Air Quality Modeling Technical Support Document for the Updated 2023 Projected Ozone Design Values

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1. Introduction

In this technical support document (TSD) we describe the air quality modeling performed to project ozone design values[1] at individual monitoring sites to 2023.[2] The 2023 air quality modeling described in this TSD represents an update to the preliminary 2023 air quality modeling which the EPA released as part of the January 2017 Notice of Data Availability.[3] The updated 2023 design values were developed to support interstate ozone transport actions by the EPA and/or states for the 2008 and/or 2015 ozone National Ambient Air Quality Standards (NAAQS). The remaining sections of this TSD are as follows. Section 2 describes the air quality modeling platform and the evaluation of model predictions using measured concentrations. Section 3 defines the procedures for projecting ozone design value concentrations.[4]

2. Air Quality Modeling Platform

The EPA used a 2011-based air quality modeling platform which includes emissions, meteorology and other inputs for 2011 as the base year and emissions for 2023 as the future analytic year base case. Specifically, the modeling platform includes a variety of data that contain information pertaining to the modeling domain and simulation period. These include gridded, hourly emissions estimates and meteorological data, and boundary concentrations. Separate emissions inventories were prepared for the 2011 base year and the 2023 base case. All other inputs (i.e. meteorological fields, initial concentrations, and boundary concentrations) were specified for the 2011 base year model application and remained unchanged for the future-year model simulations. The 2011 modeling platform and projected 2023 emissions were used to drive the 2011 base year and 2023 future case air quality model simulations. The case

[1] The ozone design value for a monitoring site is the 3-year average of the annual fourth-highest daily maximum 8-hour average ozone concentration. The 2009-2013 period includes design values for 2009-2011, 2010-2012, and 2011-2013. Each of these periods includes data from 2011. Thus, the 2009-2013 average design value is commonly referred to as the 5-year weighted average design value since the ozone concentrations that occurred in the 2011 base year are given the most weight. The maximum design value is the highest of the three design values in the period 2009-2013.

[2] The rationale for using 2023 as the future analytic year for projecting ozone design values is described in a memorandum on October 27, 2017 which can be found at https://www.epa.gov/airmarkets/october-2017-memo-and-supplemental-information-interstate-transport-sips-2008-ozone-naaqs.

[3] See Notice of Availability of the Environmental Protection Agency's Preliminary Interstate Ozone Transport Modeling Data for the 2015 Ozone National Ambient Air Quality Standard (NAAQS), 82 FR 1733 (January 6, 2017).

[4] For questions about the information in this TSD please contact Norm Possiel at possiel.norm@epa.gov.

names for the 2011 and 2023 model runs are 2011en and 2023en, respectively. The 2023 emissions used for the modeling to support this proposal reflect updates made in response to comments received on the January 2017 NODA, as described in an emissions inventory TSD (EPA, 2017).

2.1 Air Quality Model Configuration

The Comprehensive Air Quality Model with Extensions (CAMx) version 6.40 with the cb6r4 chemical mechanism (Ramboll Environ, 2016) was used along with measured air quality data to estimate ozone design values in 2023. CAMx is a three-dimensional grid-based Eulerian air quality model designed to simulate the formation and fate of oxidant precursors, primary and secondary particulate matter concentrations, and deposition over regional and urban spatial scales (e.g., the contiguous U.S.). Consideration of the different processes (e.g., transport and deposition) that affect primary (directly emitted) and secondary (formed by atmospheric processes) pollutants at the regional scale in different locations is fundamental to understanding and assessing the effects of emissions on air quality concentrations.

Figure 2-1 shows the geographic extent of the modeling domain that was used for air quality modeling in this analysis. The domain covers the 48 contiguous states along with the southern portions of Canada and the northern portions of Mexico. This modeling domain contains 25 vertical layers with a top at about 17,550 meters, or 50 millibars (mb), and horizontal grid resolution of 12 km x 12 km. The model simulations produce hourly air quality concentrations for each 12 km grid cell across the modeling domain.

Figure 2-1. Map of the modeling domain used for transport modeling.

2.2 Meteorological Data for 2011

The 2011 meteorological data for the air quality modeling of 2011 and 2023 were derived from running Version 3.4 of the Weather Research Forecasting Model (WRF) (Skamarock, et al., 2008). The meteorological outputs from WRF include hourly-varying horizontal wind components (i.e., speed and direction), temperature, moisture, vertical diffusion rates, and rainfall rates for each vertical layer in each grid cell. Selected physics options used in the WRF simulation include Pleim-Xiu land surface model (Xiu and Pleim, 2001; Pleim and Xiu, 2003), Asymmetric Convective Model version 2 planetary boundary layer scheme (Pleim 2007a,b), Kain-Fritsch cumulus parameterization (Kain, 2004) utilizing the moisture-advection trigger (Ma and Tan, 2009), Morrison double moment microphysics (Morrison, et al., 2005; Morrison and Gettelman, 2008), and RRTMG longwave and shortwave radiation schemes (Iacono, et.al., 2008).

The WRF model simulation was initialized using the 12km North American Model (12NAM) analysis product provided by the National Climatic Data Center (NCDC). Where 12NAM data were unavailable, the 40km Eta Data Assimilation System (EDAS) analysis (ds609.2) from the National Center for Atmospheric Research (NCAR) was used. Analysis "nudging" for temperature, wind, and moisture was applied above the boundary layer only.[5] The model simulations were conducted in 5.5-day blocks with soil moisture and temperature carried from one block to the next via the "ipxwrf" program (Gilliam and Pleim, 2010). Land use and land cover data were based on the 2006 National Land Cover Database (NLCD2006) data.[6] Sea surface temperatures at 1 km resolution were obtained from the Group for High Resolution Sea Surface Temperatures (GHRSST) (Stammer, et al., 2003). As shown in Table 2-1, the WRF simulation was performed with 35 vertical layers up to 50 mb, with the thinnest layers being nearest the surface to better resolve the planetary boundary layer (PBL). The WRF 35-layer structure was collapsed to 25 layers for the CAMx air quality model simulations, as shown in Table 2-2.

[5] In analysis "nudging" measured meteorological data are used during the WRF simulation to more closely align the model predictions for certain variables to the corresponding observations.

[6] The 2006 NLCD data are available at http://www.mrlc.gov/nlcd06_data.php

Table 2-1. WRF and CAMx layers and their approximate height above ground level.

CAMx Layers	WRF Layers	Sigma P	Pressure (mb)	Approximate Height (m AGL)
25	35	0.00	50.00	17,556
	34	0.05	97.50	14,780
24	33	0.10	145.00	12,822
	32	0.15	192.50	11,282
23	31	0.20	240.00	10,002
	30	0.25	287.50	8,901
22	29	0.30	335.00	7,932
	28	0.35	382.50	7,064
21	27	0.40	430.00	6,275
	26	0.45	477.50	5,553
20	25	0.50	525.00	4,885
	24	0.55	572.50	4,264
19	23	0.60	620.00	3,683
18	22	0.65	667.50	3,136
17	21	0.70	715.00	2,619
16	20	0.74	753.00	2,226
15	19	0.77	781.50	1,941
14	18	0.80	810.00	1,665
13	17	0.82	829.00	1,485
12	16	0.84	848.00	1,308
11	15	0.86	867.00	1,134
10	14	0.88	886.00	964
9	13	0.90	905.00	797
	12	0.91	914.50	714
8	11	0.92	924.00	632
	10	0.93	933.50	551
7	9	0.94	943.00	470
	8	0.95	952.50	390
6	7	0.96	962.00	311
5	6	0.97	971.50	232
4	5	0.98	981.00	154
	4	0.99	985.75	115
3	3	0.99	990.50	77
2	2	1.00	995.25	38
1	1	1.00	997.63	19

Details of the annual 2011 meteorological model simulation and evaluation are provided in a separate technical support document (US EPA, 2014a) which can be obtained at http://www.epa.gov/ttn/scram/reports/MET_TSD_2011_final_11-26-14.pdf

The meteorological data generated by the WRF simulations were processed using the wrfcamx v4.3 meteorological data processing program (Ramboll Environ, 2014) to create model-ready meteorological inputs to CAMx. In running wrfcamx, vertical eddy diffusivities (Kv) were calculated using the Yonsei University (YSU) mixing scheme (Hong and Dudhia, 2006). We used a minimum Kv of 0.1 m^2/sec except for urban grid cells where the minimum Kv was reset to 1.0 m^2/sec within the lowest 200 m of the surface in order to enhance mixing associated with the nighttime "urban heat island" effect. In addition, we invoked the subgrid convection and subgrid stratoform cloud options in the wrfcamx run.

2.3 Initial and Boundary Concentrations

The lateral boundary and initial species concentrations are provided by a three-dimensional global atmospheric chemistry model, GEOS-Chem (Yantosca, 2004) standard version 8-03-02 with 8-02-01 chemistry. The global GEOS-Chem model simulates atmospheric chemical and physical processes driven by assimilated meteorological observations from the NASA's Goddard Earth Observing System (GEOS-5; additional information available at: http://gmao.gsfc.nasa.gov/GEOS/ and http://wiki.seas.harvard.edu/geos-chem/index.php/GEOS-5). This model was run was performed for 2011 using a grid resolution of 2.0 degrees x 2.5 degrees (latitude-longitude). The predictions from the global model provided one-way dynamic boundary concentrations at one-hour intervals and an initial concentration field for the CAMx simulations. The 2011 boundary concentrations from GEOS-Chem were used for the 2011 and 2023 model simulations.[7] The procedures for translating GEOS-Chem predictions to initial and boundary concentrations are described elsewhere (Henderson, 2014). More information about the GEOS-Chem model and other applications using this tool is available at: http://www-as.harvard.edu/chemistry/trop/geos.

[7] The initial and boundary concentration data used for the updated 2023 modeling are the same as the initial and boundary condition data EPA used for the final CSAPR Update air quality modeling.

2.4 Emissions Inventories

CAMx requires detailed emissions inventories containing temporally-allocated (i.e., hourly) emissions for each grid-cell in the modeling domain for a large number of chemical species that act as primary pollutants and precursors to secondary pollutants. Annual emission inventories for 2011 and 2023 were preprocessed into CAMx-ready inputs using the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system (Houyoux et al., 2000).[8] Information on the emissions inventories used as input to the CAMx model simulations can be found in the emissions inventory technical support document (EPA, 2017).

2.5 Air Quality Model Evaluation

As part of the preliminary modeling performed for the January 2017 NODA, we conducted an operational model performance evaluation for ozone to examine the ability of the modeling system to simulate 2011 measured concentrations. This evaluation focused on graphical analyses and statistical metrics of model predictions versus observations. Since there were no notable changes in the 2011en emissions case compared to the 2011el case used for the NODA, the model performance results from the 2011el modeling are applicable for the 2011en modeling. Details on the evaluation methodology, the calculation of performance statistics, and results are provided in Appendix A. Overall, the 2011 CAMx model performance statistics are within or close to the ranges found in other recent peer-reviewed applications (e.g., Simon et al, 2012). As described in Appendix A, the predictions from the 2011 modeling platform correspond closely to observed concentrations in terms of the magnitude, temporal fluctuations, and geographic differences for 8-hour daily maximum ozone. Thus, the model performance results demonstrate the scientific credibility of our 2011 modeling platform. These results provide confidence in the ability of the modeling platform to provide a reasonable projection of expected future year ozone concentrations.

3. 2023 Ozone Design Values

The ozone predictions from the 2011 and 2023 CAMx model simulations were used to project 2009-2013 average and maximum ozone design values to 2023 following the approach described in the EPA's draft guidance for attainment demonstration modeling (US EPA, 2014b). This guidance recommends using model predictions from the "3 x 3" array of grid

[8] The SMOKE output emissions case name for the 2011 base year is "2011el_cb6v2_v6_11g" and the emissions case name for the 2023 base case is "2023el_cb6v2_v6_11g".

cells[9] surrounding the location of the monitoring site to calculate a Relative Response Factor (RRF) for that site.[10] The 2009-2013 average and maximum design values are multiplied by the RRF to project each of these design values to 2023. In this manner, the projected design values are grounded in monitored data, and not the absolute model-predicted 2023 concentrations.

In light of comments on the January 2017 NODA and other analyses, EPA also projected 2023 design values based on a modified version of the "3 x 3" approach for those monitoring sites located in coastal areas. In this alternative approach, we eliminated from the RRF calculations the modeling data in those grid cells that are dominated by water (i.e., more than 50 percent of the area in the grid cell is water) and that do not contain a monitoring site (i.e., if a grid cell is more than 50 percent water but contains an air quality monitor, that cell would remain in the calculation). The choice of more than 50 percent of the grid cell area as water as the criteria for identifying overwater grid cells is based on the treatment of land use in WRF. Specifically, in the WRF meteorological model those grid cells that are greater than 50 percent overwater are treated as being 100 percent overwater. In such cases the meteorological conditions in the entire grid cell reflect the vertical mixing and winds over water, even if part of the grid cell also happens to be over land with land-based emissions, as can often be the case for coastal areas. Overlaying land-based emissions with overwater meteorology may be representative conditions at coastal monitors during times of on-shore flow associated with synoptic conditions and/or sea-breeze or lake-breeze wind flows. But there may be other times, particularly with off-shore wind flow when vertical mixing of land-based emissions may be too limited due to the presence of overwater meteorology. Thus, for our modeling we provide projected 2023 projected average and maximum design values at individual monitoring sites based on both the "3 x 3" approach as well as the alternative approach that eliminates overwater cells in the RRF calculation for near-coastal areas.

The base period 2009-2013 average and maximum design values and the two sets of

[9] As noted above, each model grid cell is 12 x 12 km.

[10] The relative response factor represents the change in ozone based on emission changes at a given site. In order to calculate the RRF, EPA's modeling guidance recommends selecting the 10 highest ozone days in an ozone season at any given monitor in the model run's base year, noting which of the grid cells in the 3x3 array experienced the highest ozone concentrations in the base year, and averaging those ten highest concentrations. The model is then run using the projected year emissions, in this case 2023, with all other model variables held constant. Ozone concentrations from the same ten days, in the same ten grid cells, are then averaged. The fractional change between the base year (2011 model run) averaged ozone concentrations and the future year (2023 model run) averaged ozone concentrations represents the relative response factor.

2023 average and maximum design values, using the two alternative approaches explained above, along with the 2014-2016 measured design values at individual sites are provided in Appendix B. These data are also available at https://www.epa.gov/airmarkets/october-2017-memo-and-supplemental-information-interstate-transport-sips-2008-ozone-naaqs.

We evaluated the 2023 projected average and maximum design values in conjunction with the most recent measured ozone design values (i.e., 2014-2016) to identify sites that are projected to be nonattainment or maintenance receptors for the 2008 NAAQS in 2023 using the approach in the CSAPR Update. Sites with a projected 2023 average design value that exceeds the 2008 NAAQS[11] and that are currently measuring nonattainment for this NAAQS are identified as nonattainment receptors in 2023. Similarly, monitoring sites with a projected 2023 maximum design value that exceeds the 2008 NAAQS are projected to be maintenance receptors in 2023 for this NAAQS. In the CSAPR Update approach, maintenance-only receptors include both those monitoring sites where the projected 2023 average design value is below the 2008 NAAQS, but the maximum design value is above this NAAQS, and monitoring sites with projected 2023 average and maximum design values that exceed the 2008 NAAQS, but for which current design values based on measured data do not exceed the NAAQS.

As evident from the data in Appendix B, the EPA's updated 2023 modeling, using either the "3 x 3" approach or the alternative approach for near-coastal areas, indicates that there are no monitoring sites outside of California that are projected to have nonattainment or maintenance problems with respect to the 2008 ozone NAAQS in 2023. For the 2015 NAAQS, the data in Appendix B indicate that there are 25 monitoring sites outside of California that are projected to have 2023 average and/or maximum projected design values that exceed the 2015 ozone NAAQS in 2023.[12]

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[11] In determining compliance with the 2008 and NAAQS, ozone design values are truncated to integer values. A design value of 75.9 parts per billion (ppb) is truncated to 75 ppb which is attainment. In this manner, design values at or above 76.0 ppb are considered to be violations of the 2008 NAAQS. Similarly, a design value of 70.9 ppb is truncated to 70 ppb which is attainment.

[12] The design value data in Appendix B indicate that site 550790085 in Milwaukee Co., WI has projected average and maximum design values that exceed the 2015 NAAQS in 2023 based on the "No Water Cell" approach, but not the "3 x 3" approach. Conversely, site 360850067 in Richmond Co., NY has projected average and maximum design values that exceed the 2015 NAAQS in 2023 based on the "3 x 3" approach, but not the "No Water Cell" approach.

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Appendix A

2011 Model Performance Evaluation

An operational model evaluation was conducted for the 2011 base year CAMx v6.32 simulation performed for the 12 km U.S. modeling domain. The purpose of this evaluation is to examine the ability of the 2011 air quality modeling platform to represent the magnitude and spatial and temporal variability of measured (i.e., observed) ozone concentrations within the modeling domain. The evaluation presented here is based on model simulations using the 2011 emissions platform (i.e., scenario name 2011el_cb6r4_v6_11g). The model evaluation for ozone focuses on comparisons of model predicted 8-hour daily maximum concentrations to the corresponding observed data at monitoring sites in the EPA Air Quality System (AQS) and the Clean Air Status and Trends Network (CASTNet). The locations of the ozone monitoring sites in these two networks are shown in Figures A-1a and A-1b.

Included in the evaluation are statistical measures of model performance based upon model-predicted versus observed concentrations that were paired in space and time. Model performance statistics were calculated for several spatial scales and temporal periods. Statistics were calculated for individual monitoring sites, and in aggregate for monitoring sites within each state and within each of nine climate regions of the 12 km U.S. modeling domain. The regions include the Northeast, Ohio Valley, Upper Midwest, Southeast, South, Southwest, Northern Rockies, Northwest and West[1,2], which are defined based upon the states contained within the National Oceanic and Atmospheric Administration (NOAA) climate regions (Figure A-2)[3] as defined in Karl and Koss (1984).

[1] The nine climate regions are defined by States where: Northeast includes CT, DE, ME, MA, MD, NH, NJ, NY, PA, RI, and VT; Ohio Valley includes IL, IN, KY, MO, OH, TN, and WV; Upper Midwest includes IA, MI, MN, and WI; Southeast includes AL, FL, GA, NC, SC, and VA; South includes AR, KS, LA, MS, OK, and TX; Southwest includes AZ, CO, NM, and UT; Northern Rockies includes MT, NE, ND, SD, WY; Northwest includes ID, OR, and WA; and West includes CA and NV.

[2] Note most monitoring sites in the West region are located in California (see Figures 2A-2a and 2A-2b), therefore statistics for the West will be mostly representative of California ozone air quality.

[3] NOAA, National Centers for Environmental Information scientists have identified nine climatically consistent regions within the contiguous U.S., http://www.ncdc.noaa.gov/monitoring-references/maps/us-climate-regions.php.

For maximum daily average 8-hour (MDA8) ozone, model performance statistics were created for the period May through September.[4] The aggregate statistics by state and by climate region are presented in this appendix. Model performance statistics for MDA8 ozone at individual monitoring sites based on days with observed values $\geq$ 60 ppb can be found in the docket in the file named "2015 O3 NAAQS Preliminary Transport Assessment_2011 Ozone Model Performance Statistics by Site".

In addition to the above performance statistics, we prepared several graphical presentations of model performance for MDA8 ozone. These graphical presentations include:
(1) maps that show the mean bias and error as well as normalized mean bias and error calculated for MDA8 ≥ 60 ppb for May through September at individual AQS and CASTNet monitoring sites;
(2) bar and whisker plots that show the distribution of the predicted and observed MDA8 ozone concentrations by month (May through September) and by region and by network; and
(3) time series plots (May through September) of observed and predicted MDA8 ozone concentrations for selected monitoring sites.

The Atmospheric Model Evaluation Tool (AMET) was used to calculate the model performance statistics used in this document (Gilliam et al., 2005). For this evaluation we have selected the mean bias, mean error, normalized mean bias, and normalized mean error to characterize model performance, statistics which are consistent with the recommendations in Simon et al. (2012) and the draft photochemical modeling guidance (U.S. EPA, 2014a).

Mean bias (MB) is the average of the difference (predicted – observed) divided by the total number of replicates (*n*). Mean bias is given in units of ppb and is defined as:

MB = $\frac{1}{n}\sum_{1}^{n}(P - O)$, where P = predicted and O = observed concentrations

Mean error (ME) calculates the absolute value of the difference (predicted - observed) divided by the total number of replicates (*n*). Mean error is given in units of ppb and is defined as:

[4] In calculating the ozone season statistics we limited the data to those observed and predicted pairs with observations that are $\geq$ 60 ppb in order to focus on concentrations at the upper portion of the distribution of values.

$$\text{ME} = \frac{1}{n}\sum_1^n |P - O|$$

Normalized mean bias (NMB) is the average the difference (predicted - observed) over the sum of observed values. NMB is a useful model performance indicator because it avoids over inflating the observed range of values, especially at low concentrations. Normalized mean bias is given in percentage units and is defined as:

$$\text{NMB} = \frac{\sum_1^n (P-O)}{\sum_1^n (O)} * 100$$

Normalized mean error (NME) is the absolute value of the difference (predicted - observed) over the sum of observed values. Normalized mean error is given in percentage units and is defined as:

$$\text{NME} = \frac{\sum_1^n |P-O|}{\sum_1^n (O)} * 100$$

As described in more detail below, the model performance statistics indicate that the 8-hour daily maximum ozone concentrations predicted by the 2011 CAMx modeling platform closely reflect the corresponding 8-hour observed ozone concentrations in each region of the 12 km U.S. modeling domain. The acceptability of model performance was judged by considering the 2011 CAMx performance results in light of the range of performance found in recent regional ozone model applications (NRC, 2002; Phillips et al., 2007; Simon et al., 2012; U.S. EPA, 2005; U.S. EPA, 2009; U.S. EPA, 2010).[5] These other modeling studies represent a wide

[5] National Research Council (NRC), 2002. Estimating the Public Health Benefits of Proposed Air Pollution Regulations, Washington, DC: National Academies Press.

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range of modeling analyses that cover various models, model configurations, domains, years and/or episodes, chemical mechanisms, and aerosol modules. Overall, the ozone model performance results for the 2011 CAMx simulations are within the range found in other recent peer-reviewed and regulatory applications. The model performance results, as described in this document, demonstrate that the predictions from the 2011 modeling platform correspond closely to observed concentrations in terms of the magnitude, temporal fluctuations, and geographic differences for 8-hour daily maximum ozone.

The 8-hour ozone model performance bias and error statistics by network for the period May-September for each region and each state are provided in Tables A-1 and A-2, respectively. The statistics shown were calculated using data pairs on days with observed 8-hour ozone of ≥ 60 ppb. The distributions of observed and predicted 8-hour ozone by month in the period May through September for each region are shown in Figures A-3 through A-11. Spatial plots of the mean bias and error as well as the normalized mean bias and error for individual monitors are shown in Figures A-12 through A-15.

Time series plots of observed and predicted MDA 8-hour ozone during the period May through September at selected sites are provided in Figure A-16, (a) through (x). Overall, model performance for MDA8 ozone concentrations for the 2011 CAMx v6.32 simulation is similar to what was found in the model performance evaluation conducted for the 2011 CAMx v6.20 simulation performed for the final CSAPR Update.

As indicated by the statistics in Table A-1, bias and error for 8-hour daily maximum ozone are relatively low in each region. Generally, mean bias for 8-hour ozone ≥ 60 ppb during the period May through September is within ± 5 ppb[6] at AQS and CASTNet sites in four of the eastern climate regions (i.e., Northeast, Ohio Valley, Upper Midwest, and Southeast). The mean error is 10 ppb or less in all regions, except the West. Normalized mean bias is within ± 5

U.S. Environmental Protection Agency, 2010, Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis. EPA-420-R-10-006. February 2010. Sections 3.4.2.1.2 and 3.4.3.3. Docket EPA-HQ-OAR-2009-0472-11332. (http://www.epa.gov/oms/renewablefuels/420r10006.pdf)

Simon, H., Baker, K.R., and Phillips, S. (2012) Compilation and interpretation of photochemical model performance statistics published between 2006 and 2012. *Atmospheric Environment* **61**, 124-139.

[6] Note that "within ± 5 ppb" includes values that are greater than or equal to -5 ppb and less than or equal to 5 ppb.

percent for AQS sites in the Northeast, Ohio Valley, Southeast, with somewhat larger values in the Upper Midwest and South where the normalized mean bias is also relatively low at -5.9 percent and -7.6 percent, respectively. The mean bias and normalized mean bias statistics indicate a tendency for the model to under predict MDA8 ozone concentrations in the western regions for AQS and CASTNet sites. The normalized mean error is less than 15 percent for both networks in all regions, except for the CASTNet sites in the Northern Rockies and West regions. Looking at model performance for individual states (Table A-2) indicates that mean bias is within ± 5 ppb for a majority of the states and within ± 10 ppb for all but two states. The mean error is less than 10 ppb for nearly all states. The normalized mean bias is within ± 10 percent in except for California, Idaho, Nevada, North Dakota, South Dakota, and Wyoming where the normalized mean bias ranges from - 10.3 percent (Nevada) to - 23.7 percent (North Dakota) . The normalized mean error is within 15 percent for all but three states (Idaho, North Dakota, and South Dakota) and the District of Columbia.

The monthly distributions of 8-hour daily maximum model predicted ozone generally corresponds well with that of the observed concentrations, as indicated by the graphics in Figures A-3 through A-11. The distribution of predicted concentrations tends to be close to that of the observed data at the 25^{th} percentile, median and 75th percentile values for each region, although there is a persistent overestimation bias in the Northeast, Ohio Valley, and Southeast regions, and a tendency for under-prediction in some months for the western regions (i.e., Southwest, Northern Rockies, Northwest,[7] and West), particularly at CASTNet sites in the West region.

Figures A-12 through A-15 show the spatial variability in bias and error at monitor locations. Mean bias, as seen from Figure A-12, is within ± 5 ppb at many sites across the East with over-prediction of 5 to 10 ppb or more at some of the sites from the Southeast into the Northeast. Elsewhere in the U.S., mean bias is generally in the range of -5 to -10 ppb. The most notable exception is in portions of California where the mean bias is in the range of -10 to -15 ppb at a number of interior sites. Figure A-13 indicates that the normalized mean bias for days with observed 8-hour daily maximum ozone ≥ 60 ppb is within ± 10 percent at the vast majority of monitoring sites across the modeling domain. There are regional differences in model

[7] Note that the over-prediction at CASTNet sites in the Northwest seen in Figure A-10 may not be representative of performance in rural areas of this region because there are so few observed and predicted data values in this region.

performance, where the model tends to over-predict at some sites from the Southeast into the Northeast and generally under predict, mainly within the range of - 10 to - 20 percent, at sites in the Southwest, Northern Rockies, and West. Model performance in the Ohio Valley and Upper Midwest states shows that most sites are within $\pm$ 10 percent with only a relatively few sites outside of this range.

Model error, as seen from Figure A-14, is generally 10 ppb or less at most of the sites across the modeling domain. Figure A-15 indicates that the normalized mean error for days with observed 8-hour daily maximum ozone $\geq$ 60 ppb is within 15 percent at the vast majority of monitoring sites across the modeling domain. Somewhat greater error (i.e., 15 to 20 percent) is evident at sites in several areas of the domain, most notably within portions of interior California.

In addition to the above analysis of overall model performance, we also examine how well the modeling platform replicates day to day fluctuations in observed 8-hour daily maximum concentrations using data for selected monitoring sites. For this site-specific analysis we present the time series of observed and predicted 8-hour daily maximum concentrations by site over the period May through September. The results, as shown in Figures A-16 (a) through (v), indicate that the modeling platform generally replicates the day-to-day variability in ozone during this time period at these sites. That is, days with high modeled concentrations are generally also days with high measured concentrations and, conversely, days with low modeled concentrations are also days with low measured concentrations in most cases.[8] For example, model predictions at several sites not only accurately capture the day-to-day variability in the observations, but also appear to have relatively low bias on individual days: Queens County, NY; Richmond County, NY; and Suffolk County, NY. The sites in Fairfield County, CT, New Haven County, CT, Harford County, MD, and Allegan County, MI each track closely with the observations, but there is a tendency to over predict on several of the observed high ozone days. Other sites generally track well and capture day-to-day variability but underestimate ozone on some of the days with

[8] At site 060250005 in Imperial County, CA, the model predicted MDA8 concentrations were generally within the range of the corresponding observed values from May through early July. The monitor may have been offline during much of July since there are no measured data in AQS during this time period. When data became available again in late July, the measurements were notably lower than the predictions and also lower than the observations during May and June. The reasons for the difference in observed concentrations and model performance before versus after the break in the data record are not clear.

measured high ozone concentrations: Douglas County, CO; Jefferson County, CO; Wayne County, MI; Brazoria County, TX; Denton County, TX; Harris County, TX; Tarrant County, TX; and Sheboygan County, WI. Note that at the site in Brazoria County, TX and at the Harris County, TX sites, the model tends to over predict ozone on days with low observed concentrations. In particular, there is an extended period from mid-July to mid-August with very low observed ozone concentrations, mainly in the range of 30 to 40 ppb. The model also predicts generally low ozone concentrations at these sites during this period, but the modeled values were in the range of 40 to 60 ppb which is not quite as low as the observed values. Looking across all 24 sites indicates that the modeling platform is able to capture both the site-to-site differences in the short-term (i.e., day-to-day) variability and the general magnitude of the observed ozone concentrations.

