

IND Response and Recovery Planning – Animal Workgroup



Kevin Dennison, DVM
USDA APHIS Animal Care
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FEMA IND Response and Recovery

- **Sponsored by FEMA CBRNE**
 - Ongoing project with multiple work groups
 - Annual Forum
- **Identifying challenges and solutions pertaining to a nuclear detonation on US soil**
- **Animal group added in 2011**
 - Kevin Dennison, Gordon Cleveland, Mark Tinsman, and Todd Smith leading

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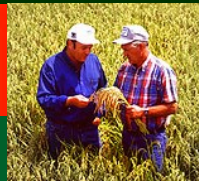
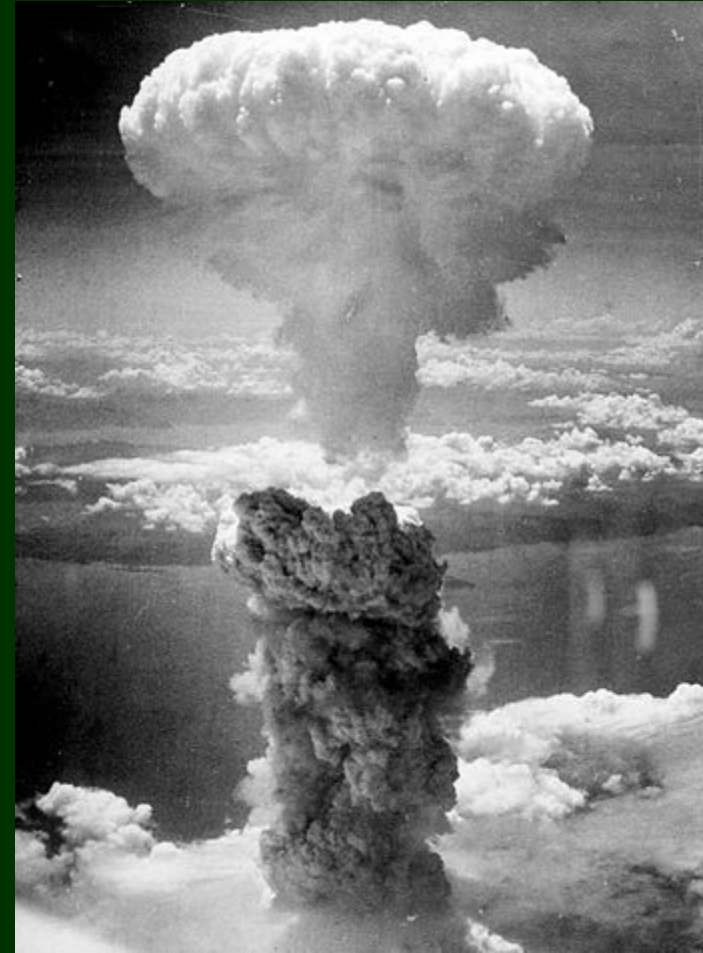


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Improvised Nuclear Device

- **5-10 kiloton yield**
 - 5,000-10,000 tons of trinitrotoluene (TNT)
 - Like several hundred semitrailers of TNT detonated
 - Hiroshima 16 KT
 - Nagasaki 21 KT



Catastrophic incident

- Likely urban center target
 - “Decapitation”
- Loss of infrastructure
 - 1st response
 - Communication
 - Transportation
 - Utilities



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Animal Work Group Goals

multi-year timeline

1. Develop productive workgroup of “experts”
2. Identify mechanisms for approximation of animal populations in affected areas
3. Identify the specific animal response and recovery missions and mechanisms to integrate such into overall ICS and MACS

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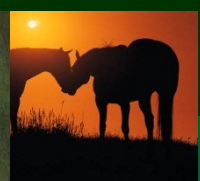


