

Near-term forecasts using deep learning in support of water management decisions

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Decisions are about the future



Why Temperature?

Reservoir thermal bank

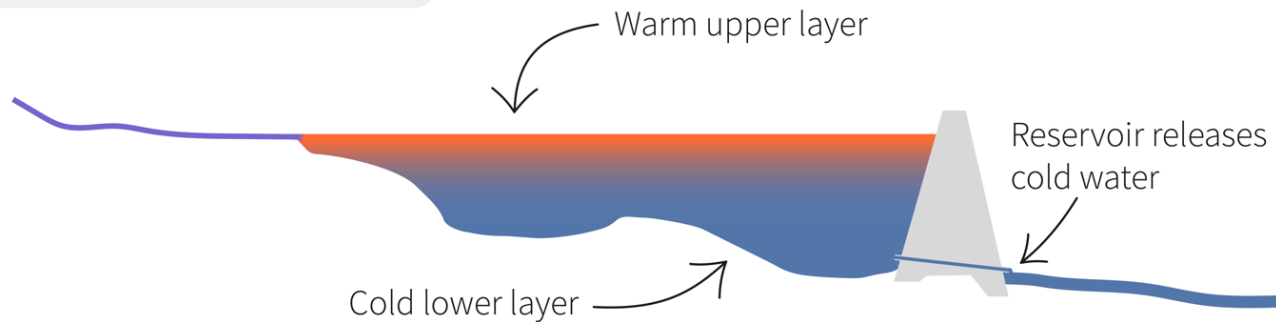
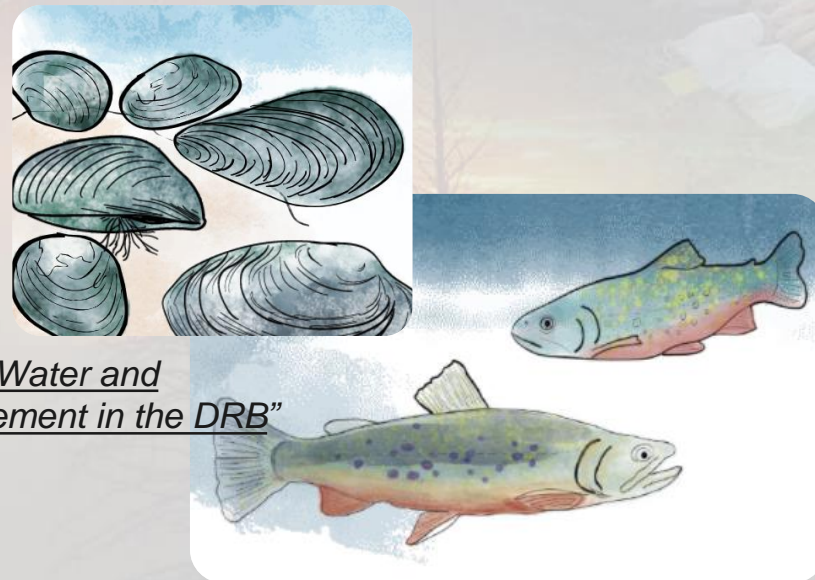
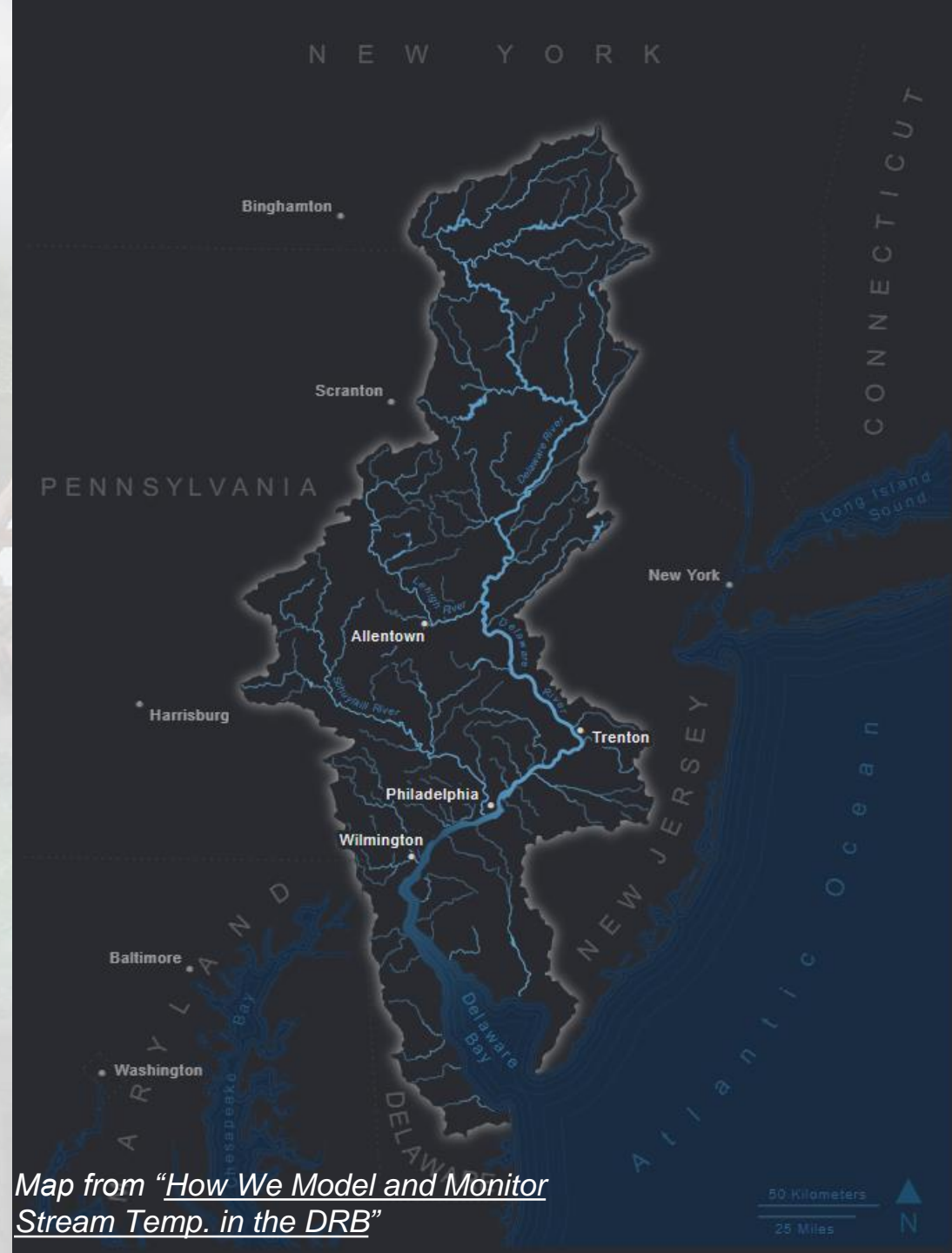