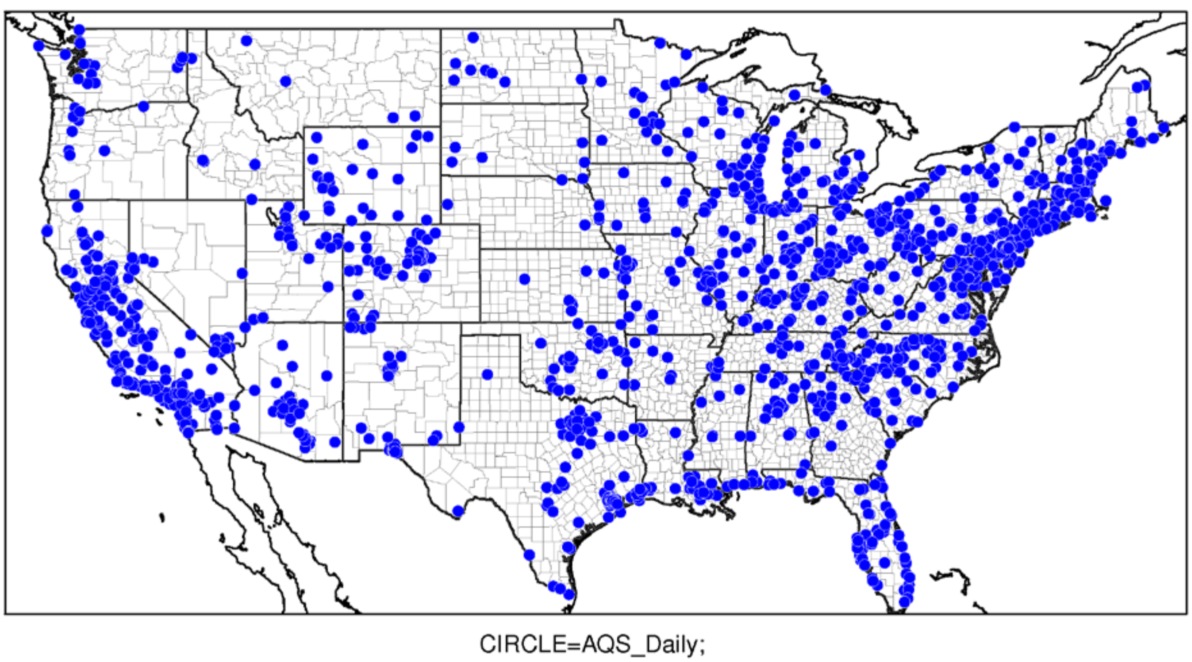

Figure A-1a. AQS ozone monitoring sites.

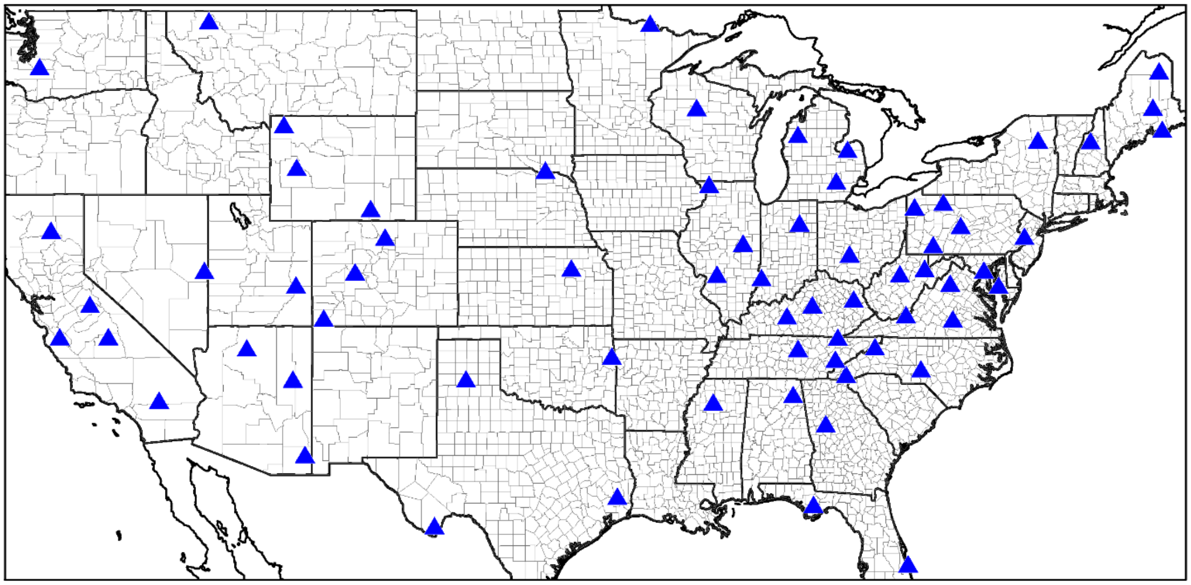

Figure A-1b. CASTNet ozone monitoring sites.

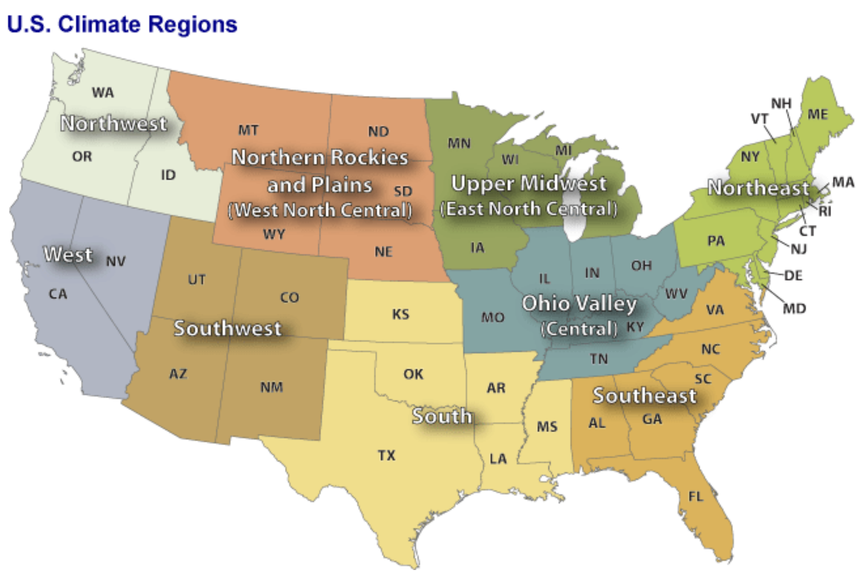

Figure A-2. NOAA climate regions (source: http://www.ncdc.noaa.gov/monitoring-references/maps/us-climate-regions.php#references)

Table A-1. Performance statistics for MDA8 ozone $\geq$ 60 ppb for May through September by climate region, for AQS and CASTNet networks.

Network	Climate Region	No. of Obs	MB (ppb)	ME (ppb)	NMB (%)	NME (%)
AQS	Northeast	4085	1.2	7.3	1.8	10.7
	Ohio Valley	6325	-0.6	7.5	-0.9	11.1
	Upper Midwest	1162	-4.0	7.6	-5.9	11.1
	Southeast	4840	2.3	6.8	3.4	10.2
	South	5694	-5.3	8.4	-7.6	12.2
	Southwest	6033	-6.2	8.5	-9.4	12.9
	Northern Rockies	380	-7.2	8.4	-11.4	13.4
	Northwest	79	-5.6	9	-8.7	14.0
	West	8655	-8.6	10.3	-12.2	14.5
CASTNet	Northeast	264	1.2	5.9	1.9	8.8
	Ohio Valley	433	-3.0	6.5	-4.5	9.7
	Upper Midwest	38	-4.6	6.0	-6.8	9.0
	Southeast	201	0.1	5.2	0.2	8.1
	South	215	-8.2	8.8	-12.3	13.2
	Southwest	382	-8.8	9.6	-13.4	14.6
	Northern Rockies	110	-9.7	10.0	-15.3	15.7
	Northwest	-	-	-	-	-
	West	425	-13.6	13.9	-18.7	19.1

Table A-2. Performance statistics for MDA8 ozone $\geq$ 60 ppb for May through September by state based on data at AQS network sites.

State	No. of Obs	MB (ppb)	ME (ppb)	NMB (%)	NME (%)
AL	739	2.9	6.9	4.4	10.4
AZ	2334	-5.8	9.1	-8.8	13.7
AR	252	-4.2	8.7	-6.1	12.9
CA	7533	-8.9	10.6	-12.4	14.8
CO	2067	-6.6	8.4	-9.9	12.6
CT	245	1.5	9.7	2.1	13.6
DE	232	1.3	6.5	1.9	9.5
DC	87	1.8	11.4	2.6	16.4
FL	581	1.2	7.4	1.8	11.1
GA	829	3.0	7.5	4.4	11.2
ID	51	-10.0	10.3	-15.7	16.3
IL	782	-3.3	8.6	-4.8	12.8
IN	1142	-0.5	6.8	-0.8	10.1
IA	126	-3.4	6.7	-5.3	10.4

State	No. of Obs	MB (ppb)	ME (ppb)	NMB (%)	NME (%)
KS	352	-5.1	7.8	-7.6	11.7
KY	845	0.4	7.5	0.6	11.3
LA	711	0.2	7.4	0.3	10.8
ME	101	-4.1	7.2	-6.2	10.9
MD	766	2.5	7.9	3.6	11.2
MA	197	1.5	7.3	2.2	10.8
MI	638	-4.0	7.9	-5.9	11.4
MN	35	0.5	6.9	0.7	10.4
MS	260	0.6	8.1	0.9	12.3
MO	719	-1.9	7.8	-2.7	11.4
MT*	-	-	-	-	-
NE	41	-2.6	5.5	-4.1	8.7
NV	1122	-6.8	8.1	-10.3	12.2
NH	98	-6.0	8.7	-9.1	13.3
NJ	439	1.4	7.2	2.0	10.3
NM	961	-5.9	7.9	-9.1	12.1
NY	504	-0.7	7.2	-1.1	10.5
NC	1496	2.4	6.2	3.5	9.3
ND	10	-14.8	14.8	-23.7	23.7
OH	1624	-0.4	7.7	-0.6	11.3
OK	1475	-6.7	8.4	-9.7	12.3
OR	21	2.6	6.3	4.0	9.7
PA	1336	2.1	6.5	3.1	9.6
RI	75	-0.6	7.8	-0.8	11.5
SC	545	1.7	6.1	2.6	9.3
SD	21	-11.9	12.1	-18.9	19.2
TN	993	0.5	7.2	0.8	10.8
TX	2644	-6.6	8.8	-9.5	12.6
UT	671	-6.4	7.7	-9.9	11.9
VT	5	-6.4	8.5	-9.6	12.6
VA	650	2.0	7.4	2.9	11.1
WA	7	2.2	7.0	3.4	10.9
WV	220	2.2	6.1	3.3	9.3
WI	363	-4.7	7.5	-6.8	10.9
WY	308	-7.3	8.4	-11.5	13.3

*No statistics were calculated for Montana because there were no days with observed MDA8 ozone $\geq$ 60 ppb in the ambient data set used for these calculations.

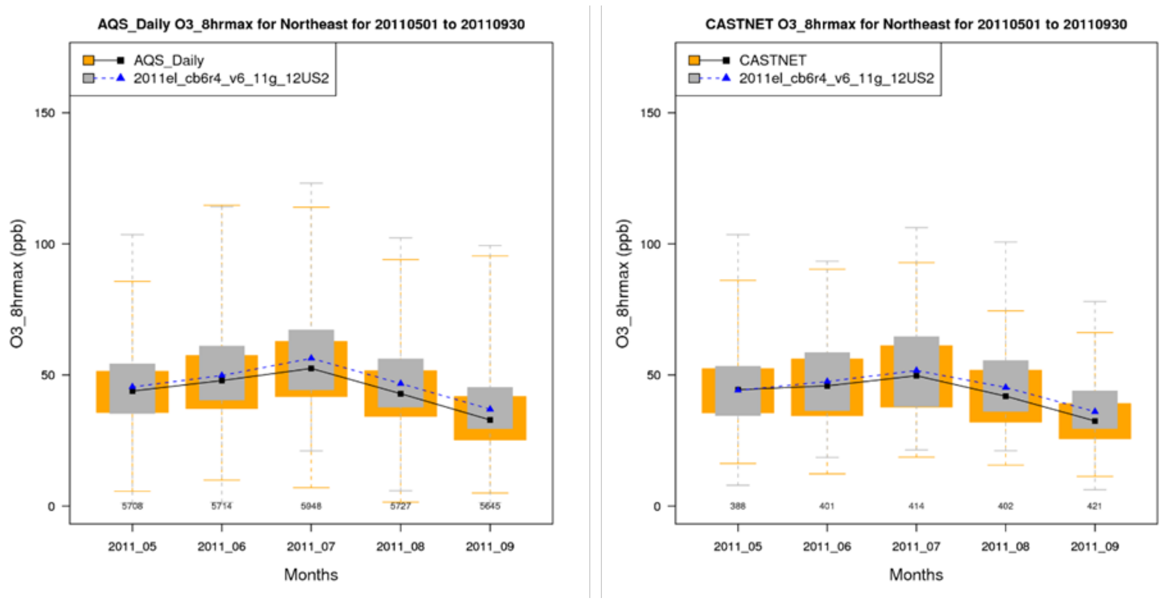

Figure A-3. Distribution of observed and predicted MDA8 ozone by month for the period May through September for the Northeast region, AQS Network (left) and CASTNet (right). [symbol = median; top/bottom of box = 75th/25th percentiles; top/bottom line = max/min values]

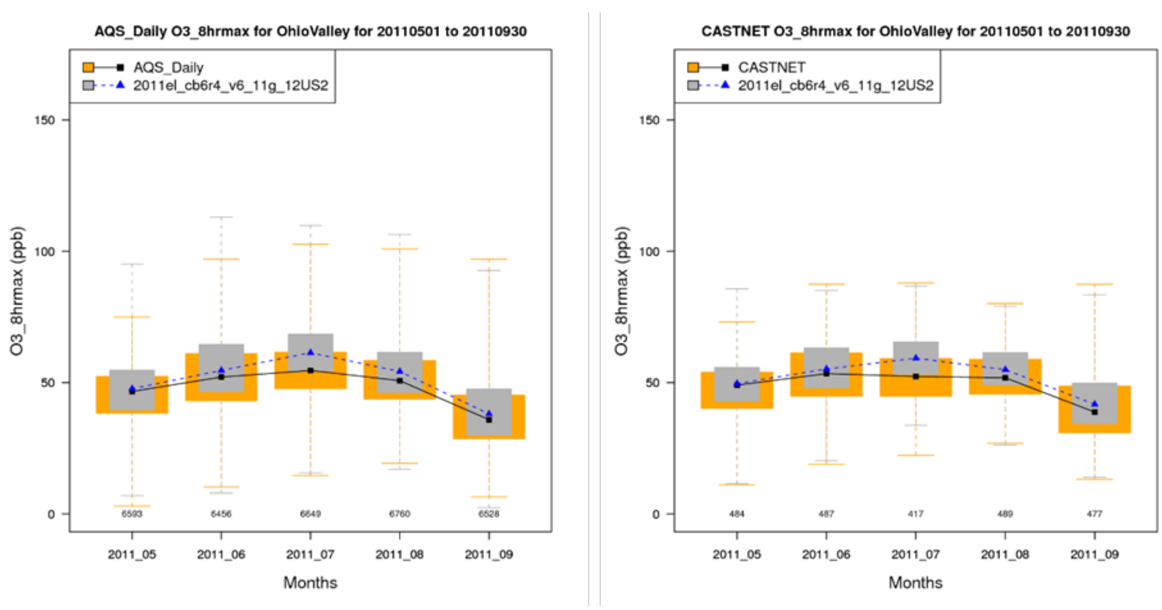

Figure A-4. Distribution of observed and predicted MDA8 ozone by month for the period May through September for the Ohio Valley region, AQS Network (left) and CASTNet (right).

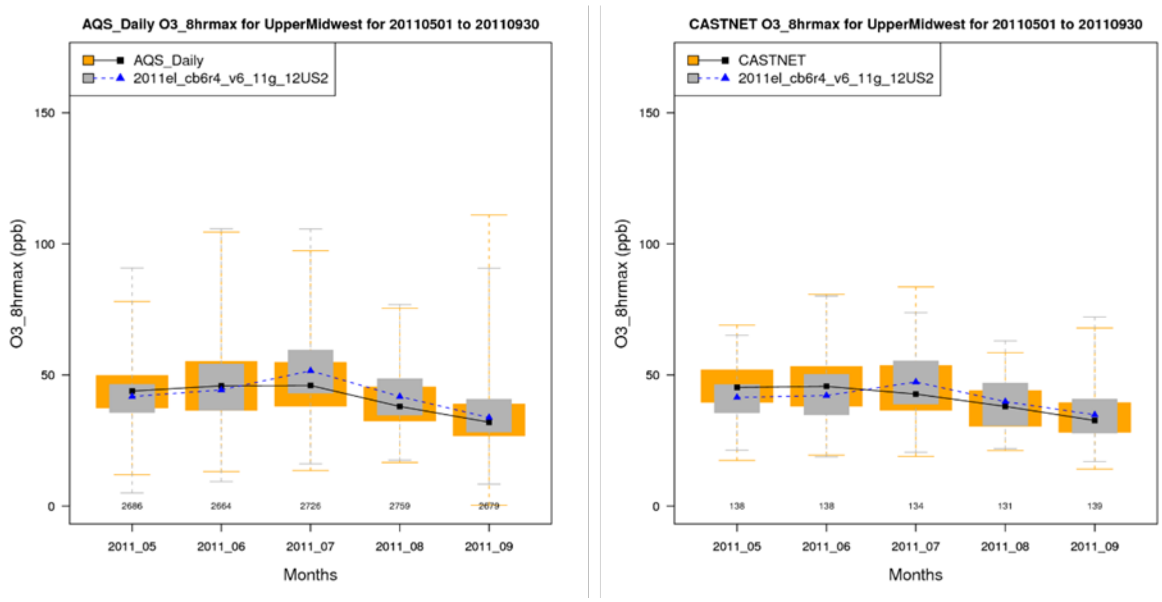

Figure A-5. Distribution of observed and predicted MDA8 ozone by month for the period May through September for the Upper Midwest region, AQS Network (left) and CASTNet (right).

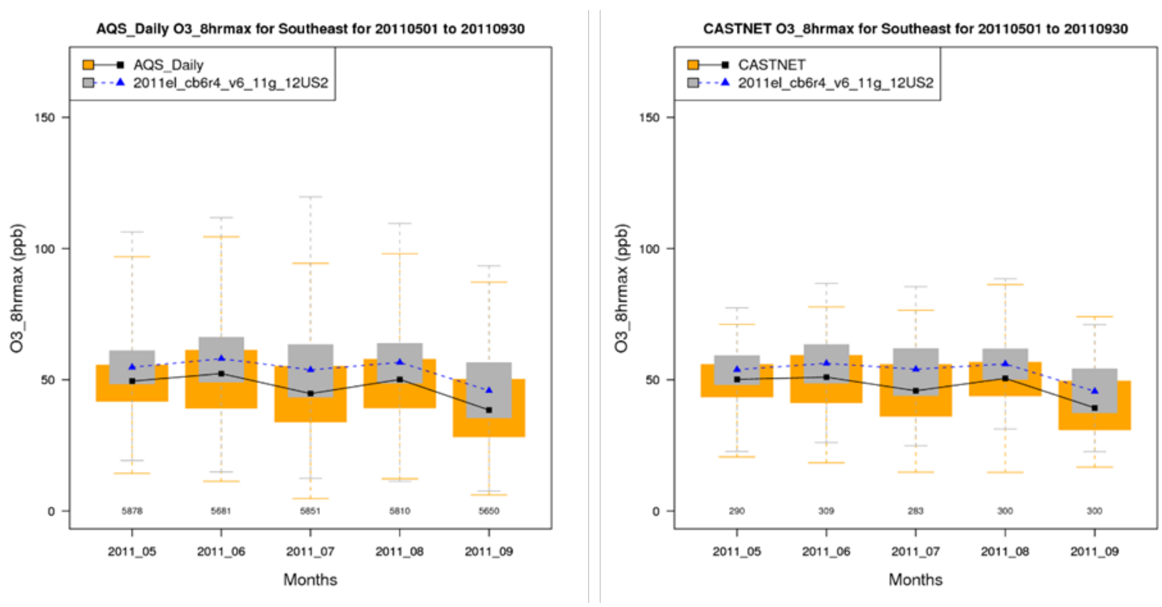

Figure A-6. Distribution of observed and predicted MDA8 ozone by month for the period May through September for the Southeast region, AQS Network (left) and CASTNet (right).

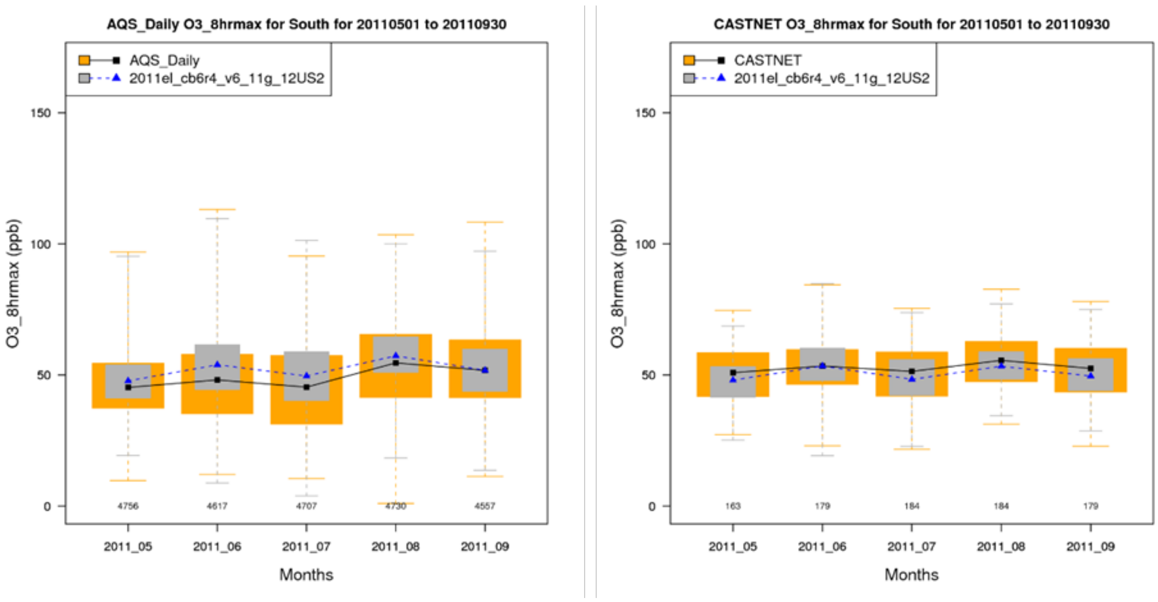

Figure A-7. Distribution of observed and predicted MDA8 ozone by month for the period May through September for the South region, AQS Network (left) and CASTNet (right).

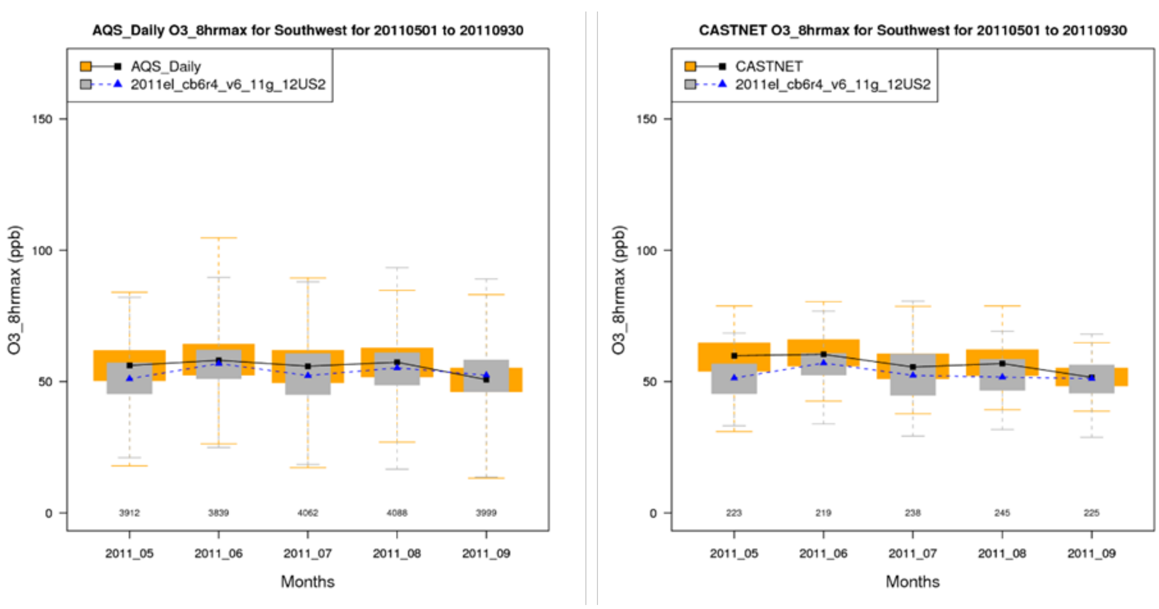

Figure A-8. Distribution of observed and predicted MDA8 ozone by month for the period May through September for the Southwest region, AQS Network (left) and CASTNet (right).

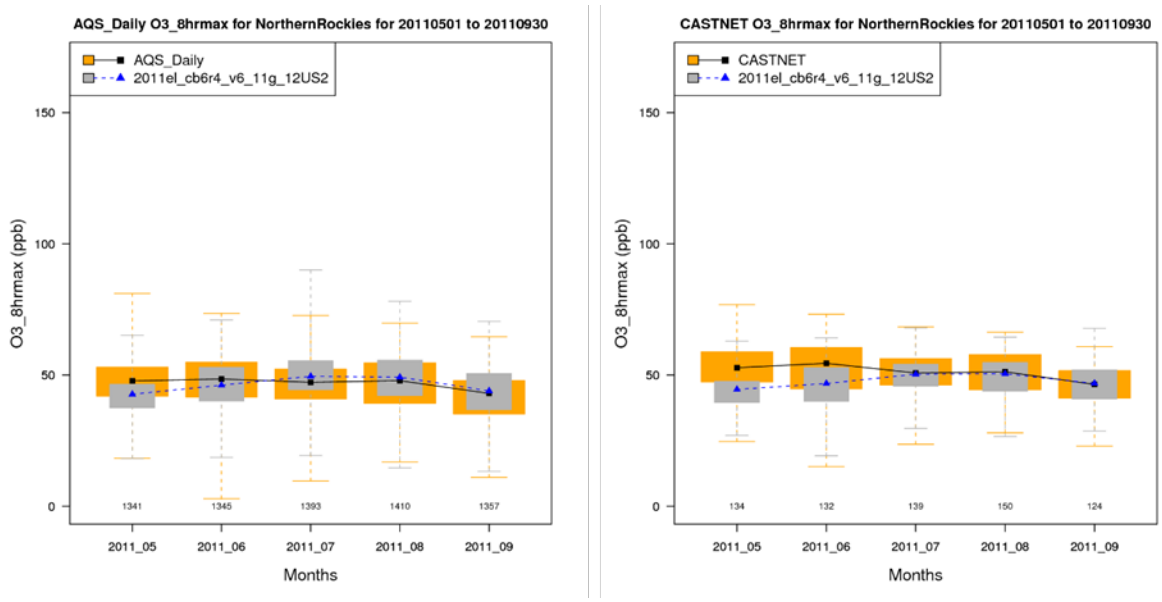

Figure A-9. Distribution of observed and predicted MDA8 ozone by month for the period May through September for the Northern Rockies region, AQS Network (left) and CASTNet (right).

