Illinois Emergency Management Agency

50-Mile Ingestion Pathway
food, water and milk control after a nuclear power station accident

William Conway, Ken Evans and Chad Gessner

September 7, 2016

Focus

The 50-mile Ingestion Pathway Emergency Planning Zone (EPZ) around Illinois' nuclear power stations.

Food, water and milk control following a nuclear power station accident.

The targeted audience for this session is response agencies and governmental entities within 50 miles of a nuclear power station.

Objectives

- Provide a basic understanding of the Ingestion Pathway Zone (IPZ) planning and response activities.
- Increase awareness and involvement in IPZ planning and training.
- Provide a starting point for enhancing IPZ preparedness and coordination.

Introduction

Radiological Emergency Preparedness (REP) Program

- The program is required by federal regulation – 44 CFR 350.
- Program focus is emergency response planning around nuclear power stations.
- Generally, planning and exercising concentrates on immediate emergency response within 10 miles of the nuclear power station.
- Ingestion Pathway Exercises are required only once every eight years per state.

Nuclear Power Stations in Illinois

Byron NPS
Ogle & Winnebago Counties

Zion NPS
(Currently being Decommissioned)

LaSalle NPS
Grundy & LaSalle Counties

Quad Cities NPS
Rock Island & Whiteside Counties

Dresden NPS
Grundy, Kendall & Will Counties

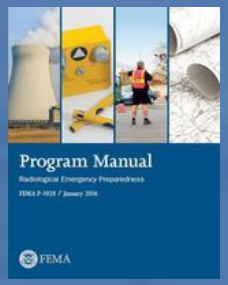
Braidwood NPS
Grundy, Kankakee & Will Counties

Clinton NPS
DeWitt, Macon, McLean & Piatt Counties

Exelon Generation

Definition

What is an Ingestion Exposure Pathway Emergency Planning Zone -commonly known as an Ingestion Pathway Zone (IPZ)?

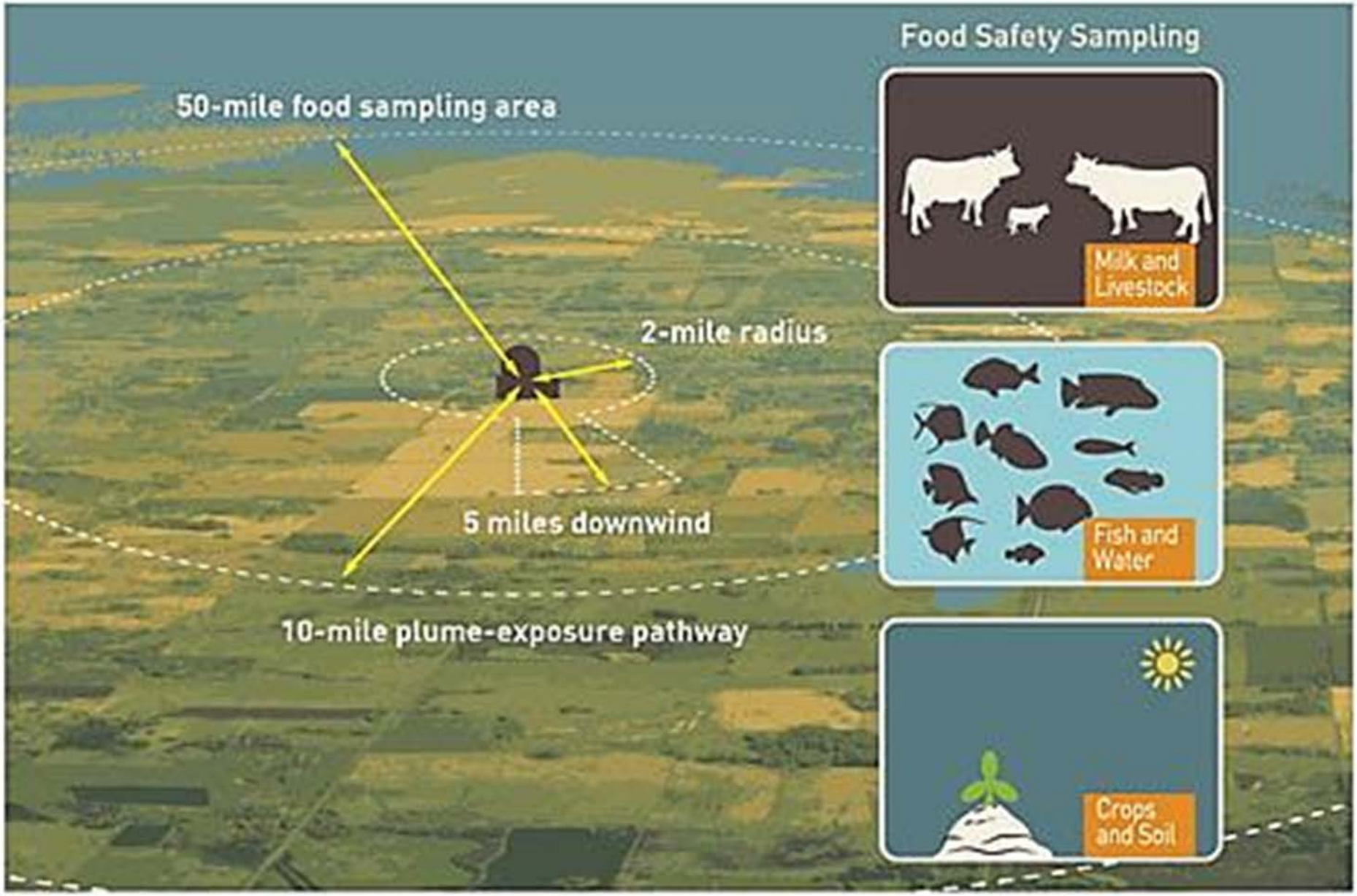


"A geographic area, approximately 50 miles in radius surrounding a commercial nuclear power plant, in which it has been estimated that the health and safety of the general public could be adversely affected through the ingestion of water or food which has been contaminated through exposure to radiation primarily from the deposition of radioisotopes after a radiological accident. The duration of such exposures could range in length from hours to months"

