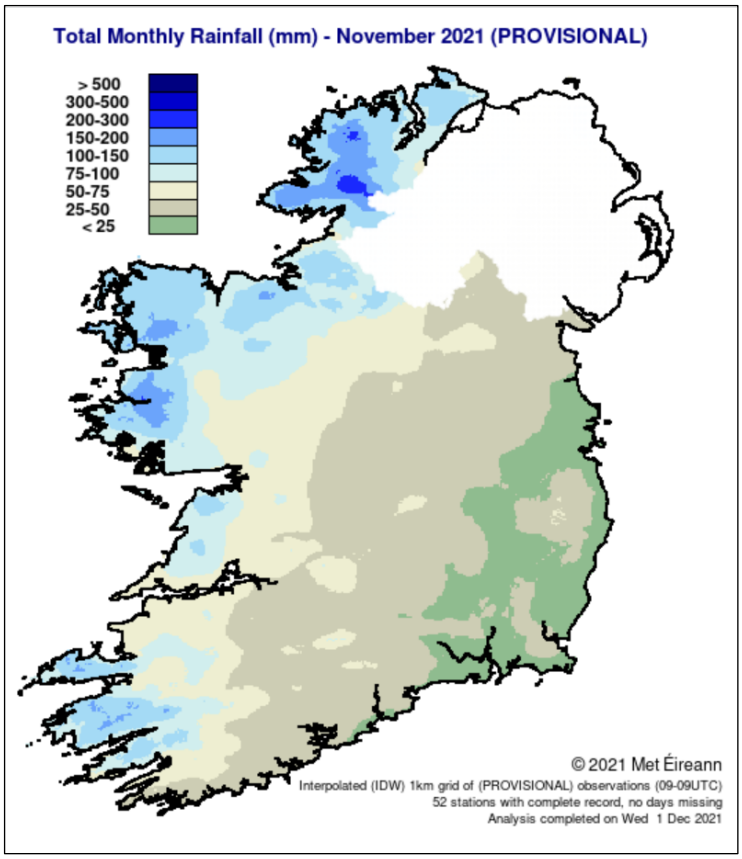


Figure 4:Rainfall map for Ireland November 2021 ***(Source: Met Eireann.ie)***

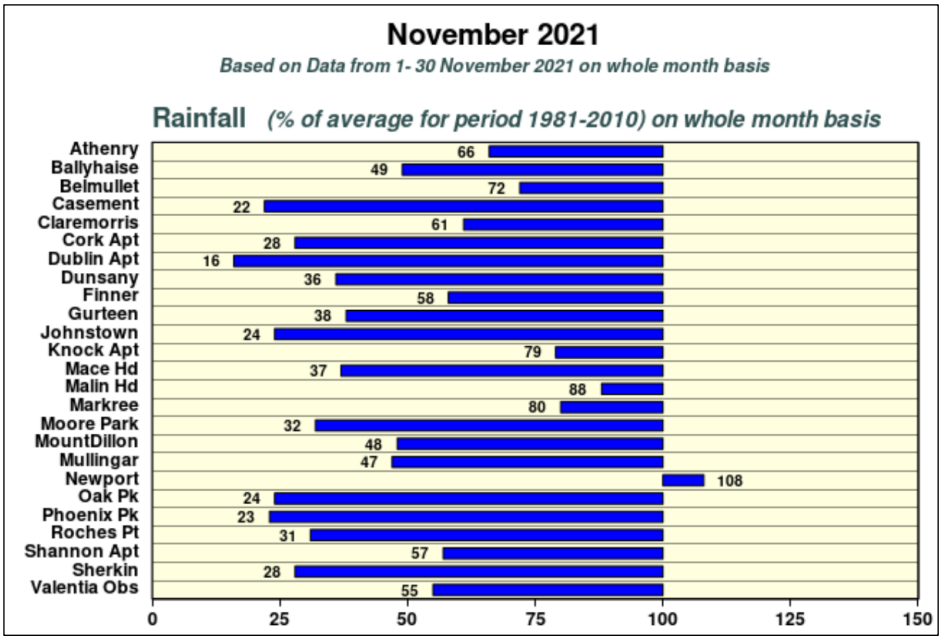


Figure 5: Summary of rainfall at synoptic stations November 2021, figures indicate the percentage difference from the Long-Term Average rainfall for November. ***(Source: Met Eireann.ie)***

