

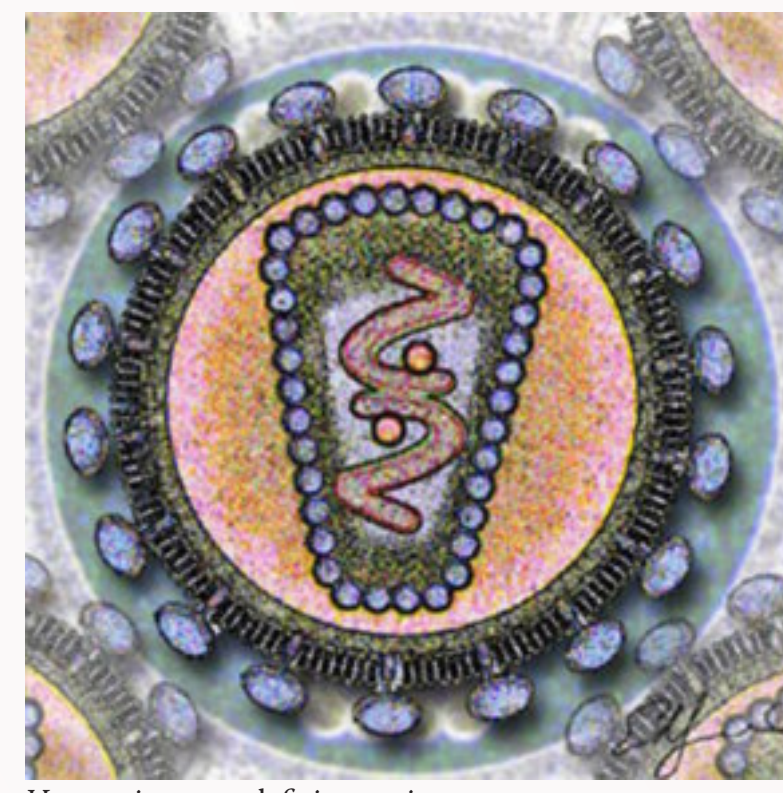
ECOLOGY OF EMERGING DISEASES

RAPID EXPANSION OF A NEW DISEASE IN WILD BIRDS

When pathogens jump hosts, new diseases emerge that often cause epidemics.



