



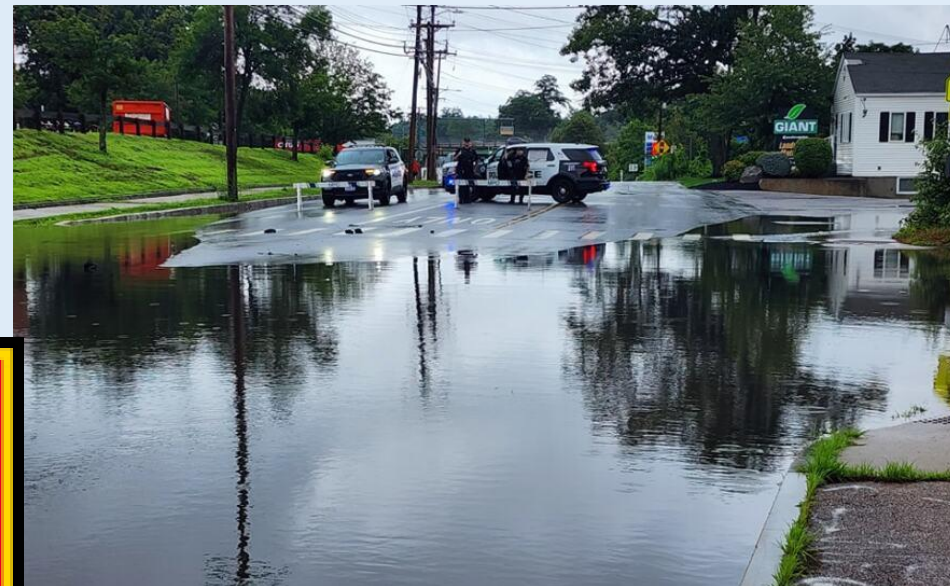
Flood Preparedness and Response

Dan Muzrall
Bedford CERT
October 2023





Swanzey, NH – July 2023



Nashua, NH – July 2023



NH – October 2017



Nashua, New Hampshire inundated
during Merrimack River Flood in
1936

Key Terms

- **Flood** - any relatively high streamflow that overtops the riverbanks
- **Flood watch** - issued when conditions are favorable for flooding. Flooding isn't guaranteed, but is possible.
- **Flood advisory** - issued when flooding is not expected to be bad enough to issue a warning. Flooding may cause significant inconvenience, and if not careful could lead to situations that may threaten life and/or property.
- **Flood warning** - issued when flooding is imminent or occurring

Key Terms

- **Floodplain** - relatively flat lowland that borders a river, usually dry but subject to flooding. Floodplain soils actually are former flood deposits.
- **100-year flood** - a flood event that has on average a 1 in 100 chance (1% probability) of being equaled or exceeded in any given year
- **River stage** - height of the water in the river, measured relative to an arbitrary fixed point

Impacts of Floods

- loss of human life
- property damage
- environmental damage
- displacement of residents
- disruption of businesses
- burden on community infrastructure, services and staff



THE MAIN TYPES OF FLOODS

River floods (fluvial floods)



Flash floods



Man-made floods



Coastal floods (storm surge)



Urban floods



Pluvial floods



River (Fluvial) Floods

- River levels rise and overflow banks
- Inundate areas that are normally dry
- Classifications:
 - Minor - low-lying areas adjacent to the stream or river, mainly rural areas and farmland and secondary roadways near the river flood.
 - Moderate - water levels rise high enough to impact homes and businesses near the river and some evacuations may be needed. Larger roads and highways may also be impacted
 - Major - Extensive rural and/or urban flooding is expected. Towns may become isolated and major traffic routes may be flooded. Evacuation of numerous homes and businesses may be required.



