

Unit Seven

Fire / Public Health and Animal Safety

Overview

In this unit, you will learn about fires and how you can protect your farm and livestock from fire damage. You will also study two cases in which you will learn about appropriate behavior in fires to protect human and animal life.

Objectives

Upon completion of this unit, you should be able to:

- Identify risk factors associated with the cause and spread of fire
- List mitigation and preparedness measures to protect against fires
- Identify threats to public and animal safety in fires
- Determine your vulnerability to fires
- Evaluate your knowledge of appropriate behavior in fires

Fires

The U.S. has one of the highest fire death rates in the industrialized world at 14.5 deaths per million. Fires account for nearly 30 percent of all disaster-related deaths, and 85 percent of all fires occur in residencies. Fires cause approximately 1 million injuries a year. Because young people and children are the most common fire victims, fires are the single greatest cause of “years of life lost.”

In 2000, 1.7 million fires were reported in the U.S., and property loss from fires was estimated at \$11 billion.

Most injuries and deaths from fires are the result of smoke inhalation. Smoke contains carbon monoxide, hot air and dust, carbon dioxide, nitrous dioxide, and sulfur dioxide. This combination of chemicals and irritants can result in sudden death from intoxication and bronchospasm or result in injuries to the lungs that may not appear until 24 to 36 hours after exposure.

The U.S. Fire Administration (<http://www.usfa.fema.gov>) compiles statistics on fires in the U.S. While it is likely that many animals also die in fires, their numbers are not officially recorded.

Types and causes of fires

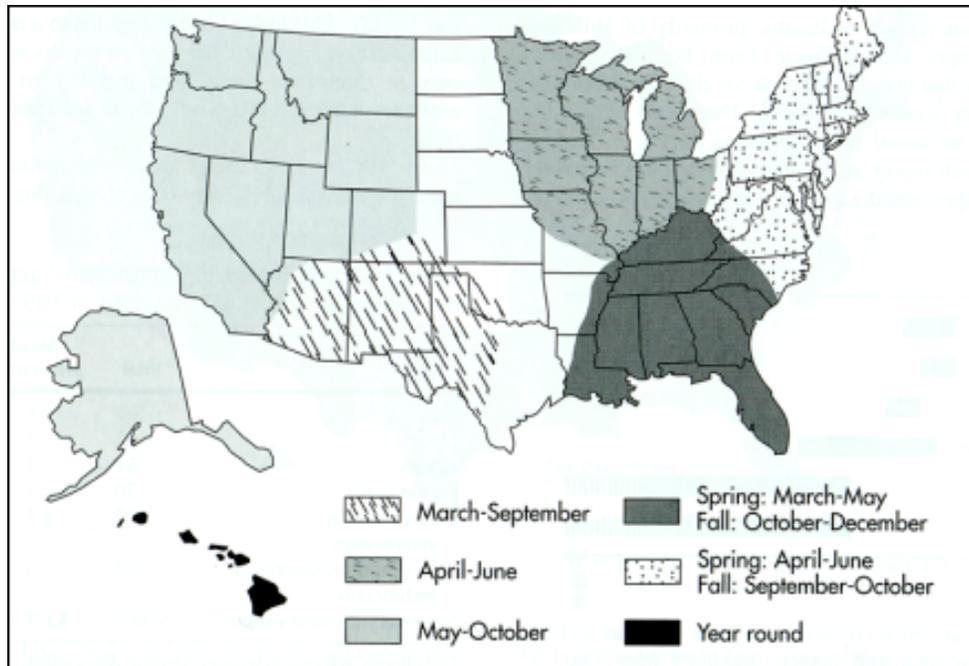
Fires are classified according to whether they occur in buildings, wild land, or other locations. Fires also occur commonly after earthquakes. Fires that involve multiple structures are often referred to as conflagrations. Urban conflagration is a fire that destroys several buildings in built-up areas.

Wildfires

The greatest impact of forest and wildfires is on the environment and wildlife rather than on the health of humans and domestic animals. A forest fire can develop into a firestorm. Firestorms produce a convection air system, frequently reach speeds of 60 to 70 mph and spread rapidly and violently across land.

Warnings

Wildfires can occur at any time of the year, but usually occur during hot, dry weather. The map below provides information about fire seasons by geographic area. The most dependable information on fire hazards is provided by the National Weather Service, U.S. Forest Service, and state forestry agencies. These services combine their information to give wildfire probability forecasts (see http://www.fs.fed.us/fire/fire_new). Sometimes local radio and television stations broadcast information and warnings on local fire conditions.



