

GAO

Briefing Report to the Committee on  
Agriculture, Nutrition, and Forestry,  
U.S. Senate

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June 1995

# ANIMAL AGRICULTURE

## Information on Waste Management and Water Quality Issues





**Resources, Community, and  
Economic Development Division**

B-261629

June 28, 1995

The Honorable Richard G. Lugar  
Chairman  
The Honorable Patrick J. Leahy  
Ranking Minority Member  
Committee on Agriculture,  
Nutrition, and Forestry  
United States Senate

Initiatives to address agricultural sources of water pollution are likely to receive considerable attention during the debates over the 1995 farm bill. In preparation for these debates, you requested that we provide information on the management of animal agriculture waste<sup>1</sup> and related water quality issues. Specifically, you asked us to provide information on (1) water quality concerns arising from animal agriculture sources of nonpoint pollution—pollution not traceable to a specific point of origin,<sup>2</sup> (2) consolidation trends and geographical shifts in animal agriculture, (3) animal agriculture production covered by point source permits,<sup>3</sup> (4) commonly used animal waste management practices and their associated costs, and (5) U.S. Department of Agriculture (USDA) cost-share assistance for animal waste management. In addressing these objectives, you also asked us to focus on the management of wastes associated with breeding and feeding operations—generally farms, ranches, and feedlots—for beef cattle, dairy cows, hogs, broilers, layers (laying hens), and turkeys. We briefed your offices on this request on June 26, 1995. This briefing report summarizes the information provided in that briefing.

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**Results in Brief**

Nonpoint pollution from animal waste runoff can impair surface water and groundwater by introducing excess nutrients, organic matter, and pathogens. In general, impaired waters are those that do not fully support one or more designated uses, such as providing drinking water, allowing swimming, or supporting the existence of edible fish and shellfish. According to water quality assessments prepared by the 50 states, agricultural nonpoint pollution (from both crop and animal production) is

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<sup>1</sup>Animal agriculture waste generally refers to manure but also includes urine, animal carcasses, bedding, poultry litter, and wastewater.

<sup>2</sup>Animal agriculture sources of nonpoint pollution include animal waste runoff from animal feeding operations; cropland where manure has been applied as fertilizer; and livestock feeding and watering areas on rangeland and pastureland.

<sup>3</sup>Point sources discharge into surface water from a discrete point, such as a pipe or other conveyance.

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a major source of impairment in the waters assessed. In addition, 18 states further reported on agricultural nonpoint pollution by specific categories—feedlots, rangeland, irrigated cropland, and nonirrigated cropland. Their information regarding animal waste runoff from feedlots and rangeland indicates that this runoff is a significant factor in water quality impairment. (See section I.)

Consolidation (or concentration) of animal production in large, confinement-type operations has increased since the 1970s for each of the livestock and poultry sectors studied. For example, in the hog industry's top 10 production states, the inventory controlled by the operations in the largest category (500 or more hogs) increased from about 40 percent of the inventory of these states in 1978 to about 77 percent in 1994. Also, in the broiler sector, sales attributable to operations in the largest category (100,000 or more birds sold) increased from about 70 percent of national sales in 1974 to about 97 percent in 1992. Over the same period, however, the top 10 production states for each livestock and poultry sector remained largely unchanged, although the relative share of production among these states usually changed. (See section 2.)

Discharges from concentrated feeding operations may be controlled by point source permits; these permits are issued by the Environmental Protection Agency (EPA) or by states delegated permitting authority by EPA.<sup>4</sup> Under EPA's regulations, concentrated animal feeding operations are generally those that have more than 1,000 animal unit equivalents<sup>5</sup> and that also discharge to U.S. waters during most storm events. According to EPA, about 1,987 concentrated animal feeding operations in the livestock and poultry sectors we examined had point source permits as of April 1995.<sup>6</sup> USDA estimates that there are about 6,600 animal feeding operations nationwide in these sectors that have more than 1,000 animal unit equivalents. According to EPA, many operations with more than 1,000 animal unit equivalents are not required to have point source permits because they do not discharge during most storm events; others should

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<sup>4</sup>Authority for issuing point source permits is contained in Section 402 of the Clean Water Act. This section establishes the National Pollutant Discharge Elimination System permit program to control discharges to U.S. waters from point sources such as wastewater treatment plants and industrial facilities. These facilities include concentrated animal feeding operations such as large feedlots.

<sup>5</sup>Animal unit equivalents are calculated for each livestock and poultry sector according to estimated rates of manure production for each species. Thus, the number of animals representing "1,000 animal unit equivalents" varies by sector.

<sup>6</sup>According to EPA, the number of concentrated animal feeding operations with point source permits in the livestock and poultry sectors we examined may exceed 1,987. EPA officials said that the agency's database of permitted operations is incomplete because some states that have been delegated authority for issuing point source permits by EPA are not regularly reporting permit issuances to EPA.

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have permits but do not because of mistaken exemptions or limited federal or state resources for identifying operations needing permits. (See section 3.)

Commonly used animal waste management practices include (1) treatment lagoons, retention ponds, and other storage structures to hold animal wastes until they can be used as fertilizer; (2) vegetative filter strips, constructed wetlands, and other buffers to remove nutrients and organic matter from animal waste runoff before it reaches surface water; and (3) nutrient management based on testing the nutrient content of soil, plant tissue, and manure to ensure proper timing and application rates when applying manure as fertilizer. The waste management practice selected depends on site-specific factors such as soil composition and the proximity of an operation to surface water or groundwater; practice costs vary depending on the size and type of operation and climatic conditions. (See section 4.)

USDA generally provides cost-share assistance to farmers for animal waste management under four conservation programs: Agricultural Conservation Program; Water Quality Incentives Projects; Small Watershed Program; and, Rural Clean Water Program. For fiscal years 1992 through 1994, these programs provided about \$89 million in cost-share assistance to farmers to assist them in financing a variety of waste management practices to prevent water pollution. Most of this funding (about \$65 million) was provided under the Agricultural Conservation Program. (See section 5.)

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## Scope and Methodology

To address our objectives, we analyzed data from various sources, including USDA's Consolidated Farm Service Agency, Economic Research Service, National Agricultural Statistics Service, and Natural Resources Conservation Service; EPA; the Department of the Interior's U.S. Geological Survey; and the Department of Commerce's Census of Agriculture.

We conducted our work between December 1994 and June 1995 in accordance with generally accepted government auditing standards. We did not independently verify the data obtained from the agencies contacted. Appendix I contains further information on our scope and methodology.

We discussed the contents of this report with officials representing USDA and EPA. At USDA, these officials included the Assistant Deputy Administrator, Economic Analysis and Appraisal Staff, Consolidated Farm

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Service Agency; Assistant Director for Economics and Communication, Resource and Technology Division, Economic Research Service; Chief, Livestock Branch, Estimates Division, National Agricultural Statistics Service; and Manager, Water Quality Program, Conservation and Ecosystem Assistance Division, Natural Resources Conservation Service. At EPA, these officials included the Chief, Nonpoint Source Control Branch, Assessment and Watershed Protection Division, Office of Wetlands, Oceans, and Watersheds; and the Chief, Pretreatment and Multi-Media Branch, Permits Division, Office of Wastewater Management. These officials agreed that the positions and data attributed to their agencies were accurate. They also provided new or clarifying information that we incorporated as appropriate.

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We are sending copies of this report to the appropriate Senate and House Committees; interested Members of Congress; the Secretary of Agriculture; the Director, Office of Management and Budget; and other interested parties. We will also make copies available to others on request.

If you or your staff have any questions, please contact me at (202) 512-5138. Major contributors to this report are listed in appendix II.



John W. Harman  
Director, Food and  
Agriculture Issues

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**Abbreviations**

ACP	Agricultural Conservation Program
AU	animal unit
BMP	best management practice
EPA	Environmental Protection Agency
ERS	Economic Research Service
GAO	General Accounting Office
NASS	National Agricultural Statistics Service
NAWQA	National Water Quality Assessment
RCWP	Rural Clean Water Program
SWP	Small Watershed Program
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WQIP	Water Quality Incentives Projects

# Water Quality Concerns Related to Animal Agriculture Production

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## GAO Surface Water Impaired by Agriculture According to State Assessments

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- Nationally, states assessed 18% of river and stream miles, 46% of lake acres, and 74% of estuary square miles
  - Rivers and streams: 38% of assessed miles were impaired; 72% of these were affected by agricultural nonpoint pollution
  - Lakes: 44% of assessed acres were impaired; 56% of these were affected by agricultural nonpoint pollution
  - Estuaries: 32% of assessed square miles were impaired; 43% of these were affected by agricultural nonpoint pollution
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Note: According to EPA officials, these state assessment data are generally the best available information on water quality from a national perspective. However, these officials said the data have several limitations: water quality assessment methodologies were not consistent across states; not all surface waters were assessed; and, surface waters assessed do not constitute a representative sample for projection purposes.

Source: National Water Quality Inventory: 1992 Report to Congress, Environmental Protection Agency (Washington, D.C.: Mar. 1994).

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**Briefing Section 1  
Water Quality Concerns Related to Animal  
Agriculture Production**

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In 1990 and 1991, each state assessed the condition of its surface water and reported this information to the Environmental Protection Agency (EPA) in accordance with section 305(b) of the Federal Water Pollution Control Act, as amended,<sup>1</sup> commonly known as the Clean Water Act. These state assessment data show the following:

- The states assessed about 18 percent of the nation's river and stream miles; 46 percent of its lake acres; and 74 percent of its estuary square miles.<sup>2</sup>
- About 38 percent of the nation's assessed river and stream miles, 44 percent of its assessed lake acres, and 32 percent of its assessed estuary square miles were impaired, meaning that they were not fully supporting their designated uses, such as providing drinking water, allowing swimming, or supporting the existence of edible fish or shellfish.
- Crop and animal agriculture nonpoint pollution affected about 72 percent of impaired river and stream miles, 56 percent of impaired lake acres, and 43 percent of impaired estuary square miles.
- Among five general categories of pollution sources (Municipal Point Sources; Urban Runoff/Storm Sewers; Agriculture; Industrial Point Sources; and Natural Sources), agriculture ranked as the number one cause of impaired rivers and streams and lakes, and the number three cause of impaired estuaries.

The states also assessed the condition of their groundwater. On the basis of these assessments, EPA concluded that although the nation's groundwater quality is generally good, many local areas have experienced significant groundwater contamination. According to EPA, agriculture is one of the main sources of groundwater pollution.

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<sup>1</sup>33 U.S.C. 1251 *et seq.*

<sup>2</sup>Estuaries are coastal areas where fresh water and salt water mingle.

## GAO Impaired River and Stream Miles by Source of Impairment for 18 States

Source of impaired miles	As a percent of total miles assessed	As a percent of agriculturally impaired miles
Feedlot	9	26
Rangeland	8	25
Nonirrigated cropland	14	42
Irrigated cropland	10	31

Note: The sum of impaired miles for each source as a percent of agriculturally impaired miles does not add to 100 percent because impairment may be attributable to multiple sources.

Source: GAO analysis of EPA's 1992 Section 305(b) data.

As part of the water quality assessments they performed, 18 states<sup>3</sup> collected data on agricultural sources of nonpoint pollution impairing river and stream miles within their borders. These sources were designated by four categories—feedlot, rangeland, nonirrigated cropland, and irrigated cropland. This information showed the following:

- Nonpoint pollution from feedlots impaired about 9 percent of the river and stream miles assessed and about 26 percent of the miles impaired by agricultural nonpoint pollution.
- Nonpoint pollution from rangeland impaired about 8 percent of the river and stream miles assessed and about 25 percent of the miles impaired by agricultural nonpoint pollution.
- Nonpoint pollution from nonirrigated cropland impaired about 14 percent of the river and stream miles assessed and about 42 percent of the miles impaired by agricultural nonpoint pollution.
- Nonpoint pollution from irrigated cropland impaired about 10 percent of the river and stream miles assessed and about 31 percent of the miles impaired by agricultural nonpoint pollution.

Feedlots contribute to river and stream impairment as a result of animal waste runoff. Rangeland contributes to this impairment because of both animal waste runoff and soil erosion. Animal waste runoff can introduce excess nutrients (such as nitrogen and phosphorus), organic matter, and pathogens. Excess nutrient loadings can overstimulate the growth of algae. The decomposition of organic matter requires oxygen that would otherwise be available for fish and aquatic animals. Pathogen contamination can result in restrictions on using waters for drinking water, fish or shellfish harvesting, or recreation such as swimming and boating.

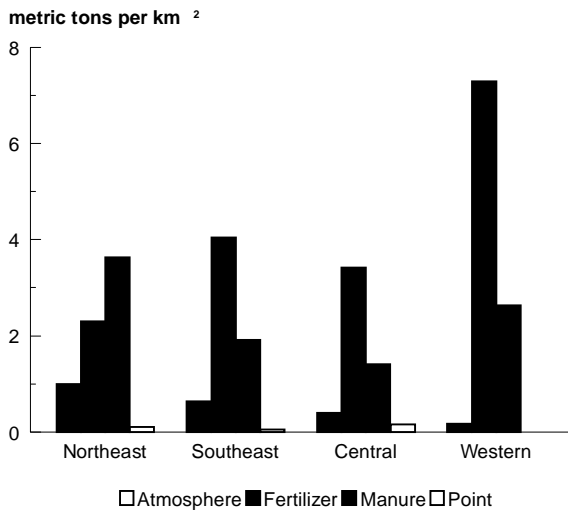
Nonirrigated and irrigated cropland contribute to river and stream impairment as a result of commercial fertilizer and pesticide runoff and soil erosion that reaches these waters; runoff of manure applied to cropland as a fertilizer may also be a component of the pollution associated with these categories.

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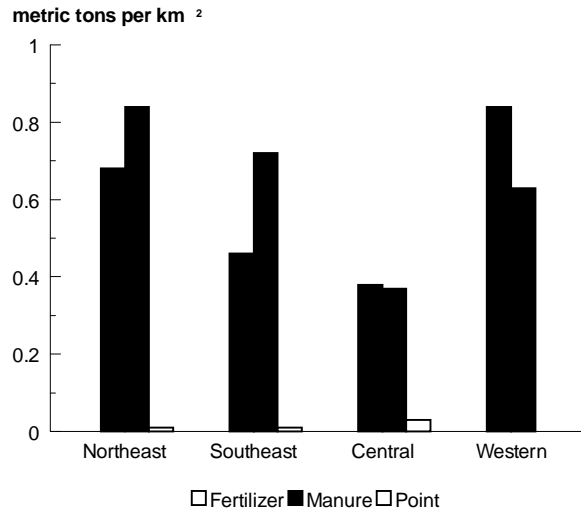
<sup>3</sup>These states are Delaware, Illinois, Kansas, Maine, Massachusetts, Michigan, Minnesota, Mississippi, Montana, Nevada, North Dakota, Oklahoma, Oregon, Texas, Vermont, Washington, West Virginia, and Wyoming. Collectively, these states (1) contain about 39 percent of the nation's river and stream miles and (2) assessed about 20 percent of their river and stream miles.

# GAO Annual Median Inputs of Nitrogen and Phosphorus to Watersheds, by Region

## Nitrogen Sources



## Phosphorus Sources



Note: Atmospheric inputs are calculated as loadings to the entire land area of a watershed. Fertilizer and manure inputs are calculated as loadings to the agricultural land in a watershed. Point source inputs are calculated as loadings to the urban land area of a watershed. According to the Department of the Interior's U.S. Geological Survey (USGS), calculating loadings in this manner was necessary to allow comparisons among the watersheds.

Source: USGS' National Water Quality Assessment data.

As part of its National Water Quality Assessment (NAWQA), USGS found that manure was a significant source of nitrogen and phosphorus inputs to the land areas of the 114 watersheds it studied using data compiled for these watersheds between 1980 and 1990.<sup>4</sup> The watersheds studied were in four geographical regions: Northeast (64 watersheds covering 17 percent of the region's land area); Southeast (20 watersheds covering 17 percent of the region's land area); Central (11 watersheds covering 11 percent of the region's land area); and Western (19 watersheds covering 8 percent of the region's land area).

