



Office of the Washington State Climatologist

August 1, 2013

July Event Summary

Mean July temperatures were warmer than normal for a majority of the state, but the noteworthy aspect of July 2013 is how remarkably dry the month was. Though the numbers are still rolling in, preliminary reports indicate that the average statewide precipitation for July 2013 will at least be among the top 5 driest Julys since 1895. (Please check the OWSC Facebook page in the next few weeks for confirmation). Figure 1 shows the total July precipitation for the Pacific Northwest from the PRISM Climate Group; note the extensive area of white on the map, indicating less than 0.01" of precipitation.

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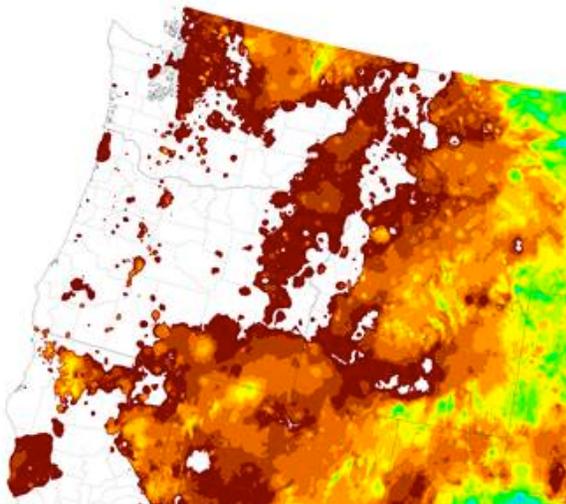
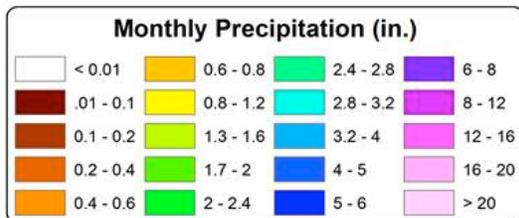


Figure 1: Total July precipitation for the Pacific Northwest. (Data is preliminary; from OSU's PRISM Climate Group).

The lack of rain on the coast is particularly striking. Quillayute Airport, which has been reporting since the mid-1960s, had both its driest July and driest month on record with 0.01" of precipitation. The 2nd driest month at Quillayute recorded 0.12" in September 1991, over a tenth of an inch higher than the record set this July. In Hoquiam, the trace of precipitation received this July ties for the driest July (previously occurred in 2009 and 1960) and the driest month. And finally, the 0.08" of precipitation in Forks ranks as the 4th driest July and 7th driest month on record (records began in 1907). There were other extremely dry locations. No measurable rain was recorded at Seattle Tacoma, Olympia Airport, or Spokane Airport, for example. Even the mountains were parched - Paradise on Mt. Rainier, for example, only recorded 0.01" for the month.

As we approach the most significant time of year for wildfires in WA state, these dry conditions are a concern for wildfires as well as agriculture

in eastern WA. At the time of this writing (August 1), large fires are burning 35 miles northwest of Chelan (Moore Point Fire; lightning-caused on July 28), 12 miles southeast of Wenatchee (Colockum Tarps; cause under investigation), and 15 miles northeast of Goldendale, WA (Mile Marker 28; cause under investigation). Portions of Highway 97 were closed during the last week of July due to the latter fire, and all three of these fires are or were threatening structures.

Summer Water Supply

Despite the extremely dry July conditions across the state, the National Weather Service Northwest River Forecast Center water supply forecast (Figure 2) has not changed much since last month's OWSC newsletter. The forecast projects normal to above normal streamflow for much of the state through September 2013. All western WA rivers and most eastern WA rivers are expected to have normal (90-110%) to above normal (110-125%) streamflow due to the abundant winter snowpack. Lower streamflow than average is projected for southeastern WA - specifically, the Snake River at Lower Granite Dam (50-75%) and just over the border in the Grande Ronde River at Troy, OR (75-90%) and Clearwater River at Spalding, ID (75-90%).