From International Association of Fire Chiefs, Finance Department: Development Strategies in the Wild Land Urban Interface, ed 2, 1996

What Can You Do?

Mitigation

Barn fires tend to break out in the winter and summer months when barn doors are closed and the demand for heating, cooling (fans), and lighting is at its highest. Many livestock facilities are built of flammable materials and are often full of incendiary material, such as hay, straw, wood, rubber, and siding. Prevention of fires starts during building construction, and is enforced through policies and maintenance activities.

Construction of buildings

Features that reduce the risk of fire and its spread include:

- Fire-resistant materials on the exterior of your home or barn, including the roof, siding, deck, trim, and paint.
- Non-combustible walls between storage area for hay and bedding and the stabling areas
- Approved fire doors

- Electrical wiring of barns and stables that meet appropriate safety standards and are installed by certified electricians.
- Smoke detectors, fire alarms, and sprinkler systems that can be monitored by the local fire and police departments
- Trickle charge-battery powered emergency lighting to permit evacuation of people
- Accessible water source on the premises (e.g., a pond), the location of which is known by the local fire department.

Design

- Hoses that are long enough to reach all parts of your building.
- A clean chimney with a spark arrestor.
- Barn in good condition, including electrical wires run through conduit. (Rodents can chew through the wiring, putting the barn at risk for fire.)

Policies

- Avoid open burning during dry or windy weather. Store firewood away from your home and barns.
- Store gas and other hazardous materials in separate buildings from animals.
- Implement and enforce no smoking policies on your property.
- Use rope or leather halters for horses and livestock because nylon halters can melt in a fire. This may lead to deep burn wounds on the animal.
- Have fire tools handy at your home and in your barn, such as a ladder, garden hoses, fire extinguishers, gas-operated water pumps, shovels, rakes, and buckets.
- Ensure all appliances in the barn are UL-approved. Cords and plugs should be in good repair. Appliances should be disconnected when not in use.

- Avoid using portable heater units in barns and never use them around animals. If heaters are used in tack room areas, they should never be left running unsupervised. Heater units should have shut off devices fitted in case they are knocked over.
- Put heat lamps at a safe distance from flammable materials. Heat lamps should not be used with extension cords.
- Place all-class (ABC) dry chemical fire extinguishers in all buildings where animals are housed, workshops, and wherever welding is done.

Maintenance

- Clear leaves and other vegetation off roof surfaces and out of gutters regularly.
- Clear brush and low vegetation back at least 30 feet from all buildings.
- Keep all areas around your barn free of cobwebs.
- Make sure your trailer is in good condition and keep the gas tank of your car and truck filled. If you do not have enough trailers, identify others who can help you evacuate.

Fire drills

- Hold fire drills regularly to familiarize staff and boarders (horse owners) with their responsibilities.

Wild land-urban interface

A special area in which fires occur is the wild land-urban interface. This increases the risk of exposure to wild land fires. In California alone it is estimated that more than 6 million people live in wild land areas and an additional 3 to 4 million live in the wild land-urban interface. Between 1980 and 1995, in California, over 5,000 buildings were destroyed in wild land or in the wild land-urban interface. This is three times more than in the 15-year period between 1965 and 1980.

Mitigation of fires in the wild land-urban interface

Wild land-urban interface fires occur most commonly during hot, dry, and windy weather. When these weather conditions are present, apply special vigilance to fire prevention.

Studies have shown that additional factors play a role in wild land-urban interface fires. Knowledge of these can help you identify potential fire hazards. Common risk factors that can be mitigated include:

- Poor access for emergency vehicles and vehicles used for evacuation
- Build up of wild land vegetation (fuel)
- Lack of defensible space
- Lack of firebreaks

Access and escape routes

Vegetation should be cut back from roads to the following dimensions:

- Roads should be at least 20 feet wide and capable of supporting vehicles weighing in excess of 40,000 lbs.
- Leave at least 14 feet clearance above the road for emergency vehicles to pass.
- Cut back vegetation greater than 10 feet from the shoulder, and 4 feet from the shoulder clearance
- Trees along roadways should be limbed up at least 6 feet

Plan several evacuation routes with your animals in case fires block your escape. If you have horses or livestock, make arrangements ahead of time for a place to temporarily relocate them. Moving them to fairgrounds, parks, racetracks, large animal shelters, or keeping them with family or friends may be options available to you.

