

Appendix H: SSTEMP Modeling

H.1.0 SSTEMP Modeling Assumptions

The SSTEMP model was chosen to simulate stream temperatures in the suspected thermally impaired segments of Prickly Pear Creek, MT41I006_030 and MT41I006_020. The goals of the SSTEMP modeling were to create realistic temperature models; to ascertain the relative benefits of restoration measures, such as enhancing riparian vegetation; and to evaluate modeling results against naturally occurring temperature for Prickly Pear Creek. Values for the model input parameters were assigned based on available monitoring data or on default parameters suggested in the SSTEMP User's Manual (Bartholow, 2002). This section summarizes the basis for the hydrology, channel geometry, shading, and meteorology modeling assumptions.

H.1.1 Hydrologic Input

For both segments MT41I006_030 and MT41I006_020, values for inflow, inflow temperature, and segment outflow were drawn from actual field data. The date chosen to be modeled was August 7th, 2003, as detailed temperature data existed for these segments from a diel dissolved oxygen and temperature survey.

In segment MT41I006_030, the model was run under the assumption that the stream flowed for the entire length of the segment, and gained 1.5 cfs of flow from the top to the bottom of the segment. Generally the stream is dry in about one half mile of this 4.4 mile segment during the summer irrigation season. Flow data measured during the summer of 2003 when the middle of the segment was dry showed that an average of 1.5 cfs of inflow was gained near the end of the reach. Due to varied water temperatures reflected in available well data for the area, the default accretion value was used in the model (USGS NWIS, 2004). The inflow temperature was taken from the median August temperature recorded on a thermograph deployed in segment MT41I006_040 at East Helena in 2003. Table H-1 lists the input hydrologic values.

For segment MT41I006_020, the model was first run on a 2.6 mile sub-reach of the segment extending from Canyon Ferry Road to Sierra Road in order to calibrate the model. A second model was then run for the entire 5.9 mile length of the segment. Multiple sources of inflow are present within this segment including the City of Helena wastewater treatment plant discharge (WWTP), tile drainage and surplus irrigation water discharges associated with the Helena Valley Irrigation District operations, and ground water discharge. Discharges from the WWTP and irrigation drains tend to be highly variable due to seasonal land application of the wastewater and sporadic irrigation water demands. Flow measurements during the summers of 2003 and 2004 showed that an average of 15 cfs was gained between the site above Stansfield Lake (near the beginning of segment MT41I006_020 and just below York Road) and the sampling site at Sierra Road. However, observations on August 7th, 2003 indicated that less than half of this gain was occurring. Therefore model input values for inflows to the segment and inflow water temperature were back calculated to achieve the actual measured flows and temperatures at Sierra Road. Input flow and temperature values for the first modeling run were set at 4 cfs and 61 degrees Fahrenheit (°F). For the second model, a gain of 14 cfs was estimated to occur along the entire segment. Due to varied temperatures shown in the available well data for the area, the default accretion value was used in the model (USGS NWIS, 2004). Table H-1 lists the input hydrologic values.

Table H-1. Hydrologic inputs for current conditions in segments MT41I006_030 and MT41I006_020.

Parameter	MT41I006_030	MT41I006_020 - to Sierra Road	MT41I006_020 - entire segment
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Segment Inflow (cfs)	1	4	4
Inflow Temperature (°F)	67.5	61	61
Segment Outflow (cfs)	2.5	7.5	18
Accretion Temperature (°F)	55	55	55

H.1.2 Channel Geometry

Topographic maps and GIS layers were used to calculate elevation, aspect, and stream length for segments MT41I006_030 and MT41I006_020. The Width's A and B term represent the wetted width to discharge relationship, where $W = A \cdot Q^B$ (W = known width, A= untransformed y-intercept of the relationship between the natural log of width versus the natural log of discharge, Q = known discharge, and B = power relationship) (Bartholow, 2002). The Width's A and B term were calculated from 2003 and 2004 channel cross-sectional measurements taken during flow gauging (Figures 1 and 2). Because the relationship tends to break down at low flow levels, only two of three flow measurement runs were used for Prickly Pear Creek at Wylie Drive (one high and one low flow). Manning's n was selected based on the stream segments' geomorphic characteristics. Table H-2 lists the input geometry values.

Figure H-1. Width to flow relationship for MT41I006_030 based on data from the sample site at Wylie Drive.

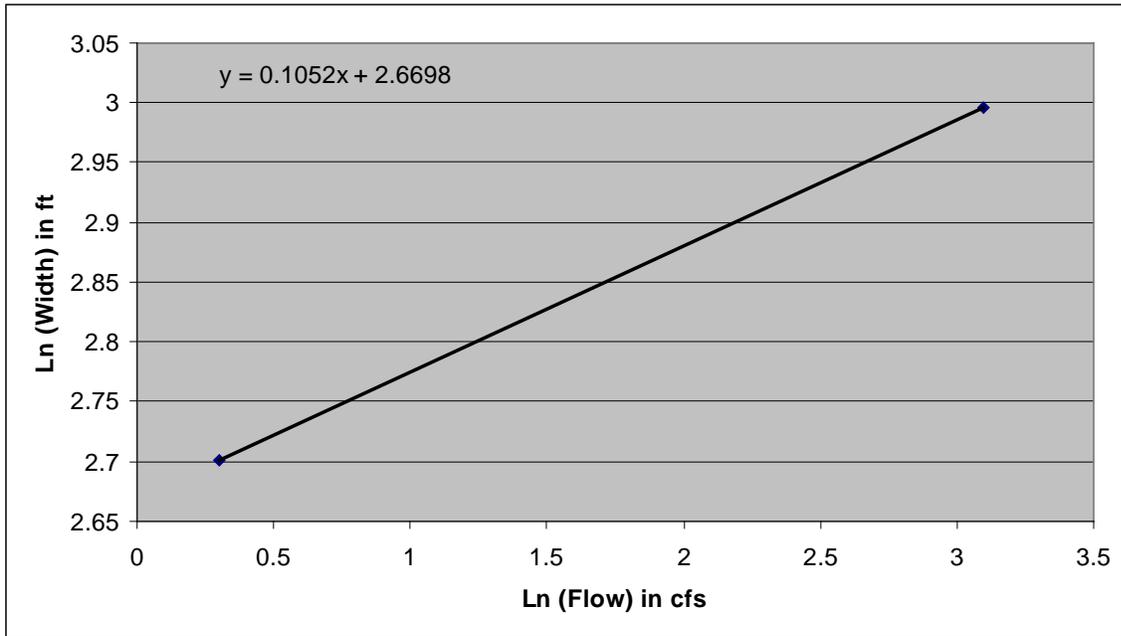


Figure H-2. Width to flow relationship for MT41I006_020 based data from the sample site at Sierra Road.

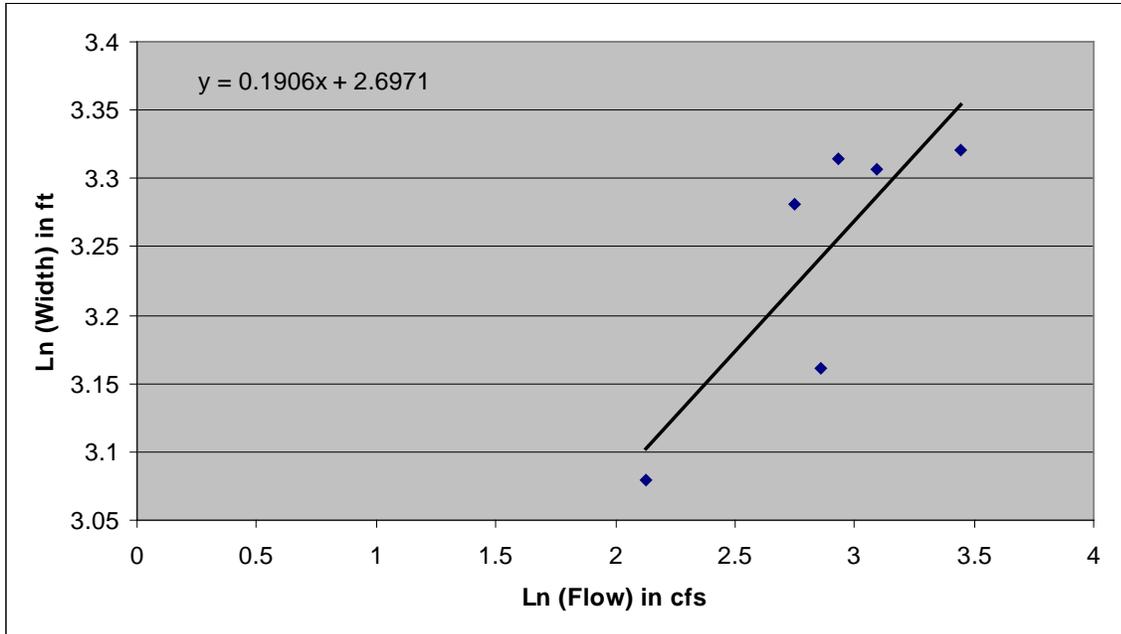


Table H-2. Geometry inputs for segments MT41I006_030 and MT41I006_020.

Parameter	MT41I006_030	MT41I006_020 - to Sierra Road	MT41I006_020 - entire segment
Latitude (degrees)	46.6	46.7	46.7
Dam at Head of Segment	not checked	not checked	not checked
Segment Length	4.42	2.62	5.92
Upstream Elevation (ft)	3840	3705	3705
Downstream Elevation (ft)	3705	3680	3650
Width's A Term (s/ft ²)	14.4	14.8	14.8
B Term	0.11	0.19	0.19
Manning's n	0.032	0.031	0.030

H.1.3 Optional Shading Variables

Shading variables were adjusted based on a review of aerial photos and field observation, while some default values were kept for segments MT41I006_030 and MT41I006_020 (Table H-3). The default values were kept for topographic altitude and vegetation height.

Table H-3. Shading inputs for segments MT41I006_030 and MT41I006_020.

Parameter	MT41I006_030		MT41I006_020	
Segment Azimuth (degrees)	-45		15	
	West	East	West	East
Topographic Altitude (degrees)	25	15	25	15
Vegetation Height (ft)	25	35	25	35
Vegetation Crown (ft)	10	15	15	10
Vegetation Offset (ft)	5	5	5	5
Vegetation Density (%)	20	60	60	20

H.1.4 Meteorology

Detailed weather data for August 7th, 2003 were acquired for the Helena Regional Airport from the Weather Underground website (2004). Air temperature and relative humidity values were corrected for elevation differences between the weather station and average values for the stream segments (Bartholow, 2002). The default values were used for ground temperature, thermal gradient, possible sun, dust coefficient, and ground reflectivity values. Table H-4 lists the input meteorology values.

Table H-4. Meteorology inputs for segments MT41I006_030 and MT41I006_020.

Parameter	MT41I006_030	MT41I006_020
Air Temperature (°F)	78.44	78.73
Maximum Air Temperature (°F)	not checked	not checked
Relative Humidity (%)	32.8	32.5
Wind Speed (mph)	7.1	7.1
Ground Temperature (°F)	55	55
Thermal Gradient (j/m ² /s/C)	1.65	1.65
Possible Sun (%)	90	90
Dust Coefficient	5	5
Ground Reflectivity (%)	25	25

H.2.0 SSTEMP Modeling Scenarios

Various SSTEMP modeling runs were conducted for segments MT41I006_030 and MT41I006_020. The goals of the modeling runs were threefold: 1) to create reasonably accurate temperature models for segments MT41I006_030 and MT41I006_020; 2) to evaluate the potential effectiveness of various restoration measures in reducing instream water temperatures in these segments; and 3) to compare modeled temperatures for Prickly Pear Creek to naturally occurring temperatures so that results could be evaluated using B-1 temperature standards. See Part 5 for the model outputs and sensitivity analyses.

The calibration models for segments MT41I006_030 and MT41I006_020 were run using the input data discussed in Section 1. For segment MT41I006_020, two calibration models were run: 1) from the beginning of the segment to Sierra Road, and 2) for the entire segment.

Restoration measures of riparian vegetation enhancement, cooler inflow temperatures, and flow augmentation were then modeled in order to assess the effectiveness of each measure alone as well as in combination. For segment MT41I006_030, vegetation density was increased from 20 to 60% on the west and from 60 to 75% on the east. Vegetation density for segment MT41I006_020 was increased from 60 to 75% on the west and from 20 to 60% on the east. Inflow temperature for segment MT41I006_030 was modeled at 5 degrees less than the current temperature. In another scenario for segment MT41I006_030, the inflow was augmented to 30 cfs. This value represents the upper inflection point modeled by the Montana Department of Fish, Wildlife and Parks as needed to support a viable salmonid fishery in the lower reaches of Prickly Pear Creek (MFWP, 1989). In order to calculate inflow temperature at the beginning of segment MT41I006_020 resulting from augmented flows in segment MT41I006_030, the equation for the temperature of mixing streams was used (Bartholow, 2002). First, the temperature of inflow from the Helena wastewater treatment plant (WWTP, 2.5 cfs at X° F) was back calculated from the calibration model with the diel data from the lower site on MT41I006_030 (1.5 cfs at 59.4° F). The result of the back calculation was 62° F. The inflow temperature value (62° F) and flow contribution (2.5 cfs) for the WWTP were combined with the model outputs from segment MT41I006_030 to generate model input values for segment MT41I006_020.

Naturally occurring temperature for segment MT41I006_030 was believed to be the restoration model with an inflow of 30cfs at 62.5° F with enhanced riparian vegetation density along the segment. For segment MT41I006_020, naturally occurring temperature was believed to be the restoration model that used the model output from the natural temperature model for segment MT41I006_030 and augmented riparian vegetation density along the segment.

H.3.0 SSTEMP Modeling Results

SSTEMP modeling results were compared to diel temperature survey data collected on August 7th, 2003. For segment MT41I006_030, model outputs were compared to diel temperature data collected near the beginning of the segment (just below Wylie Drive, Table H-5). For segment MT41I006_020, model outputs were compared to diel temperature data collected at Sierra Road (Table H-5). Bartholow states that “the theoretical basis for the model is strongest for the mean daily temperature” (p.13, 2002). Therefore, mean temperature values were given the most consideration.

Table H-5. Diel temperature collected on August 7th, 2003 for segments MT41I006_030 and MT41I006_020.

Statistics	MT41I006_030	MT41I006_020
Mean	69.4 ° F	65.0 ° F
Median	68.4 ° F	63.9 ° F
Standard Deviation	5.6 ° F	5.5 ° F
Minimum	62.8 ° F	59.0 ° F
Maximum	78.1 ° F	73.8 ° F

The calibration model for segment MT41I006_030 produced mean temperature results within 1% of the measured value (Table H-6). The modeled value of 68.7 ° F is 0.7 ° F less than the measured value. This is a reasonable outcome given that the measured temperature was recorded at the beginning of the segment before any inflow from groundwater was gained.

The calibration models for segment MT41I006_020 produced similar results (Table H-6). The first model for segment MT41I006_020 was run to the point of measured data collection, where inflow and inflow temperature were adjusted to fit the observed mean temperature. Again, the modeled mean value of 64.1 ° F for the entire segment is less than the measured value recorded near the middle of the segment. The difference is greater in segment MT41I006_020 than in segment MT41I006_030 due to the larger amount of water gained in this segment.

Table H-6. Results of the calibration models for segments MT41I006_030 and MT41I006_020.

