

Water Supply Outlook

July 8, 2016

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Interstate Commission on the Potomac River Basin (ICPRB)

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The ICPRB, through its Section for Cooperative Water Supply Operations on the Potomac (CO-OP), coordinates water supply operations during times of drought and recommends releases of stored water. These operations ensure adequate water supplies for the major Washington metropolitan area water users and for environmental flow levels. The water supply outlooks are published by CO-OP on a monthly basis between April and October. They are meant to provide an update on the possibility of low-flow conditions in the Potomac basin.

Summary/Conclusions:

There is a below normal probability of releases from the Washington metropolitan area's back-up water supply reservoirs for the 2016 summer and fall seasons. Generally, the use of Jennings Randolph and Little Seneca reservoirs is triggered by low flows brought about by a combination of low summer precipitation and low groundwater levels. The MARFC's Water Resource Outlook for the southern portion of the Middle Atlantic reports that precipitation in the month of June has been above normal, with a basin averaged precipitation 1.3 inches above normal. Potomac river flows are currently above normal. Precipitation is expected to be above normal in the month of July. At present, there is sufficient flow in the Potomac River to meet the Washington metropolitan area's water demands without augmentation from upstream reservoirs. In the event that low-flow conditions do develop, the Washington metropolitan area is well-protected from a water supply shortage because of carefully designed drought-contingency plans.

ICPRB's Low Flow Outlook:

There is a 1 to 4 percent conditional probability that natural Potomac flow will drop below 600 to 700 million gallons per day (MGD) at Little Falls through December 31 of this year; at these flow levels, water supply releases from Jennings Randolph and Little Seneca reservoirs may occur. Releases occur when predicted flow is less than demand plus a required environmental flow. Drinking water demand ranges from 400 to 700 MGD during the summer months and the minimum flow-by at Little Falls is 100 MGD. Note that natural flow is defined as observed flow at the Little Falls gage plus total Washington metropolitan Potomac withdrawals, with an adjustment made to remove the effect of North Branch reservoir releases on stream flow.

The conditional probability is estimated by analyzing the historical stream flow records and giving consideration to recent stream flow values, precipitation totals for the prior 12 months, current groundwater levels, and the current Palmer Drought Index. Past years in which watershed conditions most closely resemble current conditions are weighted more heavily in the determination of conditional probability. The historical, or unconditional, probability is based on an analysis of the historical record without weighing for current conditions. The conditional probability of 1 to 4 percent compares to a historical probability of 8 to 15 percent and is considered the more reliable indicator.

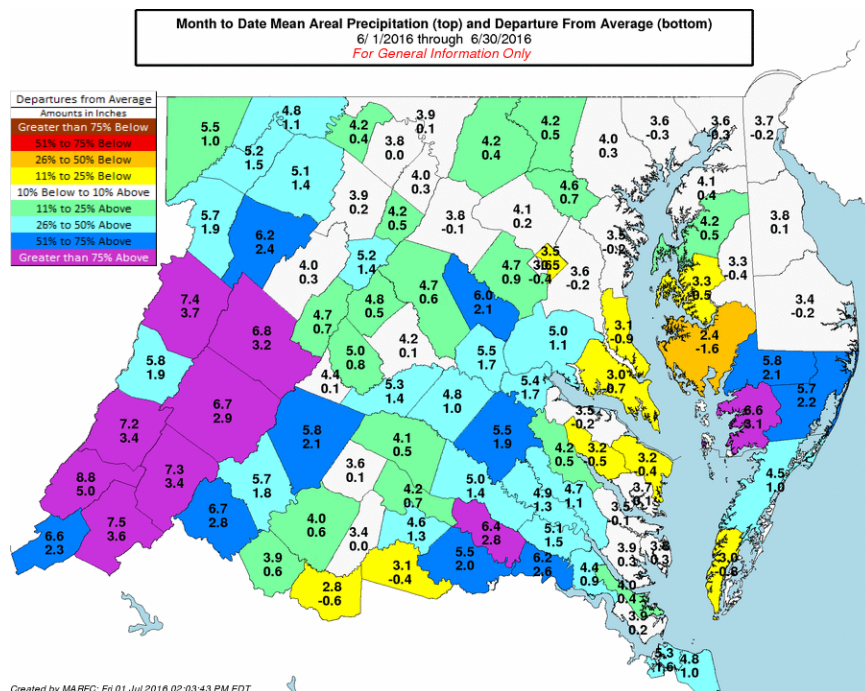
Outlook for natural Potomac River flow at Little Falls – Watershed conditions as of July 8, 2016

