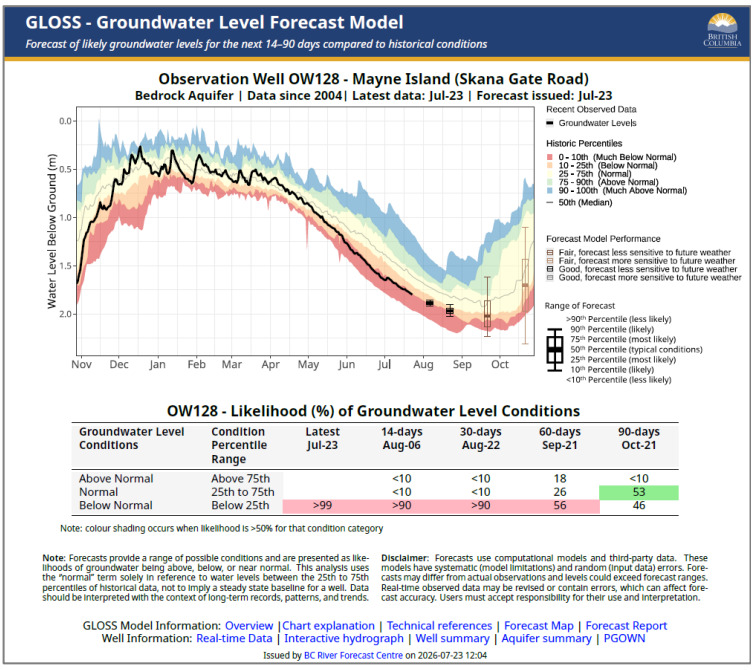
GLOSS - Groundwater Level Forecast Model

Forecast Model Overview

The GLOSS Model, Groundwater Level Outlook Simulation System, is a groundwater level forecasting tool based on an Artificial Neural Network (ANN) machine learning model. It forecasts a range of possible groundwater levels for 14, 30, 60, and 90 days in advance, supporting water management, drought monitoring and helping assess the likelihood of below-normal conditions.



Example output for OW128 from the groundwater level model with a forecast chart showing the range of forecast water levels and a table showing the likelihood of above normal, near normal or below normal conditions.

Data and Methodology

The model draws on multiple data sources, including groundwater levels from the Provincial Groundwater Observation Well Network (PGOWN), long-term climate records of temperature, precipitation, and snowpack (if applicable for a well), and 10-day forecast climate data from Environment and Climate Change Canada. The ANN learns relationships between the hydroclimatic variables and groundwater responses. The model also accounts for recharge lag times, capturing how groundwater responds to the hydroclimate data. These features enable the model to capture both short-term variability and longer-term recharge dynamics. As weather cannot be forecast with confidence at up to 90-day lead times, the model resamples historical climate data using a Monte Carlo approach to produce an ensemble of possible future conditions. These sampled climate sequences are then combined with the observed data and 10-day climate forecast data and run through the model to generate a range of forecasted groundwater levels that reflect the potential conditions ahead.

Forecast Results and Interpretation

Forecasts are produced at 14, 30, 60, and 90-day horizons and present a range of potential groundwater level outcomes – presented in the forecast chart. Forecast values further from the forecast 50th percentile are less likely, though actual water levels may fall outside the forecast bounds. The forecasts allow results to be presented as the likelihood of groundwater conditions being below normal (below 25th percentile of historic conditions), near normal (between 25th and 75th percentile), or above normal (above 75th percentile) – presented in the forecast table. This analysis uses the "normal" term solely in reference to water levels between the 25th to 75th percentiles of historical data, not to imply a steady state baseline for comparison. Data should be interpreted with the context of long-term records, patterns, and trends.

Range of Forecast

>90th Percentile (less likely)
90th Percentile (likely)
75th Percentile (most likely)
50th Percentile (typical conditions)
25th Percentile (most likely)
10th Percentile (likely)
<10th Percentile (less likely)

Forecast Model Performance

- Fair, forecast less sensitive to future weather
- Fair, forecast more sensitive to future weather
- Good, forecast less sensitive to future weather
- Good, forecast more sensitive to future weather

Forecast performance is grouped into categories that show model reliability and how sensitive the forecast depends on future weather conditions. The model is evaluated by comparing its forecasts to past groundwater observations. "Good" forecasts match past patterns closely and give strong confidence in the results. "Fair" forecasts still provide useful guidance but come with more uncertainty. Forecast sensitivity describes how strongly the results depend on upcoming weather. If sensitivity is low, the model adds value beyond long-term averages and is less affected by day-to-day weather changes. If sensitivity is high, the forecast relies more heavily on how future weather unfolds, which means there is greater uncertainty in the forecast.

