

## Summary of Nitrogen, Phosphorus, and Suspended-Sediment Loads and Trends Measured in Nine Chesapeake Bay Tributaries: Water Year 2015 Update

Changes in nitrogen, phosphorus, and suspended-sediment loads in rivers across the Chesapeake Bay watershed have been calculated using monitoring data from the nine Chesapeake Bay River Input Monitoring (RIM) stations. These results are used to help assess efforts to decrease nutrient and sediment loads being delivered to the bay. Additional information for each monitoring station is available through this USGS Web site in order to provide the State, Federal, and local partners, as well as the general public, ready access to a wide range of data for nutrient and sediment conditions across the Chesapeake Bay watershed.

The results are summarized for

1. Annual loads delivered directly to the tidal waters as measured at the River Input Monitoring (RIM) stations, and
2. trends in loads at the RIM stations.

### What are the patterns in loads delivered to tidal waters from the RIM stations?

The combined load result from the RIM stations is shown in figure 1 to quantify the total nitrogen, phosphorus, and suspended-sediment loads delivered from the watershed to tidal waters. Together, the nine RIM stations reflect loads delivered from 78 percent of its 64,000-square-mile watershed.

#### River flow and loads to tidal waters

- Estimated annual-mean streamflow entering the Chesapeake Bay in 2015 was 63,500 cfs, about 19 percent (15,100 cfs) below the long-term (1937-2015) annual-mean streamflow (fig. 2).
- In 2015, the combined loads from the nine RIM stations were as follows:
  - Total nitrogen (TN): 137 million pounds (Mlb), 72 Mlb less than the long-term average for 1985-2015 (fig. 3).
  - Total phosphorus (TP): 6.62 Mlb, 6.95 Mlb less than the long-term average for 1985-2015 (fig. 4).
  - Suspended sediment: 1.46 million tons (Mton), 3.38 Mton less than the long-term average for 1985-2015 (fig. 5).

Water quality conditions in Chesapeake Bay respond to nutrient and sediment loads delivered from the watershed. The Chesapeake Bay Program uses the RIM loads and estimates of loads from the remaining unmonitored areas to compute a total nutrient and sediment load to the bay.

## What are the trends in loads delivered to tidal waters from the RIM stations?

Trends in loads from the nine RIM stations are flow-normalized (see methods section of this Web site) to account for the changes in river flow to better understand changes related to land-use change activities in the watershed. Changes in loads for nitrogen, phosphorus, and suspended sediment are provided for two time periods: 1985-2015 (long term) and 2006-2015 (short term) (table 1). Decreasing loads are classified as improving conditions, while increasing loads are classified as degrading conditions.

### Changes in total nitrogen loads

- Long-term trends in total nitrogen loads indicate improving conditions at the majority of the stations, including the four largest rivers. The Choptank River is the only station whose data indicate degrading conditions over the long-term period.
- Short-term trends in total nitrogen loads indicate improving conditions at 4 stations and degrading conditions at 4 stations. Data from the Appomattox River indicate no discernable short-term trend.

### Changes in total phosphorus loads

- Long-term trends in total phosphorus loads indicate improving conditions at only 3 stations and degrading conditions at 5 stations.
- Short-term trends in total phosphorus loads indicate improving conditions at only the Potomac and Rappahannock stations, degrading conditions at 3 stations, and no discernable change in conditions at the 4 remaining stations.

### Changes in suspended-sediment loads

- Long-term trends in suspended-sediment loads indicate improving conditions at 3 stations, degrading conditions at 4 stations, and no discernable change in conditions at 2 stations.
- Short-term trends in suspended-sediment loads indicate improving conditions at only the Potomac and Rappahannock stations; degrading conditions at 4 stations, and no discernable change in conditions at the Susquehanna, James, and Mattaponi stations.

**Table 1.** Summary of long-term (1985-2015) and short-term (2006-2015) trends in nitrogen, phosphorus, and suspended- sediment loads for the River Input Monitoring stations.