Immunodeficiency virus
SIV → HIV



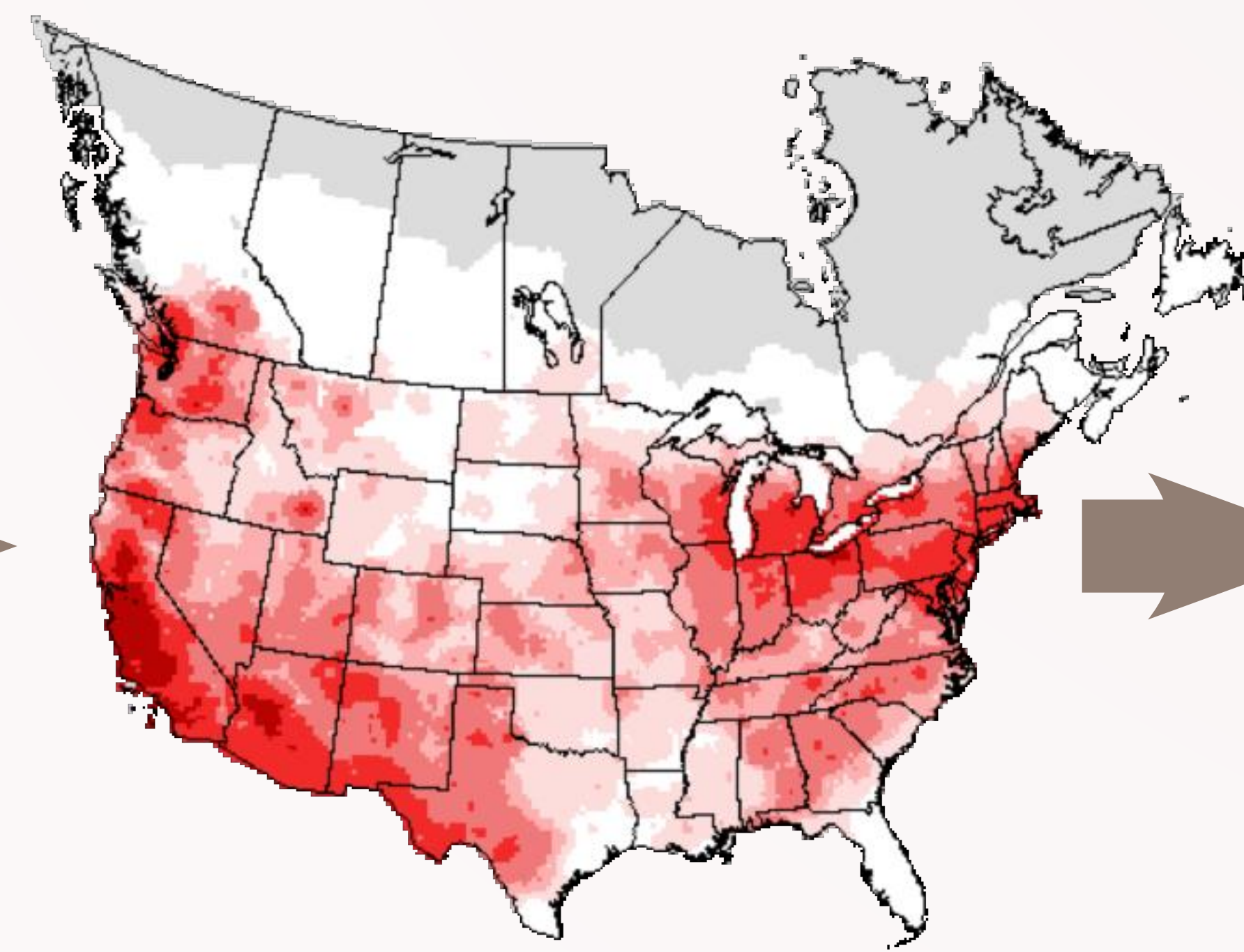
Human immunodeficiency virus



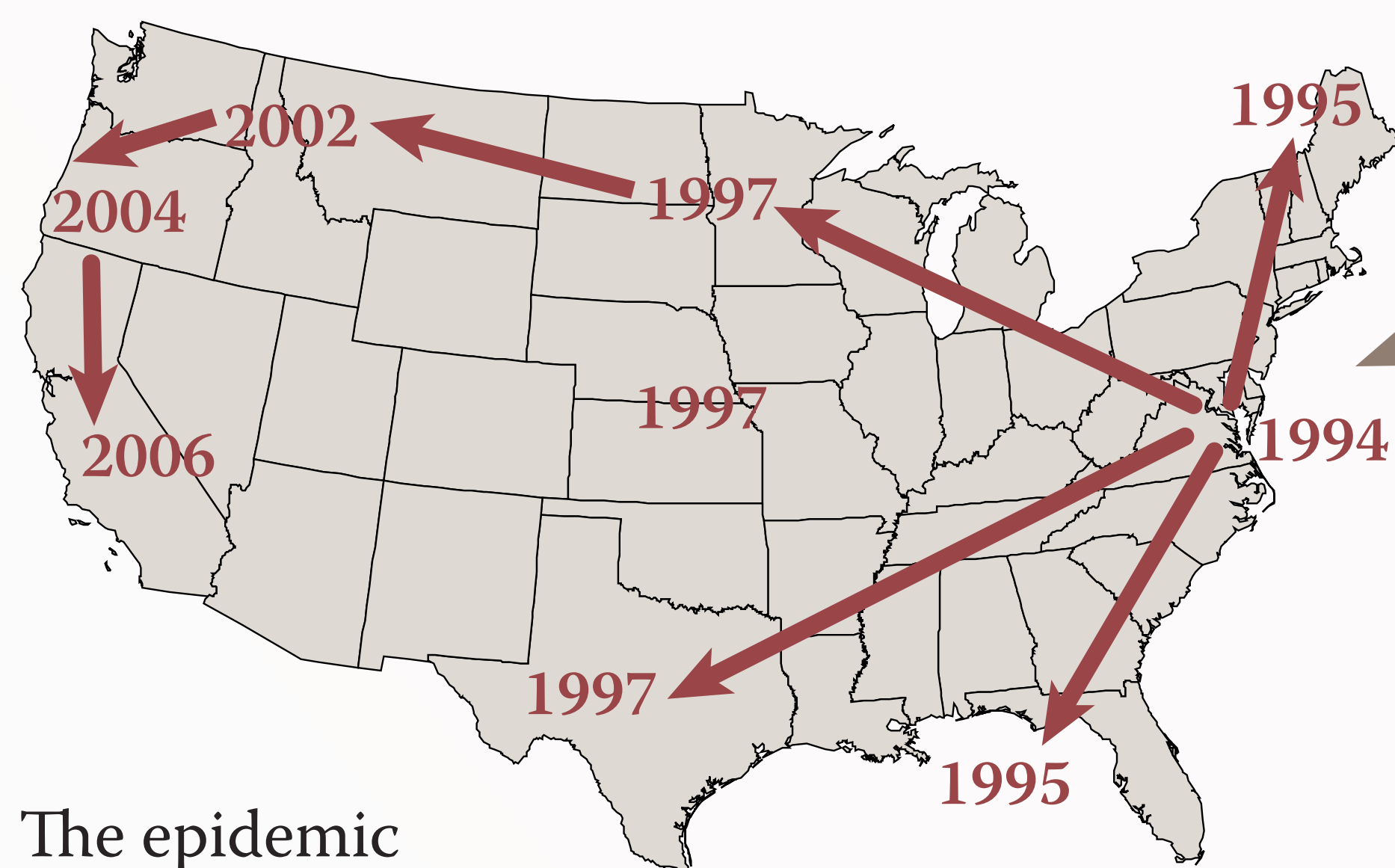
Mycoplasma gallisepticum (MG)
Chicken MG → House Finch MG



