ADDENDUM A: TEMPERATURE PLOTS FOR INDIVIDUAL YEARS COLLECTED AT EACH MONITORING SITE BY THE CENTRAL KLICKITAT CONSERVATION DISTRICT AND THE YAKAMA NATION

Plots of the individual years of data collected by the Central Klickitat Conservation District and the Yakama Nation are provided in this addendum. Each plot depicts the minimum, average, and maximum recorded temperature during the summer and early fall. Data points that look unusual and may reflect equipment failures or periods when the data recorder was out of the water are highlighted with a light gray shape. Problems with instruments or situations where the instrument was out of water cannot be confirmed.

We would like to thank the Central Klickitat Conservation District and the Yakama Nation for their cooperation with this project and the permission to use their data.

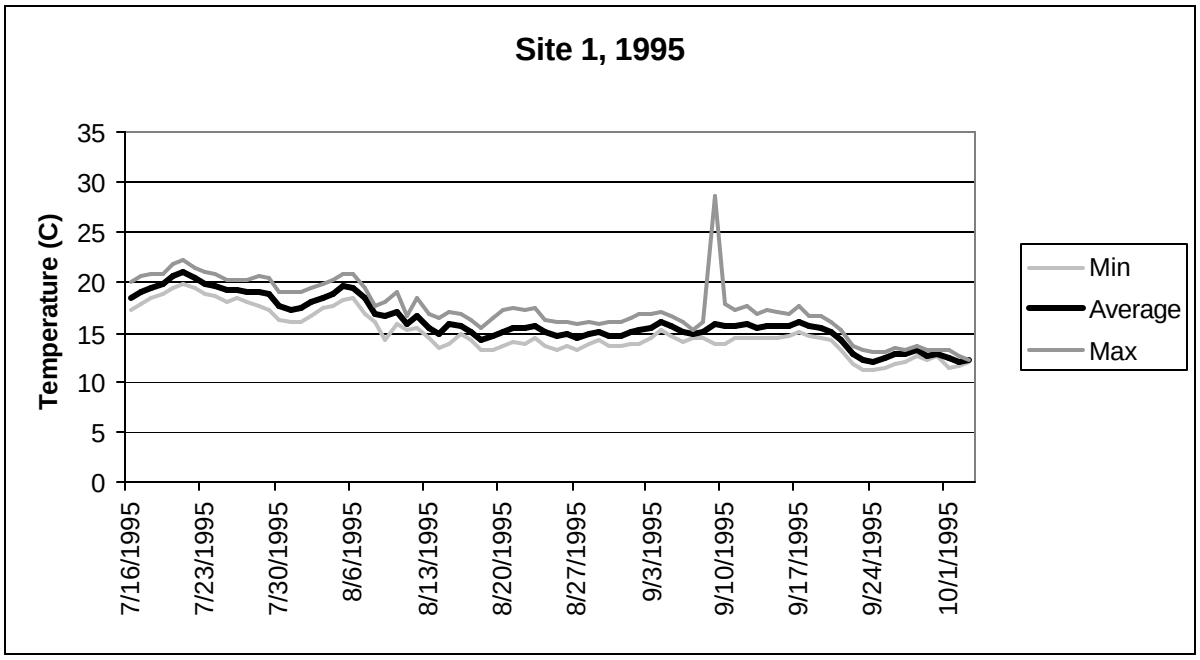

Figure A-1. Temperature recorded at site 1 (Highway 97) in 1995 by the Central Klickitat Conservation District.

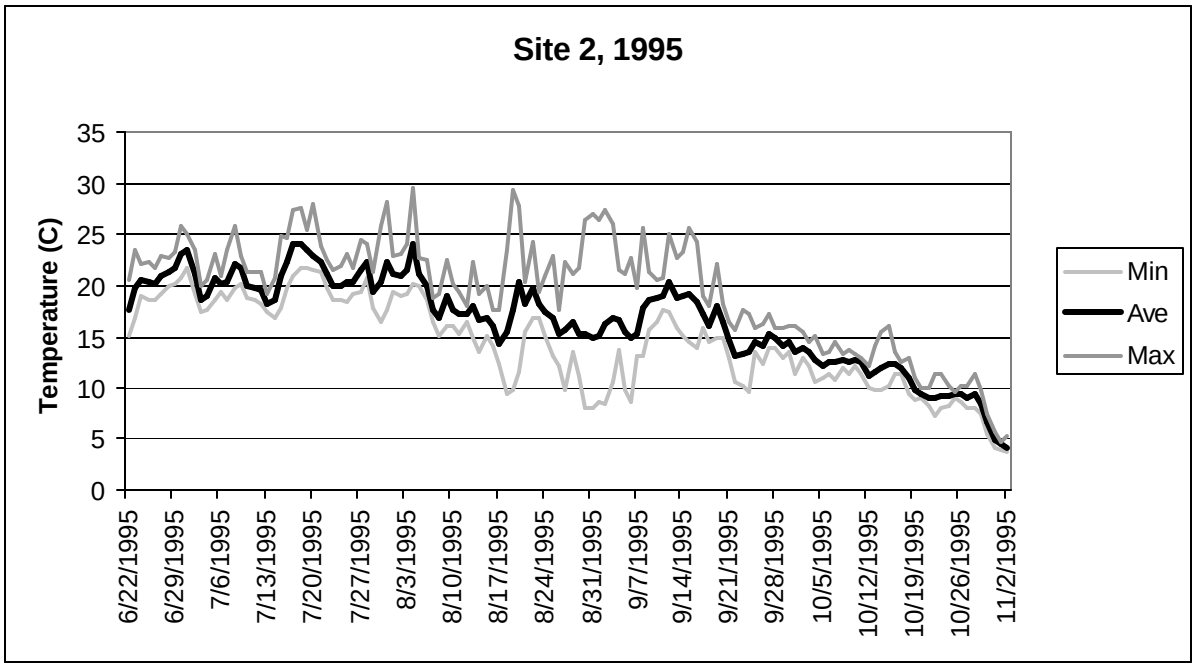

Figure A-2. Temperature recorded at site 2 (Harms Road) in 1995 by the Central Klickitat Conservation District.

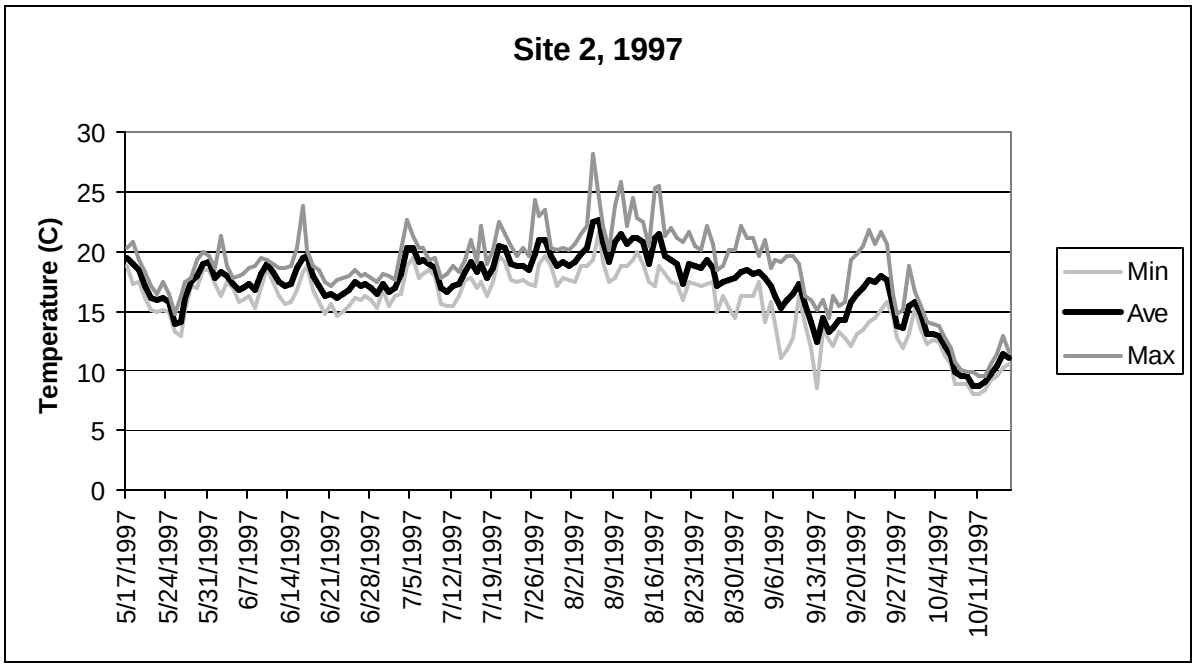

Figure A-3. Temperature recorded at site 2 (Harms Road) in 1997 by the Central Klickitat Conservation District.

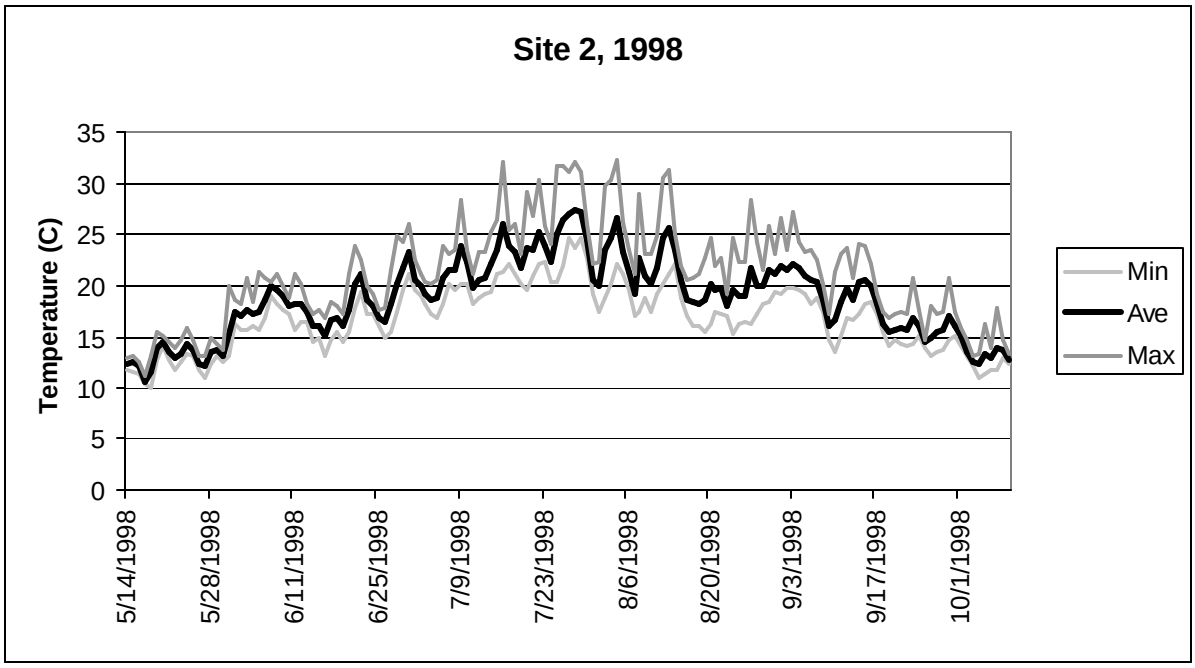

Figure A-4. Temperature recorded at site 2 (Harms Road) in 1998 by the Central Klickitat Conservation District.

