

# Flood Management and Infrastructure

## Goal

*Reduce the impact of flooding and extreme weather events on our citizens, businesses and critical infrastructure by developing a multidisciplinary plan and action strategy to maintain a resilient community.*

## Introduction

### Flooding and Climate Change

In Florida, the threat of hurricanes, tropical storms, and severe thunderstorms is well-known by residents. Climate change, however, is exacerbating their intensity. This is in part due to rising global temperatures causing an increase in evaporation rates, subsequently leading to more precipitation.<sup>[1]</sup> Humid areas such as Florida are expected to be most at risk for increased flooding as climate change worsens.<sup>[2]</sup> While much of Florida's newer infrastructure is designed to withstand flooding and high amounts of precipitation, many recent extreme weather events have exceeded the capacity of either natural or artificial drainage systems. This signifies a need to focus not only on infrastructure, but preparedness during extreme climate events.

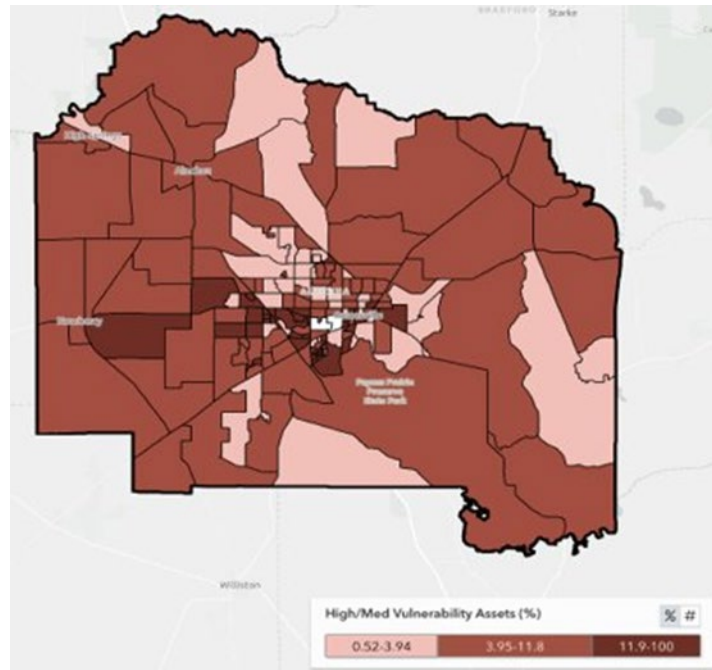
### Flooding in Alachua County

Like much of Florida, Alachua County will experience more intense/extreme events (higher daily totals) due to additional energy in storms and a warmer atmosphere that can hold more moisture caused by climate change. The newly developed high-resolution flood model for Alachua County revealed that the changing rainfall characteristics pose a greater risk of flooding (Table 3.1). This projected increase in flood risk is particularly high in areas with internally drained basins as shown in Figure 3.2.

| Asset Category          | Total Assets | 100-Year Rainfall-Induced Flooding |      |      |
|-------------------------|--------------|------------------------------------|------|------|
|                         |              | 2020                               | 2040 | 2070 |
| Critical Infrastructure | 735          | 116                                | 134  | 141  |

|  |        |             |             |              |
|--|--------|-------------|-------------|--------------|
|  |        | 16%         | 18%         | 19%          |
| Critical Community and<br>Emergency Facilities | 1,955  | 383<br>20%  | 467<br>24%  | 515<br>26%   |
| Natural, Cultural, and<br>Historic Resources   | 7,361  | 543<br>7%   | 804<br>11%  | 910<br>12%   |
| Residential                                    | 73,765 | 5700<br>8%  | 9080<br>12% | 10921<br>15% |
| Commercial                                     | 5,059  | 658<br>8%   | 881<br>10%  | 904<br>11%   |
| Services - Other                               | 811    | 137<br>16%  | 179<br>21%  | 205<br>24%   |
| Undeveloped Land<br>(Exposure Only)            | 14,009 | 7161<br>51% | 8434<br>60% | 8939<br>64%  |

**Table 3.1. Vulnerability Assessment Projection- 100-year Rainfall-Induced Flooding Risk for Asset Categories in 2020, 2040, and 2070**



**Figure 3.2. Percent of Residential Properties Highly Vulnerable to Current 100-Year Rainfall-Induced Flooding by Census Block Group**

