United States Environmental Protection Agency

# Preparedness, Resilience, and Response Tools for Water and Wastewater Utilities

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# Presentation Overview

- Flood Resilience Guide
- Hazard Mitigation Guide
- Federal Funding for Utilities -Water/Wastewater- in National Disasters (Fed FUNDS)
- Incident Action Checklists
- Water Utility Response On-The-Go! Mobile App

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# Flood Resilience: A Basic Guide for Water and Wastewater Utilities

# What does the guide do?

- Flooding is the most common hazard in the US, causing more damage than other weather-related event.

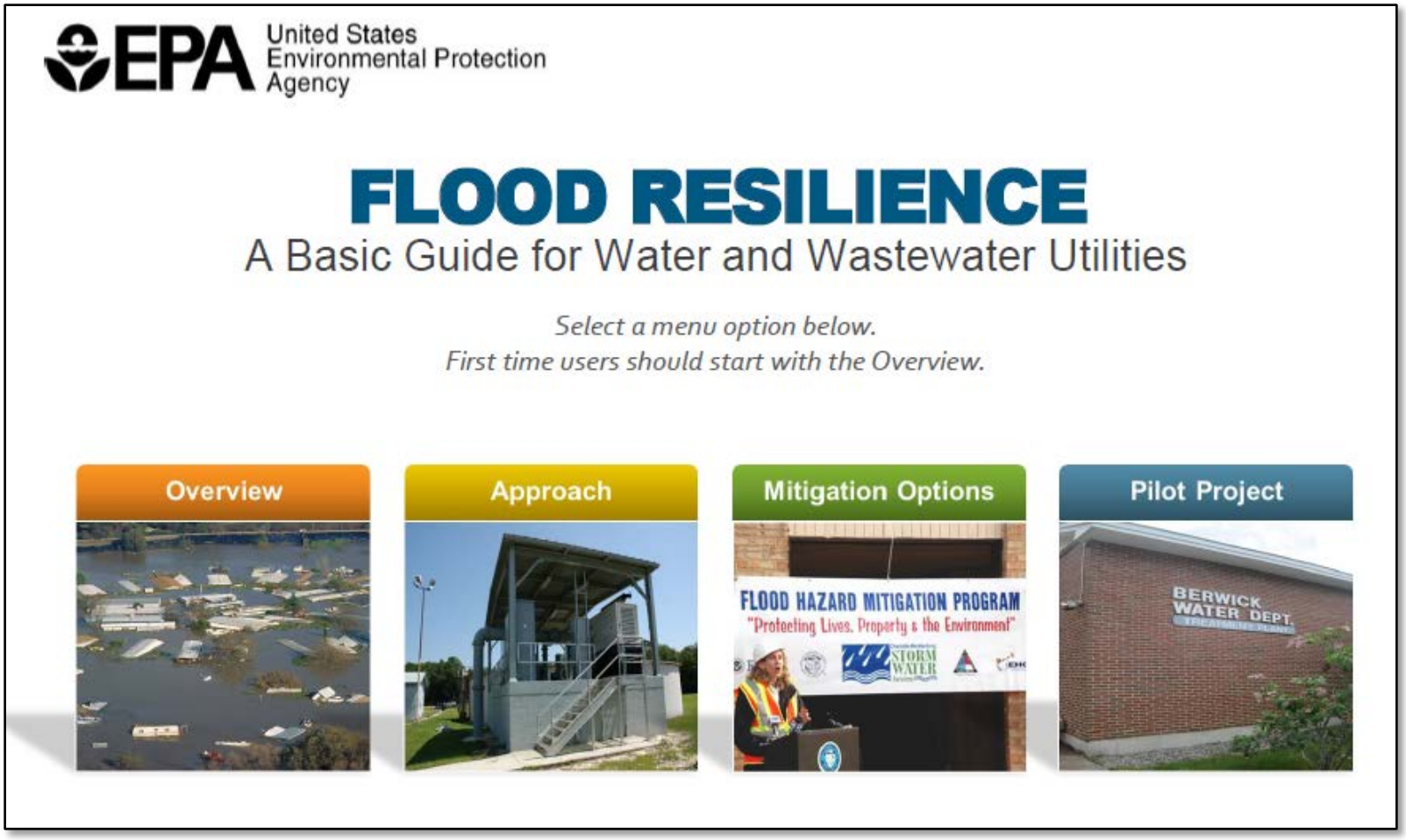
- It is ongoing challenge for drinking water and wastewater utilities (located in low lying areas) as more frequent/intense storms and sea levels rise.

