Appendix 1
Acronyms

AIIS	Automated Import Information System
APHIS	Animal and Plant Health Inspection Service
ARS	Agricultural Research Service
AVIC	Area Veterinarian in Charge
AVMA	American Veterinary Medical Association
BSE	bovine spongiform encephalopathy
CDC	Centers for Disease Control and Prevention
CEAH	Centers for Epidemiology and Animal Health
CSREES	Cooperative State Research, Education, and Extension Service
CFSAN	Center for Food Safety and Applied Nutrition
CVB	Center for Veterinary Biologics
CVM	Center for Veterinary Medicine
DHHS	Department of Health and Human Services
DOD	Department of Defense
DOI	Department of Interior
EPA	Environmental Protection Agency
ERS	Economic Research Service
EU	European Union
FAO	Food and Agriculture Organization
FAS	Foreign Agricultural Service
FBI	Federal Bureau of Investigation
FDA	Food and Drug Administration

FEMA	Federal Emergency Management Agency
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FMD	foot-and-mouth disease
FSIS	Food Safety and Inspection Service
FY	fiscal year
IICA	International Institute for Cooperation in Agriculture
NAFTA	North American Free Trade Association
NAHEMS	National Animal Health Emergency Management System
NASS	National Agricultural Statistics Service
NVSL	National Veterinary Services Laboratories
OCPM	Office of Crisis Planning and Management
OIE	Office International des Epizooties (International Office of Epizootics)
OIG	Office of Inspector General
OIRSA	Organisme Internacional Regional de Sanidad Agropecuaria
PAHO	Pan American Health Organization
PL	Public Law
TSE	transmissible spongiform encephalopathy
UK	United Kingdom
USAHA	United States Animal Health Association
USDA	U.S. Department of Agriculture
USTR	U.S. Trade Representative
vCJD	variant Creutzfeldt-Jakob disease
VDL	veterinary diagnostic laboratory

WHO	World Health Organization
WTO	World Trade Organization

Glossary

Antigen
A substance capable of inducing an immune response, such as the production of antibodies; an antigen may be a soluble protein, such as a toxin, or a particulate, such as a protein or polysaccharide portion of a bacteria, virus, or tissue cell.

Cervid
All members of the *cervidae* family and hybrids, including deer, elk, moose, caribou, reindeer, and related species.

Cud
Partly digested food that cows and other ruminants return to the mouth, after it has passed into the first stomach, to chew again as an aid to digestion

Downer Cattle
Cattle that can not rise from a recumbent position. In Europe these cattle are distinguished either as "fallen stock" if not for human consumption or "emergency slaughter" cattle if for human consumption. Less than 1% of the cattle slaughtered annually in the U.S. are downer cattle.

Endemic
Occurring in particular place (used to describe a disease occurring within a specific area, region, or locale)

Indemnity
Compensation for damage or loss sustained. In the case of FMD or BSE, the government has the legal authority to take animals from private citizens in order to carry out a disease control program. Farmers receive fair compensation for the loss of their animals.

Phytosanitary
Plant health (often related to trade issues)

Regionalization
A procedure implemented to define geographical areas of differing animal disease risk based on biological, climatological, and geographical factors within a country or among multiple countries, usually for the purpose of facilitating international trade of animals or animal products.

Ruminant

any cud-chewing hoofed mammal with an even number of toes and a stomach with multiple chambers.

Sanitary
Animal health (often related to trade issues)

Screening
Examination of humans or animals with no signs of illness, or specimens from such humans or animals, in order to detect the presence of a potential disease causing agent.

Transshipments
Cargo shipments transferred from one means of transportation to another. (For example, a shipment of meat arrives by ship and is transferred to a truck for shipment to another location.

Zoning
A procedure implemented to define geographical areas of differing animal disease status within a country, usually for the purpose of disease control or eradication.

Zoonotic
Pertaining to a disease that is communicable from animals to humans

Appendix 2. Animal Disease Risk Assessment, Prevention, and Control Act Inter-agency Work Group

USDA

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	Antonio Bravo Program Advisor for Pesticides Office of Prevention, Pesticides, and Toxic Substances Environmental Protection Agency
FEMA	Michael Lowder / Jason McNamara (alternate) Supervisory Program Specialist, Policy and Planning Branch Planning and Readiness Division, Readiness, Response and Recovery Directorate Federal Emergency Management Agency
HHS	Murray M. Lumpkin Acting Deputy Commissioner Food and Drug Administration
Interior	Sue Ellen Wooldridge Deputy Chief of Staff U.S. Department of the Interior
Justice	Craig Watz Supervisory Special Agent, Weapons of Mass Destruction Operations Unit Federal Bureau of Investigation
	Andrew C. Emrich Counsel to the Assistant Attorney General, Environmental and Natural Resources Division U.S. Department of Justice
OSTP	Clifford Gabriel Deputy Associate Director for Science, Office of Science and Tech. Policy Executive Office of the President
State	Robert E. McCreight / Julia M. Rottier (alternate) Office of Science and Technology Cooperation Department of State

Transportation	Robert McGuire Associate Administrator for Hazardous Materials Safety Research and Special Programs Administration U.S. Department of Transportation
Treasury	Al Morawski Chief, Other Government Agencies Branch, Office of Field Operations U.S. Customs Service
USTR	Sharon Bomer Lauritsen Agricultural Affairs Office of the U.S. Trade Representative

Appendix 3.
Public Input for PL107-9

List of those who provided comments in response to Docket No. 01-064-1

Written Comments	**Date Received**
R. A. Smith University of Kentucky Lexington, KY	8/24/01
R. Max Peterson International Association of Fish and Wildlife Agencies Washington, DC	9/7/01
Michael F. Jacobson and Caroline Smith DeWaal Center for Science in the Public Interest Washington, DC	9/10/01
Larry E. Gabriel South Dakota Department of Agriculture Pierre, SD	9/24/01
Michael Appleby The Humane Society of the United States Washington, DC	10/2/01
Sheldon R. Jones Arizona Department of Agriculture Phoenix, AZ	10/3/01
Mark Myers National By-Products, Inc. Des Moines, IA	10/4/01
R. Garcia Merial Limited Duluth, GA	10/5/01
Don A. Franco and Thomas M. Cook Animal Protein Producers Industry Huntsville, MO	10/9/01
Roger Johnson and Larry A. Schuler North Dakota Department of Agriculture Bismarck, ND	10/9/01

James A. Ransweiler Darling International Inc. Irving, TX	10/9/01
Ronald B. Wilson Tennessee Department of Agriculture Nashville, TN	10/9/01
Stephen Pretanik National Chicken Council Washington, DC	10/9/01
Barb Determan National Pork Producers Council Washington, DC	10/9/01
Animal Agriculture Coalition Washington, DC	10/9/01
Helen K. Groves Silverbrook Ranches Baird, TX	10/9/01
Tom Burkgren American Association of Swine Veterinarians Perry, IA	10/9/01
Bernard F. Shire American Association of Meat Processors Elizabethtown, PA	10/9/01
Jack Fisher Idaho Wildlife Federation Boise, ID	10/9/01
Arthur V. Tennyson American Veterinary Medical Association Schaumburg, IL	10/9/01

David J. Cantor Farm Sanctuary Glenside, PA	10/9/01
James J. Hickey, Jr. American Horse Council Washington, DC	10/9/01

Comments Received on APHIS E-comments Website
http;//comments.aphis.usda.gov

Stanley G. Meager	8/18/01
Terry S. Singeltary Sr.	8/22/01
Donna Pillar	9/7/01
Deborah Christensen	9/8/01
James Roza	9/24/01
Mark Blackwell Antec International	9/27/01
Tony Woods Saratoga Llamas	10/9/01
John B. Adams National Milk Producers Federation	10/9/01
Karen Conyngham	10/9/01
Gordon Brown International Dairy Foods Association	10/9/01
Patricia Lovera Global Safe Food Alliance	10/9/01
Dan Wyant Michigan Department of Agriculture	10/9/01
Gary Weber	10/9/01

National Cattlemen's Beef Association

Cary G. Peterson 10/9/01
Utah Department of Agriculture and Food

Wendy Swann 10/9/01
Animal Welfare Institute

Patrick A. Takasugi 10/9/01
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Comments Received Late

Francis Auchincloss 10/10/01
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Martin W. Holmes 10/10/01
North American Meat Processors Association
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Bruce Alberts 10/11/01
The National Academy of Sciences
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Bob Odom 10/11/01
Agriculture and Forestry
Baton Rouge, LA

Laurie Girand 10/11/01
STOP–Safe Tables Our Priority
Burlington, VT

C. Wayne McIlwraith 10/12/01
American Association of Equine Practitioners
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Matt Cartter 10/16/01
Council of State and Territorial Epidemiologists
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Florida Department of Agriculture and Consumer Services
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John W. Breitsman 10/16/01
Association of American Feed Control Officials, Inc.

Frank C. Greene 10/16/01
National Science Foundation
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Fred L. Dailey 10/16/01
Ohio Department of Agriculture
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Kendell W. Keith and Duane H. Ekedahl 10/16/01
National Grain and Feed Association and Pet Food Institute

Richard W. Newpher 10/17/01
American Farm Bureau Federation
Park Ridge, IL

Public Hearing Comments 9/28/01

Beth Lautner, National Pork Board

Ross Hamilton, Darling International, Inc.

Steve Roach, Food Animal Concerns Trust

Robin Wiley, Timberline Foundation

Karen Egbert, Center for Science in the Public Interest

Dean Goeldner, American Veterinary Medical Association

Leah Becker, National Pork Producers Council

Jim Hodges, American Meat Institute

Secretary of Agriculture's Advisory Committee on Foreign Animal and Poultry Diseases (2000)

Gus R. Douglass, State of West Virginia (Advisory Committee Chair)
Elizabeth Lautner, National Pork Producers Council (Advisory Committee Vice Chair)
John B. Adams, National Milk Producers Federation
Terry Beals, Texas Animal Health Commission
G. Marvin Beeman, Littleton Large Animal Clinic
Richard E. Breitmeyer, California Department of Food and Agriculture
Corrie C. Brown, University of Georgia
A. Konrad Eugster, Diagnostic Laboratory Services
Newton Foster, U.S. Army Center for Health Promotion and Preventive Medicine
Don Franco, National Renderers Association
G. Thomas Holder, Allen's Hatchery, Inc.
Donald Janssen, San Diego Zoo
James T. King, Concrete Masonry Services
Glenn Olsen, U.S.G.S Patuxent Wildlife Research Center
Ray Powell, State of New Mexico
Morton Silberman, Emory University
Glen Slack, National Institute of Animal Agriculture
Tim Turner, Southwestern Livestock Mineral Company
Lyle Vogel, American Veterinary Medical Association
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Animal Health Safeguarding Review Panel (2001)

Chair Gus R. Douglass, Commissioner, West Virginia Department of Agriculture
Vice Chair Lester Spell, Commissioner, Mississippi Department of Agriculture & Commerce
Richard Breitmeyer, Director, Animal Health & Food Safety Services, California Dept. of Food & Agriculture
Sharon Hietala, Professor of Clinical Immunology, California Animal Health & Food Safety Laboratory System, University of California
Bob Hillman, State Veterinarian, Idaho Department of Agriculture
Beth Lautner, Vice President, Science and Technology, National Pork Board
Donald Lein, Director of Diagnostics Laboratory, College of Veterinary Medicine, Cornell University
Martha Roberts, Commissioner, Florida Department of Agriculture & Consumer Services
Paul Rodgers, Director of Animal Health, Product Safety & Tech. Assistance, American Sheep Industry Assoc.
Richard Ross, Dean, College of Agriculture, Iowa State University
Bruce Stewart-Brown, Director of Health Services, Perdue Farms, Inc.
Peter Timoney, Director, Maxwell H. Gluck Equine Research Center, Dept. of Veterinary Science, University of Kentucky
Gary Weber, Executive Director, Regulatory Affairs, National Cattlemen's Beef Association
Sherman Wilhelm, Director, Division of Aquaculture, Florida Dept. of Agriculture & Consumer Services

Appendix 4.
Executive Summary, "Evaluation of the Potential for BSE in the United States"

November 26, 2001

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Harvard University School of Public Health
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In 1998 the United States Department of Agriculture asked the Harvard Center for Risk Analysis to evaluate the robustness of U.S. measures to prevent the spread of bovine spongiform encephalopathy (BSE or "mad cow disease") to animals and humans if it were to arise in this country. BSE is a member of a family of diseases that includes scrapie in sheep and goats, chronic wasting disease in certain North American deer and elk, transmissible mink encephalopathy, and the human ailments Creutzfeldt-Jakob disease, variant Creutzfeldt-Jakob disease and Kuru.

We have developed a probabilistic simulation model to help characterize the consequences of introducing BSE into the U.S. *via* various means. Our model allows us to predict, for example, the number of newly infected animals that would result from introduction of BSE, the time course of the disease following its introduction, and the potential for human exposure to infectious tissues. We evaluate key processes and procedures that make the spread of disease more or less likely. Results are presented as distributions reflecting the probabilistic nature of the model and the processes simulated.

Our analysis finds that the U.S. is highly resistant to any introduction of BSE or a similar disease. BSE is extremely unlikely to become established in the U.S. For example, in a hypothetical scenario in which ten cattle infected with BSE are imported into the U.S., on average only three new cases of BSE would occur. Moreover, the disease is virtually certain to be eliminated from the country within 20 years after its introduction. These results assume that the conditions affecting the spread of BSE in the U.S. would remain unchanged for the 20 years following its introduction. The new cases of BSE would come primarily from lack of compliance with the regulations enacted to protect animal feed. The import of one sick animal yields on average less than one new BSE case in 20 years and the disease and the disease is likely to be quickly eliminated from the U.S. following its introduction. Similarly, there appears to be no potential for an epidemic of BSE resulting from scrapie, chronic wasting disease, or other cross species transmission of similar diseases found in the U.S. Even if they existed, these hypothetical sources of BSE could give rise to only one to two cases per year. Similarly, if the disease does

indeed occur spontaneously in cattle, as some have suggested, it would result in one to two cases per year with little spread.

Only a small amount of potentially dangerous tissues would reach the human food supply and be available for possible human consumption. We express the amount of infectivity in terms of cattle oral ID50s for the purpose of quantifying both animal and human exposure to this agent. A cattle oral ID50 is the amount of infectious tissue that would, on average, cause 50% of exposed cattle to develop BSE. The relationship between human exposure quantified in terms of cattle oral ID50s and likelihood of human disease is unknown, but European authorities suggest that the cattle disease may be 10 to 100,000 times less virulent in humans (SSC, 1999, SSC, 2000a). In the entire 20 year period following the import of ten BSE-infected cattle, the mean estimate for the amount of infectivity potentially available for human exposure is 35 cattle oral ID50s. The greatest sources of infectivity include consumption of cattle brain, spinal cord, and meat derived from advanced meat recovery systems. Some potential exposure would result from the presence of spinal cord in certain bone-in cuts of beef, like T-bone steaks, and consumption of cattle intestines. Potential human exposure resulting from spontaneous disease or cross-species transmission of scrapie are predicted to be less than 100 cattle oral ID50s over 20 years.

