

Appendix C: DRAFT Temperature Model Validation Summary, 2000-2017

Project: USBR Framework Test USBR_FrameworkTest

Simulation: 2000-17-DraftReport1

Simulation Date: June 17, 2022 15:55

Report Date: June 17, 2022

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Introduction

This report presents an overview of temperature model validation results for the following conditions.

Project: USBR_FrameworkTest

Simulation: 2000-17-DraftReport1

Analysis Period: 1 February 2000, 00:00 to 31 December 2017, 24:00

Models:

Shasta: ResSim

Keswick: ResSim

UpperSac: ResSim

Simulation Date: June 17, 2022 15:55

Report Date: June 17, 2022

Shasta

Shasta Reservoir Temperatures Near Dam

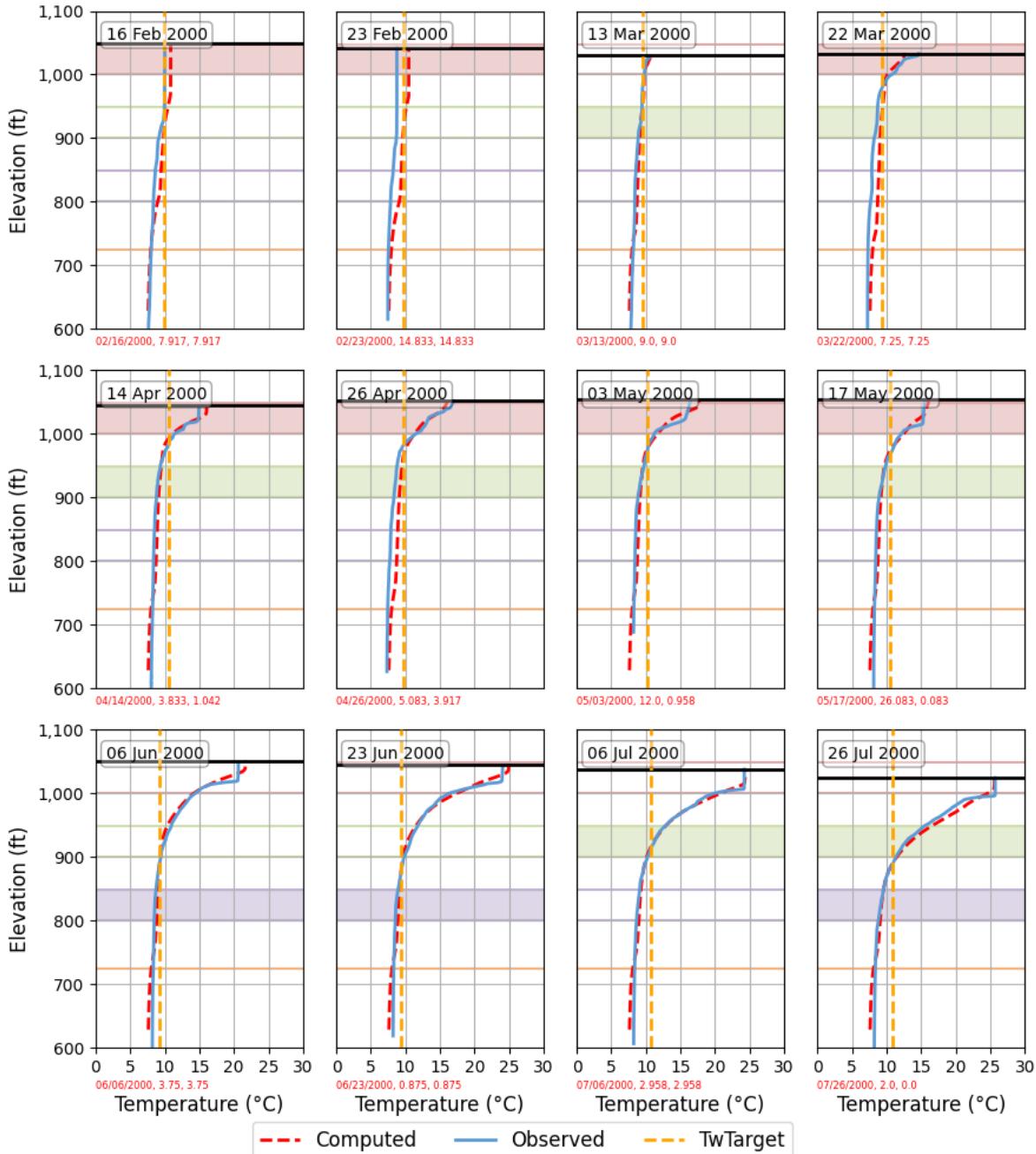


Figure 1. Shasta Lake 2000: 1 of 2

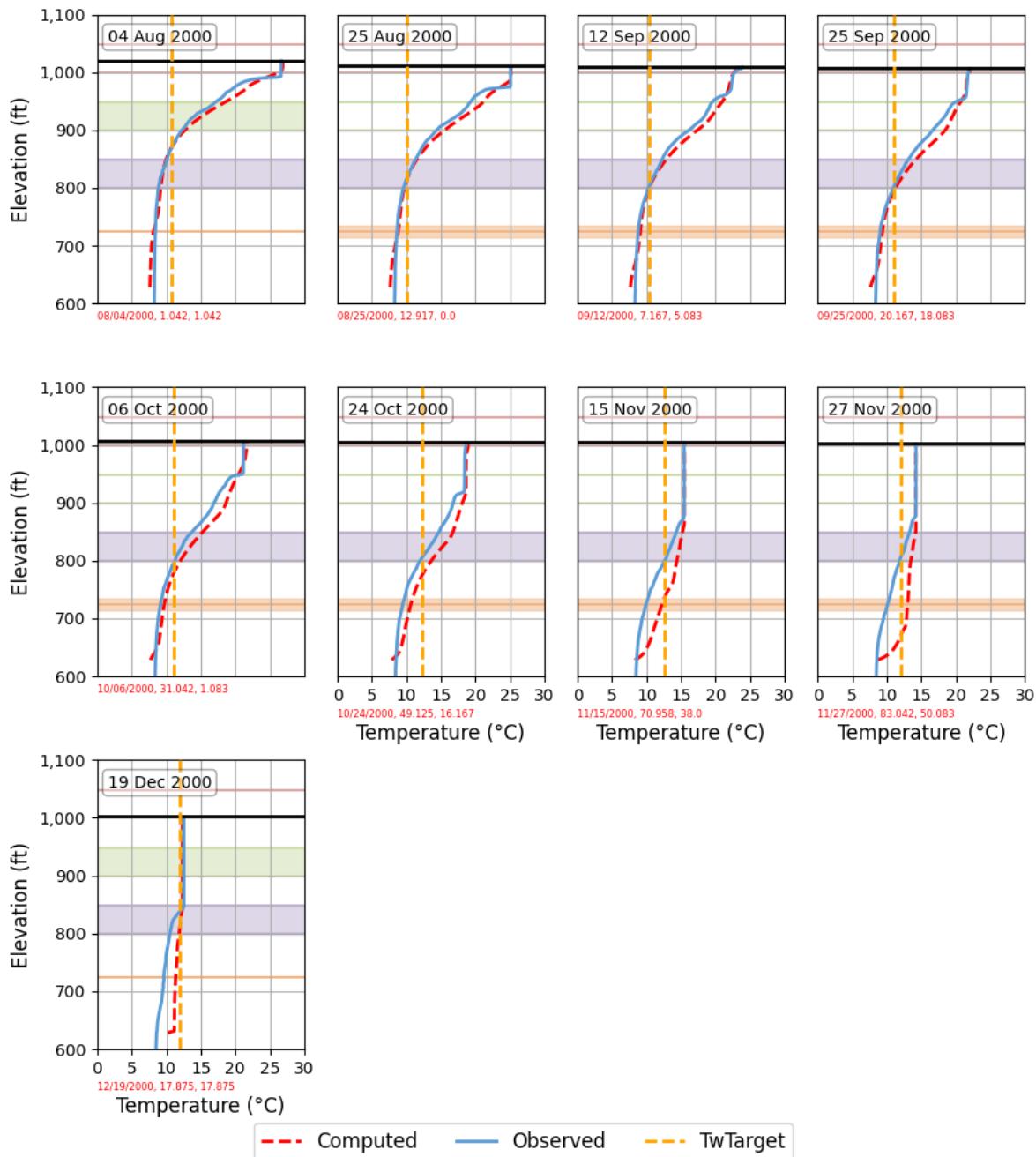


Figure 2. Shasta Lake 2000: 2 of 2

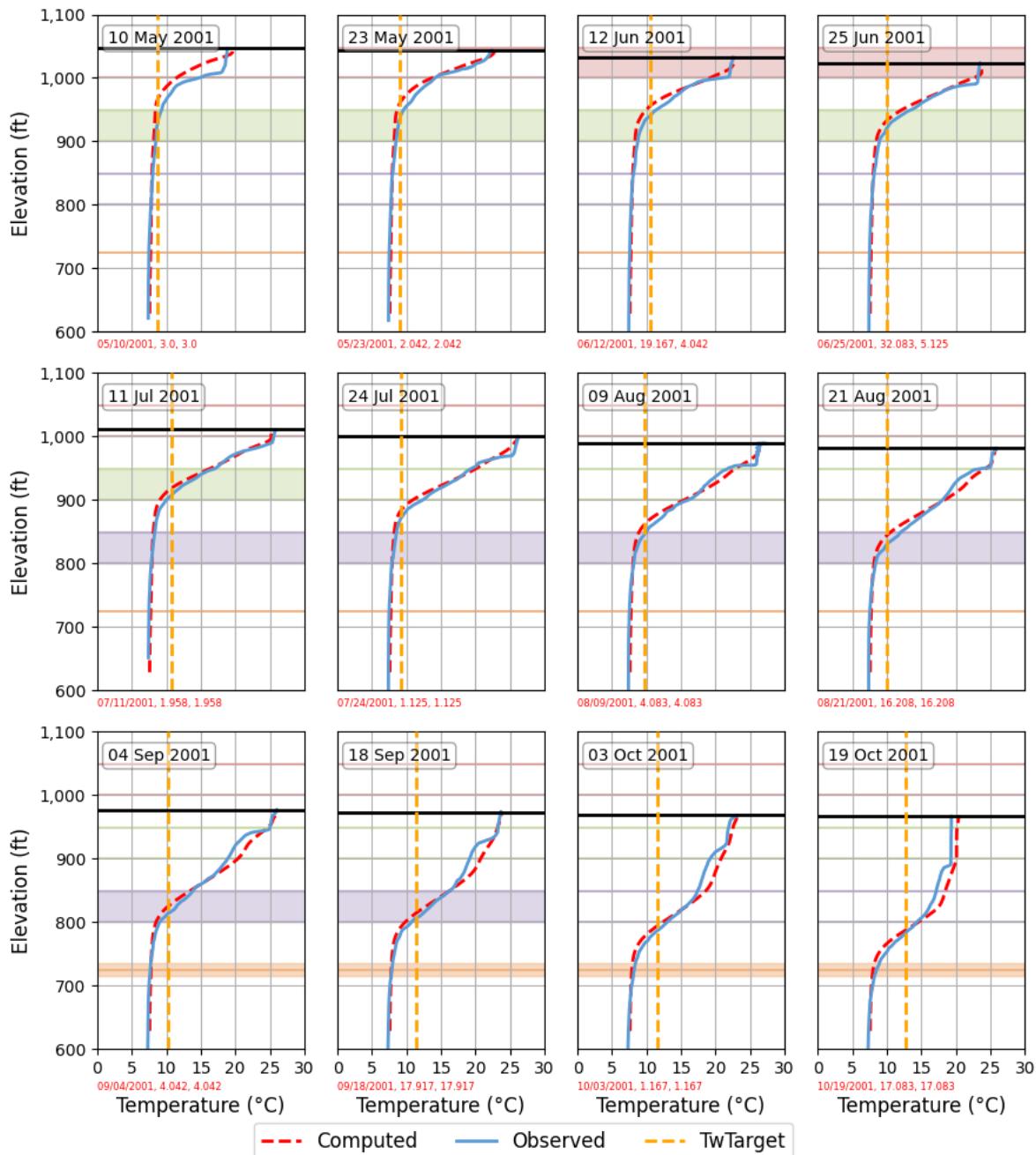


Figure 3. Shasta Lake 2001: 1 of 2

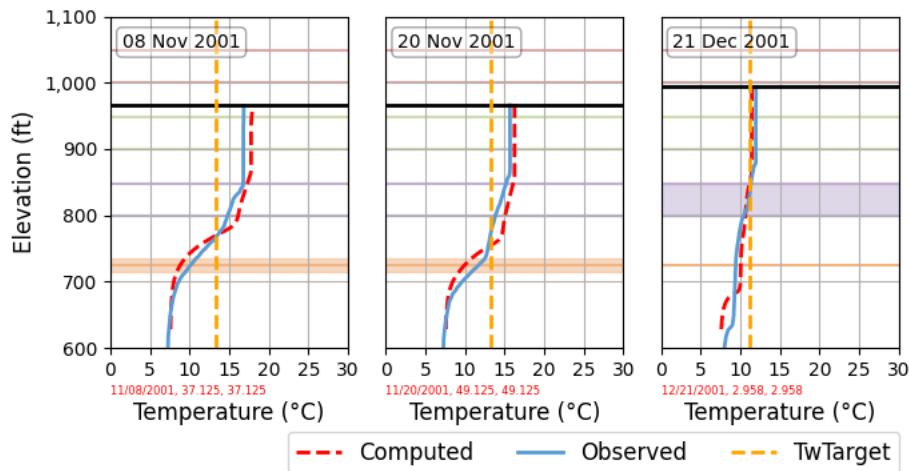
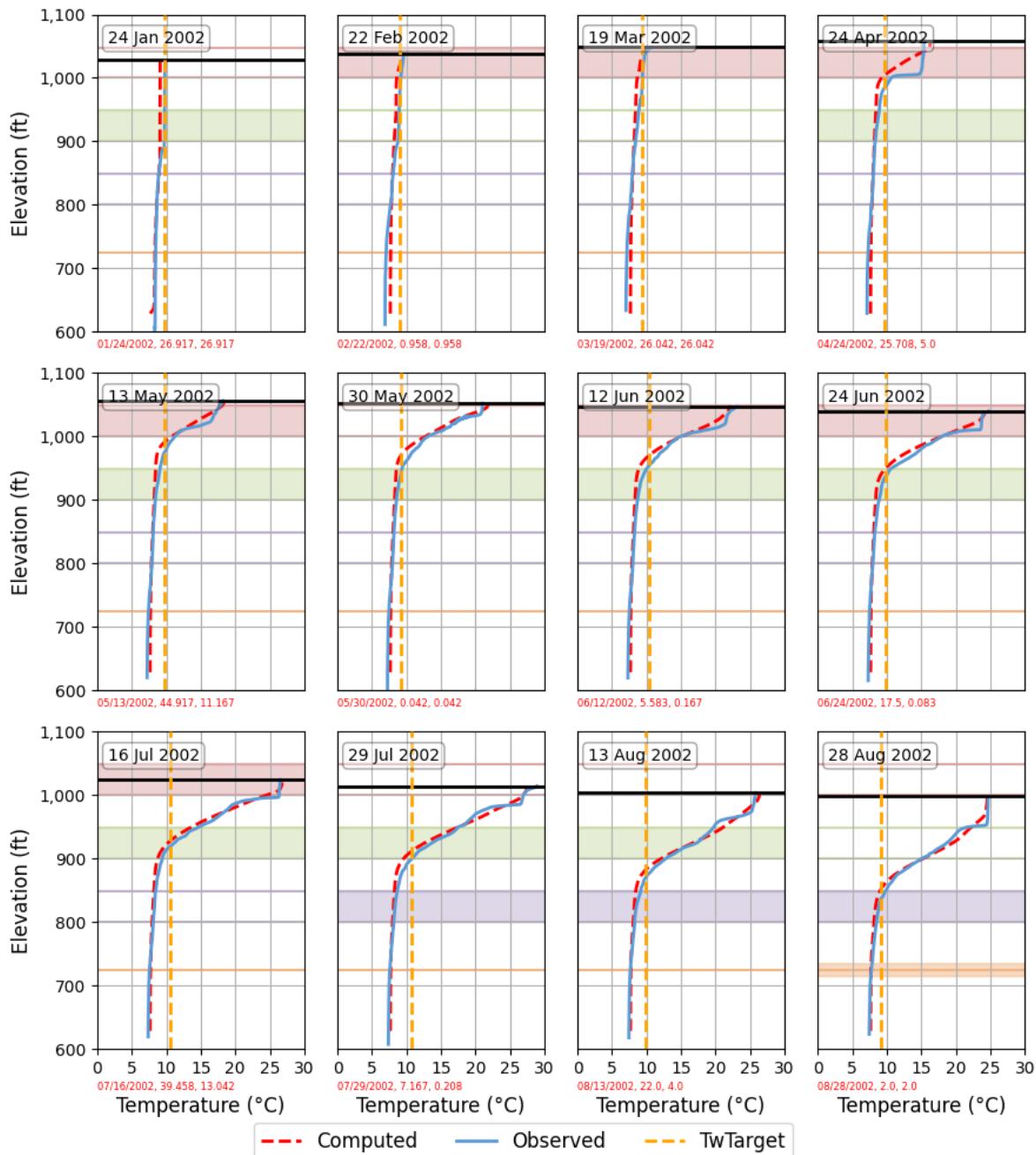