- Floods can:
  - inundate a facility
  - damage equipment
  - disconnect chemical tanks
  - break distribution lines
  - cause power outages

- The overall result can be severely disrupted operations.

- *This guide will assist small and medium sized utilities to become more prepared and flood resilient in the future.*

With a user-friendly layout, the Guide provides *worksheets*, *instructional videos*, and *flood maps* to help utilities through a simple, 4-step process!



# Approach

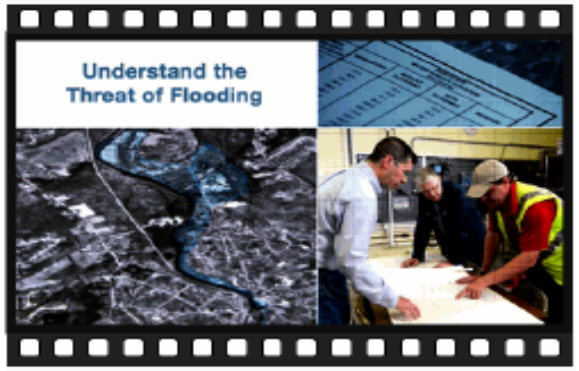


## Approach to Flood Resilience

**STEP 1** Understand the Threat of Flooding → **STEP 2** Identify Vulnerable Assets & Determine Consequences → **STEP 3** Identify & Evaluate Mitigation Measures → **STEP 4** Develop Plan to Implement Mitigation Measures

### STEP 1: UNDERSTAND THE THREAT OF FLOODING

Flooding depends on various factors including rainfall, topography, river-flow, drainage and tidal-surge. The threat of flooding is based on the likelihood that such a flooding event will occur. Learn how the Berwick Water Department (BWD) evaluated their threat of flooding from the video. Also, the Federal Emergency Management Agency (FEMA) is a resource to help you. FEMA produces maps of a "100-year flood" (a flood event that has a one percent chance of occurring in a given year) and a more catastrophic "500-year flood" (a flood event that has a two tenths of a percent chance of occurring in a given year). Click on the Step 1 worksheet icon below so that you can document the flooding threat and obtain FEMA *Flood Maps*.




*Click on the image to view the video.*

*STEP 1 Worksheet*

Click here to document the threat of flooding to your utility.

Worksheet

# Worksheets

FLOOD RESILIENCE: A Basic Guide for Water and Wastewater Utilities

Worksheet

## STEP 1: Worksheet

To better understand the threat of flooding, your utility should first examine historical flooding data and review Federal Emergency Management Agency (FEMA) Flood Maps. Below are instructions for evaluating the threat of flooding at your utility

To assist you, there are example tables completed with sample data.
Click on the icon to the right to open blank tables for you to input your utility's data

**1.1 Have you reviewed utility records of past flooding events?** ☐ Yes ☐ No

If no, review how past flooding events have threatened your utility. Use various sources, including utility records, newspapers, websites and hazard mitigation experts, to collect previous flooding data. Enter your utility's past flooding information into Table 1.

EXAMPLE OF COMPLETED TABLE 1 – PAST FLOODING EVENTS

| Event Information (e.g., Date, Name, Type*, Flood Elevation) | Description of Damage (Operational, Public Health, & Economic Impacts) |
|---|---|
| April 2007, "Patriot's Day Storm," Nor'easter, 238.5 ft | Collapsed water storage tank and damage to pump stations and chemical storage. Operated on backup power generator. Boil water notice issued for several days. Financial impacts were roughly $100,000. |

** Tropical storm, hurricane, spring thaw/snowmelt, levee failure, etc.*

**1.2 What potential sources of flooding could impact your utility?**

- ☐ Swollen rivers/streams
- ☐ Costal flooding
- ☐ Spring taw
- ☐ Flash floods
- ☐ Levee/dam failure
- ☐ Non-natural causes (e.g., main breaks)

**1.3 Have you obtained FEMA Flood Maps?** ☐ Yes ☐ No

If no, go to the Map Service Center to find FEMA Flood Maps, categorized by community. Flood Maps show areas that will be affected by both 100-year and 500-year floods. A "100-year flood" is a flood event that has a one percent chance of occurring in a given year. A "500-year flood" is a flood event that has a two tenths percent chance of occurring in a given year. Click on the icon to learn more about interpreting a Flood Map. If your Flood Map is not up to date, talk with your local community planning department or floodplain manager.


