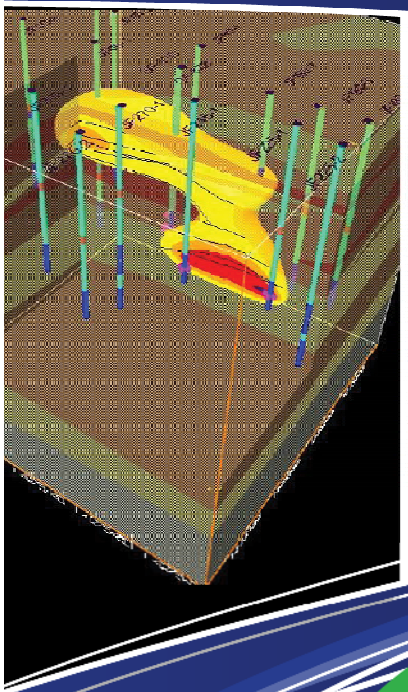

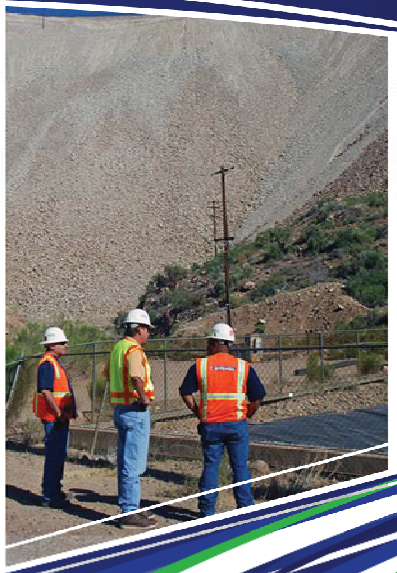

Superfund and Climate Change Adaptation

Webinar Introduction

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Environmental Protection Specialist
US EPA Superfund, Washington, DC

Webinar Agenda

- Welcome and outline
- What is climate change adaptation? *Carlos Pachon*
- Hoe climate change adaptation is integrated into site operations *Anne Dailey*
- Case studies of weather related impacts at Superfund sites
  - Hurricane Irene at Raritan River NJ. *Joe Battipaglia*
  - Ice dams at Grasse river NY, *Young Chang*
- Q&A

Basic Question for the Agency

"*How is climate change likely to affect the ability of your office to achieve its mission and strategic goals?*"

Basic Question for the Project Manager

"*How is climate change likely to affect the protectiveness of my remedy, and what should I do about it?*"

Key Definitions*

- **Climate Change**
  Any significant change in the measures of climate lasting for an extended period of time… includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer.

- **Vulnerability**
  The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed; its sensitivity; and its adaptive capacity.

- **Climate Change Adaptation**
  Adjusting to a changing climate to minimize negative effects and take advantage of new opportunities.

- **Resilience**
  A capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment.

*http://www.epa.gov/climatechange/glossary.html

Background

- The *USEPA Policy Statement on Climate-Change Adaptation* (2011) directed each national program office and region to develop a climate change adaptation implementation plan by June 2013
- Executive Order 13653 (2013) directed each federal agency to evaluate climate change risks and vulnerabilities to manage the effects of climate change on the agency's mission and operations in both the short and long-term
- In June 2014 EPA released the final EPA Climate Adaption Report

Climate Change: Adaptation vs Mitigation

- While we continue to pursue reductions in GHG emissions (mitigation), we must prepare to handle impacts from climate change that is already happening (adaptation)
- In Superfund, through green remediation practices, we seek to reduce GHG emissions to **mitigate** climate change (among other goals)
- Through **adaptation**, we seek to ensure remedy resilience in the face of climate change impacts

Superfund Climate Change Vulnerability Analysis (2012)

- Goal: Climate change vulnerability analysis across our most common remedies (portfolio analysis)
  - Developed matrix of remedy sensitivity to climate change
  - Rated relative vulnerability of individual remedies to climate change scenarios
- Screened frequent and potentially vulnerable remedies
  - GIS plot of remedies based on site lat-long coordinates
  - Focus on subset of higher vulnerability and frequent remedies
- Conducted desk audits of 5 vulnerable remedies as "case studies"
- Drew conclusions and recommendations for further work

