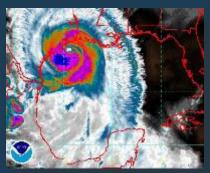
H-GAC 2025 Webinar/Workshop Series









Debris Management in Response to Flooding

WEBINAR DATE:

JULY 24, 2025

TIME:

10:00 A.M. TO 12:00 P.M.

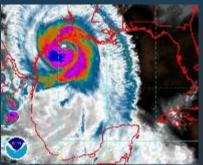


Agenda

- 1. Recent flooding incidents
- 2. Assessing the damage
- 3. Types of flood debris
- 4. Considerations with flood debris
- 5. Environmental considerations
- 6. Waterway debris removal programs
- 7. Substantial damage estimates









Part 1: Recent Flooding Events



Central Texas Floods

★ THE TEXAS TRIBUNE

- July 4, 2025
- Rounds of flooding
- Huge debris field
- Affecting multiple counties

Search for flood victims slowed by mountains of debris as thousands descend on Kerr County to assist

Crews are using construction equipment to clear vehicles, trees and homes in a race to locate more than 170 people still missing since Friday's devastating flood.

BY PAUL COBLER JULY 10, 2025 1 PM CENTRAL

SHARE REPUBLISH 7



Search and recovery teams along the Guadalupe River in Kerrville on July 7, 2025, three days after the flood that has claimed more

San Angelo, Texas Flooding

- July 4, 2025
- Thousands of structures impacted.



Pinellas County, Florida

• Storm surge flooding from Hurricanes Milton and Helene. 41,000 homes impacted.



New Mexico Flood

- July 8, 2025
- 200 homes damaged



Kansas City, Kansas Flooding

- July 16, 2025
- 10 inches of rain in 12 hours.



2025 sets new benchmark for flash flood alerts nationwide including in DC, Maryland and Virginia

If your phone keeps buzzing with flash flood alerts, you're not just imagining it.



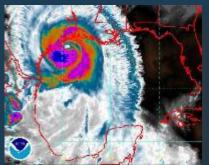
https://www.wusa9.com/article/weather/record-flash-flood-warnings-2025g dmv-surge/65-20de744f-cf8d-420b-abde-d763992bc158

When Does Damage Become Extreme Debris?

- Debris quanties are not always rapidly apparent in flood events. Think about Harvey.
- Not all debris overwhelms local crews.
- Sometimes, it can be weeks before damages and debris are realized.
- Sometimes, flooding reports seem worse than in reality.
- And sometimes, bad is really, really, bad.









Part 2: Assessing the Damage



Damage Assessments

- Assessing Storm Damage
- How Fast can you do it?
- Windshield
 Assessments vs
 Substantial Damage
- Estimating Debris
- Quality of Data



Damage Assessments



The Purpose of Damage Assessments

- Helps to determine if a disaster declaration should be approved.
- Needed to understand the scope and potential costs of response and recovery.
- Needed to make decisions regarding staffing, equipment, contractors and resource support.



PA Program Delivery Process



PRE-DECLARATION

Preliminary Damage Assessment

State/Territory/Tribe submits Declaration request (within 30 days of incident)

> Presidential Declaration

APPLICANT COLLABORATION

Recipient conducts Applicant Briefings

Applicants submit Requests for Public Assistance (within 30 days of Declaration)

> FEMA approves Applicant RPAs

FEMA conducts
Recovery Scoping
Meeting (within 21
days of RPA approval)

SUBAWARD FORMULATION

Applicant identifies and reports all damage (within 60 days of Recovery Scoping Meeting)

Develop project Scope of Work and costs

FEMA and Recipient conduct Exit Briefing

SUBAWARD FUNDING

FEMA obligates funds to Recipient

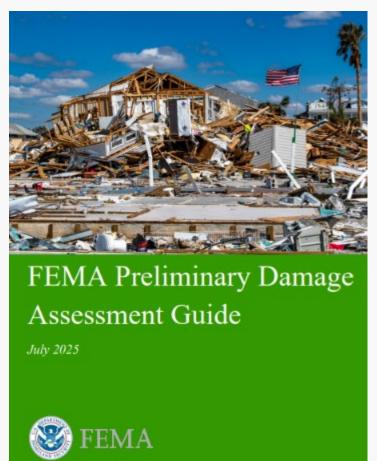
Subrecipient completes work and requests Closeout of its project(s)

