NATIONAL WILDFIRE COORDINATING GROUP

NWCG Memorandum 24-004

July 1, 2024

TO: NWCG Executive Board Members and NWCG Committee/Subgroup Chairs

FROM: Aitor Bidaburu, Chair, NWCG Executive Board

JOSE A BIDABURU

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Date: 2024.07.07 15:22:20 -06'00'

SUBJECT: Recommendations for mitigation strategies for wildland firefighters to minimize exposure due to line-of-duty environmental hazards.

Purpose: The H.R.3684 - Infrastructure Investment and Jobs Act directed: "National Wildfire Coordinating Group. – Using the amounts made available under subsection (c) (2), not later than October 1, 2022, The Secretary of the Interior and the Secretary of Agriculture shall—(A) develop and adhere to recommendations for mitigation strategies for wildland firefighters to minimize exposure due to line-of-duty environmental hazards." This memo provides information to meet the requirements stated above.

Please distribute this information through your agency channels.

Action: To complete this tasking, a group of interagency subject matter experts was assembled at the request of the National Wildfire Coordinating Group (NWCG) Risk Management Committee (RMC) chair. The work group identified and completed the following tasks to meet the objective stated in H.R. 3684.

1. Defined environmental hazard,
2. Classified line-of-duty environmental hazards,
3. Identified current mitigations and recommendations that already exist, and
4. Made recommendations for further development of mitigations for environmental hazards.

Mitigating exposure to environmental hazards is difficult as they are part of the complex and dynamic wildland fire environment. These environmental hazards may be independent or interdependent and can often be successfully managed through the Risk Management Process. Further evaluation is needed to assess if mitigations and recommendations are effective and when and to determine if and where new recommendations are needed.

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Attachments: All tasks stated above are completed in Attachment A.

Distribution:
Fire Executive Council (FEC)
NWCG Committee Chairs
NWCG Staff

Attachment A - Environmental Hazards in the Wildland Fire Environment

Environmental Hazard Definition

A line of duty **environmental hazard** is a threat to personnel in the wildland fire environment that has the potential to cause physical harm, injury, or damage to health.

- This includes physical, chemical, and biological hazards or workplace factors that are external to a person.
- Hazards can be naturally occurring or human-made (artificial).
- Personnel in the wildland fire environment include any individual who is trained in fire prevention or suppression and is engaged in the prevention, control, or extinguishment of fires or response to emergencies in which life, property, or the environment is at risk, including the prevention, control, suppression, or management of wildland fires (including wildfires and prescribed fires).[1]

Classification of line-of-duty environmental hazards

Table 1 lists line-of-duty environmental hazards categorized into physical, chemical, biological, and work organization.

Current Environmental Hazard Mitigation Strategies

All wildland firefighters are taught to mitigate many environmental hazards through NWCG training courses and position certification processes which establish performance standards and recertification requirements. Safety and hazard mitigation is included as part of the curriculum of multiple courses. For example, the entry-level wildland firefighter course includes indicators of risk and primary mitigations of Lookouts, Communications, Escape Routes, and Safety Zones (LCES), the 10 Standard Firefighting Orders, and 18 Watch Out Situations. These mitigations are foundational to identifying and controlling various hazards in the wildland fire environment.

Hazards in the wildland fire environment are also mitigated through the risk management process. This process ensures that decision-making incorporates critical factors and risks within the work environment and includes five steps: (1) Identify Hazards, (2) Assess Hazards, (3) Develop Controls and Make Risk Decisions, (4) Implement Controls, and (5) Supervise and Evaluate (IRPG, pp. 1). If operations change, the Risk Management Process is to be restarted at the appropriate step. In addition, the Risk Management Process also outlines “How to properly refuse risk” indicating that, “When an individual feels an assignment is unsafe, they also have the obligation to identify, to the degree possible, safe alternatives for completing that assignment...” (IRPG, pp. 18).

In addition to formal training requirements, Incident Position Certifications within the wildland fire service are gained through training and performance evaluation which includes identification and mitigation of a risks at every level and function. Task books are unique to the position being performed and require documentation which must be completed and submitted to evaluation groups for consideration before a responder can become qualified in the position. Safety and risk mitigation tasks are a requirement within position task books. This performance-based system

[1] Adapted from definition provided in the James M. Inhofe National Defense Authorization Act of 2023 (NDAA), Pub. L. No. 117-263. Section 5305: Fairness for Federal Firefighters

monitors performance against the standard NWCG Incident Position Description and application of the NWCG risk management process.