Remedy Vulnerability to Climate Change

Common Remedy Types*	Climate Change Scenarios							
	Flooding (Event)	Inundation (Chronic)	Extreme Storms	Large Snowfall	Wild Fires	Drought	Extreme Heat	Landslide (Precip)
Source In Situ								
SVE								
Solidification/Stabilization*								
In Situ Thermal Treatment								
Multi-phase Extraction								
Bioremediation								
Source Ex Situ								
Solidification/Stabilization*								
Physical Separation								
Recycling								
Surface Water Treatment								
Unspecified Off Site Treatment								
On-site Containment								
Groundwater In Situ								
Bioremediation								
Chemical Treatment								
Air Sparging								
Permeable Reactive Barrier								
Groundwater Ex Situ								
P&T								
Vertical Engineered Barrier								
Monitored Natural Attenuation								

Qualitative Vulnerability Analysis

* Most common remedy types based on Superfund Remedy Report

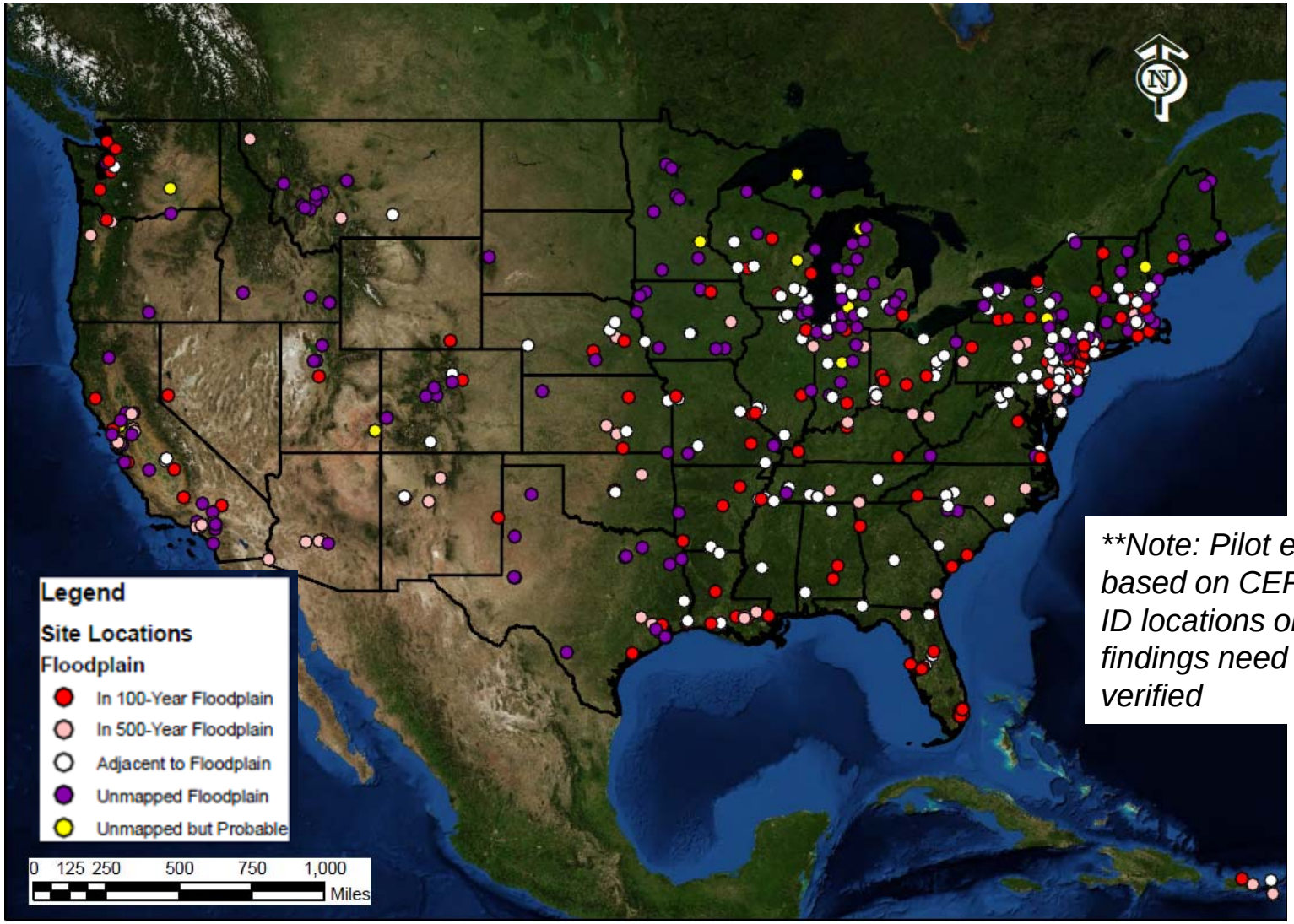
No known potential impacts

Minor impacts: Potential for temporary loss of remedy functionality or effectiveness, contaminant(s) remain contained

Moderate impacts: Potential for total loss of remedy functionality and effectiveness indefinitely, contaminant(s) remain contained

Major impacts: Potential for total loss of remedy functionality and effectiveness indefinitely, contaminant(s) release

Plotted Superfund Sites Near or Within 100 & 500 Year Floodplains



***Note: Pilot effort based on CERCLIS ID locations only; findings need to be verified*

Superfund Climate Change Vulnerability Analysis
Findings for Pump and Treat and Containment Remedies

- Of 1639 sites on the NPL at the time of analysis, 521 were within 100 year floodplains or within 1.5 meter mean sea level rise (SLR).
- The following is an analysis of P&T and containment remedies at those sites
- Why P&T?: High infrastructure cost, presence of physical plant, long operating life and high number of remedies
- Why Containment? High number of remedies and contaminants remaining on site could be mobilized

Remedy Types and Zones Of Susceptibility

Remedy Types	Combined Zones of Susceptibility				
	100-year FLP and 1 m SLR	100-year FLP and 1 – 1.5 m SLR	500- year FLP and 1 m SLR	500-year FLP and 1 – 1.5 m SLR	Total