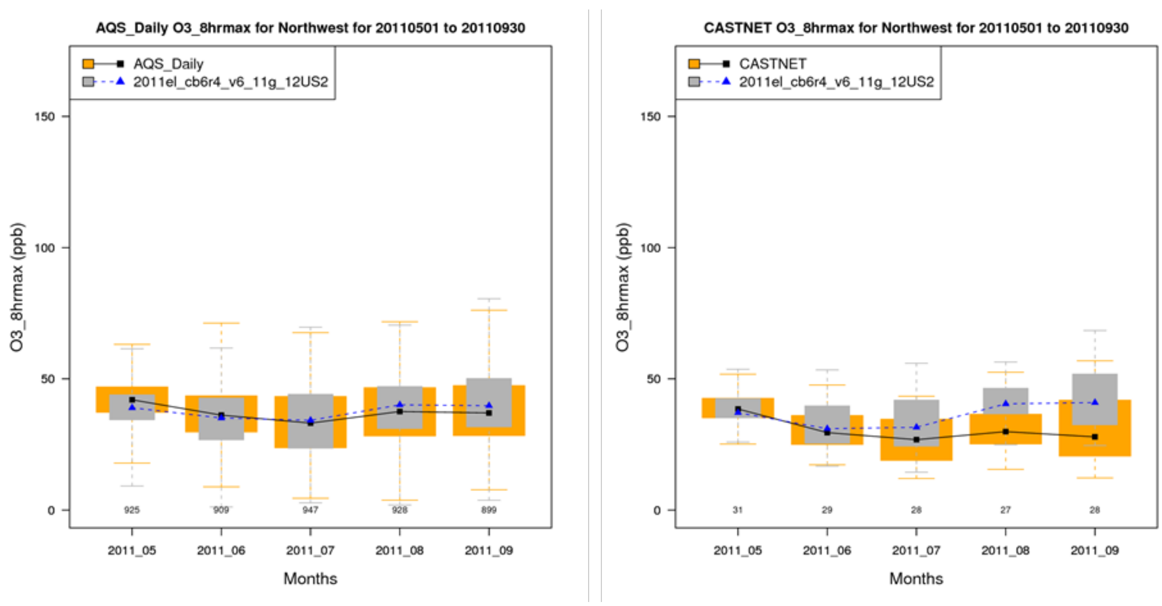

Figure A-10. Distribution of observed and predicted MDA8 ozone by month for the period May through September for the Northwest region, AQS Network (left) and CASTNet (right).

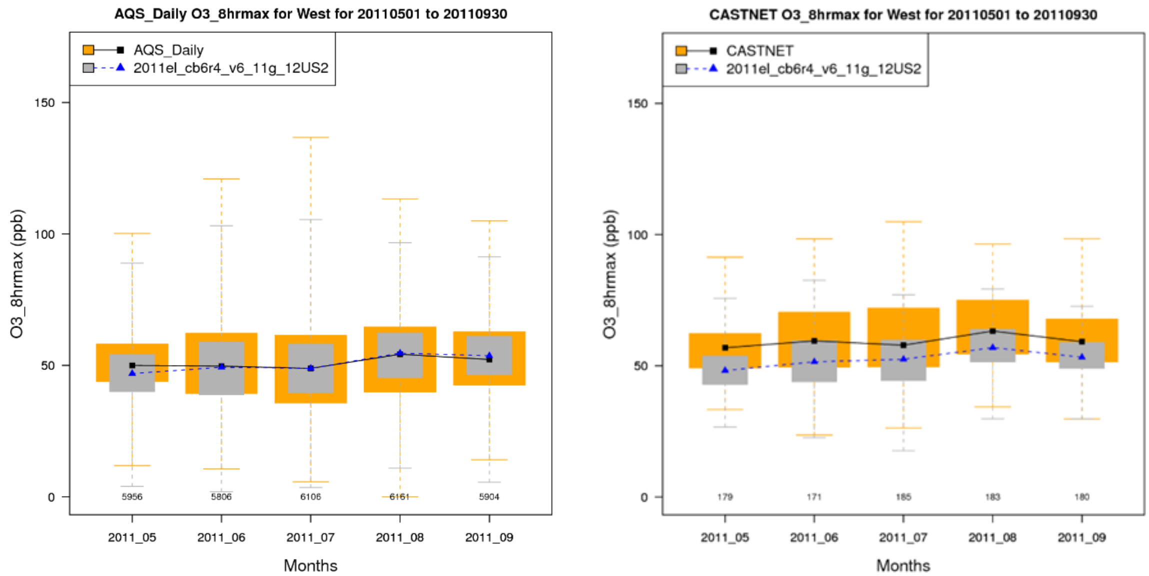

Figure A-11. Distribution of observed and predicted MDA8 ozone by month for the period May through September for the West region, AQS Network (left) and CASTNet (right).

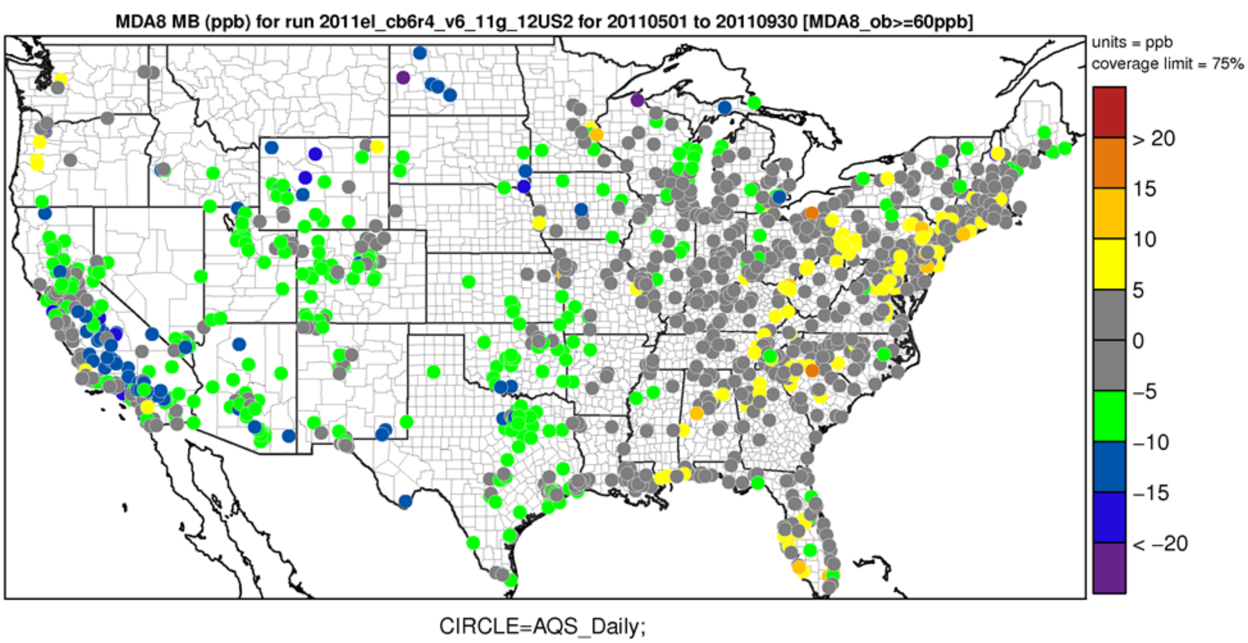

Figure A-12. Mean Bias (ppb) of MDA8 ozone ≥ 60 ppb over the period May-September 2011 at AQS and CASTNet monitoring sites.

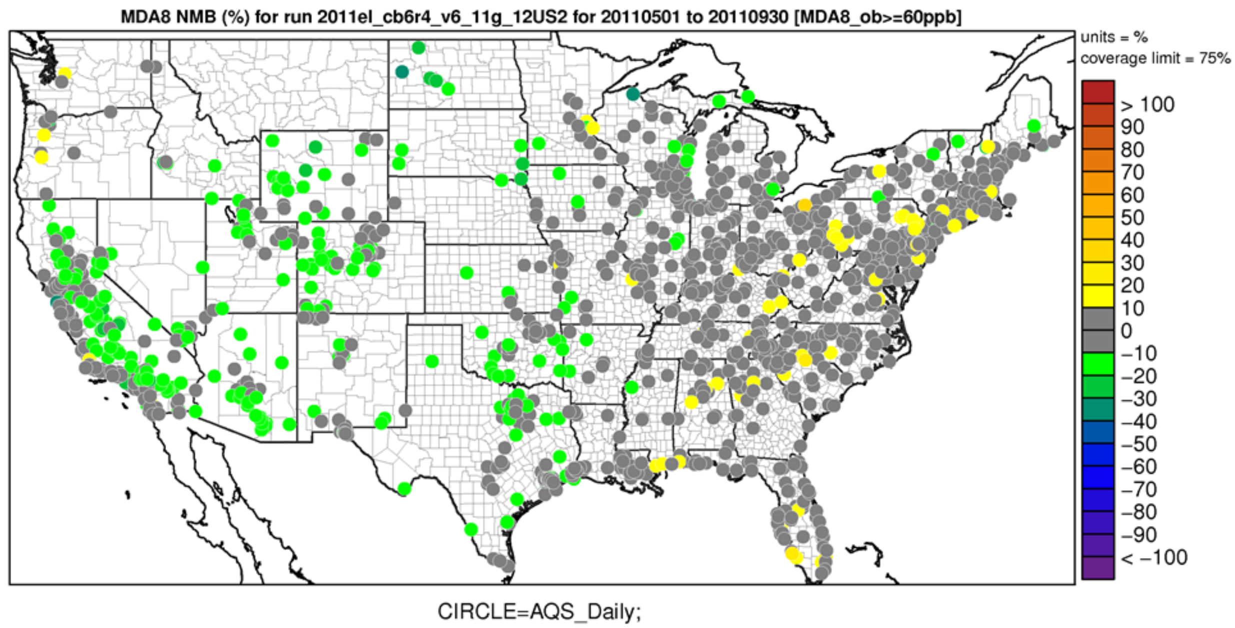

Figure A-13. Normalized Mean Bias (%) of MDA8 ozone ≥ 60 ppb over the period May-September 2011 at AQS and CASTNet monitoring sites.

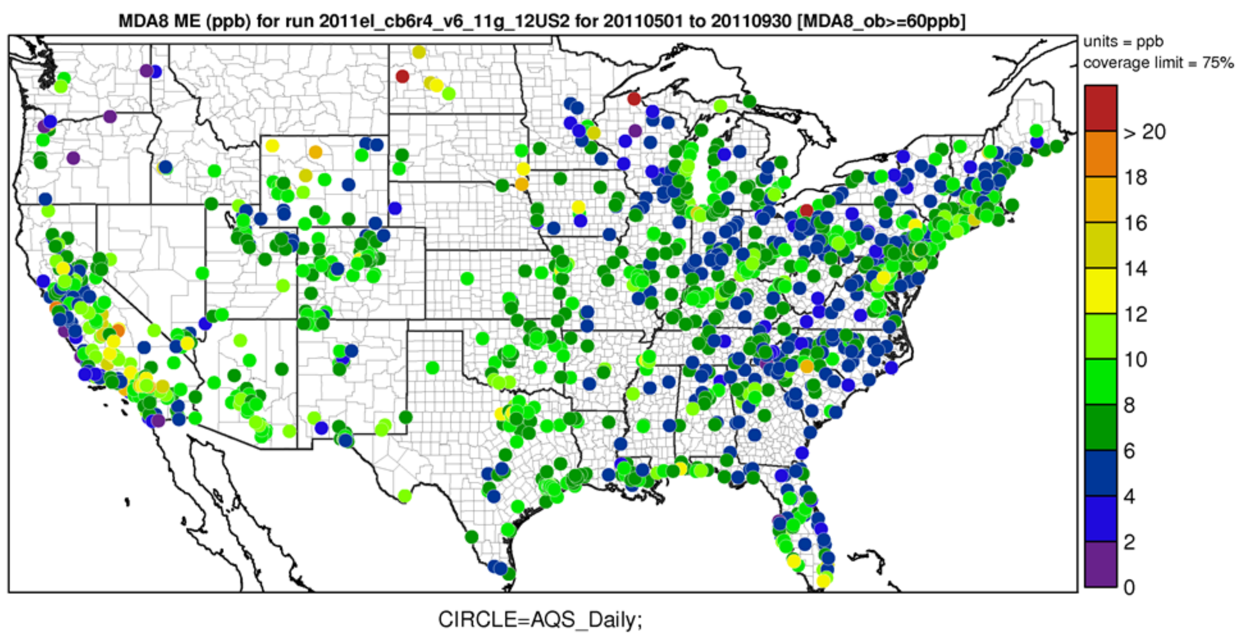

Figure A-14. Mean Error (ppb) of MDA8 ozone ≥ 60 ppb over the period May-September 2011 at AQS and CASTNet monitoring sites.

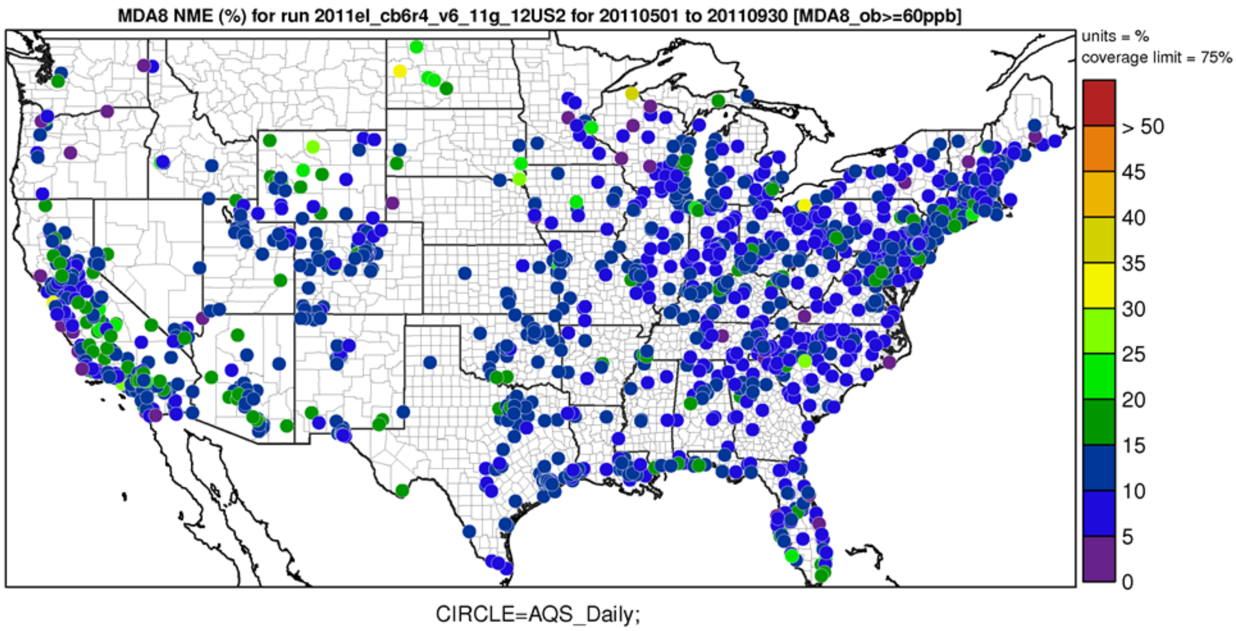

Figure A-15. Normalized Mean Error (%) of MDA8 ozone ≥ 60 ppb over the period May-September 2011 at AQS and CASTNet monitoring sites.

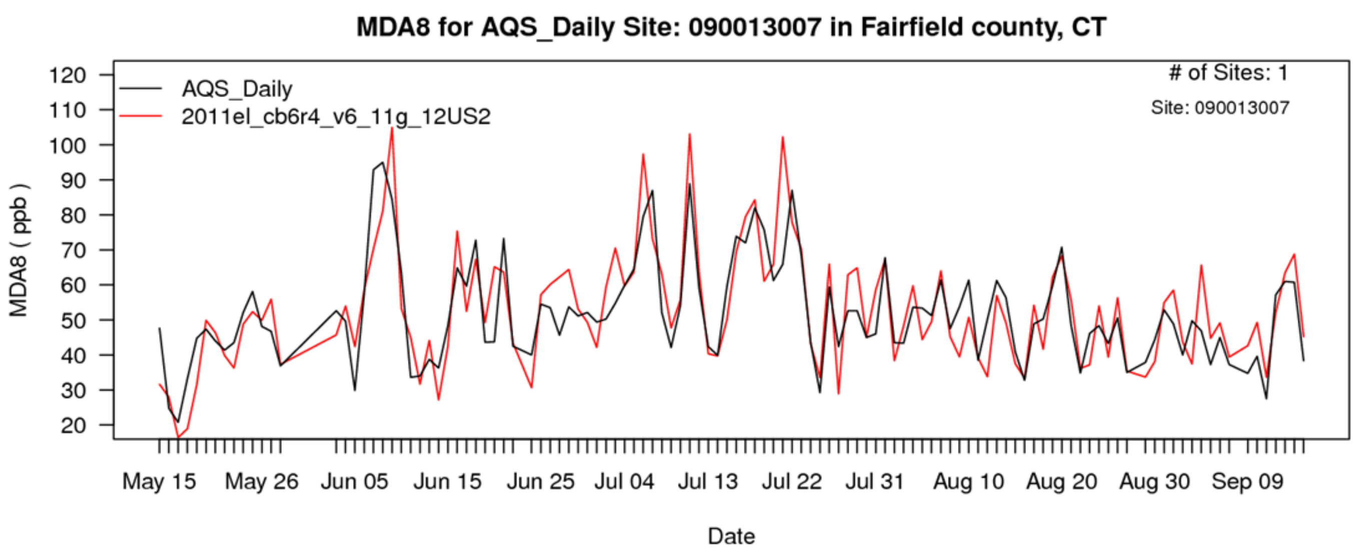

Figure A-16a. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 090013007 in Fairfield Co., Connecticut.

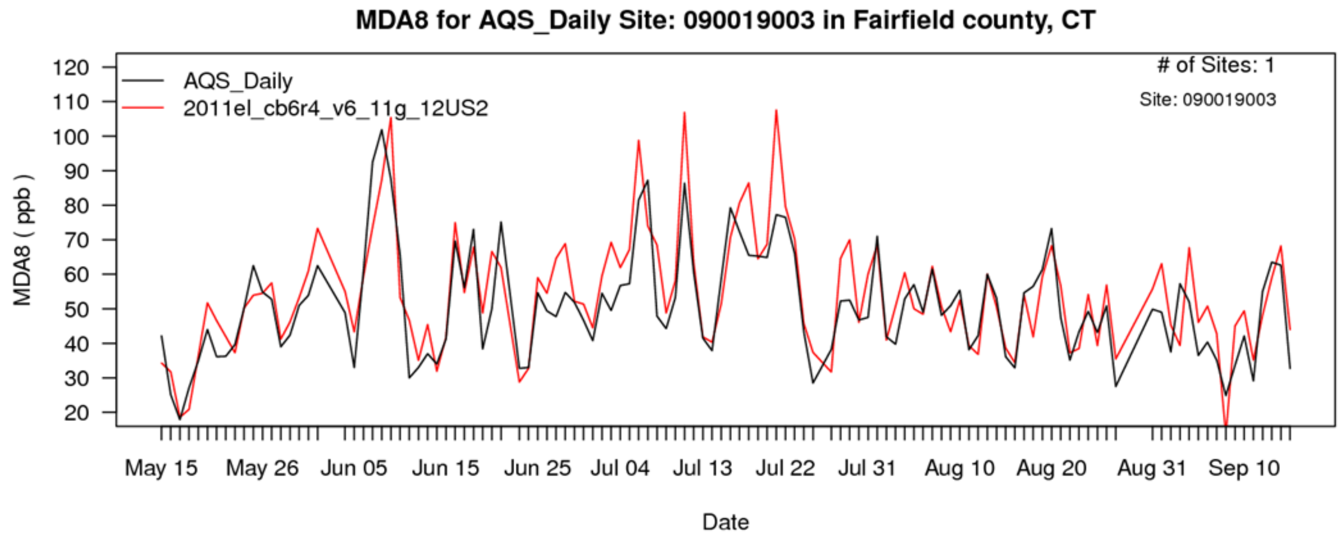

Figure A-16b. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 090019003 in Fairfield Co., Connecticut.

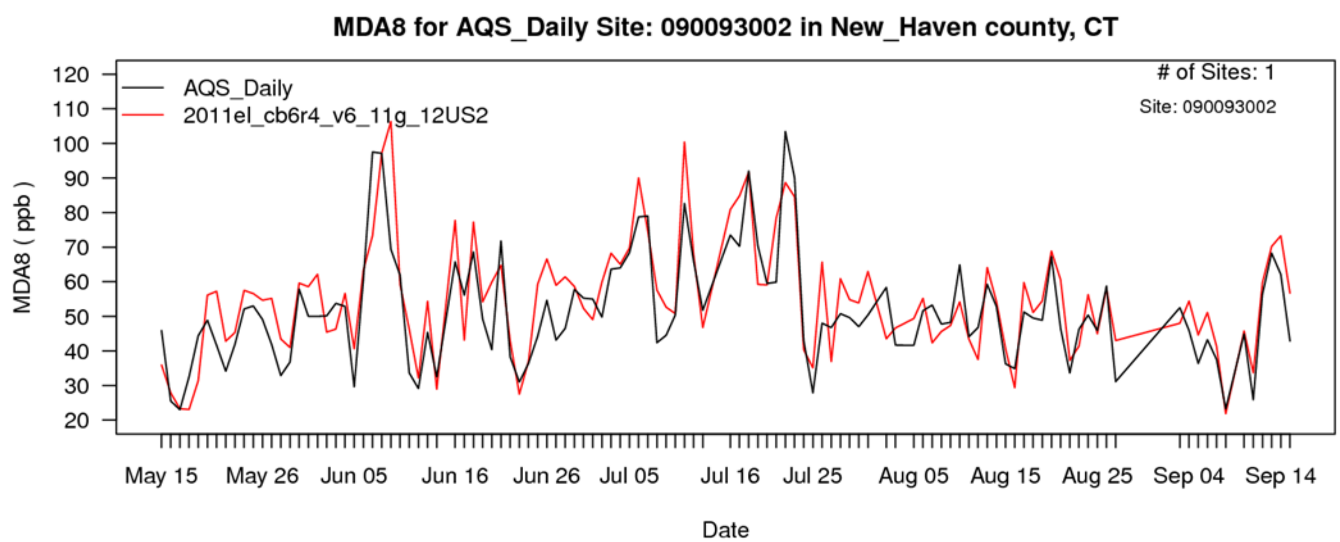

Figure A-16c. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 090099002 in New Haven Co., Connecticut.

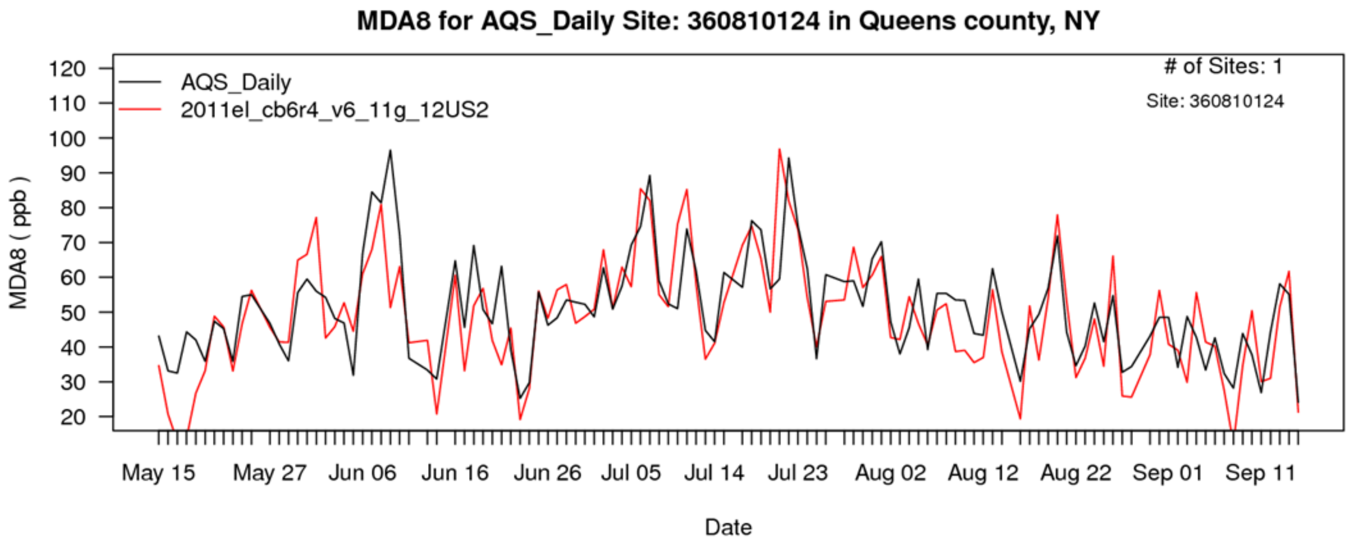

Figure A-16d. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 36810124 in Queens Co., New York.

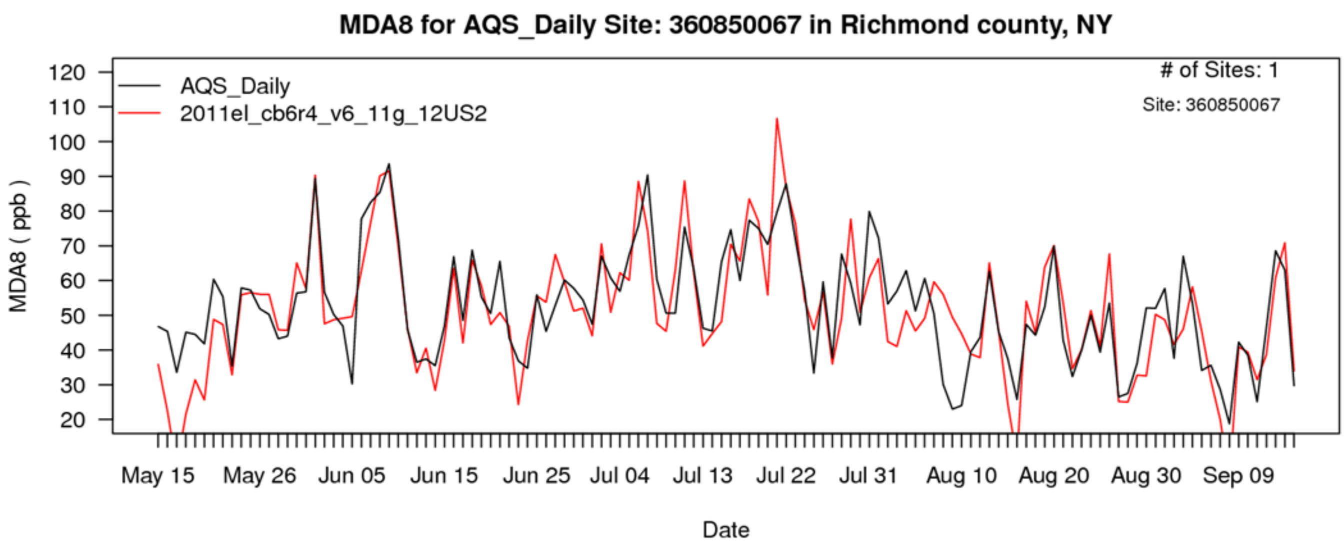

Figure A-16e. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 360850067 in Richmond Co., New York.

