

Flood Risk Products

USING FLOOD RISK PRODUCTS IN HAZARD MITIGATION PLANS



Hazard mitigation is the effort to reduce loss of life and property by reducing the impact of disasters. Disasters can cause injury and death, damage buildings and infrastructure, and have devastating consequences for a community's economic, social, and environmental well-being. Hazard mitigation plans are key to breaking the cycle of disaster damage, reconstruction, and repeated damage, and they allow communities to remain eligible to receive certain types of state, tribal, and federal assistance.

The Federal Emergency Management Agency (FEMA) provides policy, guidance, products, tools, training, and technical assistance to state, local, and tribal jurisdictions to help them develop and update mitigation plans. More information on available resources can be found on FEMA's Hazard Mitigation Planning website, www.fema.gov/hazard-mitigation-planning. In addition, FEMA's Risk Mapping, Assessment, and Planning (Risk MAP) program has developed Flood Risk Products (FRPs), which are tools created to assist in mitigating flood risk. Under the Risk MAP program, FEMA partners with local, state, and tribal governments to identify flood hazards, assess flood risks, develop plans and mitigation strategies, and implement mitigation actions using a wide range of public and private resources. Data produced from Risk MAP projects can be incorporated into a mitigation plan and help inform mitigation strategies and prioritize mitigation activities.

WHAT ARE FLOOD RISK PRODUCTS?

FRPs are data communication tools intended to be used with National Flood Insurance Program (NFIP) regulatory products, such as Flood Insurance Rate Maps (FIRMs). Communities can use FRPs to transform traditional flood mapping efforts into an integrated process of identifying, assessing, communicating, and mitigating flood-related risks. The non-regulatory FRPs, which expand upon basic flood hazard information, can be used in mitigation planning to identify areas where risk reduction actions may produce the greatest return on investment. FRPs include a main database of flood risk information called the Flood Risk Database. This geodatabase contains a variety of datasets generated during a Risk MAP project that can be used to analyze flood risk in a geographic information system (GIS) format. The standard datasets include:



- Changes Since Last FIRM
- Water Surface Elevation Grid
- Flood Depth Grids
- Percent 30-Year Chance Grid
- Flood Risk Assessment
- Areas of Mitigation Interest

Optional Flood Risk Products that can support mitigation planning decisions:

Enhanced Flood Risk Datasets: These products that enhance flood risk analysis may include datasets such as velocity grids, Water Surface Elevation change grids, and multi-frequency grids for levees. In coastal communities, enhanced datasets may include increased flooding scenarios that reflect potential sea-level rise, dune size and location, and simplified coastal zones.

Flood Risk Report: A narrative of a community's flood risk study, provided to help the community understand the study methods and results.

Flood Risk Map: A color-coded map that illustrates the range of the community's flood risk. This map also identifies essential facilities that are exposed to risk, past claims, areas with significant land-use change, stream flow constrictions, and other areas in which to focus flood mitigation efforts.

BENEFITS OF FLOOD RISK PRODUCTS

- Enhance emergency, community, and mitigation planning by prioritizing areas for risk reduction actions.
- Support improved risk communication and outreach to the public.
- Visualize flood risk and help explain differences in risks within and outside the Special Flood Hazard Area (SFHA).

FLOOD RISK PRODUCTS CAN BE USED IN HAZARD MITIGATION PLANNING TO HELP IDENTIFY AREAS WHERE RISK REDUCTION ACTIONS MAY PRODUCE THE GREATEST RETURN ON INVESTMENT.



ARE RISK MAP FLOOD RISK PRODUCTS AVAILABLE FOR ALL COMMUNITIES?

Under the Risk MAP program, FEMA produces FRPs during regulatory flood map updates, in accordance with current standards and the project scope. FEMA undertakes a limited number of flood studies each year, and they may take several years to complete. FRPs become available to communities once a Flood Insurance Study (FIS) is completed; however, they may not be available in all communities. Visit FEMA Flood Map Service Center (msc.fema.gov), select “Search All Products,” and filter selection by state, then county and/or community to check for FRP availability.

