Water Resources Coordinating Council
Wednesday, May 27, 2026
Meeting Notes

Call to Order and Virtual Meeting Logistics
The meeting was called to order at 9:00 AM. A total of 19 members and other participants were in attendance or viewing virtually. A roster of members and their attendance is included in the meeting notes.

WRCC Agency Updates
NWS/NOAA (Zogg)- NWS provided seasonal weather outlooks. A copy of the presentation is included in the meeting notes.

HHS (Wickam)- New environmental health specialist training set for August in Ankeny. Registration information is available at https://www.ieha.net/event-6671209 and at https://cdn.wildapricot.com/27820/resources/Documents/Agenda. FY27 private well grants are going out soon. Testing now expanded to include PFAS and other contaminants, resulting in more use of program .

ISU Extension (Stefanik)- INRC received 42 applications for funding. Decisions in late summer. Updates are coming to the INRS dashboard are pending final review and will go live soon reflecting water accomplishments.

IIHR (Weber)- Water quality monitoring- funding received from various sources to maintain nitrate sensor network from counties, cities, and Izaak Walton League. Some monitoring funds also directed to DNR for ambient monitoring network. NOAA/CIROH is in final year of initial 5 year support- hoping for renewal next year for 5 more years. Hosted workshop of researchers in May to do strategic planning for WQ research. Received funding from NASA for research on nutrient dynamics- partnering with larger cities/utilities to implement. Also received NASA funding for flash flooding research/forecasting in NW Iowa. Adding hydrostations in SW Iowa as well. Announcement forthcoming in July on that expansion. Working with private vendors to expand radar opportunities as well- may be worth future WRCC presentation.

DNR (Schneiders)- DNR is receiving additional funding ($500k) to support additional water quality monitoring. Determining if admin rules are needed or if RFP is sufficient and timing of funding and when it is received and becomes available. Beach monitoring is underway- looking at E.coli and microcystin among other indicators. Working with 6 communities on wastewater optimization. BMP mapping project is fully funded with support from IDALS and is underway- anticipated completion in Spring 2027.

USDA-RD (Sexton)- Conditions in Calhoun Co. are historically dry and of concern on a local level. USDA-RD continues to program disaster recovery funding. Water/wastewater is fully subscribed, still working on single-family housing.

UNI (Clayton)- Also working on funding to improve monitoring on Dry Run Creek in Black Hawk County. Want to get more sensors in place at local level. Will make data publicly available.

USGS (Krempa)- Could not attend in person- provided list of new publications included with meeting notes.

IDALS (Hansen/Kozak)- Changes to SF512 will change formula. Ends water quality loan program but increases investment in WWDWFAP. Also adds Water Quality Initiative funding for Greater Des Moines Watershed including 6 HUC8s above Des Moines. Includes investment in Rural Infrastructure bank and $25 million to Central Iowa Water Works for nitrate reduction facility upgrades. We are working on components of Greater DSM watershed offerings now- will include existing efforts and may expand to include more working lands and nutrient management. Statewide cover crops signups are open- interest will be high and we anticipate funding will go fast. Working with new Nationwide permits for wetland permitting- have used NW 27 to obtain 5 permits so far. IFELA nominations closed- 42 received. Awardees will be recognized at Iowa State Fair in August.

National Weather Service Flood Inundation Mapping Update/Demonstration

Jeff Zogg, National Weather Service, gave a presentation and demonstration of the agency's revised flood inundation mapping tools. A copy of this presentation is included with the meeting notes.

Public Comments

There were no requests by the public to address the Council.

Adjournment

The meeting was adjourned at 10:22 AM. The next meeting will be held in September, date to be determined. This meeting will be a hybrid meeting with in-person attendance available at the Hoover Building and remote participation available.

		WRCC Representative	Position	Organization
x	1	Mike Naig	Secretary (WRCC Chair)	Iowa Department of Agriculture & Land Stewardship
	2	Kim Reynolds	Governor	Governor's Office
		Lillie Brady	*Designee*	Governor's Office
	3	Kayla Lyon	Director	Iowa Department of Natural Resources
x		*Adam Schneiders*	*Designee*	Iowa Department of Natural Resources
x	4	Susan Kozak	Director	IDALS - Division of Soil Conservation & Water Quality
x		*Jake Hansen*	*Designee*	IDALS - Division of Soil Conservation & Water Quality
	5	Vacant	Director	IA Department of Public Health
x		*Tim Wickam*	*Designee*	IA Department of Public Health
	6	John Benson	Acting Director	Iowa Homeland Security & Emergency Management
		Larry Giofreddi	*Designee*	Iowa Homeland Security & Emergency Management
	7	Dan Robison	Dean	College of Agriculture and Life Sciences, ISU
x		*Jamie Benning (Elizabeth Schwab)*	*Designee*	College of Agriculture and Life Sciences, ISU
	8	Edith Parker	Dean	College of Public Health, University of Iowa
		Tom Peters	*Designee*	College of Public Health, University of Iowa
	9	John Fritsch	Dean	College of Humanities, Arts and Sciences, UNI
x		*Maureen Clayton*	*Designee*	College of Humanities, Arts and Sciences, UNI
	10	Scott Marler	Director	Iowa Department of Transportation
		Marc Solberg	*Designee*	Iowa Department of Transportation
	11	Debi Durham	Director	Iowa Economic Development Authority
		Jeff Geerts	*Designee*	Iowa Economic Development Authority
	12	Debi Durham	Executive Director	Iowa Finance Authority
		Tony Toigo	*Designee*	Iowa Finance Authority
	13	Alec Scranton	Dean	College of Engineering, University of Iowa
x		*Larry Weber*	*Designee*	College of Engineering, University of Iowa
	14	Amy Russell	Director	USGS, Iowa-Illinois Water Science Center
		Jon Lageman	*Designee*	USGS, Iowa-Illinois Water Science Center
	15	Jaia Fischer (Acting)	State Conservationist	USDA, Natural Resources Conservation Service
		Scott Cagle (Robert Mier)	*Designee*	USDA, Natural Resources Conservation Service
	16	Starlyn Perdue (Curt Goettsch)	State Executive Director	USDA, Farm Service Agency
x	17	Mike Sexton	State Director	USDA, Rural Development
		Kate Sand	*Designee*	USDA, Rural Development
	18	Jim Macy	Regional Administrator	EPA-Region 7
		Amanda Reed	*Designee*	EPA-Region 7
	19	Colonel Aaron Williams	Rock Island District Commander	US Army Corps of Engineers Rock Island District
		Abby Steele	*Designee*	US Army Corps of Engineers Rock Island District
		Philip Brown	*Designee*	US Army Corps of Engineers
x		*Jeff Zogg*	*Designee*	National Weather Service

Iowa River and Weather Briefing

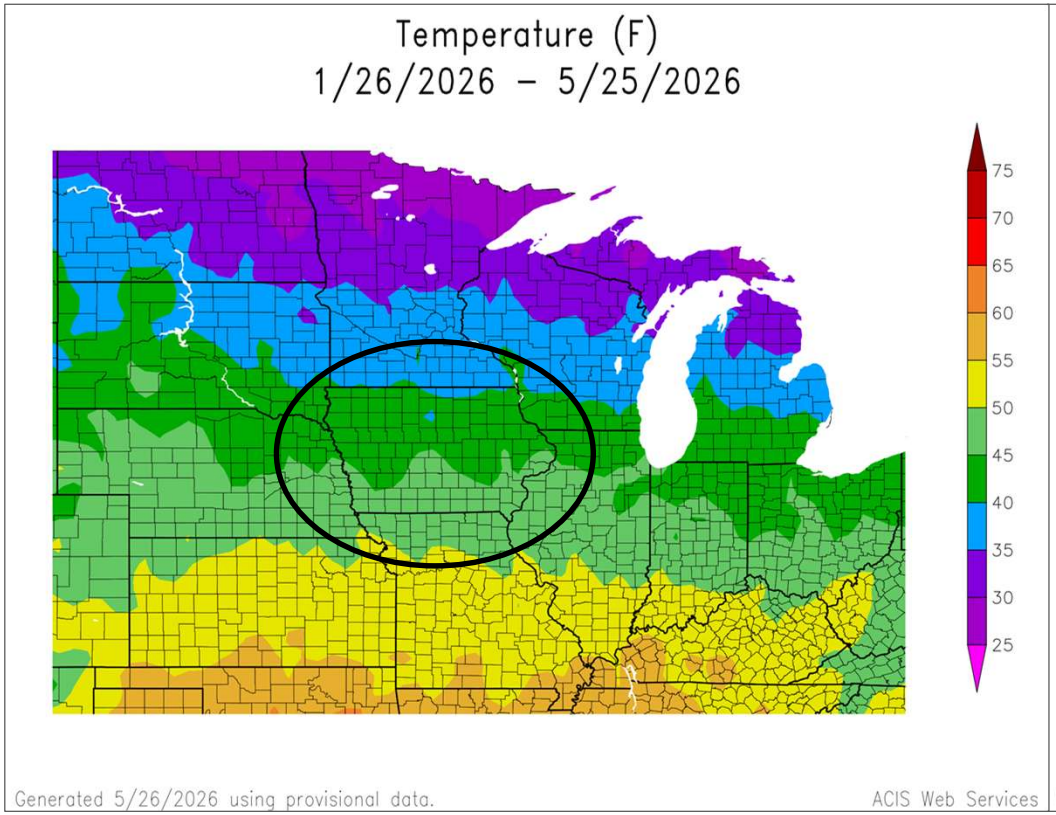
May 27, 2026
8:00 AM CDT

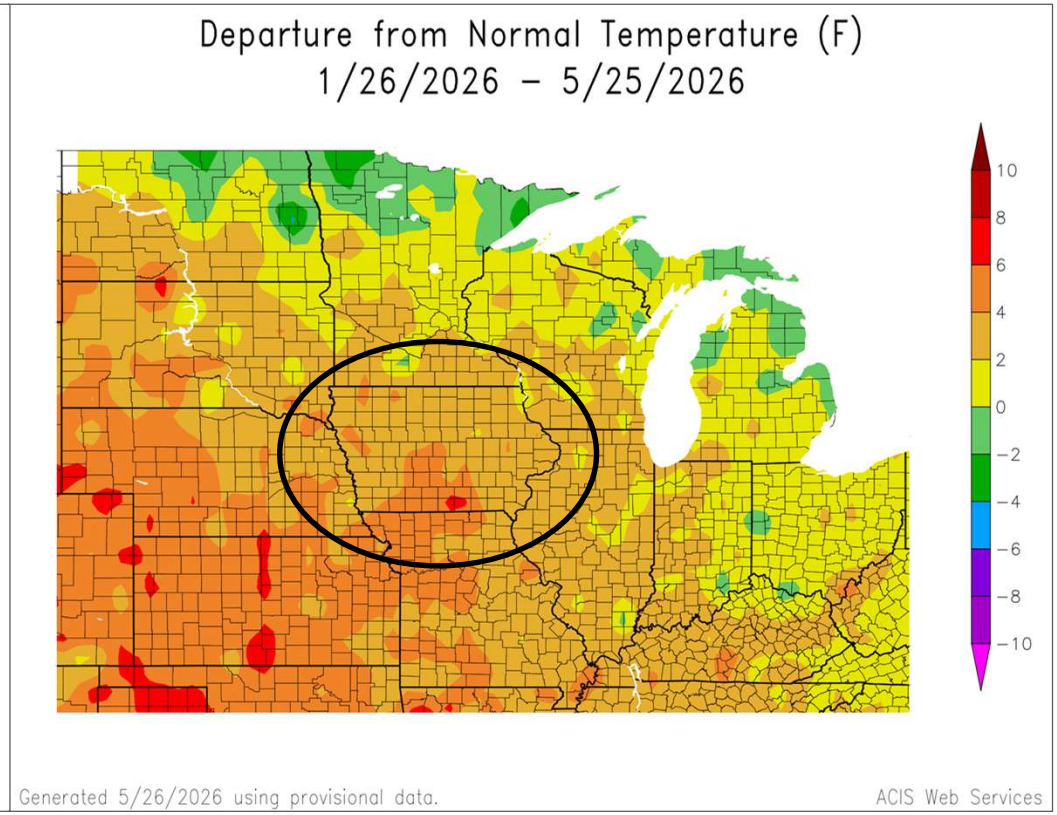
National Weather Service

Des Moines, IA

3-Month Temperature

Maps show temperature and temperature departure from normal

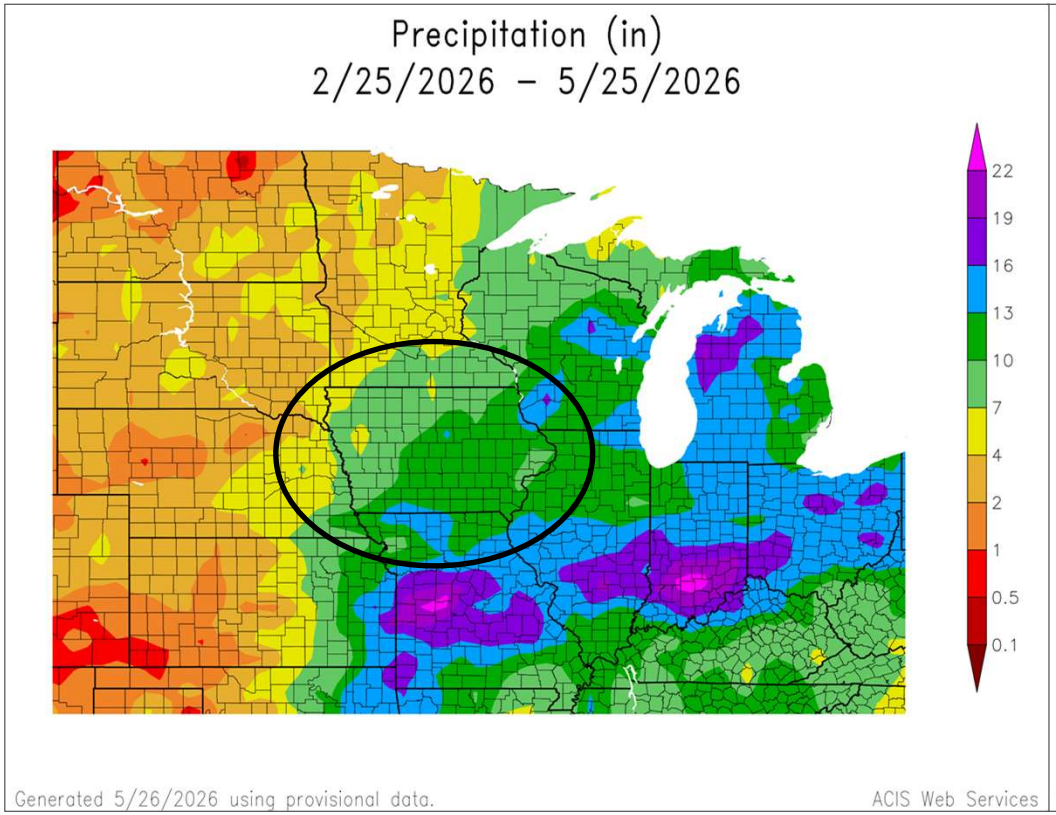


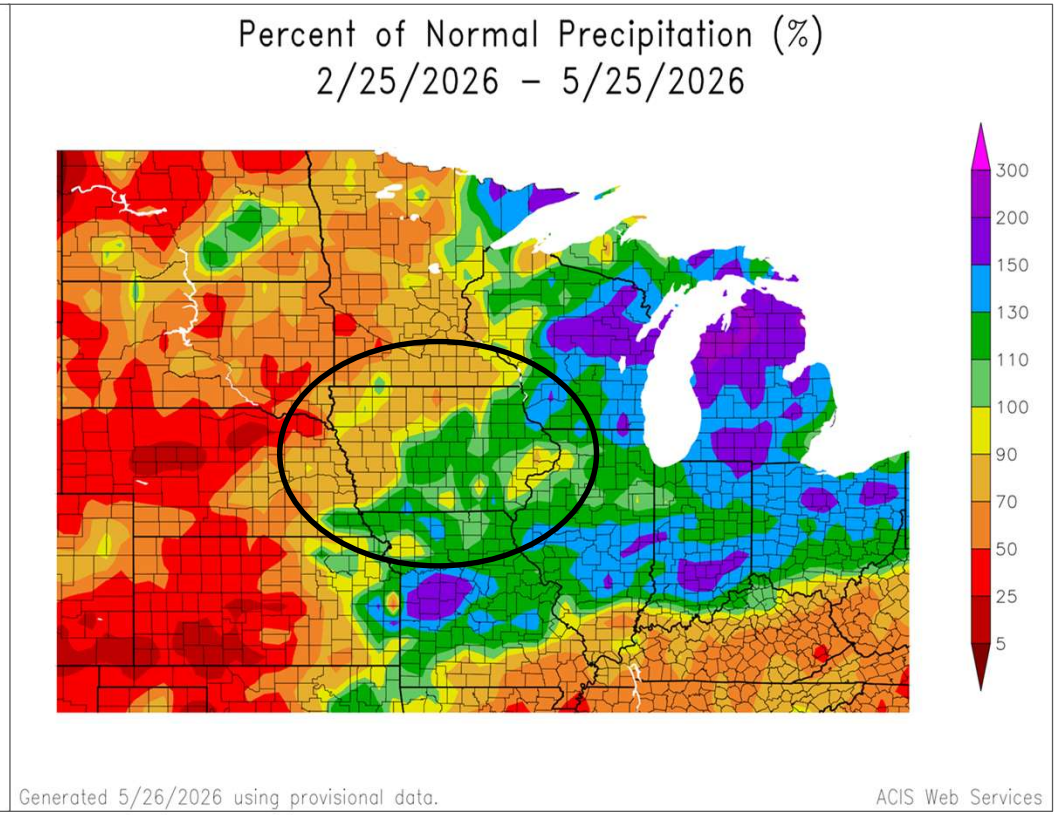


Maps from [High Plains Regional Climate Center]

3-Month Precipitation

Maps show precipitation and precipitation percent of normal

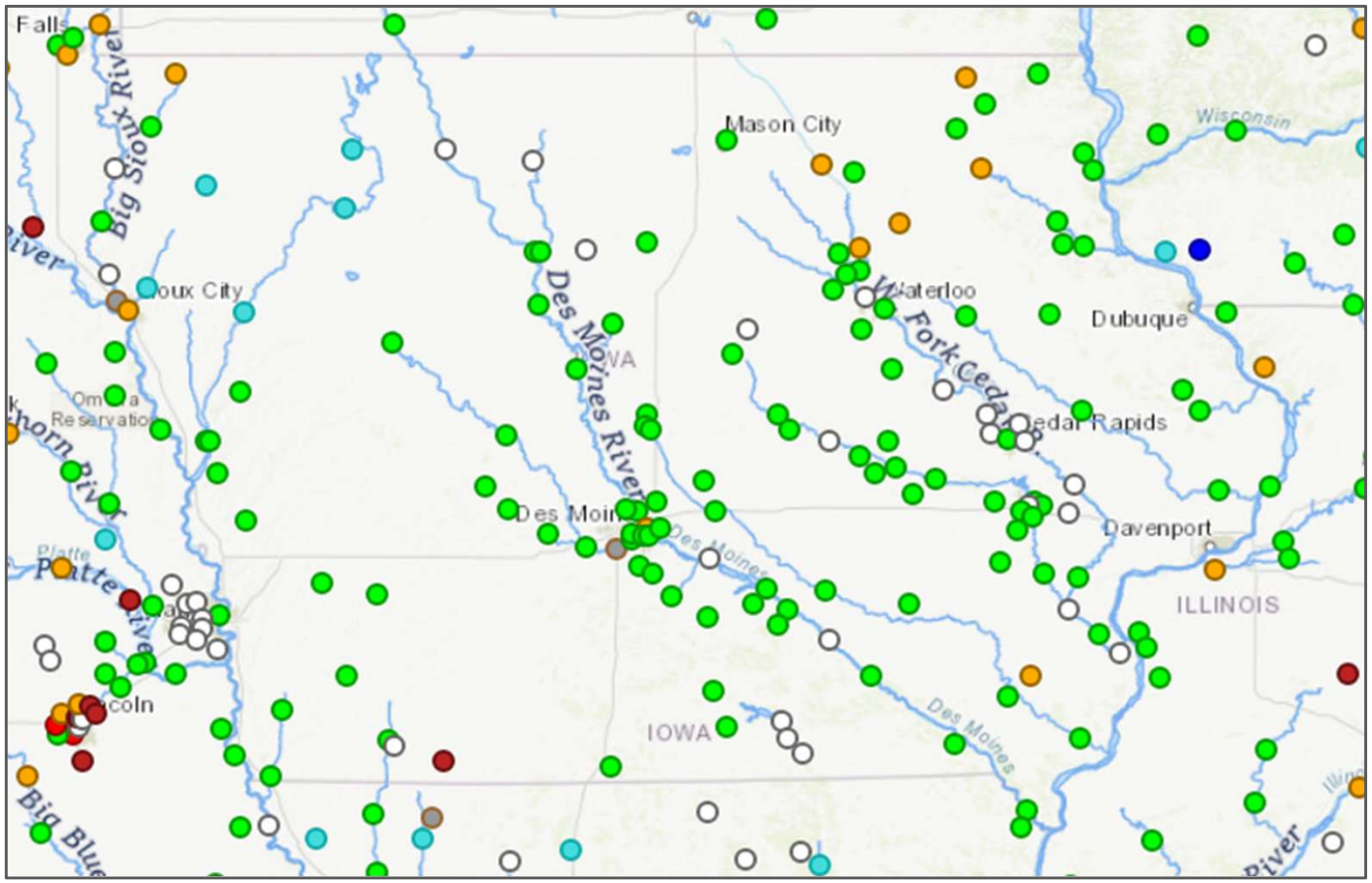




Maps from [High Plains Regional Climate Center]

