Health and Human Sciences

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Keeping Food Safe During Emergencies

Disasters can come in many forms, including straight-line winds, tornadoes, fires, floods, and snow and ice storms. In any of these emergency situations, three problems commonly arise. The first is a lack of incoming supplies. The second is damage to gas, electrical power, water supply, and sewage systems. And, the third—especially in storms, floods, or fires—is that food may become contaminated or lack proper storage conditions, making it unsafe to eat. This publication discusses how to handle foods before, during, and after an emergency to keep them safe and to avoid foodborne illness.

How Do I Plan an Emergency Food Supply?

Emergencies arise with little or no warning. How much food to store depends on the potential disaster and emergency, your location, how much you are at risk, and how much you want to be prepared. Talk with local health department or emergency management officials to learn their recommendations. One recommendation is to keep at least three to seven days of food on hand, but keep in mind that some major disasters could leave you without help for a longer time.

To insure an adequate diet during an emergency, keep a food supply that does not need refrigeration. Table 1 lists a variety of foods that can be safely stored at room temperature. Choose food based on the special needs and preferences of your family. For example, if your household includes an infant, you may need a supply of formula or food that can be easily strained or chopped. In addition to storing emergency food, it is important to keep extra essential medications and supplies as well.

Another factor to consider when choosing emergency food is the ease of preparation. Select foods that can be quickly warmed or eaten at room temperature. Canned goods are often a wise choice; the can serves as both a cooking pot and serving dish. Dried beans are generally a poor choice. Although they are easy to store, they are not so easy to prepare.

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Food Group	Suggested Foods
Dairy	evaporated canned milkpowdered milk
Vegetables	 canned vegetables canned vegetable juice
Fruits	 canned fruit canned juice dried fruit
Protein Foods	 canned meat, poultry, and fish canned meat mixtures canned beans canned soups containing meat or beans dried meat (beef jerky) peanut butter nuts
Grains	 ready-to-eat cereal instant hot cereal minute rice crackers canned spaghetti canned soup containing noodles or rice
Miscellaneous	 coffee tea hot cocoa mix powdered beverages soft drinks

Table 1: Assembling an Emergency Food Supply

Consider storage conditions and length of storage when planning an emergency food supply. Choose shelf-stable foods that can be stored in a cool, dry place at temperatures between 40°F and 70°F. Although canned and dehydrated food will still be safe after one year, time may reduce quality and nutritional value. For this reason, you should occasionally use stockpiled food for regular meals and purchase new items to replace what is used.

How Do I Prepare Food with No Power?

During an emergency, cooking and eating habits must change to fit the situation. You may have no refrigeration, no stove, and limited water. When preparing food, consider the following:

- *The amount of cooking time needed for a particular food*—If there is limited fuel for cooking, choose food that cooks quickly or serve no-cook food (see Table 1).
- *The amount of food to prepare*—If refrigeration is not available, prepare only the amount of food you need for one meal. When left at room temperature, perishable foods such as milk, meat, soup, pasta, legumes, and vegetables can cause food poisoning because bacteria grow most rapidly in this range of temperatures (40°F–140°F). Discard any perishable food left out at room temperature for more than two hours.
- **Cooking methods available**—You may need to use alternative cooking methods in an emergency, but observe all safety guidelines when doing so. Make sure that any fire used for cooking is either vented to the outside of the home or used outside of the home. Every year, there are deaths caused by people using heaters or grills that are not approved for indoor use in unventilated garages or other enclosed rooms.

Possible cooking methods include:

⊳ Fireplace

You can grill food or wrap it in foil and cook it in the fireplace. Possible fuels for cooking include wood, tightly rolled newspapers, and artificial logs made of pressed wood particles.

▷ Charcoal grill

Never use charcoal as a fuel for indoor fires. Use a charcoal grill only outside the house where there is plenty of ventilation since the carbon monoxide from the burning charcoal is very dangerous. Although charcoal grills are usually used to prepare meats, you can also use them to cook food in foil and prepare one-pot meals during an emergency.

▷ Camp stove

Use this type of stove, which uses propane or butane fuel, only outside the house. Propane and butane fires are difficult to extinguish and could easily get out of hand inside a home. A dry chemical extinguisher will put out gasoline or oil fires, but it will not put out butane or propane fires. There is little you can do to put out a propane or butane fire except shut off the gas. Learn where the shut-off valve is before lighting a camp stove.