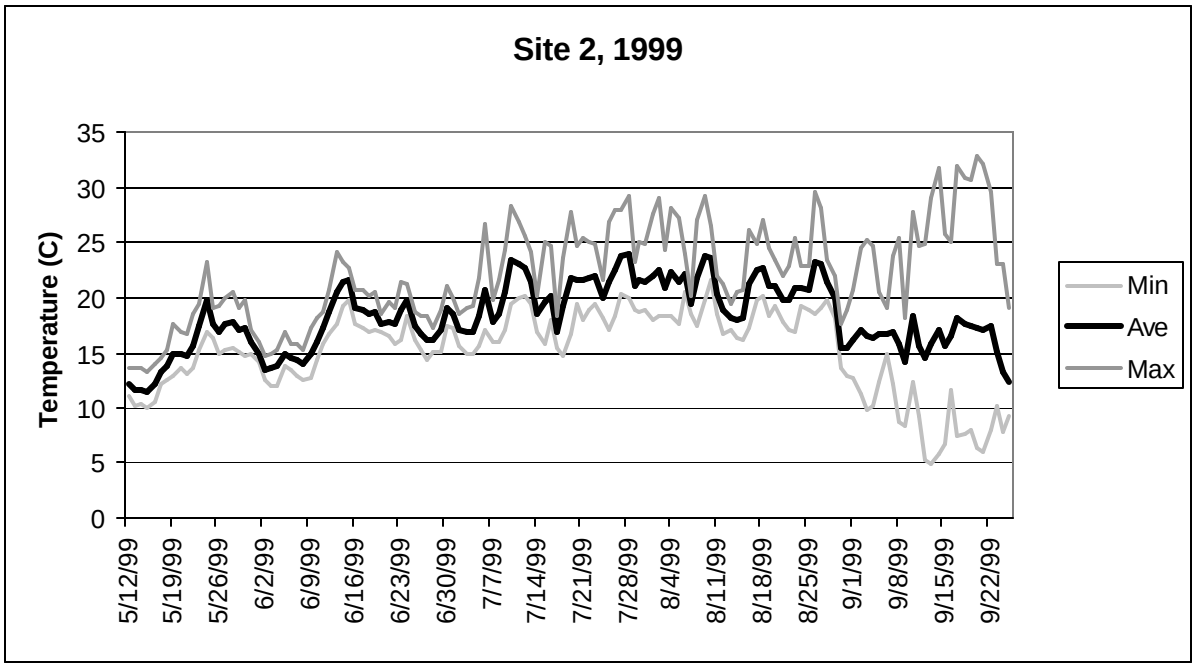

Figure A-5. Temperature recorded at site 2 (Harms Road) in 1999 by the Central Klickitat Conservation District.

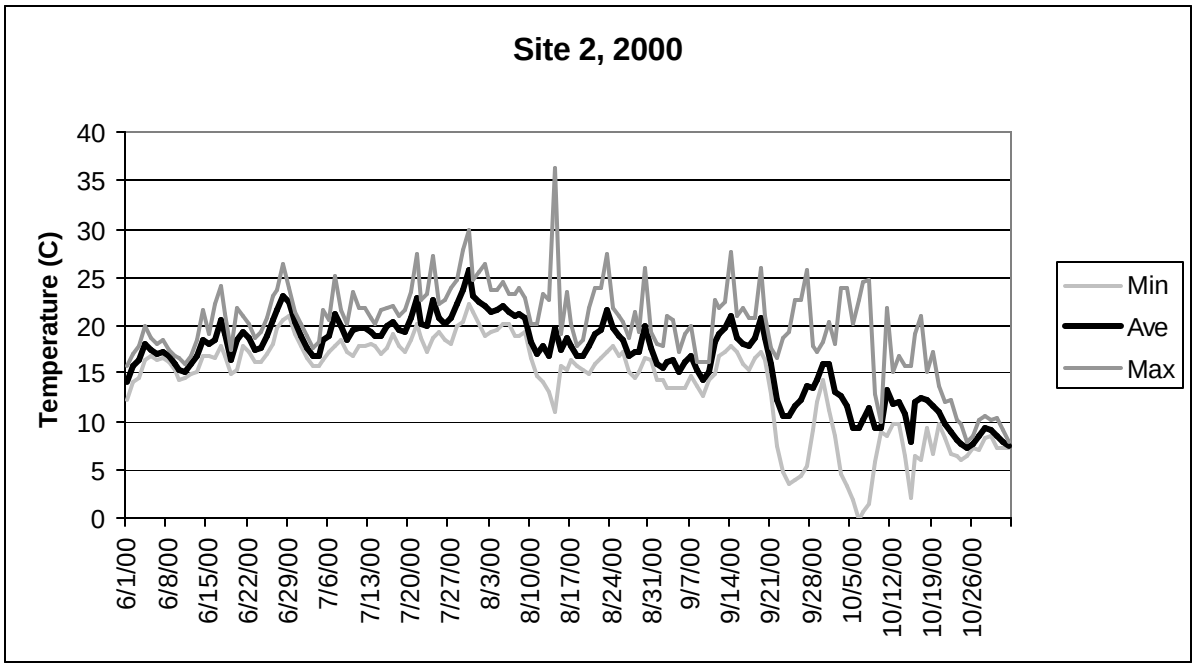

Figure A-6. Temperature recorded at site 2 (Harms Road) in 2000 by the Central Klickitat Conservation District.

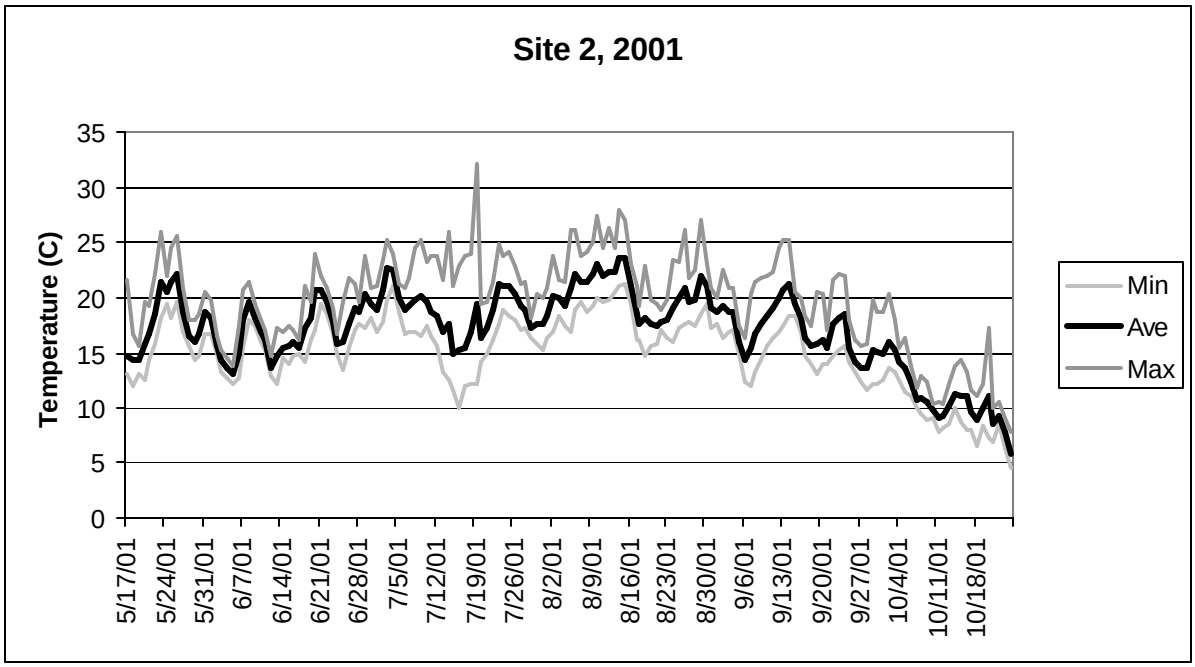

Figure A-7. Temperature recorded at site 2 (Harms Road) in 2001 by the Central Klickitat Conservation District.

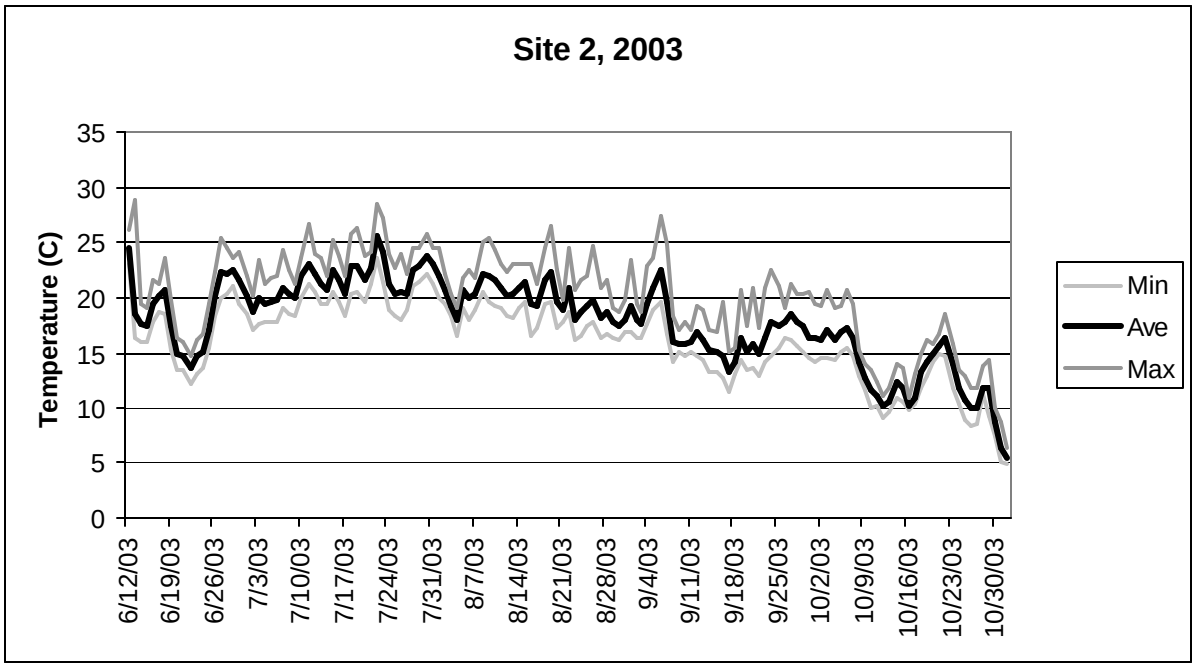

Figure A-8. Temperature recorded at site 2 (Harms Road) in 2003 by the Central Klickitat Conservation District.

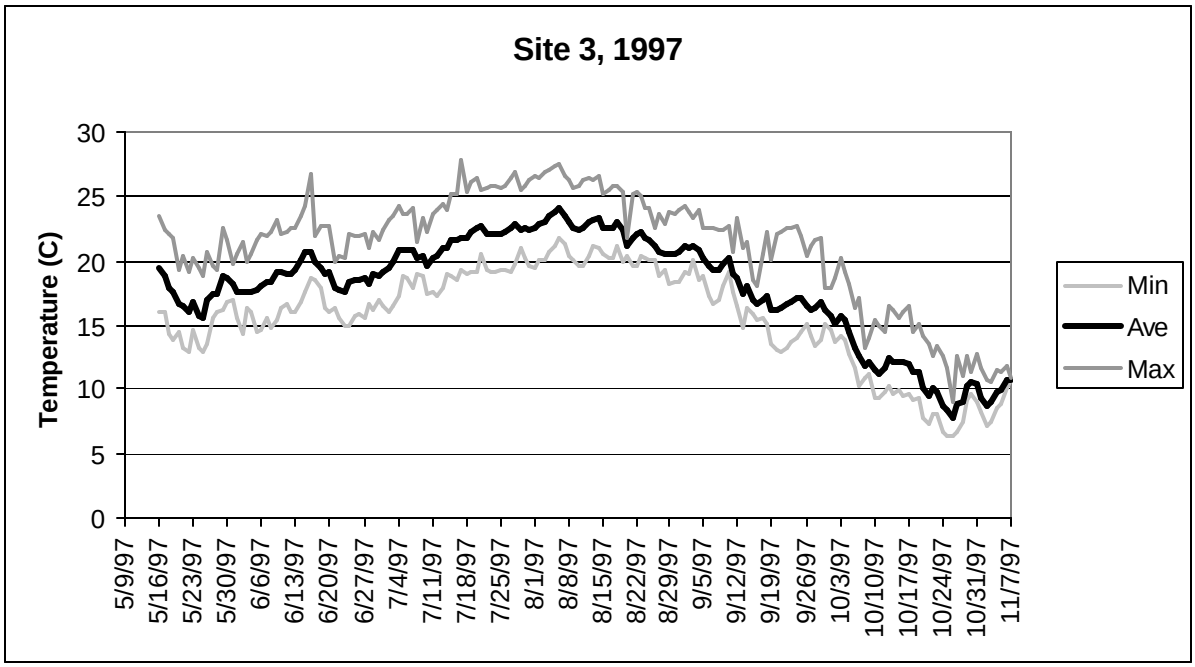

Figure A-9. Temperature recorded at site 3 (Horseshoe Bend Bridge) in 1997 by the Central Klickitat Conservation District.

