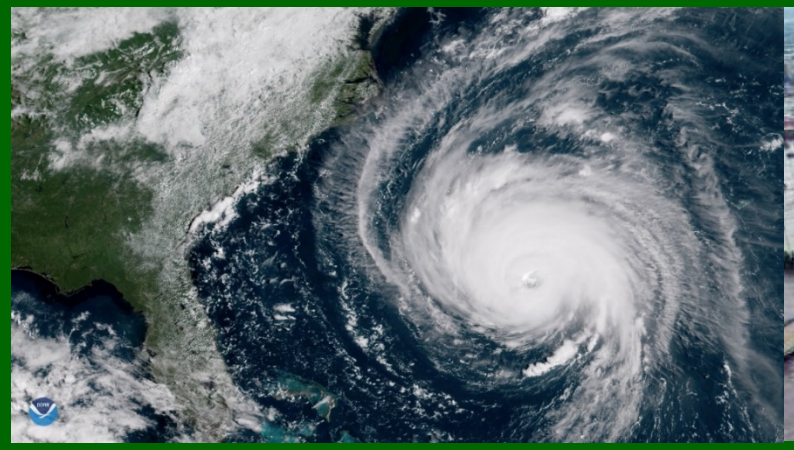
SHC Output 10.4: Impacts from Environmental and Natural Disasters

Presented by: Thomas Johnson (Output Lead)

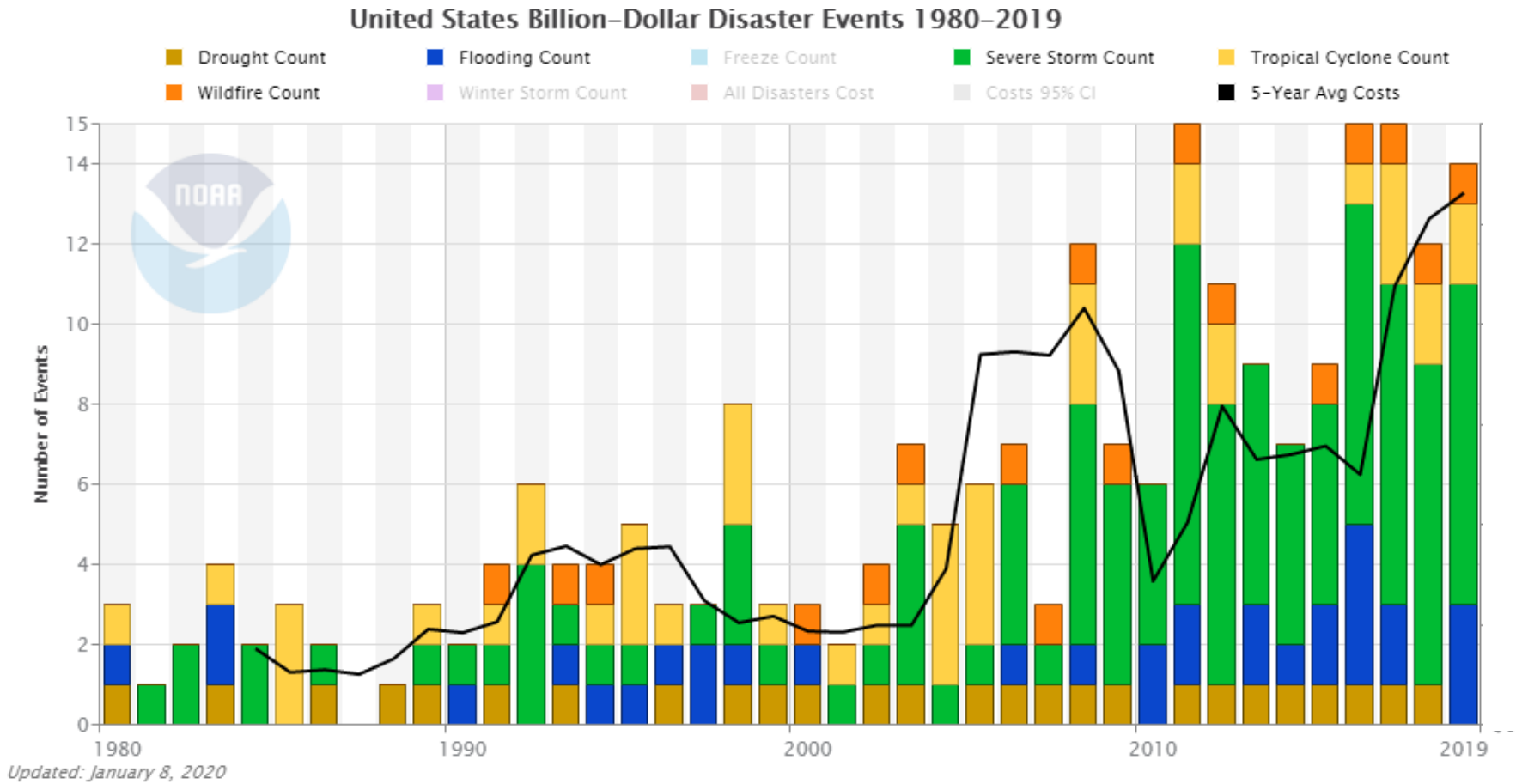
Product Leads: Pai-Yei Whung, Chunling Tang, Meridith Fry, Ray Smith, Anne Weaver, Cavin Ward-Caviness, Steve Vesper, Ozge Kaplan, Susan Thorneloe