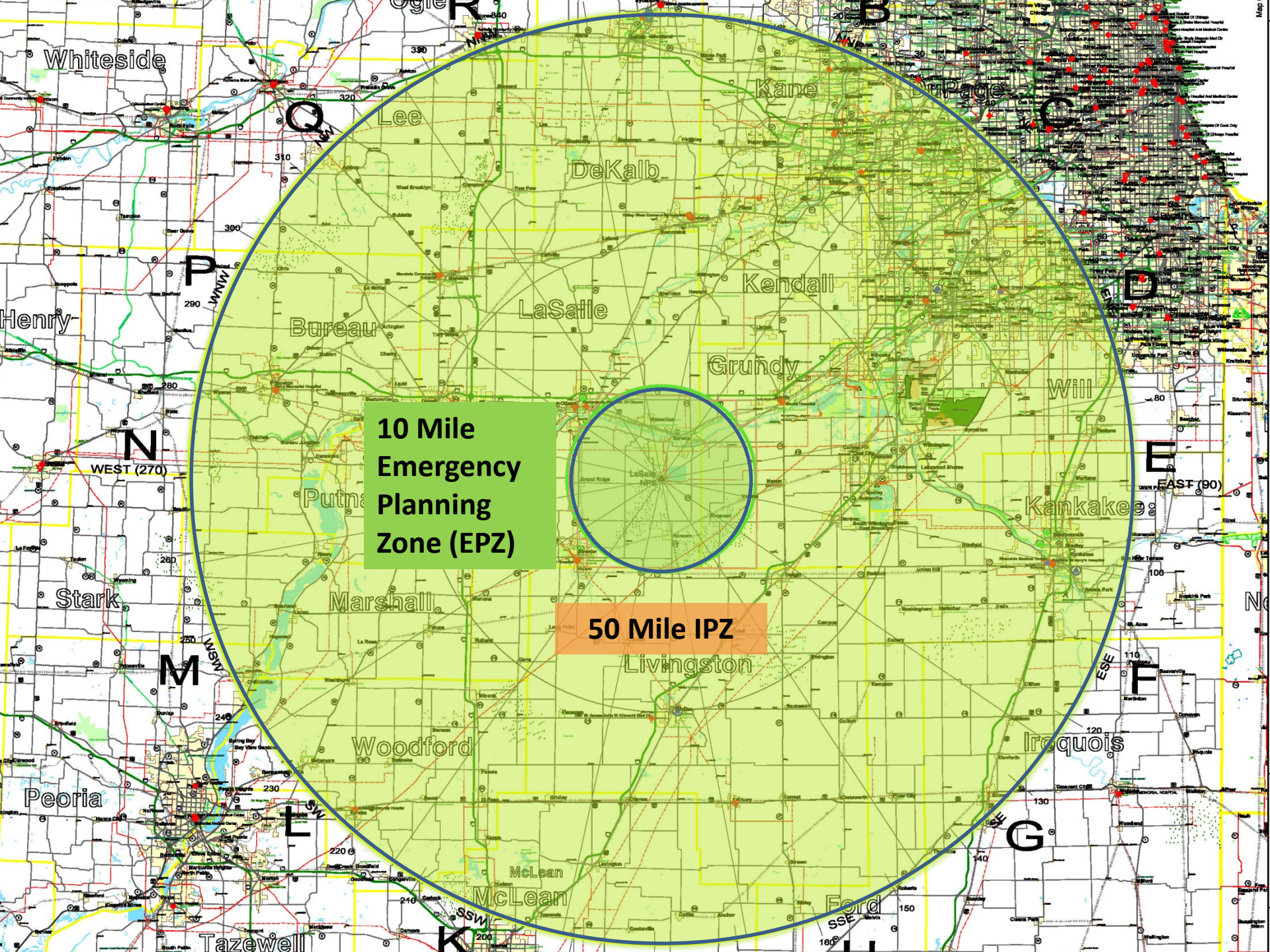
January 2016 REP Manual

Emergency Planning Zones

U.S.NRC
United States Nuclear Regulatory Commission



Note: A 2-mile ring around the plant is identified for evacuation, along with a 5-mile zone downwind of the projected release path.


