

This Chapter Has Been Updated. Updates Are Available At: www.heinzctr.org/ecosystems

Farmlands





What Indicators Are Used To Describe Farmlands? Can we report trends? Are there other useful reference points?

SYSTEM DIMENSIONS			
●	Total Cropland	How much land is used directly for production of crops and livestock?	Trends
●	The Farmland Landscape	How much of the farmland landscape is forest, grasslands and shrublands, wetlands, or urban and suburban?	Current data only, regional comparison
⊖	Fragmentation of Farmlands Landscapes by Development	How intermingled are croplands and urban and suburban development?	No data reported
⊖	Shape of "Natural" Patches in the Farmland Landscape	How much of the "natural" area in farmlands is in patches of different shapes?	No data reported

CHEMICAL AND PHYSICAL CONDITIONS			
●	Nitrate in Farmland Streams and Groundwater	How much nitrate is there in farmland streams and groundwater?	Current data only, federal standard, cross-ecosystem comparison
●	Phosphorus in Farmland Streams	How much phosphorus is there in farmland streams?	Current data only, federal guideline, cross-ecosystem comparison
●	Pesticides in Farmland Streams and Groundwater	How many pesticides are found in farmland streams and groundwater, and how often do they exceed federal standards and guidelines?	Current data only, federal standards and guidelines
⊖	Soil Organic Matter	How much organic matter is there in cropland soils?	No data reported
●	Soil Erosion	How much cropland is subject to erosion by wind or water?	Trends, national map
⊖	Soil Salinity	How much cropland soil has high salt levels?	No data reported

BIOLOGICAL COMPONENTS			
⊖	Soil Biological Condition	What is the condition of the microscopic animal communities in cropland soils?	No data reported
?	Status of Animal Species in Farmlands Areas	What is the condition of wildlife in areas that are heavily dominated by farmlands?	No data reported
?	Native Vegetation in Areas Dominated by Croplands	In areas that are heavily dominated by croplands, is most of the remaining non-cropland vegetation native or non-native?	No data reported
?	Stream Habitat Quality	What is the quality of the habitat in farmland streams?	No data reported

HUMAN USES			
●	Major Crop Yields	How has the per-acre yield of major crops changed over time?	Trends
●	Agricultural Inputs and Outputs	How have farm output and the inputs (pesticides, fertilizers, labor, land, etc.) needed to produce that output, changed over time?	Trends
●	Monetary Value of Agricultural Production	What is the value of the nation's production of crops and livestock?	Trends, national map
⊖	Recreation on Farmlands	How much recreation takes place on farmlands?	No data reported

● All Necessary Data Available
◐ Partial Data Available
⊖ Data Not Adequate for National Reporting
? Indicator Development Needed



Chapter 6: Indicators of the Condition and Use of Farmlands

America's farmlands are part of a larger "farmland landscape," a landscape they both define and are defined by. The farmland landscape includes fields and orchards, pastures and vineyards, which we refer to as "croplands." It also includes the hedgerows, streams, ponds, wetlands, prairies, and woodlots that enliven an agricultural setting, as well as lands set aside under government programs. All over the nation, from the endless wheatfields of the Midwest to the picturesque dairy farms of Pennsylvania Dutch country to the avocado groves of California, the farmland landscape provides Americans, and the world, with an abundance of food and fiber, along with an image of beauty and order that figures large in the American imagination.

What can we say about the condition and use of U.S. farmlands?

Eighteen indicators describe the condition and use of farmlands in the United States. Full data are available for nine of these indicators, a larger percentage than for any other ecosystem type. Five of these nine have a long enough data record from which to judge trends, and three can be compared to a regulatory standard or similar benchmark. For six indicators, we report no data, and three measures require additional refinement or other development before data availability can be assessed.

After the following brief summaries of the findings and data availability for each indicator, the remainder of this chapter consists of the indicators themselves. Each indicator page offers a graphic representation of the available data, defines the indicator and explains why it is important, and describes either the available data or the gaps in those data.

System Dimensions

The goods and services that we obtain from farmlands depend on both the acreage of land producing crops and other farm products and the acreage and pattern of the forests, grasslands, and urban areas mixed within the farmland landscape. Four key indicators describe the dimensions of the farmland system.

- **How much land is used directly for production of crops and livestock?** Croplands, including pasture and haylands, cover between 430 and 500 million acres (estimates from different agencies vary), or about a quarter of the land area of the United States (excluding Alaska) in 1997. Cropland acreage has declined since the 1950s, but because official estimates vary, it is difficult to determine exactly how much farmland has been converted to other uses.
- **How much of the farmland landscape is forest, grassland or shrubland, wetlands, or developed land?** Some noncropland areas provide wildlife habitat or serve as streamside buffers or windbreaks, and all these areas add to the visual character of the farmland landscape. In all regions but the Midwest, croplands make up 50–60% of the farmland landscape; the remainder is forest, wetlands, or grasslands and shrublands. In the Midwest, croplands make up about 75% of the farmland landscape.
- **How intermingled are croplands and urban and suburban development?** Increased development in farming areas can interfere with traditional farming practices and may make farming economically unviable. For example, new residents are often opposed to long-standing farming practices like field application of manure, and rising property values, and property taxes, may drive farmers out of business. Data are not adequate for national reporting on this indicator.

- **How much of the “natural” area in farmlands is in patches of different shapes?** The size and shape of these “natural” patches help determine the ecological services they provide, including erosion control and wildlife habitat. Data are not adequate for national reporting on this indicator.

Chemical and Physical Condition

Six indicators describe the chemical and physical condition of farmlands, three that characterize farmland streams and groundwater and three that tell us the state of the soil. (We complement these measures with two biological indicators related to water and soil—see Biological Components, below.)

To describe the condition of farmland streams and groundwater, we include measures of pesticides, and of nitrate and phosphorus—two important nutrients that, if present in excess, can cause problems. An indicator measuring the quality of stream habitat complements these measures (see Biological Components, below). To characterize the suitability of soils for growing crops, our indicators track changes in soil organic matter, in the potential of the soil to erode by wind and water, and in soil salinity. A complementary indicator describes the microscopic animals in cropland soils (see Biological Components, below).

- **How much nitrate is there in farmland streams and groundwater?** High levels of nitrate in drinking water—especially untreated well water—are a human health concern, and nitrate from the nation’s rivers contributes to algal blooms in coastal waters. About 20% of the groundwater wells and 10% of the stream sites tested had nitrate concentrations that exceeded federal drinking water standards. Monitored streams and groundwater in farmland regions have higher concentrations of nitrate than those in urban and suburban or forested areas.
- **How much phosphorus is there in farmland streams?** About three-fourths of farmland stream sites had phosphorus concentrations that exceeded the level recommended by the Environmental Protection Agency to protect against excess algae growth. Concentrations of phosphorus in monitored farmland streams were similar to those in urban/suburban streams, and much higher concentrations than streams in forested areas.
- **How many pesticides are found in farmland streams and groundwater, and how often do they exceed federal standards and guidelines?** Eighty-three percent of monitored streams in farmland areas had at least one pesticide whose concentration exceeded aquatic life guidelines; 4% had at least one compound that exceeded human health standards or guidelines. All streams had at least one pesticide at detectable levels throughout the year, and 75% had an average of five or more. Fewer than 1% of groundwater sites in farmland areas had pesticides in concentrations that exceeded human health standards, and 40% of groundwater sites had no detectable pesticides.
- **How much organic matter is there in cropland soils?** Organic matter improves the ability of soils to hold water, provides nutrients for crops, reduces erosion, and can help to support soil microorganisms. Data are not adequate for national reporting on this indicator.
- **How much cropland is subject to erosion by wind or water?** From 1982 to 1997, the acreage of U.S. farmland with the greatest potential for wind erosion decreased by nearly a third, to about 63 million acres, or about 15% of U.S. croplands. The area with the greatest potential for water erosion also decreased by nearly a third, to 89 million acres, or about 22% of U.S. croplands.
- **How much cropland soil has high salt levels?** High-salinity soils, which typically result from irrigation in arid climates, can reduce the ability of soils to support plant growth. Data are not adequate for national reporting on this indicator.



Biological Components

Four indicators describe the biological condition of farmlands. Continuing from the three soil indicators noted above, the first biological indicator measures the condition of microscopic animals in cropland soils. The second indicator focuses on the wildlife that live in the farmland landscape, a third reports on native and non-native plants in those parts of the farmland landscape that are not used for production, and a fourth measures stream habitat quality—the sediments in the streambed, the stability of stream banks, and similar physical attributes. The latter three indicators require additional development.

- **What is the condition of the microscopic animal communities in cropland soils?** The condition of nematodes (roundworms) in the soil is a good indicator of overall soil condition. Data are not adequate for national reporting on this indicator.
- **What is the condition of wildlife in areas that are heavily dominated by farmlands?** Additional work is necessary to develop an indicator that describes the condition of species that prosper in the farmland landscape and of those that depend on the kind of habitat that existed before conversion to agriculture.
- **In areas that are heavily dominated by croplands, is most of the remaining noncropland vegetation native or non-native?** Non-native vegetation often provides less suitable wildlife habitat. This indicator requires further development.
- **What is the quality of the habitat in streams in farmland regions?** Stream habitat quality often reflects the effects of activities, including farming practices, in the watershed. This indicator requires further development.