River Levels

Map shows streamflow percentiles



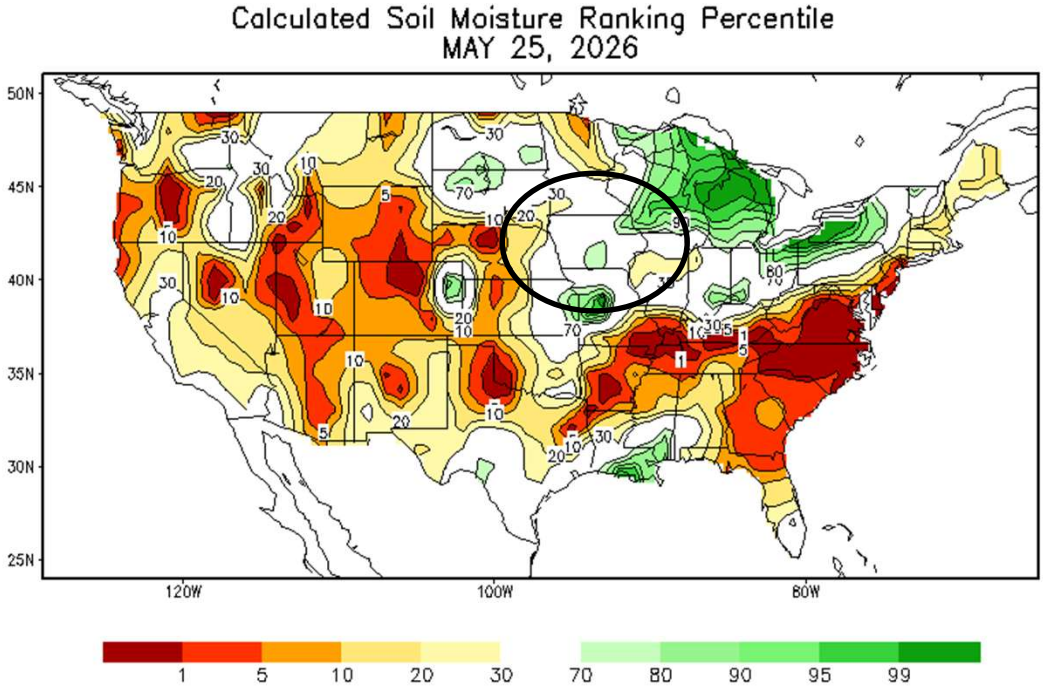
Explanation - Percentile classes

Low	<10	10-24	25-75	76-90	>90	High	No Data
	Much below normal	Below normal	Normal	Above normal	Much above normal		

Soil Conditions

Map shows soil moisture percentiles

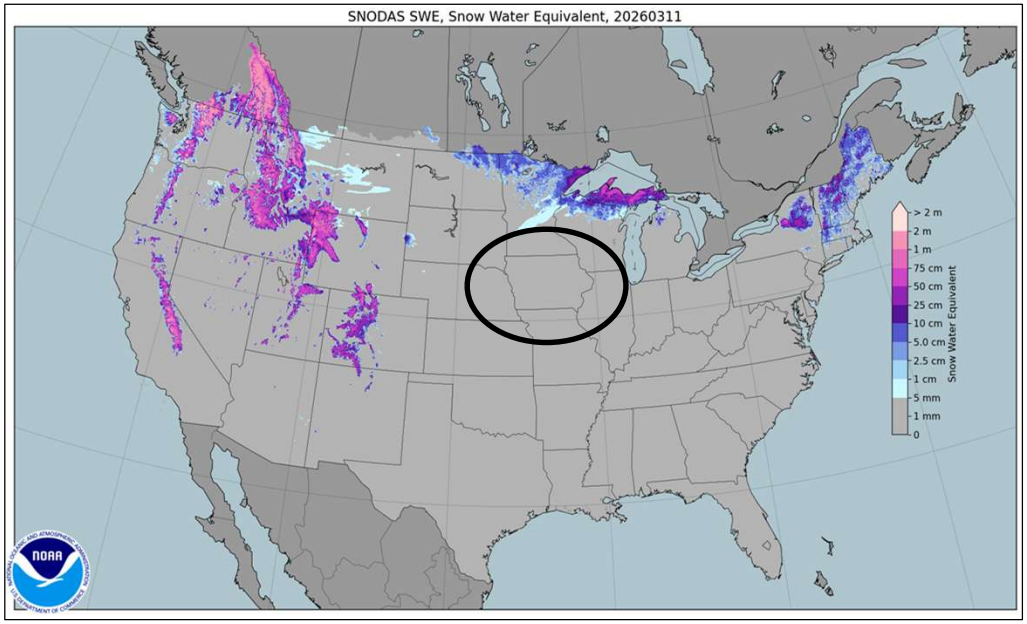
- Near normal soil moisture across Iowa

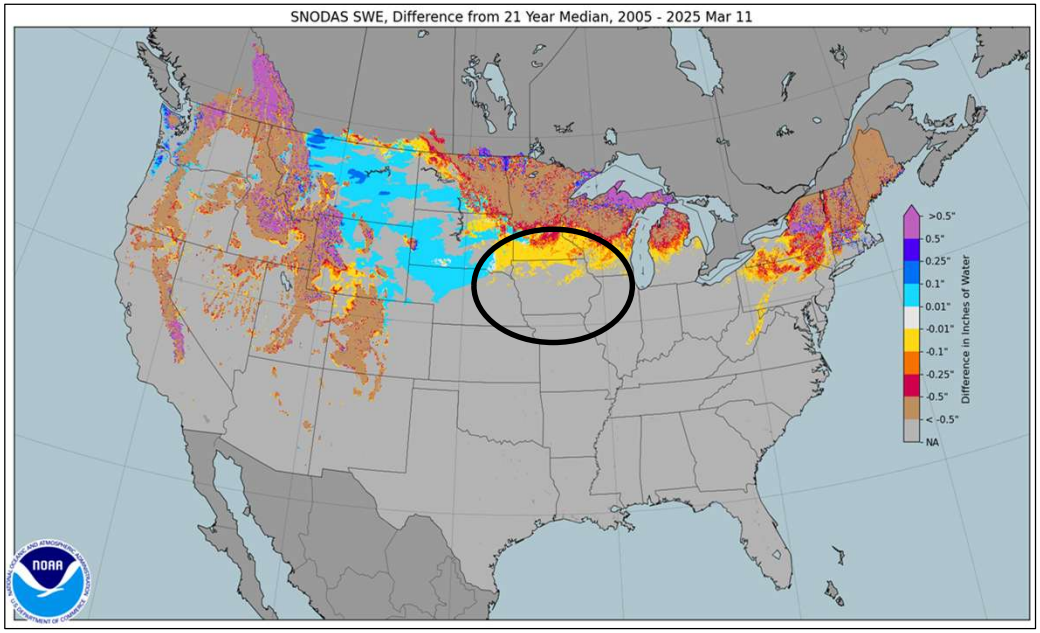


Map from [NOAA Climate Prediction Center]

Snow Water Equivalent

Maps show snow water equivalent and departure from normal





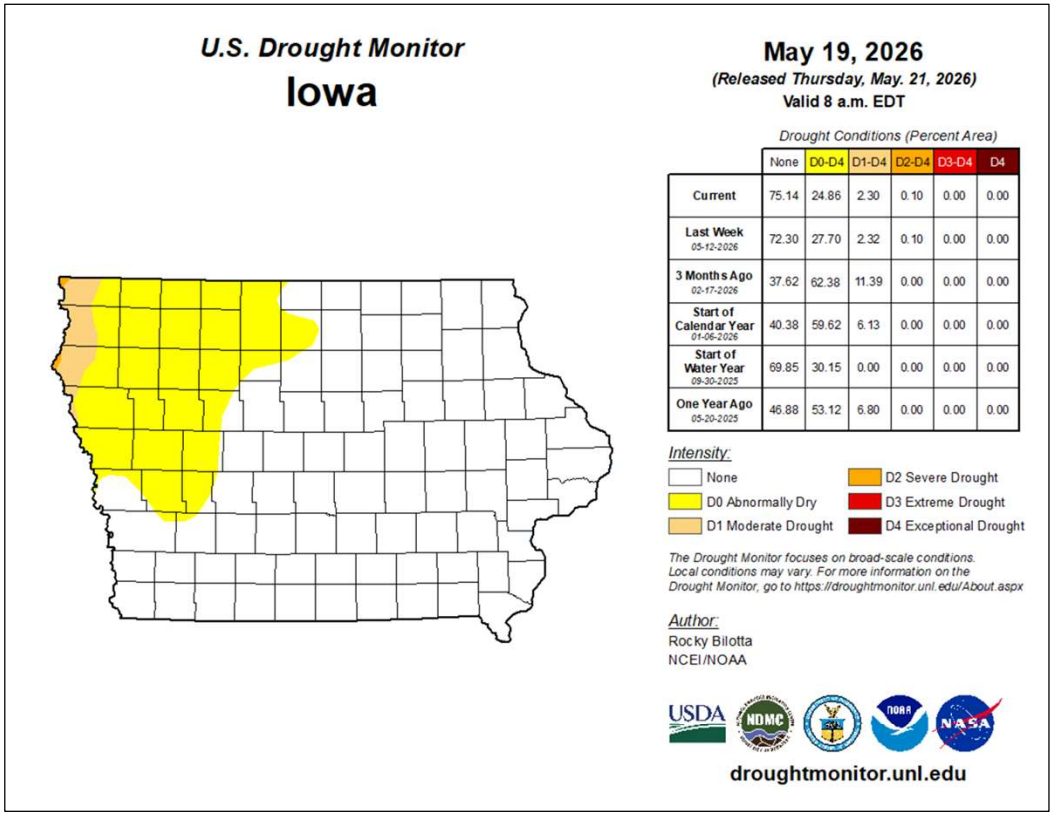
Maps from [National Hydrologic Operational Remote Sensing Center]

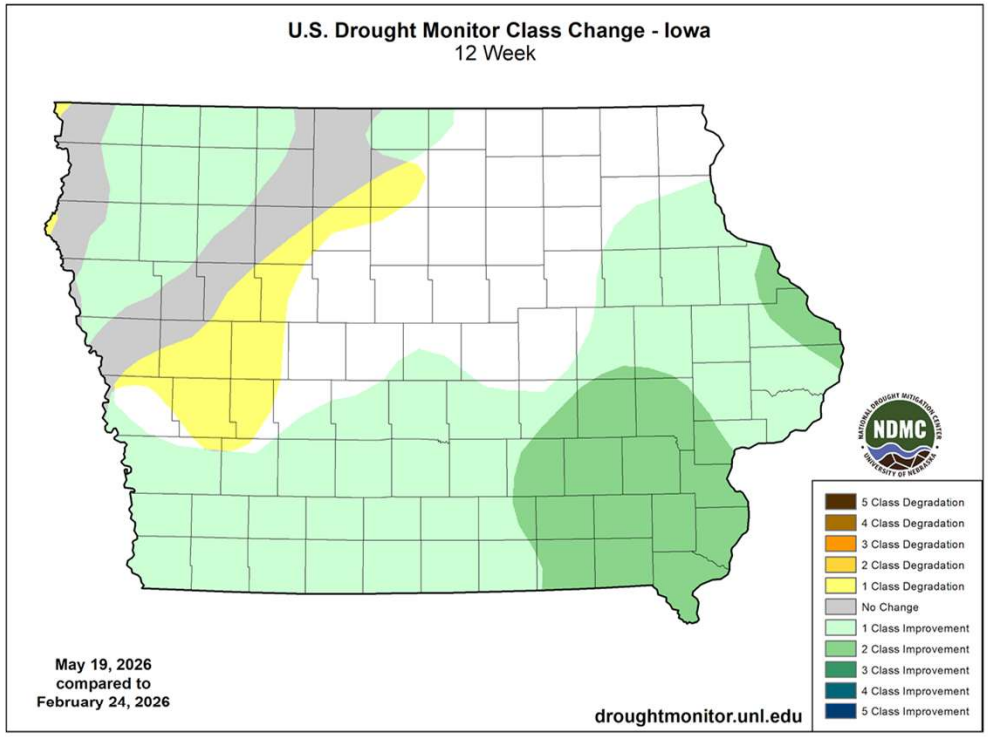
To convert centimeters (cm) to inches: approximately 2.5 cm equals one inch

- Little if any snow; near to below normal

Latest Drought Conditions

Maps show latest drought conditions and 3-month changes

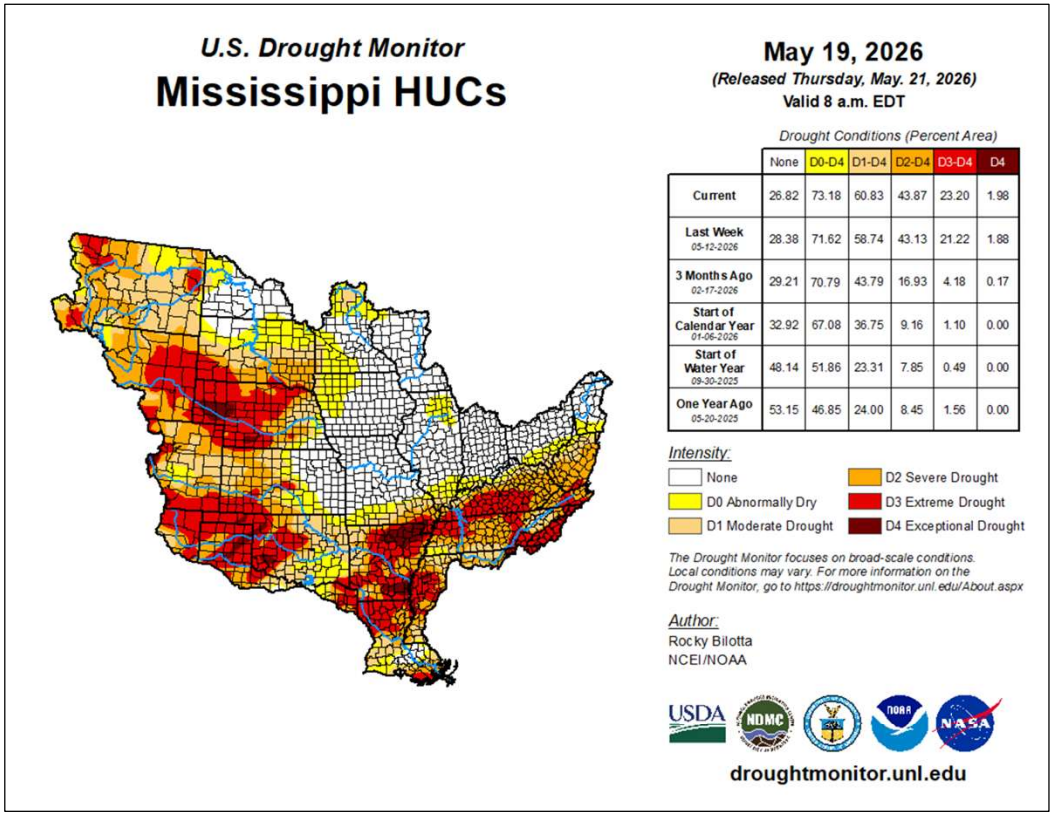


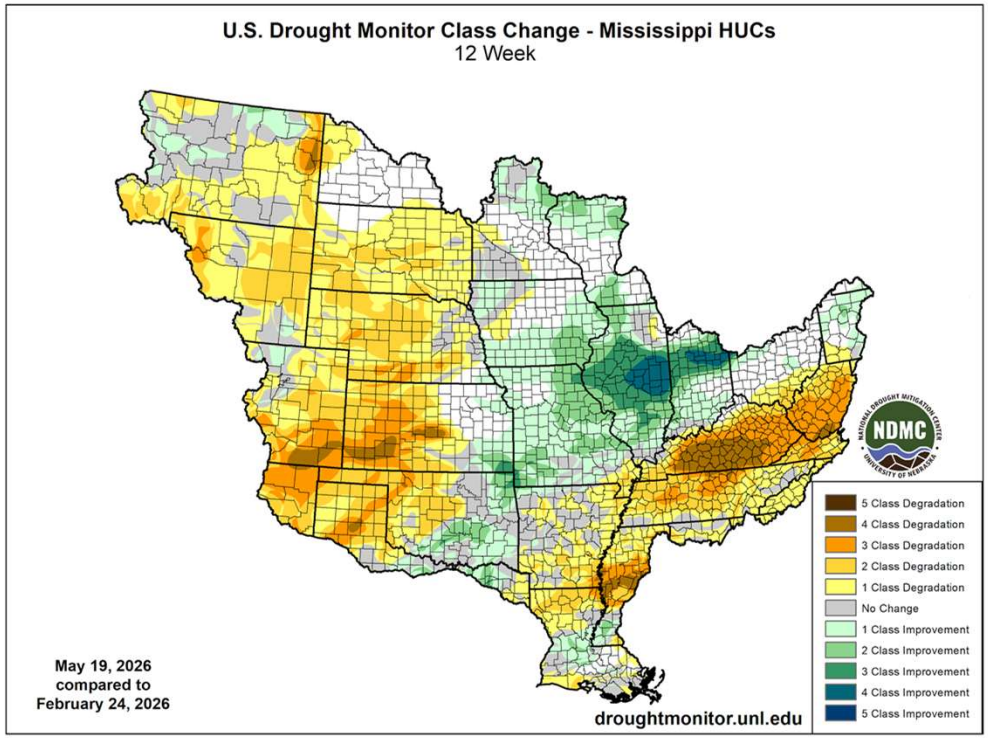


Maps from [U.S. Drought Monitor]

Latest Drought Conditions

Maps show latest drought conditions and 3-month changes

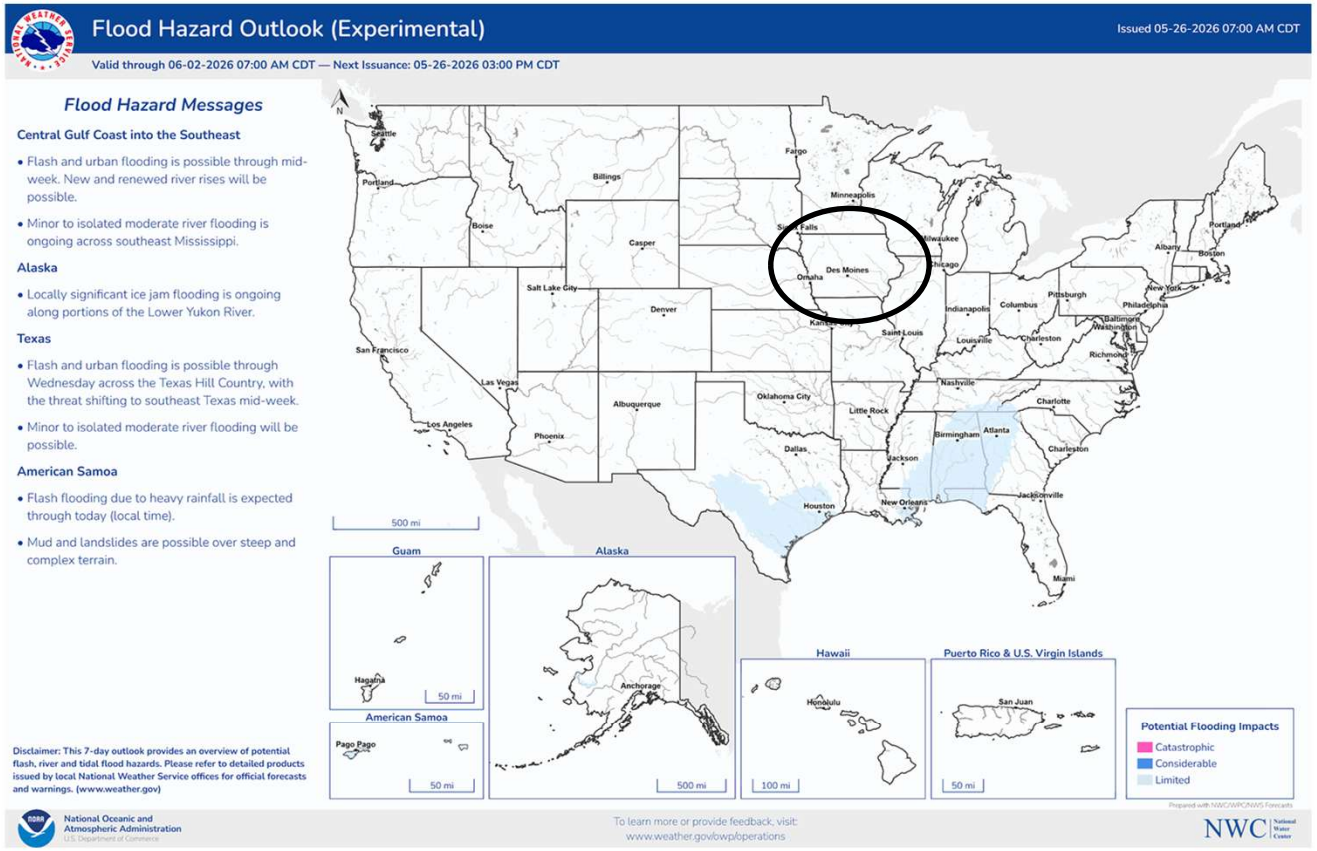




Maps from [U.S. Drought Monitor]