NEED HELP FINDING FRPs?

Contact the FEMA Map Information eXchange

(877) FEMA MAP
(877-336-2627)

Email: FEMAMapSpecialist@riskmapcdfs.com

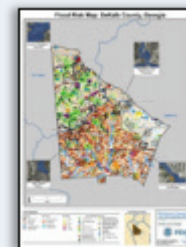
Hours of Operation: Monday through Friday, 8:00 am to 6:30 pm Eastern Time (ET)

WHAT IS THE DIFFERENCE BETWEEN REGULATORY FLOOD HAZARD PRODUCTS AND NON-REGULATORY FLOOD RISK PRODUCTS?

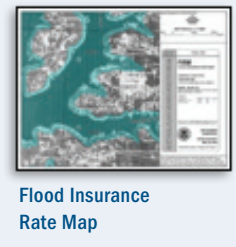
FEMA regulatory NFIP products, including FIRMs for the 1- and 0.2-percent-annual-chance flood events, Flood Insurance Study (FIS) reports, and FIRM databases, are sources of information for mitigation planning. Unlike these traditional NFIP regulatory flood mapping products, however, FRPs are not intended to be used as the basis for official actions required under the NFIP, such as determining insurance rates or mandatory insurance purchase requirements for a property, or enforcing minimum building standards for construction in a floodplain. Instead, FRPs can be used alongside regulatory products to obtain additional flood risk information and to support a community’s official actions and hazard mitigation strategies.

FIRM VS. FLOOD RISK MAP

- A FIRM is an official map that identifies SFHAs and other flood zones within a community. A FIRM has undergone formal due process and is published as the legal document for flood insurance and floodplain management purposes.
- A Flood Risk Map is an optional tool designed to support a discussion of risk by providing a graphical overview of hazards and risks within the project area. The objective of the Flood Risk Map is to summarize and highlight areas of notable flood risk and mitigation interest, to raise awareness and promote collaboration among communities within the project area.



Flood Risk Map



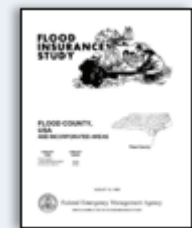
Flood Insurance Rate Map

FIS REPORT VS. FLOOD RISK REPORT

- An FIS report is a compilation and presentation of detailed flood hazard data for specific watercourses, lakes, and coastal flood hazard areas within a community. When a flood study is completed for the NFIP, the information and maps are assembled into an FIS report.
- A Flood Risk Report is an optional tool that provides a narrative of the flood risk for several different flood scenarios, an explanation of assessment methodology, as well as risk assessment information that can be incorporated into Hazard Mitigation Plans and inform land use plans. The report is written in non-technical terms to better communicate flood risk concepts, analysis results, and potential actions to various stakeholders.



Flood Risk Report



Flood Insurance Study Report

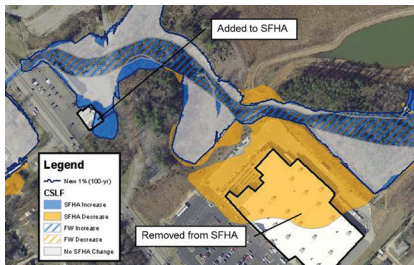
DIGITAL FIRM (DFIRM) DATABASE VS. FLOOD RISK DATABASE

- A DFIRM database contains the data layers for the FIRM and most of the quantitative data in the FIS report, in a GIS format.
- A Flood Risk Database parallels a DFIRM database, but it stores a wider variety of GIS-based flood risk information, including all the flood risk datasets (Changes Since Last Firm, Depth and Analysis Grids, Risk Assessment, and Areas of Mitigation Interest) and much of the information from the Flood Risk Report and Flood Risk Map. The datasets contained in the Flood Risk Database provide a wealth of data to use to analyze, communicate, and visualize flood risk on an ad hoc basis to support mitigation efforts and raise awareness.

