NIEHS
National Institute of
Environmental Health Sciences

National Institute of Environmental Health Sciences

Flood Response Orientation

Safety Awareness for Responders to Floods:

Protecting Yourself While Helping Others

June 2008

WORKER EDUCATION & TRAINING PROGRAM

DEPARTMENT OF HEALTH & HUMAN SERVICES USA
NATIONAL INSTITUTES OF HEALTH

This book is provided by:

The National Institute of Environmental Health Sciences' (NIEHS) Worker Education and Training Program (WETP) supports the training and education of workers engaged in activities related to hazardous materials and waste generation, removal, containment, transportation and emergency response. The WETP conducts training through a network of cooperative agreements with nonprofit organizations. The WETP includes basic hazardous waste worker, minority worker, Brownfields, Department of Energy nuclear weapons complex, and national emergency preparedness training components.

For Iowa specific flood resources, contact:

The Hazardous Materials Training and Research Institute

(800) GO HMTRI or (800) 464-6874

This booklet was developed by the National Clearinghouse for Worker Safety and Health Training. The National Clearinghouse is funded by the National Institute of Environmental Health Sciences' Worker Education and Training Program. The National Clearinghouse is operated under NIEHS contract 273-05-C-0017 by MDB, Inc.

http://tools.niehs.nih.gov/wetp

Flood_Booklet_0608_v6

Table of Contents

Workers' Rights **2**
Introduction **3**
Incident Command System 4
Protect Yourself 6
Emergency in Field 7
Physical Environment 8
Hazards **9**
Traumatic Stress 9
Heat Stress 13
Sunburn 14
Eye Injuries 15
Too Much Noise 16
Breathing Dust 17
Debris & Unstable Work Surfaces 18
Handling Sharp Objects 19
Flood Water 20
Examples of Chemicals Released 21
Potential Chemical Exposures 22
Driving and Traffic Issues 23
Electrical Lines 24
Carbon Monoxide 25
Ladders 26
Chain Saws 27
Confined Spaces 28
Structural Integrity 29
Heavy Equipment 30
Mold 31
Trench Foot 33
Blood-borne Disease 34
Handling Bodies 35
Food-borne Disease 36
Water-borne Disease 37
Poisonous Plants 38
Insects and Insect-borne Diseases 39
Animals and Animal-borne Diseases 40
Snakes and Other Reptiles 41
Other Protective Measures **42**
Credits **43**
Why This Book Was Created **44**

Workers' Rights

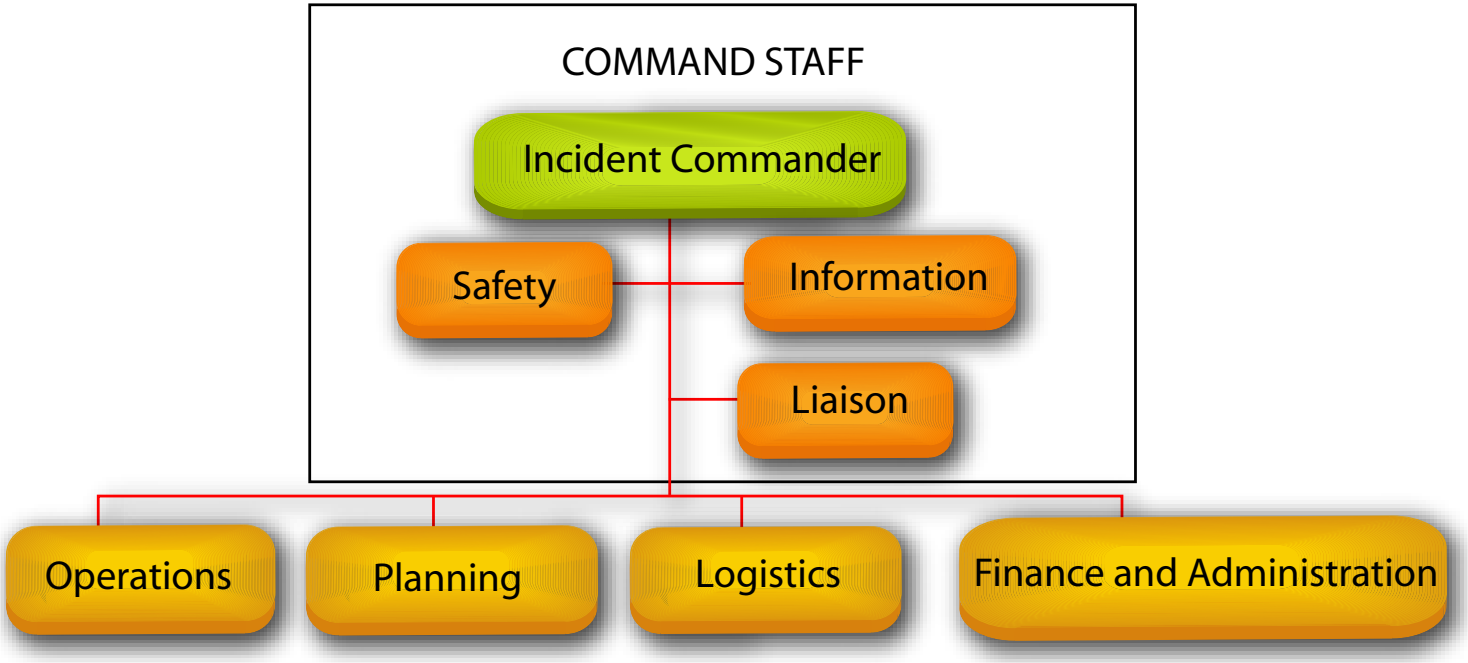
Employers and workers have responsibilities under the OSH Act.

