Association of State Floodplain Managers, Inc.

8301 Excelsior Drive, Madison, WI 53717

Phone: 608-828-3000 | **Email:** asfpm@floods.org | **Website:** www.floods.org

TESTIMONY

An Examination of Federal Flood Maps in a Changing Climate

Before the

House Committee on Science, Space and Technology
Subcommittee on the Environment & Subcommittee on Investigations and Oversight

By

Chad Berginnis, CFM
Executive Director
Association of State Floodplain Managers

February 27, 2020

Introduction

The Association of State Floodplain Managers is pleased to participate in this hearing to explore how flooding and sea level rise affect American property owners, how the Federal Emergency Management Agency (FEMA) uses science to inform its flood products, and whether additional federal resources are needed to research and communicate future flood risk to the public. We are especially pleased that Congress is exercising its oversight function as it examines the National Flood Mapping Program at FEMA and we appreciate the opportunity to discuss our views and recommendations for the future of the program. We thank you, Chairwoman Sherrill, Chairman Foster, Ranking Member Marshall, Ranking Member Norman and Members of your Subcommittees for your interest in this important subject.

ASFPM is a national nonprofit scientific and educational organization whose mission is to reduce flooding and to recognize the inherently important functions of our natural floodplains. ASFPM and its 37 chapters represent more than 20,000 local and state officials, private sector, academia, and other professionals engaged in all aspects of flood risk management and flood hazard mitigation, including management of local floodplain ordinances, flood risk mapping, engineering, planning, community development, hydrology, forecasting, emergency response, water resources development, protection of valuable floodplain functions, and flood insurance. All ASFPM members are concerned with reducing our nation's flood-related losses. For more information on the association, visit our website at *www.floods.org*.

Our Nation's Flood Risk is Increasing Dramatically

Floods are the nation's most frequent and costly hazard. The cost to taxpayers continues to increase at an alarming rate. ASFPM estimates average annual flood losses were about $5.6 billion in the 1990s. This increased to an average annual flood loss of $10 billion in the 2000s, and in this past decade came close to doubling again with a conservative estimate of $17 billion per year.

Climate change is manifesting itself in several ways as it relates to flood risk. But the two primary ways are sea level rise and more intense storms. For instance, a 2016 study updated the estimates on the amount of ice melting in Antarctica and concluded that the increase in sea level may be twice the level that was previously estimated. And, an additional source of uncertainty is the willingness and ability of the world's nations to change the trajectory of climate change. The success of agreements like the Paris Climate Conference and future agreements hold the potential to mitigate some of the projected impacts of climate change. It

appears there is increasing consistency in new scientific investigations that we have likely underestimated the amount of future sea level rise and that it is likely accelerating faster than originally projected.

In inland areas all across the country, local officials are observing more intense rainfall events. And this is showing up in the data, too. Warming conditions mean more water vapor in the air. When rain-triggering conditions are favorable, more saturated air leads to heavier precipitation. One public works official from Arkansas recently noted "It was easier when we could plan for and put in stormwater infrastructure that can handle one to two inches of rain each hour, but now we are seeing events where you might get four inches of rain in a half hour, and I am not sure how we are going to handle that." Recent research by Climate Central reinforces this observation, showing an upward trend with more days with significant rainfall events. These more intense rainfall events have resulted in an increasing threat of urban flooding, essentially when there is too much water for the local stormwater system to handle. The ASFPM Foundation recently released a report on urban flooding which concludes that much of the work to address the issue needs to happen at the state and local level; however, federal resources and assistance, including a national assessment can be an appropriate role for the federal government.

How Does Flooding and Sea Level Rise Affect Property Owners?

Flooding and sea level rise affect many property owners nationwide. Unfortunately, for those less fortunate who have little financial ability to move out of high risk areas, many federal policies create a moral hazard as well. Recent studies estimate that as many as 60 million people live in flood hazard areas—whether it be the 1% annual chance (100-year) floodplain or the .2% annual chance (500-year) floodplain. This does not account for the other flood hazard areas such as storm surge zones, tsunami zones, residual risk areas as a result of impoundment or the release of waters from dams, residual risk areas from levee failures and an increasingly impactful urban flooding threat. Indeed, flood risk is far more widespread than is perceived or known. Through flood hazard identification, the flood risk can be better known, but as a society, we are not doing enough to reduce flood risk until it is often too late and a flood is bearing down on an area. Individual property owners are affected differently from flooding risks and sea level rise depending on the actions that they have or have not taken to reduce that risk.

Consider the plight of the low income renter who finds HUD subsidized housing in a flood hazard area. While rent may be cheaper, federal policy has created a moral hazard whereby those in society who can least withstand the impact of a major flood are placed squarely in harm's way. Or consider the first time homeowner who just a day before closing finds out that the property is in a special flood hazard area, and flood insurance is required on their mortgage. Typically, the news is not well received; however, some of those property owners who later face a damaging flood become true believers in the importance of flood insurance. Others spend large amounts of time and effort fighting the flood zone determination because they do not believe they are at risk. Indeed, social scientists tell us that as individuals we tend to think of low frequency, high impact events in an irrational way, often thinking it will not happen to us…until it does. Small business owners are particularly vulnerable as most of their liquid assets are tied up in their business and flood insurance is often not a consideration. Yet data shows that 40-60% of small businesses never reopen after a disaster. There is the ongoing struggle between community leaders who potentially face the loss of tax base when thinking about solutions that would reduce the occupancy of the floodplain through buyouts or long term land use planning, even though such options are in the best interest of the property owner. And there is the plight of existing at-risk property owners who, due to lenient floodplain management standards in their own community, are put at increased risk from new development because the standards and community do not account for off-site impacts. Our members often work with those who have previously flooded, and we often see impacts largely hidden from the disaster cost tallies such as heightened anxiety, suicide, stress, and other emotional and health impacts.

