

# Incorporating River Ice to Inform Flood Inundation Mapping from NOAA's National Water Model

AMS Annual Conference, 38<sup>th</sup> Conference on Hydrology Land Data Assimilation for Improved Model Output

OWP OFFICE OF WATER PREDICTION

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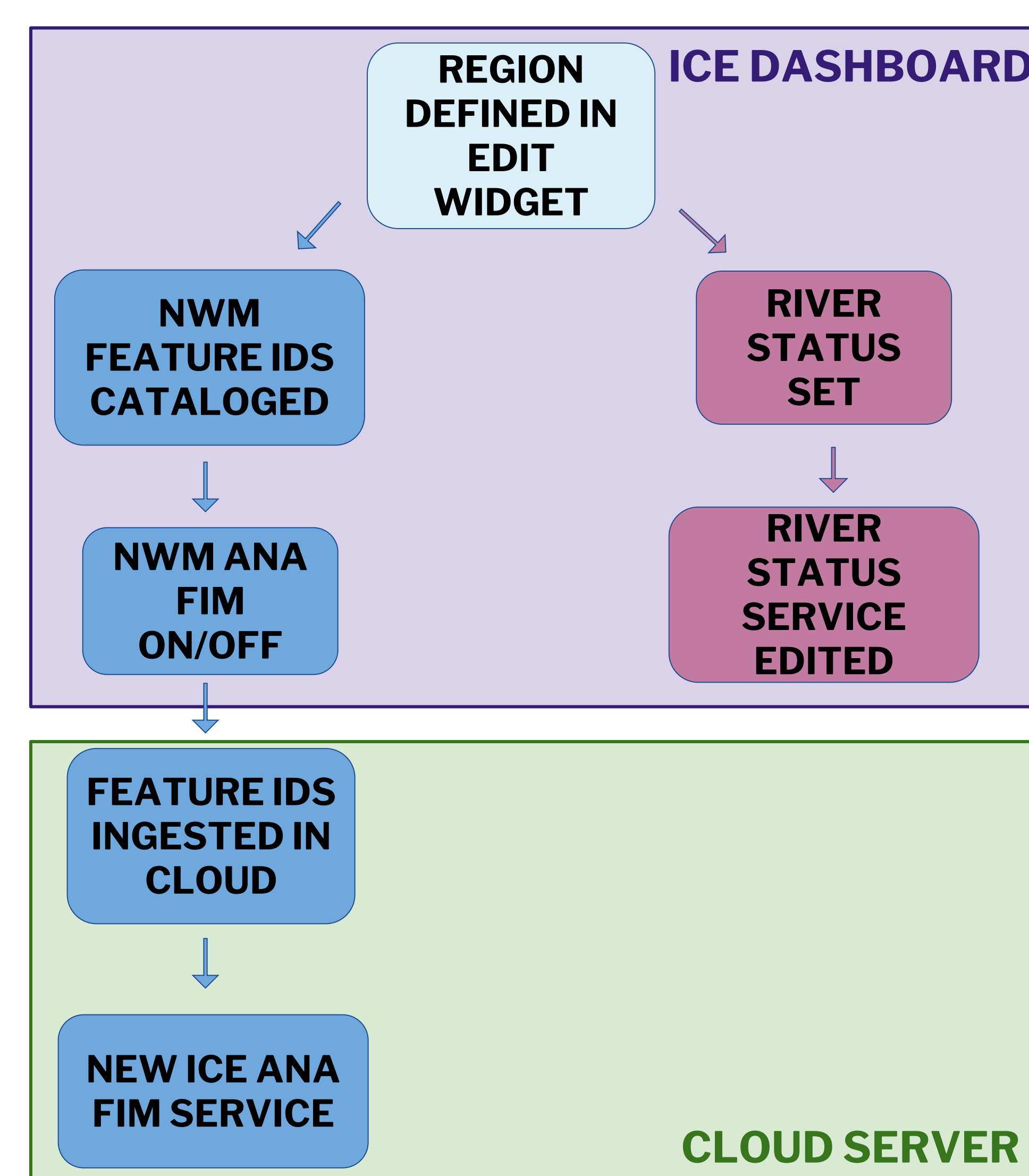
## MOTIVATION

NOAA's National Water Model v3.0 analysis and assimilation (NWM AnA) outputs are post-processed to provide flood inundation mapping (FIM) by assimilating streamflow observations at USGS gauges.