Short-Term Flood Outlook

- Significant flooding not anticipated across Iowa over the next week



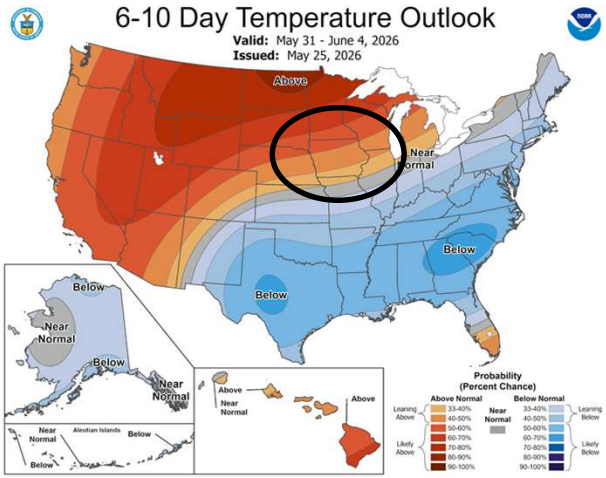
Map from [NWS National Water Center]

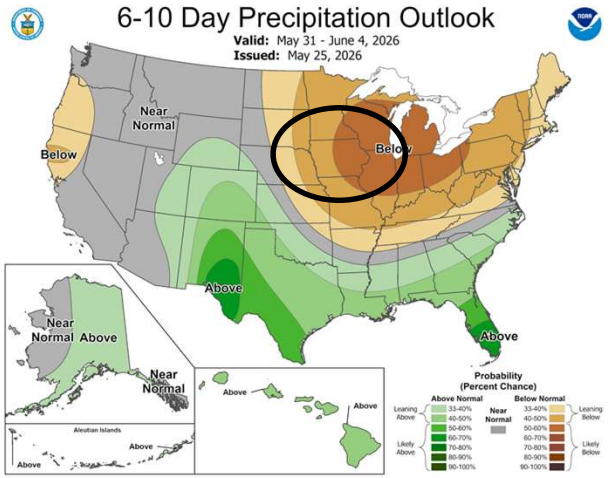
Short Term Temp/Precip Outlook

These are general outlooks that depict broad trends for the weeks ahead

6-10 Day Outlook

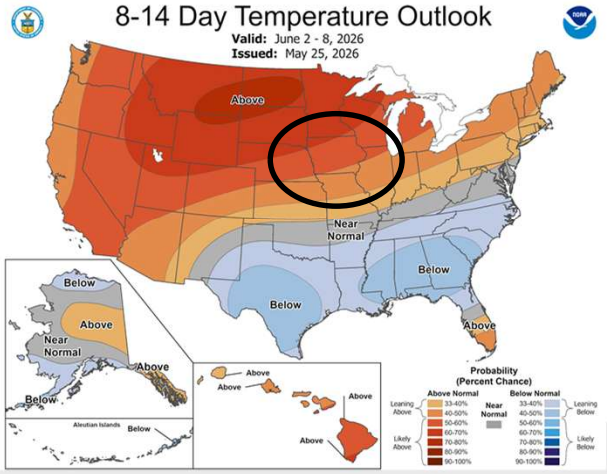
- Above normal temperatures likely
- Below normal precipitation likely

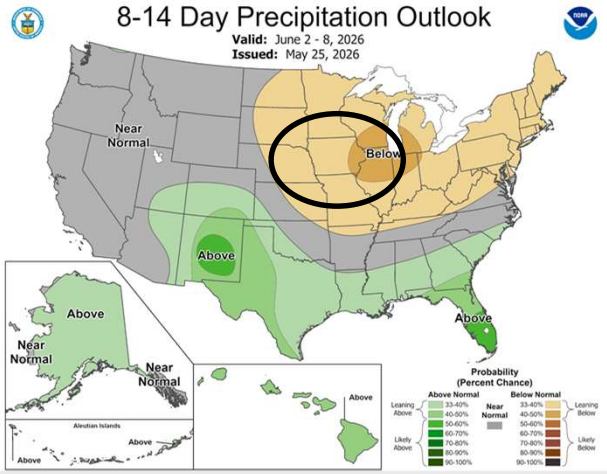




8-14 Day Outlook

- Above normal temperatures likely
- Odds favor below normal precipitation



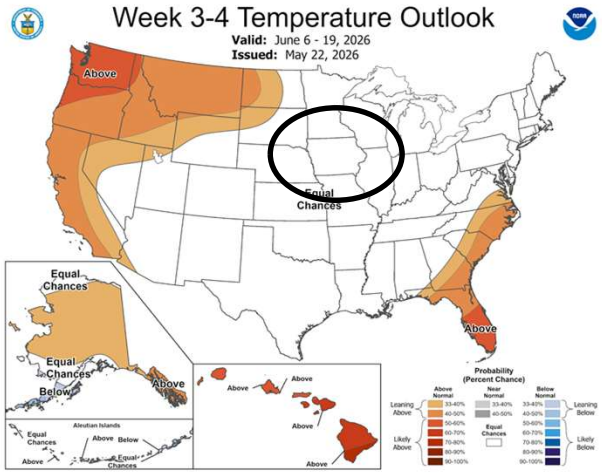


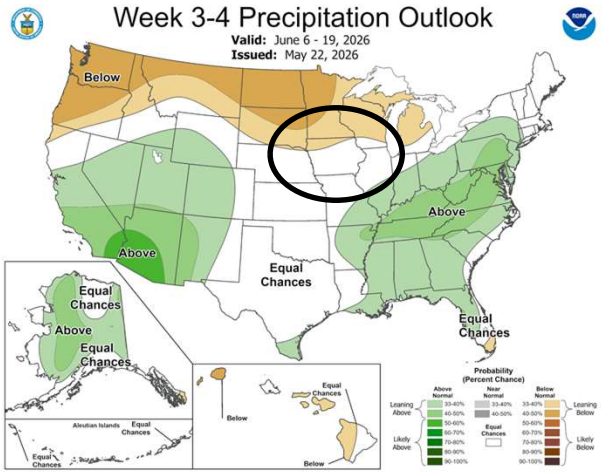
Longer Term Temp/Precip Outlook

These are general outlooks that depict broad trends for the weeks and months ahead

3-4 Week Outlook

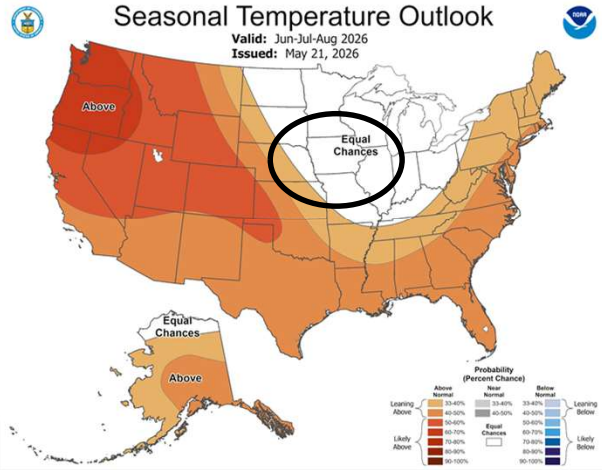
- Equal Chances for temperature and precipitation

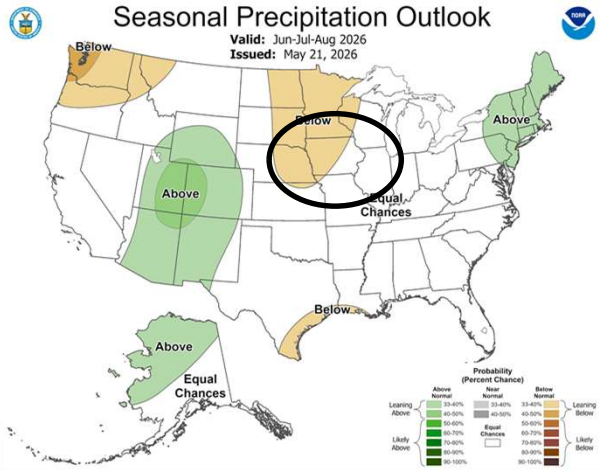




Seasonal Outlook

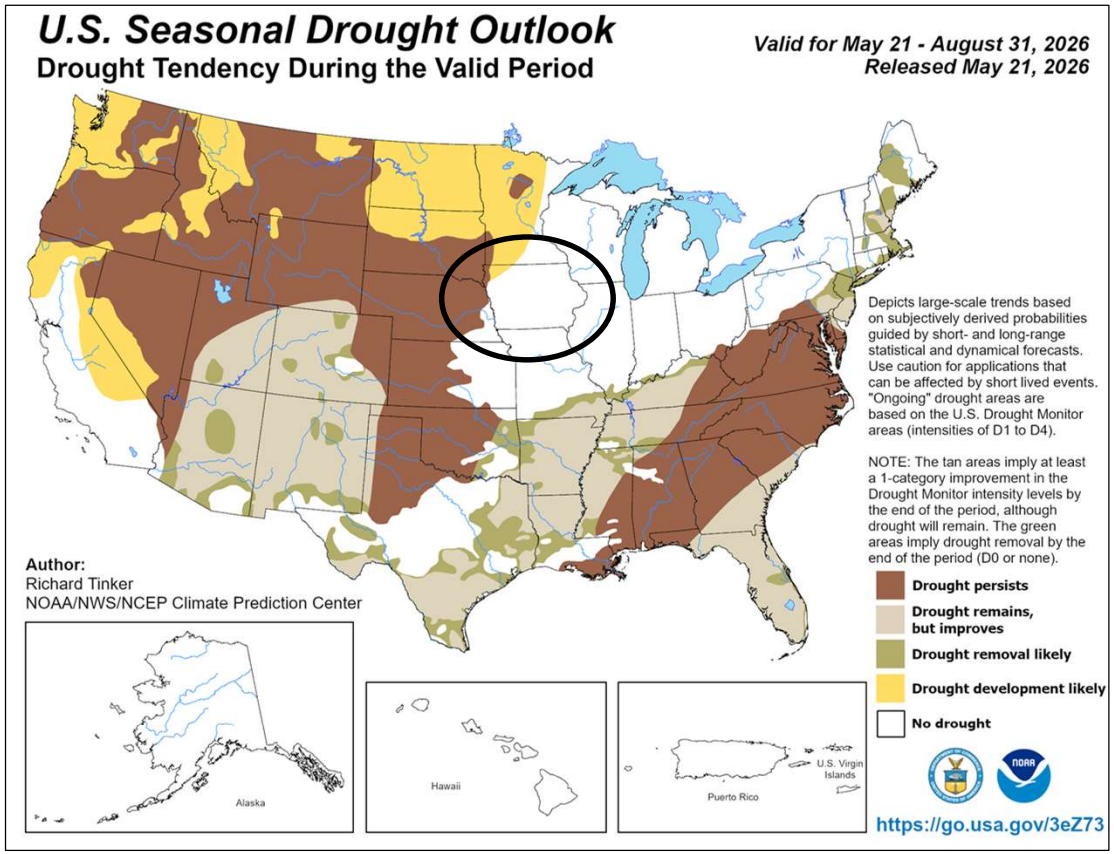
- Equal Chances for temperature
- Odds favor belo normal precipitation





Seasonal Drought Outlook

Map shows seasonal drought outlook



Map from [NOAA Climate Prediction Center]

Preliminary Spring Flood Outlook

May 27, 2026
8:00 AM CDT

Key Ingredients	Antecedent Conditions	Impact to Spring Flooding
Winter Precipitation /Temperatures	Below Normal/ Above Normal	Lesser Risk
River Levels	Near Normal	Neutral
River Ice Conditions	Above Normal	Neutral
Soil Moisture	Below Normal	Lesser Risk
Frost Depth	Near Normal	Neutral
Snow Conditions / Water Equivalent	Above Normal	Increased Risk
Rate of Snowmelt	TBD	TBD
Spring Weather Outlook	Precip Equal Chances	TBD

Overall Risk of Spring Flooding:

Near Normal*

- Competing factors
- Spring rainfall will likely be a significant factor but is presently Equal Chances

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

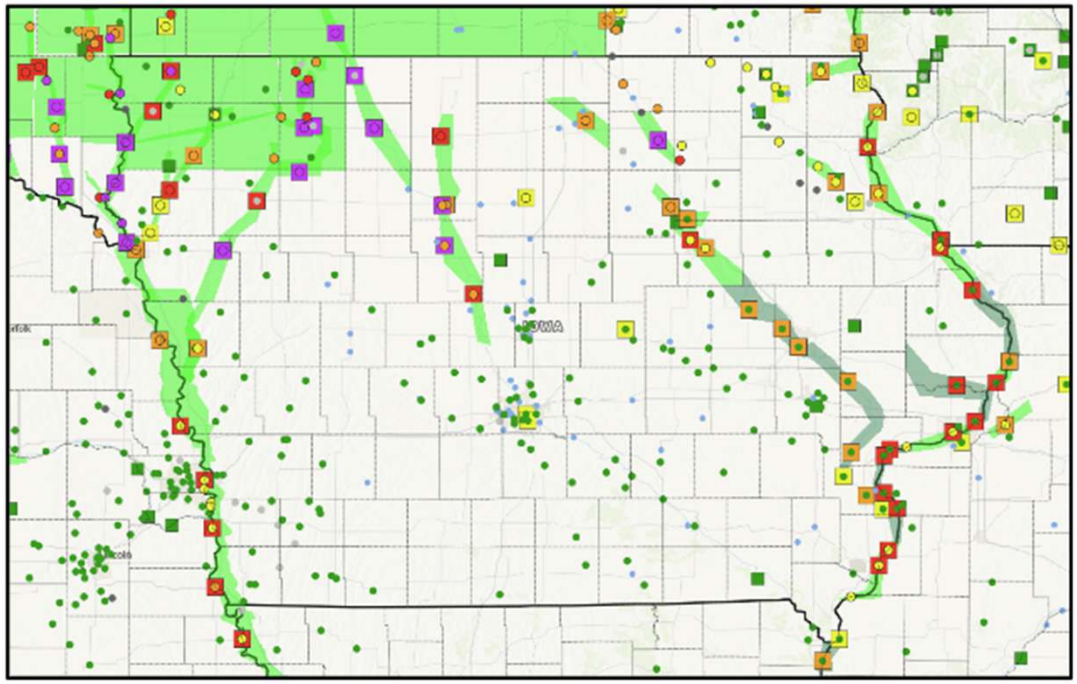
Risk Potential:	Lesser Risk	Normal Risk	Greater Risk	To Be Determined

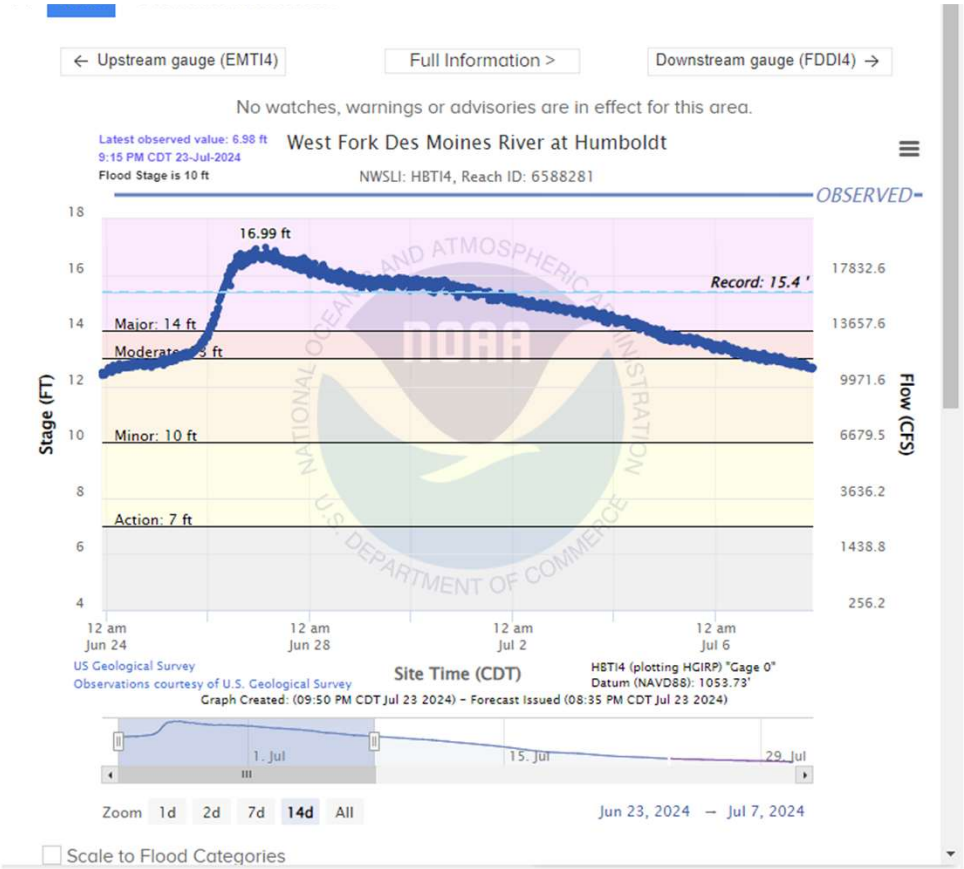
National Weather Service
Iowa

Latest Waterway Observations & Forecasts

National Water Prediction Service (NWPS)

- Visit weather.gov/desmoines/water.
- More information at weather.gov/desmoines/nwps_info.

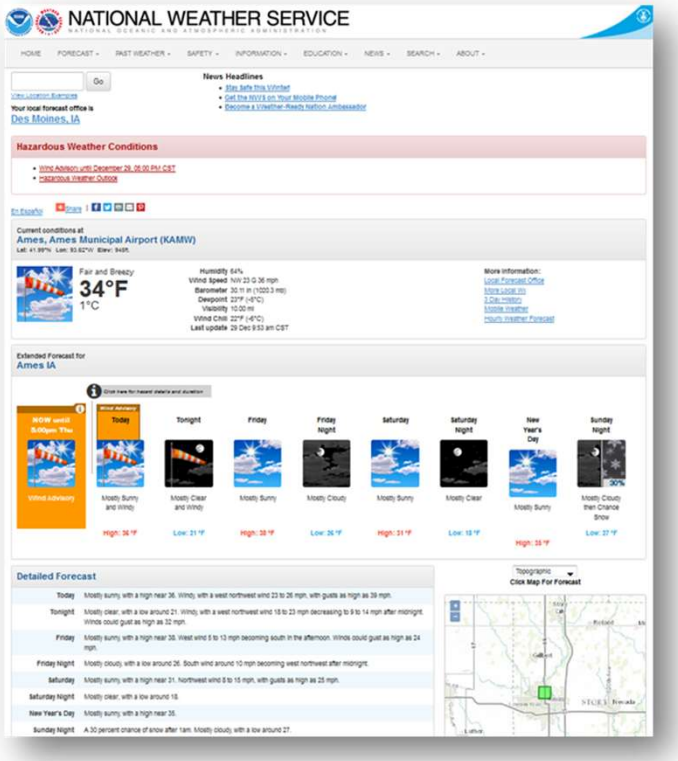




For the Most Recent Forecast

- For the most recent information for your area please visit http://weather.gov/desmoines and enter your location.

Bookmark this page and/or resultant URL for further updates. This will always be the latest information.



