SOTOYOME RESOURCE CONSERVATION DISTRICT
RUSSIAN RIVER CREEK STEWARDSHIP PROGRAM

UPPER MARK WEST CREEK
2005-2006 MONITORING SUMMARY REPORT

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Prepared for: Sonoma County Water Agency

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Upper Mark West Creek

Mark West Creek drains a watershed of approximately 30 square miles, the upper watershed referred to in this report consists of the watershed above St. Helena Road and has a watershed area of approximately 10 square miles. The study reach drains an area of approximately six square miles.

For a summary of historic watershed assessment and data collection conducted on Mark West Creek through the RRCSP, please see the Mark West Creek section of the "Russian River Creek Stewardship: Monitoring and Assessment Summary Report 1998-2004" (LMA, 2004) at http://www.sotoyomercd.org/creekstewardship/russian-river-creek/Russian-River-Creek-Stewardship.pdf and the "Mark West Study Reach Survey Report" (Jackson, 2006), located in Appendix D.

Ambient Water Quality and Indicator Bacteria Sampling

The SRCD has been collecting monitoring data on a study reach in the upper Mark West Creek watershed since 1999. Throughout this sampling period, Mark West Creek has consistently met WQOs.

2005 Results

Ambient water quality sampling was not conducted on upper Mark West Creek in 2005, other than the continuous temperature monitoring on the study reach (see below).

2006 Results

In 2006, monthly water quality sampling was conducted on upper Mark West in August and September, in addition to the pre- and post-Labor Day weekend sampling event. Grab samples were taken from the St. Helena Road bridge and either analyzed on site using the DataSonde 4a or taken to a laboratory for indicator bacteria analysis.

In 2006, instantaneous temperature measurements ranged from 14.93 to 21.00°C (58.7 to 69.8°F). Sampled pH measurements ranged from 7.82 to 7.96. Dissolved oxygen results ranged from 86.4 to 102.9% saturation. This result of super-saturated DO conditions can be indicative of algal presence, but in this case it can be explained due to the fact that the sampling location is just downstream of a riffle and all samples were taken under continuous surface flow conditions. Upper Mark West Creek was sampled for indicator bacteria levels over the 2006 Labor Day weekend. *E. coli* results were well within the WQOs with results ranging from 31.1 to 39.7 MPN/100 ml. Consistent with data from previous sampling years, upper Mark West Creek meets all WQOs.

Continuous Temperature Monitoring

2005 Results

In 2005, continuous temperature data loggers were deployed at three stations in and near the upper Mark West Creek study reach from June through October. Station UMW-10 is located approximately 1000' downstream of the study reach. This station was established in 2004.

Station UMW-20 was established at the downstream extent of the study reach in 2000 and has the longest continuous data set for this reach. Station UMW-40 is located approximately 1000' upstream of the study reach. In 2005, the logger deployed at UMW-40 malfunctioned and no data was retrieved.

Average maximum temperatures (MWAT) throughout the measured reach ranged from 11.40 to 19.08°C. Maximum daily temperatures exceeded the 21.1°C threshold for short periods of no more than four hours/day over a five-day period in mid-July. Despite the fact that the daily range for both stations was relatively small, less than 5°C for the entire monitoring period, the fact that both stations continue to show a trend of the creek heating up and cooling in response to air temperatures strengthens the indication that either shade from canopy cover upstream of the sampling sites is inadequate or that flows are too low in volume for the creek to attenuate heat input (LMA, 2004).

Monitoring data in 2001 and 2003 showed that stations upstream of the study reach (UMW-40 and UMW-50) had generally higher MWAT results than UMW-20 and UMW-10. This indicates that either a significant volume of cold water inputs are entering the creek between the upstream and downstream stations and/or that shade provided from canopy cover throughout the reach is sufficient to begin cooling the inflows. Augmenting the data set with additional upstream station data should be a priority for future data collection.

2006 Results

In 2006, continuous temperature data loggers were deployed at three stations in and near the upper Mark West Creek study reach from May through October. Station UMW-09, was established just downstream of the former UMW-10 site due to geomorphic channel changes that resulted in UMW-10 being unusable. Station UMW-20 was established at the downstream extent of the study reach in 2000 and continues to have the longest continuous data set for this reach. Station UMW-40 was replaced by UMW-39, located about 30' downstream of the former UMW-40 site that was unusable due to geomorphic channel changes. In 2005, the logger deployed at UMW-40 was not found, so no data was retrieved.

During a heat spell in late July (7/21-7/24), temperatures throughout the Russian River watershed peaked. While upper Mark West Creek stations remained relatively cool, both stations had periods that exceed the WQOs more significantly than usual. Temperature conditions exceeding the 21.1°C threshold persisted for six consecutive days, for 8-20 hours per day. Considering that the temperature loggers are deployed in the deepest pools and presumably the best available thermal refugia habitat for fish, temperatures exceeding the threshold for such a duration can reflect chronic to lethal conditions.

Again, successfully measuring data at an upstream site should be a priority for the next phase of temperature monitoring.

Stream flows, or lack there of, over the critical summer months, should be looked at as a potential barrier to cold water fish in upper Mark West Creek.

