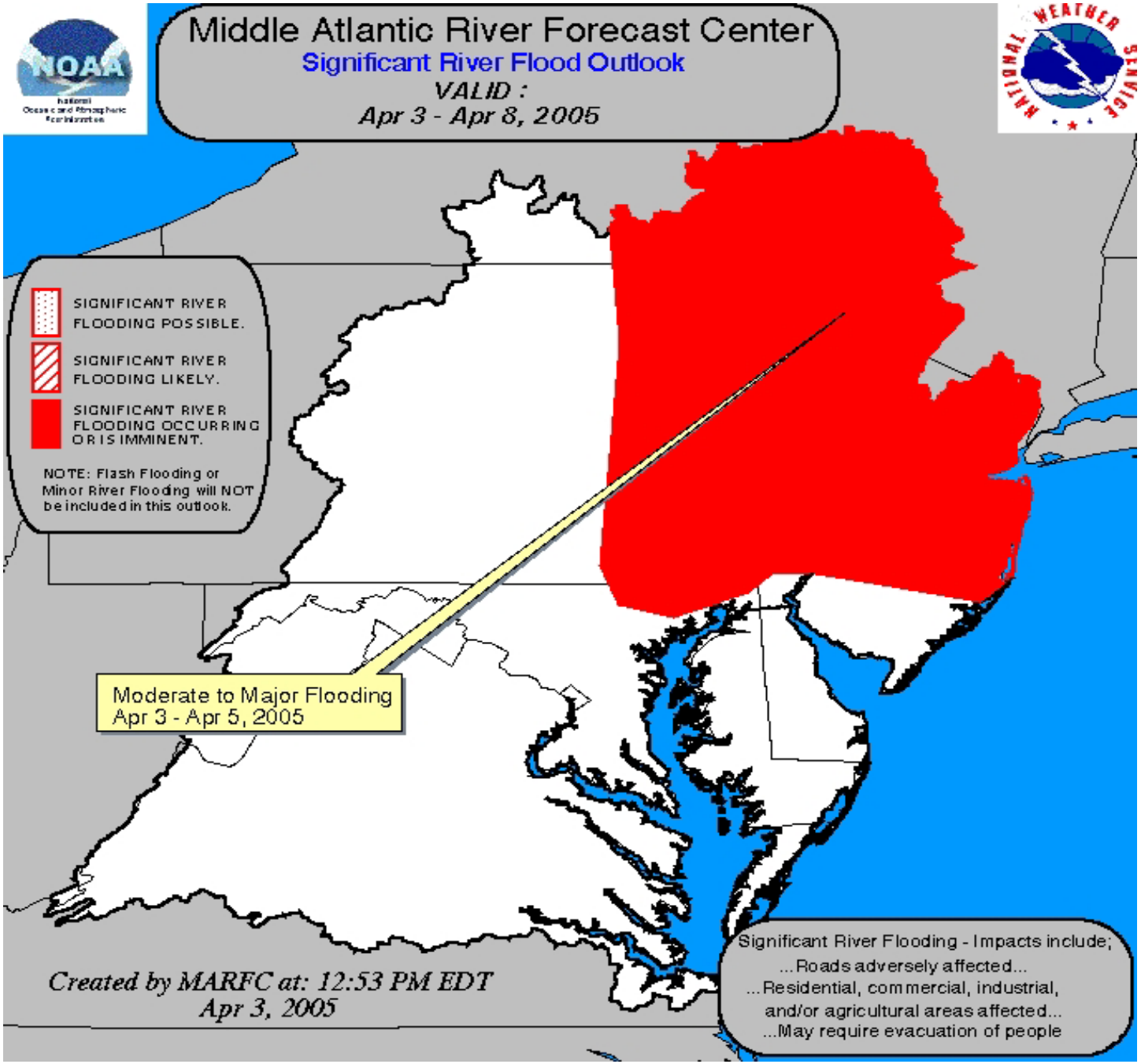
Spring Flood of April 3-4, 2005

Two early spring rainstorms - the first on March 28-29 and a second on April 2-3, 2005 - combined with snowmelt to cause major flooding in the Delaware River Basin. Along the main stem of the Delaware River, the flood crests exceeded those reached in Tropical Storm Ivan only six and a half months earlier, and again caused evacuations, bridge and road closures, and extensive damage.

Delaware Canal at Yardley, Pa. – one half mile upstream of Afton Avenue Bridge – 8:30 am, April 4, 2005
Canal bank overtopped by Delaware River. River stage at U.S. Geological Survey (USGS) Trenton gage = 25 ft.

Delaware Canal at Yardley, Pa. – one half mile north of Afton Avenue bridge – 8:30 am, April 4, 2005
View is downstream toward Afton bridge. Delaware River stage at Trenton USGS gage = 25 ft.

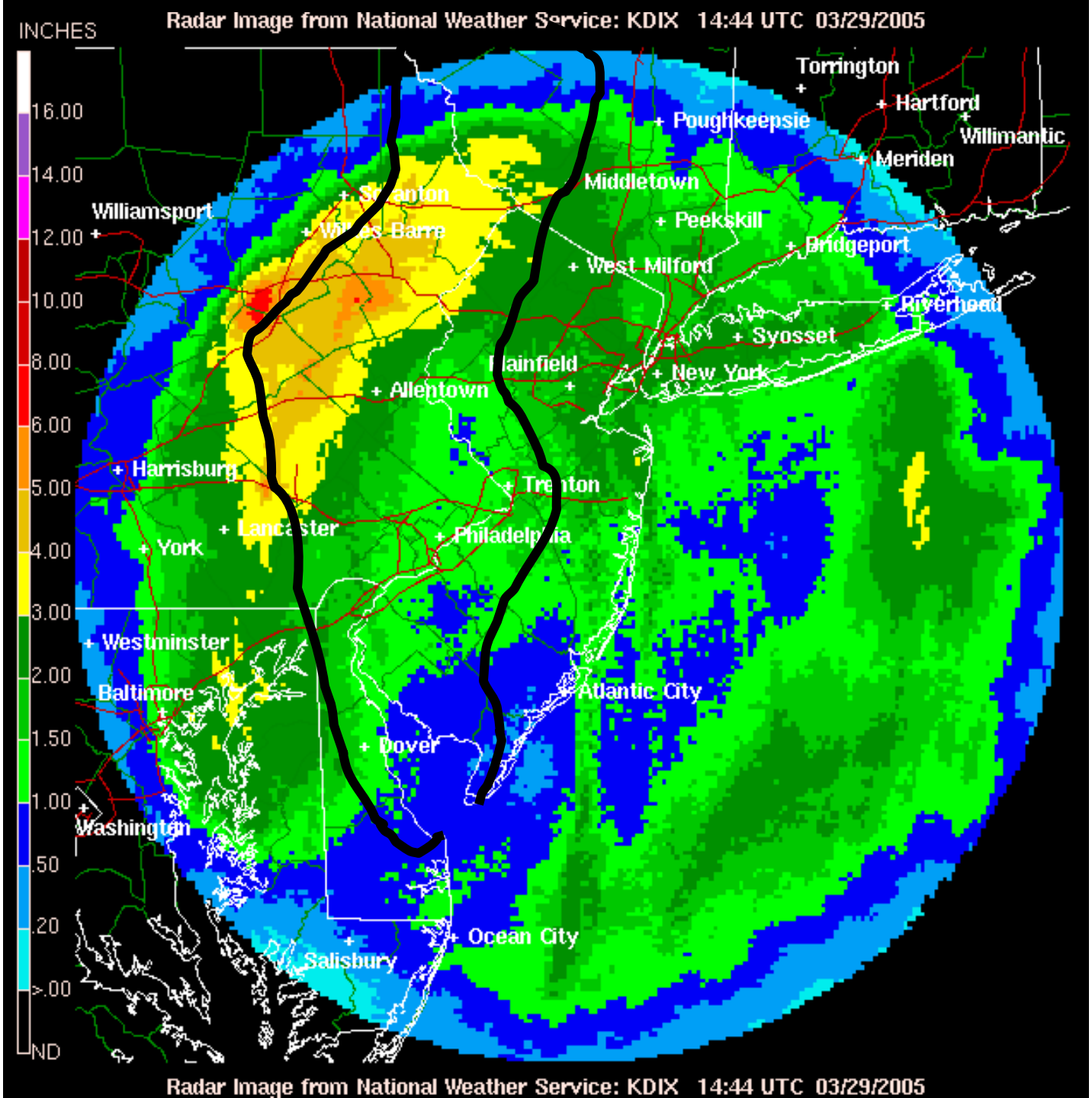
Significant river flooding was forecast over nearly the entire Delaware River Basin.



Storm No.1
Lower Basin
March 28-29, 2005

Doppler Rainfall Estimate

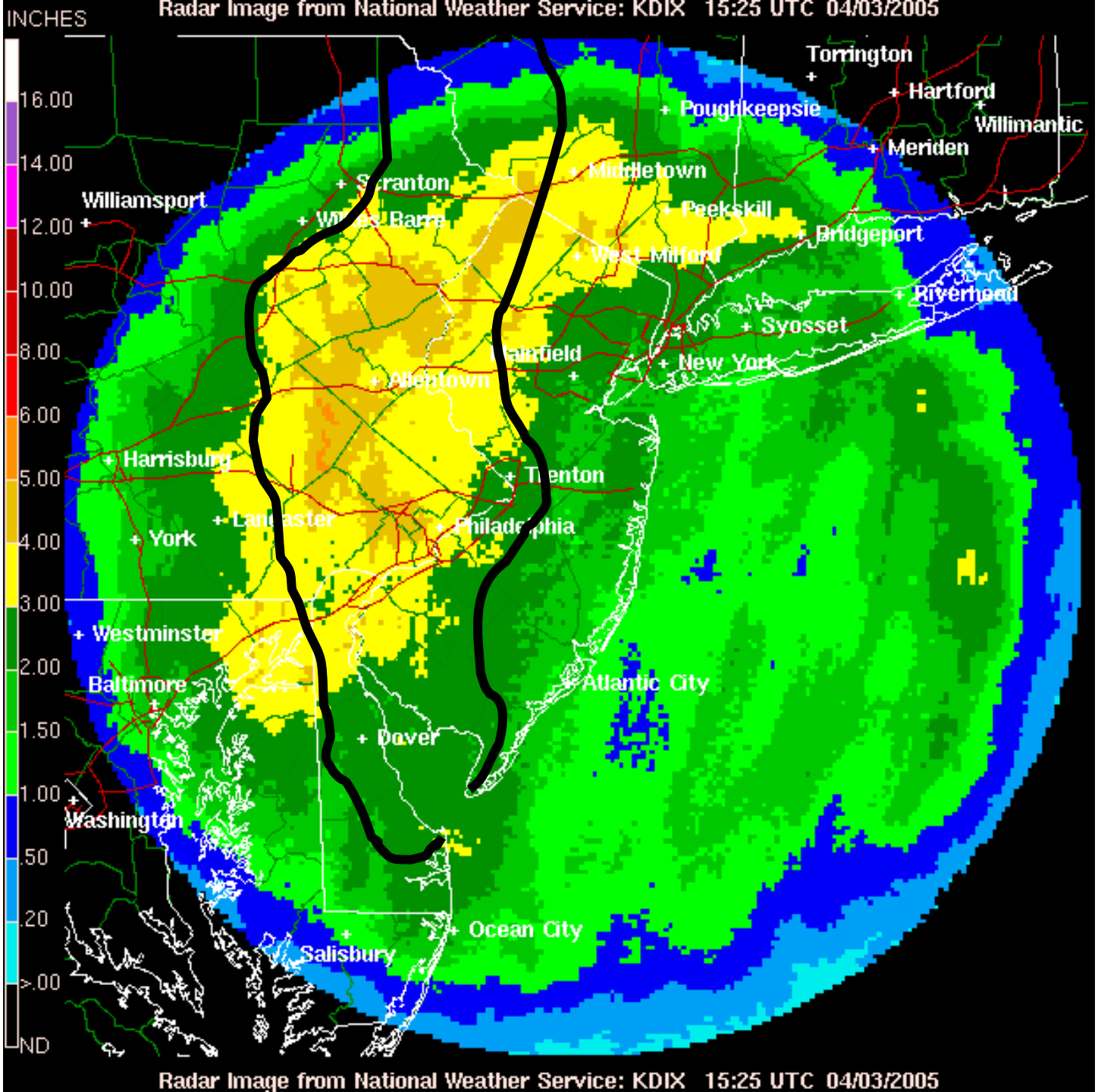
The first storm brought over two inches of rain to western and northern portions of the basin. Warm temperatures melted about half of the snowpack, which totaled over three inches water equivalent in some northern watersheds.



