STRUCTURES AT FLOOD RISK (SAFR) WEB MAPPING APPLICATION USER GUIDE

ILLINOIS
Illinois State Water Survey
PRAIRIE RESEARCH INSTITUTE

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SILVER JACKETS
MANY PARTNERS • ONE TEAM

Prepared by ISWS Staff
mitigation@isws.illinois.edu

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Accessing SAFR

SAFR is a web mapping application developed to show flood risk at the structure level in Illinois. A landing webpage with general information about SAFR is available at the link below:

Structures at Flood Risk (SAFR) Landing Page

Currently, the web map is only intended for community officials, local floodplain administrators, and emergency services & disaster agency personnel. The application is password protected as it is not meant for general public access. A username and password can be requested using the contact information at the end of this document. SAFR can be accessed at the link below, though the username and password will still be required:

Structures at Flood Risk (SAFR) Web Map

Uses of SAFR Data

The Flood Risk Assessment (FRA) datasets available on SAFR can help to guide community mitigation efforts by quantifying future potential flood losses. The data helps communities understand their flood risk and associated impacts, and to then make data-driven decisions about mitigation strategies. This data can be used to identify where flood mitigation actions, such as property buyouts, may produce the highest return on investment.

Data from SAFR is useful in the development of natural hazard mitigation plans. These plans are required for a county or municipality to be eligible for many FEMA grants for mitigation measures.

The SAFR web application allows users to view and query individual structures to better understand the structure's risk of being flooded and the specific damages and loss that would be experienced. The intended audiences for the website are federal, state and local officials including floodplain managers, mitigation officers, and city planners.

A Storymap has also been developed to provide an overview to the SAFR project. This Storymap can be accessed at the link below:

SAFR Storymap

Additional information about the SAFR data collection process, the hydraulic modeling, economic evaluations, and all other analyses can be found in individual reports written for each project (see Frequently Asked Questions/Project Information).

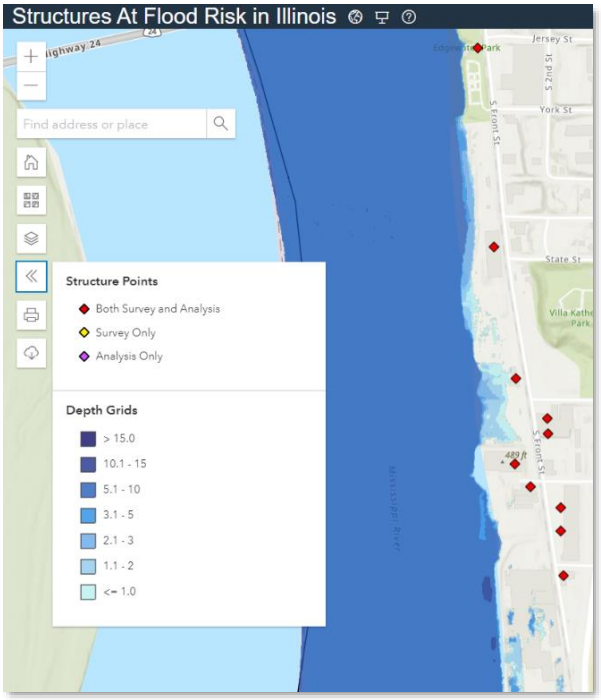
Available Data

Structure Points

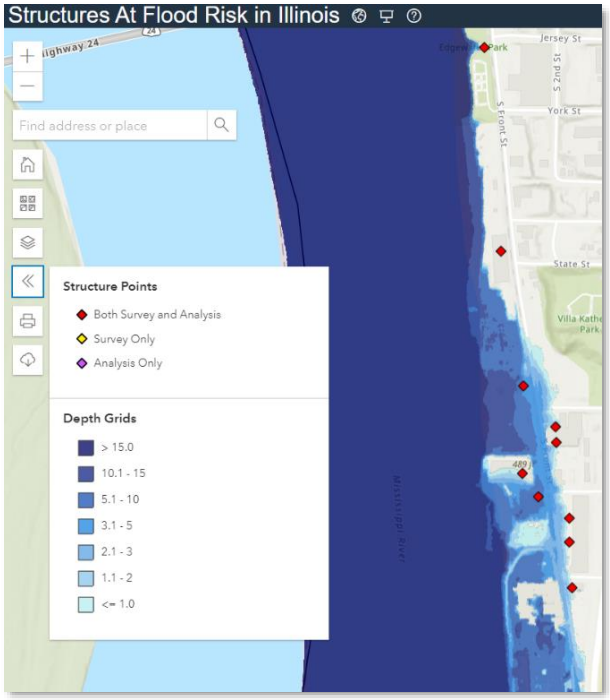
On the map, points represent structures in the building inventory that was compiled during the FRA process. Each point contains characteristics of the structure (occupancy, square footage, etc.) and the level of flood risk the structure is exposed to. Detailed surveys were completed in some locations to gather elevation data for some buildings. Likewise, flood risk analyses were completed for most, but not all buildings. The existence of survey and/or analysis data is shown on the map by the point's color.

Flood Depth Grids

Geographic Information System (GIS) raster files displayed on the map represent the estimated depth of analyzed flood events used in the flood risk assessment. Usually this consists of the 10%, 4%, 2%, 1%, and 0.2% annual chance flood events (also known as the 10-year, 25-year, 50-year, 100-year, and 500-year flood events). The flood grids show the extent of each projected flood event and which areas and structures might be impacted.



10% (10-yr) Flood Depth Grid

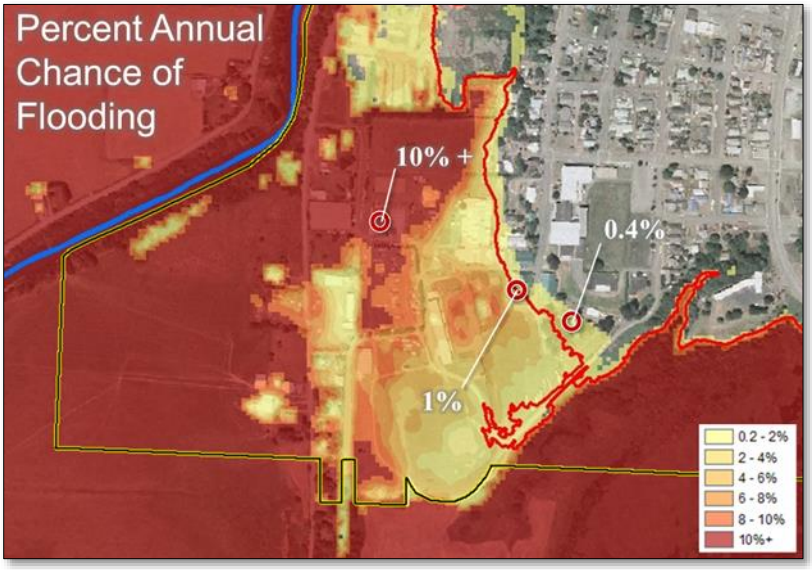


0.2% (500-yr) Flood Depth Grid

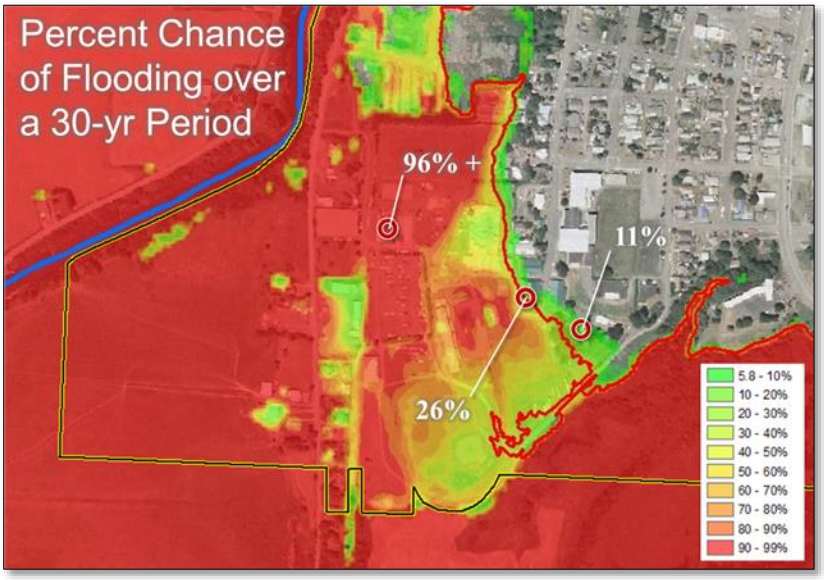
Analysis Grids

There are two different raster analysis grids that are produced for a flood risk assessment and are available on SAFR:

- **Percent Annual Chance of Flooding**
  - Shows the percent chance of flooding at a given point in any given year.



- **Percent Chance of Flooding over a 30-year Period**
  - This represents the percent chance of flooding at least one time during a 30-year period for a given location within the mapped floodplain.



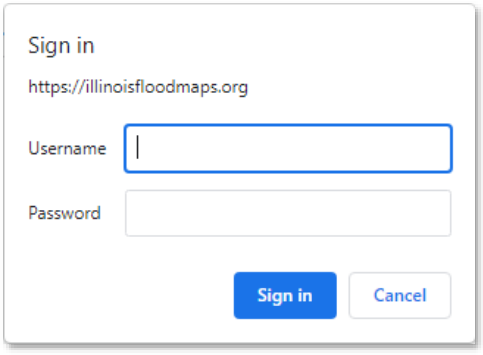
National Flood Hazard Layer (NFHL)

The NFHL is a dataset containing regulatory data made available by FEMA that was included in the creation of FEMA digital Flood Insurance Rate Maps (FIRMs). The SAFR web mapping application includes the S_Fld_Haz_Ar layer showing the regulatory floodplains used in the digital FIRMs.

