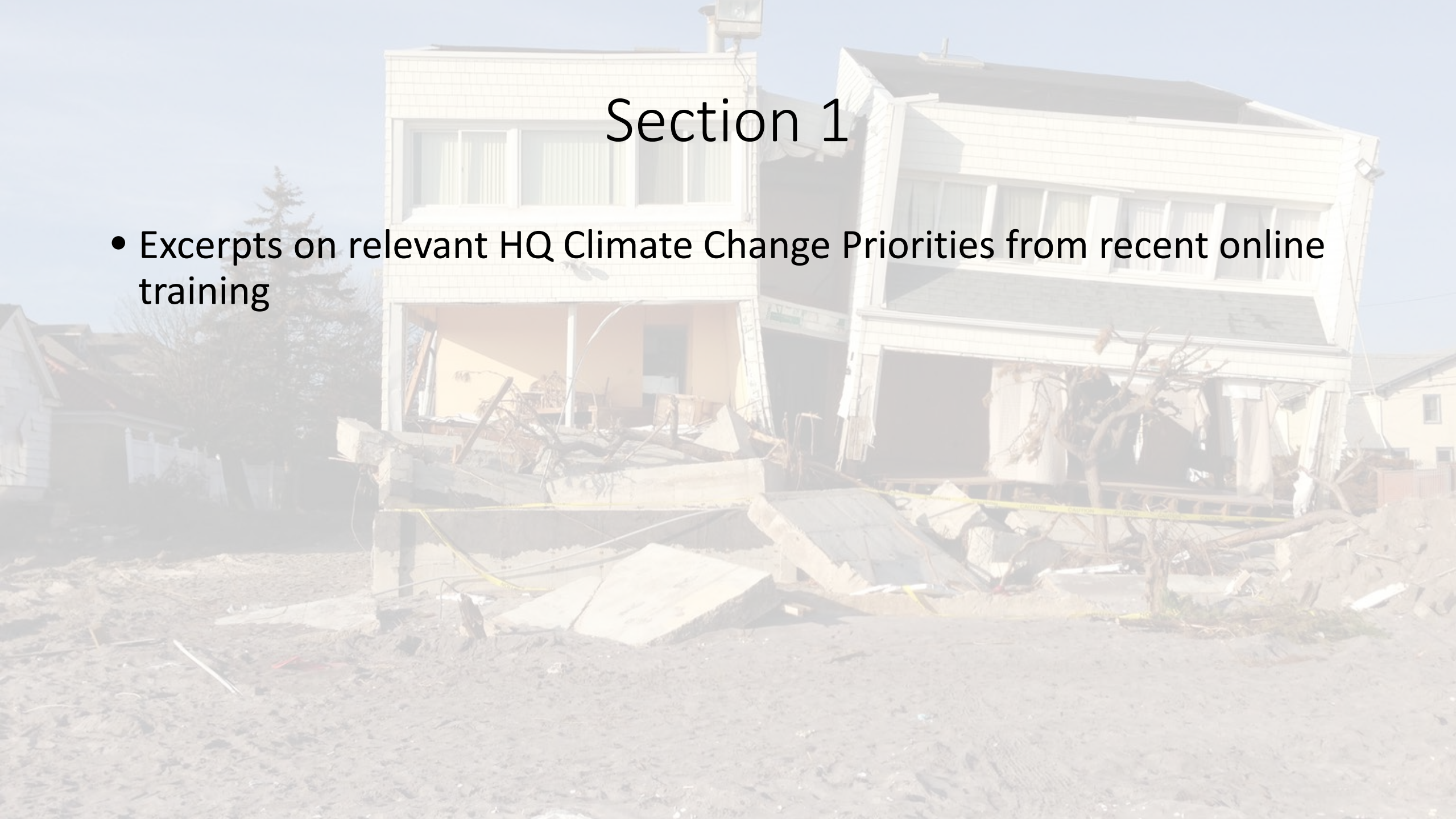




Climate Change Background

Section 1

- Excerpts on relevant HQ Climate Change Priorities from recent online training

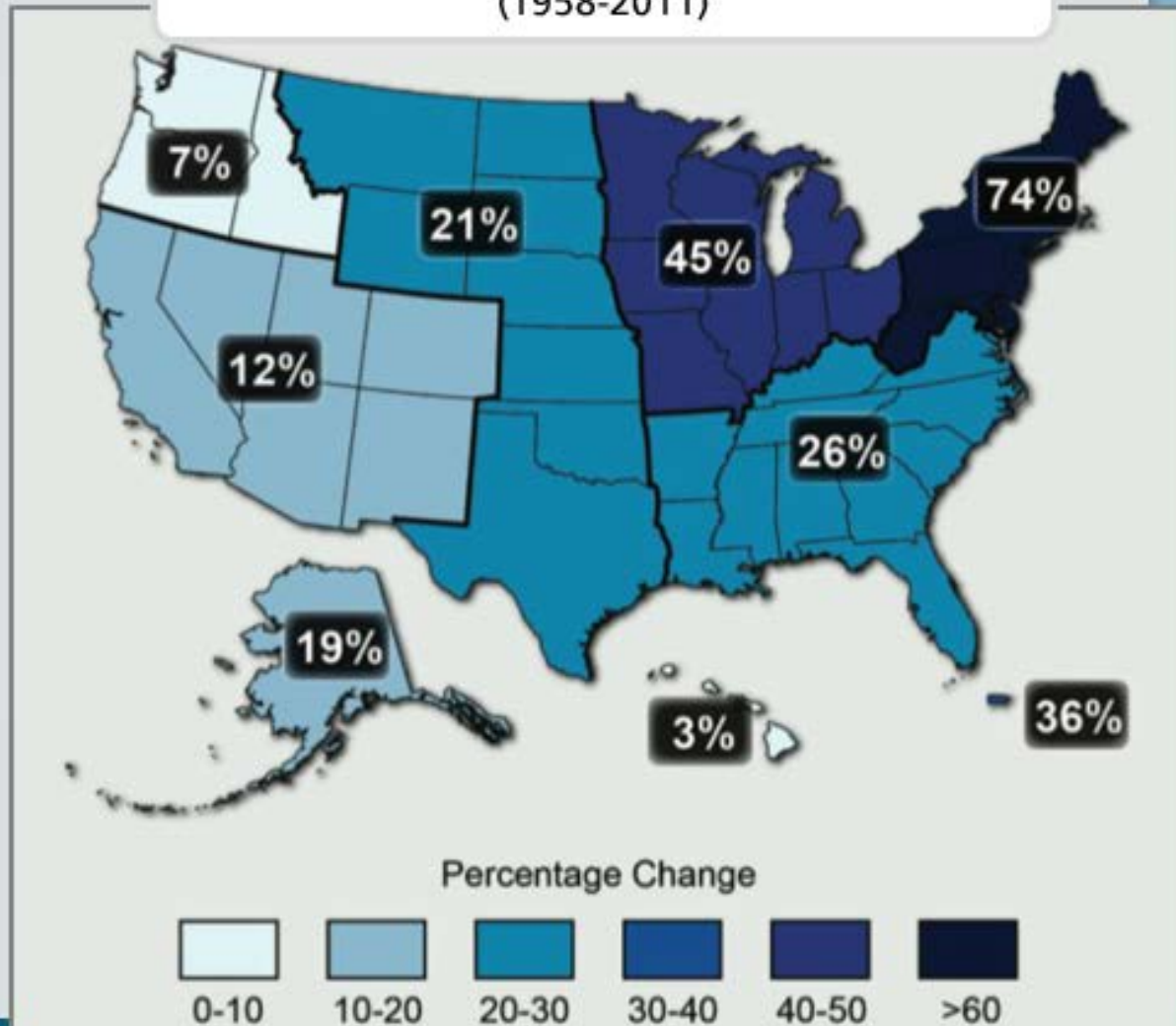


Increases in Very Heavy Precipitation Events



- Heavy rainfall events are expected to increase nationwide, and they're already increasing everywhere.
- The Northeast and Upper Midwest have experienced the most significant increases in extreme precipitation.

Percent Change in Very Heavy Precipitation (1958-2011)



Protection of water quality will be greatly challenged by changes in climate.



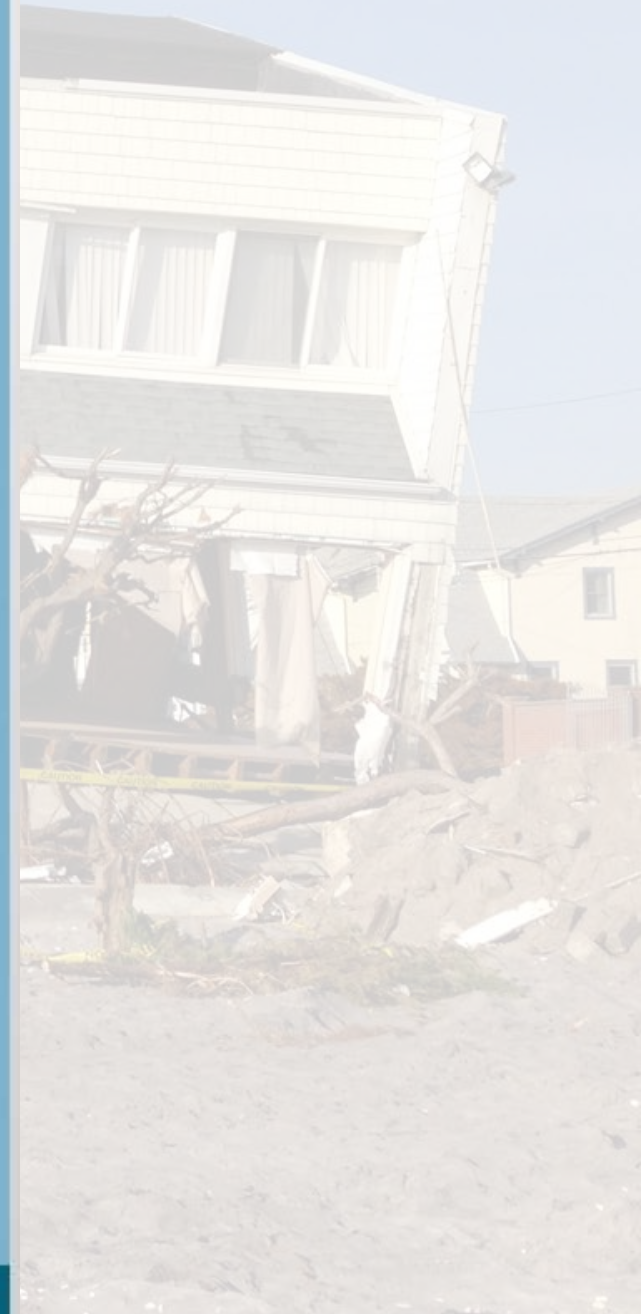
Climate Change and Water Quality

- Higher temperatures could also increase the incidence of harmful algal blooms, threatening ecosystems and public health. Increased algae growth will also increase the need for drinking water treatment.