Storm No. 2
Lower Basin
April 2-3, 2005

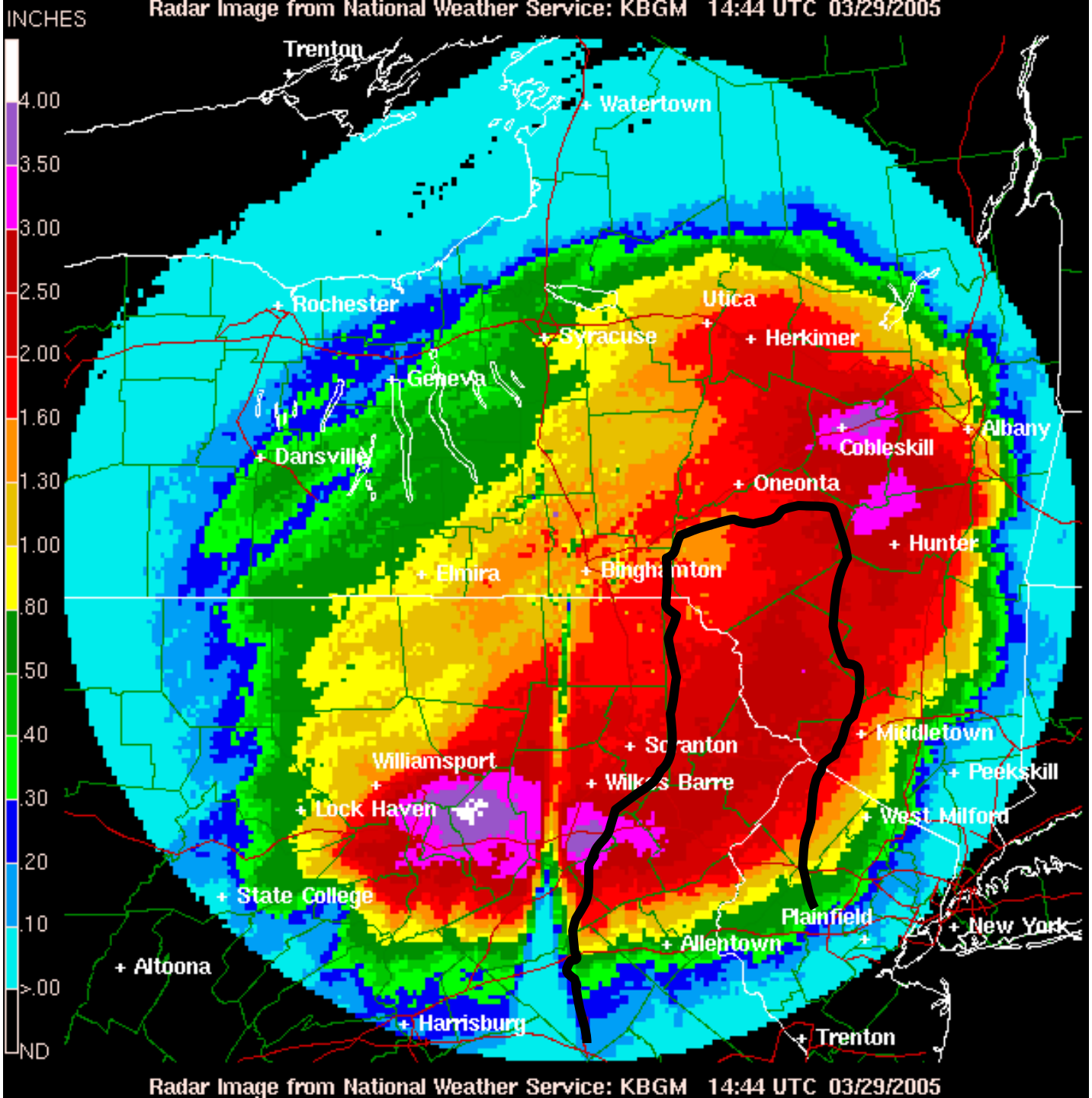
Doppler Rainfall Estimate

The second storm produced three- to five-inches of rain in the middle half of the basin, over two inches in the Catskill headwaters, and melted most of the remaining snow.



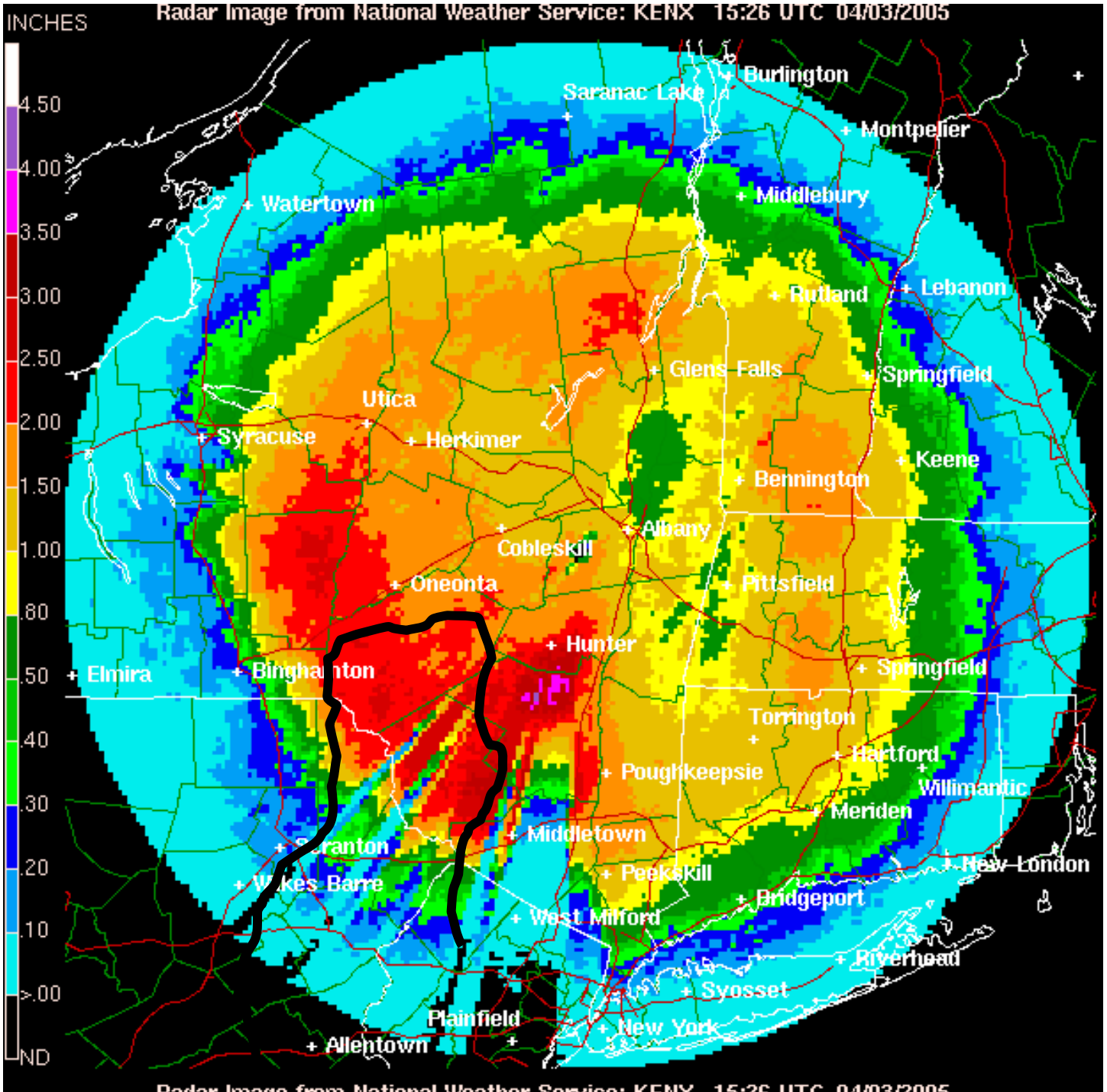
Storm No. 1
Upper Basin
March 28-29, 2005

Doppler
Rainfall
Estimate



Storm No. 2
Upper Basin
April 2-3, 2005

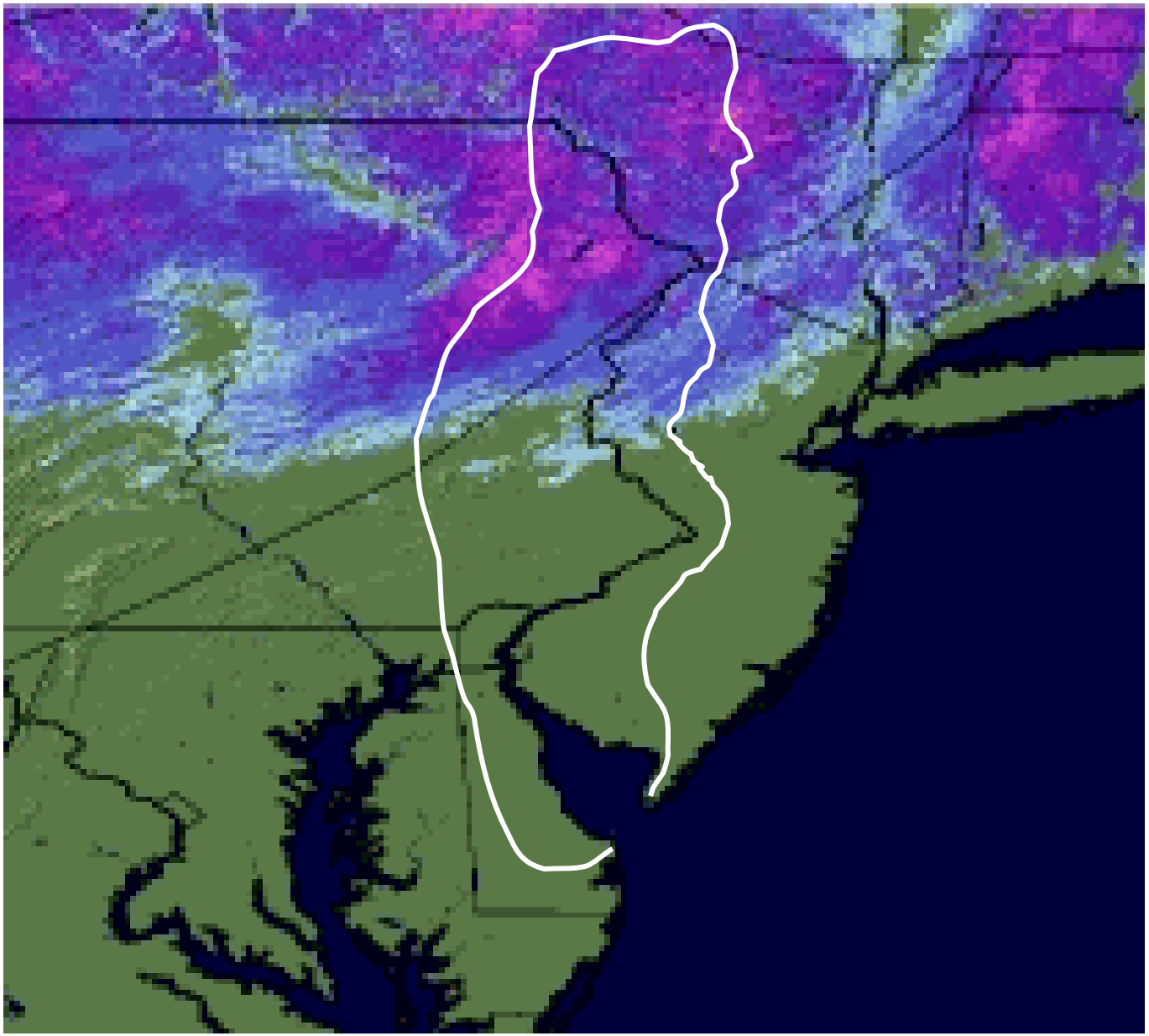
Doppler
Rainfall
Estimate



Snowpack Water Equivalent

March 27, 2005

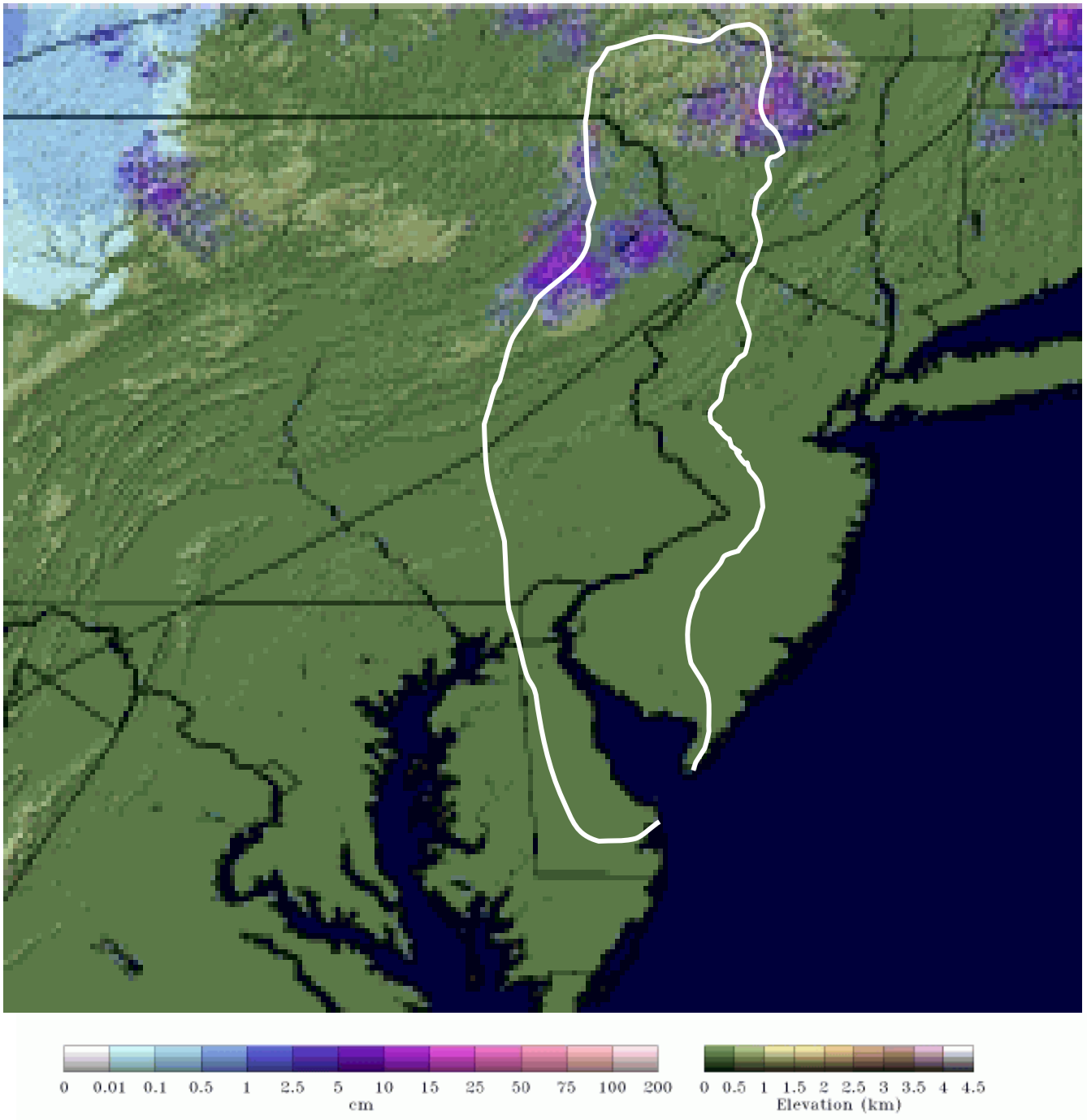
Prior to the first storm, some watersheds in the upper Delaware basin had in excess of three inches water equivalent in the snowpack.