USING FLOOD RISK PRODUCTS IN HAZARD MITIGATION PLANNING

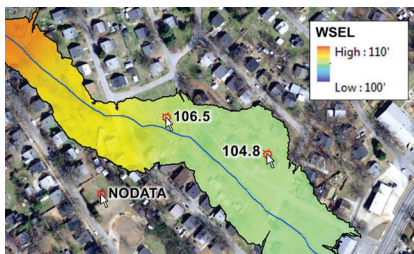
During the hazard mitigation planning process, FRPs present information that can be used in the risk and vulnerability assessment and during the development of mitigation strategies. Hazard mitigation planning teams can use the flood risk datasets described below to improve the ways in which flood risk is quantified and communicated to meet the mitigation planning requirements found in the Robert T. Stafford Disaster Relief and Emergency Assistance Act (www.fema.gov/media-library/assets/documents/15271), as amended by the Disaster Mitigation Act of 2000, and in Title 44 of the Code of Federal Regulations (CFR), Part 201: Mitigation Planning.

FRPs allow mitigation planning teams to plan for higher frequency events as well as to visualize, analyze, and communicate flood risk for areas adjacent to the SFHA. They also provide additional information on the variability of flood risk within the SFHA (depth, water surface elevations, likelihood of getting flooded, and potential losses) that helps prioritize the mitigation actions with the greatest potential impact.



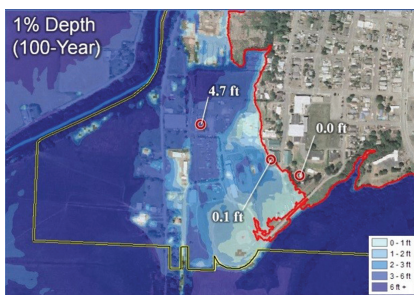
Changes Since Last FIRM

The **Changes Since Last FIRM** dataset provides information regarding changes (not depth changes) made to the regulatory floodplain and floodway boundaries during a flood mapping update or revision. The Changes Since Last FIRM dataset may include attributes for each area of change that provide some insight on why the boundaries have changed. The information contained in the Changes Since Last FIRM dataset is particularly helpful for communicating about FIRM updates, as it highlights where the flood hazards have changed. Mitigation actions can also be prioritized to address areas with an increased flood risk.



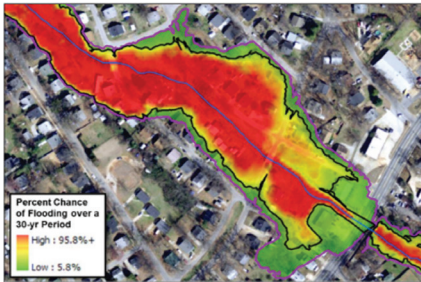
Water Surface Elevation Grid

The **Water Surface Elevation Grid** provides a way to find flood elevations for the entire floodplain. This grid is an effective tool for evaluating risk when combined with a building layer in GIS, especially if the first-floor elevations for buildings within the layer are known. The Water Surface Elevation Grid would also be helpful for populating/checking elevation certificates; developing mitigation strategies for structure elevation, buyouts, and relocation; or determining where ordinances and building codes requiring higher standards may apply.



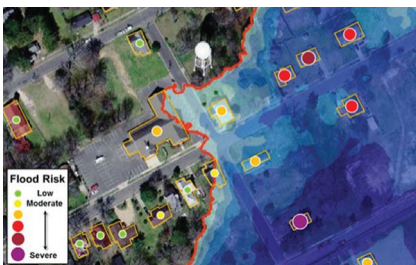
Flood Depth Grid

Flood Depth Grids illustrate the flood depth, in feet above the ground surface, to demonstrate the variability of flood depths in flood prone areas. Depending on the study, the Flood Risk Database may include depth grids for multiple flood scenarios: 10-percent (10-year), 4-percent (25-year), 2-percent (50-year), 1-percent (100-year), and 0.2-percent (500-year) annual chance. This information is useful for visualizing flood extents outside of the regulatory purview and for examining the vulnerability of structures in terms of severity and frequency for a mitigation plan. For non-technical decision makers, the depth of flooding can also be an easier concept to understand than base flood elevation, which is referenced to a vertical datum, such as the North American Vertical Datum of 1988 (NAVD 88).