Upper Mark West Creek Watershed Monitoring Stations

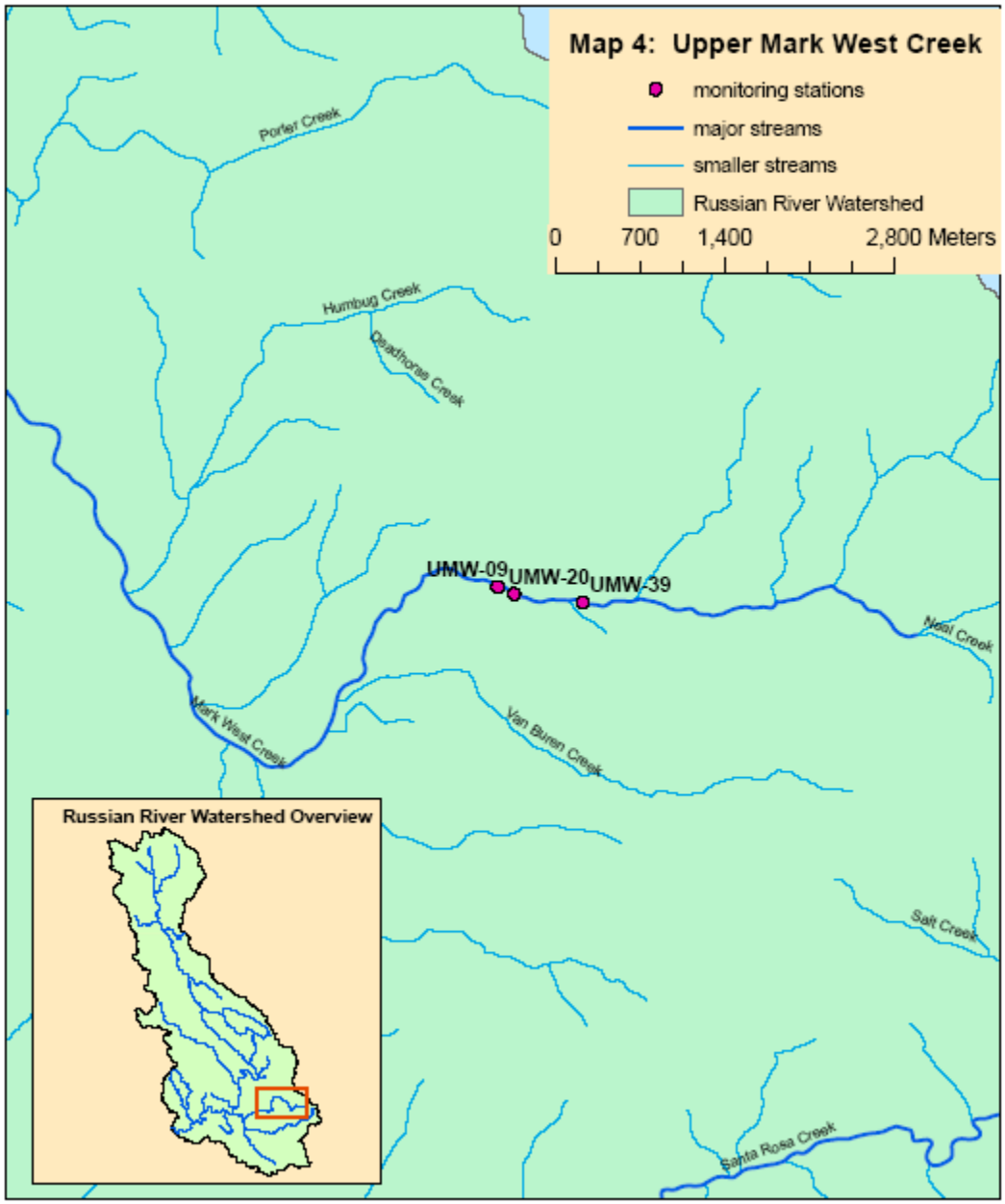


Table 10: 2005 Upper Mark West Creek Water Temperature Monitoring Stations Physical Attribute Data Summary

Station ID*	Type of Channel	Wetted width/Depth of channel at deployment (feet/tenths)	Wetted width/Depth of channel at retrieval (feet/tenths)	% Slope of Channel	Average % Canopy Cover	Watershed Drainage Area (sq. miles)	Comments
UMW-10	Partially confined alluvial	12.5'/1.3'	7.0'/1.1'	2-4%	85.02%	6.0	Downstream most station, approx. 500' downstream of study reach
UMW-20	Partially confined alluvial	NM/1.2'	17.5'/1.3'	2-4%	95.68%	6.0	In study reach. This station paired w/ air logger.
UMW-40	Partially confined alluvial	9.0'/1.0'	7.0'/1.0'	2-4%	75.66%	6.0	Upstream most station. Upstream of the study reach.

Table 11: 2005 Upper Mark West Creek Water Temperature Monitoring Summary

Station ID	MWAT (°C)	MWMT (°C)	Daily Range in °C	Number of Hours >21.1°C (70°F)	Comments
UMW-10	11.40 – 19.08	12.33 – 21.28	0.77 – 4.98	0 – 4	Continuous measurement from June-October 2005
UMW-20	11.52 – 19.02	12.66 – 20.90	0.77 – 4.60	0 – 4	Continuous measurement from June-October 2005
UMW-40					Logger malfunctioned, no data yielded

MWAT (Moving Weekly Average Temperature): the 7-day moving average of average daily temperature in °C
MWMT (Moving Weekly Maximum Temperature): the 7-day moving average of the average daily maximum temperature in °C

Table 12: 2006 Upper Mark West Creek Water Temperature Monitoring Stations Physical Attribute Data Summary

Station ID*	Type of Channel	Wetted width/Depth of channel at deployment (feet/tenths)	Wetted width/Depth of channel at retrieval (feet/tenths)	% Slope of Channel	Average % Canopy Cover	Watershed Drainage Area (sq. miles)	Comments
UMW-09	Partially confined alluvial	12.5'/1.4'	12.5'/0.9'	2-4%	98.54%	6.0	Downstream most station on study reach. Station moved slightly downstream from 2005 due to channel morphology changes. **Average flow = 0.79 ft/s
UMW-20	Partially confined alluvial	17.0'/1.25'	17.0'/1.4'	2-4%	97.5%	6.0	This station paired w/ air logger
UMW-39	Partially confined alluvial	12.7'/0.68'	Not recovered	2-4%	91.78%	6.0	Upstream most station, relocated slightly down stream from 2005 station due to channel morphology changes. Logger not recovered.

****One flow station/stream reach was measured upon deployment, not re-measured at retrieval due to time constraints**

Table 13: 2006 Upper Mark West Creek Water Temperature Monitoring Summary

Station ID	MWAT (°C)	MWMT (°C)	Daily Range in °C	Number of Hours >21.1°C (70°F)	Comments
UMW-09	11.35 – 21.37	14.47 – 22.97	0.39 – 4.57	0 – 20	Continuous measurement from May-October 2006
UMW-20	11.56 – 20.87	14.41 – 22.26	0.77 – 4.95	0 – 18	Continuous measurement from May-October 2006
UMW-39					Logger was not retrieved. No data yielded.

MWAT (Moving Weekly Average Temperature): the 7-day moving average of average daily temperature in °C
MWMT (Moving Weekly Maximum Temperature): the 7-day moving average of the average daily maximum temperature in °C

