



Testimony

Before the Subcommittee on
Environment and Climate Change,
Committee on Energy and Commerce,
House of Representatives

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SUPERFUND

EPA Should Take Additional Actions to Manage Risks from Climate Change Effects

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Accessible Version

GAO Highlights

Highlights of [GAO-21-555T](#), a testimony before the Subcommittee on Environment and Climate Change, Committee on Energy and Commerce, House of Representatives

Why GAO Did This Study

Superfund is the principal federal program for addressing sites contaminated with hazardous substances. EPA administers the program and lists some of the most seriously contaminated sites—most of which are nonfederal—on the NPL. At those sites, EPA has recorded over 500 contaminants, including arsenic and lead. Climate change may make some natural disasters more frequent or more intense, which may damage NPL sites and potentially release contaminants, according to the Fourth National Climate Assessment.

This testimony summarizes GAO's October 2019 report ([GAO-20-73](#)) on the impact of climate change on nonfederal NPL sites. Specifically, it discusses (1) what available federal data suggest about the number of nonfederal NPL sites that are located in areas that may be impacted by selected climate change effects; (2) the extent to which EPA has managed risks to human health and the environment from the potential impacts of climate change effects at nonfederal NPL sites; and (3) challenges EPA faces in managing these risks.

What GAO Recommends

In the report on which this testimony is based, GAO made four recommendations to EPA, including that it more closely align its actions with GAO's essential elements of enterprise risk management. EPA originally agreed with one recommendation and disagreed with the others, but is taking steps to respond to three of the recommendations and is considering action on the other. GAO continues to believe action on all four is warranted.

View [GAO-21-555T](#). For more information, contact J. Alfredo Gómez at (202) 512-3841 or gomezj@gao.gov.

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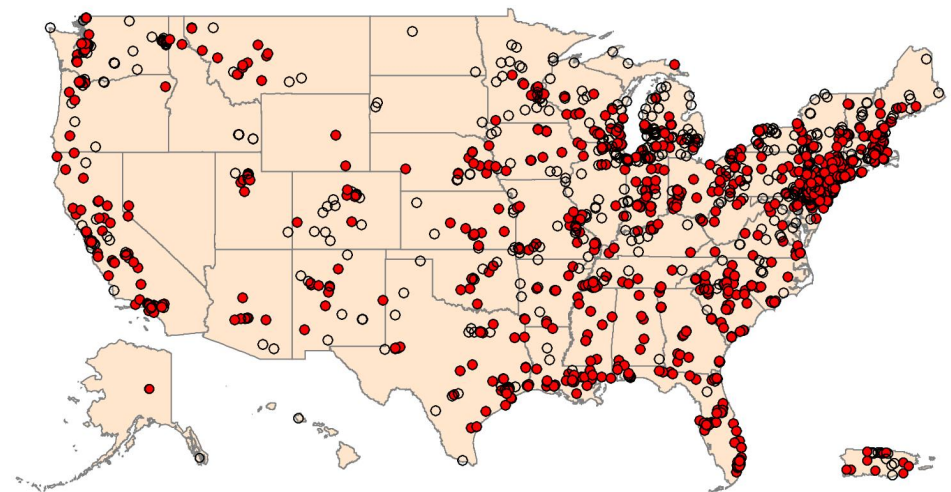
SUPERFUND

EPA Should Take Additional Actions to Manage Risks from Climate Change Effects

What GAO Found

In October 2019, GAO reported that available federal data on flooding, storm surge, wildfires, and sea level rise suggested that about 60 percent (945 of 1,571) of all nonfederal Superfund National Priorities List (NPL) sites—which have serious hazardous contamination—are located in areas that may be impacted by these potential climate change effects (see figure). In 2019, GAO released an interactive map and dataset, available with its report ([GAO-20-73](#)).

Nonfederal NPL Sites Located in Areas That May Be Impacted by Flooding, Storm Surge, Wildfires, or Sea Level Rise, as of 2019



Number of National Priorities List (NPL) sites in potentially impacted areas

● Potentially impacted sites (945) ○ No impact identified (626)

Sources: GAO analysis of Environmental Protection Agency, Federal Emergency Management Agency, National Oceanic and Atmospheric Administration, and U.S. Forest Service data; MapInfo (map). | [GAO-21-555T](#)

Notes: This map does not display all 1,571 active and deleted nonfederal NPL sites GAO analyzed in 2019, which also include six sites in American Samoa, the Federated States of Micronesia, Guam, the Northern Mariana Islands, and the U.S. Virgin Islands, though they are included in the counts above. Learn more at <https://www.gao.gov/products/GAO-20-73>. Storm surge data were not available for the West Coast and Pacific islands other than Hawaii, wildfire data were not available outside the contiguous United States, and sea level rise data were not available for Alaska.

GAO also reported in 2019 that the Environmental Protection Agency's (EPA) actions to manage risks from climate change effects at these sites aligned with three of GAO's six essential elements of enterprise risk management, partially aligned with two, and did not align with one. For example, EPA had not aligned its process for managing risks with agency-wide goals. Without clarifying this linkage, EPA could not ensure that senior officials would take an active role in strategic planning and accountability for managing these risks.

In 2019, GAO found that EPA recognized institutional, resource, and technical challenges in managing risks from climate change effects. For example, some EPA officials told us they do not have the direction they need to manage these risks. Insufficient or changing resources may also make it challenging for EPA to manage these risks, according to EPA documents and officials.

Chairman Tonko, Ranking Member McKinley, and Members of the Subcommittee:

Thank you for the opportunity to discuss our work on Superfund sites that may be impacted by climate change and steps the U.S. Environmental Protection Agency (EPA) can take to manage risks from climate change at these sites. EPA lists some of the nation's most seriously contaminated sites—most of which are nonfederal—on its National Priorities List (NPL). It has recorded over 500 contaminants, including arsenic and lead, at these sites. According to the Fourth National Climate Assessment (NCA), climate change is expected to make some natural disasters more frequent or more intense, which may damage NPL sites and potentially release contaminants. Further, the NCA reported that some climate change effects, including sea level rise and increased coastal flooding, could lead to the dispersal of pollutants, which could pose a risk to public health.

My testimony today discusses our October 2019 report about potential climate change effects on Superfund sites.¹ Specifically, it summarizes: (1) what available federal data suggest about the number of nonfederal NPL sites that are located in areas that may be impacted by selected climate change effects; (2) the extent to which EPA has managed risks to human health and the environment from the potential impacts of climate change effects at nonfederal NPL sites; and (3) challenges EPA faces in managing these risks.