Human Use

Four indicators measure the human use of farmlands. Three focus on aspects of production: the first tracks changes in the yield per acre for five major crops; the second tallies total agricultural output and changes in the inputs, such as fertilizer and labor, used to produce farm goods; and the third focuses on the dollar value of farm sales, which depends on both the amount of goods produced and the prices farmers receive. The fourth indicator focuses on another human use of farmlands, recreation.

- **How has the per-acre yield of major crops changed over time?** Since 1950, per-acre yields of corn, wheat, and cotton have more than doubled, with corn yield increasing almost fourfold. Of major crops, soybean yields went up the least, but still nearly doubled.
- **How have farm output and the inputs (pesticides, fertilizers, labor, land, etc.) needed to produce that output changed over time?** U.S. agricultural output has been increasing steadily since 1950, while the major inputs required to produce a unit of output—with the exception of pesticides—have decreased. Pesticide use has leveled off since 1980.
- **What is the value of the nation's production of crops and livestock?** The gross value of agricultural output (adjusted for inflation) was about \$180 billion in 1999, or about 10% more than in 1950. Over the past half-century, however, there have been major fluctuations, from a low of \$140 billion in 1959 to a high of about \$260 billion in 1973. Livestock sales have consistently accounted for about half of all agricultural value.
- **How much recreation takes place on farmlands?** A considerable amount of recreation takes place on farmlands—hunting and fishing, for example—and some farmers depend on income from such activities. Data are not adequate to report nationally on this indicator.

What do we mean by “farmlands” or the “farmland landscape”?

Lands used for production of annual and perennial crops and livestock—croplands—are the heart of the farmland ecosystem. However, croplands are found within a larger landscape that includes field borders and windbreaks, small woodlots, grassland or shrubland areas, wetlands, farmsteads, small villages and other built-up areas, set-aside lands, and similar areas not used for production. This overall landscape is referred to as the *farmland landscape* in this report. Some indicators describe the condition of cropped lands, while some describe the more broadly defined farmland landscape.

In general, we have excluded lands enrolled under the Conservation Reserve Program from the estimates presented here for croplands; these lands are included, however, in indicators dealing with the larger farmland landscape. In addition, lands used for intensive animal raising or feeding, often called feedlots or confined animal feeding operations, are clearly a part of the overall agricultural landscape, and some of these areas are included in the estimates of cropland that we present. However, it is also likely that some, located in otherwise nonagricultural settings and not owned by farmers/producers, are not included. The acreage involved is believed to be negligible compared to other types of cropland.

The farmland landscape inevitably overlaps with other ecosystems. Most notably, pastures are considered “croplands,” since they are clearly part of farming operations. They are also considered part of the grasslands/shrublands ecosystem, since they are grass-covered (perhaps with scattered trees or shrubs) and thus provide some of the services and values and share many characteristics of that ecosystem. (The fact that some farmers harvest hay from native prairies further blurs the distinction between these two ecosystems.) In addition, by defining the farmland landscape to include noncropland areas surrounding and intermingled with croplands, we obviously incorporate lands covered with forest, grassland or shrubland, wetlands, and suburban development.

The production of livestock is clearly an agricultural activity, but not all land used for livestock production is considered as part of the farmland landscape. For example, while pastures are included as croplands, many cattle spend significant portions of their lives grazing on grasslands or shrublands that are not subject to significant management and that we report as grasslands / shrublands, not croplands.

Clearly, distinguishing between these lands is at times difficult.

Map 6.1. Natural Resources Conservation Service Regions



A Note about Regions

One indicator (Farmland Landscape, p. 92) in this section presents data using the USDA Natural Resources Conservation Service (NRCS) regions (see Map 6.1). The data presented in the indicator do not include Alaska and Hawaii, but, when such data become available, these two states will be included. Two indicators (Soil Erosion and Monetary Value of Agricultural Production, pp. 100 and 108) present their data using maps at a finer scale of resolution.

If data were available, several indicators—Fragmentation of Farmlands Landscapes by Development; Size and Shape of “Natural” Patches in the Farmland Landscape; Soil Organic Matter; Soil Salinity; and Soil Biological Condition—would also be presented using the NRCS regions.



SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent	Nutrients, Carbon, Oxygen	Plants and Animals	Food, Fiber, and Water
Pattern	Contaminants Physical	Communities Ecological Productivity	Recreation and Other Services

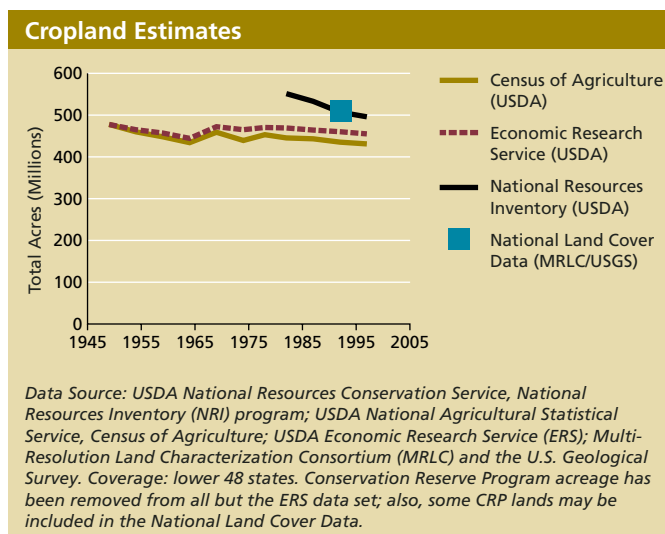
● Total Cropland (including pasture and hayland)

What Is This Indicator, and Why Is It Important?

This indicator reports the amount of land used for crops, including pasture and hay. Acreage that is enrolled in long-term set-aside programs, such as the Conservation Reserve Program (CRP) is not considered to be part of this indicator.

Agriculture is a major component of the U.S. economy, and land is the most basic resource in farming. In addition, the size of and fluctuations in the agricultural land base provide important baseline information for other indicators, such as Farmland Landscape (p. 92).

What Do the Data Show? Cropland, including pasture and haylands, covered between 430 and 500 million acres, or about a quarter of total U.S. land area (excluding Alaska) in 1997. Cropland acreage has declined over the past half century. Unfortunately, the multiple sources of cropland acreage information provide estimates that are not always consistent. Two sources—the Census of Agriculture and the Economic Research Service (ERS)—show a decline in acreage from a peak in 1949 (about 5% for ERS and 10% for the Census). In contrast, the National Resources Inventory (NRI) reports greater cropland acreage and a 10% drop over the much shorter time period from 1982 to 1997. The National Land Cover Data agree with the NRI for the single time point available.



Discussion Note that even if overall acreage changes little, different parts of the country may experience sharp increases or decreases in cropland acreage. In addition, even apparently small changes in total acreage may involve millions of acres of land (see the national extent indicator, p. 40).

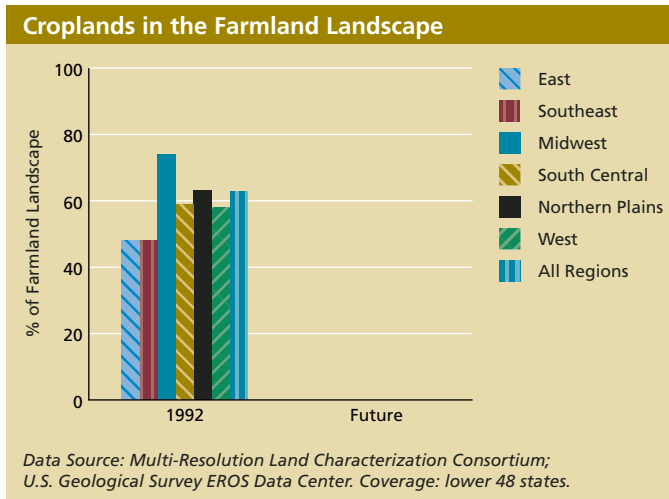
Estimates of the amount of land devoted to farming differ because different programs use different methods to acquire, define, and analyze their data. We are aware of no overall reconciliation among these estimates.

Cropland is a flexible resource: it may be used for crops one year, be left idle for one or many years, and then returned to production. Changes in government programs or crop prices may cause land to be idled for short periods or to be used for different crops. In contrast, long-term changes in cropland acreage may result from conversion of land to other uses, including CRP set-asides and development.

The technical note for this indicator is on page 229.

SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent	Nutrients, Carbon, Oxygen	Plants and Animals	Food, Fiber, and Water
Pattern	Contaminants Physical	Communities Ecological Productivity	Recreation and Other Services

● The Farmland Landscape

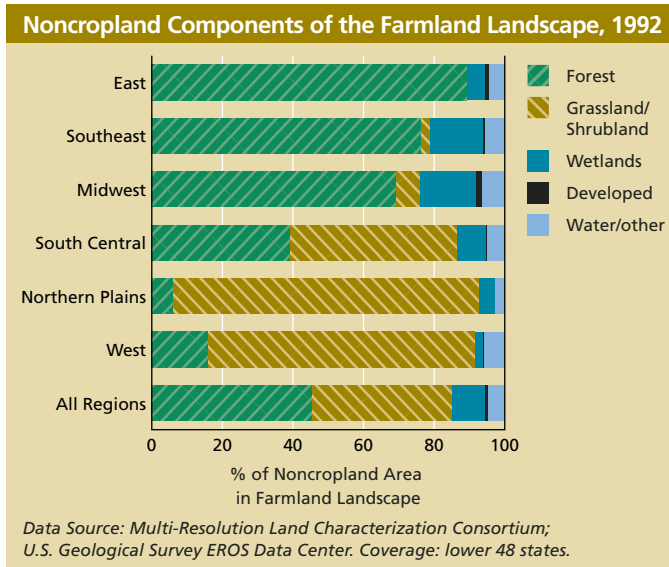


What Is this Indicator, and Why Is It Important?

This indicator reports the percentage of the farmland landscape that is actively used for crop production, pasture, or haylands (i.e., croplands, see p. 91). The “farmland landscape” includes croplands and the forests or woodlots, wetlands, grasslands and shrublands, and the like that surround or are intermingled with them. This indicator describes the degree to which croplands dominate the landscape, or, conversely, the degree to which these other lands are intermingled.

This indicator also describes the composition of the noncropland portion of the farmland landscape by reporting the percentage of these lands that are forests, grasslands and shrublands, wetlands, developed areas, and other lands and waters.

The noncropland elements of the farmland landscape (other than developed) provide wildlife habitat, serve as streamside buffers and windbreaks, and lend a distinctive visual character to the landscape. (Pasture and haylands are intermediate in character between “natural” grasslands and cultivated croplands; for this indicator, they are counted as croplands.)



What Do the Data Show?

In the East and Southeast, croplands make up about half of the overall farmland landscape; most of the remainder is forest and, in the Southeast, wetlands. In the Midwest, only about a quarter of the farmland landscape is something other than croplands; forests and wetlands dominate the noncropland areas in this region as well.

About 60% of the farmland landscape is croplands in the South Central, Northern Plains, and Western regions.

Grasslands and shrublands dominate the noncropland portion of the Western and Northern Plains regions; in the South Central region, forests and grasslands and shrublands are about equal in area.

Discussion This indicator should, over time, be sensitive to the expansion of urban and suburban land use into farmland areas as well as to the conversion of forest, grassland, or other land cover to cropland. However, the data reported here do not measure very low density “exurban” development (more than scattered rural settlements, but less dense than “suburban”).

The farmland landscape reported here is defined using satellite land cover data. Areas dominated by cropland are included, along with their immediate surroundings (see the technical note for details). Note also that identifying wetlands on croplands is difficult; wetlands data should be interpreted cautiously.

The technical note for this indicator is on page 231.



SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

⊖ Fragmentation of Farmland Landscapes by Development

What Is This Indicator, and Why Is It Important?

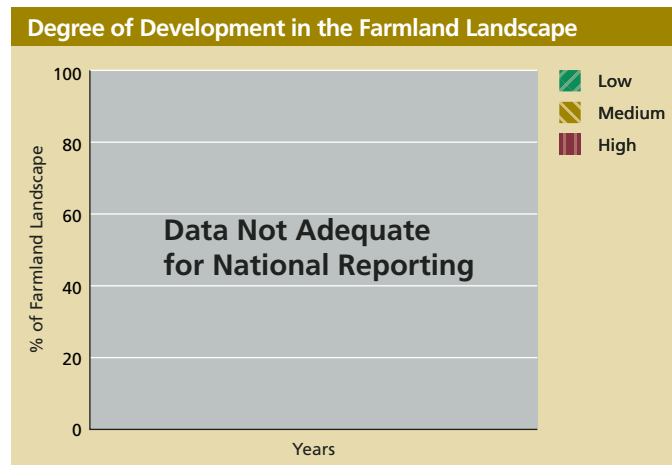
This indicator would report the degree to which suburban development and other built-up areas break up (fragment) the farmland landscape (croplands plus intermingled “natural” areas such as forests, wetlands, and grasslands and shrublands). Areas with a mosaic of cropland and intermingled natural areas—but little or no development—would be rated as “low” on the “fragmentation index” used for this indicator, while those in which small patches of cropland are mixed into a backdrop of suburban development would be rated as “high.” These data would be presented nationally, as above, and by region for the most current year.

Housing and other development in farmland areas may compromise the economic viability of farming. Low-density, scattered development requires a great deal of surface area for roads and infrastructure, spreading over a relatively large proportion of the farmland landscape. Commuter traffic on rural roads produces dangerous conflicts with slow-moving farm machinery, and new residents may object to long-standing farm practices such as manure spreading. Development also typically increases nearby land values and, in some states, the property taxes on farmland, thereby increasing incentives for farmers to sell their land for further development. Finally, some development can diminish the aesthetic quality and recreation potential of formerly pastoral landscapes.

This indicator was selected to address the ability of farmland landscapes to produce goods for human benefit. It does not address how such fragmentation affects wildlife or other environmental values; for this, see p. 94.

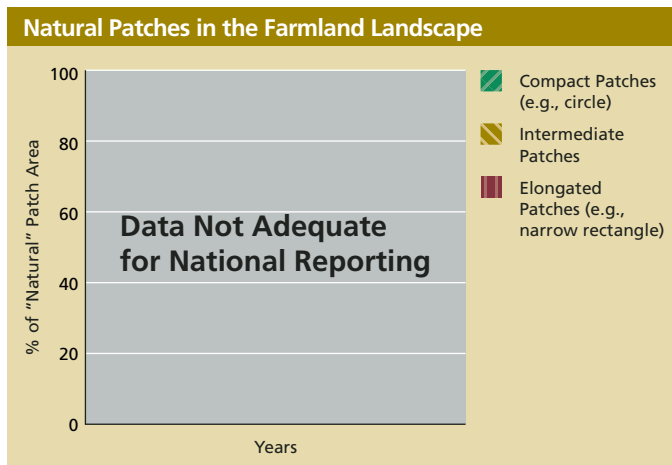
Why Can't This Indicator Be Reported at This Time? The satellite land cover data necessary to report this index are available, but the data have not yet been analyzed.

The technical note for this indicator is on page 231.



SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent	Nutrients, Carbon, Oxygen	Plants and Animals	Food, Fiber, and Water
Pattern	Contaminants Physical	Communities Ecological Productivity	Recreation and Other Services

⊖ Shape of “Natural” Patches in the Farmland Landscape



What Is This Indicator, and Why Is It Important?

This indicator describes the shape of patches of “natural” lands in the farmland landscape, by reporting on the percentage of patch area that is found in “compact” patches (e.g., like a circle), “elongated” patches (e.g., like a long narrow rectangle), and an intermediate class of patch shape. These classes are defined based on the ratio of the perimeter, or edge, of each patch to its area; these perimeter-to-area ratios will be divided by patch area for the sake of comparison. “Natural” areas include forest, grasslands and shrublands, wetlands, and lands enrolled in the Conservation Reserve Program (CRP). These data would be presented nationally and by region for the most current year.

Natural lands within the farmland landscape control erosion, facilitate groundwater recharge, provide critical habitat for wildlife, and serve other important ecological functions. The size and shape of these often small and isolated remnants, along with restored conservation areas (e.g., CRP land), directly influence the amount and type of ecosystem services provided. Habitat fragmentation may create new kinds of habitats that are colonized by generalist native species or exotic species. For example, small patches and long narrow ones may have little or no “interior” habitat. Since some species thrive only in interior habitat—where there is a relatively large and contiguous area of forest, grassland, or other natural cover (see the forest fragmentation indicator, p. 120), small narrow areas may not provide habitat for these species. On the other hand, narrow strips may function quite well for erosion and sediment control.

Why Can’t This Indicator Be Reported at This Time? As is the case for the development indicator (p. 93), the land cover data necessary to report this index are available, but have not been analyzed.

The technical note for this indicator is on page 232.



SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

● Nitrate in Farmland Streams and Groundwater

What Is This Indicator, and Why Is It Important?

This indicator reports on the concentration of nitrate in representative farmland streams and groundwater sites. Specifically, the indicator reports the percentage of streams and groundwater wells with average nitrate concentrations in one of four ranges, in areas that are primarily farmland.

Nitrate is a naturally occurring form of nitrogen and an important plant nutrient; it is often the most abundant of the forms of nitrogen that are readily usable by plants, including algae. Increased nitrate in streams that ultimately empty into coastal waters can lead to algal blooms in those waters; these blooms decrease recreational and aesthetic values and help deplete oxygen needed by fish and other animals (see the national nitrogen indicator and the hypoxia indicator, pp. 46 and 71). Elevated nitrate in drinking water is a health threat to young children and is of particular concern for people using household groundwater wells; municipal water supply systems typically take steps to remove nitrate.

Sources of nitrate in farmlands streams and groundwater include chemical fertilizers and runoff from manure associated with animal raising operations. If more fertilizer is applied than can be used by plants or stored in the soil, nitrates will seep into groundwater or drain into streams.

