**Flooding**

**Part I – What is flooding and how can we describe it?**

**Part II - How do we measure flooding?**

1. **Explore the hydrograph of the Mississippi at St. Paul.**

Type the following in your favorite search engine “*USGS national water dashboard river levels*” to open the website of the [**National Water Dashboard – USGS**](https://www.bing.com/ck/a?!&&p=7fe7c84401ed46f541755786547d7c0848966d0edb9d724dd2d580914fc83febJmltdHM9MTc1MDYzNjgwMA&ptn=3&ver=2&hsh=4&fclid=232d9a06-1420-6338-3a64-8edf150b6203&psq=usgs+national+water+dashbord+river+levels&u=a1aHR0cHM6Ly9kYXNoYm9hcmQud2F0ZXJkYXRhLnVzZ3MuZ292L2FwcC9ud2QvZW4v&ntb=1) (https://dashboard.waterdata.usgs.gov/app/nwd/en/).

A close-up of a website

AI-generated content may be incorrect.

1. Once you can see the map, select only the layer with the USGS stations with stream flow flooding by going to the “USGS Stations” section, then “Streamflow”.
2. Click on the gage station in Downtown St. Paul, called “Mississippi at St. Paul, MN”. A new tab or window will open.
3. Explore and study this hydrograph.
4. Has a flood occurred during the last week?
5. What was the approximately highest discharge that occurred during the last week?
6. At which timestep are the discharge measurements usually available?
7. Bonus: Click on the “Site page” label in the top bar to open a new window or tab with the information of the measurement station. What does the main graph display? How is it different from the hydrographs we have seen before?
8. Bonus: Extend the time scale to one year by selecting on the top. Has a major flood occurred during the last year at the Mississippi at St. Paul? If yes, what was approximately the highest gage height?

**Part III - How does flooding impact the environment and people?**

Use the **USGS Flood Inundation Mapper** (<https://fim.wim.usgs.gov/fim/>) to research, discuss, and record observations. You will use this resource to understand how different communities were affected when local floods occurred.

1. Open the Flood Inundation Mapper. Close the pop-up, and visit the ”User Guide” in the top blue bar to understand how this site works.
2. Select the Mississippi at St. Paul. The map will zoom into that location and a pop-up will open. If the pop-up covers the selected river location, move the pop-up window to the side so you can see the portion of the river in blue. If the pop-up doesn’t immediately display the current hydrograph, go to the “Hydrograph” tab in the pop-up tab to view current and forecasted water levels (gage height). Click on any point of the hydrograph to display the flood area for that particular water level (but if that water level is below flood stage in gray, no flooding will appear on the map).
3. Use the slider on the left part of the pop-up to see how the flood inundation area would change if the river was at different water levels. What do you observe?
4. Click on the “Historical Flooding” tab of the pop-up to view historical floods for this location and explore how floods have affected this area. Click on any of the flood chart bars to see the likely inundation area for that historical flood on the map.
5. Question: Did any of these floods affect nearby homes? Record the location, the date, and anything else you notice that helps you understand the effects of floods. What questions come to mind when you see these maps?

Complete this process for two or three locations of your choice among the following ones (or find your favorite location), thereof St. Paul.

* Mississippi River at St. Paul, MN
* North Fork Kentucky River at Hazard, KY
* Pawtuxet River at Cranston, RI
* Susquehanna River at Harrisburg, PA
* Medina River at Bandera, TX

Location #1:

Did any of these floods affect nearby homes? Record the location, the date, and anything else you notice that helps you understand the effects of the floods.

What questions do you have when you look at these maps?

Location #2:

Did any of these floods affect nearby homes? Record the location, the date, and anything else you notice that helps you understand the effects of the floods.

What questions do you have when you look at these maps?

Location #3:

Did any of these floods affect nearby homes? Record the location, the date, and anything else you notice that helps you understand the effects of the floods.

What questions do you have when you look at these maps?

**Part IV – How can we plan with natural river processes?**

You and your group are a team of USGS scientists tasked with identifying what the community in St. Paul should do for future planning. How can the community ensure the least amount of damage in the future? Using these maps, what would be the three most essential pieces of knowledge they should know? Discuss as a group and write down your reasons. Look for unique things about this map.