

# Indicator 4.17:

U.S. Forest Sustainability Indicators <https://www.fs.fed.us/research/sustain/>

## Area and percent of forest whose designation or land management focus is the protection of soil and water resources

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### What is the indicator and why is it important?

This indicator provides a measure of the extent to which soil and water resources in forested areas are protected. While the indicator is focused on forest lands that are designated or managed specifically to protect these resources, most forest lands in the United States are designated or managed to protect multiple resources and uses including, but not limited to, soil and water. For this reason, this indicator brief focuses on forest lands where soil and water resources are protected, regardless of the official management focus/designation.

This indicator is also related to Indicators 18 and 20, which report on the overall use of forestry best management practices (BMPs) to protect soil and water resources. Forestry BMPs include a set of preventive measures designed to control or reduce movement of sediment, nutrients, pesticides, or other pollutants from soils to receiving water bodies.

### What does the indicator show?

Every 2 years, States submit water quality reports to the U.S. Environmental Protection Agency (EPA) under Section 305(b) of the Clean Water Act. The National Assessment Database summarizes the data submitted by the States ([http://ofmpub.epa.gov/waters10/attains\\_nation\\_cy.control](http://ofmpub.epa.gov/waters10/attains_nation_cy.control)). States designate water uses and assess water quality attainment in the National Assessment Database. Waters designated by the States as public water supplies are protected waters. These waters are managed to protect soil and water resources throughout the watershed, as well as the adjacent vegetation.

There are 3,533,205 miles of rivers and streams in the United States, as reported by the States in the National Assessment Database (table 17-1). Of these, 1,105,205 miles have been assessed (31.3 percent of total). A total of 288,780 miles (8.2 percent of total) have been designated by the States as public water supplies and thus meet

Table 17-1—State-reported U.S. total estimated waterbodies, total assessed waterbodies, and amount and condition of waterbodies designated as public water supply use (U.S. Environmental Protection Agency National Assessment Database [http://ofmpub.epa.gov/waters10/attains\\_nation\\_cy.control](http://ofmpub.epa.gov/waters10/attains_nation_cy.control)). Most recent State reports are from 2006 through 2016.

Type of Water Body	Estimated Total Waters in United States)	Total Waters Assessed	Percent of Total Waters Assessed	Assessed Waters Designated as Public Water Supply	Percent of Total Waters Designated as Public Water Supply	Good (percent)	Threatened (percent)	Impaired (percent)
Rivers/ streams (miles)	3,533,205	1,105,205	31.3	288,780	8.2	74.8	0.1	25.1
Lakes/ ponds/ reservoirs (acres)	41,666,049	18,542,346	44.5	7,146,581	17.2	78.0	0.0	22.0

Indicator 4.17 protection criterion. There are 41,666,049 acres of lakes, ponds, and reservoirs in the United States reported by the States in the National Assessment Database (table 17-1). Of these, 18,542,346 acres have been assessed (44.5 percent of total). A total of 7,146,581 acres of lakes, ponds, and reservoirs (17.2 percent of total) have been designated as public water supplies. The total size of the watersheds containing assessed waters designated as public water supplies is unknown but will be directly proportional to the reported miles of rivers and streams and acres of lakes, ponds, and reservoirs. Note, however, that watersheds include nonforested areas.

In addition to the specific protections associated with watershed management for public water supply, forest management regulations and practice involve soil and watershed protection measures. These involve a variety of Federal, State, and local regulations, as well as voluntary stewardship practices, and they apply to varying degrees across different locations and across different forest ownerships.

Approximately 13.8 million hectares (34.1 million acres) or 6.2 percent of forests in the United States (excluding Alaska, Hawaii, Puerto Rico, and U.S. territorial trusts) are within 30 m (100 ft) of waterbodies, and therefore function as a protective forest to help prevent water quality

impairment. This waterbody forest buffer ranges from 2.9 percent of all forested areas in the Southwest to 20.1 percent of all forested areas in the Plains States (fig. 17-1). Percentages of protective forests vary from region to region with areal extent of forests and waterbody density. The higher percentage of forested areas within 30 m of waterbodies in the North Central region of the United States is because forested areas there tend to cluster around waterbodies.

Soil erosion potential depends on many factors, including intensity and duration of rainfall, areal extent of bare soil, soil properties that control erodibility, and slope steepness (percent slope). Steeper slopes (greater than 15 percent) tend to be more erodible than less steep slopes for a given set of rainfall, bare soil, and soil erodibility conditions. Thus, the percentage of forested areas on slopes greater than 15 percent is a suitable measure of the protective function of forests for hillslope soils. Based on measured slope data for all Forest Inventory and Analysis (FIA) plots (<https://apps.fs.usda.gov/fia/datamart/>), approximately 18 percent of forested areas in the United States are found on slopes steeper than 15 percent. The mountainous terrain of the Western United States, Puerto Rico, and the U.S. Virgin Islands have the highest percentage of forested areas on steeper (greater than 15 percent) slopes (fig. 17-2).