Additional NWS Information

Web: weather.gov/desmoines

Facebook: facebook.com/NWSDesMoines

Twitter/X: @NWSDesMoines

Latest waterway observations & forecasts: weather.gov/desmoines/water

Past precipitation information/estimates: weather.gov/desmoines/pastprecip

Decision support information: weather.gov/dmx/dsscurrent

Thank You

For questions & additional information:
NWS Des Moines, IA
weather.gov/desmoines
Phone: 515-270-4501

|**Add Weather/Water Message**|

May 27, 2026
8:00 AM CDT

|**Add Weather/Water Message (optional)**|

From: Krempa, Heather M
To: Hansen, Jake
Subject: Re: USGS Science Update
Date: Wednesday, May 27, 2026 9:52:04 AM

Hi Jake,

I was unable to attend the May 27, 2026 Water Resources Coordinating Council Meeting. Here is a list published and planned papers and presentations from the USGS Science team:

New Publications

- Woodward, E.E., Hladik, M.L., Orlando, J.L., Uychutin, M., Gray, J.L**.,** Kolpin, D.W. 2026. Assessing pesticide application contributions of per- and polyfluoroalkyl (PFAS) in agricultural streams. ES&T Letters, 12: 586-593. *https://doi.org/10.1021/acs.estlett.6c00132*.
- Woodward, E.E., Hladik, M.L., Orlando, J.L., Uychutin, M., De Parsia, M.D., Gray, J.L., and Kolpin, D.W., 2025, Concurrent Occurrence of Pesticides and Per- and Polyfluoroalkyl Substances (PFAS) in Agricultural Streams in California, USA: U.S. Geological Survey data release, *https://doi.org/10.5066/P13JU2TQ*.
- Meyer, J.R., Mianecki, A.L., Occhi, E., Kolpin, D.W., LeFevre, G.H. 2026. A novel drive-point multilevel system to investigate PFAS and other contaminants of global concern in the hyporheic zone of a wastewater effluent dominated stream. *Hydrological Processes*. v. 40, no. 4: e70517. *http://dx.doi.org/10.1002/hyp.70517*.
- Biales, A.D., Hu, M.G., Bencic, D.C., See, M.J., Glassmeyer, S.T., Furlong, E.T., Huang, W., Kolpin, D.W., Mills, M.A., Brunelle, L.D., Batt, A.L., Purucker, S.T. 2026. Performance evaluation and methods comparison of transcriptomic-based approaches for the characterization of wastewater treatment effluent. *Environmental Pollution*. 392, 127568. *https://doi.org/10.1016/j.envpol.2025.127568. IP-177758*
- Hopkins, Z.R., Tokranov, A.K., Clarahan, H., Nemickas, R., Lehmler, H-J., Kolpin, D.W., Lorah, M.M., Blount, R.J. 2025. Per- and Polyfluoroalkyl Substances (PFAS) in Tapwater from Private Wells in Clinton County, Iowa and Whiteside County, Illinois, 2024: U.S. Geological Survey, *https://doi.org/10.5066/P1Q7HATE*. (**June 11, 2026 release date**).
- Marti, M.K., and O'Shea, P.S., 2026, Floods of June 2024 in northwestern Iowa: U.S. Geological Survey Open-File Report 2026–1066, 16 p., https://doi.org/10.3133/ofr20261066.
- O'Shea, P.S., and Marti, M.K., 2026, Peak-Flow frequency analysis for U.S. Geological Survey streamgages in northwestern Iowa, based on data through water year 2024: U.S. Geological Survey data release, https://doi.org/10.5066/P1JFCNSZ.
- The high-water marks used to develop the flood profiles have been published and are available via the USGS Flood Event Viewer online application: https://apps.usgs.gov/fev/event/2024-june-ia-flood

- Garrett, J.D., 2026, Stream sediment sources in Medicine Creek, northern Missouri and southern Iowa: U.S. Geological Survey Scientific Investigations Report 2026–5121, 11 p., https://doi.org/ 10.3133/ sir20265121.

Apologies for not giving the update in person, I hope you are still able to share these publications with interested individuals.

Thanks,

Heather Krempa

Supervisory Hydrologist
US Geological Survey
Central Midwest WSC
401 NW Capital Drive
Lee's Summit MO 64086
Cell: 816-446-9463

What you do makes a difference, and you have to decide what kind of difference you want to make. -Jane Goodall

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From: Krempa, Heather M
Sent: Friday, December 12, 2025 12:08 PM
To: Jake.Hansen@Iowaagriculture.gov <Jake.Hansen@Iowaagriculture.gov>
Subject: USGS Science Update

Hi Jake,

Here is a list of the published and planned papers and presentations:

Papers Published

- Faber, K.A., Pomerantz, W.C.K., Gray, J.L., Hubbard, L.E., Kolpin, D.W., Arnold, W.A. 2025. Revealing organofluorine contamination in effluents and surface waters with complimentary approaches: Fluorine-19 nuclear magnetic spectroscopy (19F-NMR) and liquid chromatography-tandem mass spectrometry (LC-MS/MS). Environ. Sci. Technol. 59: 14695-14706. https://doi.org/10.1021/acs.est.5c05079. (collaboration with the University of Minnesota)
- Meppelink, S.M., Gray, J.L., Kolpin, D.W., Hubbard, L.E., Markland, K.M, 2025, Per- and polyfluoroalkyl substances (PFAS) results for varying industries, 2021-2022: U.S. Geological Survey data release, https://doi.org/10.5066/P14UDXGZ.
- Mianecki, A.L., Behrens, J.R., Kolpin, D.W., Hemphill, G.R., Kapoor, K., LeFevre, G.H. 2024. From Water to Web: Trophic Transfer of Neonicotinoids from a

Wastewater Effluent-Dominated Stream to Riparian Spiders. ACS Environmental AU, 5(5): 457-467. https://doi.org/10.1021/acsenvironau.5c00021. (collaboration with the University of Iowa)

- Fogarty, L.R., Iwanowicz, D.D., Hubbard, L.E., Kolpin, D.W. 2025. Helping secure our Nation's food supply: The intersection of agriculture, health, and environment. USGS Drupal Story. https://www.usgs.gov/programs/environmental-health-program/science/helping-secure-our-nations-food-supply-intersection-0
- Masoner, J.R., Kolpin, D.W., Cozzarelli, I.M., Akob, D.M., Conaway, C.H., Hladik, M.L., Hubbard, L.E., Givens, C.E., Raines, C.D., Lane, R.F., McCleskey, B.R., Preston, T.M., Varonka, M.S., Wilson, M.C. 2025. Land application of biosolid, livestock, and drilling wastes to US farmland: A potential pathway for the redistribution of contaminants in the environment. Environmental Science: Processes & Impacts. 27: 3372-3402, https://doi.org/10.1039/D5EM00312A.
- Preston, T.M., Masoner, J.R., Varonka, M.S., Akob, D.M., Cozzarelli, I.M., Givens, C.E., Hladik, M.L., Jaeschke, J.B., Kolpin, D.W., Lane, R.F., McCleskey, R.B., Raines, C.D., Repert, D.A., Roth, D.A., and Wilson, M.C., 2025, Characterization of three common land-applied wastes: Inorganic, organic, and microbial compositions of biosolid, livestock, and drilling fluid waste, United States, 2021 and 2022. U.S. Geological Survey data release, https://doi.org/10.5066/P1G9CSQS.
- Miller, S.A., Schmidt, T.S., Barber, L.B., Hladik, M.L., Kolpin, D.W., Shoda, M.E., Stackpoole, S.M. 2025. Imidacloprid in United States rivers, 2013-2022: Persistent presence and emerging chronic hazard. Environ. Sci. Technol. In press. https://doi.org/10.1021/acs.est.5c07311.
- Miller, S. A.; Schmidt, T. S.; Barber, L. B.; Hladik, M. L.; Kolpin, D. W.; Saksa, M. E.; Stackpoole, S. M. Imidacloprid concentrations and trends in United States Rivers, 2013–2022. U.S. Geological Survey Data Release. 2025. DOI: 10.5066/P13UBISN

Publications in progress

- Hopkins, Z.R., Tokranov, A.K., Clarahan, H., Nemickas, R., Lehmler, H-J., Kolpin, D.W., Lorah, M.M., Blount, R.J. 2025. Per- and Polyfluoroalkyl Substances (PFAS) in Tapwater from Private Wells in Clinton County, Iowa and Whiteside County, Illinois, 2024: U.S. Geological Survey.
- Meyer, J.R., Mianecki, A.L., Occhi, E., Kolpin, D.W., LeFevre, G.H. 2025. A novel drive-point multilevel system to investigate PFAS and other contaminants of global concern in the hyporheic zone of a wastewater effluent dominated stream. Hydrological Processes. In journal and USGS review. (collaboration with the University of Iowa).
- Remigio, R.V., Fleytas, P.M., Kamenetsky, M., Munde, S., Kolpin, D.W., Bell, J.E.,

Ward, M.H., Freeman, L.B. 2025. Short-term and long-term precipitation conditions as predictors of nitrate contamination in private wells across Iowa. GeoHealth, in USGS review.

- Woodward, E.E., Hladik, M.L., Orlando, J.L., Uychutin, M., Gray, J.L., Kolpin, D.W. 2025. Assessing pesticide application contributions of per- and polyfluoroalkyl substances (PFAS) in agricultural streams. ES&T Letters, in journal review.

Presentations

- Faber, K.A., Pomerantz, W.C.K., Gray, J.L., Hubbard, L.E., Kolpin, D.W., Arnold, W.A. 2025. Exploring the organofluorine gap: 19F-NMR and LC-MS/MS as complementary analytical approaches for PFAS. 2025 UCOWR/NIWR Water Resources Conference, Minneapolis, MN, June 3-5, 2025.
- Cozzarelli, I.M., Masoner, J.R., Kolpin, D.W., Akob, D.M., Conaway, C.H., Hladik, M.L., Hubbard, L.E., Givens, C.E., Raines, C.D., Lane, R.F., McCleskey, B.R., Preston, T.M., Varonka, M.S., Wilson, M.C. 2025. Drilling, biosolid, and livestock wastes: An under investigated source of contaminants to the environment from land application. 2025 Goldschmidt Conference, July 6-11, 2025, Prague, Czech Republic.
- Markland, K.M., Kolpin, D.W., Meppelink, S.M., Hubbard, L.E., Givens, C.E., Lane, R.F., Raines, C.D., Wilson, M.C. 2025. Assessing the effects of a large cattle feedlot on the water quality of Bloody Run Creek in northeast Iowa. 19th annual Iowa Water Conference, Ankeny, IA, September 9-10, 2025.
- Meppelink, S., Kolpin, D.W., Markland, K., Hladik, M., Lane, R., Tokranov, A., Hopkins, Z., Roth, D., Alvarez, D., Givens, C., Raines, C., Hubbard, L., McCleskey, B., Pulster, E., Gray, J., Janssen, S., Thompson, D. 2025. Environmental health of the Yellow River entering Effigy Mounds National Monument: Taking the pulse of a culturally important ecosystem. 19th annual Iowa Water Conference, Ankeny, IA, September 9-10, 2025.
- Masoner J.R, Kolpin D.W., Cozzarelli I.M., Akob D.M., Conaway C.H., Givens C.E., Hladik M.L., Hubbard L.E., Lane R.F., McCleskey R.B., Preston T.M., Raines C.D., Varonka M.S., and Wilson M.C. Land application of biosolid, livestock, and drilling wastes to US farmland: a potential pathway for the redistribution of contaminants in the environment. Oklahoma Governor's Water Conference 2025, December 3, 2025.
- Remigio, R.V., Fleytas, P.M., Kamenetsky, M., Munde, S., Kolpin, D.W., Bell, J.E., Ward, M.H., Freeman, L.B. 2025. Precipitation conditions as a predictor of nitrate contamination in private wells across Iowa. American Geophysical Union Fall Meeting 2025. December 15-19, 2025, New Orleans, LA.
- Kolpin, D.W., Hubbard, L.E. 2025. Agricultural research by the Food Resources

Lifecycle Integrated Science Team. Virtual briefing to the Iowa Cancer and the Environment Task Force Meeting, September 26, 2025.

Other Updates:

The USGS manuscript describing the 2024 summer floods in northwest Iowa is currently in peer review, as is the companion data release updating flood frequency at selected streamgages. An associated USGS manuscript describing the collection of high-water marks along portions of 5 river reaches in northwest Iowa and development of flood profile plots is being drafted. Planned publication dates for all of these products is later this year. (Project leads are Padraic O'Shea and Mackenzie Marti)

Fieldwork for the effigy mounds nm USGS/NPS partnership project has ended. There was a collaboration meeting with tribal partners, NPS, and Drake thie month to discuss pursuing funding for future studies in the watershed, and starting the analysis.

The USGS in partnership with Iowa State University College of Agriculture and Life Sciences, Iowa Department of Natural Resources, and Iowa Department of Agriculture and Land Stewardship, are continuing the 3-year project to develop methods for using complex datasets comprised of discrete and continuous water quality data to estimate riverine nutrient loads. Results from this project support Iowa's Nutrient Reduction Strategy and the ongoing work of the Gulf Hypoxia Task Force. Preliminary analyses has begun.

Sampling for two projects in the Yellow River and Bloody Run watersheds focusing on contaminants of global concern was just completed. This was supported by the USGS Environmental Health Mission Area Food Integrated Science Team.

Two publications funded through partnership with MODNR were published: "Stream Sediment Sources in Medicine Creek, Northern Missouri and Southern Iowa" and "Temporal Changes in Nutrient Concentrations in the Lower Grand River and Selected Drainage Basins, Missouri and Iowa, During the Mississippi River Basin Healthy Watersheds Initiative (2010–23)".

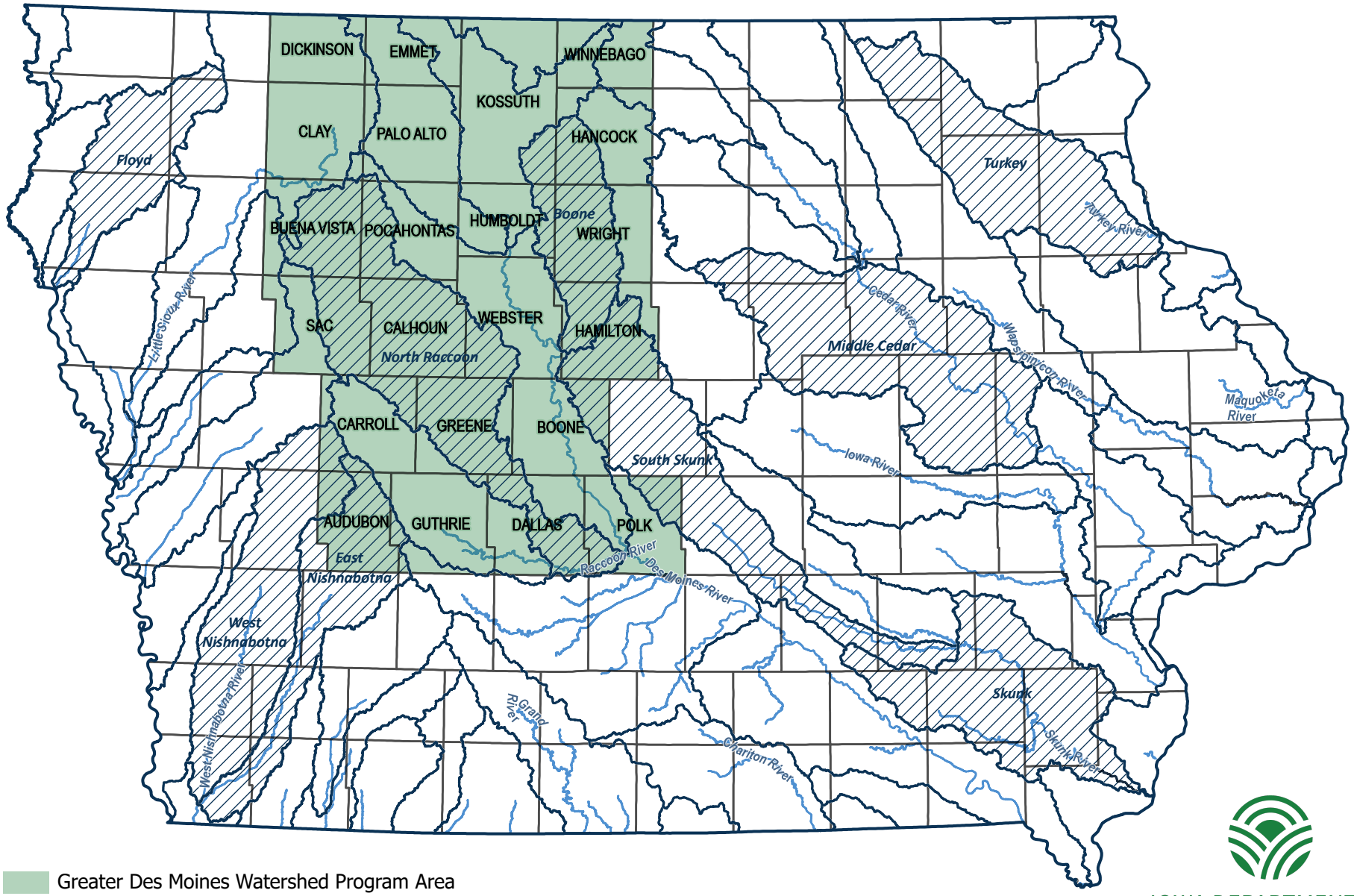
Please let me know if I can provide any further information,

Heather Krempa

Supervisory Hydrologist
US Geological Survey
Central Midwest WSC
401 NW Capital Drive
Lee's Summit MO 64086
Cell: 816-446-9463

Iowa Nutrient Reduction Strategy Priority Watersheds & Greater Des Moines Watershed Program Area

May 06, 2026



Greater Des Moines Watershed Program Area

HUC 8 boundaries

NRS Priority HUC8 Watersheds

IOWA DEPARTMENT OF
AGRICULTURE &
LAND STEWARDSHIP

National Weather Service Flood Inundation Mapping

National Weather Service
Des Moines, IA

Agenda

1
Flood Inundation Mapping Overview

2
Implementation Process

3
Viewing FIM

Flood Inundation Mapping Overview

National Weather Service

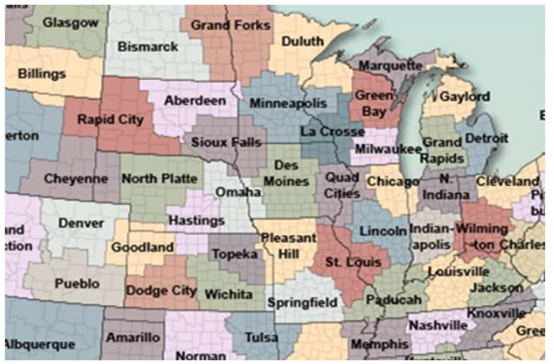
Mission accomplished by multiple levels

National centers provide guidance for weather, water and climate across the nation

Department of Commerce
NOAA
National Weather Service

Field offices use national guidance in conjunction with local knowledge and expertise to issue watches, warnings and advisories

- National Centers for Environmental Prediction
  - *(examples)*
  - NHC
  - WPC
  - SPC
- Office of Water Prediction
  - National Water Center
    - *National Water Model*
- Regional Headquarters
  - *Field Offices*
  - Weather Forecast Offices
  - River Forecast Centers



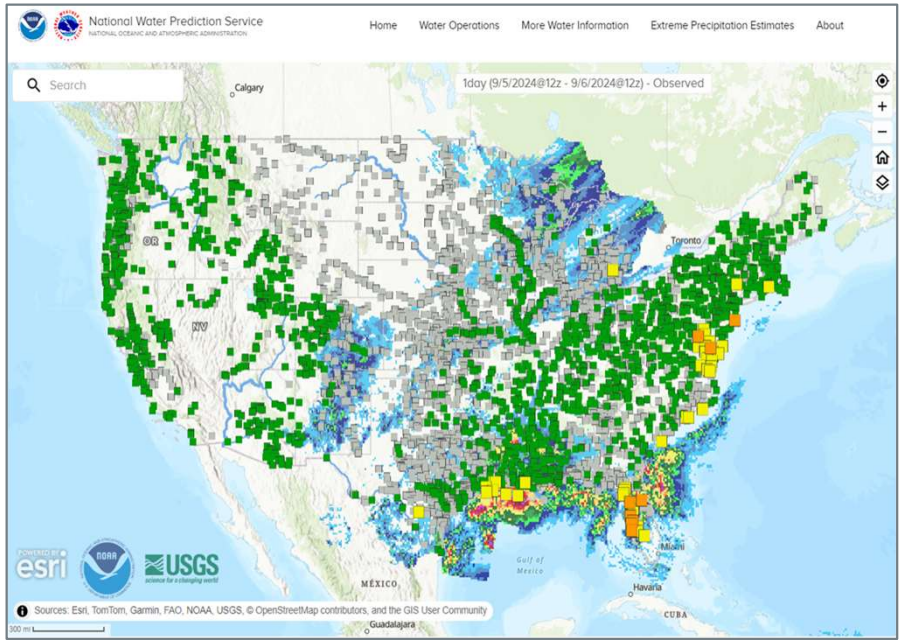
Why Use Flood Inundation Mapping?