Recipient certifies completion (within 180 days of project completion) and FEMA closes project(s)

> FEMA closes the Subrecipient

FEMA closes the Disaster PA Program Award

FEMA Preliminary Damage Assessment Guide



- Provides guidance to help local, state, tribal, and federal, partners collect, validate, quantify, and document the cause, location, and details of damage following a disaster.
- July 2025

https://www.fema.gov/sites/default/files/documents/fema_rd_pda-16 guide_07012025.pdf

Flood Damage Assessments

- Much of focus is on high-water levels.
- Assessments for flooding can require more time and resource-intensive door-to-door assessments.
- Areas to assess may be hard to reach due to washed-out or debris blocked roads.

Documenting High Water Marks

- Take pictures of highwater marks in various places in the flood zone.
- This will help determine the maximum height of a flood event and will assist in estimating damages to structures in the flood zone.



https://www.usgs.gov/media/images/high -water-marks-give-evidence-peak-riverheight-a-flood

Documenting High-Water Marks

• The US Geological Society provides other ways of determining the height of water in a flood.





https://www.usgs.gov/media/images/care-must-be-taken-make-sure-a-high-water-mark-accurate

Road Damage

- Floodwaters can completely remove sections of the road.
- Water can erode the underlying soil and granular layers beneath the pavement, weakening the road's foundation.



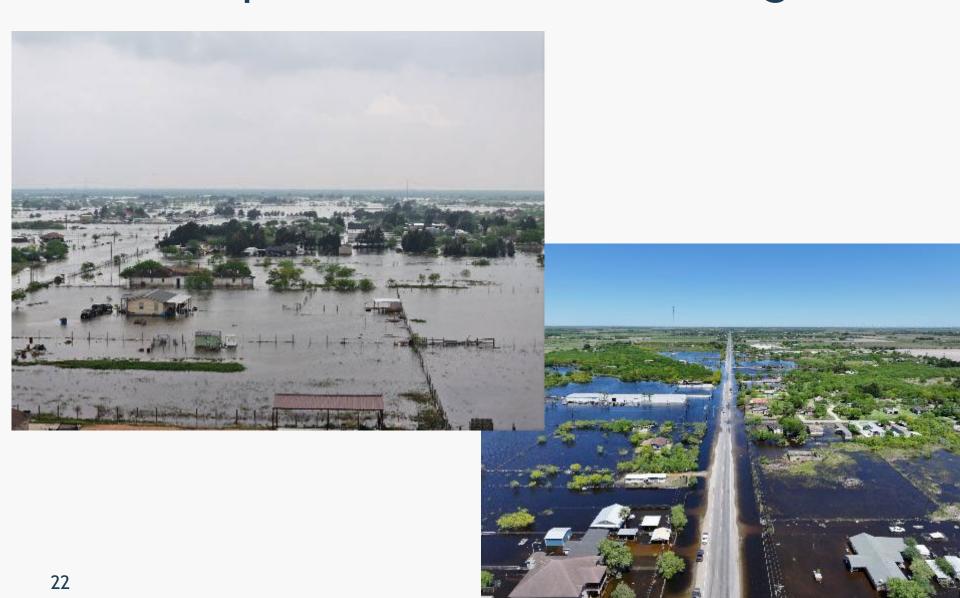
Bridges

- Examine bridges for scour where the streambed material around bridge piers and abutments have been eroded.
- Over time, scour can lead to bridge failure.



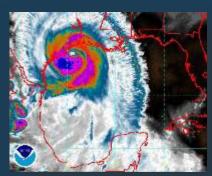
https://www.fdot.gov/docs/defaultsource/roadway/drainage/bridgescour/FD OT-Scour-Manual.pdf

Example: South Texas Flooding 2025





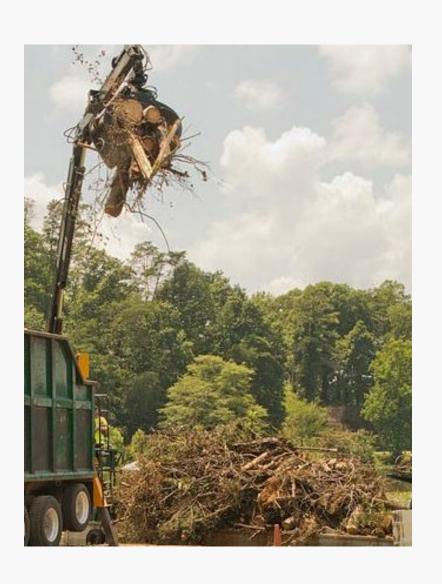






Part 3: Types of Flood Debris.