Harmful algal blooms

Source: Woods Hole Oceanographic Institute "Harmful Algae"



Changes in climate may also affect EPA's efforts to clean up and manage contaminated sites.



Climate Change and Land-based Vulnerabilities

- Contaminated sites and cleanup remedies are vulnerable to the full range of climate stressors, including changes in temperature, precipitation patterns, and storm activity.
- EPA responsibilities on contaminated sites that may be affected are:
 - Site containment, e.g., sites located in permafrost
 - Debris management
 - Emergency response (working with others)
- Flooding and inundation from more intense and frequent storms may lead to contaminant releases at Superfund, Brownfields, and underground storage tank sites, and other sites where there have been releases of hazardous wastes.

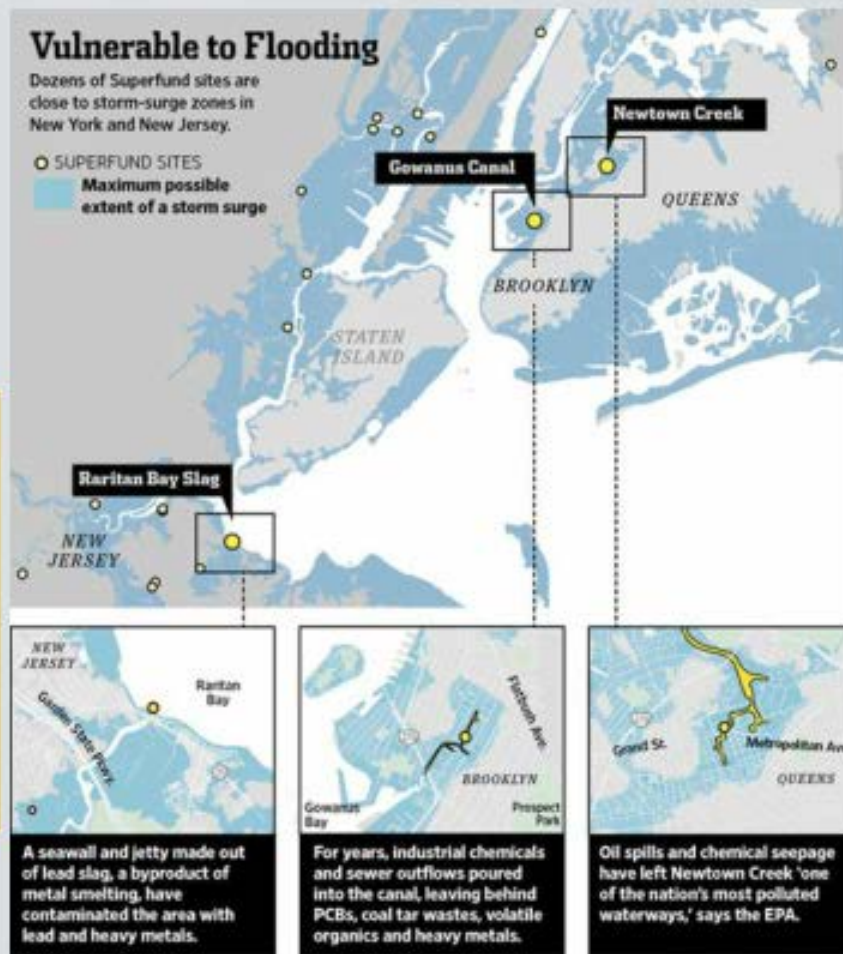


Climate Change and Land-based Vulnerabilities

This map depicts New York area Superfund sites that are vulnerable to increased flooding as a result of climate change.



Hover the mouse over the map to zoom in. When you're ready to continue with the slide, move the mouse away.



Source: U.S. Environmental Protection Agency and U.S. Army Corps of Engineers

Ronnie Regan/The Wall Street Journal



Adaptation concerns are also being incorporated into cleanup decisions for Superfund sites.

Incorporating Adaptation into the Management of Contaminated Lands

Project managers are beginning to take the following steps:



EPA Hazardous Waste: Treatment, storage, and disposal

- Assess site vulnerabilities.
- Use Superfund fact sheets describing the climate change adaptation issues associated with remediation systems.
- Incorporate adaptation measures where needed to increase the resilience of cleanup remedies to climate change impacts.



Local and Regional Outreach

WEBINARS ON CLIMATE CHANGE ADAPTATION FOR STATE AND LOCAL GOVERNMENTS

In late 2010, early 2011, and again in 2013, EPA's State and Local Climate and Energy Program hosted a series of webinars for state and local governments on the planning and implementation of adaptation efforts.

Topics included:

- Achieving buy-in for adaptation projects,
- Overcoming the uncertainty barrier to adaptation, and
- Attracting funding for adaptation.

U.S. EPA's State Climate and Energy Technical Forum & Local Climate and Energy Webcast Series
Present:

**Climate Change Adaptation for State and Local Governments
Attracting Funding for Adaptation**

Telephone call-in number: (877) 506-7699
We will start in a few minutes. Thank you for joining us.



The graphic contains the EPA logo (United States Environmental Protection Agency) on the left and the State and Local Climate and Energy Program logo on the right. The program logo features a stylized dome and buildings. Below the logos are two horizontal image strips: the top one shows a blue sky with white clouds, and the bottom one shows a green forest with wind turbines in the distance.



Climate Measures and Mainstreaming of Adaptation

EPA ADAPTATION PRIORITIES

- Protect Agency Facilities and Operations
- Factor Legal Considerations into Adaptation Efforts
- Strengthen Adaptive Capacity of EPA Staff and Partners Through Training
- Develop Decision-Support Tools that Enable EPA Staff and Partners to Integrate Climate Change Adaptation Planning into their Work
- Identify Cross-EPA Science Needs Related to Climate Change Adaptation
- Partner with Tribes to Increase Adaptive Capacity
- Focus on Most Vulnerable People and Places
- Measure and Evaluate Performance

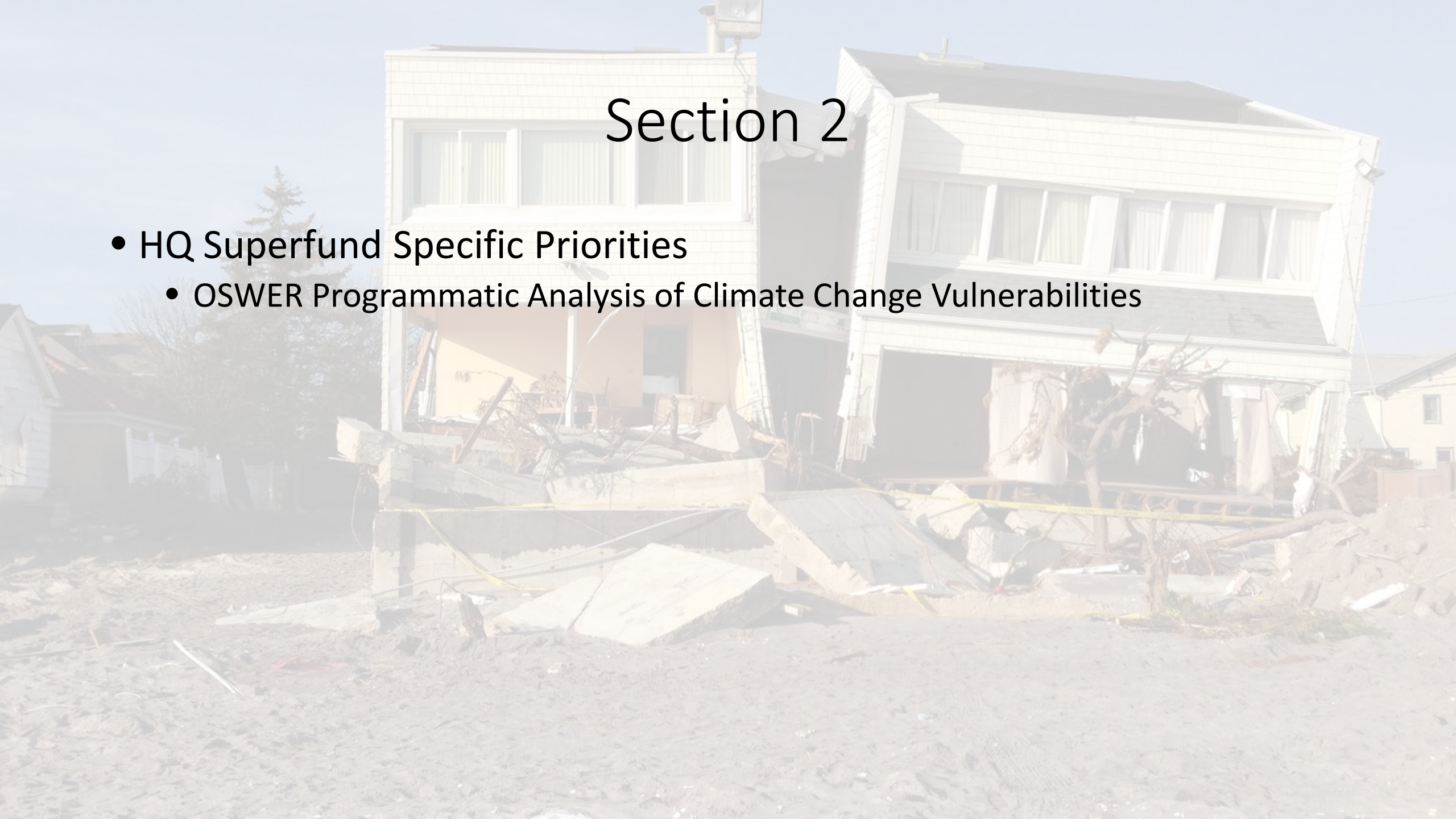
Thanks! By taking this training, you're helping EPA meet this priority.

For example, EPA has developed performance measures for tracking partnerships that support climate change adaptation.



Section 2

- HQ Superfund Specific Priorities
 - OSWER Programmatic Analysis of Climate Change Vulnerabilities



Preserving Land	Proper Management of Hazardous and Non-Hazardous Wastes	Design and placement of RCRA Treatment, Storage and Disposal facilities, non-hazardous Subtitle D landfills, Superfund remedies and municipal recycling facilities may need to change to accommodate climate change impacts.
		Hazardous waste permitting requirements may need to be updated to reflect climate change impacts.
		Current waste management capacity may be insufficient to handle surges in necessary treatment and disposal of hazardous and municipal wastes, as well as mixed wastes generated from climate events.
		Levels of necessary financial assurance at RCRA and CERCLA facilities may need to adjust for increased risks/liabilities at specific facilities that may be directly affected by climate change impacts.
	Reducing Chemical Risks and Releases	★ Remediation and containment strategies and materials used in construction may need to be strengthened to reflect changing climate conditions.
		Current equipment, scientific monitoring and sampling protocols on sites may no longer be effective and therefore may require adjustments due to climate change impacts.
		★ Current assumptions regarding protective ness of remediation and containment methods may not reflect changing climate impacts.
		Spill Prevention Plans may need to be updated due to the significant increases in the incidence of flooding and storm events.

