



ANNEX K FLOOD WARNING PLAN

Volusia County Flood Response Plan

Introduction

- A. Mission. Coordinate and facilitate resources to minimize the impacts of flood incidents of people, property, and the environment and the economy of Volusia County.
- B. Purpose. To establish responsibilities for agencies and organizations within Volusia County and document responsibilities of Volusia County Emergency Management in Regard to preparation for, response to, recovery from, and mitigating the effects of flood incidents within the county.
- C. Scope. The County of Volusia Flood Response Plan is incorporated in the Volusia County Comprehensive Emergency Management Plan. This plan addresses flooding incidents as described in each of the anticipated flood event scenarios, and provides the foundation for
 - a. The establishment of an organization and responsibilities for efficient and effective use of government, private sector, and volunteer resources if a flood incident occurs within Volusia County.
 - b. An outline of other participants responsibilities in emergency management activities within Volusia County is described in the Basic Plan of the VCEMP
- D. Organization. The Public Works Director of Volusia County functions as Incident Coordinator for all local agencies in regard to flood events within unincorporated Volusia County.

- E. Plan Update/ revision. As a part of the CEMP, this and all plans and annexes are living documents; once formally adopted by the Volusia County Council, Volusia County Emergency Management has the authority to modify / update any and all plans/annexes as conditions warrant. Any plan or annex updated will reflect the current revision date; however, the formal adoption date governs to formal adoption cycle. Every five years the plan, as a part of the Volusia County Comprehensive Emergency Management Plan, will be formally adopted by the Volusia County Council per Florida Division of Emergency Management and Florida Statute requirements. Other jurisdictions in Volusia County may formally adopt this plan and supporting documentation to meet Community Rating System Activity 610 requirements.

Policies

- A. Authority. This plan was developed, promulgated and is maintained pursuant to the following local, state, and federal agreements, statutes, and regulations:

- a. The National Response Framework, January 2008
- b. Volusia County Flood Response Plan, 2014
- c. The Volusia County CEMP, 2011
- d. FS 252, 2011

- B. Assignment of responsibilities

During a countywide flood event, the Volusia County Emergency Managers Advisory Group (MAG) will coordinate the flood response activities. This plan will be activated and implemented whenever a flood event threatens Volusia County

by the Director, Volusia County Emergency Management Division. Volusia County emergency management will notify the jurisdictions in Volusia county of any anticipated adverse weather and will forward National Weather Service advisory/watch/warning messages to the jurisdiction(s) that may be impacted by a flood event as soon as they are received

The County Emergency Management program will provide for the overall organization and direction in the development of all emergency notification, mitigation, preparedness, response, and recovery programs occurring within the County.

Volusia County Emergency Management will forward any National Weather Service flood advisories/ watches/ warnings to the affected jurisdictions. This DOES NOT alleviate the jurisdictions that may be impacted by the flood event from its responsibility to prepare for, respond to, and notify its citizens of the event.

The MAG will perform all duties imposed by F.S. 252. The MAG will review and recommend for adoption emergency management and mutual aid plans and agreements, and such resolutions and rules and regulations as are necessary to implement such plans and agreements.

- a. Emergency expenditures. Volusia County will authorize expenditure of County funds necessary to combat the disaster, protect the health and safety of persons and property, and provide assistance to disaster victims, as appropriate. In a flood situation, the County will request mutual aid from State and Federal governments, once local resources are exhausted.
- b. Prioritizing Volusia County resources: Policy level decisions involving the acquisition and distribution of food and water, supplies, equipment, and other material when critical shortages exist or are anticipated will be made by the MAG.
 - i. Volusia County maintains flood prevention materials such as sand and sand bags at various Barns around the County.
 - 1. Citizens will be allowed to fill sandbags and obtain plastic sheeting from the County prior to an anticipated flood event
- c. Provide the services and equipment to private citizens within Volusia County as necessary in response to the disaster after proclamation by the governor.
 - i. Providing necessary staff, participating in training and exercises, providing representatives to incident management as a point of contact during emergencies, and allocating equipment and resources to the event.
 - ii. Providing for the effective utilization of resources within or from outside the County to assist in an effective response to a flood event. Requests for assistance will be made through established emergency management channels

- iii. Providing emergency disaster coordination thorough the Emergency Operations Center
- d. Managers Advisory Group shall act as the single point of contact for the legislative body of their jurisdiction for emergency policy decisions
- e. Public Works Director and/or Incident Commander; responsible for establishing and maintaining emergency response coordinating, including planning, training, development of incident management facilities, dissemination and implementation of plans.
- f. Establishing an on-site Incident Command post. Assume field command of the Incident and request needs for support to the incident through the County Emergency Operations Center
- g. Army Corps of Engineers
 - i. Upon request by officials of the local jurisdiction and the County Emergency Management Director, the Corps of Engineers may serve as a resource provider to emergencies within Volusia County, with the authority to deploy personnel to assist under an all-hazards emergency response
 - ii. Technical, material, and direct assistance are the forms of response the US Army Corps of Engineers can provide to water- related disaster within the County. Technical assistance includes providing guidance on flood fight techniques and emergency construction methods; inspecting flood protection projects and dams to identify problems and recommend corrective measures; and providing hydraulic or hydrologic analysis,

geotechnical evaluations, topography and stream data, maps, and historic flood or storm information. Material assistance includes issuing supplies (primarily sandbags) and loaning pumps. Direct assistance includes rescue operation and on the ground flood fight operations.

Situation

- A. Volusia County consists of approximately 1210 square miles with 50 miles of Atlantic Coastline. Approximately 982 square miles are located in unincorporated Volusia County. On the east side of the County, the Halifax River and the Indian River/ Mosquito Lagoon make up the Intracoastal Waterway and form long, narrow estuaries which separate the mainland from the barrier island. There is one inlet, Ponce Deleon Inlet, located near the middle of the coastline which serves as the County's only passage through which ocean tides and hurricane surges propagate into the Intracoastal Waterway. The St. Johns River is the largest river in the County and flows along the west side of the County, flowing South to North. Besides the St. Johns River, the other two major streams are the Tomoka River and Spruce Creek located on the eastern side of the County. The Tomoka River has a tributary area of 159 square miles, which serves the northeastern and central portions of the County. The river flows from south to north, and discharges through the Tomoka Basin to the Halifax River. Spruce Creek has a tributary area of approximately 91 square miles, which serves southeastern Volusia County. The system also includes Spruce Creek Swamp, Turnbull Creek, and the B-19 Canal.

- B. Emergencies or disasters can occur at any time causing significant human suffering; injury and death; public and private property damage; environmental degradation; loss of essential services; economic hardships to businesses, families and individuals; and disruption of government entities.
- a. Local government officials recognize their responsibilities with regard to public safety and accept them in the implementation of this plan.
Coordination exists between emergency response organizations on a daily basis. This interaction is based on the frequent and routine practice of day-to-day responses.
 - b. Demand on emergency response agencies becomes much greater in times of crisis, and the prioritization of response to an emergency becomes critical. In addition, the resources of many of the supporting public and private organizations that normally do not interact except in crisis need to be mobilized on a cooperative basis.
 - c. Citizens, businesses, government agencies, and industries will utilize their own resources and should provide for themselves during the first three to five days of an emergency or disaster.
 - d. Nothing in this plan is intended to diminish the emergency preparedness responsibilities of Volusia County. Its first priority is meeting the needs of the citizens within its jurisdiction; and each jurisdiction maintains their right to attend to their own circumstances before committing resources to cooperative disaster response. Participation in mutual aid agreements with other agencies is entirely voluntary. Nothing in this plan is intended to

diminish the emergency preparedness responsibilities of individual citizens. Circumstances during disasters may not allow immediate response to meet all the needs of the public. Every individual should be prepared and able to provide for themselves for the first three to five days of an emergency or disaster. A free market economy and existing distribution systems should be maintained as the primary means for continuing operations of the economic and private sector systems. Normal business procedures may require modification to provide essential resources and services.