- The Occupational Safety and Health Act requires that employers provide a safe and healthful workplace free of recognized hazards and follow OSHA standards. Employers' responsibilities also include providing training, medical examinations and recordkeeping.
- Workers must follow the employer's safety and health rules and wear or use all required gear and equipment; follow safe work practices for your job, as directed by your employer; report hazardous conditions to a supervisor; and report hazardous conditions to OSHA if employers do not fix them.

Incident Command

- Incident Command provides a structure to promote effective coordination among responders.
- Allows for an integrated organizational structure not hindered by jurisdictional boundaries.
- Has 5 organizational functions to allow for a manageable span of control:
  - –Command
  - –Operations
  - –Planning
  - –Logistics
  - –Finance and Administration
- Safety is part of the Command function.

Incident Command System Structure



Protect Yourself

- Shower daily or as often as necessary.
- Wash your hands often to avoid exposure to harmful substances.
- Vehicle operations accounted for half the fatalities associated with floods. (Greg Fayard, DOL, Bureau of Labor Statistics)
- Be careful walking over and handling debris that is covered with water due to increased risk of slips, trips and falls.
- Remain current with tetanus vaccination (within the past 10 years).
- If you will be performing direct patient care or otherwise expected to have contact with bodily fluids, get the Hepatitis B vaccine series.
- Avoid contact with stagnant water.
  - –Wash and sanitize immediately if exposed
- Consider steel toe/shank footwear if available.
- Use durable gloves when handling debris.
- Use hearing protection for noisy environments.
- Know your medicines, allergies, and blood type.

If in doubt, contact your supervisor!

Emergency in the Field

- Notify your supervisor or the incident commander about all injuries sustained at your site.
- For minor injuries:
  - –Apply buddycare/first aid
  - –Seek a first aid station or clinic
- For serious injuries:
  - –Go to local hospital
  - –Call 911 (Know your exact location)

Physical Environment

- The land:
  - –Terrain varies from 500 feet above sea level to 1700 feet above sea level
- The Climate (June – November):
  - –High Humidity
  - –High Temperatures
  - –Potential for additional storms and lightning

Hazard: Traumatic Stress

- Pace yourself and take frequent rest breaks.
- Watch out for each other. Co-workers may not notice a hazard nearby or behind.
- Be conscious of those around you. Responders who are exhausted, feeling stressed or even temporarily distracted may place themselves and others at risk.
- Maintain as normal a schedule as possible: **regular eating and sleeping are crucial.**
- Make sure you drink when you are thirsty.

Hazard: Traumatic Stress (continued)

- Whenever possible, take breaks away from the work area. Eat and drink in the cleanest area available.
- Recognize and accept what you cannot change—the chain of command, organizational structure, waiting, equipment failures, etc.
- Give yourself permission to feel rotten: You are in a difficult situation.
- Recurring thoughts, dreams, or flashbacks are normal—do not try to fight them. They will decrease over time.
- Communicate with your loved ones at home as frequently as possible.

