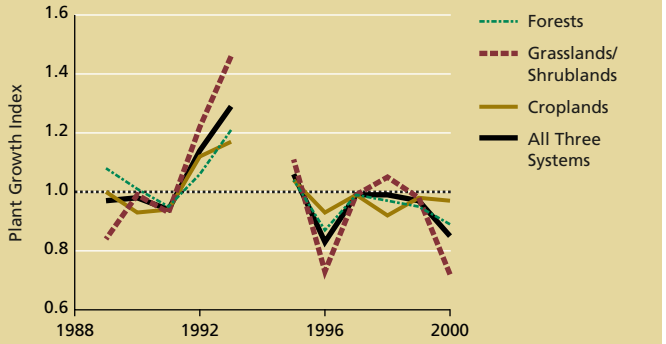
Plant Growth Index

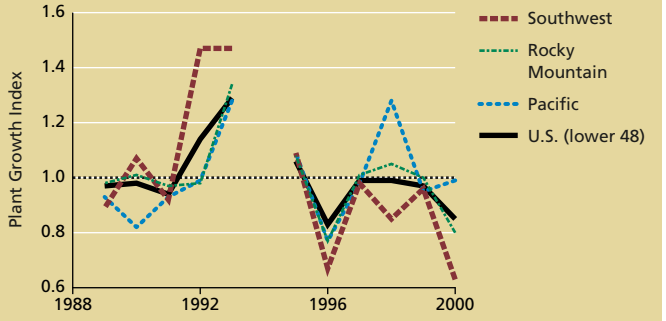
Plant Growth Index: Lower 48 States, by Ecosystem



Data Source: U.S. Geological Survey; Multi-Resolution Land Characterization Consortium. Coverage: Lower 48 states.

Note: Because of satellite problems, no data are available for 1994.

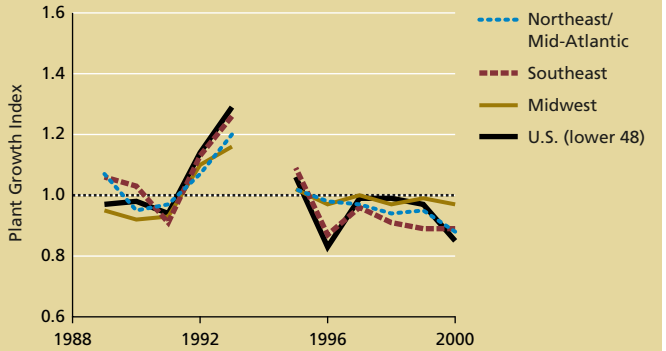
Plant Growth Index: Southwest, Rocky Mountain, Pacific Regions



Data Source: U.S. Geological Survey; Multi-Resolution Land Characterization Consortium. Coverage: Lower 48 states.

Note: Because of satellite problems, no data are available for 1994.

Plant Growth Index: Northeast, Southeast, Midwest Regions



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What Is This Indicator, and Why Is It Important? This indicator reports a plant growth index, based on satellite measurements of the amount of solar energy absorbed by vegetation and potentially used for photosynthesis.

The index shows, for any given year, whether plant growth in a region or for an ecosystem type was above or below the 11-year average (1989 through 2000, with one missing year). An index value of 1.0 in any year means that the amount of solar energy captured by vegetation and used for photosynthesis in that region or system during that year was the same as the 11-year average.

Plants use energy from the sun to turn carbon dioxide from the air, plus water and nutrients, into plant matter. This process, photosynthesis, drives and sustains virtually all life on earth. The amount of sunlight absorbed by plants is a key factor in determining the amount of photosynthesis and thus the amount of plant growth that occurs in a year. Changes in the amount of energy captured by plants over very large regions, as reported in this measure, may signal significant changes in ecosystem functioning. These changes could lead to increases or decreases in yield of products such as crops or wood and possibly changes in the number and types of species that live in a region. Changes in climate (including temperature and timing and amount of precipitation), as well as factors such as ground-level ozone, increased atmospheric deposition of nitrogen, and increased levels of carbon dioxide, might cause or contribute to changes in plant growth.

What Do the Data Show? No overall trend in plant growth can be seen for this 11-year period, either nationally or within any of the regions or ecosystem types. The similarity in year-to-year variation among regions and systems, however, is striking. For example, in 1993 all regions and systems had higher than average growth index values; in 1996, the opposite was true. The reason for this is not clear.

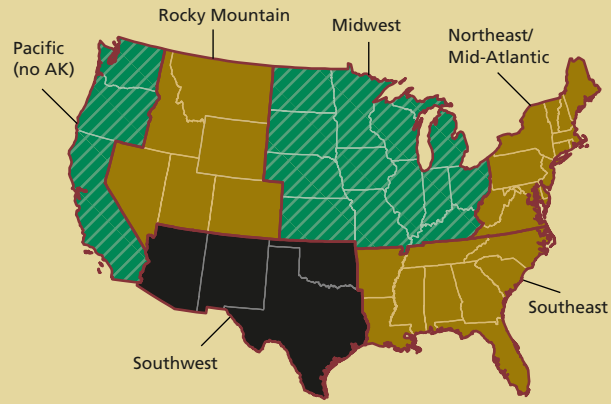
Year-to-year variability of the plant growth index is high nationally, within all six regions, and within all three ecosystem types. Year-to-year variability was greater in grasslands and shrublands than in either forests or farmlands. Variation was also greater in the West,

Plant Growth Index *(continued)*

particularly in the Pacific and Rocky Mountain regions, than in the East or Midwest.

During 2000, the plant growth index nationwide was lower than the 11-year average. The index was about average in the Pacific states and the Midwest and lower than the 11-year average in the other four regions. The index was farthest below the 11-year average in the Southwest.

Plant Growth Index: All Regions, 2000



Data Source: U.S. Geological Survey; Multi-Resolution Land Characterization Consortium. Coverage: Lower 48 states.

Discussion The energy brought into an ecosystem is an overall measure of its performance. How much energy a system absorbs can be affected by factors such as climate and weather, pollution, and how farms, forests, and other areas are managed, to name a few. Long-term changes in the amount of energy absorbed can have significant implications for the way an ecosystem functions.

Some ecosystem types naturally capture more energy than others; that is, they are more productive. Rather than comparing the absolute amount of energy captured, the plant growth index compares each year's growth at a particular location with the long-term average at that location.

Given natural year-to-year variability, the 11 years for which data are available are not enough to determine whether there are any regional or system-specific trends (data for 1994 are not available because of satellite failure). The particular satellite measurement used for this analysis, Normalized Difference Vegetation Index (NDVI), correlates well, but by no means perfectly, with ground measurements of plant productivity. Measurements are taken every two weeks and summed over the entire growing season.

Data for this measure are available only for the land area of the lower 48 states. The Coasts and Oceans section of this report includes a measure related to productivity of algae in coastal waters (p. 80), but that indicator focuses on seasonal peaks rather than annualized measurements, as reported here. In addition, it is possible to measure the plant growth or productivity of freshwater lakes, but these data are not available on a consistent basis nationwide.

The technical note for this indicator is on page 216.