River Flows

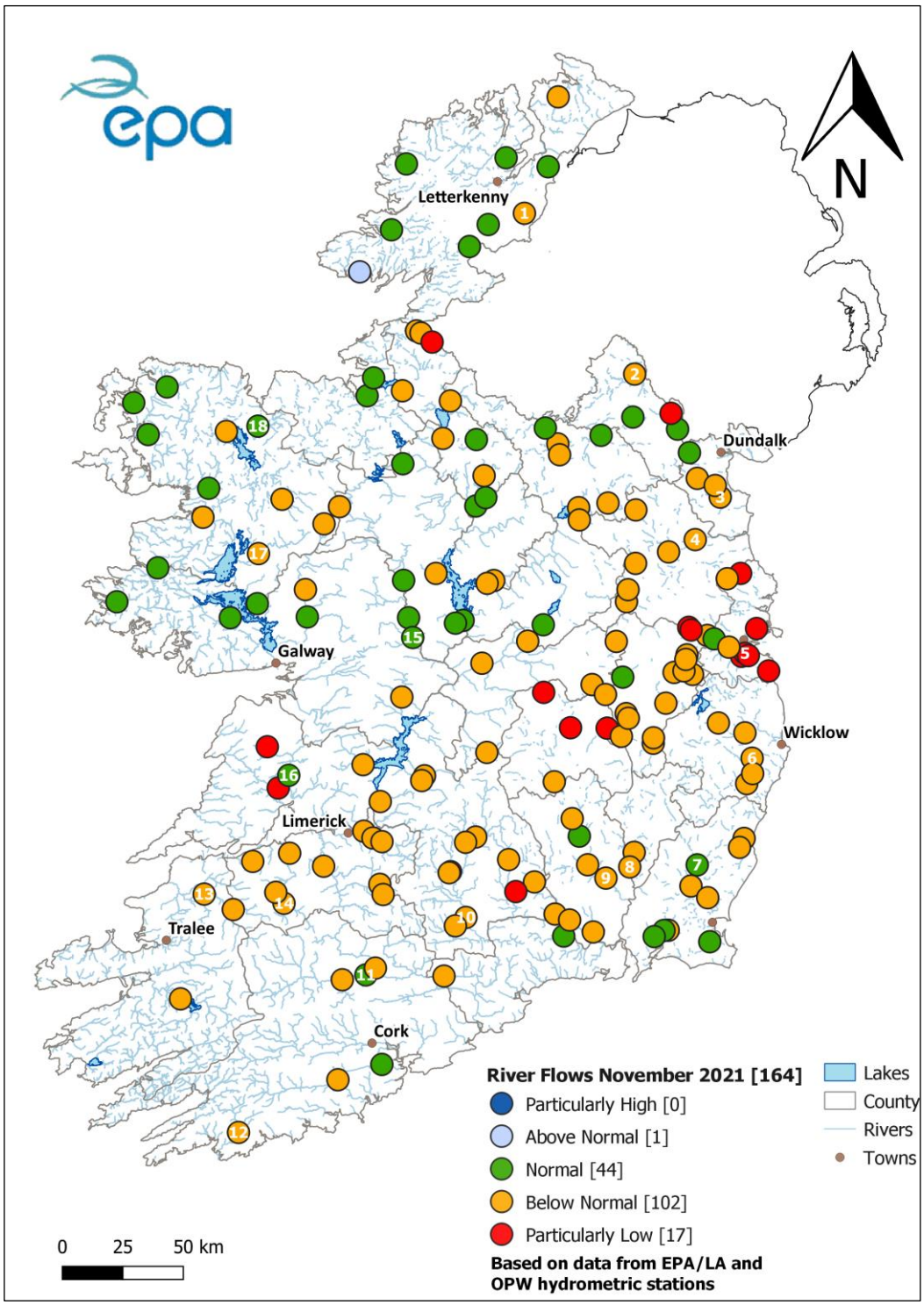


Figure 6: Monthly average river flows for November 2021 relative to historic monthly average flows expressed as percentile of the long-term values of monthly flow. Numbered sites are represented in the hydrographs below. All data are provisional and may be subject to revision. ***(Source: EPA, OPW).***

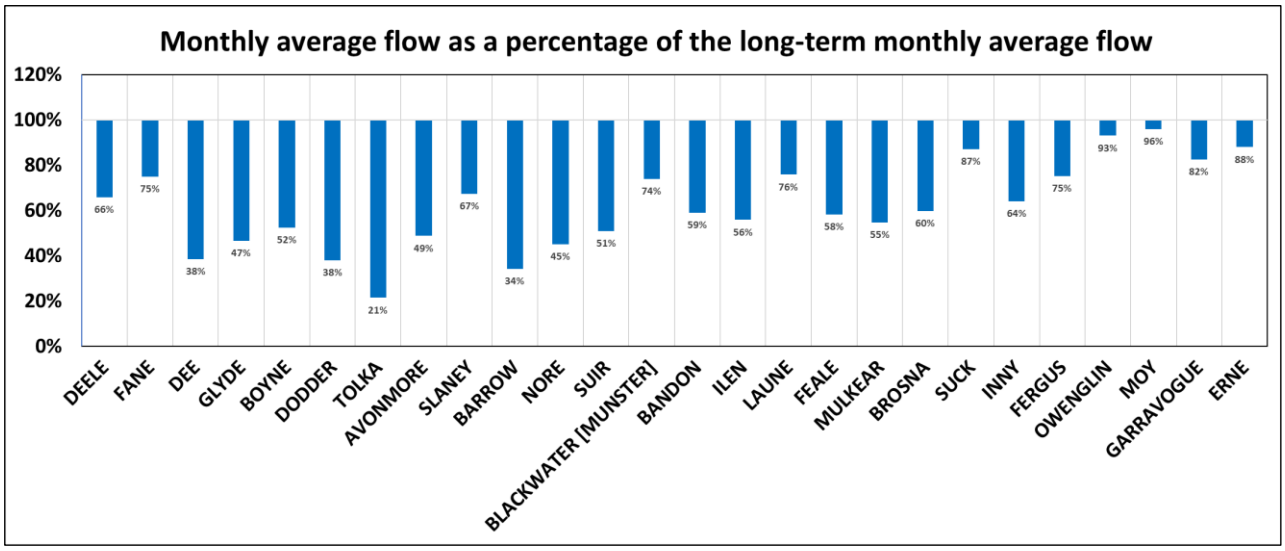
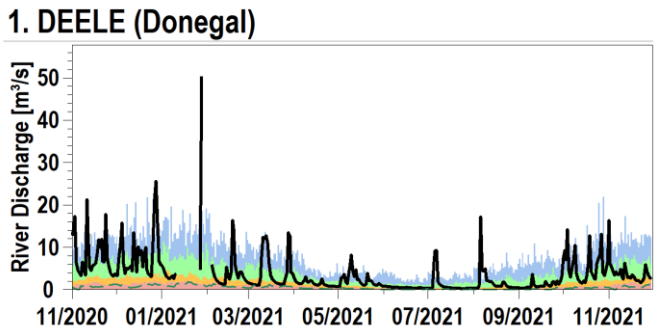
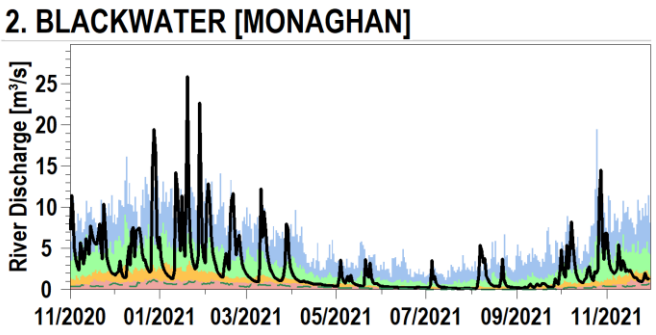
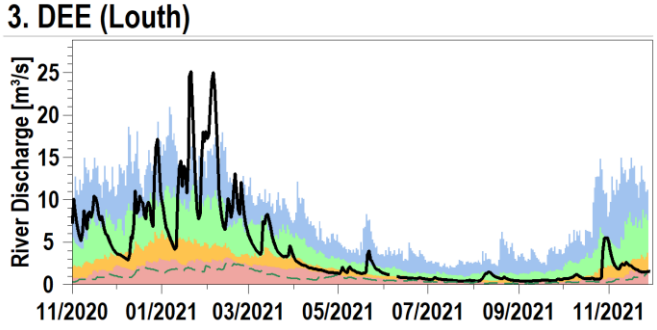


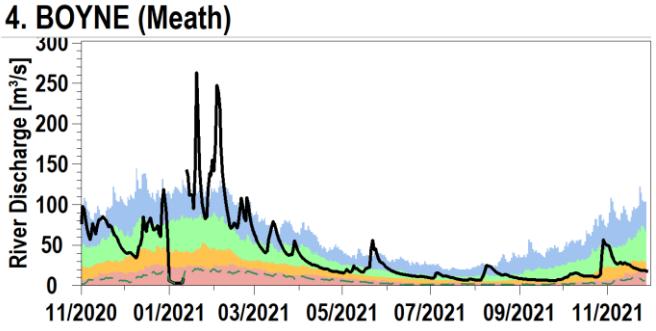
Figure 7: November 2021 average flows as a percentage of the long-term monthly average flow for November at a selected number of stations. All data are provisional and may be subject to revision. ***(Source: EPA, OPW)***