Figure by H. Corson-Dosch and C. Nell



Map from "How We Model and Monitor Stream Temp. in the DRB"



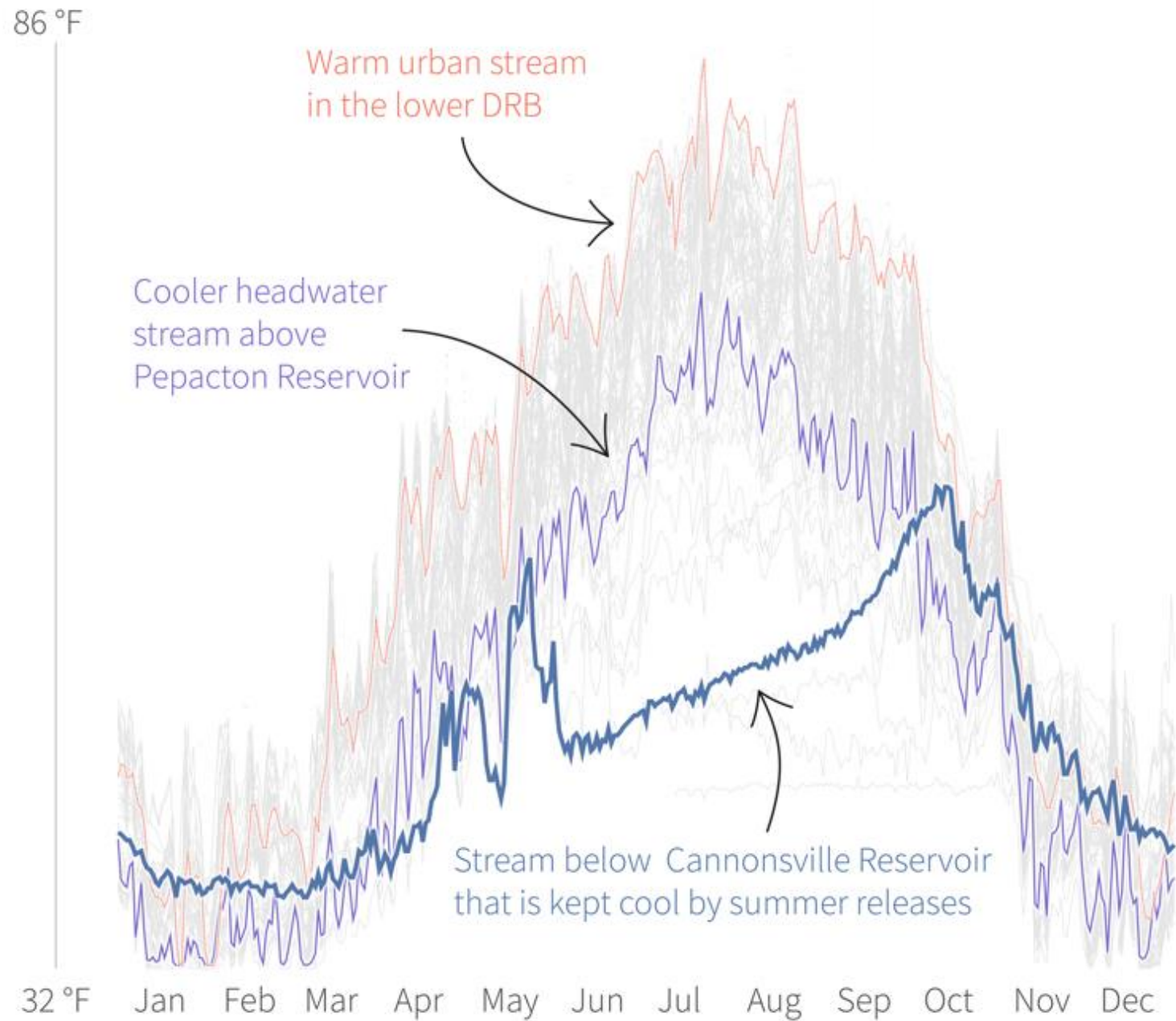
NYC Reservoir Managers

"It's likely that the addition of the USGS product improves our skill and confidence at forecasting."

"The seven-day forecast provided by the USGS product also helps NYSDEC with its staffing coverage, especially on weekends and holidays."

"We see additional benefits from the USGS temperature forecasting product to anglers and other ecotourists."

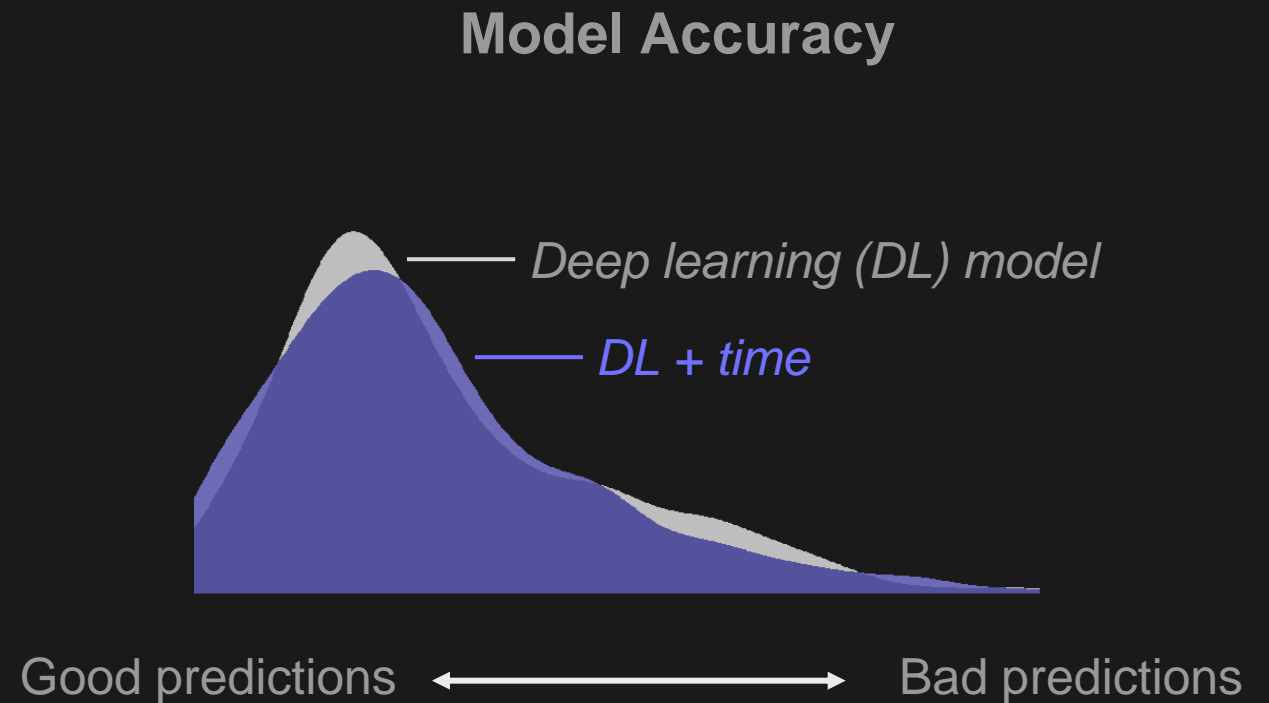
Stream Temperatures Throughout the DRB in 2019