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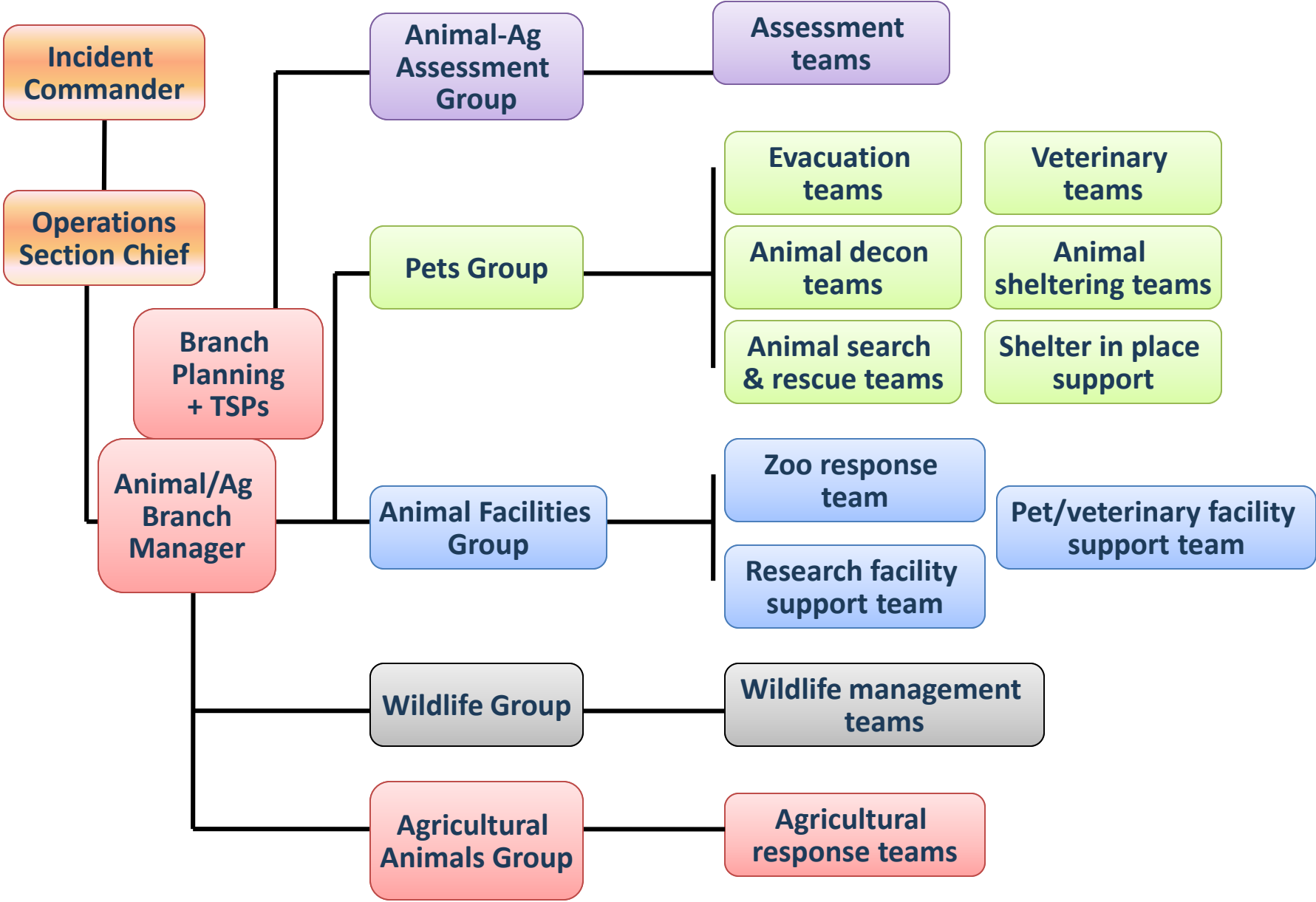


Goals (continue)

4. Identify mechanisms of mobilization of qualified personnel and other resources, including “just-in-time” training options
5. Analyze current state of scientific understanding of animal management during radiological emergencies
 - Bibliography
 - Research recommendations



Example of animal response mission areas for analysis purposes



Challenges

- **Multiple Area Commands**
 - Dozens of ICPs?
- **Intense competition for life-saving resources**
 - Fuel
 - Vehicles
 - Radios/Comm
 - Medical supplies
 - Potable water
 - Generators
 - Personnel



Operational priorities – Day 1-7

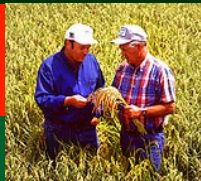
Animals, agriculture, food

- **Support of mass care missions**
 - Sheltering of animals evacuated by/with owners
 - Decon, veterinary care, etc.
 - USDA FNS support of mass feeding
- **Agricultural protective actions**
 - Warning/instructions to producers
 - Protective actions for livestock, people
 - Movement controls –livestock, crops, food

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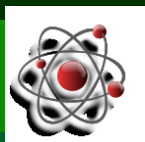
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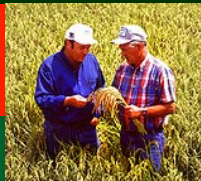
How much exposure is too much?

