Environmental Health Training in Emergency Response (EHTER) Introductory Level

California Version

Participant Manual

August 2010

Environmental Health Training in Emergency Response - Introductory Level

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Introduction Module

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Introduction

In collaboration with a number of agencies and organizations, the Environmental Health Training in Emergency Response (EHTER) Introductory Level course was developed by the federal Centers for Disease Control and Prevention (CDC) in 2006 to address the need for increased emergency preparedness and response education and training for environmental health practitioners. A California version was created by the California Department of Public Health to address the unique regulatory environment and hazards faced by the state.

The EHTER introductory level course is a comprehensive introductory training that focuses on key environmental health topics, issues, and challenges faced during emergency response, such as disaster management, food safety, water quality, wastewater management and disposal, shelters and sanitation, responder safety, vector control, and pest management. The course was developed due to a number of assessments of the environmental health work force had consistently demonstrated the need for this type of education and training.[1]

The EHTER - Introductory Level course was developed to address the need for increased education and training for environmental health practitioners in emergency preparedness and response. Recognizing that a majority of environmental health practitioners in California are positioned in local jurisdictions, the course serves as a mechanism for providing the necessary knowledge and skills to individuals who will respond to environmental health emergencies in their respective jurisdictions.

The purpose of the course is to increase the level of emergency preparedness of environmental health practitioners by providing them with the necessary knowledge and skills to address the environmental health impacts of emergencies and disasters.

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[1] Examples include the following: a) Reischl T, Buss A. 2004. Michigan environmental health training needs assessment report. Ann Arbor, MI: Michigan Center for Public Health Preparedness, University of Michigan School of Public Health. b) Burke T, Resnick B, et. al. 2005. Profile of Maryland environmental health public practice. Baltimore: The Johns Hopkins Center for Excellence in Community Environmental Health Practice. c) Holtzhauer F, Potter M, et. al. 2005. The Ohio Public health preparedness training needs survey, final reports and comparisons: perceptions of local and state public health workforce and health commissioners. Columbus, OH: The Ohio State University, School of Public Health, Office of Workforce Development. d) Association of State and Territorial Health Officials. 2005. Environmental Health Directors meeting; summary of state responses. Washington, DC: Association of State and Territorial Health Officials. e) Hedberg C, Osaki C, et. al. 2005. Environmental health preparedness education and training: a compilation from the Centers for Public Health Preparedness. Washington, DC: Association of Schools of Public Health. f) Dyjack D, Case P, et. al. 2006. California's county and city environmental health services delivery system. Loma Linda, CA: Loma Linda University School of Public Health, Office of Public Health Practice and Workforce Development.

After completion of the full course, participants will:

1. Increase their knowledge of the roles and responsibilities of environmental health practitioners in emergency preparedness and response.
2. Increase their knowledge of adverse impacts caused by a variety of emergencies and disasters in specific areas of environmental health, such as food safety, water quality, wastewater management and disposal, shelter sanitation, vector control, pest management, responder safety, and solid waste and hazardous materials.
3. Increase their knowledge about how to effectively engage in protective actions against and respond to the adverse environmental health impacts caused by a variety of emergencies and disasters.
4. Refresh and/or improve their abilities to use specific types of equipment and resources for environmental health emergency response, such as various types of thermometers and water testing and purification kits.
5. Experience and share best practices and lessons learned from recent emergencies and disasters.
6. Increase their knowledge of the roles, responsibilities, and capacities of other agencies, organizations, and disciplines in emergency preparedness and response, such as the U.S. Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), American Red Cross, U.S. Environmental Protection Agency (EPA), Centers for Disease Control and Prevention (CDC), Agency for Toxic Substances and Disease Registry (ATSDR); as well as state and local emergency management, public health, and public works.
7. Increase their knowledge of key environmental health emergency preparedness and response initiatives taking place in various federal, state, and local jurisdictions across the country.
8. Acquire resources to improve their knowledge, skills, and abilities to prepare for and respond to a variety of emergencies and disasters.

Background

In collaboration with a number of agencies and organizations, an EHTER Introductory Level pilot course was developed by CDC in 2006 to address the need for increased emergency preparedness and response education and training for environmental health practitioners. The course is a comprehensive three day introductory training that focuses on key environmental health topics, issues, and challenges faced during emergency response, such as disaster management, food safety, water quality, wastewater management and disposal, shelters and sanitation, responder safety, vector control, and pest management.

From June 2006 to June 2007, eight EHTER pilot courses were conducted by CDC at locations across the country. More than 450 environmental health practitioners from

over 40 states and territories successfully completed the course. The results of pre-training and post-training self-assessments and objective-based testing showed marked improvement among attendees.[2] Participant feedback and suggestions were extremely positive and allowed for continuous improvement of the course with each successive pilot. Additional feedback received from participants has suggested real-world application of concepts, information, and principles learned during the course and resulted in improved response capacity during actual emergencies and disasters such as hazardous materials releases, earthquakes, and wildfires.

Target Audience

The target audience for the course includes California environmental health specialists, and other federal, state, local, and tribal public health and environmental health professionals who may have roles and responsibilities in preparing for and/or responding to emergencies or disasters.

Scope

The course is applicable to the needs and interests of federal, state, local, and tribal public health and environmental health professionals who may have roles and responsibilities in preparing for and/or responding to emergencies or disasters. It is consistent with the doctrine, concepts, principles, terminology, and organizational processes in the National Response Framework (NRF) and the National Incident Management System (NIMS) and California's Standardized Emergency Management System (SEMS). It is also consistent with other California regulations and guidance as well as CDC recommendations.

The EHTER course is not intended to produce subject matter experts in the areas of environmental health emergency preparedness and response or serve as an intermediate or advanced level training in environmental health emergency preparedness and response. This course does not:

- Produce subject matter experts in the areas of environmental health emergency preparedness and response;
- Substitute or replace community and/or jurisdictional environmental health emergency preparedness and response planning, training, educational, or exercise activities and requirements; or
- Substitute or replace existing emergency operations plans, procedures, guidelines, resources, assets, and incident management systems.

[2] For example, results this testing conducted at the pilot training in Volusia County, Florida, in November 2006 showed an average increase of 34 percentage points among participants.

Knowledge, Skills, and Resources to Be Acquired

Participants will acquire the knowledge, skills, and resources to:

- Understand the roles and responsibilities of environmental health practitioners in emergency preparedness and response.
- Recognize adverse impacts caused by a variety of emergencies and disasters in specific areas of environmental health.
- Effectively engage in protective actions against and respond to the adverse environmental health impacts caused by a variety of emergencies and disasters.
- Refresh and/or improve their ability to use specific types of equipment and resources for environmental health emergency response.
- Understand the roles, responsibilities, and capacities of other agencies, organizations, and disciplines in emergency preparedness and response.
- Improve their knowledge, skills, and abilities to prepare for and respond to a variety of emergencies and disasters.

Recommended Pre-course Education and Training

Participants are encouraged to complete basic emergency management courses and trainings before EHTER attendance including:

- ICS 100 - Introduction to the Incident Command System
- ICS 200 - Incident Command System for Single Resources and Initial Action Incidents
- IS 700 - National Incident Management System (NIMS), An Introduction
- IS 800.B - National Response Framework (NRF), An Introduction
- Standardized Emergency Management System (SEMS) Introductory Course

Overview

Module Framework

The technical modules have been developed and organized around a specific framework to ensure that each module and its supporting resources consistently focus on key topics and issues that are critical to environmental health emergency preparedness and response. The framework used to develop and organize these modules is as follows:

Introduction
- Learning objectives
- Environmental health functions
- Reasons for concern
- Priority activities
- Key partners
- Responder safety

Technical Information
- Environmental systems (basics)
- Key technical information
- Conducting assessments
- Filed procedures and equipment

Exercise
- Using decision-making processes and skills learned

Messages and Information
- for emergency response partners
- for industry and business
- for the general public

Module Descriptions

The EHTER Introductory Level course was developed with one introductory and ten technical modules (Disaster Management, Responder Safety, Drinking Water, Food Safety, Shelters, Vector Control, Solid Waste, Wastewater, Hazardous Materials, and Community Health) to address the need for increased education and training for environmental health practitioners in emergency preparedness and response. The course can be delivered in16-24 hours (2-3 days) depending on the number of exercise/activities added to the course. Sixteen hours is the minimum hours needed to deliver the course.

Module	Minimum Duration	Scope
Introduction	0.5 hour	Welcome, introduction, and background on the EHTER Introductory Level course. This module will provide background on the development of the course and introduce participants to the course goals and objectives, anticipated outcomes, and the instructors and facility.
Module 1 Disaster Management	1.5 hours	This module will introduce participants to basic concepts of emergency preparedness and response. It will establish the context, background, and framework in which the other modules will be delivered.
Module 2 Responder Safety	1.5 hours	This module will introduce participants to a variety of safety hazards and risks that are often faced by response personnel after emergencies and disasters. It will also highlight basic safety concepts to protect emergency response personnel against these hazards and risks and mitigate their adverse effects.
Module 3 Drinking Water	1.5 hours	This module will introduce participants to a variety of issues and concerns associated with drinking water after emergencies and disasters. It will also highlight appropriate measures to address these issues and concerns and mitigate their adverse effects.
Module 4 Food Safety	1.5 hours	This module will introduce participants to a variety of issues and concerns associated with food safety, preparation, and disposal after emergencies and disasters. It will also highlight appropriate measures to address these issues and concerns and mitigate their adverse effects.
Module 5 Shelters	1.5 hours	This module will introduce participants to a variety of issues and concerns associated with evacuation shelters during emergencies and disasters. It will highlight environmental health issues and concerns as they relate to shelters. Appropriate measures for addressing these issues and concerns, and for mitigating their adverse effects, will be covered in this module.
Module 6 Vector Control	1.5 hours	This module will introduce participants to a variety of issues and concerns associated with vector control and pest management after emergencies and disasters. It will also highlight appropriate measures to address these issues and concerns and mitigate their adverse effects.
Module 7 Solid Waste	1.5 hours	This module will introduce participants to a variety of issues and concerns associated with solid waste management and debris removal following emergencies and disasters. Appropriate measures for addressing these issues and concerns, and for mitigating their adverse effects, will be covered in this module.

Module 8 Wastewater	1.5 hours	This module will introduce participants to a variety of issues and concerns associated with wastewater management and disposal after emergencies and disasters. It will also highlight appropriate measures to address these issues and concerns and mitigate their adverse effects.
Module 9 Hazardous Materials	1.5 hours	This module will introduce participants to a variety of issues and concerns associated with hazardous materials and wastes following emergencies and disasters. Appropriate measures for addressing these issues and concerns, and for mitigating their adverse effects, will be covered in this module.
Module 10 Community Health	1.5 hour	This module will introduce participants to a variety of issues and concerns associated with community health assessment related to emergencies and disasters. It will highlight environmental health issues and concerns as they relate to these assessments. Appropriate measures for addressing these issues and concerns, and for mitigating their adverse effects, will be covered in this module.

The EHTER modules are not intended to:

- Serve as an intermediate or advanced level training in environmental health emergency preparedness and response.
- Produce subject-matter experts in the areas of environmental health emergency preparedness and response.
  Substitute or replace community and/or jurisdictional environmental health emergency preparedness and response planning, training, educational, or exercise activities and requirements.

Acknowledgements

The California Department of Public Health thanks the following organizations for their support and assistance in the development of this training for the environmental health profession:

- Centers for Disease Control and Prevention (CDC), National Center for Environmental Health (NCEH), Division of Emergency and Environmental Health Services (EEHS), Environmental Health Services Branch (EHSB)
- California Department of Public Health, Center for Environmental Health
- California Emergency Management Agency
- Sacramento County Environmental Management Department

This course was adapted from the EHTER - Introductory Level course developed by the Centers for Disease Control and Prevention (CDC), National Center for Environmental Health (NCEH), Division of Emergency and Environmental Health Services (EEHS), Environmental Health Services Branch (EHSB) in 2006 to address the need for emergency preparedness and response education and training for environmental health practitioners. The following agencies and organizations collaborated in the planning, and development of EHTER:

- Agency for Toxic Substances and Disease Registry, Division of Regional Operations
- American Red Cross
- Centers for Disease Control and Prevention, National Center for Environmental Health
- Centers for Disease Control and Prevention, National Center for Environmental Health, Office of Terrorism Preparedness and Emergency Response
- Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health
- Center for Environmental Research and Technology, Inc.
- Contra Costa County Health Services, Environmental Health Division
- Florida Department of Health, Division of Environmental Health
- GrayZone, Inc.
- Indian Health Service, Environmental Health Services
- Loma Linda University, School of Public Health
- Louisville Metro Department of Public Health and Wellness
- Michigan State University, Global Community Security Institute
- National Environmental Health Association
- Ohio State University, College of Public Health, Office of Workforce Development, Center for Public Health Preparedness
- Sacramento County, Environmental Management Department, Environmental Health Division
- San Diego County, Department of Environmental Health

- Tulane University, School of Public Health and Tropical Medicine, Department of Environmental Health Sciences
- U.S. Department of Homeland Security, Federal Emergency Management Agency, Emergency Management Institute
- U.S. Environmental Protection Agency
- U.S. Department of Homeland Security, Office of Grants and Training
- University of Washington, School of Public Health and Community Medicine, Northwest Center for Public Health Practice, Regional Academic Environmental Public Health Center
- Yale University, School of Public Health, Center for Public Health Preparedness

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Introduction Module

Duration

Thirty (30) minutes

Scope Statement

This module will provide background on the development of the course and introduce participants to the overall course goals and objectives, anticipated outcomes, and the instructors and facility. This module includes the course welcome, introductions, and background on the EHTER Introductory Level course.

Terminal Learning Objective (TLO)

Participants will be able to explain how the EHTER course works to increase the capabilities of environmental health practitioners to respond to public health emergencies and assist the affected community in the recovery process.

Enabling Learning Objectives (ELO)

After completing this module, participants will be able to:

I-1. Recognize what environmental health (EH) is and what EH practitioners do.
I-2. Explain why the EHTER course was developed.
I-3. Explain the purpose of EHTER.

Resources

Course participant manual
Introduction Module PowerPoint slides
Pre-training test
Post-training test
Evaluation form

Instructor to Participant Ratio

1:50 or less

Reference List

CCDEH: California Conference of Directors of Environmental Health *Disaster Field Manual for Environmental Health Specialists*

Practical Exercise Statement

Participants will introduce themselves to one another and share their expectations for the course.

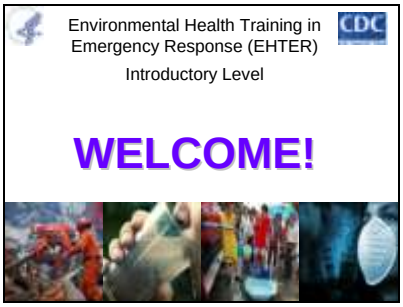
Assessment Strategy

In-class questions and module summary discussion.

Introduction Module

Environmental Training in Emergency Response (EHTER) (Slide 1)

This course was developed to address the need for emergency preparedness and response education specifically for environmental health practitioners. The EHTER course provides the knowledge, resources, and references necessary to enable users to be prepared for emergency response work related to environmental health (EH). This module will include introductions, all administrative requirements, delivery of the pre-test (if used), and classroom logistical issues.

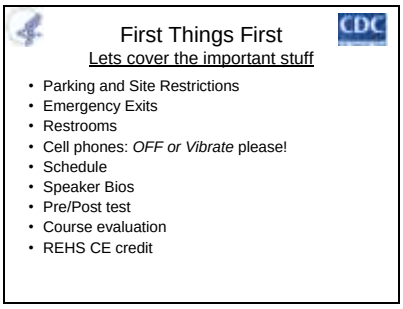


Slide 1

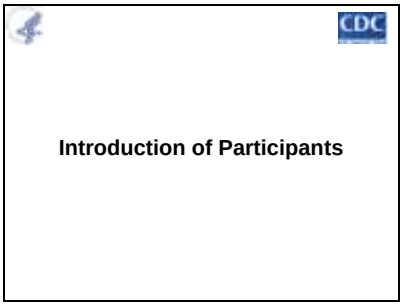
First Things First (Slides 2-3)

Module instructor will brief participants on any parking and site security or smoking restrictions, emergency exits and meeting areas, locations of restrooms, etc. Participants are asked to turn their cell phones and other electronic devices to off or vibrate and to place any necessary calls outside of the training room.

Course breaks and lunch arrangements will be shared with audiences as well as speaker information, course evaluation methods and any pre- or post course tests. Next, participants will be asked to share a little about themselves to the group.



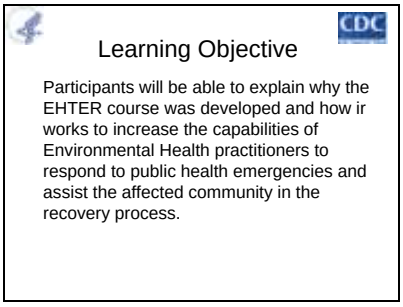
Slide 2



Slide 3

Learning Objective (Slide 4)

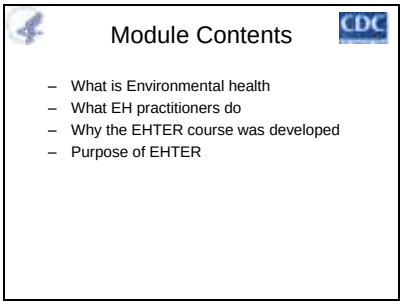
Participants will be able to explain why the EHTER course was developed and how it works to increase the capabilities of Environmental Health practitioners to respond to public health emergencies and assist in the community recovery process.



Slide 4

Module Content (Slide 5)

- What is Environmental health
- What EH practitioners do
- Why the EHTER course was developed
- Purpose of EHTER



Slide 5

What is Environmental Health? (Slide 6)

EH is the branch of public health that is concerned with all aspects of the natural and built environment that may affect human health. EH is defined by the World Health Organization as: *"Those aspects of human health and disease that are determined by factors in the environment. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially affect health."*

EH services are defined by the World Health Organization as: "*Those services which implement environmental health policies through monitoring and control activities. They also carry out that role by promoting the improvement of environmental parameters and by encouraging the use of environmentally friendly and healthy technologies and behaviors. They also have a leading role in developing and suggesting new policy areas."*

California defines the scope of practice of EH as follows: *"Scope of practice in environmental health" means the practice of environmental health by Registered Environmental Health Specialists in the public and private sector within the meaning of this article and includes, but is not limited to, organization, management, education, enforcement, consultation, and emergency response for the purpose of prevention of environmental health hazards and the promotion and protection of the public health and the environment in the following areas: food protection; housing; institutional environmental health; land use; community noise control; recreational swimming areas and waters; electromagnetic radiation control; solid, liquid, and hazardous materials management; underground storage tank control; onsite septic systems; vector control; drinking water quality; water sanitation; emergency preparedness; and milk and dairy sanitation."*

Slide 6

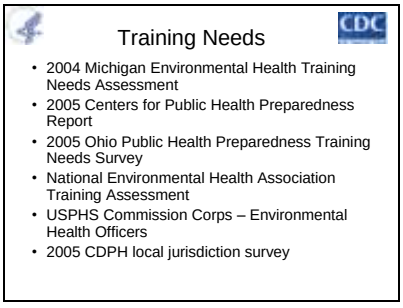
EH addresses all human-health-related aspects of both the natural environment and the built environment including:

- Air quality, both ambient outdoor air and indoor air quality;
- Body art safety;
- Climate change and its effects on health;
- Disaster preparedness and response;
- Food safety;
- Hazardous materials and waste management;
- Housing;
- Childhood lead poisoning prevention;
- Land use planning, including smart growth;
- Liquid waste disposal;
- Medical waste management and disposal;
- Noise pollution control;
- Occupational health and industrial hygiene;
- Radiological health;
- Recreational health;
- Safe drinking water;
- Solid waste management;
- Toxic chemical exposure; and
- Vector control, including the control of mosquitoes.

EH practitioners may be known as sanitarians, public health inspectors, Environmental Health Specialists or environmental health officers. Many states in the United States require that individuals have professional licenses in order to practice environmental health. California has a registration requirement for practitioners of EH that is administered by the California Department of Public Health.

Training Needs (Slides 7-8)

It was recognized by CDC that there was a lack of cross training in EH specialties and that EH services are often fragmented over several agencies in any given jurisdiction. As the EH field is diverse, the EHTER seeks to bring the major areas of practice into one course and focus on those common issues that apply to all geographic locations during an emergency.



Slide 7

The need for EH-specific emergency response training was identified by the following studies:

- 2006 California Department of Health Services survey
- 2005 Centers for Public Health Preparedness Report
- 2005 Ohio Public Health Preparedness Training Needs Survey
- 2004 Michigan Environmental Health Training Needs

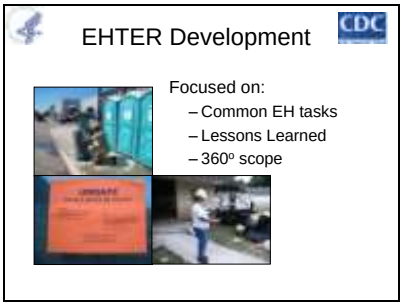
Assessment
- National Environmental Health Association Training Assessment
- U.S. Public Heath Service Commission Corps -Environmental Health Officers study

Because of the multiple programs and agencies that provide EH services in California, there is a recognized need for standardized emergency response training. This effort is complicated by:
- A lack of defined roles for EH in emergency response;
- Multiple skills needed for effective EH response;
- A lack of understanding the broader scope of EH activities; and
- No national training program for EH preparedness and response.

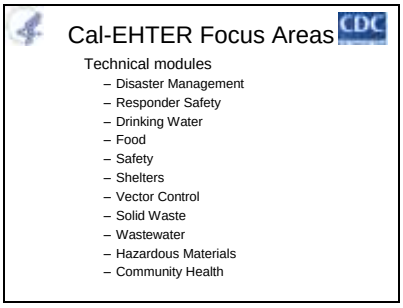
Slide 8

EHTER Development (Slides 9-10)

The EHTER course was developed through a collaborative process between federal, state and local EH agencies under the leadership of the federal Centers for Disease Control and Prevention (CDC). CDC responded to the need by developing the EHTER course that was modified for use in California. The California course focuses on key areas of EH, has common tasks, skill sets, and an all-hazards scope within 10 technical modules:
- Disaster Management
- Responder Safety
- Drinking Water
- Food Safety
- Shelters
- Vector Control
- Solid Waste
- Wastewater
- Hazardous Materials
- Community Health



Slide 9



Slide 10

The California version of EHTER builds on the information provided in the California Conference of Directors of Environmental Health (CCDEH) *Disaster Field Manual for Environmental Health Specialists*. See module reference list for more information.

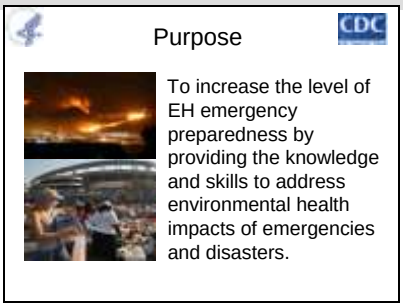
Purpose and Objectives (Slides 11-14)

The purpose of the EHTER is to increase knowledge, skills and abilities of the EH workforce by focusing on the roles and responsibilities of EH practitioners during emergency response and recovery activities, and specifically the adverse impacts caused by disasters, protective actions that should be taken to protect communities, the roles, responsibilities and capacities of response partners, and the key initiatives taking place in other jurisdictions around the country. The objectives of the EHTER are to assist the EH workforce to:

- Acquire resources to improve knowledge, skills & abilities;
- Refresh/improve ability to use equipment; and
- Experience/share best practices & lessons learned.

EH identifies environmental hazards in the affected area through community and regulated facility assessments and risk assessments. It works closely with the health community and environmental agencies to link exposures with predicted outcomes, provides input in the development of crisis and emergency risk communication messages, provides guidance on personal protective measures, and advises on environmental health guidelines.

The benefits offered by the EHTER include an enhanced understanding of how EH fits within emergency response management, introduction of a broad spectrum of EH issues into the emergency response context, and the creation of an understanding of EH systems and how they interconnect. The EHTER also serves as a foundation for basic EH knowledge and skills suitable for a diverse audience of local, state, federal public health practitioners, and it promotes networking and partnerships.



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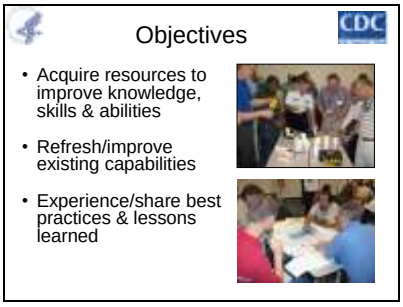

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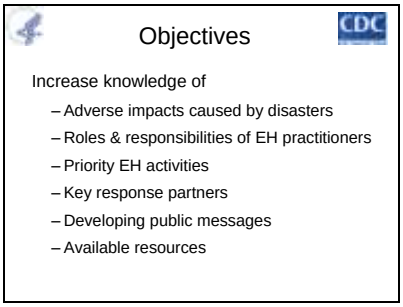

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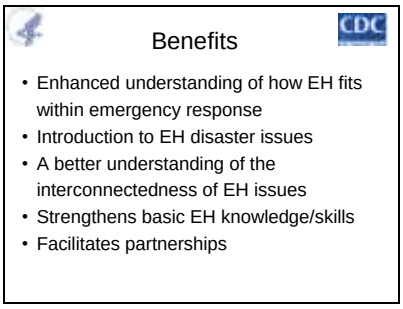
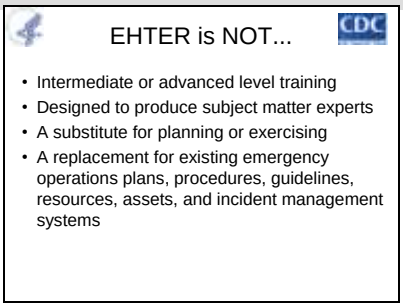


Slide 14

EHTER is NOT… (Slide 15)

The Introductory EHTER course was developed as a basic course suitable for all levels of EH practitioners. It is not an intermediate or advanced level training designed to produce subject matter experts or a substitute for other emergency response planning, educational, or exercise activities and requirements. It should not be used as a replacement for existing emergency operations plans, procedures, guidelines, resources, assets, and incident management systems or required training.



Slide 15

Target Audience (Slide 16)

The EHTER is suitable for public health and EH practitioners and environmental scientists from federal, state, local, and tribal agencies as well as other public health decision-makers and practitioners and is applicable to multiple agencies, departments, and organizations. The EHTER may also be beneficial for partner agencies to increase the understanding of the roles and responsibilities of environmental health agencies in emergency situations.

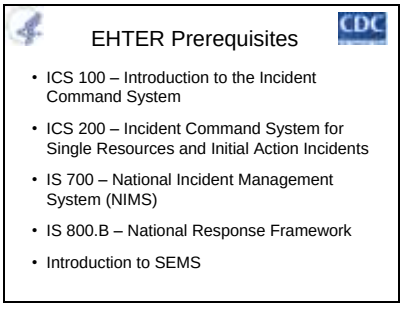
Slide 16

EHTER Prerequisites (Slide 17)

All emergency responders are required to take a minimum number of emergency management courses. At a minimum, EH practitioners that can reasonably expect to be involved in an emergency incident need to have completed:

- ICS 100 – Introduction to the Incident Command System
- ICS 200 – Incident Command System for Single Resources and Initial Action Incidents
- IS 700 – National Incident Management System (NIMS), An Introduction
- IS 800.B – National Response Framework (NRF), An Introduction
- Introduction to SEMS (Standardized Emergency Management System)

It is recommended that these courses be taken prior to the EHTER for maximum understanding of the course materials. Additional courses may be required if the EH practitioners can expect to play a supervisory role or serve in the Emergency Operations Center during the incident.



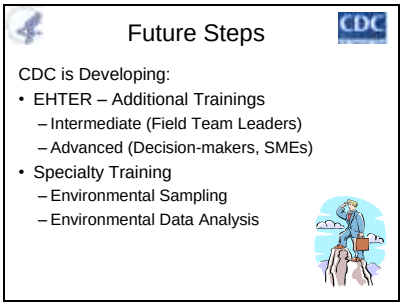
Slide 17

Future Steps (Slide 18)

The CDC has plans to develop a comprehensive EHTER training program that will include the Introductory Level training and its Train-the-Trainer course and online learning modules, with intermediate and advanced versions of the course as well as specialty training such as Environmental Sampling and Environmental Data Analysis courses.

CDC is developing:

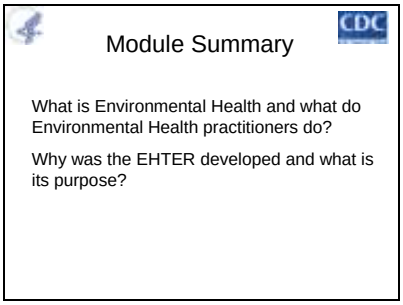
- EHTER – Additional Trainings
  - Intermediate (Field Team Leaders)
  - Advanced (Decision-makers, SMEs)
- Specialty Training
  - Environmental Sampling
  - Environmental Data Analysis



Slide 18

Module Summary (Slides 19-20)

In this module the field of environmental health was discussed including what EH practitioners do. Also covered was the development of the EHTER course and its purpose.



Slide 19

Slide 20

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Introduction Module Acronyms

CCDEH	California Conference of Directors of Environmental Health
CDC	Centers for Disease Control and Prevention
CDPH	California Department of Public Health
DHS	Department of Homeland Security
EH	Environmental Health
EHTER	Environmental Health Training in Emergency Response
ELO	Enabling Learning Objectives
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
ICS	Incident Command System
IS	Independent Study
NIMS	National Incident Management System
NRF	National Response Framework
PH	Public Health
SEMS	Standardized Emergency Management System
TLO	Terminal Learning Objectives

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Module 1 Disaster Management

Environmental Health Training in Emergency Response (EHTER) – Introductory Level *California Version*

Participant Manual

August 2010

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Module 1 Disaster Management

Duration

One and one half (1.5) hours

Scope Statement

This module will introduce participants to basic concepts of emergency preparedness and response. It will establish the context, background, and framework in which the other modules will be delivered.

Terminal Learning Objective (TLO)

Participants will be able to explain how the disaster management system works and describe the role of environmental health (EH) in emergency preparedness and response operations.

Enabling Learning Objectives (ELO)

After completing this module, participants will be able to:

1-1. Identify the characteristics and differences associated with emergencies, disasters, and catastrophes.
1-2. Identify activities associated with the four phases of the Emergency Management Cycle.
1-3. Develop good problem statements and response objectives.
1-4. Identify the national and state directives for preparedness and response planning.
1-5. Explain the components of an Emergency Operations Plan (EOP) and other types of plans as well as the importance of the planning process.
1-6. Identify the types of emergency response facilities, such as Emergency Operations Centers (EOCs), Incident Command Posts (ICPs), and Joint Information Centers (JICs).
1-7. Recognize the importance of mutual aid in emergency response capacity and mutual aid agreements, such as the national Emergency Management Assistance Compact (EMAC).
1-8. Identify the types of exercises associated with emergency preparedness, such as workshops, drills, tabletop exercises, functional exercises, and full-scale exercises.

Resources

Course participant manual
Module 1 PowerPoint slides
ICS Form 202

Instructor to Participant Ratio

1:50 or less

Reference List

Cal EMA: State Emergency Plan
http://www.oes.ca.gov/WebPage/oeswebsite.nsf/Content/79FCE3912398FA168825740F0060CE32?OpenDocument

Cal EMA: COOP/COG Planning Resources
http://www.oes.ca.gov/Operational/OESHome.nsf/ALL/3A306BE95D89C4A5882571770067622B?OpenDocument

CDC: Support for the Emergency Management Assistance Compact (EMAC)
www.bt.cdc.gov/planning/emac

CDC: Key Facts About Hurricane and Flood Recovery
http://www.bt.cdc.gov/disasters/hurricanes/recovery.asp

DHS: Preparedness and Response Guidelines
http://www.dhs.gov.xprepresp/publications/gc1189788256647.shtm

DHS: Homeland Security Exercise and Evaluation Program https://hseep.dhs.gov

DHS: Lessons Learned Information Sharing www.llis.dhs.gov

EMAC: Emergency Management Assistance Compact www.emacweb.org

FEMA: NIMS Integration Center *Resource Typing Definitions*
http://www.nimsonline.com

FEMA: Credentialing program
http://www.fema.gov/pdf/emergency/nims/credent_faq.pdf

FEMA: National Emergency Responder Credentialing – Medical and Public Health guidelines
http://www.fema.gov/library/viewRecord.do?id=3315

FEMA: Continuity of Operations (COOP) Programs
http://www.fema.gov/government/coop

FEMA: ICS forms
http://training.fema.gov/EMIWeb/IS/ICSResource/ICSResCntr_Forms.htm

FEMA: NRF Resource Center www.fema.gov/emergency/nrf

FEMA: Developing and Maintaining State, Territorial, Tribal and Local Government Emergency Plans http://www.fema.gov/about/divisions/cpg.shtm

FEMA: National Integration Center (NIC) Incident Management Systems Integration Division www.fema.gov/emergency/nims

FEMA: Target Capabilities List http://www.fema.gov/pdf/government/training/tcl.pdf

Mid-America Alliance Mutual Assistance for Public Health Preparedness www.unmc.edu/dept/midamerica

Michigan Department of Community Health: Great Lakes Border Health Initiative www.michigan.gov.borderhealth

Practical Exercise Statement

This module contains one exercise.

Recommended optional activities/exercises include touring a federal/state/local Emergency Operations Center (EOC) or other coordinating center/facility and observing an exercise.

Assessment Strategy

In-class questions, participation in group activities/exercises, and module summary discussion.

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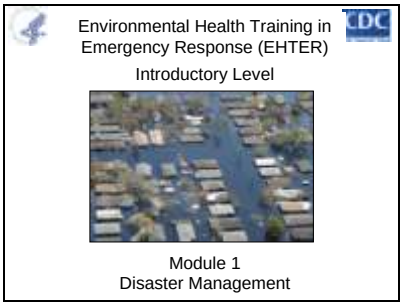
Module 1 Slides

Disaster Management (Slides 1- 2)

As a responder to emergencies it is important for the environmental health (EH) professional to have a basic understanding of the structure of emergency operations and the emergency responsibilities of government. This module provides a general overview of emergency operations and the government agencies involved in the response to emergencies.

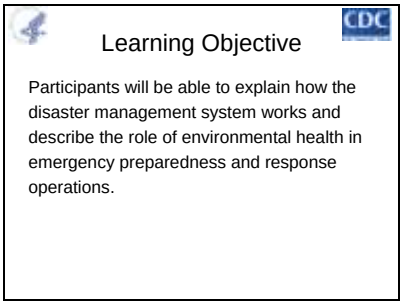


Slide 1

Slide 2

Learning Objective (Slide 3)

Participants will be able to explain how the disaster management system works and describe the role of EH in emergency preparedness and response operations.

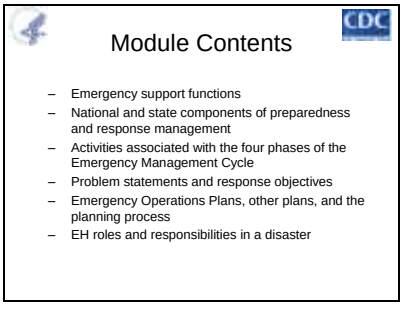


Slide 3

Module Content (Slide 4)

This module will cover:

- National and state components of preparedness and response management;
- Activities associated with the four phases of the Emergency Management Cycle;
- Emergency support functions;
- Problem statements and response objectives;
- Emergency Operations Plans, other plans, and the planning



Slide 4

process; and
- EH roles and responsibilities in a disaster.

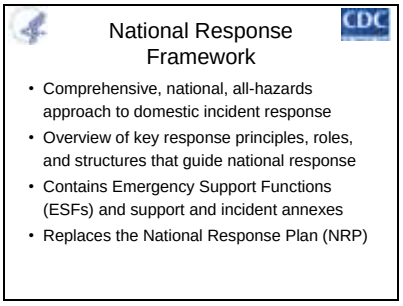
Incident Management (Slide 5)

This country's emergency incident management system is comprised of several components including the National Response Framework (NRF), the Incident Management System (ICS), and the National Incident Management System (NIMS), while California uses the California Standardized Emergency Management System (SEMS). These topics will be discussed in further detail in this module.

Slide 5

National Response Framework (Slide 6)

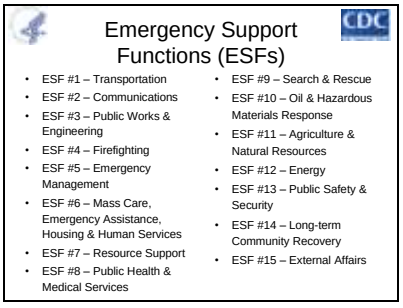
Following Hurricane Katrina in 2005, the Department of Homeland Security (DHS) Federal Emergency Management Agency (FEMA) undertook an effort to update both NIMS and the former National Response Plan. The National Response Framework (NRF) replaces the former National Response Plan and is not a plan, but a framework providing a lengthy overview of key response principles, roles, and structures that guide national response. It contains the 15 Emergency Support Functions (ESFs) and several support and incident annexes. See the module reference list for more information.



Slide 6

Emergency Support Functions (Slides 7-8)

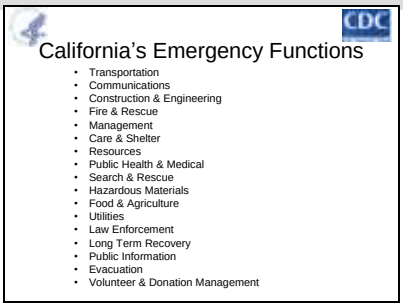
The federal government and many state governments organize their emergency response resources and capabilities as well as those of certain private-sector and nongovernmental organizations into Emergency Support Functions (ESFs) categories. ESFs align categories of resources and provide strategic objectives for their use and utilize standardized resource management concepts such as typing, inventorying, and tracking to facilitate the dispatch, deployment, and recovery of resources before, during, and after an incident. At the federal level, support available for state and local emergencies is organized into the following 15 ESFs:



Slide 7

- ESF #1 – Transportation
- ESF #2 – Communications
- ESF #3 – Public Works & Engineering

- ESF #4 – Firefighting
- ESF #5 – Emergency Management
- ESF #6 – Mass Care, Emergency Assistance, Housing & Human Services
- ESF #7 – Resource Support
- ESF #8 – Public Health & Medical Services
- ESF #9 – Search & Rescue
- ESF #10 – Oil & Hazardous Materials Response
- ESF #11 – Agriculture & Natural Resources
- ESF #12 – Energy
- ESF #13 – Public Safety & Security
- ESF #14 – Long-term Community Recovery
- ESF #15 – External Affairs



Slide 8

The ESFs that involve EH functions include:
- ESF #2 – Communications
- ESF #3 – Public Works and Engineering
- ESF #6 – Mass Care, Emergency Assistance, Housing & Human Services
- ESF #8 – Public Health & Medical Services
- ESF #10 – Oil & Hazardous Materials Response
- ESF #11 – Agriculture & Natural Resources
- ESF #14 – Long-term Community Recovery
- ESF #15- External Affairs

California organizes its emergency support resources into "Emergency Functions," similar to but not identical, to the federal ESFs.

California's agencies are organized into seventeen Emergency Functions (EFs). The EFs unify a broad-spectrum of stakeholders with various capabilities, resources and authorities to improve collaboration and coordination for a particular discipline. The EFs also provide a framework for sate government to support regional and community stakeholder collaboration and coordination at all levels of government and across overlapping jurisdictional boundaries.

A single state agency is assigned to lead each EF based on its authorities, resources and capabilities.
- EF #1 Transportation- Business, Transportation, and Housing Agency
- EF #2Communications – Office of Chief Information Officer
- EF #3 Construction and Engineering – Consumer Services Agency
- EF #4Fire and Rescue – California Emergency Management

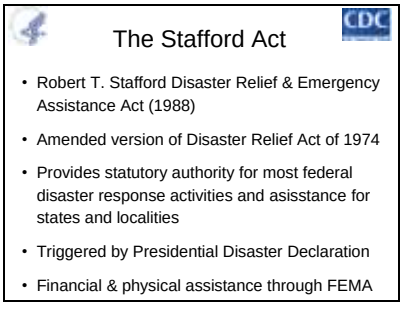
Agency
- EF #5 Management - California Emergency Management Agency
- EF #6 Care and Shelter - Health and Human Services Agency
- EF #7 Resources - Secretary of State and Consumer Services Agency
- EF #8 Public Health and Medical - Health and Human Services Agency
- EF #9 Search and Rescue - California Emergency Management Agency
- EF #10 Hazardous Materials - Environmental Protection Agency
- EF #11 Food and Agriculture - Department of Food and Agriculture
- EF #12 Utilities - Resources Agency
- EF #13 Law Enforcement - California Emergency Management Agency
- EF #14 Long Term Recovery - Secretary of State and Consumer Services Agency
- EF #15 Public Information - California Emergency Management Agency
- EF #16 Evacuation - Business, Transportation, and Housing Agency
- EF #17 Volunteer and Donation Management - California Volunteers

California's EFs are found in the State Emergency Plan. See the module reference list for more information.

The Stafford Act (Slide 9)

The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) is a federal law designed to provide an orderly and systemic means for delivering federal disaster assistance to state and local governments in carrying out their responsibilities to aid affected communities.

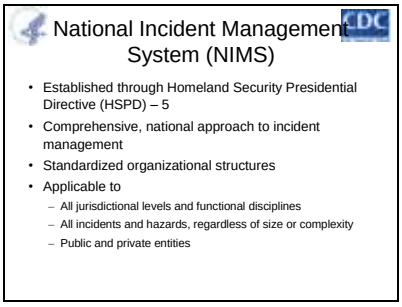
The Stafford Act is the 1988 amended version of the Disaster Relief Act of 1974 that created the system in place today by which a presidential disaster declaration of an emergency triggers financial and physical assistance through the Federal Emergency Management Agency (FEMA). The Act gives FEMA the responsibility for coordinating government-wide relief efforts.



Slide 9

National Incident Management System (Slides 10-11)

NIMS was established through Homeland Security Presidential Directive 5 in 2003. It is a comprehensive, national approach to incident management and includes many standardized organizational structures. NIMS is applicable to all jurisdictions and functional disciplines (including EH), all incidents and hazards regardless of size or complexity, and to both public and private entities.



Slide 10

Here are some key components of NIMS:

Slide 11

- Command & management – NIMS is designed to enable effective and efficient incident management and coordination by providing a flexible, standardized incident management structure. The structure is based on three key organizational constructs: the Incident Command System (ICS), Multi-agency Coordination (MAC) systems, and a public information function.

- Preparedness – NIMS promotes preparedness activities conducted on an ongoing basis. Preparedness involves an integrated combination of planning, procedures and protocols, training and exercises, personnel qualifications, certification and credentialing, and equipment certification.

- Resource management – NIMS defines standardized mechanisms and establishes the resource management process to identify requirements, order and acquire, mobilize, track and report, recover and demobilize, reimburse, and inventory resources. Resource typing is part of the effort to standardize descriptions of both personnel and equipment resources to aid in sharing those resources.

- Communications and information management – NIMS describes the requirements necessary for a standardized framework for communications and emphasizes the need for a common operating picture. NIMS is based upon the concepts of interoperability, reliability, scalability, portability, and the resiliency and redundancy of communication and information systems.

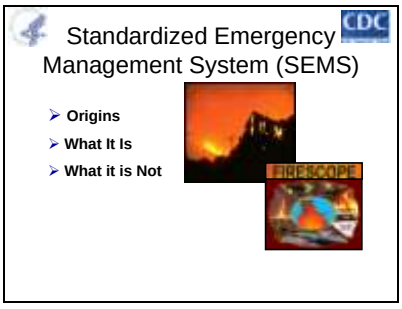
- Supporting technologies – FEMA's Incident Management Systems Division, in partnership with the Department of Homeland Security (DHS) Science and Technology Directorate, oversees and coordinates the ongoing development of incident

management related technology including strategic research and development activities.

- Ongoing management and maintenance – This is accomplished by DHS / FEMA's Incident Management Systems Division.

Standardized Emergency Management System (SEMS) (Slides 12-14)

Following the Oakland Hills fire of October 1991, the need for better emergency response coordination was identified and resulted in passage of California SB 1841 that authorized the Governor's Office of Emergency Services (OES) (now part of the California Emergency Management Agency) and local emergency response agencies to establish the Standardized Emergency Management System (SEMS), effective December1996. SEMS is a California-only emergency response system that is based on ICS, is integrated with NIMS, and includes a maintenance system and an approved course of instruction for the state's responders. SEMS includes the Multi-agency Coordination (MAC) concept that requires the inclusion of all affected agencies with jurisdictional responsibilities to coordinate resources toward common objectives.



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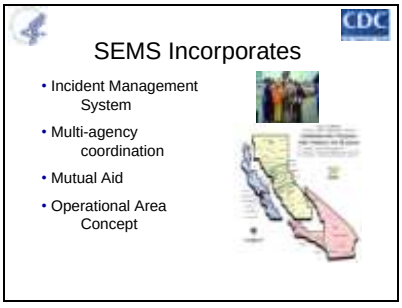
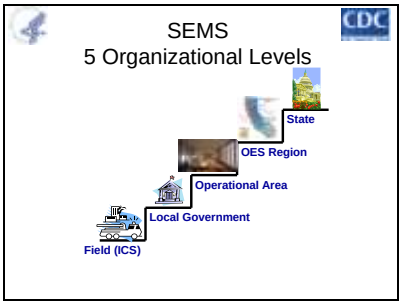


Slide 13

SEMS utilizes 5 levels of management to encompass all jurisdictions within the state: Field, Local, Operational Area, Regional and State. The Field Level is the level at which is the incident has occurred and includes the emergency responders. The Local Level is the first level of government and may include a city, special district or tribe. The Operational Area Level is the county level that includes all jurisdictions within that county. The Regional Level is one of three administrative regions within the state that coordinates resources. The State Level coordinates state resources and interacts with the federal government.



Slide 14

Resource requests typically begin at the Field Level and move one level up at a time until fulfilled. All levels above the Field Level support the field response - the field level maintains control of the incident.

Incident Command System (Slides 15-16)

The Incident Command System (ICS) is a key component within NIMS and SEMS. California's firefighting community developed ICS in the 1970s through the Firefighting Resources of California

Organized for Potential Emergencies (FIRESCOPE) initiative after experience with multiple state, local, and federal agencies responding to southern California wildfires. ICS is a standard, on-scene, all-hazards incident management system. Some of its key features include:

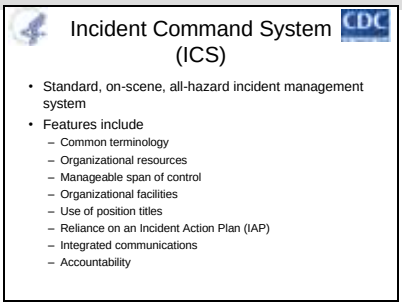
- Common terminology – ICS attempts to alleviate confusion by establishing a "common language" and "common terminology" among all response partners, regardless of functional discipline. For example, the use of standardized position titles, such as Section Chief, Branch Director, etc.
- Organizational resources – ICS provides a mechanism for coordinating the resources of multiple response partners and organizations.
- Manageable span of control – ICS provides for a supervisor/subordinate ratio of 1 supervisor to 3 to 7 subordinates. In other words, no more than 7 people at most will report to a single person.
- Organizational facilities – ICS recognizes standardized names for facilities, for example, Incident Command Posts (ICPs), Staging Areas, etc.
- Reliance on an Incident Action Plan (IAP) – ICS uses the IAP as the basis for all emergency response activities.
- Accountability – ICS creates accountability for the response effort by providing a logical structure with individuals held accountable to the system.

Here is the basic structure of incident management in ICS:

- Incident Commander (IC) – also called Incident Command is in charge at the field level. The IC may activate a Command Staff.

- Command Staff - The Public Information Officer (PIO), Safety Officer, and Liaison Officer are part of the Command Staff and coordinate closely with the IC. The Safety Officer plays an extremely important role in ICS and actually has the authority to override the IC and halt response operations if he/she deems the response environment to be unsafe.

- General Staff – These individuals are assigned to the four sections of the ICS structure, Operations, Planning/Intelligence, Logistics, and Finance/Administration - each section has a Section Chief. Environmental health will typically be deployed under the incident's Operations Section and may also be involved as a technical asset to the Planning Section.



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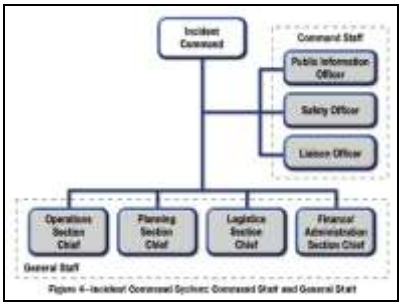


Slide 16

The National Integration Center's (NIC) Incident Management Systems Division web site is a good source for information on NIMS, ICS, etc. See the module reference list for more information.

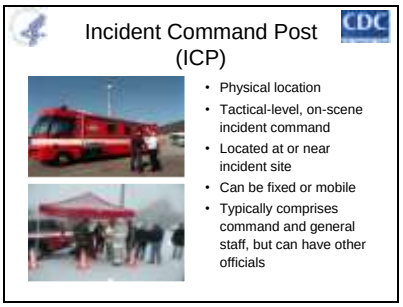
Facilities and Coordinating Centers (Slide 17)

Facilities and coordinating centers used in emergency response have standardized names under the ICS. The most common terms are discussed in the following section.

Slide 17

Incident Command Post (Slide 18)

At the field level, on-scene incident command is located at an Incident Command Post (ICP) and is typically comprised of local and mutual aid responders. Usually, you will find command and general staff at an ICP (such as the Incident Commander, Safety Officer, etc.), but there may be other officials there as well.



Slide 18

An ICP is an actual physical location that is temporary and used during the incident. There, tactical-level, on-scene incident command decisions are made and operations take place. It is usually located either at the site of the incident itself or as close to the incident site as safely and practically possible. An ICP can be setup as either a fixed or mobile facility.

Generally, the ICP is a hectic location; the larger or more serious the incident, the busier it can be. EH practitioners will generally not find themselves located at an ICP, although there may be some exceptions depending on the magnitude and nature of the incident and the cohesiveness of the response community.

Staging Area (Slide 19)

The staging area is usually a temporary location established by the Operations Section Chief in coordination with the Logistics Section Chief, where resources are "checked in" and positioned prior to deployment. Almost every kind of resource imaginable comes through the staging area: personnel, water, food, medical

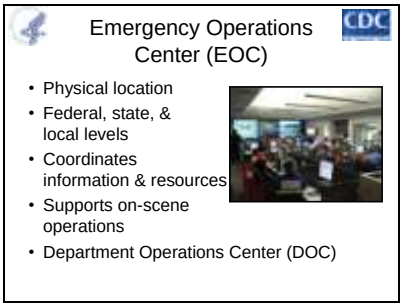
supplies, equipment, etc.

There can be multiple staging areas during a single event depending on the magnitude and scale of the event. At each staging area, there is a manager who is assigned by the Operations Section Chief. EH practitioners responding to the scene of an incident would check-in at the staging area prior to being deployed into the field.

Slide 19

Emergency Operations Center (Slides 20-21)

The Emergency Operations Center (EOC) is the physical location where multi-agency coordination occurs. EOCs help form a common operating picture of the incident; relieve on-scene command of the burden of external coordination and securing needed resources. The core functions of an EOC include coordination, communications, resource allocation and tracking, and information collection, analysis, and dissemination.



Slide 20

EOCs can be used at all levels from the local level up. If the IC determines that additional resources or capabilities are needed beyond what is readily available, he or she will contact the local EOC and relay the incident requirements to the local emergency manager who may fulfill the request or send it to the next level in SEMS for fulfillment.

In California, there may be local or city level EOCs, Operational Area (county) EOCs, and Regional EOCs activated in response to an emergency. The state's EOC is called the State Operations Center (SOC) and is located in Sacramento. The California Department of Public Health (CDPH) operates a Joint EOC (or JEOC) with the state Emergency Medical Services Authority and the Department of Health Care Services.

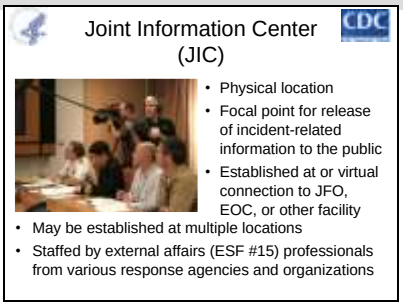
Slide 21

Any agency or department within an agency can open its own Department Operations Center (DOC). Environmental health agencies would typically support field operations through their local or Operational Area EOC and may open is its own DOC to support its field operations.

Joint Information Center (JIC) (Slide 22)

In order to coordinate the release of emergency information and other public affairs functions, an incident Joint Information Center (JIC) may be established at any level of government. The JIC

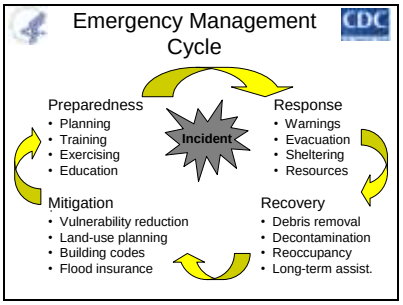
serves as a focal point for coordinated and timely release of incident-related information to the public and the media. Information about where to receive assistance is communicated directly to victims and their families in an accessible format and in appropriate languages for those with limited English proficiency.



Slide 22

A JIC can be an actual physical location that serves as the focal point for the release of incident-related information to the public such as press releases, official statements, etc. or a function. A JIC is made up of public affairs professionals from a variety of agencies and organizations. There may be multiple JICs at multiple facilities during an incident. A Joint Information System (JIS) is not necessarily a physical location - it is a coordinating "mechanism" for integrating all public information activities of an incident to ensure coordinated and consistent message development, verification, and dissemination. The JIS can be as simple as two Public Information Officers (PIOs) talking on the phone about an incident that involves both of their agencies or a group of PIOs meeting to discuss coordination of messages.

Emergency Management Cycle (Slide 23)



Slide 23

Let us focus now on the four phases of the emergency management cycle:

1. Preparedness: this includes planning, training, exercising, and education;
2. Response: this occurs once an incident has happened and may include multiple agencies, public warnings, evacuations, sheltering, etc.
3. Recovery: this follows response and is more long-term and includes activities such as debris removal, decontamination, community re-occupancy, and restoration of essential services.
4. Mitigation: this includes actions taken to alleviate the effects of the incident and of future incidents. This phase leads back to the beginning of the cycle and, if warranted, results in more preparedness activities.

National Preparedness Guidelines (Slides 24-26)

In September 2007, the U.S. Department of Homeland Security finalized the *National Preparedness Guidelines* that are intended to:

- Organize and synchronize national (including federal, state,

local, tribal, and territorial) efforts to strengthen national preparedness;
- Guide national investments in national preparedness;
- Incorporate lessons learned from past disasters into national preparedness priorities;
- Facilitate a capability-based and risk-based planning process; and
- Establish readiness metrics to measure progress and a system for assessing the nation's overall preparedness capability to respond to major events, especially those involving acts of terrorism.

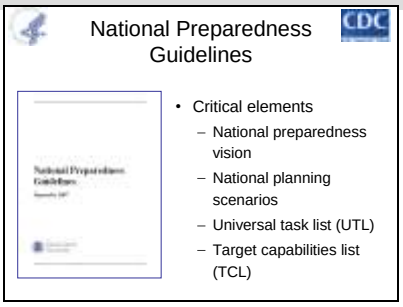
There are four critical elements in the *National Preparedness Guidelines*:

1) **National Preparedness Vision** - provides a concise statement of the core preparedness goal for the Nation.

2) **National Planning Scenarios -** depict a diverse set of high-consequence threat scenarios of both potential terrorist attacks and natural disasters. Fifteen scenarios are designed to focus contingency planning for homeland security preparedness work at all levels of government and with the private sector. The scenarios form the basis for coordinated federal planning, training, exercises, and grant investments needed to prepare for emergencies of all types.

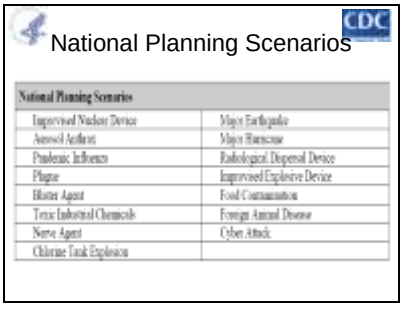
3) **Universal Task List (UTL)** - is a menu of approximately 1,600 unique tasks that can facilitate efforts to prevent, protect against, respond to, and recover from the major events that are represented by the National Planning Scenarios. It identifies key tasks that support development of essential capabilities among organizations at all levels.

4) **Target Capabilities List (TCL)** - defines 37 specific capabilities that communities, the private sector, and all levels of government should collectively possess in order to respond effectively to disasters. A TCL specifically for Environmental Health was published in August 2007. Here is a sample page from the TCL for Environmental Health. The TCL for Environmental Health is approximately 28 pages long. See the module reference list for more information.



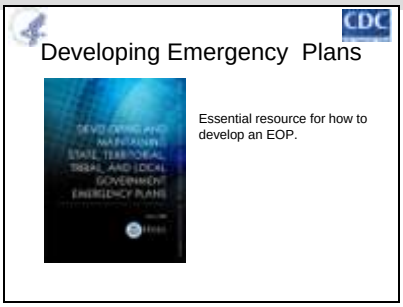
Slide 24

Slide 25



Slide 26

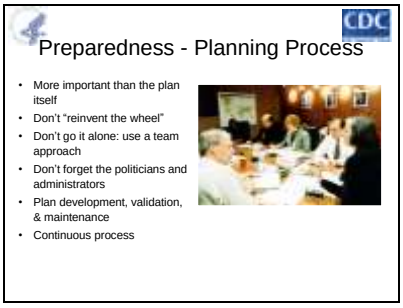
Developing Emergency Plans (Slide 27)



Slide 27

FEMA has developed an essential resource that provides detailed information on all-hazards emergency planning and how to develop each piece of an Emergency Operations Plan (EOP). FEMA's *Comprehensive Planning Guide* (CPG 101) *Developing and Maintaining State, Territorial, Tribal and Local Government Emergency Plans* also includes additional information about NIMS, NRF, and other areas related to emergency planning and preparedness. See the module reference list for more information.

Preparedness - Planning Process (Slide 28)



Slide 28

The planning process is always more important than the physical plan itself. During the planning process, stakeholders provide input on the plan being developed, typically meeting in a face-to-face setting. Without a strong, solid process of stakeholder involvement the resulting plan may be useless.

Emergency planners should take advantage of stakeholders' experiences, plans, procedures, best practices, etc. when engaged in the planning process. Building on what already exists in a jurisdiction or neighboring jurisdictions, and using available guidance materials and information results in a better plan.

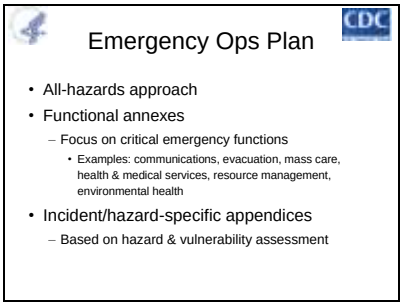
A team approach should be used when developing an emergency plan including all the appropriate stakeholders early and up-front in the planning process. There should be a community-based approach to planning that includes subject matter experts and technical specialists in the planning process. There must be buy-in and support from leadership, administration, and politicians early on in the process or the planning process may fail. It is important to validate a proposed plan with existing regulations, laws, and processes/procedures and other plans. Once developed, an emergency plan must be maintained and updated on a regular basis.

The emergency planning process should be a continuous, never-ending cycle of:

- Plan development;
- Plan review;
- Training and education on the plan;
- Testing of the plan through actual incidents and exercises; and
- Updating and improvement of the plan;

An excellent resource on the planning process is FEMA's *Developing and Maintaining State, Territorial, Tribal and Local Government Emergency Plans.* See the module reference list for more information.

Emergency Operations Plan (EOP) (Slide 29)



Slide 29

Emergency Operations Plan (EOPs) are developed by all types of organizations from governmental entities to private companies and non-profit organizations. An EOP should be all-hazards in nature, applicable to a variety of incidents such as floods, wildfires, earthquakes, chemical releases, radiological incidents, etc. and flexible enough to use in any emergency.

An outline of a sample EOP:

- Starts with an Introduction section, which contains things such as a signature page of all agencies authorizing the plan, a record of changes to the plan, and a table of contents.
- Next is the purpose section, which is basically a general statement of what the EOP is meant to do.
- The Situation and Assumptions section outlines specific hazards that are addressed in the EOP (in annexes), jurisdictional characteristics that may affect response activities, and information that must be treated as assumption rather than fact.
- The Concept of Operations (CONOPS) is the operational piece of the plan. It explains the jurisdiction's overall approach to an incident or situation (i.e., what should happen, when, and at whose direction).
- The next section establishes the emergency organization that will be used to respond to an incident or situation. It includes a listing by organization of tasks that are to be performed.
- The Administration and Logistics section covers general support requirements and the availability of services and support for all types of incidents, as well as general policies for managing resources. Mutual aid agreements can be referenced here.
- The Plan Development and Maintenance section is a description of the process on how the plan will be maintained and who will be involved.
- And finally, the Authorities and References section outlines the legal basis for emergency operations and activities. Laws, statutes, ordinances, executive orders, regulations, and formal agreements relevant to emergencies should be listed here.

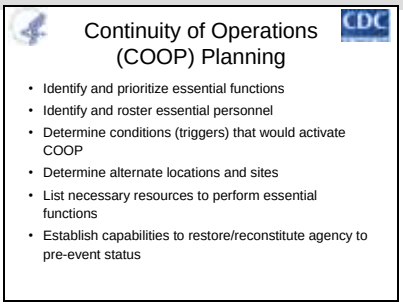
Functional Annexes are adjuncts to the basic plan and typically focus on specific emergency functions that are critical for emergency response. Some examples include Communications, Evacuation, Mass Care, Health and Medical Services, Resource Management, etc. The number and type of Functional Annexes will vary according to a jurisdiction's needs, capabilities, organization, capacities, etc. Functional Annexes are focused on operations and will reflect those emergency response personnel involved in carrying out operations during emergency response. The information outlined in the basic plan is not repeated in the Functional Annexes.

There can be incident or hazard-specific appendices or annexes to an EOP based on hazard and vulnerability assessments conducted by the jurisdiction. Focus on specific hazards and/or possible incidents will vary according to a number of factors such as geographic location, for example, California has earthquakes; Florida has hurricanes, etc. There will be different hazards and possible incidents in rural areas versus urban areas. There may be specialized facilities or structures in a jurisdiction that make certain hazards or events possible including nuclear power plants, chemical facilities, important monuments, skyscrapers, etc. or an increased likelihood for high-profile or national events in a jurisdiction (e.g., political conventions, presidential inaugurations, concerts, etc.).

The EOP may also include Standard Operating Procedures (SOPs) that are detailed instructions for fulfilling specific responsibilities and tasks or Standard Operating Guidelines (SOGs) that are similar to SOPs but are usually less detailed and prescriptive in nature. SOPs/SOGs may or may not be included in the actual EOP itself. It is up to the organization developing the EOP.

There are different schools of thought on whether to develop SOPs or SOGs. Some experts feel that the term "procedures" implies relatively inflexible task steps or instructions, while "guidelines" implies more discretion in performing the job. Since emergencies are unpredictable and flexibility is essential, some experts advise developing SOGs, thereby reducing the need to identify exceptions, and perhaps even limiting liability due to actions by personnel. Other experts believe the opposite is true: the term "guidelines" implies too much flexibility and discretion, thus reducing control and increasing the likelihood of mistakes.

Continuity of Operations Plan (COOP) (Slide 30)



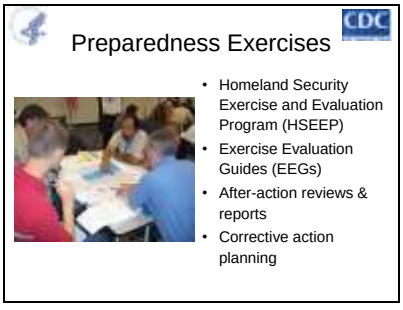
Slide 30

The Continuity of Operations (COOP) and Continuity of Government Operations (COG) plans are efforts by organizations to ensure the continuation of essential functions and services across a wide range of emergencies and events. As part of the COOP planning process, organizations typically:

- Identify and prioritize their essential functions and activities. What it is that must be continued, regardless of the situation.
- Identify and develop on-call rosters for essential personnel. Of course, this will vary from agency to agency.
- Determine what incidents, events, or conditions would activate the COOP plan, earthquake? terrorism incident? tsunami? etc.
- Determine alternate locations and/or sites at which essential functions and activities can be continued, at least on a temporary basis. These alternate locations and/or sites, however, may also be used on a longer-term basis (weeks to months), for example, the location of an alternate emergency operations center (EOC) would be included in a COOP plan.
- Identify the necessary resources required to perform essential functions and activities.
- Identify how capabilities will be restored to the level maintained prior to the incident or event.

Also extremely important in COOP planning are details on orders of succession and delegation of authority for pre-determining "who's in charge" when the organization's leadership is incapacitated. These must be determined prior to an incident or event. The FEMA COOP web site as well as the Cal EMA COOP / COG web site provide a wealth of information and resources on COOP planning. See the module reference list for more information.

Preparedness Exercises (Slides 31-32)

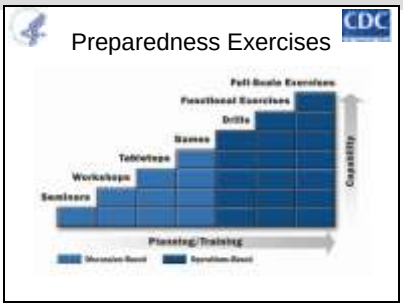


Slide 31

There are different types of activities available for enhancing emergency preparedness. They are divided between discussion-based activities and hands-on, operations-based exercises. Discussion-based activities include training seminars, workshops, tabletops, and games. In these types of activities, participants identify and discuss specific types of issues related to emergency preparedness and response.

Operations-based exercises include drills, functional exercises, and full-scale exercises. Drills focus on one or more specific process, procedure, or activity that is being practiced [e.g.,

donning specific types of Personal Protective Equipment (PPE)].



Slide 32

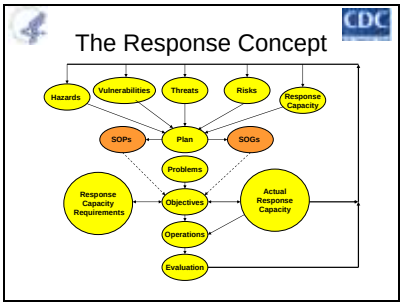
Functional exercises contain both discussion-based components and actual hands-on implementation. Full-scale exercises, of course, are hands-on, “boots-on-the-ground.” Personnel are deployed, sampling is conducted, etc. Often, several agencies will exercise together to enhance coordination, communication and interoperability capabilities.

The FEMA Homeland Security Exercise and Evaluation Program (HSEEP) provides information, resources, and guidance on all aspects of exercises. Also included in the HSEEP program are Exercise Evaluation Guides (EEGs) that are sets of guidance that focus on specific emergency response disciplines and functions that are used during an exercise to evaluate performance and capability in specific areas of emergency response. (EEGs exist specifically for EH activities.)

Following an exercise (or real-world emergency), there is an after-action review process and an After Action Report (AAR) generated. There can also be an after-action review within a specific function or discipline (for example, an after-action review within an EH department to evaluate capacity and performance following an exercise or actual event). The AAR identifies corrective actions needed to improve response capabilities leading to the development of a Corrective Action Plan.

The HSEEP web site contains the EH EEG information and information on exercise development. See the module reference list for more information.

The Response Concept (Slide 33)



Slide 33

An important consideration is the community’s emergency response plan. The blueprint for emergency response actions will be based on that plan that includes factors such as:

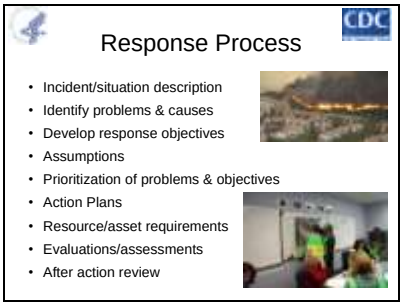
- Existing hazards;
- Existing risks;
- Vulnerabilities of the community; and
- Capabilities of local responders.

After an incident occurs and before a coordinated response can begin, the incident’s problems must be identified. Once the problems are identified, they will drive the emergency response objectives. The ability to meet the emergency response

objectives will be influenced by the response capacity required and the actual emergency response capacity that exists in the community as the actual response capacity will result in the emergency response activities undertaken.

Following the response operations, the response performance will be evaluated. Then, the cycle repeats itself again: re-evaluate hazards, vulnerabilities, threats, risks, and response capacity; and then revise the plan.

Response Process (Slide 34)



Slide 34

No matter the type of incident occurs, the response process is similar. Following an incident problems need to be identified and addressed in an efficient and effective manner. In order to address the incident's identified problems, response objectives are developed. Response objectives are incorporated into an incident's action plan that governs all response activities.

A set of assumptions will influence which response actions are undertaken based on the response objectives. For example, if the assumption is that a release of a chemical into a local waterway may affect drinking water quality and aquatic wildlife, certain decisions and response actions will be based on that assumption.

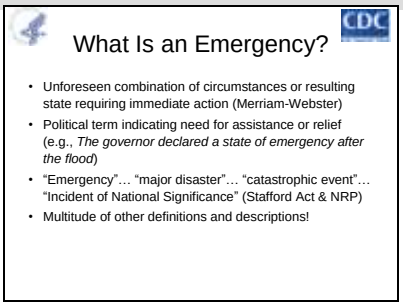
Once an incident's problems are identified and response objectives developed, they must be prioritized. There can be many competing priorities depending on the discipline. The first priority for EH must be the care of the affected population to ensure that safe food, safe water, and safe shelter is provided. For example, is it more important to initiate aerial spraying for mosquito control or inspect retail restaurant establishments following a flood?

The decisions made and response actions taken will be affected by the resources and assets available to address the incident's problems. Following the completion of response actions, there will be an evaluation via the after-action review process.

What is an Emergency? (Slides 35-36)

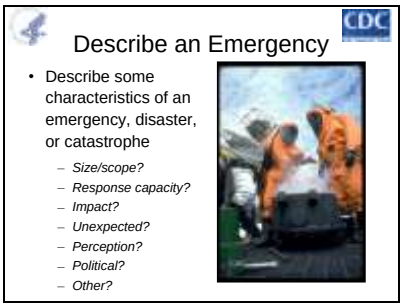
What is an emergency? What constitutes an emergency? How does one define an emergency? Webster's dictionary defines an emergency as an "unforeseen combination of circumstances requiring immediate action…" The term "emergency" is also a

political term indicating the need for assistance or relief. For example, the governor of California declared a state of emergency after the recent wildfires.



Slide 35

The Stafford Act includes definitions for the terms "emergency" and "major disaster" as follows: "Emergency means any occasion or instance for which, in the determination of the President, federal assistance is needed to supplement state and local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States."

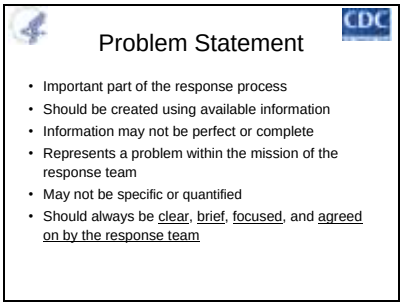


Slide 36

Major disaster means any natural catastrophe (including any hurricane, tornado, storm, high water, wind driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion, in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant major disaster assistance under this Act to supplement the efforts and available resources of States, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby. The NRF defines the term "catastrophic incident" as any natural or manmade incident, including terrorism, that results in extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, national morale, and/or government functions.
It may be easier to define an emergency in terms of certain characteristics associated with each type of event, such as:

- Size or scope;
- Response capacity needed;
- Impact;
- Nature of event, and
- Political considerations.

Problem Statement (Slide 37)



Slide 37

Exactly what is a "problem?" A "problem" can be thought of as a negative or undesirable change in a given condition, state of affairs, or situation that results from one or more causes. Those causes may not be readily apparent and therefore may require consideration of the circumstances.

A problem may be described in general terms, for example, the community is out of food; or the sewage system is nonfunctional. The problem description doesn't have to be very detailed.

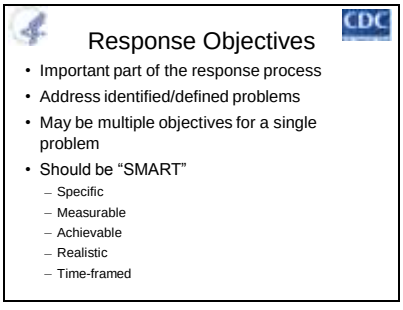
However, a problem definition is not merely a description of a situation or incident. For example, if someone states that the problem is that there is a car accident involving 10 cars – is this really the problem? Or is it merely a description of an incident? On the other hand, if someone states that because of the car accident, the hospital's emergency room will be overwhelmed and emergency care may be delayed. Is this the real problem? There are usually a multitude of problems in any given incident or situation. Think of a severe storm. How many and what types of problems are associated with such an incident?

There are many different levels of problems and their causes – some are more immediate than others. For example, not having sufficient drinking water may be more of a priority for a community than not having enough gasoline.

Developing a problem statement is an extremely important part of the response process and is the basis of the Incident Action Plan (IAP). Problem statements are based on information available at the time. The problem statement represents a problem within the mission of the specific response team or discipline. Problem statements should be focused on the mission and purpose of the team. Problem statements should ALWAYS be clear, brief, and focused. A problem statement with more than one or two sentences is too long. Conflicting opinions on whether or not a specific issue or problem should be addressed must be resolved before proceeding.

Information will almost always be incomplete and imperfect requiring working with the information available at the time. Problems are usually very dynamic in nature; they change over time. What was once a problem may not be a problem as times goes on.

Response Objectives (Slides 38-39)

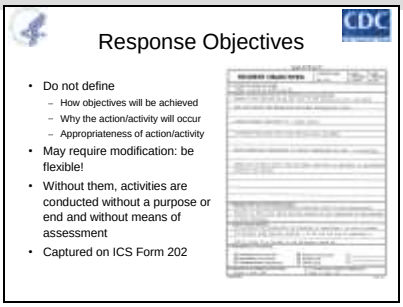


Slide 38

The development of response objectives are an important part of the incident action planning. Response objectives address problems that have been identified and defined following an incident. Several response objectives may be needed to address a single problem.

Good response objectives are specific, measurable, realistic, and time-framed. Response objectives do not include how or why they will be accomplished. Typically, an Incident Commander (IC) does not want to know how something will be

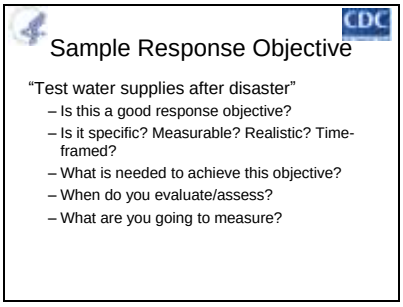
achieved, but that it will be achieved. Response objectives may (and probably will) change over time! Sometimes, the objectives will change with the incident or situation even before response actions are initiated. Therefore, flexibility is very important as emergency response is an extremely dynamic process!



Slide 39

Without defined objectives, response actions have no cohesive purpose and there is no way to evaluate or measure how successful the actions taken were. Response objectives are captured on the ICS Form 202 entitled "Incident Objectives." This form is used to develop the Incident Action Plan (IAP). An IAP contains general objectives reflecting the overall incident strategy and specific action plans for the next operational period. Note that problem statements are not captured on Form 202, even though incident's response objectives are. See the module reference list and appendix for more information and a sample of ICS Form 202.

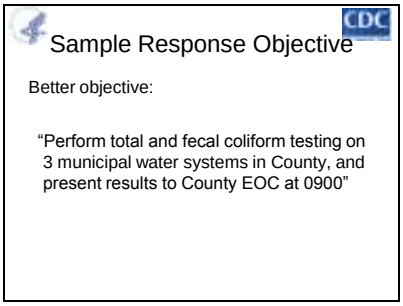
Sample Response Objective (Slides 40-41)



Slide 40

Response objectives should be written using specific terms. Looking at the sample response objective on the slide determine the following:

Is it S.M.A.R.T. specific, measurable, achievable, realistic, and time-framed?
What types of resources are needed to achieve this objective?
When and how will you evaluate, assess, or measure this objective?



Slide 41

Looking at second response objective on the following slide, is this objective specific, measurable, realistic, and time-framed? This objective provides a better idea of resources and assets needed to achieve this objective. The objective also provides some idea of how to measure, evaluate, or assess actions taken.

Exercise (Slides 42-44)

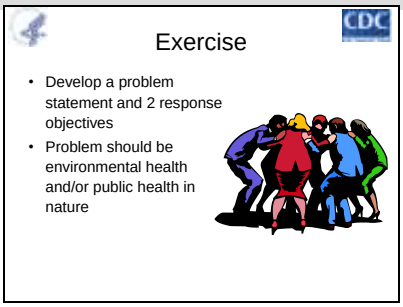
(SEE MODULE APPENDIX FOR WORKSHEET)

Scenario: Due to an earthquake, a large container that may contain a hazardous material has been discovered in a residential area after a disaster and appears to be leaking.

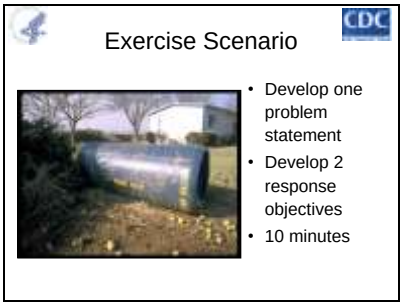
Assignment: Develop one problem statement and two response objectives based on the image shown in the slide.

Remember, "good" problem statements are:
- Clear
- Brief
- Focused, and
- Agreed upon by the team

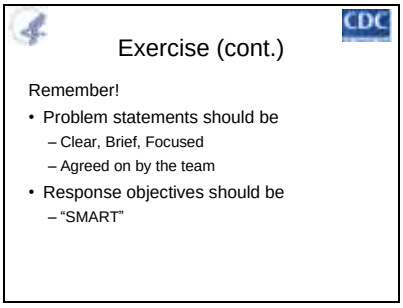
And "good" response objectives are:
- Specific
- Measurable
- Achievable
- Realistic, and
- Time-framed



Slide 42



Slide 43

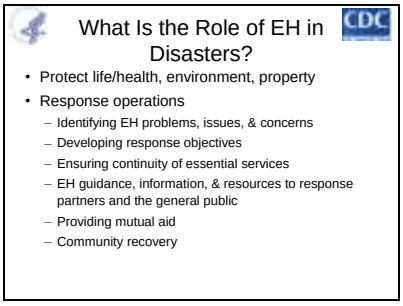


Slide 44

What is the Role of EH in a Disaster? (Slides 45-46)

We need to be aware of the priorities of residents in the affected community. These will include concern for family well being and the loss of property and possessions. What do you think are the most important priorities of a resident before, during, and after an emergency event?

EH is a key community partner in disaster preparedness, response, recovery and mitigation functions. It is extremely important for EH to be an integral part of the planning process for the assessment of community hazards, vulnerability, and risks as so many things related to EH are impacted during emergencies and disasters (food, water, air, waste, etc.) EH should be



Slide 45

included in the planning for, participation in, and implementation of education, training, and exercises related to emergency response and included as well in the after-action reviews and corrective action planning following an exercise or actual event.

EH resources should be considered in the overall community emergency response capacity assessment. EH departments should conduct capacity assessments within their own departments to determine their level or preparedness to respond to emergencies and disasters and where they can obtain additional personnel and resources.

EH assists the affected community by helping to meet the immediate needs of the residents for safe shelter, food, water, etc. To accomplish this, EH practitioners may prepare an action plan to:

- Conduct community needs assessments;
- Identify specific EH problems, issues, and concerns and develop response objectives for mitigatation that will become part of the IAP;
- Play a key role in ensuring that essential services, such as the operation of drinking water systems continue to function or are restored following an incident;
- Provide technical assistance, consultation, and support to other response partners, functions, and disciplines such as public works, public health and medical professionals;
- Provide mutual aid through mutual aid agreements. This aid may be rendered in neighboring communities or across county and state lines; and
- Provide guidance, information, and resources on specific EH topics to response partners and the general public during an incident.

EH plays its biggest role during the community recovery phase. EH assists with community recovery after the emergency operations are over in many ways, including:

- Re-establishment of community lifelines i.e. drinking water supply, sewer systems, food supply, etc.;
- Debris removal;
- Community re-occupancy issues;
- Decontamination and cleanup; and
- Other functions such as assisting public health efforts.

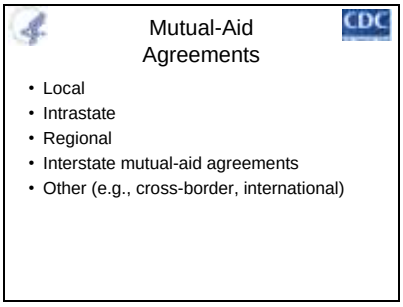
EH may assist in public health emergency functions including mass prophylaxis or vaccination efforts, in the case of a pandemic, or a bioterrorism event that would require working

Slide 46

with the local Bioterrorism Coordinator.

The mitigation phase of the emergency management cycle also includes EH such as supervising the cleanup of contaminated or debris-strewn communities or vector control activities. So, there are a myriad of roles and responsibilities for EH in all phase of the emergency management cycle.

Mutual Aid Agreements (Slide 47)



Slide 47

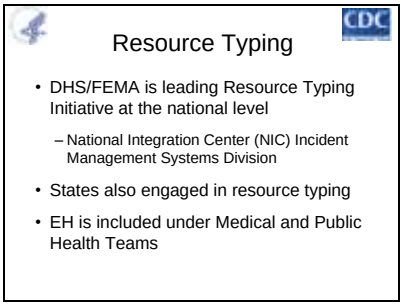
A mutual aid agreement is an agreement in which two or more parties agree to furnish resources and facilities and to render services to each and every other party of the agreement to prevent and respond to any type of disaster or emergency. Mutual aid agreements may exist between neighboring jurisdictions. All counties in California participate in the California Master Mutual Aid Agreement.

To assure an effective mutual aid response the California Emergency Management Agency (Cal EMA) coordinates all inter-regional and state agency activity related to mutual aid, and any out-of-state requests for mutual aid under the nationally recognized Emergency Management Assistance Compact (EMAC). Cal EMA is the agency formed in 2009 by combining the Governor's Office of Emergency Services and the California Office of Homeland Security. EMAC will be discussed later in this module.

Large-scale mutual aid agreements that might have applicability to Environmental Health emergency response exists in some instate regions. An example is the Mid-America Alliance – Mutual Assistance for Public Health Preparedness. This is an agreement between 10 states in the Midwest. Another is the Great Lakes Border Health Initiative, an arrangement between four states that surround the Great Lakes and Ontario, Canada.

