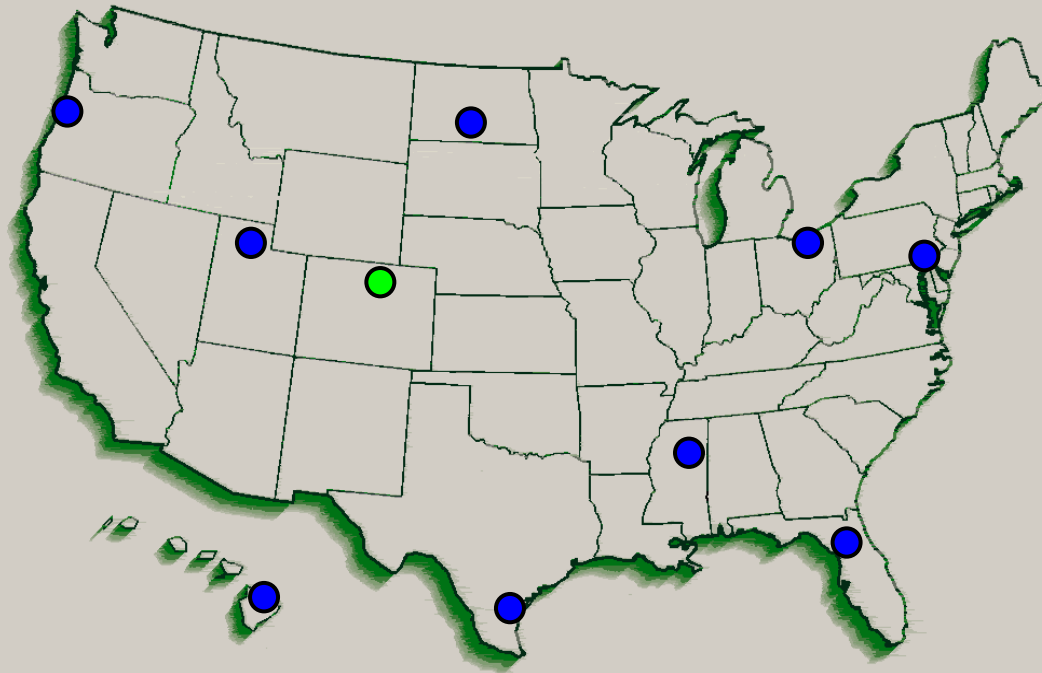


Farm Foundation: September 23-24, 2010

Zoonoses-Understanding the Animal Agriculture & Human Health Connection

**Larry Clark, Ph.D.
USDA-APHIS-WS
National Wildlife Research Center**

NWRC Locations



Apply scientific expertise to resolve human-wildlife conflicts while maintaining the quality of the environment shared with wildlife

Agriculture & Resource Protection

- Aviation Safety
- Feedlots & Dairies
- Sunflower & Rice
- Timber & Horticulture
- Pacific Rim Biosecurity
- Livestock

Technology Development

- Contraceptives
- Chemistry
- Genetics
- Toxicology

Wildlife Diseases

- Cattle Fever Tick
- Pseudorabies
- Rabies
- bovine TB
- Influenzas
- Bacteria
- CWD