To conduct the work for that report, we identified available national federal data sets on three current hazards—flooding, storm surge, and wildfires—that the NCA reports will be exacerbated by climate change. We obtained these data sets from the Federal Emergency Management Agency (FEMA), the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Forest Service. We used the most recently available data at the time of our analysis for each of these climate change effects; however, the data do not provide estimates of the projected changes in the future. We also identified data on sea level rise from NOAA. In addition, we obtained data from EPA's Superfund Enterprise Management System—EPA's system of record for the Superfund program—on the location and other characteristics of active and deleted nonfederal NPL sites. We analyzed these data using mapping software to

¹GAO, *Superfund: EPA Should Take Additional Actions to Manage Risks From Climate Change*, [GAO-20-73](#) (Washington, D.C.: Oct. 18, 2019).

identify nonfederal NPL sites located in areas that may be impacted by selected potential climate change effects—specifically flooding, storm surge, wildfires, and sea level rise. To do so, we determined whether there are areas that may be impacted by these effects within a 0.2-mile radius of the primary geographic coordinate of each nonfederal NPL site,² which we used to represent the site boundaries.³ We took steps to assess the reliability of the data we analyzed for the report and found them to be sufficiently reliable. Additional information on the objectives, scope, and methodology for our work can be found in the issued report. As part of our ongoing recommendation follow-up process, EPA provided us with updates on the actions it is taking to respond to our recommendations.

We conducted the work on which this testimony is based in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

The Superfund program—the federal government’s principal program to address sites with hazardous substances—was established by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).⁴ CERCLA requires the President to establish procedures and standards for prioritizing and responding to releases of

²According to the *Fiscal Year 2019 Superfund Program Implementation Manual*, NPL sites in the Superfund Enterprise Management System must have one primary coordinate, which indicates the primary latitude and longitude coordinates for the site. This coordinate must be located less than 1,000 meters from the site address.

³In a 2018 study, EPA used a 0.2-mile radius to approximate the size of NPL sites. In this study, EPA noted that it used additional information to adjust this radius for some NPL sites. We did not make such adjustments because doing so would have required site-specific analysis, which was outside the scope of our review. Our 2019 report found that EPA did not have quality information on the boundaries of nonfederal NPL sites. We recommended that EPA establish a schedule for standardizing and improving information on the boundaries of nonfederal NPL sites. EPA agreed with our recommendation. According to EPA, the agency has taken steps to address this recommendation, but as of June 2020, the agency had not provided a schedule.

⁴Pub. L. No. 96-510, 94 Stat. 2767 (codified as amended at 42 U.S.C. §§ 9601-9675).

hazardous substances, pollutants, and contaminants into the environment and to incorporate these procedures and substances into the National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan).⁵

EPA is responsible for administering the Superfund program and coordinating the cleanup of sites by identifying sites potentially requiring cleanup action and placing eligible sites on the NPL. As of September 2019, there were 1,336 active sites on the list, and 421 sites that EPA determined need no further cleanup action (deleted sites).⁶ About 90 percent of these sites are nonfederal, where EPA generally carries out or oversees the cleanup conducted by one or more potentially responsible parties (PRP).⁷ The other NPL sites—approximately 10 percent—are located at federal facilities, and the federal agencies that administer those facilities are responsible for their cleanup.⁸

The Superfund process begins when a potentially hazardous site is discovered or EPA is notified of the possible release of hazardous substances that may pose a threat to human health or the environment. EPA and PRPs can undertake two types of cleanup actions: removal actions and remedial actions. Removal actions are usually short-term cleanups for sites that pose immediate threats to human health or the environment. Remedial actions are generally long-term cleanups that aim to permanently and significantly reduce contamination. EPA's Superfund remedial cleanup process for nonfederal NPL sites includes the actions illustrated in figure 1.

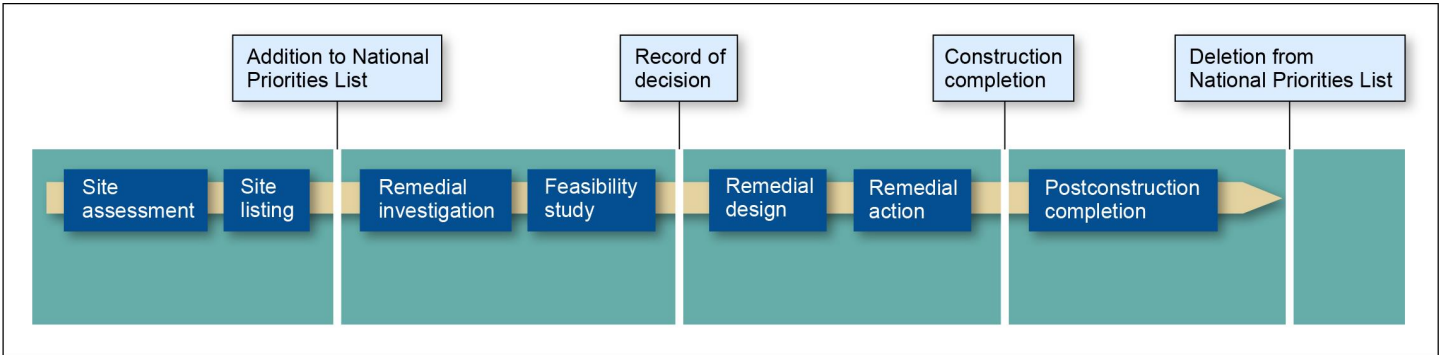
⁵According to EPA, the National Contingency Plan is the federal government's blueprint for responding to both oil spills and hazardous substance releases. The National Contingency Plan is the result of efforts to develop a national response capability and promote coordination among the hierarchy of responders and contingency plans.

⁶Under EPA's regulations, the agency may take additional remedial actions to address releases at deleted sites if warranted under future conditions. 40 C.F.R. § 300.425(e)(3).

⁷Under CERCLA, PRPs generally include current or former owners or operators of a site and the generators and transporters of the hazardous substances. See 42 U.S.C. § 9607(a) (listing the types of parties liable for cleanup costs). In addition to EPA, other entities can be the lead agencies for cleanups under CERCLA, such as state agencies; our October 2019 report focused on sites for which EPA is the lead agency.

⁸Federal NPL sites are owned or operated by a department, agency, or instrumentality of the United States, such as the Departments of Defense, Energy, and the Interior. The agencies fund cleanup of federal NPL sites; this funding does not come from EPA's Superfund appropriation. Although these federal sites are subject to the same cleanup requirements in CERCLA, we generally did not discuss them in our October 2019 report.

Figure 1: EPA's Remedial Cleanup Process at Nonfederal National Priorities List Sites



Source: GAO analysis of Environmental Protection Agency (EPA) information. | GAO-21-555T

Text of Figure 1: EPA's Remedial Cleanup Process at Nonfederal National Priorities List Sites

1. site Assessment
2. site listing
3. addition to national priorities list
4. remedial investigation
5. feasibility study
6. record of decision
7. remedial design
8. remedial action
9. construction completion
10. postconstruction completion
11. deletion from national priorities list

EPA's Superfund remedial cleanup process includes the following steps:

- **Site assessment.** EPA, states, tribes, or other federal agencies evaluate site conditions to identify appropriate responses to releases of hazardous substances to the environment.
- **Site listing.** EPA considers whether to list a site on the NPL based on a variety of factors, including the availability of alternative state or federal programs that may be used to clean up the site, as well as public comments.