- Incident authorities will establish detailed guidelines
- Average annual US dose = 300-600 mrem
 - <http://www.epa.gov/rpdweb00/understand/calculate.html>
 - Approximately 1-2 mrem daily
 - Occupational limit = 5000 mrem per year
 - Clinic signs: acute >100 rem exposure, >400 rem lethal
 - Example: 3 weeks at 2x background ~ 21-36 mrem
 - ~ 3.5-11% added to annual background dose
 - ~1/200 of annual occupational dose limit

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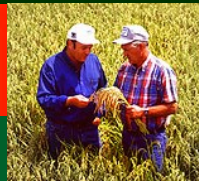
Demographics estimation - pets

- National average: For every 1000 households
 - 2600 people
 - 1529 household pets: 1368 (AVMA) 1671 (APPA)
 - .59 pets per person
 - Easy Button: # of people x .6
- Agricultural and other animals more difficult

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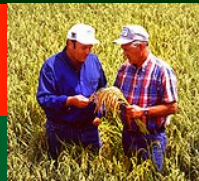
How many pets... really?

Factors that increase pet population	Factors that decrease pet population
Suburban or rural locations	Urban locations, particular concentrated urban
Smaller communities	Cities over 2,000,000
Single family homes, mobile homes	Condos, apartments
Families with children	Elderly, very young, singles
Region or State	Region or State
Increased income	Decreased income

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Washington, D.C. pet population:

- 619,000 residents, ~10,000 per sq. mile
- 123,000 pets (2012 AVMA Sourcebook)
 - 0.2 pets per person compared to .59 national average
 - Highly urban, less single family housing
 - Increased income median, but more at poverty levels
- MD/VA averages ~ .5 per person
- Need **NIGHTTIME** human population!



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Formula hypothesis –NCR (SWAG)

Nighttime human population x 0.1 for “inner city”
areas of DC

+

Nighttime human population x .25 for other urban
areas within DC/MD

+

Nighttime human population x .5 for suburban areas
- MD

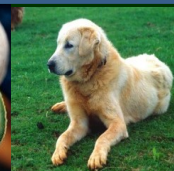
+

Nighttime human population x .6 for rural areas

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Example:

- **10 KT IND detonation**
 - DuPont Circle
 - Daytime detonation
- **But....**
 - Pet figures should be extrapolated from night or weekend population
 - Changed detonation time to midnight on Sunday.

Nuclear detonation effects and fallout predictions provided by the
DOE National Atmospheric Release Advisory Center (NARAC)
and DHS Interagency Modeling and Atmospheric Assessment Center (IMAAC)

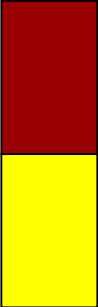
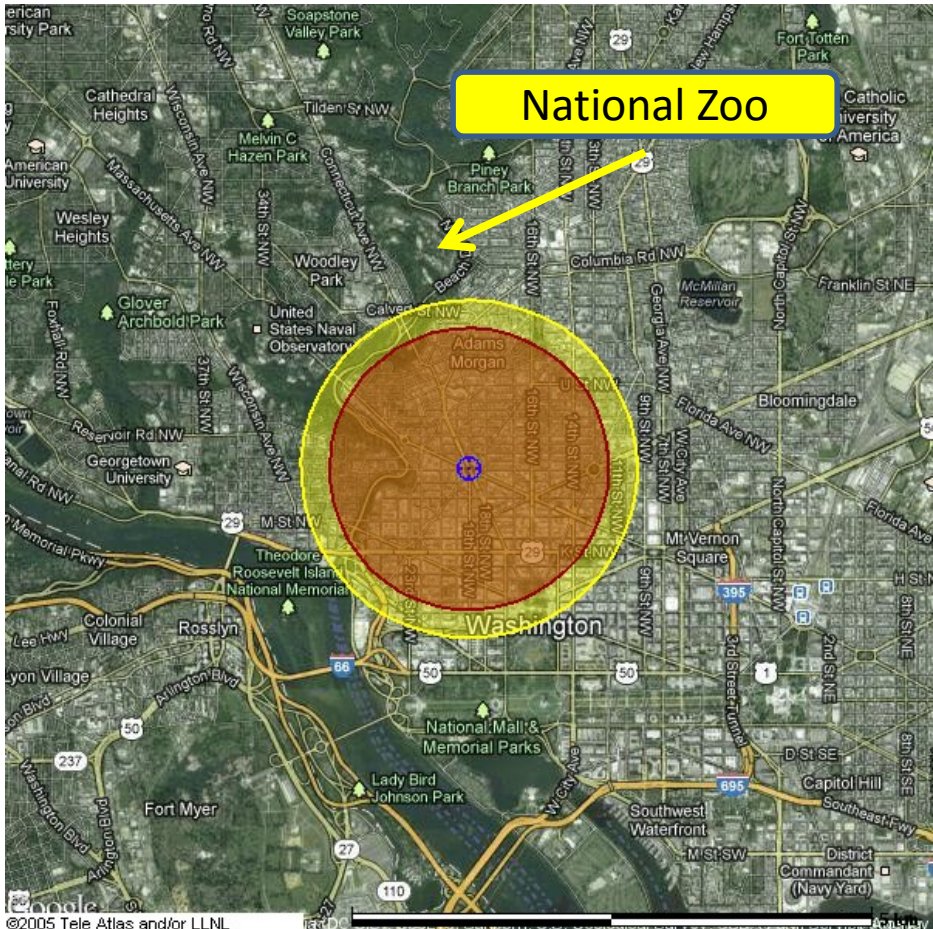


