

A photograph of a wolf standing in a snowy forest. The wolf is in the lower-left quadrant, facing right. The background is a dense forest of tall, thin trees. The ground is covered in snow with some dry leaves and twigs visible.

# Recent ecological impact studies in Chernobyl (and what they mean)

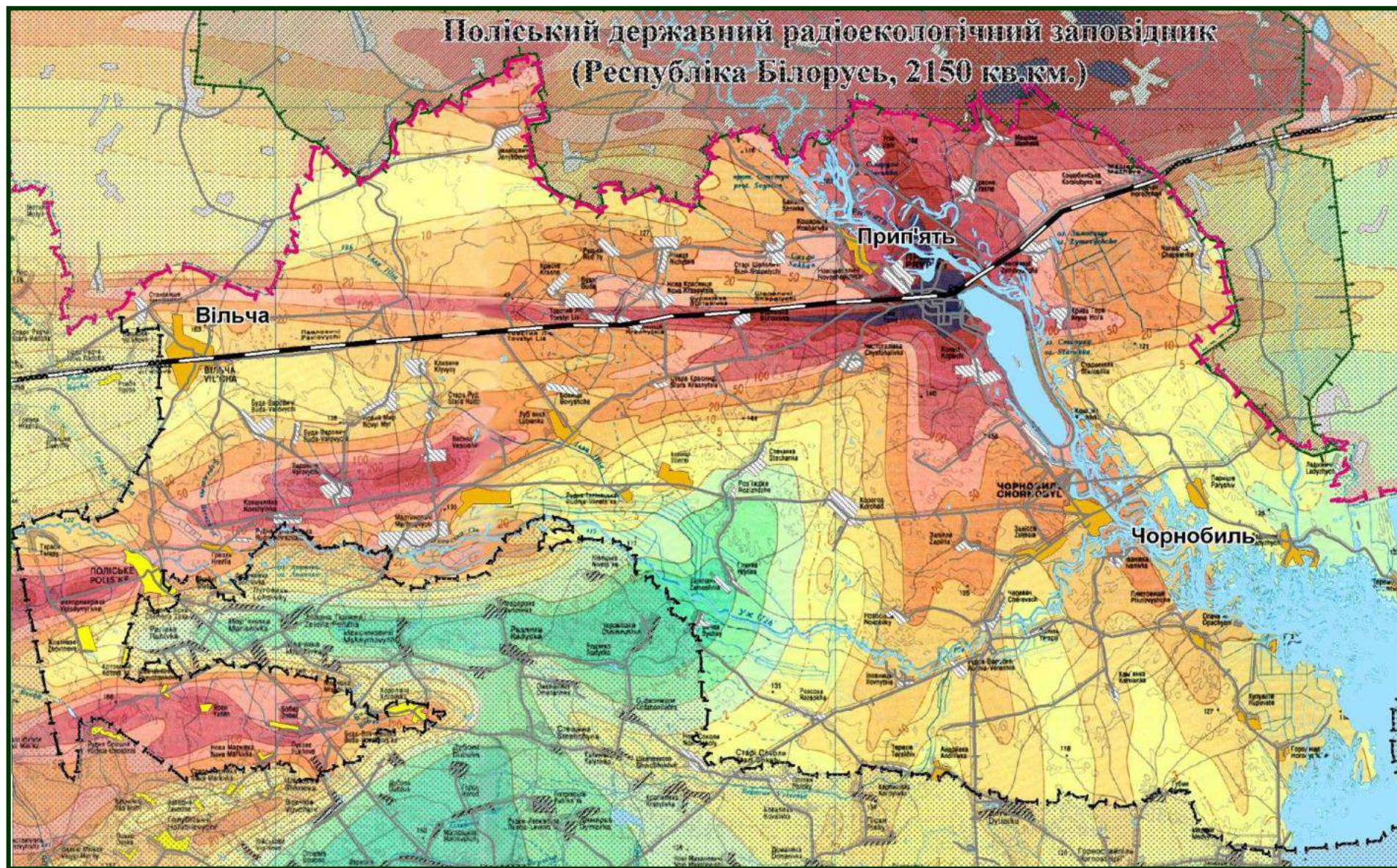
**Dr Mike Wood**  
**University of Salford, UK**

