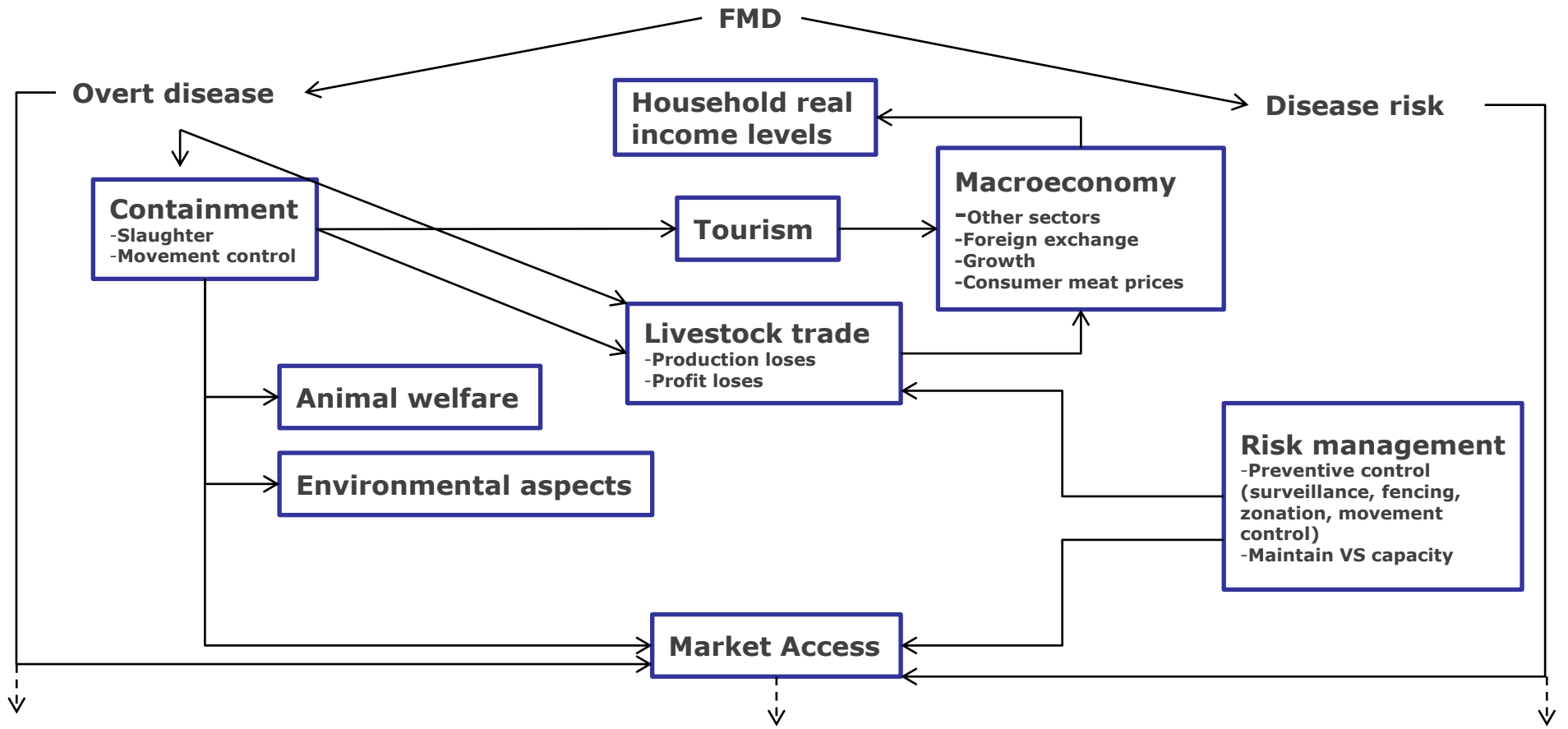
Better Training for Safer Food
BTSF

Use of databases and software in handling suspicion, outbreak and dynamics of an emerging animal disease

Telmo Nunes – FMV-TULisbon

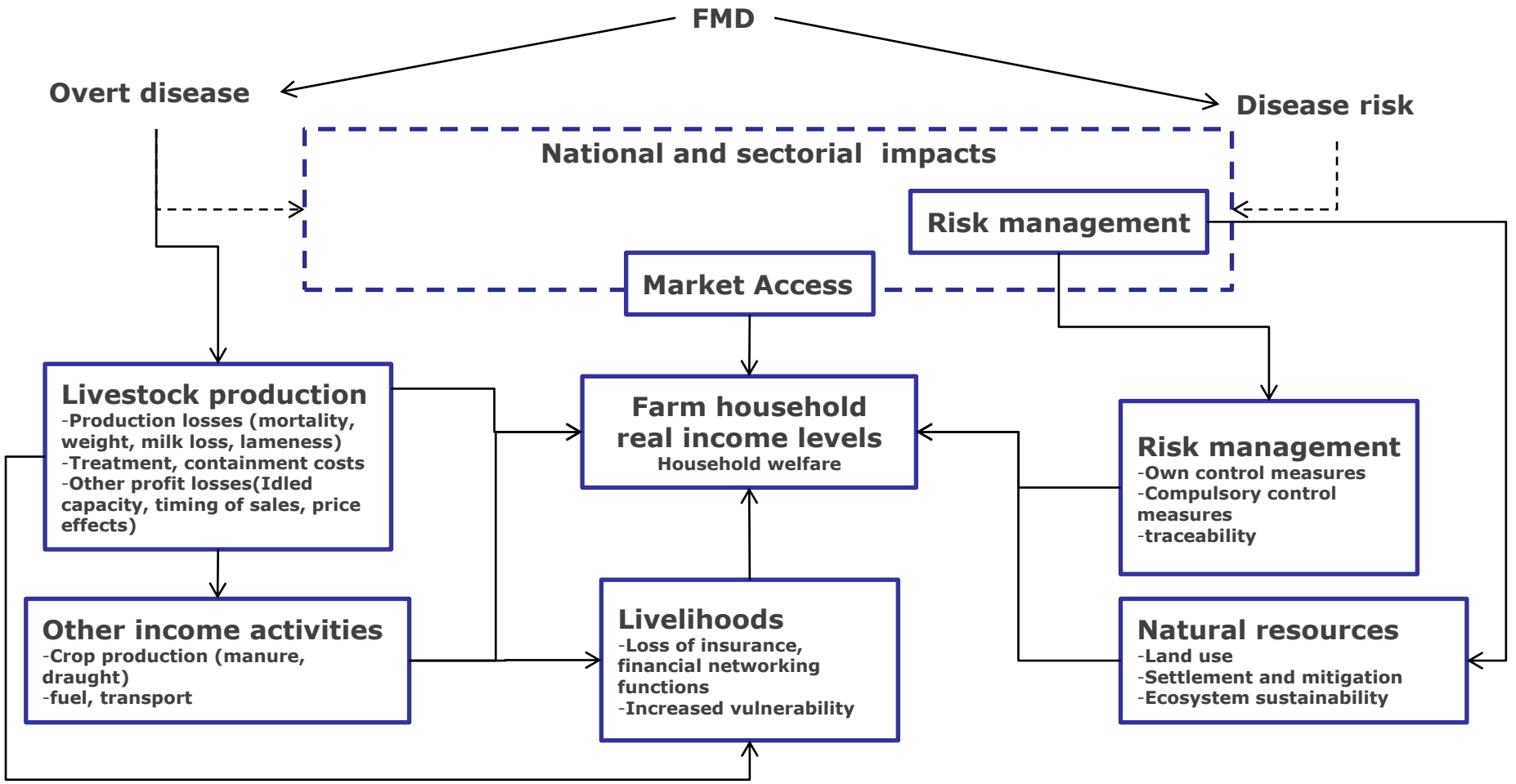
European Commission

National and sectorial impact of animal diseases



Adapted from Perry and Randolph 2003

Farm-level impact of animal diseases



Adapted from Perry and Randolph 2003

The impact of diseases

FMD outbreak . UK 2001

Number of animals slaughtered and total animals

	Numbers slaughtered	Numbers slaughtered	

≈ 6.9 Million animals culled

a) As recorded by the Agricultural Census in June 2000
b) In addition, 526,000 lambs were slaughtered under the light lambs scheme
N/A: not available

Economic impact (Million euros)

≈ 13278 Million €*

*** 1-1-2002 exchange rate**

Source: Thompson *et al* (2002)