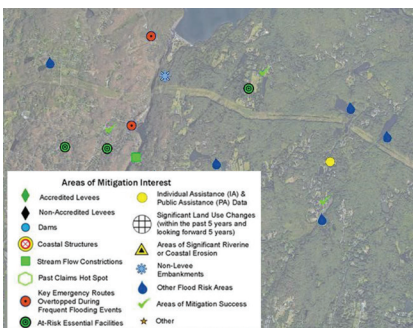
Percent 30-Year Chance Grid

A **Percent Annual Chance Grid** provides a better understanding of the likelihood that a given location will flood in any single year. It also helps explain the probability of flooding for hazard mitigation planning. The **Percent 30-Year Chance Grid** calculates the likelihood of flooding over the period of an average mortgage (30 years). It is the same analysis as the Percent Annual Chance Grid, but uses a 30-year period instead of a 1-year period, which can help homeowners understand their risk through the duration of a mortgage.



Flood Risk Assessment

The **Flood Risk Assessment** dataset is generated from [Hazus, FEMA's model loss estimation software](#), and presents loss estimates in dollar values. Risk is most often expressed as an **Average Annualized Loss** estimate. If a community has building stock or parcel-level data to contribute to the Hazus analysis, the result can be calculated at the level of the individual structure or parcel. In a Hazard Mitigation Plan, the Average Annualized Loss can be used to improve the risk assessment, identify mitigation strategies, and prioritize mitigation actions. For example, the dollar value it presents can be used to examine the costs from disasters and provide return-on-investment estimates to determine if a mitigation action would “pay for itself” through the avoided losses. It can also be used to prioritize multiple mitigation actions to identify the best use of limited grant funding. The Flood Risk Assessment dataset is provided to the community at no cost and can be used to address that portion of the mitigation plan requirements, rather than having to hire an outside contractor to perform a risk assessment.



Areas of Mitigation Interest

The **Areas of Mitigation Interest** dataset can be used to investigate the need for flood risk mitigation strategies by identifying conditions within a project area that may contribute to the severity of the flood hazard and associated losses. These conditions include areas with a history of flood claims, structures that contribute to backwater (e.g., undersized culverts, bridges, and dams), and areas experiencing land use change or development. Although the community may already know much of this information, visualizing it spatially can assist local officials with identifying mitigation strategies and prioritizing mitigation actions.



USING RISK MAP FLOOD RISK PRODUCTS TO MEET MITIGATION PLANNING REQUIREMENTS

Members of mitigation planning committees can use FRPs to better prioritize areas in need of mitigation assistance. This improved and actionable information makes a plan more usable for the communities while also helping meet certain FEMA requirements. Mitigation plan risk assessments must be based on the best available data—the FRPs are, in most instances, the best flood hazard data. FRPs are used in mapping software and are especially powerful when combined with local data. The table below describes how the information provided in FRPs and flood risk datasets can provide communities with tools and information that can assist in meeting some of the required elements of local mitigation plans. Contact your FEMA Region for more information, instructions, and training on the step-by-step processes to incorporate the FRP data into your hazard mitigation plan.

