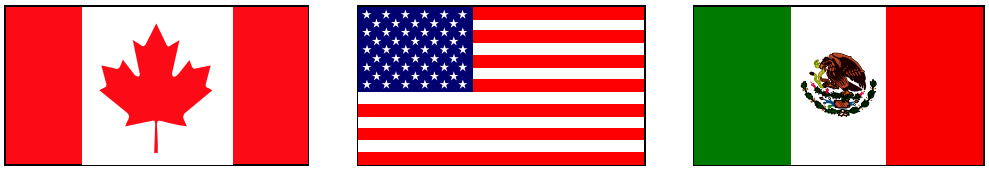
Using models to develop estimates of the number of foot-and-mouth disease vaccine doses required in the event of an outbreak



Presented by Dr. Kimberly Forde-Folle, U.S. Department of Agriculture, Animal & Plant Health Inspection Service, Veterinary Services

North American Modeling Team

Canada

- Arran Lamont
- Caroline Dubé
- Charles Caraguel
- Emery Leger
- John Berezowski

United States

- Jane Rooney
- Kim Forde-Folle
- Laurie Fromberg
- Mike Sanderson

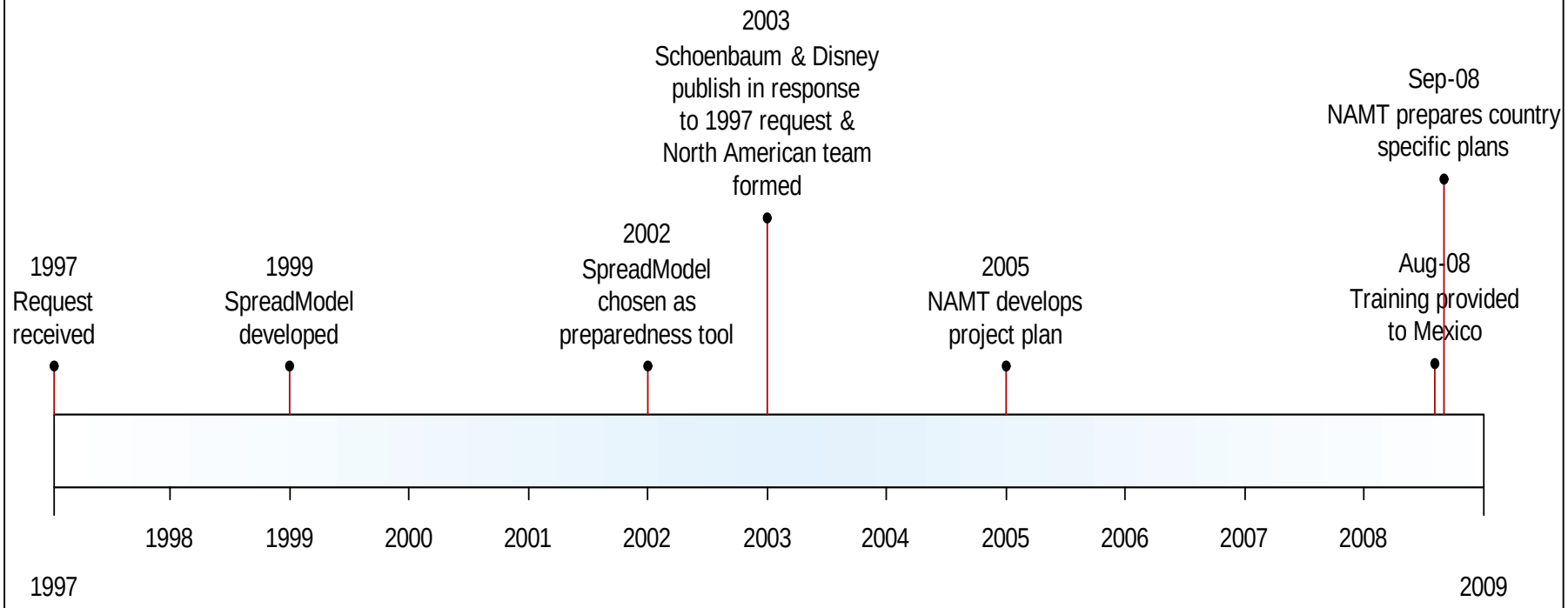
Mexico

- Concepción Becerra Lemus
- Montserrat Arroyo

Outline of presentation

1. History
2. Similarities in approach
3. Overview of the U.S. project plan
4. Inputs and assumptions
5. Overview of scenarios evaluated
6. Summary of work completed and next steps

History of the NAFMDVB project



Similarities in modeling approach across North America

- North American Animal Disease Spread Model (NAADSM)
- Simulate FMD spread in low, medium, and high density areas
- Parameters related to biology of FMD virus are consistent across North America
- Population, spread, and control variables are country-specific

U.S. project plan

- Two regions for simulation:
  - **Kansas**: Low, medium, and high density regions selected
    - Real geo-coordinates obtained from the Kansas Department of Health and Environment
    - Data sources included National Animal Health Monitoring Systems (NAHMS) studies, scientific literature, and subject matter expert opinon
    - Lead: Mike Sanderson, Kansas State University
  - **Wisconsin**: Low, medium, and high density regions selected
    - Used the National Agricultural Statistics Service 2002 Census of Agriculture data
    - Relied heavily on subject matter expert opinon
    - Lead: Laurie Fromberg, USDA

Two Primary Goals

1. Evaluate the effectiveness of FMD vaccine in limiting the spread of disease
2. Provide estimates of the number of vaccine doses required in the event of an FMD outbreak in Kansas and/or Wisconsin

Variety of control measures evaluated

- 360 scenarios generated, each varied by:
  - Herd type where the simulated outbreak started
  - Movement restrictions
  - Probability of virus transmission
  - Depopulation capacity
  - Number of herds detected before vaccination was implemented, and
  - Size of vaccination zone

Assumptions

- Two days, after disease first detected, before depopulation initiated
- Daily depopulation capacity reached by day 10
  - Kansas = 7 herds/day
  - Wisconsin = 5 herds/day

Assumptions

- Vaccination
  - All herds within a specified distance from detected herd
    - 10 and 50 km zones used
  - Initiated after specified number of herds detected
    - 10 and 100 herds used to trigger vaccination
  - Capacity – Number of herds vaccinated/day
    - Single capacity applied to all herds, regardless of type or size
    - Nine herds/day

Assumptions

- Immunity post vaccination
  - Seven day lapse prior to immune response
  - 100% efficacy (i.e. complete immunity to the whole herd)

Progress to date

- Kansas and Wisconsin
  - Parameterized
  - All scenarios run and analyzed
  - Narrowed scope to 60 scenarios
  - Preliminary results presented

Next Steps

1. Each country is working to finalize results
2. The technical committee and EMWG of the NAFMDVB will be instrumental in reviewing and helping to refine modeling assumptions
3. The consequences of implementing various vaccination strategies could be explored from an economic perspective
4. Our goal is to provide a final report in 2011