Restoring Land

Site characterization and design of cleanups may not reflect changing climate conditions.

Risk factors and rankings for risk-based cleanup strategies may need to be reassessed based on changing climate conditions.

Changing climate conditions may impact continued remedy effectiveness.

★ Remedies that are “complete” or are long-term actions may no longer be protective and resilient as climate conditions change at site.

★ Increased contaminant migration may lead to boundary changes at current sites or creation of new sites.

★ Changes in climate conditions may alter assumptions about contaminant form/volatility.

Current scientific monitoring and sampling protocols on sites may no longer be effective.

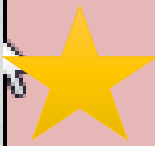
Safety procedures on sites may not reflect likelihood or intensity of surrounding conditions.

Availability of utilities and transportation infrastructure may be limited as a result of increased impacts to those systems.

Current assumptions regarding protective ness of re mediation and containment methods may not reflect changing climate impacts.

Periodic evaluations of implemented remedies may not incorporate all climate change impacts, including changes in frequency and intensity that may impact remedy effectiveness.

Use of natural resources impacted by sites may change as a result of increased need, resource scarcity, or compromised resources.



Emergency Response

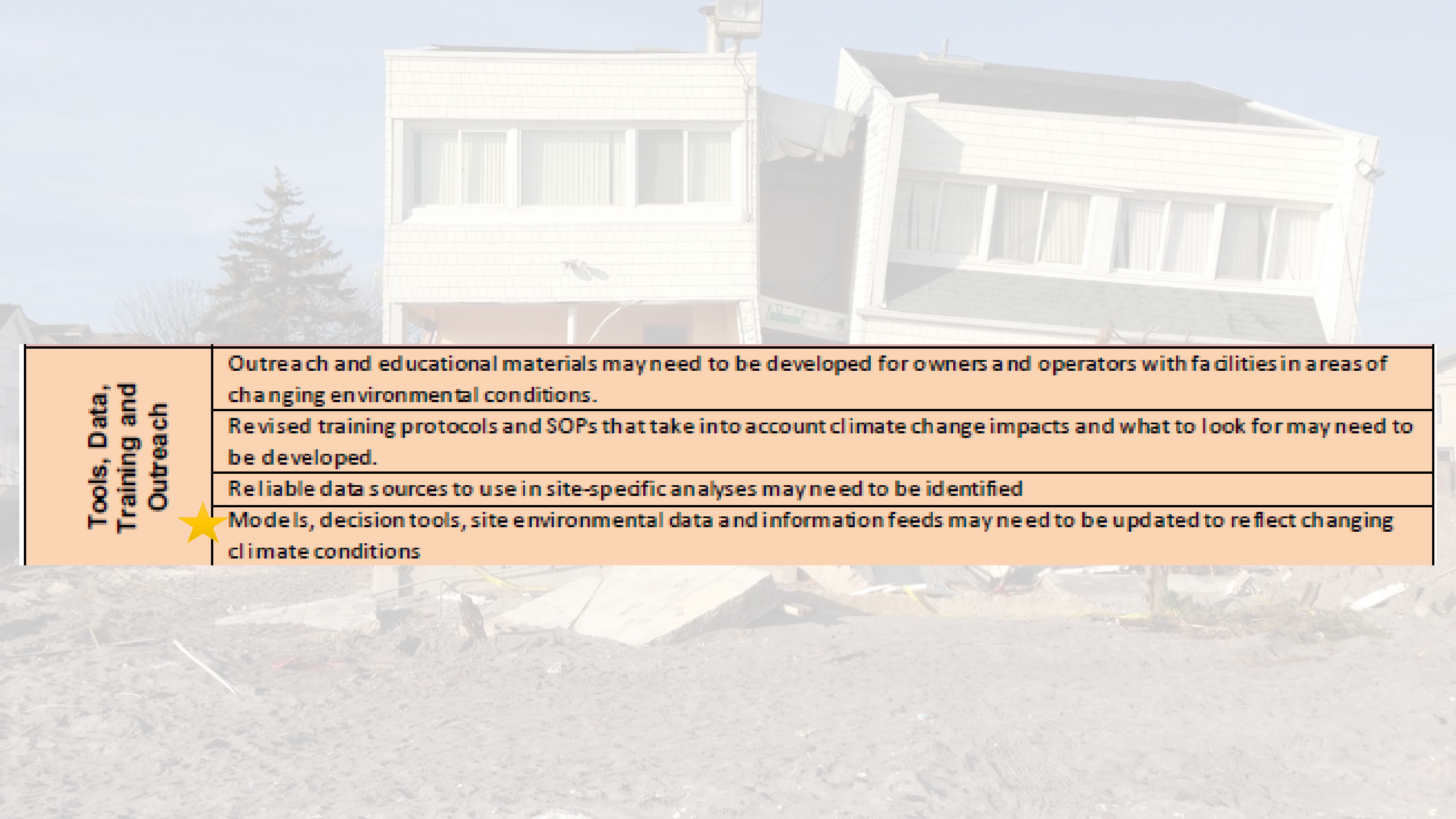
Current levels of administrative, enforcement, and emergency response staff may be insufficient to cover needs if number of extreme events increase.

Sufficient capability and capacity for conducting necessary lab analysis following significant weather events may not be available.

Current waste management capacity, including interim capacity, may be insufficient to handle surges in necessary treatment and disposal of hazardous and municipal wastes, as well as mixed wastes generated from climate events.

Training needs (both current and future) are likely to increase in order to meet the increase demand for response actions.

Existing emergency planning currently required or employed by OSWER may not sufficiently consider elevated risks from multiple climate impacts.



**Tools, Data,
Training and
Outreach**

Outreach and educational materials may need to be developed for owners and operators with facilities in areas of changing environmental conditions.

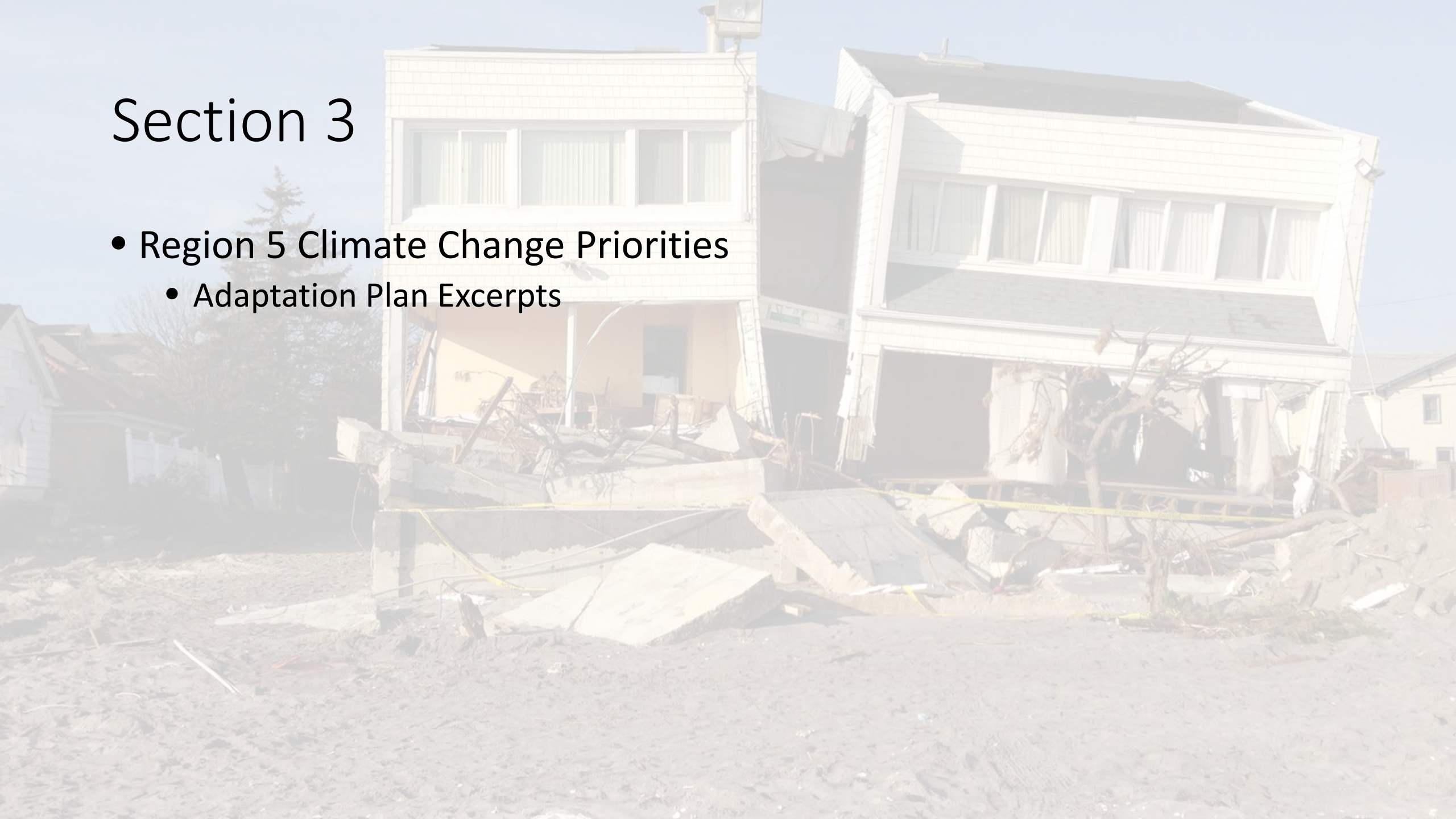
Revised training protocols and SOPs that take into account climate change impacts and what to look for may need to be developed.

Reliable data sources to use in site-specific analyses may need to be identified

★ Models, decision tools, site environmental data and information feeds may need to be updated to reflect changing climate conditions

Section 3

- Region 5 Climate Change Priorities
 - Adaptation Plan Excerpts





Goal: Risk of Contaminant Release

- Region 5 has a significant universe of contaminated sites due to our industrial legacy. Increased flood and drought conditions may impact the mobilization of contaminants at these sites and alter the time, cost and effectiveness of cleanups.
- Drier conditions might cause severe erosion issues on terrain and constructed landfills.
- Corrective actions may need to be altered to ensure they are protective given the potential for increased flooding.
- Flood events could wash away constructed remedies and increase contamination to the environment. Standing water could bring contaminants to the surface and increase exposure potential.
- Potential contaminant releases may pose an increased risk of adverse health impacts, with environmental justice and other vulnerable populations most at risk as they may reside close to these sites.