Invasive Species

Challenges



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Challenges



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Challenges

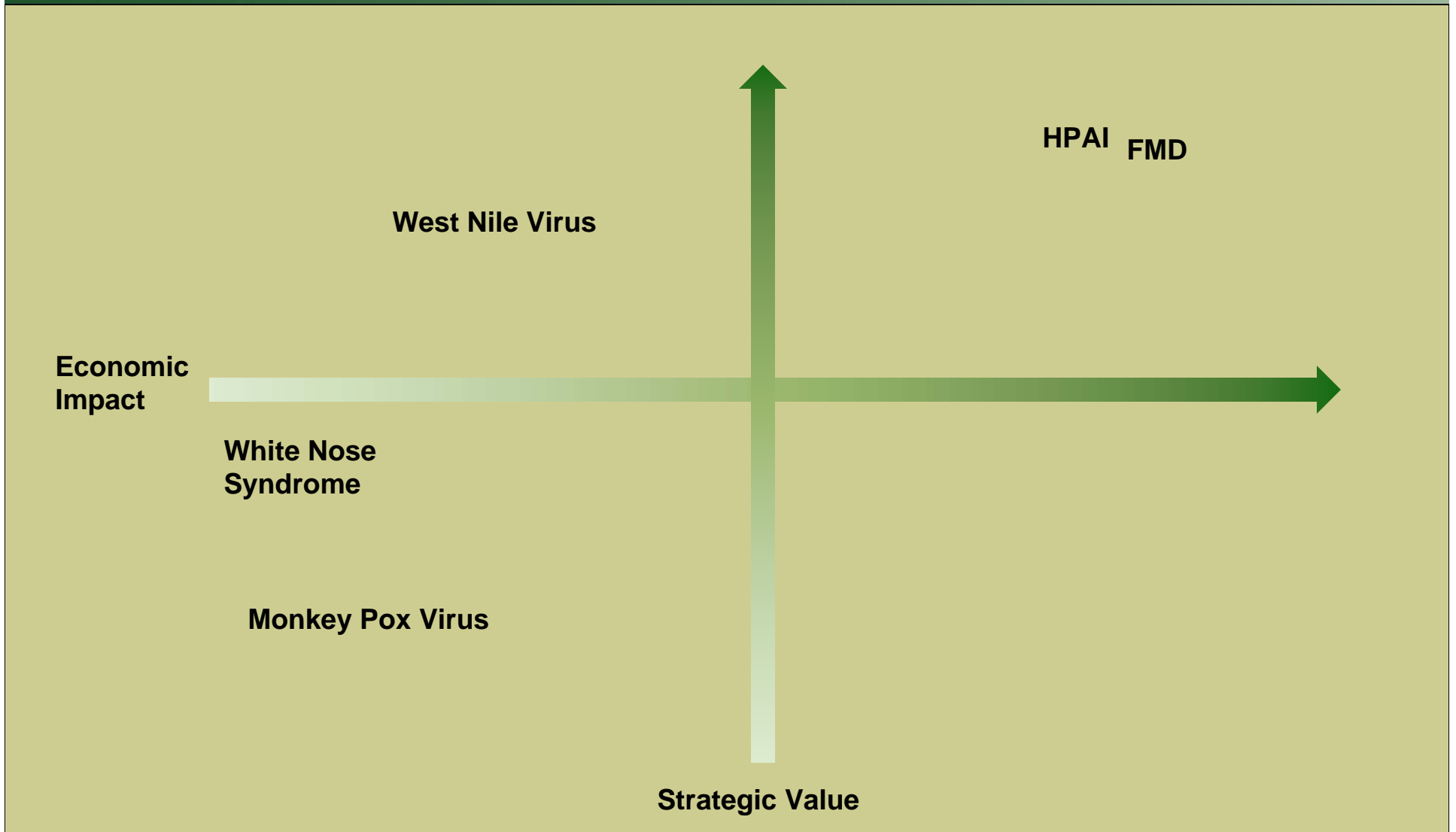


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Challenge : Are all diseases created equal?



Key Challenges

- 1. Funding**
- 2. Silos**
- 3. Conflicting Authorities**
- 4. Diffuse Effort**
- 5. Lack of Coordinated Management Plans**
- 6. Challenges to Available Tools**
- 7. Knowledge**

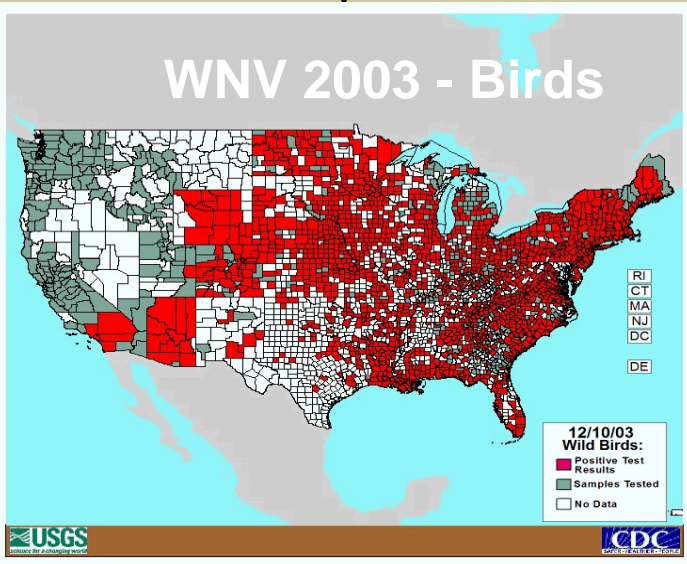
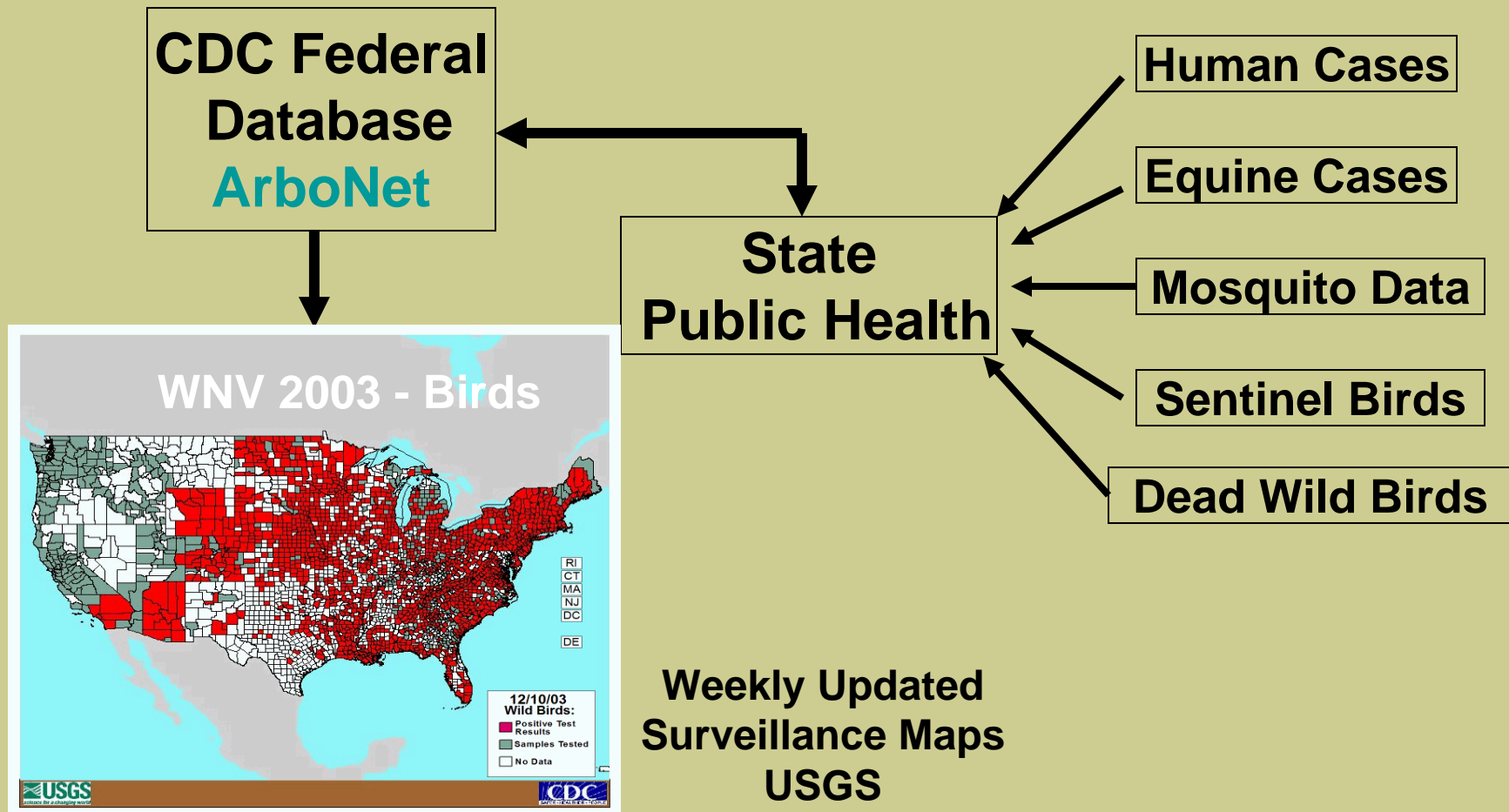
Approaches: Dynamical Models Epidemics