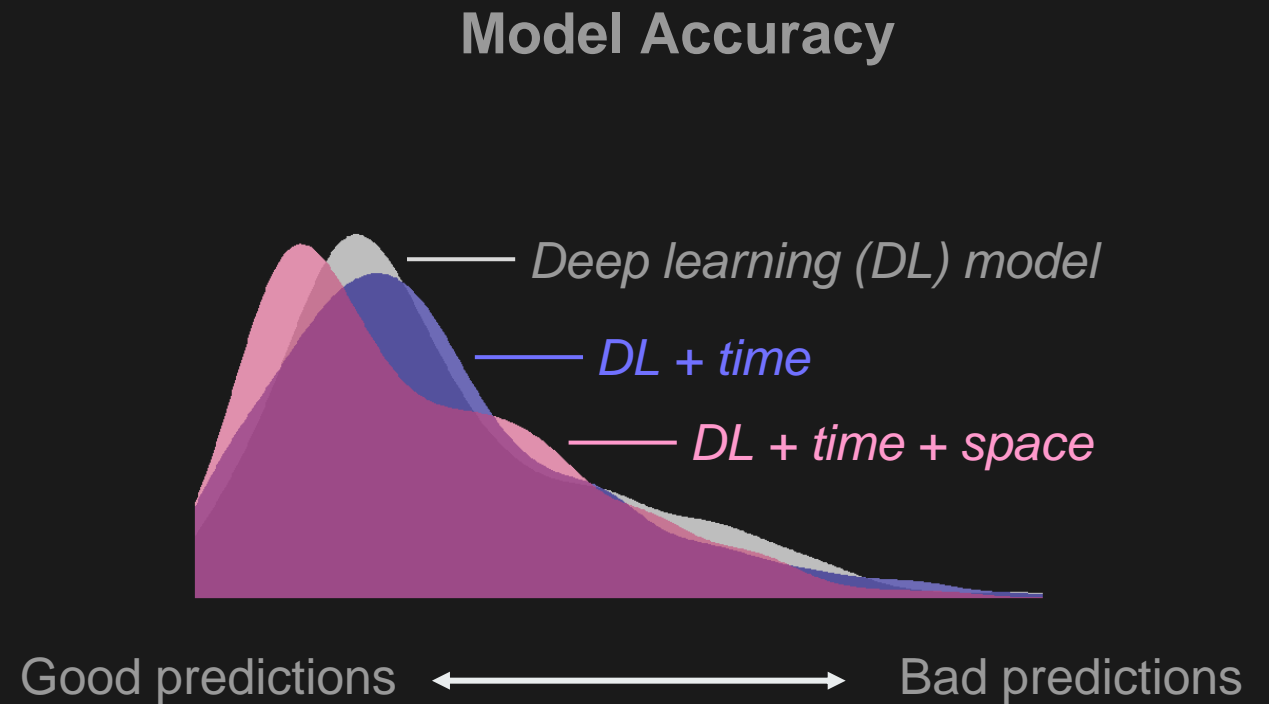
Injecting knowledge into deep learning 1



We use a special deep learning model that allows the model to pass information from one day to the next.