Goal: Emergency Response

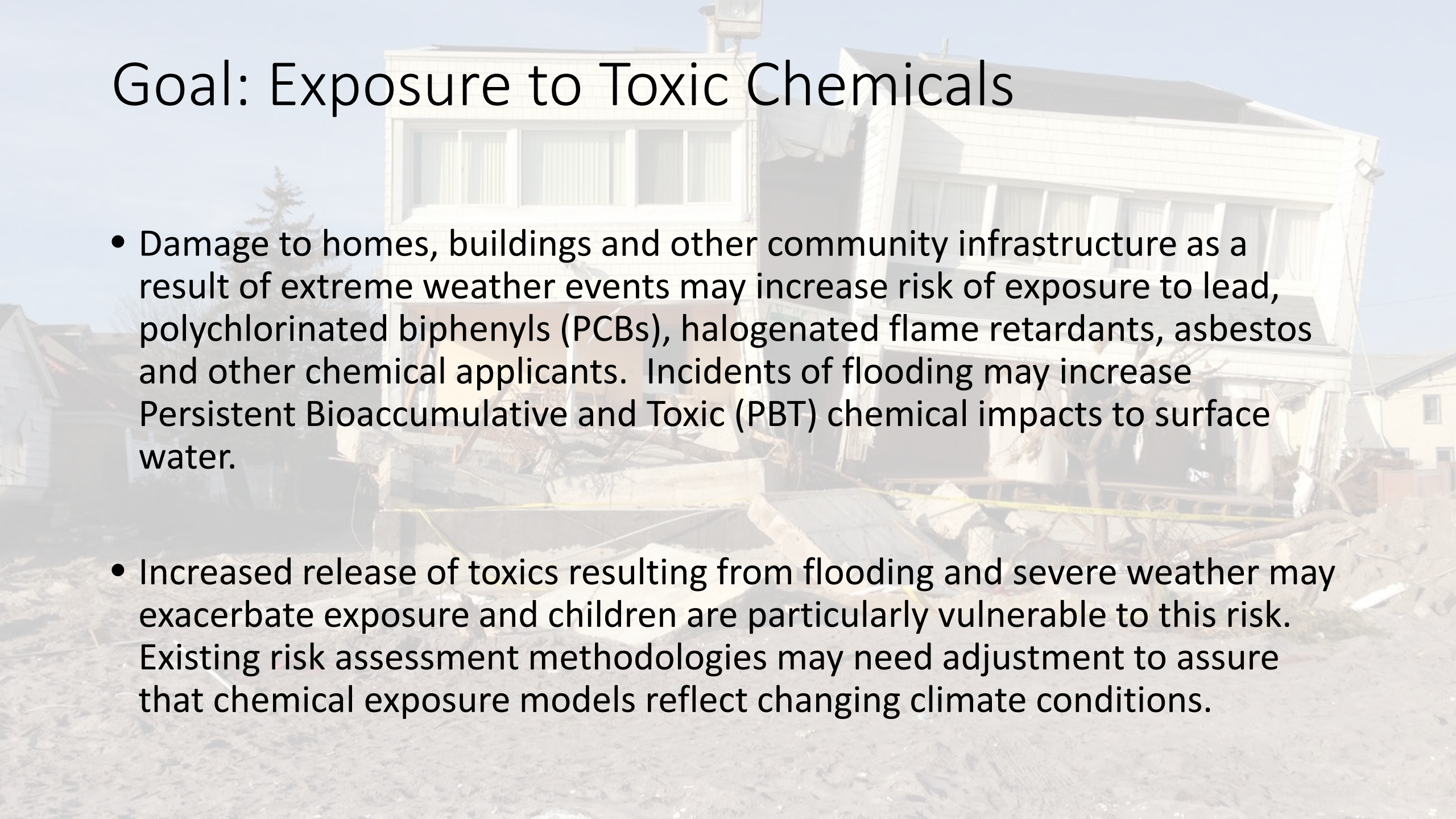


- Increased precipitation may lead to increased riverine flooding, resulting in additional hazardous waste and domestic white goods removal and cleanup.
- Availability of emergency response teams to react quickly may be stressed as extreme weather related events become more frequent.
- The need for emergency response and debris/waste management due to storms resulting in large-scale releases of chemicals and generation of debris from flooded/damaged and/or demolished buildings may also increase. Existing waste management capacity may not be adequate to meet the demands of an increased debris stream resulting from more frequent storms.
- Increased extreme temperatures will impact the health and safety of response workers.
- If climate change leads to more intense weather events and increases EPA's involvement in disaster response and remediation, then core program work in all media could be affected due to a scarcity of available staff and resources.
- The need to activate the Response Support Corps and other staff to respond to emergency/disaster situations within the Region and in support to other Regions may have an adverse impact on the Region's ability to consistently and effectively implement core activities and address identified national and regional priorities.

Goal: Clean up and Corrective Action

- The increase in heavy precipitation events that are likely to occur in the Midwest as a result of climate change may cause an increase in flooding risk; droughts are also expected to become more common.
- Flooding often produces significant debris that must be quickly managed by local communities in the region.
- Landfill design and controls may become inadequate to protect the environment and human health. The impact of flooding on non-hazardous disposal facilities and their engineered systems is significant as municipal solid waste landfills are only required to design for handling run-on or run-off from a 25-year storm.
- Drought conditions may affect the performance of vegetative caps on closed landfills which may result in increased leachate generation and/or emissions from landfills.
- Contaminated sites where groundwater is involved may have to consider different remedies that reflect the possibility of long term drought, as well as the purging effect of flooding. Groundwater, gas, and leachate monitoring systems may all be affected. States and local governments may need assistance in evaluating the impacts on these facilities.

Goal: Exposure to Toxic Chemicals

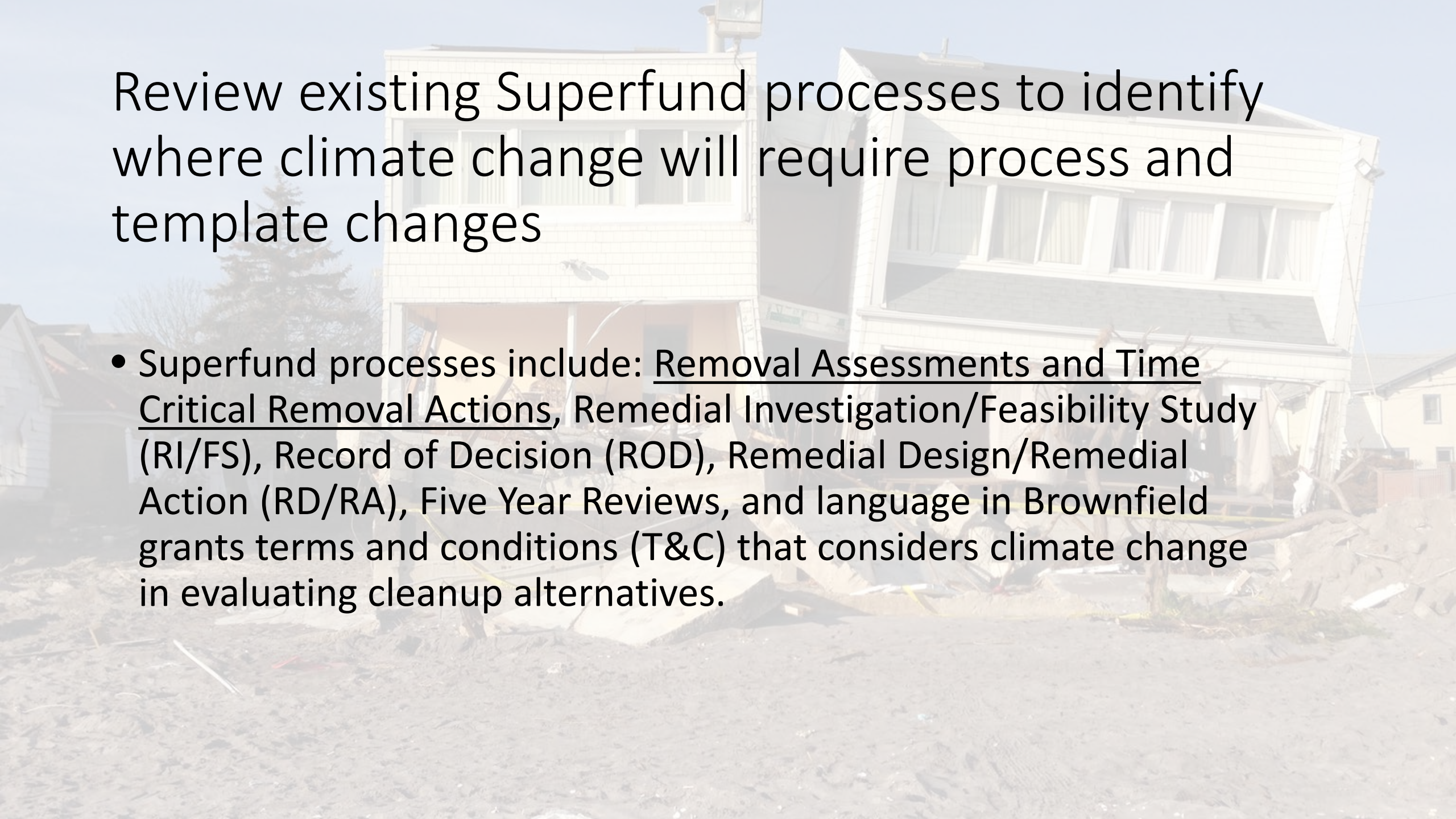


- Damage to homes, buildings and other community infrastructure as a result of extreme weather events may increase risk of exposure to lead, polychlorinated biphenyls (PCBs), halogenated flame retardants, asbestos and other chemical applicants. Incidents of flooding may increase Persistent Bioaccumulative and Toxic (PBT) chemical impacts to surface water.
- Increased release of toxics resulting from flooding and severe weather may exacerbate exposure and children are particularly vulnerable to this risk. Existing risk assessment methodologies may need adjustment to assure that chemical exposure models reflect changing climate conditions.