Fuel

Firefighting experts look at the potential risk of fire in an environment by the amount of fuel that it contains. Light fuels are things like dry grass and shrubbery. These are relatively easy to ignite, but burn at low temperatures and in relatively controlled fashion. Heavy fuels include timber, trees, and brush. They are relatively difficult to ignite, but once burning, they are difficult to extinguish. Fire fuels should not be allowed to accumulate in the environment.

Deciduous trees are a primary source of ground fuel, but they can also prevent adequate air circulation between the ground and tree canopies. Inadequate airflow can lead to preheating of fuel when fires break out, making the fuel easier to ignite. This can be prevented by removing all of the limbs and branches from the ground up to approximately one third of the tree's height or 6 feet above the ground. Where appearance is important, consult an arborist.

Coniferous trees and some types of brush present a different type of hazard, as their needles contain sclerophyll. This is a waxy turpene that normally helps the tree retain moisture, but is explosive when heated. Conifer trees can be limbed up too. Selected trees can also be thinned out.

Defensible space

Defensible space is the amount of space around buildings needed to provide opportunities for fire services to succeed against fire; structure to survive without fire services; and prevent spread of fires between structure and vegetation.

The amount of defensible space that is recommended depends on the topography surrounding the buildings. The steeper a slope, the faster a fire will ascend. Canyons act like chimneys, which can trap heat and lead to combustion of fuel and area ignition, i.e., the heat of the fire ignites fuels at a distance. Canyons can also greatly accelerate the spread of fires.

Defensible space should be at least 30 feet between the buildings and trees. Within the defensible space, grass should be kept below 6 inches in height. There should be no combustible material or vegetation under decking, aerial canopies should be at least 10 feet from the chimney spark arrester, and no firewood should be stored within 10 feet of the building. If plants are placed within the defensible space, they should be drought and fire-resistant. Plants within the defensible space should be low growing to prevent "torching" when they ignite.

Fire breaks

In the past, straight-line firebreaks were often used to prevent fires from spreading from one part of a forest to another. These are usually constructed 1.5 to 4 times as wide as the fuel (see above for definition of “fuel”) is high. Newer methods to prevent the spread of forest fires increase edge space, and, therefore, reduce the rate at which a fire can spread. These are usually referred to as fuel breaks, and take land form, visual lines, color and texture of the land into account. A fuel break is usually 100 to 300 feet wide. The increased edge space also encourages more wildlife to frequent the area. These fire breaks can be established by a number of forest management methods, including prescribed fires.

Areas where streams flow under roads through pipes should be kept free of fuel, as these can ignite in fires and act as wind tunnels that blow heated and burning ash through to the other side of the road.

Impact & Consequences

Fires have many adverse consequences. The following table presents some commonly reported problems that arise in fires and the unit where you can learn more about the consequences.

Impact	Consequence	Refer to Unit #
Fires can bring down telephone lines	Communications are challenged	5
Fires can block access to farms, houses, and businesses	Infrastructure failure	6
Injuries to people and animals are relatively common in fires	Threat to public and animal safety	This unit
Fires can spread rapidly	Need to evacuate people and animals	8
Fires are alarming and will make fearful animals flee	Displacement of animals	9
Smoke is often toxic	Threat to public and animal health	10
Fires can burn fragile habitats and displace wildlife	Adverse effects on the natural environment and wildlife	11
Animals can be killed in fires	Need for carcass disposal	12
Smoke inhalation can be debilitating in animals	Need for euthanasia	13
Fires frighten animals and place them in jeopardy	Threat to the well-being of animals	14
Fires often attract a lot of attention and make dramatic media events	Public concern	15

Threats to Public Health and Safety

These cases are designed to test your knowledge of appropriate behavior in fires and regarding fire prevention, and to make you think about how you would respond to threats to public and animal health during fires.

Case 1: Wildfires

The owner of a small ranch with seven horses in New Mexico hears on the news that wildfires have started in the area. Warnings are issued to people in her valley to plan for an evacuation. At the time of this notice two of her horses are stabled, while the other five are at pasture.

What would you do?

As an animal owner, if you were faced with this situation:

What are some concerns about evacuating your animals at this time?