Living in and around floodplains is complicated and there are constantly competing priorities. When it comes to floodplains, there are no great solutions. Instead you are choosing the least worst solution. A reality that is too often overlooked is the simple fact that flood hazard areas exist regardless of maps and ultimately it is a very hazardous area.

The future flooding condition (including sea level rise) is bleak for many of the nation's communities and at-risk property owners, especially those on the coast. In a 2016 Insight report, Sean Becketti the Vice President and Chief Economist of Freddie Mac wrote the following:

> While technical solutions may stave off some of the worst effects of climate change, rising sea levels and spreading flood plains nonetheless appear likely to destroy billions of dollars in property and to displace millions of people. The economic losses and social disruption may

happen gradually, but they are likely to be greater in total than those experienced in the housing crisis and Great Recession. That recent experience illustrated the difficulty of allocating losses between homeowners, lenders, servicers, insurers, investors, and taxpayers in general. The delays in resolving these differences at times exacerbated the losses. Similar challenges will face the nation in dealing with the impact of climate change.

Among the several issues the report ponders, one relates to the equity in a person's home. If those homes become uninsurable and/or unmarketable, the value of the homes will plummet, perhaps to zero. Unlike after the Great Recession, homeowners will have no expectation that the values of their homes will ever recover. Especially when it comes to sea level rise, how will the housing finance system work for properties that today are dry but in 30 years—the duration of a mortgage—will largely be wet due to tides or outright continuous inundation? At what point will lenders stop providing loans in these areas?

In the 2018 report *Underwater: Rising Seas, Chronic Floods, and the Implications for US Coastal Real Estate* by the Union of Concerned Scientists, several conclusions should raise alarm:

- Accelerating sea level rise in the lower 48 states, primarily driven by climate change, is projected to worsen tidal flooding, putting as many as 311,000 coastal homes with a collective market value of about $117.5 billion today at risk of chronic flooding within the next 30 years—the lifespan of a typical mortgage
- The consequences of chronic flooding of properties in specific communities could translate not just into eroding property values, but also into unlivable houses and falling tax revenues that fund schools, roads and emergency services in those places. The properties at risk by 2045 currently house roughly 550,000 people and contribute nearly $1.5 billion toward today's property tax base. These numbers jump to about 4.7 million people and $12 billion by 2100. Municipalities are looking at even deeper revenue declines when commercial property, sales, and other business tax losses are factored in.
- With chronic inundation, homeowners and owners of commercial properties are directly at risk of significant financial losses as the value of their properties declines. Such losses have ramifications for the local community, which could see its property tax base eroded and its ability to fund local services compromised. There will also be implications for the wider economy, including for banks with outstanding mortgage loans on properties at risk of inundation, coastal property developers, investors and insurers, business owners whose places of business may face flooding, and US taxpayers, broadly, who may face increased taxes to pay for measures to cope with flooding and to reduce flood risk.

So the ultimate question from a public policy standpoint is how do we get property owners and communities ready for a future where flood risk is more significant and in some areas predictably far worse? What adjustments do we need to make in our approach to flood risk management to increase awareness of hazards and align our policies and programs to ensure a high degree of resiliency as communities face tough choices about where to grow and where to invest? Experience tells us that at the community scale, flood resilience is a multi-decadal process. The most progressive communities in the country, such as Charlotte, North Carolina or Tulsa, Oklahoma have been "mitigating" flood risk for three decades or more and still much remains to be done.

Data, Analysis, and Information – An Appropriate Federal Role

If we do not have robust systems in place to provide updated and anticipated hydrologic data, flood maps, and reliable topography (and to provide sufficient resources going to research and development), we will simply never get ahead of new development in flood risk areas and create more properties at risk from flooding. ASFPM believes that that one of the most important roles the federal government can undertake in flood risk management is to provide data, analysis and information for the nation. For better or worse, the enterprise of providing current, actionable flood data is a cooperative effort among several federal agencies. Before delving further into the NFIP itself—and FEMA's role—it is important that the subcommittees understand the overall framework under which flood risk information is generated.

One trend that we are seeing across the country is that rain events are getting more intense. To compound matters, our nation tends to use outdated hydrology which only further underestimates the risk. Hydrologic information is the key input into flood models which produce flood risk data and flood maps. Traditionally, the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) has the responsibility for updating precipitation frequency estimates for various parts of the United States and affiliated territories. Updated precipitation frequency estimates, accompanied by additional relevant information, are published as "NOAA Atlas 14" and are available for download from the Precipitation Frequency Data Server (PFDS). This data is used in everything from hydrologic modeling for producing flood maps, to thousands of design decisions every day for development and redevelopment in our communities, highways and other infrastructure throughout the nation. However, NOAA has neither the budget nor clear mandate to provide this in a timely way. In fact, a note in NOAA's most recent progress report extending through March 2019 indicated

that "No funding is available to extend NOAA Atlas 14 coverage to the remaining five northwestern states: ID, MT, OR, WA, WY in Volume 12.[1]"

Consider the new Atlas 14 data for Texas which was issued in the fall of 2018. That data basically determined that the previous 100-year rainfall amounts for Houston is now about a 25-year event. In Austin, the previous 100-year rainfall amount is now about a 50-year event. As one of ASFPM's Texas members put it, "pretty much all of the flood maps in the state of Texas are now outdated." And this particular Atlas 14 update was not even looking at the future. Rather it is updating 40-50 year old data that was developed in the 1960s and 1970s. ASFPM is supportive of current NOAA efforts to test the feasibility of incorporating future climate projections into precipitation frequency analysis examining the inclusion of such data into future Atlas 14 updates.