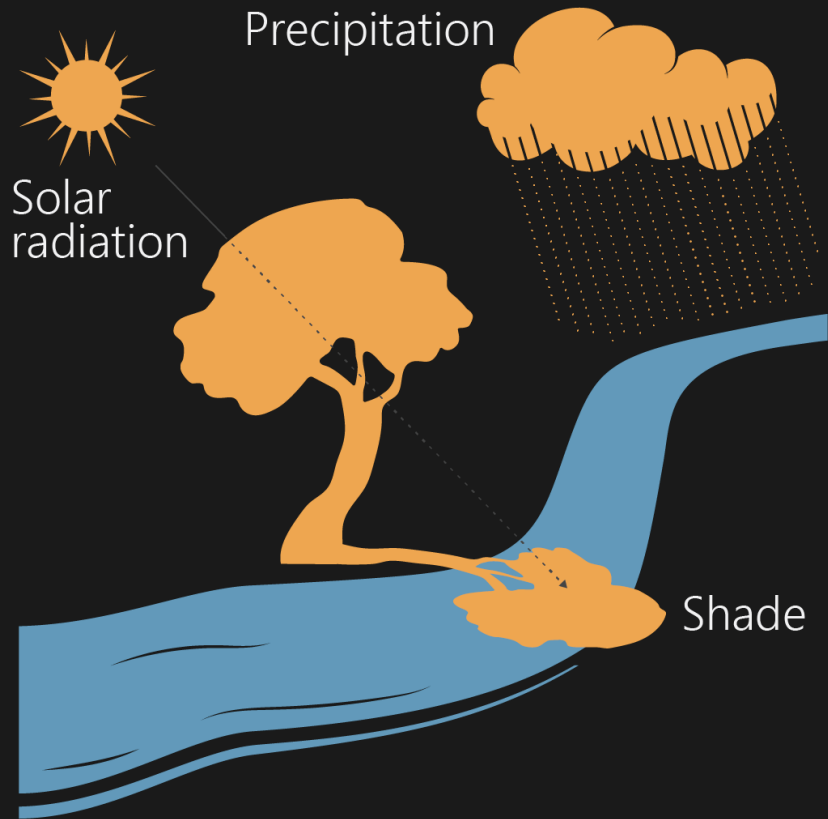


Injecting knowledge into deep learning 2



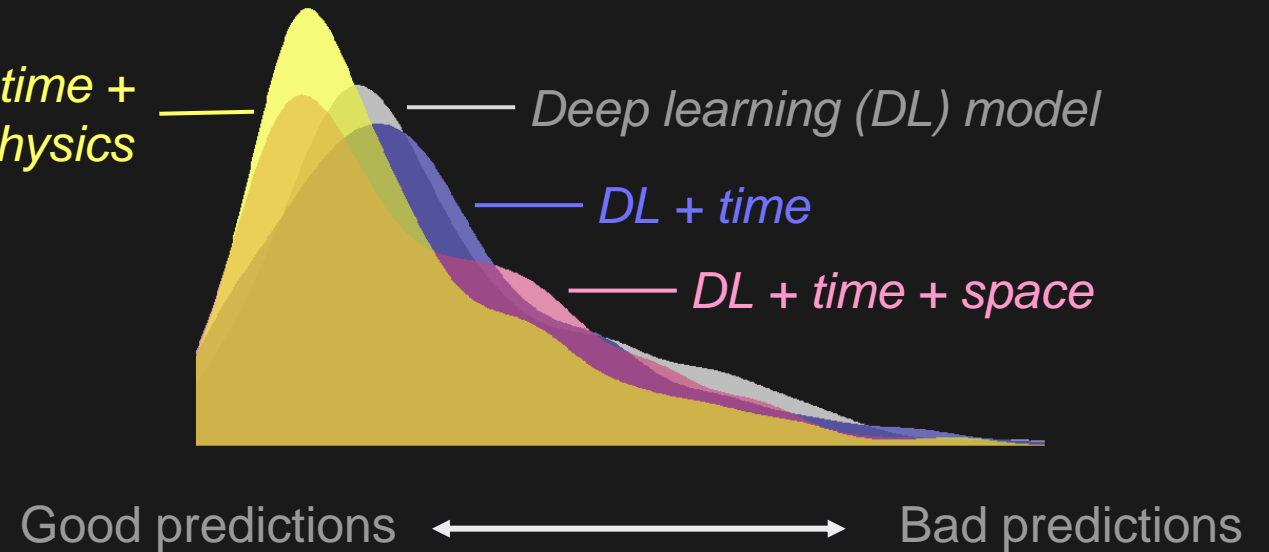
We “teach” the deep learning model about spatial relationships among streams by weighting information according to distance.