Section 4

- Region 5 Superfund Division Priorities
 - Our commitments for the next two years





Review existing Superfund processes to identify where climate change will require process and template changes

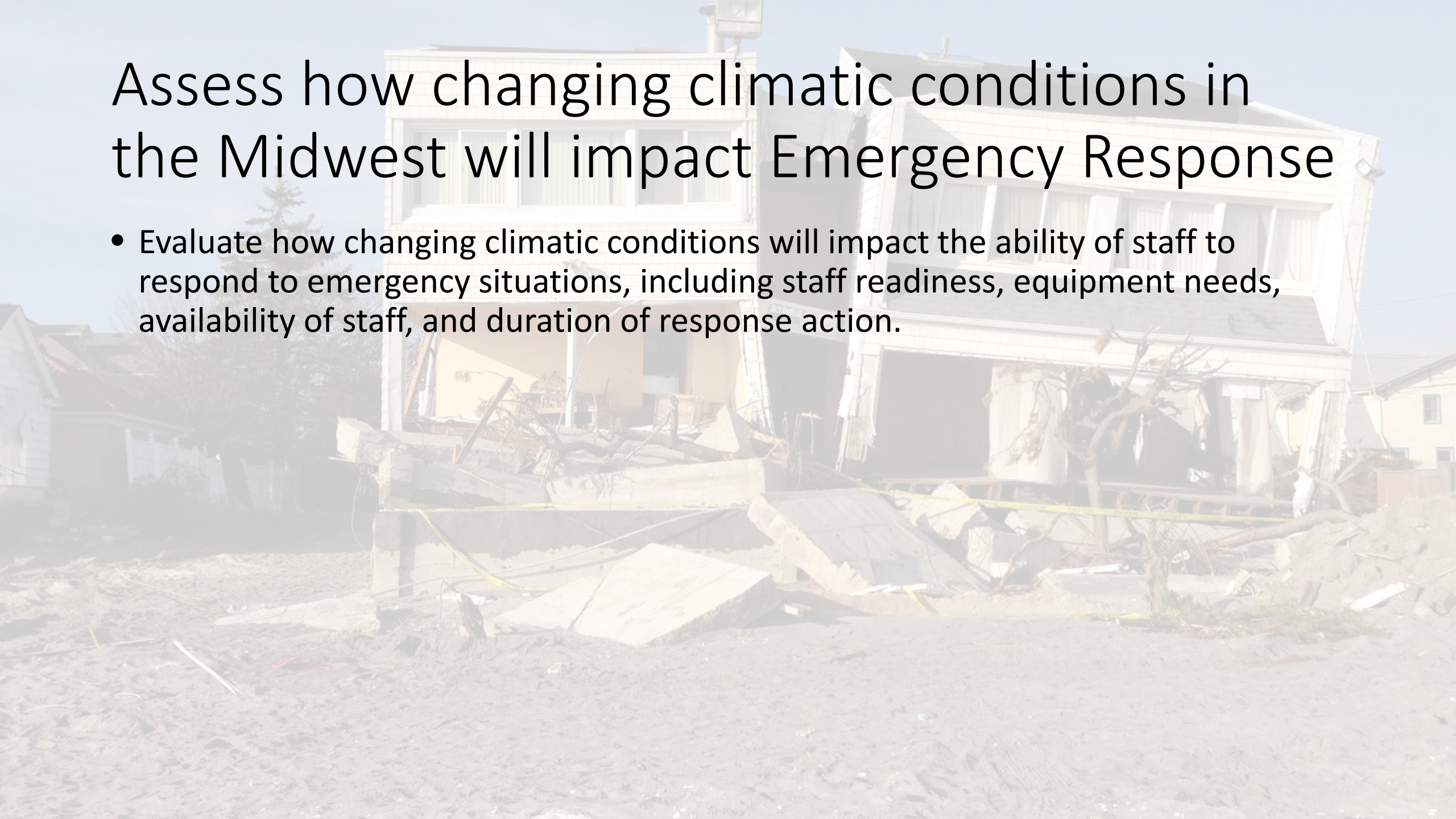
- Superfund processes include: Removal Assessments and Time Critical Removal Actions, Remedial Investigation/Feasibility Study (RI/FS), Record of Decision (ROD), Remedial Design/Remedial Action (RD/RA), Five Year Reviews, and language in Brownfield grants terms and conditions (T&C) that considers climate change in evaluating cleanup alternatives.

Adjust requirements and language in Superfund processes to reflect the new protocols.

- This includes reviewing and revising how to:
 - Evaluate alternative remedies for sites that may be impacted by floods and changing water tables, such as landfills on floodplains;
 - Choose remediation techniques that incorporate vegetation that might be more tolerant of heat, excessive rain, or drought;
 - Manage severe erosion issues on terrain and constructed landfills, with larger rain events contributing to additional erosion concerns;
 - Account for water table fluctuations that might impact changing plume direction and increase smear zones;
 - Redesign corrective actions to manage frequent flooding that may bring contaminants to the surface and increase exposure potential;
 - Manage changes in construction season due to warmer or erratic weather; and
 - Manage increases in sedimentation and scouring due to larger rain events at sites

Assess how changing climatic conditions in the Midwest will impact Emergency Response

- Evaluate how changing climatic conditions will impact the ability of staff to respond to emergency situations, including staff readiness, equipment needs, availability of staff, and duration of response action.

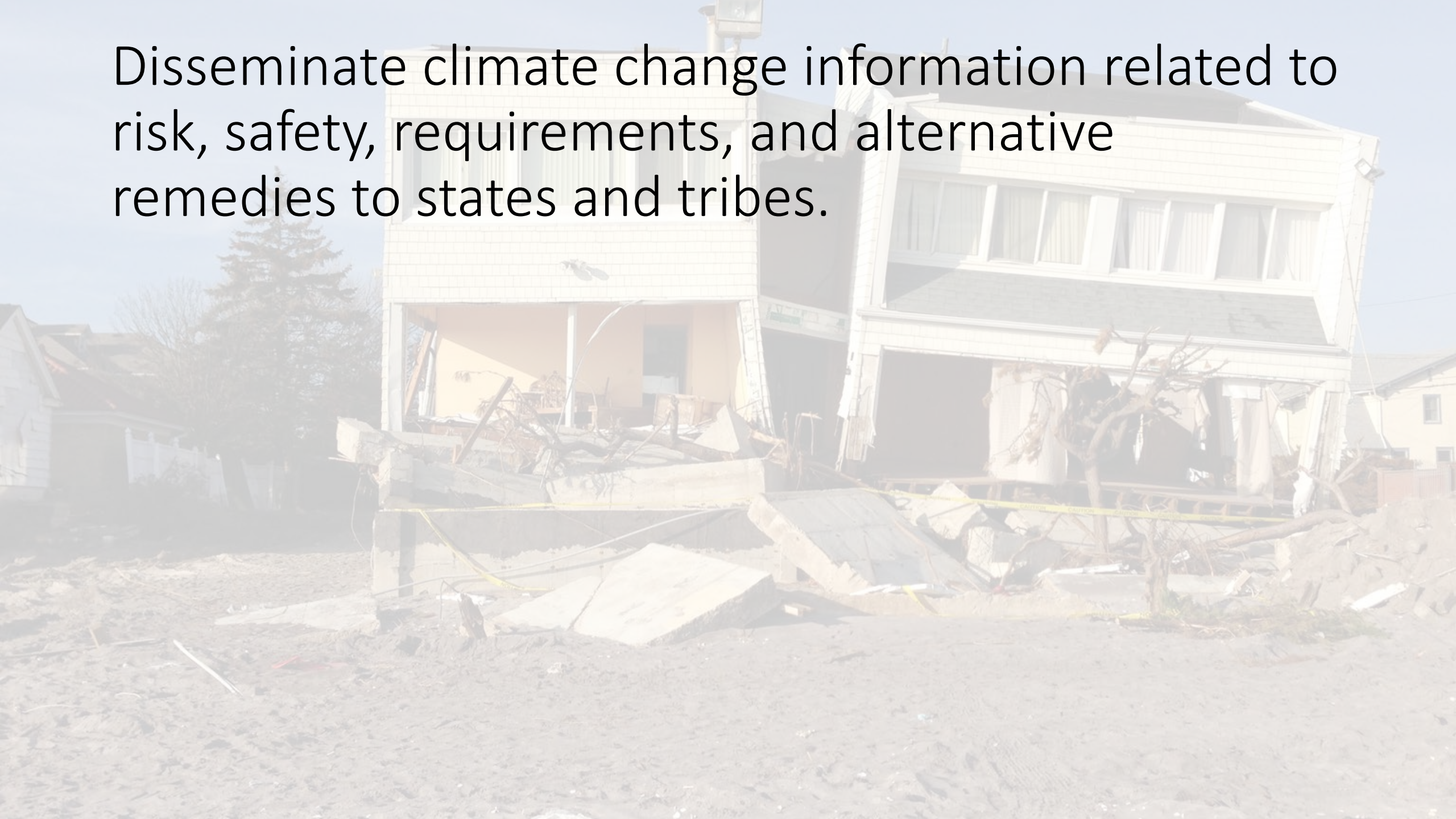


Evaluation of resource needs



- Determine how Superfund will adjust staff flexibility and availability, training, and equipment to ensure timely responses to events. This will also include improvements in communication channels with state and local authorities. Additionally, an increase in training and cross program coordination for Regional Science Council (RSC) and Incident Management Team (IMT) members will be necessary to prepare for more frequent response.

Disseminate climate change information related to risk, safety, requirements, and alternative remedies to states and tribes.



Section 5

- ESF 10 Review and response examples from prior incidents



ESF #10 Coordinator and Primary Agency



The Environmental Protection Agency (EPA):

- Is the ESF #10 coordinator.
- Serves as primary agency for incidents involving inland areas.
- Takes actions to prepare for, prevent, minimize, or mitigate a threat posed by hazardous materials.



FEMA

ESF #10 – Oil and Hazardous Materials Response

IS-810 – February 2009

Visual 16

ESF #10: Scope

ESF #10 addresses incidents involving intentional or accidental release of:

- **Oil.**
- **Hazardous substances, pollutants, and contaminants, including those that are:**
 - **Chemical.**
 - **Biological.**
 - **Radiological.**



FEMA

ESF #10 – Oil and Hazardous Materials Response

IS-810 – February 2009

Visual 14

ESF #10 Actions

ESF #10 may:

- Assess extent of contamination.
- Contain, stabilize, treat, and dispose of oil or hazmats.
- Issue permits for and monitor debris disposal.
- Remove drums/barrels/containers.
- Decontaminate buildings/structures.
- Collect household hazardous waste.
- Monitor/sample air and water quality.
- Mitigate damage to natural resources.



FEMA

ESF #10 – Oil and Hazardous Materials Response

IS-810 – February 2009

Visual 20



Response to 2005 Hurricanes



Contact Us Search: All EPA This Area Go

You are here: [EPA Home](#) » Response to 2005 Hurricanes

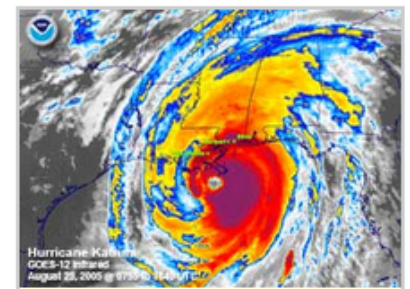
Note: EPA no longer updates this information, but it may be useful as a reference or resource.

Hurricane Quick Finder

Advisories	Air sampling data	AL: EPA response	Asbestos	Boil water
Children's health	Debris	Español	FL: EPA response	Frequent questions
Fuel waivers	Health issues	Hurricane prep	LA: EPA response	MS: EPA response
Mold	Oil spills	Playground sampling	Sediment sampling data	Superfund issues
Water issues	Water sampling data	West Nile virus		

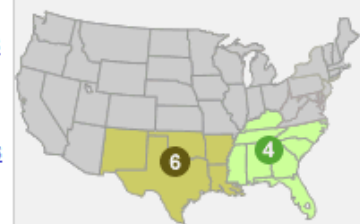
EPA emergency response personnel worked with FEMA and state and local agencies to respond to the hurricanes in 2005. In emergency situations, EPA serves as the lead Agency for the cleanup of hazardous materials. **We no longer update this Web site;** we provide the information for reference purposes only.