**1.4 Identify which floodplains your utility systems are located within.**

Locate your utility systems, such as intake, treatment, distribution, storage tank and pump stations, on your community's Flood Map to determine which floodplains they are located within. Summarize your findings in Table 2.

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## Table 2 –
### UTILITY SYSTEMS WITHIN FLOODPLAIN (FROM STEP 1)

| Utility Systems | 100-year Floodplain Elevation (_____ ft) | 500-year Floodplain Elevation (_____ ft) |
|---|---|---|
| Intake ( _____ ft ) | | |
| Treatment ( _____ ft ) | | |
| Distribution/Collection ( _____ ft ) | | |
| Storage Tank ( _____ ft ) | | |
| Pump Stations ( _____ft ) | | |
| | | |
| | | |

# Mitigation

## MITIGATION OPTIONS FOR SPECIFIC ASSETS/OPERATIONS

Click the photographs of assets/operations at drinking water (DW) and wastewater (WW) to get tables of flood mitigation measures for that specific asset/operation.

*DW Assets*

Water Intake, Distribution and Storage

Booster Stations and Other Pumps

Drinking Water Treatment Plant

*DW & WW Assets*

Buildings

Chemical and Other Storage

Instrumentation and Electrical Controls

Power Supply

*WW Assets*

Lift Stations

Headworks

Wastewater Treatment Plant

Previous | Main Menu | Next

# Mitigation (cont.)

FLOOD RESILIENCE: A Basic Guide for Water and Wastewater Utilities

Return to Mitigation Options

## Mitigation Options

### BOOSTER STATIONS AND OTHER PUMPS

☑ Drinking water

Flood waters can severely damage pumps, thereby impacting the entire drinking water system from intake through distribution. Similarly, loss of facility power could render pumps inoperable without adequate backup power. Vulnerable water facility control systems include pump controls, variable frequency drives, electrical panels, motor control centers and Supervisory Control and Data Acquisition (SCADA) systems.

See the following checklist for potential flood mitigation optior

| ✓ | Mitigation Options for Booster Stations and Other Pumps | Cost |
|---|---|---|
| **1. Prevent booster stations from flooding.** | | |
| | a) Procure temporary flood barriers (e.g., sandbags) for use in minor floods. | $ |
| | b) Install permanent physical barriers (e.g., flood walls, levees, sealed doors). | $$ |
| **2. Protect critical components if booster stations do flood.** | | |
| | a) During upgrades or design of new equipment, develop capability to temporarily remove and safely store vulnerable components in advance of a flood. | $-$$$ |
| | b) Waterproof, relocate or elevate motor controls, variable frequency drives, computers and electrical panels to a higher elevation by constructing platforms or integrating controls into existing buildings or infrastructure on-site. | $$ |
| | c) De-energize systems prior to flooding to mitigate damage to electrical components. | $ |
| | d) Replace non-submersible pumps with submersible pumps, if cost effective. | $$-$$$ |
| | e) Replace standard electrical conduits with sealed, waterproof conduits. Replace | $$$ |

# FLOOD RESILIENCE

## A Basic Guide for Water and Wastewater Utilities

*Select a menu option below.*
*First time users should start with the Overview.*


***https://www.epa.gov/waterutilityresponse/flood-resilience-basic-guide-water-and-wastewater-utilities***

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# Hazard Mitigation for Natural Disasters: A Starters Guide for Water and Wastewater Utilities

*Select a menu option below. New users should start with Overview Hazard Mitigation.*

Overview Hazard Mitigation

Join Local Mitigation Efforts

Develop Mitigation Projects


Implement and Fund Project

Mitigation Case Study

EPA

## What does the guide do?

- The primary focus of the guide is getting utilities involved in their local hazard mitigation plan.

- It helps utilities:
  - Partner with their local mitigation planners
  - Get mitigation projects listed in local mitigation plans (participation is a requirement for FEMA funding)
  - Identify potential hazard mitigation projects for various natural disasters
  - Identify ways to implement and fund mitigation projects

# HAZARD MITIGATION FOR NATURAL DISASTERS

## A Starter Guide for Water and Wastewater Utilities

*Select a menu option below. New users should start with Overview Hazard Mitigation.*

Overview Hazard Mitigation

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EPA

Next ▶

# Join Local Mitigation Efforts





## Join Local Mitigation Efforts

### Partner with your Local Mitigation Planner

Talk to your local mitigation planner because he or she is responsible for developing the hazard mitigation plan to decrease the risk to your community from various hazards. Since your utility is critical to the community, your local planner wants to help you mitigate hazards and list your proposed mitigation projects in the local plan.