FLOOD RISK PRODUCT	HOW TO USE IT IN YOUR LOCAL HAZARD MITIGATION PLAN
<p>Use the Changes Since Last FIRM dataset to...</p>	<p>Generate maps to support describing the location of flood hazard areas (Element B1, 44 CFR §201.6(c)(2)(i)). This is especially important for plan updates, which should address how the geography of flood hazards has changed since the previously approved plan.</p> <p>Understand how changes in development and the geography of flooding have affected the overall risk (Element D1, 44 CFR § 201.6(d)(3)). Plan updates must describe changes in land use and development that have occurred in hazard-prone areas. By using GIS to overlay the Changes Since Last FIRM data on local building or parcel data, the planning team can isolate land uses and/or buildings that are newly at risk to flooding.</p> <p>Describe the extent of flood hazard events (Element B1, 44 CFR § 201.6(c)(2)(i)). Extent is the strength or magnitude of the hazard. The Flood Depth Grids show the depth of flooding at any given location in the Risk MAP study area; users can click on an individual cell and learn the approximate depth of flooding at that location. Unlike the base flood elevation, the Flood Depth Grid is expressed in feet of flooding, which can be easier to understand.</p>
<p>Use the Water Surface Elevation Grid and Flood Depth Grid datasets to...</p>	<p>Generate maps to support describing the location of flood hazard areas (Element B1, 44 CFR §201.6(c)(2)(i)). The Depth Grids show the geographic area expected to flood in both larger and smaller flood events studied under Risk MAP, so unlike the FIRM, which shows the 1-percent-annual-chance flood, the Depth Grids can show the area expected to flood during a variety of return periods.</p> <p>Analyze and describe the impacts and vulnerabilities of flood hazards when used with FEMA's Hazus loss estimation software (Element B3, 44 CFR § 201.6(c)(2)(ii)). The Flood Depth Grids are a ready-to-use input for Hazus, which estimates losses for essential facilities and for a community's building stock. Using Depth Grids cuts down on the amount of computing power and processing time needed to model flood losses.</p>
<p>Use the Percent Annual Chance Grid and 30-Year Chance Grid datasets to...</p>	<p>Support the discussion of the probability of future flood hazard events (Element B2, 44 CFR § 201.6(c)(2)(i)). The Percent Annual Chance Grids can help the planning team illustrate and think through what more intense flooding scenarios might look like in the planning area. Combined with local data, the Grids can help illustrate what community assets might be more vulnerable in the future, as well.</p>



FLOOD RISK PRODUCT

HOW TO USE IT IN YOUR LOCAL HAZARD MITIGATION PLAN

Use the Flood Risk Assessment dataset to...

Quantify vulnerability and impacts for multiple flood scenarios (**Element B3, 44 CFR § 201.6(c)(2)(ii)**). The Flood Risk Assessment data presents losses in dollar values and can highlight which communities are most vulnerable to flooding.

Help develop mitigation actions for each jurisdiction and prioritize what areas need mitigation action most (**Element C5, 44 CFR § 201.6(c)(3)(iii) and 44 CFR § 201.6(c)(3)(iv)**). The Flood Risk Assessment data can show where losses will be highest and mitigation may have the most benefit—which is an essential component of prioritizing mitigation actions.

Map and identify the type and location of flood hazard(s) in the planning area (**Element B1, 44 CFR § 201.6(c)(2)(i)**). Areas of Mitigation Interest can help the planning team understand various kinds of flooding issues possible in the planning area. Because Areas of Mitigation Interest is a spatial dataset, it can support mapping the location of flood issues.

Map and describe previous occurrences of flood hazards (**Element B2, 44 CFR § 201.6(c)(2)(i)**). Areas of Mitigation Interest includes the location of past repetitive flood claims, which can support the discussion of where and when flooding has occurred in the past.

Use the Areas of Mitigation Interest dataset to...

Describe impacts and vulnerabilities, especially for essential community facilities (**Element B3, 44 CFR § 201.6(c)(2)(ii)**). Areas of Mitigation Interest includes a list of at-risk community facilities, and the past claims hotspots included in the data can also highlight areas that have been affected in the past.

Support the discussion of NFIP-insured structures repetitively damaged by flooding (**Element B4, 44 CFR § 201.6(c)(2)(ii)**). The past claims hotspots portion of Areas of Mitigation Interest shows areas where five or more repetitive loss or severe repetitive loss properties are close together. Areas of Mitigation Interest does not meet the full requirement to describe the type and number of repetitive loss properties, but it can illustrate concentrations of insured losses.

Describe areas of land use and development changes (**Element D1, 44 CFR § 201.6(d)(3)**) for plan updates. Mitigation plans must describe changes in development in hazard-prone areas, and Areas of Mitigation Interest includes data on areas that have undergone significant land use change. This can support users in both looking back at where recent development has happened and addressing areas that may become more vulnerable in the future because of new development or population growth.

