

Midwest bird flu

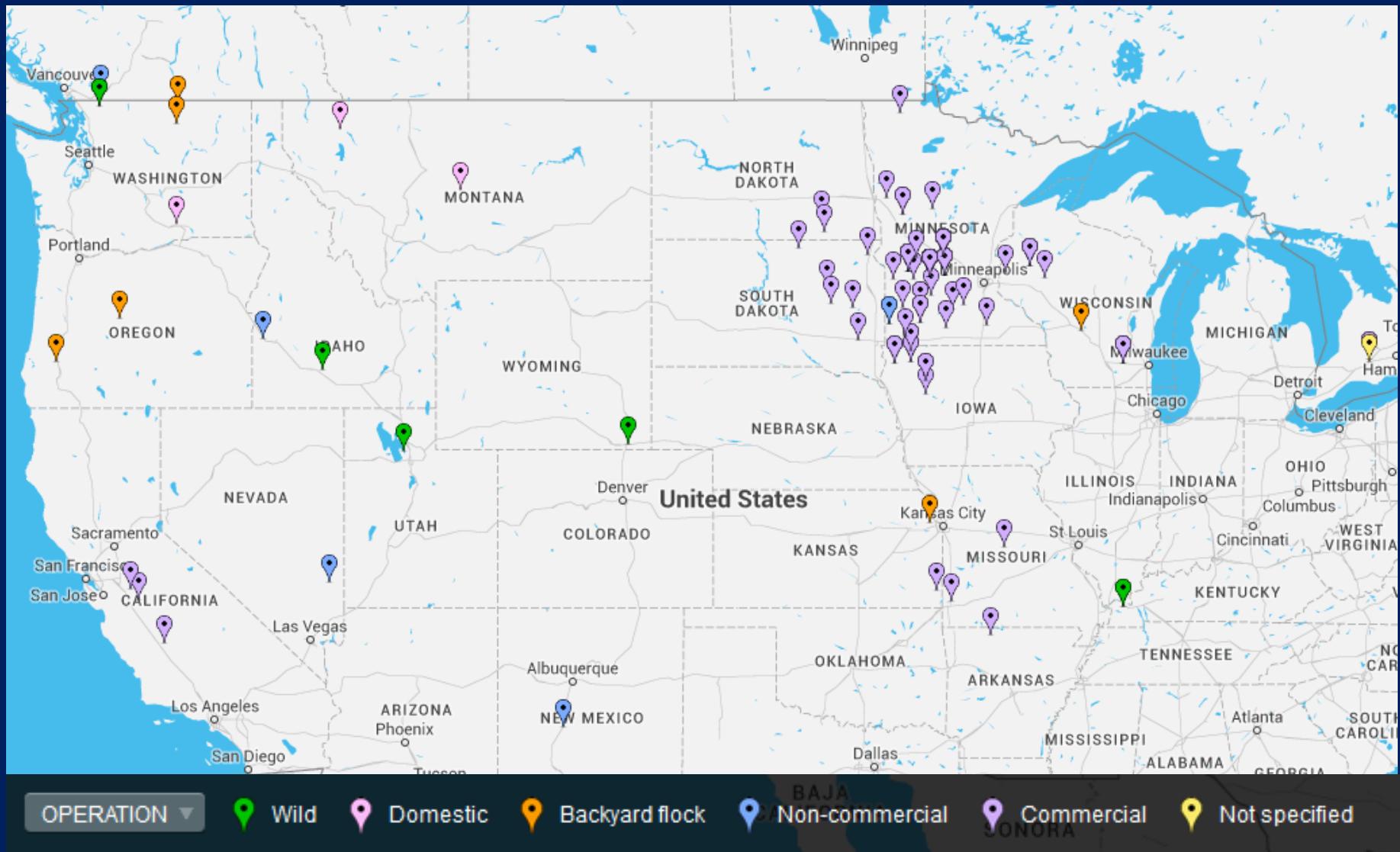
A diseconomy of industrial poultry



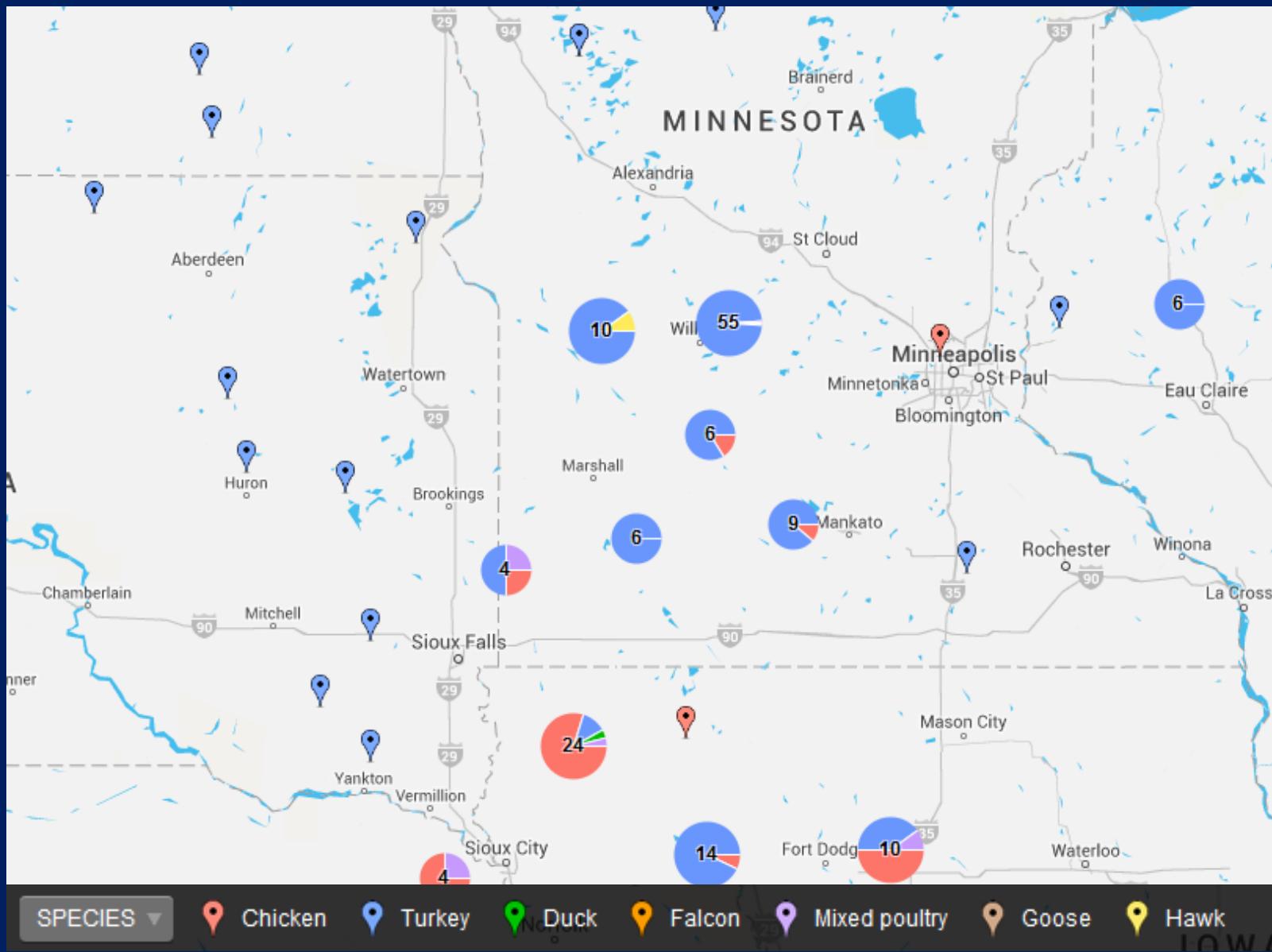
Robert G. Wallace, Ph.D.
Institute for Global Studies, University of Minnesota

Institute for Agriculture and Trade Policy
11 June 2015

Outbreaks December on



Regional H5N2 outbreaks





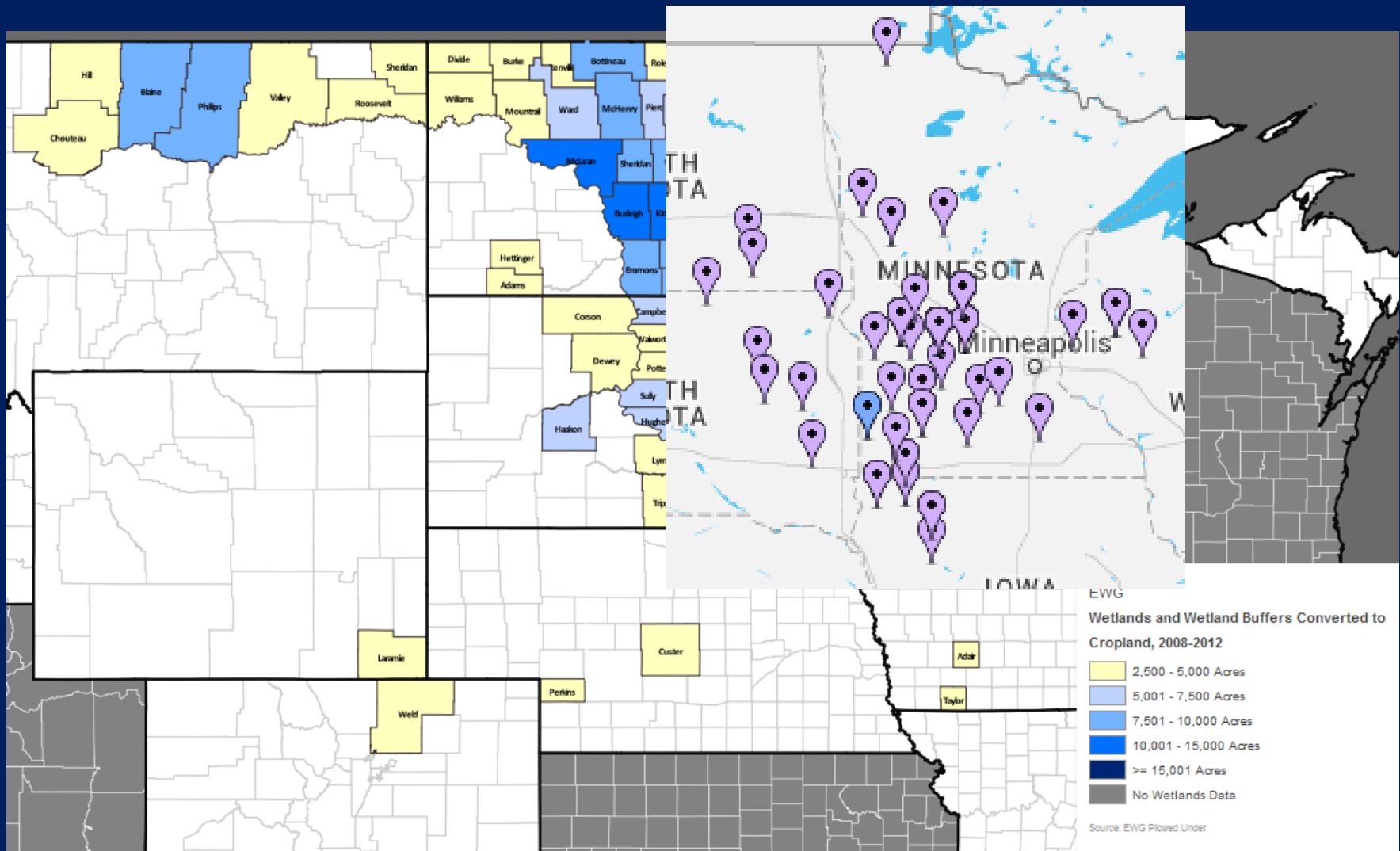
“Scientists stymied”