<i>Low flow threshold (MGD)</i>	<i>Low flow threshold (cfs)</i>	<i>Historical probability of lower flow July 1 through December 31</i>	<i>Conditional probability of lower flow July 1 through December 31</i>
1200	1858	68%	64%
1000	1548	49%	42%
800	1238	25%	12%
700	1084	15%	4%
600	929	8%	1%

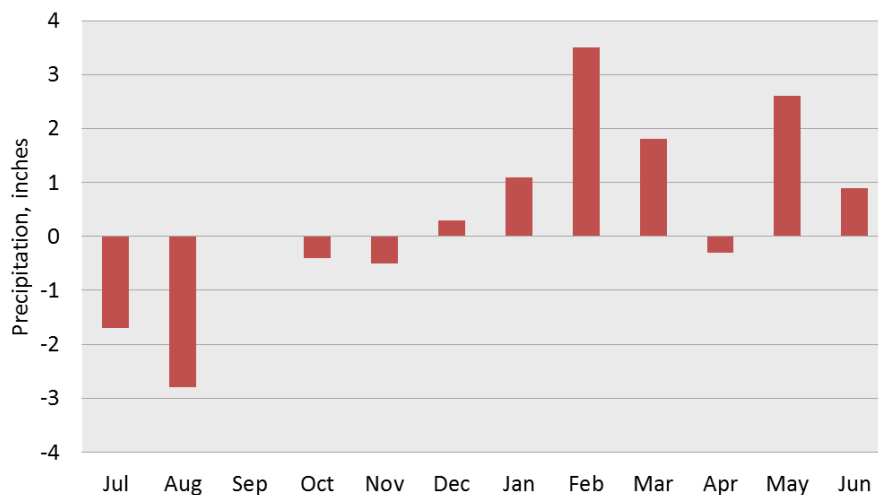
Past Precipitation:

Data from the National Weather Service's Middle Atlantic River Forecast Center (MARFC) shows that the Potomac basin upstream of Washington, D.C. has received a precipitation total of 4.3 inches for the month of June, which is 1.3 inches above normal. The map below shows that June precipitation was greater than 10% above normal across most of the Potomac basin. The 12-month cumulative basin precipitation is now 0.9 inches above normal (see graph).

Source: Middle Atlantic River Forecast Center, National Weather Service

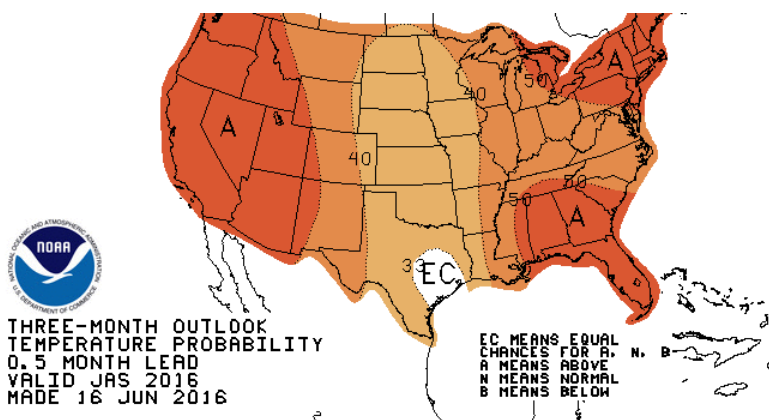


12 month cumulative departure from normal, through June 2016

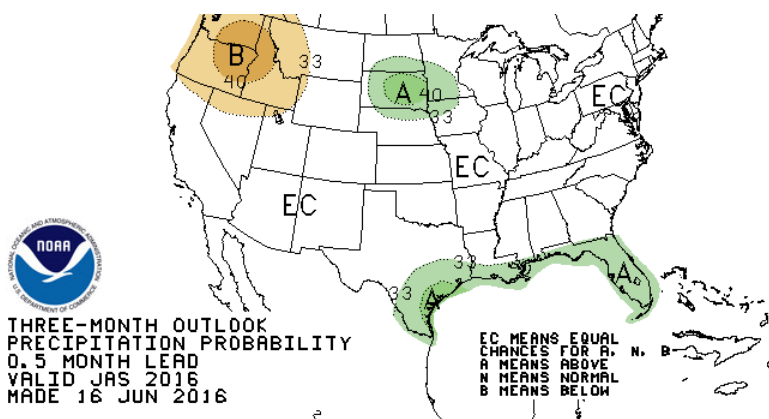


Information provided by the USGS, the Middle Atlantic River Forecast Center, and the National Weather Service.