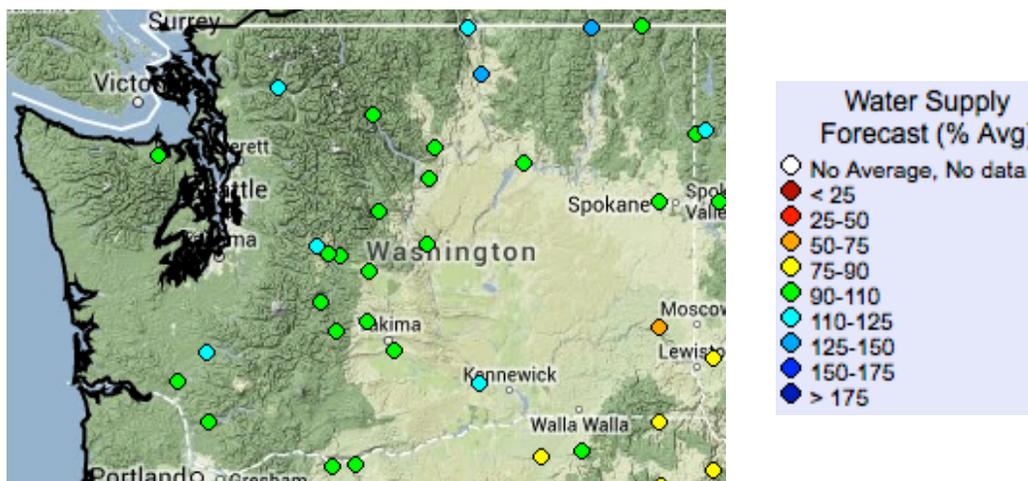


Figure 2: WA streamflow forecast through September 2013 from the NWS Northwest River Forecast Center (released 30 July 2013).

1934 - The Warmest Year in WA State History

A message from the State Climatologist

The devastating Dust Bowl drought of the 1930s is one of the most notable weather and climate events in US history. This drought was not restricted to the Great Plains, but instead at times extended across much of the country. This is exemplified in Figure 3 in terms of a map of the April-May-June 1934 Standard Precipitation Evapotranspiration Index (SPEI). In addition to dry conditions in the Pacific Northwest, 1934 was significant for WA in another way: it was the warmest year in state history.

Figure 4 shows the annual mean temperature time series averaged over WA state (from NCDC). 1934 stands out as the warmest year with an annual average temperature of 50.9°F, 2.9°F over the 20th century long-term average. 1998 and 1958 are tied as the second and third warmest years, with an average annual temperature of 50.5°F. While the overall trend in this time series is negligible compared to the variability, an extremely cold year (more than 2°F below the long-term average) has not happened since 1985.

The monthly temperature anomalies (Figure 5) indicate that the first half of 1934 was the reason the year was so warm as a whole. Temperature anomalies for the months of January through April were between 5 and 7°F above normal. Statewide mean temperatures were closer to normal June through October, but again exceeded 3.5°F above normal in November. Statewide precipitation was about 2" below normal for January through June (not shown);