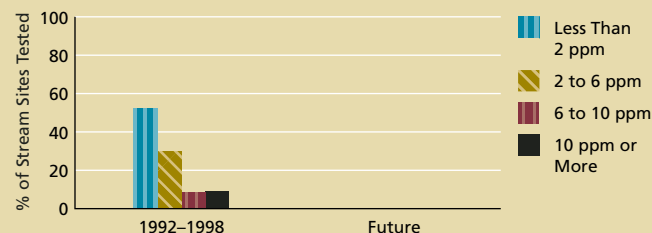
What Do the Data Show? Just over half the stream sites and 45% of groundwater wells sampled in areas where agriculture is the primary land use have concentrations of nitrate below 2 parts per million (ppm). About 20% of the groundwater wells and about 10% of stream sites had concentrations that exceed the federal drinking water standard (10 ppm).

Groundwater samples from areas dominated by agricultural use have higher concentrations of nitrate than either urban or forested areas, with forested lands having the lowest of the three. Only for farmland areas (and 3% of urban groundwater sites) did nitrate exceed the 10 ppm federal drinking water standard.

There is also a core national indicator for nitrogen (p. 46).

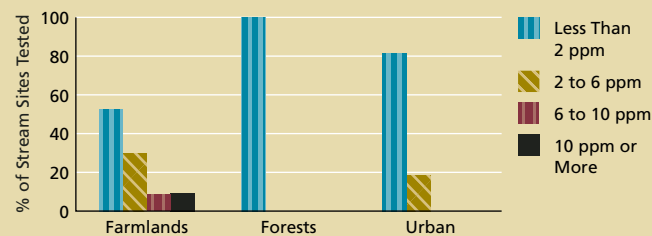
The technical note for this indicator is on page 232.

Nitrate in Farmland Streams



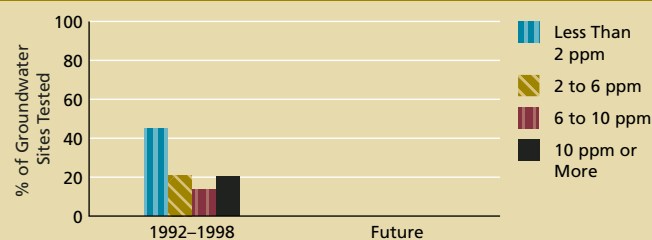
Data Source: USGS National Water Quality Assessment. Coverage: lower 48 states. Each sampling area was sampled intensively for approximately 2 years during 1992-1998.

Ecosystem Comparison: Nitrate in Streams, 1992-1998



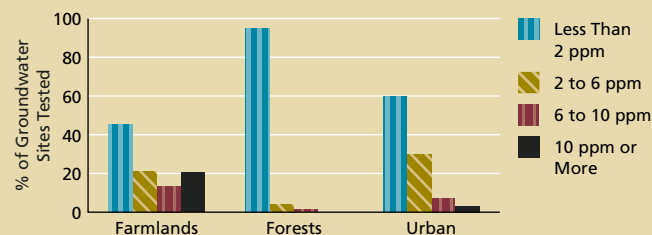
Data Source: USGS National Water Quality Assessment. Coverage: lower 48 states. Each sampling area was sampled intensively for approximately 2 years during 1992-1998.

Nitrate in Farmland Groundwater



Data Source: USGS National Water Quality Assessment. Coverage: lower 48 states. Each sampling area was sampled intensively for approximately 2 years during 1992-1998.

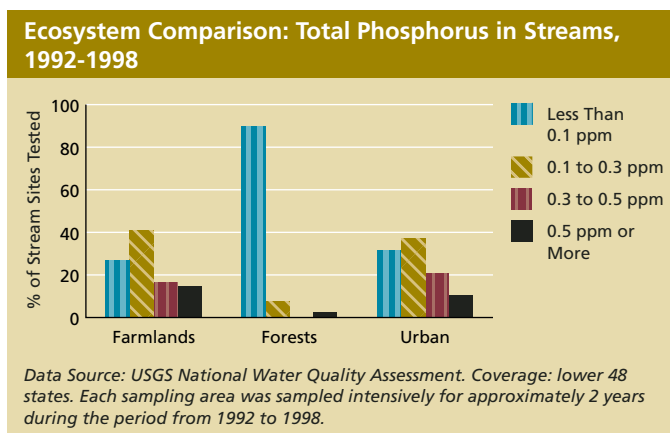
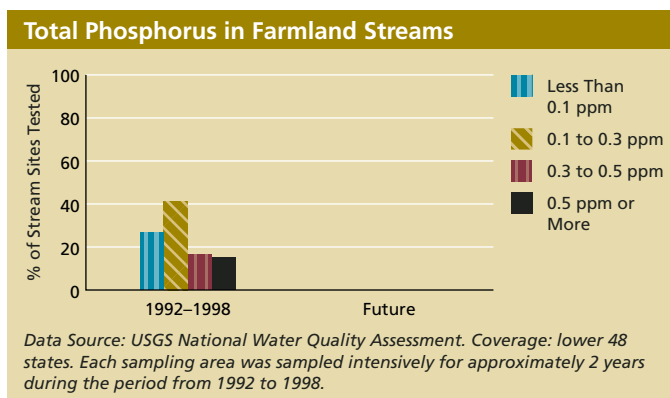
Ecosystem Comparison: Nitrate in Groundwater, 1992-1998



Data Source: USGS National Water Quality Assessment. Coverage: lower 48 states. Each sampling area was sampled intensively for approximately 2 years during 1992-1998.

SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

● Phosphorus in Farmland Streams



What Is This Indicator, and Why Is It Important?

This indicator reports on the concentration of phosphorus in representative farmland streams. Specifically, the indicator reports the percentage of streams with average annual concentrations in one of four ranges, for streams draining watersheds that are primarily farmland.

Phosphorus is an essential nutrient for all life forms and occurs naturally in soils and aquatic systems; phosphate is the most biologically active form of phosphorus. At high concentrations in freshwater systems, however, phosphorus can lead to algal blooms, which can decrease recreational and aesthetic values and help deplete oxygen needed by fish and other animals.

Sources of phosphorus in farmlands streams include chemical fertilizers and runoff from manure associated with animal-raising operations. If more fertilizer is applied than can be used by plants or stored in the soil, phosphorus will drain into adjacent streams.

What Do the Data Show? About three-fourths of farmland stream sites had concentrations of phosphorus that were at least 0.1 part per million (ppm), and about 15% of farmland stream sites had phosphorus concentrations of at least 0.5 ppm.

Average phosphorus concentrations in farmland streams are similar to concentrations in streams draining urban watersheds (p. 187) and much lower than streams draining forested watersheds.

Discussion The U.S. Environmental Protection Agency (EPA) has recommended 0.1 ppm as a goal for preventing excess algae growth in streams. In 2000, EPA took steps to facilitate development of regional criteria, but these regional criteria have not yet been adopted. There is no federal drinking water standard for phosphorus.

The technical note for this indicator is on page 232.



SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

● Pesticides in Farmland Streams and Groundwater

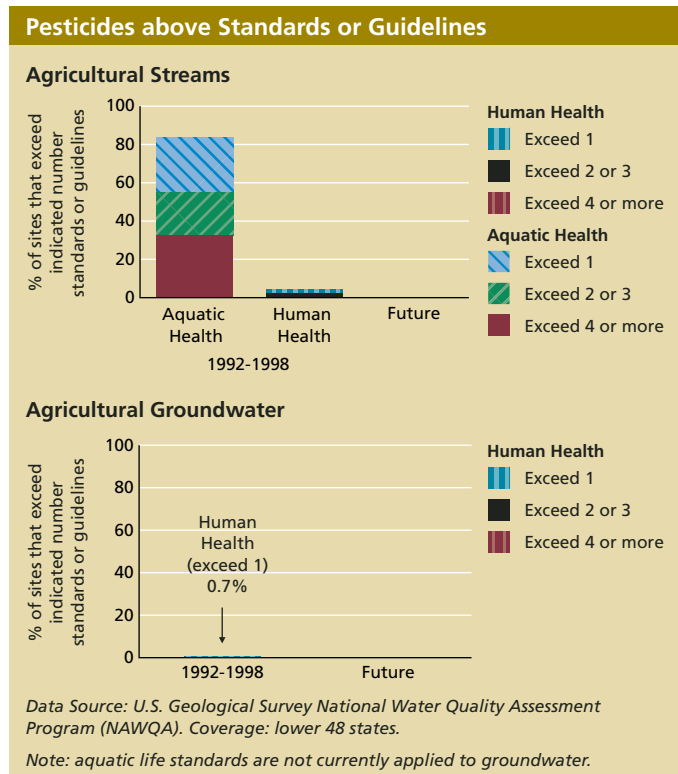
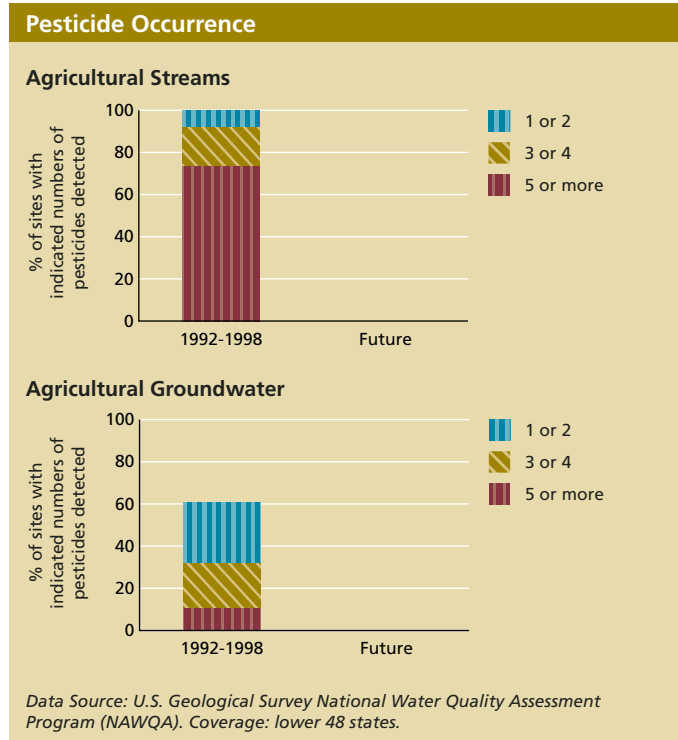
What Is This Indicator, and Why Is It Important? This indicator reports on pesticides found in farmland streams and groundwater. The graphs on the top show the average number of pesticides detected throughout the year in streams and shallow groundwater wells. The graphs on the bottom show the percentage of streams and shallow groundwater wells with pesticide concentrations that exceeded standards and guidelines (benchmarks) set for the protection of human health or aquatic life. These graphs report currently used agricultural pesticides and selected breakdown products of these pesticides, as well as selected organochlorine insecticides that were widely used in the past but whose use is no longer permitted in the United States.