The Flood Risk Products and Datasets can contribute to your hazard mitigation plan by helping to meet the criteria described in the [Local Mitigation Plan Review Guide](http://www.fema.gov/media-library/assets/documents/23194). (www.fema.gov/media-library/assets/documents/23194) The Flood Risk Products and Datasets do not meet the regulatory planning requirements on their own. Instead, they supplement and strengthen the planning team’s analysis and documentation.



FLOOD RISK PRODUCT

HOW TO USE IT IN YOUR LOCAL HAZARD MITIGATION PLAN

Use the (optional)
Flood Risk Map to...

Illustrate the location or geographic area of flood hazards (**Element B1, 44 CFR § 201.6(c)(2)(i)**). The Flood Risk Map shows new SFHAs and, if applicable, areas influenced by coastal storm surge. This helps community members visualize flood hazard areas and is especially useful when GIS capabilities are limited.

Illustrate the vulnerability of jurisdictions (**Element B3, 44 CFR § 201.6(c)(2)(ii)**). The Flood Risk Map shows the relative flood risk of the communities in the study, from very low to very high. The Flood Risk Map alone will not meet the requirement, but it adds context and is a visual companion to the plan’s description of flood impacts and the summary of community vulnerability.

Visualize locations of potential mitigation actions that will reduce risk (**Element C4, 44 CFR § 201.6(c)(3)(ii)**). The Flood Risk Map illustrates areas where mitigation action might be needed to reduce risk, like areas of significant land use change, at-risk essential facilities, problem levees, stream flow constrictions, etc. The planning team may wish to focus mitigation efforts on the areas described.

Describe the location or geographic area of flood hazards (**Element B1, 44 CFR § 201.6(c)(2)(i)**). The Flood Risk Report breaks down flood risk at the community level and can indicate which communities have greater or smaller risks of flooding. It also often lists flooding sources for each community.

List and describe previous occurrences of flood events (**Element B2, 44 CFR § 201.6(c)(2)(i)**). The Flood Risk Report often includes information on significant past flood events, along with past disaster declarations, which can be used to meet this element.

Use the (optional)
Flood Risk Report to...

Develop the overall summary description of each jurisdiction’s vulnerability to flooding (**Element B3, 44 CFR § 201.6(c)(2)(ii)**). Section 3 of the Flood Risk Report is especially helpful, since it presents the results of the flood risk analysis at the study and community levels. The report identifies dollar amounts of losses by type of structure and flood frequency. This helps communities understand what is at risk for not only a 1-percent-annual-chance flood, but also other more and less severe events.

Evaluate a comprehensive range of specific mitigation actions to reduce risk (**Element C4, 44 CFR § 201.6(c)(3)(ii)**). Section 3 of the Flood Risk Report typically summarizes areas of mitigation interest or potential in each community—areas of significant land use change, at-risk essential facilities, etc. The planning team may wish to focus mitigation efforts on the areas described. In addition, Section 4 of the Flood Risk Report describes possible types of mitigation activities and potential funding sources.

RISK MAP FLOOD RISK PRODUCT USE CASE: DEKALB COUNTY, GEORGIA

DeKalb County, Georgia's third-most populous county, is composed of nine incorporated cities, a portion of the City of Atlanta, and several unincorporated communities. Historical data supports the prediction that damage-inducing flood events will occur within the county at least once every two years. Significant flood-related damage has been experienced along the South and North Forks of Peachtree Creek, Nancy Creek, their tributaries, and other streams. In addition to building and infrastructure damage due to overland flooding, numerous undersized culverts, low water crossings, and low-capacity bridges throughout the county cause flooding problems.