Segment	Parameter	Value	Difference from Measured Value	% Different
MT41I006_030	Mean	68.7 ° F	-0.7 ° F	1
	Maximum	78.3 ° F	+0.2 ° F	0
	Minimum	59.1 ° F	-3.7 ° F	6
MT41I006_020 to Sierra Road	Mean	65.0 ° F	+0.0 ° F	0
	Maximum	74.1 ° F	+0.4 ° F	1
	Minimum	55.9 ° F	-3.1 ° F	5
MT41I006_020 entire segment	Mean	64.1 ° F	-0.9 ° F	1
	Maximum	72.0 ° F	-1.8 ° F	2
	Minimum	56.2 ° F	-2.8 ° F	5

For current conditions (low flow), increasing riparian vegetation density from 20 to 60% on the west and from 60 to 75% on the east for segment MT41I006_030 will result in the largest mean water temperature reduction. Should flows be augmented to 30 cfs in this segment, the inflows will need to be cooler to see much of a reduction in mean water temperature. Cooler inflows at 30 cfs with augmented vegetative density would have the greatest improvement on mean temperature in segment MT41I006_020 (Table H-7).

Similar results were modeled for segment MT41I006_020. Under current conditions, improving vegetative density from 60 to 75% on the west and from 20 to 60% on the east could reduce mean water temperature by about 2.5 ° F. Should flows be augmented in segment MT41I006_030, the result will be to increase heating in segment MT41I006_020, unless cooler inflows and increased vegetation density are achieved in segment MT41I006_030 (Table 7).

Table H-7. Results of the restoration models for segments MT41I006_030 and MT41I006_020.

Segment	Restoration Measure	Parameter	Value	Difference from Measured Value	% Different
MT41I006_030	1. Increase vegetation density	Mean	66.0° F	-3.4° F	5
MT41I006_030	2. Cool inflow by 5° F	Mean	68.7° F	-0.7° F	1
MT41I006_030	3. Increase vegetation density and cool inflow	Mean	66.0° F	-3.4° F	5
MT41I006_030	4. Increase inflow to 30 cfs	Mean	68.4° F	-1.0° F	1
MT41I006_030	5. Increase vegetation density and inflow to 30 cfs	Mean	67.5° F	-2.0° F	3
MT41I006_030	6. Increase inflow to 30 cfs and cool by 5° F	Mean	65.2° F	-4.2° F	6
MT41I006_030	7. Increase vegetation density, inflow to 30 cfs, and cool by 5° F	Mean	64.3° F	-5.1° F	7
MT41I006_020	1. Increase vegetation density	Mean	62.5° F	-2.5° F	4
MT41I006_020	2. Inflow from restoration 4 in segment MT41I006_030	Mean	66.3° F	+1.3° F	2
MT41I006_020	3. Increase vegetation density with inflow from restoration 4 in segment MT41I006_030	Mean	65.3° F	+0.3° F	0
MT41I006_020	4. Inflow from restoration 6 in segment MT41I006_030	Mean	65.2° F	+0.2° F	0
MT41I006_020	5. Increase vegetation density with inflow from restoration 6 in segment MT41I006_030	Mean	64.2° F	-0.8° F	1
MT41I006_020	6. Inflow from restoration 7 in segment MT41I006_030	Mean	64.9° F	-0.1° F	0

Segment	Restoration Measure	Parameter	Value	Difference from Measured Value	% Different
MT41I006_020	7. Increase vegetation density with inflow from restoration 7 in segment MT41I006_030	Mean	63.9 ° F	-1.1 ° F	2
MT41I006_020 to Sierra Road	7. Increase vegetation density with inflow from restoration 7 in segment MT41I006_030	Mean	64.5 ° F	-0.5 ° F	1

In comparison to natural temperatures, under current modeled conditions (calibration model) segment MT41I006_030 is in violation of B-1 temperature standards (the goal for this I-class stream). Montana Administrative Rules for B-1 standards state that “the maximum allowable increase over naturally occurring temperature (if the naturally occurring temperature is less than 67° F) is 1 ° F (ARM 17.30.629). SSTEMP modeled segment MT41I006_030 with 4.4 degrees in excess of natural temperature (Table H-8). Accounting for uncertainty of the models for segment MT41I006_030, the stream is at best 2.6 ° F or at worst 6.2 ° F above natural temperatures. Segment MT41I006_020 is probably in violation of B-1 temperature standards as well (Table H-8). Although the differences from natural values for both calibrations models are less than one degree, once model uncertainty is accounted for the possibility of violating the state’s standard must be considered.

Table H-8. Current conditions versus natural conditions for segments MT41I006_030 and MT41I006_020.

Segment	Current Temperature (Mean)	Calibration Model Uncertainty (Mean)	Natural Temperature (Mean)	Natural Model Uncertainty (Mean)	Difference from Natural Value (Best and Worst Case)
MT41I006_030	68.7 ° F	± 1.0 ° F	64.3 ° F	± 0.8 ° F	+4.4 ° F (2.6 to 6.3)
MT41I006_020 to Sierra Road	65.0 ° F	± 1.4 ° F	64.5 ° F	± 0.9 ° F	-0.5 ° F (-1.8 to 2.8)
MT41I006_020 (whole segment)	64.1 ° F	± 1.8 ° F	63.9 ° F	± 1.2 ° F	-0.2 ° F (-2.8 to 3.2)

H.5.0 Conclusions

Limited in-stream field data were available to calibrate the SSTEMP models. The calibration data collected in 2003 represented extreme drought conditions and unusually hot weather. This is especially important given the fact that air temperature is a very significant variable for the SSTEMP model. Nonetheless, the calibration models appeared to give reasonable estimates of mean temperature for both of the suspected thermally impaired segments of Prickly Pear Creek.

The goals of modeling with SSTEMP were to determine the relative benefits of restoration measures, such as augmenting flows, and to determine if B-1 temperature standards are violated within the suspected thermally impaired segments. The modeled average temperatures for segments MT41I006_020 and MT41I006_030 were above the natural temperatures, and thus violate the state standard set for B-1 class streams naturally below 67° F. Of the significant ‘controllable’ variables revealed in the sensitivity analysis, increasing riparian vegetation density appeared to have the greatest potential impact on reducing mean instream water temperatures. Other significant ‘controllable’ variables in order of importance were inflow temperature, streamflow, and channel morphology variables. When flows were augmented the input flow temperatures became even more important than air temperatures. Should the ultimate goal of restoring coldwater fisheries and associated aquatic life in lower Prickly Pear Creek be realized, it would appear that restoration measures will need to extend upstream of the listed segments in order to reduce inflow temperatures below those recorded in segment MT41I006_040 in 2003.

H.6.0 References

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USGS. 2003. National Water Information System [Online]. U. S. Geological Survey. Available at <http://waterdata.usgs.gov/nwis/>.

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H.7.0 SSTEMP Model Output

Prickly Pear Segment MT41I006_030

Scenario 1. Current conditions with no diversions in segment.

"SSTEMP (2.0.8)"

"English",	"Segment Inflow (cfs)",	"1.000"
"English",	"Inflow Temperature (°F)",	"67.500"
"English",	"Segment Outflow (cfs)",	"2.500"
"English",	"Accretion Temp. (°F)",	"55.000"
"English",	"Latitude (degrees)",	"46.600"
"English",	"Segment Length (mi)",	"4.420"
"English",	"Upstream Elevation (ft)",	"3840.00"
"English",	"Downstream Elevation (ft)",	"3705.00"
"English",	"Width's A Term (s/ft²)",	"14.400"
"English",	" B Term where $W = A*Q^{**}B$ ",	"0.110"
"English",	"Manning's n",	"0.032"
"English",	"Air Temperature (°F)",	"78.440"
"English",	"Relative Humidity (%)",	"32.800"
"English",	"Wind Speed (mph)",	"7.100"
"English",	"Ground Temperature (°F)",	"55.000"
"English",	"Thermal gradient (j/m²/s/C)",	"1.650"
"English",	"Possible Sun (%)",	"90.000"
"English",	"Dust Coefficient",	"5.000"
"English",	"Ground Reflectivity (%)",	"25.000"
"English",	"Solar Radiation (Langleys/d)",	"630.940"
"English",	"Total Shade (%)",	"29.473"
"English",	"Segment Azimuth (degrees)",	"-45.000"

"West Side Variables"

"English",	"Topographic Altitude (degrees)",	"25.000"
"English",	"Vegetation Height (ft)",	"25.000"
"English",	"Vegetation Crown (ft)",	"10.000"
"English",	"Vegetation Offset (ft)",	"5.000"
"English",	"Vegetation Density (%)",	"20.000"

"East Side Variables"

"English",	"Segment Azimuth (degrees)",	"15.000"
"English",	"Topographic Altitude (degrees)",	"35.000"
"English",	"Vegetation Height (ft)",	"15.000"
"English",	"Vegetation Crown (ft)",	"5.000"
"English",	"Vegetation Offset (ft)",	"60.000"
"English",	" Maximum Air Temp (°F)",	"83.422"

"Dam at Head of Segment", "Unchecked"

" Maximum Air Temp (°F)", "Unchecked"

"Solar Radiation", "Disabled"

"Total Shade", "Disabled"

"Month/day", "08/07"

"Predicted Mean (°F) = 68.68"

"Estimated Maximum (°F) = 78.29"

"Approximate Minimum (°F) = 59.08"

"Mean Equilibrium (°F) = 70.77"

"Maximum Equilibrium (°F) = 79.15"

"Minimum Equilibrium (°F) = 62.39"

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 68.68°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
Segment Inflow (cfs)	-0.13	+0.13 *	
Inflow Temperature (°F)	-0.02	+0.02	
Segment Outflow (cfs)	+0.27	-0.29 **	
Accretion Temp. (°F)	-0.73	+0.73 *****	
Width's A Term (s/ft ²)	-0.23	+0.27 **	
B Term where $W = A*Q**B$	-0.02	+0.02	
Manning's n	+0.00	+0.00	
Air Temperature (°F)	-4.53	+4.31 *****	
Relative Humidity (%)	-0.72	+0.73 *****	
Wind Speed (mph)	+0.31	-0.34 **	
Ground Temperature (°F)	-0.23	+0.23 **	
Thermal gradient (j/m ² /s/C)	+0.06	-0.06	
Possible Sun (%)	-0.31	+0.44 ***	
Dust Coefficient	+0.03	-0.03	
Ground Reflectivity (%)	-0.03	+0.03	
Segment Azimuth (degrees)	-0.17	+0.17 *	
West Side:			
Topographic Altitude (degrees)	+0.09	-0.07 *	
Vegetation Height (ft)	+0.03	-0.04	
Vegetation Crown (ft)	+0.02	-0.02	
Vegetation Offset (ft)	-0.02	+0.02	
Vegetation Density (%)	+0.11	-0.11 *	
East Side:			
Topographic Altitude (degrees)	+0.01	-0.01	
Vegetation Height (ft)	+0.02	-0.02	
Vegetation Crown (ft)	+0.03	-0.03	
Vegetation Offset (ft)	-0.02	+0.02	
Vegetation Density (%)	+0.15	-0.15 *	

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 78.29°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
Segment Inflow (cfs)	-0.06	+0.06	
Inflow Temperature (°F)	-0.01	+0.01	
Segment Outflow (cfs)	+0.16	-0.16 *	
Accretion Temp. (°F)	-0.29	+0.29 **	
Width's A Term (s/ft ²)	-0.23	+0.27 **	
B Term where $W = A*Q**B$	-0.01	+0.02	
Manning's n	+0.05	-0.06	
Air Temperature (°F)	-3.98	+3.81 *****	
Relative Humidity (%)	-0.58	+0.59 *****	
Wind Speed (mph)	+0.58	-0.62 *****	
Ground Temperature (°F)	-0.21	+0.21 **	
Thermal gradient (j/m ² /s/C)	+0.09	-0.09 *	
Possible Sun (%)	-0.63	+0.86 *****	
Dust Coefficient	+0.04	-0.04	
Ground Reflectivity (%)	-0.04	+0.04	

Segment Azimuth (degrees) -0.30 +0.30 **

West Side:

Topographic Altitude (degrees) +0.17 -0.13 *

Vegetation Height (ft) +0.05 -0.07 *

Vegetation Crown (ft) +0.03 -0.03

Vegetation Offset (ft) -0.03 +0.03

Vegetation Density (%) +0.20 -0.20 **

East Side:

Topographic Altitude (degrees) +0.03 -0.02

Vegetation Height (ft) +0.04 -0.04

Vegetation Crown (ft) +0.06 -0.06

Vegetation Offset (ft) -0.04 +0.04

Vegetation Density (%) +0.27 -0.27 **

Scenario 2. Same as Scenario 1 but increase vegetation density

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"SSTEMP (2.0.8) "
"English", "Segment Inflow (cfs)", "1.000"
"English", "Inflow Temperature (°F)", "67.500"
"English", "Segment Outflow (cfs)", "2.500"
"English", "Accretion Temp. (°F)", "55.000"
"English", "Latitude (degrees)", "46.600"
"English", "Segment Length (mi)", "4.420"
"English", "Upstream Elevation (ft)", "3840.00"
"English", "Downstream Elevation (ft)", "3705.00"
"English", "Width's A Term (s/ft²)", "14.400"
"English", " B Term where W = A*Q**B", "0.110"
"English", "Manning's n", "0.032"
"English", "Air Temperature (°F)", "78.440"
"English", "Relative Humidity (%)", "32.800"
"English", "Wind Speed (mph)", "7.100"
"English", "Ground Temperature (°F)", "55.000"
"English", "Thermal gradient (j/m²/s/C)", "1.650"
"English", "Possible Sun (%)", "90.000"
"English", "Dust Coefficient", "5.000"
"English", "Ground Reflectivity (%)", "25.000"
"English", "Solar Radiation (Langleys/d)", "630.940"
"English", "Total Shade (%)", "53.978"
"English", "Segment Azimuth (degrees)", "-45.000"
"West Side Variables"
"English", "Topographic Altitude (degrees)", "25.000"
"English", "Vegetation Height (ft)", "25.000"
"English", "Vegetation Crown (ft)", "10.000"
"English", "Vegetation Offset (ft)", "5.000"
"English", "Vegetation Density (%)", "60.000"
"East Side Variables"
"English", "Segment Azimuth (degrees)", "15.000"
"English", "Topographic Altitude (degrees)", "35.000"
"English", "Vegetation Height (ft)", "15.000"
"English", "Vegetation Crown (ft)", "5.000"
"English", "Vegetation Offset (ft)", "75.000"
"English", " Maximum Air Temp (°F)", "83.422"
"Dam at Head of Segment","Unchecked"
" Maximum Air Temp (°F)","Unchecked"
"Solar Radiation","Disabled"
"Total Shade","Disabled"
"Month/day","08/07"
    "Predicted Mean (°F) = 66.00"
    "Estimated Maximum (°F) = 73.40"
    "Approximate Minimum (°F) = 58.60"
    "Mean Equilibrium (°F) = 67.78"
    "Maximum Equilibrium (°F) = 74.39"
    "Minimum Equilibrium (°F) = 61.17"
    