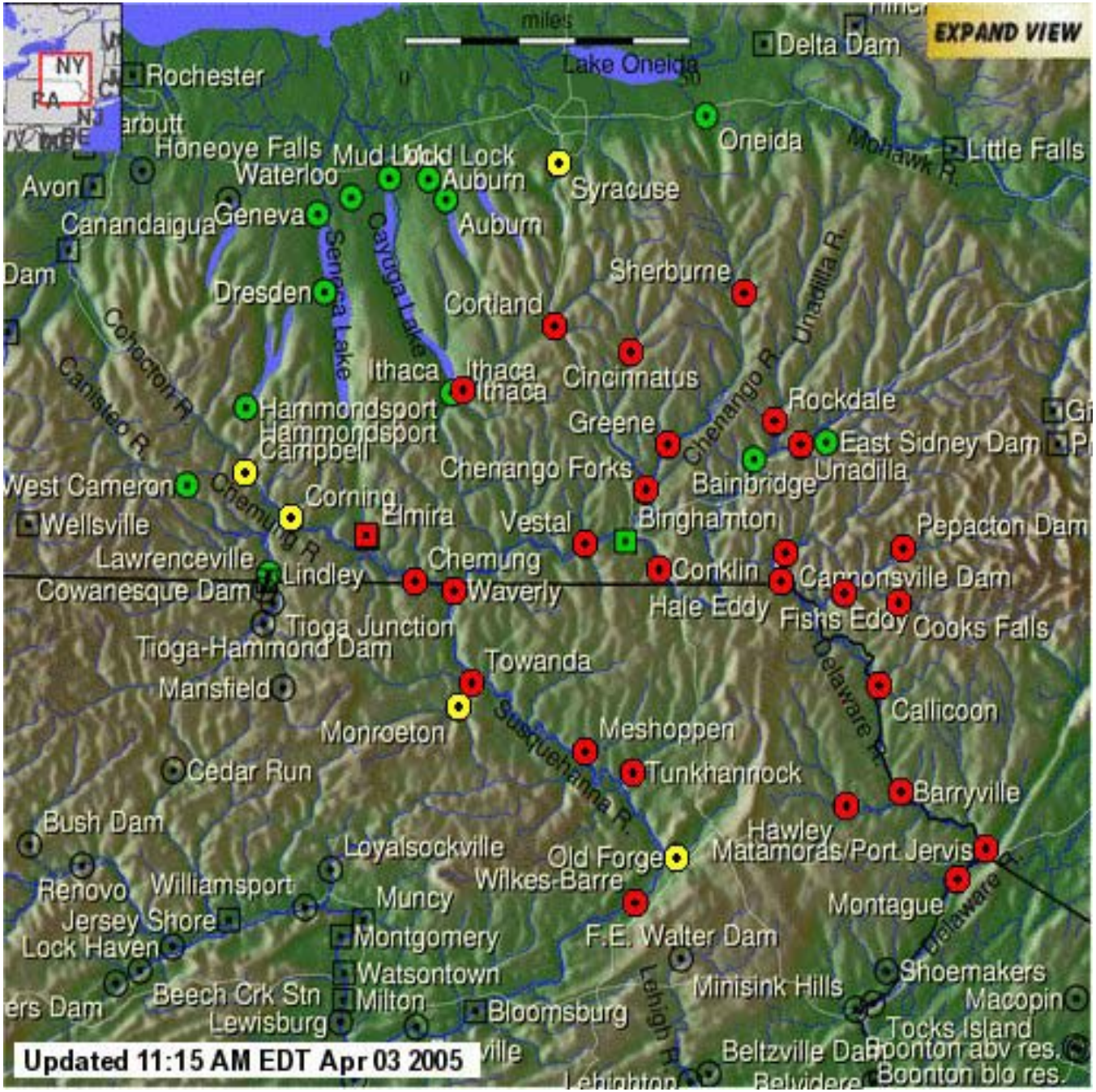
Snowpack Water Equivalent

April 3, 2005

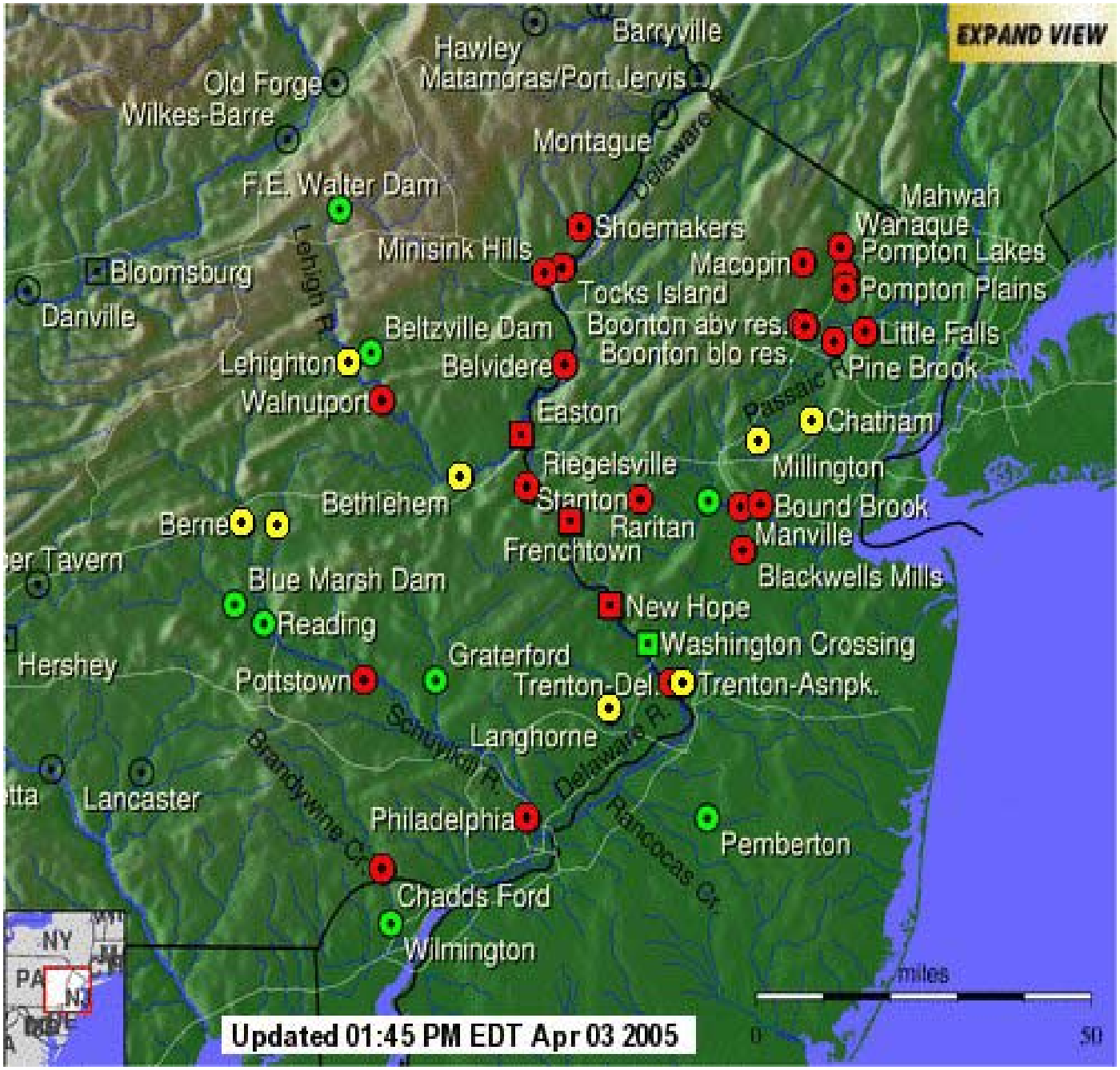
By the end of the second storm, most of the snowpack had melted.



By April 3rd, flood stages were exceeded on rivers and streams throughout the Delaware River Basin. Flooding was the most severe along the main stem Delaware River and headwater tributaries.

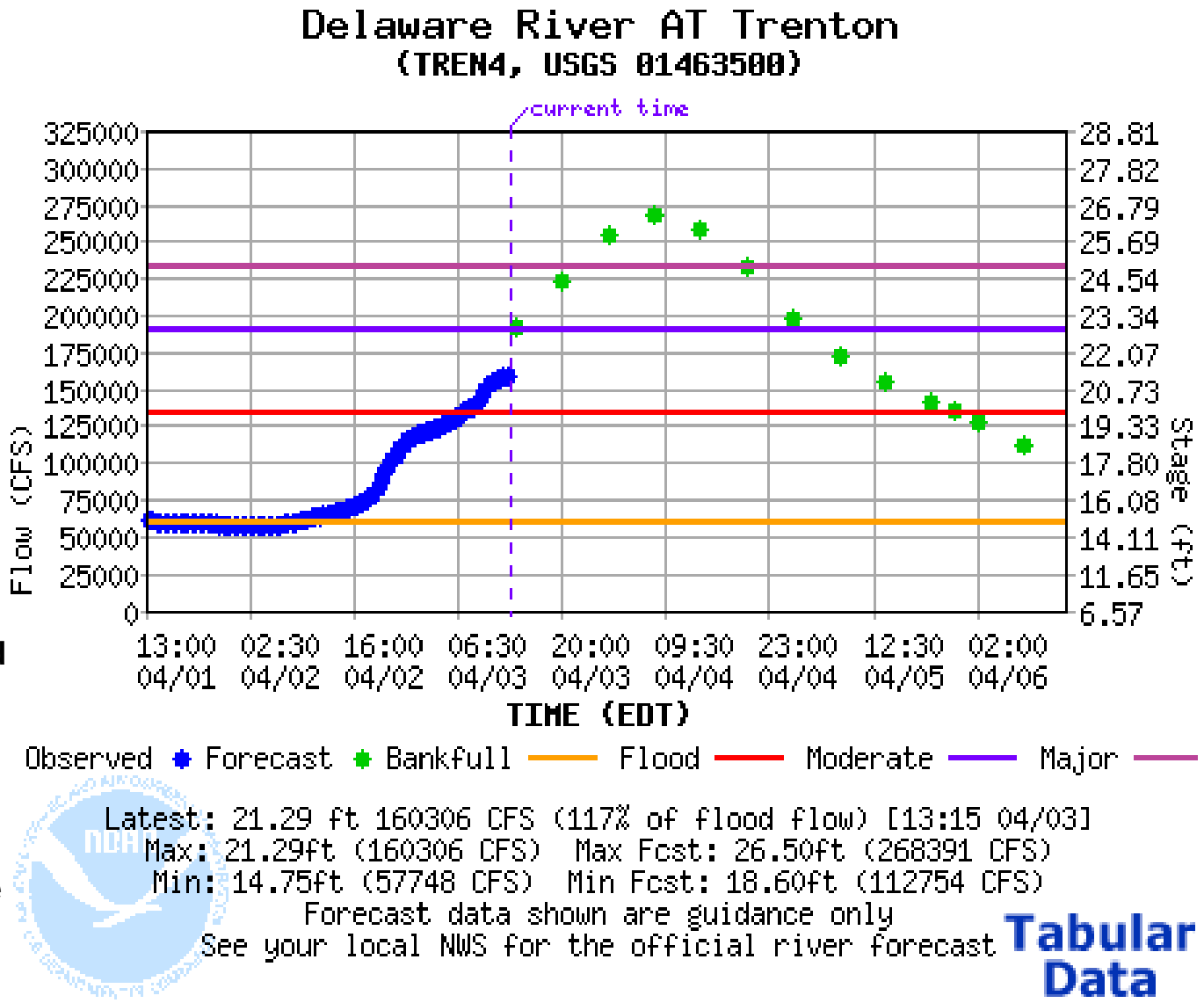


Flood watches were posted two days in advance of the second storm by the National Weather Service. Advance flood crest forecasts also were made and adjusted upward along the main stem Delaware as rainfall totals and streamflow data from U.S. Geological Survey (USGS) stream gaging stations were received.



This is an example of the flood crest forecast hydrographs posted on-line by the National Weather Service prior to and during the flood event.

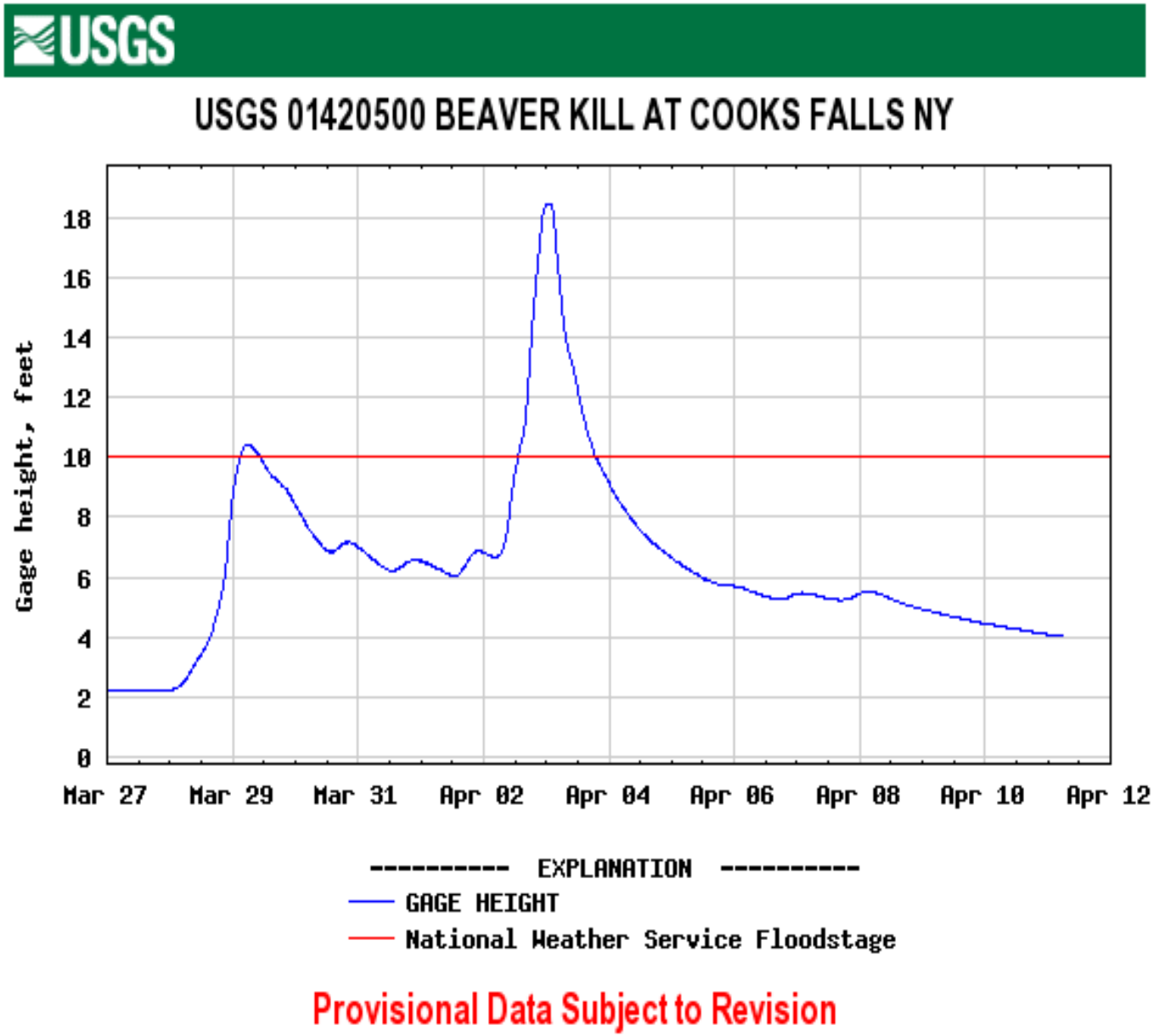
These forecast products are a result of the National Weather Service's Advanced Hydrologic Prediction Services, combined with stream monitoring by the USGS. The forecasts are made for real time gaging stations maintained by the USGS. During this severe flooding, forecasts also were made at Delaware River bridges operated and monitored by the Delaware River Joint Toll Bridge Commission.