Response to animal disease emergencies

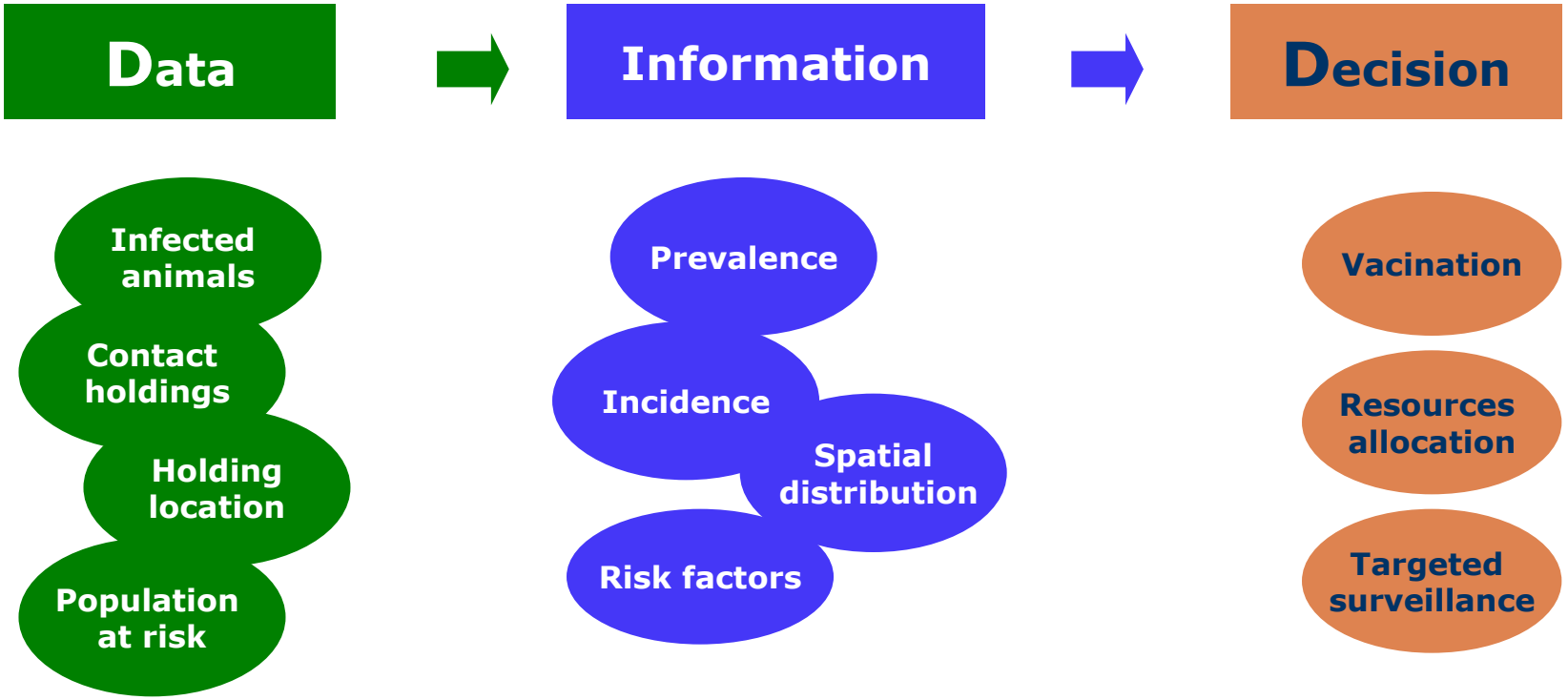
Dynamics of the 2001 UK Foot and Mouth Epidemic: Stochastic Dispersal in a Heterogeneous Landscape

Matt J. Keeling,[1]* Mark E. J. Woolhouse,[2] Darren J. Shaw,[2] Louise Matthews,[2] Margo Chase-Topping,[2] Dan T. Haydon,[3] Stephen J. Cornell,[1] Jens Kappey,[1] John Wilesmith,[4] Bryan T. Grenfell[1]

Control measure	Total cases	Total cull	Total vaccinated
Standard	105%	84%	0%
IP cull only	827%	242%	0%
Prompt cull (24/48-hour delay throughout)	57%	54%	0%
Intensive cull (high levels throughout)	45%	73%	0%
3-km ring cull only	47%	142%	0%
Standard + 90% vaccination	84%	72%	76%
Standard + vaccination from May	97%	81%	8%
IP only + vaccination	784%	156%	453%
Standard + barrier vaccination	70%	69%	251%

The reasoning for information quality

Better information = Better decisions



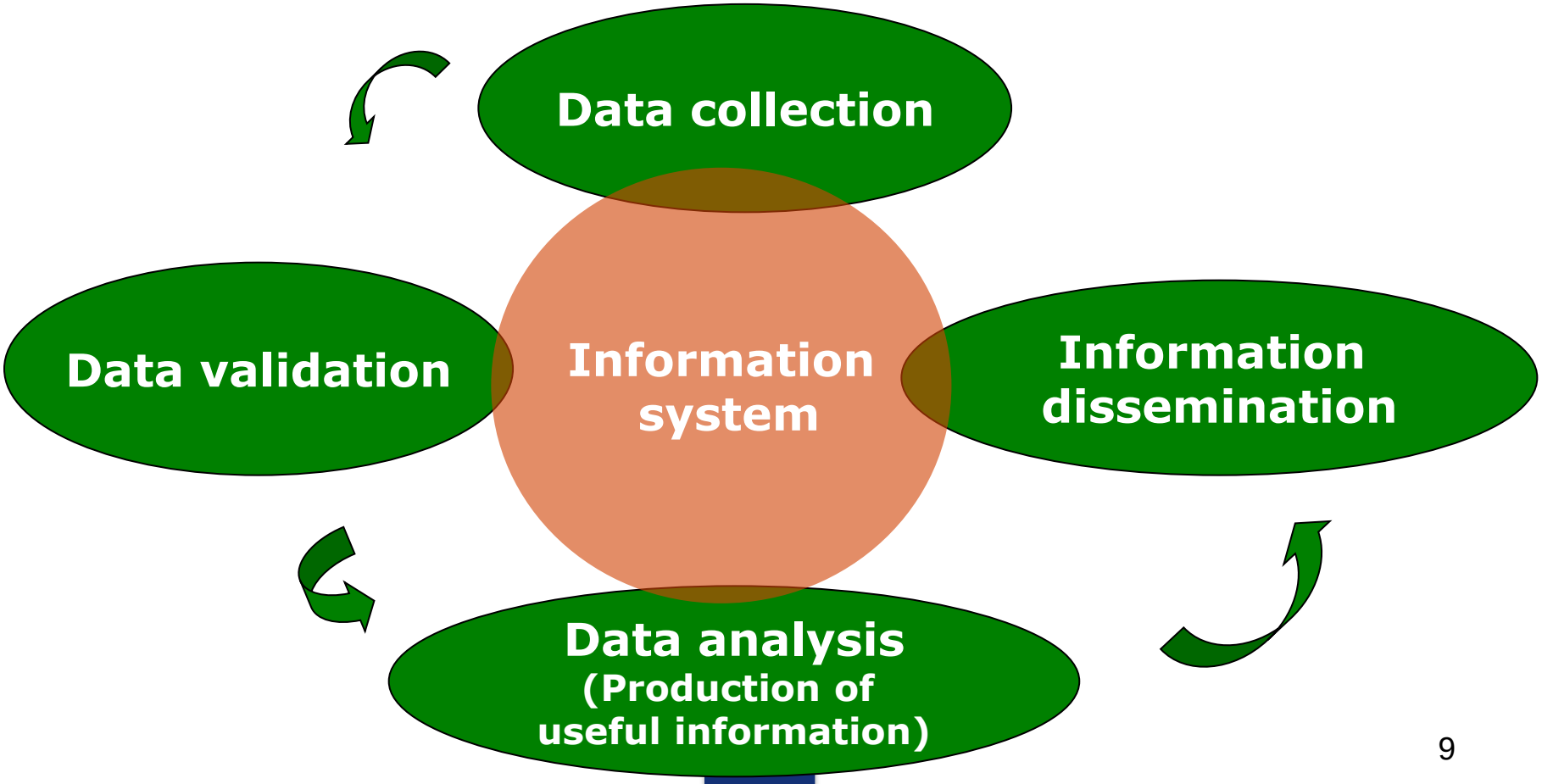
Information quality

Information=f(Data+Definition+Presentation)
Knowledge=f(People+Information+Significance)
Wisdom=f(People+Knowledge+Action)

Quality Characteristics	Knowledge worker Benefit
The *right* data	The data I *need*
With the *right* completeness	*All* the data I need
In the right *context*	Whose *meaning* I know
With the right *accuracy*	I can *trust* and rely on it
In the right *format*	I can *use* it *easily*
At the right *time*	*When* I need it
At the right *place*	*Where* I need it
For the right *purpose*	*I can accomplish our goals*

Adapted from: English L., 1999

How to assure information quality?