Current NWM AnA FIM output does not filter out ice-affected stream reaches, except in very limited cases. This results in the generation of erroneous FIM and renders FIM less effective during winter events. The NWC Operations Division has created the Ice Common Operating Environment (ICE) Dashboard as a resource for NWC and all supported field offices to consolidate and review ice-affected stream reaches for the NWM domain. The dashboard allows users to filter out quality-controlled erroneous NWM AnA FIM, providing a more useful FIM service. The dashboard is one editable interface for analysts to store supporting data, including remote sensing images and photographs. The dashboard capabilities include:

- improves the quality of NWM AnA FIM used by NWS Field Offices in support of their partners
- increases the utility of FIM in cold regions
- prevents inaccurately generated FIM from being included in post-event FIM verification efforts
- incorporates the experience and knowledge of field forecasters as well as remote sensing analysts

## ICE DASHBOARD WORKFLOW



## ACKNOWLEDGEMENTS:

The authors would like to thank Peggy Lee, OWP's HydroVIS team, and Brian Cosgrove for his input on NWM Analysis and Assimilation products.

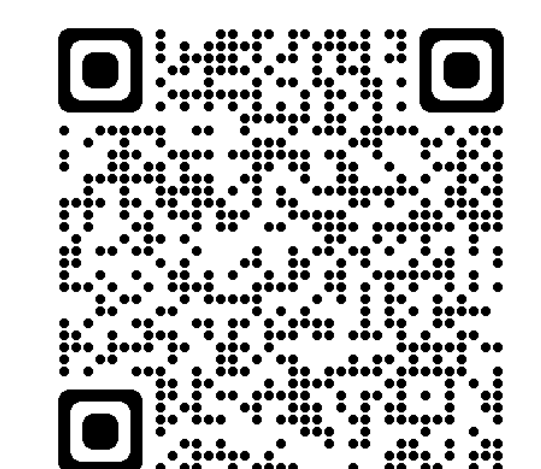
## REFERENCES:

Cosgrove, Brian, David Gochis, Trey Flowers, Aubrey Dugger, Fred Ogden, Tom Graziano, Ed Clark et al. "NOAA's National Water Model: Advancing operational hydrology through continental-scale modeling." JAWRA Journal of the American Water Resources Association (2024).