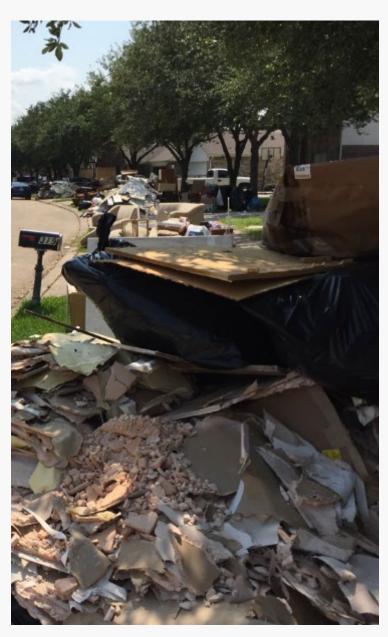
Vegetative Debris

- Organic matter from plants, such as leaves, branches, and tree limbs.
- Vegetative debris is often collected separately and may be chipped, mulched, composted, or burned.

Construction and Demolition

• Construction and demolition (C&D) debris refers to waste materials generated during the construction, renovation, or demolition of buildings, roads, and other structures.





Construction and Demolition

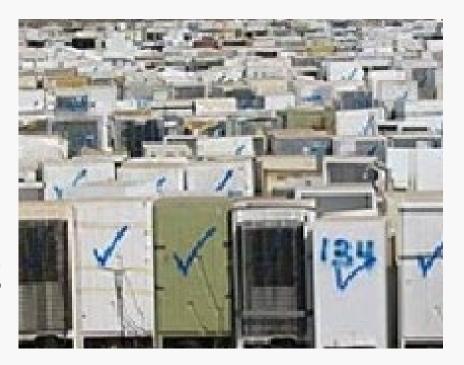
- Types of C&D can include
 - Drywall
 - Wood
 - Packing material and boxes
 - Plastics
 - Roof shingles and other roofing material
 - Metal
 - Concrete, bricks, and stones
 - Carpeting
 - Furnishings
 - Fixtures

Construction and Demolition

- Some C&D debris can be recycled such as the metals, concrete, and asphalt.
- Some materials might be able to be reused such as bricks, boards, unbroken window, etc.
- If recycling is not possible, waste should be sent to an authorized landfill.

White Goods

 Refrigerants must be removed from refrigerators, freezers, air conditioning units, etc., before recycling of the metals and/or disposal.



Household Hazardous Waste

- Paints, thinners, and turpentine; furniture strippers; wood preservatives, stains, and finishes.
- Pesticides, insecticides, flea collars and sprays, roach and ant killers, rat and mouse poisons, and herbicides.
- Oven, toilet, drain, and rug and upholstery cleaners.
- Bleaches, disinfectants, and swimming-pool chemicals.
- Floor and furniture polish.
- Household and automobile batteries.
- Fluorescent lamps and compact fluorescent light bulbs.
- Automotive products including antifreeze, transmission and brake fluids, motor oil, and gasoline.

Household Hazardous Waste

- Collect HHW separately from other debris.
- Compile the HHW in a staging area for collection and disposal by a contractor.
- City and county officials are encouraged to offer options for collection.



Electronic Waste

- Electronic waste (e-waste) refers to electronics that contain hazardous materials.
- These products contain minerals and chemicals that require specific disposal methods.



Soil, Mud, and Sand

- Document that only the disaster-generated silt and soils are removed.
- Contaminated soils may require special handling depending on the contaminant.
- Verify that any contaminated disastergenerated soils are addressed by specialists from the State's DEQ and/or U.S. Department of Environmental Protection (EPA) and managed appropriately in designated areas.