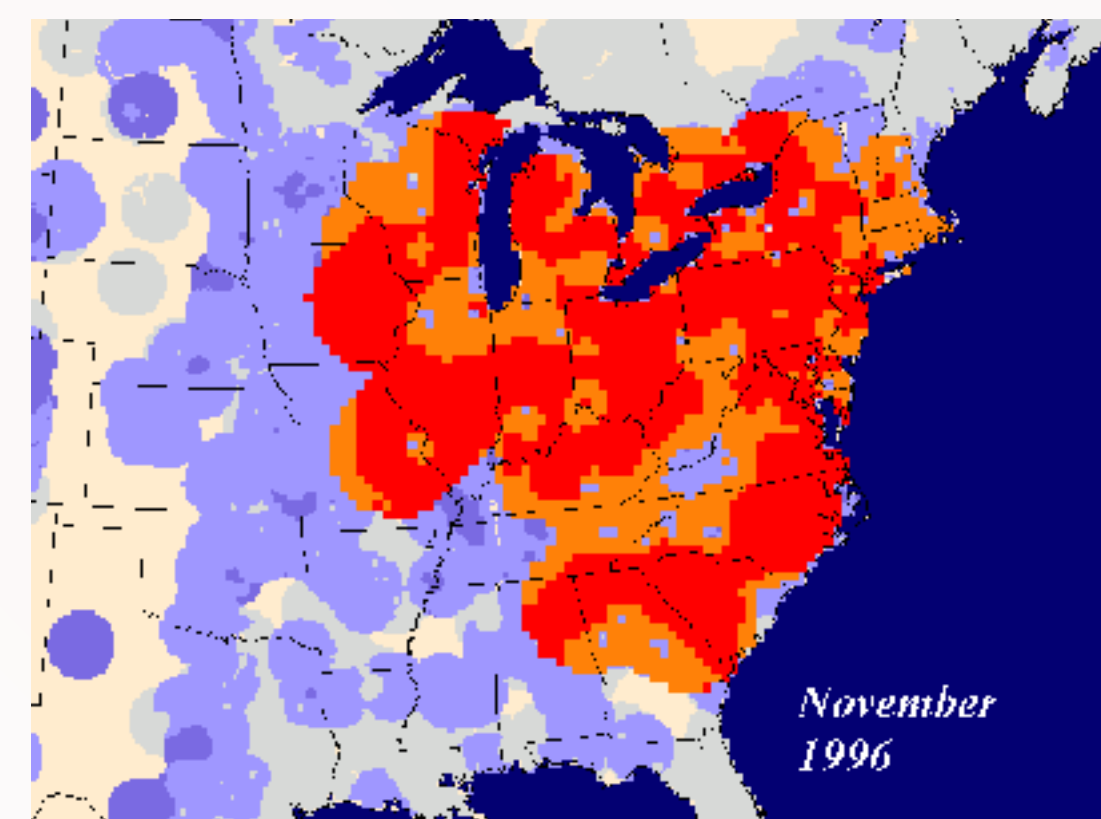
House Finches are distributed across North America. In the West they are native; in the East they were introduced (1940).