Hazard: Traumatic Stress (continued)

What you can do at home:

- Reconnect with family, spiritual, and community supports.
- Consider keeping a journal.
- Do not make any big life decisions.
- Spend time with others or alone doing the things you enjoy to refresh and recharge yourself.
- Be aware that you may feel particularly fearful for your family. This is normal and will pass in time.

Hazard: Traumatic Stress (continued)

What you can do at home:

- Remember that “getting back to normal” takes time. Gradually work back into your routine. Let others carry more weight for a while at home and at work.
- Be aware that recovery is not a straight path but a matter of two steps forward and one back. You will make progress.
- Your family will experience the disaster along with you. You need to support each other. This is a time for patience, understanding, and communication.
- Avoid overuse of drugs or alcohol. You do not need to complicate your situation with a substance abuse problem.

Hazard: Heat Stress

Heat stroke is a killer

- Drink plenty of fluids, sports drinks if available.
- Know the signs of heat-related illnesses.
- Monitor yourself and coworkers, use the buddy-system.
- Block out direct sun or other heat sources.
- Use cooling fans/air-conditioning and rest regularly.
- Wear lightweight, light-colored, loose-fitting clothes.
- Avoid alcohol, caffeinated drinks, or heavy meals.
- Seek medical attention for symptoms of:
  - –Extremely high body temperature (above 103°F)
  - –Red, hot, and dry skin (no sweating)
  - –Rapid, strong pulse
  - –Throbbing headache
  - –Dizziness
  - –Nausea
- Take shelter in shaded areas and loosen or remove excess protective clothing if feasible.

Hazard: Sunburn

- Prevent overexposing skin and eyes to sunlight and wind.
- Use sunscreen and lip balm.
- Use protective eyewear.
- Limit exposure.

Sunburn reduces responder readiness and increases the likelihood of skin cancer.

Hazard: Eye Injuries

Eye injuries can be caused by dust, flying debris, contaminated liquid, and welding flash.

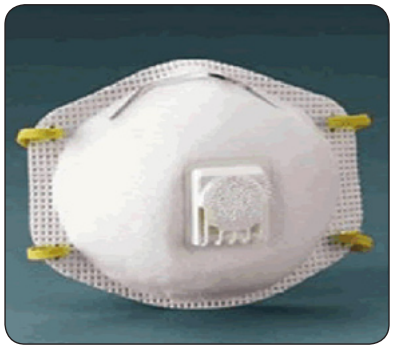
- Use safety glasses with side shields as a minimum. An eye wear retainer strap is suggested.
- Consider safety goggles for protection from fine dust particles or for use over regular prescription eye glasses.
- Only use protective eyewear that has an ANSI Z87 mark on the lenses or frames.
- Light from a welding torch can cause severe burns to the eyes and surrounding tissue. Any worker using a welding torch for cutting needs, or anyone working near a welding torch, should use special eye wear for protection from welding light.

NIEHS Flood Response Orientation

Hazard: Too Much Noise

- Use hearing protection whenever noisy equipment is used.
  –Examples: gas powered saws or heavy construction equipment
- Hearing protection will prevent temporary hearing loss that can interfere when listening for cries, moans, and other sounds from victims buried in the rubble.

Hazard: Breathing Dust Containing Asbestos, Silica and Other Toxins



N-95 Respirator

- Protect yourself from breathing dust, it can contain toxic materials.
- If in doubt about respirators, see your supervisor.
- An N-95 or greater respirator is acceptable for most activities, including silica and Portland cement dust.
- If asbestos is present, use a half-mask elastomeric respirator with N,R, or P-100 series filters.
- If airborne contaminants are causing eye irritation, full-face respirators with P-100 organic vapor/acid gas (OV/AG) combination cartridges should be used.
- Make sure you are fit-tested for a respirator; it must fit properly to protect you.
- Do a positive and negative seal check every time you wear your respirator and wash it at least once a day.
- Surgical masks should not be used because they do not provide adequate protection.

Hazard: Piles of Debris and Unstable Work Surfaces

- Don't walk on surfaces you aren't sure are stable.
- Use other ways to get to work surfaces, such as bucket trucks.
- Erect scaffolding on stable surfaces and anchor it to stable structures.
- Wear protective equipment provided, including safety shoes with slip resistant soles.
- Use fall protection with lifelines tied off to suitable anchorage points, including bucket trucks, whenever possible.