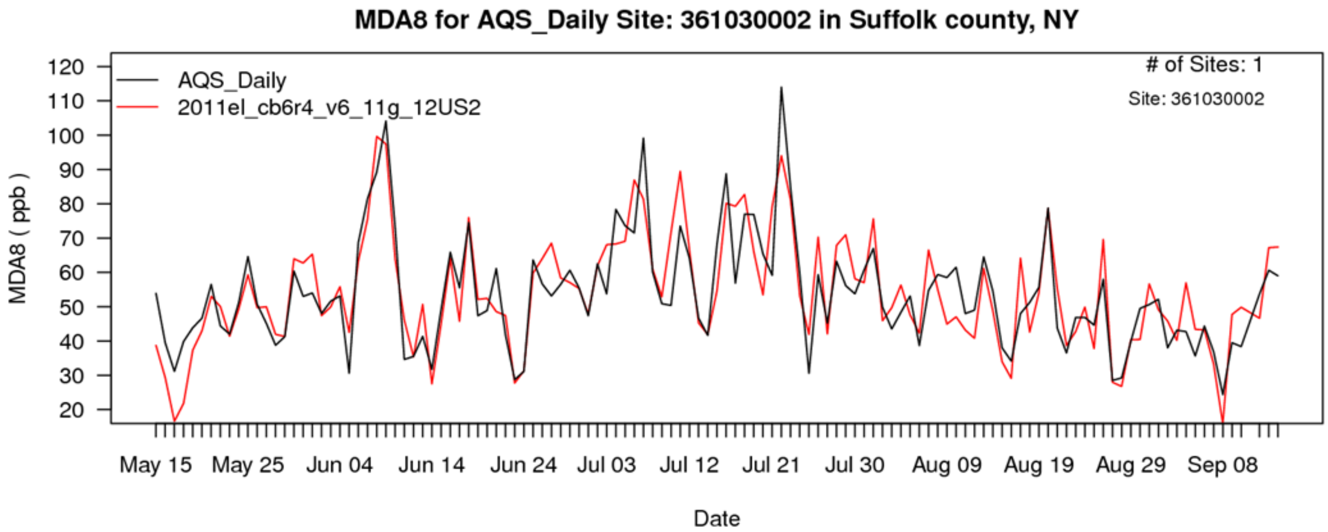

Figure A-16f. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 361030002 in Suffolk Co., New York.

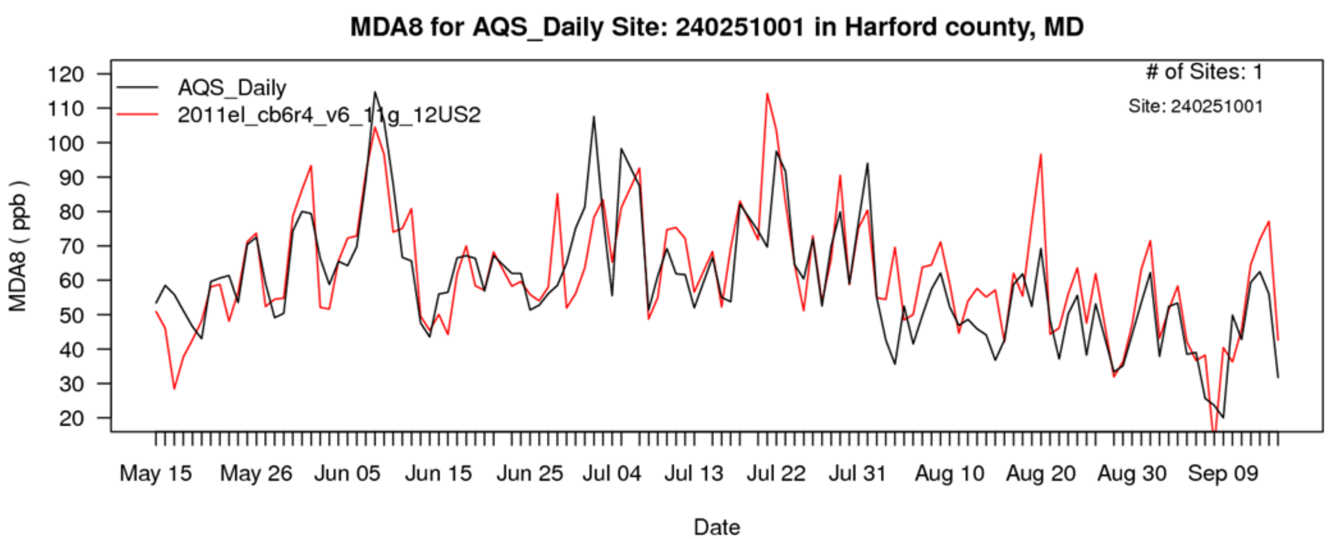

Figure A-16g. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 240251001 in Harford Co., Maryland.

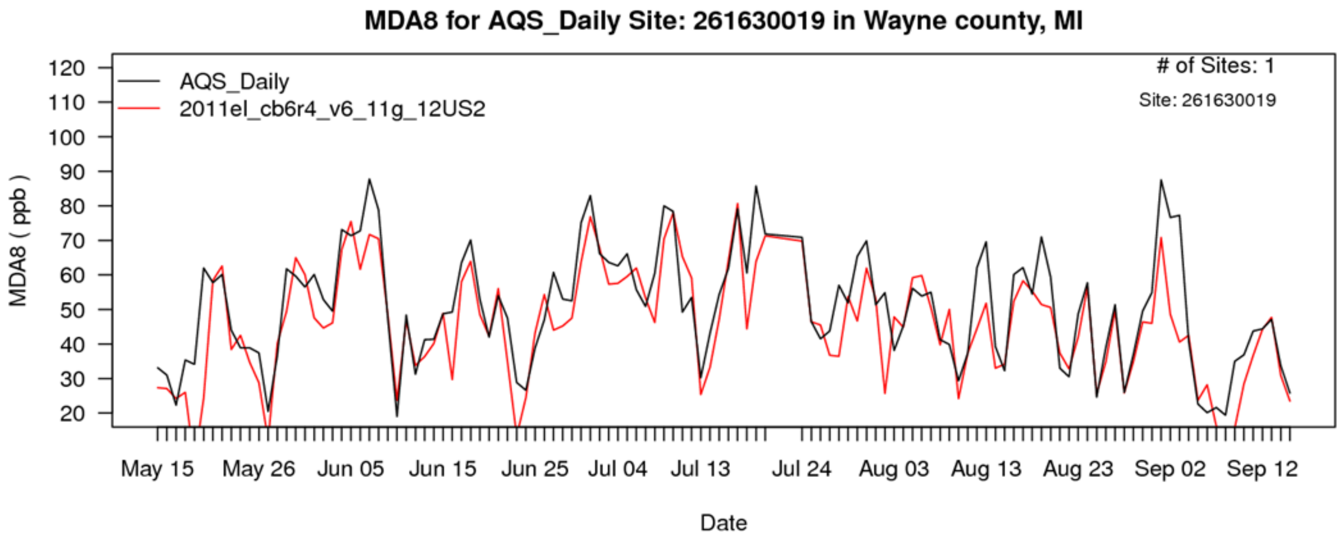

Figure A-16h. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 261630019 in Wayne Co., Michigan.

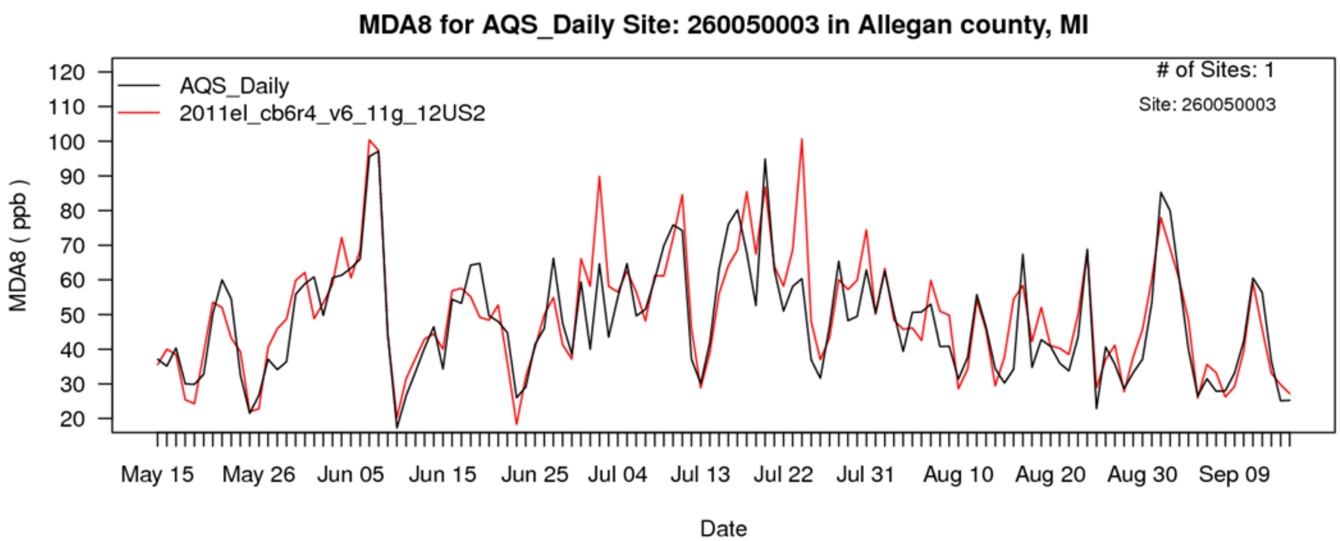

Figure A-16i. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 26005003 in Allegan Co., Michigan.

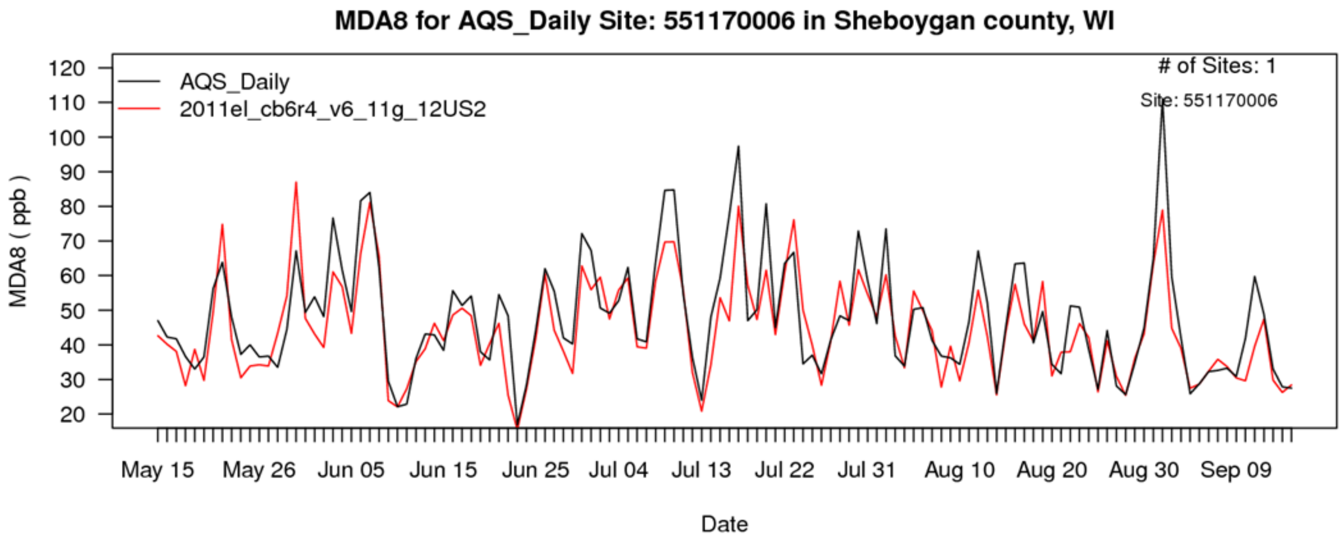

Figure A-16j. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 551170006 in Sheboygan Co., Wisconsin.

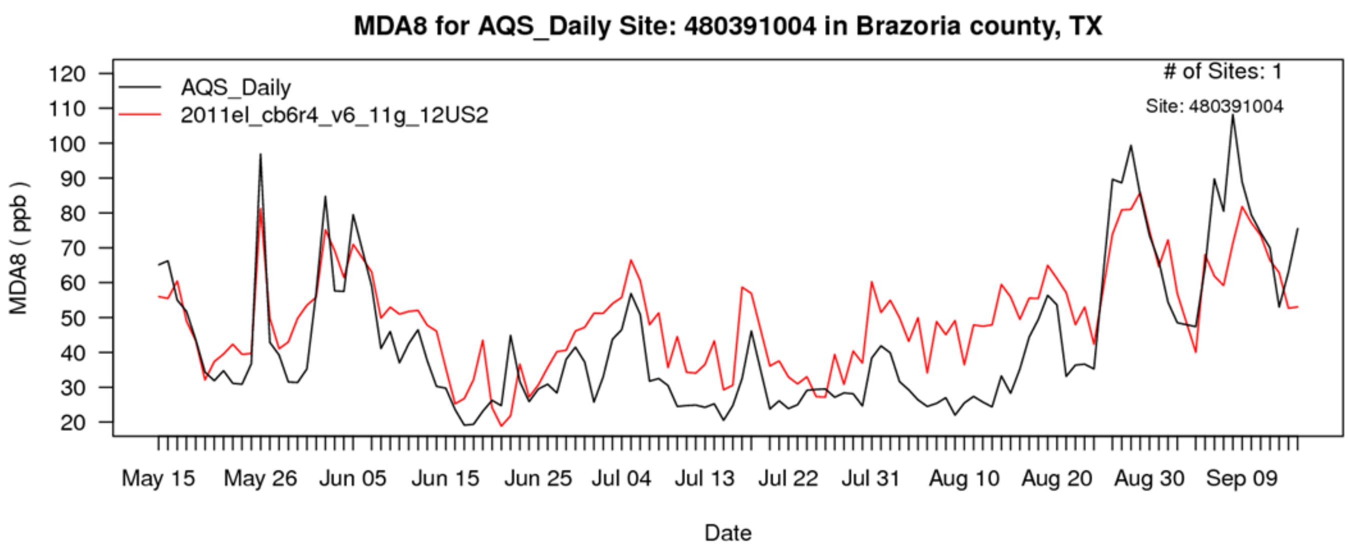

Figure A-16k. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 480391004 in Brazoria Co., Texas.

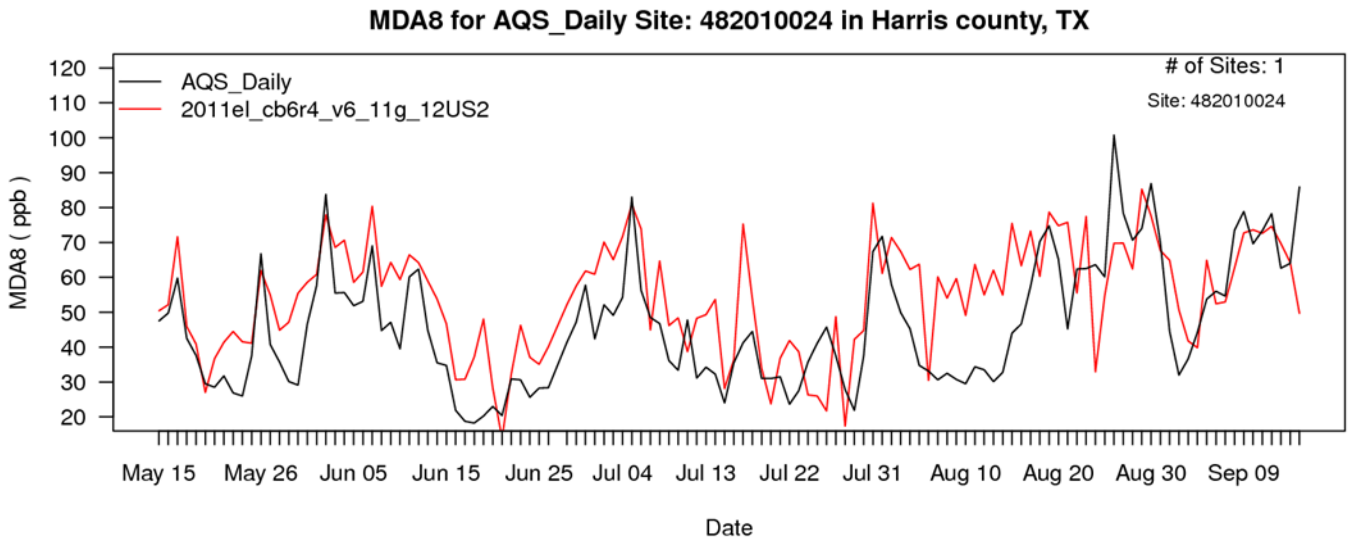

Figure A-16l. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 482010024 in Harris Co., Texas.

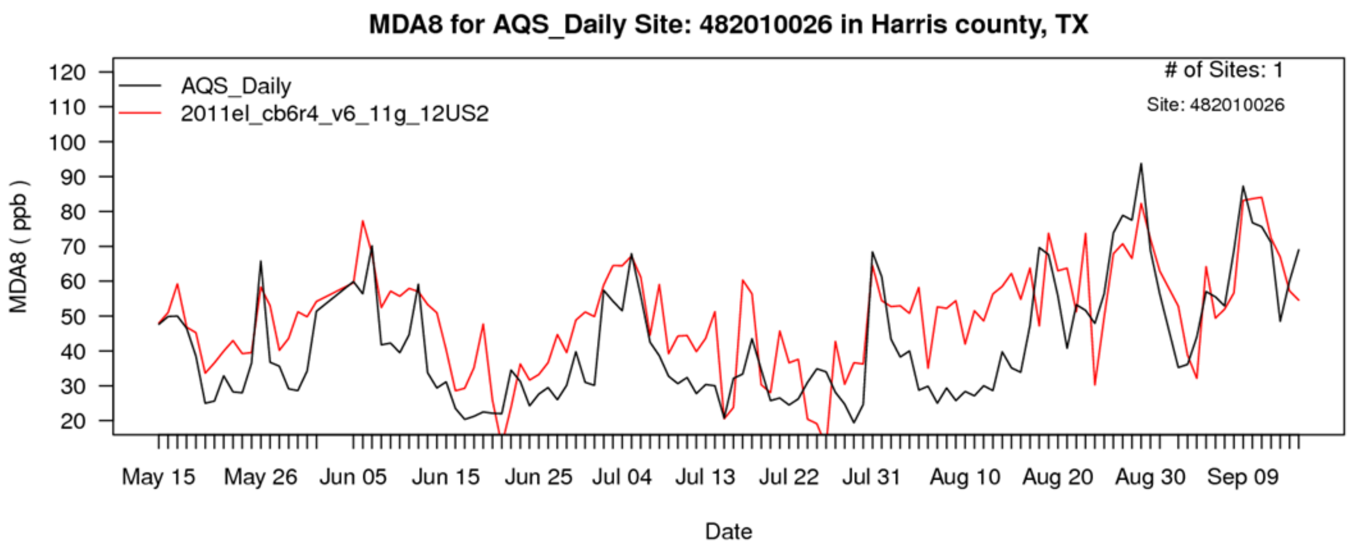

Figure A-16m. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 482010026 in Harris Co., Texas.

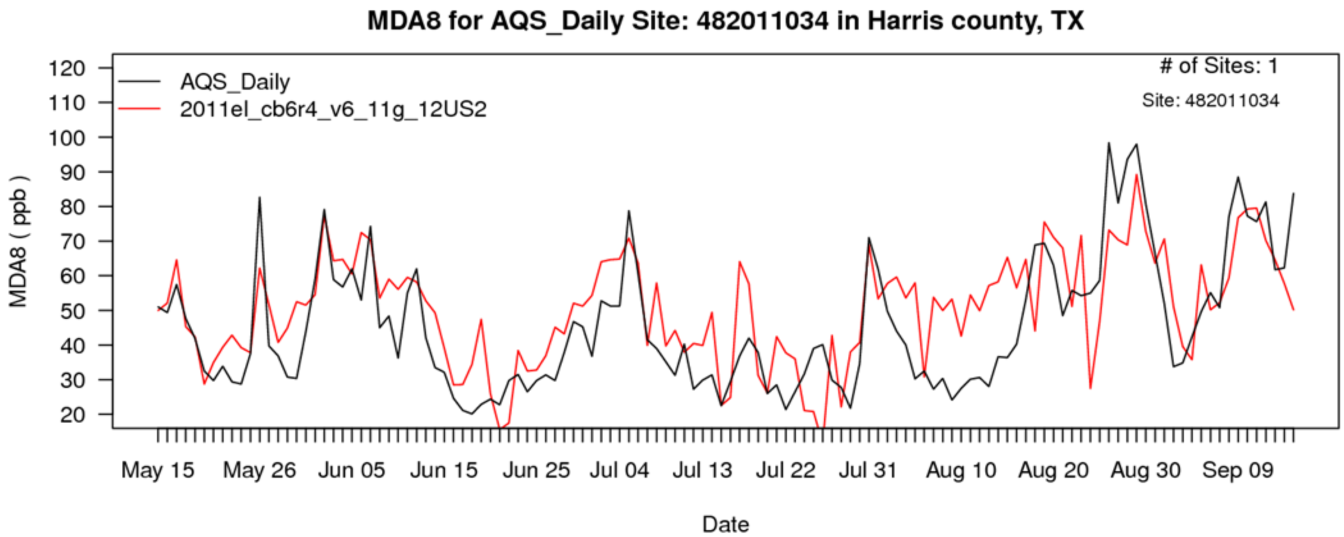

Figure A-16n. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 482011034 in Harris Co., Texas.

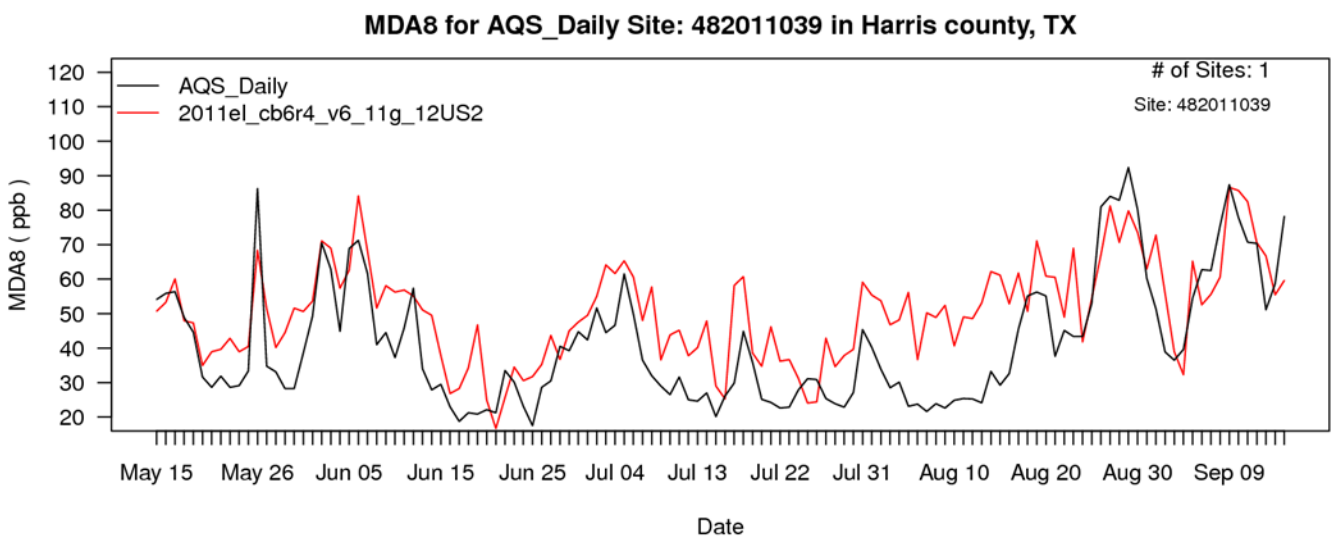

Figure A-16o. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 482011039 in Harris Co., Texas.

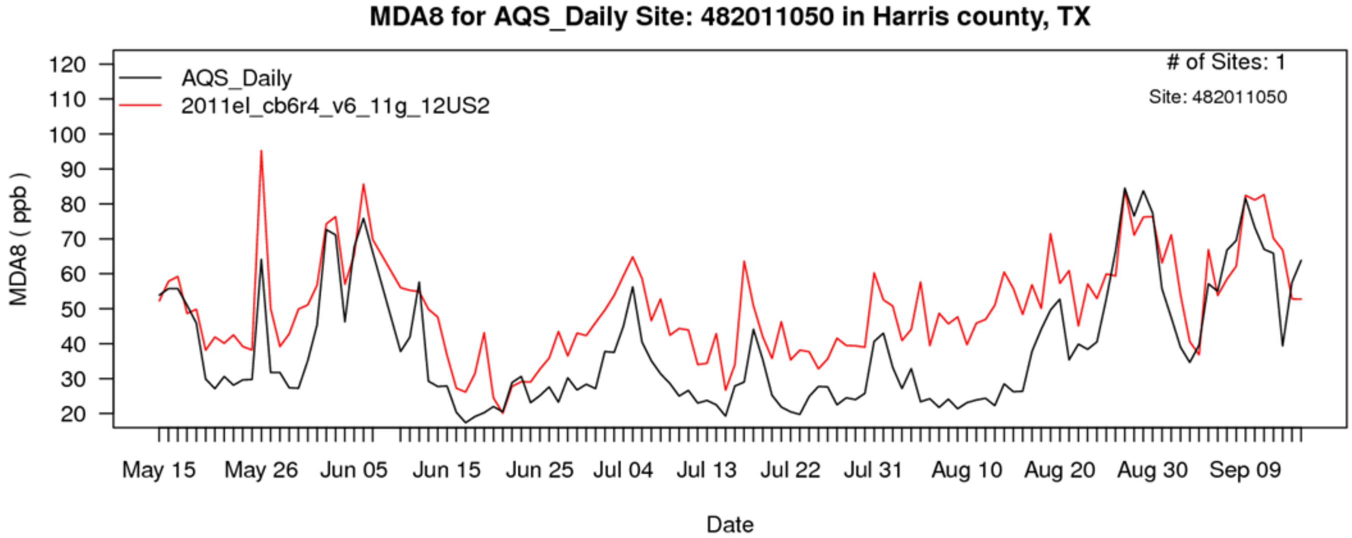

Figure A-16p. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 482011050 in Harris Co., Texas.

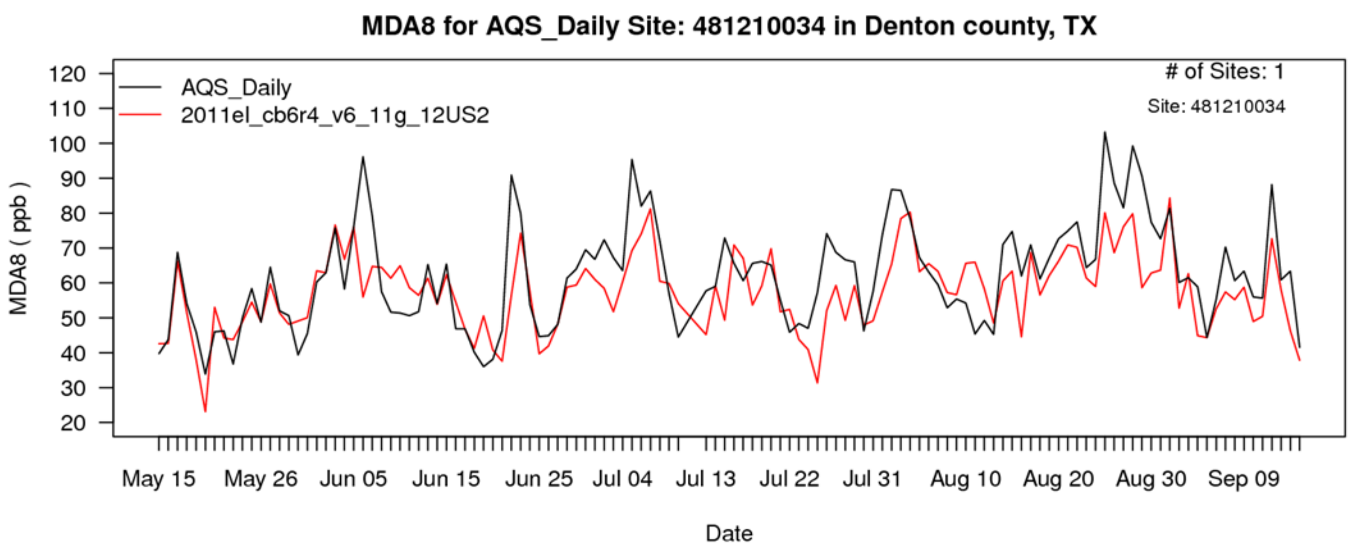

Figure A-16q. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 481210034 in Denton Co., Texas.