The number of pesticides detected is important, but the presence of pesticides does not necessarily mean that the levels are high enough to cause problems. Comparison with benchmarks provides a useful reference to help judge the significance of contamination.

However, drinking water standards or guidelines do not exist for 33 of the 76 pesticides analyzed, and aquatic life guidelines do not exist for 48 of the 76 compounds. Current benchmarks do not account for mixtures of chemicals and seasonal events involving high concentrations. In addition, potential effects on the reproductive, nervous, and immune systems, as well as on particularly sensitive people, are not yet well understood.

What Do the Data Show? All monitored streams in farmland areas had at least one pesticide at detectable levels throughout the year, and about 75% had an average of five or more. Eighty-three percent of streams had at least one pesticide whose concentration exceeded aquatic life guidelines; about 4% had one or more compounds that exceeded human health standards or guidelines.

About 60% of groundwater wells in farmland areas had at least one pesticide at detectable levels, and less than 1% had any pesticides that exceeded human health standards or guidelines.





SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

● Pesticides in Farmland Streams and Groundwater *(continued)*

Discussion The data shown here do not represent assessments of the risks posed to people or ecosystems in any specific location, since they do not incorporate factors such as whether the water tested is actually used as a drinking water source and the time of year when the pesticides are found, relative to when animals are most active.

Guidelines for the protection of aquatic life are often numerically lower than standards and guidelines to protect human health. Aquatic animals spend much or all of their life in water, and may be more sensitive than people to specific contaminants. People consume drinking water from both streams and groundwater, thus human health standards and guidelines apply to both. Guidelines to protect aquatic life are not applied to groundwater.

The pesticides reported here are generally associated with agriculture, but some may have other uses (currently or in the past). Thus, not all contamination is necessarily attributable to agricultural use.

See also the national, coastal, and urban contaminants indicators (pp. 48, 72, and 189).

The technical note for this indicator is on page 234.



SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

⊖ Soil Organic Matter

What Is This Indicator, and Why Is It Important? This indicator reports how much organic matter—partially decayed plant and animal matter—there is in the top 4–6 inches of cropland soil. This will be reported nationally over time, and by region for the most recent year of data.

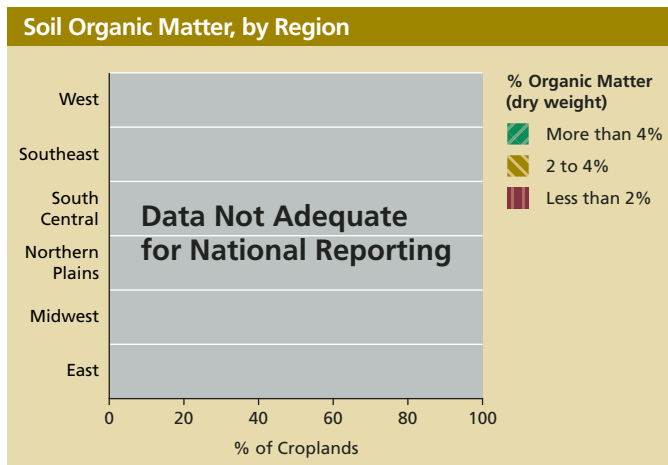
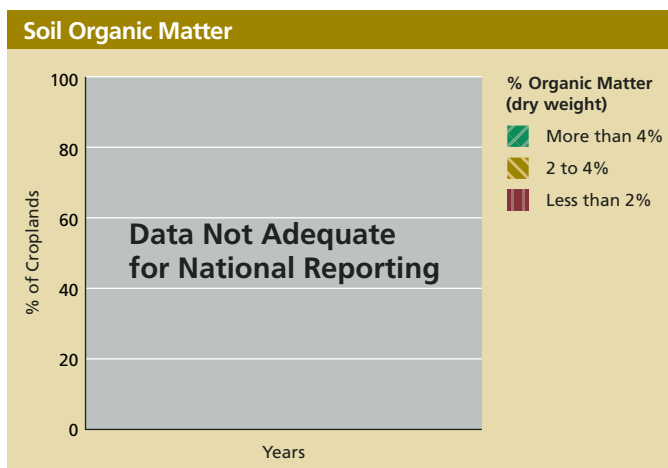
Organic matter helps the soil hold water and supplies nutrients, which are crucial for crop production; it also protects against erosion and helps support a healthy and diverse set of microscopic plants and animals. Organic matter content, erosion (p. 100), soil salinity (p. 101), and soil biological condition (p. 102) are key indicators of soil quality, reflecting the effect of agriculture on soils and the influence of changing crop and soil management practices.

Soil organic matter is usually measured as the percentage of organic matter (by dry weight) in the top 4–6 inches of the soil, where human activities have most influence on soil condition. While there are large regional differences in soil organic matter content because of climate and other factors, changes in this indicator nationally and within regions will provide important information on the effect of cropland management.

Why Can't This Indicator Be Reported at This Time?

There are baseline estimates of the amount of organic matter in soils across the United States through Soil Survey reports produced by the USDA Natural Resources Conservation Service, but there is no mechanism for systematic monitoring of changes in these amounts. Long-term observations of changes in organic matter resulting from different management practices are under way in a number of research plots and other locations, but these do not provide an adequate basis for nationwide monitoring. In addition, efforts are under way to develop techniques to use satellite data to estimate organic matter in surface soils.

The technical note for this indicator is on page 234.





SYSTEM DIMENSIONS

Extent
Pattern

CHEMICAL AND PHYSICAL

Nutrients, Carbon, Oxygen
Contaminants
Physical

BIOLOGICAL COMPONENTS

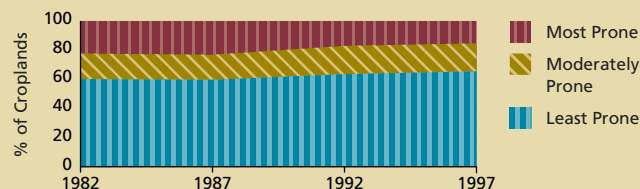
Plants and Animals
Communities
Ecological Productivity

HUMAN USES

Food, Fiber, and Water
Recreation and Other Services

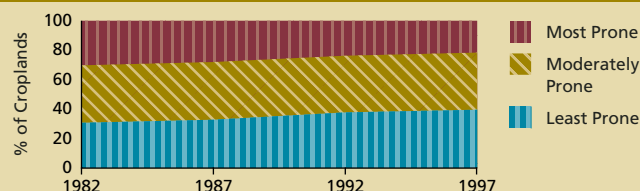
● Soil Erosion

Wind Erosion Potential



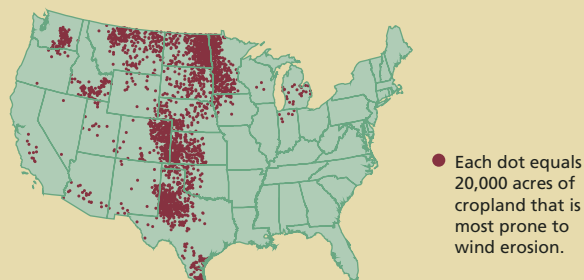
Data Source: USDA Natural Resources Conservation Service. Coverage: lower 48 states; data cover cropland and Conservation Reserve Program lands, but not pasture.

Water Erosion Potential



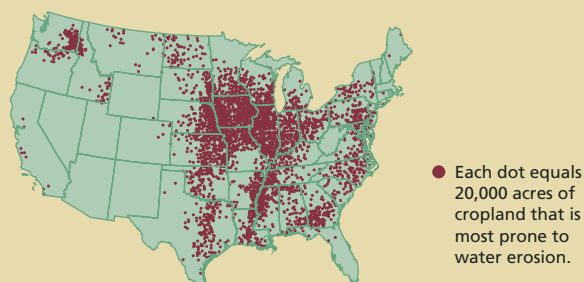
Data Source: USDA Natural Resources Conservation Service. Coverage: lower 48 states; data cover cropland and Conservation Reserve Program lands, but not pasture.