Figure 45. UMW-10: June - October 2005 Temperature Summary

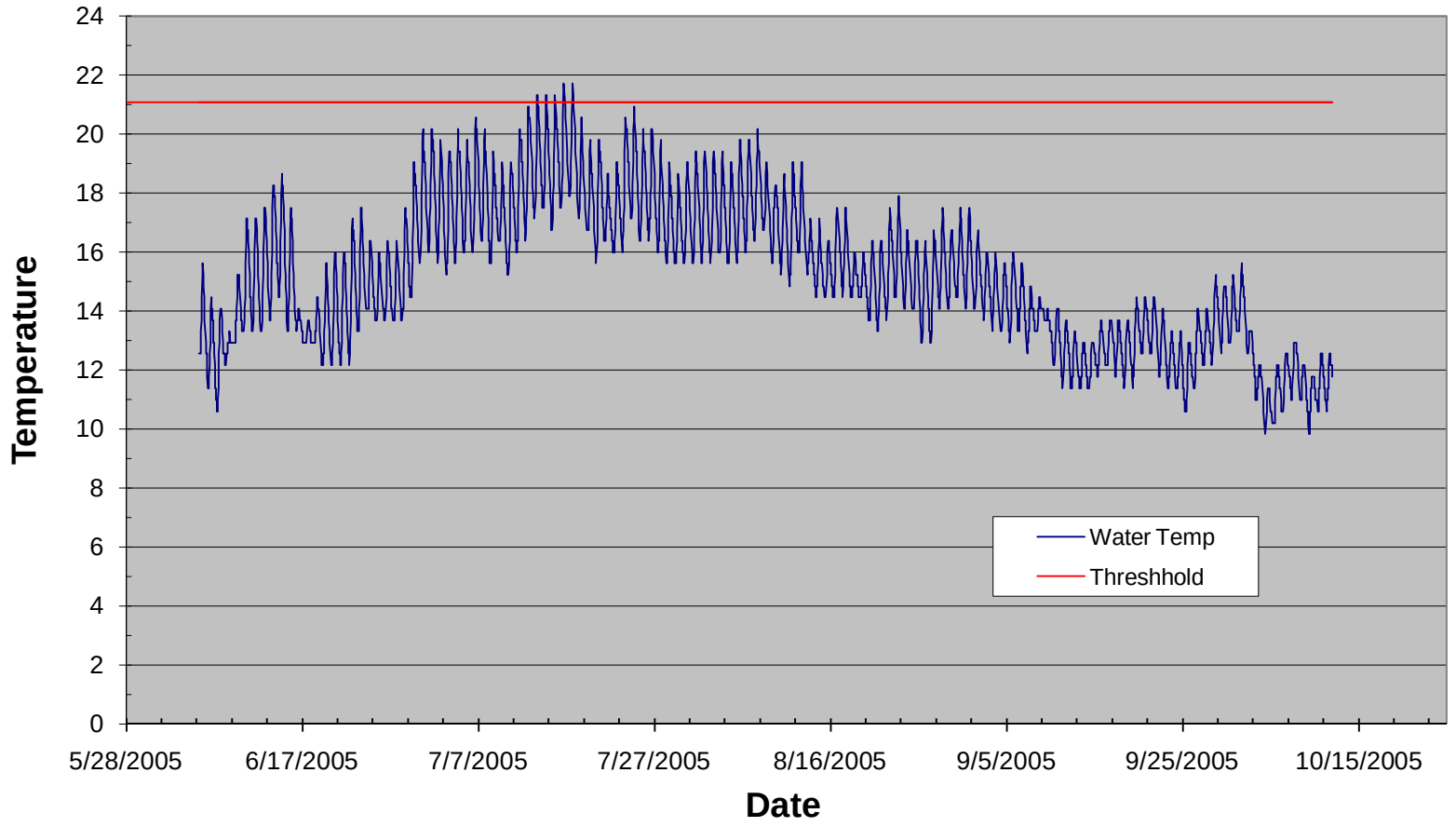


Figure 46. UMW-10: Daily Water Temperature Hours Greater than 21.1 degrees C

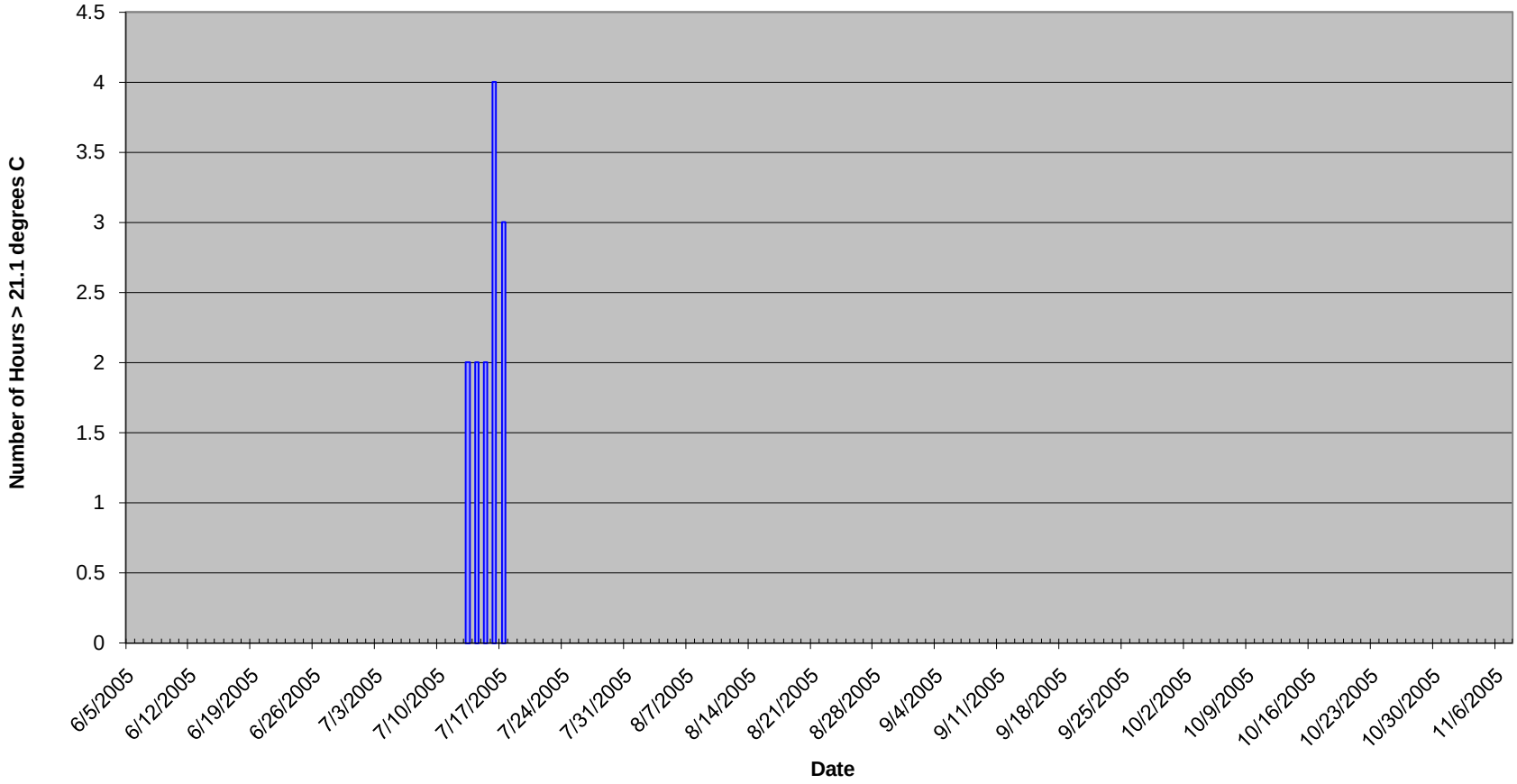


Figure 47. UMW-20: June - October 2005 Temperature Summary

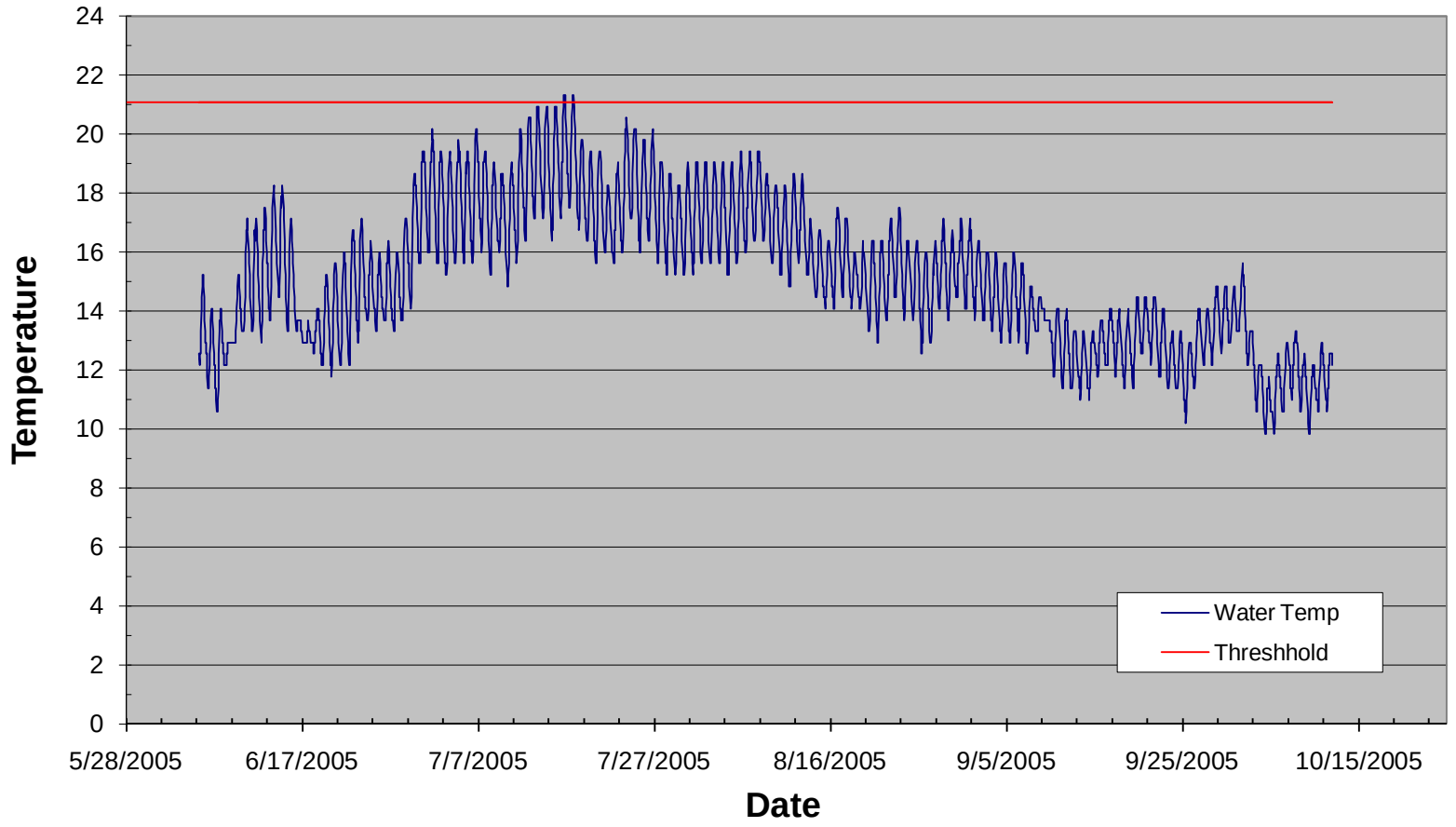


Figure 48. 2005 Upper Mark West Creek Stations MWAT Comparison Graph

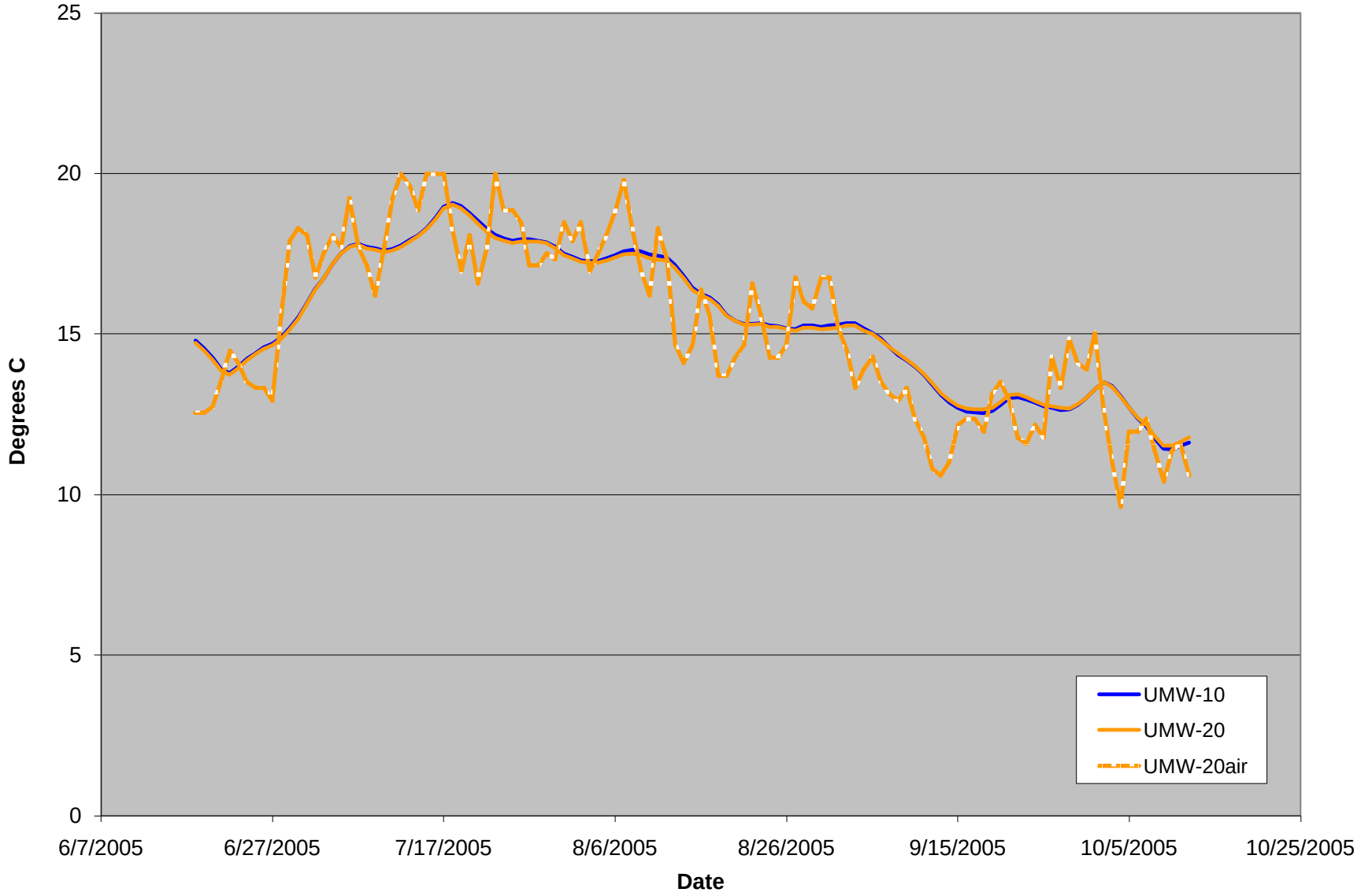


Figure 49. 2005 Upper Mark West Creek Stations MWMT Comparison Graph

Figure 50. UMW-09: May - October 2006 Temperature Summary

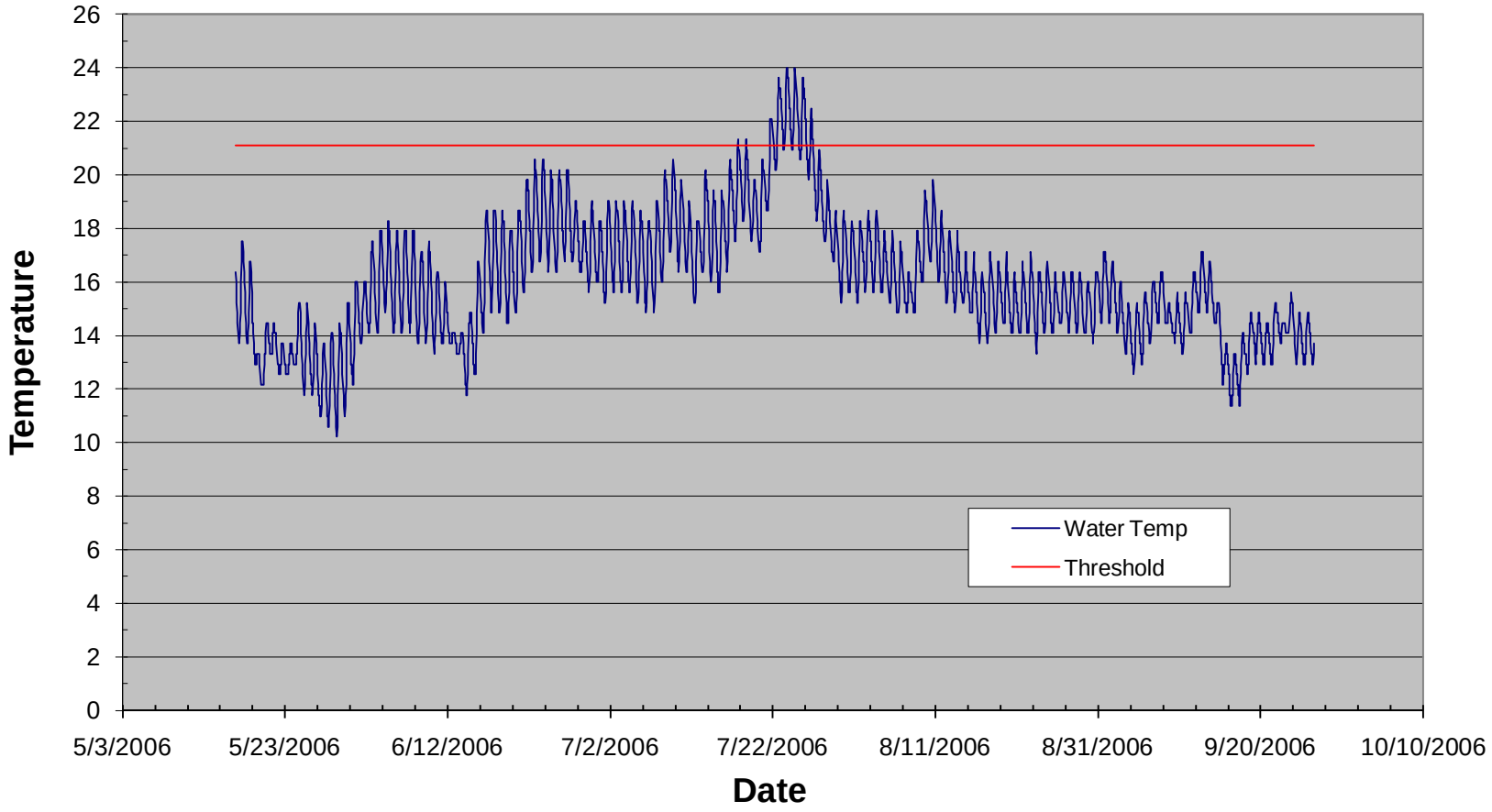