There is an International Emergency Management Assistance Memorandum of Understanding, an agreement with 6 states in New England, Quebec, and New Brunswick. Also, there are multitudes of other types of interstate mutual-aid agreements and hundreds, if not thousands, of intra-state mutual-aid agreements and other types of agreements, such as cross-border or international agreements.

Resource Typing (Slide 48)



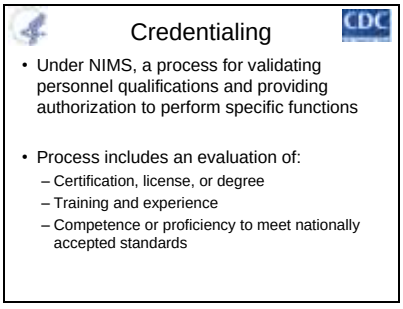
Slide 48

Resource typing is the categorization and description of response resources that are commonly exchanged in disasters through mutual aid agreements. The FEMA/NIMS Integration Center *Resource Typing Definitions* provide emergency responders with the information and terminology they need to request and receive the appropriate resources during an emergency or disaster. States are using these definitions to categorize their resources. See the module reference list for more information.

Resource typing definitions provide emergency managers with the information they need to request and receive the resources they need during an emergency or disaster. EH is included in the federal resource typing efforts under medical and public health response teams.

Resource typing is designed to enhance emergency readiness and response at all levels of government through a comprehensive and integrated system that allows jurisdictions to augment their response resources during an incident. Specifically, it allows emergency management personnel to identify, locate, request, order, and track outside resources quickly and effectively and facilitate the response of these resources to the requesting jurisdiction.

Credentialing (Slide 49)



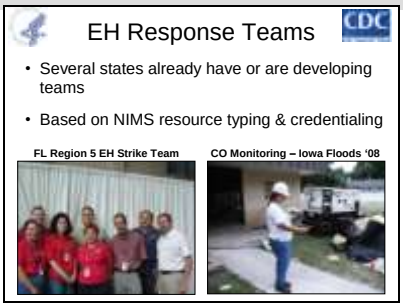
Slide 49

As a part of its resource typing efforts, FEMA has developed guidelines for the credentialing of emergency responder personnel. This guideline outlines a process to ensure that personnel responding to a disaster are properly trained and qualified.

The EH responder credentials are found in FEMA's *National Emergency Responder Credentialing – Medical and Public Health* guidelines. In this guidance the qualifications recommended for EH Generalist, EH Specialist, and EH Team Leader can be found. See the module reference list for more information.

Environmental Health Response Teams (Slides 50-52)

Many states have formed EH response or strike teams. Iowa, for example sent a 6-member Environmental Health Response Team to Louisiana in response to a request for assistance following Hurricane Katrina. Iowa was the first state to send Environmental Health assistance to Louisiana. The team was sent there just a few days after the storm made landfall.



Slide 50

The Iowa EH team coordinated and worked with a number of different jurisdictions and agencies in an around the greater New Orleans area performing many EH response functions, including:

- Testing water in private and municipal systems;
- Addressing issues related to sewage;
- Inspection of retail and industrial food establishments;
- Inspection and assessment of evacuation shelters;
- Addressing issues related to vector control and pest management;
- Building assessments and inspections;
- Solid waste management and removal;
- and a lot more!

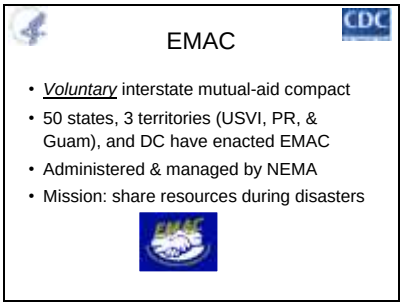
Slide 51

This was one of the many mutual aid success stories following Hurricane Katrina.

Slide 52

Emergency Management Assistance Compact (EMAC) (Slides 53-55)

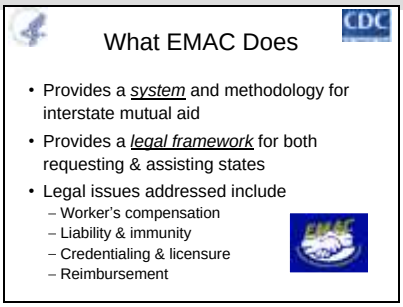
The Emergency Management Assistance Compact (EMAC) is a voluntary, interstate mutual aid system ratified by Congress in 1996. All 50 states, Puerto Rico, the U.S. Virgin Islands, and the District of Columbia are currently members of EMAC, although participation is not required by law. EMAC is administered and managed by the National Emergency Management Association.



Slide 53

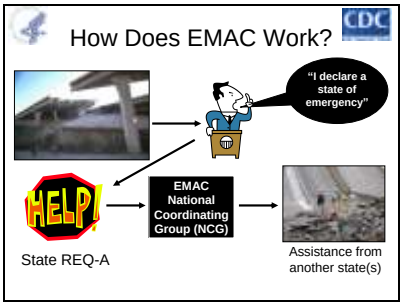
The mission of EMAC is to provide a system for sharing resources between states during disasters. ANY type of resource can be shared through EMAC, including EH personnel nd assets.

EMAC provides a legal framework for both the requesting and assisting states. It addresses many legal issues that can be "sticking points" in mutual aid agreements including worker's compensation, protections for responders regarding liability and immunity issues, credentialing and licensure requirements, etc. EMAC also provides a standard methodology for requesting emergency response assistance and reimbursement for the assisting states. Requesting states maintain control of their own personnel and resources. Assisting states provide personnel and resources to requesting states through EMAC.



Slide 54

EMAC does not replace federal assistance or support nor is it contingent on federal assistance or support. EMAC aid can precede or supplement federal assistance or support. National Guard troops can be utilized under EMAC for humanitarian purposes (e.g., distributing water and food, stacking sandbags, etc.) only; National Guard troops cannot be used for activities requiring the use of force or deadly implements.



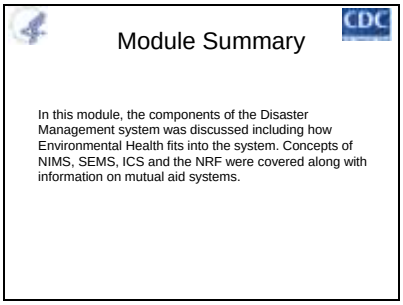
Slide 55

So how does EMAC actually work? After disaster strikes, the governor of an affected state must first issue a disaster declaration. Then a formal request for assistance is issued by the affected state. The request for assistance is sent to the EMAC National Coordinating Group for broadcast to all member states through an electronic system. States that are able to assist the affected state answer the request for assistance and send their personnel and resources.

The CDC has established an EMAC web site that provides information and resources related to EMAC and public health, and especially EH. There is much information and many good resources related not only to EMAC, but also to the issues of resource typing, licensing, credentialing, and other mutual aid agreements. See the module reference list for more information.

Module Summary (Slide 56)

In this module, the basic components of the disaster management system were discussed including ICS, NIMS, SEMS, EMAC, etc. The role of the EH practitioner was also discussed in this module.



Slide 56

Module 1 Acronyms

AAR	After Action Report
CAHAN	California Health Alert Network
Cal EMA	California Emergency Management Agency
CDC	Centers for Disease Control and Prevention
COG	Continuity of Government
CONOPS	Concept of Operations
COOP	Continuity of Operations
DHS	Department of Homeland Security
DOC	Department Operations Center
EEG	Exercise Evaluation Guideline
EF	Emergency Function
EH	Environmental Health
EHTER	Environmental Health Training in Emergency Response
ELO	Enabling Learning Objectives
EMAC	Emergency Management Assistance Compact
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
ESF	Emergency Support Function
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FIRESCOPE	Firefighting Resources of California Organized for Potential Emergencies
HSEEP	Homeland Security Exercise and Evaluation Program
IAP	Incident Action Plan
IC	Incident Command
ICP	Incident Command Post
ICS	Incident Command System
JFO	Joint Field Office
JIC	Joint Information Center
JIS	Joint Information System
JOC	Joint Operations Center
MAC	Multi-Agency Coordination
NIC	National Integration Center
NIMS	National Incident Management System
NRF	National Response Framework
OES	Office of Emergency Services
PIO	Public Information Officer
PPE	Personal Protective Equipment
PSA	Public Service Announcement
RNA	Rapid Needs Assessment

SEMS	Standardized Emergency Management System
SOC	State Operations Center
SOG	Standard Operating Guidelines
SOP	Standard Operating Procedures
TCL	Target Capabilities List
TLO	Terminal Learning Objectives
UC	Unified Command
UTL	Universal Task List

Module 1 Appendix

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Module #1 Disaster Management
Exercise Worksheet

Scenario: Due to an earthquake, a large container that may contain a hazardous material has been discovered in a residential area and appears to be leaking.

Develop one problem statement and two response objectives for this scenario.

The problem should be environmental health and/or public health in nature.

- Problem statements must be
  - Clear
  - Brief
  - Focused
  - Agreed on by the team
- Response objectives must be
  - "SMART"

PROBLEM:

RESPONSE OBJECTIVES:

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ICS Form 202

INCIDENT OBJECTIVES	1. INCIDENT NAME	2. DATE	3. TIME
4. OPERATIONAL PERIOD (DATE/TIME)			
5. GENERAL CONTROL OBJECTIVES FOR THE INCIDENT (INCLUDE ALTERNATIVES)			
6. WEATHER FORECAST FOR OPERATIONAL PERIOD			
7. GENERAL SAFETY MESSAGE			
8. Attachments (☑ if attached) ☐ Organization List (ICS 203) ☐ Medical Plan (ICS 206) ☐ Weather Forecast ☐ Assignment List (ICS 204) ☐ Incident Map ☐ ☐ Communications Plan (ICS 205) ☐ Traffic Plan ☐			
9. PREPARED BY (PLANNING SECTION CHIEF)	10. APPROVED BY (INCIDENT COMMANDER)		

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Module 2 Responder Safety

Environmental Health Training in Emergency Response (EHTER) – Introductory Level

California Version

Participant Manual

August 2010

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Module 2 Responder Safety

Duration

One and one half (1.5) hours

Scope Statement

This module will introduce participants to a variety of safety hazards and risks that are often faced by response personnel after emergencies and disasters. It will also highlight basic safety concepts to protect emergency response personnel against these hazards and risks and mitigate their adverse effects.

Terminal Learning Objective (TLO)

Participants will be able to explain the importance of safety while performing environmental health function in the emergency preparedness and response operations.

Enabling Learning Objectives (ELO)

After completion of this module, participants will be able to:

2-1. Recognize common hazards and risks present during emergencies and disasters and how these hazards and risks can affect responder health and safety.
2-2. Identify the precautions that can be taken by responders to protect their safety and health during emergencies and disasters.

Resources

Course participant manual
Module 2 PowerPoint slides
Sample Safety Assessment Checklist

Instructor to Participant Ratio

1:50 or less

Reference List

Cal EMA: California Mass Fatality Management Guide
http://www.oes.ca.gov/Operational/OESHome.nsf/0d737f261e76eeb588256b27007ac5ff/a3f586fd13d795c788256b7b0029bbff/$FILE/MassFatalityPlan.pdf

Cal/EPA: Emergency Response and Disaster Information
http://www.calepa.ca.gov/disaster/

Cal/EPA: California Air Resources Board Wildfire Smoke - A Guide for Public Health Officials http://www.arb.ca.gov/smp/progdev/pubeduc/wfgv8.pdf

Cal OSHA: California Code of Regulations Division of Occupational Safety and Health Title 8 regulations http://www.dir.ca.gov/samples/search/query.htm

CDC: Support for the Emergency Management Assistance Compact (EMAC)
www.bt.cdc.gov/planning/emac

CDC: Interim Immunization Recommendations for Disaster Response
http://www.bt.cdc.gov/disasters/disease/responderimmun.asp

CDC: Interim Health Recommendations for Workers who Handle Human Remains
http://emergency.cdc.gov/disasters/pdf/handleremains.pdf

CDC: Key Facts About Hurricane and Flood Recovery
http://www.bt.cdc.gov/disasters/hurricanes/recovery.asp

CDC: Chemical Agents http://www.bt.cdc.gov/Agent/AgentlistChem.asp

CDC: Disaster Recovery Areas
http://www.cdc.gov/niosh/topics/flood/MedScreenWork.html

CDC: Suggested Guidance for Supervisors at Disaster Rescue Sites
http://www.cdc.gov/niosh/emhaz2.html

EPA: Potential Environmental Health Hazards When Returning to Homes and Businesses
http://www.epa.gov/katrina/sep14returnhomeadvisory.htm

NIOSH Emergency Preparedness and Response Topic Page
http://www.cdc.gov/niosh/topics/emres

OSHA: Expert System, Electronic health and Safety Plans (e-HASP2)
http://www.osha.gov/dep/etools/ehasp/index.htm

OSHA: Guidance Manual for Hazardous Waste Site Activities
http://www.osha.gov/Publications/complinks/OSHG-HazWaste/4agency.html

OSHA: Hazardous waste operations and emergency response standards
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9765

Practical Exercise Statement

Not applicable to this module.

Assessment Strategy

In-class questions and module summary discussion

Module 2 Slides

Responder Safety (Slide 1)

Given the unpredictable nature of emergency response work, the environmental health (EH) practitioner is likely to face a broad range of hazards that pose a risk of occupational injuries, illnesses, and/or fatalities. Therefore attention to safety is of utmost importance in these situations.

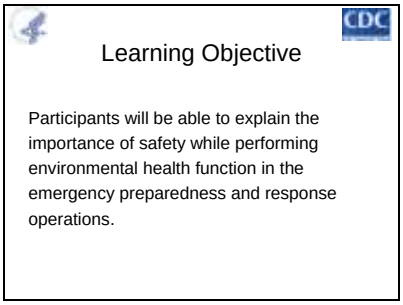
This module provides information on many of the most common and significant additional hazards that EH professionals may encounter when working in an area recently affected by a disaster. This presentation highlights a number of tasks and operations associated with disaster response and recovery. The presentation is designed to heighten awareness of the variety of health and safety precautions needed to protect oneself during a response action.

Pre-event training is critical to help raise awareness on how to protect oneself during an emergency. This presentation is not in-depth and cannot address all the potential hazards that might be encountered. However, it serves as a general awareness training for the most common hazards encountered during emergencies. It should supplement more specific, on-site training that should be available during an actual response.

Slide 1

Learning Objective (Slide 2)

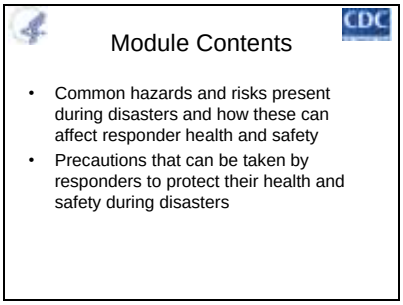
Participants will be able to explain the importance of safety while performing environmental health function in the emergency preparedness and response operations.



Slide 2

Module Content (Slide 3)

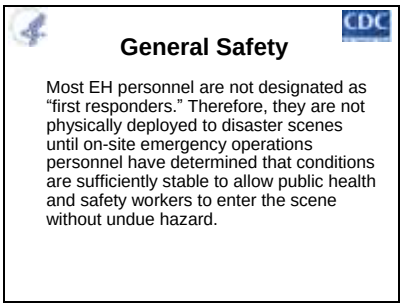
This module will cover:
- Common hazards and risks present during disasters and how these can affect responder health and safety; and
- Precautions that can be taken by responders to protect their health and safety during disasters.



Slide 3

General Safety (Slides 4-5)

In the event of a large-scale emergency, EH agency activities will change from normal day-to-day operations to emergency response operations. EH personnel are not typically designated as traditional "first responders," therefore, they are not physically deployed to disaster scenes until on-site emergency operations personnel have determined that conditions are sufficiently stable to allow public health and safety workers to enter the scene without undue hazard. The demands of a disaster may require EH practitioners to perform job duties outside of normal working conditions, therefore, safety is of the utmost concern. A safe response depends on:
- Utilizing sound judgment;
- Maintaining situational awareness;
- Hazard recognition;
- Hazard evaluation;
- Hazard avoidance;
- Planning;
- Anticipating potential hazards;
- Taking appropriate measures to avoid, eliminate or mitigate hazards; and
- Considering both man-made and naturally occurring hazards.



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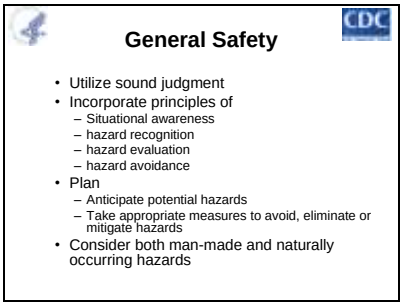
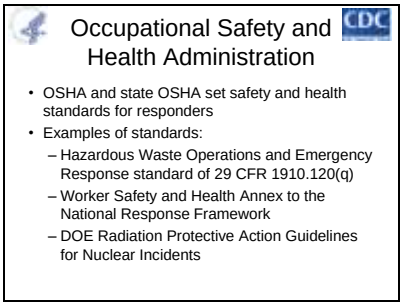


Slide 5

Situational awareness a combination of your perception of yourself, your environment, your comprehension of the current situation, and the projection of the future status of the scenario. In an emergency situation, conditions can change rapidly requiring continuous and deliberate consideration of the hazards.

Occupational Safety and Health Administration (OSHA) (Slide 6)



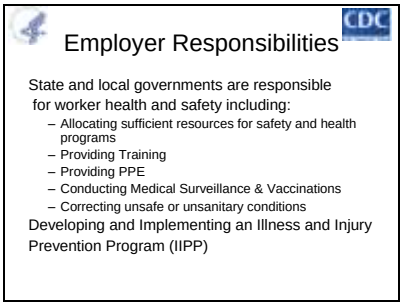
Slide 6

Several federal and state agencies, including the federal Department of Labor's Occupational Safety and Health Administration (OSHA), California OSHA (Cal OSHA) and the U.S. Environmental Protection Agency (EPA) have oversight authority for responders and response operations.
While these agencies retain their authorities, they are expected to work cooperatively and proactively with other federal, state, local, and private-sector responders prior to and during response operations to ensure the adequate protection of response workers.

Federal OSHA and Cal OSHA set safety and health standards for emergency responders, for example, the NRF includes a Worker Safety and Health Annex. The Worker Safety and Health annex does not replace the primary responsibilities of the government and employers; rather, it ensures that in fulfilling these responsibilities, response organizations plan and prepare in a consistent manner and that interoperability is a primary consideration for worker safety and health. A number of OSHA health and safety standards may be applicable to disaster areas including the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard found in 29 CFR 1910.120(q). The federal Department of Energy (DOE) and EPA are responsible for Radiation Protective Action Guidelines for Nuclear Incidents. Federal and state OSHA may provide assistance to the Safety Officer, especially on larger incidents.

Cal/OSHA is required to adopt standards at least as effective as those adopted by federal OSHA. Cal/OSHA further protects the health and safety of workers by adopting additional standards when no comparable federal standards apply.

Employer Responsibilities (Slide 7)



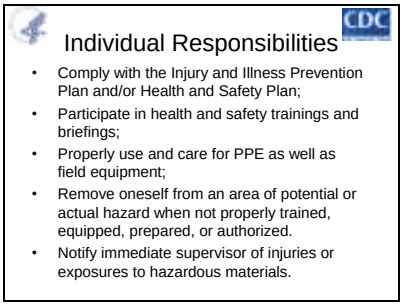
Slide 7

Emergency response work requires trained individuals who can address the situation to which they are responding. All responders need to be adequately trained to recognize and protect themselves from known and unknown safety and health hazards. Employers, including federal, state and local governments, are responsible for worker health and safety pursuant to federal, state and local statutes, and in some cases 40 CFR 311, Worker Protection. This responsibility includes

allocating sufficient resources for safety and health programs, providing training for staff, providing protective clothing and equipment, and medical surveillance, and correcting unsafe or unsanitary conditions.

Individual Responsibilities (Slides 8-10)

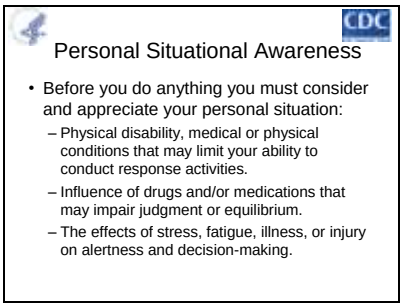
In addition to employer responsibilities, responders, whether they are traditional first responders such as firefighters or EH professionals, are responsible for following work rules and safe practices established by their employers, and in particular, should use assigned personal protective equipment (PPE) as appropriately instructed. It is incumbent on the responder not add to the problems on-site by taking inappropriate risks!



Slide 8

In order to stay safe, responders must:

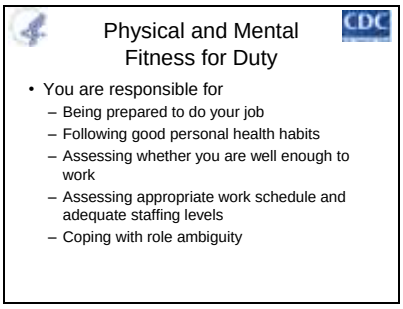
- Follow all health and safety rules and wear or use all required gear or equipment;
- Follow safe work practices for the job;
- Report hazardous conditions to the team leader/supervisor;
- Report hazardous conditions to OSHA if employers do not fix them; and
- Protect family members at home from contamination exposures by using decontamination procedures.



Slide 9

Responding to an emergency event may involve work in less than optimal conditions such as the lack of electricity, prolonged work hours and stressful circumstances. To maintain personal health, it is important for EH responders to follow good personal health habits. In addition, the responder is responsible for:

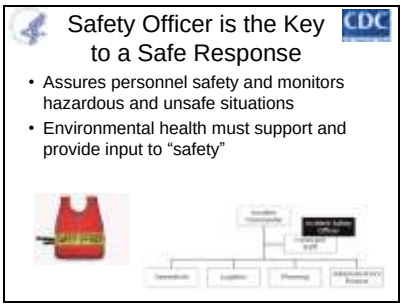
- Being prepared to do the job;
- Following good personal health habits;
- Assessing whether they are well enough to work;
- Assessing appropriate work schedules; and
- Coping with role ambiguity.



Slide 10

Personnel who are under medical care for chronic health problems are advised to discuss their conditions with their healthcare provider. Uncontrolled problems such as hypertension, diabetes, or seizure disorders may represent conditions that render a responder unfit for response activities. Note: Employees have a right to bring unsafe or unhealthful work conditions to their employers' attention and have a right to file a complaint about these conditions with OSHA and state OSHA agencies without retaliation or discrimination.

Safety Officer is Key to a Safe Response (Slide 11)



Slide 11

When a response action begins, responsibility for the entire operation, including responder safety, lies with the Incident Commander. The Incident Commander may retain Safety Officer responsibility throughout the response for small and relatively straightforward incidents, or the IC may delegate this authority to a Safety Officer for larger, complex responses. The Safety Officer and Site Safety Plan are the keys to a safe response.

The Safety Officer:

- Ensures personnel safety and monitors hazardous and unsafe situations; and
- Prepares a site-specific safety and health plan.

The Safety Officer oversees worker safety instructions specific to the incident in addition to any found in an employer's Injury and Illness Prevention Program (IIPP) that may have a section on emergency response safety.

Recommended Personal Gear (Slide 12)

Slide 12

Many responders keep a personal "Go-Kit" with them in case they need to deploy within a short time frame. Whether deploying hundreds of miles from home or to a neighboring city, this list of items is helpful to have:

- Copy of personal records and identification;
- Weather-appropriate gear (e.g., rain, snow);
- Changes of clothing;
- Toiletries;
- Alcohol-based hand sanitizer;
- Flashlight with spare batteries;
- Prescription medicines/over the counter medicines;
- Sunscreen and lip balm;
- Insect repellant;
- Hat or cap;
- Sunglasses and extra pair of glasses/contacts; and
- Cell phone and charger.

Even without a pre-packed bag, responders should create a list of essential personal items to be gathered in case of deployment. This list above is not exhaustive and will change based on work assignment, climate and season.

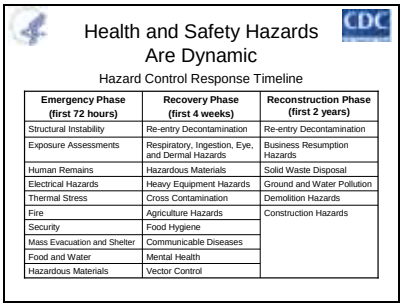
Emergencies in the Field (Slide 13)

Should you sustain an injury as part of your work in the field, immediately notify your supervisor, safety officer, or incident commander. Apply first aid care to minor injuries or seek treatment at a first aid station or clinic. For more serious injuries, seek treatment at the local hospital or call 911. In some situations phone lines may be down and you may need to rely on alternate means of communication.

Slide 13

Health and Safety Hazards Are Dynamic (Slide 14)

EH work conditions can change drastically with disaster response actions. EH professionals may be called upon to respond to a variety of events and may face additional challenges, such as downed power lines, high volumes of construction debris, or hazardous chemical environments, etc. while performing an otherwise familiar task or operation. As time goes on, hazards associated with the incident may change. The emergency, recovery, and reconstruction phases of an incident may bring its own concerns and hazards.



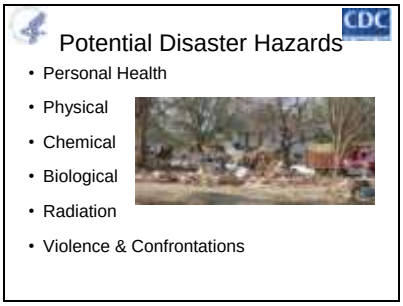
Slide 14

Hazard Control Response Timeline

Emergency Phase (first 72 hours)	Recovery Phase (first 4 weeks)	Reconstruction Phase (first 2 years)
Structural Instability	Re-entry Decontamination	Re-entry Decontamination
Exposure Assessment	Respiratory, Ingestion, Eye, and Dermal Hazards	Business Resumption Hazards
Human Remains	Hazardous Materials	Solid Waste Disposal
Electrical Hazards	Heavy Equipment Hazards	Ground and Water Pollution
Thermal Stress	Cross Contamination	Demolition Hazards
Fire	Agriculture Hazards	Construction Hazards
Security	Food Hygiene	
Mass Evacuation and Shelter	Communicable Diseases	
Food and Water	Mental Health	
Hazardous Materials	Vector Control	

Potential Disaster Hazards (Slide 15)

Disaster sites pose a multitude of health and safety concerns. The hazards and exposures are a function of the unstable nature of the site, the potential of hazardous substances being present and the type of work being performed. An accurate assessment of all hazards may not be possible because they may not be immediately obvious or identifiable. Safety professionals or other personnel may select protective measures based on limited information. In addition to the hazards of direct exposure to chemical, biological or radiological hazards, workers are also subject to dangers posed by the unstable physical environment, the stress of working in protective clothing, and the emotional trauma of the situation.



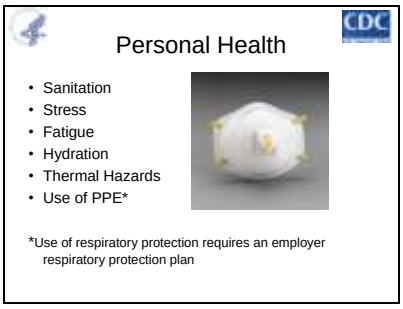
Slide 15

Personal Health (Slide 16)

Some key safety issues in all aspects of disaster response:

- Personal sanitation – keeping yourself clean. Washing hands, Clean and medicate cuts, food from safe sources
- Thermal stress – stay hydrated; carry water with you and remember to drink…if your urine is yellow, you are not getting enough water. Wear appropriate clothing for the weather.
- Stress - Take rest cycles – don't allow yourself or your team to become victims….get your needed rest.
- Personal protective equipment (PPE) - PPE such as respirators may be needed in some situations. (Note: use of respirators requires an employer training and monitoring program.)

Disaster response and recovery work often requires working long hours under stressful conditions. So physical conditioning and proper rest cycles are important. An important item to remember is that community recovery takes time. Don't be afraid to ask for help; mutual aid and federal responders may be available to assist your agency when needed.



Slide 16

Personal Protective Equipment (Slide 17)

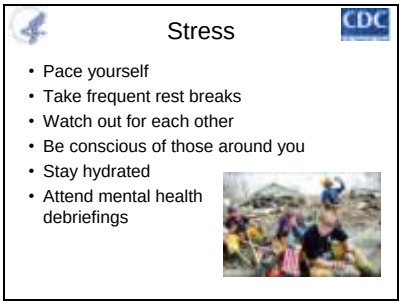
Personal protective equipment, or PPE, is designed to protect employees from injuries or illnesses resulting from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Besides face shields, safety glasses, hard hats, and safety shoes, PPE includes a variety of devices and garments such as coveralls, gloves, vests, earplugs and respirators. Use it!

Slide 17

Stress (Slide 18)

Responders who are exhausted, feeling stressed or temporarily distracted may place themselves and others at risk. For safety's sake:

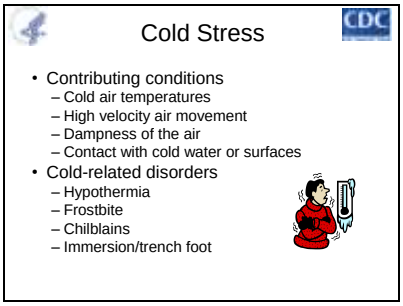
- Pace yourself - Take frequent rest breaks;
- Use the buddy system - Watch out for each other;
- Maintain situational awareness - Be conscious of your surroundings;
- Stay hydrated - Make sure that you drink plenty of fluids (water, sports drinks); and
- Deal with stress - Attend mental health debriefings and take steps to alleviate stress.



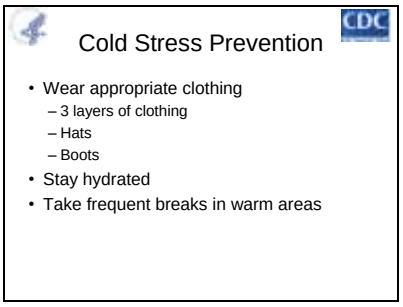
Slide 18

Cold Stress (Slides 19-20)

When the body is unable to warm itself, cold related stress may result. This may include tissue damage and possibly death. Four factors contribute to cold stress: cold air temperatures, high velocity air movement, dampness of the air, and contact with cold water or surfaces. A cold environment forces the body to work harder to maintain its temperature. Cold air, water, and snow all draw heat from the body. Wind chill is the combination of air temperature and wind speed. For example, when the air temperature is 40°F, and the wind speed is 35 miles per hour, your exposed skin receives conditions equivalent to the air temperature being 11°F. While it is obvious that below freezing conditions combined with inadequate clothing could bring about cold stress, it is also important to understand that it can also be brought about by temperatures in the 50's coupled with some rain and wind.



Slide 19



Slide 20

Your body reacts to cold conditions by shifting blood flow from your extremities (hands, feet, arms, and legs) and outer skin to your chest and abdomen. This allows exposed skin and the extremities to cool rapidly and increases the risk of frostbite and hypothermia. Combine this with cold water and trench foot may also be a problem.

Hypothermia, frostbite, and "trench foot" are the most common cold-induced problems. Hypothermia which means "low heat," is a potentially serious health condition. This occurs when body heat is lost faster than it can be replaced. The person may begin to shiver and stomp their feet in order to generate heat. Workers may lose coordination, have slurred speech, and fumble with

items in the hand. The skin will likely be pale and cold.

Anyone working in a cold environment may be at risk for cold stress. However, older people may be at more risk than younger adults since older people are not able to generate heat as quickly. Certain medications may prevent the body from generating heat normally, these include anti-depressants, sedatives, tranquilizers and others.

Frostbite occurs when the skin actually freezes and loses water content. While frostbite usually occurs when the temperatures are 30° F or lower, wind chill factors can allow frostbite to occur in above freezing temperatures. Frostbite typically affects the extremities, particularly the feet and hands. The affected body part will be cold, tingling, stinging or aching followed by numbness. Skin color turns red, then purple, then white, and is cold to the touch.

Trench foot or “immersion foot” is caused by having feet immersed in cold water at temperatures above freezing for long periods of time. It is similar to frostbite, but considered less severe. Symptoms usually consist of tingling, itching or burning sensation. Chilblains is a medical condition that is often confused with frostbite and trench foot. Chilblains are ulcers affecting the extremities that occur when a predisposed individual is exposed to cold and humidity. The cold exposure damages capillary beds in the skin, which in turn can cause redness, itching, blisters, and inflammation.

Plan ahead for work in cold weather. Wearing appropriate clothing and being aware of how your body is reacting to the cold are important to preventing cold stress. Avoiding alcohol, certain medications and smoking can also help to minimize the risk.

Protective clothing is the most important way to avoid cold stress. The type of fabric also makes a difference. Cotton loses its insulation value when it becomes wet. Wool, on the other hand, retains its insulation even when wet.

The following are recommendations for working in cold environments:

- Wear at least three layers of clothing. An outer layer to break the wind and allow some ventilation (like Gortex® or nylon). A middle layer of down or wool to absorb sweat and provide insulation. An inner layer of cotton or synthetic weave to allow

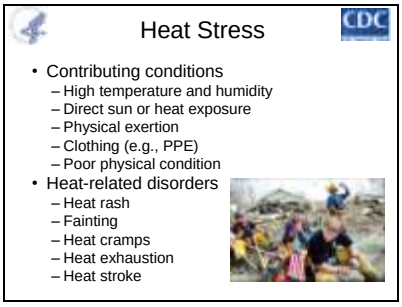
ventilation.
- Wear a hat. Up to 40% of body heat can be lost when the head is left exposed.
- Wear insulated boots or other footwear.
- Keep a change of dry clothing available in case work clothes become wet.
- Do not wear tight clothing. Loose clothing allows better ventilation.

Work practices and planning are important preventative measures. Drink plenty of liquids, avoiding caffeine and alcohol. It is easy to become dehydrated in cold weather. If possible, heavy work should be scheduled during the warmer parts of the day. Take breaks out of the cold. Try to work in pairs to keep an eye on each other and watch for signs of cold stress. Avoid fatigue since energy is needed to keep muscles warm. Take frequent breaks and consume warm, high calorie food such as pasta to maintain energy reserves.

Engineering controls can be effective in reducing the risk of cold stress. Radiant heaters may be used to warm workers. Shielding work areas from drafts or wind will reduce wind chill. Use insulating material on equipment handles, especially metal handles, when temperatures drop below 30° F.

Training in cold stress recognition and treatment is important. Supervisors, workers and coworkers should watch for signs of cold stress and allow workers to interrupt their work if they are extremely uncomfortable. Supervisors should also ensure that work schedules allow appropriate rest periods and ensure liquids are available. They should use appropriate engineering controls, personal protective equipment and work practices to reduce the risk of cold stress. All of these measures should be incorporated into health and safety plans.

Heat Stress (Slides 21-22)

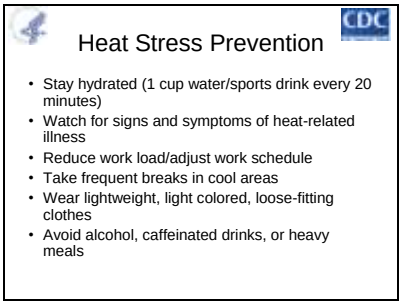


Slide 21

The body's response to heat stress is called heat strain. Operations involving high air temperatures and humidity, radiant heat sources, strenuous physical activity, and wearing impermeable protective clothing have a high potential for inducing heat strain in workers.

Heat disorders and health effects of individuals exposed to hot working environments include (in increasing order of severity)

skin disorders (heat rash, hives, etc.), heat syncope (fainting), heat cramps, heat exhaustion, and heat stroke. Heat cramps and fainting often accompany heat exhaustion. Symptoms of heat exhaustion include headaches, dizziness, lightheadedness, weakness and moist skin, and mood changes such as irritability and upset stomach. Heat exhaustion may lead to heat stroke if the person is not quickly cooled and re-hydrated. Heat stroke victims cease to sweat as their bodies fail to maintain an appropriate core temperature. This thermal regulatory failure (heat stroke) is a life-threatening emergency requiring immediate medical attention. Signs and symptoms include irritability, confusion, nausea, convulsions or unconsciousness, hot dry skin.



Slide 22

The level of heat stress at which excessive heat strain will result is highly individual and depends upon the heat tolerance capabilities of each individual. Age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or illicit drugs, prescribed medications and a variety of medical conditions, such as hypertension and diabetes, all affect a person's sensitivity to heat.

At greatest risk are un-acclimatized workers, people performing physically strenuous work, those with previous heat illnesses, the elderly, people with cardiovascular or circulatory disorders (diabetes, atherosclerotic vascular disease), those taking medications that impair the body's cooling mechanisms, people who use alcohol or are recovering from recent use, people in poor physical condition, and those recovering from illness.

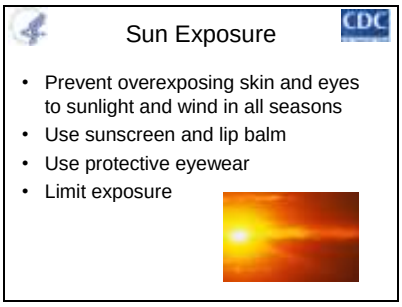
Know the signs and symptoms of heat-related illness. A good idea is to create a buddy system with co-workers so that you can monitor each other for symptoms. A buddy system will help to ensure that each has had enough water and food and is feeling okay to continue. If a co-worker appears to be disoriented or confused, or suffers inexplicable irritability, malaise, or flu-like symptoms, that person should be removed for rest in a cool location with rapidly circulating air and kept under skilled observation.

Have cool water or any cool liquid (except alcohol and caffeinated beverages) available and drink small amounts frequently, e.g. one cup every 20 minutes. If possible, schedule work at cooler times of day and share or distribute work among others. Pace yourself when performing strenuous work. Rotate

staff working outdoors or in the heat and take frequent breaks in cool areas.

Wear lightweight, light-colored, and loose-fitting clothes. Commercially available ice vests with pockets that hold ice packets are another relatively inexpensive method for cooling. Wetted clothing is another simple and inexpensive personal cooling technique that can be quite effective under conditions of high temperature and low humidity, where evaporation from the wetted garment is not restricted.

Sun Exposure (Slide 23)



Slide 23

Sun exposure can cause sunburn and eye damage. Sunburn is an inflammation of the skin that follows over exposure to ultraviolet (UV light) from the sun, sun lamps, or occupational light sources.

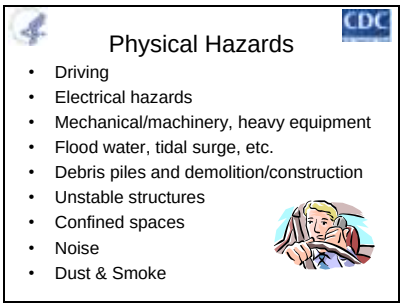
Signs and symptoms of over exposure to the sun include:
- Red swollen, painful and sometimes blistered skin;
- Fever;
- Nausea, vomiting and delirium with severe burns; and
- Tanning or peeling of skin after recovery.

There is increased risk if you are fair skinned; have red or blonde hair; are exposed to industrial light sources (welding arcs); or are on a medication which increases sensitivity of the skin to UV light. These medications are sulfa antibiotics, Tetracyclines, Amoxicillin, and oral contraceptives. The sunburn can result in skin changes that lead to premature wrinkling and loss of skin elasticity, as well as more serious outcomes such as keratosis, pre-malignant skin lesions, skin cancer, and malignant melanoma.

Wear sunscreen with a sun protection factor (SPF) of 15 or greater and covering exposed skin will prevent most sunburn. Reapply as necessary to ensure protection throughout the work shift. In cold weather, use alcohol-free sunscreen lotion.

Chapped lips and skin can be prevented through the use of lip balm and limiting exposure of skin to the environment. Skin moisturizing lotion may help the skin retain water.
When possible, set up work area in a shaded location and schedule tasks when individuals will not be exposed to direct sunlight such as during the early morning or late afternoon.

Physical Hazards (Slide 24)

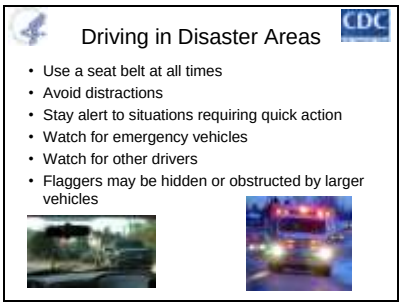


Slide 24

Physical hazard includes factors within the environment that can harm the body without necessarily touching it. Vibration and noise are examples of physical hazards. Other physical hazards include:

- Driving;
- Electrical hazards;
- Mechanical/machinery, heavy equipment;
- Flood water, tidal surge, et al.;
- Debris piles and demolition/construction waste;
- Unstable structures;
- Confined spaces; and
- Dust and smoke.

Driving in Disaster Areas (Slide 25)



Slide 25

Work-related roadway crashes continue to be the leading cause of injury fatalities for workers in the United States. Given that conditions are even more hazardous during emergencies, the importance of driving safely should not be underestimated. Responders are presented with numerous hazards associated with driving in a disaster area. Traffic may be heavy, especially around checkpoints. Traffic signs may be knocked down or not visible, and traffic signal lights may be inoperative. Street signs and landmarks may not be visible. Flooding, damage to roadways, fallen power lines, debris, poor signage and limited visibility for traffic all contribute to disaster-related accidents. Driving hazards can be reduced by:

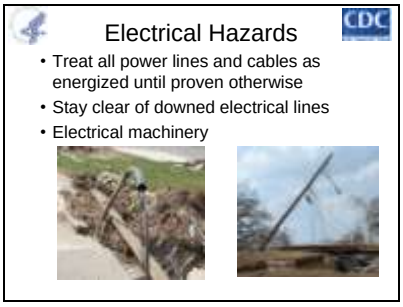
- Planning ahead and following established travel instructions.
- Wearing a seatbelt at all times.
- Avoiding driving if you are tired.
- Avoiding distractions such as adjusting the radio or talking on a radio or phone.

Allow extra time when traveling and drive defensively. Watch our for emergency vehicles. Be patient and courteous to other drivers and do not take other drivers' actions personally.
Extra care should be exercised when driving on roads that may have been damaged by the disaster. Roads may be washed out, undermined, or impassable. If possible, avoid driving into standing water due to the potential for unseen hazards. Be alert for debris and down power lines.

Reduce stress by planning a route ahead of time (bring the maps

and directions), allowing plenty of travel time, and avoiding crowded roadways and busy driving times. Always follow established communications procedures so that others know your whereabouts.

Electrical Hazards (Slide 26)



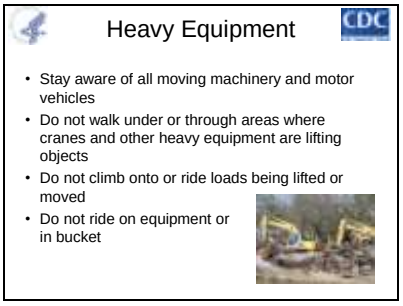
Slide 26

Overhead power lines, downed electrical wires and cables pose an electrocution risk. Workers most at risk are typically those removing debris from roadsides and in the process of pruning trees. Electricity travels in closed circuits, and its normal route is through a conductor. Electric shock or electrocution occurs when the body becomes a part of the circuit.

When an electrical shock enters the body it may produce different types of injuries to body parts or the entire body – often resulting in death. After receiving a “jolt” of electricity all or part of the body may be temporarily paralyzed and this may cause loss of grip or stability. A person may also involuntarily move as a result of receiving an electrical shock, resulting in a fall. Internal or external burns may result from contact with electricity.

Treat all power lines and cables as energized until proven otherwise!

Heavy Equipment (Slide 27)



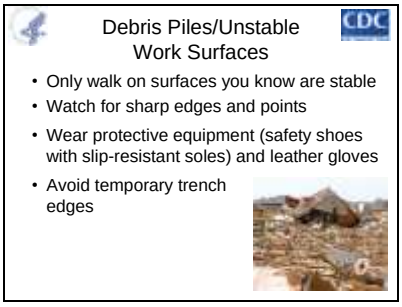
Slide 27

Working around heavy equipment, including cranes, bucket trucks, skid-steer loaders, poses a serious hazard to operators as well as nearby emergency responders. Traumatic injury, including serious and fatal injuries, can result when equipment fails or is used improperly. Workers are also at risk of being struck by moving equipment. Fatalities and serious injuries can occur if cranes are not inspected and used properly. Many fatalities can occur when the crane boom, load line or load contacts power lines and shorts electricity to the ground. Other incidents happen when workers are struck by the load, are caught inside the swing radius or fail to assemble/ disassemble the crane properly. The major causes of fatalities associated with aerial lifts such as cherry pickers or bucket trucks are falls, electrocutions, and collapses or rollovers.

Heavy equipment should be operated only by those who have received appropriate training on how to operate it correctly and safely. Remain vigilant of the activities around you so you are not

at risk for being struck by moving equipment and 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. Ensure operators do not exceed the load capacity of cranes and other lifting equipment. Hard hats and high safety visibility vests should be worn when working around heavy equipment.

Debris Piles/Unstable Work Surfaces (Slide 28)



Slide 28

Unstable work surfaces and piles of debris are common hazards found in the aftermath of an emergency event, particularly earthquakes, hurricanes, and other natural disasters. Traumatic injury, including serious fall injuries can occur from slips, trips, and falls or collapsing materials. A qualified person must determine if the walking / working surface is adequate to support the weight of workers, tools, and materials.

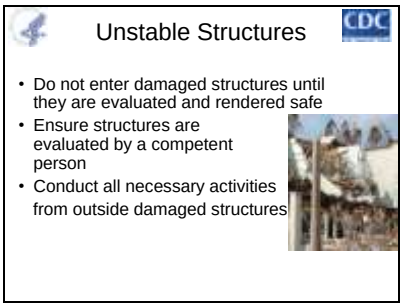
This is especially important in areas that have been compromised by floodwaters or suffered structural damage from high winds or seismic activity. Don't walk on surfaces that are not stable. If unavoidable, extra care should be exercised when stepping onto areas that are unstable or uneven, such as debris fields, or where the ground surface cannot be seen, for example if covered by water. Use alternative methods, such as bucket trucks to access work areas that are found to be unstable. Recommended PPE including safety shoes with slip resistant soles should be worn. Fall protection equipment with lifelines tied off to suitable anchorage points should be utilized whenever possible.

Objects that may dislodge and fall, especially broken glass, present a serious hazard to responders. Whenever possible, such objects should be removed before working underneath. If the objects cannot be removed, then controls such as debris netting, sidewalk sheds, canopies, or catch platforms should be installed.

Unstable Structures (Slide 29)

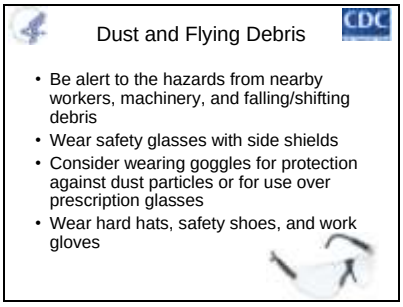
This slide provides an example of an unstable structure that responders may be tempted to enter. Be sure to conduct all necessary activities from outside damaged structures to the extent feasible and do not enter structures if you are uncertain about its stability. Ensure that a competent person evaluates the

structure's stability when access is necessary. A competent person is able to recognize existing and predictable hazardous conditions and has the authority to take prompt corrective measures to eliminate the hazardous conditions.



Slide 29

Dust and Flying Debris (Slide 30)



Slide 30

Flying debris such as dust, concrete, and metal particles may be generated from moving vehicles, nearby damaged buildings, or construction activities and can cause traumatic injury, ranging from minor eye injuries requiring first aid to serious, even disabling or fatal injury. Handling sharp or jagged materials can result in lacerations.

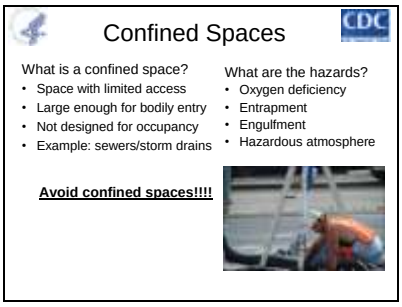
Eye hazards may arise from exposures to debris, smoke, chemicals, or welding light. Many eye injuries have occurred because of inadequate side protection, improper fit, or particles fell from above such as when drilling overhead. Safety glasses are commonly used as protection against impact and optical radiation. Side protection is required any time that there are hazards from flying particles or objects.

Personal protective eyewear, such as goggles, face shields, or safety glasses should be used when an eye hazard exists. The eye protection chosen for specific work situations depends upon the nature and extent of the hazard, the circumstances of exposure, other protective equipment used, and personal vision needs. Eye protection should be fit to an individual or adjustable to provide appropriate coverage. It should be comfortable and allow for sufficient peripheral vision. Selection of protective eyewear appropriate for a given task should be made based on a hazard assessment of each activity, including regulatory requirements when applicable.

Consider safety goggles for protection from fine dust particles or for use over regular prescription eye glasses. Goggles are used for higher impact protection, greater particle protection, chemical splashes, and welding light protection. Goggles for splash or high dust protection should have indirect venting. Goggles with

direct venting (a mesh of small holes around the sides) tend to fog less, but should not be used with liquid or fine dust hazards Faceshields are used for high impact protection and to protect the wearer's face in addition to the eyes. However, particles and chemicals can easily go around a faceshield and the curve of the faceshield can direct them into the eye, and in use faceshields are frequently lifted leaving the eyes unprotected. When choosing eye PPE, always look for the "Z87" mark on the lens or frames which indicates that it is certified by the American National Standards Institute (ANSI).

Confined Spaces (Slide 31)



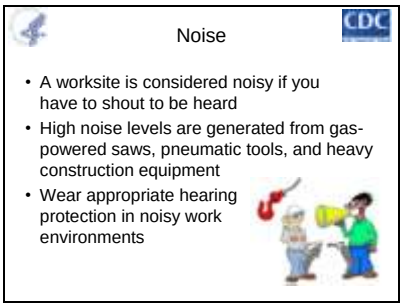
Slide 31

Confined space refers to a space which by design is not intended for human occupancy, has limited openings for entry and exit, and poor ventilation that could allow for the concentration of dangerous air contaminants. Confined spaces include but are not limited to storage tanks, compartments of ships, process vessels, pits, silos, vats, degreasers, reaction vessels, boilers, ventilation and exhaust ducts, sewers, tunnels, underground utility vaults, and pipelines.

The atmosphere in the confined space may be hazardous because of the lack of natural air movement. This characteristic of confined spaces may result in 1) oxygen deficient atmospheres, 2) flammable atmospheres, or 3) toxic atmospheres. You may also be at risk of entrapment, death by strangulation, constriction or crushing. According to data collected by the Bureau of Labor Statistics, fatal injuries in confined spaces averages 92 fatalities per year in the U.S.

Confined spaces may only be entered by authorized personnel approved by the Safety Officer. Before entering a confined space specialized training is required. All safety measures required for entering a confined space must be in place prior to entry. One person, an attendant, is required to remain outside the space to be in communication with the entrant for the duration of the operation. The space should be purged, flushed or ventilated and continually monitored for hazardous conditions. Lock out/tag out procedures for power equipment in or around the space should be implemented. Appropriate PPE including self-contained breathing apparatus (SCBA) may be needed. Adequate communications equipment and alarm systems should be in place. Finally, rescue equipment should be nearby in case of an emergency. Avoid confined spaces!

Noise (Slide 32)



Slide 32

Another hazard often encountered during emergency response operations is exposure to excessive noise from saws, large equipment, or pneumatic tools. A short, intense sound—an explosion, for example— may cause immediate hearing loss. But usually hearing loss occurs gradually after prolonged exposure to loud noise.

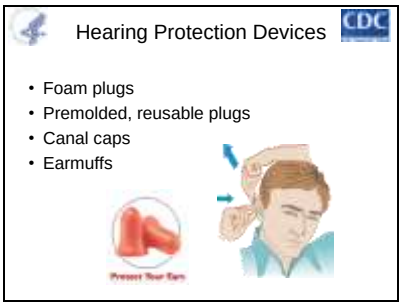
Noise-induced hearing loss is 100 percent preventable but once acquired, hearing loss is permanent and irreversible. Therefore, prevention measures must be taken to ensure that hearing is protected.

Use of hearing protection devices such as earplugs or earmuffs in noisy environments will protect your hearing. There are two rules to help to determine if hearing protection is needed:

First, if you have to raise your voice to talk to someone who is an arm's length away, then the noise level is likely to be hazardous.

Second, if your ears are ringing or sounds seem dull or flat after leaving a noisy place, then you probably were exposed to hazardous noise levels.

Hearing Protection Devices (Slide 33)



Slide 33

Hearing protection devices are acoustic barriers that reduce the amount of sound energy transmitted through the ear canal to receptors in the inner ear and can be worn to help reduce noise exposures. Proper fitting as well as use and care of hearing protection is essential to ensuring that they effectively reduce noise exposures.

The insert-type protectors such as the foam earplugs, pre-molded earplugs, and canal caps attenuate noise by plugging the external ear canal whereas the muff-type protector encloses the entire ear to provide an acoustic barrier.

Earmuffs come in many models designed to fit most people. They work to block out noise by completely covering the outer ear. Muffs can be "low profile" with small ear cups or large to hold extra materials for use in extreme noise. Some muffs also include electronic components to help users communicate or to block impulsive noises.

Workers who have heavy beards or sideburns or who wear glasses may find it difficult to get good protection from earmuffs. The hair and the temples of the glasses break the seal that the earmuff cushions make around the ear. For these workers, earplugs are best. Other potential drawbacks of earmuffs are that some people feel they can be hot and heavy in some environments.

Respiratory Protection (Slides 34-35)

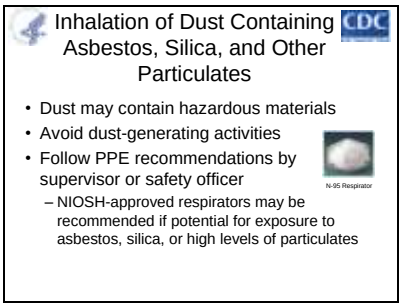
During response activities there is a risk of breathing dust containing hazardous materials including asbestos (from damaged insulation and fireproofing materials) and silica (from pulverized concrete) which are toxic to human health.

Short-term health effects include irritation of the eyes, nose, throat, and lungs. Chronic health effects will depend on the extent and the duration of any exposure. The National Institute for Occupational Safety and Health (NIOSH) recommends that air sampling be conducted to determine exposure levels found in the environment. A combination of air sampling and exposure modeling is often used to make reasonable estimates of exposure. Ideally, this determination should be made by a professional industrial hygienist.

Until the results of dust testing in the area are known, avoid inhaling the dust or limit exposure as much as possible and avoid entering visibly dusty areas if you can. Avoid the use of dry sweeping and other dust-clearing procedures that disturb settled dust and raise it into the air. Dampening settled dust with a fine water mist can markedly reduce the amount of dust that is raised by activity. (Caution: Excessive wetting may create a slip and fall hazard. Slip-resistant shoes or boots may be helpful).

Work clothing covered in dust that potentially contains asbestos or other hazardous materials must be changed to avoid taking the dust into your car or home, where your family might be exposed. It is best to remove dusty clothing while still wearing respiratory protection and then shower to remove the dust from the skin and hair before changing into clean clothing. Dusty clothes should be handled without shaking and placed in bags. They should be laundered separately from other clothing. Ideally, while working dusty clothing should be cleaned with a vacuum equipped with a high efficiency particulate air (HEPA) filter

Slide 34



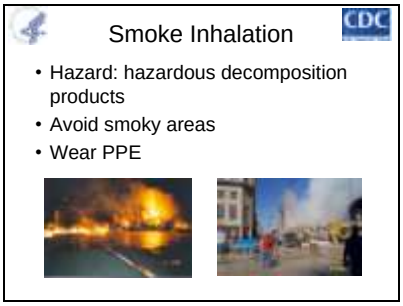
Slide 35

before washing up and taking a break.

Generally speaking, a disposable filtering respirator rated as an N95 or higher is acceptable for most activities involving exposures to silica, Portland cement dust, and other particulates. If there is a potential for an asbestos hazard at a level less than ten times the safe level use an elastomeric facepiece respirator equipped with an appropriate filter. Note that particulate filtering respirators will not provide protection from hazardous gases and vapors.

An N95 respirator is a type of disposable particulate respirator that filters at least 95% of airborne particles. Particulate respirators are also known as "air-purifying respirators" because they protect by filtering particles out of the air. NIOSH-approved disposable respirators are marked with the manufacturer's name, the part number, the protection provided by the filter (e.g. N95), and "NIOSH." Surgical masks should not be used because they do not provide adequate protection against airborne contaminants.

Smoke Inhalation (Slide 36)



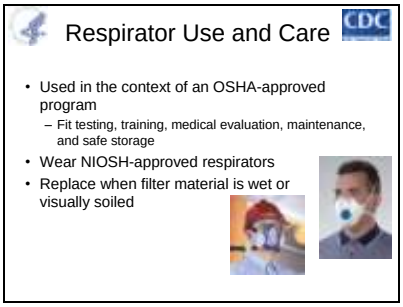
Slide 36

Smoke is a complex mixture of carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons and other organic chemicals, nitrogen oxides, and trace minerals. The individual compounds that may be present in smoke number in the thousands. Smoke composition depends on multiple factors, including the fuel type and moisture content, the fire temperature, wind conditions and other weather-related influences, whether the smoke is fresh or “aged,” and other variables.

Particulate matter is the principal pollutant of concern from wildfire smoke for the relatively short-term exposures (hours to weeks) typically experienced by the public. Particulate matter is a generic term for particles suspended in the air, typically as a mixture of both solid particles and liquid droplets. The characteristics, sources, and potential health effects of particulate matter depend on its source, the season, and atmospheric conditions. Additionally, the size of particles affects their potential to cause health effects. Many types of disasters will result in fire and smoke. Avoid smoky areas as much as possible and call emergency services if a fire is encountered. Exposure to smoke may require respiratory protection. For

information on the dangers of wildfire smoke, see *Wildfire Smoke - A Guide for Public Health Officials.* See the module reference and resource list for more information.

Respirator Use and Care (Slide 37)



Slide 37

Respirators should be used in the context of a complete employer respiratory protection program as required by OSHA. This includes training, fit-testing, and fit-checking to ensure appropriate respirator selection and use. OSHA also requires that workers be medically cleared to wear a respirator and receive training prior to using it, as well as be monitored through an employer surveillance program. Employers are required to develop standard operating procedures for storing, reusing, and disposing of respirators and replacement of filters. Note that the general public does not need to meet the OSHA requirements for respirator use that is imposed upon employers and employees.

To be effective, respirators must fit properly and seal to the surface on the wearer's face. A respirator will only protect if it is used correctly. Respirator fit tests must be provided by the employer to ensure that the respirator fits the individual. Breathing through a respirator is harder than breathing in open air. People with lung diseases such as asthma or emphysema, elderly people, and others may have trouble breathing. Some people with claustrophobia may not be able to wear a mask or hooded respirator. Some people with vision problems may have trouble seeing while wearing a mask or hood (there are special masks for people who need glasses).

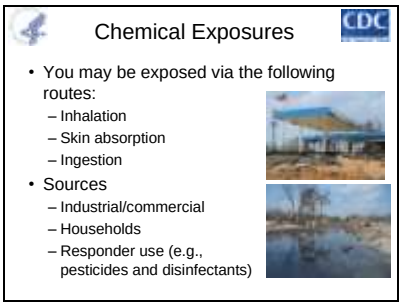
Respirators with replaceable filters are reusable, and a respirator classified as disposable may be reused by the same worker as long as it functions properly. All filters must be replaced whenever they are damaged, soiled, or causing noticeably increased breathing resistance (e.g., causing discomfort to the wearer). Before each use, the outside of the filter material should be inspected. If the filter material is physically damaged or soiled, the filter should be changed (in the case of respirators with replaceable filters) or the respirator discarded (in the case of disposable respirators). Always follow the respirator filter manufacturer's service-time-limit recommendations.

Respirators must be stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals. They must also be stored to

prevent deformation of the facepiece and exhalation valve. A good method is to place them in individual storage bins. Respirator facepieces hung on a peg for a long time will become distorted and the straps will lose their elasticity. Check for these problems before each use. Storing the respirator in a plastic sealable bag after use is not considered a good practice. The respirator may be damp after use and sealing prevents drying and encourages microbial growth. If plastic bags are used, respirators must be allowed to dry before storage.

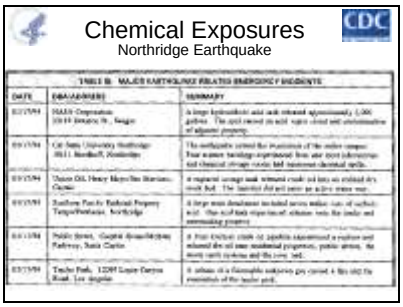
Chemical Exposures (Slides 38-40)

Hazardous materials are chemical substances, which if released or misused, can pose a threat to human health or the environment. Responders may be exposed to chemicals during emergency response activities. The source of the chemicals may result from the event itself such as an accidental hazardous chemical release or a terrorism response or as a result of secondary issues such as a fire or spills from household products.



Slide 38

Exposure can occur in three common ways:
1. Inhalation - Breathing the chemical;
2. Ingestion - Swallowing contaminated food, water, or medication; or
3. Dermal contact - Touching the chemical, or coming into contact with clothing or things that have touched the chemical. There is a less common exposure route – injection.



Slide 39

While it is difficult to anticipate the types of chemicals that may be encountered during disaster response work, common symptoms of chemical exposure may include:
- Difficulty in breathing;
- Irritation of the eyes, skin, throat, or respiratory tract;
- Changes in skin color;
- Headache or blurred vision;
- Dizziness;
- Clumsiness or lack of coordination; and
- Cramps or diarrhea.

Slide 40

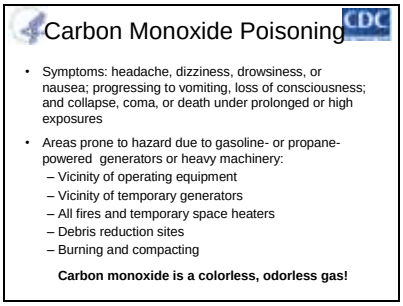
For events involving known chemicals, you should consult with the incident Safety Officer or your safety officer to determine the appropriate PPE to be worn. This may include gloves, protective clothing, shoe covers, and respiratory protection depending on the toxicity of the substance, exposure levels, and the potential

for exposure.

In situations where a leaking hazardous materials container or spill is discovered, one should:

- Move to a safe distance away from the contaminant. By minimizing the time you are exposed, you can reduce your risk of injury from breathing potentially hazardous chemicals. Some chemicals may ignite or explode.
- Avoid touching any spilled substances. If you are not sure of a substance or its effects, wait for authorities on the scene to advise you of proper medical care or attention to minimize injury. Alert local authorities of any emergencies.
- Try to stay upstream, uphill, and upwind of the accident.
- Remember, you may be exposed to a chemical even though you may not be able to see or smell anything unusual.

Carbon Monoxide Poisoning (Slide 41)



Slide 41

When power outages occur during emergencies, the use of alternative sources of fuel or electricity for heating, cooling, or cooking can cause carbon monoxide (CO), a colorless, odorless gas, to build up in an enclosed space such as a home, garage, or camper which can result in poisoning and cause death.

Red blood cells pick up CO quicker than they pick up oxygen. If there is a lot of CO in the air, the body may replace oxygen in blood with CO. This blocks oxygen from getting into the body, which can damage tissues and result in death. The most common symptoms of CO poisoning are headache, dizziness, weakness, nausea, vomiting, chest pain, and confusion. CO poisoning can be difficult to diagnose because the symptoms mimic other illnesses. People who are sleeping or intoxicated can die from CO poisoning before ever noticing symptoms.

Never run a generator, pressure washer, or any gasoline-powered engine indoors even if the doors or windows are open, unless the equipment is professionally installed and vented or outside an open window, door, or vent where exhaust can vent into an enclosed area. Never leave the motor running in a vehicle parked in an enclosed or partially enclosed space, such as a garage. Keep vents and flues free of debris, especially if winds are high. Keep in mind that dust and debris can block ventilation lines.

Use CO warning sensors when using or working around combustion sources. Shut off equipment immediately if symptoms of exposure appear.

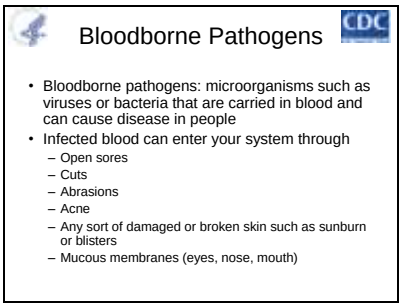
Biological Hazards (Slide 42)

Slide 42

Biological safety hazards may include:
- Bloodborne pathogens;
- Human remains and biohazardous wastes;
- Mold;
- Waterborne disease;
- Foodborne disease;
- Poisonous plants; and
- Animals and insects.

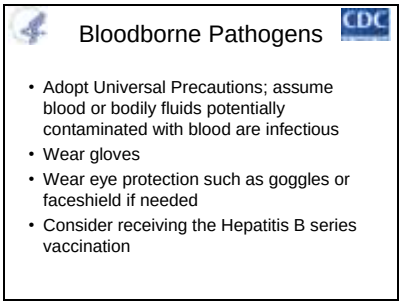
Biological hazards could also include exposure to the bioagents of terrorism i.e. anthrax.

Bloodborne Pathogens (Slides 43-44)



Slide 43

Bloodborne Pathogens are microorganisms such as viruses or bacteria that are carried in blood and can cause disease in people. There are many different bloodborne pathogens including malaria, syphilis, and brucellosis, but Hepatitis B and the Human Immunodeficiency Virus (HIV) are two diseases specifically addressed by OSHA's Bloodborne Pathogen Standard.



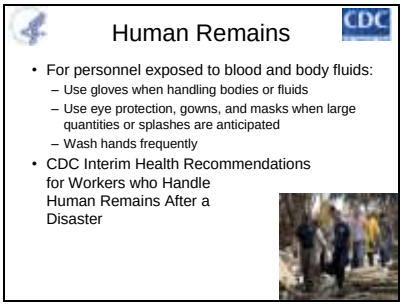
Slide 44

Exposures to bloodborne pathogens and other potentially infectious materials may arise during emergency response work. Contact with blood and/or other body fluids such as vomit and saliva, cerebrospinal fluid, amniotic fluid, semen or vaginal secretions, etc. may allow the transmission of bloodborne pathogens. It is important to know the ways exposure and transmission are most likely to occur, be it providing first aid, handling blood samples in the laboratory, or cleaning up spills of bodily fluids. Bloodborne pathogens may enter the body through:
- Open sores;
- Cuts;
- Abrasions;
- Acne;
- Mucous membranes (eyes, nose, mouth); or
- Any sort of damaged or broken skin such as sunburn or blisters.

The use of "Universal Precautions" describes a prevention strategy in which all potentially infectious materials are treated as if they are infectious, regardless of the perceived status of the source. This approach is useful in all situations where exposure to blood and bodily fluids or other infectious materials is possible.

It is extremely important to use PPE and work practice controls to protect from blood-borne pathogens whenever exposure is possible. Avoid contact with blood and other body fluids when possible, and when it's not, wear PPE. Gloves should be worn to protect the hands against exposures. Gloves come in a variety of materials such as latex, nitrile, rubber, or other impervious materials. Anytime there is a risk of splashing or aerosol generation of fluids, goggles and/or other eye protection should be used to protect your eyes as well as a respirator in some cases. If PPE is unavailable, improvise with a towel, plastic bag, or some other barrier to avoid direct contact with bodily fluids. Further protection is provided by vaccinations including the hepatitis series.

Human Remains (Slide 45)



Slide 45

For people who are not directly involved in the handling of human remains there is no direct risk of infectious diseases. Without contact, proximity to bodies and remains does not pose a health hazard. The sight and smell of decay are unpleasant, but they do not create a public health hazard.

Human remains may contain blood-borne viruses such as hepatitis viruses and HIV, or bacteria that cause diarrheal diseases, such as shigella and salmonella. These viruses and bacteria do not pose a risk to someone walking nearby, nor do they cause significant environmental contamination. However, for people who must directly handle remains, such as recovery personnel, or persons identifying remains or preparing the remains for burial or cremation, there can be a risk of exposure to an infectious agent. Workers who handle human remains should use the following precautions:

- Protect your face from splashes of body fluids and fecal material. You can use a plastic face-shield or a combination of eye protection (indirectly vented safety goggles are a good choice if available; safety glasses will only provide limited protection) and a surgical mask.

- Protect your hands from direct contact with body fluids, and also from cuts, puncture wounds, or other injuries that break the skin that might be caused by sharp environmental debris or bone fragments. A combination of a cut-proof inner layer glove and a latex or similar outer layer is preferable. Footwear should similarly protect against sharp debris.

- Maintain strict hand hygiene to prevent transmission of disease agents from fecal material and bodily fluids to your hands. Wash hands with soap and water or with an alcohol-based hand cleaner immediately after removing gloves.

- Immediate clean with soap and clean water any wounds sustained during work with human remains.

- In addition to guarding physical safety, participate in available programs to provide psychological and emotional support for workers handling human remains.

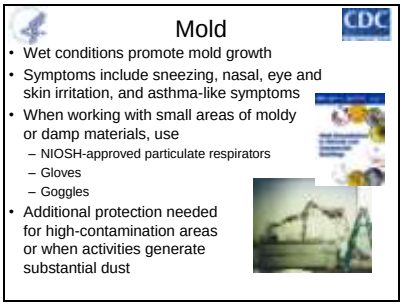
Mass Fatality Management (Slide 46)

The *California Mass Fatality Management Guide* provides guidance for meeting the extraordinary demands of a mass fatality event including dealing with the perceived risk of infectious diseases from human remains. Unlike many states, California does not have a State Coroner or Medical Examiner; primary responsibility for the investigation, recovery, and management of human remains resides with the authority of the local coroner or medical examiner. The majority of California counties (operational areas) have assigned coroner responsibilities to the Sheriff. See the module reference and resource list for more information.

Slide 46

Mold (Slide 47)

Molds are ubiquitous in nature and grow almost anywhere indoors or out. Molds spread and reproduce by making spores, which are small and lightweight, able to travel through air, capable of resisting dry, adverse environmental conditions, and capable of surviving a long time. People can be exposed to mold through skin contact, inhalation, or ingestion.



Slide 47

Mold grows best in damp, warm environments. Wood, wallboard, wallpaper, upholstery, and dust can be good nutrient sources. Substantial indoor mold growth is virtually synonymous with the

presence of moisture inside the building envelope. Flooding, particularly when floodwaters remain for days or weeks, provides an almost optimal opportunity for mold growth.

Because of the ubiquity of mold in the environment, some level of exposure is inevitable. Persons can be exposed to mold through contact with airborne spores or through contact with mold fragments. Exposure to high airborne concentrations of mold spores can occur when persons come into contact with a large mass of mold, such as might occur in a building that has been flooded. Exposure to mold fragments could occur when a person encounters a nutrient source for mold that has become disrupted, such as would occur during removal of mold-contaminated building material. Skin contact or exposure by inhalation to either spores or fragments also could occur in a dusty environment.

Numerous species of mold cause infection through respiratory exposure. The types and severity of symptoms related to exposure to mold in the indoor environment depend in part on the extent of the mold present, susceptibility of individuals (for example, whether they have pre-existing allergies or asthma).

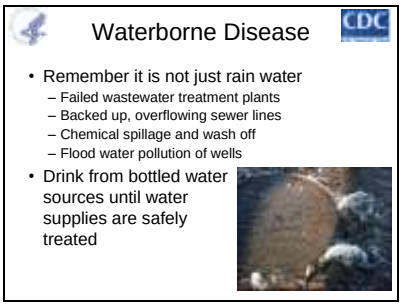
Prolonged exposure to fungi may produce health problems by mechanisms including allergy or hypersensitivity and infection. Allergic responses are the most common type of health problem associated with exposure to molds. These health problems may include sneezing; itching of the nose, eyes, mouth, or throat; nasal stuffiness and runny nose; and red, itchy eyes. Molds can trigger asthma symptoms (shortness of breath, wheezing, cough) in persons who are allergic to mold.

The US EPA has developed a document, *Mold Remediation in Schools and Commercial Buildings* that presents guidelines for the cleanup of mold and moisture problems in schools and commercial buildings; these guidelines include measures designed to protect the health of building occupants and remediation workers. See the module reference and resource list for more information.

Any structure that has been flooded should be presumed to be contaminated with mold if those materials were not thoroughly dried within 48 hours. In such cases, immediate steps should be taken to reduce the risk for exposure, including use of appropriate PPE (e.g., tight-fitting NIOSH-approved N95

respirator, gloves to limit contact of mold and cleaning solutions with skin, and goggles) while performing clean-up or other activities. The CDC's *Mold Prevention Strategies and Possible Health Effects in the Aftermath of Hurricanes and Major Floods* provides information regarding mold exposure prevention strategies. See the module reference list for more information.

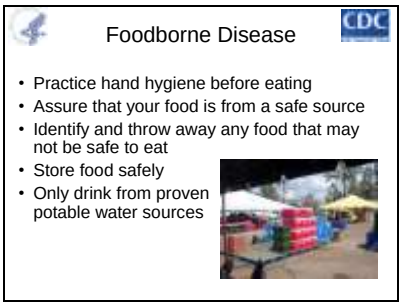
Waterborne Disease (Slide 48)



Slide 48

Communicable disease outbreaks of diarrhea and respiratory illness can occur when people are crowded into close quarters and when water and sewage systems are disrupted and personal hygiene is hard to maintain. Contact with raw sewage or standing water contaminated with hazardous substances should be avoided by wearing waders and waterproof gloves when coming into contact with flood waters. If skin comes into contact with flood water, wash thoroughly with soap and water. Local authorities will provide notification if tap water is unsafe to drink or to use for cooking or bathing. If the water is not safe to use, follow instructions to use bottled water or disinfect drinking water. Whenever possible, drink from reliable bottled water sources until water supplies are safely treated!

Foodborne Disease (Slide 49)



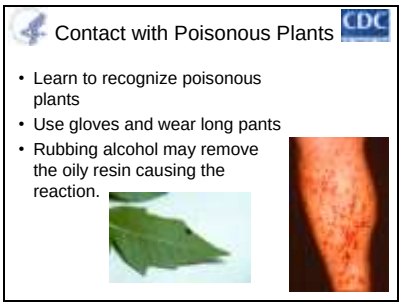
Slide 49

As a responder working in an impacted area, your food source may not be as reliable as you may desire. To keep yourself and other responders safe, follow these recommendations:

Ensure that your food and water is from safe source, identify and throw away any food that is not safe to eat, such as food that may have come in contact with flood or storm water, food that has an unusual odor, color, or texture, or potentially hazardous foods that have not been maintained at proper temperatures. Also, food containers with screw-caps, snap-lids, crimped caps (soda pop bottles), twist caps, flip tops, snap-open that have come in contact with flood water or contaminated environments, as well as any home canned items.

If the power is out, keep the refrigerator and freezer doors closed as much as possible. Add block ice or dry ice to the refrigerator if the electricity is expected to be off longer than 4 hours. Wear heavy gloves when handling ice.

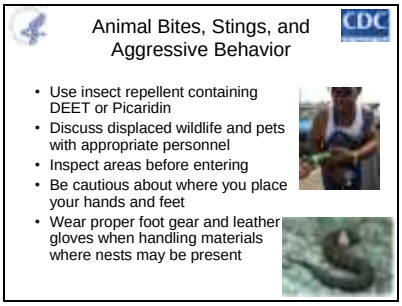
Poisonous Plants (Slide 50)



Slide 50

Learn how to recognize poisonous plants such as poison ivy, poison oak, and poison sumac. Use gloves and wear long pants and long-sleeved shirts when possibly contacting poisonous plants. Keep rubbing alcohol accessible, as it may remove the oily resin from plants up to 30 minutes after exposure. When appropriate, safely clear vegetation from areas where personnel are working and living (e.g., construction trailers and base camps). Use a barrier cream formulated to protect against poison ivy and poison oak.

Animals Bites, Stings, and Aggressive Behavior (Slide 51)



Slide 51

Wildlife may be poisonous or venomous, or may otherwise injure you. In the wake of a natural disaster, many wild and domestic animals have been displaced from their normal habitats or homes. This may cause an increased potential for interaction between animals and workers. Discuss hazardous wildlife concerns with personnel familiar with these matters (e.g., game wardens or animal control officers).

Assume that all snakes are poisonous and that all animals are rabid. Be on guard for stray or wild animals, as they can exhibit unpredictable or aggressive behavior. Unless properly trained, do not attempt to take custody of animals. Watch them from a safe distance while contacting animal rescue/control personnel.

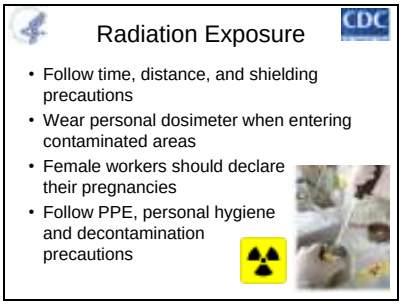
To help avoid insect and snake bites, observe areas before beginning work to locate nests or creatures. Try to avoid working in standing water. Use caution before reaching into voids or other spaces. Wear proper foot gear, such as high top leather boots, and leather gloves when handling materials where snakes, insects, and other animals may have nested (e.g., firewood, lumber, rocks, construction debris.) If you have allergies, consider avoiding this type of work or coordinate with medical authorities for first aid supplies (including auto-injector medications, if indicated).

If you are bitten by a snake: Try to identify the snake so that if it is poisonous, you can be given the correct anti-venin. Do not cut the wound or attempt to suck the venom out. Contact your local emergency services for care.

Workers should use insect repellent containing DEET or

Picaridin on exposed skin. Repellent should be reapplied according to the manufacturer's instructions. Workers should be encouraged to wear long pants and sleeves, if practical, given the possibility of heat stress concerns.

Radiation Exposure (Slide 52)



Slide 52

Radiation cannot be detected by the human senses. A radiological survey conducted with specialized equipment is the only way to confirm the presence of radiation. If an emergency incident or terrorist event involves the use of radioactive material, the potential for both responder exposure and contamination must be assessed.

Exposure occurs when a person is near a radiation source. People exposed to a source of radiation can suffer radiation illness if their dose is high enough, but they do not become radioactive. For example, an x-ray machine is a source of radiation exposure. A person does not become radioactive or pose a risk to others following a chest x-ray.

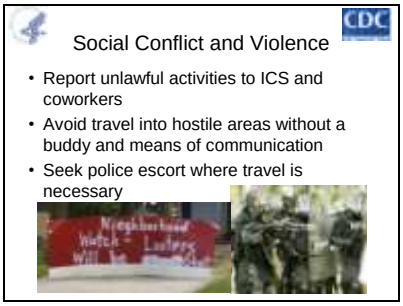
There are three primary means of eliminating or reducing radiation exposures. They are:

- Time- Since the amount of exposure occurs as a function of duration of exposure, less time means less exposure.
- Distance - Dose is inversely proportional to distance, therefore, greater distance means less dose.
- Shielding - By placing an appropriate shield between the radioactive source and the worker, radiation is attenuated and exposure may be completely eliminated or reduced to an acceptable level. The type and amount of shielding needed to achieve a safe working level varies with the type and quantity of radioactive material.

Contamination occurs when particles of radioactive material are deposited on surfaces, skin, or clothing. Internal contamination occurs when radioactive particles are inhaled, ingested, or lodged in an open wound. A person contaminated by radioactive material requires decontamination.

Social Conflict and Violence (Slide 53)

The threat of violence to responders during some disasters, such as major civil unrest or terrorist events, is particularly problematic since most responders do not encounter it during their day-to-day activities making it difficult to assess. The traumatic nature of many disaster environments present stress issues that are poorly understood by some responding organizations and are very often difficult to assess.



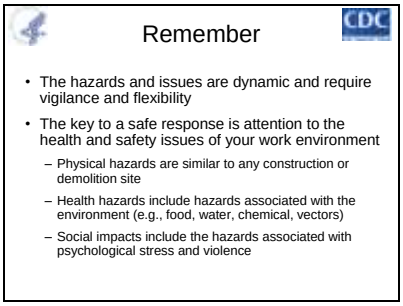
Slide 53

To maintain personal safety:

- Wear easy to see identification at all times;
- Treat people diplomatically to avoid confrontation;
- Report unlawful activities to law enforcement and coworkers;
- Use the buddy system and carry a means of communication;
- Be prepared to walk away from a threatening situation; and
- Seek police escort when travel into dangerous areas as necessary.

Remember! (Slide 54)

Because the numerous hazards at the site of a disaster are so diverse, they will inevitably go well beyond the experience of single response agencies. This makes it very difficult for individual organizations to characterize threats. Disaster hazards and issues are dynamic and require continuous vigilance and flexibility.

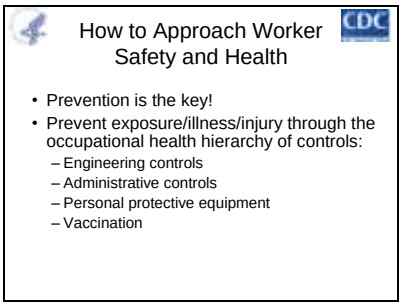


Slide 54

The key to a safe response is careful attention to the health and safety issues of the work environment:

- Physical hazards may be similar to any construction or demolition site;
- Health hazards include hazards associated with the environment (e.g., food, water, chemical, vectors);
- And social impacts include the hazards associated with psychological stress and violence.

How to Approach Worker Safety and Health (Slide 55)



Slide 55

All responders should adhere to the following rules:

- Follow employer's safety & health policies at all times.
- Follow supervisors' instructions and adhere to the established chain of command.
- Follow personnel accountability instructions such as check-in and check-out procedures.
- Obtain vaccinations in adherence with the employer's requirements.
- Promptly report all injuries, accidents, and near misses. Seek medical attention when needed.
- Report all unsafe conditions.
- Do not perform tasks until appropriate safety and health controls have been put into place. Employees may refuse to perform tasks that expose them to danger.
- Use PPE needed for the task.
- Maintain constant awareness of your surroundings.

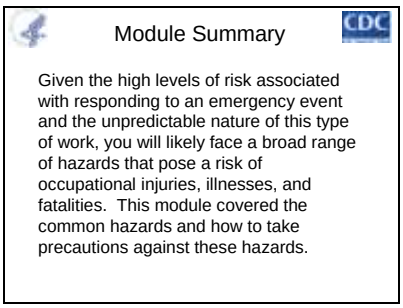
(SEE MODULE APPENDIX FOR A SAMPLE SAFETY ASSESSMENT CHECKLIST)

Safety Awareness for Environmental Health Practitioners: Protect yourself while helping others! (Slide 56)

Slide 56

Activities performed by responders for short periods of time or during events that occur infrequently could involve levels of risk much greater than that associated with everyday tasks. Events such as a major natural disaster, structural collapse, civil disturbance, bombings or terrorism activity involve hazards not normally encountered in routine work activities. In an effort to quickly respond to a situation the EH professional may be tempted to put safety aside while trying to help others. However, personal safety must come first to avoid creating additional victims.