University of  
**Salford**  
MANCHESTER

**m.d.wood@salford.ac.uk**  
**@DrMikeWood**



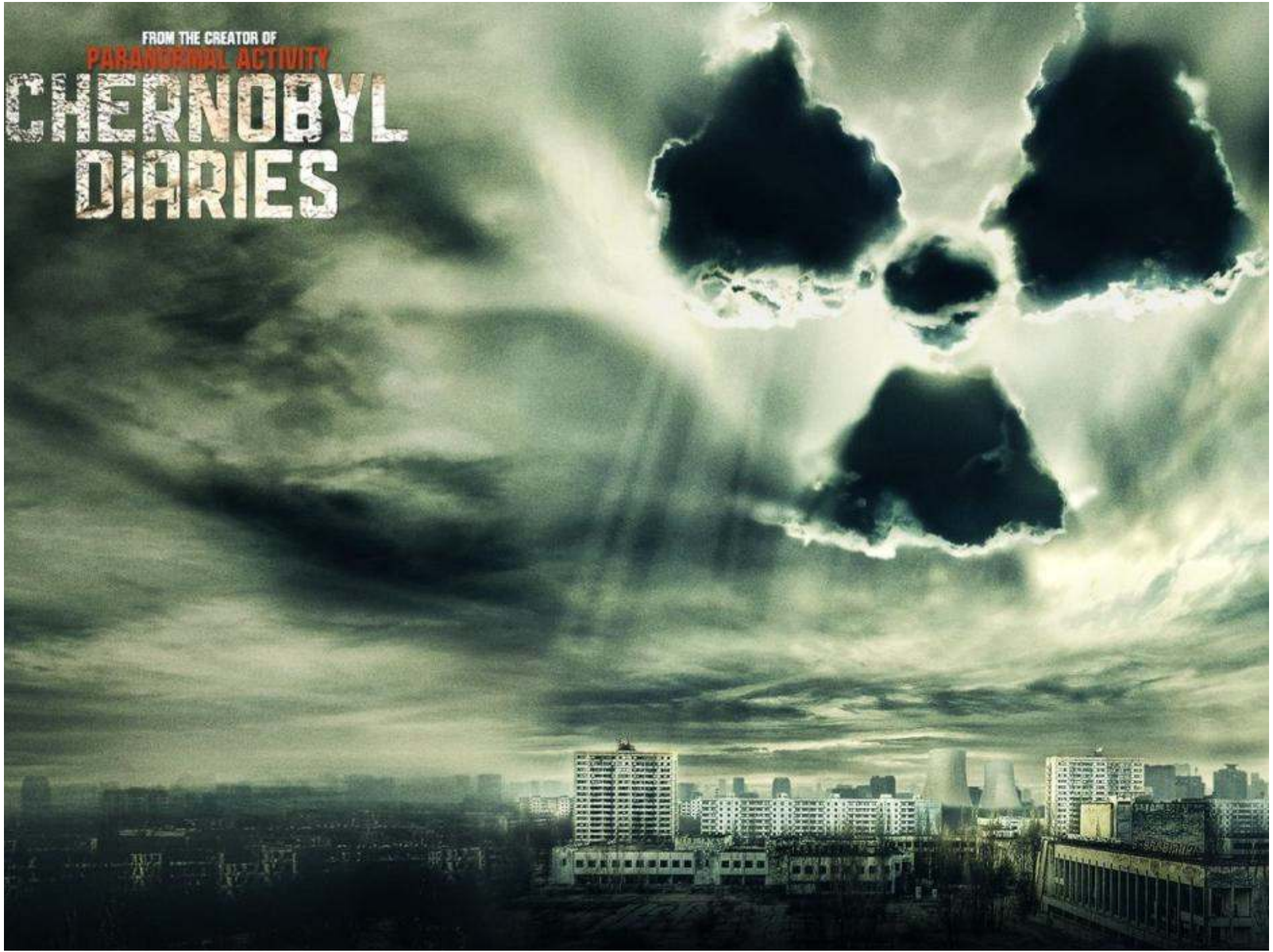




@DrMikeWood

FROM THE CREATOR OF  
**PARANORMAL ACTIVITY**

# CHERNOBYL DIARIES





FROM THE CREATOR OF

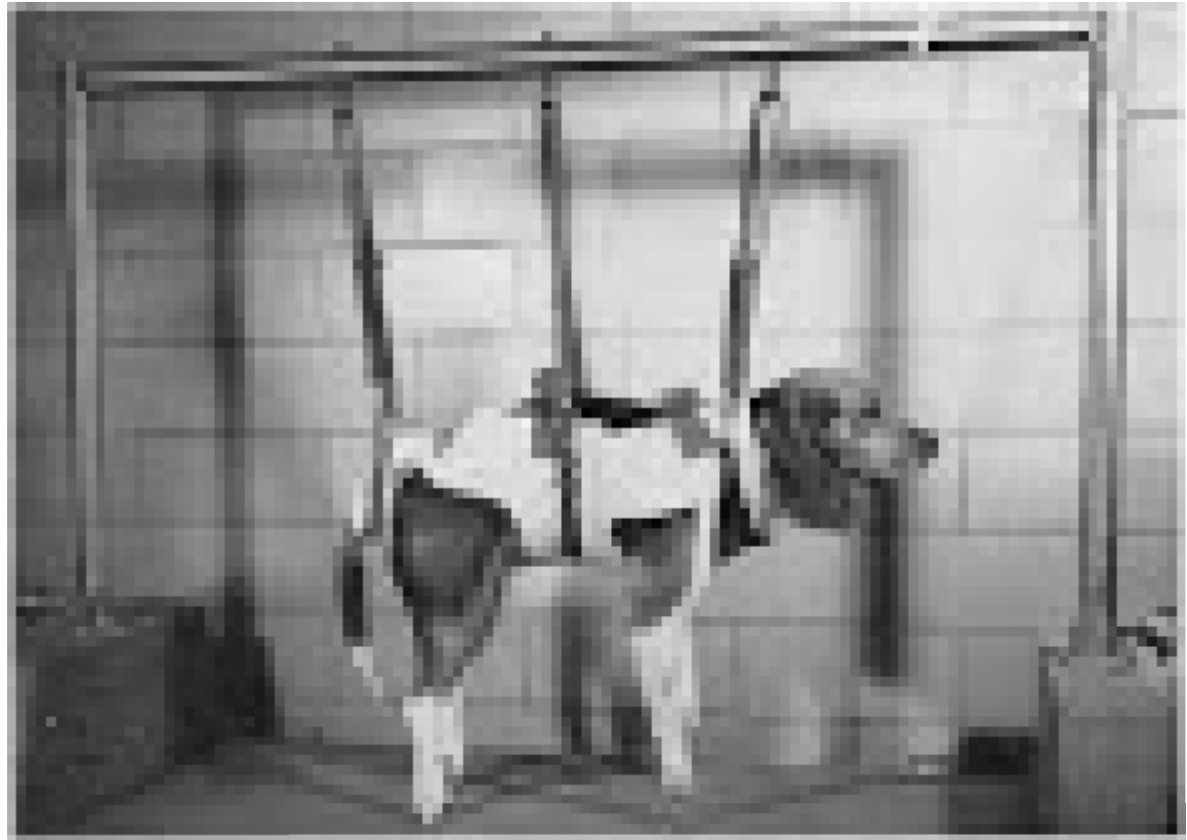
PARANORMAL ACTIVITY

# CHERNOBYL DIARIES



University of  
**Salford**  
MANCHESTER

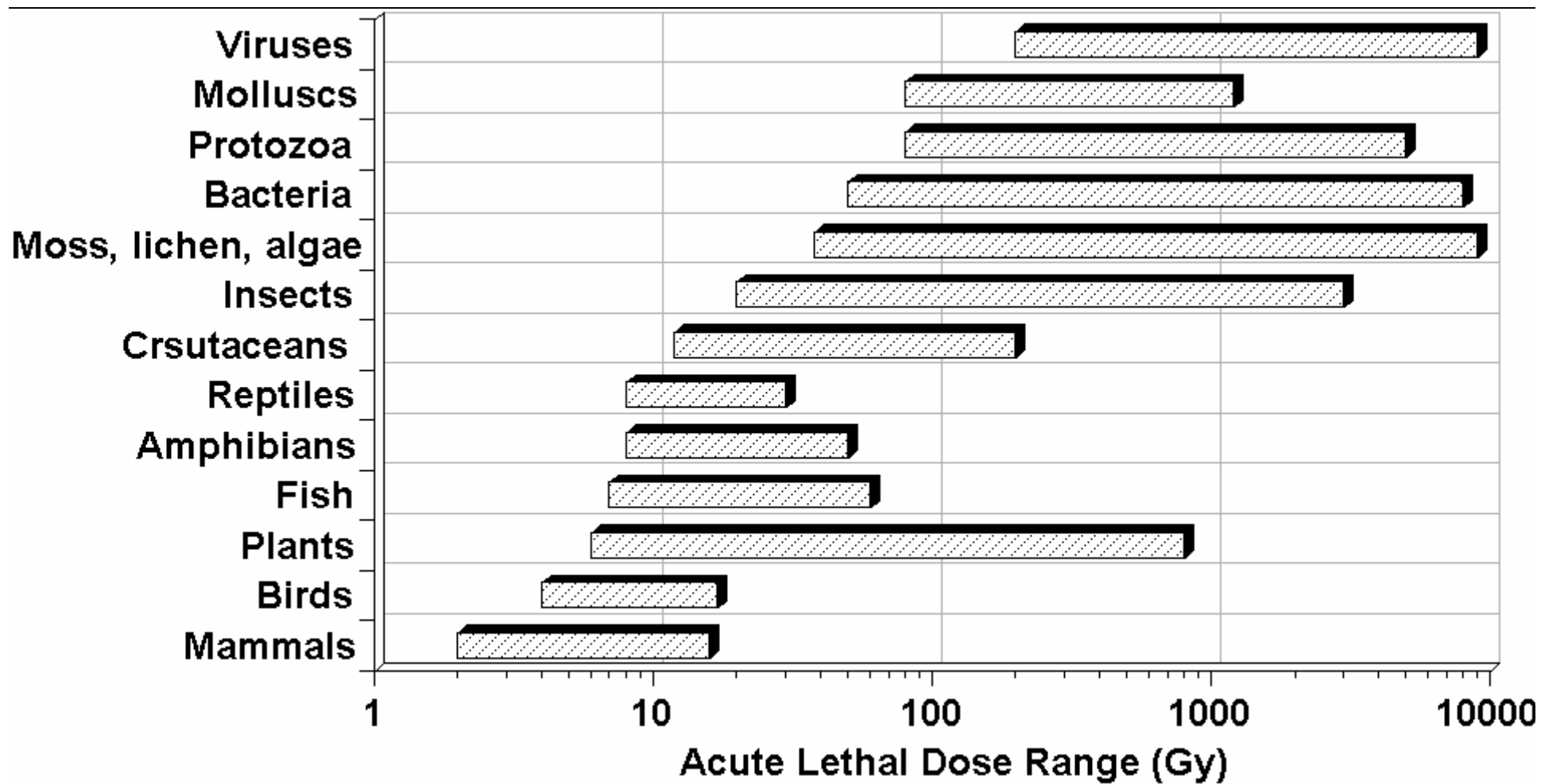
**@DrMikeWood**



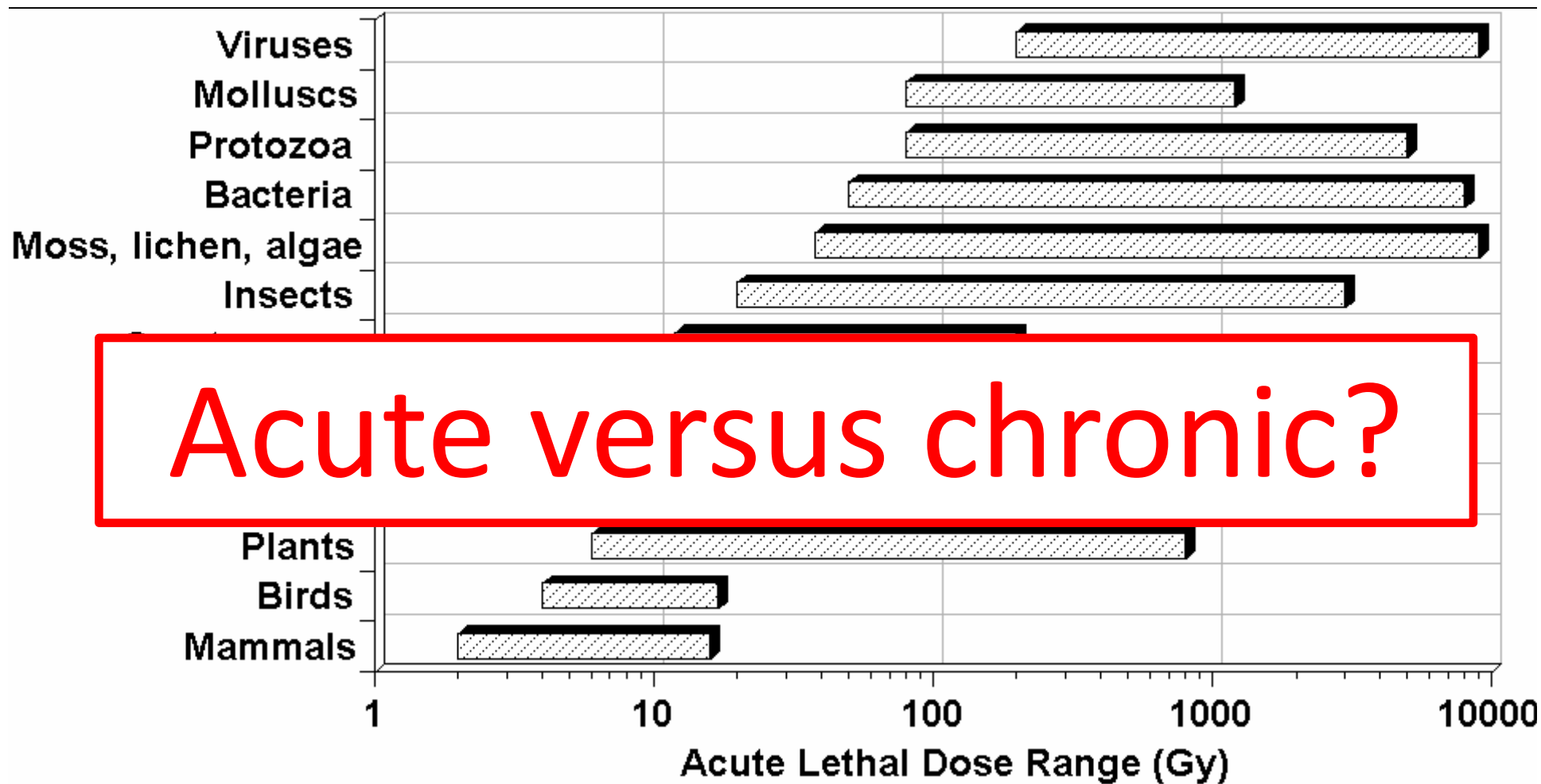
University of  
**Salford**  
MANCHESTER

**@DrMikeWood**





(Whicker and Schultz, 1982)



(Whicker and Schultz, 1982)



# Acute



# Chronic???

20 August 2010 Last updated at 10:17



Last Updated: Thursday, 20 April 2006, 05:55 GMT 06:55 UK

## Chernobyl species decline linked to DNA

By Victoria Gill

Science reporter, BBC News

E-mail this to a friend

Printable version

## Wildlife defies Chernobyl radiation

By Stephen Mulvey

BBC News



The scientists have studied the exclusion zone for more than a decade

Scientists working in Chernobyl have found a way to predict which species there are likely to be most severely damaged by radioactive contamination.

The secret to a species' vulnerability, they say, lies in its DNA.

This discovery could reveal which species are most likely to decline or even become extinct in response to other types of environmental stress.

The researchers published their findings in the Journal of Evolutionary Biology.

Professor Tim Murray, from the University of South Carolina, US, said

### Related stories

[Mammals decline in Chernobyl zone](#)

**It contains some of the most contaminated land in the world, yet it has become a haven for wildlife - a nature reserve in all but name.**

The exclusion zone around the Chernobyl nuclear power station is teeming with life.