- e. In situation not specifically addressed in this plan, responding agencies will have to improvise and carry out their responsibilities to the best of their abilities under the circumstances.
 - f. When a disaster occurs, or when one is imminent, the Emergency Management Director will activate the County Emergency Operations Center (CEOC)
 - g. In a major event, the resources within the County will be overwhelmed and outside assistance will be requested through CEOC to State,
- C. Flood response planning requires knowing how much time warnings may provide for flooding conditions. The more time available for a response, the more options are open to the responders. In Volusia County, there is normally at least 72 hours advance warning prior to a rain event, often times more in the case of a tropical storm/ hurricane. There is no single item, report, or warning that will 'predict' flooding. The decision to implement a flood response plan lies with the elected

officials of the impacted communities or government. Promulgating NWS severe weather advisories, watches, and warnings to affected jurisdictions will occur when the messages are received.

- D. The best approach to ensure maximum possible response times is to develop a monitoring plan for locations that give maximum warning of rising levels. Those locations should be easily monitored by gauges placed by the South East River Forecast Center (SERFC). SERFC provides ample flood warnings via their river level prediction forecast available at <https://water.weather.gov/ahps/forecasts.php>. As soon as the SERFC river gauges indicate that any of the water bodies monitored will reach the action stage, public notification messages will be issued through the various means available: press releases, advisories, 'reverse- 911', twitter, Facebook, e-mail alert, and law enforcement vehicle loud speaker notification to select areas.

Concept of Operations

- A. The responsibility for on-site field command and leadership, and operations during flood emergency situations in Volusia County, resides in the County Public Works Director.
- B. The PWD is responsible for carrying out flood response and recovery in the
- C. Emergency Management in the County is conducted under the universally accepted emergency management phases of mitigation, preparedness, response, and recovery. Mitigation and preparedness are constant and continuous processes.

- D. The Flood Response Plan reflects the roles and responsibilities of agencies and jurisdictions within the County for emergency management operations.
- E. Department Heads may augment County staff to perform emergency functions as directed by MAG
- F. Departments will retain their identity and autonomy during flood response operations. When County agencies assist each other, personnel will remain under the supervision of their own agency. They will receive mission assignments from the coordinating agency.
- G. Departments not having assigned emergency mission will carry out such duties as may be directed by the MAG, Public Works Director and/or Incident Commander.
- H. The County plan will make provisions for actions necessary to minimize injuries and damage, and expedite recovery from the effects of a disaster. Priority throughout the emergency period will be the preservation of life and protection of property.
- I. If the situation exceeds or threatens the initial response capabilities, the Incident Commander will contact the Volusia County Emergency Management Director to activate additional response capabilities through established procedures.
- J. The Volusia Sheriff's Office Dispatch Center ("Central") is the designated 24-Hour County Warning Point.
 - a. Incident Command System. The Incident Command System (ICS) is the basis for all direction, control, and coordination of emergency response and recovery efforts conducted under this plan. The authority of the

Incident Commander is limited to those powers specifically granted by the statute, legislative authority, or derived from this plan, Emergency response and supporting agencies and organizations agree to carry out their objectives in support to the incident command structure to the fullest extent possible.

- b. Designation of the incident Commander is made by the first responding agency
- c. Operational direction and control of emergency management response and recovery activity will be conducted on-site by the Incident Commander. Requests for assistance will be made through normal channels until the County Emergency Operations Center has been activated, at which time requests for assistance and resources will be directed to the EOC.
- d. The County Public Works Director , upon notification of an actual emergency or disaster will evaluate the situation, alert the appropriate local response agencies, request activation of local warning and emergency public information systems, submit resource requests, initiate response activities, and coordinate the situation analysis and damage assessment.
- e. Volusia County Emergency Management will coordinate disaster recovery and restoration efforts to include collection evaluation compilation and forwarding of reports and damage assistance requests; restoration of essential services; State, Federal, and other disaster assistance

programs; identify potential future mitigation initiatives; conduct reviews and critiques of emergency plans and procedures; issue an after action report identifying areas needing improvement and recommending actions to correct deficiencies.

Plan Maintenance

- A. The Volusia County Flood Response Plan will be reviewed and updated annually during the Statewide Hurricane Exercise, or as conditions warrant.
- B. Stakeholder input will be solicited and recommended changes will be incorporated into the FRP

Definitions

- A. Flooding; Flooding is an overflowing of water onto land that is normally dry. It can happen during heavy rains, when ocean waves come onshore, when snow melts too fast, or when dams or levees break. Flooding may happen with only a few inches of water, or it may cover a house to the rooftop. The most dangerous flood event, the **flash flood**, happens quickly with little or no warning; other flooding events occur over a long period and may last days, weeks, or longer. Volusia County does not experience 'flash flooding'. Flood events in the County result after extended periods of heavy rainfall. Ponding and road flooding can occur in low lying areas during brief heavy rainfall events associated with fast moving thunder storms.
- B. Coastal flooding; Coastal flooding occurs when a hurricane, tropical storm, or tropical depression produces a deadly storm surge that overwhelms coastal areas as it makes landfall. Storm surge is water pushed on shore by the force of

the winds swirling around the storm. This advancing surge combines with the normal tides to create a hurricane storm tide, which can increase the average water level 15 feet or more. The greatest natural disaster in the United States, in terms of loss of life, was caused by a storm surge and associated coastal flooding from the great Galveston, Texas, hurricane of 1900. At least 8,000 people lost their lives.

- C. Inland flooding; when tropical cyclones move inland, they are typically accompanied by torrential rain. If the decaying storm moves slowly overland, it can produce rainfall amounts of 20 to 40 inches over several days. Wide spread flash flooding and river flooding can result.
- D. Flash Flood; A flash flood is a **rapid rise of water** along a stream or low-lying urban area. Flash flooding occurs within six hours of a significant rain event and is usually caused by intense storm that produce heavy rainfall in a short amount of time. Excessive rainfall that causes rivers and streams to swell rapidly and overflow their banks is frequently associated with hurricanes and tropical storms, large clusters of thunderstorms, supercells, or squall lines.

VII. Citizens Information on Floods

- A. Preparing for a flood. To prepare for a flood, you should:
- Build an emergency kit and make a family communications plan.
 - Avoid building in a floodplain unless you elevate and reinforce your home.
 - Elevate the furnace, water heater and electric panel in your home if you live in an area that has a high flood risk.

- Consider installing “check valves” to prevent flood water from backing up into the drains of your home.
- If feasible, construct barriers to stop floodwater from entering the building and seal walls in basements with waterproofing compounds.
- <https://www.volusia.org/services/public-protection/emergency-management/get-prepared/>

B. Driving. Flood Facts:

The following are important points to remember when driving in flood conditions:

- Six inches of water will reach the bottom of most passenger cars causing loss of control and possible stalling
- A foot of water will float most vehicles.
- Two feet of rushing water can carry away most vehicles including sport utility vehicles (SUV's) and pick-ups.
- Do not attempt to driver through a flooded road. The depth of water is not always obvious. The road bed may be washed out under the water, and you could be stranded or trapped.
- Do not drive around a barricade. Barricades are there for your protection. Turn around and go the other way. Remember: “Turn Around, Don't Drown!”
- Do not try to take short cuts. They may be blocked. Stick to designated evacuation routes.
- Be especially cautious driving at night when it is harder to recognize flood dangers.

C. Flood Facts & Flood Insurance

- Floods and flash floods happen in all 50 states. Floods are our #1 natural disaster.
- Everyone lives in a flood zone. (For more information, visit <https://www.fema.gov/flood-maps/products-tools/know-your-risk/homeowners-renters>.)
- Most homeowners insurance does not cover flood damage.
- If you live in a Special Flood Hazard Area (SFHA) or high –risk area and have a federally backed mortgage, your mortgage lender requires you to have flood insurance. (To find you flood risk, fill out the Flood Risk Profile.)
- Just an inch of water can cause costly damage to your property.
- Flash floods often bring walls of water 10 to 20 feet high (N/A for Volusia County).
- A car can easily be carried away by just one foot of floodwater.
- Hurricanes and winter storms are common (but often overlooked) causes of flooding.
- New land development can incase flood risk, especially if the construction changes natural runoff paths.
- Federal disaster assistance is usually a loan that must be paid back with interest. For a \$50,000 loan at 4% interest, your monthly payment would be around 240\$ a month (\$2,800 a year) for 30 years. Compare that to a \$100,000 flood insurance premium, which is about \$400 a year (\$33 a month)

- If you live in a moderate-to-low risk area and eligible for the preferred risk policy, your flood insurance premium may be as low as \$129 a year, including coverage for your property's contents.
- You are eligible to purchase flood insurance as long as your community participates in the national Flood Insurance Program. Check the Community Status Book to see if your community is already a NFIP partner. <https://www.fema.gov/flood-insurance/work-with-nfip/community-status-book>
- It takes 30 days after purchase for a policy to take effect, so it's important to buy insurance before the floodwaters start to rise.
- In a high-risk area, your home is more than likely to be damaged by flood than a fire.
- Anyone can be financially vulnerable to floods. People outside of high-risk areas file 20% of NFIP claims and receive one-third of disaster assistance for flooding.
- The average annual U.S. flood losses in the past 10 years (2001-2010) were more than \$2.7 billion.
- When your community participates in the Community Rating System (CRS), you can qualify for an insurance premium discount of up to 45%. Read more about CRS Ratings. <https://www.fema.gov/floodplain-management/community-rating-system>
- Since 1978, the NFIP has paid over \$36.9 billion for flood insurance claims and related costs (as of 12/31/10).