Even in an extreme case, which we characterize using the 95th percentile of the output distribution from the simulation, the import of ten animals leads to only 11 new cases of BSE over twenty years. The 95th percentile value for potential human exposure is 170 cattle oral ID50s over 20 years, approximately five times the mean value. These predictions can be compared with the experience in the United Kingdom, where it is estimated that there were nearly one million infected animals and it is likely millions of cattle oral ID50s available for potential human exposure.

Measures in the U.S. that are most effective at reducing the spread of BSE include the ban on the import of live ruminants and ruminant meat and bone meal from the UK (since 1989) and all of Europe (since 1997) by USDA/APHIS, and the feed ban instituted by the Food and Drug Administration in 1997 to prevent recycling of potentially infectious cattle tissues. This feed ban greatly reduces the chance that BSE will spread from a sick animal back to other cattle through feed. Our model reflects incomplete compliance with the FDA feed ban and we evaluate the potential risks of exceptions to the ban. Measures instituted in meat packing plants by the industry and USDA/FSIS have reduced the opportunity for infectious tissues to contaminate human food.

Specific pathways or practices that would contribute the most to the spread of BSE if it were introduced into the U.S. relate to compliance with the FDA feed ban and include misfeeding on the farm and the mislabeling of feed and feed products prohibited for consumption by cattle. The disposition of cattle that die on the farm would also have a substantial influence on the spread of BSE if this disease were introduced into the U.S. Factors that influence potential human exposure include the handling of brain and spinal cord in processing plants and how well inspectors would detect animals with BSE at slaughter.

Our model is not amenable to formal validation because there are no controlled experiments in which the introduction and consequences of BSE introduction to a country has been monitored

and measured. However, as a test of the model's plausibility, we modeled the small BSE outbreak identified in Switzerland following the introduction of BSE infectivity from the UK. Working with experts in Switzerland, we identified appropriate values for model parameters necessary to appropriately characterize that country's practices and procedures and then simulated the introduction of BSE infectivity. Our simulation took into account risk management actions, such as feed bans instituted by the Swiss. The model's predictions were reasonably close to empirical observations. For example, the model predicted that during the Swiss outbreak, there would be 170 animals that developed clinical signs of disease. To date, the Swiss have detected 398 animals with BSE. The time course of the outbreak predicted by the model also reasonably resembled the pattern observed in Switzerland. The ability of the model to reasonably replicate the magnitude and time course of the Swiss outbreak gives some confidence in the structure of our model, especially in light of the many unknown factors associated with this episode.

We also evaluated the potential for BSE to have entered the U.S. prior to the 1989 ban on the import of UK cattle. BSE has not been detected in the U.S. despite 12 years of active surveillance of high-risk animals. Yet several groups, including the European Union in their Geographically Based Risk Assessment of the U.S. (SSC, 2000b), have highlighted the 334 animals brought into the U.S. from the UK between 1980 and 1989. These animals were imported as breeding stock, not as beef or dairy production animals. This fact is likely to have reduced their potential for exposure to BSE before their export from the UK. In addition, none of these animals came from a farm on which there was a case of BSE in animals from the same birth cohort (same birth farm and year). Many came into the U.S. before BSE was even a recognized disease (the first case was confirmed in the UK in 1986). The USDA has identified and traced the disposition of these animals and has verified that 161 were disposed of in a manner that poses no risk to humans or other animals. However, the Department has not been able to conclusively make this determination for the remaining 173 animals. Using data identifying the year of birth, the year of import, the date of the animal's last known sighting, and information characterizing the time course of the disease following infection, we have estimated the theoretical amount of BSE infectivity that could have theoretically been introduced into the U.S. from these 173 animals. We then used this estimate in our model to predict the possible consequences in the U.S.

Our analysis concludes that there is more than an 80% chance that the import of these animals resulted in no exposure of U.S. cattle to BSE infectivity. Even if U.S. animals were exposed to BSE, there is a significant chance that the exposure resulted in no new cases of disease. Our analysis indicates that there is only a small chance that BSE spread to U.S. cattle but that the number of cases was sufficiently small to avoid detection by U.S. government surveillance. The analysis also shows that if these imports did introduce BSE into the U.S., measures taken by the government and industry during the last five years will have arrested the disease and begun to eradicate it.

Our evaluation of potential risk mitigation actions highlights potential measures to further reduce the already low likelihood that BSE could spread to cattle or contaminate human food if it were to arise. Prohibiting the rendering of animals that die on the farm, possibly of BSE, removes a great deal of potential contamination in the animal feed chain and reduces average predicted cases of BSE following introduction of ten infected cattle by 77%. Implementation of a UK-style ban on specified risk material (*e.g.*, spinal cords, brains, vertebral columns) from both

human food and animal feed reduces the predicted number of BSE cases in cattle by 80% and the potential human exposure by 95%. These measures serve as examples of the types of evaluations of alternative risk management strategies that can be conducted using the model.

In summary, measures taken by the U.S. government and industry make the U.S. robust against the spread of BSE to animals or humans should it be introduced into this country. Preventing sick animals or contaminated feed from entering the country, ensuring compliance with the FDA feed ban, and reducing the potential for infectious tissues to enter the animal or human food supply will ensure that these risks remain low. If BSE has been introduced into the U.S., as has been suggested by some observers, the course of the disease has been arrested and it is destined for eradication by the measures currently in place.

Appendix 5. Useful Website References

Animal Health Safeguard Rev.	http://www.nasda.org/ASGRwebsite/ExecutiveSummaryWEB.pdf
APHIS	http://www.aphis.usda.gov/
APHIS BSE	http://www.aphis.usda.gov/oa/bse/
APHIS CWD	http://www.aphis.usda.gov/oa/pubs/fscwd.html
APHIS scrapie	http://www.aphis.usda.gov/oa/pubs/fsscrapie.html
APHIS FMD	http://www.aphis.usda.gov/oa/fmd/index.html
APHIS-NVSL	http://www.aphis.usda.gov/vs/nvsl/
ARS	http://www.ars.usda.gov/
ARS National Programs	http://www.nps.ars.usda.gov
ARS -NADC	http://www.nadc.ars.usda.gov/
ARS-PIADC	http://www.ars.usda.gov/plum/
ARS Pullman	http://pwa.ars.usda.gov/pullman/adru/web2.htm
CDC	http://www.cdc.gov
CDC - BSL	http://www.cdc.gov/od/ohs/biosfty/biosfty.htm
Customs Service	http://www.customs.gov
FDA	http://www.fda.gov/
FDA BSE	http://www.fda.gov/oc/opacom/hottopics/bse.html
Harvard Risk Assessment	http://www.aphis.usda.gov/oa/bse/mainreporttext.pdf
NAHEMS	http://www.usaha.org/NAHEMS/
OIE	http://www.oie.int/eng/OIE/en_oie.htm
PAHO	http://www.paho.org
U.K. BSE (DEFRA)	http://www.defra.uk/bse/index.html
U.S. Animal Health Assoc.	http://www.usaha.org

Appendix 6.

The Economic Consequences of Bovine Spongiform Encephalopathy and Foot-and-Mouth Disease Outbreaks in the United States

USDA Economic Research Service
Kenneth H. Mathews, Jr.
Janet Perry

Introduction

Recent outbreaks of foot-and-mouth disease (FMD) and bovine spongiform encephalopathy (BSE) have had a substantial impact on many segments of European economies especially the United Kingdom (U.K.)[1], and have left almost no country in Europe unaffected. This appendix describes economic effects of U.K. experiences with outbreaks of FMD and BSE and the economic effects that might be expected if either disease were to occur in the United States.

The United Kingdom was chosen for this comparison because the United Kingdom is the best example of a major occurrence of BSE, the recent FMD outbreak in that country was an extensive outbreak that occurred in a previously FMD-free livestock population. Although the comparison is useful for this analysis, it is important to note at the outset that there are several important differences between the U.K. situation and that found in the United States. The last outbreak of FMD in the United States was in 1929. There has never been a case of BSE here. Further, the Harvard Center for Risk Analysis concluded that BSE in the United States is extremely unlikely either to occur or to follow the extensive pattern of spread experienced in the United Kingdom. Nevertheless, the economic consequences from even one confirmed case of BSE in the United States could easily exceed the costs incurred, thus far, in the United Kingdom because the U.S. population is five times the U.K. population, the U.S. beef sector is ten times the size of the U.K. beef sector, and U.S. beef exports are much greater than pre-BSE beef exports from the United Kingdom. However, impacts in various U.S. sectors could be different from impacts in the corresponding U.K. sectors because of differences between various sectors in each country.

The overlapping occurrence of both BSE and FMD in the United Kingdom since February 2001 generated some confusion about these diseases and their relationship with one another. This confusion likely had some effect on consumer responses at retail meat counters. Although these diseases are epidemiologically separate and distinct, some of the economic ramifications are similar, and were confounded in the United Kingdom. Along with the livestock sectors in the United Kingdom, many non-agricultural sectors were affected by changes in prices, food safety concerns, availability of many goods, human and animal movement, and costs of production.

The economic analysis in this appendix examines U.S. sectors that could be affected. No attempt has been made to estimate any expected costs based on probabilities of the diseases occurring. Economic losses are divided into four categories: direct effects of a disease on the production system, indirect

[1] The United Kingdom consists of Great Britain (England, Scotland, and Wales), Northern Ireland, Isle of Man, Jersey, and Guernsey.

and induced effects on the entire economy, losses caused by trade restrictions, and expenditures of resources used as consequences of a disease outbreak. The size of selected U.S. sectors, potential effects from outbreaks on these sectors, and linkages between sectors are also described. The economic effect of each disease is treated separately.

Foot and Mouth Disease

When FMD was confirmed in the United Kingdom in February 2001, control measures for this disease were instituted. (These were different than previously existing control measures for BSE, and thus were added on top of the existing BSE measures.) In addition, due primarily to the movement restrictions established because of the highly contagious nature of FMD, these measures affected not only the agricultural sector, but tourism and other sectors as well.

The United States has not had a case of FMD since the 1929 outbreak in California. However, the potential for a FMD outbreak in the United States is currently perceived to be more likely than usual since February 2001, because of the recent outbreaks in the United Kingdom, Argentina, and other countries that are U.S. trading partners. Economic impacts from other similarly highly contagious animal diseases would be similar to those described here for FMD and would depend on the species affected, their distributions, and the epidemiologies of the diseases.

I. Direct impact on livestock productivity

FMD poses the most immediate threat to the U.S. livestock industry because it is highly contagious. The response to an FMD outbreak, and other similarly contagious animal diseases, would be focused on at-risk livestock and containment of human and animal movement from infected to uninfected areas (Map 2 in the main body of the report and Figure 1). Infected herds would be depopulated and indemnities paid. Since indemnity payments would be based on the value of livestock, Figure 2 gives an indication by county of relative magnitudes of potential indemnities. With FMD, any livestock operations with infected animals would be focal points of quarantines.

Productivity losses of 10 to 20 percent are reported in FMD-infected livestock (McCauley et al.) if the disease is allowed to run its course. Losses of this magnitude are too large to be acceptable to an industry with the narrow profit margins[2] encountered in U.S. livestock agriculture. Because slaughter policies would be used to minimize the spread of FMD and because products from infected animals are not allowed into the food chain, production from infected or quarantined herds would be zero immediately upon confirmation of the disease. Economic impacts on production would also depend on the extent of the quarantine areas. In the case of FMD, the quarantine area could be those herds within a several-mile radius.

[2] Average rates of return on equity for commercial (sales over $250,000, non-family corporations and cooperatives, and farms operated by hired managers) and intermediate-sized (farms with sales under $250,000 where operators report farming as their major occupation) beef, hog, and dairy operations range from negative six percent (intermediate hog operations) to positive eight percent (commercial hog operations) for 1996 through 2000.

Costs to producers go well beyond the immediate loss of livestock slaughtered to control FMD. Many producers would not be able to readily replace the many years of work that went into building their breeding herds. With FMD, premises have to be cleaned and disinfected after livestock are destroyed. In addition, there would be no income during a 30-day waiting period, as recommended in the USDA's FMD emergency guidelines ("Red Books" currently under revision), before restocking could begin, and only reduced income during the rebuilding phase. Restocking could become drawn out if remaining livestock sources were depleted and replacement livestock became more difficult to locate and purchase. Prices would likely increase for this remaining source stock. Inability to absorb additional fixed costs of rebuilding and a reduced cash flow could cause some producers to exit the industry.

Current estimates of U.S. livestock inventories are 97 million cattle and calves (USDA, NASS, *Cattle*, February 2002), 7 million sheep (USDA, NASS, *Sheep*, July 2001), and 59 million hogs and pigs (USDA, NASS, *Hogs and Pigs*, December 2001), all of which are potentially susceptible to an FMD outbreak in the United States (Map 2 in body of report and Figure 1). The rate of spread of a FMD outbreak in the United States would depend on the location of the epicenter(s) of the outbreak(s) and the extent of livestock and human movement out of the infected area(s). Spread would be most rapid in areas densely populated with susceptible livestock, where there is considerable livestock movement between operations, or in locations or areas of more intensive agri-tourism. In their 1979 report, McCauley et al. stated:

> "[I]f FMD were introduced into the United States and a stamp-out strategy failed within a reasonable time, we could expect an initial explosive period unquantifiable except by expert opinion. This period will be assumed to last for approximately 1 year and according to expert opinion, could affect 30 to 70 percent of the livestock in the United States within that period. The next 14 years could follow one of two patterns based on the way vaccine is applied [voluntary vaccination program versus compulsory vaccination program]."

FMD is not usually fatal to livestock, except young or frail animals, but does cause production to decline in infected animals—a moot point as infected animals are normally destroyed in disease-control efforts, which immediately reduces production to zero. Depopulation can be, and is in most cases, extended to uninfected livestock within a quarantine area. In such a case, depopulation would also reduce production from other livestock within the quarantine area to zero.

Over four million animals in the United Kingdom were slaughtered to contain the 2001 FMD outbreak, affecting more than 9,000 farms (DEFRA). These numbers account for roughly 8 percent of cattle, swine, and sheep inventories, and 8 percent of farms there. Similar percentages of livestock in the United States would represent 8 million cattle, 4.6 million hogs, and 640,000 sheep and goats. Cattle and calf inventories in the United Kingdom are about 12 percent of U.S. cattle and calf inventories. U.K. hog inventories are also about 12 percent of U.S. inventories. On the other hand, U.K. sheep inventories are over 4 times U.S. sheep numbers, and 80 percent of the animals slaughtered or marked for slaughter in the 2001 U.K. outbreak were sheep. (Numbers of goats, deer, and other animals slaughtered because of FMD are reported by the United Kingdom, but inventory numbers on which to base percentages are not available.)