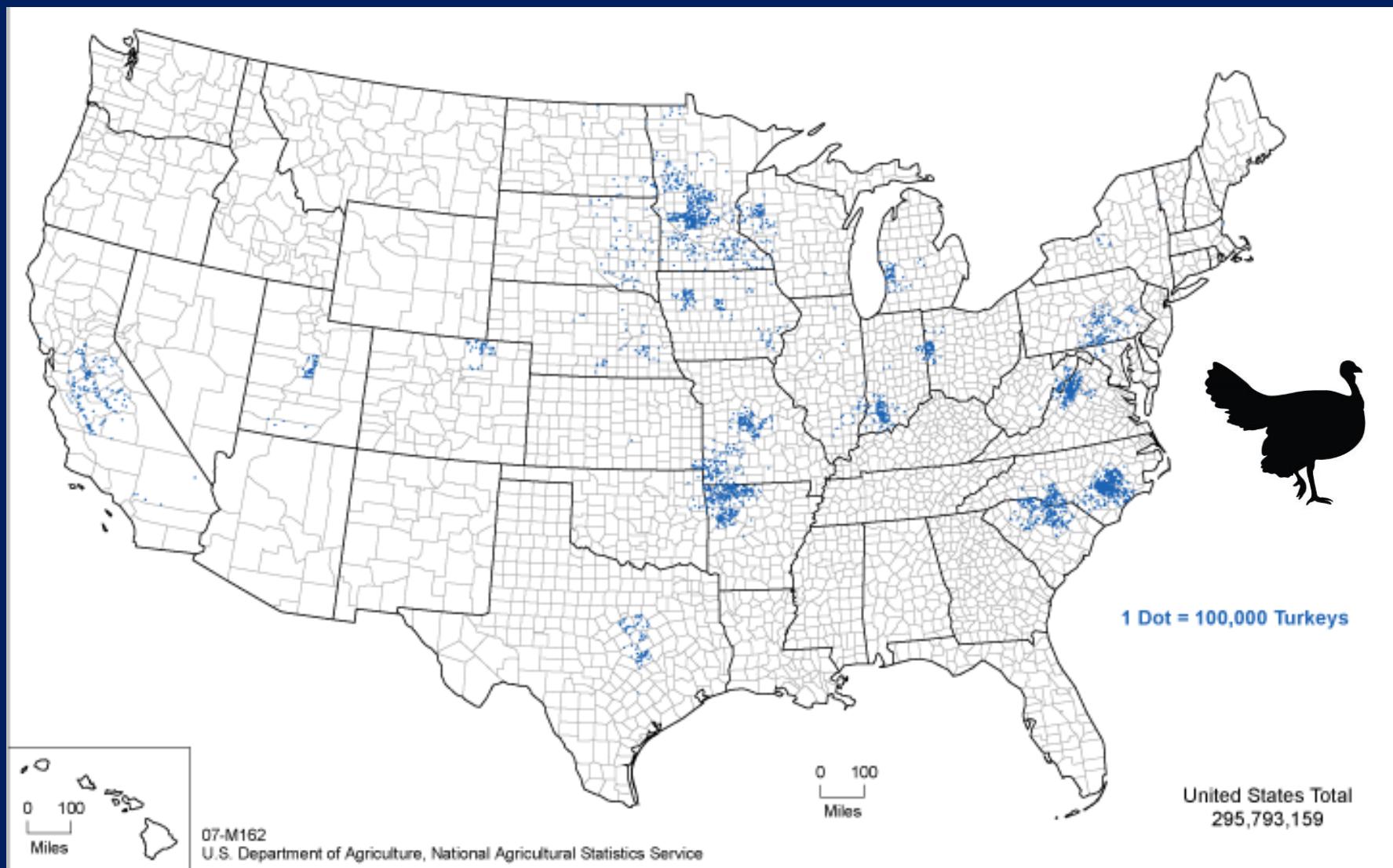


Wetlands loss expands interface



Environmental Working Group 2013

Turkeys sold, 2007



Protecting prime directives



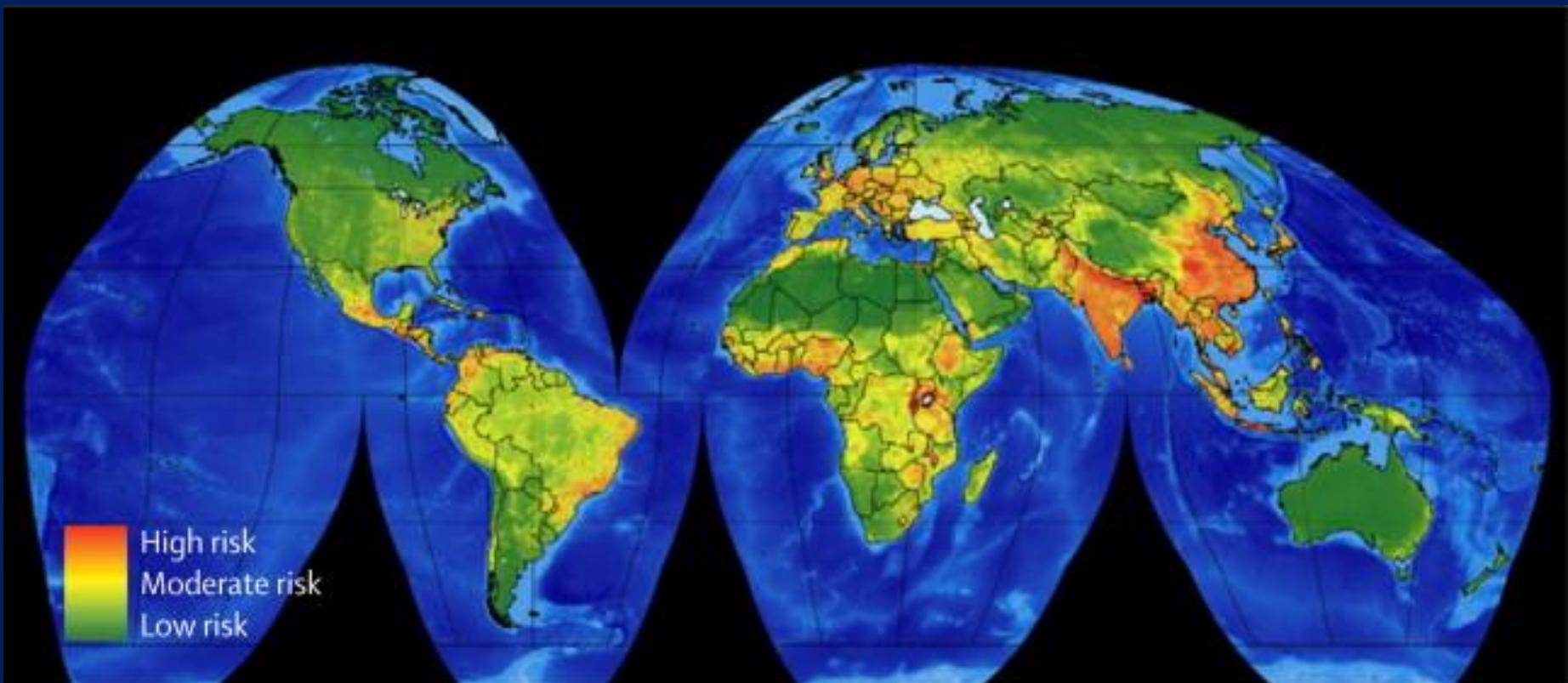
Respecting influenza's privacy



David Joles, Star Tribune

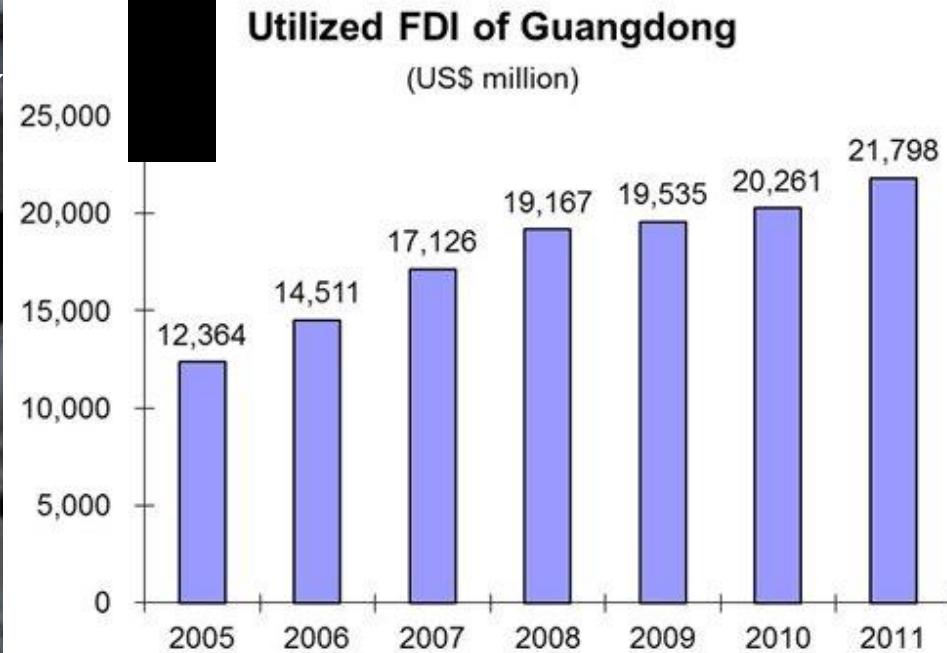


'Hot spots' confound geography for causality



Morse *et al.* 2012

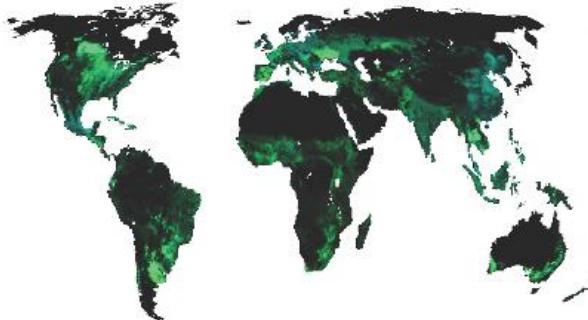
Causality's direction reversed



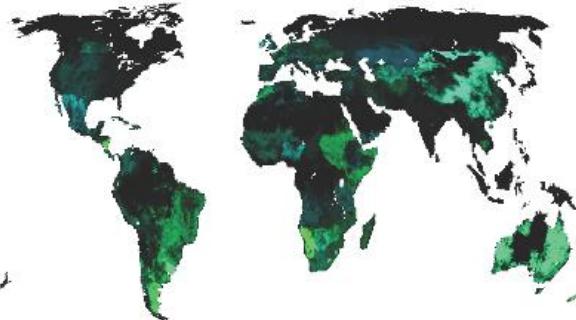
Source: Guangdong Statistical Yearbook, 2011

Landscapes are globalized...

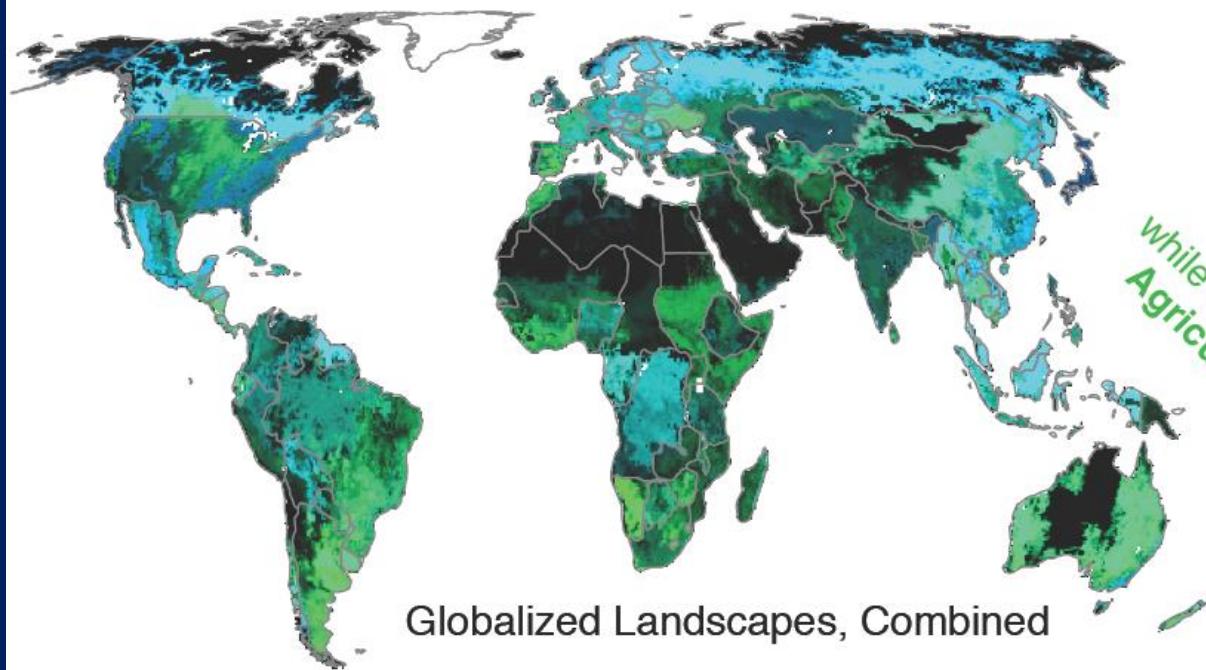
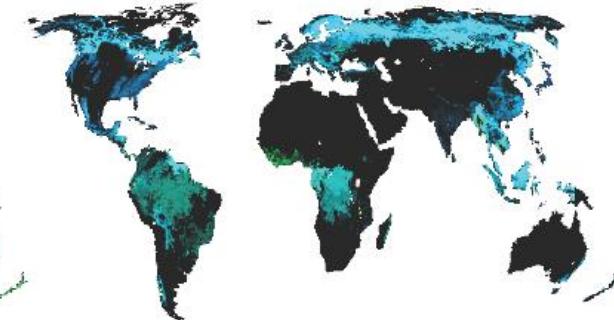
Globalized Croplands