- Over 5.5 million people currently hold flood insurance policies in more than 21,000 communities across the U.S.

For more policy and claim statistics, visit the National Flood Insurance Program. <https://www.floodsmart.gov/>

D. During an event

- Monitor www.weather.gov and www.volusia.org/emergency for the latest watches, warnings, and current conditions.
- Listen to area radio and television stations. Consider purchasing a NOAA Weather Radio to receive continuous weather information, flood warnings, reports of flooding in progress, and other critical information directly from nearby NWS local Weather Forecast office.
- Keep abreast of road conditions.
- Be prepared to evacuate at a moment's notice. When a storm surge, flood, or flash flood warning is issued for your area, follow your evacuation plan and head for higher ground, and stay there.
- Stay away from floodwaters. If you come upon a flowing stream where water is above your ankles, stop, turn around, and go another way. Six inches of swiftly moving water can sweep you off your feet. Be especially cautious at night when it is harder to recognize flood danger.
- Keep children out of water. They are curious and often lack judgement about running water or contaminated water.

- If you come upon a flooded road while driving, DO NOT attempt to cross flowing water. TURN AROUND AND DON'T DROWN. If you are caught on a flooded road and waters are rising rapidly around you, get out of the car quickly and move to higher ground. Most cars can be swept away by less than two feet of moving water.

E. Re-entering your flooded home

When returning to a home that's been flooded after natural disasters such as hurricanes, tornados, and floods, be aware that your house may be contaminated with mold or sewage, which can cause health risks for your family.

- If you have standing water in your home and can turn off the main power from a dry location, then go ahead and turn off the power, even if it delays cleaning. If you must enter standing water to access the main power switch, then call an electrician to turn it off. **NEVER turn power on or off yourself or use an electric tool or appliance while standing in water.**
- Have an electrician check the house's electrical system before turning the power on again.
- If the house has been closed up for several days, enter briefly to open doors and windows to let the house air out for a while (at least 30 minutes) before you stay for any length of time.

- If your home has been flooded and has been closed up for several days, presume your home has been contaminated with mold. (Protect Yourself from Mold.)
- If your home has been flooded, it also may be contaminated with sewage. (See After a Hurricane or Flood: Cleanup of Flood Water.)
https://www.fema.gov/sites/default/files/2020-08/sandy_factsheet1_cleaning_flooded_bldgs.pdf
- If flood or storm water has entered your home, dry it out as soon as possible. Follow these steps:
 - If you have electricity and an electrician has determined that it's safe to turn it on, use a "wet-dry" shop vacuum (or the vacuum function of a carpet steam cleaner), an electric-powered water transfer pump, or sump pump to remove standing water. If you are operating equipment in wet areas, be sure to wear rubber boots.
 - If you do not have electricity, or it is not safe to turn it on, you can use a portable generator to power equipment to remove standing water. **Note: if you must use a gasoline-powered pump, generator, pressure washer, or any other gasoline-powered tools to clean your home, never operate the gasoline engine inside a home, basement, garage, carport, porch, or other enclosed or partially enclosed structures, even if the windows or doors are open. Such improper use can create high levels of carbon monoxide and cause carbon monoxide poisoning.**

- If weather permits, open windows and doors of the house to aid in drying-out process.
- Use fans and dehumidifiers to remove excess moisture. Fans should be placed at a window or door to blow the air outwards rather than inwards, so not to spread the mold.
- Have your home heating, ventilating, and air-conditioning (HVAC) system checked and cleaned by your maintenance or service professional who is experienced in mold clean-up **before you turn it on**. If the HVAC system was flooded with water, turning on the mold-contaminated HVAC will spread mold throughout the house. Professional cleaning will kill the mold and prevent later mold growth. When the service determines that your system is clean and if it is safe to do so, you can turn it on and use it to help remove excess moisture from your home.
- Prevent water outdoors from reentering your home. For example, rain water from gutters or the roof should drain away from the house; the ground around the house should slope away from the house to keep basements and crawl spaces dry.
- Ensure that crawl spaces in basements have proper drainage to limit water seepage. Ventilate to allow the areas to dry out.
- If your home is severely damaged and you have flood insurance, you may be eligible for a federal loan to mitigate your home against future flood losses. Call Volusia County Emergency Management for more information.

VIII. Important phone numbers

Volusia County Emergency Management	386-254-1500
Volusia County Sheriff's Office	386-248-1777
American Red Cross	866-438-4636
Florida Department of Health	850-245-4321
Florida Emergency Information Line	800-342-3557
National Weather Service Melbourne	321-255-0212

IX. Flood warning dissemination and example messages

1. System Description/Emergency Warning Dissemination

The Volusia County Flood Threat Recognition System, located at the Volusia County Emergency Operations Center, consists of the following elements:

- Florida Emergency Warning and Information Network (EMWIN)
- River stage gauges throughout and County of Volusia Rivers and estuaries.
- State Warning Point satellite communications telephone system (EMNET)
- Meterologix© Storm Sentry Weather Radar/WeatherWire© Alert System.
- Baron's "Threat Net" Spotter net weather message notification system.
- National Weather Service telephone notification, provided to the EOC when a potential flood event may impact Volusia County.
- Audible notification/alert provided by county and municipal law enforcement officials in the form of public address system announcements from county/municipal patrol vehicles.

- On-line, real-time flood prediction and storm surge modeling provided by Hurrevac and Hurrtrak© software systems
- 21st Century Communications “Reverse-911” System, which provides a recorded message which contains the specific information provided by the flood threat warning originating agency (able to reach 100% of Volusia County). Text messaging is also available through this system.
- Brighthouse Cable “cable over-ride”, which permits the publishing, by the EOC, of flood alert messages to all households that subscribe to cable.
- Twitter (@VolusiaEmergencyInfo) and Facebook real-time social media (search “Volusia County Emergency Management “on Facebook).
- Email alerts through the Volusia County email alert system, available at <https://www.volusia.org/services/public-protection/emergency-management/>
- Advisories that are issued every 12 hours during a flood event. The advisories are disseminated to all municipal EM Coordinators, ESF's, local media (newspapers and television stations), critical facilities (school board, hospitals, health department).

The River gauges placed by USGS, NOAA, and the Florida Department of Transportation provide adequate advance warning, usually days, before flooding can be expected to occur. Gauges have been placed in the Tomoka River at 11th Street, U.S. Highway 92, Canal B-19 at Willow Run and at State Road 415. Hydrologic data recorded by the gauges are reported to the Volusia County Emergency Operations

Center on a daily basis, and are available “real time” 24/7 on-line from NOAA at the advanced hydrologic Prediction Center at <https://water.weather.gov/ahps/>. These gauges enable a “real time” flood forecast to be promulgated in a timely manner, and provide accurate estimates of up-river arrival times and peak flows and elevations.

The gage information is utilized by the National Weather Service to forecast specific flooding conditions throughout the affected portion of Volusia County. The NWS promulgates the forecasted flooding through a variety of means: First notification is received over the EMWIN system, followed by an audible alert and hard-copy notification that is received via Meterologix© WeatherWire© Alert System. Finally, the Florida Department of Emergency Management notifies the Volusia County Emergency Operations Center via their satellite communications system (EmNet). These systems are tested on at least a weekly basis; some systems, such as the state warning point satellite communications system and the 21st Century Communications “Reverse-911” system, are tested on a monthly basis. The flood warning system is tested on a year-round basis in the form of communications checks with the state and issuance of Twenty-First Century telephone notifications. Additionally, it is reviewed annually during the Statewide Hurricane Exercise every May prior to hurricane season.