```

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 66.00°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.11	+0.11 *
Inflow Temperature (°F)	-0.02	+0.02
Segment Outflow (cfs)	+0.23	-0.24 **
Accretion Temp. (°F)	-0.77	+0.77 *****
Width's A Term (s/ft ²)	-0.29	+0.32 **
B Term where $W = A*Q**B$	-0.02	+0.02
Manning's n	+0.00	+0.00
Air Temperature (°F)	-4.73	+4.50 *****
Relative Humidity (%)	-0.73	+0.74 *****
Wind Speed (mph)	+0.23	-0.25 **
Ground Temperature (°F)	-0.24	+0.24 **
Thermal gradient (j/m ² /s/C)	+0.05	-0.05
Possible Sun (%)	-0.21	+0.30 **
Dust Coefficient	+0.02	-0.02
Ground Reflectivity (%)	-0.02	+0.02
Segment Azimuth (degrees)	-0.09	+0.09 *
West Side:		
Topographic Altitude (degrees)	+0.05	-0.04
Vegetation Height (ft)	+0.09	-0.12 *
Vegetation Crown (ft)	+0.06	-0.06
Vegetation Offset (ft)	-0.06	+0.06
Vegetation Density (%)	+0.35	-0.35 **
East Side:		
Topographic Altitude (degrees)	+0.01	-0.01
Vegetation Height (ft)	+0.03	-0.03
Vegetation Crown (ft)	+0.04	-0.04
Vegetation Offset (ft)	-0.03	+0.03
Vegetation Density (%)	+0.20	-0.20 *

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 73.40°F

Temperature change (°F)

if variable is:

Variable Decreased Increased Relative Sensitivity

Segment Inflow (cfs)	-0.07	+0.07	
Inflow Temperature (°F)	-0.01	+0.01	
Segment Outflow (cfs)	+0.15	-0.15 *	
Accretion Temp. (°F)	-0.40	+0.40 ***	
Width's A Term (s/ft ²)	-0.39	+0.43 ***	
B Term where $W = A*Q**B$	-0.02	+0.02	
Manning's n	+0.05	-0.05	
Air Temperature (°F)	-4.35	+4.17 *****	
Relative Humidity (%)	-0.62	+0.63 *****	
Wind Speed (mph)	+0.42	-0.45 ***	
Ground Temperature (°F)	-0.23	+0.23 **	
Thermal gradient (j/m ² /s/C)	+0.08	-0.08 *	
Possible Sun (%)	-0.49	+0.64 *****	
Dust Coefficient	+0.03	-0.03	
Ground Reflectivity (%)	-0.03	+0.03	
Segment Azimuth (degrees)	-0.17	+0.17 *	
West Side:			
Topographic Altitude (degrees)	+0.10	-0.08 *	
Vegetation Height (ft)	+0.18	-0.23 **	
Vegetation Crown (ft)	+0.12	-0.11 *	
Vegetation Offset (ft)	-0.11	+0.12 *	

Vegetation Density (%) +0.66 -0.65 *****
East Side:
Topographic Altitude (degrees) +0.02 -0.02
Vegetation Height (ft) +0.06 -0.06
Vegetation Crown (ft) +0.08 -0.08 *
Vegetation Offset (ft) -0.05 +0.05
Vegetation Density (%) +0.38 -0.37 ***

Scenario 3. Same as Scenario 1 but cool inflow by 5° F

"SSTEMP (2.0.8) "
 "English", "Segment Inflow (cfs)", "1.000"
 "English", "Inflow Temperature (°F)", "62.500"
 "English", "Segment Outflow (cfs)", "2.500"
 "English", "Accretion Temp. (°F)", "55.000"
 "English", "Latitude (degrees)", "46.600"
 "English", "Segment Length (mi)", "4.420"
 "English", "Upstream Elevation (ft)", "3840.00"
 "English", "Downstream Elevation (ft)", "3705.00"
 "English", "Width's A Term (s/ft²)", "14.400"
 "English", " B Term where $W = A*Q**B$ ", "0.110"
 "English", "Manning's n", "0.032"
 "English", "Air Temperature (°F)", "78.440"
 "English", "Relative Humidity (%)", "32.800"
 "English", "Wind Speed (mph)", "7.100"
 "English", "Ground Temperature (°F)", "55.000"
 "English", "Thermal gradient (j/m²/s/C)", "1.650"
 "English", "Possible Sun (%)", "90.000"
 "English", "Dust Coefficient", "5.000"
 "English", "Ground Reflectivity (%)", "25.000"
 "English", "Solar Radiation (Langleys/d)", "630.940"
 "English", "Total Shade (%)", "29.473"
 "English", "Segment Azimuth (degrees)", "-45.000"
 "West Side Variables"
 "English", "Topographic Altitude (degrees)", "25.000"
 "English", "Vegetation Height (ft)", "25.000"
 "English", "Vegetation Crown (ft)", "10.000"
 "English", "Vegetation Offset (ft)", "5.000"
 "English", "Vegetation Density (%)", "20.000"
 "East Side Variables"
 "English", "Segment Azimuth (degrees)", "15.000"
 "English", "Topographic Altitude (degrees)", "35.000"
 "English", "Vegetation Height (ft)", "15.000"
 "English", "Vegetation Crown (ft)", "5.000"
 "English", "Vegetation Offset (ft)", "60.000"
 "English", " Maximum Air Temp (°F)", "83.422"
 "Dam at Head of Segment", "Unchecked"
 " Maximum Air Temp (°F)", "Unchecked"
 "Solar Radiation", "Disabled"
 "Total Shade", "Disabled"
 "Month/day", "08/07"
 "Predicted Mean (°F) = 68.67"
 "Estimated Maximum (°F) = 78.28"
 "Approximate Minimum (°F) = 59.06"
 "Mean Equilibrium (°F) = 70.77"
 "Maximum Equilibrium (°F) = 79.15"
 "Minimum Equilibrium (°F) = 62.39"

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 68.67°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
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Segment Inflow (cfs)	-0.13	+0.13 *
Inflow Temperature (°F)	-0.02	+0.02
Segment Outflow (cfs)	+0.27	-0.29 **
Accretion Temp. (°F)	-0.73	+0.73 *****
Width's A Term (s/ft ²)	-0.23	+0.27 **
B Term where $W = A*Q**B$	-0.02	+0.02
Manning's n	+0.00	+0.00
Air Temperature (°F)	-4.53	+4.31 *****
Relative Humidity (%)	-0.72	+0.73 *****
Wind Speed (mph)	+0.31	-0.34 **
Ground Temperature (°F)	-0.23	+0.23 **
Thermal gradient (j/m ² /s/C)	+0.06	-0.06
Possible Sun (%)	-0.31	+0.44 ***
Dust Coefficient	+0.03	-0.03
Ground Reflectivity (%)	-0.03	+0.03
Segment Azimuth (degrees)	-0.17	+0.17 *
West Side:		
Topographic Altitude (degrees)	+0.09	-0.07 *
Vegetation Height (ft)	+0.03	-0.04
Vegetation Crown (ft)	+0.02	-0.02
Vegetation Offset (ft)	-0.02	+0.02
Vegetation Density (%)	+0.11	-0.11 *
East Side:		
Topographic Altitude (degrees)	+0.01	-0.01
Vegetation Height (ft)	+0.02	-0.02
Vegetation Crown (ft)	+0.03	-0.03
Vegetation Offset (ft)	-0.02	+0.02
Vegetation Density (%)	+0.15	-0.15 *

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 78.28°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.06	+0.06	
Inflow Temperature (°F)	-0.01	+0.01	
Segment Outflow (cfs)	+0.16	-0.16 *	
Accretion Temp. (°F)	-0.29	+0.29 **	
Width's A Term (s/ft ²)	-0.23	+0.27 **	
B Term where $W = A*Q**B$	-0.01	+0.02	
Manning's n	+0.05	-0.06	
Air Temperature (°F)	-3.98	+3.81 *****	
Relative Humidity (%)	-0.58	+0.59 *****	
Wind Speed (mph)	+0.58	-0.62 *****	
Ground Temperature (°F)	-0.21	+0.21 **	
Thermal gradient (j/m ² /s/C)	+0.09	-0.09 *	
Possible Sun (%)	-0.63	+0.86 *****	
Dust Coefficient	+0.04	-0.04	
Ground Reflectivity (%)	-0.04	+0.04	
Segment Azimuth (degrees)	-0.30	+0.30 **	
West Side:			
Topographic Altitude (degrees)	+0.17	-0.13 *	
Vegetation Height (ft)	+0.05	-0.07 *	
Vegetation Crown (ft)	+0.04	-0.03	
Vegetation Offset (ft)	-0.03	+0.04	

Vegetation Density (%)	+0.20	-0.20 **
East Side:		
Topographic Altitude (degrees)	+0.03	-0.02
Vegetation Height (ft)	+0.04	-0.04
Vegetation Crown (ft)	+0.06	-0.06
Vegetation Offset (ft)	-0.04	+0.04
Vegetation Density (%)	+0.27	-0.27 **

Scenario 4. Same as Scenario 1 but increase vegetation density and cool inflow by 5° F

```

"SSTEMP (2.0.8) "
"English", "Segment Inflow (cfs)", "1.000"
"English", "Inflow Temperature (°F)", "62.500"
"English", "Segment Outflow (cfs)", "2.500"
"English", "Accretion Temp. (°F)", "55.000"
"English", "Latitude (degrees)", "46.600"
"English", "Segment Length (mi)", "4.420"
"English", "Upstream Elevation (ft)", "3840.00"
"English", "Downstream Elevation (ft)", "3705.00"
"English", "Width's A Term (s/ft²)", "14.400"
"English", " B Term where W = A*Q**B", "0.110"
"English", "Manning's n", "0.032"
"English", "Air Temperature (°F)", "78.440"
"English", "Relative Humidity (%)", "32.800"
"English", "Wind Speed (mph)", "7.100"
"English", "Ground Temperature (°F)", "55.000"
"English", "Thermal gradient (j/m²/s/C)", "1.650"
"English", "Possible Sun (%)", "90.000"
"English", "Dust Coefficient", "5.000"
"English", "Ground Reflectivity (%)", "25.000"
"English", "Solar Radiation (Langleys/d)", "630.940"
"English", "Total Shade (%)", "53.978"
"English", "Segment Azimuth (degrees)", "-45.000"
"West Side Variables"
"English", "Topographic Altitude (degrees)", "25.000"
"English", "Vegetation Height (ft)", "25.000"
"English", "Vegetation Crown (ft)", "10.000"
"English", "Vegetation Offset (ft)", "5.000"
"English", "Vegetation Density (%)", "60.000"
"East Side Variables"
"English", "Segment Azimuth (degrees)", "15.000"
"English", "Topographic Altitude (degrees)", "35.000"
"English", "Vegetation Height (ft)", "15.000"
"English", "Vegetation Crown (ft)", "5.000"
"English", "Vegetation Offset (ft)", "75.000"
"English", " Maximum Air Temp (°F)", "83.422"
"Dam at Head of Segment", "Unchecked"
" Maximum Air Temp (°F)", "Unchecked"
"Solar Radiation", "Disabled"
"Total Shade", "Disabled"
"Month/day", "08/07"
    "Predicted Mean (°F) = 65.99"
    "Estimated Maximum (°F) = 73.40"
    "Approximate Minimum (°F) = 58.58"
    "Mean Equilibrium (°F) = 67.78"
    "Maximum Equilibrium (°F) = 74.39"
    "Minimum Equilibrium (°F) = 61.17"
    