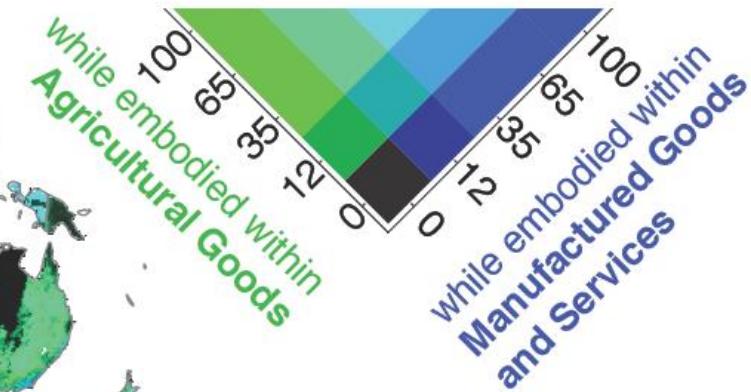
Globalized Pasturelands



Globalized Forests

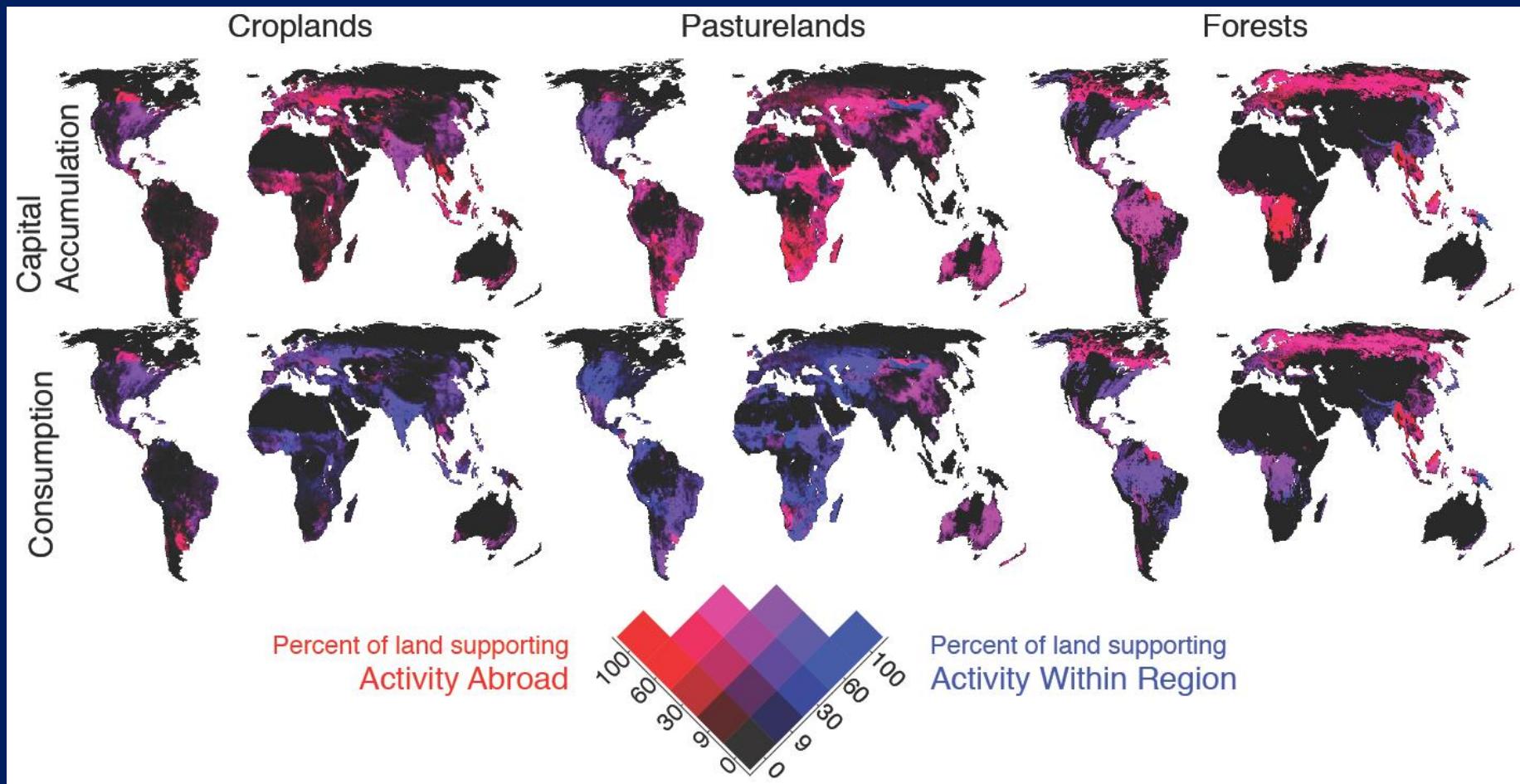


Percent of land surface
whose agricultural harvests
are consumed abroad...