Figure 4. Shasta Lake 2001: 2 of 2



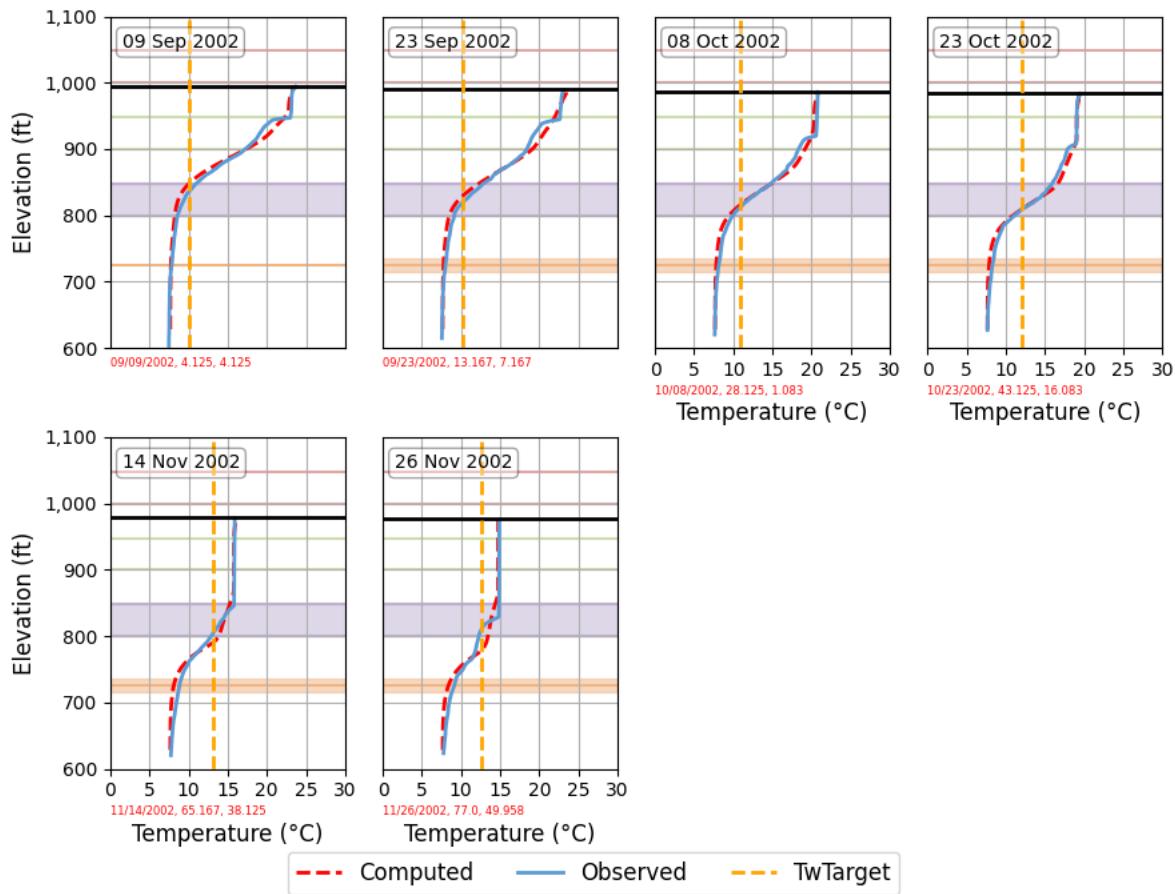


Figure 6. Shasta Lake 2002: 2 of 2

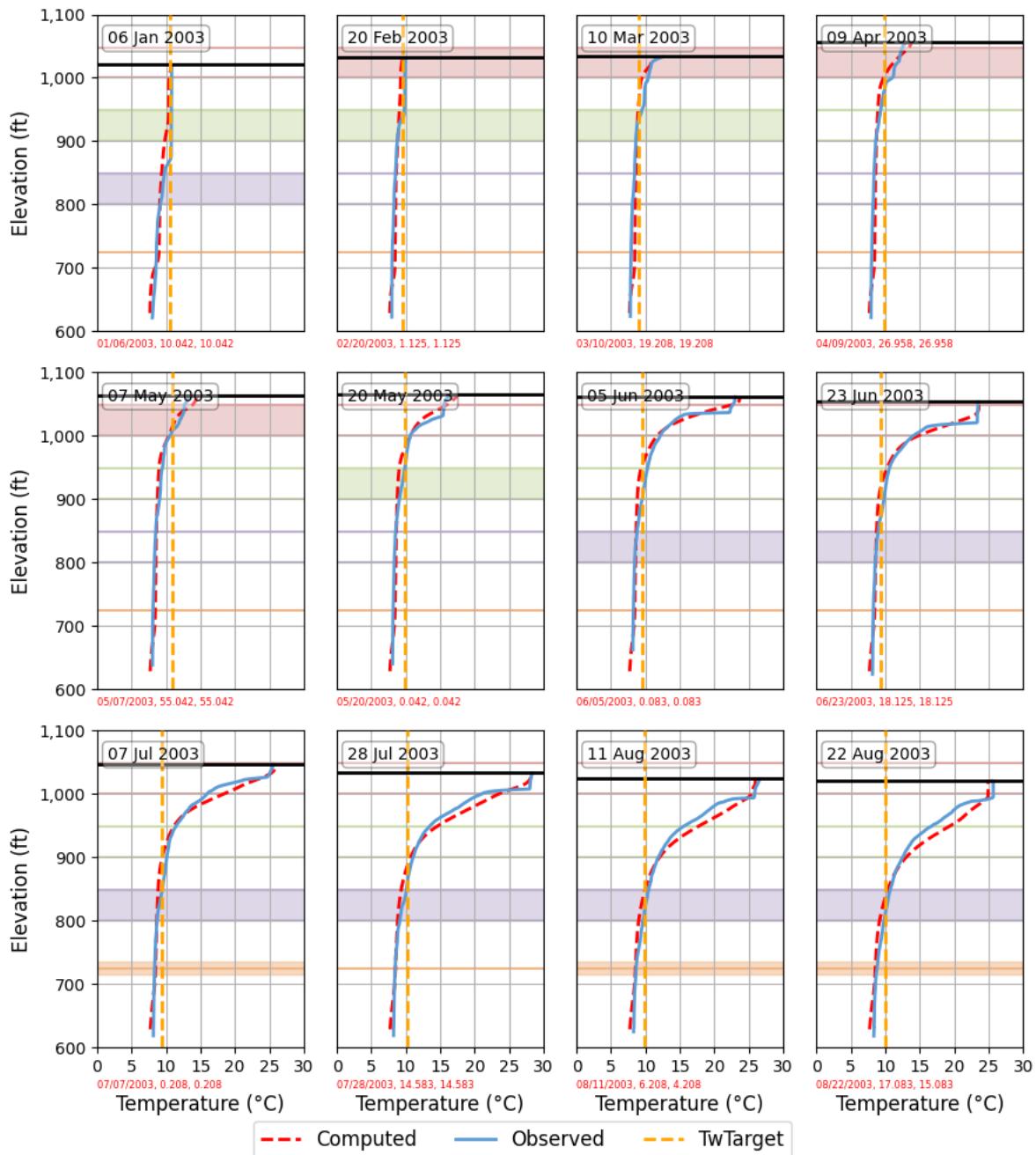


Figure 7. Shasta Lake 2003: 1 of 2

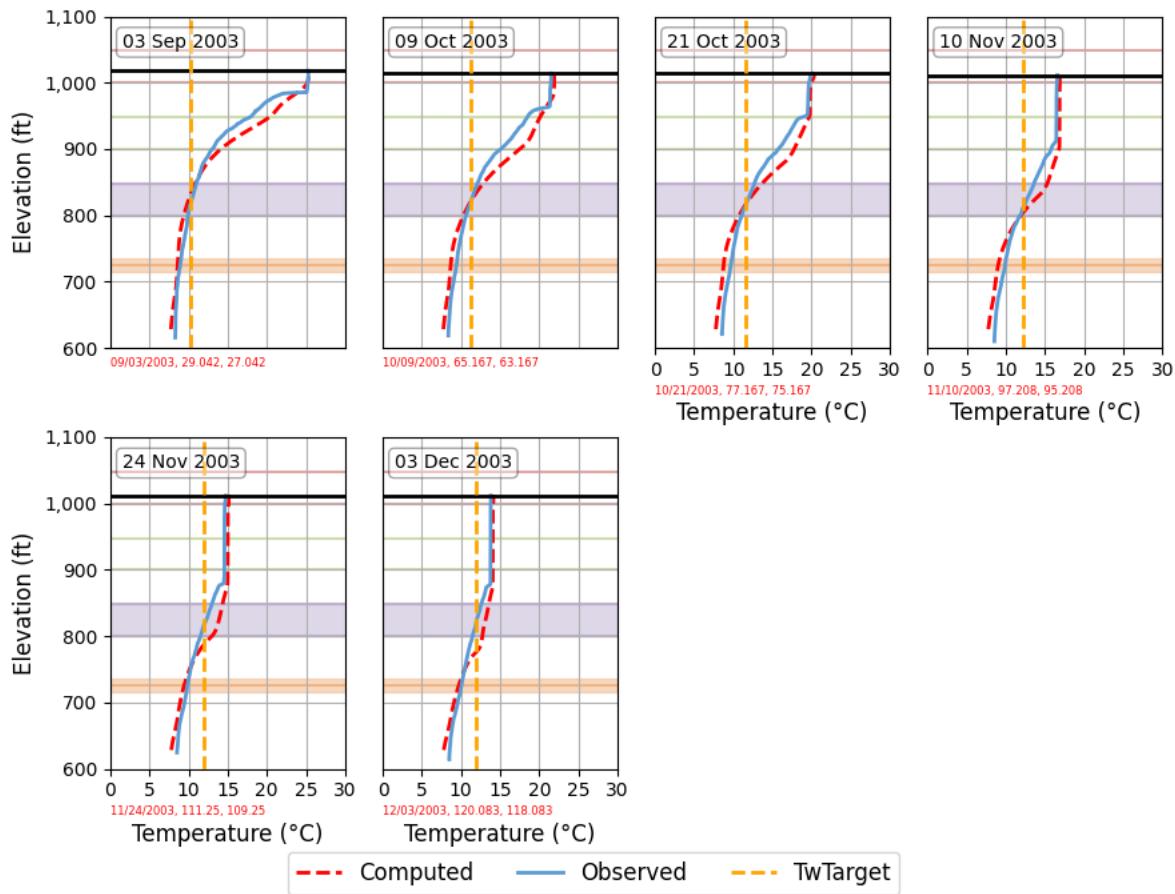


Figure 8. Shasta Lake 2003: 2 of 2

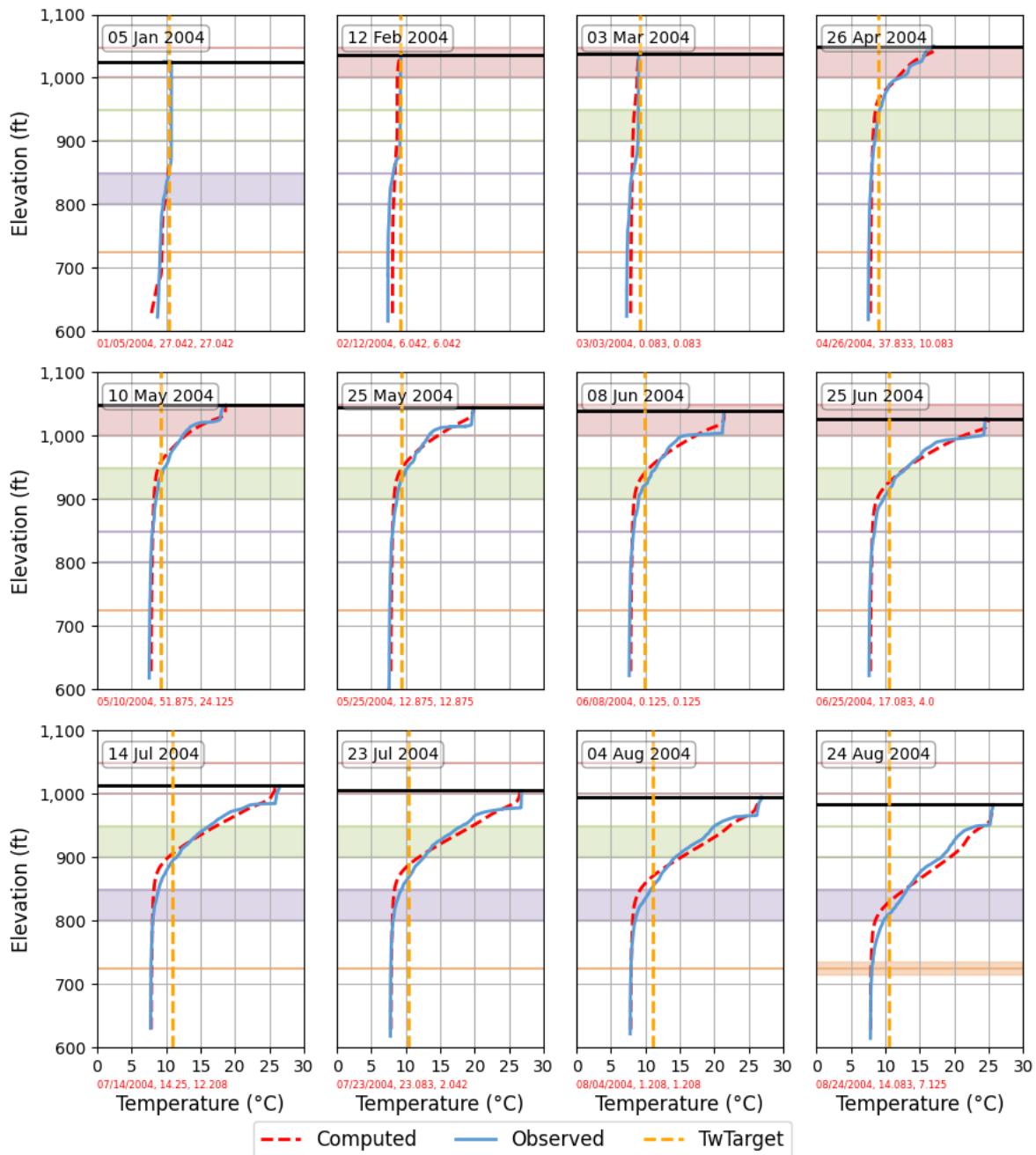


Figure 9. Shasta Lake 2004: 1 of 2

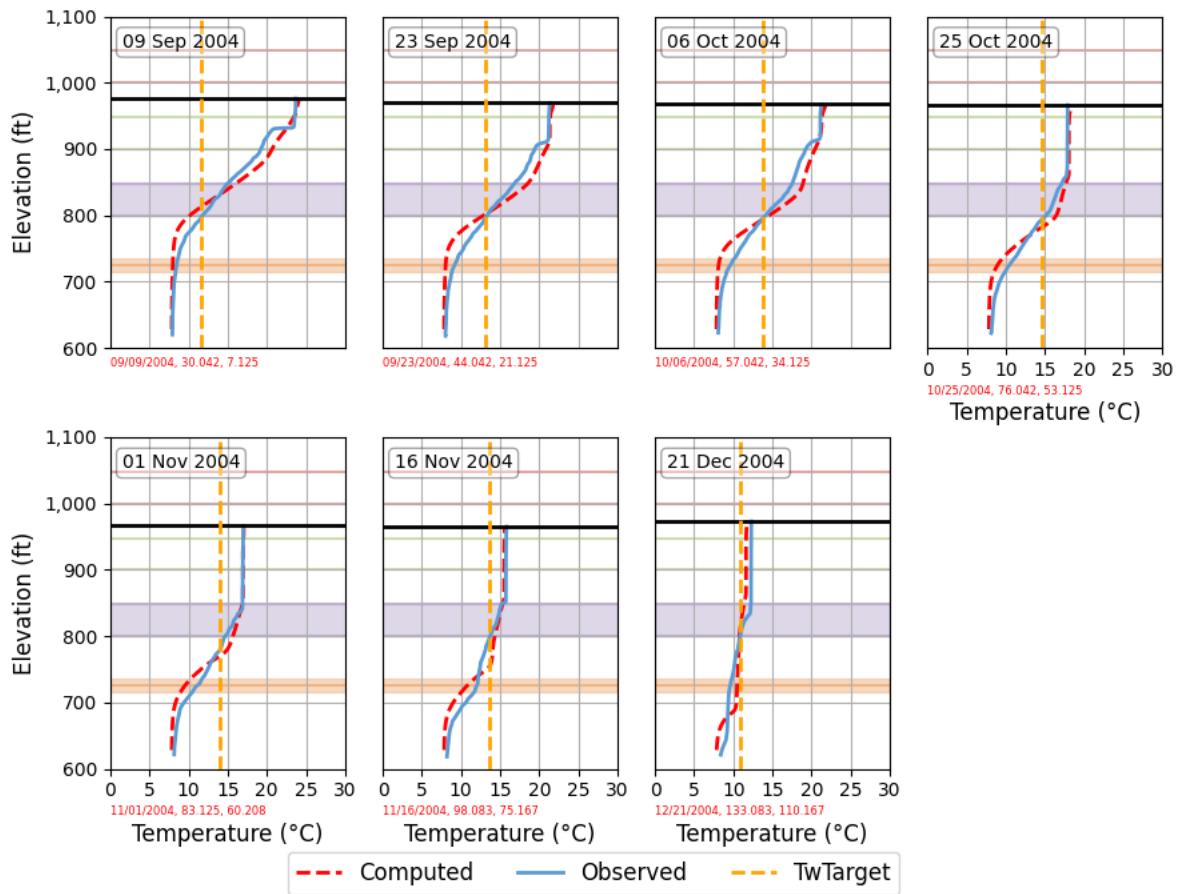


Figure 10. Shasta Lake 2004: 2 of 2

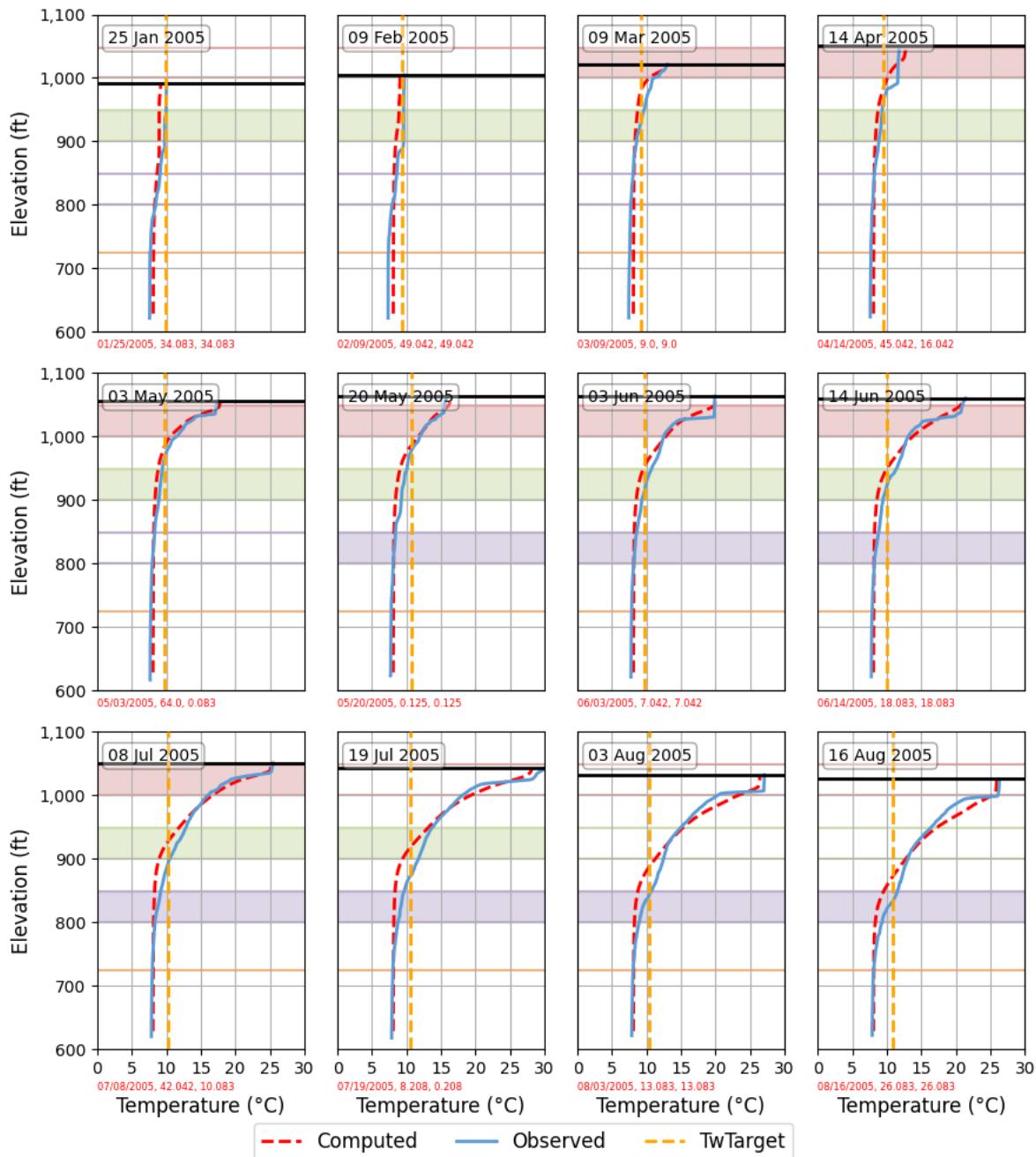


Figure 11. Shasta Lake 2005: 1 of 2

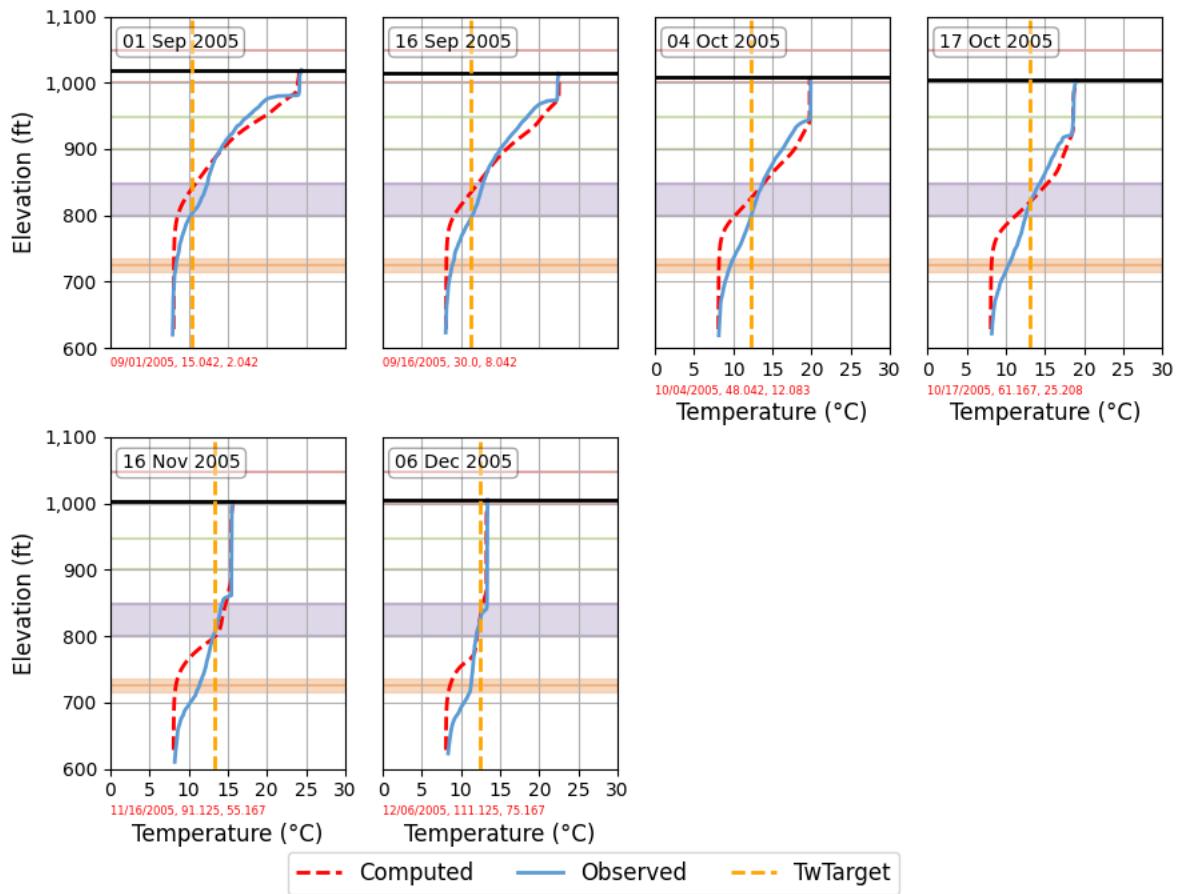


Figure 12. Shasta Lake 2005: 2 of 2

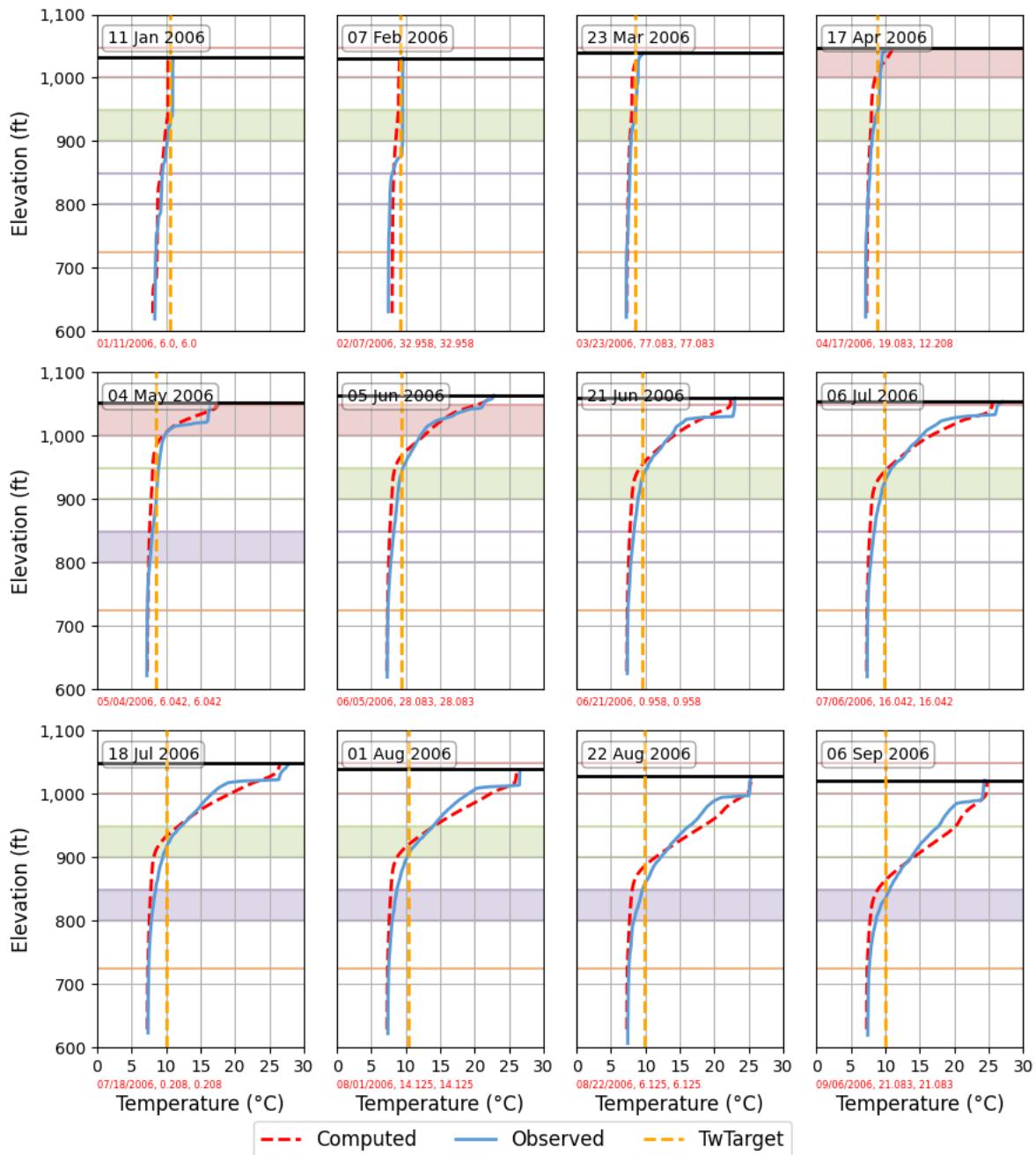


Figure 13. Shasta Lake 2006: 1 of 2

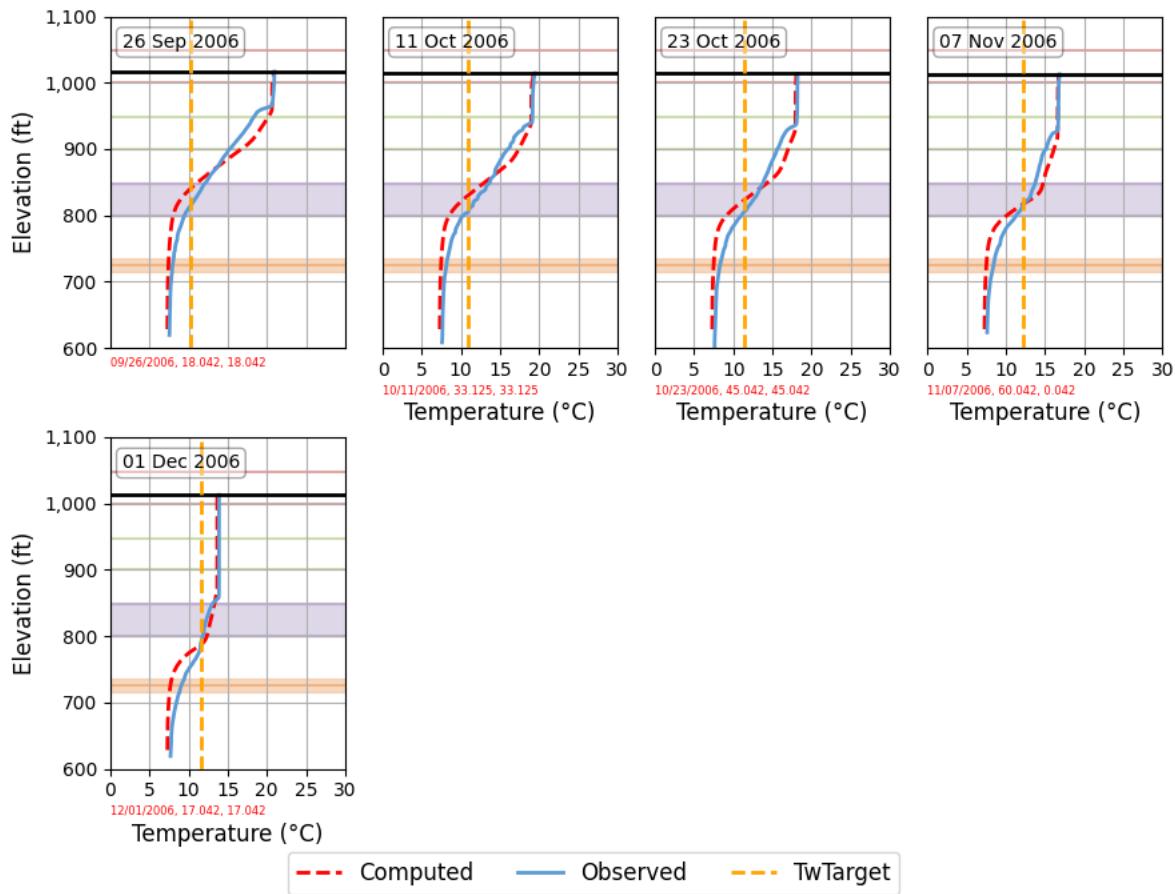