- **Remedial investigation and feasibility study.** EPA or the PRP conducts a remedial investigation to characterize site conditions and assess the risks to human health and the environment, among other actions.⁹ Then EPA or the PRP conducts a feasibility study to assess various alternatives to address the problems identified through the remedial investigation. Under the National Contingency Plan, EPA considers nine criteria, including long-term effectiveness and permanence, in its assessment of alternative remedial actions.¹⁰
- **Record of decision.** EPA issues a record of decision that identifies its selected remedy for addressing the contamination at a site, including the planned cleanup activities and an estimate of the cost.
- **Remedial design and remedial action.** EPA or the PRP plans to implement the selected remedy during the remedial design phase. In the remedial action phase, EPA or the PRP then carries out one or more remedial action projects.
- **Construction completion.** EPA generally considers construction of the remedial action to be complete for a site when all physical construction at a site is complete, including actions to address all immediate threats and to bring all long-term threats under control.
- **Postconstruction completion.** EPA, the state, or the PRP performs operation and maintenance for the remedy, if needed, such as by operating a groundwater extraction and treatment system. EPA generally reviews the remedy at least every 5 years to evaluate whether it continues to protect human health and the environment.¹¹

⁹As part of the remedial investigation, EPA is to identify applicable or relevant and appropriate requirements for the site. These requirements may include cleanup standards set by federal or state environmental laws that specifically address a contaminant, remedial action, location, or other circumstance at an NPL site.

¹⁰The nine evaluation criteria are (1) overall protection of human health and the environment; (2) compliance with applicable or relevant and appropriate requirements; (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume through treatment; (5) short-term effectiveness; (6) implementability; (7) cost; (8) state acceptance; and (9) community acceptance. 40 C.F.R. § 300.430(e)(9)(iii).

¹¹EPA is to review Superfund remedial actions at least every 5 years, including at deleted sites, where hazardous substances, pollutants, or contaminants will remain on-site above levels that allow for unlimited use and unrestricted exposure. EPA is also to report to Congress the list of sites for which these reviews are required, the results of such reviews, and any actions taken as a result of the reviews. 42 U.S.C. § 9621(c).

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- **Deletion from the NPL.** EPA may delete a site, or part of a site, from the NPL when the agency and the relevant state authority determine that no further site response is needed.

Remedial actions can take a considerable amount of time and money, depending on the nature of the contamination and other site-specific factors. In a September 2015 report, we found that annual EPA expenditures for remedial actions at nonfederal NPL sites could be considerable—about \$400 million for all such sites.¹² Under CERCLA, PRPs are liable for conducting or paying for the cleanup of hazardous substances at contaminated sites. In some cases, PRPs cannot be identified or may be unwilling or financially unable to perform the cleanup. CERCLA authorizes EPA to pay for cleanups at sites on the NPL, including these sites. To fund EPA-led cleanups at nonfederal NPL sites, among other Superfund program activities, CERCLA established the Hazardous Substance Response Trust Fund (Trust Fund), later renamed the Hazardous Substances Superfund. Historically, the Trust Fund was financed primarily by taxes on crude oil and certain chemicals, as well as an environmental tax on corporations. The authority to levy these taxes expired in 1995. At the time of our 2015 analysis, appropriations from the general fund had constituted the largest source of revenue for the Trust Fund since 2001.

EPA's Office of Superfund Remediation and Technology Innovation, which is part of the Office of Land and Emergency Management, oversees remedial actions at NPL sites.¹³ At each nonfederal NPL site, the lead official is the remedial project manager. Management of nonfederal NPL sites is the responsibility of the EPA region in which a site

¹²GAO, *Superfund: Trends in Federal Funding and Cleanup of EPA's Nonfederal National Priorities List Sites*, [GAO-15-812](#) (Washington, D.C.: Sept. 25, 2015). This funding was for remedial cleanup activities, which include remedial investigations, feasibility studies, and remedial action projects (actions taken to clean up a site). As we reported in 2015, annual federal appropriations to the Superfund program generally declined from about \$2 billion to about \$1.1 billion in constant 2013 dollars from fiscal years 1999 through 2013. EPA expenditures—from these federal appropriations—of site-specific cleanup funds on remedial cleanup activities at nonfederal NPL sites declined from about \$0.7 billion to about \$0.4 billion during the same time period. According to EPA's 2021 Justification of Appropriation Estimates for the Committee on Appropriations, in fiscal year 2020 the enacted funding for remedial cleanup activities was about \$577 million.

¹³According to EPA's website, the Office of Land and Emergency Management provides policy, guidance, and direction for the agency's emergency response and waste programs. The Office of Superfund Remediation and Technology Innovation administers the Superfund program and works to ensure that the hazardous waste sites on the NPL are cleaned up to protect human health and the environment.

is located. EPA has 10 regional offices, and each one is responsible for executing EPA programs within several states and, in some regions, territories.

EPA may select different types of on-site and off-site remedies to clean up the sites. For example, EPA may select on-site remedies that include treatment of contaminants as well as those that do not, such as on-site containment, monitored natural recovery, and institutional controls.¹⁴ EPA may also treat or dispose of the contamination off-site. Examples of off-site treatment and disposal include incineration and recycling. EPA reported that sites it analyzed may have various combinations of remedies, including treatment, on-site containment, off-site disposal, and institutional controls.

Climate change may impact Superfund sites in various ways. For example, extreme precipitation events may impact Superfund sites that have contaminated sediments in aquatic environments. Specifically, in a 2007 report, the National Research Council noted that buried contaminated sediments at Superfund sites may be transported during storms or other events with high water flow, becoming a source of future exposure and risk.¹⁵ As a result of the significant risks posed by climate change and the nation's fiscal condition, in February 2013, we added Limiting the Federal Government's Fiscal Exposure by Better Managing Climate Change Risks to our list of areas at high risk for fraud, waste, abuse, and mismanagement, or most in need of transformation.¹⁶ In March 2021, we reported on progress to address this high-risk area.¹⁷

About 60 Percent of Nonfederal NPL Sites Were Located in Areas That May Be Impacted

¹⁴Institutional controls include administrative and legal controls that minimize the potential for human exposure, for example, by limiting land use or providing information to guide behavior at the site, such as through zoning restrictions. Institutional controls are a subset of land use control, which can include physical measures such as fencing.

¹⁵National Research Council, *Sediment Dredging at Superfund Megsites: Assessing the Effectiveness* (Washington, D.C.: 2007). The National Research Council is the principal operating agency of the National Academies of Sciences, Engineering, and Medicine.