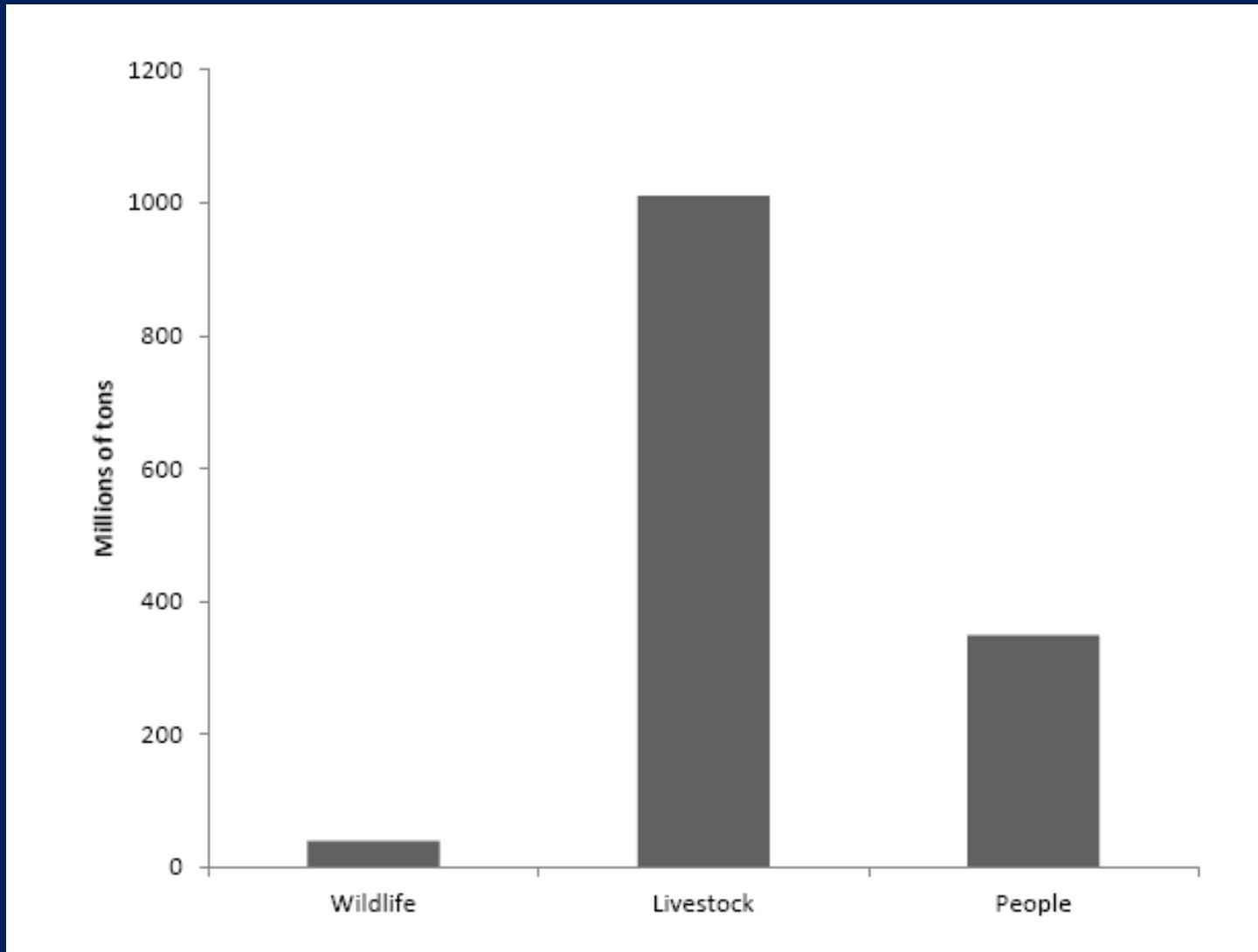
Globalized Landscapes, Combined

...by circuits of capital



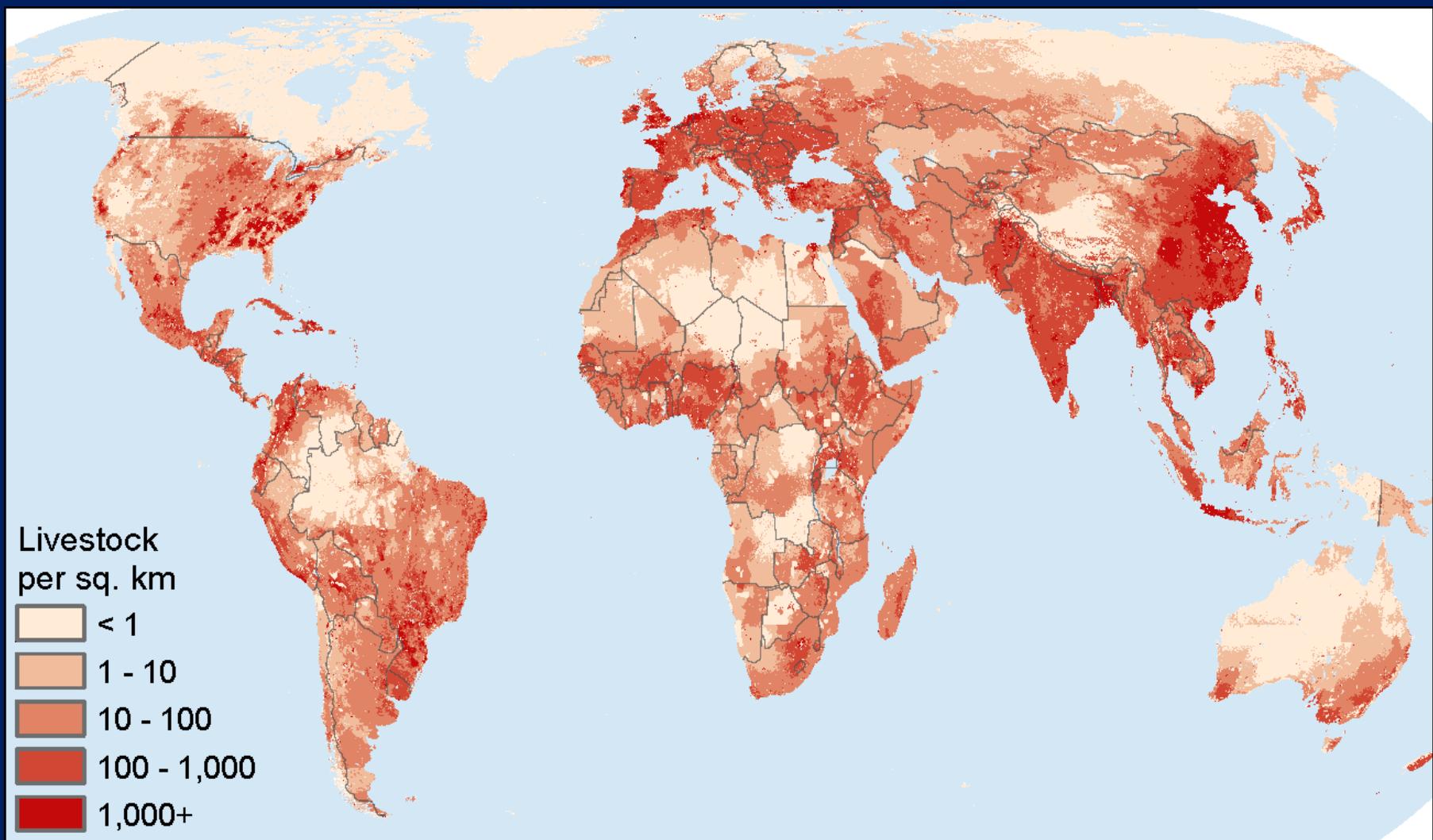
Bergmann and Holmberg 2014

Earth is now Planet Farm



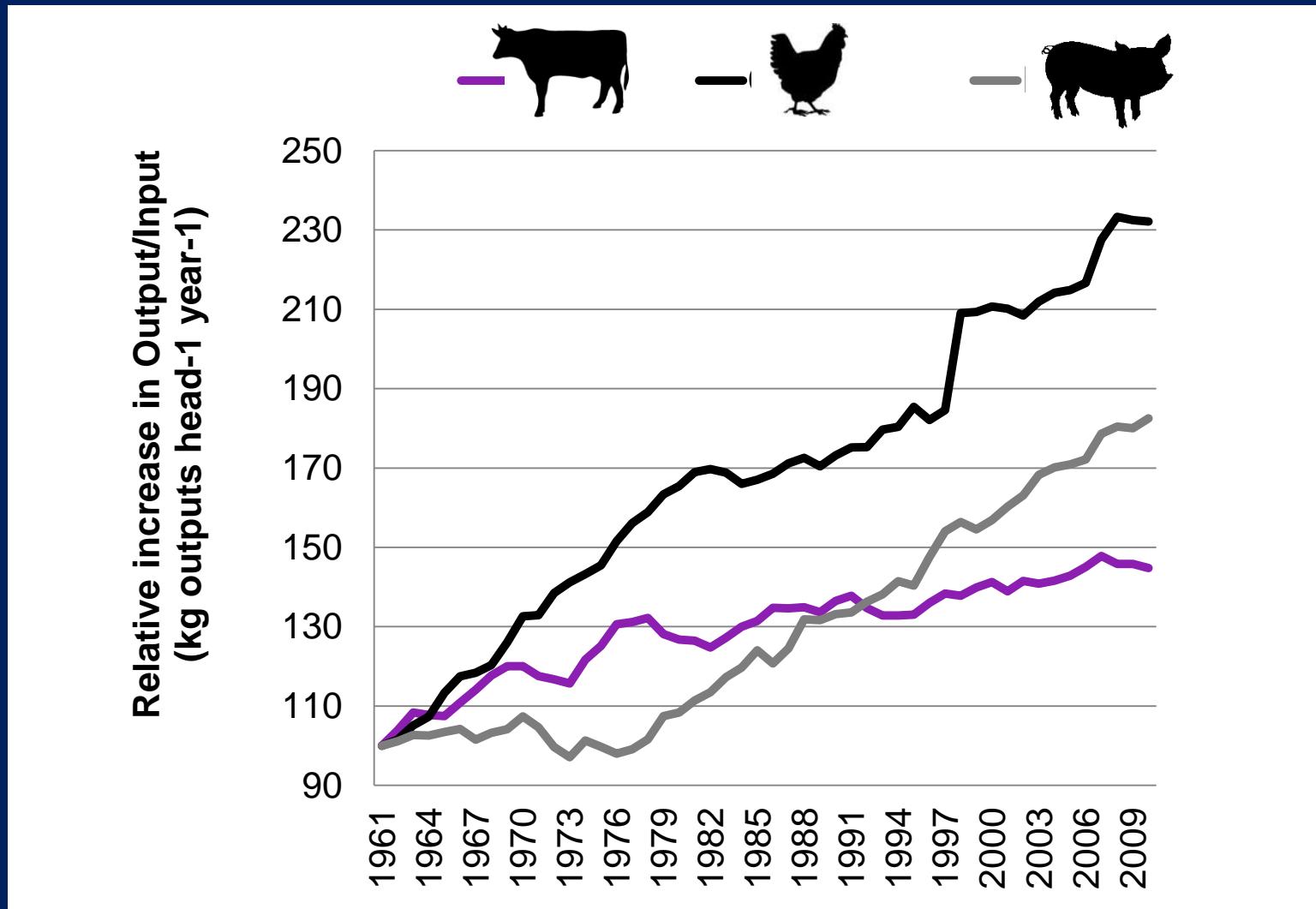
Smil 2002, FAOSTAT 2010

A globe of livestock and poultry

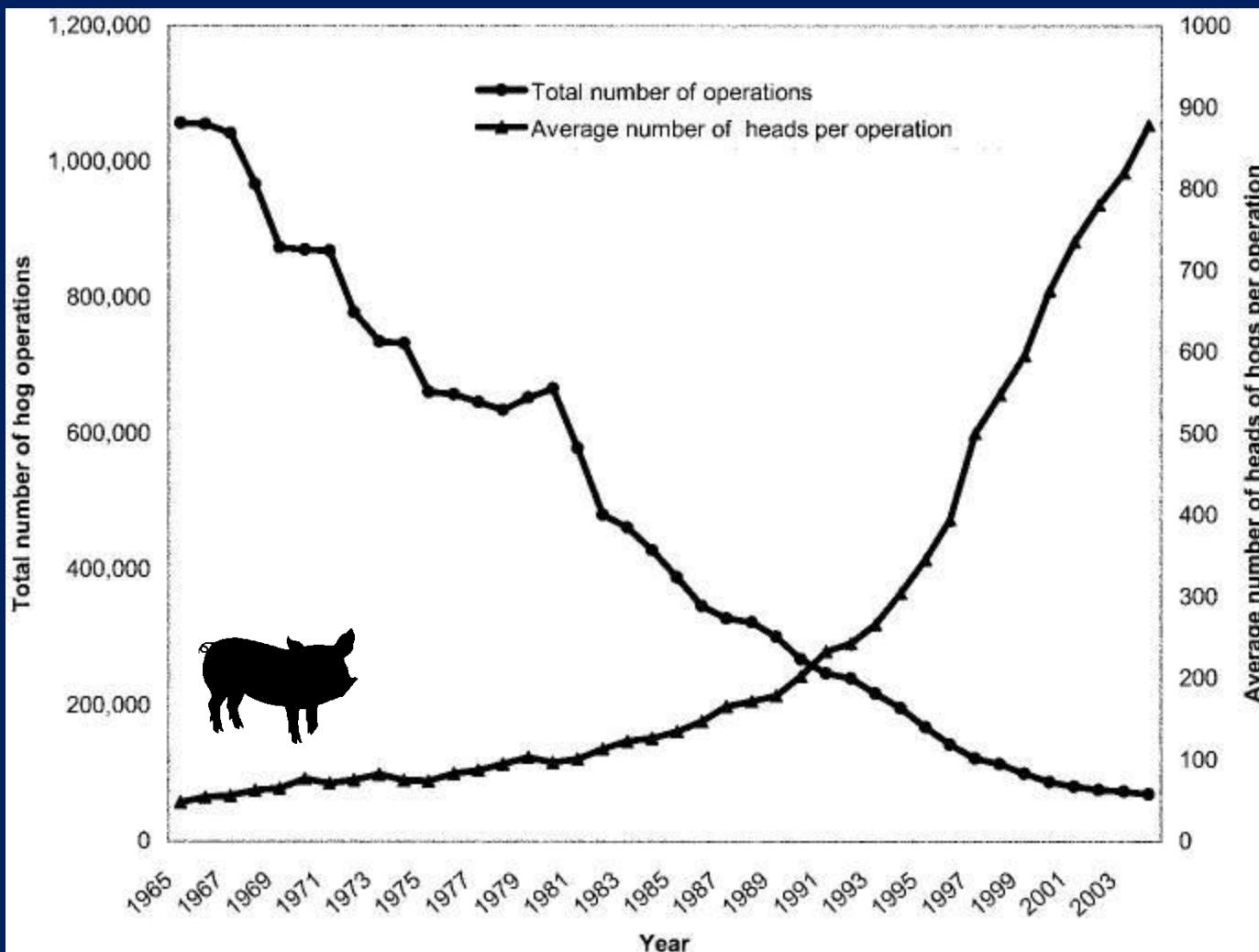


Wallace *et al.* submitted

Globalizing intensive meat



Farm consolidation



Meyers *et al.* 2006



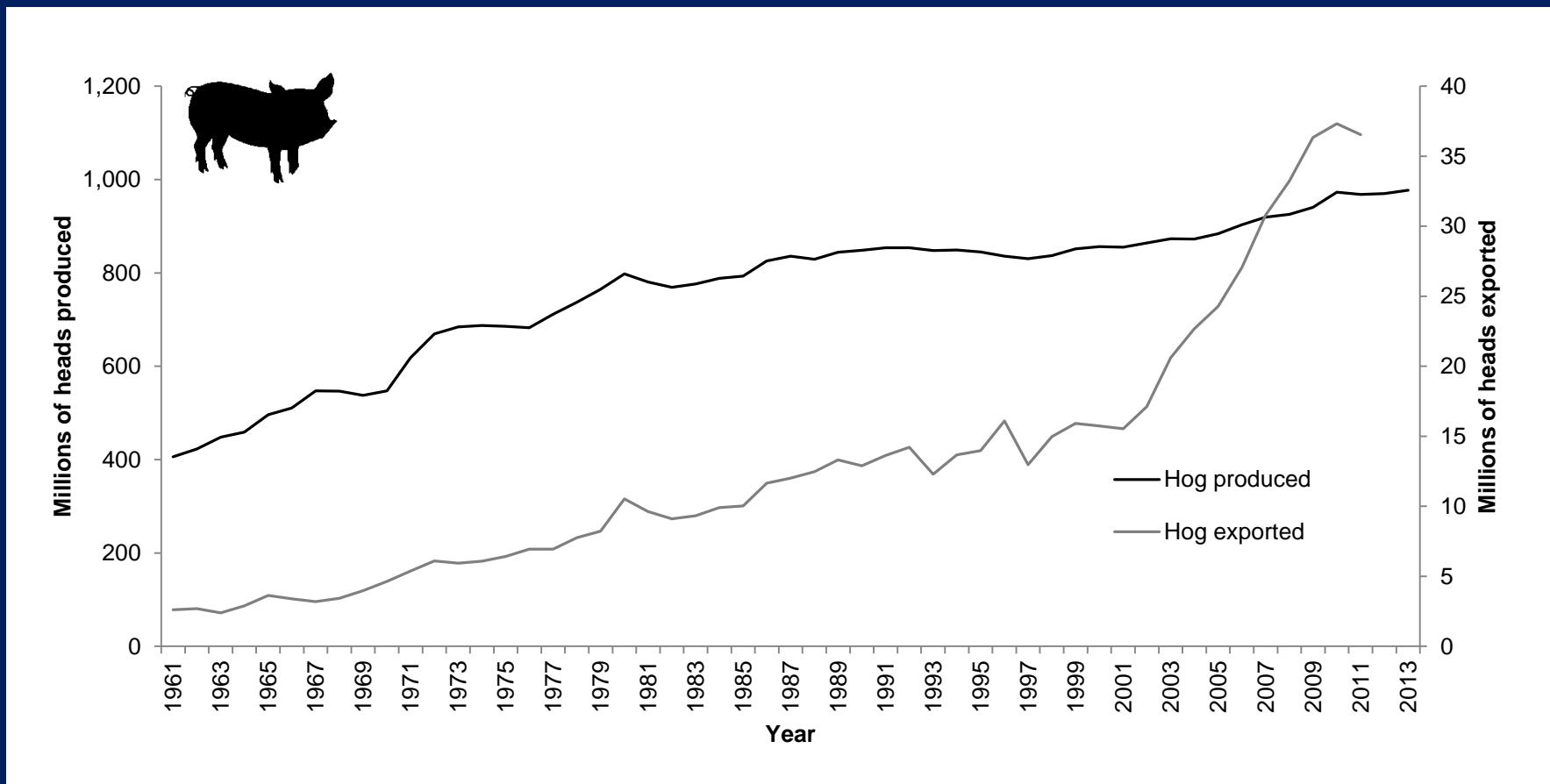
Smithfield®



Swift & Company®



Production and exports



Wallace *et al.* submitted



Increasing virulence in H5/H7

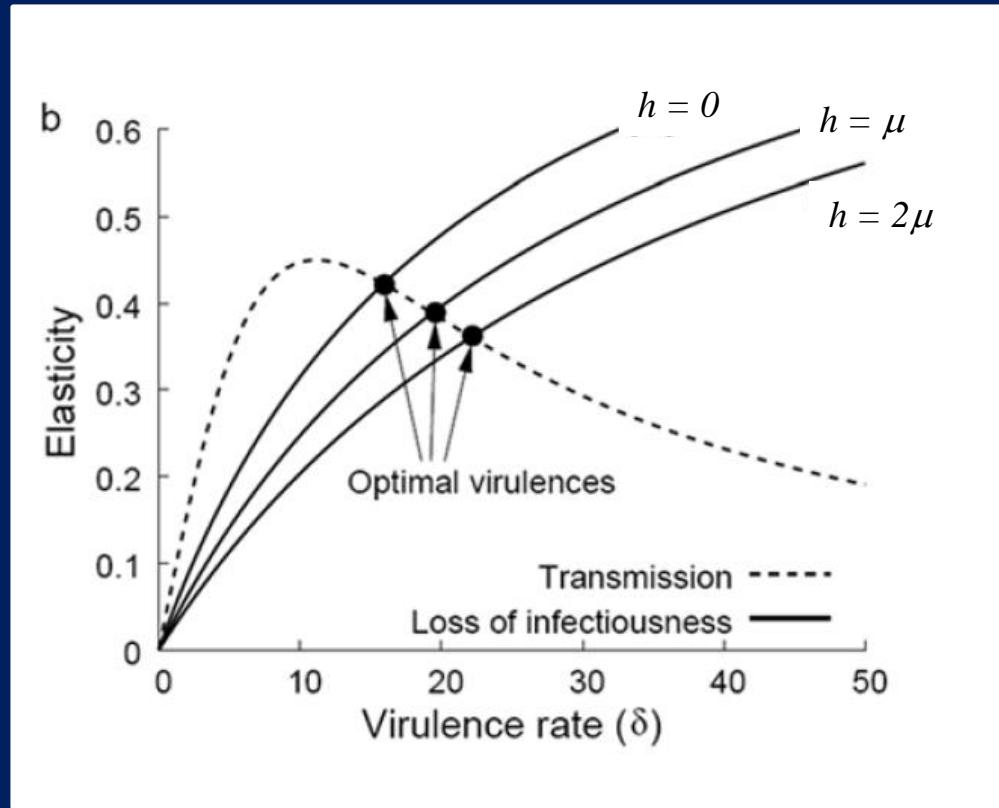


Country	Year	HPAIV Type	Index Flock Type	Refs
Australia (Victoria)	1976	H7N7	Combined broiler and egg layer farm	Westbury (1998)
USA (Pens.)	1983	H5		Bean <i>et al.</i> (1985), J. Virol 54; Henzler <i>et al.</i> (2003)
Australia (Victoria)	1985	H7N7	Multi-aged chicken farm (120k) (broiler-breeders, broilers, layers & pullets)	Westbury (1998)
Australia (Victoria)	1992	H7N3	Broiler-breeders (>13k)	Westbury (1998)
UK Norfolk	1994	H5N1	Turkeys	Wood <i>et al.</i> (1994), Archives of Virology 134:185-194
Mexico	1994	H5N2	Commercial layers	Horimoto <i>et al.</i> (1995), Virology 213
Australia (Queensland)	1994	H7N3	Egg layer (22k) (Multi-age)	
Pakistan	1995	H7N3		