What actions would you take?

The owner hesitates and waits for a specific message to evacuate.

Reports indicate that the fire is being controlled. After two days though, unfavorable weather conditions cause a sudden change in the direction of the fire.

The fire now starts moving toward the lower end of the valley in which this horse ranch is located. The only access road is at that end of the valley where the fire appears to be moving.

What would you do?

If you were faced with this situation, what would you prioritize to evacuate?

What resources would you need to evacuate?

This owner decides to open the gate for the horses at pasture to escape to public lands in the opposite direction of the fire. She does this because she thinks that horses flee fire and that if her horses are given an escape route they will run to safety.

What would you have done?

Do you think this was a wise decision?

Why, why not?

As she returns to her ranch, she is alarmed by the amount of smoke coming from the lower end of the valley. The fire has entered her valley and she is very concerned that she may be trapped. Now, time is of the essence. She hitches up her trailer to load the two horses in the stable. The first horse loads well, but is anxious and starts vocalizing and kicking in the trailer. The second horse becomes apprehensive and refuses to load.

What are your concerns?

What are the human and animal health problems that have arisen?

In the meantime, the fire service has been informed that this owner has not evacuated. They set off to investigate. As the firefighters drive up the narrow road they are met by a band of five horses. The horses are frantic as they run down the valley away from the fire. There is no room for the horses to pass the fire truck on this narrow road. Unfamiliar with handling horses, the firefighters think it would be best to try to catch the horses and lead them past the truck and to safety.

However, as the firefighters, dressed in heavy firefighting gear, approach the horses the animals are startled, turn around, and run back toward the fire. It is not possible to help the horses, so the firefighters continue with their mission to rescue the horse owner. When they arrive at the farm they are able to help the owner load the second horse and direct her out of the valley. The owner and her two horses are saved from the fire.

Several days later the fire is contained. Only four of the horses were ever found. Two of the horses have singed manes and tail and require veterinary care.

What are your concerns?

What are some common medical problems that might arise for these horses?

What could the owner have done?

Let's review how some of these adverse events could have been prevented.

This owner made several errors in judgment. She exposed herself and her animals to the fire by not evacuating early. Large animals frequently take longer to evacuate than people think, so early action is necessary.

It is not known whether the second horse was difficult to load because of the situation, or because it was difficult to load in general. However, loading animals into trailers can be life saving and animals should be taught to do this before a disaster occurs.

The owner could have loaded her horses earlier. She also should have made prior arrangements with friends, family, and neighbors about where to take her horses. Better, the owner and others in the community could have developed networks of stable owners and managers willing to transport and board horses that need to be evacuated.

The owner should have planned or initiated evacuating when there was time. Even if the fire had not entered her valley, she and her horses would have been safe. Evacuation would likely have been only a minor inconvenience. In addition, the evacuation exercise would have served as a useful drill to prepare for disasters that may occur in the future.

Finally, her escape route theory for her horses was inappropriate. Horses should be lead to safety, not left to their own devices.

What could the fire service have done?

By not evacuating, the firefighters had to rescue the owner, and in doing so also endangered their own lives. Also, loading horses under duress was dangerous, especially to firefighters who were unfamiliar with handling large animals.

The local emergency manager or fire service PIO could have issued a public service announcement directed at horse owners, with advice on evacuation, and encouraged owners to help each other, e.g., by sharing trailers. Designated evacuation routes could have been announced.

Case 2: Hay fire

During the early fall in upstate New York a sheep farmer is making a final cut of hay. This sheep farmer has another job during the week and has only the weekends to tend to major jobs on the farm. The weather has been inclement and he is rushed to cut, dry, and stack the hay between bouts of rain.

Unfortunately, after cutting the hay the weather turns. Given his limited time for farm work, he cuts the hay with minimal time for it to dry. To protect the hay from further rain he covers the stack with a tarpaulin, which he weighs down with old car tires.

Two days after stacking the hay, he gets an alarming phone call at work: *“The hay is on fire!”*

He rushes home. When he arrives at his farm, he finds the fire truck outside the farm gate, and the firefighters surrounding the haystack, which they are tearing down. His sheep have fled.

Upon inquiring, he is told the fire truck was too wide to pass through the gate to the farm, and that the firefighters were unable to locate a source of water. Hence they left the truck at the perimeter and resorted to dismantling the haystack by hand. Regrettably, much of the hay burns, in part because the tires caught fire and could not be extinguished.