- **How do I contact my Local Mitigation Planner?** Contact your State Hazard Mitigation Officer, who can then connect you to your county or local mitigation planner.
- **What should I say to the Local Mitigation Planner?**
  - Introduce yourself and express interest in learning more about mitigation efforts.
  - Ask about what hazards are of most concern and what local mitigation efforts are currently underway in your town, city, or county.
  - Share your concerns about certain hazards and possible mitigation actions you are considering.
  - Ask how your utility can be included in the next local mitigation plan update (5-year cycle for updates).
  - Ask how your utility can become involved: how can I become a participating member in the local hazard mitigation process; are there upcoming meetings; can your utility participate in the update process and provide a mitigation project to list in the plan?

Click for Other Helpful Local Partners in Hazard Mitigation

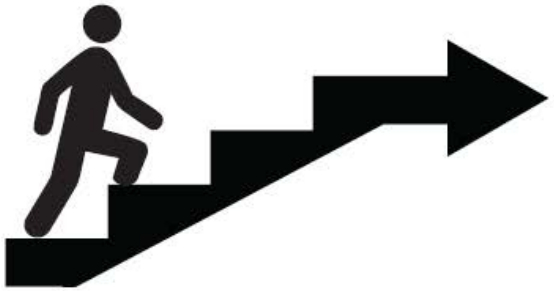
# Develop Mitigation Projects





## Steps

Click the icon to the right to learn about the four steps to develop mitigation projects.



## Mitigation Resources by Natural Disaster

Click below to explore specific resources and mitigation examples for each natural disaster.