Flow Hydrographs for selected Rivers

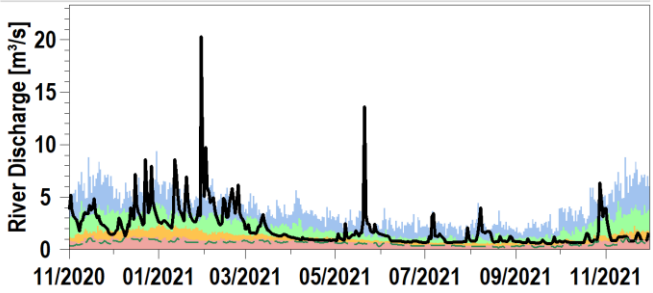




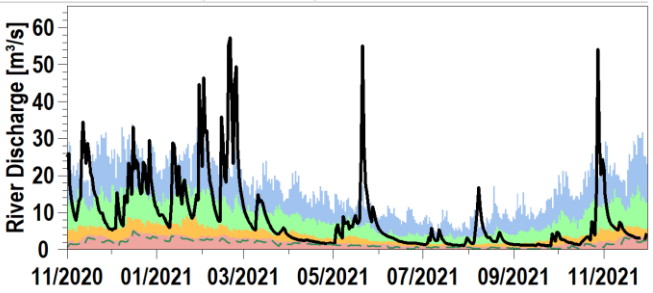




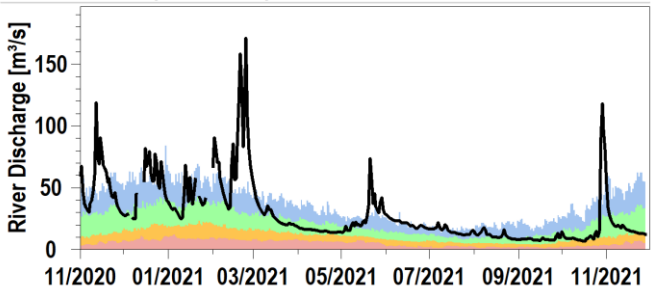
5. DODDER (Dublin)



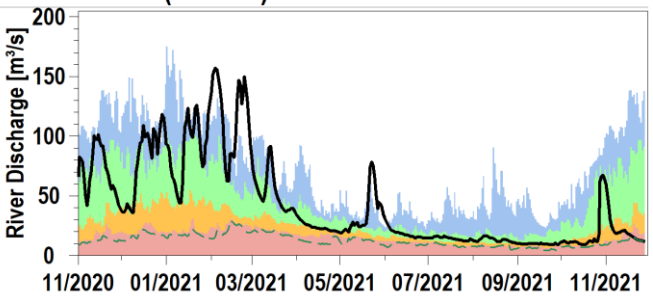
6. AVONMORE (Wicklow)



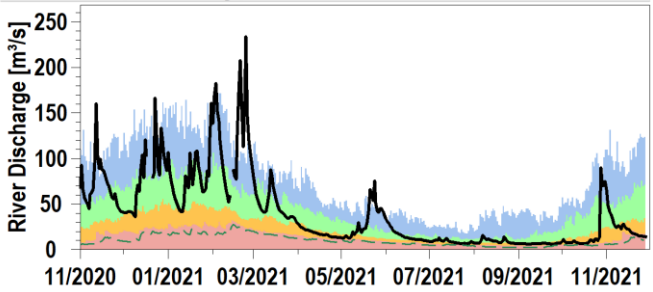
7. SLANEY (Wexford)



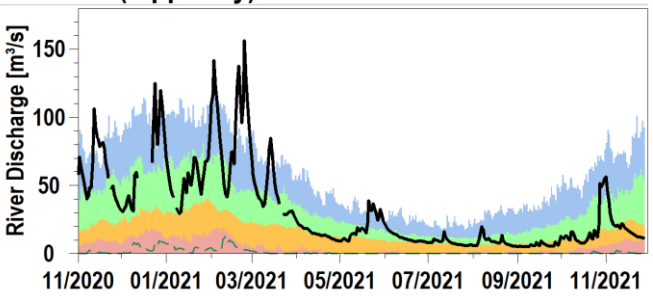
8. BARROW (Carlow)



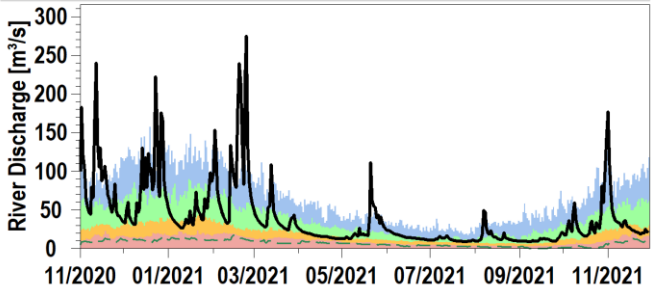
9. NORE (Kilkenny)



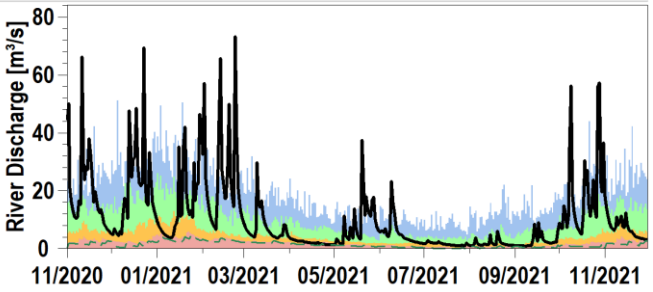
10. SUIR (Tipperary)



