

2010 Rainfall

	Jan	Feb	Mar	April	May	June
Highland	56	61	72	118	76	50
North East	111	121	84	89	98	62
Tay	65	77	59	125	60	69
Forth	57	104	92	109	58	55
Tweed	82	106	153	63	52	40
Solway	58	55	107	106	63	56
Clyde	45	66	70	120	51	46
Scotland	61	73	78	111	69	53

2010 Monthly Rainfall as a % of Long Term Average
(Source: CEH)

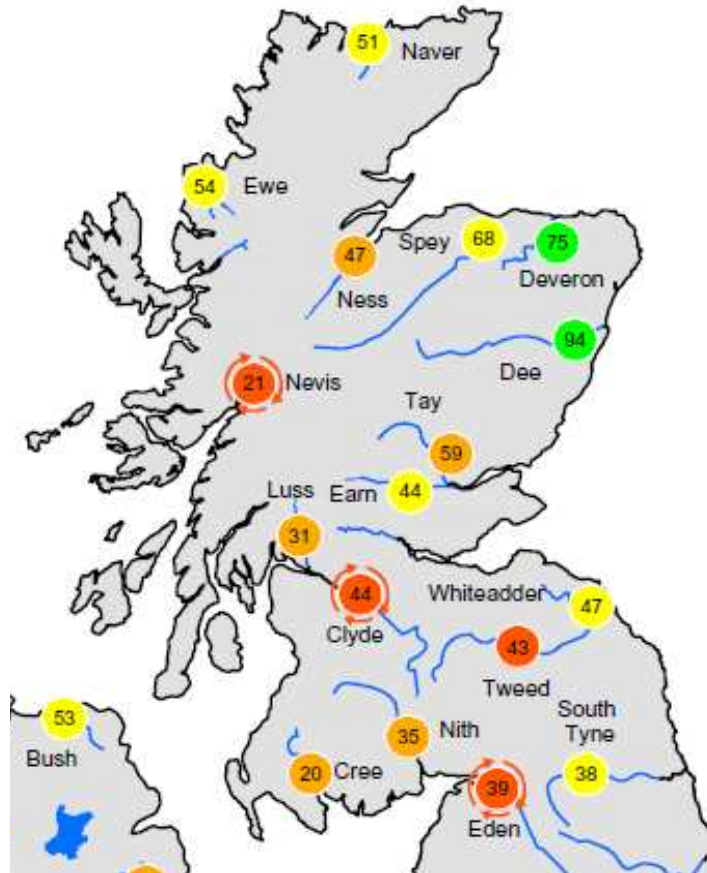


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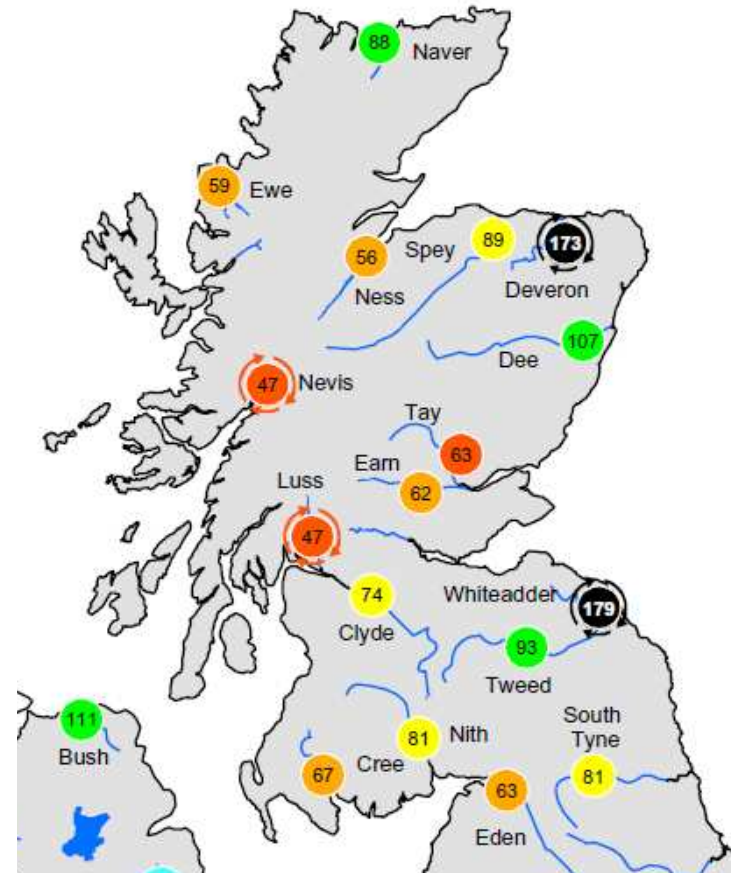
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River Flows

June 2010



January - June 2010



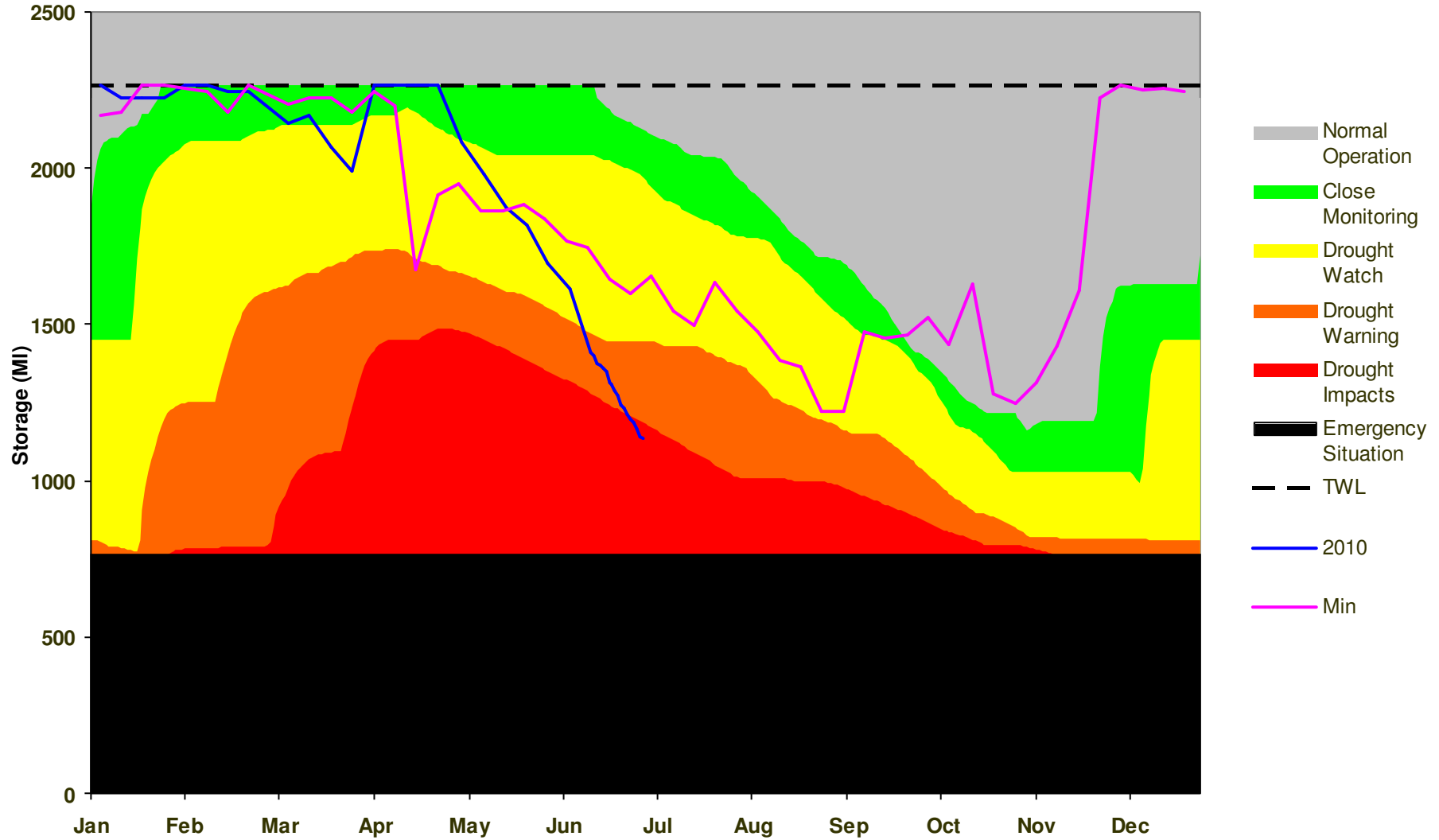
CEH River Flow Summary: % Long Term Average Monthly Flows