10 Mile Emergency Planning Zone (EPZ)
50 Mile IPZ
Whiteside
Lee
DeKalb
Kane
Kendall
LaSalle
Bureau
Grundy
Will
Henry
Putnam
Kankakee
Stark
Marshall
Livingston
Woodford
Iroquois
Peoria
McLean
Ford
Tazewell
WEST (270)
EAST (90)
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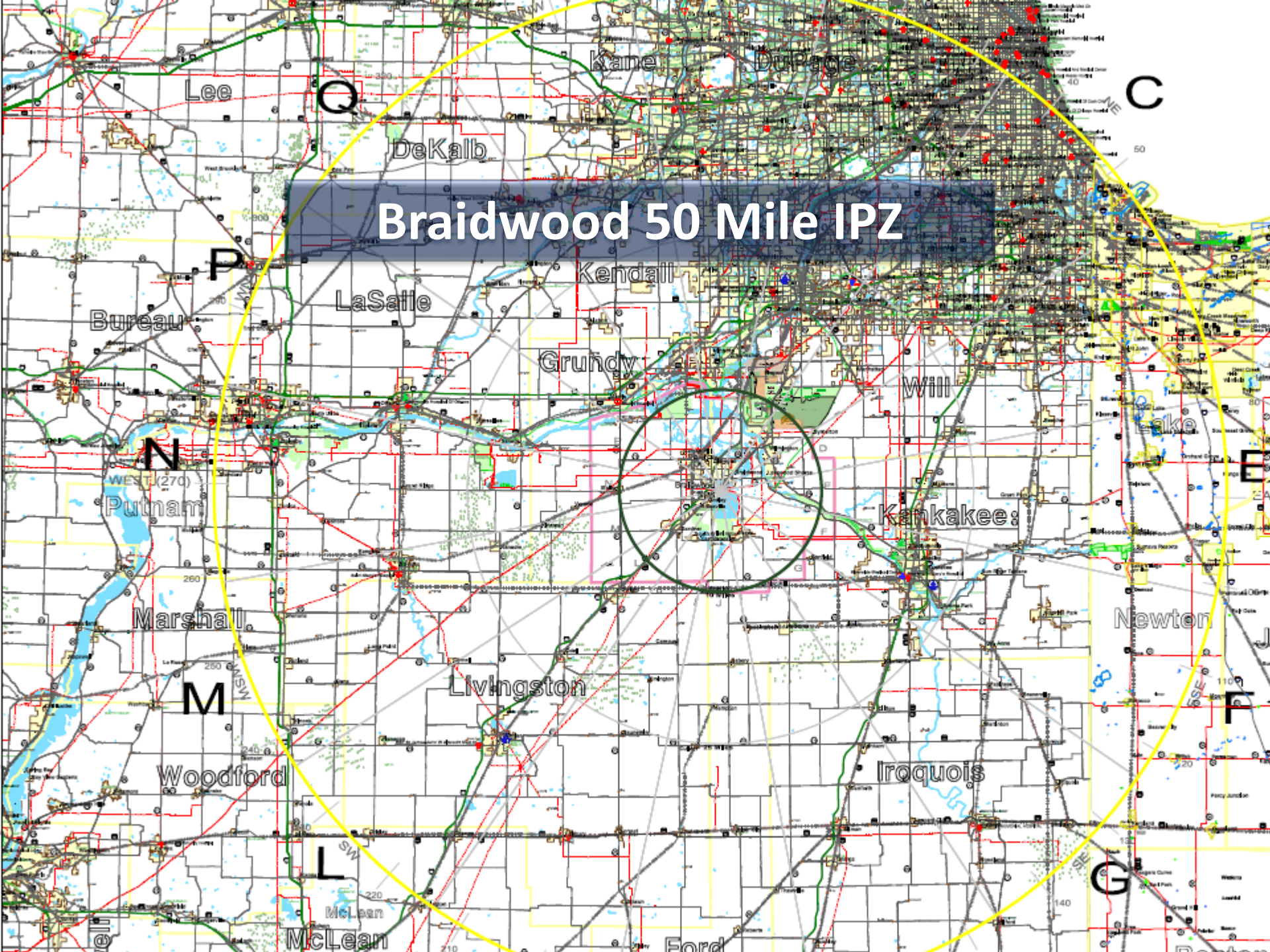
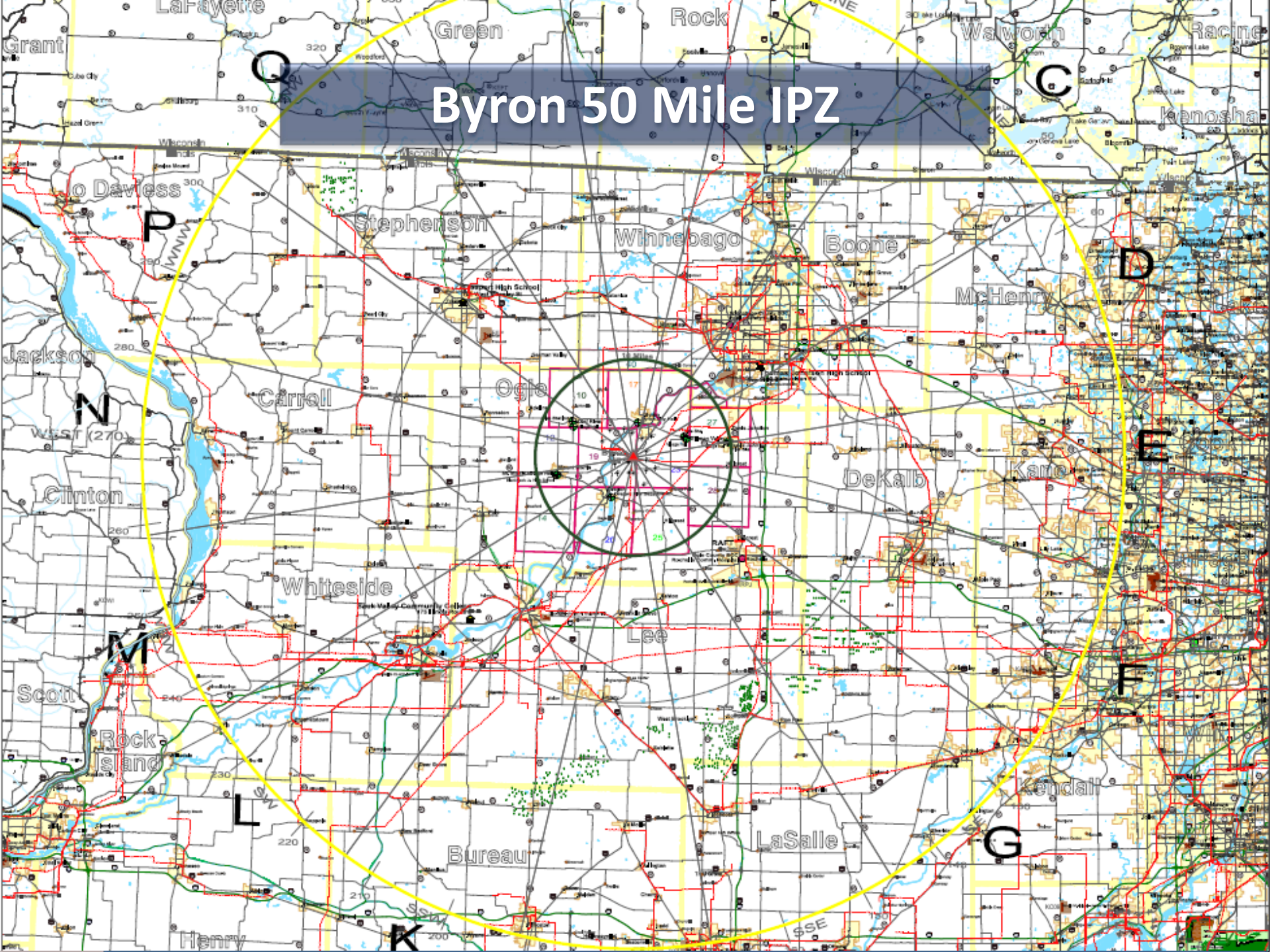
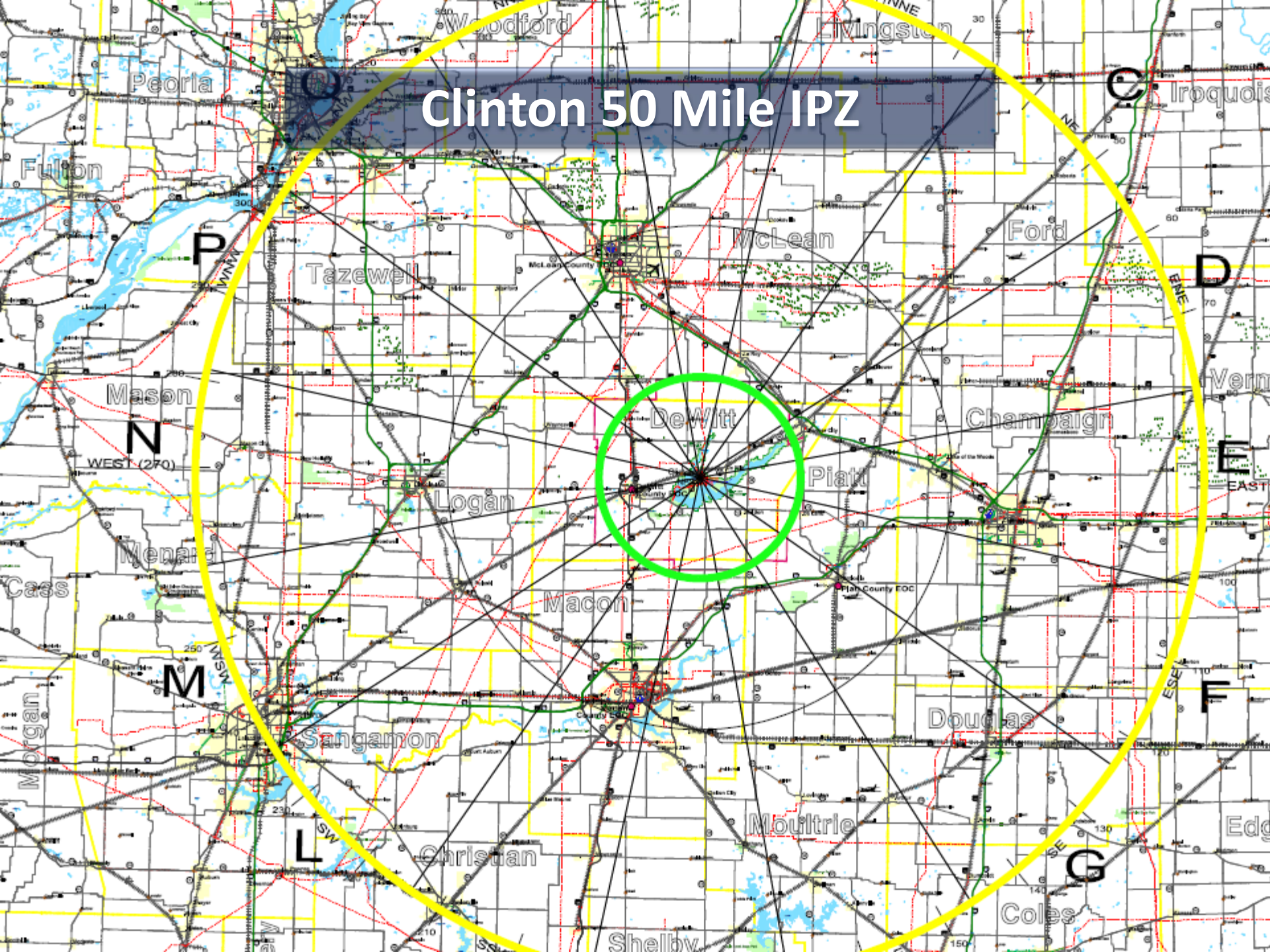
Braidwood 50 Mile IPZ