On-Site Disposal Only	0	0	2	0	2
On-Site Containment Only	4	0	3	1	8
GW P&T	0	1	0	0	1
On-Site Disposal and GW P&T	0	1	0	0	1
Landfill and On-Site Containment	3	0	0	0	3
GW P&T and On-Site Containment	4	0	2	0	6
On-Site Disposal, GW P&T, and On-Site Containment	1	0	2	0	3
TOTAL	12	2	9	1	24

Desktop Audit of Selected Focus Superfund Sites

- Selected five sites to interview RPM to evaluate vulnerability and degree to which climate change impacts have been or are addressed (FL, NJ, VA, WA)
- General findings
  - Sites were found to have no-low vulnerabilities to climate change scenarios
  - Vulnerabilities were often identified early and factored into the remedy selection, design and operations
  - Some sites considered vulnerable (by the project team) had O&M plans, for example to address flooding
  - Sites used historic flood data for future analyses
  - For long term remedial actions, five year reviews offer an opportunity to consider potential CCA needs

Superfund Climate Change Adaptation Activities

- Superfund climate change adaptation strategy focuses on five areas
  - Develop a protocol for remedial project managers to assess vulnerabilities in designing and implementing a remedy
  - Develop adaptation fact sheets for high-risk, longer-term, relatively expensive remedies
  - Identify how existing Superfund program processes (such as RI/FS, RD, RA, and five-year reviews) can include adaptation actions that ensure continued protectiveness
  - Develop training materials and programs, including open-access webinars
  - Continue outreach with legal and enforcement teams to help anticipate scenarios that may be encountered in the future

In Summary

- To address Climate Change Adaptation at your sites:
  - Screen your remedy for climate change related **vulnerabilities**
  - Conduct **sensitivity analysis** to screen out low probability/low impact vulnerabilities
  - Evaluate **adaptation** measures available and applicable to address vulnerabilities and increase remedy **resilience**
  - **Implement** adaptation measures
  - Send us an email so we can write a good case study and get the word out ;-)

http://www.epa.gov/superfund/climatechange