Figure 14. Shasta Lake 2006: 2 of 2

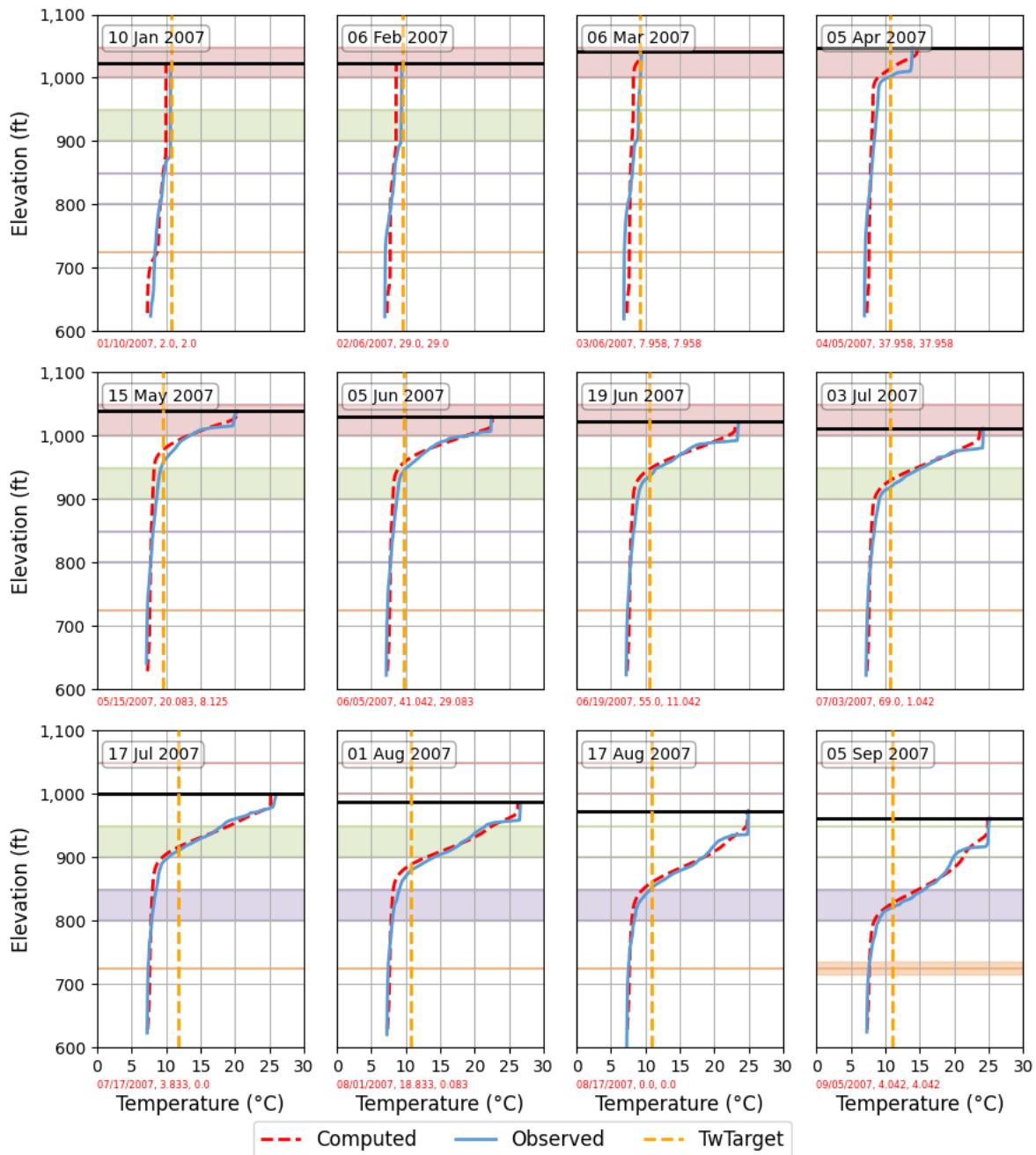


Figure 15. Shasta Lake 2007: 1 of 2

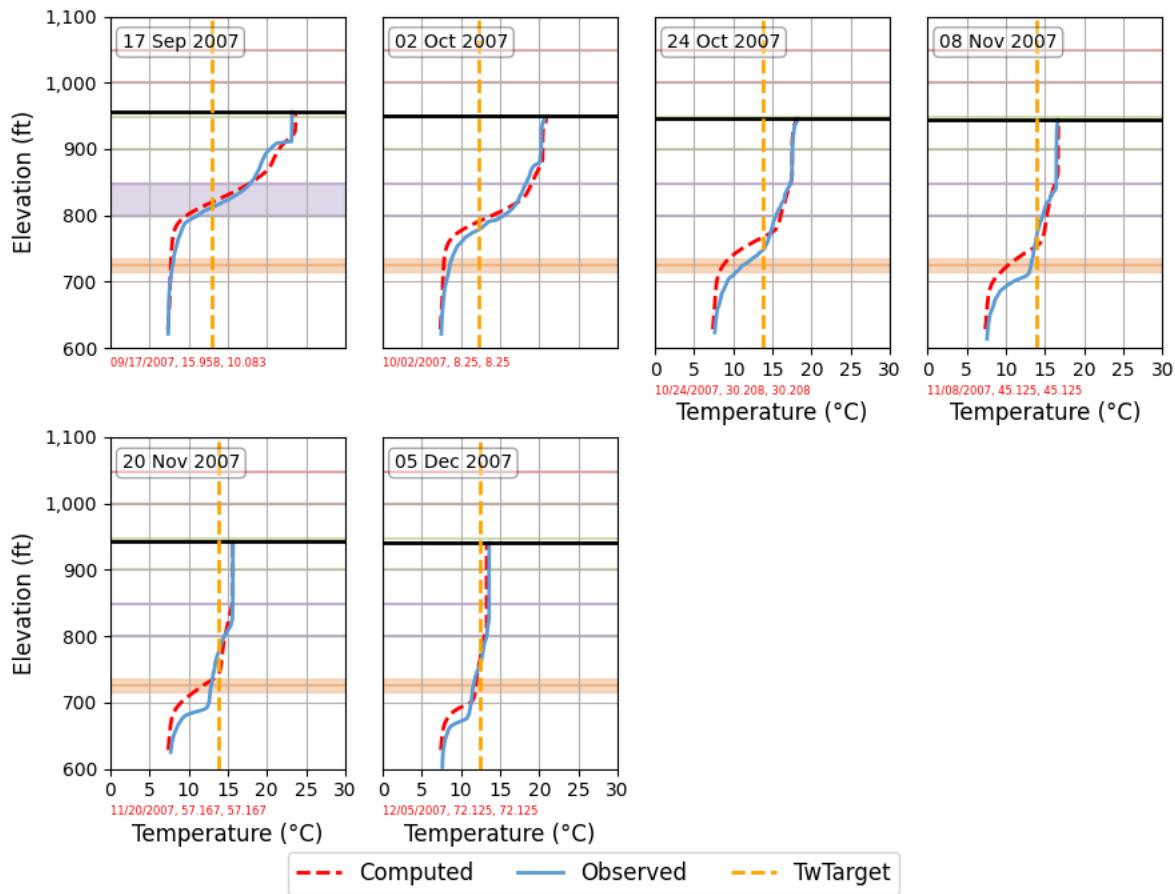


Figure 16. Shasta Lake 2007: 2 of 2

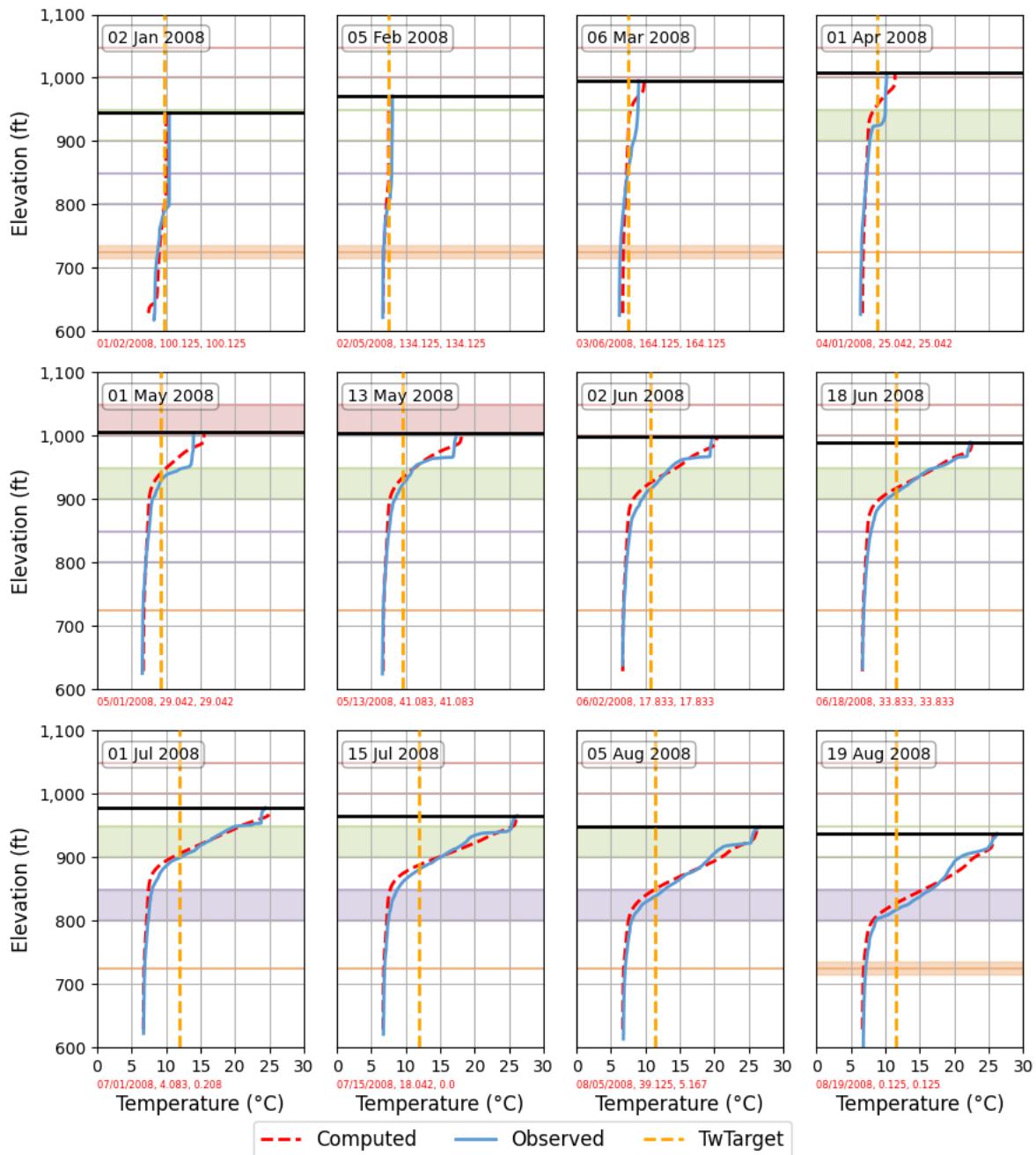


Figure 17. Shasta Lake 2008: 1 of 2

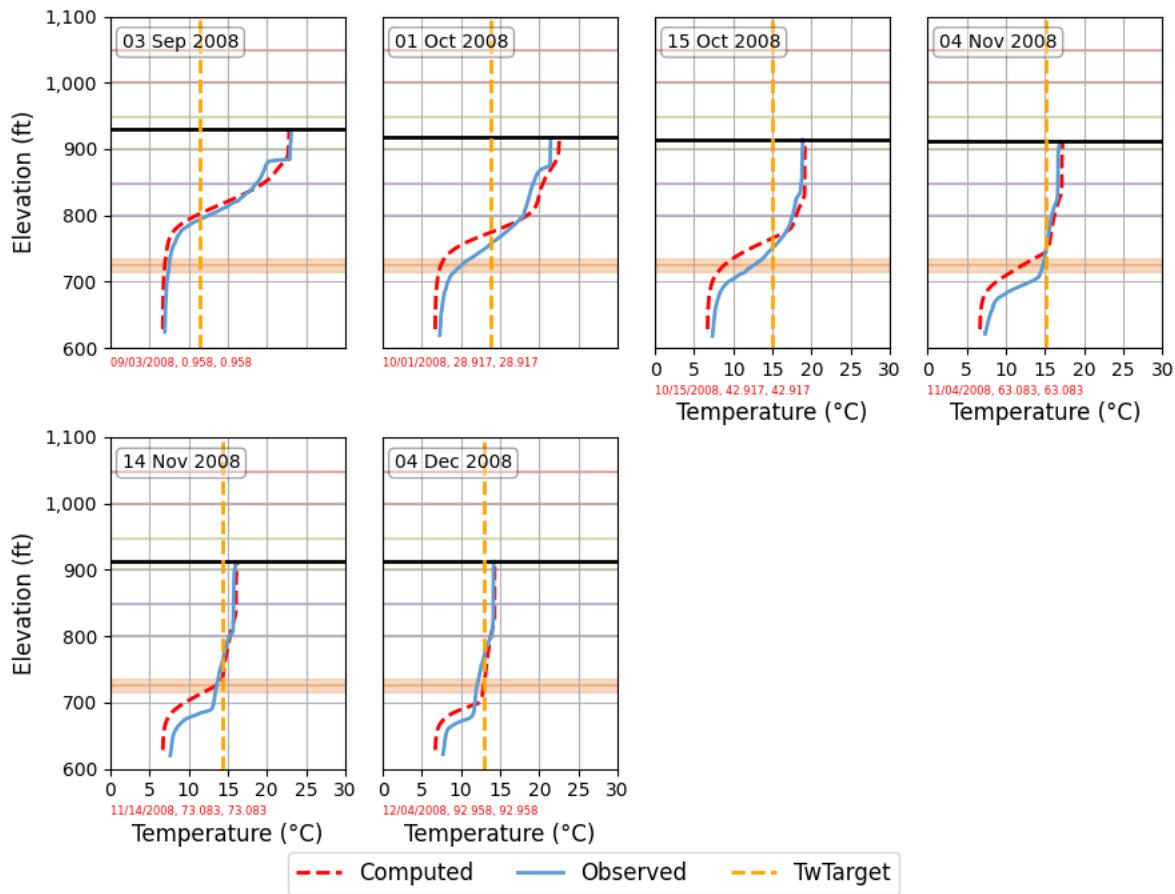


Figure 18. Shasta Lake 2008: 2 of 2

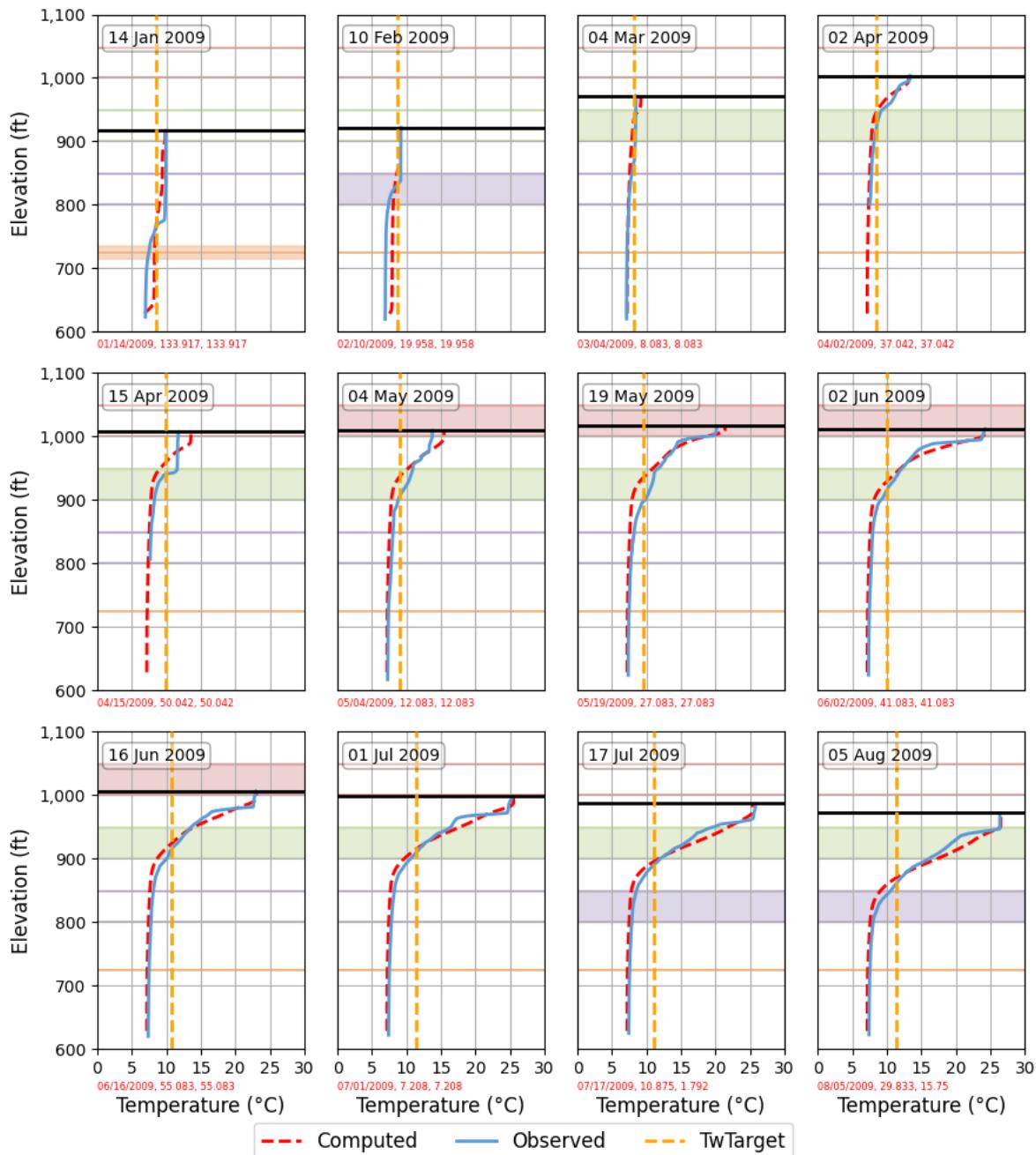


Figure 19. Shasta Lake 2009: 1 of 2

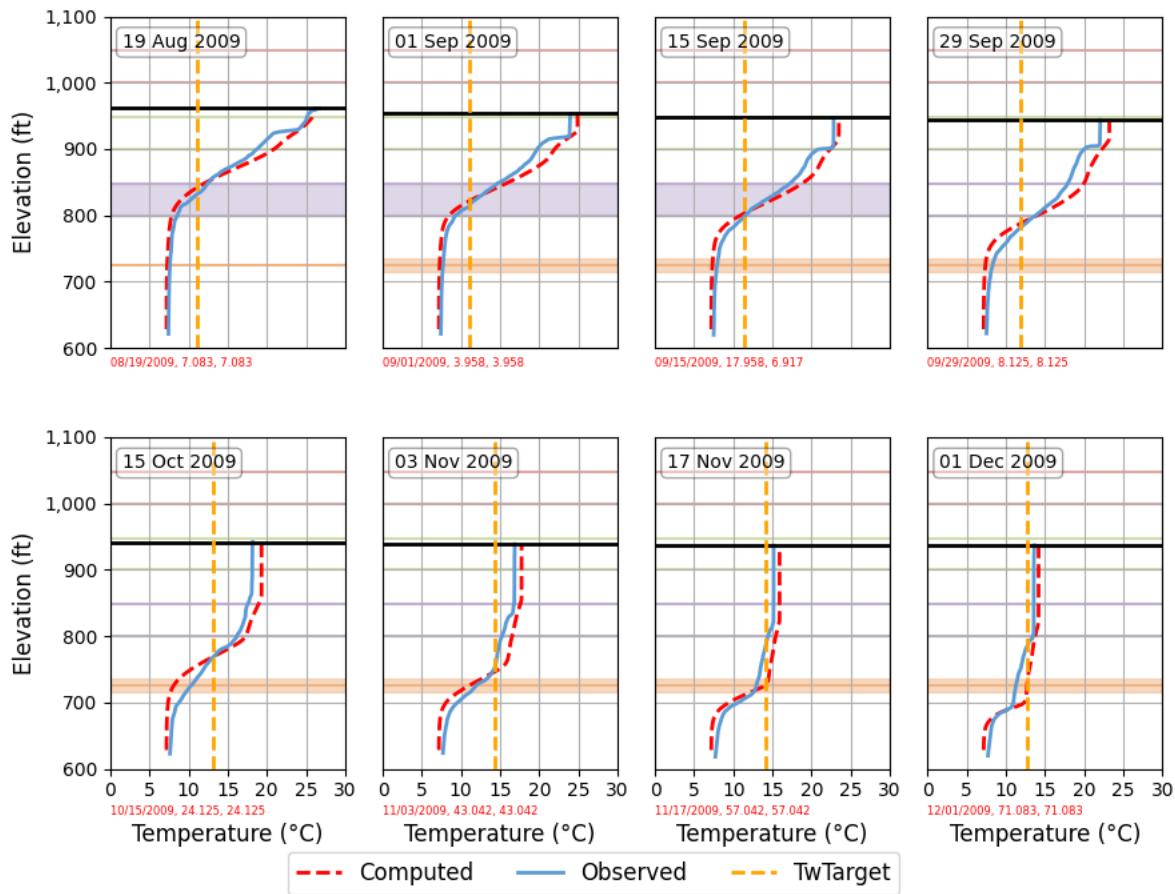


Figure 20. Shasta Lake 2009: 2 of 2

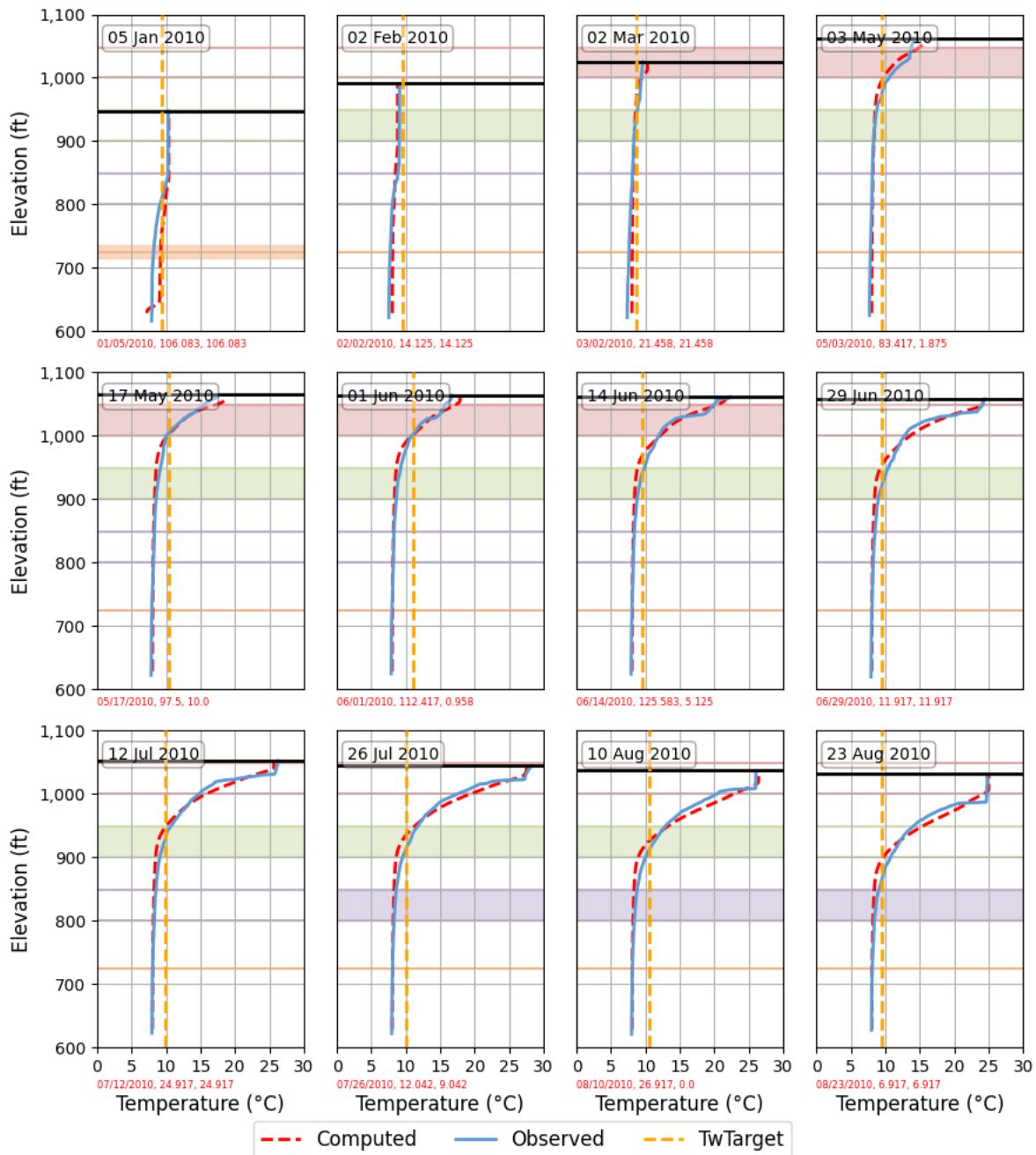


Figure 21. Shasta Lake 2010: 1 of 2

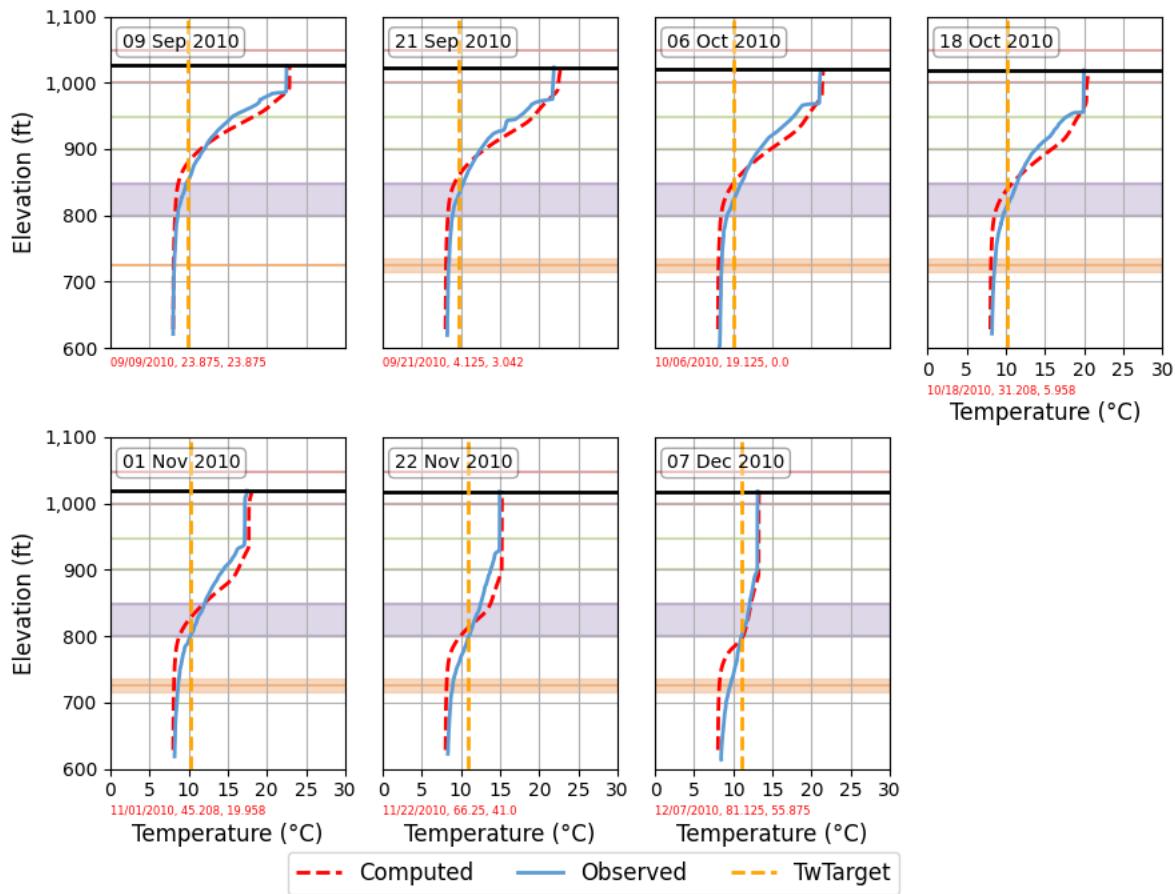


Figure 22. Shasta Lake 2010: 2 of 2

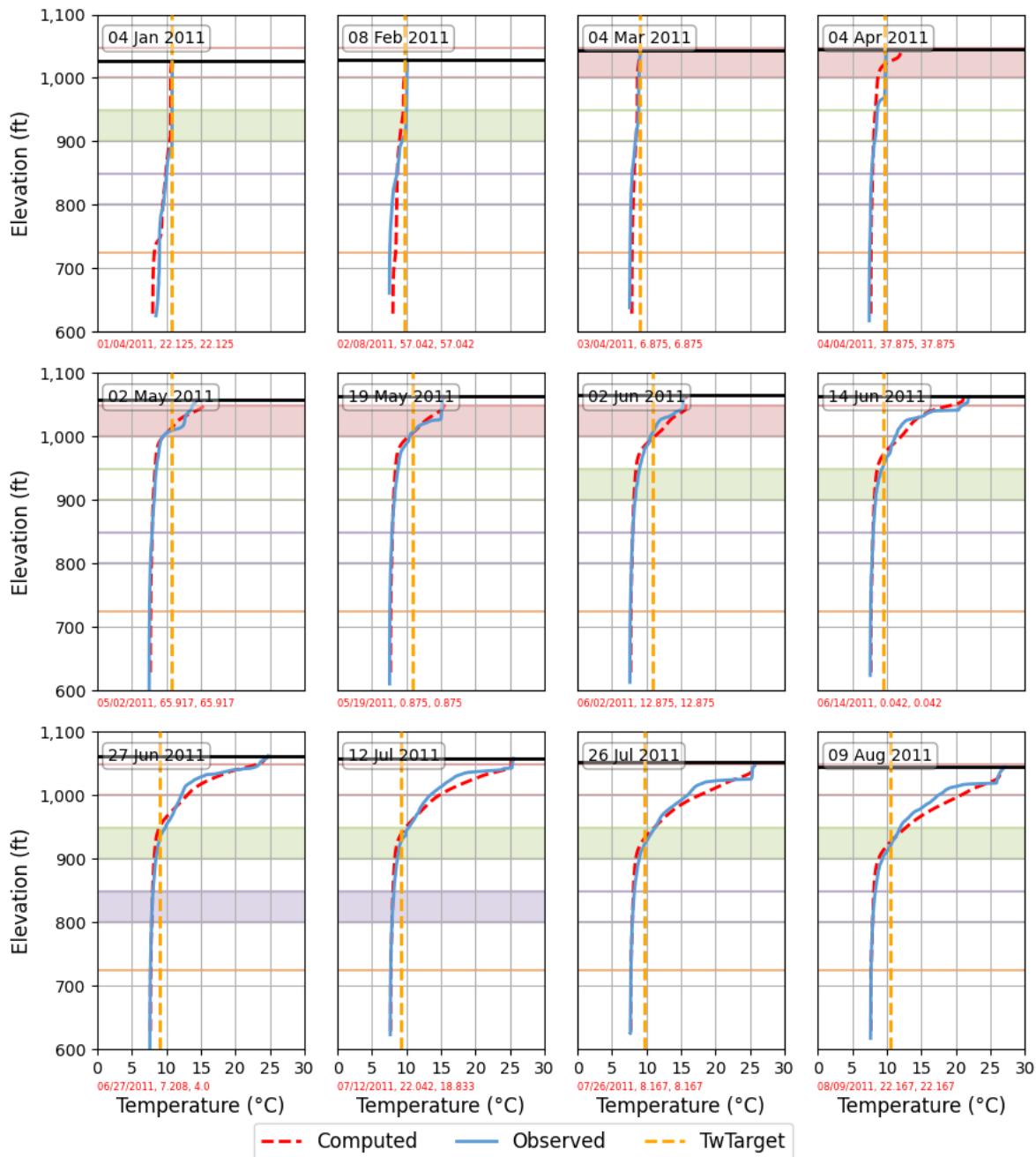