- Anniversary Reports
 - [Fifth year anniversary](#)
 - [Eighteen-month anniversary](#)
 - [One year anniversary](#)
- [Where you live](#): information by region and by Louisiana parish
- [Frequent questions](#): commonly asked questions and answers
- [Health issues](#): children's health, mold, West Nile, and more
- [Potential hazards when returning to homes and businesses](#)
- [Dealing with debris and damaged buildings](#)
- [Precautions when exposed to flood water](#)
- [Environmental testing results](#)
 - [Summary Results Of Sediment Sampling Conducted By The Environmental Protection Agency In Response To Hurricanes Katrina And Rita](#) (August 17, 2006)
 - [Summary Assessment of the Results of Sampling of Localized Areas Identified For Focused Investigations Following Hurricane Katrina](#) (March 2006)
 - [Environmental Assessment Summary for Areas of Jefferson, Orleans, St. Bernard, and Plaquemines Parishes Flooded as a Result of Hurricane Katrina](#) (December 6, 2005)
 - [Summary of Sediment Testing from September 10 – November 27, 2005: Hurricanes Katrina and Rita](#) (November 2005)
- [Public outreach materials](#)
 - handouts: [English](#) | [en Español](#) | [Tiếng Việt](#)
 - public service announcements: [English](#) | [en Español](#) | [Tiếng Việt](#)
- [Superfund site assessments](#): sites in the path of Hurricanes Katrina and Rita
- [Murphy Oil spill](#): EPA's response, data evaluation, and recommendations
- [General information about preparation for and recovery from hurricanes](#)



Hurricane Katrina struck the south central Gulf coast on August 28, 2005.

EPA Regional Information



EPA Region 4 (for Alabama, Florida, and Mississippi)
EPA Region 6 (for Arkansas, Louisiana, and Texas)
Information by Louisiana parish

- Response to 2005 Hurricanes Home
- Where You Live
- Frequent Questions
- Returning to New Orleans (Report)
- Health Issues
 - Advisories
 - Children's health
 - Mold
 - West Nile Virus
- Test Results
- Debris Issues
- Superfund Issues
- Water Issues
- Fuel Waivers
- Newsroom
- En Español
- Public Outreach Materials
- Photo Gallery
- Related Links
- General Information about Hurricanes
- Activities Updates

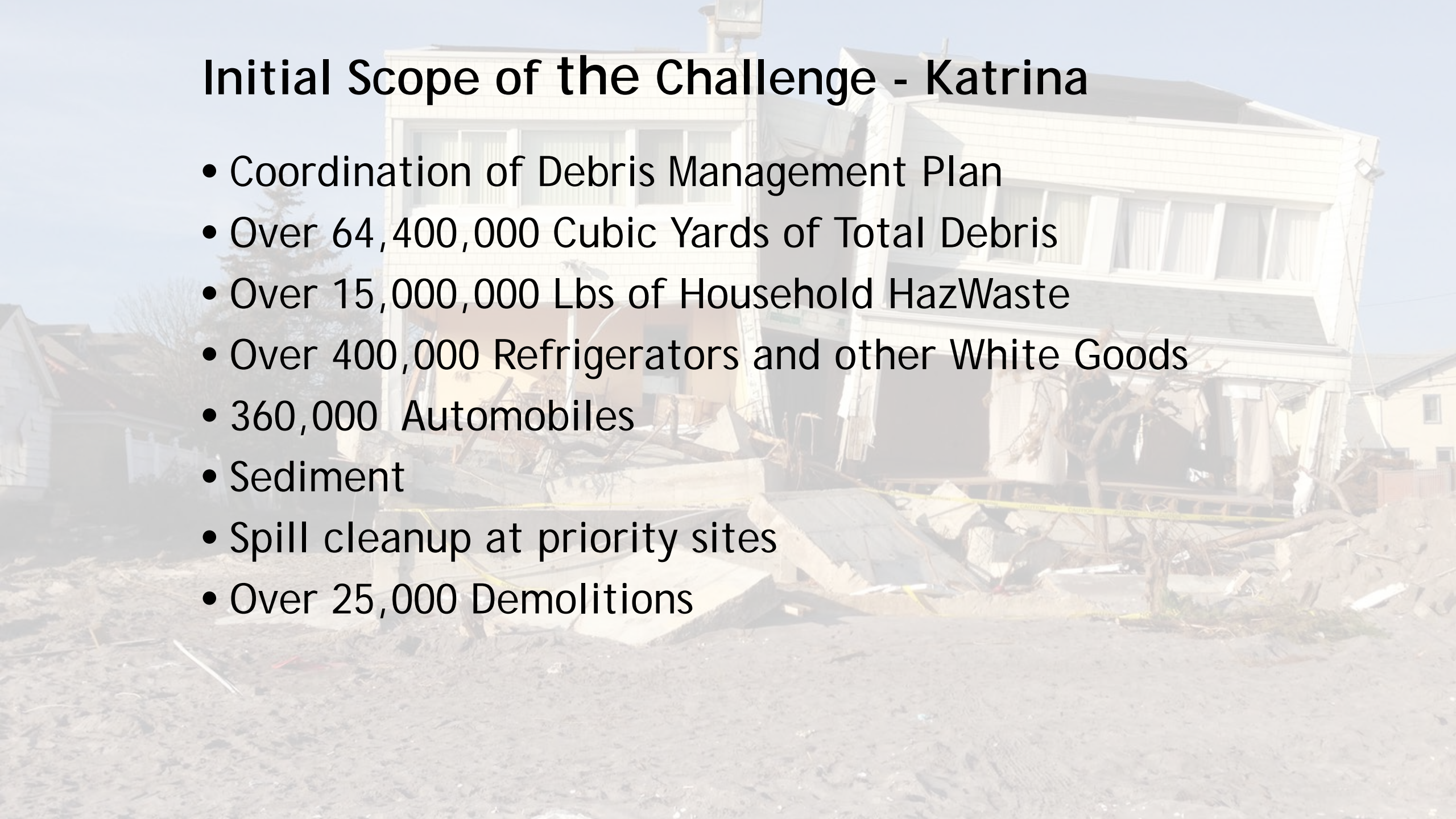
Katrina FEMA Mission Assignments

The background image shows a two-story house that has been severely damaged, likely by a hurricane. The house is tilted, and there is a large amount of debris, including branches and rubble, in the foreground. Yellow caution tape is strung across the area, indicating a restricted zone. The sky is clear and blue.

- Search & Rescue
- Environmental Sampling (including Temporary Housing sites)
- Drinking Water Assessment
- Wastewater Assessment
- Reconnaissance and Assessment of Industry/Spills
- Collection of Household Hazardous Waste
- Removal of Orphan Drums/Hazardous Debris
- Emergency Response for Spills & Special Sampling
- Cleanup of School Chemistry Labs
- Ammunition

Initial Scope of the Challenge - Katrina

- Coordination of Debris Management Plan
- Over 64,400,000 Cubic Yards of Total Debris
- Over 15,000,000 Lbs of Household HazWaste
- Over 400,000 Refrigerators and other White Goods
- 360,000 Automobiles
- Sediment
- Spill cleanup at priority sites
- Over 25,000 Demolitions



General Hurricane Katrina Response Successes

- Provided rescue operations support in New Orleans, while meeting usual ESF-10 missions
- Provided substantial support to re-establish critical infrastructure
- Demonstrated readiness by responding to two major disasters in a 30 day period
- Implemented a substantial communication system with the public and media using printed materials, interviews and the Internet

General Hurricane Katrina Response Successes

- Collected thousands of environmental samples to guide FEMA, HHS and state & local decision-makers
- Established Unified Command with LDEQ and USCG, and supported federal JFO partners - FEMA, LDHH, USACE, ATSDR, CDC
- Assembled a highly skilled workforce from every Region/and HQ Office
- Provided space, support, food and housing for 200 responders

Hurricane Sandy Response and Recovery



EPA Announces More Than a Half Billion Dollars in Post-Sandy Funding for New Jersey and New York to Help Alleviate Impacts of Future Storms.

- [Read the Press Release](#)
- [Read the Grant Application Guidance](#) [PDF 2.33 MB, 27pp]

Resources for Residents

- **Fact sheets** on flooded buildings, mold cleanup, household hazardous waste, lead paint, NJ & NY hotlines, and more.
- **Disinfecting drinking water**

General Information about Recovery

- **ALERT: Generator exhaust is deadly.** Always put generators outside well away from buildings.
- Call 1-800-424-8802 to report chemical or

Response Efforts

- **As of May 3, 2013:** Ongoing work

Questions and Answers

News Releases, Data, and Documentation

- Feb 21 - Air Monitoring Data
- Feb 15 - Air Monitoring Data

[Read more news releases](#)

HURRICANE Sandy

- Get Help
- Health and Safety
- Find Friends and Family
- Donate and Volunteer
- What the Government is Doing

MORE ON SANDY



Get this Widget 



En español

- [Hojas informativas sobre huracanes](#) | [Más de usa.gov](#)

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-  Facebook



Key EPA Actions - Sandy

- Air monitoring and sampling (burned area, incinerator)
- Water sampling (post sewage releases; post site releases)
- Sand sampling
- Debris Management
- Water and wastewater utilities
- Contaminated sites
 - Secured pre storm
 - Sampled and visually assessed post storm
- Residential Cleanup
 - Oiled water in basements
 - HHW
 - Orphan containers
- Technical assistance to states

http://epaossc.org/site/site_profile.aspx?site_id=8273

Section 6

- Available data and resources



Compiled Regional Data – To assist us with planning

- GIS Data / Flexviewer Datasets
 - ISA (fixed oil storage facilities, haz mat (facilities with extremely hazardous substances- EPCRA) petroleum terminals, pipelines, railroads)
 - Ohio Mapping project (HSIP, CAMEO)
 - Hydroviewer (region 5 chemicals, RCRA active facilities, floodplain delineation)
 - Linked subarea plans?
- Homeland Security Infrastructure Program (HSIP)
- Removal sites by status?
 - Currently unavailable – according to region

LCD: Disaster Debris Recovery Database Interactive Mapping Tool

- EPA Region 5 has developed a database of 12 types of recyclers which may manage disaster debris. This interactive map provides information and locations of over 3800 facilities throughout Region 5 capable of managing different materials which may be found in disaster debris.
- [Disaster Debris Recovery Database \(KMZ\)](#)