Precipitation and Drought Outlook for July, August and September 2016:



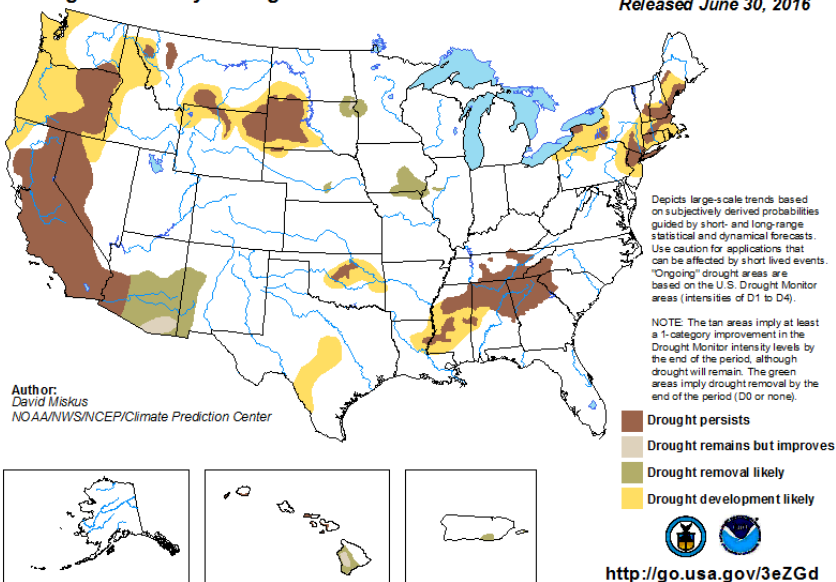
MARFC's Water Resource Outlook for the southern portion of the Middle Atlantic calls for above average rainfall into the middle of July. Temperatures are expected to be above normal.



The National Weather Service Climate Prediction Center's 30-day outlook for July calls for near normal rainfall and above normal temperatures. The 90-day outlook for July through September calls for near normal rainfall and above normal temperature.

