

Floodplain Storage: Safe or Risky?

By Elijah Kaufman

How much time does your community typically have during heavy rains before floodwaters are soaking Main Street, the local fairgrounds, or the RV park? Days? Hours? Minutes? Many communities in Nebraska are no strangers to flash flooding. Flash floods arrive quickly and without warning, bringing fast moving and extremely turbulent flow that can swiftly carry away any unfastened materials in harm's way. Fallen trees, sheds, trailers, construction materials, and cars can all be swept away in just inches of water.

Nebraska residents don't need to look far into the past to find destructive flash flood events. In the early

morning hours of May 26th, 2023, a slow-moving severe thunderstorm impacted southwestern Nebraska, producing around 10 inches of rainfall within a few short hours for the town of Stratton. With such little warning time, water rescues were needed to save at least 4 citizens stranded in their homes, and one individual who became trapped in their vehicle. Cars, trucks, tractors, campers, and tool sheds were seen being carried down the Muddy Creek and the Republican River. This event was responsible for more than \$1 million in property damage, and \$162,000 in crop damage (NWS Storm Events

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There's a New Model in Town

By Deanna Ringenberg

Floodplain maps are the product of an iterative public process and complex computer modeling.

For decades, 1 Dimensional (1D) floodplain modeling served as the industry standard for creating floodplain boundaries. This technique simplified complex scenarios by representing water flow at cross sections placed along the river. While this method was the best approach for years, it came with limitations that hindered its accuracy and applicability in certain situations.

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Flooding seen along the Republican River south of Stratton, NE, on May 26, 2023, sends vehicles and RV adrift. The flooding resulted from a slow-moving storm over southwestern Nebraska that dropped between 5 and 10 inches of rain on area communities. Photo: Scott McDonald



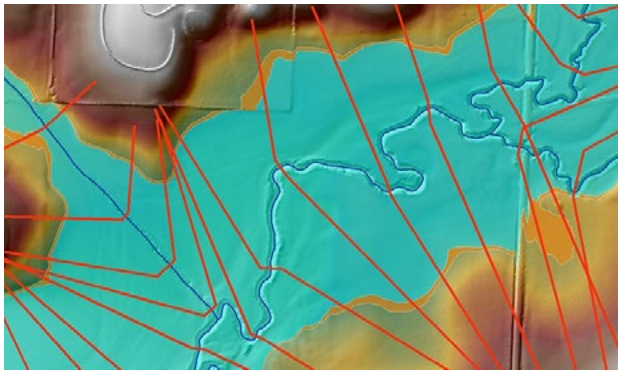
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Waterloo & Waverly Join CRS!

NeDNR is excited for the residents of Waterloo and Waverly, who will soon enjoy a 5% discount in their flood insurance rates.

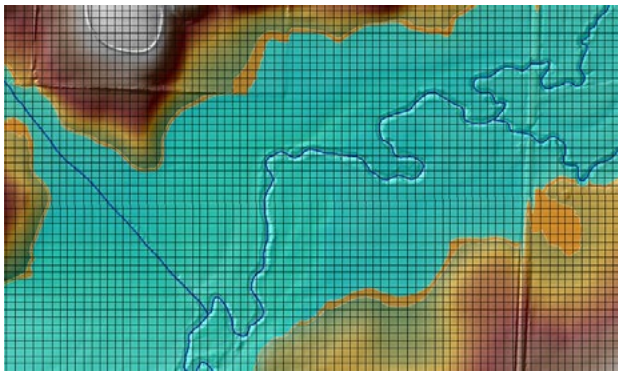
Are you interested in reaping the benefits of the CRS program? If so, contact NeDNR's floodplain management section and we'll help you get started!



Top: 1D mapping uses profile baselines (blue) and cross sections (red). Confluences such as the one shown present difficulty in 1D modeling.

Bottom: 2D modeling produces a grid of cells. 2D modeling produces more realistic results and eliminates inaccuracies caused by troublesome cross sections.

Image: Iowa Flood Center



New Model continued from page 1.