Derelict Vehicles and Vessels

- Can consist of:
 - Cars
 - Boats
 - Mobile homes



Derelict Vehicles and Vessels



- Coordinate with law enforcement.
- Follow local laws.
- Tag abandoned titled debris.
- Contract with towing company.
- Take to a holding area.
- Attempt to contact owners.
- Remove fluids.
- If owners do not claim it by required waiting period, can proceed with recycling.
- Keep careful records.

Animal Carcasses

- Animal carcasses should be buried in pits or trenches, or by mounding.
- Disposal should always be carried out in a manner that protects public health and safety, does not create a nuisance, and prevents the spread of disease and adverse effects on water quality.
- The owner or operator of a farm or facility is responsible for disposal in a timely and sanitary manner.



TCEO REGULATORY GUIDANCE

Critical Infrastructure Division RG-591 • August 2022

Disposing of Animal Carcasses Left Behind by a Declared Disaster

Here we give tips for dealing with a difficult issue sometimes encountered after a natural or human-caused disaster such as a hurricane, flood, tornado, fire, or explosion, etc.—the safe and proper disposal of carcasses of large animals.

As you return to your property after such an event – even with all the other burdens from this disaster – one of your most important tasks will be to properly dispose of the carcasses of animals that died.

Who is responsible for properly disposing of carcasses?

If you own the land or operate a farm or other facility on it, you are responsible for properly disposing of the carcasses of animals killed in a disaster. It's important to do so quickly but you must also:

- · Protect public health and safety.
- Avoid creating a nuisance.
- · Prevent the spread of disease.
- Prevent adverse effects on water quality.

Remember: Health and Safety First!

What are my options?

After a storm, hurricane, tornado, etc., your immediate options for disposing of carcasses might be limited:

- Take them to a landfill that can accept them.
- Bury them on your property.

Landfilling carcasses

One of the preferred ways to dispose of animal carcasses is as special waste in an appropriately designed landfill —in legal terms, a Type I or Type I AE landfill that also meets the provisions of Title 30 (30 TAC), Section 330.171(c)(2).

Find a landfill near you in Active Municipal Solid Waste Landfills GI-611.1

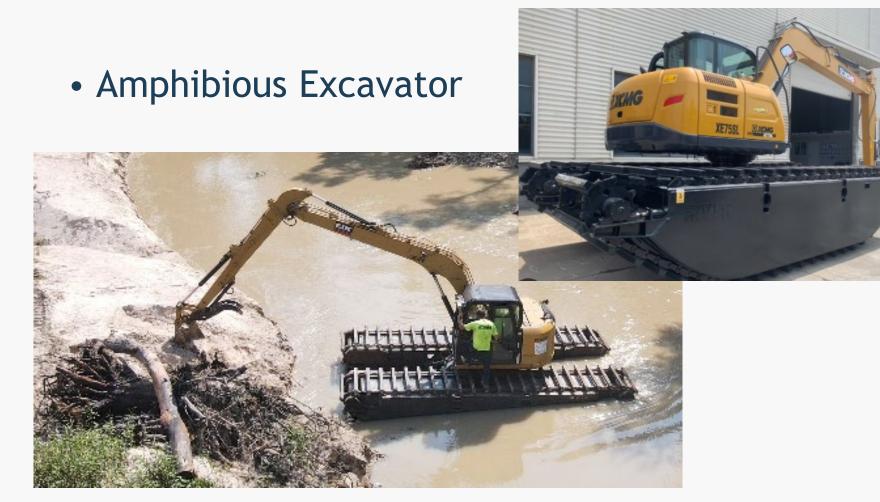
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Animal Carcasses

 Guidance in the disposal of animal carcasses can be found at: https://www.tceq.tex as.gov/downloads/co mpliance/publications /rg/rg-591-disposalof-animal-carcassesleft-behind-after-adisaster.pdf

¹ www.tceq.texas.gov/downloads/permitting/waste-permits/publications/gi-611-active-msw-landfills.pdf

Specialized Equipment Might be Needed



Specialized Equipment Might be Needed



• Debris Removal Barges/Boats



Grapple Trucks



Grinder



Air Curtain Incinerator



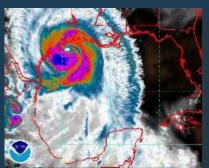
Reduction Via Compaction

Reduces the volume by approximately 33% percent.