Figure 23. Shasta Lake 2011: 1 of 2

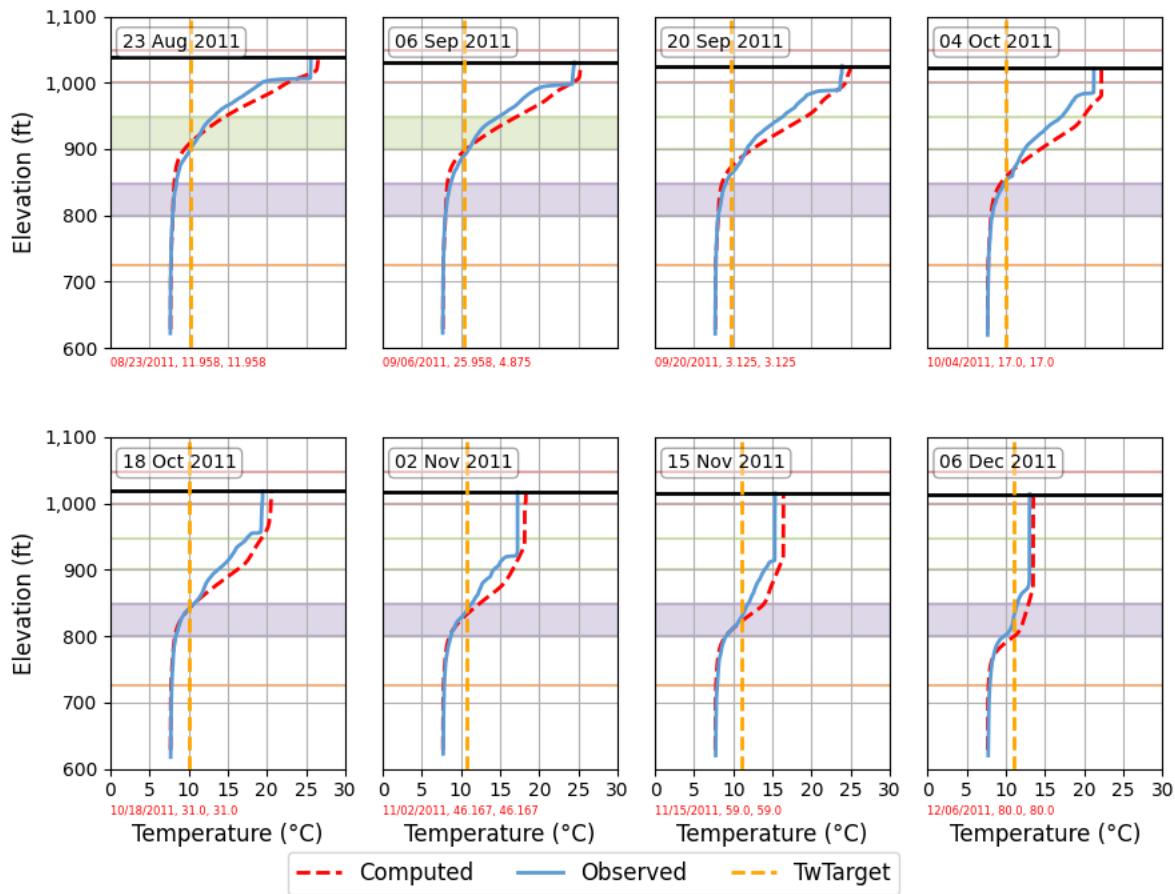


Figure 24. Shasta Lake 2011: 2 of 2

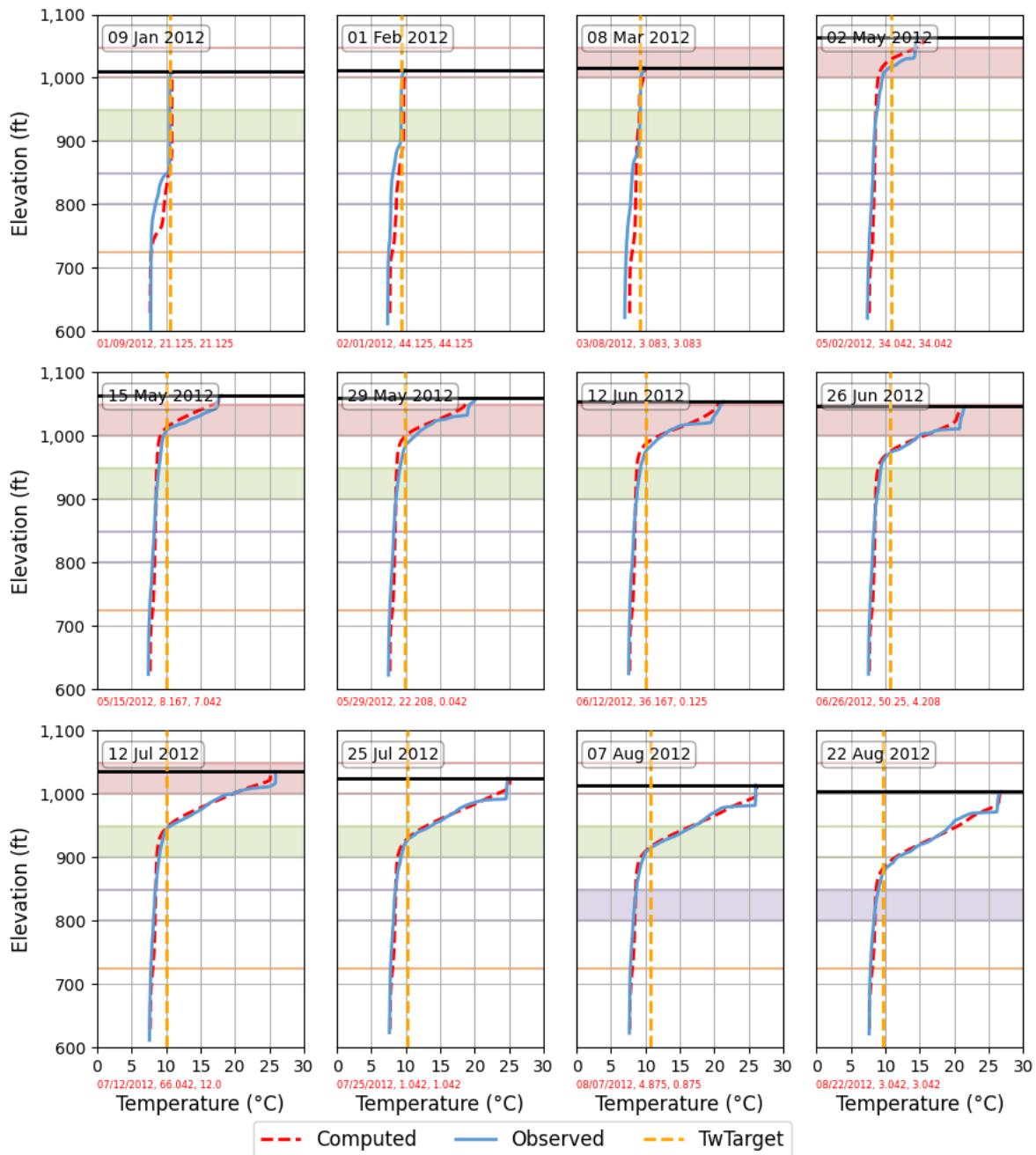


Figure 25. Shasta Lake 2012: 1 of 2

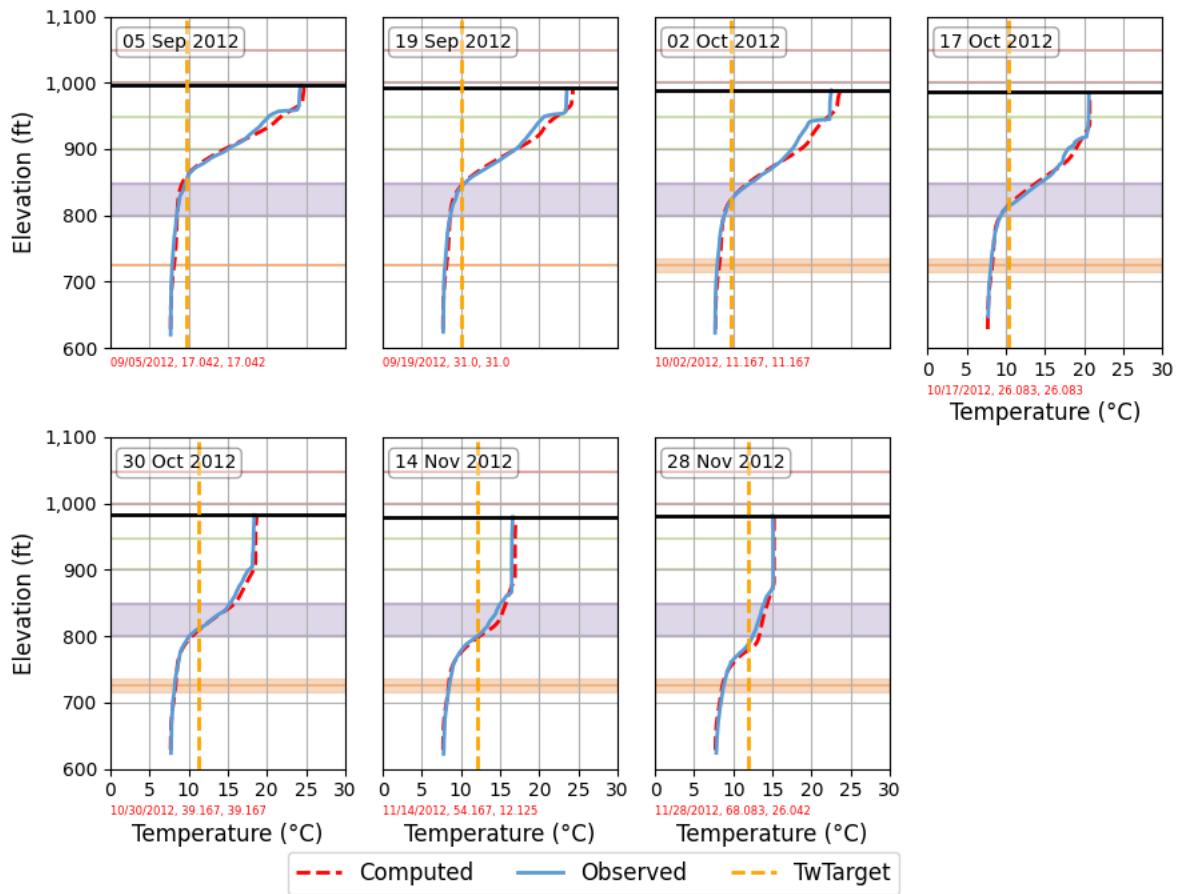


Figure 26. Shasta Lake 2012: 2 of 2

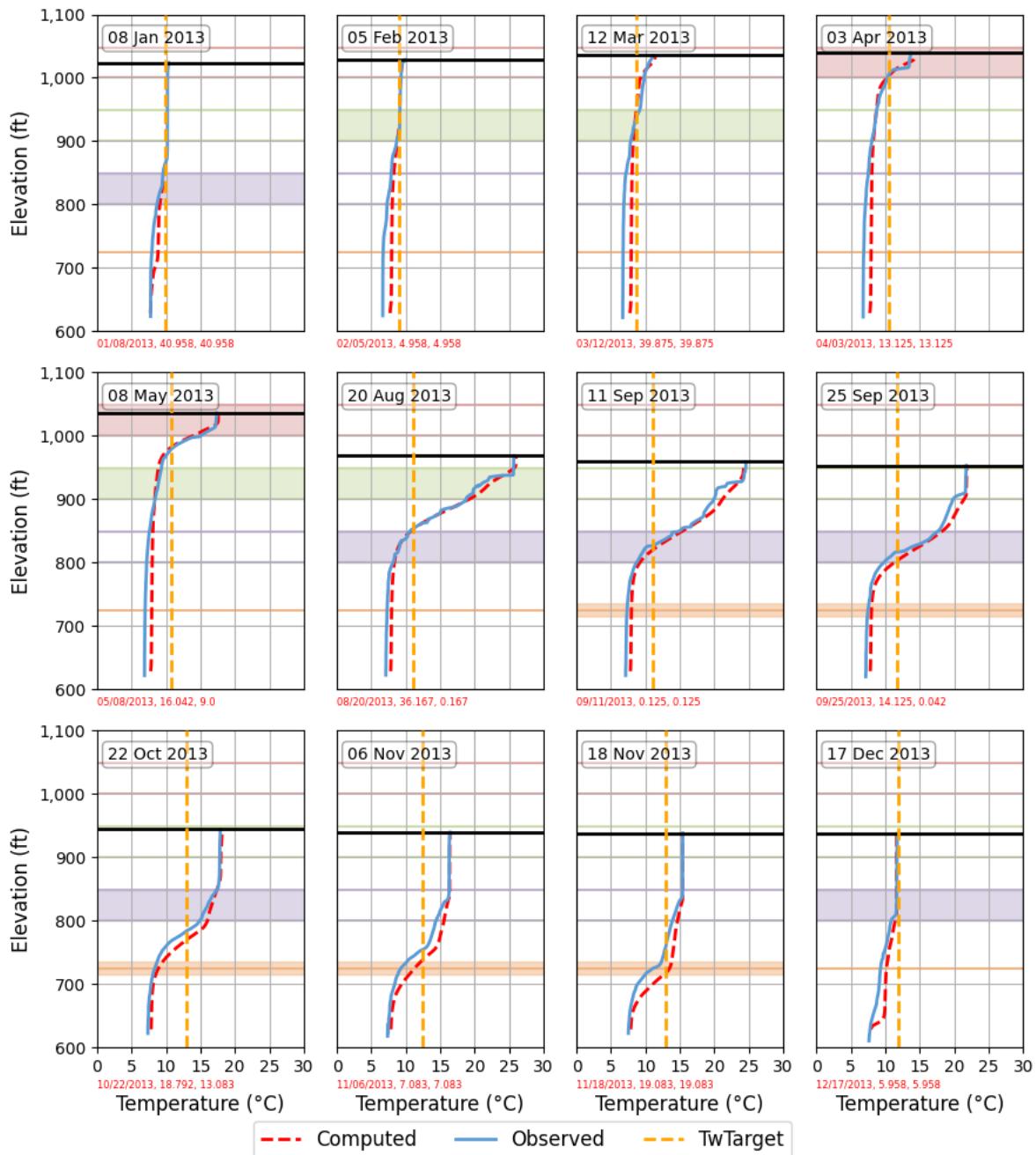


Figure 27. Shasta Lake 2013: 1 of 1

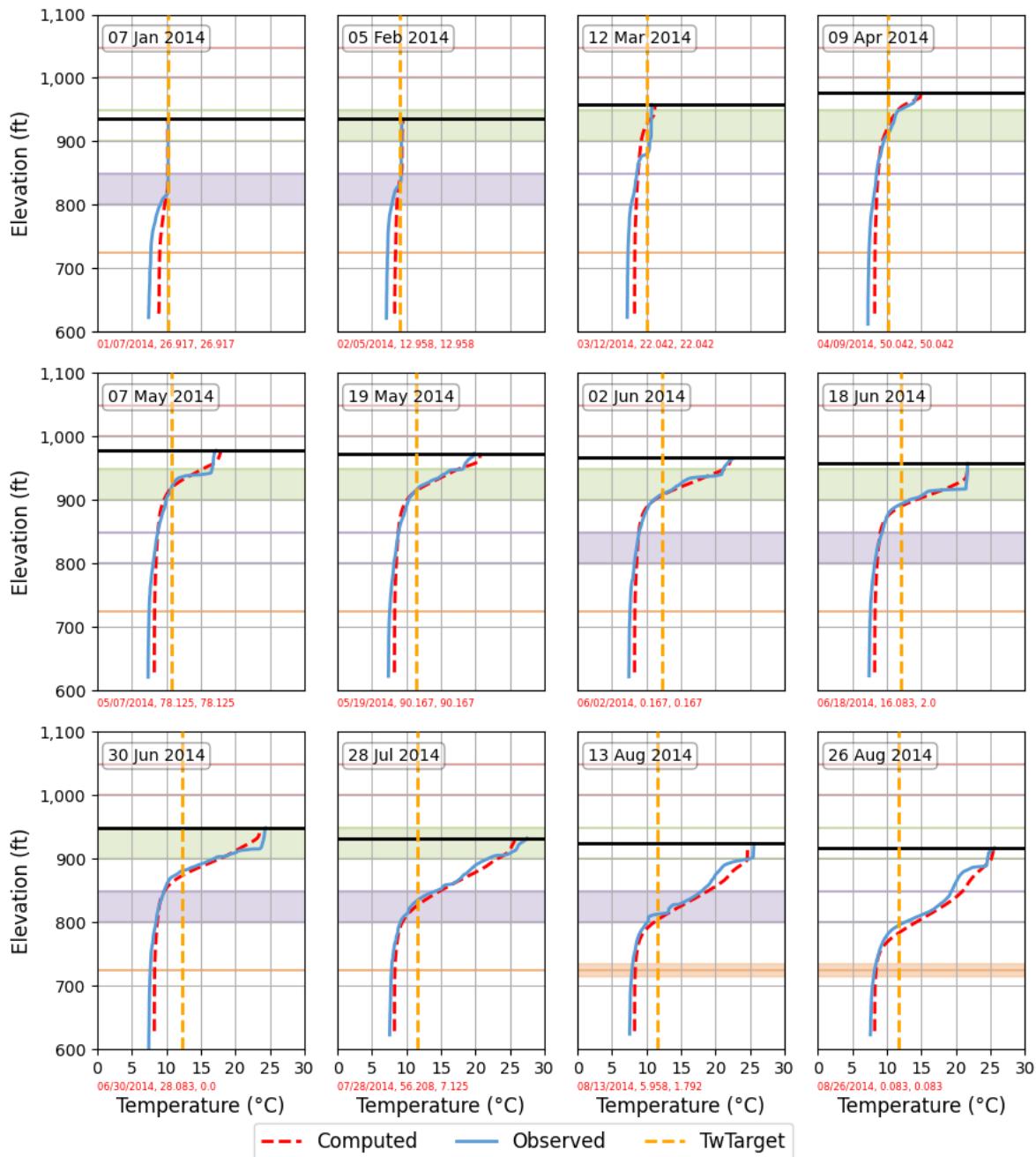


Figure 28. Shasta Lake 2014: 1 of 2

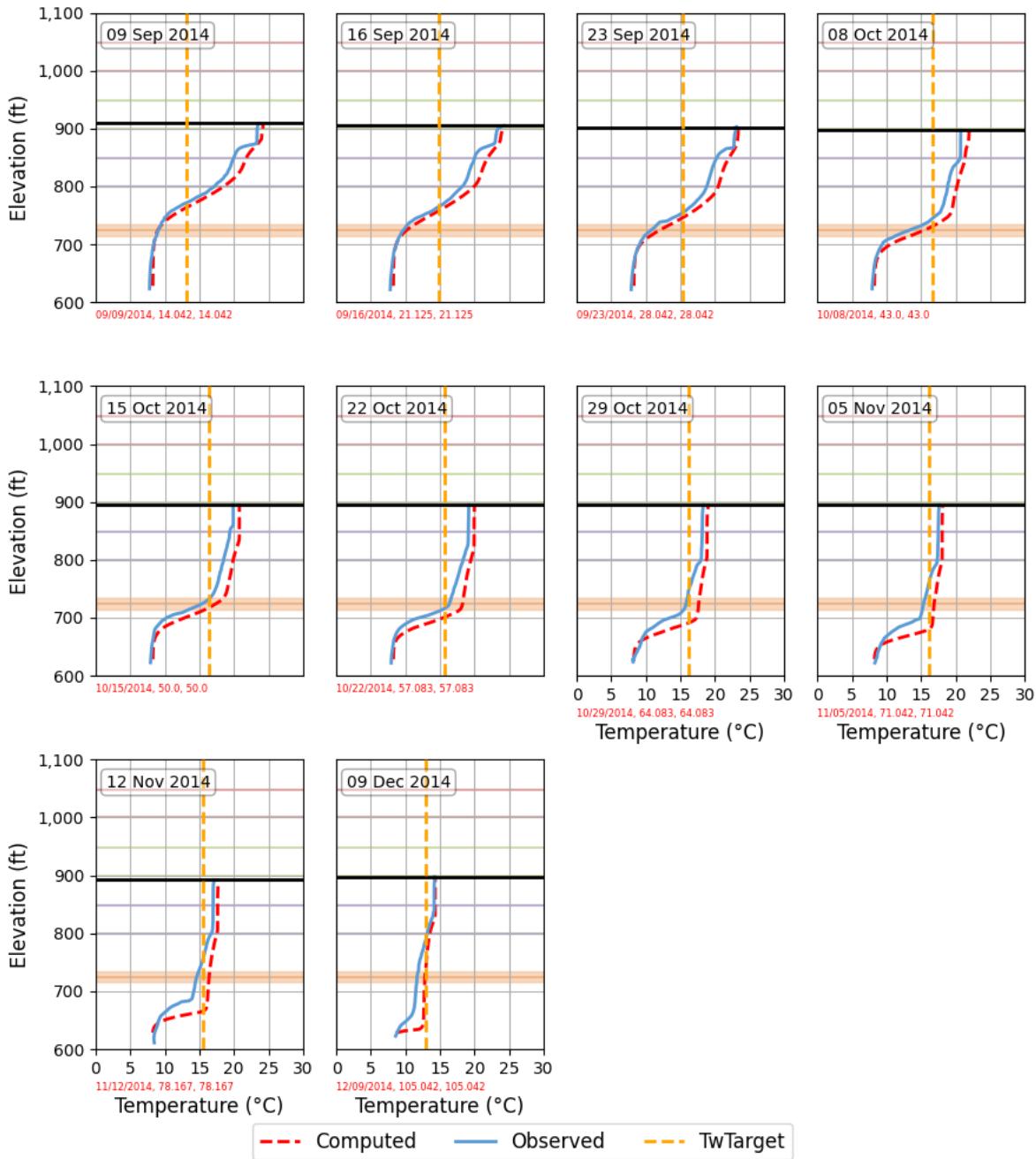


Figure 29. Shasta Lake 2014: 2 of 2

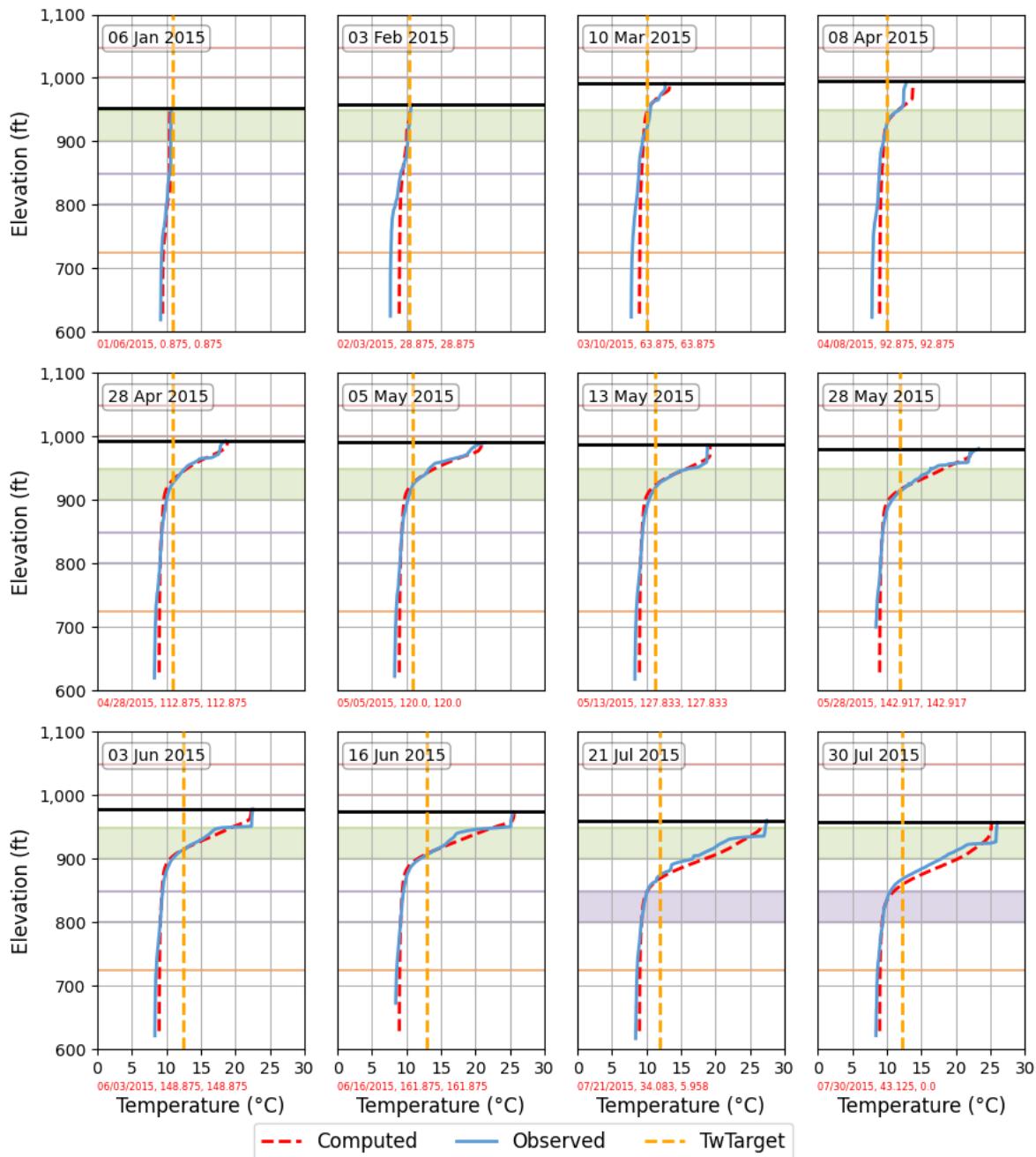


Figure 30. Shasta Lake 2015: 1 of 3

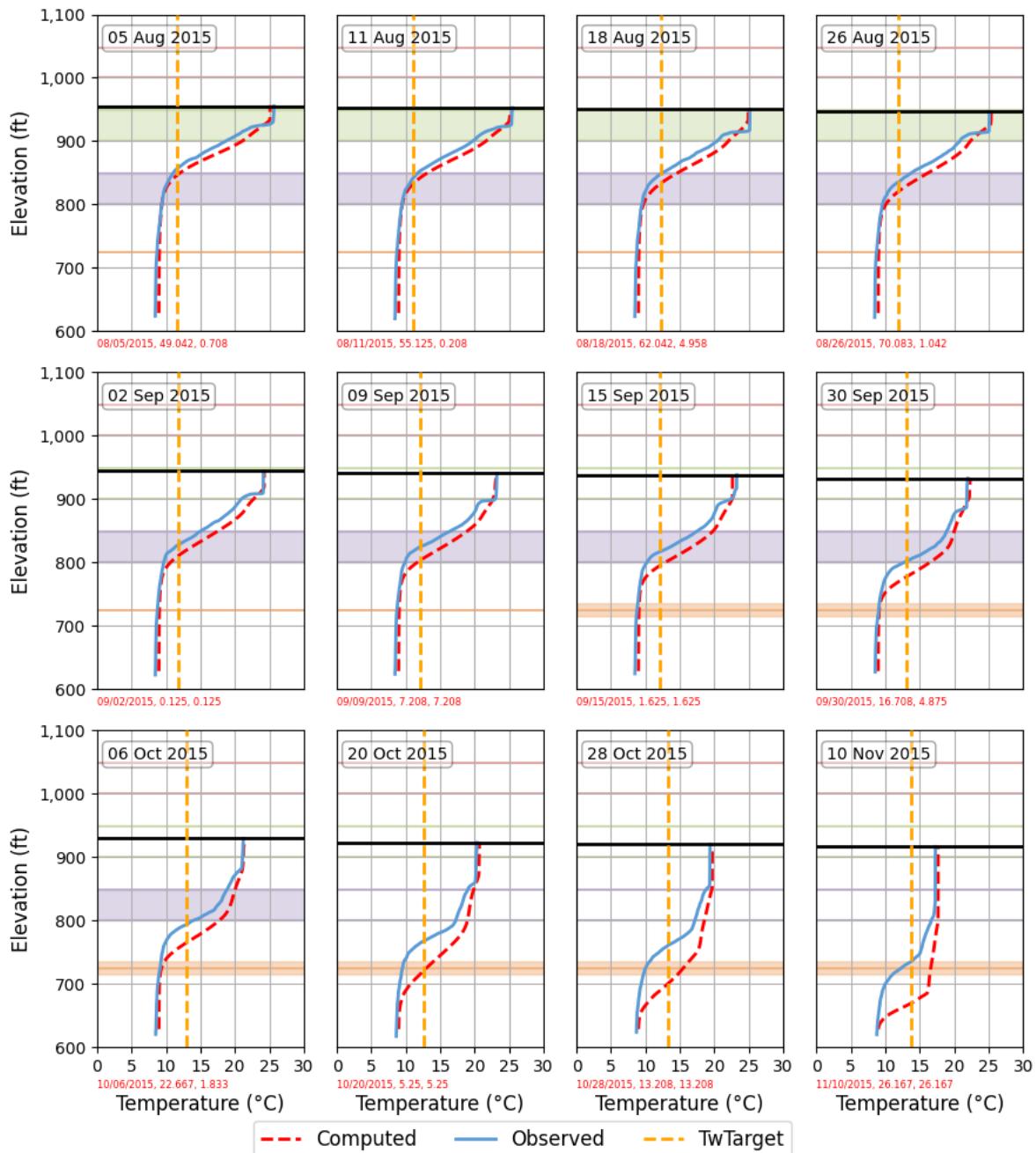


Figure 31. Shasta Lake 2015: 2 of 3

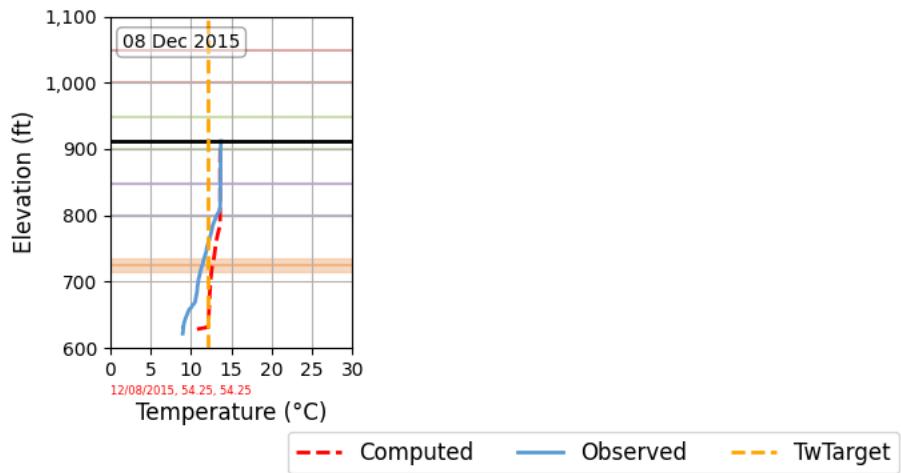