Hazard: Handling a Variety of Sharp, Jagged Materials

- Wear personal protective equipment, including hard hats, safety shoes, eye glasses, and work gloves.
- Immediately clean out all open wounds and cuts with soap and clean water. Apply an antibiotic ointment to discourage infection. Contact a doctor to find out whether more treatment is needed (such as a tetanus shot). If a wound gets red, swells, or oozes, seek immediate medical attention.
- Make sure that you have an up-to-date tetanus shot (within the past 10 years).

Hazard: Flood Water

- There are usually elevated levels of contamination associated with raw sewage and other hazardous substances in flood waters.
- The EPA advises that human contact with flood water should be minimized.
- Workers should wear waders and waterproof gloves when coming into contact with flood water.
- If clothes come into contact with flood water, wash them in water and detergent separately from uncontaminated clothes and linens.
- If skin comes into contact with flood water, wash thoroughly with soap and water.
- If you have any open cuts or sores that will be exposed to floodwater, keep them as clean as possible by washing them with soap and applying an antibiotic ointment to discourage infection.
- Make sure flood water does not get in your mouth.
- Stay alert for flash flooding.
- Make sure leisure water crafts have sufficient power to navigate fast moving water.

Hazard: Examples of Chemicals Released Following Disasters

- Various orphaned chemical and fuel tanks and barrels.
- Diesel, gasoline, motor oil, chlorine, liquid oxygen, medical waste and corrosives.
- Industrial and household products in all sizes and quantities.
- Leaky underground fuel tanks.

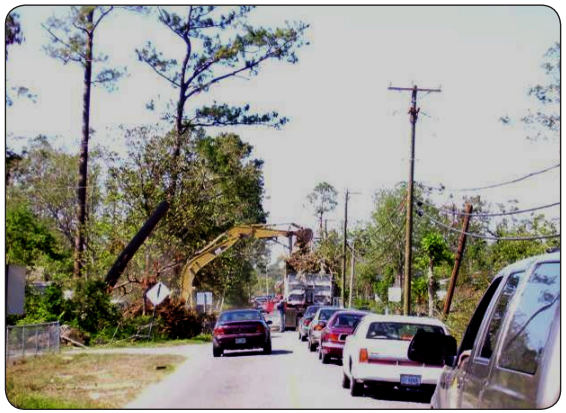
Hazard: Potential Chemical Exposures

Symptoms: Eye, nose, throat, upper respiratory tract, and skin irritation; flu like symptoms; difficulty breathing; fatigue; loss of coordination; memory difficulties; sleeplessness; mental confusion. Chronic effects depend on the extent and the duration of exposure.

- Fire Fighting: Use Self Contained Breathing Apparatus (SCBA) with full face piece in pressure demand or other positive pressure mode.
- Entry into unknown concentration: Use SCBA gear.
- Rescue operations with vapors present: Use gas mask with front mounted organic vapor canister (OVC) or any chemical cartridge respirator with an organic vapor cartridge, if enough breathing air is present.
- Dusty environments: Use combination HEPA/Organic Vapor Cartridge.

Hazard: Driving and Traffic Issues

- Non-operating traffic control signals.
- Avoid washed out sections of road, debris and/or potholes.
- Landmarks and street signs may be missing so know where you are going before you go there.
- Puddles may hide hazards and it takes very little water to cause hydroplaning and loss of control.
- Drive defensively.
- Be prepared for delays.
- Watch for construction vehicles, flaggers, and over loaded vehicles.



NIEHS Flood Response Orientation

Hazard: Electrical, Overhead Power Lines, Downed Electrical Wires, Cables

- Treat all power lines as energized until they have been de-energized and tested.
- Verifying that a line is not energized may not ensure your safety. Lines on both the load and supply side of the work area must be grounded. Grounding is necessary to protect you from the hazards of feedback electrical energy from a secondary power source, such as a portable generator.
- Use ground fault circuit interrupters (GFCI).

Hazard: Carbon Monoxide From Gasoline- or Propane-Powered Generators, Heavy Equipment, and Tools

Symptoms: Headache, dizziness, drowsiness, or nausea; progressing to vomiting, loss of consciousness, and collapse, coma or death under prolonged or high exposures.