- Flooding is the most frequent severe-weather related and the costliest natural disaster in the U.S.
- Historically, flooding has totally or partially accounted for 80% of all Presidential disaster declarations involving Iowa.

Why Use Flood Inundation Mapping?

- Puts water on the map at the neighborhood scale.
- Helps communicate the timing and magnitude of high water events by showing modeled inundated areas.
- Improves how the NWS can help protect lives and property.

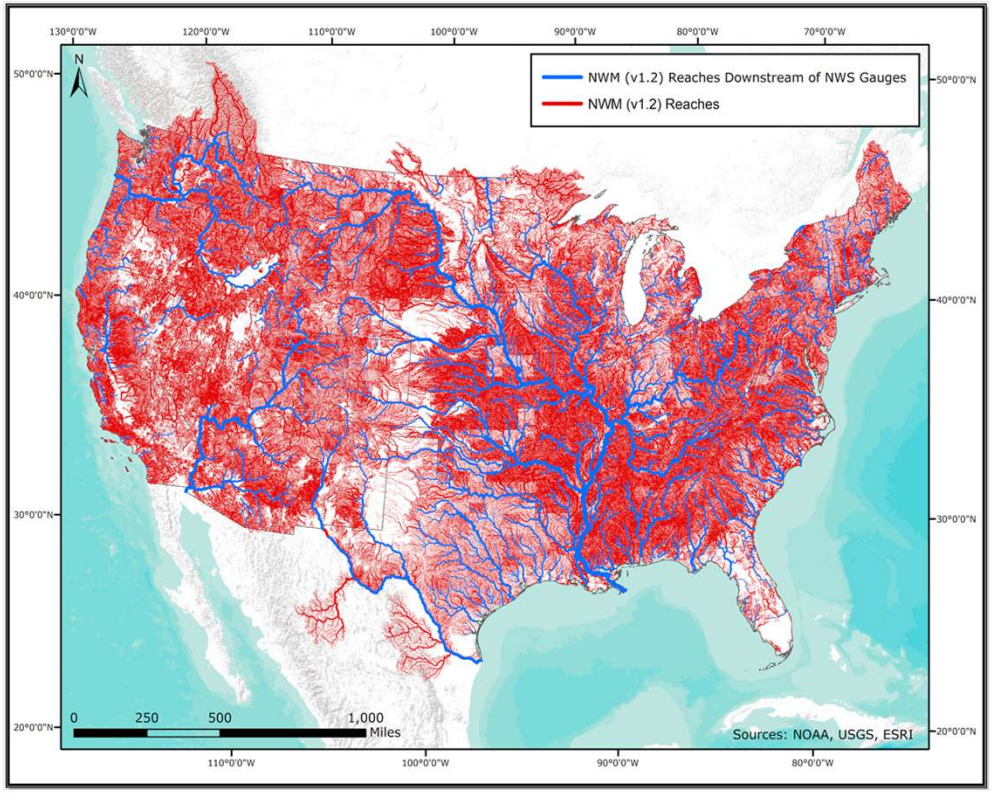
Evolving Water Prediction Capabilities



~3,600 NWPS Forecast Points

River Forecast Center (RFC) Forecast Models

FIM provided for ~ 110,000 river miles



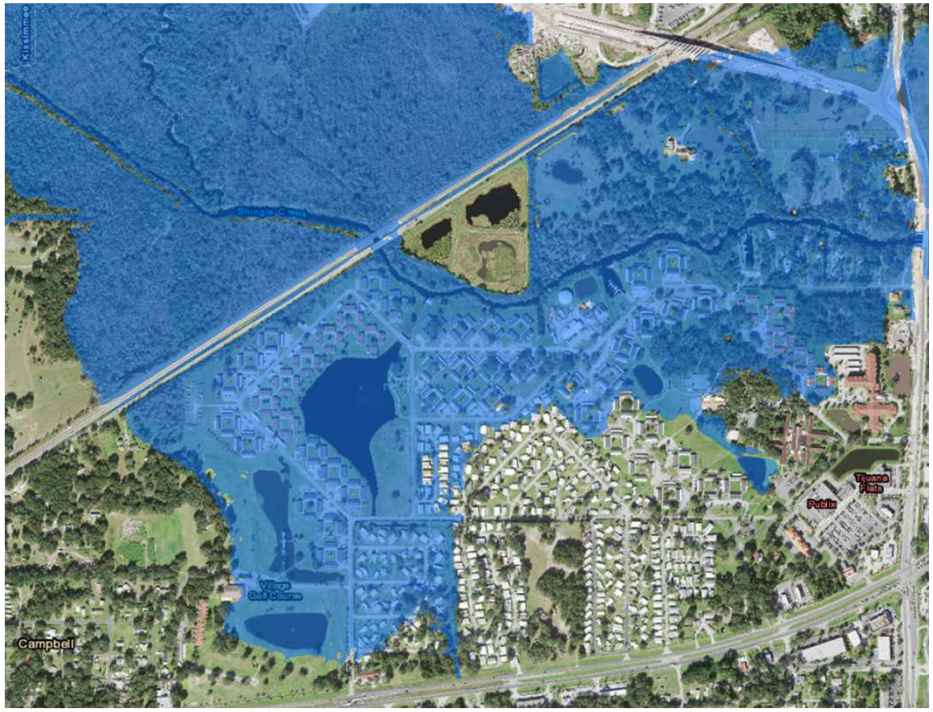
~2.7M NWM Forecast Points

National Water Model (NWM)

FIM provided for ~ 3.4 million river miles

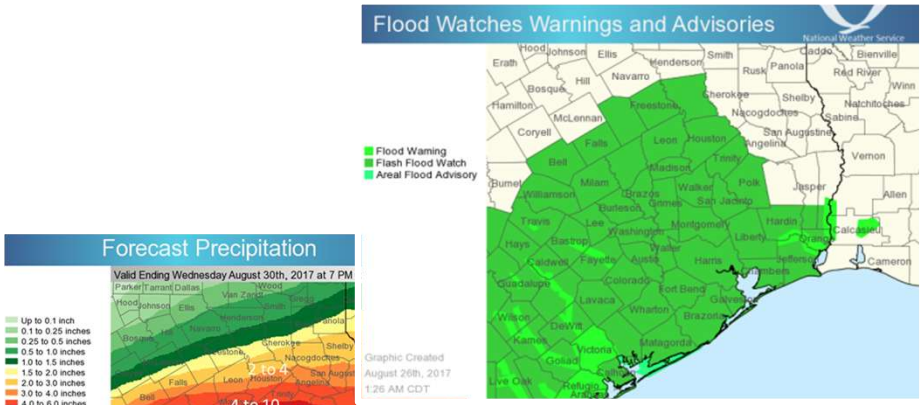
Map vs. Text

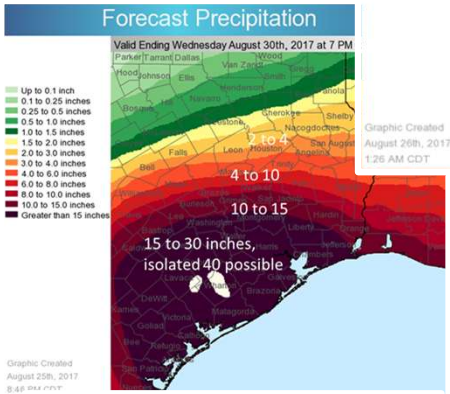
```
FLC097-292345-
/O.EXT.KMLB.FL.W.0006.000000T0000Z-220930T1926Z/
/SHIF1.3.ER.220929T0557Z.220929T1200Z.220930T1326Z.NR/
735 AM EDT Thu Sep 29 2022

...FLOOD WARNING NOW IN EFFECT UNTIL TOMORROW AFTERNOON...

* WHAT...Major flooding is occurring and major flooding is forecast.
  This approaches the flood of record.

* WHERE...Shingle Creek At Campbell.

* WHEN...Until tomorrow afternoon.

* IMPACTS...At 62.3 feet, Water enters many homes in Good Samaritan
  Village. Water approaches Sherwood Forest manufactured homes.
  Streets in Camelot and Sherwood Forest not navigable by regular
  vehicles. Property and roads in southern Old Town receiving water.

* ADDITIONAL DETAILS...
  - At 7:15 AM EDT Thursday the stage was 62.2 feet.
  - Recent Activity...The maximum river stage in the 24 hours
    ending at 7:15 AM EDT Thursday was 62.2 feet.
  - Forecast...The river is expected to fall below flood stage
    late tomorrow morning and continue falling to 58.6 feet early
    Saturday morning.
  - Flood stage is 60.0 feet.
  - http://www.weather.gov/safety/flood

&&

            Fld   Observed        Forecasts (8 am)
Location    Stg   Stg   Day/Time  Fri   Sat   Sun   Mon   Tue

Shingle Creek
Campbell    60.0  62.2  Thu 7 am  60.8  60.1   MSG   MSG   MSG
```



Example: Hurricane Harvey--2017

- Flood warning polygons provide value but they don't give the whole picture
- Flood inundation mapping would have painted a better picture about potential impacts
- Better at answering questions…
  - Do we have to evacuate the assisted living facility?
  - How many houses are going to flood?
  - From where should we bring swift water rescue teams?
  - How bad is it going to be?
  - How much worse will it get?
  - What's your reasonable worst case scenario?
  - When can we get into the area that flooded?





Example: Asheville, NC / Helene--2024

Record Flooding Forecast in Asheville, NC

Friday, September 27, 2024
12:45 AM EDT

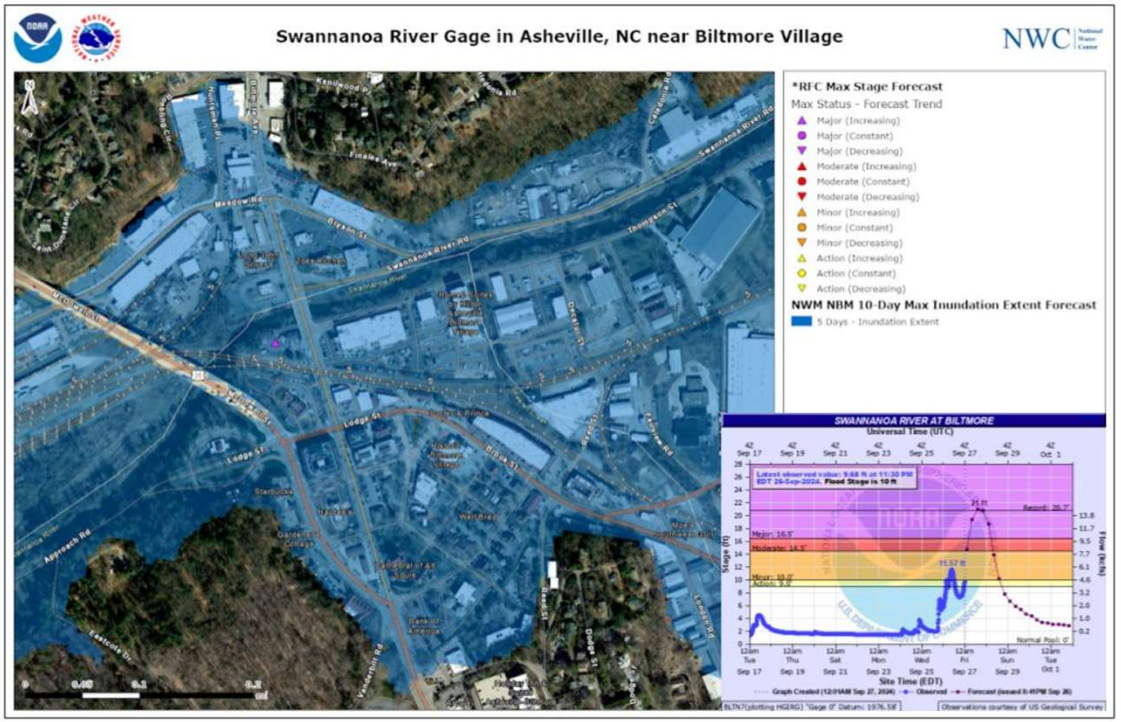
Life Threatening Flooding Possible

Key Messages

- Record flooding is forecast along the Swannanoa River
- Life threatening flooding may be possible
- Flood inundation mapping suggests widespread flooding in the Biltmore Village area of Asheville (shown in blue in the image on the right)
- To escape rising water, take the shortest path to higher ground.

Timing

- Flooding is ongoing and expected to crest Friday evening at record stage

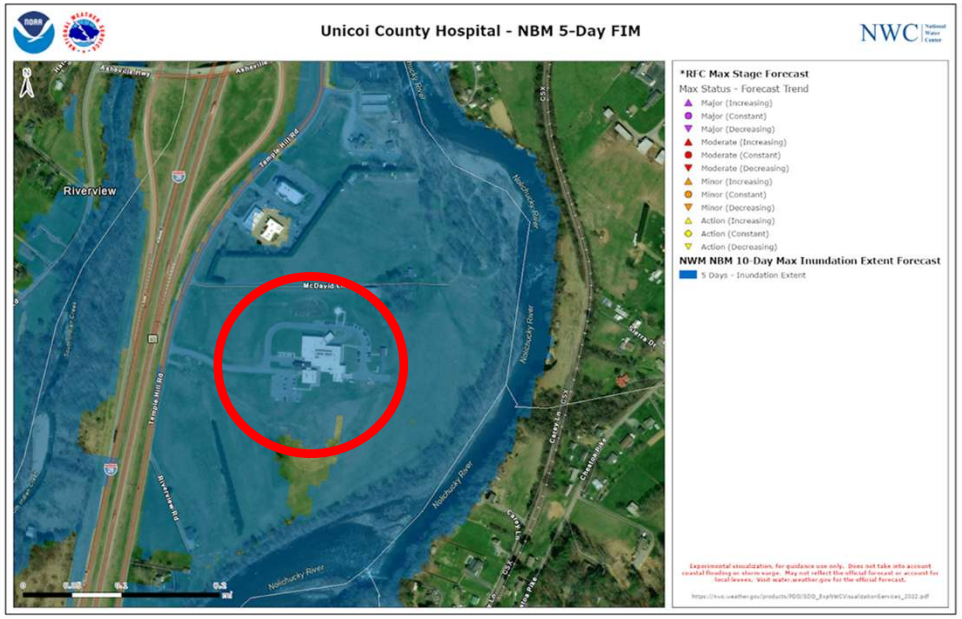


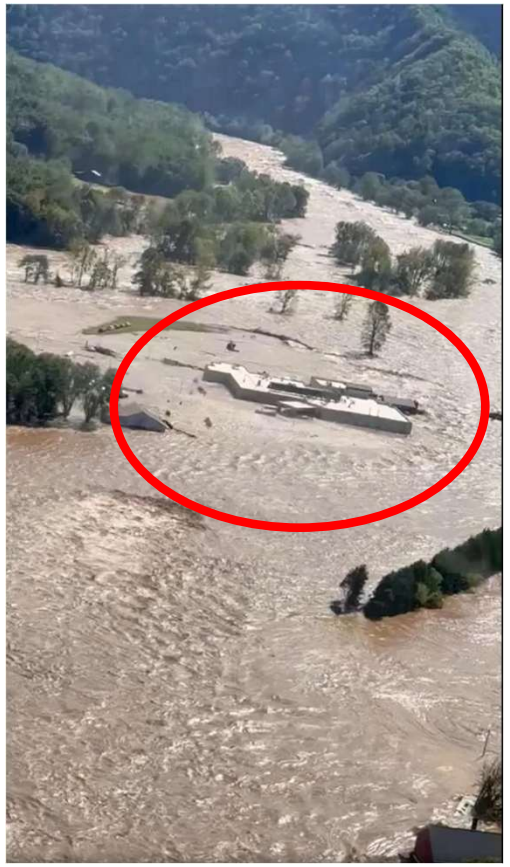
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

National Weather Service
National Water Center

Example: Unicoi County Hospital (Erwin, TN / Helene--2024)

- Official NWS river forecast indicated record flooding on the Nolichucky River
- Stages far above those even seen before
- How high will the water get?
- What will be affected?

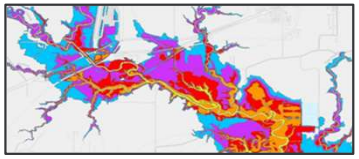




NWS FIM Capabilities

Static

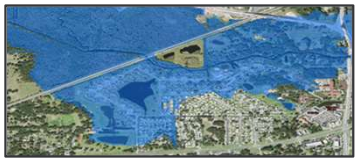
NWPS Partner FIM Libraries (NWPS Partner FIM) ~200 NWS river forecast locations. Shows the flood extent & depth based on a river crest of X feet. This is a hydraulic-based FIM which can be used with high confidence.



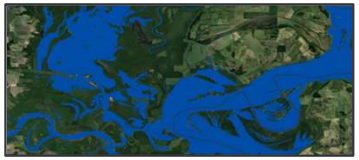
NWS Flood Categorical HAND FIM Libraries (CatFIM) ~3,000 NWS river forecast locations. Maps derived from 10 m Height Above Nearest Drainage (HAND) solution. *(Currently scheduled for public launch in Spring 2024)*

Dynamic

Forecast River Forecast Center Flood Maps (RFC 5-Day Max Forecast) downstream of ~3,600 NWS river forecast locations. Maps derived from traditional NWS river forecasts and 10-m Height Above Nearest Drainage (HAND) solution.



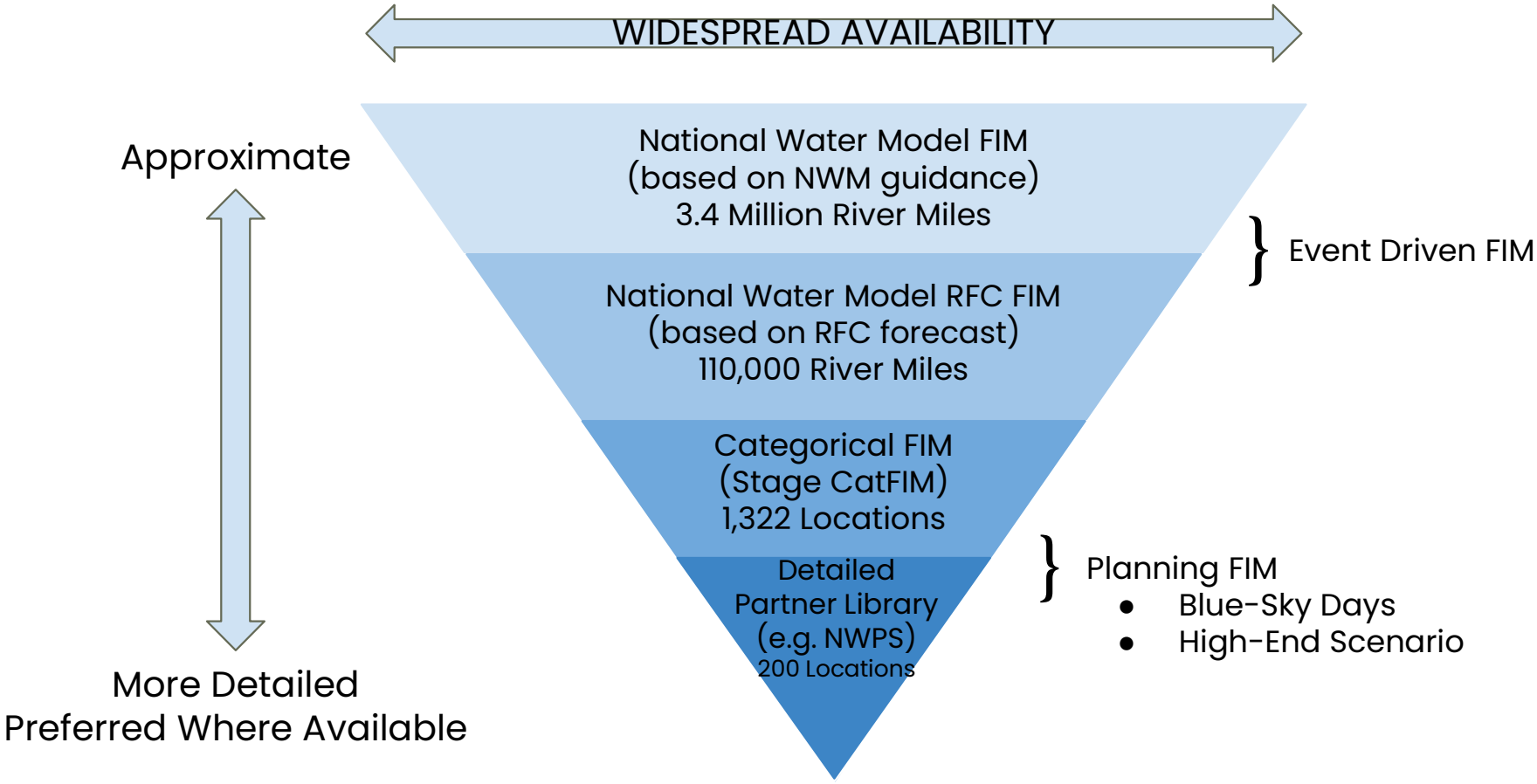
Forecast National Water Model Flood Maps (NWM 5-Day Max Forecast) along NHDPlus reach locations. Maps derived from NWM forecast and 10-m Height Above Nearest Drainage (HAND) solution.



