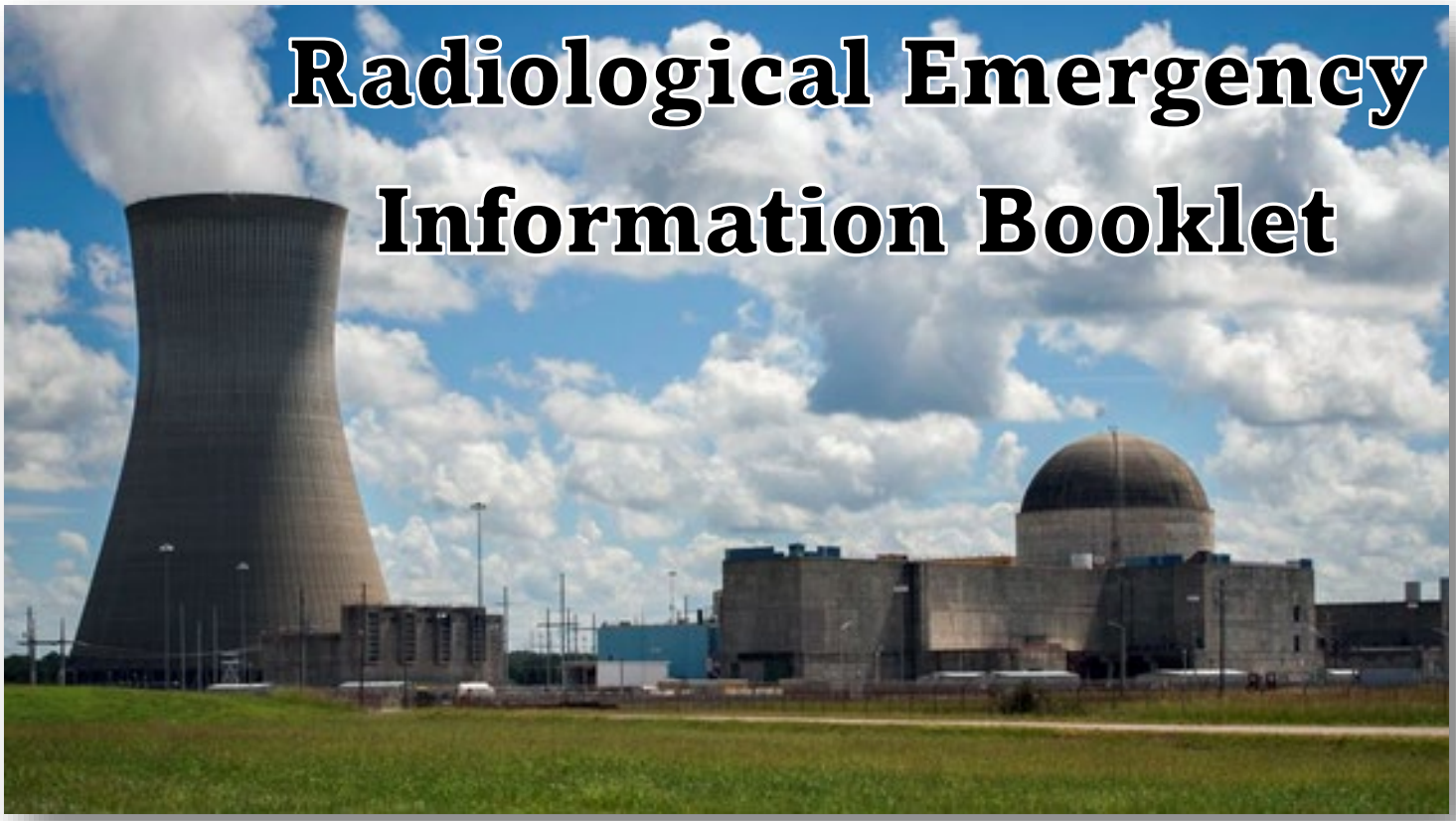
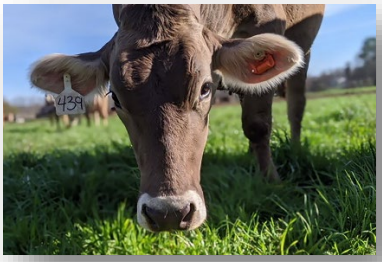