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Black Esk Reservoir





Black Esk Reservoir



2010/06/29

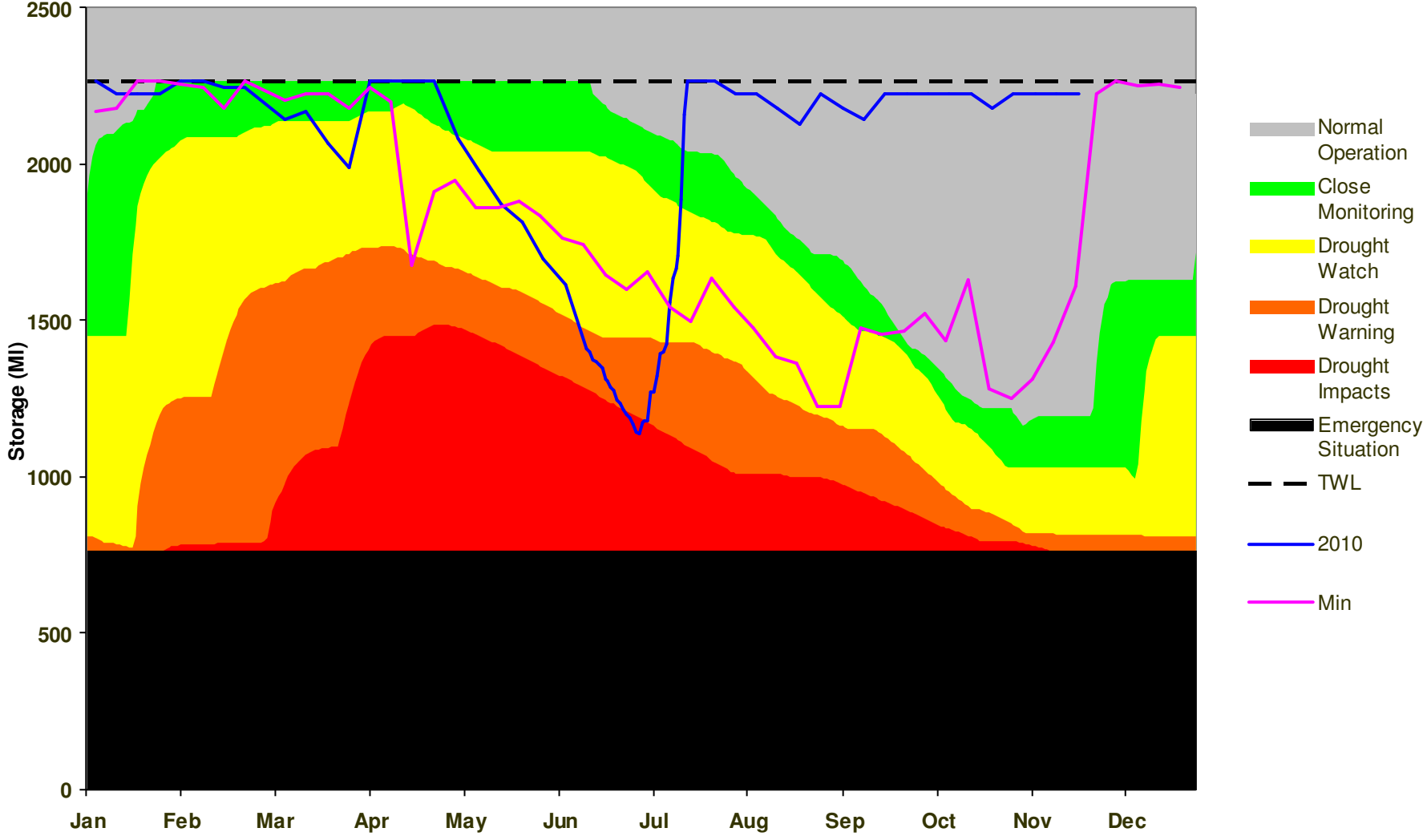