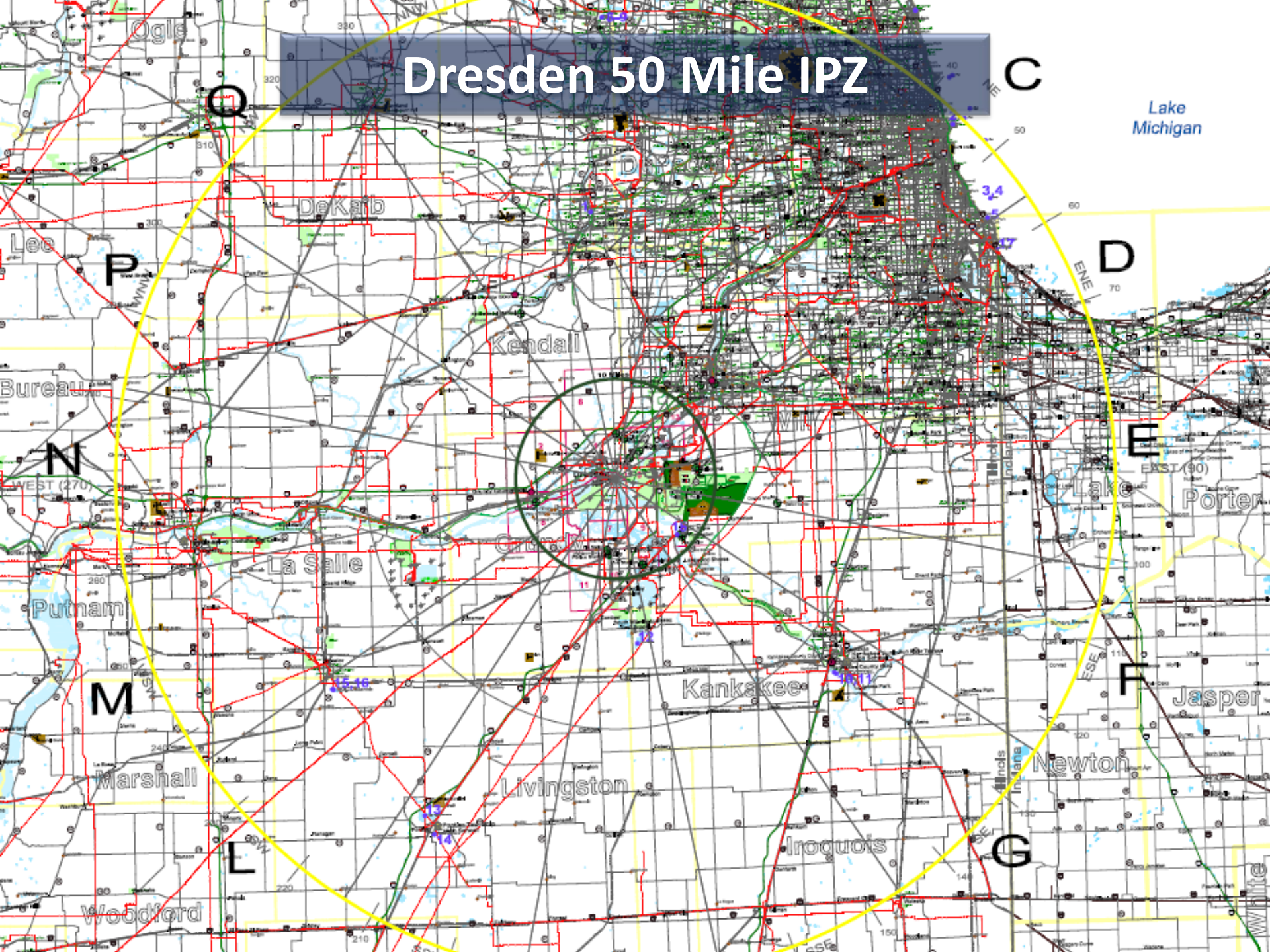
Byron 50 Mile IPZ



Clinton 50 Mile IPZ

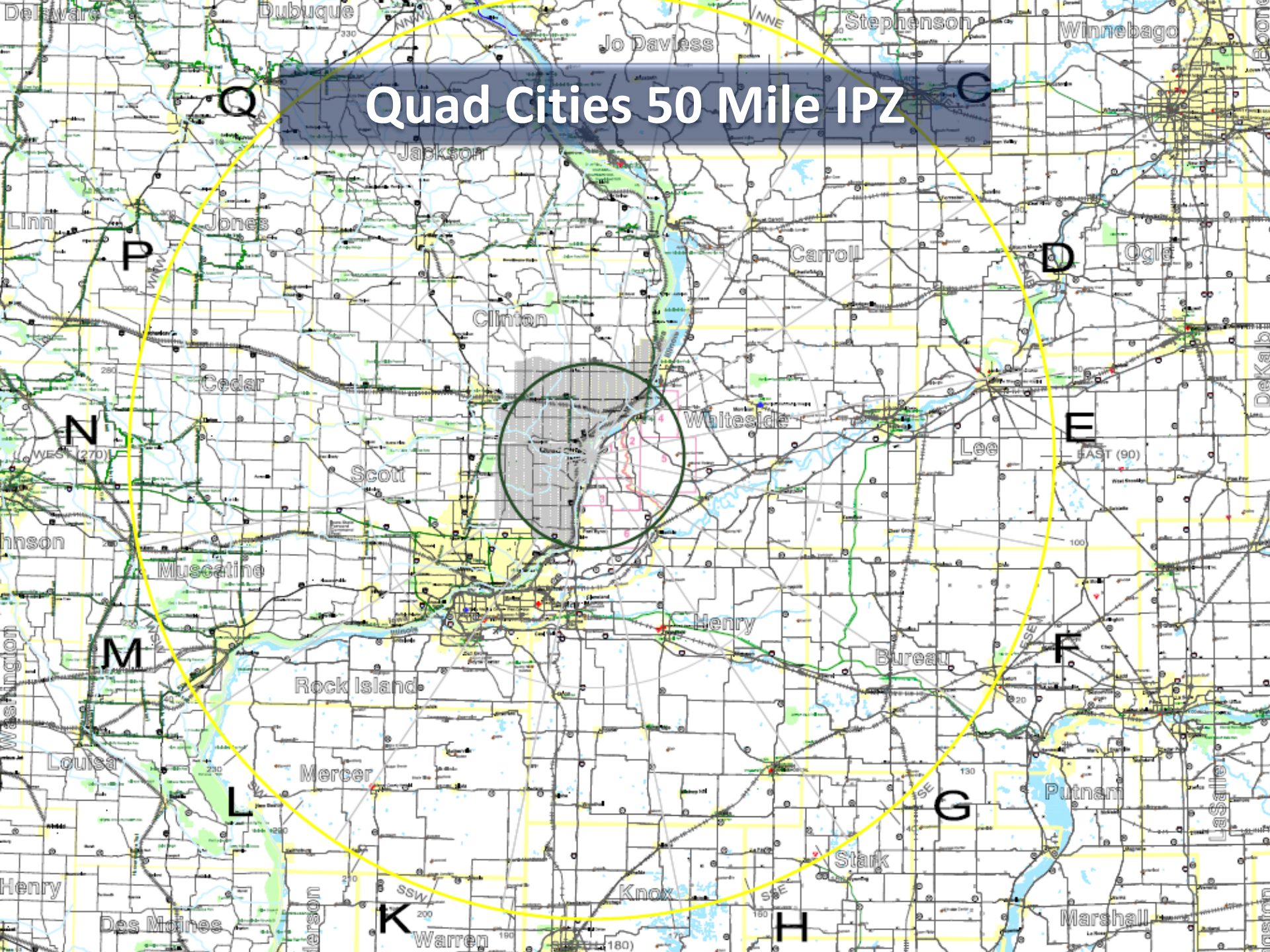


Dresden 50 Mile IPZ

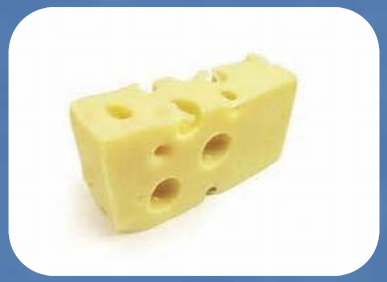


LaSalle 50 Mile IPZ

Quad Cities 50 Mile IPZ



IPZ Planning Considerations



Water

Milk (dairy products)