Radiological Emergency Information Booklet

For Farmers, Food Processors, and Distributors



North Carolina Department of Agriculture and Consumer Services

https://www.ncagr.gov/oep/Prepare

Published July 2022

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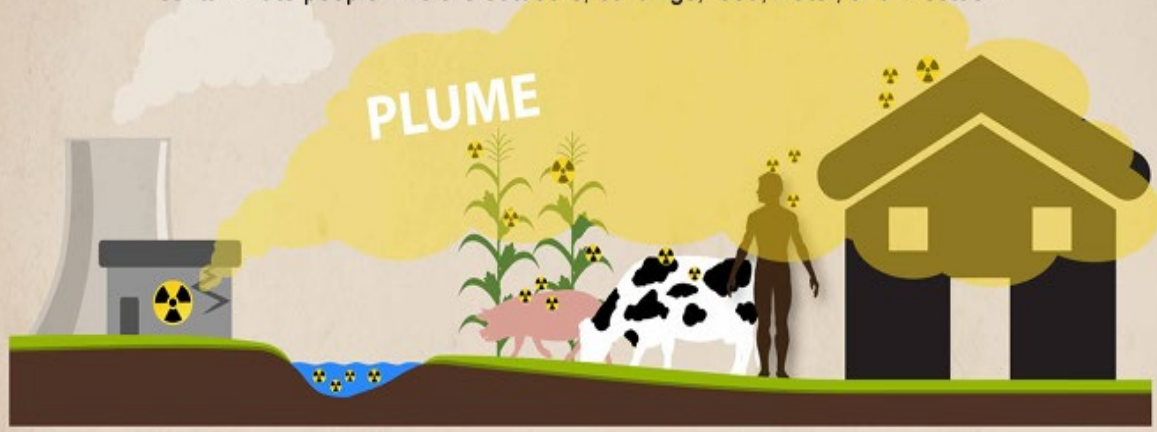
Contents

NUCLEAR POWER PLANT ACCIDENTS

Nuclear power plants have safety and security procedures in place and are closely monitored by the Nuclear Regulatory Commission (NRC). An accident at a nuclear power plant could release dangerous levels of radiation over an area (sometimes called a plume).

What are the main dangers of nuclear power plant accidents?

Radioactive materials in the plume from the nuclear power plant can settle and contaminate people who are outdoors, buildings, food, water, and livestock.



Radioactive materials can also get inside the body if people breathe it in, or eat or drink something that is contaminated.

People living close to the nuclear power plant who are exposed to radiation could experience long-term health effects such as cancer.

What should I do to protect myself during a nuclear power plant accident?

If you live near a nuclear power plant, you can get emergency information materials from the power company that operates your local nuclear power plant or your local emergency services office.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

http://emergency.cdc.gov/radiation

Introduction

While it is unlikely that a nuclear power plant accident will occur, it is important to be prepared. An accidental release of radioactive material into the environment could pose a risk to public health and impact agriculture. The purpose of this booklet is to provide guidance to members of the agricultural community located within 50 miles of a nuclear power plant. It describes the actions that may be recommended to protect your family, farm animals, and agriculture products if a radiological emergency occurs.

Note: While the primary hazard addressed in this booklet is radiological contamination, the same precautionary measures and protective actions may apply to other hazardous materials incidents. Contact your local agriculture and environmental health officials for recommendations when necessary.

Emergency Notifications

In the event of a nuclear power plant emergency, state and local officials will use the Emergency Alert System (EAS) to broadcast information through radio and television outlets. Local officials may also use the Integrated Public Alert and Warning System (IPAWS) to provide text and audible messages to cell phones in the area. Additional information will be provided to news media and may be posted on official government websites and social media. These messages will provide specific instructions to protect the health and safety of the population at risk. If the emergency has the potential to affect agriculture and food production, instructions for farmers will also be provided.

Radiation

Radiation is both naturally occurring and man-made. Radiation is in the air we breathe, the food we eat, the soil, our homes, sunshine, and even our bodies. The radiation existing naturally in our environment is called background radiation.

We are also exposed to man-made sources of radiation, such as medical and dental X-rays, CT and PET scans, and cardiac stress tests. Consumer products such as tobacco products, smoke detectors, lantern mantels and building supplies also contain radiation.

Each of us receives an average of 620 or more units of radiation called millirem each year. Half of this dose comes from background radiation while the other half comes from man-made sources.