Figure 32. Shasta Lake 2015: 3 of 3

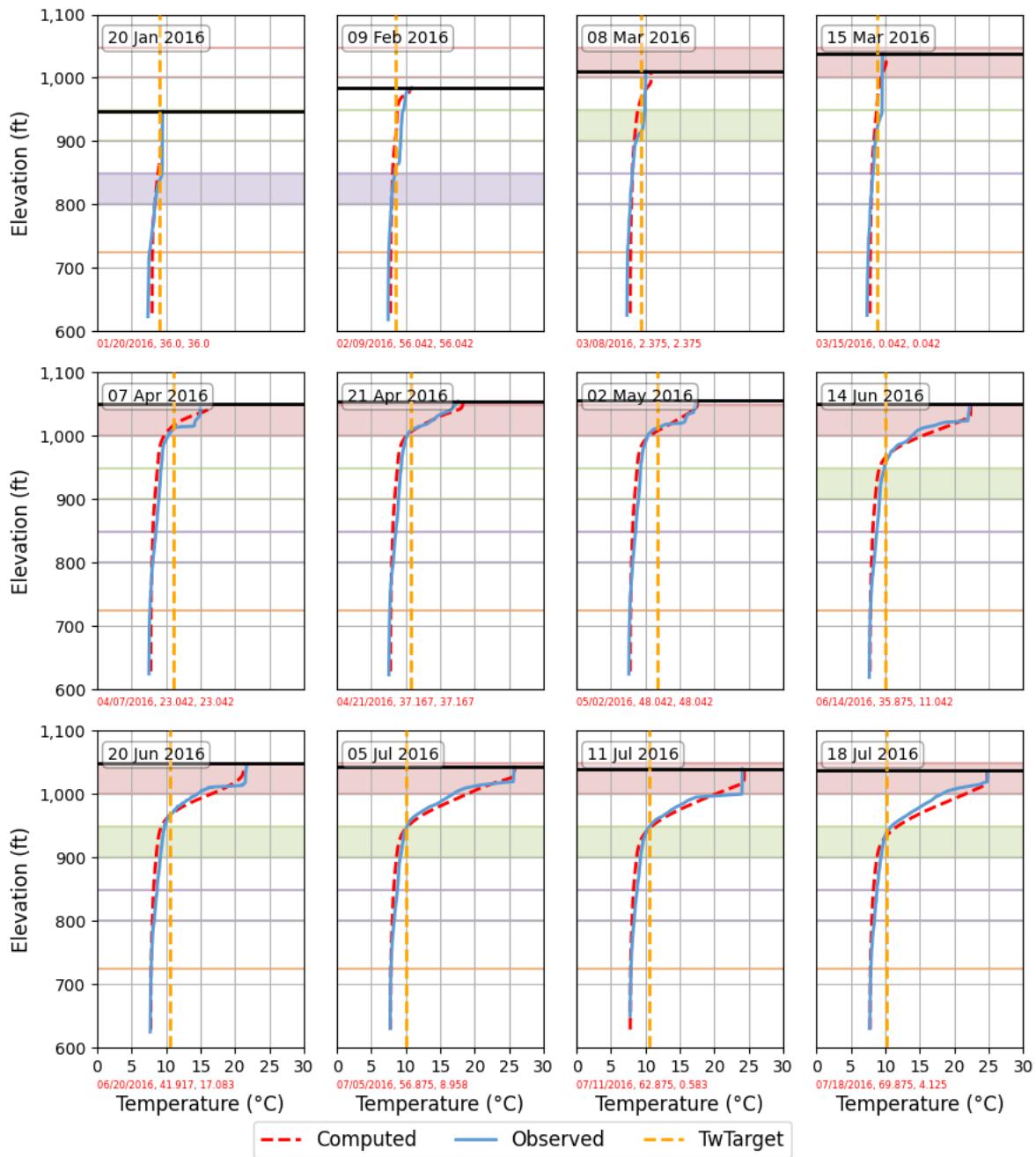


Figure 33. Shasta Lake 2016: 1 of 3

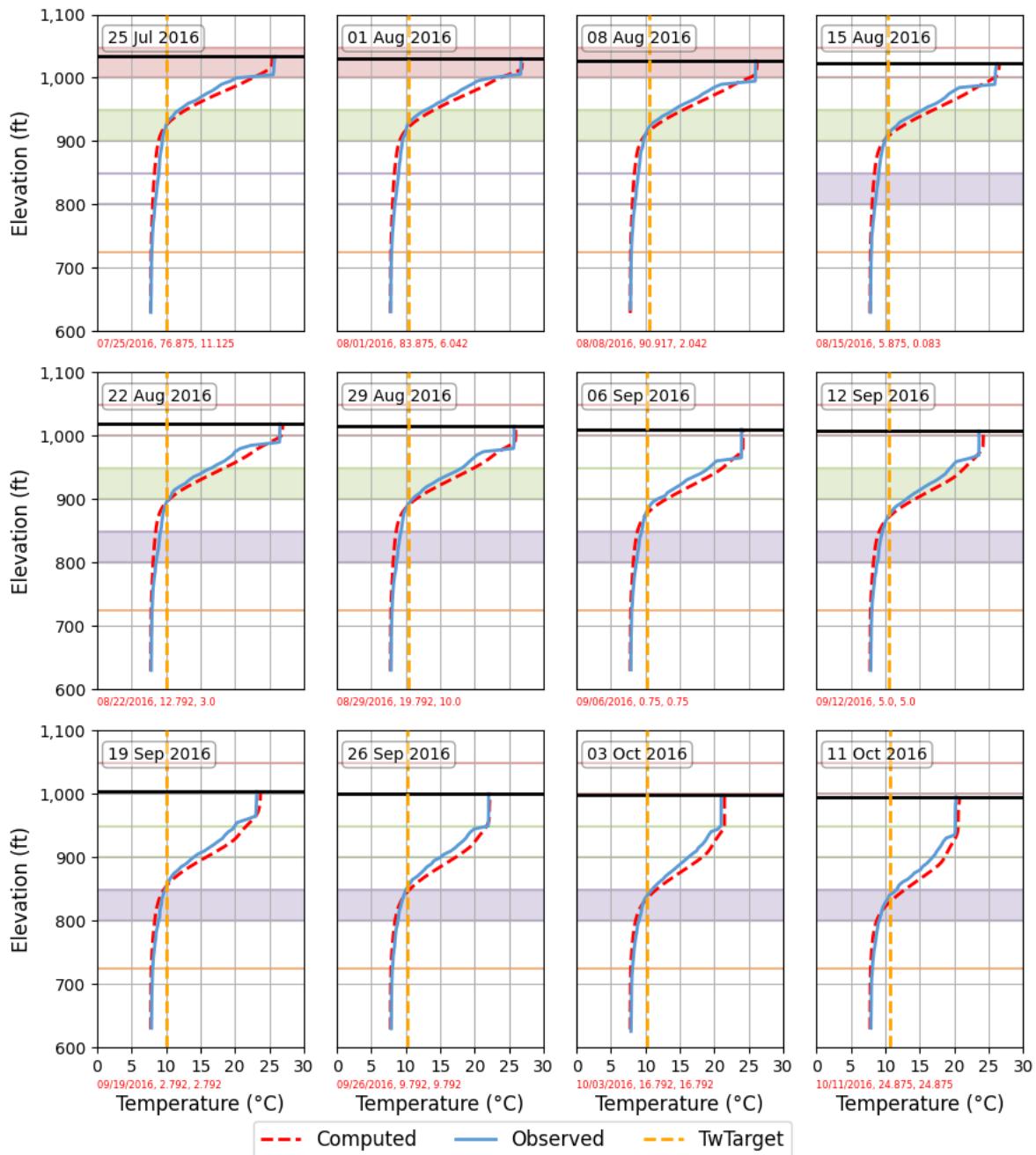


Figure 34. Shasta Lake 2016: 2 of 3

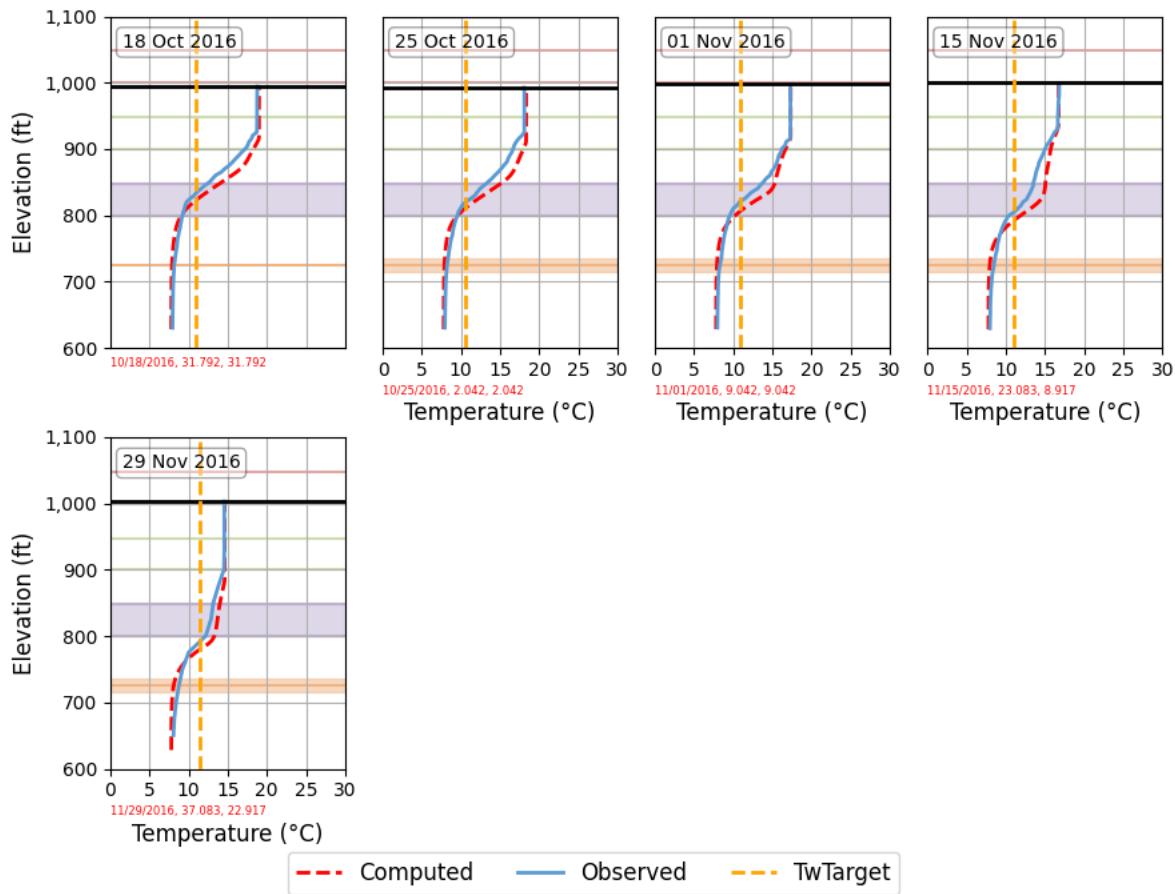
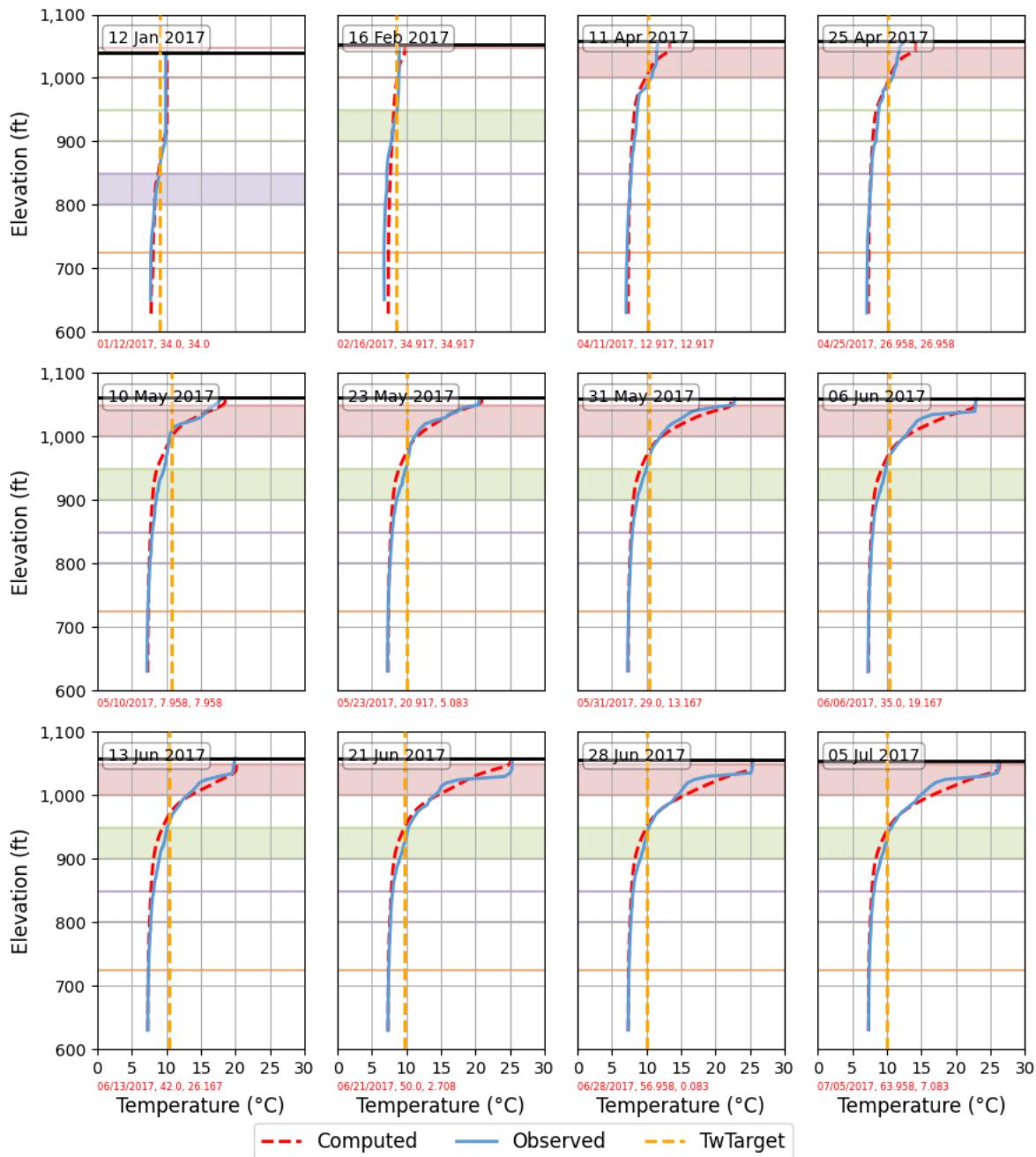


Figure 35. Shasta Lake 2016: 3 of 3



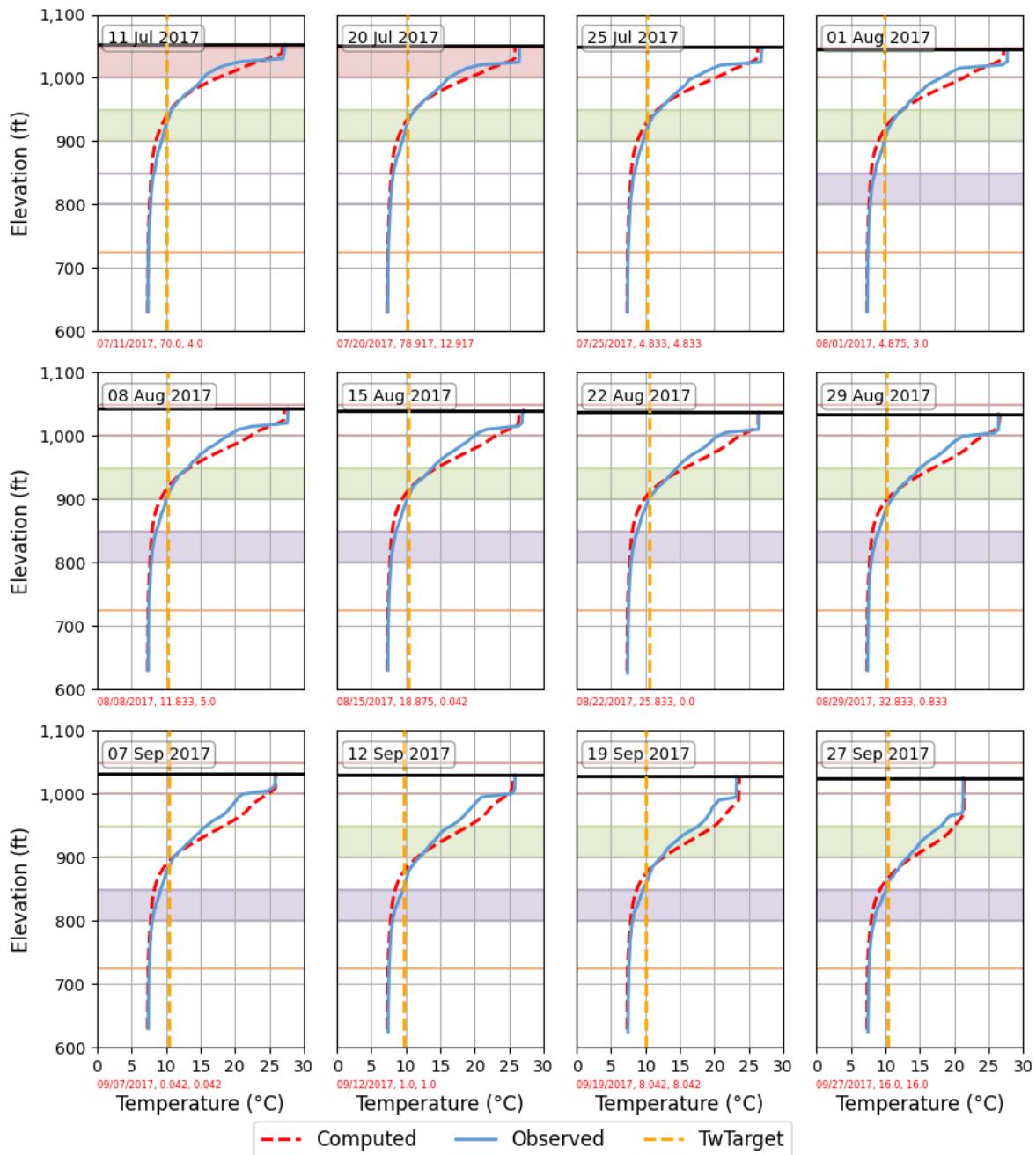


Figure 37. Shasta Lake 2017: 2 of 3

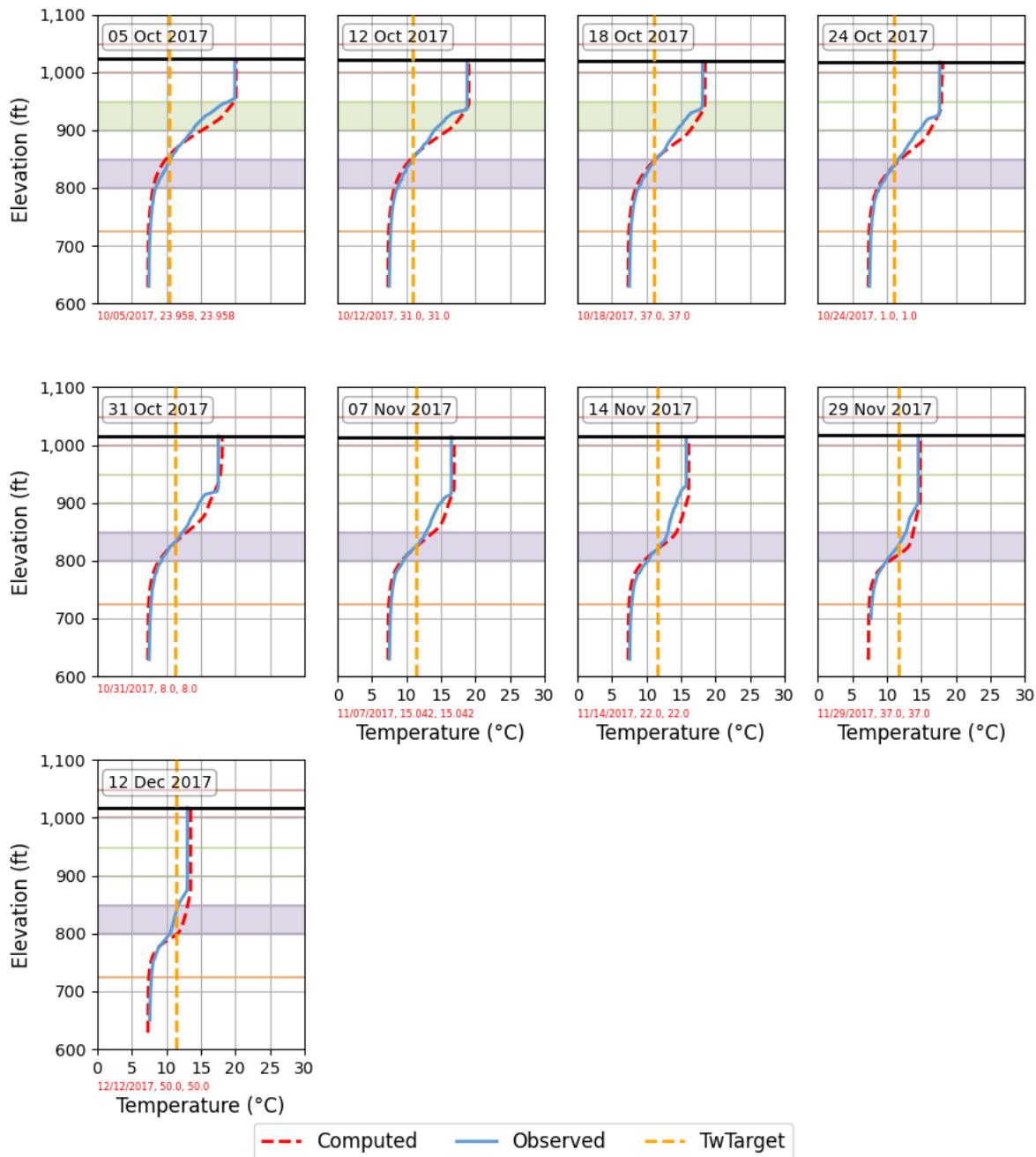


Table 1. Shasta Lake Profile Statistics 2000

Statistics	16Feb2000	23Feb2000	13Mar2000	22Mar2000	14Apr2000	26Apr2000
Mean Bias (°C)	0.42	0.98	0.08	0.62	0.03	0.58
MAE (°C)	0.49	0.98	0.23	0.73	0.35	0.66
RMSE (°C)	0.59	1.11	0.25	0.78	0.40	0.72
Nash-Sutcliffe (NSE)	0.49	-3.29	0.84	0.63	0.94	0.88