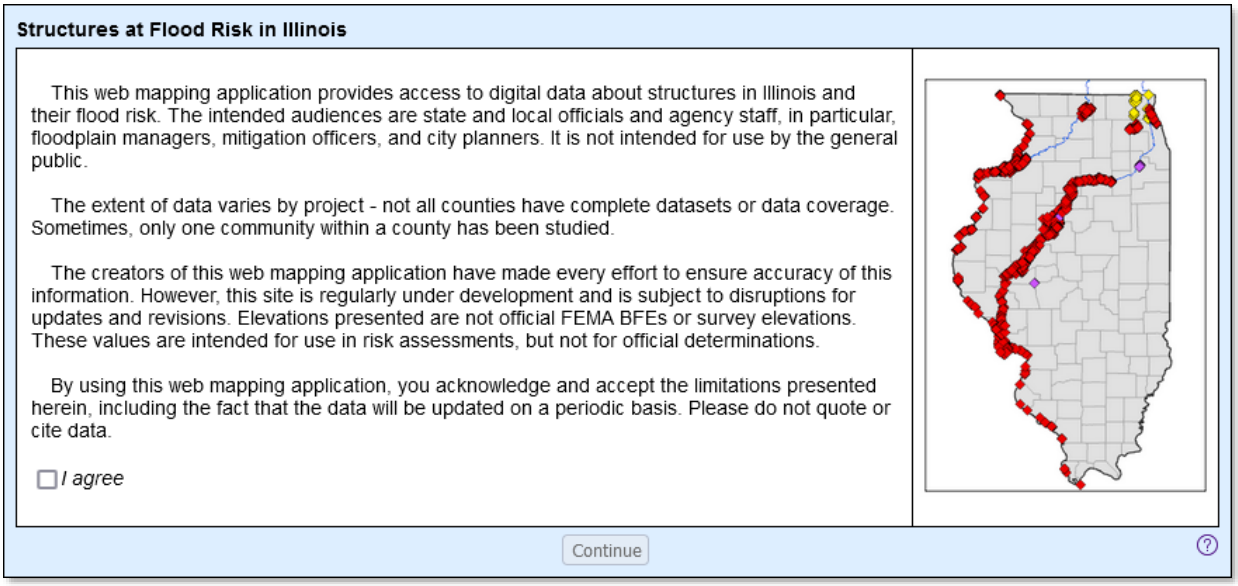
Components of the SAFR Web Map

Splash Screen

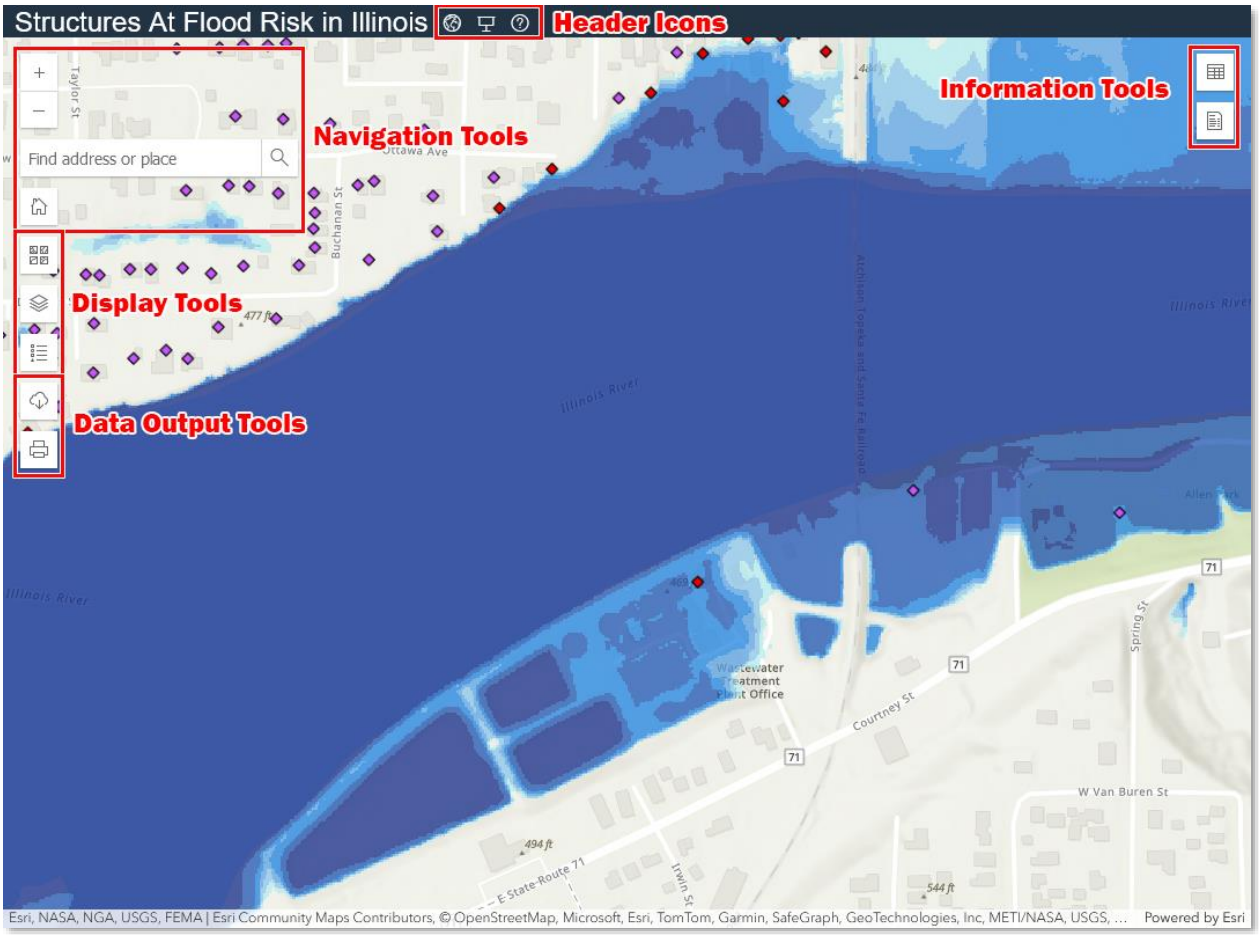
When first visiting SAFR there will be a prompt to enter a username and password. This is not publicly available but can be requested using the contact info at the end of this document. Some users have experienced a "401 – Unauthorized" error when trying to access SAFR. This is usually caused by Ad/popup blockers that stop the login screen from appearing. Possible solutions are to turn off any adblockers or to try a different internet browser.



After entering the username and password a splash screen will pop up showing a disclaimer. After reading the disclaimer, check the "I Agree" box at the bottom, then click the "Continue" button below to access the web map interface.



Multiple icons and tools are displayed on the web map interface. The white header icons at the top are hyperlinked to open applicable web pages. The Navigation tools on the upper left side are used to navigate the map. Below that, the display tools are used to change how the map looks. Next, the data output tools are used to get maps or data from SAFR. Last, the information tools in the upper right are used to view data on SAFR.



Header Icons

Once a user has accessed the SAFR web mapping application they will notice three icons at the top of the page:

Return to Splash Screen:
This icon returns to the initial splash screen where a different project area can be chosen.

User Guide Video:
This icon links to the SAFR Video User Guide that is hosted on Media Space.

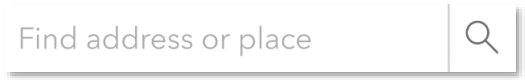
Frequently Asked Questions (FAQ):
Links to the FAQ page containing useful information on the different aspects of SAFR.

- This icon is also located in several different areas of SAFR and when clicked on will jump to a specific topic in the FAQ.

Navigation Tools

Zoom:
Zooms in and out on the map.

Location Search:
Search for specific addresses, cities, or other location data. The tool will autocomplete to assist with search. If the address is found, the map zooms and pans to its location.



Home:
Returns to the extent of the project area selected in the initial SAFR splash screen.

Display Tools

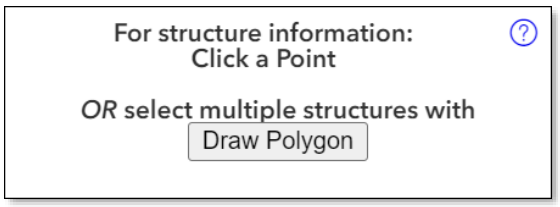
Basemap Gallery:
Selects the map displayed behind the SAFR data.

Data Layer List:
List of the data layers available to display.

Legend:
Displays and describes the symbology used for the data layers currently displayed on SAFR.

Information Tools

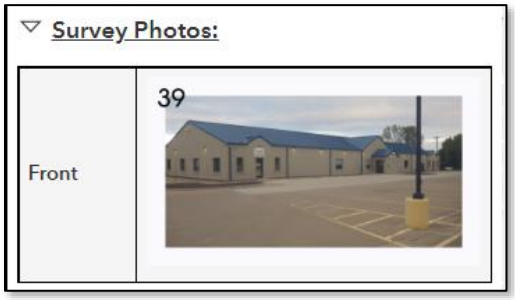
Structure Information Pane:
Structures within the database are shown on the map with diamond-shaped points.

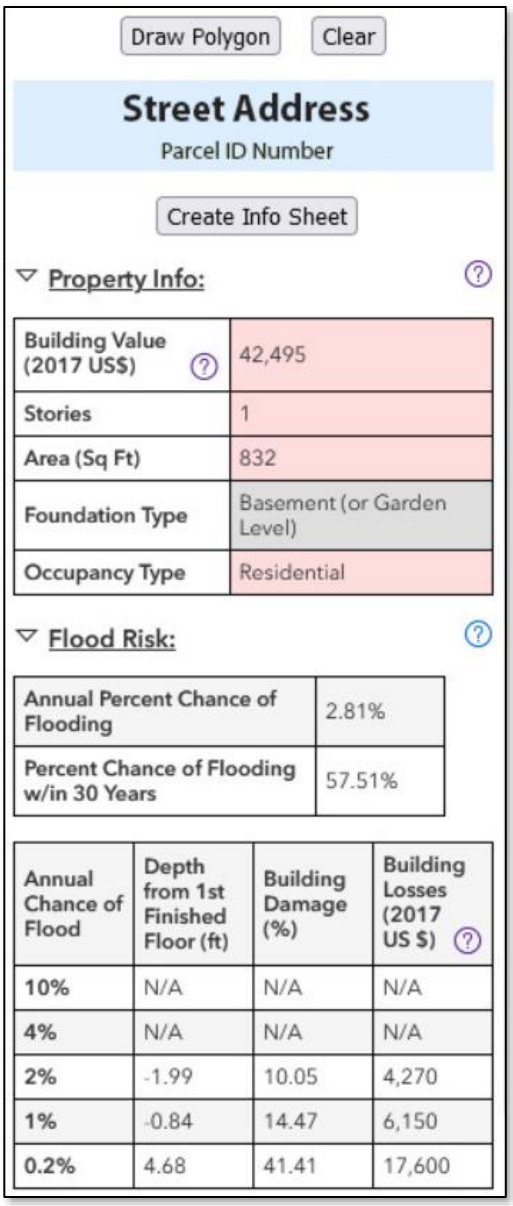


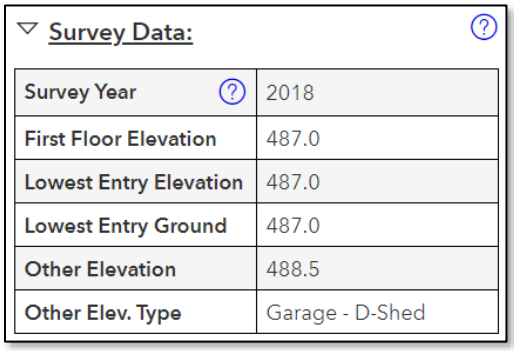
There are two ways to select structures and see their data. Selecting a single structure can be done by clicking on the structure of interest. To select multiple structures at the same time, use the “Draw Polygon” button found in the upper right corner of the map to draw a polygon around structures of interest.