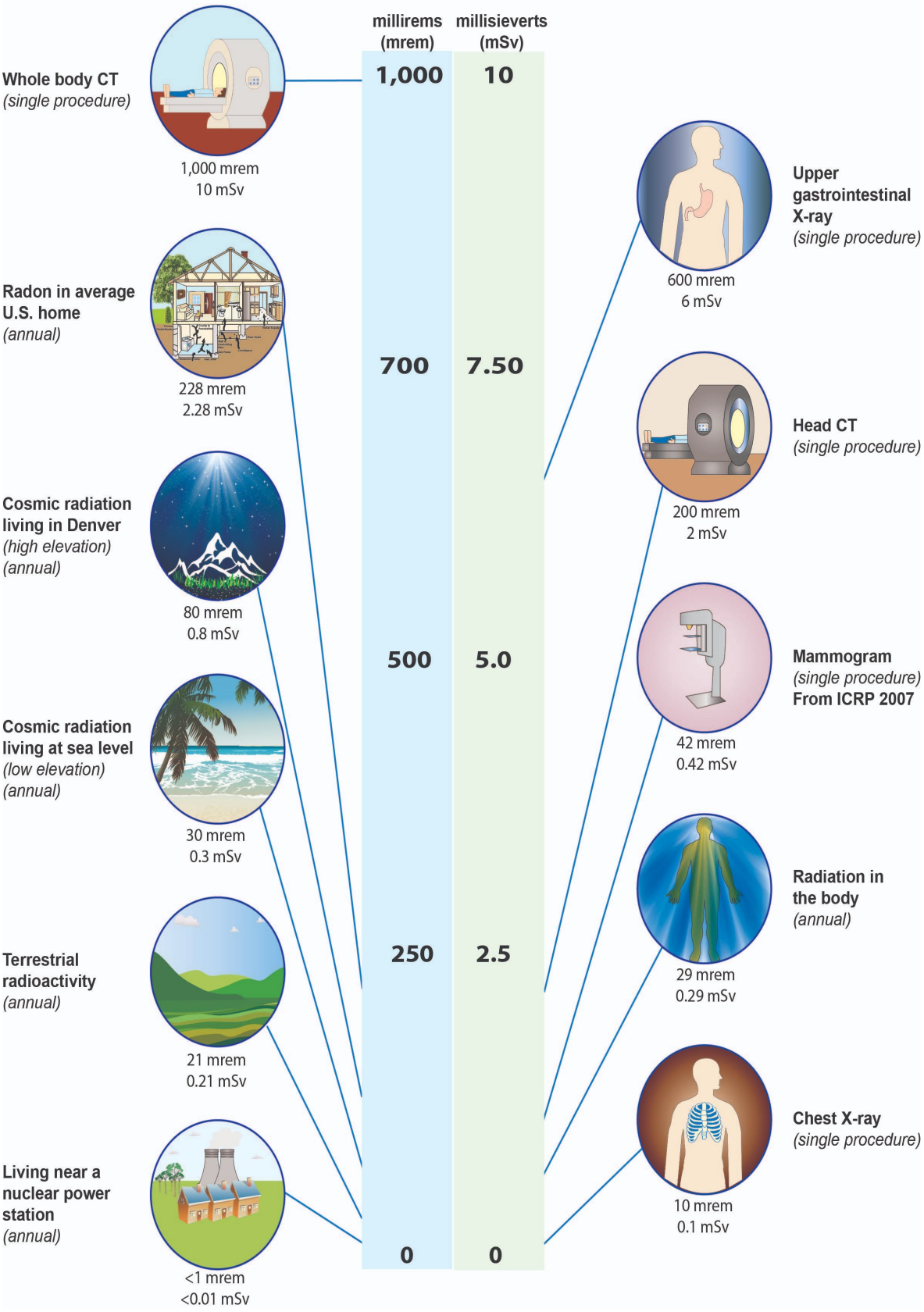
Forms of Radiation

There are two basic physical forms of radiation:

Particle radiation is tiny fast-moving particles that have both energy and weight. This form of radiation includes **alpha particles**, **beta particles**, and **neutrons**.

RELATIVE DOSES FROM RADIATION SOURCES

All doses from the National Council on Radiation Protection & Measurements, Report No. 160 (unless otherwise denoted)



Electromagnetic radiation is pure energy with no weight. **This form of radiation** has pulsating rays or "waves" of electrical and magnetic energy. Familiar types of electromagnetic radiation include sunlight, **X-rays**, radar, microwaves, infrared, and radio waves.

Exposure

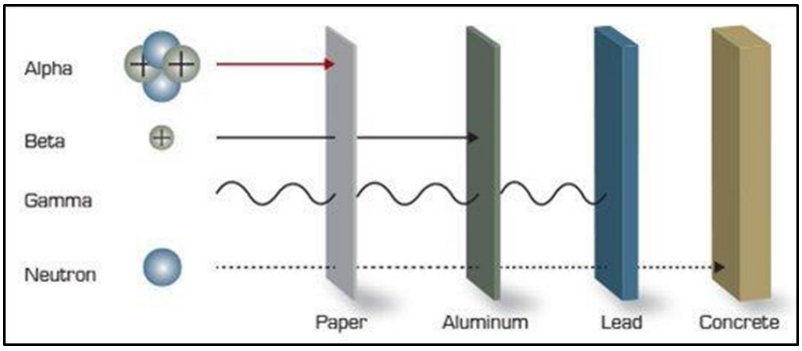
Our bodies have been designed to deal with the low levels of naturally occurring radiation we are exposed to every day, but too much radiation can be harmful. Being exposed to a lot of radiation over a short period of time, such as nuclear power plant **emergency**, can cause damage to our bodies.

Avoiding Exposure

The guiding principle of radiation safety is "ALARA". ALARA stands for "as low as reasonably achievable". ALARA means avoiding exposure to radiation that does not have a direct benefit to you, even if the dose is small.

To do this, you can use the three basic protective measures in radiation safety: time, distance, and shielding.

- **Time** - Simply refers to the amount of time you spend near a radioactive source. Reducing the amount of time you spend near a radioactive source will decrease the dose.
- **Distance** - Refers to how close you are to a radioactive source. If you increase your distance, you decrease your dose.
- **Shielding -** To shield yourself from a radiation source, you need to put something between you and the radiation source such as a wall, plexiglass, lead, etc.
  The type of shielding that is effective will depend on the type of radiation.