Module Summary (Slide 57)



Slide 57

Given the high levels of risk associated with responding to an emergency event and the unpredictable nature of this type of work, you will likely face a broad range of hazards that pose a risk of occupational injuries, illnesses, and fatalities. This module covered the common hazards and how to take precautions against these hazards.

Module 2 Acronyms

ANSI	American National Standards Institute
Cal/EPA	California Environmental Protection Agency
Cal OSHA	California Occupational Safety Health Administration
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
CO	Carbon Monoxide
DEET	N,N-diethyl-meta-toluamide
DOE	Department of Energy
DHS	Department of Homeland Security
EH	Environmental Health
ELO	Enabling Learning Objectives
EPA	Environmental Protection Agency
HAZWOPER	Hazardous Waste Operations Emergency Response
HEPA	High Efficiency Particulate Air
HIV	Human Immunodeficiency Virus
IIPP	Injury and Illness Prevention Program
IC	Incident Command
N95	Respirator that filters out 95% of airborne particles
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety Health Administration
PPE	Personal Protective Equipment
ppm	Parts per Million
SPF	Sun Protection Factor
TLO	Terminal Learning Objectives
USEPA	United States Environmental Protection Agency

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Module 2 Appendix

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SAMPLE SAFETY ASSESSMENT CHECKLIST

Incident Name	**Safety Officer**
Incident Address	
Type	

Assessment Points	**Status**				**Comments**
	YES	**NO**	**NA**	**UNK**	
Itinerary/location notification completed					
Health and safety plan provided					
Appropriate PPE provided					
PPE checked for fitness					
Adequate communications equipment					
Adequate supplies/ go-kit provided					
Adequate training for task assigned					
Adequate training for PPE assigned					
Adequate action plan provided					
Adequate field instructions provided					
Potential hazard – chemical					Type:
Potential hazard – biological					Type:
Potential hazard – radiological					Type:
Potential hazard – physical					Type:
Potential hazard – personal health					Type:
Potential hazard – social (conflict)					Type:
Potential hazard – other					Type:

Additional comments

Specialist Name	**Date/Time**

USE REVERSE SIDE FOR ADDITIONAL INFORMATION

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Module 3 Drinking Water

Environmental Health Training in Emergency Response (EHTER) – Introductory Level

California Version

Participant Manual

August 2010

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Module 3 Drinking Water

Duration

One and one half (1.5) hours

Scope Statement

This module will introduce participants to a variety of environmental health (EH) issues and concerns associated with drinking water after emergencies and disasters. It will also highlight appropriate measures to address these issues and concerns and mitigate their adverse effects.

Terminal Learning Objective (TLO)

Participants will recognize the key EH issues related to drinking water and have the necessary knowledge to perform drinking-water related activities.

Enabling Learning Objectives (ELO)

After completion of this module, participants will be able to:

3-1. List the major water issues and concerns faced during emergencies and disasters.
3-2. Identify the roles and responsibilities of EH practitioners in addressing water issues and concerns during emergencies and disasters.
3-3. Identify the basic components of wells.
3-4. Identify key messages related to drinking water issues and concerns for both response partners and the general public.
3-5. Identify key emergency response partners
3-6. List resources and procedures used to address drinking water concerns during emergencies (e.g. sampling, assessment forms, CALWARN).

Resources

Course participant manual
Module 3 PowerPoint slides
Exercise Worksheet
Sample Assessment Checklist

Instructor to Participant Ratio

1:50 or less

Reference List

AWWA: American Water Works Association; Water and Wastewater Agency Response Networks
http://www.awwa.org/Government/Content.cfm?ItemNumber=3837&&navItemNumber=3838

AWWA: Standard C652-02 *Disinfection of Water-Storage Facilities*

Cal EMA: *Multi-Agency Response Guidance for Emergency Drinking Water Procurement & Distribution* *http://www.oes.ca.gov/Operational/OESHome.nsf/PDF/Drinking%20Water%20Guidance/$file/DrinkWaterGd.pdf*

CALWARN: California Water/Wastewater Agency Response Network http://www.calwarn.org/

CCDEH: California Conference of Directors of Environmental Health *Disaster Field Manual for Environmental Health Specialists* http://www.ccdeh.com/products/disaster_field_manual_info.htm

CDPH: California Department of Public Health, Division of Drinking Water & Environmental Management http://www.cdph.ca.gov/programs/Pages/DDWEM.aspx

CDPH : California Department of Public Health, Division of Drinking Water & Environmental Management, *Crisis and Emergency Risk Communication (CERC) Toolkit* http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Security/CERCtoolkit.pdf

CDPH: California Department of Public Health, Division of Drinking Water & Environmental Management, *Sample Emergency Response Plan for Small Systems* http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Security/ExampleERP.doc

CDC: *Crisis and Emergency Risk Communication by Leaders for Leaders* http://www.bt.cdc.gov/erc/leaders.pdf

CDC: *Cleaning and Sanitizing with Bleach after an Emergency July 2008* http://www.bt.cdc.gov/disasters/bleach.asp

CDC: CDC/ HUD Healthy Housing Reference Manual: http://www.cdc.gov/nceh/publications/books/housing/housing.htm

CDC: Emergency Preparedness and Response; Natural Disasters & Severe Weather site - www.bt.cdc.gov/disasters

City of Pensacola; Post-Disaster Recovery and Redevelopment http://escambia-emergency.com/Local_Mitigation/LMSdraftupdate/E-MitigationPlan/CityofPensacolaPostDisaster/PostDisasterRedevelopment.pdf

EPA: Private Drinking Water Wells: Drilled Wells http://www.epa.gov/privatewells/basic_drilled.html

EPA: Region IX: Chloramines
www.epa.gov/region9/water/chloramine.html

EPA: Ground Water and Drinking Water; Emergency Disinfection of Drinking Water site
www.epa.gov/safewater/faq/emerg.html

FEMA: Target Capabilities List http://www.fema.gov/pdf/government/training/tcl.pdf

Missouri Department of Health and Senior Services; Disinfection of Contaminated Wells and Cisterns - http://www.dhss.mo.gov/Lab/EnvBact/Lab-10D.pdf

National Environmental Health Association (NEHA): *Handbook of Environmental Health: Pollutant Interactions in Air, Water, and Soil*

National Rural Water Association: http://www.nrwa.org/

Seattle & King County Drinking Water Program: Springs
http://www.metrokc.gov/health/water/springs.htm

University of South Florida Private Inspectapedia:www.bt.usf.edu

Volume Calculator for well or pipe capacity
http://pages.prodigy.net/rich_demartile/files/pipe-vol.xls
For circular and rectangular tank volume www.sterilex.com/toolscalc.htm

Practical Exercise Statement

This module contains one exercise.

Additional recommended training activities include touring a local water treatment facility and viewing a demonstration of a mobile water treatment unit/equipment.

Assessment Strategy

In-class questions, participation in group activities/exercises, and module summary discussion.

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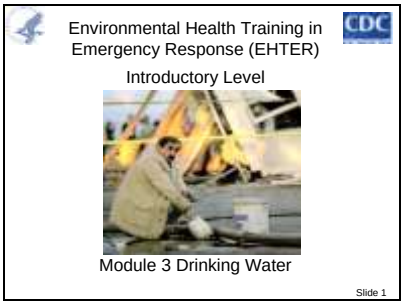
Module 3 Slides

Drinking Water Module (Slide 1)

In a major disaster such as a significant earthquake, water systems including treatment plants and distribution systems may suffer damage that could disrupt the delivery of potable water to consumers. In this case, safe drinking water will need to be provided to the public to prevent outbreaks of waterborne disease. Providing safe drinking water is one of the most critical services following a disaster or large-scale emergency and is essential to community recovery efforts.

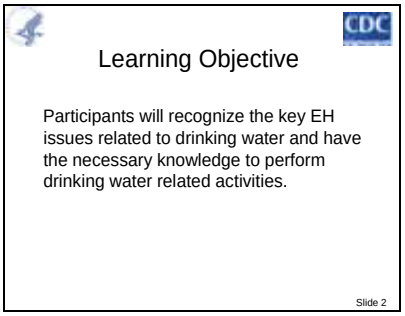
Environmental health (EH) practitioners play an important role in ensuring drinking water quality after a disaster event.



Slide 1

Learning Objective (Slide 2)

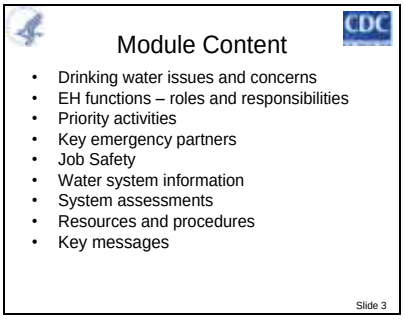
Participants will recognize the key EH issues related to drinking water and have the necessary knowledge to perform drinking water related activities.



Slide 2

Module Content (Slide 3)

This modules covers:
- Drinking water issues and concerns
- EH functions – roles and responsibilities
- Priority activities
- Key emergency partners
- Water system assessments
- Resources and procedures
- Key public messages



Slide 3

Reasons for Concern (Slides 4-5)

Disaster impacts to the drinking water infrastructure raises concern over:
- Quality – is the water safe to drink?
- Quantity – is there sufficient water to meet needs?

- Continuity – is the water supply subject to interruption?

Damage to water treatment plants and distribution systems can cause outages and the threat of contamination. To presence of coliform bacteria, e-coli, viruses, Giardia, Cryptosporidium, and other organisms pose a threat of waterborne illness. Other threats include chemical and radiological contamination.

Even without a disaster, there are reasons for concern with respect to the public water system infrastructure. All of the reasons below are major concerns and are likely to become more severe over time as existing infrastructure ages:

- Deteriorating systems;
- Population growth;
- Frequency of natural disasters;
- Terrorism threats, and
- Poor oversight of smaller water systems.

In 1994, the federal Government Accounting Office (GAO) conducted a multi-state survey of 5,520 private wells and found that:

- 41% were contaminated with coliform bacteria;
- 11% were contaminated with E-coli; and
- 65% had detectable nitrates.

Another survey was conducted by the State Water Resources Control Board (SWRCB) Groundwater Ambient Monitoring & Assessment (GAMA) Program on domestic wells to determine the incidence of contamination and to assess the status of water quality and well vulnerability. The wells surveyed were not classified as to well construction type or whether they had adequate seals, etc.

Slide 4

Slide 5

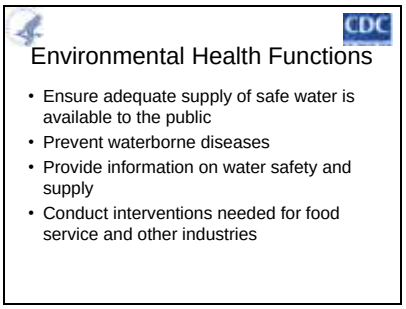
SWRCB GAMA Domestic Well Project Testing Results Summary [1]										
Number of Wells at or above CDHS Primary and Secondary Maximum Contaminant Levels (MCL/SMCL) and/or Notification Level (NL) [2]										
Focus Area (Year)	**Yuba (2002)[3]**		**El Dorado (2003-04)**		**Tehama (2005)**		**Tulare (2006)**		**Cumulative Domestic Well Project Total**	
Number of Wells Sampled	**128**		**398**		**229**		**181**		**928**	
Compound	***Number of Wells at or Above***		***Number of Wells at or Above***		***Number of Wells at or Above***		***Number of Wells at or Above***		***Number of Wells at or Above***	
Nitrate	***2***	**2%**	***7***	**2%**	***2***	**1%**	***75***	**41%**	***86***	**9%**
Total Coliform	***28***	**22%**	***104***	**26%**	***56***	**25%**	***60***	**33%**	***248***	**27%**
Fecal Coliform	***4***	**3%**	***13***	**3%**	***3***	**1%**	***15***	**8%**	***35***	**4%**

Notes:
1. The selection of wells sampled was based upon responses from a request mailed to well owners. Therefore, these results may not reflect the spatial distribution of domestic wells in the areas sampled.
2. MCLs and NLs are used for comparison since domestic well water quality is not regulated
3. Includes nine wells from 2002 Pilot Study

Roughly five percent of the public water systems in California serve 95 percent of the state's population. Most of the large water systems use surface water resulting in approximately 60 percent of drinking water coming from surface water sources and 40 percent from groundwater. Groundwater sources serve many smaller systems including individual homes. Individual domestic wells are generally not regulated once in use. New construction requires permits and inspection by the local EH jurisdiction. The California Department of Water Resources estimates that between 10,000 and15,000 new domestic wells are installed annually in the state.

Environmental Health Functions (Slide 6)

Local EH will likely be involved with drinking water supply issues after a disaster Along with drinking water systems, EH may also oversee aspects of alternative water supplies including bottled water, hauled water and ice. These three are regulated statewide by the CDPH Food and Drug Branch. EH needs to contact and work/collaborate with CDPH to ensure that the drinking water and ice brought in an affected community is safe for use.



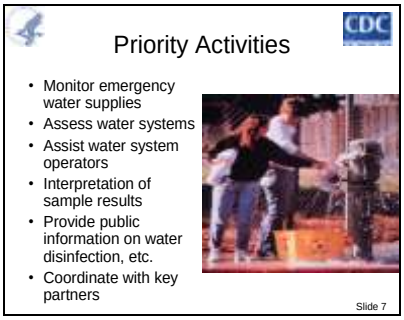
Slide 6

In short, EH drinking water functions include preventing waterborne illness through:

- Ensuring an adequate supply of safe water;
- Providing public information on water safety and supply;
- Working with water systems and homeowners to assist them in restoring water supplies; and

Conducting interventions as needed for food service and other facilities using water from compromised water systems.

Priority Activities (Slide 7)



Slide 7

The disaster-related priority activities for the California Department of Health (CDPH) Drinking Water Program (DWP), Local Primacy Agencies (LPAs) and local EH are typically as follows:

- Monitoring emergency water supplies
- Assessing water systems
- Assisting water system operators
- Interpretation of sample results
- Providing public information on water disinfection, etc.
- Coordinating with key partners

In disaster situations, there may be other priority activities related to drinking water as well. This priority list constitutes the first steps necessary to assess the situation, ensure services are safe and being restored, and to provide public information.

Key Partners (Slide 8)

Slide 8

In any situation, key partnerships are essential to providing safe water for the public. The EH practitioner, depending on the size of the event and other factors, may engage at various points of time with emergency management agency personnel, state and local health agencies, other EH departments, public works departments, volunteer and community organizations (American Red Cross for example), water haulers and purveyors, and those in federal Emergency Support Function roles. Another key partner is the media! They help get the word out to the public on water outages and recommended actions.

Safety (Slide 9)

Slide 9

Some key safety issues in all aspects of disaster response:

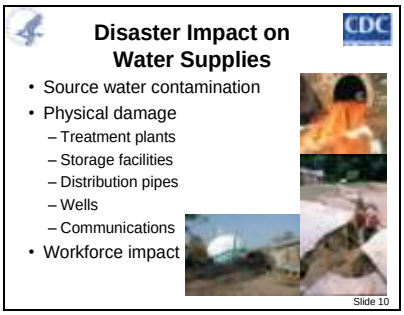
- Personal sanitation – keeping yourself clean. Washing hands, Clean and medicate cuts, food from safe sources
- Thermal stress – stay hydrated; carry water with you and remember to drink…if your urine is yellow, you are not getting enough water. Wear appropriate clothing for the weather.
- Stress - Take rest cycles – don't allow yourself or your team to become victims….get your needed rest.
- Personal protective equipment (PPE) - such as respirators may be needed in some situations. (Note: use of respirators requires an employer training and monitoring program.)

Disaster response and recovery work often requires working long hours under stressful conditions. Physical conditioning and proper rest cycles are important. An important item to remember is that recovery takes time. Don't be afraid to ask for help; you cannot do this alone; mutual aid and federal responders may be available to assist your agency.

Disaster Impacts on Water Supplies (Slides 10-11)

Disaster impacts on drinking water supplies can be seen at the water source and throughout the distribution system whether it be an earthquake, flood, or other disaster. Damage to the treatment plant itself is always a major concern. Disasters can also have a snowball effect, where not only is the infrastructure damaged, but transportation can be disrupted delaying needed contractors and replacement parts and the workforce may be unable to report to work. Area-wide impacts such as flooded wells can contaminate groundwater and require months or years of remediation leaving lasting impacts on a community.

California wild fires of recent years damaged many water systems both public and private. From destroyed water tanks to melted well casings and piping, fires can be devastating on a community that can be left without a safe water source.



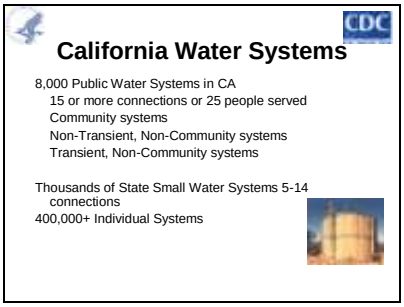
Slide 10

Slide 11

California's Water Systems (Slide 12)

There are approximately 8,000 public water systems in California classified by the number of service connections. Most of these systems are smaller, for example 2,000 systems serve less than 200 people.

CDPH regulates the larger systems with 200 or more service connections. CDPH has granted primacy (authority to regulate) to 35 local agencies (counties) that have chosen to receive the delegation. Local Primacy Agencies (LPA) regulate public water systems serving fewer than 200 service connections. CDPH regulates public water systems in the counties not delegated primacy. Water systems with less than 5 service connections are not regulated in much of California.



Slide 12

California's Drinking Water Program (Slides 13-14)

CDPH Drinking Water Program (DWP) is responsible for enforcing the Safe Drinking Water Act. The DWP consists of:

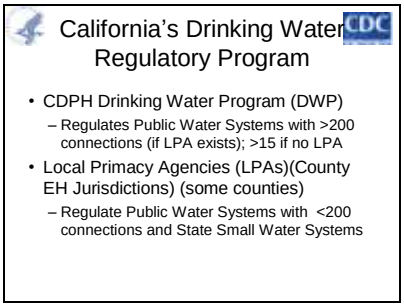
- Headquarters/Management (Sacramento)
- Northern California Field Operations Branch
- Southern California Field Operations Branch
- Technical Programs Branch

LPAs regulate smaller systems in 35 counties.

In 1976, California enacted its own Safe Drinking Water Act, requiring the state to regulate drinking water including setting and enforcing federal and state drinking water standards; administering water quality testing programs; and administering permits for public water system operations.

In 1989, significant amendments to the Act incorporated new federal safe drinking water act requirements into California law. This gave CDPH the discretion to set more stringent Maximum Contaminant Levels (MCLs) and recommended public health levels for contaminants of concern.

CDPH DWP offices are distributed throughout the state and concentrated in areas where the population is the greatest. DWP District Engineers can call on resources from other parts of the state to assist water systems in an affected area.

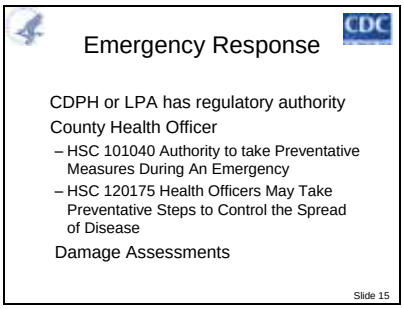


Slide 13

Slide 14

Emergency Response (Slide 15)

The California Health and Safety Code gives the local health officer the authority to take any preventive measure that may be necessary to protect and preserve the public health from any public health hazard during any "state of war emergency," "state of emergency," or "local emergency" within his or her jurisdiction. "Preventive measure" means abatement, correction, removal or any other protective step that may be taken against any public health hazard that is caused by a disaster and affects the public health.



Slide 15

Assessments (Slides 16-18)

EH professionals may be involved with water system surveys and assessments following a disaster if their agency regulates small water systems, is an LPA or if CDPH requires assistance.

After a major disaster, there may be representatives from various agencies and organizations working alongside each other in the EOC and in the field. Partnerships will be needed to get work done efficiently.

The general steps involved with conducting water system surveys include the following:

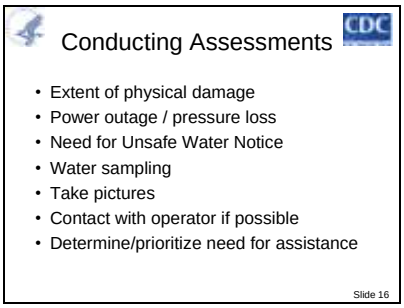
- Get maps and location data for systems (GPS location data is extremely helpful!);
- Contact the water system lead operator or owner if possible to find out if the system is operating or has damages; and then
- Send staff into the affected areas.

The first thing to consider is safety because unsafe conditions are very common in disasters, so assess each situation first before entering a damaged area.

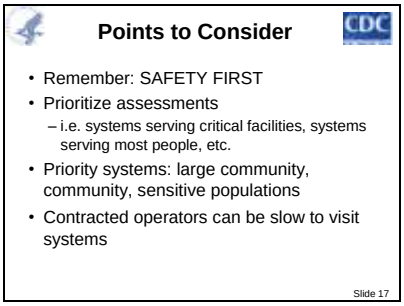
Field assessments capture critical first information such as is the system operating? Has the system sustained damage? Is there power? Water samples are typically taken during assessments to help prioritize which systems need assistance. Generally, the largest systems are assessed first, moving then down the system size classification list. This is part of risk reduction – taking care of the larger populations first. However, the local emergency management agency may have a list of water systems they would like to have assessed first for other reasons such as the types of populations they may serve i.e. hospitals, or other essential services.

Initial water system assessments help to establish recovery priorities while more detailed follow-up assessments may be conducted to measure the extent of damage and establish a timeline for recovery. Initial assessment for priority systems should be conducted within 12 hours. The data collected helps focus recovery efforts on water systems that can be brought on-line the soonest or serve the largest/ or most sensitive populations. It also identifies where additional assistance is needed, such as where power generators are needed. The 2007 Environmental Health Target Capabilities List recommends that public water systems be assessed within 14 days of the incident.

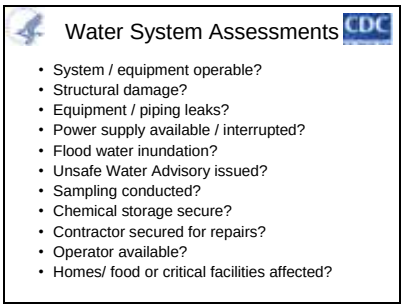
A specific assessment form should be used to distinguish the assessment from a routine inspection. A sample of a water system assessment form developed by CDC is shown in slide; the module appendix includes a sample assessment checklist.



Slide 16



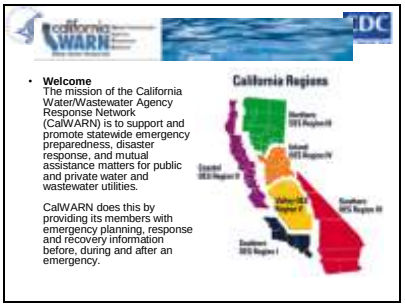
Slide 17



Slide 18

During this stage, it helps to develop a status monitoring system where all water system status updates can be tracked and managed. After the initial assessment, the next steps are to complete a more detailed assessment during a follow up visit made to collect additional information. The second, more detailed assessment will collect additional data such as the staffing levels available, hazardous materials storage area problems, leaks in the distribution system, problems with recovery operations, etc. Note that Cal EMA also performs some water system component assessments after a disaster through their Safety Assessment Program (SAP). Typically the SAP is interested in reservoir/dam safety type concerns.

CalWarn (Slide 19)

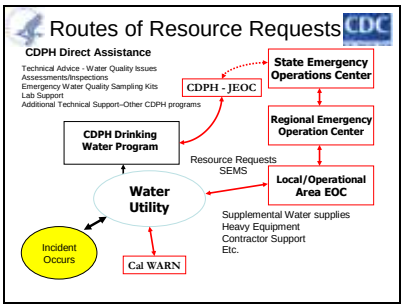


Slide 19

The Wastewater Agency Response Network (WARN) is a resources available for emergency response mutual aid. WARN resulted from a joint venture of utility firms providing aid to disaster-stricken areas. WARN provides assistance with mutual aid agreements and policy statements for joint assistance during disaster events. WARN can be modified for any mutual aid effort. See the module reference list for more information.

CalWARN provides its member utilities with a mutual assistance network for sharing emergency resources among members statewide. This assistance allows its members to respond and recover more quickly from a disaster. CalWARN also offers a forum for developing and maintaining emergency contacts and relationships and sharing new ideas from lessons learned in disasters. This mutual assistance program is consistent with other statewide mutual aid programs, the Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS).

Routes of Resource Requests (Slide 20)



Slide 20

CDPH serves in many capacities to assists water utilities through interacting with EH agencies, PWS and other organizations and acting as a liaison, when necessary, for obtaining additional resources. The CDPH Joint Emergency Operations Center (JEOC) activates during a disaster to support Department representatives at the medical/health desk at the State Operations Center (SOC) and/or Regional Emergency Operations Center (REOC) as well as programs internal to the Departments. The JEOC coordinates information and state

resources in support of the medical, public health, and environmental health response to the disaster. A major responsibility of the JEOC is the assignment/acquisition of state personnel, supplies and equipment when assistance is needed.

Safe Water In Emergencies (Slide 21-24)

EH may assist in the distribution of emergency drinking water supplies by providing technical assistance with vendors, containers, disinfection procedures, and other concerns. This may include the assessment of water tanks and vessels, disinfectant residuals, and water hauler source records.

Options for emergency drinking water include:

- Bottled water stored by emergency organizations such as the American Red Cross can be distributed;
- Local water supplies can be used in small events where treatment facilities are not affected;
- In cases where large amounts of drinking water are needed, regional beverage distributors can switch their facilities to produce canned/bottled water;
- Water can be hauled into affected areas;
- Emergency disinfection procedures can be instituted;
- The National Guard can set up water treatment units; and
- Requests for drinking water supplies can be submitted through the local emergency operations center.

Critical facilities including emergency shelters, mass feeding centers, hospitals and nursing centers, residential facilities and medical facilities that perform dialysis should be provided assistance during a water outage or unsafe conditions. Schools and food facilities should also be provided assistance with water problems.

Slide 21

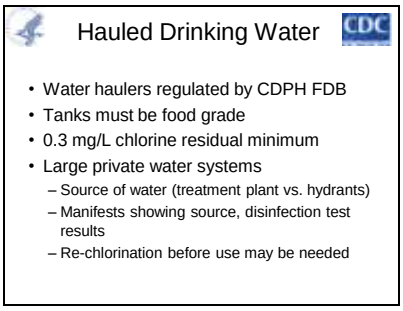
Slide 22

Slide 23

Slide 24

Hauled Drinking Water (Slides 25-27)

Because water is critical for many businesses to stay open, when there are water outages, business owners or others may resort to hauling water from external sources to satisfy their needs. Sometimes this water is obtained from unapproved sources and transported in questionable containers. Therefore, the source of water brought into a community must be known in order to protect public health. Manifests must be checked to determine the source of the water.



Slide 25

Hauled water used during an emergency must be obtained from an approved source and delivered to the user with a free chlorine residual of at least 0.3 mg/L (ppm). Note: Politicians and other influential groups, media, etc. often place pressure on health agencies to get businesses operating again, this pressure should not prevent EH professionals from thoroughly checking imported water supplies.

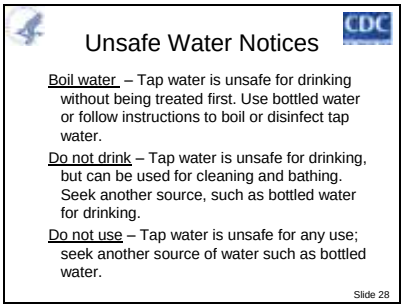
Slide 26

Water tanks and tanker trucks must be certified as “food grade.” In disaster situations, you may see many types of water hauling tanker trucks, and not all of them will be acceptable. If the source is safe and the tanks are food grade, then the imported water should be tested for chlorine residual to ensure its safety. In California, drinking water bottlers and haulers are regulated by the CDPH Food and Drug Branch. Check with CDPH for a list of approved water haulers and bottlers.

Slide 27

Unsafe Water Notices (Slide 28)

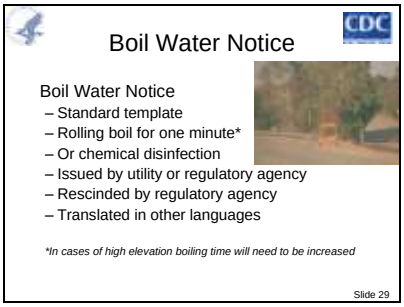
When it comes to water system emergencies, there are three main types of public notifications: 'Boil Water', 'Do Not Drink', and 'Do Not Use' based on the type of emergency and impact on drinking water supplies. An area-wide 'Unsafe Water Advisory' could be issued if a large area is affected by a disaster.



Slide 28

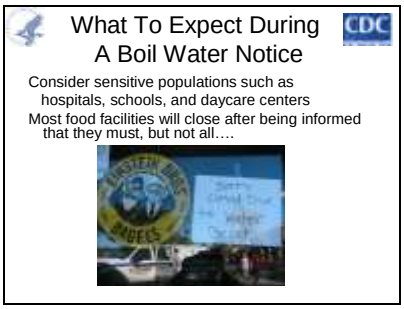
Boil Water Notice (Slides 29-30)

A Boil Water Notice is issued by a water system or regulatory agency in an emergency situation when there is concern that the integrity of a water system has been compromised or when the situation is unknown. The notice should also include information on treating water at home to make it safe to drink. For example, include the length of time needed to boil water for disinfection and the amount of bleach to use. Currently, the information provided by various public health organizations often differs on how to accomplish emergency disinfection of drinking water.



Slide 29

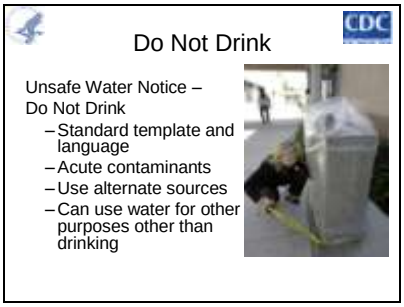
Inconsistencies between agencies can cause confusion and may lead to wasting water when water is scarce (in the case of instructing people to boil water for more than 1 minute). EH should ensure that adequate public notification has been made.



Slide 30

Do Not Drink (Slide 31)

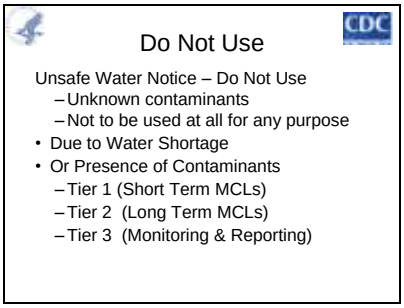
A 'Do Not Drink' notice is issued when disinfection of the water will not correct the problem and an alternate source of drinking water is needed. In this case consumers are not to drink or use the water in food preparation. It is acceptable however to use the water for bathing, washing clothes or dishes and other domestic uses.



Slide 31

Do Not Use (Slide 32)

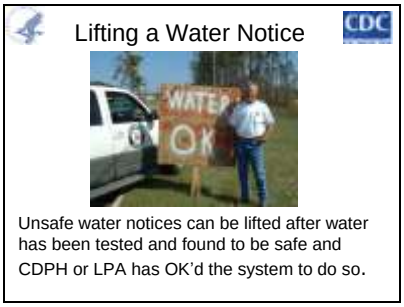
A 'Do Not Use' notice is issued when there is concern about contamination that has not yet been identified. This is the most restrictive notice; consumers are not to use the water for drinking or food prep, brushing teeth, bathing, washing clothes or dishes, or other domestic uses. Disinfecting the water in this case will not correct the problem; alternate sources of domestic water are needed.



Slide 32

Lifting an Unsafe Water Notice (Slide 33)

Unsafe Water Notices must only be lifted after the regulatory agency has given direction to the water utility to do so. There may be significant pressure on the regulatory agency from the utility, community or politicians to restore water service. Make sure that the water is safe to use first – CDPH can provide the guidance and if need be can help with handling the pressure.



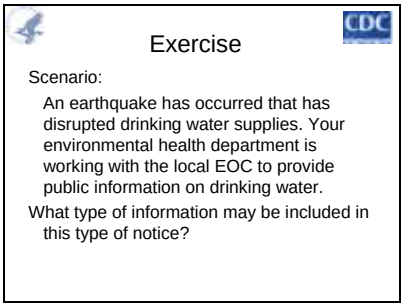
Slide 33

Exercise (Slide 34)

(SEE MODULE APPENDIX FOR WORKSHEET)

Scenario: A 7.0 earthquake has occurred in your area. Your EH department is working with the local Emergency Operations Center to provide the public information on drinking water supplies. As part of this effort, you have been asked to prepare a public notification. What type of information may be included in this type of notice?

Consult the *Disaster Field Manual for Environmental Health Specialists,* if available.



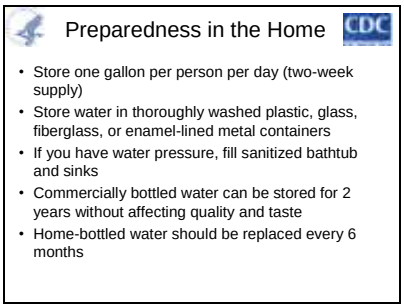
Slide 34

Preparedness in the Home (Slide 35)

Water should be a top priority in preparing for any disaster event, particularly in the home setting. It is recommended that for each family member, a two week supply of drinking water be stored. Recent disasters have shown that the previous recommendation of a 3-4 day supply is inadequate. People should be advised to store enough drinking water for at least 1 gallon per person per

day for 14 days with additional water for bathing, cleaning and pets.

Drinking water should be stored in clean, odor free, metal, plastic, or glass containers and replaced every 6 months. Sealed bottled water can be stored for up to two years if kept dry and cool. During an emergency, large quantities of water can be temporarily stored in bathtubs or sinks. Make sure they are clean and sanitized before filling.

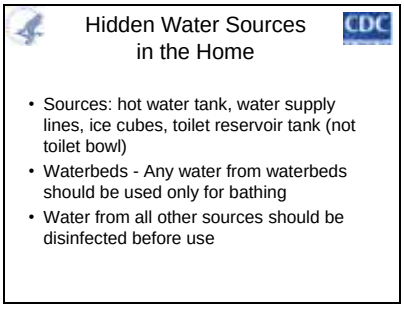


Slide 35

Hidden Water Sources in the Home (Slide 36)

If a disaster interrupts the supply of water, residents can utilize water in:

- hot water tank;
- toilet tank;
- pipes and faucets;
- ice cubes;
- pools and spas and waterbeds.

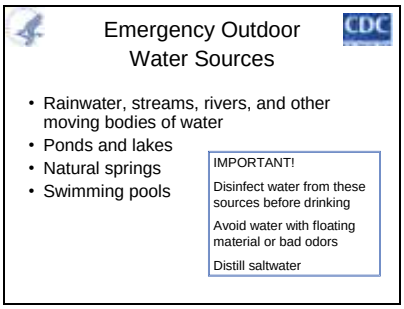


Slide 36

To use the water in a hot water heater tank, the electricity or gas supply must be first turned off. Then open the drain at the bottom of the tank. Start the water flowing by turning off the water intake valve at the tank and turning on a hot-water faucet. Refill the tank before turning the gas or electricity back on. If the gas is turned off, only a professional should turn it back on. To use the water left in pipes, identify and turn on the highest faucet in the home to let air into the plumbing, then water will flow to the lowest faucet. Not all of this water is suitable for drinking. Water obtained from outside of the home's plumbing system should be treated before use or restricted to bathing needs. Waterbed, pool, spa water is not suitable for drinking due to chemical additives.

Emergency Outdoor Water Sources (Slide 37)

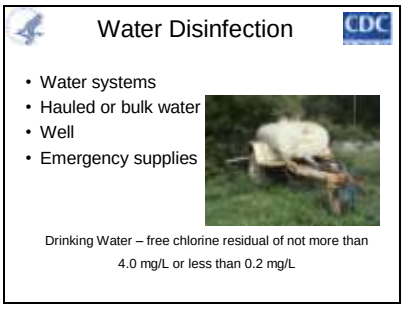
Additional water sources around the home include swimming pools, sprinkler systems, rainwater, streams, rivers, lakes, and natural springs. This water must be treated before drinking. Floodwater should not be used for drinking water since it may be contaminated with sewage and hazardous materials. Also, water with floating material, an odor or dark color should be avoided. Saltwater requires distillation before drinking.



Slide 37

Water Disinfection (Slide 38)

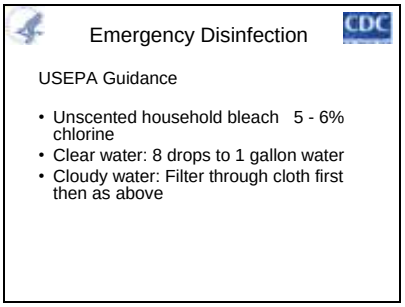
Emergency disinfection is often needed during a disaster for public water supplies, hauled or bulk water, and private systems using wells. For drinking water, the target concentration of chlorine should not exceed 2.0 mg/L (ppm) or less than 0.2 mg/L. A chlorine concentration of 4.0 mg/L* is the maximum residual disinfectant level that should be used for water that will be used for drinking and other domestic purposes. Minimum trace levels (i.e. 0.2 mg/L) are required at points of distribution throughout the system to provide protection.
*4.0 mg/L is noted as free chlorine levels



Slide 38

Emergency Disinfection (Slides 39-41)

The most commonly used disinfection chemical used in the United States is chlorine. It is widely available in three forms: gaseous chlorine (100% available chlorine ion) that is a liquid under pressure inside a cylinder and a gas when released (at atmospheric pressure); calcium hypochlorite (HTH) is a solid (powder, granular or tablet) that contains 65 to 75% chlorine ion; and sodium hypochlorite, a liquid that can vary from 3-6% (household bleach) to 12.5% (commercially available) chlorine.

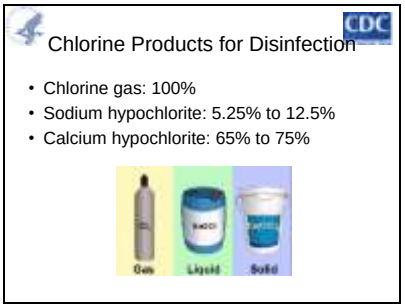


Slide 39

U.S. EPA recommends that bottled water from a safe course be used in an emergency, if bottled water is not available, boiling should be performed to make water safe. Boiling water will kill most types of disease-causing organisms that may be present. If the water is cloudy, filter it through clean cloths or allow it to settle, and draw off the clear water for boiling. Boil the water for one minute, let it cool, and store it in clean containers with covers.

Slide 40

If boiling is not possible, then disinfection with household bleach is recommended. Bleach will kill some, but not all, types of disease-causing organisms that may be in the water. If the water is cloudy, filter it through clean cloths or allow it to settle, and draw off the clear water for disinfection. Add 1/8 teaspoon (or 8 drops) of regular, unscented, liquid household bleach for each gallon of water, stir it well and let it stand for 30 minutes before using. Store disinfected water in clean containers with covers. Water is disinfected but never completely sterilized in this process.



Slide 41

EPA issues registration numbers for chlorine sanitizer solutions

suitable for disinfection use. Check bleach labels for the EPA registration number. Fresh bleach is more effective than older solutions. Bleach without added fragrance and other additives should be used.

Disinfection Principles (Slides 42-44)

To disinfect water, 3 pieces of information are needed:

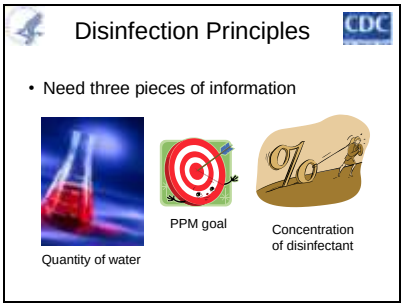
- Quantity of water to disinfect;
- Concentration of the disinfectant; and
- Target part per million (mg/L) residual.

In order to be effective, chlorine must be given adequate time to react with the microorganisms. The time required depends on the temperature and the pH of the water. Chlorine works best in water with a low pH and a high temperature. Higher disinfectant levels are needed for shorter contact times.

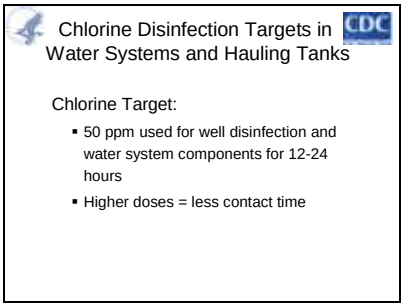
Chlorine disinfection concentration targets for water hauling tanks and components of water systems depend on the contact time used. For most system components, contaminated wells, and water tankers, a 50 ppm chlorine residual and a 12-24 hour contact time is recommended. If a shorter contact time is needed, then the chlorine concentration must be increased.

Public water systems should disinfect storage tanks and distribution systems in accordance with the procedures contained in AWWA standards: Standard C652-02 Disinfection of Water Storage Facilities; Standard 653-03 - Disinfection of Water Treatment Plants; Standard 654-03 Disinfection of Wells; and Standard C651-99 Water Mains. Such work should be performed under the direct supervision of a qualified distribution or treatment operator.

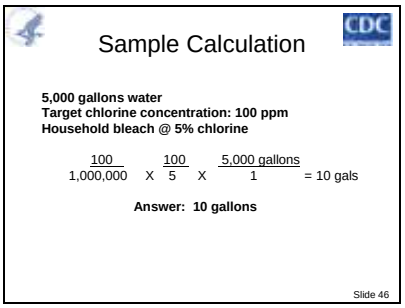
Note that the disinfection target provided here is for equipment disinfection purposes only, not for water to be used for drinking or other domestic uses. Local EH personnel should consult with a CDPH District Engineer, if they become aware of contamination issues associated with a public water system's storage tanks or distribution system, Local EH jurisdictions that are the LPA should work with water system operators for those water systems for which they have oversight. See module reference list for more information.



Slide 42



Slide 43



Slide 44

Below is a handy look-up table developed by the CDC that can be used to quickly determine the amount of household bleach (5-6% chlorine) needed to achieve various levels of concentrations referenced in this manual. If the volume of the container to be treated is not known, an estimate of the container's volume must be made via calculations or use of a table. See the module reference list for more information.

CDC Recommendations for Disinfection Dosages Using Household Bleach (5-6% Chlorine)

Quantity of Water (gal)	Desired Chlorine Concentration in Parts Per Million (ppm)					
	1ppm	**5ppm**	**25ppm**	**50ppm**	**100ppm**	**200ppm**
50,000	1 gal	5 gal	24 gal	48 gal	95 gal	190 gal
25,000	61 fl oz (7-3/4 cups)	3 gal	12 gal	24 gal	48 gal	95 gal
10,000	24 fl oz (3 cups)	5.00	5 gal	10 gal	19 gal	38 gal
5,000	13 fl oz (1-1/2 cups)	61 fl oz (7-3/4 cups)	3 gal	5 gal	10 gal	19 gal
2,000	5.1 fl oz (1/2 cup)	24 fl oz (3 cups)	1 gal	2 gal	4 gal	8 gal
1,000	2.6 fl oz (1/4 cup)	13 fl oz (1-1/2 cups)	61 fl oz (7-3/4 cups)	1 gal	2 gal	4 gal
500	1.3 fl oz (2-1/2 tbsp)	6.4 fl oz (3/4 cup)	31 fl oz (3-3/4 cups)	61 fl oz (7-3/4 cups)	1 gal	2 gal
200	0.5 fl oz (1/2 tbsp)	2.6 fl oz (1/4 cup)	13 fl oz (1-1/2 cups)	24 fl oz (3 cups)	49 fl oz (6 cups)	97 fl oz (12 cups)
100	0.25 fl oz (1-1/2 tsp)	1.3 fl oz (2-1/2 tbsp)	6.4 fl oz (3/4 cup)	13 fl oz (1-1/2 cups)	24 fl oz (3 cups)	49 fl oz (6 cups)
50	0.13 fl oz (3/4 tsp)	0.6 fl oz (1-1/4 tbsp)	2.6 fl oz (1/4 cup)	6.4 fl oz (3/4 cup)	13 fl oz (1-1/2 cups)	24 fl oz (3 cups)
25	0.06 fl oz (5/8 tsp)	0.25 fl oz (1-1/2 tsp)	1.3 fl oz (2-1/2 tbsp)	2.6 fl oz (1/4 cup)	6.4 fl oz (3/4 cup)	13 fl oz (1-1/2 cups)
10	0.03 fl oz (1/4 tsp or 16 drops)	0.13 fl oz (3/4 tsp)	0.6 fl oz (1-1/4 tbsp)	1.3 fl oz (2-1/2 tbsp)	2.6 fl oz (1/4 cup)	5.1 fl oz (1/2 cup)
5	0.01 fl oz (1/8 tsp or 8 drops)	0.06 fl oz (3/8 tsp)	0.25 fl oz (1-1/2 tsp)	0.6 fl oz (1-1/4 tbsp)	1.3 fl oz (2-1/2 tbsp)	2.6 fl oz (1/4 cup)

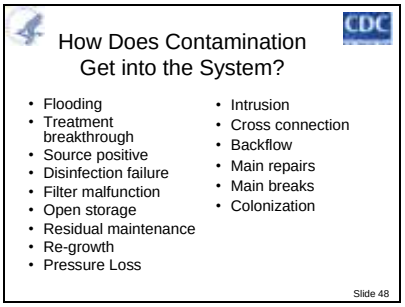
Notes: Use only unscented household liquid chlorine bleach. Concentration of bleach can vary between 5% - 6%. Quantities given in this table are approximate, and are rounded to the nearest practical measurement.

gal = gallon	tsp = teaspoon	1 cup = 8 fl oz
fl oz = fluid ounce	1 tbsp = 3 tsp	1 gal = 16 cups
tbsp = tablespoon	1 fl oz = 2 tbsp	1 tsp = 76 drops

Well Contamination? (Slides 45-46)

Slide 45

Almost any type of disaster event can impact drinking water supplies. Earthquakes, hurricanes, floods, tornadoes, mud slides, and terrorist attacks can damage water system infrastructure including dams, treatment plants, wells, and distribution networks. Fires can have a significant impact on water pressure, quantity and quality. In this slide, can you imagine the impact to drinking water quality if this area was served by private wells?

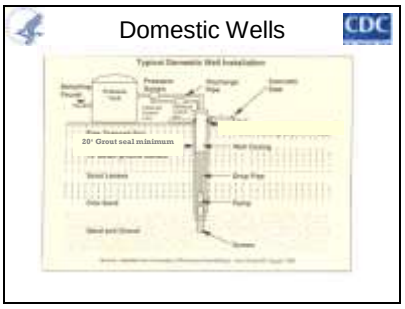


Slide 46

How contamination gets into a water system:

- Flooding
- Treatment breakthrough
- Source positive
- Disinfection failure
- Filter malfunction
- Open storage
- Residual maintenance
- Re-growth
- Pressure Loss
- Intrusion
- Cross connection
- Backflow
- Main repairs
- Main breaks
- Colonization

Domestic Wells (Slides 47-49)

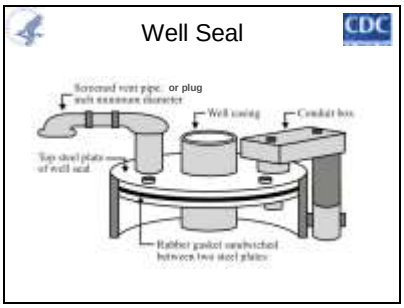


Slide 47

This diagram shows the major features of a drilled well including the well head, slab, casing and pressure tank. Drilled wells usually provide safe water and therefore are the most utilized type of private water supply system. The well is drilled into water-bearing strata, intercepting groundwater which is pumped to the surface. The well casing may be placed at varying depths depending on the type of the geologic formation. A twenty (20) foot seal is usually required between the borehole and the well casing to prevent the intrusion of surface water into the well. Head heads and casings are typically watertight and provide protection from contamination, however, all wells should be considered to be contaminated if subjected to flood waters.

The casing is usually metal but can be plastic pipe, six inches and up in diameter, that extends into the subsurface deep enough to prevent shallow ground water from entering the well.

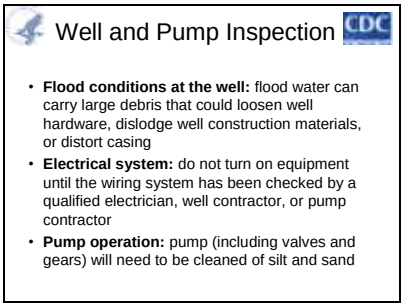
The casing should also extend a foot or two above the ground surface. (This is not done however, in areas subject to seasonal freezing.) A sealant, such as cement grout or bentonite clay, should be poured between the borehole and outside of the casing to the ground surface. A pad sloping away from the well head is typically created at the ground surface.



Slide 48

The well is capped to prevent surface water or precipitation from entering the well. The vent pipe can be a point of entry for contaminants but can also be an excellent place to pour disinfectants into a contaminated well without having to remove the well cap. Older wells may lack some of the mentioned sanitary features.

Submersible pumps, located near the bottom of the well, are most commonly used in drilled wells. Wells completed in a shallow water table may feature a jet pump located on top of the well or inside the home. Most modern drilled wells (especially in colder climates) incorporate a pitless adapter designed to provide a sanitary seal at the subsurface point below the frost line where the discharge water line leaves the well to enter the home. The device attaches directly to the casing below the frost line and provides a watertight subsurface connection, protecting the well from frost and contamination.



Slide 49

Disasters, including fires and floods, can damage wells by loosening well hardware, dislodging well construction materials or distorting the casing. Floods may cause some wells to collapse. Coarse sediments carried by the flood waters can enter the well and erode pump and electrical components. If the well is not tightly capped or properly sealed, sediment and contaminated flood water can enter the well or casing and contaminate the water supply. Wells that are more than 10 years old or less than 50 feet deep subjected to flood water are likely to be contaminated, even if there is no apparent damage.

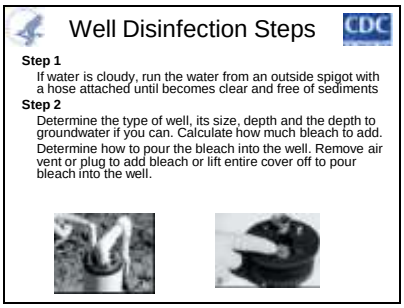
Well Disinfection Steps (Slides 50-53)

After any type of repair or maintenance to water system components, disinfection should be performed. For safety, assume all wells subjected to flood water or other disaster impacts are contaminated and require disinfection.

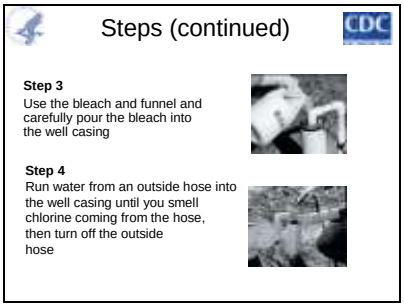
Well disinfection includes the following steps:

Step 1
If water is cloudy, run the water from an outdoor spigot with a hose attached until becomes clear and free of sediments.
Step 2
Determine what type of well it is and the diameter of the casing and well depth. Calculate how much bleach is needed to achieve a 50 ppm chlorine concentration or use a lookup table to determine (see step 9).
Step 3
Using unscented household bleach and a funnel, carefully pour the needed quantity of bleach into the well casing via the vent opening. Some wells have a sanitary seal with either an air vent or a plug that can be removed. Otherwise, the entire cap must be lifted off the well to provide a space for pouring bleach into the well.
Step 4
Run water from an outdoor hose until you smell chlorine coming from the hose, then turn off the outside hose.
Step 5
Turn on all inside and outside cold water faucets until you smell chlorine from each faucet then shut off all faucets.
Step 6
Wait 24 hours before turning the faucets back on. Do not use water during this period for any purpose because it contains high amounts of chlorine.
Step 7
After the 24 hour waiting period, turn on an outdoor spigot with hose attached and run water into a safe area where it will not disturb plants, lakes, streams, or septic tanks. There are restrictions on where heavily chlorinated water can be discharged! Check with the local storm water utility if you are unsure. Run the water until there is no longer a chlorine odor detected and then turn the water off.
Step 8
The system should now be disinfected. Take an initial bacteriological sample within 24 hours of disinfection.
Step 9
Have water re-tested for bacteria 7 to 10 days after disinfection.

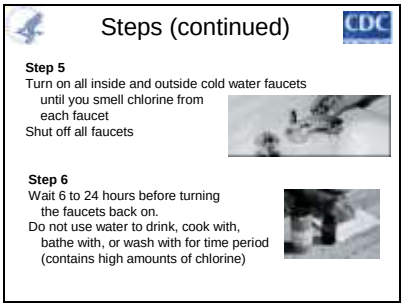
Important: An initial negative test may not be an indicator of long-term protection. It is advisable to test the well periodically after a disaster event (preferably monthly for the first 6 months – then at least annually afterward if samples continue to be negative).



Slide 50



Slide 51



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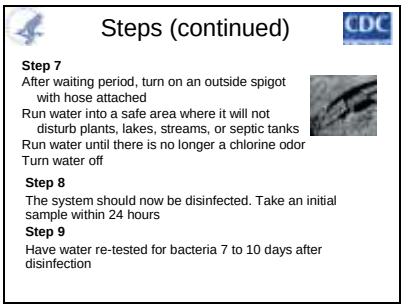


Slide 53

Disinfection of Well Casing or Pipe

Chlorine required to dose 100 feet of pipe at 50 ppm			
Diameter of Pipe or Casing (inches)	65% Available Chlorine (Calcium Hypochlorite or HTH)	25% Available Chlorine (Chloride of Lime)	5% Available Chlorine (Household Bleach)
2	¼ ounces	½ ounces	2 fl. ounces
4	1 ounce	2 ounces	9 fl. ounces
6	2 ounces	4 ounces	20 fl. ounces
8	3 ounces	7 ounces	2 ½ pints
10	4 ounces	11 ounces	3 ½ pints
12	6 ounces	1 pound	5 pints
16	10 ounces	1 ¾ pounds	1 gallon
20	1 pound	3 pounds	1 2/3 gallons
24	1 ½ pounds	4 pounds	2 1/3 gallons

For solids and powders: 1 ounce = 28 grams

Be prepared to provide this information to homeowners with wells along with lists of well contractors, water testing laboratories, etc. This will help homeowners with the recovery process.

Water Sampling (Slides 54-56)

EH practitioners will often be involved with collecting water samples for bacteriological analysis after a disaster. Here is an overview of the steps involved in collecting water samples.

Before sampling, have all of the supplies at hand, including:
- Cooler for storage and shipping of samples;
- Ice for shipping cooler;
- Polyvinyl Chloride (PVC) or Neoprene gloves (optional);
- Sample bottles with sodium thiosulfate for chlorinated systems - sterilized 125 mL plastic bottles most common; and
- Lab slips, labels, and markers;

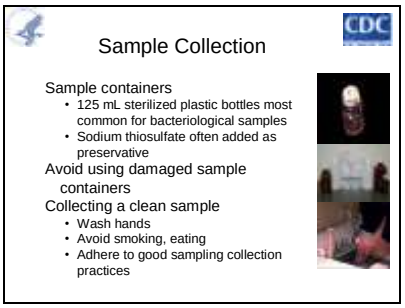
Other recommended items:
- Paper towels for drying off sample containers;
- Plastic storage baggies for ice and sample container; and
- Method of cleaning sample tap i.e. alcohol wipes.

Pre-sampling handwashing is highly recommended for the sample collector. Also, food and drink should never come into contact with the sample or its containers. Foreign objects such as these have been suspected of causing false results in

Slide 54

Slide 55

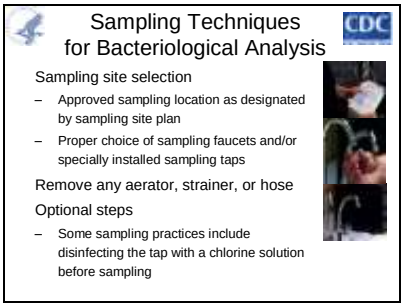
samples, so be sure to practice good clean sample collection procedures.



Slide 56

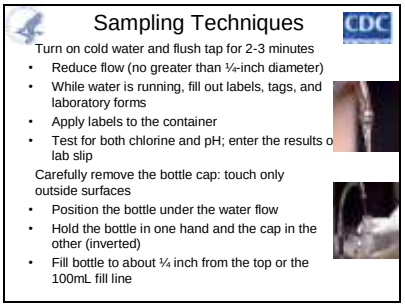
Sampling Technique for Bacteriological Analysis (Slides 57-61)

The laboratory that supplies the sampling containers normally provides sampling instructions with the sampling kit. Refer to those instructions when provided. Sampling site selection should be based on an approved sampling plan that has the sampling locations designated, if available. Some locations will have may have designated sampling faucets and/or specially installed sampling taps. When sampling at homes with wells, sample where people normally get their drinking water e.g. kitchen sink. Utility companies usually won't sample inside homes, they typically sample from an outdoor spigot.



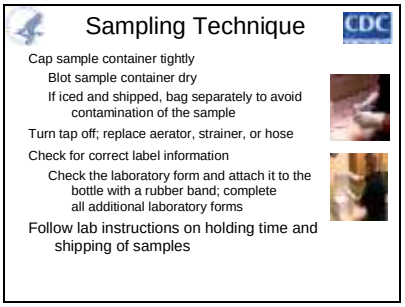
Slide 57

The following instructions are general sampling procedures for collecting samples for bacteriological (coliform and E. coli) analysis.



Slide 58

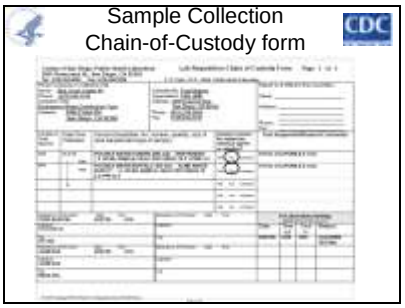
Step 1
Remove any aerator, strainer, or hose from the tap. Optional step: some sampling practices involve treating the tap with a chlorine solution, or even flaming the tap.
Step 2
Turn on cold water and flush tap for 2–3 minutes. Then reduce flow to no greater than ¼-inch in diameter. While water is running, fill out labels, tags, and laboratory forms, apply labels to the container, etc. Test the water for both chlorine and pH levels; enter the results on the lab slip.
Step 3
Carefully remove the sample bottle cap touching only the outside surfaces of the container. Hold the bottle in one hand and the cap in the other. Position the bottle under the water flow and fill bottle to about ¼ inch from the top or the 100-mL fill line. Cap sample container tightly and blot sample container dry.



Slide 59

Step 4
Turn tap off, replace aerator, strainer, or hose. Check for correct label information, place sample container in a bag and place in cooler with ice. Check the laboratory form and attach it to the bottle with a rubber band; complete all additional laboratory forms. Bag samples and ice separately

Step 5
Samples should be refrigerated or cooled to below 10° Celsius (50° Fahrenheit). Use ice packs and coolers during transport. Deliver the samples if lab is close by, or use an overnight courier service. Tape the ice chest closed before shipping. Laboratory analysis must begin within 30 hours of sample collection.



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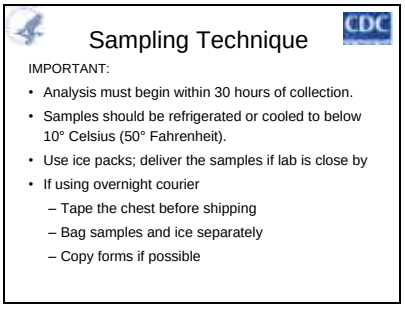


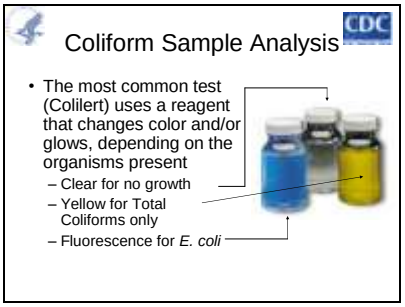
Slide 61

Coliform Sample Analysis (Slides 62-63)

In the laboratory reagent is added to the water sample, the liquid remains clear (see slide) if the total *Coliform* count in the sample is less than 1 colony-forming-unit or 1cfu/100ml and turns yellow (right hand photo) if the total *Coliform* count is above 1 cfu/100ml of water in the water. The yellow color indicates a 'coliform present' result. Blue fluorescence indicates the presence of *Escherichia coli* , or *E. coli* for short.

A ‘coliform present’ result indicates that the water source may have been contaminated by surface water. Coliform bacteria are found throughout the environment and tend to live longer than pathogenic (disease-causing) microbes and be easily cultured in the laboratory. Coliform bacteria themselves are not considered pathogenic but serve as an indicator of contamination.

Fecal coliforms are bacteria that occur naturally in the digestive tract and therefore are found in the feces of humans and other warm-blooded animals. Feces may also contain bacterial and viral pathogens. Because these pathogens are relatively scarce in water, it is difficult and time consuming to monitor directly for them. The presence of *E. coli* in water has become accepted as indicative of recent fecal contamination and the possible



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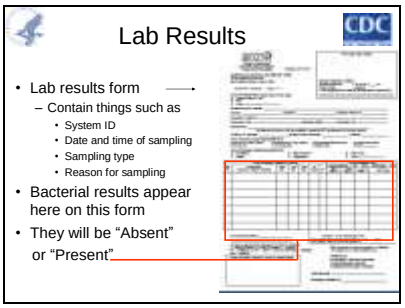


Slide 63

presence of pathogens. Diseases and illness such as typhoid fever, hepatitis, gastroenteritis, dysentery, and ear infections are associated with waters with high fecal coliform counts.

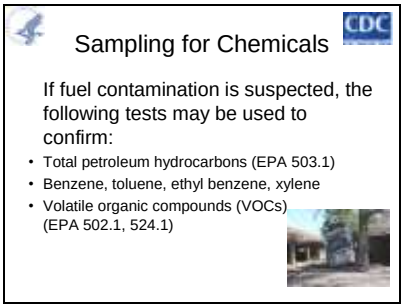
Sampling for Chemicals (Slides 64-65)

The release of petroleum, gasoline and other fuels can be a big concern in disaster events. During Hurricane Katrina spilled fuels caused much of the assessment work EH practitioners performed. When there is concern that drinking water supplies have been contaminated with petroleum hydrocarbons and fuel additives, water sampling for chemical analysis is often performed. If fuel contamination is suspected, analyses for the following constituent is typically performed:

- Total petroleum hydrocarbons (TPH);
- Benzene, toluene, ethyl benzene, xylene (BTEX); and
- Volatile organic compounds (VOC).

Other analysis may be performed as well, especially if flood waters have impacted water supplies:

- Pesticide scans;
- Metals such as lead; and
- Inorganics such as arsenic.



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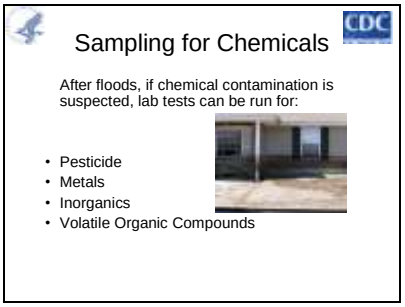


Slide 65

Collecting Organic Samples (Slide 66)

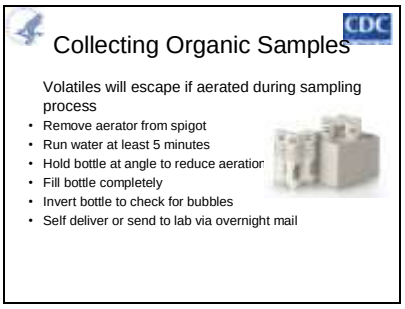
Water sampling for chemical analysis is different from bacteriological sampling. Volatile organic compounds may escape the sample if proper sample collection techniques are not followed. The laboratory that supplies the sampling containers normally provides sampling instructions with the sampling kit. Refer to those instructions when provided.

The following instructions are for collecting samples for chemical analysis:

Step 1
Remove any aerator, strainer, or hose from the tap.

Step 2
Turn on cold water and flush tap for 5 minutes. Then reduce flow to no greater than ¼-inch in diameter. While water is running, fill out labels, tags, and laboratory forms, apply labels to the container, etc.

Step 3
Carefully remove the sample bottle cap touching only the outside



Slide 66

surfaces of the container. Hold the bottle in one hand and the cap in the other. Position the bottle under the water flow holding the bottle at angle to reduce aeration. Fill container completely (no air space). Invert bottle to check for bubbles, if bubbles are present, pour out and retake sample. Cap the sample container tightly and blot sample container dry. Invert the sample container and check for air bubbles. If bubbles are present, pour out and retake the sample.

Step 4

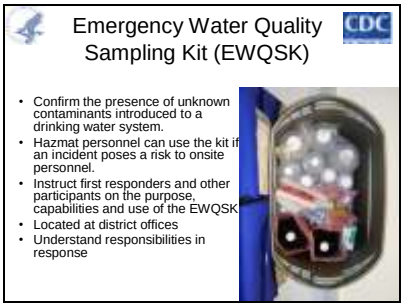
Turn tap off, replace aerator, strainer, or hose. Check for correct label information, place sample container in a bag and place in cooler with ice. Check the laboratory form and attach it to the bottle with a rubber band; complete all additional laboratory forms. Bag samples and ice separately.

Step 5

Samples should be refrigerated or cooled to below 10° Celsius (50° Fahrenheit). Use ice packs and coolers during transport. Deliver the samples if lab is close by, or use an overnight courier service. Tape the ice chest closed before shipping. Laboratory analysis must begin within 24 hours of sample collection.

Emergency Water Quality Sampling Kit (Slide 67)

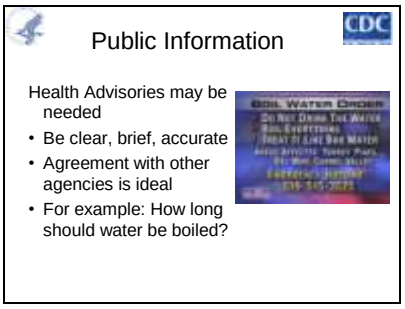
Emergency Water Quality Sampling Kits (EWQSK), located at each CDPH DWP Field Office, are used to determine the presence of chemical contaminants introduced to a drinking water system in the event that law enforcement has determined that a credible threat has occurred. CDPH DWP will coordinate with local hazardous materials responders and law enforcement to collect and transport samples to the state laboratory in Richmond for analysis. CDPH offers a class to instruct first responders and other participants on the purpose, capabilities and use of the EWQSK and to understand water-related responsibilities in disaster response.



Slide 67

Public Messages (Slides 68-69)

An important function for EH is providing public information on drinking water safety after a disaster. To be effective in this function, EH should have a communications plan. Working with the EH agency's or county's Public Information Officer (PIO) is a must for keeping information on drinking water safety out in front of the public.



Slide 68

Keep in mind that due to the 24/7 news cycle, the internet, and other rapid communications methods, there is an accelerated speed at which information reaches the public.

During an emergency, the media and the public will have many questions, especially if an unsafe water notice has been issued. Expect the public to be concerned and upset during an emergency. During events when public health is in question, it may be necessary to issue health advisories. It is best to have advisory template prepared in advance to expedite incident-specific issuance.

REMEMBER!
Preparing Public Messages

Your public messages should adhere to the STARCC principle:

- **S**imple - Frightened people don't want to hear big words
- **T**imely - Frightened people want information NOW
- **A**ccurate - Frightened people won't get nuances so give it straight
- **R**elevant - Answer their questions and give action steps
- **C**redible - Empathy and openness are key to credibility
- **C**onsistent - The slightest change in the message is upsetting and dissected by all

Slide 69

Unfortunately, emergency public health information is not always easy to find, accurate or clear. Develop key messages to use with the media that are clear, brief, and accurate. And make them easy to find. If this information is provided on-line, provide a prominent link on your agency homepage such as a button labeled "important disaster/emergency information" that links directly to a page with the information. It should take no more than one or two clicks to locate this information.

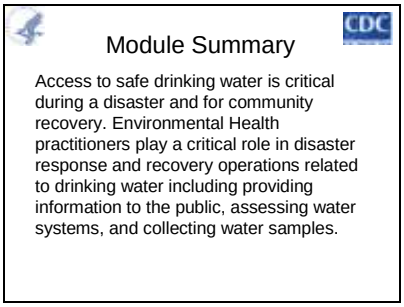
Get the facts right, repeat them consistently through your department or county PIO and ensure that local government agencies use the same information as much as possible. Emergency messages should be coordinated with local and state officials. If your messages are different from other agencies be prepared to explain why. Erroneous or conflicting information can make a disaster situation worse by increasing anxiety and damaging agency credibility. Consistency helps to avoid confusion and maintains the public trust.

Chose words carefully when developing a public message! Avoid using jargon or acronyms that are not universally understood. Ensure that field and office staff know how to deal with questions from the media and the public. It may be necessary to establish protocols for how to direct questions to a spokesperson or hotline.

Having standardized disaster information prepared in advance will help get emergency information out rapidly. Regularly review emergency messages for needed revisions and updates. Any information posed on websites should be kept current. The STARCC principle is from the CDC's *Crisis and Emergency Risk Communication by Leaders for Leaders.* See the module reference list for more information.

Module Summary (Slide 70)

Access to safe drinking water is critical during a disaster and for community recovery. Environmental health practitioners play a critical role in disaster response and recovery operations related to drinking water including providing information to the public how to treat drinking water when needed, assessing water systems and hauled water supplies, and collecting water samples for bacteriological and chemical analysis.



Slide 70

Module 3 Acronyms

AWWA	American Water Works Association
BTEX	Benzene Toluene Ethylbenzene Xylene
CAHAN	California Health Alert Network
Cal EMA	California Emergency Management Agency
CalWARN	California Water Agency Response Network
CCDEH	California Conference of Directors of Environmental Health
CDC	Centers for Disease Control and Prevention
CDPH	California Department of Public Health
CDPH FDB	California Department of Public Health Food and Drug Branch
CWS	Community Water System
DFM	Disaster Field Manual (CCDEH manual)
DWP	Drinking Water Program
DWR	Department of Water Resources
EH	Environmental Health
ELO	Enabling Learning Objective
EMA	Emergency Management Agency
EPA	Environmental Protection Agency
EOC	Emergency Operations Center
ESF	Emergency Support Function
EWQSK	Emergency Water Quality Sampling Kit
GAMA	Groundwater Ambient Monitoring and Assessment
GAO	General Accountancy Office
HTH	Calcium hypochlorite (High Test Hypochlorite)
JEOC	Joint Emergency Operations Center
LPA	Local Primacy Agency
MCL	Maximum Contaminant Level
Mg/L	Milligrams per liter
NEHA	National Environmental Health Association
NTNC	Nontransient Noncommunity
OES	Office of Emergency Services
PIO	Public Information Officer
PPE	Personal Protective Equipment
ppm	Parts Per Million
PWS	Public Water System
REOC	Regional Emergency Operations Center
SAP	Safety Assessment Program
SDWA	Safe Drinking Water Act
SEMS	Standardized Emergency Management System
SOC	State Operations Center
SWRCB	State Water Resources Control Board
TNC	Transient Noncommunity

TLO	Terminal Learning Objective
TPH	Total Petroleum Hydrocarbons
VOC	Volatile Organic Compound
WARN	Water Agency Response Network

Module 3 Appendix

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Module #3 Drinking Water
Exercise Worksheet

Scenario: A 7.0 earthquake has occurred in your area. Your EH department is working with the local Emergency Operations Center to provide the public information on drinking water supplies. As part of this effort, you have been asked to prepare a public notification. What type of information may be included in this type of notice?

Consult the *Disaster Field Manual for Environmental Health Specialists,* if available.

TEXT HERE:

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DRINKING WATER SYSTEM ASSESSMENT CHECKLIST

Facility Name/ID#				**Point of Contact**		
acility Address						
Type	☐ Community	☐ Non-community	☐ NC,NT	☐ State Small	☐ Residence	☐ Other
Source	☐ Surface	☐ Well	☐ Spring	☐ Other	**Service Connections**	_____

Assessment Points	**Status**				**Comments**
	YES	**NO**	**NA**	**UNK**	
System operable					
Structural damage –Treatment					
Structural damage – Distribution					
Structural damage – Storage					
Equipment or piping leaks					
Power supply interrupted					Duration:
Generator power					
System depressurized					
Flood water inundation					
Unsafe water notice issued					Type:☐ BWN ☐ DND ☐ DNU
Unsafe water notice lifted					
Water samples collected					Type:
Competent operator available					
System disinfected					
Acceptable disinfectant residual					
Treatment chemicals available					
Chemical storage secure					
Contractors secured for repairs					

Additional comments

System Status	☐ Operating	☐ Not operating	☐ Permit modification needed	☐ Follow up needed

Specialist Name	**Date/Time**

USE REVERSE SIDE FOR ADDITIONAL INFORMATION

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Module 4 Food Safety

Environmental Health Training in Emergency Response (EHTER) – Introductory Level

California Version

Participant Manual

August 2010

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Module 4 Food Safety

Duration

One and one half (1.5) hours

Scope Statement

This module will introduce participants to a variety of issues and concerns associated with food safety, preparation, and disposal after emergencies and disasters. It will also highlight appropriate measures to address these issues and concerns and mitigate their adverse effects.

Terminal Learning Objective (TLO)

Participants will recognize the key EH issues related to disaster food safety and have the necessary knowledge to perform food-related activities.

Enabling Learning Objectives (ELO)

After completion of this module, participants will be able to:

4-1. Identify food safety issues and concerns faced in emergencies and disasters.
4-2. Recognize the role of EH practitioners in addressing food safety issues.
4-3. Explain basic concepts and principles of disaster food safety.
4-4. Identify key messages related to food safety issues and concerns for response partners, industry, and the general public.
4-5. Identify key emergency response partners.
4-6. Locate resources used to address food safety issues and concerns during emergencies and disasters.

Resources

Course participant manual
Module 4 PowerPoint slides
Exercise Worksheet
Food Locker video (optional)
Sample Assessment Checklist

Instructor to Participant Ratio

1:50 or less

Reference List

ARC: Food Safety in a Power Outage
https://americanredcross.com/services/disaster/0,1082,0_564_,00.html

CCDEH: California Conference of Directors of Environmental Health *Disaster Field Manual for Environmental Health Specialists*

http://www.ccdeh.com/products/disaster_field_manual_info.htm

CDC: *Crisis and Emergency Risk Communication by Leaders for Leaders*
http://www.bt.cdc.gov/erc/leaders.pdf

CDC: *Cleaning and Sanitizing with Bleach after an Emergency July 2008*
http://www.bt.cdc.gov/disasters/bleach.asp

CDC: Emergency and Terrorism Preparedness Web site provides a one-stop shop for environmental health practitioners. There is a specific section on food.
http://www.cdc.gov/nceh/ehs/ETP/default.htm

CDC: Emergency and Terrorism Preparedness Web site for Environmental Health Practitioners: http://www.cdc.gov/nceh/ehs/ETP/

CDC: Food and Water in Emergencies: http://www.bt.cdc.gov/disasters/foodwater

CDC: Environmental Health Emergency Response Guide
http://www.cdc.gov/nceh/ehs/Docs/EH_Emergency_Response_Guide.pdf

CRFSC: Cal Code http://www.crfsc.org/calcode/default.asp

FEMA: Disaster Types: http://www.fema.gov/hazard/types.shtm

FEMA: Target Capabilities List http://www.fema.gov/pdf/government/training/tcl.pdf

FDA: What Consumers Need to Know: http://www.cfsan.fda.gov/~dms/fsdisas.html

FDA: Investigations Operations Manual
http://www.fda.gov/ora/inspect_ref/iom/ChapterText/8_5.html

FDA: Reference state plans and FDA Food Code
http://www.cfsan.fda.gov/~dms/foodcode.html

FDA: Guidelines for Retail and Foodservice Establishments Affected by Natural or Other Disasters
http://www.aamp.com/foodsafety/documents/FSIS-FDAGuidelines-RetailandFoodservice.pdf

Michigan: Emergency Action Plan for Retail Food Establishments:
http://www.michigan.gov/documents/MDA_EmergencyActionPlan_109428_7.pdf

Michigan: Flip Chart of Emergency Procedures:
http://www.michigan.gov/documents/MDA_FSPR_EmergencyFlipChart_Jan06_148793_7.pdf

NACCHO: Emergency Handbook for Food Managers:
http://www.naccho.org/topics/demonstration/APC/MN.cfm

USDA: Resources for Food Safety and Storage in Emergency Situations:
http://www.nal.usda.gov/fnic/emerg.html

USDA: Keeping Food Safe:
http://www.fsis.usda.gov/Fact_Sheets/keeping_food_Safe_during_an_emergency/index

Practical Exercise Statement

This module contains one exercise.

Assessment Strategy

In-class questions, participation in exercises, and module summary discussion.

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Module 4 Slides

Food Safety Module (Slide 1)

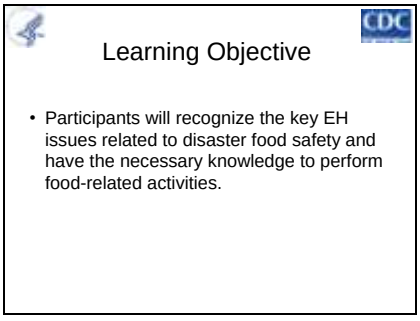
Due to a disaster, homes, markets and restaurants may suffer damage that disrupts the normal sources of food and requires operation of mass feeding centers. Both damaged food establishments and mass feeding operations need environmental health (EH) surveillance to prevent foodborne illnesses.

Food safety is a major area of responsibility for EH practitioners. Keeping food safe for both the public and emergency responders is key to helping the affected community recover.

Slide 1

Learning Objective (Slide 2)

Participants will recognize the key EH issues related to disaster food safety and have the necessary knowledge to perform food-related activities.

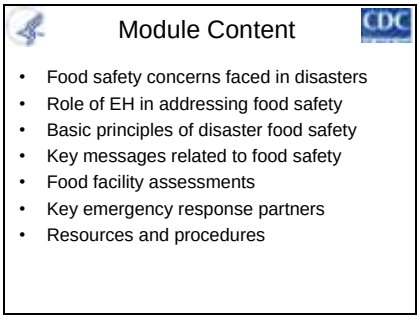


Slide 2

Module Content (Slide 3)

This module covers:

- Food safety concerns faced in disasters
- Role of EH in addressing food safety concerns
- Basic principles of disaster food safety
- Food facility assessments
- Key emergency response partners
- Resources and procedures
- Key messages related to food safety concerns for response partners, industry, and the general public



Slide 3

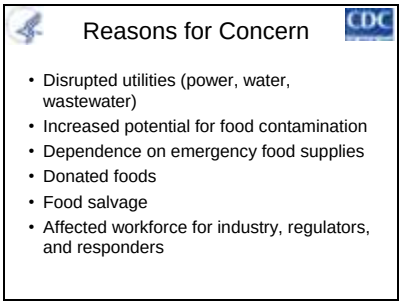
Reasons for Concern (Slides 4-6)

Floods, earthquakes, hurricanes, tornadoes and other disasters create situations where damaged infrastructure can cause the loss of power and other utilities. The loss of potable water and electricity can create a higher risk for food safety and increase the potential for contaminated food and foodborne illness. Damaged food facilities and homes can create a greater demand for emergency food supplies.

Disaster-related food safety concerns include:

- Disrupted utilities (power, water, wastewater);
- Increased potential for food contamination;
- Dependence on emergency food supplies;
- Donated foods;
- Improper food salvage;
- Food handlers affected by the disaster and may be unavailable; and
- Agroterrorism or bioterrorism incidents.

Slide 4



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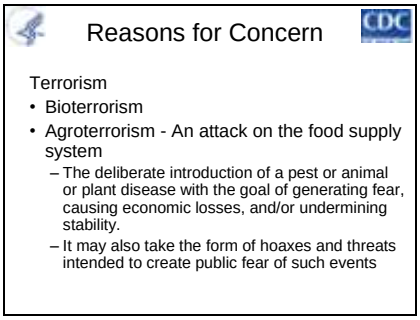
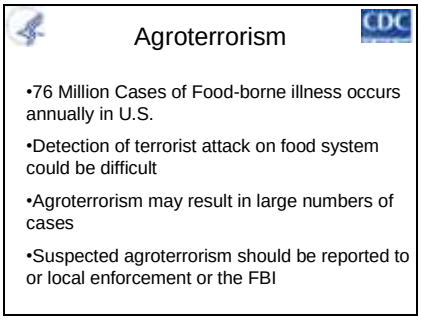


Slide 6

Agroterrorism (Slide 7)

Agroterrorism, which includes attacks against the food system may be conducted by an individual or group whose intent is to instill fear or cause harm to people and facilities. Contamination of the food supply, whether intentional or unintentional, falls into four general categories:

- Inorganics e.g. toxic metals or cyanide;
- Organics e.g. pesticides or volatile compounds;
- Radionuclides; and
- Pathogenic microorganisms.

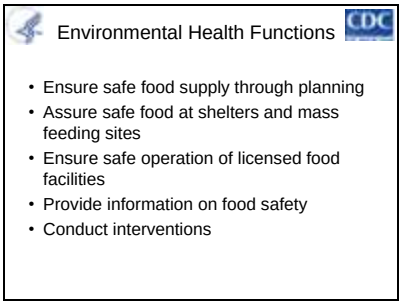


Slide 7

Over 76 million cases of foodborne illness occur annually in United States making detection of a terrorist attack on the food system potentially difficult, at least initially. Agroterrorism may be slow to manifest itself, difficult to detect, and hard to identify as terrorist-initiated. It may be possible to distinguish agroterrorism from a naturally occurring infectious disease outbreak if it results in a larger number of cases of a disease that occurs naturally. In some areas of the state, certain zoonotic diseases are endemic and so a disease outbreak due to agroterrorism could occur and appear to be natural in origin, however large outbreaks, outbreaks in non-endemic disease areas or out of season, should raise concern for terrorism. Suspected agroterrorism should be reported to local law enforcement or the Federal Bureau of Investigations (FBI).

The food system is vulnerable to terrorism from farm to fork. Many community members play a vital role in prevention and response to food supply terrorism incidents. Responders include EH professionals along with law enforcement and emergency agencies.

Environmental Health Functions (Slide 8)

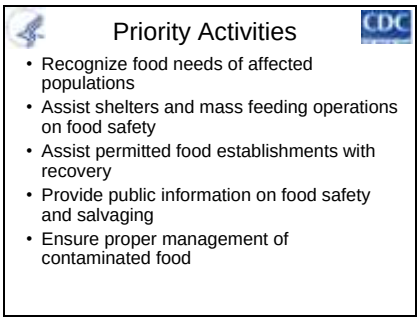


Slide 8

There is a continuum of food safety activities to prepare for disasters that may be one day away or a decade away and ensure food safety during disasters and during disaster recovery. Often the focus is on the event and the few days or weeks afterward. Your food safety disaster work needs to go on a lot longer than that. Specifically, EH functions to prevent foodborne illness after a disaster by:

- Ensuring a safe food supply through planning;
- Assuring safe food is served at shelters and mass feeding sites
- Ensuring the safe operation of licensed food facilities
- Providing information on food safety to the public; and
- Conducting interventions as needed.