National Water Model Latest Analysis (AnA) Flood Maps - utilizing observed rain and stream data to depict current flood extent. Maps derived from 10-m Height Above Nearest Drainage (HAND) solution.

Coverages
< 1,000 miles
~30,000 miles
~110k miles
~3.4M miles
~3.4M miles

FIM Availability and Confidence Level

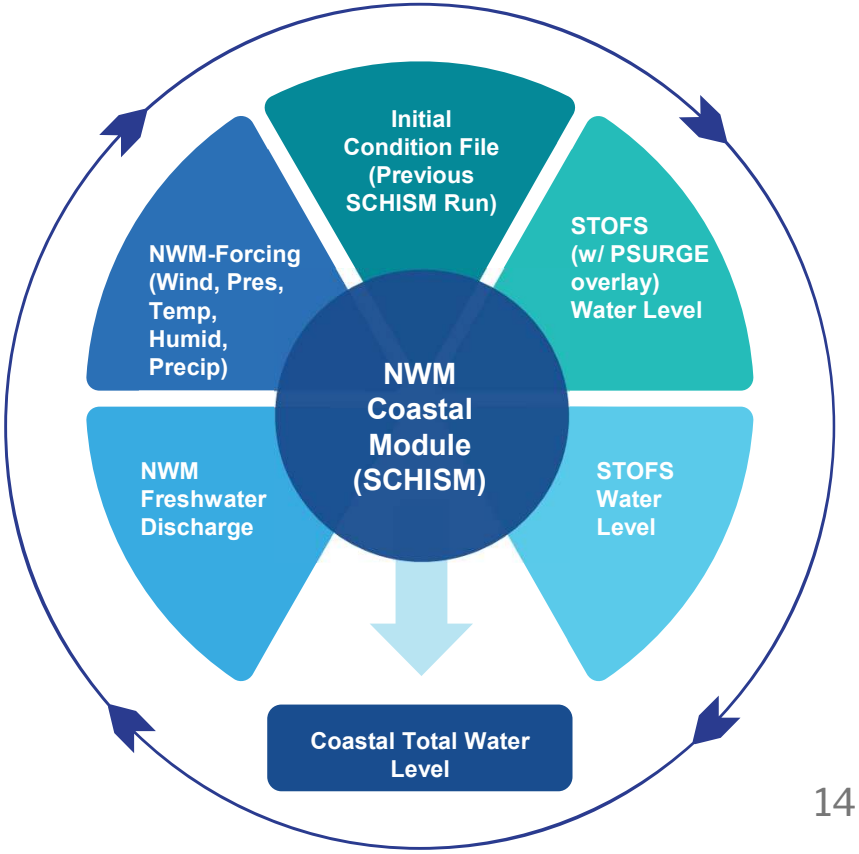


Coastal Limitations

- The current FIM capabilities are only able to address freshwater flooding
- Work is underway to couple the freshwater with tidal and storm surge based modeling

TWL output is masked to a 5 meter bathymetric depth offshore, extends to 10 meter topographic height inland

Effective Resolution
East/Gulf: 70 – 100 m



Interpreting NWS FIM

What is flooded?

~~How deep will the water be?~~

Flood Impacts & Photos — Collapse

If you notice any errors in the below information, please contact our Webmaster

18 Water reaches the bridge next to the gage house.

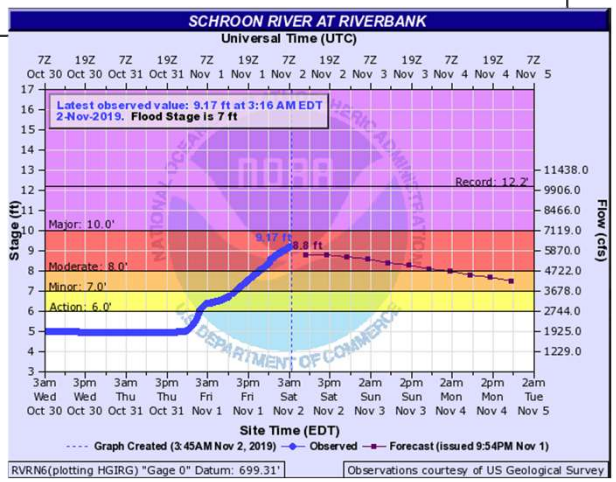
10 Water reaches major flood stage. There is 1 to 2 feet of water in homes and vacation properties near Warrensburg. Route 418 is under water in several locations. Sections of the highway are flooded along the right bank of river mostly upstream of gage.

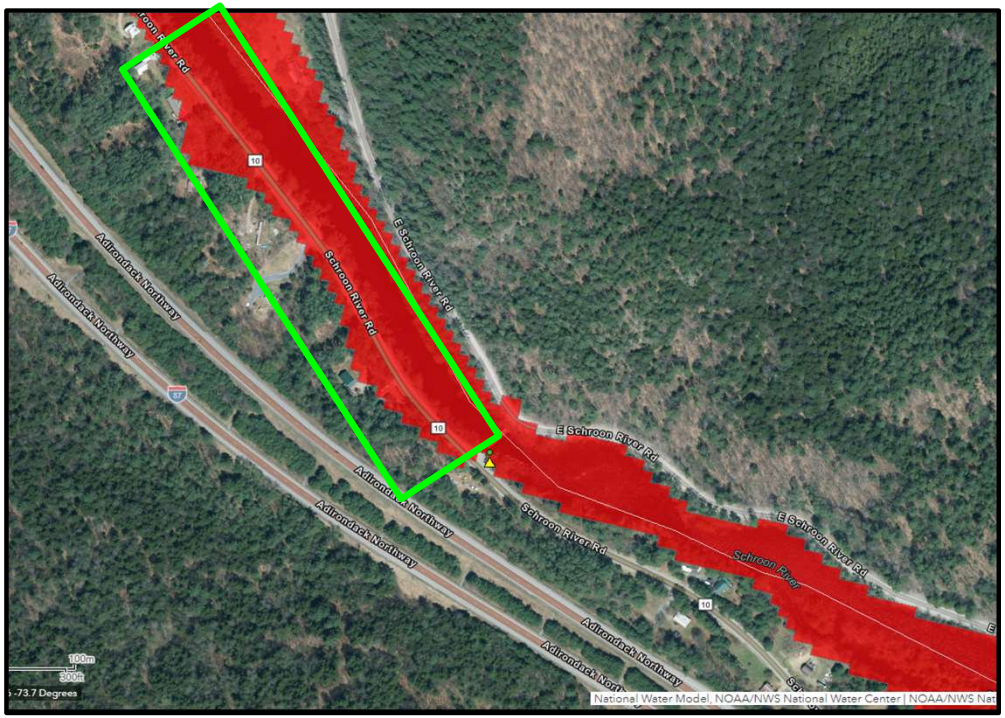
9 Water is over Tannery Road.

8 Water reaches moderate flood stage. Water surrounds several homes on Schroon River Road.

7 Water reaches minor flood stage with water in nearby lowlands and outbuildings.

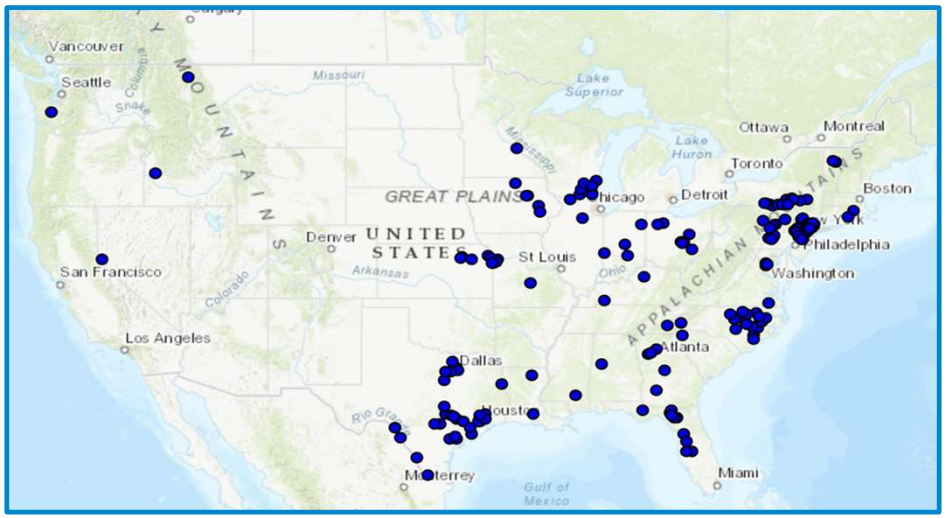
6 Action stage. The river is near bankfull.

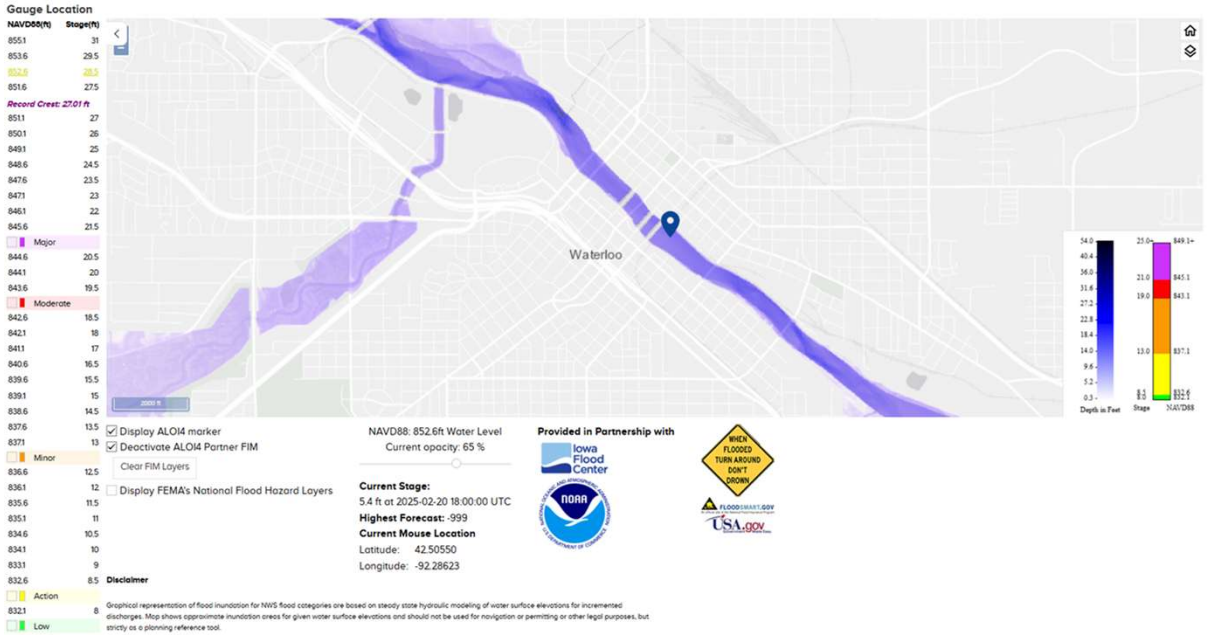




NWPS Partner FIM

- Uses hydraulic modeling
- Not based on real-time river forecasts
- Availability: Nearly 200 sites nationwide
- 5 miles up / downstream
- High resolution (< 10 m)
- Extensively calibrated, verified
- Limited inundation of neighboring tributaries





Locations currently in Iowa

- **Winnebago River at Mason City**
- **Iowa River at Iowa City**
- **Cedar River at Cedar Falls**
- **Cedar River at Waterloo**
- **Cedar River at Cedar Rapids**

IOWA FLOOD CENTER
Flood Inundation Mapping

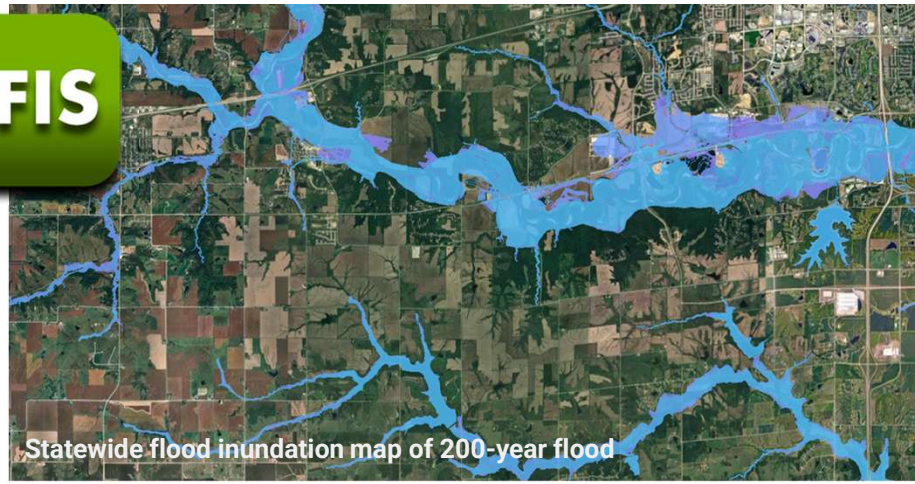
A critical resource to help citizens, emergency managers, community leaders and decision-makers identify and communicate Iowa's flood hazards and support informed floodplain management decisions.

Statewide Maps

- A collaboration with Iowa DNR, USACE and FEMA to update flood maps for every Iowa county. IFC researchers used laser radar (LiDAR) data provided by Iowa DNR to map all streams draining more than one square mile.

Community Maps

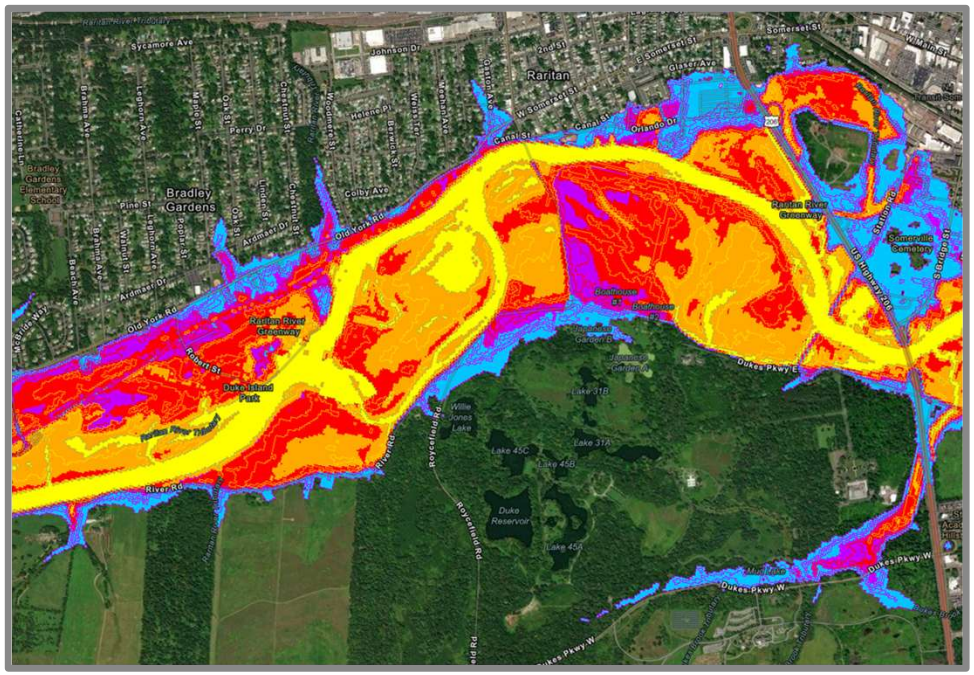
- IFC has developed flood inundation maps for dozens of Iowa communities that translate forecasted river stages into high-resolution, interactive, scenario-based maps.



Learn More → iowafloodcenter.uiowa.edu
View Flood Inundation Maps → ifis.iowafloodcenter.org

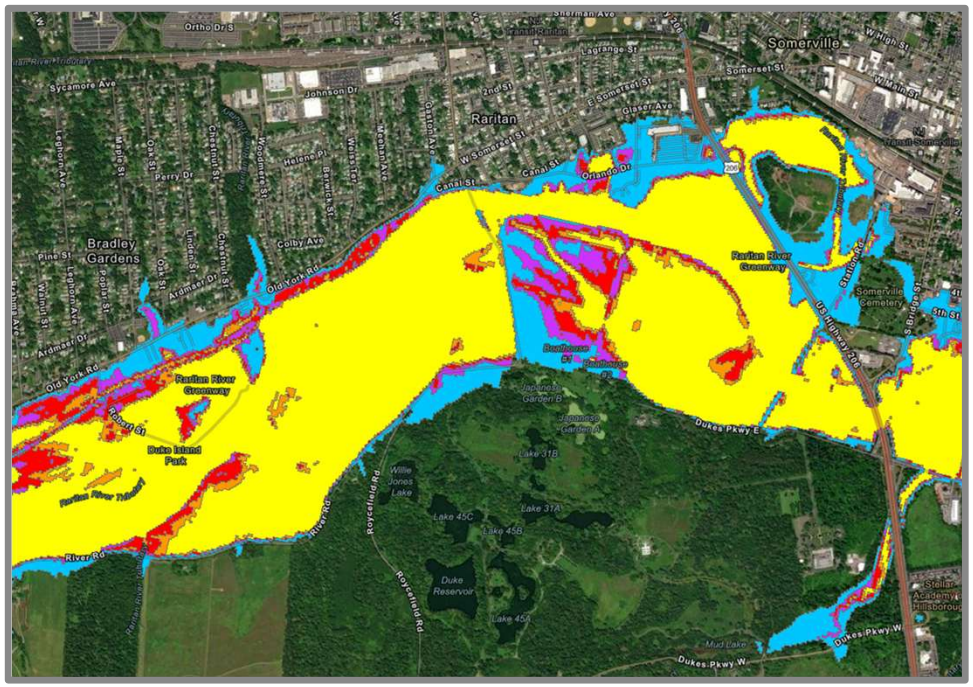
Stage-Based Categorical FIM (CatFIM)

- Derived from NWM
- Not based on real-time river forecasts
- Limited availability (official NWS forecast points only)
- Inundation extent at 1 ft intervals
- Includes local flood categories
- 5 miles up / downstream
- 10 m resolution
- Uses USGS rating curves to establish the water surface elevation at the streamgage
- Planning / reference / what-if

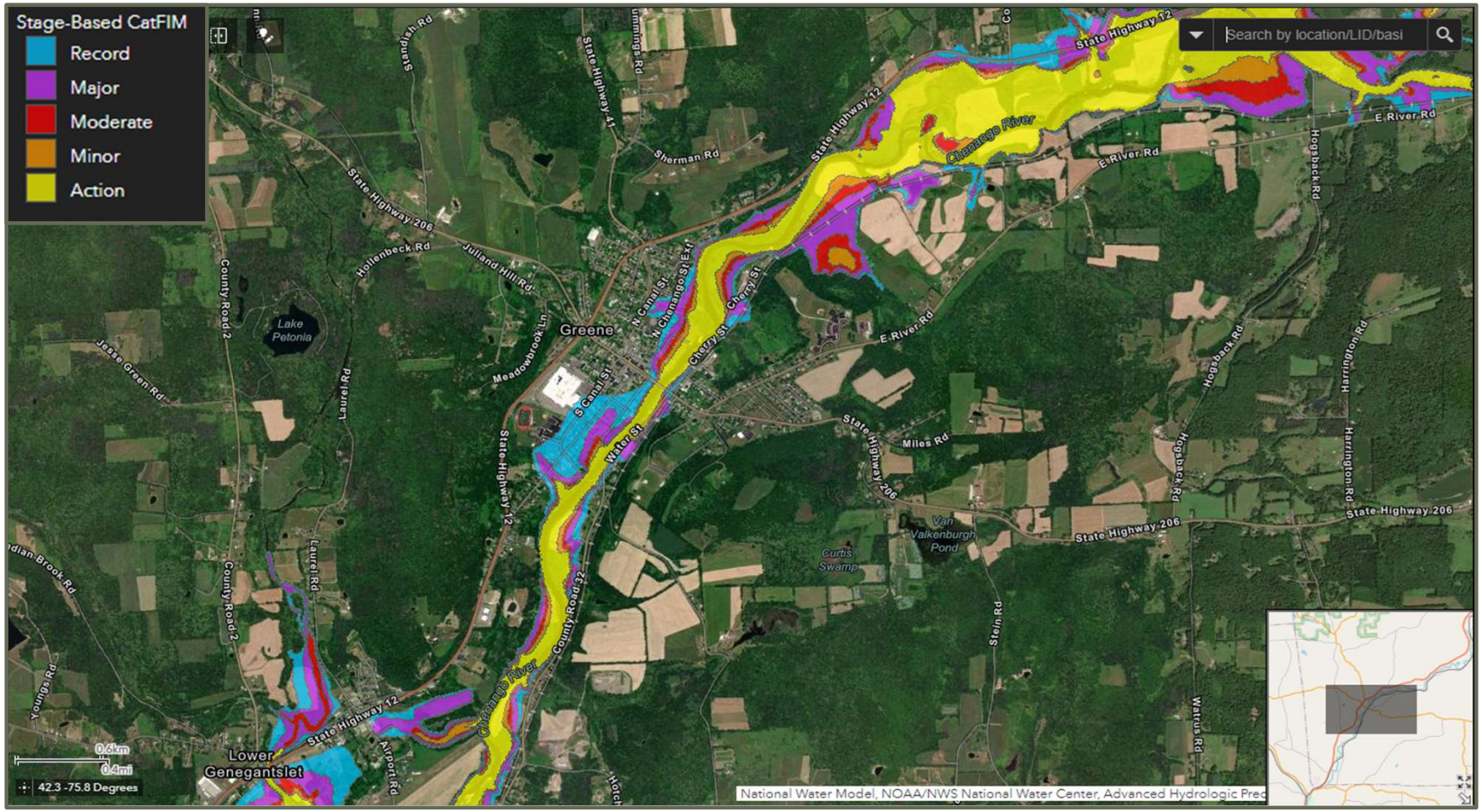


Flow-Based Categorical FIM (CatFIM)