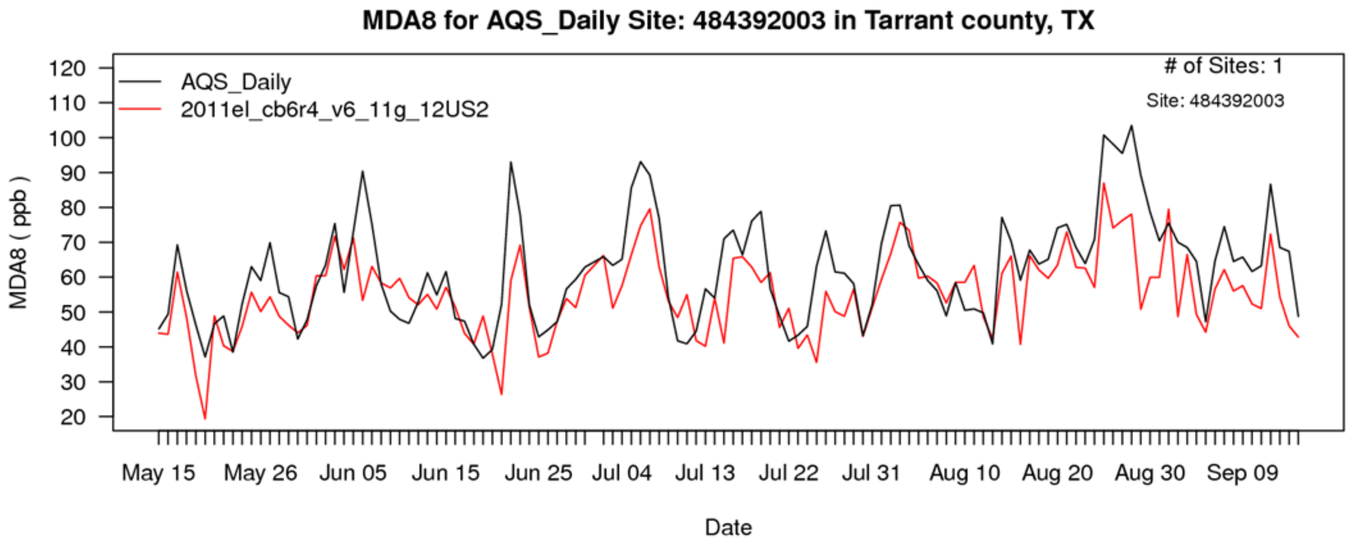

Figure A-16r. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 484392003 in Tarrant Co., Texas.

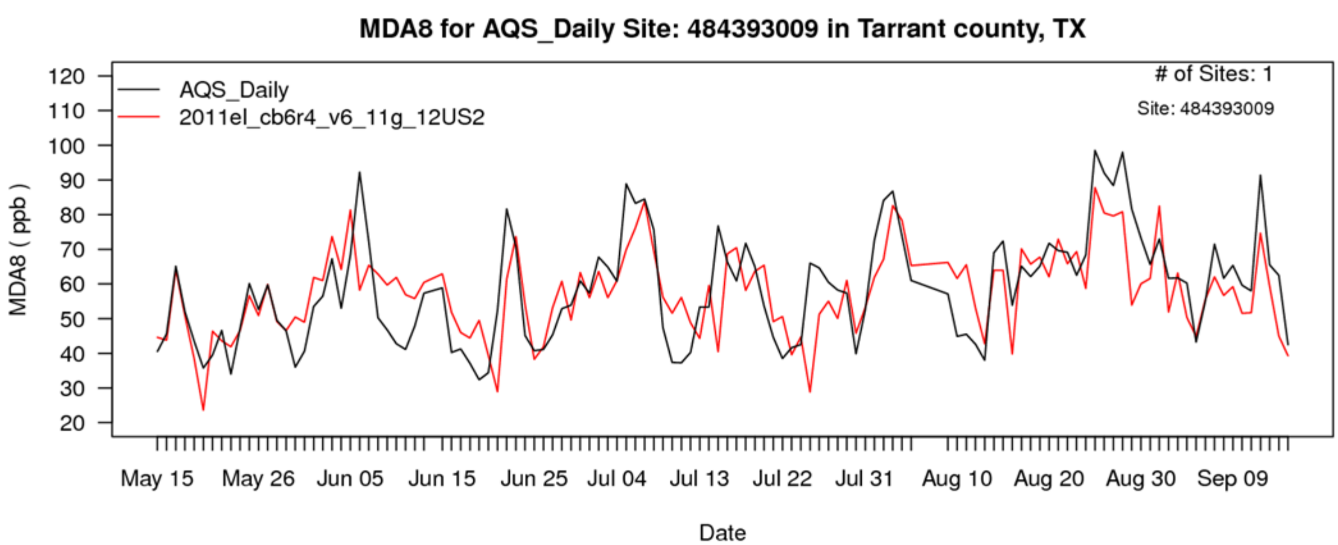

Figure A-16s. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 484393009 in Tarrant Co., Texas.

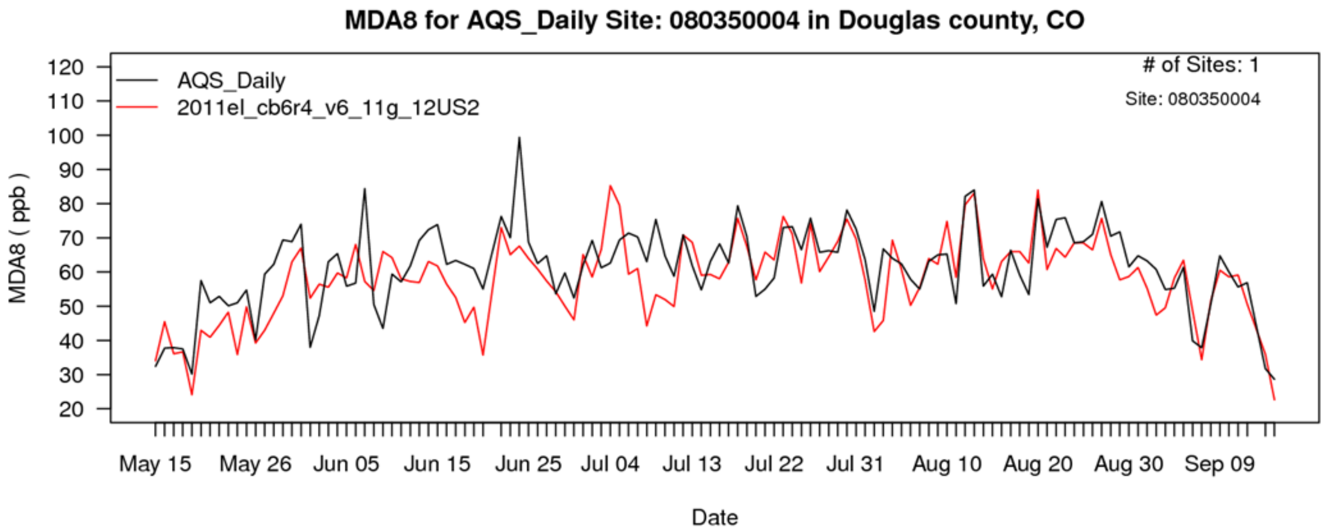

Figure A-16t. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 080350004 in Douglas Co., Colorado.

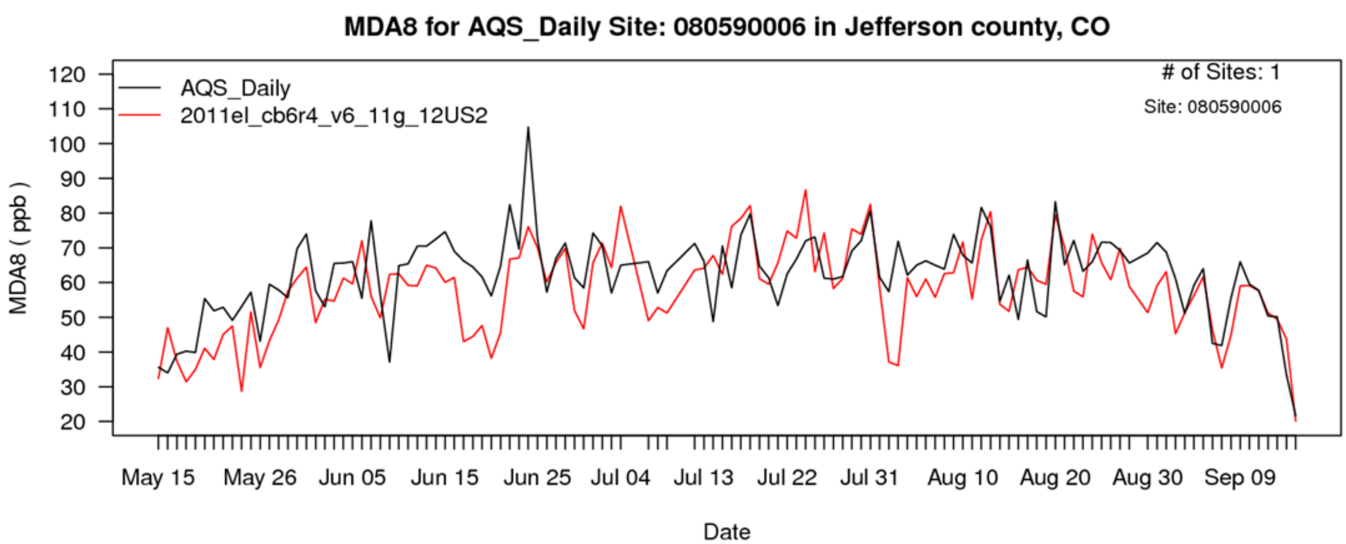

Figure A-16u. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 080590006 in Jefferson Co., Colorado.

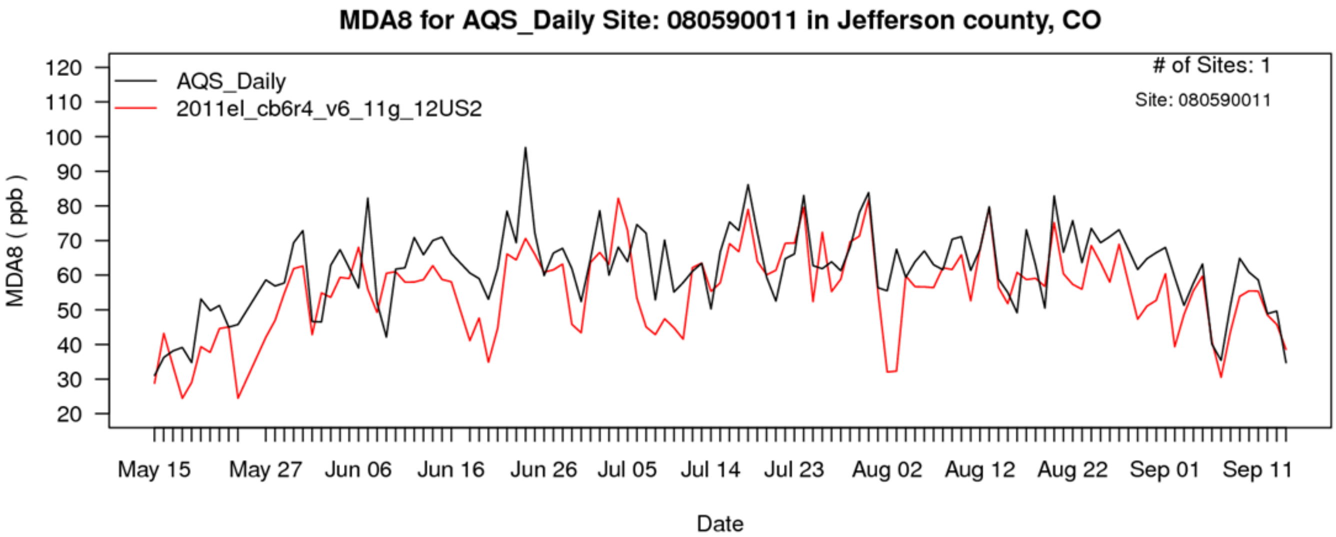

Figure A-16v. Time series of observed (black) and predicted (red) MDA8 ozone for May through September 2011 at site 080590011 in Jefferson Co., Colorado.

Appendix B

Projected Ozone Design Values at Individual Monitoring Sites Based on the EPA's Updated 2023 Transport Modeling

This attachment contains projected ozone design values at individual monitoring sites nationwide based on EPA's updated transport modeling for 2023. The scenario name for the updated modeling is "2023en." All of the data are in units of "ppb."

The following data are provided in table below.
(1) Base period 2009 – 2013 average and maximum design values based on 2009 – 2013 measured data.
(2) Projected 2023 average and maximum design values based on the "3x3" approach recommended in EPA's photochemical modeling guidance.
(3) Projected 2023 average and maximum design values based on a modified "3x3" approach in which model predictions in grid cells without monitors that are predominately water are excluded from the projection calculations ("No Water").
Note that the modified approach only affects the projection of design values for monitoring sites in or near coastal areas.
(4) 2016 ozone design values based on 2014 – 2016 measured data (N/A indicates that a 2016 design value is not available). The following web site has additional information on the 2016 design values: *https://www.epa.gov/air-trends/air-quality-design-values#report*.

Note, a design value of 75.9 ppb (or less) is considered to not exceed the 2008 ozone NAAQS, and a value of 76.0 ppb (or higher) is considered to exceed the 2008 ozone NAAQS. Similarly, a design value of 70.9 ppb (or less) is considered to not exceed the 2015 ozone NAAQS, and a value of 71.0 ppb (or higher) is considered to exceed the 2015 ozone NAAQS.

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
10030010	AL	Baldwin	70.0	72	53.4	54.9	55.4	57.0	65
10331002	AL	Colbert	65.0	67	45.5	46.9	45.5	46.9	59
10499991	AL	DeKalb	66.0	66	50.7	50.7	50.7	50.7	63
10510001	AL	Elmore	66.3	68	49.5	50.7	49.5	50.7	N/A
10550011	AL	Etowah	61.7	62	46.2	46.4	46.2	46.4	61
10690004	AL	Houston	63.7	65	49.2	50.2	49.2	50.2	59
10730023	AL	Jefferson	72.3	75	54.9	56.9	54.9	56.9	68
10731003	AL	Jefferson	72.0	75	55.2	57.5	55.2	57.5	66
10731005	AL	Jefferson	75.3	77	56.8	58.1	56.8	58.1	N/A
10731009	AL	Jefferson	72.0	74	56.1	57.7	56.1	57.7	N/A
10731010	AL	Jefferson	73.7	76	55.4	57.2	55.4	57.2	64
10732006	AL	Jefferson	75.0	77	55.7	57.1	55.7	57.1	66
10735002	AL	Jefferson	72.0	74	54.2	55.7	54.2	55.7	N/A
10735003	AL	Jefferson	71.0	73	55.0	56.5	55.0	56.5	N/A
10736002	AL	Jefferson	76.7	80	58.8	61.3	58.8	61.3	68

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
10890014	AL	Madison	70.7	73	52.8	54.5	52.8	54.5	64
10970003	AL	Mobile	69.0	71	53.2	54.7	53.2	54.7	63
10972005	AL	Mobile	73.0	73	56.6	56.6	57.3	57.3	65
11011002	AL	Montgomery	67.3	69	49.6	50.8	49.6	50.8	62
11030011	AL	Morgan	68.7	71	54.2	56.0	54.2	56.0	64
11130002	AL	Russell	66.0	67	49.9	50.6	49.9	50.6	62
11170004	AL	Shelby	73.3	75	54.0	55.3	54.0	55.3	67
11190002	AL	Sumter	61.0	61	49.2	49.2	49.2	49.2	N/A
11250010	AL	Tuscaloosa	58.7	59	45.1	45.4	45.1	45.4	60
40038001	AZ	Cochise	72.0	73	69.4	70.4	69.4	70.4	65
40051008	AZ	Coconino	69.0	69	64.2	64.2	64.2	64.2	69
40058001	AZ	Coconino	71.0	72	66.3	67.2	66.3	67.2	67
40070010	AZ	Gila	74.5	75	64.2	64.6	64.2	64.6	71
40130019	AZ	Maricopa	76.7	79	69.3	71.4	69.3	71.4	73
40131004	AZ	Maricopa	79.7	81	69.8	71.0	69.8	71.0	75
40131010	AZ	Maricopa	69.7	72	60.4	62.3	60.4	62.3	73
40132001	AZ	Maricopa	74.7	76	66.1	67.2	66.1	67.2	68
40132005	AZ	Maricopa	76.0	77	65.3	66.2	65.3	66.2	77
40133002	AZ	Maricopa	73.3	75	65.6	67.2	65.6	67.2	70
40133003	AZ	Maricopa	75.7	77	66.2	67.3	66.2	67.3	70
40134003	AZ	Maricopa	74.7	76	67.8	69.0	67.8	69.0	70
40134004	AZ	Maricopa	72.7	74	63.7	64.8	63.7	64.8	69
40134005	AZ	Maricopa	69.7	71	61.3	62.4	61.3	62.4	N/A
40134008	AZ	Maricopa	76.3	77	65.2	65.8	65.2	65.8	71
40134010	AZ	Maricopa	71.0	72	60.8	61.7	60.8	61.7	66
40134011	AZ	Maricopa	65.0	66	57.6	58.5	57.6	58.5	59
40137003	AZ	Maricopa	70.7	72	62.4	63.6	62.4	63.6	67
40137020	AZ	Maricopa	73.7	75	64.4	65.5	64.4	65.5	72
40137021	AZ	Maricopa	76.7	77	65.9	66.2	65.9	66.2	76
40137022	AZ	Maricopa	73.3	75	63.0	64.4	63.0	64.4	74
40137024	AZ	Maricopa	73.3	74	64.1	64.7	64.1	64.7	71
40139508	AZ	Maricopa	74.0	76	62.5	64.2	62.5	64.2	73
40139702	AZ	Maricopa	74.7	77	63.9	65.9	63.9	65.9	72
40139704	AZ	Maricopa	74.5	76	64.0	65.3	64.0	65.3	N/A
40139706	AZ	Maricopa	74.0	75	63.6	64.5	63.6	64.5	70
40139997	AZ	Maricopa	76.0	77	68.1	69.0	68.1	69.0	75
40170119	AZ	Navajo	68.7	70	60.2	61.3	60.2	61.3	64
40190021	AZ	Pima	71.3	73	61.4	62.9	61.4	62.9	68
40191011	AZ	Pima	67.0	68	57.3	58.1	57.3	58.1	62
40191018	AZ	Pima	68.3	69	59.4	60.0	59.4	60.0	64

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
40191020	AZ	Pima	69.7	71	59.2	60.3	59.2	60.3	64
40191028	AZ	Pima	67.0	68	57.5	58.3	57.5	58.3	64
40191030	AZ	Pima	68.7	70	59.2	60.3	59.2	60.3	63
40191032	AZ	Pima	66.3	67	57.0	57.6	57.0	57.6	64
40191034	AZ	Pima	64.0	65	56.8	57.6	56.8	57.6	61
40213001	AZ	Pinal	73.0	74	62.6	63.4	62.6	63.4	70
40213003	AZ	Pinal	68.3	69	59.7	60.3	59.7	60.3	65
40213007	AZ	Pinal	68.3	69	61.5	62.1	61.5	62.1	65
40217001	AZ	Pinal	70.3	72	61.2	62.6	61.2	62.6	65
40218001	AZ	Pinal	76.0	76	65.3	65.3	65.3	65.3	71
40278011	AZ	Yuma	76.5	77	70.4	70.8	70.4	70.8	74
50350005	AR	Crittenden	77.3	79	60.3	61.6	60.3	61.6	67
51010002	AR	Newton	68.0	69	53.1	53.9	53.1	53.9	59
51130003	AR	Polk	72.3	73	60.8	61.3	60.8	61.3	62
51190007	AR	Pulaski	72.3	73	53.0	53.5	53.0	53.5	64
51191002	AR	Pulaski	75.7	77	55.6	56.6	55.6	56.6	64
51191008	AR	Pulaski	73.0	75	55.0	56.5	55.0	56.5	N/A
51430005	AR	Washington	71.0	73	57.1	58.8	57.1	58.8	59
60010007	CA	Alameda	73.3	76	64.2	66.6	64.2	66.6	74
60010009	CA	Alameda	45.7	49	44.3	47.5	44.3	47.5	55
60010011	CA	Alameda	45.0	45	44.0	44.0	44.0	44.0	49
60012001	CA	Alameda	56.0	56	52.9	52.9	52.9	52.9	66
60050002	CA	Amador	72.0	74	58.6	60.3	58.6	60.3	73
60070007	CA	Butte	76.3	77	62.0	62.6	62.0	62.6	75
60070008	CA	Butte	65.0	66	53.4	54.2	53.4	54.2	66
60090001	CA	Calaveras	75.0	77	61.1	62.7	61.1	62.7	76
60111002	CA	Colusa	61.0	62	52.5	53.4	52.5	53.4	63
60130002	CA	Contra Costa	70.7	73	62.9	64.9	62.9	64.9	67
60131002	CA	Contra Costa	71.7	74	62.7	64.8	62.7	64.8	68
60131004	CA	Contra Costa	51.0	51	49.7	49.7	49.7	49.7	54
60170010	CA	El Dorado	81.0	82	64.4	65.2	64.4	65.2	85
60170012	CA	El Dorado	68.3	69	60.7	61.4	60.7	61.4	N/A
60170020	CA	El Dorado	82.7	84	65.9	66.9	65.9	66.9	82
60190007	CA	Fresno	94.7	95	79.2	79.4	79.2	79.4	86
60190011	CA	Fresno	93.0	96	78.6	81.2	78.6	81.2	89
60190242	CA	Fresno	91.7	95	79.4	82.2	79.4	82.2	86
60192009	CA	Fresno	77.0	77	65.1	65.1	65.1	65.1	76
60194001	CA	Fresno	90.7	92	73.3	74.4	73.3	74.4	91
60195001	CA	Fresno	97.0	99	79.6	81.2	79.6	81.2	94
60210003	CA	Glenn	64.3	65	56.0	56.6	56.0	56.6	64

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
60250005	CA	Imperial	74.7	76	73.3	74.6	73.3	74.6	76
60251003	CA	Imperial	81.0	82	79.0	80.0	79.0	80.0	76
60254003	CA	Imperial	72.0	73	67.6	68.5	68.4	69.4	N/A
60254004	CA	Imperial	71.3	73	63.1	64.6	66.3	67.9	67
60270101	CA	Inyo	71.7	72	67.3	67.6	67.3	67.6	70
60290007	CA	Kern	91.7	96	77.7	81.3	77.7	81.3	87
60290008	CA	Kern	86.3	88	71.3	72.8	71.3	72.8	81
60290011	CA	Kern	80.0	81	69.5	70.4	69.5	70.4	84
60290014	CA	Kern	87.7	89	74.1	75.2	74.1	75.2	84
60290232	CA	Kern	87.3	89	73.7	75.2	73.7	75.2	77
60295002	CA	Kern	90.0	91	75.9	76.8	75.9	76.8	87
60296001	CA	Kern	84.3	86	70.9	72.4	70.9	72.4	81
60311004	CA	Kings	87.0	90	71.7	74.2	71.7	74.2	84
60370002	CA	Los Angeles	80.0	82	73.3	75.1	73.3	75.1	88
60370016	CA	Los Angeles	94.0	97	86.1	88.9	86.1	88.9	96
60370113	CA	Los Angeles	65.0	68	60.3	63.1	60.3	63.1	70
60371002	CA	Los Angeles	80.0	81	69.4	70.3	69.4	70.3	N/A
60371103	CA	Los Angeles	63.7	65	59.1	60.3	59.1	60.3	71
60371201	CA	Los Angeles	90.0	90	79.8	79.8	79.8	79.8	85
60371302	CA	Los Angeles	58.0	58	57.2	57.2	57.2	57.2	67
60371602	CA	Los Angeles	63.5	64	61.6	62.1	61.6	62.1	76
60371701	CA	Los Angeles	84.0	85	78.1	79.1	78.1	79.1	90
60372005	CA	Los Angeles	79.5	82	72.3	74.6	72.3	74.6	83
60374002	CA	Los Angeles	58.5	59	56.1	56.6	56.1	56.6	N/A
60376012	CA	Los Angeles	97.3	99	85.9	87.4	85.9	87.4	96
60379033	CA	Los Angeles	90.0	91	76.3	77.2	76.3	77.2	88
60390004	CA	Madera	79.3	81	68.6	70.1	68.6	70.1	83
60392010	CA	Madera	85.0	86	72.1	72.9	72.1	72.9	83
60410001	CA	Marin	52.3	53	47.6	48.2	47.2	47.9	61
60430003	CA	Mariposa	77.3	78	69.8	70.4	69.8	70.4	74
60430006	CA	Mariposa	77.0	78	64.6	65.5	64.6	65.5	75
60470003	CA	Merced	82.7	84	69.9	71.0	69.9	71.0	82
60530002	CA	Monterey	57.0	58	49.0	49.9	49.0	49.9	59
60530008	CA	Monterey	58.0	60	48.6	50.3	48.6	50.3	60
60531003	CA	Monterey	52.3	54	45.1	46.5	45.1	46.5	55
60550003	CA	Napa	62.3	65	51.9	54.2	51.9	54.2	62
60570005	CA	Nevada	77.7	79	62.3	63.3	62.3	63.3	83
60570007	CA	Nevada	76.0	78	60.7	62.3	60.7	62.3	N/A
60590007	CA	Orange	63.7	64	61.1	61.4	61.1	61.4	70
60591003	CA	Orange	61.3	62	58.1	58.8	57.8	58.4	69

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
60592022	CA	Orange	72.0	74	60.3	61.9	60.3	61.9	77
60595001	CA	Orange	69.7	71	68.3	69.6	68.3	69.6	74
60610003	CA	Placer	83.0	85	66.1	67.7	66.1	67.7	83
60610004	CA	Placer	74.0	75	58.9	59.7	58.9	59.7	76
60610006	CA	Placer	84.0	86	68.6	70.2	68.6	70.2	80
60650004	CA	Riverside	85.0	85	76.7	76.7	76.7	76.7	N/A
60650012	CA	Riverside	97.3	99	83.6	85.1	83.6	85.1	93
60650016	CA	Riverside	77.0	77	62.8	62.8	62.8	62.8	77
60651016	CA	Riverside	100.7	101	85.2	85.5	85.2	85.5	97
60652002	CA	Riverside	84.3	85	72.4	73.0	72.4	73.0	81
60655001	CA	Riverside	92.3	93	79.5	80.1	79.5	80.1	87
60656001	CA	Riverside	94.0	98	78.3	81.6	78.3	81.6	91
60658001	CA	Riverside	97.0	98	87.0	87.9	87.0	87.9	94
60658005	CA	Riverside	92.7	94	83.2	84.4	83.2	84.4	91
60659001	CA	Riverside	88.3	91	73.7	75.9	73.7	75.9	86
60659003	CA	Riverside	67.0	68	60.2	61.1	60.2	61.1	66
60670002	CA	Sacramento	76.7	77	64.8	65.0	64.8	65.0	77
60670006	CA	Sacramento	78.7	81	66.6	68.6	66.6	68.6	77
60670010	CA	Sacramento	70.3	71	60.4	61.0	60.4	61.0	69
60670011	CA	Sacramento	72.5	74	61.3	62.6	61.3	62.6	68
60670012	CA	Sacramento	93.3	95	74.5	75.9	74.5	75.9	83
60670014	CA	Sacramento	69.3	70	58.8	59.4	58.8	59.4	71
60675003	CA	Sacramento	86.3	88	69.9	71.3	69.9	71.3	79
60690002	CA	San Benito	62.0	66	52.0	55.4	52.0	55.4	63
60690003	CA	San Benito	70.0	70	59.9	59.9	59.9	59.9	69
60710001	CA	San Bernardino	77.0	78	68.0	68.9	68.0	68.9	80
60710005	CA	San Bernardino	105.0	107	96.2	98.1	96.2	98.1	108
60710012	CA	San Bernardino	95.0	97	84.1	85.8	84.1	85.8	91
60710306	CA	San Bernardino	83.7	85	76.2	77.4	76.2	77.4	86
60711004	CA	San Bernardino	96.7	98	89.8	91.0	89.8	91.0	101
60711234	CA	San Bernardino	69.0	69	64.1	64.1	64.1	64.1	69
60712002	CA	San Bernardino	101.0	103	93.1	95.0	93.1	95.0	97
60714001	CA	San Bernardino	94.3	97	86.0	88.5	86.0	88.5	90
60714003	CA	San Bernardino	105.0	107	94.1	95.8	94.1	95.8	101
60719002	CA	San Bernardino	92.3	94	80.0	81.4	80.0	81.4	86
60719004	CA	San Bernardino	98.7	99	88.4	88.7	88.4	88.7	104
60730001	CA	San Diego	61.3	63	58.0	59.6	58.0	59.6	61
60731001	CA	San Diego	63.0	64	56.4	57.3	56.2	57.0	67
60731002	CA	San Diego	70.3	72	55.9	57.3	55.9	57.3	N/A
60731006	CA	San Diego	81.0	82	69.4	70.2	69.4	70.2	81

