The State of the Land

Our challenge as we attempt to read America's land is not a lack of data. Computers full of figures and books with myriad tables and graphs are essential to this process, but they often overwhelm us with data and give us little in the way of useful information. Still we can use these data to construct an overall picture that, in a sense, represents the land's condition or health. Complicating that task, of course, is the need to create the picture in terms of space–how particular conditions relate to each other over large areas, such as watersheds or states or regions–and time–how today's conditions relate to the past, indicating if our path is one of improvement or deterioration.

Natural resource concerns today are different from what they were in the Dust Bowl era, so we ask different questions and seek different insights. Fortunately, we have the latest in modern technology to help interpret today's information. Our grandchildren may well raise questions we have not yet thought of and use technologies we can only imagine. Such realities are an integral part of our continued learning and living on this vast and complex American landscape.

So what is the state of America's private land today? Is there a reason for hope? We think so! What follows is a snapshot of land use change, soil erosion and quality estimates, water quality and quantity, and wildlife numbers and trends. These are only the pieces of a national portrait of our land. Each is important only if we can see how it connects or relates to the others and to the well-being of the people whose lives depend upon the health of the landscape.

About two-thirds of the total value of U.S. agricultural production takes place in or adjacent to metropolitan counties.

America's Private Land

We in the United States are endowed with an enormous and complex landscape. Its highly variable geography and climate lend themselves to a great array of soil, water, and vegetative conditions. Most privately owned land is in an agricultural use–crops, grazing, or forest. Although urban land has nearly tripled since 1945, it remains less than 3 percent of total land use.

About one-fifth of the Nation's land is used for crops (382 million acres), most of which is in row crops, such as corn, cotton, oilseeds, and vegetables, or close-grown crops, such as wheat, rice, and barley. Grazing land, which includes rangeland and pasture, accounts for one-quarter of our Nation's private land (525 million acres). Rangeland is found in nearly every state, although it is concentrated in the West. Privately owned rangeland totals about 399 million acres. Pasture is often part of a crop rotation or a permanent use of land too difficult to till. Most of the 126 million acres of pasture are in the humid eastern half of the United States.

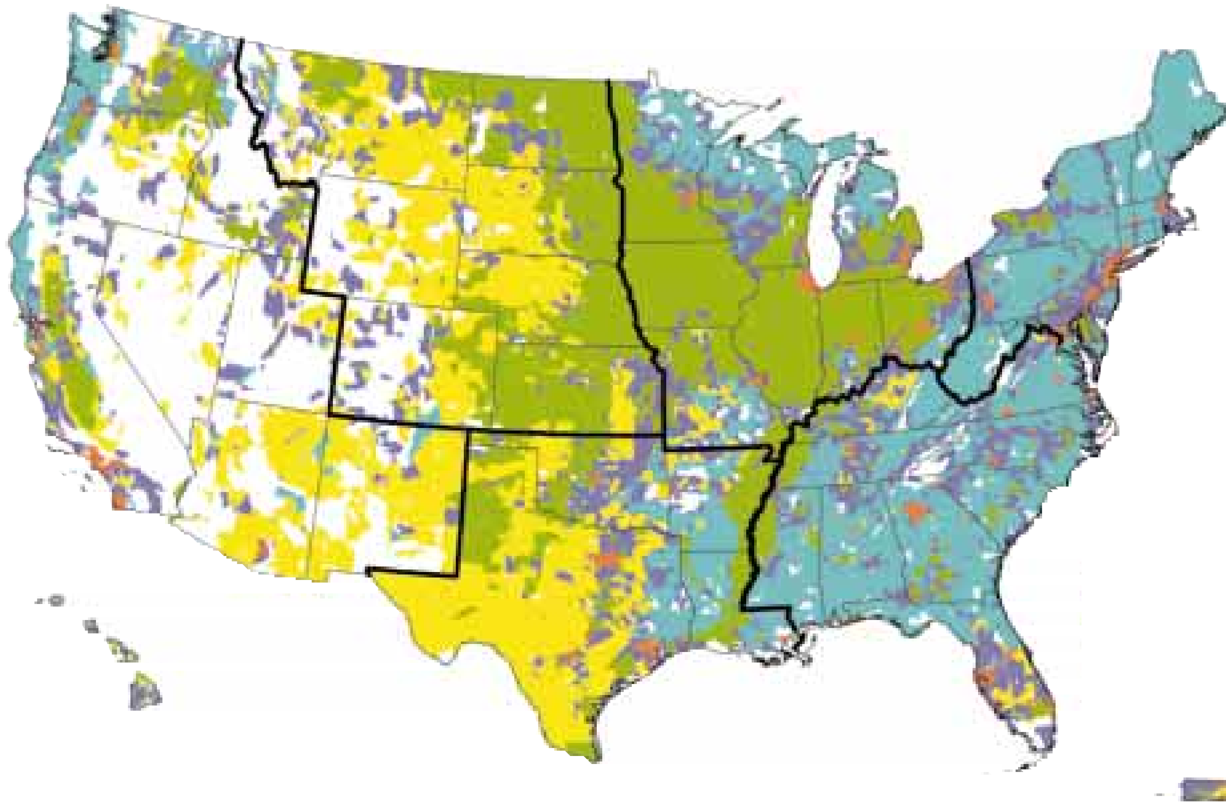
Dominant Land Uses, 1992

Land Uses Occupying Over 50% of Area.

LEGEND

- Developed Land
- Cropland
- Rangeland/Pasture
- Forest Land
- Mix of Two or More Land Uses
- Federal Land/Water/Non-Sampled Area

Source:
USDA/NRCS National Resources Inventory, #RWH.1542, 1992

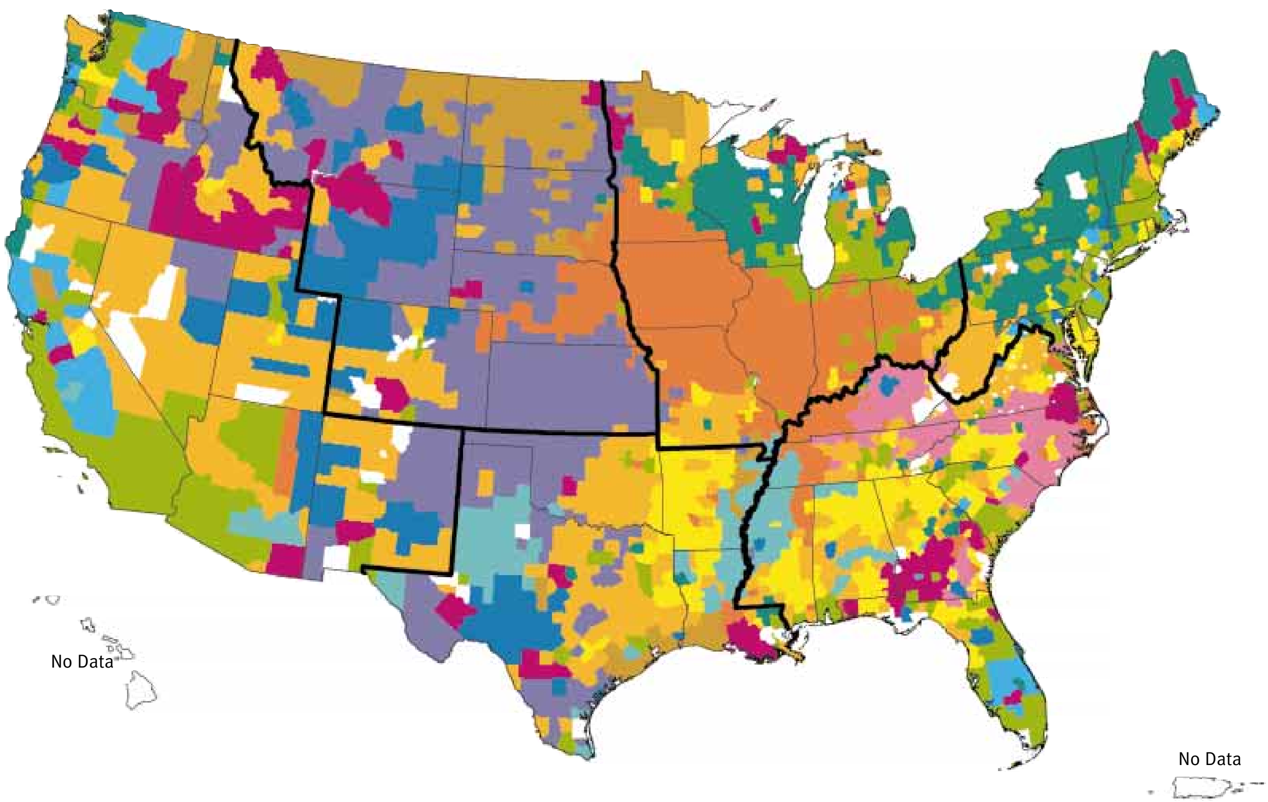


Privately owned forests comprise another one-fifth of our Nation's private land (395 million acres). The majority of private forest is concentrated in the East, where marginal crop and pasture land has gradually reverted to forest. Almost half of the Nation's timber supply in 1992 came from private, nonindustrial forests, even though almost 90 percent of those forests are less than 100 acres in size and most such ownerships are held primarily for recreational, homesite, or similar purposes.

Land Productivity and Diversity

The U.S. agriculture and food system is an integral component of our national economy, contributing $950.2 billion (15.7 percent) to the Nation's gross domestic product in 1992 and accounting for at least 18 percent of the Nation's 127 million civilian jobs. It varies widely in enterprise size, scale, resource use, product mix, and interaction with the nonfarm sector. Major grain crops, for example, are found in the Nation's central breadbasket (Midwest and Northern Plains); most timber

PATTERNS OF AGRICULTURAL DIVERSITY



Each of the cluster categories represents farm types that are similar in terms of commodities produced, farm resources, and employment and income on- and off-farm. Eastern and southeastern states are characterized by smaller, more diverse production activities (e.g., mixed dairy, woodlots, specialty crops) than those in the Midwest and Northern Plains.

LEGEND

- Corn, Soybeans, Hogs
- Poultry
- Dairy
- Cattle, Wheat, Sorghum
- Tobacco
- Part-time Cattle
- Fruit
- Other Crops
- Vegetables, Nursery Products
- Wheat, Oats, Other Grains
- Cotton
- Sheep, Cattle, Other Livestock
- Insufficient Data

Source:
USDA Economic Research Service, Diversity in U.S. Agriculture
(Rep. #646), #RWH.1472, 1991

production, industrial and nonindustrial, takes place in the Northwest and Southeast; rangeland characterizes the arid and semiarid West. Specialty products, such as fruits, vegetables, and horticultural crops, are commonly found near metropolitan areas, where almost two-thirds of U.S. agricultural production–valuewise–occurs.

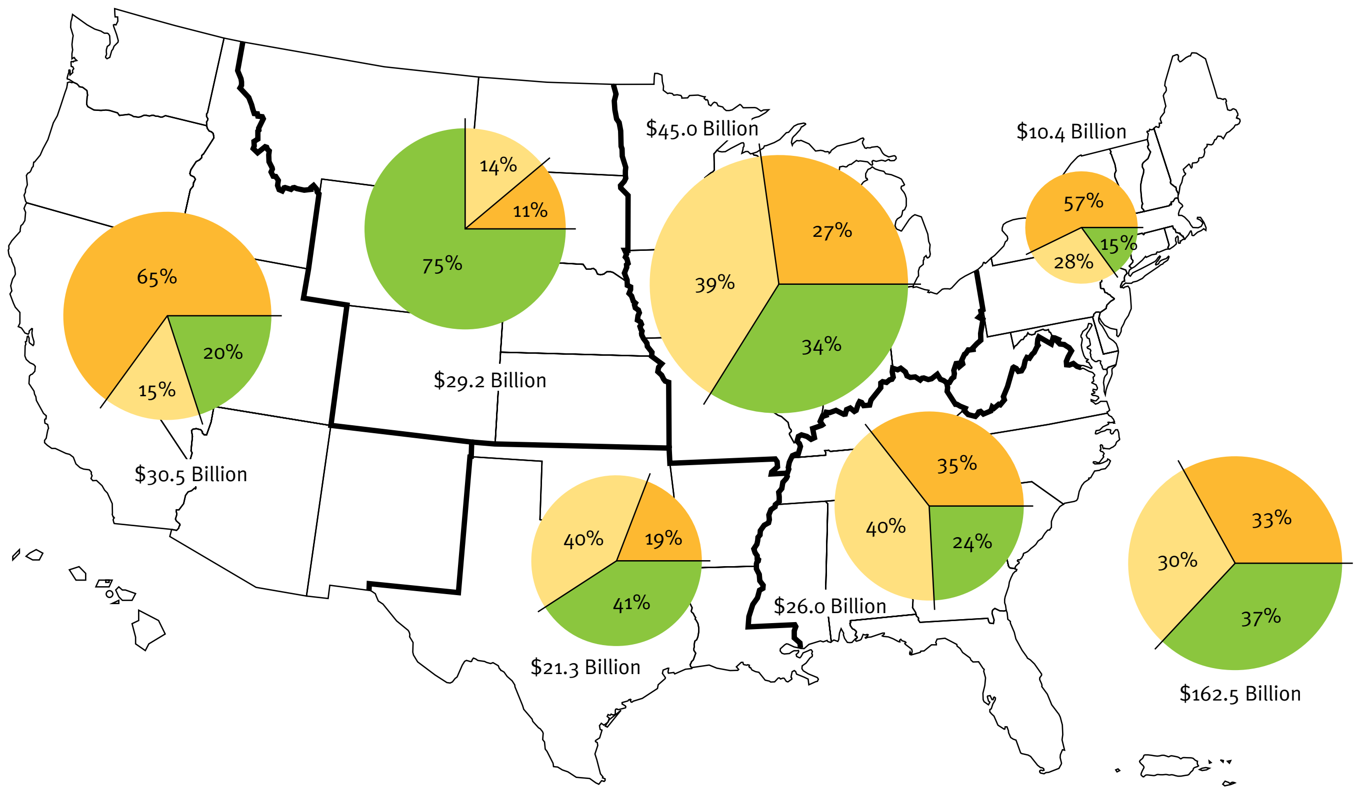
Agriculture has a significant economic influence in metropolitan areas of the United States. In 1992, agricultural production in metropolitan counties accounted for $53.6 billion; production value in counties adjacent to metropolitan areas accounted for another $48.7 billion. Based on sales per acre, urban-fringe agriculture is two and a half times as productive as rural agriculture. Some of these farms are associated with innovative marketing techniques, such as "pick-your-own" operations that also provide recreation and a connection to the land for urban and suburban residents.