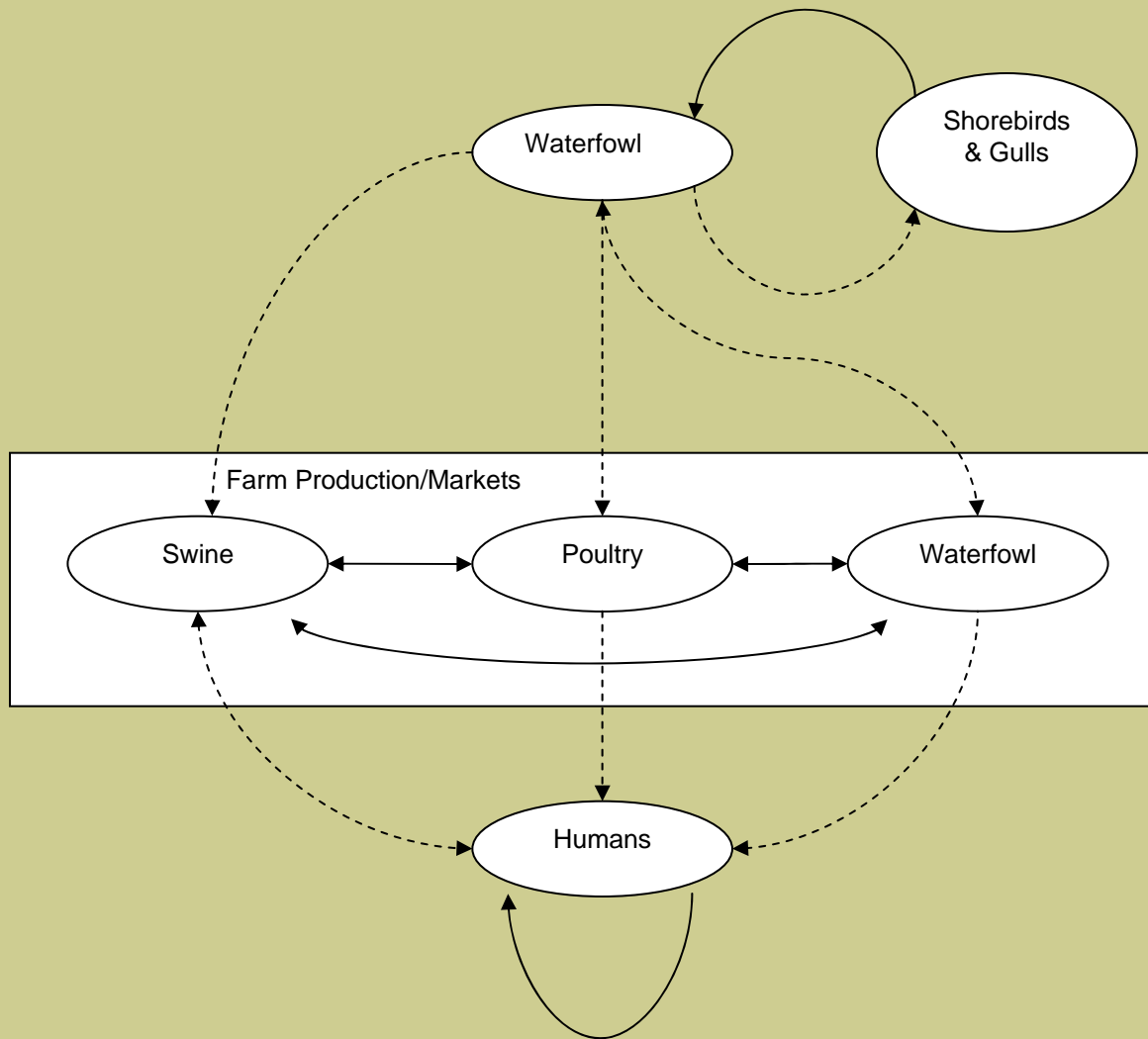
1. Estimate key parameters
2. Link data across scales
3. Identify & evaluate control measures