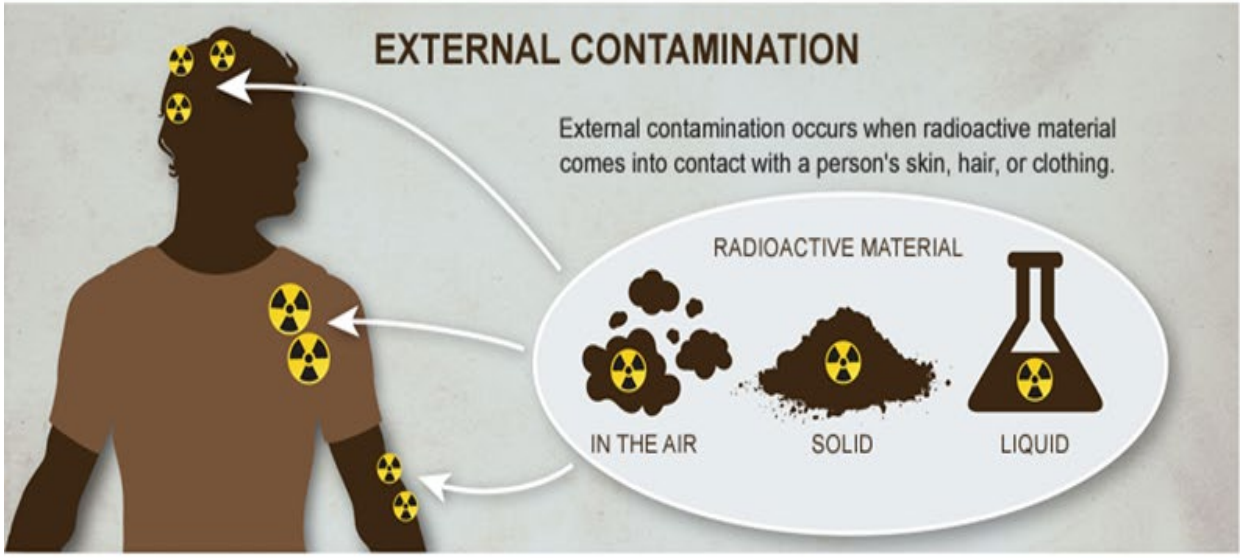
Contamination

Contamination is an undesirable radioactive material that is either airborne or deposited on the surface of structures, objects, soil, water, plants, people, or animals in a concentration that may be harmful.

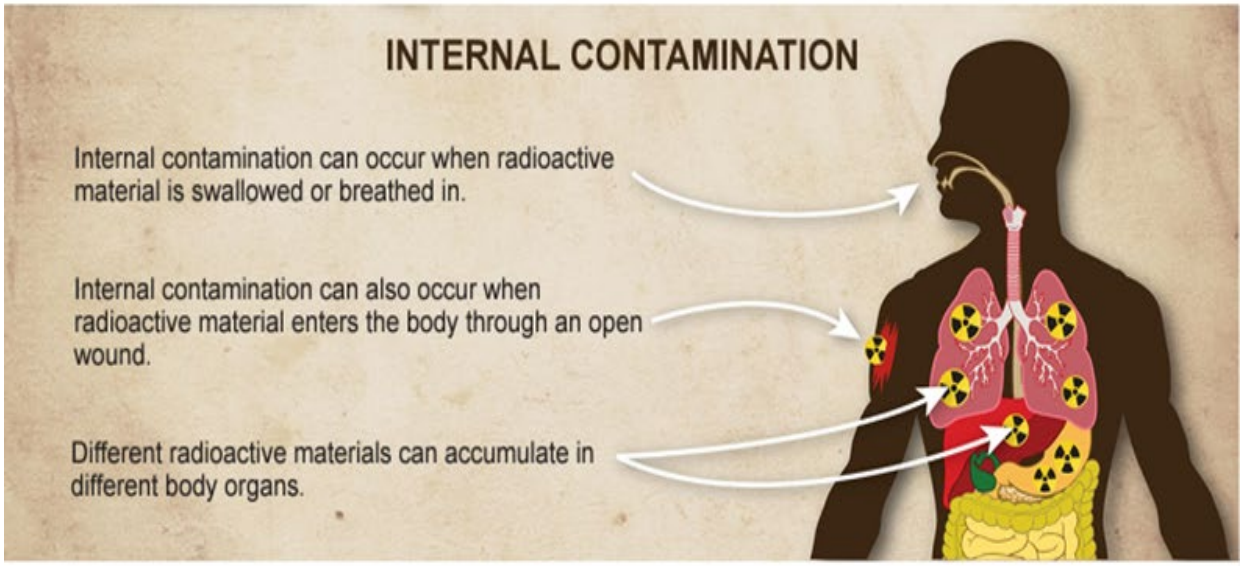
- A person is **externally** contaminated if radioactive material is on the skin or clothing.
- A person is **internally** contaminated if radioactive material is inhaled, swallowed (ingested), or absorbed through wounds.