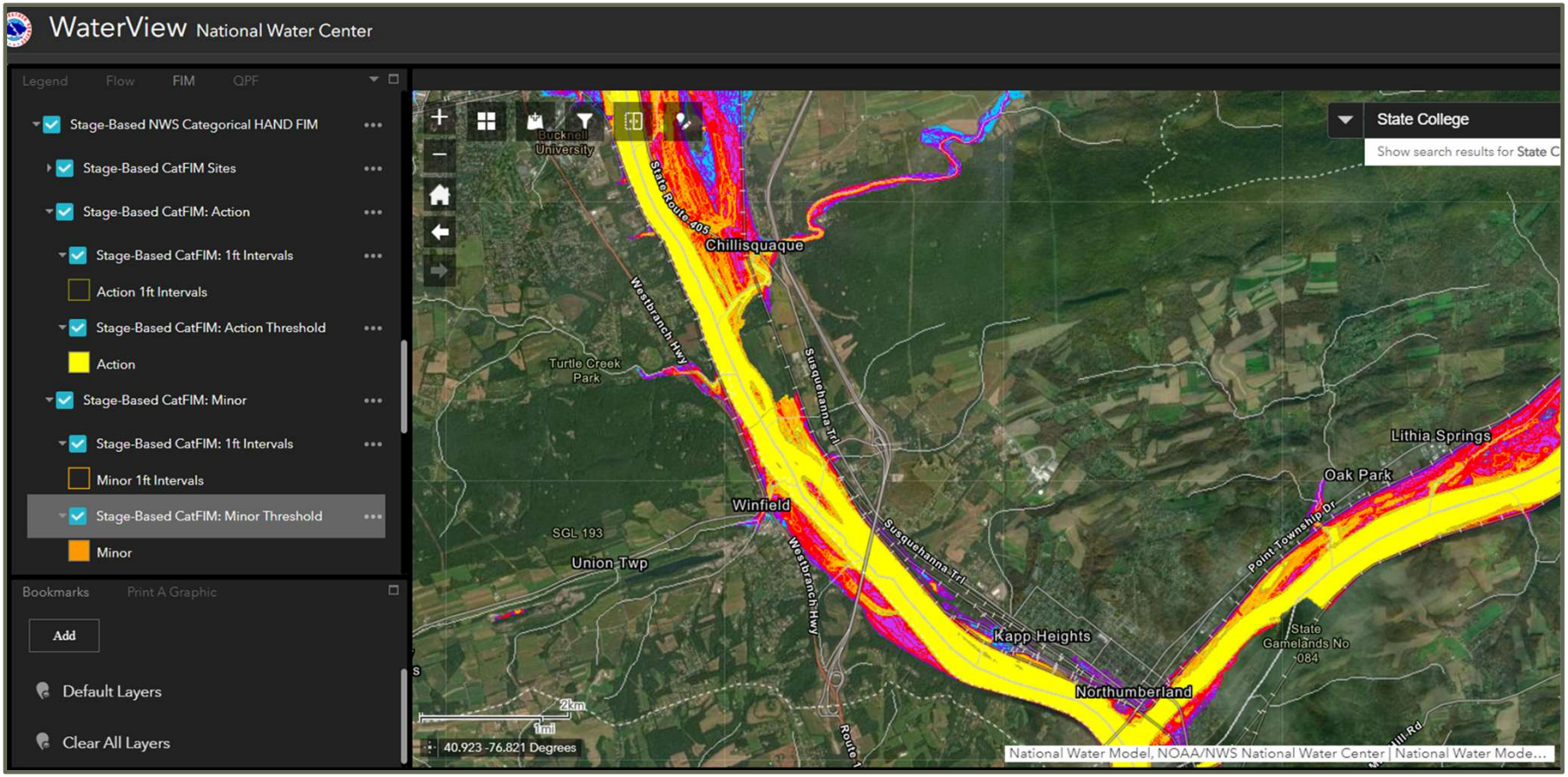
- Derived from NWM per HAND
- Not based on real-time river forecasts
- Limited availability (official NWS forecast points only)
- Inundation extents at NWPS thresholds
- 5 miles up / downstream
- 10 m resolution
- Uses SRCs to determine stage throughout the reach and thus is subject to SRC error
- Planning / reference / what-if



Stage-Based Categorical FIM (CatFIM)

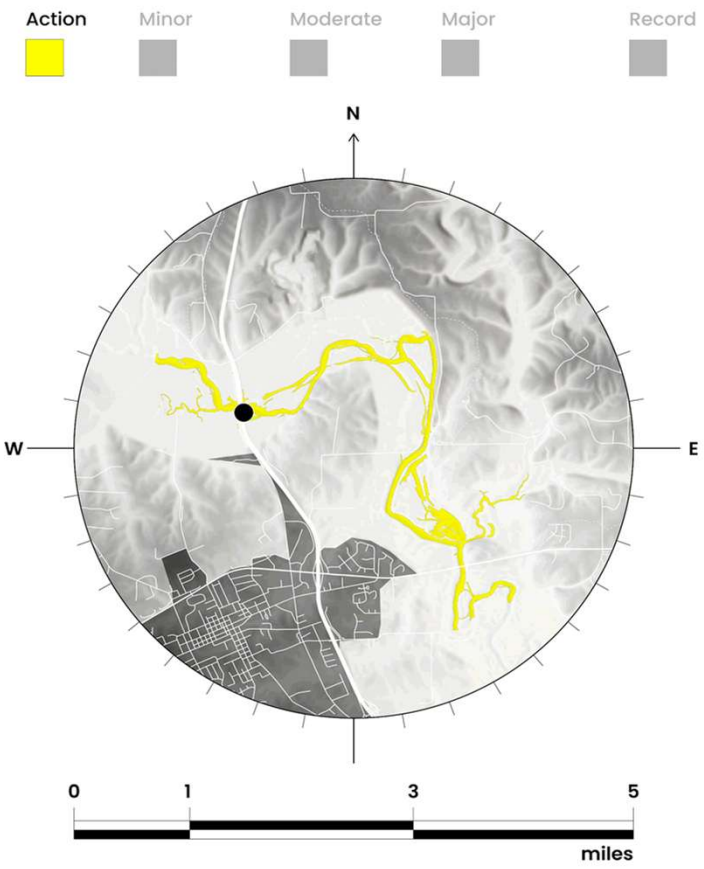


Stage-Based CatFIM

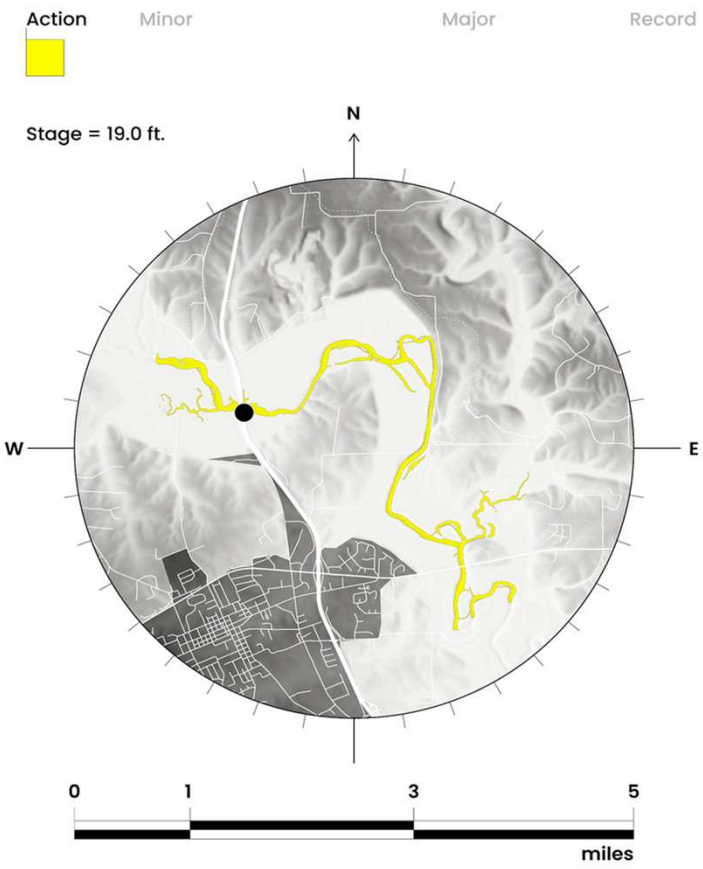


Flow-Based vs Stage-Based CatFIM (animation)

Flow-Based CatFIM



Stage-Based CatFIM



RFC 5-Day Max Inundation Forecast FIM

- Depicts maximum inundation extent over the next 5 days derived from the official River Forecast Center (RFC) forecast
- Maximum streamflows are available downstream of NWS river forecast points whose forecast reaches Action Stage or higher flow threshold categories
- Latency (timing): ~45 minutes after forecast is issued
- Limitation: only available downstream of NWPS forecast points

NWM 5-Day Max Forecast FIM

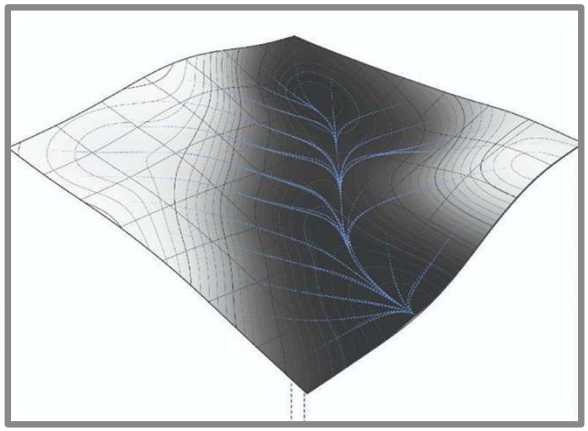
- Depicts inundation extent of peak National Water Model (NWM) streamflow forecast over the next 5 days where NWM is producing flows that meet or exceed high water threshold for a given river reach
- High water thresholds vary by region
- Latency (timing): ~30 minutes after 12Z, 18Z, 00Z and 06Z
- Limitation: Quality Control (QC) limitation exists because no forecaster is involved in decision-making process regarding forecast

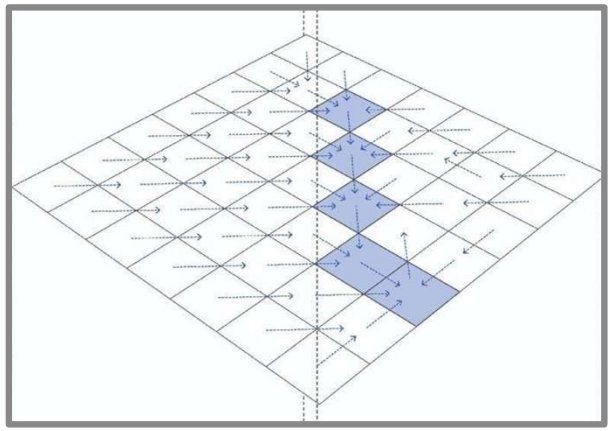
NWM Latest Analysis (AnA)

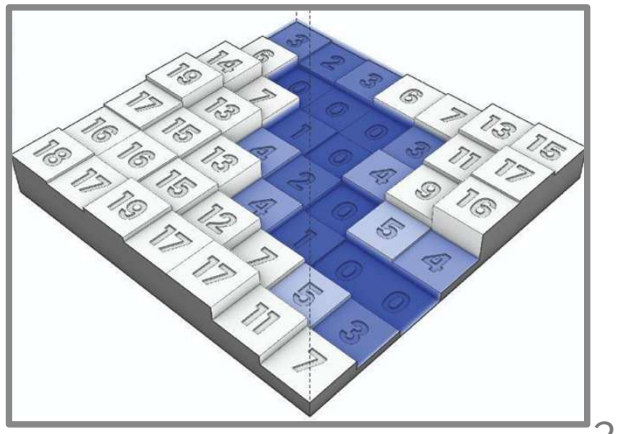
- Depicts closest reasonable inundation extent at the current time for locations exceeding the high water threshold
- High water threshold varies by region
- Latency (timing): ~80 minutes after top of every hour
- Limitation: reliability decreases in ungauged areas (or other data voids) where analysis cannot be tuned to observed information

How is FIM Developed?

- HAND method (Height Above Nearest Drainage) is utilized to calculate inundation for the FIM models
- Each basin catchment utilizes a 10m Digital Elevation Model (DEM) and converts that to a Relative Elevation Model (REM).
  - Each drainage basin is relative to a specific point, usually 0ft, indicating the stream level.







General FIM Limitations

- FIM is not perfect even though the maps can look neat
  - FIM may suffer from inaccuracies arising from issues with the modeling, elevation/landscape data and building/road placement
  - FIM may also suffer from inaccuracies in the input stream forecasts
  - Please coordinate with the NWS leading up to and during flood events so that you can make the best-informed decisions

- FIM is based on landscape conditions at the time it was developed
  - FIM accuracy may be reduced if natural or man-made changes (permanent or temporary) occur to the river channel or flood plain afterwards
  - Examples: development, modification, failure or removal of flood protection systems such as levees, floodwalls or the development, modification, failure or removal of bridges and dams

General FIM Limitations (cont'd)

- NWS FIM is designed to address flooding from waterways such as rivers and streams (i.e., fluvial flooding)–not from flash flooding due to rapid runoff from rainfall such as in urban areas or in fields (i.e., pluvial flooding)

- NWS FIM is not designed for inundation resulting from ice jam flooding
  - With ice jams there can be local fluctuations in stage caused by the ice itself, not by the river flow

- NWS FIM--when compared to the regulatory FEMA Digital Flood Insurance Rate Maps (DFIRMs)--will depict different flooding scenarios
  - The differences occur because FIM and FEMA maps have been designed for different purposes and were developed based on different assumptions

Strengths of RFC and NWM FIM

- Visualizes flood forecasts and impacts for every river across the nation (including Alaska, Hawaii, Puerto Rico and the Virgin Islands)
- Creates a common picture of the river/stream flood threat in a given area
- Improves ability to target areas and preposition resources (regional, not local)
- Large scale regional response and reaction
- Can be used by national, regional, and county partners

"Had I have had this tool in 2011, we would have had a larger evacuation area established earlier, would have moved emergency assets out of the flood zone, pre-positioned support resources and been able to provide better information to the residents of the affected area."

- County Emergency Manager

Limitations of RFC and NWM FIM

- Extent only
  - Number 1 question about flooding after “where?” is “how deep?” Depth is not currently part of NWS FIM but is planned for the future
- Limited to 10 m digital elevation model
  - Can’t see small physical features and their impact on FIM extent such as small ridges, bridges or unofficial levees
- Simplified physics
  - Equations describing the physics are simpler with more assumptions as compared to hydraulic models like HEC-RAS
  - Height Above Nearest Drainage (HAND) technique limitations

Limitations of RFC and NWM FIM (cont'd)

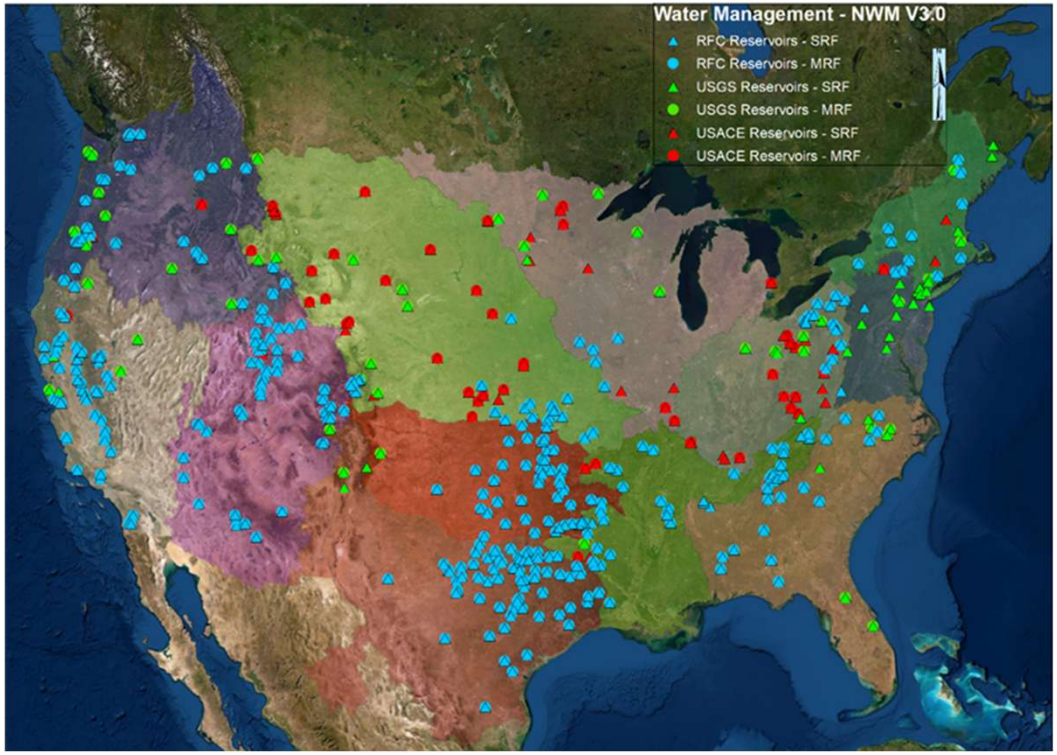
- NWM versions limited by quantitative precipitation forecast (QPF) input
  - The rainfall creating the flow is currently only Global Forecast System
  - Can't adjust or manipulate the forecast rainfall going into the model
- NWM Versions flow has no human influence for the forecast
  - Similar to being unable to adjust the rainfall, NWM version has no ability to adjust the flow generating the map
- Coastal use is limited
  - Current FIM capabilities are only able to address freshwater flooding
  - *Total Water Level FIM derived from a coastal coupled NWM approach is under development*