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
60731008	CA	San Diego	64.7	67	55.1	57.1	54.9	56.8	70
60731010	CA	San Diego	56.3	59	53.2	55.8	53.2	55.8	62
60731016	CA	San Diego	68.0	69	59.8	60.7	59.8	60.7	68
60731018	CA	San Diego	69.7	71	59.2	60.3	59.2	60.3	N/A
60732007	CA	San Diego	57.7	58	54.0	54.2	54.0	54.2	N/A
60771002	CA	San Joaquin	68.0	69	59.1	60.0	59.1	60.0	68
60773005	CA	San Joaquin	79.0	80	67.2	68.1	67.2	68.1	79
60790005	CA	San Luis Obispo	64.3	66	54.1	55.5	54.1	55.5	62
60792006	CA	San Luis Obispo	54.3	57	45.4	47.7	45.4	47.7	57
60793001	CA	San Luis Obispo	53.3	55	45.4	46.9	45.4	46.9	55
60794002	CA	San Luis Obispo	58.7	62	49.0	51.7	49.0	51.7	62
60798002	CA	San Luis Obispo	62.3	63	52.3	52.9	52.3	52.9	63
60798005	CA	San Luis Obispo	78.0	79	66.0	66.8	66.0	66.8	73
60798006	CA	San Luis Obispo	75.0	76	64.0	64.9	64.0	64.9	68
60811001	CA	San Mateo	54.0	56	54.0	56.1	54.0	56.1	59
60830008	CA	Santa Barbara	57.7	59	50.1	51.3	50.2	51.4	61
60830011	CA	Santa Barbara	56.0	57	49.0	49.9	48.6	49.4	63
60831008	CA	Santa Barbara	50.3	52	42.1	43.5	42.1	43.5	54
60831013	CA	Santa Barbara	62.7	64	53.2	54.3	53.2	54.3	62
60831014	CA	Santa Barbara	67.0	69	57.5	59.2	57.5	59.2	64
60831018	CA	Santa Barbara	55.0	56	47.5	48.3	47.1	47.9	60
60831021	CA	Santa Barbara	66.7	71	58.6	62.4	57.6	61.3	63
60831025	CA	Santa Barbara	68.3	73	59.4	63.4	59.5	63.6	67
60832004	CA	Santa Barbara	53.0	54	45.5	46.4	45.5	46.4	56
60832011	CA	Santa Barbara	55.7	57	48.9	50.0	48.6	49.7	63
60833001	CA	Santa Barbara	59.7	62	51.1	53.0	51.1	53.0	62
60834003	CA	Santa Barbara	60.3	61	52.2	52.8	51.9	52.5	60
60850002	CA	Santa Clara	68.3	71	56.7	58.9	56.7	58.9	66
60850005	CA	Santa Clara	60.7	63	57.3	59.5	57.3	59.5	63
60851001	CA	Santa Clara	66.0	70	60.0	63.7	60.0	63.7	67
60852006	CA	Santa Clara	71.3	74	60.1	62.3	60.1	62.3	70
60852009	CA	Santa Clara	62.0	62	57.9	57.9	57.9	57.9	N/A
60870007	CA	Santa Cruz	53.0	55	47.1	48.9	47.1	48.9	57
60890004	CA	Shasta	60.0	64	48.8	52.0	48.8	52.0	70
60890007	CA	Shasta	67.0	69	55.1	56.7	55.1	56.7	68
60890009	CA	Shasta	68.0	69	55.3	56.2	55.3	56.2	N/A
60893003	CA	Shasta	66.3	68	57.2	58.7	57.2	58.7	65
60950004	CA	Solano	59.0	61	52.0	53.8	52.0	53.8	63
60950005	CA	Solano	67.3	69	56.0	57.4	56.0	57.4	64
60953003	CA	Solano	68.0	69	56.7	57.5	56.7	57.5	67

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
60970003	CA	Sonoma	48.0	50	39.0	40.6	39.0	40.6	N/A
60990005	CA	Stanislaus	75.0	75	65.2	65.2	65.2	65.2	81
60990006	CA	Stanislaus	87.0	88	74.8	75.7	74.8	75.7	83
61010003	CA	Sutter	65.0	66	53.4	54.3	53.4	54.3	65
61030004	CA	Tehama	75.3	76	62.3	62.9	62.3	62.9	79
61030007	CA	Tehama	72.5	73	59.7	60.1	59.7	60.1	67
61070006	CA	Tulare	81.7	85	69.1	71.9	69.1	71.9	84
61070009	CA	Tulare	94.7	96	76.1	77.2	76.1	77.2	89
61072002	CA	Tulare	85.0	88	68.9	71.4	68.9	71.4	80
61072010	CA	Tulare	89.0	90	73.1	73.9	73.1	73.9	83
61090005	CA	Tuolumne	73.3	74	60.6	61.2	60.6	61.2	79
61110007	CA	Ventura	71.7	76	62.9	66.7	62.9	66.7	69
61110009	CA	Ventura	74.0	77	63.7	66.2	63.7	66.2	74
61111004	CA	Ventura	76.7	77	66.1	66.4	66.1	66.4	74
61112002	CA	Ventura	81.0	83	70.5	72.2	70.5	72.2	77
61113001	CA	Ventura	60.7	63	53.3	55.3	53.3	55.3	63
61130004	CA	Yolo	68.7	70	56.5	57.6	56.5	57.6	64
61131003	CA	Yolo	69.0	69	59.5	59.5	59.5	59.5	69
80013001	CO	Adams	76.0	76	70.8	70.8	70.8	70.8	67
80050002	CO	Arapahoe	76.7	79	69.3	71.3	69.3	71.3	N/A
80050006	CO	Arapahoe	73.5	74	65.0	65.4	65.0	65.4	67
80130011	CO	Boulder	74.7	77	65.5	67.5	65.5	67.5	N/A
80310014	CO	Denver	71.0	73	66.2	68.0	66.2	68.0	N/A
80310025	CO	Denver	65.0	65	61.8	61.8	61.8	61.8	N/A
80350004	CO	Douglas	80.7	83	71.1	73.2	71.1	73.2	77
80410013	CO	El Paso	71.0	74	64.0	66.7	64.0	66.7	66
80410016	CO	El Paso	72.7	74	65.4	66.6	65.4	66.6	64
80450012	CO	Garfield	65.0	66	62.4	63.3	62.4	63.3	63
80590002	CO	Jefferson	74.0	74	66.7	66.7	66.7	66.7	N/A
80590005	CO	Jefferson	75.7	78	67.5	69.5	67.5	69.5	72
80590006	CO	Jefferson	80.3	83	71.3	73.7	71.3	73.7	77
80590011	CO	Jefferson	78.7	82	70.9	73.9	70.9	73.9	80
80590013	CO	Jefferson	74.5	75	65.6	66.1	65.6	66.1	70
80671004	CO	La Plata	73.0	74	66.0	66.9	66.0	66.9	N/A
80677001	CO	La Plata	68.7	69	61.9	62.2	61.9	62.2	68
80690007	CO	Larimer	75.7	77	66.8	68.0	66.8	68.0	69
80690011	CO	Larimer	78.0	80	71.2	73.0	71.2	73.0	75
80690012	CO	Larimer	71.0	71	64.2	64.2	64.2	64.2	N/A
80691004	CO	Larimer	68.7	72	63.3	66.3	63.3	66.3	70
80770020	CO	Mesa	67.0	68	63.1	64.1	63.1	64.1	63

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
80830006	CO	Montezuma	67.3	68	59.8	60.4	59.8	60.4	62
80830101	CO	Montezuma	68.3	69	59.3	59.9	59.3	59.9	65
81030005	CO	Rio Blanco	63.5	64	59.8	60.3	59.8	60.3	61
81230009	CO	Weld	74.7	76	70.2	71.4	70.2	71.4	70
90010017	CT	Fairfield	80.3	83	69.8	72.1	68.9	71.2	80
90011123	CT	Fairfield	81.3	83	66.4	67.8	66.4	67.8	78
90013007	CT	Fairfield	84.3	89	71.2	75.2	71.0	75.0	81
90019003	CT	Fairfield	83.7	87	72.7	75.6	73.0	75.9	85
90031003	CT	Hartford	73.7	75	60.7	61.7	60.7	61.7	75
90050005	CT	Litchfield	70.3	71	57.2	57.8	57.2	57.8	74
90070007	CT	Middlesex	79.3	81	64.7	66.1	64.7	66.1	79
90090027	CT	New Haven	74.3	78	62.3	65.4	61.9	65.0	76
90099002	CT	New Haven	85.7	89	71.2	73.9	69.9	72.6	76
90110124	CT	New London	80.3	84	66.4	69.5	67.3	70.4	72
90131001	CT	Tolland	75.3	77	61.4	62.8	61.4	62.8	73
100010002	DE	Kent	74.3	78	58.3	61.2	57.6	60.5	66
100031007	DE	New Castle	76.3	80	59.2	62.0	59.2	62.0	68
100031010	DE	New Castle	78.0	78	61.2	61.2	61.2	61.2	74
100031013	DE	New Castle	77.7	80	60.8	62.6	60.8	62.6	70
100051002	DE	Sussex	77.3	81	59.7	62.6	59.7	62.6	65
100051003	DE	Sussex	77.7	81	62.4	65.1	61.1	63.7	69
110010041	DC	DC	76.0	80	58.7	61.7	58.7	61.7	N/A
110010043	DC	DC	80.7	84	62.3	64.8	62.3	64.8	70
120013011	FL	Alachua	63.7	65	51.0	52.0	51.0	52.0	58
120030002	FL	Baker	61.7	63	50.5	51.6	50.5	51.6	59
120050006	FL	Bay	68.0	69	51.7	52.4	52.6	53.4	62
120090007	FL	Brevard	64.0	64	52.2	52.2	51.6	51.6	58
120094001	FL	Brevard	64.0	65	52.6	53.4	51.7	52.5	61
120110033	FL	Broward	58.0	59	53.6	54.5	53.6	54.5	59
120112003	FL	Broward	58.0	58	50.7	50.7	52.6	52.6	N/A
120118002	FL	Broward	59.3	60	53.1	53.7	55.7	56.3	62
120210004	FL	Collier	59.5	60	49.8	50.2	51.2	51.6	57
120230002	FL	Columbia	62.7	64	51.6	52.7	51.6	52.7	N/A
120310077	FL	Duval	63.3	66	49.8	51.9	51.2	53.3	N/A
120310100	FL	Duval	64.3	67	50.3	52.5	50.4	52.5	N/A
120310106	FL	Duval	63.0	64	51.4	52.2	51.4	52.2	N/A
120330004	FL	Escambia	68.7	70	54.0	55.0	55.8	56.8	64
120330018	FL	Escambia	72.0	73	56.2	57.0	58.8	59.6	64
120550003	FL	Highlands	63.3	64	52.8	53.4	52.8	53.4	60
120570081	FL	Hillsborough	71.7	73	60.6	61.7	60.8	61.9	68

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
120571035	FL	Hillsborough	68.3	69	57.5	58.1	58.4	59.0	66
120571065	FL	Hillsborough	70.7	72	59.9	61.0	60.7	61.8	66
120573002	FL	Hillsborough	71.5	72	58.5	58.9	58.5	58.9	66
120590004	FL	Holmes	62.3	63	47.8	48.3	47.8	48.3	60
120619991	FL	Indian River	65.0	65	53.3	53.3	54.1	54.1	61
120690002	FL	Lake	65.7	66	53.5	53.7	54.1	54.3	63
120712002	FL	Lee	63.7	64	53.4	53.7	53.6	53.8	60
120713002	FL	Lee	61.3	62	50.7	51.3	51.7	52.3	59
120730012	FL	Leon	64.3	66	49.3	50.6	49.3	50.6	60
120730013	FL	Leon	64.0	65	49.2	50.0	49.2	50.0	N/A
120813002	FL	Manatee	64.0	65	53.3	54.2	53.0	53.8	59
120814012	FL	Manatee	67.0	67	55.4	55.4	55.5	55.5	N/A
120830003	FL	Marion	65.0	66	52.7	53.5	52.7	53.5	61
120830004	FL	Marion	62.0	63	49.6	50.4	49.6	50.4	58
120860027	FL	Miami-Dade	64.0	65	58.5	59.4	60.3	61.2	62
120860029	FL	Miami-Dade	63.3	64	56.4	57.0	57.7	58.4	61
120910002	FL	Okaloosa	66.0	67	51.2	52.0	51.3	52.1	62
120950008	FL	Orange	71.0	72	58.0	58.8	58.0	58.8	62
120952002	FL	Orange	71.7	73	60.0	61.1	60.0	61.1	62
120972002	FL	Osceola	66.0	66	53.2	53.2	53.2	53.2	63
120990009	FL	Palm Beach	62.7	63	54.1	54.4	54.1	54.4	N/A
120990020	FL	Palm Beach	61.7	62	54.0	54.2	54.3	54.5	N/A
121010005	FL	Pasco	66.7	67	53.9	54.1	53.9	54.1	61
121012001	FL	Pasco	65.3	67	55.6	57.1	55.7	57.1	62
121030004	FL	Pinellas	66.7	67	57.1	57.3	57.1	57.3	61
121030018	FL	Pinellas	65.3	66	57.8	58.4	56.9	57.5	61
121035002	FL	Pinellas	64.3	65	54.9	55.5	54.8	55.4	59
121056005	FL	Polk	67.3	68	55.1	55.7	55.1	55.7	63
121056006	FL	Polk	68.3	69	56.0	56.6	56.0	56.6	62
121130015	FL	Santa Rosa	71.7	74	55.4	57.2	55.3	57.1	64
121151005	FL	Sarasota	71.3	72	58.7	59.3	58.7	59.2	62
121151006	FL	Sarasota	67.7	68	55.2	55.4	55.2	55.5	62
121152002	FL	Sarasota	66.0	67	54.5	55.3	54.6	55.5	61
121171002	FL	Seminole	67.3	69	55.1	56.5	55.1	56.5	61
121272001	FL	Volusia	59.7	60	46.6	46.9	48.3	48.6	59
121275002	FL	Volusia	63.3	64	50.4	51.0	51.6	52.1	59
121290001	FL	Wakulla	63.7	65	50.8	51.8	50.0	51.0	N/A
130210012	GA	Bibb	72.3	73	51.3	51.8	51.3	51.8	65
130510021	GA	Chatham	63.3	64	49.7	50.3	49.7	50.3	57
130550001	GA	Chattooga	66.3	67	50.1	50.7	50.1	50.7	62

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
130590002	GA	Clarke	70.7	73	50.6	52.3	50.6	52.3	64
130670003	GA	Cobb	76.0	78	55.4	56.9	55.4	56.9	N/A
130730001	GA	Columbia	68.7	70	50.6	51.5	50.6	51.5	61
130770002	GA	Coweta	65.0	67	46.4	47.8	46.4	47.8	66
130850001	GA	Dawson	66.3	68	47.7	48.9	47.7	48.9	65
130890002	GA	DeKalb	77.3	80	56.1	58.1	56.1	58.1	71
130970004	GA	Douglas	73.3	75	52.9	54.2	52.9	54.2	68
131210055	GA	Fulton	81.0	83	59.2	60.6	59.2	60.6	75
131270006	GA	Glynn	60.0	61	47.4	48.2	47.6	48.4	56
131350002	GA	Gwinnett	76.7	78	54.5	55.4	54.5	55.4	72
131510002	GA	Henry	80.0	82	57.7	59.2	57.7	59.2	74
132130003	GA	Murray	70.3	72	51.2	52.5	51.2	52.5	65
132150008	GA	Muscogee	66.0	67	50.2	50.9	50.2	50.9	62
132230003	GA	Paulding	70.7	72	54.3	55.3	54.3	55.3	63
132450091	GA	Richmond	70.0	72	51.9	53.4	51.9	53.4	62
132470001	GA	Rockdale	77.0	79	54.4	55.8	54.4	55.8	74
132611001	GA	Sumter	64.7	66	50.4	51.4	50.4	51.4	60
160010017	ID	Ada	67.5	68	59.4	59.8	59.4	59.8	67
160010019	ID	Ada	62.0	62	54.2	54.2	54.2	54.2	N/A
160230101	ID	Butte	62.3	63	59.6	60.2	59.6	60.2	60
160550003	ID	Kootenai	56.0	56	47.9	47.9	47.9	47.9	N/A
170010007	IL	Adams	67.0	69	54.5	56.2	54.5	56.2	62
170190007	IL	Champaign	71.0	71	57.7	57.7	57.7	57.7	63
170230001	IL	Clark	66.0	66	53.8	53.8	53.8	53.8	64
170310001	IL	Cook	72.0	74	63.2	64.9	63.2	64.9	69
170310032	IL	Cook	77.7	81	58.8	61.3	66.6	69.5	70
170310064	IL	Cook	71.3	75	53.9	56.7	61.1	64.3	N/A
170310076	IL	Cook	71.7	74	62.7	64.7	62.7	64.7	69
170311003	IL	Cook	69.7	72	53.3	55.1	62.4	64.4	69
170311601	IL	Cook	71.3	74	61.5	63.9	61.5	63.9	69
170314002	IL	Cook	71.7	74	55.8	57.6	62.3	64.3	66
170314007	IL	Cook	65.7	68	49.2	50.9	58.0	60.0	71
170314201	IL	Cook	75.7	78	56.7	58.4	66.8	68.8	71
170317002	IL	Cook	76.0	80	55.7	58.6	66.8	70.3	72
170436001	IL	DuPage	66.3	68	57.9	59.4	57.9	59.4	68
170491001	IL	Effingham	68.3	70	55.5	56.9	55.5	56.9	64
170650002	IL	Hamilton	74.3	78	60.7	63.8	60.7	63.8	65
170831001	IL	Jersey	76.0	79	58.4	60.7	58.4	60.7	68
170859991	IL	Jo Daviess	68.0	68	56.4	56.4	56.4	56.4	65
170890005	IL	Kane	69.7	71	62.8	63.9	62.8	63.9	68

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170971007	IL	Lake	79.3	82	57.5	59.5	63.4	65.6	73
171110001	IL	McHenry	69.7	71	61.8	62.9	61.8	62.9	68
171132003	IL	McLean	70.3	72	56.0	57.4	56.0	57.4	64
171150013	IL	Macon	71.3	73	58.0	59.4	58.0	59.4	66
171170002	IL	Macoupin	71.3	73	53.8	55.1	53.8	55.1	64
171190008	IL	Madison	77.0	80	59.5	61.8	59.5	61.8	71
171191009	IL	Madison	78.3	80	59.9	61.2	59.9	61.2	67
171193007	IL	Madison	76.7	79	59.3	61.0	59.3	61.0	71
171199991	IL	Madison	76.0	76	56.7	56.7	56.7	56.7	67
171430024	IL	Peoria	61.7	63	51.3	52.4	51.3	52.4	64
171431001	IL	Peoria	70.7	72	58.8	59.8	58.8	59.8	N/A
171570001	IL	Randolph	67.7	70	54.7	56.6	54.7	56.6	67
171613002	IL	Rock Island	58.3	60	49.2	50.6	49.2	50.6	62
171630010	IL	Saint Clair	74.7	77	56.9	58.7	56.9	58.7	68
171670014	IL	Sangamon	72.0	72	56.8	56.8	56.8	56.8	63
171971011	IL	Will	64.0	65	55.6	56.5	55.6	56.5	64
172012001	IL	Winnebago	67.3	68	57.5	58.0	57.5	58.0	68
180030002	IN	Allen	68.3	70	55.2	56.6	55.2	56.6	63
180030004	IN	Allen	69.3	71	56.1	57.4	56.1	57.4	63
180110001	IN	Boone	72.3	74	59.4	60.8	59.4	60.8	66
180150002	IN	Carroll	69.0	71	56.8	58.5	56.8	58.5	64
180190008	IN	Clark	78.0	81	62.1	64.5	62.1	64.5	70
180350010	IN	Delaware	68.7	70	54.4	55.5	54.4	55.5	59
180390007	IN	Elkhart	67.7	70	54.6	56.5	54.6	56.5	61
180431004	IN	Floyd	76.0	79	61.7	64.1	61.7	64.1	69
180550001	IN	Greene	77.0	78	63.5	64.3	63.5	64.3	66
180570006	IN	Hamilton	71.0	72	57.2	58.0	57.2	58.0	63
180590003	IN	Hancock	66.7	69	53.4	55.2	53.4	55.2	N/A
180630004	IN	Hendricks	67.0	68	55.5	56.3	55.5	56.3	60
180690002	IN	Huntington	65.0	66	53.0	53.8	53.0	53.8	58
180710001	IN	Jackson	66.0	67	53.0	53.8	53.0	53.8	66
180810002	IN	Johnson	69.0	70	56.0	56.8	56.0	56.8	60
180839991	IN	Knox	73.0	73	59.2	59.2	59.2	59.2	65
180890022	IN	Lake	66.7	69	55.2	57.1	58.3	60.3	67
180890030	IN	Lake	69.7	73	58.9	61.7	61.9	64.8	N/A
180892008	IN	Lake	68.0	68	57.5	57.5	60.4	60.4	65
180910005	IN	LaPorte	79.3	83	65.4	68.5	67.2	70.4	N/A
180910010	IN	LaPorte	69.7	72	59.2	61.2	58.9	60.9	63
180950010	IN	Madison	68.3	70	54.2	55.5	54.2	55.5	57
180970050	IN	Marion	72.7	74	59.1	60.2	59.1	60.2	69

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
180970057	IN	Marion	69.0	71	57.8	59.4	57.8	59.4	65
180970073	IN	Marion	72.0	74	59.1	60.7	59.1	60.7	65
180970078	IN	Marion	69.7	72	58.3	60.3	58.3	60.3	N/A
181090005	IN	Morgan	69.0	70	55.1	55.9	55.1	55.9	64
181230009	IN	Perry	72.7	75	53.6	55.3	53.6	55.3	67
181270024	IN	Porter	70.3	72	57.6	59.0	61.8	63.3	69
181270026	IN	Porter	63.0	64	54.4	55.3	54.4	55.3	66
181290003	IN	Posey	70.3	71	56.5	57.0	56.5	57.0	66
181410010	IN	St. Joseph	62.7	64	51.2	52.3	51.2	52.3	62
181410015	IN	St. Joseph	69.3	73	56.9	59.9	56.9	59.9	68
181411007	IN	St. Joseph	64.0	64	52.5	52.5	52.5	52.5	N/A
181450001	IN	Shelby	74.0	75	60.6	61.4	60.6	61.4	62
181630013	IN	Vanderburgh	71.7	73	56.2	57.3	56.2	57.3	69
181630021	IN	Vanderburgh	74.0	74	58.6	58.6	58.6	58.6	70
181670018	IN	Vigo	65.7	68	52.5	54.3	52.5	54.3	65
181670024	IN	Vigo	64.0	64	51.3	51.3	51.3	51.3	61
181730008	IN	Warrick	71.0	73	54.9	56.5	54.9	56.5	68
181730009	IN	Warrick	69.7	72	55.0	56.8	55.0	56.8	66
181730011	IN	Warrick	71.0	74	54.2	56.5	54.2	56.5	67
190170011	IA	Bremer	64.0	65	50.9	51.7	50.9	51.7	60
190450021	IA	Clinton	66.7	68	55.9	57.0	55.9	57.0	63
190850007	IA	Harrison	66.7	68	53.9	54.9	53.9	54.9	62
190851101	IA	Harrison	67.7	69	54.7	55.7	54.7	55.7	62
191130028	IA	Linn	64.3	66	54.1	55.5	54.1	55.5	61
191130033	IA	Linn	64.0	65	51.9	52.7	51.9	52.7	61
191130040	IA	Linn	62.7	64	52.8	53.9	52.8	53.9	61
191370002	IA	Montgomery	65.3	67	54.1	55.5	54.1	55.5	60
191471002	IA	Palo Alto	66.7	68	55.2	56.3	55.2	56.3	61
191530030	IA	Polk	59.7	61	48.1	49.2	48.1	49.2	60
191630014	IA	Scott	63.0	63	52.4	52.4	52.4	52.4	63
191630015	IA	Scott	66.0	67	55.7	56.5	55.7	56.5	60
191690011	IA	Story	61.3	62	49.1	49.7	49.1	49.7	60
191770006	IA	Van Buren	65.7	68	53.0	54.9	53.0	54.9	60
191810022	IA	Warren	63.7	65	51.8	52.9	51.8	52.9	58
200910010	KS	Johnson	72.7	76	59.0	61.7	59.0	61.7	60
201030003	KS	Leavenworth	72.0	74	56.3	57.8	56.3	57.8	63
201070002	KS	Linn	70.0	72	55.4	57.0	55.4	57.0	N/A
201730010	KS	Sedgwick	76.3	78	61.9	63.2	61.9	63.2	65
201730018	KS	Sedgwick	75.7	77	61.6	62.6	61.6	62.6	65
201770013	KS	Shawnee	71.7	74	56.0	57.8	56.0	57.8	63

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
201910002	KS	Sumner	76.3	78	63.0	64.4	63.0	64.4	64
201950001	KS	Trego	72.3	74	64.3	65.9	64.3	65.9	63
202090021	KS	Wyandotte	65.7	70	52.8	56.3	52.8	56.3	63
210130002	KY	Bell	63.3	65	49.3	50.6	49.3	50.6	61
210150003	KY	Boone	68.0	70	53.5	55.1	53.5	55.1	63
210190017	KY	Boyd	70.0	72	57.7	59.3	57.7	59.3	66
210290006	KY	Bullitt	72.3	75	58.0	60.1	58.0	60.1	66
210373002	KY	Campbell	76.7	79	61.3	63.1	61.3	63.1	70
210430500	KY	Carter	67.0	69	53.6	55.2	53.6	55.2	61
210470006	KY	Christian	70.7	73	55.6	57.4	55.6	57.4	62
210590005	KY	Daviess	76.3	79	57.1	59.1	57.1	59.1	65
210610501	KY	Edmonson	72.0	75	56.3	58.6	56.3	58.6	64
210670012	KY	Fayette	71.3	74	57.0	59.1	57.0	59.1	67
210890007	KY	Greenup	69.7	72	57.4	59.2	57.4	59.2	63
210910012	KY	Hancock	73.7	76	54.1	55.8	54.1	55.8	68
210930006	KY	Hardin	70.3	73	54.2	56.3	54.2	56.3	65
211010014	KY	Henderson	76.3	79	59.7	61.8	59.7	61.8	69
211110027	KY	Jefferson	77.0	80	62.5	64.9	62.5	64.9	69
211110051	KY	Jefferson	78.5	79	64.4	64.8	64.4	64.8	69
211110067	KY	Jefferson	85.0	85	70.1	70.1	70.1	70.1	74
211130001	KY	Jessamine	70.0	72	55.3	56.9	55.3	56.9	65
211390003	KY	Livingston	72.3	75	57.1	59.2	57.1	59.2	65
211451024	KY	McCracken	73.7	77	59.3	62.0	59.3	62.0	63
211850004	KY	Oldham	82.0	86	63.5	66.6	63.5	66.6	70
211930003	KY	Perry	65.3	68	54.3	56.5	54.3	56.5	58
211950002	KY	Pike	65.7	68	53.1	55.0	53.1	55.0	60
211990003	KY	Pulaski	66.7	69	51.1	52.9	51.1	52.9	62
212130004	KY	Simpson	69.3	71	52.9	54.2	52.9	54.2	64
212218001	KY	Trigg	69.0	69	54.8	54.8	54.8	54.8	N/A
212270008	KY	Warren	64.0	64	49.5	49.5	49.5	49.5	N/A
212299991	KY	Washington	69.0	69	54.4	54.4	54.4	54.4	64
220050004	LA	Ascension	74.7	77	63.5	65.4	63.5	65.4	71
220150008	LA	Bossier	77.3	80	63.4	65.6	63.4	65.6	65
220170001	LA	Caddo	74.7	76	61.0	62.0	61.0	62.0	64
220190002	LA	Calcasieu	72.7	75	66.5	68.6	66.5	68.6	68
220190008	LA	Calcasieu	67.7	69	61.7	62.8	61.7	62.8	N/A
220190009	LA	Calcasieu	72.0	74	63.6	65.4	63.6	65.4	64
220330003	LA	E. Baton Rouge	78.7	82	67.8	70.6	67.8	70.6	72
220330009	LA	E. Baton Rouge	75.0	77	64.1	65.8	64.1	65.8	66
220330013	LA	E. Baton Rouge	71.0	72	60.5	61.4	60.5	61.4	N/A