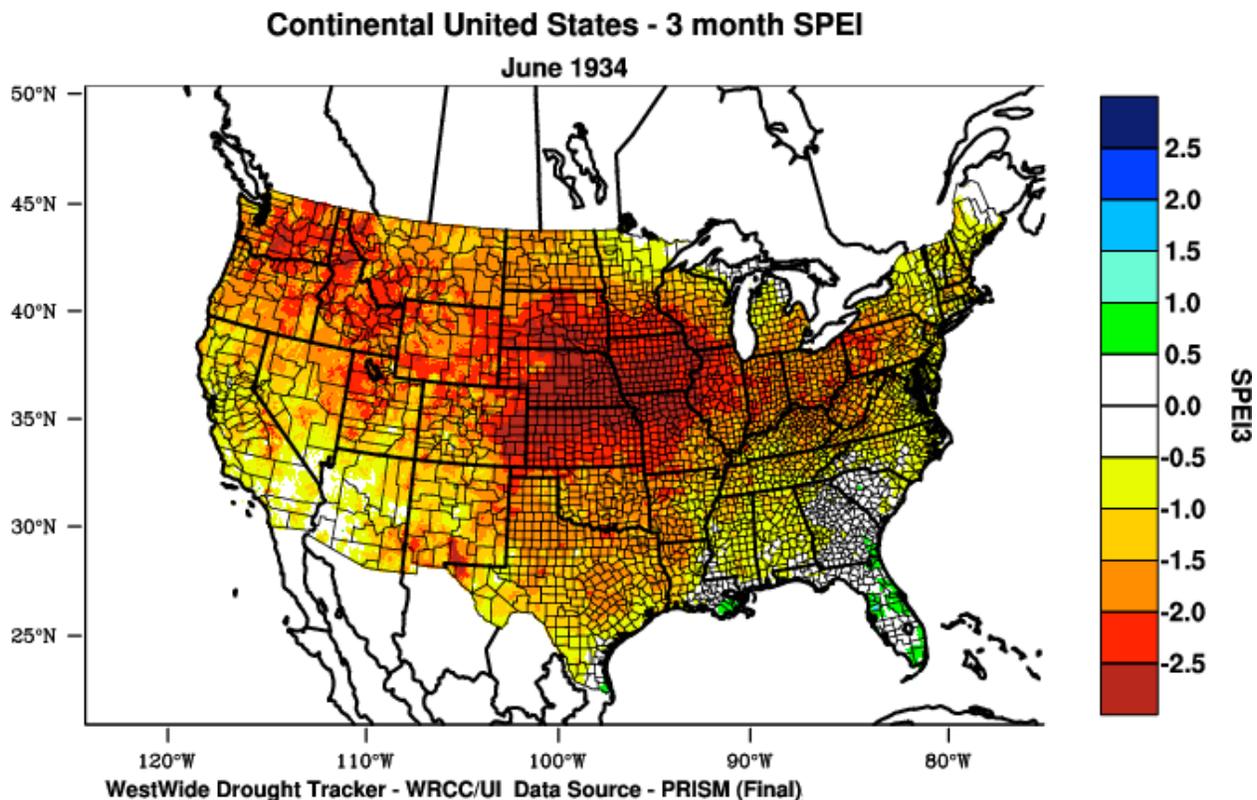


Figure 3: The April-May-June 1934 Standard Precipitation Evapotranspiration Index (SPEI) for the United States (from the Western Regional Climate Center).

the anomalously low precipitation amounts and warm temperatures explain the low SPEI values shown in Figure 3. Total precipitation for 1934 was not unusual on an annual basis, however, as there was over 4" surplus of precipitation in the second half of the year from a statewide perspective.

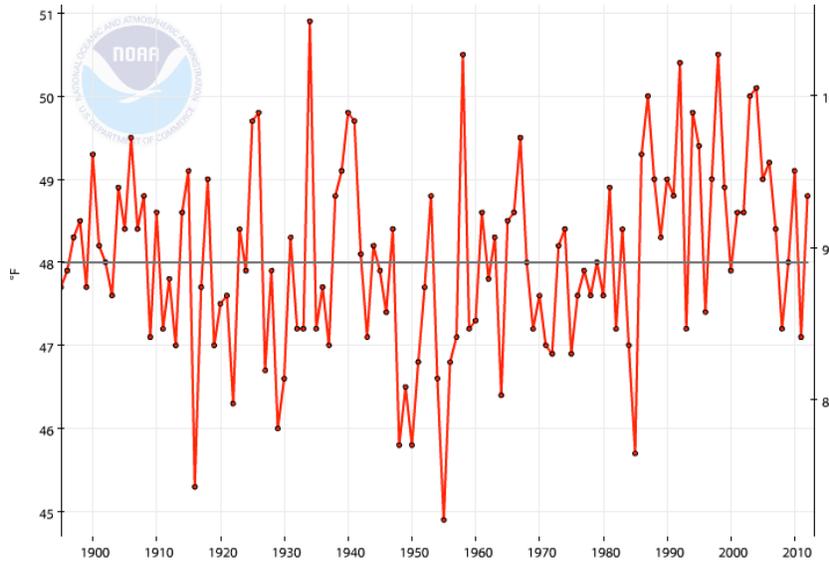


Figure 4: Mean annual temperature for WA 1895-2012 (from the National Climatic Data Center).