▷ Fondue pot or chafing dish

You can use these pieces of equipment inside as long as the fuel heating them is approved for indoor use. Read the manufacturer's specifications for fuel that is safe to use indoors.

How Do I Plan an Emergency Water Supply?

A disaster may contaminate the water supply and/or disrupt the electricity needed to pump water in the home. Planning ahead can ensure there is enough safe water for drinking, preparing food, brushing teeth, and keeping clean. Plan at least one gallon per person per day for drinking and sanitation. And keep enough water stored for pets, too. If you are not sure how much your pets use each day, monitor their food and water usage for a few days and plan accordingly.

To store water for emergency use, use new food-grade water containers purchased for that purpose, or clean and reuse plastic soda bottles. Before filling, wash all containers with soap and water, then sterilize them by rinsing them in a solution of one teaspoon of bleach per gallon of water. If you are filling containers with municipal water, no additive is needed. If you are filling the containers with non-chlorine-treated well water, add one drop of chlorine bleach per liter or quart. Water stored in sterilized containers will keep for six months. While the water may taste flat, it is safe to drink or use in cooking.

Another option would be to purchase water that has been prepackaged commercially. If you do, you should note the recommended use date and rotate your stored supplies as you do with your food supplies.

How Can I Get Safe Water During an Emergency?

In an emergency, you may have several options for obtaining safe water if you don't already have an emergency supply on hand. When using any water that originates from outside your home, follow local public health department or emergency services guidelines.

Keep in mind that your home water heater or water pressure tank could supply many gallons of safe water during an emergency if it has not been contaminated. Before using water from the water heater, switch off the gas or electricity that heats the water. Leaving the power on while the heater is empty could cause an explosion or burn out the heating elements. Turn off the power source, allow the water to cool, and then open the drain valve at the bottom of the tank. Do not turn the water heater on again until the water system is back in service.

In most disasters, shelters, faith-based organizations, and businesses may have supplies of donated drinking water. Check with one of the above or with emergency management, your local health department, your Purdue Extension county office, and/or the news media.

If you suspect or have been told that your water source is contaminated with hazardous chemicals, do not use it until the emergency is resolved. If you rely on a municipal water supply, listen for guidance from local officials regarding water safety. If your water comes from a private source, such as a well, further action will be needed to make sure your water supply is safe. In this case, contact your Purdue Extension county office or public health department for further information to address your specific concerns.

If your water supply may be contaminated with bacteria, purify all water before using it for drinking, preparing food, brushing teeth, or washing dishes. If the water contains sediment or floating material, strain it through a cloth before purifying it. If you have access to heat or power, water can be made safe by boiling. If not, you will have to treat it with chemicals.

For information about how to make wells safe again following contamination, contact your Purdue Extension county office or visit https://www.extension. purdue.edu/waterquality/drinking_water_human_ health.htm.

Water Purification Methods

Boiling

Boil water at a rolling boil for ten minutes to kill any disease-causing bacteria.

Chemical Treatment

Any of these chemical treatments will purify water:

Chlorine bleach—Household bleach is a good disinfectant for water. Before using, check the label to be sure hypochlorite is the only active ingredient in the bleach. Use unscented bleach that does not contain soap. Since the amount of chlorine in bleach is variable, use Table 2 to determine the appropriate amount needed to purify water.

Table 2:	: Bleach	Amounts	for	Water	Purification
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Percent of chlorine in bleach	Amount of bleach per gallon of water
1%	40 drops
2 to 6%	8 drops
7 to 10%	4 drops
unknown	10 drops

Mix the bleach thoroughly in the water and let it stand for 30 minutes. The water should have a slight chlorine odor. If it doesn't, repeat the dose and let the water stand for an additional 15 minutes. Be sure to follow health department guidelines for disposal of bleach. Note that in cases where hundreds of homes may be affected and waste handling may be strained by a flooded system, public health officials may not want bleach entering the water treatment system.

In an emergency ...

Before using bleach during an emergency situation, check with local health department officials. Some communities or areas may ban the use of bleach with chlorine to reduce the strain on the wastewater treatment system.