China	1996	H5N1	First isolated from Geese	Comment: different from other instances in that it is the only reassortant (check origin of different genes)

Atkins *et al.* 2010

Australia	1997	H7N4	Commercial broiler-breeder (128k birds)	Sellek <i>et al</i> (2003), Avian Dis 47
Italy	1997	H5N2	Backyard	Capua <i>et al.</i> (1999) cited in Capua & Alexander (2004)
Italy	1999	H7N1	Meat turkey flock	Banks <i>et al</i> .(2001), Arch Virol 146
Chile	2002	H7N3	Broiler breeder (app 560k hens)	Suarez <i>et al.</i> (2004)
Holland	2003	H7N7	Commercial layers, 2 flocks (7k and 21k)	Stegeman <i>et al.</i> (2004), JID 190
Pakistan	2003	H7N3	Commercial layer (41 flocks with 700k birds)	Naeem <i>et al.</i> (2007), Avian Dis 51
Canada (Brit. Col.)	2004	H7N3	Broiler breeders (2 flocks, 9k and 8k)	Bowes <i>et al.</i> (2004) Avian Dis 48, Pasik cited in Berhane
USA Texas	2004	H5N2	Broiler chicken flock (6.6k)	Pelzel <i>et al.</i> (2006), JAVMA (virus only pathogenic in birds co-infected with <i>M. gallisepticum</i>)
Canada (Saskatchewan)	2007	H7N3	Broiler breeders (53k)	Berhane <i>et al.</i> (2009) EID 15
UK	2008	H7N7	Free-range layers (25k)	DEFRA, SCoFCAH Mtg, 18/06/08 ('possible mutation')
Spain	2009	H7N7	Laying hens (308k)	Anon., SCoFCAH Mtg, 03/05/10

Modeling virulence in poultry



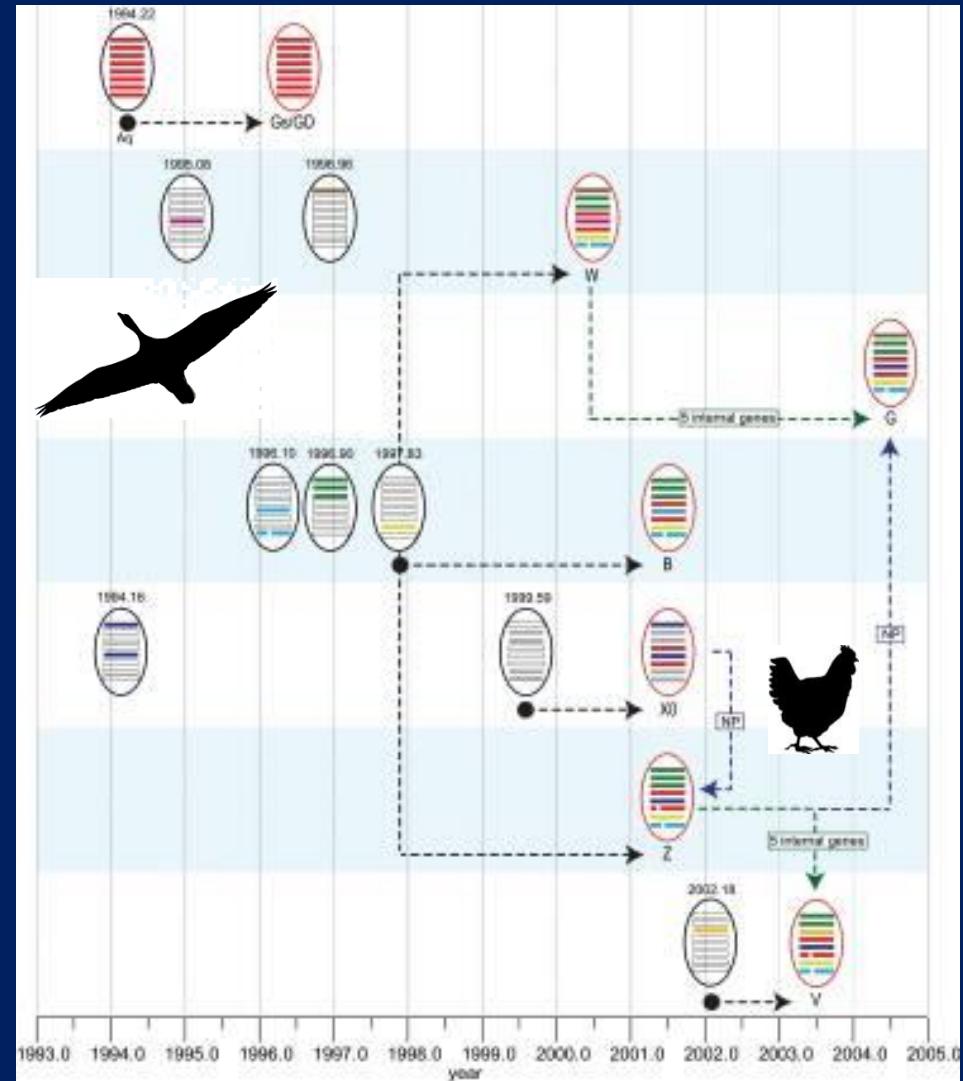
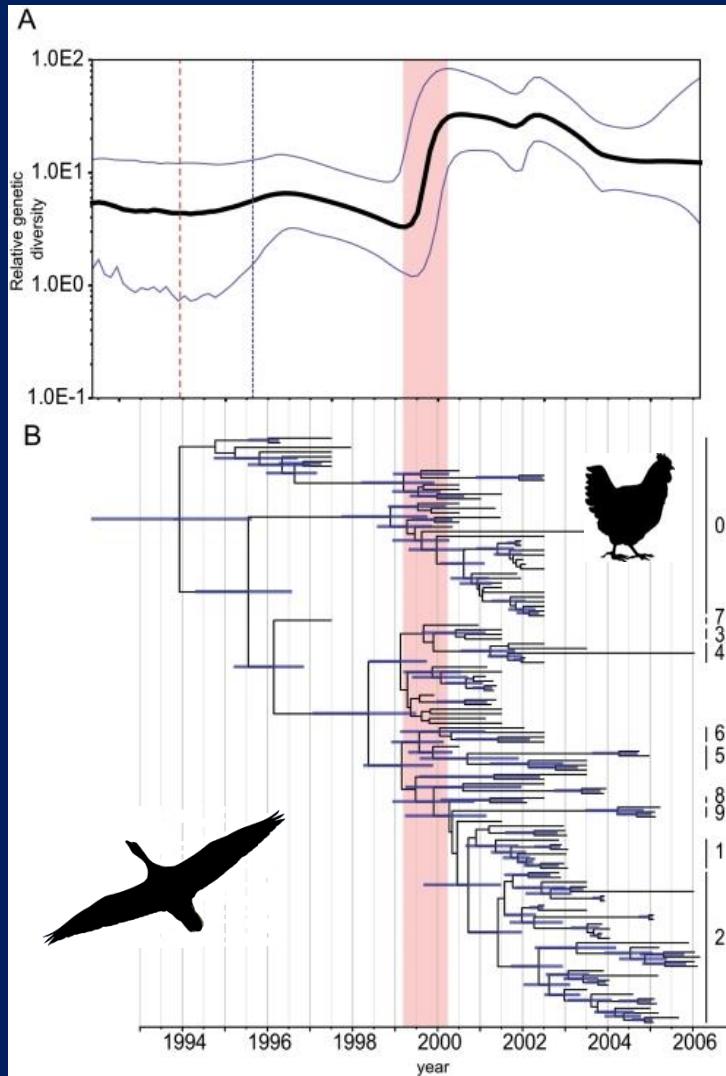
Increasing
harvesting rate
 h increases
virulence selected