II. Upstream (input sector) and downstream (marketing sector) effects

The recent FMD outbreak in the United Kingdom and its European Union (E.U.) neighbors initially significantly affected agriculture, food consumption, trade, and tourism. However, the effects have not been as large or as long-lasting as expected. U.K. and E.U. member authorities managed to contain the FMD epidemic, and minimize its spread to continental Europe. There were initial reports of declines in beef consumption in some E.U. countries because of some consumer confusion of FMD with BSE. However, beef consumption in most countries has rebounded to near pre-2000/01 trends according to the European Commission. On individual farms in the United Kingdom, livestock production and farm incomes were severely affected by the crisis, but livestock productivity for the European Union as a whole has hardly been impacted. As for trade, the United States and other countries lifted FMD-motivated bans on exports from most E.U. members. However, because of BSE, a ban on ruminants and ruminant products was in place for many months before the FMD outbreak, and this trade restriction remains in place for the United Kingdom and the European Union.

In addition, in the United Kingdom animal welfare issues were raised because animals in the FMD quarantine areas were not allowed to be moved. Costs can quickly mount for supplying feed and waste disposal for animals that will have no productive use and cannot be moved, and many U.K. facilities did not have the capacity to humanely care for large numbers of animals in transit to farms, feedlots, or slaughter facilities. In addition, ill animals, as well as those herdmates slated for destruction, had to be cared for while awaiting slaughter.

If FMD were to occur in the United States, upstream sectors that provide inputs for the livestock production sectors (for example, the feed industry) would be affected, and downstream effects would be felt in many unrelated industries (for example, the tourism industry) using products derived from cloven-hoofed animals (Figures 3 and 4). Demand for livestock feeds could decline, thus affecting the feedstuffs and processing sectors, and possibly affecting demand for grains. In the case of a FMD outbreak, affected downstream sectors would likely include transportation, labor, food establishments, hotels and accommodations, tourism and recreation sectors and their supporting sectors (Figure 3 and Tables II.1 and II.2).

Price Waterhouse Coopers estimated that economic impacts of the current FMD outbreak in the United Kingdom will total £2.5 to £8 billion (US$3.6 to $11.6 billion) or 0.3 to 0.8 percent of that country's gross domestic product (The Economist, 2001). Some portions of those costs are the effects of BSE confounded with FMD effects on consumption of meat there, and these are difficult to separate. Because of supply and trade impacts, the U.K. outbreak also affected meat consumption in the rest of Europe. Converted to U.S. dollars, the economic impact in the United Kingdom equates to $1,389 to $4,477 per head for the approximately 2.6 million head on which indemnities were, or were expected to be, paid.

Two assessments of potential economic impacts for a U.S. outbreak (McCauley *et al.* in 1979; Ekboir, 2001) significantly differed from the U.K. impacts. The economic impacts for the U.K. outbreak are 17 to 54 percent of Ekboir's estimates for a 3.6 million-head outbreak in California, which were roughly $8,278 on a per head basis. Indexing McCauley's 1979 cost estimates in 1976 dollars, for a 270,550-head outbreak in the upper Midwest, to year 2000 dollars yields an estimate of $752 per head. The McCauley estimates are lower than Ekboir's estimates in part because they include only

costs associated directly with the livestock aspects of an outbreak, and do not include effects on other sectors of the national economy or trade effects. Differences in technologies associated with intervention responses between the 2001 U.K. experience and the 1979 U.S. estimates (McCauley *et al.*) could also account for differences in dollar amounts. The difference between the U.K. impact amount and Ekboir's estimate of U.S. impact is due in large part to substantially different quantities of livestock products exported by each country.

Food safety and supplies

The FMD virus rarely infects humans. The approximately 40 documented cases of human FMD, historically and worldwide, have been attributed to ingesting infected milk, airborne contact, and direct contact with infected animals (USDA, 1994). Meat from FMD-infected livestock does not pose food safety risks to most humans.

During an FMD outbreak there will likely be a reduction in total supplies of livestock products. The depopulation procedures in the quarantine areas reduce supplies. U.S. regulations place restrictions on the slaughter of animals infected with FMD (as well as many other diseases). At the same time quarantines are put into place because infected products that are chilled, frozen, or insufficiently processed could spread FMD to other susceptible livestock. Because sufficient heat and reduced pH common to some processing procedures will destroy the FMD virus, properly heated and processed meat from *uninfected* animals and milk that has been heated to 145°F for at least 30 minutes (or that has been processed into cheese or sour cream) can be moved out of the quarantine area (USDA, 1994). However, the quarantine restrictions limit such processing to facilities that are located within the quarantine area. In reality, and despite the fact that processing facilities are often located near concentrated livestock facilities, it is not likely that processing facilities, often large and relatively few in number, would be within each quarantine area. The overall result is fewer livestock products available for consumption.

The U.S. beef industry, which is ten times the size of the U.K. beef industry, is heavily dependent on exports. (Swine, sheep, goats, and other cloven-hoofed mammal sectors are not as dependent on exports as the beef industry.) The suspension of imports of U.S. beef by other countries would cause domestic meat supplies to increase for as long as the infected and related livestock slaughter was less than quantities of beef remaining on the domestic market because of import bans imposed by other countries. Retail beef prices could be reduced by an estimated 1.189 percent for every 1 percent increase in domestic supplies (Eales and Unnevehr, 1993). Meat and products from other livestock species would be affected also. Impacts of import bans, therefore, would be extensive for the period of a FMD outbreak and post-surveillance period. Retail beef prices would decline, but, in addition, so would prices for other cloven-hoofed livestock products. Retail pork prices would decline by an estimated 0.88 percent for every 1-percent increase in domestic supplies (Eales and Unnevehr, 1993). While few studies of the U.S. meat demand system estimate elasticities for sheep, lamb, or goat products, one could expect similar price responses for products from these species. Increased supply effects would be moderated to the extent that slaughter associated with quarantines reduced domestic supply. Some beef products could remain on the domestic market if the beef were from non-FMD infected animals. Substitution effects in the form of increased demand for and prices of other non-

beef meat products from other livestock species would also occur. These substitutions could increase prices for those meats.

If the FMD outbreak were large and/or long enough in duration, slaughter of livestock could cause meat supply to decline as meat slated for export was retained because of other country import bans. If demand remained the same or declined only slightly, prices could then increase as domestic supplies declined.

Slaughter, rendering, and byproduct industries

A FMD outbreak would affect the slaughtering, processing, packing, rendering, and byproduct industries through changes in supplies of their primary livestock inputs, because of disease-related slaughter and disposition requirements. If animal movement were restricted because of a FMD outbreak, movement of animals to packing houses would be reduced, packing house labor would be idled, as would be movement from packing house to retail meat outlets, rendering facilities, and related sectors. Thousands of workers could potentially be idled (Tables II.1.a and II.1.b).

Normally in the absence of disease, livestock are slaughtered and then turned into meat and other products. Estimates from the 1997 census indicate the numbers of people who could be directly affected and total dollar amounts at risk in each sector. The animal slaughtering industry employed 142,374 people in 1997. Value added by manufacture was $8.5 billion. Cost of materials for this industry was $46 billion, and total capital expenditures were $537 million. Value of shipments for the animal slaughtering industry was $54.5 billion (U.S. Department of Commerce, 2001a). In 1997, the industry categorized as "meat processed from carcasses", which does not include poultry, consisted of 1,164 companies employing 87,966 people, with value added by manufacture of $9.136 billion. Cost of materials for this sector was $15.846 billion, and capital expenditures were just over $527 million (U.S. Department of Commerce, 1999).

Animal byproduct and rendering industries take non meat byproducts produced during slaughter (portions of the cattle, pigs, sheep, poultry, and fish) and processes them into the starting materials for many useful products. The size of the byproduct and rendering industries is dependent on the number, size, and composition of animals slaughtered. For example, a steer that weighs 1,000 pounds will produce 420 pounds of retail cuts, 110 pounds of edible fat, 38 pounds of variety meats, 80 pounds of hide, 40 pounds of blood, 175 pounds of inedible fats, and 140 pounds of liquids and shrinkage (Texas A&M). Regardless of quantity, byproducts and rendered products from the slaughter process must be sold at whatever price will clear the market or the industry (and the environment) incurs a cost for disposal.

U.S. renderers produced 18 billion pounds (over 8 million metric tons) of rendered products in 2000, down 4 percent from 1999 (Render, 2001). As of 1997, there were 137 rendering companies operating 240 establishments. Most of these establishments have fewer than 100 employees. The U.S. rendering industry had a payroll of $270 million and almost 10,000 employees (U.S. Department of Commerce 2001b). Texas and California have the greatest number of establishments (and employees) at 20 each, followed by Nebraska and Minnesota (U.S. Department of Commerce, 2001b). In 2000, U.S. exports totaled 1,820,962 metric tons of rendered products (Render, 2001).

The rendering process produces a protein fraction--meat and bone meal (MBM--see discussion about impacts of BSE below), bone meal, poultry meal, and some others–-and a fat fraction--tallow, lard and yellow grease, among others. Rendered products may be manufactured into soaps, pet and livestock feed, fertilizers, lubricants, and other industrial products. Tallow and lard were used historically in cooking and the cosmetic industry, but have been mostly replaced by vegetable oils. Fats are the highest caloric-dense foodstuffs and today animal fats are use as feed ingredients. Foreign markets use a large portion of rendered products, lard and tallow in particular.

Transportation

Transportation of all types could be disrupted from a FMD outbreak to prevent spread of the virus. If transportation were halted in a quarantine area, goods and services could become locally scarce, and the transportation industry could lose employment and income for the shutdown period. The magnitude of transportation losses would depend on the severity of the FMD outbreak and on how quickly it could be controlled. Tables II.2.a and II.2.b show the size of various transportation sectors.

In the United States, heavy concentrations of livestock are located in the Midwest, Central and Southern Plains, and in North Carolina (Map 2 (Body of Report)). Livestock production in the United States often involves significant movement of livestock from one area to another. Approximately one to three million feeder pigs are transported annually from North Carolina to other areas outside North Carolina, primarily in the MidWest (Zering, personal communication, 2001). Another four million market hogs are shipped to slaughter facilities outside North Carolina, mainly in Virginia and some in Pennsylvania (Zering, personal communication, 2001). Cattle movements are generally from dispersed bases to concentrated markets, often again to dispersed interim operations, and then concentrated again in feedlots. Cattle are raised on farms dispersed throughout the country. About 80 percent of cattle move more than 200 miles from these generally dispersed cow/calf operations to primary feeder cattle markets and cattle feeding areas in the Central and Southern Plains (Von Bailey, Brorsen, and Thomsen, 1995, p. 316). Calves too small to place in feedlots often move from the cattle markets to stocker operations (farms, ranches, or backgrounding lots that grow weaned calves to feedlot size) and then are again gathered, moved, and finished in feedlots. Generally, slaughter facilities are located near finishing operations for all livestock species. Mobile slaughter facilities process some wildlife species and bison, which are also at risk for FMD and could mechanically spread the disease if moved from an infected herd to a susceptible herd.

In addition to transportation being curtailed, livestock that would have been scheduled to move out of a quarantine area to the next phase in growth or processing—that is, to hog finishing facilities, cattle feedlots, and other intermediate facilities—would not be allowed to move. These animals would incur additional feed and other costs until they were disposed of or allowed to move again. Transporting feed to quarantined animals and disposing of manure waste materials at temporary facilities would compound the situation.

Tourism and recreation

In the recent U.K. outbreak, losses to tourism due to the FMD outbreak were $4.8 billion and exceeded losses to the livestock sector (Associated Press (10/24/02) and Reuters (1/15/02 and

3/22/02)). Many tourist activities were restricted, especially in quarantined areas. However, many tourist restrictions were lifted even before trade restrictions were lifted.

Similarly, if there were a FMD outbreak in the United States, many activities not directly related to agriculture could be disrupted by restricted movement of both animals and humans to limit the mechanical spread of the virus. Some of these activities constitute large sectors of the national and regional economies, such as tourism and recreation, and losses to these industries could exceed losses to livestock sectors. Input-output multipliers for tourism, recreation, and related sectors indicate that for every dollar lost in these sectors, local/regional impacts would be reduced by more than a dollar. However, in many cases, restrictions would be local, and tourist and recreation activities prohibited in one area might be transferred to other areas. Thus, one area's lost tourist and recreation dollars would become another area's boom.

In the United Kingdom, walking and hiking through agricultural countrysides (agri-tourism) is a popular pastime, and there are numerous walking paths through pastures and farms. This type of activity is not common in the United States, in part because private property rights prevent free access to private land. However, other forms of agri-tourism are becoming increasingly popular. For example, visits to farms to self- harvest various fruit and vegetable crops is part of a $1.1 billion dollar (1997) direct-marketing industry in the United States (Lucier, Personal communication, September, 2001). The Amish farms in Lancaster County, Pennsylvania, are popular tourist destinations. Dude ranches in the United States are also popular, and constitute an estimated $206-$240 million dollar industry. Many agricultural operations derive significant shares of their annual receipts from leasing hunting and fishing rights and privileges. Some operations derive as much as a third of their receipts from guided hunting and wildlife-related activities (Baquet and Smith, 1989).

III. International trade effects of an outbreak of FMD in the United States (e.g., impact of restrictions on movement of animals and animal products)

FMD can and has occurred in almost every country of the world, but is endemic in most countries. Currently, North America, Central America, parts of South America, Japan, some other Asian countries, some European countries, Madagascar, Australia, and New Zealand are FMD free. Trade status of trading partners, including that of the United States, is threatened by FMD. International standards, as laid down by the Office of International Epizootics (OIE), include guidelines for regaining recognition of FMD-free status. The time frame for this recognition, which would be necessary prior to the resumption of trade, varies depending on the control measures applied in an outbreak. For example, the guidelines state that a country that previously was recognized as free may regain that status 3 months after the last case, if a stamping-out policy was applied; or 3 months after the last vaccinated animal was slaughtered, if vaccination and a stamping-out policy were applied. An ongoing vaccination program lengthens the period required to regain trade status.

In the United States, exports of cattle, sheep, hogs, poultry, and many of their products varies annually from about $6 to $10 billion, or roughly ten percent of the value of cash receipts for those livestock species at the farm level. In 2001, U.S. exports consisted of $0.7 billion in live animals, $5.2 billion in meat products (excluding poultry), including $1.8 billion in hides, and $0.3 billion in rendered products (*Agricultural Outlook*, 2002).