Injecting knowledge into deep learning 3



DL + time + space + physics

Model Accuracy

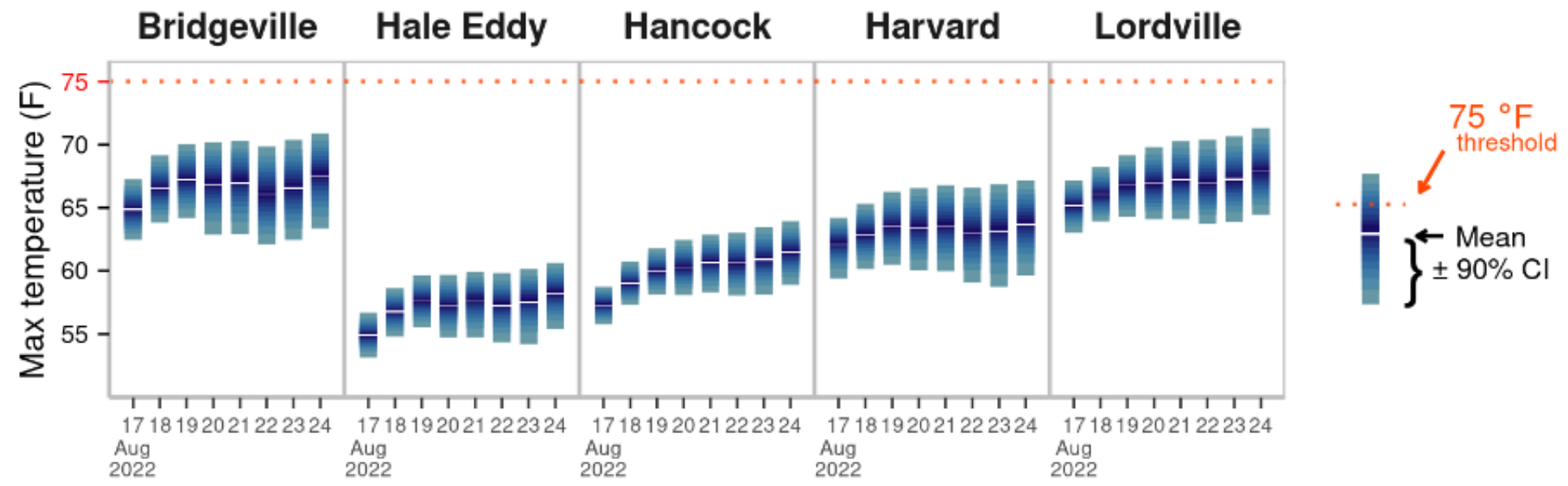


Deep learning model “learns” physics through pre-training with thermodynamic model predictions.