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Predicted Prompt Effects of Nuclear Detonation on Population

Effects of overpressure, heat, and immediate radiation on unprotected population producing immediate to near-term injury, illness or death



Few, if any, unprotected survivors. Survivors possible in intact shelters (may require medical care). Total Exposed Population: 46500 Area: 5.7 km2 Extent: 1.3 km

Numerous injuries with increasing rate of fatality moving inward. Immediate assistance will greatly improve survivability. Total Exposed Population: 64900 Area: 8.2 km2 Extent: 1.6 km

Notes:

- There may be ongoing dangerous radiation levels due to fallout (see Predicted Dangerous Fallout Zone (DF) product).
- Use in conjunction with Predicted Damage Response Zones product for planning areas to focus available resources.
- Effects are committed within a few seconds after detonation.
- Some immediate survivors may have been fatally exposed to radiation.
- Effects are not uniformly radial as shown. Effects may intensify or diminish due to buildings and structures.
- Those in substantial shelters have increased survivability
- Population cited is total exposed, not number of casualties.

Assumptions:

- Assumes 10 kt detonation at 0 ft elevation.
- Areas shown are model predictions based on an estimated source term but no measurements.
- Radioactive cloud has passed area displayed, radiation from fallout remains a serious hazard.

Interpretation

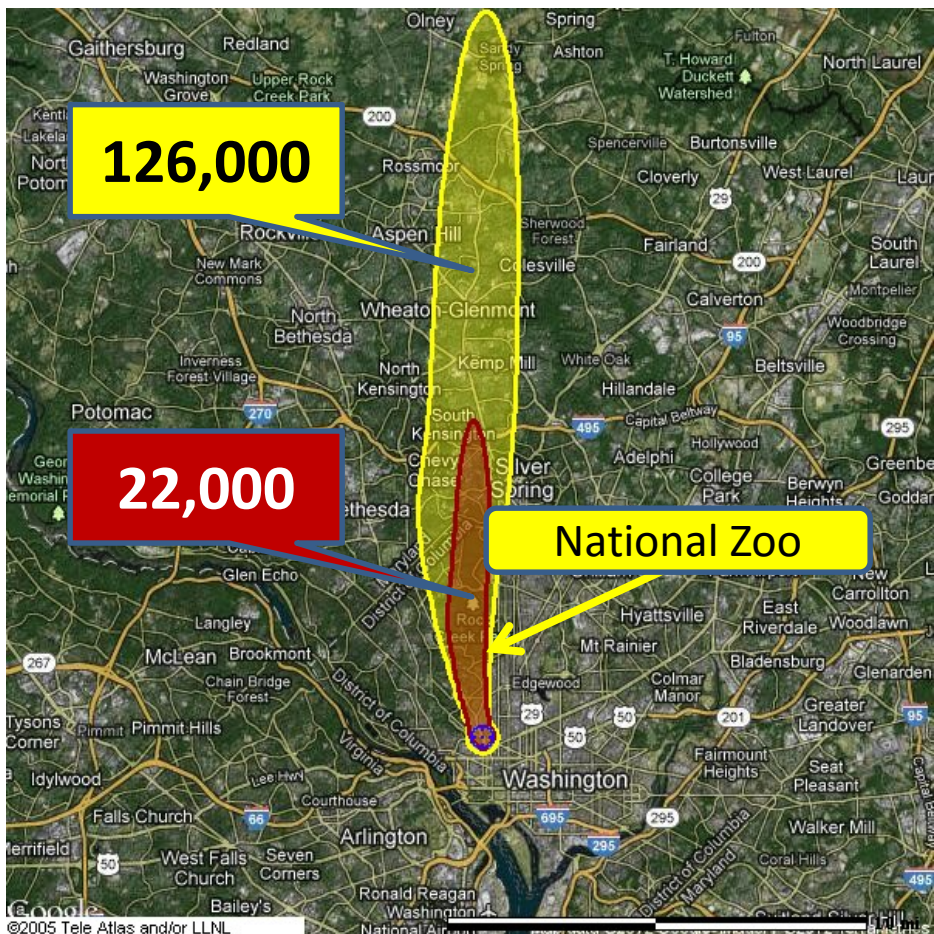
- Few, if any, unprotected survivors. Survivors possible in intact shelters, 46500 night-time residents
 - Inner city zone, estimate .1 pets per person
 - ~4,500 pets
- Numerous injuries with increasing rate of fatality moving inward. 64900 night-time residents (cumulative)
 - Inner city zone, estimate .1 pets per person
 - ~6500 pets



Automated Report: Testing
(38.9097,-77.0435)
Nuclear Detonation at 21 Apr 2012 04:00 UTC

Predicted Area for Potential Fallout Casualties at 28 Apr 2012 04:00 UTC