Vegetables and Fruits

Meat and Meat Products
(including wildlife)

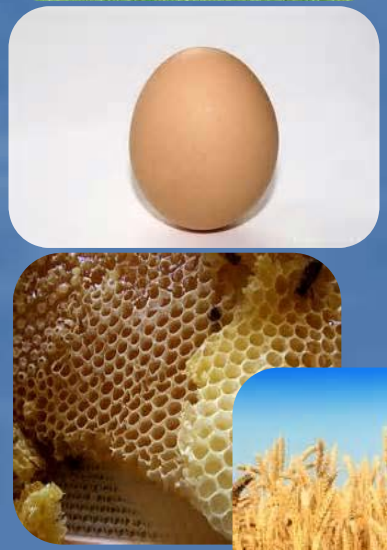
Poultry and Poultry Products

Crops/Grains

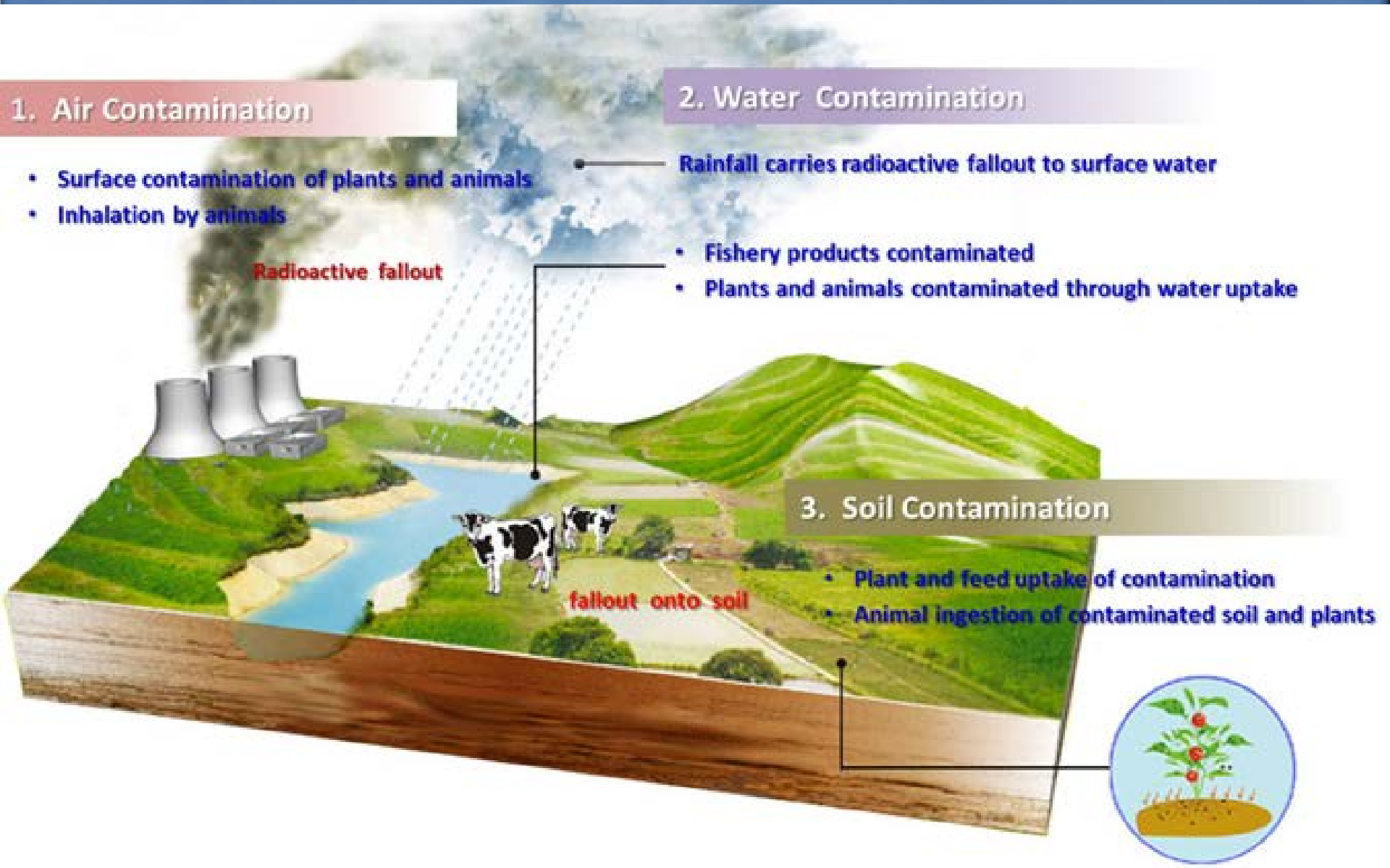
Fish

Honey

Soil



Contamination Concerns



Other Considerations

Initial Precautionary Actions

Precautionary actions taken <u>prior</u> to confirmation of contamination include:

1. **Simple precautionary actions to avoid or reduce the potential for contamination of food and animal feeds.**
   - These will not guarantee that contamination in food will be below the Derived Intervention Levels, but they should significantly reduce the severity of the problem.
   - Typical precautionary actions include covering exposed products, moving animals to shelter, corralling livestock, and providing protected feed and water.

1. **Temporary embargoes to prevent food that is likely to be contaminated from entering into commerce.**
   - Because of potential economic impacts, OROs must take care when determining the area for a temporary embargo prior to determining the levels of contamination in food.

Protective Action Decisions

For the IPZ, there are two categories of Protective Action Decisions (PADs):

(1) **Preventive protective actions**: prevent or reduce contamination of milk, food, and drinking water.

(2) **Emergency protective actions**: isolate food to prevent its introduction into commerce and to determine whether condemnation or other disposition is appropriate.

Both preventive and emergency protective actions are considered "precautionary" if they are undertaken before verifying radionuclide measurements by field monitoring or laboratory analysis.

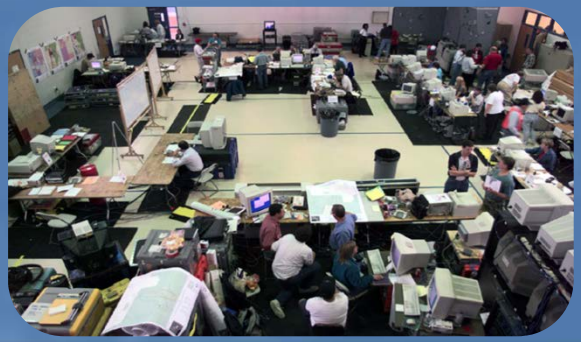
Preventative / Mitigation Actions

- Sampling and monitoring of food, plants, water, milk, livestock, etc.
- Additional cleaning, washing of products
- Plowing under of topsoil
- Decay period (half life)
- Food embargos
- Crop rotation

Science-driven Decision Making

$$CED = DFIR_{age,f} * \sum_{i}^{n} \left(FFC_i * FC_i * IngDC_{organ,i,age} * \left(\frac{1 - e^{-(\lambda_i * t)}}{\lambda_i} \right) \right)$$

- In the 10-mile EPZ the PAGs are based on direct exposure or inhalation
- There is a reason the 50-mile EPZ is called the Ingestion Exposure EPZ because the PAGs are based on Ingestion
- If you think it takes a much larger source term for inhalation than ingestion you would be correct.