The flood alert warnings provide explicit detail of the expected flooding, location to be affected, time that the flooding is expected to begin, anticipated extent of the flooding in area and amount, and the time the flood alert expires. These alerts are provided for all anticipated flooding events, including storm surge, hurricane/tropical storm flooding from rainfall, periods of brief, intense rainfall associated with localized weather events.

The HurrEvac/Hurrtrak computerized storm surge prediction models also provide expected rain amounts, in inches, and areas expected to be most heavily impacted by the rain event. Audible alerts are provided by the county/municipal law enforcement agencies in the form of public announcements from their patrol vehicles. They are utilized extensively in the event of an evacuation needs to be ordered for a hurricane or intense, localized flooding occurs. This system provides a back-up benefit to those residents who do not have telephones and have not received telephone notification via the "Reverse-911" system.

The Volusia County flood warning dissemination system is described in the Flood Information Section of the "Bell South Complete Phonebook Covering Volusia/Flagler Counties".

2. Sample Message

The following is a typical flood warning message issued by the Melbourne Office of the National Weather Service. When issued, these messages are disseminated to EM Coordinators, ESF's, critical facilities, and the public.

FLASH FLOOD WARNING

NATIONAL WEATHER SERVICE MELBOURNE FL

807AM EDT FRI MAY 22 2009

THE NATIONAL WEATHER SERVICE IN MELBOURNE HAS ISSUED A

*FLASH FLOOD WARNING FOR... NORTHEASTERN VOLUSIA COUNTY IN
FLORIDA... THIS INCLUDES THE CITIES OF... NEW SMYRNA BEACH...

SOUTH DAYTONA.... PORT ORANGE... PONCE INLET... ORMOND BEACH...
HOLLY HILL... EDGEWATER... DAYTONA BEACH... *UNTIL 1100AM EDT

*AT 805 AM EDT... NATIONAL WEATHER SERVICE DOPPLER RADAR
INDICATED A PERSISTENT BAND OF SHOWERS AND STORMS MOVING
ONSHORE FROM THE ATLANTIC. THIS RAINFALL IS MOVING INTO AN AREA
THAT HAS ALREADY RECEIVED TORRENTIAL RAINFALL AMOUNTS IN THE
PAST FEW DAYS AND THE ADDITIONAL RAINS ACT TO FURTHER WORSEN
AN ALREADY SERIOUS FLOODING SITUATION. ADDITIONAL RAINFALL
AMOUNTS OF TWO OR FOUR INCHES OF ISOLATED HIGHER AMOUNTS MAY
OCCUR THOROUGH LATE MORNING. PERSONS IN THESE AREAS SHOULD
TAKE QUICK ACTION TO PROTECT LIFE AND PROPERTY.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

FLOODING IS OCCURRING OR IS IMMINENT. MOST FLOOD RELATED DEATHS
OCCUR IN AUTOMOBILES. DO NOT ATTEMPT TO CROSS WATER COVERED
BRIDGES... DIPS... OR LOW WATER CROSSING. NEVER TRY TO CROSS A
FLOWING STREAM... EVEN A SMALL ONE... ON FOOT.

AFFECTED COUNTIES: IN FORIDA: VOLUSIA

X. Development exposed to flooding in Volusia County

1. Number and types of buildings vulnerable to flooding

A. Residential –

B. Commercial –

XI. Impacts of flooding on health, safety, and community functions

The health, social and economic impacts of major floods are devastating, affecting people's physical and mental health and disrupting and dispersing communities.

Impacts can range from immediate death, injury and harm from contaminated water, through lasting psychological consequences caused by damaged homes, loss of personal possessions and financial issues. Populations may be isolated by floodwaters, particularly in the southern, rural part of Volusia County, and the barrier island.

In Volusia County, following a flooding, snakes and other creatures will be displaced from their normal habitat. Fire ants and other insects will also be displaced from their nests. Sewage from septic tanks may contaminate flood waters, posing a risk to health. Sharp objects, broken glass, rocks, holes, and other obstacles will be hidden by floodwaters. Due to these risks avoid walking through flood waters without adequate foot and leg protection. Use a stout walking stick or cane to assist with mobility.

The adverse human health consequences of flooding are complex, far-reaching, and difficult to attribute to the flood event itself. There is very limited quantitative evidence of the health impacts of floods. The main health impacts are deaths, injuries and mental health illness during the flood event itself, during the restoration process, or from effects brought about by damage to major infrastructure, including displacement of populations.

On average, the higher the water depth and the greater the flow velocity of a flood, the greater the damage to property. Most flood-related deaths can be attributed to rapid-rise floods. Floods with fewer deaths and severe injuries were attributed to mild temperatures, government rescue plans, civilian rescue operations and disaster

occurrence at times when most people were at home. Other health problems and injuries were reduced by measures taken by trained military personnel and distribution of boots and gloves to responders. Driving into flood waters is dangerous, as cars can become buoyant and swept away by a foot of water. The fatal effects of slow-rise river floods proved to be lower if people were aware the risk of flooding and better prepared for a potential disaster. Sprains, strains, lacerations, abrasions and contusions are the most commonly reported injuries following floods. The risk of communicable disease outbreaks following flooding is small in industrialized countries (excluding tropical regions of industrialized countries like Australia) due to effective water treatment and sewage pumping, safe drinking-water, and public health infrastructure. However, national ministries and governments might need to take additional action on case-by-case basis.

Providing accurate information on safe management of flood water during evacuation and clean-up and the actual situation is essential. Chronic health effects followed by flooding are explained by exposure to human animal viruses during evacuation, or substantial psychology or physical stress at the time of flooding. Furthermore, flooding is associated with increased rates of anxiety and depression stemming from the experience itself, troubles brought about by geographic displacement, damage to the home or loss of familiar possessions and stress in dealing with builders and other repair people in the aftermath. The persistence of flood-related health effects is directly related to flood intensity. A comprehensive surveillance of morbidity from floods is limited, however. Hospitals, ambulances, retirement homes,

schools and kindergarten in flood-prone areas are at risk, and evacuation of patients and vulnerable groups might represent a further risk.

The potential impacts on community property and functions from flooding and flood events is significant. The Volusia County Local Mitigation Strategy, Chapter 6, Vulnerability Assessment pages 6:28 and 6:31- 6:36; and 6:38, provides a detailed analysis of the potential impact to people and built property to flood damage.

As noted by the number of critical facilities located in the Special Flood Hazard Area, the potential disruption to community services could be significant. Wide spread power outages, loss of lift stations, inability of response vehicles to access flooded neighborhoods, and hazardous materials incidents are some the impacts that have occurred in Volusia County due to flooding.

Secondary and tertiary effects due to flooding also occur. Secondary effects are those that occur because of the primary effects and tertiary effects are the long term changes that take place. Among the secondary effects of a flood are:

- Disruption of services –
 - Drinking water supplies may become polluted, especially if sewerage treatment plants are flooded. This may result in disease and other health effects, especially in under developed countries
 - Gas and electrical service may be disrupted.
 - Transportation systems may be disrupted, resulting in shortages of food and clean-up supplies. In under developed countries food shortages often lead to starvation.

- Soil erosion and land degradation – soil erosion removed valuable top soil which is the most productive part of the soil profile. This results in lower yields and higher costs of production.

- Health Impacts

- Heart attacks
- Drowning
- Poisoning
- Injuries
- Snake and insect bites
- Heat exhaustion
- Mental illness

- Long – term effects (secondary effects)

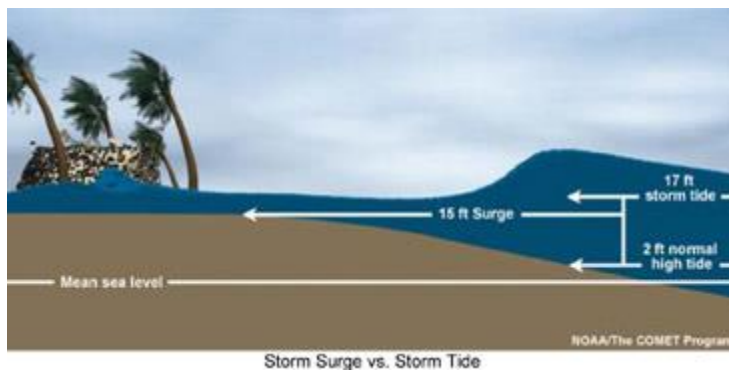
- Location of river channels may change as the result of flooding, new channels develop, leaving the old channels dry.
- Sediment deposited by flooding may destroy farm land (although silt deposited by floodwaters could also help to increase agricultural productivity)
- Jobs may be lost due to the disruption of services, destruction of business, etc. (although jobs may be gained in the construction industry to help rebuild or repair flood damage).
- Insurance rates may increase.
- Corruption may result from misuse of relief funds.
- Destruction of wildlife habitat.