Snowmelt

- Snow melts faster than it can be absorbed into the ground
- Flooding results when there is more water than the ground can absorb
- Can be impacted by wet falls where ground doesn't dry out before freezing and by heavy snows

Ice/Debris Jams

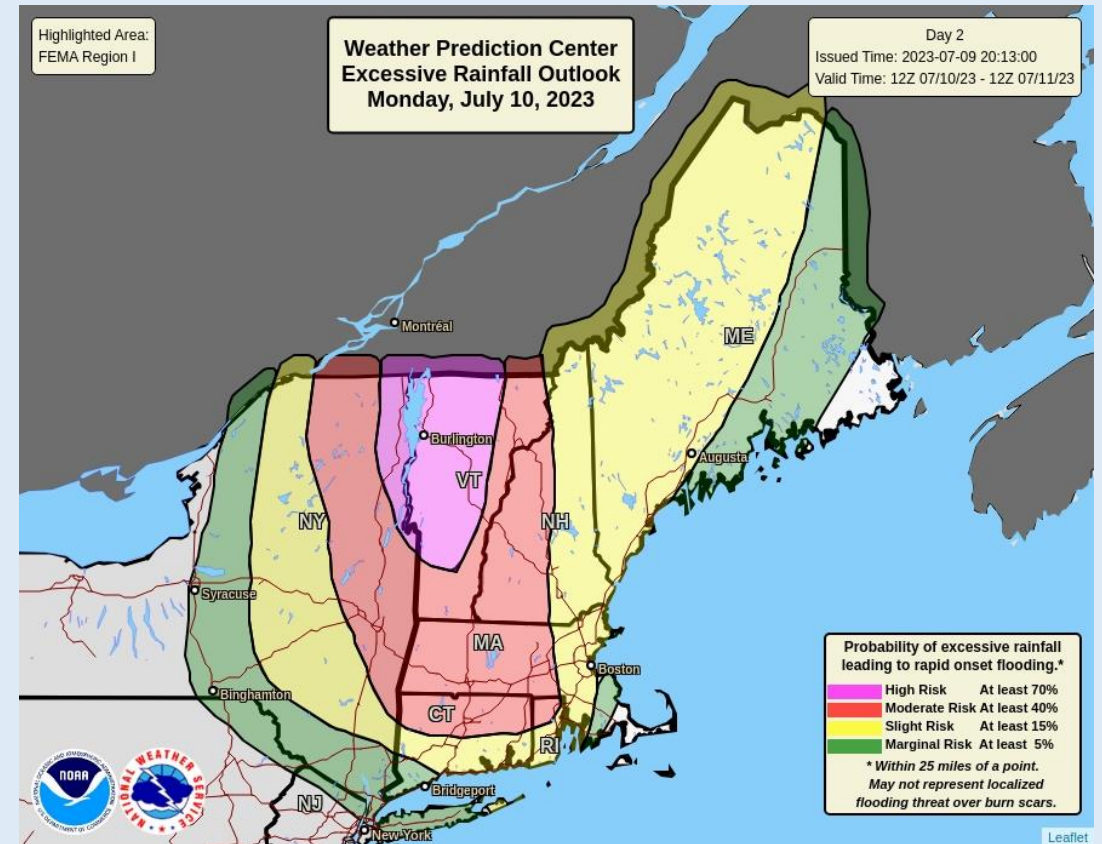
- Ice/debris jams can act as a temporary dam
- Jams can cause upstream flooding as water is entrained
- Downstream flash flooding can occur when the jam melts or breaks up



*Connecticut River
NH – Feb. 2022*

Flash Floods

- Commonly caused by significant rainfall associated with thunderstorms, especially slow moving or multiple storm systems in one area
- generally develop within 6 hours of the immediate cause, such as heavy rain, ice or debris jams, and levee or dam failure.
- may occur well away from where heavy rain initially fell.



YouTube – Flash Flood videos



Man-made Floods

- Result from a failure of a man-made system
- Pipe Leaks/equipment failures
- Sewer backups/overflowing toilets, sinks, drains
- Storm sewer overwhelmed
- Dam/levee failures