Figure 51. UMW-09: Daily Water Temperature Hours Greater than 21.1 degrees C

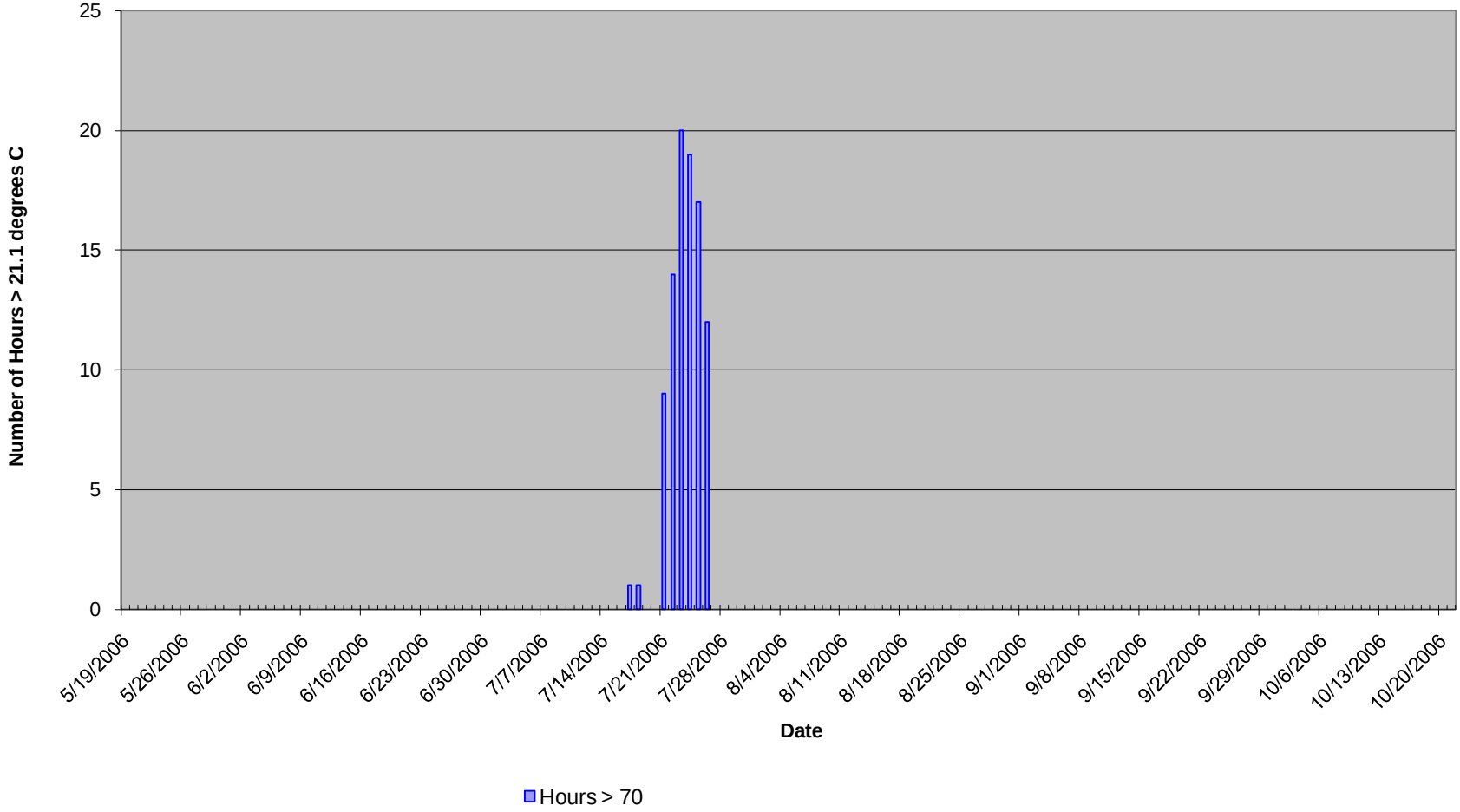


Figure 52. UMW-20: May - October 2006 Temperature Summary

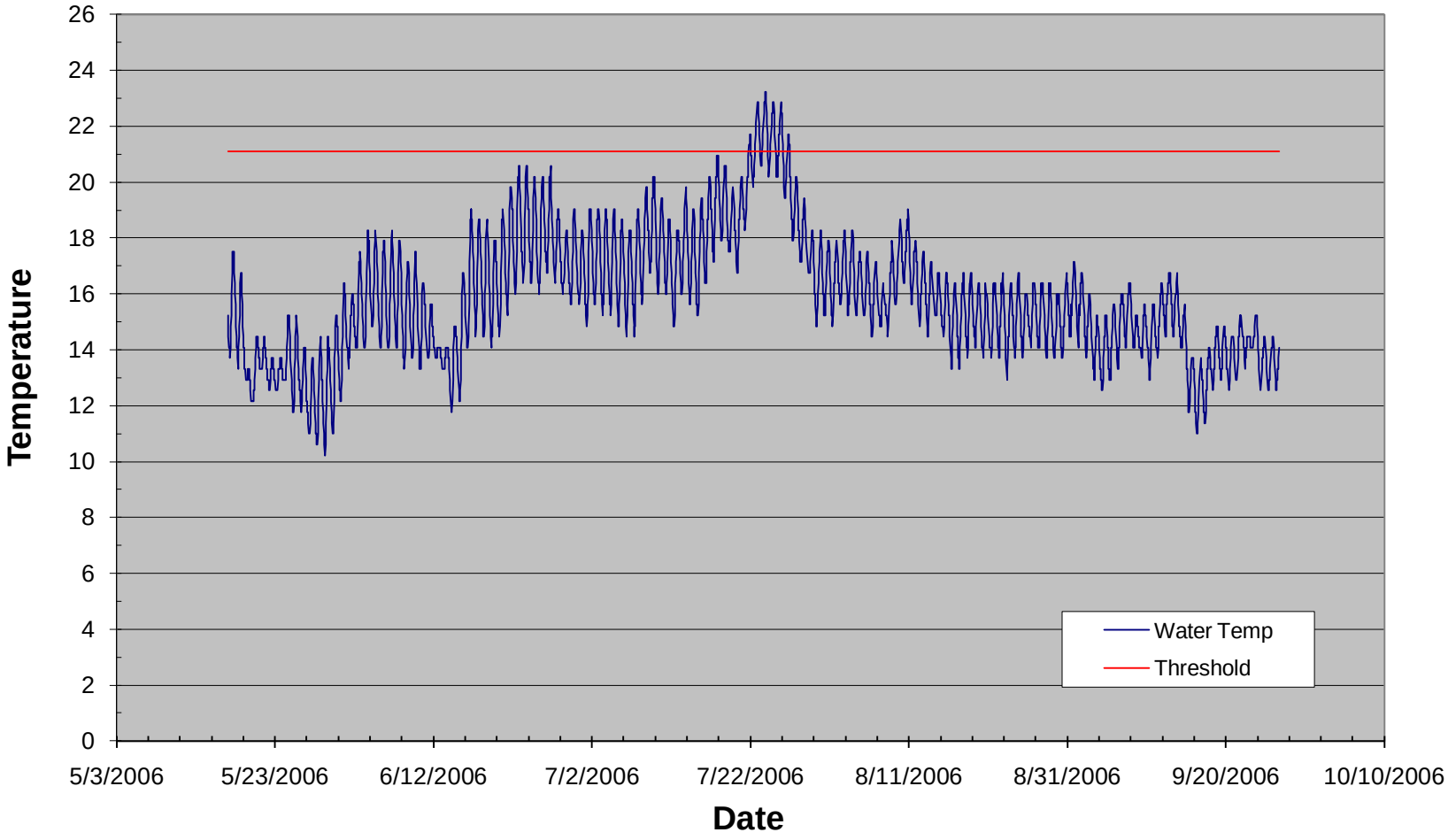


Figure 53. UMW-20: Daily Water Temperature Hours Greater than 21.1 degrees C

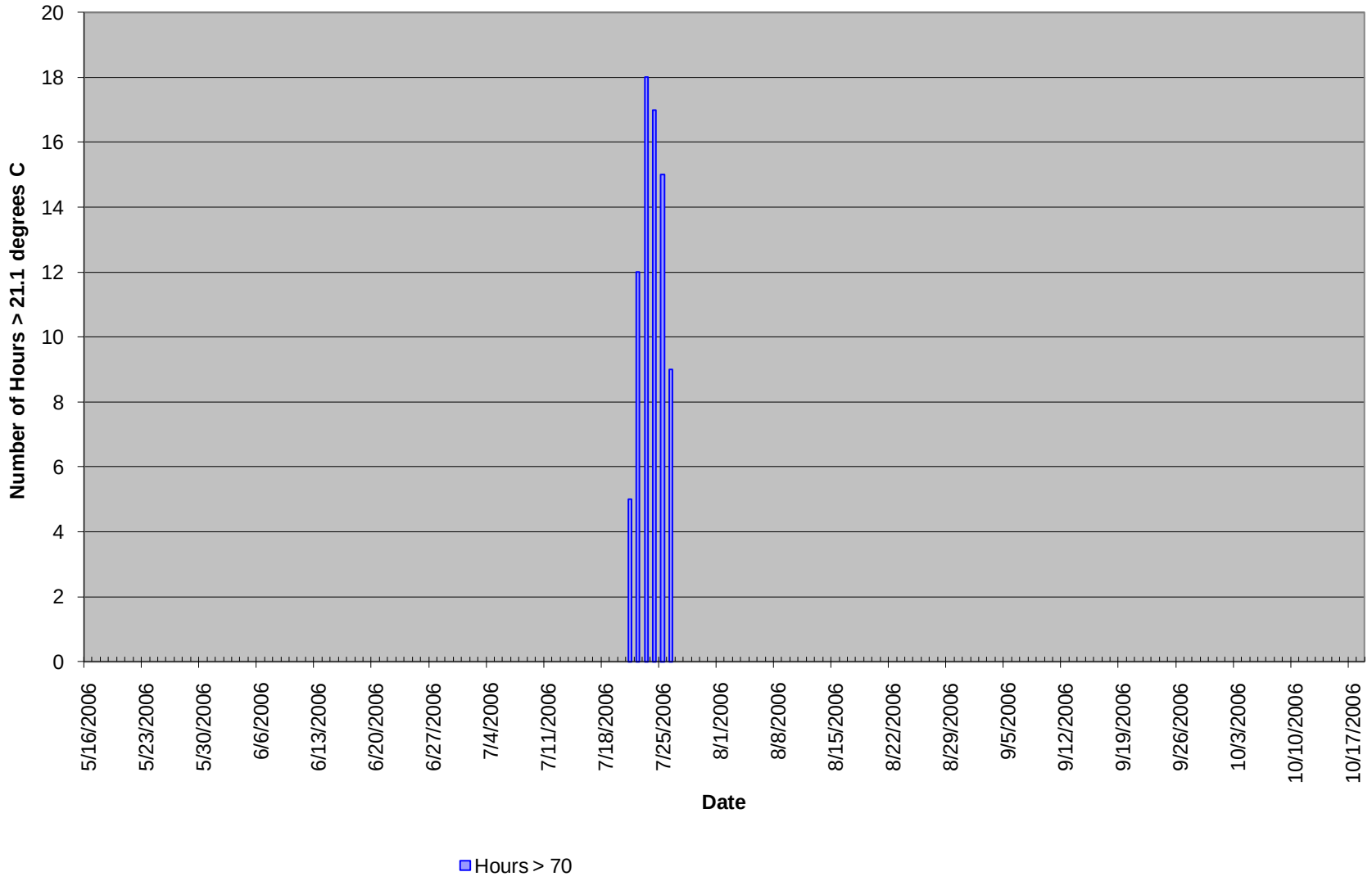


Figure 54. UMW-20air: Daily Temperature Hours Greater than 21.1 degrees C

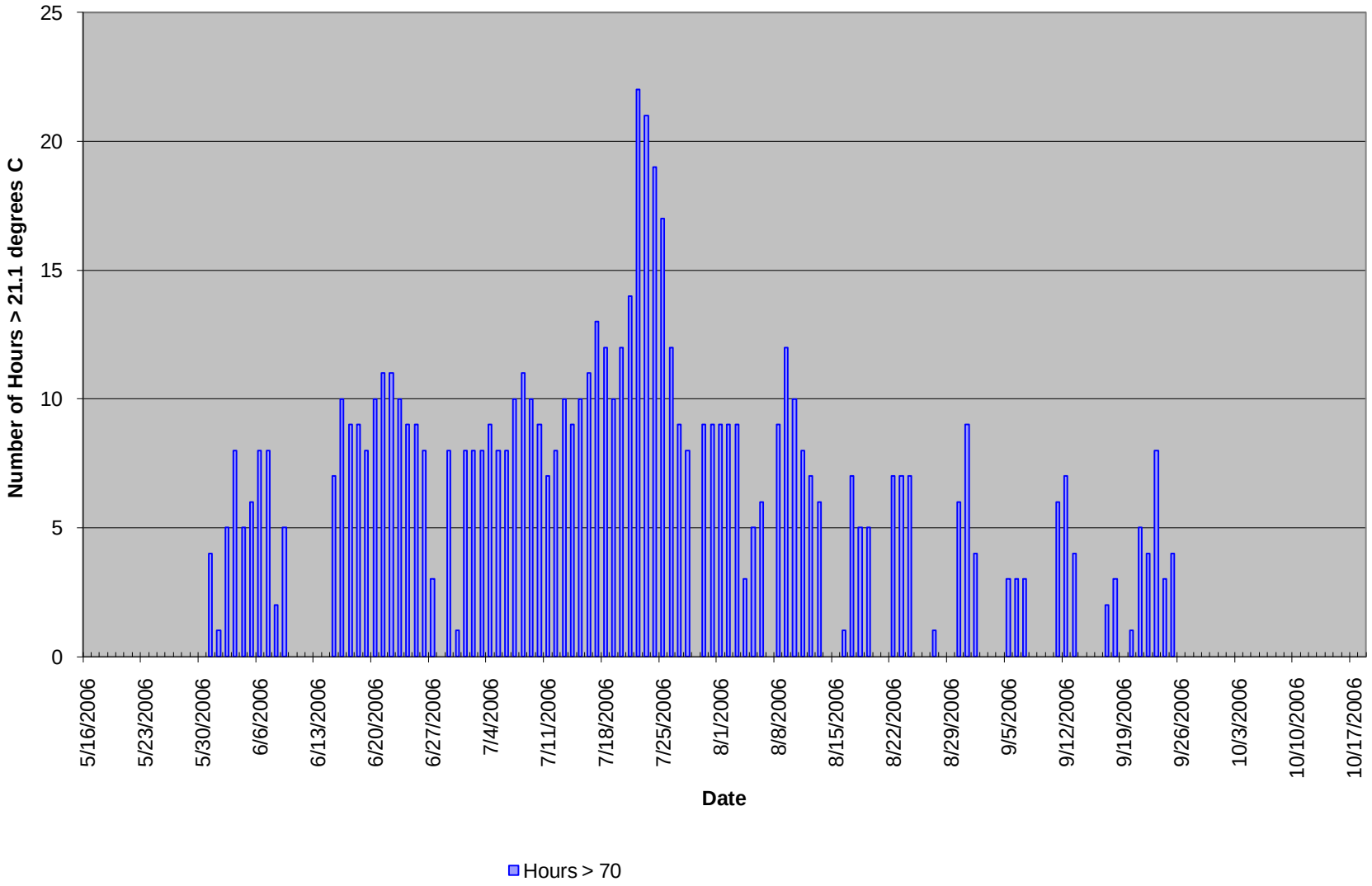


Figure 55. 2006 Upper Mark West Creek Stations MWAT Comparison Graph

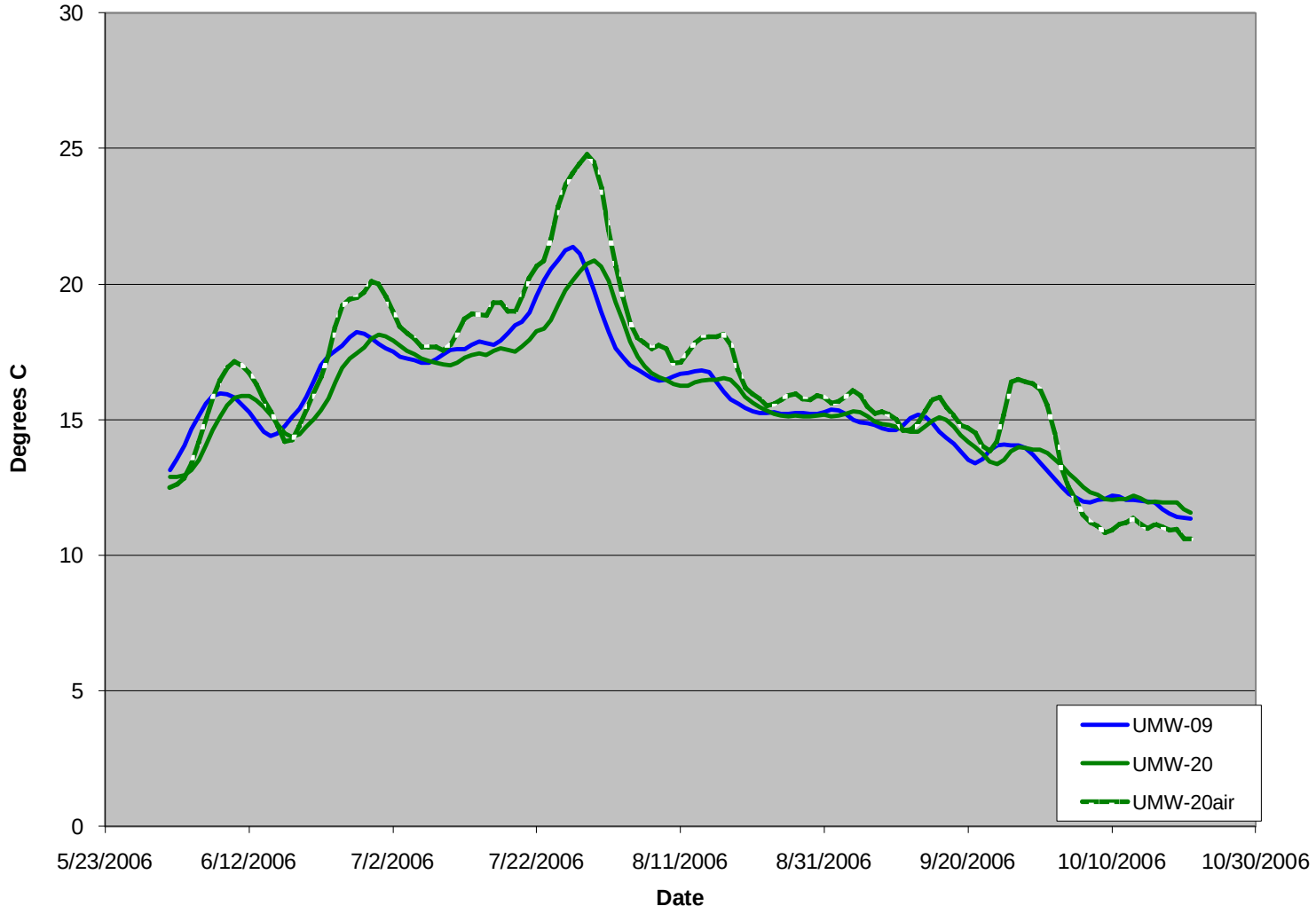
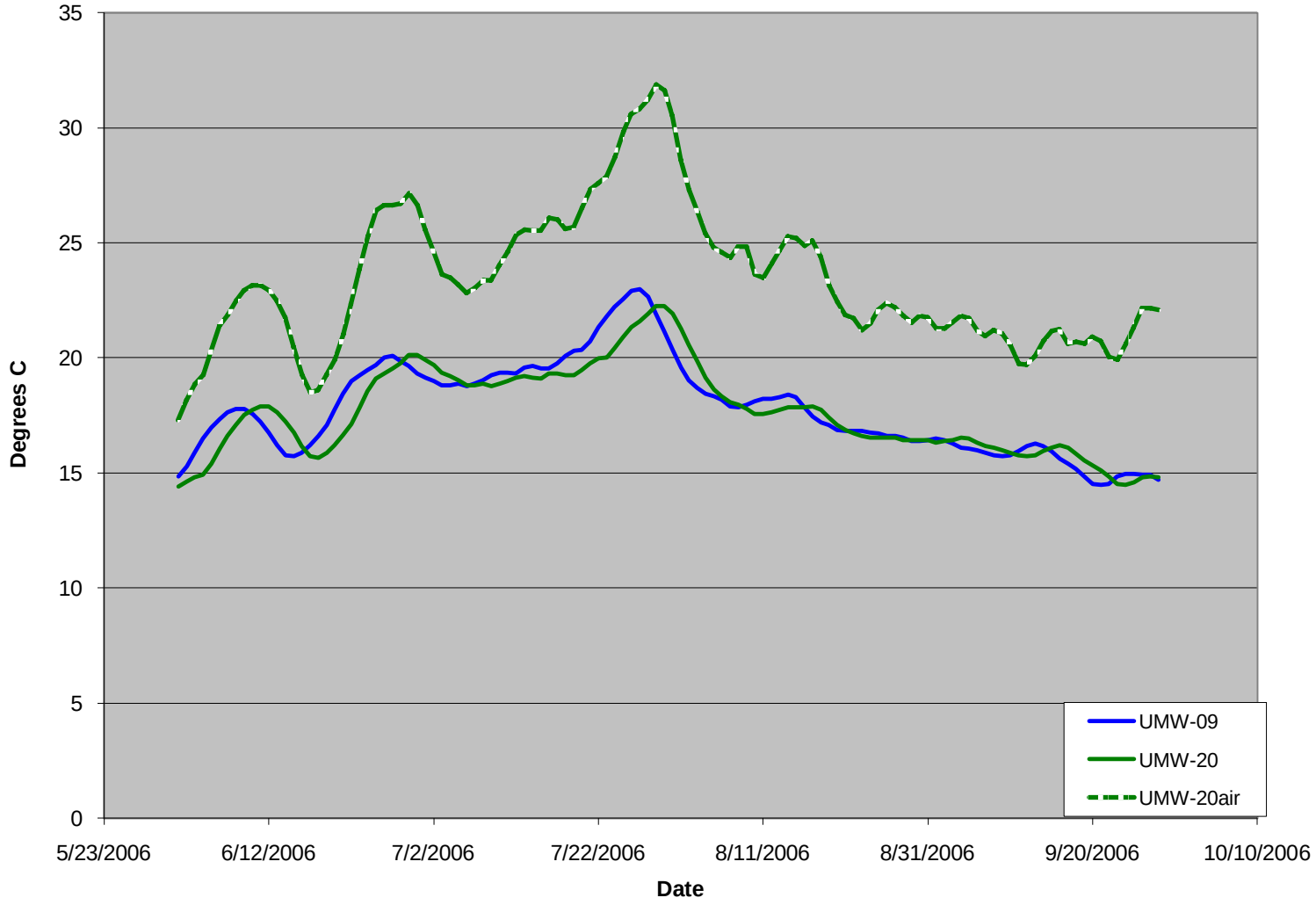


Figure 56. 2006 Upper Mark West Creek Stations MWMT Comparison Graph