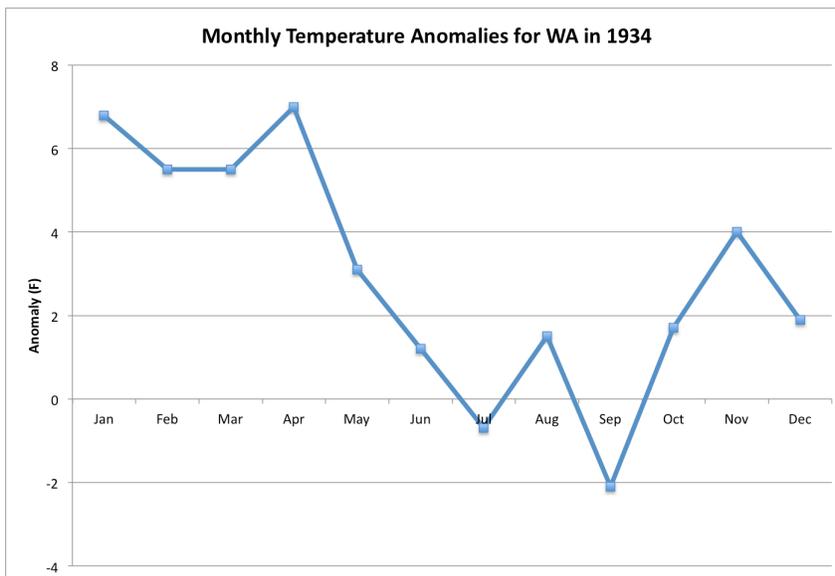


Figure 5: Monthly temperature anomalies (°F) for WA during 1934.

So what caused the anomalous warmth in January through June of 1934? Using the 20th Century Reanalysis product from NOAA-CIRES, the 500 mb geopotential height anomalies for Jan-Jun 1934 were plotted with respect to the 1981-2010 climatology (Figure 6). 500 mb heights in excess of 90 m greater than normal are centered over WA state during that time. The magnitude of these anomalies are about twice the magnitude of the next highest year during the Jan-Jun period in the 20th Century Reanalysis record (1871 through 2012). The warmth during Jan-Jun 1934 can be attributed to this substantial disruption in the atmospheric circulation.

The weather of the US during the 1930s is known for the Dust Bowl, and rightfully so. This summary merely serves to highlight that we experienced extreme conditions in WA state as well, and that 1934 still holds the record as the warmest year in state history. We appreciate the efforts of those that have de-

veloped the products used here, in particular the 20th Century Reanalysis and the Westwide Drought Tracker, that allow us to look back at the weather and climate so far into the past.

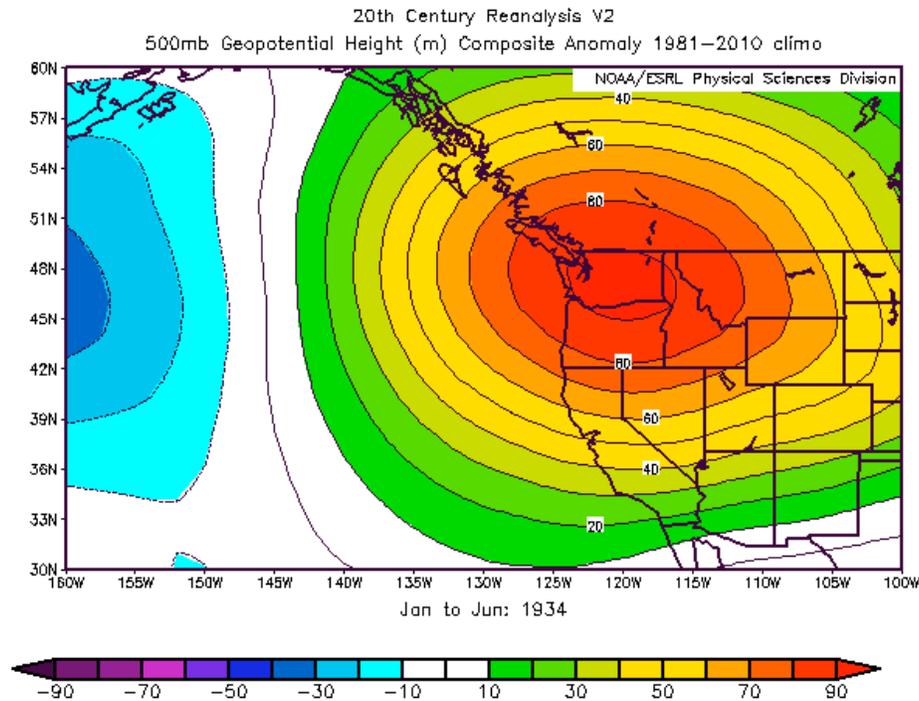


Figure 6: Mean 500 mb geopotential height anomalies (in meters) for January-June 1934 from NOAA's 20th Century Reanalysis.