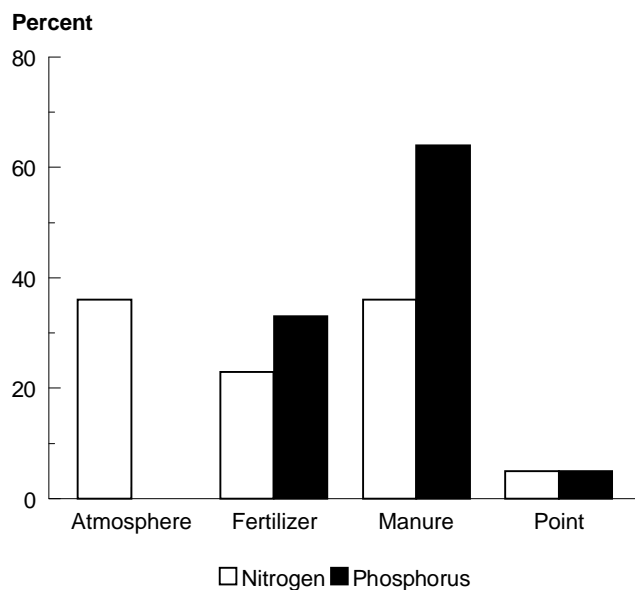
Manure was the primary source of nitrogen inputs in the Northeast region; it was the second most important source of inputs in the other regions. For phosphorus, manure was the primary source of inputs in the Northeast and Southeast regions; it was the second most important source in the Central and Western regions. According to USGS, the relatively high inputs of nitrogen and phosphorus from manure in the Northeast correspond to the high density of confined animal production—especially dairy—in that region. Similarly, USGS cited confined poultry and hog production in the Southeast as a reason for relatively high inputs of nitrogen and phosphorus from manure in this region.

According to USGS, most of the nutrient inputs to the land areas of these watersheds will not end up in rivers, streams, or other surface waters. Most of these nutrients will be absorbed by plants or bound up in the soil. Also, part of the nitrogen will return to the atmosphere as a gas. Nevertheless, statistical studies of water quality trends indicate that increases in in-stream loadings of nitrogen and phosphorus are, in part, strongly correlated with increases in the concentration of the livestock population in a watershed.

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<sup>4</sup>USGS' study delineated nitrogen inputs by four sources: atmospheric deposition (nitrogen constitutes about 78 percent of the earth's atmosphere, by volume); fertilizer (commercial fertilizers); manure; and point sources (primarily wastewater treatment and industrial discharges). Phosphorus sources were delineated by three sources: fertilizer, manure, and point sources. The 114 watersheds studied do not constitute a representative sample for projection purposes.

# GAO Sources of Nitrogen and Phosphorus Median Inputs for Northeast Region



Source: GAO analysis of NAWQA data.



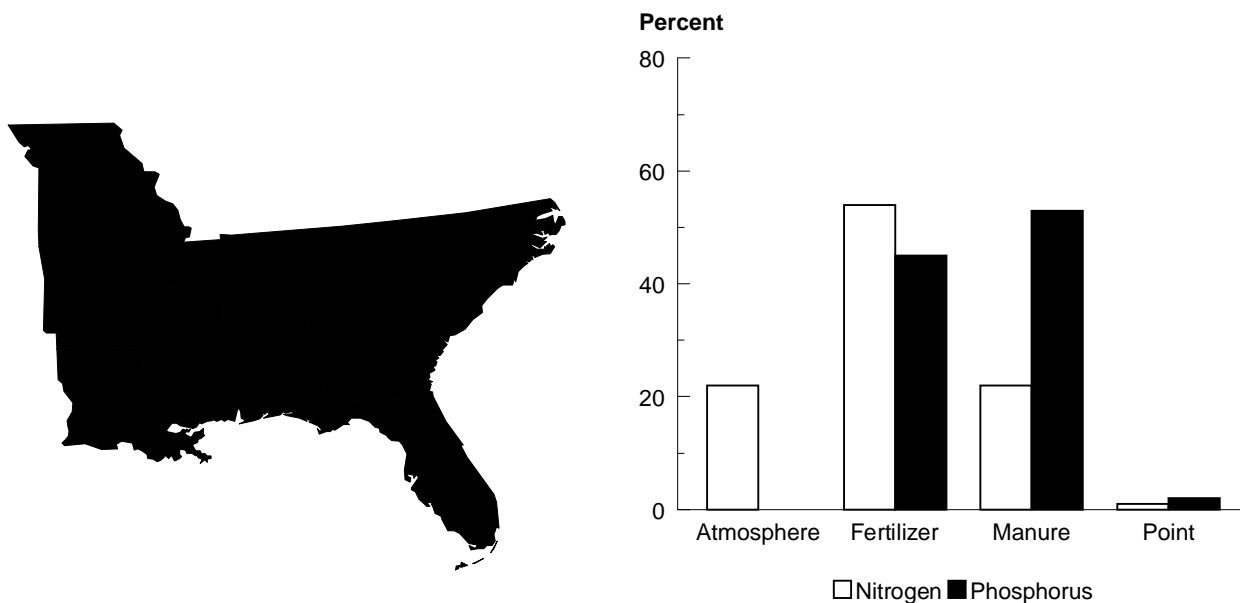
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**Briefing Section 1  
Water Quality Concerns Related to Animal  
Agriculture Production**

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According to NAWQA data, animal manure was a significant source of nitrogen and the primary source of phosphorus inputs in the watersheds studied in the Northeast region. Specifically, inputs of these nutrients from manure accounted for 36 percent of median inputs of nitrogen and 64 percent of median inputs of phosphorus in these watersheds.

# GAO Sources of Nitrogen and Phosphorus Median Inputs for Southeast Region



Source: GAO analysis of NAWQA data.

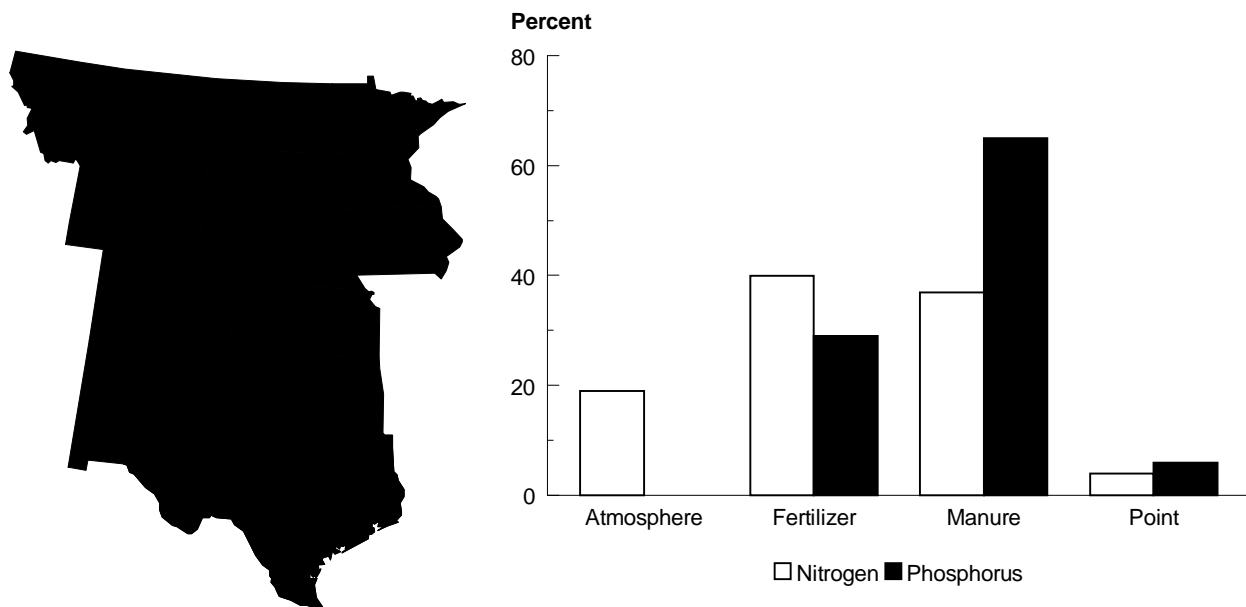
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**Briefing Section 1**  
**Water Quality Concerns Related to Animal**  
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NAWQA data indicate that animal manure was a contributing source of nitrogen and the most significant source of phosphorus inputs in watersheds studied in the Southeast region. Specifically, manure accounted for 22 percent of median inputs of nitrogen and 53 percent of median inputs of phosphorus in these watersheds.

# GAO Sources of Nitrogen and Phosphorus Median Inputs for Central Region



Source: GAO analysis of NAWQA data.

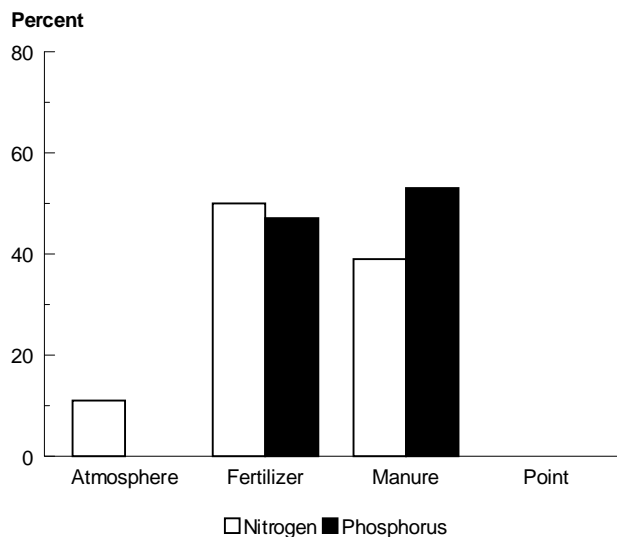
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**Briefing Section 1**  
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According to NAWQA data, manure was the second most significant source of nitrogen and the leading source of phosphorus inputs in the watersheds studied in the Central region. Specifically, inputs of these nutrients from manure accounted for 37 percent of median inputs of nitrogen and 65 percent of median inputs of phosphorus in these watersheds.

# GAO Sources of Nitrogen and Phosphorus Median Inputs for Western Region



Source: GAO analysis of NAWQA data.

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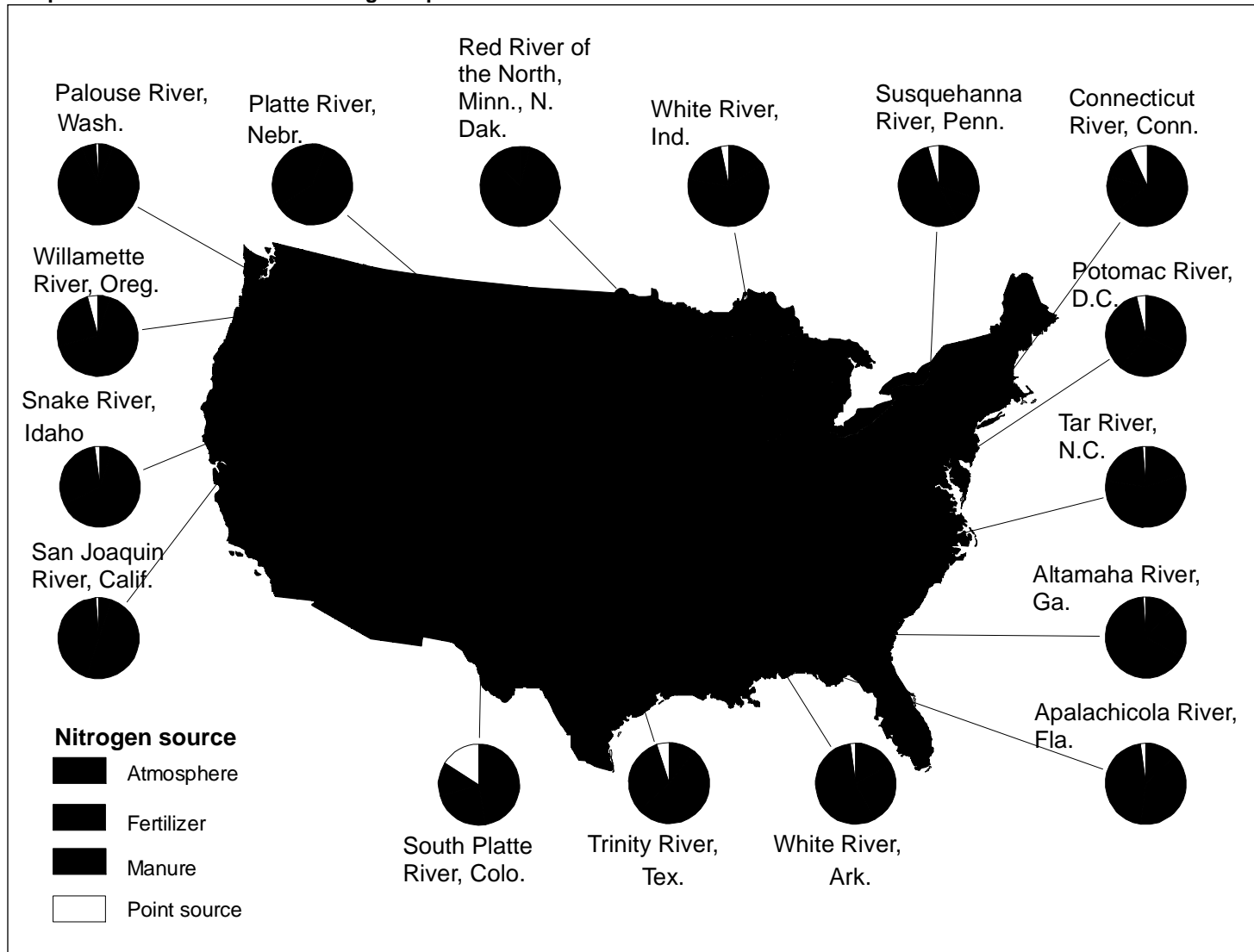
**Briefing Section 1**  
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NAWQA data indicate that manure was the second most important source of nitrogen and the leading source of phosphorus inputs in the watersheds studied in the Western region. Specifically, manure accounted for 39 percent of median inputs of nitrogen and 53 percent of median inputs of phosphorus in the watersheds studied.

**Briefing Section 1  
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**Nonpoint and Point Sources of Nitrogen Inputs in NAWQA Watersheds**



Source: NAWQA data.



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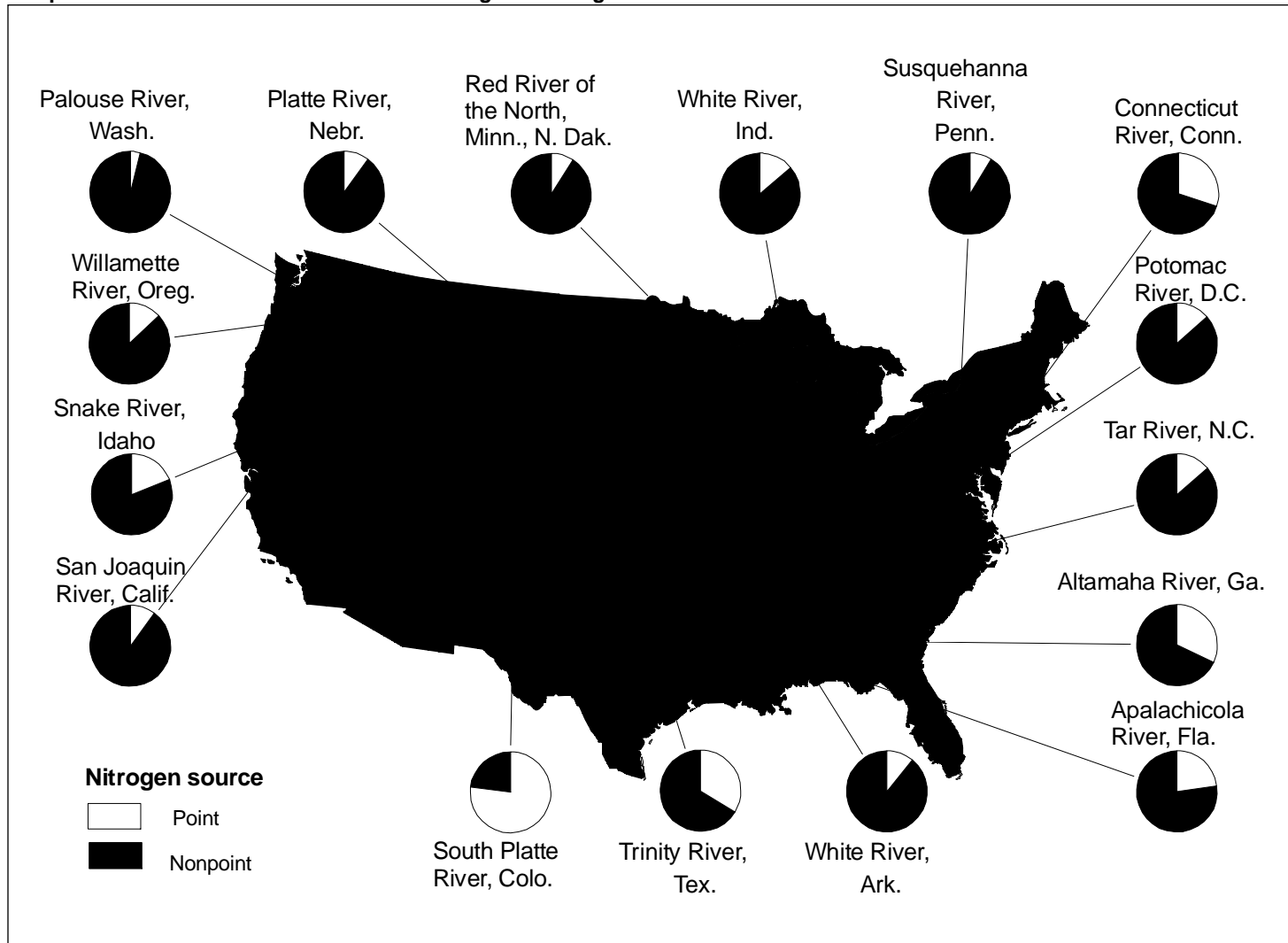
**Briefing Section 1**  
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This map depicts nitrogen inputs from nonpoint and point sources to the land areas of 16 NAWQA watersheds. Nonpoint sources include atmospheric deposition, commercial fertilizer, and manure. Point sources include wastewater treatment and industrial discharges. Manure contributes more than 25 percent of the nitrogen inputs to 10 of these watersheds, and more than 50 percent of the inputs to 3 other watersheds.