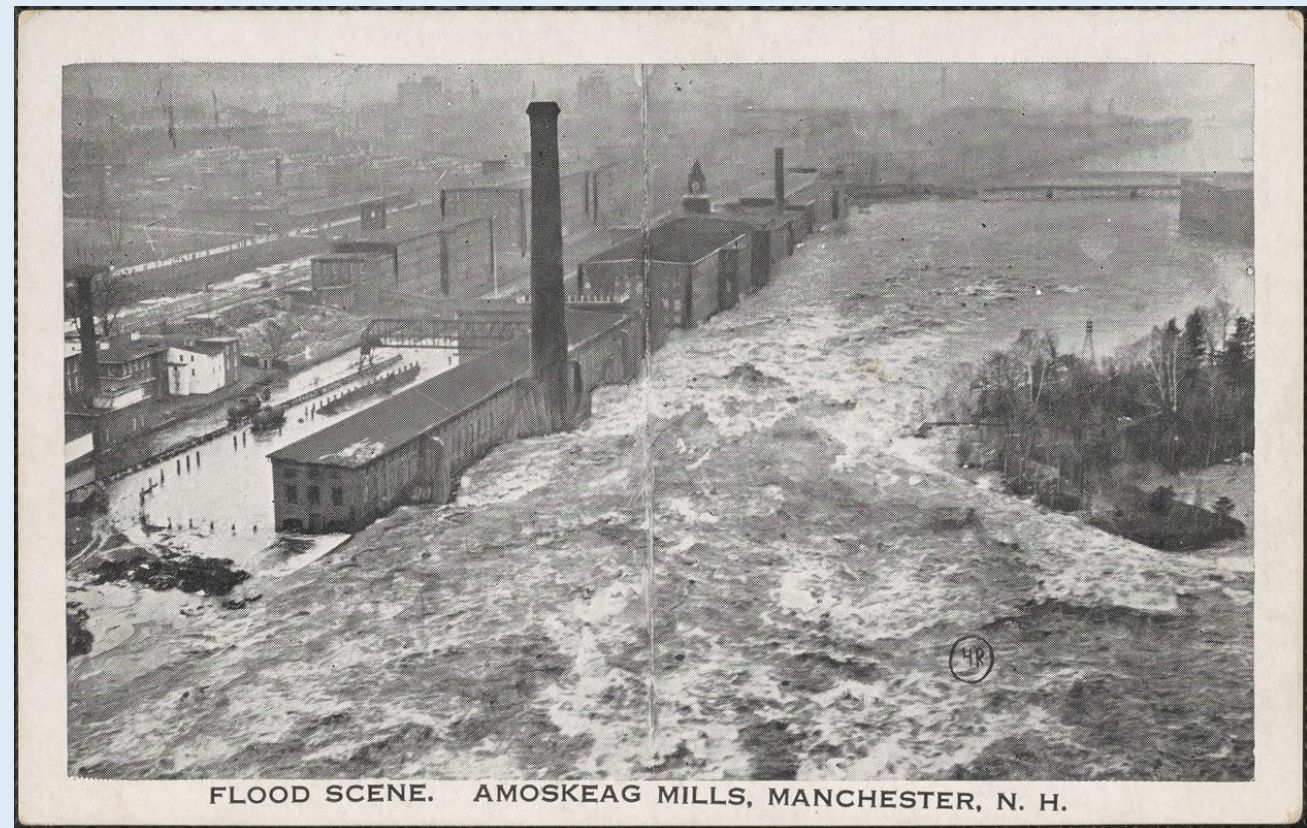
Coastal Floods (Storm Surge)

- Often associated with large storms (hurricanes, nor'easters)
- Can be compounded by high tides
- Storms push water into low-lying coastal areas
- High winds



Urban Floods

- Urban areas prone to flash floods due to lots of impervious surfaces which prevent the water from being absorbed into the soil easily
- Storm water collection systems can quickly be overwhelmed by heavy rains.