Penwhirn Reservoir



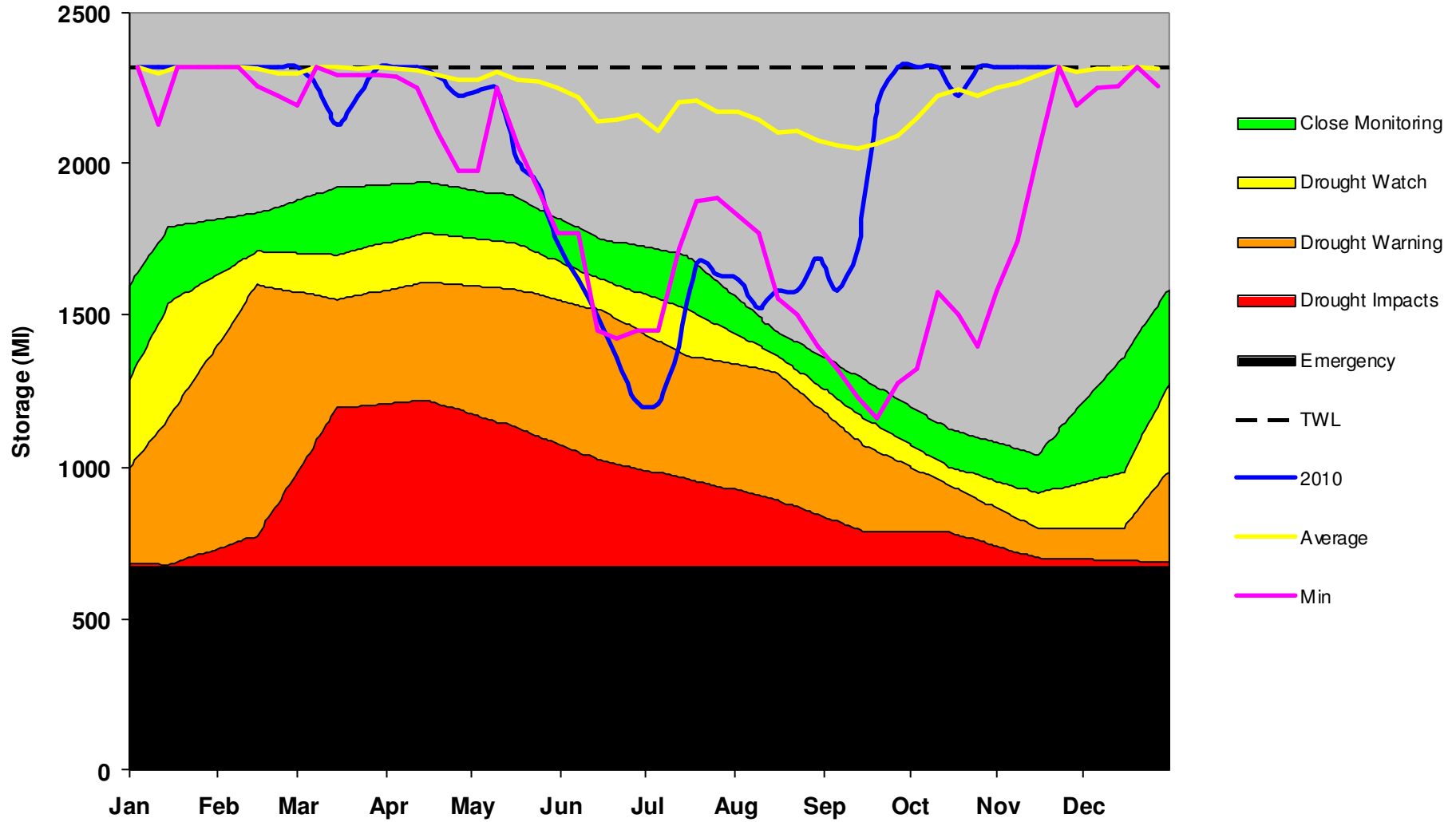
Penwhirn Reservoir



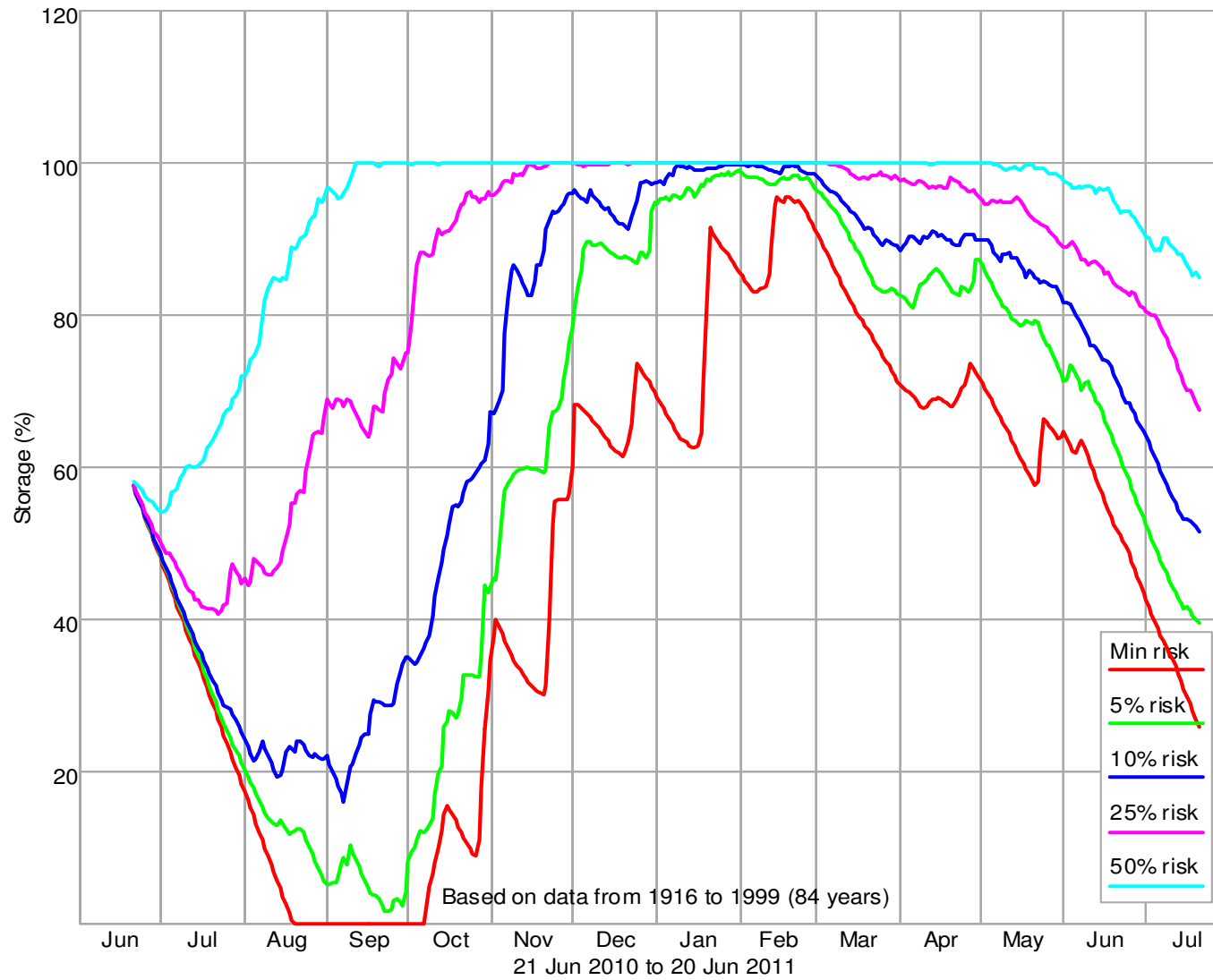