Value of Agricultural Production by Proximity to Metro Areas

LEGEND
- Metro County
- Adjacent to Metro County
- Not Adjacent to Metro County

NOTE:
U.S. pie is not the same scale as regional pies.

Source:
USDA/NRCS, based on 1992 Census of Agriculture data, #RWH.1523, 1996



National Resources Inventory: From Data to Information

For more than 50 years, the U.S. Department of Agriculture has "read" the land through conservation needs assessments and natural resource inventories. One of USDA's principal data gathering efforts today is the Natural Resources Conservation Service's National Resources Inventory (NRI), the Nation's most comprehensive program for gathering data and presenting information on the condition and trends on nonfederal land in the United States. Detailed NRI information is available for the 48 contiguous states, Hawaii, Puerto Rico, and the U.S. Virgin Islands. Similar, though less extensive, information is under development for Alaska and certain Pacific Basin islands. The NRI is a multiresource inventory based on soils and other natural resource data collected at sample sites–800,000 sites in 1992. It provides a record of the Nation's conservation accomplishments and needs. The database currently includes data from 3 inventory years–1982, 1987, and 1992.

Each NRI has expanded and improved upon the previous one. For example, the 1992 NRI added a first measure of wildlife habitat diversity. Today, the NRI and other data collection efforts are being coordinated to achieve a continuous monitoring and assessment of natural resource conditions and trends.

NRCS is also developing new indicators that can be used to measure natural resource and ecosystem health. These new indicators will:

- Enable people to assess ecosystem conditions, including ecological, social, and economic elements.
- Allow quantification of objectives, use of analytic tools, and integration of multiple objectives within the planning process.
- Evaluate the effects of broad-scale program and management actions in order to make corrections in implementation plans or goals and to increase the knowledge of how systems respond to management changes.
- Enable public interest groups, professional resource managers, public agencies, nongovernmental organizations, and others to evaluate ecosystem conditions using a common set of terms and methods.

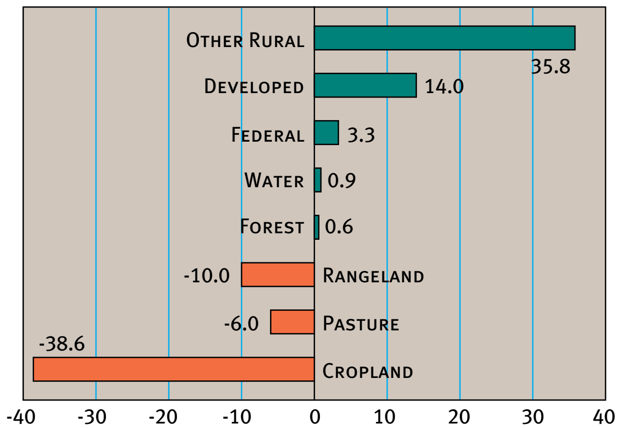
NRI information can be used to formulate policy and evaluate programs at national, regional, state, and multi-county levels. When combined with other Federal, state, and local government inventories, the NRI can provide a snapshot of the state of the land and identify natural resource trends. NRCS field offices and new information dissemination systems, such as the Internet, will become increasingly important in getting this information to the people who most need it: landowners and natural resource managers.

Many maps in this report are based on NRI data. Each sample point in the NRI database is linked to specific geographic areas–county, hydrologic unit (watershed), and Major Land Resource Area. With this linkage, NRI data can be mapped to geographic areas of interest for natural resource analysis. Those estimates are generated using weighted averages or sums for the data from the appropriate sample points. Caution is thus needed when making highly localized interpretations based on NRI maps. NRI data are statistically reliable only at certain substate levels. The specific level of reliability varies by area, density of sample points, and nature of the resource feature being estimated.

Net Changes in Use of Nonfederal Rural Land, 1982-1992 (million acres)

Other rural land is primarily composed of CRP acres, but also includes farmsteads and other farm structures, field windbreaks, barren land, and marshland.

Source:
USDA/NRCS National Resources Inventory, 1992



The Land Dynamic

Land shifts into and out of various uses. Between 1982 and 1992, the net amount of land devoted to crops, pasture, and range declined by 39 million cropland acres (of which 36.4 million were enrolled in the Conservation Reserve Program), 6 million pasture acres, and 10 million rangeland acres. Forest land showed a modest increase during the period.

The net acreage gained or lost to different land uses reveals only part of the story. Although 60 million acres shifted from cropland to other uses between 1982 and 1992, about 21 million acres shifted from other uses into cropland during this same period. Nearly 3 million acres of cropland were developed for residential purposes (or 68 percent of total

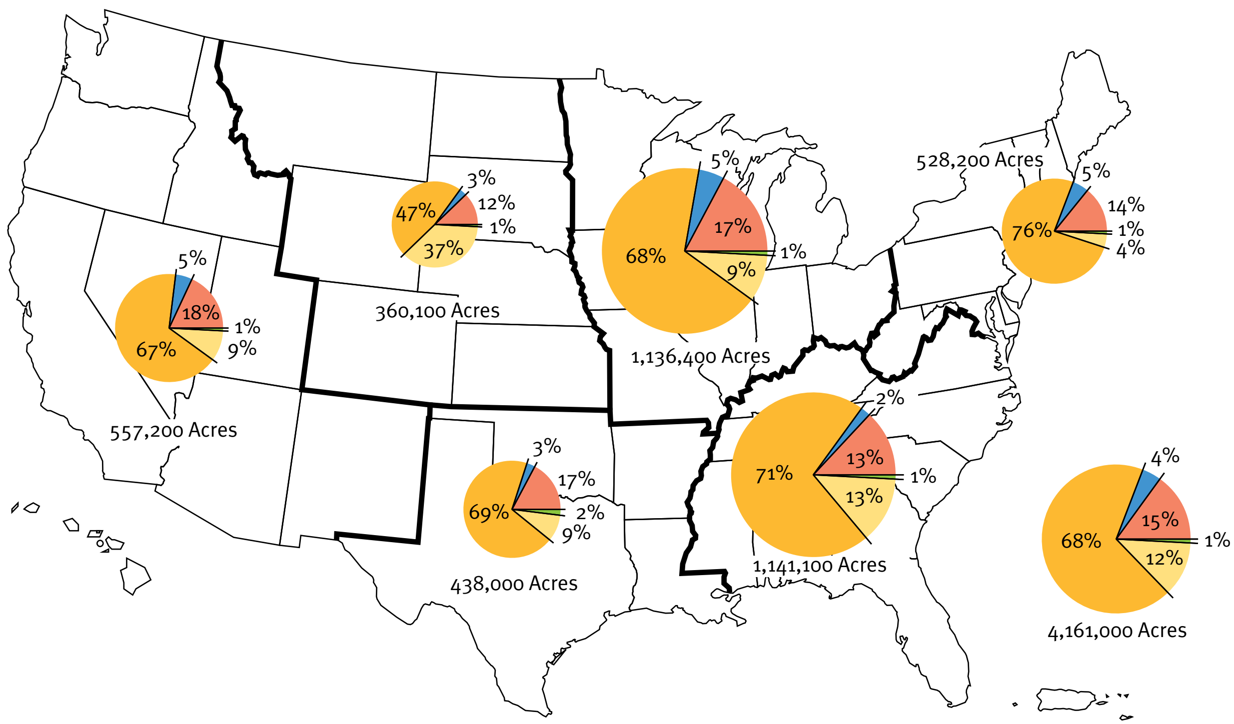
Cropland Converted to Developed Land, 1982-1992

Percent of 1982 Cropland Converted to Other Uses

LEGEND
- Business
- Recreation
- Residential
- Transportation
- Other

NOTE:
U.S. pie is not the same scale as regional pies.

Source:
USDA/NRCS National Resources Inventory, #RWH.1481, 1992

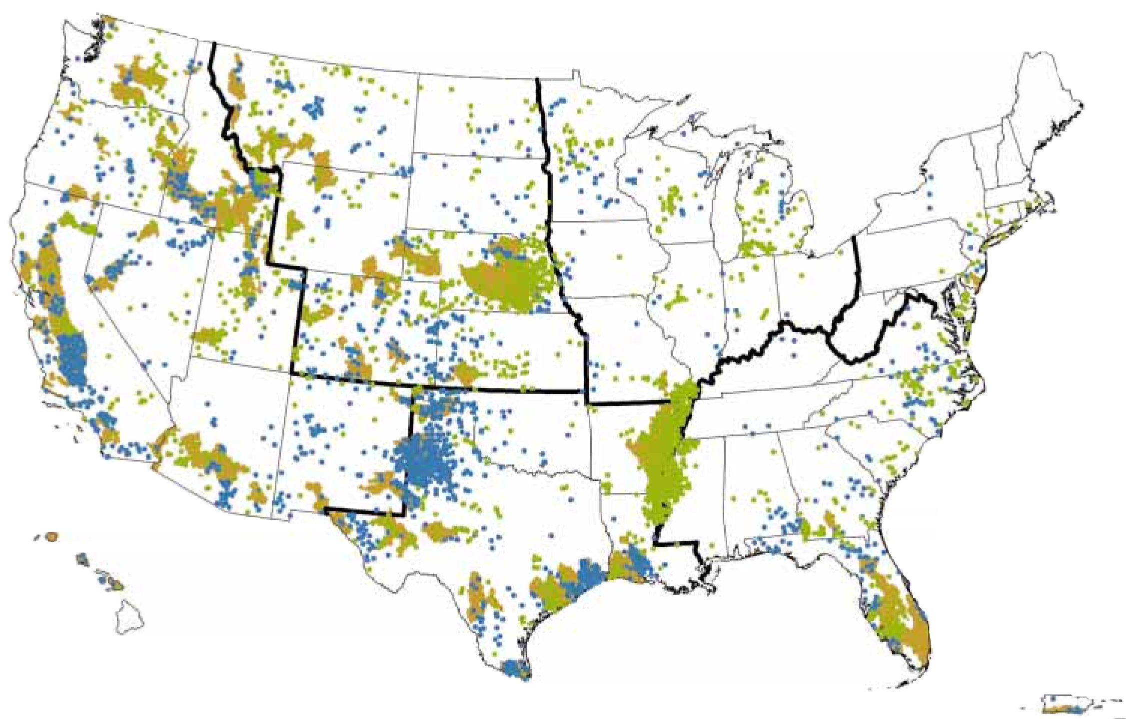


conversions). But this rate had slowed compared to earlier decades. The 10-year rate of expansion in urban areas (18 percent) was half the rate of growth in the 1950s (39 percent).

As agricultural land is converted, its contribution to local economies declines. The total value of agricultural production in the Central Valley of California could drop by as much as $2 billion annually as a result of low-density urban sprawl, an amount roughly equal to the entire agricultural production of New York, Virginia, Oregon, or Mississippi. Farmland preservation surrounding some urban areas is undertaken at least in part to preserve the feeling of openness that is so important to us. Scenic vistas with a minimum of manmade obstructions have been shown to reduce the stress of modern living. Natural areas provide us with opportunities for reflection, rest, and renewal.

Land use changes also may occur when one use is abandoned because it can no longer be supported economically. In 1992, about 62 million acres of agricultural land were irrigated, down only slightly from 1982. But a regional shift was evident. Irrigated acreage in the western states declined substantially as the use of groundwater for irrigation became uneconomical. Conversely, irrigation expanded in the eastern United States, in part reflecting producers' efforts to reduce risk from drought. Irrigation in relatively humid areas is supplemental, with precipitation meeting the crop's major water needs.

Net Gains and Losses in Irrigated Cropland Acreage, 1982-1992



Percent of Cropland Area in Irrigation

LEGEND

- Greater Than 50%
- Less Than 5% Cropland or Less Than 50% Irrigation in Sample
- 1 Green Dot = 2,500 Acres Net Gain
- 1 Blue Dot = 2,500 Acres Net Loss

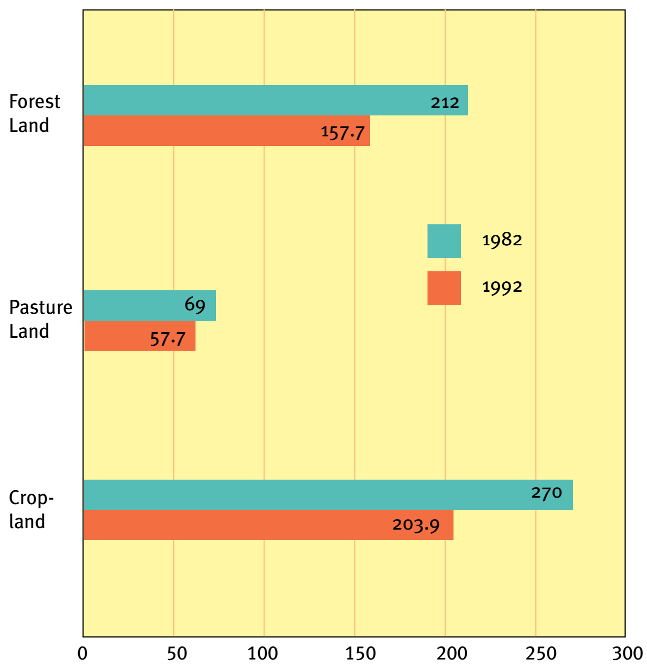
Source:
USDA/NRCS National Resources Inventory, #RWH.1607, 1992

Protecting and Enhancing Agricultural Productivity

The amount of cropland still requiring conservation treatment to maintain productivity declined by nearly a quarter between 1982 and 1992, in part because of land retirement, but also because of producers' adoption of soil-conserving crop management practices, such as conservation tillage. Pasture and forest acres needing conservation treatment also declined between 1982 and 1992. Conservation treatment, primarily forage improvement, was needed on 46 percent of pasture land in 1992, a decline from 53 percent requiring treatment in 1982.

Private, nonindustrial forest concerns include structural and biological diversity, fuel-loading and fire management, insects and disease, pollution, and riparian area damage. Aging, overcrowded stands are more likely to be stressed by insect and disease attacks and environmental changes, such as drought and pollution. Northern and eastern forests in particular are threatened by ozone and acidic deposition, and large areas of loblolly pine in the South are subject to damage from drought stress and insects. In the West, fuel-loading and wildfire are the major concerns. Between 1986 and 1991, timber mortality increased in all regions of the country.