Priority Activities (Slide 9)



Slide 9

Prevention of foodborne illness outbreaks through maintaining food safety in shelters and mass feeding centers will be a high priority for EH practitioners working for local agencies. Surveillance and assessment of these facilities will be needed to ensure the safety of the people being served. EH practitioners may also provide the following services during and following a disaster:

- Recognizing the food needs of the affected population;
- Technical assistance and food safety training at shelters, mass feeding centers, and other institutions;
- Technical assistance to food establishments;
- Assessment of recovering food facilities;
- Surveillance for ad hoc food vendors and facilities;
- Information on food salvaging;
- Surveillance of collection and disposal of contaminated food;
- Advice for community leaders, food establishments and the public on food safety; and
- Assistance to State Food and Drug with wholesale and food storage facilities.

Key Partners (Slide 10)

Slide 10

Some of EH's key partners are the local (city or county) emergency management agency that helps coordinate the emergency response effort. Environmental health will typically operate in the field under the Operations Section of the Incident Command system (ICS) to assist with food safety issues. Other partners include the California Department of Public Health (CDPH) Food and Drug Branch (FDB). Local EH has jurisdiction over the retail food program while the FDB has responsibility for wholesale food facilities. The California Department of Food and Agriculture (CDFA); the local public health agency, neighboring EH departments and the local agricultural commissioner play a role in protecting the food supply.

On the federal level, the Food and Drug Administration (FDA) and the Centers for Disease Control and Prevention (CDC) provide support through:

- ESF #6 – Mass Care, Emergency Assistance, Housing & Human Services, and
- ESF #8 – Public Health & Medical Services

In the case of food supply terrorism, the state and/or federal Homeland Security agencies, FDA and the FBI will be involved as well. For mass feeding operations, partners include the American Red Cross and several other Volunteer Organizations Active in Disasters (VOAD) that provide emergency food to affected populations.

Safety (Slides 11-12)

Slide 11

Some key safety issues in all aspects of disaster response:

- Personal sanitation;
- Physical hazards;
- Biological hazards;
- Chemical hazards;
- Radiation hazards; and
- Confrontations.

Personal sanitation is critical. Wash hands frequently, clean and medicate cuts and make sure that food consumed is from safe sources.

Thermal stress can be an issue; it is important to stay hydrated, carry water with you and remember to drink it. If your urine is yellow, you are not getting enough water. Wear appropriate clothing for the weather. Take rest cycles – don't allow yourself or your team to become victims. Get your needed rest!

Slide 12

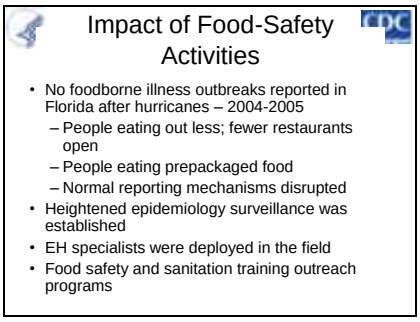
Confrontations can be a concern at mass feeding and shelters or with business owners due to the level of stress people will be experiencing. As the disaster moves in to the recovery phase, food facility operators will be anxious to get back in operation, which will create a heavy workload on them and on you.

You will be working long hours under stressful conditions. Physical conditioning and proper rest cycles are important. Disaster workers also suffer from a disaster and so it is important for people to have appropriate rest cycles and an adequate amount of help with tasks.

It is important to remember that recovery takes time. Don't be afraid to ask for help; you cannot do this alone. Mutual aid and federal responders may be available to assist your agency.

U.S. EPA produced this five minute video on the hazards encountered while clearing out large walk-in refrigerators after Hurricane Katrina.

Impact of Food Safety Activities (Slide 13)

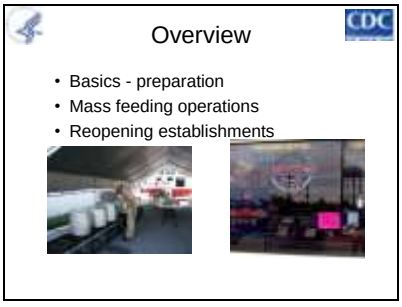


Slide 13

It is important that EH provides oversight and active monitoring of mass food operations. After suffering the effects of a disaster, the last thing that people need is a foodborne illness outbreak. Recent disasters have resulted in less incidence of foodborne illness, likely due to people eating out less; fewer restaurants open, people eating more prepackaged food, and the disruption of normal reporting mechanisms. It can be expected that early and sustained interventions by EH will result in heightened awareness and surveillance for foodborne illness, and increased surveillance and training for mass feeding operations.

During the 2004 and 2005 hurricane seasons in Florida, there were no reported foodborne illness outbreaks. The lack of foodborne illness has been attributed to the EH specialists who were deployed in the field for food safety surveillance and to provide food safety training to volunteers; a reliance on ready-to-eat and simple menus in emergency shelters; and a disruption in the normal foodborne illness reporting mechanisms.

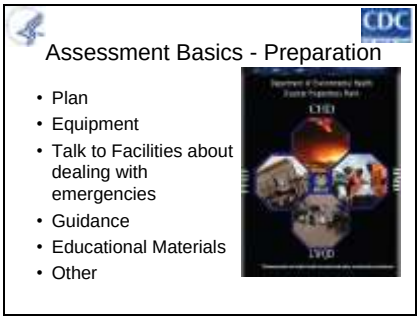
Food Safety Overview (Slide 14)



Slide 14

This section covers some of the specifics related to best practices with regard to assessing mass feeding operations and reopening food facilities. Remember in many disaster mass feeding situations you may be working with volunteers, not professional cooks, so it is important to focus on the really important food safety items. The 2007 Environmental Health Target Capabilities List recommends that priority food facilities be assessed within 24 hours of the incident.

Assessment Basics - Preparation (Slides 15-16)



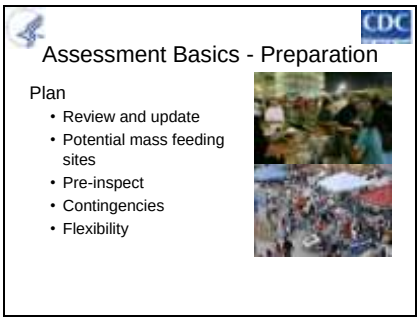
Slide 15

Most communities across the nation have emergency plans in place for dealing with likely emergencies. In California that may be wildfires, floods, earthquakes and mudslides; in Florida and the Gulf Coast states it can be hurricanes; and in the Midwest it may be floods or tornadoes. EH practitioners should be familiar with their local plan and what their role is within the plan.

Many EH departments maintain their own emergency operations plans and conduct preparedness activities, that may include:

- Preparing food operators for a disaster;

- Identifying facilities suitable for mass feeding operations; and
- Working with response partners to identify acceptable food preparation sites and procedures.



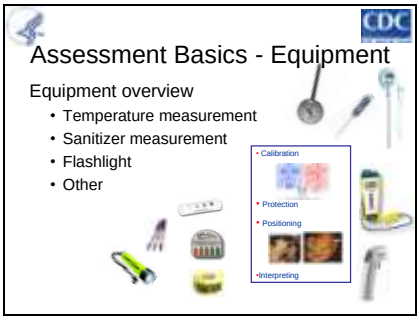
Slide 16

Is the National Guard armory or the school adequate to serve as one of these sites? What will your community do if the facility identified as a shelter or mass feeding center is damaged? Is there a backup plan? What food safety information will EH release to the public and food facility operators? As part of your plan you should include key contact information for your response partners such as ARC, CDPH, FDA and USDA/FSIS.

Keep your organization's disaster response plan updated and share it with others. The plan will provide you with a common play book that you and your partners can operate with and sing from the same sheet of music.

How will you get emergency information to food service establishments? You need basic information that is easy to read and understood by operators and the public - it can be contained within fact sheets, posters, web sites, etc. The appropriate languages and reading levels for the area should be considered when creating informational materials. Make the materials as visual as possible. Don't reinvent the wheel and don't overwhelm with information – practical guidance is needed for disaster food-safety scenarios, not a rulebook. Ideally, this type of information is created in advance and is ready to go if an emergency occurs.

Assessment Basics – Equipment (Slide 17)



Slide 17

Preparation includes having the basic equipment needed to conduct food safety assessments. If you could only take three items with you to conduct a food safety assessment, what equipment would you take?

Here are the essential tools for conducting food safety assessments:

- Food temperature measurement device – Options include a bayonet-type thermometer, a simple and low-cost instrument; or a Thermister, a little more expensive and requires batteries that may not always be available during a disaster event; a thermocouple, the most accurate and some have storage capacity; or an infrared thermometer, can be expensive but good for quick reads on surface temps.

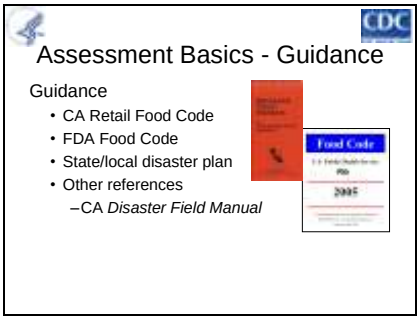
There are four things to consider when using temperature measuring devices:

1. Calibration – make sure the thermometer is accurate. A crushed ice bath and boiling water can be used to calibrate the thermometer. The thermometer should read 32°F in an ice bath and 212°F in boiling water. Use a wrench to adjust the nut on the back of the thermometer to adjust the temperature. Electronic devices can also be calibrated.
2. Cross-contamination – clean thermometer probe after each use with alcohol swab.
3. Positioning – how do you take the temperature of a large pot of soup in the refrigerator? Stir the pot. For meats, insert the thermometer in the thickest part of the meat.
4. Interpretation – what are the required temperatures of various cooked foods and for hot and cold foods?

- Sanitizer concentration measuring method: sanitizers are used on food preparation surfaces and for dishes, so there is a need for a way to measure concentrations. Test strips are used to take quick measurements. Three main types of chemicals are used in this process. Chlorine is most common, but quaternary ammonia and iodine are used as well. As a minimum, have chlorine test strips and quat test strips; and
- A flashlight.

Other useful items: Paper and markers are handy for writing reminders and impromptu posters for food service operations. As you conduct assessments, educate workers, help correct situations, and leave behind tools that can help; for example, temperature reminders and log sheets.

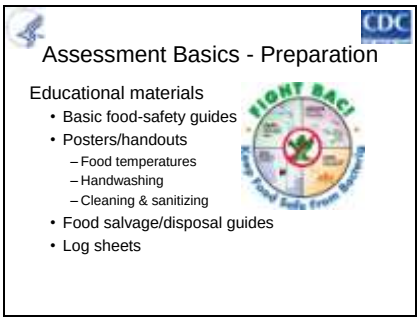
Assessment Basics – Guidance (Slides 18-20)



Slide 18

Food safety standards can vary from one jurisdiction to another, so remember that local rules prevail. You may come from another state or county but you must use what the local food code states. For example, the California Retail Food Code (Cal Code) is based on the FDA Food Code, but is not that same. Other helpful materials include the California Conference of Directors of Environmental Health (CCDEH) *Disaster Field Manual for Environmental Health Specialists.* It has a section on food safety with guidance on working with mass feeding operations and for food facilities in both the initial response phases and the recovery phase of the event. The CDC

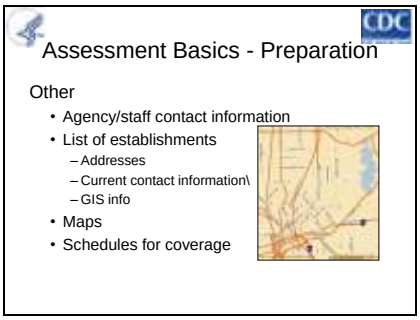
Emergency and Terrorism Preparedness web site provides resources for EH practitioners including educational materials to aid in getting public health messages across such as basic food safety guides, and posters on food temperatures, handwashing, cleaning & sanitizing, etc. as well as food salvage/disposal guides and log sheets. See the module reference list for more information.



Slide 19

Other items that will be helpful in guiding food safety response to disaster events:

- food safety information handouts;
- food facility assessment forms;
- partner agency and staff emergency contact information;
- list of food establishments and shelter sites with addresses, and current contact information;
- maps of area; and
- blank personnel rosters to plan staff coverage.



Slide 20

Emergencies do not occur on an 8-5 Monday through Friday schedule, so you need to be able to reach people. Do you have a way to reach your staff after normal working hours? Do you have enough staff scheduled to cover the event if shifts are required?

Maps are helpful, especially if food facilities are geo-coded and shown on maps. In an emergency, partners may be assisting EH from other parts of the state or country therefore mapping would be a great tool for locating food facilities. Both electronic and hard copy lists and maps are best because power may not be available to access electronic records.

Assessing Mass Feeding Operations (Slides 21-23)

Slide 21

Mass feeding operations can vary widely in size and scope. For example, while the American Red Cross (ARC) responds to apartment fires on a regular basis providing residents with food and shelter, recent hurricanes and the space shuttle Columbia disaster were the largest mass feeding efforts that the ARC has ever undertaken. The Columbia response alone required 100 feeding stations spread over several states to feed response workers.

An ARC mobile unit used to deliver food is called an Emergency Response Vehicle (ERV). ARC meals can be prepared on-site by professional cooks and volunteers or in some instances

mobile food services may deliver meals prepared from a central kitchen. ARC provides some excellent training for volunteers working in the food service area.

Other organizations, such as the Salvation Army and other faith-based organizations, have field kitchens and mobile units capable of feeding thousands of people at a time.

A list of active emergency shelters and feeding centers should be available through the local EOC. CDC's Shelter Assessment form may be used to assess food operations within a shelter. See module appendix for this form and a sample assessment checklist.

Slide 22

Slide 23

Assessing Mass Feeding Operations - Safe Sources (Slide 24)

How can food be produced in large amounts and delivered safely to the population that needs it? The following slides will discuss mass feeding operations and the method used by the ARC and other volunteer organizations. First of all, food supplies must be from approved sources of food – the organization must be able to provide information on how food is prepared on-site or off-site.

Slide 24

Several food sources are used by volunteer organizations depending on the situation:

- Fast food may be used for smaller events where the infrastructure is still intact; or
- Boxed heater meals or meals-ready-to-eat (MREs) may be used when the infrastructure has been damaged; or
- Some states use prison kitchens to cook large amounts of food quickly; or
- Volunteer organizations may set up a mass feeding operation within a shelter or distribute food using mobile food vehicles.

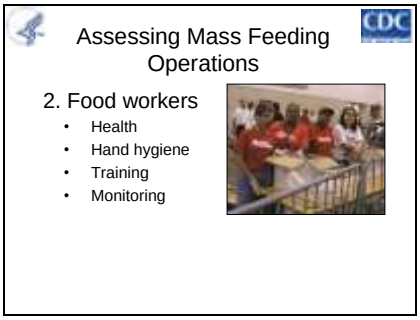
Note: Donated food prepared in home kitchens **cannot** be accepted in disaster food operations. Only food prepared from

approved kitchens can be used. This is a sensitive issue and should be handled with care so that people understand the reason for the rules. Mass feeding sites should not accept food or water from unapproved or unknown sources.

Assessing Mass Feeding Operations – Food Worker Health (Slides 25-26)

Food service workers are a key link in the food safety chain and in disaster situations food handlers are likely to be volunteers without much food safety knowledge or experience. Therefore, it is incumbent on the EH professional to pay close attention the workers and be ready to provide training as needed. The important considerations in monitoring food workers during emergencies feeding operations are:

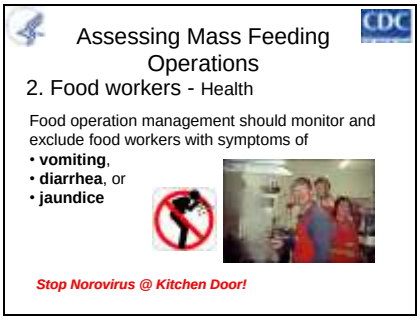
- Their health;
- Handwashing and hygiene; and
- Training.



Slide 25

Food handlers must practice good hygiene and be in good health without open sores, cuts or communicable diseases.

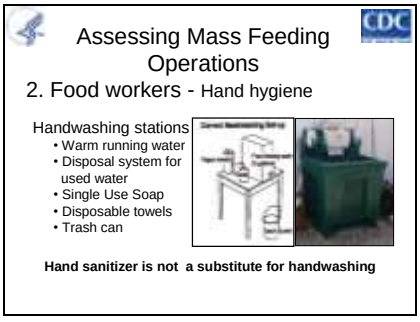
Workers should not be allowed to prepare food if they are sick. Illness caused by microorganisms such as norovirus can be easily spread by ill workers. Because some feeding operations serve thousands of meals a day, consider the impact that one ill worker could have on both the victims and the responders of a disaster. To prevent the occurrence of foodborne illness, feeding operation management should monitor and exclude food workers with symptoms of vomiting, diarrhea, or jaundice.



Slide 26

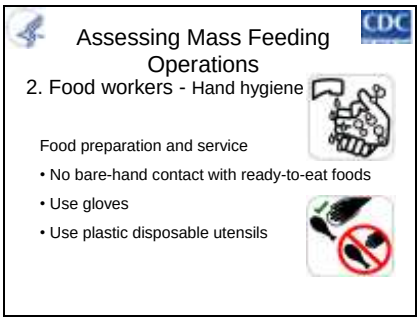
Assessing Mass Feeding Operations - Hand Hygiene (Slides 27-28)

Handwashing is one of the most important elements of food safety. The ARC requires that its food service volunteers take a handwashing class for which ARC issues cards certifying attendance. Hand sanitizers are not a substitute for proper hand-washing. Sanitizers are not effective on all organisms and they cannot remove organic material from hands the way handwashing does. Sanitizers are only to be used alone when handwashing is not available. When used, hand sanitizers must have greater than 60 percent alcohol to be effective against norovirus.



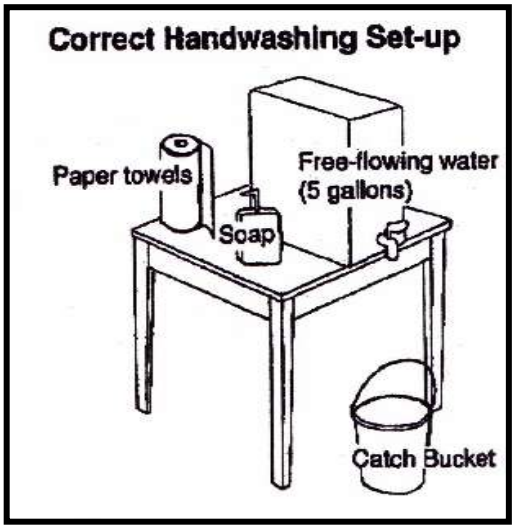
Slide 27

Foodhandler adherence to a no-bare-hand-contact rule is recommended. The proper use of gloves should be promoted. When gloves are not available, utensils or hand wraps could be used instead.

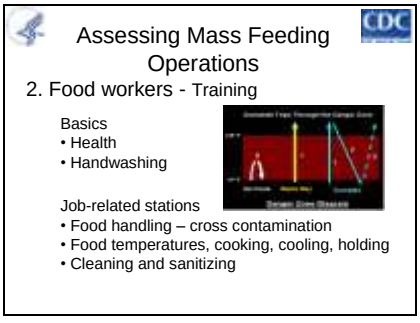


Slide 28

Effective handwashing requires a proper station that has warm running water, disposal system for wastewater, single use soap, disposable towels, and a trash can. Discuss alternatives for setting up handwashing stations when regular hand wash sinks are not available or functioning with operators. Provide hand washing soap and paper towels at toilet facilities.



Assessing Mass Feeding Operations – Worker Training (Slide 29)



Slide 29

ARC typically has a designated person monitoring food operations in disaster feeding operations. This person has a higher level training in food safety and acts as the on-site public health monitor assessing operations for handling, food temperatures, glove use, etc. Providing monitoring checklists and logs can help that person do the job correctly.

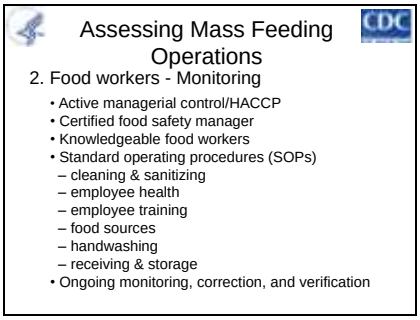
ARC has a training program established for its food service volunteers. The ARC *Safe Handling Procedures* booklet covers the basics and is included in the ARC kitchen deployment kits and is a part of all trainings. The training covers information on cross contamination, proper temperatures for cooking, cooling, and holding food, and cleaning and sanitizing equipment.

Assessing Mass Feeding Operations – Monitoring (Slide 30)

In addition to its food worker training program, ARC maintains active managerial control of its food service operations using the principles of Hazard Analysis Critical Control Points (HACCP) by assigning a certified food safety manager to each operation and following standard operating procedures (SOPs) developed for:

- cleaning & sanitizing;
- employee health;
- employee training;
- food sources;
- ongoing monitoring, correction, and verification:
- handwashing; and
- receiving & storage

ARC welcomes EH food safety personnel to inspect their facilities at any time but the earlier in the operations, the better. Early assessments are helpful because they give food service volunteers time to correct problems. Daily monitoring of large operations and discussions with the on-site manager are recommended.



Slide 30

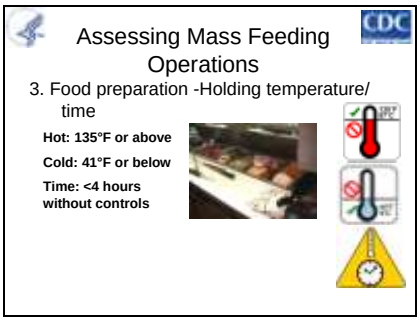
Assessing Mass Feeding Operations - Food Preparation (Slides 31-32)

Cooking potentially hazardous food to the proper internal temperature is the key to preventing foodborne illness. Proper cooking temperatures destroy disease causing microorganisms.

Retail food operations are regulated by the California Retail Food Code (Cal Code) which stipulates 135°F as the minimum cooking temperatures.

Food holding temperatures - according to Cal Code hot foods must be kept at 135°F or above; cold foods at 41°F or below. If time is used as a control in lieu of these holding temperatures, then food must be disposed of after 4 hours held out of safe temperature ranges.

Slide 31



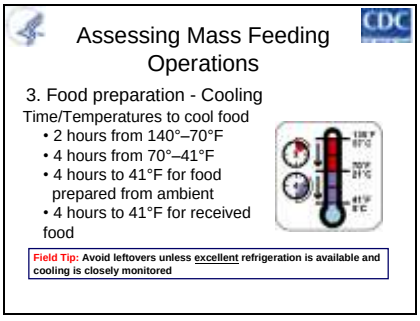
Slide 32

Minimum Internal Cooking Temperatures

Food	Minimum Temperature*
Raw eggs prepared for immediate service; fish, pork, & meat	145°F
Raw eggs not prepared for immediate service; and ground meat and sausages or comminuted fish	155°F
Poultry or stuffed meat, pasta, poultry, or fish and reheating leftovers	165°F
*15 seconds minimum holding time at this temperature	

It is best to prepare just enough food for the daily feeding operation and not attempt to store leftover food and reheat it. If food must be reheated, the food must be quickly refrigerated to below 41°F then reheated for at least 15 seconds at 165°F or above. However, the best rule for leftovers is **no leftovers!**

Assessing Mass Feeding Operations – Cooling (Slide 33)



Slide 33

Generally, in mass feeding operations leftover food is disposed of due to a lack of refrigeration capacity. Disposal of food can be a sensitive issue because the demand for it may be great one day but the next day there might be a lot left over. But storing potentially hazardous foods has its risks, so it is best to dispose of all leftovers.

If leftovers must be stored, then these rules must be followed for refrigeration to prevent the growth of disease-causing organisms:

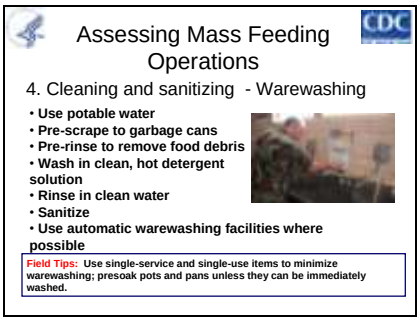
- Shallow storage containers should be used to allow for quick cooling of foods. (Large pots may take more than 4 hours to cool and increase the risk for the growth of dangerous organisms.)
- Hot foods must cool within 2 hours from 135° to 70°F and within 4 hours from 70° to 41°F.
- Received foods and foods prepared at room temperature must cooled within 4 hours to 41°F.

Assessing Mass Feeding Operations - Cleaning and Sanitizing (Slides 34-35)

Proper cleaning and sanitizing of cookware and utensils is essential for food safety. These procedures should be followed

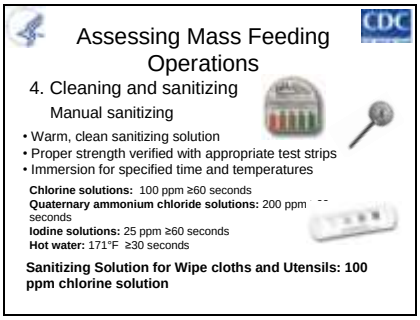
for cleaning:

- Use potable water;
- Pre-scrape items to be washed to garbage cans;
- Pre-rinse items to remove food debris;
- Wash in a clean, hot detergent solution;
- Rinse with clean water;
- Sanitize; or
- Use automatic dishwashing facilities when possible.



Slide 34

Note: To reduce workload and improve sanitation in a mass feeding operation, the use of single-use items such as disposable serving utensils and other food service items should be promoted. Chemical sanitizers are used on food prep surfaces, cooking utensils and multi-use food service items. There are several types of sanitizers available and approved for use in food establishments: chlorine; quaternary ammonium chloride; iodine; and hot water.



Slide 35

Since chlorine bleach is readily available it is the most often used. With chlorine, a 100 parts per million (ppm) concentration is needed; this is accomplished by adding approximately 1/2 tablespoon of household bleach to a gallon of water. A contact time of at least 1 minute is necessary for items treated with this solution, so they should be allowed to air dry. Multi-use cleaning cloths are to be kept in a sanitizer solution that is replaced when visibly soiled. If hot water is used for sanitizing, it must be at least 171°F with a contact time of at least 30 seconds. Quaternary ammonium chloride solution is required to be 200 ppm for at least 60 seconds, and iodine solution of 25 ppm for 60 seconds.

Assessing Mass Feeding Operations – Facilities (Slide 36)

Slide 36

Mass feeding operations can present a number of challenges for operators that EH practitioners need to aware of for monitoring purposes. For example, these operations often create a high volume of wastewater and in situations where the wastewater system is non-functional or there is no connection to the sewage system, wastewater must be stored and disposed of in accordance with local requirements. Field kitchens may need to make provisions to have wastewater hauled offsite for disposal. The same goes for solid waste.

Food operations need protection from the elements. Food service vehicles or field kitchens need cover to keep dust, debris, etc. out of the food. Insect control can be an issue as well, especially in warmer climates. Fly screens or netting may need to be erected or fans can be used at entries to prevent insect entry. Food must be stored in water resistant, rodent-proof containers. Solid waste must be securely stored to prevent insect and rodent attraction.

Food supplies should be secured in an area with limited access. Only designated personnel should be allowed in food storage and preparation areas. Identification badges and uniforms assist with this process. ARC designates safety and security personnel to monitor operations to ensure that security is maintained. Control of toxic items should be maintained as well, the proper storage of cleaning chemicals and proper chemical mixing procedures should be used.

Obtaining an adequate supply of potable water can present a challenge as well. ARC stores drinking water in its warehouses that can be deployed along with food operations. Local water supplies may be used in events where water treatment facilities have not affected. In cases where alternative supplies or large amounts of drinking water are needed, approved water haulers can be used or regional beverage distributors may be able to switch their facilities to produce canned/bottled water. Requests for water supplies should be coordinated through the local emergency operations center.

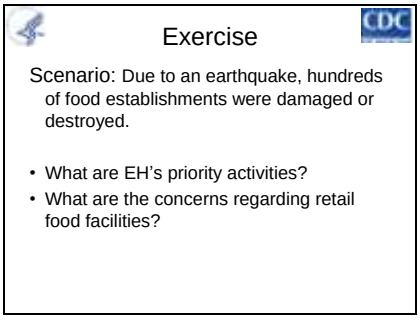
Exercise (Slide 37)

(SEE MODULE APPENDIX FOR WORKSHEET)

Scenario: Due to an earthquake, hundreds of food establishments were damaged or destroyed in your area.

- What are the EH priority activities?
- What are the concerns regarding food safety at retail food facilities?

Consult the *Disaster Field Manual for Environmental Health Specialists,* if available.



Slide 37

Assessing Regulated Food Facilities – Prioritize! (Slide 38)

Slide 38

Before beginning recovery efforts, it is important to conduct an initial assessment of the entire situation to determine the impacts of the disaster and to establish EH operational priorities. Work with your partners in public works and emergency management to obtain needed information. By focusing on priority areas you will save time and effort and help speed community recovery.

Develop an assessment plan with food facility reopening criteria, and reporting and tracking procedures. Communicate with the local emergency management agency, decision makers, industry, other EH staff, and the public on the efforts to assess food establishments.

Determine which food facilities should be assessed first based on local priorities. For example, it may be prudent to focus on grocery stores and fast food establishments first to allow people to re-stock their homes with food and find a quick meal. Residential institutions may also be a priority. Or harvest low-hanging fruit by getting some smaller food establishments operating even if on a limited basis. See module appendix for a sample assessment checklist.

Assessing Regulated Food Facilities – Operation Criteria (Slide 39)

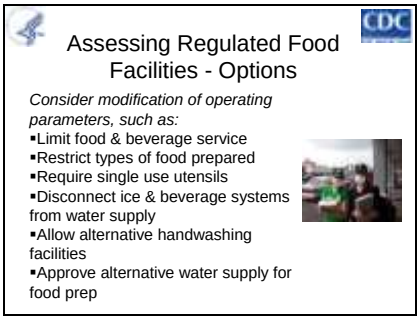
Slide 39

After the emergency response needs of the public have been met, the recovery process begins. Food service establishment play an important role in community recovery, so the quicker they are able to come back on-line the better, but it has to be done with consideration of public health. Keep in mind that restoring a sense of normalcy is important to community recovery efforts, therefore reopening neighborhood food establishments will not only restore a source of food, but also a source of comfort and community.

A disaster assessment may not be an inspection in the routine sense. A disaster assessment requires recognition that extraordinary conditions sometimes require flexibility in operation standards. It is important to have a plan for guiding recovery efforts, but be flexible; disasters are dynamic and priorities can change quickly.

Many issues will arise during the assessment of food establishments including building/electrical safety, water supply and wastewater disposal, food salvage and disposal, vector control, cleanup procedures, problems with equipment such as refrigeration, food/provision re-supply, etc. Focus on the most important issues without compromising public health. In disaster events, business owners can be under tremendous stress due to loss of revenue and livelihood, damaged facilities, or even the injury or death of family members; this can cause people to lash out.

Assessing Regulated Food Facilities – Options (Slide 40)



Slide 40

It may be necessary to consider issuing modified operating permits so that businesses can continue to operate and the community can recover. Food establishments will be looking to EH for guidance on what is expected of them. Ideally, food facilities will have been informed in advance of what to do when there is a loss of electricity or water supply, etc.

Working with food operators ahead of the event is the key to success. For example, after the 2003 power failures in the Northeast, Michigan developed a guide for food service operations on what to do when faced with emergency events that they have used to train the industry.

To keep critical food facilities open, consider modification of operating parameters, such as:

- Limited food & beverage service;
- Restrictions on the types of food prepared;
- Requiring single use utensils;
- Disconnection of ice & beverage systems from water supply;
- Allowing alternative handwashing facilities; and
- Approving alternative water supplies for food preparation.

Be prepared in advance to issue permit modifications. Consider multiple ways for getting information out to the food operators. In some situations, printed materials placed on the doors of businesses may be the best communication method.

Assessing Regulated Food Facilities – Closure (Slide 41)

Serious threats to public health and safety in food establishments should prompt EH to consider closure until conditions can be improved. Significant issues with

building/electrical safety, water supply, waste disposal, vector control, equipment operation, food source and food salvage issues may result in the closure of an establishment.

It may be necessary to post the facility as closed until critical food safety systems are restored. In this case, EH should work with closed facilities to assist them in reopening as soon as safely possible. Food establishments will be looking to EH for this assistance.

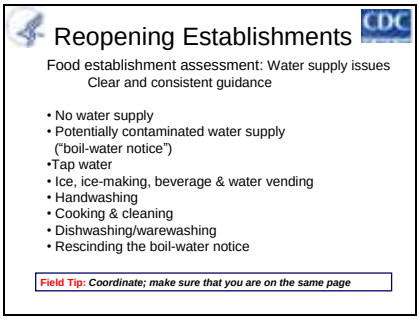
Slide 41

The goals of EH are to:

- Respond promptly to imminent health hazards;
- Provide guidance to help food establishments resume operation as quickly as possible;
- Assist food establishments in assessing food safety during an emergency;
- Communicate with the industry during the emergency; and
- Conduct enforcement activities as appropriate to protect public health.

Reopening Establishments - Water Supply Issues (Slides 42-44)

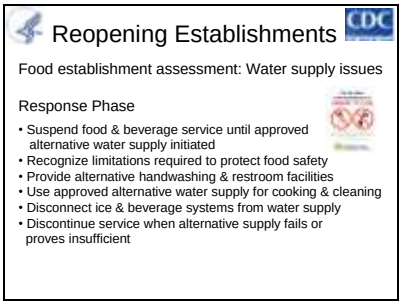
During and post disaster events, Boil Water Notices are commonplace. However, they can also be part of routine operations when repairs or loss of pressure result in supply disruptions. These events greatly affect food service establishments and require that adjustments be made in operations. Boil Water Notice issuance requires communication among EH, public health, utilities, businesses and the public. All have to be on the same page to ensure that the right information is communicated in a timely manner to industry and the public.



Slide 42

A food establishment's response to a problem with the water supply should involve the following response actions:

- Recognition of the steps required to protect food safety;
- Suspension of food and beverage service until an approved alternative water supply is obtained;
- Providing adequate restroom and handwashing facilities;
- Using approved alternative water supply for cooking/cleaning;
- Disconnecting ice and beverage systems from water supply;
- Discontinuing food preparation when alternative supply fails or proves insufficient; and
- Adjustments in food service i.e. only pre-packaged food items.

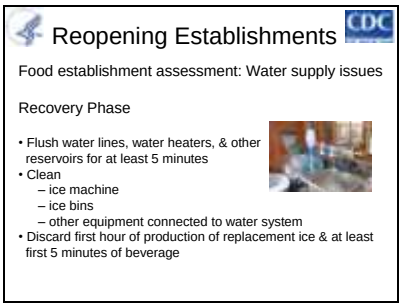


Slide 43

Once a safe water supply has been restored, the food establishment should take the following recovery actions:

- Flush water lines, water heaters, and other reservoirs for at least 5 minutes;
- Clean ice machines and bins, soda dispensing machines, dishwashers and other equipment directly connected to water supply and discard first hour of production of replacement ice and at least first 5 minute flow of beverages.

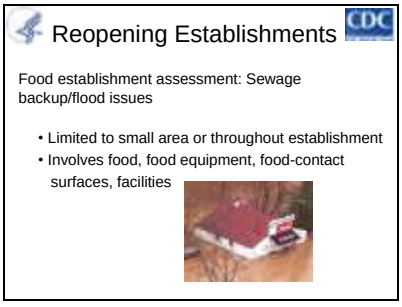
Note: Food facilities on an individual water system should be required to demonstrate that their water supply is safe before resuming operations.



Slide 44

Reopening Establishments – Sewage Issues (Slides 45-47)

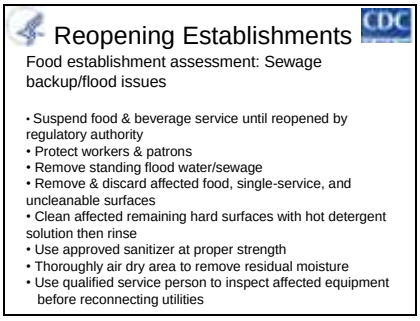
Flood water can result in raw sewage, chemical waste, oil and debris entering into a food establishment. Both sewage backups and flooding events can bring disease pathogens into food storage, preparation, and service areas. The extent of the contamination from a flood or sewage backup can be limited or can affect the entire establishment. No matter how small an amount of sewage that backs up through the drains, food service operations must be suspended until the affected equipment and areas are cleaned thoroughly and sanitized.



Slide 45

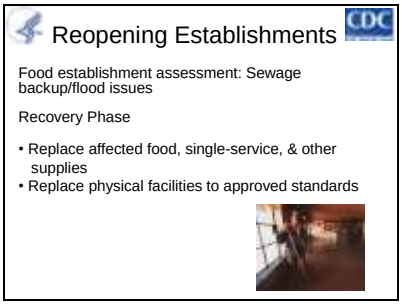
Reopening a food establishment that has been flooded or has had a sewage backup requires several steps:

- Remove standing flood water/sewage;
- Remove and discard affected food, single-service utensils, and uncleanable surfaces;
- Clean remaining hard surfaces with hot detergent solution then rinse;
- Use approved disinfectant/sanitizer at proper strength to cleaned surfaces (1,000 ppm non-porous surfaces/ 5,000 ppm porous surfaces);
- Thoroughly air dry area to remove residual moisture;
- Use a qualified service person to inspect affected equipment before reconnecting utilities;
- Replace discarded food, single-service, and other supplies; and
- Restore physical facilities to approved standards



Slide 46

To protect workers and patrons food and beverage service should be suspended until the establishment is reopened by a regulatory authority.



Slide 47

Food Salvage (Slides 48-50)

Food salvage rule #1: When in doubt - throw it out! Salvage situations take time to assess. If there has been a widespread emergency, there probably isn't enough time to do a good job with food salvage. For smaller scale emergencies such as a fire in a food establishment, it may be possible.

These items cannot be salvaged:

- Raw foods and produce;
- Food in open containers (ice, salt shakers, etc.);
- Food in screw-top, crimped cap (soda-pop bottles) or snap-open containers;
- Food in flexible packages made of paper, cardboard, cellophane, plastic film, etc.; and
- Single-service items (cups, straws, utensils, etc.)

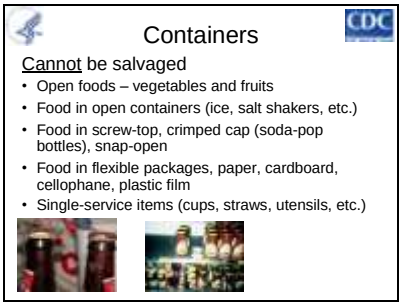
These items may be suitable for salvage:

- Food in sealed, impervious containers if there is no damage to the container.

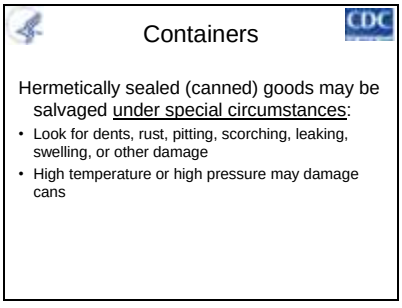
Salvaged food containers must be thoroughly washed and disinfected if they have come into contact with contaminants. Look for dents, rust, pitting, scorching, leaking, swelling, or other damage. Frozen or refrigerated foods must be discarded if it has come into contact with sewage, flood water, wastewater, smoke, fumes, or chemicals or it has been thawed or out of temperature for more than 4 hours. Potentially hazardous foods should be discarded if they have been in the danger zone (41-135°F) for more than 2 hours.

EH should be prepared to provide food salvage information to food facilities and the public. EH may also be involved with solid waste issues related to mass food disposal.

Slide 48



Slide 49



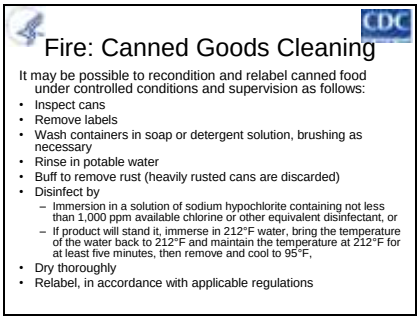
Slide 50

Fire Damage (Slides 51-52)

In the case of a fire, excessive heat, loss of power, water from fire fighting and the activation of the fire suppression system can cause food to be unfit for consumption. Even if the power has not been out, there should be concern about food in flexible wrapping (e.g., plastic wrap, plastic bags, paper wrappers) due to exposure to smoke and fumes generated by a fire. Different plastics have different properties and will allow different-sized molecules to pass through.

Slide 51

In some cases, canned food may be salvageable after a fire. Where the heat and water damage has been minimal, canned goods can be salvaged by cleaning the exterior surfaces and moving them to suitable storage areas away from the fire damage. Cleaning and re-labeling relatively small quantities of canned goods is usually not attempted because of the cost involved compared to the lower value of the salvaged product.

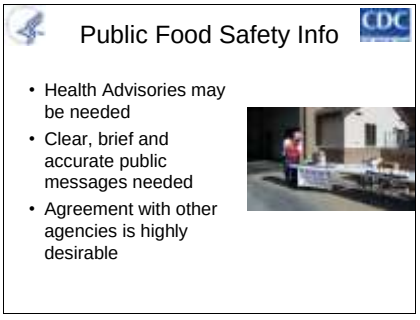


Slide 52

When possible, undamaged canned foods may be reconditioned and relabeled after a fire under controlled conditions and under EH supervision as follows:

- Inspect cans;
- Remove labels;
- Wash containers in soap or detergent solution, brushing as necessary;
- Rinse in potable water;
- Buff to remove rust (heavily rusted cans are discarded);
- Disinfect by immersion in a solution of sodium hypochlorite containing not less than 1,000 ppm available chlorine or other equivalent disinfectant; or
- If product will stand it, immerse in 212°F water, bring the temperature of the water back to 212°F and maintain the temperature at 212°F for at least five minutes;
- Remove and cool;
- Dry thoroughly; and
- Re-label in accordance with application regulations.

Public Food Safety Info (Slide 53)



Slide 53

During an emergency, the media and the public will have many questions, especially if there are concerns about food safety. Expect the public to be concerned and upset during an emergency. During events when public health is in question, it may be necessary to issue health advisories. It is best to have advisory template prepared in advance to expedite public information.

Develop key messages to use with the media that are clear, brief, and accurate. Make sure your messages are carefully planned and have been coordinated with local and state officials. If your messages are different you'll want to know that and be prepared to explain why.

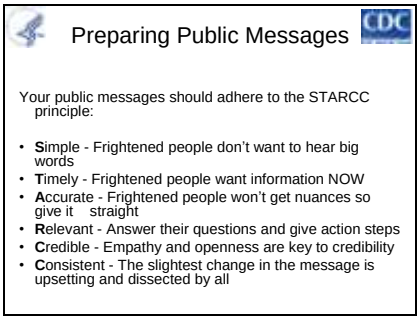
Make sure field and office staff knows how to deal with the media and questions from the public. It may be necessary to establish

protocols for both field and office staff to respectfully defer questions to a spokesperson or hotline.

Preparing Public Messages (Slide 54)

The public will be listening for factual information, and some will be expecting to hear a recommendation for action. Get the facts right, repeat them consistently through your department or county Public Information Officer (PIO) and ensure that all credible sources share the same facts. Speak with one voice. Inconsistent messages will increase anxiety and can damage agency credibility.

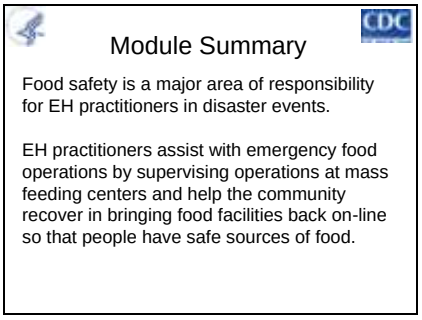
Having standardized disaster information prepared in advance and easily available on your agency's website, will help the public find the information they need to take action to protect themselves. Work with neighboring counties and other agencies to ensure your disaster information is as consistent as possible with theirs. This principle is from the CDC's *Crisis and Emergency Risk Communication by Leaders for Leaders.* See the module reference list for more information.



Slide 54

Module Summary (Slide 55)

This module covered the work that occurs in emergency response and recovery at the local level with respect to safety of the retail food supply. Food safety is a major area of responsibility for EH practitioners in disaster events. Keeping the food safe for both responders and the public is key to helping the communities recover from a disaster. EH practitioners respond by supervising operations at mass feeding centers and help the community recover in bringing food facilities back on-line so that people have safe sources of food. Remember when working with mass feeding operations and food facilities, be flexible and make sure that your actions are protective of public health.



Slide 55

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Module 4 Acronyms

ARC	American Red Cross
CDC	Centers for Disease Control and Prevention
CCDEH	California Conference of Directors of Environmental Health
CDFA	California Department of Food and Agriculture
CDPH	California Department of Public Health
CDPH FDB	California Department of Public Health Food and Drug Branch
CRFSC	California Retail Food Safety Coalition
EH	Environmental Health
EHTER	Environmental Health Training in Emergency Response
ELO	Enabling Learning Objective
ESF	Emergency Support Function
F	Fahrenheit
FBI	Federal Bureau of Investigations
FDA	Federal Department of Agriculture
FEMA	Federal Emergency Management Agency
FSIS	Food Safety Inspection Service
HACCP	Hazard Assessment and Critical Control Program
ICS	Incident Command System
MRE	Meals Ready to Eat
NACCHO	National Association of County and City Health Officials
PIO	Public Information Officer
ppm	Parts Per Million
PSA	Public Service Announcement
SOP	Standard Operation Procedures
TLO	Terminal Learning Objective
USDA	United States Department of Agriculture
USEPA	United State Environmental Protection Agency
VOAD	Voluntary Organizations Active in Disaster

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Module 4 Appendix

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Module #4 Food Safety
Exercise Worksheet

Scenario: Due to an earthquake, hundreds of food establishments were damaged or destroyed in your area.

- What are the EH priority activities?
- What are the concerns regarding food safety at retail food facilities?

Consult the *Disaster Field Manual for Environmental Health Specialists,* if available.

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Module #4 Food Safety
CDC Assessment Form

State Logo

ENVIRONMENTAL HEALTH ASSESSMENT FORM FOR SHELTERS
For Rapid Assessment of Shelter Conditions during Disasters

I. ASSESSING AGENCY DATA

[1]Agency /Organization Name _____ [90]Immediate Needs Identified: ☐ Yes ☐ No

[2]Assessor Name/Title _____

[3]Phone __ __ __ - __ __ __ - __ __ __ __ [4]Email or Other Contact _____

II. FACILITY TYPE, NAME AND CENSUS DATA

[5]Shelter Type ☐ Community/Recovery ☐ Special Needs ☐ Other _____ [6]ARC Facility ☐ Yes ☐ No ☐ Unk/NA [7]ARC Code _____

[8]Date Shelter Opened __ __ /__ __/__ __ (mm/dd/yr) [9]Date Assessed __ __ /__ __/__ __ (mm/dd/yr) [10]Time Assessed __ __ : __ __ ☐ am ☐ pm

[11]Reason for Assessment ☐ Preoperational ☐ Initial ☐ Routine ☐ Other _____

[12]Location Name and Description _____

[13]Street Address _____

[14]City / County _____ [15]State __ __ [16]Zip Code __ __ __ __ __ [17]Latitude/Longitude _____/_____

[18]Facility Contact / Title _____ [19]Facility Type ☐ School ☐ Arena/Convention center ☐ Other_____

[20]Phone __ __ __ - __ __ __ - __ __ __ __ [21]Fax __ __ __ - __ __ __ - __ __ __ __ [22]E-mail or Other Contact _____

[23]Current Census _____ [24]Estimated Capacity _____ [25]Number of Residents _____ [26]Number of Staff / Volunteers _____

III. FACILITY

[27]Structural damage	☐ Yes	☐ No	☐ Unk/NA
[28]Security / law enforcement available	☐ Yes	☐ No	☐ Unk/NA
[29]Water system operational	☐ Yes	☐ No	☐ Unk/NA
[30]Hot water available	☐ Yes	☐ No	☐ Unk/NA
[31]HVAC system operational	☐ Yes	☐ No	☐ Unk/NA
[32]Adequate ventilation	☐ Yes	☐ No	☐ Unk/NA
[33]Adequate space per person	☐ Yes	☐ No	☐ Unk/NA
[34]Free of injury /occupational hazards	☐ Yes	☐ No	☐ Unk/NA
[35]Free of pest / vector issues	☐ Yes	☐ No	☐ Unk/NA
[36]Acceptable level of cleanliness	☐ Yes	☐ No	☐ Unk/NA
[37]Electrical grid system operational	☐ Yes	☐ No	☐ Unk/NA
[38]Generator in use, [39] If yes, Type_____	☐ Yes	☐ No	☐ Unk/NA
[40]Indoor temperature _____ °F			☐ Unk/NA

IV. FOOD

[41]Preparation on site	☐ Yes	☐ No	☐ Unk/NA
[42]Served on site	☐ Yes	☐ No	☐ Unk/NA
[43]Safe food source	☐ Yes	☐ No	☐ Unk/NA
[44]Adequate supply	☐ Yes	☐ No	☐ Unk/NA
[45]Appropriate storage	☐ Yes	☐ No	☐ Unk/NA
[46]Appropriate temperatures	☐ Yes	☐ No	☐ Unk/NA
[47]Hand-washing facilities available	☐ Yes	☐ No	☐ Unk/NA
[48]Safe food handling	☐ Yes	☐ No	☐ Unk/NA
[49]Dishwashing facilities available	☐ Yes	☐ No	☐ Unk/NA
[50]Clean kitchen area	☐ Yes	☐ No	☐ Unk/NA

V. DRINKING WATER AND ICE

[51]Adequate water supply	☐ Yes	☐ No	☐ Unk/NA
[52]Adequate ice supply	☐ Yes	☐ No	☐ Unk/NA
[53]Safe water source	☐ Yes	☐ No	☐ Unk/NA
[54]Safe ice source	☐ Yes	☐ No	☐ Unk/NA

VI. HEALTH / MEDICAL

[55]Reported outbreaks, unusual illness / injuries	☐ Yes	☐ No	☐ Unk/NA
[56]Medical care services on site	☐ Yes	☐ No	☐ Unk/NA
[57]Counseling services available	☐ Yes	☐ No	☐ Unk/NA

VII. SANITATION

[58]Adequate laundry services	☐ Yes	☐ No	☐ Unk/NA
[59]Adequate number of toilets	☐ Yes	☐ No	☐ Unk/NA
[60]Adequate number of showers	☐ Yes	☐ No	☐ Unk/NA
[61]Adequate number of hand-washing stations	☐ Yes	☐ No	☐ Unk/NA
[62]Hand-washing supplies available	☐ Yes	☐ No	☐ Unk/NA
[63]Toilet supplies available	☐ Yes	☐ No	☐ Unk/NA
[64]Acceptable level of cleanliness	☐ Yes	☐ No	☐ Unk/NA
[65]Sewage system type ☐ Community ☐ On site ☐ Portable			☐ Unk/NA

VIII. SOLID WASTE GENERATED

[66]Adequate number of collection receptacles	☐ Yes	☐ No	☐ Unk/NA
[67]Appropriate separation	☐ Yes	☐ No	☐ Unk/NA
[68]Appropriate disposal	☐ Yes	☐ No	☐ Unk/NA
[69]Appropriate storage	☐ Yes	☐ No	☐ Unk/NA
[70]Timely removal	☐ Yes	☐ No	☐ Unk/NA
[71]Types ☐ Solid ☐ Hazardous ☐ Medical			☐ Unk/NA

IX. CHILDCARE AREA

[72]Clean diaper-changing facilities	☐ Yes	☐ No	☐ Unk/NA
[73]Hand-washing facilities available	☐ Yes	☐ No	☐ Unk/NA
[74]Adequate toy hygiene	☐ Yes	☐ No	☐ Unk/NA
[75]Safe toys	☐ Yes	☐ No	☐ Unk/NA
[76]Clean food/bottle preparation area	☐ Yes	☐ No	☐ Unk/NA
[77]Adequate child/caregiver ratio	☐ Yes	☐ No	☐ Unk/NA
[78]Acceptable level of cleanliness	☐ Yes	☐ No	☐ Unk/NA

X. SLEEPING AREA

[79]Adequate number of cots/beds/mats	☐ Yes	☐ No	☐ Unk/NA
[80]Adequate supply of bedding	☐ Yes	☐ No	☐ Unk/NA
[81]Bedding changed regularly	☐ Yes	☐ No	☐ Unk/NA
[82]Adequate spacing	☐ Yes	☐ No	☐ Unk/NA
[83]Acceptable level of cleanliness	☐ Yes	☐ No	☐ Unk/NA

XI. COMPANION ANIMALS

[84]Companion animals present	☐ Yes	☐ No	☐ Unk/NA
[85]Animal care available	☐ Yes	☐ No	☐ Unk/NA
[86]Designated animal area	☐ Yes	☐ No	☐ Unk/NA
[87]Acceptable level of cleanliness	☐ Yes	☐ No	☐ Unk/NA

XII. OTHER CONSIDERATIONS

[88]Handicap accessibility	☐ Yes	☐ No	☐ Unk/NA
[89]Designated smoking areas	☐ Yes	☐ No	☐ Unk/NA

XIII. COMMENTS ***(List Critical Needs on Immediate Needs Sheet)***

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

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SAMPLE FOOD FACILITY ASSESSMENT CHECKLIST

Facility Name/ID#	**Point of Contact**
Facility Address	

Type	☐ Mass Feeding	☐ Regulated facility	☐ Temporary	☐ Other

Assessment Points	**Status**				**Comments**
	YES	**NO**	**NA**	**UNK**	
Facility operable					
Structural damage					
Safe food sources					
Safe ice sources					
Safe water sources					
Adequate hot water					
Power available					
Adequate refrigeration					
Refrigeration interrupted					Duration:
Flood water/ sewage inundation					
Fire/ smoke damage					
Adequate cleanliness/ sanitation					
Appropriate food storage					
Adequate foodhandler training					
Adequate handwashing facilities					
Adequate restroom facilities					
Safe food handling techniques					
Appropriate food temperatures					
Vector control concerns					
Adequate wastewater management					
Adequate solid waste management					

Additional comments

Facility Status	☐ Operating	☐ Not operating	☐ Permit modification	☐ Follow up needed

Specialist Name	**Date/Time**

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Module 5 Shelters

Environmental Health Training in Emergency Response (EHTER) – Introductory Level *California Version*

Participant Manual

August 2010

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Module 5 Shelters

Duration

One and one half (1.5) Hours

Scope Statement

This module will introduce participants to a variety of issues and concerns associated with evacuation shelters during emergencies and disasters. It will highlight environmental health (EH) issues and concerns as they relate to shelters. Appropriate measures for addressing these issues and concerns, and for mitigating their adverse effects, will be covered in this module.

Terminal Learning Objective (TLO)

Participants will recognize the key EH issues related to emergency shelters and have the necessary knowledge to perform shelter-related activities.

Enabling Learning Objectives (ELO)

After completion of this module, participants will be able to:

5-1. Recognize shelter-related EH issues faced during disasters.
5-2. Recognize the roles and responsibilities of EH practitioners in addressing shelter sanitation and safety issues.
5-3. Identify key partners.
5-4. Identify basic components of shelters.
5-5. Explain how an EH shelter assessment is conducted.
5-6. Identify key public health messages for shelter populations.

Resources

Module 5 PowerPoint slides
Course participant manual
Exercise worksheet
Shelter Assessment Form
Shelter Survey Form
Sample Assessment Checklist

Instructor to Participant Ratio

1:50 or less

Reference List

ARC: Shelter Selection and Design http://www.redcross.org

ARC: Shelter Operations Manual http://www.redcross.org

ARC: Shelter Operations Management Toolkit http://www.redcross.org

ASCE: *Standard Minimum Design Loads for Buildings and Other Structures, SEI/ASCE 7-02*

California *Meeting the Needs of Vulnerable People in Times of Disaster: A Guide for Emergency Managers*

California Department of Social Services *Adult Protective Services Emergency Shelter Care and Temporary In-Home Protection*

California Department of Social Services
Disaster Services Website: http://www.dss.cahwnet.gov/dis/Default.htm
FAST Website: http://www.dss.cahwnet.gov/dis/PG1909.htm

CCDEH: *Disaster Field Manual for Environmental Health Specialists*
http://www.ccdeh.com/products/disaster_field_manual_info.htm

CDC: *Crisis and Emergency Risk Communication by Leaders for Leaders*
http://www.bt.cdc.gov/erc/leaders.pdf

CDC: A Guide for Shelter Care and Planning
http://www.cdc.gov/nceh/ehs/Docs/Guide_for_Local_Jurisdictions_Care_and_Shelter_Planning.pdf

CDC: Public Health Guidance Document for Shelters
http://www.cdc.gov/nceh/ehs/Docs/Shelter_Guidance_Dallas_County

CDC: Shelter Resources http://www.cdc.gov/nceh/ehs/ETP/shelter.htm

CDC: Environmental Health Services Norovirus Topic Page
http://www.cdc.gov/nceh/ehs/Topics/norovirus.htm

CDC: *Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007* http://www.cdc.gov/ncidod/dhqp/gl_isolation.html

CDC: Emergency Preparedness and Response: Evacuee Educational Materials
http://www.bt.cdc.gov/disasters/hurricanes/educationalmaterials.asp

CDC: Healthy Housing Reference Manual
http://www.cdc.gov/nceh/publications/books/housing/housing.htm

CDC: Modified from the California Disaster Manual and the APC Environmental Health Emergency Response Guide
http://www.cdc.gov/nceh/ehs/Docs/EH_Emergency_Response_Guide.pdf

EPA: Registered Antimicrobial Products Effective Against *Norovirus*
http://www.epa.gov/oppad001/list_g_norovirus.pdf

FEMA: Target Capabilities List http://www.fema.gov/pdf/government/training/tcl.pdf

Florida Department of Health – Special Needs Shelter
http://www.doh.state.fl.us/PHNursing/SpNS/SpecialNeedsShelter/SpecialNeedsShelter.html

Florida Department of Environmental Health has developed a website for environmental health responders http://def.sharepoint.doh.ad.state.fl.us/DEH/Preparedness

Florida: State Agriculture Response Team - section on pets in disasters
http://www.flsart.org/library/index.htm#PD

Florida: State Agricultural Response Team (SART) Creating an Effective County SART Steps to Success Program – http://www.flsart.org

Humane Society: Disaster Preparedness Resources
http://www.hsus.org/hsus_field/hsus_disaster_center/resources

International Association of Assembly Managers, Inc: Mega–Shelter Best Practices
http://www.health.umt.edu/schools/practice/mbtp/documents/panffx/Mega-ShelterPlanning&Activation.pdf

National Health Care for the Homeless: http://www.nhchc.org/shelterhealth.html

Michigan: *Guidelines For Environmental Cleaning and Disinfection of Norovirus*
http://www.michigan.gov/documents/Guidelines_for_Environmental_Cleaning_1258467.pdf

National Resource Center for Health and Safety in Child Care and Early Education
Caring for Our Children: National Health and Safety Performance Standards: Guidelines for Out-of-Home Child Care, 2nd Edition
http://nrc.uchsc.edu/CFOC/index.html

Sphere: Humanitarian Charter and Minimal Standards in Disaster Response –
http://www.sphereproject.org/content/view/27/84

WHO: World Health Organization (WHO) - Environmental Health in Disasters
http://www.who.int/water_sanitation_health/hygiene/emergencies

Practical Exercise Statement

One exercise has been incorporated into this module.

Additional recommended activities/exercises include visiting a local homeless shelter to compare and contrast health issues and concerns with those found in evacuation shelters; attending an American Red Cross (ARC) training on shelters; conducting joint training sessions on shelters with ARC and other Voluntary Organizations Active in Disaster (VOAD); and planning and conducting a shelter exercise with public health, ARC, and VOAD.

Assessment Strategy

In-class questions, participation in exercises, and module summary discussion.

Module 5 Slides

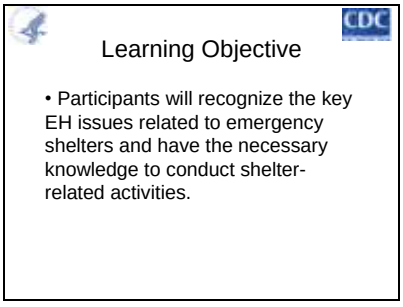
Shelters (Slide 1)

In the event of a major disaster, public and private entities will need to pool resources for the housing and care of displaced persons. Environmental health (EH) practitioners are likely to be called upon to provide guidance and oversight of sanitation in emergency shelters. This module will present an overview of the EH issues in shelters.

Slide 1

Learning Objective (Slide 2)

Participants will recognize the key EH issues related to emergency shelters and have the necessary knowledge to conduct shelter-related activities.



Slide 2

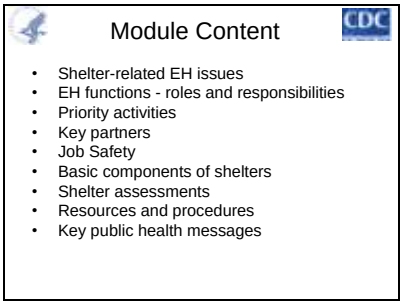
After completion of this module, participants will be able to:

5-1. Recognize shelter-related EH issues faced during disasters.
5-2. Recognize the roles and responsibilities of EH practitioners in addressing shelter sanitation and safety issues.
5-3. Identify key partners.
5-4. Identify basic components of shelters.
5-5. Explain how an EH shelter assessment is conducted.
5-6. Identify key public health messages for shelter populations.

Module Content (Slide 3)

This module covers:

- Shelter-related EH issues
- EH functions - roles and responsibilities
- Priority activities
- Key partners
- Job Safety
- Basic components of shelters
- Shelter assessments
- Resources and procedures
- Key public health messages

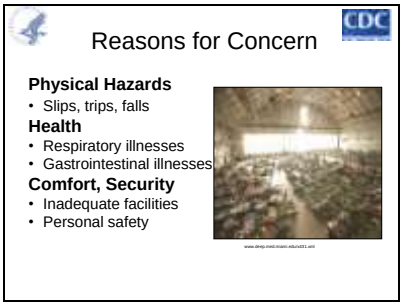


Slide 3

Reasons for Concern (Slides 4-5)

Shelters are a health concern due to:

- Close living quarters - Shelter situations create close living quarters increasing the potential for exposure to respiratory and gastrointestinal illnesses and other diseases.
- Different groups – shelters bring together people who are unfamiliar to one another increasing the potential for misunderstanding or conflict. Security can be a concern.
- Stressed population - The results of disaster events creates stress. People may have lost homes or loved ones.
- Disrupted protection systems - Police or court systems may be disrupted, creating opportunities for the criminal element in shelters.
- Health care maybe limited - Health care systems may be disrupted. Limited health care may be available in a shelter from practitioners unfamiliar with the health issues of the individual.
- Increased demands on the facility - The capacity of a shelter and its sanitation facilities are often stressed, food service and other facilities may be lacking or inadequate. There can be a potential for physicals hazards as the facility was likely not designed as a shelter.



Slide 4

Slide 5

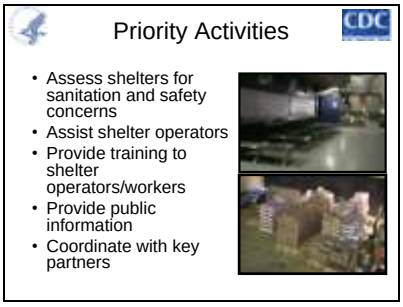
Environmental Health Functions (Slide 6)

EH practitioners protect the public from hazards in the natural and built environment related to: food, water, waste, disease vectors, and toxic materials. As such, EH professionals are involved with many functions in the emergency shelters that house victims of disasters.

All types of shelters have potential health issues. As the shelter population increases so do the opportunities for disease. The main health threats to shelter residents are the spread of gastrointestinal and respiratory disease and hazards that can cause injury. Rapid identification of hazards protects shelter residents and the earlier EH professionals become involved, the better they can assist with public health aspects of the shelter operation.

Slide 6

Priority Activities (Slide 7)



Slide 7

Prior to the disaster event an EH professional may be involved with site selection, organization and layout of shelters and staff training, however most of the EH involvement occurs once a shelter is opened in response to an emergency.

While an emergency shelter is open, the EH professional may assess the facility for:

- Food safety;
- Safe and adequate water supply;
- Personal hygiene amenities;
- Proper wastewater management;
- Proper solid waste management;
- Air quality;
- General safety;
- Housekeeping, cleaning, and sanitation;
- Vector/pest control issues;
- Outside grounds;
- Childcare safety and sanitation;
- Needs of shelter population; and
- Health education for public, volunteers, and response partners.

Key Partners (Slide 8)

Slide 8

Emergency shelters are a team effort requiring many partners including:

- Local Emergency Management Agency (EMA);
- Local Emergency Operations Center (EOC);
- Public Health;
- California Health and Human Services Agency;
- California Emergency Management Agency (Cal EMA);
- Community organizations such as American Red Cross (ARC), Salvation Army, and other Voluntary Organizations Active in Disaster (VOAD);
- Federal assistance agencies;
- Industry; and the
- Media.

Shelters are often opened and operated by the ARC, assisted by local or county employees. Meals are provided at the shelters and may also be provided for disaster victims unable to prepare meals but who have remained in their homes or those living in their vehicles. The mass care and shelter disaster response function in California is delegated to the Disaster Services

Section of the California Department of Social Services through an Administrative Order of the California Emergency Management Agency (Cal EMA).

Disaster Services Section staff assist in the mass care and shelter function by:
1) Tracking shelter status;
2) Tracking feeding services;
3) Responding to requests for state resources;
4) Supporting the American Red Cross in sheltering operations; and
5) Ensuring that the needs of emergency responders are being handled by the appropriate State agency.

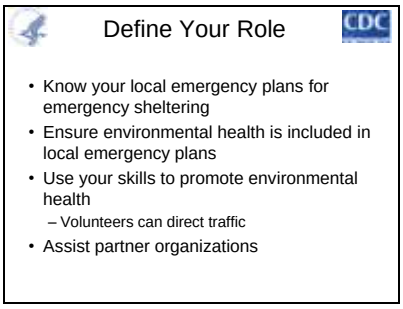
The needs of a shelter operation depend on the size of the shelter, duration of the event, and complexity. The larger the shelter the more partners involved. Some of the key partners are the local EMA that helps to coordinate the emergency response and supports the Incident Command System (ICS).

There can be many volunteer organizations that support the sheltering effort but ARC plays a lead role in providing the management of the many sheltering operations. Other VOAD support the effort as well, such as the Salvation Army. ARC has some excellent training on shelters operations that would be good for public health professionals to attend.

FEMA plays a key role by supporting state and local agencies in the implementation of a coordinated, nationwide shelter system for managing information about shelter facilities, capacity, and population counts. The National Shelter System (NSS) is a comprehensive web-based, data system created to support agencies responsible for shelter management. The NSS allows users to identify, track, analyze, and report on shelter data in a consistent and reliable manner. The NSS supports federal Emergency Support Function (ESF) #6 - Mass Care, Housing, and Human Services. The NSS is a collaborative partnership, between the ARC and FEMA that has produced a methodology to address one of the lessons learned from Hurricane Katrina: there is an expectation for a cohesive mass care system.

Large shelters often have a permanent Public Health and Medical Group assigned to their operation. In a large-scale disaster situation, health and mass care support from federal agencies may be provided for shelter operations.

Define Your Role (Slide 9)



Slide 9

EH is a part of the emergency management team. Make sure that the EH role is defined in your local emergency and shelter plans. Beyond the initial emergency phase of an incident, EH may be needed to assist local officials in the transition of shelter residents to temporary homes if there is widespread damage to residences.

Use EH expertise skills wisely! Volunteers should be used to provide simple services; EH professionals should focus on public health issues. With that said, be willing to help when needed. Be a partner before the event! Assist VOAD to prepare their workers for mass care and sheltering events.

Job #1 - Safety (Slide 10)

Slide 10

Shelter operations present many potential hazards and stressors for residents, workers and EH staff. It is very important to pay attention to personal hygiene in the shelters – wash hands and use hand sanitizer regularly.

Confrontations are a possibility and EH should use the buddy system in large shelters; there may be areas that are not well monitored or secured. Always remember that a criminal element can be present in a shelter population. Communication is essential, especially in larger facilities with greater walking distances. Hand held radios are a great time saver.

Stress and mental health problems are also an issue to consider. Responders and shelter residents will be stressed. EH staff need to be helpful and courteous even when are not being treated well. One of the functions of an evacuation shelter is to provide psychological first aid to the displaced population. Remember what the people in the shelter have just experienced as you interact with them.

Adjusting the approach from a regulatory to an advisory role can help reduce stress. Remember that this is an emergency situation. Be flexible and focus on public health priorities. Help to correct problems, don’t just quote the regulations.

Events and Shelter Requirements (Slide 11)

Shelters are established for a variety of reasons, but the circumstances may allow little time for setting up the shelter.

Slow-rising floods or incoming hurricanes may allow time to establish a shelter, whereas an earthquake will strike without warning and can destroy housing and infrastructure, creating a rapid and longer term need for emergency housing.
Short-term shelters may be needed in a large emergency or for a smaller incident such as an apartment building fire or hazardous materials release; while long-term sheltering may be needed for earthquake, flood, wildfire, or an act of terrorism that displace people for longer periods of time.

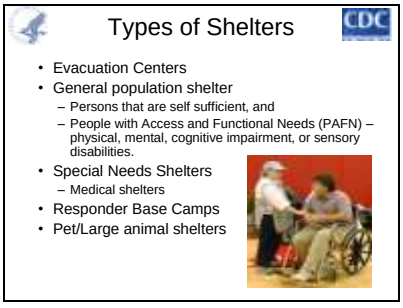
Slide 11

Disaster Events and Shelter Needs

	WARNING	NO WARNING
Short Term	Example: Hurricane ▪ More time to open shelter ▪ Time to advise residents to bring essential items ▪ Residents can prepare emotionally ▪ Less need for long term services ▪ Fewer supply requirements	Example: Apartment Fire, HAZMAT Spill ▪ Less opportunity for site selection ▪ Clients may arrive before Red Cross ▪ Clients have little time to gather essentials ▪ Less need for long term services ▪ Fewer supply requirements
Long Term	Example: Slow-rising Floods ▪ More time to open and establish logistics ▪ Need for long term services ▪ Greater supply needs ▪ Need for longer term staffing ▪ Shelters become a focal point for relief services	Example: Earthquake, Tornado ▪ Clients arrive before Red Cross ▪ Short lead time for obtaining supplies ▪ Need for long term services ▪ Greater supply needs ▪ Need for longer term staffing ▪ Shelters become a focal point for relief services

Types of Shelters (Slide 12)

Short term evacuation centers accept all who enter and can provide some level of medical care. California relies on a “one shelter” concept of operations as much as possible and does not automatically segregate shelter residents by medical needs. People with Access and Functional Needs (PAFN), that is physical, mental, cognitive or sensory disabilities, are accommodated in general shelters. Just because people have impairments does not mean they cannot be housed in general population shelters. Most shelters comply with the Americans with Disabilities Act and therefore are suitable for housing people with mobility and other types of impairments.



Slide 12

However, special needs shelters may be needed for medically fragile individuals such as residents of evacuated hospitals and nursing centers and other individuals dependent on medical assistance. Medical shelters provide more medical care and may include field hospitals. Public health is typically the lead for managing the medical needs in shelters and operating medical shelters.

Responder base camps can benefit from environmental health assessments too! Care needs to be taken so that food and waterborne illnesses do not affect the disaster workforce. Ask yourself what would happen if there was a water or foodborne illness outbreak in a shelter or responder base camp. Environmental health needs to become involved with shelter operations of all kinds.

People's Needs Vary (Slide 13)

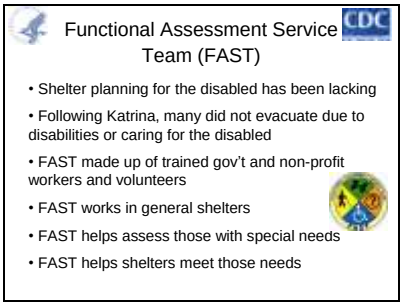
There are approximately 50 million American with disabilities, or about one in five persons. The Center for Personal Assistance Services has statistics on the number of people with disabilities and/or need for self-care assistance based on data from Census Bureau. It found that 15 percent of California's population has some disability and 43 percent of people 65 years or older have disabilities. Note: Many people with disabilities have a family caregiver so it is important to keep families together in a shelter.

Slide 13

In all shelters there is a need for vigilance to ensure that sanitation and safety standards are at the highest standard possible. In areas where there are special needs such as accommodating People with Access and Functional Needs (PAFN) some extra attention is needed.

Functional Assessment Service Team (FAST) (Slide 14)

The purpose of the Function Assessment Service Team (FAST) concept is to ensure that People with Access and Functional Needs (PAFN) have their needs met while residing in emergency shelters while maintaining their functional independence. FASTs are made up of trained workers from government and non-profit organizations and volunteers who conduct assessments of evacuees to determine if their needs can be met by the capabilities of the shelter; specifically, assessing the need for



Slide 14

support services i.e. assistants, medical equipment, supplies and medications. FAST also provides technical assistance to the shelter managers.

Shelter Selection (Slides 15-16)

Many public buildings are constructed with the intent of use as a shelter and must meet certain engineering requirements. The American Society for Civil Engineering (ASCE) Standard Minimum Design Loads for Buildings and Other Structures, SEI/ASCE 7-02 provides the requirements for flood, wind, snow, rain, ice, and earthquake loads, and their combinations, that are suitable for inclusion in building codes and other documents. See the module reference list for more information.

Slide 15

Shelters should be located in protected areas away from hazards and accessible to the affected population via major highway or road routes. Sports arenas, schools, conference centers, and places of worship are often used as shelters because they have flexible floor plans, large restrooms, and food facilities all in one location. Camps or tent cities are frequently used in other countries specifically with refugee populations. In the U.S. they are often used to house emergency responders and occasionally evacuees.

Slide 16

A “mega shelter” is a major facility such as a stadium over convention center that is used to house evacuees from a disaster area. A mega shelter best practices report was developed by the International Association of Assembly Managers working on shelter operations following the 2005 Hurricane Katrina. It provides some great insight on public health issues faced by the managers of these facilities. See the module reference list for more information.

The ARC uses standard assessment criteria for identifying facilities that are suitable for shelters. When local facilities are evaluated for suitability it would be useful for EH practitioners to participate in the evaluation. ARC form #6564 provides a useful checklist for evaluating a facility’s compatibility for use as an evacuation shelter (see the module appendix for the form).

Note: In most areas many facilities have been screened and identified as potential emergency shelters. EH should maintain a list of the shelter sites within their community. During an emergency, the local EOC will maintain a list of active shelters.

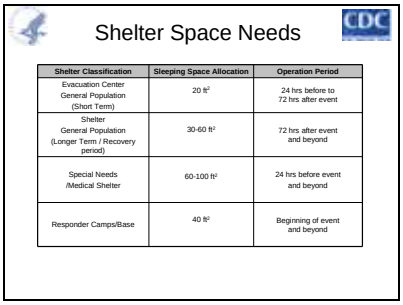
Shelter Criteria Guidance (Slides 17-18)

There are various space classification methods for emergency shelters. The table in the slide shows the criteria used by the ARC. Evacuation shelters that house people for short periods of time can be smaller but typically general population shelters require 40 square feet of sleeping space per person. The *Disaster Manual for EH Specialists* recommends at least 40-50 cubic feet of air space per person with 30 sq. ft. per person for single-tier bed units and 20 sq. ft. per person for double-tier bed units with beds spaced a minimum of 3 feet apart and arranged alternatively head-to-toe to reduce spread of communicable diseases.

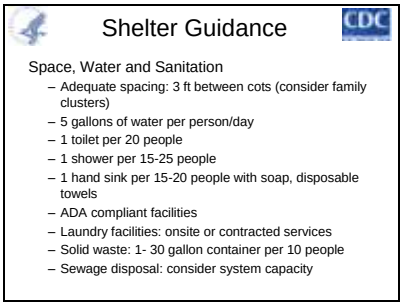
Shelter Classification	Sleeping Space Allocation	Operation Period
Evacuation Center General Population (Short Term)	20 ft2	24 hrs before to 72 hrs after event
Emergency Shelter General Population (Longer Term / Recovery period)	30-60 ft2	72 hrs after event and beyond
Special Needs /Medical Shelter	60-100 ft2	24 hrs before event and beyond
Responder Camps/Base	40 ft2	Beginning of event and beyond

Where used, special needs or medical shelters may require more space because of the need for medical equipment, larger beds, and medical staff. The layout of the floor plan for sleeping quarters can make a huge difference on the space needed, so it is important that a shelter be properly arranged.

Shelter operations are based on a set of recommendations or guidance documents and can vary somewhat depending on the source of information. Two good sources are the *ARC Shelter Operations Manual* and, for a quick reference guide, the *Disaster Field Manual for EH Specialists.* Recommendations will also vary depending on climate and physiologic needs - keep in mind that these are just recommendations. Space needs are different



Slide 17



Slide 18

depending on the length of operation and the duration of resident stays in the shelter. After the immediate danger has passed, many will leave the shelter, but those remaining because of damaged homes will need expanded space.

Recommendations:

- Space - ARC shelters provide a minimum of 40-60 square feet, two blankets and one cot per person (no sheets or pillows). Adequate spacing between cots is considered to be three feet but clustering of cots of allowable for family groups.
- Water - five gallons per person per day is needed for all uses, however, the ARC will plan on an additional one gallon of drinking water per person per day on hand for emergencies - just in case the water supply is interrupted.
- Sanitation – ARC uses one toilet and one shower per 40 people; *Disaster Manual for EH Specialists* recommends one toilet per 20 people; and one handsink with hot water, soap, disposable towels and shower per 15 people.
- Laundry facilities - can be on-site or outside contracted services can be used.
- Solid waste - one 30-gallon waste container is recommended per 10 people.
- Safety - Facilities should be fire-safety and code compliant. Typically, a Fire Marshal has the expertise to conduct this type of assessment. But as a reminder, safety is everyone's job: keep egresses clear and report problems.

In refugee camps or tent cities, the Sphere manual is a good tool for space recommendations. It recommends 484 square feet per person to size the entire camp space. The *Disaster Manual for EH Specialists* recommends no more than six to eight individuals per 16’ x 16’ size tent. See the module reference list for more information.

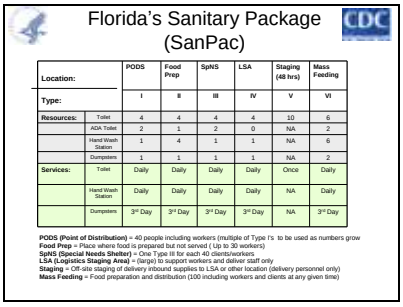
Be observant about the shelter population’s needs; for example, if there are excessive waiting times for the restroom, then more restroom facilities are needed. Consider the location and distance of travel to the restrooms as well. Restrooms should be clean and convenient and provide separate facilities for male and female occupants. Consider the capacity of the sewage disposal system as well.

Sanitary Facilities (Slides 19-20)

The slide shows sanitary facilities set up for a tent city after Hurricane Andrew. They weren't fancy, but they got the job done. This setup has all the important elements: a handwashing sink, towels, and soap. Sometimes you have to work with what you have. The blue barrel on top of the yellow barrel is a hand wash station. Operators added a spigot and provided soap and hand towels.

Slide 19

In past emergency events, Florida experienced problems with getting adequate sanitary facilities at key locations, so they developed what they call a "sanitary package" or "SanPac" concept. Florida uses the "SanPac" concept for determining the number of restroom and handwashing facilities needed for shelters. This chart shows the number of facilities needed for specific emergency response operations such as special needs shelters and mass feeding operations. For example, in Florida, special needs shelters are provided 4 toilets, 2 disability toilets, 1 hand wash sink, and 1 dumpster for every 40 people with daily servicing. This is above and beyond the usual requirements found in most recommendations, but is intended to provide a safety factor in case servicing is interrupted or delayed.



Slide 20

Florida Sanitary Package (SanPac)

Location:		PODS	Food Prep	SpNS	LSA	Staging (48 hrs)	Mass Feeding
Type:		I	II	III	IV	V	VI
Resources:	Toilet	4	4	4	4	10	6
	ADA	2	1	2	0	NA	2
	Hand-washing Station	1	4	1	1	NA	6
	Dumpsters	1	1	1	1	NA	2
Services:	Toilet	Daily	Daily	Daily	Daily	Once	Daily
	Hand-washing Station	Daily	Daily	Daily	Daily	NA	Daily
	Dumpsters	3rd Day	3rd Day	3rd Day	3rd Day	NA	3rd Day

PODS (Point of Distribution) = 40 people including workers (multiple of Type I's to be used as numbers grow
Food Prep = Place where food is prepared but not served (Up to 30 workers)
SpNS (Special Needs Shelter) = One Type III for each 40 clients/workers
LSA (Logistics Staging Area) = (large) to support workers and deliver staff only
Staging = Off-site staging of delivery inbound supplies to LSA or other location (delivery personnel only)
Mass Feeding = Food preparation and distribution (100 including workers and clients at any given time)

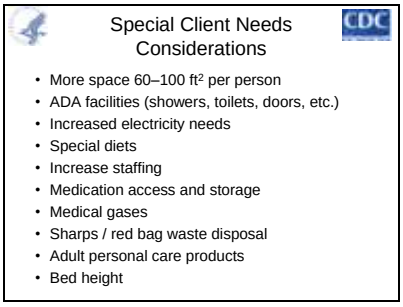
Special Needs (Slides 21-22)

Special arrangements may be needed for some shelter clients; such as persons with mobility issues or health concerns.

Shelters accommodate these clients by:

- Keeping aisles wide enough for wheelchairs and walkers;
- Removing tripping hazards and avoiding walkways with uneven surfaces;
- Providing special bed heights;
- Having ADA compliant sanitary facilities located within a reasonable distance;
- Providing additional space (60–100 square feet per resident);
- Accommodating special dietary needs;
- Providing access to and storage for medications and medical gases;
- Providing personal care products such as adult diapers;
- Providing biohazards/sharps waste disposal facilities;
- Increasing staffing, electricity, and handwashing facilities where needed.

The photo in this slide shows a convention facility that made a great shelter because it had a very flexible floor plan with electrical, water, and sewage facilities located in the flooe every 10 feet. This made the installation of special facilities such as this wheelchair-accessible shower very easy.