Problem Statement

EPA programs, and the communities we serve, must be able to identify the expected impacts from natural or manmade perturbations, and to integrate that information into effective, cost-efficient actions for resilience, adaption, and risk reduction

Impacts of Extreme Events - Increasing Urgency



Source: NOAA National Centers for Environmental Information https://www.ncdc.noaa.gov/billions/

Output 10.4 – Response to Problem

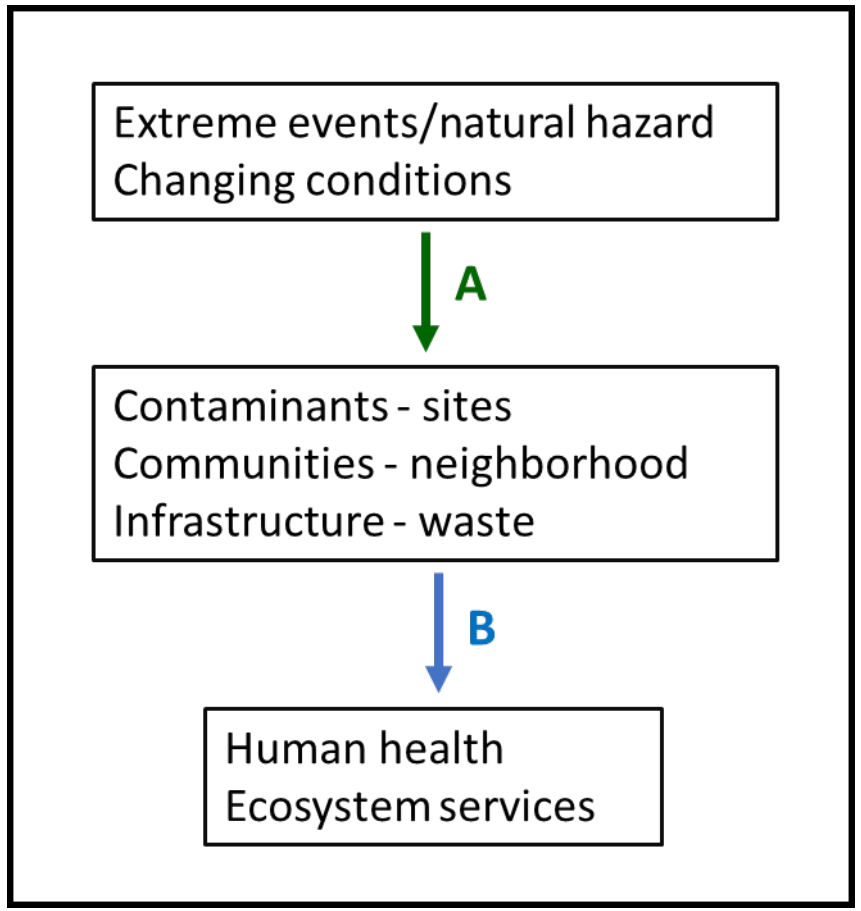
Output 10.4 will develop information and approaches to help communities assess and manage their vulnerabilities to hazards, especially those related to extreme event-related, unintended releases of toxic chemicals from contaminated sites