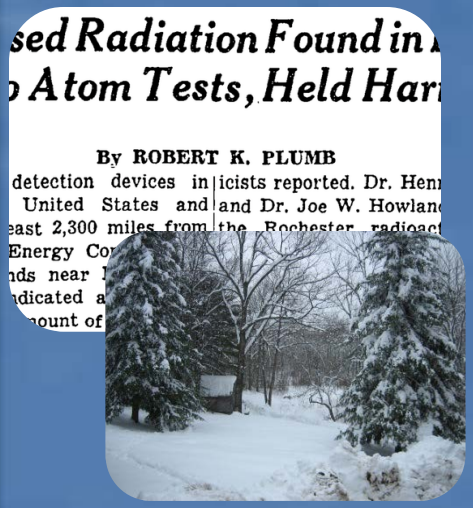


Science-driven Decision Making

- The dose conversion factor for I-131 for ingestion is several hundred times larger than the inhalation dose conversion factor
- In TMI less than 50 Curies of Iodine were released
- No evacuations would be required because of this but milk may have to be sampled at these levels

U.S. Historical Perspective

- Eastman Kodak film issues, Indiana (1946)
  - 1 month after test; Fogged X-ray film
  - Packing material made of corn husks was contaminated by radioactive fallout for test 1000 miles away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By ROBERT K. PLUMB

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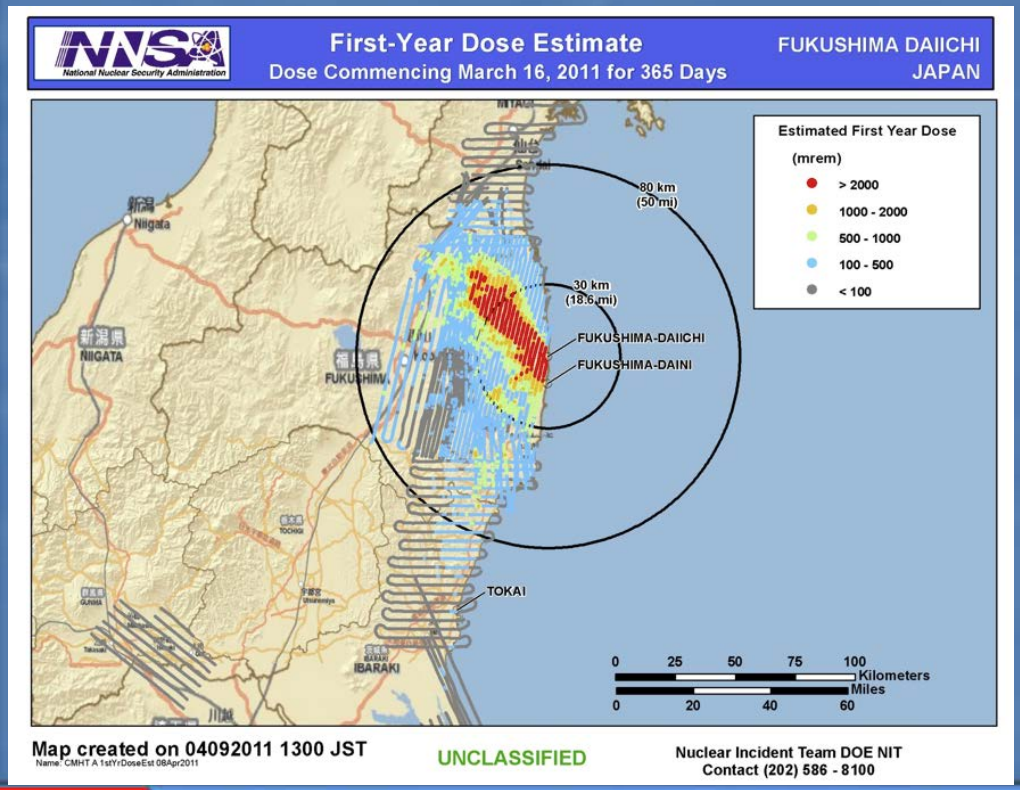
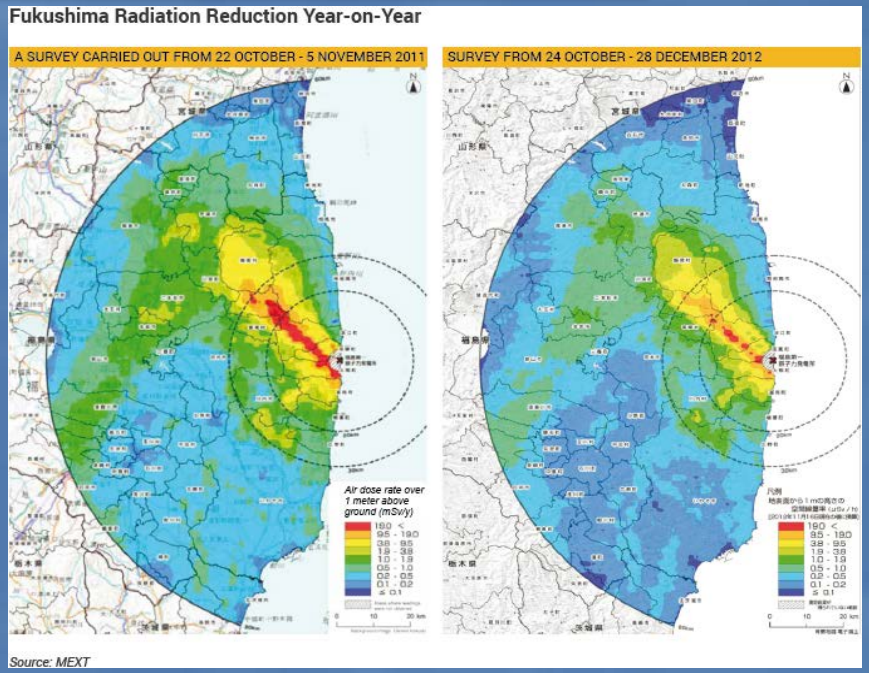
- Radioactive Snow in Rochester, NY
  - January 1951

Current Example: Fukushima, Japan





Began March 11, 2011

Fukushima

"Thousands of radioactive boars are overrunning farmland in Fukushima"

Washington Post - April 11, 2016

Fukushima

The wild boar population is thriving in Fukushima.

The number of boar has increased 300% since 2014, currently at approximately 13,000.

$900,000 in agricultural damage – destroying/eating crops.

Fukushima

The average size of a male hog is around 200 pounds. Considering this average, if 13,000 are killed, hunters have around **2,600,000** pounds of potentially dangerous flesh requiring disposal.

There are few areas for burial/disposal. Most available areas are already near capacity.

Fukushima

The best solution would be incinerating the bodies, which requires a special facility that can filter out radioactive materials to prevent the resulting smoke from blanketing nearby areas and contaminating them.

One such facility exists in the city of Soma, but the $1.4 million crematorium's capacity is severely limited. It can only handle three boars a day (or 21 a week, which is only 1,092 each year; not quite 13,000).

INGESTION PATHWAY RESPONSIBILITIES AND RESOURCES

Responsibilities

Federal government provides technical support and resources to state and locals.

The state is responsible for coordination and implementation of IPZ :

-State Emergency Operation Center (SEOC) – support/resource coordination

-Radiological Emergency Assessment Center (REAC) – technical support

-Radiological Assessment Field Team (RAFT) - monitoring and sampling

County and local levels will be responsible for implementing protective actions for the ingestion pathway.