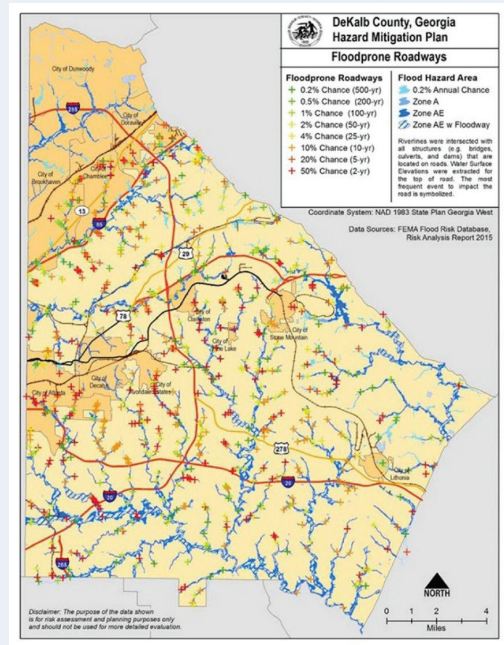
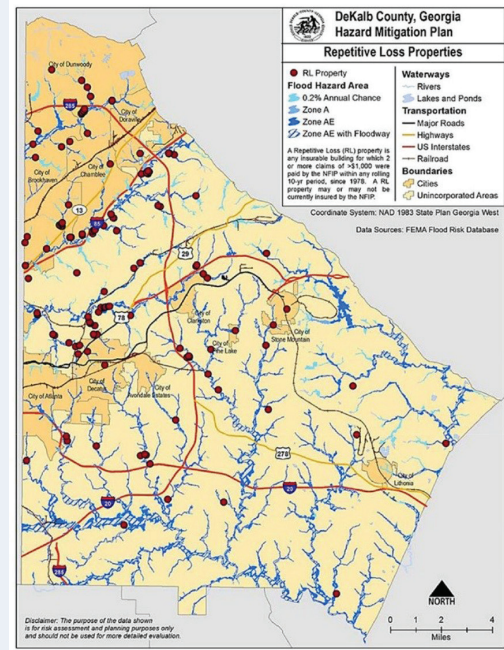
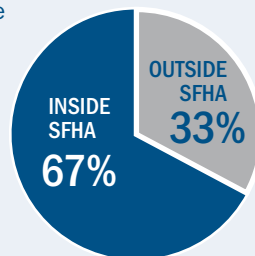
DeKalb County's Mitigation Advisory Committee collaborated to update the county's Hazard Mitigation Plan in 2016 and incorporated flood risk datasets that were provided as part of a FEMA Risk MAP project. The information provided in the FRPs and datasets was used to assess the vulnerability of infrastructure, critical facilities, and parcels at a greater level of detail than in the past. For instance, analyses of floodprone roadways and repetitive loss properties were conducted to identify vulnerable infrastructure and facilitate specific mitigation actions that addressed improving stormwater infrastructure and acquiring or elevating repetitive loss properties to avoid future losses.

IDENTIFYING FLOODPRONE ROADWAYS

To identify floodprone roadways, river lines were intersected with all structures (including bridges, culverts, and dams). The water surface elevations were extracted from the Water Surface Elevation dataset and compared to the top of the roads, with the most frequent and impactful flood event noted. The DeKalb County 2016 Hazard Mitigation Advisory Committee developed a map that identified the floodprone roads by color, based on the frequency of occurrence. Roads designated with a red plus sign (+) have a 50-percent annual chance of occurrence (2-year event), and roads shown with the dark green plus sign are inundated by the 0.2-percent-annual-chance (500-year) event. Roadways that were identified as being vulnerable to flooding can be evaluated for potential retrofitting projects that are able to produce the necessary cost-benefit results required for grant funding eligibility.

IDENTIFYING REPETITIVE LOSS PROPERTIES

Repetitive loss properties were identified in the enhanced Areas of Mitigation Interest dataset that was provided to DeKalb County during the Risk MAP project. The repetitive loss property analysis identified that 33 percent of the claims for these properties were outside of the SFHA. This indicates that there is no such thing as no risk for flooding.