- Population relocation to less flood-prone areas (out-of-county migration).

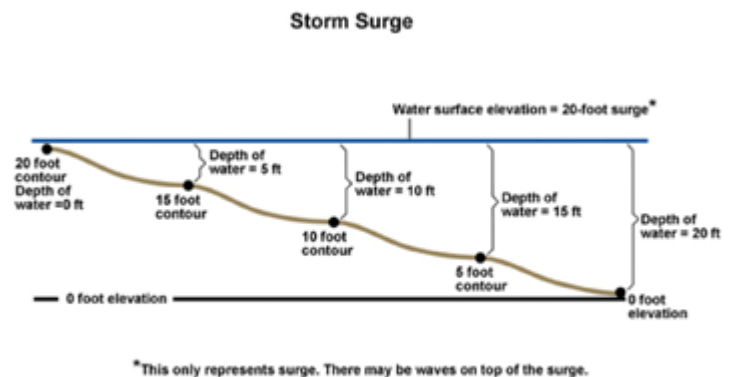
Storm Surge

What is a storm surge?

A storm surge is a rise above the normal water level along a shore resulting from strong onshore winds and/or reduced atmospheric pressure. Storm surges accompany a tropical cyclone as it comes ashore. They may also be formed by intense low-pressure systems in non- tropical areas.



Storm Surge + Normal Tide = Storm Tide



The combination of storm surge and normal (astronomical) tide is known as a 'storm tide'. The worst impact occurs when the storm surge arrives on top of a high tide. When this happens, the storm tide can reach areas that might otherwise have been safe. On top of this are pounding waves generated by powerful winds.

The area of sea water flooding may extend along the coast for over 100 miles, with water pushing several miles inland if the land is low lying.

The combined effects of the storm tide and waves can knock down buildings, wash away roads, and run ships aground. If you are caught in your home or in a car when a significant storm surge arrives, you may not survive.

The paths of cyclones are often erratic, which makes it hard to forecast exactly when and where a cyclone will cross the coast. This makes it difficult to predict how high the astronomical tide will be when the storm surge strikes, since the time difference between high and low tide is only a few hours. As a result, the Bureau of Meteorology, in its warnings to the public, makes the 'worst case' assumption that the cyclone will cross the coast at high tide.

Had Cyclone Tracy arrived in Darwin during a high tide, the devastation would have been even worse. Similarly, a low tide saved Townsville from a dangerous storm surge that accompanied Cyclone Althea in 1971.

Storm surges and tsunamis

Storm surges and tsunamis are generated by quite different phenomena. While both can cause inundation and significant damage in coastal regions, they have quite different characteristics.

A storm surge is generated by weather systems forcing water onshore over a generally limited stretch of coastline, it will normally build up over a time frame of a few hours, as the cyclone or similar weather system approaches. Normally wind waves on top of the surge will contribute to this effect.

A tsunami is generated by earthquakes, undersea landslides, volcanic eruptions, explosions, or meteorites. These travel great distances, sometimes across entire oceans affecting vast lengths of coastal land.

What should you do?

You need to plan well ahead of time.

Are you under threat?

If you live or work in the coastal tropics or subtropics, find out from your local emergency services or local council whether you are in a surge prone area. If you are, decide where you will go in event of a storm surge. You might have a friend living on higher ground with whom you could go and stay. Wherever you're nearest safe high ground shelter might be, work out the safest way to get there. To find out if you live in a storm surge area, go to <https://www.volusia.org/services/public-protection/emergency-management/types-of-disasters/floods/storm-surge.shtml> , scroll down to the middle of the page and click on storm surge mapping

Are you ready to evacuate?

Now is the time to plan what you will do in the event of evacuation. Will you have essential medicines? What about vital documents? What will you do with your pets?

Talk with your local council or Emergency Services about what you plan to do.

Annex A **Volusia County Flood Response Plan – Flood Response Actions**

1. Volusia County Emergency Management Division is the agency responsible for forwarding national Weather Service flood advisory, watch, and warnings to the jurisdictions in Volusia County. However, per Florida Statute, this does not alleviate the responsibility of local government to notify its citizens of impending flood events or its ability to help citizens prepare for and respond to a flood event. Volusia County Emergency Management will coordinate with jurisdictional emergency Management Coordinators to assist in promulgating NWS flood advisory, watch, and warning messaging.
2. Volusia County has a distinctive geology that requires somewhat different flood response actions based on location. The west side of the county- west of DeLand Ridge- the county consists of closed basins; that is there is no natural drainage to rivers or the ocean. Communities along the St. Johns River, which flows south to north, are impacted by rising waters as the result of rainfall events. Significant rainfall events can occur south of Volusia County that do not directly impact the county itself. However, as the St. Johns flows south to north, a tropical storm that impacts the southeast part of the state can cause major flooding along the St. Johns River days, or even weeks after the event. Fortunately, there is enough advance notice (several days, usually) provided by the NOAA South East River Forecast Center and the real time river gauges located along the St. Johns to allow residents and government officials sufficient time to prepare and respond to the event. West Volusia County areas other than those along the St. Johns River impacted by significant rain events much as the east side of the county, that is low lying areas will flood whenever there is a major rain event. The major differences is rainfall is directed to the Halifax and Tomoka rivers, either directly via swales and outfalls, or from detention/retention areas, then to the two rivers.
3. East Volusia County – east of the DeLand Ridge – rainfall drains to the Halifax and Tomoka Rivers and then to the Atlantic Ocean. This is known as an “open basin”. Flooding in the east of the county occurs in low-lying areas when the storm water system is overwhelmed, and water is no longer able to flow into the Halifax and Tomoka Rivers. This occurs when there is a strong “Nor’easter” that pushes the water to the west, preventing water from flowing from the Halifax and Tomoka Rivers into the Atlantic Ocean. This condition is exacerbated by high tides, particularly during high tides when there is a full moon. Flooding also occurs during periods of unusually heavy rain over an extended period of time, such as the “No-Name” rain event of 2009.

While there is one real time river gauge located on the Tomoka River near Holly Hill, to date categories have not been established, nor are historic crest data available. However, anecdotal data is sufficient to indicate that when the Tomoka and Halifax Rivers approach 9 feet, yards and some structures along both rivers will flood.

Fortunately, Volusia County does not experience true “Flash Flood” events anywhere in the county. Floods occur only after extended periods of heavy rainfall. This provides sufficient time to alert citizens to prepare for the event.