Water purification tablets—These tablets are available at pharmacies or stores that sell camping supplies. Follow the manufacturer's instructions.

Iodine—While chlorine is commonly used for disinfecting water and is preferred, another option is to use household iodine from the medicine cabinet or first-aid kit, if it is available. Similar to chlorine, iodine tincture can be effective against bacteria in water when used in the proper concentration for the correct length of time. The iodine tincture should be 2% United States Pharmacopeia (U.S.P.) strength. Add 20 drops per gallon of clear water and 40 drops per gallon of cloudy water, and let it stand for at least 30 minutes. As with any product, follow the instructions.

IMPORTANT: The use of iodine for disinfecting water should be limited to less than two weeks and preferably only for a few days. According to the Centers for Disease Control and Prevention, iodine use is not recommended for people with unstable thyroid disease or known iodine allergy, and iodine should not be used by pregnant women because of the potential effect on the fetal thyroid.

How Do I Keep My Refrigerated and Frozen Food Cold If the Power Goes Out?

A power outage brings with it the risk of food spoilage. Food will remain chilled for four to six hours in a refrigerator without power. Once the freezer loses power, the length of time food in it will stay frozen depends on:

- *the amount of food in the freezer*—A full freezer, if not opened, will stay cold enough to keep food frozen for about two days, even in the summer. In a freezer that is half full, food will stay frozen for only one day.
- *the kind of food in the freezer*—Foods that are dense and have a higher water content will stay frozen longer.

For example, a freezer full of meat will not warm as quickly as a freezer full of vegetables.

- *the temperature of the food before the power failure* The colder the food, the longer it will stay frozen. Keep your freezer set at 0°F or lower.
- *freezer insulation*—A well-insulated freezer will keep food frozen much longer than one with little insulation.
- *size of the freezer*—The larger the freezer, the longer the food will stay frozen.

As soon as you discover a power failure, call the utility company to find out when power might be restored. If the outage is expected to be short (several hours or less), then you can keep your foods colder longer by keeping the refrigerator and freezer doors closed. If there is a chance that you will be without power for some time, though, follow these tips to reduce the loss of refrigerated and frozen food:

- Add ice on the upper shelves to keep food cold longer. Use pans to catch the melting ice on lower shelves. The more ice you use, the longer the temperature will stay cool. You can use regular bagged ice. Or if it is cold enough outside, make ice by freezing water outside.
- Place a thermometer in the area furthest from the ice to monitor the temperature. Check the refrigerator temperature when adding ice and as soon as the power returns to be sure that food has been kept below 40°F.
- Replace the ice at the same time that you open the refrigerator or freezer to get food out in order to reduce opening and closing the door.
- After adding ice, cover the freezer with blankets or quilts. Be sure to pin or fasten the covering so the air

vent openings are not blocked. The power may return without warning.

• In extreme situations, you may be able to keep food cold outdoors. If temperatures are below 0°F, keep food in containers such as coolers to protect it. In all situations, you will need to monitor temperatures closely to make sure food is maintained at proper temperatures.

How Can I Tell If My Food Is Still Safe to Use?

Once your refrigerator and freezer are working again, you will need to evaluate the safety of the affected food. The United States Department of Agriculture (USDA) has two resources available to help consumers answer food safety questions:

- The USDA Meat and Poultry Hotline is available at 1-888-MPHotline (1-888-674-6854; toll free) from Monday through Friday, 10 a.m. to 4 p.m. Eastern Time. (Recorded food safety messages are available 24 hours a day.)
- Ask Karen is the USDA's automated response system that can provide online food safety information to consumers 24 hours a day, 7 days a week. The Ask Karen system, which responds to questions typed into the search engine, is available at askkaren.gov.

In general, for refrigerated food, consider the temperature inside the refrigerator before the return of power, the type of food, and the time these foods have been stored above 40°F (storage time above 40°F should not exceed two hours). Use a food thermometer to check the internal temperature of the food. For frozen food, consider the type of food and the extent of thawing.

Use Tables 3 and 4 when deciding which foods are safe to consume and which ones should be thrown out.