```

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 65.99°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.11	+0.11 *
Inflow Temperature (°F)	-0.02	+0.02
Segment Outflow (cfs)	+0.23	-0.24 **
Accretion Temp. (°F)	-0.77	+0.77 *****
Width's A Term (s/ft ²)	-0.29	+0.32 **
B Term where $W = A*Q**B$	-0.02	+0.02
Manning's n	+0.00	+0.00
Air Temperature (°F)	-4.73	+4.50 *****
Relative Humidity (%)	-0.73	+0.74 *****
Wind Speed (mph)	+0.23	-0.25 **
Ground Temperature (°F)	-0.24	+0.25 **
Thermal gradient (j/m ² /s/C)	+0.05	-0.05
Possible Sun (%)	-0.21	+0.30 **
Dust Coefficient	+0.02	-0.02
Ground Reflectivity (%)	-0.02	+0.02
Segment Azimuth (degrees)	-0.09	+0.09 *
West Side:		
Topographic Altitude (degrees)	+0.05	-0.04
Vegetation Height (ft)	+0.09	-0.12 *
Vegetation Crown (ft)	+0.06	-0.06
Vegetation Offset (ft)	-0.06	+0.06
Vegetation Density (%)	+0.35	-0.35 **
East Side:		
Topographic Altitude (degrees)	+0.01	-0.01
Vegetation Height (ft)	+0.03	-0.03
Vegetation Crown (ft)	+0.04	-0.04
Vegetation Offset (ft)	-0.03	+0.03
Vegetation Density (%)	+0.20	-0.20 *

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 73.40°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.07	+0.07	
Inflow Temperature (°F)	-0.01	+0.01	
Segment Outflow (cfs)	+0.16	-0.15 *	
Accretion Temp. (°F)	-0.40	+0.40 ***	
Width's A Term (s/ft ²)	-0.39	+0.43 ***	
B Term where $W = A*Q**B$	-0.02	+0.02	
Manning's n	+0.05	-0.05	
Air Temperature (°F)	-4.35	+4.17 *****	
Relative Humidity (%)	-0.62	+0.63 *****	
Wind Speed (mph)	+0.42	-0.45 ***	
Ground Temperature (°F)	-0.23	+0.23 **	
Thermal gradient (j/m ² /s/C)	+0.08	-0.08 *	
Possible Sun (%)	-0.49	+0.64 *****	
Dust Coefficient	+0.03	-0.03	
Ground Reflectivity (%)	-0.03	+0.03	
Segment Azimuth (degrees)	-0.17	+0.17 *	
West Side:			
Topographic Altitude (degrees)	+0.10	-0.08 *	
Vegetation Height (ft)	+0.18	-0.23 **	
Vegetation Crown (ft)	+0.12	-0.11 *	
Vegetation Offset (ft)	-0.11	+0.12 *	

Vegetation Density (%) +0.66 -0.65 *****
East Side:
Topographic Altitude (degrees) +0.02 -0.02
Vegetation Height (ft) +0.06 -0.06
Vegetation Crown (ft) +0.08 -0.08 *
Vegetation Offset (ft) -0.05 +0.05
Vegetation Density (%) +0.38 -0.37 ***

Scenario 5. Same as Scenario 1 but begin with 30 cfs

"SSTEMP (2.0.8)"
 "English", "Segment Inflow (cfs)", "30.000"
 "English", "Inflow Temperature (°F)", "67.500"
 "English", "Segment Outflow (cfs)", "31.500"
 "English", "Accretion Temp. (°F)", "55.000"
 "English", "Latitude (degrees)", "46.600"
 "English", "Segment Length (mi)", "4.420"
 "English", "Upstream Elevation (ft)", "3840.00"
 "English", "Downstream Elevation (ft)", "3705.00"
 "English", "Width's A Term (s/ft²)", "14.400"
 "English", " B Term where $W = A*Q^{**}B$ ", "0.110"
 "English", "Manning's n", "0.032"
 "English", "Air Temperature (°F)", "78.440"
 "English", "Relative Humidity (%)", "32.800"
 "English", "Wind Speed (mph)", "7.100"
 "English", "Ground Temperature (°F)", "55.000"
 "English", "Thermal gradient (j/m²/s/C)", "1.650"
 "English", "Possible Sun (%)", "90.000"
 "English", "Dust Coefficient", "5.000"
 "English", "Ground Reflectivity (%)", "25.000"
 "English", "Solar Radiation (Langleys/d)", "630.940"
 "English", "Total Shade (%)", "27.022"
 "English", "Segment Azimuth (degrees)", "-45.000"
 "West Side Variables"
 "English", "Topographic Altitude (degrees)", "25.000"
 "English", "Vegetation Height (ft)", "25.000"
 "English", "Vegetation Crown (ft)", "10.000"
 "English", "Vegetation Offset (ft)", "5.000"
 "English", "Vegetation Density (%)", "20.000"
 "East Side Variables"
 "English", "Segment Azimuth (degrees)", "15.000"
 "English", "Topographic Altitude (degrees)", "35.000"
 "English", "Vegetation Height (ft)", "15.000"
 "English", "Vegetation Crown (ft)", "5.000"
 "English", "Vegetation Offset (ft)", "60.000"
 "English", " Maximum Air Temp (°F)", "83.422"
 "Dam at Head of Segment", "Unchecked"
 " Maximum Air Temp (°F)", "Unchecked"
 "Solar Radiation", "Disabled"
 "Total Shade", "Disabled"
 "Month/day", "08/07"
 "Predicted Mean (°F) = 68.38"
 "Estimated Maximum (°F) = 75.58"
 "Approximate Minimum (°F) = 61.19"
 "Mean Equilibrium (°F) = 71.43"
 "Maximum Equilibrium (°F) = 79.90"
 "Minimum Equilibrium (°F) = 62.95"

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 68.38°F

Temperature change (°F)

if variable is:

Variable Decreased Increased Relative Sensitivity

Segment Inflow (cfs)	-0.46	+0.97	*****
Inflow Temperature (°F)	-4.08	+4.30	*****
Segment Outflow (cfs)	+0.98	-0.54	*****
Accretion Temp. (°F)	-0.20	+0.21	*
Width's A Term (s/ft ²)	-0.14	+0.14	*
B Term where $W = A*Q**B$	-0.05	+0.05	
Manning's n	+0.00	+0.00	
Air Temperature (°F)	-1.89	+1.66	*****
Relative Humidity (%)	-0.29	+0.29	**
Wind Speed (mph)	+0.12	-0.12	*
Ground Temperature (°F)	-0.09	+0.09	*
Thermal gradient (j/m ² /s/C)	+0.02	-0.02	
Possible Sun (%)	-0.13	+0.18	*
Dust Coefficient	+0.01	-0.01	
Ground Reflectivity (%)	-0.01	+0.01	
Segment Azimuth (degrees)	-0.07	+0.07	
West Side:			
Topographic Altitude (degrees)	+0.04	-0.03	
Vegetation Height (ft)	+0.02	-0.02	
Vegetation Crown (ft)	+0.01	-0.01	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.04	-0.04	
East Side:			
Topographic Altitude (degrees)	+0.01	-0.01	
Vegetation Height (ft)	+0.01	-0.01	
Vegetation Crown (ft)	+0.01	-0.01	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.06	-0.06	

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 75.58°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity

Segment Inflow (cfs)	-0.37	+0.78	*****
Inflow Temperature (°F)	-3.17	+3.34	*****
Segment Outflow (cfs)	+0.95	-0.61	*****
Accretion Temp. (°F)	-0.16	+0.16	*
Width's A Term (s/ft ²)	-0.37	+0.41	****
B Term where $W = A*Q**B$	-0.15	+0.15	*
Manning's n	+0.19	-0.20	**
Air Temperature (°F)	-2.19	+1.97	*****
Relative Humidity (%)	-0.29	+0.30	***
Wind Speed (mph)	+0.27	-0.28	**
Ground Temperature (°F)	-0.11	+0.11	*
Thermal gradient (j/m ² /s/C)	+0.05	-0.05	
Possible Sun (%)	-0.46	+0.60	*****
Dust Coefficient	+0.03	-0.03	
Ground Reflectivity (%)	-0.03	+0.03	
Segment Azimuth (degrees)	-0.21	+0.20	**
West Side:			
Topographic Altitude (degrees)	+0.11	-0.08	*
Vegetation Height (ft)	+0.05	-0.06	*
Vegetation Crown (ft)	+0.03	-0.03	
Vegetation Offset (ft)	-0.03	+0.03	

Vegetation Density (%)	+0.12	-0.12 *
East Side:		
Topographic Altitude (degrees)	+0.02	-0.02
Vegetation Height (ft)	+0.04	-0.04
Vegetation Crown (ft)	+0.04	-0.04
Vegetation Offset (ft)	-0.02	+0.02
Vegetation Density (%)	+0.17	-0.17 **

Scenario 6. Same as Scenario 5 but increase vegetation density

"SSTEMP (2.0.8)"
 "English", "Segment Inflow (cfs)", "30.000"
 "English", "Inflow Temperature (°F)", "67.500"
 "English", "Segment Outflow (cfs)", "31.500"
 "English", "Accretion Temp. (°F)", "55.000"
 "English", "Latitude (degrees)", "46.600"
 "English", "Segment Length (mi)", "4.420"
 "English", "Upstream Elevation (ft)", "3840.00"
 "English", "Downstream Elevation (ft)", "3705.00"
 "English", "Width's A Term (s/ft²)", "14.400"
 "English", " B Term where $W = A * Q^{**}B$ ", "0.110"
 "English", "Manning's n", "0.032"
 "English", "Air Temperature (°F)", "78.440"
 "English", "Relative Humidity (%)", "32.800"
 "English", "Wind Speed (mph)", "7.100"
 "English", "Ground Temperature (°F)", "55.000"
 "English", "Thermal gradient (j/m²/s/C)", "1.650"
 "English", "Possible Sun (%)", "90.000"
 "English", "Dust Coefficient", "5.000"
 "English", "Ground Reflectivity (%)", "25.000"
 "English", "Solar Radiation (Langleys/d)", "630.940"
 "English", "Total Shade (%)", "48.807"
 "English", "Segment Azimuth (degrees)", "-45.000"
 "West Side Variables"
 "English", "Topographic Altitude (degrees)", "25.000"
 "English", "Vegetation Height (ft)", "25.000"
 "English", "Vegetation Crown (ft)", "10.000"
 "English", "Vegetation Offset (ft)", "5.000"
 "English", "Vegetation Density (%)", "60.000"
 "East Side Variables"
 "English", "Segment Azimuth (degrees)", "15.000"
 "English", "Topographic Altitude (degrees)", "35.000"
 "English", "Vegetation Height (ft)", "15.000"
 "English", "Vegetation Crown (ft)", "5.000"
 "English", "Vegetation Offset (ft)", "75.000"
 "English", " Maximum Air Temp (°F)", "83.422"
 "Dam at Head of Segment", "Unchecked"
 " Maximum Air Temp (°F)", "Unchecked"
 "Solar Radiation", "Disabled"
 "Total Shade", "Disabled"
 "Month/day", "08/07"
 "Predicted Mean (°F) = 67.45"
 "Estimated Maximum (°F) = 72.80"
 "Approximate Minimum (°F) = 62.11"
 "Mean Equilibrium (°F) = 68.81"
 "Maximum Equilibrium (°F) = 75.77"
 "Minimum Equilibrium (°F) = 61.85"

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 67.45°F

Temperature change (°F)

if variable is:

Variable Decreased Increased Relative Sensitivity

Segment Inflow (cfs)	-0.49	+1.00	*****
Inflow Temperature (°F)	-4.10	+4.32	*****
Segment Outflow (cfs)	+0.94	-0.51	*****
Accretion Temp. (°F)	-0.21	+0.22	*
Width's A Term (s/ft ²)	-0.11	+0.11	*
B Term where $W = A*Q**B$	-0.04	+0.04	
Manning's n	+0.00	+0.00	
Air Temperature (°F)	-1.88	+1.65	*****
Relative Humidity (%)	-0.28	+0.28	**
Wind Speed (mph)	+0.11	-0.11	*
Ground Temperature (°F)	-0.09	+0.09	*
Thermal gradient (j/m ² /s/C)	+0.02	-0.02	
Possible Sun (%)	-0.09	+0.13	*
Dust Coefficient	+0.01	-0.01	
Ground Reflectivity (%)	-0.01	+0.01	
Segment Azimuth (degrees)	-0.04	+0.04	
West Side:			
Topographic Altitude (degrees)	+0.02	-0.01	
Vegetation Height (ft)	+0.05	-0.06	
Vegetation Crown (ft)	+0.03	-0.03	
Vegetation Offset (ft)	-0.03	+0.03	
Vegetation Density (%)	+0.12	-0.12	*
East Side:			
Topographic Altitude (degrees)	+0.00	0.00	
Vegetation Height (ft)	+0.02	-0.02	
Vegetation Crown (ft)	+0.02	-0.02	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.07	-0.07	

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 72.80°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity

Segment Inflow (cfs)	-0.43	+0.85	*****
Inflow Temperature (°F)	-3.41	+3.59	*****
Segment Outflow (cfs)	+0.93	-0.56	*****
Accretion Temp. (°F)	-0.18	+0.18	*
Width's A Term (s/ft ²)	-0.40	+0.42	***
B Term where $W = A*Q**B$	-0.16	+0.16	*
Manning's n	+0.14	-0.16	*
Air Temperature (°F)	-2.16	+1.93	*****
Relative Humidity (%)	-0.29	+0.29	**
Wind Speed (mph)	+0.20	-0.21	**
Ground Temperature (°F)	-0.11	+0.11	*
Thermal gradient (j/m ² /s/C)	+0.04	-0.04	
Possible Sun (%)	-0.33	+0.43	****
Dust Coefficient	+0.02	-0.02	
Ground Reflectivity (%)	-0.02	+0.02	
Segment Azimuth (degrees)	-0.13	+0.12	*
West Side:			
Topographic Altitude (degrees)	+0.05	-0.04	
Vegetation Height (ft)	+0.15	-0.18	*
Vegetation Crown (ft)	+0.08	-0.08	*
Vegetation Offset (ft)	-0.08	+0.08	*

Vegetation Density (%)	+0.35	-0.35 ***
East Side:		
Topographic Altitude (degrees)	+0.01	-0.01
Vegetation Height (ft)	+0.05	-0.05
Vegetation Crown (ft)	+0.05	-0.05
Vegetation Offset (ft)	-0.03	+0.03
Vegetation Density (%)	+0.21	-0.21 **

Scenario 7. Same as Scenario 5 but cool inflow by 5° F

"SSTEMP (2.0.8)"
 "English", "Segment Inflow (cfs)", "30.000"
 "English", "Inflow Temperature (°F)", "62.500"
 "English", "Segment Outflow (cfs)", "31.500"
 "English", "Accretion Temp. (°F)", "55.000"
 "English", "Latitude (degrees)", "46.600"
 "English", "Segment Length (mi)", "4.420"
 "English", "Upstream Elevation (ft)", "3840.00"
 "English", "Downstream Elevation (ft)", "3705.00"
 "English", "Width's A Term (s/ft²)", "14.400"
 "English", " B Term where $W = A*Q^{**}B$ ", "0.110"
 "English", "Manning's n", "0.032"
 "English", "Air Temperature (°F)", "78.440"
 "English", "Relative Humidity (%)", "32.800"
 "English", "Wind Speed (mph)", "7.100"
 "English", "Ground Temperature (°F)", "55.000"
 "English", "Thermal gradient (j/m²/s/C)", "1.650"
 "English", "Possible Sun (%)", "90.000"
 "English", "Dust Coefficient", "5.000"
 "English", "Ground Reflectivity (%)", "25.000"
 "English", "Solar Radiation (Langleys/d)", "630.940"
 "English", "Total Shade (%)", "27.022"
 "English", "Segment Azimuth (degrees)", "-45.000"
 "West Side Variables"
 "English", "Topographic Altitude (degrees)", "25.000"
 "English", "Vegetation Height (ft)", "25.000"
 "English", "Vegetation Crown (ft)", "10.000"
 "English", "Vegetation Offset (ft)", "5.000"
 "English", "Vegetation Density (%)", "20.000"
 "East Side Variables"
 "English", "Segment Azimuth (degrees)", "15.000"
 "English", "Topographic Altitude (degrees)", "35.000"
 "English", "Vegetation Height (ft)", "15.000"
 "English", "Vegetation Crown (ft)", "5.000"
 "English", "Vegetation Offset (ft)", "60.000"
 "English", " Maximum Air Temp (°F)", "83.422"
 "Dam at Head of Segment", "Unchecked"
 " Maximum Air Temp (°F)", "Unchecked"
 "Solar Radiation", "Disabled"
 "Total Shade", "Disabled"
 "Month/day", "08/07"
 "Predicted Mean (°F) = 65.22"
 "Estimated Maximum (°F) = 73.12"
 "Approximate Minimum (°F) = 57.32"
 "Mean Equilibrium (°F) = 71.43"
 "Maximum Equilibrium (°F) = 79.90"
 "Minimum Equilibrium (°F) = 62.95"

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 65.22°F

Temperature change (°F)

if variable is:

Variable Decreased Increased Relative Sensitivity

Segment Inflow (cfs)	-0.21	+0.55	****
Inflow Temperature (°F)	-3.94	+4.11	*****
Segment Outflow (cfs)	+0.70	-0.42	****
Accretion Temp. (°F)	-0.19	+0.19	*
Width's A Term (s/ft ²)	-0.26	+0.27	**
B Term where $W = A*Q**B$	-0.10	+0.10	*
Manning's n	+0.00	+0.00	
Air Temperature (°F)	-1.92	+1.68	*****
Relative Humidity (%)	-0.29	+0.30	**
Wind Speed (mph)	+0.07	-0.07	*
Ground Temperature (°F)	-0.09	+0.09	*
Thermal gradient (j/m ² /s/C)	+0.02	-0.02	
Possible Sun (%)	-0.13	+0.18	*
Dust Coefficient	+0.01	-0.01	
Ground Reflectivity (%)	-0.01	+0.01	
Segment Azimuth (degrees)	-0.07	+0.07	*
West Side:			
Topographic Altitude (degrees)	+0.04	-0.03	
Vegetation Height (ft)	+0.02	-0.02	
Vegetation Crown (ft)	+0.01	-0.01	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.04	-0.04	
East Side:			
Topographic Altitude (degrees)	+0.01	-0.01	
Vegetation Height (ft)	+0.01	-0.01	
Vegetation Crown (ft)	+0.01	-0.01	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.06	-0.06	

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 73.12°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity

Segment Inflow (cfs)	-0.19	+0.45	****
Inflow Temperature (°F)	-3.06	+3.19	*****
Segment Outflow (cfs)	+0.76	-0.56	*****
Accretion Temp. (°F)	-0.15	+0.15	*
Width's A Term (s/ft ²)	-0.51	+0.56	*****
B Term where $W = A*Q**B$	-0.20	+0.20	**
Manning's n	+0.22	-0.24	**
Air Temperature (°F)	-2.24	+2.01	*****
Relative Humidity (%)	-0.30	+0.30	***
Wind Speed (mph)	+0.22	-0.23	**
Ground Temperature (°F)	-0.11	+0.11	*
Thermal gradient (j/m ² /s/C)	+0.05	-0.05	
Possible Sun (%)	-0.49	+0.64	*****
Dust Coefficient	+0.03	-0.03	
Ground Reflectivity (%)	-0.03	+0.03	
Segment Azimuth (degrees)	-0.22	+0.22	**
West Side:			
Topographic Altitude (degrees)	+0.12	-0.09	*
Vegetation Height (ft)	+0.06	-0.06	*
Vegetation Crown (ft)	+0.03	-0.03	
Vegetation Offset (ft)	-0.03	+0.03	

Vegetation Density (%) +0.13 -0.13 *

East Side:

Topographic Altitude (degrees) +0.02 -0.02

Vegetation Height (ft) +0.04 -0.04

Vegetation Crown (ft) +0.04 -0.04

Vegetation Offset (ft) -0.03 +0.03

Vegetation Density (%) +0.18 -0.18 **

Scenario 8. Same as Scenario 5 but increase vegetation density and cool inflow by 5° F

"SSTEMP (2.0.8)"
 "English", "Segment Inflow (cfs)", "30.000"
 "English", "Inflow Temperature (°F)", "62.500"
 "English", "Segment Outflow (cfs)", "31.500"
 "English", "Accretion Temp. (°F)", "55.000"
 "English", "Latitude (degrees)", "46.600"
 "English", "Segment Length (mi)", "4.420"
 "English", "Upstream Elevation (ft)", "3840.00"
 "English", "Downstream Elevation (ft)", "3705.00"
 "English", "Width's A Term (s/ft²)", "14.400"
 "English", " B Term where $W = A * Q^{**}B$ ", "0.110"
 "English", "Manning's n", "0.032"
 "English", "Air Temperature (°F)", "78.440"
 "English", "Relative Humidity (%)", "32.800"
 "English", "Wind Speed (mph)", "7.100"
 "English", "Ground Temperature (°F)", "55.000"
 "English", "Thermal gradient (j/m²/s/C)", "1.650"
 "English", "Possible Sun (%)", "90.000"
 "English", "Dust Coefficient", "5.000"
 "English", "Ground Reflectivity (%)", "25.000"
 "English", "Solar Radiation (Langleys/d)", "630.940"
 "English", "Total Shade (%)", "48.807"
 "English", "Segment Azimuth (degrees)", "-45.000"
 "West Side Variables"
 "English", "Topographic Altitude (degrees)", "25.000"
 "English", "Vegetation Height (ft)", "25.000"
 "English", "Vegetation Crown (ft)", "10.000"
 "English", "Vegetation Offset (ft)", "5.000"
 "English", "Vegetation Density (%)", "60.000"
 "East Side Variables"
 "English", "Segment Azimuth (degrees)", "15.000"
 "English", "Topographic Altitude (degrees)", "35.000"
 "English", "Vegetation Height (ft)", "15.000"
 "English", "Vegetation Crown (ft)", "5.000"
 "English", "Vegetation Offset (ft)", "75.000"
 "English", " Maximum Air Temp (°F)", "83.422"
 "Dam at Head of Segment", "Unchecked"
 " Maximum Air Temp (°F)", "Unchecked"
 "Solar Radiation", "Disabled"
 "Total Shade", "Disabled"
 "Month/day", "08/07"
 "Predicted Mean (°F) = 64.27"
 "Estimated Maximum (°F) = 70.16"
 "Approximate Minimum (°F) = 58.39"
 "Mean Equilibrium (°F) = 68.81"
 "Maximum Equilibrium (°F) = 75.77"
 "Minimum Equilibrium (°F) = 61.85"

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 64.27°F

Temperature change (°F)

if variable is:

Variable Decreased Increased Relative Sensitivity

Segment Inflow (cfs)	-0.25	+0.58	****
Inflow Temperature (°F)	-3.96	+4.12	*****
Segment Outflow (cfs)	+0.66	-0.38	****
Accretion Temp. (°F)	-0.20	+0.20	*
Width's A Term (s/ft ²)	-0.24	+0.24	**
B Term where $W = A*Q**B$	-0.09	+0.09	*
Manning's n	+0.00	+0.00	
Air Temperature (°F)	-1.91	+1.67	*****
Relative Humidity (%)	-0.28	+0.29	**
Wind Speed (mph)	+0.06	-0.06	
Ground Temperature (°F)	-0.09	+0.09	*
Thermal gradient (j/m ² /s/C)	+0.02	-0.02	
Possible Sun (%)	-0.09	+0.13	*
Dust Coefficient	+0.01	-0.01	
Ground Reflectivity (%)	-0.01	+0.01	
Segment Azimuth (degrees)	-0.04	+0.04	
West Side:			
Topographic Altitude (degrees)	+0.02	-0.01	
Vegetation Height (ft)	+0.05	-0.06	
Vegetation Crown (ft)	+0.03	-0.03	
Vegetation Offset (ft)	-0.03	+0.03	
Vegetation Density (%)	+0.12	-0.12	*
East Side:			
Topographic Altitude (degrees)	+0.00	0.00	
Vegetation Height (ft)	+0.02	-0.02	
Vegetation Crown (ft)	+0.02	-0.02	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.07	-0.07	*

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 70.16°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity

Segment Inflow (cfs)	-0.23	+0.51	****
Inflow Temperature (°F)	-3.29	+3.43	*****
Segment Outflow (cfs)	+0.71	-0.49	****
Accretion Temp. (°F)	-0.17	+0.17	*
Width's A Term (s/ft ²)	-0.54	+0.57	****
B Term where $W = A*Q**B$	-0.22	+0.22	**
Manning's n	+0.17	-0.19	**
Air Temperature (°F)	-2.21	+1.98	*****
Relative Humidity (%)	-0.29	+0.29	***
Wind Speed (mph)	+0.15	-0.16	*
Ground Temperature (°F)	-0.11	+0.11	*
Thermal gradient (j/m ² /s/C)	+0.04	-0.04	
Possible Sun (%)	-0.36	+0.46	****
Dust Coefficient	+0.02	-0.02	
Ground Reflectivity (%)	-0.02	+0.02	
Segment Azimuth (degrees)	-0.13	+0.13	*
West Side:			
Topographic Altitude (degrees)	+0.06	-0.04	
Vegetation Height (ft)	+0.16	-0.19	**
Vegetation Crown (ft)	+0.08	-0.08	*
Vegetation Offset (ft)	-0.08	+0.08	*

Vegetation Density (%)	+0.37	-0.37 ***
East Side:		
Topographic Altitude (degrees)	+0.01	-0.01
Vegetation Height (ft)	+0.05	-0.05
Vegetation Crown (ft)	+0.05	-0.05
Vegetation Offset (ft)	-0.03	+0.03
Vegetation Density (%)	+0.22	-0.22 **

Prickly Pear Segment MT41I006_020

Scenario 1. Current conditions but stop segment at Sierra Road crossing

"SSTEMP (2.0.8) "
 "English", "Segment Inflow (cfs)", "4.000"
 "English", "Inflow Temperature (°F)", "61.000"
 "English", "Segment Outflow (cfs)", "7.500"
 "English", "Accretion Temp. (°F)", "55.000"
 "English", "Latitude (degrees)", "46.700"
 "English", "Segment Length (mi)", "2.620"
 "English", "Upstream Elevation (ft)", "3705.00"
 "English", "Downstream Elevation (ft)", "3680.00"
 "English", "Width's A Term (s/ft²)", "14.800"
 "English", " B Term where $W = A*Q**B$ ", "0.190"
 "English", "Manning's n", "0.031"
 "English", "Air Temperature (°F)", "78.730"
 "English", "Relative Humidity (%)", "32.500"
 "English", "Wind Speed (mph)", "7.100"
 "English", "Ground Temperature (°F)", "55.000"
 "English", "Thermal gradient (j/m²/s/C)", "1.650"
 "English", "Possible Sun (%)", "90.000"
 "English", "Dust Coefficient", "5.000"
 "English", "Ground Reflectivity (%)", "25.000"
 "English", "Solar Radiation (Langleys/d)", "630.326"
 "English", "Total Shade (%)", "33.179"
 "English", "Segment Azimuth (degrees)", "15.000"
 "West Side Variables"
 "English", "Topographic Altitude (degrees)", "25.000"
 "English", "Vegetation Height (ft)", "25.000"
 "English", "Vegetation Crown (ft)", "15.000"
 "English", "Vegetation Offset (ft)", "5.000"
 "English", "Vegetation Density (%)", "60.000"
 "East Side Variables"
 "English", "Segment Azimuth (degrees)", "15.000"
 "English", "Topographic Altitude (degrees)", "35.000"
 "English", "Vegetation Height (ft)", "10.000"
 "English", "Vegetation Crown (ft)", "5.000"
 "English", "Vegetation Offset (ft)", "20.000"
 "English", " Maximum Air Temp (°F)", "83.722"
 "Dam at Head of Segment", "Unchecked"
 " Maximum Air Temp (°F)", "Unchecked"
 "Solar Radiation", "Disabled"
 "Total Shade", "Disabled"
 "Month/day", "08/07"
 "Predicted Mean (°F) = 65.02"
 "Estimated Maximum (°F) = 74.13"
 "Approximate Minimum (°F) = 55.91"
 "Mean Equilibrium (°F) = 70.43"
 "Maximum Equilibrium (°F) = 78.54"
 "Minimum Equilibrium (°F) = 62.33"

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)
 Original mean temperature = 65.02°F
 Temperature change (°F)
 if variable is:

Variable	Decreased	Increased	Relative Sensitivity
Segment Inflow (cfs)	-0.25	+0.25	**
Inflow Temperature (°F)	-0.82	+0.90	*****
Segment Outflow (cfs)	+0.50	-0.57	*****
Accretion Temp. (°F)	-1.46	+1.46	*****
Width's A Term (s/ft ²)	-0.43	+0.46	*****
B Term where $W = A*Q**B$	-0.15	+0.15	*
Manning's n	+0.00	+0.00	
Air Temperature (°F)	-3.53	+3.13	*****
Relative Humidity (%)	-0.54	+0.54	*****
Wind Speed (mph)	+0.13	-0.13	*
Ground Temperature (°F)	-0.17	+0.17	*
Thermal gradient (j/m ² /s/C)	+0.03	-0.03	
Possible Sun (%)	-0.22	+0.31	***
Dust Coefficient	+0.02	-0.02	
Ground Reflectivity (%)	-0.02	+0.02	
Segment Azimuth (degrees)	-0.02	+0.02	
West Side:			
Topographic Altitude (degrees)	+0.03	-0.04	
Vegetation Height (ft)	+0.04	-0.05	
Vegetation Crown (ft)	+0.04	-0.04	
Vegetation Offset (ft)	-0.03	+0.03	
Vegetation Density (%)	+0.13	-0.13	*
East Side:			
Topographic Altitude (degrees)	+0.03	-0.03	
Vegetation Height (ft)	+0.02	-0.02	
Vegetation Crown (ft)	+0.01	-0.01	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.07	-0.07	*

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 74.13°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
Segment Inflow (cfs)	-0.19	+0.19	**
Inflow Temperature (°F)	-0.56	+0.61	*****
Segment Outflow (cfs)	+0.49	-0.54	*****
Accretion Temp. (°F)	-0.99	+0.99	*****
Width's A Term (s/ft ²)	-0.59	+0.64	*****
B Term where $W = A*Q**B$	-0.21	+0.20	**
Manning's n	+0.18	-0.19	**
Air Temperature (°F)	-3.47	+3.17	*****
Relative Humidity (%)	-0.48	+0.49	****
Wind Speed (mph)	+0.34	-0.36	***
Ground Temperature (°F)	-0.18	+0.18	**
Thermal gradient (j/m ² /s/C)	+0.07	-0.07	*
Possible Sun (%)	-0.59	+0.78	*****
Dust Coefficient	+0.04	-0.04	
Ground Reflectivity (%)	-0.04	+0.04	
Segment Azimuth (degrees)	-0.05	+0.05	
West Side:			
Topographic Altitude (degrees)	+0.08	-0.08	*
Vegetation Height (ft)	+0.08	-0.11	*

Vegetation Crown (ft)	+0.08	-0.09 *
Vegetation Offset (ft)	-0.06	+0.06 *
Vegetation Density (%)	+0.29	-0.29 ***
East Side:		
Topographic Altitude (degrees)	+0.07	-0.06 *
Vegetation Height (ft)	+0.04	-0.05
Vegetation Crown (ft)	+0.02	-0.02
Vegetation Offset (ft)	-0.02	+0.02
Vegetation Density (%)	+0.15	-0.15 *

Scenario 2. Current conditions to end of segment