Economic impacts depend on the magnitude of slaughter and the responses of trading partners. If FMD were discovered in the United States, one economic response could be reduced import demand by third countries for cloven-hoofed animals and their products from the United States. Exports of live animals, fresh meat products, dairy products, and other animal byproducts of susceptible species from the United States would likely be sharply reduced, and completely banned by some countries, if a FMD outbreak were to occur in the United States. Some products from uninfected animals could be processed and repackaged, replacing fresh meat products, and again be eligible for export. The United States exports a variety of products, not all of which are popular here. While FMD does not cause disease in some of these species and products, restrictions on movements out of quarantine areas could be imposed, and some of these products might not find a domestic marketplace, causing prices for those products to decline significantly.

IV. Costs of Government intervention

If an outbreak of FMD were to occur in the United States, the Federal government and States, and thus taxpayers, would bear the brunt of costs associated with containing the disease. Costs incurred with an outbreak would include increased surveillance costs, costs of tests and confirmation, costs of livestock depopulation and disposal, and costs associated with any vaccination intervention (Table IV.1). Government costs would include most of the costs of diagnosing and confirming FMD, depopulating, disposing of infected and quarantined livestock, and paying indemnities to affected livestock producers (Table IV.1).

If an outbreak were to occur, producers would likely be paid an indemnity for condemned livestock. Figure 2 is helpful because it shows the distribution of the value of cloven-hoofed animals and, therefore, gives some indication of the location and relative magnitude of indemnity effects for a FMD outbreak. An outbreak would likely affect only a portion of the United States, probably not the entire country. Current indemnity processes are set up to pay producers a fair market value for their livestock based on an assessment by an appraiser. Alternative valuation procedures have been proposed, but, as yet, no procedures or schedules have been adopted. Producers would not be paid for lost future production under current indemnity plans. Further, no indemnities for losses in affected industries beyond the farm gate are established.

In some cases, it is difficult to separate budget costs for FMD from costs for other diseases. Ongoing budgeted costs for FMD and BSE are just over $22 million (Table IV.1). Costs to prevent the introduction of these and other diseases into the United States (exclusion) are a significant share of government costs and would remain in place or increase if an outbreak were to occur. Some budget items have already been increased because of perceived increases in the threat of introduction of foreign animal diseases. For example, announced budgets for the Agriculture Quarantine Inspection Program (AQI) are $278 million for FY 2001 and $296 million for FY2002. Additional funds have also been allocated for stepped-up emergency measures such as increased decontamination and inspection procedures at international ports of entry. Costs for testing and confirming diseases are listed in Table IV-1. If a FMD outbreak were to occur, individual producers would not likely be charged for testing and confirming the disease.

Animals confirmed with FMD, must be disposed of within 24 hours. Animals within a quarantine area must be disposed of within 48 hours, and for both infected and quarantined animals, burial or burning takes place on the affected operation. Costs associated with these efforts are large, and logistics cumbersome because of the precautions necessary to prevent mechanically spreading FMD via personnel or equipment.

Two studies have estimated costs for an FMD outbreak in the United States. Indemnity payments from the McCauley et al. study amount to $61.5 million (year 2000 dollars) for a 2.6 million-head FMD outbreak. Ekboir estimated costs, based on December 1997 prices, of depopulating, and disposing of quarantined livestock and cleaning and disinfecting facilities at between $0.476 and $1.462 billion and one wider-spread California scenario costing $4.8 billion. These costs would be borne mostly by the Federal government, with some share paid by State governments. Both the McCauley et al. and the Ekboir studies assumed that the Federal government would pay all indemnity costs.

V. Summary impact

If an FMD outbreak were to occur in the United States and this resulted in the slaughter of three million head (an outbreak intermediate in magnitude between outbreaks in the studies by McCauley et al. and Ekboir), U.S. cattle, hog, and sheep inventories would be reduced by just under two percent. Prices could fall initially in the short run as consumers responded to perceptions of disease effects on meat and meat supplies, similar to what was observed in the E.U. However, as the disease outbreak was brought under control, prices could reach levels higher than before the outbreak as slaughter of infected livestock reduced supplies.

Disease Implications for Humans

There have been about 40 documented cases of FMD in humans, historically, though none were serious human illnesses, and none have been confirmed in the 2001 outbreak. Because so few humans have been infected with FMD, it is not considered a human food safety issue. If a FMD outbreak were to occur in the United States, domestic livestock and livestock product supplies would increase as international trading partners banned imports of U.S. livestock and livestock products and the United States was unable to export those products. The increased domestic supplies would result in price declines for cloven-hoofed livestock and their products. Consumption could decline as well, compounding price declines. However, as disease-related slaughter and livestock disposal increased, consumption would likely recover, as it appears to be doing in the United Kingdom. Prices for U.S. livestock and livestock products would also likely recover as import bans against U.S. livestock products were relaxed and overall demand recovered toward pre-FMD levels.

Bovine Spongiform Encephalopathy

First described in Britain in 1986, BSE was initially considered an animal health concern affecting cattle supplies, and measures were directed at its effects regarding reductions in livestock production. The United Kingdom has been disposing of BSE-infected cattle since 1986, with indemnity payments to farmers and temporary reductions in beef consumption and market prices. The disease officially became a human health/food safety issue in 1996, with the U.K. government's announcement of a possible link between BSE and a new variant of Creutzfield-Jacob Disease (vCJD), a human neurological disease. Control measures were tightened and re-evaluated at that time, with some additional measures implemented. Also, additional trade restrictions were imposed by the European Union on cattle and their products exported from the United Kingdom in 1996 as a response to the announcement. This increased the already existing costs and economic consequences. In 2000, both BSE and vCJD were found in countries outside the United Kingdom.

BSE has not exhibited a contagious character and to date the diagnosis has been limited to cattle. There is some evidence that sheep may become infected with BSE, but this has yet to be confirmed outside a research situation. Nevertheless, the European Union has imposed regulations to remove specified risk materials from sheep, and a number of countries (including the United States) impose import restrictions on ruminants and ruminant products, not just on cattle. A response to a BSE outbreak would be focused initially on identifying animal-derived protein feed sources (meat and bone meal--MBM) for the affected animals and tracing the origins of any introduced cattle or sheep and their progeny. Other response activities would be focused on removing the highest risk tissues from the food and feed chain, and possibly increasing restrictions on the use of mammalian-derived protein sources. Some producers have voluntarily extended the current restrictions and feed no mammalian-derived meat and bone meal to any livestock species. At present, only animals infected, or suspected to be infected, with BSE would be quarantined and destroyed. Since it is not a highly contagious disease, there is no need for extensive preventive slaughter efforts, such as would be applied in a contagious disease outbreak.

I. Direct impact on livestock productivity

Production impacts would be primarily those imposed from the slaughter of affected animals. The condition and productivity of an animal with BSE declines steadily from the onset of the disease until the animal dies or is destroyed. BSE cannot be diagnosed in live animals. Whether or not an animal has had BSE is only confirmed *post mortem*. Production would decrease as symptoms increased in infected cattle and as more animals were destroyed. In addition, herdmates of an infected and confirmed bovine also would be quarantined, depopulated, and tested. Because herds with infected animals would be depopulated and because products from infected animals are not allowed into the food chain, production from infected or quarantined herds would drop immediately upon their destruction. Economic impacts on production would also depend on the extent of the quarantine areas. In the case of BSE, the quarantine area would likely be a herd or feedlot or other isolated facility. .

When BSE was first discovered in the United Kingdom, only animals affected with the disease were depopulated. Additional control efforts were added in 1996 for various reasons. These included the "Over Thirty Month" scheme, which prohibits the use of meat or tissues from cattle over 30 months of age at slaughter as animal or human food. In addition, depopulation efforts have been added for the offspring of infected cattle, birth cohorts, feed cohorts, and other at-risk animals. Currently in the United Kingdom, only infected cattle on a farm and their offspring born on or after August 1, 1996, are depopulated. Other herdmates and cattle on contiguous farms are usually not affected because the suspected BSE-infective agent is likely spread through contaminated feed and not contagious. As of March 15, 2002, in the United Kingdom a total of 181,864 head of cattle on more than 35,406 farms had been diagnosed with BSE, and over 5 million head have been destroyed (DEFRA[3]). By one estimate, the BSE outbreak has cost U.K. farmers over $700 million (Food Institute Report).

BSE has never been diagnosed in cattle in the United States. BSE has been confirmed in native cattle in at least 19 countries, including the United Kingdom. However, over 95 percent of all BSE cases have occurred in the United Kingdom. Indeed, most cases of both BSE and vCJD have occurred there. The incidence of BSE peaked in U.K. cattle in 1993.

As with FMD and other contagious diseases, costs to producers would extend well beyond the immediate loss of livestock that might be slaughtered to control BSE. Producers might not be able to readily replace many years' work that went into building their breeding herds. Inability to absorb additional fixed costs of rebuilding and a reduced cash flow would likely cause some producers to exit the industry, if their herds became infected and had to be destroyed. The already struggling sheep and goat industries could also be adversely affected if high-risk materials from those species were also removed from the animal and human food chains.

II. Upstream (input sector) and downstream (marketing sector) effects

There were initial reports of large monthly declines in beef consumption in some E.U. countries immediately after the BSE-vCJD announcement in 1996. However, beef consumption in most countries has rebounded to near the pre-announcement trends, according to the European Commission. Much of this consumption is at significantly lower prices, suggesting a downward shift in demand. On individual farms in the United Kingdom, livestock production and farm incomes were severely affected by the crisis, but livestock productivity for the European Union as a whole has hardly been impacted. Stringent measures on the use of mammalian meat-and-bone-meal as an animal feed are in place in Europe because of the increasing discoveries of BSE-infected cattle there. As of January 1, 2001, the European Union put in place a temporary ban on feeding processed animal proteins to all farm animals used in the production of food. The ban is still in effect. Fish meal is excluded from this ban, but the European Union has banned it for feeding to ruminants. The E.U. ban does not include tallow except in France and Germany.

If BSE were to occur in the United States, downstream effects would be felt in many industries, not all of which are directly related to the livestock production sectors (Figures 3 and 4). Demand for livestock feeds could decline, thus affecting the feedstuffs and processing sectors. In the case of a

[3] The United Kingdom's Ministry of Agriculture, Fisheries, and Food (MAFF) has been superceded by the Department of Environment, Food and Rural Affairs (DEFRA).

BSE outbreak, affected sectors would likely include transportation, labor, and food establishments serving beef. Figure 3 and Tables II.1 and II.2 show the magnitudes of some of these sectors and where they are concentrated.

If there were an outbreak of BSE in the United States, much of the response would depend on the nature of the outbreak. For example, if an imported animal was discovered to be infected with BSE, ramifications would likely not be the same as those that would follow from an outbreak in native animals traced to a long-standing source of animal-based protein that was widely distributed and fed to large numbers of widely-dispersed animals. Beef consumption would likely decline in either case, but there is nothing to indicate long-term losses would be greater, on a percentage basis, than those observed in the United Kingdom (Burton and Young; Atkinson). However, absolute effects could be much larger because the U.S. population is five times the U.K. population, U.S. cattle inventories are ten times U.K. inventories, and U.S. meat exports amount to about $3 billion per year.

Food safety and supplies

Beef consumption in the United Kingdom has been declining since at least 1977 and many factors, which predated BSE impacts, have contributed to those long-term declines. However, a study of the initial 1986 BSE outbreak in Britain showed a marked decrease in consumer expenditure shares for beef and veal, both in the short run and long run, due to BSE (Burton and Young). The short-run decrease in meat expenditure share was six percent in the second quarter of 1990. The longer-run decrease, through 1993, was 4.5 percent. In a later paper, Atkinson, Head of the International Economics Division of the U.K. Ministry of Agriculture, Fisheries, and Food, reported that U.K. beef consumption appeared to have recovered to a level just above its long-term, downward trend. However, prices adjusted for inflation, at 31 percent below pre-outbreak levels, have not recovered and indicate a long-term, downward shift in demand.

As the Burton and Young and Atkinson studies came out before the FMD outbreak, none of the reported BSE effects were confounded by the FMD outbreak. Because outbreaks of FMD and BSE overlapped in the United Kingdom, as of February 2001, there has been some confusion about the economic effects of the two diseases. Therefore, it is difficult to portion the most recent price declines there between BSE, FMD, and the general long-term decline in beef consumption. A study by the European Commission, however, does not anticipate significant effects of BSE on E.U. beef consumption in the long run (E.C., 2001). Long-run declines in beef consumption and prices in the European Union are most likely due to structural factors, such as changing consumer tastes and preferences, with BSE contributing to the downward demand shifts. At the same time, E.U. farm policy reforms are reducing production and, therefore, supplies.

If BSE were discovered in the United States, one economic response could be reduced import demand for U.S. beef and beef byproducts by other countries. The U.S. beef industry is ten times the size of the U.K. beef industry, and it depends on exports. A suspension of imports of U.S. beef by other countries would cause domestic meat supplies to increase for as long as the infected and related livestock slaughter were less than banned import quantities of beef remaining on the domestic market. BSE would affect only cattle. Assuming the same price-quantity relationships as used for the impact of FMD, retail beef prices would be reduced by 1.189 percent for every 1 percent increase in domestic supplies (Eales and Unnevehr, 1993). Because there are five times as many people in the

United States as in the United Kingdom, consumer response here to even one confirmed case of BSE could be five times what the U.K. response has been during the 1989 and 1996 BSE crises (Burton and Young; Atkinson). Consumer response is difficult to predict. However, domestic consumption of beef would likely drop due to even *one* confirmed case of BSE, (even though most cattle would not likely be infected) until the epidemiological route of the infection was determined and the public reassured of the safety of beef. The additional supply would put downward pressure on beef prices. Substitution effects in the form of increased demand for and prices of meat products from other livestock species would also occur as a result of a BSE outbreak. These substitutions could lead to higher prices for those meats. Pork prices, for example, would increase 0.07 percent for every 1-percent decline in supplies of beef (Eales and Unnevehr, 1993).

Slaughter, rendering, and byproduct industries

If BSE were to occur in the United States, the outbreak would likely affect the slaughtering, packing, processing, rendering, and by-product industries. Because of disease-related slaughter and disposition requirements, these industries could experience changes in supplies of their primary livestock inputs, and their ability to manufacture products. In addition, increased restrictions on such things as specified risk materials or the use of rendered products could severely impact these industries.

The direct economic effect of BSE on the meat processing industries would depend on whether the animals identified as potentially having BSE were imported or native, on the extent of the disease, and on how many animals were taken out of the system. It is unknown how many workers in the meat industry could potentially be idled. However, the 1997 census shows the numbers of people in sectors that could be directly affected if BSE were to be found here (Tables II.1.a and II.1.b). The total dollar amounts at risk in each sector were discussed above in the corresponding section on effects of FMD.