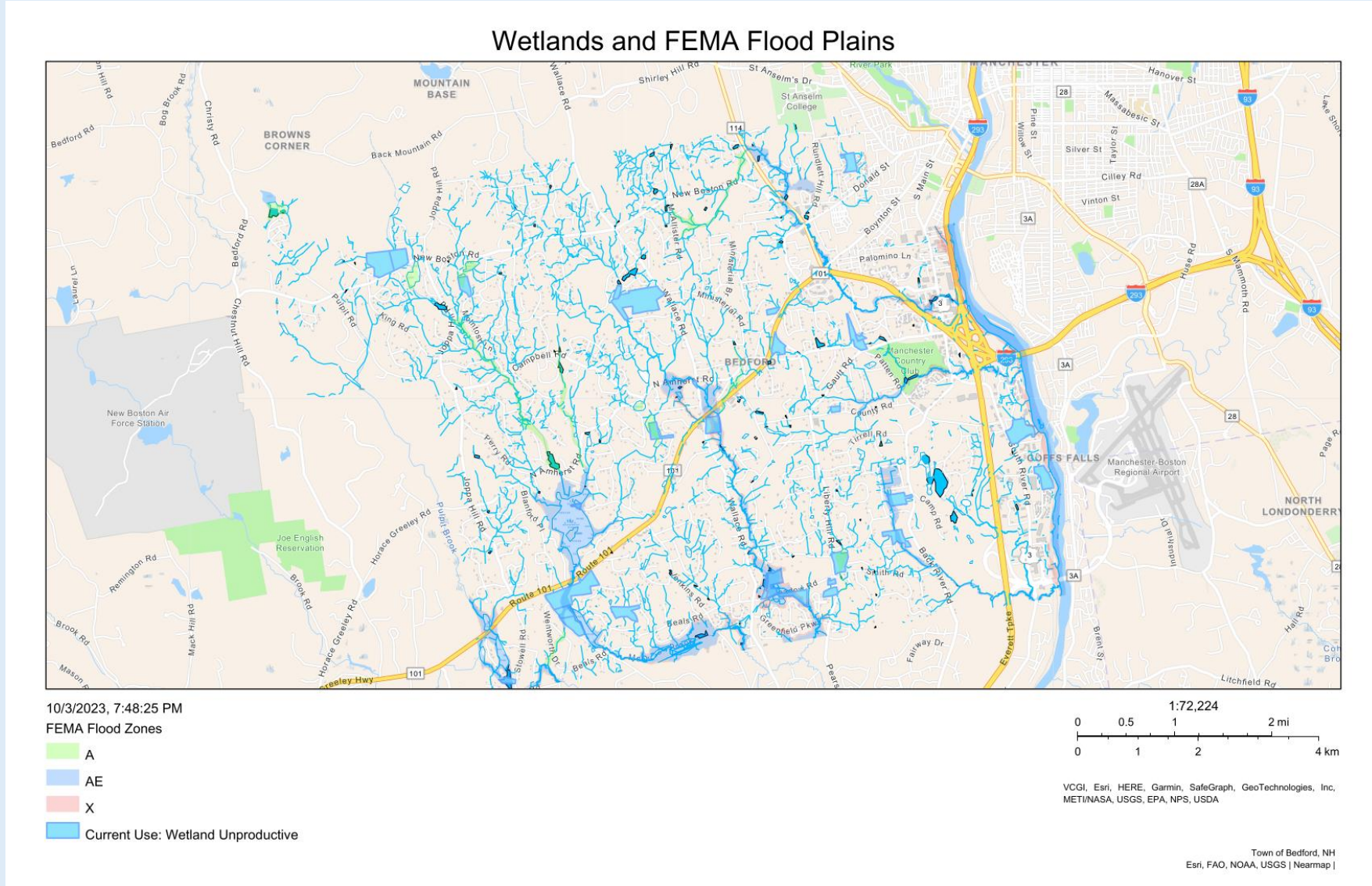


Pluvial Flooding

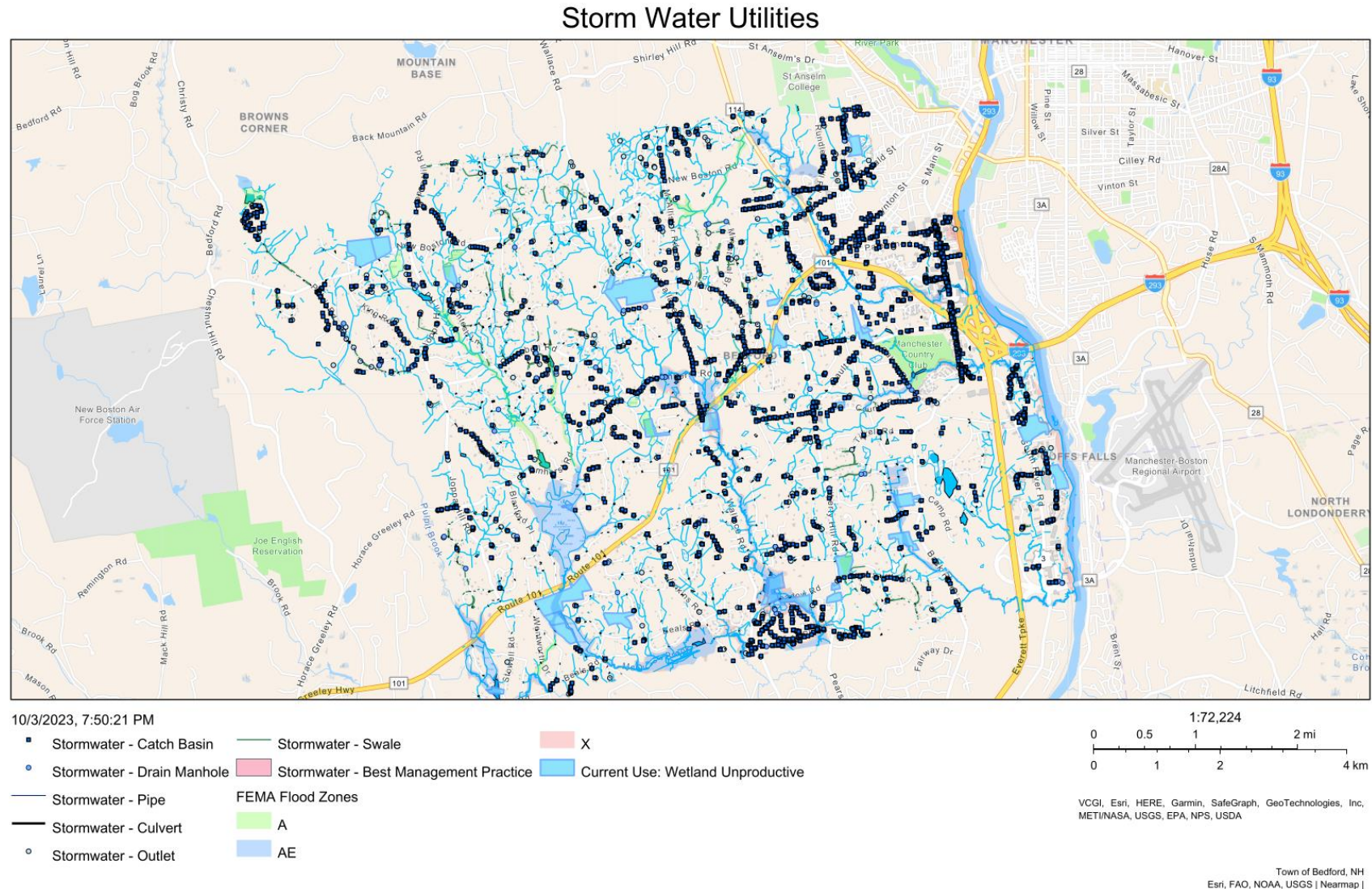
- Occurs when there's long periods of persistent rain
- Rain falls faster than the ground can absorb it, and/or faster than storm drains and surface waters can take it away