RADIATION CONTAMINATION VERSUS EXPOSURE

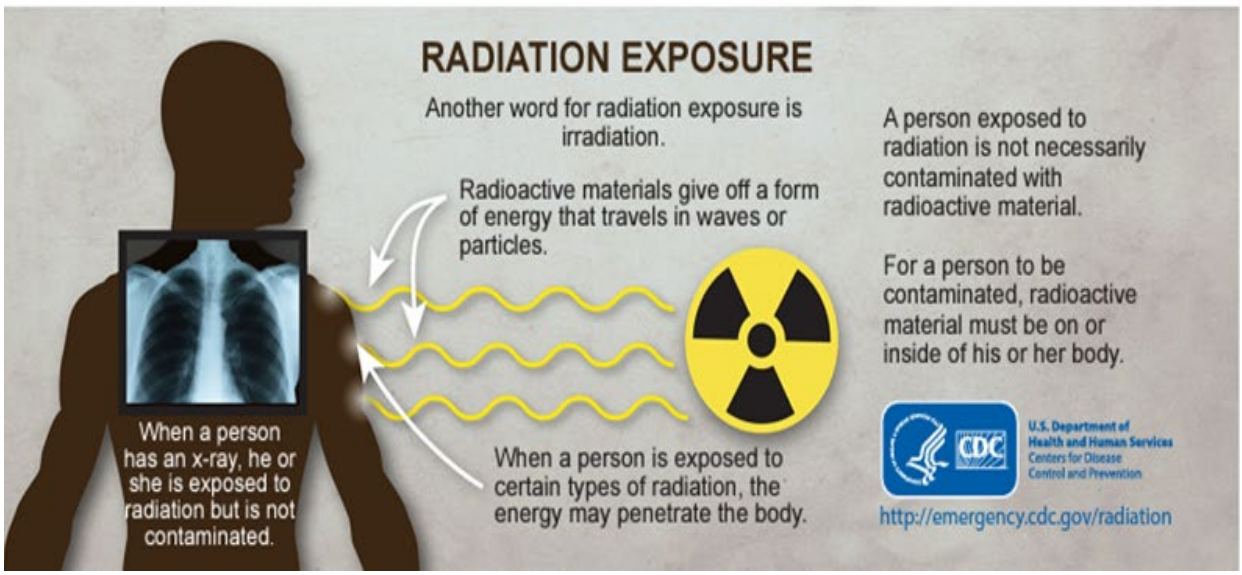
EXTERNAL CONTAMINATION



INTERNAL CONTAMINATION



RADIATION EXPOSURE



A nuclear power plant emergency may involve an unplanned release of tiny radioactive dust-like particles and gases. The radioactive particles can be spread by wind and eventually fall to earth potentially contaminating food, feed, and water supplies.

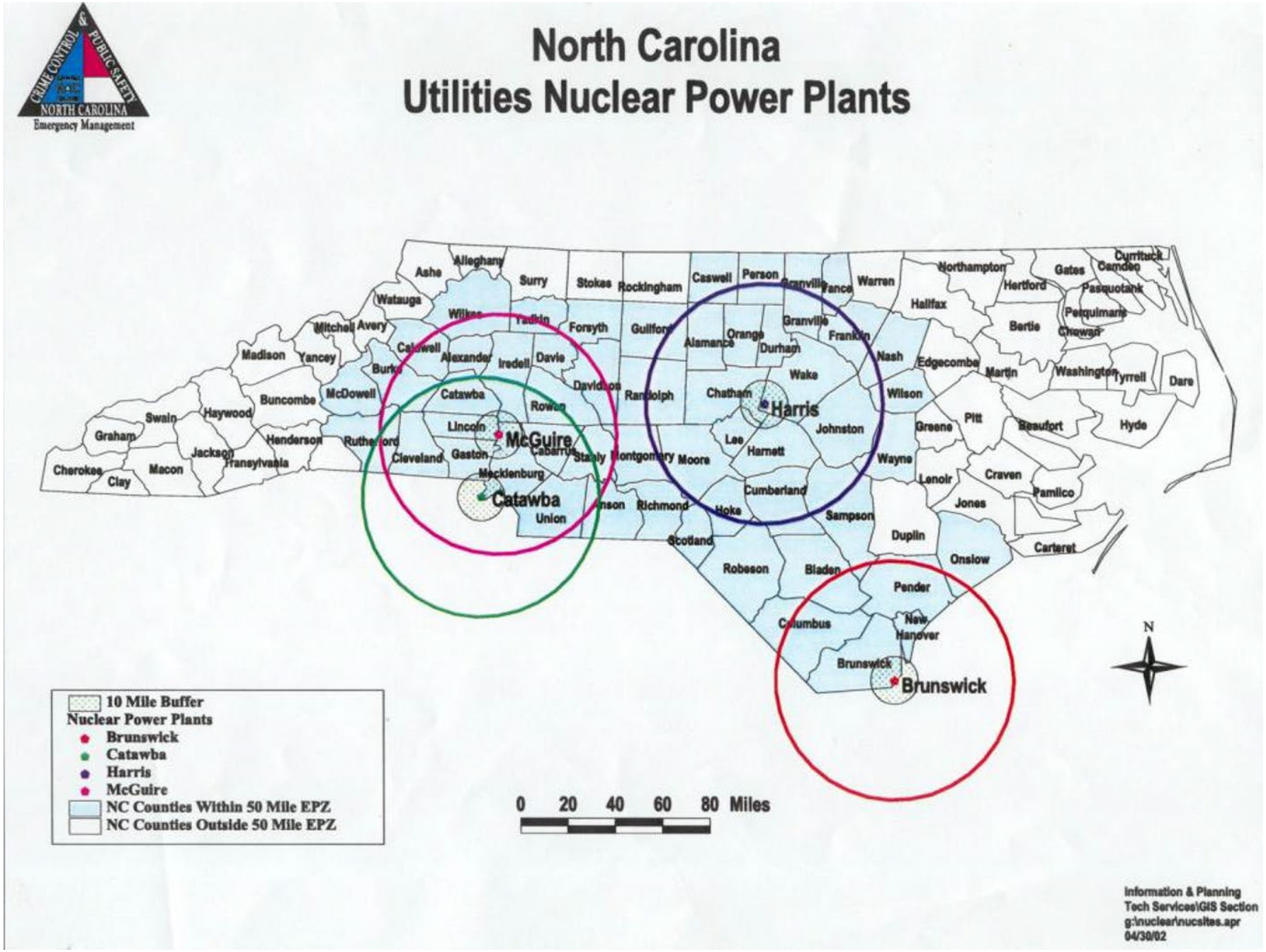
The distance the particles may travel is dependent on weather conditions, the heaviest particles may fall more quickly than light particles. Rain or snowfall could increase the rate at which the particles fall - creating some areas of higher concentration.