U.S. Monthly Drought Outlook Drought Tendency During the Valid Period

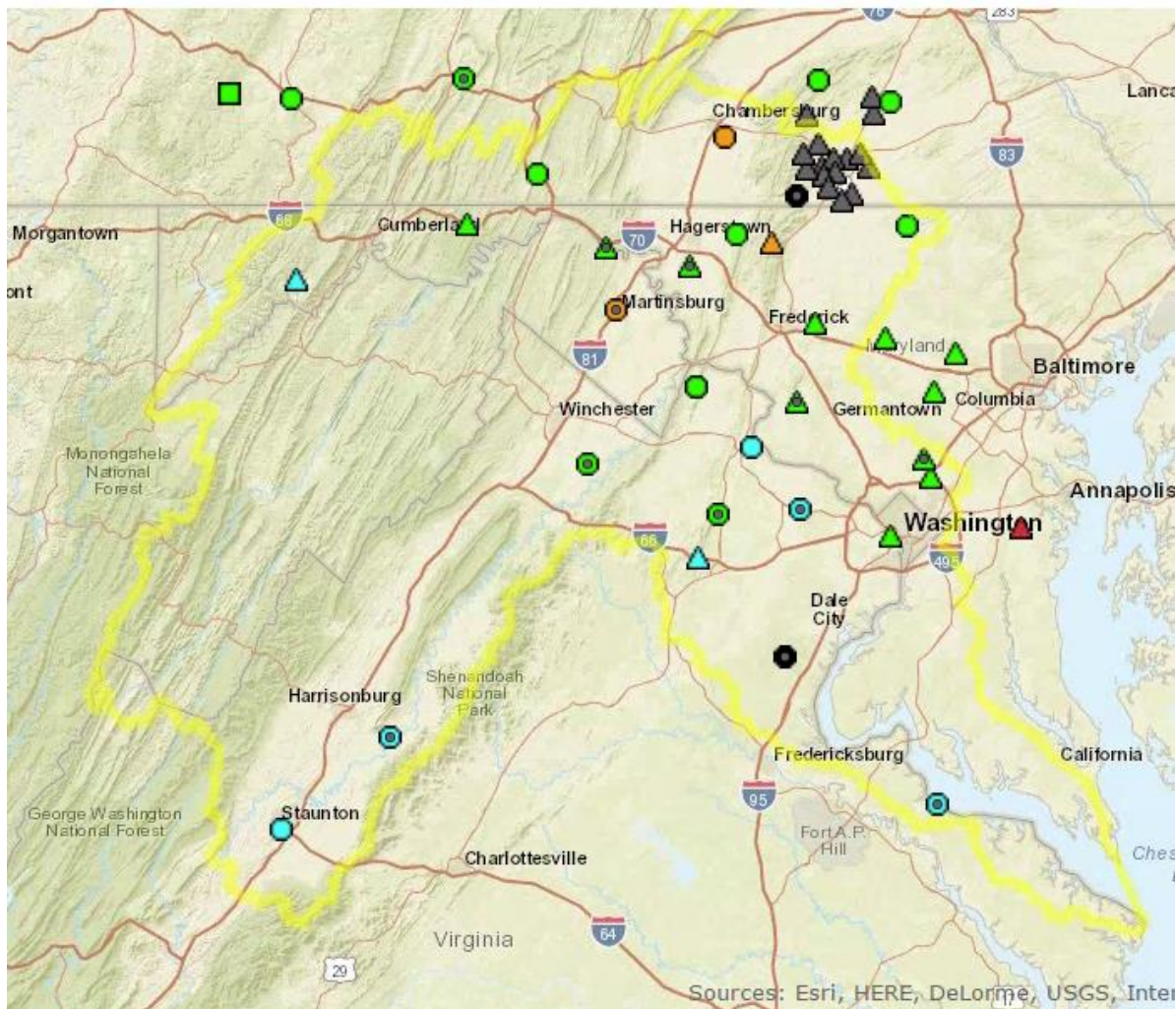
Valid for July 2016
Released June 30, 2016



As of June 30, the Climate Prediction Center's U.S. Seasonal Drought Outlook indicates that drought development is not likely for the Potomac basin.

Groundwater – Current Conditions:

MARFC's Water Resource Outlook for the southern portion of the Middle Atlantic reports that groundwater levels are near or above normal. The groundwater map below, created by the U.S. Geological Survey (USGS), Pennsylvania Water Science Center, shows that current water levels in monitoring wells in the Potomac basin range from "Below Normal" to "Above Normal", with most falling in the "Normal" category. In this map, the USGS defines "Normal" as between the 25th and 75th percentiles.



Wells with a gray dot inside the symbol identify water supply outlook wells

Explanation - Percentile classes (symbol color based on most recent measurement)						
Low	<10	10-24	25-75	76-90	>90	High
	Much Below Normal	Below Normal	Normal	Above Normal	Much Above Normal	Not Ranked

Wells

- Real Time
- Continuous
- Periodic Measurement

Reservoir Storage – Current Conditions:

No water supply releases from the COOP shared system have been made this year.

Information provided by the USGS, the Middle Atlantic River Forecast Center, and the National Weather Service.

Reservoir storage as of July 8 2016

Facility	Percent Full	Current usable storage, BG	Total usable capacity, BG
WSSC's Patuxent reservoirs	97	9.9	10.2
Fairfax Water's Occoquan Reservoir	100	8.1	8.1
Little Seneca Reservoir ¹	99	3.8	3.9
Jennings Randolph water supply ²	100	13.1	13.1
Jennings Randolph water quality ²	100	16.3	16.3
Savage Reservoir ³	91	5.7	6.3

¹ Usable capacity consistent with Ortt, *et al.* (2011).

² 2013 revised stage-storage curve provided by Bill Haines, US Army Corps of Engineers, Baltimore District.