11. BLACKWATER [MUNSTER] (Cork)



12. ILEN (Cork)



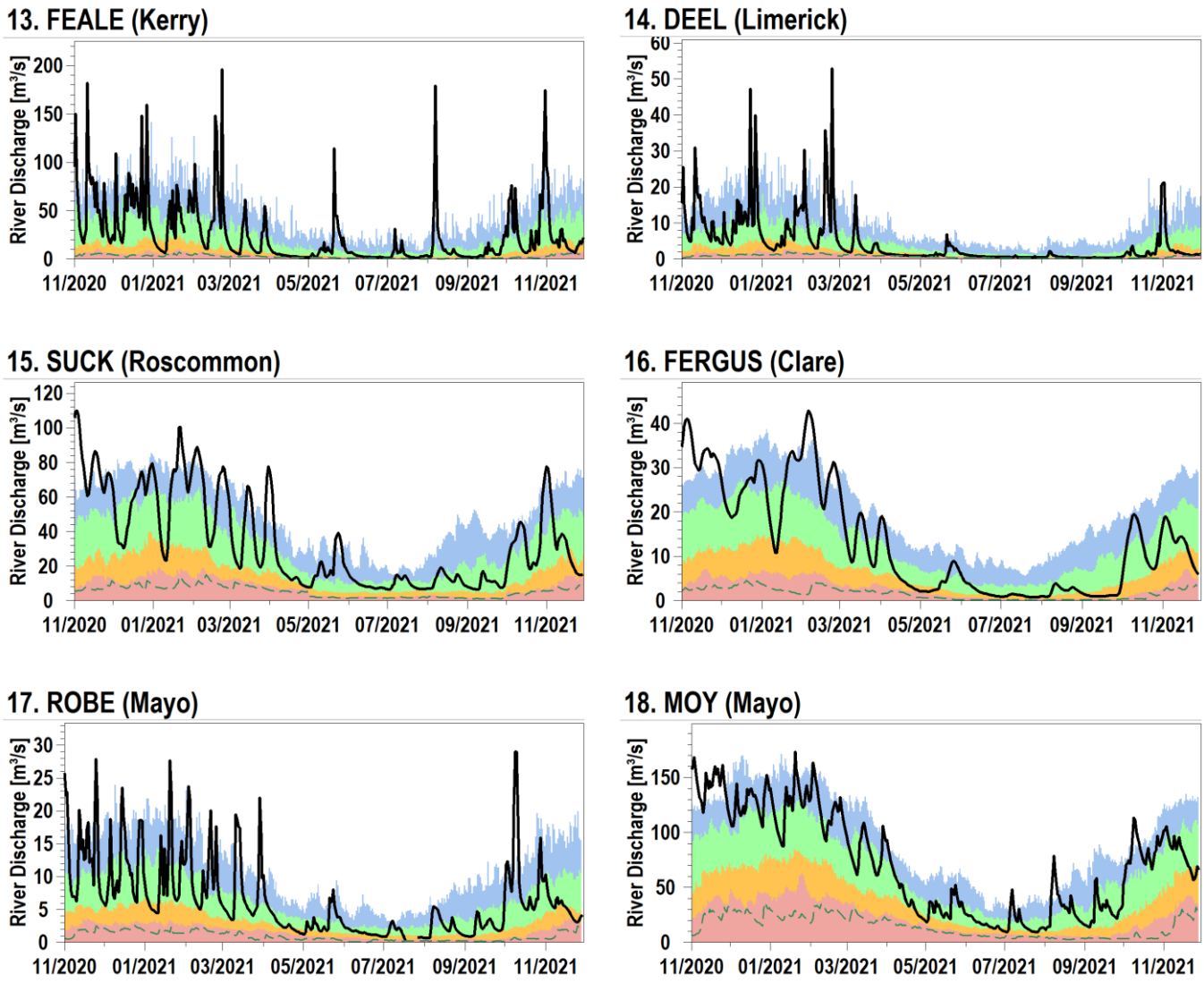


Figure 8: Daily average river flows up to November 2021 relative to historic daily average flows expressed as percentile of the long-term values of each day. All data are provisional and may be subject to revision. ***(Source: EPA, OPW)***

Explanation - Classes						
Particularly Low <95%tile daily average flow	Below Normal >95%tile <70%tile daily average flow	Normal >70 %tile <30%tile daily average flow	Above Normal >30%tile 10%tile daily average flow	Particularly High >10%tile daily average flow	Daily Mean Flow	Lowest Daily Mean Flow

Lake Levels

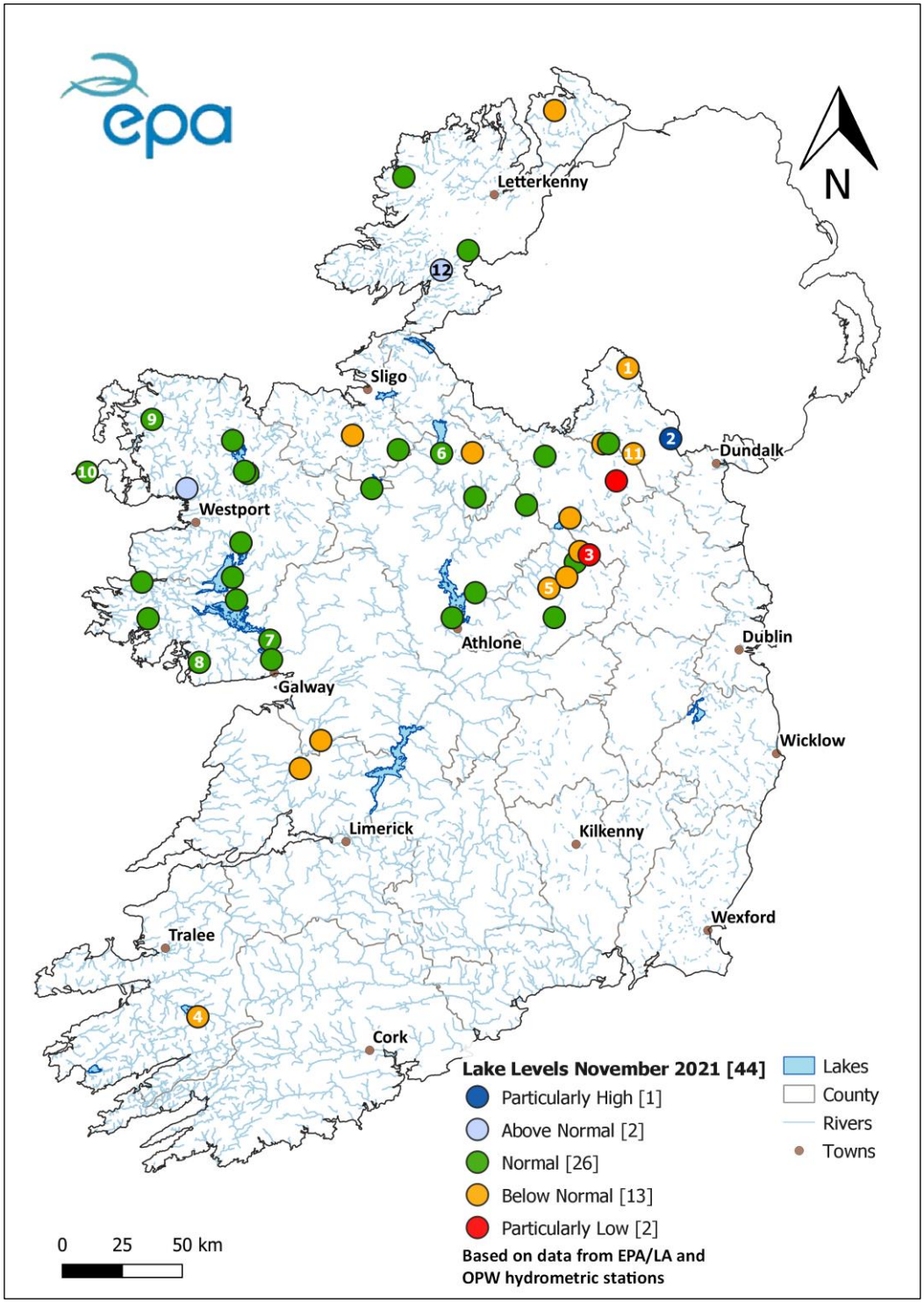
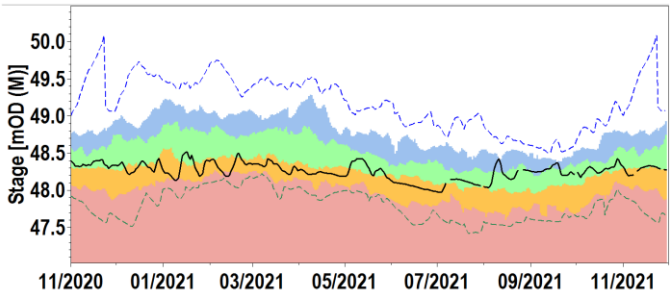