National Weather Service
Flood Inundation Map (FIM)
Resources and Services

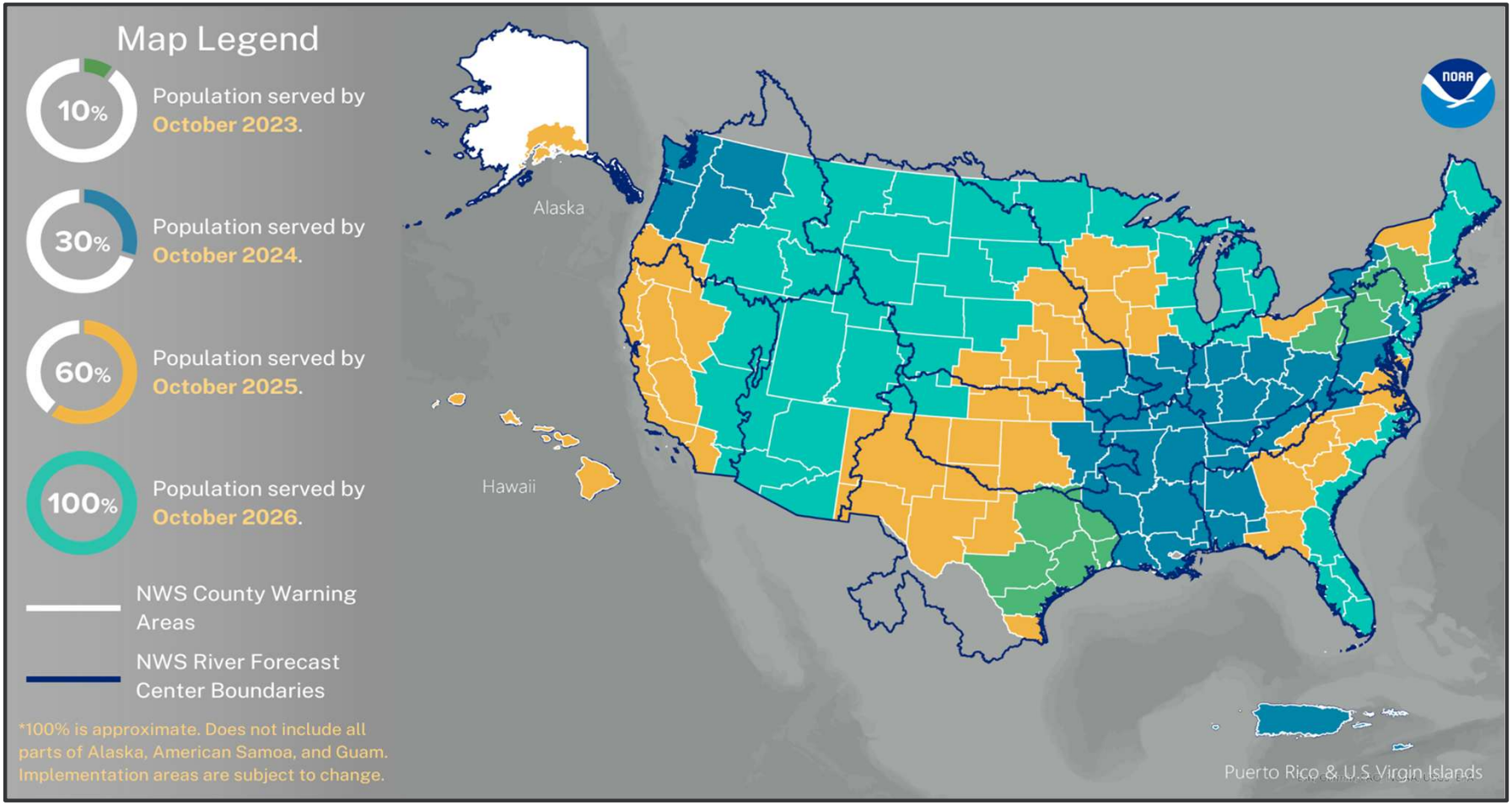
	Reference Maps ("Blue Sky") (These maps are always available; not forecast dependent depend on forecasts)		Forecast Maps ("Dark Sky") (These maps are only available when flood/near-flood is forecast)		
	NWPS Partner FIM	**CatFIM**	**RFC FIM**	**NWM AnA FIM** AnA = "Analysis"	**NWM 5-Day FIM**
How often is it updated?	**Always available** (static maps)	**Always available** (static maps)	**Event-by-event;** **Up to 1.5 hours after latest forecast is issued** (Forecast must exceed Action Stage)	**Event-by-event;** **Every 1.5 hours** (Forecast must be near flood)	**Event-by-event;** **Every 6.5 hours** (Forecast must be near flood)
Where is it available?	At some NWPS streamgage locations • View **maps online**	At most NWPS streamgage locations with defined NWS flood categories • View **maps online** • Add **to your GIS Dashboard**	At most NWPS streamgage locations with official NWS river forecasts • View **maps online** • Add **to your GIS Dashboard**	At any Stream in the NWM • View **maps online** • Add **to your GIS Dashboard**	At any Stream in the NWM • View **maps online** • Add **to your GIS Dashboard**
How should I use it?	• Best available NWS-sourced FIM • Provides high confidence of inundation extent and depth (but no FIM is perfect!) • Provides guidance for inundation around most levees, flood control structures and bridges	• View inundation extent near an NWPS river stream gage at 1-foot intervals, including at each of the NWS flood categories (Action, Minor, Moderate, Major, Record) • Best used for streamgaged streams - limited inundation availability for smaller tributaries	• View inundation extent based on the max value from the latest official NWS river forecast (up to 3-5 days) • RFC FIM may change with each forecast update	• View current, "right now" inundation extent for any stream or river • View max inundation extent for a recent flood • Inundation along smaller and unstreamgaged streams may be less accurate due to limited verification	• View max inundation extent over the next 5 days for any stream or river, based on NWM model guidance • NWM 5-Day FIM may change with each forecast update • Completely model-driven
When should I use it?	• Ongoing flooding • 1-3+ days prior to flood, for "what-if" planning • "Blue sky" reference	• Ongoing flooding, where NWPS Partner FIM is unavailable • 1-3+ days prior to flood, for "what-if" planning • "Blue sky" reference	• Ongoing flooding, where NWPS Partner FIM is unavailable • 1-2 days prior to flood, if NWS river forecast confidence is high	• Ongoing flooding, where no other FIM is available • Post-flood analysis, up to 14 days after flood	• Ongoing flooding, where no other FIM is available • 1-2 days prior to flood, for streams where no other FIM is available

Reservoir Impacts on FIM

- Reservoir operations and outflows impact NWM streamflow accuracy and as a result the resulting FIM - flows could change if there has been significant impact
- Several thousand reservoirs represented in NWM but in basic fashion
  - "Fill and spill"
- NWM uses two other data ingest approaches (direct insertion assimilation) to improve modeled outflows



NWS Flood Inundation Mapping Services Implementation

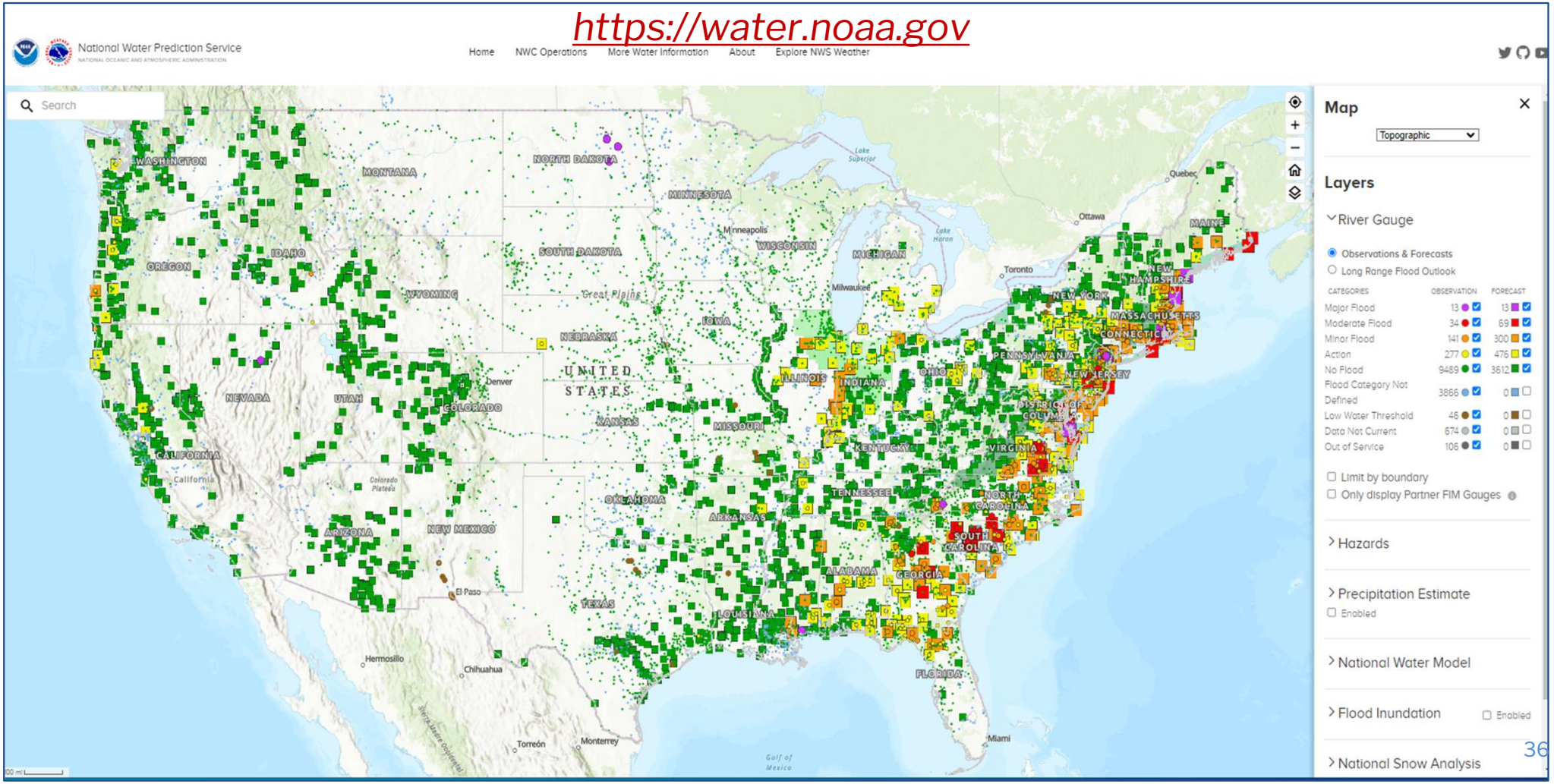


Viewing FIM

National Water Prediction Service (NWPS)

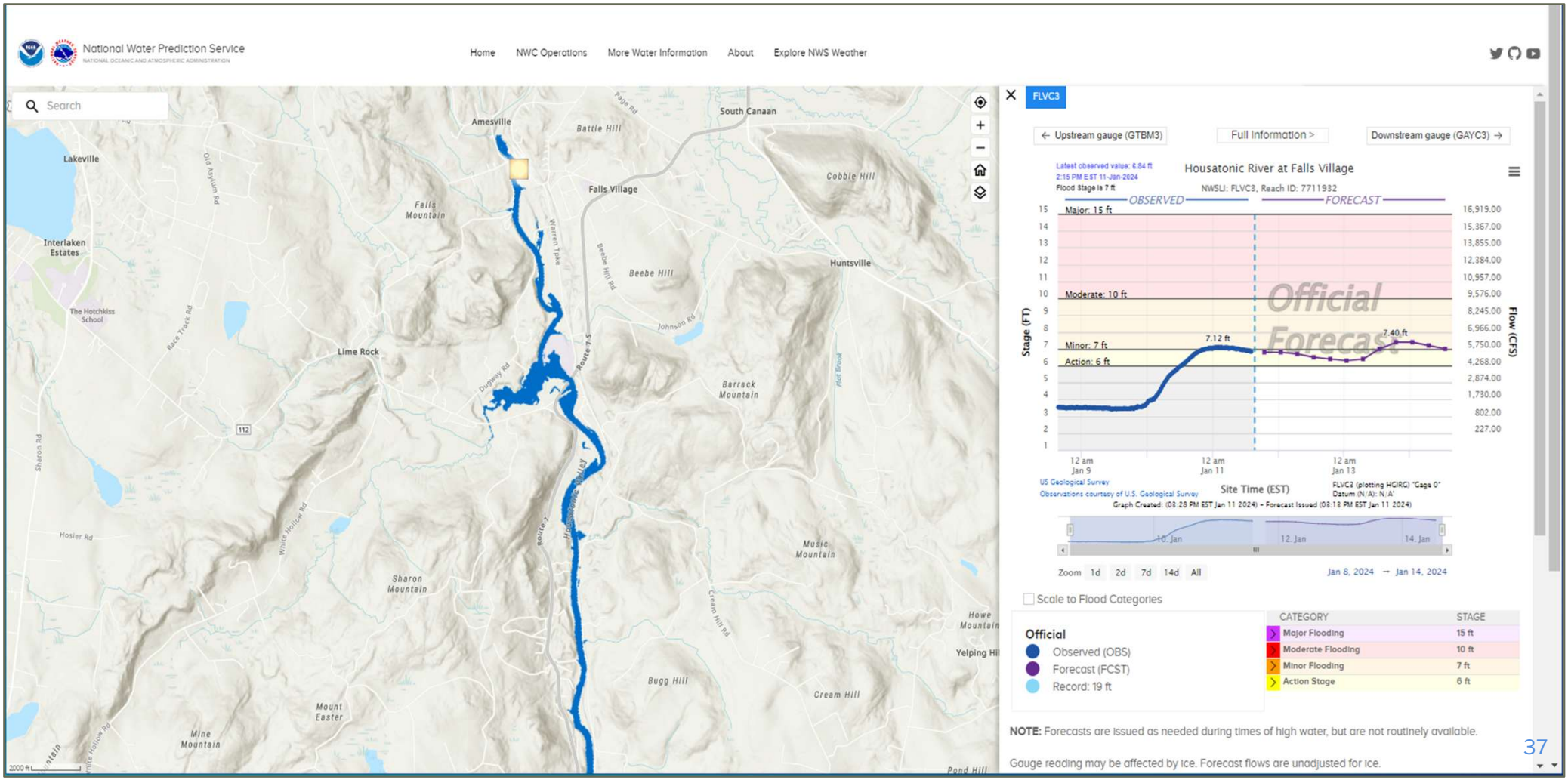
Implemented on 3/27/2024

https://water.noaa.gov



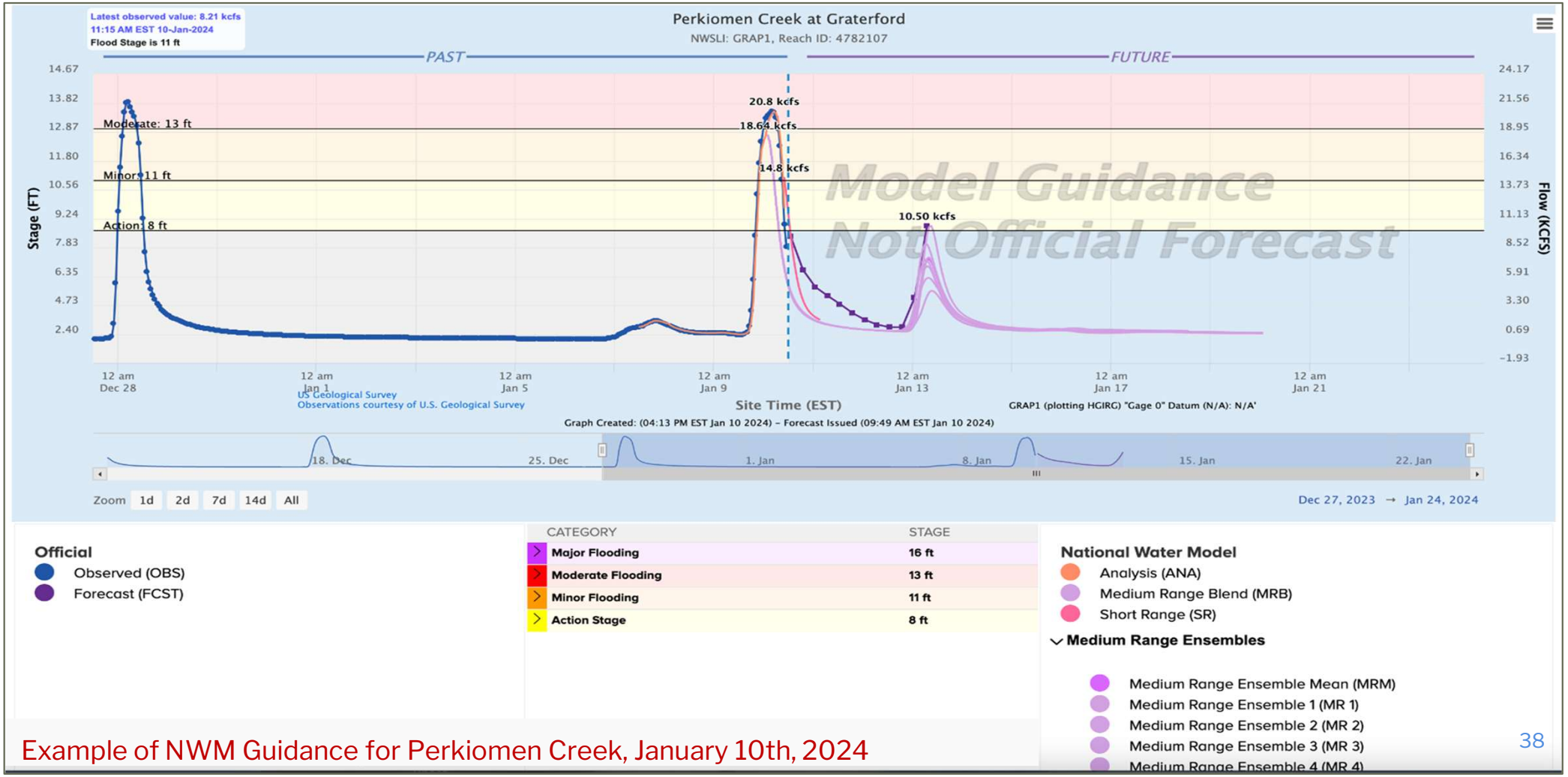
National Water Prediction Service (NWPS)

Linking Official NWS Forecasts and NWS FIM Services



National Water Prediction Service (NWPS)

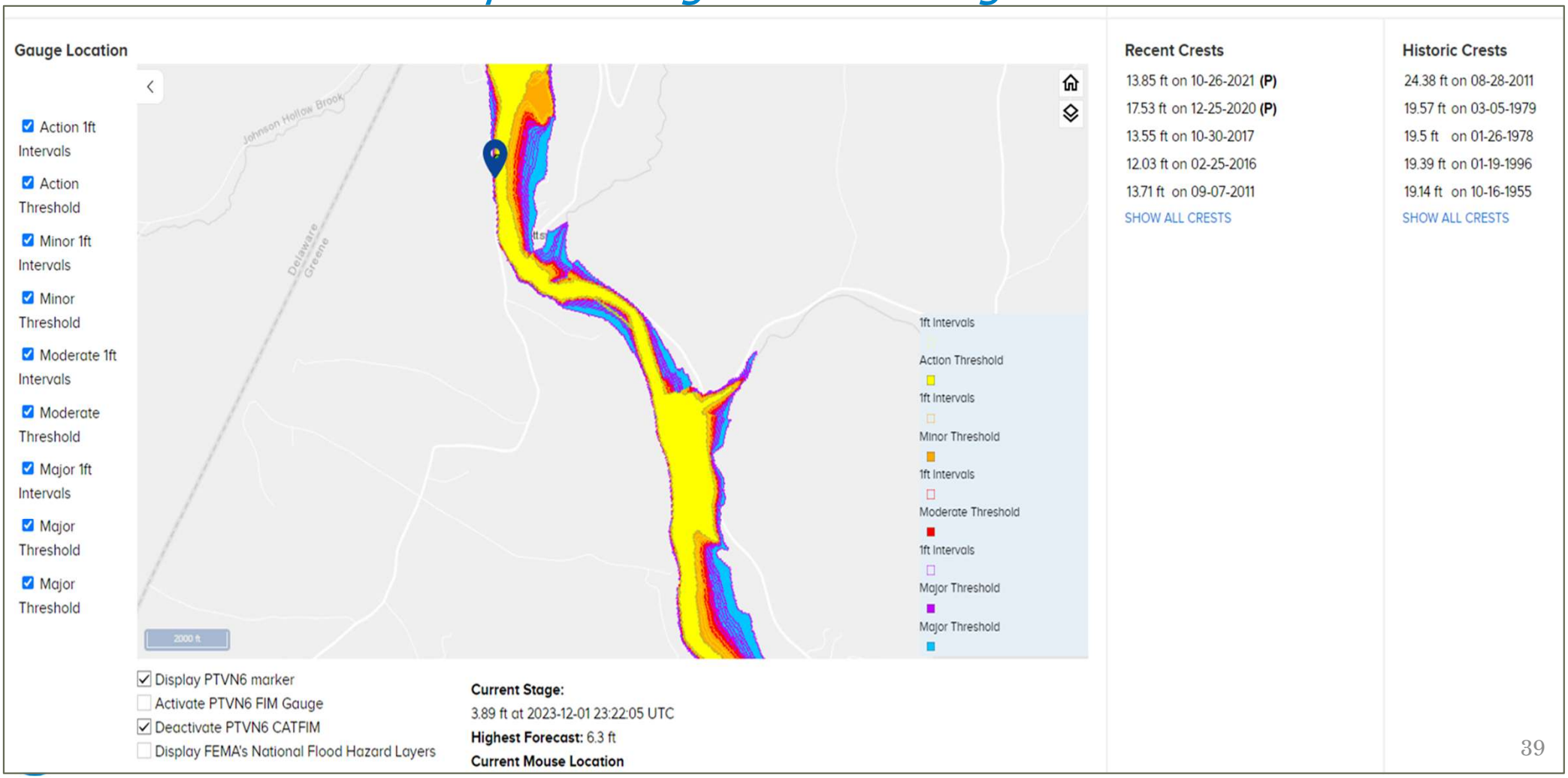
NWM Guidance at Point Locations



Example of NWM Guidance for Perkiomen Creek, January 10th, 2024

National Water Prediction Service (NWPS)

Example of Stage-based Categorical FIM



Thank You!

For more information visit:
https://www.weather.gov/dmx/fim_info

National Water Prediction Service (NWPS):
https://www.weather.gov/desmoines/water

NWS Des Moines Hydro Decision Support webpage:
https://www.weather.gov/desmoines/dsshydro