Total external dose from radioactive fallout during first 168 hr of exposure leading to near-term (days to weeks) illness or death



Fallout lethal to most without adequate shelter (exceeds 450 rad). Best action is early shelter followed by informed evacuation to control exposure. Total Exposed Population: 22600 Area: 14.1 km2 Extent: 12.1 km

Dangerous fallout levels can cause death, injury or illness (exceeds 100 rad). Zone of greatest opportunity for life saving and injury reduction. Dose management for first responders essential. Total Exposed Population: 126000 Area: 73.0 km2 Extent: 27.8 km

Notes:

- The best initial action is to seek adequate shelter immediately.
- Sheltering with delayed evacuation is preferred, unless evacuation can be completed before fallout arrival.
- Highest radiation hazard during first hours, then rapidly declines.
- Expect few deaths or serious injuries due to radiation outside the maximum extent of these regions.
- Area size will increase rapidly the first few days, then vary slowly, as they show total dose accumulated since detonation.

Assumptions:

- Assumes 10 kt detonation at 0 ft elevation.
- Areas shown are model predictions based on an estimated source term; confirm with measurements.
- Model assumes that no shelter or other protective actions have been taken to decrease exposure.

Briefing Product for Public Officials
Current: 27 Apr 2012 20:05 UTC
Check for updates

Interpretation

- Fallout lethal to most without adequate shelter, 22600 night-time residents
 - Use .25 pets per person ~5,500 pets
- Dangerous fallout levels can cause death, injury or illness, 126,000 night-time residents
 - Use .5 pets per person ~63,000 pets
- National zoo?

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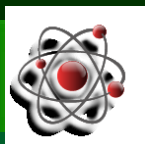
What about the zoo?

- 400 species, over 2000 individual animals
- 163 acre compound
- Several hundred FT, PT, seasonal staff
- <1800 volunteers total
- Thousands of visitors and staff at any one time
- Lots of substantial exhibits and buildings