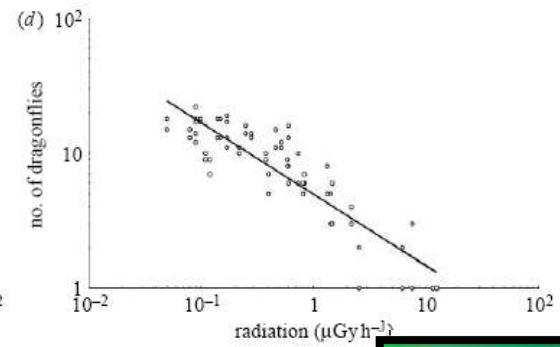
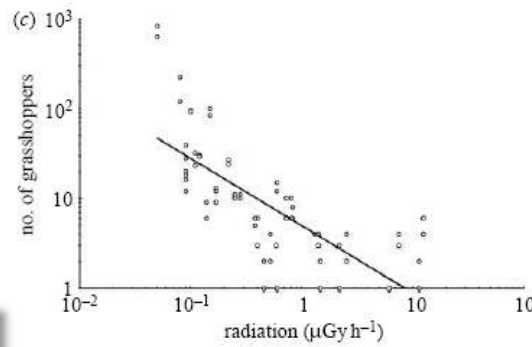
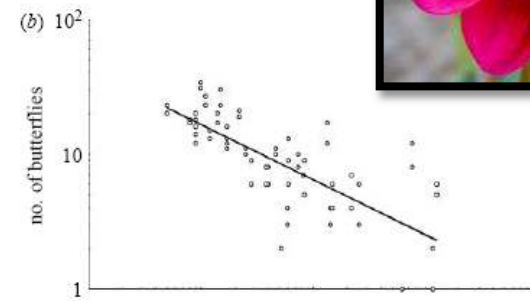
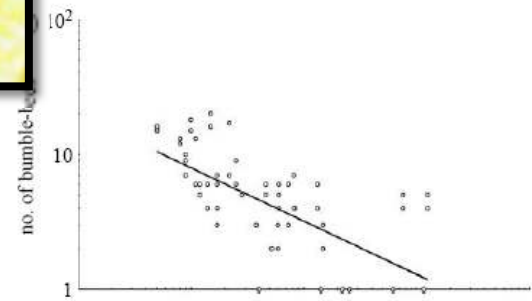
As humans were evacuated from the area 20 years ago, animals moved in. Existing populations multiplied and species not seen for decades, such as the lynx and eagle owl, began to return.

There are even tantalising footprints of a bear, an animal that has not trodden this part

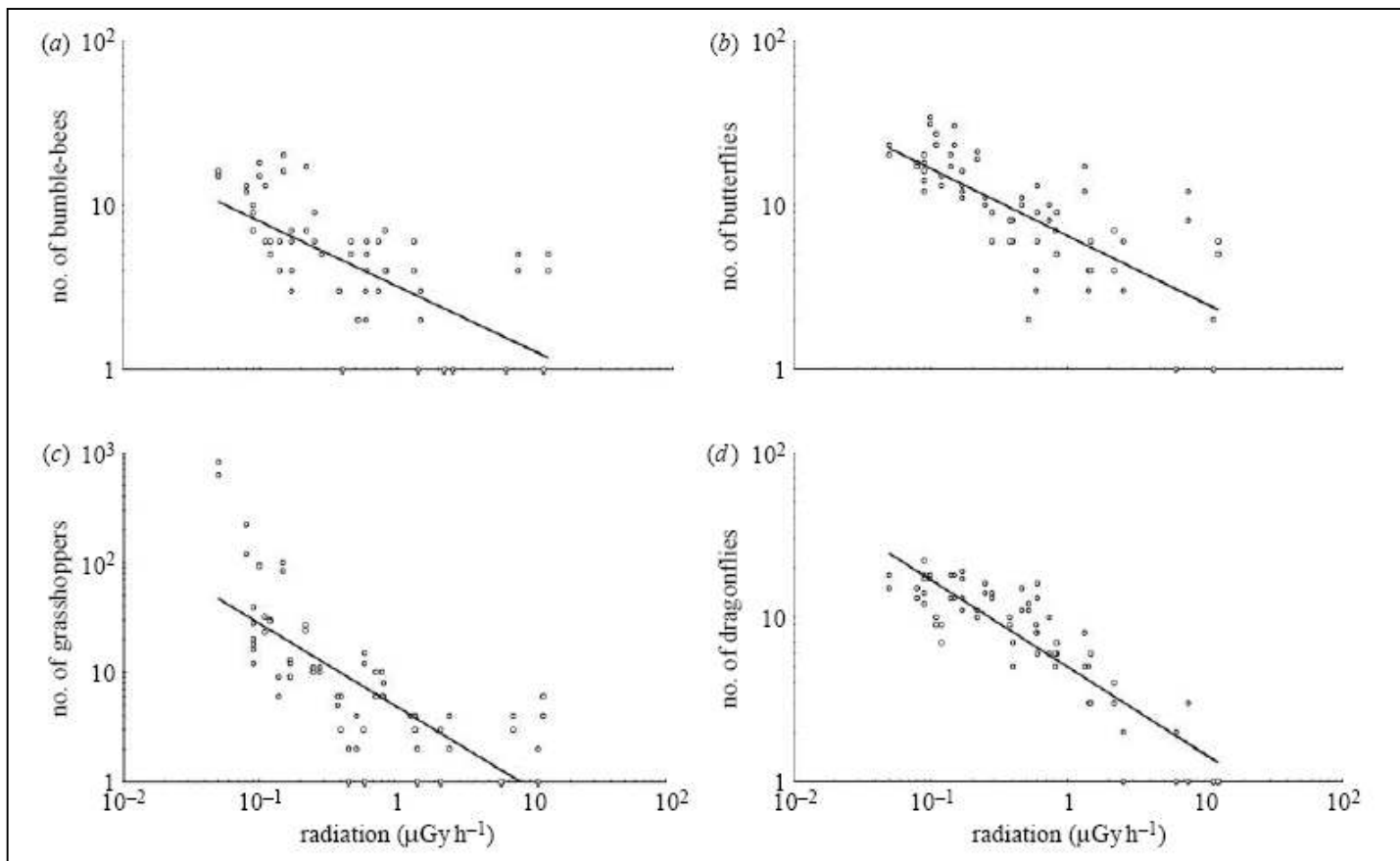


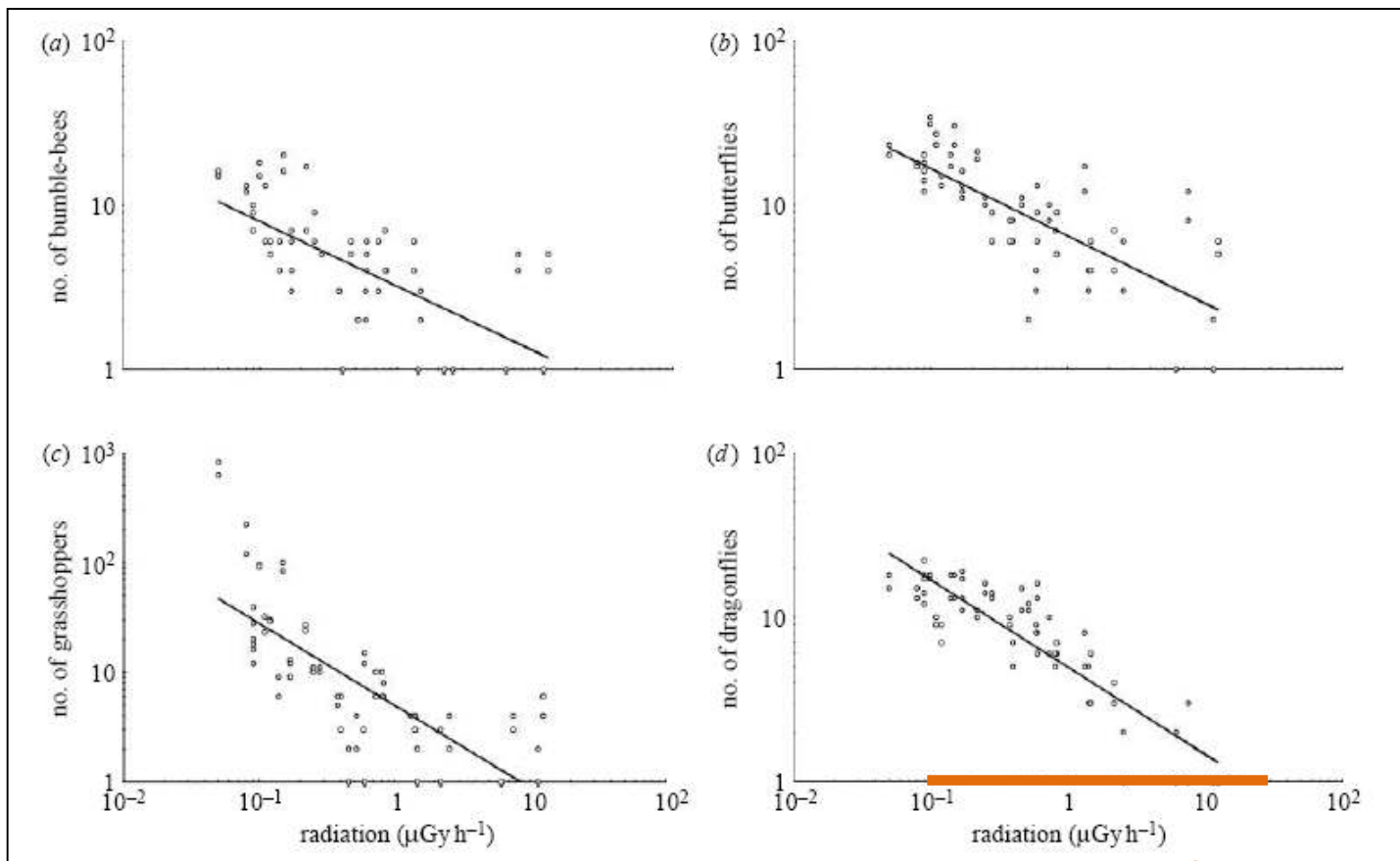
University of  
**Salford**  
MANCHESTER

@DrMikeWood



Møller & Mousseau (2009)





UK natural  
background



# Wildlife in Chernobyl going blind from cataracts because of radiation from nuclear disaster



By Hannah Osborne

February 11, 2016 13:09 GMT



University of  
**Salford**  
MANCHESTER

**@DrMikeWood**

# Wildlife in Chernobyl going blind from cataracts because of radiation from nuclear disaster



[www.nature.com/scientificreports](http://www.nature.com/scientificreports)

## SCIENTIFIC REPORTS

OPEN

### Fitness costs of increased cataract frequency and cumulative radiation dose in natural mammalian populations from Chernobyl

Received: 11 June 2015  
Accepted: 21 December 2015  
Published: 27 January 2016

Philipp Lehmann<sup>1,2</sup>, Zbyszek Boratyński<sup>3</sup>, Tapio Mappes<sup>1</sup>, Timothy A. Mousseau<sup>4</sup> & Anders P. Møller<sup>5</sup>

A cataract is a clouding of the lens that reduces light transmission to the retina, and it decreases the visual acuity of the bearer. The prevalence of cataracts in natural populations of mammals, and their potential ecological significance, is poorly known. Cataracts have been reported to arise from high levels of oxidative stress and a major cause of oxidative stress is ionizing radiation. We investigated whether elevated frequencies of cataracts are found in eyes of bank voles *Myodes glareolus* collected from natural populations in areas with varying levels of background radiation in Chernobyl. We found high frequencies of cataracts in voles collected from different areas in Chernobyl. The frequency of cataracts was positively correlated with age, and in females also with the accumulated radiation dose.