[Improving or degrading trends classified as likelihood estimates greater than or equal to 66 percent]

Monitoring station	Total nitrogen load		Total phosphorus load		Suspended-sediment load	
	Long term	Short term	Long term	Short term	Long term	Short term
SUSQUEHANNA RIVER AT CONOWINGO, MD	Improving	Degrading	Degrading	Degrading	Degrading	No trend
POTOMAC RIVER AT WASHINGTON, DC	Improving	Improving	Improving	Improving	Improving	Improving
JAMES RIVER AT CARTERSVILLE, VA	Improving	Improving	Improving	No Trend	Degrading	No Trend
RAPPAHANNOCK RIVER NR FREDERICKSBURG, VA	Improving	Improving	Degrading	Improving	Degrading	Improving
APPOMATTOX RIVER AT MATOACA, VA	No Trend	No Trend	Degrading	No Trend	No Trend	Degrading
PAMUNKEY RIVER NEAR HANOVER, VA	No trend	Degrading	Degrading	No trend	Degrading	Degrading
MATTAPONI RIVER NEAR BEULAHVILLE, VA	Improving	Degrading	No Trend	Degrading	No Trend	No Trend
PATUXENT RIVER NEAR BOWIE, MD	Improving	Improving	Improving	No Trend	Improving	Degrading
CHOPTANK RIVER NEAR GREENSBORO, MD	Degrading	Degrading	Degrading	Degrading	Improving	Degrading

## Additional Information

- Tabular results for each station are available at <http://dx.doi.org/10.5066/F7Q81B5N>.

## USGS Contacts

Doug Moyer [dlmoyer@usgs.gov](mailto:dlmoyer@usgs.gov)

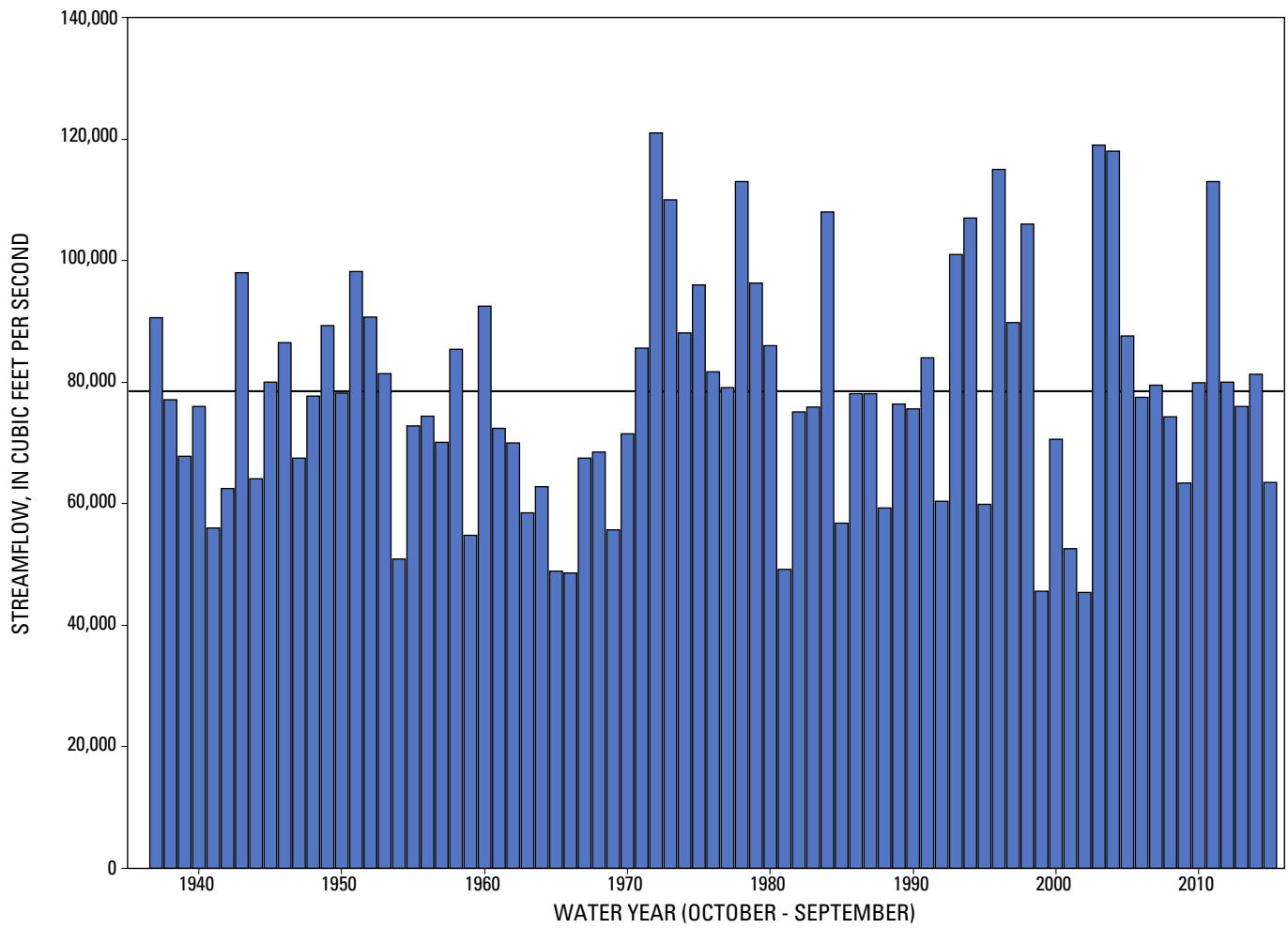
Joel Blomquist [jdblomqu@usgs.gov](mailto:jdblomqu@usgs.gov)