Black Esk Reservoir



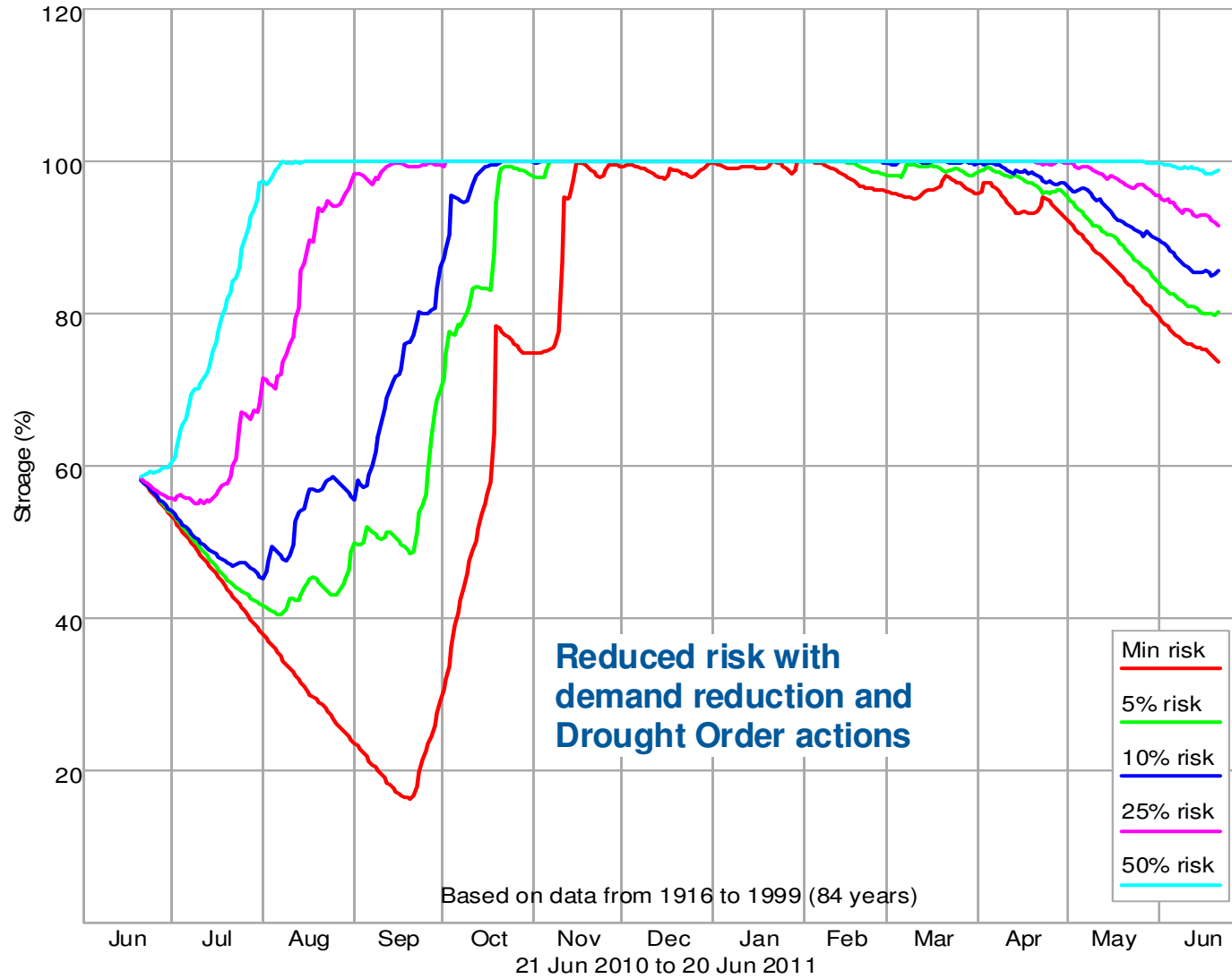
Penwhirn Reservoir



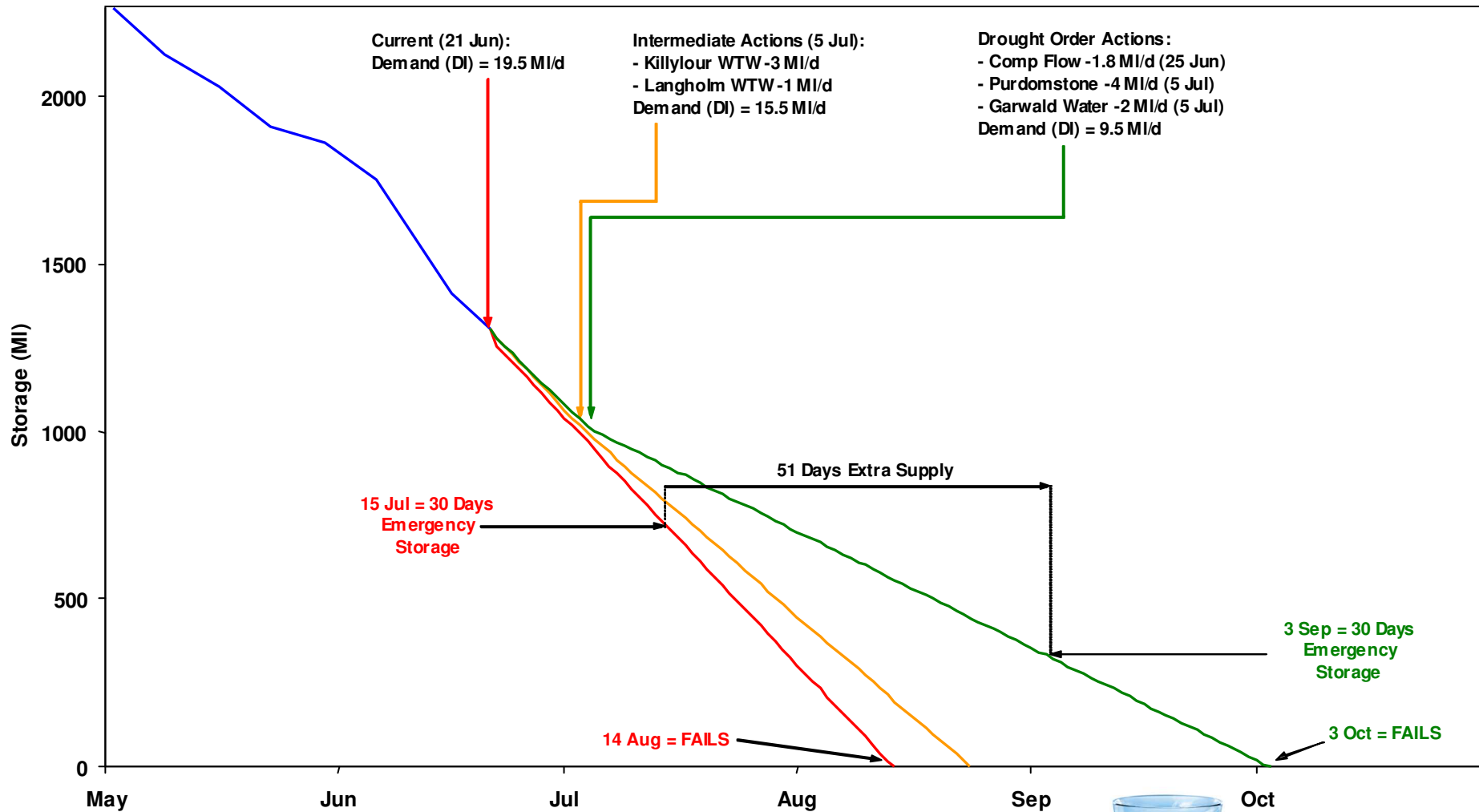
Aquator Model – Risk Projections