Stream Temperature Forecasts for Sites in the Delaware River Basin

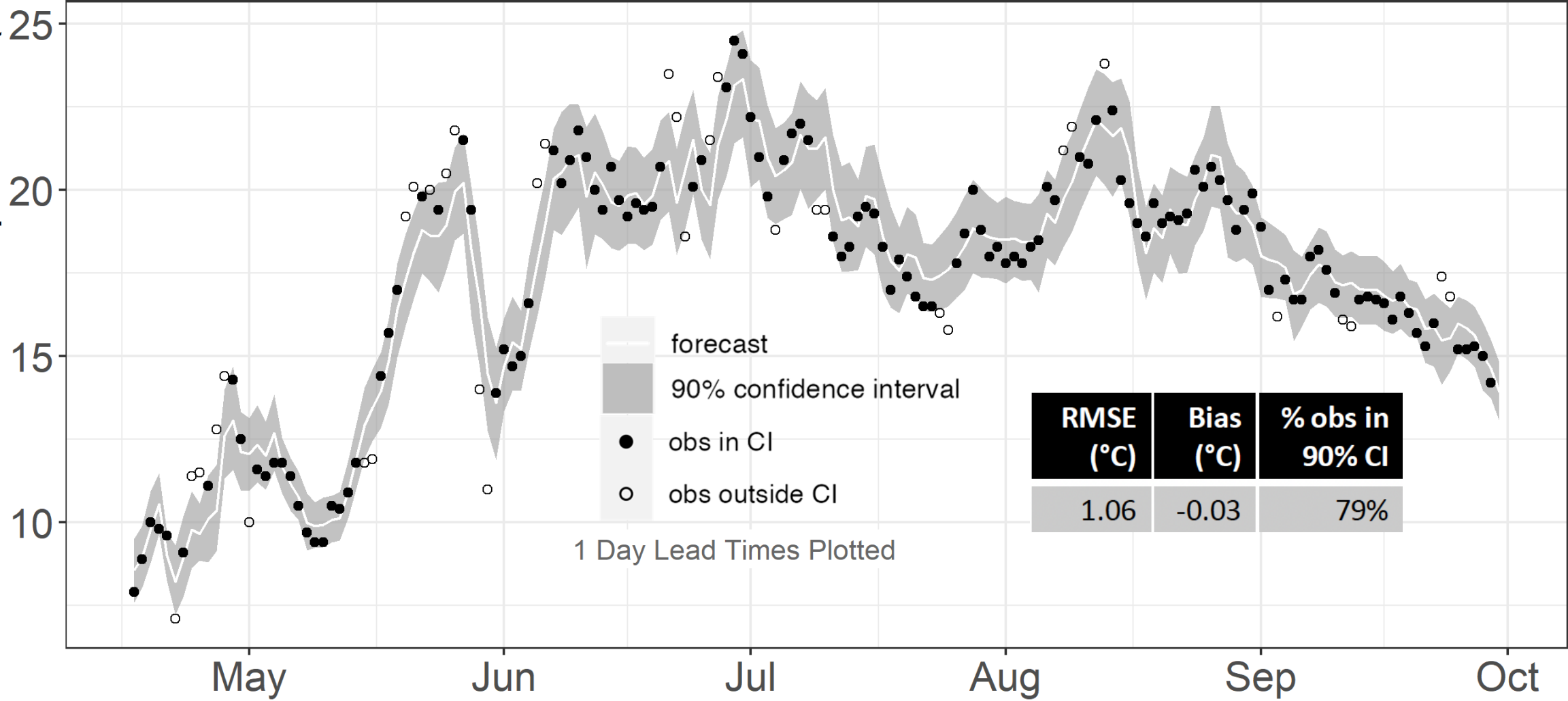
Today's Forecast

Issued on 2022-08-17



DR @ Lordville

Maximum Water Temperature (C)

