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 during 1985 to 2017 (Moyer and Blomquist, 2018). These results for the nine RIM stations 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 the USGS Chesapeake Bay Nontidal Web site (https://cbrim.er.usgs.gov/) that provides 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. Results from two time periods are reported in this summary: a long-term time period (1985-2017), and short-term time period (2008-2017). All annual results are based on a water year which extends from October 1 to September 30.

The results are summarized for
1. loads delivered directly to the tidal waters for the most recent year (Water year 2017); specifically, the combined load from the nine River Input Monitoring (RIM) stations, and
2. trends in loads at the RIM stations over the long- and short-time periods.

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

The USGS combined the load results from the nine RIM stations 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 2017 was 73,950 cfs, about 5.7 percent (4,470 cfs) below the long-term (1937-2017) annual-mean streamflow of 78,420 cfs (fig. 2).
- In 2017, the combined loads from the nine RIM stations were as follows:
  - Total nitrogen (TN): 157 million pounds (Mlb), 47 Mlb less than the long-term average of 204 Mlb for 1985-2017 (fig. 3).
  - Total phosphorus (TP): 8.78 Mlb, 4.53 Mlb less than the long-term average of 13.31 Mlb for 1985-2017 (fig. 4).
  - Suspended sediment: 2.17 million tons (Mton), 2.49 Mton less than the long-term average of 4.66 (Mtons) for 1985-2017 (fig. 5).

The Chesapeake Bay Program uses the RIM loads and estimates 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 to integrate out the year-to-year variability in river flow; by doing so, changes in nitrogen, phosphorus, and suspended-sediment loads resulting from changing sources, delays associated with storage and transport of historical inputs, and (or) implemented management actions are identified. Changes in loads for nitrogen, phosphorus, and suspended sediment are provided for two time periods: 1985-2017 (long term) and 2008-2017 (short term) (table 1). Loads that are
lower in the end year than the start year are classified as improving conditions, while loads that are higher in the end year than the start year are classified as degrading conditions. Loads are classified as having no trend if there is not a discernable difference between start and end years.

**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 and Pamunkey are the only stations where conditions are degrading.
- Short-term trends in total nitrogen loads indicate improving conditions at 3 stations and degrading conditions at 4 stations. Data from the Susquehanna and Rappahannock stations indicate no discernable short-term trends.

**Changes in total phosphorus loads**
- Long-term trends in total phosphorus loads indicate improving conditions at 3 stations and degrading conditions at another 5 stations.
- Short-term trends in total phosphorus loads indicate improving conditions at the Pamunkey and Patuxent stations, degrading conditions at 5 stations, and no discernable change in conditions at the James and Mattaponi 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 the James station; degrading conditions at 6 stations, and no discernable change in conditions at the Susquehanna and Rappahannock stations.

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

<table>
<thead>
<tr>
<th>Monitoring station</th>
<th>Total nitrogen load</th>
<th>Total phosphorus load</th>
<th>Suspended-sediment load</th>
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<tr>
<td></td>
<td>Long term</td>
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<td>Long term</td>
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<tr>
<td>SUSQUEHANNA RIVER AT CONOWINGO, MD</td>
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</table>
Additional Information

- Tabular results for each station are available by going to the “Download“ section of the following web page: https://cbrim.er.usgs.gov/

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Figure 1. Location of the 9 River Input Monitoring (RIM) stations in the Chesapeake Bay watershed. Station numbers and names are provided in table 2.
Figure 2. Estimated annual-mean streamflow entering Chesapeake Bay. Black line represents the average annual-mean streamflow of 78,420 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 204 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 13.3 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 4.66 million tons per year.