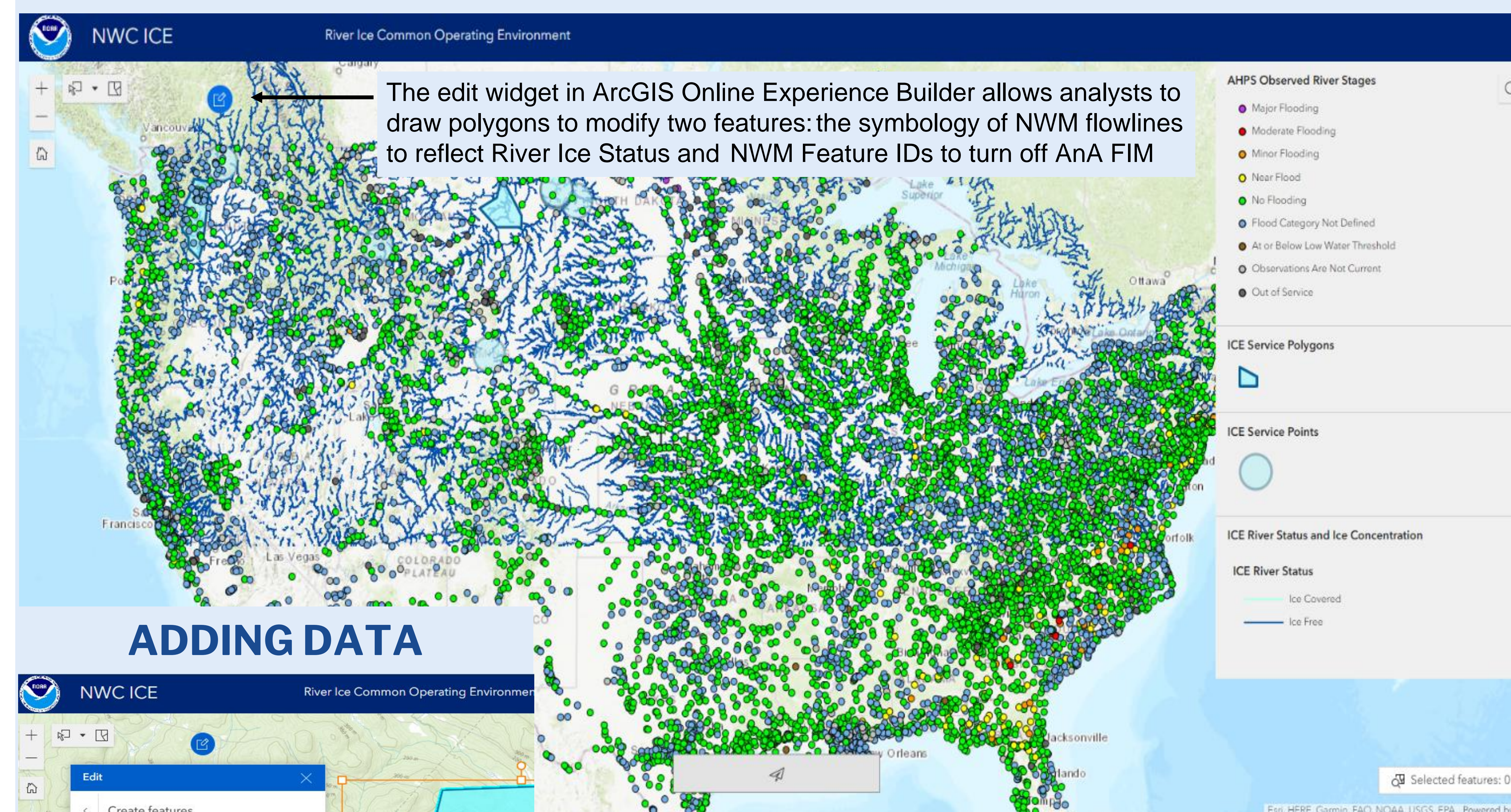
## CONTACT

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