Statistics	03May2000	17May2000	06Jun2000	23Jun2000	06Jul2000	26Jul2000
Mean Bias (°C)	0.07	-0.01	-0.16	-0.08	-0.04	0.10
MAE (°C)	0.36	0.32	0.39	0.38	0.28	0.45
RMSE (°C)	0.49	0.37	0.53	0.50	0.38	0.61
Nash-Sutcliffe (NSE)	0.95	0.97	0.97	0.99	0.99	0.99

Statistics	04Aug2000	25Aug2000	12Sep2000	25Sep2000	06Oct2000	24Oct2000
Mean Bias (°C)	0.21	0.30	0.34	0.51	0.76	1.04
MAE (°C)	0.57	0.53	0.50	0.61	0.84	1.07
RMSE (°C)	0.78	0.74	0.67	0.81	0.98	1.22
Nash-Sutcliffe (NSE)	0.98	0.98	0.98	0.97	0.95	0.90

Statistics	15Nov2000	27Nov2000	19Dec2000
Mean Bias (°C)	1.14	1.38	0.86
MAE (°C)	1.15	1.38	1.05
RMSE (°C)	1.51	1.85	1.32
Nash-Sutcliffe (NSE)	0.68	0.22	0.21

Table 2. Shasta Lake Profile Statistics 2001

Statistics	10May2001	23May2001	12Jun2001	25Jun2001	11Jul2001	24Jul2001
Mean Bias (°C)	-0.44	-0.21	-0.22	-0.18	-0.16	-0.14
MAE (°C)	0.62	0.39	0.39	0.37	0.37	0.40
RMSE (°C)	1.17	0.57	0.61	0.54	0.48	0.55
Nash-Sutcliffe (NSE)	0.86	0.97	0.98	0.99	0.99	0.99

Statistics	09Aug2001	21Aug2001	04Sep2001	18Sep2001	03Oct2001	19Oct2001
Mean Bias (°C)	-0.03	0.02	0.16	0.16	0.25	0.34
MAE (°C)	0.47	0.53	0.54	0.53	0.64	0.71
RMSE (°C)	0.64	0.75	0.76	0.75	0.81	0.84
Nash-Sutcliffe (NSE)	0.99	0.98	0.98	0.98	0.98	0.97

Statistics	08Nov2001	20Nov2001	21Dec2001
Mean Bias (°C)	0.30	0.24	-0.20
MAE (°C)	0.81	0.80	0.56
RMSE (°C)	0.90	0.93	0.65
Nash-Sutcliffe (NSE)	0.94	0.90	0.69

Table 3. Shasta Lake Profile Statistics 2002

Statistics	24Jan2002	22Feb2002	19Mar2002	24Apr2002	13May2002	30May2002
Mean Bias (°C)	-0.29	0.06	0.04	-0.23	-0.15	-0.20
MAE (°C)	0.29	0.45	0.41	0.58	0.37	0.41
RMSE (°C)	0.41	0.50	0.47	1.04	0.53	0.53
Nash-Sutcliffe (NSE)	0.51	0.67	0.72	0.82	0.96	0.97

Statistics	12Jun2002	24Jun2002	16Jul2002	29Jul2002	13Aug2002	28Aug2002
Mean Bias (°C)	-0.27	-0.26	-0.19	-0.15	-0.09	-0.10
MAE (°C)	0.44	0.43	0.42	0.46	0.41	0.39
RMSE (°C)	0.63	0.65	0.59	0.65	0.56	0.52
Nash-Sutcliffe (NSE)	0.97	0.98	0.99	0.99	0.99	0.99

Statistics	09Sep2002	23Sep2002	08Oct2002	23Oct2002	14Nov2002	26Nov2002
Mean Bias (°C)	-0.11	-0.08	-0.10	-0.02	-0.14	-0.16
MAE (°C)	0.40	0.41	0.34	0.28	0.32	0.43
RMSE (°C)	0.54	0.53	0.41	0.37	0.43	0.53
Nash-Sutcliffe (NSE)	0.99	0.99	0.99	0.99	0.98	0.97

Table 4. Shasta Lake Profile Statistics 2003

Statistics	06Jan2003	20Feb2003	10Mar2003	09Apr2003	07May2003	20May2003
Mean Bias (°C)	-0.31	-0.04	0.07	0.00	-0.02	-0.15
MAE (°C)	0.44	0.31	0.36	0.35	0.29	0.36
RMSE (°C)	0.50	0.37	0.43	0.43	0.37	0.52
Nash-Sutcliffe (NSE)	0.76	0.72	0.76	0.88	0.93	0.94

Statistics	05Jun2003	23Jun2003	07Jul2003	28Jul2003	11Aug2003	22Aug2003
Mean Bias (°C)	-0.19	-0.16	0.03	0.06	0.13	0.18
MAE (°C)	0.43	0.35	0.48	0.56	0.70	0.80
RMSE (°C)	0.62	0.51	0.79	0.85	1.01	1.11
Nash-Sutcliffe (NSE)	0.97	0.98	0.96	0.97	0.96	0.95

Statistics	03Sep2003	09Oct2003	21Oct2003	10Nov2003	24Nov2003	03Dec2003
Mean Bias (°C)	0.26	0.32	0.18	0.15	0.34	0.26
MAE (°C)	0.79	0.90	0.89	0.73	0.66	0.55
RMSE (°C)	1.12	1.14	1.07	0.84	0.80	0.65
Nash-Sutcliffe (NSE)	0.95	0.93	0.92	0.92	0.88	0.88

Table 5. Shasta Lake Profile Statistics 2004

Statistics	05Jan2004	12Feb2004	03Mar2004	26Apr2004	10May2004	25May2004
Mean Bias (°C)	-0.05	0.16	0.04	-0.00	0.04	-0.01
MAE (°C)	0.20	0.51	0.44	0.32	0.33	0.38
RMSE (°C)	0.27	0.53	0.48	0.39	0.41	0.56
Nash-Sutcliffe (NSE)	0.88	0.57	0.56	0.97	0.98	0.97

Statistics	08Jun2004	25Jun2004	14Jul2004	23Jul2004	04Aug2004	24Aug2004
Mean Bias (°C)	-0.13	-0.02	-0.10	-0.06	0.02	0.04
MAE (°C)	0.45	0.40	0.46	0.55	0.58	0.68
RMSE (°C)	0.72	0.62	0.68	0.82	0.87	0.93
Nash-Sutcliffe (NSE)	0.96	0.98	0.98	0.98	0.98	0.97

Statistics	09Sep2004	23Sep2004	06Oct2004	25Oct2004	01Nov2004	16Nov2004
Mean Bias (°C)	-0.01	-0.08	-0.03	-0.08	-0.19	-0.21
MAE (°C)	0.82	0.90	0.91	0.66	0.51	0.61
RMSE (°C)	1.03	1.09	1.07	0.79	0.71	0.77
Nash-Sutcliffe (NSE)	0.97	0.95	0.95	0.96	0.96	0.91

Statistics	21Dec2004
Mean Bias (°C)	-0.23
MAE (°C)	0.64
RMSE (°C)	0.70
Nash-Sutcliffe (NSE)	0.72

Table 6. Shasta Lake Profile Statistics 2005

Statistics	25Jan2005	09Feb2005	09Mar2005	14Apr2005	03May2005	20May2005
Mean Bias (°C)	-0.14	-0.00	0.06	-0.06	-0.10	-0.14
MAE (°C)	0.53	0.61	0.53	0.47	0.41	0.41
RMSE (°C)	0.59	0.66	0.60	0.57	0.46	0.50
Nash-Sutcliffe (NSE)	0.61	0.51	0.77	0.82	0.96	0.95

Statistics	03Jun2005	14Jun2005	08Jul2005	19Jul2005	03Aug2005	16Aug2005
Mean Bias (°C)	-0.24	-0.22	-0.30	-0.50	-0.22	-0.13
MAE (°C)	0.50	0.55	0.58	0.80	0.79	0.79
RMSE (°C)	0.69	0.70	0.79	1.09	1.10	1.12
Nash-Sutcliffe (NSE)	0.95	0.96	0.96	0.95	0.95	0.95

Statistics	01Sep2005	16Sep2005	04Oct2005	17Oct2005	16Nov2005	06Dec2005
Mean Bias (°C)	-0.18	-0.23	-0.46	-0.49	-0.72	-0.63
MAE (°C)	0.84	0.94	1.03	1.03	0.87	0.64
RMSE (°C)	1.15	1.22	1.34	1.38	1.35	1.07
Nash-Sutcliffe (NSE)	0.95	0.93	0.89	0.86	0.71	0.58

Table 7. Shasta Lake Profile Statistics 2006

Statistics	11Jan2006	07Feb2006	23Mar2006	17Apr2006	04May2006	05Jun2006
Mean Bias (°C)	-0.31	-0.00	-0.20	-0.14	-0.38	-0.35
MAE (°C)	0.37	0.55	0.25	0.32	0.44	0.45
RMSE (°C)	0.43	0.59	0.35	0.45	0.70	0.59
Nash-Sutcliffe (NSE)	0.81	0.60	0.67	0.69	0.90	0.97

Statistics	21Jun2006	06Jul2006	18Jul2006	01Aug2006	22Aug2006	06Sep2006
Mean Bias (°C)	-0.39	-0.21	-0.15	-0.10	-0.04	0.08
MAE (°C)	0.58	0.58	0.68	0.78	0.88	0.92
RMSE (°C)	0.85	0.83	1.02	1.12	1.23	1.23
Nash-Sutcliffe (NSE)	0.96	0.97	0.96	0.95	0.94	0.94

Statistics	26Sep2006	11Oct2006	23Oct2006	07Nov2006	01Dec2006
Mean Bias (°C)	-0.19	-0.36	-0.28	-0.17	-0.44
MAE (°C)	0.86	0.81	0.85	0.71	0.60
RMSE (°C)	1.06	0.98	1.02	0.85	0.77
Nash-Sutcliffe (NSE)	0.95	0.95	0.94	0.94	0.90

Table 8. Shasta Lake Profile Statistics 2007

Statistics	10Jan2007	06Feb2007	06Mar2007	05Apr2007	15May2007	05Jun2007
Mean Bias (°C)	-0.37	-0.09	-0.05	-0.11	-0.23	-0.12
MAE (°C)	0.48	0.51	0.59	0.55	0.46	0.42
RMSE (°C)	0.54	0.57	0.64	0.74	0.61	0.52
Nash-Sutcliffe (NSE)	0.74	0.66	0.54	0.84	0.96	0.98

Statistics	19Jun2007	03Jul2007	17Jul2007	01Aug2007	17Aug2007	05Sep2007
Mean Bias (°C)	-0.20	-0.27	-0.08	-0.21	-0.12	-0.17
MAE (°C)	0.43	0.45	0.39	0.48	0.42	0.49
RMSE (°C)	0.59	0.64	0.50	0.64	0.58	0.68
Nash-Sutcliffe (NSE)	0.98	0.98	0.99	0.99	0.99	0.99

Statistics	17Sep2007	02Oct2007	24Oct2007	08Nov2007	20Nov2007	05Dec2007
Mean Bias (°C)	-0.11	-0.30	-0.55	-0.43	-0.46	-0.38
MAE (°C)	0.59	0.65	0.74	0.81	0.67	0.45
RMSE (°C)	0.77	0.85	1.17	1.24	1.16	0.68
Nash-Sutcliffe (NSE)	0.98	0.97	0.90	0.84	0.81	0.87

Table 9. Shasta Lake Profile Statistics 2008

Statistics	02Jan2008	05Feb2008	06Mar2008	01Apr2008	01May2008	13May2008
Mean Bias (°C)	-0.16	-0.22	-0.02	-0.05	-0.24	-0.24
MAE (°C)	0.39	0.26	0.49	0.43	0.47	0.34
RMSE (°C)	0.42	0.34	0.59	0.67	0.81	0.65
Nash-Sutcliffe (NSE)	0.78	0.67	0.67	0.74	0.89	0.96

Statistics	02Jun2008	18Jun2008	01Jul2008	15Jul2008	05Aug2008	19Aug2008
Mean Bias (°C)	-0.25	-0.29	-0.25	-0.17	-0.19	-0.19
MAE (°C)	0.41	0.33	0.40	0.50	0.53	0.69
RMSE (°C)	0.65	0.47	0.57	0.75	0.75	0.93
Nash-Sutcliffe (NSE)	0.97	0.99	0.99	0.98	0.98	0.98

Statistics	03Sep2008	01Oct2008	15Oct2008	04Nov2008	14Nov2008	04Dec2008
Mean Bias (°C)	-0.33	-0.53	-0.78	-0.67	-0.58	-0.15
MAE (°C)	0.70	1.44	1.21	1.13	0.93	0.67
RMSE (°C)	0.85	1.70	1.64	1.65	1.46	0.97
Nash-Sutcliffe (NSE)	0.98	0.90	0.86	0.73	0.71	0.78

Table 10. Shasta Lake Profile Statistics 2009

Statistics	14Jan2009	10Feb2009	04Mar2009	02Apr2009	15Apr2009	04May2009
Mean Bias (°C)	0.12	0.51	-0.07	-0.37	-0.39	-0.33
MAE (°C)	0.68	0.67	0.20	0.43	0.81	0.54
RMSE (°C)	0.77	0.75	0.29	0.50	1.05	0.73
Nash-Sutcliffe (NSE)	0.64	0.39	0.70	0.91	0.60	0.85

Statistics	19May2009	02Jun2009	16Jun2009	01Jul2009	17Jul2009	05Aug2009
Mean Bias (°C)	-0.48	-0.22	-0.29	-0.20	-0.16	-0.03
MAE (°C)	0.62	0.48	0.54	0.58	0.60	0.69
RMSE (°C)	0.85	0.70	0.70	0.79	0.81	0.97
Nash-Sutcliffe (NSE)	0.92	0.97	0.97	0.97	0.98	0.97

Statistics	19Aug2009	01Sep2009	15Sep2009	29Sep2009	15Oct2009	03Nov2009
Mean Bias (°C)	0.07	0.21	0.14	0.28	0.07	0.27
MAE (°C)	0.74	0.83	0.83	1.16	1.12	0.99
RMSE (°C)	0.97	1.04	0.98	1.32	1.22	1.03
Nash-Sutcliffe (NSE)	0.97	0.97	0.97	0.94	0.91	0.91

Statistics	17Nov2009	01Dec2009
Mean Bias (°C)	0.37	0.52
MAE (°C)	0.89	0.76
RMSE (°C)	0.91	0.84
Nash-Sutcliffe (NSE)	0.89	0.83

Table 11. Shasta Lake Profile Statistics 2010

Statistics	05Jan2010	02Feb2010	02Mar2010	03May2010	17May2010	01Jun2010
Mean Bias (°C)	0.57	0.06	0.22	-0.02	-0.01	-0.05
MAE (°C)	0.62	0.31	0.34	0.31	0.26	0.26
RMSE (°C)	0.75	0.33	0.40	0.46	0.43	0.41
Nash-Sutcliffe (NSE)	0.42	0.72	0.62	0.92	0.95	0.96

Statistics	14Jun2010	29Jun2010	12Jul2010	26Jul2010	10Aug2010	23Aug2010
Mean Bias (°C)	-0.15	-0.14	-0.12	-0.06	0.03	-0.06
MAE (°C)	0.32	0.40	0.40	0.46	0.52	0.52
RMSE (°C)	0.46	0.61	0.66	0.73	0.84	0.80
Nash-Sutcliffe (NSE)	0.97	0.97	0.98	0.98	0.97	0.98

Statistics	09Sep2010	21Sep2010	06Oct2010	18Oct2010	01Nov2010	22Nov2010
Mean Bias (°C)	0.10	0.03	0.07	0.06	0.02	-0.02

Statistics	09Sep2010	21Sep2010	06Oct2010	18Oct2010	01Nov2010	22Nov2010
MAE (°C)	0.62	0.72	0.78	0.80	0.78	0.77
RMSE (°C)	0.94	0.90	0.99	1.00	0.92	0.90
Nash-Sutcliffe (NSE)	0.96	0.96	0.95	0.94	0.93	0.87

Statistics	07Dec2010
Mean Bias (°C)	-0.33
MAE (°C)	0.54
RMSE (°C)	0.74
Nash-Sutcliffe (NSE)	0.81

Table 12. Shasta Lake Profile Statistics 2011

Statistics	04Jan2011	08Feb2011	04Mar2011	04Apr2011	02May2011	19May2011
Mean Bias (°C)	-0.30	0.17	0.13	-0.02	0.03	-0.06
MAE (°C)	0.34	0.50	0.24	0.36	0.23	0.23
RMSE (°C)	0.43	0.56	0.25	0.54	0.39	0.37
Nash-Sutcliffe (NSE)	0.74	0.71	0.78	0.58	0.94	0.97

Statistics	02Jun2011	14Jun2011	27Jun2011	12Jul2011	26Jul2011	09Aug2011
Mean Bias (°C)	0.07	-0.08	0.06	0.19	0.14	0.29
MAE (°C)	0.26	0.32	0.32	0.41	0.39	0.51
RMSE (°C)	0.42	0.57	0.60	0.89	0.79	1.02
Nash-Sutcliffe (NSE)	0.95	0.96	0.97	0.95	0.97	0.96

Statistics	23Aug2011	06Sep2011	20Sep2011	04Oct2011	18Oct2011	02Nov2011
Mean Bias (°C)	0.35	0.43	0.52	0.69	0.61	0.59
MAE (°C)	0.58	0.64	0.71	0.86	0.68	0.69
RMSE (°C)	1.06	1.13	1.23	1.41	1.10	1.04
Nash-Sutcliffe (NSE)	0.96	0.95	0.94	0.90	0.94	0.93

Statistics	15Nov2011	06Dec2011
Mean Bias (°C)	0.62	0.42
MAE (°C)	0.74	0.52

Statistics	15Nov2011	06Dec2011
RMSE (°C)	1.01	0.68
Nash-Sutcliffe (NSE)	0.90	0.91

Table 13. Shasta Lake Profile Statistics 2012

Statistics	09Jan2012	01Feb2012	08Mar2012	02May2012	15May2012	29May2012
Mean Bias (°C)	0.39	0.52	0.45	0.02	-0.04	-0.10
MAE (°C)	0.43	0.52	0.54	0.42	0.38	0.41
RMSE (°C)	0.62	0.57	0.62	0.60	0.54	0.56
Nash-Sutcliffe (NSE)	0.75	0.48	0.52	0.89	0.95	0.96

Statistics	12Jun2012	26Jun2012	12Jul2012	25Jul2012	07Aug2012	22Aug2012
Mean Bias (°C)	-0.07	-0.05	-0.08	-0.03	-0.03	0.02
MAE (°C)	0.36	0.32	0.32	0.32	0.31	0.34
RMSE (°C)	0.49	0.49	0.46	0.48	0.47	0.52
Nash-Sutcliffe (NSE)	0.98	0.98	0.99	0.99	0.99	0.99

Statistics	05Sep2012	19Sep2012	02Oct2012	17Oct2012	30Oct2012	14Nov2012
Mean Bias (°C)	0.13	0.18	0.31	0.05	0.20	0.22
MAE (°C)	0.31	0.33	0.39	0.22	0.23	0.30
RMSE (°C)	0.47	0.52	0.61	0.33	0.31	0.39
Nash-Sutcliffe (NSE)	0.99	0.99	0.99	1.00	0.99	0.99

Statistics	28Nov2012
Mean Bias (°C)	0.15
MAE (°C)	0.27
RMSE (°C)	0.35
Nash-Sutcliffe (NSE)	0.99

Table 14. Shasta Lake Profile Statistics 2013

Statistics	08Jan2013	05Feb2013	12Mar2013	03Apr2013	08May2013	20Aug2013
Mean Bias (°C)	0.20	0.58	0.63	0.55	0.40	0.45
MAE (°C)	0.29	0.61	0.81	0.66	0.63	0.54

Statistics	08Jan2013	05Feb2013	12Mar2013	03Apr2013	08May2013	20Aug2013
RMSE (°C)	0.40	0.78	0.90	0.76	0.70	0.64
Nash-Sutcliffe (NSE)	0.85	0.43	0.44	0.79	0.94	0.99

Statistics	11Sep2013	25Sep2013	22Oct2013	06Nov2013	18Nov2013	17Dec2013
Mean Bias (°C)	0.66	0.73	0.60	0.73	0.73	0.50
MAE (°C)	0.71	0.73	0.60	0.73	0.73	0.53
RMSE (°C)	0.79	0.85	0.81	0.98	1.06	0.72
Nash-Sutcliffe (NSE)	0.98	0.98	0.97	0.92	0.87	0.71

Table 15. Shasta Lake Profile Statistics 2014

Statistics	07Jan2014	05Feb2014	12Mar2014	09Apr2014	07May2014	19May2014
Mean Bias (°C)	0.73	0.71	0.41	0.41	0.37	0.43
MAE (°C)	0.76	0.72	0.79	0.59	0.60	0.53
RMSE (°C)	0.97	0.87	0.87	0.67	0.70	0.62
Nash-Sutcliffe (NSE)	0.34	0.10	0.56	0.85	0.94	0.96

Statistics	02Jun2014	18Jun2014	30Jun2014	28Jul2014	13Aug2014	26Aug2014
Mean Bias (°C)	0.41	0.35	0.31	0.49	0.71	0.79
MAE (°C)	0.51	0.58	0.65	0.63	0.82	0.80
RMSE (°C)	0.61	0.73	0.82	0.73	0.98	1.00
Nash-Sutcliffe (NSE)	0.97	0.97	0.97	0.98	0.97	0.97

Statistics	09Sep2014	16Sep2014	23Sep2014	08Oct2014	15Oct2014	22Oct2014
Mean Bias (°C)	0.84	0.92	0.98	1.10	1.30	1.27
MAE (°C)	0.85	0.93	0.98	1.10	1.30	1.27
RMSE (°C)	1.07	1.14	1.18	1.25	1.45	1.51
Nash-Sutcliffe (NSE)	0.97	0.96	0.95	0.94	0.90	0.88

Statistics	29Oct2014	05Nov2014	12Nov2014	09Dec2014
Mean Bias (°C)	1.24	1.17	1.38	0.86
MAE (°C)	1.31	1.23	1.42	0.87
RMSE (°C)	1.64	1.62	1.86	1.14

Statistics	29Oct2014	05Nov2014	12Nov2014	09Dec2014
Nash-Sutcliffe (NSE)	0.78	0.72	0.55	0.41

Table 16. Shasta Lake Profile Statistics 2015

Statistics	06Jan2015	03Feb2015	10Mar2015	08Apr2015	28Apr2015	05May2015
Mean Bias (°C)	0.09	0.68	0.59	0.66	0.18	0.26
MAE (°C)	0.19	0.77	0.70	0.67	0.36	0.39
RMSE (°C)	0.20	0.92	0.79	0.79	0.43	0.49
Nash-Sutcliffe (NSE)	0.88	0.27	0.59	0.69	0.97	0.97

Statistics	13May2015	28May2015	03Jun2015	16Jun2015	21Jul2015	30Jul2015
Mean Bias (°C)	0.13	0.14	0.19	0.21	0.47	0.49
MAE (°C)	0.36	0.34	0.39	0.41	0.66	0.67
RMSE (°C)	0.44	0.49	0.53	0.67	0.99	0.97
Nash-Sutcliffe (NSE)	0.98	0.98	0.98	0.98	0.97	0.97

Statistics	05Aug2015	11Aug2015	18Aug2015	26Aug2015	02Sep2015	09Sep2015
Mean Bias (°C)	0.58	0.61	0.70	0.80	0.91	0.93
MAE (°C)	0.69	0.68	0.82	0.85	0.92	0.98
RMSE (°C)	0.99	0.94	1.13	1.15	1.26	1.38
Nash-Sutcliffe (NSE)	0.97	0.97	0.96	0.96	0.95	0.94

Statistics	15Sep2015	30Sep2015	06Oct2015	20Oct2015	28Oct2015	10Nov2015
Mean Bias (°C)	0.97	1.04	1.18	1.63	2.02	2.04
MAE (°C)	1.07	1.05	1.18	1.63	2.02	2.04
RMSE (°C)	1.48	1.54	1.75	2.24	2.76	2.90
Nash-Sutcliffe (NSE)	0.93	0.91	0.88	0.78	0.60	0.27

Statistics	08Dec2015
Mean Bias (°C)	0.93
MAE (°C)	0.96
RMSE (°C)	1.31
Nash-Sutcliffe (NSE)	0.26

Table 17. Shasta Lake Profile Statistics 2016

Statistics	20Jan2016	09Feb2016	08Mar2016	15Mar2016	07Apr2016	21Apr2016
Mean Bias (°C)	0.09	-0.14	0.05	-0.00	-0.27	-0.13
MAE (°C)	0.29	0.40	0.40	0.31	0.44	0.34
RMSE (°C)	0.36	0.49	0.50	0.36	0.66	0.41
Nash-Sutcliffe (NSE)	0.82	0.68	0.75	0.81	0.88	0.96

Statistics	02May2016	14Jun2016	20Jun2016	05Jul2016	11Jul2016	18Jul2016
Mean Bias (°C)	-0.18	-0.08	-0.14	0.01	-0.16	0.19
MAE (°C)	0.32	0.45	0.40	0.43	0.46	0.57
RMSE (°C)	0.39	0.70	0.61	0.66	0.75	0.99
Nash-Sutcliffe (NSE)	0.97	0.96	0.97	0.98	0.98	0.95

Statistics	25Jul2016	01Aug2016	08Aug2016	15Aug2016	22Aug2016	29Aug2016
Mean Bias (°C)	-0.00	0.07	0.06	0.07	0.16	0.13
MAE (°C)	0.52	0.52	0.51	0.56	0.61	0.57
RMSE (°C)	0.78	0.76	0.75	0.83	0.90	0.84
Nash-Sutcliffe (NSE)	0.98	0.98	0.98	0.98	0.97	0.98

Statistics	06Sep2016	12Sep2016	19Sep2016	26Sep2016	03Oct2016	11Oct2016
Mean Bias (°C)	0.17	0.21	0.28	0.34	0.33	0.39
MAE (°C)	0.57	0.61	0.62	0.60	0.61	0.65
RMSE (°C)	0.85	0.85	0.87	0.92	0.83	0.89
Nash-Sutcliffe (NSE)	0.98	0.97	0.97	0.97	0.97	0.96

Statistics	18Oct2016	25Oct2016	01Nov2016	15Nov2016	29Nov2016
Mean Bias (°C)	0.32	0.33	0.22	0.34	0.19
MAE (°C)	0.60	0.63	0.48	0.63	0.48
RMSE (°C)	0.81	0.84	0.72	0.85	0.61
Nash-Sutcliffe (NSE)	0.97	0.96	0.97	0.94	0.94