**Briefing Section 1  
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**Nonpoint and Point Sources of In-Stream Nitrogen Loadings in NAWQA Watersheds**



Source: NAWQA data.

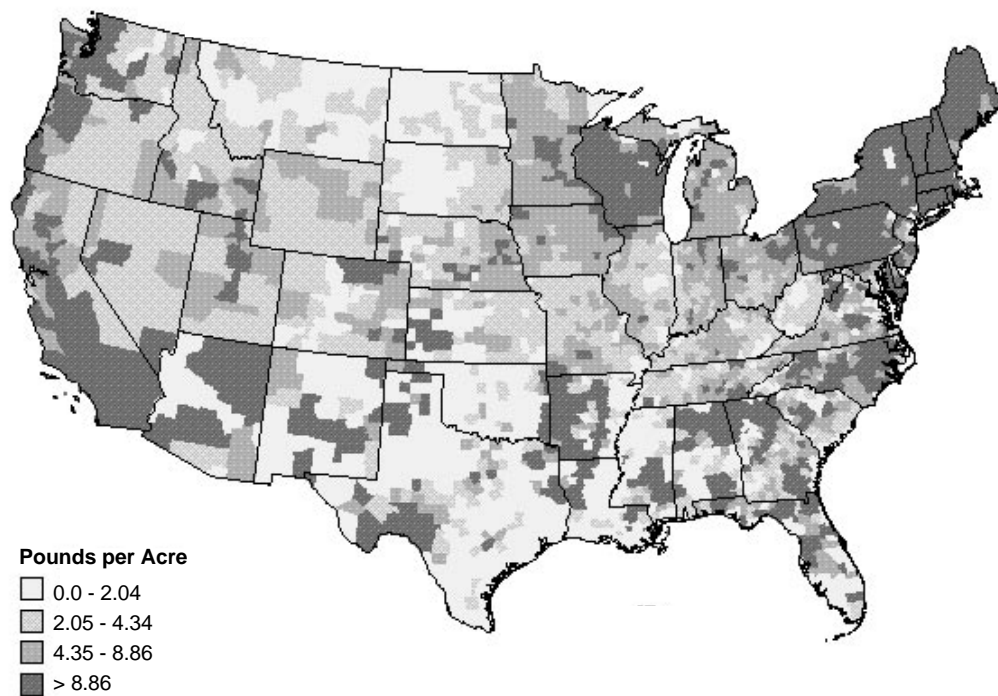
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**Briefing Section 1  
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This map depicts in-stream loadings (i.e., reaching surface waters) of nitrogen from point and nonpoint (including manure) sources for 16 NAWQA watersheds. Nonpoint sources contributed more than 50 percent of in-stream loadings of nitrogen in all but one of these watersheds (the South Platte River); in 12 of these watersheds, nonpoint sources contributed more than 75 percent of the in-stream nitrogen loadings.

## GAO Ratio of Nitrogen From Manure to Available Cropland by County



Note: Available cropland refers to the cropland on livestock and poultry farms in each county.

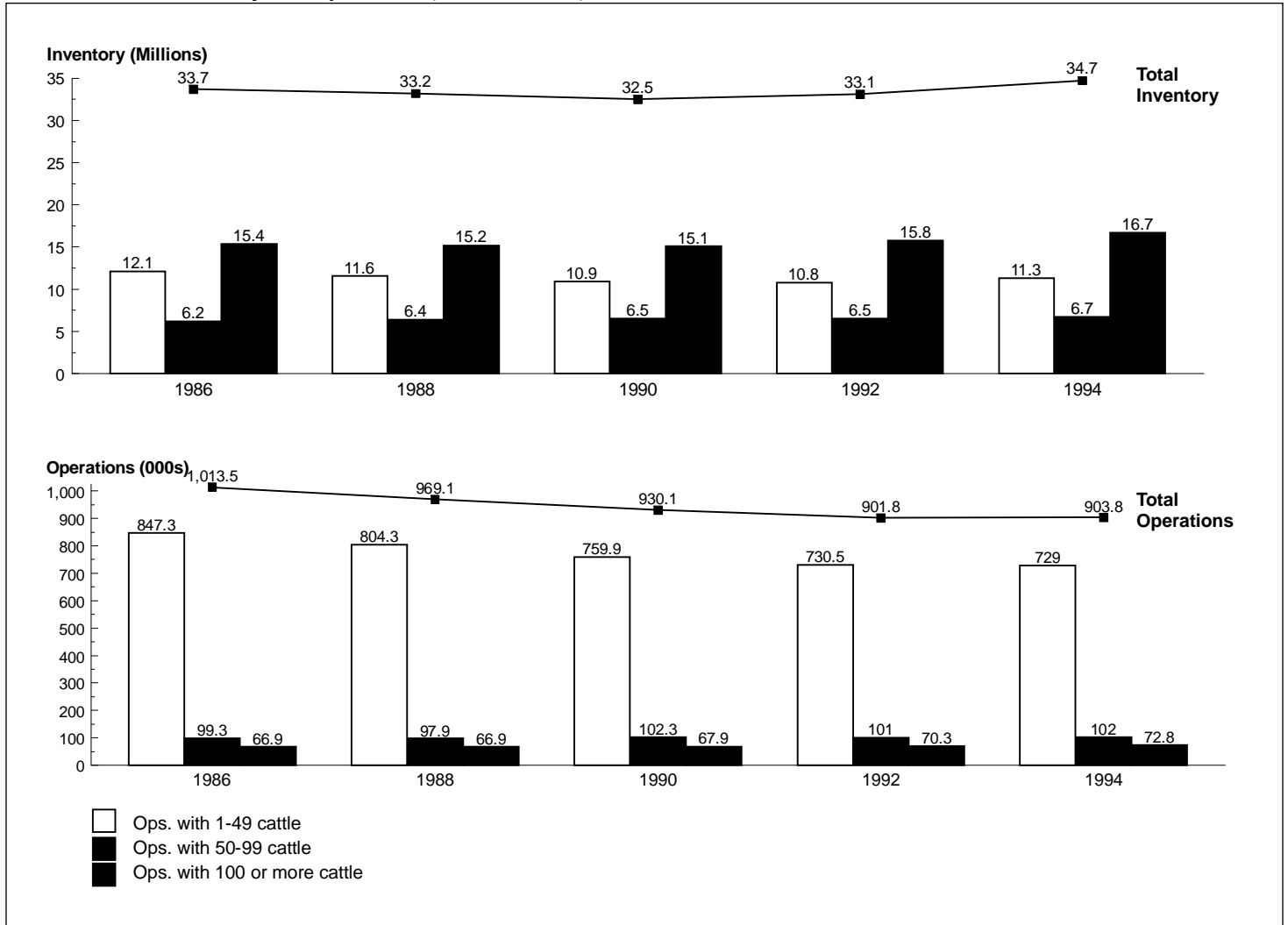
Source: Economic Research Service analysis of 1987 Census of Agriculture data.

Using 1987 Census of Agriculture data and information from other sources on manure production and manure nutrient content, the U.S. Department of Agriculture's (USDA) Economic Research Service (ERS) estimated and mapped nitrogen from manure concentrations by county. These concentrations are expressed as a ratio of the quantity of nitrogen from manure (in pounds) to the cropland acreage operated by livestock and poultry producers in each county. The estimates show where nitrogen from manure is available as a crop nutrient; the estimates are not necessarily an indication of water quality problems or improper manure management. These estimates indicate that the counties with the highest manure nitrogen concentrations per acre are generally located in the northeastern states; parts of the Southeast; Wisconsin; northeastern Arizona; and southern California. ERS' estimates of manure phosphorus concentrations per acre are distributed similarly to the estimates for manure nitrogen.

Geographic variation in manure nitrogen concentrations per cropland acre may be an important consideration in assessing water quality problems, but a number of other factors must also be considered. According to ERS, to fully relate nutrient management to water quality, information on nutrient inputs from chemical fertilizer applications, crop nutrient uptake, soil leaching and runoff properties, and rainfall patterns is needed. In addition, livestock and poultry producers with little available cropland may transfer manure to non-livestock producers within the county who have greater amounts of land available to utilize the manure nutrients. Some of this manure may also be used for other purposes such as methane gas production.

# Consolidation Trends and Geographical Shifts in Animal Agriculture Production

**U.S. Beef Cattle Inventory and Operations** (Selected Years)



Source: GAO analysis of National Agricultural Statistics Service (NASS) data.

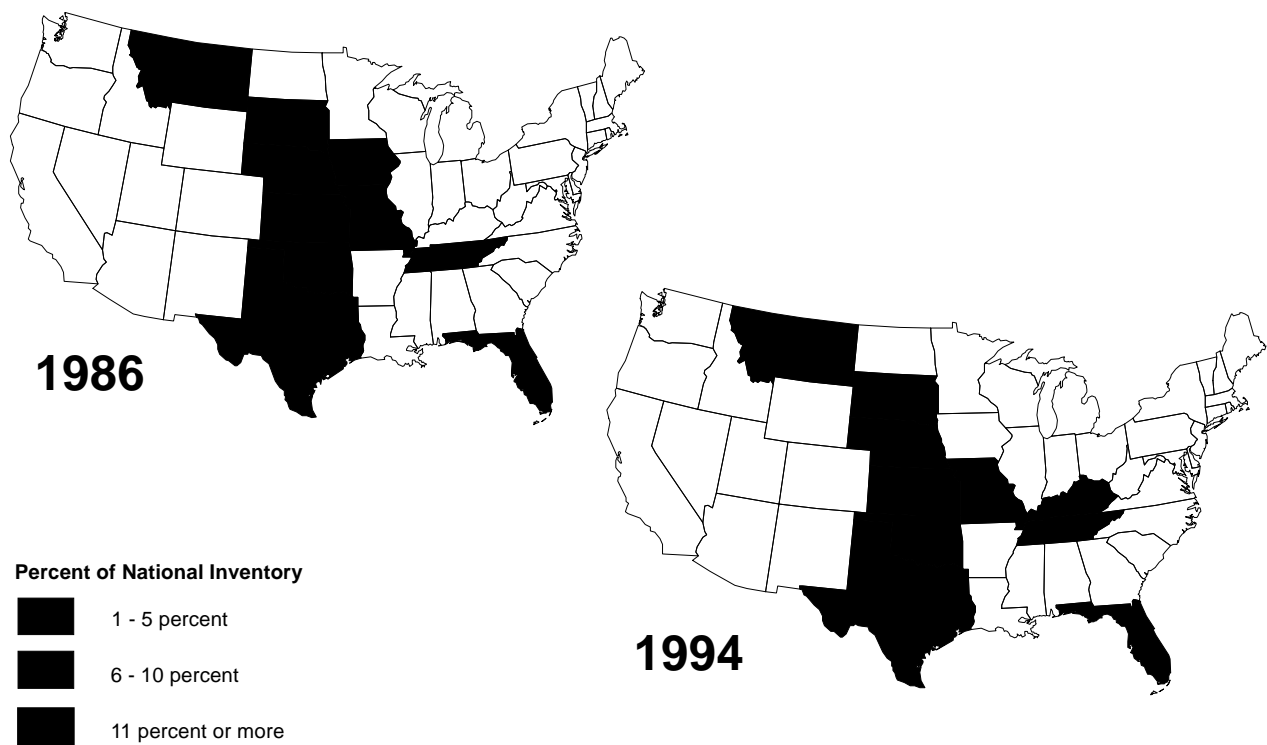
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**Briefing Section 2**  
**Consolidation Trends and Geographical**  
**Shifts in Animal Agriculture Production**

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From 1986 to 1994, the beef cattle sector (including ranches and farms but excluding feedlots) experienced a slight growth in consolidation—generally, the concentration of production in large, confinement-type operations. During this period, the inventory controlled by operations in the largest category (100 or more cattle) increased from about 46 percent of national inventory in 1986 to about 48 percent in 1994. Also, the number of operations in this category increased by about 9 percent, while the total number of operations (of all sizes) decreased by about 11 percent.

**GAO** Geographic Shifts in Top 10 Beef Cattle  
Production States From 1986 to 1994



Source: GAO analysis of NASS data.



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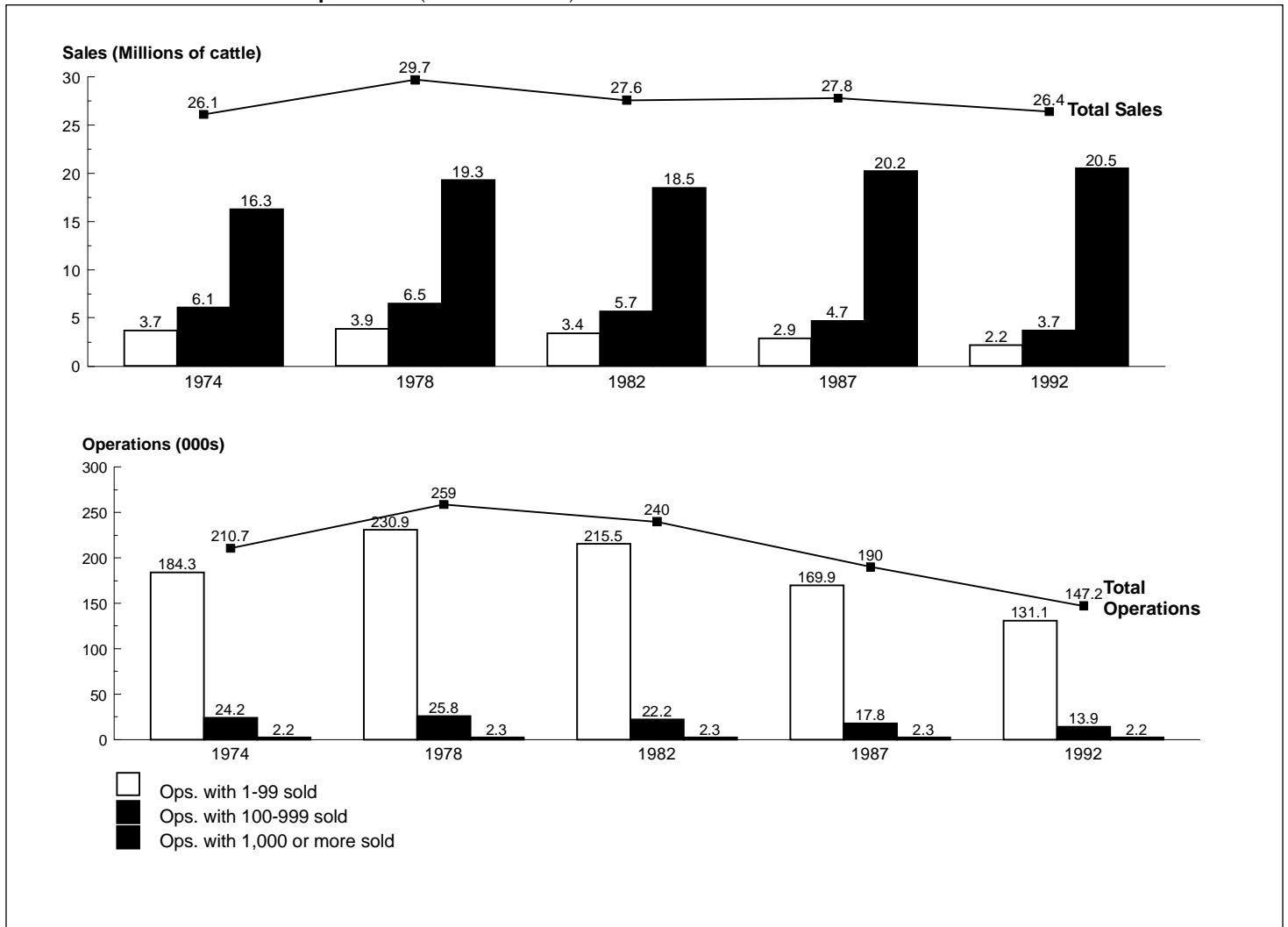
**Briefing Section 2**  
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From 1986 to 1994, the top 10 beef cattle production states (excluding feedlots) experienced little change; Texas remained the number one production state, Iowa dropped out of the top 10 states, and Kentucky joined this group. None of the other states experienced a change of greater than 1 percent in its share of national inventory. Industry sources expect little change in terms of geographic shifts or consolidation in the beef cattle industry over the next few years.