Data sources

National/Regional

- Animal/holding databases
- Animal Health Information Systems
- Ancillary databases:
  - Entomological surveillance
  - Syndromic surveillance
  - Wildlife disease/mortality

International

- Animal movement
  - TRACES, Eurostat
- Animal Health
  - Official
    - ADNS
    - WAHID
    - EMPRES-I
  - Other
    - Promed-mail
    - Healthmap

Crowdsourced data

Advantages

- **Millions of potential data providers**
- **Real time data**

Risks

- **More data ≠ Better data**
- **Creating expectations**

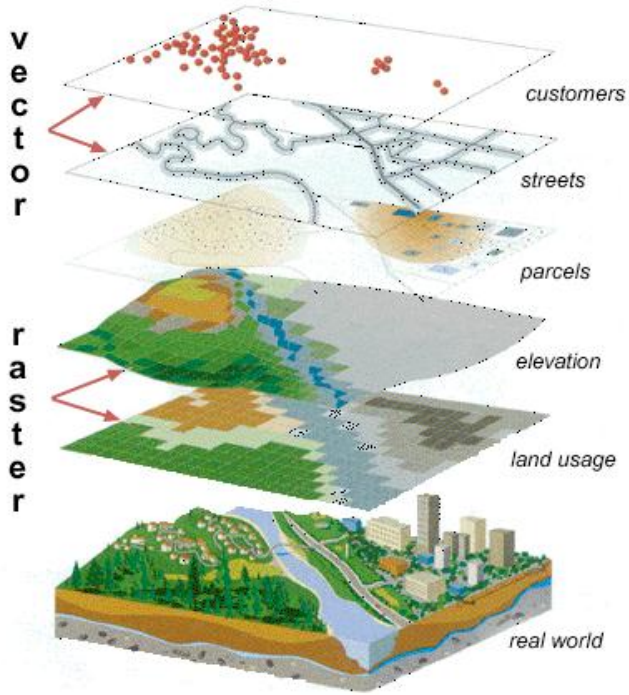
Using geographic information to control diseases

John Snow's "Ghost map" - 1854

Geographical Information Systems

GIS deals with data by using several different layers each of which represents an abstraction the real world

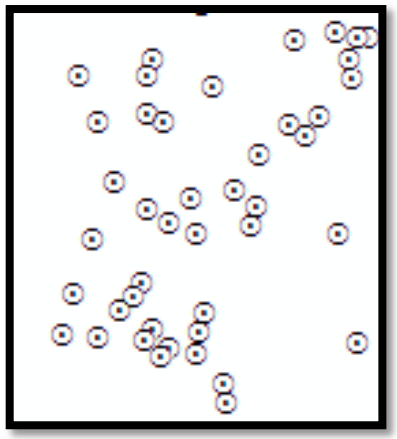
Each layer should have one and only one theme



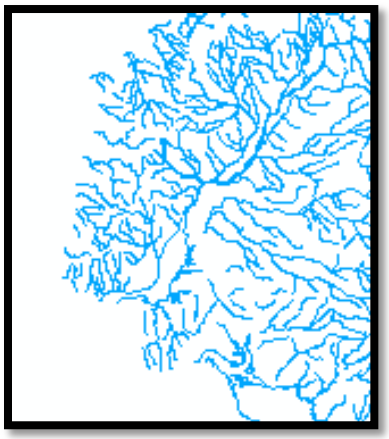
Vectorial Data

- useful for the recording of discrete spatial data (like farms, rivers, buildings, train stations, …)
POINTS LINES POLYGONS
- 3 types of geometry:

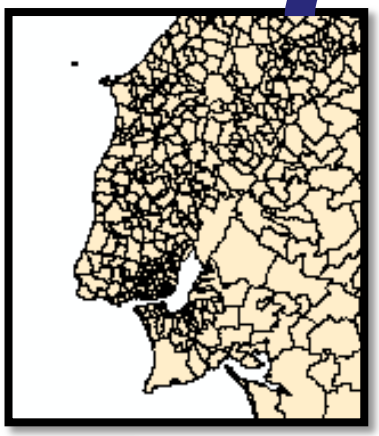
Points



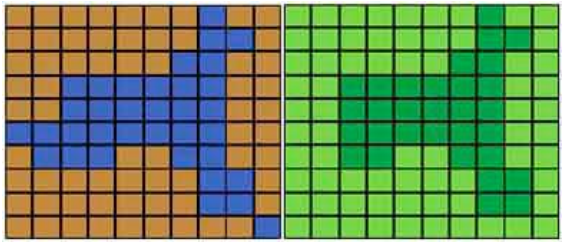
Lines



Polygons



FID	Shape	DICOFRE	FREGUESIA
0	Polygon	010101	AGADÃO
1	Polygon	010102	AGUADA DE BAIXO
2	Polygon	010103	AGUADA DE CIMA
3	Polygon	010104	ÁGUEDA
4	Polygon	010105	BARRÔ
5	Polygon	010106	BELAZAIMA DO CHÃO
6	Polygon	010107	CASTANHEIRA DO VOUGA
7	Polygon	010108	ESPINHEL



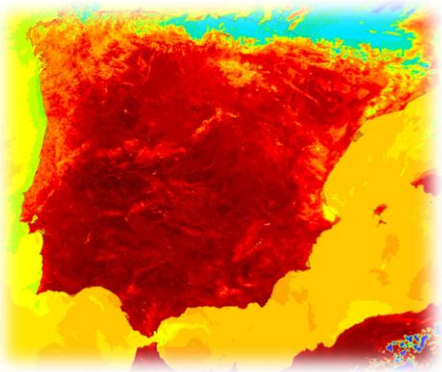
Raster data

- Raster are Images, where each pixel is the unit

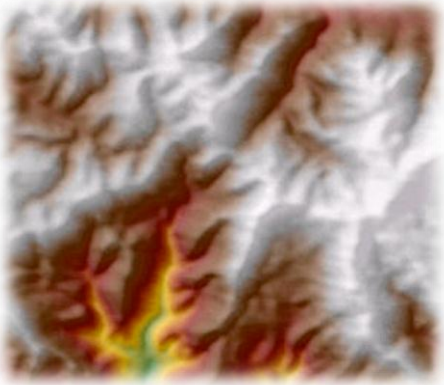
- useful for the recording of spatial data that has a continuous geographical distribution

(temperature, elevation, slope, satellite imagery, …)

- it can also be used to store ortophotos (aerial imagery), satellite imagery and scanned maps



Surface Temperature



Elevation

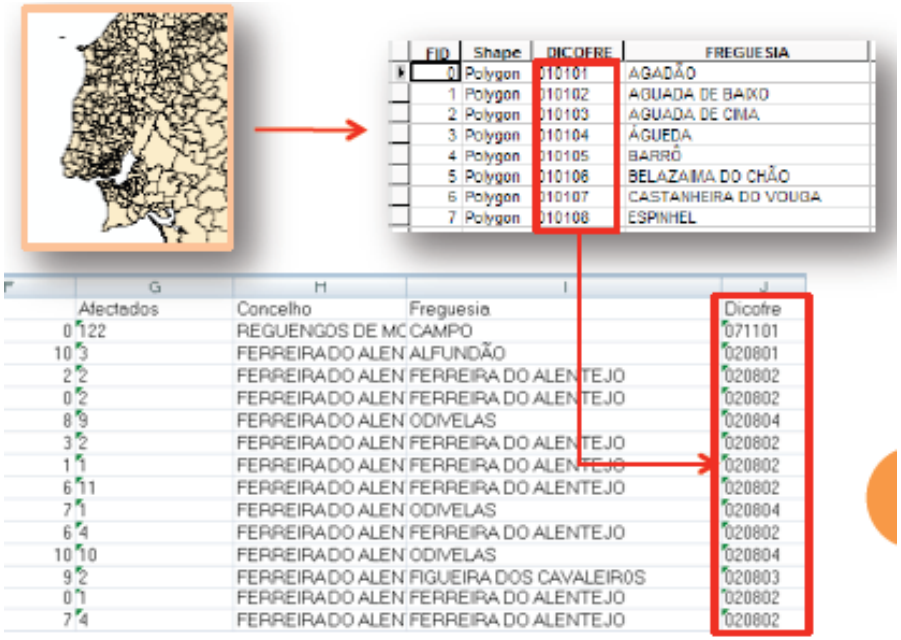
Digitized maps

Satellite imagery

Alphanumeric data

GIS can also read alphanumerical data as data tables that can be geographically represented using:

A relational model **OR** **Tables with coordinates**



FID	Shape	DICOFRE	FREGUESIA
0	Polygon	010101	AGADÃO
1	Polygon	010102	AGUADA DE BAIXO
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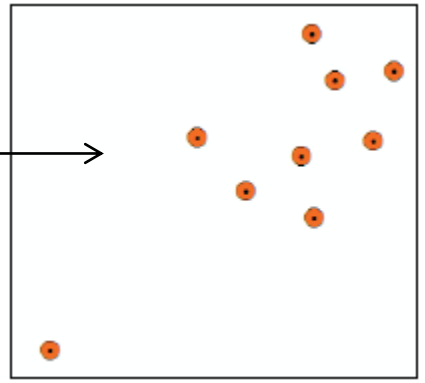
3	Polygon	010104	ÁGUEDA
4	Polygon	010105	BARRÔ
5	Polygon	010106	BELAZAIMA DO CHÃO
6	Polygon	010107	CASTANHEIRA DO VOUGA
7	Polygon	010108	ESPINHEL

	Afectados	Concelho	Freguesia	Dicofre
0	122	REGUENGOS DE MC	CAMPO	071101
10	3	FERREIRA DO ALEN	ALFUNDÃO	020801
2	2	FERREIRA DO ALEN	FERREIRA DO ALENTEJO	020802
0	2	FERREIRA DO ALEN	FERREIRA DO ALENTEJO	020802
8	9	FERREIRA DO ALEN	ODIVELAS	020804
3	2	FERREIRA DO ALEN	FERREIRA DO ALENTEJO	020802
1	1	FERREIRA DO ALEN	FERREIRA DO ALENTEJO	020802
6	11	FERREIRA DO ALEN	FERREIRA DO ALENTEJO	020802
7	1	FERREIRA DO ALEN	ODIVELAS	020804
6	4	FERREIRA DO ALEN	FERREIRA DO ALENTEJO	020802
10	10	FERREIRA DO ALEN	ODIVELAS	020804
9	2	FERREIRA DO ALEN	FIGUEIRA DOS CAVALEIROS	020803
0	1	FERREIRA DO ALEN	FERREIRA DO ALENTEJO	020802
7	4	FERREIRA DO ALEN	FERREIRA DO ALENTEJO	020802

FID	Shape *	long	lat	
0	Point	-8,4507	39,503	Exploração Foco
1	Point	-8,44264	39,512	Exploração Foco
2	Point	-8,436144444	39,5086	PTRP05B
3	Point	-8,439916667	39,50973056	Tojeira 3
4	Point	-8,436838889	39,5112	Tojeira 2
5	Point	-8,432869444	39,51186944	Tojeira 1
6	Point	-8,435030556	39,51446111	Tojeira 5
7	Point	-8,43175	39,51486944	Tojeira 4
8	Point	-8,436286111	39,51642778	Tojeira 6

Spatial reference System



Components of animal disease emergency preparedness plans

Early warning

+

Early reaction

Early warning

Objectives

- **Rapid detection of:**
  - **Introduction of the disease**
  - **Sudden increase in the incidence**

Methods

- **disease surveillance,**
- **reporting**
- **epidemiological analysis**

Results

- **Knowledge of the distribution and behavior of disease outbreaks**
- **Monitoring of the effectiveness of disease control campaigns**
- **“Forecasting” of the evolution of the disease outbreaks**

Risk based surveillance

Example: *BTV8 in Portugal (May 2008)*

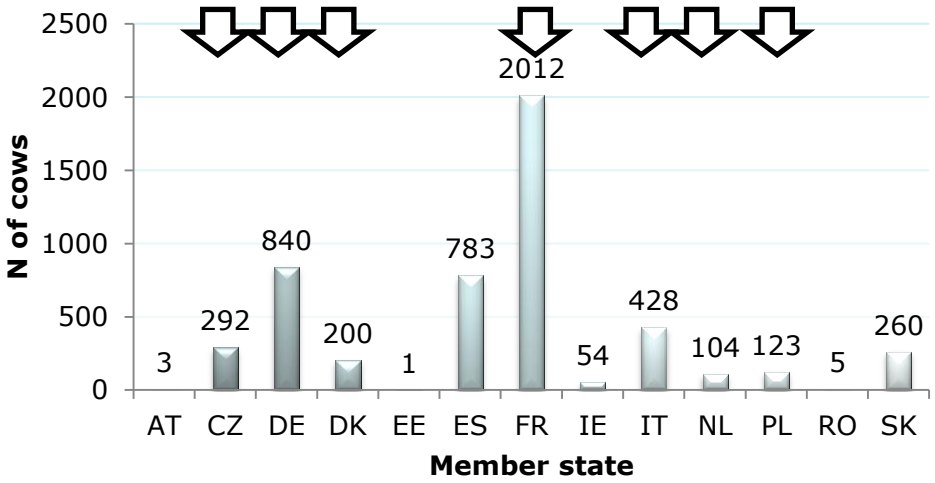
Objective: *Identification of areas with bovines moved from BTV8 infected areas or their offspring where BTV8 competent vectors were present*

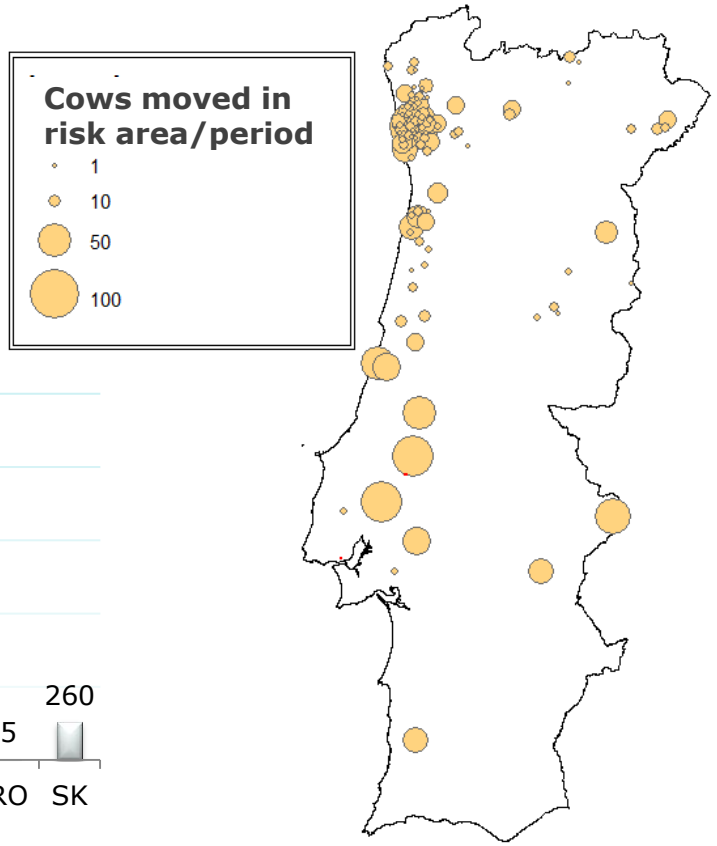
Data sources:

- **Entomological data –** Vector presence models (Entomological surveillance program)
- **Animal movements and births–** TRACES, National Bovine Identification System
- **BTV8 infected areas** – ADNS, WAHID

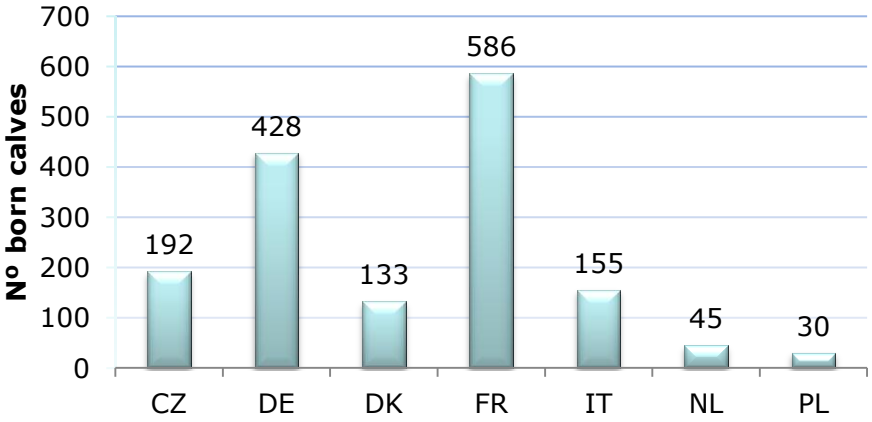
Risk based surveillance – BTV8 in Portugal