Crest = 18.40 ft
New Record

Top 6 Historical Crests
(1) 18.40 ft on 04/03/2005
(2) 17.80 ft on 08/24/1933
(3) 17.79 ft on 01/19/1996
(4) 17.67 ft on 09/18/2004
(5) 16.34 ft on 12/17/2000
(6) 16.02 ft on 03/31/1951

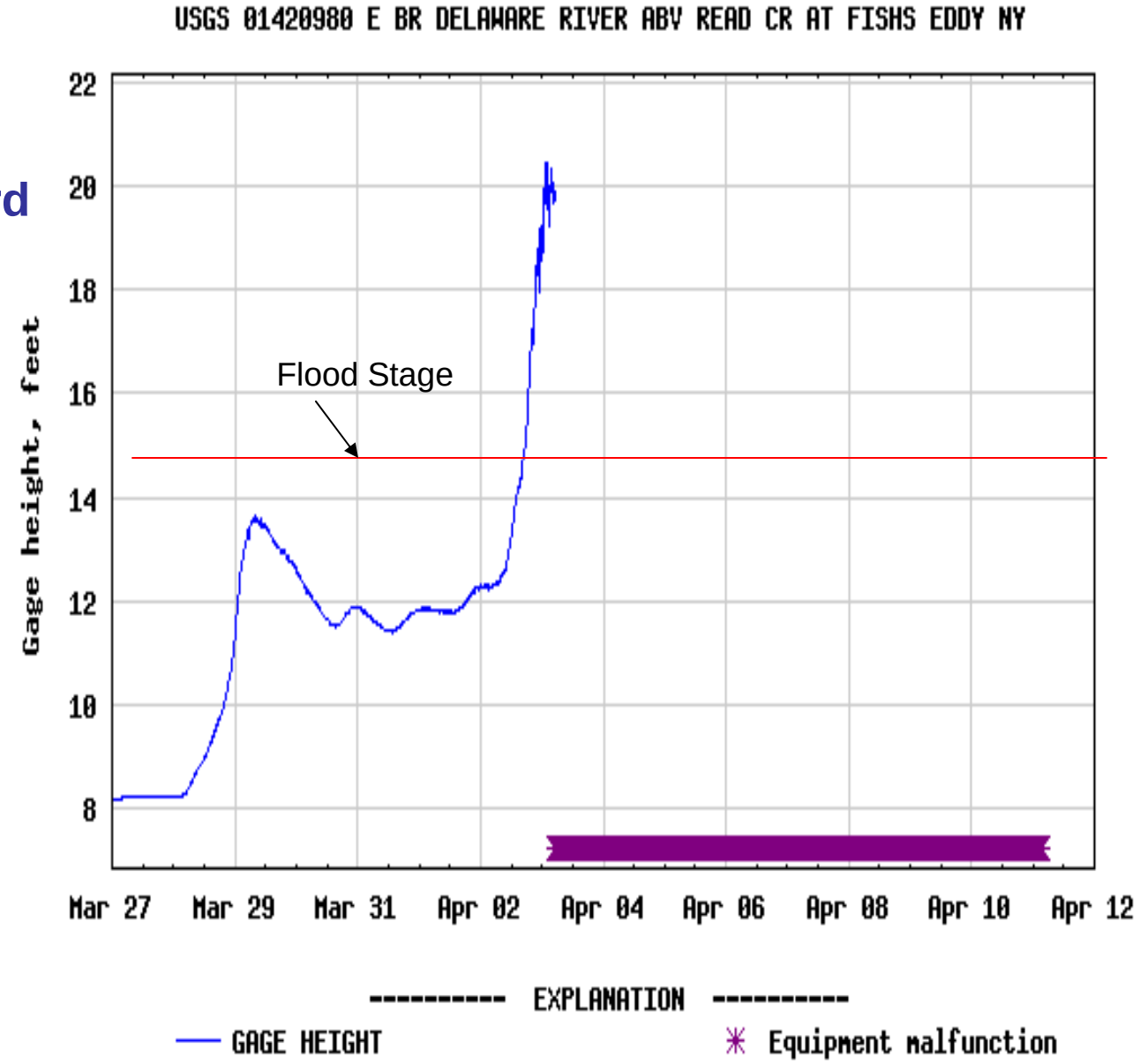
This USGS hydrograph also shows the peak flows from the first storm on March 28. Residual high flow from the first storm and the intensity of the April 2-3 rainfall combined to cause the rapid rises in stream stage on April 2.



Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

Crest = 20.46 ft
4th Highest on Record

Top 6 Historical Crests
(1) 23.60 ft on 10/09/1903
(2) 21.11 ft on 09/18/2004
(3) 20.60 ft on 08/24/1933
(4) 20.46 ft on 04/03/2005
(5) 19.21 ft on 03/18/1936
(6) 19.00 ft on 09/30/1924

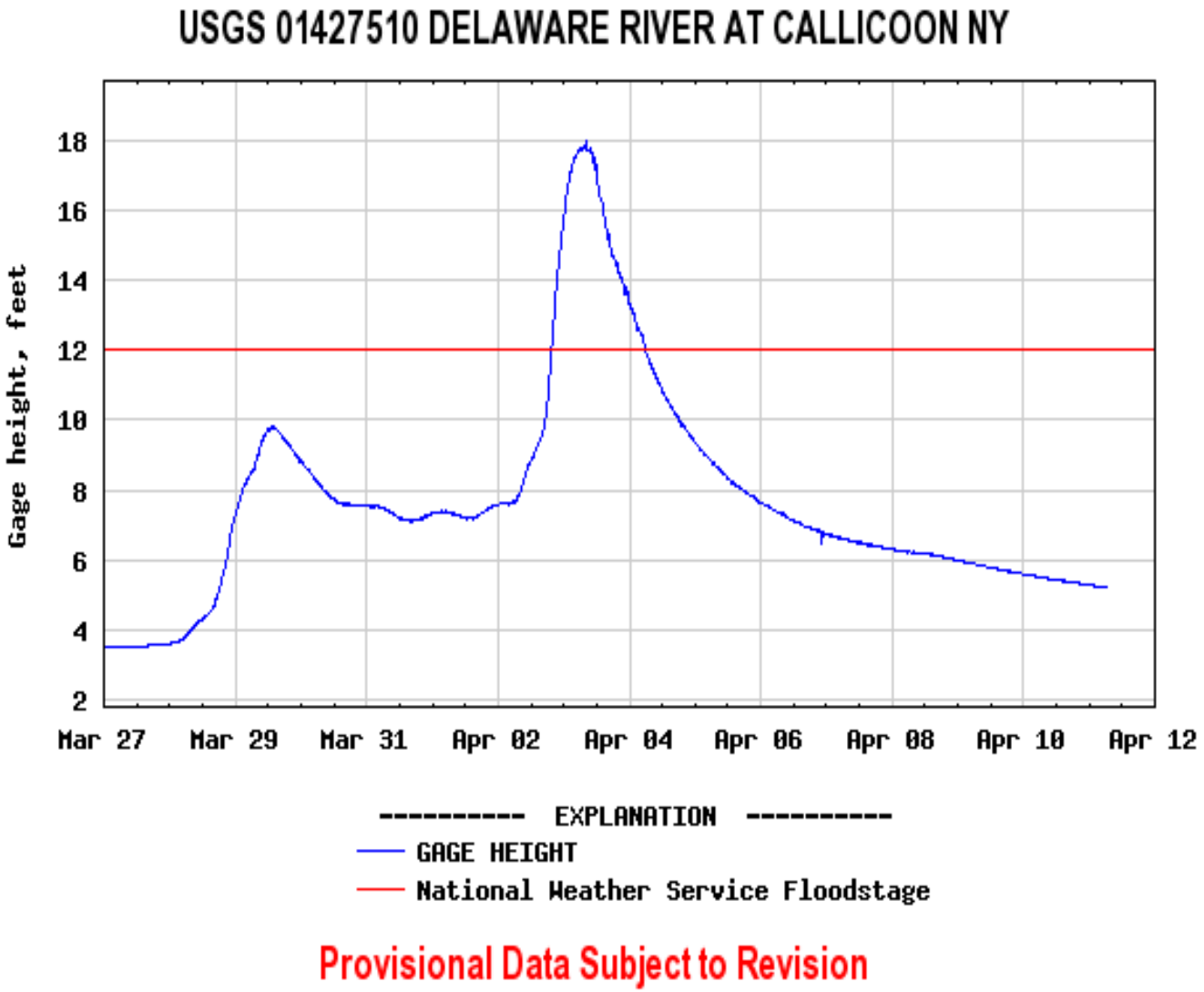


Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

Crest = 17.97 ft
New Record

Top 6 Historical Crests
(1) 17.97 ft on 04/03/2005
(2) 17.33 ft on 09/18/2004
(3) 16.31 ft on 01/20/1996
(4) 14.83 ft on 01/09/1979
(5) 13.42 ft on 03/15/1986
(6) 13.19 ft on 02/12/1981