Volusia County west of the DeLand Ridge

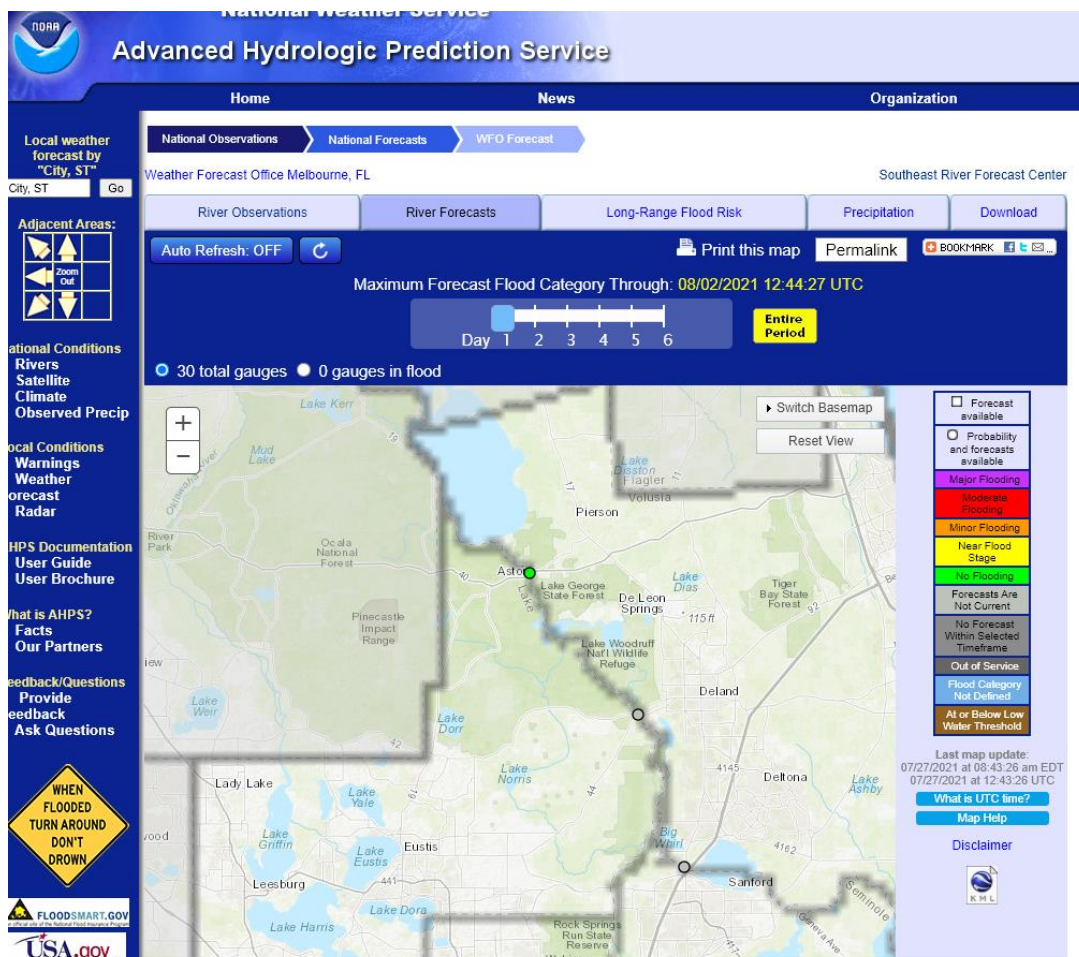
The following charts illustrate various river heights at different locations along the St. Johns River with actions that will be taken when the forecast indicates that the river will reach various levels at each site.

In general, the causes of increase river height include:

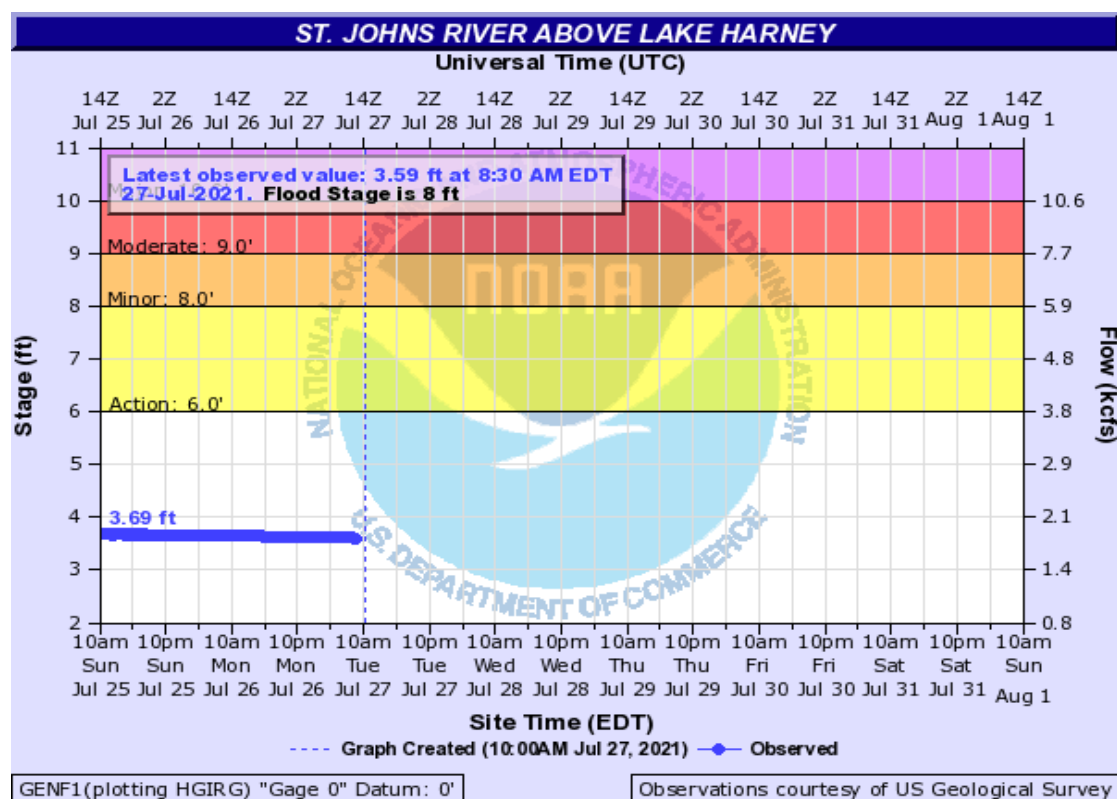
1. Large amounts of rainfall over a short period of time
2. Small, steady amounts of rainfall over a long period of time

As conditions warrant, the on-duty Volusia County Operations Officer will monitor all gauges every four hours.

River gauge locations- St. Johns River



1. St. Johns River above Lake Harney

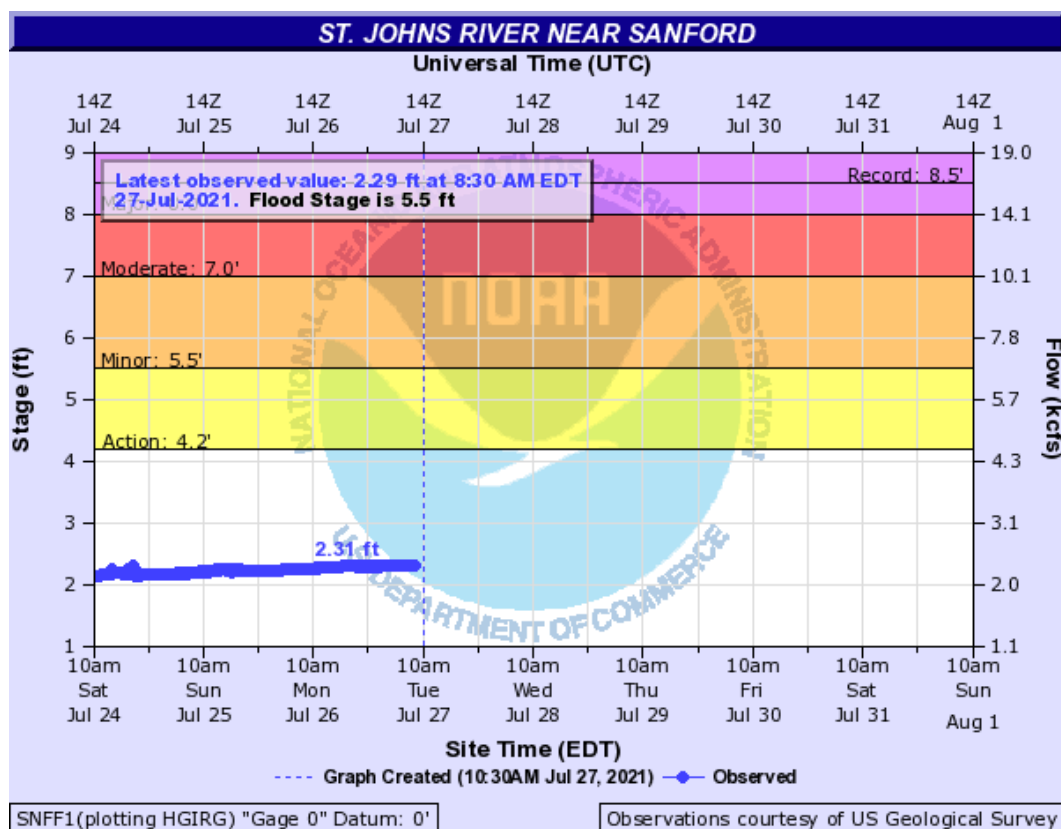


Gauge Height	Category	NOAA Description of Flood	Action
6.0 -6.5	Action Stage	No Wake Zones in effect and county parks closed for areas east of Lake Monroe to Lake Harney. Minor flooding to a few low lying areas along the river.	Coordinate with FWC/VSO to increase no-wake zones. Notify residents to take precautions. Coordinate with PIO to issue press releases/social media messages. Alert Public Works that sandbags may be necessary
7.0-7.5	Action Stage	Water approaches boat ramps, docks in Lake Jesup Park and Mullet Lake Park. Some docks, islands and small trees along the river north of Lake Harney will be covered with water, making boating hazardous.	Coordinate with FWC/VSO to increase no-wake zones. Notify residents to take precautions. Coordinate with PIO to issue press releases/social media messages. Alert Public Works that sandbags may be necessary
8.0 – 8.3	Minor Flooding	Water moves into yards on Prevatt Road off State Road 46 near Lake Harney.	Make sandbags available to residents of affected areas.