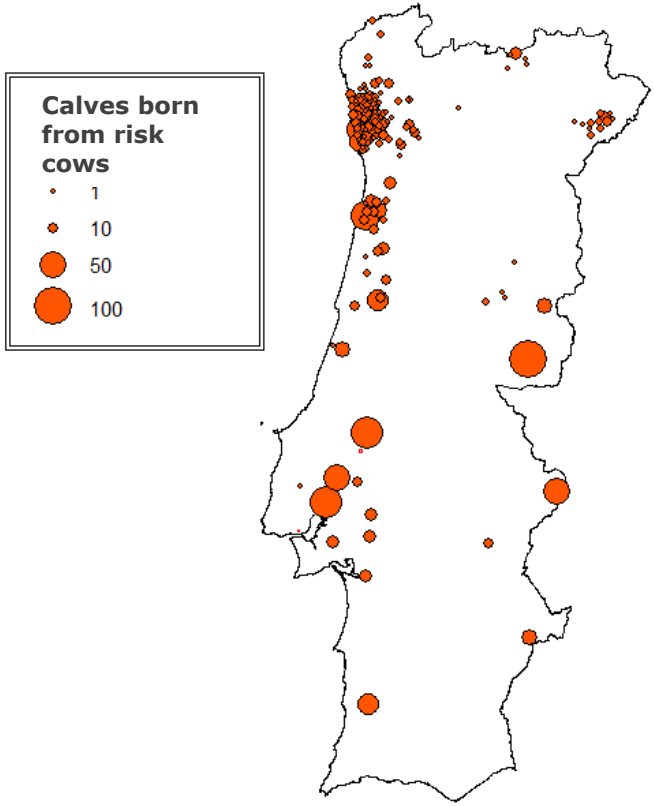
Movements from affected member states in the vector activity period: ***3999 cows***





1569 calves born from cows moved from affected areas





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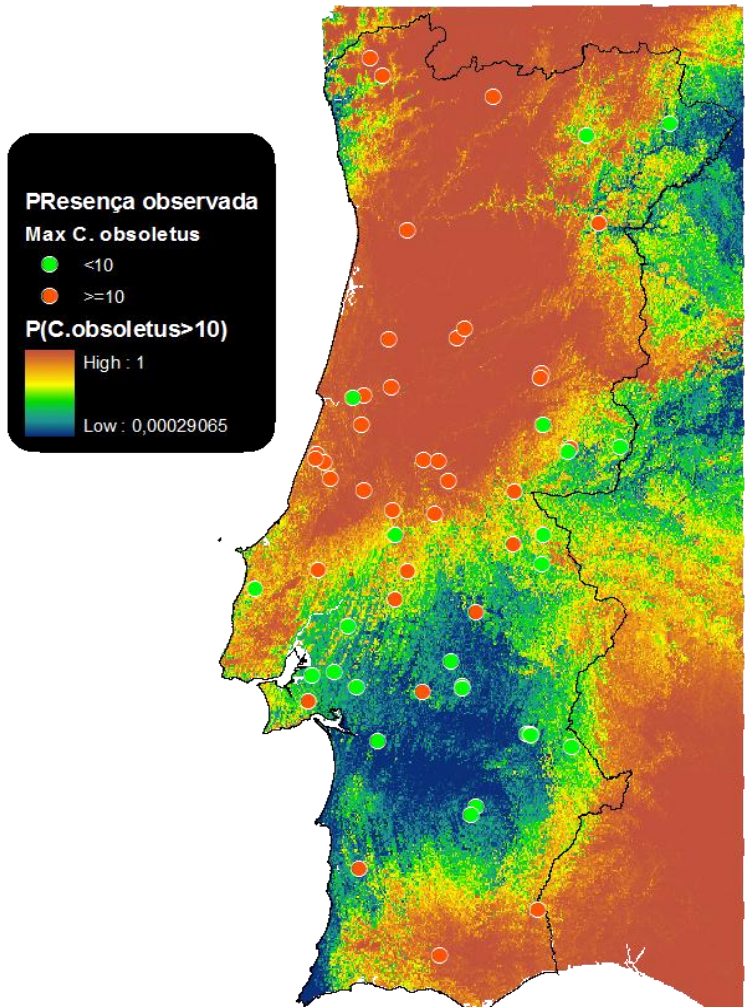
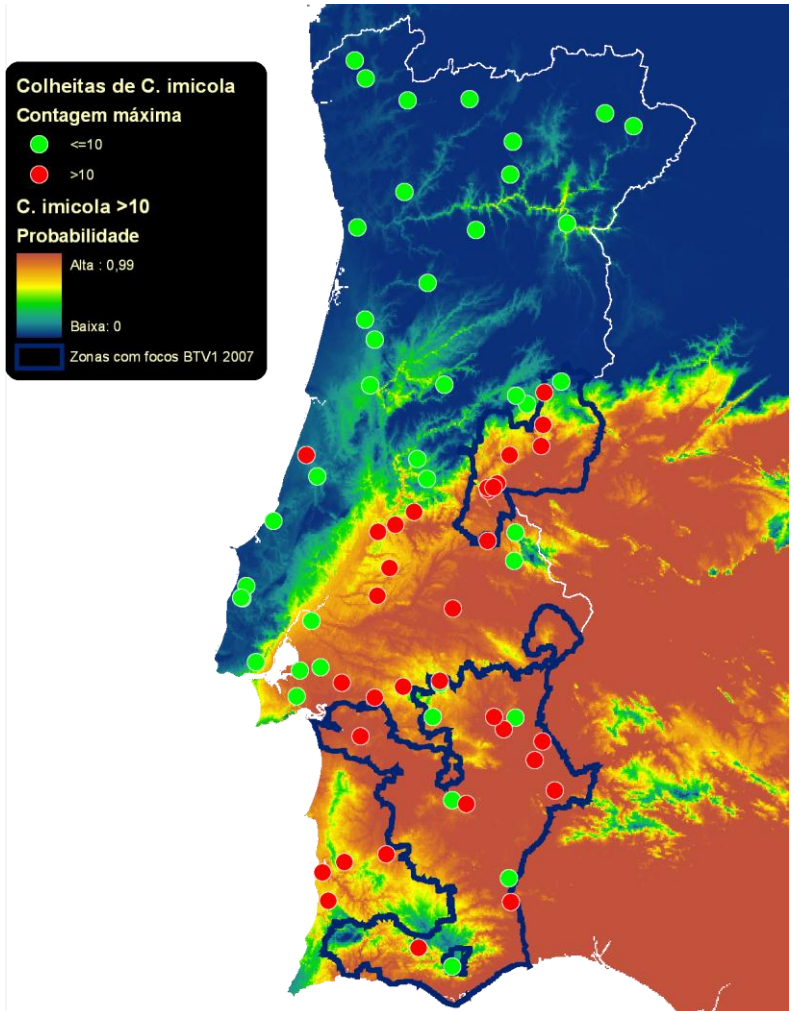
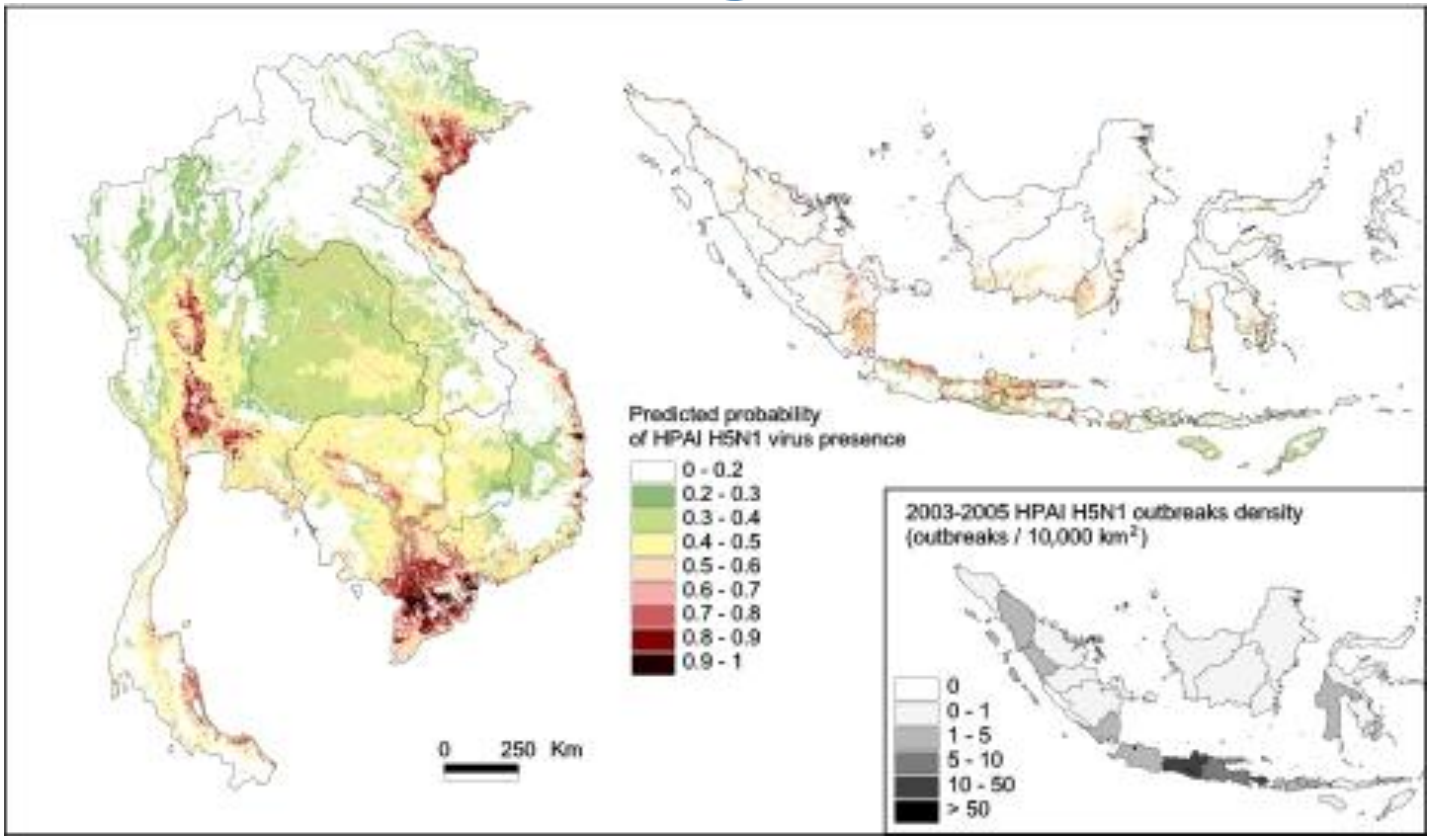
C. obsoletus (complex)