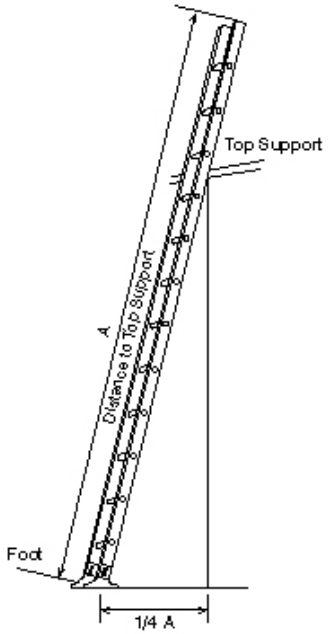
Carbon Monoxide has no warning properties; it is a colorless, odorless gas!

- Use CO warning sensors when using or working around combustion sources.
- Shut off engine immediately if you begin to develop symptoms and get fresh air.
- Do not use gasoline generators or portable fuel driven tools in confined spaces or poorly ventilated areas.
- Do not work in areas near exhaust (CO poisoning even occurs outdoors if engines generate high concentrations of exhaust gases near workers).

Hazard: Ladders

Ladders can create a falling hazard. Make sure your ladder is secure:

- Inspect ladder for cracks, broken or defective parts
- Avoid electrical wires when placing ladder
- Position ladder at a 75 degree angle to extend at least 3 feet above the landing
- Avoid placing on uneven or unstable terrain
- Do not apply more weight on the ladder than it is designed to support



Hazard: Operating a Chain Saw

- Operate, adjust, and maintain the saw according to manufacturer's instructions provided in the manual accompanying the chain saw.
- Properly sharpen chain saw blades and properly lubricate the blade with bar and chain oil. Additionally, the operator should periodically check and adjust the tension of the chain saw blade to ensure good cutting action.
- Choose the proper size of chain saw to match the job, and include safety features such as a chain brake, front and rear hand guards, stop switch, chain catcher and a spark arrester.
- Wear the appropriate protective equipment, including hard hat, safety glasses, hearing protection, heavy work gloves, cut-resistant leg wear (chain saw chaps) that extend from the waist to the top of the foot, and boots which cover the ankle.
- Avoid contact with power lines until the lines are verified as being de-energized.
- Always cut at waist level or below to ensure that you maintain secure control over the chain saw.
- Bystanders or coworkers should remain at least 2 tree lengths (at least 150 feet) away from anyone felling a tree and at least 30 feet from anyone operating a chain saw to remove limbs or cut a fallen tree.

Hazard: Confined Spaces

The following must be done before you enter a confined space.* Your supervisor must:

- Make sure you and the attendant are trained
- Ventilate and monitor for hazardous conditions
- Lock out or tag out all power equipment in the space
- Issue appropriate PPE, possibly including self-contained breathing apparatus (SCBA)
- Establish barriers to external traffic such as vehicles and pedestrians
- Provide ladders or similar equipment for safe entry and exit in the space
- Provide good communications equipment and alarm systems
- Have rescue equipment and trained rescue personnel nearby

** A confined space is large enough for an employee to enter fully and perform assigned work; Is not designed for continuous occupancy by the employee; and has a limited or restricted means of entry or exit. OSHA Standard 29 CFR 1910.146*

Hazard: Structural Integrity

- Do not enter a structure that shows indication of being unsafe such as walls with large cracks, shifting, or partial collapse.
- Consider entering the structure during daytime especially if it is without electricity and you have no lights.
- OSHA requires walls or floor to be shored or braced before demolition if workers are within the structure.
- Do not cut or remove any structure or load supporting members on any floor until all stories above have been demolished and removed.
- Determine if any hazardous substances have been anywhere on the property including pipes and tanks.
- Ensure appropriate utilities have been notified prior to entering and starting demolition work.
- Leave the structure if unusual sounds (indication of shifting) or smells (possible gas leak) are noticed.

Hazard: Heavy Equipment, Including Cranes, Bucket Trucks, Skid-Steer Loaders

- Operate equipment correctly and safely.
- Stay aware of the activities around you.
- Do not exceed the load capacity of cranes and other lifting equipment.
- Do not walk under or through areas where cranes and other heavy equipment are being used to lift objects.
- Do not climb onto or ride loads being lifted or moved.

Hazard: Mold

After flooding, the water creates the perfect environment for mold to grow in homes and other buildings. Exposure to mold can cause wheezing and severe nasal, eye and skin irritation.