- Focus on impacts, vulnerability and risk
- Contributes to RA10 focus area on decision making to improve resiliency
- Includes consideration of changing conditions of extreme events

Value to Partners - Examples

- EPA Regions
  - Assist State and community actions with resilience and risk reduction
- Office of Land and Emergency Management (OLEM)
  - Evaluate a site/project's vulnerability to extreme weather events, and how can be made resilient
- Office of Community Revitalization (OP/OCR)
  - Anticipate future changes in extreme weather events, assess impacts and identify best practices for responding

Output 10.4 Products



Products focus on impacts, vulnerability, and risk:

(A) Direct extreme event impacts on contaminants, communities and infrastructure

10.4.1: Contaminant Risk from Flooding at NE Sites

10.4.2: Community and Contaminated Site Vulnerability

10.4.4: Waste Infrastructure Vulnerability to Extreme Events

(B) Cascading impacts on human health/ecosystem services

10.4.3: Community Health Effects of Hurricane Related Flooding

10.4.1 – Contaminant Risk from Flooding at NE Sites

Extreme weather and flooding can impact contaminated sites (e.g., Superfund, RCRA), inducing undesired transport of contaminants and sediments and presenting a risk to nearby communities

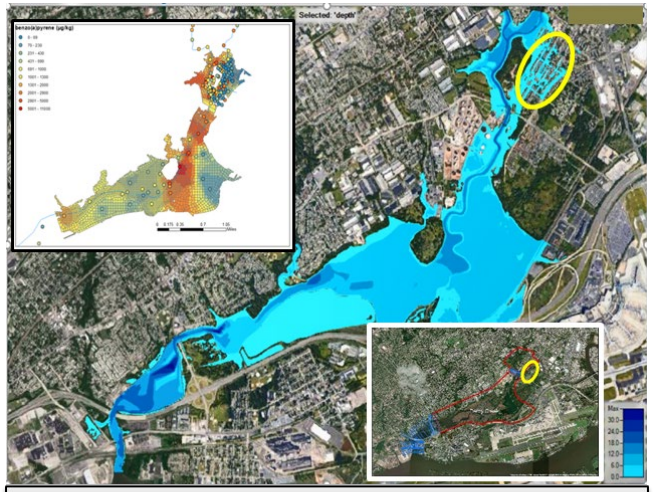
This product will apply multiple modeling approaches to assess impacts and vulnerability:

- Coupling hydrodynamic and environmental fate-and-transport models to simulate spatiotemporal climate and storm surge impacts on flood-induced contaminant migrations at Superfund and RCRA sites
- Developing a high resolution sediment model to simulate contaminated sediment transport in R1 NPL sites for the past and future

10.4.1 – Products/Response to Problem

Products will be delivered as:

- Screening level metrics to rank R1 and R3 NPL sites' vulnerability to flood impacts
- High spatiotemporal resolution maps of contaminant (e.g., PAH, Pb) transport in multiple flood return periods for R3 Lower Darby Creek Area (Superfund) & R2 Chevron Asphalt Refinery (RCRA) sites