The most obvious impact in Alachua County is the risk of flooding during heavy rainfall or storms. As Hurricane Irma demonstrated, floodwaters can inundate neighborhoods, causing household property damage, displacing residents, and disrupting daily life. There are notable disproportionate impacts to assisted living and affordable housing including manufactured housing. Our Vulnerability Assessment revealed that 12% naturally occurring affordable housing (NOAH) and subsidized housing is highly vulnerable to current rainfall-induced flooding.<sup>[3]</sup>

Floodwaters can also damage critical infrastructure such as roads, bridges, utilities, community services, and environmental assets. Approximately 75 percent of major roads (approximately 1,049 lane miles) in Alachua County could become inaccessible to emergency services to a 100-year flooding event in current conditions, which is projected to increase to nearly 85 percent of major roads or approximately 1,195 lane miles in 2040.

There are notable economic consequences to flooding. Frequent flooding in a neighborhood can lead to decreased property values, for instance. Businesses may suffer losses due to property damage and disruption of operations. Repairs and reconstruction can be costly and time-consuming, impacting the local economy and community services.

Repeated flooding in floodplain areas may force residents to relocate, causing population shifts and altering the demographics of the affected neighborhoods. Given flood pressures in other parts of the state, population increases due to climate migrants will start measurably increasing around 2040 up to an additional 26,000 people by 2100 and beyond. This is a concern of 68% of survey respondents.

Floodwaters can also pose risks to public health by contaminating water sources with pollutants, sewage, or chemicals. Additionally, flood events may require emergency evacuations, risking residents' safety.

Finally, flooding can damage or destroy cultural resources, resulting in cultural heritage and identity loss. Flood prevention that alters the natural water flow or encroaches on these areas can disrupt wildlife habitats and reduce biodiversity, signifying a need to find solutions that take human and our environment's needs into consideration.

## **Flooding Resiliency**

Flooding disproportionately impacts communities with inadequate or old infrastructure that are unable to withstand high levels of precipitation. As mentioned previously, our Vulnerability Assessment revealed that 12% of naturally occurring affordable housing (NOAH) and subsidized housing is highly vulnerable to current rainfall-induced flooding. Many other facilities with vulnerable populations, such as nursing homes or assisted-living facilities, are also considered to be highly vulnerable to flooding. These communities are often the ones who have the least means to repair many of the damages resulting from flooding, signaling a need to address inequities in flooding infrastructure.

## **Baseline & Targets**

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### **Alachua County Comprehensive Plan**

Understanding the urgency of flooding, the Alachua County Comprehensive Plan dedicates an entire section to stormwater management. The three elements for flooding are: Avoid, Minimize, and Mitigate. Its goal is to protect natural drainage features and the quality of waters as well as protect new and existing developments in accordance with adopted levels of service for floodplain management, water quantity and water quality (Stormwater Management Goal 1). It also establishes stormwater management standards for different types of facilities (Stormwater Management Element 3.1.1).

## **Past and Current Efforts**

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### **Alachua County Comprehensive Plan**

The Comprehensive Plan has helped implement several flood management codes into government operations. These include, but are not limited to:

**Policy 5.1.6** Conserve and enhance through the use of system upgrades the use of drainageways where appropriate as habitat corridors which allow the passage of wildlife between natural areas and throughout the County, as well as providing wildlife habitat.

**Policy 5.1.8** Alachua County shall require stormwater management facilities be designed in accordance with the Stormwater Management and Landscaping Policies of the Metropolitan Transportation Planning Organization (MTPO) as outlined in the MTPO Policies Manual as an integral part of the development, as a physical or visual amenity that provides usable open space or that resembles native habitat communities by planting native vegetation in and around the facility to the maximum extent feasible.

## **OBJECTIVE 7.1**

Stormwater management in floodplain areas shall protect the public health, safety and welfare by incorporating hazard mitigation and multi-functional designs.

**Policy 7.1.1** Alachua County shall continue participation in the State Local Mitigation Strategy program and emphasize public education programs for floodplain protection.

**Policy 7.1.2** Construction activities in the 100 year floodplain areas shall conform to the National Flood Insurance Program, and shall meet or exceed Chapter 65-25 and all other federal, state, regional, WMD and local regulations in effect on the date of adoption this comprehensive plan.