Search

Fly To Find Businesses Directions

Fly to e.g., 94043

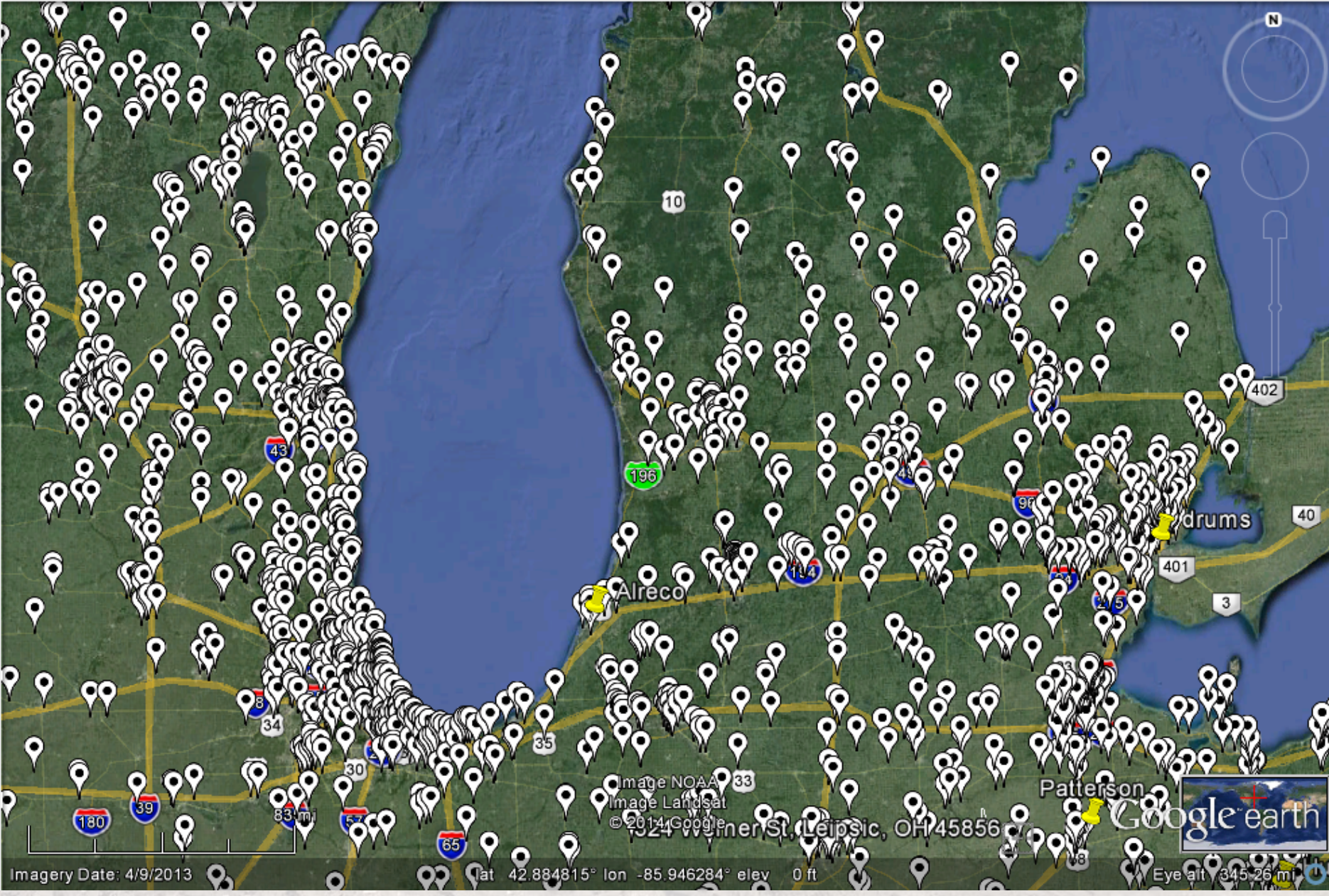
Search input field with magnifying glass icon

Places

- R5 Disaster Debris Recovery Database**
The US EPA Region 5 Disaster Debris Recovery Database is a database organized to promote the
- Composters (1,107)**
- Demolition Contractors (119)**
- Haulers (139)**
- Landfills**
 - Landfills - Construction & Demolition (221)**
 - Landfills - Municipal Solid Waste (238)**
 - Landfills - Hazardous Waste (7)**
- Recyclers**
 - Recyclers - Construction & Demolition Debris (7)**
 - Recyclers - Electronics (188)**
 - Recyclers - Hazardous Waste (232)**
 - Recyclers - Household Hazardous Waste (345)**
 - Recyclers - Metals (333)**
 - Recyclers - Tires (127)**
 - Recyclers - Vehicles (174)**
 - Recyclers - White Goods (44)**

Layers

- Primary Database
- Earth Pro (US)
- Borders and Labels
- Places
- Photos
- Roads



Imagery Date: 4/9/2013

Lat 42.884815° Lon -85.946284° elev 0 ft



Eye alt 345.26 m

Climate and Precipitation Models

- Unfortunately the increased precipitation models are not very location specific – generally I think we can conclude that we are predicted to see increased precipitation in our region. I was hoping to find more specific models to help us prioritize geographic focus areas and I searched hard and talked to a number of folks but haven't found much to date.
- Temperature models are a bit more geographically specific
- Screen shots of a couple examples of these models and modelling resources follow



Downscaled CMIP3 and CMIP5 Climate and Hydrology Projections

This site is best viewed with [Chrome](#) (recommended) or [Firefox](#). Some features are unavailable when using Internet Explorer. [Requires JavaScript to be enabled.](#)

- Welcome
- About
- Tutorials
- Projections: Subset Request
- Projections: Complete Archives
- Feedback
- Links

Downscaled CMIP5 climate and hydrology projections' documentation and release notes available [here](#).

Summary

This archive contains fine spatial resolution translations of climate projections over the contiguous United States (U.S.) developed using two downscaling techniques (monthly BCSD Figure 1, and daily BCCA Figure 2), CMIP3 hydrologic projections over the western U.S. (roughly the western U.S. Figure 3), and CMIP5 hydrology projections over the contiguous U.S. corresponding to monthly BCSD climate projections.

Archive content is based on global climate projections from the [World Climate Research Programme's](#) (WCRP's) [Coupled Model Intercomparison Project phase 3 \(CMIP3\)](#) multi-model dataset referenced in the Intergovernmental Panel on Climate Change Fourth Assessment Report, and the phase 5 ([CMIP5](#)) multi-model dataset that is informing the IPCC Fifth Assessment.

For information about downscaled climate and hydrology projections development, please see the [About](#) page.

Purpose

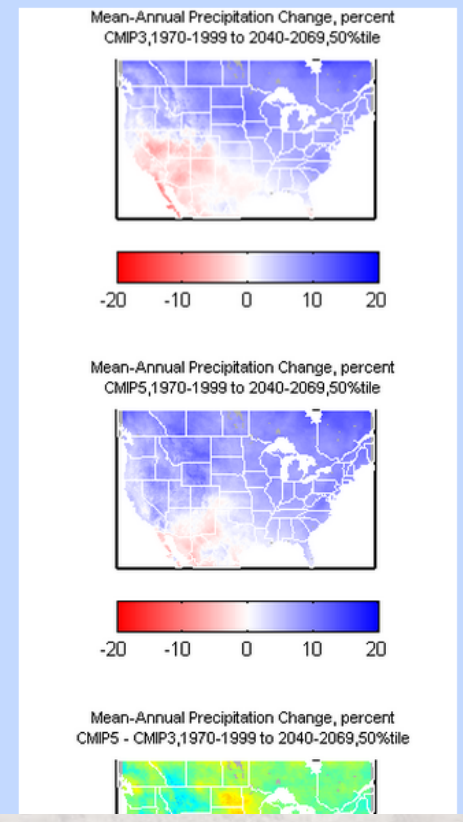
The archive is meant to provide access to climate and hydrologic projections at spatial and temporal scales relevant to some of the watershed and basin-scale decisions facing water and natural resource managers and planners dealing with climate change. Such access permits several types of analyses, including:

- assessment of potential climate change impacts on natural and social systems (e.g., watershed hydrology, ecosystems, water and energy demands).
- assessment of local to regional climate projection uncertainty.
- risk-based exploration of planning and policy responses framed by potential climate changes exemplified by these projections.

Archive History

- November 2007: Archive launched, initially serving 112 projections of monthly BCSD CMIP3 temperature and precipitation projections over the contiguous U.S. for the period 1950-2099.
- December 2010: Archive expanded to include (1) gridded meteorological observations that guided BCSD CMIP3 application and (2) the intermediate datasets developed during BCSD application, namely the 2-degree "regrid" global climate projections (i.e. over spatially interpolated global climate model results from native model resolution to a common 2-degree grid over the contiguous U.S.) and 2-degree bias-corrected versions of the regrid projections.
- August 2011: Archive expanded to include (1) 53 projections of daily BCCA CMIP3 projections of minimum temperature, maximum temperature and precipitation for three periods (1961-2000, 2046-2065, 2081-2100), with results being of potential interest to ecological studies requiring information on projected diurnal temperature range and/or flood-related studies requiring information about projected daily precipitation patterns; and, (2) 112 projections of monthly and daily hydrologic projections in the western U.S. associated with the monthly BCSD CMIP3 projections.

Figure 1. Central Tendency Changes in Mean-Annual Precipitation over the contiguous U.S. from 1970-1999 to 2040-2069 for BCSD3, BCSD5, and Difference.



US EPR BASINS 4.0 Climate Assess Risk MAP Progress Websit https://s3-us-gov-west-1 riskmapprogress.msc.fema.gov CLU-IN | Training & Event

riskmapprogress.msc.fema.gov

Apps UICA - Exhibitions Deli Menu | Founder... Rentals | Cannonsbu... Rates & Rentals - Pa... Pin It Inbox The EPA TCLP: Toxi... DEQ - Operational ... List of Lists Databas...

FEMA
Risk MAP Progress

Risk MAP
 Levee Funded
 Levee Complete
 Other Riverine Funded
 Other Riverine

Coastal
 Coastal
 Watershed
 Watershed

FEMA Funded Elevation
 Map Mod
 Map Mod Ongoing
 Map Mod Preliminary
 Map Mod Effective
 Map Mod Not Planned

Watersheds
 Counties
 113th Congressional Districts

Reset Help

Close Legend

Streets US Topo Quads Imagery

POWERED BY **esri**

Wayne County, MI (Multiple Flooding Source)

Case Number: MICS_30291
 1st Funded FY: Map Mod
 Preliminary Map: FY08
 Effective Map: 02/02/2012
 Project Status: Completed
 Project Type: RIVERINE
 Communities: 51

Case Number	Community Name	County	Preliminary Map	Effective Map
MICS_30291	HARPER WOODS, CITY OF	Washtenaw	FY08	02/02/2012
MICS_30291	HARPER WOODS, CITY OF	Wayne	FY08	02/02/2012
MICS_30291	ALLEN PARK, CITY OF	Wayne	FY08	02/02/2012
MICS_30291	BROWNSTOWN, CHARTER TOWNSHIP OF	Wayne	FY08	02/02/2012
MICS_30291	CANTON TOWNSHIP OF	Wayne	FY08	02/02/2012



Climate Ready Water Utilities Toolbox










The CRWU Toolbox provides access to resources containing climate-related information relevant to the water sector. The Toolbox contains [highlighted resources](#) below organized into categories to help guide the user to the most relevant information. Hundreds of additional resources in the Toolbox can be [searched](#) by geographic region, water utility type and size, water resources, climate change impact, and climate change response strategies. These resources will be updated frequently to provide the most current water sector climate change information.