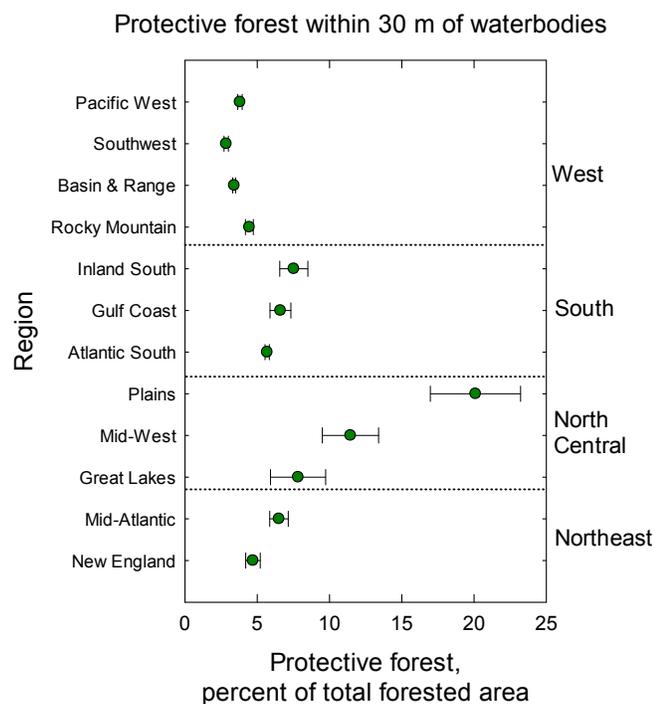


Figure 17-1—Mean  $\pm$  standard error protective forests as percent of total forested areas within 30 m (100 ft) of water bodies in various U.S. geographic regions.

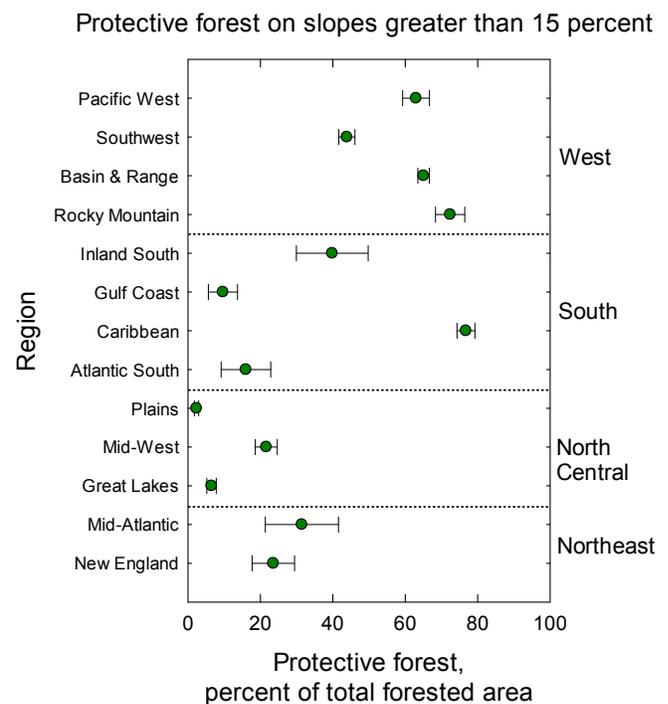


Figure 17-2—Mean  $\pm$  standard error protective forests as percent of total forested area located on slopes greater than 15 percent in various U.S. geographic regions.

## What has changed since 2010?

More waterbodies have been assessed since the 2010 report. A greater percentage of rivers/streams have been designated as public water supplies since the 2010 report (8.2 percent vs. 5.2 percent previously), but the percentage of lakes/ponds/reservoirs designated as public water supplies has declined (17.2 percent vs. 18.6 percent previously). The percent of public water supplies (rivers/streams and lakes/ponds/reservoirs) in good condition has declined (79.6 percent to 74.8 percent and 78.6 percent to 78.0 percent, respectively), while the percent in impaired condition has increased (19.3 percent to 25.1 percent and 19.5 percent to 22.0 percent, respectively). Protective forests within 30 m of waterbodies and on slopes greater than 15 percent were not reported in the 2010 edition.

## Are there important regional differences?

Because many States do not have a separate use designation for public water supplies, it is not yet possible to determine whether there are regional differences in designation of protected water resources. Also, a majority of waterbodies in each State have yet to be assessed. Regional differences were found in the percentages of forested areas found within 30 m of waterbodies (highest proportion in the Plains States) and on slopes greater than 15 percent (predominantly in mountainous terrain of the West), as shown in figures 17-1 and 17-2. These regional differences may reflect underlying natural distribution of forests as much or more than forest management actions.

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

The public database that addresses this indicator collects and reports data in terms of miles of streams and rivers and acres of lakes, ponds, and reservoirs, even though the indicator implies that data will be reported in terms of forested area. Although watershed land area is directly proportional to the size of the waterbodies within the watershed, the forested portions of watersheds containing waters designated as public water supplies are unknown. Nevertheless, since these are waters designated as public water supplies, they are protected via management, and forest land will be the major land use classification in many of those watersheds. The forested parts of hydrologic unit codes are known, but the necessary overlay of water use designation from the EPA database and the forest land use database for each watershed is not available for this report. In an attempt to directly address the indicator reference to forest land area, we have estimated percentages of forested areas functioning in a protective capacity as waterbody buffers and on steeper slopes (greater than 15 percent) for the first time.

## References

U.S. Environmental Protection Agency. 2012. National Assessment Database. [http://ofmpub.epa.gov/waters10/attains\\_nation\\_cy.control](http://ofmpub.epa.gov/waters10/attains_nation_cy.control). (February 2018).

USDA Forest Service. Forest Inventory and Analysis. FIA DataMart. FIADB ver. 5.1. <http://apps.fs.fed.us/fiadb-downloads/datamart.html>. (Date accessed unknown).