USGS

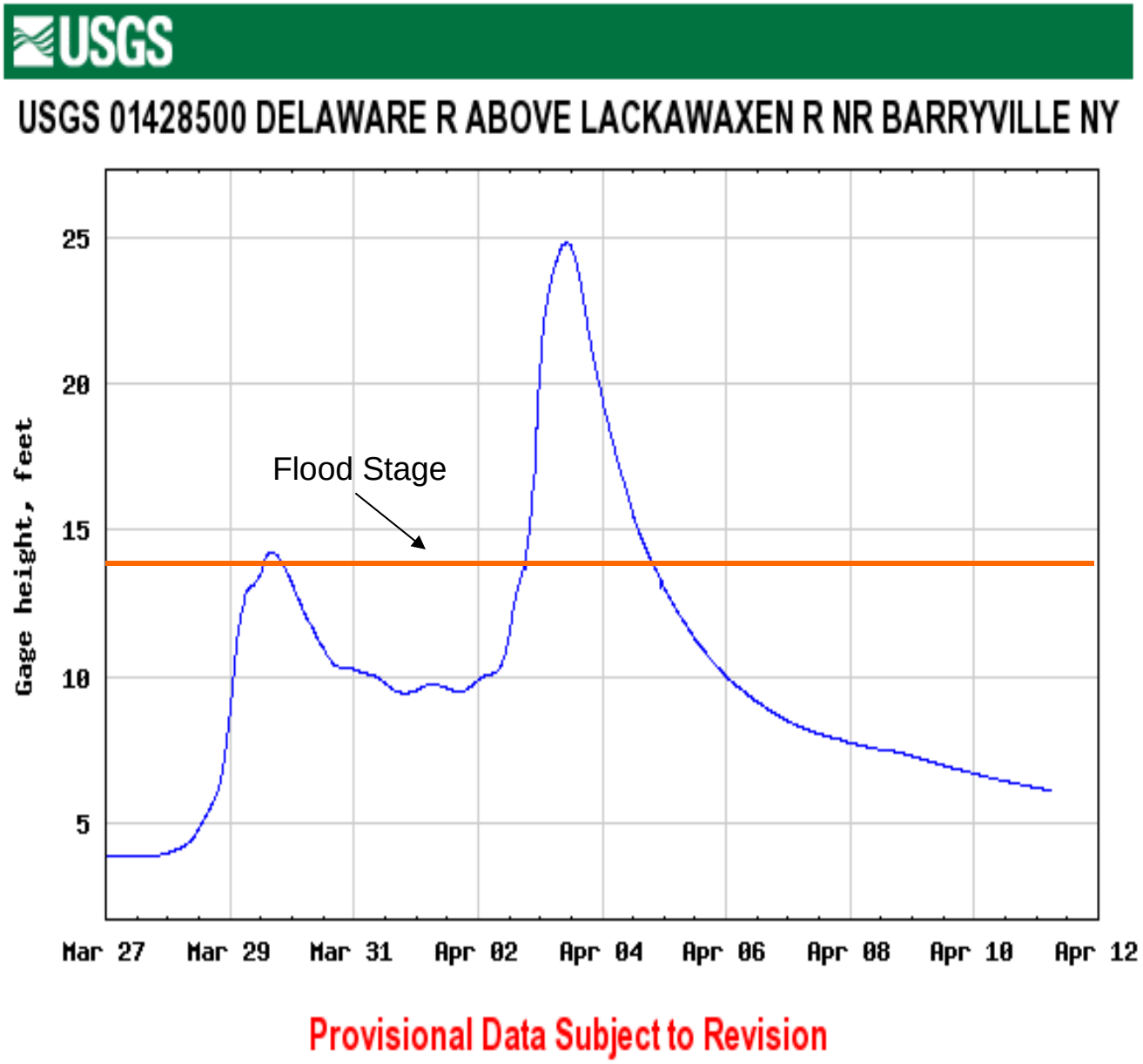


Provisional Data Subject to Revision

Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

Crest = 24.93 ft
2nd Highest on Record

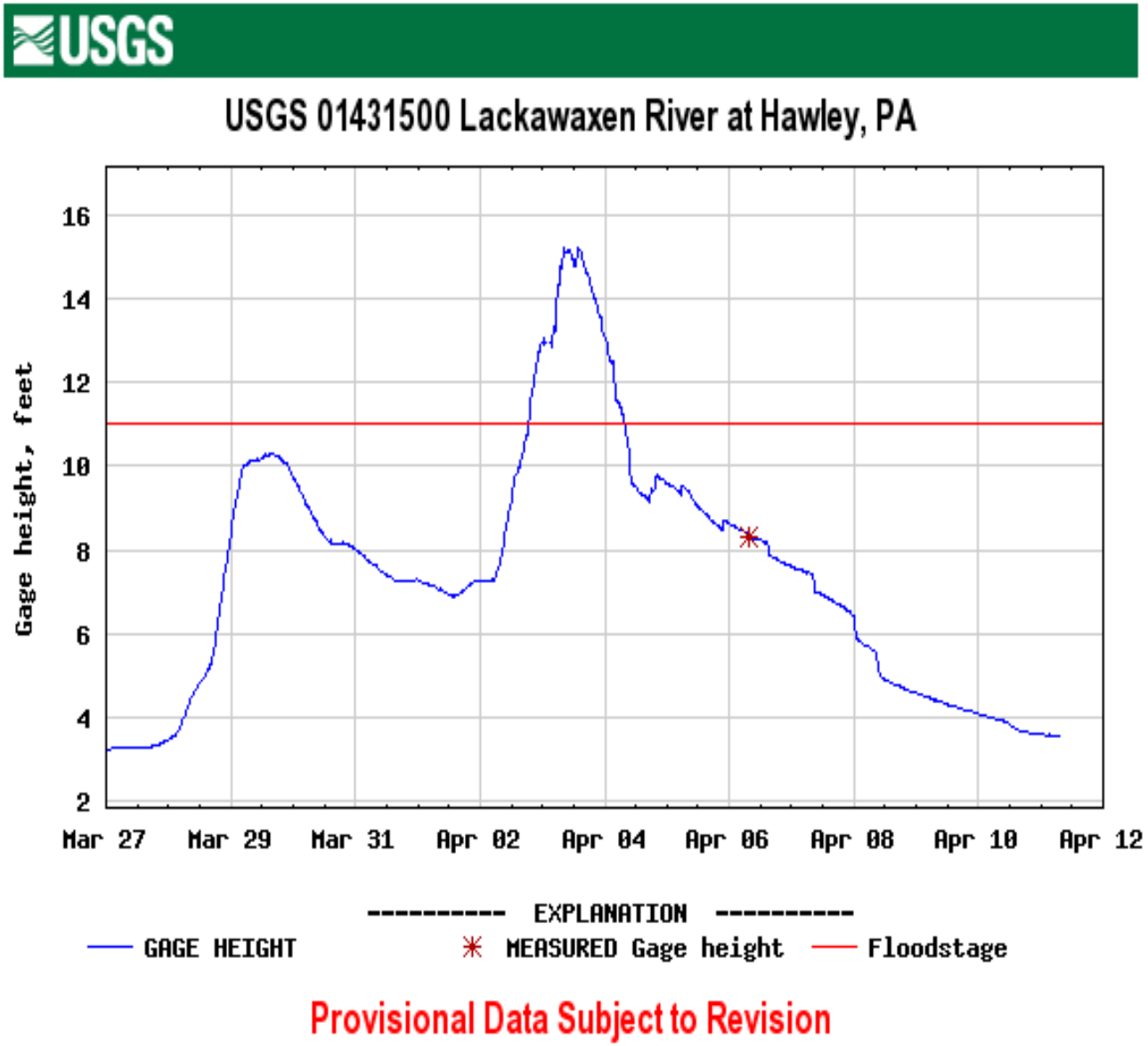
Top 6 Historical Crests
(1) 26.40 ft on 08/19/1955
(2) 24.93 ft on 04/03/2005
(3) 24.09 ft on 09/18/2004
(4) 23.19 ft on 05/23/1942
(5) 22.18 ft on 01/20/1996
(6) 20.90 ft on 02/11/1981



Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

Crest = 15.31 ft
4th Highest of Record

Top 6 Historical Crests
(1) 24.80 ft on 08/19/1955
(2) 20.10 ft on 05/23/1942
(3) 19.10 ft on 03/12/1936
(4) 15.31 ft on 04/03/2005
(4) 15.15 ft on 03/18/1936
(6) 14.49 ft on 09/18/2004

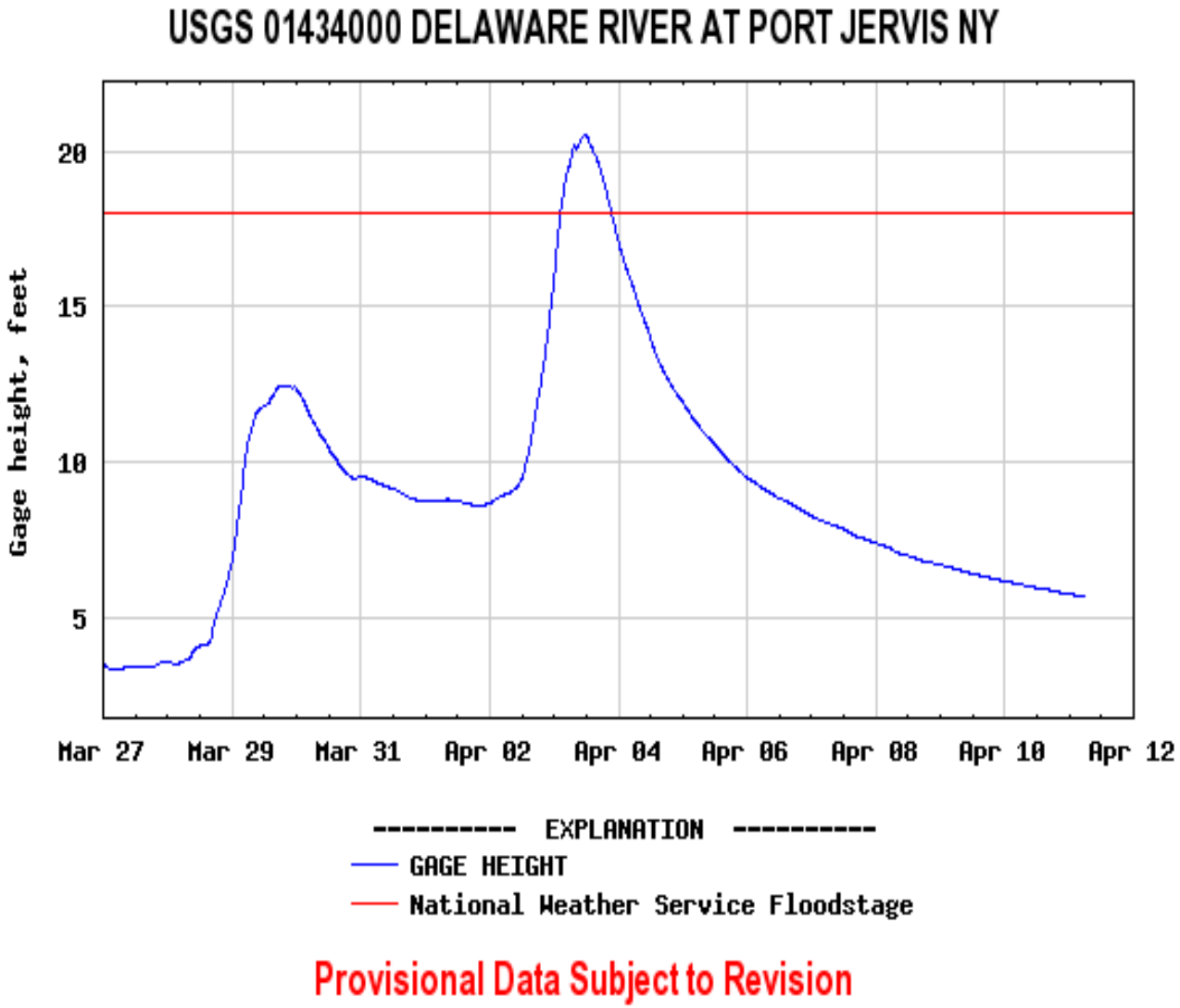


Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

Crest = 20.53 ft
5th Highest of Record

Top 6 Historical Crests
(1) 26.60 ft on 02/12/1981
(2) 25.50 ft on 03/08/1904
(3) 23.91 ft on 08/19/1955
(4) 23.10 ft on 10/10/1903
(5) 20.53 ft on 04/03/2005
(6) 19.52 ft on 09/18/2004

USGS



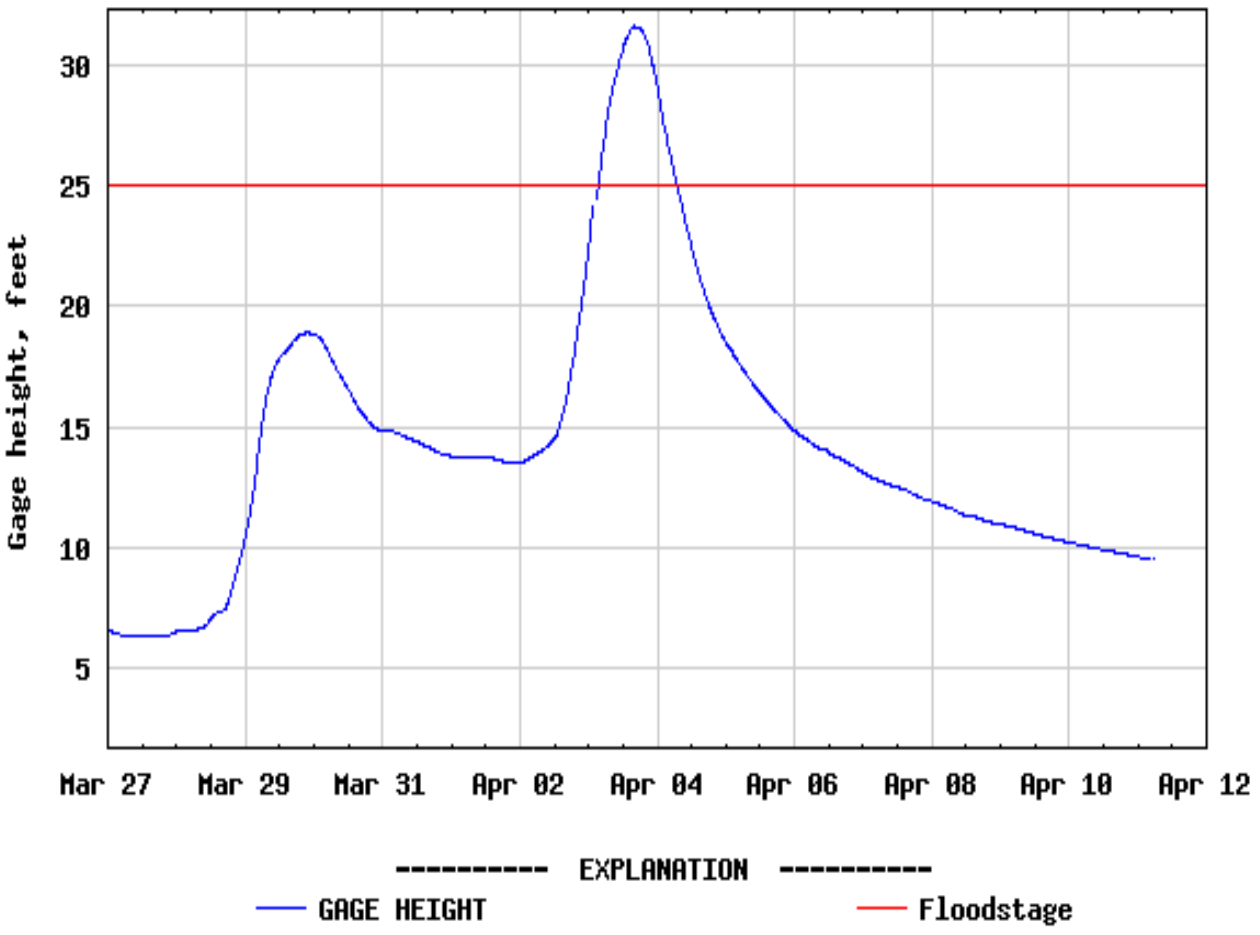
Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

Crest = 31.69 ft
3rd Highest of Record

Top 6 Historical Crests
(1) 35.50 ft on 10/10/1903
(2) 35.15 ft on 08/19/1955
(3) 31.69 ft on 04/03/2005
(4) 28.3 ft on 09/18/2004
(5) 26.66 ft on 01/20/1996
(6) 25.70 ft on 05/23/1942

USGS

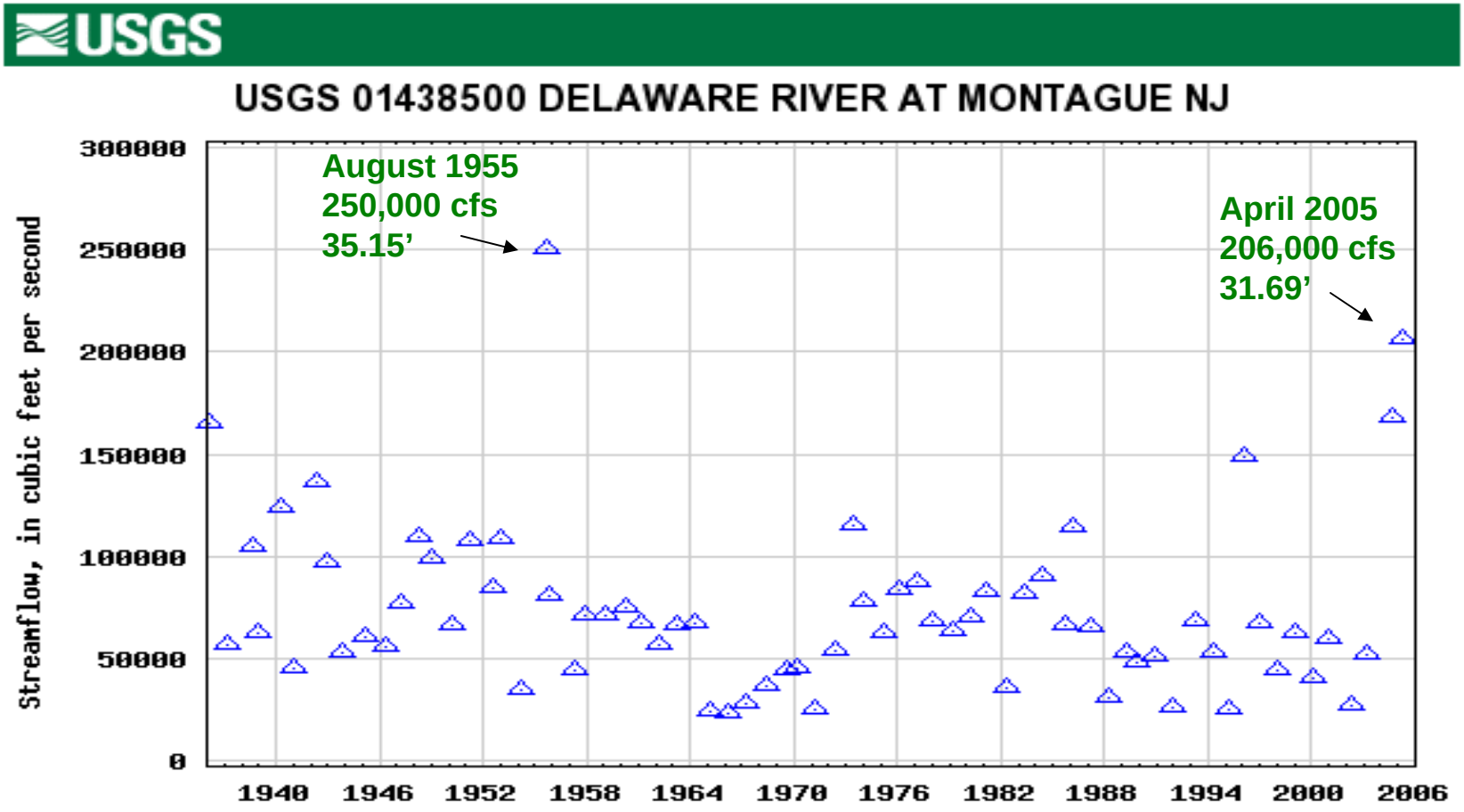
USGS 01438500 DELAWARE RIVER AT MONTAGUE NJ