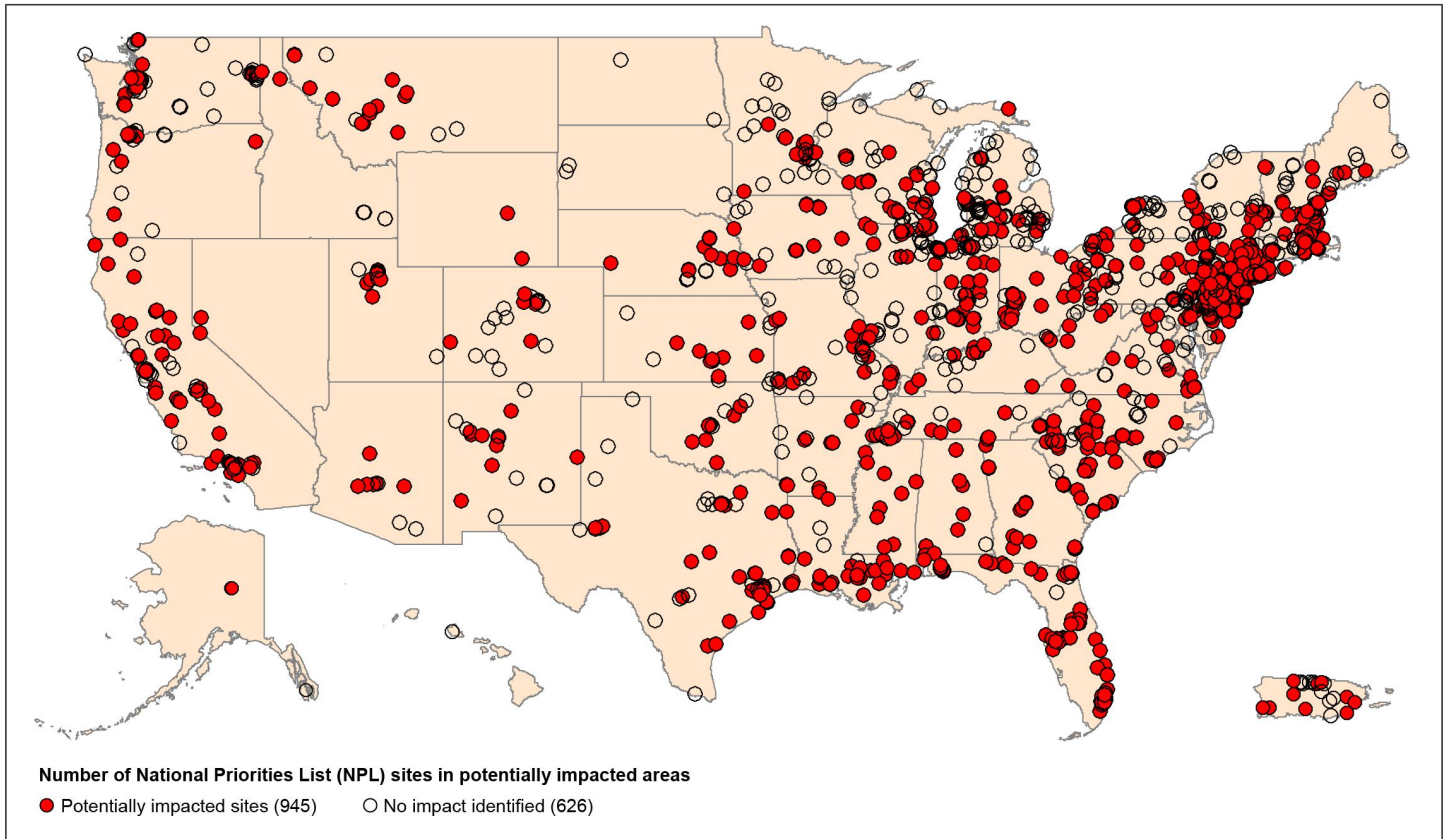
¹⁶GAO, *High-Risk Series: An Update*, [GAO-13-283](#) (Washington, D.C.: Feb. 14, 2013).

¹⁷GAO, *High-Risk Series: Dedicated Leadership Needed to Address Limited Progress in Most High-Risk Areas*, [GAO-21-119SP](#) (Washington, D.C.: Mar. 2, 2021).

by Selected Climate Change Effects; Additional Sites May Be Impacted in the Future

Available federal data on four potential climate change effects—flooding, storm surge, wildfires, and sea level rise—suggested that about 60 percent (945 of 1,571) of all nonfederal NPL sites were located in areas that may be impacted by one or more of these potential climate change effects, according to our October 2019 report. The locations of these sites are shown in figure 2.

Figure 2: Nonfederal NPL Sites Located in Areas That May Be Impacted by Flooding, Storm Surge, Wildfires, or Sea Level Rise, as of 2019



Sources: GAO analysis of Environmental Protection Agency, Federal Emergency Management Agency, National Oceanic and Atmospheric Administration, and U.S. Forest Service data; MapInfo (map). | GAO-21-555T

Notes: This map does not display all 1,571 active and deleted nonfederal NPL sites GAO analyzed in 2019, which also include six sites in American Samoa, the Federated States of Micronesia, Guam, the Northern Mariana Islands, and the U.S. Virgin Islands, though they are included in the counts above. Additional information on all sites GAO analyzed can be viewed at

<https://www.gao.gov/products/GAO-20-73>. Storm surge data were not available for the West Coast and Pacific islands other than Hawaii, wildfire data were not available outside the contiguous United States, and sea level rise data were not available for Alaska.

Flooding: We identified 783 nonfederal NPL sites—approximately 50 percent—in areas that FEMA identified as having 0.2 percent or higher annual chance of flooding, which FEMA considers moderate flood hazard, or other flood hazards, as of October 2018.¹⁸ We provided information on the number of sites in areas with moderate or other flood hazards because, according to the NCA, heavy rainfall is increasing in intensity and frequency across the United States and is expected to continue to increase, which may lead to an increase in flooding in the future.

Storm surge: We identified 187 nonfederal NPL sites—12 percent—in areas that may be inundated by storm surge corresponding to Category 4 or 5 hurricanes, the highest possible category, according to NOAA's storm surge model, as of November 2018.¹⁹ Nationwide, the number of nonfederal NPL sites in areas that may be impacted by storm surge may be higher than 187 because NOAA had not modeled areas along the West Coast and Pacific islands other than Hawaii.

Wildfires: We identified 234 nonfederal NPL sites—15 percent—located in areas that have high or very high wildfire hazard potential—those more likely to burn with a higher intensity—according to a U.S. Forest Service

¹⁸FEMA's National Flood Hazard Layer is a database of the most current flood hazard data. In general, flood hazards are based on existing conditions in the watershed and floodplains. The National Flood Hazard Layer identifies areas at the highest risk of flooding, which are those that have a 1 percent or higher annual chance of flooding. In some locations, the National Flood Hazard Layer also identifies areas with 0.2 percent or higher annual chance of flooding, which FEMA considers to be a moderate flood hazard, as well as other flood hazards. Other flood hazards include areas with reduced risk because of levees as well as areas with flood hazard based on future conditions, for example, if land use plans were implemented.