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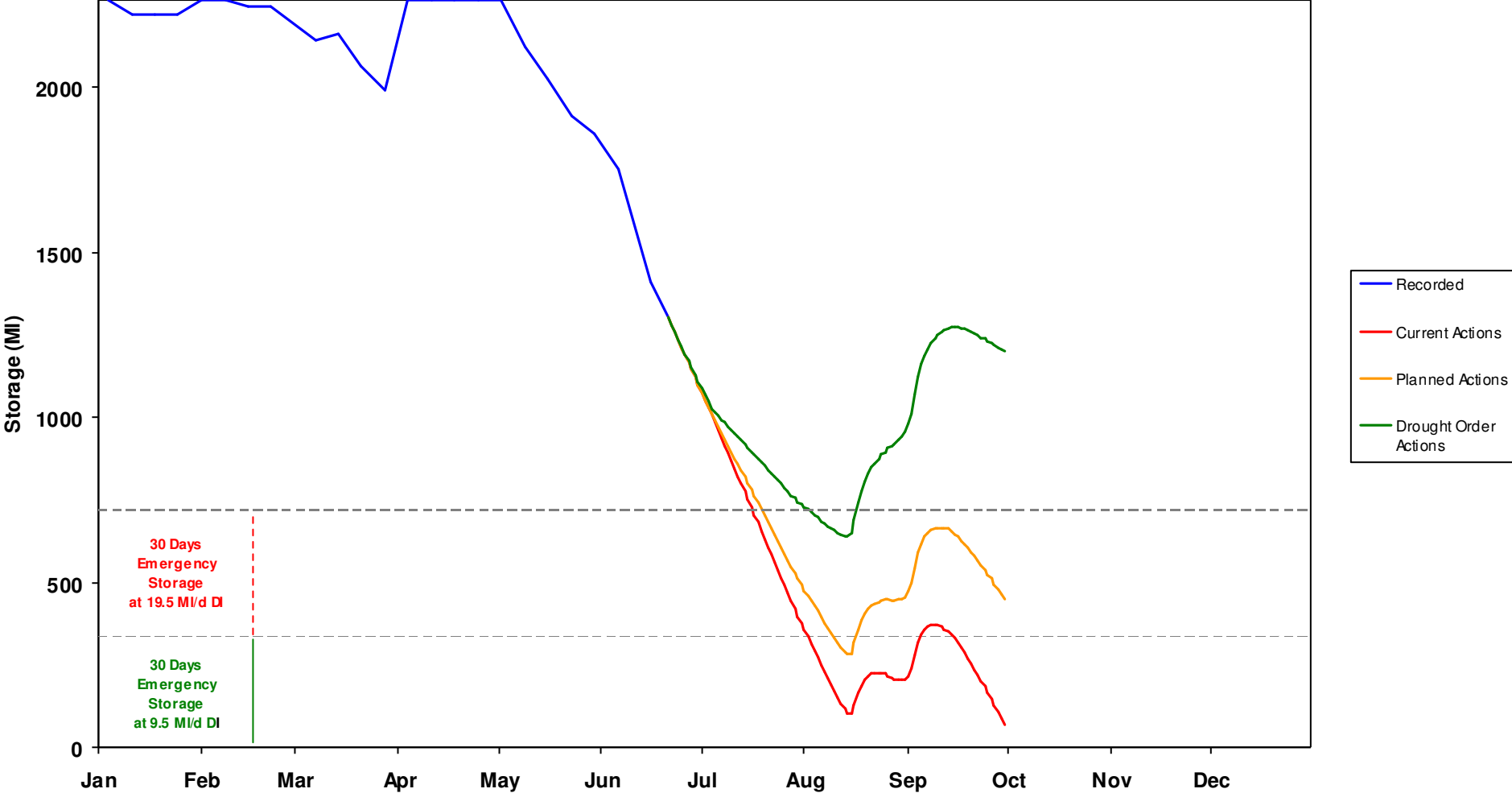
Black Esk: Zero Rainfall Projections