Given the owner’s limited budget, the sheep farmer tries to recoup some of his losses. Later that year he feeds the remainder of the burnt hay to his sheep.

What are some public health concerns?

What are the human health risks that arose from this situation?

Firefighters were exposed to great risks by having to manually dismantle the haystack. Other structures could have caught fire and endangered life. Smoke is hazardous.

What are some animal health concerns?

What are some animal health risks that arose from this situation?

The sheep fled out of fear and scattered. The small amount of burnt hay remaining should not have been fed to the sheep. Hay that combusts spontaneously also frequently contains fungal molds. The hay may have also been contaminated with residues from the burning tires.

Livestock that have been exposed to toxic molds and residues from fires may also not be safe for slaughter and human consumption. The risk of introducing these toxins to the food supply is a significant public health concern.

Additional considerations after a fire

Fires are destructive to life and property. Some of the physical issues can be addressed by knowing the appropriate procedures for cleaning and preserving damaged materials. For property losses, owners may also consult IRS Publication 547: “*Tax Information on Disasters, Casualty Losses and Thefts*” for information on dealing with these losses at tax time. This publication contains recommendations and procedures for filing tax returns after a major fire.

It is common for fire victims to seek and benefit from mental health counseling.

Assess Your Vulnerability

Fire	
Item	Vulnerability Score
1. Based on the location of your farm, building type, types of vegetation around your farm, and access to water, how vulnerable is your farm to fires? 1 (resistant)—5 (very vulnerable)	
2. How many of the recommended mitigation measures described in this unit do you have in place now? 1 (all and more)—5 (none)	
3. What is your vulnerability to fires? Add 1 and 2	Enter this number on page 16-3
Public and Animal Health Risks	
Item	Vulnerability Score
1. Based on your responses to the questions in the case studies, how often would you have taken the correct actions? 1 (almost always)—5 (rarely)	
2. As you read the material in this unit, how many of the public and animal health risks that arise from fires did you know of? 1 (knew most of them)—5 (now know much more)	
3. What is your knowledge of appropriate behavior in fires? Add 1 and 2	Enter this number on page 16-5



Learning Check

Directions: Determine if the following statements are true or false based on the material presented in this unit. When you have finished, check your answers on page 7-19.

1. Fires are the single greatest cause of “years of life lost” in humans.
True or False?
2. Most fire-related injuries and deaths are a result of smoke inhalation.
True or False?
3. Light fuels are hard to ignite, burn at high temperatures, and are relatively difficult to extinguish.
True or False?
4. Wildfires can develop into raging fire storms.
True or False?
5. Structure fires are common after earthquakes.
True or False?
6. Faulty electrical wiring that has aged or wiring that has been damaged by rodents is a common cause of barn fires.
True or False?



Learning Check

7. Livestock barn fires are easy to control because barns contain lots of incendiary materials.
True or False?
8. Enforcing a no-smoking policy is an important mitigation measure to reduce the risk of fires.
True or False?
9. Access to barns and water is generally easy for firefighters during fires on farms.
True or False?
10. The safest way to protect livestock from approaching wildfires is to evacuate them early.
True or False?
11. Smoke residues can be harmful to livestock, but this has no impact on their safety for human consumption.
True or False?
12. Livestock owners should always wait until the fire department orders them to evacuate their farms.
True or False?



Learning Check

13. Roads leading to farms should be wide enough and free from overhangs to allow access by fire trucks.

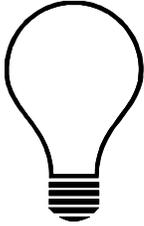
True or False?

14. The minimum defensible space around a house is 10 feet.

True or False?

15. Fire victims frequently benefit from mental health counseling.

True or False?



Answers

For every question that you answered incorrectly, review the page listed next to the answer to find out why your answer was incorrect.

1. True..... 7-1
2. True.....7-1
3. False.....7-6
4. True.....7-2
5. True.....7-2
6. True.....7-3
7. False.....7-3
8. True.....7-4
9. False.....7-5
10. True.....7-11
11. False.....7-12
12. False.....7-11
13. True.....7-5
14. False.....7-6
15. True.....7-14

Summary

This unit described the dangers of fires and explained why fires are common in agricultural buildings. This unit also presented information on protecting your barn and protecting public health and safety when fires break out.