¹⁹NOAA provides estimates of hurricane storm surge using a model called Sea, Lake, and Overland Surges from Hurricanes. The model takes into account a specific locale's shoreline, incorporating bay and river configurations, water depths, bridges, roads, levees, and other physical features. It estimates the maximum extent of storm surge at high tide by modeling hypothetical hurricanes under different storm conditions, such as landfall location, storm trajectory, and forward speed. According to a NOAA website, the model does not account for future conditions, such as erosion, subsidence (i.e., the sinking of an area of land), construction, or sea level rise.

model, as of July 2018.²⁰ According to the NCA, the incidence of large forest fires in the western United States and Alaska has increased since the early 1980s and is projected to further increase in those regions as the climate changes. As described in figure 3, wildfires can pose risks at nonfederal NPL sites, such as the Iron Mountain Mine site near Redding, California.

Figure 3: Iron Mountain Mine National Priorities List Site in California

Overview: The 4,400-acre Iron Mountain Mine site near Redding, California, produced iron, silver, gold, copper, zinc, and pyrite through 1963. The underground mine workings and the fractured bedrock allow water and oxygen to react with the ore. The resulting acid mine drainage contains metals such as copper, cadmium, and zinc that are toxic to aquatic life, such as trout and salmon. EPA listed the site on the National Priorities List in 1983. In 2000, federal agencies and California reached a settlement with Aventis, the principal responsible party at the Iron Mountain Mine site. Global Loss Prevention, a wholly owned subsidiary of American International Group, operates the site.

Site status in cleanup process: Cleanup of the site is ongoing. EPA has constructed interim remedies, such as diverting streams to avoid contamination with acid mine drainage, and has begun a remedial investigation and feasibility study. According to EPA's sixth Five-Year Review report, in 2000, the potentially responsible party completed the construction of a water treatment system, seen in the picture, that captures most of the acid mine drainage, neutralizes it, and removes metals prior to discharge. The interim remedies remove 95 percent of the historic quantities of copper, cadmium, and zinc discharged from the Iron Mountain Mine and prevent uncontrolled releases of acid mine drainage into nearby streams and the Sacramento River in all but the most severe storms.



Potential impacts of climate change: According to our analysis, the site is located in an area with high or very high wildfire hazard potential. In July 2018, the Carr Fire burned through the site and almost destroyed the water treatment system. In the days that followed, fire was discovered in the high density polyethylene pipe that conveys acid mine drainage from one of the mines to the water treatment system. Firefighters, using specialized equipment, successfully extinguished the fire before it reached the ore body in the mine, which could have led to an explosion and substantial environmental and health hazards, according to an EPA report. EPA and state officials told us that increasing frequency and intensity of wildfires and landslides and erosion because of storm runoffs are an ongoing concern at the site.

Actions EPA has taken to manage risks to human health and environment from impacts of climate change: Following the fire, the site operator replaced portions of the pipes conveying acid mine drainage with nonflammable stainless steel, as can be seen in the bottom left corner of the picture. EPA officials told us that they plan to develop a model of water quality, including potential changing precipitation patterns because of climate change, in their remedial investigation for one of the operable units at the site.



Sources: GAO analysis of Environmental Protection Agency (EPA) information; GAO (photos). | GAO-21-555T

²⁰The U.S. Forest Service maps wildfire hazard potential based on landscape conditions and other observations. According to the U.S. Forest Service, the objective of the wildfire hazard potential map is to depict the relative potential for wildfire that would be difficult for suppression resources to contain. According to the U.S. Forest Service, areas with higher values of wildfire hazard potential represent vegetation that is more likely to burn with high intensity under certain weather conditions.

Text of Figure 3: Iron Mountain Mine National Priorities List Site in California

- Overview: The 4,400-acre Iron Mountain Mine site near Redding, California, produced iron, silver, gold, copper, zinc, and pyrite through 1963. The underground mine workings and the fractured bedrock allow water and oxygen to react with the ore. The resulting acid mine drainage contains metals such as copper, cadmium, and zinc that are toxic to aquatic life, such as trout and salmon. EPA listed the site on the National Priorities List in 1983. In 2000, federal agencies and California reached a settlement with Aventis, the principal responsible party at the Iron Mountain Mine site. Global Loss Prevention, a wholly owned subsidiary of American International Group, operates the site.
- Site status in cleanup process: Cleanup of the site is ongoing. EPA has constructed interim remedies, such as diverting streams to avoid contamination with acid mine drainage, and has begun a remedial investigation and feasibility study. According to EPA's sixth Five-Year Review report, in 2000, the potentially responsible party completed the construction of a water treatment system, seen in the picture, that captures most of the acid mine drainage, neutralizes it, and removes metals prior to discharge. The interim remedies remove 95 percent of the historic quantities of copper, cadmium, and zinc discharged from the Iron Mountain Mine and prevent uncontrolled releases of acid mine drainage into nearby streams and the Sacramento River in all but the most severe storms.
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Sources: GAO analysis of Environmental Protection Agency (EPA) information; GAO (photos). | GAO-21-555T

Sea level rise: We identified 110 nonfederal NPL sites—7 percent—located in areas that would be inundated by a sea level rise of 3 feet, according to our analysis of EPA and NOAA data as of March 2019 and September 2018, respectively.²¹ For example, sea level rise and other coastal hazards may impact nonfederal NPL sites such as the one in the San Jacinto River Waste Pits site in Texas, parts of which are already under water (see figure 4).

²¹NOAA models the extent of inundations from various heights of sea level rise (up to 10 feet above average high tides) for the contiguous United States, Hawaii, the Pacific islands, Puerto Rico, and the U.S. Virgin Islands and provides the results in a web mapping tool called the Sea Level Rise Viewer. NOAA does not model natural processes, such as erosion, subsidence, or future construction, or forecast how much sea level is likely to rise in a given area. Rather, for various heights of local sea level rise, NOAA determines extent of inundation based on the elevation of an area and the potential for water to flow between areas.

Figure 4: San Jacinto River Waste Pits National Priorities List Site in Texas

Overview: The approximately 40-acre San Jacinto River Waste Pits site is located east of Houston, Texas, between two unincorporated areas known as Channelview and Highlands. In the mid-1960s, liquid and solid pulp and paper mill wastes were disposed of at the site in impoundments, or waste disposal areas. The primary hazardous substances at the site, by-products of the pulp bleaching process, are dioxins and furans, exposure to which can cause several health effects, including skin diseases and liver damage.

Added to the National Priorities List in 2008, the site consists of impoundments in and adjacent to the San Jacinto River north and south of Interstate 10.

As seen in the picture, the San Jacinto River covers part of the northern impoundment, the boundaries of which are marked with buoys.

The International Paper Company and McGinnes Industrial Maintenance Corporation are responsible for the cleanup.



Site status in cleanup process: Cleanup of the site is ongoing. In 2010, EPA required the potentially responsible parties to, among other

things, install and maintain a temporary armored cap over the waste that could withstand storm events with 1 percent or higher annual chance of occurring. The temporary armored cap includes an impervious geomembrane under the northern impoundment and a cover over the impoundment. The potentially responsible parties also stabilized and solidified part of the paper mill waste. EPA is currently designing the long-term remedy for the site.