Part 4: Considerations with Flood Debris



Definitions - Pluvial Flooding

- Also known as surface water flooding.
- Occurs when heavy rainfall overwhelms the capacity of drainage systems and the ground to absorb water, causing water to accumulate and flow over the surface.



Houston 2015 Flooding

Definitions - Fluvial Flooding

- Also known as river flooding.
- Occurs when the water level in a river, lake or stream rises and overflows onto neighboring land. This can be due to excessive rain or snowmelt.



Blue Hole Park Flooding 2002

Definitions - Coastal Flooding

- The inundation of land along the coast by seawater, typically caused by intense windstorms coinciding with high tide, or by tsunamis.
- Storm surge, often the greatest threat associated with hurricanes or typhoons, occurs when high winds force water onshore.



Miami Flooding 2016

Challenges to Flood Debris Management Operations

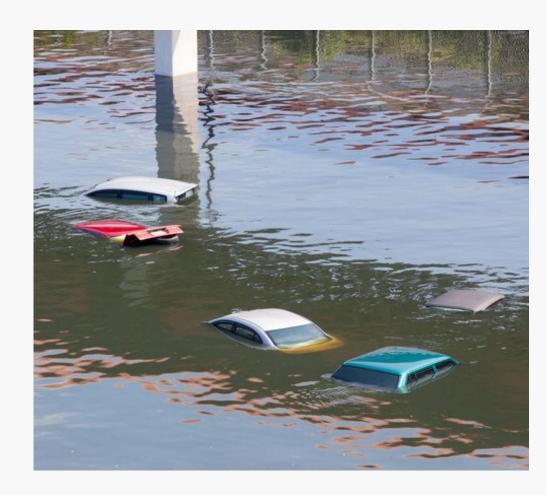
Search and Rescue

 Debris clearing may need to coordinated in conjunction with search and rescue and other response and recovery activities.



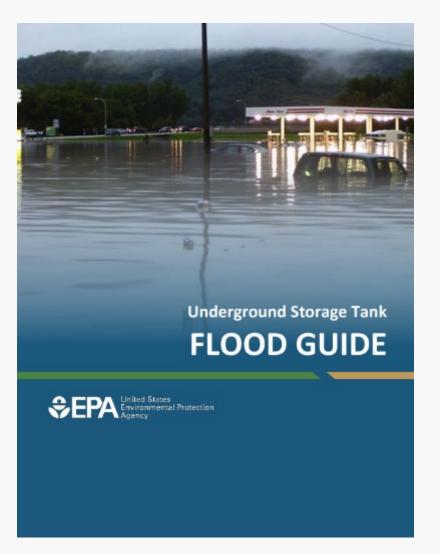
Access Issues

 In the event of flooding, mud or standing water may make it difficult for heavy equipment to reach the debris



Fuel Availability

- If a large number of vehicles and fueldependent equipment is needed, consider the possible implications of a fuel shortage due to the disaster.
- Power outages and damage distribution systems may also impact fuel availability.
- Fuel trucks may not be able to make deliveries due to damaged roads and bridges.



Fuel Availability

- Local sources in underground storage tanks may have been contaminated from the flood.
- The Underground
 Storage Tank Flood
 Guide provides guidance
 to operators of the
 tanks.

https://www.epa.gov/sites/default/files/2014-03/documents/ustfloodguide.pdf

Displaced Animals

- Animals may have been displaced due to the flood (e.g., snakes and/or alligators).
- Livestock and pets may have been left to fend for themselves.
- Animals may be disoriented or injured.



https://www.usace.army.mil/Media/News/NewsSearch/Article/2213135/safety-around-venomous-snakes-of-texas/

- According to the Centers for Disease Control and Prevention (CDC), an increase in nuisance or floodwater mosquito populations is expected in the weeks after flooding.
- Floodwater mosquitoes are aggressive biters but don't spread germs to people.

Mosquitoes



www.galvestoncountytx.gov/county-offices/mosquito-control

Mosquitoes

- Mosquito control professionals may use insecticides to reduce numbers of mosquitoes in affected areas.
- Use Environmental Protection Agency (EPA)registered insect repellents.
- Wear loose-fitting, long-sleeved shirts and pants.
- Wear clothing and gear treated with permethrin.