Once a structure is selected, the Structure Information Pane will pop up which contains relevant information about the selected structure. The different sections in this pane can be expanded and contracted by clicking on the arrow next to the title. All the of the information detailed here is available for download.

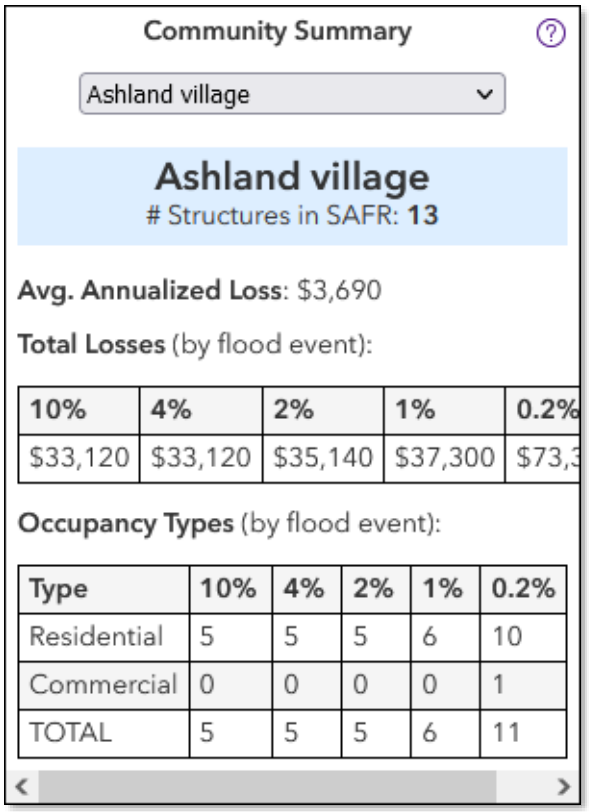
- **Create Info Sheet**
  - Creates a one-page map (PDF) for the selected structure that contains the information shown in the Structure Information Pane.
  - If you have selected multiple structures using the polygon feature, you will obtain individual maps for each selection
- **Property Info**
  - Details on the selected structure.
  - Values are color coded based on their data source. The data source color code values can be viewed in the FAQ page by clicking on the ⓘ icon and clicking on Property Information.
- **Flood Risk**
  - Contains the following values for each structure derived from the flood depth and analysis grids:
    - Annual Percent Chance of Flooding.
    - Percent Chance of Flooding within 30 Years.
    - Depth from 1st finished floor.
      - Many of these values will be negative as 1st finished floors are often above ground level.
    - Building Damage percent.
    - Building Losses in USD.
- **Survey Data**
  - Surveyed elevations and the year the survey was performed.
- **Survey Photos**
  - Photos of the structures being surveyed.







Community Summary Pane:
The Community Summary allows users to see aggregated data for an entire community in one snapshot.



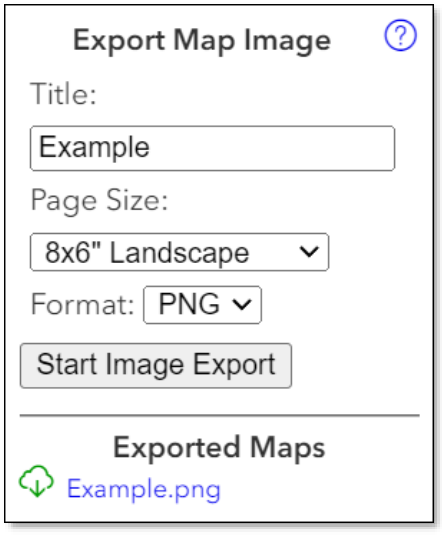
If the Community Summary pane is not showing, click on the button that looks like a page, located in the upper right, below the structure information button.

To see data, select a community's name from the dropdown. The Community Summary Pane will populate itself with data. The map will then zoom and pan to the structures located within that jurisdiction.

- **Avg. Annualized Loss**
  - Sum of average annualized loss for all structures in the jurisdiction.
- **Total Losses**
  - Sum of total loss values for all impacted structures. Shows data for each flood event where at least one structure has a total loss > $0.
- **Occupancy Types**
  - Occupancy types for all impacted structures. Shows data for each flood event where at least one structure has a total loss > $0.

Data Output Tools

Export Map Image
Creates and exports a map using the current extent and data layers that are being viewed in the browser. Options are available to title the map, choose a page size, and choose a file type. Options are listed below:



- Page Size:
  - 8x6" Landscape
  - 6x8" Portrait
  - 11x8.5" Landscape
  - 8.5x11" Portrait
- Image Format:
  - PNG
  - JPG
  - PDF

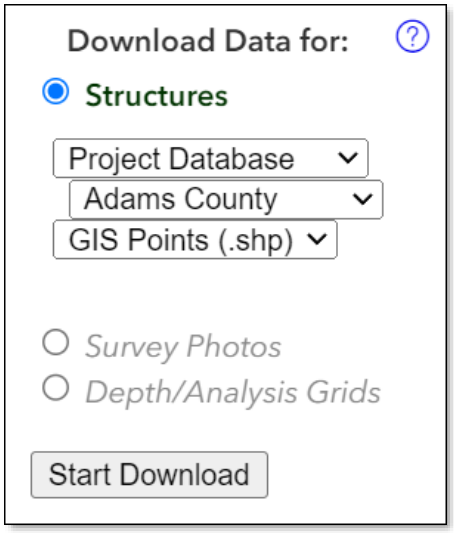
Once the preferred options have been selected, click the “Start Image Export” button and a link will be generated at the bottom under “Exported Maps.”

The generated map includes a legend detailing the data displayed. This is a great way to create a quick snapshot that can be used to display and communicate the data contained within the SAFR application.

Download Data
Allows data to be downloaded from the flood risk assessments hosted on SAFR.

Downloadable data includes:

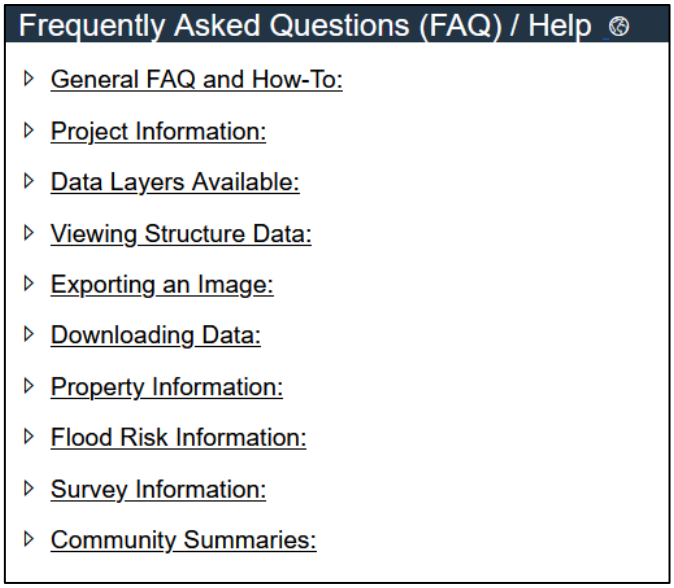
- Structures
  - Can be downloaded either at the project level, or by structures that have been individually selected by the user.
  - To download the project database, select the project of interest from the dropdown menu.
  - Data can be downloaded in the following formats:
    - GIS Shapefile
    - GIS File Geodatabase
    - CSV file
- Survey Photos
  - Photos of structures in .jpg file format are downloadable at the project level.
- Depth/Analysis Grids
  - File Geodatabase is downloadable at the project level. It contains:
    - Flood Depth Grids
    - Percent Annual Chance of Flooding Grid
    - Percent Chance of Flooding over a 30-year Period Grid



Frequently Asked Questions (FAQ)/Help Page

Access

A FAQ/Help page was created to assist the user in navigating SAFR and to understand the data contained within.



The FAQ page can be accessed by clicking on one of the many ⓘ icons located throughout SAFR. The ⓘ icon will link to the FAQ appropriate for the section of the application the icon is located in.

The different sections in this pane can be expanded and contracted by clicking on the arrow next to the title. Some of the information has been provided in this User Guide but in some cases additional instructions and information is outlined. Additional instructions for overall site navigation and further explanation of what type of information is contained in the FAQ can be found in **Appendix A.**

Contact Information:

For any questions please contact the Illinois State Water Survey Mitigation group at mitigation@isws.illinois.edu

Please reach out if there are any suggested changes to this User Guide, the step-by-step instructions in Appendix A, the instructional video, the SAFR website, or to include additional information in the FAQ page.

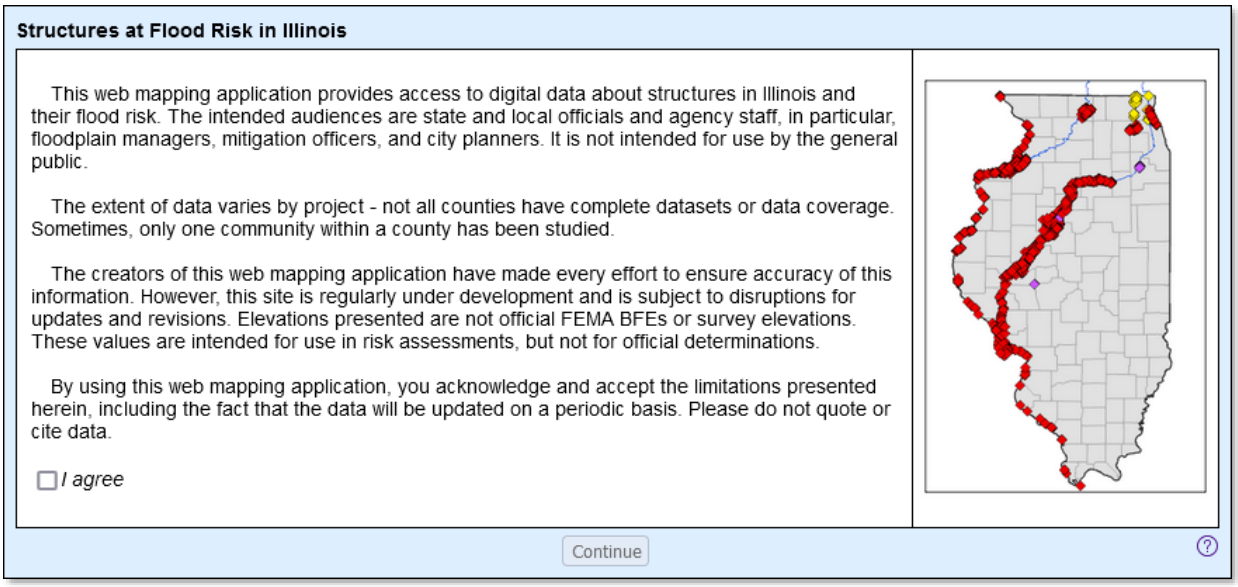
Appendix A – SAFR Walkthrough

To access SAFR, use the link below:
https://go.illinois.edu/SAFR

A dialog box will pop up asking for a Username and Password.