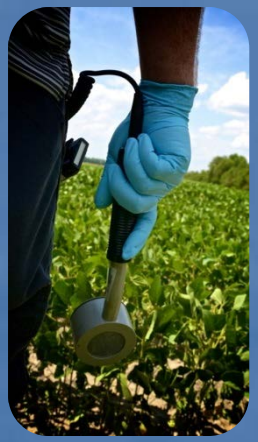
Federal Support

The Advisory Team (A-Team) for Environment, Food and Heath

The goal of the A-Team is to provide coordinated advice and recommendations to the State, Coordinating Agency, and DHS concerning environmental, food, and health matters.

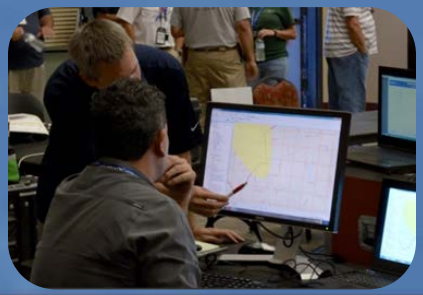
Membership is comprised principally of :

Advisory Team Duties Overview



A-Team provides *recommendations* in matters related to :

- Environmental assessments (field monitoring) required for developing recommendations;
- Protective Action Guides and their application to the emergency;
- Protective Action Recommendations using data and assessments from Federal Radiological Monitoring and Assessment Center (FRMAC);



Federal Support

For a more detailed description of the A-Team, supporting federal agencies and their related duties, please refer to the

National Response Framework,

Nuclear/Radiological Incident Annex
and
Emergency Support Function (ESF) -
ESF #8–HHS
ESF #10–EPA
ESF #11–USDA

State-Level Support & Resources

Illinois Department of Transportation

ILLINOIS STATE POLICE

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

IDPH
ILLINOIS DEPARTMENT OF PUBLIC HEALTH

Illinois Commerce Commission

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

IEMA

Illinois Department of Agriculture

State Resource Coordination

- State Emergency Operations Center (SEOC)
  - Hosts FEMA / FCO, State Response Organizations & Partners
- Unified Area Command (UAC)
- IEMA Regional Offices / Regional Coordinators

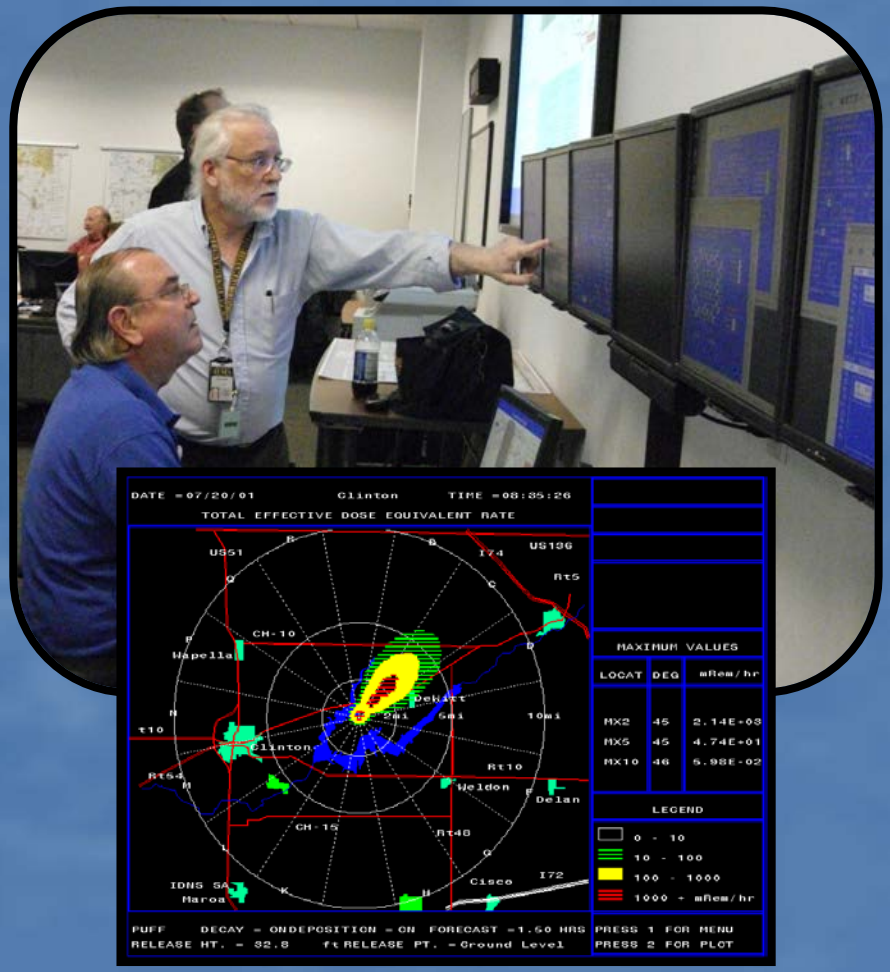
RAD HAZARD ANALYSIS: IEMA Technical Resources

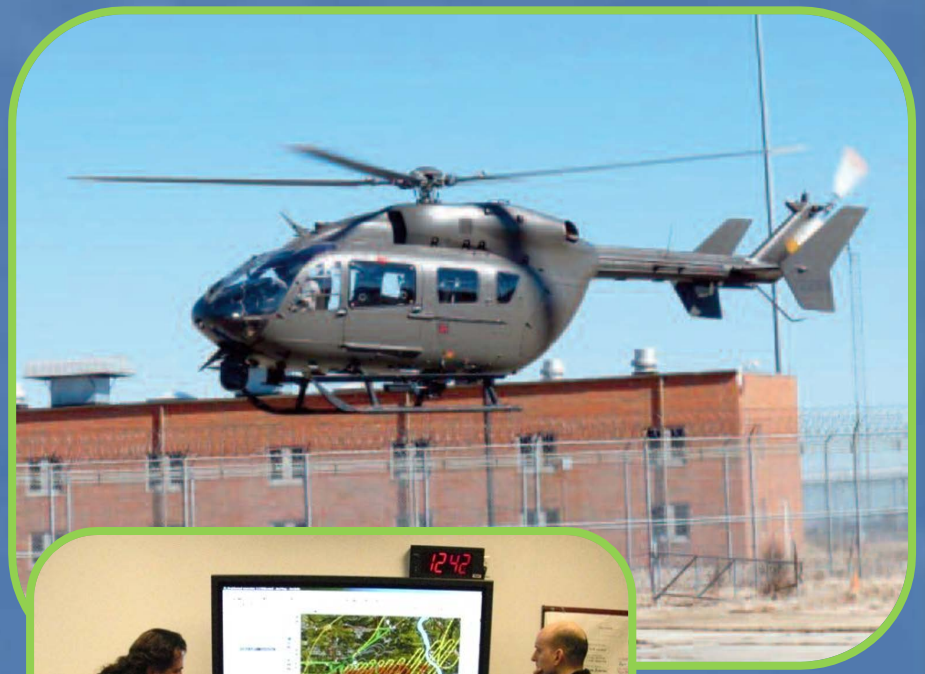
- Radiological Emergency Assessment Center
  - Station Monitoring
  - Accident Assessment
  - Plume Modeling & Mapping
  - Protective Action Recommendations for the Public
- Radiological Assessment Field Teams
  - Field Verification of Radiological Conditions