Hidden Hazards In Flood Water

- Debris and sharp objects under the water.
- Deep holes. The water may be deeper than you think. Turn around don't drown.
- Downed power lines.





Contaminated Water

- Flood water can be contaminated with:
 - Sewage
 - Fuel
 - Hazardous waste
 - Medical waste
- Exposure can result in:
 - Wound infections
 - Skin rash
 - Gastrointestinal illness
 - Tetanus

https://www.cdc.gov/floods/safety/floodwater-after-a-disaster-oremergency-safety.html

Human Remains

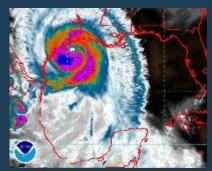
- Human remains may be found in flood debris.
- Call 911 to report the situation.
- Do not handle or touch the body.
- Obstruct the view of the body from the public if possible.
- Law enforcement will conduct an investigation and coordinate with the Justice of the Peace or Medical Examiner's Office to identify the remains and determine the cause of death.

Recycling

- E-waste that has been damaged by floodwaters might be accepted by recyclers if the items are clean (e.g., no mud or mold) and dried.
- Reuse and recycling opportunities for clean (i.e., not treated or painted) wood, however, may be limited if it has been in a flood. Even if dried, the wood might no longer be structurally sound or aesthetically appropriate for reuse or recycling in some applications
- Metal that has been in floodwaters would likely still be able to be recycled as scrap metal.









Part 5: Environmental Considerations



Water Contamination

- Floodwaters can pick up and transport a wide range of pollutants, including sewage, chemicals from agriculture and industry, and heavy metals.
- This can contaminate drinking water sources, harm aquatic life, and pose health risks to humans and animals.

Habitat Destruction

- Flood debris can damage or destroy natural habitats, including riverbanks, wetlands, and coastal areas.
- The debris can smother vegetation, disrupt animal nesting sites, and alter the physical structure of ecosystems.



Erosion and Sedimentation

Flooding can cause significant erosion,
 particularly of riverbanks and shorelines. This
 erosion can deposit large amounts of sediment
 into waterways, impacting water quality,
 reducing water depths, and affecting aquatic

habitats.



www.codot.gov



Infrastructure Damage

 Flood debris can damage roads, bridges, buildings, and other infrastructure, leading to further environmental problems like the release of hazardous materials and increased waste.

https://www.climate.gov/newsfeatures/climate-case-studies/coloradorebuilding-riverside-roads-withstandfuture-floods

Long-term Contamination

 Some pollutants carried by floodwaters, such as heavy metals, can persist in the environment for extended periods, contaminating soil and water sources long after the flood has subsided.



Debris Jams

- Accumulations of flood debris can create jams in rivers and streams, potentially leading to further flooding, bank erosion, and habitat disruption.
- Removal of this debris is crucial to prevent or reduce such damage.



Asbestos

 Exposure to asbestos increases a person's risk of developing lung disease.

Structures built before 1980 are more likely to

contain asbestos.

Asbestos is found in:

- Attic and wall insulation
- Ceiling and floor tiles
- Roofing and siding shingles
- Automobile clutches and brakes
- Coatings for pipes
- Heat resistance fabrics



Asbestos pipe wrap (joint partially removed) (EPA website)

OSHA Fact Sheet

Asbestos

Asbestos is a naturally occurring mineral fiber. It was used in numerous building materials and vehicle products for its strength and ability to resist heat and corrosion before its dangerous health effects were discovered. Individual asbestos fibers cannot be seen by the naked eye, which puts workers at an increased risk. The Occupational Safety and Health Administration (OSHA) has regulations to protect workers from the hazards of asbestos.

What is the hazard?

Asbestos fibers are released into the air during activities that disturb asbestos-containing materials.

The asbestos fibers can then be inhaled without knowing and trapped in the lungs. If swallowed, they can become embedded into the digestive tract as well.

Asbestos is a known human carcinogen and can cause chronic lung disease as well as lung and other cancers. Symptoms and/or cancer may take many years to develop following exposure.

Where is the hazard?

The hazard may occur during manufacturing of asbestos-containing products; performing brake or clutch repairs; renovating or demolishing buildings or ships; or cleanup from those activities; contact with deteriorating asbestoscontaining materials and during cleanup after natural disasters.