Potential impacts of climate change: According to our analysis, the site is located in an area that has a 1 percent or higher annual chance of flooding and that may be impacted by storm surge from Category 1 hurricanes and sea level rise of 0 foot. According to the 2017 record of decision, since the installation of the temporary cap, EPA has observed repeated damage to sections of the cap, including in September 2017 from Hurricane Harvey. Record-breaking rainfall during the hurricane led to flooding, which eroded the cap in some places, exposing some of the contaminated material. EPA detected high levels of dioxins in one area it sampled.

Actions EPA has taken to manage risks to human health and environment from impacts of climate change: According to the operations, monitoring, and maintenance plan of the time-critical removal action for the site, EPA has directed the potentially responsible parties to periodically inspect the cap and conduct repairs as needed after certain flood events. In the 2017 record of decision, EPA required the potentially responsible parties to remove and treat most of the contaminated material off-site, because of, among other things, risk of future flooding from hurricanes and sea level rise.

Sources: GAO analysis of Environmental Protection Agency (EPA) information; GAO (photo). | GAO-21-555T

Text of Figure 4: San Jacinto River Waste Pits National Priorities List Site in Texas

- **Overview:** The approximately 40-acre San Jacinto River Waste Pits site is located east of Houston, Texas, between two unincorporated areas known as Channelview and Highlands. In the mid-1960s, liquid and solid pulp and paper mill wastes were disposed of at the site in impoundments, or waste disposal areas. The primary hazardous substances at the site, by-products of the pulp bleaching process, are dioxins and furans, exposure to which can cause several health effects, including skin diseases and liver damage. Added to the National Priorities List in 2008, the site consists of □ impoundments in and adjacent to the San Jacinto River north and south of Interstate 10. As seen in the picture, the San Jacinto River covers part of the northern impoundment, the boundaries of which are marked with buoys. The International Paper Company and McGinnes Industrial Maintenance Corporation are responsible for the cleanup.
- **Site status in cleanup process:** Cleanup of the site is ongoing. In 2010, EPA required the potentially responsible parties to, among other things, install and maintain a temporary armored cap over the

waste that could withstand storm events with 1 percent or higher annual chance of occurring. The temporary armored cap includes an impervious geomembrane under the northern impoundment and a cover over the impoundment. The potentially responsible parties also stabilized and solidified part of the paper mill waste. EPA is currently designing the long-term remedy for the site.

- Potential impacts of climate change: According to our analysis, the site is located in an area that has a 1 percent or higher annual chance of flooding and that may be impacted by storm surge from Category 1 hurricanes and sea level rise of 0 foot. According to the 2017 record of decision, since the installation of the temporary cap, EPA has observed repeated damage to sections of the cap, including in September 2017 from Hurricane Harvey. Record-breaking rainfall during the hurricane led to flooding, which eroded the cap in some places, exposing some of the contaminated material. EPA detected high levels of dioxins in one area it sampled.
- Actions EPA has taken to manage risks to human health and environment from impacts of climate change: According to the operations, monitoring, and maintenance plan of the time-critical removal action for the site, EPA has directed the potentially responsible parties to periodically inspect the cap and conduct repairs as needed after certain flood events. In the 2017 record of decision, EPA required the potentially responsible parties to remove and treat most of the contaminated material off-site, because of, among other things, risk of future flooding from hurricanes and sea level rise.

Sources: GAO analysis of Environmental Protection Agency (EPA) information; GAO (photo). | GAO-21-555T

Our analysis may not have fully accounted for the number of nonfederal NPL sites that may be impacted by the effects of climate change for various reasons, including the following:

- We represented the areas of nonfederal NPL sites based on a 0.2-mile radius around their primary geographic coordinates, which may not accurately reflect their area (i.e., they may be larger or smaller).
- We did not analyze site-specific information for these nonfederal NPL sites, including the extent of contamination and location of remedies. Such site-specific analyses would be needed to determine whether there is a risk to human health and the environment at nonfederal NPL sites as a result of these potential climate change effects.

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- According to the NCA, EPA documents, and interviews with EPA officials, there may be other climate change effects that could impact nonfederal NPL sites, such as potential increases in salt water intrusion, drought, precipitation, hurricane winds, and average and extreme temperatures. We did not analyze these effects because we did not identify relevant national-level federal data sets.

EPA Has Taken Some Actions to Manage Risks from the Potential Impacts of Climate Change Effects at Nonfederal NPL Sites

We reported in October 2019 that EPA's actions to manage risks to human health and the environment from the potential impacts of climate change effects at nonfederal NPL sites align with three of the six essential elements of enterprise risk management, partially aligned with two elements, and did not align with the one, as shown in table 1. Enterprise risk management is a tool that allows agencies to assess threats and opportunities—such as risks to human health and the environment from the potential impacts of climate change effects—that could affect the achievement of their goals. In a December 2016 report, we stated that enterprise risk management promotes risk management by considering the effect of risk across the entire organization and how it may interact with other identified risks.²² Additionally, it addresses other topics such as governance, communicating with stakeholders, and measuring performance. The six essential elements of enterprise risk management that we identified in our December 2016 report are: align risk management process with goals and objectives, identify risks, assess risks, respond to risks, monitor risks, and communicate and report on risks.

²²GAO, *Enterprise Risk Management: Selected Agencies' Experiences Illustrate Good Practices in Managing Risk*, [GAO-17-63](#) (Washington, D.C.: Dec. 1, 2016). See also GAO, *Risk Management: Further Refinements Needed to Assess Risks and Prioritize Protective Measures at Ports and Other Critical Infrastructure*, [GAO-06-91](#) (Washington, D.C.: Dec. 15, 2005).

Table 1: Extent to Which EPA’s Actions to Manage Risks to Human Health and the Environment from the Potential Impacts of Climate Change Effects at Nonfederal National Priorities List Sites Aligned with GAO’s Essential Elements of Enterprise Risk Management

Essential elements	Extent to which EPA’s actions aligned with essential elements
Aligning enterprise risk management process with goals and objectives	Not aligned
Identifying risks	Aligned
Assessing risks	Partially aligned
Responding to risks	Partially aligned
Monitoring risks	Aligned
Communicating about and reporting on risks	Aligned

Sources: [GAO-17-63](#) and GAO analysis of Environmental Protection Agency (EPA) and stakeholder information. | GAO-21-555T

Aligning Risk Management Process with Goals and Objectives

One of the essential elements for enterprise risk management is for an agency to align its risk management processes with its goals and objectives. We reported that EPA had not taken action to clearly align its process for managing risks from the potential impacts of climate change effects at nonfederal NPL sites with agency-wide goals and objectives. For example, the 2018 to 2022 EPA strategic plan does not include goals and objectives related to climate change or discuss strategies for addressing the impacts of climate change effects.²³

In our report, we said that without clarifying how the agency’s ongoing actions to manage these risks at nonfederal NPL sites align with current agency goals and objectives, EPA would not have reasonable assurance that senior officials will take an active role in supporting these actions. We recommended that EPA clarify how its actions to manage these risks at nonfederal NPL sites align with the agency’s current goals and objectives. EPA initially disagreed with this recommendation; however, in April 2021, EPA stated that it is considering whether to take action responsive to this recommendation. We continue to believe that our recommendation is warranted.

