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Letter to the Editor

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Non-routine Environmental Hazards Encountered by National Park First Responders

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The diversity of areas located within the National Park system presents a series of challenges to emergency responders within the parks. More than 20,000 full-time employees work in the National Park Service (NPS) as "park rangers," a position with assigned duties including emergency response, trail guiding, law enforcement, and other assignments that vary widely from park to park.[1–3] In addition to routine and well-known occupational hazards, such as traumatic injuries,[4] it is plausible to hypothesize that park rangers acting as first responders may encounter dangers on the job related to environmental exposures to hazardous materials. An investigation of the peer-reviewed literature failed to reveal previous studies or reports describing nonroutine environmental hazards encountered by National Park rangers. To better understand whether nonroutine environmental exposures occur in this population, a gray literature review was performed.

This gray literature review aimed to identify environmental releases that could present a direct threat to human health in NPS-managed areas. Access World News, a database that contains "major national and international newspapers, as well as local and regional titles as well as newswires, blogs, Web-only content, videos, journals, magazines, transcripts and more" was chosen to provide access to a wide range of publications.[5] In total, over 40 search terms and variants were used (see Table 1).

A total of 51 reports of environmental release incidents in NPS-managed areas were found between January 2000 and July 2020. For ease of classification, incidents were separated into 3 categories: biological (viral outbreaks, zoonotic spread), chemical (spills or dumping of hazardous materials), and radiation (exposure to radioactive substances). The parks with the greatest number of incidents were Yosemite ($n = 6$), Congaree ($n = 4$), Indiana Dunes ($n = 4$), Yellowstone ($n = 4$), and Grand Canyon ($n = 3$). A full list of hazards is described in Table 2.

These findings indicated that while environmental releases and biological illnesses with inter-human transmission potential seemed to be rare, they were by no means unknown to NPS-managed areas. While certain parks experienced higher occurrences of certain hazards (eg, 14 of a total of 34 chemical releases were recorded in NPS sites in or near waterways), certain incidents could not be predicted. Illegal dumping of hazardous materials, nearby industrial accidents, viral outbreaks, and other hazards have the potential to happen within all national parks.

Table 1. List of keywords used to search Access World News

Keywords Searched		
Cyanide	Herbicide	Industrial Waste
Radon	Pesticide	Industrial Accident
Norovirus	Wildfire	Infection
Rabies	Norwalk	Ammonia
Chemical Spill	Plague	Arsine
Chromium	Hazardous Release	Boron
Heavy Metals	Outbreak	Carbon Disulfide
Chlorine	Gas Leak	Diborane
Hantavirus	Corona Virus	Ethylene Oxide
Oil Spill	Poison Fine/Spill	Fluorine
Phosphorus Trichloride	Formaldehyde	Nitric Acid
Sulfur Dioxide	Hydrogen Bromide	Phosgene
Sulfuric Acid	Hydrogen Chloride	Hydrogen Fluoride
Tungsten Hexafluoride	Hydrogen Cyanide	Hydrogen Sulfide

Table 2. Overview of Incidents at NP and NPS-managed areas

Classification	Incident Detail	# of Cases
Biological	Primarily resulting from viral outbreaks and zoonotic spread *Coronavirus (n=1), Norovirus (n=4), Norwalk Virus (n=1), Plague (n=1), Rabies (n=5), Unknown Virus (n=1)*	13
Chemical	Primarily resulting from chemical spills/ accidental or deliberate dumping of hazardous materials	33
	Ammonia (n=2), Arsenic (n=2), Asbestos (n=2), Boron (n=1), Capsaicin (n=1), Carbon Disulfide (n=1), Chlorine (n=1), Coal Ash (n=1), Cyanide (n=3), Diesel-Fuel (n=1), Formaldehyde (n=1), Hazardous Materials Unknown (n=4), Heavy Metals (n=2), Hexavalent Chromium (n=1), Mustard Gas (n=1), Oil (n=3), Pesticides (n=4), Sewage (n=2), Unquantified Others	
Radiation	Resulting from radioactive waste in landfills, leak of contaminated water, and mishandled uranium ore.	4
	Radium 226 (n=1), Radon (n=1), Uranium (n=2)	

NPS rangers may be exposed to a wider breadth of biological, chemical, and radiation than previously known. It seems reasonable to expect that NPS first responders, like community first responders, have basic awareness of hazardous materials handling, as well as the ability to immediately respond to and coordinate with Hazmat teams. While many of these recorded incidents were not immediately dangerous to life or health, they could plausibly lead to chronic illness from exposure. The number of biological and infectious disease incidents found in this review, as well as the present threat of coronavirus disease 2019 (COVID-19), suggests a need for familiarity with personal protective equipment. The lack of peer-reviewed literature on this topic suggests a need for further and more formal research.

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