Some materials are presumed to contain asbestos if installed before 1981. Examples of these materials, as well as other presumed asbestos-containing materials are:

- · Thermal system insulation
- Roofing and siding shingles
- Vinyl floor tiles
- · Plaster, cement, putties and caulk
- Ceiling tiles and spray-on coatings
- Industrial pipe wrapping
- · Heat-resistant textiles
- Automobile brake linings and clutch pads

OSHA Standards

OSHA has three standards to protect workers from the hazards of asbestos depending on the type of workplace. For complete information on all of the requirements, see the standard specific to your type of workplace:

General Industry: 29 CFR 1910.1001 covers work in general industry, such as exposure during brake and clutch repair, maintenance work, and manufacture of asbestos-containing products.

Shipyards: 29 CFR 1915.1001 covers construction, alteration, repair, maintenance, renovation and demolition of structures containing asbestos during work in shipyards.

Construction: 29 CFR 1926.1101 covers construction, alteration, repair, maintenance, or renovation and demolition of structures containing asbestos.

What protections exist in the Standards?

- Permissible Exposure Limit (PEL) for asbestos is 0.1 fiber per cubic centimeter of air as an eight-hour time-weighted average (TWA), with an excursion limit (EL) of 1.0 asbestos fibers per cubic centimeter over a 30-minute period. The employer must ensure that no one is exposed above these limits.
- Assessment of workplaces covered by the standards must be completed to determine if asbestos is present and if the work will generate airborne fibers by a specific method under each standard.
- Monitoring necessary to detect if asbestos exposure is at or above the PEL or EL for workers who are, or may be expected to be exposed to asbestos. Frequency depends on work classification and exposure. The construction and shipyard standards require assessment and monitoring by a competent person.

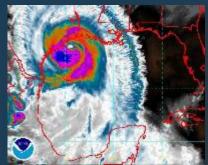
Asbestos

 Asbestos must be accurately identified, safely collected, and properly disposed of using qualified personnel or contractors.

https://www.osha.gov/sites/default/files/publications/OSHA3507.pdf









Part 6: Waterway Debris Removal Programs



Natural Resources Conservation Service (NRCS)

- The NRCS manages the Emergency Watershed Protection Program (EWP)
- The NRCS EWP is an emergency recovery program designed to relieve imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences.



NRCS EWP Activities

- NRCS EWP Activities include, but are not limited to, providing financial and technical assistance to:
 - Remove debris from stream channels, road culverts, and bridges.
 - Reshape and protect eroded banks.
 - Correct damaged drainage facilities.
 - Establish cover on critically eroding lands.
 - Repair levees and structures.
 - Repair conservation practices.

Eligibility Under the Public Assistance Program

 Debris removal from waterways that is necessary to eliminate an immediate threat to life, public health and safety, or improved property is eligible for reimbursement under the Public Assistance Program.



Roles and Responsibilities

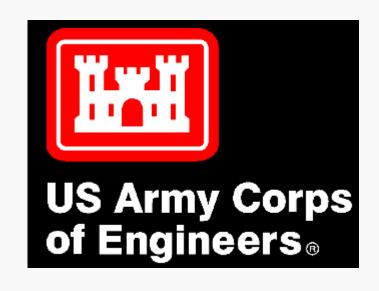
- The U.S. Environmental Protection Agency (EPA) and the U.S. Coast Guard (USCG) have the specific authority to remove hazardous materials.
- EPA is responsible for removing such material from inland water zones.
- The USCG is responsible for coastal water zones.





Roles and Responsibilities

 Debris removal from waterways usually requires coordination with the USACE for the use of a nationwide permit and with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) to ensure compliance with Section 7 of the Endangered Species Act (ESA).





Navigable Waterways

- If the applicant has the legal responsibility to maintain a non-federally maintained navigable waterway, removal and disposal of incident-related debris that obstructs the passage of vessels is eligible.
- Debris removal is eligible to a maximum depth of 2 feet below the low-tide draft of the largest vessel that utilized the waterway prior to the incident.
- Any debris below this zone is ineligible unless it is necessary to remove debris extending upward into an eligible zone.

