

## Summary of Water-Air Temperature Correlation

NMED Surface Water Quality Bureau

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Water temperature is correlated with air temperature. This is well described in the literature; for example, the documentation provided with SSTEMP states: "Air temperature will usually be the single most important factor in determining mean daily water temperature."

Since in 1999, the SWQB has deployed approximately 400 long-term temperature data recorders or thermographs in New Mexico streams, and 70 air thermographs near the water monitoring stations. The thermographs were usually deployed during the summer season of June through August and recorded hourly temperatures, providing approximately 3,000 data points at each monitoring station. These data have been reduced to summary statistics that include a reference date which is the date of the first maximum temperature, the maximum temperature, the maximum weekly average temperature (MWAT), and the 4-hour maximum temperature that occurs for 3 consecutive days (4T3). One of the results of the data reduction is that the maximum water temperature typically occurs in mid-July.

The 70 locations where both water and air temperature thermograph data are available can be used to develop relationships between water and air temperature. However, a much larger temperature dataset is available for any geographic coordinate in the United States. This dataset, the PRISM (Parameter-elevation Regressions on Independent Slopes Model) dataset, is available at <http://www.prism.oregonstate.edu/>. PRISM provides gridded data that can be used to find representative July temperatures for any location in the United States.

Therefore, July average temperatures are available for any geographic coordinates from PRISM, and maximum weekly average water temperatures (generally in mid-July) are available for approximately 300 New Mexico sites from the thermograph data. These data were used to develop a correlation between water and air temperature.

After removing points that are known to represent water temperatures that are not correlated to the ambient air temperature (such as points known to be influenced by warm or cool subsurface flow, or discharge from reservoirs), the middle 50<sup>th</sup> percentile was determined by setting limits at the 75<sup>th</sup> percentile above and the 25<sup>th</sup> percentile below the median.

Points outside the middle 50<sup>th</sup> percentile are considered to be either outliers or the result of extreme or unusual local conditions, such as extremely little shade or extremely high width-to-depth ratios.

Points within the middle 50<sup>th</sup> percentile are considered to represent water temperatures that are within the range of natural variation as determined by the ambient air temperature.

Therefore, at a specific ambient air temperature, the water temperature that may be used for criteria determination is the temperature at the 75<sup>th</sup> percentile. Temperatures higher than this are outside the expected range, given the ambient air temperature.