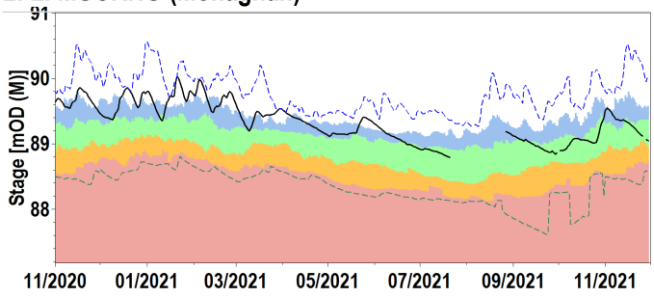
Figure 9: Monthly average lake levels for November 2021 relative to historic monthly average levels expressed as percentile of the long- term values of November. Numbered sites are represented in the hydrographs below. All data are provisional and may be subject to revision. ***(Source: EPA, OPW)***

Water Level Hydrographs for selected Lakes

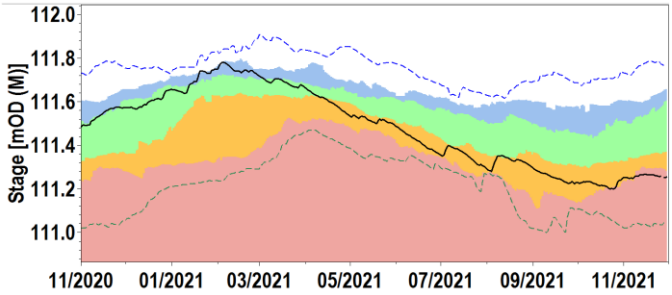
1. EMY LOUGH (Monaghan)



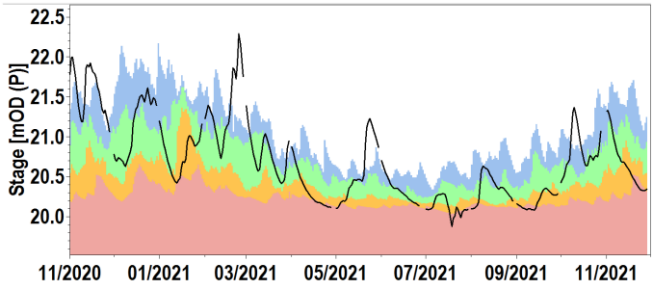
2. L. MUCKNO (Monaghan)



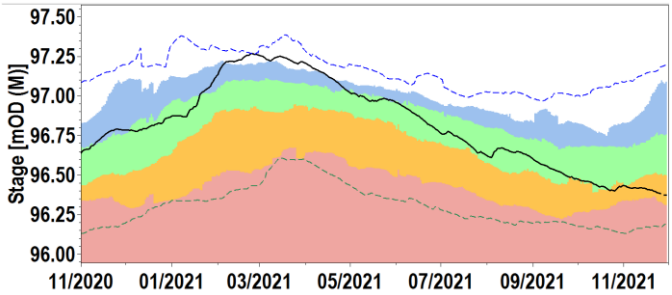
3. L. BANE (Meath)



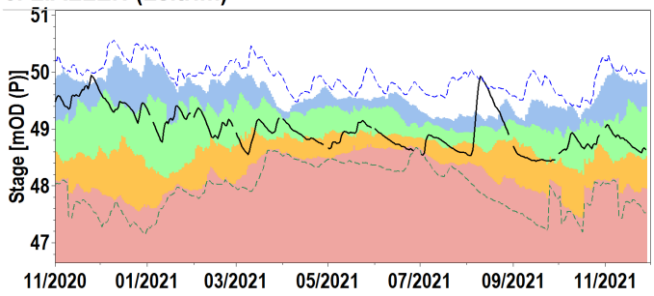
4. L. LEANE (Kerry)



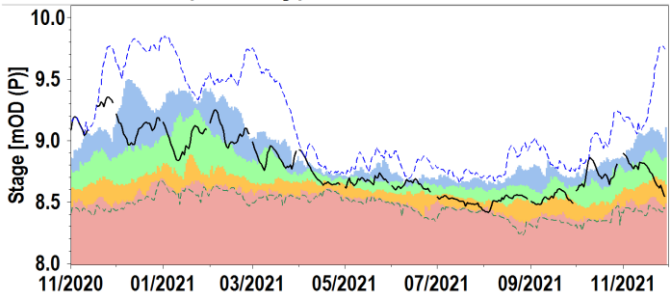
5. L. OWEL (Westmeath)



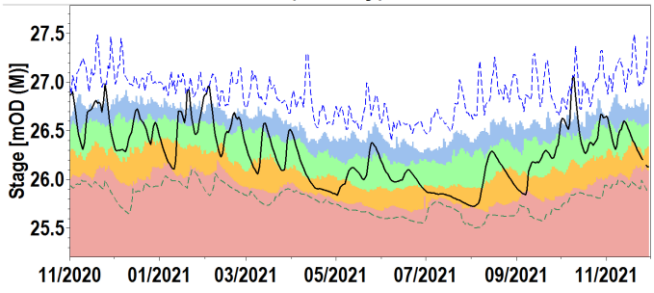
6. L.ALLEN (Leitrim)



