NWS Flood Inundation Mapping (FIM):

Roles and Experiences at River Forecast Centers

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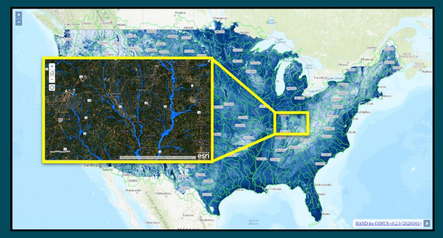
What is FIM?

NWS Flood Inundation Maps (FIM) are powerful tools for communicating flood forecasts and flood risk.

Forecast FIM products use NWS River Forecast Center (RFC) streamflow forecasts or National Water Model (NWM) guidance to compute flood inundation and provide actionable information in real-time.

Analysis FIM maps, which combine observed flows and NWM simulations, depict ongoing or maximum flood inundation extents, particularly useful in the Post-Flood phase.

Static FIM maps show flood inundation at critical river stages and are used in the Pre-Flood phase for planning, training, and outreach or during flood events to consider scenarios when flow forecasts are uncertain.



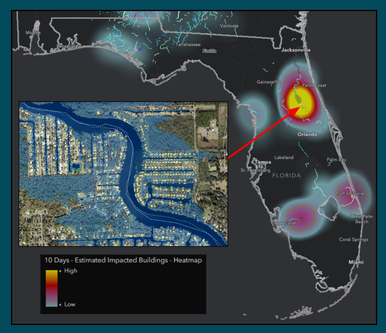
National Water Model (NWM) and NWS FIM availability spans over 3.4 million river miles across the United States.

Pre-Flood Phase

RFCs are working with Weather Forecast Offices (WFOs) and the National Water Center to **train staff and partners**, as well as **evaluate the strengths and limitations** of new NWS FIM products.

Location	State	NWSLI	Flow-Based CatFIM		
			Reviewer/Date	Review Verdict	Notes
Godeffroy	NY	NEVN6	EM 5/30/23	Use Caution	Similar to the stage based and therefore it does quite well with the stretch
Old Forge	PA	OFRP1	EM 5/31/23	Use Caution	Compared to the stage based. It overinundates more at action-minor. Eve
Bridgeville	NY	BRGN6	EM 5/31/23	Use Caution	Very similar to stage based, overinundates at action at relatively the same
West Cameron	NY	WCRN6	EM 6/6/23	Use Caution	This is really close to stage based and they basically could be treated equ
Conklin	NY	CKLN6	EM/ 2-9-12	Good Overall	This generally slightly underpredicted the flooding north of the gauge but re
Chenango Forks	NY	CNON6	EM/ 2-13-12	Use Caution	It was largely representative below the gauge where there was AHPS reac
Wilkes-Barre	PA	WBRP1	EM/ 6/6/23	Good Overall	Presumably, this was calibrated by the AHPS because it lines up almost ex
Vestal	NY	VSTN6	EM/ 1-31-23	Do Not Use	Flow based significantly under inundates the entire area. It should not be u
Chemung	NY	CMGN6	EM 6/5/23	Good Overall	This one was definitely calibrated to AHPS FIM. It still overinundates slight
Unadilla	NY	UNDN6	EM/2-23-23	Do Not Use	Lots of problems, severe underinundation at all levels for most of the area

Example FIM Review Tracker. Reviewers can provide notes to share confidence in NWS FIM output at various locations.



FIMPact heat map, illustrating concentrated areas where structures may flood, as depicted by NWS FIM.

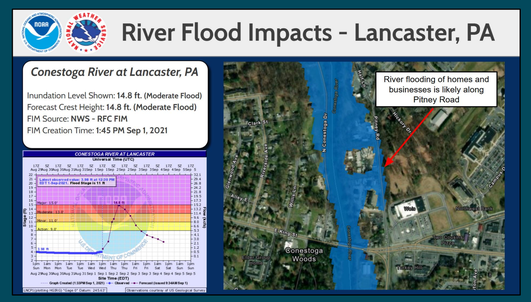
Example review of a Static FIM. FIM output can be compared to prior floods and known flood impacts.