In addition to meat producing operations (slaughterhouses, packing plants, and related meat processing), two other industries would be directly affected by a BSE outbreak in the U.S.: The by-product processing industry and the animal products rendering industry take byproducts produced during slaughter (portions of the cattle, pigs, sheep, poultry, and fish) and process them into byproducts and the starting materials for many other useful products. For example, gelatin and collagen are animal byproducts used extensively in the cosmetic and pharmaceutical industry. Other animal byproducts (for example, enzymes, triglycerides, and isopropenyl esters) are used in the pharmaceutical industry and in the manufacture of fatty acids, paints, varnishes, rubber goods, plastics, and lubricants.

After edible meats and byproducts are removed from the carcass, the remainder is rendered. The rendering process produces a protein fraction—meat and bone meal, bone meal, poultry meal, and some others–and a fat fraction--tallow, lard and yellow grease, among others. Rendered animal products may be manufactured into soaps, pet and livestock feed, fertilizers, lubricants, and other industrial products. Historically, tallow and lard were used in cooking and in the cosmetic industry, but have been mostly replaced by vegetable oils. Fats are the highest caloric-dense foodstuffs, and today animal fats are uses as feed ingredients, both domestically and as a product for export. Foreign markets use a large portion of animal byproducts and rendered products, lard and tallow in particular.

If these products are not allowed to enter the market, the industry (and the environment) incurs a cost for disposal. Other characteristics of the rendering industry and its economic contribution to the U.S. economy are detailed in the corresponding sections on FMD.

Meat and bone meal containing, or derived from, infected tissue is suspected to be the primary carrier of the infective prion causing BSE. In August 1997, FDA established a regulation that prohibits the use of most mammalian protein in the manufacture of animal feeds for ruminants. (Protein manufactured from ruminants and other animals may still be fed to hogs and poultry.) The FDA estimated that this rule will ultimately cost the U.S. $53 million (FDA, 1997). Even before FDA imposed feeding meat and bone meal to ruminants, only small amounts of animal proteins were fed to ruminants in this country, primarily to dairy cattle. Range cattle here have received little protein supplement of any kind. In the United States, vegetable proteins are more commonly fed to ruminants because they are a cheaper source of protein than animal-derived proteins. Cattle on high grain diets, like feedlot cattle, often receive urea as part of their protein allotment. In the European Union, animal protein prices were more competitive with vegetable protein, and meat and bone meal was used there before the feed ban. Most of the meat and bone meal fed in the United States is fed to nonruminants, mainly pets, swine, and poultry. However, some poultry producers have voluntarily reduced their use of meat and bone meal in rations.

U.S. meat and bone meal production was just under 4.2 billion pounds in 2000, which, at a price of $174 per ton, would be valued at about $360 million. If the practice of feeding meat and bone meal to nonruminant livestock and pets declined, prices for substitute sources of livestock protein feedstuffs, like soybean meal, other oil seed meals, or other protein sources, depending on degree of substitutability, could increase. U.S. renderers produced 18 billion pounds (over 8 million metric tons) of rendered products in 2000, down 4 percent from 1999 (Render, 2001). As of 1997, there were 137 rendering companies operating 240 establishments. Most of these establishments have fewer than 100 employees. The U.S. rendering industry had a payroll of $270 million and almost 10,000 employees (U.S. Department of Commerce 2001b). Texas and California have the greatest number of establishments (and employees), at 20 each, followed by Nebraska and Minnesota (U.S. Department of Commerce, 2001b). In 2000, U.S. exports totaled 1,820,962 metric tons of rendered products (Render, 2001).

If a case of BSE were diagnosed in the United States, it is possible that additional restrictions on the use of rendered animal proteins would be imposed. Current exemptions in the feed ban might be removed. The use of mammalian protein in animal feed might be completely prohibited as feed for any species. In any of these instances, other uses would have to be found for meat and bone meal, other rendered protein products, and byproducts from the slaughter process, or some means of disposal would have to be devised. One other possible use of some rendered products is for the production of bio-fuel. Currently, disposal options include incineration or digestion. Any of these solutions would be costly and might require significant changes to physical facilities, especially if extreme measures, like a 30-month culling program, were implemented. Stockpiled meat and bone meal and other materials would accrue storage costs. Most countries, including the United States, do not have disposal facilities designed to handle such volumes of materials. For example, the United Kingdom continues to work through significant stockpiles of meat and bone meal from cattle condemned during their 30-month culling program that was implemented in 1996 to control BSE. (This disposition was complicated by the 2001 FMD outbreak.)

Additional restrictions on the use of specified risk materials (SRM's) would likely be implemented in the United States if a case of BSE were diagnosed. SRM's are those tissues that research has demonstrated have the highest infectivity, such as brain and spinal cord. The definition of SRM's may involve a wider range of tissues in addition to brain and spinal cord, as more is discovered about BSE. Prohibitions on the use of these tissues in food, feed, or pharmaceutical products are in place in the European Union, and may be considered if a case of BSE were diagnosed in the United States. This would create significant additional costs and hardship on various industries and would also require adequate disposal options for these tissues.

Transportation, Tourism and Recreation, and Other Sectors

Transportation engaged in moving livestock and livestock products to other sectors would probably not be noticeably impacted in the case of a BSE diagnosis. BSE is not a highly contagious disease, so stringent movement restrictions on animals or humans are not necessary. However, locally, effects could be burdensome.

If there were an outbreak of BSE in the United States, some spillover effects could be felt in industries dependent on animals susceptible to other TSEs. The sheep and goat industry could be directly affected because of the possibility of BSE occurring in these species. In addition, if restrictions on specified risk materials from these species were implemented it could have a significant impact. Income from hunting deer, elk, and other cervids could be adversely affected, especially as concerns about chronic wasting disease, a related TSE, are already present. Decreased hunting pressure on deer could also increase costs from damages caused by deer-automobile collisions and to landscaping.

III. International trade effects of an outbreak of BSE in the United States (e.g., impact of restrictions on international movement of animals and animal products)

In the United States, exports of cattle and many of their products vary annually in the neighborhood of $3 to $4 billion, or roughly three percent of the value of cash receipts for cattle at the farm level. In 2000, the United States exported $608 million in live animals (all livestock species), $5.454 billion in meat products (excluding poultry), including $1.166 billion in hides, and $421 million in rendered products (*Agricultural Outlook*, 2001).

If there were an outbreak of BSE in the United States, beef and beef products would be the primary items for which trade would be affected. Effects could extend to many other downstream products, like rendered products, pet food, and pharmaceutical products. Currently there is a tendency for importing countries to stop imports of beef from BSE-infected countries. Due to the long incubation period for BSE, these restrictions are open-ended or are extended for years. Trade in other ruminants, especially sheep and goats, and their products could also be affected. Generally, trade in non-ruminant species is not affected.

A case of BSE traced to an imported bovine, could result in a very short-lived response, perhaps only a few days. However, one confirmed native-born case of BSE in the United States would likely result

in a significant reduction in import demand for U.S. beef and beef products in other countries. The loss of export dollars to the U.S. economy due to trade effects could be several times the dollar value of trade effects the United Kingdom has experienced. Trade effects on the U.S. economy probably would be larger because the United States produces and exports about ten times what the United Kingdom produces and exports.

Trade for beef byproducts and rendered products are affected because of the currently-held belief that prions in protein feeds made from these products are the mode of transmission of the infective agent. As mentioned earlier, BSE has been identified in native animals in 19 countries to date. Many countries have imposed import restrictions on cattle and bovine products from these countries. Some countries, including the United States, have imposed broader restrictions. The United States restricts the importation of ruminants and most ruminant products from countries that have identified BSE in native animals or that are deemed to be at risk for BSE. These restrictions were initially imposed in 1989 and have remained in place, with amendments, since that time. Additional restrictions would likely occur with a BSE outbreak in the United States, and prices for affected products and commodities here would likely change. These price changes and disrupted trade patterns would further alter cost efficiencies in affected industries in the United States.

IV. Costs of Government intervention

If an outbreak of BSE were to occur in the U.S., the Federal and State governments, and thus taxpayers, would bear the brunt of costs associated with containing the disease. Costs incurred with an outbreak would include increased surveillance costs, costs of tests and confirmation, costs of livestock depopulation and disposal, and costs associated with additional restrictions imposed on specified risk materials or rendered proteins (Table IV.1). Producers would not be paid for lost future production under current indemnity plans. No indemnities for losses in affected industries beyond the farm gate are established.

In some cases, it is difficult to separate budget costs for BSE from costs for FMD or from costs for other diseases. Ongoing budgeted costs for FMD and BSE are just over $22 million (Table IV.1). Costs to prevent the introduction of foreign animal diseases into the U.S. (exclusion) are a significant share of costs. Some budget items have increased. For example, announced budgets for the Agriculture Quarantine Inspection Program (AQI) are $278 million for FY 2001 and $296 million for FY2002. Additional funds have also been allocated for stepped-up emergency measures, like increased decontamination and inspection procedures at international ports of entry, to keep exotic diseases out of the United States.

Costs for testing and confirming diseases are listed in Table IV-1. If a BSE outbreak were to occur, individual producers would not likely be charged for testing and confirming the disease. With BSE, minor additional costs of transportation and testing would be incurred for those samples sent to the United Kingdom for confirmation.[4] These costs in a BSE outbreak in the United States would remain small, accruing on a case-by-case basis, unless increased testing or some larger eradication scheme,

[4] The first case of any foreign animal disease is usually sent to the world reference lab for that disease. For BSE that lab is in the U.K. (L. Detwiler, Personal communication, September 2001).

like a 30-month cull similar to what was imposed in the United Kingdom and Japan, were put into effect. If an outbreak were to occur in the United States, producers would likely be paid an indemnity for condemned livestock (Figure 2). Current indemnity processes are set up to pay producers a fair market value for their livestock, based on an assessment by an appraiser.

With BSE, there can be a long lag between detection of the suspected disease, confirmation by autopsy, and disposal of the quarantined herd. While cattle might be quarantined within hours, disposal might not occur for months. And, unlike with contagious diseases like FMD, a BSE-infected herd may be moved before the animals are depopulated.

V. Summary impact

In the case of BSE in the United Kingdom, declines in consumption resulted in price declines and beef's market share dropped by 4.5 percent during the initial 1989-90 outbreak (Burton and Young). Real prices for cattle declined by 31 percent after the March 1996 British announcement of a potential link between BSE and new variant Creutzfeld-Jacob Disease (Atkinson). There do not appear to be significant long-term impacts of BSE on the downward trends of beef consumption, but prices in the European Union remain below pre-outbreak levels. However, beef consumption in the United Kingdom has been declining since the late 1970s. Short-term impacts in the United States could fall between observed impacts for the two BSE studies in the United Kingdom (Young and Burton; Atkinson)—in the case of a U.S. outbreak of BSE, short-run effects on the livestock sector would likely include lower prices for beef with some loss in beef's market share.

If a BSE outbreak were to occur in the United States, it is not likely that depopulation of infected herds would reduce cattle inventories by much, because BSE is not thought to be a contagious disease. There would be no effects on inventories of other livestock species, with the possible exception of sheep. Sheep are infected with their own transmissible spongiform encephalopathy, scrapie, and may also be susceptible to BSE, a fact which motivated USDA's condemnation of two herd of Vermont sheep and their depopulation in March 2001. With BSE, beef consumption and prices would fall initially, beef could lose some market share, and the beef industry would suffer severe consequences. Again, consequences from a BSE case traced to native-born cattle would likely be much greater than from a case traced to an imported animal.

Disease Implications for Humans

The human variant of BSE, vCJD, is always fatal. More than a hundred known human deaths (117 in the United Kingdom, 5 in France, and 1 in the Republic of Ireland, as of March 15, 2002) have been attributed to vCJD. However, the full extent of human impact for this disease is as yet unknown because it can have an incubation period of several years.

Conclusions

This appendix has focused on the potential economic effects of FMD and BSE outbreaks if they were to occur in the United States. FMD and BSE are epidemiologically unrelated diseases of livestock.

However, both have similar affects on livestock product prices, because disease-response policies affect supplies and trade status, and also because of consumers' responses at the retail meat counter.

BSE and FMD vary in their potential as economic threats to U.S. producers and consumers, and in their pervasiveness in terms of the numbers of animals and people that each affects. If an outbreak of either disease were to occur in the United States, economic effects would likely be similar to the U.K. experience, in terms of general directions of changes in economic variables. However, rates of change and magnitudes of impacts from a potential outbreak in the United States are difficult to predict. Variation in expected epidemiology, depending on where in the United States these diseases would strike and how rapidly they could be spread before being contained, will contribute to variation in response. The 2001-2002 FMD outbreak has resulted in the slaughter of almost 4 million head of livestock in Europe in roughly the space of a year (80% of which were sheep, 16% cattle). The approximately 180,000 confirmed BSE cases have resulted in the slaughter of over 5 million head of cattle since 1986. Despite these losses, consumer response in the United Kingdom has resulted in lowered demand, and prices for livestock and livestock products have experienced short-run declines with both BSE and FMD

These diseases have far reaching implications for international trade in livestock and livestock products, and for supplies and safety of livestock products. In terms of dollars, expected impacts from just one native-born case of BSE in the United States could easily exceed the U.K. experience. Even for a FMD outbreak, paying indemnities and disposing of infected cattle would likely be a relatively small part of the total public and private costs, which would include social costs and losses to tourism, trade, and other sectors not directly related to livestock production (see Table IV.1). U.S. beef exports in 2000 were about $3 billion. Two or three years of trade effects alone from one confirmed case of BSE in the United States could exceed the total amount that the United Kingdom has spent to date on BSE.

Both diseases have thus far been kept out of this country largely through the combined efforts of USDA, DHHS, other Federal organizations, and State regulatory and health agencies. These organizations have taken aggressive actions to reduce the risk of BSE or FMD being introduced and spread in this country.

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Table II.1a—Employee statistics for selected sectors of the U.S. economy that could be affected during a Foot and Mouth Disease outbreak (number of paid employees).