**Briefing Section 2  
Consolidation Trends and Geographical  
Shifts in Animal Agriculture Production**

**U.S. Feedlot Cattle Sales and Operations (Selected Years)**



Source: GAO analysis of Census of Agriculture data.

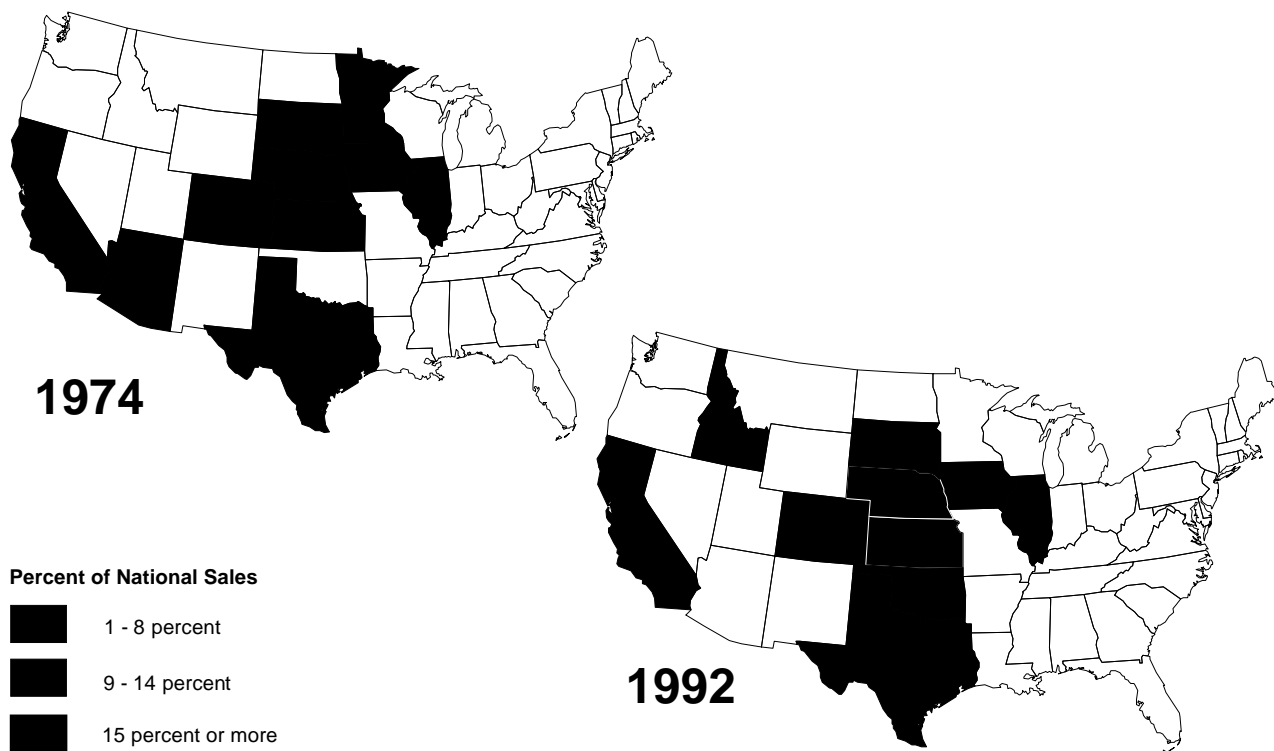
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**Briefing Section 2**  
**Consolidation Trends and Geographical**  
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From 1974 to 1992, the feedlot cattle sector experienced a growth in consolidation. During this period, sales by operations in the largest category (1,000 or more cattle sold) increased from about 62 percent of national sales in 1974 to about 78 percent in 1992. Also, the number of operations in this category decreased by about 2 percent, while the total number of operations (of all sizes) decreased by 30 percent.

# GAO Geographic Shifts in Top 10 Feedlot Cattle Production States From 1974 to 1992



Source: GAO analysis of Census of Agriculture data.

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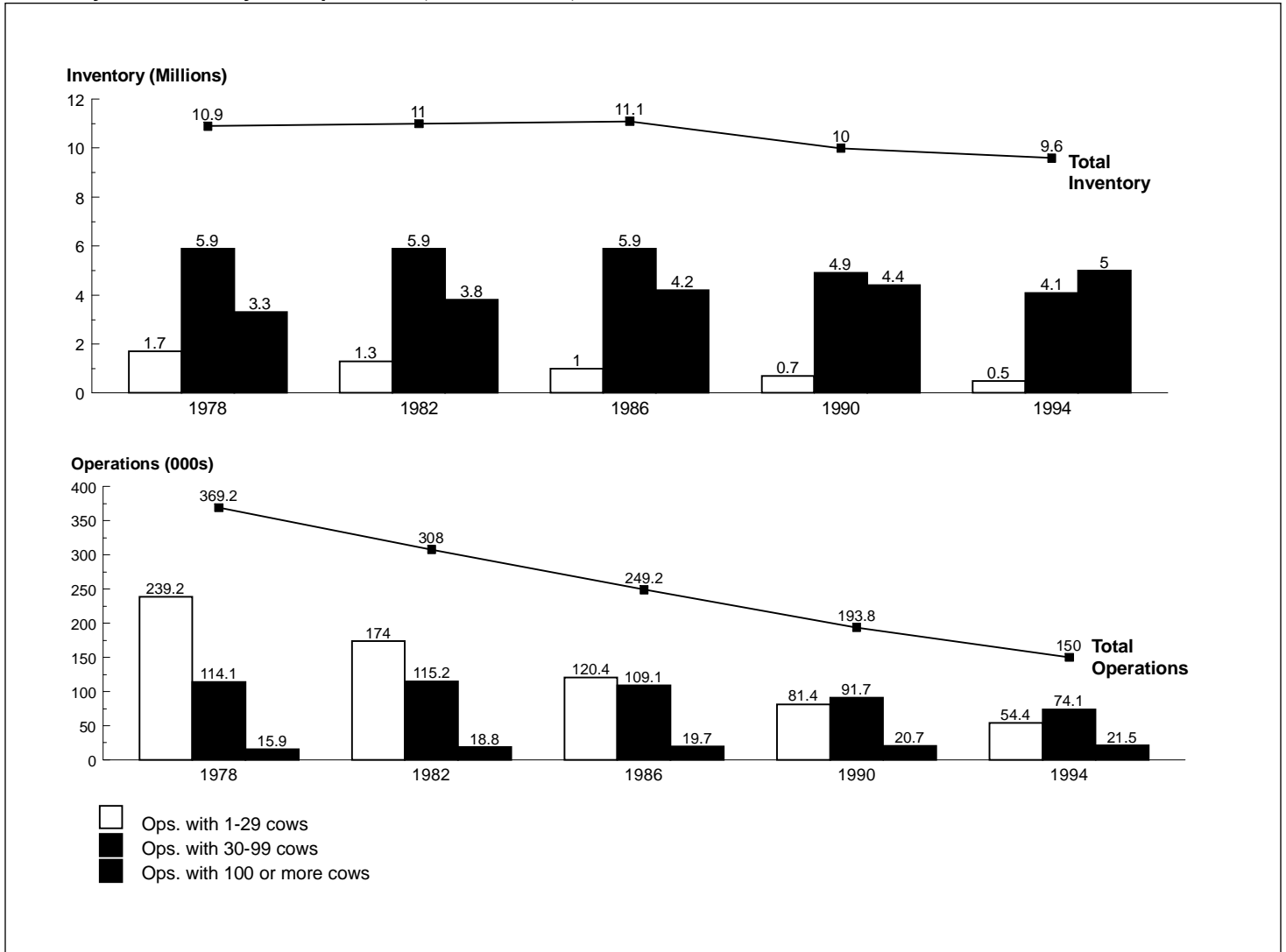
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From 1974 to 1992, Kansas moved from fourth to first place among the top 10 feedlot cattle states, with its share of national sales increasing from about 10 percent to about 19 percent. Nebraska and Texas also increased their share of national sales, while Oklahoma and Idaho joined the list of the top 10 states. In contrast, Iowa and California lost about 5- and 4-percent shares, respectively, of national sales, while Arizona and Minnesota dropped off the top 10 list.

**Briefing Section 2  
Consolidation Trends and Geographical  
Shifts in Animal Agriculture Production**

**U.S. Dairy Cow Inventory and Operations (Selected Years)**



Source: GAO analysis of NASS data.

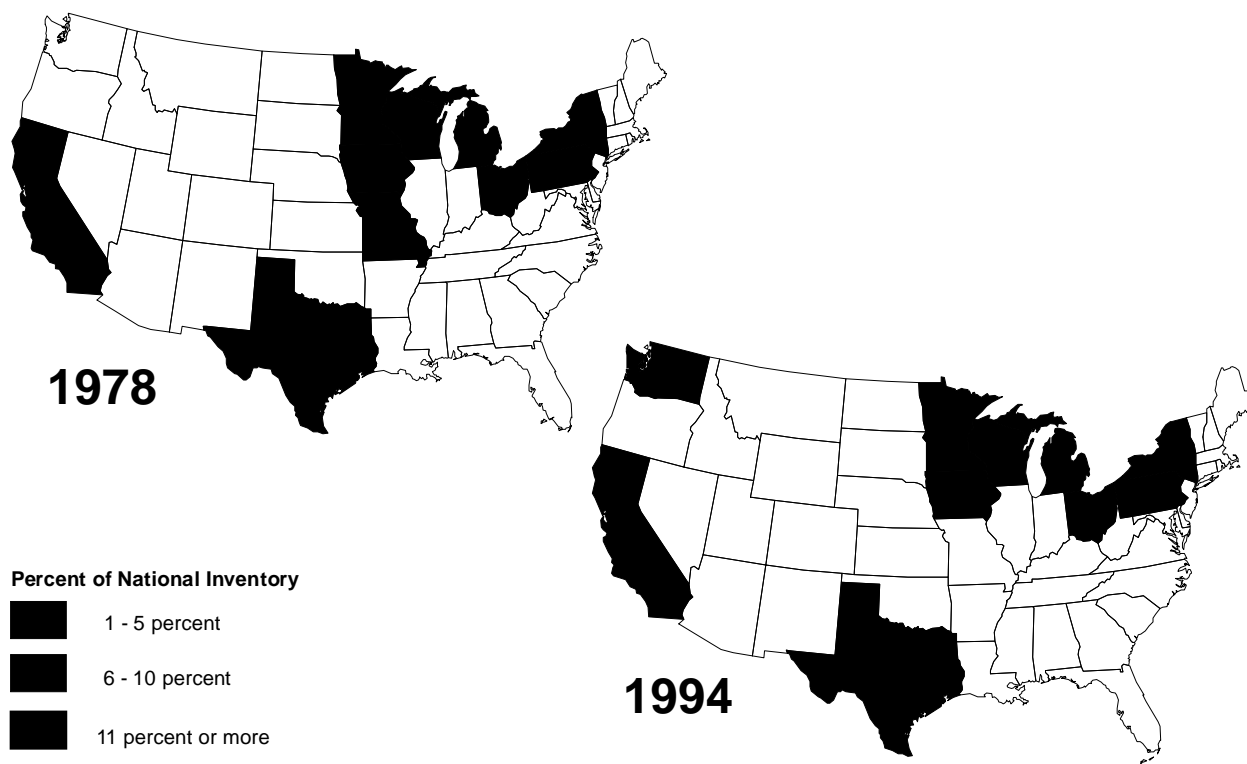
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**Briefing Section 2**  
**Consolidation Trends and Geographical**  
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From 1978 to 1994, the dairy cow sector became more consolidated. During this period, the inventory controlled by operations in the largest category (100 or more cows) increased from about 30 percent of national inventory in 1978 to about 52 percent in 1994. Also, the number of operations in this category increased by about 35 percent, while the total number of operations (of all sizes) fell by nearly 60 percent.

# GAO Geographic Shifts in Top 10 Dairy Production States From 1978 to 1994



Source: GAO analysis of NASS data.



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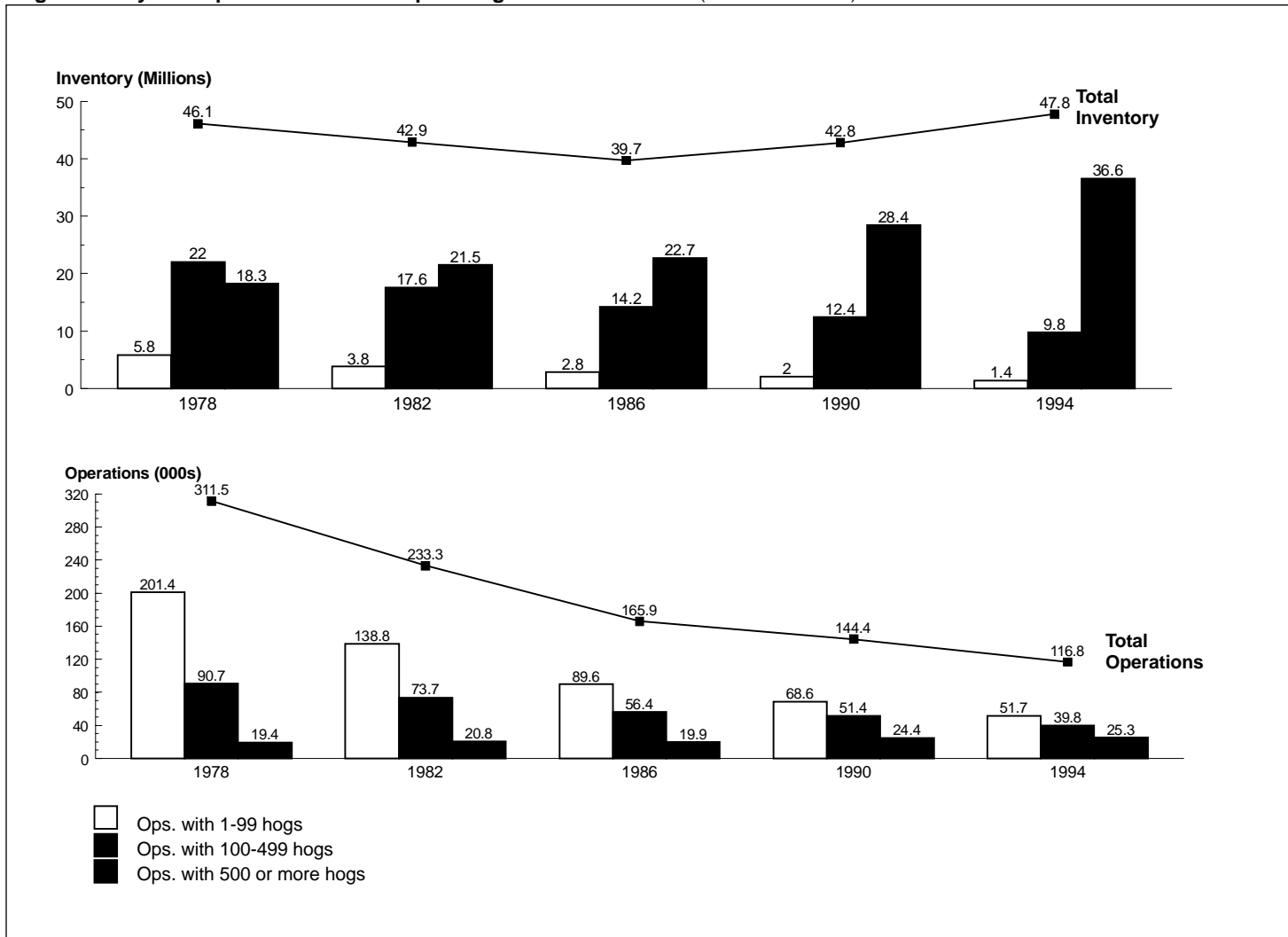
From 1978 to 1994, California moved from fourth to second place among the top 10 dairy cow production states, increasing its share of the nation's dairy cow inventory from about 8 percent to about 13 percent. Washington State and Texas also increased their shares.<sup>1</sup> Dairy cow inventories dropped in the traditional dairy production states of Wisconsin, Minnesota, and New York, while Missouri dropped out of the top 10 states. According to ERS, California's rapid population growth increased demand for locally produced milk, which, in turn, prompted dairy producers in this state to expand their production.

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<sup>1</sup>The federal dairy pricing system is a factor in encouraging expanded dairy production in areas outside the Upper Midwest and the Northeast. For example, the distance differential paid under the Milk Marketing Order Program increases the guaranteed price for milk used for fluid consumption and is generally based on the distance of a plant from Eau Claire, Wisconsin. See our report, Federal Dairy Programs: Information on Dairy Pricing and Related 1995 Farm Bill Issues (GAO/RCED-95-97BR, Mar. 27, 1995).