7. L.CORRIB (Galway)



8. GLENICMURRIN LAKE (Galway)



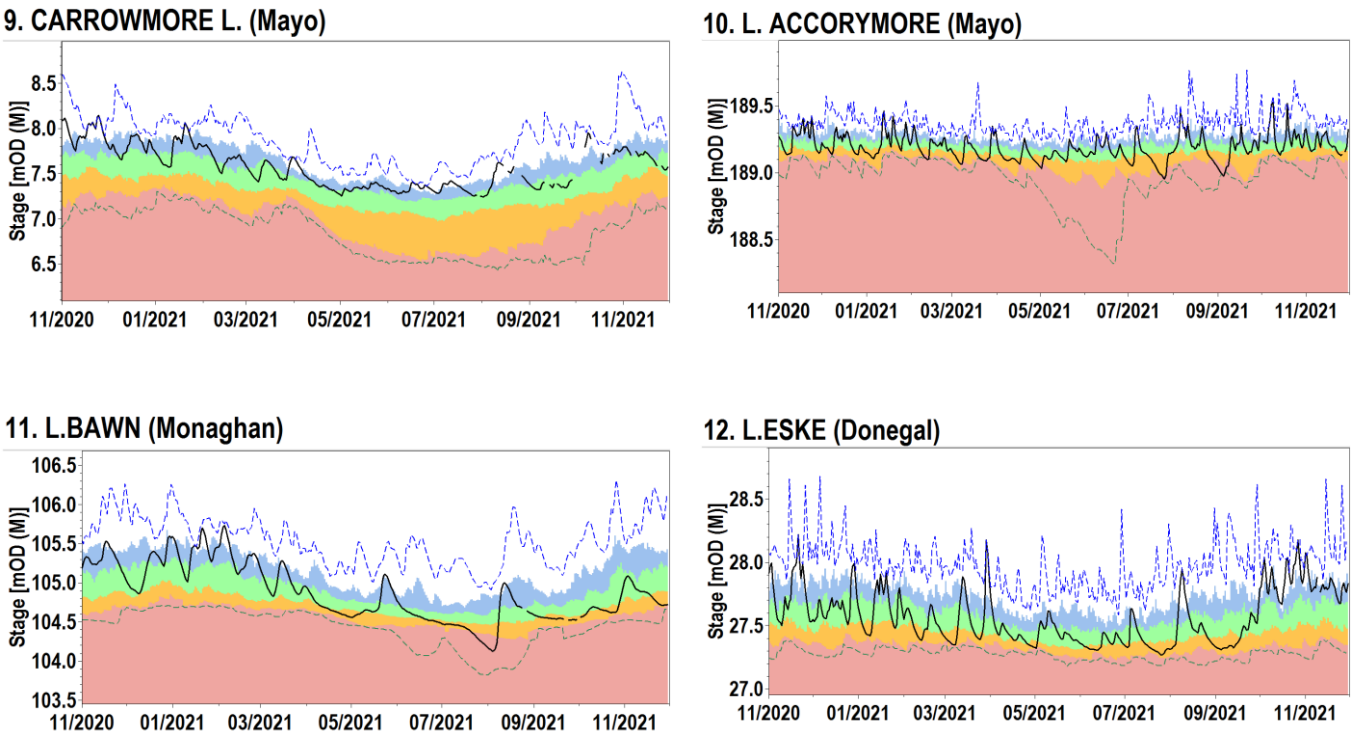


Figure 10: Daily mean lake levels classed relative to historic daily mean levels expressed as percentile of the values of each day with long-term maximum and minimum daily levels. All data are provisional and may be subject to revision. ***(Source: EPA, OPW)***

Explanation - Classes							
Particularly Low **<95%tile daily average level**	**Below Normal** **>95%tile <70%tile daily average level**	**Normal** **>70 %tile <30%tile daily average level**	**Above Normal** **>30%tile <10%tile daily average level**	**Particularly High** **>10%tile daily average level**	**Daily Mean Level mOD**	**Highest Daily Mean Level mOD**	**Lowest Daily Mean Level mOD**

Groundwater Levels and Spring Flows

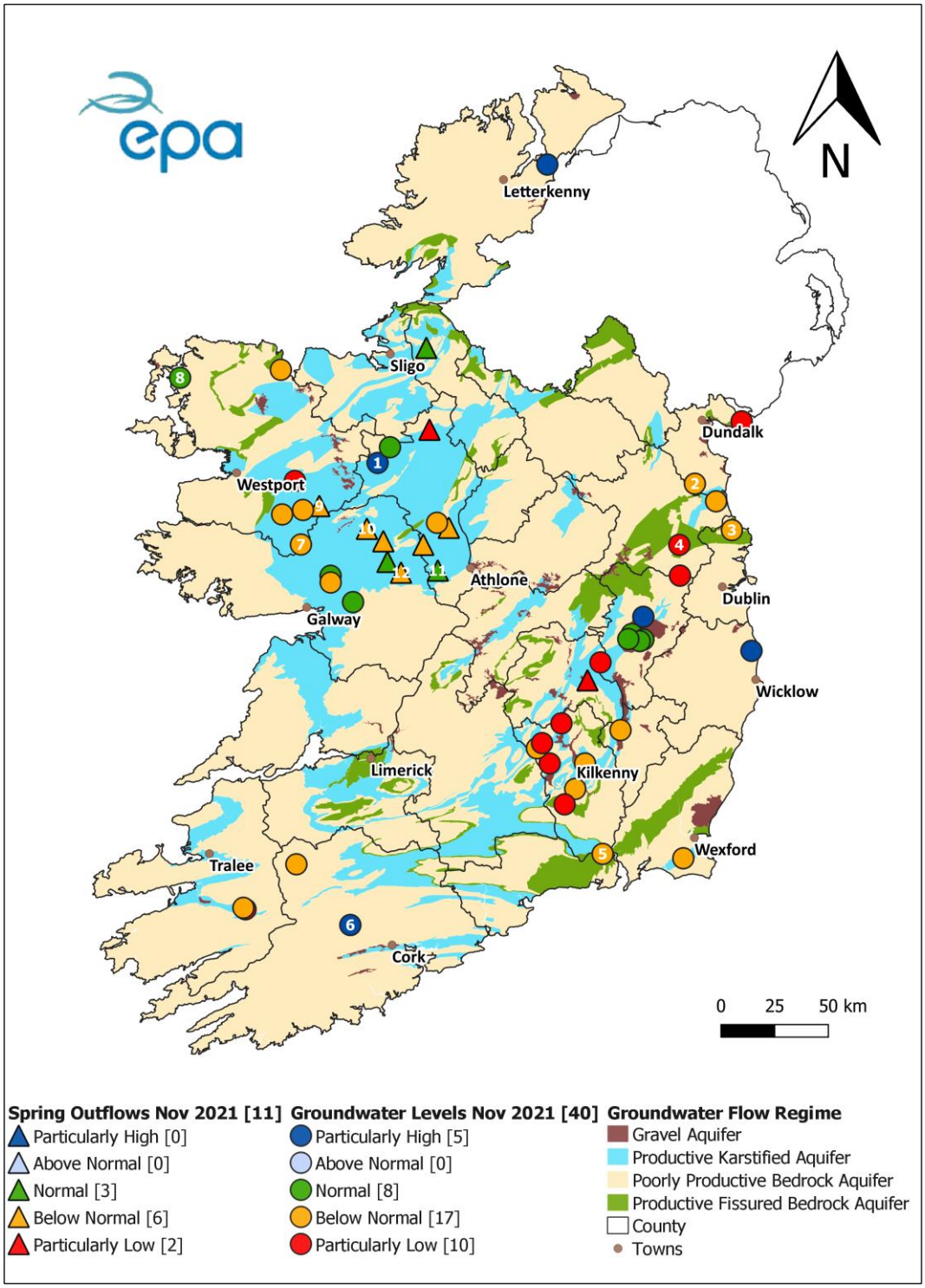
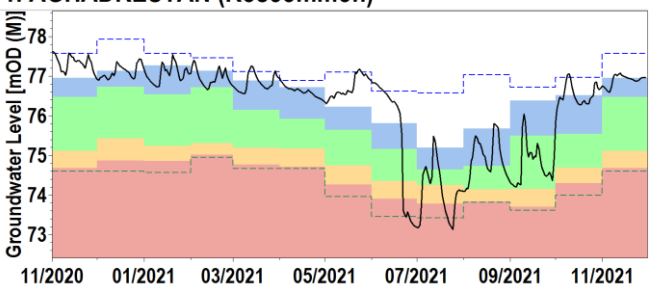