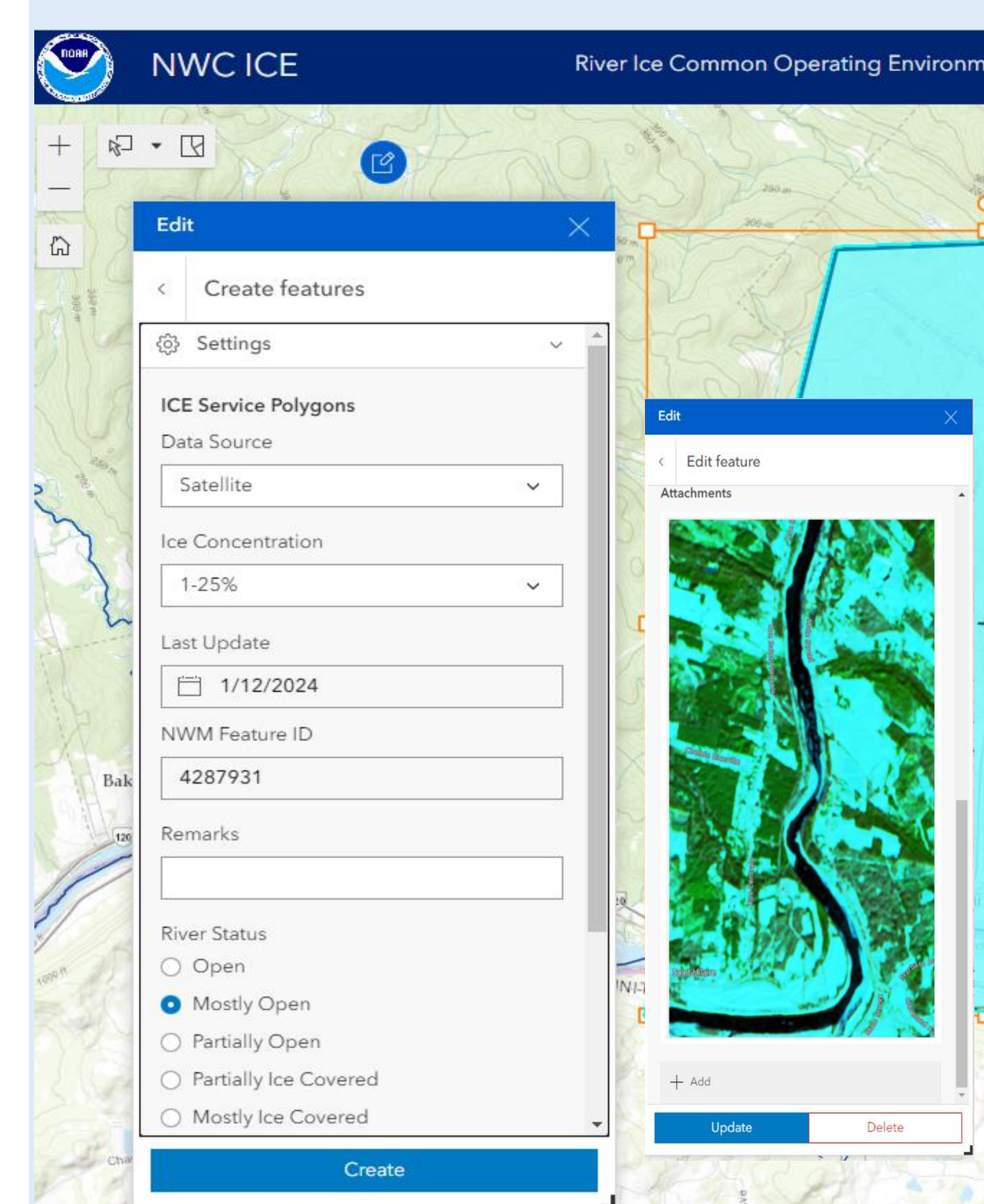
View the National Water Center's Operations Page