²³Environmental Protection Agency, *Working Together: FY 2018-2022 EPA Strategic Plan*, EPA-190-R-18-003 (Washington, D.C.: February 2018).

Identifying Risks

In our report, we found that EPA actions to identify risks from climate change effects at nonfederal NPL sites aligned with this essential element. Specifically, EPA had identified climate change effects that may impact nonfederal NPL sites in studies and climate change adaptation and implementation plans. For example, in a 2012 study of adaptation of Superfund remediation to climate change, EPA identified eight climate change effects that may impact certain NPL site remedies: flooding, sea level rise, extreme storms, large snowfall, wildfires, drought, extreme heat, and landslides.²⁴ In 2014, EPA issued an agency-wide climate change adaptation plan and climate change adaptation implementation plans for the office that oversees the Superfund program and 10 regional offices.²⁵ These reports identified climate change effects that may impact NPL sites. Additionally, we found in 2019 that five regional offices had conducted or were conducting additional screening-level studies to identify which climate change effects, if any, may impact each of the NPL sites in these regions.²⁶

Assessing Risks

Our 2019 report found that EPA's actions to assess risks at nonfederal NPL sites partially aligned with this essential element. EPA took a number of steps to assess risks. For example, EPA assessed the potential

²⁴Environmental Protection Agency, *Adaptation of Superfund Remediation to Climate Change* (Washington, D.C.: February 2012). According to an EPA official, the agency does not plan to update this 2012 study because the data upon which its conclusions are based remain valid.

²⁵Environmental Protection Agency, *U.S. Environmental Protection Agency Climate Change Adaptation Plan*, EPA 100-K-14-001 (June 2014). In 2014, EPA developed an agency-wide climate change adaptation plan and climate change adaptation implementation plans for each EPA program office and the 10 EPA regions in response to Executive Order 13653, issued in 2013, which directed each federal agency to evaluate climate change risks and vulnerabilities to the agency's mission and operations in both the short and long term. Exec. Order No. 13653, 78 Fed. Reg. 66819 (Nov. 6, 2013). The adaptation plan stated that EPA will take the actions necessary to ensure that it continues to fulfill its mission of protecting human health and the environment even as the climate changes. Executive Order 13653 was revoked in 2017 by Executive Order 13783. Exec. Order No. 13783, 82 Fed. Reg. 16093 (Mar. 31, 2017). In 2021, Executive Order 14008 directed the head of EPA to submit a draft climate action plan to the newly formed National Climate Task Force and the Federal Chief Sustainability Officer that describes steps the agency can take with regard to its facilities and operations to bolster adaptation and increase resilience to the impacts of climate change. Exec. Order No. 14008, § 211(a), 86 Fed. Reg. 7619, 7625 (Feb. 1, 2021).

²⁶These are regions 1, 3, 4, 6, and 10.

impacts of climate change effects on nonfederal NPL sites in the 2012 report and 2014 plans discussed above. EPA also provided training and direction to remedial project managers on conducting site-level risk assessments that incorporate information on potential impacts of climate change effects. However, our report also found that regional officials were not consistently integrating climate change information into their site-level risk assessments. EPA officials in four regions provided us with site-specific examples of how they used climate change information to assess risks, but officials from other regions stated that they had not always integrated climate change information into their risk assessments. For example, officials in six regions told us that they had not used climate change projections for flooding or rainfall in site-level risk assessments.

Our 2019 report further found that EPA officials had not consistently incorporated climate change information into their assessment of site-level risks because they did not always have the climate data they needed to do so. For example, officials in three regions told us that they had not used rainfall or flood projections because the data were not available or they were unsure which data to use. We reported on similar challenges with climate data in our 2015 report on climate information, which found that existing federal efforts did not fully meet the climate information needs of federal, state, local, and private-sector decision makers.²⁷ In that report, we recommended that the Executive Office of the President designate a federal entity to develop and periodically update a set of authoritative climate change observations and projections for use in federal decision-making and create a national climate information system with defined roles for federal agencies and nonfederal entities. As of December 2020, the Executive Office of the President had yet to take action in response to this recommendation.²⁸

In addition, we reported in October 2019 that EPA's practice for assessing risks at NPL sites did not always include consideration of

²⁷GAO, *Climate Information: A National System Could Help Federal, State, Local, and Private Sector Decision Makers Use Climate Information*, [GAO-16-37](#) (Washington, D.C.: Nov. 23, 2015).

²⁸In 2021, Executive Order 14008 directed the heads of certain federal agencies to provide to the newly formed National Climate Task Force a report on ways to expand and improve climate forecast capabilities and information products for the public. It also directed the heads of certain federal agencies to assess and provide a report to the Task Force on the potential development of a consolidated federal geographic mapping service that can facilitate public access to climate-related information that will assist federal, state, local, and tribal governments in climate planning and resilience activities. Exec. Order No. 14008, § 211(d), 86 Fed. Reg. 7619, 7625 (Feb. 1, 2021).

climate change. For example, officials in two regions told us that they did not have direction on how to alter their practices to account for climate change. Without providing direction to remedial project managers on how to integrate information on the potential impacts of climate change effects into site-level risk assessments at nonfederal NPL sites across all regions and types of remedies, EPA cannot ensure that remedies will protect human health and the environment in the long term.

In our October 2019 report, we recommended that EPA provide direction on how to integrate information on the potential impacts of climate change effects into risk assessments at non-federal NPL sites. EPA initially disagreed with this recommendation, but in April 2021, EPA stated that it would issue a memorandum on this topic, with an expected release date this month. At that time, we will review the memorandum to determine if it is responsive to our recommendation.

Responding to Risks

In our October 2019 report, we found that EPA's actions to respond to risks from climate change at nonfederal NPL sites partially aligned with this essential element. EPA took a number of steps to respond to these risks. For example, EPA officials from three regions provided us with examples of site decision documents that described how climate change information would be incorporated into remedy selection and design.

However, we also found that regional officials had not consistently integrated climate change information into remedy selection and design. For example, officials from two regions stated that they were not aware of any remedial project managers in their regions who were taking action at nonfederal NPL sites to respond to climate change or consider future conditions. EPA officials had not done so because they did not always have sufficient direction to do so, according to our interviews with EPA officials. For example, EPA officials from three regions told us that they were unsure how to translate data on potential impacts of climate change effects into the design of remedies.