C. imicola



Risk based surveillance
Identification of high risk areas



Source: Pfeiffer *et al* (2009)

Early reaction

Carrying out without delay the disease control activities needed to:

- **contain the outbreak**
- **eliminate the disease and infection in the shortest possible time**
- **in the most cost-effective way**

provide objective, scientific evidence that these objectives has been attained.

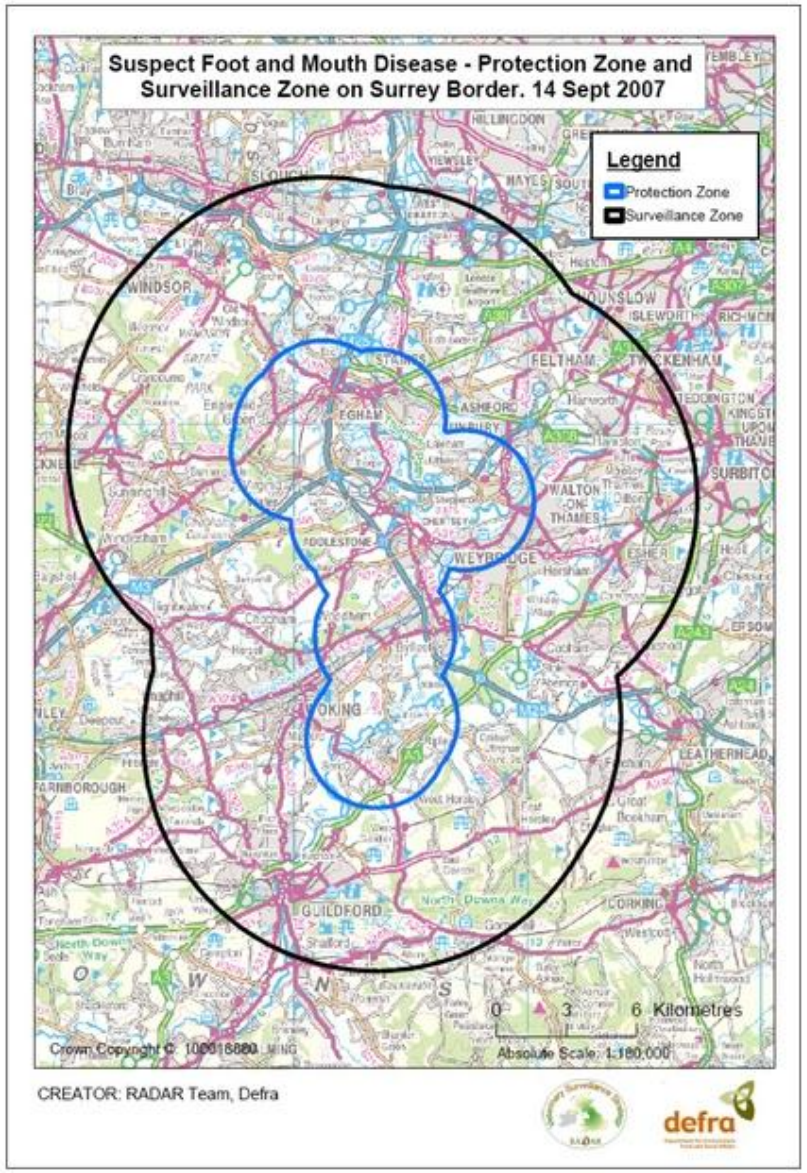
Steps in a Response

Detection
Investigation/Diagnosis
Quarantine/Stop Movements
Surveillance
Depopulation
Disposal
Cleaning and Disinfection
Indemnity/Recovery

