

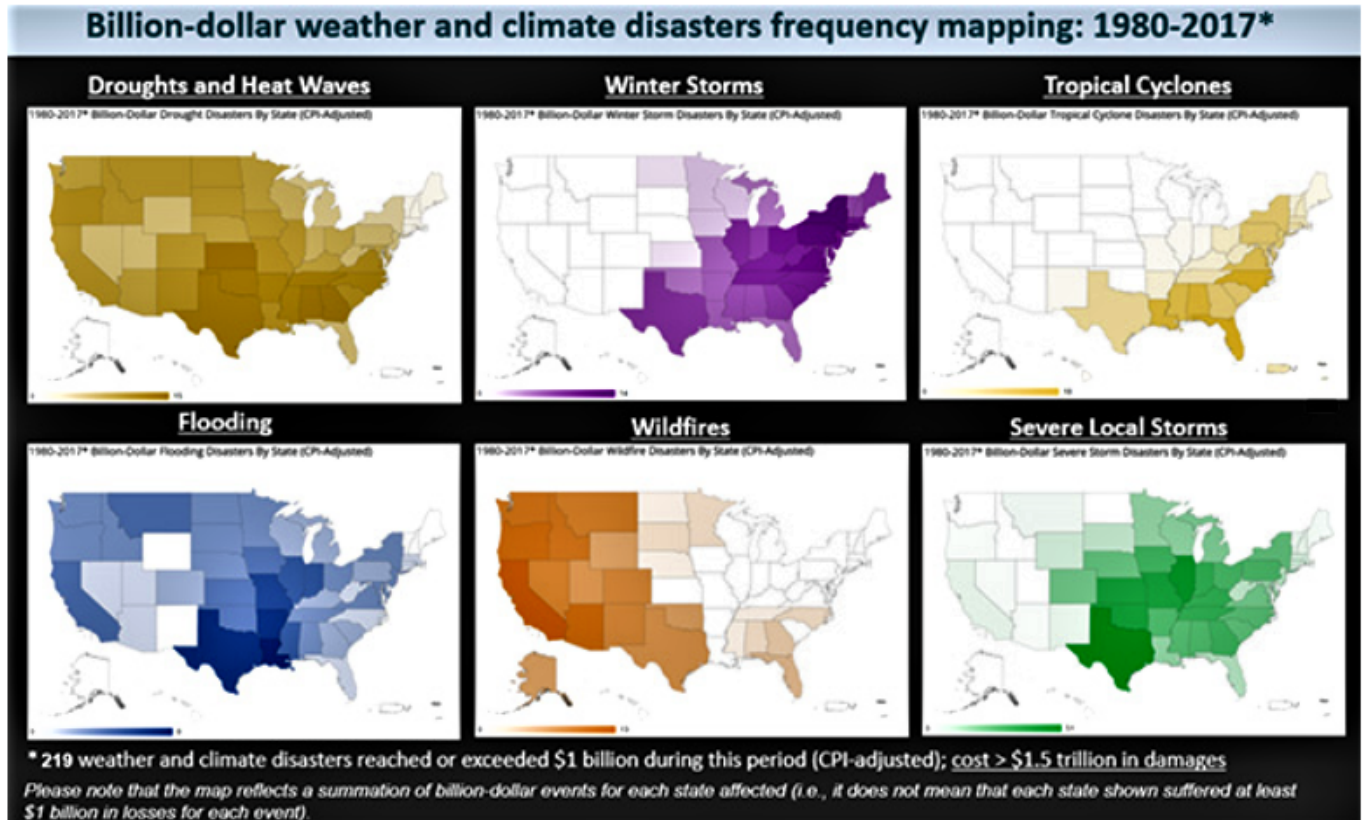


Personal Protective Equipment

Flood Protection and Above the Shoulders PPE

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Flooding. It seems to be a more regular occurrence. But does the meteorological record back that up? Each of the 1982, 1993, and 2015-16 floods resulted in eight peaks of record among the selected stations included in this study, whereas the 2017 flood resulted in 21 peaks of record. By the numbers, drought (\$236.6 billion, CPI-adjusted), severe storms (\$206.1 billion, CPI-adjusted) and inland flooding (\$119.9 billion, CPI-adjusted) have caused considerable damage based on the list of billion-dollar events in just the Southwestern area of the U.S. alone.