Provisional Data Subject to Revision

Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

HISTORICAL PEAK FLOWS AT MONTAGUE, NJ
Water Years 1936-2005

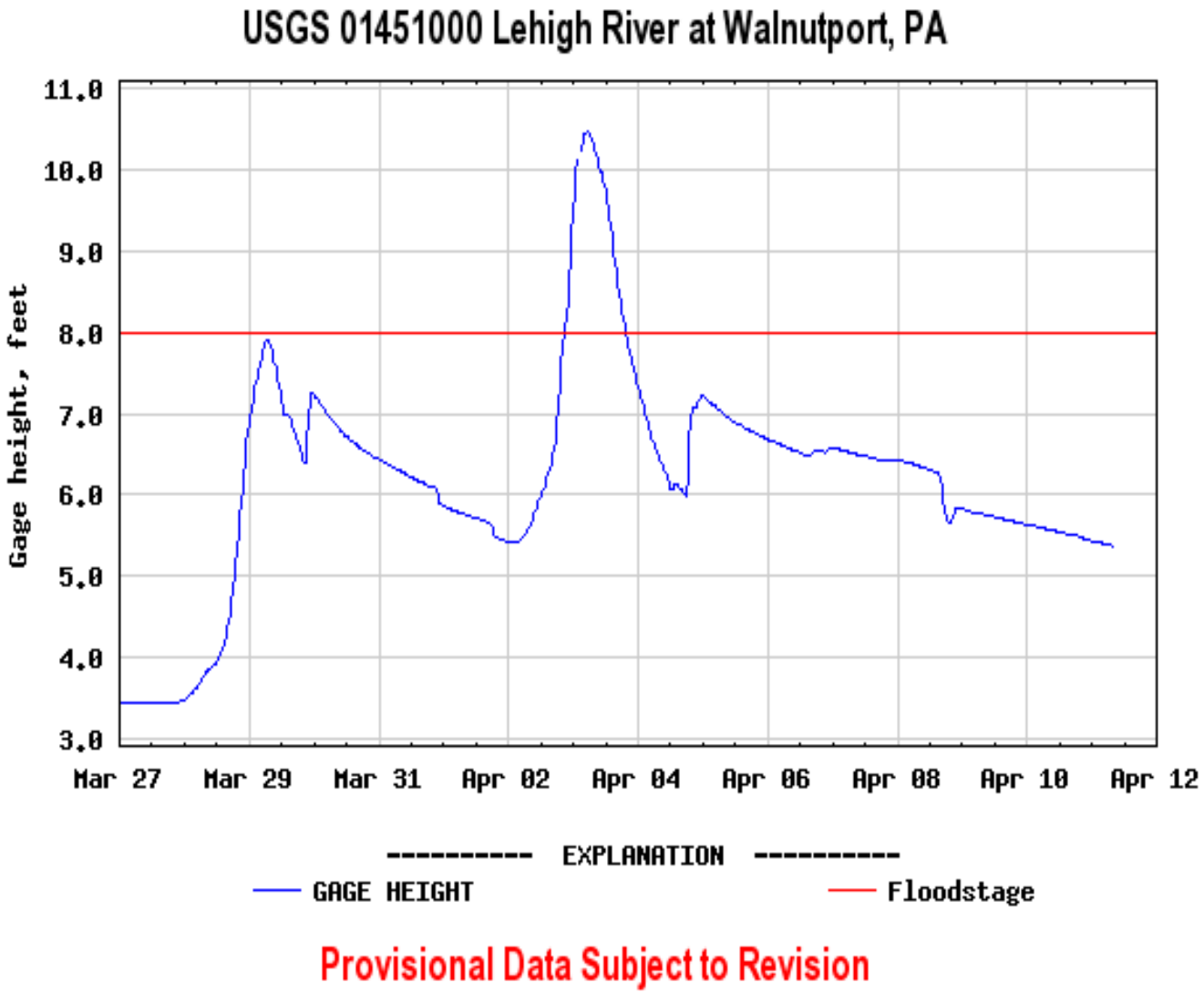


Peak flow data provided by US Geological Survey (USGS)

Crest = 10.49 ft on 4/3/2005

Top 5 Historical Crests
(1) 20.60 ft on 05/23/1942
(2) 17.68 ft on 08/19/1955
(3) 12.66 ft on 12/04/1950
(4) 12.32 ft on 01/19/1996
(5) 12.29 ft on 09/18/2004

USGS

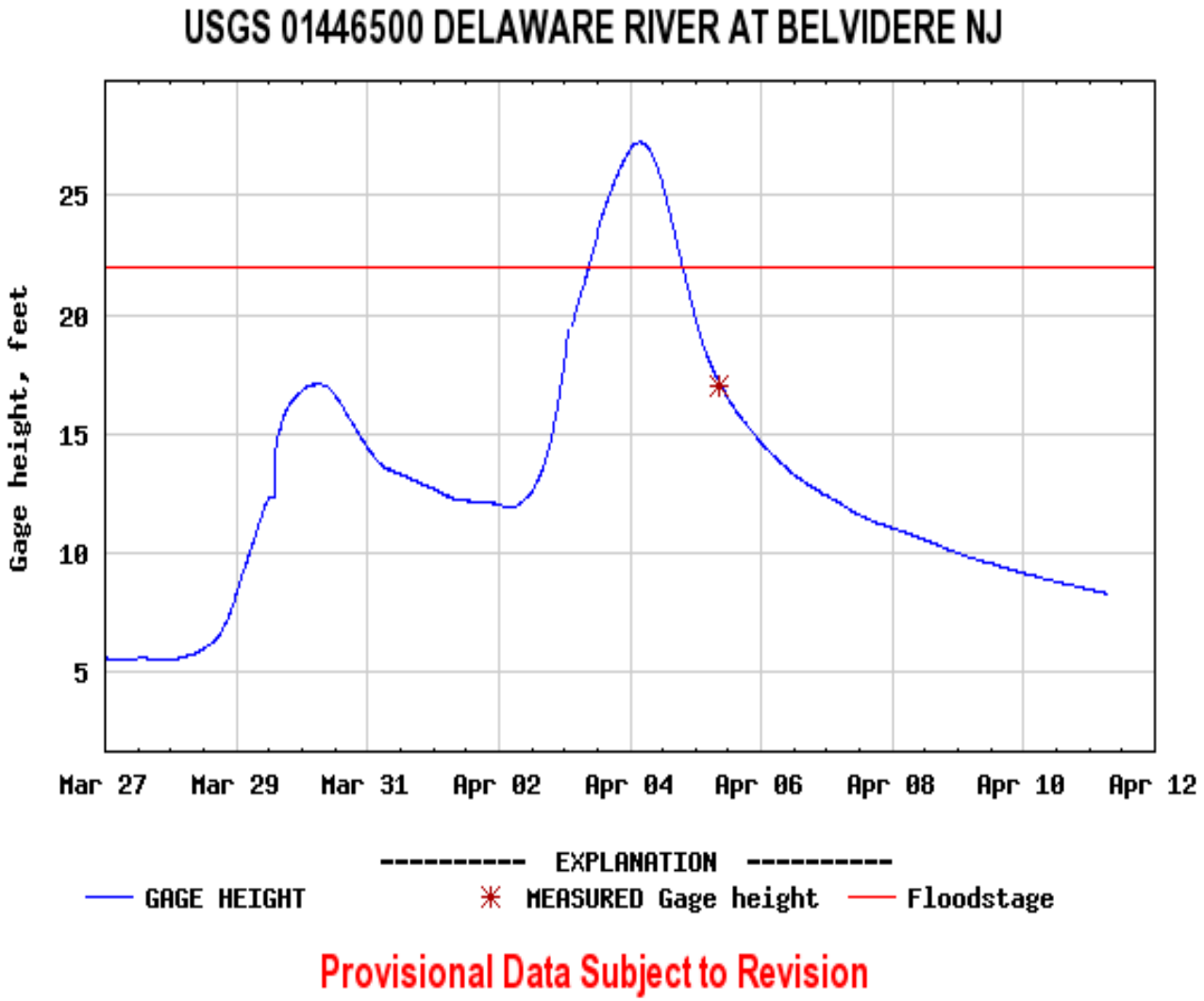


Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

Crest = 27.24 ft
3rd Highest of Record

Top 6 Historical Crests
(1) 30.21 ft on 08/19/1955
(2) 28.60 ft on 10/03/1903
(3) 27.24 ft on 4/4/2005
(4) 25.00 ft on 03/19/1936
(5) 24.83 ft on 09/19/2004
(6) 22.96 ft on 01/20/1996

USGS



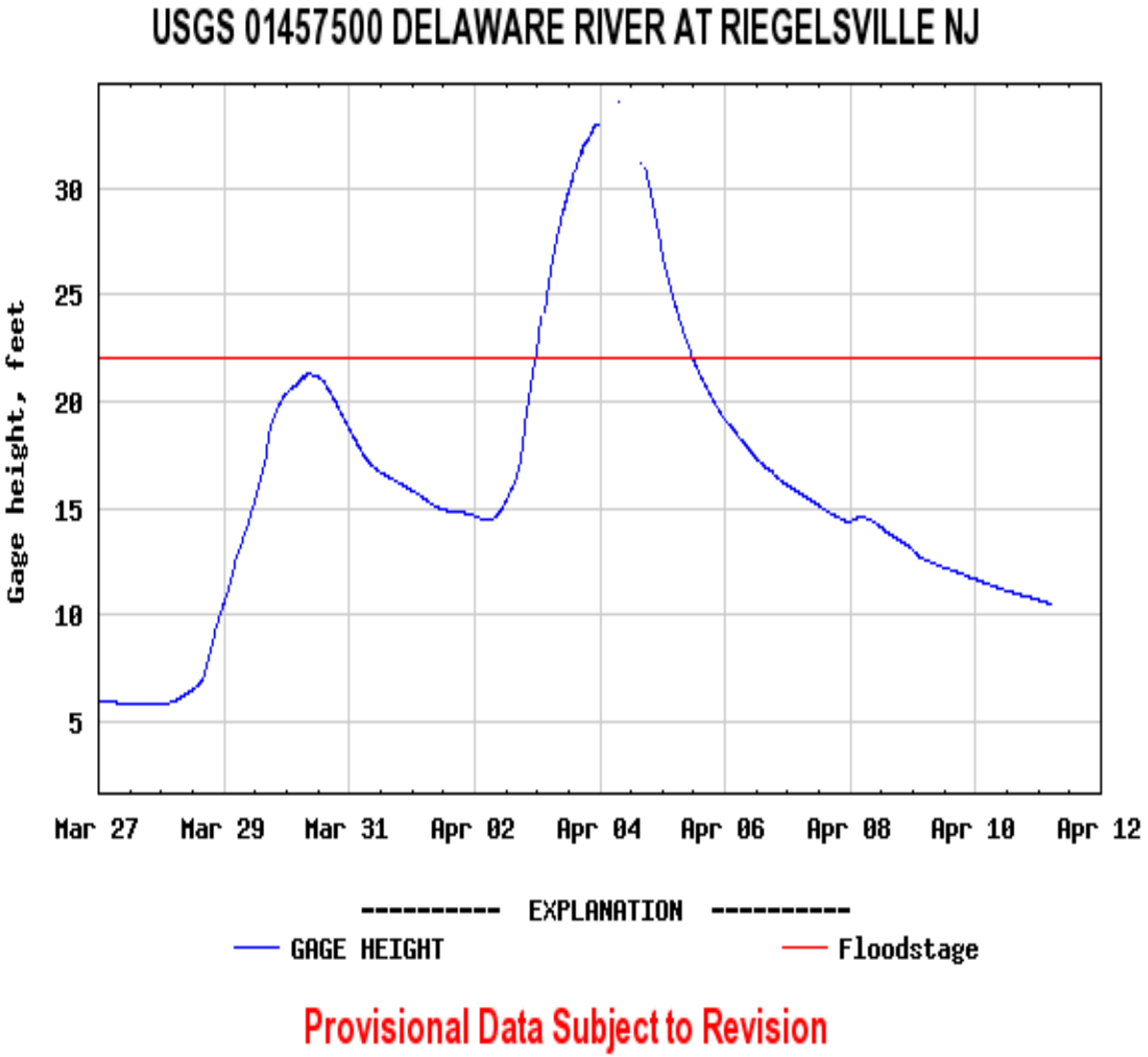
Provisional Data Subject to Revision

Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

Crest= 34.07 ft
3rd Highest on Record

Top 6 Historical Crests
(1) 38.85 ft on 08/20/1955
(2) 35.90 ft on 10/10/1903
(3) 34.07 ft on 4/3/2005
(4) 32.50 ft on 01/08/1841
(5) 32.45 ft on 03/19/1936
(6) 30.95 ft on 09/19/2004