Many environmental hazard exposures commonly experienced in the wildland fire environment can be mitigated through training, the proper use of personal protective equipment (PPE), LCES, 10 Standard Firefighting Orders, 18 Watch Out Situations, and implementing the Risk Management Process. Additionally, guidance and recommendations on how to mitigate risk to specific environmental hazards can be found in interagency standards, recommendations from incident reports and learning reviews, and agency handbooks. These sources include:

- Interagency Standards for Fire and Fire Aviation Operations (Red Book),
- NWCG Incident Response Pocket Guide (IRPG),
- Interagency Initiatives and Programs
- NWCG Member Agency Handbooks, Manuals, and Guides

Tables 2 and 3 provide details on specific mitigations by NWCG for specific environmental hazards.

Interagency Initiatives and Programs

The Wildland Fire Lessons Learned Center (LLC) was created to "promote learning in the wildland fire service by providing useful and relevant products and services that help to reveal the complexity and risk in the wildland fire environment." The LLC serves the entire wildland fire community. One resource to highlight from the LLC is the Wildland Fire Lessons Learned Center Incident Review Database where various reports and learning tools from specific incidents and hazards can be queried. Many of the products produced by the LLC promote organizational learning and include recommendations for mitigating risk in the wildfire environment.

The NWCG 6 Minutes for Safety (6MFS) program is designed to share quick and relevant daily lessons to the field to enhance firefighter safety, efficiency, and risk management. Topics address many identified environmental hazards including: aviation, chainsaw use, communication, smoke exposure, human factors, leadership, vehicle use, weather, and fire behavior. The intent of this communication tool is to facilitate learning through dialogue, discussion, and links to additional information. The content is produced by a NWCG Risk Management subcommittee and is published in the daily Situation Report generated and distributed by the National Interagency Coordination Center. Table 4 includes a list for individual 6MFS topics that cover many of the identified environmental hazards.

NWCG Member Agency Handbooks, Manuals, and Guides

Each of the NWCG member agencies has handbooks, manuals, and guides that provide direction to their specific employees regarding safety and risk management practices, protocols, policies. These documents fall outside of the scope of NWCG, but in many cases address similar environmental hazards.

Recommendations for Future Mitigations

The workgroup recommends that the following environmental hazards be addressed, and mitigations be developed as these hazards are not considered in the aforementioned sources:

- Sunlight and ultraviolet rays,
- Vibration,
- Engine Fuel and Diesel Exhaust,
- Smoke and soot (dermal), and
- Chemically Treated PPE.

Conclusion

Mitigating exposure to environmental hazards is difficult as they are part of the complex and dynamic wildland fire environment. These environmental hazards may be independent or interdependent and can often be successfully managed through the Risk Management Process. Further evaluation is needed to assess if mitigations and recommendations are effective and when, and to determine if and where new recommendations are needed.

Table 1 - List of physical, chemical, biological, or workplace environmental hazards