Lessons Learned: West Nile Virus



Conceptual Model of Risk Paths from Birds to Farms



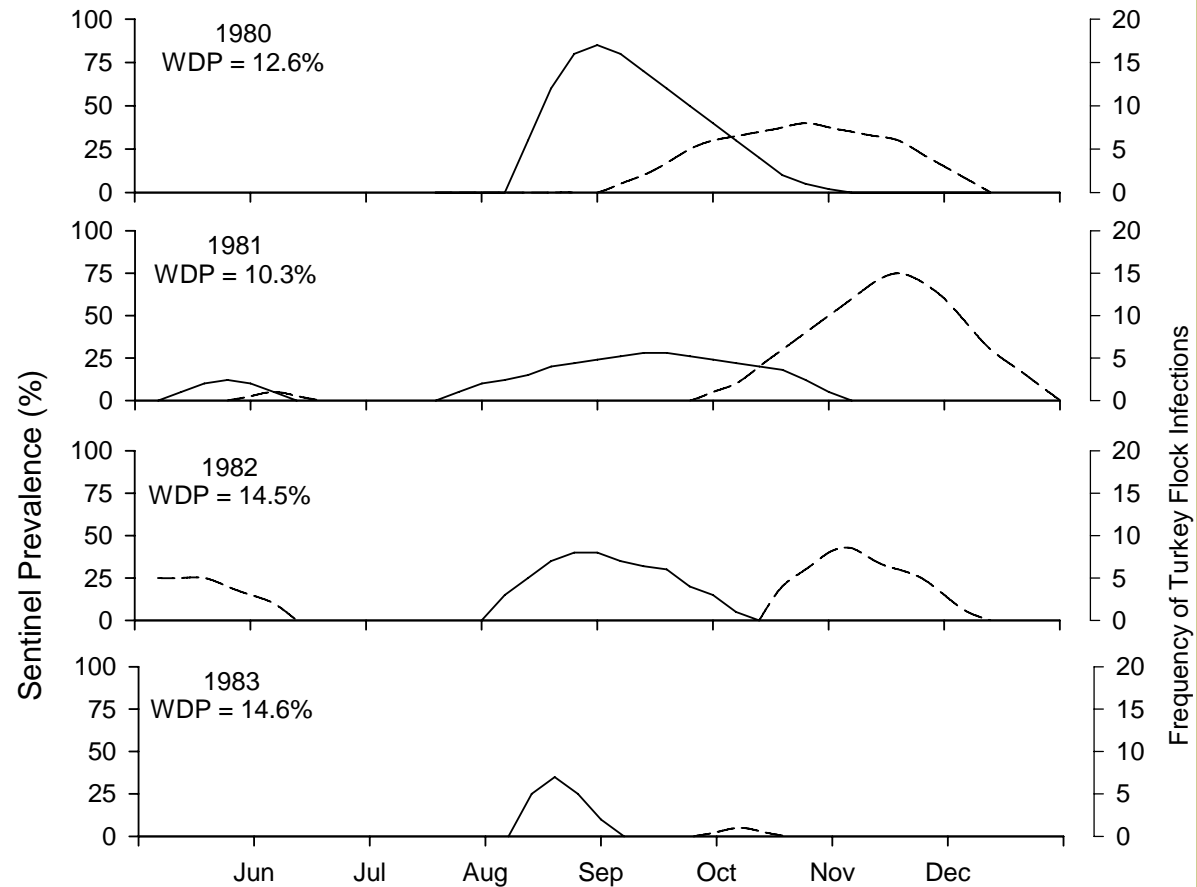
Clark & Hall 2006

Parameterization: Which wildlife species are good models?

Functional Group/Species	No.	%AI positive
Dabbling duck (12 species)	39198	12.6
American green-winged teal	5802	11.6
Blue-winged teal	3349	15.3
Mallard	14041	16.4
Northern pintail	3228	16.7
Wood duck	3317	3.5
Dark geese (4 species)	5795	2.5
Canada goose	5183	2.6
All Species (109 species)	56497	9.9

Webb et al 2010

Parameterization: Which wildlife species are good models?



Halvorson et al 1985

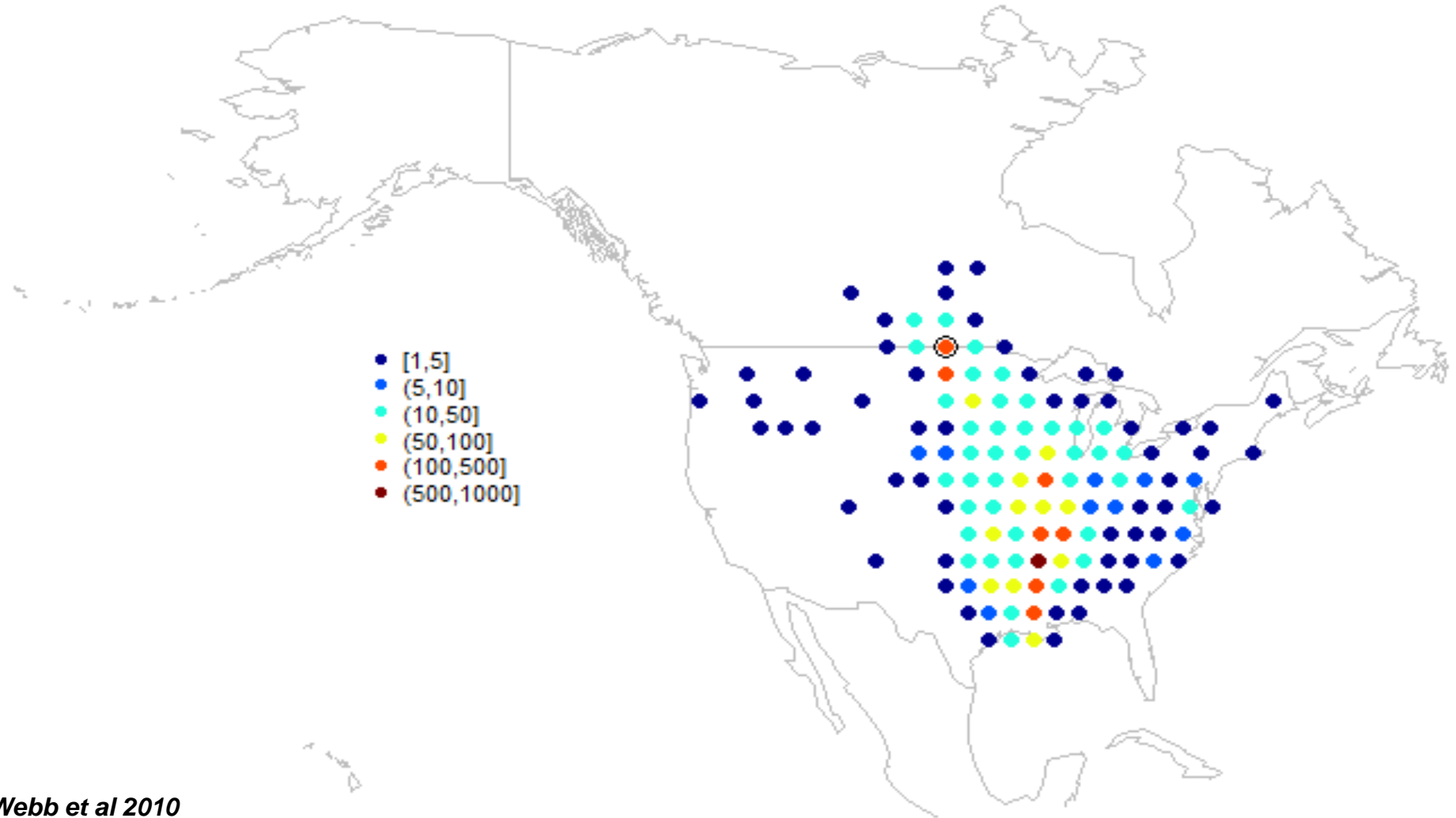
Animal Movement

- Where are the populations?
- Where did they come from?
- Where are they likely to go?

How few places do we need to monitor? → Where do we put a detection network?

Webb et al 2010

Animal Movement: where do they go?