Enter 2D Modeling

The introduction of 2 Dimensional (2D) floodplain modeling has marked a significant advancement in flood risk assessment. 2D models can provide a more realistic representation of how water spreads and travels during a flood.

Where 1D models represented topography with cross sections spaced hundreds to thousands of feet apart, in a 2D model, the floodplain is divided into a grid of square cells with dimensions as small as 10 feet. The modeling program then calculates how water flows between each cell, allowing for more detailed understanding of how floodwaters really move through a floodplain. The refined topography and multi-directional flow calculation make 2D modeling incredibly valuable in urban areas, areas with multiple channels and flow directions, and in areas with non-riverine flow, like the Sandhills.

Advantages of 2D Modeling

2D models can capture complex flood behaviors, including backflow, overbank flooding, and local variations in flow velocity. This level of detail is crucial for assessing flood risks accurately. The program also creates a short video animation of the flood which can be shared with stakeholders throughout the watershed.

At this point, you may be asking “how does this affect me?” First off, 2D mapping Base Flood Elevations (BFEs) will look a little different. These determinations may show more water going up small streams and streets. Additionally, the BFEs will not be straight lines at even intervals as they were in 1D, they will curve like a contour map.

NeDNR is excited to bring this new methodology to Nebraska, we believe it will give us a more accurate picture of flood risk in the state. ■

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Database). Until this event, the southwestern region of Nebraska was experiencing a severe drought, and communities were not prepared to be inundated with such high amounts of water. Many residents and community officials were unfortunately reminded of the 1935 Republican River flood, which occurred under similar conditions and displaced thousands of people.

There are a number of takeaways one can get from this story, but there are two you should remember from this article. One; flooding can happen anywhere at any time and with little warning. Two; any unanchored material in the path of a flood can and will become debris.

So, what happens when someone purchases a lot in the floodplain with the intent to store cars, trailers, construction materials, or equipment in an open environment? A floodplain administrator should first go to their floodplain ordinance to review their regulations on stored materials.

According to Nebraska’s Minimum Standards for Floodplain Management Programs Title 455, paragraph 004.15, which aligns with FEMA’s regulations for storage of materials:

“The storage or processing of materials that are in time of flooding buoyant, flammable, explosive, or could be injurious to human, animal or plant life is prohibited. Storage of other material or equipment may be allowed if not subject to major damage by floods and firmly anchored to prevent flotation or if readily removable from the area within the time available after flood warning.”

To summarize these regulations, unless the stored items can be safely removed in the event of a flood, each individual stored item must be fully anchored to stop lateral movement and the effects of buoyancy. The determination on whether or not the removal of these items is feasible is one that the community will need to make. The property owner should provide evidence to show that they have the capacity, resources, time, and awareness to evacuate all stored

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items from the premises before a flood arrives. Evacuation routes must be predetermined, staff must be assigned duties, and equipment must be listed to prove to the floodplain administrator that their storage facility will not produce debris that could impact neighboring properties. This would also be a great time to meet with the local emergency manager to identify hazards and to draft an evacuation plan. Remember that the amount of warning time before a flood can vary between communities and rain events and that even the most well-developed plan may not be enough to accommodate for real world conditions. If it cannot be proven that each item can be removed in time before a flood event, then the items must be anchored to eliminate the effects of flotation, lateral movement, and buoyancy.

The regulations also state that materials that are flammable, explosive, or could be injurious to human, animal or plant life is prohibited. This means that trailers/campers with propane tanks, gasoline storage, or other hazardous materials would not be allowed to be stored at this facility.