## NWC OPERATIONAL ICE DASHBOARD

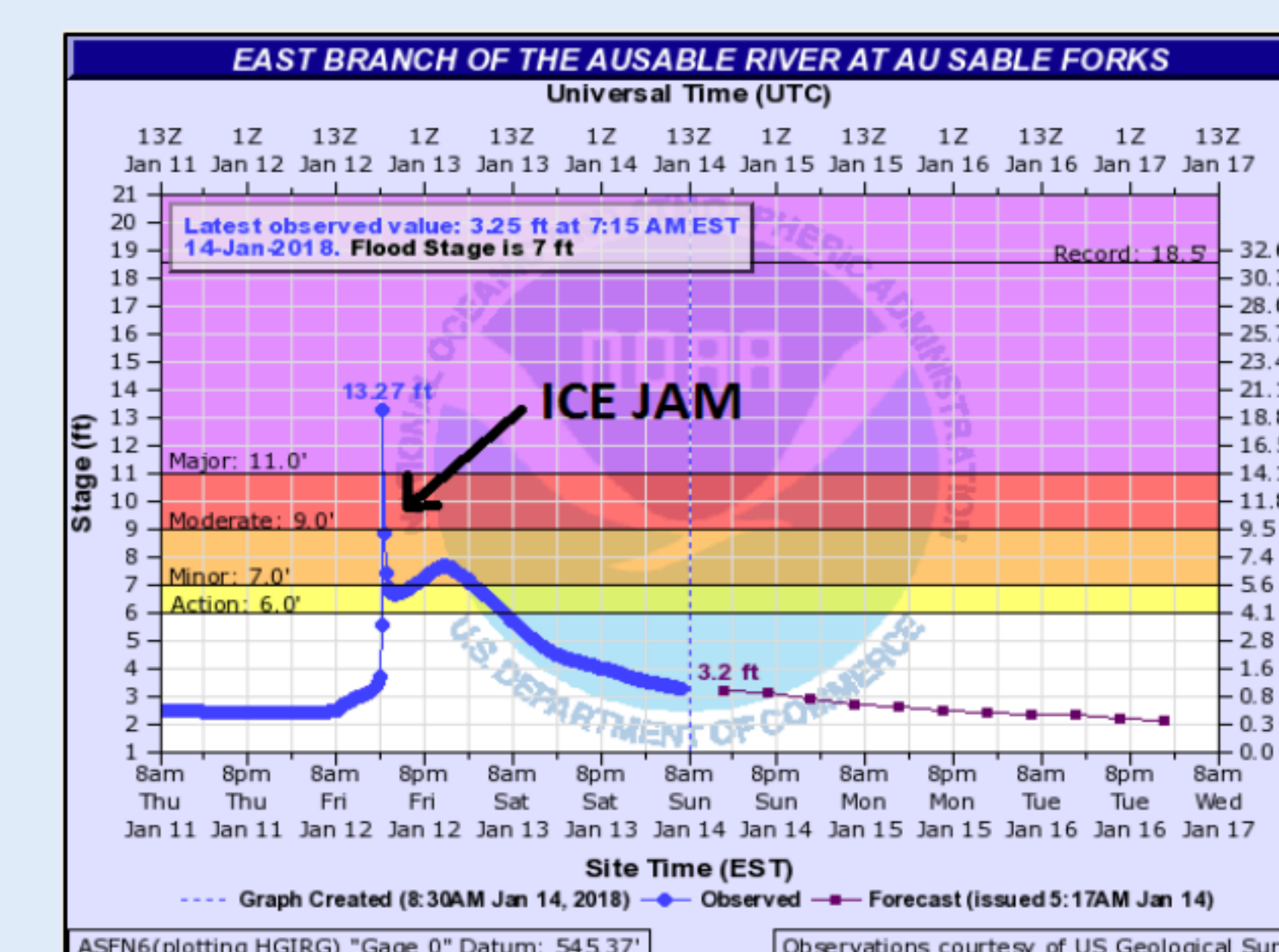


## ADDING DATA



Users fill the dialogue box based on their analysis. In this case, NWC operational forecasters used a Sentinel-2 short-wave infrared remote sensing image to analyze this reach of the Saint John River. They classified the river status as mostly open, but due to a constriction of shore fast ice at a low-velocity reach, forecasters elected to turn off NWM AnA FIM. Analysts have the option to add satellite images or airborne images to justify conclusions made within the application.

Only ice-affected stream reaches of stream order 4 or greater and North of the 37<sup>th</sup> Parallel are included in NWC ICE: stream order 4 is the highest resolution river ice can be detected with our remote sensing products and the 37<sup>th</sup> Parallel furthest South river ice will accumulate.



These pans can create anomalous gage readings (figure to the right), and the analyst would highlight this reach and downstream reaches to "turn off" AnA FIM.