European Commission

Applications of GIS in Early reaction activities

Controlled area delineation and reporting

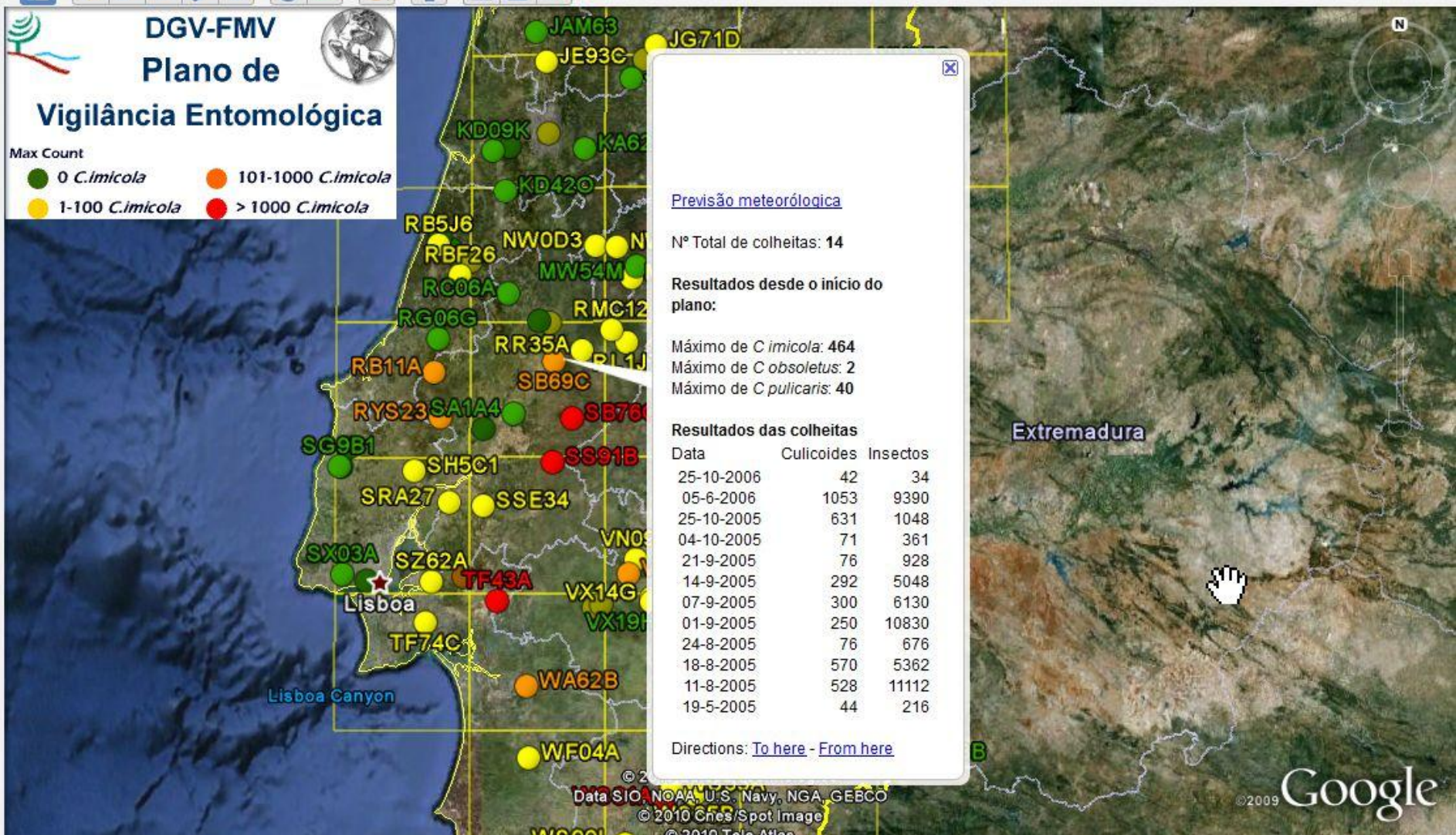


Applications of GIS in Early reaction activities

Controlled area delineation and reporting

Production of routine summary maps for controlers, government, ministers and the media

European Commission



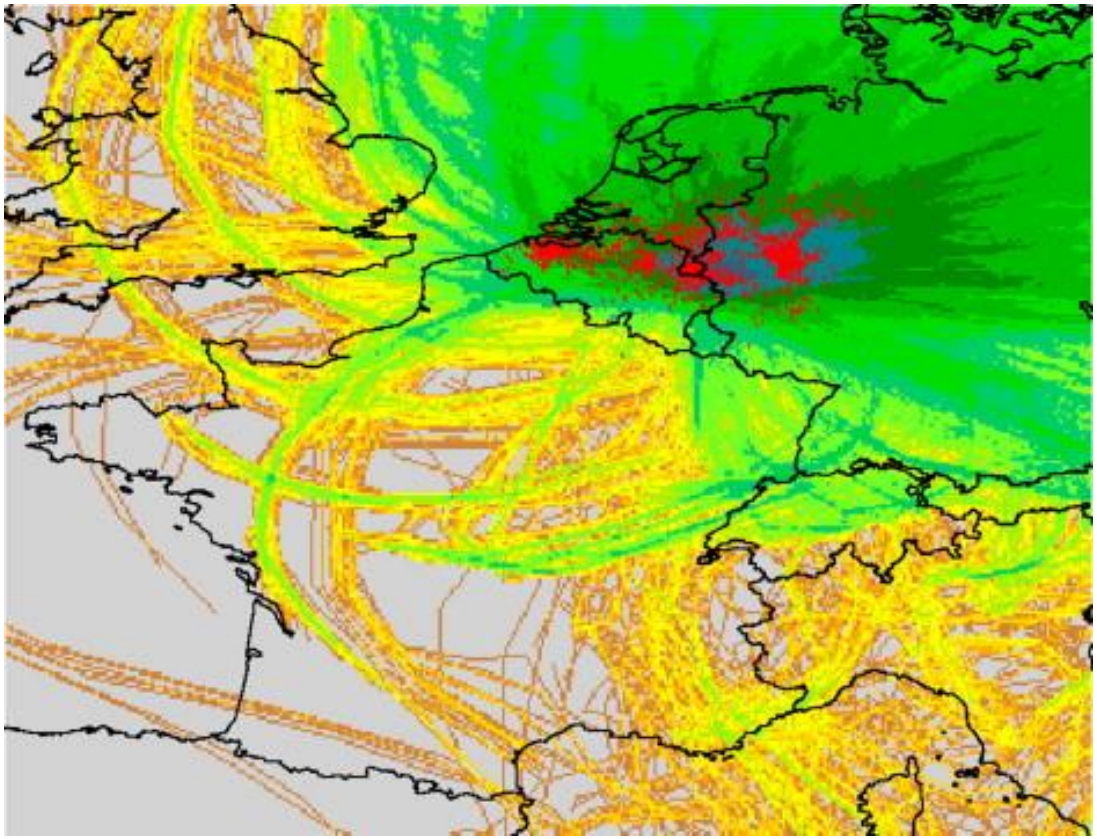
Applications of GIS in Early reaction activities

Controlled area delineation and reporting

Production of routine summary maps for controlers, government, ministers and the media

Searching for likely sources of infection for new infected premises

Airborne spread of culicoides



Source: Hendrickx *et al* (2008)

Applications of GIS in Early reaction activities

Controlled area delineation and reporting

Production of routine summary maps for controlers, government, ministers and the media

Searching for likely sources of infection for new infected premises

Identify immediate neighbours and farms to within a given distance of IP

Estimating resources required for farm visits

Allocating at-risk farms to patrol veterinarians, including route optimization

Monitoring the visiting of at-risk farms

Identification of animal disposal areas

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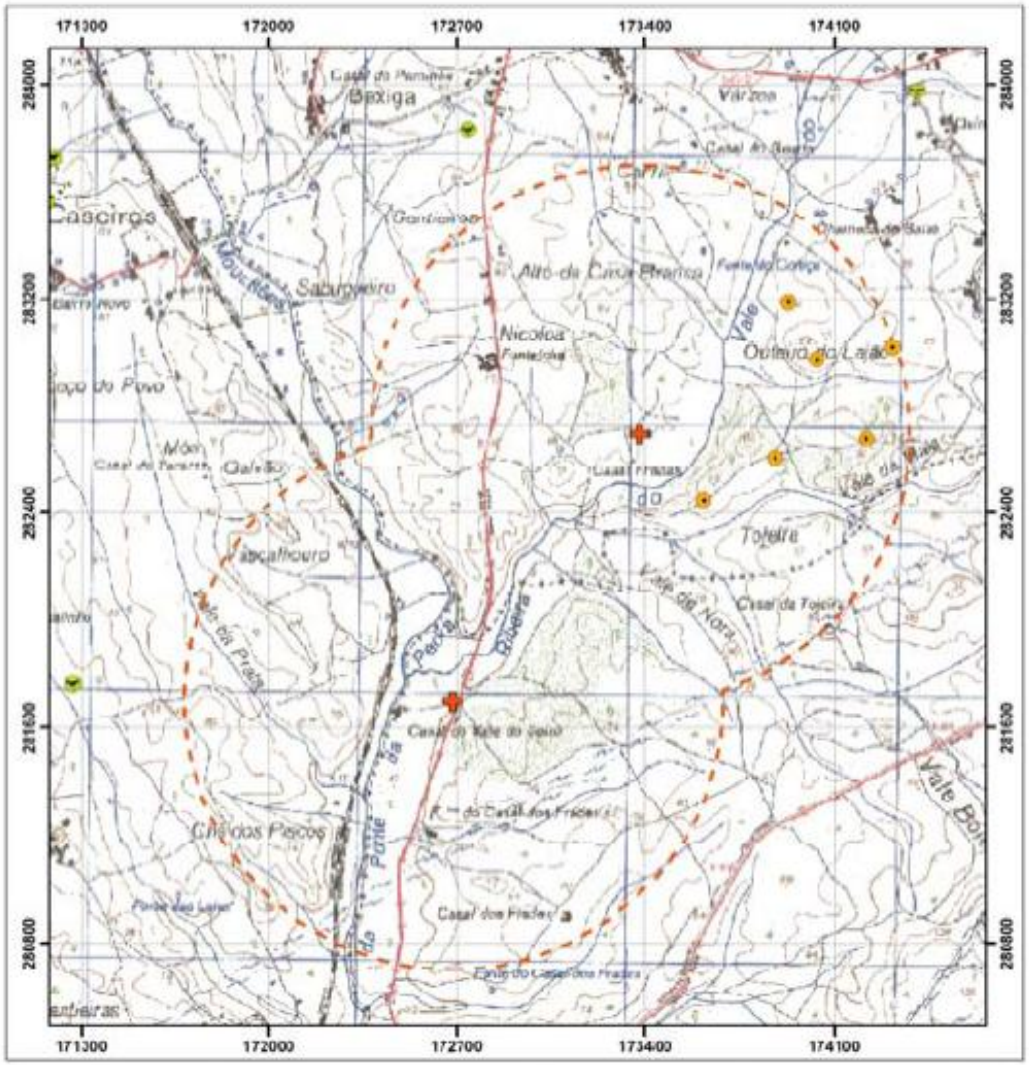