Flood

Earthquake

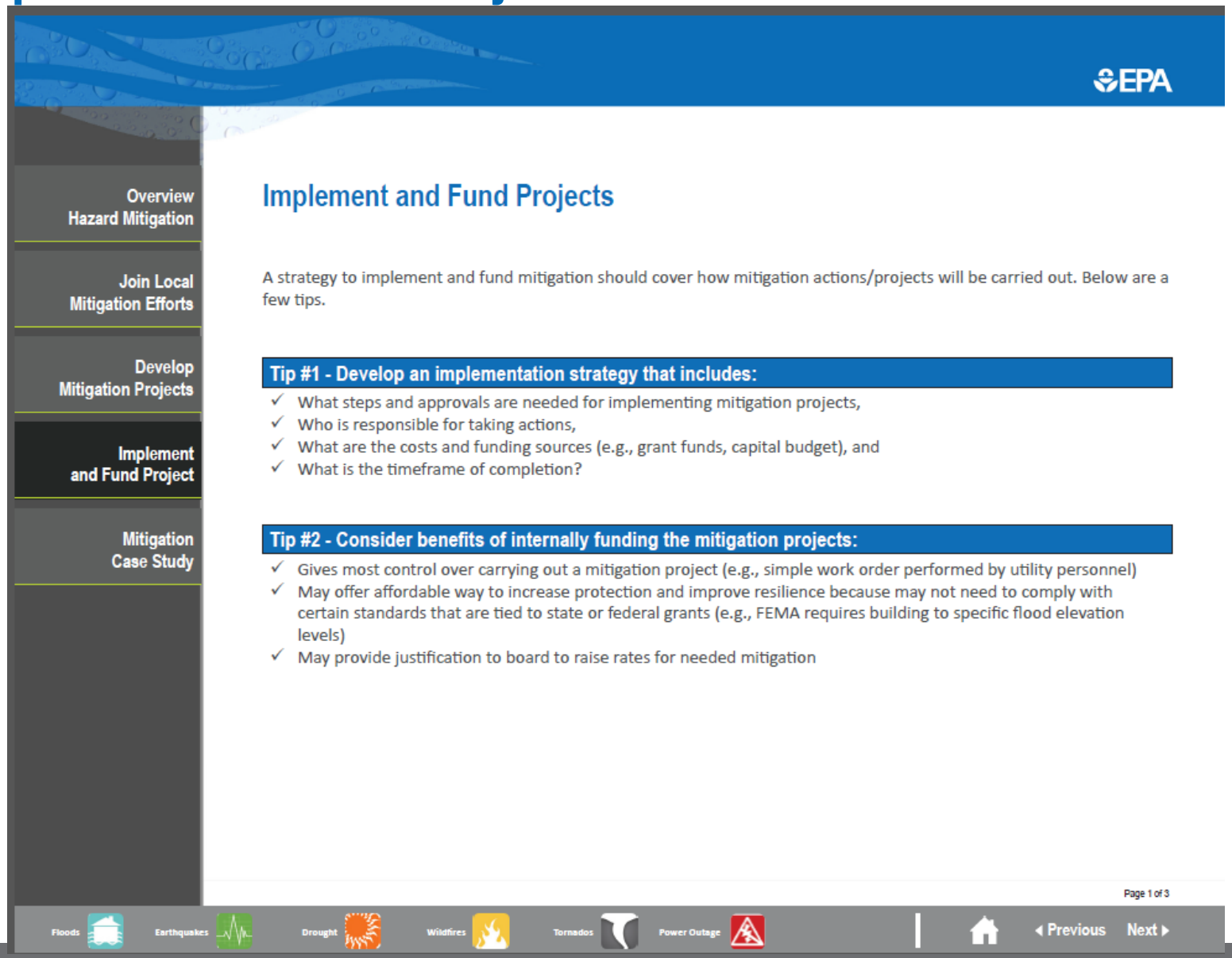
Drought

Wildfire

Tornado

Power Outage

# Implement & Fund Projects

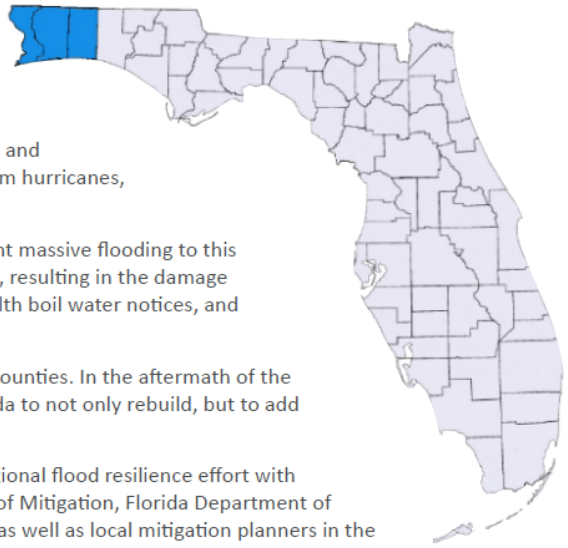


# Mitigation Case Study





## Mitigation Case Study



**Florida Panhandle.** In 2015, EPA sponsored an effort to develop regional flood resilience in the Florida Panhandle. This three-county region (Escambia, Santa Rosa, and Okaloosa counties) was chosen because the area suffers from hurricanes, heavy spring rains, and coastal flooding.

For example, in April of 2014, a violent storm system brought massive flooding to this region. Several water and wastewater utilities were flooded, resulting in the damage to pumps, disconnected pipelines, loss of power, public health boil water notices, and emergency bypass of sewage into the nearby sound.

A Presidential Disaster Declaration was issued for all three counties. In the aftermath of the flooding, federal mitigation funds became available to Florida to not only rebuild, but to add resilience to future flooding events.

**Regional Flood Resilience.** In 2015, EPA co-sponsored a regional flood resilience effort with FEMA, Florida Division of Emergency Management-Bureau of Mitigation, Florida Department of Environmental Protection, Florida Rural Water Association, as well as local mitigation planners in the three counties. The project involved two workshops and a series of utility site visits. Numerous local utilities as well as local mitigation planners participated.

# HAZARD MITIGATION FOR NATURAL DISASTERS

A Starter Guide for Water and Wastewater Utilities

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Next ▶

***https://www.epa.gov/waterutilityresponse/hazard-mitigation-natural-disasters***

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# Federal Funding for Utilities - Water/Wastewater- in National Disasters (Fed FUNDS)





# What does Fed FUNDS do?

- Fed FUNDS is an intuitive web-based tool that provides tailored information for water/wastewater utilities to obtain information on federal disaster funding programs.

- Using Fed FUNDS, a utility can:
  - Easily identify appropriate funding opportunities
  - Gain insight on the application process
  - Access customized forms to document costs
  - Download successful utility applications
  - Contact utility funding mentors

- Fed FUNDS features federal disaster funding programs from FEMA, EPA, USDA, HUD, and SBA.

# Fed FUNDS (cont.)

Click on this button, answer a few questions, and be steered to the most appropriate Federal Disaster Funding Programs.

Click on this button if you are currently experiencing a disaster or large-scale interruption. This page contains recommendations including printable forms on how to document damage, emergency response and temporary repair actions.