RFCs are also leading **Static FIM reviews**, which allow forecasters to assess their confidence with NWS FIM output, before a flood strikes.

When a **flood starts to loom** in forecast outlooks, RFCs can leverage NWS FIM and related services to **message potential impacts**, including the forecast confidence.

Flood Phase

NWS FIM **"puts water on the map,"** going beyond the hydrograph, by illustrating the potential flood inundation and impacts, based on the current river forecast and model guidance.

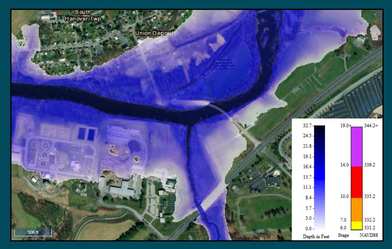


Example of a FIM partner briefing slide. The RFC FIM depicted above corresponds directly to the crest from the RFC forecast hydrograph.

River flooding along Pitney Road in Lancaster, PA, accurately illustrated by RFC FIM (left).

Using state-of-the-art modeling, RFCs produce official river forecasts and **provide impact-based decision support services (IDSS)** directly to core partners.

NWS FIM offers **new tools** to illustrate the river flood forecasts and impacts, which can inform critical decisions.



Some Static FIM can depict inundation extent and depth at select locations nationwide. Future enhancements to NWS FIM will broaden this and other capabilities.

Flash flooding is particularly challenging to forecast and illustrate with NWS FIM. As the local offices update the forecast and issue warnings, colleagues at other offices can assist with FIM IDSS and broadening situational awareness.

RFCs provide **"reach-back capability"** for WFOs regarding questions about NWS FIM or the river flood forecast from local partners and the public.

RFCs and other NWS offices can request assistance with FIM reviews and IDSS via NWSChat 2.0 or Mutual Aid procedures.

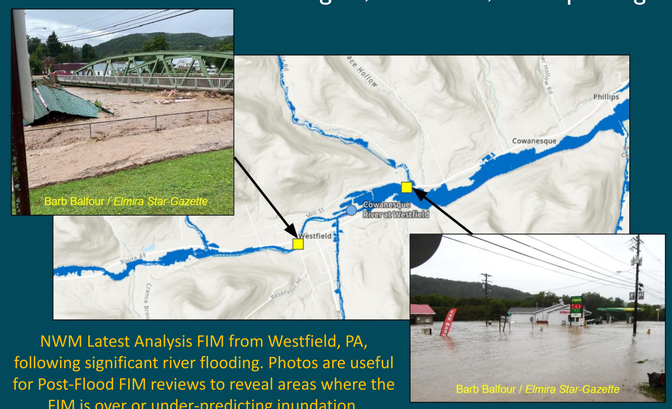
Post-Flood Phase

High water marks and other flood documentation are crucial datasets for flood warning and FIM verification.

As flood waters recede, NWS FIM still plays an important role, helping officials determine when it is safe to return. **Post-Flood FIM** can depict the maximum extent of flooding, useful for recovery efforts.

NWS offices are developing techniques for **Post-Flood FIM Reviews.**

By mapping out flood photos and reports, reviewers can **verify flood forecasts and NWS FIM output**, identifying additional strengths, limitations, and reporting issues.



NWM Latest Analysis FIM from Westfield, PA, following significant river flooding. Photos are useful for Post-Flood FIM reviews to reveal areas where the FIM is over or under-predicting inundation.

RFCs can assist partners, including the USGS, USACE, and emergency managers, with **Post-Flood FIM analysis** for damage assessments, disaster declarations, and high-water mark surveys.

NWS FIM has **already proven valuable** during flood events and **continues to improve** as a resource for addressing the challenges of future floods.

To view NWS FIM, visit:
National Water Prediction Service (NWPS)

water.noaa.gov