Acres Needing Conservation Treatment by Land Use, 1982 and 1992 (million acres)



Conservation treatment needs are based on the judgment of a qualified specialist using the NRCS technical guide and information about the prevailing agricultural operations. The specialist can record up to three conservation treatments needed to sustain and enhance soil, water, plant, and animal resources. Conservation treatments include erosion control, drainage, irrigation management, various forms of forage improvement and reestablishment, and toxic salt reduction. Data on rangeland conservation needs are available only in preliminary form.

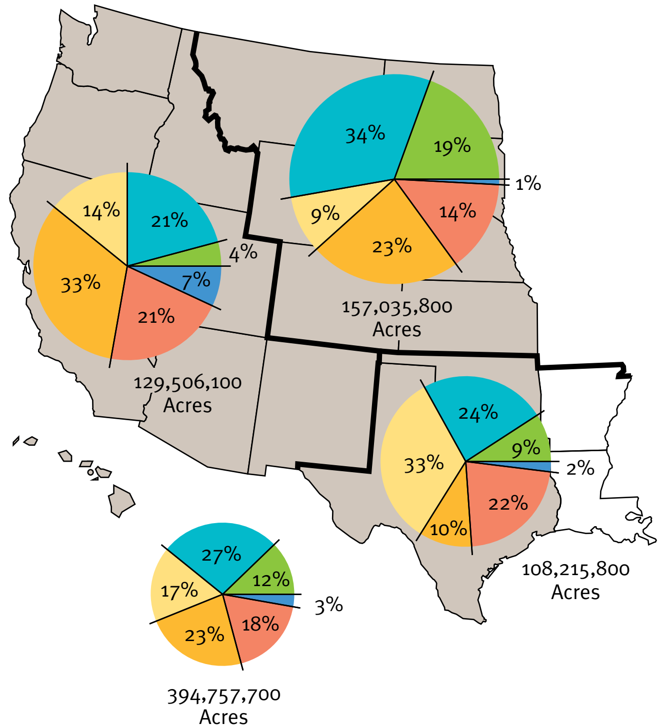
Source:
USDA/NRCS National Resources Inventory, 1982 and 1992

The bulk of private rangeland evaluated in 1992 (59 percent) exhibited some form of disturbance that affected its productive capacity. Accelerated soil erosion threatens sustained production on at least a fifth of all rangeland acres. Invasive weeds and unwanted brush are the other major management problems on rangeland, adversely affecting at least 69 million acres–about 17 percent of all rangeland. Invasive perennial weed species are distributed across the entire West, posing a significant hazard to rangeland health specifically. Leafy spurge is one of the most notable and damaging of the invasive perennial weeds.

Irrigation in arid and semiarid regions often concentrates salts in soil and water, sometimes creating severe production and environmental problems. About 570 million acres (30 percent) of the contiguous United States have a moderate to severe potential for soil and water salinity problems. Saline soils contain sufficient soluble salts to adversely affect plant growth. At least 48 million acres of cropland and pasture are currently affected. Reclaiming saline soils economically is difficult, if not impossible. Salinized soil is lost to agricultural production, at least in the near term. In 1971, 81,430 acres of saline-affected cropland had been taken out of production in Montana. By 1987, that figure had risen to 300,000 acres (about 2 percent of Montana's total cropland). Recent surveys indicate that affected areas are growing at a rate of 10 percent a year.

Conservation gains are seldom permanent. Changes in conservation technology and application are challenged to keep pace with natural resource conditions, land use, market forces, and production technology and trends. The years between 1982 and 1992 were significant in terms of conservation gains. During this period, new agricultural conservation policies were put in place that reduced conversion of wetlands to cropland, required compliance with soil conservation provisions as a feature of par-

Rangeland Status in the Western United States, 1992



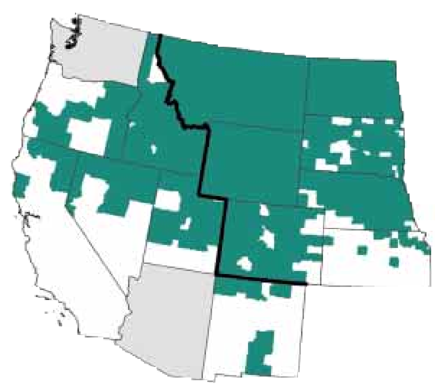
A little over half of all U.S. land is classified as rangeland (1.2 billion acres). Of this, Alaska has the most (230 million acres). In the lower 48 states, Texas has the largest acreage (92 million), and Florida has the most acreage of any state east of the Mississippi River (2 million). Other eastern states also contain rangeland, but little information is gathered on its extent or condition. Rangeland assessment methods changed between 1982 and 1992, making a comparison of conservation treatment needs impossible.

LEGEND
- No Serious Problem
- Minor Problems Correctable With Improved Management
- Brush or Weed Problems
- Accelerated Wind and Water Erosion
- Multiple Problems
- Insufficient Data
- States with Rangeland Data

NOTE:
U.S. pie is not the same scale as regional pies.

Source:
USDA/NRCS National Resources Inventory, #RWH.1711, 1992

Distribution of Leafy Spurge in the Western United States by County, 1996



LEGEND
- Leafy Spurge
- No Data Collected

Source:
USDA/NRCS, based on data from Montana State University, #RWH.1705, 1996

ticipation in commodity and other Federal farm programs, and encouraged long-term retirement of cropland particularly susceptible to degradation; important conservation cost-share programs also remained in place. The challenge is to expand on those accomplishments and make sure they endure. External forces may prove to have the most influence on the Nation's conservation progress. Rising world food demands, new markets, and expanding free-trade policies could encourage production on formerly retired, environmentally sensitive land.

Soil and Productivity

Soil erosion occurs naturally on all land, with at least 40 percent of the total soil erosion in the United States resulting from such activities as construction, logging, and off-road vehicle use, or natural events, such as fire, flooding, or drought. While erosion can reduce soil productivity, it also has a substantial effect on the quality of our water and atmospheric resources. A certain level of soil erosion is tolerable, meaning that it does not harm soil productivity. This level, referred to as T, varies by soil type and considers a number of factors, including the time required for new soil to form.

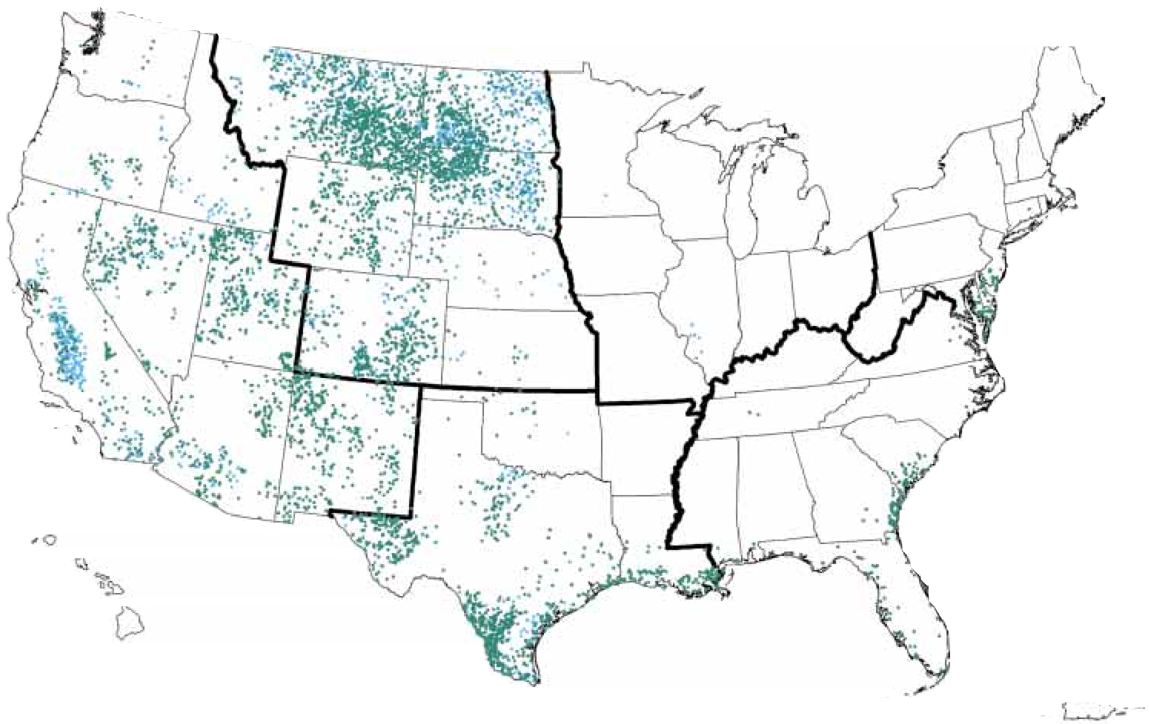
Salinity-Influenced Soils on Nonfederal Land, 1992

Salinity levels generally are expressed in terms of electrical conductivity. The higher the salt level the greater the conductivity. This graphic depicts areas with salinity levels greater than 4 millimhos/cm (mmho/cm), the level at which most plants are adversely affected. Salinity levels this high can alter soil structure and promote waterlogging, cause salt toxicity in plants, and reduce the plant's ability to take up water. But this is an average value. Salt-intolerant plants may be adversely affected at 2 mmho/cm, whereas salt-tolerant plants may adapt to 8 mmho/cm or more.

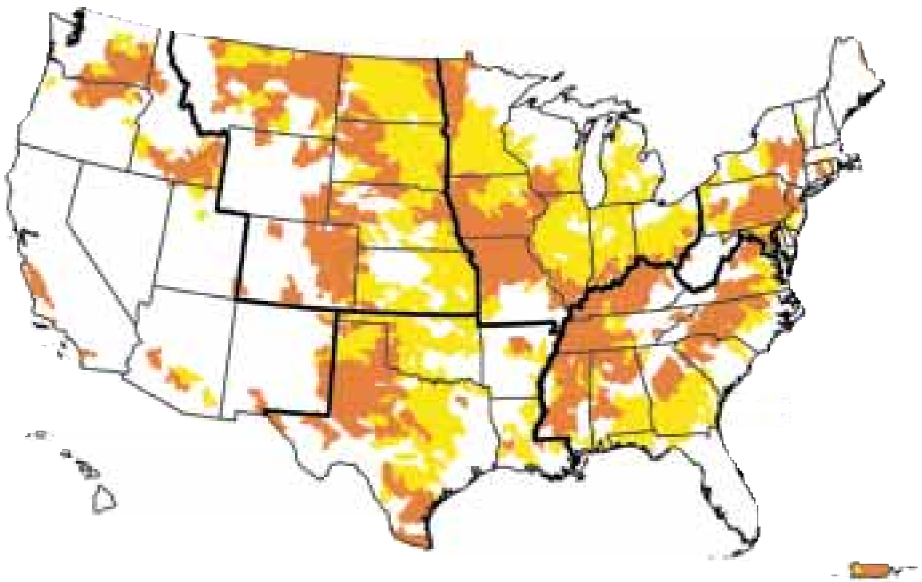
LEGEND

- 1 Green Dot=10,000 Acres Other Land
- 1 Blue Dot=10,000 Acres Cropland, CRP, and Potential Cropland

Source:
USDA/NRCS National Resources Inventory, #SMW.1597, 1992



Soil Erosion as a Proportion of the Tolerable Rate (T), 1982



Actual Soil Loss Rate/Tolerable Soil Loss Rate

LEGEND

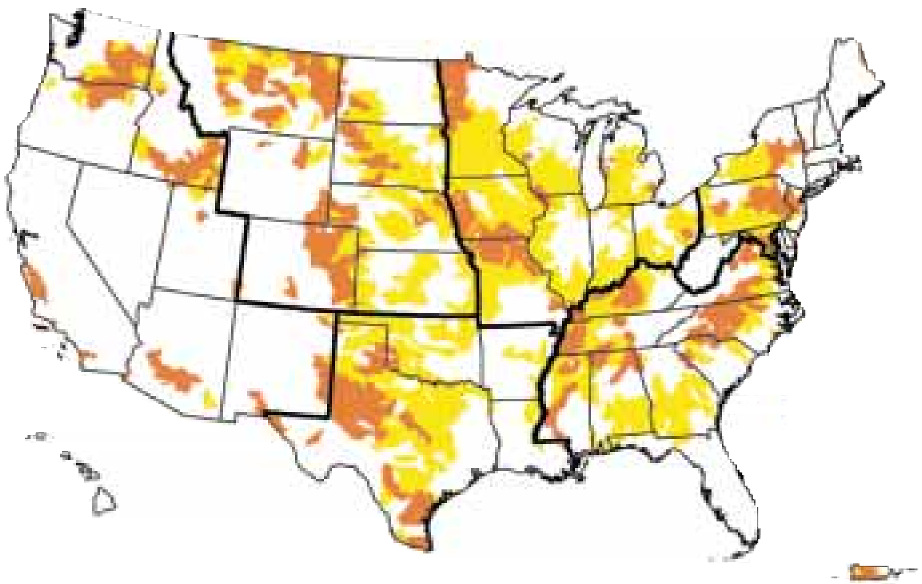
2T or More

T-2T

NOTE:
Average annual soil erosion by wind and water where cultivated cropland is greater than 5% land area.

Source:
USDA/NRCS National Resources Inventory, #RWH.1570, 1982

Soil Erosion as a Proportion of the Tolerable Rate (T), 1992



Actual Soil Loss Rate/Tolerable Soil Loss Rate

LEGEND

2T or More

T-2T

NOTE:
Average annual soil erosion by wind and water where cultivated cropland is greater than 5% land area.

Source:
USDA/NRCS National Resources Inventory, #RWH.1571, 1992

Soil erosion at rates greater than T is a special concern because it threatens agricultural sustainability. Sheet and rill erosion tends to be a greater problem in the humid East, while wind erosion is a greater problem in the arid and semiarid West. Estimates of streambank, gully, irrigation-induced, and ephemeral gully erosion currently are not included in standard soil erosion assessments. Such forms of erosion can be substantial in certain situations.

Knowing where we are today, how we got to this point, and where we are headed is the essence of reading the land.