Use the Username and Password that have been provided. Username and Password can be requested by emailing the Illinois State Water Survey at mitigation@isws.illinois.edu.

After entering the username and password, a splash screen will appear showing a disclaimer and a small map of the state. As seen in the map, most projects only cover a part of a county, such as the Mississippi or Illinois Rivers. Agree to the disclaimer by checking the box, then click continue to access SAFR.

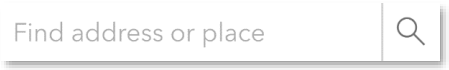


Navigation

Like most popular webmap applications, panning the map can be accomplished by clicking and holding the mouse button down while moving the mouse.

Zooming in and out on the map can be done by scrolling the mouse wheel forward and back. The Zoom Tool in the upper left can also be used.

The ⓘ symbol is located throughout the website. This icon links you directly to the specific FAQ related to the section being navigated. This icon can be clicked any time to get further information about the website, the data, or how to navigate the site.

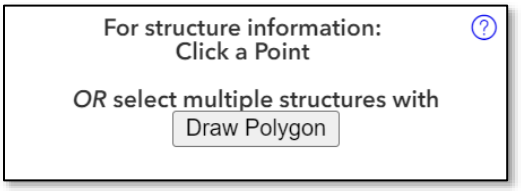


To find a specific location using an address, use the search bar on the left side of the screen. The search bar will offer suggestions as an address is typed in. Either click on one of the suggestions or hit the Enter key and the map will zoom and pan to the structure at that address.

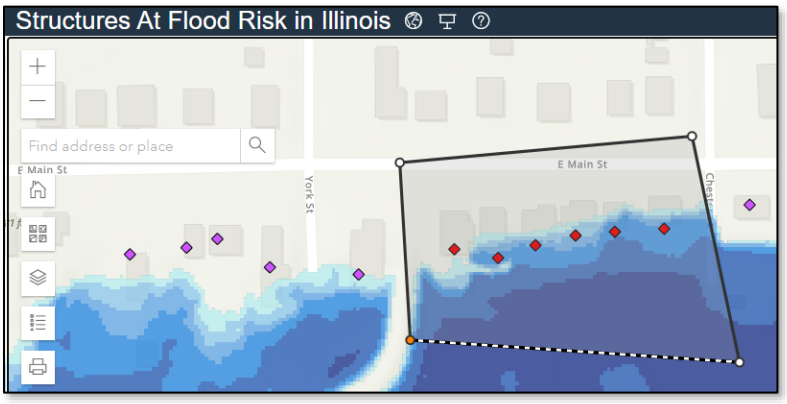
Selecting a Structure

To select a structure based on its location on the map, navigate to the area of interest and click on the structure point of interest.

To select multiple structures at one time, click on the “Draw Polygon” button in the structure information pane at the upper right corner of the screen.

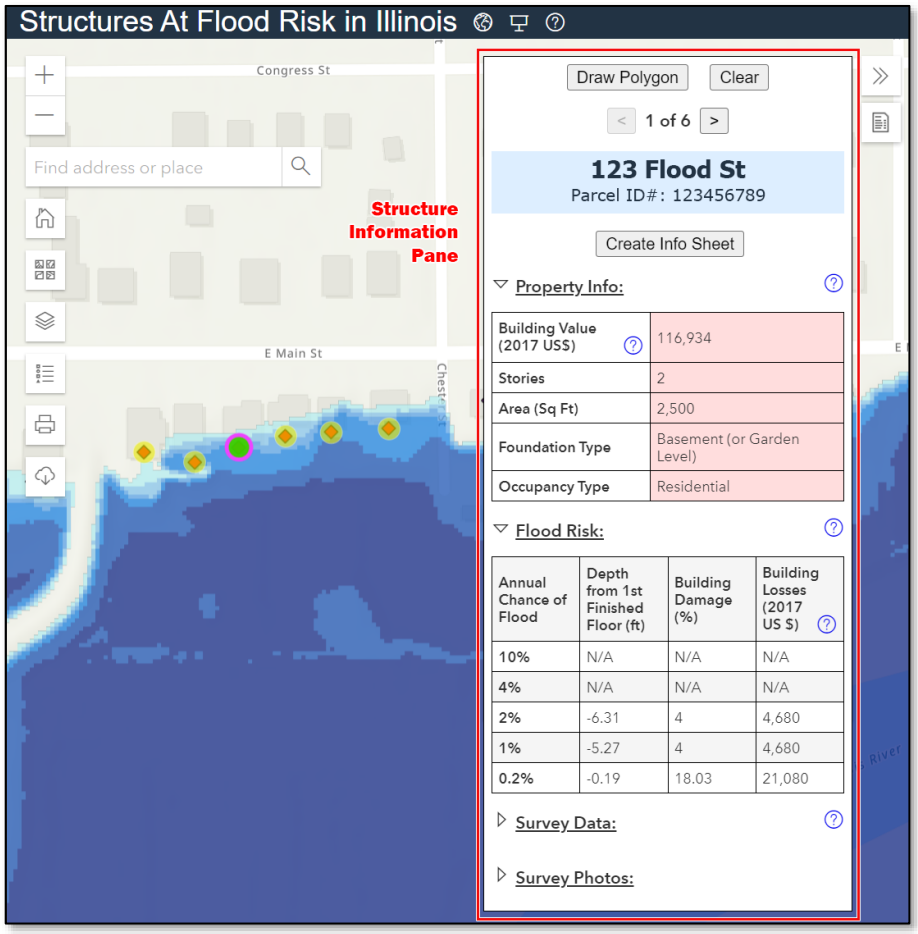


After the button has been clicked, the structure information pane will disappear, and the mouse arrow will change to a crosshair. Using this new mouse crosshair, single-click on the map to draw a box around the structures of interest. Double-click the mouse button to complete the selection.



Using the Structure Information Pane

Once the selection is done, the selected structures will be highlighted yellow. The structure information pane will pop up on the right side of the screen. The structure information pane contains relevant information about the selected structure. The different sections in this pane can be expanded and contracted by clicking on the arrow next to the title.



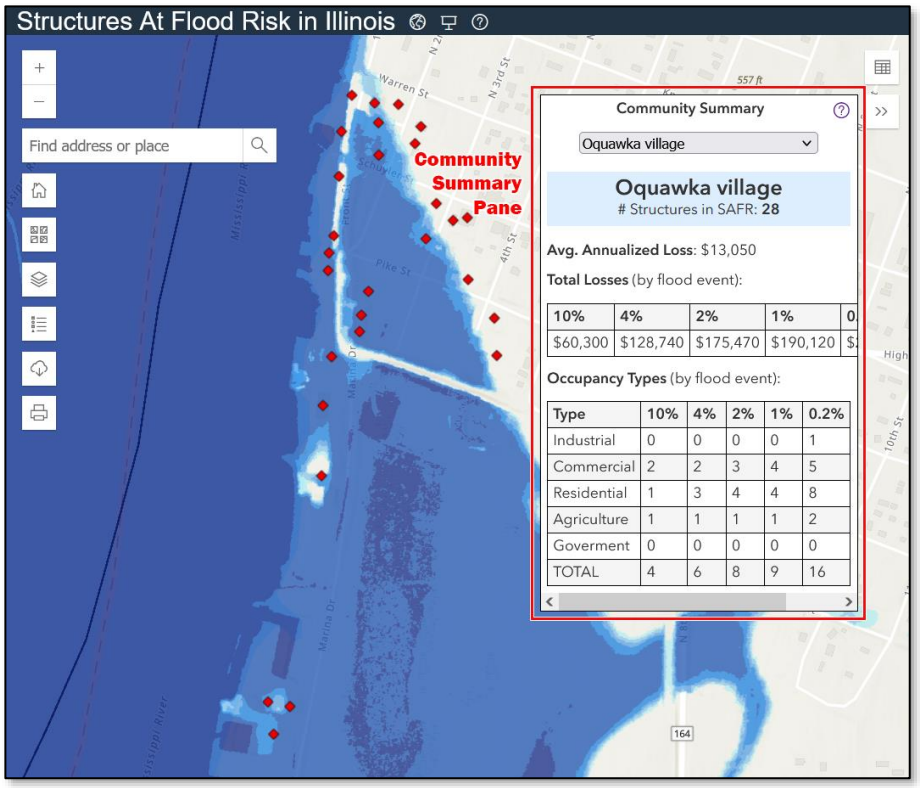
In the example to the right, six structures have been selected. Information on the selected structures can be browsed by clicking on the left or right arrow buttons located above the address.

If a new selection needs to be made, you can click the “Draw Polygon” button at the top of the structure information pane and repeat the process above. The previous selection will be cleared. Clicking the “Clear” button at the top of the structure information pane will also clear out the selection.

To make the structure info pane disappear, click on the icon located to the top right of the pane. When the pane is open, the icon will be displayed as two arrows pointing right as seen in the example to the left of this sentence. This is true of the icon for the community summary pane as well.

Using the Community Summary Pane

If the Community Summary pane is not showing, click on the button that looks like a page, located in the upper right, below the structure information button.



To see aggregated data for a community, select the community's name from the dropdown. The Community Summary Pane will populate itself with data. The map will then zoom and pan to the structures located within that jurisdiction.

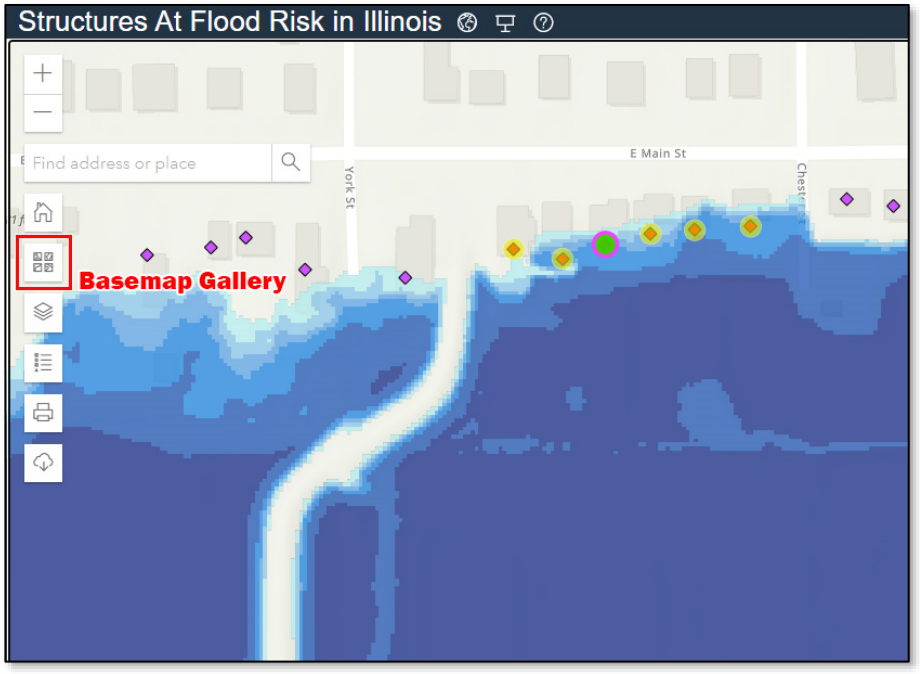
In the example to the right, the Village of Oquawka has been selected. Information displayed in the pane includes the total number of structures in SAFR within this jurisdiction, plus average annualized losses, total losses (listed by flood event), and structure occupancy types (listed by flood event) for all structures within the jurisdiction.