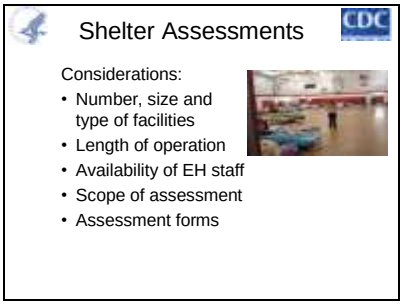
Slide 21

Slide 22

Shelter Assessments (Slides 23-24)

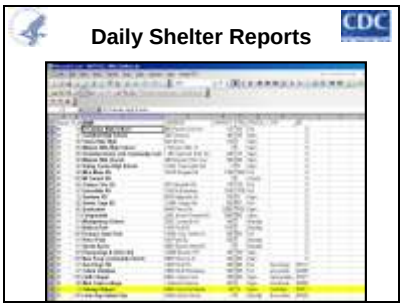
When and how often to conduct shelter assessments depends on:

- How long will the facility be open? Is it just open for the one night or several weeks/months?
- Facility size and type: Is it a large or small operation? Is it located in an older facility where you have more potential health risks to the population?
- What are you being asked to assess? Is it just the food service operation or the whole facility?
- Is there sufficient EH to conduct assessments?
- How complex are the sheltering operations? Are there many potential risk areas?
- Is there a need to conduct an overview type assessment or a more comprehensive assessment?



Slide 23

The local Emergency Operations Center (EOC) should be able to provide a daily report on the number and locations of shelters as well as the population size served by each shelter. This information will help prioritize how assessment resources are used.



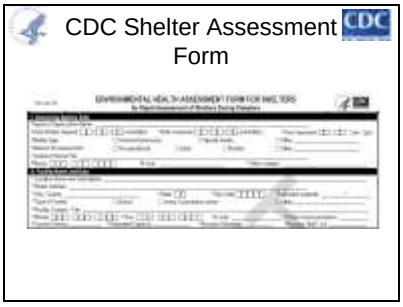
Slide 24

Assessment Forms (Slides 25-26)

A standardized assessment form should be used to guide the assessment no matter the depth or breadth. During Hurricane Katrina, there were many different shelter assessment forms created by local health departments. Since then, CDC has worked with several states to bring together the best attributes of all of the forms used. The CDC Shelter Assessment form is available for states or local governments to use or alter to fit their specific needs. Several jurisdictions in California have created shelter assessment forms; San Diego's form is shown in this slide.

(SEE MODULE APPENDIX FOR ENTIRE CDC FORM)

The appendix also includes a sample assessment checklist.



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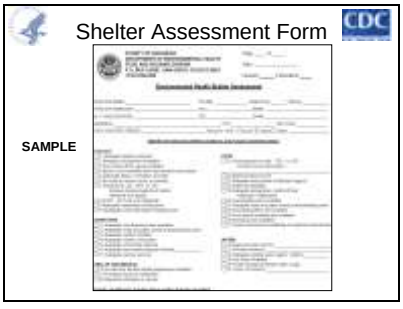
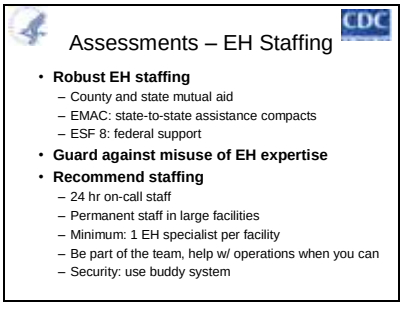


Slide 26

Assessments - Environmental Health Staffing (Slide 27)

EH practitioners typically are involved with assessing emergency shelters ensuring that basic needs related to potable water, food safety, general sanitation, disposal of wastes, and personal hygiene are being met.

EH is part of the health and medical team within the shelter operations and is often asked to assess the various operations within an emergency shelter to ensure health and safety standards are met and maintained. EH staff must be assigned and an assessment process established prior to performing shelter assessments. It is recommended that EH practitioners be



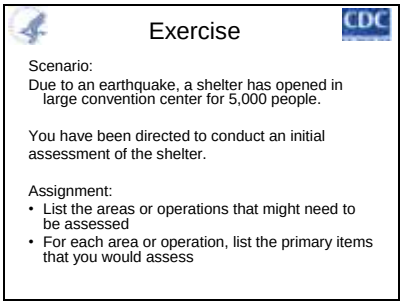
Slide 27

available on a 24 hour / on-call basis with at least one EH professional assigned to the larger facilities. A ratio of one EH professional to 500 residents is suggested by FEMA as a guide to determine how many staffers are needed for shelter assessments. The 2007 Environmental Health Target Capabilities List recommends that an initial assessment be conducted within 48 hours of a shelter being activated.

If additional assistance is needed with shelter assessments, assets can be deployed through the SEMS process from a variety of sources including county and state mutual aid agreements, Emergency Management Assistance Compacts (EMAC) and federal assistance. EH staff should guard against performing activities outside of environmental health responsibilities. Make sure that EH issues are covered first before becoming involved in other health-related or shelter activities.

Exercise (Slide 28)

(SEE MODULE APPENDIX FOR WORKSHEET)



Slide 28

Scenario:

Due to a severe earthquake, a shelter has opened in a large convention center for a displaced population of 5,000 people. You have been directed to conduct an initial comprehensive environmental health assessment of the shelter.

Assignment:
- List the areas or operations that need to be assessed
- For each area or operation, list the primary items that you would need to assess.

Consult the *Disaster Field Manual for Environmental Health Specialists,* if available.

Assessment Process (Slides 29-30)

There are many issues to consider, particularly for larger shelters, when developing a shelter assessment process. Consider each operation within the shelter and schedule an assessment at appropriate and critical times; for example, a food survey during meal preparation. Whenever possible, correct problems during the assessment. For example, if thawing

hamburger was observed stored above ready-to-eat items in the refrigerator, ask that it be corrected or jump in and help the kitchen manager change it around. Critical items that can have a direct impact on health should be dealt with immediately.

Identify training needs for staff and volunteers. Instituting a short training session for volunteers can go a long way in protecting health, i.e. how to mix cleaning solutions or food handling instructions. Make reports simple and easy to read. Always review shelter assessment findings with managers before leaving the facility. Be aware that shelter management staff may rotate every few weeks. It may be necessary summarize assessments from many different shelters for shelter leadership. Look for system-wide fixes - sometimes problems are repeated in several different shelters. For example, problems with trash removal may point to insufficient dumpsters or lack of a contract with a solid waste hauler.

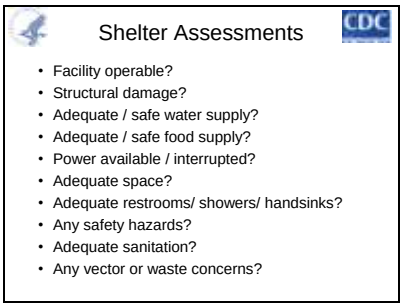
Assessments should include the following items:

- Adequate shelter staff
- Emergency equipment including automatic fire extinguishing systems, portable fire extinguishers, and emergency evacuation plans
- A minimum of two (2) means of fire egress should be available.
- Beds or cots with clean bedding
- Adequate space
- Sufficient toilet, handwashing, and showering facilities
- Adequate refuse container and disposal frequency
- Auxiliary light source, primarily from battery-powered flashlight (no lanterns, candles or open flame)
- Exhaust gases should be directed away from the shelter, residents, and personnel to avoid carbon monoxide exposures.
- Air turnover rates should be adequate.
- Animal areas should be clean.

Shelter Operations: Food (Slides 31-32)

If shelter operations include a kitchen, the following items require monitoring:

- Handwashing facilities - soap, disposable towels, etc. must be accessible for kitchen staff.
- Food handlers - appropriate use of gloves, be observant of how the gloves are being used.
- Food temperature control - hot food held 135°F and above; cold food held 41°F or below.



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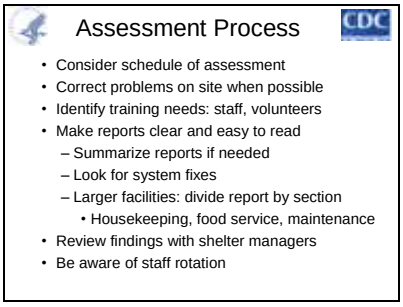

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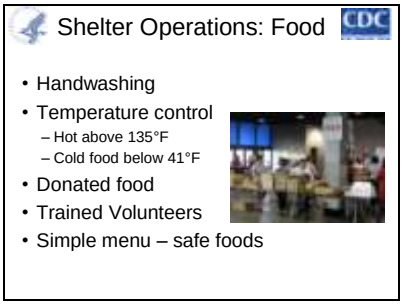


Slide 31

- Donated food - no donated foods can be accepted in a shelter feeding operation. People always want to donate food, but when the preparation methods and sources cannot be verified it cannot be used.
- Food handler training - EH professionals may be needed for conducting food safety training for food services volunteers.
- Simple menu consisting of safe foods – the use of low-risk food is key!
- Control insects and rodents in food areas using only approved pesticides.

Slide 32

Remember that shelter food service surveillance it is not about enforcing the regulations - it is about working together to keep the people housed in the shelter safe and healthy. The people being cared for in the shelter have suffered many losses, so the focus should be on keeping them safe and healthy. Note: Food safety is a big priority with a medically fragile population as a foodborne illness outbreak could be devastating.

More information on food safety is found in Module 4.

Shelter Operations: Water Supply (Slide 33)

Shelters require an adequate supply of potable water:
- Shelter: 5 gallons/person/day
- Feeding Center: 5-8 gallons/person/day
- First Aid Station:10-15 gallons/person/day

Slide 33

A critical concern is that the water supplied to a shelter is safe to drink. Compromised or suspect water supply systems can only be deemed suitable as a potable source following mitigation and satisfactory laboratory confirmation. Emergency disinfection methods may be needed if water is of unknown or uncertain bacteriological quality. The U.S. EPA recommends 1/8 teaspoon or 8 drops of household bleach (5-6% chlorine) per gallon of drinking water. Other water concerns include:
- Water temperature for sanitation: warm water at 100 degrees Fahrenheit and 110 degrees Fahrenheit for hot water.
- Water storage: water must be stored in appropriate containers to avoid contamination. A chlorine residual should be maintained between 0.2 and 1.0 mg/L (0.2-1 ppm)
- Cross connections: must be eliminated to avoid contamination of drinking water.

More information on drinking water safety is found in Module 3.

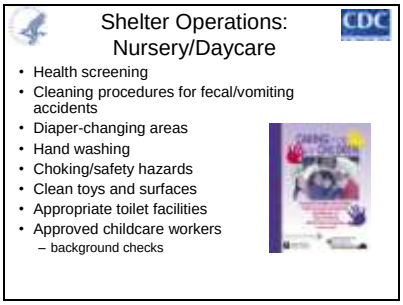
Shelter Operations - Nursery/Daycare (Slides 34-35)

If daycare is provided within the shelter, look to provide similar safety and infection control assessments as done in any regular childcare operation, with modifications. Some of the guidance documents that can help are local daycare health codes and a guide called *Caring for our Children*. It is considered by many to be the bible to health and safety for child care operations. See the module reference list for more information.

Assessment of this area may include:

- Health screening for workers and children;
- Cleaning procedures for bodily fluid accidents;
- Sanitation of diaper changing areas;
- Toilet and handwashing facilities;
- Choking and safety hazards;
- Cleanliness of toys and surfaces; and
- Childcare worker screening including background checks.

Diaper changing areas shall be kept clean and sanitary with handwashing facilities available nearby.



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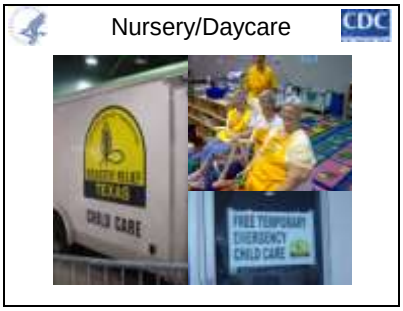


Slide 35

Cleaning / Housekeeping (Slides 36-39)

Another important shelter consideration is housekeeping. Take a close look at how the cleaning operations are being conducted. Who conducts housekeeping within a shelter can vary; they may be volunteers, shelter residents, or professional contractors.

Here are some of the key areas of concern:

- Are the proper disinfectants being used? How is it mixed/applied?
- Are the proper cleaning and disinfection methods being used? For example, is the same towel used for cleaning toilets being used to clean sink handles?
- How frequently is cleaning required? Small operations may require only daily cleaning where larger shelters may require increased frequency.
- Are the cleaning staff professionals or volunteers? Is “just in time” volunteer training needed?
- Is the cleaning staff properly protected? Do they have adequate personal protective equipment (PPE) and are chemicals being mixed properly?
- Does the cleaning staff have supplies and training for bodily

Slide 36

Slide 37

fluid clean up?

The EH professional should be familiar with proper bodily fluid cleaning and disinfection procedures as a bodily fluid spill poses the risk for disease transmission. When an event occurs make sure that an adequate job of disinfection is done to eliminate the potential for the spread of disease. It should always be assumed that this type of incident presents the potential for contact with one of toughest germs out there - norovirus.

These items should be included in a bodily fluids spill kit:

- PPE
- Paper towels
- Plastic garbage bags
- Absorbent
- Mop and mop bucket
- Detergent
- Disinfectant approved for norovirus

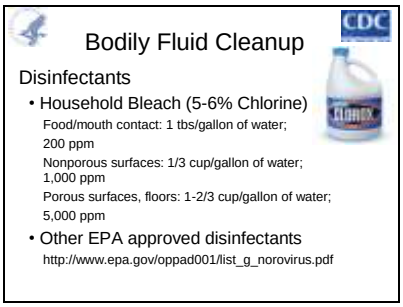
Bodily fluid spill kits are available commercially.

Appropriate disinfectants for shelter operations include chlorine bleach (household type with at least. 5 percent concentration sodium hypochlorite). Bleach is an effective sanitizer and is usually readily available at low cost, but can harm some surfaces. If improperly mixed bleach compounds can generate gases that create a health concern. Never mix bleach with ammonia! If there is concern about damaging surfaces, test the bleach solution on a small area before applying to the entire area.

Here are concentrations and mixing instructions for a disinfecting solution used when norovirus is a concern:

- For items that have a potential food or mouth contact use one 1/3 cup per gallon of water for a 1,000 ppm solution.
- For nonporous surfaces such as floors use approximately 1/3 cup per gallon of water for a 1,000 ppm solution.
- For porous surfaces use 1½ cups per gallon of water for a 5,000 ppm solution.

Carpet and other soft surfaces may be damaged by a bleach solution however, there are several other EPA-approved disinfectants appropriate for norovirus that can be used on these type of surfaces. See the module reference list for more information. Porous surfaces are best addressed by discarding



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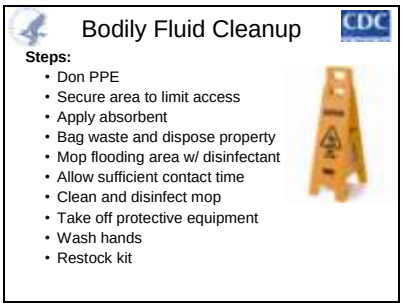


Slide 39

them whenever possible.

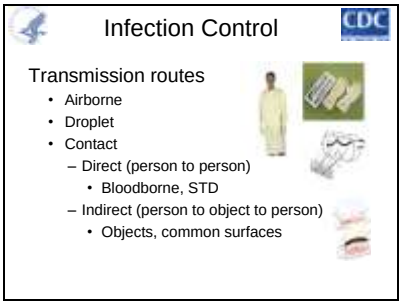
For cleaning spills of bodily fluids such as vomitus or stool, this process should be used:

Step 1
Don PPE and secure area to limit access
Step 2
Clean up any visible organic debris with absorbent material (double layer and place in a plastic bag to minimize exposure to aerosols). Clean area with detergent.
Step 3
Liberally disinfect area and objects surrounding the contamination with a disinfectant solution. See above for chlorine solution instructions. Provide sufficient contact time by allowing area to air dry - 15-20 minutes should suffice.

Don't forget to:
- Clean and disinfect cleaning equipment
- Wash hands after doffing PPE, and
- Restock cleaning kit

Kits should have appropriate PPE: gloves, eye protection/face shield, protective gowns or aprons, etc. Depending on the chemical being used, a durable, chemically resistant glove may be needed. An N95 type respirator is recommended especially when dealing with norovirus. Protective gowns or aprons need to be cleaned after each use wash in hot water and bleach or use disposable gowns. The CDC guidance document *Preventing Transmission of Infectious Agents in Healthcare Settings* provides a good list of protective equipment for cleaning bodily fluid spills. See the module reference list for more information.

Infection Control (Slides 40-42)



Slide 40

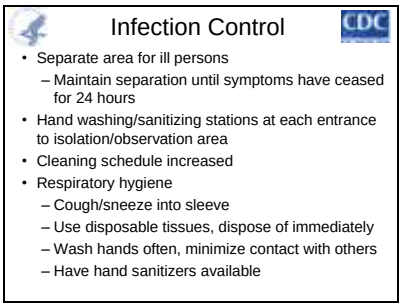
Shelter operations require special vigilance on infection control. Diseases can be transmitted through the air by sneezing, as droplets by splashing, or by contact either by direct person-to-person contact or indirectly by contamination of surfaces such as door handles and hand rails.

EH practitioners need to ensure that procedures are in place to prevent the spread of disease. It is very important to have disease monitoring procedures established in the shelter. It is ideal to have an infection control nurse assigned to monitor

infection control procedures and to track and record disease rates to determine the health status of the sheltered population.

Some infection control strategies for shelters:

- Maintain a separate area for ill persons until symptoms have ceased for at least 24 hours;
- Handwashing / sanitizing stations at each entrance to the examination/isolation/observation areas as well as food lines;
- Use of hand sanitizers in addition to frequent handwashing;
- An increased cleaning schedule for sickbay and restrooms;
- Attention to respiratory hygiene i.e. Cough/sneeze into sleeve;
- Keeping restroom doors propped open; and
- Frequent sanitizing of common surfaces with bleach or other EPA-approved disinfectant.



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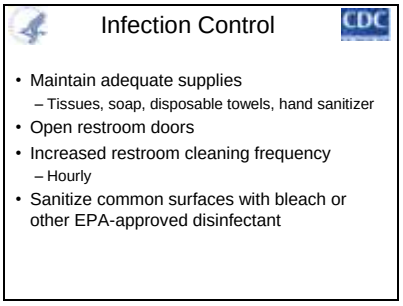


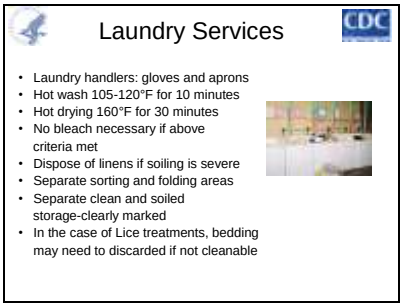
Slide 42

Laundry Services (Slide 43)

On-site laundry facilities are rare in shelters but if available, the following procedures are recommended:

- Laundry handlers use gloves and aprons
- Hot wash laundry at 105-120°F for 10 minutes
- Hot drying laundry at 160°F for 30 minutes
- No bleach necessary if above criteria met
- Dispose of linens if soiling is severe
- Separate dirty sorting and clean folding areas
- Storage areas should be clearly marked

Laundry facilities may be established on-site if designed in such a way as to minimize contamination of stored food, water, surrounding soil. Waste effluent must be properly managed i.e. treated as sewage. If no hot water is available, bleach can be used to sanitize bedding and other laundry items. Note: If lice is a concern in a shelter, it may be necessary to discard bedding if it cannot be adequately laundered.



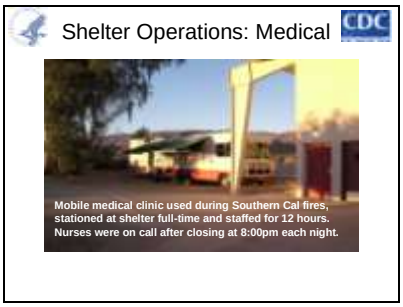
Slide 43

Shelter Operations: Medical (Slide 44)

At least one full-time health professional should be on site and responsible for health supervision. A medical log book should be maintained with the following information:

- Name, age, personal information of person treated,
- First aid or medical treatment provided,
- Dates of treatment, and
- Name, title of treatment provider.

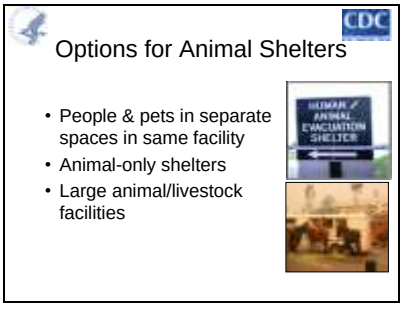
Report should be made to the local EH agency of all occurrences of foodborne illness, and records maintained of all medically diagnosed infectious, contagious or communicable diseases.



Slide 44

Shelter Operations: Animals (Slides 45-48)

The sheltering of animals, both pets and larger animals must be considered if an evacuation is required. There are options on how animals are sheltered. Pets and owners are sometimes housed in the same facility, but in separate areas. This way the owners can care for their pets making the operations less labor intensive than animal-only shelters. There are clear physical and mental health benefits to this arrangement. Taking care of pets gives people an activity that increases physical activity, reduces stress, and improves mood.



Slide 45

Some of the positives and negatives of having people sheltered near their pets are:

- Owners can care for pets;
- Owners do not have to worry about pets;
- Owners may be soothed by having pet nearby;
- Owners not immediately available at all times and will require use of volunteers; and
- Setup can be labor intensive.

Slide 46

Pet shelters and people shelters can exist in the same complex and both populations can remain healthy if the right protections are put into place. A public building such as a school can be converted to a pet shelter with the proper preparation. Rooms and hallways can be lined with heavy duty plastic with runners placed on top to create walkways.

Some kind of control is needed to keep track of animals in the shelters. Armbands can be given to owners and neckbands for the pets. Volunteers are often used register pets and owners.

From a public health standpoint, several issues must be considered:

- Disease transmission to humans – Could an outbreak of disease in a pet shelter spread to a human shelter?
- Allergies – Considerations should be made for sensitive populations.
- Potable water needs – Will the demand for potable water at the pet shelter affect the human supply?
- Animal food storage and donation management - Proper storage is needed to reduce rodent issues.
- Handwashing facilities– Are they available and used by owners and staff?
- Cleaning - General cleaning and disinfection of cages is needed.
- Air flow and temperature control – Keep pets and workers safe
- Worker training and protection – Proper training of volunteers
- Fecal management – How will pet waste be managed both in the kennels and outside the shelter?
- Biohazards/sharps – How will the animal clinic operation manage its medical waste?
- Animal control and handling safety – General safety and bite prevention through use of leashes and other restraints

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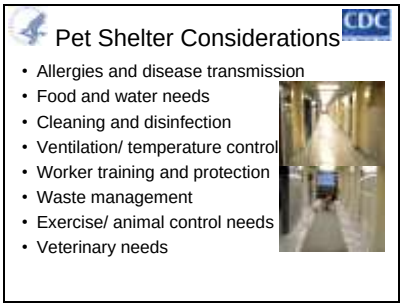


Slide 48

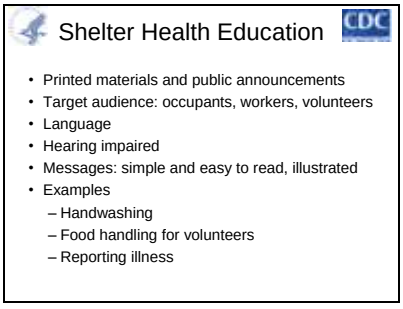
Disaster training is provided through the Human Society and it does include a health and safety component for animals. Information about planning for pets and animals in disasters is available from the Human Society website. See the reference list for this module for more information.

Shelter Health Education (Slides 49-51)

Another important EH function in shelter operations is promoting health through the use of educational messages. Messages can be handed out and/or posted, as well as broadcast via the public address system.

The target audience for the messages can vary therefore messages should be made appropriate for the shelter occupants, workers, and volunteers. Language should be considered and translation services provided when needed. The needs of the hearing-impaired population should also be considered. Health messages should be simple, easy to understand, and supported with appropriate images depicting the positive action desired.

Some example of message topics:



Slide 49

- Handwashing;
- Food handling; and
- Reporting illness to shelter medical staff.

Handwashing signs were posted at the beginning of a food line at the George R. Brown Convention Center Shelter in Houston. A handwashing station was located there too. Shelter clients were encouraged to wash hands and the operation was coupled with counseling services. A counselor would hand clients disposable hand towels and ask people how they were feeling and inform them of the availability of counseling services.

Several examples of multi-language messages can be found on CDC shelter resources web site. Why reinvent the wheel if you don't have to? Existing materials can be used or modified to the situation. See the module reference list for more information.

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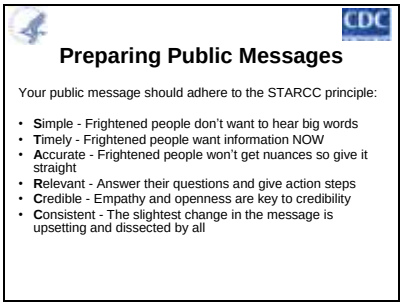
Slide 51

Preparing Public Messages (Slide 52)

The public will be listening for factual information, and some will be expecting to hear a recommendation for action. Get the facts right, repeat them consistently through your department or county Public Information Officer (PIO) and ensure that all credible sources share the same facts. Speak with one voice. Again, preparation counts. Consistent messages are vital. Inconsistent messages will increase anxiety and will quickly torpedo credibility of experts.

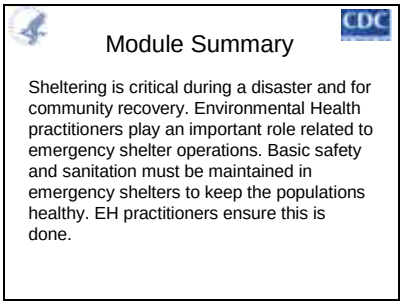
Having standardized disaster information prepared in advance and easily available on your agency's website, will help the public find the information they need to take action to protect themselves. Work with neighboring counties and other agencies to ensure your disaster information is consistent with theirs. STARCC is from the CDC's *Crisis and Emergency Risk Communication by Leaders for Leaders.* See the module reference list for more information.



Slide 52

Module Summary (Slide 53)

Sheltering is critical during a disaster and for community recovery. Environmental health practitioners play an important role related to emergency shelter operations. Basic safety and sanitation must be maintained in emergency shelters to keep the populations healthy. EH practitioners ensure that this is accomplished.



Slide 53

Module 5 Acronyms

ADA	Americans with Disabilities Act
ARC	American Red Cross
ASCE	American Society of Civil Engineers
Cal EMA	California Emergency Management Agency
CDC	Centers for Disease Control and Prevention
CCDEH	California Conference of Directors of Environmental Health
CDPH	California Department of Public Health
DFM	Disaster Field Manual (CCDEH)
EH	Environmental Health
ELO	Enabling Learning Objective
EMA	Emergency Management Agency
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
ERV	Emergency Response Vehicle
ESF	Emergency Support Function
FAST	Functional Assessment Services Team
FEMA	Federal Emergency Management Agency
ICS	Incident Command Structure
IPM	Integrated Pest Management
NSS	National Shelter System
PIO	Public Information Officer
PPE	Personal Protective Equipment
ppm	Parts per Million
SOP	Standard Operating Procedure
STD	Sexually Transmitted Disease
TLO	Terminal Learning Objective
VOAD	Volunteer Organizations Assisting in Disaster
WHO	World Health Organization

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Module 5 Appendix

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Module #5 Shelters
Exercise Worksheet

Scenario:

Due to a severe earthquake, a shelter has opened in a large convention center for a displaced population of 5,000 people. You have been directed to conduct an initial comprehensive environmental health assessment of the shelter.

Assignment:
- List the areas or operations that need to be assessed
- For each area or operation, list the primary items that you would need to assess.

Consult the *Disaster Field Manual for Environmental Health Specialists,* if available.
Scenario:

Shelter Area or Operation	Assessment Items

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CDC Form

State Logo

ENVIRONMENTAL HEALTH ASSESSMENT FORM FOR SHELTERS

For Rapid Assessment of Shelter Conditions during Disasters

I. ASSESSING AGENCY DATA

[1]Agency /Organization Name _____ [90]Immediate Needs Identified: ☐ Yes ☐ No

[2]Assessor Name/Title _____

[3]Phone __ __ __ - __ __ __ - __ __ __ __ [4]Email or Other Contact _____

II. FACILITY TYPE, NAME AND CENSUS DATA

[5]Shelter Type ☐ Community/Recovery ☐ Special Needs ☐ Other _____ [6]ARC Facility ☐ Yes ☐ No ☐ Unk/NA [7]ARC Code _____

[8]Date Shelter Opened __ __ /__ __/__ __ (mm/dd/yr) [9]Date Assessed __ __ /__ __/__ __ (mm/dd/yr) [10]Time Assessed __ __ : __ __ ☐ am ☐ pm

[11]Reason for Assessment ☐ Preoperational ☐ Initial ☐ Routine ☐ Other _____

[12]Location Name and Description _____

[13]Street Address _____

[14]City / County _____ [15]State __ __ [16]Zip Code __ __ __ __ __ [17]Latitude/Longitude _____/_____

[18]Facility Contact / Title _____ [19]Facility Type ☐ School ☐ Arena/Convention center ☐ Other_____

[20]Phone __ __ __ - __ __ __ - __ __ __ __ [21]Fax __ __ __ - __ __ __ - __ __ __ __ [22]E-mail or Other Contact _____

[23]Current Census _____ [24]Estimated Capacity _____ [25]Number of Residents _____ [26]Number of Staff / Volunteers _____

III. FACILITY

[27]Structural damage	☐ Yes	☐ No	☐ Unk/NA
[28]Security / law enforcement available	☐ Yes	☐ No	☐ Unk/NA
[29]Water system operational	☐ Yes	☐ No	☐ Unk/NA
[30]Hot water available	☐ Yes	☐ No	☐ Unk/NA
[31]HVAC system operational	☐ Yes	☐ No	☐ Unk/NA
[32]Adequate ventilation	☐ Yes	☐ No	☐ Unk/NA
[33]Adequate space per person	☐ Yes	☐ No	☐ Unk/NA
[34]Free of injury /occupational hazards	☐ Yes	☐ No	☐ Unk/NA
[35]Free of pest / vector issues	☐ Yes	☐ No	☐ Unk/NA
[36]Acceptable level of cleanliness	☐ Yes	☐ No	☐ Unk/NA
[37]Electrical grid system operational	☐ Yes	☐ No	☐ Unk/NA
[38]Generator in use, [39] If yes, Type_____	☐ Yes	☐ No	☐ Unk/NA
[40]Indoor temperature _____ °F			☐ Unk/NA

IV. FOOD

[41]Preparation on site	☐ Yes	☐ No	☐ Unk/NA
[42]Served on site	☐ Yes	☐ No	☐ Unk/NA
[43]Safe food source	☐ Yes	☐ No	☐ Unk/NA
[44]Adequate supply	☐ Yes	☐ No	☐ Unk/NA
[45]Appropriate storage	☐ Yes	☐ No	☐ Unk/NA
[46]Appropriate temperatures	☐ Yes	☐ No	☐ Unk/NA
[47]Hand-washing facilities available	☐ Yes	☐ No	☐ Unk/NA
[48]Safe food handling	☐ Yes	☐ No	☐ Unk/NA
[49]Dishwashing facilities available	☐ Yes	☐ No	☐ Unk/NA
[50]Clean kitchen area	☐ Yes	☐ No	☐ Unk/NA

V. DRINKING WATER AND ICE

[51]Adequate water supply	☐ Yes	☐ No	☐ Unk/NA
[52]Adequate ice supply	☐ Yes	☐ No	☐ Unk/NA
[53]Safe water source	☐ Yes	☐ No	☐ Unk/NA
[54]Safe ice source	☐ Yes	☐ No	☐ Unk/NA

VI. HEALTH / MEDICAL

[55]Reported outbreaks, unusual illness / injuries	☐ Yes	☐ No	☐ Unk/NA
[56]Medical care services on site	☐ Yes	☐ No	☐ Unk/NA
[57]Counseling services available	☐ Yes	☐ No	☐ Unk/NA

VII. SANITATION

[58]Adequate laundry services	☐ Yes	☐ No	☐ Unk/NA
[59]Adequate number of toilets	☐ Yes	☐ No	☐ Unk/NA
[60]Adequate number of showers	☐ Yes	☐ No	☐ Unk/NA
[61]Adequate number of hand-washing stations	☐ Yes	☐ No	☐ Unk/NA
[62]Hand-washing supplies available	☐ Yes	☐ No	☐ Unk/NA
[63]Toilet supplies available	☐ Yes	☐ No	☐ Unk/NA
[64]Acceptable level of cleanliness	☐ Yes	☐ No	☐ Unk/NA
[65]Sewage system type	☐ Community	☐ On site	☐ Portable ☐ Unk/NA

VIII. SOLID WASTE GENERATED

[66]Adequate number of collection receptacles	☐ Yes	☐ No	☐ Unk/NA
[67]Appropriate separation	☐ Yes	☐ No	☐ Unk/NA
[68]Appropriate disposal	☐ Yes	☐ No	☐ Unk/NA
[69]Appropriate storage	☐ Yes	☐ No	☐ Unk/NA
[70]Timely removal	☐ Yes	☐ No	☐ Unk/NA
[71]Types	☐ Solid	☐ Hazardous	☐ Medical ☐ Unk/NA

IX. CHILDCARE AREA

[72]Clean diaper-changing facilities	☐ Yes	☐ No	☐ Unk/NA
[73]Hand-washing facilities available	☐ Yes	☐ No	☐ Unk/NA
[74]Adequate toy hygiene	☐ Yes	☐ No	☐ Unk/NA
[75]Safe toys	☐ Yes	☐ No	☐ Unk/NA
[76]Clean food/bottle preparation area	☐ Yes	☐ No	☐ Unk/NA
[77]Adequate child/caregiver ratio	☐ Yes	☐ No	☐ Unk/NA
[78]Acceptable level of cleanliness	☐ Yes	☐ No	☐ Unk/NA

X. SLEEPING AREA

[79]Adequate number of cots/beds/mats	☐ Yes	☐ No	☐ Unk/NA
[80]Adequate supply of bedding	☐ Yes	☐ No	☐ Unk/NA
[81]Bedding changed regularly	☐ Yes	☐ No	☐ Unk/NA
[82]Adequate spacing	☐ Yes	☐ No	☐ Unk/NA
[83]Acceptable level of cleanliness	☐ Yes	☐ No	☐ Unk/NA

XI. COMPANION ANIMALS

[84]Companion animals present	☐ Yes	☐ No	☐ Unk/NA
[85]Animal care available	☐ Yes	☐ No	☐ Unk/NA
[86]Designated animal area	☐ Yes	☐ No	☐ Unk/NA
[87]Acceptable level of cleanliness	☐ Yes	☐ No	☐ Unk/NA

XII. OTHER CONSIDERATIONS

[88]Handicap accessibility	☐ Yes	☐ No	☐ Unk/NA
[89]Designated smoking areas	☐ Yes	☐ No	☐ Unk/NA

XIII. COMMENTS *(List Critical Needs on Immediate Needs Sheet)*

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

XIV. IMMEDIATE NEEDS SHEET

Item #	Description

(Rev. 01/31/2008) DCS 08_116592

ARC form #6564

SHELTER FACILITY SURVEY

Please print all information. This form is generic to many types of shelters; some of the questions on this form might not apply to every site. In such cases, answer N/A (not applicable).

Site Name:
Street Address:
Town/City: **County/Parish:** **State: _____** **Zip Code: _____**
Mailing Address (if different):
Phone: ( ) _____-_____ **Fax:** ( ) _____-_____
Email address (if applicable):

EMERGENCY CONTACT INFORMATION:

To authorize facility use, contact (Name[s], phone number[s], cell number[s]); include secondary contacts:

_____

_____

To open the facility 24/7, contact (Name[s], phone number[s], cell number[s]); include secondary contacts:

_____

_____

Directions to the facility from the nearest major highway evacuation route. Use major landmarks (e.g., highways, intersections, rivers, railroad crossings, etc.). Do not use landmarks likely to be destroyed or unrecognizable after the disaster. Include latitude and longitude if available (they can be obtained via GPS).

_____

_____

Latitude: _____ Longitude: _____

CAPACITY

Capacity for all shelters should be calculated using any space that could feasibly be used as sleeping space for an event. In an evacuation shelter, capacity should be calculated using 15 to 20 square feet per person. In a general shelter, use 40 to 60 square feet per person to determine capacity.

Capacity **Evacuation = _____ at _____ square feet**
General = _____ at _____ square feet

LIMITATIONS ON FACILITY USE

Some facilities are only available during certain times due to other activities. Please indicate the dates that the facility is available.

☐ This facility will be available for use at any time during the year.

☐ This facility is **only** available for use during the following time periods.

From: _____ to _____

From: _____ to _____

☐ This facility **is not** available for use during the following time periods:

From: _____to _____

From: _____ to _____

Some facilities have specific areas that can be used as an emergency shelter. Please indicate restrictions on use of certain areas of the building or if the entire facility is available for use.

GENERAL FACILITY INFORMATION

FIRE SAFETY

Some facilities that appear to be suitable for sheltering might not meet fire codes based on building capacity. This list of questions is not meant to be exhaustive. It is recommended that local codes be examined to determine if the facility meets them. In addition, contact can be made with the fire department to ensure compliance.

Does the facility have inspected fire extinguishers? ☐ Yes ☐ No

Does the facility have functional fire sprinklers? ☐ Yes ☐ No

Does the facility have a fire alarm? ☐ Yes ☐ No

If yes, choose one: ☐ Manual (pull-down) ☐ Automatic

Does the fire alarm directly alert the fire department? ☐ Yes ☐ No

Comments from fire department, if available: _____

UTILITIES

A major concern in running an emergency shelter is whether or not utilities can continue to run after a storm. This section is designed to evaluate the capabilities of the facility and to list the appropriate contacts in case the utilities fail.

Emergency generator on site? ☐ Yes ☐ No

IF YES- Capacity in kilowatts _____ Power for entire shelter? ☐ Yes ☐ No
If no, what will it operate? _____

Operating time, in hours, without refueling, at rated capacity: _____

☐ Auto start ☐ Manual start Fuel type _____

Utility company name: _____

Contact name: _____ Emergency phone number: (_____) _____-_____

Generator fuel vendor: _____ Emergency phone number: (_____) _____-_____

Generator repair contact: _____ Emergency phone number: (_____) _____-_____

IF NO- Emergency generators do not have to be present in order to use the facility as a shelter. However, care must be taken to evaluate the appropriateness of the facility in emergency situations. For example, if there are no appropriate facilities in the area available for sheltering that have emergency generators, consideration should be made to use those facilities. Most pre-identified emergency shelters do not have generators. In addition, if a shelter does not have a generator on site, it is appropriate to pre-identify vendors so that a generator could be brought in if necessary.

Heating ☐ Electric ☐ Natural gas ☐ Propane ☐ Fuel ☐ Oil

Utility/vendor name: _____

Contact name: _____ Emergency phone number: (_____) _____-_____

Repair contact: _____ Emergency phone number: (_____) _____-_____

Cooling ☐ Electric ☐ Natural gas ☐ Propane

Utility/vendor name: _____

Contact name: _____ Emergency phone number: (_____) _____-_____

Repair contact: _____ Emergency phone number: (_____) _____-_____

Cooking ☐ Electric ☐ Natural Gas ☐ Propane ☐ No cooking facilities on site

Utility/Vendor name: _____

Contact name: _____ Emergency phone number: (_____) _____-_____

Repair contact: _____ Emergency phone number: (_____) _____-_____

See the Food Preparation section below.

Telephones Business phones available to shelter staff? ☐ Yes ☐ No

Phones available to shelter residents? ☐ Yes ☐ No

Number of phones: _____ Locations: _____

Utility/vendor name: _____

Contact name: _____ Emergency phone number: (_____) _____-_____

Repair contact: _____ Emergency phone number: (_____) _____-_____

Water ☐ Municipal ☐ Well(s) ☐ Trapped water

If trapped: Potable (drinkable) storage capacity in gallons: _____

Non-potable (undrinkable) storage capacity in gallons: _____

Utility/vendor name: _____

Contact name: _____ Emergency phone number: (_____) _____-_____

Repair contact: _____ Emergency phone number: (_____) _____-_____

Planning for Drinking Water

The recommended amount of potable water to have on hand per evacuee is one gallon per day. Presuming that existing water supplies remain available, and that the goal for resources on hand is for three days after the shelter opens, you should strive to have three gallons on hand for each projected shelter resident. *Projected population x 3 =projected number of gallons of water needed.*

Projected population x 3 _____

_____-Total available _____

Gallons of Water Needed _____

MATERIAL SUPPORT

COTS & BLANKETS

During evacuation sheltering, it is often impractical to have cots and bedding for all evacuees. However, it is desirable to have some cots and bedding on hand to be provided on a case by case basis to shelter residents who could, for a variety of reasons, experience hardship by sleeping on the floor. A good planning target for the quantity of cots to have on hand for evacuation sheltering is enough for 10% of the projected population. Generally, it is recommended to have two blankets per person in the shelter. *Projected population ÷10 = projected number of cots needed.*

Projected population ÷10 _____
- Total available _____
Cots needed _____

Projected population ÷ 5 _____
- Total available _____
Blankets needed _____

ACCESSIBILITY FOR PEOPLE WITH DISABILITIES

Many people with disabilities can be accommodated in general shelters. It is important to evaluate a building to determine if it is accessible to people with disabilities. No single deficiency in the following list makes a facility "out of compliance" or unfit for consideration. There are many acceptable temporary mechanisms that can make a facility accessible. For guidance in this area, contact your local building or safety department, an assisted living center or a disability advocacy organization.

Access to building

☐ Curb cuts (minimum 35 inches wide)

☐ Accessible doorways (minimum 35 inches wide)

☐ Automatic doors or appropriate door handles

☐ Ramps (minimum 35 inches wide) Are ramps: ☐ Fixed ☐ Portable

☐ Level Landings

Accessible and accommodating restrooms

☐ Grab bars (33-36 inches wide) ☐ Sinks @ 34 inches in height

☐ Stall (38 inches wide) ☐ Towel dispenser @ 39 inches in height

Showers

☐ Shower stall (minimum 36 inches by 36 inches) ☐ Grab bars (33-36 inches in height)

☐ Shower seat (17-19 inches high) ☐ Hand-held spray unit with hose

☐ Fixed shower head (48 inches high)

Accessible and accommodating cafeterias

☐ Tables (28-34 inches high)

☐ Serving line [counter] (28-34 inches high)

☐ Aisles (minimum 38 inches wide)

Accessible telephones

☐ Maximum 48 inches high ☐ TDD available ☐ Earpiece (volume adjustable)

SANITATION

TOILETS

The American Red Cross recommended ratio for toilet facilities is a minimum of 1 restroom for 40 people. Count only those facilities that will be accessible to shelter residents and shelter staff.
Projected population ÷ 40 = projected needed number of toilet facilities.

Number of toilets available: Men _____ Women _____ Unisex _____ People with Disabilities _____

Projected need: Men _____ Women _____ Unisex _____ People with Disabilities _____

- Total available: Men _____ Women _____ Unisex _____ People with Disabilities _____

Portable toilets needed: Men _____ Women _____ Unisex _____ People with Disabilities _____

SINKS

The recommended ratio of sinks is one sink for every two toilets.
Number of sinks available: Men Women Unisex People with Disabilities

Projected need	Men	Women	Unisex	People with Disabilities
Total available:	Men	Women	Unisex	People with Disabilities

Portable sinks needed: Men Women Unisex People with Disabilities

SHOWERS
The best case scenario for showers is 1 shower for every 40 residents. In the case of evacuation shelters, the ratio can be higher. However, if it is determined that an evacuation shelter will be open longer term, alternative arrangements will have to be made. There might be a nearby facility that, while it couldn't be used a shelter, might have showers available. Consider requesting transportation through partner agencies; when a Disaster Relief Operation (DRO) has been set up, requests can go through Partner Services at the DRO. Portable showers might need to be acquired.

Number of showers available: Men _____ Women _____ Unisex _____ People with Disabilities _____

Number of showers needed: Men _____ Women _____ Unisex _____ People with Disabilities _____

Are there any limitations on the availability of showers (time of day, etc.)? ☐ Yes ☐No

Alternatives for showers on-site:

Alternatives for showers off-site:

FOOD PREPARATION
☐ None on site ☐ Warming oven kitchen

☐ Full-service kitchen

(If full-service meals, "per meal" number that can be produced): _____

☐ Facility uses central kitchen — meals are delivered

Central kitchen contact: _____ Phone Number: (_____) _____-_____

Planning for shelter feeding
While people coming to evacuation shelters are encouraged to bring food with them, for a variety of reasons this doesn't always occur. Therefore, it pays to be prepared to feed shelter residents. For planning purposes, it is helpful to think in terms of three to five days of meals with no outside assistance. This covers the possibility of widespread damage to commercial food sources and infrastructure. Meals can range from freshly prepared food at shelter facilities that have adequate kitchen facilities to prepackaged shelf-stable meals (military-style Meals Ready to Eat [MREs], Heater Meals, etc.). The planning target should be 5 meals worth of food in inventory for each projected shelter resident.
Projected population x 5 = projected number of meals needed.

Projected need _____

- Total available _____

Meals Needed _____

Equipment (Indicate quantity and size [sq. ft.] as appropriate).

Refrigerators _____	Walk-in refrigerators _____	Ice machines _____
Freezers _____	Walk-in freezers _____	Braising pans _____
Burners _____	Griddles _____	Warmers _____
Ovens _____	Convection ovens _____	Microwave ovens _____
Steamers _____	Steam kettles _____	
Sinks _____	Dishwashers _____	

FEEDING AREAS

☐ None on site ☐ Snack Bar (seating capacity: _____) Cafeteria (seating capacity: _____)

☐ Other indoor seating (describe, including size and capacity estimate): _____

Total estimated seating capacity for eating: _____

Comments related to feeding: _____

OTHER CONSIDERATIONS

ARC 4496

"Standards for Selection of Hurricane Evacuation Shelters," or ARC4496, is a document published by the American Red Cross. Planning considerations for hurricane evacuation shelters involve a number of factors and require close coordination with local officials responsible for public safety. Technical information contained in hurricane evacuation studies, storm surge mapping, flood mapping and other data can now be used to make informed decisions about the suitability of shelters. Anyone considering using a facility as a hurricane evacuation shelters should carefully review ARC 4496 and consult with local officials to ensure safety of the facility is considered.

HEALTH SERVICES

Number of rooms available: _____ Number of beds or cots available: _____

Number of rooms needed: _____ Number of beds or cots needed: _____

Total square footage of available health care space: _____

BABY AND INFANT SUPPORT SUPPLIES

Diaper changing tables are extremely important due to health safety considerations. While there is not a recommended number of tables by population, there should be changing tables available. Beyond diaper changing, it is helpful to know in advance what baby supplies are available, if needed.

# of diaper changing tables: _____

# of diapers available: _____

Cans of formula available: _____

LAUNDRY FACILITIES

Generally, shelters do not have access to laundry facilities. Availability of such facilities would be considered an extra and not a necessity. These facilities would be especially useful for a shelter open longer than a week.

Number of clothes washers: _____ Number of clothes dryers: _____

Will the shelter worker or shelter residents have access to these machines? ☐Yes ☐No

Are laundry facilities coin operated? ☐Yes ☐No

Special conditions or restrictions: _____

ADDITIONAL INFORMATION

Does the entity that plans to manage the shelter own the building? ☐Yes ☐No

If NO- is there a current written agreement to use this site? ☐Yes ☐No

Is this facility within five miles of an evacuation route? ☐Yes ☐No

Is this facility within ten miles of a nuclear power plant? ☐Yes ☐No

Groups associated with this facility

Facility staff required when using facility? ☐Yes ☐No

Paid feeding staff required when using facility? ☐Yes ☐No

Church auxiliary required when using facility? ☐Yes ☐No

Fire auxiliary required when using facility? ☐Yes ☐No

Other: _____ Required ☐Yes ☐No

Other: _____ Required ☐Yes ☐No

Will any of the above groups be trained or experienced in shelter management?

IF YES, please list: _____

RECOMMENDATIONS/OTHER INFORMATION (Be specific):

_____

••••• Attach a sketch or copy of the facility floor plan •••••

Survey completed/updated by

_____ _____ _____

Printed Name Signature Date completed

_____ _____ _____

Printed Name Signature Date completed

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SAMPLE EMERGENCY SHELTER ASSESSMENT CHECKLIST

Facility Name/ID#				**Point of Contact**
Facility Address				
Type	☐ General shelter	☐ Medical shelter	☐ Ad hoc	Population size_____

Assessment Points	**Status**				**Comments**
	YES	**NO**	**NA**	**UNK**	
Facility operable					
Structural damage					
Adequate/ safe water source					
Power available					
Adequate lighting/ HVAC					
Adequate security					
Adequate space					
Adequate/ safe food source					
Safe food handling (see food assessment)					
Adequate cleanliness/ sanitation					
Adequate toilet/ showering facilities					
Adequate handwashing facilities					
Adequate medical care/ surveillance					
Adequate management/worker training					
Adequate ADA accessibility					
Any safety hazards					
Any vector concerns					
Adequate wastewater management					
Adequate solid waste management					

Additional comments			
Facility Status	☐ Operating	☐ Not operating	☐ Follow up needed
Specialist Name			**Date/Time**

USE REVERSE SIDE FOR ADDITIONAL INFORMATION

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Module 6 Vector Control

Environmental Health Training in Emergency Response (EHTER) – Introductory Level

California Version

Participant Manual

August 2010

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Module 6: Vector Control

Duration

One and one half (1.5) hours

Scope Statement

This module will introduce participants to a variety of issues and concerns associated with vector control and pest management after emergencies and disasters. It will also highlight appropriate measures to address these issues and concerns and mitigate their adverse effects.

Terminal Learning Objective (TLO)

Participants will recognize the key EH issues related to pests and have the necessary knowledge to conduct vector control-related activities.

Enabling Learning Objectives (ELO)

After completion of this module, participants will be able to:

6-1. Identify major vector issues and concerns during emergencies and disasters.
6-2. Recognize the roles and responsibilities of environmental health practitioners in addressing vector control issues and concerns during emergencies and disasters.
6-3. Explain the basic control measures used for disease vectors in disaster response operations.
6-4. Identify key emergency response partners.
6-5. Identify key public health messages related to vector control.

Resources

Course participant manual
Module 6 PowerPoint slides
Exercise Worksheet
Sample Assessment Checklist

Instructor to Participant Ratio

1:50 or less

Reference List

AMCA: American Mosquito Control Association http://www.mosquito.org

AVMA: American Veterinary Medical Association Disaster Preparedness and Response Guide http://www.avma.org/disaster/responseguide/responseguide_toc.asp

CCDEH: California Conference of Directors of Environmental Health *Disaster Field Manual for Environmental Health Specialists*
http://www.ccdeh.com/products/disaster_field_manual_info.htm

CDC: *Crisis and Emergency Risk Communication by Leaders for Leaders*
http://www.bt.cdc.gov/erc/leaders.pdf

CDC: Pesticides Used in Mosquito Control Page
http://www.cdc.gov/ncidod/dvbid/westnile/qa/pesticides.htm

CDC: Hantavirus Pulmonary Syndrome
www.cdc.gov/ncidod/diseases/hanta/hps/index.htm

CDC: Rodent Control: Seal Up! Trap Up! Clean Up! www.cdc.gov/rodents

CDC: Division of Vector Borne Infectious Diseases www.cdc.gov/ncidod/dvbid

CDC: Natural Disasters and Severe Weather page www.bt.cdc.gov/disasters

CDC: Protect Yourself from Animal and Insect Related Hazards after a Disaster
www.bt.cdc.gov/disasters/animalhazards.asp

CDC: Returning Home after a Disaster: Be Healthy and Safe
http://www.bt.cdc.gov/disasters/hurricanes/returnhome.asp

CDC, MMWR, July 26, 2002 / 51(RR09);1-12 *Hantavirus Pulmonary Syndrome - United States: Updated Recommendations for Risk Reduction*

EPA:Mosquito Control Page http://www.epa.gov/pesticides/health/mosquitoes/

EPA: Naled for Mosquito Control
http://www.epa.gov/pesticides/health/mosquitoes/naled4mosquitoes.htm

FEMA: Target Capabilities List http://www.fema.gov/pdf/government/training/tcl.pdf

National Library of Medicine and National Institutes of Health: Animal Diseases and Your Health http://www.nlm.nih.gov/medlineplus/animaldiseasesandyourhealth.html

NIOSH: Interim Guidance on Health and Safety Hazards When Working with Displaced Domestic Animals www.cdc.gov/niosh/topics/flood/pdfs/displacedanimals.pdf

NASPHV: Compendium of Animal Rabies Prevention and Control
http://www.avma.org/pubhlth/rabies_compendium_2005.pdf

PAHO: Rodents in Disasters www.paho.org/english/dd/ped/te_rdes.htm

WHO: World Health Organization, Rodent Control in Disaster Settings
http://www.searo.who.int/EN/Section23/Section1108/Section1835/Section1864_8625.htm

Practical Exercise Statement

One exercise has been incorporated into this module.

Additional recommended training activities include visiting a local vector control and/or pest management program and a local mosquito control district office.

Assessment Strategy

In-class questions, participation in exercise and module summary discussion.

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Module 6 Slides

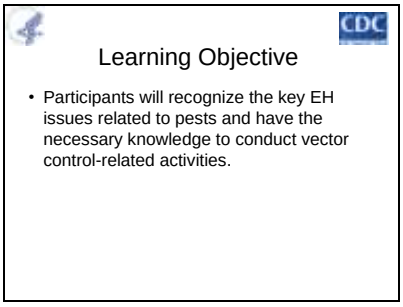
Vector Control Module (Slide 1)

Disasters often create conditions that result in increases in insects, arthropods and animals which can serve as vectors of disease as well as producing injury or discomfort in humans and domestic animals. The objective of this module is to provide environmental health (EH) practitioners with basic information on emergency corrective measures related to these vectors.

Slide 1

Learning Objective (Slide 2)

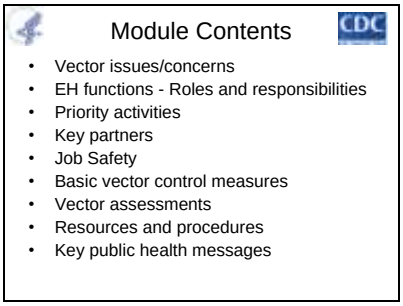
Participants will recognize the key EH issues related to pests and have the necessary knowledge to conduct vector control-related activities.



Slide 2

Module Contents (Slide 3)

This module will cover:
- Vector concerns
- EH functions - roles and responsibilities
- Priority activities
- Key partners
- Jobsafety
- Basic vector control measures
- Vector assessments
- Resources and procedures
- Key public health messages



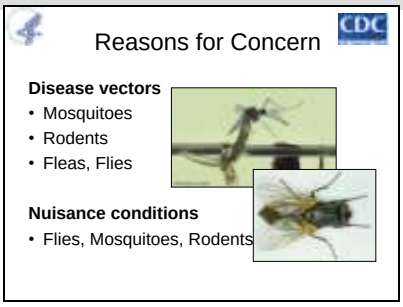
Slide 3

Reasons for Concern (Slides 4-5)

Reasons for concerns related to vector control and pest management may include these factors that increase the likelihood for vectorborne disease:
- frequency of natural disasters;
- vector population increase;
- introduction of new vectorborne diseases; and

- lack of funding for routine control programs (existing vector control infrastructure).

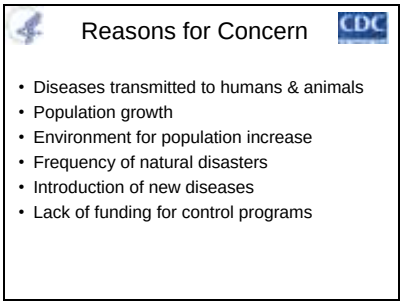
Vectors can be responsible for disease in humans and animals but are often more of a nuisance, especially after disasters. This is especially true of mosquitoes, stinging insects, etc. that can further stress recovering disaster victims. Disaster situations can create the conditions that increase the food, harborage, and opportunity for rodents and insects to breed and thrive making their control part of disaster recovery operations.



Slide 4

Disaster events also present opportunities for the introduction of new diseases that may arise when rodents and other animals are killed while their ectoparasites are left behind. For example, fleas that normally feed on rodents will seek an alternate host following a rodent die off and could transmit disease, such as plague.

The lack of funding for routine vector control programs in many communities is a real concern. Without adequate funding to obtain control agents and surveillance equipment, the potential threat to public health grows and may surface after a disaster.

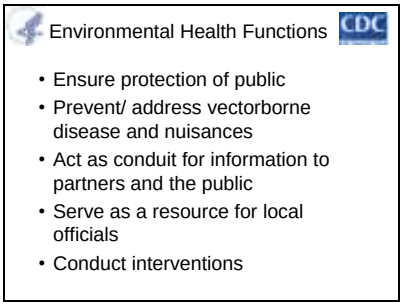


Slide 5

Environmental Health Functions (Slide 6)

EH principles are universal. The same scientific principles you use in your job every day are the same principles you will use in a disaster environment. However, the magnitude of problems seen in a disaster may be greater by orders of magnitude.

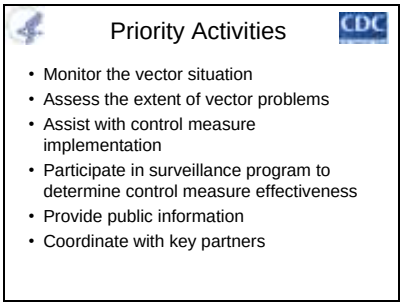
After a disaster, the local EH agency may be responsible for overseeing aspects of vector control and pest management including assessing the situation to determine the extent of vector problems, determining the measures of control needed, acting as a conduit for information to partners and the public and serving as a resource for local officials regarding vector issues.



Slide 6

Priority Activities (Slide 7)

EH is in a unique position to be able to anticipate and recognize the situations that can occur with vectors after a disaster. Therefore, priority activities may include assessing and monitoring the effects of the disaster on existing vector populations. If a disease potential or nuisance condition is identified, then EH may oversee control measures taken to reduce the threat.



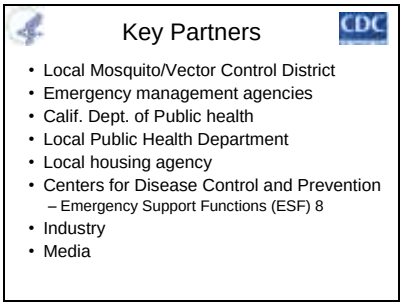
Slide 7

When pest control measures are required, EH may advise on the appropriate measures and monitor the progress. EH may also provide information on vector control issues, insects and pests, and the measures needed to eliminate problems to key partners and the public. Communication of information to the public can be accomplished through on-line public messages and handouts (preferably created before a disaster) and through the local emergency management agency and media outlets.

The EH practitioner may be requested to provide input on vector control issues in shelters, mass feeding operations, and/or solid waste disposal. Keep in mind that damage to transportation routes and communication systems and the limited availability of personnel after a disaster may impact the ability to carry out vector assessment work, at least initially.

Key Partners (Slide 8)

Partnerships are essential to providing for the health and safety of the public. The EH practitioner, depending on the size of the event and other factors, may consult with at various points of time mosquito/vector control districts, emergency management agency (EMA) personnel, state and local health agencies such as the California Department of Public Health (CDPH) Vectorborne Disease Section, other EH departments, public works departments, volunteer and community organizations (e.g. American Red Cross), pest control operators, and those in federal Emergency Support Function roles such as Centers for Disease Control. Don't forget the media! They can help get the word out to the public on pest issues and recommended actions.

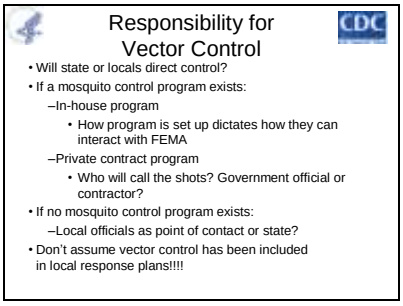


Slide 8

Responsibility for Vector Control (Slide 9)

Many areas do not have an existing vector control program and in areas where one does exist, it may be disrupted after an emergency event due to physical damage to facilities and equipment, disrupted infrastructure (communication/ fuel/ supplies), lack of food/water and shelter for employees, safety issues due to debris/power lines/wildlife or staff shortages.

In either case, which agency will direct vector control operations? If there is an existing mosquito control program in place, how that agency is set up, i.e. state, local, or via joint powers agreement will dictate how it interacts with federal resources. If there is a private mosquito control program operated under contract, which agency will control the disaster operations?



Slide 9

Where there is no existing local mosquito program, then efforts may be needed by state or federal resources. CDPH should be consulted to assist in assessing needs.

The EH practitioner should not assume that vector control has been included in local response plans! It may be left up to the EH responder to emphasize vector control as a recovery concern.

Job #1 is Safety (Slide 10)

Slide 10

Vector control operations present several safety issues associated with the vectors themselves and the application of chemicals used to treat vector problems, storage of these chemicals, and other associated issues. Of particular concern are the following safety issues:

- Chemical - the use of pesticides presents the potential for skin contact and inhalation of volatiles, use personal protective equipment (PPE); and
- Biological - contact with insect and animal vectors present the possibility of being bitten or exposed to disease-causing agents. For example, the potential for exposure to hantavirus exists through encounters with mouse droppings.

Remember: All disaster situations can create stress and fatigue that increase the risk of injury.

Vector Control in Disaster Events (Slide 11)

Slide 11

Disaster environments often create conditions that are conducive to proliferation of insects, rodents, and animals. Environmental factors that promote growth of insect and rodent populations must be addressed as part of the overall disaster response effort or vector problems may become severe in the weeks and months following the event.

Below is an excerpt from an article that was picked up by many U.S. newspapers several months after Hurricane Katrina. It serves as a reminder that there are numerous types of animals, insects and other pests that people may have to deal with when returning home after a disaster event.

"As more and more residents return to their flooded homes they're having to reclaim their urban and suburban realms from nature, in all its creeping, crawling, slithering grandeur. They're finding large wharf rats and their smaller, more common cousins, Norway rats; swarms of mosquitoes and millions of voracious

Formosan termites; marauding raccoons, opossums and armadillos; and snakes. And of course, alligators. Rats appear to be a frontrunner in breeding and nesting in homes."

Integrated Pest Management – Food, Water, and Harborage (Slide 12)

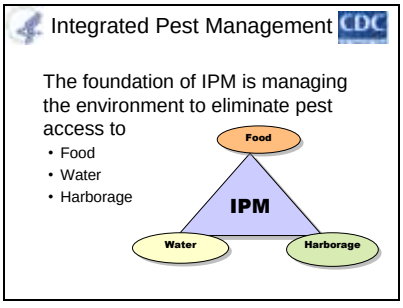
Slide 12

Integrated Pest Management (IPM) is a science-based decision-making approach to managing pests that combines biological, cultural, physical, and low-impact chemical tools to reduce pest populations in an effective, environmentally sensitive, and sustainable manner while minimizing economic, human health and environmental risks by reducing the use of more hazardous pest control products. IPM incorporates the control of food, water and harborage into its approach.

IPM Compared to Conventional Pest Management

Program Elements	Integrated Pest Management	Conventional Pest Management
Strategy	Preventative	Reactive
Customer Education	Extensive	Minimal
Potential Liability	Low	High
Emphasis	Pesticides used only when other measures inadequate	Pesticides used routinely
Inspection & monitoring	Extensive	Minimal
Pesticide application	Only as needed	Regular schedule
Insecticides in occupied spaces	Baits and gels	Sprays and aerosols
Application of insecticide sprays	Crack and crevice Treatment	Surface treatment
Insecticide spray and fog use	Minimal	Extensive
Use of non-chemical controls	Extensive	Minimal
Identification of pests	Required	Sometimes
Use of pest thresholds	Extensive	Minimal
Outcome evaluation	Required	Sometimes

Integrated Pest Management (Slide 13)



Slide 13

All three factors: food, water, and harborage are critical for vector populations to flourish and after a disaster, each will likely be abundant. Removal of at least one of the triangle points, for example elimination of readily available food, will have a significant impact on a vector population. If two of the triangle points are removed, there can be a major reduction in the vector population.

Many people think IPM means using no chemical control methods. This is not true. IPM uses a hierarchy of control methods that emphasize controlling the environment to control

the pest. Although chemical control is typically used as a last resort to reduce pest problems.

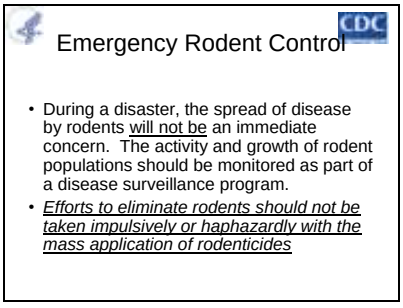
IPM uses a variety of common sense pest management techniques that focus on prevention, reduction, and elimination of conditions that lead to pest infestations. The National Pest Management Association recommends 5 five steps for an IPM Program:

- Inspections on a routine basis;
- Identification of pest species. (It is critical to properly identify the species of pest to be managed.);
- Establishment of pest population threshold levels;
- Employment of two or more appropriate control measures targeting the IPM triangle points; and
- Evaluation of measure effectiveness and revisions made as necessary.

Reduction of pest populations below threshold levels is key because it is unlikely that pests will be completely eliminated. Therefore, it is important to determine a threshold level at which public health impacts will be minimized. The EH practitioner should be part of a team that determines this threshold level.

Emergency Rodent Control (Slide 14)

During a disaster, the spread of disease by rodents will **not** be an immediate concern. However, the activity and size of rodent populations should be monitored as part of a disease surveillance program. Efforts to eliminate rodents should not be taken impulsively or haphazardly with the mass application of rodenticides.



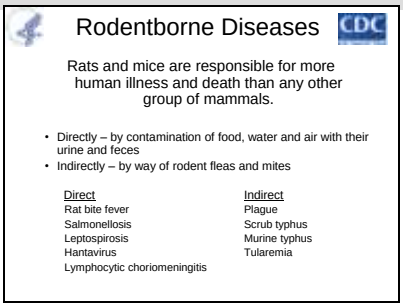
Slide 14

Rodent control issues may not be an immediate concern in comparison to the other disaster-related issues such as food safety and drinking water supplies. However, if food, water, and harborage are available in abundance, rodent populations may increase and create problems un the disaster recovery phase.

Rodentborne Diseases (Slide 15)

With all of the potential issues that may arise in a disaster, why should EH responders be concerned with rodent control? Historically, rodents are responsible for more human illness and death than any other group of mammals.

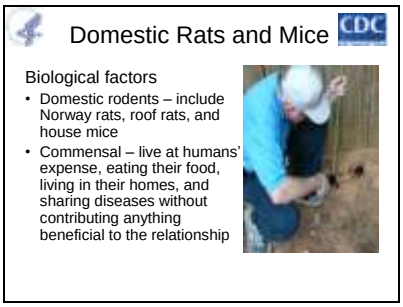
There are approximately 35 diseases that can be spread by rodents to humans. These diseases are spread by either direct transmission or indirect transmission. Direct transmission happens through contamination of food, water, or air with the rodents' urine and feces, while indirect transmission spreads disease through contact with rodent fleas, mites or ticks. Examples of direct transmission diseases are rat bite fever, Salmonellosis, Leptospirosis, and Lymphocytic Choriomeningitis. The more familiar diseases are in the indirect category: plague which is transmitted by fleas, scrub and murine typhus that is transmitted by mites, and tularemia which can be transmitted by ticks.



Slide 15

Domestic Rats and Mice (Slide 16)

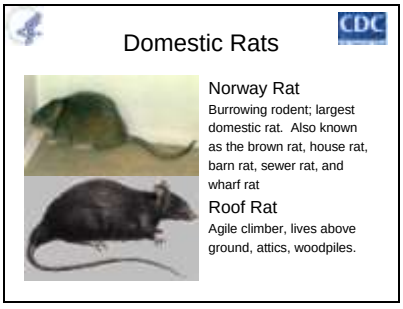
Domestic rodents include Norway rats, roof rats, and deer and house mice that often live in close proximity to humans, eating their food, living in their homes, and sharing diseases.



Slide 16

Domestic Rats (Slide 17)

The Norway rat is the largest domestic rat and is also known as the sewer rat, wharf rat or brown rat. It weighs about 7-18 ounces, with a body about 6-8.5 inches in length and a tail about 13-18.5 inches long. It is usually brown with coarse fur, and whitish fur on the belly, a blunt nose, and small ears.



Slide 17

The droppings are large, up to ¾ inch long and capsule-shaped. It reaches sexual maturity at 3-5 months; females produce 4-7 litters per year with 12-18 young per litter. The gestation period averages 22 days. The rat lives about one year and covers a range of about 100-150 feet from its burrow.

The Norway rat can be found in burrows in the ground, under building foundations, in garbage dumps and in sewers. Indoors it may be found in the space between floors and ceilings, in walls, enclosed spaces, cabinets, shelving, appliances, and other spaces concealed from view. Its diet consists of garbage, meat, fish, vegetable, fruit, and cereal.

Norway Rat:

- Burrowing rodent; largest domestic rat
- Also known as the brown rat, house rat, barn rat, sewer rat, and wharf rat
- Weight: 7-18 ounces (200-500 grams)
- Length of head and body: 6-8.5 inches
- Total length w/tail: 13-18.6 inches
- Usually brown w/ coarse fur, whitish belly, blunt nose
- Small ears rarely over ¾ inch long
- Large droppings, up to ¾" long capsule shaped
- Sexual maturity: 3-5 months
- Gestation period: averages 22 days
- 12-18 young per litter
- Approx. 4-7 liters per year
- Average life span is about 1 year
- Range is about 100-150 feet

Harborage: Outdoors – burrows in the ground, under building foundations, in rubbish/garbage dumps and in sewers
Indoors – between floor and ceilings, in walls, enclosed spaces, cabinets, shelving, appliances, and other spaces concealed from view.
Food: Garbage, meat, fish, vegetable, fruit, and cereal baits are well accepted; daily requirement, ¾ to 1 ounce of dry food, more of moist food
Water: Daily requirement, ½ to 1 ounce

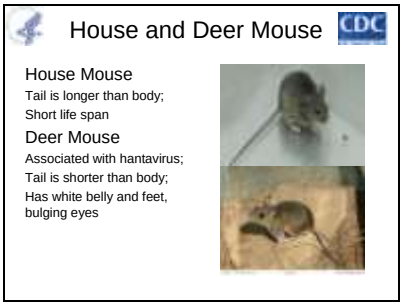
The roof rat is smaller than the Norway rat and a more agile climber. Its body appears slender and graceful with a weight of about 4 -12 ounces. The head plus body is approximately 6.5-8 inches long. One of its distinguishing features is a tail that is longer than its body. The tail can be 7.5-10 inches long for a total length of 14-18 inches. The fur is fine and varies in color from black to slate-gray above and white to yellow in color underneath. The nose is pointed, eyes are large and ears prominent. The droppings are smaller than the Norway rat at about 1/2 inch.

The roof rat reaches sexual maturity in 3 to 5 months. Litters range from 6-8 young after a gestation period of 22 days with 4-6 litters possible per year. Life span is about one year and the range is about 100-150 feet. Roof rats live above ground in trees and dense vegetative growth or in attics, between floors and ceilings, in walls and in enclosed spaces of cabinets and shelving. It differs from the Norway rat in preferring vegetables, fruits, and cereal grains only.

Roof Rat:
- Smaller than Norway rat and a more agile climber, Slender and graceful
- Body weight: 4-12 ozs
- Head and body: 6.5-8 inches + Tail 7.5-10 inches
- Total length: 14-18 inches
- Fine body fur, variable colors: Black to slate-gray and white or yellowish underneath
- Pointed nose, large eyes, large prominent ears
- Dropping medium size, up to ½ inch
- Sexual maturity: 3 to 5 months.
- Gestation period: averages 22 days
- 6-8 young per litter, usually 4-6 litters per year
- Life span: ~1 year
- Range: 100-150 feet

Harborage - above ground level; Indoors – in attics, between floors and ceilings, in walls and in enclosed spaces of cabinets and shelving; Outdoors – in trees and dense vine growth
Food – vegetables, fruits, and cereal grains preferred; daily requirement ½ to 1 ounce of dry food, more if moist
Water – up to 1 ounce each day

House Mouse and Deer Mouse (Slide 18)



Slide 18

The house mouse is found throughout the world. It has a slender and graceful body about ½ to ¾ ounces in weight and 2½-3½ inches in length. The tail is about 3-4 inches long. The fur is fine and brownish-gray on back and gray on belly. The nose is pointed; ears are large and prominent and can be pulled over the eye. The eyes are large. The droppings are small up to about ¼ inch in size. It reaches sexual maturity at about 1½-2 months. The gestation period averages about 19 days, there are 5-6 young per litter and as many as 8 litters per year. The house mouse lives less than one year. It prefers cereal grains but will eat most types of edible materials.

House mouse:
- Found throughout the world
- Slender and graceful
- Weight: ½ to ¾ ounces
- Length of head and body: 2½-3½”
- Tail: 3-4 inches long
- Fur: fine, brownish-gray on back, gray on belly
- Nose: pointed
- Ear: large, prominent, with some hairs, can be pulled over eye

- Eye: large
- Droppings: small, up to ¼ inch
- Sexual maturity: reached 1½-2 months
- Gestation period: averages about 19 days
- Young: 5-6 per litter
- Number of litters: as many as 8 per year
- Length of life: less than one year

The deer mouse is associated with hantavirus. The deer mouse is about 7 inches long including the tail. The bi-colored tail is less than 90% of the head and body length; this distinguishes the deer mouse from other mice. The deer mouse has a distinctly darker upper body coloration compared to the white undersides. The body color varies from a yellowish or reddish brown to grayish above, with pure white undersides and feet. The bi-colored body and distinctive large ears distinguish the deer mouse from the house mouse which is grayish. Deer mice have large, bulging eyes and big ears.

Deer mice live up to five years, longer than any other species of small rodent. Deer mice do not burrow but build their nest from grasses in protected areas above ground beneath debris, in tree cavities, in rotting logs, or in abandoned burrows. Deer mice feed heavily on larvae and other insects in the spring. In the fall, seeds become a major food source and are stored in caches for use during the winter.

Deer mouse:
- Found almost everywhere in natural environments
- Length of head, body and tail: 7”
- Tail: 90% of body length
- Fur: brownish upper body, white belly and feet
- Eyes: large, bulging
- Ears: large, rounded, prominent
- Gestation period: about 22 days
- Young: 3-6 per litter
- Number of litters: up to 4 per year
- Lifespan: up to 5 years

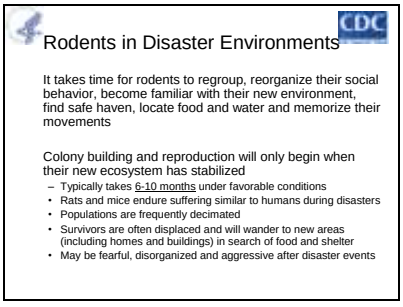
The house mouse is found in urban areas while the deer mouse prefers natural habitats. You can find either where development pushes against undeveloped lands.

Rodents in Disaster Environments (Slide 19)

Rodents endure suffering similar to humans during disasters, their populations are frequently decimated and survivors displaced. As a result, they may be seen wandering to new areas in search of food and shelter. They may be fearful, disorganized and aggressive after disaster events.

Like humans, rodents need time after a disaster to regroup and reorganize their social behavior, to become familiar with their new environment, find safe haven, and locate new sources of food and water. Colony rebuilding and reproduction will only begin when their new ecosystem has stabilized. This typically takes 6-10 months in the best of conditions.

Accordingly, the rat and mice population increase after Hurricane Katrina did not occur until about 10 months after the hurricane.



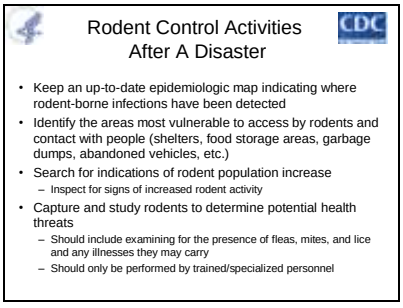
Slide 19

Rodent Control Activities After a Disaster (Slides 20-22)

Solid waste collection services may be disrupted or severely curtailed after a disaster occurs. To avoid pest problems, EH should work with local authorities to develop alternative strategies for solid waste storage and removal until normal collection systems are fully operational. There can be tremendous amounts of downed trees and vegetation, refuse, garbage, and building and construction debris generated by a disaster. At the same time, landfill sites may be damaged or otherwise inoperable or transportation systems limited. Frustrated homeowners often will not wait for the solid waste collection process to begin. Instead, they may find a place in the neighborhood to dump debris. When dumpsites are created they can grow rapidly. This should be addressed immediately because they can become a source of food and harborage for rodent populations. Any open dumps generated from the disaster should be removed and the site cleaned as soon as possible.

Rodent control activities after a disaster include keeping an epidemiological map indicating where rodent activity and rodentborne infections have been detected. Other activities for monitoring rodent populations include

- Identification of the areas most vulnerable to access by rodents and contact with people (shelters, food storage areas, garbage dumps, abandoned vehicles, etc.);
- Search for indications of rodent population increases and signs



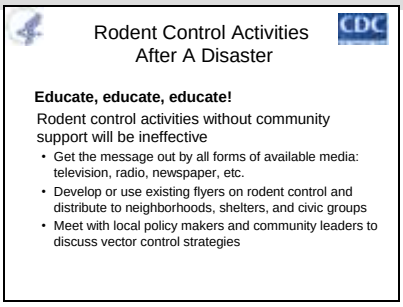
Slide 20

Slide 21

of activity; and

- Capture and study rodents to determine potential health threats including examining for the presence of fleas, mites, and lice and the illnesses they may carry. This activity should only be performed by trained, specialized personnel.

Note: Anyone bitten by a rat should wash the wound thoroughly with soap and water and be encouraged to see a doctor immediately.

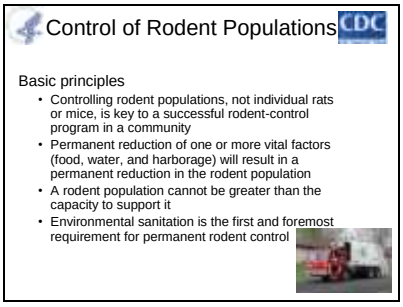


Slide 22

To keep rodent populations in check remove food sources where possible by storing food in rodent-proof metal boxes or in tightly sealed heavy-gauge plastic containers. Encourage proper solid waste disposal practices. Remove trash piles including damaged furniture, mattresses, etc. from homes as soon as possible. Promote good general hygiene and sanitation practices in the affected areas.

The most important vector control activity that EH can implement after a disaster is to educate the public and community. If the community does not support rodent control measures the program will not work! Get the message out by all forms of available media: television, radio, newspaper, etc. Develop or use existing handouts on rodent control and distribute to neighborhoods, shelters, and civic groups. Meet with local policy makers and community leaders to discuss vector control strategies. The EH responder should work with local authorities to develop alternative strategies for solid waste storage and removal until collection systems are fully operational.

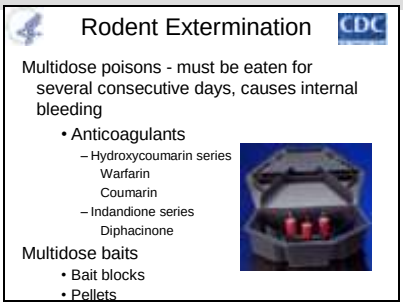
Control of Rodent Populations (Slide 23)



Slide 23

Controlling rodent populations, not individual rats or mice, is key to a successful rodent control program in an affected community. This means controlling the things that the rodent population requires to thrive. Permanent reduction of one or more vital factors (food, water, and harborage) will result in a permanent reduction in the rodent population because a rodent population cannot be greater than the capacity to support it.

Environmental sanitation is the first and foremost requirement for permanent rodent control.



Slide 24

Rodent Extermination (Slide 24)

It is important to recognize that rodent extermination without environmental control efforts, particularly good sanitation, will be ineffective. In an IPM approach to rodent elimination, chemical control is considered a last resort to reduce pest problems.

Chemical controls methods come in the form of baits and poisons. Typically poisons come in multi-dose or single dose forms. Multi-dose poisons are anticoagulants that must be eaten for several consecutive days to cause internal bleeding and death. Because multi-dose poisons require several feedings, they provide a margin of safety for humans and animals that may accidentally ingest the poison.

Single-dose poisons are generally not recommended for post-disaster application. They are fatal to the rodent after a single feeding within 15 minutes to 2 days, depending on the type of poison. They can also be lethal to humans and pets. Zinc phosphide and strychnine are two examples of single dose poisons. The use of sterilants is controversial in a disaster environment. Sterilants can also affect pets and even children, and so they are NOT recommended.

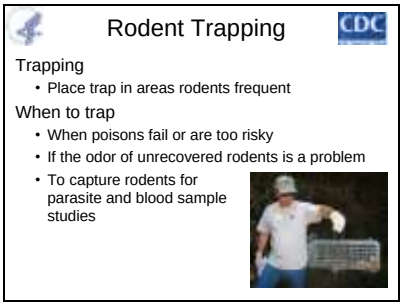
Common Rodenticides

Rodenticide	Formulation	Effect
Brodifacoum	Bait, wax block	Anticoagulant
Bromadiolone	Bait, oil-based, wax block, powder concentrate, Tracking powder	Anticoagulant
Bromethalin	Bait	Acute
Calciferol	Bait	Sub-acute
Coumatetralyl	Wax block, bait, Tracking powder	Anticoagulant
Difenacoum	Wax block, bait	Anticoagulant
Difethialone	Wax block, bait	Anticoagulant
Diphacinone	Powder concentrate, bait, Water soluble concentrate	Anticoagulant
Warfarin	Concentrate, Tracking powder, bait	Anticoagulant
Zinc phosphide	Bait	Acute

When using poisons, be generous with bait and place baits in areas where rodents frequent but out of reach of children and

pets. Maintain wholesome and attractive fresh bait. Use bait stations where applicable. Be sure to follow all label directions, some products require the use of tamper proof bait stations.

Rodent Trapping (Slide 25)



Slide 25

Trapping is used for rodent surveillance and extermination. There are times when rodenticide use is not practical and there is a need for other means of eliminating rodents such as when poisons fail or are too risky, or if the odor of unrecovered rodents is a problem, or if there is a need to capture rodents for parasite and blood sample studies. Trapping has several advantages. It is safer for humans and pets than potentially hazardous poison baits and it has immediate results. Trapping allows for easy disposal of dead rodents avoiding odor problems that will occur if rodents die in inaccessible areas. Traps should be placed in areas rodents frequent.

Place traps up against walls, behind objects, and in secluded areas where droppings, gnawing and damage are evident. Snap traps should be oriented perpendicular to the wall, with the trigger end toward the vertical surface. Multiple-catch traps should be placed with the entrance hole parallel to the wall.