- **NOAA should be given the mandate and full budget to update our nation's rainfall frequency information at least every 10 years and this update must include future climate projections into precipitation frequency analysis.**

Stream and tidal gages are the stethoscopes of our hydrologic network and are another important input into flood models and maps. Ask any local official about a critical data need and most will say that there needs to be more streamgages. Yet funding for even those deemed critical by the federal government is in short supply. For example, the Federal Priority Streamgages (FPS) Network (previously known as the National Streamflow Information Program) was conceived in 1999 to be a core, federally funded network. The original network design included 4,300 then active, previously discontinued, or proposed new gages that were strategically positioned across the country to address long-term Federal information needs (such as supporting NWS flood forecasts, or interstate and international compacts and decrees). At present (2018), more than 4,700 locations meet the criteria for inclusion in the FPS network, but only about 3,600 FPS streamgages are active because of funding limitations. These active FPS are supported through a combination of Federal and partner funding—less than one-quarter are fully funded by Congress through the United States Geologic Survey.

- **Congress should fully fund our critical national stream gauge and tidal gauge networks.**

Today's flood maps are based on models that incorporate hydrologic information and topographic information. Good progress has been made in the last decade on high quality

[1] Hydrometeorological Design Studies Center Progress Report for Period OCTOBER 2018 to MARCH 2019, page 4.

topographic information for the nation through the United States Geological Survey (USGS) 3 Digital Elevation Program (3DEP). These high quality topographic data inform critical decisions that are made across the nation every day ranging from immediate safety of life, property and long-term planning for infrastructure projects. Currently at 60% complete, the goal of 3DEP is to complete the acquisition of nationwide high resolution elevation data by 2023.

- **Congress should ensure that the USGS 3DEP program is fully funded to provide high quality topographic information for the entire nation.**

Even if good flood data is developed, there are some policy hurdles preventing it from being publicly available. For example, ASFPM was pleased with the release of the US Army Corps of Engineers (Corps) new policy on Emergency Action Plans (EAPs) which requires several types of flood inundation mapping (EC 1110-2-6074). This policy standardizes inundation mapping (maps showing the areas that will be flooded when the dam or levee fails or is overtopped), and establishes inundation mapping requirements for dams and levees. In theory, having inundation mapping available to the public can help avoid debacles like those witnessed around Barker and Addicks Reservoirs post-Harvey in Texas, when thousands of homes in inundation areas of those structures were impacted. Had local land use planners, property owners and others been aware of these risks, additional steps could have been taken to reduce that risk. The new EAP policy, however, includes the following statement: *EAP maps are considered sensitive data and must be marked "For Official Use Only" according to AR 380-5 and DoDM 5200.01.* In other words, inundation maps associated with EAPs are still not publicly available. Why would we be withholding this vital information on flood risk from property buyers and owners?

The 2016 TMAC report National Flood Mapping Program Review, identified a legacy DHS policy through its Security Classification Guide for the Protection of Critical Infrastructure and Key Resources, which listed dam failure inundation maps as "For Official Use Only." However, this policy conflicts with the National Flood Mapping Program requirements that such areas be provided on Flood Insurance Rate Maps and on publicly-available databases such as National Levee Database (NLD) and National Inventory of Dams (NID). As noted in the report, a Virginia law passed in 2008 essentially requires that all inundation mapping developed for state-regulated dams be made available to communities and the public. This has now been implemented for a decade without issues and state officials there believe in supporting wider public availability of this data. More recently, when speaking to agency officials, there has been

a mistaken belief that this issue had been dealt with. It is clear to ASFPM that it has not and the unwillingness of agencies to act on it demands congressional intervention.

- **Congress should mandate that any flood risk data, including all dam/levee inundation mapping, developed by the federal government and/or associated with any federal program be made publicly available.**

More recently, flood risk data, and in particular flood insurance claims data, has been more difficult to obtain from FEMA as a result of FEMA's evolving compliance with the Federal Privacy Act. These data help inform local mitigation plans, can provide heat maps on claims hotspots, are needed to apply for and administer flood mitigation grants, property disclosure, and are useful in communicating flood risk. Given that some flood mapping programs are beginning to incorporate structure specific information, the lack of available claims data and the inherent conflict between the benefits of communicating these data and the Privacy Act need to be resolved.

For the past decade, a novel approach to data management, tool development and data dissemination has been piloted at NOAA through the Digital Coast Partnership. Developed and maintained by NOAA, hundreds of organizations and federal, state, and local agencies have contributed to this curated collection of high-quality authoritative data and tools focused on coastal and ocean issues. "More than Just Data" is the slogan of the Digital Coast because data alone is not enough, especially when users of that data do not know how it can be used, or what steps to take to get information they need. Digital Coast tools and training help users turn data into powerful information that continues to increase the coastal knowledge of our nation.

For example, one of the most popular tools being used by practitioners today on the Digital Coast website is the Sea Level Rise viewer. ASFPM was a founding member of the Digital Coast Partnership and strongly believes that to better understand the future flooding risk in coastal areas and manage that risk, programs like Digital Coast will be vital.

- **Congress should pass the Digital Coast Act.**

Federal Agency / Programs and Policies

There are numerous programs and federal agencies that address the threat of flooding and floodplain management. As part of a research project in 2012, ASFPM analyzed more than 130 federal programs that had some impact on the use and development of floodplains. ASFPM works with many of the federal agencies in addressing flood risk whether it be through commenting on statutory authorities or policies, serving on task forces or advisory groups, or using our own power to convene agencies so they can work together to address cross-cutting issues.

We would like to highlight a key federal coordinating entity. In 1975, Congress established the Federal Interagency Floodplain Management Task Force (FIFM-TF). Its purpose was to carry out the responsibility of the president to prepare for the Congress proposals necessary for a Unified National Program for Floodplain Management. For more than 40 years, some form of an interagency group has worked to better understand the appropriate roles of local, state and federal governments in reducing flood losses, the interactions between human actions and natural systems in the floodplain environment and to make recommendations to reduce the loss of life and property caused by floods. Also, the task force is useful to identify and address policy or programmatic conflicts among federal agencies that may be resulting in poor floodplain management decisions. The main report of the FIFM-TF, a Unified National Program for Floodplain Management was first written in 1979, then updated in 1986 and last updated in 1995. Unfortunately, the report hasn't been updated in almost 25 years while the threats resulting from flooding have exploded. Not only is research showing significant social impacts of flooding, new flooding types like urban flooding are emerging.