In 1982, erosive forces moved nearly 3.1 billion tons of soil from our Nation's cropland (1.4 billion tons via wind and 1.7 billion tons via water). By 1992, soil erosion had dropped to 2.1 billion tons (0.9 billion tons via wind and 1.2 billion tons via water).

American farmers have made great strides in reducing cropland erosion using soil-conserving practices, such as crop residue management, contour tillage, stripcropping, and land retirement. Highly erodible land was the target of the first five Conservation Reserve Program sign-ups. After 13 sign-ups, U.S. farmers and ranchers had placed 36.4 million acres under CRP contracts, planting this environmentally sensitive land to trees, grasses, windbreaks, wildlife ponds and plantings, and other approved conservation practices.

CRP significantly improved the status of resources between 1982 and 1992. Average annual soil erosion on CRP land declined from 12.5 tons per acre per year to 1.5 tons per acre per year. The program hit its target! Erosion rates were lowered. Wildlife populations rebounded significantly in many areas as grassland and forest habitat increased, with associated gains in recreational opportunity, scenic amenities, and water quality.

Soil Erosion on Cultivated Cropland, 1982-1992

	Sheet and Rill Erosion		
Year	Less than T* (percent of total acres)	T - 2T (percent of total acres)	Greater than 2T (percent of total acres)
1982 - 366,199,800 total acres	73.1	14.1	12.8
1992 - 325,462,100 total acres	78.6	12.4	9.0
	Wind Erosion		
Year	Less than T* (percent of total acres)	T - 2T (percent of total acres)	Greater than 2 T (percent of total acres)
1982 - 366,199,800 total acres	78.9	9.4	11.7
1992 - 325,462,100 total acres	83.9	7.6	8.5

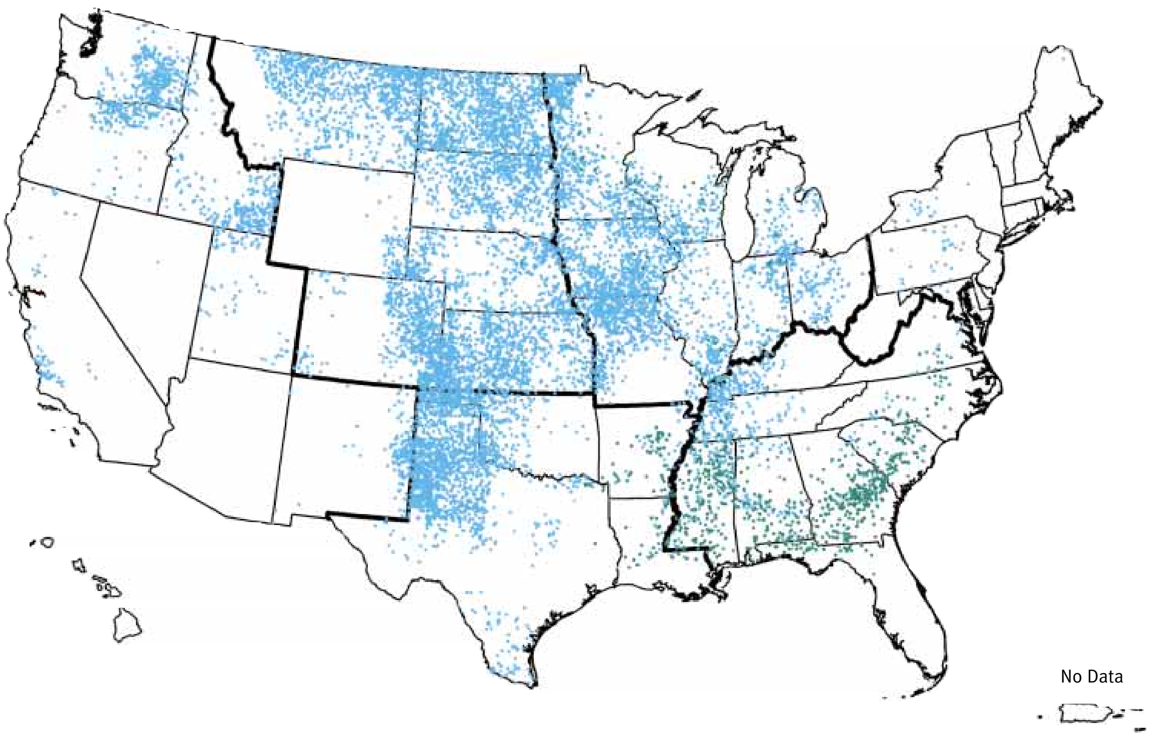
*T is the level of erosion believed tolerable on different soils to maintain productivity

Source:
USDA/NRCS National Resources Inventory, 1992

Controlling soil erosion is only one aspect of improving soil quality, however. Organic matter content is an important measure of soil quality and productivity. Organic matter contributes to a soil's ability to hold nutrients and water, supports microbial life, and maintains a texture and structure conducive to plant growth. Agricultural cropping, rotation, and tillage systems profoundly influence soil organic matter content. Rotations that include cover crops or grass-based sod systems can increase soil organic matter by adding root mass to the soil. Conservation tillage, which reduces soil disturbance and maintains residue levels of at least 30 percent on a field surface, can increase soil organic matter while significantly reducing soil erosion rates.

Nationally, conservation tillage is now used on nearly as many cropland acres as conventional tillage, although regional variations are evident. About 98 million acres of cultivated cropland were under a conservation tillage system in 1995, a 37-percent increase from 1989. Conservation tillage acres are concentrated in the Midwest and Northern Plains, the only regions where the practice is undertaken on more acres than conventional or reduced tillage.

Conservation Reserve Program Acres, First Through Twelfth Sign-Up



LEGEND

- 1 Green Dot=3,000 Acres Where Trees are Being Grown
- 1 Blue Dot=3,000 Acres Where Other Practices Are in Place

Source:
USDA/NRCS, based on CRP Contract Data, #RWH.1609, 1996

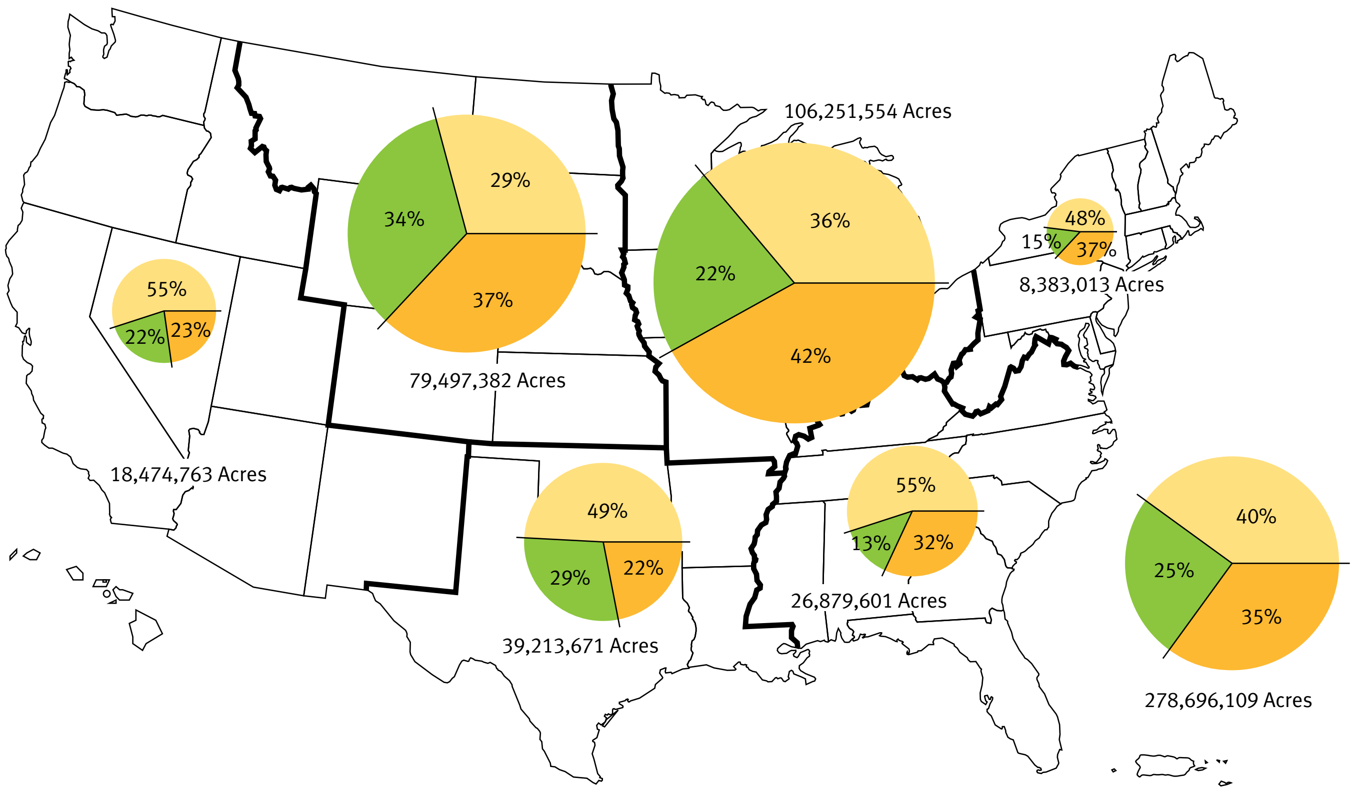
Increasing soil organic matter provides benefits far beyond improved soil productivity. Sequestration of carbon in soil organic matter reduces the accumulation of carbon dioxide–a greenhouse gas–in the atmosphere. The Earth's soil organic reservoir stores as much as three times more carbon than all of the planet's vegetation. Soil organic matter also promotes the biological activity that is fundamental to sequestering or metabolizing pesticides and fertilizers. Well-developed soil organic matter reservoirs contribute to good soil condition, promoting infiltration of rainfall and reducing runoff that might carry potential contaminants to nearby water bodies. Given the relationship between soil quality and the quality of other natural resources, soil conservation is central to maintaining healthy ecosystems.

Tillage Practices by Region, 1995

Tillage practices are distinguished in part by the level of residue left on the soil surface. Conventional tillage, which completely inverts the soil and promotes oxidation of the organic matter reservoir, maintains residue levels of less than 15 percent on the soil surface. Conservation tillage maintains residue levels of at least 30 percent, and reduced tillage is intermediate, between 15 and 30 percent.

LEGEND

- Conventional Tillage
- Reduced Tillage
- Conservation Tillage



NOTE:
U.S. pie is not the same scale as regional pies.

Source:
USDA/NRCS, based on Conservation Technology Information Center data, #RWH.1655, 1995

Ephemeral Gully Erosion: Soil Loss Not Accounted For

Ephemeral gully erosion results when water flows in small channels and swales that are routinely destroyed by tillage or along field edges where ridged rows or wheel tracks concentrate water. Because erosion is concentrated, there is greater potential for sediment to leave the field and enter a waterbody. Most ephemeral gullies occur on fields with highly erodible soils, little or no crop residue cover, or where crop harvest disturbs the soil (potatoes, peanuts, carrots, onions, etc.).

Ephemeral gully erosion is not accounted for in current soil loss assessment programs. But it can be significant in many watersheds, depending upon climatic, landscape, soil, and cultural factors. In recent studies of ephemeral gully erosion in 19 states, the amount of erosion ranged from an additional 21 percent to 275 percent of the estimated sheet and rill erosion on the field.

Because ephemeral gully erosion is associated with water flow, it tends to be greater where runoff is great–southern coastal states and northern-tier states where snowmelt runoff is significant. Ephemeral gullies can be controlled by controlling surface water runoff with such practices as diversions, contoured grass buffer strips, waterways, terraces, underground outlets, or stripcropping.

Location	Estimated Annual Sheet and Rill Erosion (tons/acre/year)	Measured Ephemeral Gully Erosion (tons/acre/year)	Ephemeral Gully Erosion as a Percentage of Sheet and Rill Erosion
Alabama[a]	15.60	9.30	59
Delaware	1.03	2.52	245
Illinois	7.10	5.20	73
Iowa	9.60	3.00	31
Kansas	21.98	8.00	36
Louisiana	17.80	6.04	34
Maine	11.21	5.15	46
Maryland	5.30	4.00	75
Michigan	4.67	1.22	26
Mississippi	17.60	7.50	43
New Jersey	6.70	5.20	77
New York	23.77	5.05	21
North Dakota	7.54	3.55	47
Pennsylvania	2.53	1.78	71
Rhode Island	9.00	3.70	41
Vermont	4.50	6.10	136
Virginia	13.0	12.80	98
Washington	0.69	1.89	275
Wisconsin	7.87	4.19	53

Values in the table were developed for selected sites in the identified states. More data are needed to define the extent and severity of this type of erosion.

a The estimate for Alabama is an average of the data gathered from 3 locations: Southern Ridge and Valley, Southern Coastal Plain, and the Blackland Prairies.

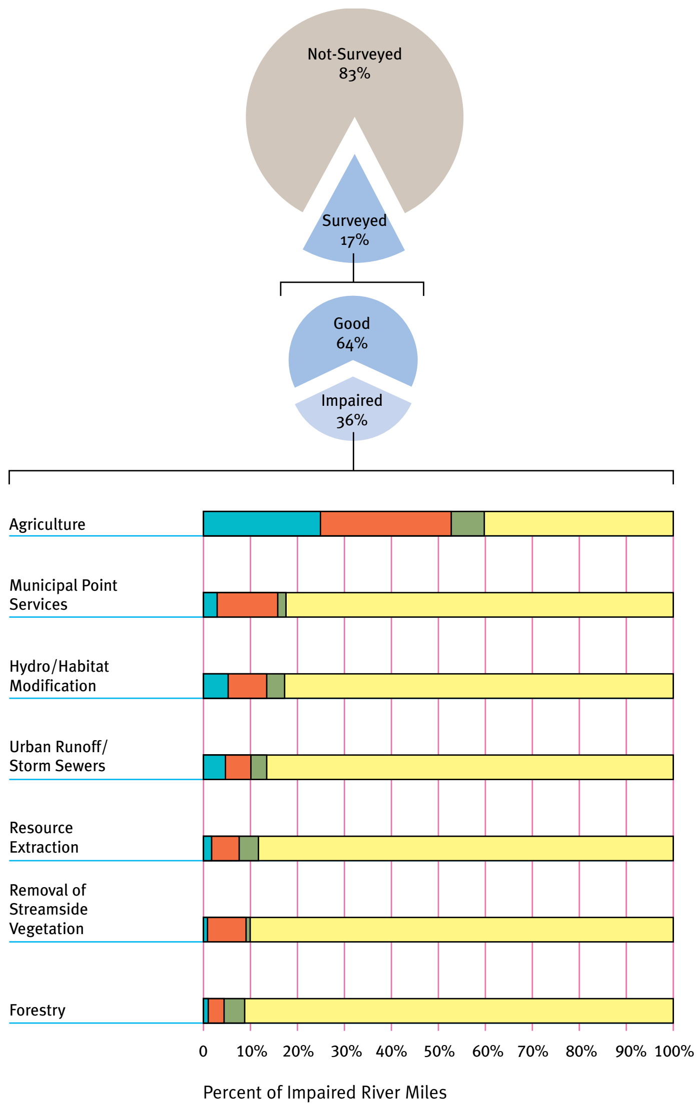
Leading Sources of Impairment of U.S. River Miles, U.S. Environmental Protection Agency, 305 (b), 1994

While 305(b) data provides insight into public perceptions of the quality of water resources, limitations on the use of the data exist. First, the data cannot be used to estimate national water quality trends over time. Second, the data cannot be used to compare the status of waters among states. These limitations result from the variability in states' assessment efforts (including the comprehensive nature of the assessment, the objectives, and the reporting format), variability in state water quality standards, and variability in the degree to which states follow the EPA guidelines.