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Products

There are various ways to view the results of the forecast model. One-page reports for each well present the forecast range and likelihood of certain groundwater conditions (seen in chart above). Links to these individual reports can be found on the Groundwater Level Forecast Map and Report products. These products present both the likelihood of "Below Normal" groundwater level conditions and most likely conditions in different map layers and tables. These products are updated daily throughout the year, unless issues with data availability or other problems arise.

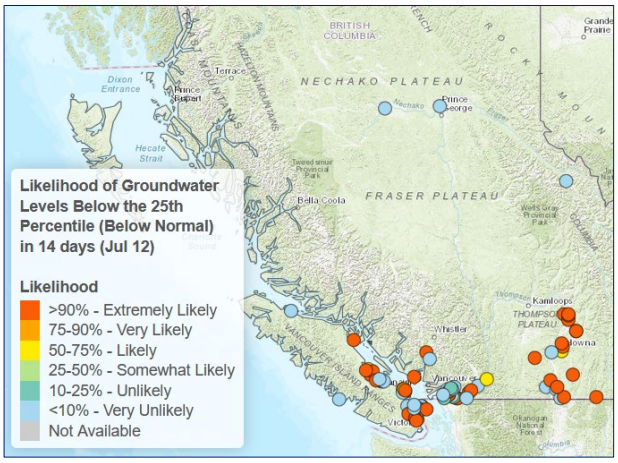
Model Limitations and Uncertainty

Forecast uncertainty arises from both the model structure and the climate data used as inputs. Systematic errors reflect limitations in the model's representation of groundwater system behaviour, while random errors result from uncertainty and variability in input data. Forecast uncertainty generally increases with longer lead times and during extreme weather events or unusual recharge conditions. Because the model is trained on historical relationships, its performance may be reduced when conditions differ substantially from those observed in the historical record, including emerging climate patterns and unprecedented events.

Disclaimer

Forecasts represent simulated future groundwater conditions and may differ from observed groundwater levels. Results are based on climate observations and forecasts from third-party providers and on near real-time groundwater and climate data that may be subject to revision or quality-control updates. Consequently, forecast outputs may change as input data are corrected or updated. These forecasts are intended to support situational awareness and planning and should not be used as the sole basis for operational or management decisions. Users are responsible for interpreting and applying the information appropriately. Additional details on model development, validation, and performance are provided in the Technical References.

Forecast Products



Groundwater Level Forecast Map

Likelihood of Below Normal Groundwater Level Conditions

Well	Location	Latest (Jul-28)	14 days (Aug-11)	30 days (Aug-27)	60 days (Sep-26)	90 days (Oct-26)
	South Coast Region					
OW002	Abbotsford (Airport, Huntingdon Rd W Of Clearbrook Rd)	Normal	<10% - Very Unlikely	<10% - Very Unlikely	<10% - Very Unlikely	10-25% - Unlikely
OW008	Abbotsford (Vye Rd E Of Mccallum Rd)	Normal	<10% - Very Unlikely	<10% - Very Unlikely	<10% - Very Unlikely	<10% - Very Unlikely
OW299	Abbotsford (Mt Lehman Rd N Of Marshall Rd Extension)	Normal	<10% - Very Unlikely	<10% - Very Unlikely	<10% - Very Unlikely	25-50% - Somewhat Likely
OW301	Abbotsford (King Rd W Of Bradner Rd)	Normal	<10% - Very Unlikely	<10% - Very Unlikely	25-50% - Somewhat Likely	50-75% - Likely
OW406	Chilliwack	Below Normal	>90% - Extremely Likely	50-75% - Likely	25-50% - Somewhat Likely	25-50% - Somewhat Likely
OW450	Chilliwack (Sweet Briar Ave)	Below Normal	>90% - Extremely Likely	>90% - Extremely Likely	>90% - Extremely Likely	75-90% - Very Likely
OW451	Hope (Tobena Road At Flood Hope Road)	Normal	25-50% - Somewhat Likely	50-75% - Likely	25-50% - Somewhat Likely	50-75% - Likely
OW452	Langley (Fort Langley Park)	Normal	<10% - Very Unlikely	<10% - Very Unlikely	<10% - Very Unlikely	10-25% - Unlikely
OW492	Columbia Valley (Kosikar Rd)	Normal	<10% - Very Unlikely	<10% - Very Unlikely	<10% - Very Unlikely	<10% - Very Unlikely
OW353	Langley (196 St Near 36 Ave)	Above Normal	<10% - Very Unlikely	<10% - Very Unlikely	<10% - Very Unlikely	<10% - Very Unlikely

Groundwater Level Forecast Report

GLOSS Model Links: Technical references | Chart explanation | Forecast map | Forecast report | Code (GitHub)

Related Links: RFC Homepage | Provincial Groundwater Observation Well Network (PGOWN) | List of active PGOWN wells | Latest Groundwater Level Conditions | Real-time water data tool | ECCC Climate Data | BC Snow Program | B.C. Drought Information Portal

BC River Forecast Centre

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