USGS



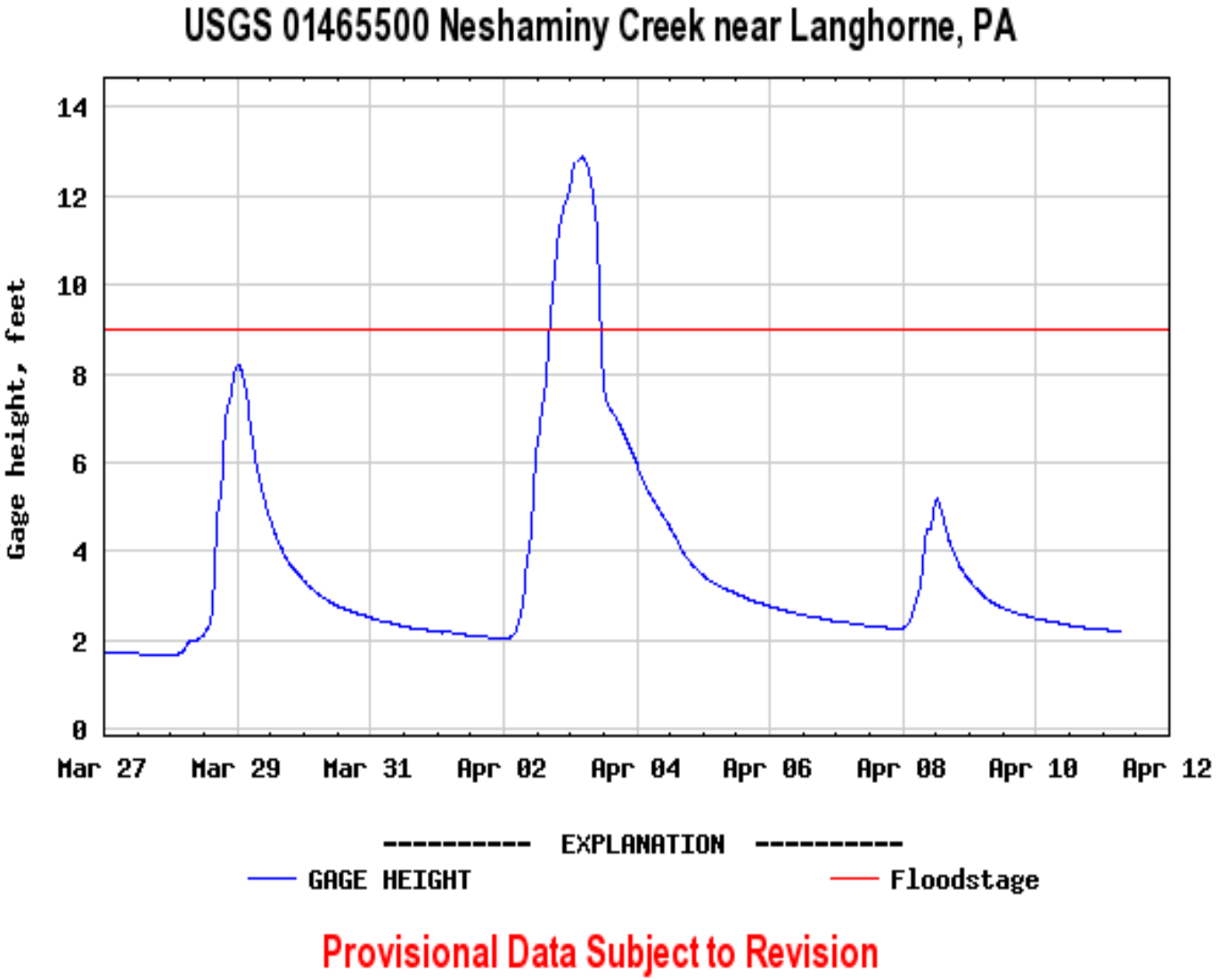
Provisional Data Subject to Revision

Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

Crest = 12.87 ft on 04/03/2005

Top 5 Historical Crests
(1) 22.84 ft on 08/19/1955
(2) 21.91 ft on 09/16/1999
(3) 18.99 ft on 06/30/1973
(4) 17.30 ft on 08/23/1933
(5) 16.87 ft on 06/17/2001

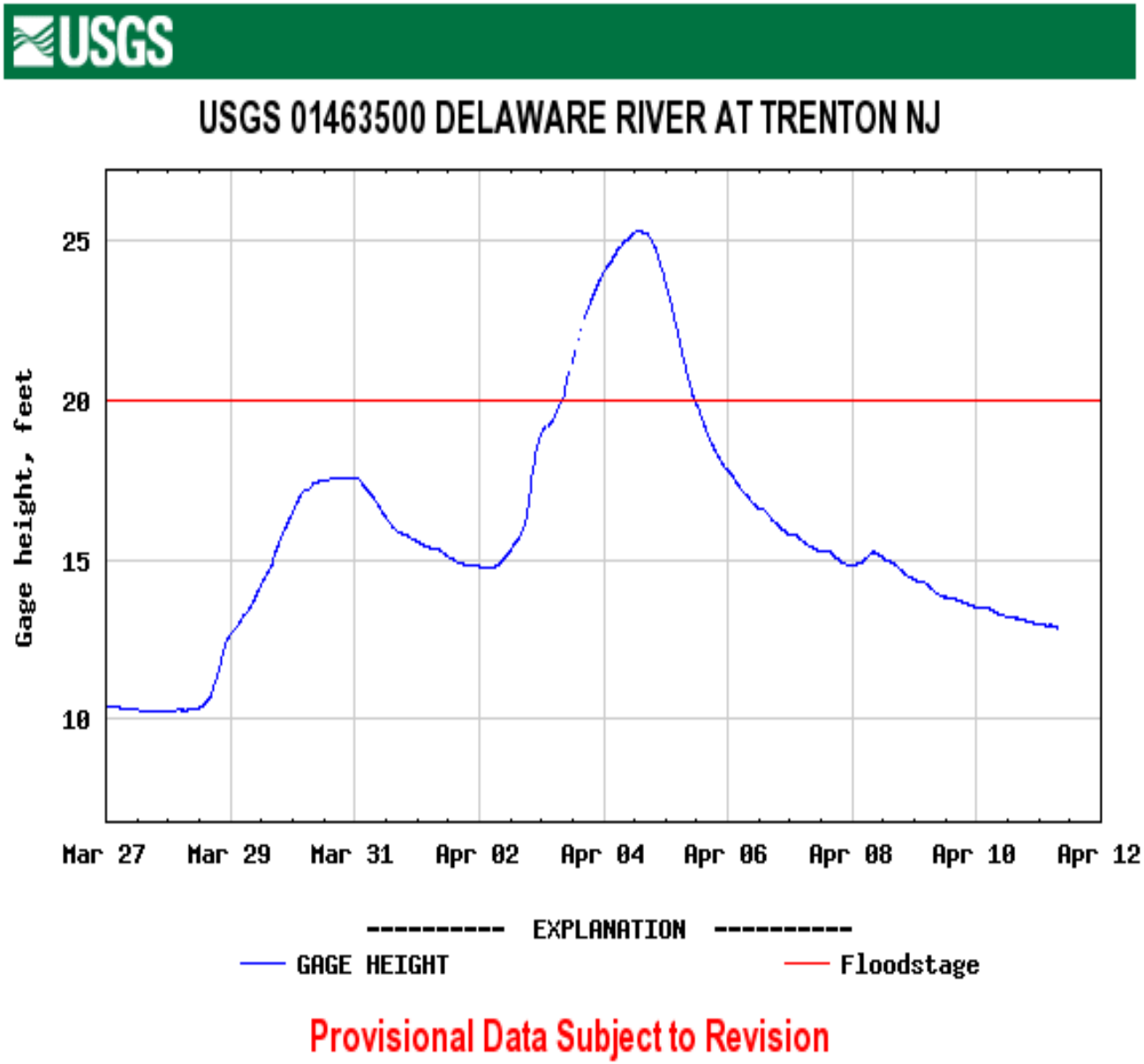
USGS



Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

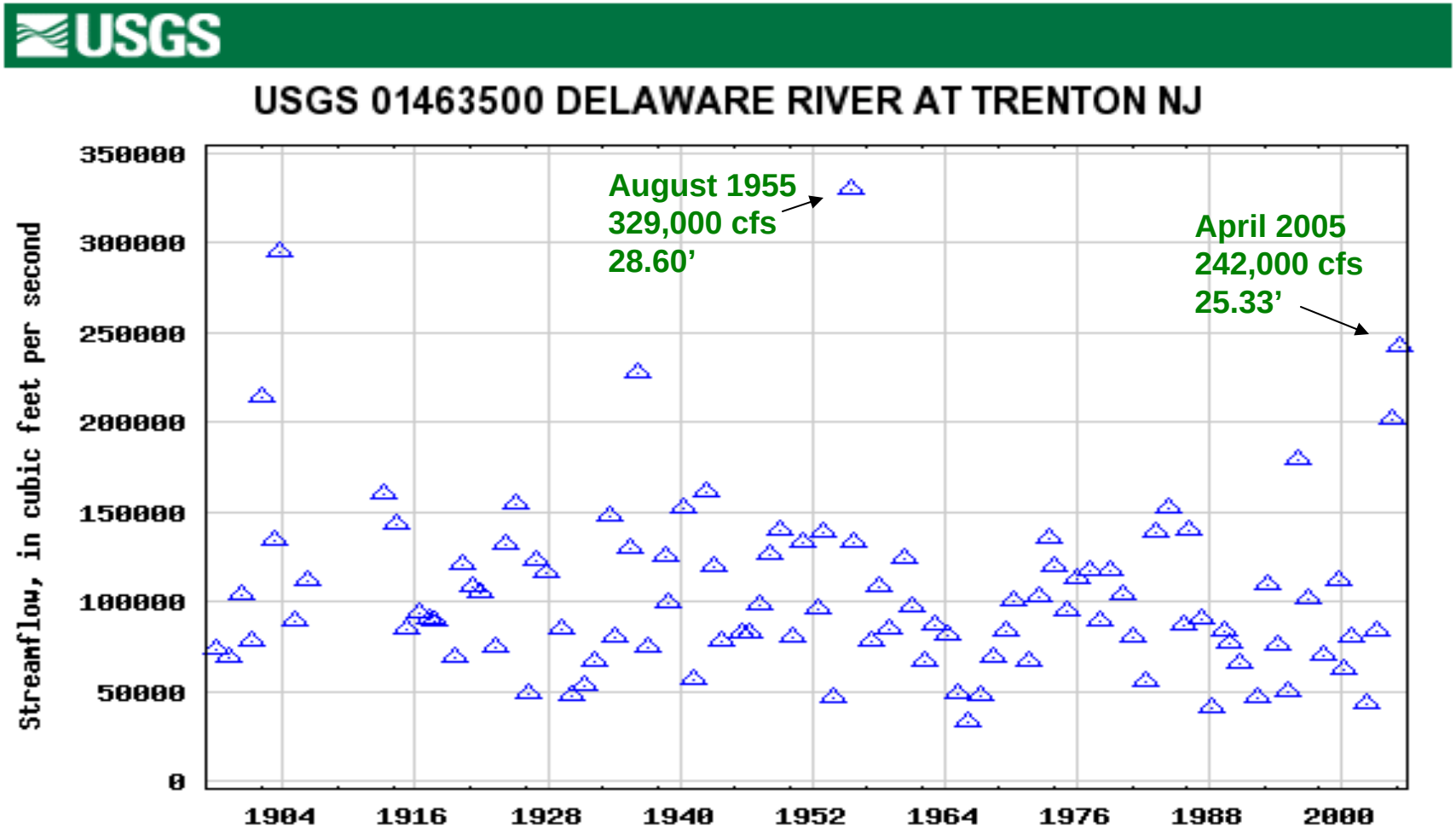
Crest=25.33 ft
4th Highest on Record

Top 6 Historical Crests
(1) 30.60 ft on 03/08/1904
(2) 28.60 ft on 08/20/1955
(3) 28.50 ft on 10/11/1903
(4) 25.33 ft on 4/4/2005
(5) 24.43 ft on 03/19/1936
(6) 23.39 ft on 09/19/2004



Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

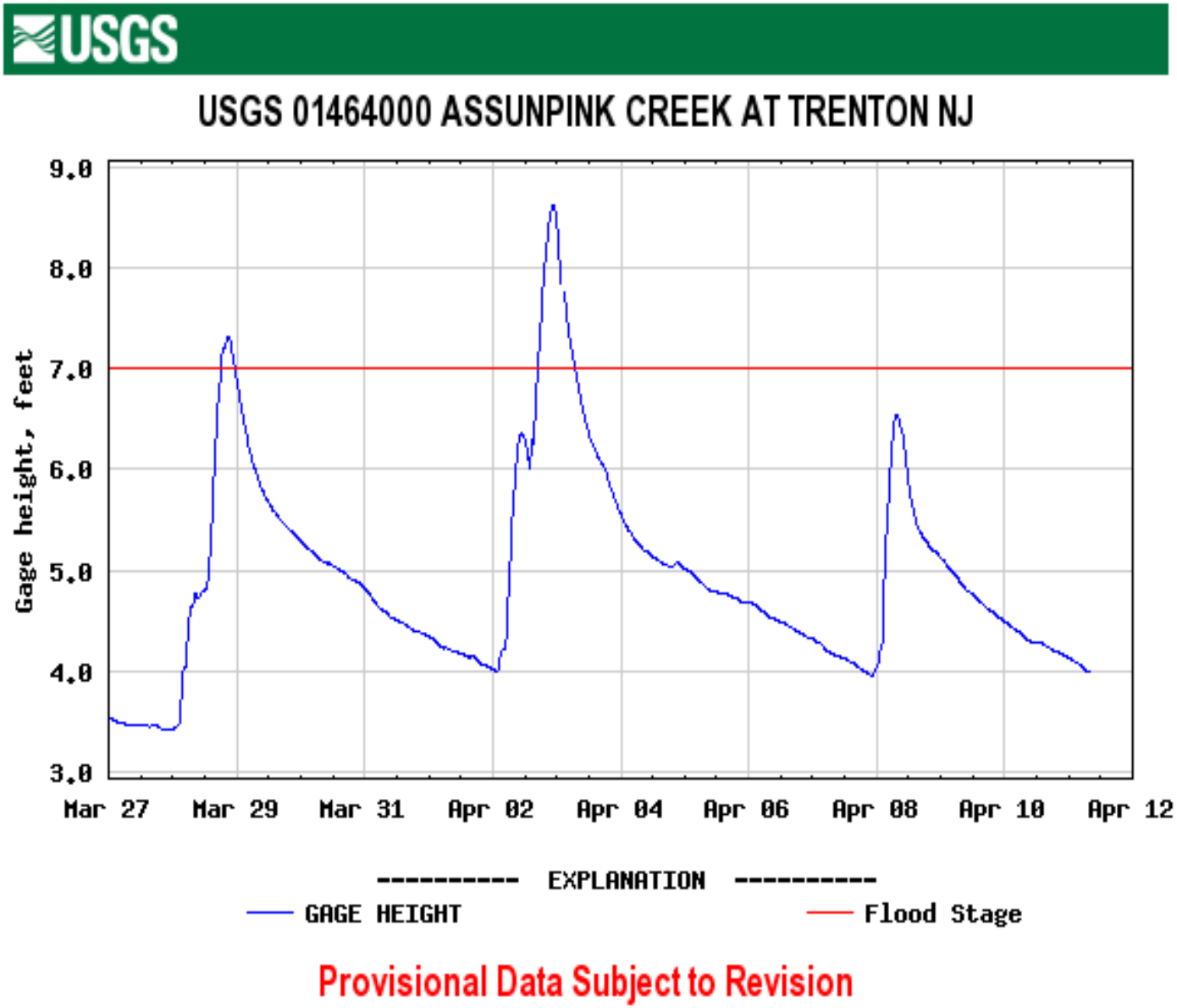
HISTORICAL PEAK FLOWS AT TRENTON, NJ
Water Years 1898-2005