Webb et al 2010

What areas are we concerned with?

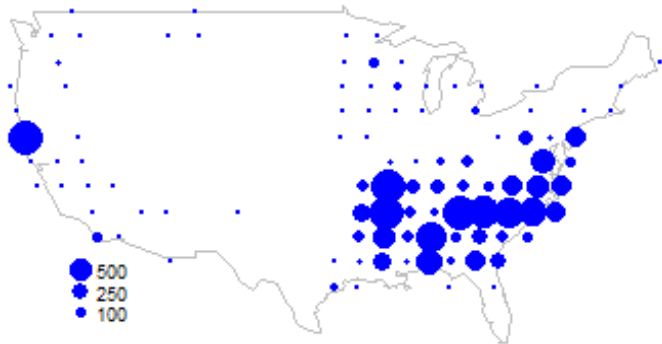
Small broiler operations



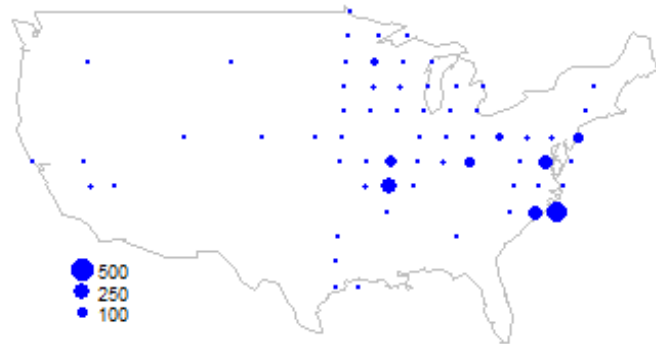
Small turkey operations



Large broiler operations

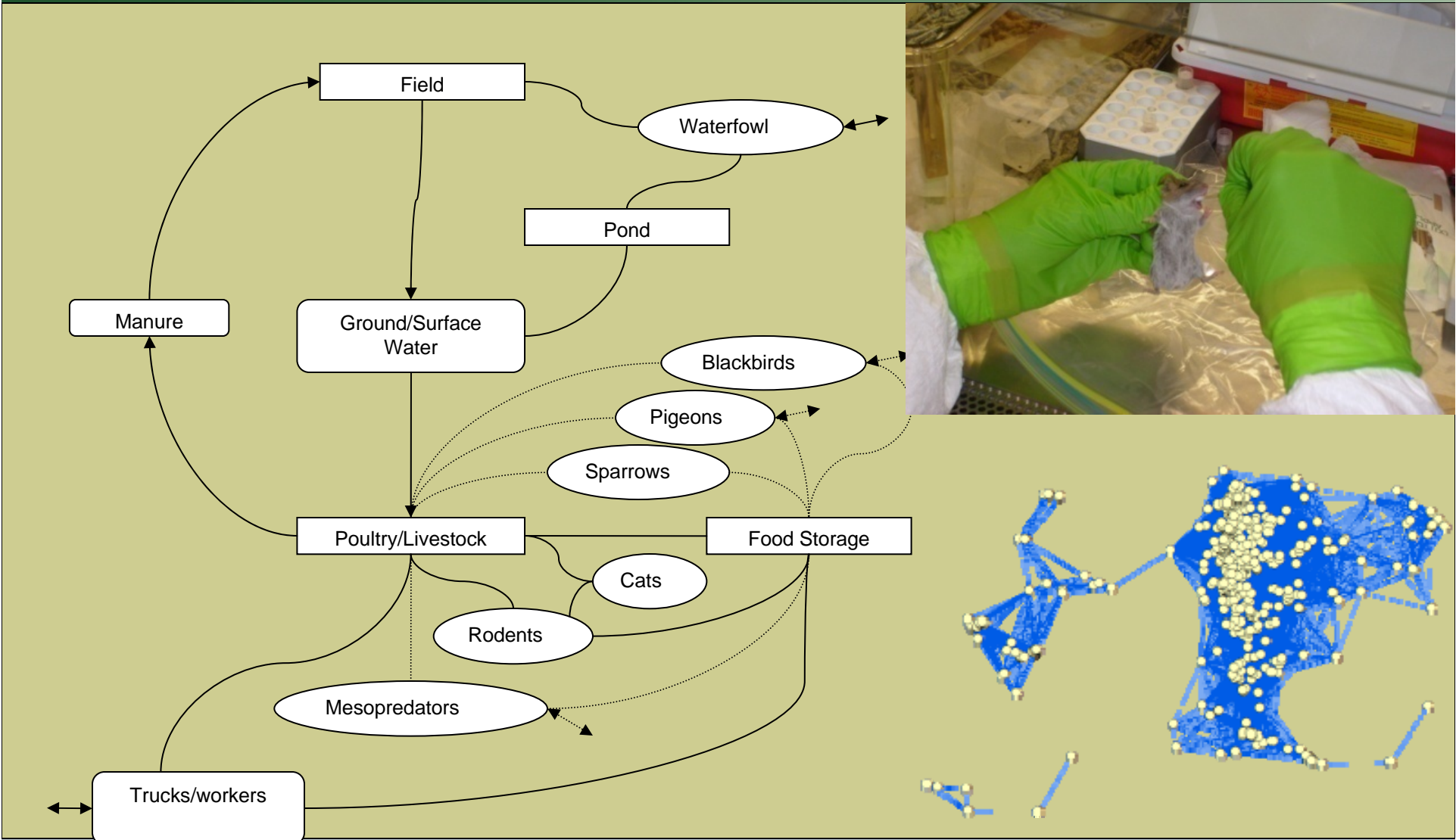


Large turkey operations



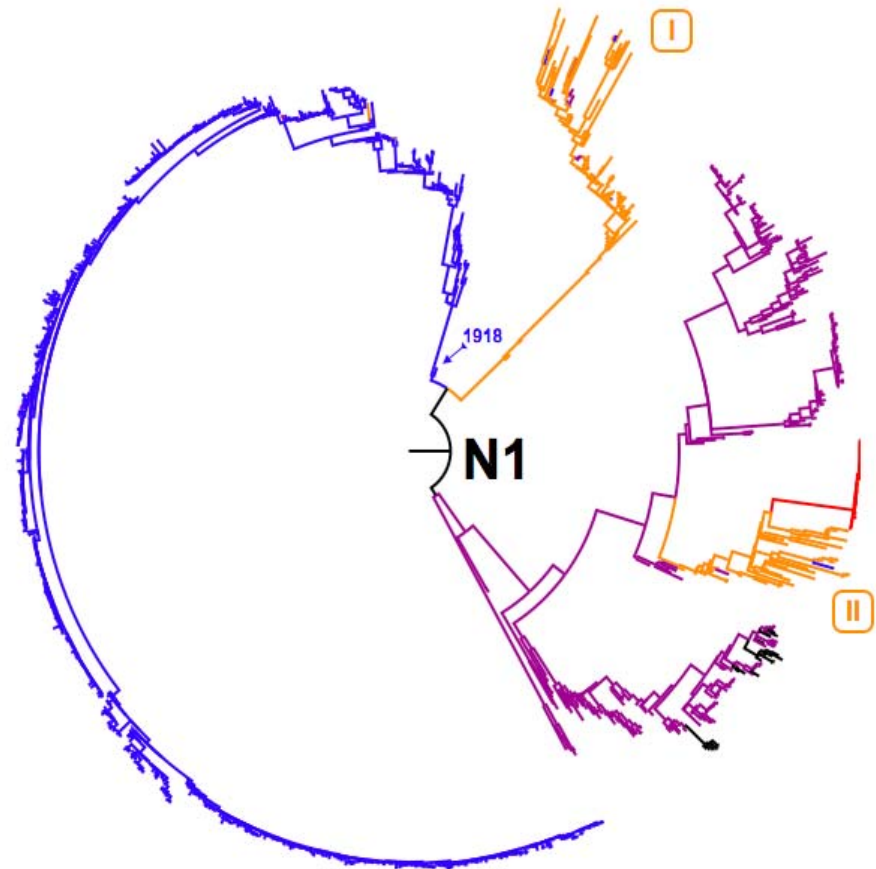