Today, the FIFM-TF is still operational; however, it is under resourced and not as effectively utilized as it could be. One concern expressed by the subcommittees was the state of federal coordination on flood science, mitigation and risk communication. The FIFM-TF, if properly resourced, and enabled, could serve capably to enhance these functions.

The NFIP is a National Comprehensive Flood Risk Reduction Program

Central to the nation's efforts in managing flood risk is the National Flood Insurance Program (NFIP). It was created by statute in 1968 to accomplish several objectives. Among other things, the NFIP was created to:

- Provide for the expeditious identification of and dissemination of information concerning flood-prone areas through flood mapping

- Provide communities the opportunity to voluntarily participate in the National Flood Insurance Program in order for their citizens to buy flood insurance and, as a condition of future federal financial assistance, to adopt adequate floodplain ordinances consistent with federal flood loss reduction standards

- Require the purchase of flood insurance in special flood hazard areas by property owners who are being assisted by federal programs or by federally supervised, regulated or insured lenders or agencies (mortgages from federally backed lenders).

- Encourage state and local governments to make appropriate land use adjustments to constrict the development of land exposed to flood damage so homes and businesses are safer and to minimize damage caused by flood losses and reduce future taxpayer costs for disasters

- Guide the development of proposed future construction, where practicable, away from locations threatened by flood hazards (avoidance of high risk flood areas)

- Authorize a nationwide flood insurance program through the cooperative efforts of the federal government and private insurance industry

- Provide flexibility in the program so flood insurance may be based on workable methods of distributing burdens equitably among those protected by flood insurance and the general public who benefit from lower disaster costs

Beyond merely providing flood insurance, the NFIP is unique as it integrates multiple approaches for identification of flood risk, communication of risk, and techniques to reduce flood losses and to mitigate existing flood risk. It is a unique collaborative partnership enlisting participation at the state and local level. It is a multi-faceted, multiple objective program—a four-legged stool, as it is often called. The four legs of the stool are (1) floodplain mapping, (2) flood standards, (3) flood hazard mitigation and (4) flood insurance. Altering one leg without careful consideration of impacts on the other three legs can have serious repercussions on reducing flood losses. NFIP on the whole provides substantial public benefits as it is, in effect, a national flood risk management program.

Floodplain Mapping under the NFIP

In addition to being an important part of the NFIP, floodplain mapping is the foundation of all flood risk reduction efforts, including design and location of transportation and other infrastructure essential to support businesses and the nation's economy. The flood maps are also used for emergency warning and evacuation, community planning, and locating critical facilities like hospitals and emergency shelters. Floodplain mapping is cost-effective with at least a 2-to-1 taxpayer benefit, and floodplain maps support communities' resilience actions. Inasmuch as flood maps identify areas where new development must be built to NFIP construction standards, flood maps reduce disaster costs as such structures suffer 80% less damage than those that are not built to NFIP standards.

For most of the history of the NFIP, flood mapping was done to primarily support two functions of the NFIP: flood insurance rating and floodplain management standards. As a result, two pieces of data were typically produced: the 100-year and the 500-year flood. However, as the NFIP grew and as flood risk management became more important, the nation's citizens looked to the FEMA flood maps as the primary source of any kind of flood risk information for a given area. In 2012, Congress, for the first time, authorized a National Flood Mapping Program (NFMP) as part of the NFIP reform legislation which took this more expansive view of flood mapping. It required, among other things, several new, mandatory types of flood risks to be shown on the nation's Flood Insurance Rate Maps (FIRMs) beyond the 100-year and 500-year flood including:

1. All populated areas and areas of possible population growth located within the 100-year and 500-year floodplains;

2. Areas of residual risk, including areas that are protected by levees, dams, and other flood control structures and the level of protection provided by those structures;

3. Ensuring that current, accurate ground elevation data is used;

4. Inclusion of future conditions risk assessment and modeling incorporating the best available climate science; and

5. Including any other relevant data from NOAA, USACE, USGS and other agencies on coastal inundation, storm surge, land subsidence, coastal erosion hazards, changing lake levels and other related flood hazards.

Unfortunately, ASFPM is not aware of any single flood map in the entire country that exists today where all of these data sets exist on either a FIRM panel or in the accompanying data FEMA provides. Therein lies the problem. We have had a National Flood Mapping Program authorized since 2012, but many key elements have not been implemented. In fairness to FEMA since 2012, progress has been made on improving the quality of the existing flood maps, in use of high resolution topography, and in the area of communicating information to communities and the public (either through the mapping process itself or through technologies and tools). Nevertheless, we believe these additional elements are essential for an effective national flood mapping program.

What is the gap then? ASFPM believes that the gap lies in getting the job done initially mapping the nation. Consider:

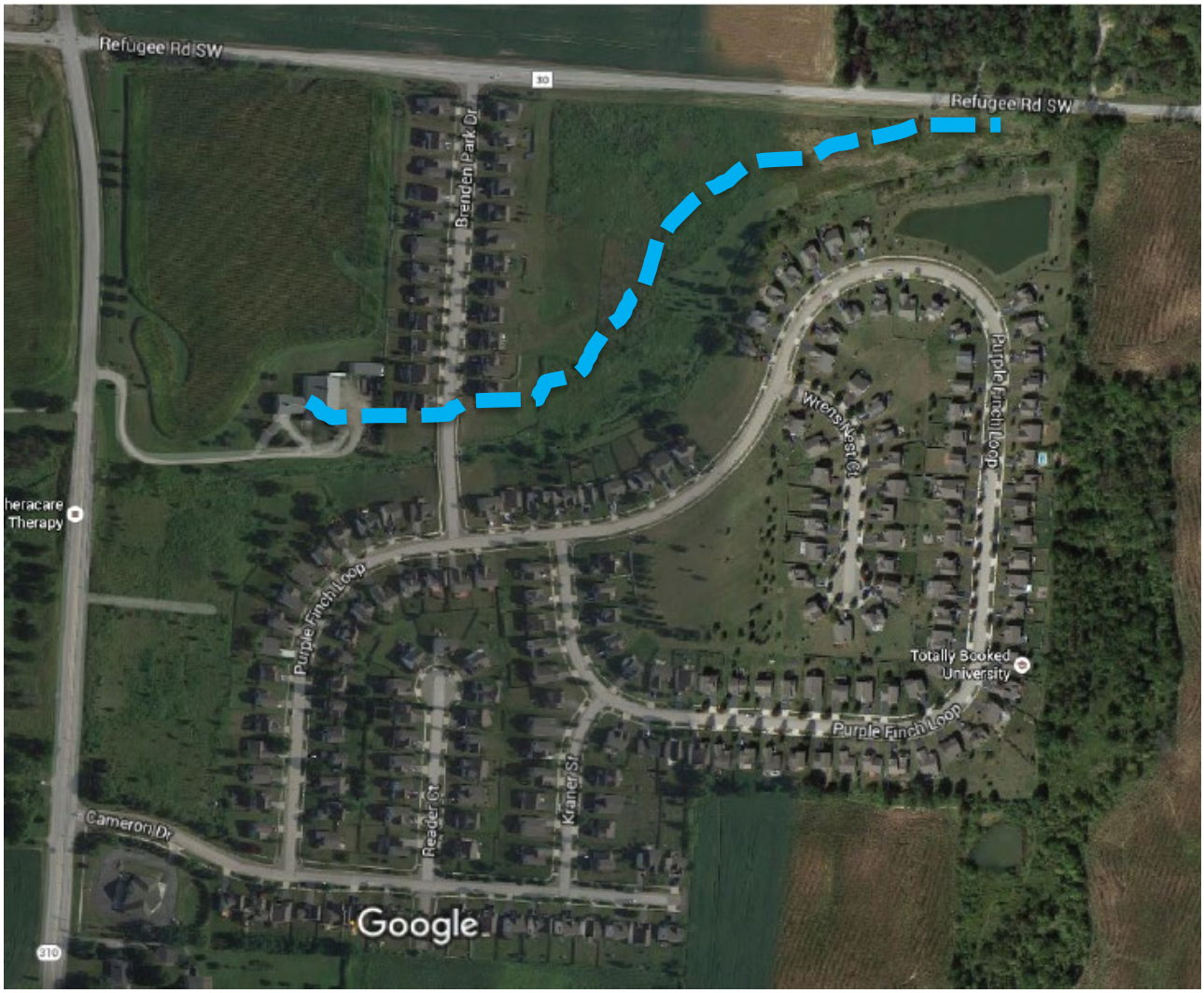
- Based on the National Hydrography Dataset (NHD) and NOAA shoreline data, there are approximately 3.5 million miles of streams and rivers, and 95,471 miles of coastlines in the nation. **Currently, only 1.14 million stream miles and 45,128 shoreline miles have flood maps. By this metric, only about 1/3 of the nation has been mapped**.

- **Over 3,300, or roughly 15%, of NFIP communities have maps over 15 years old, with many of these over 30 years old and still having "un-modernized" paper maps**.

- **Many of the added mapping requirements from 2012 haven't even been started beyond studies and research.** This includes residual risk mapping around flood control structures and future conditions mapping. A 2016 TMAC report reviewing the National Flood Mapping Program stated *"To create technically credible flood hazard data, FEMA needs to address residual risk areas in the near term. Residual risk areas associated with levees and dams are of great concern."*

ASFPM believes this gap in data is contributing significantly to the increasing flood losses in the nation. A 2018 study shows that the total US population exposed to serious flooding is 2.6–3.1 times higher than previous estimates, and that nearly 41 million Americans live within the 100-year floodplain (compared to only 13 million when calculated using FEMA flood maps). This translates into 15.4 million housing units. The same study indicates that over 60 million people live in the 500-year floodplain.