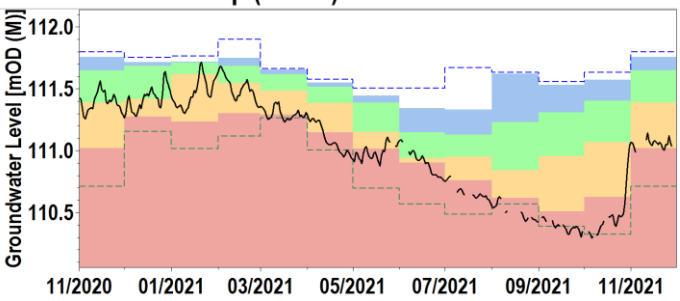
Figure 11: Groundwater level and Spring Flow status for November 2021, relative to historic November groundwater levels. Numbered sites are represented in the hydrographs below. All data are provisional and may be subject to revision. ***(Source: EPA)***

Groundwater and Spring Hydrographs

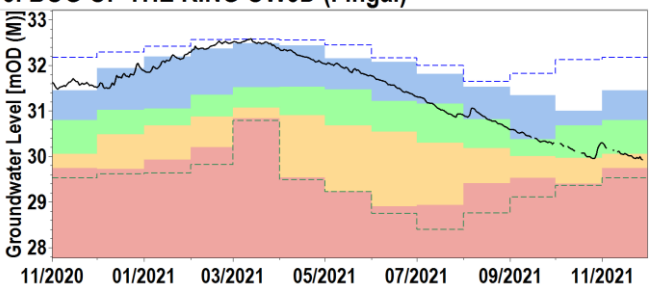
1. AGHADRESTAN (Roscommon)



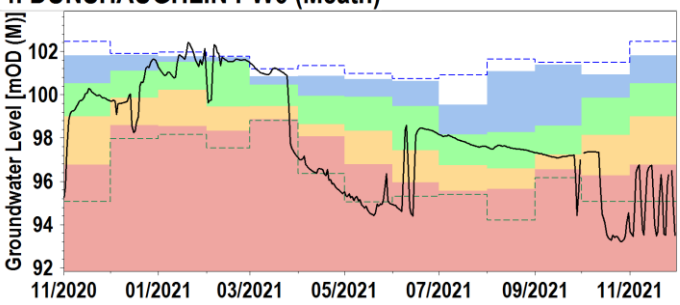
2. Mattock MK1 Deep (Meath)



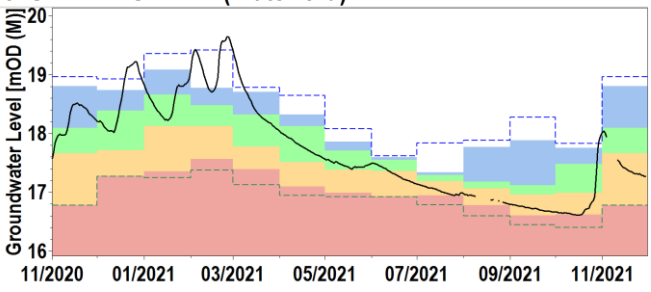
3. BOG OF THE RING OW3D (Fingal)



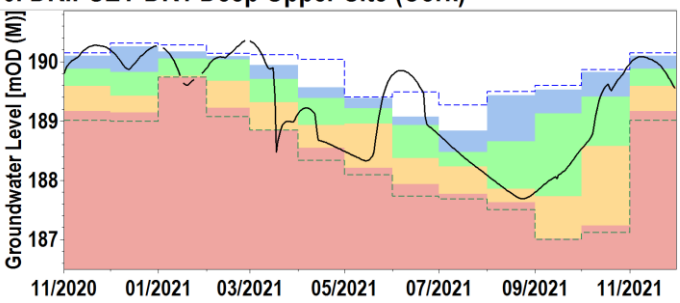
4. DUNSHAUGHLIN PW6 (Meath)



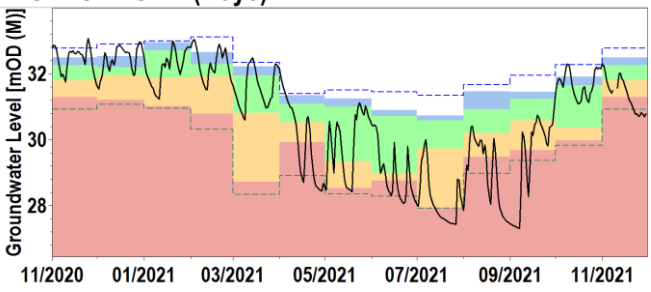
5. SLIEVEROE BH1 (Waterford)



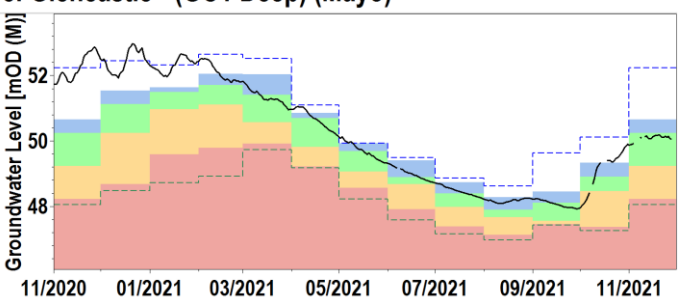
6. DRIPSEY DR1 Deep Upper Site (Cork)