Radiological Emergency Assessment Center

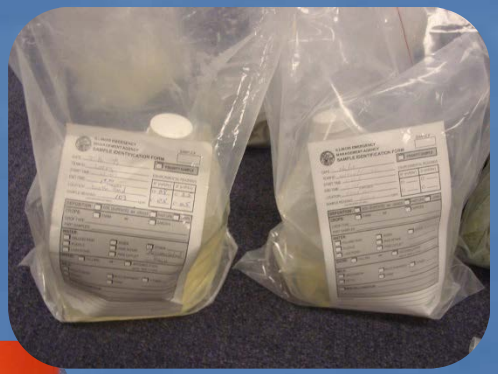
Springfield

RAD Projection & Monitoring





Radiological Assessment Field Teams



Emergency Operations Centers

Municipal • County • State • Utility • Federal

EOCs Provide for a Coordinated Response

County-Level Responsibilities

County and local government activities generally would be covered under the county's all-hazard emergency operation plan (EOP), such as;

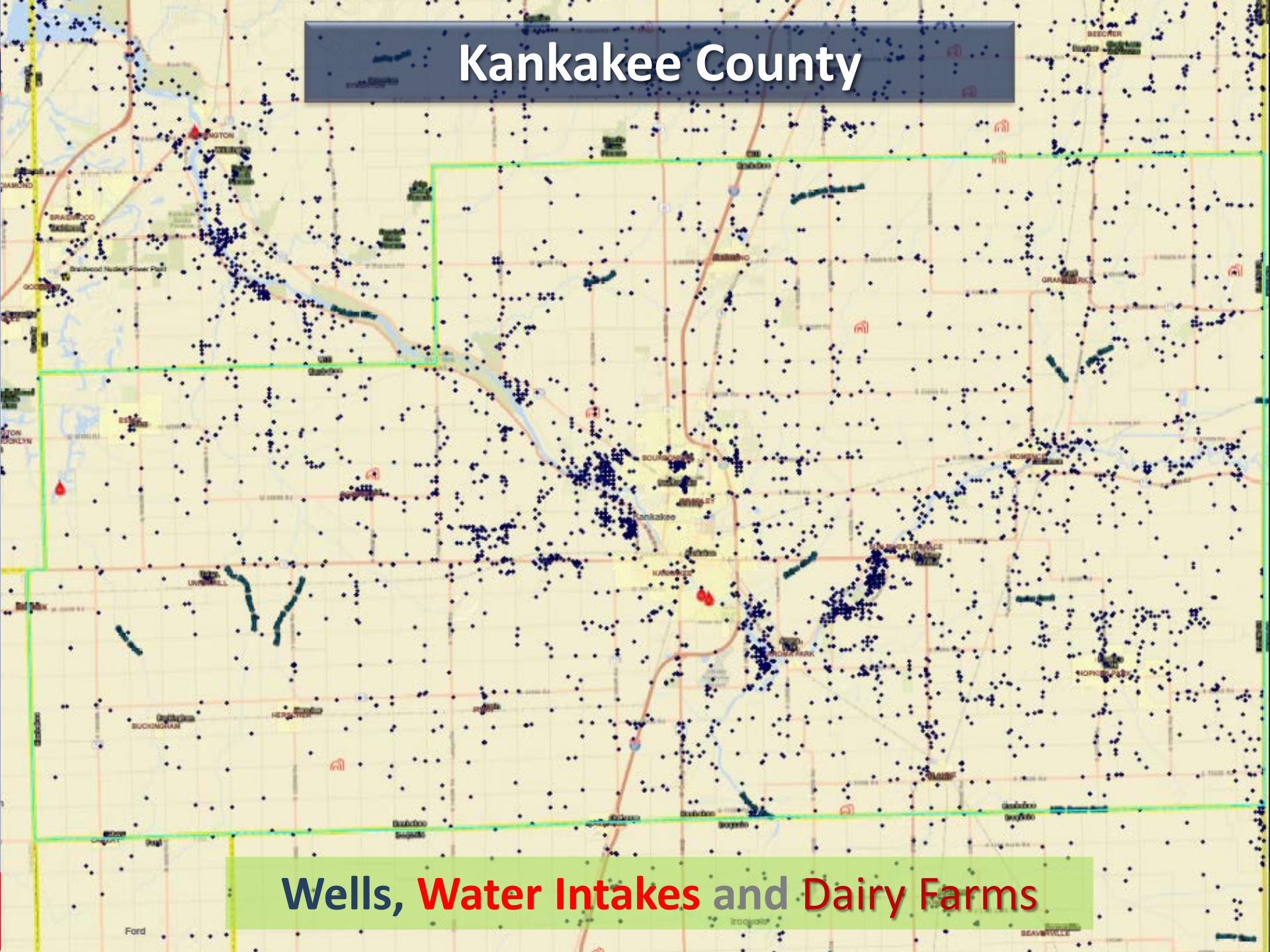
- Public information and notification
- Traffic and access control (law enforcement)
- EOC activation and notification
- Mutual aid agreements and partnerships
- Disaster declarations and recovery programs

Kankakee County

- Is in the Plume Exposure Pathway (10 mile) for Braidwood and the Ingestion Pathway (50 mile) for Braidwood, Dresden and LaSalle Nuclear Power Stations
- County Population: 113,449 681 square miles
- **642,637 acres** of farmland; total market value of agricultural products sold in county **$287,494,000** (2012*) of which:
  - $28M was generated by livestock, poultry and their products*
  - 25 farms raised vegetables, melons and potatoes on 2,869 acres*

(*Agrinews, 12/9/14)

Kankakee County



Wells, Water Intakes and Dairy Farms

County Expectations and Issues

- Full expectation that county can't "do it alone" and will need state, federal, and possibly private sector support
- Will need subject matter expertise and guidance on radiological effects and related considerations
- Will need support for public information, especially recommendations for recovery, return, and cleanup issues;
- Will need potential law enforcement, technical and/or regulatory support for embargoes, disposal of contaminated food, water, milk, livestock, etc.

Ongoing Challenges

Interdiction or condemnation of foods, feeds or other contaminated products.

How do you ensure contaminated milk and food products don't leave the area without monitoring?

What do we do with contaminated milk?

What do we do with contaminated crops?

What do we do with contaminated animals?

What do we do with contaminated soil/fields?

How "clean" is clean?

Where We Go From Here

There is a need for greater awareness and involvement in IPZ planning, training and exercising at the state, county and local levels.

It is important to pre-identify farms, dairies, water supplies, food processors, crop land, etc.

We will develop IPZ Workshops to help facilitate increased understanding and preparedness (projected 2017/2018).

The Path Forward

- **FEMA Ingestion Pathway Training Program**

  (Pilot completed; waiting for final rollout)

- **Bi-State IL/WI Ingestion Pathway Workshop** (Date TBD)

- **IL Ingestion Pathway Workshops** – 2017

- **IL Ingestion Pathway Workshops** – 2019

- **Evaluated Ingestion Pathway Exercise** – Byron

  (proposed for 3/24/2021)

Objectives

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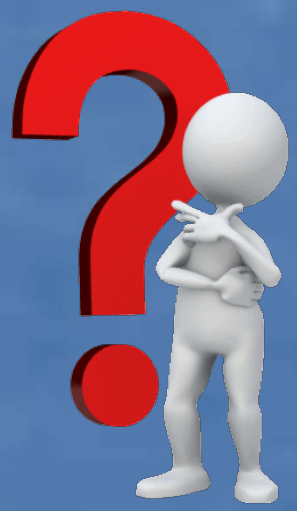
- ✓ Increased awareness and involvement in IPZ planning and training.
- ✓ Provided a starting point for enhancing IPZ preparedness and coordination.



QUESTIONS?

Contact Information

Bill Conway, REP Program Manager
Bureau of Nuclear Facility Safety
Illinois Emergency Management Agency
217-785-9986
William.Conway@illinois.gov

www.ready.illinois.gov