Changing the Basemap

A basemap is the map that is shown in the background of SAFR. Common examples include:

- Aerial photography
- Street Maps
- Topographical Maps

There are many basemaps to choose from in SAFR. Most of these are a combination of the three examples above (aerial photo with streets, Topography with streets, etc…) and many include building footprints.



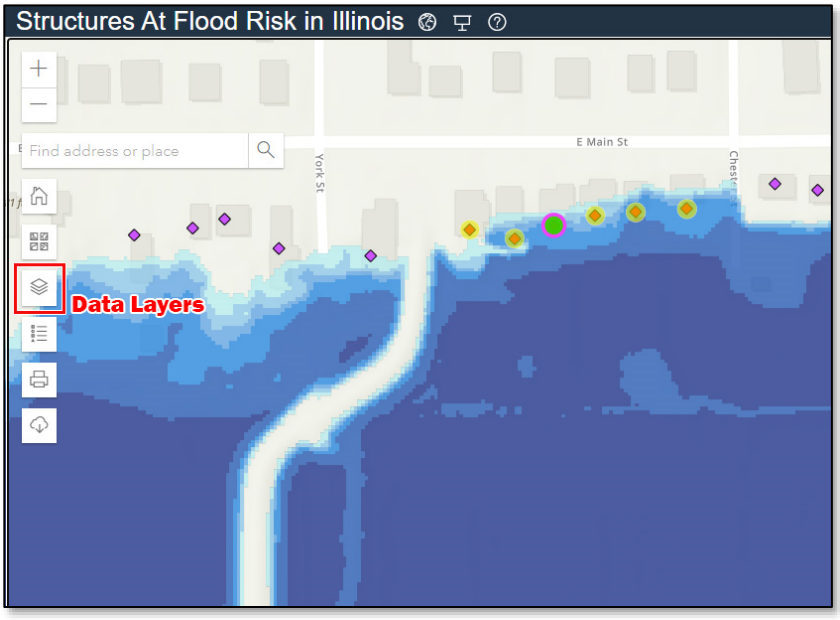
To access the different basemaps, click the “Basemap Gallery” icon on the left side of the screen.

Once clicked, a list of basemaps will pop up showing all the available options. Clicking on the options will change the background of SAFR. The list will remain active so the user can feel free to browse until they find the basemap that appeals to them. Use the scroll bar on the right of the list to view all the available basemap options.

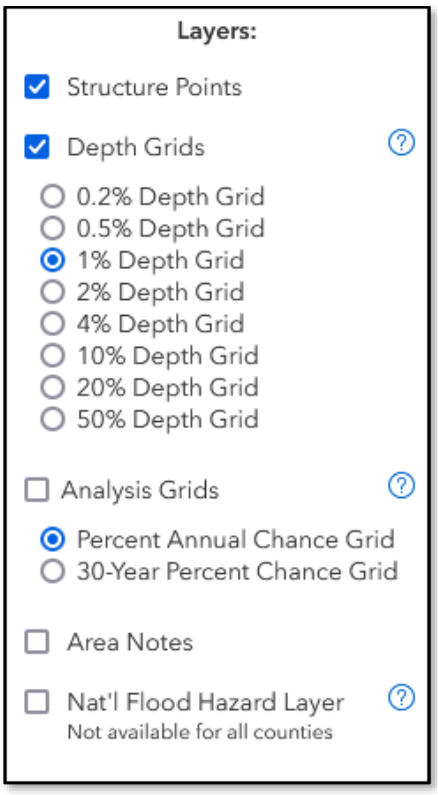
To make the basemap list disappear, click on the basemap gallery icon which will be located to the top left of the list. When this pane is open, the icon will display as two arrows pointing left as seen in the example to the left of this sentence. This is true of all of the following icons below.

Selecting Data Layers

Several different data layers can be displayed on top of the basemap selected in the previous step.

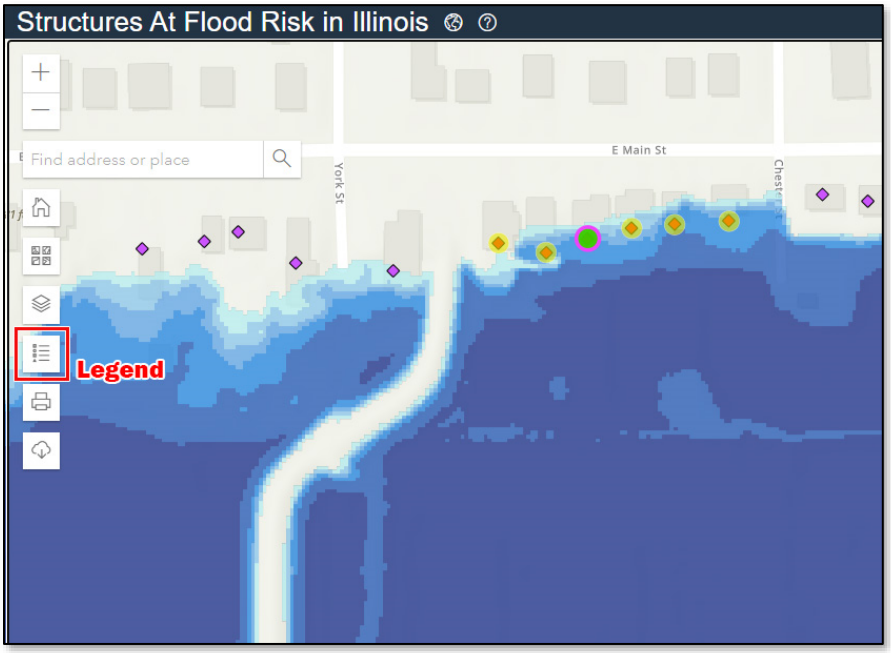


Data Layer Options include:

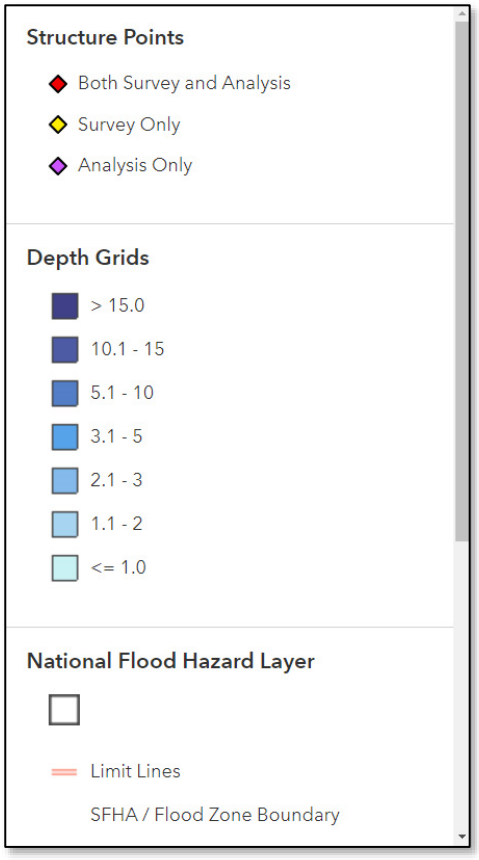


- Structure Points
  - Structures analyzed in the Flood Risk Assessments
- Flood Depth Grids
  - Toggle the depth grid button and then select a grid of interest. You can only select one of these grids at a time.
- Analysis Grids
  - Percent Annual Chance Grid
    - Shows the percent chance of flooding at a given point in any given year
  - 30-Year Percent Chance Grid
    - Represents the percent chance of flooding at least one time during a 30-year period for a given location within the mapped floodplain
- Area Notes
  - Denotes locations with special notes for users
- National Flood Hazard Layer (NFHL)
  - Shows data from the NFHL which is the Federal Emergency Management Agency (FEMA)'s digital database containing flood hazard mapping data from FEMA's National Flood Insurance Program (NFIP). This is the data shown on FEMA Flood Insurance Rate Maps (FIRMs).
  - Data visible includes:
    - FEMA regulatory floodplains
    - FEMA regulatory cross sections
      - Displays 1% annual chance (100-year) flood surface elevations in feet.
    - FIRM Panel information
  - If the NFHL data is not visible, zoom in and it will appear at the proper extent.

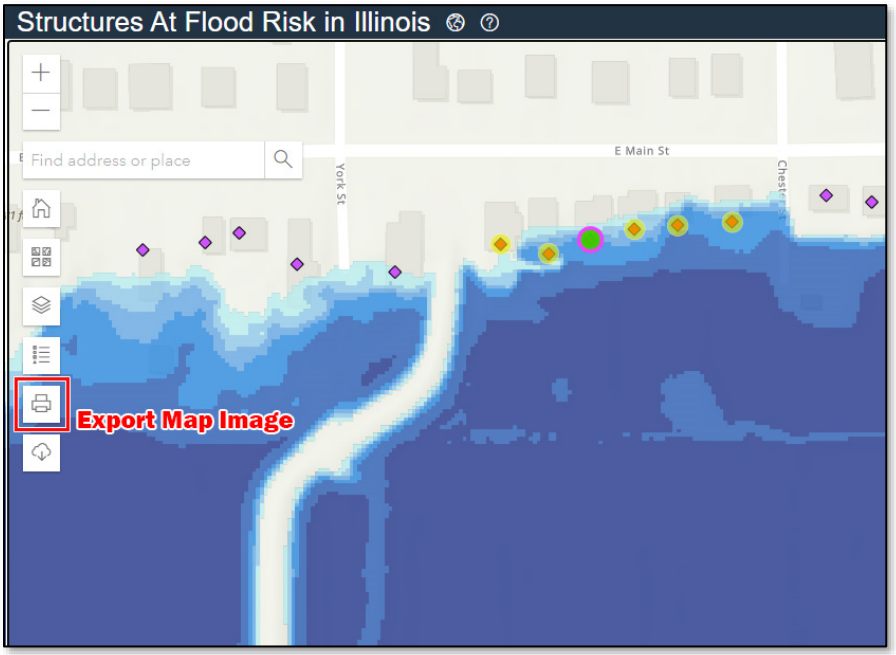
Viewing the Legend



The legend displays and describes the symbology used for the data layers currently displayed on SAFR. This means that the legend will change based on the selections made in the Data Layers box. If there are more layers displayed then fit in the legend, the scroll bar on the right side of the Legend box can be used to scroll down and see all layers.