		Flooding of boat ramps and roads occurs in Mullet Lake Park. Docks are partially submerged along the river between Lake Harney and Lemon Bluff.	Coordinate with ARC to put shelters on standby. Continue to issue press releases/social media messages. Prepare for road closures. Prepare to activate VC EOC
8.5 – 8.8	Minor Flooding	Water surrounds homes on stilts on Prevatt road, entering garages on the first story. Water fills yards and ditches along Whitcomb Drive and Lake Harney road. Roads flood in the Palm Shores and Mullet Lake areas. Water covers Whitcomb Road.	Make sandbags available to residents of affected areas. Coordinate with ARC to put shelters on standby. Continue to issue press releases/social media messages. Prepare for road closures. Prepare to activate VC EOC
9.0 – 9.3	Moderate Flooding	Water enters the first story of homes on Whitcomb Drive between Crossover Lane and Lake Harney Road. Water covers Mullet Lake Park. Many secondary roads are flooded near Lake Harney. Flooding in the Hatbill Road area near Loughman Lake.	Partially activate the VC EOC Continue actions as described previously Prepare local state of emergency declaration.
9.5	Moderate Flooding	Water begins to move into homes in low lying areas along the river. Flooding around the Black Hammock area near Lake Jesup.	Partially activate the VC EOC Continue actions as described previously Prepare local state of emergency declaration.
10.0	Major Flooding	Flooding of homes in low lying areas becomes more significant. Many secondary roads are impassable, limiting access to homes.	Close roads as needed. Provide emergency sheltering (as required). Begin pumping where feasible. Declare local state of emergency Continue with press releases/social media messages

10.5 – 10.8	Major Flooding	Water covers many secondary roads near the river, limiting access to homes to boats or high terrain vehicles. Flooding of homes along secondary roads near the river becomes more significant. Water begins to encroach on State road 46 near Jungle Road and Prevatt Road. Water covers State Road 46 and it may become impassable near Jungle Road and Prevatt Road. Standing water on secondary roads near the river deepens to more than three feet in some areas. Flooding becomes more significant to structures and marinas from above Lake Harney to the Lake Jesup area.	Close roads as needed. Provide emergency sheltering (as required). Begin pumping where feasible. Declare local state of emergency Continue with press releases/social media messages
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2. St. Johns River Near Sanford



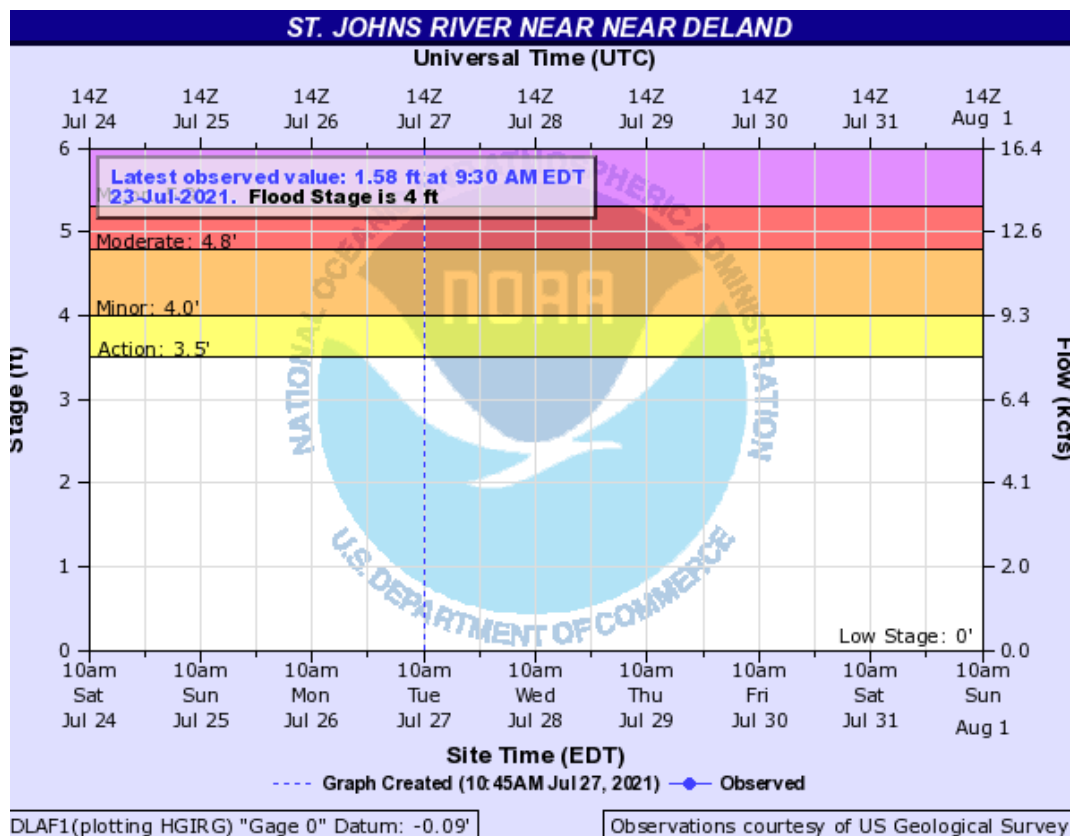
Gauge Height	Category	NOAA Description of Flood	Action
4.2	Action Stage	No wake zone and parks closed along the river, also some boat ramps closed.	Coordinate with FWC/VSO to increase no-wake zones. Notify residents to take precautions. Coordinate with PIO to issue press releases/social media messages. Alert Public Works that sandbags may be necessary
5.5	Minor Flooding	Water surrounds homes and covers some driveways in the Stone Island area near Enterprise in Volusia County. Water enters yards and floods docks in the River Oaks Estates subdivision.	Make sandbags available to residents of affected areas. Coordinate with ARC to put shelters on standby. Continue to issue press releases/social media messages. Prepare for road closures. Prepare to activate VC EOC

6.0 – 6.2	Minor Flooding	Water encroaches on low lying roads, also pool enclosures and patios in the Stone Island area. Water completely surrounds many homes in the Stone Island and Still Brook subdivisions. Pool enclosures and patios become flooded. Water covers many of the roads. Flooding occurs on Enterprise Road and in the Bethel Loop subdivision.	Make sandbags available to residents of affected areas. Coordinate with ARC to put shelters on standby. Continue to issue press releases/social media messages. Prepare for road closures. Prepare to activate VC EOC
6.5	Minor Flooding	Water enters a few lower lying homes in the Stone Island and Stillbrook subdivisions. The road into Stone Island becomes impassable. Water rises onto low lying property near Sanford. Parks and docks are flooded near Lake Monroe.	Make sandbags available to residents of affected areas. Coordinate with ARC to put shelters on standby. Continue to issue press releases/social media messages. Prepare for road closures. Prepare to activate VC EOC
7.0	Moderate Flooding	Water begins to move over sea wall around Lake Monroe and rises into grassy areas around the sea wall. Water begins to encroach on Seminole Boulevard.	Partially activate the VC EOC Continue actions as described previously Prepare local state of emergency declaration.
7.4	Moderate Flooding	Many secondary roads are flooded and may become impassable around Lake Monroe and in Enterprise. Rising water begins to impact more areas of Stone Island and water approaches homes in River Oaks Estates.	Partially activate the VC EOC Continue actions as described previously Prepare local state of emergency declaration.
8.0	Major Flooding	Flooding becomes more significant to low lying structures and marinas along the river in Volusia and Seminole counties, including Sanford, Enterprise and Lake Monroe.	Close roads as needed. Provide emergency sheltering (as required). Begin pumping where feasible.