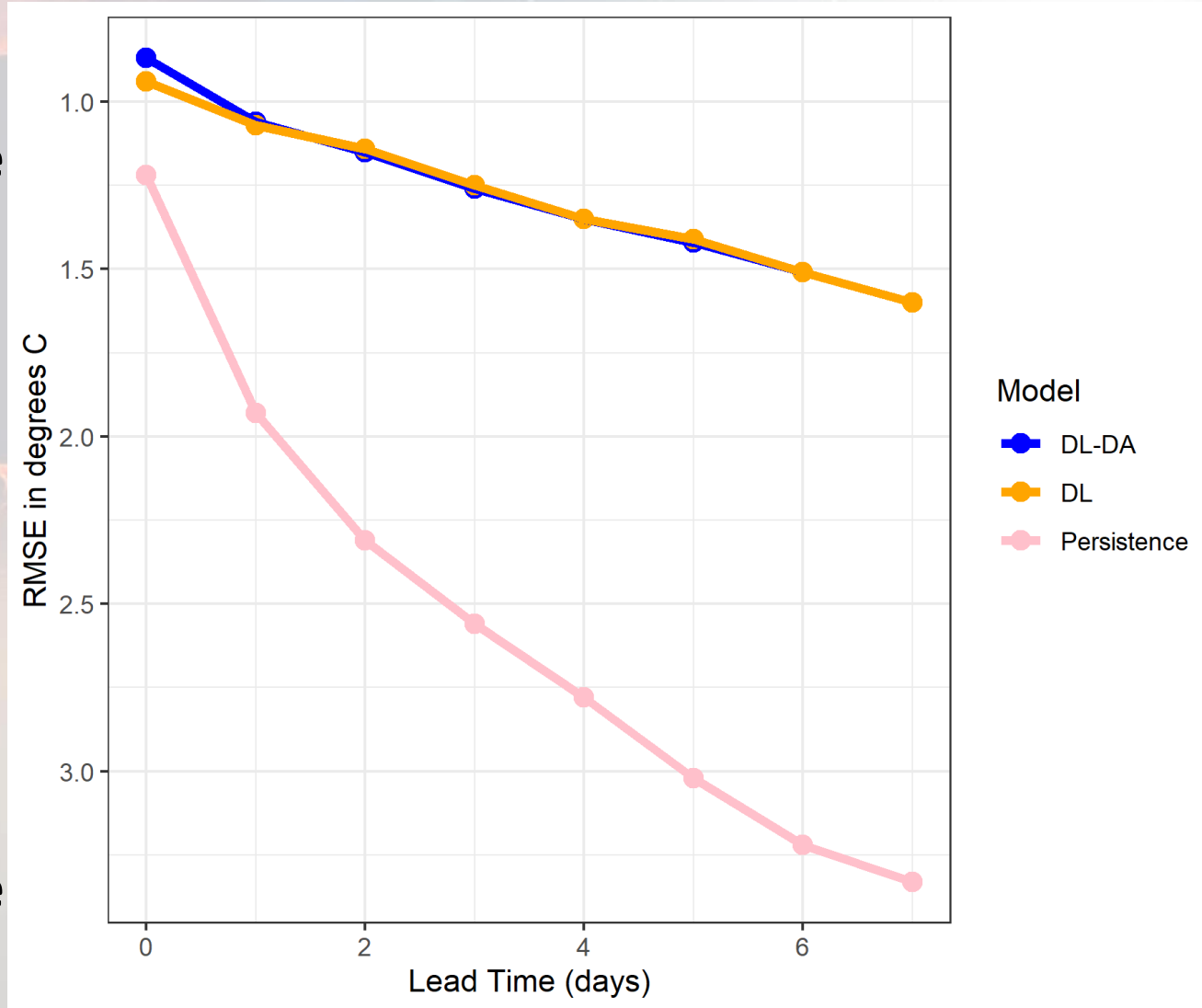


Zwart et al. 2021

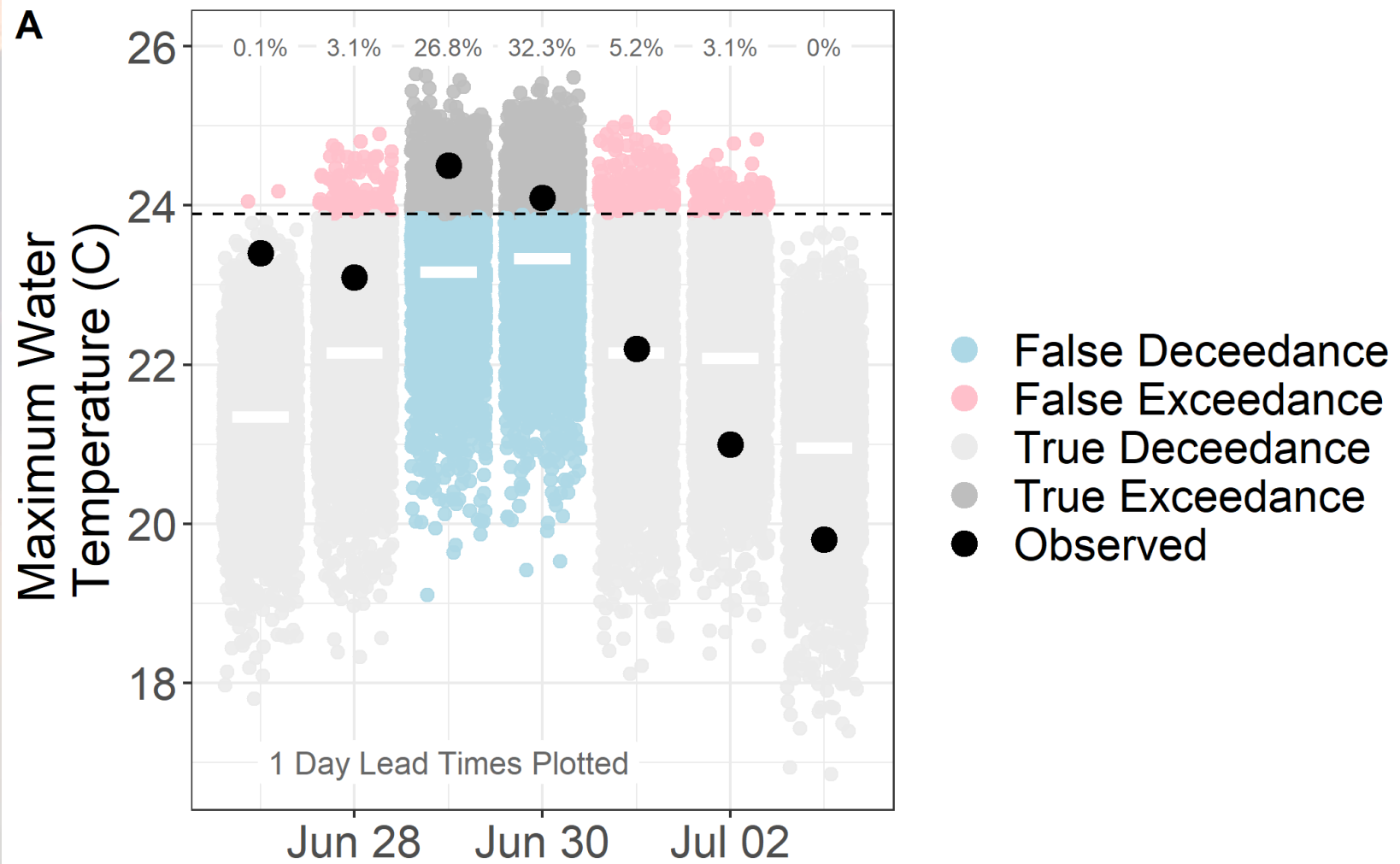
Lordville

More
Accurate

Less
Accurate



Further into the Future



Zwart et al. 2021

- Expanding to 70 sites in 2023
- Maximum temperature forecasts 7 days into the future
- Posting forecasts to the website daily