Croplands Most Prone to Wind Erosion, 1997



Data Source: USDA Natural Resources Conservation Service. Coverage: lower 48 states; data cover cropland and Conservation Reserve Program lands, but not pasture.

Croplands Most Prone to Water Erosion, 1997



Data Source: USDA Natural Resources Conservation Service. Coverage: lower 48 states; data cover cropland and Conservation Reserve Program lands, but not pasture.

What Is This Indicator, and Why Is It Important?

This indicator reports the percentage of U.S. farmlands according to their potential for erosion by wind or water. These data are based on an index that combines information on soil characteristics, topography, and management activities such as tillage practices and whether crop residue is left on the field or not. This indicator covers croplands (excluding pastures) and Conservation Reserve Program (CRP) lands. In addition, those croplands most prone to wind and water erosion are mapped for 1997.

Agricultural soil erosion reduces soil quality and degrades water quality. Even relatively small movements—for example, from the top of a slope to the bottom—cause changes in soil structure that can reduce fertility and make normal cropping practices difficult. When soil moves further, eventually ending up in streams and lakes, it causes water quality problems, in part because eroded sediments often carry both fertilizers and pesticides. Even without such pollution, sedimentation alone imposes significant costs on reservoirs and water treatment facilities, navigation, and other water and waterway users. Erosion, organic matter content (p. 99), soil salinity (p. 101), and soil biological condition (p. 102) are key indicators of soil quality; changes to crop and soil management practices affect soil quality.

What Do the Data Show? From 1982 to 1997, the acreage of U.S. farmland with the greatest potential for wind erosion decreased by nearly one-third, to about 63 million acres, or about 15% of U.S. croplands. The area with the greatest potential for water erosion also decreased by nearly one-third, to 89 million acres, or about 22% of U.S. croplands.

Although both water and wind erosion occur throughout the United States, high levels of water erosion are more common in the eastern half of the nation, and wind erosion is more likely in the West.

Discussion Reductions in erosion can result from changes in management practices; common practices used to reduce soil erosion are no-till or minimum tillage,

installation of terraces and field wind breaks, and contour farming. In addition, removal of highly erosion-prone lands from cultivation, (for example, enrollment in the Conservation Reserve Program) typically lowers its erosion potential.

The technical note for this indicator is on page 235.



SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

⊖ Soil Salinity

What Is This Indicator, and Why Is It Important?

This indicator would report the percentage of cropland with different levels of salt content, measured in decisiemens per meter (dS/m). A map showing the percentage of land in each major cropland region with elevated salt levels (i.e., over 4 dS/m), would accompany the nationwide data.

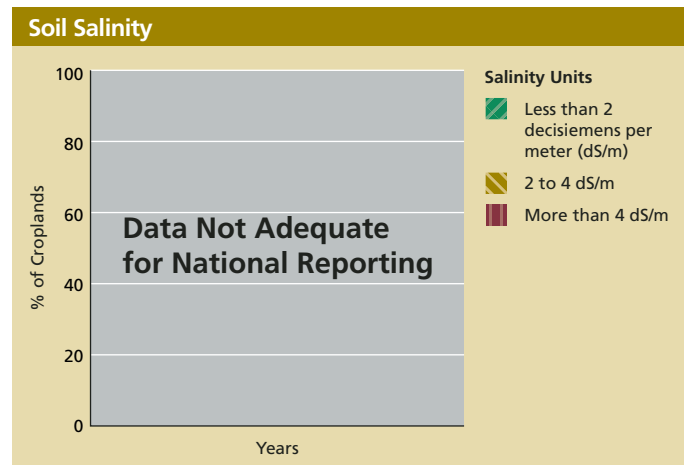
Excess salt has the same effect on plants as drought: too much salt in soil reduces the ability of plants to take up water, which interferes with their growth and reduces their vitality. Excess salt in soils can also enter groundwater and surface water. Highly saline water is hazardous to freshwater fish, and waterfowl accustomed to freshwater avoid it. Some salts, like those containing sodium, can change the physical condition of the soil, reducing infiltration, increasing runoff and erosion, and impairing biological activity. Soil salinity, along with organic matter content (p. 99), erosion (p. 100), and soil biological condition (p. 102), is a key indicator of soil quality.

Soil salinization often results from irrigated agriculture, and it is generally a problem in arid areas. Water used for irrigation contains small amounts of salt, and when water evaporates from the soil surface or from the leaves of plants, it leaves salt behind in the soil. In arid areas, these salts can accumulate and cause problems. In areas with greater rainfall, salts are drained from the soil by the larger volumes of water flowing through the soil, and tend not to accumulate to high levels.

Although much less widespread, salinization can occur in the absence of irrigation. Some areas have naturally high salt content in their soil, while saline seeps can occur when water moves through the soil, picking up salts, and then emerges at a seep or spring.

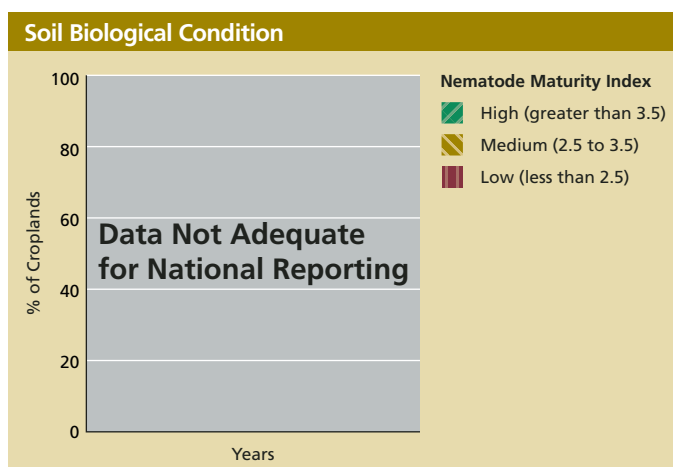
Why Can't This Indicator Be Reported at This Time? Salinity measurements are often included in routine soil tests conducted by farmers, government agencies, and researchers. However, there is no unified effort to collect these data and incorporate them into a national database to monitor trends over time.

The technical note for this indicator is on page 235.



SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

⊖ Soil Biological Condition



What Is This Indicator, and Why Is It Important?

This indicator would report the percentage of croplands in three different ranges on the Nematode Maturity Index (NMI), an index that measures the types of roundworms, or nematodes, in the soil. A map showing the percentage of cropland in each major cropland region with low index values (indicating disturbed soils) would accompany the nationwide data.

Healthy soils contain many different microscopic animals. Agricultural practices often disturb the soil, and the amount of disturbance can be measured by changes in these microscopic animals. This indicator is based on the identification of various types of nematodes, each of which has a different tolerance for soil disturbance.

Calculation of the NMI is based on the proportion of nematodes with different levels of tolerance for disturbance. Low NMI values (less than 2.5) are often found in soils subjected to intensive agricultural production methods, like monoculture and the use of high levels of nitrogen fertilizer and pesticides. Midrange values (from 2.5 to 3.5) suggest a more diverse soil community and often reflect such practices as crop mixtures and rotations and no-till farming. High NMI values (greater than 3.5) are rarely found on cultivated lands.

Soil biological condition, along with organic matter content (p. 99), erosion (p. 100), and soil salinity (p. 101) are key indicators of soil quality, reflecting the effect of agriculture on soils and the influence of changing crop and soil management practices

Why Can't This Indicator Be Reported at This Time? Measuring soil quality by measuring soil organisms has gained broad scientific acceptance. While the Nematode Maturity Index is a promising indicator, it has not yet been adopted by a nationwide monitoring program. However, NMI has been applied successfully in two statewide surveys (North Carolina and Nebraska) carried out in cooperation with the National Agricultural Statistics Service.

Reporting of soil quality based on nematode populations would require large-scale implementation of the indicator described here. This could be done through an existing national monitoring program, or state-based monitoring using consistent methods would allow the resulting information to be aggregated at the national level.

The technical note for this indicator is on page 236.



SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

② Status of Animal Species in Farmland Areas

What Is This Indicator, and Why Is It Important? This indicator would report on the status of wildlife in farmland areas.

Farmlands—including both croplands and the patches of natural lands that are intermingled with them—are home to many kinds of wildlife. Some species would be found in the forests, grasslands, or shrublands from which the farmlands were created. Such species may find fewer habitat opportunities in farmland areas, but may take advantage of remaining patches of habitat (see p. 94) and remain in the area, but at low population levels. However, there are many species that favor the kinds of conditions found in areas with extensive farmlands, and these species are often more common than they were before conversion to agriculture.

Status of Animal Species in Farmland Areas

Indicator Development Needed

Why Can't This Indicator be Reported at this Time? An index is needed that that would account for both types of species found on farmlands—those that favor the pre-agricultural landscape and those that favor landscapes dominated by agriculture. This approach must necessarily differ from that taken in reporting on marine, forest, grassland and shrubland, and freshwater species (see pp. 75, 124, 144, and 168), because it is not possible to define a set of “farmland” species in the same way that one can identify species that have evolved to depend on these other ecosystem types.