- Avoid breathing dust (fungal spores) generated by wet building materials.
- Use an N-95 NIOSH-approved disposable respirator as a minimum when working with small areas of moldy or damp materials. More protection may be needed for extended work.
- Wear long gloves that reach the middle of your forearm. If you are using a disinfectant, a biocide such as chlorine bleach, or a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or PVC. Avoid touching mold or moldy items with your bare hands.

Hazard: Mold (continued)

- Wear goggles that do not have ventilation holes. Avoid getting mold or mold spores in your eyes.
- Consider discarding all water-damaged materials. Articles that have visible mold should be thrown away. (***When in doubt, throw it out.)***
- After working with mold-contaminated materials, wash thoroughly, including your hair, scalp, and nails.

Hazard: Trench Foot (Immersion Foot)

- Trench foot, also known as immersion foot, occurs when the feet are wet for long periods of time. It can be quite painful.
- Symptoms include a tingling and/or itching sensation, pain, swelling, cold and blotchy skin, numbness, and a prickly or heavy feeling in the foot. The foot may be red, dry, and painful after it becomes warm. Blisters may form, followed by skin and tissue dying and falling off. Obtain medical assistance as soon as possible.
- To prevent trench foot, when possible, air-dry and elevate your feet, and exchange wet shoes and socks for dry ones.

Hazard: Blood-borne Disease

- Use impervious gloves when handling human remains.
- Replace gloves if punctured or torn.
- Do not handle human remains if you have skin cuts or punctures.
- Use goggles or face shield and mask for handling human remains, recovering deceased. Make sure to cover your nose and mouth.
- Transport human remains in closed, leak-proof, labeled containers.

Hazard: Handling Bodies of Victims

- There is no direct risk of infectious disease from being near human remains for people who are not directly handling dead bodies.
- Human remains may contain blood-borne viruses such as hepatitis viruses and HIV, and bacteria that cause diarrheal diseases, such as shigella and salmonella.
- For personnel exposed to blood and body fluids:
  - –Use gloves when handling bodies or body fluids
  - –Use eye protection, gowns, and masks when large quantities or splashes of blood are anticipated
  - –Wash hands frequently
  - –Use body bags to reduce the risk of contamination

Hazard: Food-borne Disease

- Identify and throw away food that may not be safe to eat:
  - –Throw away food that may have come in contact with flood or storm water
  - –Throw away food that has an unusual odor, color, or texture
  - –Throw away perishable foods (including meat, poultry, fish, eggs and leftovers) that have been above 40° Fahrenheit (F) for 2 hours or more
  - –Food containers with screw-caps, snap-lids, crimped caps (soda pop bottles), twist caps, flip tops, snap-open, and home canned foods should be discarded if they have come into contact with floodwater because they cannot be disinfected
- Store food safely:
  - –While the power is out, keep the refrigerator and freezer doors closed as much as possible
  - –Add block ice or dry ice to your refrigerator if the electricity is expected to be off longer than 4 hours. Wear heavy gloves when handling ice

Hazard: Water-borne Disease

Communicable disease outbreaks of diarrhea and respiratory illness can occur when water and sewage systems are not working and personal hygiene is hard to maintain as a result of a disaster.

- Local authorities will tell you if tap water is safe to drink or to use for cooking or bathing.
- If the water is not safe to use, follow local instructions to use bottled water or to boil or disinfect water for cooking, cleaning, or bathing.
- Wash your hands often.
- Because some water-borne diseases can be contracted through contact with contaminated standing water, it is important to follow the guidelines outlined in the Standing Water Hazard Page.
- If you develop a high fever OR, nausea, vomiting, diarrhea, jaundice or flu-like symptoms, seek medical attention immediately!

Hazard: Poisonous Plants

- Learn to recognize poisonous plants:
  - –Poison Ivy
  - –Poison Oak
  - –Poison Sumac
- Use gloves and wear long pants when possibly contacting poisonous plants.
- Rubbing alcohol, if used immediately upon exposure, may remove the oily resin that causes the allergic reaction.

Clothes, shoes, and tools may become contaminated by coming in contact with poisonous plants.

Hazard: Insects and Insect-borne Diseases

- **Mosquitoes –** Mosquitoes can carry diseases such as West Nile virus or dengue fever. Use screens on dwellings, and wear long pants, socks, and long-sleeved shirts. Use insect repellents that contain DEET or Picaridin.