USGS Chesapeake Bay Studies:

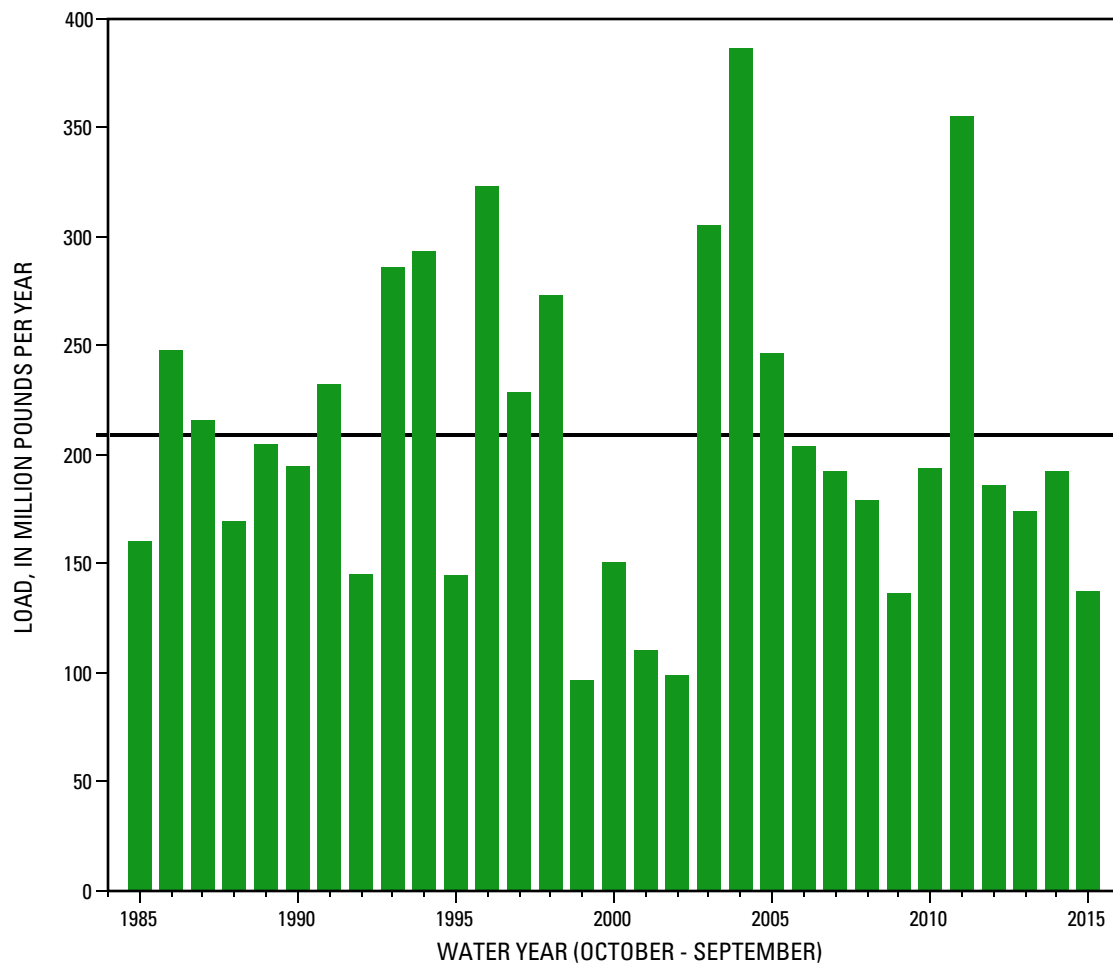
Scott Phillips, [swphilli@usgs.gov](mailto:swphilli@usgs.gov) or visit <http://chesapeake.usgs.gov/>