**Briefing Section 2  
Consolidation Trends and Geographical  
Shifts in Animal Agriculture Production**

**Hog Inventory and Operations for the Top 10 Hog Production States (Selected Years)**



Note: The table shows inventory and operations for the top 10 production states in 1978; data for subsequent years is for the same 10 states. The actual top 10 states in 1994 differed from the top 10 states in 1978 by only one state. (See also, pp. 44-45.)

Source: GAO analysis of NASS data.

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**Briefing Section 2**  
**Consolidation Trends and Geographical**  
**Shifts in Animal Agriculture Production**

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From 1978 to 1994, the top 10 hog-producing states<sup>2</sup> experienced a dramatic increase in consolidation. During this period, the inventory controlled by operations in the largest size category (500 or more hogs) increased from about 40 percent of the top 10 states' inventory in 1978 to about 77 percent of this inventory in 1994. Also, the number of operations in the largest size category increased by about 30 percent, while the total number of operations decreased by about 63 percent.

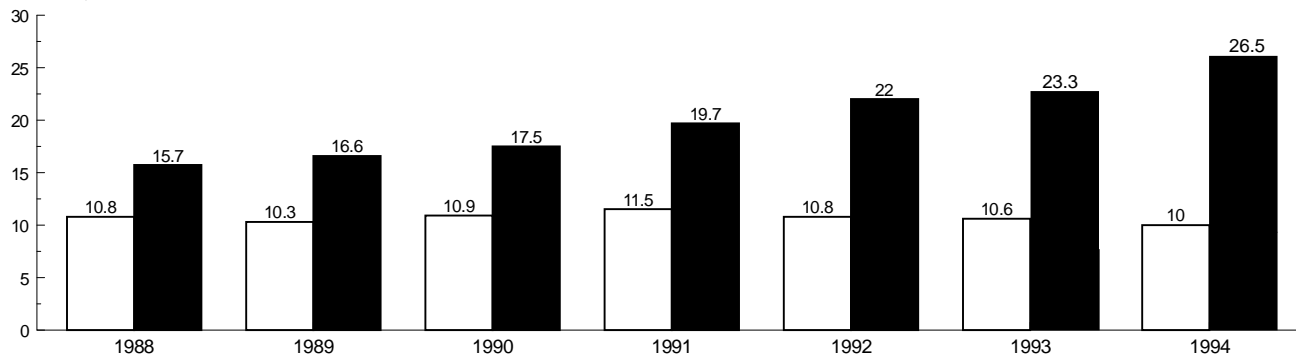
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<sup>2</sup>While USDA reports total hog operations and inventory data for all 50 states, it does so by size-of-operation categories for the top 10 hog production states only. From 1978 to 1994, the total number of operations (of all sizes) decreased by about 67 percent—from 635,000 to 209,000—while national inventory remained virtually the same at about 60 million head.

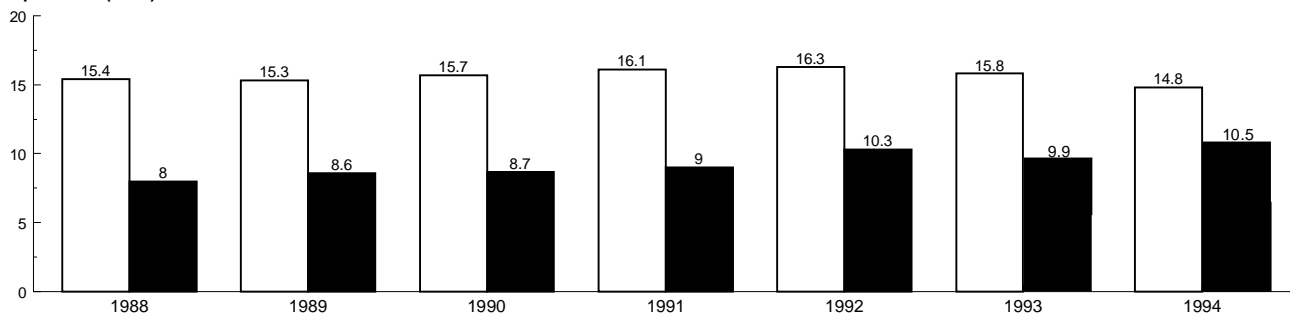
**Briefing Section 2  
Consolidation Trends and Geographical  
Shifts in Animal Agriculture Production**

**Hog Inventory and Operations for the Top 10 Hog Production States From 1988 to 1994**

**Inventory (Millions)**



**Operations (000s)**



- Ops. with 500-999 hogs
- Ops. with 1,000 or more hogs
- Ops. with 1,000-1,999 hogs
- Ops. with 2,000 or more hogs

Source: GAO analysis of NASS data.

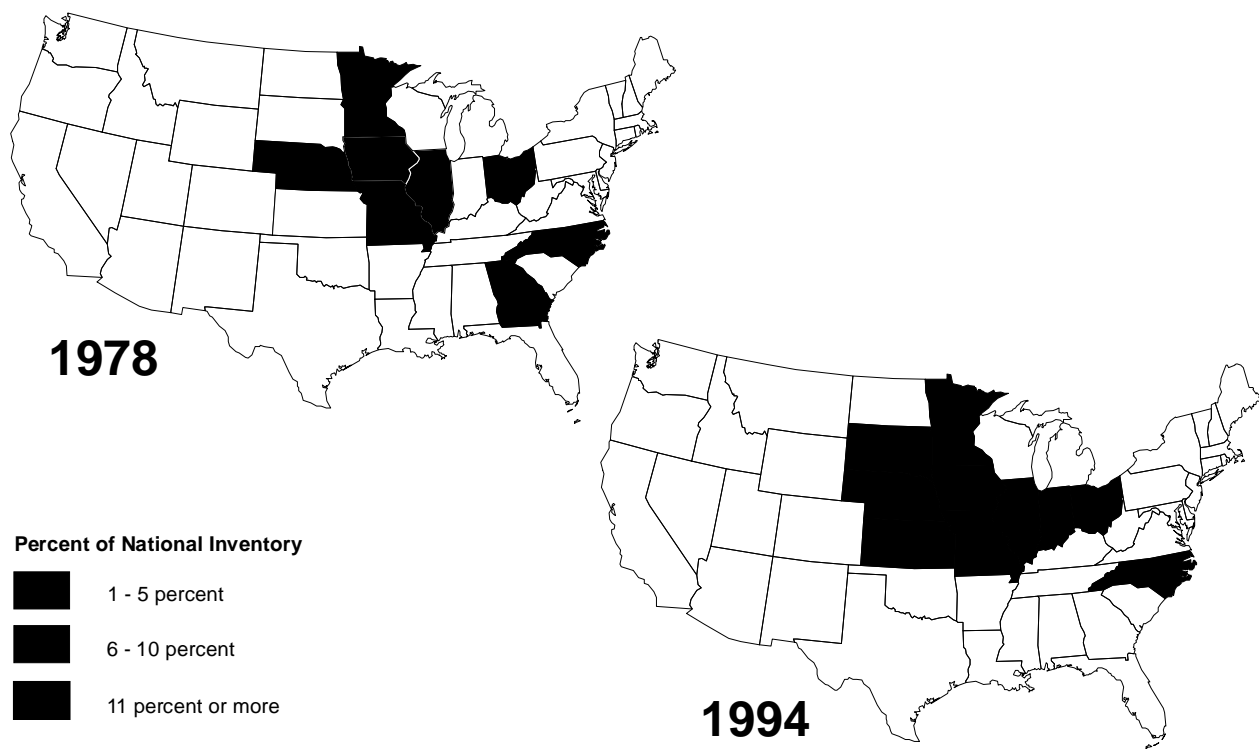
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**Briefing Section 2**  
**Consolidation Trends and Geographical**  
**Shifts in Animal Agriculture Production**

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Because of the strong consolidation trend in the hog sector, USDA introduced a new size category in 1988 (1,000 or more hogs) and then split this category into two categories in 1993 (1,000 to 1,999 and 2,000 or more hogs) to track production associated with large operations. From 1988 to 1994, the inventory controlled by operations with 1,000 or more hogs increased from about 36 percent of the top 10 states' inventory in 1988 to about 56 percent in 1994. Also, the number of operations in this size category increased by about 31 percent.

# GAO Geographic Shifts in Top 10 Hog Production States From 1978 to 1994



Source: GAO analysis of NASS data.

A number of geographical shifts in the level of hog production occurred among the top 10 hog-producing states between 1978 and 1994. North Carolina moved from seventh to second place among these states, increasing its share of the nation's hog inventory from about 4 percent to about 12 percent. Minnesota also experienced an increase in its share of this inventory, moving from about 7 percent to about 8 percent, while South Dakota joined the list of the top 10 states and Georgia dropped out.

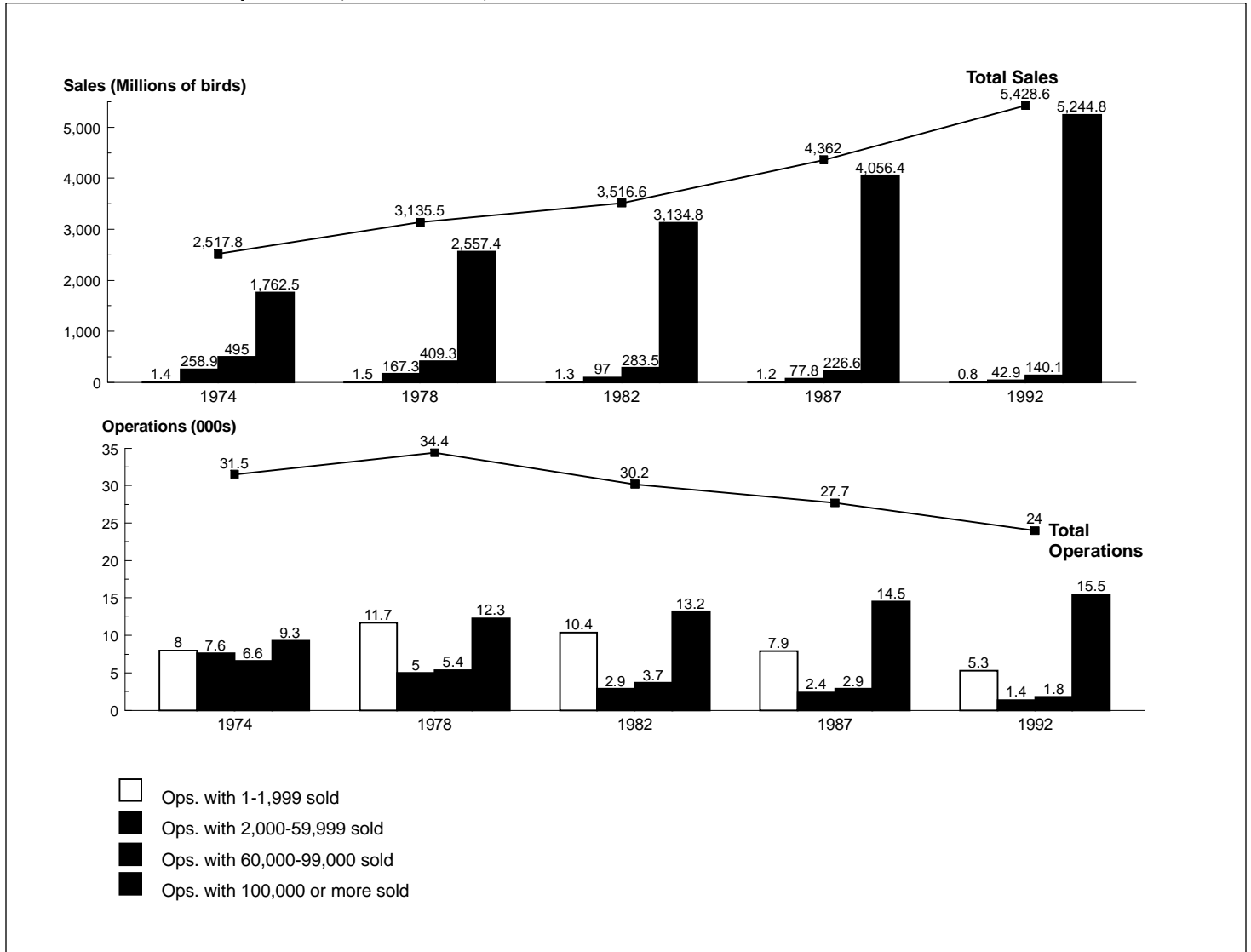
In addition, hog production fell slightly in the Corn Belt states—Illinois, Indiana, Iowa, Missouri, and Ohio—although nearly half of the nation's hog production continued to be centered in this region. For example, although Iowa remained the top hog-producing state, its share of the nation's inventory dropped from about 25 percent in 1978 to about 24 percent in 1994. Illinois and Missouri experienced similar reductions.

According to USDA and industry sources, the strong consolidation trend in the hog industry is a factor in both North Carolina's emergence and the Corn Belt's decrease. North Carolina has a tradition of consolidated poultry production; pork production companies in this state have modeled themselves after the consolidated poultry sector, which features close business ties between poultry producers and processors (slaughtering and packing plants). The result has been a rapid growth in the number of large hog confinement operations in North Carolina. In contrast, there has been significant public opposition to the growth of these operations in the Corn Belt, which has a strong tradition of family farm hog production. An industry source also cited North Carolina's proximity to large consumer markets in the East and mild climate as other reasons for this state's hog production gains.

Hog industry sources generally believe that the consolidation trends in the hog sector are likely to continue over the next few years.

**Briefing Section 2**  
**Consolidation Trends and Geographical**  
**Shifts in Animal Agriculture Production**

**U.S. Broiler Sales and Operations (Selected Years)**



Source: GAO analysis of Census of Agriculture data.



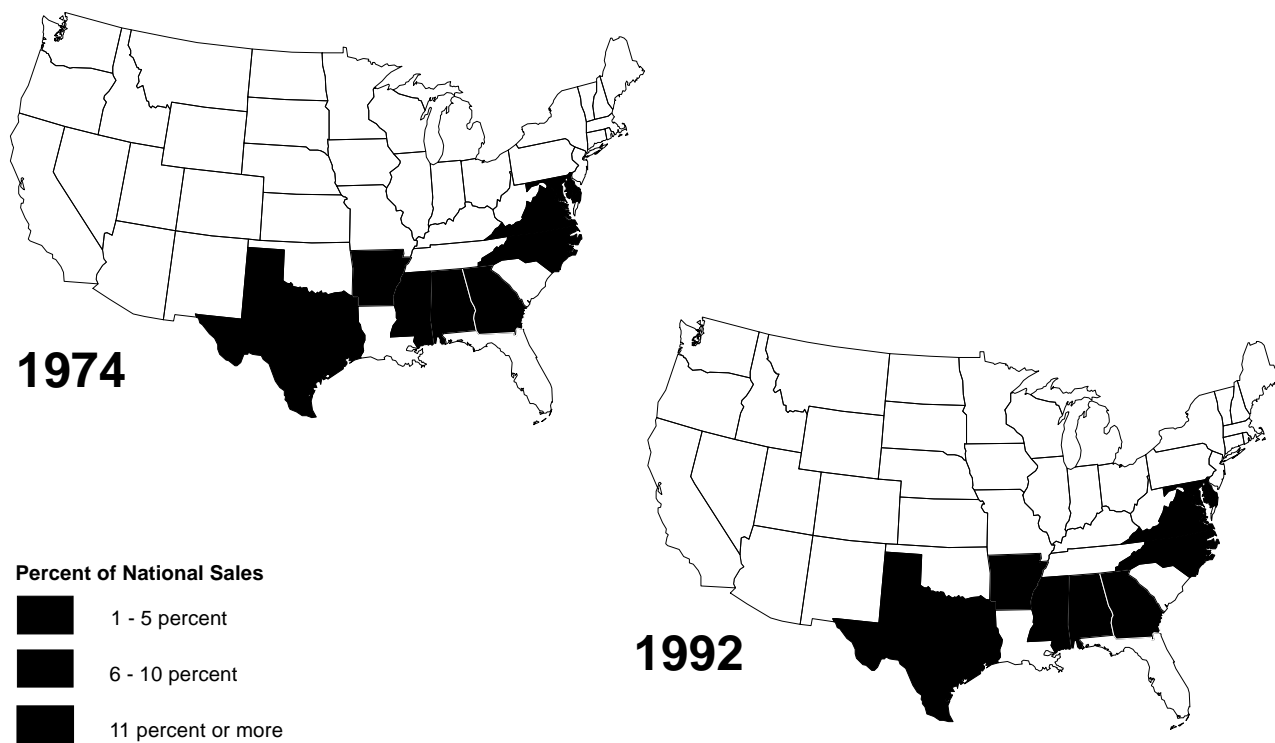
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**Briefing Section 2**  
**Consolidation Trends and Geographical**  
**Shifts in Animal Agriculture Production**

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From 1974 to 1992, the broiler sector experienced a steady increase in consolidation. During this period, sales attributable to operations in the largest category (100,000 or more broilers sold) increased from about 70 percent of national sales in 1974 to about 97 percent in 1992. Also, the number of operations in the largest size category increased by nearly 67 percent, while the total number of operations (of all sizes) decreased by about 24 percent.