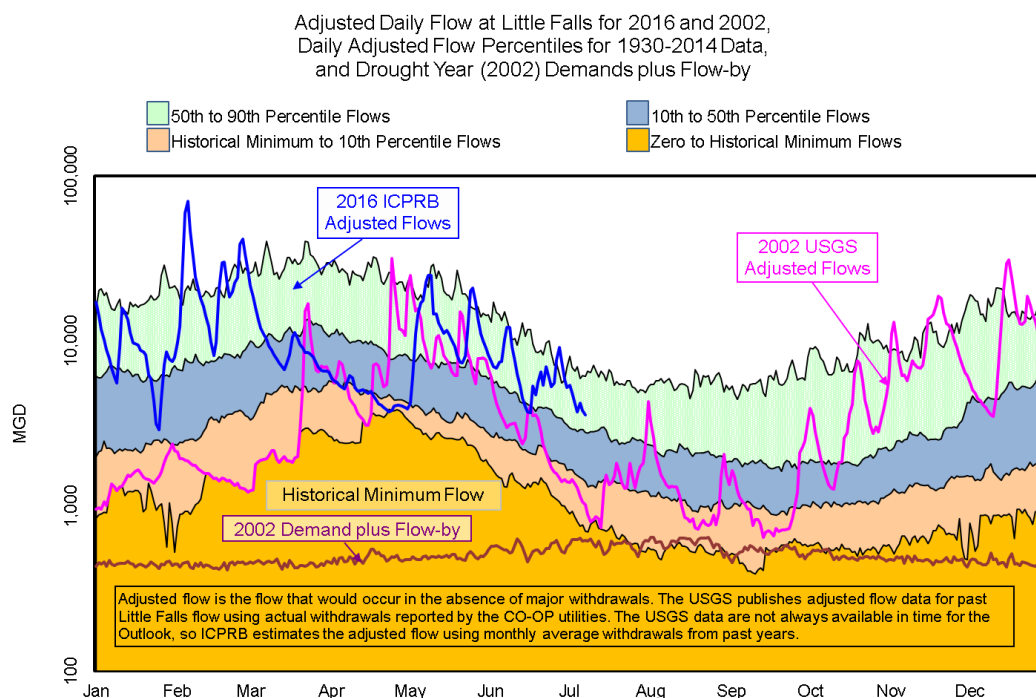
³ 1998 revised stage-storage curve provided by Bill Haines, US Army Corps of Engineers, Baltimore District.

Potomac River Flow:

The estimated adjusted Potomac flow at Little Falls on July 1 was 5.39 billion gallons per day (BGD). For this day of the year, this value was above the historical 50th percentile value of 2.98 BGD and below the 90th percentile value of 8.11 BGD. Adjusted flow, shown in the figure below, is the flow that would occur in the absence of major Washington metropolitan area withdrawals, but includes releases from upstream reservoirs. Adjusted flow averaged 6.79.0 BGD for the past three months and 8.59 BGD in June.

Environmental Flow-by:

Average observed Potomac flow at Little Falls in June was well above the minimum flow recommendation of 100 MGD.