Non-Navigable Waterways

- Includes flood control works and natural waterways.
- Debris deposited by the incident may obstruct a natural waterway that is not improved or maintained or a constructed channel, including flood control works. In these cases, removal of the debris from the channel is eligible if the debris poses an immediate threat.

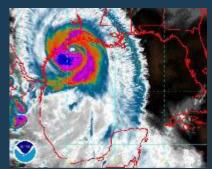
Non-Navigable Waterways

Threats include:

- Obstructs, or could obstruct, intake structures;
- Could cause damage to structures, such as bridges and culverts; or
- Is causing, or could cause, flooding to improved public or private property during the occurrence of a 5-year flood.









Part 7: Substantial Damage Estimates





Protect the life you've built with flood insurance.

Flooding is the most common and costly natural disaster in the United States. Just one inch of water in your home can cause more than \$25,000 in damage.

Most homeowners policies don't cover flooding – only flood insurance reimburses homeowners for flood damage. Most policies have a 30 day waiting period before going into effect, so talk to your insurance agent today about purchasing flood insurance through the National Flood Insurance Program.



National Flood Insurance Program

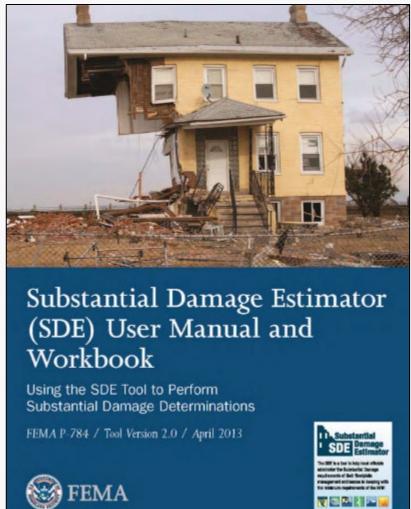
- The NFIP offers flood insurance policies to homeowners, renters, and businesses in participating communities.
- Communities must adopt and enforce floodplain management regulations to participate in the NFIP.

National Flood Insurance Program

 To participate in the National Flood Insurance Program (NFIP), the impacts of damages to structures within a jurisdiction's established Special Flood Hazard Area (SFHA) must be assessed before repairs can be made.



Substantial Damage Assessment Process



 These assessments help identify whether a property is "substantially damaged," meaning the cost to restore the building exceeds 50% of its pre-disaster market value.

Substantial Damage Estimation Process



- 1. Property owner is mailed a notification about the SDE process.
- 2. Assessors evaluate damage from the event.
- 3. Analysis is performed to determine if the cost to repair is 50% or more of the market value. If yes, the structure is considered Substantially Damaged.

Substantial Damage Estimation Process



- 4. Community officials formally notify property owners assessment results, determination if substantially damaged, and if so, obligations for compliance.
- 5. Property owner informed of necessary actions to comply with floodplain management regulations.
- 6. If necessary, property owner investigates available funding and assistance programs for recovery.

Substantial Damage Estimation Process

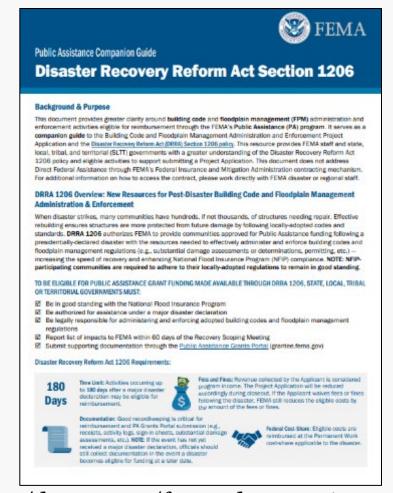
7. Begin Recovery

8. Property Inspection

- 7. Property owner submits request for necessary permits hiring contractors as needed to begin repairs.
- 8. Community performs inspections based on the type of work undertaken (repairs vs new construction) to confirm compliance with regulations.

Substantial Damage Estimation Facts

- FEMA used to conduct these inspections, now local governments are responsible for them.
- Local contractors can be used to conduct substantial damage estimates.
- A robust public information strategy is needed.
- The basis for substantial damage estimation can be found in the Disaster Recovery Reform Act, Section 1206.



https://www.fema.gov/sites/default/files/documents/fema_drra-1206-companion-document.pdf