```

"SSTEMP (2.0.8) "
"English", "Segment Inflow (cfs)", "4.000"
"English", "Inflow Temperature (°F)", "61.000"
"English", "Segment Outflow (cfs)", "18.000"
"English", "Accretion Temp. (°F)", "55.000"
"English", "Latitude (degrees)", "46.700"
"English", "Segment Length (mi)", "5.920"
"English", "Upstream Elevation (ft)", "3705.00"
"English", "Downstream Elevation (ft)", "3650.00"
"English", "Width's A Term (s/ft²)", "14.800"
"English", " B Term where W = A*Q**B", "0.190"
"English", "Manning's n", "0.030"
"English", "Air Temperature (°F)", "78.730"
"English", "Relative Humidity (%)", "32.500"
"English", "Wind Speed (mph)", "7.100"
"English", "Ground Temperature (°F)", "55.000"
"English", "Thermal gradient (j/m²/s/C)", "1.650"
"English", "Possible Sun (%)", "90.000"
"English", "Dust Coefficient", "5.000"
"English", "Ground Reflectivity (%)", "25.000"
"English", "Solar Radiation (Langleys/d)", "630.297"
"English", "Total Shade (%)", "31.956"
"English", "Segment Azimuth (degrees)", "15.000"
"West Side Variables"
"English", "Topographic Altitude (degrees)", "25.000"
"English", "Vegetation Height (ft)", "25.000"
"English", "Vegetation Crown (ft)", "15.000"
"English", "Vegetation Offset (ft)", "5.000"
"English", "Vegetation Density (%)", "60.000"
"East Side Variables"
"English", "Segment Azimuth (degrees)", "15.000"
"English", "Topographic Altitude (degrees)", "35.000"
"English", "Vegetation Height (ft)", "10.000"
"English", "Vegetation Crown (ft)", "5.000"
"English", "Vegetation Offset (ft)", "20.000"
"English", " Maximum Air Temp (°F)", "83.722"
"Dam at Head of Segment", "Unchecked"
" Maximum Air Temp (°F)", "Unchecked"
"Solar Radiation", "Disabled"
"Total Shade", "Disabled"
"Month/day", "08/07"
    "Predicted Mean (°F) = 64.08"
    "Estimated Maximum (°F) = 71.99"
    "Approximate Minimum (°F) = 56.18"
    "Mean Equilibrium (°F) = 70.58"
    "Maximum Equilibrium (°F) = 78.77"
    "Minimum Equilibrium (°F) = 62.39"
    