Crops, livestock, feed, uncovered water supplies, and land could be contaminated above established safety levels. When these levels are exceeded, the food is considered to be adulterated. Eating contaminated foods and drinking contaminated milk or water could have a harmful, long-term effect on your health.

Emergency Planning

Emergency preparedness personnel from nuclear power plants and all levels of government work together continuously to protect against the threat of a possible radiation accident. Detailed emergency plans for each power plant and each county within 50 miles are continuously reviewed and revised as needed. Each plan includes two emergency planning zones around the nuclear power plant.

- The **Plume Emergency Planning Zone** covers a radius of approximately 10 miles around the plant. Planning for this zone focuses mainly on the risks to public health associated with direct exposure to radiation and the potential need for evacuation or sheltering.
- The **Ingestion Pathway Emergency Planning Zone** covers a radius of approximately 50 miles around the plant. Planning for this zone focuses mainly on the risks to public health from contamination, more specifically internal contamination by ingestion of contaminated food and drink.


North Carolina
Utilities Nuclear Power Plants
CRIME CONTROL & PUBLIC SAFETY
NORTH CAROLINA
Emergency Management
Ashe
Alleghany
Surry
Stokes
Rockingham
Caswell
Person
Granville
Vance
Warren
Northampton
Gates
Camden
Currituck
Hertford
Pasquotank
Halifax
Perquimans
Bertie
Chowan
Watauga
Wilkes
Yadkin
Forsyth
Guilford
Alamance
Orange
Durham
Franklin
Nash
Edgecombe
Martin
Washington
Tyrrell
Dare
Hyde
Beaufort
Pitt
Greene
Wilson
Johnston
Wake
Chatham
Harris
Lee
Harnett
Wayne
Lenoir
Craven
Pamlico
Jones
Carteret
Onslow
Duplin
Sampson
Cumberland
Moore
Montgomery
Stanly
Cabarrus
Rowan
Davidson
Randolph
Iredell
Davie
Alexander
Caldwell
Mitchell
Avery
Madison
Yancey
Burke
McDowell
Buncombe
Haywood
Swain
Graham
Jackson
Transylvania
Henderson
Rutherford
Cleveland
Gaston
Lincoln
McGuire
Catawba
Mecklenburg
Union
Anson
Richmond
Scotland
Hoke
Robeson
Bladen
Columbus
Brunswick
New Hanover
Pender
Macon
Clay
Cherokee
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Nuclear Power Plants
Brunswick
Catawba
Harris
McGuire
NC Counties Within 50 Mile EPZ
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Ingestion Pathway Emergency Planning Zone

During a nuclear power plant emergency, state and local officials will notify the public and advise the agricultural community (including food processors, distributors, and warehouse operators) on the protective actions to take to prevent or minimize radiological contamination from entering the human food chain.

Precautionary Protective Actions

Whenever possible, precautionary actions are communicated to the agricultural community in advance of a potential release of radioactive materials. This advanced communication is to allow time for farmers to protect their agricultural assets (e.g., livestock, milk, produce) and their workers, before individuals are asked to take shelter or leave the area. An example is moving dairy animals under shelter and placing them on stored feed and covered water prior to a release of radioactive materials occurring.