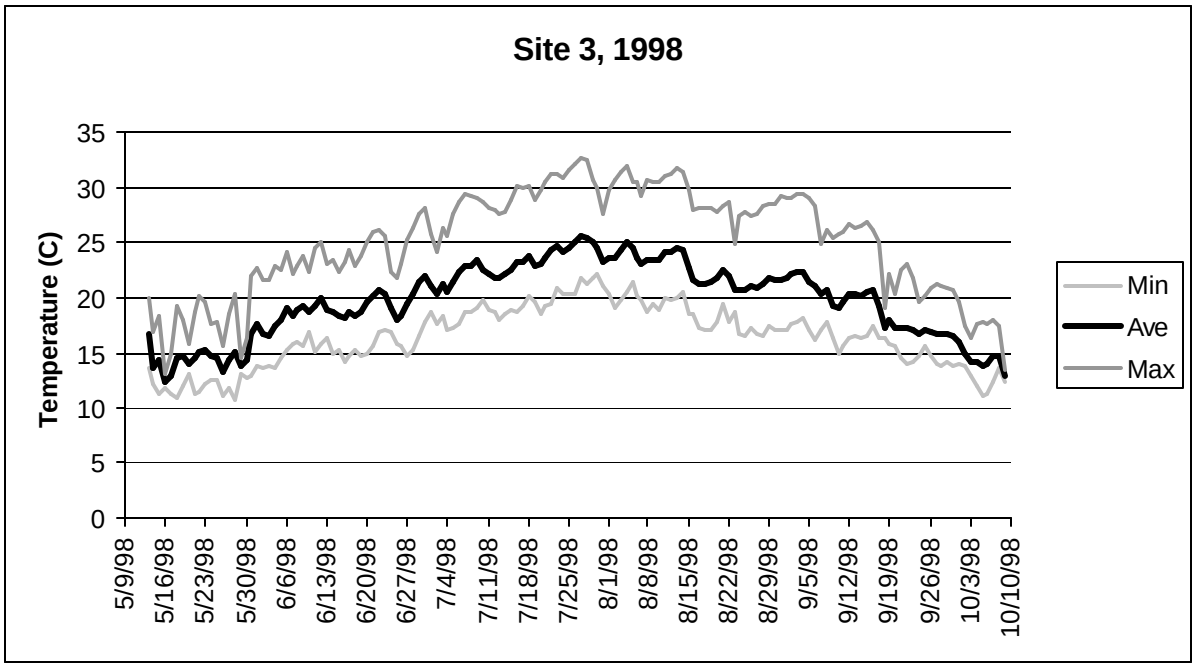

Figure A-10. Temperature recorded at site 3 (Horseshoe Bend Bridge) in 1998 by the Central Klickitat Conservation District.

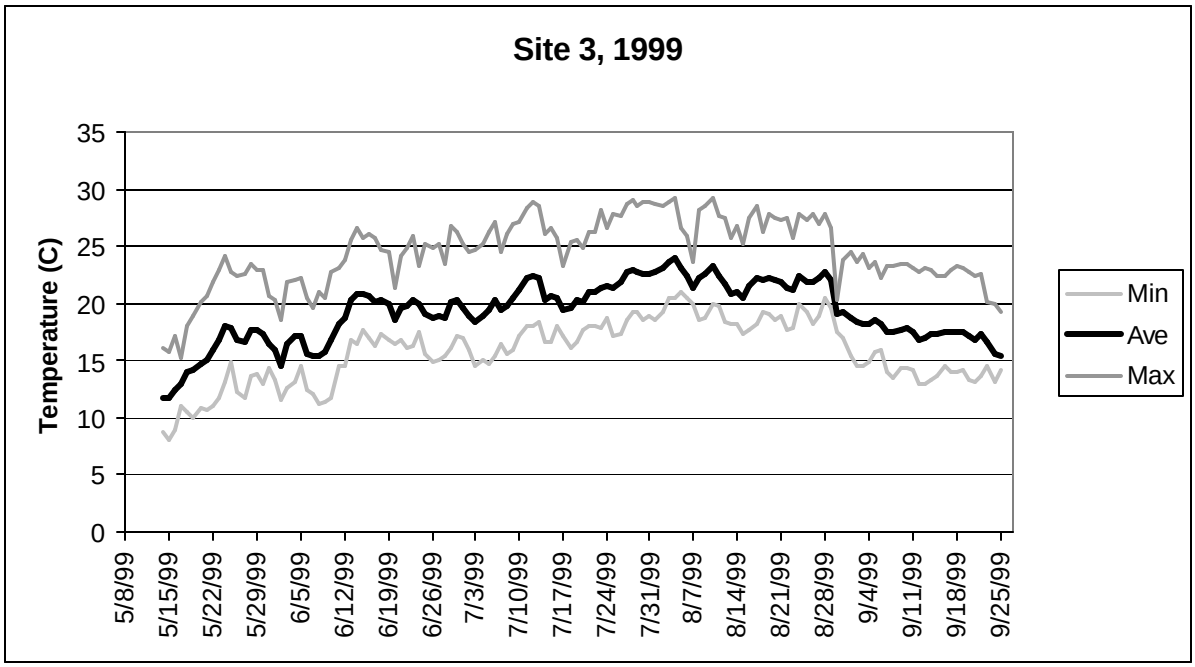

Figure A-11. Temperature recorded at site 3 (Horseshoe Bend Bridge) in 1999 by the Central Klickitat Conservation District.

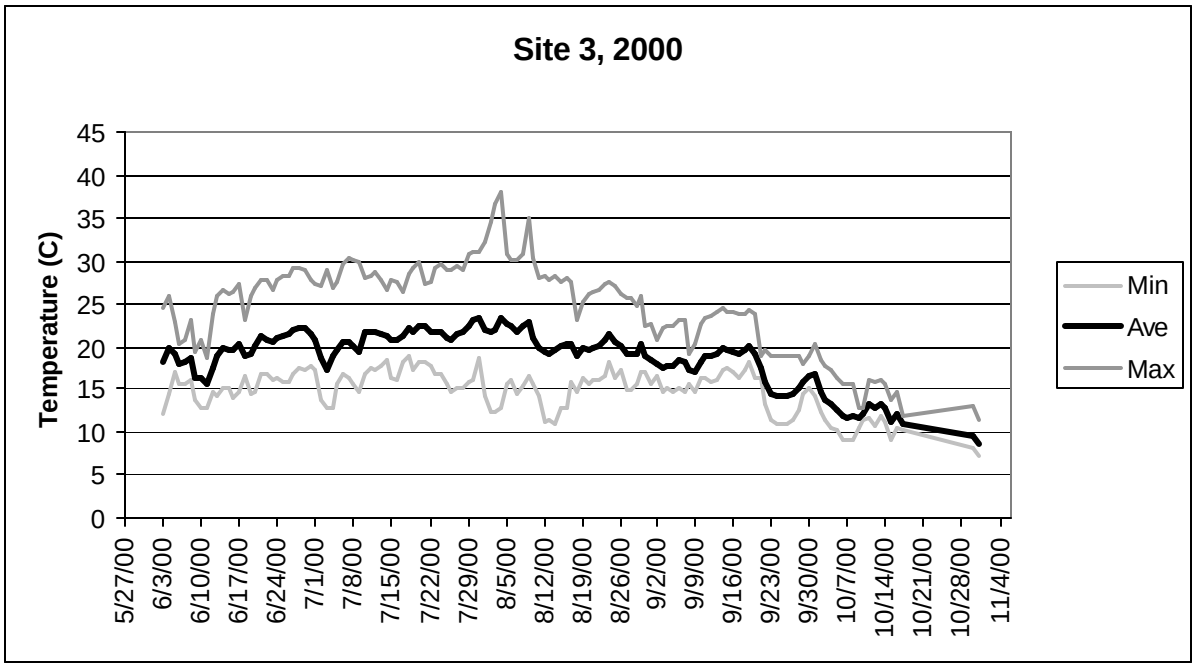

Figure A-12. Temperature recorded at site 3 (Horseshoe Bend Bridge) in 2000 by the Central Klickitat Conservation District.

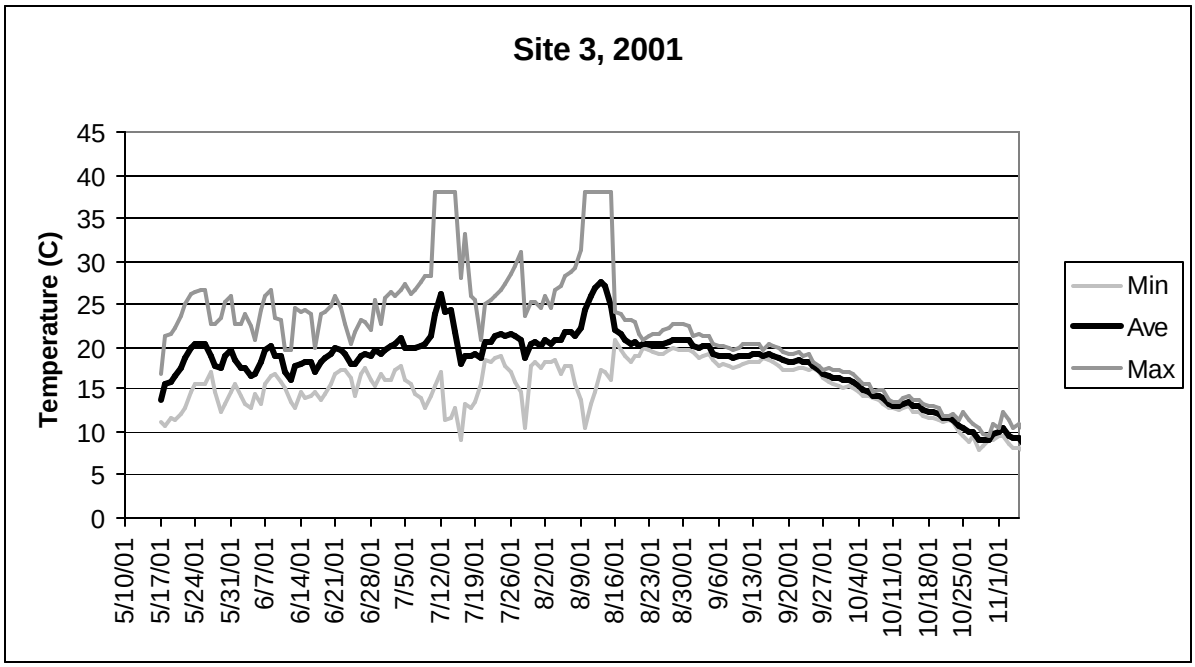

Figure A-13. Temperature recorded at site 3 (Horseshoe Bend Bridge) in 2001 by the Central Klickitat Conservation District.