If rodent trapping is to be performed, safety is necessary for the individual/team performing the task. Rodent trapping and processing should be performed by trained specialists. The use of gloves and permethrin on outer clothing is recommended to keep off any ticks and mites. Rodent processing for antibody sampling requires full body protection (Tyvek or other protective clothing) with permethrin, as well as double latex gloves, eye protection, and a respirator may be necessary.

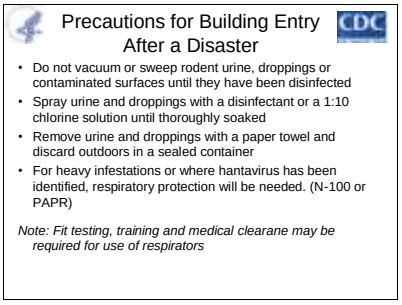
Note: Fit testing and training is required for respirator use. Check traps regularly. Dead rodents should be sprayed with a disinfectant or chlorine solution. Use gloves to remove the rodent from trap and place it in a double sealed bag. Discard rodent in a sealed outdoor waste receptacle. Disinfect gloves if they will be reused. After removing gloves, wash hands thoroughly with soap and water (or use a waterless alcohol-based gel). If the trap will be reused, decontaminate it by immersing and washing it in a disinfectant or chlorine solution and rinsing well afterwards. See module reference list for more information.

Precautions for Building Entry after a Disaster (Slide 26)

Homes and other buildings that have been damaged or abandoned due to a disaster may become infested with rodents. Look for signs of rodent activity such as droppings, marks from gnawing and rubbing, and burrows. An ultra-violet light can be used to locate rodent urine.

If rodent feces are present, a thorough cleaning will be necessary. Do not vacuum or sweep rodent urine, droppings or contaminated surfaces until they have been disinfected. Spray urine and droppings with a disinfectant or a 1:10 chlorine bleach solution (1 cup bleach to 10 gallons of water) until thoroughly soaked. Remove urine and droppings with a paper towel and discard outdoors in a sealed container.

Hantavirus is associated with deer mouse droppings. The virus can travel by attaching to dust particles that can be inhaled into the lungs. Respiratory protection will be needed for heavy infestations or where hantavirus has been identified. Note: Fit testing and training are required for use of respirators. See module reference list for more information.



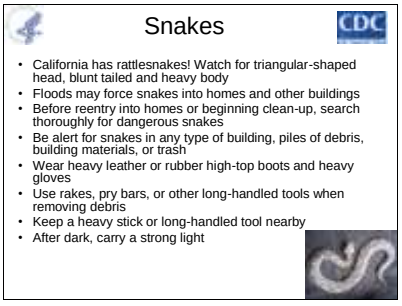
Slide 26

Snakes (Slides 27-28)

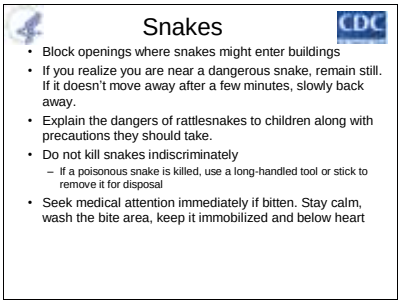
Rattlesnakes can be a concern in California. Disasters such as flooding may force snakes into homes and other buildings. Before reentry into homes or beginning cleanup, search thoroughly for snakes and be alert for dangerous snakes in any type of building, piles of debris, building materials, or trash.

Where snakes are a concern, wear heavy leather or rubber high-top boots and heavy gloves, use rakes, pry bars, or other long-handled tools when removing debris. Keep a heavy stick or long-handled tool nearby. If you encounter a rattlesnake, remain still. If it doesn't move away after a few minutes, slowly back away. Explain the dangers of rattlesnakes to children along with precautions they should take. Do not kill snakes indiscriminately.

If a poisonous snake is killed, use a long-handled tool or stick to remove it for disposal. If bitten, stay calm, wash bite area with soap and water, immobilize the area and keep it below the heart. If bitten on the arm, remove any watches or rings etc. Seek medical attention immediately.



Slide 27



Slide 28

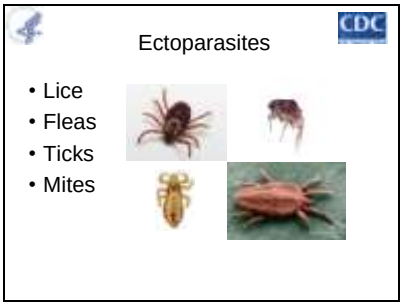
Displaced Animals (Slide 29)

After a disaster, pets and other animals will be displaced and likely be hungry, scared, and looking for places to harbor. They may be injured which can make them even more dangerous. Take precautions around wildlife and abandoned animals.

Slide 29

Ectoparasites (Slide 30)

Since many rodentborne diseases are associated with ectoparasites, it is important to know the common ectoparasites when implementing a rodent control program. Lice, fleas, mites, ticks and other arthropods can create serious problems following disasters.



Slide 30

For lice, the body louse is the only species that is an important vector. It is the only proven vector of two diseases, louse-borne (epidemic) typhus and epidemic relapsing fever, a spirochete disease. Other lice can also cause a great deal of discomfort through their bites. Head lice are not important as disease vectors, so that mass treatment may only be necessary when the prevalence is extremely high. Lotions or shampoos of malathion, pyrethrins or gamma HCH provide effective treatment. When school children are infested, treating of all family members is recommended for successfully controlling infestation. Crab lice are usually found in the pubic and perianal areas of the body but are not disease vectors and may be treated on an individual basis using shampoo, lotion or cream formulations of pyrethrins.

Surveys should be conducted in order to determine the extent of the lice problem and the number of individuals who require treatment, and to determine the effectiveness of the control program. A louse survey involves searching for the insects and their eggs, or nits. Body lice are found on shirt collars, the waistband, pockets and seams of trousers, and the seams of underwear. Head lice are normally found in the hair of the head, particularly around the ears and nape of the neck. The nits of head lice found within 7 millimeters of the scalp may be considered viable.

All known species of flea are obligate parasites. The most important diseases transmitted by fleas are plague and murine

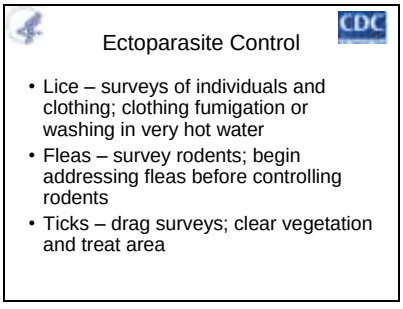
(endemic) typhus. Both of these diseases have host reservoirs so that attempts to eliminate fleas should be coordinated with rodent control programs.

Mites are small, sometimes microscopic, organisms that can transmit diseases such as scrub typhus and Q fever. The annoyance created by itching and dermatitis can, however, be important. When people are in crowded spaces and mammals and birds share the same space, these ectoparasites may flow over to humans and cause sudden epidemics of the "itch" in a shelter or temporary camp. Ointments exist which can be used to treat individual cases, but the best method of solving the problem is to improve sanitary habits and remove the animal reservoir.

An infectious disease of the skin called scabies is caused by a mite. Scabies may be widespread during disasters especially in developing countries. Treatment involves the use of an ointment through two courses within seven to ten days. Case finding efforts should be extended to the screening of whole families, and soap and facilities for mass bathing and laundering should also be made available.

Ticks are vectors of Rocky Mountain Spotted Fever, Colorado Tick Fever, Q fever, tick-borne relapsing fever and several other diseases. Certain species also cause tick paralysis.

Ectoparasite Control (Slide 31)



Slide 31

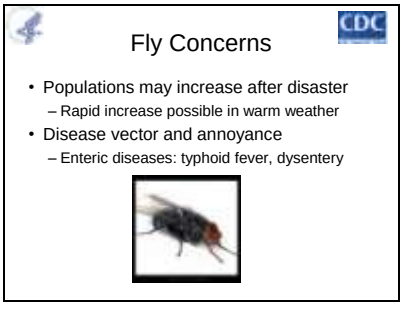
There must be a quick reaction to a serious increase in body louse infestations, with the threat of an epidemic outbreak of disease. In emergency camps, clothing fumigants may be an option. Mass laundering of clothing or bedding is effective only if a water temperature of 52°C (125°F) or more can be maintained. It is necessary to alert the population through public education to the dangers of louse-borne diseases and the need for delousing.

Fleas can be collected by hand from the bodies of infested persons or animals. They can also be removed by combing small wild animal hosts. Mass rodent control should begin only after flea populations have been eliminated, so that newly emerged fleas, deprived of their normal hosts, will not seek humans.

Tick surveys involve either collecting specimens from wild animal hosts, or using a tick drag. A tick drag is a piece of white flannel which is slowly pulled over the vegetation along trails and road ways for a specific distance, and is then examined. A tick

problem can be reduced by clearing the vegetation fifty to one hundred feet around an emergency camp. In chemical control, an area is treated with an insecticide such as chlorpyrifos or tetrachlorvinphos.

Fly Concerns (Slide 32)



Slide 32

Mosquitoes and flies are two primary groups of arthropods that are likely to cause concern after a disaster. Flies, like mosquitoes, will be a problem mostly during warm months. During warm and wet disaster events, vegetation and animals that have been killed and swept away are deposited in piles of debris and can cause major fly problems. Fly population increases may also be expected due to the breakdown of sanitary services.

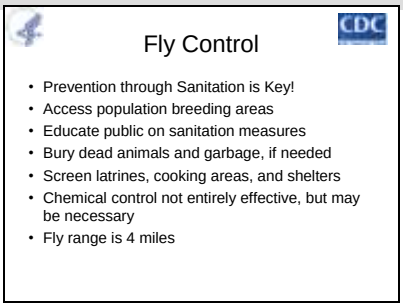
The presence of flies has potential epidemiological and hygienic implications and the annoyance factor of flies interfering with human comfort. The first indication of a fly problem may be complaints from people living in shelters or who return to their homes in the disaster areas. The house fly is both a filth feeder and breeder, and health problems can occur when it comes into contact with human food and drink. The contamination of food and drink by pathogens can take place mechanically, through its legs, body, proboscis and wings. Pathogens can also be defecated or regurgitated. Flies have been incriminated in the transmission of many of the enteric diseases of man, including dysenteries, cholera and typhoid fever. Yaws, conjunctivitis, enteroviral infections, and intestinal parasites may be transmitted by different species of flies. Special concern is the dissemination of Salmonella, Shigella, Vibrio, Escherichia and other bacterial organisms that can cause serious diarrheal diseases in humans.

Female house flies lay eggs in a number of habitats, especially in garbage and animal wastes. When the average outside temperature is approximately 80°F the cycle of the fly from egg to adult, is approximately one to two weeks.

Fly Control (Slide 33)

Prevention is recommended over control. High priority should be placed on sanitary services in disaster areas because of crowding and other unhealthy conditions. Sanitary services should also be restored to communities as soon as it is possible. Dead animals should be immediately cremated or buried, latrines should be made fly-proof, and the rooms in shelter buildings,

particularly kitchens and eating places, should be screened.

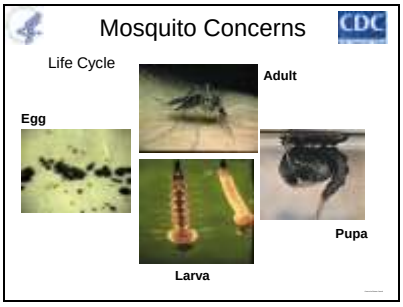


Slide 33

Assessment of fly populations is needed to determine if control efforts are effective or additional effort is needed. There are a number of fly traps, such as sticky paper, that can be used to assess population densities. The easiest way of performing a survey is to count flies as they rest on refuse, vegetation, the walls of buildings and other resting places. Evaluation may be largely based on direct observation. If an insecticide is not causing an appropriate level of mortality, an alternative should be used. Walking through an area, especially around pit latrines, food preparation areas and garbage collection sites, provides a means of visually assessing the reduction of the population. In control operations, it should be taken into account that flies can migrate up to four miles to new food attractants or to breeding areas.

The public should receive information on ways to prevent fly breeding. Control recommendations may include burying garbage when sanitary services are not available and using fabric curtains at doors and windows to limit fly entry. Chemical control of flies over a long period of time is usually not recommended because resistance to insecticides develops rapidly and is already widespread. During disasters, however, it may be necessary. The use of sticky tapes and household aerosol sprays inside of buildings may help to reduce fly numbers. Residual spraying of indoor resting places may be required and, if available, sugar and syrup baits with insecticides can be utilized once a sanitary program is well underway.

Mosquito Concerns (Slide 34)



Slide 34

After floods, hurricanes and other disasters, mosquitoes can become major public health and nuisance problems. This is particularly true during warm weather months when various pathogens and parasites that can be transmitted to humans reach their peak abundance and can cause serious threats to human health. Mosquitoes can become so abundant that they cause disruptions in community services and cause severe stress in the affected local human, pet and livestock populations. Surveillance for and control of disease vectors and nuisance pests is considered an essential part of disaster recovery efforts.

Knowing which species of mosquitoes is causing problems is important because breeding locations, biting behavior and other factors are often species-specific and will help in determining

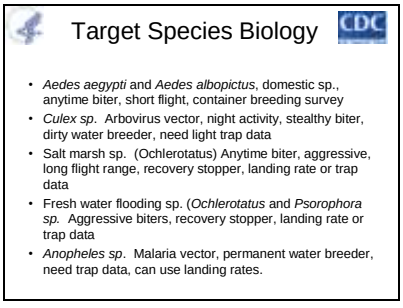
appropriate control measures. Depending on the species, mosquito eggs can be laid directly on water or in dry areas that are prone to flooding. Also, depending on the species, eggs can be laid singularly or in rafts of many eggs. Some mosquito species can develop in salty or brackish water while others need fresh water; some thrive on waters of high organic content while others need relatively clean water. During warm weather, certain species can go from egg to adult in as little as five days. Water temperature plays an important role in just how quickly the mosquitoes will develop.

The distance mosquitoes fly from their emergence site varies from species to species and can range from a few feet to over 50 miles. Adult mosquito biting behavior varies significantly from species to species. Not all mosquitoes will bite man or even mammals. Some are more active in the day time hours while others are most active at dusk and dawn or during the night. Some mosquito species are aggressive biters while others are not and some species serve as vectors for disease.

Target Species Biology (Slide 35)

Common mosquito species and survey methods:

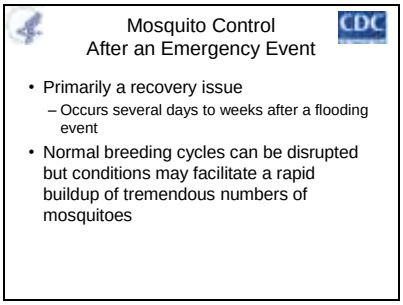
- Aedes aegypti and Aedes albopictus - domestic species, anytime biters, short flights, container breeding survey needed;
- Culex species - Arbovirus vector, night activity, stealthy biter, dirty water breeder, need light trap data;
- Salt marsh species (Ochlerotatus) - Anytime biter, aggressive, long flight range, recovery stopper, landing rate or trap data;
- Fresh water flooding species (Ochlerotatus and Psorophora) - aggressive biters, recovery stopper, landing rate or trap data; and
- Anopheles species - Malaria vector, permanent water breeder, need trap data, can use landing rates.



Slide 35

Mosquito Control After an Emergency Event (Slide 36)

Mosquito control is primarily a community recovery issue. Problems occur several days to weeks after a flooding event. Disasters can disrupt normal breeding cycles but conditions may allow a rapid buildup of tremendous numbers of mosquitoes. Large infestations of mosquitoes can affect the overall recovery effort by restricting outdoor activities.



Slide 36

Integrated Mosquito Management (Slide 37)

Slide 37

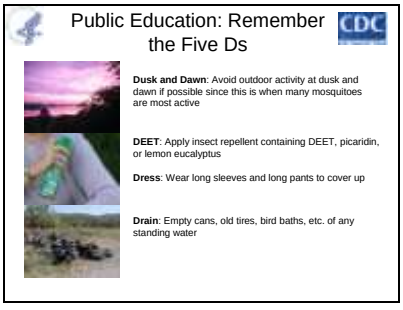
Integrated mosquito management programs consist of:

- Mosquito Surveillance;
- Disease Surveillance (monitoring methods);
- Biological Control;
- Physical Control;
- Chemical Control;
- Resistance Management (are methods effective or are the insects resistant to control methods); and
- Education and outreach (educate the public and let them know what they can do).

Physical barriers such as window screens are very effective ways of preventing mosquitoes from gaining access to a blood meal. Unfortunately, in many disasters, the windows and screens that can keep mosquitoes out of a structure are damaged or lost. Also, windows are often left open during a power outage because the air conditioning is not on. It is important to repair or replace screening and windows as quickly as possible to prevent access for mosquitoes.

Mosquito netting, particularly permethrin treated nets may be useful after a disaster, especially for displaced people living in tents. Any screening material stapled over damaged windows is a huge help, a simple treated sheet hung for a door will repel mosquitoes.

Public Education: Remember the Five D's (Slide 38)



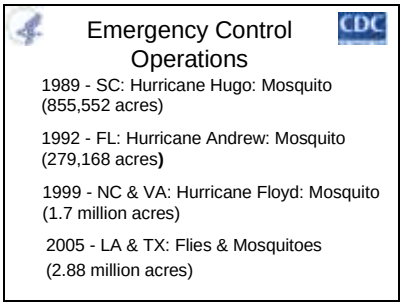
Slide 38

Public education is one of the most important components of any vector control program. It is important to begin a public education program about mosquito control as soon as possible after a disaster to minimize problems.

Use the 5 D's to craft your message:
1) Dusk and
2) Dawn - These are the times of day when mosquitoes are most active so curtail outdoor activity at those times when possible.
3) DEET - Use it as a repellant, if not available, you can substitute picaridin or lemon eucalyptus oil.
4) Dress - Wear long sleeves and long pants to cover up to avoid bites.
5) Drain – Check outside area for containers, tires, bird baths, or anything else that can hold standing water, drain water and remove items.

Emergency Control Operations (Slide 39)

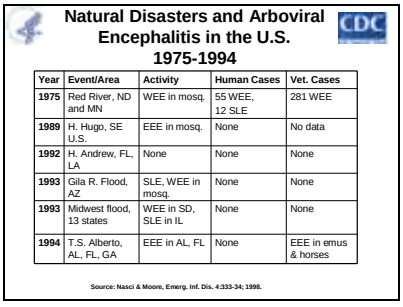
Emergency mosquito control operations have been initiated after several of the recent hurricanes. For example, after Hurricane Hugo in 1989, 855,552 acres were treated in South Carolina; and after Hurricane Andrew in Florida 279,000 acres were treated and Hurricane Floyd resulted in 1.7 million acres being treated in North Carolina and Virginia.



Slide 39

Natural Disasters and Arboviral Encephalitis (Slides 40-41)

People may be concerned about mosquitoborne diseases following a disaster event. However, diseases such as encephalitis are not usually an issue because they are diseases that develop through cycles (mosquito to bird to human). Disasters often disrupt those cycles.

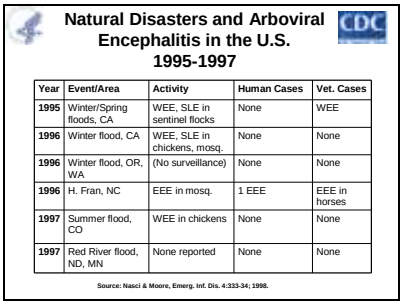


Natural Disasters and Arboviral Encephalitis in the U.S. 1975-1994

Year	Event/Area	Activity	Human Cases	Vet. Cases
1975	Red River, ND and MN	WEE in mosq.	55 WEE, 12 SLE	281 WEE
1989	H. Hugo, SE U.S.	EEE in mosq.	None	No data
1992	H. Andrew, FL, LA	None	None	None
1993	Gila R. Flood, AZ	SLE, WEE in mosq.	None	None
1993	Midwest flood, 13 states	WEE in SD, SLE in IL	None	None
1994	T.S. Alberto, AL, FL, GA	EEE in AL, FL	None	EEE in emus & horses

Source: Nasci & Moore, Emerg. Inf. Dis. 4:333-34; 1998.

Slide 40



Natural Disasters and Arboviral Encephalitis in the U.S. 1995-1997

Year	Event/Area	Activity	Human Cases	Vet. Cases
1995	Winter/Spring floods, CA	WEE, SLE in sentinel flocks	None	WEE
1996	Winter flood, CA	WEE, SLE in chickens, mosq.	None	None
1996	Winter flood, OR, WA	(No surveillance)	None	None
1996	H. Fran, NC	EEE in mosq.	1 EEE	EEE in horses
1997	Summer flood, CO	WEE in chickens	None	None
1997	Red River flood, ND, MN	None reported	None	None

Source: Nasci & Moore, Emerg. Inf. Dis. 4:333-34; 1998.

Slide 41

Recent U.S. Disasters and the Prevalence of Encephalitis

Year	Event/Area	Activity	Human Cases	Veterinary Cases
1975	Red River, No. Dakota and MN	WEE in mosq.	55 WEE, 12 SLE	281 WEE
1989	Hurricane Hugo, SE U.S.	EEE in mosq.	None	No data
1993	Gila R. Flood, AZ	SLE, WEE in mosq.	None	None
1993	Midwest flood, 13 states	WEE in SD, SLE in IL	None	None
1994	Tropical Storm Alberto, AL, FL, GA	EEE in AL, FL	None	EEE in emus & horses
1995	Winter/Spring floods, CA	WEE, SLE in sentinel flocks	None	WEE
1996	Winter flood, CA	WEE, SLE in chickens, mosq.	None	None
1996	Hurricane Fran, NC	EEE in mosq.	1 EEE	EEE in horses
1997	Summer flood, CO	WEE in chickens	None	None
1997	Red River flood, ND	None reported	None	None

WEE – Western Equine Encephalitis
EEE – Eastern Equine Encephalitis
SLE - St. Louis Encephalitis

As you can see from the table, California has experienced disaster-related mosquitoborne illness concerns.

Surveillance and Control Efforts (Slides 42-43)

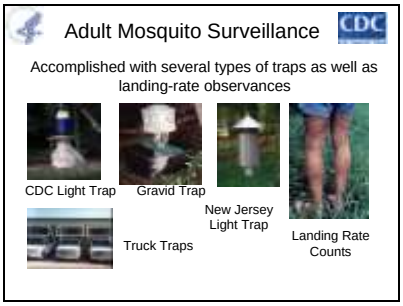
Mosquito complaints and service requests from residents and businesses should be mapped as complaints are received as an indicator of where to concentrate surveillance and control efforts. Complaints may be followed up with field surveys including trap counts and landing rates show to assess the extent of the problem. A container breeding survey should be conducted addressing stagnant swimming pools, old tires and other items that can hold water.

Slide 42

Control measures may be needed if field surveys show:

- Swimming pools are stagnating
- Window screens are compromised
- Areas of debris-laden standing water exist

Several different types of traps are available for capture of adult mosquitoes. Some traps attract adult mosquitoes using light, such as the CDC and New Jersey Light Traps. Gravid traps capture pregnant females ready to lay eggs and Truck Traps use a funnel to collect mosquitoes that are flying about as the truck is moving along the road. Landing rate counts give an estimate of the number of biting mosquitoes landing on a surface, usually skin, over a specified time.



Slide 43

Typically, the use of traps depends on the availability of power and bait. Trapping is great if this option is available, but landing counts and other collection methods for identifying mosquitoes are probably more immediately effective – both for nuisance and disease concerns. Trapping is done at night. The following morning, mosquito control staff sort and identify mosquitoes caught in each collection device and map their densities so that decisions may be made regarding control of adult mosquitoes. A disease risk assessment can be performed once the mosquito population has been assessed.

Plan for Prioritization (Slides 44-45)

Mosquito control operations need to be prioritized after a disaster event once a threat has been identified. A reality in all disaster situations is that resource limitations will curtail the scope and methods used in response operations, therefore priorities must be set.

Some the items that must be considered in setting vector control priorities are:

- Date of service request – where are the problems now?
- What are the local capabilities / resource limitations?
- Is there surveillance data to back up what is being planned?
- Risk assessment data / what are the disease threats?
- What are the cost constraints?
- Will re-treatment be necessary?

Slide 44

Slide 45

Control Options (Slide 46)

Measures taken to control mosquitoes may require outside assistance. After large natural disasters such as hurricanes it has often been necessary to use aerial spraying to control mosquitoes. Often due to resource limitations, local vector control programs are not able to address widespread problems.

Spraying during daylight hours is not effective against some mosquito species. Foot patrols and larvaciding are good options, but will not break a disease transmission cycle if already established. Even with the limited effectiveness, pinpoint treatment of swimming pools and stagnant bodies of water can be helpful if done on a consistent and ongoing manner.

Finding and treating even half of the larval development sources will not noticeably decrease adult mosquito populations and disease transmission potential. When disease transmission is a concern, adult spraying may be necessary. Aerial application is an effective but expensive way to treat large amounts of land. There is public resistance to aerial spraying however in a disaster situation it may not prevent its use.

Slide 46

Larval Application to Breeding Areas (Slide 47)

Biological pathogens may be used to control mosquito larvae. Examples include *Bacillus sphaericus* and *Bacillus thuringiensis israelensis* that are ingested by the larvae causing a lethal effect. Juvenile hormones that prevent larvae from becoming adults, monomolecular films and oils that cause suffocation, and the chemical temephos may be applied to standing water to control mosquito larvae.

Slide 47

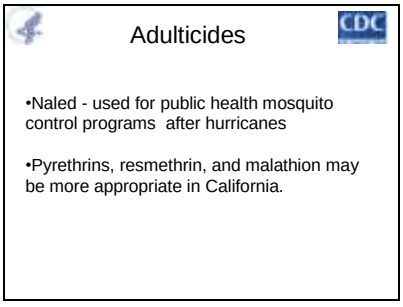
Adulticiding (Slide 48)

Ground adulticiding and aerial spraying are the two primary forms of adult mosquito control. Ultra low volume (ULV) equipment is used for both ground and aerial adulticiding. ULV spraying creates a cloud of drops of concentrated material in a very specific micron size range designed to contact and kill flying mosquitoes. This method uses very small volumes of pesticides to cover large areas; application rates usually range from a few ounces to less than an ounce per acre.

Slide 48

Adulticides (Slide 49)

Key issues with aerial spray utilizing Naled or Dibrome focus on safety. CDC has performed testing in conjunction with the Florida State Health Department that measured exposure in the urine of residents where spraying took place. The outcome showed no detectible exposure from ULV application. US EPA's website estimates exposure and risks to adults and children is well below the amount that present a health hazard or concern.



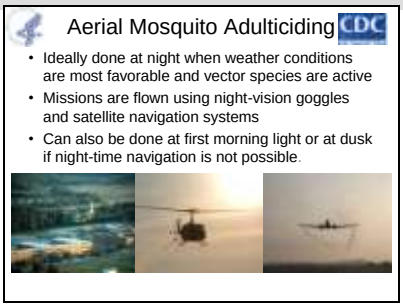
Slide 49

Naled is an effective product, however there are alternatives including pyrethrins, resmethrin, and malathion. Naled is often used after hurricanes, however other pesticides would likely be more acceptable for use in California. In order to make a decision on the product to be used, resistance testing with adult mosquitoes should be performed. A local mosquito control program would likely have knowledge about pesticide resistance in the area. CDPH also maintains this information.

Aerial Mosquito Adulticiding (Slide 50)

Mosquito adulticiding from the air and from the ground is ideally done at night when weather conditions are most favorable and the vector species are active. Aerial missions are flown using

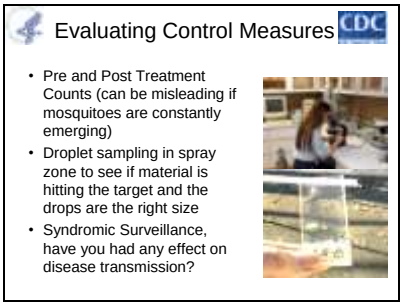
night vision goggles and satellite navigation systems. Spray altitude is usually around 300 feet for this type of mission and lower in daytime spraying to keep the material close to the ground.



Slide 50

Weather conditions must be conducive to keep the spray cloud near the ground and the wind should be 3 to 10 miles per hour to favor drift. If the spray cloud rises too quickly to contact mosquitoes it will not be effective. The US Air Force has provided assistance with disaster aerial spraying when requested.

Evaluating Control Measures (Slide 51)



Slide 51

One of the important pieces of any vector control program is the evaluation of the effectiveness of control activities. Therefore, it is important to:

- Perform pre- and post-treatment mosquito counts;
- Conduct droplet sampling in spray zone to see if product is hitting the target areas and the drops are the right size; and
- Conduct syndromic surveillance to determine if control measures had any effect on disease transmission.

Droplet size sampling is costly and difficult to do. An easier, less costly alternative is to set out containers with mosquitoes, preferably lab-raised and therefore susceptible to the product, to monitor whether an area was treated.

Control Challenges (Slide 52)

Slide 52

The widespread use of pesticides will likely cause concern from the public, bee keepers, and organic farmers. Resistance to adulticiding, especially aerial spraying, will exist. As an information source, EH may serve the public by providing notification of when mosquito control operations are taking place as well as information on personal protection measures. However, in a severe emergency pesticide concerns are expected to be lessened.

Other obstacles to mosquito control measures that may occur include:

- Disruption of means of transportation / navigation;
- Drivers/pilots unfamiliarity with area;
- Training/licensing issues;
- Safety – unlit streets and towers, and
- Impassible streets.

Other public issues that may come into play during mosquito control operations are demands for rapid response and explanations on how service will be prioritized.

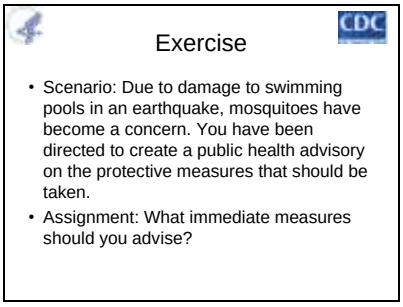
Exercise (Slide 53)

(SEE MODULE APPENDIX FOR WORKSHEET)

Scenario: Your county has experienced an earthquake and mosquitoes have become a concern in the aftermath. You have been directed to create a public health advisory on the protective measures that should be taken.

Assignment: What immediate measures should you advise?

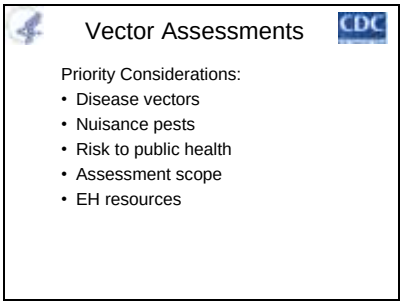
Consult the *Disaster Field Manual for Environmental Health Specialists,* if available.



Slide 53

Vector Assessments (Slides 54-55)

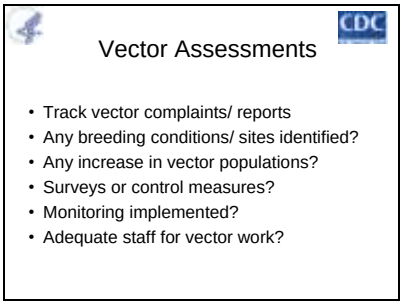
EH may respond to complaints and reports of vector problems after a disaster. This response may include the assessment of the potential for disaster-related vector problems including the effect of the disaster on existing vectors and pests and the possible impact on the human population. The 2007 Environmental Health Target Capabilities List recommends that an initial assessment of insect, animal and rodent vectors be conducted within 72 hours of an incident.



Slide 54

An assessment may include a review the current information on vector populations in the affected areas to identify potential problems including, but not limited to, these considerations:

- flooding, abandoned swimming pools, disaster debris serving as containers for water that could support an increase in the mosquito population;
- disaster debris including uncollected household solid waste and animal carcasses that could support an increase in fly breeding;
- displaced rodents that result in an increase in human contact.



Slide 55

Also, the disaster's effects on human populations:

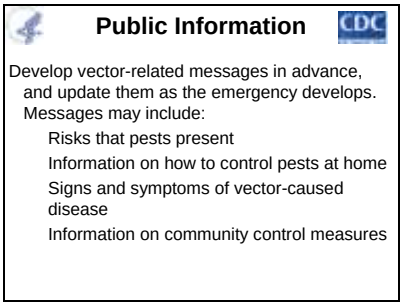
- Will temporary shelters result in overcrowding conditions conducive to transmission of ectoparasites such as lice, and scabies mites?
- Are outdoor shelter options being used such as camping or group tents that will expose people to contact with rodents and

other vectors?
- Will mass migration of people into the area create more contact with vectors and nuisance pests?
- Are public services such as solid waste pick up interrupted or suspended?

For those vectors of concern, an assessment of the geographical areas affected, vector population size, distribution, and effect on the human population should be made. This will likely be accomplished through a combination of field surveys, complaint or service request mapping, and follow up studies.

(SEE MODULE APPENDIX FOR SAMPLE ASSESSMENT CHECKLIST)

Public Information (Slide 56)

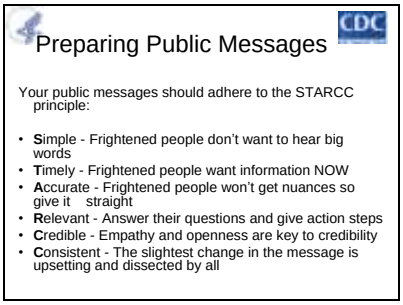


Slide 56

During an emergency, the media and the public will have many questions. Expect the public to be concerned and upset during an emergency, especially when public health is in question. It may be necessary to issue health advisories. It is best to have advisory template prepared in advance to expedite incident-specific issuance.

The EH practitioners may be involved with creating public advisories related to vector control and public health. These messages should include information on the risks that pests may present, signs and symptoms of vector-caused disease, and the control measures to be taken.

Preparing Public Messages (Slide 57)



Slide 57

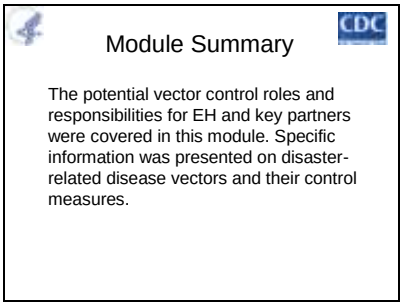
The public will be listening for factual information, and some will be expecting to hear a recommendation for action. Get the facts right, repeat them consistently through your department or county Public Information Officer (PIO) and ensure that all credible sources share the same facts. Speak with one voice. Again, preparation counts. Consistent messages are vital. Inconsistent messages will increase anxiety and will quickly torpedo credibility of experts.

Having standardized disaster information prepared in advance and easily available on your agency's website, will help the public find the information they need to take action to protect themselves. Work with neighboring counties and other agencies to ensure your disaster information is consistent with theirs.

STARCC is from the CDC's *Crisis and Emergency Risk Communication by Leaders for Leaders.* See the module reference list for more information.

Module Summary (Slide 58)

In this module, information was presented on disaster-related disease vectors and their control. The modules covered the roles and responsibilities EH and key partners in vector response situations, the typical vectors of concern during a disaster event and the EH priority activities related to their control.



Slide 58

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Module 6 Acronyms

AMCA	American Mosquito Control Association
AVMA	American Veterinary Medical Association
CCDEH	California Conference of Directors of Environmental Health
CDC	Centers for Disease Control and Prevention
CDPH	California Department of Public Health
DEET	N,N-diethyl-meta-toluamide
EEE	Eastern Equine Encephalitis
EH	Environmental Health
ELO	Enabling Learning Objective
EMA	Emergency Management Agency
EPA	Environmental Protection Agency
ESF	Emergency Support Function
FEMA	Federal Emergency Management Agency
IPM	Integrated Pest Management
NASPHV	National Association of State Public Health Veterinarians
NIOSH	National Institute for Occupational Safety and Health
PAHO	Pan American Health Organization
PIO	Public Information Officer
PPE	Personal Protective Equipment
ppm	Parts per Million
SLE	St. Louis Encephalitis
SOP	Standard Operating Procedure
TLO	Terminal Learning Objective
ULV	Ultra Low Volume
USEPA	United States Environmental Protection Agency
WEE	Western Equine Encephalitis
WHO	World Health Organization

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Module 6 Appendix

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Module #6 Vector Control
Exercise Worksheet

Scenario: Your county has experienced an earthquake and mosquitoes have become a concern in the aftermath. You have been directed to create a public health advisory on the protective measures that should be taken.

Assignment: What immediate measures should you advise?

Consult the *Disaster Field Manual for Environmental Health Specialists,* if available.

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SAMPLE VECTOR ASSESSMENT CHECKLIST

Facility Name/ID#				**Point of Contact**	
Facility Address					
Type	☐ Mosquito	☐ Rodent	☐ Fly	☐ Ectoparasite	☐ Other_____

Assessment Points	**Status**				**Comments**
	YES	**NO**	**NA**	**UNK**	
Complaints/ reports received					
Vector survey conducted					
Breeding conditions identified					
Breeding sites identified					
Increase in vector population					
Disease potential					Type:
Nuisance potential					Type:
Mitigation measures implemented					Type:
Control measures implemented					Type:
Monitoring measures implemented					Type:
Adequate equipment/ supplies					
Adequate management/ staffing					

Additional comments

Facility Status	☐ Vector activity	☐ No vector activity	☐ Public education needed	☐ Follow up needed

Specialist Name	**Date/Time**

USE REVERSE SIDE FOR ADDITIONAL INFORMATION

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Module 7 Solid Waste

Environmental Health Training in Emergency Response (EHTER) – Introductory Level

California Version

Participant Manual

August 2010

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Module 7 Solid Waste

Duration

One and one half (1.5) hours

Scope Statement

This module will introduce participants to a variety of issues and concerns associated with solid waste management and debris removal following emergencies and disasters. Appropriate measures for addressing these issues and concerns, and for mitigating their adverse effects, will be covered in this module.

Terminal Learning Objective (TLO)

Participants will recognize the key EH issues related to disaster debris removal and solid waste operations and have the necessary knowledge to conduct solid waste-related activities.

Enabling Learning Objectives (ELO)

After completion of this module, participants will be able to:

7-1. Identify solid waste issues related disaster events and the impacts they have on the environment and on human exposure.
7-2. Recognize the key roles that EH practitioners play in addressing disaster waste issues.
7-3. Identify key response partners.
7-4. List the major elements needed in developing a disaster waste plan.
7-5. Identify key messages for the public and for EH partners.

Resources

Course participant manual
Module 7 PowerPoint slides
Exercise Worksheet
Sample Assessment Checklist

Instructor to Participant Ratio

1:50 or less

Reference List

CCDEH: California Conference of Directors of Environmental Health *Disaster Field Manual for Environmental Health Specialists*
http://www.ccdeh.com/products/disaster_field_manual_info.htm

Cal/EPA: Disaster Site Planning Checklist - http://www.ciwmb.ca.gov/Disaster/DisasterPlan/chp4ck.htm

Cal/EPA: Disaster Site Planning Checklist: Site planning checklist for temporary storage sites http://www.ciwmb.ca.gov/Disaster/DisasterPlan/chp4ck.htm

Cal/EPA: Emergency Animal Diseases – Regulatory Guidance for Disposal and Decontamination October, 2004
http://www.calepa.ca.gov/Disaster/Documents/EADisease.pdf

Cal/EPA: Integrated Waste Management Disaster Plan
http://www.ciwmb.ca.gov/disaster/DisasterPlan/

CDC: Environmental Health Emergency Response Guide
http://www.cdc.gov/nceh/ehs/Docs/EH_Emergency_Response_Guide.pdf (Modified from the California Disaster Manual and the APC Environmental Health)

CDC: *Crisis and Emergency Risk Communication by Leaders for Leaders*
http://www.bt.cdc.gov/erc/leaders.pdf

CDC: Infectious Disease Risks from Dead Bodies – Pan American Public Health
Disposing of Liquid Wastes from Tsunami-Affected Areas – Guidance from CDC
www.bt.cdc.gov/disasters/tsunamis

CDFA: California Response to Foreign Animal Diseases – A Multi-Agency, Statewide Plan for Response
http://www.cdfa.ca.gov/ahfss/Animal_Health/pdfs/Ca_Response_to_FAD.pdf

CDFA: Listing of collection centers, haulers and rendering plants
http://www.cdfa.ca.gov/ahfss/emergency_Preparedness/Dead_Stock_Hauling.htm

EPA: Planning for Disaster Debris: http://www.epa.gov/epaoswer/non-hw/muncpl/disaster/dstr-pdf.pdf

FEMA: Target Capabilities List http://www.fema.gov/pdf/government/training/tcl.pdf

OSHA: The Application of HAZWOPER to Worksite Response and Cleanup Activities
http://www.osha.gov/SLTC/hazardouswaste/application_worksiteresponse.html

SWANA: Site planning, collection, and disposal of waste after a disaster
Hurricane Katrina Disaster Debris Management: Lessons Learned from State and Local Governments: http://www.swana.org/pdf/swana_pdf_358.pdf

USDA National Agricultural Biosecurity Center: Carcass Disposal: A Comprehensive Review

http://nabc.ksu.edu/content/weblog/article/carcass_disposal_a_comprehensive_review/

WHO: Management of Dead Bodies after Disasters – Field Guide for First Responders
www.paho.org/disasters (click on Publications Catalog)

Guidelines for Mass Fatality Management during Terrorist Incidents Involving Chemical Agents U.S. Army Soldier and Biological Chemical Command (SBCCOM), 2001.
Joint Tactics, Techniques, and Procedures for Mortuary Affair in Joint Operations (Joint Pub 4-06), Joints Chiefs of Staff, August 1996

Capstone Document: *Mass Fatality Management for Incidents involving Weapons of Mass Destruction.* U.S. Army Research Development and Engineering Command

The California Mass Fatality Management Guide: A Supplement to the State of California Coroners' Mutual Aid Plan
http://www.oes.ca.gov/Operational/OESHome.nsf/0d737f261e76eeb588256b27007ac5ff/a3f586fd13d795c788256b7b0029bbff/$FILE/MassFatalityPlan.pdf

Mass Fatality Incident Management: Guidance for Hospitals and Other Healthcare Entities, Los Angles County
http://ems.dhs.lacounty.gov/ManualsProtocols/MFIM/MFIGuidanceForHospitals808.pdf

Practical Exercise Statement

One exercise has been incorporated into this module.

Assessment Strategy

In-class questions, participation in the exercise, and module summary discussion.

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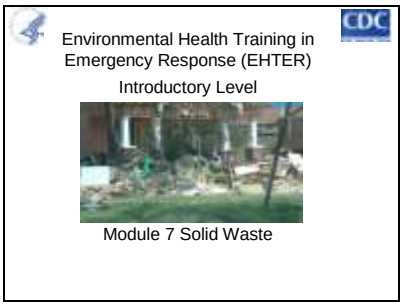
Module 7 Slides

Introduction to Solid Waste (Slide 1)

Natural and manmade disasters can generate large amounts of solid waste and debris and cause considerable challenges for public officials. Cleaning up can be time-consuming and costly. Recent disasters provide illustrations of the waste that can be generated: the World Trade Center collapse in 2001 generated approximately 1.6 million tons of debris and hurricanes Katrina and Rita in 2005 generated 30 million cubic yards of waste.

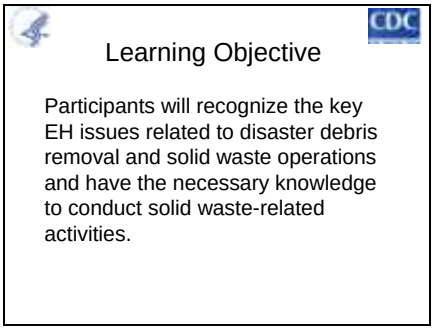
EH professionals need to have an understanding of the types of debris that are typically generate din a disaster and how they are handled to effectively prepare for and respond to debris-related issues.



Slide 1

Learning Objective (Slide 2)

Participants will recognize the key EH issues related to disaster debris removal and solid waste operations and have the necessary knowledge to conduct solid waste-related activities.

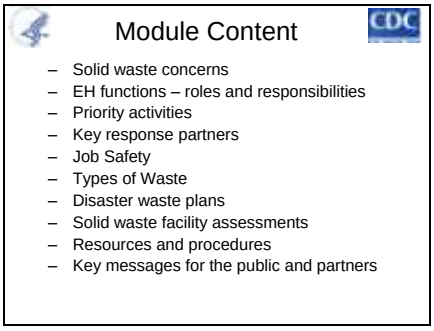


Slide 2

Module Content (Slide 3)

This module covers:

- Solid waste issues/concerns
- EH functions – roles and responsibilities
- Priority activities
- Key response partners
- Job Safety
- Types of Waste
- Disaster waste plans
- Solid waste facility assessments
- Resources and procedures
- Key messages for the public and partners



Slide 3

Reasons for Concern (Slides 4-5)

When disasters such as floods, fires, or earthquakes strike a community, solid waste management is not the most obvious concern. Natural disasters, however, can generate tons of debris, including building rubble, soil and sediments, green waste (e.g., trees and shrubs), personal property, ash, and charred wood. All of this waste material places an additional burden on a community already struggling to cope.

Slide 4

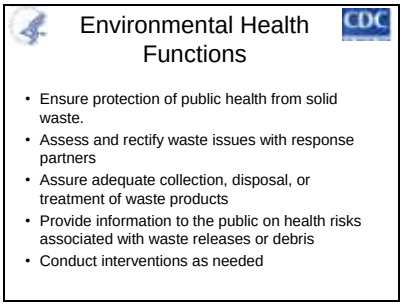
This debris can block critical roadways needed by emergency responders. In the initial time period after a disaster, life saving operations take precedent and may require that debris be removed from highways, bridges and other critical infrastructure. Piles of debris also create fire and safety hazards. Uncollected household and municipal solid waste can become the source of vector breeding, undesirable odors, and other nuisances.

Slide 5

For example, in 2005 as a result of Hurricane Katrina, more than 1,500 people lost their lives and more than a million were driven from their homes on the Gulf Coast. Tens of thousands of homes in New Orleans were flooded, many requiring either demolition or gutting before reconstruction. Years later, the New Orleans area still faced significant debris management issues and challenges. For example, the Louisiana Department of Environmental Quality stated that while the Federal Emergency Management Agency (FEMA) estimated in July 2008 that it had funded about 16,900 home demolitions, an estimated 6,000 homes still needed to be demolished in the New Orleans area.

Environmental Health Functions (Slide 6)

The role of the EH practitioner typically would focus on efforts to ensure that the affected population is protected. This includes leading efforts to properly collect and dispose of solid and hazardous waste materials generated by the disaster. EH staff often works in coordination with key partners. This may include the responsibility to investigate reports of solid waste problems, assess damage at existing facilities, identify new waste sites, and oversee cleanup efforts.



Slide 6

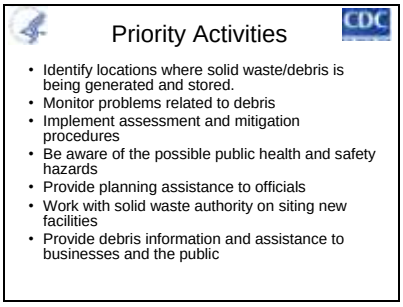
EH professionals also may be asked to serve as points of contact for information dissemination to the public and to partners regarding public health risks associated with solid

waste. The EH practitioner may be called upon to advise and interpret information on toxicology, chemical, radiological, biological, medical and industrial hygiene issues related to solid waste.

If the local EH agency is a Local Enforcing Agency (LEA), the responsibilities will be more defined and include:

- Determining if existing waste sites are safe for use;
- Assisting in identifying sites for recycling, temporary storage and disposal of waste;
- Identifying new storage areas at existing or closed waste facilities;
- Determining environmental controls needed at temporary sites;
- Providing input into the contractual conditions needed for cleanup contracts; and
- Assisting in developing a plan to assist businesses and property owners with cleaning up.

Priority Activities (Slide 7)



Slide 7

Initial response activities performed in the early days of the event are typically limited to the clearance of debris that hinders life-saving activities and poses an immediate threat to public health and safety. Clearance of debris from roadways allows movement of emergency vehicles, and law enforcement agencies, resumption of critical services: power, water, and telephone, and damage assessment of critical public facilities.

EH monitors the generation of wastes in a disaster situation and provides technical assistance to local officials concerning the health risks and mitigation process as well as working with key partners to provide public assistance and information. EH priority activities will vary depending on the local EH agency's status as a solid waste Local Enforcement Agency (LEA). LEAs enforce the state's solid waste environmental and public health laws and therefore have a lead in disaster-related solid waste issues at the local level. Key EH activities concerning debris removal and disposal include surveillance of illegal dumping, establishment of recycling and temporary storage sites, monitoring of landfill capacity and other solid waste concerns.

The California Conference of Directors of Environmental Health (CCDEH) *Disaster Field Manual for Environmental Health Specialists* and the Advanced Practice Centers' *Environmental Health Emergency Response Guide* are valuable resources on

disaster-related EH activities. See the module reference list for more information.

Ensuring that the debris is removed in a timely fashion is important to protect the safety of the community and to return the community back to normal. Debris that may pose an immediate threat to human health and the environment should be a first priority in collection such as putrescible waste (e.g., food waste), animal carcasses, and leaking hazardous waste containers.

Following that, the strategy should address materials that are priorities for recycling or reuse. Other wastes, such as vegetative debris, can be collected and stored over a longer period of time. Local officials make these decisions in accordance with plans, policies and best practices.

Key Partners (Slide 8)

Some of EH's key partners are the local emergency management agency that helps coordinate the emergency response. Also involved will be Operational Area (OA) Emergency Operations Center (EOC), the California Emergency Management Agency (Cal EMA), California Environmental Protection Agency (Cal/EPA), and the California Department of Resources Recycling and Recovery (CalRecycle) as well as other state agencies, federal agencies, utilities, and volunteers organizations.

Slide 8

Federal agencies that have responsibility for overseeing specific support functions related to solid waste include the Army Corps of Engineers, EPA, and the Coast Guard. The Federal Emergency Management Agency (FEMA) role related to debris management includes administering the Public Assistance Grant Program. The program provides supplemental financial assistance to states, local governments, and certain nonprofit organizations for debris removal and disposal, emergency protective measures, including the repair, replacement, or restoration of government and non-profit facilities.

Remember, in many disaster situations, partners will vary depending on the nature of the incident and the waste generated.

California's Solid Waste Regulatory Agencies (Slide 9)

Slide 9

In California, the solid waste Local Enforcement Agency (LEA) is the government agency designated with enforcing environmental and public health laws related to solid waste. The LEA is typically found within a city or county public health or environmental health department. LEAs have the primary responsibility for overseeing the operation and closure of solid waste facilities. They also have responsibilities for ensuring proper storage and transportation of solid wastes.

CalRecycle is responsible for ensuring that state's waste management programs are carried out through the LEAs and acts as the LEA in several cities and counties. Cal/EPA's Department of Toxic Substances Control (DTSC) is involved with hazardous waste issues.

Both Cal EMA and Cal/EPA provide technical assistance to evaluate potential disposal or reuse options for disaster-related debris. Additionally, Cal EMA has a debris management team that may be involved to coordinate solid waste removal. Contacts with these agencies should be established during emergency planning activities to facilitate efficient decision-making when a disaster occurs.

Job #1 – Safety (Slide 10)

Slide 10

Because of the nature of a disaster event, it is necessary for the EH practitioner to think ahead and often about safety issues. The priority is to take personal precautions, and this calls for assessing all situations and to proceed with caution.

When dealing with wastes pay particular attention to personal sanitation. Wash hands often; wash them immediately after returning from the field and before handling food. Cleanliness is essential to preventing the spread of germs and disease. Be alert for downed power lines and the operation of heavy equipment. Wear a high visibility vest, safety shoes/boots, hard hat and other personal protective equipment as needed during solid waste facility assessments. And take extra precautions around heavy equipment.

To avoid thermal stress, stay hydrated; carry water with you and

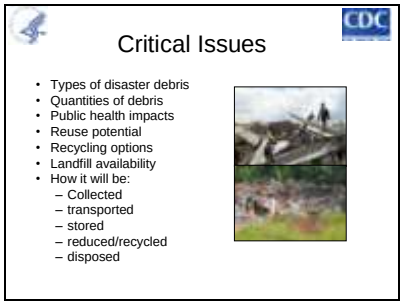
remember to drink enough water. Wear appropriate clothing for the weather. Take rest cycles – don't allow yourself or your team to be a victim….get your needed rest.

Keep others away from spills of hazardous materials. Do not allow food or liquids near gases or spills and keep sources of ignition away. Be particularly aware of the hazards caused by fires; exploding canisters; reactions with fuels; flammable combustible materials; confined spaces; biological, chemical, and electrical hazards, cold and heat exposure, and oxygen-deficient atmospheres.

Airborne hazards are common to disaster events whether it is a wildfire, earthquake, hazardous material spill, etc., exposure to smoke and chemical vapors is possible. Personal protective equipment (PPE) such as respirators may be needed in some situations. If you use PPE, have a backup with you. Use of a respirator will require fit testing, training and certification.
For information on wildfire smoke, see *Wildfire Smoke - A Guide for Public Health Officials* California Air Resources Board. See the module reference list for more information.

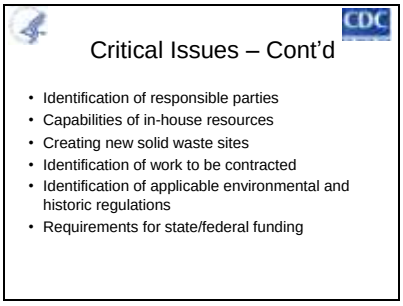
Critical Issues (Slides 11-12)

Massive amounts of different types of solid waste can be generated that need to be disposed of in a safe and sanitary manner. Many factors determine the critical issues for EH practitioners, including the type of disaster. For example, a strong earthquake can reduce blocks of a city to rubble that impedes emergency traffic making debris removal an immediate concern.



Slide 11

To address disaster-related debris concerns, the following information is needed:
- Estimated quantities and types of debris;
- Opportunities for waste recycling;
- Landfill availability;
- Waste collection, storage, and transport options;
- Identification of responsible agencies;
- Capabilities of waste resources;
- Identification of work that needs to be contracted out;
- Identification of applicable regulations; and
- Requirements for state/federal disaster funding.



Slide 12

The amounts of waste generated by a disaster can be

staggering; Hurricanes Katrina and Rita of 2005 generated a combined 30 million cubic yards of waste. The South Lake Tahoe Angora fire of 2007 generated 60 tons of debris. The 1.8 million tons of mixed debris from the collapse of the world Trade Center towers was taken to formerly closed Fresh Kills Landfill for recovery of human remains, personal objects, and material evidence. Disaster debris management costs typically comprise 40% of the total cost of any given disaster.

Categories of Waste (Slide 13)

Slide 13

To effectively prepare for and respond to debris-related issues, it is first necessary to have an understanding of the types of wastes that can be generated.

Debris is the waste stream resulting from a disaster and often includes building materials, soil and sediment, vegetative debris, personal property, vehicles, and other materials. It is important for the EH professional to recognize that disasters can produce both solid and hazardous wastes that can cause harm to human health and the environment and create public health nuisances.

Disasters generate many different types of waste including:

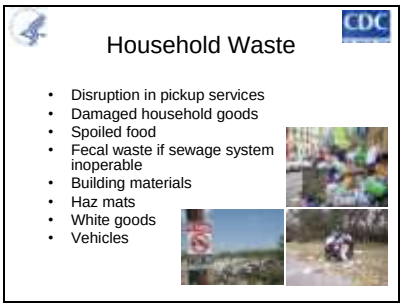
- Municipal solid waste
- White goods and electronics
- Green waste /wood waste
- Animal carcasses
- Hazardous waste
- Construction and demolition waste, and infrastructure waste

The options for management of these wastes are many with reuse and recycling the highest priorities. The number of options for waste management depending on careful sorting and segregation. Debris generated by a disaster may have a market value that can be used to offset the cost of disaster operations. But if waste is not property sorted and segregated, reclamation and recycling cannot occur. Solid and hazardous waste need to be categorized separately for recycling, treatment and disposal purposes to minimize the burden on waste facilities.

Household Waste (Slide 14)

Disruptions in normal solid waste collection services may be caused by a disaster that affects transportation, and municipal services. The sheer amount of waste generated may overwhelm solid waste services even if they are still in operation.

After Hurricane Katrina, illegal dumping of household and construction debris became a huge issue requiring a joint effort by the Louisiana Department of Environmental Quality, federal EPA, and the Louisiana National Guard. Water quality issues, vector control concerns, etc. can arise from illegal dumping practices.



Slide 14

Domestic Solid Waste (Slides 15)

Under normal circumstances, much municipal solid waste is recycled. The remainder is disposed of in sanitary landfills that are equipped with devices to control pollutants. These standard methods may not be sufficient to handle the amount of waste and debris generated by a disaster. Disaster debris can overwhelm existing landfill facilities causing concern for those communities depending on future availability of that capacity. Disasters often disrupt solid waste collection services for homes and businesses that can lead to nuisance conditions. This is compounded by the cleanup efforts that will begin immediately after the event. To address this, communities often set up temporary refuse collection points where residents and businesses can bring in their wastes.

Slide 15

White Goods and Electronic Debris (Slide 16)

White goods are household items such as refrigerators, ovens, heating/cooling units and other appliances, as well as smaller items such as e-waste including computers, televisions, and electronic equipment that contain hazardous materials such as mercury switches and heavy metals. Disposal of these items is often accomplished through community-wide collection events.

Slide 16

Video Presentation – White Goods Collection and Disposal (Slide 17)

The U.S. EPA produced this video on the disposal of white goods after Hurricane Katrina.

Slide 17

Metals (Slide 18)

Metals are prime candidates for recycling, if it is well sorted. Specialized contractors should be available to bid on disposal of debris by recycling, if it is well sorted. Contracts and monitoring procedures should be developed to ensure that the recyclers comply with local, tribal, state and federal environmental regulations. Recycling should be considered early in the debris removal and disposal operation because it may present an opportunity to reduce the overall cost of the operation.

Slide 18

Green Waste (Slides 19-20)

Many counties in California are both urban and rural in nature and therefore can have a wide variety of solid waste after a disaster. Some areas of the state have a significant amount of agriculture activity and other facilities associated with rural areas, in addition to those facilities associated with urban areas.

Disasters create massive amounts of vegetative debris, the majority of which was typically landfilled or burned in the open in the past. In California, an effort is made to recycle as much of the debris generated by a disaster as possible to preserve landfill space. As an alternative to burning or land- filling, wood debris can be recycled via mulching, composting and chipping for later use as biomass fuel, ground application, or agriculture uses.

Grinding and chipping woody debris is a viable reduction method that can produce mulch suitable to be used to replenish any eroded topsoil and for other beneficial uses. Careful attention to debris segregation will both expedite general recovery and increase the chances for the reuse of disaster debris.

Slide 19

Slide 20

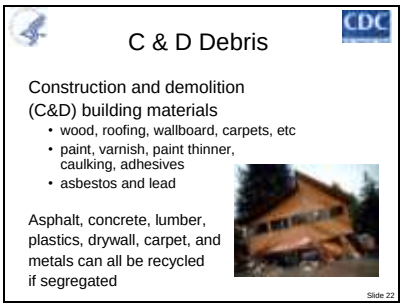
Construction and Demolition Debris (Slides 21-23)

Construction and demolition (C&D) materials consist of the debris generated during the construction, renovation, and demolition of buildings, roads, and bridges. C&D materials often contain bulky, heavy materials, such as concrete, wood, metals, glass, and salvaged building components. Reducing and recycling C&D materials conserves landfill space, reduces the environmental impact of producing new materials, creates jobs, and can reduce overall building project expenses through avoided purchase/disposal costs.

Once mixed debris is removed from the damaged area, it will be taken to sites for temporary storage, sorting and disposal. Like items should be stored together to ensure safety, maximize recycling, and reduce disposal costs. It is important to segregate both solid and hazardous waste by like properties as much as possible to facilitate recycling and for efficient collection, disposal, and cost control. Recycling reduces mixed debris volume requiring landfill disposal. Recycling is attractive and strongly supported because there may be an economic value to the recovered material if it can be sorted and sold.

A portable Materials Recovery Facility (MRF) could be set up at the site. By properly sorting debris, an affected community should be able to maximize reuse opportunities and minimize disposal of combined waste as hazardous waste. However, to accomplish this, waste handlers must understand the requirements for handling any hazardous waste as well as have a plan for sorting and segregating the debris stream.

Building demolition waste can include hazards. It may include asbestos-containing material and lead-based paint debris. In the case of fires, the ash may contain concentrated levels of heavy metals. Note: Volunteer organizations may become involved with debris removal and can pose a challenge as they are typically not equipped or trained to handle with hazardous materials.



Slide 21

Slide 22

Slide 23

Putrescible Wastes (Slides 24-25)

One of the biggest issues, after blocked roadways, is the management of putrescible wastes (waste that contains organic matter capable of being decomposed by microorganisms and capable of causing obnoxious odors and attracting insects and animals).

Rotting food from processing plants, warehouses, cold storage facilities, grocery stores, restaurants, institutions, and other facilities can pose a disposal challenge after a disaster.

In rural and agricultural areas, there may be livestock and other dead animals to contend with, as well as farm debris, crops, feedlot debris and fodder, etc. In urban areas, putrescible waste sources may include commercial food storage warehouses, grocery stores, food processing plants, and animal slaughter plants.

Slide 24

Slide 25

Animal Carcasses (Slides 26-29)

Animals, including livestock and pets as well as wildlife, may be killed by the disaster. In agricultural areas there may be chicken ranches, diaries, and other large scale concentrated animal feeding operations. An animal carcass disposal emergency may occur after a large die-off due to natural or man-made disaster, a disease outbreak, or agroterrorism. Owners are responsible for the disposal of their livestock and domestic animals, but when large numbers of animals are involved, it may be beyond the means of the owner to properly dispose of the carcasses.

Slide 26

The California Department of Food and Agriculture (CDFA) is the primary state agency responsible for developing emergency animal disease identification, containment, and removal procedures. CDFA together with Cal/EPA, California Department of Public Health (CDPH) and local jurisdictions, determines the most appropriate method(s) for disposal of dead animals.

Options for Carcass Disposal

Possible Carcass Disposal Methods		
No Animal Disease Involved	Transport Available	Rendering
		Landfill
		Temporary Storage
		Composting
		Incineration
		Chemical Digestion
		Burial: trench or mass burial
	Transport Unavailable	Temporary Storage
		On-site Burial: trench or mass burial
		On-site Burning: open air or air curtain
Animal Disease Involved	CDFA/USDA are lead agencies & determine disposal method	

Slide 27

Several factors influence disposal decisions including the cause of death, the urgency of disposal, the location and scale of the incident, environment concerns and cost. Evaluation is needed of available disposal options which typically include commercial

rendering, burial, incineration and composting. Factors to be considered in the decision are the ability to temporarily store and/or transport the carcasses, the local rendering or incineration capacity, and the capacity of appropriate landfills. The environmental impacts of each disposal options must be considered.

Slide 28

Commercial rendering offers a relatively safe disposal method that is compatible with environmental controls, although animal rendering capacity in California is limited. Animals must be received by a rendering facility soon after death or they will decompose to the point that they can not be transported and may have to be disposed of on site. Outbreaks of certain diseases such as foot and mouth disease may result in travel restrictions that make it impossible to utilize rendering plants. A listing of California rendering facilities is available on the CDFA website; see the module reference list for more information.

Slide 29

Burial serves as a means of disposing of animal carcasses, however it does not necessarily eliminate disease agents that may be present. On-site burial is often the most economical choice for burial but there are environmental concerns that may necessitate long-term site monitoring. Burial in a sanitary landfill offers the advantage of an existing waste disposal facility that may be immediately available if landfill operators are willing to accept animal carcasses and the transportation costs and potential for spread of the disease agent is manageable.

Carcass burning offers the advantage of destroying most disease-causing agents; however it should not be used in cases where bovine spongiform encephalopathy (BSE) or the human variant, transmissible spongiform encephalopathy (TSE) is a concern (Mad Cow disease). Open air burning is relatively inexpensive but presents environmental concerns and is dependent on favorable weather conditions and public acceptance. Carcass disposal at a high temperature incineration facility offers the ability to destroy BSE and TSE agents in a secure environment but can be expensive due to transportation costs because California has no large-scale incineration facilities. Mobile incineration technology is available and may be suitable for carcass and other organic debris management.

Composting is another option for carcass disposal. It may provide an acceptable disposal method if strict monitoring is employed to avoid environmental degradation. Note: California

regulations prohibit the composting of mammal flesh, organs, unprocessed hide, blood, bone and marrow, without a declaration of a state of emergency.

Disaster Carcass Disposal Options

Presence of Disease	Limiting Factors	Options
No Animal Disease Involved	Transport is Available	Rendering
		Landfill Burial
		Composting
		Incineration
	Transport is Unavailable	Temporary Storage
		On-site Trench or Mass Burial
		On-site Open Air or Mobile Facility Burning
Animal Disease Involved	CDFA/USDA are lead agencies & determine disposal method(s)	

Estimated Carcass Disposal Costs/Ton and Capacity

Rendering	$86	35-40 ton/hour
Burial	$30-60	10 ton/hour
Composting	$40-60	Equipment Limit
Air-curtain incineration	$30-200	5-6 ton/hour
Landfill	$40-100	Transport Limit
Alkaline hydrolysis	$45-260	4 Hours/Cycle
Plasma	$60	.25 to 7.5 tons/hr
Ocean disposal	$1	Transport Limit

Wilson, D. (2003). Presentation on Disposal Options. Kansas City, Missouri: Midwest Regional Carcass Disposal Conference.

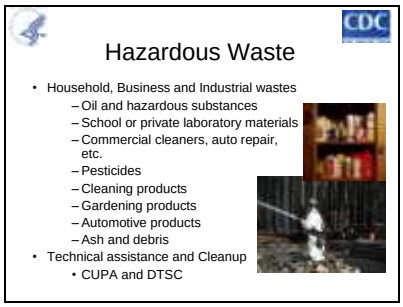
Hazardous Waste (Slides 30-32)

After a disaster strikes, it is typical for homes and businesses to be damaged causing concern over releases of hazardous materials that require an immediate assessment and may require remediation of the situation. Hazardous wastes are those wastes that exhibit ignitable, corrosive, reactive, toxic or other special characteristics can come from any number of sources in a disaster event. Most people think of hazardous waste being generated from industrial releases such as oil spills or chemical fires, however, many disaster-related releases of hazardous waste originate from residences and small businesses.

Business waste should be monitored to be certain it does not meet the definition of hazardous waste. Waste handlers at temporary sites must understand these requirements as well as have a plan for controlling and diverting the hazardous waste from the debris stream.

It is important to recognize that homes are a significant source of hazardous waste that must be segregated from disaster debris. Otherwise the combined waste should be handled as hazardous waste. Household hazardous wastes (HHW) include motor oil, automobile batteries, paints and solvents, household cleaners and drain openers, swimming pool chemicals, pesticides, and compressed gas tanks (such as propane and oxygen).

Communities often stage special collection events or curbside pickup services after a disaster to avoid the illegal dumping of hazardous materials.



Slide 30

Slide 31

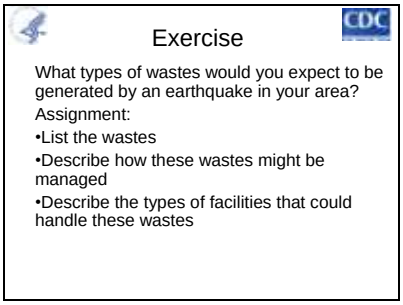
Slide 32

Exercise (Slide 33)

(SEE MODULE APPENDIX FOR WORKSHEET)

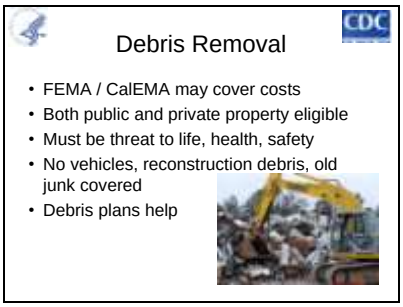
Scenario: What types of solid waste would you expect to be generated by a major earthquake in your area?

Assignment: List the wastes, how these wastes would likely be managed, and the types of facilities that would likely receive these wastes. Consult the *Disaster Field Manual for Environmental Health Specialists,* if available.



Slide 33

Debris Removal (Slide 34)

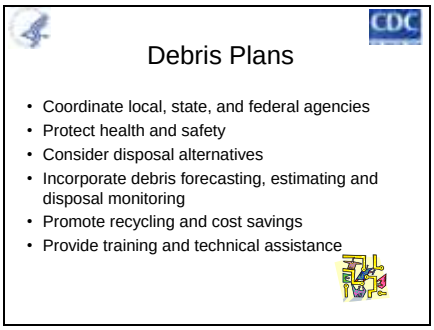


Slide 34

The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) establishes programs and processes for the federal government to provide major disaster and emergency assistance to states, local governments, tribal nations, and others. FEMA has the responsibility for administering the provisions of the Stafford Act, including approving and funding the assistance provided under it.

Large disasters typically result in a state emergency and/or Presidential disaster declaration that allows Cal EMA and FEMA to provide assistance for eligible debris related activities to affected communities. FEMA eligible activities include road clearance, demolition and reduction of immediate threats and debris removal.

Debris Plans (Slides 35-37)



Slide 35

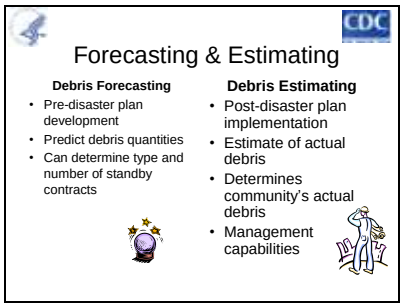
Emergency management agencies realized the need for a systems approach to debris management following disasters that resulted in tons of debris. The incorporation of debris management into local emergency planning activities is an essential element of disaster preparedness and cost-effective response and recovery operations. This approach emphasizes the interdependency and connectivity of all aspects of debris management.

Slide 36

Before disaster strikes, local planners should have developed a plan for handling increased volumes of solid waste caused by a disaster. A disaster debris management plan can help a community identify options for collecting, recycling, and disposing of debris. Not only does a plan identify management options and sources for help, but it also can save valuable time and resources if it is needed. The plan should emphasize the protection of the public from the hazards posed by disaster debris and should be detailed enough to allow for quick implementation. It should also include a mechanism for evaluating the debris management process to ensure that protections are in place for the community, workers, and the environment.

The benefits of putting a recovery plan in place before a disaster occurs include: Reducing the time needed to identify debris management options after a disaster, saving money by avoiding

rushed decisions that could result in costly mistakes in disaster waste management, and reducing potential hazards by identifying which hazards may exist, who will address them, and how.



Slide 37

After a disaster occurs, incident-specific debris planning should be conducted in collaboration with partner agencies because the type and amount of debris generated from a disaster varies from situation to situation. An incident-specific debris plan will allow for efficient and cost-effective waste removal. The pre-disaster plan and the post disaster planning will help communities faced with the dilemma of how to use their existing solid waste capacity for recycling, composting, combustion, and disposal make effective decisions on appropriate debris management options and avoid rushed or, ultimately, poor decisions.

Pre-disaster plans typically include debris forecasting while post-disaster plans focus on estimating to determine types and quantities of solid waste.

Debris Forecasting:
- Pre-disaster plan development;
- Predict debris quantities; and
- Can determine type and number of standby contracts.

Debris Estimating:
- Post-disaster plan implementation;
- Estimate of actual debris;
- Determines community's actual debris; and
- Management capabilities.

Site Planning (Slides 38-39)

Slide 38

In developing a disaster-specific solid waste response plan priorities need to be set.

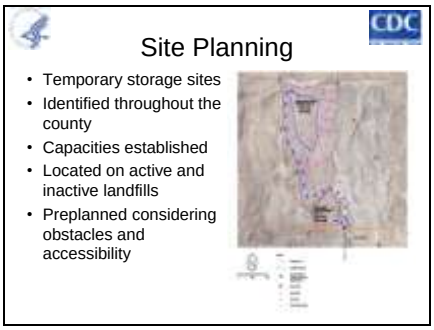
First: The plan protects human life. This includes protection of the general public, emergency responders, and the utility crews working with the waste.
Second: The plan protects the environment. Numerous state and federal regulations require the protection of air, water, and land, for example, the Clean Air Act, Clean Water Act, and RCRA.
Third: The plan protects property. If a temporary solid waste transfer station is to be established, site selection and operation

guidelines are critical.

If a new solid waste site is needed to handle disaster debris, reviews, permits and site monitoring will be required prior to site establishment. To facilitate the process:

- Identify agencies responsible for issuing permit/variance.
- Determine time needed to process permit application.
- Use local authority to designated temporary storage areas.
- Consider developing pre-approved waiver to site temporary storage areas.

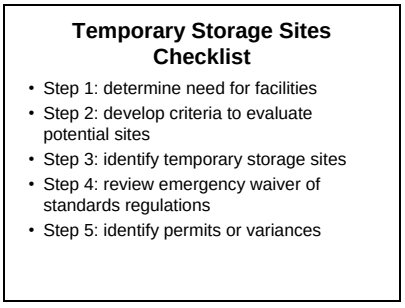
Site planning should be addressed before disaster strikes whenever possible.



Slide 39

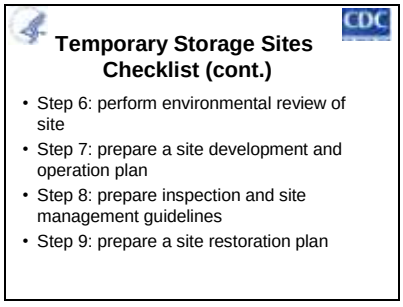
Temporary Storage Sites (Slides 40-41)

All activities associated with debris clearance, removal, and disposal activities depend upon the availability of suitable sites for managing debris. In major disasters, there may be insufficient landfill capacity available in the short-term to handle the debris in a timely fashion. In this case, communities use Temporary Debris Storage and Reduction Sites (TDSRS) to store, segregate, or reduce the volume of disaster-generated debris. As part of pre-disaster planning, communities should have selected suitable locations for TDSRSs. Preferably, these sites are on public property and consist of 10 acres or more, depending on anticipated needs.



Slide 40

Large open sites are needed for any type of debris staging activity. Paved sites are best. Semi-paved or large parking lots paved in stone dust or gravel is the next best option. Sites should have good ingress/egress to accommodate heavy truck traffic and have a site configuration that will allow for an efficient layout. Meadows are least desirable because they may be inaccessible due to saturated soils after extended and heavy precipitation and there is a greater chance for groundwater contamination.



Slide 41

Per FEMA guidance, the soil, groundwater and/or surface water at and near a proposed staging area should be tested prior to receipt of disaster-generated debris to establish pre-existing baseline conditions. A TDSRS for debris other than green waste should not be allowed in public drinking water supply watersheds or public well source areas. Setbacks for sites adjacent to wetlands should be determined in coordination with appropriate

agencies. Impacts from noise, dust, and traffic that are tolerated by the public early on in a disaster recovery may have to be mitigated later on. Thus, to the extent feasible, the TDSRS should not be located near residential areas, schools, hospitals, and other sensitive uses. The TDSRS should not have critical habitat or rare ecosystems, threatened and/or endangered species, historic and/or archaeological sites.

Based on FEMA guidance for operating a TDSRS, the site should have:

- Visible, demarcated buffer areas based on the established wetland setback line;
- Storm water controls, such as silt fences, to prevent discharge of contaminated runoff into water bodies;
- Some method to control the off-site migration of dust, wood chips, or other debris residuals from vehicular traffic and from the handling of debris and ash;
- An adequate supply of water to ensure that the debris is adequately wet during the segregation, processing and/or packaging of the waste to prevent risk of fire and/or dust migration;
- Some type of access control to prevent unauthorized dumping and scavenging;
- Monitors to correctly identify and segregate waste types, especially hazardous waste from non-hazardous waste, for appropriate management; and
- Oversight management for the site.

When staging debris other than green waste, such as hazardous wastes, the following actions may be appropriate:

- install wells and perform groundwater sampling;
- conduct spot soil sampling at “hot” areas such as household hazardous waste (HHW), ash, other waste types;
- provide specific fuel storage areas;
- take videos, photos of the site before operations begin;
- periodically sketch/map layout including “hot” areas; and
- prepare quality assurance reports, spill reports, etc. as part of the overall project.

Temporary sites will need approval from the regulatory agency; much of the approval process can be completed prior to a disaster. Here is a checklist the reviews the site approval process:

Step 1

Determine the extent of need by reviewing preliminary damage survey results. Estimate types and quantities of debris and determine if existing facilities have capacity for it. Consider options for increasing capacity at existing facilities and/or reducing the amount of waste to be handled. A sorting site could be established to facilitate recycling.

Step 2

If new solid waste sites must be established, develop criteria to evaluate potential sites such as the length of storage time needed i.e. temporary or long-term; real estate costs; site constraints, etc.

Step 3

Prepare list of potential sites using criteria developed in step 2 and then consider the range of sites that could include recycling facilities, landfills, transfer stations, vacant lots, city/county-owned land, and private property.

Step 4

Review emergency waiver of standards regulations to see which solid waste regulations may be waived, if any, the LEA can issue a waiver of upon request for temporary relief from specific standards or conditions of solid waste facilities permits if the waiver does not pose a threat to public health and the environment and steps are put into place to maximize reuse, recycling, or composting of disaster-related waste.

Step 5

Identify and needed other permits or variances. Consider developing pre-approved waiver to site temporary storage areas.

Step 6

Perform environmental review of site in accordance with NEPA/CEQA and local requirements.

Step 7

Prepare a site development and operation plan including a contingency plan and procedures for hazardous wastes, if found.

Step 8

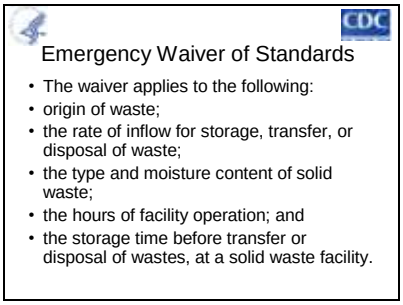
Develop inspection and site management guidelines including a tracking system for waste.

Step 9

Prepare a site restoration plan with identification of the processing and removal of materials from the site.

A good reference for this process is the *Integrated Waste Management Disaster Plan, Guidance for Local Government on Disaster Debris Management*, California Integrated Waste Management Board. See the module reference list for more information.

Emergency Waiver of Standards (Slide 42)



Slide 42

Immediately following a major disaster, the cleanup effort often results in a need to handle more and different types of debris than existing solid waste facility permits allow. An emergency waiver of standards is a waiver issued by an enforcement agency which grants a solid waste facility operator temporary relief from specific state minimum standards or specific terms or conditions of a solid waste facility permit.

More specifically, an enforcement agency may approve and issue a waiver for the express purpose of enabling an operator of an existing permitted solid waste facility or approved temporary transfer or processing site to accept disaster debris and other nonhazardous wastes, in a manner not consistent with the terms and conditions of the relevant solid waste facility permit, during the recovery phase of a state of emergency or local emergency. An emergency waiver of standards may only be issued when there has been a proclamation of a state of emergency or local emergency as those terms are defined in the regulations.

Emergency waiver of standards regulations allow LEAs to issue emergency waivers to solid waste facility operators upon request in the event of a state of emergency or local emergency.

The waiver may apply to any of the following:
- origin of waste;
- the rate of inflow for storage, transfer, or disposal of waste;
- the type and moisture content of solid waste;
- the hours of facility operation; and
- the storage time before transfer or disposal of wastes, at a solid waste facility.

A waiver can also be granted to an operator for the establishment of a locally-approved temporary transfer or processing site, if authorized by the local enforcement agency

To obtain a waiver, a solid waste facility operator shall submit a written request to the LEA. The request shall include, but not be limited to, the following information:
- A listing of the permit terms and conditions and state minimum standards to be waived in order to facilitate recovery and disposal of disaster debris;
- A statement of the remaining disposal capacity of the solid

waste disposal site;
- A description of all facility-related diversion programs and onsite recycling facilities; and
- A listing of locally approved temporary transfer or processing sites to be used to store disaster debris for future reuse or recycling.

Facility Assessments (Slides 43-45)

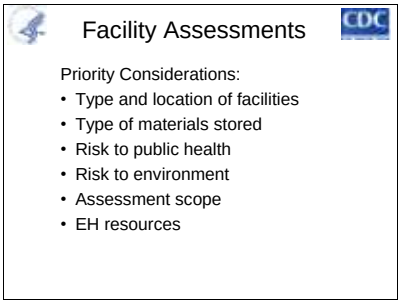
Where Environmental Health is the Local Enforcement Agency (LEA) for solid waste, it will coordinate with partner agencies on emergency debris removal/diversion from landfills. This may include issuing emergency regulatory permits and/or waivers that will allow waste sites to temporarily operate outside the terms of their operating permit.

EH may provide assessments of the solid waste facilities either created or impacted by the disaster monitoring and evaluating the management of solid waste by haulers and facility operators. Assessments should be prioritized to address risks to public health and safety and the environment. Assessments may be used to determine the status and operability of a regulated facility or activity and to determine if operations can resume in a manner consistent with safe solid waste handling practice. The 2007 Environmental Health Target Capabilities List recommends that solid waste facility and debris removal operation monitoring and assessments begin within 24 hours of incident.

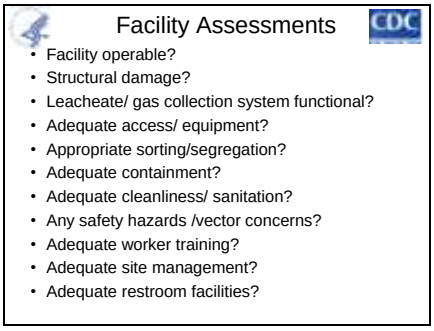
(SEE MODULE APPENDIX FOR SAMPLE ASSESSMENT CHECKLIST)

If waste is not property segregated, problems can occur. A fire occurred in New Orleans waste site where waste was not segregated by properties or like substances, but was mixed into large piles after curb site pick up began. The pile spontaneously ignited and presented additional problems. This occurs very frequently and must be considered when collecting waste.

Not having a community plan for disaster debris removal ready in advance of an incident can be an obstacle to efficient debris removal. Cleanup may take longer and cost a lot more without a debris management plan. Other challenges can include private property issues.



Slide 43



Slide 44

Slide 45

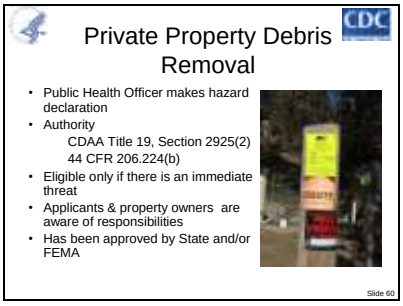
Private Property Debris Removal (Slides 46-48)

Large debris generating events often result in a state and/or Presidential disaster declaration whereby financial assistance for eligible debris related activities may be available to those communities declared in the disaster.