**Correspondence**  
**Long-term census  
data reveal  
abundant wildlife  
populations at  
Chernobyl**

T.G. Deryabina<sup>1</sup>, S.V. Kuchmel<sup>1</sup>,  
L.L. Nagorskaya<sup>2</sup>, T.G. Hinton<sup>3</sup>,  
J.C. Beasley<sup>4</sup>, A. Lerebours<sup>5</sup>,  
and J.T. Smith<sup>5,\*</sup>

Hypothesis 1 proposes that mammal abundances are negatively correlated with levels of radioactive contamination at Chernobyl. This hypothesis was not supported by the data. Mean number



# TREE



**Transfer - Exposure - Effects:**

integrating the science needed to underpin radioactivity assessments for humans and wildlife



Centre for Ecology & Hydrology  
NATURAL ENVIRONMENT RESEARCH COUNCIL



University of the West of England



UNIVERSITY OF STIRLING



University of Portsmouth



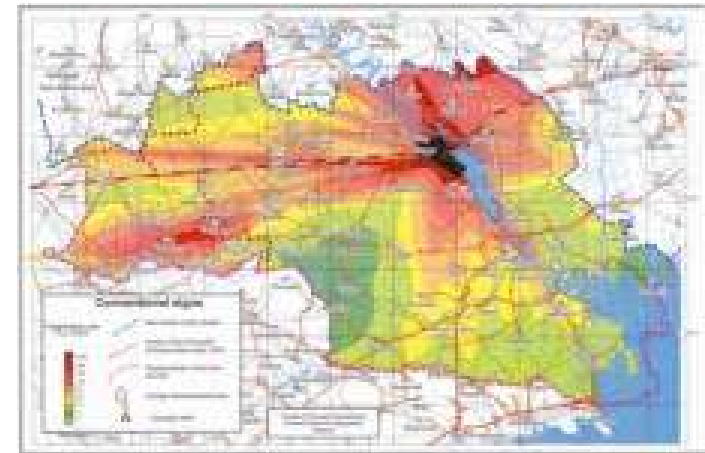
The University of Nottingham

University of Salford  
MANCHESTER



RESEARCH WITH PLYMOUTH UNIVERSITY

- Oct 2013 – Sept 2018
- International environmental radiation protection
- Chernobyl-based



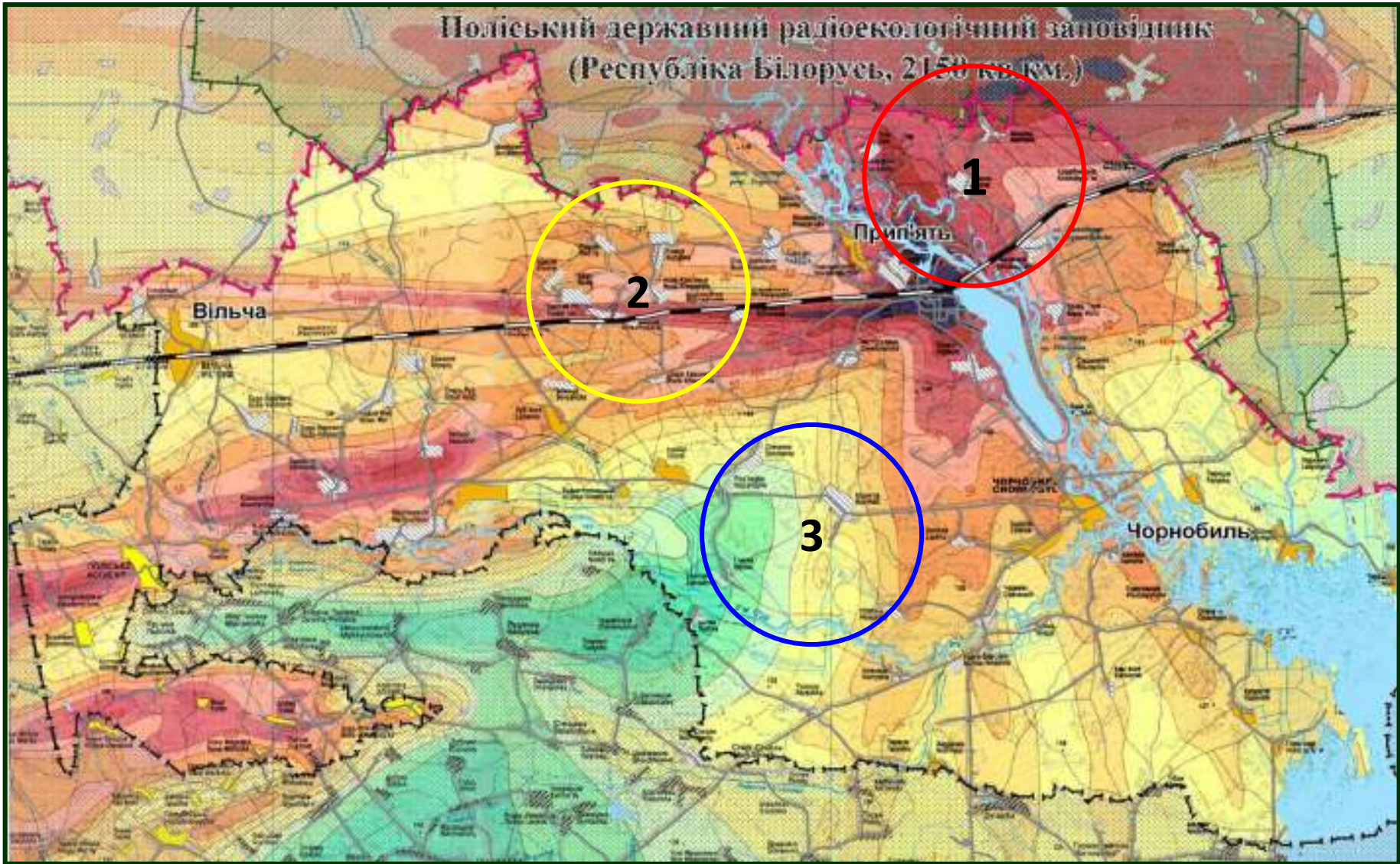
<http://www.ceh.ac.uk/tree>  
@DrMikeWood





## Hypothesis:

Large mammal diversity and abundance is not significantly impacted by radiation exposure within the CEZ











Ltl Acorn 7047

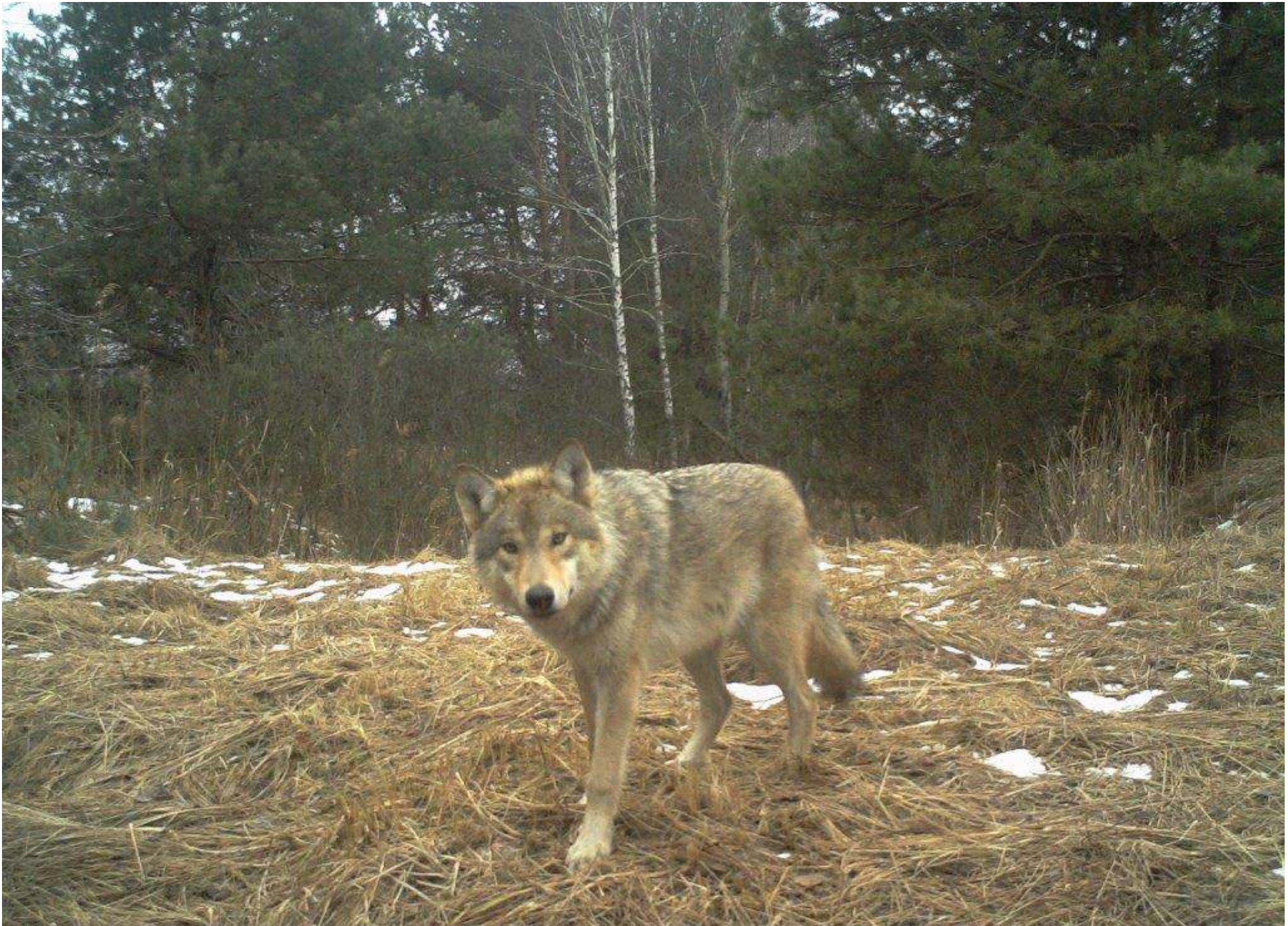
☾ 044°F 007°C

11.21.2012 11:05:30



Bushnell  B120112070 75°F23°C ●

06-07-2013 15:35:15



Ltl Acorn

2234

)