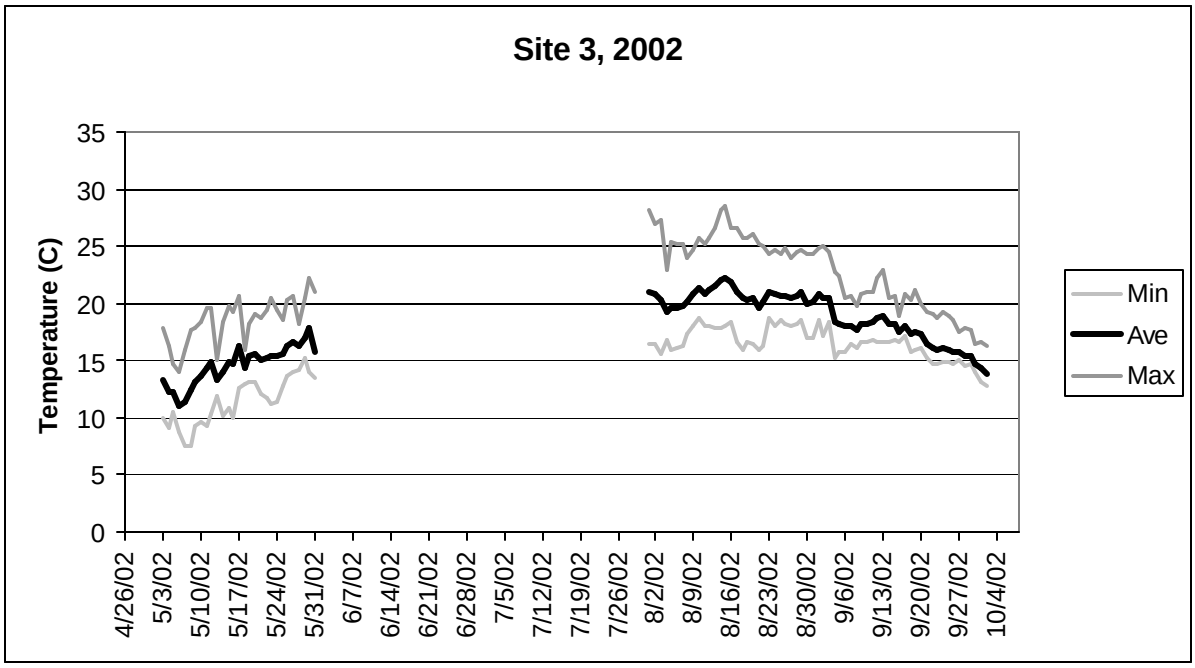

Figure A-14. Temperature recorded at site 3 (Horseshoe Bend Bridge) in 2002 by the Central Klickitat Conservation District.

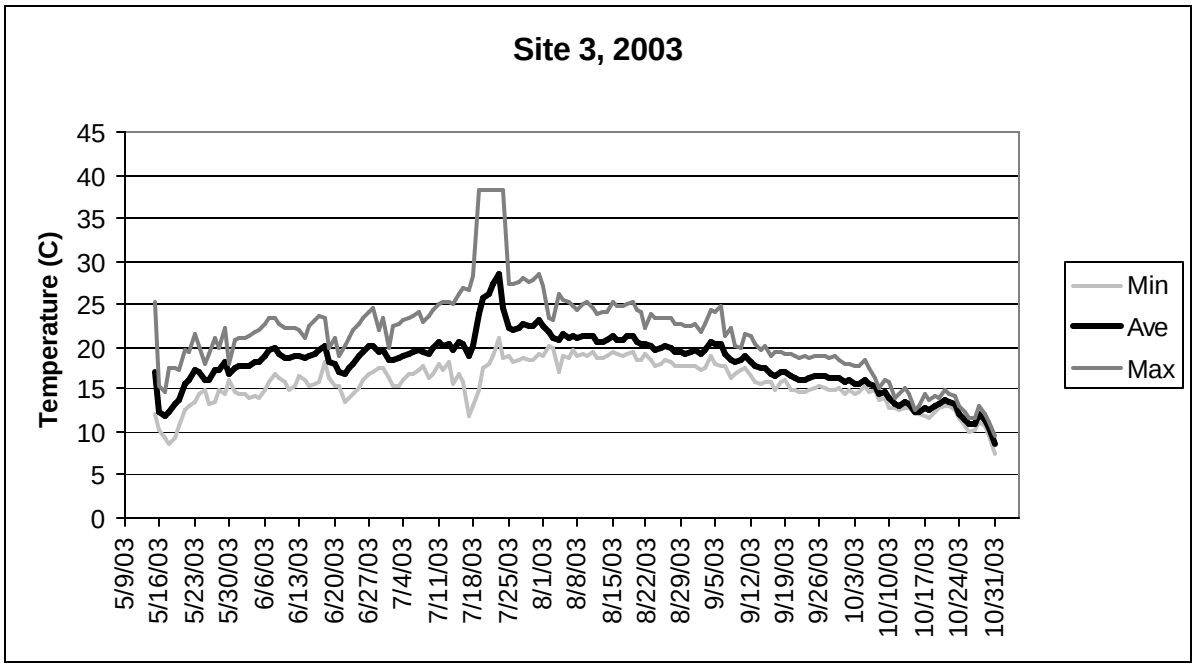

Figure A-15. Temperature recorded at site 3 (Horseshoe Bend Bridge) in 2003 by the Central Klickitat Conservation District.

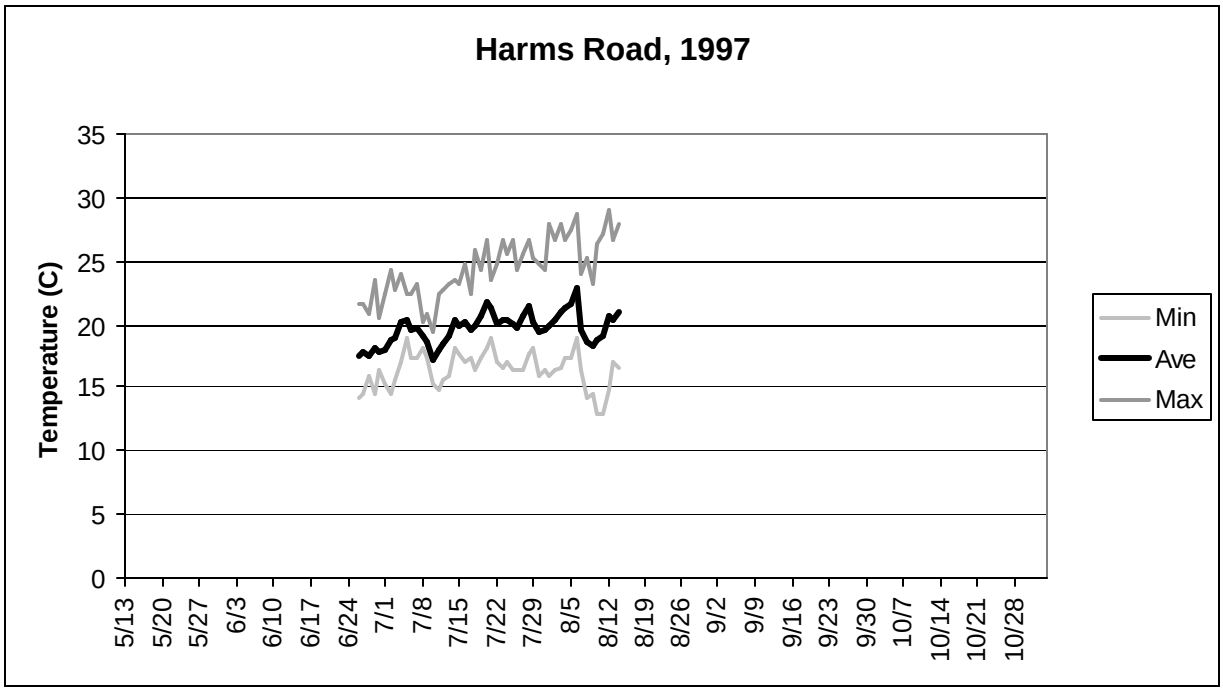

Figure A-16. Temperature recorded at Harms Road in 1997 by the Yakama Nation.

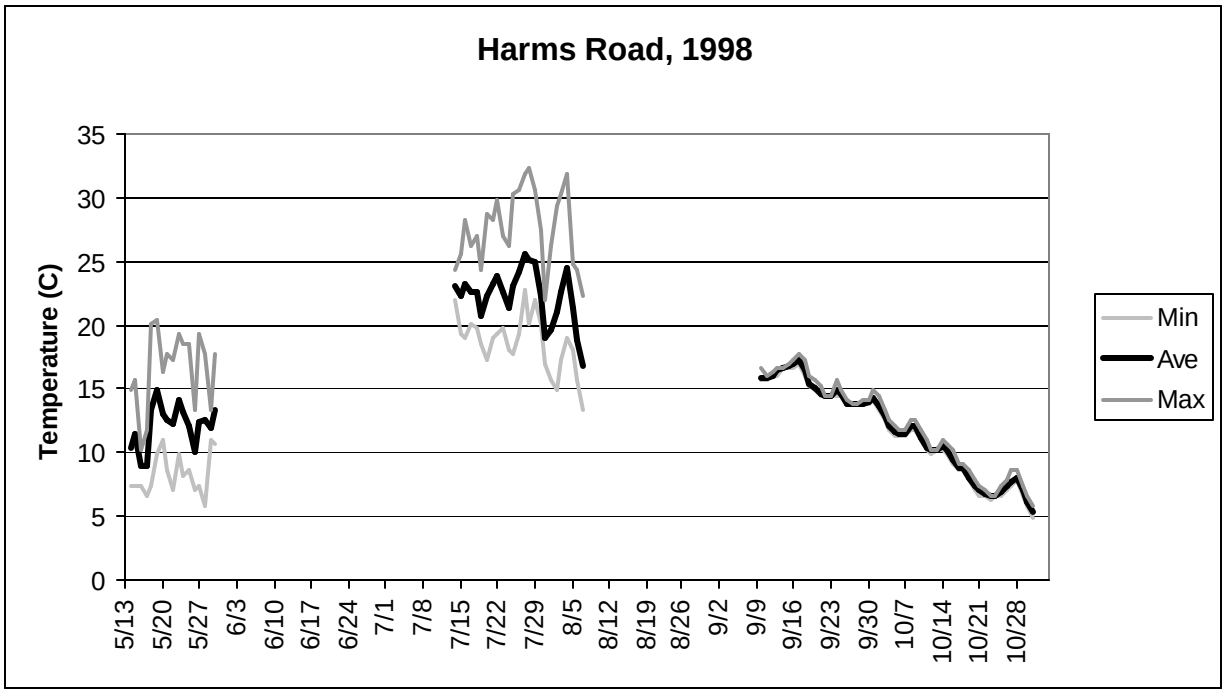

Figure A-17. Temperature recorded at Harms Road in 1998 by the Yakama Nation.

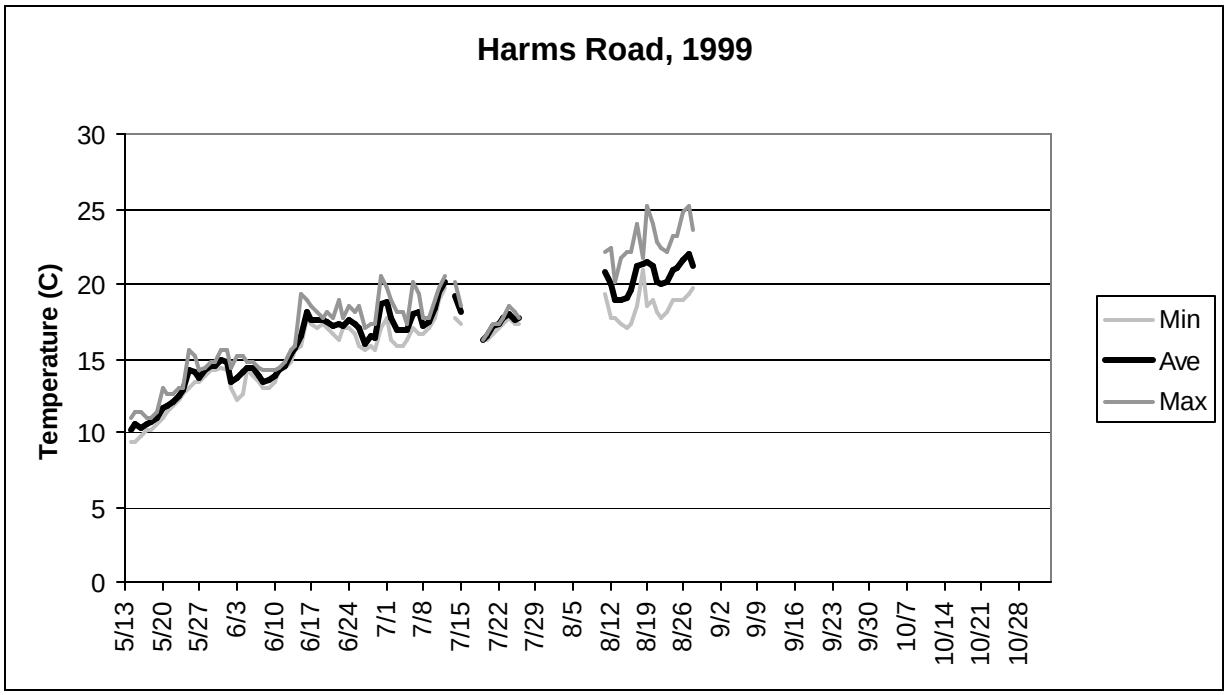

Figure A-18. Temperature recorded at Harms Road in 1999 by the Yakama Nation.