## ARCGIS ONLINE TO THE AWS CLOUD

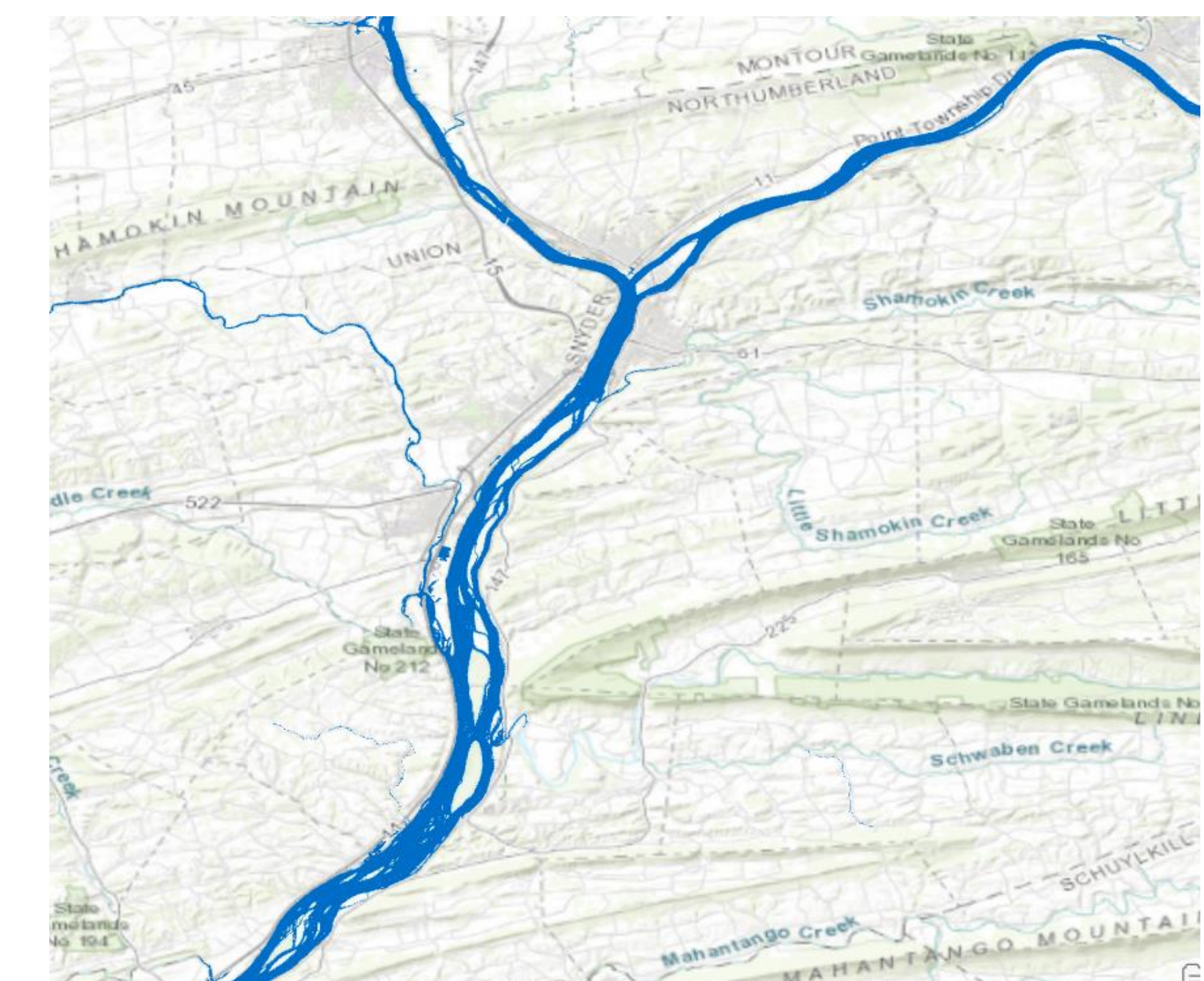
A NWM Feature ID is pulled into an ICE Service polygon or point using an intersect script in Arcade

The NWC AWS Cloud environment, HydroVIS, ingests the REST Endpoints of the editable ICE Service Polygons and ICE Service Points, including the NWM Feature IDs and whether operational forecasters have indicated that Analysis FIM should be turned off at that reach.