**GAO** Geographic Shifts in Top 10 Broiler Production States by Sales From 1974 to 1992



Source: GAO analysis of Census of Agriculture data.

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**Briefing Section 2**  
**Consolidation Trends and Geographical**  
**Shifts in Animal Agriculture Production**

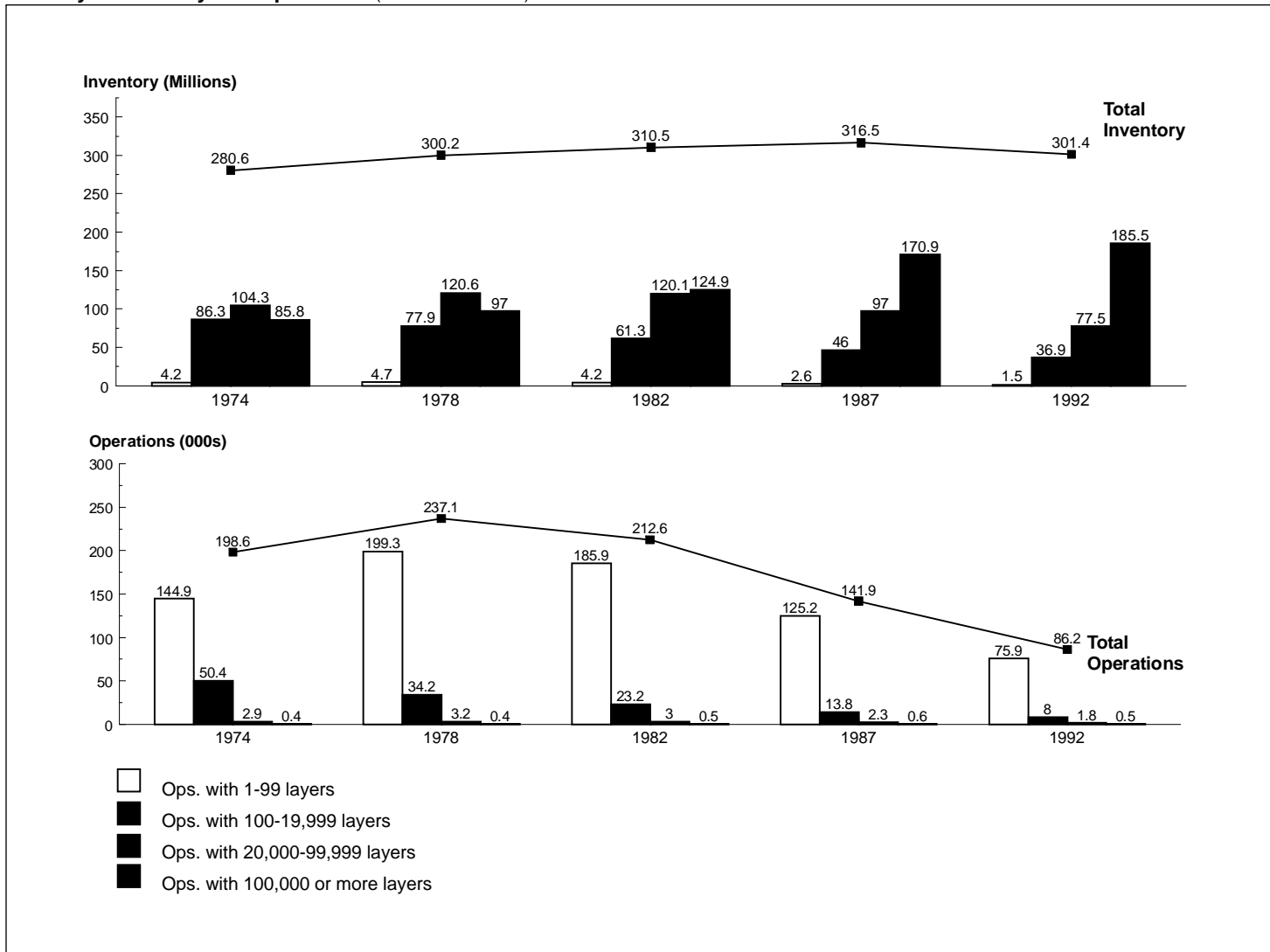
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From 1974 to 1992, the top 10 states in broiler sales remained the same, with only minor fluctuations in their percentage of sales. While Virginia gained about 1 percent of the nation's sales, Arkansas, Delaware, and Maryland each lost approximately 1 percent; Texas lost about a half percent.

According to ERS, broiler production developed and expanded in the Southeast because of this region's relatively low production and processing costs. For example, broiler housing costs are lower in the Southeast because of its warm climate. Processing costs are lower because of the region's relatively low labor costs. In addition, the Southeast has a strong infrastructure to support the broiler industry.

**Briefing Section 2  
Consolidation Trends and Geographical  
Shifts in Animal Agriculture Production**

**U.S. Layer Inventory and Operations (Selected Years)**



Note: This analysis includes data for all layers. The layer flock consists of hens producing eggs for human consumption (table eggs) and hens producing eggs for broiler industry hatcheries (hatching eggs).

Source: GAO analysis of Census of Agriculture data.

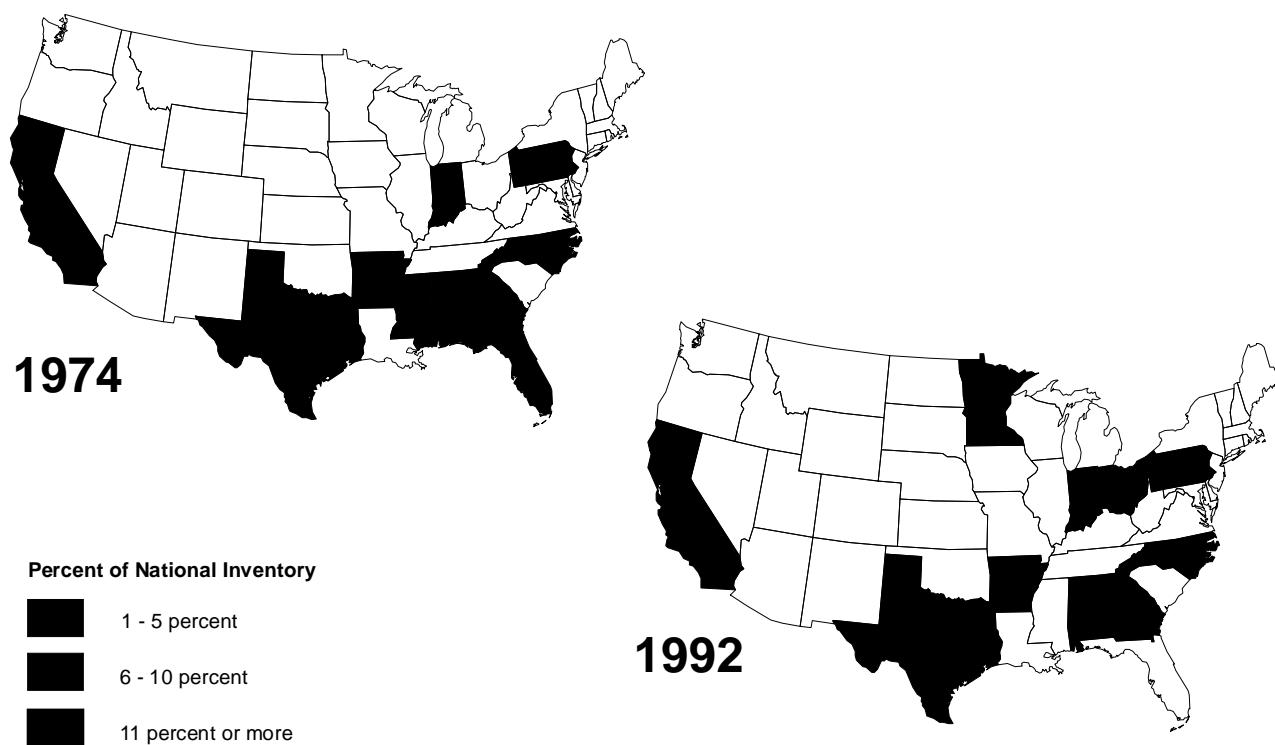
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**Briefing Section 2**  
**Consolidation Trends and Geographical**  
**Shifts in Animal Agriculture Production**

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The layer sector experienced an increase in consolidation from 1974 to 1992. During this period, the inventory controlled by operations in the largest category (100,000 or more layers) increased from about 31 percent of national inventory in 1974 to about 62 percent in 1992. In addition, the number of operations in the largest category increased by about 50 percent, while the total number of operations (of all sizes) decreased by about 57 percent.

**GAO** Geographic Shifts in Top 10 Layer  
Production States From 1974 to 1992



Source: GAO analysis of Census of Agriculture data.

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**Briefing Section 2**  
**Consolidation Trends and Geographical**  
**Shifts in Animal Agriculture Production**

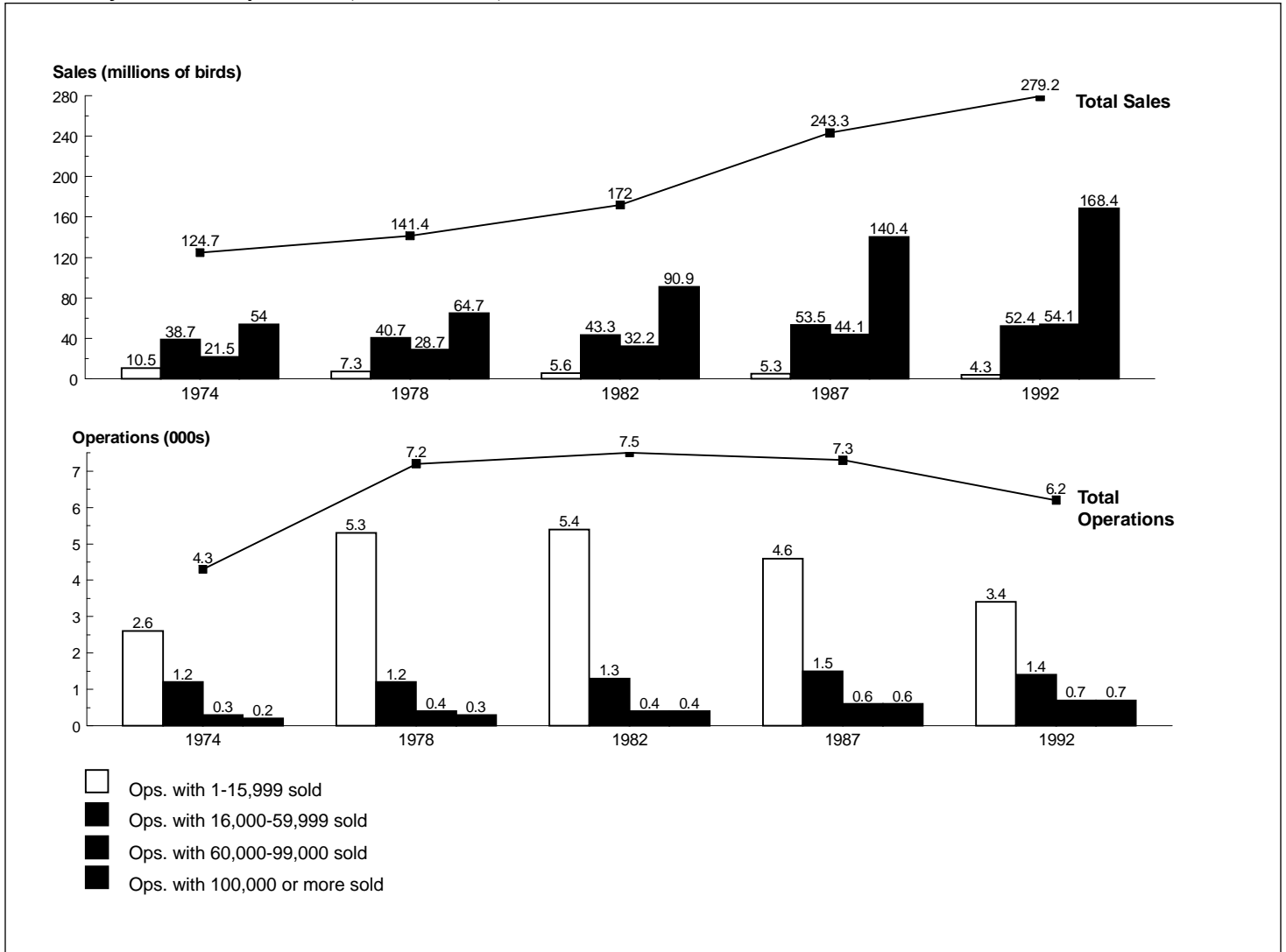
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From 1974 to 1992, Pennsylvania, Indiana, and Texas each increased its share of the nation's layer inventory by about 1 to 4 percent. Ohio and Minnesota also joined the list of the top 10 layer states. California experienced the largest loss of inventory—about 4 percent—although it maintained its status as the leading layer inventory state; Mississippi and Florida dropped out of the top 10 category.

According to ERS, new technology has caused some relocation of the layer industry for table egg production to the Midwest in order to be near grain-producing areas. This technology includes the construction of large complexes (e.g., 1 million or more layers) that include both egg production and processing facilities. In addition, greater demand for egg products has resulted in construction of specialized facilities in the Midwest that produce dried, liquid, and frozen egg products for shipment across the nation.

**Briefing Section 2  
Consolidation Trends and Geographical  
Shifts in Animal Agriculture Production**

**U.S. Turkey Sales and Operations (Selected Years)**



Source: GAO analysis of Census of Agriculture data.



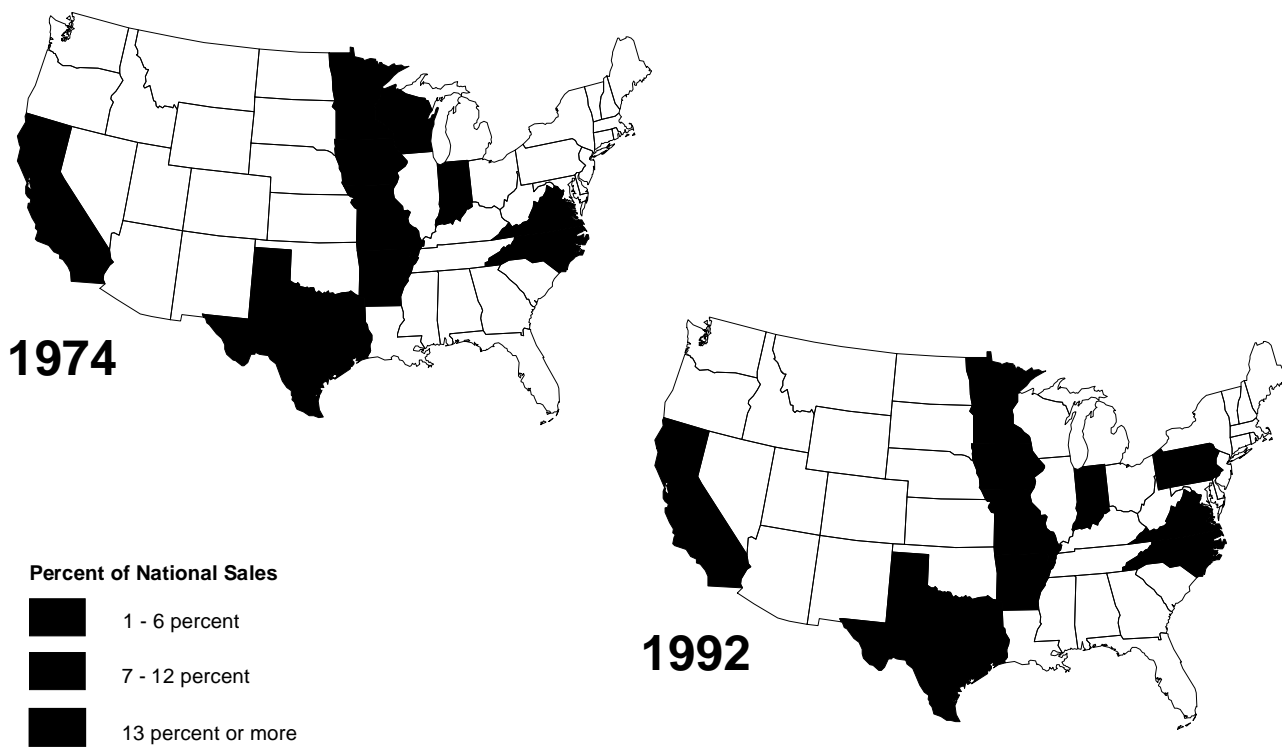
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**Briefing Section 2**  
**Consolidation Trends and Geographical**  
**Shifts in Animal Agriculture Production**

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From 1974 to 1992, the turkey sector experienced an increase in consolidation. During this period, sales by operations in the largest size category (100,000 or more turkeys sold) increased from about 43 percent of national sales in 1974 to about 60 percent in 1992. Also, the number of operations in the largest size category increased by over 200 percent, while the total number of operations (of all sizes) increased by 42 percent.