\*\*\*\* [www.usgs.gov](http://www.usgs.gov) \*\*\*\*

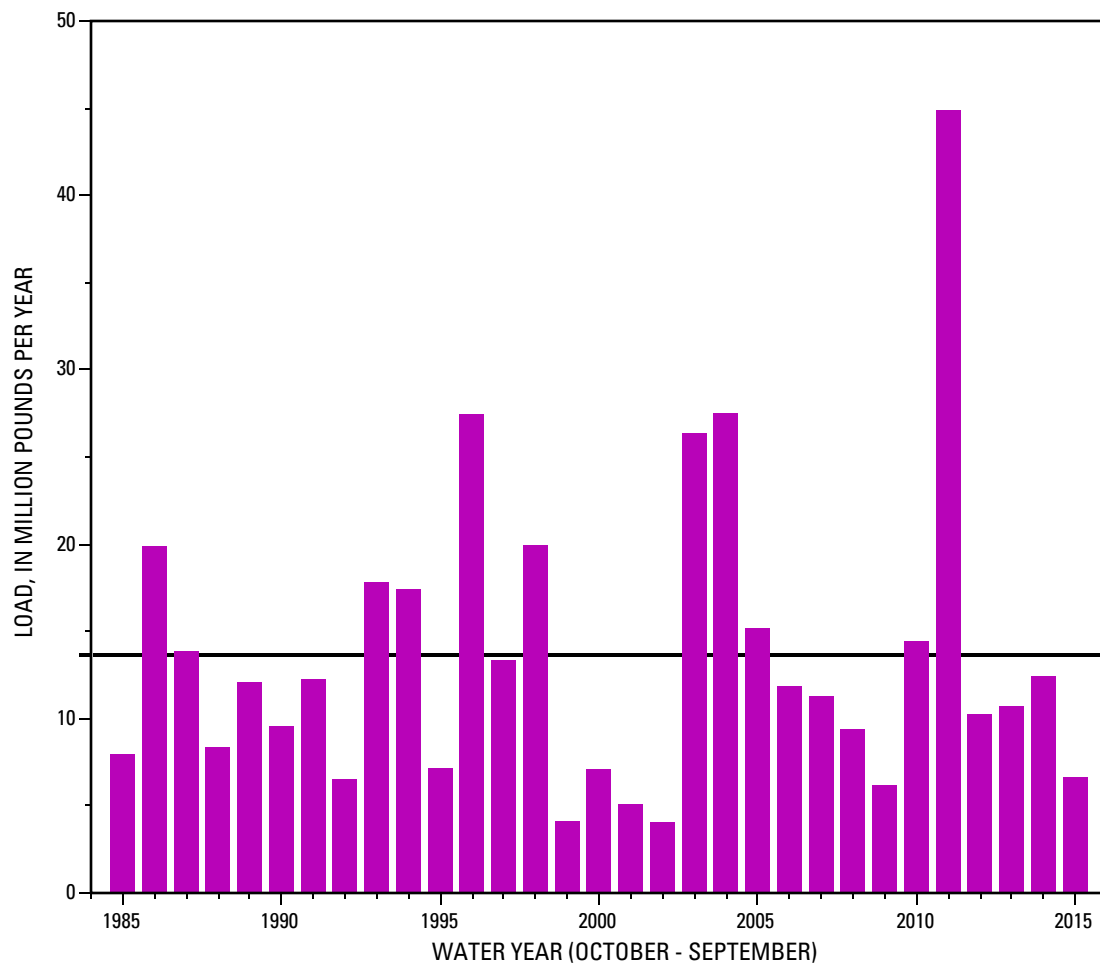




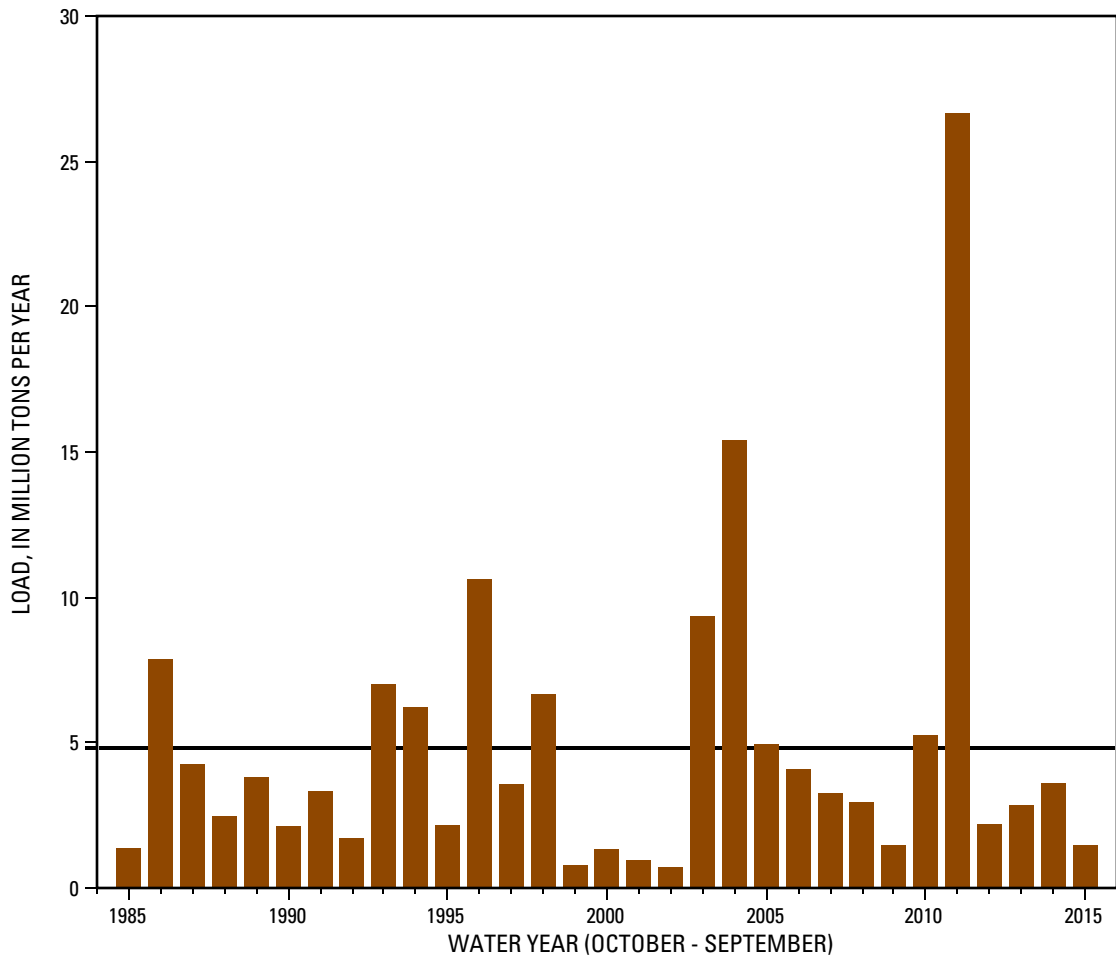
**Figure 2.** Estimated annual-mean streamflow entering Chesapeake Bay. Black line represents the average annual-mean streamflow of 78,563 cubic feet per second. Source <http://md.water.usgs.gov/waterdata/chesinflow/wy/>



**Figure 3.** Combined annual total nitrogen load delivered from the nine River Input Monitoring stations to the Chesapeake Bay. Black line represents the mean annual combined load of 209 million pounds per year.



**Figure 4.** Combined annual total phosphorus load delivered from the nine River Input Monitoring stations to the Chesapeake Bay. Black line represents the mean annual combined load of 13.6 million pounds per year.



**Figure 5.** Combined annual suspended-sediment load delivered from the nine River Input Monitoring stations to the Chesapeake Bay. Black line represents the mean annual combined load of 4.84 million tons per year.