Click on this button to learn about FEMA, EPA, USDA and other disaster funding programs.


Click on this button for a checklist of activities to prepare for funding such as developing emergency procurement procedures.

Click on this button for information on just-in-time training, technical assistance from mentor utilities, and example completed forms.

***http://water.epa.gov/infrastructure/watersecurity/funding/fedfunds/index.cfm***

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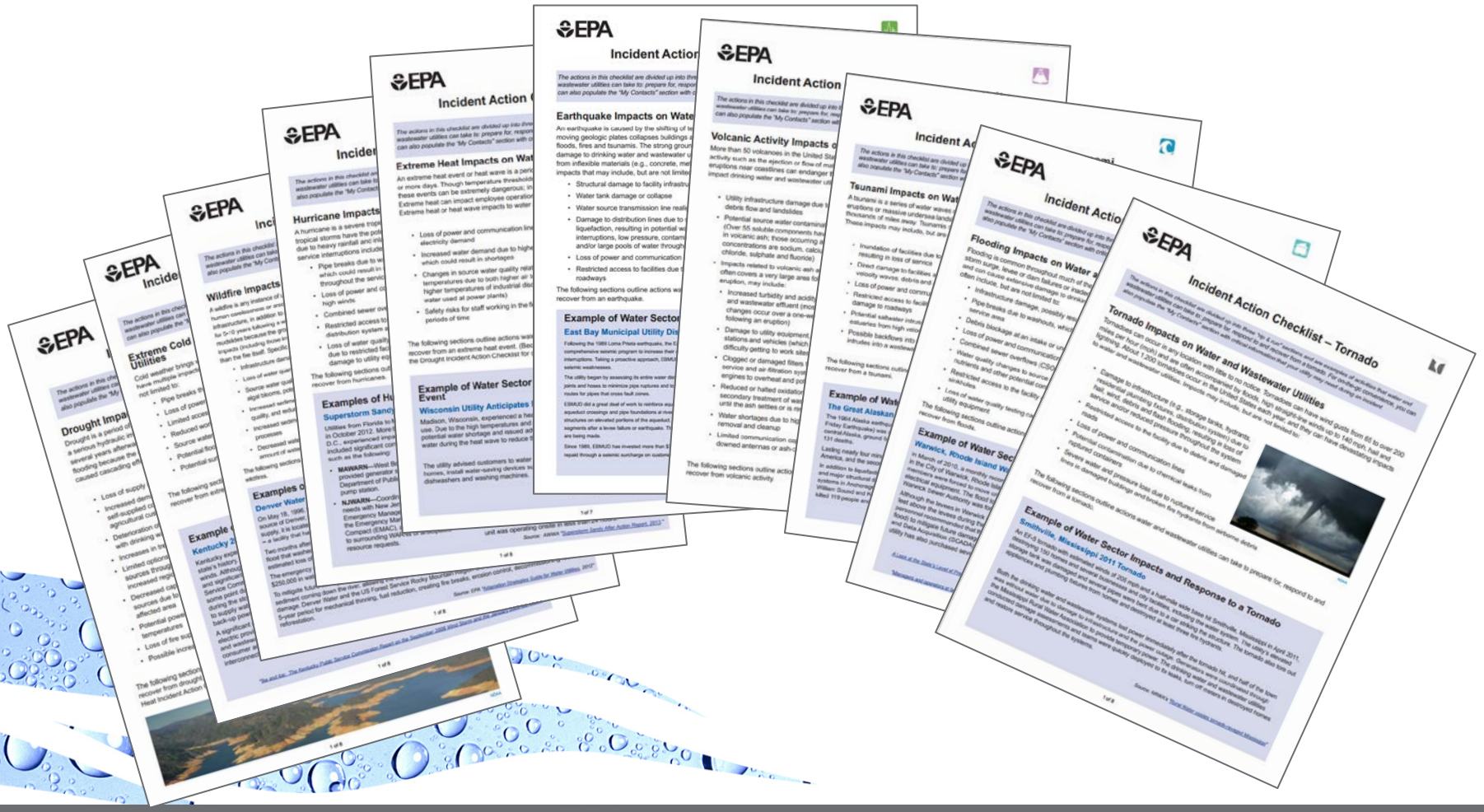
# Incident Action Checklists