**Policy 7.1.3** All road construction and improvement projects within the 100-year floodplain shall be designed in such a manner as to avoid any increase in floodway obstruction, any increase in the peak rate or volume of stormwater runoff and any increase in pollutant runoff to the maximum extent technically feasible.

**Policy 7.1.4** A natural regulated buffer determined on a site-specific basis shall be required on public lands within the 100 year floodplain for the purposes of visual screening, stormwater runoff, erosion control, resource-based recreation where deemed appropriate, and public safety.

## **Physical Infrastructure**

In Alachua County, efforts have been made to update and implement physical infrastructure that can withstand high levels of precipitation and flooding. Large pump stations have been installed in areas with recurring flooding. We are also prepared to install temporary pumps in other areas of recurring flooding. Additionally, the County is buying out properties with repeated flooding.

## **Communication**

One of the first steps of addressing flooding is ensuring that the public is aware of any risks or upcoming intense weather so that they can make preparation and avoid any hazards. Staff

developed [Alachua County Ready](#) to provide real-time weather information to residents via text message. Text ALACHUA to 888-777 to receive real-time County updates during a large-scale incident or emergency.

[Another alert system](#) enables the County to provide residents with critical information quickly in a variety of situations, such as severe weather, unexpected road closures, missing persons and evacuations of buildings or neighborhoods. Residents will receive time-sensitive messages wherever they specify, such as their home, mobile or business phones, email address, text messages and more.

## **Floodplain Management**

Alachua County has an active Floodplain management program, where the County is Class 5 under the Community Rating Systems resulting in a discount on flood insurance policies in the County. The County provides base flood elevations (BFE) for Special Flood Hazard Areas that do not have a BFE assigned by FEMA (Zone A). BFE is used to build structures at a height above where the floodwaters are expected to reach during a 100-year flood event.

The County has regulations to avoid building in flood prone areas as well as providing for BFE to help avoid flooding for habitable structures.

Land development regulations have been implemented that require floodplain avoidance and compensating storage for fill in the floodplain.

## **Florida Building Code and Land Conservation Program**

Alachua County adopted the Florida Building Code with floodproofing standards, which includes:

- 4-foot elevation requirement for manufactured housing/mobile homes
- Anchoring required for propane tanks.

Our Land Conservation Program (see Natural Resources Chapter for more information) incorporates floodplain conservation, underpinning the value of our floodplains to our ecosystem and safety. We also adopted SRWMD current (as of 2023) rainfall depths that are consistent with near future rainfall conditions. Future conditions inundation modeling was performed as part of the Vulnerability Assessment.

## **Finance**

The Resilient Florida Grant program was designed to provide funding to increase climate resilience, especially in regard to sea level rise and flooding. Alachua County has received Resilient Florida Grants for the Vulnerability Analysis, Adaptation Planning and for specific resiliency projects. The County has received matching funds for property purchases from the

Resiliency Grants and counties to pursue other Grants such as Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance Program (FMA), and Hurricane Loss Mitigation Program (MLMP) when available.

## Future Strategies and Action Items

The following are ideas for future actions that the County could take to improve resiliency. Currently these are discussion points for the future.

### Physical Infrastructure

The most critical way we can improve flooding resilience is by improving and replacing the current physical infrastructure. It is important to keep in mind that as climate impacts worsen, Alachua County is projected to be at risk for flooding. This means that physical infrastructure improvements need to be made under the pretense that we will experience more 100-year flooding events.

| Table 3.2 Physical Infrastructure   |                                |  |  |
|---|--------------------------------|--|--|
| Action Plan Components  | Jurisdiction                   | Pros   | Cons   |
| Encourage Green Stormwater Infrastructure/Low Impact Design in areas already developed. This includes larger scale retrofits by the County and small-scale retrofits by individual property owners. | County, Local governments, WMD | Increases capacity and improves water quality issues | Requires support from all review agencies                          |
| Installation of more permanent pumps at areas with recurring flooding.  | County and local governments   | Quick response to a known local flooding issue       | Does not address the flooding issues and can be costly to maintain |

|  |                           |  |  |
|--|---------------------------|--|--|
| Include a flood mitigation component to water quality projects where possible. | County                    | Address flooding with water quality improvement          | Could add costs and additional agency review and oversight |
| Apply for Local Mitigation Strategy funds                                      | County, Local governments | Use funds to improve infrastructure impacted by flooding | Only available for public projects                         |

## Planning

Alongside strong infrastructure there must be sufficient plans in place to ensure that communities are at the least amount of risk as possible. This involves changing the way we develop and thorough research on which areas are most flood prone.