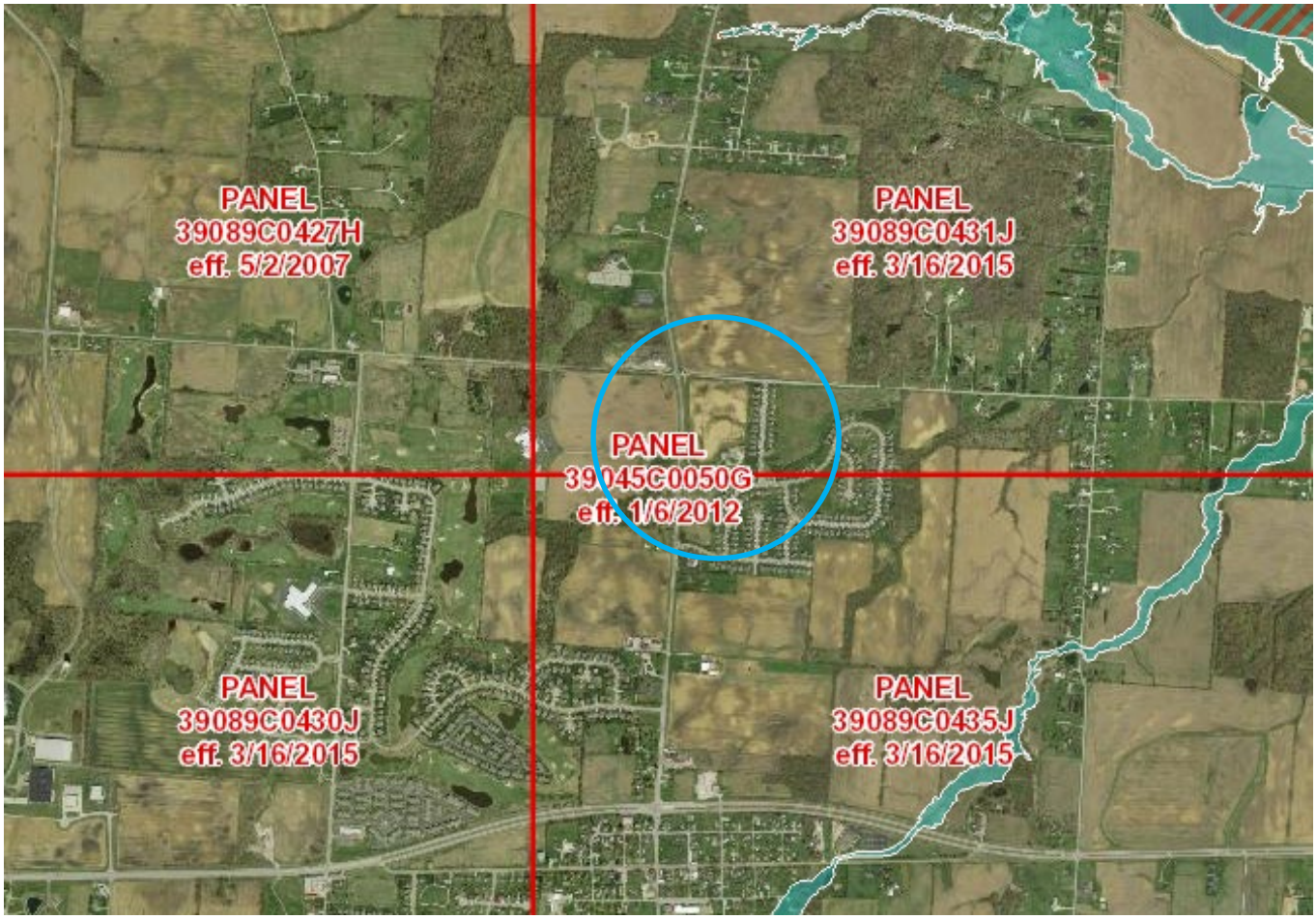
To better understand the gap between what is mapped and what needs to be done to finish the job, here is a specific example. Cameron Chase is an 87-acre residential subdivision developed in the early 2000s in Licking County, Ohio. It is 17 miles from downtown Columbus, Ohio (metro area population 2+ million). An unnamed stream flows through the subdivision:



(Above: Aerial view of Cameron Chase division, Etna Township, Licking County Ohio. The unnamed stream is highlighted as the dashed blue line)

The unnamed stream is not mapped on the FEMA maps that were effective at the time, and even on today's maps. Why? The old guideline for mapping these small streams was that you needed about 10 square miles of land draining into the stream for it to reach a threshold for FEMA mapping in rural areas. In the case of this tributary, it only had about 760 acres, or just

over one square mile of drainage. Also, the land previously had been a cornfield, and as a result it never had enough property at risk for FEMA to map prior to development.



(Above: Portion of FEMA FIRM Index Panel for Licking County, Ohio. The Cameron Chase subdivision is circled; note that the unnamed stream does not have a FEMA mapped floodplain – it does not show up until several miles downstream)

Luckily, Licking County is one of the rare communities in the nation that has strong local floodplain management regulations exceeding federal minimum standards and the regulations required the developer to map the floodplain on any stream where one wasn't identified. So prior to development, a flood study (similar to one that FEMA would prepare) was completed. The result? A 100-year floodplain that ranged from 150 feet wide to 300 feet wide and, more importantly, a map to guide the proposed development and ensure that local flood protection standards applied. But most communities do not have such standards, and what happens then? The development occurs with no flood standards. What you see happening with

Cameron Chase is happening in thousands of subdivisions across the country: areas that were once cornfields and cow pastures are developing into tens of thousands of housing units. Later, after there is significant development at risk and often after a flood or two, FEMA comes in and maps it. Then the dynamic changes and everything becomes adversarial. People think FEMA put a floodplain "on them," when it was there all along. The property owner is angry because they have to buy flood insurance at high premiums because flood elevations were previously unknown. Realtors are upset because it is a surprise and may have an impact on the future salability of homes. And local elected officials fight to minimize the size of the mapped floodplain, spending thousands of dollars on competing flood studies.

Why, then, is there such a gap in the extent of flood hazard identification? ASFPM believes there are several reasons for this.

Funding. Direct appropriations for flood mapping has varied significantly since the inception of the NFMP from a low as $89 million in FY 2013 to a high of $262.5 million in FY 2019. In ASFPM's recently released *Flood Mapping for the Nation* report, we estimate it will cost between $3.2 billion and $11.8 billion to "complete" the flood mapping in the nation, and then the steady-state annual cost to maintain this flood map inventory will be between $107 million and $480 million. Currently the NFMP is authorized at $400 million in annual appropriations. The bottom line is that to complete the initial job of mapping the nation consistent with Congress' mandate, more funding needs to be appropriated by Congress both in the form of a higher authorized amount for the NFMP and higher annual appropriations.

Existing program momentum and metrics. Prior to the NFMP being authorized by Congress, FEMA had just initiated a new flood mapping program called RiskMAP. However, in the years since, it did not appear that RiskMAP program nor its program metrics were ever re-evaluated or incorporated these important new mandates from Congress. Further, flood mapping priorities have been complicated by over 100 recommendations from the Technical Mapping Advisory Council which included the identification of additional mapping priorities such as structure specific information and graduated risk zones for insurance rating purposes. With no Congressional oversight, more requirements than funding and a new RiskMAP program, there was little impetus to focus on the required mapping elements under the NFMP.