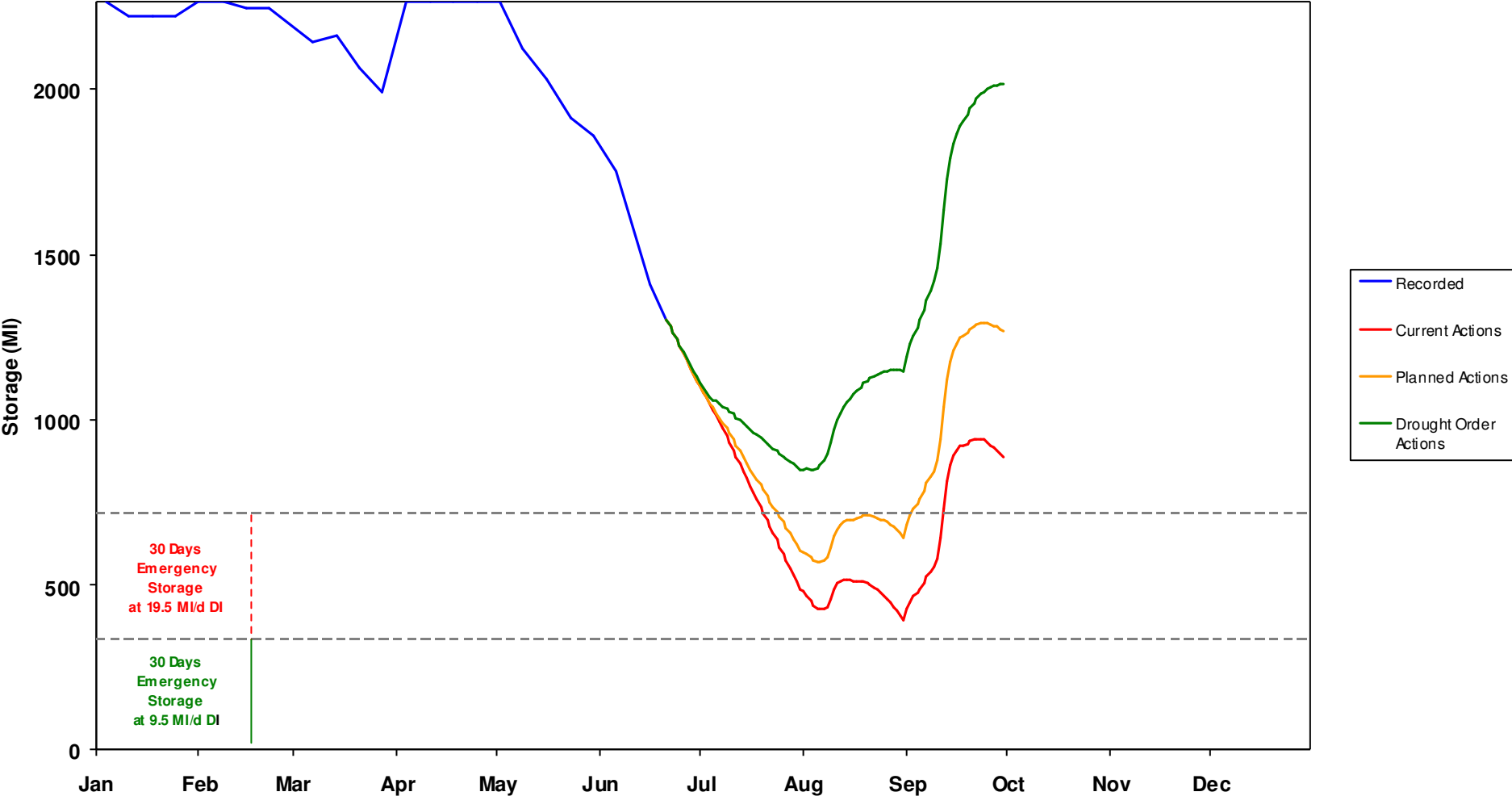
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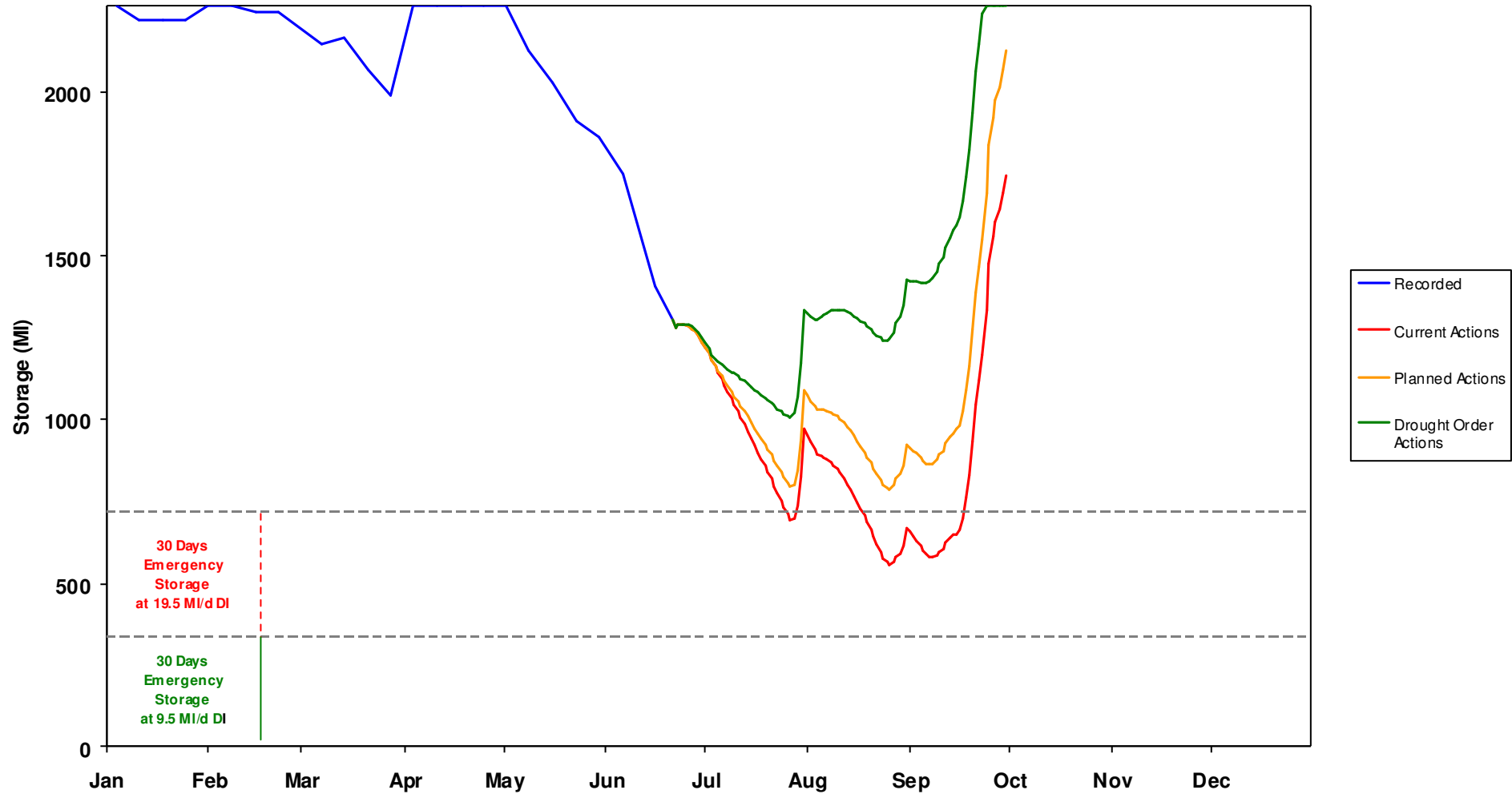
Black Esk: 25% LTA Rainfall Jul-Sep



Black Esk: 50% LTA Rainfall Jul-Sep



Black Esk: Average Rainfall Jul-Sep



Quantifying Drought Severity

Black Esk and Penwhirn worst affected due to combination of driest conditions and insufficient drought resilience

Dam raising planned at both reservoirs to provide 1 in 40 year level of service

But other systems also affected so important to quantify severity of 2010 event



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Quantifying Drought Severity (2)

Rainfall: Eskdalemuir

= 30 yr return period for 2 month duration (May-Jun)

= 60 yr return period for 6 month duration (Jan-Jun)

River Flows: Tima Water (near Black Esk)

= 24 yr return period (2nd worst on record)

Reservoir Drawdown: Black Esk

Less than 1 in 10 year return period event

Drought significance clearly limited by relatively short duration

Shows that all droughts are different. Difficult to define and quantify



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Historic Droughts in Scotland

2003/4 - Tayside - Drought Order for Backwater / Lintrathen

1984 - Most regions affected, hose-pipe bans and non-essential use restrictions. Water rationing in Dumfries & Galloway.