027°F - 003°C

01/25/2015 08:46:42



Ltl Acorn

2239



066°F

019°C

05/03/2015 11:43:35



Ltl Acorn

2235



051°F

011°C

02/10/2015 10:20:07



Ltl Acorn

9346



053°F

012°C

03/19/2015 15:57:16



Ltl Acorn

2218



041°F

005°C

08/25/2015 06:14:42





Ltl Acorn

( 059°F 015°C

01.17.2009 20:28:25



Bushnell (M) B120112070 53°F11°C

06-16-2013 06:22:47

30 July 2010 Last updated at 16:00



## Chernobyl zone shows decline in biodiversity

30 July 2010 Last updated at 16:00

## Chernobyl zone shows decline in biodiversity



Wood

30 July 2010 Last updated at 16:00

# Chernobyl zone shows decline in biodiversity

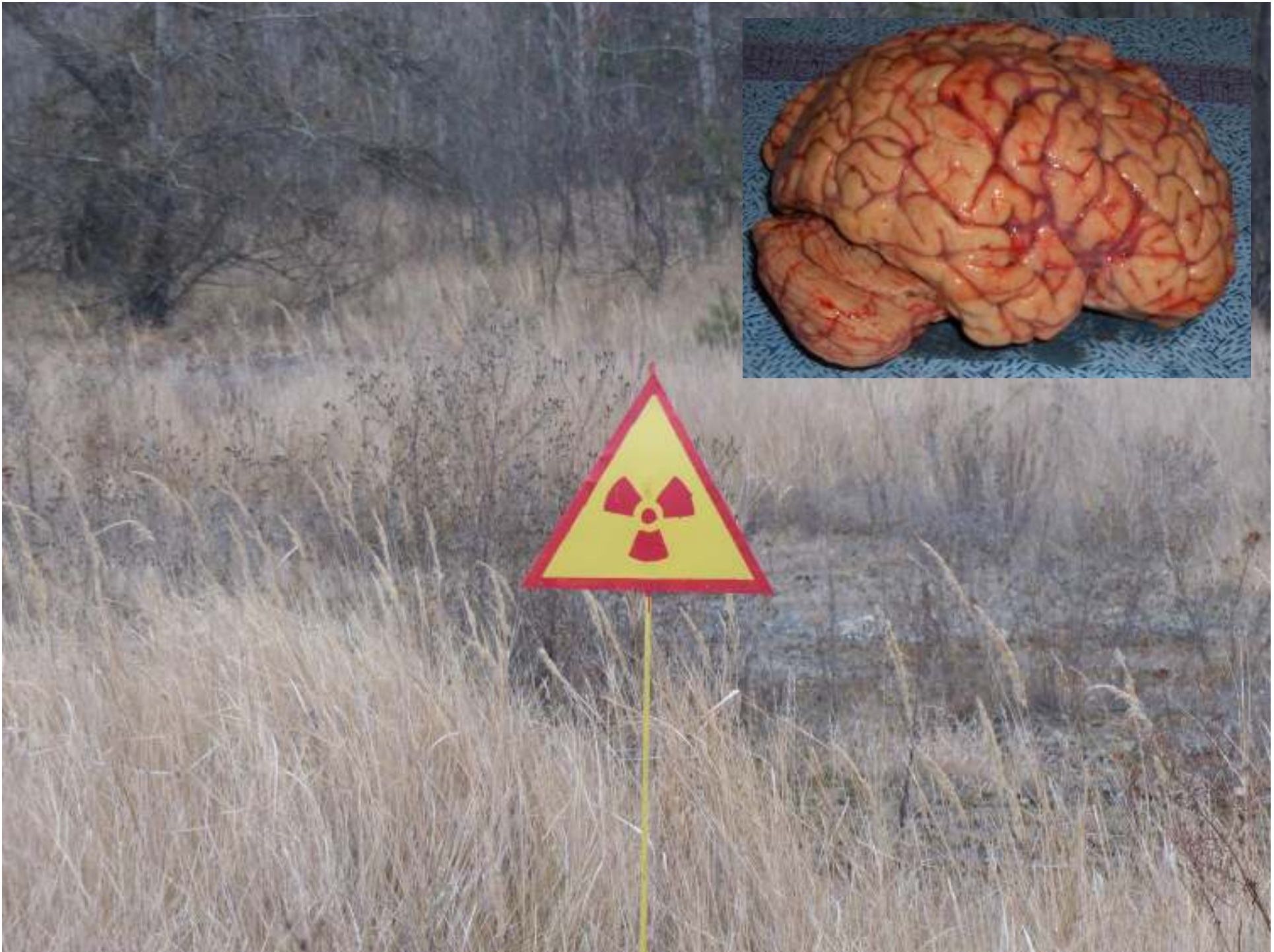


What do we mean by 'biodiversity'?

Wood

Considerations for ecological research in the Chernobyl 'Natural Laboratory' (and many other radiologically contaminated sites)

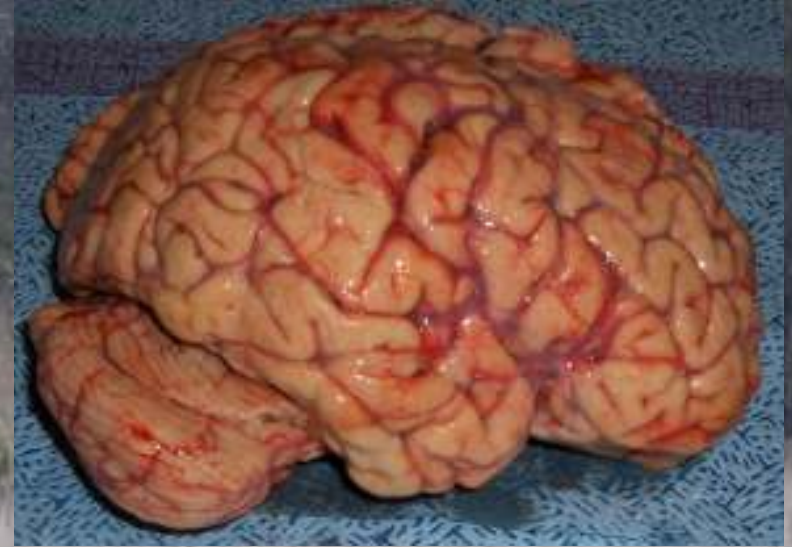




# Ecosystem memory

Recovery:

1. Internal
2. External





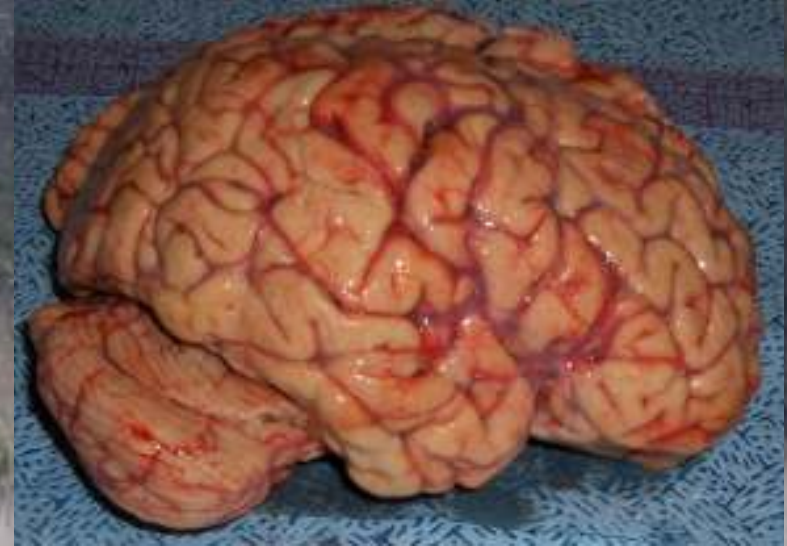
# Ecosystem memory

## Recovery:

1. Internal
2. External

## Disturbance:

1. Acute
2. Chronic



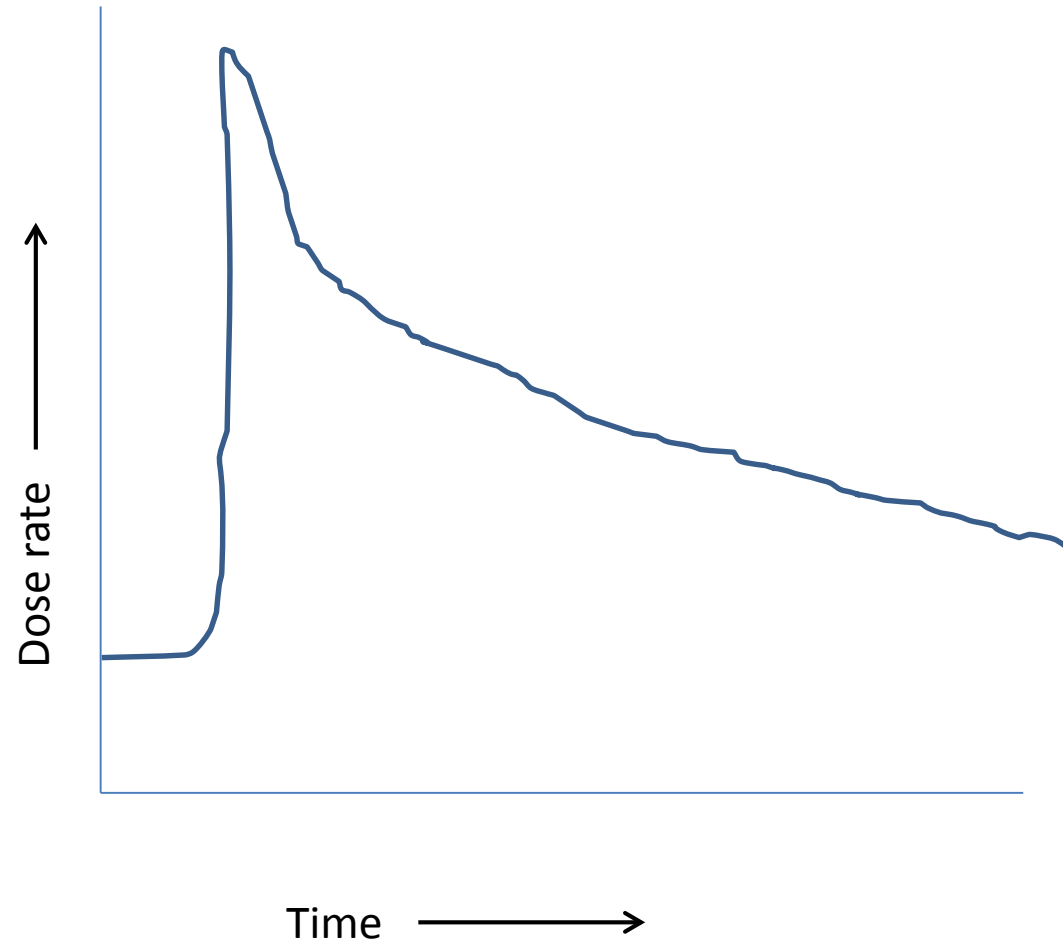
# Ecosystem memory

Recovery:

1. Internal
2. External

Disturbance:

1. Acute
2. Chronic



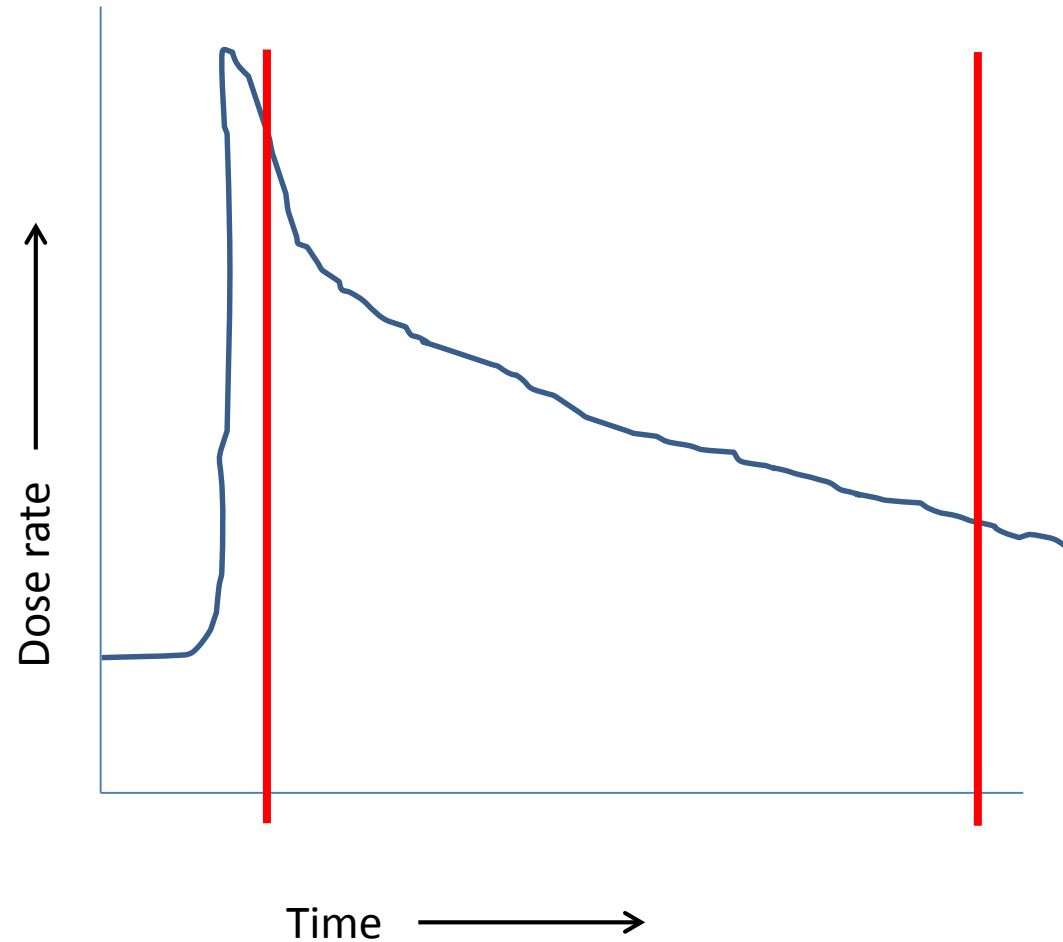
# Ecosystem memory

Recovery:

1. Internal
2. External

Disturbance:

1. Acute
2. Chronic



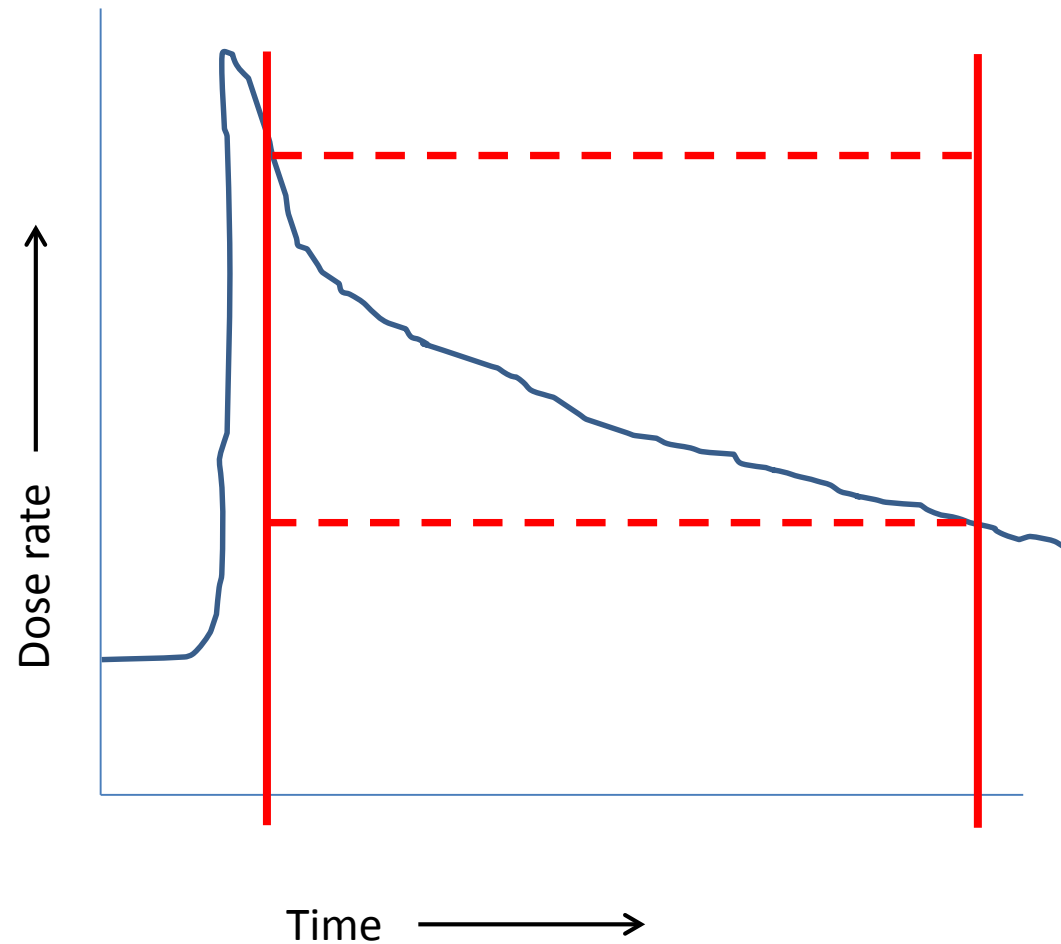
# Ecosystem memory

Recovery:

1. Internal
2. External

Disturbance:

1. Acute
2. Chronic



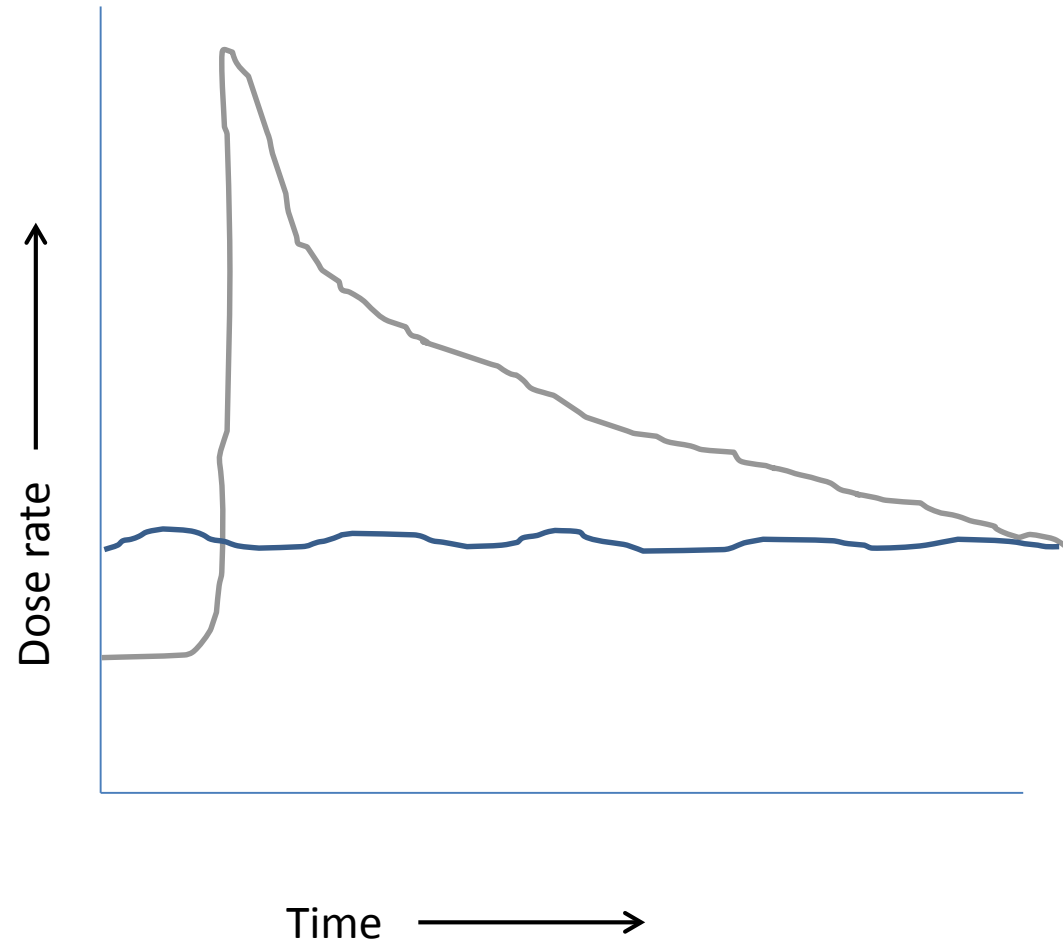
# Ecosystem memory

Recovery:

1. Internal
2. External

Disturbance:

1. Acute
2. Chronic



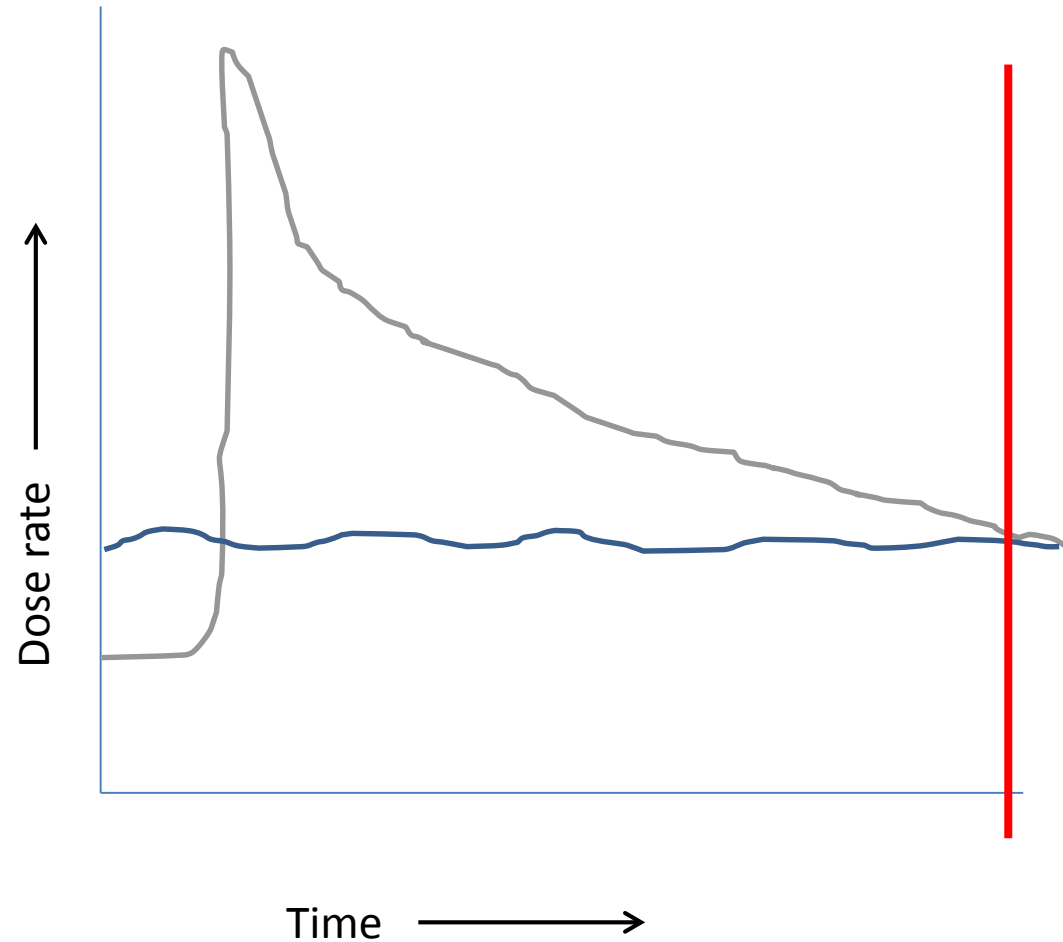
# Ecosystem memory

Recovery:

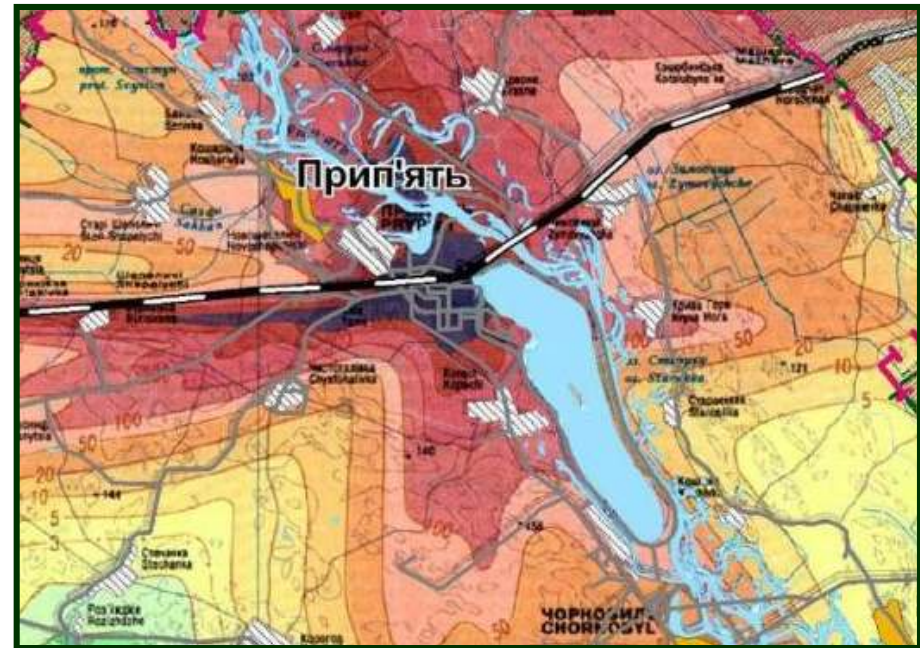
1. Internal
2. External

Disturbance:

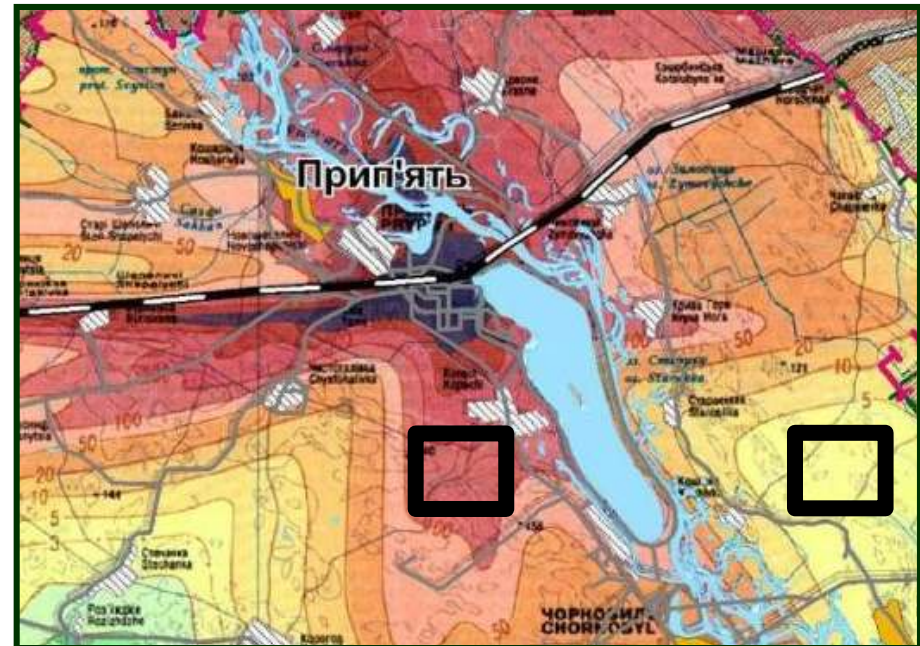
1. Acute
2. Chronic



# System permeability

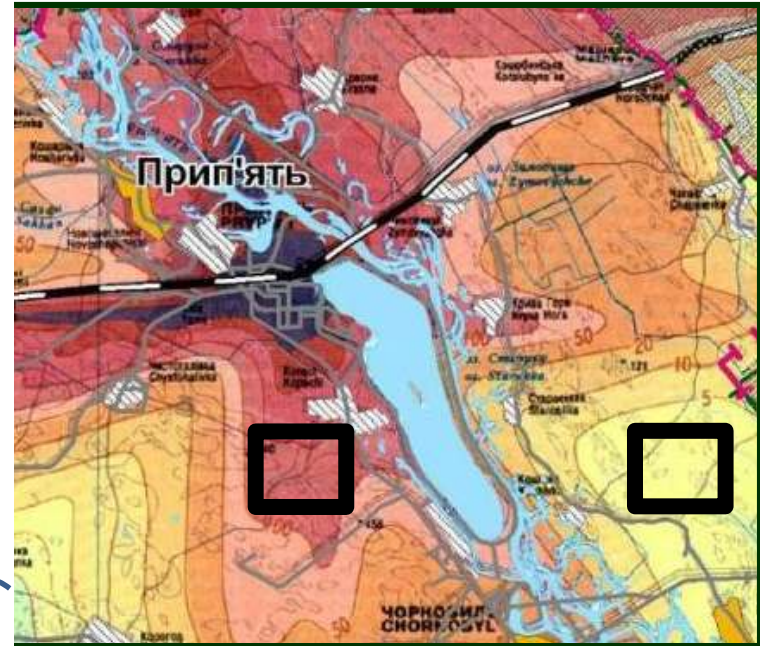
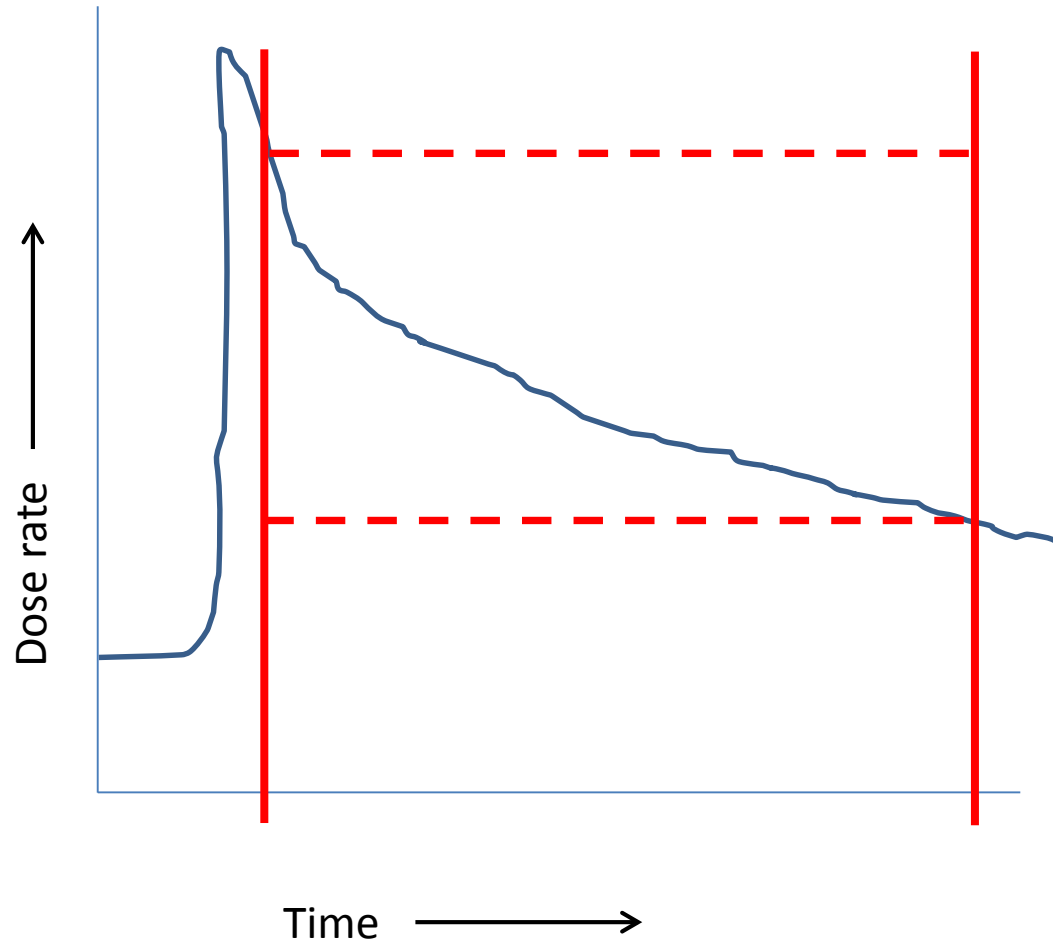


# System permeability



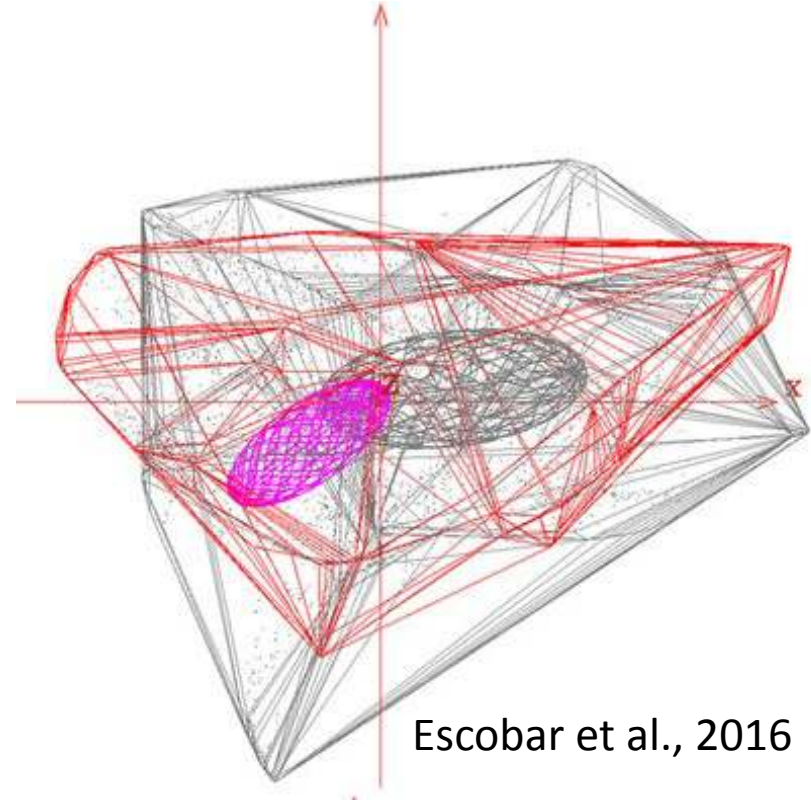


# System permeability



@DrMikeWood

# Niche influences

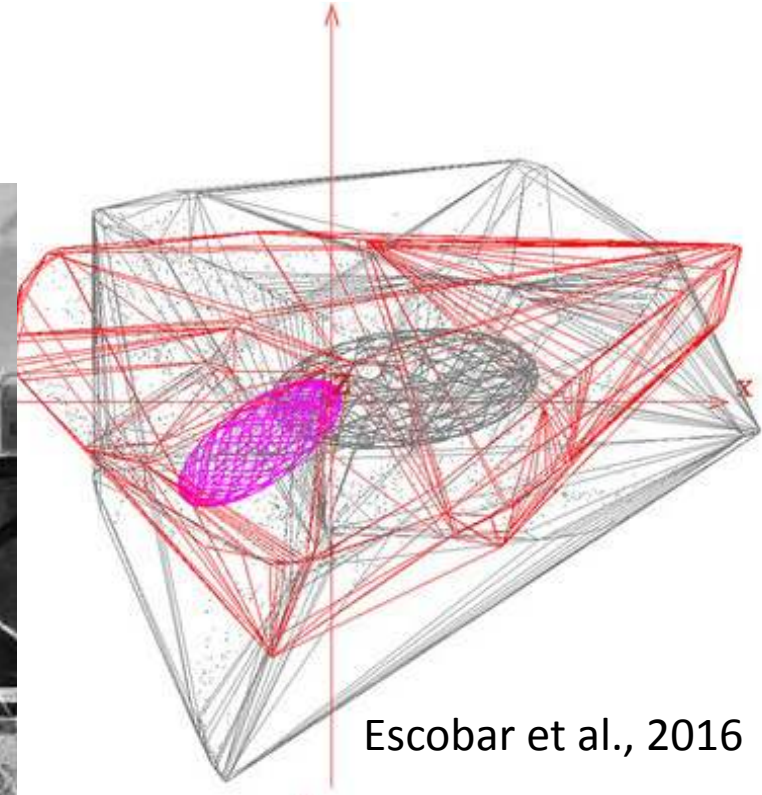


Escobar et al., 2016

# Niche influences

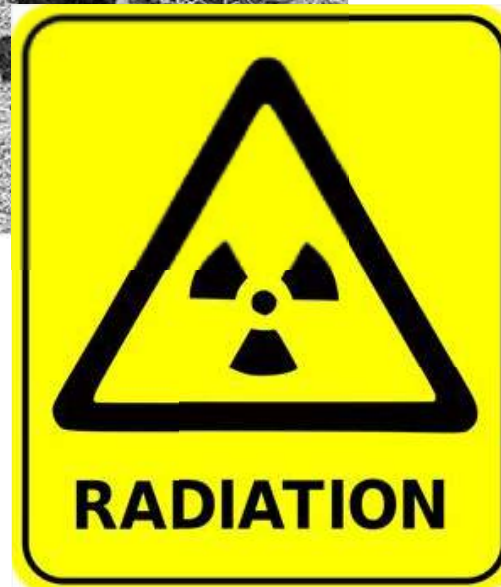


www.alamy.com - B57TR2



Escobar et al., 2016

University of  
**Salford**  
MANCHESTER



@DrMikeWood

# Key messages

- Chernobyl = Natural Laboratory BUT use with care
- Early phases after the accident – impacts evident
- Long term impacts less clear
  
- When learning from Chernobyl, ecosystem science is fundamental. e.g.
  - Ecosystem memory
  - System permeability
  - n-dimensional hypervolume



# My recommendation from 2005...

Seventh International Symposium of the Society for Radiological Protection

  
THE UNIVERSITY  
of LIVERPOOL

Change and Continuity in Radiation Protection  
12-17 June 2005, Cardiff, UK

**Ground-truthing of current environmental radiation protection frameworks: Putting the 'ecology' back in 'radioecology'**

M. D. Wood<sup>1</sup>, J.V. Smallcombe<sup>1</sup>, J.L. Hingston<sup>2</sup>, D. Copplestone<sup>2</sup> and R. T. Leah<sup>1</sup>

<sup>1</sup>School of Biological Sciences, Jones Building, University of Liverpool, Liverpool, L69 3GS, UK e-mail [mwood@liv.ac.uk](mailto:mwood@liv.ac.uk)  
<sup>2</sup>Environment Agency, Knutsford Road, Warrington, WA4 1HG, UK



Mike Wood  
CBiol MSciol, MREEM

...is still a work in progress!


Any  
questions?



**COVERT**

07.31.2013 03:04:56

● 24

007°C 045°F  9