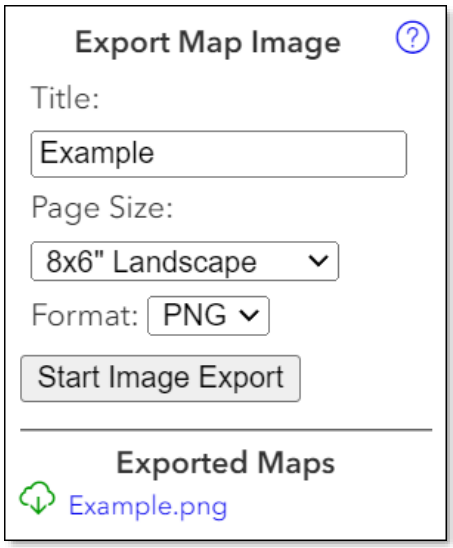


Export Map Image



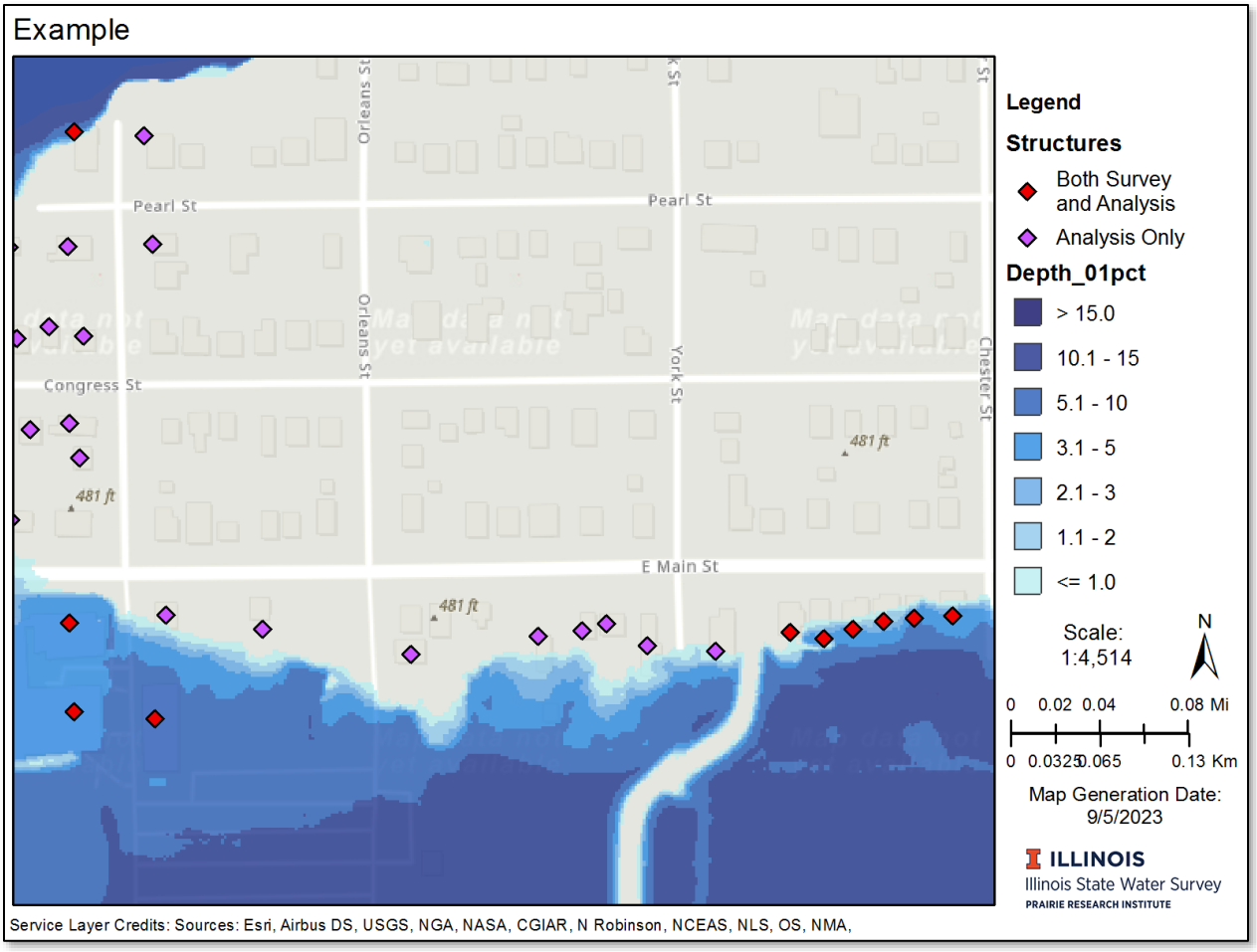
Creates and exports a map using the current extent and data layers that are being viewed in the browser. Options are available to title the map, choose a page size, and choose a file type. Options are listed below:

- Page Size:
  - 8” x 6” Landscape
  - 6” x 8” Portrait
  - 11” x 8.5” Landscape
  - 8.5” x 11” Portrait
- Image Format:
  - PNG
  - JPG
  - PDF



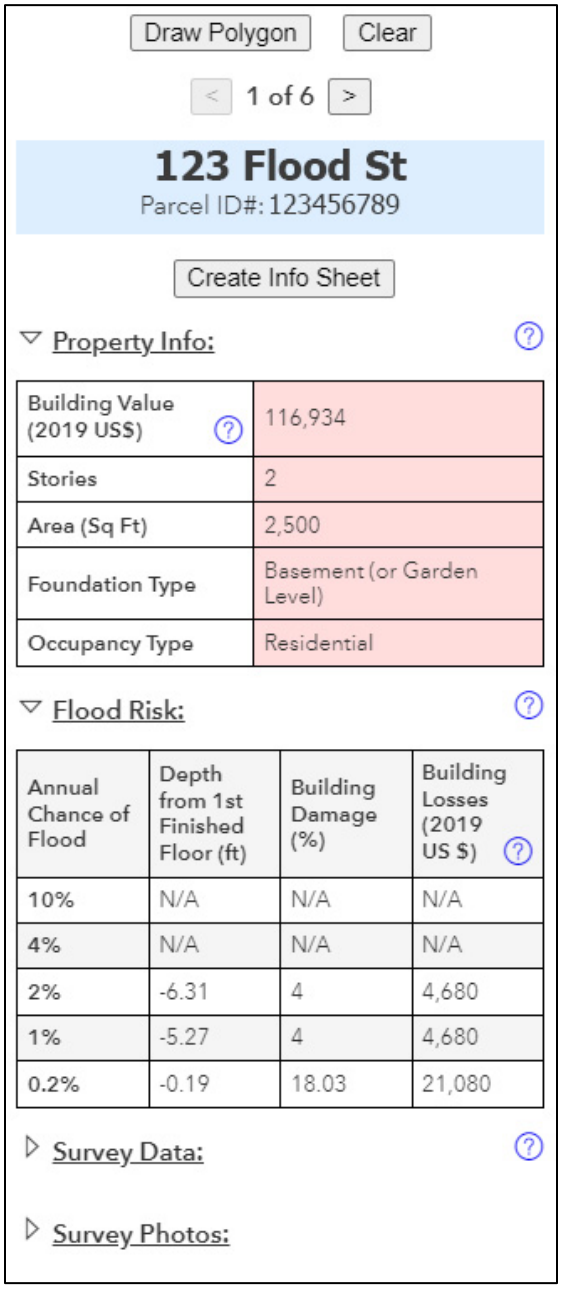
Once the preferred options have been selected, click the “Start Image Export” button and a link will be generated at the bottom of the pane under the “Exported Maps” label. Click the link to see the generated map.

The generated map includes a legend detailing the data displayed. This is a great way to create a quick snapshot that can be used to display and communicate the data contained within the SAFR application.

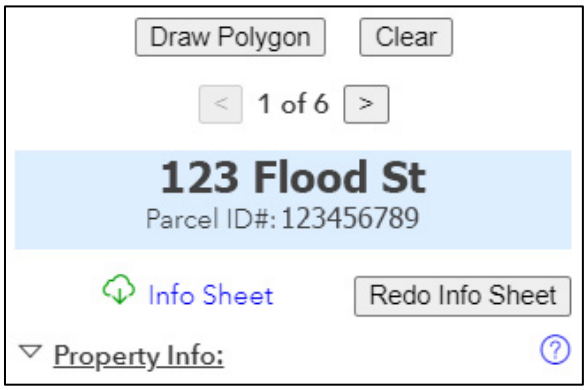


If PNG or JPG format options were chosen, the map can be saved by right-clicking and selecting “Save Image As…”, or by dragging and dropping the image onto the desktop. If the PDF option was chosen, the map can be saved using the download option in the upper right of the browser window (see examples under the “Create Info Sheet” section below).

Create Info Sheet



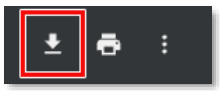
To create an Info Sheet, click on the "Create Info Sheet" button located under the address on the structure information pane. Once the button is clicked, an info sheet will be generated. This process can take several seconds. Once complete, an Info Sheet link will be displayed in blue as per the example below. Click on this link to display the info sheet in the internet browser.



Please note that the map display consists of a screenshot taken from where the screen is centered at the time the Info Sheet is created. If the extent needs to be changed to center on the selected structure, just pan the screen to the desired extent and click the "Redo Info Sheet" button. Once the Info Sheet is displayed, it can be downloaded as a PDF using the download button in the internet browser.

Below are examples of how to download the Info Sheet for the three most popular Windows browsers. The download button is circled in red. The location of these buttons may change based on any customizations made on the browser.

Chrome: Download button located in the upper right corner of the screen.



Microsoft Edge: Download button by default is in the upper right corner of the screen.