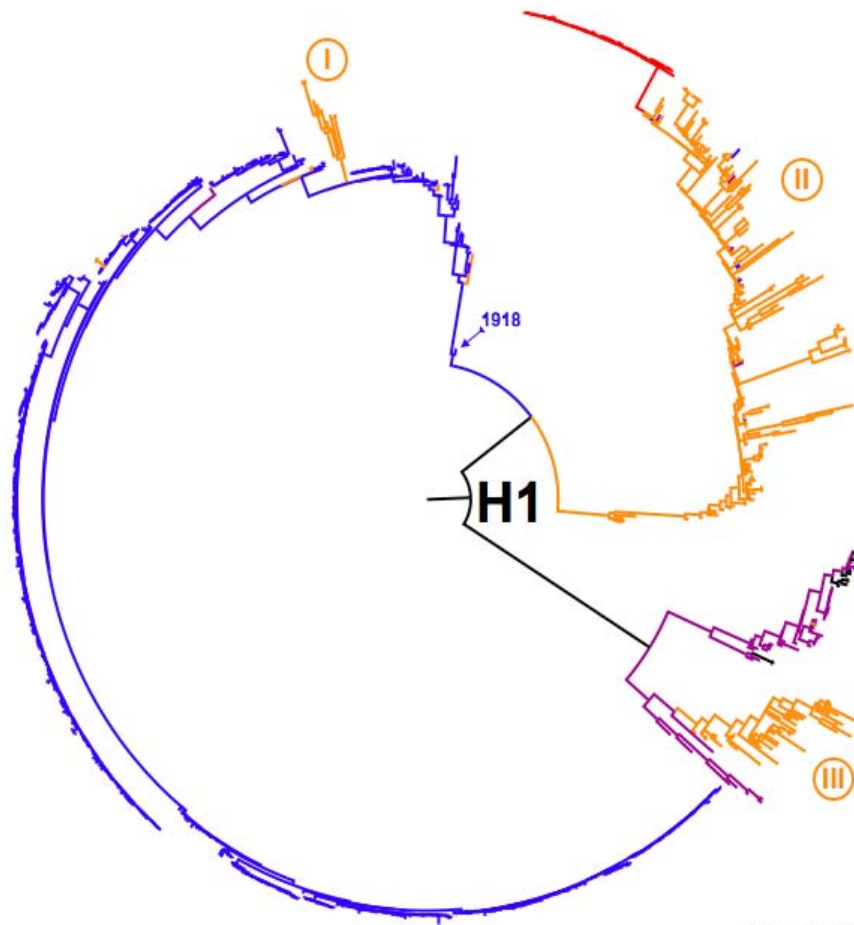
Webb et al 2010

Conceptual Model of Risk Paths from Birds to Field Crops

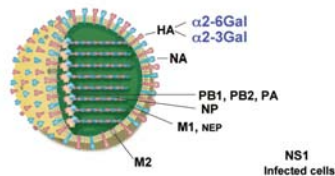


Excluding wild birds as a recent risk path for the H1N1 outbreak

● human ● H1N1 outbreak ● swine ● avian ● USDA



Influenza A virus
 ■ Family: Orthomyxoviridae
 • Negative sense single strand RNA genome