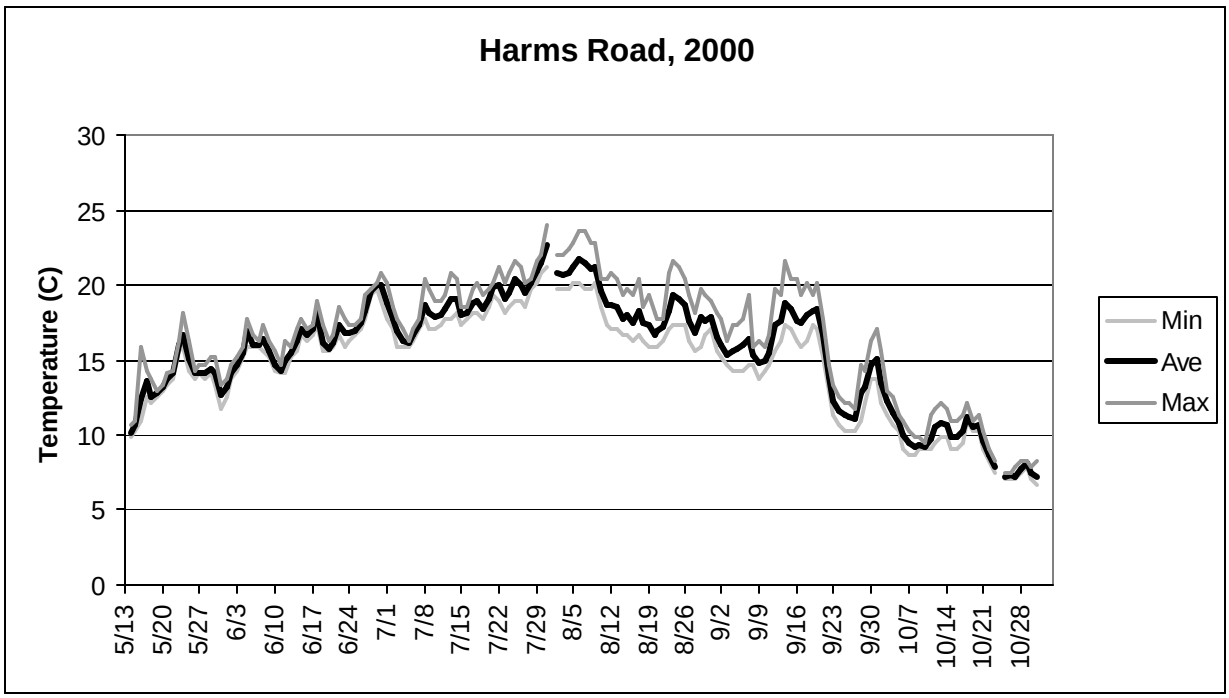

Figure A-19. Temperature recorded at Harms Road in 2000 by the Yakama Nation.

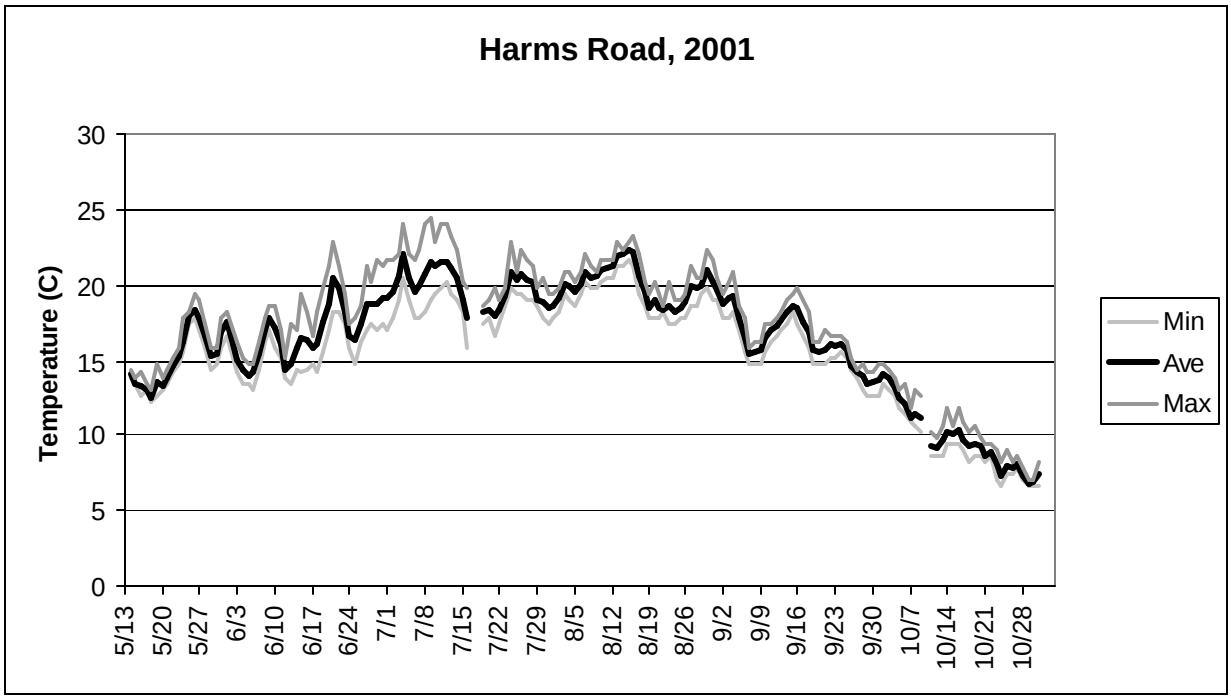

Figure A-20. Temperature recorded at Harms Road in 2001 by the Yakama Nation.

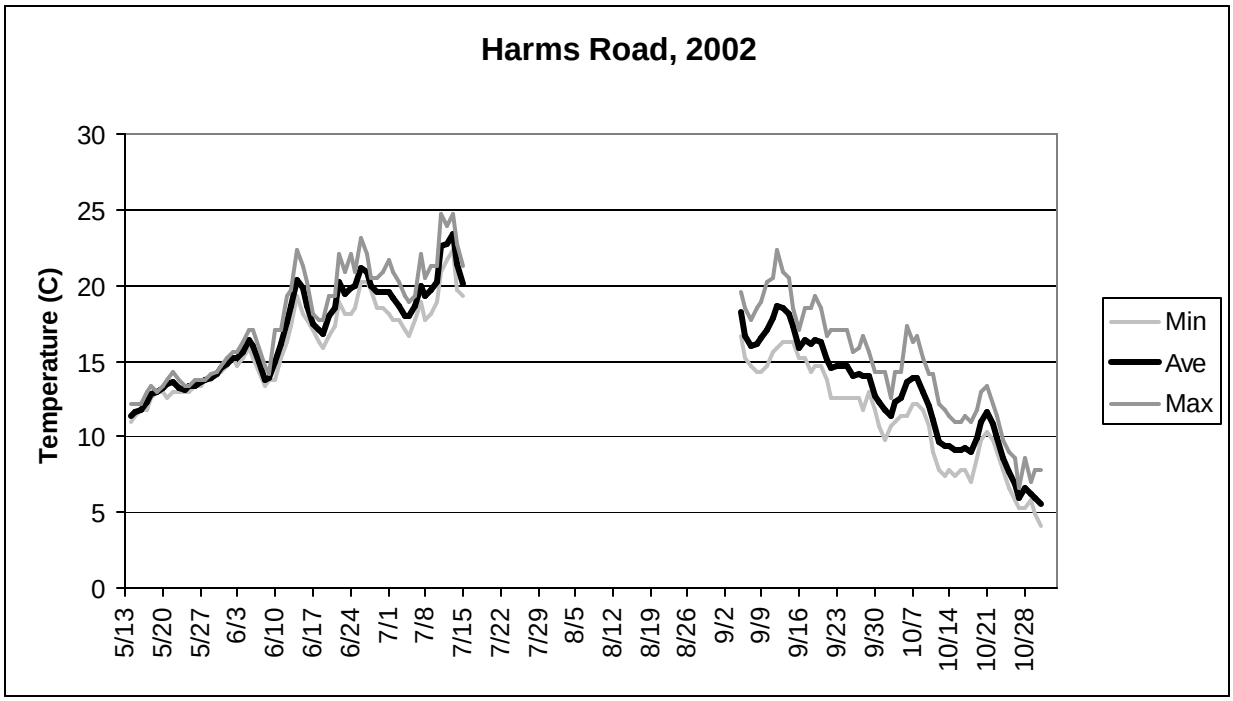

Figure A-21. Temperature recorded at Harms Road in 2002 by the Yakama Nation.

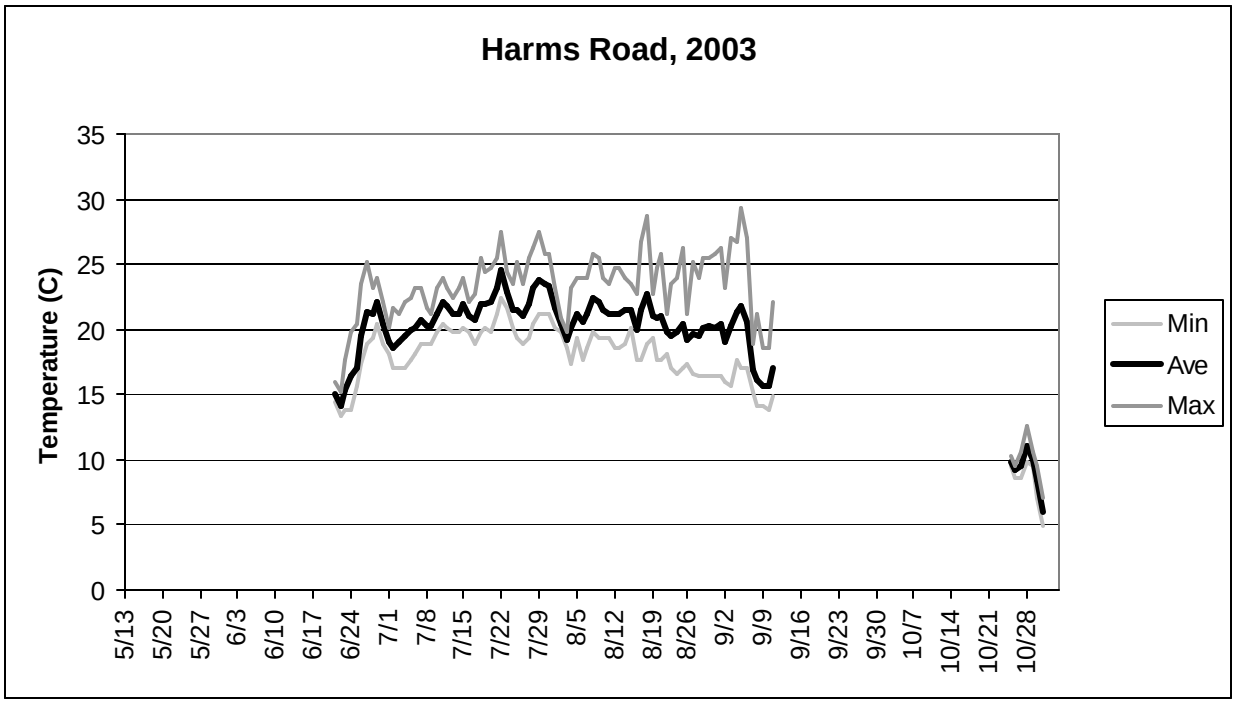

Figure A-22. Temperature recorded at Harms Road in 2003 by the Yakama Nation.