Where would it flood? Bedford Waterbodies

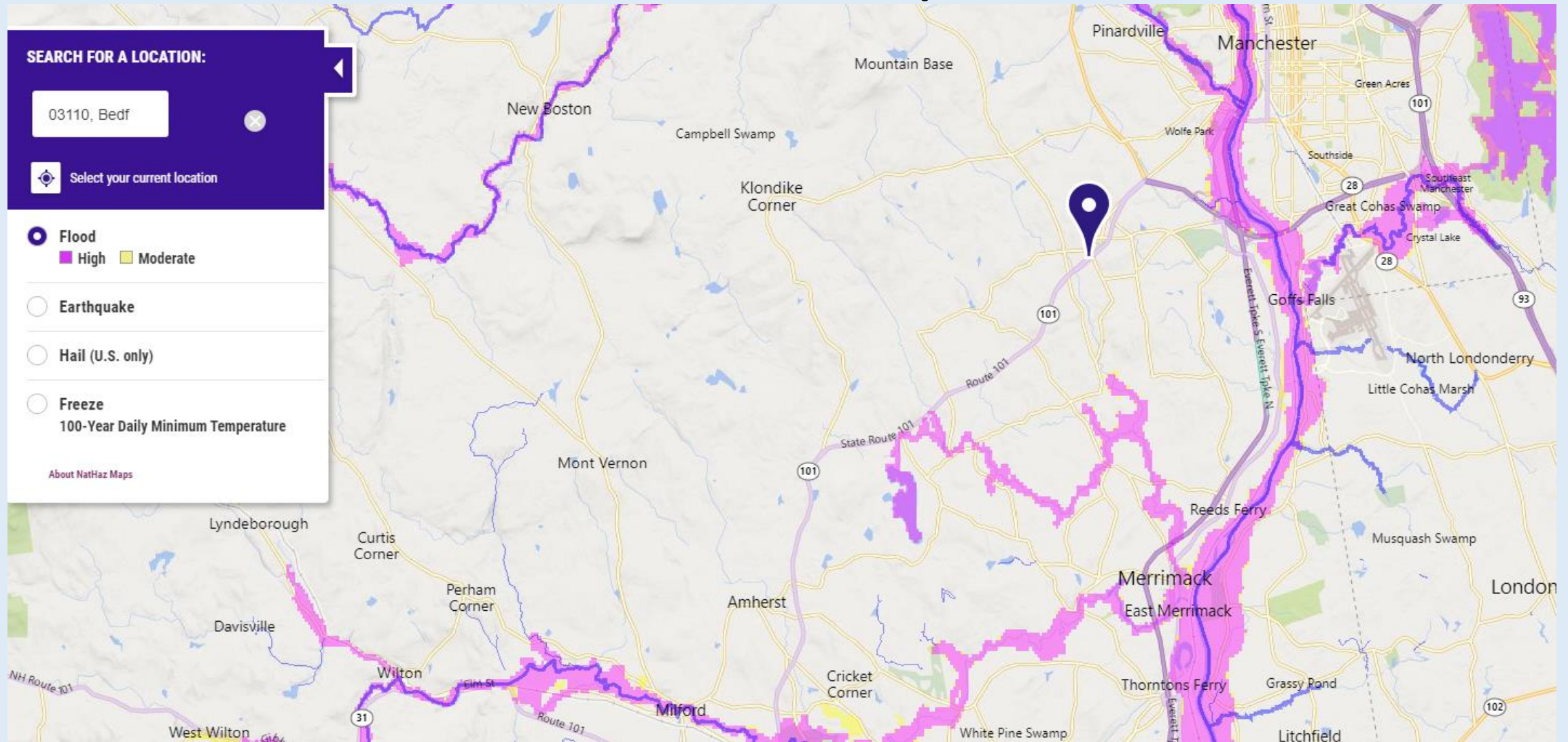


Storm Water Management Utilities



Map source: <https://bedfordnh.maps.arcgis.com/apps/webappviewer/index.html?id=139e6262415044d59a78f9b6625975bd>