Food Categories	Specific Foods	Held above 40°F for more than 2 hours
Meat, poultry, seafood	Raw or leftover cooked meat, poultry, fish, or seafood; soy meat substitutes	Discard
	Thawing meat or poultry	Discard
	Salads: meat, tuna, shrimp, chicken, or egg salad	Discard
	Gravy, stuffing, broth	Discard
	Lunchmeats, hot dogs, bacon, sausage, dried beef	Discard
	Pizza – with any topping	Discard
	Canned hams labeled "Keep Refrigerated"	Discard
	Canned meats and fish, opened	Discard
	Casseroles, soups, stews	Discard
Cheese	Soft cheeses: blue/bleu, Roquefort, Brie, Camem- bert, cottage, cream, Edam, Monterey Jack, ricotta, mozzarella, Muenster, Neufchâtel, queso blanco, queso fresco	Discard
	Hard cheeses: cheddar, Colby, Swiss, Parmesan, provolone, Romano	Safe

Table 3: Evaluating Refrigerated Foods

Table 3: Evaluating Refrigerated Foods (continued)

Food Categories	Specific Foods	Held above 40°F for more than 2 hours
	Processed cheeses	Safe
Cheese	Shredded cheeses	Discard
	Lowfat cheeses	Discard
	Grated Parmesan, Romano, or combination (in can or jar)	Safe
	Milk, cream, sour cream, buttermilk, evaporated milk, yogurt, eggnog, soy milk	Discard
Dairy	Butter, margarine	Safe
	Baby formula, opened	Discard
Eggs	Fresh eggs, hard-cooked in shell, egg dishes, egg Discard	
	Fresh fruits, cut	Discard
	Fruit juices, opened	Safe
Fruits	Canned fruits, opened	Safe
	Fresh fruits, coconut, raisins, dried fruits, candied fruits, dates	Safe
	Opened mayonnaise, tarter sauce, horseradish	Discard if above 50°F for more than 8 hours
	Peanut butter	Safe
	Jelly, relish, taco sauce, mustard, catsup, olives, pickles,	Safe
Sauces, spreads, jams	Worcestershire, soy, barbecue, hoisin sauces	Safe
	Fish sauces, oyster sauce	Discard
	Opened vinegar-based dressings	Safe
	Opened creamy-based dressings	Discard
	Spaghetti sauce, opened jars	Discard
	Bread, rolls, cakes, muffins, quick breads, tortillas	Safe
	Refrigerator biscuits, rolls, cookie dough	Discard
	Cooked pasta, rice, potatoes	Discard
Bread, cakes, cookies,	Pasta salads with mayonnaise or vinaigrette	Discard
	Fresh pasta	Discard
	Cheesecake	Discard
	Breakfast foods – waffles, pancakes, bagels	Safe
	Pastries, cream filled	Discard
Pies, pastry	Pies – custard, chees filled, or chiffon; quiche	Discard
	Pies, fruit	Safe
	Fresh mushrooms, herbs, spices	Safe
	Greens, pre-cut, pre-washed, packaged	Discard
	Vegetables, raw	Safe
	Vegetables, cooked; tofu	Discard
Vegetables	Vegetable juice, opened	Discard
	Baked potatoes	Discard
	Commercial garlic in oil	Discard
	Potato salad	Discard
	Casseroles, soups, stews	Discard

Source: FoodSafety.gov, U.S. Department of Health and Human Services, http://www.foodsafety.gov/keep/charts/refridg_food.html