**Table 3.3 Planning**

| Action Plan Components  | Jurisdiction              | Pros   | Cons                               |
|---|---------------------------|--|------------------------------------|
| Require all new construction to be outside of floodplains.                          | County                    | Reduces the potential for flooding in future develops, saves significant money in longterm | Reduces available developable area |
| Coordinate with FEMA on new flood studies and possible funding for our own studies. | County, local governments | Support for additional funding to reduce costs   | Extends project timelines          |
| Initiate new flood study areas in   | County                    | Projects are more inclusive of entire  | Require additional funding sources |



|  |  |   |  |
|--|--|---|--|
| coordination with other jurisdictions. |  | impacted areas not just within one jurisdiction |  |
|--|--|---|--|

## Policy

Supporting infrastructure and planning are effective policy decisions that prioritize minimizing flooding risks and facilitate smart stormwater design.

**Table 3.4 Policy**

| Action Plan Components   | Jurisdiction              | Pros  | Cons   |
|--|---------------------------|---|--|
| Incentivize LID in new development with runoff quantity credit.  | County                    | Provides more options for developers  | Requires coordination with WMD reviewers                             |
| Allow certain areas to have stormwater use in large events like athletic fields and open space.            | County, Local Governments | Increases the multifunctionality of land, reduces potential runoff from development | May limit uses during and after rain events, may require more upkeep |
| Specific setbacks for large floodplains.   | County                    | Provides a protective buffer as increased flooding becomes more common              | Reduced developable land   |
| Adopt rainfall and require future conditions change factors when available for critical duration analysis. | County                    | Increase accuracy   | Increases complexity of analysis                                     |

## Communication

The most important aspect of flooding resilience is ensuring the safety of citizens and providing the most up-to-date information about flooding hazards. While the County has already developed an alert system for our citizens, it is also essential to provide informative data on potential flooding risks and projections for future flooding.

| Table 3.5 Communication                     |              |  |   |
|---|--------------|--|---|
| Action Plan Components                      | Jurisdiction | Pros   | Cons                                      |
| Make inundation models available to public. | County       | More accurate and latest data available for everyone | Misuse or misunderstanding of information |

## Finance

Financing flooding infrastructure ensures that projects are insured and completed efficiently. Without funding from sources such as grants, many resilience projects would not be possible. The County will continue to apply for grants and obtain funding.

| Table 3.6 Finance   |                             |   |  |
|---|-----------------------------|---|--|
| Action Plan Components  | Jurisdiction                | Pros  | Cons   |
| Develop planning strategies for protecting critical infrastructure. | County, Local Government    | Study funded through a recently awarded Resilient Florida Grant to be completed in early 2026 | Costs could be significant to address concerns |
| Special assessment districts for known flooded areas.               | County, City of Gainesville | Increase funds available to address   | Increase costs for residents in these areas    |

|   |                          |  |   |
|---|--------------------------|--|---|
|   |                          | specific areas with flooding problems    |   |
| Additional grant applications for State and Federal grants. | County, Local Government | Helps reduce local expenses for projects | Additional oversight and staffing needs |

## What Can You Do?

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### Sign Up for Text Alerts

Staying aware of the potential flooding risks in your community can help you create a plan of action. To stay up to date on potential flooding risks, sign up for severe weather alerts via Alachua County Ready and Alert Alachua.

Purchase flood insurance for property in areas that have a high potential of flooding now or in the future.

Install cisterns, rain barrels, and other stormwater capture systems and reuse water for irrigation needs. Consider building rain gardens to capture roof runoff or from other impervious areas to help reduce local flooding issues in your area.

## References

- <sup>[1]</sup> NASA. "How Does Climate Change Affect Precipitation?" <https://gpm.nasa.gov/resources/faq/how-does-climate-change-affect-precipitation>.
- <sup>[2]</sup> Tabari, H. "Climate Change Impact on Flood and Extreme Precipitation Increases with Water Availability." *Scientific Reports*, 2020.
- <sup>[3]</sup> NOAH consists of existing rental properties that are affordable to low-income households without public subsidy.