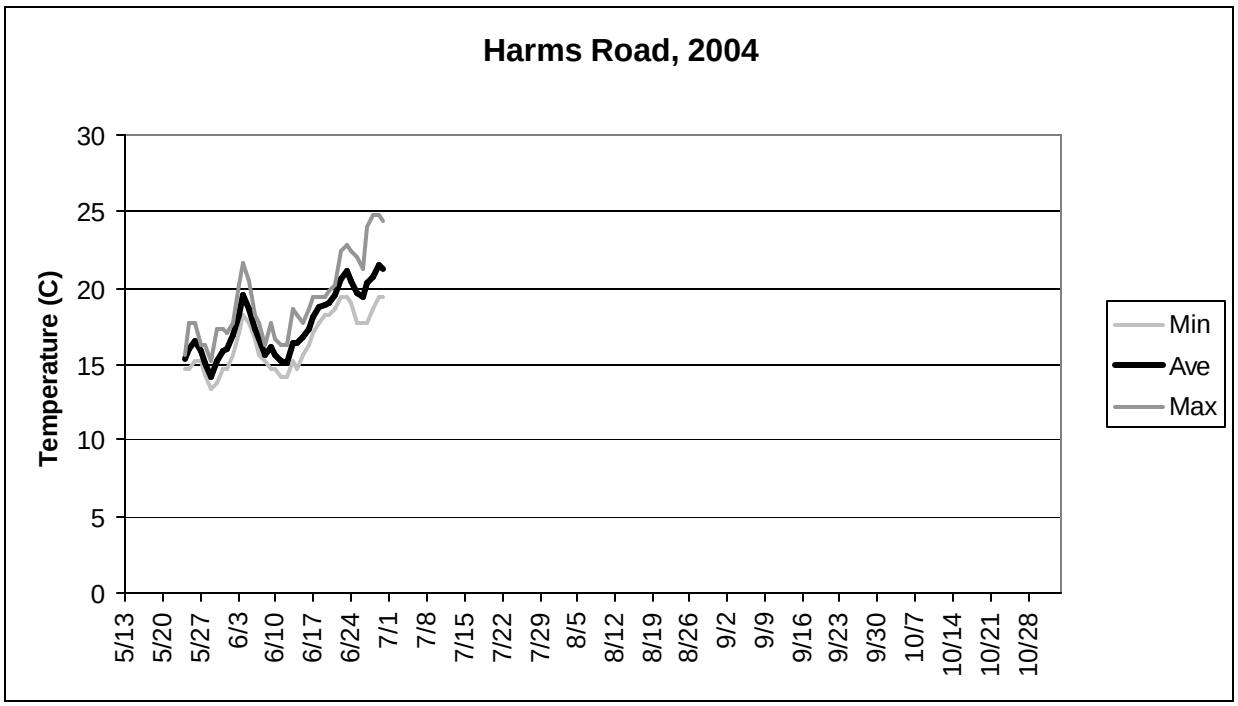

Figure A-23. Temperature recorded at Harms Road in 2004 by the Yakama Nation.

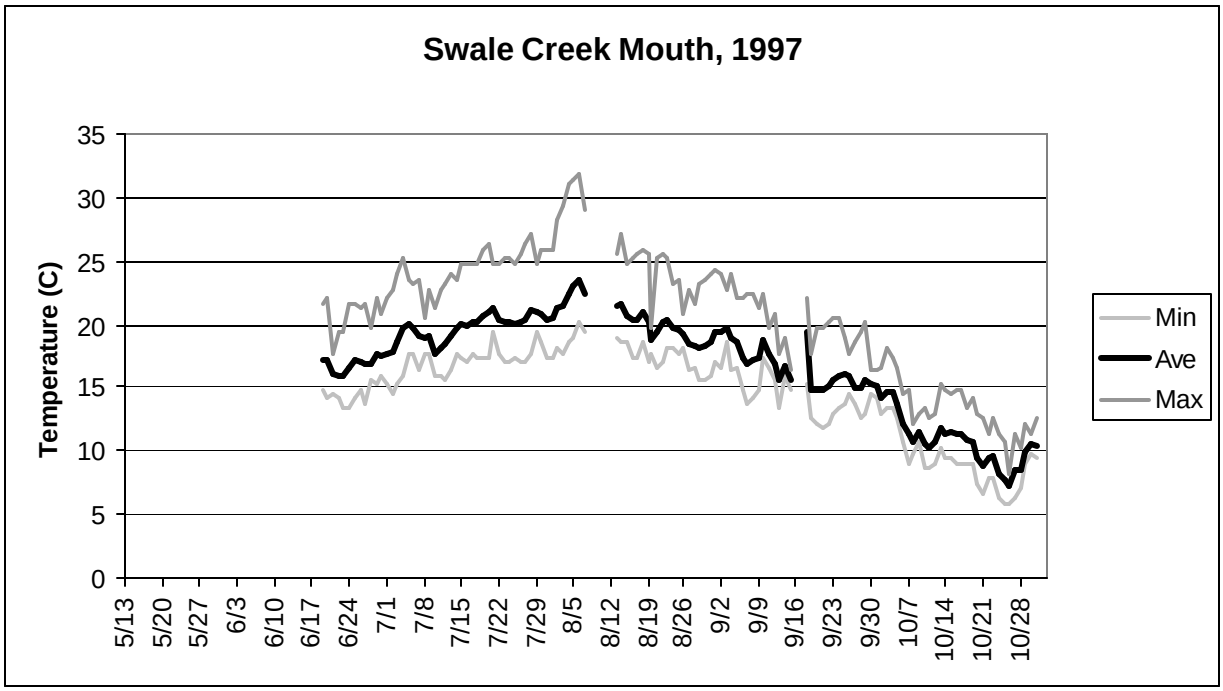

Figure A-24. Temperature recorded at the mouth of Swale Creek in 1997 by the Yakama Nation.

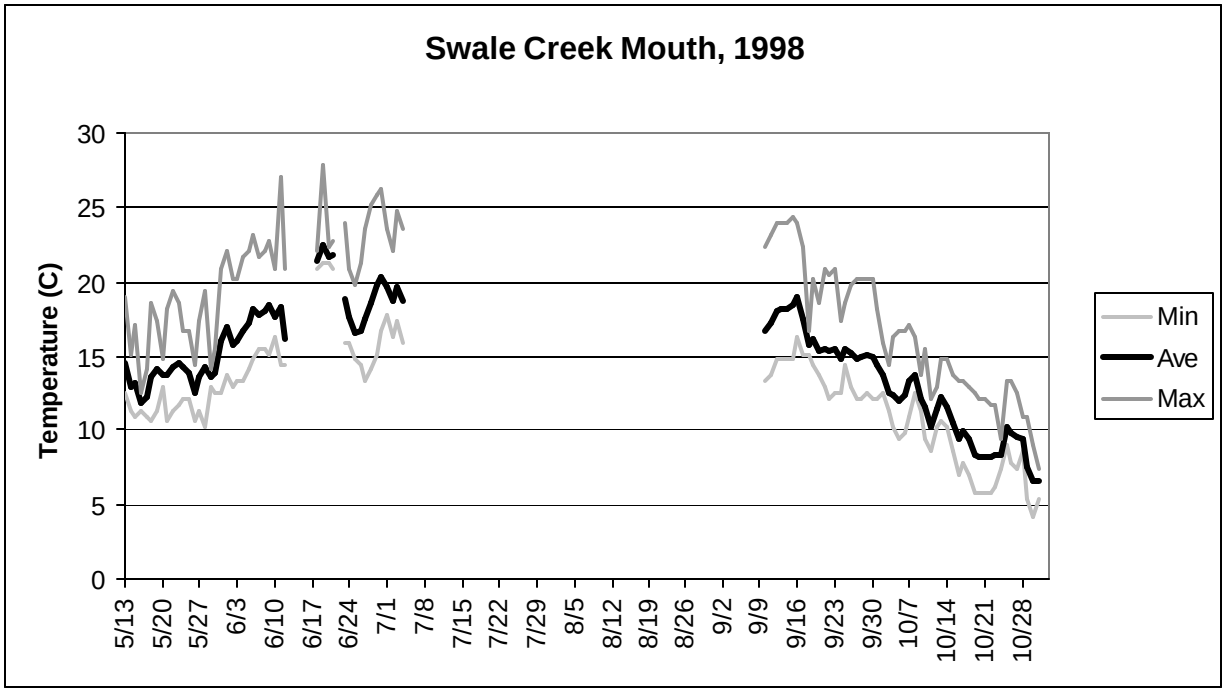

Figure A-25. Temperature recorded at the mouth of Swale Creek in 1998 by the Yakama Nation.

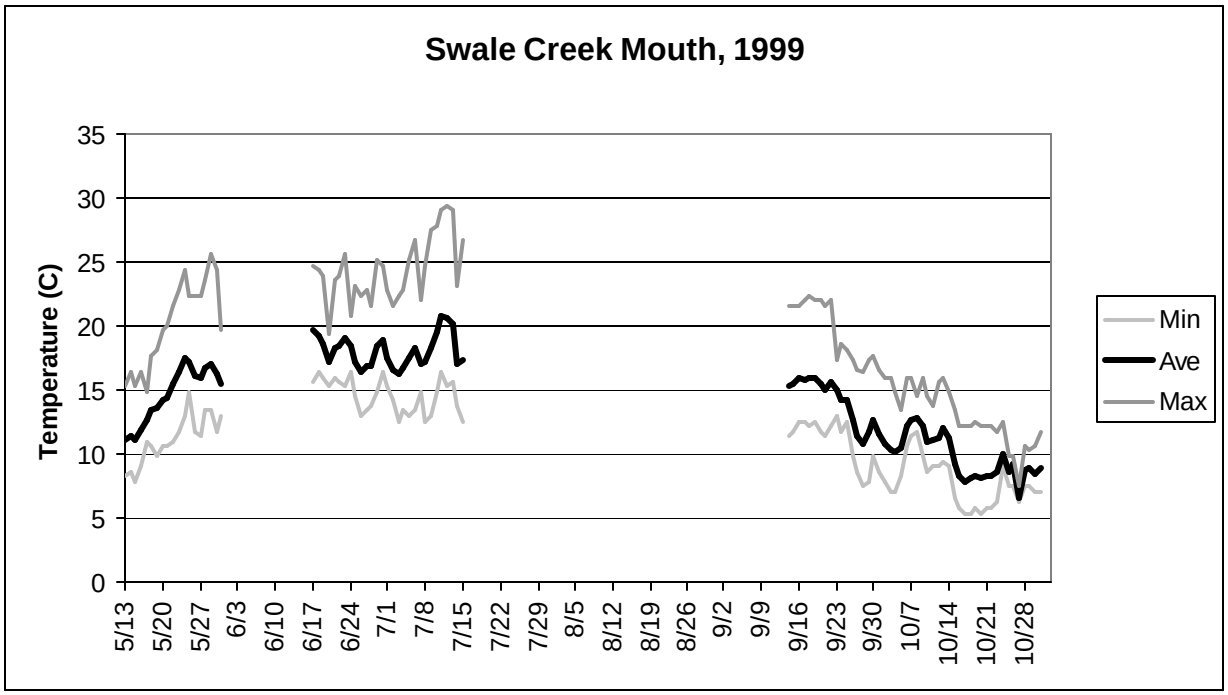

Figure A-26. Temperature recorded at the mouth of Swale Creek in 1999 by the Yakama Nation.