State	Accommodations, and food services	Amusement and recreation industries	Museums, historical sites, and similar institutions	Scenic and sightseeing transportation	Air transportation	Transit and ground passenger transportation
United States	(r)9,451,226	(r)964,166	7281	23907	89125	339579
Alabama	134719	7122	79	57	95	1782
Alaska	20587	2917	2	477	3291	1344
Arizona	(r)184,382	19797	204	f	844	3799
Arkansas	73397	3759	48	c	728	f
California	(r)1,054,106	142222	451	3249	12343	32510
Colorado	(r)195,262	26939	292	b	2008	4088
Connecticut	96556	24425	3	b	f	8303
Delaware	26969	2153	15	a	b	2029
District of Columbia	42650	819	1448	302	410	1084
Florida	608834	84245	62	3359	8228	9761
Georgia	274322	18081	114	c	1133	h
Hawaii	88083	5283	a	4346	777	3547
Idaho	(r)42,087	3942	170	b	416	1447
Illinois	397300	38942	41	687	2031	19403
Indiana	215710	20855	10	f	1084	h
Iowa	99148	10426	23	36	418	1552
Kansas	91173	5956	7	b	224	3534
Kentucky	129442	7899	156	e	10437	g

Table II.1a--Continued

State	Accommodations, and food services	Amusement and recreation industries	Museums, historical sites, and similar institutions	Scenic and sightseeing transportation	Air transportation	Transit and ground passenger transportation
Louisiana	147016	19004	21	1602	2544	3387
Maine	(r)39,657	4789	42	129	c	1014
Maryland	161273	14296	85	c	939	6733
Massachusetts	(r)227,898	17872	27	e	924	16518
Michigan	320014	27770	153	175	3997	3890
Minnesota	179487	23866	20	c	1210	12017
Mississippi	84834	21000	191	24	91	768
Missouri	203849	23631	1	113	482	9014
Montana	(r)38,551	5442	a	b	478	1302
Nebraska	61048	4975	8	44	421	1144
Nevada	(r)241,682	21250	19	617	1169	6916
New Hampshire	(r)43,996	5721	201	b	233	2650
New Jersey	(r)252,031	22552	78	731	1077	33773
New Mexico	(r)67,203	7734	263	c	720	2476
New York	(r)473,481	43485	591	f	9555	51059
North Carolina	262848	18681	a	c	1526	2778
North Dakota	26330	3067	156	c	c	f
Ohio	401206	29163	10	9	2578	6787
Oklahoma	105934	7497	176	c	251	523
Oregon	(r)124,506	(r)13,836	150	f	1968	3541
Pennsylvania	365158	30622	b	b	2313	24935
Rhode Island	34162	2899	324	371	b	2052
South Carolina	150621	16362	93	117	224	1623

Table II.1a--Continued

State	Accommodations, and food services	Amusement and recreation industries	Museums, historical sites, and similar institutions	Scenic and sightseeing transportation	Air transportation	Transit and ground passenger transportation
South Dakota	(r)30,136	4310	272	203	229	992
Tennessee	197881	12435	565	749	488	3940
Texas	638333	53749	93	c	4396	12070
Utah	(r)74,481	7559	8	a	1418	950
Vermont	27088	5244	313	e	b	966
Virginia	233639	21673	35	682	2178	4317
Washington	(r)195,157	24470	41	a	1024	4320
West Virginia	51529	3135	171	b	169	408
Wisconsin	(r)190,520	18330	13	a	692	12621
Wyoming	24950	1965			222	391

Source: U.S. Bureau of the Census, 1997 Economic Census; D: Withheld to avoid disclosing data of individual companies; data are included in higher level totals; N: Not available or not comparable; S: Withheld because estimate did not meet publication standards; Z: Less than half the unit shown; a: 0 - 19 employees; b: 20 - 99 employees; c: 100 - 249 employees; e: 250 - 499 employees; f: 500 - 999 employees; g: 1,000 - 2,499 employees; h: 2,500 - 4,999 employees; i: 5,000 - 9,999 employees; j: 10,000 - 24,999 employees; k: 25,000 - 49,999 employees; l: 50,000 - 99,999 employees; m: 100,000 or more employees; p: 10 to 19 percent estimated; q: 20 to 29 percent estimated; r: Revised; s: Sampling error exceeds 40 percent.

Table II.1b—Employment statistics for selected livestock and related sectors of the U.S. economy that could be affected during a Foot and Mouth Disease outbreak (number of paid employees).

State	Meat product manufacturing	Dairy product manufacturing	Animal food manufacturing	Leather and allied product manufacturing	Truck transportation
United States					1293790
Alabama	21066	1807	1194	119	28466
Alaska					3245
Arizona	1487	1656	315	208	23467
Arkansas	35487	844	1108	3128	28507
California	17520	12935	3915	7528	103675
Colorado	7955	1917	672	1622	15735
Connecticut	866	1045	287	274	7050
Delaware	6359	108	258		2921
District of Columbia					241
Florida	7127	2074	852	3720	52124
Georgia	34197	1465	1681	461	47836
Hawaii	191	600			2897
Idaho	2064	1718	238	210	6806
Illinois	16707	4140	2021	2760	64869
Indiana	7742	4750	1677	1574	49538
Iowa	23148	3618	3119 f		25068
Kansas	17411	588	1834	338	16563
Kentucky	5980	1965 f		1203	20222
Louisiana	3155	1310	283	269	19301
Maine	1129	485		7466	5789

Table II.1b—Continued.

State	Meat product manufacturing	Dairy product manufacturing	Animal food manufacturing	Leather and allied product manufacturing	Truck transportation
Maryland	4364	2019	326	1321	17578
Massachusetts	2098	4063	292	3800	16546
Michigan	7659	4715	386	3133	40056
Minnesota	14129 i		1274	2164	23260
Mississippi	18605	489	564	351	16699
Missouri	16460	4620	2250	4000	38724
Montana	303	330	133		5551
Nebraska	22839	942	1666 f		15757
Nevada	112	865			5083
New Hampshire	f	347		1582	3133
New Jersey	3586	3251	382	2632	41923
New Mexico	427	748			6025
New York	3226	6916	1677	5699	40674
North Carolina	28452	1434	1568	3350	48448
North Dakota	800	486	171		6295
Ohio	7607	5645	1997	2105	60000
Oklahoma	6140 f		1085 f		17704
Oregon	1979	1879	275	457	19479
Pennsylvania	14755	7599	2647	5199	54496
Rhode Island	167 c			343	2160
South Carolina	8973	791	210		17186
South Dakota	4769	1022	456		5017
Tennessee	7828	2771	949	2899	47134
Texas	32932	6043	4114	4736	93146
Utah	2216	2553	506	220	18482

Table II.1b—Continued.

State	Meat product manufacturing	Dairy product manufacturing	Animal food manufacturing	Leather and allied product manufacturing	Truck transportation
Vermont	135	1624	205		2676
Virginia	17756	2245	803	709	28825
Washington	4396	1998	477	775	24285
West Virginia	2935	388		717	8895
Wisconsin	17470	16104	2031	5539	41357
Wyoming					2876

Source: U.S. Bureau of the Census, 1997 Economic Census; D: Withheld to avoid disclosing data of individual companies; data are included in higher level totals; N: Not available or not comparable; S: Withheld because estimate did not meet publication standards; Z: Less than half the unit shown; a: 0 - 19 employees; b: 20 - 99 employees; c: 100 - 249 employees; e: 250 - 499 employees; f: 500 - 999 employees; g: 1,000 - 2,499 employees; h: 2,500 - 4,999 employees; i: 5,000 - 9,999 employees; j: 10,000 - 24,999 employees; k: 25,000 - 49,999 employees; l: 50,000 - 99,999 employees; m: 100,000 or more employees; p: 10 to 19 percent estimated; q: 20 to 29 percent estimated; r: Revised; s: Sampling error exceeds 40 percent.

Table II.2a--Shipments, sales, and receipts for selected sectors of the U.S. economy that could be affected during a Foot and Mouth Disease outbreak ($1,000).

State	Accommodations, and food services	Amusement and recreation industries	Museums, historical Sites, and similar institutions	Scenic and sightseeing transportation	Air transportation	Transit and ground passenger transportation
United States	(r)350,399,194	(r)51,861,195	483683	1893436	20249033	13792414
Alabama	3881782	266925	2071	2975	13858	57003
Alaska	1065459	156139	1090	104796	403116	38311
Arizona	(r)6,634,744	1503750	13387	D	204708	147056
Arkansas	2179696	148279	1916	D	150903	D
California	(r)42,312,641	7290886	37000	225053	4403641	1495251
Colorado	(r)6,710,540	1335404	18217	D	469102	168013
Connecticut	3746560	2166249	196	D	D	357941
Delaware	1008954	77224	1358	D	D	81000
District of Columbia	2263498	52780	107527	18775	274838	91933
Florida	24165336	5751146	2912	232073	1770277	489276
Georgia	9689927	847031	4640	D	256524	D
Hawaii	5007899	310403	D	267338	117500	114434
Idaho	(r)1,233,215	145406	2286	D	54357	36913
Illinois	14826805	2488821	1530	48717	908417	776311
Indiana	6646318	1336529	1312	D	200073	D
Iowa	2762766	611086	881	1143	30609	44114
Kansas	2685732	241521	318	D	20890	122063
Kentucky	4056107	297583	3903	D	673458	D
Louisiana	5259921	1713458	1876	192855	331083	188413
Maine	(r)1,510,182	187264	1128	14393	D	32045
Maryland	5972467	644131	7337	D	224006	264332

Table II.2a—Continued.

State	Accommodations, and food services	Amusement and recreation industries	Museums, historical Sites, and similar institutions	Scenic and sightseeing transportation	Air transportation	Transit and ground passenger transportation
Massachusetts	(r)9,282,541	857820	2652	D	363013	609192
Michigan	10158693	1389739	8016	10926	575569	163154
Minnesota	5934155	988750	989	D	203710	368072
Mississippi	3064753	1365258	12999	1606	11997	24023
Missouri	6780812	1081927	306	7635	63434	248775
Montana	(r)1,199,251	281170	D	D	43244	32400
Nebraska	1726647	198311	1497	1163	58783	32520
Nevada	(r)15,323,751	1347755	2315	75573	129079	288141
New Hampshire	(r)1,544,942	255407	8048	D	32534	80792
New Jersey	(r)13,416,088	1220867	4588	83128	529489	1477235
New Mexico	(r)2,146,558	440737	39385	D	92641	66190
New York	(r)21,680,529	2244461	45301	D	3395824	2610931
North Carolina	8624993	790965	D	D	266355	120721
North Dakota	684930	153905	5157	D	D	D
Ohio	12410978	1479948	808	1104	435481	244459
Oklahoma	3151332	441978	9928	D	40102	18993
Oregon	(r)4,388,304	(r)650,397	8181	D	359690	109360
Pennsylvania	12227177	1393473	D	D	481108	865670
Rhode Island	1220865	140479	19861	20257	D	75488
South Carolina	4835839	964383	7280	3693	27697	49319
South Dakota	(r)888,148	278333	16643	25074	24118	22981
Tennessee	6790159	545511	36533	47737	80645	156905
Texas	22698848	2255642	2910	D	1237289	446034
Utah	(r)2,313,309	249172	772	D	182707	33351
Vermont	910188	190744	15343	D	D	38618

Table II.2a—Continued.

State	Accommodations, and food services	Amusement and recreation industries	Museums, historical Sites, and similar institutions	Scenic and sightseeing transportation	Air transportation	Transit and ground passenger transportation
Virginia	8281218	777978	1975	73693	394344	181673
Washington	(r)7,001,716	1162468	1725	D	350354	168167
West Virginia	1633164	129042	16881	D	21963	13158
Wisconsin	(r)5,649,870	938032	804	D	159875	357246
Wyoming	808887	74528			28243	13835

Source: U.S. Bureau of the Census, 1997 Economic Census; D: Withheld to avoid disclosing data of individual companies; data are included in higher level totals; N: Not available or not comparable; S: Withheld because estimate did not meet publication standards; Z: Less than half the unit shown; a: 0 - 19 employees; b: 20 - 99 employees; c: 100 - 249 employees; e: 250 - 499 employees; f: 500 - 999 employees; g: 1,000 - 2,499 employees; h: 2,500 - 4,999 employees; i: 5,000 - 9,999 employees; j: 10,000 - 24,999 employees; k: 25,000 - 49,999 employees; l: 50,000 - 99,999 employees; m: 100,000 or more employees; p: 10 to 19 percent estimated; q: 20 to 29 percent estimated; r: Revised; s: Sampling error exceeds 40 percent.

Table II.2b--Shipments, sales, and receipts for selected livestock and related sectors of the U.S. economy that could be affected during a Foot and Mouth Disease outbreak.

State	Meat product manufacturing	Dairy product manufacturing	Animal food manufacturing	Leather and allied product manufacturing	Truck transportation
United States					141225398
Alabama	2559080	466995	955884	10633	2864075
Alaska					615860
Arizona	490396	913656	305836	26020	2017261
Arkansas	5467194	257400	1312789	184592	2731108
California	4223511	7377576	2594723	633780	11372458
Colorado	3285224	516188	447895	600553	1667060
Connecticut	183936	345756	110914	76318	808438
Delaware	845434	26066	388450		275121
District of Columbia					11584
Florida	1040155	947308	281178	315246	6149233
Georgia	4951140	493014	1576443	41227	4461792
Hawaii	24760	135248			242560
Idaho	799523	891435	76884	22960	654001
Illinois	5010274	1887820	1002390	262255	7925190
Indiana	1795820	2197874	840106	146449	6428062
Iowa	8088470	1744144	2272608 D		2917859
Kansas	8024154	231290	819188	81266	1710660
Kentucky	1263944	758332 D		210150	2284109
Louisiana	423348	389407	232454	17579	1723776
Maine	224831	158997		1081429	639575
Maryland	709467	794644	279718	354828	1709241
Massachusetts	497325	1234565	81363	520296	1786431
Michigan	2466619	2304126	148734	655941	5401839

Table II.2b—Continued.

State	Meat product manufacturing	Dairy product manufacturing	Animal food manufacturing	Leather and allied product manufacturing	Truck transportation
Minnesota	4233772	D	598482	376033	3195843
Mississippi	2547153	132861	413154	40719	1558510
Missouri	3372213	2418863	1355009	314144	5496027
Montana	53190	89833	31202		666624
Nebraska	9697353	363963	840871	D	2529350
Nevada	23393	282751			532802
New Hampshire	D	104734		392211	323151
New Jersey	711357	1288059	169318	323522	4780621
New Mexico	82681	388711			564058
New York	1387295	2962475	997115	625243	3789597
North Carolina	4738935	543008	1398712	403669	4205060
North Dakota	246645	132027	47640		659190
Ohio	1958157	2406729	1096345	260056	7049316
Oklahoma	1346814	D	738074	D	1721318
Oregon	363713	661565	124997	39648	1866528
Pennsylvania	4137792	2860109	1041222	676577	5633486
Rhode Island	41543	D		32775	316412
South Carolina	1153404	280169	160336		1532749
South Dakota	1396799	441888	180651		703531
Tennessee	1449006	799894	435638	259249	4669092
Texas	10445440	2100361	2070344	551360	9626850
Utah	686323	940894	158545	23199	1780857
Vermont	25135	570809	97913		260543
Virginia	3712689	1266462	596912	32731	2529569
Washington	1656675	999349	339479	140457	2625493
West Virginia	420507	86771		46319	870280
Wisconsin	5437135	8561181	737234	772133	5057846

Table II.2b—Continued.