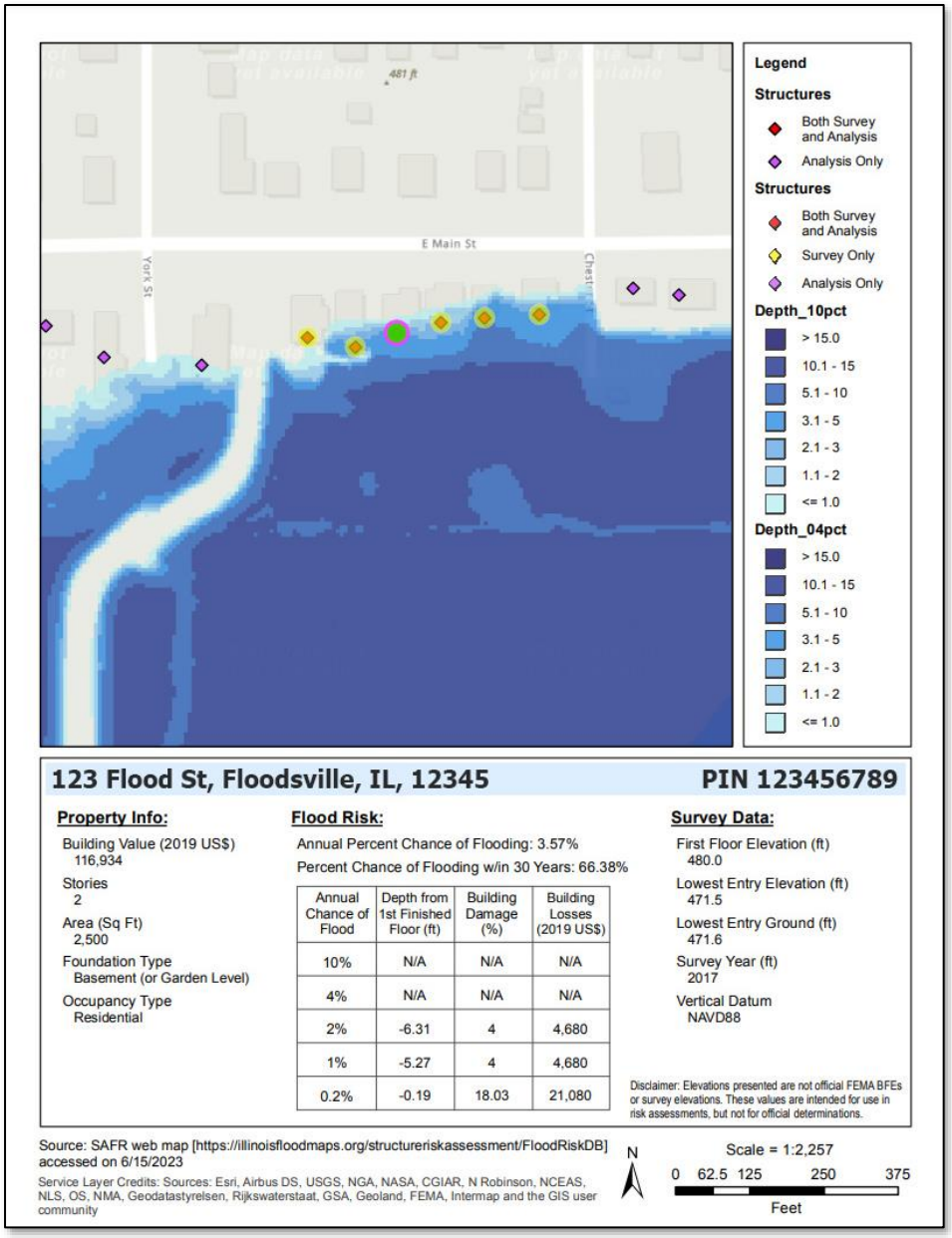
Mozilla Firefox: Download button by default is in the upper right corner of the screen.

The Info Sheet is similar to the Export Map Image, the difference being that detailed information on a selected structure is included.

As can be seen in the example to the right, this additional information includes:

- Property Information
- Flood Risk Information
- Survey Data

Like the Export Map Image, the map legend will show the data layers that were displayed on SAFR when the Info Sheet was created.



123 Flood St, Floodsville, IL, 12345 **PIN 123456789**

Property Info:

Building Value (2019 US$)
116,934

Stories
2

Area (Sq Ft)
2,500

Foundation Type
Basement (or Garden Level)

Occupancy Type
Residential

Flood Risk:

Annual Percent Chance of Flooding: 3.57%

Percent Chance of Flooding w/in 30 Years: 66.38%

Annual Chance of Flood	Depth from 1st Finished Floor (ft)	Building Damage (%)	Building Losses (2019 US$)
10%	N/A	N/A	N/A
4%	N/A	N/A	N/A
2%	-6.31	4	4,680
1%	-5.27	4	4,680
0.2%	-0.19	18.03	21,080

Survey Data:

First Floor Elevation (ft)
480.0

Lowest Entry Elevation (ft)
471.5

Lowest Entry Ground (ft)
471.6

Survey Year (ft)
2017

Vertical Datum
NAVD88

Disclaimer: Elevations presented are not official FEMA BFEs or survey elevations. These values are intended for use in risk assessments, but not for official determinations.

Source: SAFR web map [https://illinoisfloodmaps.org/structureriskassessment/FloodRiskDB] accessed on 6/15/2023

Service Layer Credits: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

N

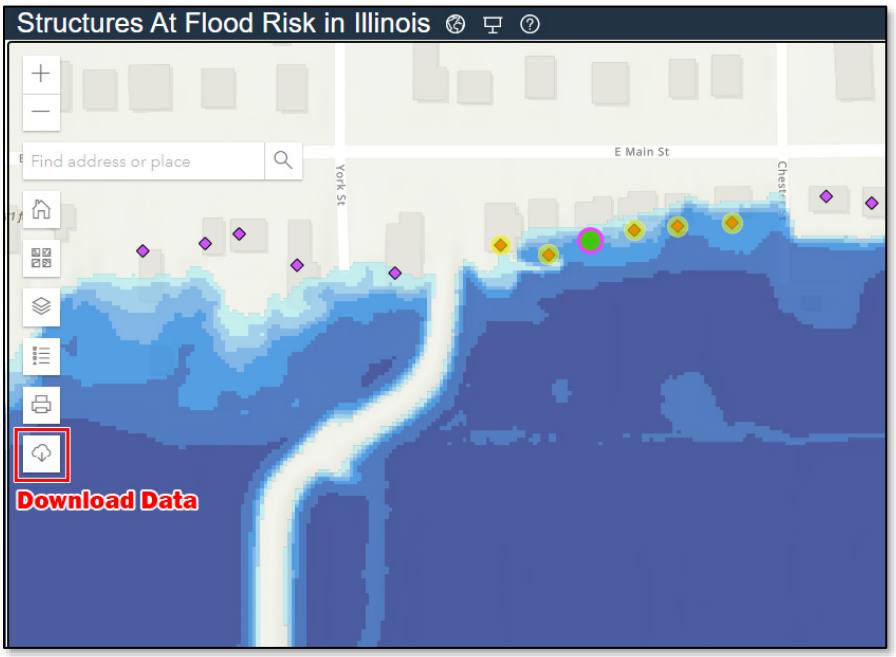
Scale = 1:2,257

0 62.5 125 250 375

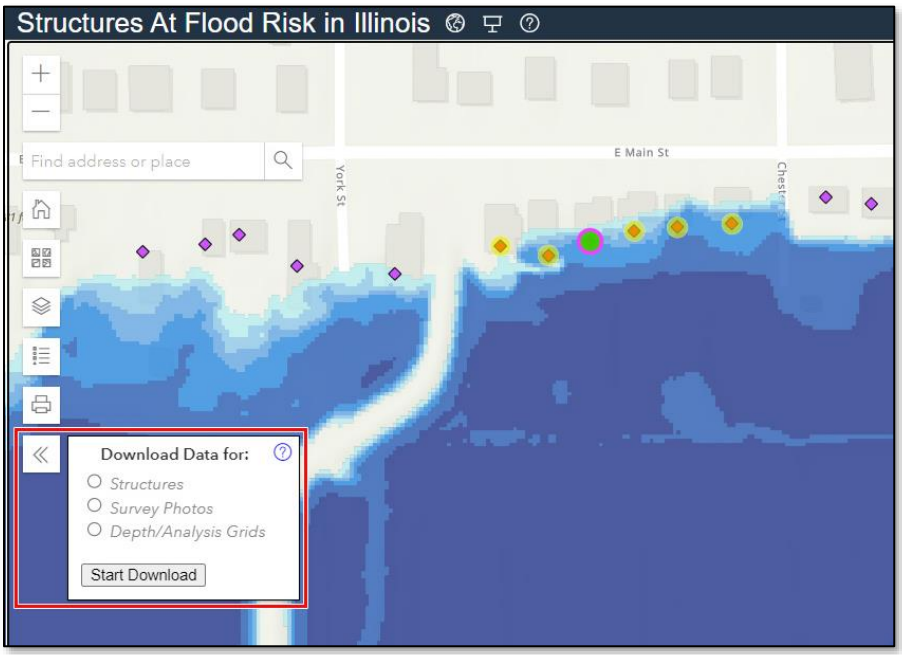
Feet

Downloading Data

Flood risk data can be retrieved from the site by using the Download Data button circled in red in the screenshot below.

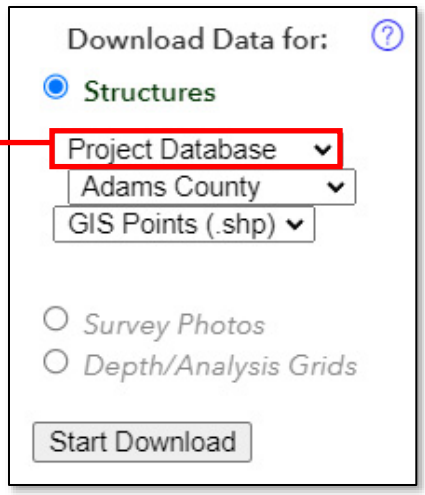


Once the Download Data icon is clicked, the download pane will be displayed showing available options for the data download. This consists of three options shown in the screenshot below. Details on these options are included on the following pages.

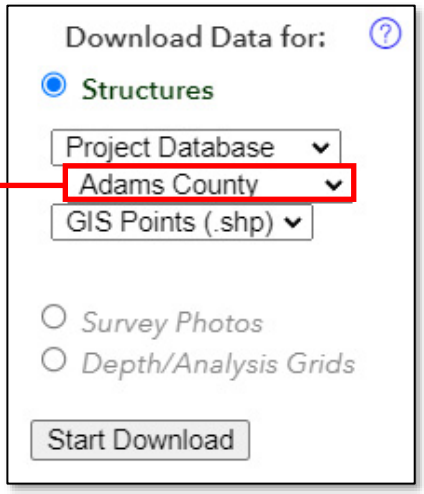


Structures

Project Database: Downloads all points in the selected Project Area
Selected Structures: Only the structures that are currently selected in the SAFR web map will be downloaded.