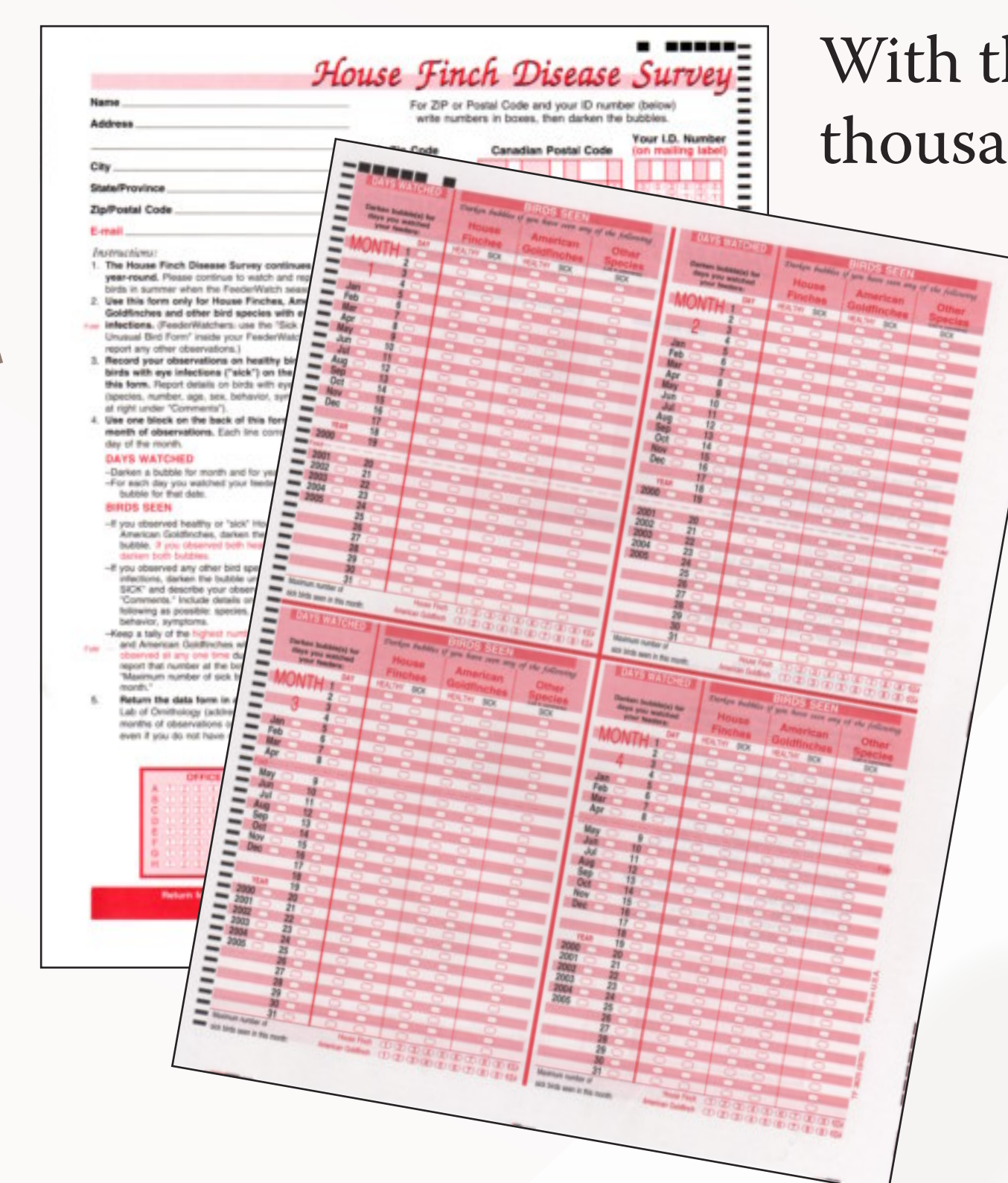
In 1994 House Finches with severe eye infections suddenly appeared in the Washington, D.C., area. The eye infections were caused by a novel strain of a poultry pathogen, *Mycoplasma gallisepticum*.



The epidemic has spread far less quickly in the West.



Within two-and-a-half years the epidemic covered most of eastern North America. Roughly half of all House Finches died.



With the help of thousands of volunteers we could follow how the epidemic spread.



SCIENTIFIC STUDIES

Our volunteer-based study led to NSF funding under the Ecology of Infectious Diseases program. We assembled a multi-disciplinary research team (ecologists, microbiologists, veterinarians, mathematical modelers) to find out

- Why some individuals die but not others
- Why the disease spread so rapidly in some directions, but not others
- Whether bird behavior affected expansion of the epidemic
- Why the disease has only severely affected one species of wild birds
- If birds or bacterium have changed through time
- Which aspects of this host-disease system can help us understand other diseases (e.g., avian influenza, HIV-AIDS)



RESULTS

Many of our results are generally important for understanding diseases animals, and are relevant for devising strategies to fight epidemics in humans, and in livestock or poultry.

- **Population-wide differences in the amount of genetic variation** may affect rates of disease spread and impacts on abundance.
- **Genetic variation and social dominance** of an individual relative to its neighbors affects the severity of disease symptoms.
- **How an animal becomes infected** (e.g., through eyes, or mouth) will determine the severity of disease symptoms.
- **“Carrier” animals**, not showing disease symptoms and potentially partially immune to a disease, can be critical to the persistence or reappearance of a disease epidemic in a local area.

BROADER IMPACT

- Education of the public by participation in research
- Education of students at all levels across disciplines
- Provide scientific information to media



CORNELL LAB of ORNITHOLOGY

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