Indicator 4.21.

Area and Percent of Water Bodies or Stream Length in Forest Areas With Significant Change in Physical, Chemical, or Biological Properties From Reference Conditions

What is the indicator and why is it important?

Water quality in forest ecosystems is controlled by climate and hydrology, catchment geology, natural disturbances, land management, and actual land use activities whether managed or not. Water quality in undisturbed forested catchments can serve as important baseline references for water quality in catchments with varying land use and management activities. Trends in physical, chemical, or biological properties can indicate effects of changing land use and management can be altered to preserve water quality.

What does the indicator show?

Every 2 years, States submit water quality reports to the EPA under Section 305(b) of the Clean Water Act. The National Assessment Database summarizes the data submitted by the States (http://www.epa.gov/waters/305b/ index.html). States designate water uses and assess water quality attainment in the National Assessment Database. States also determine the

principal sources of impairment for both linear water bodies (rivers and streams) and area-based water bodies (lakes, ponds, and reservoirs).

The States reported 3,589,765 miles of rivers and streams in the 2006 National Assessment Database. Of these, 822,340 miles have been assessed for water quality attainment (22.9 percent of total). Sixteen States (Arizona, Alaska, Arkansas, California, Illinois, Kentucky, Louisiana, Montana, New Mexico, Ohio, Pennsylvania, Tennessee, Vermont, Virginia, West Virginia, Wisconsin) identified silvicultural activities as a source of impairment for 23,722 miles of rivers and streams (2.9 percent of total assessed miles—see table 21-1).

The various sources of impairment of rivers and streams identified by the States were grouped into eight broad impairment source categories (table 21-1): (1) physical changes to the water body, (2) crop production, (3) animal production and grazing, (4) forestry (including silviculture, forest roads, and fire), (5) resource extraction, (6) municipal and industrial sources,

Table 21-1. Sources of water quality impairment for assessed U.S. rivers/streams and lakes/ponds/reservoirs. (U.S. Environmental Protection Agency 2006 National Assessment Database. http://www.epa.gov/waters/305b/index.html).

Source of Impairment*	Rivers/Streams		Lakes/Ponds/Reservoirs	
	Miles	Percent of total assessed	Acres	Percent of total assessed
Physical changes	164,498	20.0	1,849,582	11.1
Crop production	114,849	14.0	1,988,175	12.0
Animal production	80,269	9.8	555,054	3.3
Forestry	23,727	2.9	316,071	1.9
Resource extraction	41,916	5.1	599,280	3.6
Municipal/industrial	205,673	25.0	6,048,322	36.4
Natural	40,743	5.0	1,354,245	8.2
Unspecified/unknown	125,308	15.2	4,551,991	27.4
Total assessed	822,340		16,610,248	
Total United States	3,589,765		42,003,669	

* **Sources of impairment:**

- Physical changes: hydromodification, flow regulation, dams and impoundments, water diversion, channelization, dredging, bank destabilization, habitat changes, loss of wetlands and riparian areas, erosion, and sedimentation.
- Crop production: all agricultural sources related to irrigated and nonirrigated crop production.
- Animal production: all agricultural sources related to animal production, including confined animal feeding operations and upland and riparian grazing.
- Forestry: all silvicultural and forest industry activities, forest roads, and fire.
- Resource extraction: mineral resource development, mining, oil, gas, and coal production.
- Municipal and Industrial: all municipal, urban, and industrial point and nonpoint sources, including runoff; construction and development; and waste disposal.
- Natural: mineral deposits and ecosystem nutrient cycling.
- Unspecified or unknown: all unidentified or unknown point and nonpoint sources.

(7) natural sources, and (8) unspecified or unknown sources. Of these eight broad sources of impairment, forestry-related activities impaired the fewest miles of rivers and streams (2.9 percent of total assessed). In contrast, all agricultural activities (crop and animal production, including grazing) impaired about 8 times as many miles (about 24 percent of total assessed).

A total of 42,003,669 acres of lakes, ponds, and reservoirs were reported by the States in the 2006 National Assessment Database. Of these, 16,610,248 acres have been assessed for water quality attainment (39.5 percent of total). Just 11 States (Arizona, California, Illinois, Louisiana, Montana, New Mexico, North Dakota, Oklahoma, Utah, Vermont, and West Virginia) identified silvicultural activities as a source of impairment for 316,071 acres (0.8 percent of total acres, 1.9 percent of total assessed acres, 1.8 percent of all impaired acres) (table 21-1).

As in the case of rivers and streams, forestry-related activities impaired the fewest acres of aerial water bodies (1.9 percent of total assessed). In contrast, all agricultural activities related to crop and animal production impaired about 8 times as much water body acreage (about 15 percent of total assessed).

What has changed since 2003?

How this indicator is evaluated has changed since the 2003 report. In 2003, water quality data were reported as the percentage of counties with hydrologic unit code (HUC) watersheds with water quality parameters significantly different from other counties within each region. The 2003 report data could not be unambiguously analyzed solely for forested areas. On the other hand, States were able to identify silvicultural activities as a source of impairment for the National Assessment Database. Thus, it is not possible to directly compare the data in this report with that from the 2003 report.

Are there important regional differences?

Because many states do not specifically identify silviculture as a source of water quality impairment, and because many waters have yet to be assessed, it is not yet possible to determine regional differences.

Why can't the entire indicator be reported at this time?

Many other sources of water quality impairment are identified in the National Assessment Database. Some of these such as flow and habitat modification, sedimentation, riparian vegetation removal, grazing effects, resource extraction, and others occur in forested areas. Unfortunately, other than silviculture, the National Assessment Database does not separate sources of impairment by land use. Thus, it is not possible to separate resource extraction impairments, for example, in forested areas from other land use classification areas.

Another problematic issue is sources of impairment may originate inside or outside of forested areas. Also, the National Assessment Database does not indicate the degree of impairment. Some impairments may be transitory, others more permanent. Although individual stressors and pollutants are identified, quantitative water quality data summarized by forested area across the entire United States are lacking. To fully report this indicator, quantitative water quality data summarized by land and water use, vegetative cover, sources and origins of impairments, and stressors and pollutants are needed. A full integration of EPA assessment and USGS water quality data by forested HUC would best meet the intent of the indicator.