LEGEND

- Major Source
- Minor Source
- Not Specified
- Not Affected

Source:
Adapted from U.S. Environmental Protection Agency, 1994



Agriculture Affects Water Quality

The status of the Nation's water resources (rivers, lakes, and estuaries) is assessed by states and Native American tribes in accordance with Section 305(b) of the Clean Water Act. Water quality is defined by each state and tribe for each water resource, based on the state's or tribe's determination of the water's beneficial uses (swimming, fishing, supporting aquatic life, etc.). A determination of impairment thus reflects subjective decisions as well as scientific findings.

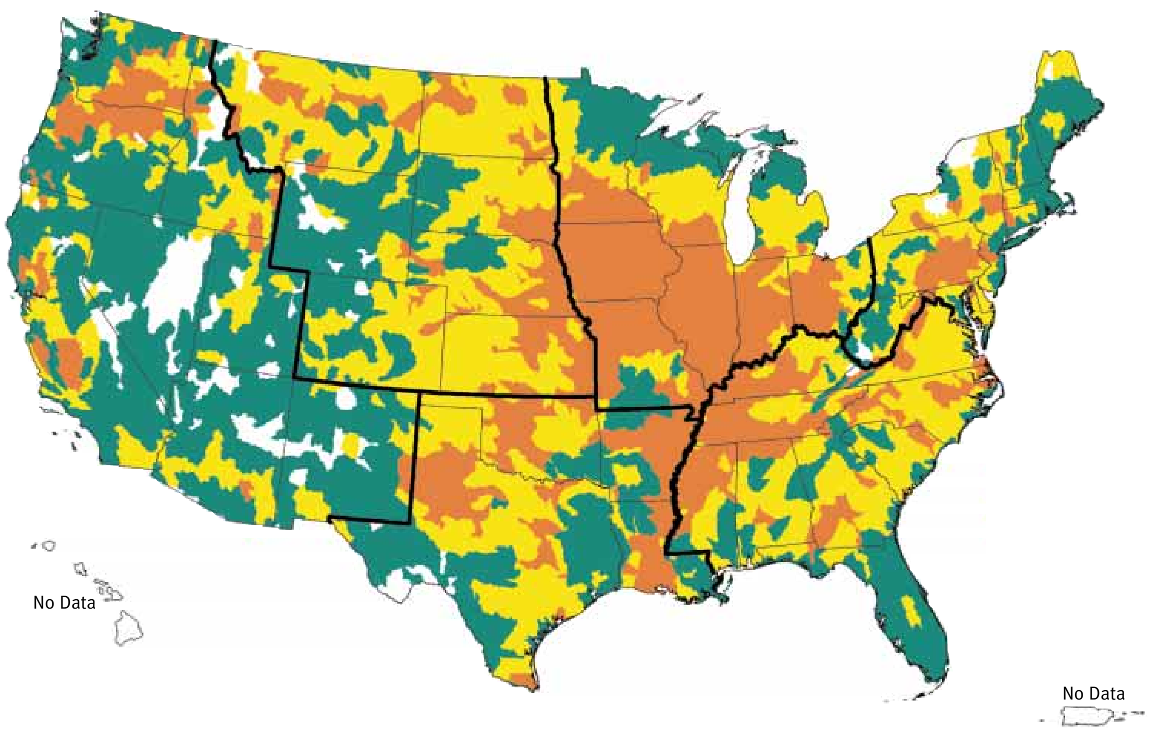
In the 1994 assessment, states and tribes reported on 17 percent of river miles, 42 percent of lake acres, and 78 percent of estuarine square miles. Of the river miles assessed, about 64 percent were found to be of good quality, with no identified use impairments. Thirty-six percent of the assessed miles suffered from use impairments caused by one or more sources. Agriculture was found to contribute to impairment in 60 percent of the impaired river miles, equivalent to 22 percent of the total assessed river miles.

One of the major sources of water quality impairment from agriculture is the sediment, often with nutrients or chemicals adsorbed to the soil particles, that enters streams and rivers as a result of soil erosion. While eroded soil may not move directly into waterways, and prevention of field erosion does not stop soil movement within water channels, there is a direct water quality benefit when America's farmers and ranchers reduce the amount of soil that moves off their land.

Concentrated animal production sites are of particular environmental concern because of the potential for nutrient and bacterial contamination of water resources as well as odor problems affecting neighboring communities. Industrialization of the livestock production sector, spurred by economies of size and new production and processing technologies, has produced livestock concentrations and geographic shifts unprecedented in the United States. Parts of the Southeast and West are the primary hotspots for animal manure problems, in part because of soil and climatic factors and in part because those areas lack adequate cropland on which to apply manure properly. The link between feed production and livestock concentration in the Midwest does allow, in many instances, for land application of animal manure and recycling of the nutrients in the crop production system, but that does not mean that all manure is now being handled adequately.

Nutrients, mainly nitrogen, phosphorous, and potassium, are applied to promote plant growth. If they are applied inappropriately or in excessive amounts, those beneficial materials can threaten associated water resources.

Sediment Delivered to Rivers and Streams from Sheet & Rill Erosion



This map shows estimates of sediment delivered to rivers and streams for the approximately 2,150 watersheds comprising the contiguous United States. The Universal Soil Loss Equation was used to estimate sheet and rill erosion rates for the agricultural land in each watershed (other erosion processes are not included in this estimate). Erosion rates were converted to tons of sediment delivered to streams from agricultural land using a delivery ratio formula based on an empirical relationship between soil erosion rates and sediment loads in several U.S. river basins.

Sediment Delivered

LEGEND

- High
- Medium
- Low
- None/No Data

Source:
USDA/NRCS based on data from R. Srinivasan and C. Walker, Texas Agricultural Experiment Station, 1996

Nitrate nitrogen is highly mobile and has a high potential to leach below the root zone into groundwater, volatilize into the atmosphere, or be carried overland to nearby surface waters. Phosphate, while not as mobile as nitrate, tends to be carried on soil particles that move off the field because of erosion. The potential for these and other chemicals to move from land to water is governed by a variety of factors, such as soil type, climate, and tillage practices.

Confined Livestock Concentration, 1992

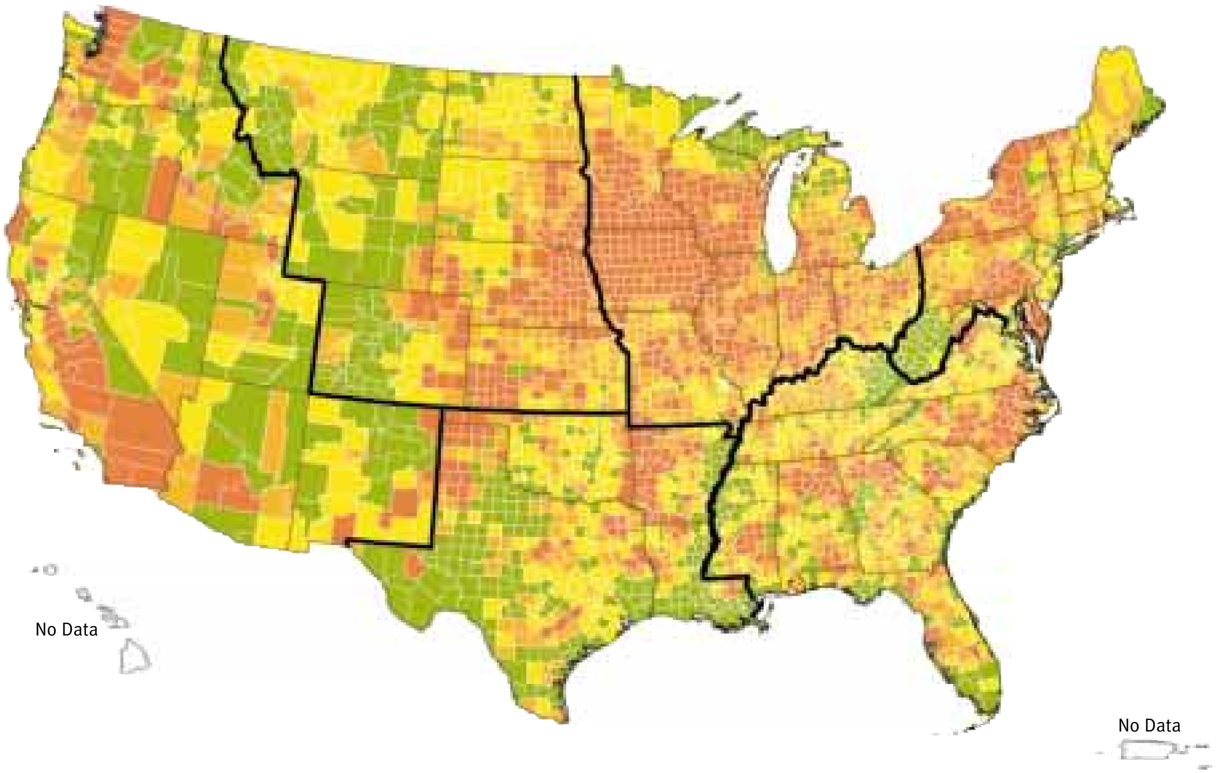
Confined livestock operations in the Midwest tend to use available manure to reduce or replace the need for commercial fertilizer on crop acres. In the Southeast and West, manure often is not managed agronomically. This may be due to smaller farm sizes; the lack of a feed production component in the operation; producer unawareness of agronomic uses of manure; or producer concerns about manure nutrient variability, equipment needs for spreading manure, or production practices that are incompatible with manure spreading.

County Ranking of Number of Animal Units

LEGEND

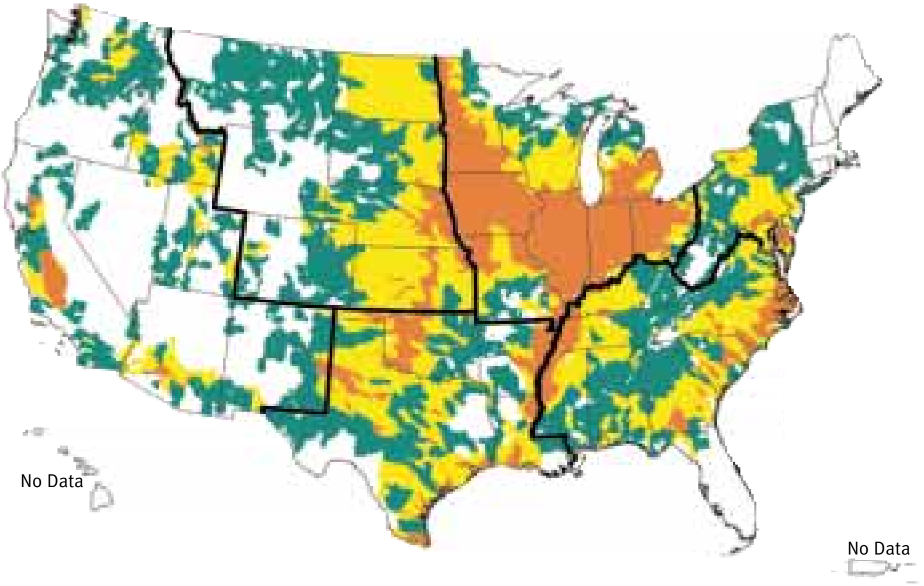
- Highest Quartile
- Second Quartile
- Third Quartile
- Lowest Quartile

Source:
USDA/NRCS, based on Economic Research Service, analysis of Census of Agriculture data, #SMW.1612, 1992



These graphics reflect the amounts of applied nitrogen and phosphate fertilizers that are not taken up by the harvested crop and, as such, may be available for loss to the environment. This does not imply that the materials actually move from the field, however. Both materials may be immobilized in the soil or managed in some other way by producers to reduce the potential for loss to the environment. Whereas nitrogen is highly mobile, phosphorus may build up in soils. But both can move from farm fields into surface water and groundwater, sometimes causing significant environmental impacts.

NITROGEN



Average Pounds per Acre

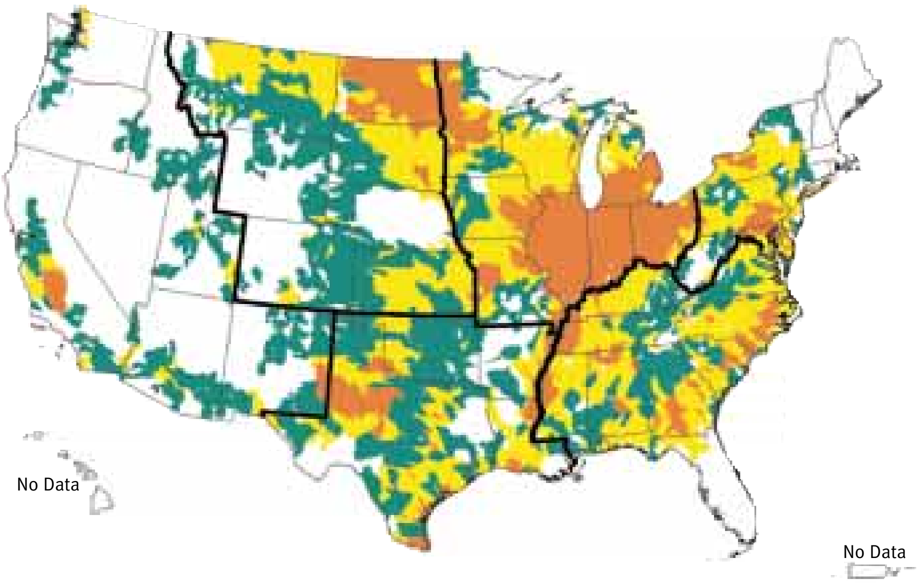
LEGEND

- > 8.7
- 2.1 — 8.7
- > 0 — 2.1
- Greater than 95% Federal land or no acreage in the 7 crops or value equal to zero.