Community Collaborative Rain, Hail, and Snow Network

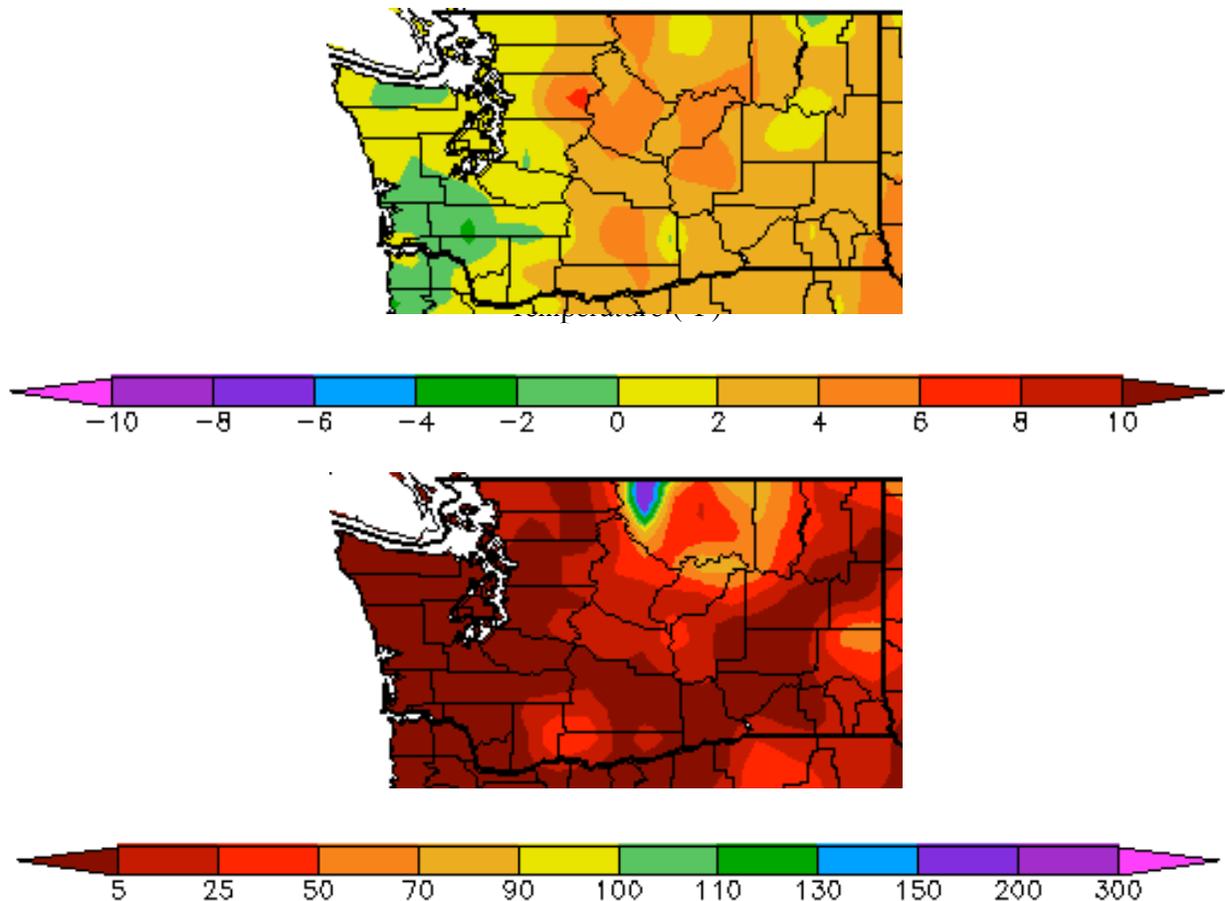
While we may not have had much to measure this month, OWSC appreciates the efforts of our local CoCoRaHS observers. It may be a good time of the year to clean out your gauge - spiders have found the OWSC rain gauge to be quite hospitable. We filled the inner tube with some warm water and mild liquid soap, and let that sit for a few minutes. We then used some rolled up newspaper to twist to the bottom of the inner tube and wipe the dirt from the bottom of the gauge (once it was moistened by the water - it came out rather easily). For more information, please see www.cocorahs.org.