# What does an Incident Action Checklist do?

- Drinking water and wastewater utilities can use the flowing twelve "rip & run" style checklists to help with *emergency preparedness, response and recovery activities:*
  - Drought
  - Earthquake
  - Extreme Cold and Winter Storms
  - Extreme Heat
  - Flooding
  - Hurricane
  - Tornado
  - Tsunami
  - Volcanic Activity
  - Wildfire
  - Harmful Algal Bloom
  - Cybersecurity

EPA

# Incident Action Checklist – Flooding

*The actions in this checklist are divided up into three "rip & run" sections and are examples of activities that water and wastewater utilities can take to: prepare for, respond to and recover from flooding. For on-the-go convenience, you can also populate the "My Contacts" section with critical information that your utility may need during an incident.*

## Flooding Impacts on Water and Wastewater Utilities

Flooding is common throughout much of the United States and can be caused by heavy precipitation events, storm surge, levee or dam failures or inadequate drainage. These events often occur with little or no notice, and can cause extensive damage to drinking water and wastewater infrastructure. Flooding impacts to utilities often include, but are not limited to:

- Infrastructure damage, possibly resulting in service interruptions
- Pipe breaks due to washouts, which could result in sewage spills or low water pressure throughout the service area
- Debris blockage at an intake or unearthed water and wastewater lines due to falling trees
- Loss of power and communication lines
- Combined sewer overflows (CSOs)
- Water quality changes to source waters and treated effluents, including increased turbidity, increased nutrients and other potential contaminants
- Restricted access to the facility due to debris, flood waters and damage to roadways from washouts and sinkholes
- Loss of water quality testing capability due to restricted facility and laboratory access and damage to utility equipment

The following sections outline actions water and wastewater utilities can take to prepare for, respond to and recover from floods.

## Example of Water Sector Impacts and Response to a Flood

### Warwick, Rhode Island Wastewater Treatment Plant Flooding

In March of 2010, a monthly record of nearly 16 inches of rain caused extreme flooding along the Pawtuxet River in the City of Warwick, Rhode Island, and left the Warwick Wastewater Treatment Plant completely flooded. Staff members were forced to move critical mobile equipment to higher ground as flood waters rose and threatened electrical equipment. The flood took the facility and six pumping stations along the Pawtuxet River offline. The Warwick Sewer Authority was forced to purchase five large portable pumps to keep up capacity.

Although the levees in Warwick were built three feet higher than the 100-year flood level, the river reached three feet above the levees during the 2010 flood. Rhode Island Department of Emergency Management (RIDEM) personnel recommended that the wastewater treatment plant be designed to higher flood levels (e.g., 500-year flood) to mitigate future damage from flooding events. Since the flood, the utility moved its Supervisory Control and Data Acquisition (SCADA) system to the second floor from the ground floor of the operations building. The utility has also purchased several new generators and other energy efficient equipment.

*Source: Brown University Center for Environmental Studies, "Emergency Management in Rhode Island: A Look at the State's Level of Preparedness and Management of Resources, Communication, and Infrastructure During the March 2010 Floods."*

*Source: Treatment Plant Operator Magazine, January 2011 Issue, "Managers and operators at two Rhode Island treatment plants report experiences and lessons learned from the severe floods of March 2010."*



## My Contacts and Resources

| CONTACT NAME | UTILITY/ORGANIZATION NAME | PHONE NUMBER |
|---|---|---|
| | Local EMA | |
| | State EMA | |
| | State Primacy Agency | |
| | WARN Chair | |
| | Power Utility | |
| | | |
| | | |
| | | |
| | | |
| | | |

### Planning

- Incident monitoring:
  - Quantitative Precipitation Forecasts (National Oceanic and Atmospheric Administration [NOAA])
  - Excessive Rainfall Forecasts (NOAA)
  - River Observations, Forecasts, and Experimental Long-Range Flood Risk (NOAA)
  - U.S. Spring Flood Risk (NOAA)
  - Flood Inundation Mapper (United States Geological Survey [USGS])
  - WaterNow (USGS)
  - WaterAlert (USGS)
  - WaterWatch (USGS)
- Map Service Center to find flood map by address (Federal Emergency Management Agency [FEMA])
- National Weather Service Weather Alerts (NOAA)
- Planning for an Emergency Drinking Water Supply (EPA)
- All-Hazard Consequence Management Planning for the Water Sector (Water Sector Emergency Response Critical Infrastructure Partnership Advisory Council [CIPAC] Workgroup)
- Vulnerability Self Assessment Tool (VSAT) (EPA)
- Preparing for Extreme Weather Events: Workshop Planner for the Water Sector (EPA)
- Tabletop Exercise Tool for Water Systems: Emergency Preparedness, Response, and Climate Resiliency (EPA)
- How to Develop a Multi-Year Training and Exercise (T&E) Plan (EPA)
- Make a Plan (FEMA)