FM Global Flood Hazard Map



<https://www.fmglobal.com/research-and-resources/nathaz-toolkit/flood-map#>

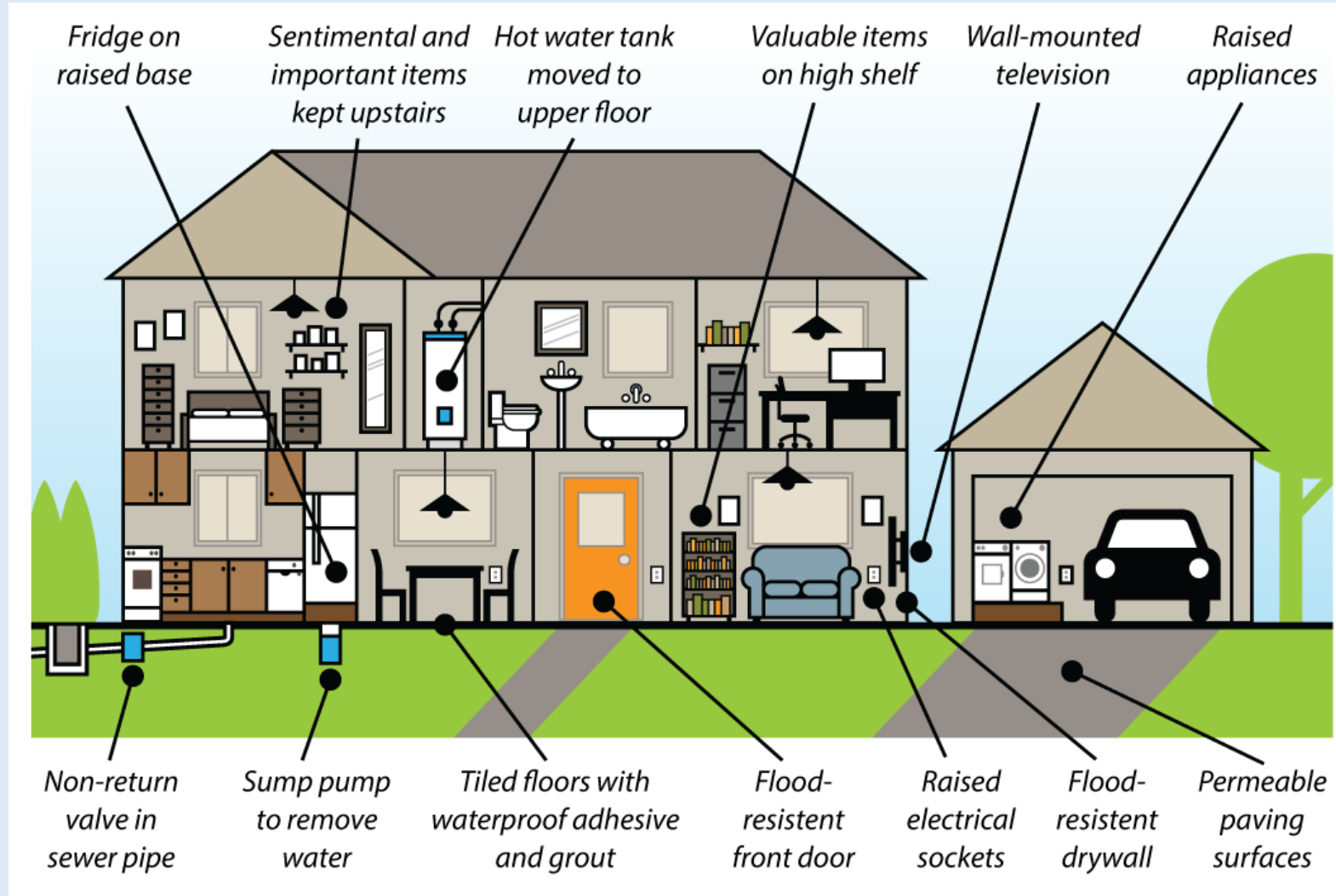
Safety – Before the storm

- Know your flood risks
- Know your terrain
- Monitor the weather
- Secure loose/movable items
- Have a plan – where to go/how, communications, etc.
- Have a kit – food, water, supplies
- Storm preps - Ensure that storm water collection systems are clear (catch basins, swales, culverts, etc.), sandbags, install check valves on drains
- Get flood insurance



<https://www.weather.gov/safety/flood-before>

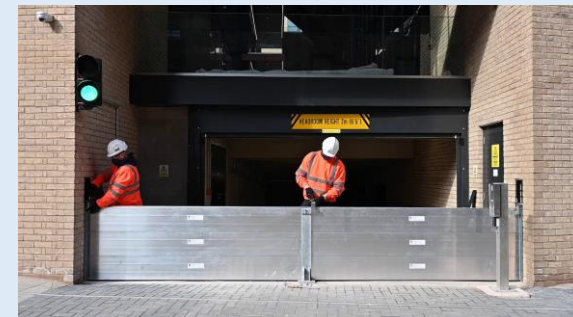
Preparing your home



ANSI FM 2510 Flood Mitigation Equipment

1. **Perimeter barriers:** Emergency structures that, when deployed, are intended to protect buildings and equipment from rising water. These temporary perimeter barriers have been evaluated for their ability to control riverine- or rainfall-related flood conditions.
2. **Opening barriers:** Permanent or temporary devices, such as flexible walls or stackable aluminum gates, that prevent floodwater passage through doors, windows, vents and other openings in a building.
3. **Flood mitigation valves:** Devices that block floodwaters from entering buildings through overwhelmed drainage systems. These valves prevent buildings from flooding from the inside out or bottom up.
4. **Flood mitigation pumps:** Devices that remove water already entering buildings or underground passages and can help mitigate damage from corrosion and mold.
5. **Penetration sealing devices:** Products that are used to seal small openings in a building.
6. **Flood glazing:** Reinforced glass structures that serve as flood barriers in urban settings.