1995, 1970's, 1953, 1934, 1918, 1888

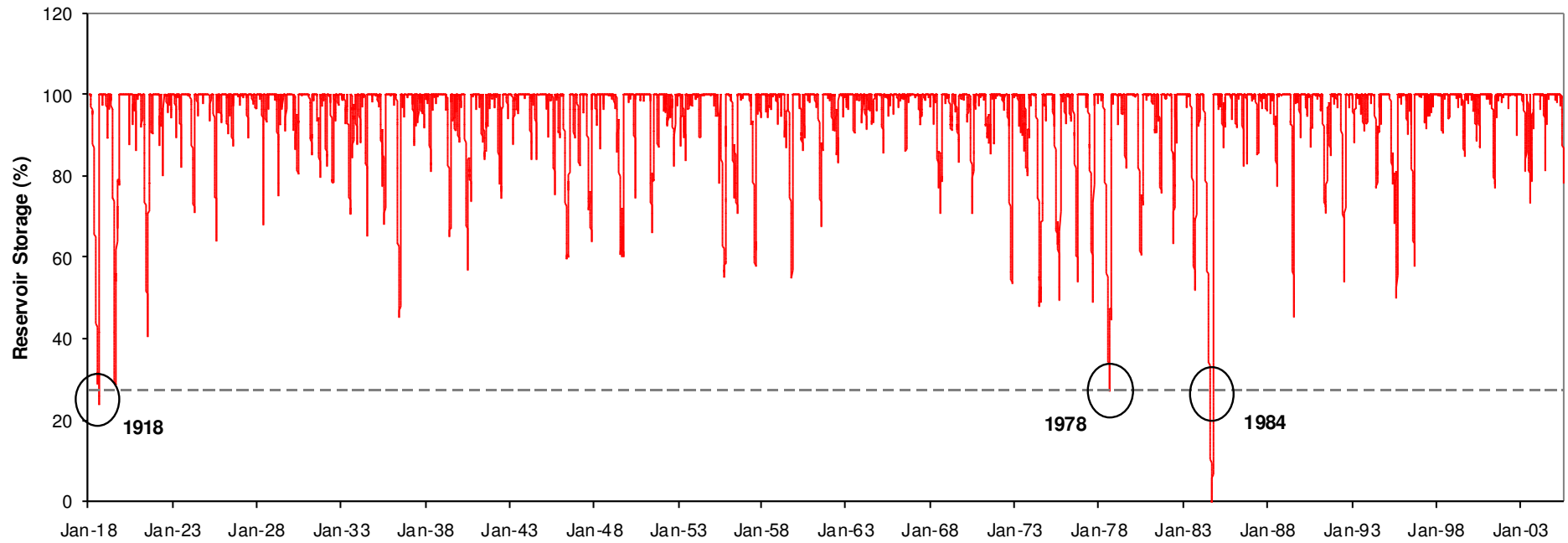
Modelled impact of these historic drought years only – no information on actual impacts



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Black Esk Modelled Drawdown



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Drought Planning - Challenges

Wide range of water resource systems

Supply Demand Balance vs. Drought Planning

Lack of historical information and experience

Hydrological data and modelling uncertainty

Perception and communication issues



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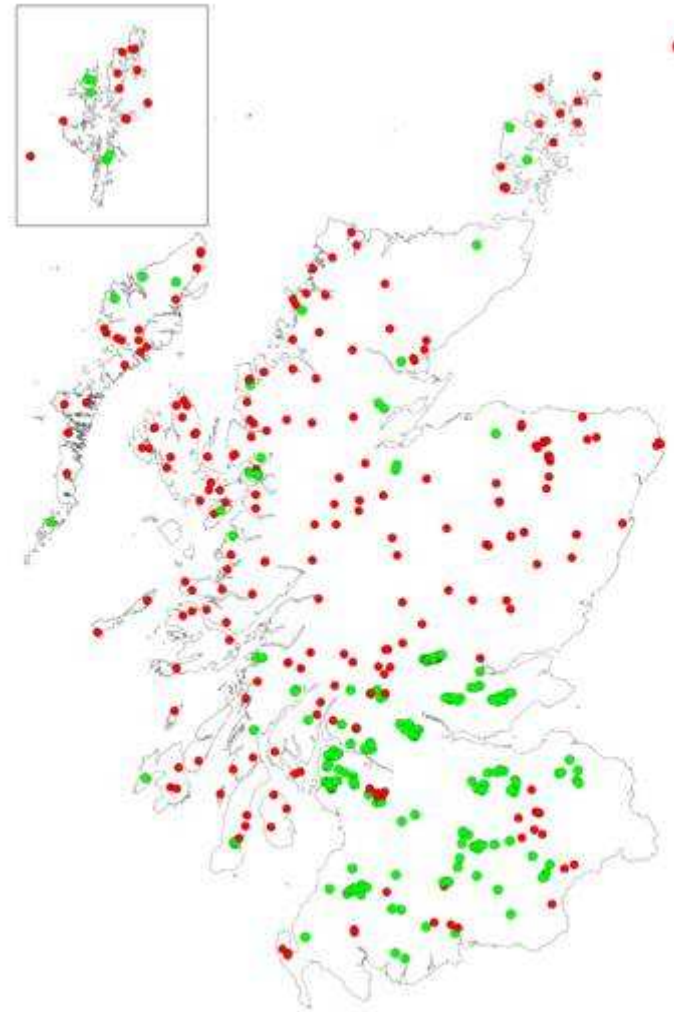
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Scottish Water Drought Planning

46 Drought Plans over next 3 years - prioritised by population and general drought risk

Cover a range of systems – from small, isolated systems in Shetland up to larger complex systems, e.g. Edinburgh