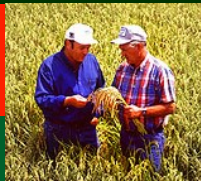


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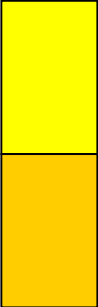
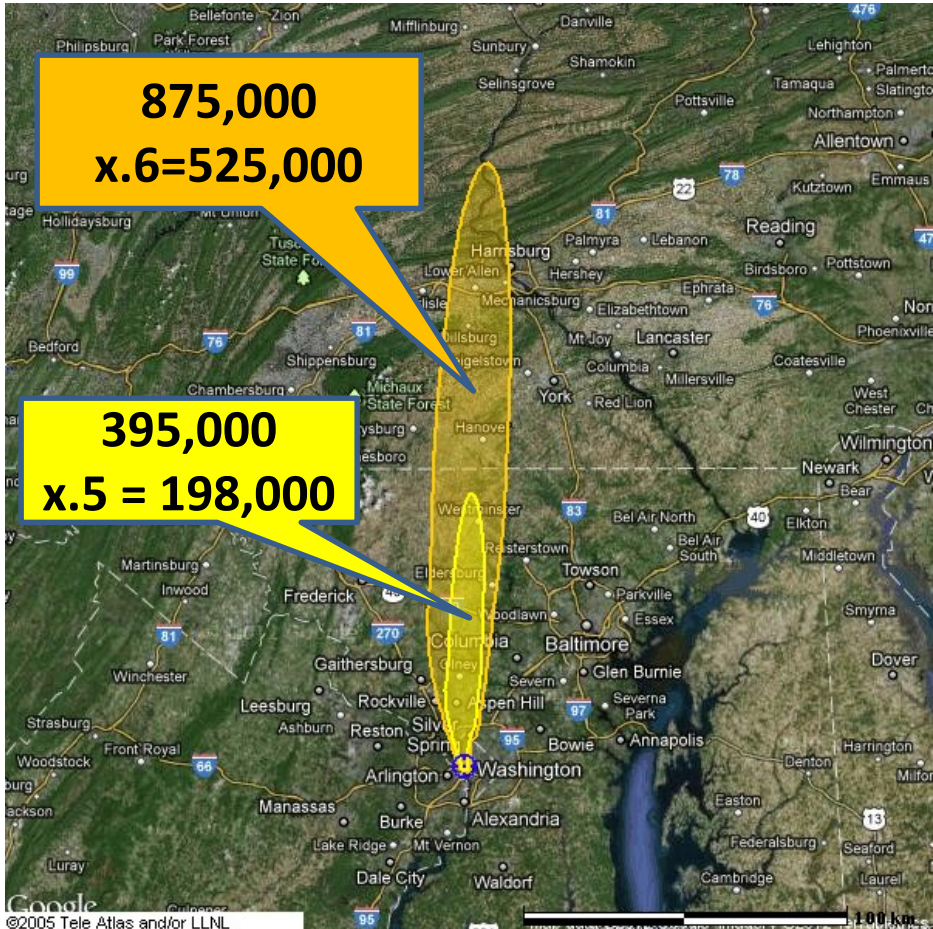
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Automated Report: Testing
(38.9097,-77.0435)
Nuclear Detonation at 21 Apr 2012 04:00 UTC

Predicted EPA/DHS Relocation Areas

Addresses avoidable additional long-term cancer risk, not acute radiation injury or death



Relocation warranted due to dose expected to be received during the 2nd year (begins 21 Apr 2013 04:00 UTC). Exceeds 0.5 rem. Total Population: 395000 Area: 666 km2 Extent: 82.6 km

Relocation warranted due to dose expected to be received during the 1st year after 22 Apr 2012 04:00 UTC. Exceeds 2 rem. Total Population: 875000 Area: 3,197 km2 Extent: 183 km

Notes:

- Relocation addresses only increased cancer risk due to long term exposures.
- Predicted dose assumes unsheltered individual with no protective actions or mitigation.
- First-Year zone decreases in size with time, because dose received in the past and before the relocation is not included. Protective actions are based only on dose that can be avoided.
- Individuals may have received a much higher total dose if present since detonation time.

Assumptions:

- Assumes 10 kt detonation at 0 ft elevation.
- Areas shown are model predictions based on an estimated source term; confirm with measurements.
- Model assumes that no shelter or other protective actions have been taken to decrease exposure.

Briefing Product for Public Officials
Current: 27 Apr 2012 20:07 UTC
Check for updates

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Exponents do make a difference!