**GAO** Geographic Shifts in Top 10 Turkey  
Production States From 1974 to 1992



Source: GAO analysis of Census of Agriculture data.

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**Briefing Section 2**  
**Consolidation Trends and Geographical**  
**Shifts in Animal Agriculture Production**

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From 1974 to 1992, North Carolina moved from third to first place among the top 10 states in turkey sales, increasing its share of national sales from about 11 percent to about 20 percent. Arkansas, Virginia, and Indiana also increased their shares of national sales, while Pennsylvania joined the list of the top 10 states. California, Iowa, Minnesota, Missouri, and Texas each experienced a loss of about 1 to 3 percent of national sales. Wisconsin dropped out of the top 10 group.

# Animal Agriculture Production Subject to Point Source Permits

## GAO Livestock and Poultry Operations With Point Source Permits

<b>Livestock or poultry sector</b>	<b>Operations as of April 1995</b>
Beef feedlot	632
Broiler	5
Dairy	992
Hog	324
Layer	24
Turkey	10
<b>Total</b>	<b>1,987</b>

Notes: (1) EPA does not track the inventories of livestock and poultry production operations that have been issued point source permits. Therefore, we cannot report the number of animals covered by these permits. (2) EPA reported permitted operations in three other livestock and poultry categories: beef cattle (not including cattle on feedlots); general livestock (mixed livestock operations, except dairy and poultry); and poultry hatcheries. A total of 326 operations in these categories had point source permits as of April 1995.

Source: EPA permit data.

Section 402 of the Clean Water Act establishes the National Pollutant Discharge Elimination System permit program to control discharges from point sources<sup>1</sup> such as treatment plants and industrial facilities, including certain animal feeding operations.<sup>2</sup> As of April 1995, 1,987 animal feeding operations in the livestock and poultry sectors we examined (excluding beef cattle not on feedlots) had point source permits issued either by EPA or by states delegated permitting authority by EPA. Most of these operations were in the beef cattle on feedlots and dairy sectors.

Under EPA regulations, point source permits are required for animal feeding operations that discharge to U.S. waters during most storm events and are “concentrated.” These operations

- have more than 1,000 animal units (AU);<sup>3</sup> or
- have more than 300 AUS and either discharge through a man-made device into navigable waters or directly into waters of the United States that originate outside the facility; or
- are of any size but have been determined by EPA or the state permitting authority, on a case-by-case basis, to significantly contribute to water pollution, taking into account such factors as location and terrain. If there are fewer than 300 AUS, one of the factors concerning discharge cited above must also be present for an animal feeding operation to fall within this category.

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<sup>1</sup>Section 502 of the Clean Water Act defines point sources as discernable, confined, and discrete conveyances from which pollutants are or may be discharged.

<sup>2</sup>Under EPA regulations, “animal feeding operations” are those that confine livestock or poultry for 45 days or more in a 12-month period in a facility that has no vegetative ground cover. Animal feeding operations that are “concentrated” because of their size and other factors may be required to obtain a point source permit.

<sup>3</sup>The 1,000 AU equivalents for the animal sectors we were asked to examine are the following: 700 mature dairy cattle; 1,000 slaughter and feeder cattle; 2,500 hogs (over 55 pounds); 30,000 broilers or layers (liquid manure system); 55,000 turkeys or 100,000 broilers or layers (continuous watering system).

## GAO Confined Operations With More Than 1,000 AU Equivalents By Sector

Livestock or poultry sector	Total number of operations	Estimated animals on site (000's hd)	Number of operations with >1,000 AU equivalents	Estimated animals on site on operations with >1,000 AU equivalents (000's hd)	Percent of estimated animals on site on operations with >1,000 AU equivalents
Beef feedlot	147,201	10,034	943	7,098	71%
Broiler	35,759	933,368	1,398	246,667	26%
Dairy	155,339	9,492	939	1,252	13%
Hog	206,450	57,343	2,578	15,270	27%
Layer	88,235	351,310	599	209,911	60%
Turkey	10,566	86,614	102	21,703	25%

Notes: (1) Confined operations include feedlots or other operations where animals are concentrated in a small area. (2) According to ERS, the columns in this table generally should not be totaled because of potential double-counting, i.e., some operations (farms) have more than one type of animal production. However, ERS officials said that the number of operations with more than 1,000 AU equivalents could be totaled. According to these officials, this total, about 6,600 operations, is a reasonable estimate because very few of these operations will have more than 1,000 AU equivalents for more than one type of livestock or poultry.

Source: ERS estimates based on 1992 Census of Agriculture data.

According to ERS' analysis of 1992 Census of Agriculture data, about 6,600 operations (farms) in the livestock and poultry sectors we examined (excluding beef cattle not on feedlots) have more than 1,000 AU equivalents. This represents about 1.5 percent of the 450,000 operations nationwide with confined livestock or poultry production.<sup>4</sup> ERS also estimated that the percent of animals on site<sup>5</sup> for operations with more than 1,000 AU equivalents ranges from about 13 percent for dairy to about 71 percent for beef cattle on feedlots.

The number of operations with more than 1,000 AU equivalents—about 6,600—exceeds the number of permitted operations in the corresponding livestock and poultry sectors—1,987. According to EPA, a number of factors account for this difference. For example, many operations with more than 1,000 AU equivalents are not required to obtain point source permits because they do not discharge into U.S. waters during most storm events.<sup>6</sup> Also, some confined animal operations that should have point source permits do not because of limited federal and state resources for identifying these operations or inappropriate permit exemptions.

Furthermore, according to EPA, the number of operations having point source permits in the livestock and poultry sectors we examined may exceed 1,987. EPA officials said the agency's data base of permitted operations is incomplete because some states that have been delegated authority to issue these permits are not regularly reporting these issuances to EPA.

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<sup>4</sup>According to ERS officials, the 1992 Census of Agriculture reported that there were about 450,000 operations nationwide with confined livestock and/or poultry production.

<sup>5</sup>ERS' methodology for calculating animals on site varies by sector. ERS used annual sales and inventory data for the broiler, turkey, and hog sectors to account for seasonal production variations; sales data adjusted for the production cycle for the beef feedlot sector; and inventory data for the dairy cattle and layer sectors.

<sup>6</sup>Point source permits are generally required only for operations that discharge into U.S. waters during storm events less severe than a 24-hour heavy precipitation event expected to occur only once every 25 years.

# Best Management Practices and Associated Costs

## GAO Examples of BMPs for Confined and Nonconfined Operations and Manure Application

<b>BMP</b>	<b>Confined operations</b>	<b>Nonconfined operations</b>	<b>Manure application</b>
Treatment lagoon	X		
Retention pond	X		
Storage structure	X		
Irrigation	X		
Composting	X		
Filter strips	X	X	X
Fencing	X	X	
Nutrient management			X
Diet manipulation	X	X	

Note: Confined operations include feedlots or other operations that concentrate animals in a small area. Nonconfined operations include pasture and rangeland where animals are allowed to roam over a large area.

Source: USDA.



According to USDA, a variety of animal waste management practices, generally referred to as best management practices (BMP), are available to manage wastes and minimize their potential effects on water quality. In general, the approaches encompassed by these BMPs include (1) minimizing the discharge of animal wastes by storing them until they can be used as fertilizer or to increase the organic content of soil, (2) preventing manure runoff from reaching surface waters, and (3) incorporating nutrient management practices when applying manure to cropland as a fertilizer. BMP selection depends on site-specific factors such as soil composition and the proximity of an operation to surface water or groundwater.

BMPS such as treatment lagoons, retention ponds, and other storage structures are used to store animal waste and prevent runoff from confined operations. Irrigation equipment pumps liquid animal waste from the storage structures onto agricultural land. Some confined operations—especially poultry operations—use composting systems to dispose of dead animals and manure. Composting reduces the volume and weight of waste and produces an end product that can be used as fertilizer.

Vegetated filter strips and constructed wetlands remove nutrients and suspended solids from the runoff of confined operations. Filter strips and wetlands also serve as buffers between range or pastureland and surface water bodies; they perform a similar function for agricultural land to which manure has been applied as fertilizer. Fencing restricts livestock access to surface water bodies, preventing animals from depositing wastes directly into these waters.

Nutrient management encompasses testing the nutrient content of soil, plant tissues, and manure to determine the proper timing and rates of application when applying manure as a fertilizer. Diet or feed manipulation reduces the amount of waste generated by livestock or reduces the nutrient content of this manure.

## GAO EPA Estimates of BMP Investment Costs for Small and Medium Operations

Livestock category	Size of operation	Retention pond & irrigation option (\$000s)	Filter strip option (\$000s)
Beef	50 head	\$ 4.4 - 10.3	\$ 2.2 - 6.1
	750 head	35.6 - 74.1	17.3 - 57.0
Dairy	35 head	5.3 - 11.6	3.1 - 7.2
	540 head	40.2 - 82.5	21.4 - 65.5
Hog	140 head	1.4 - 3.2	0.9 - 1.8
	2,000 head	7.5 - 23.6	4.6 - 12.1

Note: Ranges depicted represent total investment costs and are extremes in terms of anticipated storm water volume and temperature. Low-end costs assume storm water volumes of up to 4 inches of rain in a 24-hour period and a non-northern location. High-end costs assume storm water volumes of up to 10 inches of rain in a 24-hour period and a northern location. Also, EPA's cost estimates assume that no waste management practices are in place under baseline conditions.

Source: EPA data.

EPA has estimated the range of investment costs for employing various BMPs for typical small- and medium-sized livestock confinement operations; these BMPs include the retention pond and irrigation system and vegetative filter strip options. According to EPA's analysis, BMP investment costs vary by operation, depending on the BMP selected and the operation's size and type. The retention pond and irrigation system option, for example, is more costly than the filter strip option. In addition, as operation size increases, total investment costs for a particular BMP generally increase; however, investment costs calculated on a per animal basis may decrease. The type of operation—e.g., dairy versus beef cattle—will also affect costs; a dairy cow generally produces significantly more manure than a beef feedlot animal because dairy cows are usually larger and are fed a diet high in roughage.

According to EPA, investment costs may also be greater if climatic conditions, such as periodically large storm water volumes or prolonged periods of subfreezing temperatures, require additional manure storage capacity. Investment costs for manure storage capacity, for example, are significantly higher for operations in locations expected to experience high storm water volumes than in locations expected to experience low storm water volumes.<sup>1</sup> Similarly, storage costs are higher in northern states, which generally experience longer periods of subfreezing temperatures than other parts of the country; manure must be stored for longer periods of time to preclude its application to frozen cropland, from which it might easily be washed off into surface waters during thaws.

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<sup>1</sup>EPA's analysis separates locations into four categories for expected storm water volumes in a 24-hour period: 4 inches; 6 inches; 8 inches; and 10 inches. These are the storm water volumes that are expected to occur once every 25 years; the 25-year criterion is provided for in USDA's design standards for waste management systems.

**GAO** Projected BMP Costs for Livestock:  
 Retention Pond/Irrigation Option

<b>BMP</b>	<b>Beef feedlot (750 head)</b>	<b>Dairy (540 head)</b>	<b>Hog (2000 head)</b>
Diking	\$ 2,683	\$ 0	\$ 0
Gutter & diking	0	5,763	2,307
Settling basin	14,148	15,044	2,372
Retention pond	23,712	25,016	5,000
Irrigation	6,072	6,114	0
<b>Annualized investment</b>			
	5,562	6,188	1,137
Manure handling	6,564	11,290	2,342
Effluent disposal	457	472	325
Facility O&M	1,763	1,983	411

Source: EPA data.

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**Briefing Section 4  
Best Management Practices and Associated  
Costs**

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This table depicts EPA's estimated investment and annual operations costs for use of the retention pond and irrigation system option on medium-sized feedlot, dairy, and hog operations. This option involves storing wastes until they can be spread on fields as fertilizer. The estimates assume (1) a settling basin and retention pond large enough to handle runoff associated with storms of up to 6 inches of rain in 24 hours and (2) a non-northern location.<sup>2</sup>

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<sup>2</sup>Estimates for the hog operation also assume that irrigation equipment would not be purchased because the retention pond for this operation would be relatively small. Accordingly, it would be cheaper to pay a commercial service to periodically drain the pond than to purchase irrigation equipment to pump the pond's contents onto fields as fertilizer.

## GAO Projected BMP Costs for Livestock: Filter Strip Option

BMP	Beef feedlot (750 head)	Dairy (540 head)	Hog (2000 head)
Diking	\$ 2,683	\$ 0	\$ 0
Gutter & diking	0	5,763	2,307
Settling basin	14,148	15,044	2,372
Filter strip	7,149	7,720	763
Annualized investment	2,818	3,352	639
Manure hauling	6,564	11,290	2,342
Facility O&M	1,101	1,292	241

Source: EPA data.

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**Briefing Section 4  
Best Management Practices and Associated  
Costs**

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This table depicts EPA's estimated investment and annual operations costs for use of the filter strip option on medium-sized feedlot, dairy, and hog operations. This option involves disposal of liquid wastes on a vegetated strip where nutrients and suspended solids are filtered out and absorbed into the soil. The estimates assume (1) a vegetated strip large enough to handle runoff associated with storms of up to 6 inches of rain in 24 hours and (2) a non-northern location.

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**GAO**      **Projected Costs for Poultry Manure Storage  
and Composting Systems--80,000 Birds**

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<b>Poultry type</b>	<b>Compost facility cost</b>	<b>Annual compost investment</b>	<b>Annual compost operation and maintenance</b>	<b>Annual manure storing and hauling costs</b>	<b>Total annual cost</b>
Broilers	\$6,720	\$884	\$5,793	\$4,001	\$10,679
Layers	5,040	663	1,621	6,119	8,403

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Source: EPA data.



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**Briefing Section 4**  
**Best Management Practices and Associated**  
**Costs**

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This table depicts EPA's estimated investment and annual operations costs for a waste storage and composting system used on an 80,000-bird poultry operation. Under this system, the majority of the poultry bedding and manure are stored dry and covered for subsequent use as fertilizer. The remainder of the bedding and manure is placed in aerobic composters with dead bird carcasses; these composted wastes are also used as fertilizer.<sup>3</sup>

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<sup>3</sup>According to EPA, composting is more expensive for broiler operations than for layer operations of the same size because broiler mortality rates are higher and broiler operations therefore require larger composting storage capacity.

# USDA Conservation Programs Providing Cost-Share Assistance for Animal Waste Management

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## GAO USDA Conservation Programs Providing Cost-Share Assistance

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- A number of USDA conservation programs provide cost-share assistance; most of this assistance has been for soil erosion control
  - Four programs provided about \$89 million in cost-share assistance for animal waste management during 1992-94
    - ✓ Agricultural Conservation Program
    - ✓ Water Quality Incentives Projects
    - ✓ Small Watershed Program
    - ✓ Rural Clean Water Program
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**Briefing Section 5**  
**USDA Conservation Programs Providing**  
**Cost-Share Assistance for Animal Waste**  
**Management**

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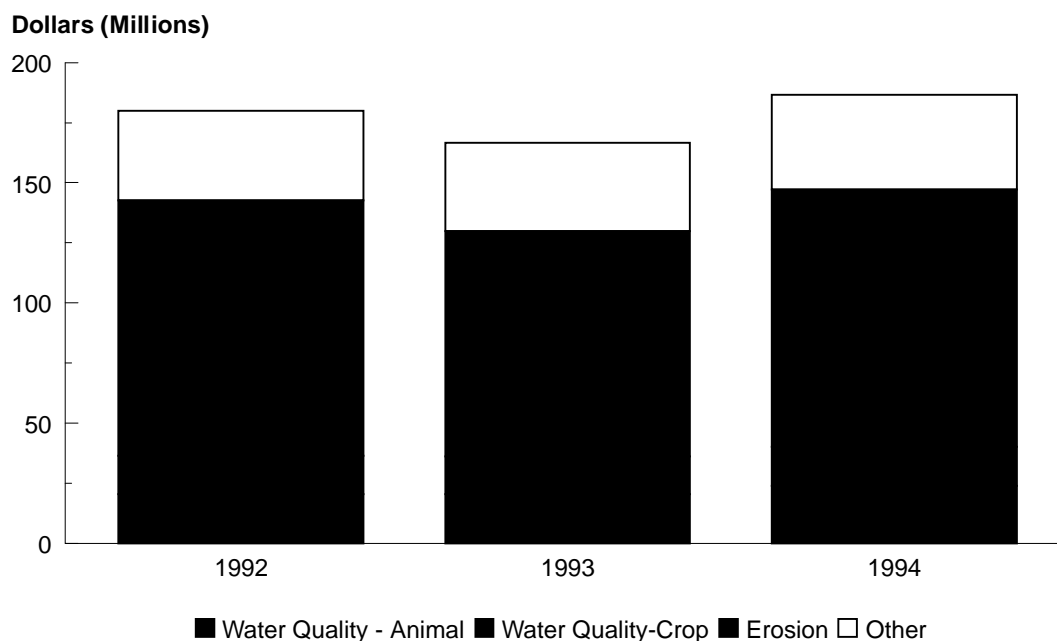
A number of USDA conservation programs share the cost of implementing conservation practices with farmers through direct payments.<sup>1</sup> In general, these cost-share programs address one or more conservation objectives, including soil erosion control, water pollution abatement for animal agriculture or crop production, or other (including fish and wildlife enhancement, flood control, water conservation, and forestry). During fiscal years 1992 through 1994, about half of the cost-share assistance provided under these programs was for soil erosion control. However, many conservation measures may have secondary conservation purposes and result in multiple environmental benefits.