Atkins *et al.* 2010

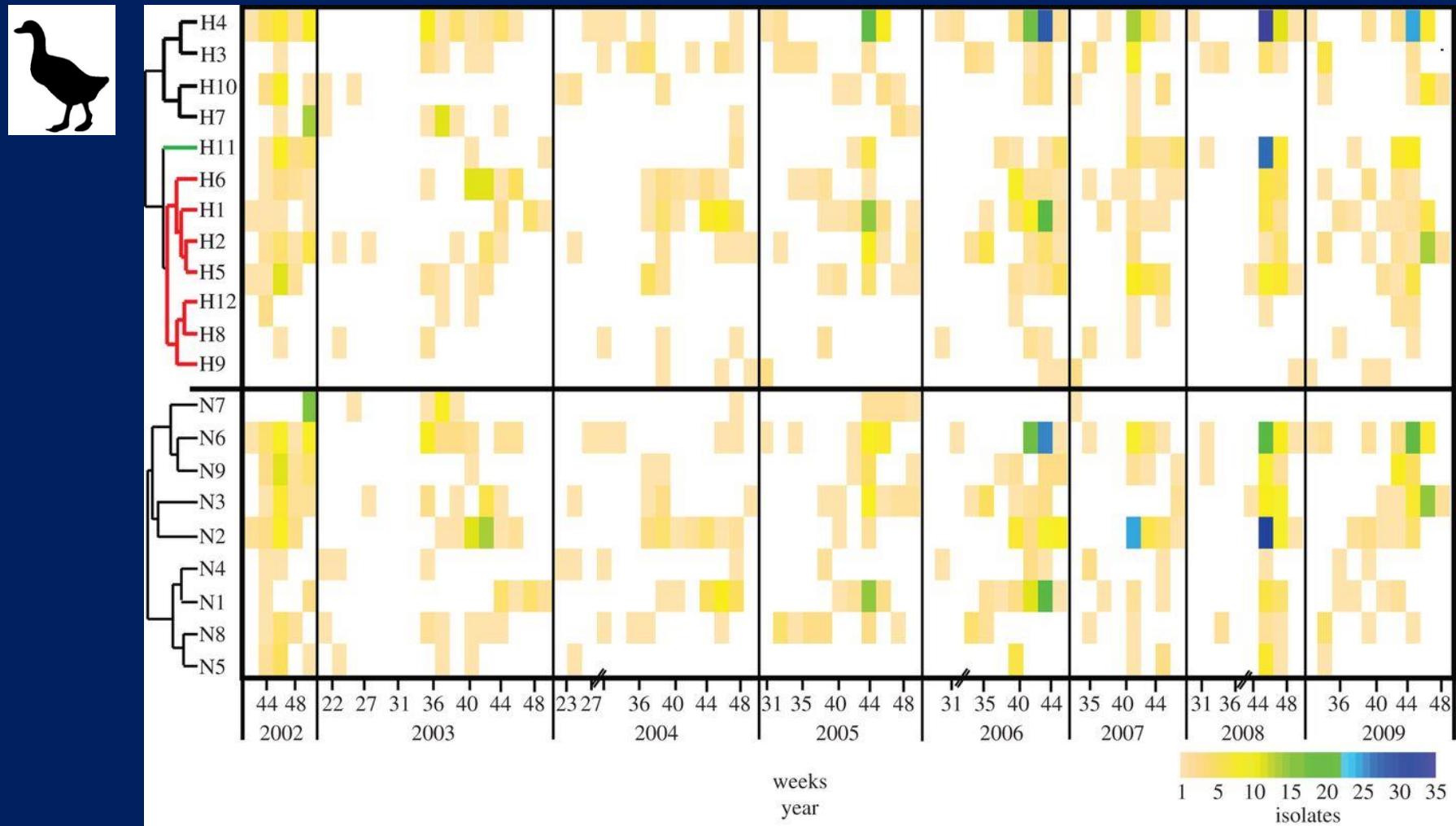
Seroepidemiology

Group	Subjects Tested	Anti-H5– Positive	Anti-H9– Positive	Odds Ratio (95% CI)	P Value†
	no.	no. (%)			
Poultry retailers in food market	252	2 (0.8)	39 (15.5)	14.00 (4.92–39.81)	<0.001
Poultry wholesalers in poultry wholesale market	244	2 (0.8)	16 (6.6)	5.49 (1.81–16.69)	0.003
Workers in large-scale poultry-breeding enterprise‡	125	0	7 (5.6)	4.74 (1.34–16.56)	0.01
Farmers in small-scale rural poultry farm§	869	0	24 (2.8)	2.48 (0.84–7.29)	0.06
Workers in pig-breeding enterprise	182	0	5 (2.7)	2.42 (0.63–9.23)	0.38
Retailers of goods other than poultry in food market	218	0	4 (1.8)	1.42 (0.35–5.75)	0.63

Phylogenetic evidence rolling in

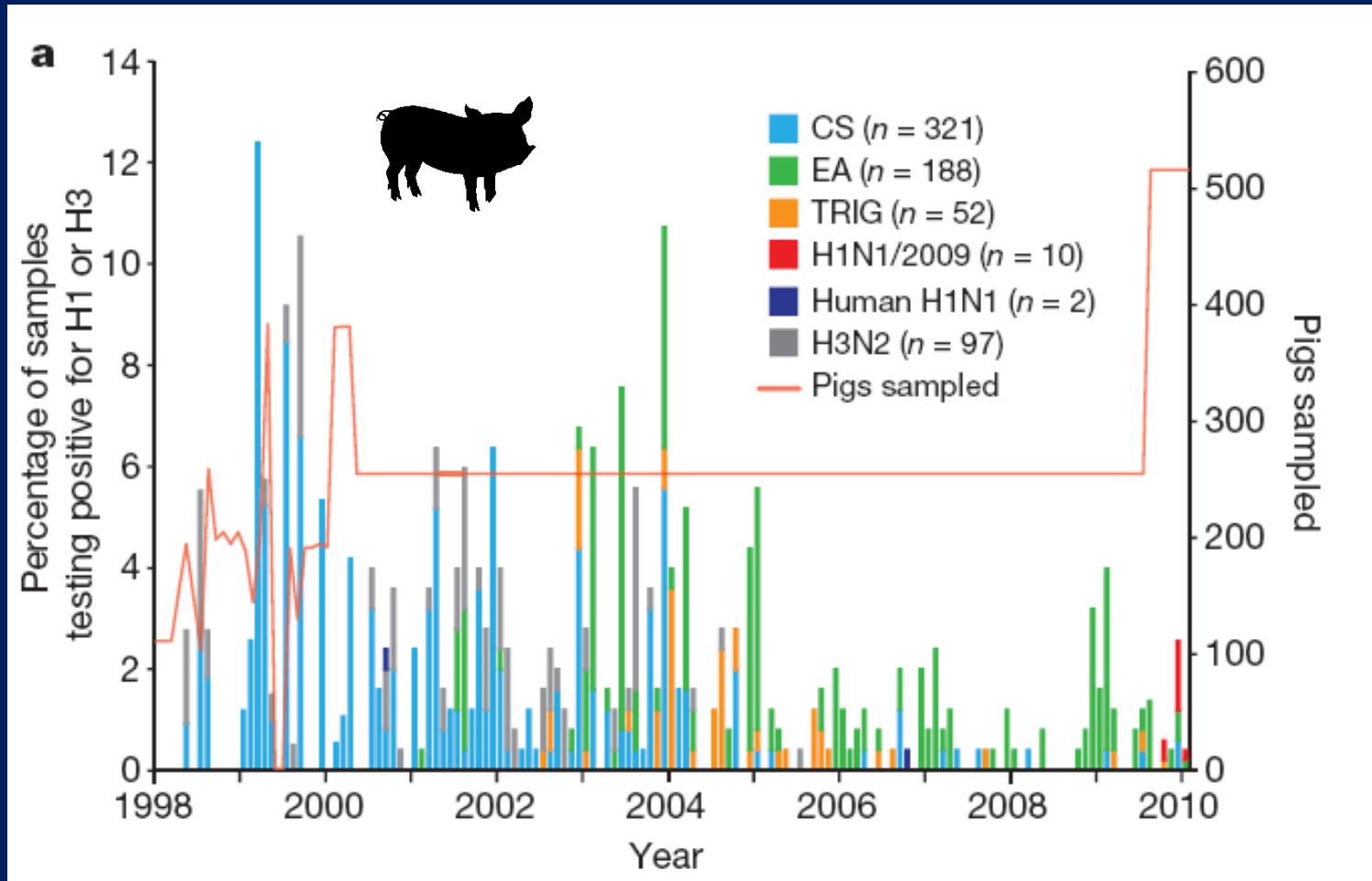


‘Wildtype’ influenza diversity...



Latorre-Margalef *et al.* 2014

...now found at industrial sites



Vijaykrishna *et al.* 2011

Increasing spillover across poultry...

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16
N1	8+	5+	1+	1	48+	8+	6+	0	3+	4+	1+	3	0	0	0	0
N2	4+	2	6+	1+	9+	8+	2+	0	11+	3	6	1	4+	0	1	0
N3	1+	3	3+	1+	5+	1	9+	1	1	4	2	3	1	1	0	6+
N4	1	1	1	1	1	3+	3	2	1	3+	1+	3	0	0	1	0
N5	3	2	1+	2	1	1+	1+	1	4+	1	2+	5+	0	2	0	0
N6	2	2	8+	6+	1	3+	2+	0	1	3+	2	1	7+	1	1+	0
N7	0	5+	2	2+	2+	0	7+	0	1+	9+	1	0	0	0	0	0
N8	1	3+	20+	6+	1	10+	3+	1	0	3+	1	1	2	0	0	0
N9	3+	4+	2	2	1	2+	2+	0	3+	2+	10+	1	4+	0	3+	0



Olson *et al.* 2014

...as well as into humans

Influenza A Subtypes: Species Affected

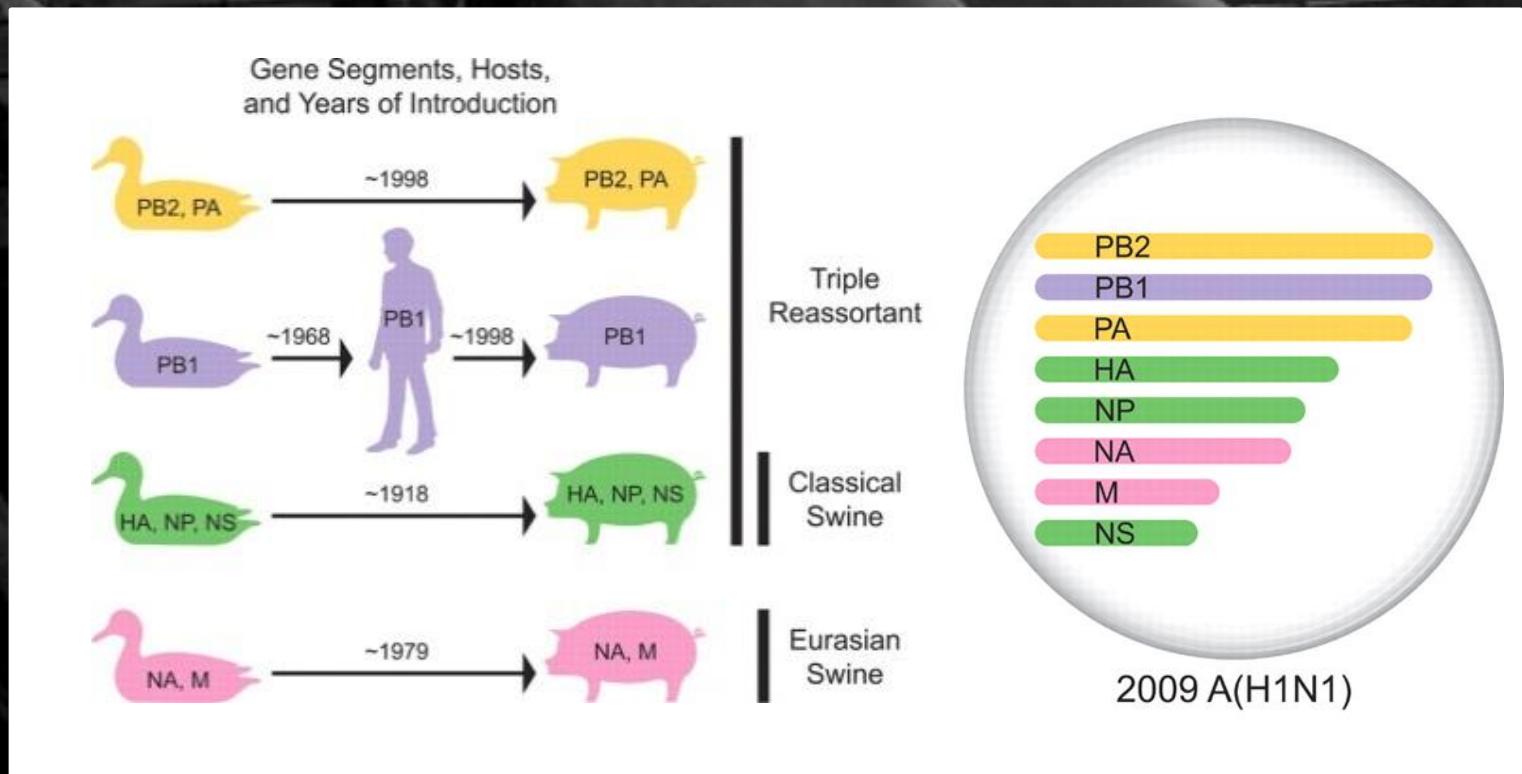
Hemagglutinin

SubType	People	Poultry	Pigs	Bats / Other
H1				
H2				
H3				Other Animals
H4				Other Animals
H5				
H6				
H7				Other Animals
H8				
H9				
H10				

Neuraminidase

SubType	People	Poultry	Pigs	Bats / Other
N1				
N2				
N3				
N4				
N5				
N6				
N7				Other Animals
N8				Other Animals
N9				
N10				

Intercontinental reassortment



Poultry breeders block immune resistance



Does flu ‘farm’ poultry?