Table 4: Evaluating Freezer Foods

Food Categories	Specific Foods	Still contains ice crystals and feels as cold as if refrigerated (Use a food thermometer to verify actual temperature.)	Thawed and held above 40°F for more than 2 hours
	Beef, veal, lamb, pork, ground meats	Refreeze	Discard
Meat, poultry, seafood	Poultry and ground poultry	Refreeze	Discard
	Variety meats (liver, kidney, heart, chitterlings)	Refreeze	Discard
	Casseroles, stews, soups	Refreeze	Discard
	Fish, shellfish, breaded seafood products	Refreeze. However, there will be some texture and flavor loss.	Discard
	Milk	Refreeze. May lose some texture.	Discard
	Eggs (out of shell) and egg products	Refreeze	Discard
	Ice cream, frozen yogurt	Discard	Discard
Dairy	Cheese (soft and semi- soft)	Refreeze. May lose some texture.	Discard
	Hard cheeses	Refreeze	Refreeze
	Shredded cheeses	Refreeze	Discard
	Casseroles containing milk, cream, eggs, soft cheeses	Refreeze	Discard
	Cheesecake	Refreeze	Discard
Fruit	Juices	Refreeze	Refreeze. Discard if mold, yeasty smell, or sliminess develops.
	Commercially or home packaged	Refreeze. Will change texture and flavor.	Refreeze. Discard if mold, yeasty smell, or sliminess develops.
Vegetables	Juices	Refreeze	Discard after held above 40°F for 6 hours.
	Home or commercially packaged or blanched	Refreeze. May suffer texture and flavor loss.	Discard after held above 40°F for 6 hours.
Bread, pastries	Breads, rolls, muffins, cakes (without custard fillings)	Refreeze	Refreeze
	Cakes, pies, pastries with custard or cheese fillings	Refreeze	Discard
	Pie crusts, commercial and homemade bread dough	Refreeze. Some quality loss may occur.	Refreeze. Quality loss is considerable.
Other	Casseroles – pasta, rice based	Refreeze	Discard
	Flour, cornmeal, nuts	Refreeze	Refreeze
	Breakfast items – waffles, pancakes, bagels	Refreeze	Refreeze
	Frozen meal, entree, specialty items (pizza, sausage and biscuit, meat pie, convenience foods)	Refreeze	Discard

Source: FoodSafety.gov, U.S. Department of Health and Human Services, http://www.foodsafety.gov/keep/charts/frozen_food.html

How Do I Get Rid of Odors in a Refrigerator or Freezer?

Strong food odors may develop as a result of food spoilage during a power failure. Because the refrigerator or freezer must be empty and unplugged when cleaning, the best time to combat these odors is before restocking foods. Try these ideas for removing unwanted odors:

- Use one of the following solutions to wash the interior walls of the refrigerator or freezer, then rinse with water and dry. Do not combine any of these household chemicals because it could result in toxic fumes that could be fatal. Check with your local public health officials for specific recommendations.
 - ▷ Vinegar: 1 cup per gallon of water
 - ▷ *Household ammonia*: 1 cup per gallon of water
 - ▷ *Chlorine bleach*: ½ cup per gallon of water
- Take out all removable parts and wash with mild soap and water.
- Fill a large shallow container with vinegar. Set in refrigerator or freezer several hours. If odor persists, allow it to remain for two to three days, changing vinegar every eight hours.
- Try activated charcoal, available at a pharmacy or pet supply store, to absorb lingering odors. Place the charcoal in large shallow pans or on paper in the bottom of the refrigerator or freezer. Leave for several days, changing the charcoal every few days. After the odor disappears, rinse and dry the interior before replacing food.

Is Food that Has Been in a Flood Safe?

Floodwaters may carry silt, raw sewage, oil, or chemical waste. Being prepared is the key to keeping food safe during a flood. Most flood damage occurs in basements or in the lowest four feet of the first floor, where food is often stored. Depending on the amount of time you have in a flood warning, consider moving stored food to an upper level or to a secure place five feet above floor level. Keep in mind that floodwater in the home will most likely topple tables and unsecured furniture or cabinets, so any food stacked in these locations will likely be tossed into the floodwaters.

Here are ways to prevent floodwater from coming into contact with food:

- Place cement blocks under the corners of refrigerators and freezers to raise them.
- Move food from low cabinets to higher ones.
- Move canned goods and other food stored in the basement to areas upstairs that are at least five feet above floor level.

Consider that you may not be able to return to your home for as long as a week or two as floodwaters recede. In this

Remember—When in doubt, throw it out!

case, almost all foods in the home will likely be unsafe. If there is any chance that food items have come into contact with floodwaters, use the following chart to determine their safety.

- Discard:
- meat, poultry, fish, and eggs
- fresh produce
- any food in containers that are not waterproof, including those with screw caps, snap lids, pull tops, and crimped caps
- all food in cardboard boxes, paper, foil, cellophane, or cloth
- spices, seasonings, and extracts
- home-canned food
- opened containers and packages
- flour, sugar, and other staples in canisters
- cans that are dented, leaking, bulging, or rusted Save:
- Undamaged canned goods are safe if you sanitize the containers using these instructions:

Instructions for sanitizing flooded foods sealed in cans

- 1. Mark contents on can with indelible ink.
- 2. Remove labels. Paper can harbor dangerous bacteria.
- 3. Wash cans in a strong detergent solution with a scrub brush.
- 4. Immerse cans for 15 minutes in a solution of 1 tablespoon chlorine bleach per quart of room-temperature water.
- 5. Allow cans to air dry before opening.