Another item to note is that there are no elevation requirements for stored materials. Other potential concerns to address before the lot can be permitted for storage include:

- Materials stored in the floodplain below Base Flood Elevation (BFE) are at an increased risk of being in harm's way during a flood.
- Materials stored in the floodplain below BFE are at an increased risk of becoming debris that could cause damages to materials within this facility and property on neighboring lots. What does this mean from a liability perspective for the community or the lot owner?
- By having this storage below BFE, the lot owner would be making the conscious decision to allow



NeRF
Nebraska Real-time Flood Forecasting

The Nebraska Real-time Flood Forecasting (NeRF) site successfully launched on September 1st! If you haven't done so already, take some time to checkout NeDNR's latest tool to assist with flood disaster planning at nerff.nebraska.gov. The Flood Simulator option allows users to view calculated inundation boundaries at every half foot of stage height, and is available at 46 gage sites across the state. For more information regarding how your community can benefit from this new tool, please contact a member of our Floodplain Management Section staff.

renters to place their belongings potentially in harm's way.

- Can these items truly be removed in time in the event of a flood? Is that a realistic expectation/requirement?
- What anchoring methods can be realistically employed at this site?

Consider When Permitting

While there are no elevation requirements for stored materials of this type, floodplain administrators can require the property owner to compromise in some form. For example, elevating to reduce the depth of floodwater could reduce the costs of anchoring, and would also reduce the risk of the stored items becoming debris. Notice that in 004.15, stored materials cannot be subject to major damage by floods, so some actions should occur to reduce the depth of floodwater flowing through the property.

Additionally, it may be in the community's best interest to require the property owner to notify every individual using the site that the property is below BFE and is at risk of flooding. Whether this be in a waiver that is handed to every customer, signs posted along the fencing, or a notice posted at the entrance, the users of this storage facility need to know that their items must be

anchored or readily removable in the event of a flood.

Communities could treat open storage facilities similarly to RV parks, where the duration of storage would be limited to a set number of consecutive days, or to a period of time during the year.

Communities may limit the floodplain development permit to a set duration of time, where the property owner must reapply for a new permit once the other has lapsed. This allows the floodplain administrator to review the site on a routine schedule, and limits the opportunity for violations to occur.

If the property owner is not able to prove the items will be readily removable, and will not be able to anchor each item, they would have the option to have the area removed from the floodplain by Letter of Map Revision based on Fill (LOMR-F). This would require a permit for fill to elevate the area to 1 foot above the BFE, and the community to sign a Community Acknowledgment Form that all proposed development will be reasonably safe from flooding. Once the property owner obtains the LOMR-F, then the items within the removed area would not be required to follow the community's floodplain regulations unless otherwise specified by the community.

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Training and Events

Notice of Funding Opportunity released for BRIC & FMA grants!

FEMA has posted notices of funding opportunities for both the Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance (FMA) grants. The application period is open from October 16, 2023 - February 29, 2024.

To be eligible for these grants, jurisdictions must have participated in and adopted their local hazard mitigation plan. Additional criteria

and scoring information is available online:

- [FEMA's BRIC web page](#)
- [FEMA's FMA web page](#)

Interested jurisdictions are encouraged to complete a Notice of Interest (NOI) form available on the Nebraska Emergency Management Agency website. Submit BRIC NOIs to nema.hazardmitigation@nebraska.gov, and FMA NOIs to Jamie.Reinke@Nebraska.gov. ■

11.01 □ Adapting Legal Frameworks to Address Climate Change in High-Risk Communities

11:00 AM - 12:00 PM

Local governments, especially in flood-prone regions, are pushing forward new initiatives to bolster resilience through stricter regulatory standards, but the path toward innovative policy can be rocky. To shed light on this crucial intersection of law, policy, climate adaptation and flood risk, Forerunner excited to host Mark Nevitt, an Emory University law professor. Mark will break down the historical context of our current legal framework and help guide floodplain managers in navigating legal challenges. To learn more and to register, visit this [link](#).

11.02 ■ G-557 Rapid Needs Assessment

Grand Island, NE
8:00 AM - 5:00 PM

This NEMA ICS training course provides information and resources to enable participants to develop an effective damage assessment program and conduct rapid and effective needs assessments. Prerequisites are required. For more information and to register, please visit this [link](#).