Emergency Protective Actions

Emergency Protective Actions are measures taken to isolate or contain agricultural products meant for human or animal consumption and prevent them from entering the food chain until they have been tested and determined to be safe. An example would be to restrict or withhold agriculture and dairy products from the marketplace by prohibiting their transportation out of the affected areas. This may be accomplished by a quarantine or temporary embargo placed by the North Carolina Department of Agriculture and Consumer Services on products from affected areas.

Recommended Actions You Can Take

Sheltering Animals

During a radiological emergency you may be advised to shelter animals. Move animals from pasture and shelter them in a barn or other structure where they can be protected from exposure and contamination. If closed-sided barns are not available, open-sided shelters with a roof will offer some protection from contamination. If time allows place hay, sacked feed, fertilizer, or other materials around the open sides to create a wall-like barrier. Densely forested areas may also offer some protection for animals that are not sheltered.

If shelter space and time are limited, you will need to prioritize animals. Lactating animals, dairy animals, breeding stock and your most valuable animals should be sheltered first. Bulls, steers, dry cows, and non-lactating animals may be a lower priority.

When there is no risk to animal welfare, set ventilation fans at a lower speed to minimize outside air contaminants from coming in.

Using Stored Feed and Covered Water

During a radiological emergency you may be advised to place animals on stored feed and covered water.

Why are the feed and water important?

When animals eat or drink contaminated feed or water, some radioactive materials may be passed along the food chain through their eggs, meat, or milk.

Feed

The use of feeds should be limited to those under cover or otherwise protected. Types of protected feed include:

- Grains stored in grain elevators, covered bins, or containers
- Hay stored in a barn or covered shed
- Hay bales covered by a tarp or barrier plastic or with outer layers discarded
- Feed that had been stored in a building
- Feed in a protected self-feeder
- Silage stored in a covered silo or trench

Water

You may also be advised to offer covered water. Some suggested water sources include:

- Covered wells
- Storage tanks
- Cisterns

Note: Disconnect rainwater collection and drainage systems from water storage containers. Open water sources such as rain barrels, troughs, and tanks should be covered to prevent contamination.

Dairy Animals

Whenever possible, animals used for milk production should be sheltered and given stored feed and covered water. This is due to radioactive material transferred from the animal into their milk.

If contamination is detected in the area, sampling teams may come to your farm to take milk, feed, and water samples for laboratory analysis to determine whether any of these products are contaminated. Do not drink milk or consume any dairy products from these animals until laboratory results are available.

Meat Animals

Meat-producing animals should be restricted from grazing on contaminated pastures. Ideally, only allow animals to eat protected feed, hay, silage, or grain. When grazing cannot be avoided, supplement with protected feeds to limit the amount of contamination ingested.

To the extent possible, prevent livestock from drinking from ponds, lakes, rivers, and streams. Provide water from covered sources such as a well or tank to avoid contamination.

Poultry

Eggs and poultry products are important food sources and should be protected to prevent contamination. Poultry raised indoors and fed stored feed and covered water are less likely to be contaminated. Poultry raised outside should be moved inside and placed on stored feed and covered water whenever possible.

When there is no risk to animal health and welfare, set ventilation fans at a low speed to minimize outside air contaminants from coming in.

All poultry, especially those kept for egg production, should be monitored by taking samples for laboratory testing to determine the presence of contamination.

Swine

Swine raised in buildings and fed stored feed and covered water are less likely to become contaminated. When there is no risk to animal health and welfare, set ventilation fans at a low speed to minimize outside air contaminants from coming in. For swine raised outside follow the same recommendations given for other meat animals.

Fruits and Vegetables

If contamination is detected in the area, ripe fruits and vegetables may be lost due to the risk involved in harvesting. Fruits and vegetables that do not need immediate harvesting could be picked and cleaned after officials have determined that the surface contamination has decreased to a safe level.

Fruits and vegetables should not be consumed or sold until you are told that it is safe to do so. Harvesting, processing, or consumption of wild foods such as mushrooms or berries should be controlled in the same manner as fruits, grapes, vegetables, and nuts.

Once it has been declared safe to so, harvested vegetables, fruits, pods, nuts, and leaves that are contaminated on the surface should be cleaned before being eaten. Wash, scrub, peel, or shell fruits, vegetables, nuts, roots, tubers, and grapes to remove surface contamination.

Canning, freezing, or storage of fruits and vegetables will also allow radioactive levels to decay.

Note: Washing contaminated fruits and vegetables should be done in a place other than the kitchen to prevent possible cross-contamination with other foods, utensils, and counter surfaces.

Milk

If dairy products are found to be contaminated, those products will be withheld from the market. It is possible, however, for milk products contaminated with certain radioactive materials to be safe for human consumption after a measured period of time. Freezing and storing fluid milk and other milk products such as butter, cheese, dry milk, and evaporated milk for a measured period of time may allow for the necessary amount of radioactive decay.

Bees

Honey and beehives will need to be sampled and analyzed by appropriate state officials if radioactive contamination is detected in the area. Information will be provided on how to handle the hives and honey.