Four USDA conservation programs—Agricultural Conservation Program (ACP), Water Quality Incentives Projects (WQIP), Small Watershed Program (SWP), and Rural Clean Water Program (RCWP)—account for most of USDA's cost-share assistance to abate water pollution resulting from animal agriculture. For fiscal years 1992 through 1994, these programs provided about \$89 million for this purpose, according to USDA program activity data for ACP, WQIP, and RCWP and estimated expenditures for SWP.

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<sup>1</sup>These programs include the Agricultural Conservation Program, Colorado River Basin Salinity Control Program, Emergency Conservation Program, Forestry Incentives Program, Great Plains Conservation Program, Rural Clean Water Program, Stewardship Incentive Program, Small Watershed Program, and Water Quality Incentives Projects. Detailed information on the goals and funding for these and other USDA conservation programs is contained in our report entitled Agricultural Conservation: Status of Programs That Provide Financial Incentives (GAO/RCED-95-169, Apr. 28, 1995).

# GAO Agricultural Conservation Program Expenditures, Fiscal Years 1992-94



Source: GAO analysis of USDA program activity data.

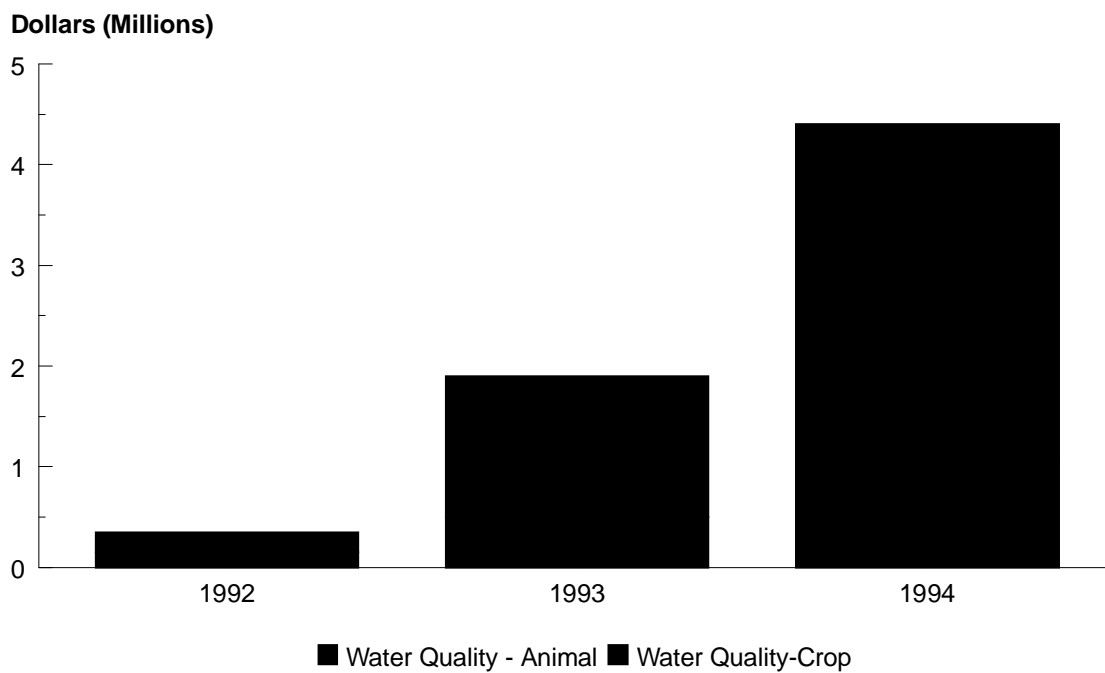
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**Briefing Section 5  
USDA Conservation Programs Providing  
Cost-Share Assistance for Animal Waste  
Management**

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For fiscal years 1992 through 1994, ACP provided approximately \$65 million in cost-share assistance for animal waste management; this represented about 12 percent of the cost-share funds available under the program. This assistance was provided for a variety of waste management practices, including treatment lagoons and storage facilities, constructed wetlands systems, and composting facilities. Under ACP, cost-share assistance is generally limited to 50 percent of the total cost of the financed activity; the maximum assistance level per participant is \$3,500 annually or \$35,000 under 10-year agreements.

## GAO Water Quality Incentives Projects Expenditures, Fiscal Years 1992-94



Source: GAO analysis of USDA program activity data.

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**Briefing Section 5**  
**USDA Conservation Programs Providing**  
**Cost-Share Assistance for Animal Waste**  
**Management**

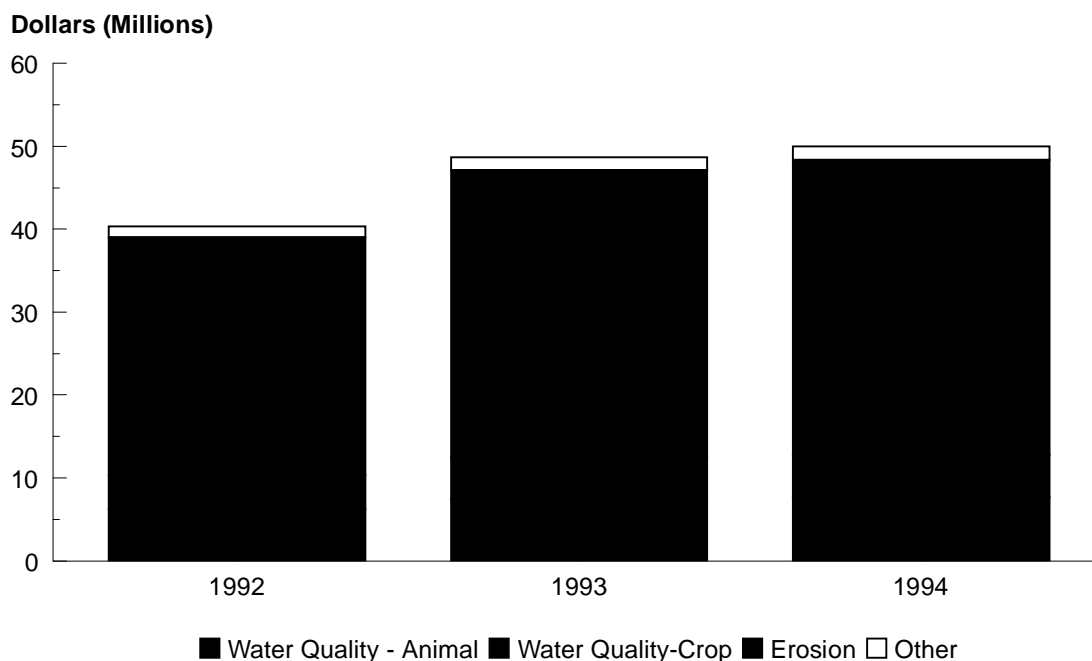
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For fiscal years 1992 through 1994, WQIP provided about \$2 million in cost-share assistance for animal waste management; this represented about 26 percent of the cost-share funds available under the program. WQIP cost-share assistance may only be used for management practices such as waste utilization and nutrient management; it may not be used for structural practices such as waste storage facilities.<sup>2</sup> Under WQIP, cost-share assistance is limited to \$3,500 annually per participant for up to 5 years.

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<sup>2</sup>Technically, WQIP provides “incentive payments” to encourage farmers to use improved waste management practices, rather than cost-share assistance for the construction of storage facilities. However, WQIP has been funded through ACP’s appropriation; ACP is a cost-share program. Also, assistance available to a farmer under WQIP is limited by any payments made to that farmer under ACP in the same year.

## GAO Small Watershed Program Estimated Expenditures, Fiscal Years 1992-94



Source: GAO analysis of USDA estimated expenditures for SWP.



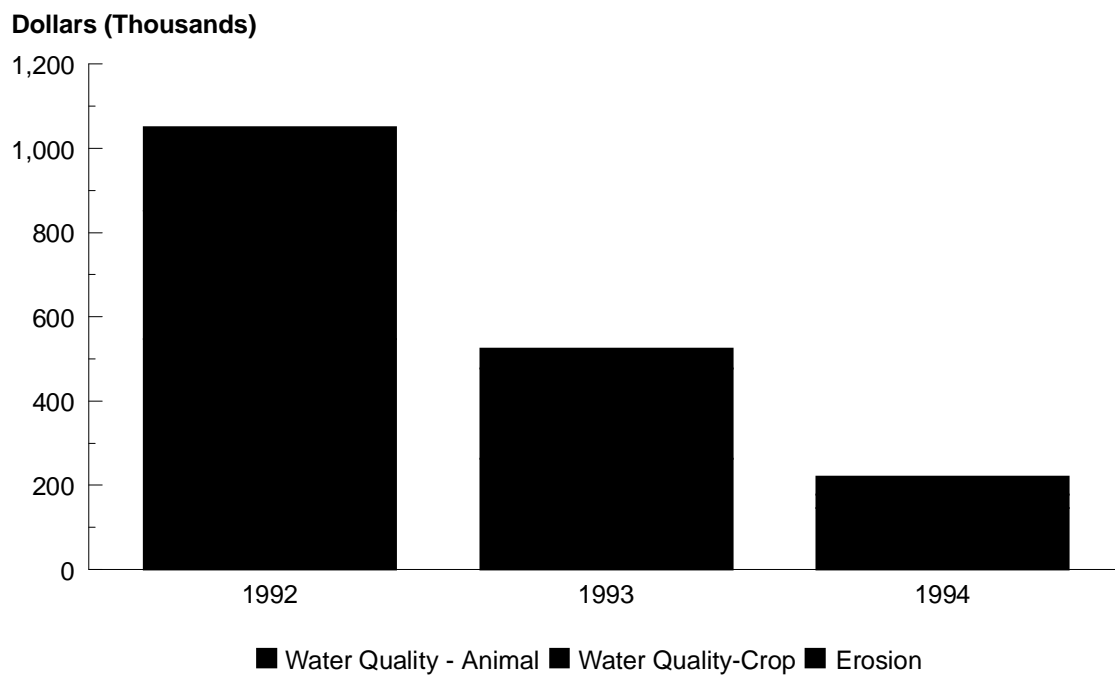
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**Briefing Section 5**  
**USDA Conservation Programs Providing**  
**Cost-Share Assistance for Animal Waste**  
**Management**

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For fiscal years 1992 through 1994, SWP provided an estimated \$21 million in cost-share assistance for animal waste management; this represented about 15 percent of the cost-share funds available under the program. SWP cost-share assistance may be used for a variety of waste management practices, including waste treatment lagoons and storage structures. Under SWP, cost-share assistance is limited to 50 percent of construction costs, with a maximum of \$100,000 per participant for the life of the program.

## GAO Rural Clean Water Program Expenditures, Fiscal Years 1992-94



Source: GAO analysis of USDA program activity data.

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**Briefing Section 5**  
**USDA Conservation Programs Providing**  
**Cost-Share Assistance for Animal Waste**  
**Management**

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For fiscal years 1992 through 1994, RCWP provided about \$1 million in cost-share assistance for animal waste management; this represented about 53 percent of the cost-share funds available under the program.<sup>3</sup> This assistance was provided for a variety of waste management measures in 22 states, including waste storage structures and constructed wetlands systems. Under RCWP, cost-share assistance is limited to 75 percent of the total cost of the financed activity, with a maximum of \$50,000 per recipient.

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<sup>3</sup>According to USDA, funds were last appropriated for RCWP in fiscal year 1981 under long-term contracts to establish best management practices. The final payment under this program is scheduled to be made in 1999.

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# Objectives, Scope, and Methodology

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The Chairman and Ranking Minority Member of the Senate Committee on Agriculture, Nutrition, and Forestry asked us to provide information on animal agriculture waste management and related water quality issues. Specifically, the requesters asked us to provide information on (1) water quality concerns arising from animal agriculture sources of nonpoint pollution—pollution not traceable to a specific point of origin, (2) consolidation trends and geographical shifts in animal agriculture, (3) animal agricultural production covered by point source permits, (4) the most commonly used animal waste management practices and associated costs, and (5) U.S. Department of Agriculture (USDA) cost-share assistance for animal waste management. In addressing these objectives, the requesters asked us to focus on the management of wastes associated with breeding and feeding operations—generally farms, ranches, and feedlots—for beef cattle, dairy cows, hogs, broilers, layers (laying hens), and turkeys.

To address the first objective, we analyzed data from the Environmental Protection Agency's (EPA) 1992 inventory of water quality; the Department of the Interior's U.S. Geological Survey's National Water Quality Assessment program; and USDA's Economic Research Service's analysis of counties with high ratios of nutrients from manure to cropland.

To address the second objective, we analyzed data from (1) USDA's National Agricultural Statistics Service (NASS) for the years 1978 through 1994 and (2) the Department of Commerce's Census of Agriculture for census years 1974, 1978, 1982, 1987, and 1992. For the beef cattle (except feedlots), dairy cow, and hog sectors, we used NASS inventory data because they were more current than Census of Agriculture inventory data. For the layer sector, we used Census of Agriculture inventory data because they were more complete than the NASS inventory data for this sector. For the feedlot cattle and broiler sectors, we used Census of Agriculture annual sales data (number of animals sold) because these data were generally more complete than either Census of Agriculture or NASS inventory data for these sectors. We also used Census of Agriculture annual sales data for the turkey sector because inventory fluctuates seasonally with demand. In addition, we interviewed USDA and animal producer organization officials to obtain their views on future consolidation trends and the reasons for geographical shifts in these sectors.<sup>1</sup>

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<sup>1</sup>We contacted the following animal producer organizations: the National Cattlemen's Association; National Milk Producers Federation; National Pork Producers Council; National Broiler Council; and National Turkey Federation.

To address the third objective, we analyzed data from EPA's Office of Wastewater Management and Region VII and ERS' analysis of confined animal production operations as reported in the 1992 Census of Agriculture. We also interviewed EPA officials and reviewed relevant documentation to obtain a better understanding of point source permit requirements.

To address the fourth objective, we obtained and analyzed information from a variety of sources, including waste management handbooks prepared by USDA and the Poultry Water Quality Consortium<sup>2</sup> and EPA's analysis of the economic impacts on confined animal operations of waste management measures specified in the Coastal Zone Act Reauthorization Amendments of 1990.<sup>3</sup> We also interviewed officials from USDA's Natural Resource Conservation Service and Agricultural Research Service, the American Society of Agricultural Engineers, and animal producer organizations to obtain their views on preferred waste management practices and associated costs.

To address the fifth objective, we analyzed program activity data for fiscal years 1992-94 for USDA conservation programs providing cost-share assistance. We also reviewed prior GAO reports that discuss USDA conservation programs providing cost-share assistance.

We conducted our work between December 1994 and June 1995 in accordance with generally accepted government auditing standards. We did not independently verify the data obtained from the agencies contacted.

We discussed the contents of this report with officials representing USDA and EPA. At USDA, these officials included the Assistant Deputy Administrator, Economic Analysis and Appraisal Staff, Consolidated Farm Service Agency; Assistant Director for Economics and Communication, Resource and Technology Division, Economic Research Service; Chief, Livestock Branch, Estimates Division, National Agricultural Statistics Service; and Manager, Water Quality Program, Conservation and Ecosystem Assistance Division, Natural Resources Conservation Service. At EPA, these officials included the Chief, Nonpoint Source Control Branch,

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<sup>2</sup>The Poultry Water Quality Consortium is a cooperative effort involving the Southeastern Poultry and Egg Association, EPA, USDA, and the Tennessee Valley Authority. The Consortium's purpose is to identify and adopt environmentally prudent uses of poultry wastes and by-products.

<sup>3</sup>Pub. L. No. 101-508, Title VI, Subtitle C, Nov. 5, 1990, 104 Stat. 1388, 1388-299. Section 6217 of the 1990 act identifying these management measures is codified at 16 U.S.C. 1455b.

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**Appendix I**  
**Objectives, Scope, and Methodology**

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Assessment and Watershed Protection Division, Office of Wetlands, Oceans, and Watersheds; and the Chief, Pretreatment and Multi-Media Branch, Permits Division, Office of Wastewater Management. These officials agreed that the positions and data attributed to their agencies were accurate. They also provided new or clarifying information that we incorporated as appropriate.

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