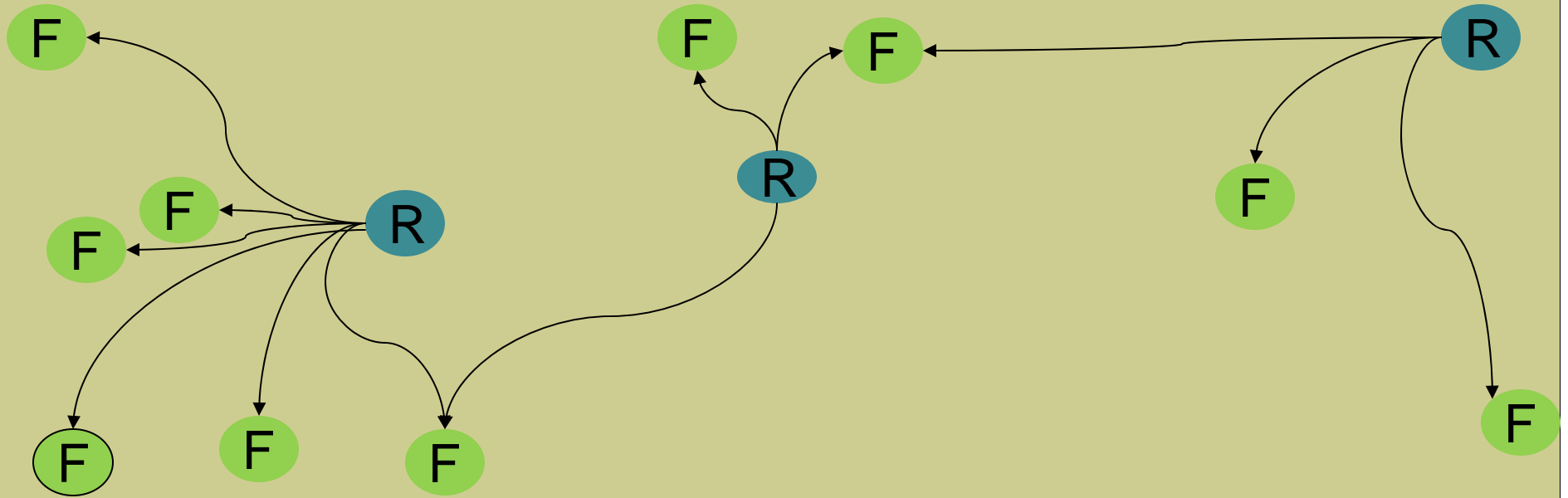
Piaggio et al 2010

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Interconnectivity of feedlots through pigeons