IMPORTANT: During an emergency, remember to follow instructions from local public health officials on the use of bleach with chlorine, its disposal, and possible alternative products for sanitizing.

You will also need to sanitize all dishes, glassware, cookware, and utensils that were in contact with floodwaters. For instructions about how to sanitize specific items, contact individual manufacturers for recommendations. Otherwise, follow the general guidelines below.

- 1. Start by discarding and replacing dishes, baby bottles, utensils, and other food storage or handling items made of plastic or wood.
- For the remaining items, clean by thoroughly scrubbing and rinsing dishes to remove dirt and debris. Wash dishes in a strong detergent solution with a

scrub brush. Disinfect metal pans and utensils by boiling them in water for 10 minutes and/or by using the bleach solution noted in the next step (#3).

- 3. Items should be immersed in a solution of 1 tablespoon of chlorine beach per gallon of drinking water for 15 minutes.
- 4. Allow containers to air dry, or if you have a dishwasher, use it for the final cleaning.

IMPORTANT: During an emergency, remember to follow instructions from local public health officials on the use of bleach with chlorine, its disposal, and possible alternative products for sanitizing.

Can I Eat Food that Has Been in a Fire?

Fires can seriously compromise the safety of food. Three factors can affect food that has been exposed to fire: the heat of the fire, smoke and fumes, and chemicals used to fight the fire. Food in cans or jars may seem "OK" but may, in fact, be inedible since high temperatures can activate food spoilage bacteria. One of the most dangerous elements of a fire is the toxic fumes released from burning materials. These fumes can contaminate food. Chemicals used to fight fires also contain toxic materials and can contaminate food and cookware. The expression "When it doubt, throw it out" is especially true for food that may have been exposed to fire, smoke, or fumes because there are too many unseen effects that might not alter the look of the food or container but could affect the quality of the food. Below are some guidelines for checking the safety of food after a fire:

- Throw away any food stored in permeable packaging, such as cardboard, plastic wrap, screw-top jars, bottles, etc. Toxic fumes, smoke, and chemicals can penetrate the packaging and contaminate the food.
- Discard any raw foods stored outside the refrigerator, such as potatoes or fruit, which could be contaminated by toxic fumes, smoke, and chemicals.
- Check for odors in the refrigerator and freezer. Because the seal is not airtight, fumes can contaminate foods within. If foods from your refrigerator or freezer have an off-flavor or odor, throw them away.
- Decontaminate canned goods and cookware exposed to fumes, smoke, or chemicals using the instructions for sanitizing after a flood.

Where Can I Get Additional Information?

While most people think natural disasters will never strike them, more than 800,000 Americans are affected by such catastrophes each year. Loss of electrical power and refrigeration as well as chemical and bacterial contamination can jeopardize food and put people at risk for food poisoning. If you have additional questions on how to safely store food before an emergency and how to handle food safely during and after an emergency, please contact your Purdue Extension county office or local public health office.

References

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http://www.fsis.usda.gov/wps/portal/fsis/topics/foodsafety-education/get-answers/food-safety-fact-sheets/ emergency-preparedness/a-consumers-guide-to-foodsafety-severe-storms-and-hurricanes/ct_index

- "Keep Food and Water Safe After a Disaster or Emergency" web page, Centers for Disease Control and Prevention http://emergency.cdc.gov/disasters/foodwater/facts.asp
- "Keeping Food Safe During an Emergency" web page,
 - USDA Food Safety and Inspection Service http://www.fsis.usda.gov/wps/portal/fsis/topics/foodsafety-education/get-answers/food-safety-fact-sheets/ emergency-preparedness/keeping-food-safe-during-anemergency/CT_Index
- "Food Safety: In an Emergency" web page, FoodSafety. gov—www.foodsafety.gov/keep/emergency/

Ready website, Federal Emergency Management Agency www.ready.gov

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