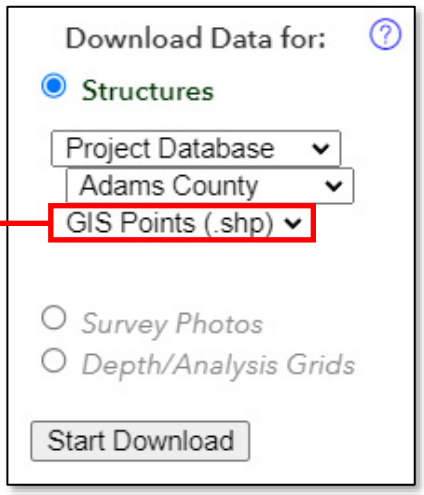


Project Area: Clicking on this drop down will produce a list of the project areas where structure data is available for download if **Project Database** is selected in the drop down above.



Data Format: Clicking on this drop down allows the user to select the format of the structure data being downloaded.
Available formats are as follows:

GIS Points (.shp): ESRI GIS Shapefile
GIS Points (.gdb): ESRI GIS File Geodatabase
CSV File (.csv): Comma-Separated Values .csv file (Compatible with Microsoft Excel)

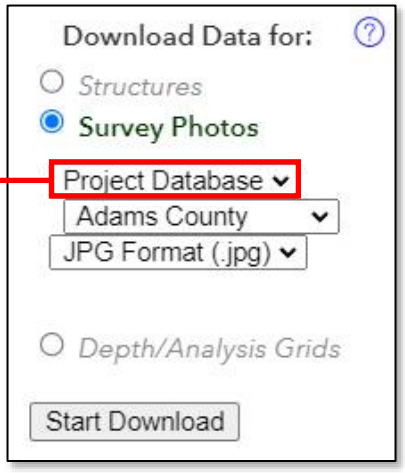


All of these download options includes a Data_Dictionary PDF which contains descriptions for each of the data fields.

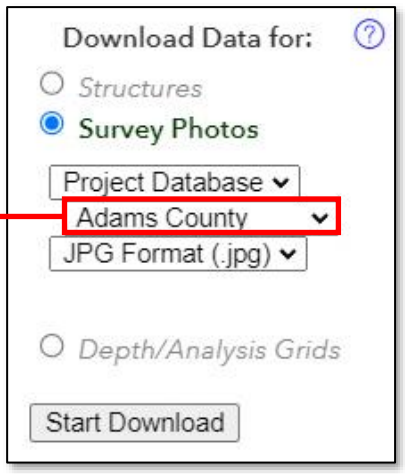
Survey Photos

Includes photos of surveyed structures. Includes the front of the structures, and in some projects includes a photo of the Low Entry Elevation as well.

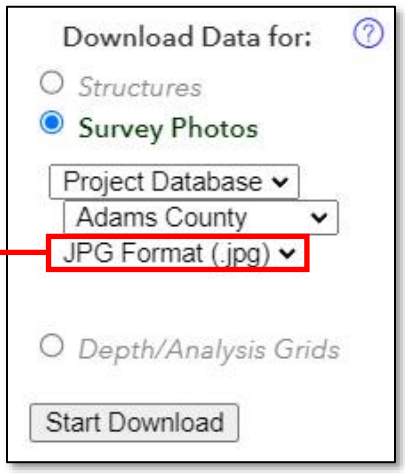
Downloads are for the Project Database only, consisting of all of the photos for the selected project area.



Project Area: Clicking on this drop down will produce a list of the project areas where structure photos are available.



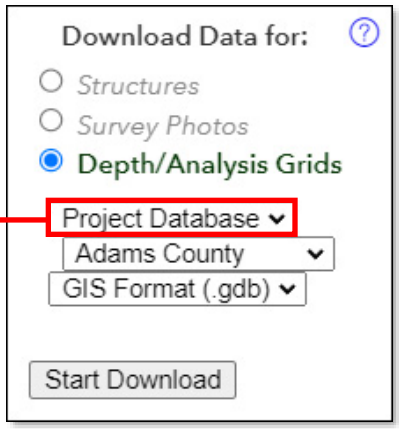
Data Format: Survey photos are available in .jpg format only.



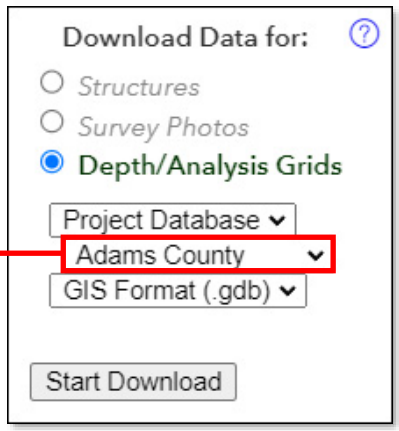
Depth/Analysis Grids

GIS Raster files assosiated with hosted FRA projects.
Rasters available for download:

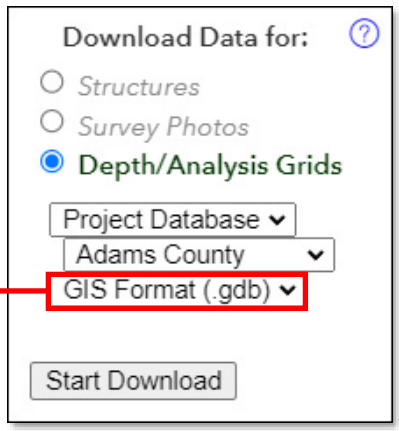
- Flood Depth Grids
  - Estimated depth of analyzed flood events used in the flood risk assessment. Typically consists of the 10%, 4%, 2%, 1%, and 0.2% annual chance flood events.
- Percent Annual Chance of Flooding
  - Percent chance of flooding at a given point in any given year.
- Percent Chance of Flooding over a 30-year period.
  - Percent chance of flooding at least one time during a 30-year period



Downloads are for the Project Database only, consisting of all of the Depth/Analysis Grids for the selected project area.



Project Area: Clicking on this drop down will produce a list of the project areas where Depth/Analysis Grids are available.



Data Format: Depth/Analysis Grids are only available in Esri File Geodatabase format.

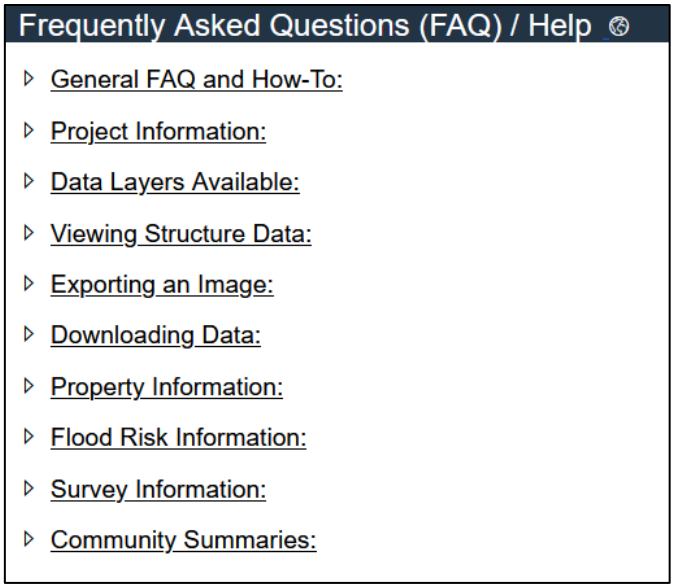
Once the desired options are set, click the “Start Download” button to download the selected data.

Viewing the FAQ

A FAQ/Help page was created to assist the user in navigating SAFR and to understand the data contained within.

The FAQ page can be accessed by clicking on one of the many ⓘ icons located throughout SAFR. The ⓘ icon will link to the FAQ appropriate for the section of the application the icon is located in.

The different sections in this pane can be expanded and contracted by clicking on the arrow next to the title. Some of the information has been provided in this User Guide but in some cases additional instructions and information is outlined in the FAQ.



General FAQ and How-To

Provides additional information about some of the information referenced in SAFR. It also contains some detailed instructions for navigating the site.

Project Information

When selecting the Project Information section in the FAQ page the following summary information for each project hosted on SAFR can be viewed:

- Year for $
  - The year of the monetary values of the project in US Dollars.
- Survey Year
  - Year the structure surveys were performed.
- LiDAR Year
  - Year of the LiDAR topographical data used to create the project flood depth and analysis grids.
- Link to Report(s)
  - A link to the reports created for each project if available. The report link also includes map books for each area that show inundation mapping for the various storm events used in the data analysis.

Data Layers Available

Provides additional information about the various data layers viewable on SAFR and how to navigate those layers.

Viewing Structure Data

Contains additional instructions about how to select structures for viewing in the SAFR database.

Exporting an Image and Downloading Data

Contains additional instructions about exporting either an individual map of a selected area or the structure information sheet in PDF format.

Downloading Data

Includes instructions and additional data format information for downloading the data contained in the SAFR website geodatabase.

Property Information

Describes the coding used to denote where some of the main input data originated or was determined.

Flood Risk Information and Survey Information

Provides some definitions and assumptions used in the flood risk analysis used to develop SAFR. Survey data definitions are also provided.

Community Summaries

Includes instructions and additional information for viewing aggregated data by community on SAFR.

Appendix B: Definitions

What is the National Flood Hazard Layer (NFHL)?
The NFHL is the Federal Emergency Management Agency (FEMA)'s digital database containing flood hazard mapping data from FEMA's National Flood Insurance Program (NFIP). For more information, see the FEMA NFHL webpage: https://www.fema.gov/national-flood-hazard-layer-nfhl

Base Flood	The flood having a 1% probability of being equaled or exceeded in any given year. This is the regulatory standard also referred to as the "100-year flood." The base flood is the national standard used by the National Flood Insurance Program (NFIP) and all Federal agencies for the purposes of requiring the purchase of flood insurance and regulating new development. Base Flood Elevations (BFEs) are typically shown on Flood Insurance Rate Maps (FIRMs) for Zone AE.
Special Flood Hazard Area (SFHA)	The land area covered by the floodwaters of the base flood is the Special Flood Hazard Area (SFHA) on NFIP maps. The SFHA is the area where the NFIP's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies.
Annual Chance of Flood	The likelihood of a flood occurring during a single year.
Building Value	Estimate of the market value of the building. Building descriptions are based on the best available data, typically from an assessor's office. When assessor's data is not available, Building Value is estimated using R.S. Means construction cost square foot values taken from the Hazus building inventory.
Building Losses	Estimated losses in U.S. Dollars to the building only. In addition to Building losses, Content and Inventory losses are available for download via the web mapping application.

Avg. Annualized Loss	Estimated long-term value of losses averaged on an annual basis.
First Floor Elevation	This is the elevation of the top of the lowest finished floor above grade in a building.
Finished Floor	The lowest floor with 'livable' space, i.e., living room or bedroom.
Lowest Entry Elevation	The elevation of the lowest spot where water could enter the structure, i.e. basement windows, outdoor stairway to basement, or door entry.
Lowest Entry Ground	Lowest exterior ground surveyed elevation of the structure where water will meet the foundation.