State	Meat product manufacturing	Dairy product manufacturing	Animal food manufacturing	Leather and allied product manufacturing	Truck transportation
Wyoming					283402

Source: U.S. Bureau of the Census, 1997 Economic Census; D: Withheld to avoid disclosing data of individual companies; data are included in higher level totals; N: Not available or not comparable; S: Withheld because estimate did not meet publication standards; Z: Less than half the unit shown; a: 0 - 19 employees; b: 20 - 99 employees; c: 100 - 249 employees; e: 250 - 499 employees; f: 500 - 999 employees; g: 1,000 - 2,499 employees; h: 2,500 - 4,999 employees; i: 5,000 - 9,999 employees; j: 10,000 - 24,999 employees; k: 25,000 - 49,999 employees; l: 50,000 - 99,999 employees; m: 100,000 or more employees; p: 10 to 19 percent estimated; q: 20 to 29 percent estimated; r: Revised; s: Sampling error exceeds 40 percent.

Table IV.1--Government costs for exclusion, surveillance, indemnities, transport, inspection, testing, and disposal			
Aggregate budgeted costs			
		Foot and Mouth Disease	Bovine Spongiform Encephalopathy
Indemnities		Appraisal (market value)	Appraisal (market value)
Exclusion (spent in foreign countries)		$3,795,000[a]	
Exclusion (U.S. ports of entry)		$14,200,000[a]	
Monitoring and Surveillance		$562,000[a]	$656,000[a]
Preparedness (includes research and emergency preparedness)		$3,117,000[a]	
Diagnostics		$621,000[a]	$329,000[a]
Costs on a per-head basis			
Inspection/testing	Minimum:	$84.5-$88.25 (virus isolation) $12.75 (ELISA)[b]	$60 per head[b]
	Possible additional:	$33.00 (complement fixation) $25.75 (virus neutralization) $14.75 (VIAA)[b]	
Disposal	Burying	$35.00[c]	$35.00[c]
	Burning/incine-ration	$120.00[c]	$120.00[c]

[a]Fiscal year 2001 budget amounts, primarily annual apropriated funds. FMD amounts include Agriculture Quarantine Inspection Program (AQI) user fee and supplemental funds.
[b]Seitzinger, A.H., U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Personal communication, September 5, 2001.
[c]Original estimates, indexed to year 2000 dollars, were from McCauley, E.H., J.C. New, Jr., N.A. Aulaqi, W.B. Sundquist, and W.M. Miller. *A Study of the Potential Economic Impact of Foot-and-Mouth Disease in the United States*. TB-1597, Cooperative agreement between the University of Minnesota, St. Paul, MN, and the Animal and Plant Health Inspection Service, U.S. Department of Agriculture, May, 1979.

Table V.1—Comparison of effects of Foot and Mouth Disease and Bovine Spongiform Encephalopathy		
	Foot and Mouth Disease (FMD)	Bovine Spongiform Encephalopathy (BSE)
Animal cases to date	over 3,837,000 head; 9,327 farms[a]	184,865 head; 35,406+ farms[b]
Human health/Food safety issues	No	Yes
Human illnesses to date	40 worldwide[c]	Approximately 124 worldwide, none in the U.S.[d]
Animal health threat to trading partners	Yes	Yes
Contageousness to animals	Highly; through many modes of transmission	Yes; possibly through prion-infected meat and bone meal
Causitive agent	virus	prion (?)
Estimated costs and location of recent outbreaks	$3.6-$11.6 billion; U.K.[e]	$700+million; U.K.[f]

[a]Source: DEFRA (Department of Environment, Food, and Rural Affairs), United Kingdom "Foot and Mouth Disease" homepage, <<http://www.defra.gov.uk/animalh/diseases/fmd/generalstats.asp>>, as accessed on September 6, 2001.
[b]Office International des Epizooties, World Organisation for Animal Health, Paris, France <<http://www.oie.int/eng/info/en_esbmonde.htm>> as accessed on September 6, 2001, and Dr. L. Detwiler, personal communication, April 11, 2002.
[c]Dr. Tom Gomez, Center for Disease Control and Prevention, U.S. Department of Health and Human Services, Atlanta, GA, in July, 2001.
[d]World Health Organization, <<http://www.who.int/inf-fs/en/fact180.html>> as accessed on September 6, 2001.
[e]The Economist. "Foot, Mouth and Public Policies." *The Economist*. April 1, 2001, http://www.economist.com/agenda/displaystory.cfm?story_id=560922&CFID=47031&CFTOKEN=59860087, accessed April 12, 2001.
[f]Food Institute Report, January 29, 2001 <<www.foodinstitute.com>> accessed May 5, 2001.

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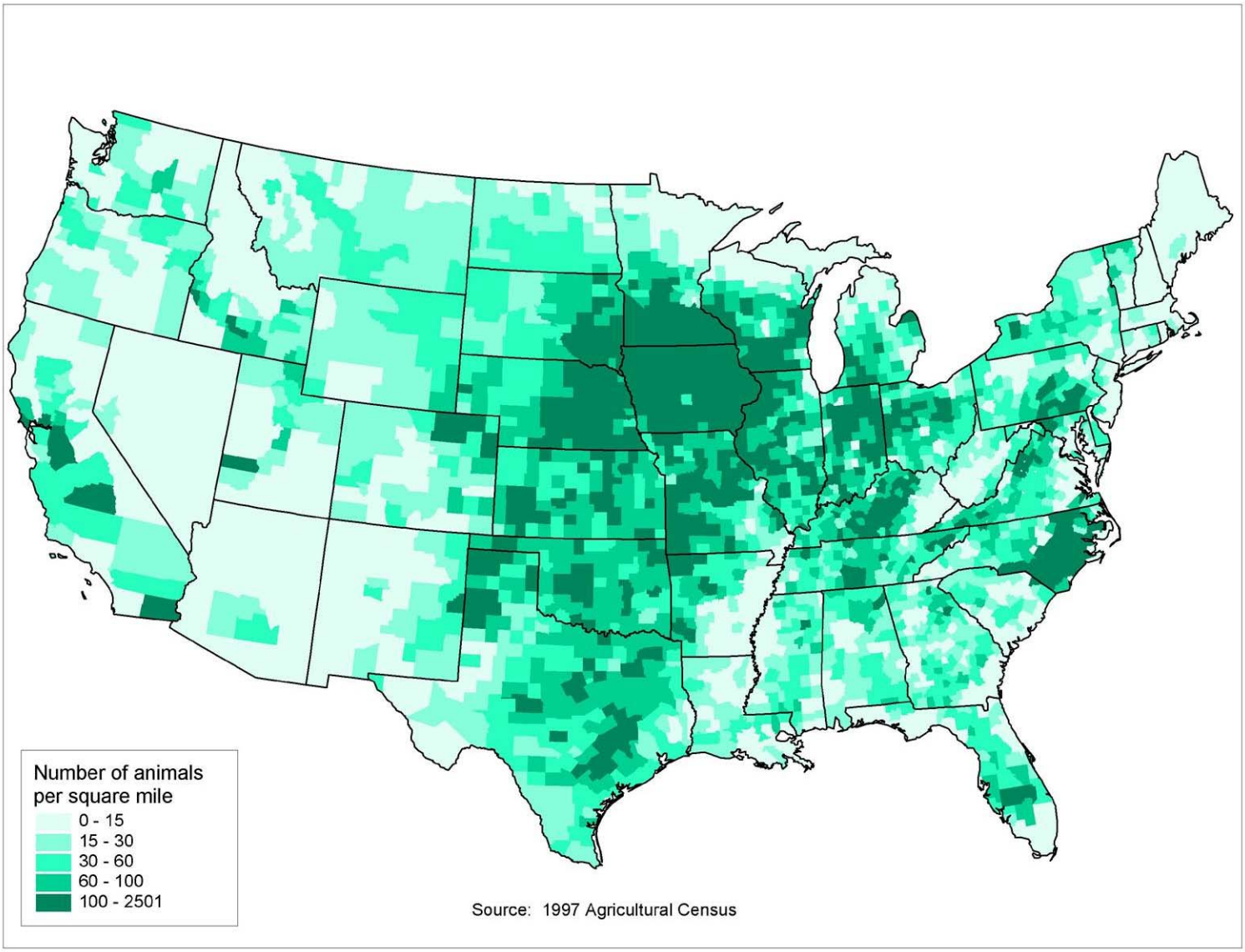
Figure 1. Density of Cloven-Hoofed Livestock in the United States, 1997.



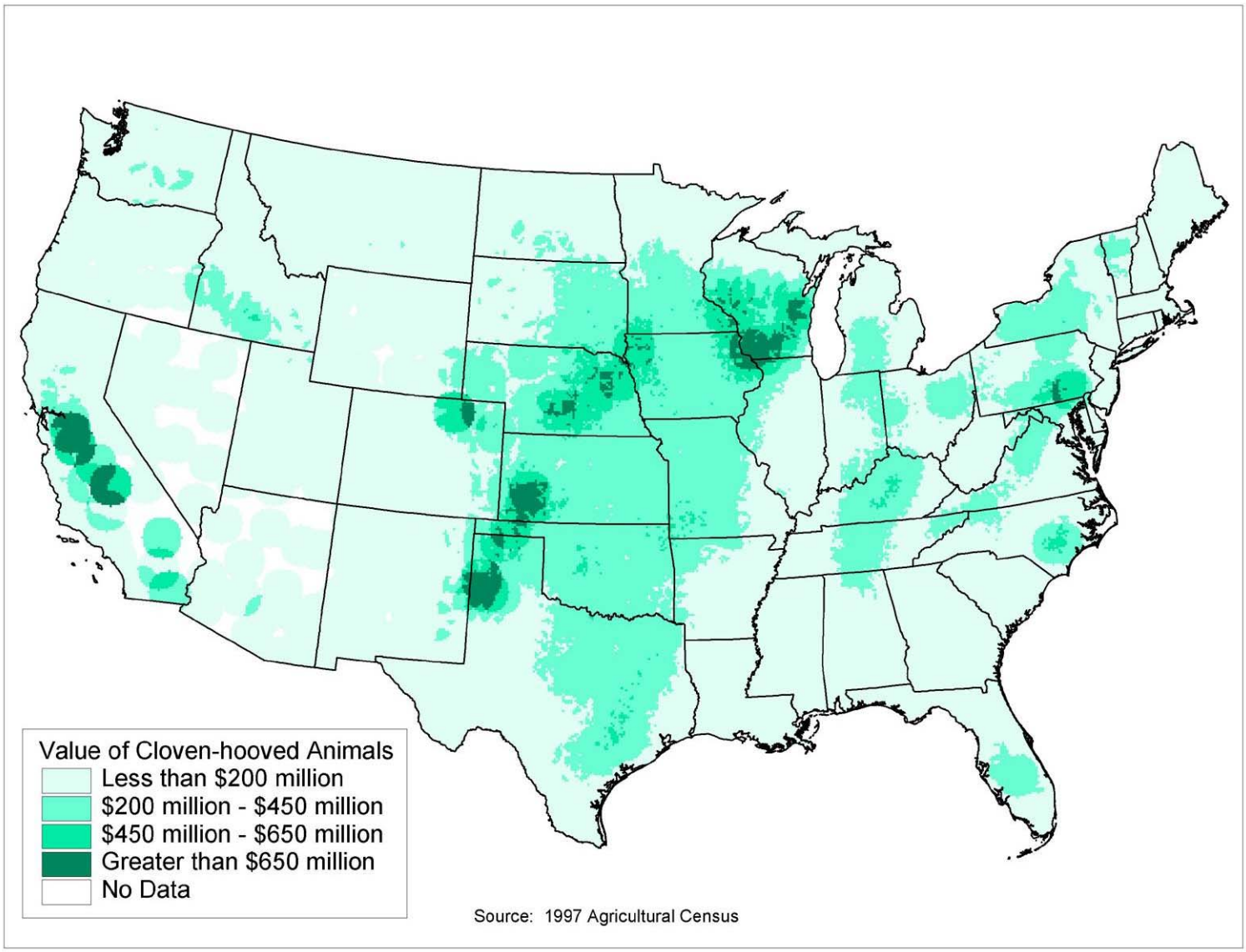


Figure 2. Value of Cloven-Hoofed Livestock in the United States, 1997.

Figure 3. Receipts for Lodging, Food and Drink, Amusement, and Recreation Within Fifty Miles of County Centroids in the United States, 1997.

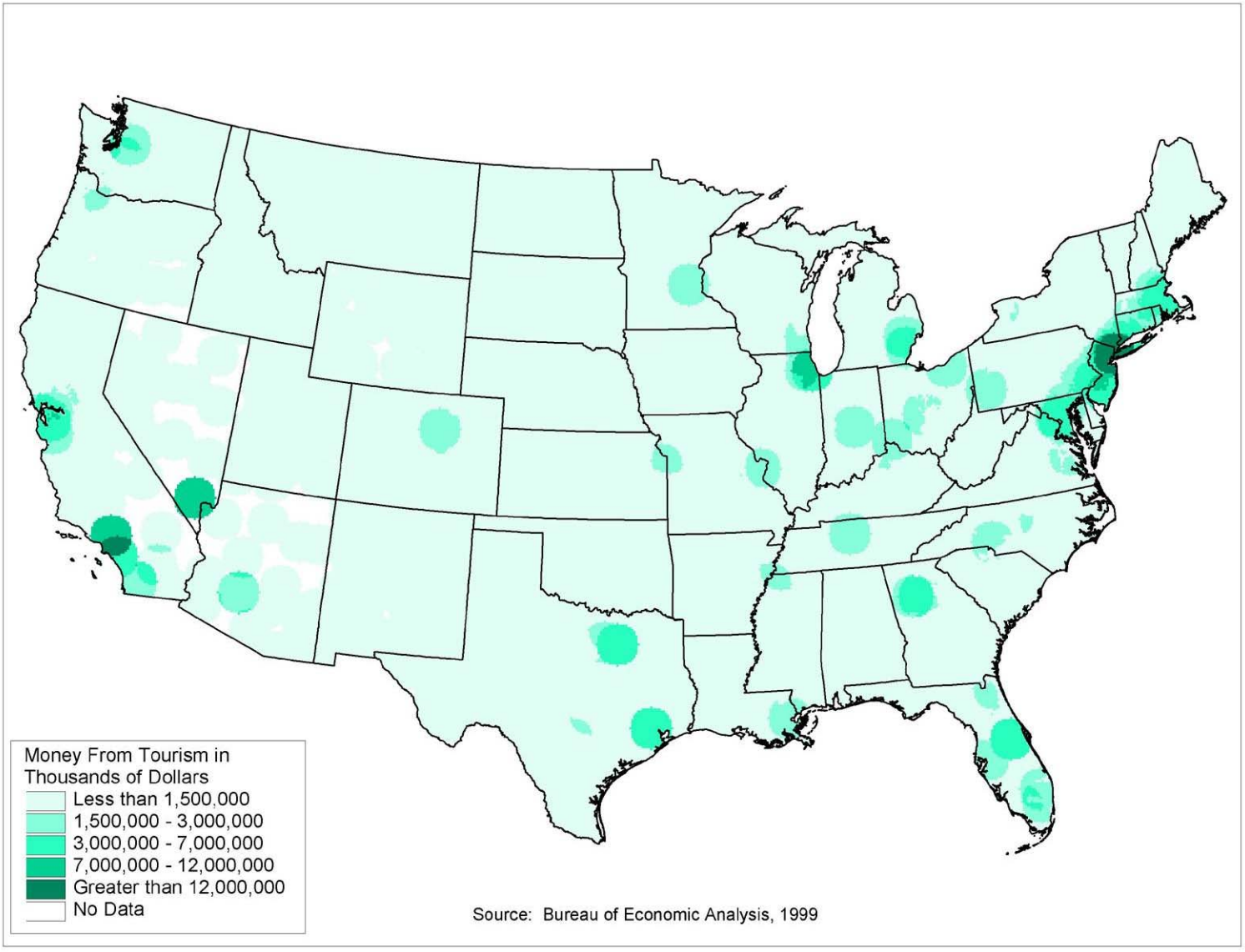


Figure 4. Receipts for Hotels and Other Lodging, Food and Drink, Amusement, Recreation, and Cloven-Hoofed Livestock Within Fifty Miles of County Centroids in the United States, 1997.