Ilaria Capua

Contractor debt as trap crop



Randall Hill/Reuters/Corbin

Contract epizootiology



Myopic block a design feature



Agribusiness externalizes costs



Regional planning



Wean waterfowl off farms

A photograph capturing a massive flock of birds in flight against a clear blue sky. In the foreground, a dark shoreline is visible, dotted with numerous birds resting on the ground. Beyond the shore, a dense line of trees with autumn-colored leaves (orange and yellow) marks the edge of a body of water. In the distance, two low, rounded hills or mountains are visible under the same clear blue sky.

Diversify birds and farmers alike



FARMING PATHOGENS

Disease in a world of our own making

Made in Minnesota

Posted in Ecological resilience, Evolution, Influenza, Organic agriculture with tags [avian influenza](#), [Cargill](#), [Carol Cardona](#), [externalized costs](#), [fomites](#), [Glen Taylor](#), [H5N2](#), [Hormel](#), [James Shiffer](#), [Jeffrey Ettinger](#), [Jennie-O Turkey](#), [Minnesota](#), [Montserrat Torremorell](#), [Prairie Pothole Region](#), [Rebecca White](#), [Rembrandt Enterprises](#), [Star Tribune](#), [University of Minnesota](#), [wetlands](#) on June 10, 2015 by rgwallace



From the outside, the headquarters of the Cankor Health Group resembles

Rob Wallace

I'm an evolutionary biologist and public health phylogeographer presently visiting the Institute of Global Studies at the University of Minnesota. I blog at 'Farming Pathogens' on disease in a world of our own making. Following agriculture, infections, evolution, ecological resilience, dialectical biology, and the practice of science.

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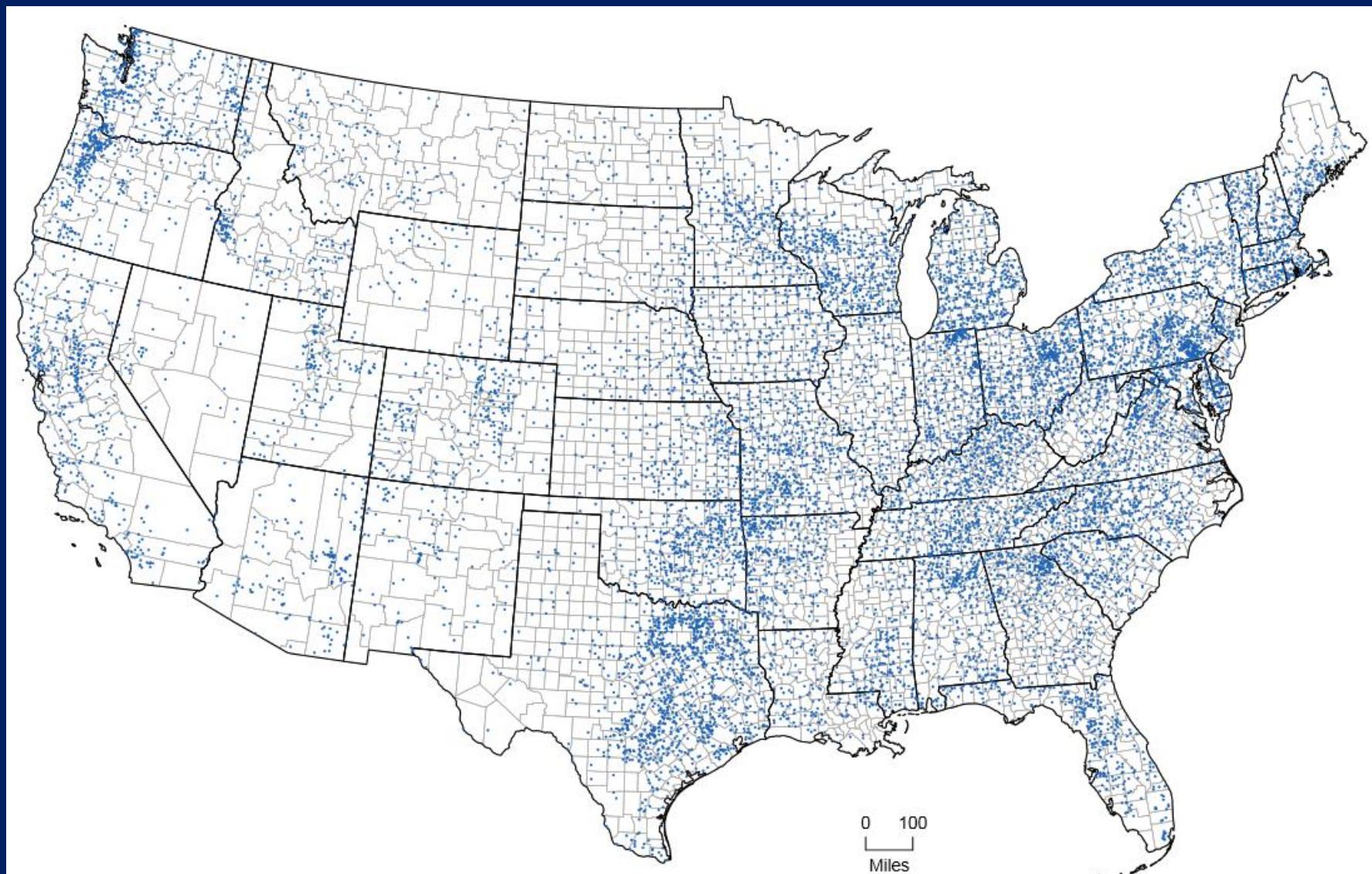
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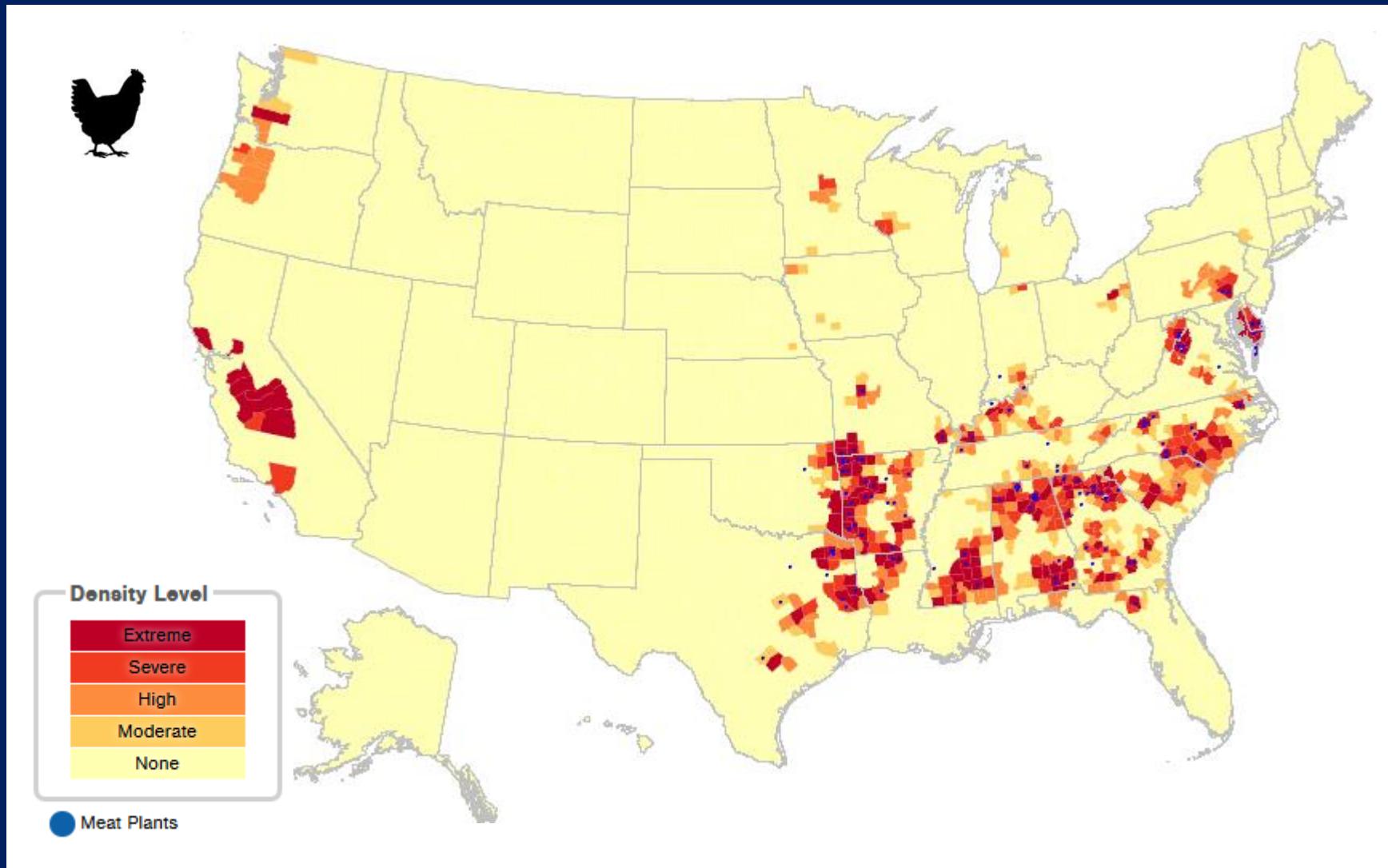
Glen Stubbe, Star Tribune