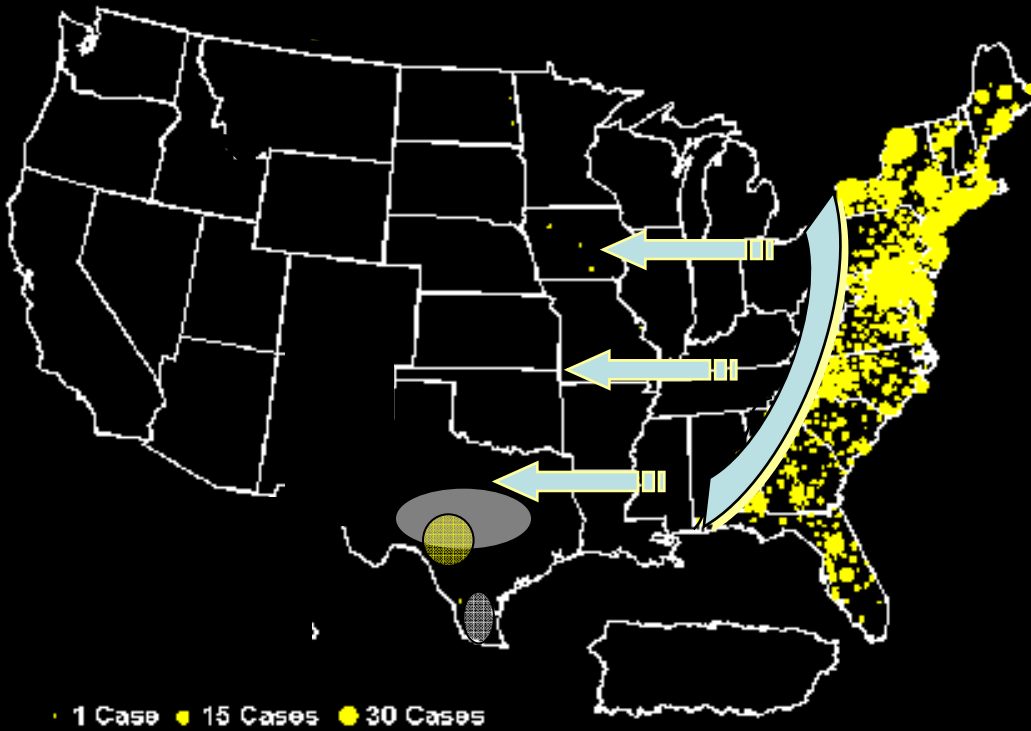


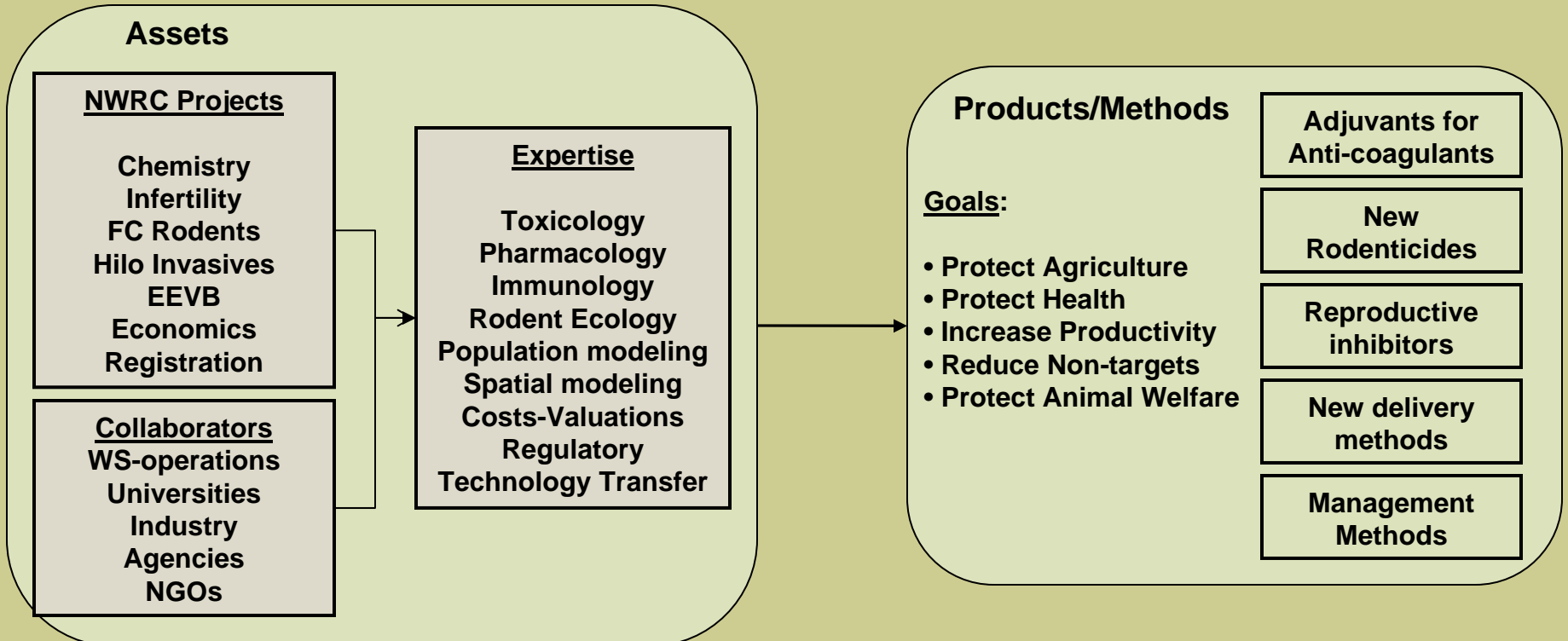
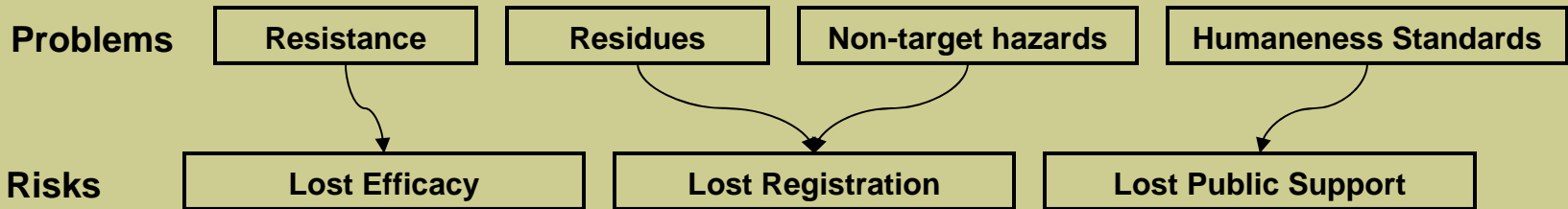
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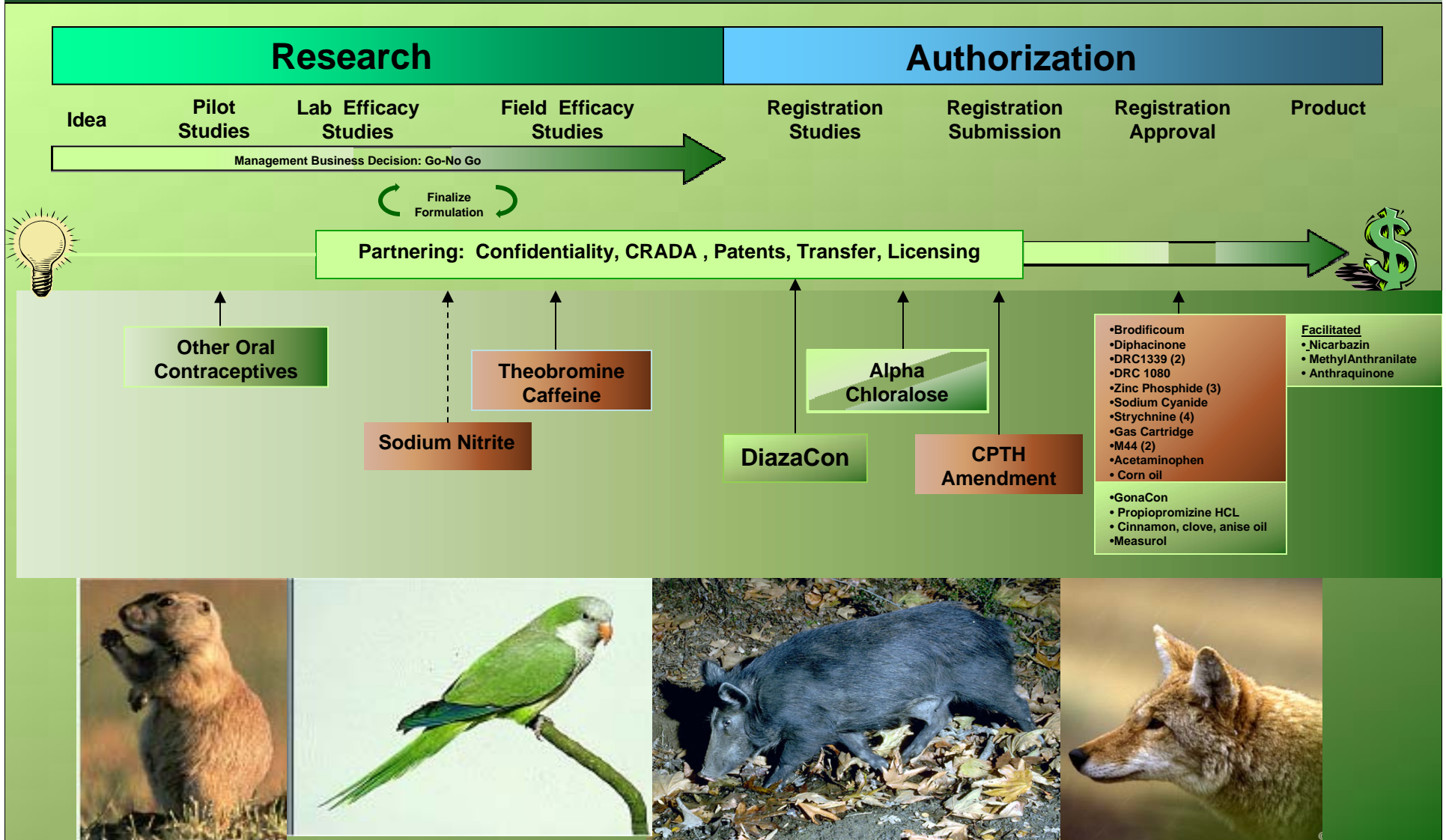
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Management on a Continental Scale





Status of Wildlife Service Chemical Products



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**If the only tool you have is a hammer, you tend to see every problem as a nail
---Abraham Maslow**



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