7. SHRULE GWL (Mayo)



8. Glencastle - (GC1 Deep) (Mayo)



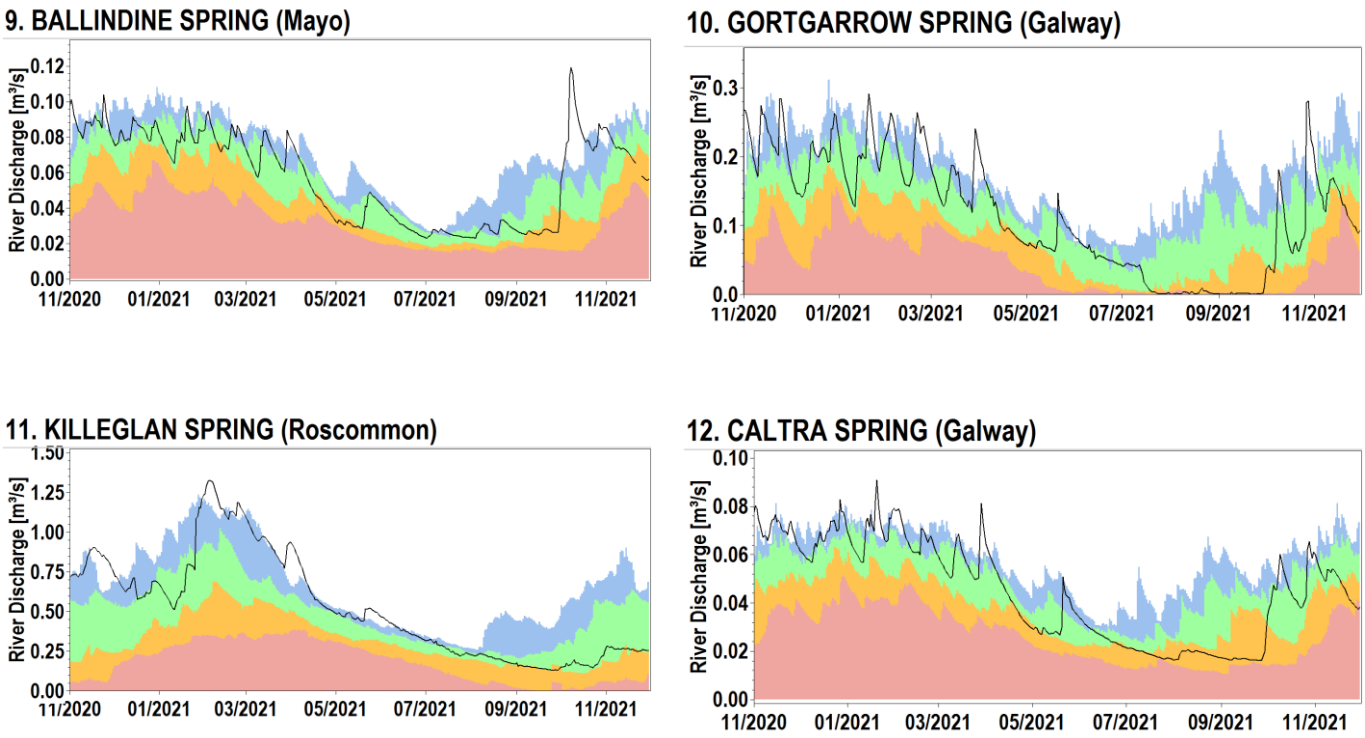


Figure 12: Daily mean groundwater levels (black trace) measured in meters above ordnance datum compared to the 10%tile, 30%tile, 70%tile and 95%tile for each month for the period of record and long-term maximum and minimum levels. All data are provisional and may be subject to revision. ***(Source: EPA)***

Explanation - Classes							
Particularly Low <95%tile monthly average level	Below Normal >95%tile <70%tile monthly average level	Normal >70 %tile <30%tile monthly average level	Above Normal >30%tile <10%tile monthly average level	Particularly High >10%tile monthly average level	Daily Mean Level mOD	Highest Month Mean Level mOD	Lowest Month Mean Level mOD

Glossary of Terms

Aquifer Type	An aquifer is an underground body of water bearing rock or unconsolidated materials (gravel or sand) from which groundwater can be extracted in useful amounts. For the purposes of this report they have been grouped into four aquifer categories as follows: ➢ Karstic (Rk and Lk) aquifers; ➢ Gravel (Rg and Lg) aquifers; ➢ Productive fractured bedrock (Rf and Lm) aquifers; ➢ Poorly productive bedrock (Ll, Pl and Pu) aquifers.
Dry spell	A dry spell is a period of 15 or more consecutive days to none of which is credited 1.0 mm or more of precipitation (i.e. daily tot < 1.0 mm).
Long term average (LTA)	The arithmetic mean calculated from historic record. For rainfall, the period 1981 to 2010 is used. For other parameters, such as groundwater levels, lake levels and river flow the period may vary according to data availability.
mOD	Groundwater levels or lake levels above ordnance datum. In most cases this is relative to mean sea level at Malin but in some cases is relative to Poolbeg.
Long-term monthly average	The arithmetic mean calculated from historic record of all monthly averages.
Percentile Level/Flow	Level or flow that is equalled or exceeded the stated percent of the time, e.g. 30%tile is the level or flow that is equalled or exceeded 30 percent of the time.
Very Wet Days	A very wet day is a day with 10.0 mm or more of rainfall.
Wet Days	A wet day is a day with 1.0 mm or more of rainfall.
Dry Spell	A dry spell is a period of 15 or more consecutive days to none of which is credited 1.0mm or more of precipitation (i.e. daily tot < 1.0 mm).
Absolute Drought	An absolute drought is a period of 15 or more consecutive days to none of which is credited 0.2 mm or more of precipitation.

Description of flow and level percentile classifications

Particularly High	>10%tile exceedance	Monthly level or flow that can occur 10% of the time
Above Normal	>30%tile <10%tile exceedance	Monthly level or flow that can occur 20% of the time
Normal	>70%tile <30%tile exceedance	Monthly level or flow that can occur 40% of the time
Below Normal	>95%tile <70%tile exceedance	Monthly level or flow that can occur 20% of the time
Particularly Low	<95%tile exceedance	Monthly level or flow that can occur 5% of the time

Useful Links

Access to EPA/LA Hydrometric data on HydroNet

Access to provisional water level only data from OPW hydrometric stations on waterLevel.ie

Access to archived water level and flow data from OPW hydrometric stations on HydroData

Access to turlough and borehole level data from GSI hydrometric stations on gwlevel.ie

Access to this month's Met Éireann and historic weather statements.