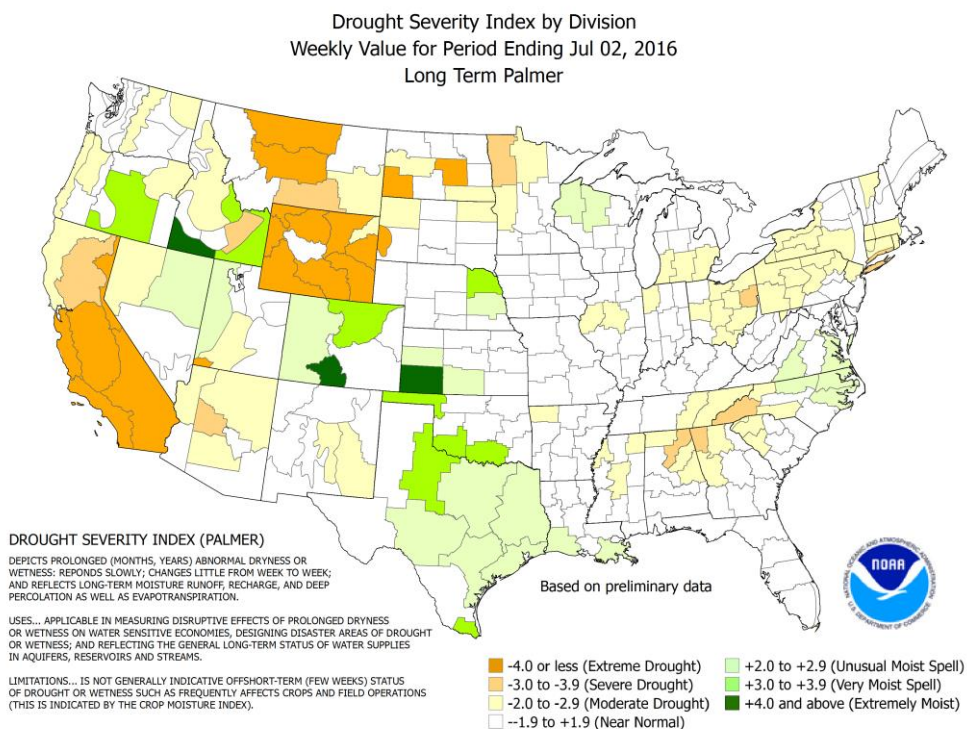
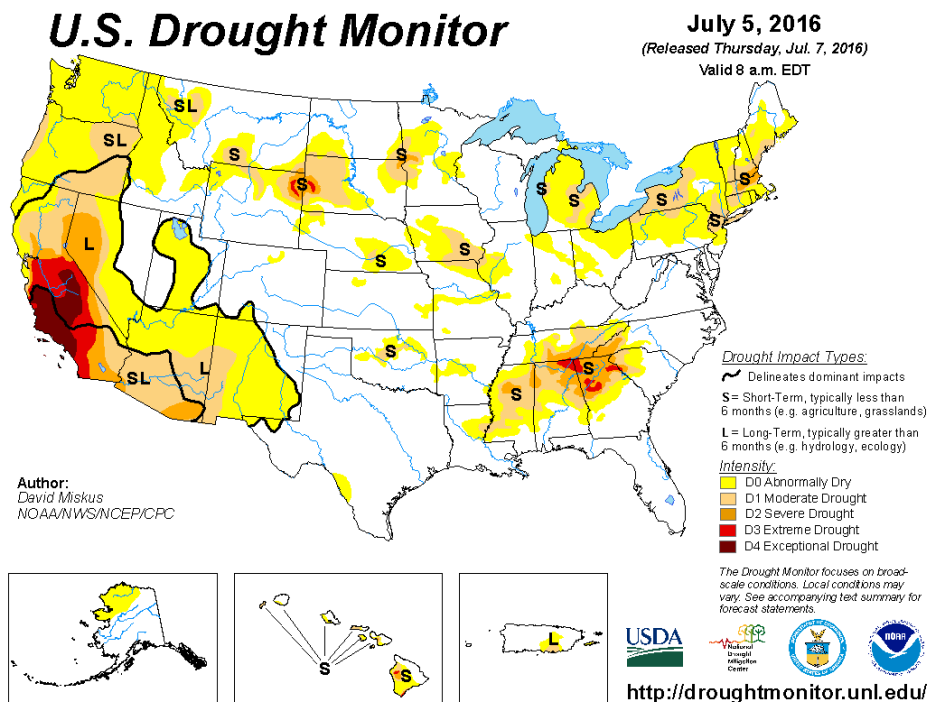


Little Falls flow statistics are based on 1930 through 2014 USGS published gage flow, "USGS 01646502 POTOMAC RIVER (ADJUSTED) NEAR WASH, DC". To create this flow record, the USGS has added historical water supply withdrawals from the Potomac as reported by FW, WSSC, the Aqueduct, and Rockville to the Little Falls gage flow record.

Information provided by the USGS, the Middle Atlantic River Forecast Center, and the National Weather Service.

Drought Monitor and Soil Moisture:

The NOAA Climate Prediction Center's U.S. Drought Monitor map (see first figure below) indicates normal conditions for the Potomac basin. The Palmer Drought Severity Index by Division map (see second figure below) indicates near normal to unusually moist conditions in the basin.



Information provided by the USGS, the Middle Atlantic River Forecast Center, and the National Weather Service.