```

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 64.08°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.11	+0.11 *
Inflow Temperature (°F)	-0.16	+0.18 **
Segment Outflow (cfs)	+0.38	-0.43 *****
Accretion Temp. (°F)	-2.20	+2.20 *****
Width's A Term (s/ft ²)	-0.44	+0.48 *****
B Term where $W = A*Q**B$	-0.21	+0.21 **
Manning's n	+0.00	+0.00
Air Temperature (°F)	-3.42	+3.04 *****
Relative Humidity (%)	-0.52	+0.53 *****
Wind Speed (mph)	+0.12	-0.12 *
Ground Temperature (°F)	-0.17	+0.17 *
Thermal gradient (j/m ² /s/C)	+0.03	-0.03
Possible Sun (%)	-0.22	+0.30 ***
Dust Coefficient	+0.02	-0.02
Ground Reflectivity (%)	-0.02	+0.02
Segment Azimuth (degrees)	-0.02	+0.02
West Side:		
Topographic Altitude (degrees)	+0.04	-0.03
Vegetation Height (ft)	+0.04	-0.05
Vegetation Crown (ft)	+0.04	-0.04
Vegetation Offset (ft)	-0.02	+0.02
Vegetation Density (%)	+0.12	-0.12 *
East Side:		
Topographic Altitude (degrees)	+0.03	-0.03
Vegetation Height (ft)	+0.02	-0.02
Vegetation Crown (ft)	+0.01	-0.01
Vegetation Offset (ft)	-0.01	+0.01
Vegetation Density (%)	+0.06	-0.06 *

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 71.99°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.09	+0.09 *
Inflow Temperature (°F)	-0.12	+0.14 *
Segment Outflow (cfs)	+0.48	-0.52 *****
Accretion Temp. (°F)	-1.70	+1.70 *****
Width's A Term (s/ft ²)	-0.66	+0.74 *****
B Term where $W = A*Q**B$	-0.31	+0.32 ***
Manning's n	+0.23	-0.25 **
Air Temperature (°F)	-3.41	+3.11 *****
Relative Humidity (%)	-0.48	+0.48 *****
Wind Speed (mph)	+0.25	-0.27 **
Ground Temperature (°F)	-0.17	+0.17 **
Thermal gradient (j/m ² /s/C)	+0.06	-0.06 *
Possible Sun (%)	-0.55	+0.73 *****
Dust Coefficient	+0.03	-0.03
Ground Reflectivity (%)	-0.04	+0.03
Segment Azimuth (degrees)	-0.05	+0.05
West Side:		
Topographic Altitude (degrees)	+0.08	-0.07 *
Vegetation Height (ft)	+0.09	-0.10 *
Vegetation Crown (ft)	+0.08	-0.08 *
Vegetation Offset (ft)	-0.05	+0.05

Vegetation Density (%)	+0.26	-0.26 **
East Side:		
Topographic Altitude (degrees)	+0.07	-0.06 *
Vegetation Height (ft)	+0.04	-0.04
Vegetation Crown (ft)	+0.02	-0.02
Vegetation Offset (ft)	-0.02	+0.02
Vegetation Density (%)	+0.14	-0.14 *

Scenario 3. Same as Scenario 2 but increase vegetation density

```

"SSTEMP (2.0.8) "
"English", "Segment Inflow (cfs)", "4.000"
"English", "Inflow Temperature (°F)", "61.000"
"English", "Segment Outflow (cfs)", "18.000"
"English", "Accretion Temp. (°F)", "55.000"
"English", "Latitude (degrees)", "46.700"
"English", "Segment Length (mi)", "5.920"
"English", "Upstream Elevation (ft)", "3705.00"
"English", "Downstream Elevation (ft)", "3650.00"
"English", "Width's A Term (s/ft²)", "14.800"
"English", " B Term where W = A*Q**B", "0.190"
"English", "Manning's n", "0.030"
"English", "Air Temperature (°F)", "78.730"
"English", "Relative Humidity (%)", "32.500"
"English", "Wind Speed (mph)", "7.100"
"English", "Ground Temperature (°F)", "55.000"
"English", "Thermal gradient (j/m²/s/C)", "1.650"
"English", "Possible Sun (%)", "90.000"
"English", "Dust Coefficient", "5.000"
"English", "Ground Reflectivity (%)", "25.000"
"English", "Solar Radiation (Langleys/d)", "630.297"
"English", "Total Shade (%)", "52.106"
"English", "Segment Azimuth (degrees)", "15.000"
"West Side Variables"
"English", "Topographic Altitude (degrees)", "25.000"
"English", "Vegetation Height (ft)", "25.000"
"English", "Vegetation Crown (ft)", "15.000"
"English", "Vegetation Offset (ft)", "5.000"
"English", "Vegetation Density (%)", "75.000"
"East Side Variables"
"English", "Segment Azimuth (degrees)", "15.000"
"English", "Topographic Altitude (degrees)", "35.000"
"English", "Vegetation Height (ft)", "10.000"
"English", "Vegetation Crown (ft)", "5.000"
"English", "Vegetation Offset (ft)", "60.000"
"English", " Maximum Air Temp (°F)", "83.722"
"Dam at Head of Segment", "Unchecked"
" Maximum Air Temp (°F)", "Unchecked"
"Solar Radiation", "Disabled"
"Total Shade", "Disabled"
"Month/day", "08/07"
    "Predicted Mean (°F) = 62.52"
    "Estimated Maximum (°F) = 68.58"
    "Approximate Minimum (°F) = 56.45"
    "Mean Equilibrium (°F) = 68.13"
    "Maximum Equilibrium (°F) = 74.86"
    "Minimum Equilibrium (°F) = 61.39"
    
```

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 62.52°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.10	+0.10 *
Inflow Temperature (°F)	-0.17	+0.19 **
Segment Outflow (cfs)	+0.31	-0.35 ***
Accretion Temp. (°F)	-2.26	+2.26 *****
Width's A Term (s/ft ²)	-0.42	+0.47 *****
B Term where $W = A*Q**B$	-0.20	+0.20 **
Manning's n	+0.00	+0.00
Air Temperature (°F)	-3.43	+3.05 *****
Relative Humidity (%)	-0.51	+0.52 *****
Wind Speed (mph)	+0.08	-0.08 *
Ground Temperature (°F)	-0.17	+0.17 *
Thermal gradient (j/m ² /s/C)	+0.02	-0.02
Possible Sun (%)	-0.15	+0.21 **
Dust Coefficient	+0.01	-0.01
Ground Reflectivity (%)	-0.01	+0.01
Segment Azimuth (degrees)	-0.01	+0.01
West Side:		
Topographic Altitude (degrees)	+0.03	-0.02
Vegetation Height (ft)	+0.05	-0.06 *
Vegetation Crown (ft)	+0.05	-0.05
Vegetation Offset (ft)	-0.03	+0.03
Vegetation Density (%)	+0.15	-0.15 *
East Side:		
Topographic Altitude (degrees)	+0.02	-0.01
Vegetation Height (ft)	+0.05	-0.05
Vegetation Crown (ft)	+0.02	-0.02
Vegetation Offset (ft)	-0.02	+0.02
Vegetation Density (%)	+0.19	-0.19 **

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 68.58°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.09	+0.09 *
Inflow Temperature (°F)	-0.14	+0.16 *
Segment Outflow (cfs)	+0.39	-0.43 *****
Accretion Temp. (°F)	-1.87	+1.87 *****
Width's A Term (s/ft ²)	-0.69	+0.77 *****
B Term where $W = A*Q**B$	-0.33	+0.33 ***
Manning's n	+0.18	-0.20 **
Air Temperature (°F)	-3.49	+3.15 *****
Relative Humidity (%)	-0.48	+0.48 *****
Wind Speed (mph)	+0.17	-0.18 **
Ground Temperature (°F)	-0.18	+0.18 **
Thermal gradient (j/m ² /s/C)	+0.05	-0.05
Possible Sun (%)	-0.42	+0.54 *****
Dust Coefficient	+0.02	-0.02
Ground Reflectivity (%)	-0.02	+0.02
Segment Azimuth (degrees)	-0.02	+0.02
West Side:		
Topographic Altitude (degrees)	+0.06	-0.05
Vegetation Height (ft)	+0.12	-0.13 *
Vegetation Crown (ft)	+0.10	-0.10 *
Vegetation Offset (ft)	-0.07	+0.07 *

Vegetation Density (%) +0.33 -0.33 ***
East Side:
Topographic Altitude (degrees) +0.04 -0.03
Vegetation Height (ft) +0.12 -0.12 *
Vegetation Crown (ft) +0.05 -0.05
Vegetation Offset (ft) -0.05 +0.05
Vegetation Density (%) +0.42 -0.42 *****

Scenario 4. Modeling using output from MT41I006 030 – Scenario 5*

```

"SSTEMP (2.0.8) "
"English", "Segment Inflow (cfs)", "34.000"
"English", "Inflow Temperature (°F)", "67.910"
"English", "Segment Outflow (cfs)", "48.000"
"English", "Accretion Temp. (°F)", "55.000"
"English", "Latitude (degrees)", "46.700"
"English", "Segment Length (mi)", "5.920"
"English", "Upstream Elevation (ft)", "3705.00"
"English", "Downstream Elevation (ft)", "3650.00"
"English", "Width's A Term (s/ft²)", "14.800"
"English", " B Term where W = A*Q**B", "0.190"
"English", "Manning's n", "0.030"
"English", "Air Temperature (°F)", "78.730"
"English", "Relative Humidity (%)", "32.500"
"English", "Wind Speed (mph)", "7.100"
"English", "Ground Temperature (°F)", "55.000"
"English", "Thermal gradient (j/m²/s/C)", "1.650"
"English", "Possible Sun (%)", "90.000"
"English", "Dust Coefficient", "5.000"
"English", "Ground Reflectivity (%)", "25.000"
"English", "Solar Radiation (Langleys/d)", "630.297"
"English", "Total Shade (%)", "29.369"
"English", "Segment Azimuth (degrees)", "15.000"
"West Side Variables"
"English", "Topographic Altitude (degrees)", "25.000"
"English", "Vegetation Height (ft)", "25.000"
"English", "Vegetation Crown (ft)", "15.000"
"English", "Vegetation Offset (ft)", "5.000"
"English", "Vegetation Density (%)", "60.000"
"East Side Variables"
"English", "Segment Azimuth (degrees)", "15.000"
"English", "Topographic Altitude (degrees)", "35.000"
"English", "Vegetation Height (ft)", "10.000"
"English", "Vegetation Crown (ft)", "5.000"
"English", "Vegetation Offset (ft)", "20.000"
"English", " Maximum Air Temp (°F)", "83.722"
"Dam at Head of Segment", "Unchecked"
" Maximum Air Temp (°F)", "Unchecked"
"Solar Radiation", "Disabled"
"Total Shade", "Disabled"
"Month/day", "08/07"
    "Predicted Mean (°F) = 66.30"
    "Estimated Maximum (°F) = 72.34"
    "Approximate Minimum (°F) = 60.27"
    "Mean Equilibrium (°F) = 70.96"
    "Maximum Equilibrium (°F) = 79.31"
    "Minimum Equilibrium (°F) = 62.62"
    
```

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 66.30°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.71	+0.70	*****
Inflow Temperature (°F)	-2.34	+2.57	*****
Segment Outflow (cfs)	+0.77	-0.90	*****
Accretion Temp. (°F)	-1.22	+1.24	*****
Width's A Term (s/ft ²)	-0.22	+0.23	***
B Term where $W = A*Q**B$	-0.16	+0.15	**
Manning's n	+0.00	+0.00	
Air Temperature (°F)	-2.38	+2.05	*****
Relative Humidity (%)	-0.36	+0.36	****
Wind Speed (mph)	+0.13	-0.13	**
Ground Temperature (°F)	-0.12	+0.12	*
Thermal gradient (j/m ² /s/C)	+0.03	-0.03	
Possible Sun (%)	-0.15	+0.22	***
Dust Coefficient	+0.01	-0.01	
Ground Reflectivity (%)	-0.01	+0.01	
Segment Azimuth (degrees)	-0.01	+0.01	
West Side:			
Topographic Altitude (degrees)	+0.02	-0.02	
Vegetation Height (ft)	+0.03	-0.04	
Vegetation Crown (ft)	+0.02	-0.02	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.07	-0.07	*
East Side:			
Topographic Altitude (degrees)	+0.02	-0.02	
Vegetation Height (ft)	+0.02	-0.02	
Vegetation Crown (ft)	+0.01	-0.01	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.04	-0.04	

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 72.34°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.62	+0.62	*****
Inflow Temperature (°F)	-1.97	+2.16	*****
Segment Outflow (cfs)	+0.84	-0.96	*****
Accretion Temp. (°F)	-1.03	+1.04	*****
Width's A Term (s/ft ²)	-0.49	+0.52	*****
B Term where $W = A*Q**B$	-0.36	+0.35	****
Manning's n	+0.21	-0.24	***
Air Temperature (°F)	-2.55	+2.26	*****
Relative Humidity (%)	-0.35	+0.35	****
Wind Speed (mph)	+0.21	-0.22	***
Ground Temperature (°F)	-0.13	+0.13	*
Thermal gradient (j/m ² /s/C)	+0.04	-0.04	*
Possible Sun (%)	-0.43	+0.57	*****
Dust Coefficient	+0.03	-0.03	
Ground Reflectivity (%)	-0.03	+0.03	
Segment Azimuth (degrees)	-0.03	+0.03	
West Side:			
Topographic Altitude (degrees)	+0.06	-0.06	*
Vegetation Height (ft)	+0.08	-0.09	*
Vegetation Crown (ft)	+0.05	-0.05	*
Vegetation Offset (ft)	-0.03	+0.03	

Vegetation Density (%)	+0.17	-0.17 **
East Side:		
Topographic Altitude (degrees)	+0.05	-0.04 *
Vegetation Height (ft)	+0.04	-0.04
Vegetation Crown (ft)	+0.01	-0.01
Vegetation Offset (ft)	-0.01	+0.01
Vegetation Density (%)	+0.09	-0.09 *

Scenario 5. Modeling using output from MT41I006 030 – Scenario 5 and increase vegetation density in segment MT41I006 020*

```

"SSTEMP (2.0.8) "
"English", "Segment Inflow (cfs)", "34.000"
"English", "Inflow Temperature (°F)", "67.910"
"English", "Segment Outflow (cfs)", "48.000"
"English", "Accretion Temp. (°F)", "55.000"
"English", "Latitude (degrees)", "46.700"
"English", "Segment Length (mi)", "5.920"
"English", "Upstream Elevation (ft)", "3705.00"
"English", "Downstream Elevation (ft)", "3650.00"
"English", "Width's A Term (s/ft²)", "14.800"
"English", " B Term where W = A*Q**B", "0.190"
"English", "Manning's n", "0.030"
"English", "Air Temperature (°F)", "78.730"
"English", "Relative Humidity (%)", "32.500"
"English", "Wind Speed (mph)", "7.100"
"English", "Ground Temperature (°F)", "55.000"
"English", "Thermal gradient (j/m²/s/C)", "1.650"
"English", "Possible Sun (%)", "90.000"
"English", "Dust Coefficient", "5.000"
"English", "Ground Reflectivity (%)", "25.000"
"English", "Solar Radiation (Langleys/d)", "630.297"
"English", "Total Shade (%)", "47.689"
"English", "Segment Azimuth (degrees)", "15.000"
"West Side Variables"
"English", "Topographic Altitude (degrees)", "25.000"
"English", "Vegetation Height (ft)", "25.000"
"English", "Vegetation Crown (ft)", "15.000"
"English", "Vegetation Offset (ft)", "5.000"
"English", "Vegetation Density (%)", "75.000"
"East Side Variables"
"English", "Segment Azimuth (degrees)", "15.000"
"English", "Topographic Altitude (degrees)", "35.000"
"English", "Vegetation Height (ft)", "10.000"
"English", "Vegetation Crown (ft)", "5.000"
"English", "Vegetation Offset (ft)", "60.000"
"English", " Maximum Air Temp (°F)", "83.722"
"Dam at Head of Segment", "Unchecked"
" Maximum Air Temp (°F)", "Unchecked"
"Solar Radiation", "Disabled"
"Total Shade", "Disabled"
"Month/day", "08/07"
    "Predicted Mean (°F) = 65.33"
    "Estimated Maximum (°F) = 70.04"
    "Approximate Minimum (°F) = 60.63"
    "Mean Equilibrium (°F) = 68.76"
    "Maximum Equilibrium (°F) = 75.82"
    "Minimum Equilibrium (°F) = 61.70"
    