10^1 , 10^2 , 10^3 , 10^4 , 10^5 , 10^6

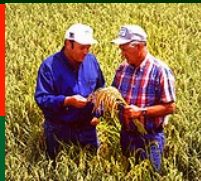
- CDC reception area goal is 1000 persons per hour
 - ??? Pets per hour
- Need better options for efficiency in mass decon operations
 - Vacuum gross decon?
 - Interim/warm zone shelters
- Awareness level training on basic radiological response principles + just in time training ready to go

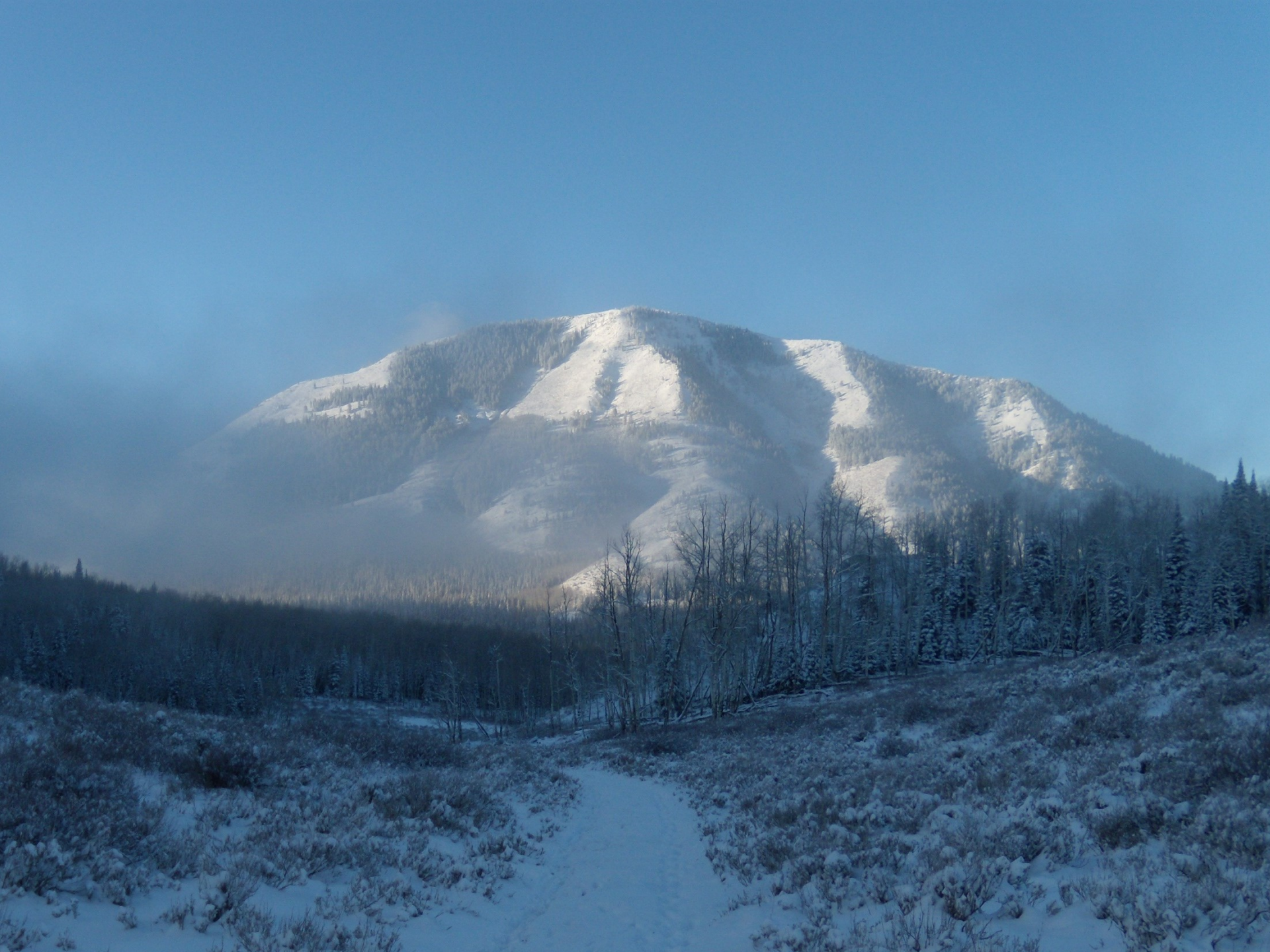


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Contact Information

Dr. Kevin M. Dennison

USDA APHIS Animal Care

- Western Region Emergency Program Manager
- Advisory Team on Environment, Food, and Health

Kevin.M.Dennison@aphis.usda.gov

970-494-7433 office

970-231-3477 cellular

Thank you!



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