These billion-dollar events are followed by recovery and cleanup. With floods come hazards such as mold or airborne dusts containing harmful substances. And, the need for personal protective equipment (PPE) for a wide swath of professional workers. It is important to note that workers fall

under the scope of occupational health and safety regulatory agencies and requirements apply when using this PPE.

For questions about the proper use of PPE, refer to product user instructions or **contact the manufacturer directly**. The following is a discussion of "above the shoulders PPE" including respiratory, hearing, and head/eye/face protection for use during flood recovery and cleanup. There may also be a need for other protection in the form of protective footwear, clothing, gloves, etc., depending on the situation.

DISASTER TYPE	NUMBER OF EVENTS	PERCENT FREQUENCY	CPI-ADJUSTED LOSSES (BILLIONS OF DOLLARS)	PERCENT OF TOTAL LOSSES	AVERAGE EVENT COST (BILLIONS OF DOLLARS)	DEATHS
Drought	25	11.4%	\$236.6	15.4%	\$9.5	2,993†
Flooding	28	12.8%	\$119.9	7.8%	\$4.3	540
Freeze	8	3.7%	\$27.6	1.8%	\$3.5	162
Severe Storm	91	41.6%	\$206.1	13.4%	\$2.3	1,578
Tropical Cyclone	38	17.4%	\$850.5	55.3%	\$22.4	3,461
Wildfire	15	6.8%	\$53.6	3.5%	\$3.6	238
Winter Storm	14	6.4%	\$43.1	2.8%	\$3.1	1,013
All Disasters	219	100.0%	\$1,537.4	100.0%	\$7.0	9,985

Billion-dollar events to affect the U.S. from 1980 to 2017 (CPI-Adjusted)

Respiratory Protection

Workers involved in flood recovery and clean-up face both obvious and hidden respiratory hazards. Many of these hazards do not become apparent until the waters have receded.

Mold

The flood aftermath can create optimal conditions for mold growth. An assessment of homes in the New Orleans district after Hurricane Katrina identified ~46% of homes with some mold contamination and ~17% with heavy mold contamination.^[7] Although mold can be found almost anywhere indoors or outdoors, mold needs moisture and nutrients to grow. Mold grows best in damp, warm environments. The availability of nutrients in indoor environments rarely limits mold growth as building materials including wood, wallboard, wallpaper, and upholstery can be nutrient sources.

Following water damage, mold may begin to grow on a variety of building materials and surfaces, both in open and hidden locations. For instance, hidden mold may occur in places such as the back-side of plaster walls, wallpaper or paneling, inside ceiling cavities, behind furniture, and the underside of carpets.

Mold growth can occur in a relatively short time. Building contents constructed of absorbent materials (paper, cloth, wood, etc.) that have been wet for more than 48 hours are a likely location for mold

growth. Disposal is typically the only remediation option for these materials, whereas smooth, hard surfaces such as metal and plastics can often be cleaned effectively. Disturbing the mold in any manner can result in higher air concentrations or aerosolization.

Aerosolization can occur in many ways, including disturbance of mold-contaminated areas by human activity like cleaning and dispersal of spores through contaminated air conditioning systems. **Molds can also release low levels of volatile organic compounds (VOCs)** that are thought to be the source of mold/mildew odors.

Dusts Containing Asbestos, Lead, and Crystalline Silica

Cleanup and demolition in older buildings, both residential and commercial, can present exposure concerns to asbestos, lead, and silica. Structures built prior to 1975 may contain significant amounts of asbestos. Asbestos-containing materials were commonly used in boiler/pipe insulation, fireproofing, floor and ceiling tiles, roofing and siding materials. Many homes built prior to 1978 may contain lead-based paint. **Crystalline silica** may be present naturally and in pulverized concrete. Any cleanup activity that involves disturbing debris can create airborne dusts, which may contain these and other harmful substances.