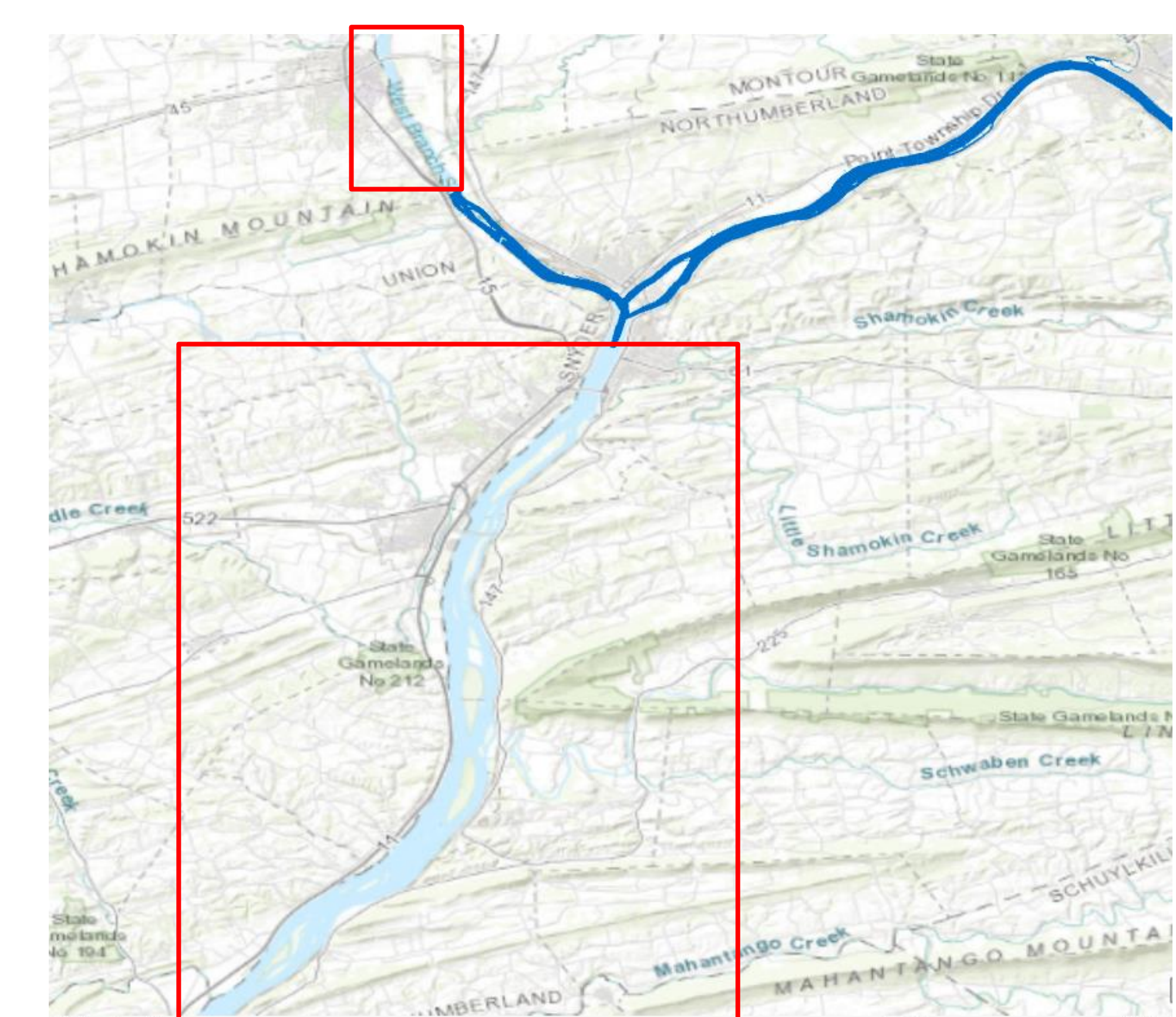
The NWM Ice-Affected Analysis and Assimilation FIM has one additional attribute indicating whether FIM should run for that stream reach.

## RESULTS: ICE-AFFECTED FIM

NWM AnA FIM without ICE Dashboard input. The original AnA FIM service produces FIM along all reaches (below).



The NWM AnA FIM service after the ICE Dashboard has allowed users to filter out FIM along ice-affected stream reaches. Note the difference between ice-affected reaches to the North v. unaffected reaches to the South:



## UPCOMING DEVELOPMENT

- Expansion of NWC ICE to include field contributions to be integrated after NWC QA/QC
- Addition of USGS Ice-affected Streamflow Gauges to NWC ICE