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Remember, applicants must provide all information in detail to allow the floodplain administrator to determine that the proposal is consistent with the need to minimize flood damage. Section 4.4 "Application for Permit and Demonstration of Compliance" of the Nebraska Model Ordinance has this language built in, and your community may adopt this language if it isn't there already. If you have additional thoughts or concerns on permitting, please don't hesitate to contact our team here: <https://dnr.nebraska.gov/floodplain/contact>. ■

Your Suggestions Welcome!

What common permitting situations you have experienced in your community and would like to see discussed in the NeDNR Floodplain newsletter?

Please send suggestions to Adele Phillips at Adele.Phillips@Nebraska.gov

11.07 □ Elevation Certificates: Section A

1:30 PM - 2:30 PM

The Kansas Department of Agriculture is offering a free virtual training designed for community officials that focuses on Section A of the elevation certificate (EC) form. For more information and to register, please visit this [link](#).

11.08 □ Elevation Certificates: Section B

1:30 PM - 2:30 PM

The Kansas Department of Agriculture is offering a free virtual training designed for community officials that focuses on Section B of the EC form. For more information and to register, please visit this [link](#).

11.09 □ Elevation Certificates: Sections C, D, & E

1:30 PM - 2:30 PM

The Kansas Department of Agriculture is offering a free virtual training designed for community officials that focuses on Sections C, D, and E of the EC form. For more information and to register, please visit this [link](#).

Training and Events Cont.

11.09 □
The NEW Elevation Certificate: What Every Floodplain Administrator Needs to Know

Time TBD

Save the date to join NeDNR and FEMA staff for 2-hour virtual class detailing the new sections of the EC, how it is the Floodplain Administrator, not the Surveyor, who is responsible for ensuring an EC is correct, the most common errors and the best way for Floodplain Administrators to properly edit the EC. Watch your email for registration and other information coming soon, or visit this [link](#).

12.14 □
Basic Floodplain Management

10:00 AM - 3:00 PM

Save the date to join NeDNR staff for a free 4-hour virtual class on the fundamentals of floodplain management. Suitable for both novice and seasoned floodplain administrators. The class will cover the following topics, and more: floodplain permitting, map reading, LOMAs and LOMR-Fs, and substantial damage. There will be an hour break for lunch. Watch your email for registration and other information coming soon, or visit this [link](#).

12.06 □
Virtual Office Hours: Floodplain Q&A

10:00 AM - 11:00 AM

Join NeDNR Floodplain staff for an open discussion, to ask questions, and receive resources regarding floodplain and NFIP topics of your choice! We will welcome all questions from the very basic to the most advanced. Or feel free to join us to just listen in on topics of interest from others. For more information visit: To learn more, visit this [link](#).

01.18 □
Floodplain Development Permitting with Confidence

Time TBD

Save the date to join NeDNR staff for an informative class on the fundamentals of permitting for floodplain management. The class will cover: NeDNR’s Model Floodplain Development Permit Application, NeDNR’s Floodplain Interactive Map, and Elevation Certificates. Watch your email for registration and other information coming soon, or visit this [link](#).

Self-Paced □
NFIP 101: Introduction to Floodplain Management

FEMA’s Floodplain Management Training, Education, and Development Committee has launched a new online NFIP 101 course. This training is hosted in partnership with ASFPM and will help new and experienced floodplain administrators, emergency managers, elected officials, and others learn more about the NFIP and its requirements. The course is free and **does not require** ASFPM membership.

The self-paced course will take about 14-18 hours to complete. There is no time limit, so you can finish the course over days, weeks, or months. Those new to floodplain management who wish to learn the basics and earn professional credit may complete an exam and, if passed, receive 12 continuing education credits from ASFPM. The course is also useful as a reference guide for more experienced floodplain administrators who are seeking a refresher on basic floodplain management tools, terms, and concepts. To learn more, visit this [link](#).

November

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December

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January

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Want More Information?

Visit the NeDNR Floodplain Management website at: <https://dnr.nebraska.gov/floodplain>

Check out our Interactive Floodplain map at: <http://ne.gov/go/floodriskmap>

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