Benthic Macroinvertebrates

2006 Results

The SRCD, in partnership with Pacific Watershed Associates (PWA), implemented the first phase of the Upper Mark West Creek Sediment Reduction Project in 2006. With the support and cooperation of over 71 landowners, this project resulted in the improvement of over 11 miles of unpaved private road with an estimated sediment savings of 14,106 cubic yards of sediment from entering upper Mark West Creek and its tributaries. To establish baseline creek conditions in conjunction with this project, BMI assemblages and geomorphic surveying were conducted. These data can be used to show that the implementation of this project has maintained and/or improved high quality aquatic habitat conditions, currently considered suitable for salmonids.

Upper Mark West Creek was sampled for BMI assemblages in September 2006. The samples were analyzed by Jon Lee Consulting and the results are summarized in the report "Interpretation of Benthic Macroinvertebrate Samples Collected at Four Stream Sites in Sonoma County, California" (Lee, 2006) located in Appendix B.

The upper Mark West Creek site showed the highest overall IBI score among the four creeks sampled in 2006, suggesting relatively high quality habitat and a cobble dominated heterogeneous substrate. The relatively high number of BMIs in the shredder functional feeding group suggest an intact riparian zone.

Geomorphic Surveying

The methodologies and results of the 2006 survey and summaries of previous surveys conducted between 1999 and 2004 are included in the "Mark West Creek Study Reach Survey" Report (Jackson, 2006). The summary report of the surveying results from 1998 to 2005 was prepared by Dennis Jackson, Hydrologist and is located in Appendix D of this report.

Through the RRCSP, surveys were conducted on the upper Mark West Creek monitoring reach in 1999, 2000, and 2006. Each of the three surveys included 7 cross sections, a thalweg profile, a water surface profile and a centerline profile. The first two surveys also included a survey of bankfull indicators.

Most of the changes observed on the cross sections and the profile surveys involve changes in elevation (deposit or scour) of 1.0 foot or less. In general, this is typically within the annual variation expected in a stream channel. Based on the data spanning a seven-year period and showing no persistent trend of either aggradation or degradation, Jackson has concluded that this reach of Mark West Creek appears to be geomorphically stable.

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