NOTE:
Corn, soybeans, wheat, cotton, barley, sorghum and rice, using average yield over 1988 to 1992.

Source:
USDA/NRCS, #SMW.1554, 1992

PHOSPHATE



Average Pounds per Acre

LEGEND

- > 1.75
- 0.3 — 1.75
- > 0 — 0.3
- Greater than 95% Federal land or no acreage in the 7 crops or value equal to zero.

NOTE:
Corn, soybeans, wheat, cotton, barley, sorghum and rice, using average yield over 1988 to 1992.

Source:
USDA/NRCS, #SMW.1555, 1992

Too Much of a Good Thing: The Hypoxic Zone

The hypoxic zone: It's in the Gulf of Mexico, just off the coast of Louisiana and Texas. Covering 6,000 square miles near where the Mississippi and Atchafalaya Rivers flow into the Gulf, it earns its name because, during summer, there is not enough oxygen in the water to support normal populations of fish and shellfish.

Our story starts in the Upper Mississippi River Basin, where nitrogen from fertilizers, animal manure, decaying plants, municipal and domestic wastes, and atmospheric deposition enter the river system. A certain level of nutrients in the freshwater entering the Gulf is vital to the marine food web. But excessive nutrients nourish an overgrowth, or bloom, of algae. When the algae die, they drop to the bottom and decompose. This decomposition uses much of the oxygen in the water, leaving too little to sustain organisms that live along the sea floor. Lack of oxygen kills fish, shellfish, and other bottom-dwellers and causes others to move out of the zone in search of food and oxygen.

The hypoxic zone is not only an environmental problem but also an economic one. Marine fisheries contribute more than $1 billion a year to Louisiana's economy. The fisheries are important both commercially and for recreation. But the solution is out of Louisiana's hands.

Compounding the problem is that the links between nutrient loading a thousand miles upstream and the hypoxic zone are not apparent. But the average annual nitrate-nitrogen concentration in the Mississippi River has doubled since 1950, and runoff from farmland is considered the main source.

If there is uncertainty about how to apportion responsibility for hypoxia in the Gulf, there is also uncertainty about how to deal with the problem. But as Bob Perciasepe, Assistant Administrator, Office of Water, U.S. Environmental Protection Agency, says, "The smart thing is to begin to take common-sense actions while we improve our scientific knowledge."

To that end, the Gulf of Mexico Program office is advocating a voluntary, consensus-based approach that identifies key scientific issues to be resolved while building on existing conservation efforts. Specific steps now being taken include:

- Encouraging "win-win" voluntary actions, which prevent or reduce the loss or discharge of nutrients into local waterways.
- Targeting available public funds and building on existing local, state, and Federal programs.
- Building partnerships among public and private stakeholders up and down the watershed.
- Continuing to improve our understanding of the scientific, technical, and economic aspects of the problem.
- Building an inventory of nutrient-reduction work already underway in the basin.
- Monitoring the hypoxic zone to measure and report changes in nutrient loads and the zone's extent.

Nitrogen Flux to the Gulf of Mexico from the Interior Basins

Percent by Basin of Nitrogen Flux to the Gulf of Mexico

LEGEND

- 31% Upper Mississippi
- 23% Lower Mississippi
- 22% Ohio
- 11% Missouri
- 8% Central Mississippi
- 6% White/Arkansas
- Bottom Water Hypoxia Area

Source:
USDA/NRCS, based on data from R.B. Alexander, R.A. Smith, and G.E. Schwartz (USGS), and N.N. Rabalais, R.E. Turner and W.J. Wiseman, Jr. (Louisiana Universities Marine Consortium) #RWH.1606, 1996

Since 1979, the agricultural sector has accounted for about 80 percent of all pesticide use each year. Some crops, such as cotton, are pesticide-intensive. Others, such as wheat, are not. Pesticides may contaminate water by leaching through the soil profile or by running off the field surface into nearby water bodies. Many of the same factors affect leaching and runoff potential, and some areas have high potential for both pathways. But distinctions are also apparent. For example, pesticide runoff potential is greater in the Midwest, while leaching potential is greater in the humid Southeast.

Developments such as integrated pest management, biotechnology, improved pesticide and nutrient management planning, and livestock manure management systems all work to reduce the potential for agriculture to impair the Nation's water resources. Agriculture also contributes to water quality improvement through such conservation measures as buffer strips, grassed waterways, and wetland and riparian area restoration, among others.

Nutrient Management Systems Reduce Environmental Risk

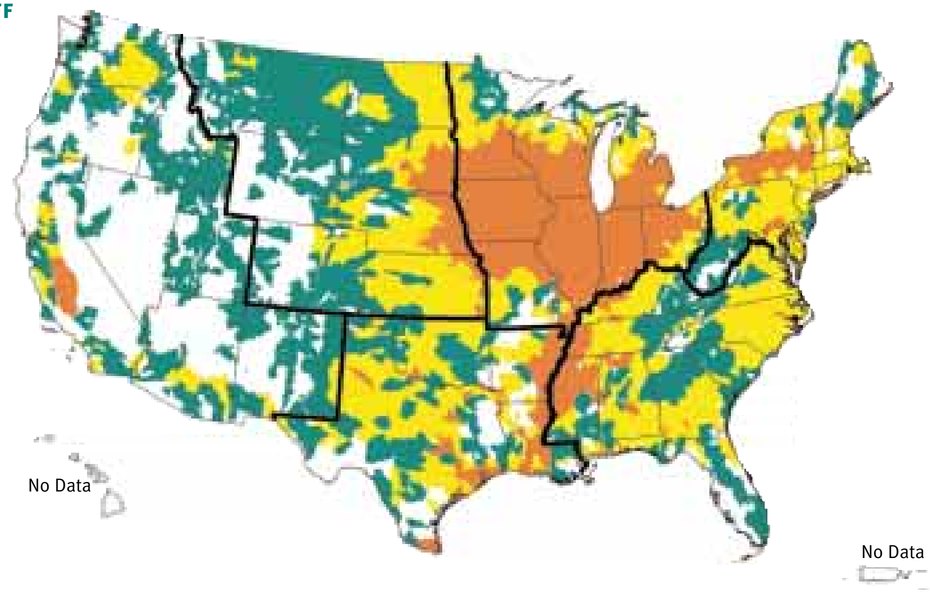
Loss of nutrients from farm fields and livestock operations can be reduced substantially by using nutrient management systems tailored to the enterprise and to the soil and climatic conditions. Federal, state, and local governments and industries in association with farmers and ranchers have established programs to test the effectiveness of nutrient management systems. Among these are the U.S. Department of Agriculture's Management System Evaluation Areas (MSEA), Hydrologic Unit Areas (HUA), and Demonstration projects (DPs). The 6 MSEAs apply promising research results to improve crop and livestock management systems. The 74 HUAs focus on remediating documented water quality problems through educational, technical, and financial assistance. Sixteen DPs, located in broad areas of actual or potential water quality impairment, demonstrate innovative practices at specific sites, and use educational efforts to accelerate broad producer adoption of new practices.

Between 1991 and 1994, USDA evaluated 16 HUA and DP water quality projects for progress in improving and protecting water quality. The projects reported substantial producer adoption of conservation practices and management improvements. At least 134 different practices were identified in the study units, ranging from structural practices, such as vegetative filter strips and constructed wetlands to reduce nutrient and sediment delivery to streams, to management practices, such as integrated crop management, improved fertilizer timing and application, and use of soil nitrogen tests. The most widely adopted practices were nutrient management, conservation cropping, cover or green manure crops, conservation tillage, and animal manure management.

Considerable improvement in agrichemical management was evident in each of the projects. For example, in Delaware (Inland Bays), farmers adopted nutrient management practices on 44,000 acres, reducing nitrogen applications by 2,600 tons and phosphorus applications by 2,100 tons. In Michigan, 18 farm members of the Sycamore Creek Crop Management Association reduced fertilizer inputs by 65 tons, pesticide inputs by 1,500 pounds, and input costs by $18,000 in a single year. Across the 16 projects, annual nitrogen application rates were reduced by 14 to 129 pounds per acre; phosphorus applications were reduced by 3 to 106 pounds per acre. As of 1994, total annual reductions were 22.3 million pounds of nitrogen and 10.3 million pounds of phosphorus. The cumulative work undertaken through these various research and demonstration efforts has improved knowledge about nutrient transport and fate and mechanisms to reduce environmental impacts from nutrient use.

Pesticide Runoff and Leaching Potential for Field Crop Production

Runoff



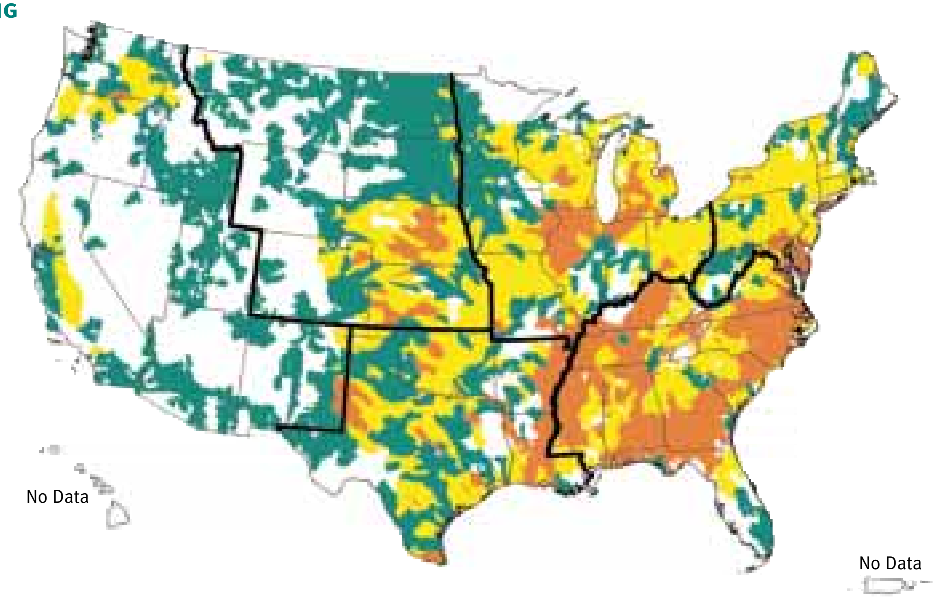
Average Loss

LEGEND
- High
- Medium
- Low
- Greater than 95% Federal land or no acreage in the 13 crops or value equal to zero.

NOTE:
Includes dissolved and adsorbed pesticides.

Source:
USDA/NRCS based on data from D.W. Goss, Texas Agricultural Experiment Station, #SMW.1662, 1996.

Leaching



Average Loss

LEGEND
- High
- Medium
- Low
- Greater than 95% Federal land or no acreage in the 13 crops or value equal to zero.

Source:
USDA/NRCS based on data from D.W. Goss, Texas Agricultural Experiment Station, #SMW.1663, 1996.

These graphics were obtained using a newly created database on the potential for pesticide losses from farm fields. Pesticide use in field production of barley, corn, cotton, oats, peanuts, potatoes, rice, sorghum, soybeans, beets, sunflowers, tobacco, and wheat was evaluated by watershed and averaged over all nonfederal land. Pesticide losses due to runoff and leaching were simulated using the process model GLEAMS and national data on land use, chemical use, soils, and climate. Such information can be key in identifying and prioritizing needed information and skills for farmers and resource managers to improve pesticide management programs and thus reduce the potential for loss of pesticides from farm fields.

Managing Environmental Risk from Pesticide Use

Loss of agricultural chemicals from farm fields can be reduced substantially by using farm management practices tailored to specific pest problems as well as soil, crop, and climatic conditions. The potential for reducing environmental risk through the adoption of better farm management practices is illustrated for two areas of the country where pesticide use is high–the Iowa Cedar River Basin and the Lower Illinois River Basin. A simulation model was used to estimate the potential risk to fish caused by chemicals leaving 1,400 representative farm fields scattered throughout the two basins. Actual chemical use and farm practices, such as tillage and pesticide application rates, were evaluated. Annual pesticide losses to surface runoff (including drainage and other subsurface contributions to surface water) were converted into a pesticide risk score for each field. An average pesticide risk score was calculated for each of the 28 watersheds in the two river basins. A relatively high risk score is only an indicator of the potential for pesticide impacts on water quality; monitoring is required to identify actual problem areas.

Average pesticide risk scores for 14 of the 28 watersheds indicated the potential for a relatively high risk of water resource impairment under existing farm management and chemical use practices. Three alternative management practices were simulated using the model:

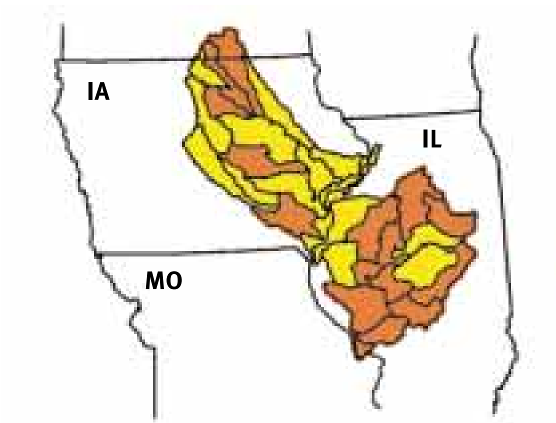
- Pesticide banding (applying pesticide in the crop rows but not between the rows).
- Use of conservation tillage (which reduces offsite movement of soil and water).
- Reduced pesticide application rates.

The simulation model predicted that risk to fish would be reduced 77 percent overall. The three watersheds with scores still in the relatively high-risk range showed a risk reduction of 65 percent.