  (Make sure you follow the directions written on the label.)
- **Bees, Wasps, and Hornets –** Most bees and wasps won't attack unless provoked. Always wear shoes and work gloves when working outdoors. Avoid brightly colored, flowery or black clothing. Khakis, beiges, blues apparently are non-provocative colors. Odors of food and flowers attract insects so use perfumes, hair product and fragrant soaps sparingly, if at all. Put food scraps in sealed garbage containers and be cautious around open garbage bins.
- **Spiders –** Depending on the area of the country black widow and brown recluse spiders may be present. If you suspect being bitten by a venomous spider seek medical attention and bring in the spider, if available for identification.
- **Ticks –** Ticks can carry diseases such as Lyme, Ehrlichiosis, and Babesia. Use insect repellent with DEET and wear long sleeves, long pants and socks. Check your body for ticks after being outdoors. If you notice a tick on your skin, remove promptly. To remove, use tweezers, if available, pulling straight up in a steady, slow motion.

Hazard: Animals and Animal-borne Diseases

Flood waters may have displaced wild and domestic animals. It will therefore not be uncommon to come into contact with animals you usually wouldn't under normal circumstances. Dead and live animals can spread diseases such as Rat-Bite Fever and Rabies.

- Beware of wild or stray animals. Avoid wild or stray animals. Call local authorities to handle animals. Get rid of dead animals according to local guidelines. Wear proper protective clothing when handling carcasses.
- Avoid contact with rats or rat-contaminated dwellings. In addition to Rat bite fever, contact with rodents, rodent droppings, and dead rodents may result in other infectious diseases. If you cannot avoid contact with rats, wear protective gloves, and practice regular hand washing.
- If you do get bitten or scratched by an animal, seek medical attention immediately, even if it is a domestic animal.

Hazard: Snakes and Other Reptiles

- Be on the alert for snakes swimming in the water to get to higher ground and hiding under debris or other objects. If you see a snake, back away from it slowly and do not touch it.
- If you or someone else is bitten by a snake:
  - –Remember the color and shape of the snake, which can help with treatment of the snake bite
  - –Keep the bitten person still and calm; this can slow down the spread of venom if the snake is poisonous
  - –Seek medical attention as soon as possible; dial 911 or call local Emergency Medical Services (EMS)
  - –Apply first aid if you can not get the person to the hospital right away
  - –Lay or sit the person down with the bite below the level of the heart; tell him/her to stay calm and still
  - –Cover the bite with a clean, dry dressing
- Use appropriate tools to move debris and to probe areas that may harbor snakes or other threats.
- Wear high boots and/or snake gaiters.

Other Protective Measures

Key items to have:

- Insect repellent with Deet or Picaridin
- PPE – For information on what equipment you need for protection, contact your local OSHA office or NIOSH
- Personal floatation device
- Earplugs
- Bottled water
- Sun screen
- Rain Gear
- Pocket Knife (put in your checked luggage)

*For more information, call **1-800-321-OSHA** or log onto **www.osha.gov***

Credits

This presentation was adapted from:

- NIOSH Guide called "Suggested Guidance for Supervisors at Disaster Rescue Sites." More information is available at their site: *www.cdc.gov/niosh/emhaz2.html*
- NIOSH "Traumatic Incident Stress: Information for Emergency Response Workers", *http://www.cdc.gov/niosh/unp-trinstrs.html*
- CDC Emergency and Preparedness & Response website *http://www.bt.cdc.gov/disasters/floods/*
- U.S. Army Center for Health Promotion and Preventive Medicine PowerPoint (Some slides have applicability for floods): *http://usachppm.apgea.army.mil/hiomtb/content/Disaster_MTBs/HurricaneReliefResponse_09.05.ppt#691,1,PREFACE PRESENTATION*
- OSHA's Hurricane eMatrix (Some applicability to floods): *http://www.osha.gov/SLTC/etools/hurricane/index.html*

Why this book was created

This booklet was created by the National Clearinghouse for Worker Safety and Health Training under a contract with the NIEHS Worker Education and Training Program (WETP). WETP has trained over a million emergency responders and hazardous waste workers since 1987 to do their jobs safely. WETP is a part of the Department of Health and Human Services, which is a cooperating agency under the Worker Safety and Health Support Annex of the National Response Framework. As part of the coordinated federal effort, WETP created a booklet and a companion orientation briefing for responders. The booklet is available at: *http://tools.niehs.nih.gov/wetp.*