Legenda

- Explorações de Contacto
- Explorações Foco H5N2
- Explorações não infectadas
- Perímetro de Protecção

N

0 250 500 1.000
Metros

Carta Militar Folha nº 320
Série militar M 888

Coordenadas Cartográficas do Sistema Militar Português

Elipsóide de Hayford

Projecção de Gauss-Kruger

Datum Lisboa

Carta de localização dos focos de gripe aviária de baixa patogenicidade

Produzido por:	Data: Novembro de 2007
Hugo Martins	Escala: 1:20.000

Applications of GIS in Early reaction activities

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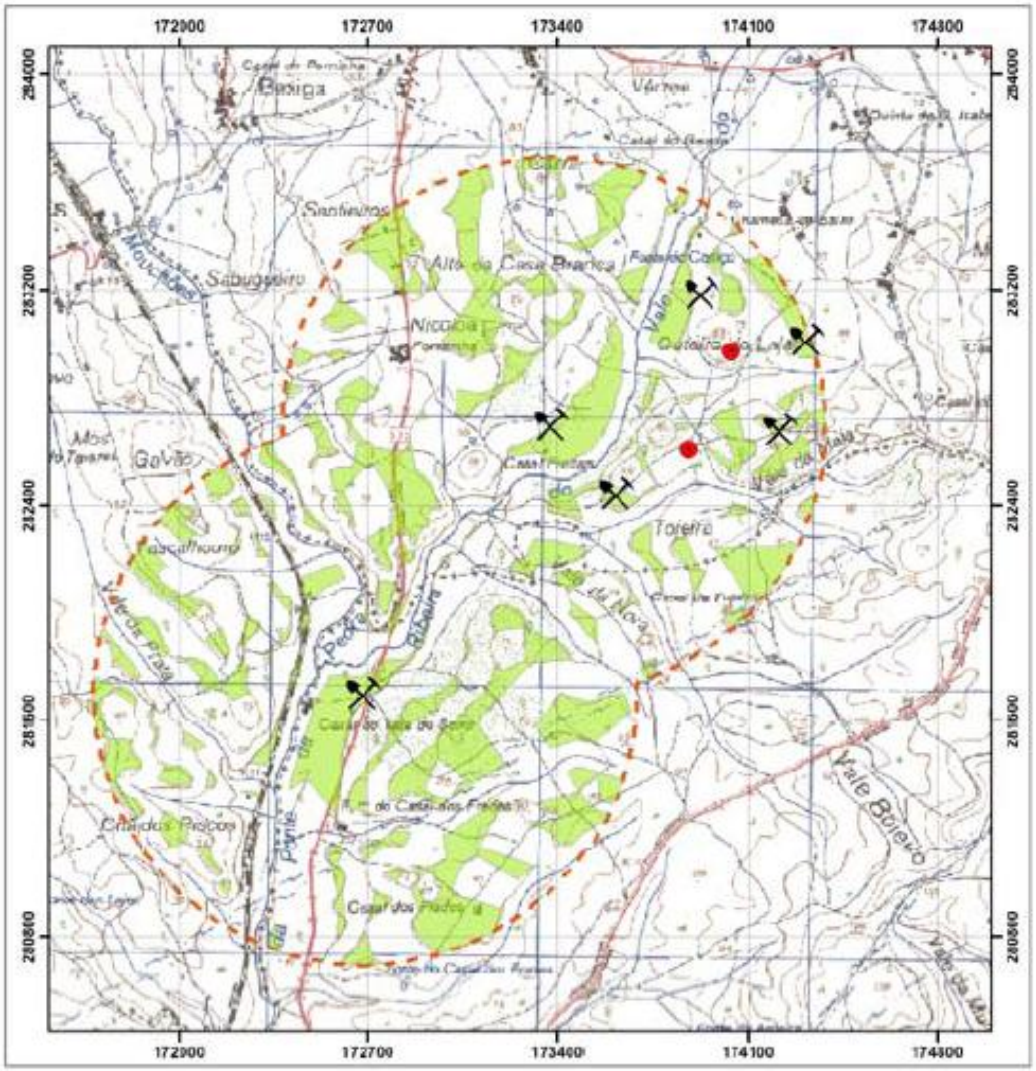


European Commission

Wildlife Health Event Reporter

A Component of the Wildlife Health Monitoring Network

wdin

Home | Report an Event | Search Reports | Edit Reports | Feeds/Alerting | FAQs | Mobile App | About | Help | My Account | Logout

Have you seen dead or sick wild animals?

What to report? Why report an event?

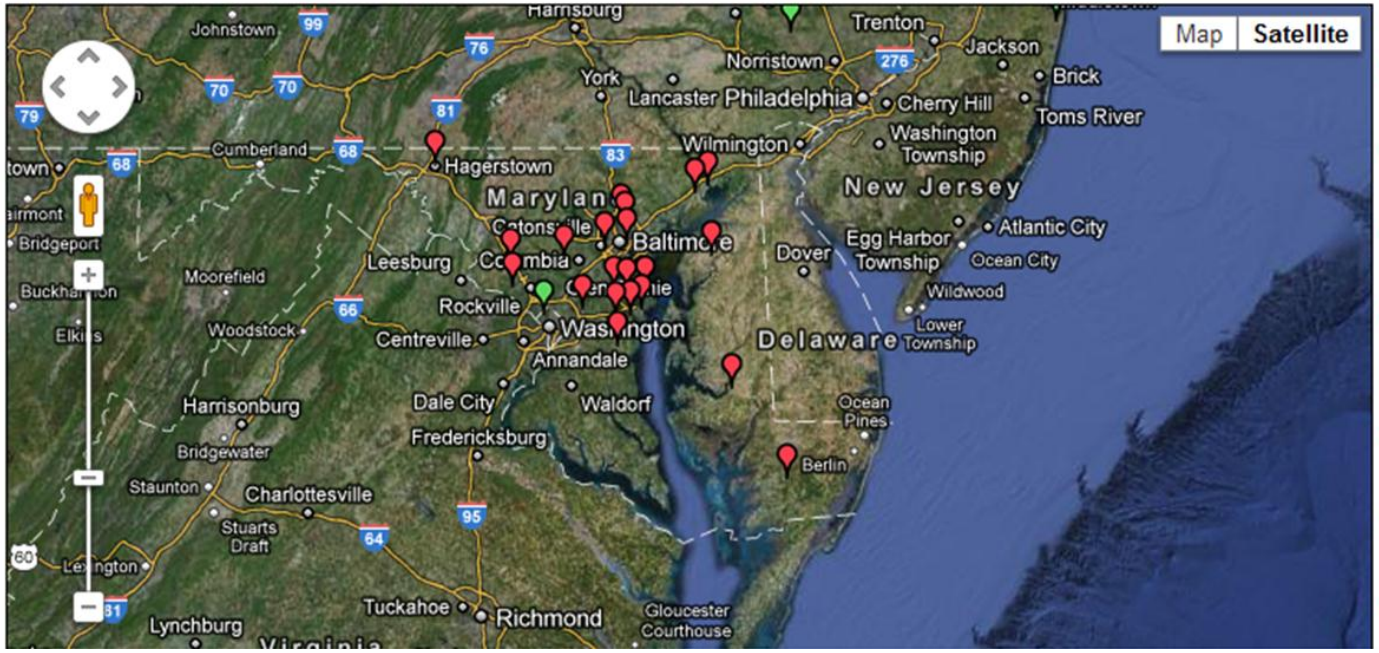
Information on sick/injured animals

WHER News and Information

- Lake Erie Algae Bloom News
- How Do I Create a WHER Account?
- News of Possible Botulism Outbreak in Great...

Login and Report

Create an Account



Recent Events

- WHER: 2012-04-03: White-tailed deer
- WHER: 2012-03-29: Chukar
- WHER: 2012-03-27: American black bear
- WHER: 2012-03-11: Chipmunks/Groundhogs dogs/Squirrels
- WHER: 2012-03-10: Raccoon
- HEALTHMAP: 2012-02-22: Mammal
- WHER: 2012-02-20: Coyote

Thank you for your attention

Questions?

Share your experiences!