Unfortunately, the adaptation of RiskMAP metrics ended up resulting in considerable confusion as to the status of flood mapping in the nation. Here are the two most egregious examples. The administration's proposed budget for FEMA in 2021 indicates that 98% of the population

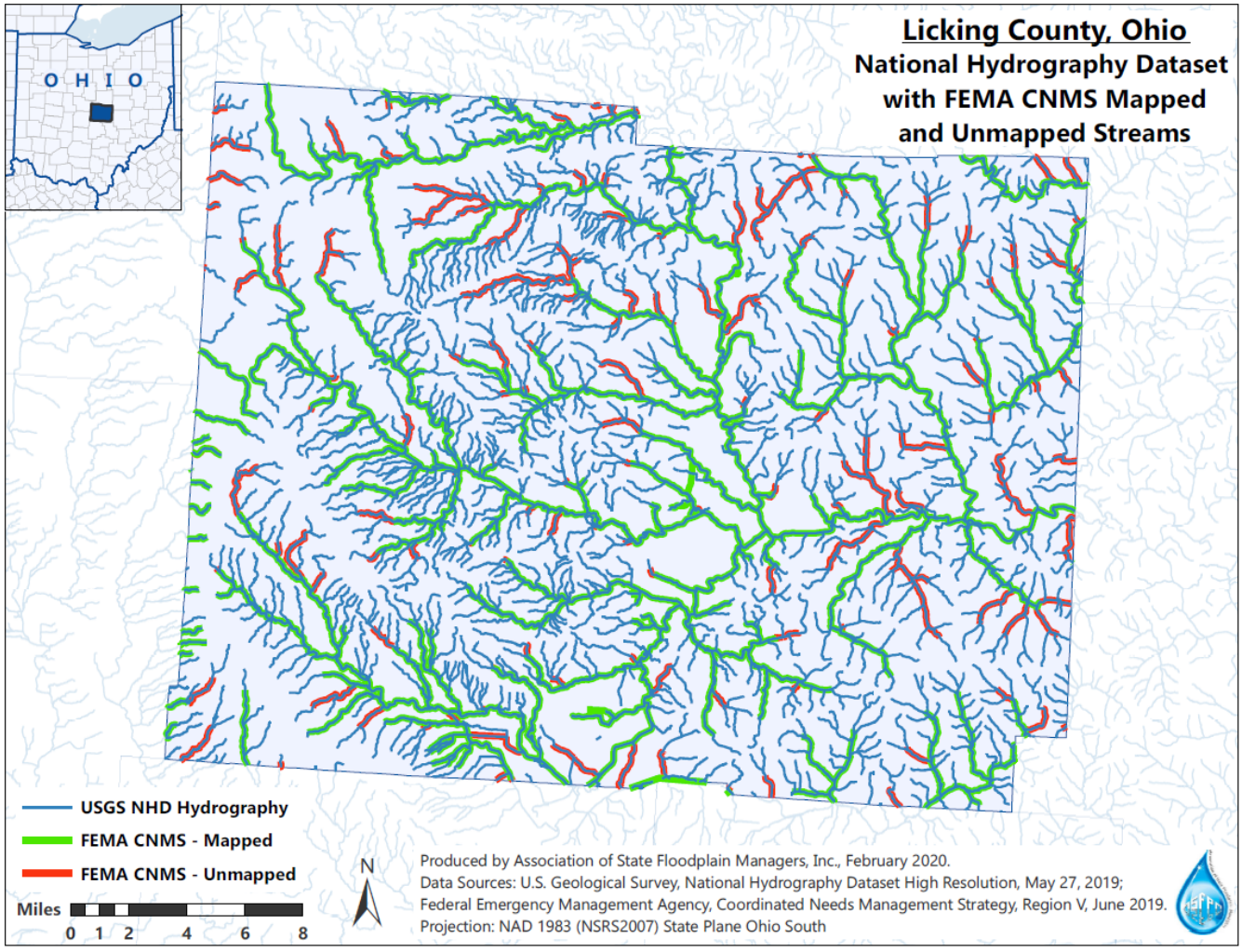
has been mapped (this is a metric FEMA's leadership has used as talking points on the topic). This metric, however, grossly overstates the population covered. This problem is discussed in the 2015 TMAC Future Conditions Assessment and Modeling report:

> *However, this population metric has two challenges for moving forward. First, the metric over-predicts the population covered by a modernized map. FEMA generally studies streams that drain a drainage area of greater than one square mile. If a census block group has 10 miles of stream and only 1 mile is studied, the current metric will count 100 percent of the population within the census block group as being covered by a modernized map, as opposed to the 10 percent that may actually be covered. Therefore, the current metric can lead to a significant over-prediction of the population covered by a modernized map. This could lead policy makers to believe that flood hazards have been more widely identified than the reality. If the metric is changed to be more reflective of the streams studied within a census block group, then it may more realistically illustrate that the country has flood hazard areas defined for only somewhere* ***between 16 percent and 22 percent of all streams.*** [EMPHASIS ADDED]

The bottom line is that the deployment metric has been grossly misapplied and should be replaced or supplemented with a metric based on the number of stream miles studied in the nation. A program does what it measures and if we aren't measuring the number of stream miles mapped, it is hard to envision mapping for the entire nation ever getting done.

In recent years, FEMA has also discussed its work towards meeting the New, Valid, or Updated Engineering (NVUE) metric over the past several years with the goal being 80% NVUE compliant. For this metric, it is important to understand what NVUE is and what it is not. It <u>is</u> a metric to assess the quality of the existing FEMA flood map inventory. And FEMA's flood map inventory overall has improved significantly. It <u>is not</u>, however, a metric to understand how much of the nation has flood mapping. The NVUE percent attained is a ratio of all NVUE study miles divided by the total miles in FEMA's mapped inventory. That means when FEMA attains 80% NVUE, it means that only about 910,000 miles of flood mapping have updated or valid studies, the remaining 230,000 miles have not been updated, and 2.36 million miles have not been mapped at all. Also, even on NVUE-attained stream miles, it is important to remember that these have not been evaluated to be "valid" when it comes to residual risk zones or future conditions. Too often, though, NVUE gets confused with completing the job of mapping the nation.

Again using Licking County as an example, the following map shows that there are 1,032 stream miles and approximately 463 of those miles are mapped (less than 50%). Because FEMA considers Licking County to have a modified digital FIRM, all of the population of the county contributes to the 98% digital data (deployment) metric. All of the blue and red streams are those that need mapping in Licking County, Ohio and nearly all of that land, especially in the western part of Licking County, is suitable for and will likely result in future residential and commercial development.