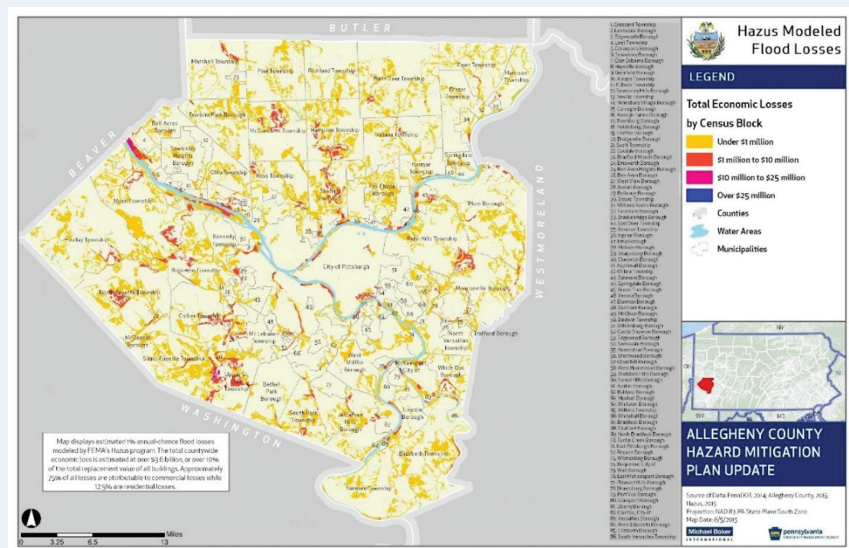


RISK MAP FLOOD RISK PRODUCT USE CASE: ALLEGHENY COUNTY, PENNSYLVANIA

Allegheny County is a large, mostly urban county in southwestern Pennsylvania, with an area of 745 square miles. The county has 130 municipalities—more than any other county in the Commonwealth. It also has four major rivers—the Allegheny, Monongahela, and Ohio Rivers, which meet at the center of the county in the City of Pittsburgh, and the Youghiogheny River. Historic decisions to locate industrial and other large facilities next to rivers have resulted in many important facilities being in the floodplain and increased Allegheny County's vulnerability to flooding. The Allegheny County Hazard Mitigation Plan (HMP) was due for an update in 2015, shortly after the county's Risk MAP project was completed. As part of the update process, the plan was prepared to meet both FEMA's and the Pennsylvania Emergency Management Agency's (PEMA) requirements, so the county would be eligible for funding and technical assistance from state and federal hazard mitigation grants. The first meeting of the Allegheny County HMP Steering Committee to discuss the update reviewed PEMA's priorities for HMP updates. One of PEMA's major priorities was to refine and enhance the Hazus analysis for flooding to obtain more realistic flood loss estimates for essential facilities and the building stock countywide.

Performing Enhanced Hazus Flood Analysis

As opposed to a basic analysis, enhanced analysis incorporates datasets that are more up-to-date and/or have a higher spatial resolution than the default data included in the Hazus software. The enhanced data incorporated into the 2015 Allegheny County HMP update included an updated essential facilities data layer and the 1-percent-annual-chance Flood Depth Grid generated during Allegheny County's Risk MAP project. With the help of Hazus-Multi Hazard version 2.2, current scientific and engineering knowledge was coupled with the latest GIS technology to produce estimates of flood hazard-related damage before a disaster occurs. Use of the Flood Depth Grid also reduced the overall time and effort needed to develop Hazus loss estimates, ultimately allowing the Steering Committee to spend their time on extra outreach and developing mitigation strategies with each of the communities.



WANT MORE INFORMATION ON FLOOD RISK DATASETS?

Check out our FRP Training by contacting your Regional Risk Analysis Branch or the FEMA Map Information eXchange (FMIX) toll free at 877-FEMA MAP or by email at FEMAMapSpecialist@riskmapcdfs.com.

WANT MORE INFORMATION ON MITIGATION PLANNING?

Visit FEMA's Hazard Mitigation Planning website, www.fema.gov/hazard-mitigation-planning, or contact your State Hazard Mitigation Officer or FEMA Regional Risk Analysis Branch. Visit FEMA's Hazard Mitigation Planning Contacts page for more information, www.fema.gov/hazard-mitigation-planning-contacts.