Without providing direction for remedial project managers on how to integrate information on potential impacts of climate change effects into site-level risk response decision-making at nonfederal NPL sites, EPA cannot ensure that remedies will protect human health and the environment in the long term. In our October 2019 report, we recommended that EPA provide direction on how to integrate information on the potential impacts of climate change effects into risk response

decisions at nonfederal NPL sites. EPA initially disagreed with this recommendation; however, in April 2021, EPA stated that it would issue a memorandum that would provide direction on this topic, with an expected release date this month. At that time, we will review the memorandum to determine if it is responsive to our recommendation.

Monitoring Risks

In our October 2019 report, we found that EPA's actions to monitor risks at nonfederal NPL sites through its Five-Year Review process aligned with this essential element. For example, in 2016, EPA introduced a new recommended template for the Five-Year Review that includes a section for officials to document their consideration of whether any newly available information related to climate change may call into question a remedy's protectiveness.²⁹

Communicating and Reporting on Risks

We also found that EPA's actions to communicate about and report on risks to human health and the environment from the potential impacts of climate change effects at nonfederal NPL sites aligned with this essential element. For example, EPA reported on potential impacts of climate change effects on NPL sites in the 2014 agency-wide climate change adaptation plan and implementation plans discussed above. EPA officials may also communicate this information in response to questions from the public. EPA also communicated about these risks in other ways, such as through a workshop and an online mapping tool.³⁰

EPA Recognized Various Challenges in Managing Risks from the Potential Impacts of

²⁹Environmental Protection Agency, *Five-Year Review Recommended Template*, OLEM 9200.0-89 (Washington, D.C.: Jan. 20, 2016). According to an EPA memorandum, the template provides officials with an approach for preparing the Five-Year Review reports in a manner intended to promote national consistency, to reduce nonessential information, and to decrease repetitiveness in the reports.

³⁰The Cleanups in My Community online tool maps and lists hazardous waste cleanup locations and grant areas, such as nonfederal NPL sites. EPA also integrates other federal data into the tool, including sea level rise scenarios and FEMA flood hazard areas. Accessed April 8, 2019, at <https://www.epa.gov/cleanups/cleanups-my-community>.

Climate Change Effects at Nonfederal NPL Sites

In 2019, we reported that EPA recognized there were institutional, resource, and technical challenges in managing risks to human health and the environment from the potential impacts of climate change effects at nonfederal NPL sites, according to agency and other documents that we reviewed and EPA officials and stakeholders we interviewed.

Institutional Challenges

We reported that EPA faced institutional challenges in managing risks from climate change at nonfederal NPL sites. For example, officials from three regions told us that they did not have the direction they need to manage these risks. Further, we reported that it may not be clear whether EPA could require PRPs to consider climate change impacts in the cleanup process. Another institutional challenge that EPA faced is that its ability to manage these risks may depend on actions of other entities that are outside of its control, according to EPA documents we reviewed and EPA officials we interviewed. For example, EPA officials from Region 1 told us that they are not certain whether a hurricane barrier built by the U.S. Army Corps of Engineers that protects the New Bedford Harbor site in Massachusetts is designed to withstand future storms. Managing risks may also require internal coordination within EPA, which presents another challenge. For example, an EPA headquarters official told us that it can be challenging for regional Superfund program staff to connect with EPA experts on climate change, who may be in different program offices. Furthermore, EPA officials from three regions told us that they face challenges related to the sensitive nature of climate change. For example, officials in Region 6 told us that when they engaged with the local community during the decision-making process for the San Jacinto River Waste Pits site in Texas, they avoided using the term climate change because of concerns that the charged term would alienate some community members.

Resource Challenges

We also reported that insufficient or changing resources—specifically, funding and staffing—may make managing risks to human health and the environment from the potential impacts of climate change effects challenging for EPA. For example, according to two regional climate change adaptation implementation plans and EPA officials, assessing

these risks may require more resources than assessing risks based on current or past conditions. In addition, we reported that designing or modifying existing remedies to respond to these risks could increase costs. Moreover, EPA officials from three regions told us that staffing constraints can make it difficult to manage risks. For example, EPA officials from Region 9 told us that the need for remedial project managers to respond to other emergencies, such as overseeing hazardous materials removal after fires, means that they have less time to oversee cleanup of nonfederal NPL sites.

Technical Challenges

We reported that EPA faces technical challenges in managing risks from the potential impacts of climate change effects in terms of available expertise and data. In its 2014 agency-wide climate change adaptation plan, EPA reported that site vulnerabilities may be difficult to assess because of limited scientific understanding. In addition, in 2019, EPA officials told us that they need additional expertise and training to better manage risks. According to EPA documents and EPA officials from two regions, appropriate climate change data may not be available to inform assessments that help manage risk. For example, a Region 4 study of the vulnerability of NPL sites stated that climate model projections of temperature and precipitation patterns were not available at a spatial resolution that was useful for assessing vulnerabilities at the site level. In addition, the level of uncertainty inherent in climate change data may make it challenging for EPA to incorporate that information into risk management processes, according to agency documents we reviewed and some agency officials we interviewed.

In conclusion, our October 2019 report emphasized the importance for EPA to take additional actions to manage risks to human health and the environment from the potential impacts of climate change effects at nonfederal NPL sites. Climate change may result in more frequent or intense extreme events—such as flooding, storm surge, and wildfires—that could damage remedies at nonfederal NPL sites and lead to releases of contaminants that could pose risks to human health and the environment. Our 2019 analysis showed that more than half of nonfederal NPL sites are located in areas that may be impacted by selected climate change effects.

Our 2019 analysis also found that EPA had taken some actions to manage risks to human health and the environment from the potential impacts of climate change effects at nonfederal NPL sites. However, EPA

has not clarified how its actions to manage risks from these effects at nonfederal NPL sites align with current agency goals and objectives, which could limit its senior officials' ability to manage these risks. Further, EPA officials did not always have direction to ensure that they consistently integrate climate change information into site-level risk assessments and risk response decisions, according to EPA documents and officials. Without providing such direction for remedial project managers, EPA cannot ensure that remedies at nonfederal NPL sites will protect human health and the environment in the long term.

Chairman Tonko, Ranking Member McKinley, and Members of the Committee, this completes my prepared statement. I would be pleased to respond to any questions that you may have at this time.

GAO Contacts and Staff Acknowledgments

If you or your staff members have any questions about this testimony, please contact J. Alfredo Gómez, Director, Natural Resources and Environment, at (202) 512-3841 or gomezj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. GAO staff who made key contributions to this testimony are Barb Patterson (Assistant Director), Krista Mantsch (Analyst in Charge), Cindy Gilbert, Gwen Kirby, Skip McClinton, Patricia Moye, Dan Royer, and Ruth Solomon. GAO staff who made key contributions to the 2019 report that part of this testimony is based on are Barb Patterson (Assistant Director), Ruth Solomon (Analyst in Charge), Breanne Cave, Charles Culverwell, Cindy Gilbert, Richard Johnson, Gwen Kirby, Krista Mantsch, Patricia Moye, Eleni Orphanides, Ernest Powell Jr., Dan Royer, and Kiki Theodoropoulos.

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