Reimbursement for removal of debris from private property can only be performed under specific circumstances and only with prior state and/or federal approval. The debris removal must be necessary to eliminate an immediate threat to life, public health and safety or to improve public or private property. The local public health officer must make this determination. The applicant must demonstrate a threat to the public health and safety before approval from FEMA or Cal EMA will be given for this task.
In addition, the applicant (state/county) must make sure that they received the following from the property owner:

- Insurance documents;
- Hold Harmless Agreement; and
- Right-of-Entry (ROE) Agreement.

Slide 46

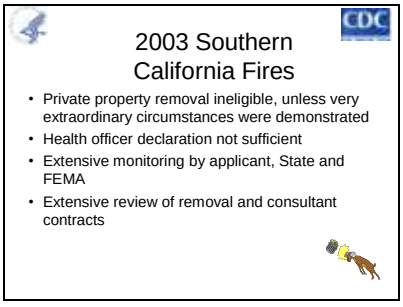


Slide 47

Slide 48

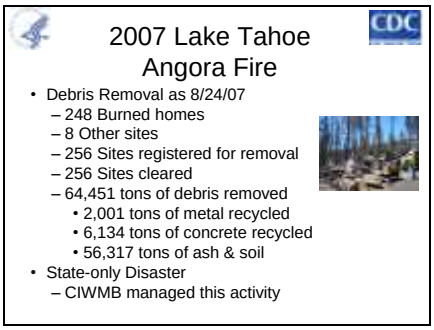
California Wildfires (Slides 49-51)

Debris removal after the recent California wildfires was handled in different ways. After the 2003 wildfires, private property debris removal was deemed ineligible. After the 2007 Lake Tahoe fire, that was a state-only disaster; private property debris removal was allowed for reimbursement. The county EH department worked with property owners to allow access for site cleanup. State cleanup of the Fall 2007 wildfires was allowed after a Debris Task Force was formed.



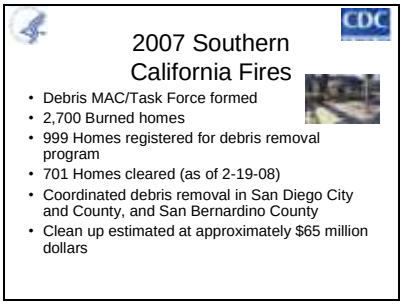
Slide 49

In October 2003 two wildfires, the Cedar and Pines fires, burned more than 400,000 acres and destroyed nearly 6,000 structures and 4,000 vehicles in the unincorporated area of San Diego County. The San Diego County Office of Public Works responded immediately focusing resources on the recovery effort. A plan was in place within a week and the debris removal effort commenced approximately six weeks after the fires began. Overall, more than 128,000 tons of debris was collected in the wake of the fires. Approximately 74,000 tons of concrete, metal, and vegetative debris were recycled resulting in a recycling rate of nearly 60% and preserving more than 185,000 cubic yards of landfill space.



Slide 50

San Diego County provided approximately 1,500 roll-off bins (typically 30 or 40 cubic yards each) to be used by residents to remove debris from their property. This service was provided at no cost to the fire victims. These bins were intended for use by the surrounding community – owners of the property on which the bins were placed were required to sign right-to-enter forms. Thus, anyone could use them, not just the person who requested the bin. The residents were given written instructions to separate metals and wood first into provided recycling bins. A separate bin was provided for the remainder of the debris. County officials concluded that the bin program was very successful in assisting in the timely clean-up of the fire debris.

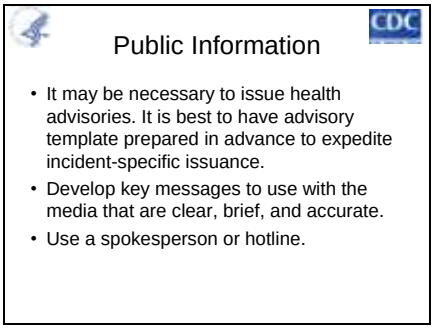


Slide 51

San Diego County held three temporary HHW collection events following the wildfires. They collected more than 82,000 pounds of material at the events. The County also established a burned vehicle program that collected and recycled more than 4,000 vehicles.

Public Information (Slides 52-53)

During an emergency, the media and the public will have many questions. Expect the public to be concerned and upset during an emergency. During events when public health is in question, it may be necessary to issue health advisories. It is best to have advisory template prepared in advance to expedite incident-specific issuance.



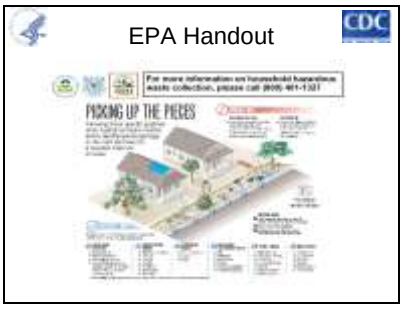
Slide 52

Develop key messages to use with the media that are clear, brief, and accurate. Make sure your messages are carefully planned and have been coordinated with local and state officials. If your messages are different you'll want to know that and be

prepared to explain why.

Make sure field and office staff know how to deal with the media and questions from the public. It may be necessary to establish protocols for both field and office staff to respectfully defer questions to a spokesperson or hotline.

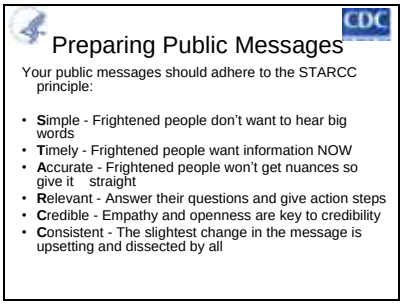
The slide shows an example of a public information handout created by US EPA.



Slide 53

Preparing Public Messages (Slide 54)

The public will be listening for factual information, and some will be expecting to hear a recommendation for action. Get the facts right, repeat them consistently through your department or county Public Information Officer (PIO) and ensure that all credible sources share the same facts. Speak with one voice. Again, preparation counts. Consistent messages are vital. Inconsistent messages will increase anxiety and will quickly torpedo credibility of experts.



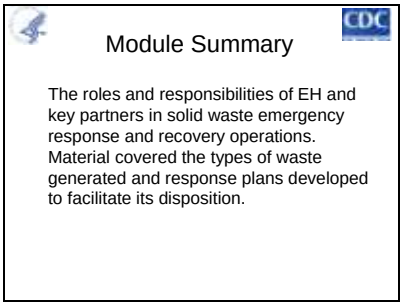
Slide 54

Standardized disaster information prepared in advance and easily available on your agency's website, will help the public find the information they need to take action to protect themselves. Work with neighboring counties and other agencies to ensure your disaster information is consistent with theirs. This principle is from the CDC's *Crisis and Emergency Risk Communication by Leaders for Leaders.* See the module reference list for more information.

Module Summary (Slide 55)

In this module, information was presented on disaster debris management including the types typically generated and how it is managed. Specifically, the module covered:

- The roles and responsibilities EH and key partners in solid waste emergency response situations including federal, state, and local support for waste operations.
- The typical types of waste generated during a disaster event and the EH priority activities related to those wastes.
- The types of response plans that EH practitioners may be involved with or lead, including the various components of waste plan development.



Slide 55

Module 7 Acronyms

BSE	Bovine Spongiform Encephalopathy
C&D	Construction and Demolition
CalRecycle	California Department of Resources Recycling and Recovery
Cal EMA	California Emergency Management Agency
Cal/EPA	California Environmental Protection Agency
CCDEH	California Conference of Directors of Environmental Health
CDC	Centers for Disease Control and Prevention
Cal DC	California Department of Conservation
CDFA	California Department of Food and Agriculture
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
DTSC	Department of Toxic Substances Control
EH	Environmental Health
EOC	Emergency Operations Center
ELO	Enabling Learning Objective
EPA	Environmental Protection Agency
ESF	Emergency Support Function
FEMA	Federal Emergency Management Agency
HHW	Household Hazardous Waste
LEA	Local Enforcement Agency
MAC	Multi-Agency Coordination
MRF	Materials Recovery Facility
NEPA	National Environmental Protection Act
OA	Operational Area
OSHA	Occupational Safety and Health Administration
PIO	Public Information Officer
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
ROE	Right of Entry
SOP	Standard Operating Procedure
SWANA	Solid Waste Association of North America
TDS	Temporary Debris Site
TDSRS	Temporary Debris Staging and Reduction Site
TSE	Transmissible Spongiform Encephalopathy
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
WHO	World Health Organization

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Module 7 Appendix

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Module #7 Solid Waste
Exercise Worksheet

Scenario: What types of solid waste would you expect to be generated by a major earthquake in your area?

Assignment:
- List the wastes,
- How these wastes would likely be managed, and the
- Types of facilities would likely to receive these wastes.

Consult the *Disaster Field Manual for Environmental Health Specialists,* if available.

Type of Waste	Management Method	Waste Handling Facility

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SAMPLE SOLID WASTE FACILITY ASSESSMENT CHECKLIST

Facility Name/ID#	**Point of Contact**
Facility Address	

Type	☐ Landfill	☐ Transfer	☐ MRF	☐ Temporary	☐ Compost	☐ Other

Assessment Points	**Status**				**Comments**
	YES	**NO**	**NA**	**UNK**	
Facility operable					
Structural damage					
Leachate collection system functional					
Landfill gas collection system functional					
Adequate access					
Adequate equipment					
Appropriate sorting/segregation					
Adequate containment					
Adequate cleanliness/ sanitation					
Any safety hazards					
Any vector concerns					
Adequate worker training					
Adequate site management					
Adequate restroom facilities					

Additional comments

Facility Status	☐ Operating	☐ Not operating	☐ Permit modification needed	☐ Follow up needed

Specialist Name	**Date/Time**

USE REVERSE SIDE FOR ADDITIONAL INFORMATION

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Module 8 Wastewater

Environmental Health Training in Emergency Response (EHTER) – Introductory Level *California Version*

Participant Manual

August 2010

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Module 8 Wastewater

Duration

One and one half (1.5) hours

Scope Statement

This module will introduce participants to a variety of issues and concerns associated with wastewater management and disposal after emergencies and disasters. It will also highlight appropriate measures to address these issues and concerns and mitigate their adverse effects.

Terminal Learning Objective (TLO)

Participants will recognize the key EH issues related to wastewater and have the necessary knowledge to conduct wastewater-related activities.

Enabling Learning Objectives (ELO)

After completion of this module, participants will be able to:

8-1. Identify wastewater issues and concerns faced in emergencies and disasters.
8-2. Recognize the roles and responsibilities of EH practitioners in addressing wastewater issues during emergencies and disasters.
8-3. Identify the basic components of wastewater systems.
8-4. Identify key emergency response partners.
8-5. Identify key messages related to wastewater issues and concerns for both response partners and the general public.
8-6. Identify resources used to address wastewater issues and concerns during emergencies and disasters (e.g., rapid assessment forms, CALWARN, SanPac).

Resources

Course participant manual
Module 8 PowerPoint presentation slides
Exercise Worksheet
Sample Assessment Checklist

Instructor to Participant Ratio

1:50 or less

Reference List

California State University, Chico, *Status Report: Onsite Wastewater Systems in California* (2003), California Wastewater Training and Research Center, 2003

CCDEH: California Conference of Directors of Environmental Health *Disaster Field Manual for Environmental Health Specialists*
http://www.ccdeh.com/products/disaster_field_manual_info.htm

CCR: California Ocean Water-Contact Sports Standards, California Code of Regulations - Title 17 and the California Health and Safety Code

CDC: *Crisis and Emergency Risk Communication by Leaders for Leaders*
http://www.bt.cdc.gov/erc/leaders.pdf

CDC: *Cleaning and Sanitizing with Bleach after an Emergency* July 2008
http://www.bt.cdc.gov/disasters/bleach.asp

CDC: Emergency and Terrorism Preparedness Web site for Environmental Health Practitioners http://www.cdc.gov/nceh/ehs/ETP/

EPA: Septic Systems – What to Do after the Flood, 2005
http://www.epa.gov/safewater/faq/pdfs/fs_whattodoafteraflood_septic_eng.pdf

EPA: Homeowner's Guide to Septic Systems (EPA 832-B-02-005)

EPA: Onsite Wastewater Treatment Systems Manual, 2002, EPA/625/R-00/008

EPA: Disinfectant Information: http://www.epa.gov/oppad001/list_g_norovirus.pdf

FEMA: Guidance, Sewage Back-up
http://www.fema.gov/pdf/plan/prevent/howto/how2007.pdf

FEMA: Target Capabilities List http://www.fema.gov/pdf/government/training/tcl.pdf

NESC: Maintaining Your Septic System: A Guide for Homeowners. - *Pipeline newsletter, Fall 2004.* http://www.nesc.wvu.edu/pdf/ww/septic/pl_fall04.pdf

Vallejo Sanitary District Sewage Backup Prevention Guidance
http://www.vsfcd.com/report.htm

Practical Exercise Statement

One exercise has been incorporated into this module.

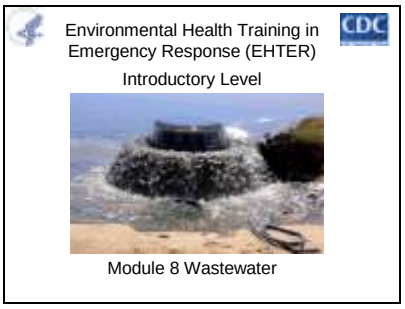
Assessment Strategy

In-class questions, participation in group activities/exercises, and module summary discussion

Module 8 Slides

Wastewater Module Introduction (Slide 1)

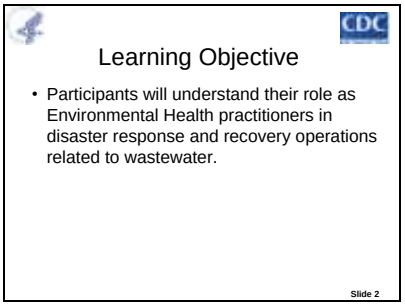
In the event of a large scale disaster the sanitary disposal of human waste will require the direct and immediate attention of emergency response personnel including environmental health (EH) professionals. This module contains basic information and action that should be taken by EH professionals in order to mitigate the effects of wastewater impacts on human health and the environment.



Slide 1

Learning Objective (Slide 2)

Participants will recognize the key EH issues related to wastewater and have the necessary knowledge to conduct wastewater-related activities.

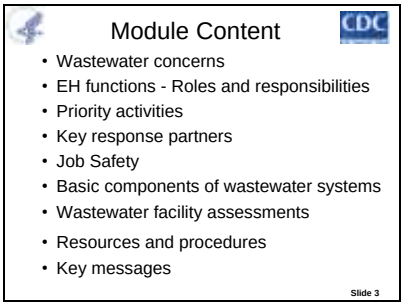


Slide 2

Module Content (Slide 3)

This module covers:

- Wastewater issues / concerns
- EH functions - roles and responsibilities
- Priority activities
- Key response partners
- Job Safety
- Basic components of wastewater systems
- Wastewater facility assessments
- Resources and procedures
- Key messages



Slide 3

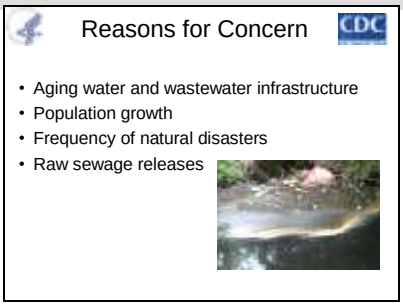
Reasons for Concern (Slides 4-5)

Disaster events can cause the release of raw sewage into the environment. During the 2003 North East Power Grid failure, New York City released 490 million gallons of raw sewage into the environment due to the power outage.

One of the most critical challenges facing the nation is how to sustain our aging public water and wastewater infrastructure. Further, a warming of the earth's atmosphere may mean that we are entering a period of increased frequency and severity of drought, flooding, and catastrophic storms.

Sewage spills are pathways for pathogens. Raw sewage can carry bacteria, viruses, protozoa (parasitic organisms), and intestinal worms. Resulting diseases may range in severity from mild gastroenteritis (causing stomach cramps and diarrhea) to life-threatening ailments such as dysentery, hepatitis, cholera and severe gastroenteritis. These pathogens can be spread unknowingly into habitable areas far from the point source.

Residents may not recognize the potential for harm. EH practitioners need to clearly identify these hazards and see that they are addressed as soon as possible. Local level EH often initiates, oversees, and coordinates with state and local agencies to make sure that appropriate parties are involved and actions are being taken to address public health concerns.

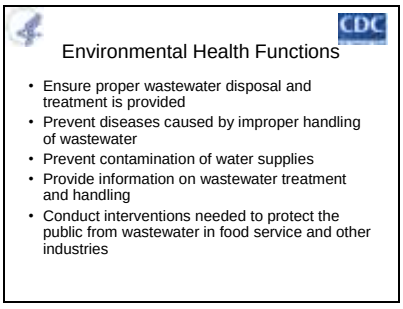


Slide 4

Slide 5

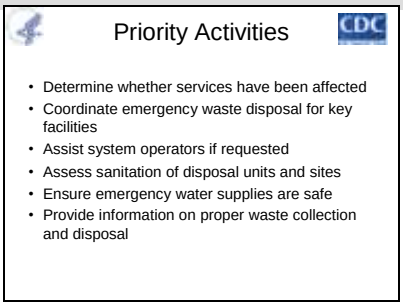
Environmental Health Functions (Slide 6)

One of the most important functions EH has is to assess the situation after a disaster and determine the operational condition of the public sewer system. If a failure of the sewage treatment system has occurred, EH will assist with emergency waste disposal protocols in the community to ensure that proper wastewater disposal and treatment is provided to prevent diseases caused by contact with wastewater and contamination of drinking water supplies. EH will provide information on wastewater treatment and handling methods to the local emergency agency and the public, and will conduct the interventions as needed to protect the public from wastewater hazards in critical facilities such as hospitals, residential facilities, nursing centers, emergency shelters, food service and other facilities.



Slide 6

Priority Activities (Slide 7)



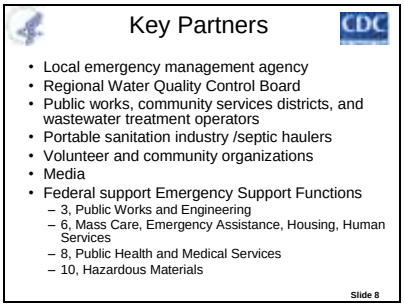
Slide 7

EH often initiates, oversees and coordinates with state and local agencies to ensure that appropriate parties are involved and actions are being taken to address public health concerns.

EH responders may conduct the following activities:

- Respond to reports for sewage releases
- Conduct assessments of sewage facilities.
- Provide technical assistance to wastewater system operators and owners by assessing wastewater systems and providing information on proper emergency waste collection and disposal methods. This may include advising facility operators on options for diverting flow from damaged sewage lines i.e. ditchs or holding ponds, and cleaning up releases.
- Provide instructions on alternate human waste collection and disposal methods.
- Conduct surveys to determine if food facilities, emergency shelters, hospitals, etc. have been impacted by sewage outages, backups, and/or floodwaters. Where services have been impacted, EH will help coordinate emergency waste disposal options.
- Ensure that wastewater disposal does not impact drinking water supplies.
- Advise residents and facility operations on proper methods for cleaning and disinfection of surfaces contaminated by sewage or floodwaters.

Key Partners (Slides 8-9)



Slide 8

Partnerships are essential to ensuring the health and safety of the public. The EH practitioner, depending on the size of the event and other factors, may engage at various points of time with emergency management agency (EMA) personnel, state and local health agencies, the State Water Resources Control Board and Regional Water Quality Control Boards, other EH departments, public works departments, private industry, volunteer and community organizations (American Red Cross for example) and those in federal Emergency Support Function roles. And don't forget the media! They help get the word out to the public on wastewater concerns and recommended actions.

The Regional Water Quality Control Boards have primary responsibility for overseeing sewages spill remediation, however EH may assist with these activities.

Slide 9

Job #1 - Safety (Slide 10)

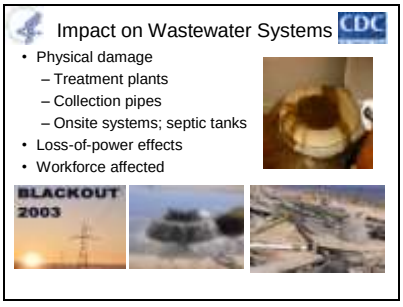
Personal sanitation is a must. Washing hands, cleaning and medicating cuts, and keeping food and drinking water safe from contamination, are a few of the important considerations. Working around powered equipment poses an electrocution risk, also emergency generators are associated with a risk of carbon monoxide poisoning. Wastewater treatment facilities often have confined spaces that should not be entered by unauthorized individuals. Chemicals used at wastewater treatment facilities may also pose hazards, especially chlorine. Personal protective equipment (PPE) such as waterproof boots, gloves and respirators may be needed in some situations.

Slide 10

Thermal stress: stay hydrated; carry water with you and remember to drink it. If your urine is yellow, you are not getting enough water. Wear appropriate clothing for the weather. Take rest cycles – don't allow yourself or your team to become victims; get your needed rest.

Impact on Wastewater Systems (Slide 11)

A disaster can affect wastewater systems in many ways. Municipal treatment plants and on-site septic systems may suffer physical damage or lose power. Examples of physical damage include flooding that overwhelms a treatment system and earthquake damage to collection pipes. Power failures can impair pump stations; without power lines will fill up and overflow.



A disaster may also prevent utility workers from reporting to work, further impacting the wastewater system.

Slide 11

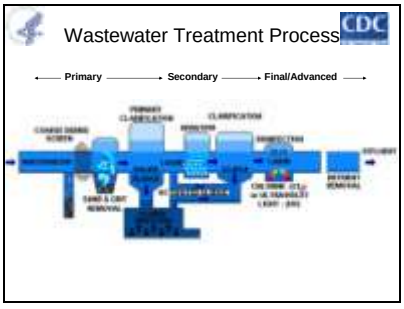
Public Sewer Systems (Slide 12)

Slide 12

Wastewater systems are designed to ensure public health by collecting, treating, and disposing of domestic and other wastes on a large scale. During times of disaster, these systems can be compromised and create health hazards. Proactive precautionary measures can lessen or even eliminate hazards.

Public sewer systems in California range in size from plants as large as the Los Angeles Hyperion sewage treatment plant, with an average flow of 450 million gallons per day and 6,500 miles of collection lines to small package plants that service areas such as interstate rest stops.

Wastewater Treatment Process (Slide 13)



Slide 13

Modern treatment plants use natural processes to treat sewage, typically, in 3 phases: primary, secondary, and tertiary (also called final treatment). Primary treatment includes screening and settling of solids and grit.

Secondary treatment involves using the bacteria that exists in the waste to further degrade the waste. Air is introduced to speed up the process or the waste is allowed to flow over biological media. In this phase, bacteria reduce the volume of waste by 85%.

Final or tertiary treatment involves the reduction of bacteria, nitrogenous demand from ammonia, and/or suspended solids. This is accomplished by the addition of chlorine, advanced filtering, and de-nitrification through filtering processes and anaerobic treatment.

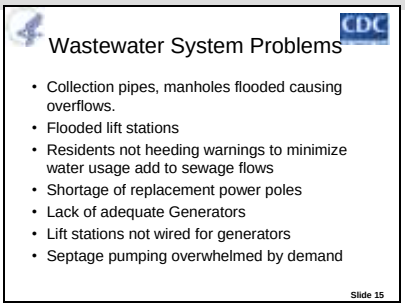
Note: These treatment processes require a lot of electricity. During power losses, the emergency generators in many plants can only run parts of the treatment process. This can allow for the release of partially treated waste.

Wastewater System Problems (Slides 14-16)

Treatment plants are required to have emergency plans, emergency generators, etc. but when a disaster occurs many things can still go wrong, including

- Collection pipes, manholes flooded causing overflows.
- Flooded lift stations

- Residents not heeding warnings to minimize water usage add to sewage flows
- Shortage of replacement power poles
- Lack of adequate Generators
- Lift stations not wired for generators
- Septage pumping overwhelmed by demand



Slide 14

Treatment plants can be directly affected by floods, fires, earthquakes and other disasters. Wastewater treatment plants maintain a delicate balance of microorganism that work to breakdown waste in sewage. This balance can be thrown into shock by disaster events that cause the intrusion of saltwater or hazardous substances, or large fluctuations in flow. These situations can affect the quality of treatment and the quality of effluent discharged from the plant into the receiving environment.

Slide 15

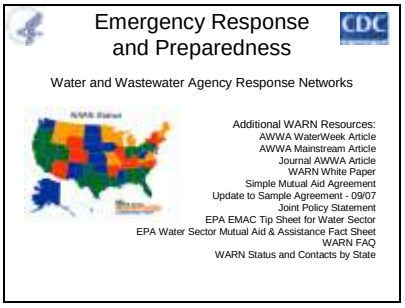
Wastewater is collected in the community through a series of collection pipes that eventually flows to a treatment plant. Hills and valleys create elevation differences that require pumping of the waste to the plant.

Collection lines can become plugged with debris and silt, directly affecting the treatment plant's incoming flow. And collection systems can be inundated with water causing them to overflow. If power is lost, lift stations may stop working causing them to fill up and overflow. Note: The majority of collection systems run parallel to our roadways. Drinking water distribution lines and wastewater collection lines are often co-located along these roadways. There is a required separation but the potential for contamination of water lines is present.

Slide 16

Water and Wastewater Agency Response Networks (Slides 17-18)

Networking and sharing of resources is key to effective emergency response. The Water and Wastewater Agency Response Network (WARN) is a network of utilities helping other utilities respond to and recover from emergencies. The purpose of a WARN is to provide resources to water/wastewater utilities that have sustained or anticipate damages from an emergency. Resources and assistance provided include personnel, equipment, materials, and other associated services. For more information, see the module reference list.



Slide 17

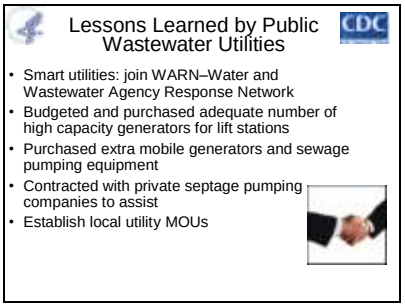
CalWARN provides its member utilities with assistance through mutual aid agreements and the sharing of emergency resources. This network allows utilities to respond and recover more quickly from a disaster. This mutual assistance program is consistent with other statewide mutual aid programs and the Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS). CalWARN is also a forum for member utilities to develop and maintain relationships and share lessons learned in disasters.

Slide 18

Lessons Learned by Wastewater Utilities (Slides 19-20)

Wastewater utilities that have experienced disasters have learned that they need to have:

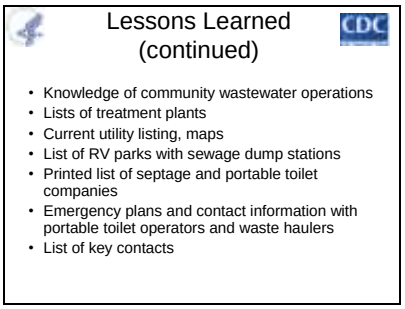
- an adequate number of generators are available for lift stations;
- advance contracts with private septage pumping companies; and
- established mutual assistance agreements with other utilities.



Slide 19

Utility companies should also make prior arrangements for staffing during emergencies and the possibility that personnel will need to stay on the job for a prolonged period of time.

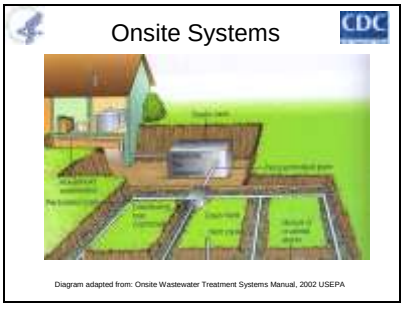
Mutual assistance agreement between utilities for sharing resources during disasters can be a win-win situation for everyone. Public health officials may promote and facilitate development of such agreements. EH may coordinate emergency response operations by maintaining a list of all treatment plants with maps showing locations, list of RV parks with sewage dump stations, septage haulers, and portable toilet companies.



Slide 20

Onsite Systems (Slides 21-23)

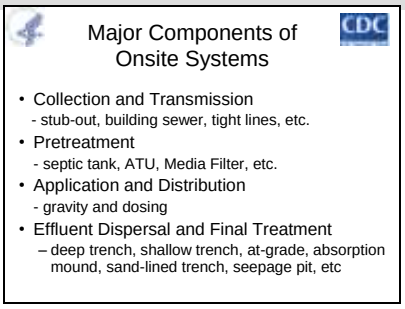
In California, most EH specialists work in communities that are served by community sewer systems and therefore may not have had experience with on-site systems. It is surprising to some that in areas considered urban there can be a significant number of septic systems – for example, in Los Angeles there are more than onsite 80,000 systems. While nationally more than 25 percent of the population relies on onsite systems for sewage treatment, in California, that number is roughly 10 percent of the population. However in one half of the state's counties the percentage is approximately 25 percent. Fourteen of the rural counties have more than 50 percent of the homes served by on-



Slide 21

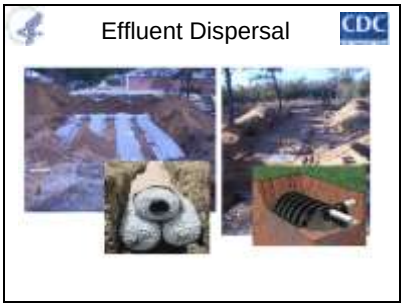
site septic systems.

In a conventional or standard onsite system household wastewater flows to the septic tank where settling of solids and primary treatment takes place. Treated effluent then flows into a distribution box and then to the perforated pipe in the drainfield. These are passive systems that are generally not affected by power outages.



Slide 22

Advanced or alternative systems consist of septic tank plus additional treatment components, perhaps a separate pump chamber, pressure or gravity dosing, and final treatment by native or imported soil (mound) that may include subsurface drip dispersal. These systems have mechanical components such as pumps, control panels, blowers, etc. that require a power source. The need for power is a source of vulnerability during disasters.



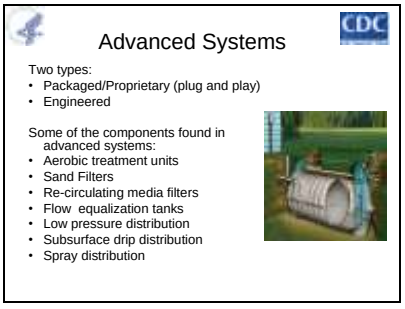
Slide 23

Onsite systems typically rely on the soil to provide the final treatment and therefore the effectiveness of treatment depends on the depth and nature of the soil (texture, structure, saturation, etc.). Effluent dispersal (drainfield) systems can consist of a variety of materials: soil, gravel or stone and stone substitutes such as shredded tires, and other materials and are constructed differently depending on soil characteristics.

Advanced Systems (Slide 24)

Advanced systems may be separated into two major types because there are differences in the vulnerability to flooding/erosion between the two:

- Packaged/Proprietary – a plug and play or packaged type system (Advanced Treatment Unit (ATU), fabric filter, peat filter, etc.) Usually come to the site assembled and ready to wire, plumb and calibrate.
- Engineered – a specially built and engineered system for the site conditions (Intermittent sand filter, low pressure system)

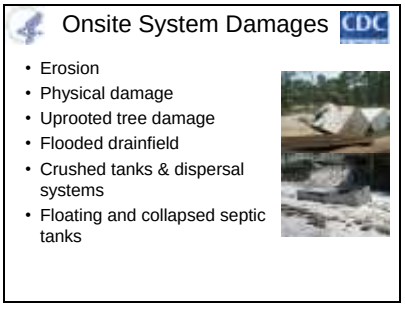


Slide 24

Some of the components found in advanced systems:

- Aerobic treatment units;
- Sand filters;
- Re-circulating media filters;
- Flow equalization tanks;
- Low pressure distribution;
- Subsurface drip distribution; and
- Spray distribution.

Onsite System Damages (Slide 25)



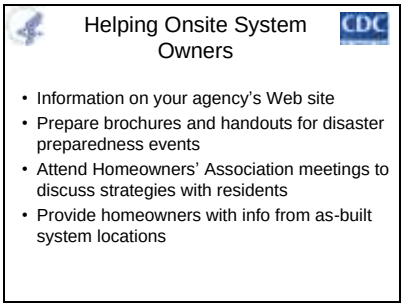
Slide 25

Floods, heavy rains, and hurricanes can affect onsite systems by eroding dispersal systems and the area around tanks. Seismic activity can also cause damage to septic tanks and dispersal systems. Other sources of damage include emergency vehicles driving over the drainfield, high water tables causing empty tanks to float out of the ground, and uprooted trees dislodging or breaking system components.

All onsite systems have vulnerabilities depending on the type of disaster, such as flooding, erosion or mechanical failure due to power outage. Be aware that alternative systems used to deal with difficult soil conditions and will often have a shallow placement and an extensive network.

Dispersal systems have their own vulnerabilities to damage. For instance, mound systems are susceptible to damage from floods and erosion. Low pressure pipe systems are susceptible due to shallow installation and are subject to physical damage, erosion and flooding. Systems that rely on power to pump effluent into the drainfield are vulnerable to power outages. Subsurface drip systems are shallow and often installed between trees, landscaping and slopes and are vulnerable to weather that uproots vegetation.

Helping Onsite System Owners (Slides 26-27)



Slide 26

EH staff can serve as a conduit for disaster recovery information for owners of on-site wastewater systems. Consider placing information on your agency's web site, preparing disaster brochures and handouts in advance, or attending homeowners' association meetings to discuss recovery strategies with residents. EH can also provide lists of portable toilet companies, septic tank service companies, and provide advice on proper use of disinfectants for sewage spills and overflows, etc. This type of information can be distributed through home improvement centers, community centers, disaster recovery centers, and informational phone lines.

There is an opportunity to help owners be aware of emergency issues before a disaster occurs. For example, EH could provide emergency information on septic system "do's and don'ts" with every new installation, modification, change of ownership or new use. Homeowners should be advised of strategies such as pumping out septic tanks halfway to provide some additional

capacity while maintaining septic tank structural integrity and avoiding use of an on-site well until it has been testing. Removal of trees around a septic system can prevent physical damage during disaster events. Homeowners may want to consider incorporating backup power (generators) for systems that have pumps or other equipment that require power.

The Federal Emergency Management Agency (FEMA) provides help to onsite system owners after a large disaster. The excerpt below is from a FEMA letter describing the eligibility requirements for funding the repair of septic systems and private wells:
"Homeowners in declared areas may be eligible for grant funding to pump septic tanks, perform required repairs or replace the system as needed. Damaged private wells that are the sole source of water for the home also may be repaired or decontaminated."

Note: While conducting onsite system assessments, direct people to the nearest FEMA Disaster Recovery Center for assistance.

Helping Onsite System Owners

Provide:
- Lists of portable toilet companies and septic tank service companies
- Advice on proper procedure for disinfection and cleaning of property and residence
  - proper use of lime to treat sewage overflows, etc.
- Information through home improvement centers, Community centers, FEMA, information hotlines

Slide 27

Emergency Waste Collection and Disposal (Slides 28-30)

When normal sewage collection systems are inoperable, temporary systems can be used to collect waste including portable toilets, waste bladders, and waste tanks. In a residential setting, other alternatives for waste disposal may exist, including using campers or motor homes with a restroom and holding tank.

Emergency Waste Collection

Slide 28

One question EH may get is "How do we flush a toilet when our water service is out?" Toilets can often be flushed manually by simply pouring a bucket of water into the bowl. Before trying this method, try it on an unused toilet first to make sure it works. Keep in mind that the water used to flush the toilet does not need to be potable water. Collected rain water, salt water, etc. can be used for this purpose to conserve drinking water supplies. Make sure to keep the water trap in commodes filled to avoid leakage of sewage gases into the home. If a toilet cannot be flushed, it can be modified as described in the following field toilet instructions.

Emergency Facilities at Home

Options:
- Use campers/motor homes with restroom and holding tank
- Create a homemade port-a-john:
  - Use 5-gallon buckets lined with heavy-duty plastic garbage bags
  - Add deodorizer such as lime, household bleach or kitty litter
  - Keep buckets in a cool, dark place, tight lid
  - Do not throw human waste in regular trash
  - Dispose of waste by flushing down the toilet when services are restored or bury
  - Clean and disinfect buckets
- Modify existing toilet:
  - Flush until the bowl has no water
  - Line with heavy-duty trash bags and disinfect with chlorine bleach after each use
  - When full, tie shut and remove to an outside location

Slide 29

A field toilet can be improvised by taking a container such as a large bucket or small garbage can and lining it with two sturdy plastic garbage bags. The inner bag should be tightly closed and twist-tied after each use. A deodorizer such as lime, household

bleach, or kitty litter can be added to control odors. The outer bag serves as backup protection and support for the inner bag. Make sure that the bags have no rips or holes in them. Remove the inner bag when full or every few hours and place it in a larger, tightly sealed garbage can for storage. Always clean and sanitize the buckets before reuse.

Slide 30

When the wastewater disposal system becomes functional again the stored waste can be dumped from the bags into the toilet and flushed away. The empty bags should then be resealed and disposal of in a sanitary landfill as well as bags containing the diapers and personal hygiene items when the disaster event is over. Otherwise, sewage waste must be handled by a septage hauler (such as a septic tank pumper) that can stabilize the waste and properly dispose of it.

Be prepared to disseminate this type of information in to the public. Try to limit the information to one page if providing a handout. If you can encapsulate your message in a short message for radio or a telephone recording, record it before an event if possible. Talk with other counties about public information that they have already developed. You don't have to reinvent the wheel. It is easy to modify other informational handouts and use them in your area.

Sanitation for Shelters (Slides 31-33)

Slide 31

It may be necessary to provide assistance to shelters, hospitals, field camps, food and other facilities with wastewater disposal when the system has sustained damage during an emergency. Temporary portable toilets may be needed for residences and shelters without functioning waterwater services. Other options for shelters and camps may include improvised chemical toilets, latrines constructed above an existing septic tank, and other types of field latrines. EH should supervise the construction of alternate waste disposal facilities that store or discharge waste into the subsurface.

Florida Sanitary Package (SanPac)

Location:		PODS	Food Prep	SpNS	LSA	Staging (48 hrs)	Mass Feeding
Type:		I	II	III	IV	V	VI
Resources	Toilet	4	4	4	4	10	6
	ADA Toilet	2	1	2	0	NA	2
	Hand Wash Station	1	4	1	1	NA	6
	Dumpsters	1	1	1	1	NA	2
Services	Toilet	Daily	Daily	Daily	Daily	Once	Daily
	Hand Wash Station	Daily	Daily	Daily	Daily	NA	Daily
	Dumpsters	3rd Day	3rd Day	3rd Day	3rd Day	NA	3rd Day

Slide 32

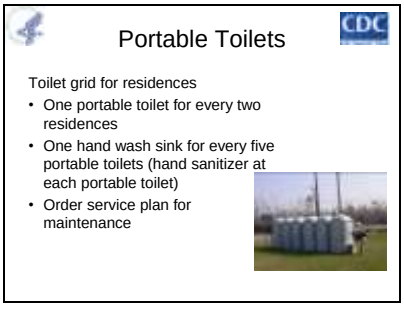
Florida uses a Sanitary Package (SanPac) concept to ensure that shelters and other emergency operations are adequately supplied with temporary portable toilets, handwashing sinks, and trash receptacles. Specific emergency operations are assigned an estimated number of facilities; for example, a Type III Special Needs Shelter requires 6 portable toilets, one handwashing sink, and one dumpster for every 40 clients and workers.

Florida Sanitary Package (SanPac)

Location:		PODS	Food Prep	SpNS	LSA	Staging (48 hrs)	Mass Feeding
Type:		I	II	III	IV	V	VI
Resources:	Toilet	4	4	4	4	10	6
	ADA	2	1	2	0	NA	2
	Hand-washing Station	1	4	1	1	NA	6
	Dumpsters	1	1	1	1	NA	2
Services:	Toilet	Daily	Daily	Daily	Daily	Once	Daily
	Hand-washing Station	Daily	Daily	Daily	Daily	NA	Daily
	Dumpsters	3rd Day	3rd Day	3rd Day	3rd Day	NA	3rd Day

PODS (Point of Distribution) = 40 people including workers (multiple of Type I's to be used as numbers grow
Food Prep = Place where food is prepared but not served (Up to 30 workers)
SpNS (Special Needs Shelter) = One Type III for each 40 clients/workers
LSA (Logistics Staging Area) = (large) to support workers and deliver staff only
Staging = Off-site staging of delivery inbound supplies to LSA or other location (delivery personnel only)
Mass Feeding = Food preparation and distribution (100 including workers and clients at any given time)

Florida also created a customizable portable toilet grid for neighborhoods using a ratio of one portable toilet for every two residences and one handwash sink for every five portable toilets (with hand sanitizer provided at each portable toilet). This ratio is based on daily servicing. Poorly maintained portable toilets can create sanitary nuisances injurious to health.



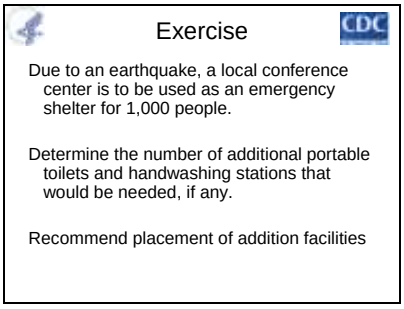
Slide 33

Exercise (Slide 34)

(SEE MODULE APPENDIX FOR WORKSHEET)

Scenario: Due to a major earthquake, a local conference center is to be used as an emergency shelter for 1,000 people. Four existing restrooms are located in the center; each of the two floors has one men's and one women's restroom with 6 toilets each. Each restroom has 4 handwashing sinks.

Assignment:
Determine the number of portable toilets and handwashing stations that would be needed in addition to the existing facilities, if any. Recommend the placement location of any additional facilities.

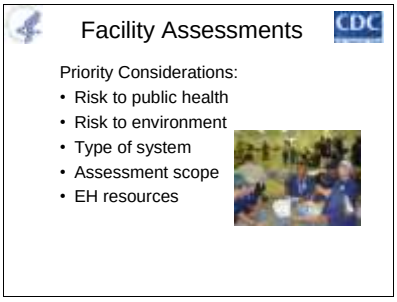


Slide 34

Consult the *Disaster Field Manual for Environmental Health Specialists*, if available (see shelter section). If not available, use the ratio of 1 toilet per 20 people and 1 hand sink per 15 people.

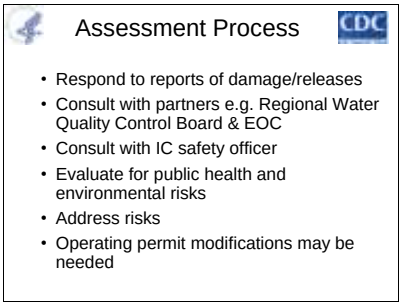
Facility Assessments (Slides 35-37)

Primary responsibility for the assessment of public sewer systems and treatment facilities lies with the utility and the Regional Water Quality Control Board (RWQCB). Wastewater facility assessments may also be conducted by the California Emergency Management Agency (Cal EMA) Safety Assessment Program (SAP). EH may assist with these assessments. EH may also provide assessments of onsite septic systems including providing guidance to owners for repairs and cleanups.



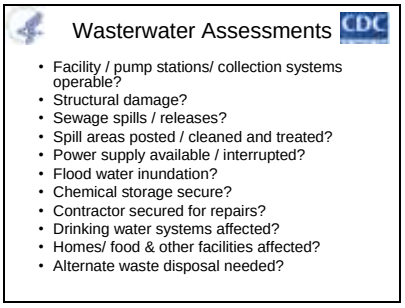
Slide 35

EH may respond to reports of sewage releases assessing risks and taking measures to reduce threats to public health i.e. quarantine of contaminated areas, erecting barriers and posting signs, supervising repairs and cleanup, and water sample collection. EH may also advise facility operators on diversion and cleanup options for sewage releases from damaged lines.



Slide 36

Disruption of the wastewater infrastructure can impact all aspects of a community. Restoring reliable wastewater services is on of the most important EH aspects of recovery. The need for cleaning and disinfection of homes and facilities due to contamination by sewage, wastewater and/or floodwater can complicate recovery. EH will take an important role in assuring that these efforts are conducted to prevent the spread of disease.



Slide 37

There are many issues of concern during the assessment including the operational status of the system/plant, structural damage, power supply status, flooding, fuel leaks and releases of other hazardous materials. The storage and use of chlorine gas can present a danger to the surrounding community if disinfection facilities have been damaged. Regardless of the disinfecting agent used, there will be hazardous materials present on site with a potential for an accidental release. Earthquakes in particular can cause significant damage to wastewater collection, transport and treatment facilities. Repairs may extend over a long period of time requiring the use of temporary treatment facilities.

The 2007 Environmental Health Target Capabilities List recommends that priority wastewater facilities such as those that serve critical facilities including hospitals and shelters be assessed within 12 hours and all public wastewater systems should be assessed with 14 days of the incident.

Other facilities that may require assessment include:

- Damaged onsite systems;
- Wastewater facilities at recreational vehicle parks and mobile/ manufactured homes that use flexible connections and dump stations;
- Septage treatment and disposal sites; and
- Wastewater systems that serve critical facilities (hospitals, shelters, clinics, schools, etc.).

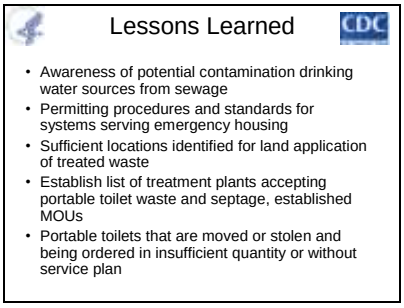
(SEE MODULE APPENDIX FOR SAMPLE ASSESSMENT CHECKLIST)

Wastewater and Drinking Water (Slides 38-39)

It is important to note the relationship of drinking water supplies and wastewater systems. Many rivers and lakes serve as both a disposal route for treated wastewater and a drinking water supply. Normally, there is an extensive buffer zone that serves as part of the natural treatment system, but during times of disaster raw sewage releases can impact receiving waters causing environmental concerns and public health issues. EH practitioners should be aware of these potential concerns and include this in their assessment of wastewater facilities.

Slide 38

A damaged or malfunctioning onsite wastewater system can impact nearby drinking water supply wells. This is the primary concern after a disaster with these types of systems. It is sometimes difficult to convince the public that these out-of-sight, out-of-mind features can cause great concern. Just because sewage is not surfacing does not mean there is not a problem with the system. Sewage from septic tanks installed in areas with shallow soil depths or rapidly percing soils can allow inadequately treated effluent to move into rock fractures and enter poorly grouted wells or enter directly into groundwater tables through rock fractures.



Slide 39

Lessons learned from recent emergency events, including the hurricanes of the 2005 season:

- Have emergency permit procedures/ standards for wastewater systems ready;

- Identify locations suitable for land application of treated sewage;
- Have a list of treatment plants accepting portable toilet waste and septage with established contracts; and
- Be aware that portable toilets can be moved or stolen, or ordered in insufficient quantity or without a service plan.

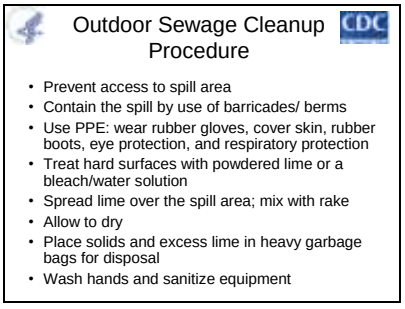
Sewage Backup and Spill Cleanup (Slides 40-44)

EH practitioners need to know how sewage spills should be handled in the home, public places and the environment. When spills are released to the environment, the person(s) responsible for the spill shall take the following actions:

- Determine the extent of the spill;
- Contain the spill by physical means;
- Limit public access to spill site; and
- Conduct or contract for the clean up.

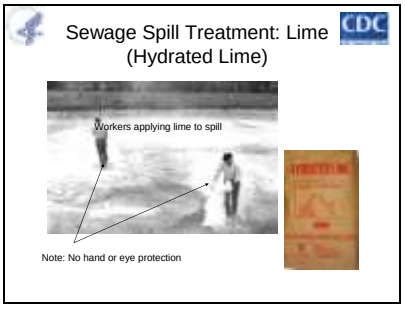
Slide 40

Minor outdoor spills onto soil require immediate attention and may be disinfected with hydrated lime (calcium hydroxide) from a garden or home improvement store. Follow the lime container's label instructions for PPE, gloves, eye protection, and half-face N95 respirator are recommended. Calcium hydroxide is an alkaline compound that can create pH levels as high as 12.4, acting to destroy the cell membranes of harmful pathogens. It is a caustic material and can be dangerous to handle and apply. Lime should only be used or applied by people experienced in using this material.



Slide 41

The high pH also provides a vector attraction barrier, preventing flies and other insects from landing on the treated waste. Because lime has low solubility in water, lime molecules persist in the solid material in sewage. The solubility of calcium hydroxide also provides free calcium ions, which react and form complexes with odorous sulfur species such as hydrogen sulfide. Thus the sewage odors are not just covered over but are actually destroyed.



Slide 42

Sprinkle the lime onto the spill until the spill is mostly white on the surface. If the residue is thicker in some places use a rake to mix in the lime. After a day, rake up the thicker residue and place it in a trash bag for disposal. Use a sprinkler or hose to water the lime and sewage residue into the soil. Let the area dry in the sun a day before allowing access to the area. If there is still white lime dust visible on the ground surface, water it until the white dust is gone. Re-vegetate area, if needed. Smooth, hard outdoor

surfaces such as asphalt or concrete should be cleaned and treated with lime or a bleach solution taking care not to allow chlorinated water to run off into a storm drain.

Note: Be aware that public health terms can cause confusion for the public: For example, what is lime? CDC reports that after a recommendation to apply lime to a sewage spill was provided, a confused homeowner squeezed fresh limes over a sewage spill!

Indoor sewage backups and floodwater can be cleaned with this method:

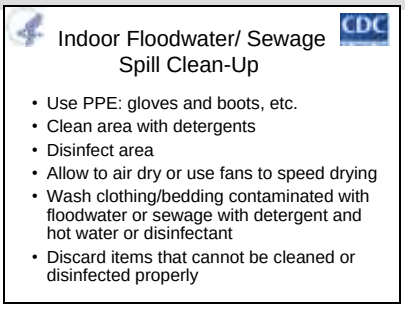
- Use PPE: gloves and boots, etc.
- Clean area with detergents
- Disinfect area
- Allow to air dry or use fans to speed drying
- Wash clothing/bedding contaminated with floodwater or sewage with detergent and hot water or disinfectant
- Discard items that cannot be cleaned or disinfected properly

For sewage spills, backups, or flood water contamination of an interior area, the following procedures are recommended:

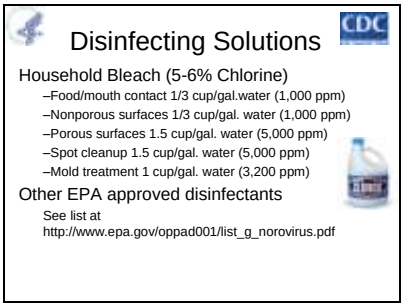
Non-porous materials such as resilient flooring, concrete, block walls can be cleaned then disinfected using bleach. Remove solids, clean surfaces with soap and water, and then disinfect with a bleach and water solution.. Apply solution in a well-ventilated area. After cleaning and disinfecting, speed the drying process by using fans, air conditioning units, and dehumidifiers, if possible.

Porous materials that have been contaminated by sewage will most likely have to be discarded. This includes clothing and shoes, furniture and household items, drywall, wood, and similar items because they will retain sewage, which will make them impossible to adequately clean and disinfect. Advisories should include reminders to wear proper PPE: waterproof boots and gloves when cleaning up affected areas and observe personal sanitation measures such as washing hands. CDC's *Cleaning and Sanitizing with Bleach after an Emergency* July 2008 is a good reference. See the module reference list for more information.

Household bleach (sodium hypochlorite) is an effective sanitizer, is usually readily available at low cost, but can harm some surfaces, and if improperly mixed it can be a health concern. Never mix with ammonia! If there is concern about damaging a surface, test the bleach solution on the surface first before



Slide 43



Slide 44

applying to the whole area.

To make an effective disinfectant solution follow these instructions designed for the control of norovirus:

- For nonporous surfaces including floors, stainless steel, items with food/mouth contact items, toys, etc. mix 1/3 cup of bleach with one gallon of water for a 1,000 ppm (parts per million) solution.
- For porous surfaces and spot cleaning mix 1.5 cups of bleach and one gallon of water for a 5,000 ppm solution.

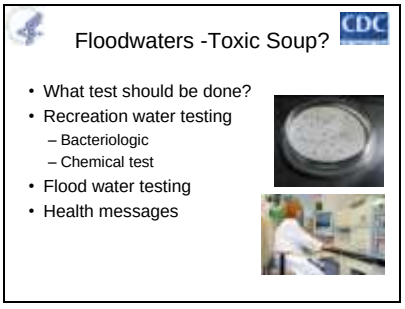
Carpet and other surfaces cannot be cleaned with bleach but there are several other EPA approved disinfectants for norovirus that can be used on these types of surfaces. The US EPA web site has a list. See the module reference list for more information.

Floodwater (Slides 45-46)

Floods cause concern about contaminated water entering homes and businesses. In this situation, analyses for chemical and bacteriological contamination are often done to determine if flood waters are a “toxic soup” or not.

Slide 45

Bacteriological analysis for the presence of coliform bacteria is used as an indicator for the presence of sewage. Coliform bacteria are mostly harmless bacteria found in decaying organic material and live in soil, water, and the digestive system of animals. Fecal coliform bacteria, which belong to this group, are present in large numbers in the feces and intestinal tracts of humans and other warm-blooded animals and can enter water bodies from human and animal waste. Determining whether coliforms are fecal coliforms can take up several days for sample results. Therefore, the quicker test for Total Coliforms is often used. A positive result with this method suggests that there may also be fecal coliforms present as well.



Slide 46

The type of chemical analysis performed will depend on the nearby hazardous materials sources and chemicals of concern. Typical chemical contaminants include petroleum hydrocarbons, volatile organic compounds, and heavy metals.

Sewage Release to Surface Water (Slides 47-48)

After heavy rainfall that produces significant urban runoff, bacterial levels can increase significantly in ocean, bay and other surface water, especially near storm drains and other outlets. As a precaution, it may be advisable to alert the public to avoid contact with ocean, bay and other surface waters for a period of 3 days (72 hours), after rainfall ends or sampling has been conducted. When sewage has obviously contaminated surface water, there is no need to wait for lab results to take action. *If appropriate*, apply lime to the area to the water's edge, establish a sampling regime, and collect grab samples. At least three samples should be collected: at the point the sewage enters the surface water, a background sample collected upwind and upstream, and a downstream sample. More samples may be needed based on spill size and/or location of the spill. You need to note current direction, wind speed, and any other mitigating factors that may influence the extent of the contamination. Post the area with warning signs and notify media that beach or area has been posted. Notify state environment and public health agencies, as appropriate.

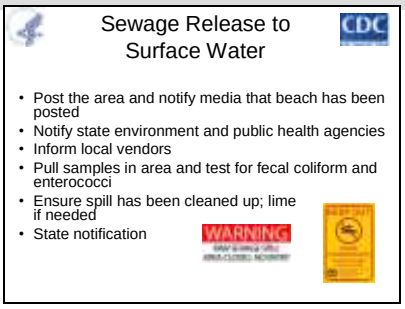
Standards for a public beach or water contact sports area are as follows for a single sample:

- Total coliforms - 10,000 organisms per 100 milliliters (ml) of sample;
- Fecal coliforms - 400 organisms per 100 ml of sample;
- Enterococci - 16 organisms per 100 ml; or
- E. coli – 235 organisms per 100 ml.

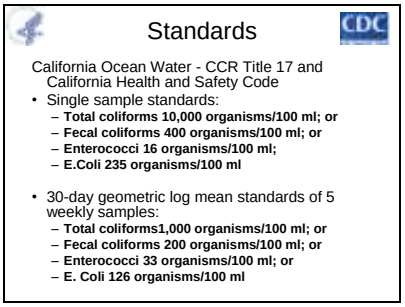
Based on the mean of the logarithms of the results of at least 5 weekly samples during any 30-day sampling period, the density of bacteria in water from any sampling station at a public beach or public water contact sports area, shall not exceed any of these standards:

- Total coliform - 1,000 organisms per 100 ml of sample;
- Fecal coliform - 200 organisms per 100 ml of sample;
- Enterococci - 33 organisms per 100 ml of sample; or
- E. coli - 126 organisms per 100 ml.

The California Ocean Water-Contact Sports Standards are found in the California Code of Regulations - Title 17 and the California Health and Safety Code. See the module reference list for more information.



Slide 47



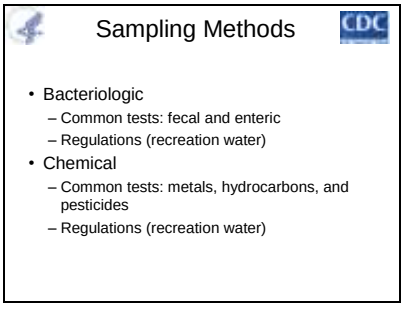
Slide 48

Sampling Methods (Slides 49-50)

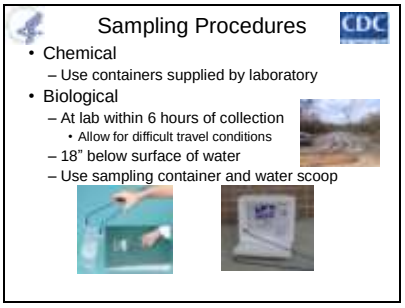
Common analyses for bacteriologic contamination are total coliforms and fecal coliforms. Analyses for fecal coliform or Escherichia coli (E. coli) and Enterococcus bacteria are better indicators of the source of the contamination, often performed if coliform bacteria were present in the initial sampling, or if there are signs of sewage contamination. Fecal coliform samples are collected using grab samples. Samples for biological analysis must be submitted to the laboratory within 6 hours of collection and are typically taken 18" below surface of water if sampling from a water body. Consult with the laboratory on sample collection and handling methods.

A positive fecal coliform result does not necessarily mean that the source is from a septic tank system or wastewater treatment plant. The source could be the result of contaminated surface water or simply a dirty faucet.

For possible chemical contamination, common tests include metals, hydrocarbons, and pesticides. The chemical parameters of concern will dictate the type of container and collection methods needed. Consult with the laboratory on container selection and sample collection methods.



Slide 49



Slide 50

Sewage/Septage Disposal (Slide 51)

Collected sewage and septage should be disposed using sanitary sewer plants or septage land application sites. During times of disaster, these types of waste can be slowly introduced into a wastewater treatment plant (if operational) and/or can be introduced at off-peak times to prevent plant shock or overload.

It may be possible to use land application lime stabilization facilities in a high and dry area for septage disposal or sewage disposal during disaster events. EH would have to work with other regulatory agencies to find an appropriate site for this purpose. The public will need information on how to dispose of collected waste from emergency toilet facilities.

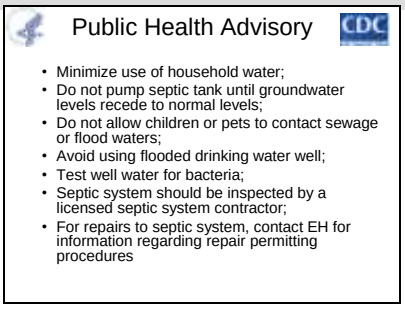
Slide 51

Public Health Advisories (Slides 52-53)

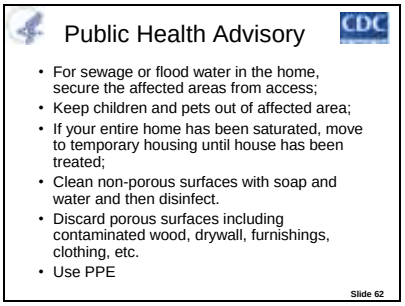
EH staff can provide advice to homeowners on how to cope with an on-site septic system that has been impacted by a disaster.

Here is a sample of what might be included in a public advisory:

- Minimize use of household water;
- Avoid using system during saturated soil conditions;
- Do not pump septic tank until groundwater levels recede to normal levels;
- Do not allow children or pets to contact flood waters because sewage-contaminated water can cause disease;
- If you have a drinking water well and the area around the well is flooded or the well casing is flooded, disinfect your drinking water per EH department recommendations or seek alternative sources. Test the well before resuming use;
- Have the well water tested for bacteria levels after flood waters recede;
- Have your septic system professionally inspected by a licensed septic system contractor as soon as possible after the event; and, if repairs are needed;
- Instructions on how to clean up sewage spills; and
- Contact your local EH department for information regarding septic system repair permitting procedures



Slide 52

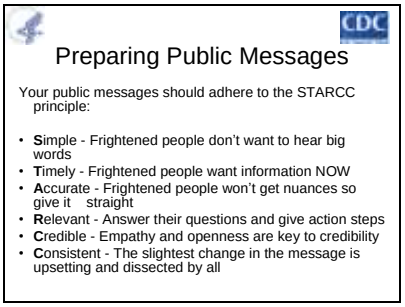


Slide 53

Preparing Public Messages (Slide 54)

The public will be listening for factual information, and some will be expecting to hear a recommendation for action. Get the facts right, repeat them consistently through your department or county Public Information Officer (PIO) and ensure that all credible sources share the same facts. Speak with one voice. Again, preparation counts. Consistent messages are vital. Inconsistent messages will increase anxiety and will quickly torpedo credibility of experts.

Having standardized disaster information prepared in advance and easily available on your agency's website, will help the public find the information they need to take action to protect themselves. Work with neighboring counties and other agencies to ensure your disaster information is consistent with theirs. This principle is from the CDC's *Crisis and Emergency Risk Communication by Leaders for Leaders.* See the module reference list for more information.

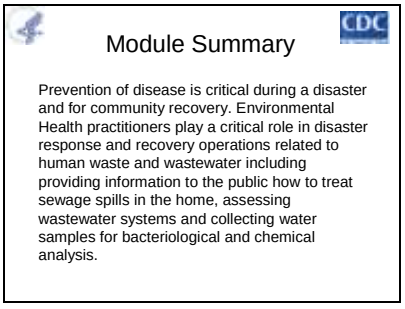


Slide 54

Module Summary (Slide 55)

Prevention of disease is critical during a disaster and for community recovery. EH practitioners play a critical role in disaster response and recovery operations related to human

waste and wastewater including providing information to the public on how to treat sewage spills in the home, assessing wastewater systems and collecting water samples for bacteriological and chemical analysis.



Slide 55

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Module 8 Acronyms

ATU	Aerobic Treatment Unit
CalEPA	California Environmental Protection Agency
CalWARN	California Wastewater Agency Alert Network
CDC	Centers for Disease Control and Prevention
CHDs	County Health Departments
CCR	California Code of Regulation
CSD	Community Services District
EH	Environmental Health
ELO	Enabling Learning Objective
EPA	Environmental Protection Agency
ESF	Emergency Support Function
FEMA	Federal Emergency Management Agency
HQ	Headquarters
LSA	Logistics Staging Area
MOU	Memorandum of Understanding
NESC	National Environmental Services Center
NIMS	National Incident Management System
OSTDS	Onsite Sewage Treatment and Dispersal System
PIO	Public Information Officer
PODS	Point of Distribution
POTW	Publicly Owned Treatment Works
PPE	Personal Protective Equipment
PSA	Public Service Announcement
RWQCB	Regional Water Quality Control Board
SAP	Safety Assessment Program
SEMS	Standardized Emergency Management System
SpNS	Special Needs Shelter
STEG	Septic Tank Effluent Gravity (collection system)
STEP	Septic Tank Effluent Pump (collection system)
SWRCB	State Water Resources Control Board
TLO	Terminal Learning Objective
WARN	Wastewater Agency Alert Network
WWTPs	Wastewater Treatment Plants

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Module 8 Appendix

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Module #8 Wastewater
Exercise Worksheet

Scenario:
Due to a major earthquake, a local conference center is to be used as an emergency shelter for 1,000 people. Four existing restrooms are located in the center; each of the two floors has one men's and one women's restroom with 6 toilets each. Each restroom has 4 handwashing sinks.

Assignment:
Determine the number of portable toilets and handwashing stations that would be needed in addition to the existing facilities, if any.

Total number of toilets needed:

Additional toilets needed:

Total number of handwashing stations:

Additional handwashing stations needed:

Recommend the placement location of any additional facilities:

Consult the *Disaster Field Manual for Environmental Health Specialists*, if available (see shelter section). If not available, use the ratio of 1 toilet per 20 people and 1 hand sink per 15 people.

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SAMPLE WASTEWATER FACILITY ASSESSMENT CHECKLIST

Facility Name/ID#				**Point of Contact**
Facility Address				
Type	☐ Public system	☐ Individual system	☐ Temporary	☐ Other_____

Assessment Points	**Status**				**Comments**
	YES	**NO**	**NA**	**UNK**	
Facility operable					
Structural damage					
Pump stations operable					
Collection system damage					
Equipment/ system leaks					
Power available					
Power supply interrupted					Duration:
Generator power available					
Flood water inundation					
Sewage spills/ releases					
Spill areas posted					
Adequate spill area cleanup					
Chemical storage secure					
Contractor secured for repairs					
Drinking water systems affected					
Homes/ food & other facilities affected					
Alternate waste disposal needed					

Additional comments

Facility Status	☐ Operating	☐ Not operating	☐ Permit modification needed	☐ Follow up needed

Specialist Name	**Date/Time**

USE REVERSE SIDE FOR ADDITIONAL INFORMATION

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Module 9 Hazardous Materials

Environmental Health Training in Emergency Response (EHTER) – Introductory Level

California Version

Participant Manual

August 2010

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Module 9 Hazardous Materials

Duration

One and one half (1.5) hours

Scope Statement

This module will introduce participants to a variety of issues and concerns associated with hazardous materials and hazardous waste management following large scale emergencies. Appropriate measures for addressing the environmental health (EH) issues and concerns, and for mitigating their adverse effects, will be covered in this module.

Terminal Learning Objective (TLO)

Participants will recognize the key EH issues related to hazardous materials and have the necessary knowledge to conduct hazardous material-related activities.

Enabling Learning Objectives (ELO)

After completion of this module, participants will be able to:

9-1. Identify hazardous waste issues related disaster events and the impacts they have on the environment and on human exposure.
9-2. Recognize the key roles that EH practitioners play in addressing disaster waste issues.
9-3. Identify key response partners who have roles in identifying waste hazards, providing mechanisms for waste assessment, and assisting EH practitioners with providing information to the public.
9-4. Identify key messages for the public and for EH partners.

Resources

Course participant manual
Module 9 PowerPoint slides
U.S. Department of Transportation (DOT) *Emergency Response Guidebook*
Exercise Worksheet
Sample Assessment Checklist

Instructor to Participant Ratio

1:50 or less

Reference List

Cal/EPA: Disaster Site Planning Checklist: Site planning checklist for temporary storage sites http://www.ciwmb.ca.gov/Disaster/DisasterPlan/chp4ck.htm

Cal/EPA: California Integrated Waste Management Board: Emergency Planning, site planning, collection of waste after a disaster http://www.ciwmb.ca.gov/

Cal/EPA: Disaster Site Planning Checklist: Site planning checklist for temporary storage sites http://www.ciwmb.ca.gov/Disaster/DisasterPlan/chp4ck.htm

Cal/EPA: Emergency Response and Disaster Preparedness Home http://www.calepa.ca.gov/Disaster/

CCDEH: California Conference of Directors of Environmental Health *Disaster Field Manual for Environmental Health Specialists* http://www.ccdeh.com/products/disaster_field_manual_info.htm

CDC: *Crisis and Emergency Risk Communication by Leaders for Leaders* http://www.bt.cdc.gov/erc/leaders.pdf

CDC: Environmental Health Emergency Response Guide http://www.cdc.gov/nceh/ehs/Docs/EH_Emergency_Response_Guide.pdf (Modified from the California Disaster Manual and the APC Environmental Health)

FEMA: Target Capabilities List http://www.fema.gov/pdf/government/training/tcl.pdf

NIOSH: National Institute for Occupational Safety and Health (NIOSH) *Pocket Guide to Chemical Hazards* http://www.cdc.gov/niosh/npg/

NIOSH: *Guidance for Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attack*s http://www.cdc.gov/niosh/docs/2003-136/2003-136g.html

OSHA: Application of HAZWOPER to Worksite Response and Cleanup Activities: http://www.osha.gov/SLTC/hazardouswaste/application_worksiteresponse.html

OSHA: A Guide to the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) http://www.osha.gov/dsg/hazcom/ghs.html#3.0

SWANA: Hurricane Katrina Disaster Debris Management: Lessons Learned from State and Local Governments: http://www.swana.org/pdf/swana_pdf_358.pdf

Practical Exercise Statement

Two videos and one exercise have been incorporated into this module.

Assessment Strategy

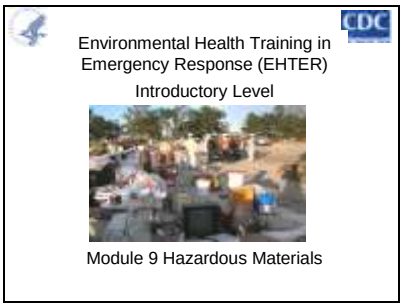
In-class questions, participation in the exercise, and module summary discussion.

Module 9 Slides

Hazardous Materials (Slide 1)

The unplanned release and improper disposal of hazardous materials will likely occur as a result of a natural or manmade disaster. This module covers what environmental health (EH) professionals need to know to effectively maintain personal safety and ensure the safety of the public and protection of the environment if a release of hazardous materials has occurred.

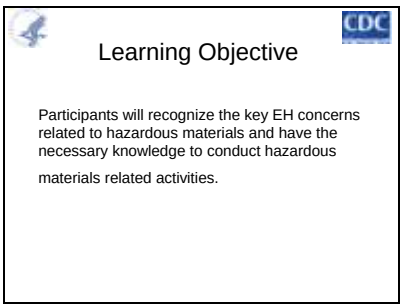
Response to hazardous materials incidents should be limited to individuals who have received appropriate training and have specialized equipment. Those who not trained or equipped for hazardous materials response should not enter any area where a hazardous materials release or suspected release has occurred.



Slide 1

Learning Objective (Slide 2)

Participants will recognize the key EH issues related to hazardous materials and have the necessary knowledge to conduct limited hazardous material-related activities.

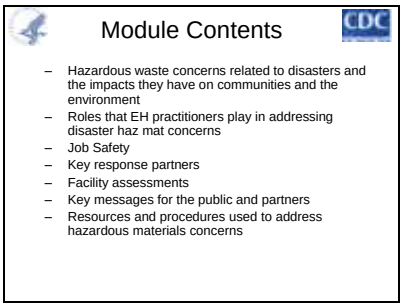


Slide 2

Module Content (Slide 3)

This module will cover:

- Hazardous waste issues/ concerns related to disaster events;
- EH functions - role and responsibilities;
- Priority activities;
- Key response partners;
- Job safety
- Hazardous materials assessments;
- Resources and procedures; and
- Key messages.



Slide 3

Environmental Health Functions (Slide 4)

EH functions related to hazardous materials before, during and after disaster events are varied. For local EH agencies that maintain Certified Unified Program Agency (CUPA) status, the

functions include concerns related to facilities with:
- aboveground and underground storage tanks;
- an inventory of hazardous materials; and
- activities that generate hazardous wastes.

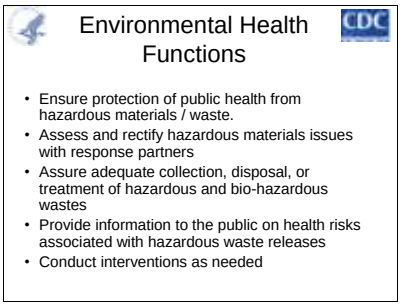
EH may also:
- investigate complaints/reports on releases of hazardous materials;
- organize the collection of household hazardous waste; and
- oversee the restoration of the environment after a hazardous materials release.

Some EH agencies maintain hazardous materials incident response capabilities. During a disaster, these agencies will work within the Incident Command System (ICS) to address these situations and support the response.

It may be necessary after a disaster to conduct area-wide assessments of facilities that store hazardous materials to determine their status; this includes addressing the release of hazardous materials and wastes from households. EH agencies often serve as a focal point of coordination with key partners - this may include taking a leadership role with respect to the management of hazardous wastes after disaster strikes.

EH agencies also may be asked to serve as points of contact for disseminating information to the public and to partner agencies regarding the health risks associated with hazardous materials releases. Part of the role of the EH practitioner is to advise and interpret information on toxicology, chemical, radiological, biological, medical and industrial hygiene issues. The California Conference of Directors of Environmental Health (CCDEH) *Disaster Field Manual for Environmental Health Specialists* is one resource for disaster-related EH activities. See the module reference list for more information.

It is important to note that the role of an EH practitioner who is not trained in hazardous materials incident response, is typically limited to:
- Notifying the appropriate response agency when hazardous materials releases are discovered;
- Protecting people from the release by taking actions to keep people out of the area, if it can de done safely;
- Acting as a resource for public information and technical assistance for response agencies; and



Slide 4

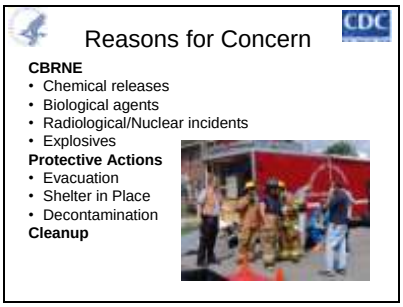
- Participation in the planning efforts that take place before and after a disaster event.

Reasons for Concern (Slides 5-7)

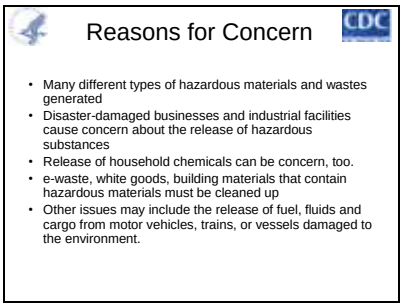
There are many reasons for concern with respect to hazardous materials in a disaster scenario. In almost any community, there are many different types of hazardous materials stored and hazardous wastes generated that may be impacted by a disaster and need to be addressed in order for a community to recover.

It can be expected that a disaster will leave businesses and industrial facilities damaged, causing concerns about the release of hazardous substances. This is true in homes as well - the release of household chemicals can be concern, especially due to the huge number of different chemicals that may be released if a large area has been affected. Additionally, electronic wastes, universal wastes and white goods such as refrigerators and other appliances that may contain hazardous materials must be recovered and disposed of properly to avoid injury to the public or environmental contamination. Other issues may include the release of fuel, fluids and cargo from motor vehicles, trains, or vessels damaged during a disaster.

Slide 5



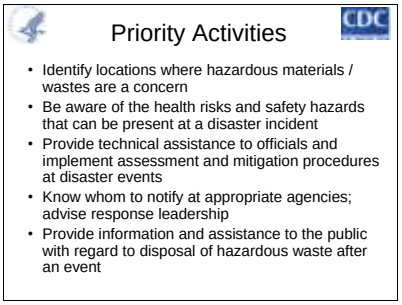
Slide 6



Slide 7

Priority Activities (Slide 8)

EH priority activities will vary depending on the local EH agency's status as a CUPA. CUPAs enforce hazardous materials laws and regulations and therefore will have a lead in disaster-related hazardous materials/waste issues. A CUPA will typically have information available to help identify where hazardous materials are stored in a community. This information can be useful during disaster recovery efforts. EH may perform field surveys or assessments to check on regulated businesses



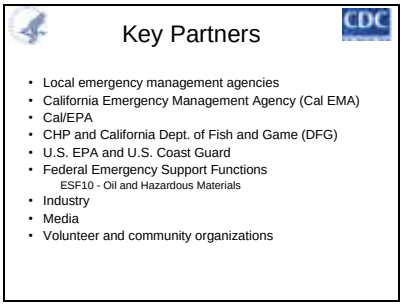
Slide 8

after a disaster to ensure that they can safely resume operations.

EH agencies will typically monitor the generation of hazardous wastes during disaster recovery operations and provide technical assistance to local officials on the health risks and mitigation process as well as work with key partners to provide public assistance and information. There may be a need to provide the public with information on how to dispose of household hazardous waste after a disaster. EH may provide this information and/or organize special household hazardous waste collection events.

Key Partners (Slides 9-10)

EH will work with several key partners including the affected community's local emergency management agency that coordinates the emergency response and recovery activities. Also involved will be Operational Area (county) Emergency Operations Center (EOC), the California Emergency Management Agency (Cal EMA), California Environmental Protection Agency (Cal/EPA), as well as federal and other state agencies, as well as volunteer organizations.



Slide 9

Cal EMA, Cal/EPA and CalRecycle (formerly the CIWMB within CalEPA) provide technical assistance to an affected community to help evaluate cleanup and disposal options for disaster-related hazardous wastes. Releases of hazardous materials to the environment will likely involve additional departments and programs within Cal/EPA such as the affected area's Regional Water Quality Control Board; the California Air Resources Board (and/or the local Air Quality Management District); the Department of Toxic Substances Control (DTSC); etc. depending on the nature of the event. The California Department of Fish and Game may be involved if wildlife habitat has been affected. The California Department of Water Resources and the California Department of Boating and Waterways may be involved with releases to surface water.

Slide 10

Note: The U.S. Coast Guard is the lead Federal Agency for releases to navigable water. In a large-scale disaster, federal support would be provided via ESF #10 through involvement by the U.S. EPA.

Local, state, and federal agency coordination is essential to efficient and effective hazardous materials response efforts

following a disaster. EH may be involved with obtaining waivers from the state for the operation of temporary HHW collection facilities in the disaster area, and if a CUPA agency, EH may work with DTSC on granting permit or storage time waivers to hazardous waste generators.

Private sector resources may be required to respond to a hazardous materials cleanup. Typically, contractors are used to manage hazardous waste collection following a disaster. Owners of displaced or released hazardous materials may be held responsible for retrieval and cleanup. Therefore, business operators are key partners for EH in community cleanup and recovery efforts. Contacts with key partners should be established during emergency planning activities to facilitate efficient decision-making when a disaster occurs.

Job #1 – Safety (Slide 11)

Due to the dynamic nature of a disaster event, it is necessary for the responding EH practitioner to think ahead and often about personal safety issues. The priority in disaster response is to take personal safety precautions before taking action; this calls for assessing all situations and proceeding with caution.

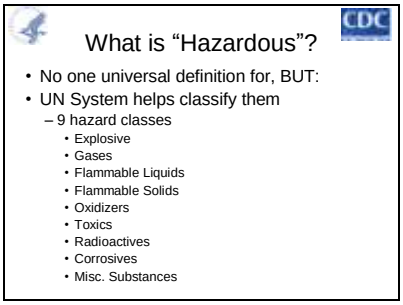
Slide 11

Response to hazardous materials incidents must be limited to individuals who have received appropriate training and have specialized equipment. Those who are not trained or equipped for hazardous materials response work should not enter any area where a known or suspected hazardous materials release has occurred. Be particularly aware of the potential hazards posed by flammable materials; chemical reactions; decomposition products from a fire involving hazardous materials; confined spaces; biological, chemical, radiological and electrical hazards, cold and heat exposure, and oxygen-deficient atmospheres. Whenever possible, keep the public away from these hazards!

Airborne hazards are common to disaster events whether it is a wildfire, earthquake, or hazardous material spill; so exposure to smoke and chemical vapors is possible. Personal protective equipment (PPE) such as respirators may be needed in some situations. However, use of a respirator will require employee training, fit testing and monitoring. For information on wildfire smoke, see Wildfire Smoke - A Guide for Public Health Officials, California Air Resources Board. See the module reference list for more information.

As in all disaster events, to avoid thermal stress, stay hydrated; carry water with you and remember to drink it. Wear appropriate clothing for the weather. Maintain regular rest cycles – don't allow yourself or your team to be a victim, get your needed rest!

What is "Hazardous?" (Slide 12)



Slide 12

Hazardous materials are substances that can threaten or harm people, the environment and/or property. Included in this definition are specific regulatory terms such as hazardous waste, hazardous substances, toxic substances, and hazardous chemicals. The California Health and Safety Code defines hazardous materials as: "Any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or threatened hazard to human health and safety or to the environment, if released into the workplace or the environment."

The United Nations (UN) hazard classification system for classifying hazardous materials is recognized internationally and is used by the federal government. The UN system consists of nine classes of materials:

- Class 1: Ammunition and explosives
- Class 2: Compressed gases, flammable and nonflammable, poison gases
- Class 3 : Flammable liquids
- Class 4: Flammable solids or substances
- Class 5: Oxidizing materials
- Class 6: Poisonous substances, irritating materials, etiologic agents
- Class 7: Radioactive materials
- Class 8: Corrosive materials
- Class 9: Miscellaneous dangerous substances/other regulated material

Miscellaneous materials may include materials such as ammunition and biohazards. The UN classifications are used as the basis for the Department of Transportation (DOT) placarding system. The DOT Emergency Response Guidebook (ERG) provides information on hazardous materials based on this system. See the module reference list for more information.

Hazardous Materials Recognition Clues (Slides 13-14)

The key to staying safe is to be able to recognize the clues of a possible hazardous materials release. All types of disasters can cause the release of hazardous materials; in California, this includes earthquakes that can cause building component and storage facility failure.

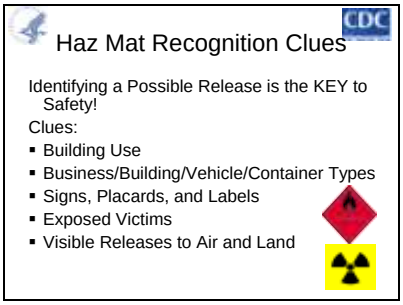
The first clue in hazard recognition is the type of business or structure involved. Businesses that have fueling operations, handle pesticides or other agricultural chemicals, engage in manufacturing or processing, etc. will have hazardous materials. Retail businesses with hazardous materials include but are not limited to: swimming pool supply, home improvement stores, gasoline and propane stations and grocery stores. Other businesses with hazardous materials include auto repair, laboratories, farms, trucking operations, etc.

Sometimes businesses have placards on the outside of the building such as the National Fire Protection Association (NFPA) placard that indicate the presence of hazardous materials. (But many do not.) The NFPA system is used to alert workers and responders to the chemical hazards in the facility.

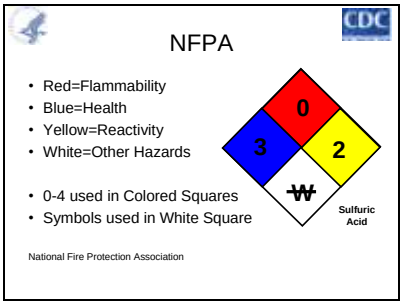
The diamond-shaped NFPA placard is divided into four areas:
- Health is blue;
- Red is flammability;
- Yellow is reactivity; and
- White is used for special hazards.

In the colored squares, a number from 0 (no hazard) to 4 (severe hazard) is used. A facility will typically use one placard to indicate the hazards of all of the materials used within.