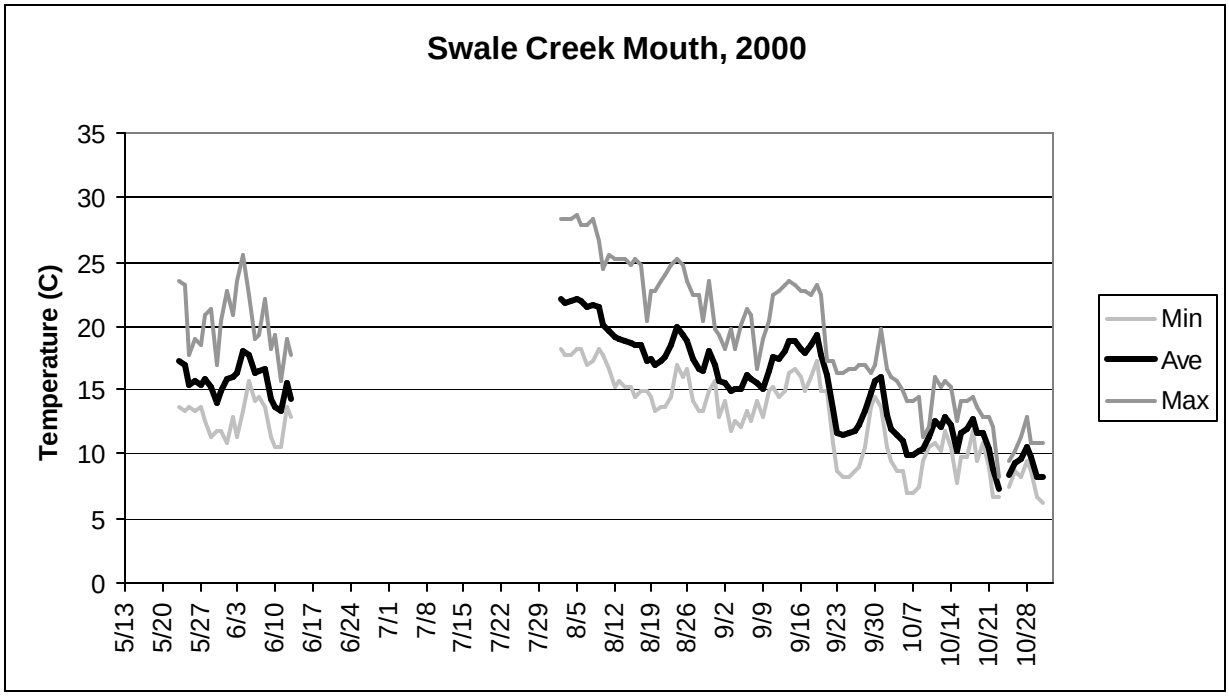

Figure A-27. Temperature recorded at the mouth of Swale Creek in 2000 by the Yakama Nation.

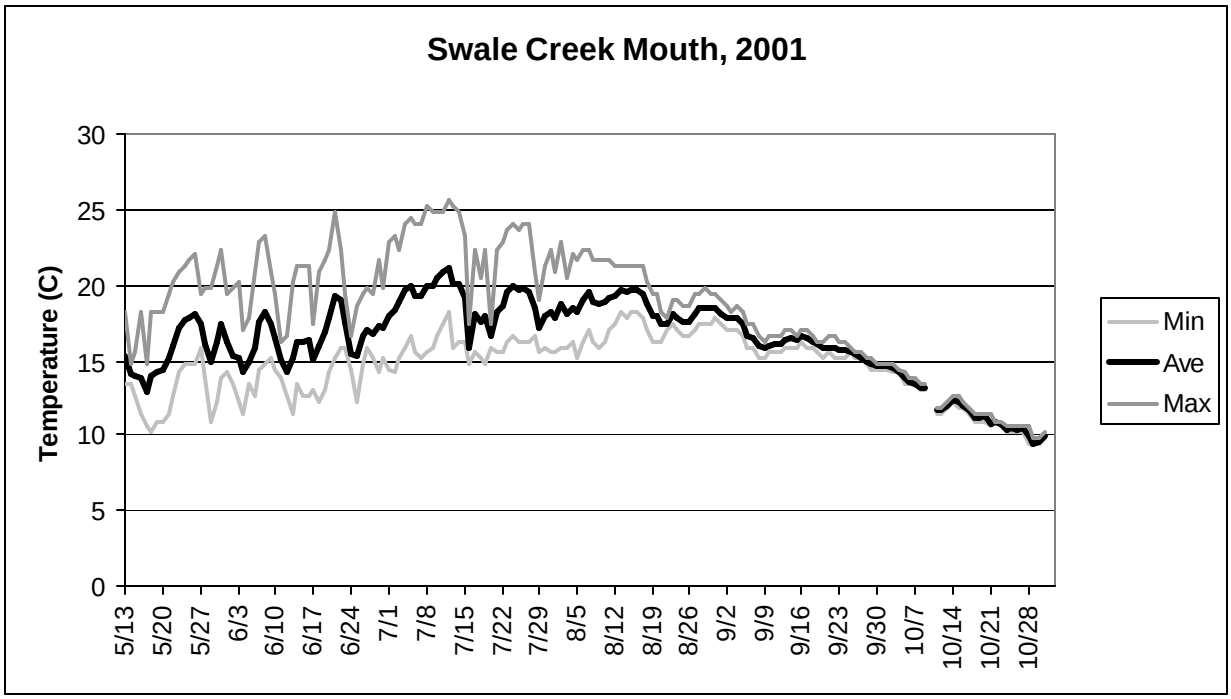

Figure A-28. Temperature recorded at the mouth of Swale Creek in 2001 by the Yakama Nation.

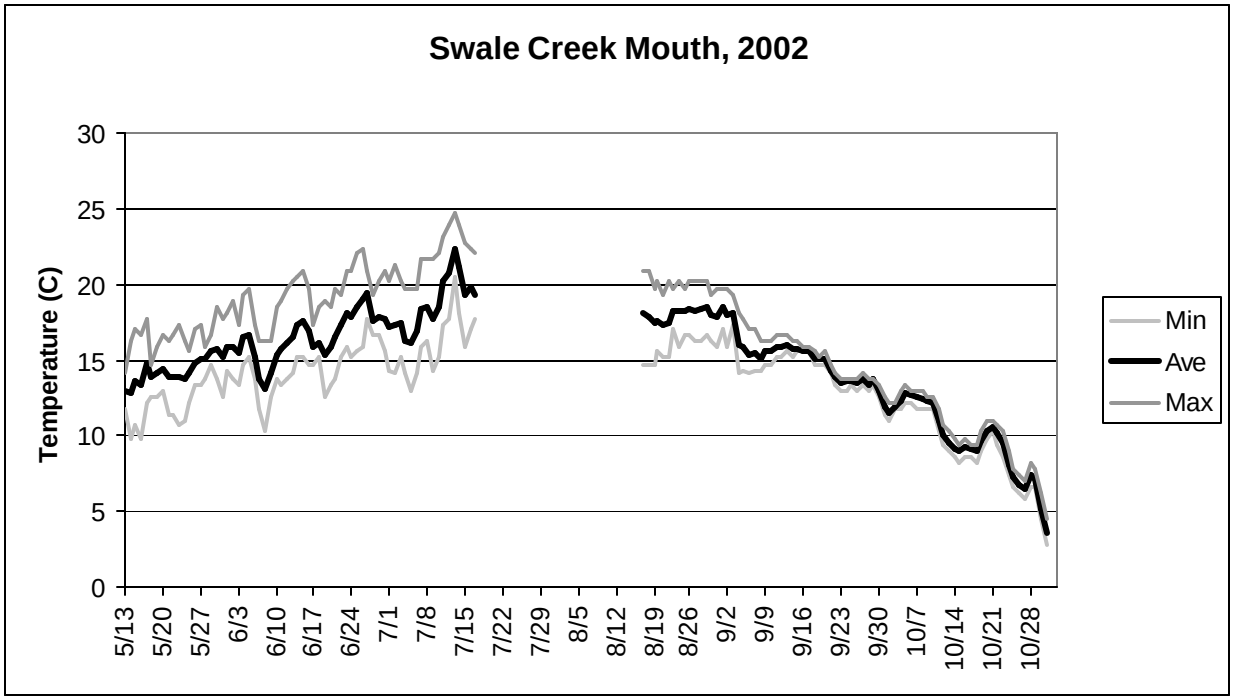

Figure A-29. Temperature recorded at the mouth of Swale Creek in 2002 by the Yakama Nation.

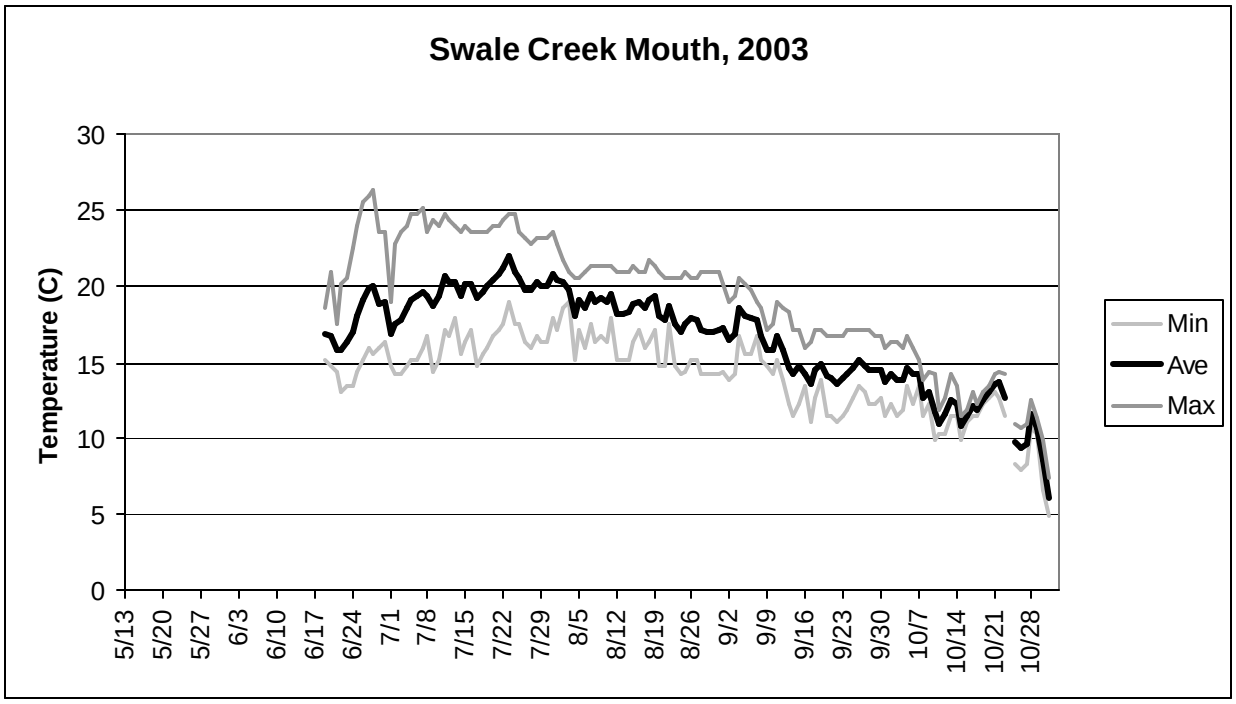

Figure A-30. Temperature recorded at the mouth of Swale Creek in 2003 by the Yakama Nation.