The technical note for this indicator is on page 237.



SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

? Native Vegetation in Areas Dominated by Croplands

Native Vegetation in Areas Dominated by Croplands

Indicator Development Needed

What Is This Indicator, and Why Is It Important?

This indicator would report, for areas where croplands account for a large percentage of the land cover, how much of the remaining vegetation (outside of croplands) is native to the area.

Where croplands dominate the landscape, wildlife rely more heavily on the remaining areas for their habitat needs. Since vegetation dominated by non-native species often has much lower value as wildlife habitat, a high proportion of non-native plant species in the remaining non-cropland areas will have a harmful effect on wildlife populations. For example, when lands in the Conservation Reserve Program, which provides rental payments to

farmers who retire lands important for conservation, are converted from non-native grasses to native prairie grass, upland bird populations increase significantly.

Why Can't This Indicator Be Reported at This Time? Several questions must be answered before this indicator can be implemented. These include the scale at which it should be reported (i.e., county, state, or region?); the threshold for including an area in the indicator (i.e., should the indicator include only areas with more than 50% croplands, or more than 75%?); and the proportion of non-native species that should be used to categorize areas as “dominated” by non-native rather than native species.

Once the indicator is clearly defined, obtaining data may also be difficult. The fraction of land in a county, state, or region that is cropland, and its location, are readily available from satellite data. Whether vegetation is dominated by native or non-native species cannot generally be determined using satellite imagery, but many state and federal agencies, nongovernmental organizations, and universities collect data on non-native plants. However, these data have never been brought together to provide consistent information over large areas. Many existing federal, state, and local government programs could contribute to reporting on the extent of non-native species, as could nongovernmental organizations and academic institutions.

The technical note for this indicator is on page 237.



SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

❓ Stream Habitat Quality

What Is This Indicator, and Why Is It Important?

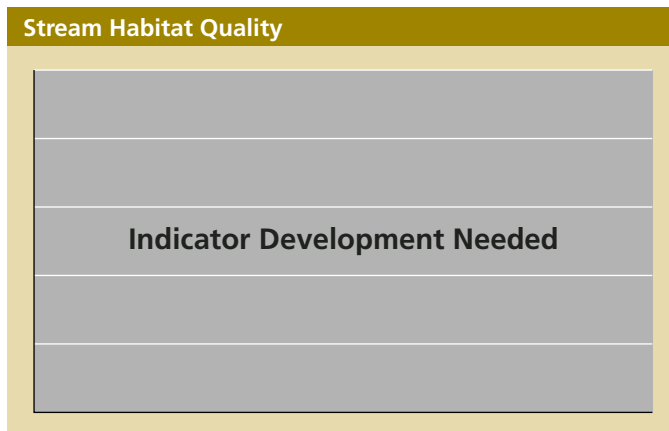
This indicator would describe the habitat quality of farmland streams by comparing a number of key attributes to those of relatively undisturbed streams in the same general area. The index would incorporate the presence of riffles and pools, the size of streambed sediments and the degree to which larger gravel and cobbles are buried in silt, the presence of branches, tree trunks, and other large woody pieces, and the stability of the bank. A companion indicator (p. 149) would report on all streams, not just on those in farmlands.

Streams with higher condition ratings (those that resemble undisturbed streams) have a more natural and diverse array of underwater and bank habitats and are therefore capable of supporting diverse native species. These streams are also more likely to have relatively undisturbed flow patterns (see p. 142) and to have vegetation along their banks—features that help maintain the conditions necessary to support a healthy biological community over the long term.

Like their counterparts on land, stream-dwelling animals and plants require specific habitat conditions in order to survive and reproduce. Because each species has its own particular habitat requirements, a variety of habitats along a stream are needed to maintain the stream’s natural complement of plants and animals.

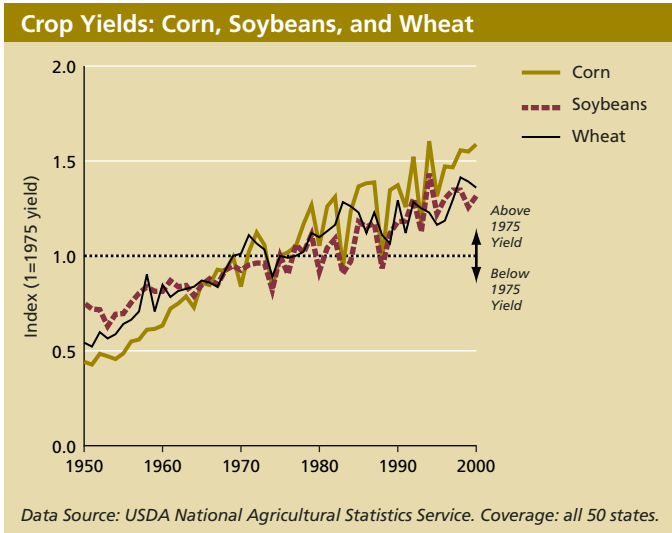
Why Can’t This Indicator Be Reported at This Time? Scientists generally agree on the key stream attributes that should be measured to evaluate stream habitat quality (riffles and pools, streambed sediments, and so on), and there is a considerable work under way by the Environmental Protection Agency, the U.S. Geological Survey, and state agencies to gather data and develop ranking methods. However, there is still no generally accepted method for combining data on individual attributes into a single index. In addition, habitat values for any particular stream must be evaluated in relation to the plants and animals in that region, so any stream habitat index would have to be tailored for different regions.

The technical note for this indicator is on page 237.



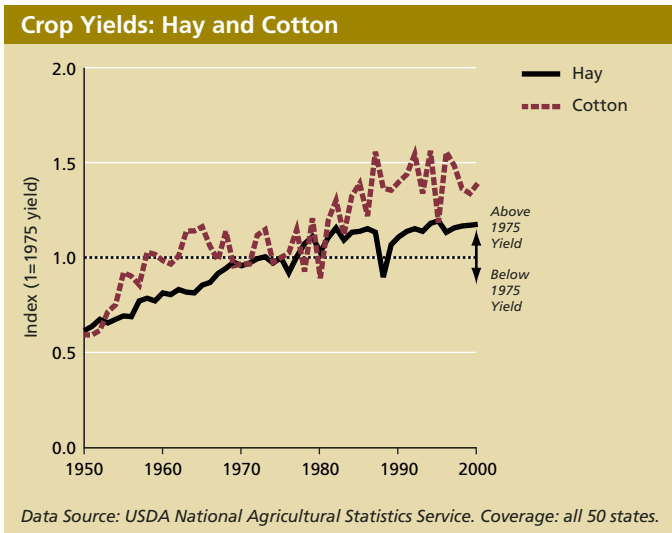
SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

● Major Crop Yields



What Is This Indicator, and Why Is It Important? This indicator reports the yield of corn, soybeans, wheat, hay, and cotton, as an index with 1975 as the base year. Values above 1.0 indicate higher yields, typically measured as tons or bushels per acre, than in 1975; values below 1.0 indicate lower yields than in 1975. These five crops account for about 90% of harvested acreage in the United States and more than half the monetary value of all crops (p. 108).

Increasing the amount of food grown per acre has allowed U.S. agriculture to produce more food and fiber without corresponding increases in farm acreage. The total acreage used for agricultural production has declined slightly over the past half-century (p. 91), and a significant increase in the acreage devoted to agriculture is generally considered unlikely.



What Do the Data Show? Per-acre yields of the major crops grown in the United States have increased dramatically over the past 50 years. Yields for three of the five major crops (corn, wheat, and cotton) more than doubled over this period, with corn yields increasing almost fourfold. Of these five major crops, soybean yields increased the least, but even they nearly doubled over the period.

Discussion Increases in crop yields are believed to result from a combination of factors. These include improvements in breeding, changes in cultivation practices, and increased use of a variety of inputs, including pesticides and fertilizers. More intensive use of farmland is thought to play an important role in

improving yields, but it may also have negative effects, such as increased concentrations of nitrogen, phosphorus, or pesticides in streams, lakes, and coastal waters (see the farmland nitrogen and phosphorus indicators, pp. 95 and 96, the farmland pesticide indicator, p. 97, and the national nitrogen indicator, p. 46).

The technical note for this indicator is on page 238.



SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

● Agricultural Inputs and Outputs

What Is This Indicator, and Why Is It Important? This indicator reports the amount of inputs used to produce one unit of output, with 1975 as the base year. So, for any input, the index value for a given year describes whether more or less of that input was used to produce a unit of output in that year than in 1975. The indicator also reports agricultural outputs over time, again compared to the output in 1975.