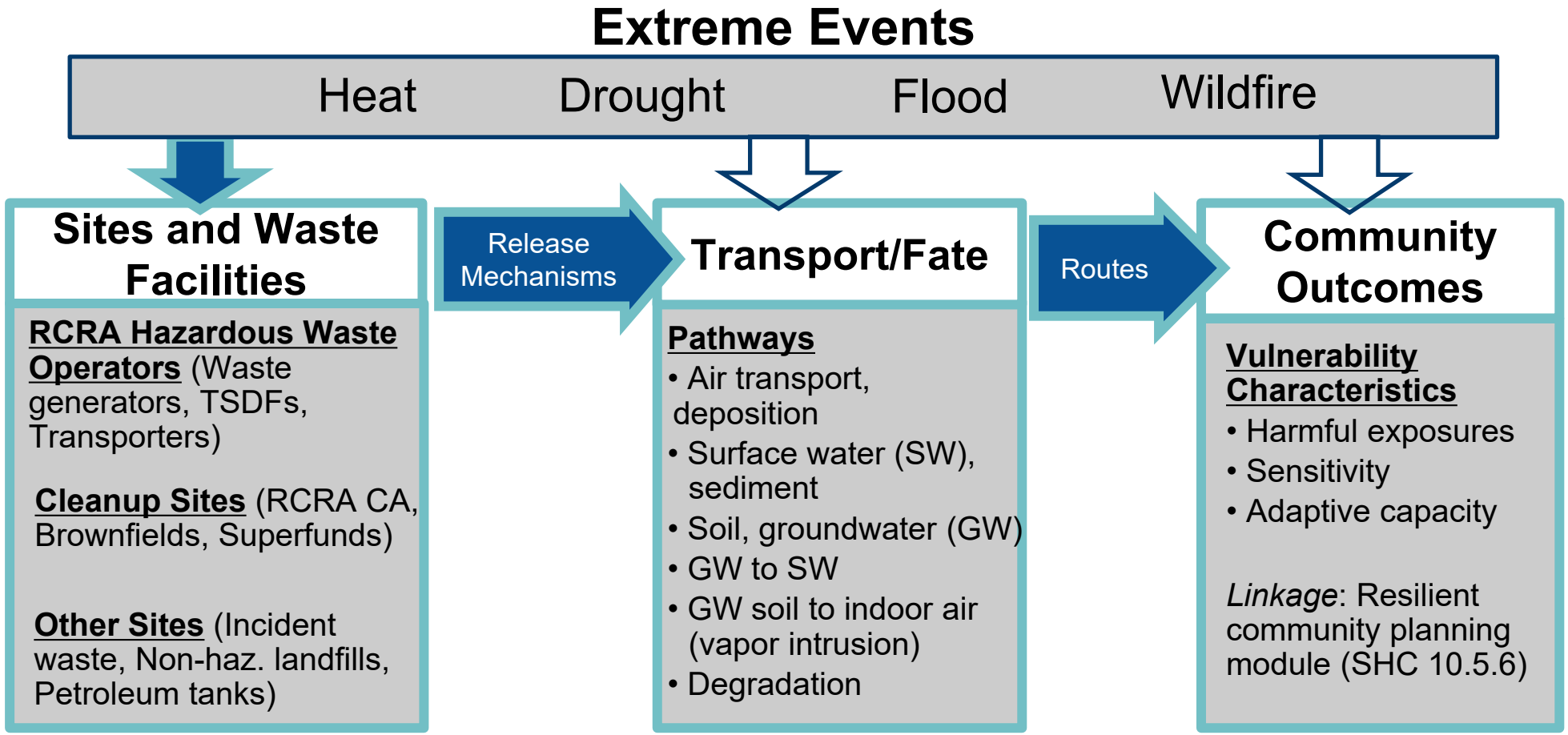


Whung: Preliminary Lower Darby Creek Area 500-yr Flood Simulation & Observed PAH for WASP Model Initiation (Eastwick Neighborhood in Yellow Circle)

Value to partners:

- "We view the primary benefit is facilitating proactive remedial (and removal) planning and management." (*R3 Superfund Risk Assessor & Lower Darby Creek Remedial Project Manager*)
- R1 Superfund managers can use results to assist with NPL site vulnerability assessment and mapping, clean up and remediation

10.4.2 – Best Practices for Assessing Community and Contaminated Site Vulnerability to Extreme Events



10.4.2 – Products/Response to Problem

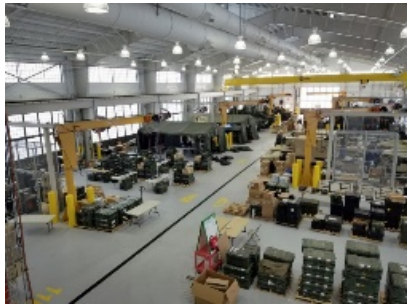
Products delivered as indicators, maps, and fact sheets