1.0 ADDENDUM B: HEAT SOURCE INPUTS AND RESULTS

Swale Creek - Heat Source Model Calibration on 7/29/03

Input parameters

Reach #	0	1	2	3	4	5	6	7	8
Stream	Swale	Swale	Swale	Swale	Swale	Swale	Swale	Swale	Swale
Date		7/29/03	7/29/03	7/29/03	7/29/03	7/29/03	7/29/03	7/29/03	7/29/03
Latitude (°)		46	46	46	46	46	46	46	46
Longitude (°)		121	121	121	121	121	121	121	121
Stream aspect (°)		20	310	10	50	50	60	10	40
% bedrock		60%	60%	60%	40%	40%	20%	20%	20%
Reach length (m)	0	730	220	490	680	400	1,580	610	700
Stream width (m)		1.5	4.6	3.7	4.6	9.1	6.1	7.6	7.6
U/S flow volume (cms)		0.0028	0.0057	0.0099	0.0142	0.0198	0.0198	0.0198	0.0198
Velocity (m/s)		0.0183	0.0056	0.0108	0.0122	0.0071	0.0053	0.0085	0.0085
G/W inflow (cms)		0.0028	0.0042	0.0042	0.0057	0.0000	0.0000	0.0000	0.0000
G/W temperature (°C)		19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Buffer height (m)		6	6	8	8	6	6	6	6
Buffer width (m)		6	6	6	6	6	4	6	6
Canopy density		30%	20%	30%	30%	80%	50%	50%	10%
Distance to stream (m)		0.0	0.0	0.0	0.0	1.0	2.0	2.0	2.0
Incision (m)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tree overhang (m)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Topographic west (°)		30	0	0	40	0	0	0	0
Topographic east (°)		30	0	30	30	0	0	0	0
Min. air temp. (°C)		29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
Max. air temp. (°C)		39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
Min. humidity		5%	5%	5%	5%	5%	5%	5%	5%
Max. humidity		60%	60%	60%	60%	60%	60%	60%	60%
Elevation (m)		244	232	226	213	207	189	171	165
Wind speed (m/s)		3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Predicted average	19.6	19.9	20.4	20.5	20.3	20.7	21.7	21.2	21.9
Predicted maximum	22.1	22.8	23.0	22.8	23.0	24.1	23.7	24.7	25.4
Measured average				20.1	20.6		20.2		22.6
Measured maximum				21.4	23.1		24.0		31.4
Distance (m)	0	730	950	1,440	2,120	2,520	4,100	4,710	5,410
Normal Year -									
Current average		17.5	18.4	18.1	17.6	17.1	17.9	17.4	18.1
Current maximum		20.3	21.0	20.4	20.4	20.6	19.9	21.0	21.6
Potential average		17.5	17.6	17.3	16.5	15.6	16.2	16.2	16.0
Potential maximum		20.3	18.7	18.7	17.9	17.7	17.5	18.7	18.1
Unusual Year -									
Current average		19.9	20.4	20.5	20.3	20.7	21.7	21.2	21.9
Current maximum		22.8	23.0	22.8	23.0	24.1	23.7	24.7	25.4

Potential average	19.9	19.6	19.7	19.2	19.4	20.3	20.3	20.1
Potential maximum	22.8	20.8	21.2	20.6	21.5	21.5	22.8	22.3

Swale Creek - Heat Source Model Inputs 8/14/03

Input parameters

Reach #	0	1	2	3	4	5	6	7	8
Stream	Swale	Swale	Swale	Swale	Swale	Swale	Swale	Swale	Swale
Date		8/14/03	8/14/03	8/14/03	8/14/03	8/14/03	8/14/03	8/14/03	8/14/03
Latitude (°)		46	46	46	46	46	46	46	46
Longitude (°)		121	121	121	121	121	121	121	121
Stream aspect (°)		20	310	10	50	50	60	10	40
% bedrock		60%	60%	60%	40%	40%	20%	20%	20%
Reach length (m)	0	730	220	490	680	400	1,580	610	700
Stream width (m)		1.5	4.6	3.7	4.6	9.1	6.1	7.6	7.6
U/S flow volume (cms)		0.0025	0.0049	0.0086	0.0123	0.0172	0.0172	0.0172	0.0172
Velocity (m/s)		0.0159	0.0049	0.0094	0.0106	0.0062	0.0046	0.0074	0.0074
G/W inflow (cms)		0.0025	0.0037	0.0037	0.0049	0.0000	0.0000	0.0000	0.0000
G/W temperature (°C)		19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Buffer height (m)		6	6	8	8	6	6	6	6
Buffer width (m)		6	6	6	6	6	4	6	6
Canopy density		30%	20%	30%	30%	80%	50%	50%	10%
Distance to stream (m)		0.0	0.0	0.0	0.0	1.0	2.0	2.0	2.0
Incision (m)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tree overhang (m)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Topographic west (°)		30	0	0	40	0	0	0	0
Topographic east (°)		30	0	30	30	0	0	0	0
Min. air temp. (°C)		25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Max. air temp. (°C)		34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0
Min. humidity		10%	10%	10%	10%	10%	10%	10%	10%
Max. humidity		70%	70%	70%	70%	70%	70%	70%	70%
Elevation (m)		244	232	226	213	207	189	171	165
Wind speed (m/s)		3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Predicted average	17.6	18.9	19.6	19.6	19.2	19.1	19.9	19.6	20.3
Predicted maximum	20.1	21.6	22.0	21.7	21.7	22.1	21.7	22.7	23.6
Measured average					18.9		18.3		20.8
Measured maximum					20.8		19.8		23.8
Distance (m)	0	730	950	1,440	2,120	2,520	4,100	4,710	5,410

Swale Creek - Heat Source Model Inputs For a Normal Year on 7/29

Input parameters

Reach #	0	1	2	3	4	5	6	7	8
Stream	Swale	Swale	Swale	Swale	Swale	Swale	Swale	Swale	Swale
Date		7/29/03	7/29/03	7/29/03	7/29/03	7/29/03	7/29/03	7/29/03	7/29/03
Latitude (°)		46	46	46	46	46	46	46	46
Longitude (°)		121	121	121	121	121	121	121	121
Stream aspect (°)		20	310	10	50	50	60	10	40
% bedrock		60%	60%	60%	40%	40%	20%	20%	20%
Reach length (m)	0	730	220	490	680	400	1,580	610	700
Stream width (m)		1.5	4.6	3.7	4.6	9.1	6.1	7.6	7.6
U/S flow volume (cms)		0.0031	0.0062	0.0109	0.0156	0.0218	0.0218	0.0218	0.0218
Velocity (m/s)		0.0201	0.0061	0.0119	0.0134	0.0078	0.0059	0.0094	0.0094
G/W inflow (cms)		0.0031	0.0047	0.0047	0.0062	0.0000	0.0000	0.0000	0.0000
G/W temperature (°C)		19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Buffer height (m)		6	6	8	8	6	6	6	6
Buffer width (m)		6	6	6	6	6	4	6	6
Canopy density		30%	20%	30%	30%	80%	50%	50%	10%
Distance to stream (m)		0.0	0.0	0.0	0.0	1.0	2.0	2.0	2.0
Incision (m)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tree overhang (m)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Topographic west (°)		30	0	0	40	0	0	0	0
Topographic east (°)		30	0	30	30	0	0	0	0
Min. air temp. (°C)		23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Max. air temp. (°C)		28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Min. humidity		10%	10%	10%	10%	10%	10%	10%	10%
Max. humidity		60%	60%	60%	60%	60%	60%	60%	60%
Elevation (m)		244	232	226	213	207	189	171	165
Wind speed (m/s)		3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Predicted average	17.6	17.5	18.4	18.1	17.6	17.1	17.9	17.4	18.1
Predicted maximum	20.1	20.3	21.0	20.4	20.4	20.6	19.9	21.0	21.6
Distance (m)	0	730	950	1,440	2,120	2,520	4,100	4,710	5,410

Swale Creek - Heat Source Model Inputs For a Normal Year on 7/29 with Potential Vegetation

Input parameters

Reach #	0	1	2	3	4	5	6	7	8
Stream	Swale	Swale	Swale	Swale	Swale	Swale	Swale	Swale	Swale
Date		7/29/03	7/29/03	7/29/03	7/29/03	7/29/03	7/29/03	7/29/03	7/29/03
Latitude (°)		46	46	46	46	46	46	46	46
Longitude (°)		121	121	121	121	121	121	121	121
Stream aspect (°)		20	310	10	50	50	60	10	40
% bedrock		60%	60%	60%	40%	40%	20%	20%	20%
Reach length (m)	0	730	220	490	680	400	1,580	610	700
Stream width (m)		1.5	4.6	3.7	4.6	9.1	6.1	7.6	7.6
U/S flow volume (cms)		0.0031	0.0062	0.0109	0.0156	0.0218	0.0218	0.0218	0.0218
Velocity (m/s)		0.0201	0.0061	0.0119	0.0134	0.0078	0.0059	0.0094	0.0094
G/W inflow (cms)		0.0031	0.0047	0.0047	0.0062	0.0000	0.0000	0.0000	0.0000
G/W temperature (°C)		19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Buffer height (m)		6	18	18	18	18	18	18	23
Buffer width (m)		6	8	6	8	10	8	8	10
Canopy density		30%	70%	80%	80%	90%	70%	80%	80%
Distance to stream (m)		0.0	0.0	0.0	0.0	1.0	2.0	2.0	2.0
Incision (m)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tree overhang (m)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Topographic west (°)		30	0	0	40	0	0	0	0
Topographic east (°)		30	0	30	30	0	0	0	0
Min. air temp. (°C)		23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Max. air temp. (°C)		28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Min. humidity		10%	10%	10%	10%	10%	10%	10%	10%
Max. humidity		60%	60%	60%	60%	60%	60%	60%	60%
Elevation (m)		244	232	226	213	207	189	171	165
Wind speed (m/s)		3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Predicted average	17.6	17.5	17.6	17.3	16.5	15.6	16.2	16.2	16.0
Predicted maximum	20.1	20.3	18.7	18.7	17.9	17.7	17.5	18.7	18.1
Distance (m)	0	730	950	1,440	2,120	2,520	4,100	4,710	5,410

Swale Creek - Heat Source Model Inputs for 2003 on 7/29/03 with Potential Vegetation

Input parameters

Reach #	0	1	2	3	4	5	6	7	8
Stream	Swale	Swale	Swale	Swale	Swale	Swale	Swale	Swale	Swale
Date		7/29/03	7/29/03	7/29/03	7/29/03	7/29/03	7/29/03	7/29/03	7/29/03
Latitude (°)		46	46	46	46	46	46	46	46
Longitude (°)		121	121	121	121	121	121	121	121
Stream aspect (°)		20	310	10	50	50	60	10	40
% bedrock		60%	60%	60%	40%	40%	20%	20%	20%
Reach length (m)	0	730	220	490	680	400	1,580	610	700
Stream width (m)		1.5	4.6	3.7	4.6	9.1	6.1	7.6	7.6
U/S flow volume (cms)		0.0028	0.0057	0.0099	0.0142	0.0198	0.0198	0.0198	0.0198
Velocity (m/s)		0.0183	0.0056	0.0108	0.0122	0.0071	0.0053	0.0085	0.0085
G/W inflow (cms)		0.0028	0.0042	0.0042	0.0057	0.0000	0.0000	0.0000	0.0000
G/W temperature (°C)		19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Buffer height (m)		6	18	18	18	18	18	18	23
Buffer width (m)		6	8	6	8	10	8	8	10
Canopy density		30%	70%	80%	80%	90%	70%	80%	80%
Distance to stream (m)		0.0	0.0	0.0	0.0	1.0	2.0	2.0	2.0
Incision (m)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tree overhang (m)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Topographic west (°)		30	0	0	40	0	0	0	0
Topographic east (°)		30	0	30	30	0	0	0	0
Min. air temp. (°C)		29.0	29.0	29.0	29.0	29.0	29.0	29.0	29.0
Max. air temp. (°C)		39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
Min. humidity		5%	5%	5%	5%	5%	5%	5%	5%
Max. humidity		60%	60%	60%	60%	60%	60%	60%	60%
Elevation (m)		244	232	226	213	207	189	171	165
Wind speed (m/s)		3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Predicted average	19.6	19.9	19.6	19.7	19.2	19.4	20.3	20.3	20.1
Predicted maximum	22.1	22.8	20.8	21.2	20.6	21.5	21.5	22.8	22.3
Distance (m)	0	730	950	1,440	2,120	2,520	4,100	4,710	5,410