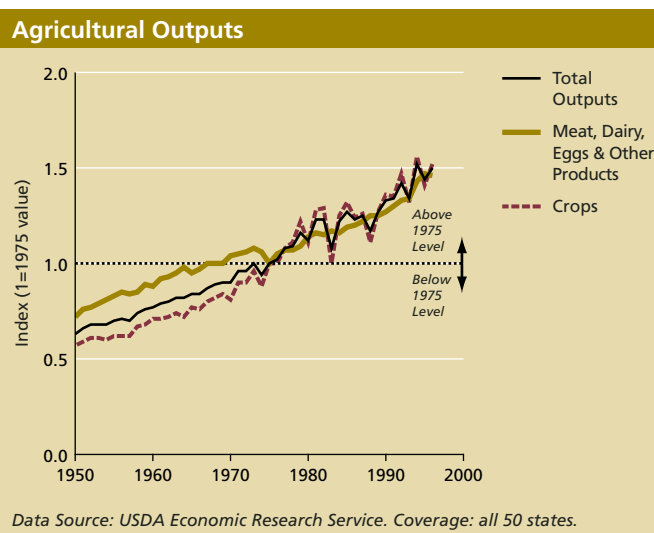
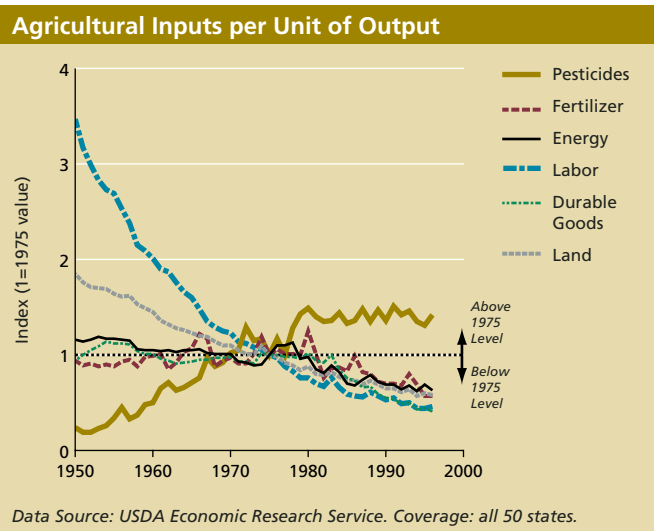
This is a very broad analysis. For example, all fertilizers used on U.S. farms were divided by all agricultural outputs—even if different amounts of fertilizer were used to produce each commodity. Agricultural production is driven by physical inputs and by the knowledge and skill of farmers, plant breeders, and others. A decreasing input index results because the input is used more efficiently by farmers (e.g., less fertilizer per ton of corn due to targeted application), or because of a series of advances (e.g., less labor required because of increased mechanization and more effective pesticides). Because inputs are often expensive and, like pesticides and fertilizers, may have environmental consequences, input trends are an important indicator of the long-term health of the agricultural enterprise and the level of its environmental impact.

What Do the Data Show? U.S. agricultural output has been increasing steadily since 1950, while the major inputs required to produce a unit of that output—with the exception of pesticides—have decreased. The amounts of both labor and land needed to produce a unit of output have fallen steadily since 1950, although the decrease in labor has been much larger. Farmers have produced more output per unit of fertilizer, energy, and durable goods such as tractors since the mid-1970s. Pesticide use per unit of output, which showed steady increases from the 1950s, leveled off around 1980.

Discussion As technology and farming practices change, inputs can change considerably. For example, a pound of pesticides today provides far more pest control than did the same amount 30 years ago. For this reason, this indicator relies upon a complex analysis of the quantities and quality of inputs used (see the technical note). A similar analysis was used for outputs, because they cannot simply be added together (a pound of strawberries is not equal to a pound of corn).

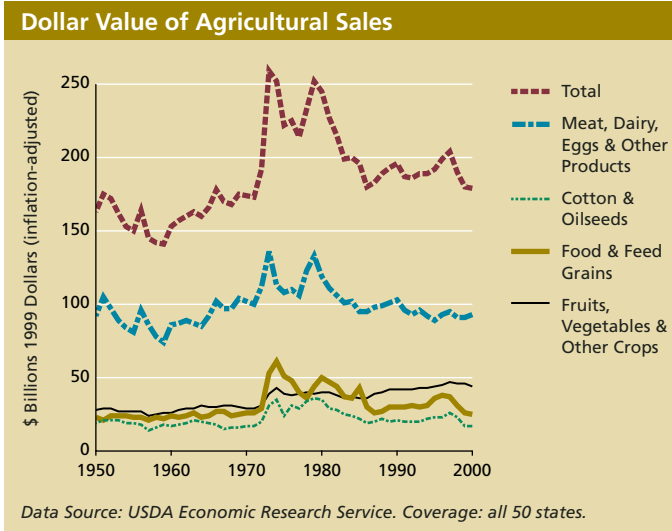
The indicator focuses on a few major, quantifiable, inputs. This means that some factors, such as changes in plant breeding (including the introduction of genetically engineered crops), are not addressed at all, and some inputs, such as water, are addressed only indirectly (in this case, through the energy costs associated with irrigation).

The technical note for this indicator is on page 238.



SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

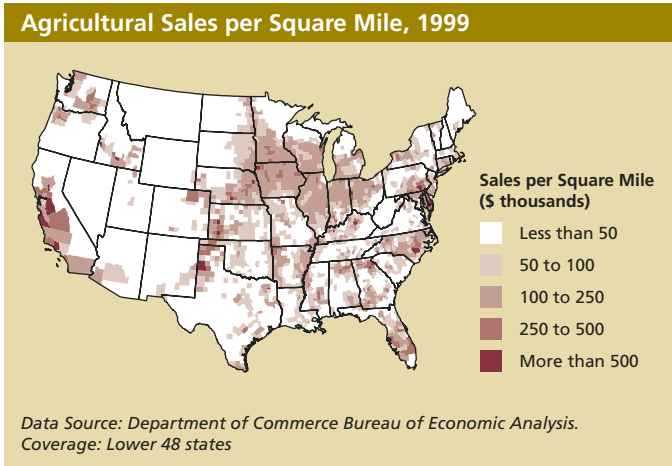
● Monetary Value of Agricultural Production



What Is This Indicator, and Why Is It Important?

This indicator reports the dollar value of the annual output of major crops and livestock. The value is determined by multiplying the amount of output by the prices received by farmers (in 1999 dollars). The data are presented both nationally over time and by location for the most recent year available (in this case, 1999).

Farming is a business, and the monetary value of the goods produced is an indication of the importance to society of those goods. In addition, some areas have high concentrations of agriculture or produce high-value crops (or both). In these areas, farming is often a significant component of the local economy.



What Do the Data Show?

The gross value of agricultural output (adjusted for inflation) was about \$180 billion in 1999, or about 10% more than in 1950. Over this half-century, however, there were major fluctuations—from a low of about \$140 billion in 1959 to a high of about \$260 billion in 1973. Livestock products consistently account for about half of overall agricultural income. Agricultural production is concentrated in the Midwest, but there are concentrations of very high agricultural sales in many areas across the country.

Discussion

Advances over the last 50 years have enabled farmers to produce more per acre of land (p. 106) and to increase total physical outputs, while requiring, in general, fewer inputs (p. 107). However, as

shown here, these advances have not translated into steadily increasing farm sales. Note that the values reported here are gross revenues, meant to represent the value of the harvest from croplands—they reveal nothing about the profitability of American farming. This indicator also reports the money received by farmers, not the retail price of farm products.

The technical note for this indicator is on page 238.



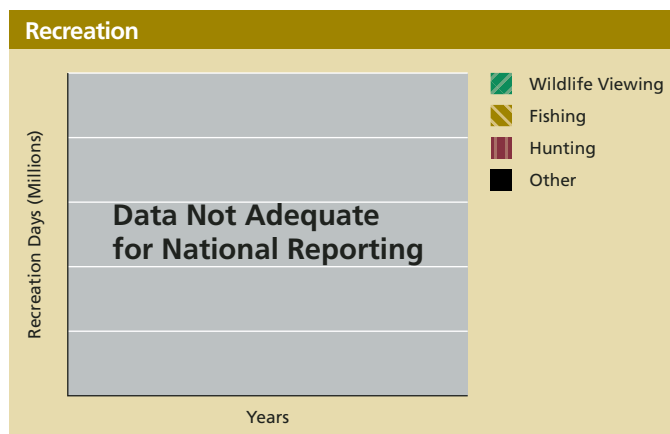
SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

⊖ Recreation

What Is This Indicator, and Why Is It Important?

This indicator would report the number of days spent fishing, hunting, viewing wildlife, or engaged in other recreational activities on farmland.

A great deal of recreation takes place on our nation’s farmlands, and those enjoying these recreational opportunities may be the farmers themselves, their friends, or visitors. In many areas, farmers supplement their income by charging to hunt or fish on their property, and they may even take steps to increase the abundance of wildlife in order to attract business. Wildlife-associated recreation is an important source of income for many small agricultural communities.



Why Can’t This Indicator Be Reported at This Time?

There are no national data sets that document the type and level of recreation on farmlands. The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (<http://fa.r9.fws.gov/surveys/surveys.html>) and the National Survey on Recreation and the Environment (<http://www.srs.fs.fed.us/trends/nsre.html>) both provide reliable data on these activities, but neither survey identifies activities that take place on farmlands. The Census of Agriculture (<http://www.nass.usda.gov/census/>), which provides information on a wide range of farm-related subjects, does not address recreational activities.

Adequate reporting would require modification of existing surveys to elicit information either on the location of recreational activities or on the amount of recreation on farms.

There is no technical note for this indicator.