Hazard Category	Environmental Hazard	Considerations and Potential Sources of Hazards
Physical	Extreme Fire Behavior	Extreme temperature exposures and increased risk of entrapments
	Tree Canopy	Tree failure (snags, widow makers or green trees) Procedural failures (dominos, leans and hangers, unable to clear felling area)
	Large objects (rocks/logs)	Struck by/caught between/falls and footing
	Slopes and uneven ground	Slips, trips, falls/ ground collapse/stobs
	Heavy Equipment	Struck by/noise exposure/
	Noise	Pumps/generators, chainsaws, aviation, heavy equipment, radio, firing devices
	Vehicle and Aviation	Accidents, crashes, and collisions/struck by
	Electrical	Working under and around power lines
	Temperature Extremes	Hot and cold
	Extreme weather	Thunder and Lightning
	Sunlight/ultraviolet rays	High exposures
	Radiation	Ionizing and nonionizing (electromagnetic fields, microwaves, radio waves, etc.)
	Unexploded ordnance	lead
	Vibration	Chainsaw use
Chemical	Smoke and soot (inhalation)	By-products of combustions (VOCs, PM, PAHs,CO)/ WUI exposures (metals, flame retardants)
	Smoke and soot (dermal)	By-products of combustions (VOCs, PM, PAHs,CO)/ WUI exposures (metals, flame retardants)
	Engine Fuel and Exhaust	Generated by vehicles, generators, chainsaws
	Hazardous materials	Fuel, batteries, cleaning supplies, water treatment, solvents, petroleum products, dry Chemicals/fire extinguishers, lead
	Silica	Dirt, dust, and ash
	Chemically treated PPE	Durable water repellant finishes
	Retardant	Exposure to suspected carcinogens and hydrogen chloride through mixing and by walking/working in areas that were treated
	Asbestos	Naturally occurring or in the WUI
Biological	Blood and other body fluids	Needle sticks
	Fungi	Coccidioides (valley fever)
	Bacteria and viruses	Norovirus, COVID, strep throat
	Plants	Poison ivy, poison oak, cacti
	Insects	Bites and stings
	Animals	Droppings and bites
Work Organization	Workload demands and schedule Intensity and pace Lack of control	Shift work, cumulative fatigue, sleep deprivation, burn out, unfamiliar terrain and environment, potentially traumatic event, lack of available personnel and high vacancy rates
	Violence	Harassment, terrorism, active shooter

Table 2 – Mitigations for Environmental Hazards in the 2024 Red Book

Hazard Category	Environmental Hazard	Red Book (Chapter 7)
Physical	Noise	Hearing Protection and Personal Protective Equipment
	Vehicle and Aviation	Driving standard
	Radiation	Industrial and Naturally Occurring Hazardous Materials Exposure
	Unexploded ordnances	Explosives, Munitions, and Unexploded Ordnance
Chemical	Smoke and soot (inhalation)	Respiratory protection
	Hazardous materials	Industrial and Naturally Occurring Hazardous Materials Exposure
Biological	Fungi	
Work Organization	Workload demands and schedule	Work/rest

Table 3 – Mitigations for Environmental Hazards in the IRPG (2022)

Hazard Category	Environmental Hazard	IRPG
Physical	Extreme Fire Behavior	Fire Environment Section (pg. 33-51) Sections focused on operational engagement, how to properly refuse risk, last resort survival, strategies, fireline location.
	Tree Canopy	Situation Awareness and Hazard Control (pg. 20-21) Hazard Tree Safety
	Extreme Weather	Thunderstorm Safety (pg. 17)
	Heavy Equipment	Working with Heavy Equipment section in IRPG
	Electrical	Powerline safety (pg. 22)
	Temperature Extremes	Heat-related injury (pg. 109)
	Unexploded ordnance	Unexploded Ordinance section of IRPG
Chemical	Smoke and soot (inhalation)	Recommendations for Line personnel and ICP and Spike Camps to reduce exposure through administrative controls (pg. 28)
Biological	Blood and other body fluids	EM Care Guidelines (pg. 105)

Table 4 – Environmental Hazards Highlighted in NWCG 6MFS

Hazard Category	Environmental Hazard	6MFS Topic
Physical	Extreme Fire Behavior	Extreme-fire-behavior Base-all-actions Common denominators of fire behavior on tragedy fires Frequent spot fires across the line Nfdrs pocket cards Proper use of trigger points Spot weather forecast Thunderstorm safety Unfamiliar with weather and local factors
	Tree Canopy	Felling safety
	Noise	Noise exposure-safety
	Vehicle and Aviation	Vehicles roads Aviation
	Electrical	Power line safety
	Temperature Extremes	Hypothermia Heat stress
	Extreme weather	Lightning awareness
	Unexploded ordnances	Unexploded ordnance safety
Chemical	Smoke and soot (inhalation)	Effects of smoke exposure
	Hazardous materials	Hazmat incident operations
Biological	Fungi	Valley fever
	Bacteria and viruses	Contagious diseases
	Plants	Poisonous plants
	Insects	Bees and wasps
	Animals	Snake bites
Work Organization	Workload demands and schedule	Firefighter stress management
	Intensity and pace	Fatigue stress
	Violence	Active shooter how to respond