Peak flow data provided by US Geological Survey (USGS)

Crest = 8.62 ft on 04/02/2005

Top 5 Historical Crests
(1) 14.61 ft on 07/21/1975
(2) 14.01 ft on 09/17/1999
(3) 13.46 ft on 08/28/1971
(4) 11.69 ft on 06/13/1996
(5) 11.67 ft on 01/28/1994

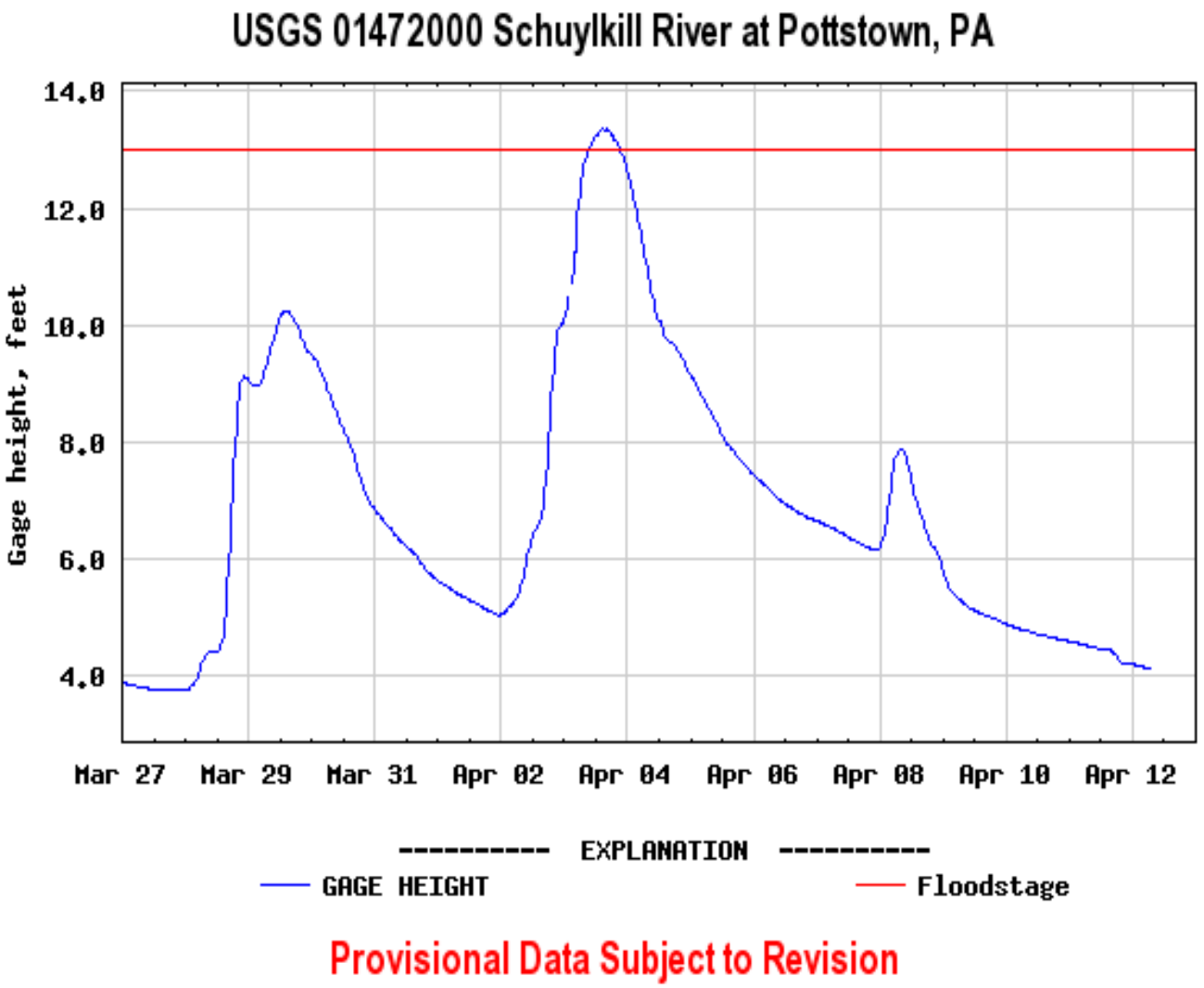


Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

Crest = 13.41 ft on 04/03/2005

Top 5 Historical Crests
(1) 29.97 ft on 06/23/1972
(2) 21.00 ft on 02/28/1902
(3) 20.15 ft on 05/23/1942
(4) 19.20 ft on 08/24/1933
(5) 18.21 ft on 01/25/1979

USGS



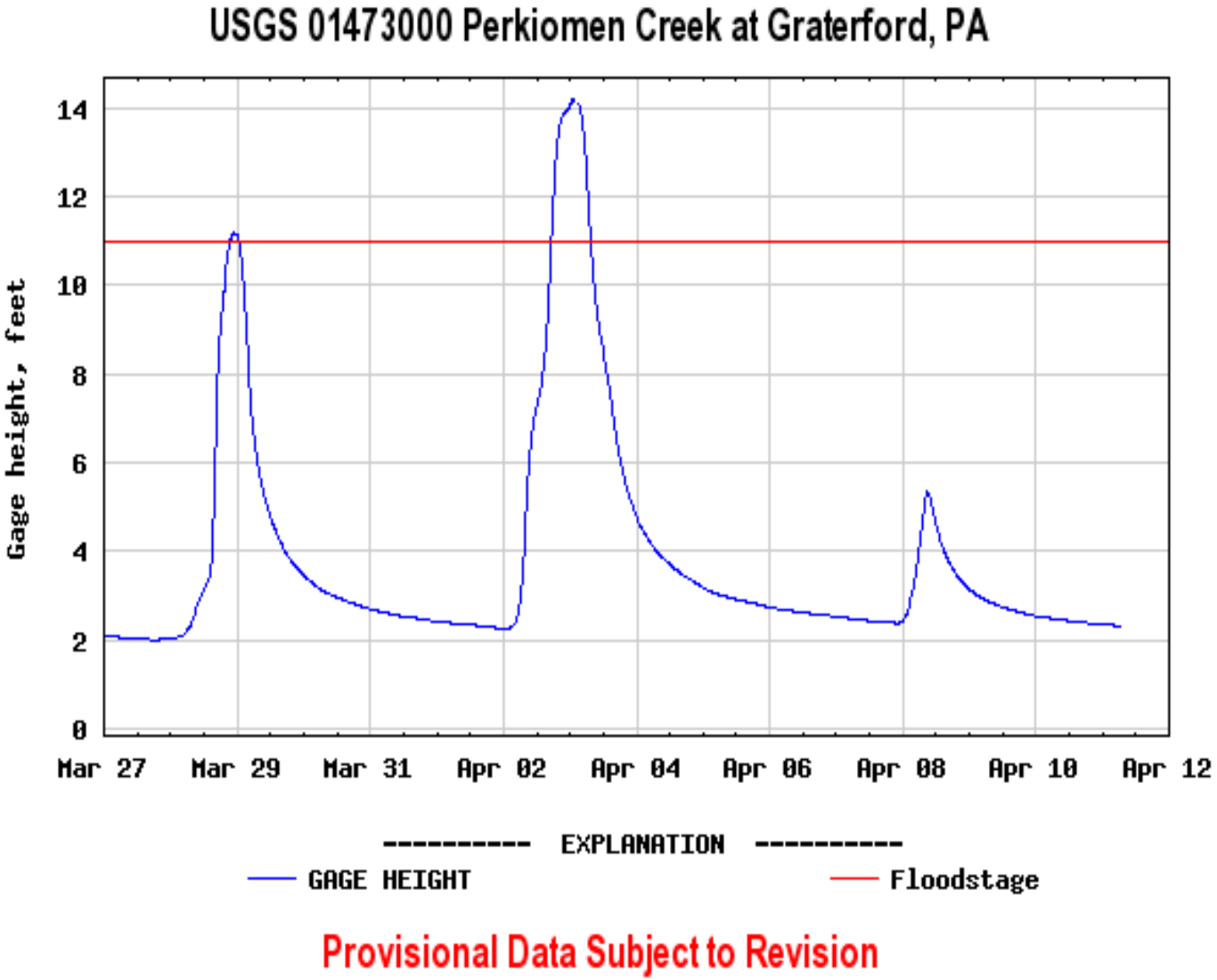
Provisional Data Subject to Revision

Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

Crest = 14.18 ft on 04/03/2005

Top 5 Historical Crests
(1) 18.26 ft on 07/09/1935
(2) 17.08 ft on 06/22/1972
(3) 16.65 ft on 08/23/1933
(4) 16.59 ft on 09/16/1999
(5) 16.45 ft on 01/19/1996

USGS

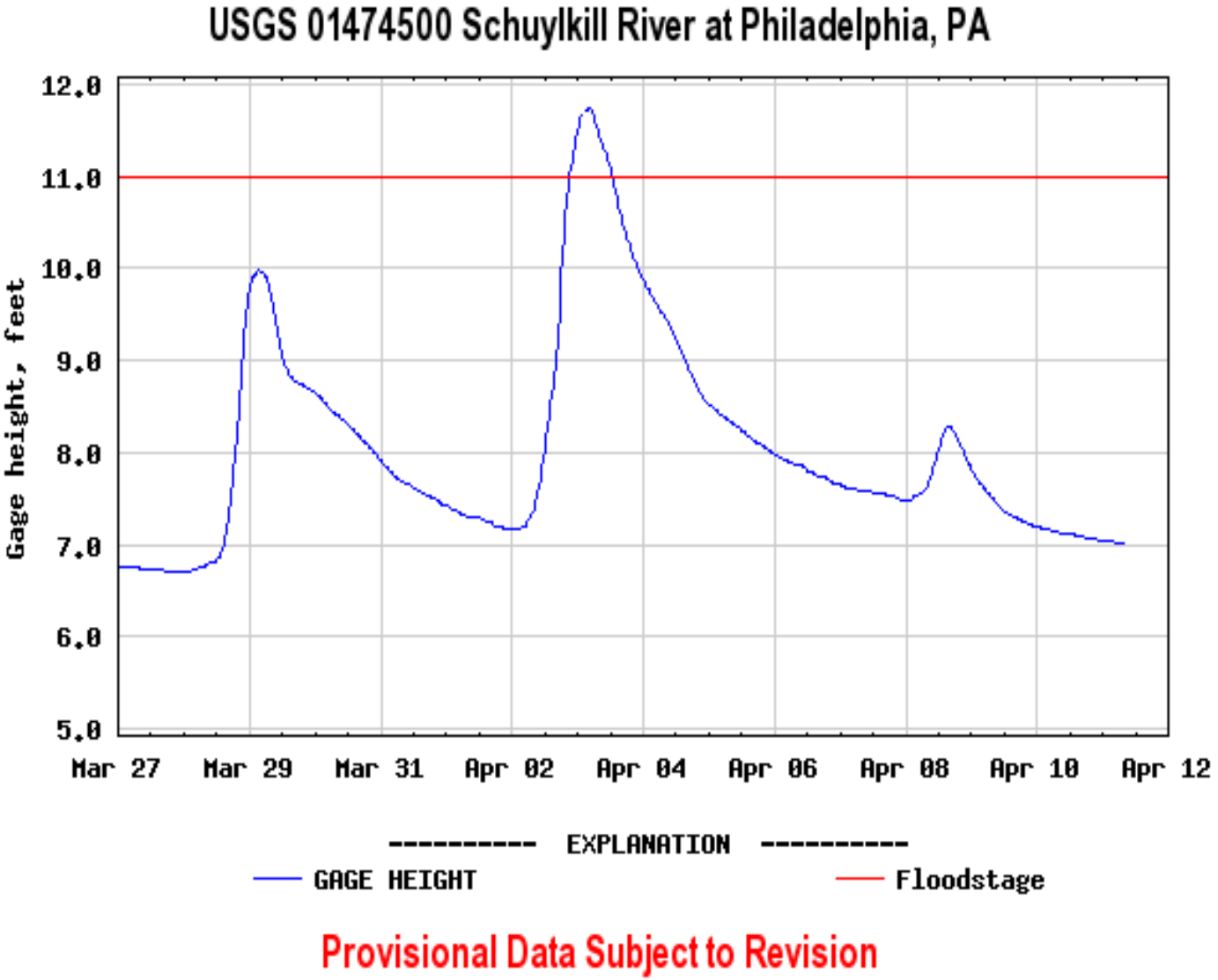


Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

Crest = 11.74 ft on 04/03/2005

Top 5 Historical Crests
(1) 17.00 ft on 10/04/1869
(2) 14.80 ft on 03/01/1902
(3) 14.70 ft on 08/24/1933
(4) 14.65 ft on 06/23/1972
(5) 14.57 ft on 06/02/1946

USGS



Hydrograph provided by US Geological Survey (USGS)
Crest data is USGS data provided through the National Weather Service

FLOOD PEAK COMPARISON
AT SELECT BRIDGES ON THE DELAWARE RIVER

BRIDGE	AUG 1955 PEAK	SEPT 2004 PEAK	APR 2005 PEAK
Phillipsburg-Easton	43.70’	33.45’	E36.5’
Frenchtown	27.80’	20.70’	22.55’
Stockton	28.40’	22.50’	E26.75’
New Hope	24.30’	*	19.70’
Washington Crossing	27.80’	20.20’	E26.7’

**gage was removed for construction during 2004.*
E=estimated

SOURCE: National Weather Service.
Data is provisional and subject to change.