Some of the resources on this page are links to non-EPA websites that provide additional information about Climate Ready Water Utilities. In these cases, you will leave the EPA.gov domain and enter another page with more information. EPA cannot attest to the accuracy of information on that non-EPA page. Providing links to a non-EPA Web site is not an endorsement of the other site or the information it contains by EPA or any of its employees. Also, be aware that the privacy protection provided on the EPA.gov domain (see [Privacy and Security Notice](#)) may not be available at the external link. [EXIT Disclaimer](#)

You will need Adobe Acrobat Reader to view some of the files on this page. See [EPA's PDF page](#) to learn more about PDF, and for a link to the free Acrobat Reader.

Looking for more information? [Search the CRWU Toolbox](#) or [view all resources in a new tab or window](#).

[View a list of acronyms](#) used in the CRWU Toolbox.

 Featured Resource	Expand all Collapse all
 Region Map	+ EPA – Climate Resilience Evaluation and Awareness Tool
 Activities	+ EPA – BASINS (Better Assessment Science Integrating point and Non-point Sources)
 Funding	+ National Drought Mitigation Center – Drought Impact Reporter
 Publications and Reports	+ NOAA – NOAA Climate Portal
 Tools and Models	+ NOAA – Coastal Inundation Toolkit
 Training, Workshops and Seminars	+ NOAA – Digital Coast
 Mitigation Strategies	+ USDA, NOAA – U.S. Drought Portal
 Adaptation Strategies	+ Island Press, EcoAdapt – CAKE: Climate Adaptation Knowledge Exchange
	+ The Nature Conservancy – Climate Wizard
	+ University Corporation for Atmospheric Research and National Center for Atmospheric Research – MAGICC/SCENGEN
	+ University Corporation for Atmospheric Research’s Unidata, National Science Foundation – Integrated Data Viewer (IDV)
	+ IPCC – IPCC Data Distribution Centre
	+ DOI USGS – U.S. Geological Survey WaterAlert
	+ NOAA – State of the Climate

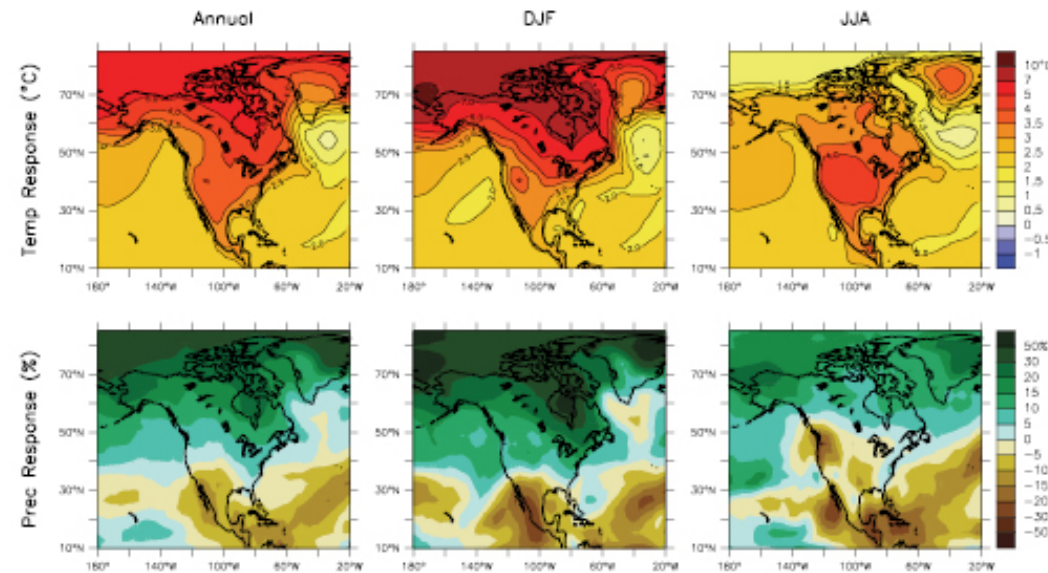
Climate Change 2007: Working Group I: The Physical Science Basis

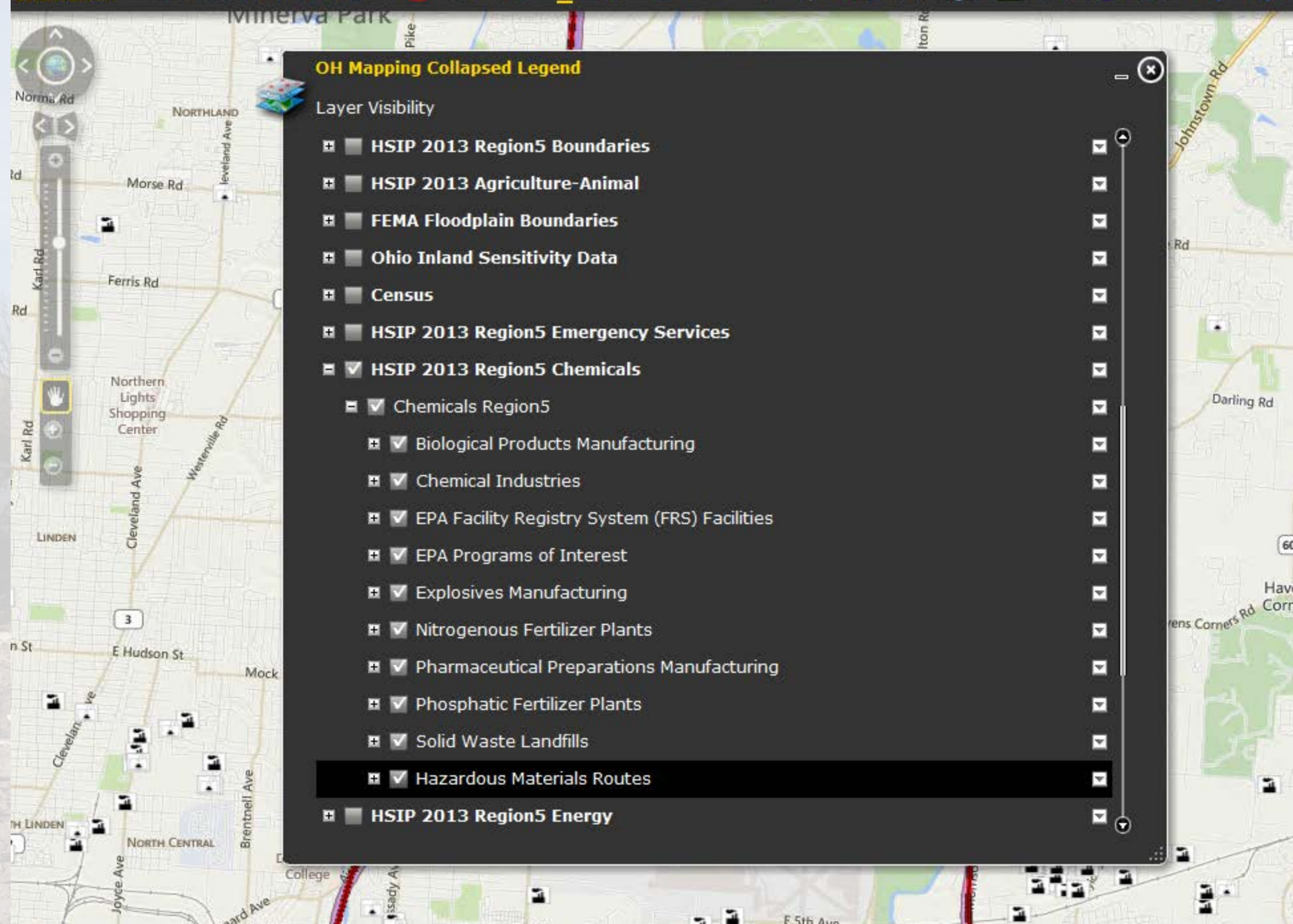
[Contents](#)
[11](#)
[11.5](#)
[11.5.3](#)
[11.5.3.2](#)

11.5.3.2 Precipitation



As a consequence of the temperature dependence of the saturation vapour pressure in the atmosphere, the projected warming is expected to be accompanied by an increase in atmospheric moisture flux and its convergence/divergence intensity. This results in a general increase in precipitation over most of the continent except the most south-westerly part (Figure 11.12). The ensemble mean of MMD models projects an increase in annual mean precipitation in the north reaching +20%, which is twice the inter-model spread, so likely significant; the projected increase reaches as much as +30% in winter. Because the increased saturation vapour pressure can also yield greater evaporation, projected increases in annual precipitation are partially offset by increases in evaporation; regions in central North America may experience net surface drying as a result (see Supplementary Material Figure S11.1). See Table 11.1 and Supplementary Table S11.2 for more regional and seasonal details, noting that regional averaging hides important north-south differences.

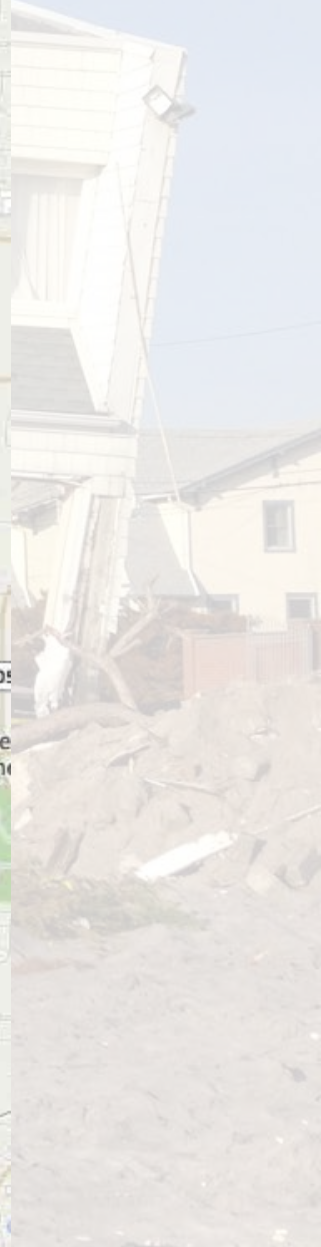





OH Mapping Collapsed Legend

Layer Visibility

- HSIP 2013 Region5 Boundaries
- HSIP 2013 Agriculture-Animal
- FEMA Floodplain Boundaries
- Ohio Inland Sensitivity Data
- Census
- HSIP 2013 Region5 Emergency Services
- HSIP 2013 Region5 Chemicals
 - Chemicals Region5
 - Biological Products Manufacturing
 - Chemical Industries
 - EPA Facility Registry System (FRS) Facilities
 - EPA Programs of Interest
 - Explosives Manufacturing
 - Nitrogenous Fertilizer Plants
 - Pharmaceutical Preparations Manufacturing
 - Phosphatic Fertilizer Plants
 - Solid Waste Landfills
 - Hazardous Materials Routes
- HSIP 2013 Region5 Energy



Section 7 – Next Step Ideas



- Review after action reports from flood and hurricane responses if available
- Mapping:
 - intersect high priority layers with floodplain layers to identify facilities at high flood risk
- Define high priority geographic focus areas
- Brainstorm regarding:
 - actions to take in advance of floods
 - waste staging areas
 - additional staff, training, equipment and communications channels needed
 - remediation technique changes that may be needed
 - Outreach materials needed