Bioaerosols

Floodwater often contains infectious organisms, which may include intestinal bacteria such as E. coli, Salmonella, Shigella, and Hepatitis A Virus.^[2] Pools of standing or stagnant water become breeding grounds for mosquitoes, increasing the risk of Ross River virus and other mosquito-borne diseases. Most cases of illness associated with flood conditions are brought about by ingesting contaminated food or water. Exposures may also occur via skin contact and, to a lesser extent, inhalation of bioaerosols. As a particulate respiratory hazard, infectious agents may become airborne during certain cleanup activities such as dumping/aeration of floodwater or high-pressure cleaning of contaminated surfaces.

Respirator Selection

The general approach to **respirator selection requires knowledge of the specific contaminant**, the air concentration and the occupational exposure limit. Some U.S. health authorities have published recommendations for selecting **respirators for mold remediation activities** based upon the size of the contaminated area. The U.S. Centers for Disease Control and Prevention (CDC) has prepared a chart containing population-specific recommendations for PPE, including respiratory protection, for protection against mold in flooded buildings.^[3]

Respirator selection for other potential air contaminants must also be considered. In many cases, respirators used for mold exposures may also be used for other air contaminants as well. Employers must select respirators based on occupational health and safety regulatory requirements in conjunction with the respirator manufacturer's user instructions consistent with OSHA and NIOSH. 3M also encourages you to **download this FAQ** entitled 'Potential Hazards and Respiratory Protection After a Flood or a Hurricane' for additional helpful information.

Organizations must implement a written respiratory protection program that meets the requirements of 29 CFR 1910.134 before requiring use of a respirator by workers. To learn more about how to implement and manage a program, please see 3M's **Center for Respiratory Protection**.

Additional Considerations for PPE after a Flood

Hearing Protection

Hazardous levels of noise are common among workers involved in debris collection, site clearing and transportation activities. High exposures (>90dBA) are associated with operating heavy equipment, chippers, chain saws, and industrial vacuums.

Virtually any model or brand of **hearing protector**, if properly selected and worn, is capable of providing more than 10 dB of protection. Consideration of other factors, such as overall comfort, is also important when selecting a hearing protection device.

Head, Eye and Face Protection

Potential head, eye and face hazards during emergency response/disaster recovery can include impacts, airborne particles, falling debris, building materials, glass, irritating vapors/gases, thermal hazards and fires.

Thousands suffer eye injuries at work each year, yet 90% of them could have been prevented by using proper protective eyewear. Common injuries include corneal abrasions, conjunctivitis, particles embedded in the eye, chemical splash or burn, lacerations, facial contusion, and infectious agent exposure.

There are many criteria important in selecting the correct **protective eyewear**. These include:

- Size and fit of eyewear
- Lens tint and color
- Scratch resistant/anti-fog coatings
- Protection from chemical splash and dust hazards
- Protection from irritant vapors and gases
- Compatibility with other PPE
- Need for secondary protection, such as a faceshield
- Vision correction needs

For common flood cleanup activities, safety glasses or safety goggles with low or medium impact resistance will typically be suitable.

Head protection is necessary in any situation where:

- There is a risk of falling objects.
- A person may strike their head against an object.
- Accidental head contact with an electrical hazard exists.

To learn more or order respirators, hearing protectors, eye protection, faceshields, or head protection, please contact 3M today at 1-800-243-4630 to **Speak with a safety specialist**.

Resources:

Charts come from: <https://pubs.usgs.gov/of/2018/1004/ofr20181004.pdf> and <https://www.climate.gov/news-features/blogs/beyond-data/2017-us-billion-...>, respectively.

^[1] CDC. "Mould Prevention Strategies and Possible Health Effects in the Aftermath of Hurricanes and Major Floods". MMWR Recommendations and Reports. June 9, 2006. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5508a1.htm>

^[2] OSHA. Fact Sheets on Natural Disaster Recovery: Flood Cleanup. Available at: <http://www.osha.gov/OshDoc/floodCleanup.html>

^[3] http://www.cdc.gov/disasters/mold/report/pdf/2005_moldtables.pdf

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