Table 18. Shasta Lake Profile Statistics 2017

Statistics	12Jan2017	16Feb2017	11Apr2017	25Apr2017	10May2017	23May2017
Mean Bias (°C)	0.11	0.30	0.01	0.06	-0.14	-0.12
MAE (°C)	0.18	0.46	0.32	0.28	0.33	0.29
RMSE (°C)	0.19	0.50	0.46	0.50	0.45	0.45
Nash-Sutcliffe (NSE)	0.96	0.66	0.89	0.88	0.96	0.98

Statistics	31May2017	06Jun2017	13Jun2017	21Jun2017	28Jun2017	05Jul2017
Mean Bias (°C)	-0.02	-0.04	-0.13	-0.30	-0.00	0.04
MAE (°C)	0.39	0.33	0.41	0.48	0.40	0.44
RMSE (°C)	0.69	0.63	0.61	0.88	0.80	0.86
Nash-Sutcliffe (NSE)	0.95	0.97	0.96	0.96	0.96	0.96

Statistics	11Jul2017	20Jul2017	25Jul2017	01Aug2017	08Aug2017	15Aug2017
Mean Bias (°C)	0.00	0.05	0.05	0.07	0.11	0.13
MAE (°C)	0.49	0.48	0.58	0.60	0.65	0.61
RMSE (°C)	0.90	0.90	1.02	1.03	1.07	1.02
Nash-Sutcliffe (NSE)	0.97	0.97	0.96	0.96	0.96	0.96

Statistics	22Aug2017	29Aug2017	07Sep2017	12Sep2017	19Sep2017	27Sep2017
Mean Bias (°C)	0.12	0.16	0.29	0.20	0.30	0.14
MAE (°C)	0.64	0.68	0.76	0.78	0.74	0.60
RMSE (°C)	1.06	1.08	1.21	1.19	1.12	0.89
Nash-Sutcliffe (NSE)	0.96	0.96	0.95	0.95	0.95	0.97

Statistics	05Oct2017	12Oct2017	18Oct2017	24Oct2017	31Oct2017	07Nov2017
Mean Bias (°C)	0.11	0.11	0.17	0.18	0.19	0.23
MAE (°C)	0.53	0.47	0.50	0.45	0.50	0.49
RMSE (°C)	0.80	0.69	0.70	0.63	0.66	0.65
Nash-Sutcliffe (NSE)	0.97	0.98	0.97	0.98	0.97	0.97

Statistics	14Nov2017	29Nov2017	12Dec2017
Mean Bias (°C)	0.23	0.33	0.35

Statistics	14Nov2017	29Nov2017	12Dec2017
MAE (°C)	0.58	0.53	0.58
RMSE (°C)	0.74	0.65	0.69
Nash-Sutcliffe (NSE)	0.95	0.94	0.91

Table 19. Shasta Profile Temperature NSE, invalid under .65

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	-0.30	0.65	0.90	0.96	0.98	0.99	0.98	0.98	0.93	0.52	0.22
2001	-	-	-	-	0.92	0.98	0.99	0.99	0.98	0.97	0.93	0.70
2002	0.50	0.66	0.71	0.83	0.97	0.97	0.99	0.99	0.99	0.99	0.98	-
2003	0.76	0.72	0.75	0.88	0.93	0.97	0.97	0.95	0.95	0.93	0.91	0.88
2004	0.86	0.56	0.55	0.97	0.97	0.97	0.98	0.97	0.96	0.95	0.94	0.72
2005	0.61	0.50	0.74	0.81	0.95	0.95	0.95	0.95	0.94	0.87	0.72	0.59
2006	0.81	0.60	0.66	0.70	0.87	0.95	0.95	0.95	0.94	0.94	0.94	0.90
2007	0.74	0.66	0.53	0.84	0.96	0.98	0.99	0.99	0.99	0.95	0.83	0.87
2008	0.77	0.68	0.67	0.75	0.92	0.98	0.98	0.98	0.98	0.88	0.74	0.78
2009	0.65	0.38	0.71	0.77	0.89	0.97	0.97	0.97	0.96	0.92	0.90	0.83
2010	0.44	0.72	0.60	-	0.94	0.97	0.98	0.97	0.96	0.95	0.91	0.81
2011	0.74	0.71	0.78	0.62	0.97	0.96	0.96	0.96	0.94	0.92	0.92	0.91
2012	0.74	0.47	0.51	-	0.94	0.98	0.99	0.99	0.99	0.99	0.99	-
2013	0.85	0.42	0.40	0.76	0.95	-	-	0.99	0.98	0.97	0.90	0.72
2014	0.33	0.07	0.55	0.84	0.95	0.97	0.98	0.97	0.96	0.89	0.66	0.43
2015	0.88	0.24	0.56	0.89	0.98	0.98	0.97	0.97	0.93	0.77	0.27	0.29
2016	0.81	0.67	0.77	0.93	0.96	0.96	0.97	0.98	0.97	0.97	0.95	-
2017	0.96	0.66	-	0.88	0.96	0.96	0.96	0.96	0.96	0.97	0.96	0.91
All	0.75	0.53	0.67	0.87	0.95	0.97	0.97	0.97	0.96	0.94	0.88	0.79

Table 20. Shasta Profile Temperature MeanBias, invalid when +- .75

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.69	0.35	0.32	0.03	-0.14	0.01	0.24	0.42	0.89	1.25	0.87
2001	-	-	-	-	-0.33	-0.19	-0.15	0.02	0.16	0.29	0.26	-0.20
2002	-0.29	0.07	0.05	-0.21	-0.18	-0.27	-0.20	-0.08	-0.09	-0.05	-0.15	-

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003	-0.31	-0.04	0.07	-0.02	-0.09	-0.16	0.05	0.14	0.28	0.24	0.23	0.26
2004	-0.05	0.17	0.05	-0.01	-0.00	-0.06	-0.10	0.04	-0.03	-0.05	-0.21	-0.23
2005	-0.13	0.01	0.07	-0.06	-0.13	-0.25	-0.39	-0.18	-0.21	-0.47	-0.73	-0.63
2006	-0.31	0.01	-0.20	-0.15	-0.40	-0.39	-0.14	-0.07	-0.06	-0.32	-0.17	-0.44
2007	-0.37	-0.08	-0.05	-0.10	-0.22	-0.16	-0.16	-0.17	-0.15	-0.42	-0.44	-0.38
2008	-0.17	-0.22	-0.02	-0.05	-0.26	-0.26	-0.23	-0.18	-0.31	-0.66	-0.63	-0.16
2009	0.12	0.52	-0.08	-0.39	-0.42	-0.27	-0.19	0.01	0.20	0.07	0.31	0.51
2010	0.56	0.07	0.23	-	-0.02	-0.11	-0.06	-0.05	0.06	0.06	-0.00	-0.33
2011	-0.30	0.17	0.14	-0.03	-0.02	0.01	0.17	0.31	0.48	0.65	0.59	0.42
2012	0.39	0.52	0.45	-	-0.04	-0.05	-0.03	0.02	0.13	0.18	0.18	-
2013	0.20	0.59	0.64	0.57	0.41	-	-	0.47	0.70	0.60	0.72	0.50
2014	0.74	0.72	0.42	0.41	0.38	0.38	0.52	0.75	0.91	1.22	1.27	0.84
2015	0.09	0.69	0.59	0.42	0.17	0.19	0.48	0.67	0.96	1.61	2.04	0.93
2016	0.10	-0.15	0.02	-0.20	-0.18	-0.08	-0.01	0.11	0.25	0.34	0.25	-
2017	0.11	0.30	-	0.02	-0.09	-0.12	0.07	0.11	0.22	0.15	0.26	0.35
All	0.02	0.26	0.17	0.03	-0.07	-0.10	-0.03	0.14	0.28	0.31	0.27	0.15

Table 21. Shasta Profile Temperature MAE, invalid over 1.0

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.73	0.48	0.49	0.33	0.39	0.39	0.56	0.56	0.96	1.26	1.06
2001	-	-	-	-	0.49	0.38	0.38	0.50	0.53	0.67	0.80	0.56
2002	0.29	0.45	0.41	0.54	0.38	0.44	0.46	0.38	0.40	0.31	0.37	-
2003	0.44	0.31	0.36	0.35	0.33	0.40	0.51	0.75	0.80	0.88	0.70	0.56
2004	0.21	0.52	0.44	0.30	0.36	0.43	0.52	0.64	0.85	0.79	0.57	0.65
2005	0.53	0.62	0.53	0.46	0.41	0.54	0.70	0.78	0.88	1.03	0.88	0.65
2006	0.37	0.55	0.25	0.31	0.44	0.52	0.63	0.83	0.89	0.82	0.72	0.60
2007	0.48	0.51	0.59	0.53	0.44	0.44	0.40	0.47	0.55	0.69	0.74	0.45
2008	0.39	0.25	0.48	0.42	0.42	0.36	0.46	0.61	0.71	1.33	1.03	0.68
2009	0.67	0.67	0.20	0.61	0.56	0.52	0.61	0.71	0.93	1.12	0.93	0.76
2010	0.60	0.31	0.33	-	0.28	0.32	0.40	0.52	0.66	0.80	0.77	0.54

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	0.34	0.49	0.24	0.34	0.22	0.30	0.38	0.54	0.68	0.77	0.70	0.51
2012	0.44	0.52	0.54	-	0.40	0.33	0.30	0.32	0.31	0.27	0.28	-
2013	0.29	0.61	0.82	0.64	0.63	-	-	0.53	0.72	0.60	0.73	0.53
2014	0.77	0.73	0.79	0.59	0.58	0.59	0.62	0.81	0.92	1.24	1.32	0.85
2015	0.20	0.78	0.70	0.52	0.37	0.43	0.66	0.76	1.01	1.61	2.04	0.96
2016	0.29	0.40	0.35	0.36	0.33	0.44	0.49	0.55	0.60	0.62	0.53	-
2017	0.17	0.46	-	0.29	0.34	0.42	0.50	0.62	0.71	0.49	0.54	0.58
All	0.41	0.54	0.46	0.45	0.40	0.42	0.49	0.61	0.72	0.82	0.78	0.66

Table 22. Shasta Profile Temperature RMSE, invalid over 1.5

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.88	0.58	0.57	0.40	0.55	0.54	0.77	0.75	1.11	1.69	1.31
2001	-	-	-	-	0.89	0.58	0.51	0.69	0.75	0.82	0.92	0.64
2002	0.41	0.51	0.47	0.94	0.52	0.68	0.66	0.51	0.52	0.39	0.48	-
2003	0.51	0.37	0.43	0.42	0.44	0.58	0.80	1.06	1.14	1.10	0.82	0.66
2004	0.29	0.54	0.48	0.35	0.52	0.69	0.79	0.91	1.05	0.94	0.75	0.70
2005	0.59	0.66	0.60	0.57	0.48	0.74	0.96	1.09	1.17	1.36	1.35	1.07
2006	0.43	0.58	0.34	0.44	0.78	0.77	0.94	1.17	1.16	0.99	0.86	0.77
2007	0.54	0.57	0.64	0.69	0.57	0.59	0.54	0.63	0.74	1.01	1.20	0.67
2008	0.43	0.33	0.58	0.66	0.77	0.54	0.68	0.86	0.86	1.67	1.55	0.98
2009	0.77	0.75	0.28	0.81	0.78	0.72	0.84	0.97	1.12	1.21	0.97	0.84
2010	0.74	0.33	0.40	-	0.43	0.48	0.64	0.82	0.92	1.00	0.91	0.74
2011	0.43	0.56	0.26	0.51	0.34	0.53	0.80	1.03	1.20	1.27	1.02	0.68
2012	0.62	0.57	0.62	-	0.57	0.46	0.41	0.46	0.47	0.44	0.37	-
2013	0.40	0.79	0.90	0.75	0.70	-	-	0.62	0.83	0.81	1.02	0.71
2014	0.98	0.88	0.87	0.67	0.69	0.74	0.72	0.99	1.13	1.47	1.75	1.14
2015	0.20	0.93	0.80	0.64	0.48	0.64	0.98	1.05	1.42	2.29	2.90	1.30
2016	0.36	0.49	0.43	0.49	0.41	0.69	0.82	0.81	0.88	0.85	0.73	-
2017	0.19	0.49	-	0.47	0.53	0.75	0.92	1.02	1.10	0.70	0.68	0.69
All	0.53	0.65	0.57	0.62	0.58	0.64	0.77	0.90	1.02	1.17	1.15	0.89