- Hazard maps of contaminant exposure pathways and potentially vulnerable populations/resources
- Fact sheet listing chemical and site vulnerability characteristics

Brownfields

Programs, Regions, and communities will use to:

- Develop community & site/facility emergency preparedness plans
- Prioritize facilities and sites for future investigation and action
- Identify which chemicals are of high concern (and why)
- Link characteristics of site infrastructure to vulnerabilities



Facilities

10.4.3 – Health Effects of Hurricane-Related Flooding

Hurricane-related flooding can result in short- and long-term impacts for communities:

- Property damage, food insecurity, water contamination, mold growth
- Health effects including gastrointestinal and respiratory illness, e.g. asthma
- Impacts may be exacerbated in disadvantaged communities

This product will map community assets and vulnerabilities, and evaluate community health effects in communities affected by past hurricane-related flooding (in North Carolina and Puerto Rico)

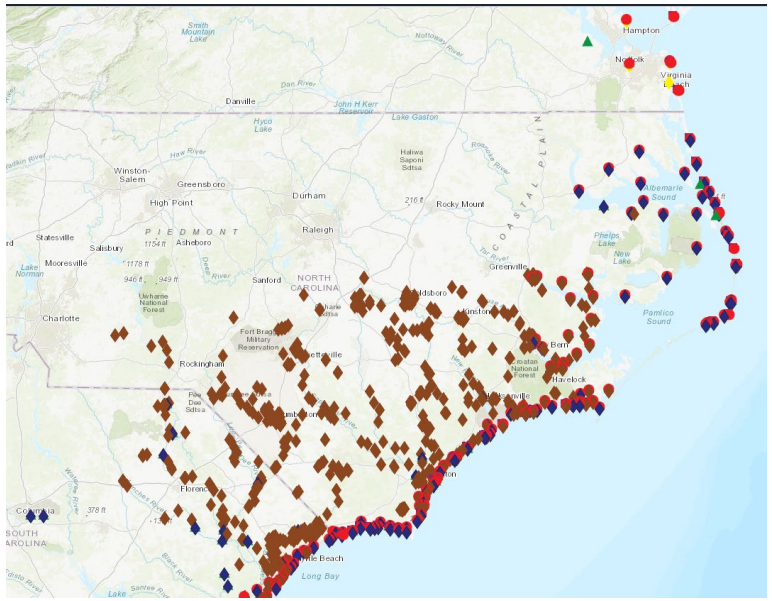
10.4.3 – Products/Response to Problem

Products will be delivered as:

- Interactive maps of community assets, vulnerability to flooding in NC (e.g., Hurricane Florence)
- Visualization tool of flooding-related illness in NC
- Dataset on mold growth; asthma admissions in PR (e.g., Hurricane Maria)

Regions and communities will use to:

- Identify community and health-related assets and vulnerabilities; including EJ communities
- Inform medical preparedness and emergency response



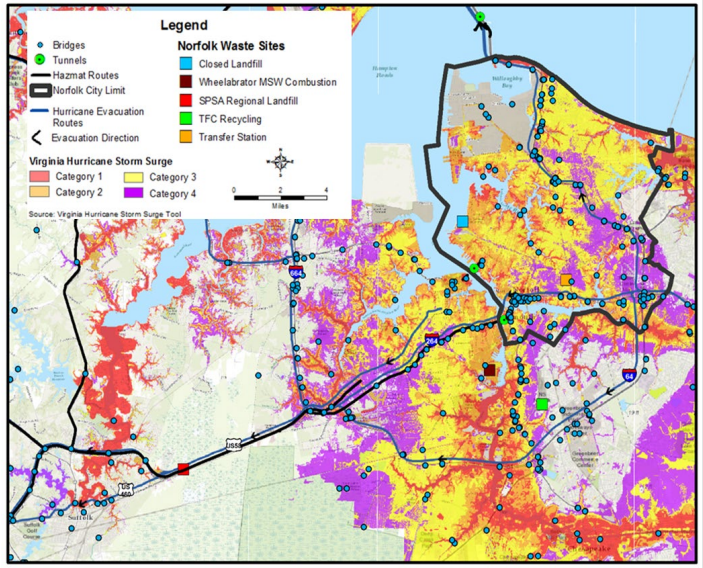
Flooding events from Hurricane Florence (2018) in North Carolina (source: USGS)