### Coordination

- Water/Wastewater Agency Response Network (WARN) (EPA)
- Community Based Water Resiliency (EPA)

### Facility and Service Area

- Emergency Response and Preparedness Florida WARN Best Management Practices for Water and Wastewater Systems (University of Florida Center for Training)
- What to Do After the Flood (EPA)

### Mitigation

- Climate Resilience Evaluation and Awareness Tool (CREAT) (EPA)
- Adaptation Strategies Guide (EPA)



**https://www.epa.gov/waterutilityresponse/incident-action-checklists-water-utilities**

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# Water Utility Response On-The-Go!

## A Mobile App for a Mobile Response

EPA

# What does the On-The-Go! App do?

- The app creates a one-stop-shop for the most important information and tools needed for utility personnel responding to a water-related incident.
- Users are able to access critical information, record and track their response actions, and email assessments to others from your mobile phone tablet or desktop.
- EPA worked with the water sector to develop the content and functionalities of this mobile App.

One of

**Public Works Magazine's**

"Apps That Make the Grade"

*Awarded 4 stars for exceptional accessibility, user interface, and reliability*

-Public Works Magazine, June 27, 2017

**Download today:**

***www.epa.gov/waterutilityresponse/water-utility-response-go-mobile-application-and-website***

# Water Utility Response

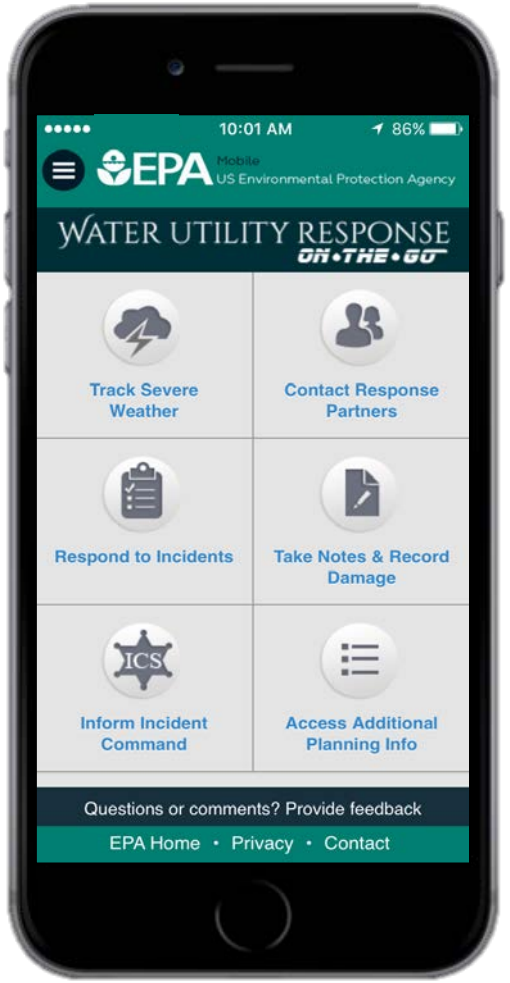
## *On-The-Go!*

***A Mobile App for a Mobile Response***

Forecasts for severe weather systems provided by NWS. Latest update includes **local conditions, watches and warnings.**

Critical incident-specific actions to take before, during and after an emergency. Checklists save to your local device.

Communicate with Incident command using the **Incident Briefing Form** (ICS 201) and other important ICS resources.




Database of local, state, and federal emergency contacts. Now includes **lab support** and **customizable contact lists.**

Fillable damage assessment forms and pictures that can be emailed from the field. App includes **more specific fields** for more detail.

Provides links to other emergency/incident planning and mutual aid resources
Includes **quick tips** button to

**Download today:**

***www.epa.gov/waterutilityresponse/water-utility-response-go-mobile-application-and-website***

# Questions?

- **Flood Resilience/Hazard Mitigation Guides & Fed FUNDS**
  David Goldbloom-Helzner
  Goldbloom-Helzner.David@epa.gov
  (202) 564-2106

- **Incident Action Checklists**
  Dawn Ison
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  (513) 569-7686

- **Water Utility Response On-The-Go! Mobile App**
  Kevin Tingley
  Tingley.Kevinepa.gov
  (202) 564-4619

***https://www.epa.gov/waterresilience***