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
220470009	LA	Iberville	73.3	75	63.5	65.0	63.5	65.0	N/A
220470012	LA	Iberville	76.0	77	65.7	66.6	65.7	66.6	N/A
220511001	LA	Jefferson	73.7	76	66.0	68.0	66.6	68.6	68
220550007	LA	Lafayette	71.0	72	59.8	60.7	59.8	60.7	66
220570004	LA	Lafourche	72.3	74	64.1	65.6	64.1	65.6	65
220630002	LA	Livingston	74.0	76	63.3	65.0	63.3	65.0	70
220710012	LA	Orleans	69.3	70	62.1	62.7	62.2	62.8	N/A
220730004	LA	Ouachita	63.3	66	52.8	55.1	52.8	55.1	N/A
220770001	LA	Pointe Coupee	75.3	77	63.3	64.7	63.3	64.7	68
220870004	LA	St. Bernard	69.0	69	61.8	61.8	61.9	61.9	66
220890003	LA	St. Charles	70.0	72	62.7	64.5	63.0	64.8	N/A
220930002	LA	St. James	68.0	69	60.0	60.9	60.0	60.9	65
220950002	LA	St. John the Baptist	74.0	75	66.3	67.2	66.3	67.2	66
221030002	LA	St. Tammany	73.3	74	64.1	64.7	64.0	64.6	68
221210001	LA	West Baton Rouge	70.3	72	60.0	61.5	60.0	61.5	66
230010014	ME	Androscoggin	61.0	62	49.4	50.2	49.3	50.1	60
230052003	ME	Cumberland	69.3	70	56.2	56.8	56.7	57.3	65
230090102	ME	Hancock	71.7	74	61.3	63.2	59.9	61.8	66
230090103	ME	Hancock	66.3	69	55.0	57.3	55.3	57.5	62
230112005	ME	Kennebec	62.7	64	50.5	51.5	50.5	51.5	59
230130004	ME	Knox	67.7	69	54.7	55.7	54.8	55.8	63
230173001	ME	Oxford	54.3	55	43.7	44.3	43.7	44.3	N/A
230194008	ME	Penobscot	57.7	59	46.6	47.6	46.6	47.6	58
230230006	ME	Sagadahoc	61.0	61	48.7	48.7	48.7	48.7	N/A
230310038	ME	York	60.3	62	48.2	49.6	48.2	49.6	58
230310040	ME	York	64.3	65	51.5	52.0	51.5	52.0	61
230312002	ME	York	73.7	75	60.1	61.2	59.6	60.7	67
240030014	MD	Anne Arundel	83.0	87	63.4	66.4	63.4	66.4	N/A
240051007	MD	Baltimore	79.0	82	63.9	66.3	63.9	66.3	72
240053001	MD	Baltimore	80.7	84	64.9	67.6	65.3	67.9	72
240090011	MD	Calvert	79.7	83	64.2	66.9	63.2	65.9	69
240130001	MD	Carroll	76.3	79	58.8	60.9	58.8	60.9	68
240150003	MD	Cecil	83.0	86	64.5	66.8	64.5	66.8	76
240170010	MD	Charles	79.0	83	61.6	64.7	61.6	64.7	70
240199991	MD	Dorchester	75.0	75	60.7	60.7	59.4	59.4	66
240210037	MD	Frederick	76.3	79	59.6	61.8	59.6	61.8	67
240230002	MD	Garrett	72.0	75	55.1	57.4	55.1	57.4	65
240251001	MD	Harford	90.0	93	71.4	73.8	70.9	73.3	73

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
240259001	MD	Harford	79.3	82	61.8	63.9	62.2	64.3	73
240290002	MD	Kent	78.7	82	61.2	63.7	61.2	63.7	70
240313001	MD	Montgomery	75.7	77	60.0	61.0	60.0	61.0	68
240330030	MD	Prince George's	79.0	82	60.5	62.8	60.5	62.8	69
240338003	MD	Prince George's	82.3	87	63.2	66.8	63.2	66.8	71
240339991	MD	Prince George's	80.0	80	61.0	61.0	61.0	61.0	68
240430009	MD	Washington	72.7	75	56.0	57.8	56.0	57.8	66
245100054	MD	Baltimore (City)	73.7	75	59.9	61.0	59.4	60.4	69
250010002	MA	Barnstable	73.0	75	59.6	61.3	60.5	62.2	N/A
250034002	MA	Berkshire	69.0	71	56.1	57.7	56.1	57.7	N/A
250051002	MA	Bristol	74.0	74	61.6	61.6	61.2	61.2	N/A
250070001	MA	Dukes	77.0	80	64.1	66.6	64.1	66.6	N/A
250092006	MA	Essex	71.0	71	57.5	57.5	58.4	58.4	65
250094005	MA	Essex	70.0	70	57.2	57.2	57.2	57.2	64
250095005	MA	Essex	69.3	70	56.2	56.8	56.2	56.8	62
250130008	MA	Hampden	73.7	74	59.3	59.5	59.3	59.5	70
250150103	MA	Hampshire	64.7	66	51.9	53.0	51.9	53.0	N/A
250154002	MA	Hampshire	71.3	72	57.0	57.5	57.0	57.5	70
250170009	MA	Middlesex	67.3	68	54.0	54.5	54.0	54.5	63
250171102	MA	Middlesex	67.0	67	53.4	53.4	53.4	53.4	N/A
250213003	MA	Norfolk	72.3	73	59.6	60.2	59.6	60.2	67
250250041	MA	Suffolk	68.3	70	56.4	57.8	55.5	56.9	N/A
250250042	MA	Suffolk	60.7	61	49.6	49.9	50.1	50.4	56
250270015	MA	Worcester	68.3	70	54.6	55.9	54.6	55.9	64
250270024	MA	Worcester	69.0	70	54.9	55.7	54.9	55.7	64
260050003	MI	Allegan	82.7	86	69.0	71.8	69.0	71.7	75
260190003	MI	Benzie	73.0	75	60.9	62.6	60.6	62.3	69
260210014	MI	Berrien	79.7	82	67.4	69.3	66.9	68.8	74
260270003	MI	Cass	76.7	78	62.0	63.1	62.0	63.1	70
260370001	MI	Clinton	69.3	71	56.2	57.6	56.2	57.6	67
260490021	MI	Genesee	73.0	76	60.1	62.5	60.1	62.5	68
260492001	MI	Genesee	72.3	74	58.8	60.2	58.8	60.2	69
260630007	MI	Huron	71.3	74	59.5	61.7	59.0	61.2	68
260650012	MI	Ingham	70.3	72	56.8	58.2	56.8	58.2	67
260770008	MI	Kalamazoo	73.7	75	59.9	60.9	59.9	60.9	69
260810020	MI	Kent	73.0	75	59.8	61.4	59.8	61.4	69
260810022	MI	Kent	72.7	74	58.3	59.3	58.3	59.3	67
260910007	MI	Lenawee	75.5	76	60.6	61.0	60.6	61.0	67
260990009	MI	Macomb	76.7	78	65.1	66.2	64.5	65.6	72
260991003	MI	Macomb	77.3	79	66.7	68.1	66.7	68.1	67

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
261010922	MI	Manistee	72.3	74	60.2	61.6	60.5	61.9	68
261050007	MI	Mason	73.3	75	60.7	62.1	60.7	62.1	70
261130001	MI	Missaukee	68.3	70	56.9	58.3	56.9	58.3	67
261210039	MI	Muskegon	79.7	82	65.6	67.5	65.8	67.7	75
261250001	MI	Oakland	76.3	78	64.1	65.6	64.1	65.6	69
261390005	MI	Ottawa	76.0	78	62.3	64.0	62.3	64.0	70
261470005	MI	St. Clair	75.3	77	63.7	65.1	62.5	63.9	73
261530001	MI	Schoolcraft	71.7	75	59.4	62.1	59.4	62.1	70
261610008	MI	Washtenaw	73.3	76	60.7	62.9	60.7	62.9	67
261630001	MI	Wayne	71.7	74	60.5	62.4	60.5	62.4	65
261630019	MI	Wayne	78.7	81	69.0	71.0	69.0	71.0	72
270031001	MN	Anoka	67.0	67	55.1	55.1	55.1	55.1	60
270031002	MN	Anoka	66.3	67	57.3	57.9	57.3	57.9	63
270353204	MN	Crow Wing	62.0	62	50.7	50.7	50.7	50.7	59
270495302	MN	Goodhue	62.5	63	52.2	52.6	52.2	52.6	61
270834210	MN	Lyon	64.5	65	54.1	54.5	54.1	54.5	62
270953051	MN	Mille Lacs	59.7	60	48.6	48.8	48.9	49.2	60
271095008	MN	Olmsted	63.5	64	52.3	52.7	52.3	52.7	61
271377550	MN	Saint Louis	49.7	50	42.0	42.2	42.2	42.5	53
271390505	MN	Scott	63.5	65	54.3	55.5	54.3	55.5	60
271453052	MN	Stearns	61.5	62	52.7	53.1	52.7	53.1	60
271713201	MN	Wright	63.5	64	54.6	55.0	54.6	55.0	61
280110001	MS	Bolivar	71.7	74	60.9	62.9	60.9	62.9	62
280330002	MS	DeSoto	72.3	74	55.4	56.7	55.4	56.7	64
280450003	MS	Hancock	66.3	67	53.4	53.9	53.9	54.4	63
280470008	MS	Harrison	72.3	75	55.9	58.0	57.7	59.9	67
280490010	MS	Hinds	67.0	68	50.0	50.7	50.0	50.7	N/A
280590006	MS	Jackson	71.7	73	56.9	58.0	57.1	58.2	67
280750003	MS	Lauderdale	62.7	63	50.0	50.2	50.0	50.2	57
280810005	MS	Lee	65.0	66	49.7	50.5	49.7	50.5	59
281619991	MS	Yalobusha	63.0	63	51.4	51.4	51.4	51.4	57
290030001	MO	Andrew	73.3	75	58.3	59.6	58.3	59.6	63
290190011	MO	Boone	69.0	72	54.0	56.3	54.0	56.3	64
290270002	MO	Callaway	67.7	70	53.5	55.3	53.5	55.3	64
290370003	MO	Cass	70.0	72	56.3	57.9	56.3	57.9	63
290390001	MO	Cedar	71.7	74	58.0	59.9	58.0	59.9	61
290470003	MO	Clay	77.0	79	61.9	63.5	61.9	63.5	65
290470005	MO	Clay	75.3	77	59.8	61.1	59.8	61.1	64
290470006	MO	Clay	77.7	80	61.7	63.5	61.7	63.5	67
290490001	MO	Clinton	78.0	80	61.3	62.9	61.3	62.9	67

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
290770036	MO	Greene	69.3	71	54.5	55.8	54.5	55.8	59
290770042	MO	Greene	71.7	74	56.4	58.2	56.4	58.2	60
290970004	MO	Jasper	76.7	78	60.2	61.2	60.2	61.2	61
290990019	MO	Jefferson	76.3	79	58.7	60.8	58.7	60.8	70
291130003	MO	Lincoln	77.0	80	59.6	62.0	59.6	62.0	65
291370001	MO	Monroe	68.7	71	55.8	57.7	55.8	57.7	59
291570001	MO	Perry	74.3	77	59.7	61.9	59.7	61.9	67
291831002	MO	Saint Charles	82.3	86	63.2	66.1	63.2	66.1	72
291831004	MO	Saint Charles	77.7	80	61.9	63.8	61.9	63.8	71
291860005	MO	Sainte Genevieve	72.3	75	57.4	59.5	57.4	59.5	66
291890005	MO	Saint Louis	72.0	74	54.4	55.9	54.4	55.9	65
291890014	MO	Saint Louis	79.0	82	60.5	62.8	60.5	62.8	71
292130004	MO	Taney	69.0	70	55.3	56.1	55.3	56.1	57
295100085	MO	St. Louis City	75.7	79	58.7	61.2	58.7	61.2	65
300870001	MT	Rosebud	55.5	56	51.6	52.1	51.6	52.1	56
310550019	NE	Douglas	67.0	67	56.2	56.2	56.2	56.2	62
310550028	NE	Douglas	58.7	60	49.3	50.3	49.3	50.3	59
310550035	NE	Douglas	64.0	66	53.1	54.7	53.1	54.7	N/A
311090016	NE	Lancaster	53.3	55	43.4	44.7	43.4	44.7	60
320010002	NV	Churchill	56.7	58	51.9	53.1	51.9	53.1	67
320030043	NV	Clark	74.7	76	67.7	68.8	67.7	68.8	73
320030071	NV	Clark	75.3	76	68.7	69.4	68.7	69.4	71
320030073	NV	Clark	74.7	76	68.2	69.4	68.2	69.4	73
320030075	NV	Clark	76.0	77	67.4	68.3	67.4	68.3	75
320030538	NV	Clark	71.0	72	62.9	63.8	62.9	63.8	N/A
320030540	NV	Clark	71.0	71	62.9	62.9	62.9	62.9	70
320030601	NV	Clark	72.0	72	65.7	65.7	65.7	65.7	67
320031019	NV	Clark	74.3	75	66.8	67.4	66.8	67.4	70
320032002	NV	Clark	71.7	73	63.4	64.5	63.4	64.5	73
320190006	NV	Lyon	68.5	69	62.1	62.5	62.1	62.5	69
320310016	NV	Washoe	66.0	67	59.2	60.1	59.2	60.1	70
320310020	NV	Washoe	67.0	68	60.1	61.0	60.1	61.0	68
320310025	NV	Washoe	66.3	67	60.0	60.6	60.0	60.6	67
320311005	NV	Washoe	67.3	68	59.9	60.5	59.9	60.5	69
320312002	NV	Washoe	61.7	62	54.3	54.5	55.2	55.5	62
320312009	NV	Washoe	67.0	68	60.1	61.0	60.1	61.0	69
320330101	NV	White Pine	72.0	74	65.8	67.7	65.8	67.7	64
325100002	NV	Carson City	66.0	66	60.2	60.2	60.2	60.2	N/A
330012004	NH	Belknap	62.3	63	50.4	51.0	50.0	50.6	58

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
330050007	NH	Cheshire	62.3	63	49.7	50.2	49.7	50.2	61
330074001	NH	Coos	69.3	70	57.1	57.7	57.1	57.7	67
330074002	NH	Coos	59.7	61	49.3	50.4	49.3	50.4	57
330090010	NH	Grafton	59.7	60	48.1	48.4	48.1	48.4	57
330111011	NH	Hillsborough	66.3	67	53.6	54.2	53.6	54.2	63
330115001	NH	Hillsborough	69.0	70	55.5	56.3	55.5	56.3	68
330131007	NH	Merrimack	64.7	65	51.6	51.8	51.6	51.8	61
330150014	NH	Rockingham	66.0	66	53.6	53.6	53.4	53.4	65
330150016	NH	Rockingham	66.3	67	53.8	54.4	53.6	54.2	67
330150018	NH	Rockingham	68.0	68	55.1	55.1	55.1	55.1	65
340010006	NJ	Atlantic	74.3	76	58.5	59.9	58.6	60.0	64
340030006	NJ	Bergen	77.0	78	64.1	65.0	64.1	65.0	74
340071001	NJ	Camden	82.7	87	66.3	69.8	66.3	69.8	69
340110007	NJ	Cumberland	72.0	75	57.0	59.4	57.0	59.4	68
340130003	NJ	Essex	78.0	82	64.3	67.6	64.3	67.6	70
340150002	NJ	Gloucester	84.3	87	68.2	70.4	68.2	70.4	74
340170006	NJ	Hudson	77.0	78	65.4	66.3	64.6	65.4	72
340190001	NJ	Hunterdon	78.0	80	62.0	63.6	62.0	63.6	72
340210005	NJ	Mercer	78.3	81	63.2	65.4	63.2	65.4	72
340219991	NJ	Mercer	76.0	76	60.4	60.4	60.4	60.4	73
340230011	NJ	Middlesex	81.3	85	65.0	68.0	65.0	68.0	74
340250005	NJ	Monmouth	80.0	83	65.4	67.8	64.1	66.5	70
340273001	NJ	Morris	76.3	78	62.4	63.8	62.4	63.8	69
340290006	NJ	Ocean	82.0	85	65.8	68.2	65.8	68.2	73
340315001	NJ	Passaic	73.3	75	61.3	62.7	61.3	62.7	70
340410007	NJ	Warren	66.0	66	54.0	54.0	54.0	54.0	64
350010023	NM	Bernalillo	68.0	70	59.0	60.7	59.0	60.7	65
350010024	NM	Bernalillo	69.3	70	60.1	60.7	60.1	60.7	N/A
350010027	NM	Bernalillo	70.0	71	63.4	64.3	63.4	64.3	N/A
350010029	NM	Bernalillo	68.7	70	59.2	60.3	59.2	60.3	65
350010032	NM	Bernalillo	70.0	70	60.6	60.6	60.6	60.6	N/A
350011012	NM	Bernalillo	72.0	74	64.2	66.0	64.2	66.0	64
350011013	NM	Bernalillo	68.7	69	61.1	61.3	61.1	61.3	N/A
350130008	NM	Dona Ana	64.7	67	60.8	63.0	60.8	63.0	66
350130017	NM	Dona Ana	66.7	68	63.1	64.3	63.1	64.3	N/A
350130020	NM	Dona Ana	67.7	69	62.8	64.0	62.8	64.0	66
350130021	NM	Dona Ana	71.0	72	67.1	68.1	67.1	68.1	72
350130022	NM	Dona Ana	70.3	75	66.3	70.8	66.3	70.8	68
350130023	NM	Dona Ana	64.3	65	58.7	59.3	58.7	59.3	65
350151005	NM	Eddy	70.3	71	67.7	68.4	67.7	68.4	67

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
350171003	NM	Grant	65.0	67	61.9	63.8	61.9	63.8	N/A
350250008	NM	Lea	62.7	66	59.9	63.0	59.9	63.0	66
350290003	NM	Luna	63.0	67	58.2	61.9	58.2	61.9	N/A
350431001	NM	Sandoval	61.7	63	55.4	56.5	55.4	56.5	64
350439004	NM	Sandoval	63.0	63	58.8	58.8	58.8	58.8	N/A
350450009	NM	San Juan	65.3	68	56.7	59.0	56.7	59.0	62
350450018	NM	San Juan	71.0	71	62.0	62.0	62.0	62.0	66
350451005	NM	San Juan	66.0	68	55.3	57.0	55.3	57.0	62
350490021	NM	Santa Fe	64.3	66	60.5	62.1	60.5	62.1	63
350610008	NM	Valencia	68.5	70	60.1	61.4	60.1	61.4	64
360010012	NY	Albany	68.0	70	55.4	57.0	55.4	57.0	64
360050133	NY	Bronx	74.0	76	68.0	69.9	63.3	65.0	70
360130006	NY	Chautauqua	73.3	76	59.6	61.7	58.5	60.7	68
360130011	NY	Chautauqua	74.0	76	60.2	61.8	59.4	61.0	N/A
360150003	NY	Chemung	66.5	67	54.9	55.3	54.9	55.3	N/A
360270007	NY	Dutchess	72.0	74	58.6	60.2	58.6	60.2	68
360290002	NY	Erie	71.3	73	58.3	59.7	58.2	59.6	69
360310002	NY	Essex	70.3	73	57.5	59.8	57.5	59.8	62
360310003	NY	Essex	67.3	69	55.1	56.5	55.1	56.5	65
360410005	NY	Hamilton	66.0	67	53.7	54.5	53.7	54.5	60
360430005	NY	Herkimer	62.0	63	50.5	51.3	50.5	51.3	63
360450002	NY	Jefferson	71.7	74	59.0	60.9	59.4	61.3	63
360530006	NY	Madison	67.0	67	55.0	55.0	55.0	55.0	N/A
360610135	NY	New York	73.3	76	65.3	67.8	64.2	66.5	69
360631006	NY	Niagara	72.3	75	60.5	62.8	59.5	61.7	66
360650004	NY	Oneida	61.5	64	50.5	52.5	50.5	52.5	N/A
360671015	NY	Onondaga	69.3	72	57.8	60.1	57.8	60.1	64
360715001	NY	Orange	67.0	69	55.3	56.9	55.3	56.9	66
360750003	NY	Oswego	68.0	70	55.7	57.4	55.6	57.2	60
360790005	NY	Putnam	70.0	71	58.4	59.2	58.4	59.2	68
360810124	NY	Queens	78.0	80	70.1	71.9	70.2	72.0	69
360830004	NY	Rensselaer	67.0	67	54.4	54.4	54.4	54.4	N/A
360850067	NY	Richmond	81.3	83	71.9	73.4	67.1	68.5	76
360870005	NY	Rockland	75.0	76	62.0	62.8	62.0	62.8	72
360910004	NY	Saratoga	67.0	68	54.3	55.1	54.3	55.1	63
361010003	NY	Steuben	65.3	67	54.4	55.9	54.4	55.9	59
361030002	NY	Suffolk	83.3	85	72.5	74.0	74.0	75.5	72
361030004	NY	Suffolk	78.0	80	66.3	68.0	65.2	66.9	72
361030009	NY	Suffolk	78.7	80	68.5	69.7	67.6	68.7	N/A
361111005	NY	Ulster	69.0	69	57.4	57.4	57.4	57.4	N/A

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
361173001	NY	Wayne	65.0	67	53.4	55.0	53.4	55.0	64
361192004	NY	Westchester	75.3	76	68.1	68.8	63.8	64.4	74
370030004	NC	Alexander	66.7	68	51.3	52.3	51.3	52.3	N/A
370110002	NC	Avery	63.3	65	48.1	49.3	48.1	49.3	62
370119991	NC	Avery	63.0	63	48.9	48.9	48.9	48.9	64
370210030	NC	Buncombe	66.7	68	48.8	49.8	48.8	49.8	63
370270003	NC	Caldwell	66.0	67	49.6	50.3	49.6	50.3	64
370330001	NC	Caswell	70.7	73	53.9	55.7	53.9	55.7	63
370370004	NC	Chatham	64.0	66	47.4	48.9	47.4	48.9	N/A
370510008	NC	Cumberland	68.7	70	51.1	52.0	51.1	52.0	61
370511003	NC	Cumberland	70.7	72	51.5	52.4	51.5	52.4	N/A
370590003	NC	Davie	71.0	73	53.5	55.0	53.5	55.0	N/A
370630015	NC	Durham	70.0	72	49.8	51.3	49.8	51.3	62
370650099	NC	Edgecombe	70.0	71	51.3	52.0	51.3	52.0	N/A
370670022	NC	Forsyth	75.3	78	56.6	58.6	56.6	58.6	67
370670028	NC	Forsyth	69.7	72	52.0	53.7	52.0	53.7	N/A
370670030	NC	Forsyth	72.7	76	55.0	57.5	55.0	57.5	68
370671008	NC	Forsyth	72.3	75	54.5	56.5	54.5	56.5	67
370690001	NC	Franklin	69.3	71	50.2	51.5	50.2	51.5	N/A
370750001	NC	Graham	70.3	72	54.4	55.7	54.4	55.7	64
370770001	NC	Granville	70.7	72	51.2	52.1	51.2	52.1	64
370810013	NC	Guilford	74.0	76	55.0	56.5	55.0	56.5	65
370870008	NC	Haywood	61.0	61	48.6	48.6	48.6	48.6	62
370870036	NC	Haywood	67.7	69	53.8	54.8	53.8	54.8	65
370990005	NC	Jackson	67.0	67	53.1	53.1	53.1	53.1	N/A
371010002	NC	Johnston	71.7	74	51.5	53.2	51.5	53.2	65
371070004	NC	Lenoir	67.7	69	51.7	52.7	51.7	52.7	63
371090004	NC	Lincoln	72.7	75	55.4	57.1	55.4	57.1	67
371170001	NC	Martin	66.3	67	50.7	51.2	50.7	51.2	60
371190041	NC	Mecklenburg	80.0	83	60.8	63.1	60.8	63.1	69
371191005	NC	Mecklenburg	75.0	77	56.4	57.9	56.4	57.9	N/A
371191009	NC	Mecklenburg	79.7	83	58.2	60.6	58.2	60.6	N/A
371239991	NC	Montgomery	66.0	66	47.2	47.2	47.2	47.2	61
371290002	NC	New Hanover	63.0	64	46.0	46.8	46.9	47.6	60
371450003	NC	Person	71.0	74	57.5	59.9	57.5	59.9	63
371470006	NC	Pitt	69.7	71	52.6	53.6	52.6	53.6	62
371570099	NC	Rockingham	71.0	73	56.2	57.8	56.2	57.8	66
371590021	NC	Rowan	75.3	78	54.5	56.5	54.5	56.5	65
371590022	NC	Rowan	75.0	77	53.7	55.2	53.7	55.2	N/A
371730002	NC	Swain	60.7	62	48.7	49.7	48.7	49.7	60

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
371790003	NC	Union	71.0	73	50.9	52.4	50.9	52.4	68
371830014	NC	Wake	70.3	72	51.3	52.6	51.3	52.6	65
371830016	NC	Wake	73.0	75	54.2	55.7	54.2	55.7	N/A
371990004	NC	Yancey	69.7	71	53.0	54.0	53.0	54.0	65
390030009	OH	Allen	73.0	74	59.6	60.4	59.6	60.4	66
390071001	OH	Ashtabula	77.3	79	60.7	62.1	61.3	62.7	70
390090004	OH	Athens	69.0	69	55.5	55.5	55.5	55.5	N/A
390170004	OH	Butler	77.0	79	62.2	63.8	62.2	63.8	72
390170018	OH	Butler	79.7	82	63.0	64.9	63.0	64.9	71
390179991	OH	Butler	77.0	77	59.7	59.7	59.7	59.7	69
390230001	OH	Clark	75.0	76	58.6	59.4	58.6	59.4	69
390230003	OH	Clark	74.0	75	58.6	59.4	58.6	59.4	67
390250022	OH	Clermont	78.7	82	60.2	62.7	60.2	62.7	70
390271002	OH	Clinton	78.7	82	59.3	61.8	59.3	61.8	70
390350034	OH	Cuyahoga	77.7	80	57.0	58.7	62.1	63.9	69
390350060	OH	Cuyahoga	68.5	70	52.4	53.6	54.1	55.3	64
390350064	OH	Cuyahoga	70.0	73	56.1	58.5	57.4	59.9	64
390355002	OH	Cuyahoga	76.7	80	56.9	59.4	61.0	63.7	68
390410002	OH	Delaware	73.0	74	58.5	59.3	58.5	59.3	67
390479991	OH	Fayette	72.0	72	55.6	55.6	55.6	55.6	68
390490029	OH	Franklin	80.3	82	65.3	66.7	65.3	66.7	71
390490037	OH	Franklin	75.0	76	60.8	61.6	60.8	61.6	66
390490081	OH	Franklin	71.0	73	57.7	59.4	57.7	59.4	67
390550004	OH	Geauga	74.7	78	59.0	61.6	59.0	61.6	71
390570006	OH	Greene	73.0	74	55.4	56.2	55.4	56.2	68
390610006	OH	Hamilton	82.0	85	65.0	67.4	65.0	67.4	72
390610010	OH	Hamilton	76.3	80	60.4	63.3	60.4	63.3	72
390610040	OH	Hamilton	78.7	80	63.2	64.3	63.2	64.3	71
390810017	OH	Jefferson	70.3	72	57.9	59.3	57.9	59.3	65
390830002	OH	Knox	73.7	75	57.6	58.6	57.6	58.6	67
390850003	OH	Lake	80.0	83	58.0	60.2	63.5	65.8	75
390850007	OH	Lake	71.7	73	53.0	54.0	56.1	57.2	67
390870011	OH	Lawrence	65.0	67	51.8	53.4	51.8	53.4	64
390870012	OH	Lawrence	70.0	72	57.6	59.2	57.6	59.2	67
390890005	OH	Licking	74.3	76	57.5	58.8	57.5	58.8	67
390930018	OH	Lorain	71.7	75	54.6	57.1	58.8	61.5	66
390950024	OH	Lucas	68.0	70	53.9	55.5	55.3	57.0	67
390950027	OH	Lucas	66.7	68	55.4	56.5	55.4	56.5	64
390950034	OH	Lucas	73.7	76	58.9	60.7	60.2	62.1	N/A
390970007	OH	Madison	74.3	76	56.5	57.8	56.5	57.8	68