```

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 65.33°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.71	+0.71	*****
Inflow Temperature (°F)	-2.36	+2.59	*****
Segment Outflow (cfs)	+0.72	-0.84	*****
Accretion Temp. (°F)	-1.25	+1.27	*****
Width's A Term (s/ft ²)	-0.20	+0.20	**
B Term where $W = A*Q**B$	-0.15	+0.14	**
Manning's n	+0.00	+0.00	
Air Temperature (°F)	-2.35	+2.03	*****
Relative Humidity (%)	-0.35	+0.38	****
Wind Speed (mph)	+0.11	-0.12	*
Ground Temperature (°F)	-0.12	+0.11	*
Thermal gradient (j/m ² /s/C)	+0.02	-0.02	
Possible Sun (%)	-0.11	+0.16	**
Dust Coefficient	+0.01	-0.01	
Ground Reflectivity (%)	-0.01	+0.01	
Segment Azimuth (degrees)	-0.01	+0.01	
West Side:			
Topographic Altitude (degrees)	+0.01	-0.02	
Vegetation Height (ft)	+0.04	-0.05	*
Vegetation Crown (ft)	+0.03	-0.03	
Vegetation Offset (ft)	-0.02	+0.02	
Vegetation Density (%)	+0.09	-0.09	*
East Side:			
Topographic Altitude (degrees)	+0.01	-0.01	
Vegetation Height (ft)	+0.04	-0.04	*
Vegetation Crown (ft)	+0.02	-0.02	
Vegetation Offset (ft)	-0.02	+0.02	
Vegetation Density (%)	+0.12	-0.12	*

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 70.04°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
Segment Inflow (cfs)	-0.65	+0.65	*****
Inflow Temperature (°F)	-2.07	+2.27	*****
Segment Outflow (cfs)	+0.77	-0.89	*****
Accretion Temp. (°F)	-1.10	+1.11	*****
Width's A Term (s/ft ²)	-0.49	+0.51	*****
B Term where $W = A*Q**B$	-0.36	+0.34	****
Manning's n	+0.17	-0.19	**
Air Temperature (°F)	-2.53	+2.23	*****
Relative Humidity (%)	-0.34	+0.38	****
Wind Speed (mph)	+0.16	-0.17	**
Ground Temperature (°F)	-0.13	+0.13	*
Thermal gradient (j/m ² /s/C)	+0.04	-0.04	
Possible Sun (%)	-0.33	+0.43	*****
Dust Coefficient	+0.02	-0.02	
Ground Reflectivity (%)	-0.02	+0.02	
Segment Azimuth (degrees)	-0.02	+0.01	
West Side:			
Topographic Altitude (degrees)	+0.03	-0.04	
Vegetation Height (ft)	+0.09	-0.11	*
Vegetation Crown (ft)	+0.06	-0.07	*

Vegetation Offset (ft)	-0.04	+0.04 *
Vegetation Density (%)	+0.21	-0.21 **
East Side:		
Topographic Altitude (degrees)	+0.03	-0.02
Vegetation Height (ft)	+0.11	-0.11 *
Vegetation Crown (ft)	+0.04	-0.04
Vegetation Offset (ft)	-0.04	+0.04
Vegetation Density (%)	+0.28	-0.28 ***

Scenario 6. Modeling using output from MT41I006 030 – Scenario 7*

```

"SSTEMP (2.0.8) "
"English", "Segment Inflow (cfs)", "34.000"
"English", "Inflow Temperature (°F)", "64.980"
"English", "Segment Outflow (cfs)", "48.000"
"English", "Accretion Temp. (°F)", "55.000"
"English", "Latitude (degrees)", "46.700"
"English", "Segment Length (mi)", "5.920"
"English", "Upstream Elevation (ft)", "3705.00"
"English", "Downstream Elevation (ft)", "3650.00"
"English", "Width's A Term (s/ft²)", "14.800"
"English", " B Term where W = A*Q**B", "0.190"
"English", "Manning's n", "0.030"
"English", "Air Temperature (°F)", "78.730"
"English", "Relative Humidity (%)", "32.500"
"English", "Wind Speed (mph)", "7.100"
"English", "Ground Temperature (°F)", "55.000"
"English", "Thermal gradient (j/m²/s/C)", "1.650"
"English", "Possible Sun (%)", "90.000"
"English", "Dust Coefficient", "5.000"
"English", "Ground Reflectivity (%)", "25.000"
"English", "Solar Radiation (Langleys/d)", "630.297"
"English", "Total Shade (%)", "29.369"
"English", "Segment Azimuth (degrees)", "15.000"
"West Side Variables"
"English", "Topographic Altitude (degrees)", "25.000"
"English", "Vegetation Height (ft)", "25.000"
"English", "Vegetation Crown (ft)", "15.000"
"English", "Vegetation Offset (ft)", "5.000"
"English", "Vegetation Density (%)", "60.000"
"East Side Variables"
"English", "Segment Azimuth (degrees)", "15.000"
"English", "Topographic Altitude (degrees)", "35.000"
"English", "Vegetation Height (ft)", "10.000"
"English", "Vegetation Crown (ft)", "5.000"
"English", "Vegetation Offset (ft)", "20.000"
"English", " Maximum Air Temp (°F)", "83.722"
"Dam at Head of Segment", "Unchecked"
" Maximum Air Temp (°F)", "Unchecked"
"Solar Radiation", "Disabled"
"Total Shade", "Disabled"
"Month/day", "08/07"
    "Predicted Mean (°F) = 65.22"
    "Estimated Maximum (°F) = 71.43"
    "Approximate Minimum (°F) = 59.02"
    "Mean Equilibrium (°F) = 70.96"
    "Maximum Equilibrium (°F) = 79.31"
    "Minimum Equilibrium (°F) = 62.62"
    
```

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 65.22°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.56	+0.56	*****
Inflow Temperature (°F)	-2.34	+2.54	*****
Segment Outflow (cfs)	+0.68	-0.80	*****
Accretion Temp. (°F)	-1.19	+1.21	*****
Width's A Term (s/ft ²)	-0.29	+0.29	***
B Term where $W = A*Q**B$	-0.21	+0.20	**
Manning's n	+0.00	+0.00	
Air Temperature (°F)	-2.40	+2.07	*****
Relative Humidity (%)	-0.36	+0.36	****
Wind Speed (mph)	+0.10	-0.10	*
Ground Temperature (°F)	-0.12	+0.12	*
Thermal gradient (j/m ² /s/C)	+0.02	-0.02	
Possible Sun (%)	-0.16	+0.22	***
Dust Coefficient	+0.01	-0.01	
Ground Reflectivity (%)	-0.01	+0.01	
Segment Azimuth (degrees)	-0.01	+0.01	
West Side:			
Topographic Altitude (degrees)	+0.02	-0.02	
Vegetation Height (ft)	+0.03	-0.04	
Vegetation Crown (ft)	+0.02	-0.02	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.07	-0.07	*
East Side:			
Topographic Altitude (degrees)	+0.02	-0.02	
Vegetation Height (ft)	+0.02	-0.02	
Vegetation Crown (ft)	+0.01	-0.01	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.04	-0.04	

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 71.43°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.50	+0.50	*****
Inflow Temperature (°F)	-1.97	+2.14	*****
Segment Outflow (cfs)	+0.77	-0.88	*****
Accretion Temp. (°F)	-1.01	+1.02	*****
Width's A Term (s/ft ²)	-0.55	+0.59	*****
B Term where $W = A*Q**B$	-0.41	+0.39	*****
Manning's n	+0.22	-0.25	***
Air Temperature (°F)	-2.58	+2.28	*****
Relative Humidity (%)	-0.35	+0.36	****
Wind Speed (mph)	+0.19	-0.20	**
Ground Temperature (°F)	-0.13	+0.13	*
Thermal gradient (j/m ² /s/C)	+0.04	-0.04	
Possible Sun (%)	-0.44	+0.58	*****
Dust Coefficient	+0.03	-0.03	
Ground Reflectivity (%)	-0.03	+0.03	
Segment Azimuth (degrees)	-0.03	+0.03	
West Side:			
Topographic Altitude (degrees)	+0.06	-0.06	*
Vegetation Height (ft)	+0.08	-0.09	*
Vegetation Crown (ft)	+0.05	-0.06	*
Vegetation Offset (ft)	-0.04	+0.04	

Vegetation Density (%)	+0.17	-0.17 **
East Side:		
Topographic Altitude (degrees)	+0.05	-0.05 *
Vegetation Height (ft)	+0.04	-0.04
Vegetation Crown (ft)	+0.01	-0.01
Vegetation Offset (ft)	-0.01	+0.01
Vegetation Density (%)	+0.10	-0.10 *

Scenario 7. Modeling using output from MT41I006 030 – Scenario 7 and increase vegetation density in segment MT41I006 020*

```

"SSTEMP (2.0.8) "
"English", "Segment Inflow (cfs)", "34.000"
"English", "Inflow Temperature (°F)", "64.980"
"English", "Segment Outflow (cfs)", "48.000"
"English", "Accretion Temp. (°F)", "55.000"
"English", "Latitude (degrees)", "46.700"
"English", "Segment Length (mi)", "5.920"
"English", "Upstream Elevation (ft)", "3705.00"
"English", "Downstream Elevation (ft)", "3650.00"
"English", "Width's A Term (s/ft²)", "14.800"
"English", " B Term where W = A*Q**B", "0.190"
"English", "Manning's n", "0.030"
"English", "Air Temperature (°F)", "78.730"
"English", "Relative Humidity (%)", "32.500"
"English", "Wind Speed (mph)", "7.100"
"English", "Ground Temperature (°F)", "55.000"
"English", "Thermal gradient (j/m²/s/C)", "1.650"
"English", "Possible Sun (%)", "90.000"
"English", "Dust Coefficient", "5.000"
"English", "Ground Reflectivity (%)", "25.000"
"English", "Solar Radiation (Langleys/d)", "630.297"
"English", "Total Shade (%)", "47.689"
"English", "Segment Azimuth (degrees)", "15.000"
"West Side Variables"
"English", "Topographic Altitude (degrees)", "25.000"
"English", "Vegetation Height (ft)", "25.000"
"English", "Vegetation Crown (ft)", "15.000"
"English", "Vegetation Offset (ft)", "5.000"
"English", "Vegetation Density (%)", "75.000"
"East Side Variables"
"English", "Segment Azimuth (degrees)", "15.000"
"English", "Topographic Altitude (degrees)", "35.000"
"English", "Vegetation Height (ft)", "10.000"
"English", "Vegetation Crown (ft)", "5.000"
"English", "Vegetation Offset (ft)", "60.000"
"English", " Maximum Air Temp (°F)", "83.722"
"Dam at Head of Segment", "Unchecked"
" Maximum Air Temp (°F)", "Unchecked"
"Solar Radiation", "Disabled"
"Total Shade", "Disabled"
"Month/day", "08/07"
    "Predicted Mean (°F) = 64.24"
    "Estimated Maximum (°F) = 69.08"
    "Approximate Minimum (°F) = 59.41"
    "Mean Equilibrium (°F) = 68.76"
    "Maximum Equilibrium (°F) = 75.82"
    "Minimum Equilibrium (°F) = 61.70"
    
```

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 64.24°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.56	+0.56	*****
Inflow Temperature (°F)	-2.36	+2.56	*****
Segment Outflow (cfs)	+0.63	-0.74	*****
Accretion Temp. (°F)	-1.22	+1.24	*****
Width's A Term (s/ft ²)	-0.26	+0.27	***
B Term where $W = A*Q**B$	-0.19	+0.18	**
Manning's n	+0.00	+0.00	
Air Temperature (°F)	-2.38	+2.05	*****
Relative Humidity (%)	-0.35	+0.35	****
Wind Speed (mph)	+0.09	-0.09	*
Ground Temperature (°F)	-0.12	+0.12	*
Thermal gradient (j/m ² /s/C)	+0.02	-0.02	
Possible Sun (%)	-0.11	+0.16	**
Dust Coefficient	+0.01	-0.01	
Ground Reflectivity (%)	-0.01	+0.01	
Segment Azimuth (degrees)	-0.01	+0.01	
West Side:			
Topographic Altitude (degrees)	+0.01	-0.02	
Vegetation Height (ft)	+0.04	-0.05	*
Vegetation Crown (ft)	+0.03	-0.03	
Vegetation Offset (ft)	-0.02	+0.02	
Vegetation Density (%)	+0.09	-0.09	*
East Side:			
Topographic Altitude (degrees)	+0.01	-0.01	
Vegetation Height (ft)	+0.05	-0.05	*
Vegetation Crown (ft)	+0.02	-0.02	
Vegetation Offset (ft)	-0.02	+0.02	
Vegetation Density (%)	+0.12	-0.12	*

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 69.08°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.52	+0.52	*****
Inflow Temperature (°F)	-2.07	+2.25	*****
Segment Outflow (cfs)	+0.70	-0.80	*****
Accretion Temp. (°F)	-1.07	+1.09	*****
Width's A Term (s/ft ²)	-0.55	+0.58	*****
B Term where $W = A*Q**B$	-0.41	+0.39	*****
Manning's n	+0.18	-0.20	**
Air Temperature (°F)	-2.56	+2.25	*****
Relative Humidity (%)	-0.35	+0.35	****
Wind Speed (mph)	+0.14	-0.15	**
Ground Temperature (°F)	-0.13	+0.13	*
Thermal gradient (j/m ² /s/C)	+0.04	-0.04	
Possible Sun (%)	-0.34	+0.44	*****
Dust Coefficient	+0.02	-0.02	
Ground Reflectivity (%)	-0.02	+0.02	
Segment Azimuth (degrees)	-0.02	+0.01	
West Side:			
Topographic Altitude (degrees)	+0.03	-0.04	
Vegetation Height (ft)	+0.09	-0.12	*
Vegetation Crown (ft)	+0.07	-0.07	*

Vegetation Offset (ft)	-0.04	+0.04 *
Vegetation Density (%)	+0.21	-0.21 **
East Side:		
Topographic Altitude (degrees)	+0.03	-0.02
Vegetation Height (ft)	+0.11	-0.11 *
Vegetation Crown (ft)	+0.04	-0.04
Vegetation Offset (ft)	-0.04	+0.04
Vegetation Density (%)	+0.29	-0.29 ***

Scenario 8. Modeling using output from MT41I006 030 – Scenario 8*

```

"SSTEMP (2.0.8) "
"English", "Segment Inflow (cfs)", "34.000"
"English", "Inflow Temperature (°F)", "64.100"
"English", "Segment Outflow (cfs)", "48.000"
"English", "Accretion Temp. (°F)", "55.000"
"English", "Latitude (degrees)", "46.700"
"English", "Segment Length (mi)", "5.920"
"English", "Upstream Elevation (ft)", "3705.00"
"English", "Downstream Elevation (ft)", "3650.00"
"English", "Width's A Term (s/ft²)", "14.800"
"English", " B Term where W = A*Q**B", "0.190"
"English", "Manning's n", "0.030"
"English", "Air Temperature (°F)", "78.730"
"English", "Relative Humidity (%)", "32.500"
"English", "Wind Speed (mph)", "7.100"
"English", "Ground Temperature (°F)", "55.000"
"English", "Thermal gradient (j/m²/s/C)", "1.650"
"English", "Possible Sun (%)", "90.000"
"English", "Dust Coefficient", "5.000"
"English", "Ground Reflectivity (%)", "25.000"
"English", "Solar Radiation (Langleys/d)", "630.297"
"English", "Total Shade (%)", "29.369"
"English", "Segment Azimuth (degrees)", "15.000"
"West Side Variables"
"English", "Topographic Altitude (degrees)", "25.000"
"English", "Vegetation Height (ft)", "25.000"
"English", "Vegetation Crown (ft)", "15.000"
"English", "Vegetation Offset (ft)", "5.000"
"English", "Vegetation Density (%)", "60.000"
"East Side Variables"
"English", "Segment Azimuth (degrees)", "15.000"
"English", "Topographic Altitude (degrees)", "35.000"
"English", "Vegetation Height (ft)", "10.000"
"English", "Vegetation Crown (ft)", "5.000"
"English", "Vegetation Offset (ft)", "20.000"
"English", " Maximum Air Temp (°F)", "83.722"
"Dam at Head of Segment", "Unchecked"
" Maximum Air Temp (°F)", "Unchecked"
"Solar Radiation", "Disabled"
"Total Shade", "Disabled"
"Month/day", "08/07"
    "Predicted Mean (°F) = 64.89"
    "Estimated Maximum (°F) = 71.15"
    "Approximate Minimum (°F) = 58.63"
    "Mean Equilibrium (°F) = 70.96"
    "Maximum Equilibrium (°F) = 79.31"
    "Minimum Equilibrium (°F) = 62.62"
    