Recognition of other federal, state and local data. In doing research for the updated Flood Mapping for the Nation report, ASFPM was concerned when we discovered that it appeared

that FEMA had not really progressed when it came to the number of stream miles mapped in the country since the time the original report was published in 2013. Yet the FEMA Administrator's 2016 Report to Congress on TMAC Recommendations identified the completion of "large scale automated engineering for 45,000 stream miles." ASFPM believes this is a reference to the base level engineering (BLE), an innovative automated flood mapping process that provides high quality, low cost flood risk information for non-urbanized areas. More recently ASFPM inquired as to whether these BLE miles were included in FEMA's flood mapping inventory and were told they were not. Further, some states have active flood mapping programs. Indiana, for example, recently completed a milestone in their state – all streams up to a square mile of drainage have been mapped. Unfortunately, these additional miles are not included in FEMA's inventory. According to the state flood mapping coordinator, it is difficult and inefficient to tell property owners that not only do they need to look at FEMA's flood maps/inventory, but they need to look at the state's inventory as well. ASFPM suspects that progress has indeed been made on increasing the number of stream miles mapped nationwide and urges FEMA to determine how their systems can serve up and account for these additional mapping activities.

Inclusions under the NFMP are tied to the Flood Insurance Rate Map (FIRM) which is problematic. Since the early days of the NFIP, the primary "map" that people are familiar with is the FIRM. Yet, today, digital databases serve up "layers" of flood hazard data. For example, FEMA's National Flood Hazard Layer (NFHL) serves up not only flood map data such as the 100-year or 500-year floodplain, but also information such as Coastal Barrier Resource System (CBRA) zones. Unfortunately, under the NFMP, all of these data are to be provided on the FIRM which provides for logistical challenges and could further delay the actual release of these data. The point is that at a minimum, FEMA should be able to collect, include, track and count for the purposes of metrics, data that it generates like BLE and data from other agencies such as residual risk inundation mapping from the Corps of Engineers (mentioned earlier) which would meet the intent of providing residual risk mapping information for the purposes of the NFMP. These additional flood risk datasets could be provided through mechanisms like the NFHL.

- **As part of the reauthorization of the NFIP, Congress should increase the authorization of the National Flood Mapping Program to at least $600 million annually.**
- **A metric must be developed for National Flood Mapping Program that measures the completeness of the required mapping elements for the entire nation.**

- **FEMA should prioritize the elimination of the paper map inventory and the modernization of all un-modernized maps.**
- **FEMA should establish national program performance standards and include various flood hazard related data layers for all flood hazard-related data layers (residual risk, base level engineering, future conditions, erosion, subsidence, closed lake basins, frazil ice, ice jams, tsunamis, debris flow and mud slides, relevant wetland and groundwater) so that data created by state, local, and other mapping partners can be readily utilized by FEMA and incorporated into the National Flood Hazard Layer and FIRMs as necessary.**
- **FEMA should develop a program and timeline to ensure future conditions flood data and residual risk data are incorporated into every new flood study.**

Cooperating Technical Partners Program

While part of FEMA's flood mapping effort, it's very popular Cooperating Technical Partners (CTP) program is a mechanism whereby states, tribes, regional agencies, communities, and universities can assume delegated flood mapping responsibilities in accordance with their capabilities. This partnership capitalizes on the interest, capability and most importantly local knowledge of flood mapping issues. From a risk communication standpoint, CTPs are often viewed as a trusted source of local knowledge. For example, when a CTP is introducing a preliminary flood map in a community, there is more ownership in the products by the community which can, in turn, fundamentally change the "us versus FEMA" mentality. Previously, legislation has been introduced in Congress to somehow create a mechanism for states and communities to produce flood maps. ASFPM believes that such legislation is not needed and efforts should be made to strengthen the existing CTP program instead.

DHS Flood Apex R&D Program

One deficiency ASFPM has noted is that unlike other science and regulatory agencies, FEMA does not have a robust research and development (R&D) capacity. While FEMA does well in some regards incorporating some of the best available science and technology when applied to the flood mapping program in particular, ASFPM believes that this ability is hampered by not having an internal R&D capacity. This, in turn, leads to not having an intentional R&D agenda. Intentionality is the key.

The Department of Homeland Security Science and Technology Directorate's Flood Apex Program was created in 2016 at the request of the Administrator of the Federal Emergency Management Agency (FEMA) to bring together new and emerging technologies designed to increase communities' resilience to flood disasters and provide flood predictive analytic tools

to FEMA, state and local governments, and other stakeholders. The program has a particular focus on new and emerging technologies including activities that focus on developing them. For example, one project is focused on using time-series satellite imagery to compliment flood risk mapping and visualizations. Another is using high performing and artificial intelligence to detect physical buildings from satellite images to develop a national inventory of structures in the floodplain. In short, Flood Apex has been a capable approach to addressing FEMA's R&D needs and could be of significant support to the flood mapping program in the future. Unfortunately, this program is slated to expire in FY 2021.

- **Congress should ensure that there is a specific function within DHS Science and Technology dedicated to Research and Development activities for flood loss reduction and ensure that FEMA's R&D needs are met.**

In Conclusion

Floods are this nation's most frequent and costly natural disasters and the trends are worsening. Comprehensively identifying the flood hazards in the United States is the foundational step that must be taken in order to have effective flood risk reduction policies and programs. As our testimony identifies, though, the pathway to providing that information involves multiple agencies and programs. While FEMA flood maps and their mapping platform may be the ultimate point of dissemination, we have already wasted too much time in developing a true national picture of flood risk.

ASFPM appreciates this opportunity to share our observations and recommendations with the Subcommittees. For any questions, please contact Chad Berginnis, ASFPM Executive Director, at *cberginnis@floods.org* (608 828-3000); or Merrie Inderfurth, ASFPM Washington Liaison, at *merrie@floods.org* (703 732-6070).