The rain gauge at OWSC recorded 0.10" for July, which all fell overnight on July 16 from some showers and thunderstorms in the region.

Climate Summary

Mean July temperatures were above normal across most of the state, with a few areas in the western portion checking in with below normal monthly temperatures, according to the High Plains Regional Climate Center map below. Temperatures were warmer than normal east of the Cascades, with values ranging between 2 and 6°F above normal. Temperatures west of the Cascades ranged within about 2.5°F of normal, with a tendency to be on the warm side (Table 1).

The phrase “total July precipitation” is nearly an oxymoron when in reference to the last month. As noted above, very little precipitation fell during the month, and most of the state received fewer than 5% of the normal. North central WA was the exception, with total amounting to between about 10 to 50% of normal (Table 1).



July temperature (°F) departure from normal (top) and July precipitation % of normal (bottom). (High Plains Regional Climate Center (<http://www.bprcc.unl.edu>); relative to the 1981-2010 normal).

	Mean Temperature (°F)			Precipitation (inches)		
	Average	Normal	Departure from Normal	Total	Normal	Percent of Normal
Western Washington						
Olympia	64.1	63.8	0.3	T	0.63	0
Seattle WFO	67.1	65.9	1.2	0.03	0.79	4
Sea-Tac	67.9	65.7	2.2	T	0.70	0
Quillayute	61.3	58.9	2.4	0.01	1.98	0.5
Hoquiam	60.0	59.9	0.1	T	1.14	0
Bellingham AP	64.6	62.3	2.3	0.05	1.18	4
Vancouver AP	68.9	68.4	0.5	0	0.69	0
Eastern Washington						
Spokane AP	73.9	69.8	4.1	T	0.64	0
Wenatchee	78.3	74.2	4.1	0.06	0.27	22
Omak	76.0	72.7	3.3	0.26	0.81	32
Pullman AP	67.4	65.6	1.8	0.12	0.69	17
Ephrata	79.2	74.2	5.0	T	0.40	0
Pasco AP	76.8	73.5	3.3	T	0.28	0
Hanford	80.7	77.1	3.6	0.01	0.23	4
Sunnyside	72.6	73.9	-1.3	0	0.14	0

Table 1: July climate summaries for locations around Washington with a climate normal baseline of 1981-2010. Note that the Vancouver Pearson Airport and Seattle WFO 1981-2010 normals involved using surrounding stations in NCDC's new normal release, as records for these station began in 1998 and 1986, respectively.

Climate Outlook

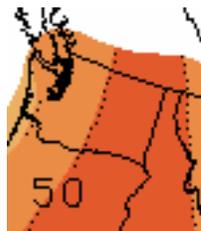
The conditions in the equatorial Pacific Ocean are ENSO-neutral, according to the Climate Prediction Center (CPC): <http://www.cpc.ncep.noaa.gov/>. In the last 4 weeks, sea-surface temperatures (SSTs) have been near-normal in the western and central equatorial Pacific Ocean and below normal in the eastern equatorial Pacific. There is a consensus among the model predictions that near-neutral ENSO conditions will persist through summer 2013, and the models also indicate that neutral conditions are likely to last into the autumn as well.

The CPC three-class outlook for August has increased chances for warmer than normal temperatures for the entire state, with higher chances of warm temperatures for the eastern half of the state. It's a toss up for precipitation: there are equal chances of below, equal to, or above normal precipitation statewide.

The three-month temperature outlook for August-September-October (ASO) has relatively high chances of above normal temperatures statewide. The likelihood of warmer than normal temperatures is higher for eastern WA. As for the August outlook, there are equal chances of below, equal to, or above normal precipitation for ASO.



August outlook for temperature (left) and precipitation (right) from the CPC.



August-September-October outlook for temperature (left) and precipitation (right) from the CPC.

These outlooks are based on a tercile system with three classes: below normal, near normal, and above normal, with the thresholds for these categories such that each class occurs, on average, one-third of the time. In situations for which there are equal chances of each outcome, "EC" is denoted on the map. When the odds are tilted one way or another, "A" and "B" is used to denote above-normal and below-normal, respectively.