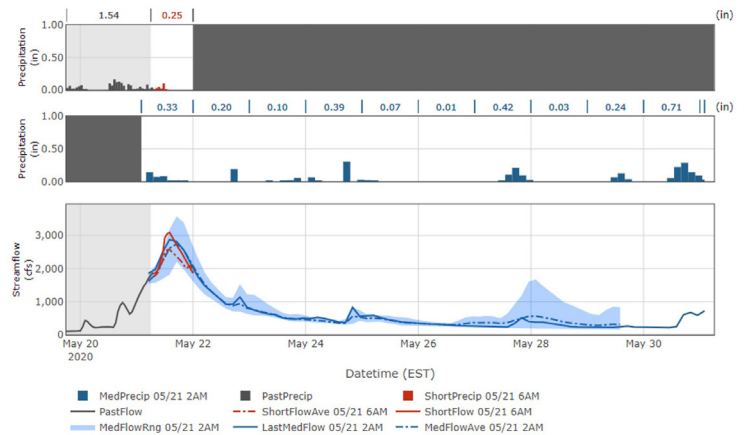


SERVICE-BASED RIVER FORECASTING

WHAT IS A SERVICE-BASED FORECAST SYSTEM?

With a service-based river forecast system, RTI's Center for Water Resources handles the day-to-day operations and maintenance of the system for your team. We work with you to design and implement the system to meet your needs, then we operate it on a regular basis and provide the resulting river forecasts directly to you.

To operate the system, RTI collects the inputs, which commonly include rainfall, temperature, water level and flow data, from public sources or from your organization's monitoring network. Using state-of-the-art methods, we generate or post-process river forecasts for you, reducing your technical burden so that you can focus your time and resources on critical decision-making. We deliver forecast products at the frequency and in the format you need via your preferred communication approach (e.g., website, email, text, etc.). The products are custom-designed to include displays that clearly convey the latest forecasts in the context of your situation, highlighting the specific, relevant information that you need to make decisions. RTI also provides training for your team so that you can quickly interpret the forecast, and understand the associated uncertainties, helping you to make best use of the forecasts to benefit your organization.



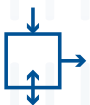
Forecast Issued: May 21, 2020, 6:00 AM

A RANGE OF OPTIONS

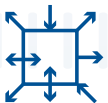
Forecast systems can vary greatly in functionality, resource requirements, and flexibility, creating a wide range of simple and sophisticated potential system designs. With all designs, we operate the system to generate the forecast products that best meet your needs. Examples include:



For the simplest service-based systems, we download publicly available river forecasts and automatically process them into the specific information you need, such as local reservoir inflows. We build tools to enable you to review the river forecasts in conjunction with weather forecasts and other local, contextual information (e.g., decision thresholds).



Middle ground options may include post-processing publicly available forecasts, integrating publicly available river forecasts with custom reservoir models, or running a limited suite of custom models (e.g. rainfall-runoff only).



The most sophisticated systems ingest your preferred hydrometeorological data sources and integrate rainfall-runoff, reservoir operations, and/or economic analysis models into a single, multi-purpose forecast system. This allows us to provide more tailored forecast products with maximum flexibility to create the information your organization needs.

DESIGN CONSIDERATIONS

When designing your service-based forecast system, RTI collaborates with you to create a system that best aligns with your needs and objectives. There are many important factors to consider in the design, which may impact not only the choice of forecast source (e.g., publicly available forecasts versus custom modeling) but also the details of the design specifications. Examples of factors and the associated design considerations include:

Design Consideration	
Decision variable	What information impacts your decision? Streamflow, water level, water temperature, water quality, or another variable? This will influence whether publicly available forecasts are an option and/or which models should be included in the forecast system that we operate for you.
Basin Characteristics	What are the size and characteristics of the basin area? This will influence the spatial resolution and type of models needed for your system. Also, in certain locations, public forecasts may not perform well and would not be recommended due to complex terrain, poorly represented regulation, coastal influences, or other factors.
Operational complexity	If your river basin includes some type of regulation (either operated by your organization or upstream of your location), how complex are the system operations? Systems with complex operations often warrant custom models to effectively account for the associated impact on streamflow in forecasts.
Existing models and processes	Does your organization have existing processes or models that should be integrated into a new forecast system? Examples include precipitation or streamflow monitoring networks, existing hydrologic or hydraulic models, reservoir/operations models, optimization processes, etc. The nature and extent of such integration would impact the system design and whether publicly available forecasts are an option.
Risk tolerance	How much forecast risk is acceptable for your organization and how significant are consequences that may result from inaccurate forecasts? In some cases, custom modeling is the best option because public forecasts do not perform well at a specific location. In other cases, an organization may currently make decisions based on very little information and even rough estimates would be helpful to reduce operational risk.
Decision horizon or frequency	How far into the future are forecasts needed and how often must they be updated? User-specific decision horizons and required frequency may dictate whether public forecasts will meet your needs or if custom-generated forecasts are a better option.

HOW USEFUL ARE THE FORECASTS?

The decision to invest in forecast services and integrate forecasts into your decision-making process typically rests on the benefits that the process can bring to your organization. However, it is often difficult to judge how accurate and useful forecasts will be until we start creating and using them. Even as we generate forecasts, it is difficult to track and evaluate all aspects of the forecast performance to guide how to best use the forecasts for decision-making. Thus, we highly recommend combining forecast generation services with structured forecast evaluation services to realize the greatest value in using forecasts for your organization.

Forecast evaluation can help in several ways:

- Before we begin to provide regular forecast products, we can use the system's hydrologic models to recreate past river forecasts, a process called 'hindcasting', using archives of precipitation forecasts as input. The resulting hindcasts can be compared to historical observations to assess their accuracy and potential value to decision making.
- Once the system is fully implemented, we can provide continuous forecast evaluation results to show how well recent forecasts performed, which allows users to assess the extent to which decisions were improved through the use of the forecasts.
- Together, we can use hindcast evaluation and ongoing forecast evaluation to adjust future forecasts, making them more accurate and reliable on average.

Reach out to our technical staff for a consultation and demo of our offerings.

CONTACT US

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