Grains

If grains (and hay) are permitted to grow to maturity, a good portion of the contamination may be removed by the wind and rain. Milling or polishing will likely remove any remaining contamination. It can take a month from the time grains are harvested until they reach the consumer, sampling and laboratory analysis will determine if the grain is safe to use. When harvesting potentially contaminated grain, it should be stored separately from grain harvested and stored before the release.

Farmed Fish and Shellfish

Fish, shellfish, and other aquatics raised in ponds may continue to be harvested unless state officials have determined through laboratory analysis of samples that they are contaminated. Samples of fish, water, and marine life from ponds and open bodies of freshwater and saltwater should be analyzed to ensure that they are safe to consume.

Soil

It is anticipated that most land would be able to return to normal agricultural use within several weeks or months following radiological contamination. The exact length of time that the land remains contaminated would depend on the amount and type of radioactive deposition.

State officials will provide guidance on proper soil management procedures that can be implemented to reduce contamination to safe levels.

- **Idling** (the non-use of the land) for a specific period of time may be necessary in some cases.
- **Deep plowing** of the soil can move radioactive substances below plant root level, preventing plants from taking up contaminated nutrients, and allowing the level of radioactivity to decrease over time.
- **Alternative crops,** such as fiber crops, can be grown in place of food crops in some situations.

Note: Radioactive decay is a natural process whereby radioactivity becomes reduced over time. Some radioactive elements reduce to a harmless level in a relatively short time.

Protecting Yourself and Your Employees

People who continue to work on farms and in gardens may be advised to take protective actions to reduce the possibility of further contamination.

To minimize contact, inhalation, or ingestion of radioactive contamination from vegetation or soil, and to avoid bringing it into living spaces, you may be advised to take the following actions:

- Wear clothing such as coveralls, gloves, and hats while working outside.
- Avoid activities that can stir up contamination such as plowing, digging, burning, or mowing. Wear a dust mask to avoid inhalation when engaged in these activities.
- Do not eat, drink, or use tobacco products while working outside.
- Wash hands and shower after completing outside activities.
- Wash outer clothing.

Packaged and Stored Food in Your Home

Radioactivity will travel as fine particles that may coat the outside of food product containers. Food in finished packaging should not be harmful to eat as long as the outer wrappings are discarded. Food that was stored inside pantries, refrigerators, cellars, and other containment before the radiological emergency is consumable.

Processors, Warehouses, and Commodity Terminals

Following a radiological emergency, officials may restrict the movement of food products from the affected area and withhold them from the marketplace (i.e., embargo).

These products may not be released for use or distribution until they are determined to be safe for consumption or until a decision is made to dispose of them.

Processors—State officials may take samples of food, produce, and finished products for contamination analysis. After testing, they will determine if products are safe for processing and distribution.

Warehouses, Terminals, and Distributors – State officials may inspect shipments to check for contamination. After testing, they will determine if the shipment is safe for distribution.

Food warehouses, terminals, and distributors may act to minimize contamination at their facilities by:

- Shutting down the air intake and or vacuum system.
- Closing windows and doors, and
- Implementing procedures to monitor incoming food ingredients.

Re-Entry, Relocation, Return, Recovery

The following describes post-emergency actions that may take place if a radiological release has occurred and contamination has been identified.

Restricted Zone(s) are designated areas from which the population has been evacuated or relocated, and access is controlled.

Re-entry is the temporary entry, under controlled conditions, into a restricted zone where contamination is present. If you are evacuated you may be allowed to re-enter the restricted zone temporarily to perform essential tasks such as milking, watering, and feeding farm animals. The amount of time and frequency allowed for re-entry will be determined based on radiation levels in the area. Individuals will be required to enter and leave the restricted area through designated access control points where further instructions will be provided.

Relocation is where populations move/relocate away from an area where deposited radioactive materials exceed protective action guidelines. Relocation may also occur if critical infrastructure (e.g., emergency services, water, power, sewer, etc.) is insufficient to support the population.

Return is the orderly reoccupation of areas that were evacuated during the emergency phase or populations that were relocated during the post-emergency phase.

Recovery is the process of reducing radiation in the environment to acceptable levels for normal daily living. Following the emergency, federal, state, and local government officials will continue to take samples of air, water, soil, crops, and animal products from your farm or business. You will be provided with instructions and assisted with the decontamination of your animals, food, and property if such actions are necessary.

Temporary Embargoes may be put in place to restrict the movement of food products and withhold them from the marketplace if they are found to be contaminated. These products should not be released until they are safe for consumption, or until a decision is made to dispose of them. You will be instructed on how to safely handle and dispose of contaminated food products and how to decontaminate your animals, food, and property if such actions are necessary.

Contaminated food is isolated (temporary embargoed) to prevent its introduction into the marketplace. Federal, state, and local government officials will work together to determine whether condemnation and disposal are appropriate.

Condemnation is the designation of agricultural products as unfit for consumption, as determined by federal or state government officials.

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