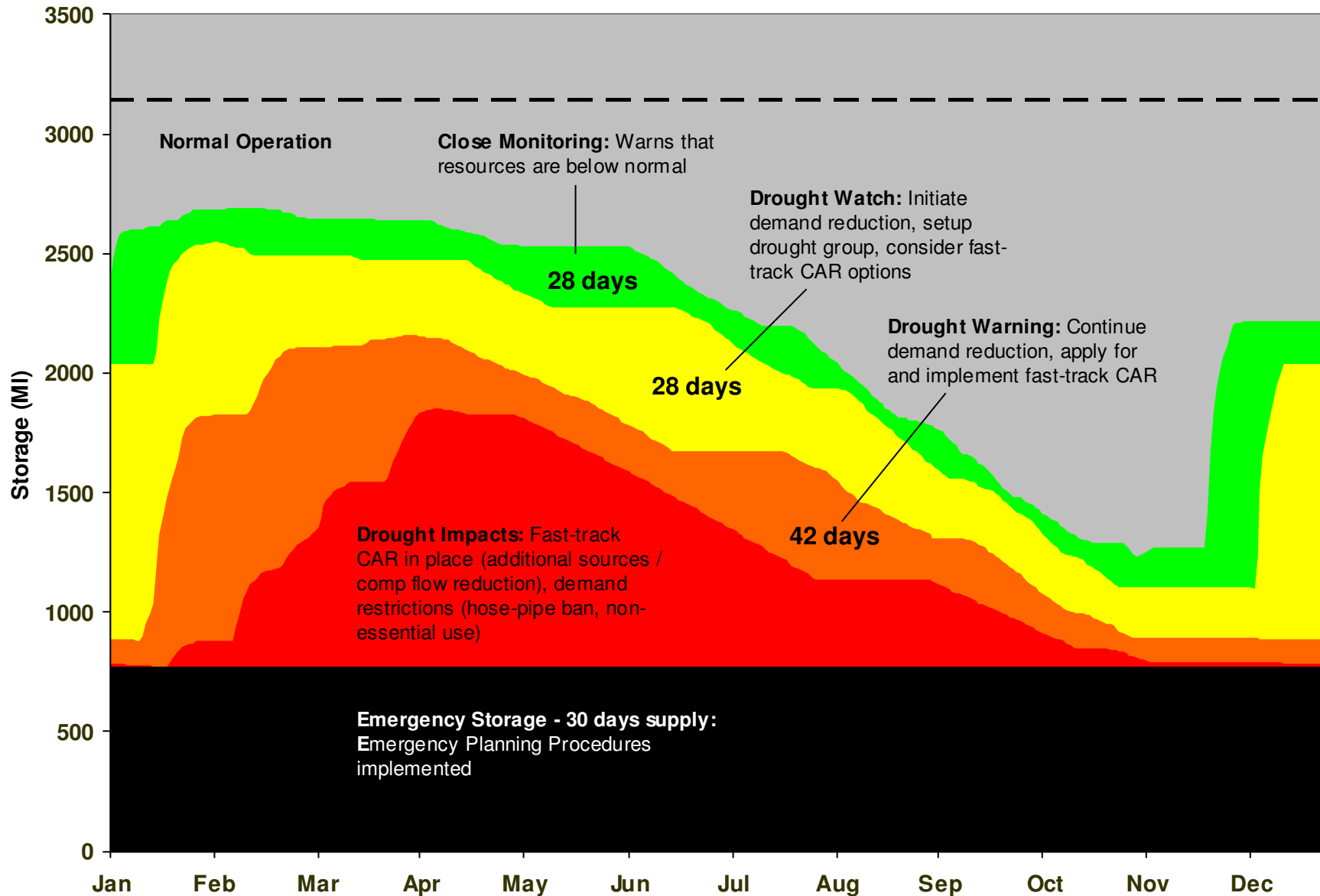
Drought Contingency Plans to cover all remaining WRZs (ca. 170 WRZs) - smaller storage systems, rivers and groundwater sources where warning time is limited



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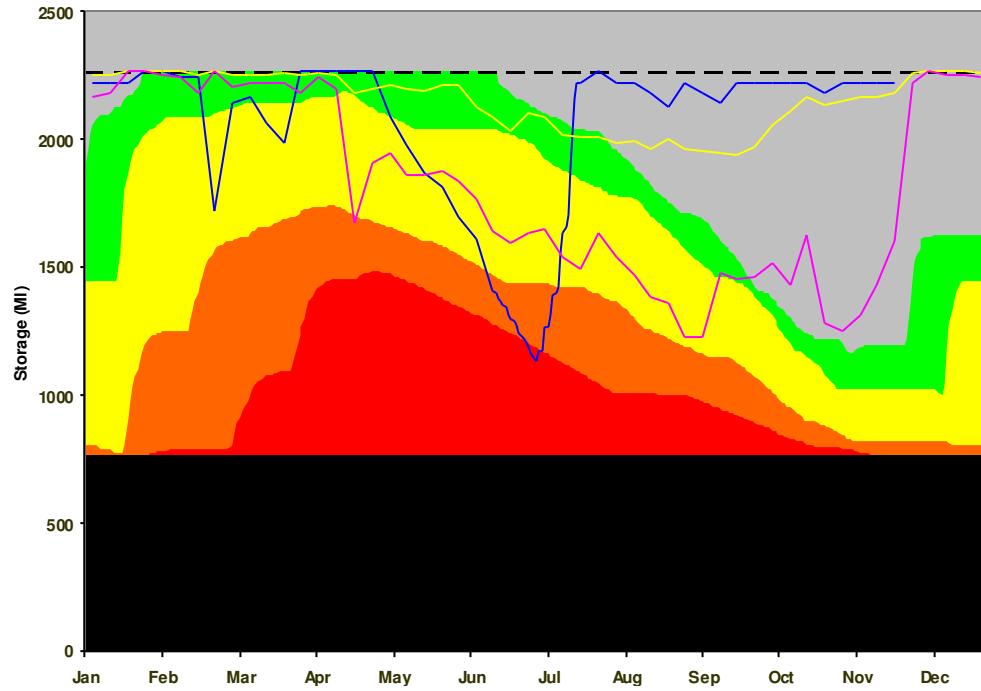
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Drought Control Curve Methodology

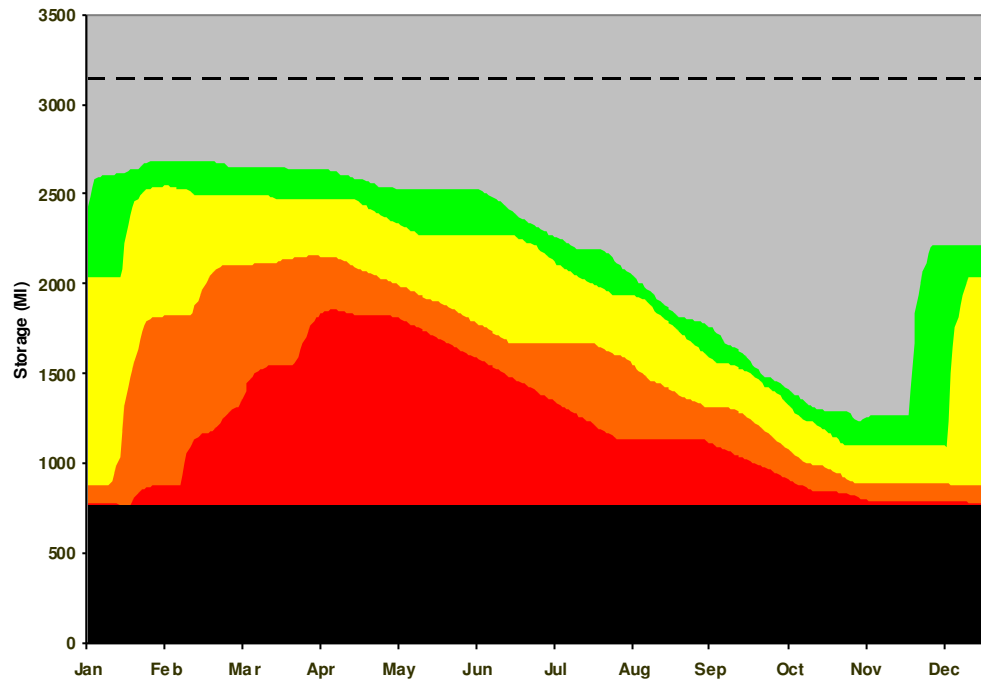


Black Esk Drought Control Curves

Current Storage



Future Storage:
2.5m dam raising



Future Work

SEPA Drought indices project

Reservoir level monitoring - use of telemetry data rather than manual readings

Longer term - improve WRZ connectivity and drought resilience further, e.g. Central Belt



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The End



Questions?



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