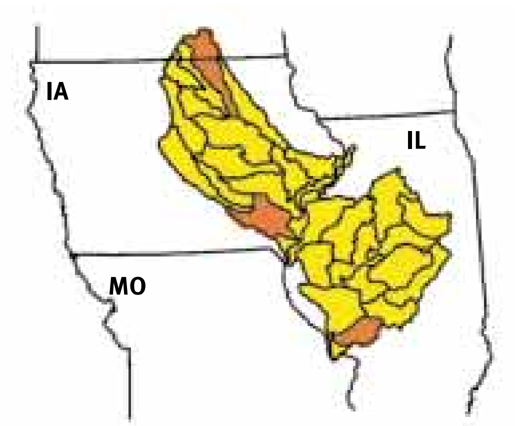
Even greater reductions in environmental risk could be expected in priority watersheds where pesticide management assistance was identified as a critical need. Chemical substitutions, crop rotations, scouting, spot treatments, postemergent application instead of preemergent application, incorporation of pesticides into the soil during application, and use of grassed waterways and buffer strips are among the management strategies not included in the simulation exercise that could be part of comprehensive farm management plans.

Potential Environmental Risk from Pesticide Use

Under Current Farm Management Practices



After Simulating Adoption of Alternative Farm Management Practices



Risk to Fish from Concentration of Pesticides in Water Leaving Farm Fields.

LEGEND

- Relatively high risk
- Relatively low risk

Source:
USDA/NRCS, #SMW.1620 & 1621, 1996

Understanding Agricultural Water Quality Problems

The U.S. Geological Survey's National Water Quality Assessment (NAWQA) program provides consistent, comparable information on water resources through studies in 60 important river basins and aquifers nationwide. These 60 study units account for about half of the land area of the 48 states and 60 to 70 percent of its water use and population served by public water supply. The data are building blocks for understanding regional differences in physical, chemical, and biological characteristics of the Nation's groundwater and surface water and for understanding relationships between and among natural factors, human activities, and water quality conditions. NAWQA findings reveal that water resource vulnerability to contamination by nitrogen and pesticides is complex and controlled by a variety of natural and land use factors. What has NAWQA found with respect to agriculture? Following are selected highlights:

Commercial fertilizers, animal manure, and atmospheric deposition are the primary nonpoint sources of nitrate in surface water and groundwater. Areas with well-drained soils and high nitrogen inputs appear to have the highest risk for high nitrate levels in groundwater. Commercial fertilizers are the dominant nonpoint source in the western, central, and southeastern United States, and atmospheric deposition is the dominant nonpoint source in the Northeast. The proportion of nonpoint to point sources of nitrogen varies from watershed to watershed. Nonpoint nitrogen sources account for more than half the nitrogen load in 90 percent of the studied watersheds, although regional variations are evident. Point sources are often a major source near large urban areas. Streams near large cities often receive a large part (up to 77 percent) of their nitrogen from point sources, such as sewage treatment plants.

Land use was the primary factor influencing instream nutrient concentrations in the eastern Wisconsin and part of Michigan's Upper Peninsula study unit. Nutrient concentrations in stream runoff were highest from agricultural and urban areas and lowest from forested areas.

In the Central Columbia Plateau of Washington and Idaho study unit, irrigation and agricultural fertilizers are associated with high nitrogen concentrations and high frequency of groundwater contamination, primarily in shallow groundwater. Nearly 20 percent of sampled wells in the study unit have nitrate concentrations exceeding the U.S. Environmental Protection Agency's maximum contaminant level.

Poultry and livestock manure contributes more than half the nutrient load in the Apalachicola-Chattahoochee-Flint River Basin of Georgia, Alabama, and Florida. In 1990, more than half of the total nutrient load–120,000 tons of nitrogen and 28,000 tons of phosphorus–came from poultry manure.

Pesticides from every major chemical class have been detected in groundwater. Transformation products, rather than parent compounds, were most frequently detected. Factors strongly linked with increased likelihood of pesticide occurrence in wells are high pesticide use; high recharge; and shallow, inadequately sealed, or older wells. Frequencies of pesticide detection are almost always low in low-use areas, but vary widely in areas of high use. While pesticides are commonly present in low concentrations in groundwater beneath agricultural areas, they seldom are at levels exceeding water-quality standards. Often, low rates of pesticide detection are found in high-use areas, indicating other factors affect their occurrence in groundwater (e.g., hydrogeologic factors). Frequency of pesticide detection may also be substantial in nonagricultural areas.

In an area of intense agriculture in Colorado's shallow San Luis Valley aquifer, pesticides were detected in only 5 of 35 monitor wells dispersed among 2,000 center-pivot irrigation systems over 270,000 acres. Four pesticides (metolachlor, p,p'-DDE, metribuzin, and prometon) were detected in the upper 10 feet of the saturated zone, with a maximum concentration of 0.07 microgram per liter.

In the Delmarva study unit, while pesticides used on corn and soybeans were detected, their concentrations generally did not violate Federal drinking water standards.

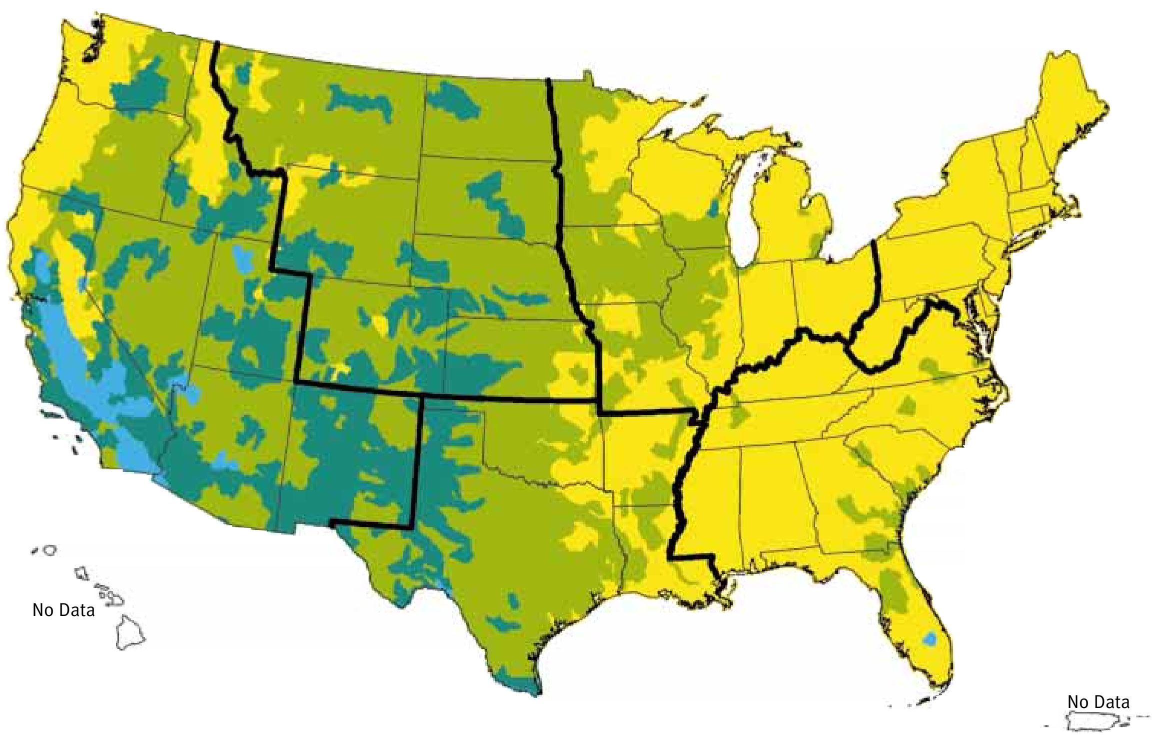
In the Georgia portion of the Apalachicola-Chattahoochee-Flint River Basin, urban watersheds contribute a variety of pesticides (herbicides, insecticides, and fungicides) applied to lawns, golf courses, parks, roadsides, swimming pools, and residential structures. Concentrations of these compounds tend to be higher and are found for a greater part of the year than in agricultural watersheds.

Private Land and Water Supply

The United States is a water-rich Nation, but water availability could be the most significant national water issue in the 21st century. Certain areas of the country, such as the Southwest, have insufficient precipitation to meet demand in an average year. These areas use more than 100 percent of their average annual precipitation and either import water from other watersheds or mine groundwater to meet annual demand. Water use conflicts have existed in those areas for decades, but the conflicts have intensified as demands have increased.

Where water demand exceeds 75 percent of available precipitation, water use conflicts are just beginning to emerge and will likely escalate if development should increase demand. Much of the East and parts of the Pacific Northwest have abundant freshwater supplies, but even these areas have experienced water use conflicts and more may arise. Water quality and quantity issues are closely linked. Actions that reduce water quantity can adversely affect water quality, just as poor water quality can reduce the amount of water able to support desired or beneficial uses.

Freshwater Consumption as a Percentage of Local Average Annual Precipitation



LEGEND

- Greater than 150%
- 100% to 150%
- 75% to 100%
- Less than 75%

Source:
USDA/NRCS and Texas Agricultural Experiment Station, Agricultural Research Service, HUMUS Project, #RWH.1576, 1996

Much of land use change and increased competition for water is driven by population growth. Even at the low rate of natural increase in the United States, total population is projected to approach 335 million by 2025. Much of the increase in recent years has occurred in areas that already depend upon more than 100 percent of their average annual precipitation.

Groundwater withdrawal at rates that exceed replenishment–groundwater mining–leads to water table declines, land subsidence, and saltwater intrusion into freshwater aquifers. The Central Valley of California is the most heavily pumped area in the United States. Because of the structure of the aquifer, land subsidence has characterized groundwater development in a large part of the valley. Once an area has subsided from overdraft, the underlying aquifer capacity cannot return to its predrawdown level.

The High Plains aquifer underlies parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming. About 30 percent of the groundwater used

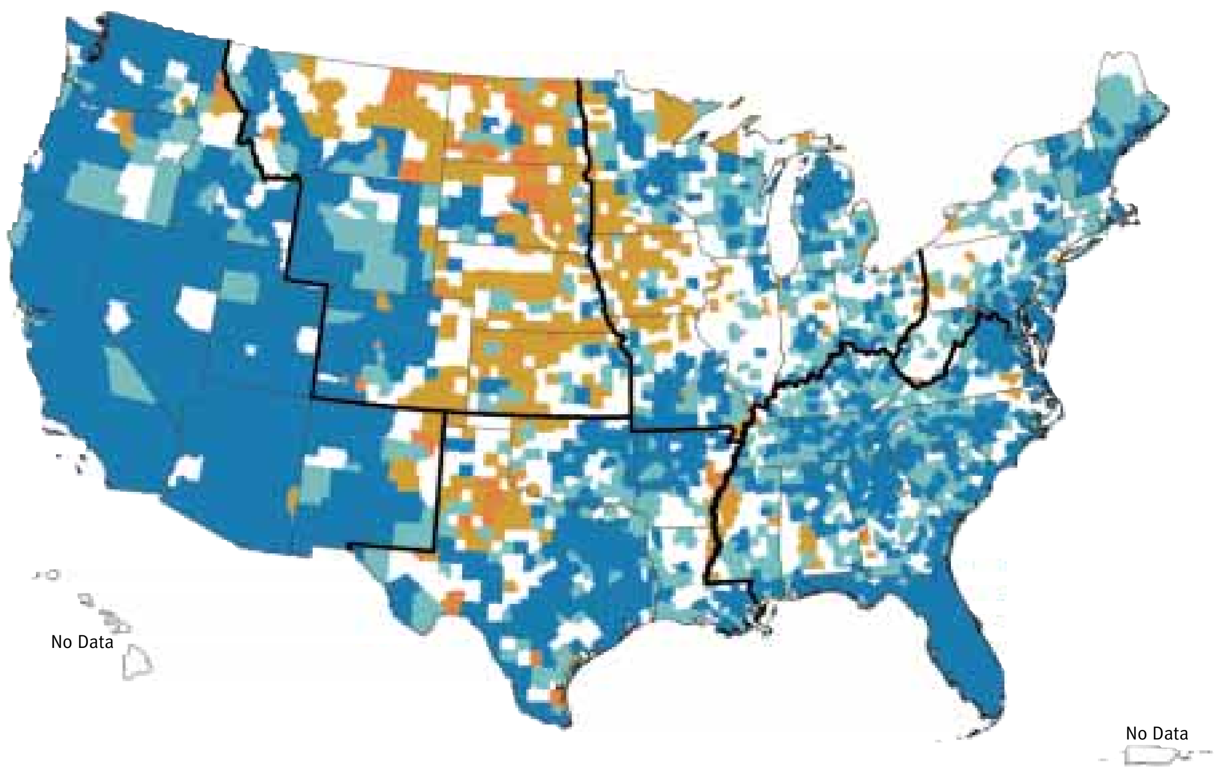
Percent Change in Total Population by County, 1970-1990

Percent Gain/Loss of Population by County

LEGEND

- Gain of more than 25%
- Gain of 10% to 25%
- Loss of 10% to 25%
- Loss of More Than 25%
- Less than 10% change

Source:
USDA/NRCS, based on 1970 and 1990 Population Census data, #RWH.1630, 1996

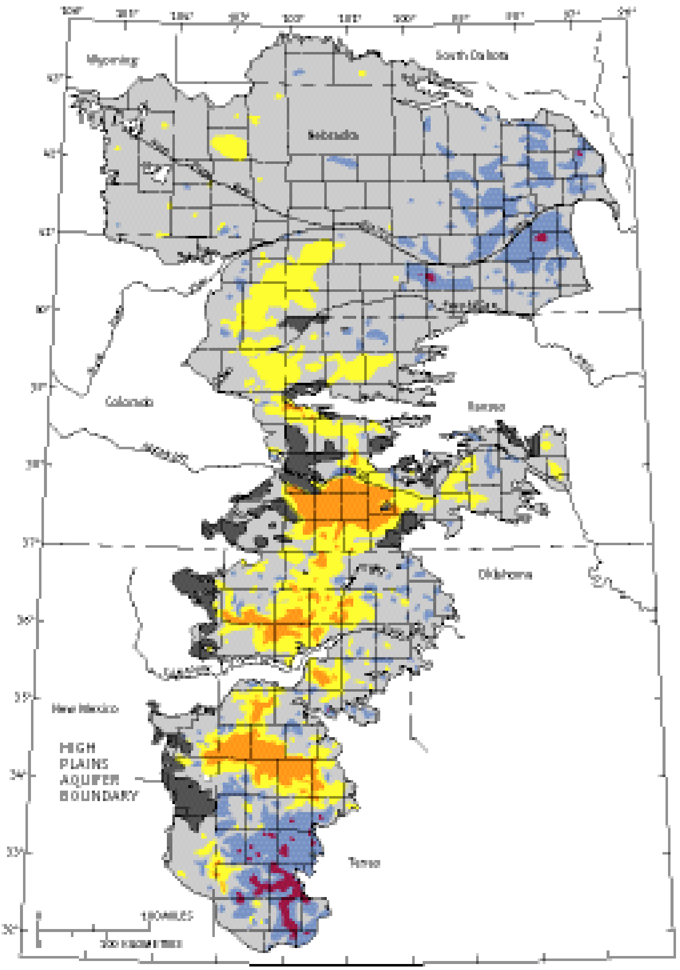


for irrigation in the United States is pumped from this aquifer. In 1990, 15.6 million acre-feet of water was withdrawn from the aquifer to irrigate approximately 14 million acres. This intense use has led to significant declines from pre-development water levels in many areas. In the central and the southern High Plains, declines have exceeded 100 feet. Smaller, less extensive declines have occurred thus far in the northern High Plains, where irrigation has been practiced for a shorter time.