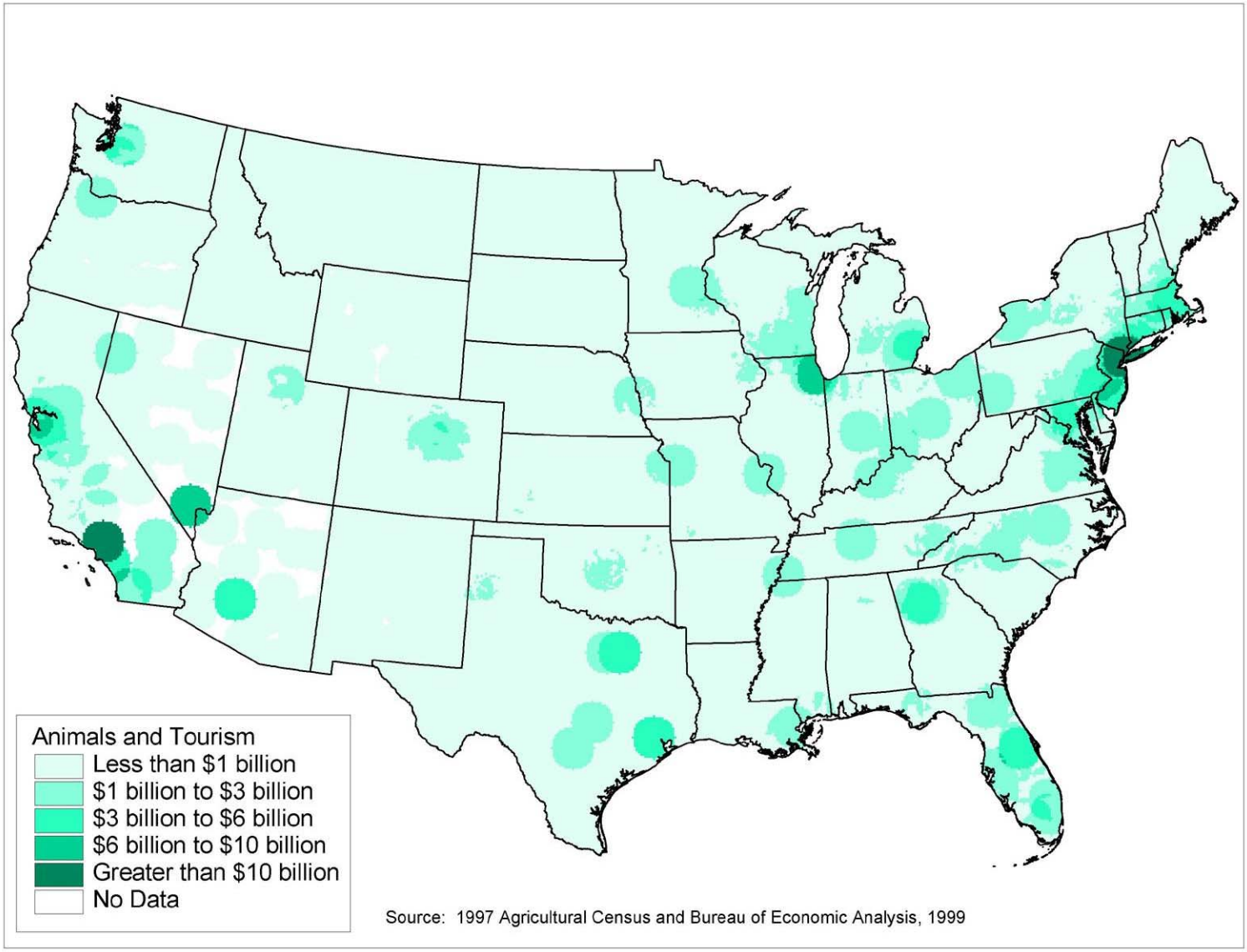
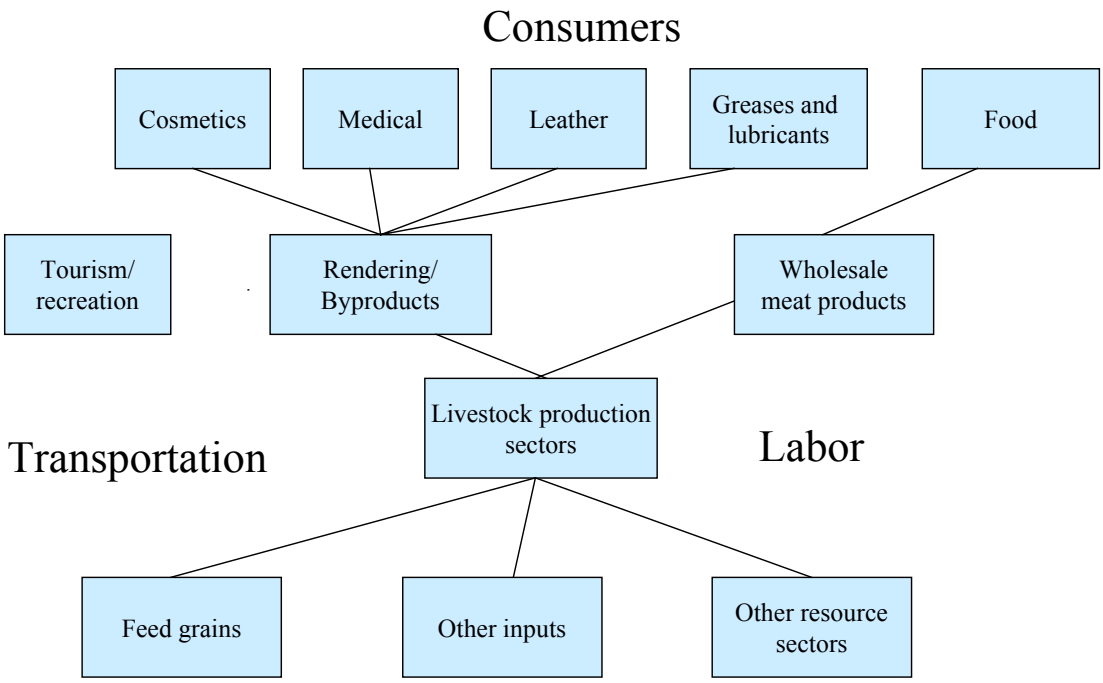


Figure 5. Schematic of Potential Distribution of Economic Sectors Affected by Outbreaks of Major Livestock Diseases in the United States.



Appendix 7. U.S. Customs Enforcement Strategy Proposal

INTERAGENCY ENFORCEMENT STRATEGY FOR THE PREVENTION OF THE INTRODUCTION OF FOREIGN ANIMAL DISEASES INTO THE UNITED STATES

Introduction

In order to prevent the introduction of any foreign animal disease into the United States, an effective interagency enforcement strategy must developed. The strategy must possess two key elements, communication and coordination, or the initiative will be doomed to failure. Absent these elements, the process will be prone to inevitable loopholes and lapses in the effectiveness of the enforcement procedures.

It should be noted that the following enforcement methodology is not limited to prevention measures or to international trade for that matter. This methodology may be employed for any type of enforcement activity that requires coordination with external sources. It is not limited in scope and addresses the threat of agricultural, biological and chemical terrorist activities.

Communication

Communication is the first vital step in the enforcement mission.

All entities involved in the enforcement effort must be in possession of the full facts of the mission, the expected outcome of the enforcement action, and most importantly, a clear understanding of the desired goal. This requires a clear, concise communication from the primary agency.

A primary agency may be defined as the entity that by law has the fundamental interest in a particular issue and exercises their authority regarding the ultimate disposition of said issue.

The Enforcement Condition

When an enforcement condition develops, the primary agency must conduct a thorough data analysis of the situation. All impacted entities within the agency (offices, divisions, sectors, branches, etc.) must be alerted to the condition and take an active role in the data analysis endeavor.

This action will require a complete examination of the agency's internal structure to determine the realms of responsibility and legal/operational jurisdiction for each component

of the agency. Upon completion of the activity, an internal agency task force must be formed.

Analysis of the Enforcement Condition

The internal agency task force must establish operating guidelines for the agency. "Points of contact" must be assigned to represent the various entities of the agency. The agency task force must analyze the external impact of this enforcement condition.

To effectively analyze the external impact, a series of "what if" questions and scenarios must be developed. "What if" questions and scenarios are used to examine the lifecycle of the initiative, including all expected and unexpected outcomes and events, involved with the condition.

The results of this analysis will be used to identify the external sources (Federal, State and local agencies, departments and authorities) that may participate in the enforcement strategy. A thorough examination of current "Memorandums of Understanding" (MOU) with the impacted external sources must be performed.

With this information, the task force will develop a proposed enforcement strategy. The proposed enforcement strategy must include all aspects of the enforcement mission, including all possible outcomes. The task force must now contact all impacted external sources to schedule the initial meeting.

Interagency Initial Meeting

The initial meeting is used to present the enforcement condition. During the initial meeting, the primary agency will describe the scope of the enforcement condition. The scope must include the facts and the lifecycle analysis of the enforcement condition.

The primary agency will also present the proposed enforcement strategy. External sources should be encouraged to examine the proposed enforcement strategy and complete business process. A follow up meeting should be scheduled. All participants should be prepared to present their analysis and recommendations to the proposed enforcement strategy.

The External Sources

The external sources should perform the same exercises as executed by the primary agency. They should identify all impacted entities with in their respective agency. These impacted entities must conduct a comprehensive analysis of the enforcement condition, the proposed enforcement strategy, and the business process and perform an agency impact

study. They must determine the agency's role in the proposed enforcement strategy, including legal responsibility.

An agency "point of contact" should be established. This individual will be responsible for the overall coordination of the mission for the agency. A report should be developed for presentation at the follow up meeting.

Interagency Follow-up Meeting

The purpose of the follow up meeting is to foster an open dialogue between the primary agency and all external sources. This is accomplished as each agency presents their unique perspective of the proposed enforcement strategy.

It is here that all parties will begin to understand the limitations, liabilities and possible loopholes in the proposed enforcement strategy. Once an understanding is reached, an effective enforcement strategy may be developed.

During the development of the actual enforcement strategy, the business process may be altered which may result in a complete departure from the original enforcement strategy concept. Considerations must be made toward resource allocations and other workload-related constraints however the role of the agencies should not change. Legal and operational jurisdictions will remain unaltered and will provide clear lines of delineation of agency responsibility.

Enforcement Strategy Implementation and Beyond

After the enforcement strategy has been implemented, the primary agency and impacted external sources must monitor the progress of the mission. Statistics must be gathered and analyzed. The complete lifecycle of the enforcement mission must be tracked and recorded. This will require an extensive interagency coordination effort.

Coordination and Data Sharing

Coordination, which is woven throughout the enforcement process, will now take center stage.

It is vital to the success of the mission that any pertinent enforcement data is shared. The goal of this data-sharing enterprise is to focus the enforcement efforts into a more targeted approach. Using the principles of risk management and business process modeling, the enforcement criteria becomes more refined, and therefore, more effective.

To successfully accomplish this task, subsequent meetings should be scheduled for all entities involved in the enforcement strategy. All entities will share the results of their findings. Armed with this information, enforcement criteria may now be updated as appropriate by each entity.

Data sharing and analysis should continue over the lifetime of the enforcement mission. Trend analysis and resource impact studies must be performed to ensure that effective enforcement activities remain strong.

Internal Audit Studies

As part of the analysis effort, all entities must be assured that their internal enforcement procedures are effective. Internal audit studies must be incorporated into the analytical process. These studies are an effective tool to measure the accountability standards of employees as related to their area of responsibility in the enforcement strategy. The results of these studies will help to shape and redefine the scope of the enforcement strategy.

Conclusion

In conclusion, communication and coordination must be considered as essential elements in any interagency enforcement exercise. Foreign animal diseases represent a deadly threat not only to the health and well being of the American public and America's agricultural industry, but also to the economy of the United States.

The issue here is not what to do if an outbreak occurs but what must be done to prevent such an occurrence.

The prevention of the introduction of foreign animal diseases into the United States is an issue for all impacted Federal, state and local authorities. Communication and coordination among these entities will serve as the vehicle that will ensure the successful completion of the mission.

Appendix 8.
FY 2003 FMD and BSE Related Budget Initiatives for USDA Agencies on the PL107-9 Interagency Working Group

Agency	**Proposed activity**	**Amount** ($ 000's)
USDA		
APHIS	Increased AQI border inspections	2,800
	Increased AQI cargo inspections	4,979
	Coordination with Customs database	4,200
	FMD surveillance overseas	4,119
	Emergency management technical assistance overseas	789
	FMD/FAD domestic surveillance	9,046
	Swine feeding facilities increased inspections	4,000
	BSE surveillance	8,443
	CWD certification and control program	7,233
	Scrapie Testing and Control	19,358
	Wildlife surveillance	8,225
	Emergency Managers	4,000
	FAD laboratory testing	2,300
	Total for APHIS	**79,492**
ARS	Research on FMD detection methods and vaccines	2,500
	TSE pathogenesis studies and biosecurity	2,000
	Counterterrorism activities, including lab systems for implementation of rapid diagnostic detection technologies.	5,000
	Total for ARS	**9,500**
CSREES	FMD research on epidemiologic models, control/eradication	102
	TSE transmission, control and detection methods	431
	Total for CSREES	**533**
ERS	Research on the Effects of Invasive Pests and Diseases on the Competitiveness of U.S. Agriculture	**2,000**
FSIS	Targeted epidemiological surveys for foreign animal diseases at slaughter facilities	**1,200**
Total USDA		**92,725**