```

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 64.89°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.51	+0.51	*****
Inflow Temperature (°F)	-2.34	+2.53	*****
Segment Outflow (cfs)	+0.66	-0.77	*****
Accretion Temp. (°F)	-1.19	+1.20	*****
Width's A Term (s/ft ²)	-0.31	+0.31	****
B Term where $W = A*Q**B$	-0.22	+0.21	***
Manning's n	+0.00	+0.00	
Air Temperature (°F)	-2.41	+2.08	*****
Relative Humidity (%)	-0.36	+0.36	****
Wind Speed (mph)	+0.09	-0.10	*
Ground Temperature (°F)	-0.12	+0.12	*
Thermal gradient (j/m ² /s/C)	+0.02	-0.02	
Possible Sun (%)	-0.16	+0.22	***
Dust Coefficient	+0.01	-0.01	
Ground Reflectivity (%)	-0.01	+0.01	
Segment Azimuth (degrees)	-0.01	+0.01	
West Side:			
Topographic Altitude (degrees)	+0.02	-0.02	
Vegetation Height (ft)	+0.03	-0.04	
Vegetation Crown (ft)	+0.02	-0.02	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.07	-0.07	*
East Side:			
Topographic Altitude (degrees)	+0.02	-0.02	
Vegetation Height (ft)	+0.02	-0.02	
Vegetation Crown (ft)	+0.01	-0.01	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.04	-0.04	

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 71.15°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.46	+0.46	*****
Inflow Temperature (°F)	-1.97	+2.13	*****
Segment Outflow (cfs)	+0.75	-0.85	*****
Accretion Temp. (°F)	-1.00	+1.02	*****
Width's A Term (s/ft ²)	-0.57	+0.61	*****
B Term where $W = A*Q**B$	-0.42	+0.41	*****
Manning's n	+0.22	-0.25	***
Air Temperature (°F)	-2.59	+2.29	*****
Relative Humidity (%)	-0.35	+0.36	****
Wind Speed (mph)	+0.18	-0.19	**
Ground Temperature (°F)	-0.13	+0.13	*
Thermal gradient (j/m ² /s/C)	+0.04	-0.04	
Possible Sun (%)	-0.44	+0.58	*****
Dust Coefficient	+0.03	-0.03	
Ground Reflectivity (%)	-0.03	+0.03	
Segment Azimuth (degrees)	-0.03	+0.03	
West Side:			
Topographic Altitude (degrees)	+0.06	-0.06	*
Vegetation Height (ft)	+0.08	-0.10	*
Vegetation Crown (ft)	+0.05	-0.06	*
Vegetation Offset (ft)	-0.04	+0.04	

Vegetation Density (%)	+0.17	-0.17 **
East Side:		
Topographic Altitude (degrees)	+0.05	-0.05 *
Vegetation Height (ft)	+0.04	-0.04
Vegetation Crown (ft)	+0.01	-0.01
Vegetation Offset (ft)	-0.01	+0.01
Vegetation Density (%)	+0.10	-0.10 *

Scenario 9. Modeling using output from MT41I006 030 – Scenario 8 and increase vegetation density in segment MT41I006 020*

"SSTEMP (2.0.8) "

"English", "Segment Inflow (cfs)", "34.000"

"English", "Inflow Temperature (°F)", "64.100"

"English", "Segment Outflow (cfs)", "48.000"

"English", "Accretion Temp. (°F)", "55.000"

"English", "Latitude (degrees)", "46.700"

"English", "Segment Length (mi)", "5.920"

"English", "Upstream Elevation (ft)", "3705.00"

"English", "Downstream Elevation (ft)", "3650.00"

"English", "Width's A Term (s/ft²)", "14.800"

"English", " B Term where $W = A*Q^{**}B$ ", "0.190"

"English", "Manning's n", "0.030"

"English", "Air Temperature (°F)", "78.730"

"English", "Relative Humidity (%)", "32.500"

"English", "Wind Speed (mph)", "7.100"

"English", "Ground Temperature (°F)", "55.000"

"English", "Thermal gradient (j/m²/s/C)", "1.650"

"English", "Possible Sun (%)", "90.000"

"English", "Dust Coefficient", "5.000"

"English", "Ground Reflectivity (%)", "25.000"

"English", "Solar Radiation (Langleys/d)", "630.297"

"English", "Total Shade (%)", "47.689"

"English", "Segment Azimuth (degrees)", "15.000"

"West Side Variables"

"English", "Topographic Altitude (degrees)", "25.000"

"English", "Vegetation Height (ft)", "25.000"

"English", "Vegetation Crown (ft)", "15.000"

"English", "Vegetation Offset (ft)", "5.000"

"English", "Vegetation Density (%)", "75.000"

"East Side Variables"

"English", "Segment Azimuth (degrees)", "15.000"

"English", "Topographic Altitude (degrees)", "35.000"

"English", "Vegetation Height (ft)", "10.000"

"English", "Vegetation Crown (ft)", "5.000"

"English", "Vegetation Offset (ft)", "60.000"

"English", " Maximum Air Temp (°F)", "83.722"

"Dam at Head of Segment", "Unchecked"

" Maximum Air Temp (°F)", "Unchecked"

"Solar Radiation", "Disabled"

"Total Shade", "Disabled"

"Month/day", "08/07"

"Predicted Mean (°F) = 63.91"

"Estimated Maximum (°F) = 68.79"

"Approximate Minimum (°F) = 59.03"

"Mean Equilibrium (°F) = 68.76"

"Maximum Equilibrium (°F) = 75.82"

"Minimum Equilibrium (°F) = 61.70"

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 63.91°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
----------	-----------	-----------	----------------------

Segment Inflow (cfs)	-0.52	+0.52	*****
Inflow Temperature (°F)	-2.36	+2.55	*****
Segment Outflow (cfs)	+0.60	-0.70	*****
Accretion Temp. (°F)	-1.22	+1.23	*****
Width's A Term (s/ft ²)	-0.28	+0.29	***
B Term where $W = A*Q**B$	-0.21	+0.19	**
Manning's n	+0.00	+0.00	
Air Temperature (°F)	-2.39	+2.06	*****
Relative Humidity (%)	-0.35	+0.35	****
Wind Speed (mph)	+0.08	-0.08	*
Ground Temperature (°F)	-0.12	+0.12	*
Thermal gradient (j/m ² /s/C)	+0.02	-0.02	
Possible Sun (%)	-0.11	+0.16	**
Dust Coefficient	+0.01	-0.01	
Ground Reflectivity (%)	-0.01	+0.01	
Segment Azimuth (degrees)	-0.01	+0.01	
West Side:			
Topographic Altitude (degrees)	+0.01	-0.02	
Vegetation Height (ft)	+0.04	-0.05	*
Vegetation Crown (ft)	+0.03	-0.03	
Vegetation Offset (ft)	-0.02	+0.02	
Vegetation Density (%)	+0.09	-0.09	*
East Side:			
Topographic Altitude (degrees)	+0.01	-0.01	
Vegetation Height (ft)	+0.05	-0.05	*
Vegetation Crown (ft)	+0.02	-0.02	
Vegetation Offset (ft)	-0.02	+0.02	
Vegetation Density (%)	+0.12	-0.12	*

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 68.79°F
 Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
Segment Inflow (cfs)	-0.48	+0.48	*****
Inflow Temperature (°F)	-2.07	+2.24	*****
Segment Outflow (cfs)	+0.67	-0.77	*****
Accretion Temp. (°F)	-1.07	+1.08	*****
Width's A Term (s/ft ²)	-0.57	+0.60	*****
B Term where $W = A*Q**B$	-0.42	+0.41	*****
Manning's n	+0.18	-0.20	**
Air Temperature (°F)	-2.57	+2.26	*****
Relative Humidity (%)	-0.35	+0.35	****
Wind Speed (mph)	+0.13	-0.14	**
Ground Temperature (°F)	-0.13	+0.13	*
Thermal gradient (j/m ² /s/C)	+0.04	-0.04	
Possible Sun (%)	-0.34	+0.44	*****
Dust Coefficient	+0.02	-0.02	
Ground Reflectivity (%)	-0.02	+0.02	
Segment Azimuth (degrees)	-0.02	+0.01	
West Side:			
Topographic Altitude (degrees)	+0.03	-0.04	
Vegetation Height (ft)	+0.09	-0.12	*
Vegetation Crown (ft)	+0.07	-0.07	*

Vegetation Offset (ft)	-0.04	+0.04 *
Vegetation Density (%)	+0.21	-0.21 **
East Side:		
Topographic Altitude (degrees)	+0.03	-0.02
Vegetation Height (ft)	+0.11	-0.11 *
Vegetation Crown (ft)	+0.04	-0.04
Vegetation Offset (ft)	-0.04	+0.04
Vegetation Density (%)	+0.29	-0.29 ***

Scenario 10. Modeling using output from MT41I006_030 – Scenario 8 and increase vegetation density in segment MT41I006_020 but model only to Sierra Road*

"SSTEMP (2.0.8)"
 "NoName"
 "English", "Segment Inflow (cfs)", "34.000"
 "English", "Inflow Temperature (°F)", "64.100"
 "English", "Segment Outflow (cfs)", "37.500"
 "English", "Accretion Temp. (°F)", "55.000"
 "English", "Latitude (degrees)", "46.700"
 "English", "Segment Length (mi)", "2.620"
 "English", "Upstream Elevation (ft)", "3705.00"
 "English", "Downstream Elevation (ft)", "3680.00"
 "English", "Width's A Term (s/ft²)", "14.800"
 "English", " B Term where $W = A*Q**B$ ", "0.190"
 "English", "Manning's n", "0.031"
 "English", "Air Temperature (°F)", "78.730"
 "English", "Relative Humidity (%)", "32.500"
 "English", "Wind Speed (mph)", "7.100"
 "English", "Ground Temperature (°F)", "55.000"
 "English", "Thermal gradient (j/m²/s/C)", "1.650"
 "English", "Possible Sun (%)", "90.000"
 "English", "Dust Coefficient", "5.000"
 "English", "Ground Reflectivity (%)", "25.000"
 "English", "Solar Radiation (Langleys/d)", "630.326"
 "English", "Total Shade (%)", "48.156"
 "English", "Segment Azimuth (degrees)", "15.000"
 "West Side Variables"
 "English", "Topographic Altitude (degrees)", "25.000"
 "English", "Vegetation Height (ft)", "25.000"
 "English", "Vegetation Crown (ft)", "15.000"
 "English", "Vegetation Offset (ft)", "5.000"
 "English", "Vegetation Density (%)", "75.000"
 "East Side Variables"
 "English", "Segment Azimuth (degrees)", "15.000"
 "English", "Topographic Altitude (degrees)", "35.000"
 "English", "Vegetation Height (ft)", "10.000"
 "English", "Vegetation Crown (ft)", "5.000"
 "English", "Vegetation Offset (ft)", "60.000"
 "English", " Maximum Air Temp (°F)", "83.722"
 "Dam at Head of Segment", "Unchecked"
 " Maximum Air Temp (°F)", "Unchecked"
 "Solar Radiation", "Disabled"
 "Total Shade", "Disabled"
 "Month/day", "08/07"
 "Predicted Mean (°F) = 64.49"
 "Estimated Maximum (°F) = 69.64"
 "Approximate Minimum (°F) = 59.35"
 "Mean Equilibrium (°F) = 68.70"
 "Maximum Equilibrium (°F) = 75.73"
 "Minimum Equilibrium (°F) = 61.68"

Sensitivity for mean temperature values (10% variation) SSTEMP (2.0.8)

Original mean temperature = 64.49°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
Segment Inflow (cfs)	-0.70	+0.73	*****
Inflow Temperature (°F)	-4.25	+4.43	*****
Segment Outflow (cfs)	+0.74	-0.79	*****
Accretion Temp. (°F)	-0.43	+0.44	***
Width's A Term (s/ft ²)	-0.16	+0.17	*
B Term where $W = A*Q**B$	-0.12	+0.11	*
Manning's n	+0.00	+0.00	
Air Temperature (°F)	-1.46	+1.26	*****
Relative Humidity (%)	-0.22	+0.22	*
Wind Speed (mph)	+0.05	-0.05	
Ground Temperature (°F)	-0.07	+0.07	
Thermal gradient (j/m ² /s/C)	+0.01	-0.01	
Possible Sun (%)	-0.07	+0.10	*
Dust Coefficient	+0.01	-0.01	
Ground Reflectivity (%)	-0.01	+0.01	
Segment Azimuth (degrees)	0.00	+0.00	
West Side:			
Topographic Altitude (degrees)	+0.01	-0.01	
Vegetation Height (ft)	+0.02	-0.03	
Vegetation Crown (ft)	+0.02	-0.02	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.06	-0.06	
East Side:			
Topographic Altitude (degrees)	+0.01	-0.01	
Vegetation Height (ft)	+0.03	-0.03	
Vegetation Crown (ft)	+0.01	-0.01	
Vegetation Offset (ft)	-0.01	+0.01	
Vegetation Density (%)	+0.07	-0.07	*

Sensitivity for maximum temperature values (10% variation) SSTEMP (2.0.8)

Original maximum temperature = 69.64°F

Temperature change (°F)

if variable is:

Variable	Decreased	Increased	Relative Sensitivity
Segment Inflow (cfs)	-0.64	+0.66	*****
Inflow Temperature (°F)	-3.67	+3.82	*****
Segment Outflow (cfs)	+0.79	-0.84	*****
Accretion Temp. (°F)	-0.37	+0.38	***
Width's A Term (s/ft ²)	-0.48	+0.51	****
B Term where $W = A*Q**B$	-0.34	+0.33	***
Manning's n	+0.17	-0.19	*
Air Temperature (°F)	-1.78	+1.58	*****
Relative Humidity (%)	-0.23	+0.23	**
Wind Speed (mph)	+0.12	-0.13	*
Ground Temperature (°F)	-0.09	+0.09	*
Thermal gradient (j/m ² /s/C)	+0.03	-0.03	
Possible Sun (%)	-0.31	+0.40	***
Dust Coefficient	+0.02	-0.02	
Ground Reflectivity (%)	-0.02	+0.02	
Segment Azimuth (degrees)	-0.01	+0.01	
West Side:			
Topographic Altitude (degrees)	+0.03	-0.03	
Vegetation Height (ft)	+0.09	-0.10	*

Vegetation Crown (ft)	+0.06	-0.06
Vegetation Offset (ft)	-0.04	+0.04
Vegetation Density (%)	+0.19	-0.19 **
East Side:		
Topographic Altitude (degrees)	+0.02	-0.02
Vegetation Height (ft)	+0.10	-0.10 *
Vegetation Crown (ft)	+0.04	-0.04
Vegetation Offset (ft)	-0.04	+0.04
Vegetation Density (%)	+0.26	-0.26 **

*** Mixing water equation used to calculate inflow temperature**