			Declare local state of emergency Continue with press releases/social media messages
9.0	Major Flooding	Flooding becomes more significant to the Sanford waterfront area. Water approaches low lying areas on the waterfront.	Close roads as needed. Provide emergency sheltering (as required). Begin pumping where feasible. Declare local state of emergency Continue with press releases/social media messages
9.5	Major Flooding	Water encroaches on Sanford Landing Apartments and other low lying structures along the waterfront.	Close roads as needed. Provide emergency sheltering (as required). Begin pumping where feasible. Declare local state of emergency Continue with press releases/social media messages
10.0	Major Flooding	Water enters the old Post Office and Sanford Landing Apartments in Sanford.	Close roads as needed. Provide emergency sheltering (as required). Begin pumping where feasible. Declare local state of emergency Continue with press releases/social media messages
10.5	Major Flooding	Water enters the Regatta Shores Apartments and Towne Center Apartments in Sanford.	Close roads as needed. Provide emergency sheltering (as required). Begin pumping where feasible. Declare local state of emergency Continue with press releases/social media messages
11.0	Major Flooding	Water enters the Sailpoint Apartments, Lake Monroe Inn, City Hall and approaches the Courthouse in Sanford.	Close roads as needed. Provide emergency sheltering (as required). Begin pumping where feasible.

			Declare local state of emergency Continue with press releases/social media messages
13.0	Major Flooding	Water level rises in parking lots at Central Florida Regional Hospital and approaches New Tribes Mission in Sanford.	Close roads as needed. Provide emergency sheltering (as required). Begin pumping where feasible. Declare local state of emergency Continue with press releases/social media messages

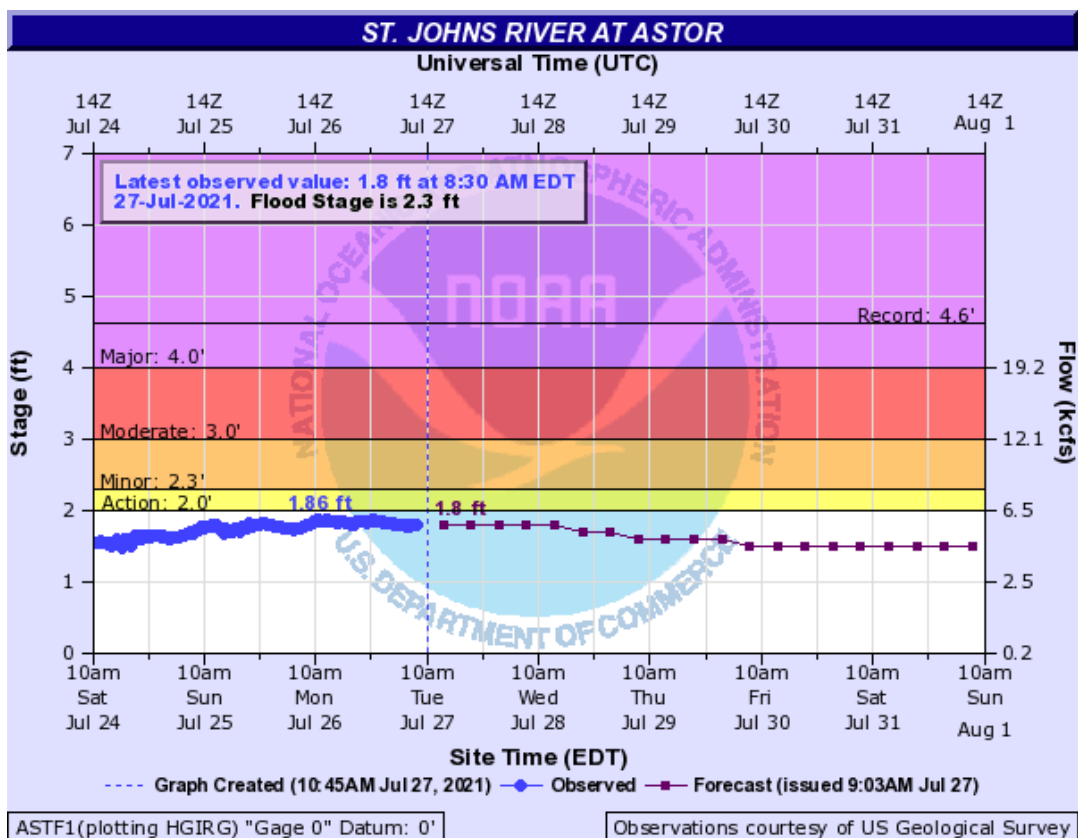
3. St. Johns River near DeLand



Gauge Height	Category	NOAA Description of Flood	Action
3.5	Action Stage	Flooding of campsites and trails occurs at Hontoon Island State Park.	Coordinate with FWC/VSO to increase no-wake zones. Notify residents to take precautions. Coordinate with PIO to issue press releases/social media messages. Alert Public Works that sandbags may be necessary
4.0	Minor Flooding	Docks and piers are completely submerged at Pier 44 Marina. Many docks are partially submerged at Hontoon Landing Marina	Make sandbags available to residents of affected areas. Coordinate with ARC to put shelters on standby. Continue to issue press releases/social media messages. Prepare for road closures.

			Prepare to activate VC EOC
4.5	Minor Flooding	Water moves into yards and approaches buildings around Hontoon Island.	Make sandbags available to residents of affected areas. Coordinate with ARC to put shelters on standby. Continue to issue press releases/social media messages. Prepare for road closures. Prepare to activate VC EOC
4.8	Moderate Flooding	Water starts to enter low lying buildings around Hontoon Island. Many secondary roads and homes in low lying areas are flooded.	Partially activate the VC EOC Continue actions as described previously Prepare local state of emergency declaration.
5.3	Major Flooding	Major flooding occurs to many structures and marinas along the river and in the Hontoon Island area.	Close roads as needed. Provide emergency sheltering (as required). Begin pumping where feasible. Declare local state of emergency Continue with press releases/social media messages

4. St. Johns River near Astor



Gauge Height	Category	NOAA Description of Flood	Action
2.0	Action Stage	Water begins to move into yards and cover boat ramps in low lying areas along the river.	Coordinate with FWC/VSO to increase no-wake zones. Notify residents to take precautions. Coordinate with PIO to issue press releases/social media messages. Alert Public Works that sandbags may be necessary
2.3	Minor Flooding	Minor flooding of low lying streets and yards north of Fox Road on Lake County side of Astor, and from River Road northward on Volusia side of river. Water begins to cover docks at South Moon Fish Camp.	Make sandbags available to residents of affected areas. Coordinate with ARC to put shelters on standby. Continue to issue press releases/social media messages. Prepare for road closures. Prepare to activate VC EOC

2.8	Minor Flooding	Docks and boat ramps covered at South Moon Fish Camp and approaching sea wall at Blair's Jungle Den.	Make sandbags available to residents of affected areas. Coordinate with ARC to put shelters on standby. Continue to issue press releases/social media messages. Prepare for road closures. Prepare to activate VC EOC
3.0	Moderate Flooding	Moderate flooding, with water covering yards and further encroaching on many low lying homes near the river. Flooding of many yards and low lying roads near the river.	Partially activate the VC EOC Continue actions as described previously Prepare local state of emergency declaration.
3.5	Moderate Flooding	Many yards and streets along the river, and with canals flooded, water enters the first floor of low lying homes. Flooding to docks and yards at condominiums on Juno Trail and docks at Astor Bridge Marina. Roads flooded in South Moon Fish Camp and starting to move over the sea wall at Blair's Jungle Den.	Partially activate the VC EOC Continue actions as described previously Prepare local state of emergency declaration.
4.0	Major Flooding	Major flooding occurs, with water entering the first story of many homes and businesses along the river. Some roads inaccessible and rescues likely needed.	Close roads as needed. Provide emergency sheltering (as required). Begin pumping where feasible. Declare local state of emergency Continue with press releases/social media messages