Hazardous materials business plans may also provide information on the type and quantity of hazardous materials inside of a facility if that location stores materials above the planning threshold of 55 gallons (for liquids), 500 pounds (for solids) or 200 cubic feet of a gas. The local CUPA agency may be able to provide this information.

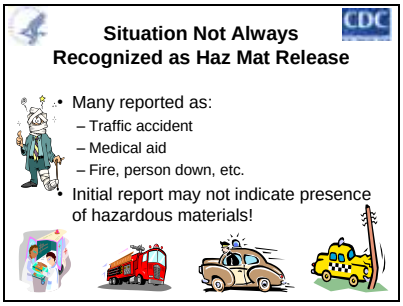


Slide 13



Slide 14

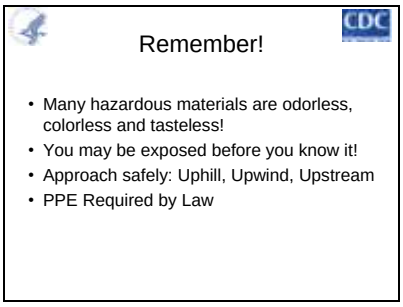
Situation May Not be Recognized as Haz Mat Release (Slide 15)



Slide 15

Hazardous materials can be found in almost any facility. If unsure of whether a business in question handles hazardous materials, assume that hazardous materials are present. Look for placards, NFPA signs, or labels on storage containers for clues to the presence of hazardous materials. Be alert for signs of a hazardous material release – i.e. sick people on the ground, dead animals or birds, visible vapor clouds or runoff, and unusual odors. But be aware that these signs may be absent.

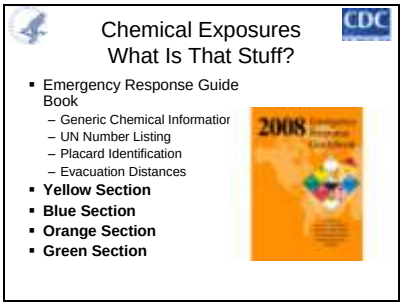
Remember! (Slide 16)



Slide 16

Hazardous materials are all around in homes, workplaces, schools, industrial and commercial buildings, and on the roadways. Hazardous materials may be explosive, flammable, combustible, corrosive, reactive, poisonous, biological or radioactive, as well as solid, liquid or gaseous. When properly handled, they pose little health threat. When improperly transported, stored, or used, or when accidentally released, however, there is a potential for devastating damage. And because many are odorless, colorless and tasteless, such as carbon monoxide and radiation, monitoring equipment may be needed to detect their presence.

Chemical Exposures – What is That Stuff? (Slide 17)



Slide 17

EH practitioner should not enter any area where a release of hazardous materials has occurred or suspected unless they have received specialized training and have appropriate PPE. Knowing which substance may have been released can aid in relaying information to emergency responders. The use of reference materials can assist with identifying the materials to ensure the safety of the public and responders.

The U.S. Department of Transportation (DOT) *Emergency Response Guidebook* (ERG) can be used to help identify hazardous materials that have been released during shipping. The DOT ERG has been divided in to color coded sections that allow for easy reference based on the information that may be available in the field.

Yellow Section

- This section lists hazardous materials in order of the

assigned UN (United Nations) number which is (often) shown on hazardous materials placards.

Blue Section

- This section lists hazardous materials in alphabetical order of its name. In both the Yellow and Blue Sections, a highlighted entry means additional information on evacuation is provided in the Green Section.

Orange Section

- This section provides directions for emergency responders on how to proceed during the first thirty minutes of the release. It gives information on fighting fires (example, do not apply water to sodium), warnings for spills or leaks, and special directions for first aid (example, not to give mouth-to-mouth respiration if the materials are toxic).

Green Section

- This section suggests initial evacuation or shelter-in-place distances (protective action distances) for spills of materials certain materials.

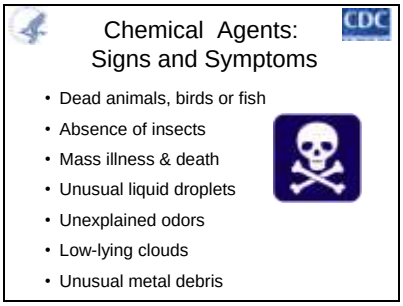
Another reference is the National Institute for Occupational Safety and Health (NIOSH) *Pocket Guide to Chemical Hazards.* See module reference list for more information.

Terrorism and Bioterrorism (Slides 18-21)

Acts of terrorism are carried out by individuals or groups whose intent is to instill fear and harm people and facilities. Acts of terrorism are a very real threat in the United States today. There are many potential threats, including chemical, biological or radiological contamination. The release of these materials by terrorists may mimic “ordinary” hazardous materials releases and a terrorist attack may not be initially identified as such. Large numbers of people made ill, dead animals, birds or fish, unusual odors or liquids, and vapor clouds may be indicators of a chemical attack. Example of chemical agents that could be used for terrorism: chlorine gas, phosgene, sarin, and cyanide.

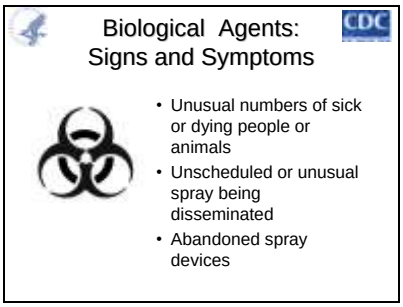
Bioterrorism is the threat of, or actual release of viruses, bacteria, or other biological agents used to cause illness or death in people or animals, or damage to agricultural products. Bioterrorism agents are typically found in nature, but it is possible that they could be altered to increase their ability to cause disease, make them resistant to current medicines, or to increase their ability to be spread into the environment. Biological agents can be spread through the air, water, or food.

Slide 18



Slide 19

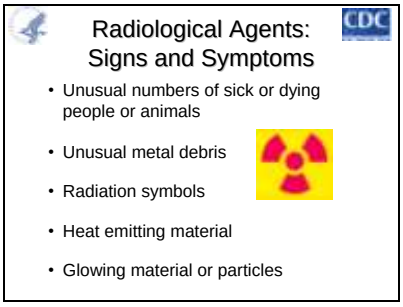
Terrorists may use biological agents because they can be extremely difficult to detect and may not cause illness for several hours to several days. Some bioterrorism agents, like the smallpox virus, can be spread from person to person and others, like anthrax, can not. Other agents of concern that could be used for terrorism include ricin and the organisms that cause botulism, tularemia, and plague.



Slide 20

Terrorists may use radiological dispersal devices (RDDs), nuclear weapons, or attack facilities with nuclear/radiologic materials. Although to-date there have been few attempted attacks on nuclear facilities, and no actual uses of RDDs in the U.S., governments around the world have become increasingly concerned about the threat of such attacks.

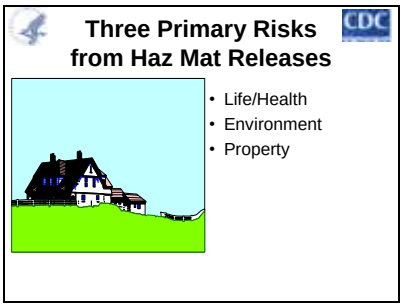
If radiation hazard indicators are evident, such as containers with radiation symbols or warning labels, glowing material or particles, or unusual metal debris, appropriate safety precautions should be taken and law enforcement contacted.



Slide 21

Three Primary Risks from Haz Mat Releases (Slide 22)

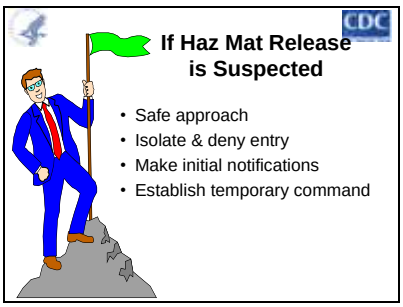
Chemical, physical and biological properties of hazardous materials pose a potential risk to life, health, the environment and property. To protect the affected community and promote community recovery after a disaster, immediate threats to life, the environment and property must be identified and mitigated.



Slide 22

If a Haz Mat Release is Suspected (Slide 23)

If an initial assessment of the situation indicates that hazardous materials may be present, caution is needed while determining if any hazards exist. If there is an indication that a hazardous materials release has occurred, proceed with extreme caution employing a safe approach. Response to hazardous materials incidents should be limited to individuals who have received appropriate training and have specialized equipment. Those not trained or equipped for hazardous materials response should not enter any area where a hazardous materials release or suspected release has occurred.



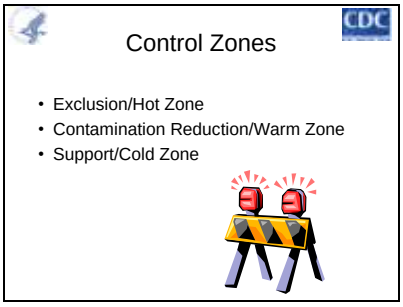
Slide 23

Safety. Isolate. Notify. (Slide 24)

Slide 24

If there is an obvious release of hazardous materials, stay on the upwind and uphill side. Determine the wind direction and if it is safe to do so, approach from the upwind direction (wind at your back) in a defensive manner only getting close enough to isolate the situation and deny entry to the public. Make initial notifications to response agencies from a safe location and alert incoming responders of the safe direction of approach to the incident. Whenever practical, emergency personnel should approach from the upwind side and emergency vehicles should be parked upwind and upslope from liquid spills.

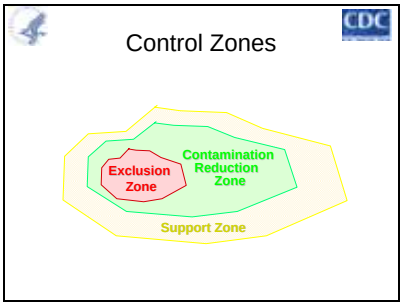
Control Zones (Slides 25-26)



Slide 25

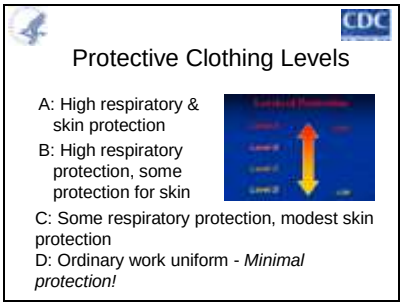
After the initial isolation and notification, emergency responders will isolate the area by establishing the boundaries of an Exclusion Zone (contaminated area sometimes known as the Hot Zone), a Contamination Reduction Zone (uncontaminated area sometimes known as the Warm Zone), and a Support Zone (sometimes known as the Cold Zone).

The Exclusion Zone is the area where the contamination is or is suspected. Access to this area is limited to persons wearing the proper PPE. Exit from the Exclusion Zone is made through the Contamination Reduction Zone after appropriate decontamination has been performed. The Contamination Reduction Zone is the area where personnel and equipment are decontaminated before exiting to the Support Zone. The Support Zone is the area outside of the Contamination Reduction Zone that is safe for persons without PPE. The outer perimeter control line should be located where exposure levels do not pose a threat to the public, and the command post should be established near the outer perimeter control line.



Slide 26

Personal Protective Equipment Levels (Slides 27-28)

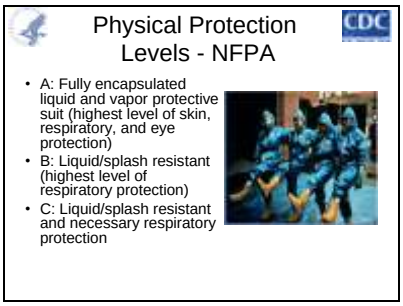


Slide 27

The choice of PPE is based on the hazardous conditions that may be encountered, i.e. chemicals, smoke, dust, or gas. Level A PPE is selected when the greatest level of skin, respiratory, and eye protection is required. The following constitutes Level A PPE:

- Positive pressure, full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH);

- Totally-encapsulating chemical-protective suit;
- Coveralls (as needed);
- Long underwear (as needed);
- Gloves, outer, chemical-resistant;
- Gloves, inner, chemical-resistant;
- Boots, chemical-resistant, steel toe and shank;
- Boot-covers, outer, chemical-resistant (disposable) (as needed); and
- Hard hat (under suit).



Slide 28

Level B provides the highest level of respiratory protection but a lesser level of skin protection. The following constitutes Level B PPE:

- Positive pressure, full-face, SCBA, or positive pressure supplied air respirator with escape SCBA (NIOSH approved);
- Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit;
- Gloves, outer, chemical-resistant;
- Gloves, inner, chemical-resistant;
- Boots, outer, chemical-resistant steel toe and shank;
- Boot-covers, outer, chemical-resistant (disposable) (as needed);
- Hard hat (as needed); and
- Face shield (as needed).

Level C PPE is used when the concentration and type of hazardous substance is known and the criteria for using air purifying respirators are met. Level C provides the lesser respiratory protection and lesser skin protection. The following constitutes Level C PPE:

- Full-face or half-mask, air purifying respirators (NIOSH approved);
- Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit or disposable chemical-resistant overalls);
- Gloves, outer, chemical-resistant;
- Gloves, inner, chemical-resistant;
- Boots (outer), chemical-resistant steel toe and shank (as needed);
- Boot-covers, outer, chemical-resistant (disposable) (as needed):
- Hard hat (as needed);
- Escape mask (as needed); and
- Face shield (as needed).

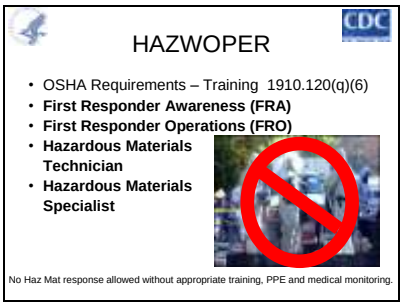
Level D PPE is typically a work uniform that affords minimal protection and is used for nuisance contamination only. The following constitutes Level D PPE:

- Coveralls;
- Gloves (as needed);
- Boots, chemical-resistant (as needed);
- Safety glasses or chemical splash goggles (as needed);
- Hard hat (as needed); and
- Face shield (as needed).

Note: Personnel using respirators need to be pre-identified and participate in their employer's Respiratory Protection Program.

Who Can Suit Up? (Slides 29-30)

Slide 29



Slide 30

According to federal and state regulations, anyone who could be expected to come into contact with or discover an actual or potential hazardous material release is required to have received specialized training. The federal Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) 29CFR1910 .120 applies to five distinct groups of employers and their employees:

1. clean-up operations conducted at uncontrolled hazardous waste sites;
2. corrective actions involving clean-up operations;
3. voluntary clean-up operations at uncontrolled hazardous waste sites;
4. operations involving hazardous wastes that are conducted at treatment, storage, and disposal facilities; and
5. emergency response operations for releases of, or substantial threats of releases of, hazardous substances.

Personnel at the first responder awareness (FRA) level are individuals who are likely to witness or discover a hazardous substance release and who have been trained to initiate an emergency response sequence by notifying the proper authorities of the release. They would take no further action beyond notifying the authorities and isolating and denying entry to the release site.

First responders at the operations (FRO) level respond to hazardous materials incidents in a defensive manner within their existing resources and capabilities to contain the release to keep it from spreading and to prevent exposures to nearby persons, property or the environment.

Hazardous materials technicians are individuals who respond to

releases or potential releases for the purpose of stopping the release. They assume a more aggressive role than the FRO in that they will approach the point of release in order to stop the release of a hazardous substance. Hazardous materials technicians receive at least 24 hours of training equal to the FRO level and in addition have competency certified by their employer.

According to OSHA, hazardous materials specialists are "individuals who respond with and provide support to hazardous materials technicians." Their duties parallel those of the hazardous materials technician, however, their duties require a more directed or specific knowledge of the various substances they may be called upon to contain. The hazardous materials specialist would also act as the site liaison with federal, state, local and other government authorities.

Remember: hazardous materials response activities are restricted to those who have had appropriate training, PPE, and medical monitoring.

Decontamination (Slides 31-33)

Decontamination or "decon" is the process of removing contaminates from people, equipment, structures, the environment and anything else that may become contaminated. The decontamination process is designed to minimize exposure to hazardous substances and limit the spread of contamination. Decon is conducted on emergency responders, patients, and other individuals, as well as equipment and vehicles exposed to hazardous materials. The exact process will vary depending on the hazardous substance involved.

Slide 31

Decontamination will typically occur in the Contamination Reduction Zone. Essentially, an area is set up with several stations and the contaminated worker/patient/equipment moves from one station to the next being rinsed, washed, and rinsed again along the way. The individual and equipment are washed from top to bottom, paying close attention to areas that can be expected to have more contamination such as the gloves or boots.

Slide 32

Pools (e.g. inflatable wading pools) are used to contain the

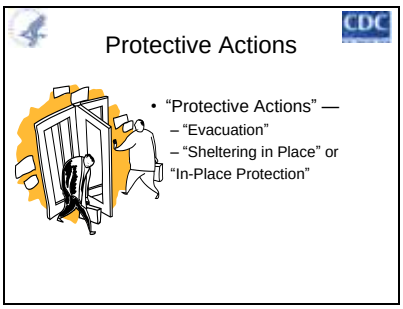
contaminated wastewater. The concept is that as the individual moves from one pool to the next he/she becomes progressively less contaminated. The individual exits the last pool and proceeds to an adjacent area for suit removal. Decon workers will assist with this process. Equipment and disposable items are bagged and secured with tape. The industry standard is to use solid colored bags for waste (hazardous) and clear bags for equipment that will be reused. There is no one method that will work in all situations, but as long as the process is appropriate for the contaminant and follows a logical order, decon will be effective. The wastewater generated during decontamination may require special handling and disposal. It must be captured and tested prior to disposal.

Slide 33

Sometimes emergency decontamination is necessary for responders or victims. This is often accomplished with a thorough flushing with water after removing contaminated garments. Care should be taken to provide a means to maintain modesty such as providing a change of clothing i.e.Tyvek suits.

Protective Actions (Slides 34-36)

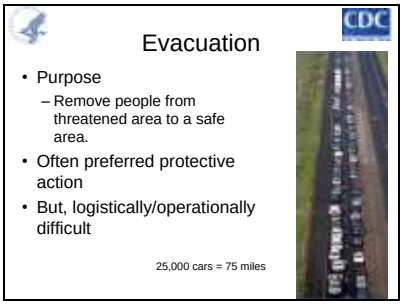
In the event of a hazardous materials release, compromised air or water quality may threaten public health. In these cases protective actions may be needed to protect people in the affected area. Shelter-in-place and evacuation are two recognized protective measures that are often employed when releases or potential releases threaten public health. These protective actions are also used when a natural disaster threatens.



Slide 34

Evacuation:

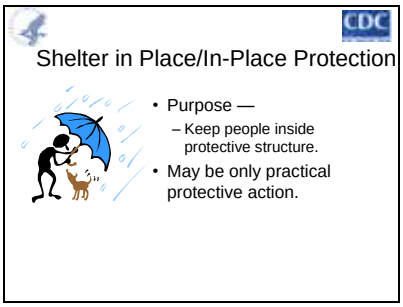
- is often selected for immediate threats such as hazardous materials releases, bombs or fires;
- requires adequate time for safe escape before the expected event occurs;
- can be difficult due to the resources needed to implement and some populations, i.e. hospital or nursing home patients, are difficult to safely evacuate; and
- may create hazards for evacuees such as traffic difficulties, travel through a plume of toxic chemicals or hazardous weather conditions causing risk of health affects or even death.



Slide 35

There is a strong bias toward choosing evacuation rather than

sheltering-in-place among emergency management officials. This is natural due to the experience many first responders have with evacuation and the comfort managers and responders may get from doing something active rather than something passive. However, in many cases sheltering in-place can be a viable alternative that keeps residents safe inside a protective environment.



Slide 36

Sheltering-in-place simply means staying put inside the home, workplace, or other building until the emergency passes. Sheltering-in-place is often the safest option, especially when a large population is threatened.

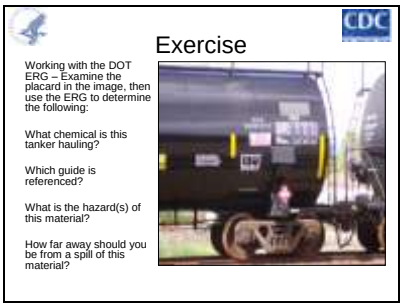
Shelter-in-place may include:
- closing windows and air vents and placing damp towels at the base of doors and windows (in the case of a hazardous materials release);
- occupants staying in an internal, windowless space, if possible; and
- monitoring public safety messages for an “all-clear” signal.

Things to consider when considering protective actions:
- The nature of the hazard will influence the choice of action.
- The number of people in the affected area - is there enough time to organize a safe and orderly evacuation?
- Is it likely more people will be harmed as they try to evacuate rather than shelter-in-place?

Local officials may require assistance from EH to select the appropriate protective actions in a large-scale incident, especially if hazardous materials are involved.

Exercise (Slide 37)

(SEE MODULE APPENDIX FOR WORKSHEET)



Slide 37

Scenario: While doing disaster assessment work after an earthquake, you discover a rail car that may be leaking. Consulting the DOT ERG, find information that you can provide to emergency responders.

Assignment: Examine the placard in the image, then use the ERG to determine the following:
- What chemical is this car hauling?
- Which guide is referenced?

- What is the hazard(s) of this material?
- How far away should you be from a small spill of this material?

Facility Assessments (Slides 38-40)

EH assessment activities will vary depending on the local EH agency's status as a CUPA. CUPAs may perform field surveys or assessments to check on regulated businesses after a disaster to ensure that they can safely resume operations. Hazardous materials facility assessments should be prioritized based on volume and type of chemicals stored. Priority should be based on:

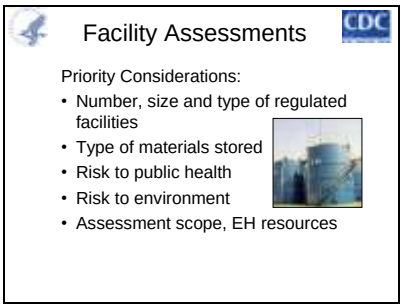
- Chemical properties of stored materials
- Volume of stored material
- Potential public health risk
- Potential environmental impacts

(SEE MODULE APPENDIX FOR SAMPLE ASSESSMENT CHECKLIST)

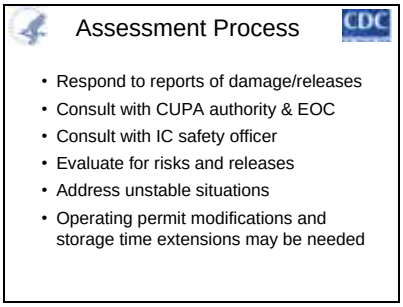
Assessments evaluate the capacity of a facility to continue to comply with operating permit requirements and continue safe operations. Assessments will include identifying releases or potential releases of hazardous materials from facilities. Operating permit requirement waivers and hazardous waste storage time extensions may need to be considered.

For aboveground and underground storage tank sites the assessment would include an evaluation of the integrity of the storage systems. Monitoring systems need to be assessed to determine that they are functioning properly to assure any leaks that may occur are detected in a timely fashion. Any leaks to the environment need to be assessed and mitigated.

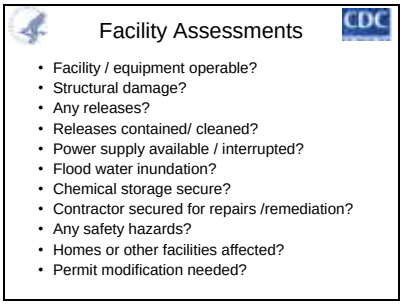
The 2007 FEMA Environmental Health TCL recommends that hazardous materials technical assistance be provided to emergency responders within 24 hours of incident and support for damage assessments be provided within 48 hours. For more information see the module reference list.



Slide 38



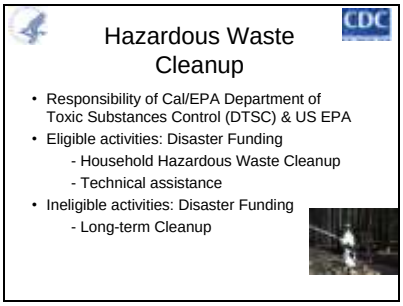
Slide 39



Slide 40

Disaster-related Hazardous Waste (Slides 41-42)

Slide 41



Slide 42

Disaster-created wastes from businesses that store hazardous materials will likely contain hazardous substances. Petroleum products, solvents, cleaners, paints, acids, metals, etc. may be expected in disaster debris from commercial properties. Additionally, debris from commercial buildings and homes may contain toxic substances because of the type of building materials present; older building components, in particular, may contain asbestos and lead-based paint.

Most people think of disaster-related hazardous waste being generated from industrial spills such as oil spills or chemical fires, however, disasters often result in releases of hazardous materials from residences and small businesses as well. Generally, household hazardous waste (HHW) is waste that displays one or more of the following characteristics - ignitability, corrosivity, reactivity, or toxicity. HHW can come from any number of sources in the home and garage such as the storage of gasoline, cleaning products, pesticides, ammunition, motor oil, batteries, paints and solvents, drain openers, swimming pool chemicals, and compressed gas tanks (such as propane and oxygen).

It is important to recognize that after a disaster homes are a significant source of hazardous waste that must be segregated from disaster debris. Once segregated, HHW requires special handling and disposal. Residents should be advised not to commbine HHW with other debris or dispose of these substances with solid waste. Residents should be directed to take HHW to a specified location or collection event set up as part of the community recovery effort. Alternatively, residents may have the option to use special curbside HHW pickup services. Local officials may rely on EH to coordinate special HHW collection events/services with other agencies, such as Cal/EPA DTSC.

After recent disasters including the Loma Prieta earthquake and the southern California wildfires, DTSC, in conjunction with local agencies, set up special collection sites for HHW, and provided technical assistance and special variances related to hazardous wastes for businesses.

EH agencies often serve as a point of reference for businesses and the public. For non-emergency releases of hazardous materials, the local CUPA agency should be prepared to assist

businesses. Businesses that store reportable quantities of hazardous materials may require a site visit after a disaster to determine their need for assistance. In the case of a large disaster the U.S. EPA may support and assist with hazardous materials assessment and cleanup activities. Furthermore, special disaster funding may be available to help community cleanup of hazardous materials releases.

Community Hazardous Waste Collection (Slides 43-44)

EH agencies will typically monitor the generation of hazardous wastes during disaster recovery operations and provide technical assistance to local officials on the health risks and mitigation process as well as work with key partners to provide public assistance and information. There may be a need to provide the public with information on how to dispose of household hazardous waste after a disaster; EH may provide this information and/or organize special household hazardous waste collection events

Slide 43

HHW collection programs may differ in the type of materials targeted for collection, collection method and disposal options. Fixed HHW facility, special event or curbside collection services exist in many California communities. After a disaster, these collection programs may be used to collect disaster-related HHW. Door-to-door HHW collection programs generally run on an appointment basis and can provide services to individuals who are housebound or cannot travel to a collection site. A milk-run type collection may be organized to collect HHW for a certain time period at one site and then moves on to another.

Slide 44

Other collection options include use of “roundup type” special HHW collection events that use existing facilities including parking lots, city maintenance yards, fairgrounds, or landfills. For a HHW collection event, a hazardous waste contractor is typically selected to assist in selecting a site that is easily accessible, accommodates the contractor's equipment, and accommodates traffic. To setup special HHW collection events or services the local government should contact the solid waste/hazardous waste agencies to take care of permitting concerns. In California, DTSC would be the lead agency. Local EH may also be involved with the management of HHW collection. The EH agency may work with local officials to establish the type of collection system that best fits the particular situation and community.

Electronic Waste and White Goods (Slides 45-46)

White goods are household items such as refrigerators, ovens, heating and cooling units, as well as smaller items such as e-waste including computers, televisions and electronic equipment that can have hazardous materials such as mercury switches and heavy metals. After a disaster, collection and disposal of these items is often accomplished through community-wide collection events. The U.S. EPA produced this video on the disposal of white goods after Hurricane Katrina.

Slide 45

Slide 46

Biohazardous Waste (Slide 47)

The disposal of medical wastes from health care facilities may be disrupted in the event of a large-scale public health emergency or disaster. A surge in the demand for emergency medical care due to a disease outbreak or disaster may create a situation where the amount of medical waste generated overwhelms the existing treatment and disposal system, even if it is still functioning. As a result, hospitals may require assistance from EH agencies to help determine how to cope with medical waste, especially if transportation or treatment facilities are disrupted.

Slide 47

In California, many EH agencies have been designated as the local medical waste enforcement agency. In this case, EH may perform an assessment of the hospitals and medical waste treatment facilities in the affected area. When routine medical waste handling systems have been disrupted, EH can provide technical assistance on alternate disposal methods. If storage space is a concern, it may be possible to use roll-off boxes and trailers on a temporary basis. If prolonged on-site storage time is necessary, refrigerated trailers or freezers may need to be provided. EH should work with key partners on making these decisions, including the California Department of Public Health (CDPH) and local emergency management officials.

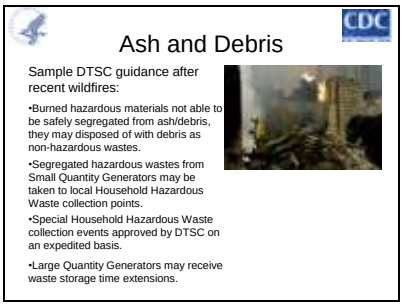
Cleaning Up (Slide 48)

Slide 48

After fires and other disasters, household, business and infrastructure debris, ash and other debris may be contaminated with hazardous wastes. Contaminated debris should be cleaned up and contained as quickly as possible to minimize exposure to emergency personnel, the public, and workers involved with restoration efforts, and to minimize dispersion to the air and runoff to waterways.

Hazardous waste releases may present hazards that need to be addressed as rapidly as possible. As always, safety must be considered. And in keeping with the EH mission, resources should be prioritized, so that the hazardous wastes that present the most risk to public health and safety will be addressed immediately. Remember that community cleanup operations will generate hazardous waste as well as disaster debris and damaged building components may contain lead-based paint or asbestos.
Note: In California, actions taken to immediately mitigate, contain and control hazardous waste releases are exempt from hazardous waste permit requirements [22 CCR 66270.1(c)(3)(A)] when the Governor has declared a State of Emergency. During recent wildfire response this provision was applied to the emergency actions taken to clean up, contain and dispose of ash and debris from burned structures.

Ash and Debris (Slides 49-50)

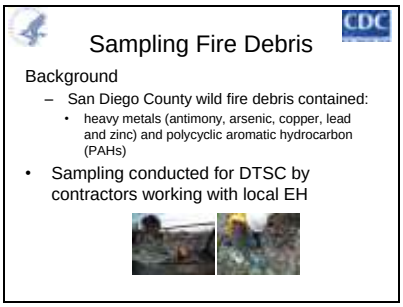


Slide 49

After fires, unburned or undamaged hazardous materials (i.e., hazardous materials with only smoke damage) should not be commingled with ash and other debris. These materials should be segregated and directed to a hazardous waste collection program. Ash and debris generated by a fire may also include hazardous materials that cannot be safely segregated from other debris. DTSC issued special guidance after the 2007 Southern California wildfires on this issue. After the Governor declared a State of Emergency contaminated debris in the affected area was allowed to be disposed of with other non-contaminated debris. In this situation, segregated hazardous waste from small quantity generators was allowed to be taken to local HHW collection points. Larger quantity generators were provided the opportunity to extend storage times beyond the statutory 90 day period. Emergency permits were also made available for special hazardous waste accumulation, treatment and storage facilities.

Some ash must be tested prior to disposal to determine if it is hazardous prior to disposal if lead-based paint, asbestos or heavy metals are present. Testing objectives:

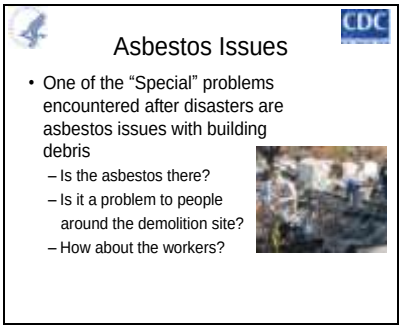
- Assess the presence of Constituents of Concern (COC);
- Protect against threats to human health, public safety and the environment; and
- Obtain reimbursement funding from FEMA for debris removal.



Slide 50

Asbestos Issues (Slide 51)

Asbestos is commonly found in buildings constructed prior to 1984. Asbestos is a carcinogen that has been known to cause lung cancer. Because of its fire-resistant fibers, airborne asbestos is a primary concern in the fire ash and debris. The potential presence of asbestos is one of the reasons that the use of volunteers to cleanup damaged home sites is often discouraged. Sites should be cleared for hazardous waste prior to volunteers beginning cleanup operations.



Slide 51

Temporary Facilities (Slide 52)

Facilities for temporarily handling and storing hazardous waste resulting from disaster cleanup efforts may be needed. Consider the following safeguards for any temporary hazardous waste site:

- Area to be used should be covered with two layers of plastic sheeting, tarps, or a concrete pad;
- Fence off the storage area;
- Surround the fenced-off area with absorbent booms (to absorb any potential leaks) or sandbags (to prevent spills from seeping into the ground);
- Raise collection bins off the ground (to spot any leaks);
- Provide adequate space for walking/carrying items between containers;
- Provide separate areas for segregation of containerized gases, liquids, or solids by material type (e.g. corrosive wastes, reactive wastes), place each material type in a separate bin or barrel, and label the container appropriately;
- Cover collection containers with lids or cover the entire hazardous waste collection site to prevent precipitation entering containers;
- Provide sufficient fire extinguishers for the site - four fire

Slide 52

extinguishers per 10,000 square feet are recommended, placed at the corners or in easily accessible locations.

An emergency hazardous waste storage permit may be required from DTSC to establish these waste facilities. DTSC may be available to provide assistance through emergency response / cleanup contractors.

Sorting and Segregation (Slide 53)

Slide 53

Separating these materials into appropriate categories prevents incompatible materials from commingling and possibly causing a chemical reaction or safety hazard for workers. Field testing by appropriately trained personnel may be required in order to sort unlabeled hazardous materials. At a hazardous waste bulking site, safeguards should be implemented to prevent releases. Waste sorting and segregating also minimizes the amount of waste that must be handled as hazardous, thereby keeping disposal costs down. Federal and state laws require hazardous materials to be reused whenever possible. Segregated hazardous wastes should be transferred to a hazardous waste facility. Permits are typically needed for sites that receive hazardous waste.

A plan for controlling, appropriately handling, and diverting hazardous materials from the solid waste stream helps avoid the release of hazardous constituents into the environment. This plan must include a provision to provide waste handlers with adequate training to comply with OSHA regulations. Waste handlers must understand these requirements as well as have a plan for controlling and diverting the hazardous waste from the solid waste / general debris stream.

Waste Pickup and Transport (Slide 54)

Slide 54

HHW is sometimes collected at solid waste transfer stations where municipal solid waste is unloaded from collection vehicles and held until being reloaded onto long-distance transport vehicles for shipment to landfills or other disposal facilities. These transfer stations may be used to manage hazardous disaster debris as well. If hazardous waste will be transported, DOT regulations will apply to containers depending on the classification of the waste.

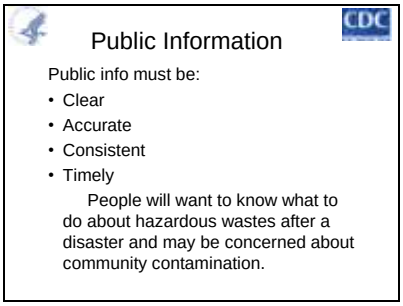
Public Information (Slides 55-56)

After a catastrophic event such as an earthquake, business will require information on how to proceed with the cleanup and disposal of hazardous materials and damaged containers. Homeowners will also need guidance on dealing with HHW. Whenever possible, EH agencies should be prepared to provide information on where businesses and the public may take hazardous waste.

Public education will be essential in discouraging the dumping, washing down or disposing of hazardous materials to the environment, including storm drains and sanitary sewer systems. Develop key messages to use with the media that are clear, brief, and accurate. Make sure your messages are carefully planned and have been coordinated with local and state officials. If your messages are different you'll want to know that and be prepared to explain why. Make sure field and office staff know how to deal with the media and questions from the public. It may be necessary to establish protocols for both field and office staff to respectfully defer questions to a spokesperson or hotline.

The public will be listening for factual information and recommendations for action. Get the facts right, repeat them consistently through your department or county Public Information Officer (PIO) and ensure that all credible sources share the same facts. Speak with one voice. Again, preparation counts. Consistent messages are vital. Inconsistent messages will increase anxiety and will quickly torpedo credibility of experts.

Having standardized disaster information prepared in advance and easily available on your agency's website will help the public find the information they need to take action to protect themselves and begin the recovery process. Work with neighboring counties and other agencies to ensure your disaster information is consistent with theirs. This principle is from the CDC's *Crisis and Emergency Risk Communication by Leaders for Leaders.* See the module reference list for more information.



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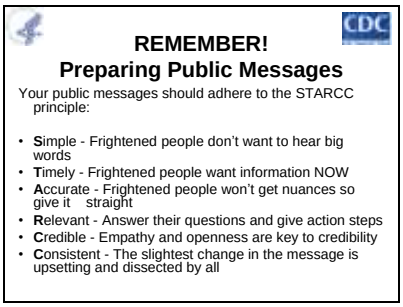
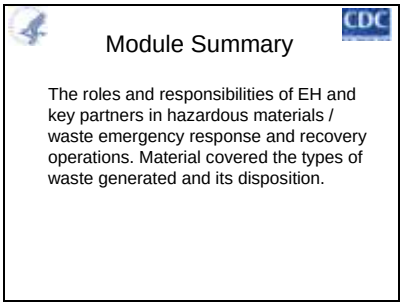


Slide 56

Module Summary (Slide 57)

In this module, information was presented on disaster-related hazardous wastes and its management. Specifically, this module covered the roles and responsibilities of EH and its key partners in hazardous waste emergency response and cleanup efforts.

The module also discussed the typical types of hazardous waste generated during a disaster event and the EH priority activities related to those wastes.



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Module 9 Acronyms

Cal/EPA	California Environmental Protection Agency
Cal EMA	California Emergency Management Agency
CCDEH	California Conference of Directors of Environmental Health
CCR	California Code of Regulations
CDC	Centers for Disease Control and Prevention
CDPH	California Department of Public Health
CUPA	Certified Unified Program Agency
DOT	Department of Transportation
DTSC	Department of Toxic Substances Control
EH	Environmental Health
ELO	Enabling Learning Objective
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
ERG	Emergency Response Guidebook
ESF	Emergency Support Function
FEMA	Federal Emergency Management Agency
FRA	First Responder Awareness (level)
FRO	First Responder Operational (level)
HAZWOPER	Hazardous Waste Operations and Emergency Response
HHW	Household Hazardous Waste
ICS	Incident Command System
NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety and Health
OA	Operational Area
OES	Office of Emergency Services
OSHA	Occupational and Safety Health Administration
PIO	Public Information Officer
PPE	Personal Protective Equipment
RDD	Radiological Dispersion Device
SCBA	Self-contained Breathing Apparatus
SEMS	Standardized Emergency Management System
SOP	Standard Operating Procedure
SWANA	Solid Waste Association of North America
TLO	Terminal Learning Objective
UN	United Nations
USEPA	United State Environmental Protection Agency
WHO	World Health Organization

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Module 9 Appendix

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Module #9 Hazardous Materials
Exercise Worksheet

Scenario:
While doing disaster assessment work after an earthquake, you discover a rail car that may be leaking.

Consulting the DOT ERG, find information that you can provide to emergency responders.

Assignment:
Examine the placard in the image, then use the ERG to determine the following:

- What chemical is this car hauling?
- Which guide is referenced?
- What is the hazard(s) of this material?
- How far away should you be from a small spill of this material?

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SAMPLE HAZARDOUS MATERIALS FACILITY ASSESSMENT CHECKLIST

Facility Name/ID#				**Point of Contact**	
Facility Address					
Type	☐ Haz materials	☐ Haz wastes	☐ USTs	☐ ASTs	☐ Other_____

Assessment Points	**Status**				**Comments**
	YES	**NO**	**NA**	**UNK**	
Facility/ equipment operable					
Structural damage					
Container/ equipment/ piping leaks					
Damaged systems emptied					
Flood water/ debris inundation					
Power supply interruption					Duration:
Adequate spill response supplies					
Monitoring system operable					
Any off-site release					
Release contained/ cleaned up					
Clean up contractor secured					
Adequate materials segregation					
Adequate waste containment					
Materials storage area secure					
Any safety hazards					
Adequate management					
Contingency plan activated					
Emergency notifications made					
Contractor secured for repairs					

Additional comments				
Facility Status	☐ Operating	☐ Not operating	☐ Permit modification needed	☐ Follow up needed
Specialist Name			**Date/Time**	

USE REVERSE SIDE FOR ADDITIONAL INFORMATION

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Module 10 Community Health

Environmental Health Training in Emergency Response (EHTER) – Introductory Level *California Version*

Participant Manual

August 2010

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Module 10 Community Health

Duration

One and one half (1.5) hours

Scope Statement

This module will introduce participants to a variety of issues and concerns associated with community health assessment related to emergencies and disasters. It will highlight environmental health (EH) issues and concerns as they relate to these assessments. Appropriate measures for addressing these issues and concerns, and for mitigating their adverse effects, will be covered in this module.

Terminal Learning Objective (TLO)

Participants will recognize the key EH and Public Health aspects of community health issues related to emergency response and recovery activities.

Enabling Learning Objectives (ELO)

After completion of this module, participants will be able to

10-1. Identify assessment objectives, community health issues, and needs.
10-2. Explain why assessments are conducted.
10-3. Identify public health issues and how they affect re-occupancy and recovery decisions.

Resources

Course participant manuals
Module 10 PowerPoint slides
Exercise Worksheet
Sample Assessment Checklist

Instructor to Participant Ratio

1:50 or less

Reference List

AIHA: General discussion of the major types of collection methods and analytical procedures. Specific discussion of strengths and weaknesses of principal methods and refers to Field Guide for Determination of Biological Contaminants in Environmental Samples
http://www.aiha.org/Content/CE/DL/Mold+Sampling+Analysis+and+Interpretation.htm

ARC: Disaster Services Training
http://www.redcross.org/flash/course01_v01/

Cal EMA: Safety Assessment Program Fact Sheet
http://www.oes.ca.gov/Operational/OESHome.nsf/PDF/SAP-PDFs%202007/$file/SAPInfoFlyer.pdf

CDC: *Crisis and Emergency Risk Communication by Leaders for Leaders*
http://www.bt.cdc.gov/erc/leaders.pdf

CDC: *Cleaning and Sanitizing with Bleach after an Emergency* July 2008
http://www.bt.cdc.gov/disasters/bleach.asp

CDC: National Center for Environmental Health, cleanup and remediation, general information, mold-related issues, fungal sampling, etc.
http://www.cdc.gov/mold

CDPH: Indoor Air Quality Info Sheet *Mold in My Home: What Do I Do?* June 2006
http://www.cal-iaq.org/MIMH_2006-06.html

CDPH: Indoor Air Quality Program web site with mold resources
http://www.cal-iaq.org/MOLD/

CDSS: *Disaster Planning Self-Assessment Guide for Child Care Centers and Family Child Care Homes*
http://www.ccld.ca.gov/Res%5Cpdf%5CDisasterGuideforHomesCenters.pdf

EPA: mold references *Mold Remediation in Schools and Commercial Buildings* (2001) *A Brief Guide to Mold, Moisture, and Your Home* (2002) and Mold Course - Introduction to Mold and Mold Remediation for Environmental and Public Health Professionals
http://www.epa.gov/mold

FEMA: Target Capabilities List http://www.fema.gov/pdf/government/training/tcl.pdf

IICRC: Canadian Construction Association Mould Guidelines, 2004, may be helpful for hidden mold, medical or legal reasons
http://www.iicrc.org/s520info.shtml

New York City Department of Health and Mental Hygiene
http://www.nyc.gov/html/doh/html/epi/moldrpt1.shtml

OSHA: Guidelines on Assessment and Remediation of Fungi in Indoor Environments
http://www.osha.gov/SLTC/molds/

OSHA: *Preventing Mold-Related Problems in the Indoor Workplace: A Guide for Building Owners, Managers and Occupants* 2006
http://www.osha.gov/Publications/preventing_mold.pdf

U.S. Department of Health & Human Services: Community Strategy for Pandemic Influenza Mitigation
http://www.pandemicflu.gov/professional/community/commitigation.html

Practical Exercise Statement

One exercise has been incorporated into this module.

Assessment Strategy

In-class questions, participation in group activities/exercises, and module summary discussion

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Module 10 Slides

Community Health (Slide 1)

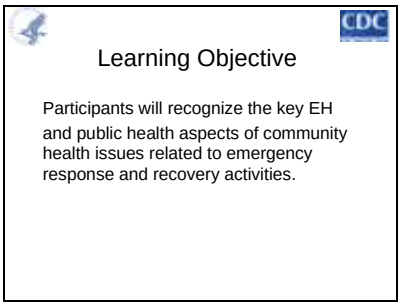
Assessing community/environmental health after a naturally occurring disaster such as an earthquake, a man-made disaster such as a bioterrorism event or a health emergency such as a communicable disease outbreak presents many challenges to environmental health (EH) practitioners. It requires an understanding the vulnerability of populations to the impacts related to a disaster

This module provides an overview of community assessment and the roles EH plays along with some useful resources.

Slide 1

Learning Objective (Slide 2)

Participants will recognize the key EH issues related to community health and have the necessary knowledge to conduct health-related response and recovery activities.

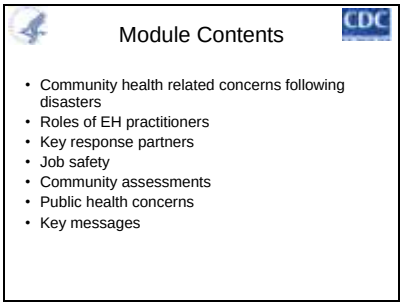


Slide 2

Module Contents (Slide 3)

This module covers:

- Community health related concerns following disasters
- EH functions – roles and responsibilities
- Key response partners
- Job safety
- Community assessments
- Key public messages



Slide 3

Reasons for Concern (Slides 4-5)

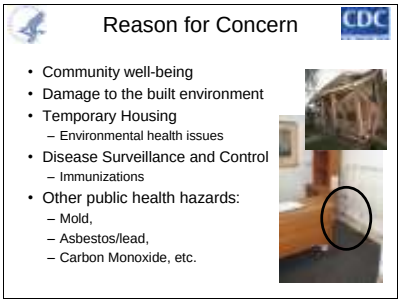
After a disaster strikes, community well-being is the highest concern. The assessment of the impacts of a disaster may be conducted by many agencies including public health and building department officials or engineers or by multi-disciplinary teams.

Other agencies may look to EH to make the determination if the presence of chemical or biological hazards are likely to impact the occupant's health and if so what needs to be done to mitigate the risk.

After a disaster, there will be many not-so-obvious damages that will likely present health concerns. Typically, EH would advise on indoor air quality and other health issues related to building occupancy after a disaster. Decision makers will need the technical assistance that EH can provide related to the suitability of housing and community facilities for re-occupancy. Partner agencies and the public will have questions on how to cleanup and return their homes to pre-disaster condition.

If residences are too badly damaged for immediate re-occupancy, evacuees may require temporary or transitional housing i.e. travel trailers and recreational vehicle parks, hotels and motels, etc.

Slide 4

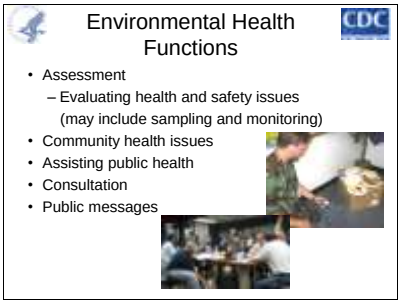


Slide 5

Environmental Health Functions (Slide 6)

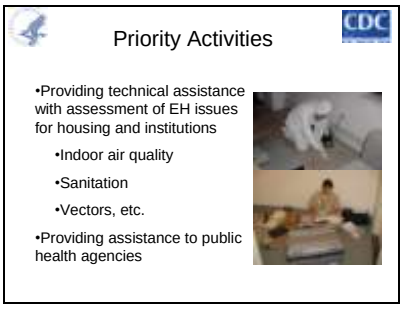
EH may be asked for advice by public officials about health and safety issues related to re-occupancy of buildings. EH agencies may also be called upon to develop and distribute public information on health risks associated with specific contaminants such as asbestos, lead-based paint, mold, bioterrorism agents such as anthrax, or a communicable disease such as pandemic influenza. If temporary housing is established, EH should be involved with the placement and set up to minimize health concerns.

EH may also assist public health partners with conducting community needs assessments. EH may perform assessments of the built environment as part of a team or separately.



Slide 6

Priority Activities (Slide 7)



Slide 7

EH priority activities will vary depending on the programs the local EH agency offers. EH may perform field surveys or assessments to check on the status of pools and spas, and rental housing or institutions after a disaster to ensure that they can safely be re-occupied or resume operations. If long-term temporary housing is required, EH may be involved with assessing the condition of that housing. EH agencies will typically provide technical assistance to local officials on health issues related to housing as well as work with key partners to provide public information. There may be a need to provide the public with information on how to prepare a home or institution for re-occupancy after a disaster.

If a public health emergency has occurred such as an infectious disease outbreak, EH may assist with the operation of mass prophylaxis or vaccination of other health-related functions.

Key Partners (Slide 8)

Slide 8

EH will likely work with several key partners in the disaster assessment of the built environment including homeowners, institution managers, permittees of retail food facilities, etc.

Key partners will be local emergency management officials, building departments, state licensing and permitting entities such as the California Department of Public Health (CDPH) and the California Department of Social Services (CDSS); building owners/operators and their contractors as well as federal and state representatives. Contact with these representatives is critical to successful community assessment.

For commercial licensees and permitees such as retail stores and restaurants, their viability may depend upon the assessment of the suitability for re-occupancy. Institutional administrators may base their decisions about the future operability of the building on its assessment. Engineers and contractors are an important part of the assessment team. They will have knowledge about structural requirements and affects of disasters. Structural integrity of public buildings needs to be determined by engineers, especially after significant earthquakes. Permitting and licensing authorities will make determinations based on assessment findings.

California Emergency Management Agency (Cal EMA) has a Safety Assessment Program (SAP) that utilizes volunteers and mutual aid resources to provide professional engineers and architects and certified building inspectors to assist local governments in the evaluation of the built environment in an aftermath of a disaster. The program is managed by Cal EMA in cooperation with professional organizations. SAP produces two resources, SAP Evaluators, described above, and SAP Coordinators, which are local government representatives that coordinate the program. See the module resource list for more information.

Voluntary Organizations Active in Disaster (VOAD) such as the American Red Cross (ARC) also perform disaster assessment work. ARC trains volunteers to conduct community needs assessments after a disaster to determine what resources are needed. See the module resource list for more information.

Job #1 - Safety (Slide 9)

Slide 9

EH staff may be required to work long hours under stressful conditions, so physical conditioning and proper rest cycles are important. Some key safety issues in all aspects of disaster response:

- Personal sanitation;
- Physical hazards;
- Chemical hazards;
- Biological hazards
- Radiation hazards; and
- Confrontations

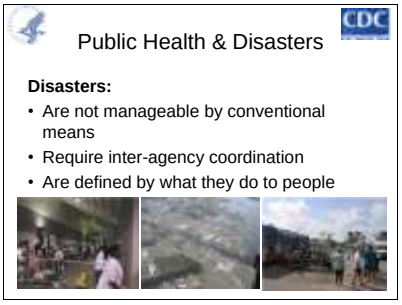
Damaged buildings present many hazards!

In addition to the specific hazards mentioned, situational awareness or being aware of what is happening around you and what that means, is key to staying safe. Assessment team members need to be aware of their operational environment including travel conditions and the hazards of the individual buildings being assessed such as exposures to contaminants, potential security issues, etc. Understanding as much as possible about the potential hazards prior to entering a building AND paying attention after entry is necessary to maintain safety.

Communication is essential between assessment team members and key partners. Arrangement for adequate and effective

means of communication is necessary to ensure team safety and situational awareness of team leadership. Assessment team members should consider developing a pre-disaster subject matter expert and essential contact list that can be taken to the field to ensure timely access to important information and resources.

Public Health and Disasters (Slides 10-11)



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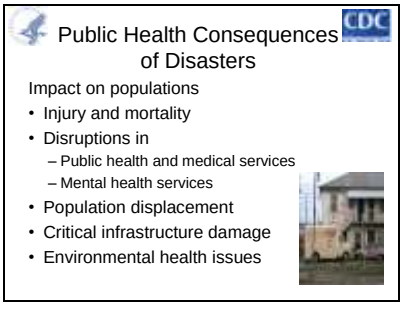


Slide 11

Disasters are not manageable by conventional means and require inter-agency coordination. For EH purposes, disasters are defined by what they do to people, or the impact on community health including:

- Injury and mortality;
- Public health and preventive services;
- Medical and mental health services;
- Environmental health;
- Nutritional;
- Critical infrastructure; and
- Population displacements.

The overall objectives of disaster management from the viewpoint of public health are: 1) needs assessments; 2) matching available resources with defined needs; 3) prevention of further adverse health effects; 4) implementation of disease-control strategies; 5) evaluation of the effectiveness of the application of these strategies; and 6) improvement in contingency planning for future disasters.

The public health consequences of a disaster may include:

- Increased injury and mortality;
- Disruptions in public health and medical services as well as mental health services;
- Population displacement;
- Critical infrastructure damage; and
- Environmental health issues.

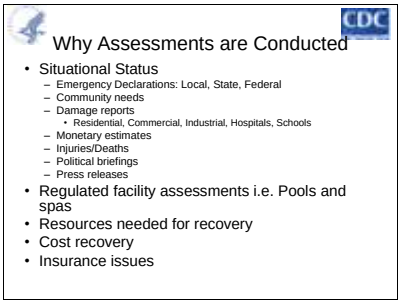
Conducting Assessments (Slides 12-14)

Conducting community assessments is an EH strength – indoor air quality and health and safety assessments are common EH functions. When conducting an assessment, be thorough and document everything - take notes about findings made and take photographs, if possible. Based on the findings of an assessment, you may be expected to make judgments about whether an area can be safely re-occupied. A thorough evaluation of the indoor environment that identifies hazards is crucial to the decision process for individual building re-occupancy.

Community assessments may be made after a disaster strikes to evaluate many things including the extent of damage and whether the disaster meets criteria for emergency declarations on the Local, State, Federal level, or to estimate costs or the toll on human life or the resources needed to respond.

EH will primarily be involved with assessments of damages to the built environment that impact human health. Assessments may be made of regulated facilities, residential, commercial, industrial buildings, institutions such as schools and hospitals, etc. to determine any community safety and re-occupancy issues that need to be addressed. Sometimes these assessments take the form of “windshield” or “dashboard” surveys to determine the extent of damage to an area. For example, EH professionals may be used to assess the need for a household hazardous materials cleanup event, infrastructural damage to water systems and other critical services, problems with nuisances related to vectors or safety, the impact to regulated facilities, etc.

Slide 12



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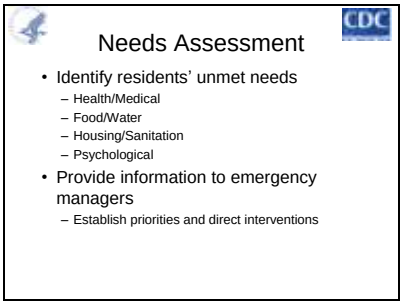


Slide 15

Needs Assessments (Slides 15-18)

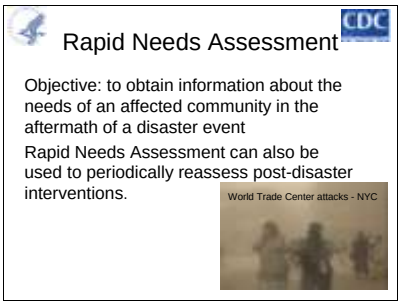
Rapid Needs Assessments are typically conducted by state or federal disaster teams. They can broad or focused in nature. For example, Environmental Health Rapid Needs Assessments are sometimes conducted, but often EH needs are combined with other Public Health needs.

The objective of a Rapid Needs Assessments is to obtain information about the needs of an affected community in the aftermath of a disaster event. These assessments can also be used to periodically reassess the efficacy of post-disaster

interventions.

An Environmental Health Rapid Needs Assessment is conducted to determine immediate resource needs of an affected area and is typically focused on identifying residents' unmet needs related to:

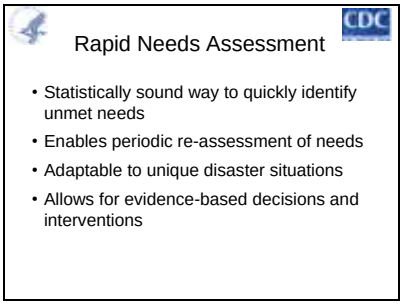
- Food
- Water
- Housing



Slide 16

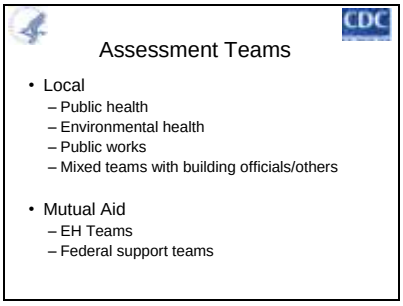
Assessments provide information to local Emergency Managers and help establish priorities and direct interventions. EH responders may use needs assessments to formulate problem statements and conduct emergency action planning.

If done in a methodical manner, Rapid Needs Assessments are a statistically sound way to quickly identify unmet needs and allow for evidence-based decisions and interventions.



Slide 17

Assessment teams may be confined to public or EH or include other disciplines. Engineers and contractors can be an important part of the assessment team looking at facilities. They will have knowledge about structural requirements and affects of disasters. Structural integrity of public buildings needs to be determined by engineers, especially after significant earthquakes. State and federal partners may assist with community needs assessments after a disaster.



Slide 18

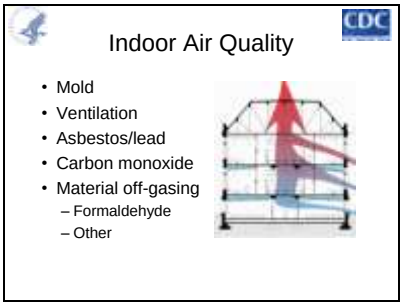
Building Assessments (Slide 19)

Buildings can be damaged by the disaster itself during earthquakes, floods, high winds, etc, or in the natural disaster's aftermath, when flood waters or power outages create hazardous conditions. For example, buildings in warm climates may require air conditioning in the summer in order to be habitable and may not be suitable for re-occupancy without power. Abandoned, flood water-damaged buildings may not be safe to reoccupy without significant clean up and remediation. Earthquakes that damage buildings may cause asbestos-containing material to be released and affect indoor air quality. Food service establishments can't serve food without a potable

Slide 19

water source. And buildings used as temporary or make-shift shelters, alternate care sites, or morgues during a disaster many need clearance from EH prior to re-occupancy, particularly if a public building such as a school was used for this purpose.

Indoor Air Quality (Slide 20)



Slide 20

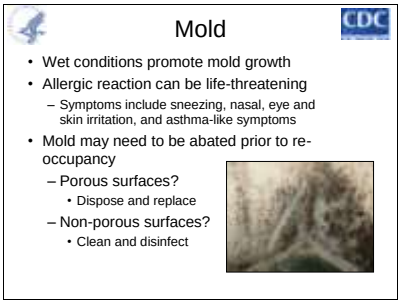
Indoor Air Quality issues can be problematic in temporary or damaged housing. Such problems include:

- Mold;
- Poor ventilation;
- Asbestos/lead dust;
- Carbon monoxide; and
- Material off-gassing e.g. formaldehyde

After Hurricane Katrina there were problems with the trailers used as temporary housing and formaldehyde off-gassing. The chemical is used in a wide variety of products, including composite wood and plywood panels and is considered a human carcinogen.

Drywall made in China has caused problems in many homes that were rebuilt following Hurricane Katrina. Chinese drywall has been linked to complaints over sulfur gas that emit a “rotten eggs” odor and causes metals, such as air conditioning coils, to corrode. The fumes have also been associated with respiratory and sinus problems in some residents.

Mold (Slide 21)



Slide 21

Mold grows where water or water vapor is present, and though it is common to have small amounts of black mold (mildew) growing on shower or bath tiles in homes, after a flood or even during heavy rains mold can grow on window frames and sills, along baseboards and walls, or in carpets. High humidity can also cause mold to grow; even in areas where there was no flooding. Mold stains objects or areas such as walls and ceilings and has a musty, earthy smell. Mold can be hidden behind furniture, under carpets and floors, under cabinets, in closets or attics, and inside walls.

There are hundreds of different types of mold and fungi that can grow indoors, and they come in many different colors, including white, pink, orange, brown, and black. Almost all molds are known to produce substances or volatile chemicals that can

cause allergies or make them worse irritating eyes, nose, or throat. Mold may trigger asthma attacks in people with asthma. In areas where visible mold is present, or where moldy odors indicate the presence of hidden fungal contamination, it is unhealthy and inadvisable for anyone to live or work in the environment. Mold can be life threatening for some individuals.

It is generally unnecessary to identify what type of mold is growing in a home before taking steps to remove it. Small areas of mold (less than two square feet) on solid surfaces such as walls, baseboards, and window frames be cleaned using the following procedure:

Step 1

Prepare a solution of one cup of household bleach for every gallon of water (3,200 ppm) wearing wear protective clothing, such as rubber gloves and a long-sleeved shirt. Provide good ventilation by opening windows or using a portable fan;

Step 2

Apply the bleach solution to the moldy area gently with a sponge or mop -- a spray applicator is not recommended as it can cause the mold spores to become airborne and spread to other locations. (Be aware that bleach may damage rugs, fabrics, and wallpaper);

Step 3

Allow the bleach solution to stay in contact with the surface for 15-20 minutes, then rinse the area with clean water; and ensure that the treated area dries out because molds will re-grow if surfaces remain damp.

If the home has large areas of mold growth, EH should advise the occupant to contact a professional contractor who can determine where moisture is coming from and how the problem can be corrected. The removal of large areas of mold should be done by individuals with special training, such as restoration specialists or asbestos abatement contractors, to prevent the spread of mold to other areas of the home.

CDC's *Cleaning and Sanitizing with Bleach after an Emergency* is a valuable resource. See the module reference list for more information.

Temporary Housing (Slide 22)

After a large-scale disaster, meeting the intermediate and longer-term housing needs of individuals impacted by the event may

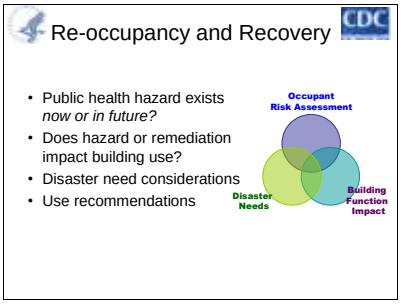
result in the use of temporary housing including school gymnasiums, sports facilities, trailers, hotels, motels, and apartments, even “tent cities” in extreme situations.

Slide 22

EH may play a role at the local level in determining the suitability of temporary housing options due to climate considerations. Other EH concerns regarding temporary housing include:

- Vector control;
- Indoor Air Quality;
- Infrastructure requirements; and
- Potential for communicable diseases (especially in longer-term group settings).

Re-occupancy and Recovery (Slide 23)



Slide 23

How will you determine that a hazard no longer exists in a community or that it will not be a hazard in the future (how clean is clean?) There may be standards to compare your findings with, but possibly not.

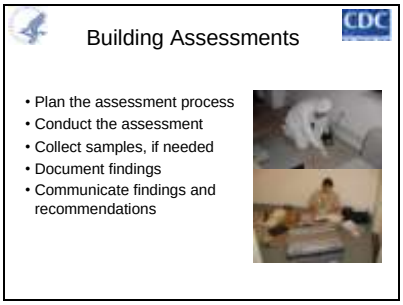
An assessment may be necessary prior to building re-occupancy. For example: How much mold is acceptable to allow in a building used by children? How about adults?
Or, if hazards are identified but not considered a health risk, is there a potential for these hazards to become problems in the future? Many of the situations encountered with building and community assessments will require extrapolation of existing standards/guidelines and input from outside experts.

It is critical that EH practitioners know their “professional judgment boundaries” and consult with standards and experts before operating outside of those boundaries. Especially if building re-purposing or temporary measures are being considered. Can the occupant use or building components be modified to allow temporary use of the building until the hazard is abated? For example: Would opening the windows and running air filtration equipment lower mold levels in that room to a level acceptable for use until long-term remediation is achieved be allowable? Sometimes adaptations must be made, especially when dealing with buildings that provide essential services.

Building Assessments (Slides 24-25)

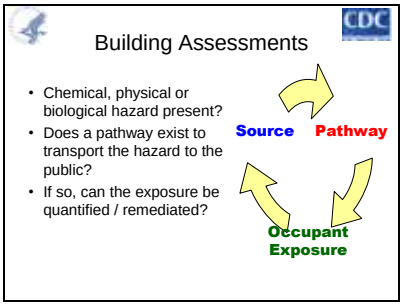
Assessments occur after a building is deemed structurally sound by a qualified professional and may take the form of a multi-

component assessment that includes sanitation, water and wastewater, vector control, indoor air quality, and safety considerations. EH may provide support on assessing schools, shelters, institutions, homes, and other community facilities. EH may also monitor the status of re-entry and re-occupancy of these facilities. Buildings depended upon for emergency services may also be damaged during disasters, causing their use to be curtailed or changed. For example, a hospital may not be able to operate without a source of electricity, but it may be able to house volunteers. A school may not be safe for students but might be suitable for sheltering displaced people.



Slide 24

Performing or assisting with assessments is a function that EH may assume to help the affected community recover from a disaster. Planning for assessment activities includes identifying the areas to be assessed, prioritizing the assessments based on community needs, and determining the assessment process to be used (including assessment forms) and the equipment needed to do the job. Most assessments follow a basic 3-step process:



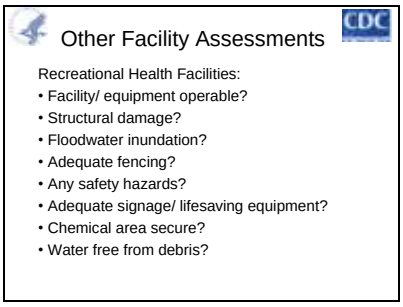
Slide 25

Step 1
The first step is to determine if a biological, chemical or physical hazard exists in the community (through observation and testing).
Step 2
The second step is to evaluate if resident exposure is possible.
Step 3
If an exposure is (or will be) likely, the third step is quantify that exposure and compare it to existing standards to determine whether an area is safe to occupy. Specialized sampling or monitoring may be needed as part of the assessment process.

Sometimes the need for an assessment does not arise until after an area or building has been re-occupied. For example, asbestos or lead-based paint in a building may be a concern after a disaster if occupants are concerned about exposure during and after repairs. This may involve interviewing the building owner and contractor, determining the presence of lead-based paint or asbestos, and talking to residents about their exposure risk. A consultant may be needed in this case to collect environmental samples to determine the presence of contaminants. If there is contamination at levels that could cause health impacts, then EH may need to require remediation.

Other Assessments (Slide 26)

EH may perform assessments of other facilities after a disaster such as pools, spas, and beach areas. Fencing and enclosures may be damaged or missing, floodwaters or debris may have inundated the structures or and the electricity could have been off for an extended period of time causing water quality and vector concerns. Activities may involve assessing risks and hazards posed by public pools and spas and recreational bathing areas to public health and safety; posting and closing pools and swimming areas; water quality monitoring of impacted recreational facilities; and conducting public and operator education.



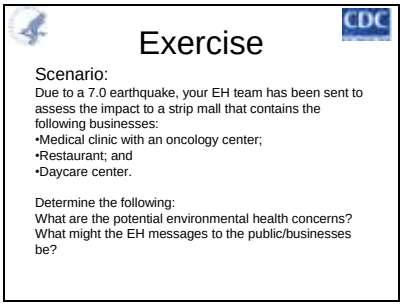
Slide 26

Note: Inundated in-ground pools and spas pose a unique hazard in that they may not be recognizable.

(SEE MODULE APPENDIX FOR SAMPLE ASSESSMENT CHECKLIST)

Exercise (Slide 27)

(SEE APPENDIX FOR WORKSHEET)



Slide 27

Scenario:
A 7.0 earthquake has struck in your area. Your EH team has been sent to assess the environmental health concerns at a retail strip development after it was cleared for structural hazards. The strip center contains the following businesses:

- Medical clinic with an oncology center;
- Restaurant; and
- Daycare center.

Assignment:
Your EH team visits the strip mall to assess the situation to determine the following:

- What are the potential environmental health concerns?
- What might the EH messages to the public/businesses be?

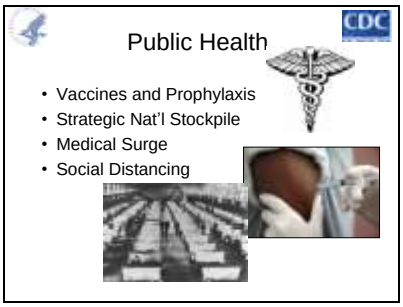
Public Health (Slides 28-29)

Since 2001, the United States has undergone a significant overhaul of its emergency preparedness and response infrastructure including an increase in funding to state and local

public health agencies to strengthen the nation's public health infrastructure and to re-examine the role of public health in disasters of all types. State and local health departments have received funding to develop and exercise plans for receiving and deploying the Strategic National Stockpile (SNS). The SNS is the United States' national repository of antibiotics, chemical antidotes, and antitoxins. Other supplies available through the SNS may include portable ventilators, N95 masks, alternate care caches, and other medical surge supplies.

Slide 28

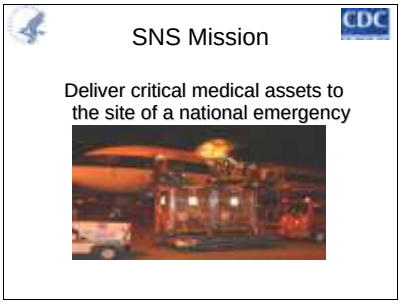
In the event of a national emergency, the SNS has the capability to supplement and re-supply local health authorities that may be overwhelmed by the crisis, with response time as little as 12 hours. The SNS is jointly run by the Centers for Disease Control and Prevention (CDC) and the Department of Homeland Security.



Slide 29

Using SNS resources, local health department planning is underway to distribute pharmaceuticals to individuals within 48 hours of a known event or exposure. This would require using nonmedical models, at Points of Dispensing (PODs). To distribute prophylaxis quickly. EH personnel may be called upon to assist public health at PODs by serving as health and safety officers, quality control staff helping to ensure that pharmaceuticals are stored under proper conditions, overseeing the handling of biohazardous wastes, and handling other EH needs at these mass dispensing sites.

Strategic National Stockpile (SNS) (Slides 30-32)



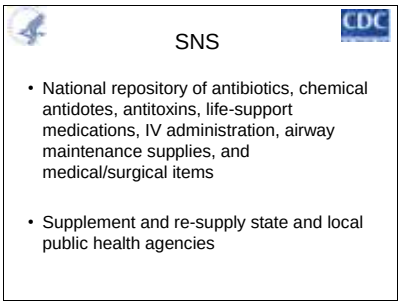
Slide 30

SNS was established in 1999 at the CDC to provide an inventory of medications and medical supplies available to send to a location in the event of a large infectious disease outbreak or other public health emergency, including a bioterrorism attack. The SNS deployed a 12-hour Push Package to New York City in response to 9/11 and to numerous locations in response to the anthrax attacks of 2001.

Following landfall of Hurricane Katrina on the Gulf coast of Mississippi and Louisiana in September, 2005, officials at CDC deployed stockpile assets, technical assistance and response units, and federal medical contingency stations to state-approved locations near or in the disaster areas.

In the event of a severe infectious disease outbreak, social

distancing may be used to limit the spread of the disease. Two ways of increasing social distance are to cancel public events and close buildings or to restrict access to certain sites or buildings. Depending on the situation, building closures might include: cancellation of concerts, sports events, movies, plays and closure of schools, recreational facilities (community swimming pools, youth clubs, gymnasiums), etc. these facilities may be used for other purposes such as Points of Dispensing (PODs) or alternate care sites. Food handling and preparation, and other EH issues will be important considerations when operating such sites. And re-occupancy concerns of parents, teachers and the community will need to be addressed by EH personnel before these facilities can be returned to their intended uses.



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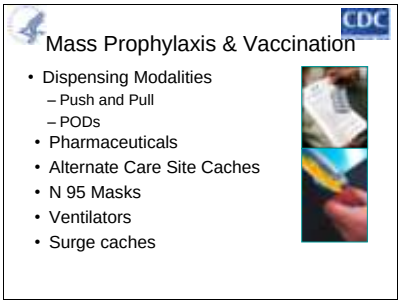
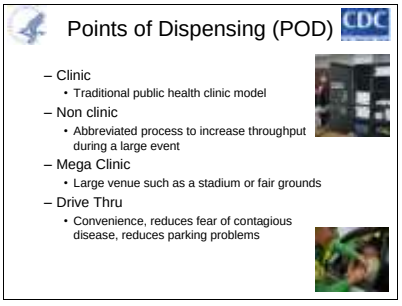


Slide 32

Closure of office buildings, stores, schools, and public transportation systems may be feasible community containment measures during a pandemic. All of these have significant impact on the community and workforce, however, and careful consideration should be focused on their potential effectiveness how they can most effectively be implemented, and how to maintain critical supplies and infrastructure while limiting community interaction. For example, when public transportation is cancelled, other modes of transportation must be provided for emergency medical services and medical evaluation.

Points of Dispensing (PODs) (Slide 33)



Slide 33

Dispensing of antibiotics and/or vaccines is a cornerstone of any mass prophylaxis campaign against outbreaks of preventable disease and the basis for the SNS. A Point of Dispensing (POD) is a location that will distribute medication to healthy individuals (as opposed to a health care setting that will handle ill individuals). PODs can be fixed facilities, such as schools or can be a set up as a more convenient operation such as drive through vaccination site.

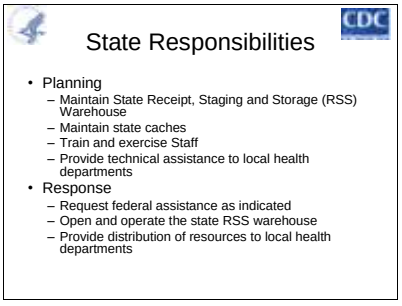
Fixed PODs typically require a large, open, space that allows for the flow of large numbers of people through site. It should have weather protection for those in line, the ability to be made secure to prevent loss of equipment or pharmaceuticals, be accessible for people with disabilities, be convenient for the community served.

PODs require many individuals to run, in additional to medical

staff, they require security personnel, coordinators who assist with the flow through the POD, inventory/supply managers, etc. In the event of a large emergency that requires the activation of the POD, it can be expected that EH personnel who assist local Public Health staff in the setup and operations of the site.

State Responsibilities (Slide 34)

In California, responsibility for identifying and pre-qualifying Receipt, Staging and Storage (RSS) sites is a state function. SNS supplies come from an external source, arrive at the state-run RSS, are stored there and are subsequently shipped out directly to county PODs or other locations as requested. CDC will deliver to RSS sites. Although the RSS will be located as close as possible, the RSS will not be located within the impacted area.

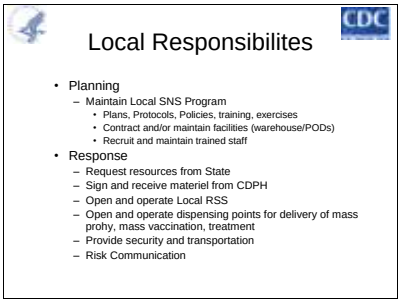


Slide 34

The state is also responsible for planning all aspects of the RSS function. It maintains the state drug and supply cache, trains and exercises its staff and local public health, and works with local public health on their planning efforts. In the event of an emergency, the state requests federal assistance as indicated, opens and operates the State RSS Warehouse, ships out resources to local health departments as needed.

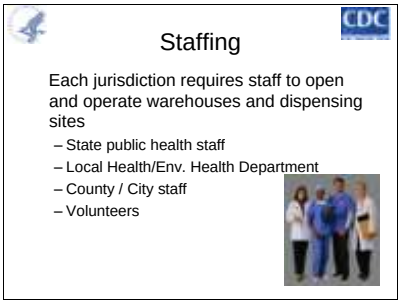
Local Responsibilities (Slides 35-36)

Counties/local jurisdictions conduct SNS planning efforts as well to maintain a local SNS/CRI program. This involves developing plans, protocols, policies, training, and exercises as well as maintaining facilities for the purpose of staging PODs and storage for POD supplies.



Slide 35

In the event of an emergency, the local area or county requests resources from the state. Receives the resources and opens and operates a local Receipt, Staging, and Storage (RSS) facility and PODs which are the dispensing points for delivery of mass prophylaxis, mass vaccination, treatment, etc.



Slide 36

Each local jurisdiction is required to open and operate dispensing sites and therefore require a large number of individuals. A key element to the success of dispensing SNS medications and supplies is the role of volunteers. While state and local public health staff will fill key roles, EH personnel may be called upon to fill health and safety roles, assist public health

staff, monitor medical waste handling, and perform other functions. Each local jurisdiction is required to open and operate warehouses and therefore require a large number of individuals. Staff is needed for RSS safety, security, receiving, inventory control, quality Control, and transportation.

California Health Alert Network (CAHAN) (Slide 37)

The California Department of Public Health maintains the California Health Alert Network (CAHAN) to coordinate statewide health-related emergency communications. CAHAN is designed to broadcast information regarding public health emergencies to local agencies and health care facilities. When a health alert is issued, CAHAN is capable of sending alerts to e-mail addresses, telephones, faxes and pagers with essential information. State, county, and local level agencies as well as hospitals and other health care organizations and utilities now use CAHAN as a vital tool for emergency communication.

Slide 37

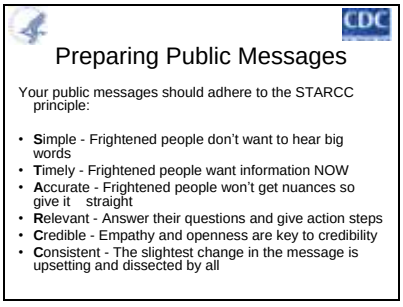
Preparing Public Message (Slides 38-39)

Develop key messages to use with the media that are clear, brief, and accurate. Make sure your messages are carefully planned and have been coordinated with local and state officials. If your messages are different you'll want to know that and be prepared to explain why.

Make sure field and office staff know how to deal with the media and questions from the public. It may be necessary to establish protocols for both field and office staff to respectfully defer questions to a spokesperson or hotline.

The public will be listening for factual information, and some will be expecting to hear a recommendation for action. Get the facts right, repeat them consistently through your department or county Public Information Officer (PIO) and ensure that all credible sources share the same facts. Speak with one voice. Again, preparation counts. Consistent messages are vital. Inconsistent messages will increase anxiety and will quickly torpedo credibility of experts.

Having standardized disaster information prepared in advance and easily available on your agency's website, will help the public find the information they need to take action to protect themselves. Work with neighboring counties and other agencies to ensure your disaster information is consistent with theirs. This



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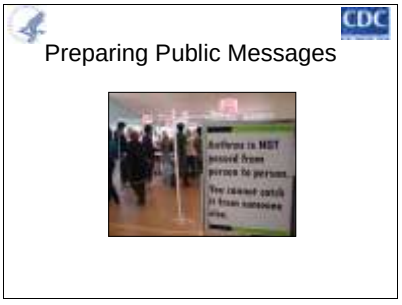
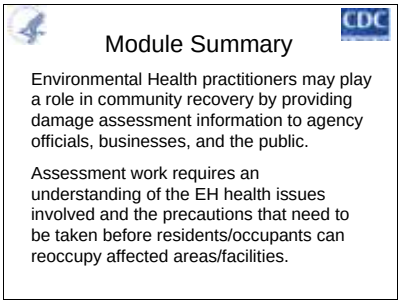


Slide 39

principle is from the CDC's *Crisis and Emergency Risk Communication by Leaders for Leaders.* See the module reference list for more information.

Module Summary (Slide 40)

After a disaster event EH practitioners may play a role in community recovery by providing damage assessment information to building and business owners/operators. Assessment work requires an understanding of the EH issues involved and the precautions that need to be taken before occupants can safely re-enter the facility. They can also play a critical role in dealing with the safety, biohazardous wastes, and related issues at PODs and alternate care sites.



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Module 10 Acronyms

AIHA	American Industrial Hygiene Association
Cal EMA	California Emergency Management Agency
CDC	Centers for Disease Control and Prevention
CDPH	California Department of Public Health
CDSS	California Department of Social Services
CRI	Cities Readiness Initiative
EH	Environmental Health
ELO	Enabling Learning Objective
EPA	Environmental Protection Agency
ESF	Emergency Support Function
FEMA	Federal Emergency Management Agency
HVAC	Heating, Ventilation, and Air Conditioning
IICRC	Institute of Inspection, Cleaning and Restoration Certification
OES	Office of Emergency Services
OSHA	Occupational Safety and Health Administration
PIO	Public Information Officer
POD	Point of Dispensing
PPE	Personal Protective Equipment
RSS	Receipt, Staging and Storage
SAP	Safety Assessment Program
SNS	Strategic National Stockpile
SOP	Standard Operating Procedure
TLO	Terminal Learning Objective
VOAD	Volunteer Organizations Active in Disasters
WHO	World Health Organization

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Module 10 Appendix

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Module #10 Community Health
Exercise #1 Worksheet

Scenario:
A 7.0 earthquake has struck in your area. Your EH team has been sent to assess the environmental health concerns at a retail strip development after it was cleared for structural hazards.

The strip center contains the following businesses:
- Medical clinic with an oncology center;
- Restaurant; and
- Daycare center.

Assignment:
Your EH team visits the strip mall to assess the situation to determine the following:

- What are the potential environmental health concerns?

- What might the EH messages to the public/businesses be?

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SAMPLE RECREATIONAL HEALTH FACILITY ASSESSMENT CHECKLIST

Facility Name/ID#				**Point of Contact**
Facility Address				
Type	☐ Bathing area ☐ Fresh ☐ Ocean	☐ Pool	☐ Spa	☐ Other_____

Assessment Points	**Status**				**Comments**
	YES	**NO**	**NA**	**UNK**	
Facility/ equipment operable					
Structural damage					
Equipment/ piping leaks					
Adequate fencing/ gates					
Flood water/ sewage inundation					
Debris/ chemical contamination					
Any safety hazards					
Generator power available					
Power supply interrupted					Duration:
Acceptable water clarity					
Acceptable disinfectant residual					
Adequate supply of chemicals					
Chemical storage secure					
Acceptable signage					
Adequate life safety equipment					
Adequate lifeguard service					
Contractor secured for repairs					
Available operator					
Water samples collected					Type:

Additional comments

Facility Status	☐ Operating	☐ Not operating	☐ Permit modification	☐ Follow up needed
Specialist Name			**Date/Time**	

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