10.4.4 – Waste Infrastructure Vulnerability to Extreme Events

Hurricanes, storm surges, and tornados disrupt solid waste management and damage supporting infrastructure (e.g. transportation, energy, and water); they also generate large amounts of post-disaster waste and debris

This product will refine methods and tools for assessing vulnerability of waste management and supporting infrastructure, including future changes in extreme weather events

Builds on previous study assessing climate-induced vulnerabilities in Norfolk, VA



Ref: EPA 600/R-18/011

10.4.4 – Products/Response to Problem

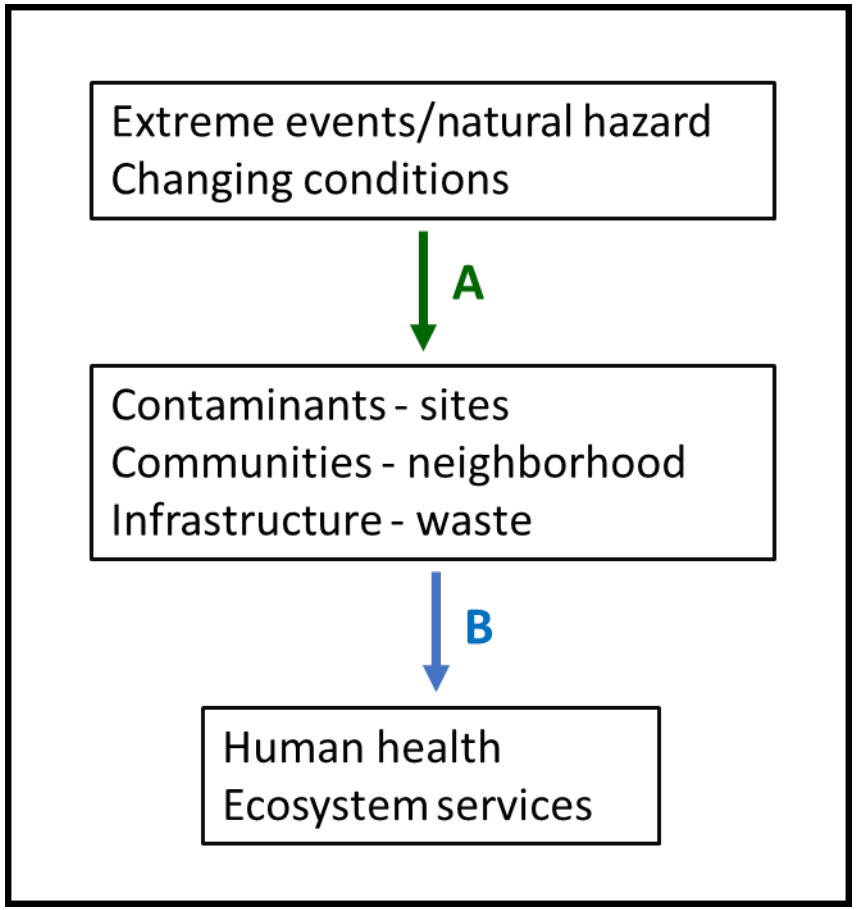
Products will be delivered as:

- Decision makers' guide for customizing solid waste management plans to reduce vulnerabilities and increase resilience to extreme weather events
- Improved functionality of waste and debris management tools for community recovery and resilience planning

Partners will use results to:

- Assess and manage current and long-term, future vulnerabilities of waste management and supporting infrastructure
- Identify sustainable material management strategies leading to minimization of waste and debris

Output 10.4: Key Points



Four products address extreme event impacts, vulnerability and risk; focus on

- contaminants, communities, infrastructure
- human health and ecosystem services

Contribute to RA10 focus area on decision making to improve resiliency

Long term goal - building the capacity of EPA program offices and Regions to anticipate and plan for impacts extreme events and natural disasters

Thanks for listening!