Poultry farms, 2012

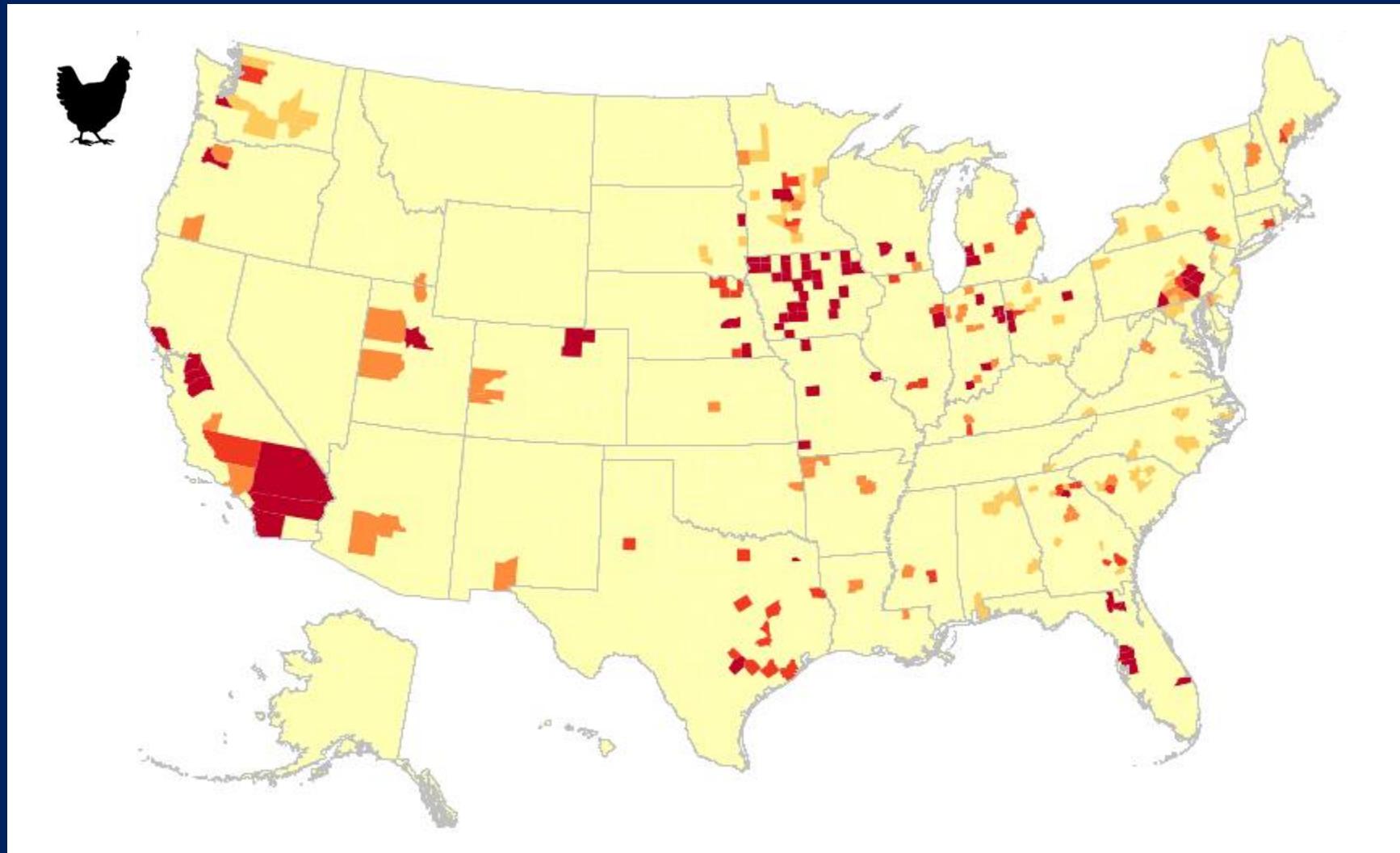


USDA, National Agricultural Statistics Service 2013

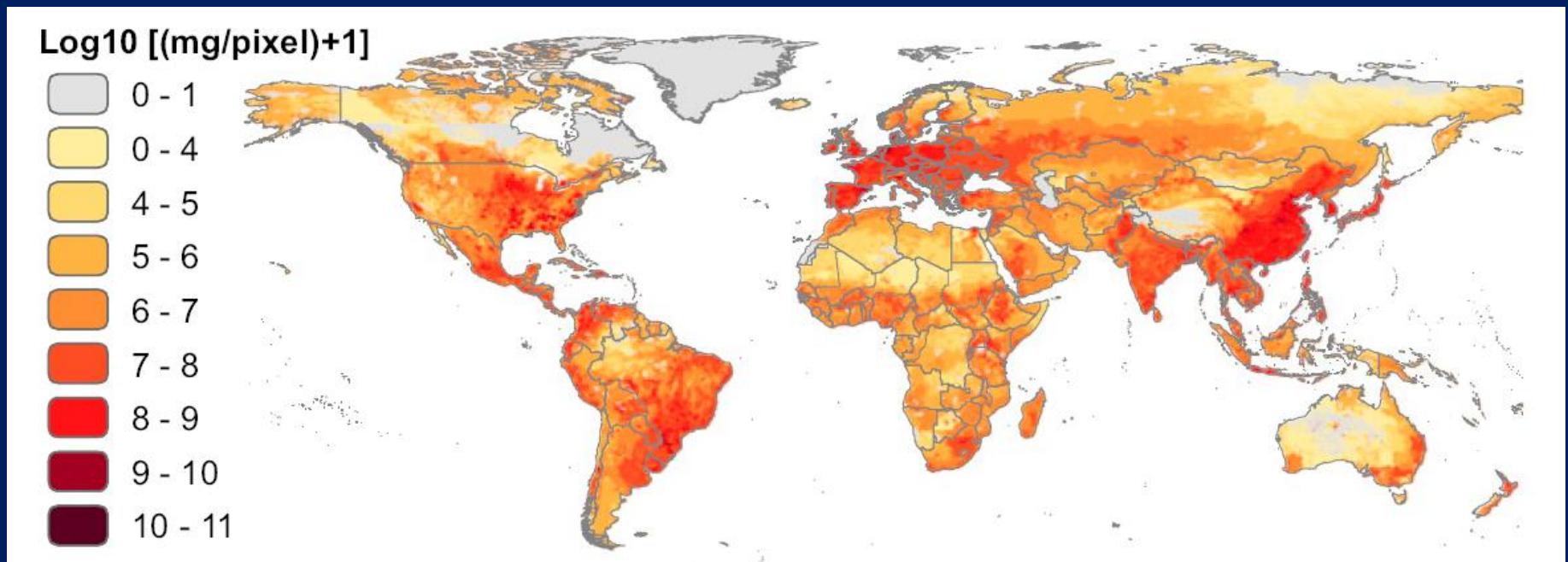
Broilers, 2007



Layers, 2007



Antibiotic use in livestock

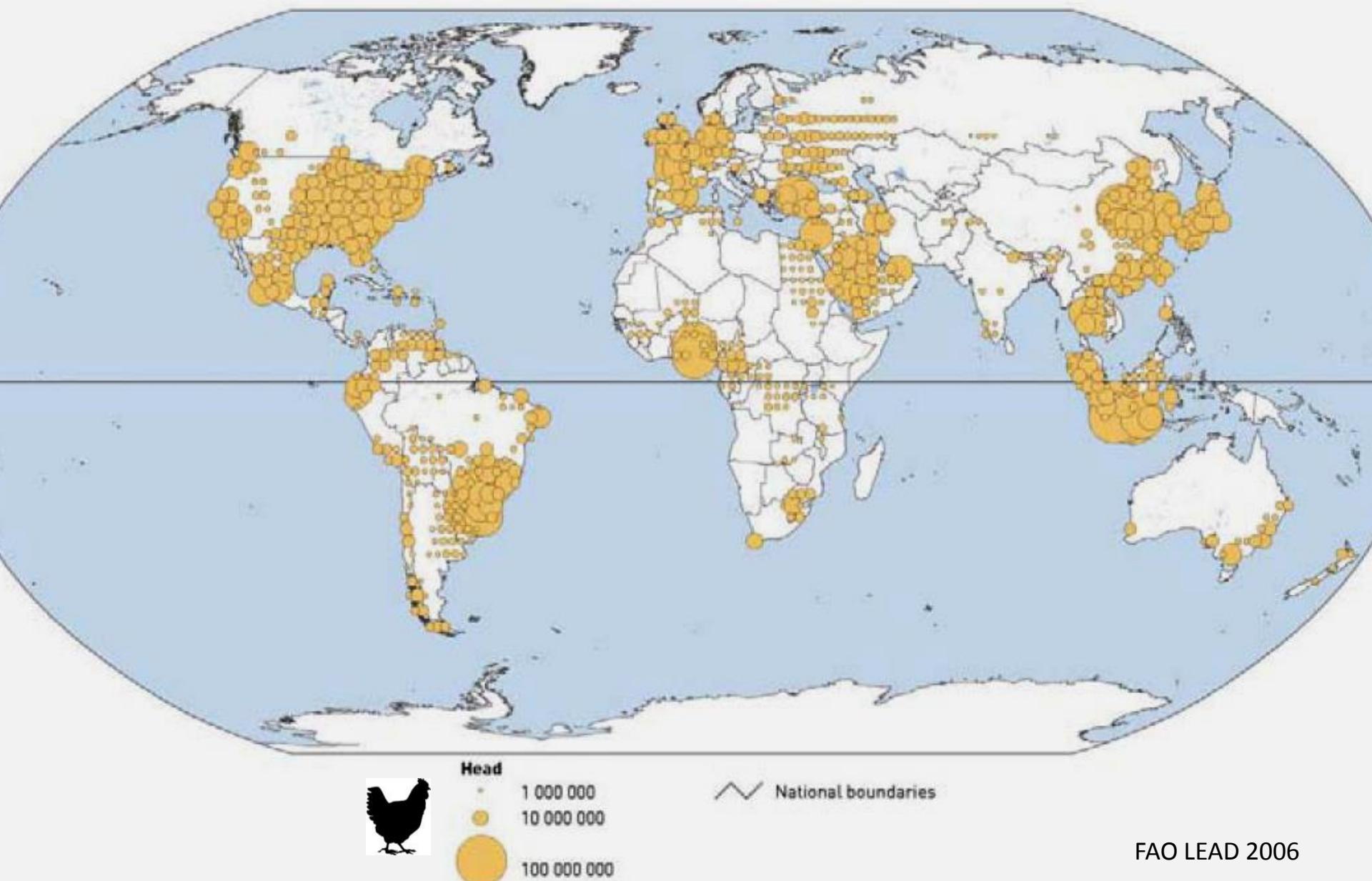


Van Boeckel et al. 2015

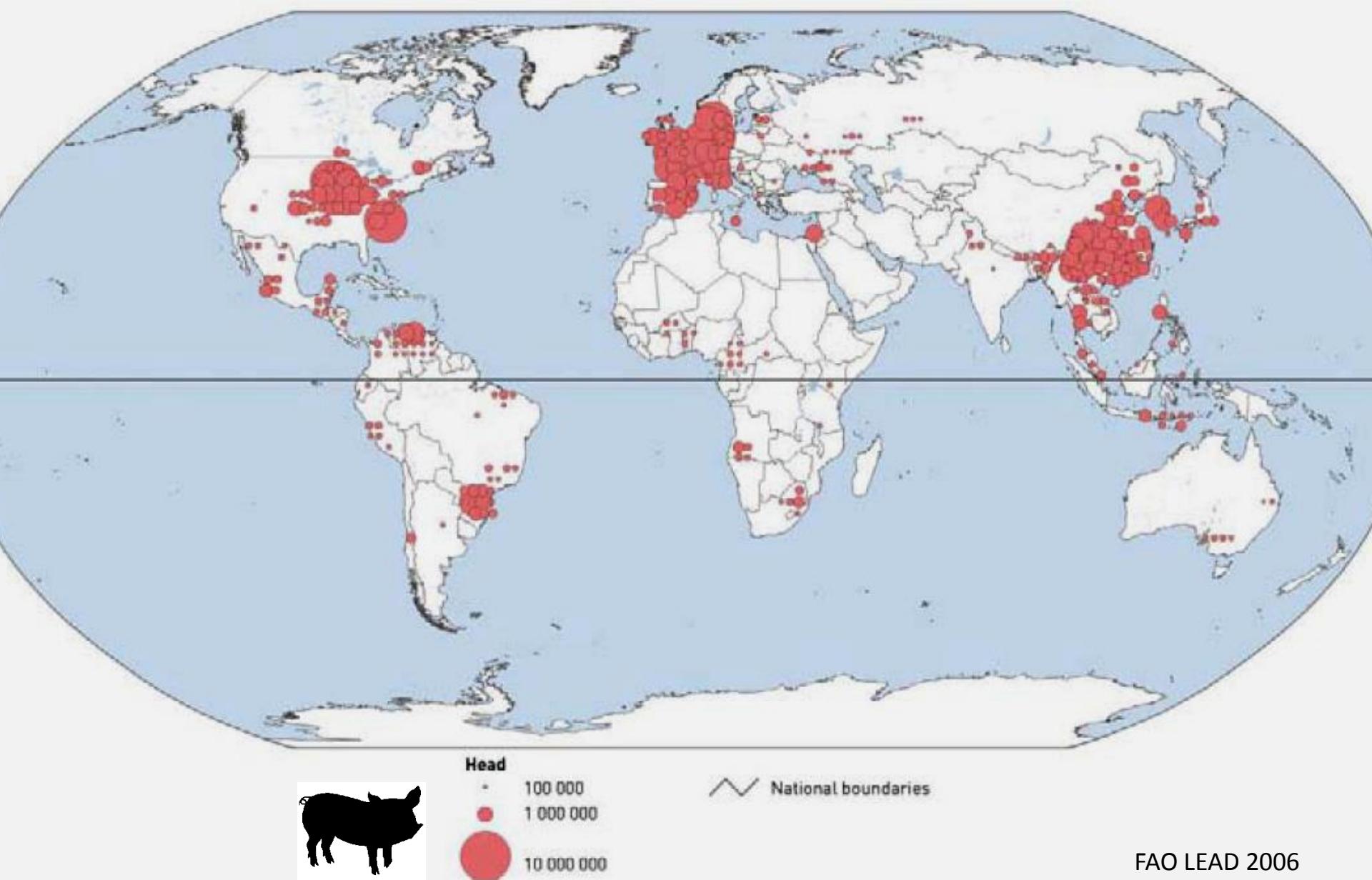
Not so biosecure or inert



Industrially produced poultry



Industrially produced hog



To sum up the problem



Multiple diseconomies of scale