<https://www.fmglobal.com/insights-and-impacts/2020/mitigate-flood-risk>



Safety – During the storm

- Continue monitoring the weather
- Get to high(er) ground
- Adhere to evacuation orders
- Avoid flood waters
- Don't try to cross flooded roads –
in vehicles or on foot

<https://www.weather.gov/safety/flood-during>



Safety – After the storm

- Monitor the situation/stay informed
- Avoid flood waters
- Avoid disaster areas
- Wait for all clear before re-entering; multiple hazards, including structural
- Don't try to cross flooded roads – in vehicles or on foot; don't bypass closure signs/barricades
- Contact family/important contacts

<https://www.weather.gov/safety/flood-after>



Recovery after the storm

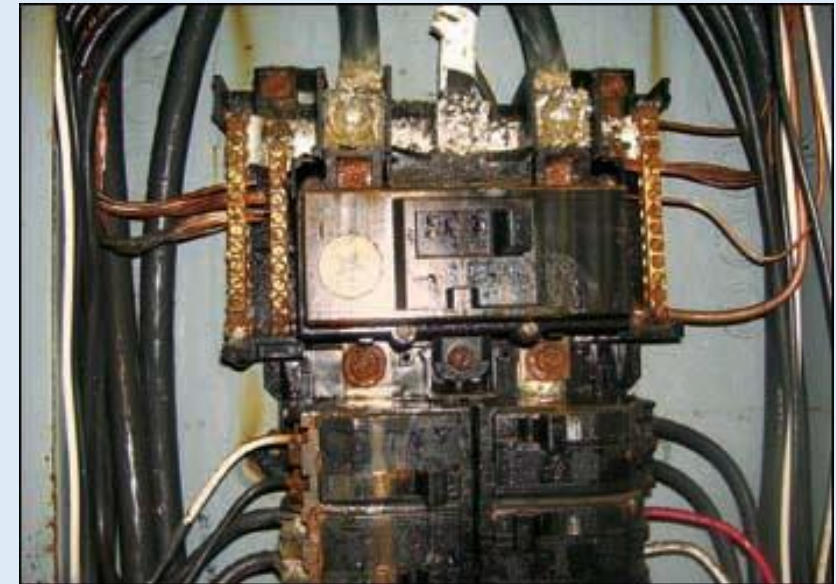


- Wait for all clear before re-entering; multiple hazards, including structural
- Wear PPE – boots, gloves, safety glasses
- Dispose of things that can't be disinfected (drywall, rugs, etc.)
- Use drying equipment (fans, blowers, AC, dehumidifiers)
- Clean surfaces with soap/water or disinfect with bleach/water mix
- Use proper hygiene practices
- Follow community safety instructions (boil water advisories, etc.)
- Contact homeowners/flood insurance company



Flood hazards

- Electrical
- Orphan containers/white goods
- Hazardous materials/waste – including fuels
- Sewage
- Mold
- Well contamination
- Wildlife



How CERT can assist

- Information collection
- Damage assessment
- Traffic control
- Shelter activation
- Filling sand bags



Flood Resources

<https://www.ready.gov/floods>

<https://www.fema.gov/flood-insurance>

<https://www.weather.gov/safety/flood>

<https://www.weather.gov/safety/flood-hazards>

<https://www.weather.gov/gyx/skywarn> -River forecasts

<https://www.usace.army.mil/Missions/Civil-Works/Flood-Risk-Management/>

<https://www.fmglobal.com/research-and-resources/nathaz-toolkit/flood>

<https://www.nhmunicipal.org/town-city-article/new-hampshire-flood-hazards-handbook-municipal-officials-new-resource-help-your>

<https://www.iwr.usace.army.mil/Missions/Flood-Risk-Management/Flood-Risk-Management-Program/>



FEMA



**US Army Corps
of Engineers®**

Upcoming SkyWarn Trainings



Hello,

Just wanted to make you aware of two winter weather spotter training sessions coming up along with a coastal flooding specific training session. I have attached 3 fliers for these courses if you want to share with your friends. You can also access the online registration [here](#):

Here are the registration links for the courses:

- Oct 26th 6 PM - <https://register.gotowebinar.com/register/8169718174673470550>
- Nov 13th 6 PM - <https://register.gotowebinar.com/register/2244470903414422869>
- Nov 15th 6 PM (coastal flooding) - <https://register.gotowebinar.com/register/8169718174673470550>

If you have taken the winter focused course recently, you don't have to retake the course. We recommend you take a refresher course every 3 years for each track we offer (winter, summer, ice jam and coastal flooding).

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www.weather.gov/gyx