Agriculture also can contribute to enhancing water supplies. Irrigators, for example, are using water more efficiently. Nationally, average water application rates have dropped 14 percent since 1970. Between 1982 and 1992, 11 million more irrigated acres were managed with water conservation systems. Cropping techniques, such as terracing and good grazing management, can increase the water available for use in a watershed. Conservation plantings can promote infiltration of rainfall, capturing more water for use by agriculture and communities.

Another form of water management–drainage–has been used extensively to extend the productive capacity of our cropland. Like irrigation systems, drainage systems require maintenance to sustain crop production.

Water-Level Change in the High Plains Aquifer, 1980-1994



Water-level Change, in Feet, 1980 to 1994

LEGEND

Declines
- More than 20
- 5 to 20

No significant change
- -5 to 5

Rises
- 5 to 20
- More than 20
- Area of little or no saturated thickness

Source:
U.S. Geological Survey, 1994

Agriculture's Contribution to Wetland Protection

Conversion of wetlands to agricultural land has declined steadily since the 1950s. In the mid-1950s, agriculture, with government encouragement, was responsible for an estimated 87 percent of wetland conversions. In contrast, between 1982 and 1992, 56.7 percent of total wetland losses were attributed to urban development, only 19.8 percent to agriculture, 12.9 percent to deepwater conversions, and 10.6 percent to miscellaneous causes.

Wetlands are an important bridge between land and water–with indistinct boundaries. Because they are so biologically rich, wetlands and adjacent upland represent an important habitat type for many wild species.

The United States has adopted a policy of "no net loss" of wetland acres, seeking to halt the diking, draining, and filling that eliminated more than half of the Nation's wetland endowment. In some highly agricultural states, such as Iowa, up to 90 percent of the wetland acreage was converted by 1970.

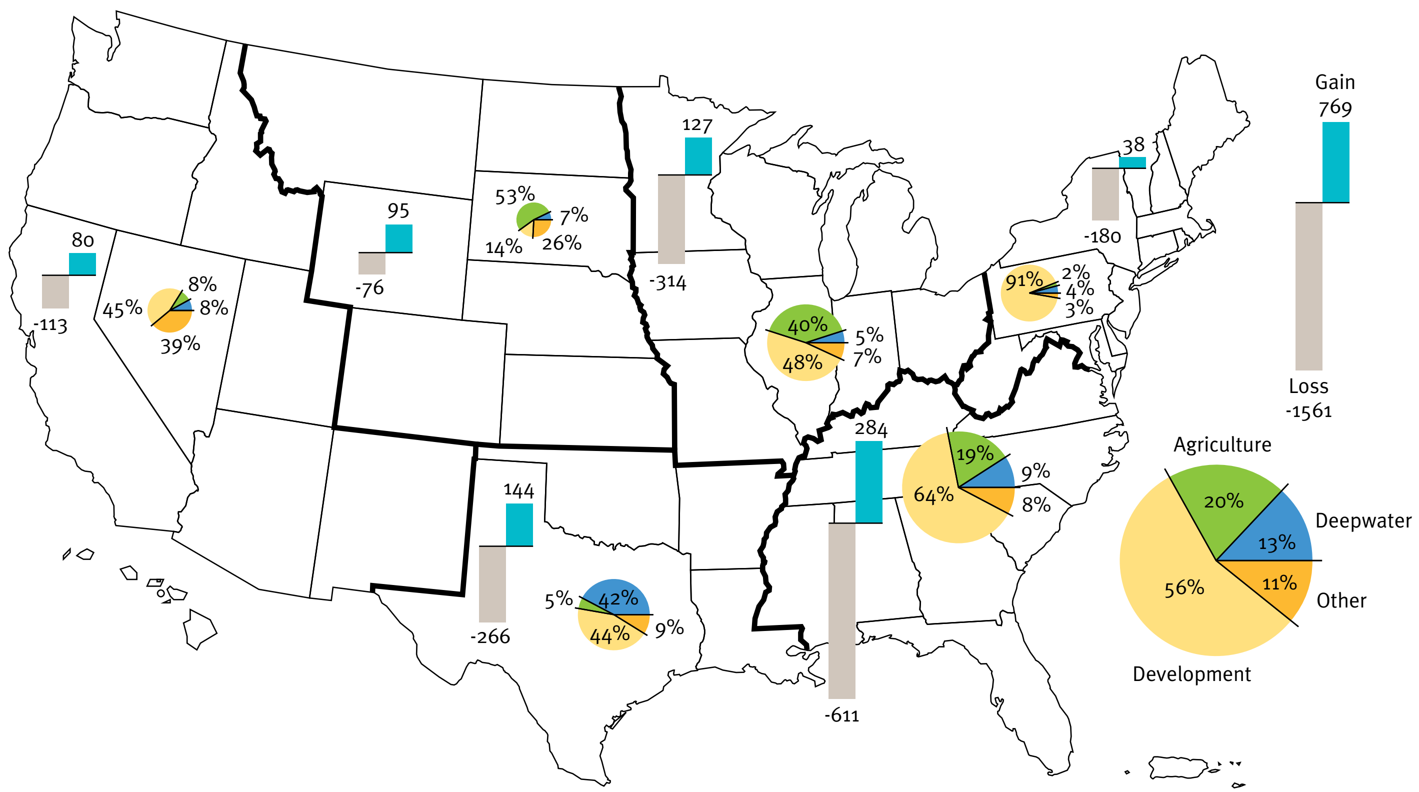
Changes in Wetland Acreage on Nonfederal Land, 1982 to 1992 (thousands of acres)

Wetland losses exceeded gains in nearly all regions. The Great Plains and arid regions of the West are prone to have variable precipitation patterns and what appear to be ephemeral wetlands that are distinct in some years, then difficult to observe during drier periods. The changes in wetland acreage in the Northern Plains and the West are not statistically significant and should not be interpreted as actual increases or declines in wetland acreage.

Pies Represent Loss of Wetland to Four Major Categories.

NOTE:
U.S. bar is not the same scale as regional bars.

Source:
USDA/NRCS National Resources Inventory, #RWH.1712, 1992

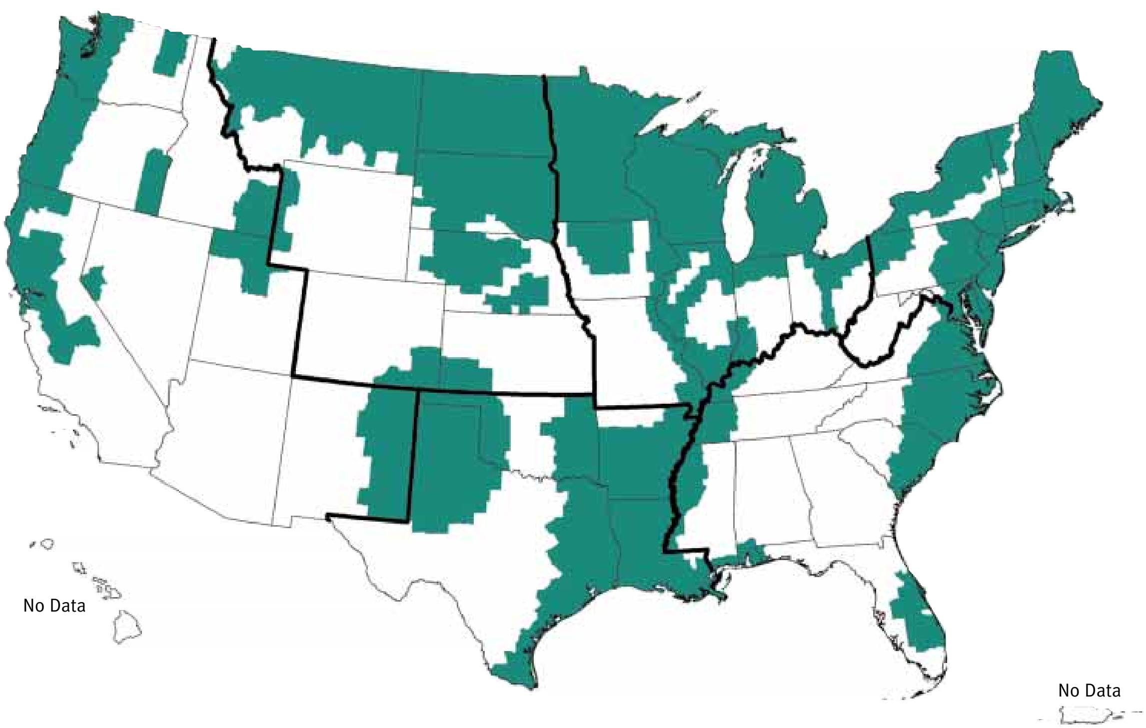


Wetland gains come from multiple sources, reflecting wetland restoration, greater than average precipitation in some regions and identification of ephemeral wetlands. Since 1992, at least 400,000 acres of restorable wetlands and adjacent upland have been enrolled in the newly created Wetlands Reserve Program and the Emergency Wetlands Reserve Program. The Partners for Wildlife Program administered by the U.S. Fish and Wildlife Service also has been an important wetland restoration effort. The Nation may not have yet achieved its no-net-loss goal, but that target clearly is within reach, in part because of agriculture's success in protecting and restoring wetlands.

Private Land: Benefits for Wildlife

Habitat range and diversity are key factors affecting the distribution and health of wild populations, and land use is the principal factor affecting habitat. Although the total number of U.S. species is unknown, one estimate suggests there are at least 100,000 native species. Loss and fragmentation of habitat, simplification of forest and pasture ecosystems, and conversion of forested and agricultural areas to urban and suburban development all have contributed to declining wildlife populations. At the same time, habitat on private land continues to support many

Important Waterfowl Habitat Areas



While key waterfowl habitat areas have been delineated as this graphic depicts, waterfowl management is broader than this might suggest. Waterfowl populations are found in every region of the country, as residents or migrants. Management in these areas also can be important to maintaining a healthy population.

Source:
U.S. Fish and Wildlife Service, #JDV.1625, 1996

wildlife species, and considerable opportunity exists to improve and expand that habitat while respecting the rights of landowners.

Data on current trends in species populations indicate some with growing populations (colonial wading birds, such as egrets and herons, for example) and many with declining populations: certain ducks, grassland birds, forest interior birds, and salmonid fish. Some population declines are so severe that the Federal Government may formally list species as threatened or endangered, and it has. Currently, 631 species of plants and animals are listed as threatened or endangered (357 animals and 274 plants). Of the threatened and endangered species in the contiguous states, agriculture is listed as a contributing factor for about 42 percent of the species (262 species); grazing was identified for about 26 percent (161 species).

Priority wildlife conservation areas have been delineated for certain species, such as waterfowl, and similar efforts are underway for shorebirds, songbirds, and amphibians. Most species of North American waterfowl are migratory, which means that priority conservation areas are broadly dispersed. These birds depend upon wetlands–permanent and ephemeral–for breeding, wintering, and as migratory stopovers. More than 12 million ducks breed annually in U.S. wetlands, with at least half depending upon the prairie potholes in the Northern Plains. Because each area along their migratory route is seasonally important to the lifecycle of waterfowl, disruption or loss of one component can affect the viability of an entire population.

Wildlife and agriculture are not always competing interests. Indeed, many agricultural crops depend upon nature's pollinators (insects, birds, bats, etc.) to complete their life cycle. Some farmers rely on natural predators to defend their crops from insect pests. Hedgerows, shelterbelts, and filter strips, among other measures that provide soil conservation benefits, also provide much needed habitat for many wildlife species. Retirement of environmentally sensitive cropland, installation of vegetative buffer strips, and improved woodlot management can help fit wildlife into the agricultural landscape and protect soil

and water resources. A healthy agriculture is one in which wildlife–and biodiversity–flourishes.

As land is managed for diversity, landowners are also realizing new economic opportunities, such as hunting, fishing, camping, and bird-watching. Wild species support a broad range of commercial interests, such as ecotourism, that depend upon the health of the natural landscape. Wild plant and animal species contribute an estimated $200 billion to the U.S. economy annually (4.5 percent of the Gross Domestic Product). Americans spend about $18 billion annually to watch wildlife, one-third of which is associated with bird-watching. The Nation's 50 million anglers spend $24 billion on tackle, equipment, food, and lodging, among other fishing-related expenses.

Improving the State of the Land

There is much good news about the state of America's private land. America's landowners seem to be maintaining and, in many instances, improving the health of the land on millions of acres. There remain areas, however, where the state of the land is in decline and national concern is warranted. NRCS is dedicated to helping locate those situations and to working with the affected people in developing realistic, effective solutions that reverse deterioration and establish more healthy trends.

That is the mission to which the agency has been called by the American people. To meet this challenge adequately, NRCS must move beyond science and data and trends and reach out effectively to the millions of people who are intimately affected by the health of the land. That, then, becomes a matter of organization, approach, and cooperation. Only in the success of our abilities to work together, coupled with our skill in assessing the land, will we realize our public as well as individual conservation objectives.

Grant Heilman Photography

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