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
390990013	OH	Mahoning	70.7	73	57.0	58.8	57.0	58.8	63
391030004	OH	Medina	69.0	69	55.9	55.9	55.9	55.9	64
391090005	OH	Miami	73.3	74	57.2	57.8	57.2	57.8	67
391130037	OH	Montgomery	76.7	78	60.6	61.6	60.6	61.6	70
391331001	OH	Portage	68.3	71	54.8	57.0	54.8	57.0	61
391351001	OH	Preble	72.3	74	58.0	59.3	58.0	59.3	67
391510016	OH	Stark	76.7	79	60.9	62.7	60.9	62.7	69
391510022	OH	Stark	72.0	73	57.3	58.1	57.3	58.1	64
391514005	OH	Stark	72.3	75	57.2	59.3	57.2	59.3	66
391530020	OH	Summit	72.0	74	58.8	60.4	58.8	60.4	61
391550009	OH	Trumbull	71.0	73	56.1	57.7	56.1	57.7	N/A
391550011	OH	Trumbull	76.3	79	60.8	63.0	60.8	63.0	68
391650007	OH	Warren	77.7	79	59.5	60.5	59.5	60.5	72
391670004	OH	Washington	71.3	74	56.4	58.5	56.4	58.5	65
391730003	OH	Wood	71.3	73	58.6	60.0	58.6	60.0	63
400019009	OK	Adair	73.7	76	58.6	60.4	58.6	60.4	61
400159008	OK	Caddo	74.7	77	61.2	63.1	61.2	63.1	N/A
400170101	OK	Canadian	75.7	76	60.4	60.6	60.4	60.6	65
400219002	OK	Cherokee	73.7	76	57.9	59.7	57.9	59.7	60
400270049	OK	Cleveland	75.0	76	61.8	62.7	61.8	62.7	66
400310651	OK	Comanche	74.7	77	62.6	64.5	62.6	64.5	65
400370144	OK	Creek	77.0	78	58.5	59.2	58.5	59.2	64
400430860	OK	Dewey	72.3	74	63.4	64.9	63.4	64.9	65
400719010	OK	Kay	73.0	77	60.3	63.6	60.3	63.6	63
400871073	OK	McClain	74.0	75	60.2	61.0	60.2	61.0	66
400892001	OK	McCurtain	68.0	68	58.9	58.9	58.9	58.9	N/A
400979014	OK	Mayes	76.3	78	56.6	57.9	56.6	57.9	62
401090033	OK	Oklahoma	76.7	78	62.7	63.8	62.7	63.8	67
401090096	OK	Oklahoma	76.0	77	61.5	62.4	61.5	62.4	65
401091037	OK	Oklahoma	78.3	79	64.4	65.0	64.4	65.0	68
401159004	OK	Ottawa	74.0	76	57.7	59.3	57.7	59.3	54
401210415	OK	Pittsburg	73.3	75	61.8	63.3	61.8	63.3	60
401359021	OK	Sequoyah	72.0	72	58.7	58.7	58.7	58.7	60
401430137	OK	Tulsa	79.0	80	61.0	61.7	61.0	61.7	N/A
401430174	OK	Tulsa	75.3	77	59.0	60.3	59.0	60.3	N/A
401430178	OK	Tulsa	76.7	78	60.9	61.9	60.9	61.9	63
401431127	OK	Tulsa	78.3	80	62.1	63.5	62.1	63.5	N/A
410050004	OR	Clackamas	64.0	66	55.0	56.8	55.0	56.8	65
410090004	OR	Columbia	51.3	53	45.3	46.8	45.3	46.8	54
410170122	OR	Deschutes	58.5	59	52.8	53.2	52.8	53.2	N/A

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
410290201	OR	Jackson	61.7	63	53.5	54.7	53.5	54.7	59
410390060	OR	Lane	58.0	59	48.3	49.2	48.3	49.2	61
410391007	OR	Lane	60.0	61	49.7	50.5	49.7	50.5	61
410470004	OR	Marion	59.3	61	49.7	51.1	49.7	51.1	65
410510080	OR	Multnomah	56.7	57	51.2	51.5	51.2	51.5	55
410591003	OR	Umatilla	61.3	62	51.2	51.8	51.2	51.8	65
410671004	OR	Washington	57.7	59	50.6	51.8	50.6	51.8	59
420030008	PA	Allegheny	76.3	79	65.5	67.8	65.5	67.8	67
420030010	PA	Allegheny	73.7	75	63.3	64.4	63.3	64.4	N/A
420030067	PA	Allegheny	75.7	78	63.0	65.0	63.0	65.0	68
420031008	PA	Allegheny	80.7	82	67.1	68.2	67.1	68.2	70
420050001	PA	Armstrong	74.3	75	60.6	61.2	60.6	61.2	70
420070002	PA	Beaver	70.7	72	59.5	60.6	59.5	60.6	70
420070005	PA	Beaver	74.7	77	63.0	64.9	63.0	64.9	68
420070014	PA	Beaver	72.3	74	61.0	62.5	61.0	62.5	65
420110006	PA	Berks	71.7	75	56.2	58.8	56.2	58.8	66
420110011	PA	Berks	76.3	79	58.9	61.0	58.9	61.0	71
420130801	PA	Blair	72.7	75	60.3	62.3	60.3	62.3	63
420170012	PA	Bucks	80.3	83	64.6	66.8	64.6	66.8	77
420210011	PA	Cambria	70.3	72	58.0	59.4	58.0	59.4	63
420270100	PA	Centre	71.0	73	59.1	60.8	59.1	60.8	63
420279991	PA	Centre	72.0	72	59.8	59.8	59.8	59.8	65
420290100	PA	Chester	76.3	79	58.7	60.8	58.7	60.8	73
420334000	PA	Clearfield	72.3	74	60.3	61.8	60.3	61.8	64
420430401	PA	Dauphin	69.0	69	54.7	54.7	54.7	54.7	66
420431100	PA	Dauphin	74.7	77	58.3	60.1	58.3	60.1	67
420450002	PA	Delaware	75.7	78	60.3	62.1	60.3	62.1	72
420490003	PA	Erie	74.0	76	59.1	60.7	59.5	61.1	66
420550001	PA	Franklin	67.0	68	53.2	53.9	53.2	53.9	60
420590002	PA	Greene	69.0	71	56.5	58.1	56.5	58.1	67
420630004	PA	Indiana	75.7	79	62.7	65.4	62.7	65.4	70
420690101	PA	Lackawanna	71.0	72	55.8	56.6	55.8	56.6	67
420692006	PA	Lackawanna	68.7	71	54.0	55.8	54.0	55.8	N/A
420710007	PA	Lancaster	77.0	80	60.1	62.4	60.1	62.4	69
420710012	PA	Lancaster	78.0	82	60.2	63.3	60.2	63.3	66
420730015	PA	Lawrence	71.0	73	58.0	59.6	58.0	59.6	68
420750100	PA	Lebanon	76.0	76	58.6	58.6	58.6	58.6	71
420770004	PA	Lehigh	76.0	78	59.5	61.1	59.5	61.1	70
420791100	PA	Luzerne	65.0	66	49.9	50.6	49.9	50.6	N/A
420791101	PA	Luzerne	64.3	66	49.9	51.2	49.9	51.2	64

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
420810100	PA	Lycoming	67.0	69	53.9	55.5	53.9	55.5	64
420850100	PA	Mercer	76.3	79	60.0	62.1	60.0	62.1	69
420890002	PA	Monroe	66.7	70	52.9	55.6	52.9	55.6	65
420910013	PA	Montgomery	76.3	78	61.0	62.4	61.0	62.4	72
420950025	PA	Northampton	74.3	77	58.5	60.6	58.5	60.6	70
420958000	PA	Northampton	69.7	71	54.8	55.9	54.8	55.9	69
420990301	PA	Perry	68.3	70	54.8	56.2	54.8	56.2	N/A
421010004	PA	Philadelphia	66.0	70	53.9	57.1	53.9	57.1	61
421010024	PA	Philadelphia	83.3	87	67.3	70.3	67.3	70.3	77
421011002	PA	Philadelphia	80.0	80	64.7	64.7	64.7	64.7	N/A
421119991	PA	Somerset	65.0	65	50.8	50.8	50.8	50.8	N/A
421174000	PA	Tioga	69.7	71	57.3	58.3	57.3	58.3	63
421250005	PA	Washington	70.0	72	57.6	59.2	57.6	59.2	68
421250200	PA	Washington	70.7	73	57.6	59.4	57.6	59.4	65
421255001	PA	Washington	70.3	71	57.9	58.5	57.9	58.5	68
421290006	PA	Westmoreland	71.7	74	60.1	62.0	60.1	62.0	N/A
421290008	PA	Westmoreland	71.0	73	58.0	59.6	58.0	59.6	68
421330008	PA	York	72.3	74	56.9	58.3	56.9	58.3	66
421330011	PA	York	74.3	77	58.0	60.1	58.0	60.1	N/A
440030002	RI	Kent	73.7	74	60.4	60.7	60.4	60.7	70
440071010	RI	Providence	74.0	76	60.1	61.8	59.5	61.1	68
440090007	RI	Washington	76.3	78	63.6	65.0	62.6	64.0	70
450010001	SC	Abbeville	62.0	64	45.3	46.8	45.3	46.8	N/A
450030003	SC	Aiken	64.3	67	47.6	49.7	47.6	49.7	60
450070005	SC	Anderson	70.0	73	52.1	54.4	52.1	54.4	60
450150002	SC	Berkeley	62.3	64	47.4	48.7	47.4	48.7	N/A
450190046	SC	Charleston	64.7	66	49.6	50.6	49.8	50.8	N/A
450210002	SC	Cherokee	67.3	70	49.2	51.2	49.2	51.2	N/A
450250001	SC	Chesterfield	64.3	66	48.4	49.6	48.4	49.6	60
450290002	SC	Colleton	61.0	64	46.4	48.7	46.4	48.7	N/A
450310003	SC	Darlington	68.0	70	52.1	53.6	52.1	53.6	62
450370001	SC	Edgefield	63.0	63	46.2	46.2	46.2	46.2	N/A
450450016	SC	Greenville	68.0	69	50.5	51.2	50.5	51.2	N/A
450451003	SC	Greenville	65.3	67	48.9	50.2	48.9	50.2	N/A
450730001	SC	Oconee	64.5	65	48.6	48.9	48.6	48.9	63
450770002	SC	Pickens	69.7	71	52.5	53.5	52.5	53.5	N/A
450790007	SC	Richland	70.0	70	51.2	51.2	51.2	51.2	N/A
450790021	SC	Richland	60.0	62	44.1	45.6	44.1	45.6	N/A
450791001	SC	Richland	71.7	73	52.4	53.4	52.4	53.4	N/A
450830009	SC	Spartanburg	73.7	75	54.6	55.5	54.6	55.5	N/A

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
450910006	SC	York	64.0	65	47.7	48.4	47.7	48.4	59
460330132	SD	Custer	61.7	63	57.6	58.8	57.6	58.8	58
460710001	SD	Jackson	57.0	59	52.2	54.0	52.2	54.0	58
460930001	SD	Meade	58.5	60	52.0	53.3	52.0	53.3	57
460990008	SD	Minnehaha	66.0	68	55.3	56.9	55.3	56.9	64
461270003	SD	Union	62.5	64	52.6	53.9	52.6	53.9	N/A
470010101	TN	Anderson	70.7	73	54.3	56.0	54.3	56.0	63
470090101	TN	Blount	76.7	79	59.0	60.7	59.0	60.7	67
470090102	TN	Blount	66.3	68	50.8	52.1	50.8	52.1	60
470259991	TN	Claiborne	62.0	62	48.0	48.0	48.0	48.0	63
470370011	TN	Davidson	66.0	69	52.6	54.9	52.6	54.9	66
470370026	TN	Davidson	67.0	67	52.7	52.7	52.7	52.7	67
470651011	TN	Hamilton	72.3	75	54.9	57.0	54.9	57.0	65
470654003	TN	Hamilton	73.3	76	55.4	57.4	55.4	57.4	68
470890002	TN	Jefferson	74.7	78	56.9	59.4	56.9	59.4	68
470930021	TN	Knox	69.0	71	52.6	54.2	52.6	54.2	64
470931020	TN	Knox	71.7	74	54.2	55.9	54.2	55.9	66
471050109	TN	Loudon	72.3	75	55.9	58.0	55.9	58.0	N/A
471210104	TN	Meigs	71.3	74	54.4	56.5	54.4	56.5	N/A
471490101	TN	Rutherford	68.5	70	52.8	53.9	52.8	53.9	N/A
471550101	TN	Sevier	74.3	76	57.6	58.9	57.6	58.9	68
471570021	TN	Shelby	76.7	79	59.2	61.0	59.2	61.0	67
471570075	TN	Shelby	78.0	78	60.5	60.5	60.5	60.5	66
471571004	TN	Shelby	75.0	78	57.2	59.5	57.2	59.5	66
471632002	TN	Sullivan	71.7	74	59.2	61.1	59.2	61.1	66
471632003	TN	Sullivan	70.3	72	58.7	60.1	58.7	60.1	64
471650007	TN	Sumner	76.7	79	59.9	61.7	59.9	61.7	67
471650101	TN	Sumner	73.0	75	57.0	58.5	57.0	58.5	N/A
471870106	TN	Williamson	70.3	73	53.9	55.9	53.9	55.9	61
471890103	TN	Wilson	71.7	74	55.1	56.8	55.1	56.8	64
480271047	TX	Bell	74.5	75	63.8	64.2	63.8	64.2	67
480290032	TX	Bexar	76.7	78	66.3	67.4	66.3	67.4	73
480290052	TX	Bexar	78.7	81	68.4	70.4	68.4	70.4	73
480290059	TX	Bexar	68.3	70	59.4	60.9	59.4	60.9	64
480391004	TX	Brazoria	88.0	89	74.0	74.9	74.0	74.9	75
480391016	TX	Brazoria	71.7	73	61.3	62.4	61.3	62.4	64
480430101	TX	Brewster	70.0	71	67.9	68.9	67.9	68.9	62
480610006	TX	Cameron	62.7	64	56.7	57.9	56.7	57.9	57
480850005	TX	Collin	82.7	84	68.2	69.2	68.2	69.2	74
481130069	TX	Dallas	79.7	84	66.2	69.8	66.2	69.8	71

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
481130075	TX	Dallas	82.0	83	69.0	69.9	69.0	69.9	72
481130087	TX	Dallas	80.0	81	66.9	67.8	66.9	67.8	64
481210034	TX	Denton	84.3	87	69.7	72.0	69.7	72.0	80
481211032	TX	Denton	82.7	84	67.7	68.8	67.7	68.8	76
481390016	TX	Ellis	75.7	77	63.5	64.6	63.5	64.6	63
481391044	TX	Ellis	70.0	72	59.3	61.0	59.3	61.0	62
481410029	TX	El Paso	65.0	65	61.1	61.1	61.1	61.1	62
481410037	TX	El Paso	71.0	72	67.6	68.5	67.6	68.5	71
481410044	TX	El Paso	69.0	70	65.7	66.6	65.7	66.6	67
481410055	TX	El Paso	66.3	68	63.1	64.7	63.1	64.7	64
481410057	TX	El Paso	66.0	66	62.6	62.6	62.6	62.6	66
481410058	TX	El Paso	69.3	71	65.4	67.0	65.4	67.0	68
481671034	TX	Galveston	77.3	80	67.5	69.9	67.3	69.6	76
481830001	TX	Gregg	77.7	79	65.1	66.2	65.1	66.2	66
482010024	TX	Harris	80.3	83	70.4	72.8	70.4	72.8	79
482010026	TX	Harris	77.3	80	67.9	70.2	67.6	70.0	68
482010029	TX	Harris	83.0	84	68.7	69.5	68.7	69.5	69
482010046	TX	Harris	75.7	77	66.4	67.5	66.4	67.5	67
482010047	TX	Harris	78.3	79	66.7	67.3	66.7	67.3	74
482010051	TX	Harris	80.3	81	67.5	68.1	67.5	68.1	71
482010055	TX	Harris	81.3	83	68.3	69.8	68.3	69.8	75
482010062	TX	Harris	76.7	78	66.0	67.1	66.0	67.1	65
482010066	TX	Harris	77.0	79	64.7	66.4	64.7	66.4	76
482010070	TX	Harris	77.0	77	66.5	66.5	66.5	66.5	N/A
482010416	TX	Harris	78.7	80	66.7	67.8	66.7	67.8	72
482011015	TX	Harris	74.3	77	65.2	67.6	65.0	67.4	65
482011034	TX	Harris	81.0	82	70.8	71.6	70.8	71.6	73
482011035	TX	Harris	78.3	80	68.4	69.9	68.4	69.9	69
482011039	TX	Harris	82.0	84	71.8	73.6	71.8	73.5	67
482011050	TX	Harris	78.3	80	68.3	69.8	68.0	69.5	70
482030002	TX	Harrison	72.7	74	59.9	61.0	59.9	61.0	62
482150043	TX	Hidalgo	61.0	62	55.3	56.2	55.3	56.2	55
482151048	TX	Hidalgo	59.5	60	53.8	54.2	53.8	54.2	N/A
482210001	TX	Hood	76.7	77	63.4	63.7	63.4	63.7	69
482311006	TX	Hunt	71.7	74	59.1	61.0	59.1	61.0	60
482450009	TX	Jefferson	73.3	75	63.5	65.0	63.5	65.0	64
482450011	TX	Jefferson	76.0	76	66.5	66.5	66.2	66.2	67
482450022	TX	Jefferson	71.3	72	61.1	61.7	61.1	61.7	68
482450101	TX	Jefferson	78.0	80	68.4	70.2	68.2	70.0	65
482450102	TX	Jefferson	69.7	71	60.8	62.0	61.0	62.2	62

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
482450628	TX	Jefferson	70.7	73	61.9	63.9	61.6	63.6	N/A
482451035	TX	Jefferson	71.0	72	62.0	62.8	62.2	63.0	68
482510003	TX	Johnson	79.0	79	65.8	65.8	65.8	65.8	72
482570005	TX	Kaufman	70.7	74	60.5	63.4	60.5	63.4	61
483091037	TX	McLennan	72.7	74	61.9	63.0	61.9	63.0	63
483390078	TX	Montgomery	77.3	79	65.7	67.1	65.7	67.1	72
483491051	TX	Navarro	71.0	72	61.4	62.2	61.4	62.2	61
483550025	TX	Nueces	71.0	72	62.9	63.8	63.5	64.4	64
483550026	TX	Nueces	70.7	72	62.9	64.1	62.9	64.1	63
483611001	TX	Orange	72.7	75	63.7	65.7	64.5	66.6	61
483611100	TX	Orange	68.7	69	60.7	60.9	60.7	60.9	N/A
483670081	TX	Parker	78.7	79	65.8	66.0	65.8	66.0	73
483970001	TX	Rockwall	77.0	77	64.0	64.0	64.0	64.0	66
484230007	TX	Smith	75.0	75	62.3	62.3	62.3	62.3	65
484390075	TX	Tarrant	82.0	83	67.8	68.7	67.8	68.7	72
484391002	TX	Tarrant	81.0	82	67.5	68.4	67.5	68.4	74
484392003	TX	Tarrant	87.3	90	72.5	74.8	72.5	74.8	73
484393009	TX	Tarrant	86.0	86	70.6	70.6	70.6	70.6	75
484393011	TX	Tarrant	80.7	83	68.0	70.0	68.0	70.0	65
484530014	TX	Travis	73.7	75	62.9	64.0	62.9	64.0	66
484530020	TX	Travis	72.0	73	60.8	61.6	60.8	61.6	66
484690003	TX	Victoria	68.7	70	61.4	62.6	61.4	62.6	65
490030003	UT	Box Elder	67.7	69	59.8	60.9	60.9	62.1	67
490050004	UT	Cache	64.3	67	57.9	60.3	57.9	60.3	N/A
490071003	UT	Carbon	69.0	69	61.1	61.1	61.1	61.1	66
490110004	UT	Davis	69.3	71	61.3	62.8	60.0	61.5	74
490131001	UT	Duchesne	68.0	68	62.0	62.0	62.0	62.0	N/A
490352004	UT	Salt Lake	74.0	76	65.5	67.2	65.4	67.1	N/A
490353006	UT	Salt Lake	76.0	76	65.8	65.8	65.8	65.8	75
490370101	UT	San Juan	68.7	69	63.6	63.9	63.6	63.9	64
490450003	UT	Tooele	72.0	73	63.9	64.8	63.5	64.4	N/A
490490002	UT	Utah	70.0	73	62.5	65.2	62.7	65.4	71
490495010	UT	Utah	69.3	70	61.9	62.5	62.3	62.9	73
490530006	UT	Washington	67.0	67	61.4	61.4	61.4	61.4	N/A
490530130	UT	Washington	71.7	73	65.8	67.0	65.8	67.0	N/A
490570002	UT	Weber	71.7	72	64.0	64.3	64.0	64.3	71
490571003	UT	Weber	72.7	74	64.1	65.2	65.3	66.5	72
500030004	VT	Bennington	63.7	65	51.3	52.4	51.3	52.4	63
500070007	VT	Chittenden	61.0	62	49.6	50.4	49.6	50.4	61
510030001	VA	Albemarle	66.7	68	52.9	53.9	52.9	53.9	N/A

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
510130020	VA	Arlington	81.7	86	64.9	68.3	64.9	68.3	72
510330001	VA	Caroline	72.0	74	56.0	57.6	56.0	57.6	N/A
510360002	VA	Charles	75.7	79	59.4	62.0	59.4	62.0	63
510410004	VA	Chesterfield	72.0	75	56.8	59.2	56.8	59.2	62
510590030	VA	Fairfax	82.3	86	65.1	68.1	65.1	68.1	70
510610002	VA	Fauquier	62.7	64	49.5	50.5	49.5	50.5	59
510690010	VA	Frederick	66.7	69	51.4	53.2	51.4	53.2	61
510719991	VA	Giles	63.0	63	47.1	47.1	47.1	47.1	62
510850003	VA	Hanover	73.7	76	56.9	58.6	56.9	58.6	62
510870014	VA	Henrico	75.0	78	58.8	61.2	58.8	61.2	N/A
511071005	VA	Loudoun	73.0	75	57.8	59.4	57.8	59.4	67
511130003	VA	Madison	70.7	72	57.0	58.0	57.0	58.0	63
511390004	VA	Page	66.3	68	53.2	54.6	53.2	54.6	N/A
511479991	VA	Prince Edward	62.0	62	50.3	50.3	50.3	50.3	60
511530009	VA	Prince William	70.0	72	56.2	57.8	56.2	57.8	65
511611004	VA	Roanoke	67.3	70	53.4	55.5	53.4	55.5	62
511630003	VA	Rockbridge	62.3	64	50.2	51.6	50.2	51.6	58
511650003	VA	Rockingham	66.0	68	53.7	55.3	53.7	55.3	60
511790001	VA	Stafford	73.0	76	55.4	57.7	57.1	59.4	63
511970002	VA	Wythe	64.3	66	51.9	53.3	51.9	53.3	61
515100009	VA	Alexandria City	80.0	83	63.4	65.8	63.4	65.8	N/A
516500008	VA	Hampton City	74.0	76	58.2	59.8	56.9	58.4	64
518000004	VA	Suffolk City	71.3	73	58.7	60.1	56.2	57.5	60
518000005	VA	Suffolk City	69.7	71	54.7	55.7	54.7	55.7	61
530110011	WA	Clark	56.0	57	50.4	51.3	50.4	51.3	59
530330010	WA	King	55.0	57	50.0	51.8	50.0	51.8	55
530330017	WA	King	57.0	59	48.9	50.6	48.9	50.6	58
530330023	WA	King	65.0	67	54.9	56.6	54.9	56.6	67
530531010	WA	Pierce	53.3	54	46.2	46.8	46.2	46.8	N/A
530630001	WA	Spokane	58.7	60	51.8	53.0	51.8	53.0	N/A
530630021	WA	Spokane	59.0	60	53.1	54.0	53.1	54.0	N/A
530630046	WA	Spokane	58.7	60	51.0	52.1	51.0	52.1	59
530670005	WA	Thurston	55.7	56	48.3	48.6	48.3	48.6	57
540030003	WV	Berkeley	68.0	70	52.6	54.2	52.6	54.2	63
540110006	WV	Cabell	69.3	72	57.0	59.2	57.0	59.2	64
540219991	WV	Gilmer	60.0	60	49.5	49.5	49.5	49.5	59
540250003	WV	Greenbrier	64.7	66	53.1	54.1	53.1	54.1	59
540291004	WV	Hancock	73.0	75	60.2	61.8	60.2	61.8	N/A
540390010	WV	Kanawha	72.3	74	60.1	61.5	60.1	61.5	N/A
540610003	WV	Monongalia	69.7	72	58.0	59.9	58.0	59.9	64

Site	St	County	2009-2013 Avg	2009-2013 Max	2023en "3x3" Avg	2023en "3x3" Max	2023en "No Water" Avg	2023en "No Water" Max	2014-2016
540690010	WV	Ohio	72.3	74	59.3	60.7	59.3	60.7	68
541071002	WV	Wood	68.3	71	54.5	56.6	54.5	56.6	68
550090026	WI	Brown	68.3	70	56.8	58.2	58.0	59.4	66
550210015	WI	Columbia	67.0	69	55.3	57.0	55.3	57.0	67
550250041	WI	Dane	66.3	69	55.8	58.1	55.8	58.1	65
550270001	WI	Dodge	71.5	72	61.5	61.9	61.5	61.9	68
550290004	WI	Door	75.7	78	63.6	65.5	63.3	65.2	72
550350014	WI	Eau Claire	62.0	62	50.0	50.0	50.0	50.0	61
550390006	WI	Fond du Lac	70.0	72	59.8	61.5	59.8	61.5	66
550410007	WI	Forest	64.7	67	53.3	55.2	53.3	55.2	63
550550002	WI	Jefferson	68.5	70	58.1	59.4	58.1	59.4	N/A
550590019	WI	Kenosha	81.0	84	58.7	60.9	64.8	67.2	77
550610002	WI	Kewaunee	75.0	78	64.0	66.5	64.5	67.1	69
550630012	WI	La Crosse	63.3	65	52.0	53.4	52.0	53.4	62
550710007	WI	Manitowoc	78.7	80	65.6	66.7	67.6	68.7	72
550730012	WI	Marathon	63.3	65	51.3	52.7	51.3	52.7	65
550790010	WI	Milwaukee	69.7	72	55.8	57.6	60.6	62.6	64
550790026	WI	Milwaukee	74.7	78	60.4	63.1	66.5	69.4	68
550790085	WI	Milwaukee	80.0	82	65.4	67.0	71.2	73.0	71
550870009	WI	Outagamie	69.3	72	59.1	61.4	59.1	61.4	67
550890008	WI	Ozaukee	76.3	80	65.7	68.8	67.2	70.5	71
550890009	WI	Ozaukee	74.7	77	62.2	64.1	63.6	65.5	73
551010017	WI	Racine	77.7	81	57.5	59.9	62.2	64.8	N/A
551050024	WI	Rock	69.5	72	58.9	61.1	58.9	61.1	N/A
551110007	WI	Sauk	65.0	67	54.2	55.8	54.2	55.8	64
551170006	WI	Sheboygan	84.3	87	70.8	73.1	72.8	75.1	79
551199991	WI	Taylor	63.0	63	51.1	51.1	51.1	51.1	61
551270005	WI	Walworth	69.3	71	59.7	61.2	59.7	61.2	70
551330027	WI	Waukesha	66.7	69	58.1	60.1	58.1	60.1	66
560050123	WY	Campbell	63.7	65	59.3	60.5	59.3	60.5	58
560050456	WY	Campbell	63.0	64	59.1	60.1	59.1	60.1	60
560070100	WY	Carbon	63.0	64	58.7	59.6	58.7	59.6	60
560130232	WY	Fremont	65.0	66	61.2	62.1	61.2	62.1	61
560210100	WY	Laramie	68.0	68	62.4	62.4	62.4	62.4	63
560350700	WY	Sublette	64.0	64	59.9	59.9	59.9	59.9	61
560370200	WY	Sweetwater	63.7	64	57.9	58.2	57.9	58.2	55
560370300	WY	Sweetwater	66.0	66	60.0	60.0	60.0	60.0	66
560391011	WY	Teton	65.3	66	62.6	63.3	62.4	63.1	60
560410101	WY	Uinta	64.3	65	58.0	58.6	58.0	58.6	61