Shasta Reservoir Outflow Temperature

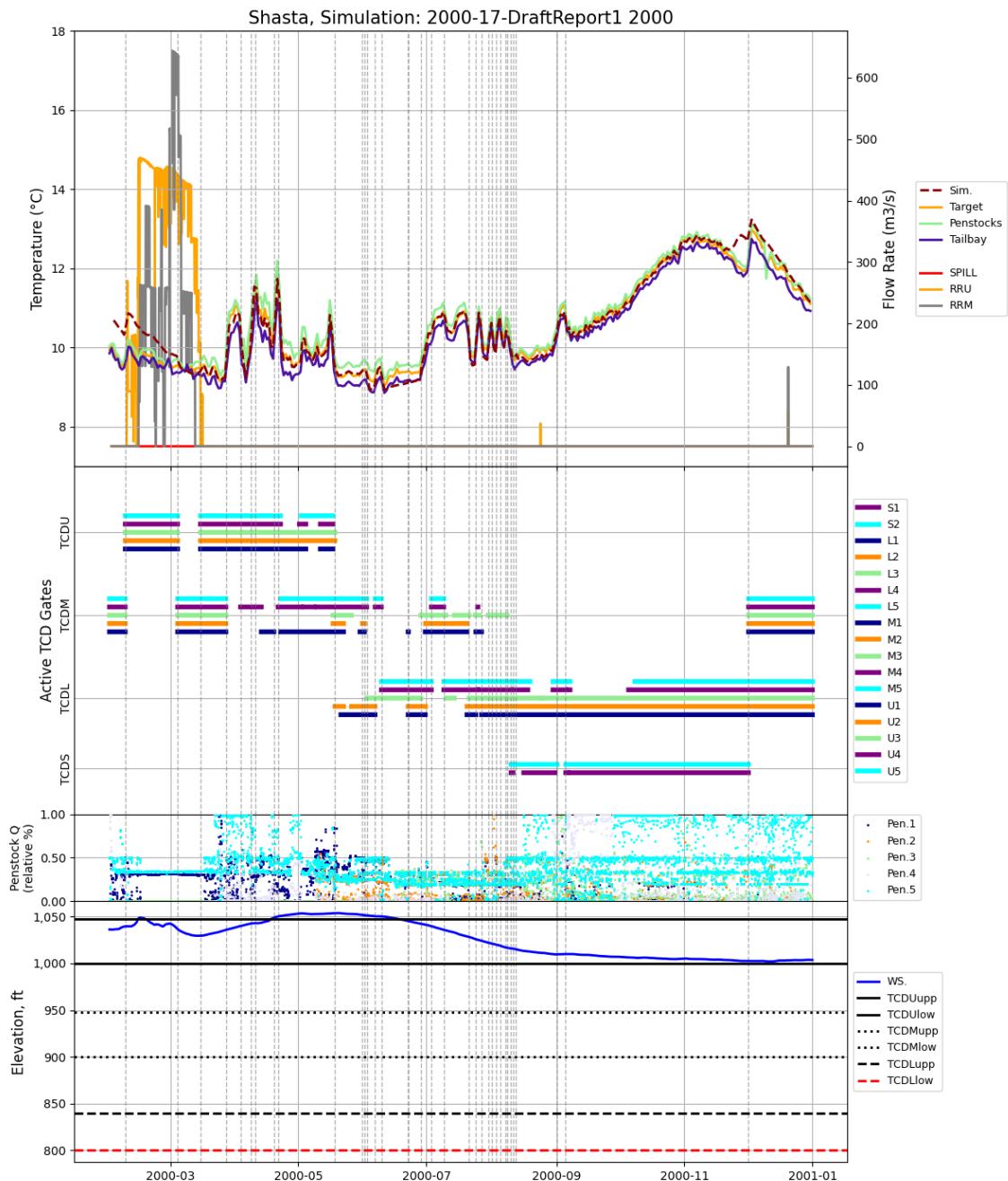


Figure 39. Shasta Temperature Outflow 2000

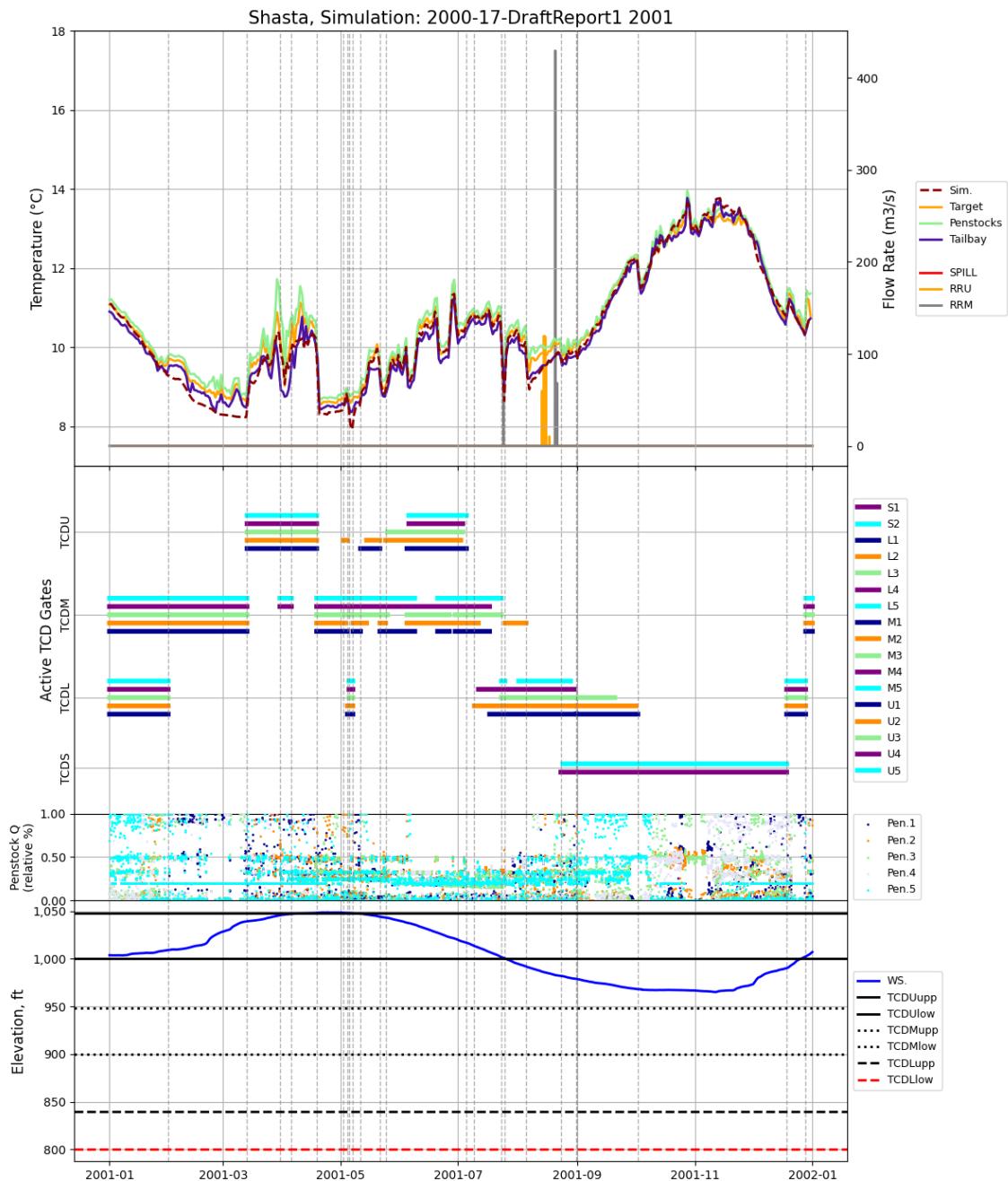


Figure 40. Shasta Temperature Outflow 2001

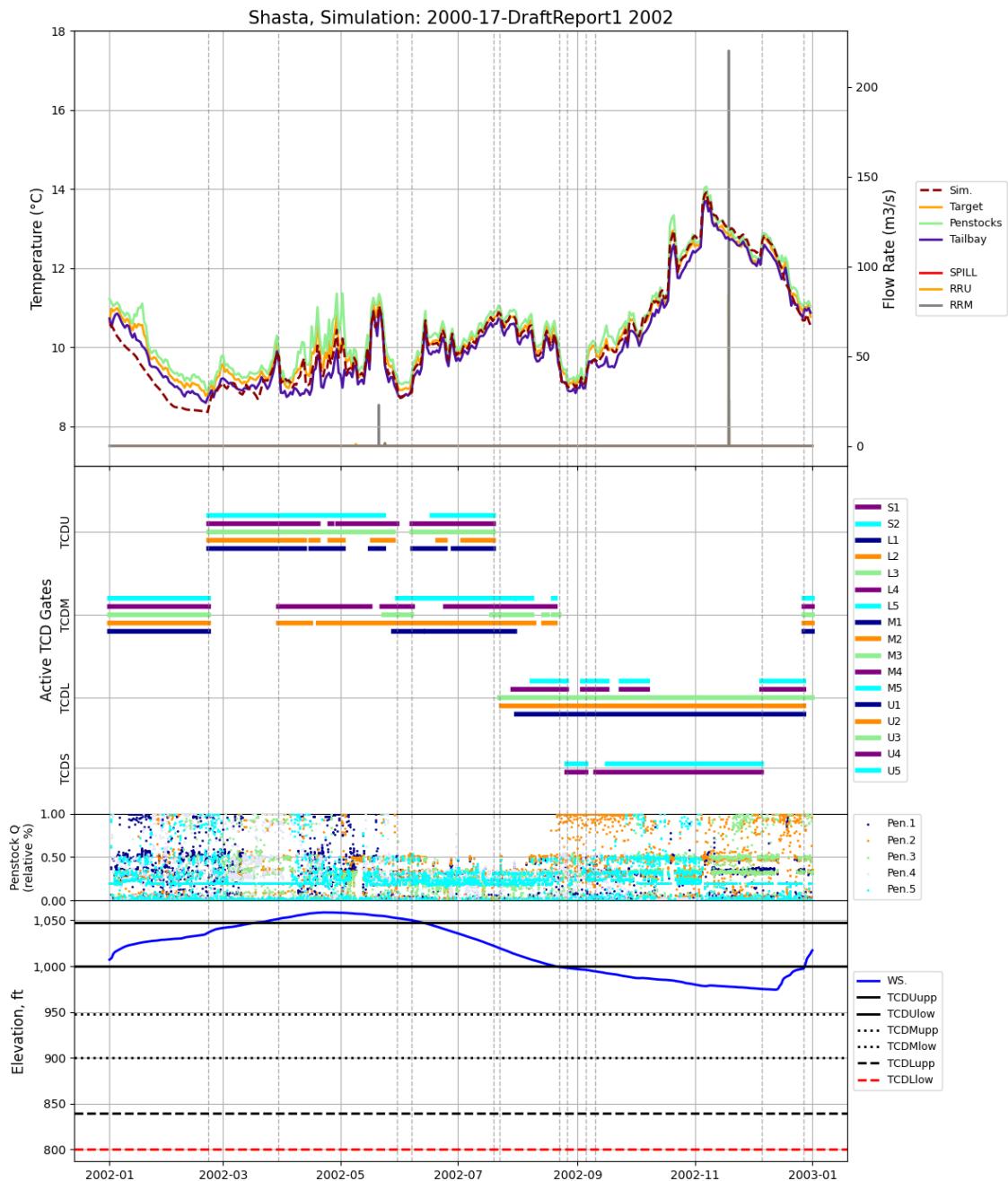


Figure 41. Shasta Temperature Outflow 2002

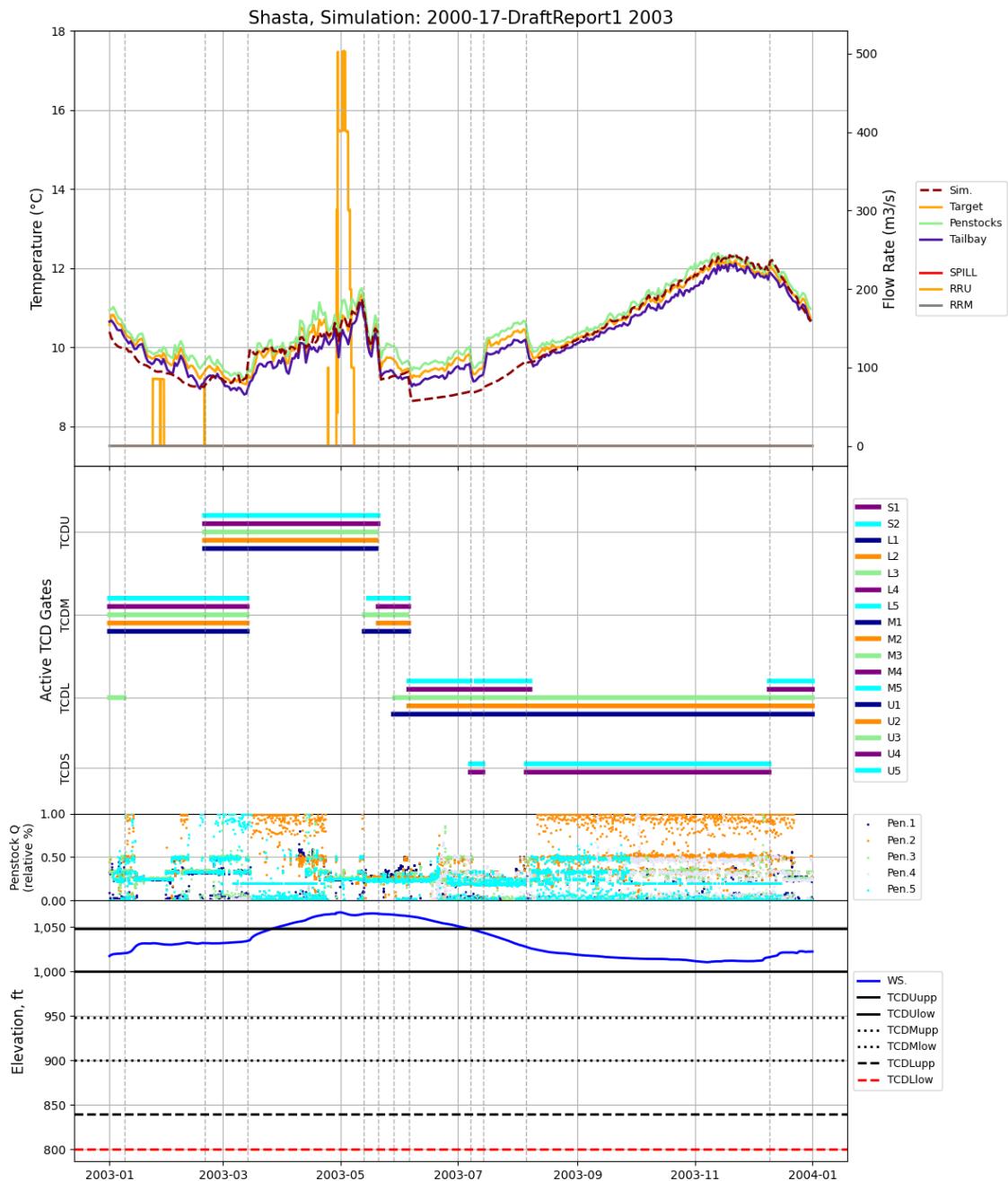


Figure 42. Shasta Temperature Outflow 2003

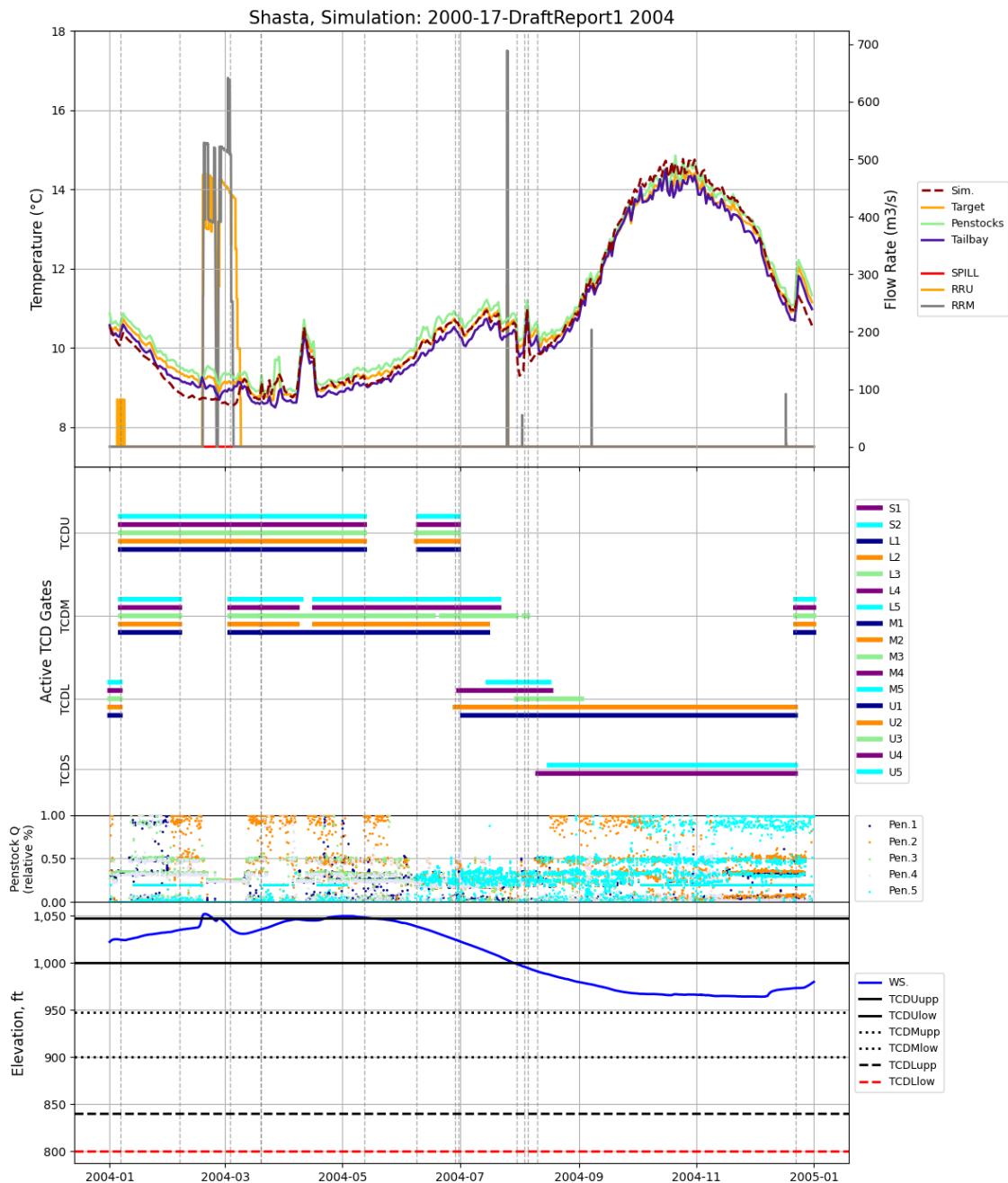


Figure 43. Shasta Temperature Outflow 2004

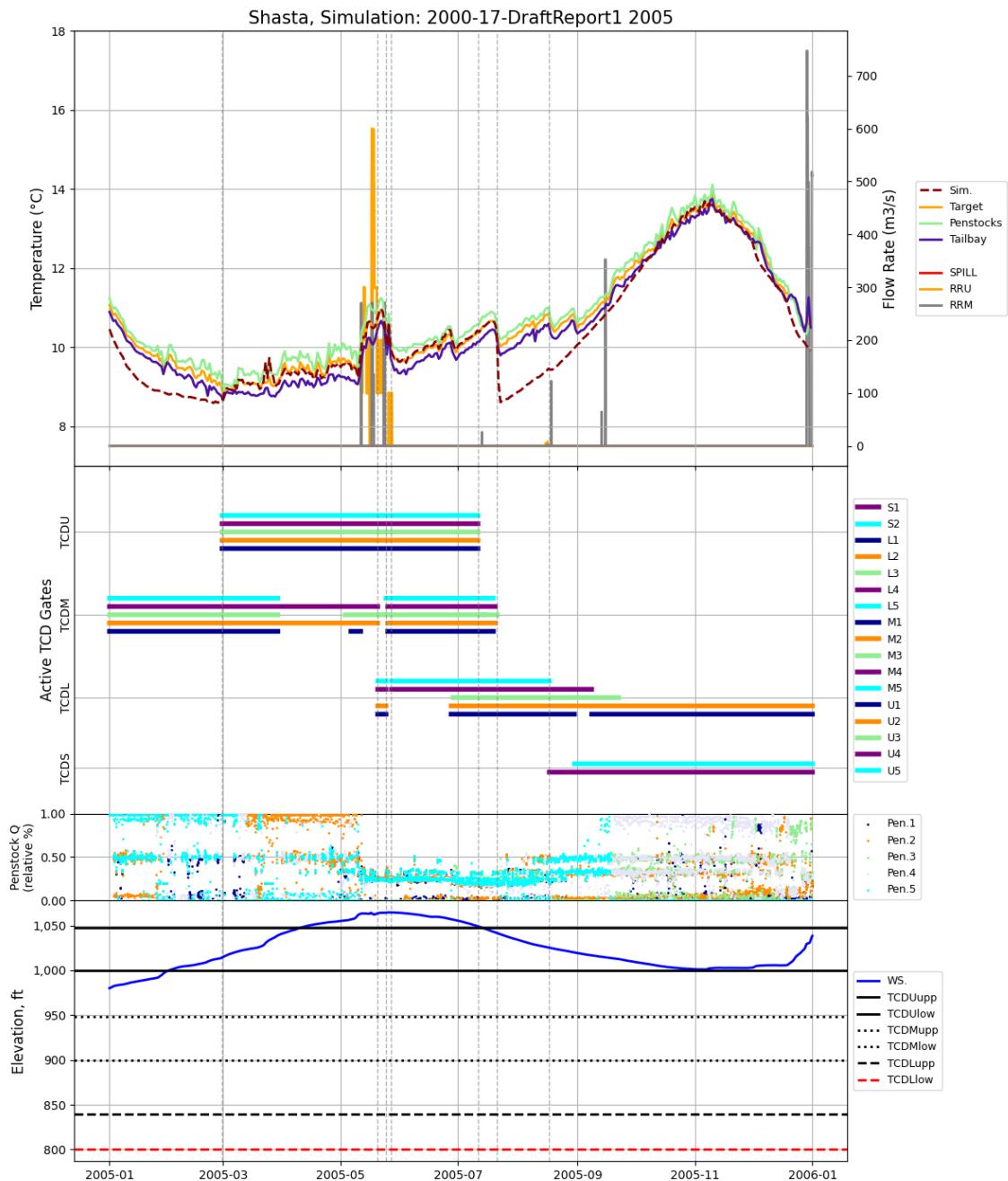


Figure 44. Shasta Temperature Outflow 2005

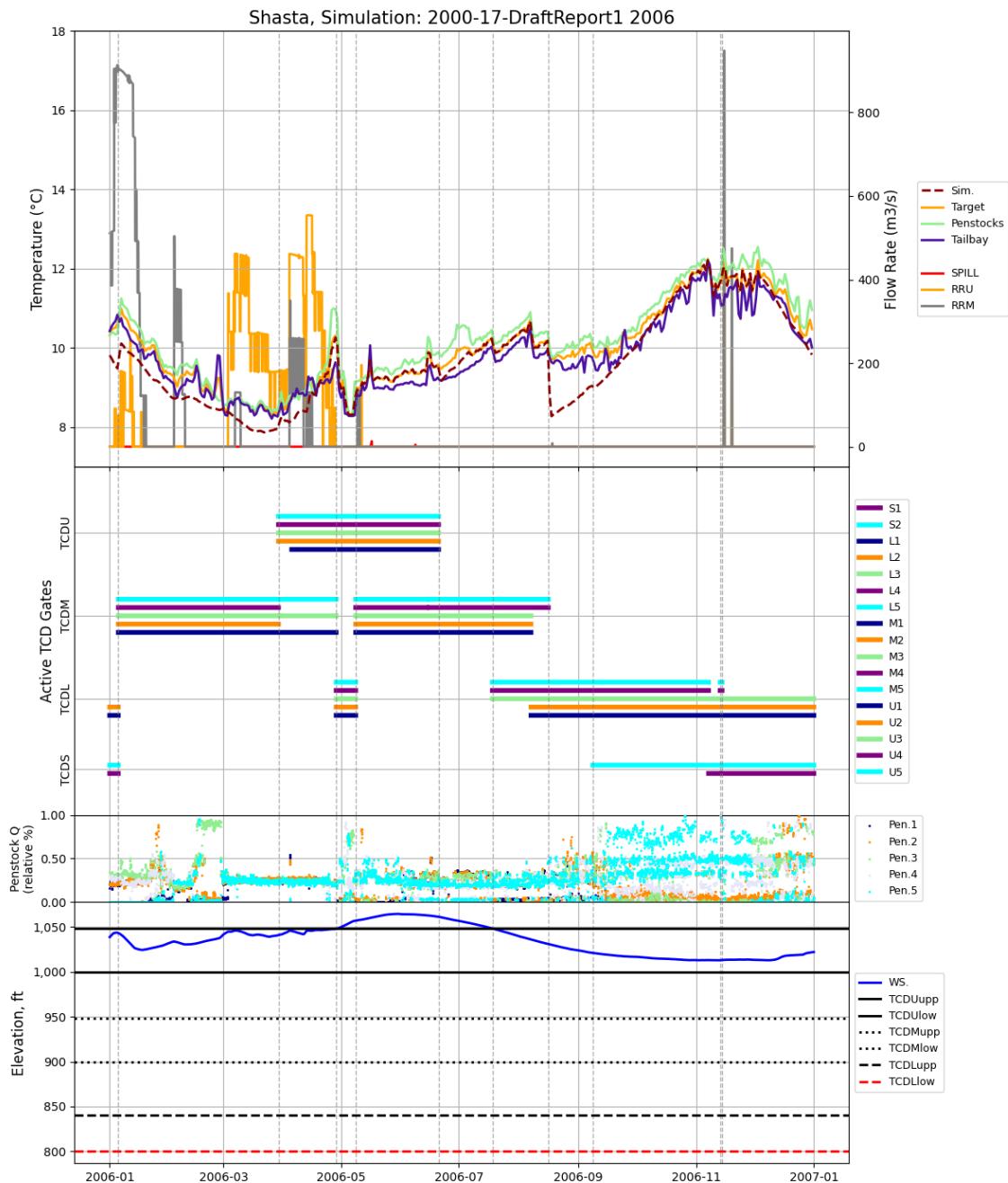


Figure 45. Shasta Temperature Outflow 2006

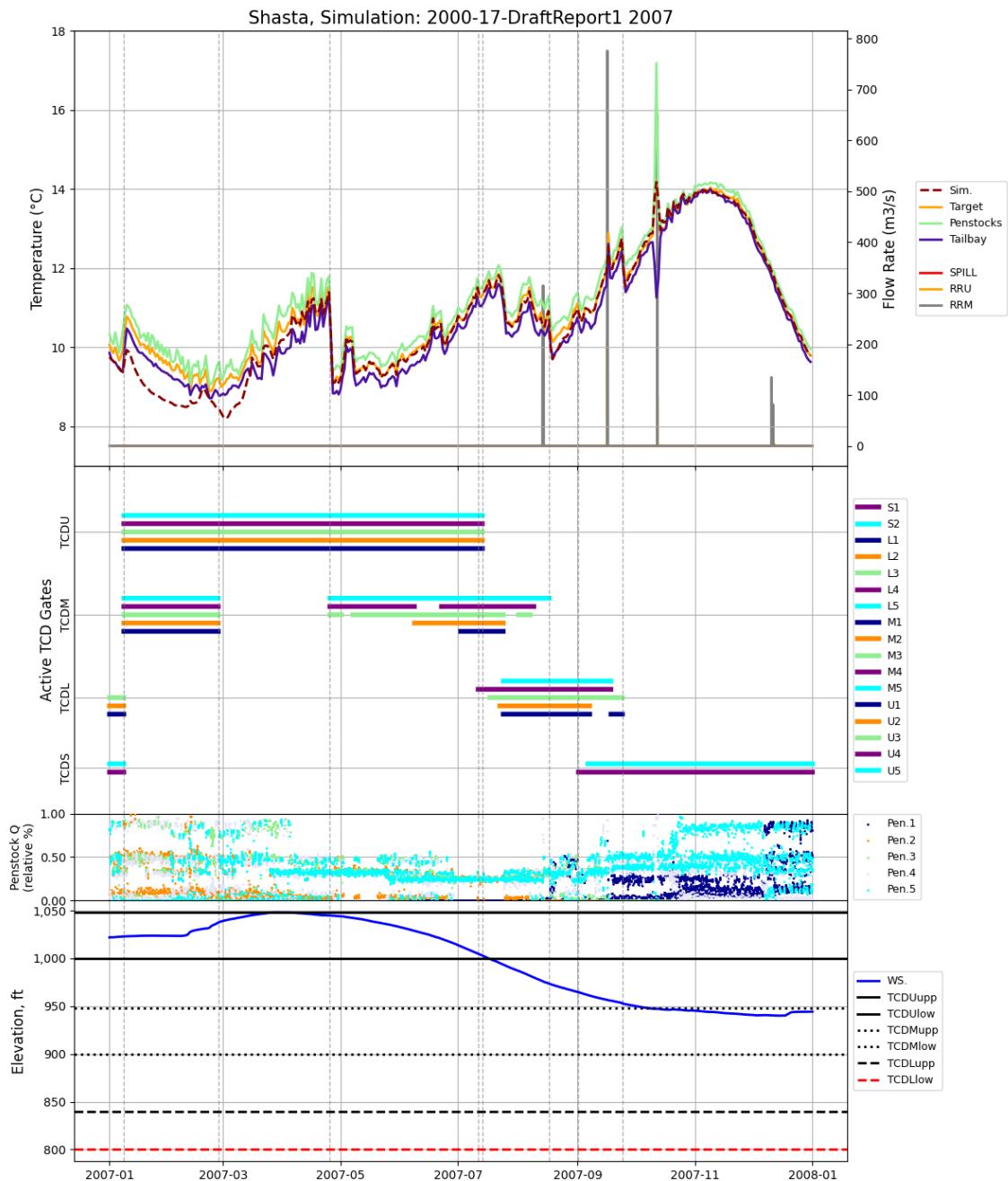


Figure 46. Shasta Temperature Outflow 2007

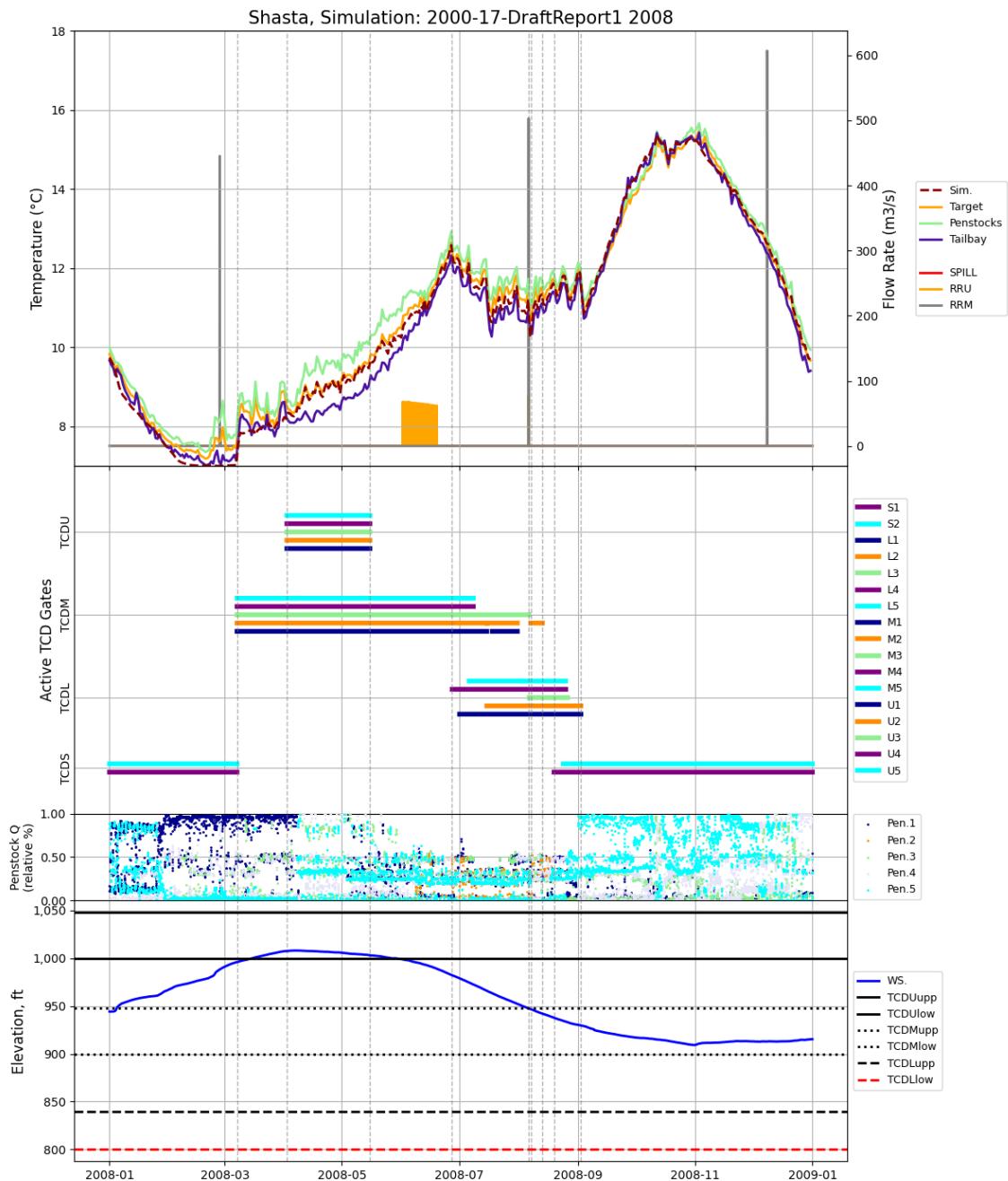


Figure 47. Shasta Temperature Outflow 2008

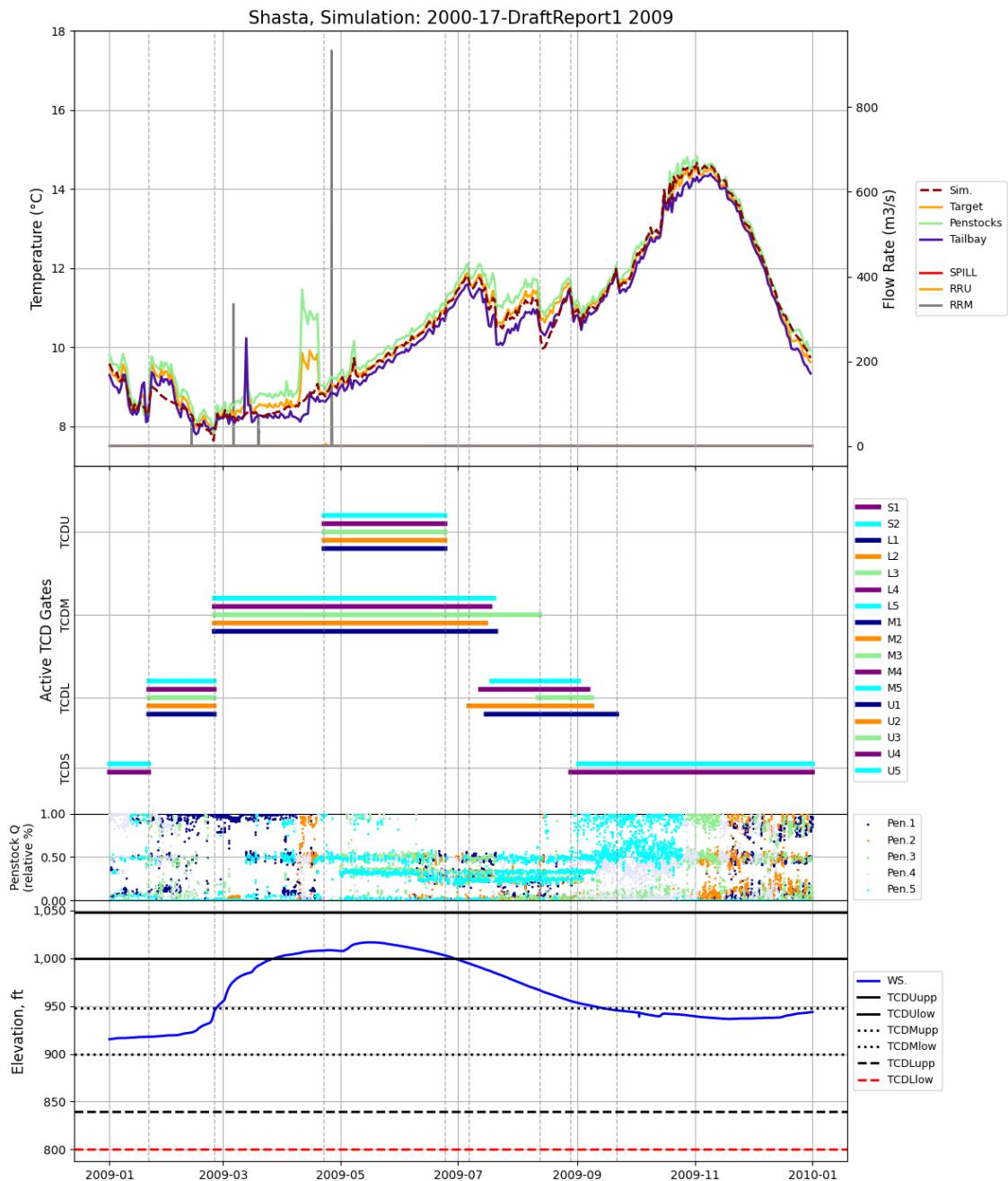


Figure 48. Shasta Temperature Outflow 2009

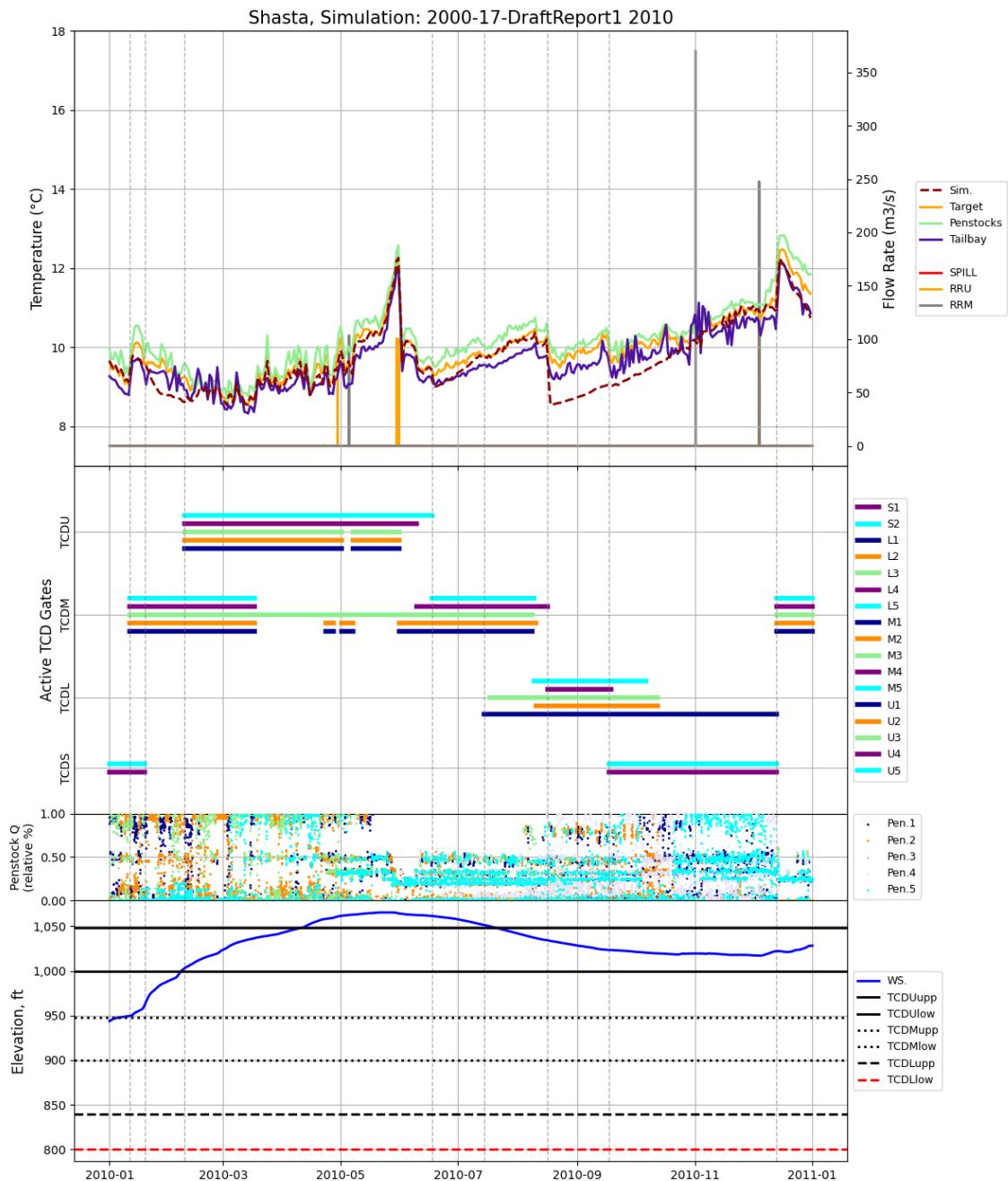


Figure 49. Shasta Temperature Outflow 2010

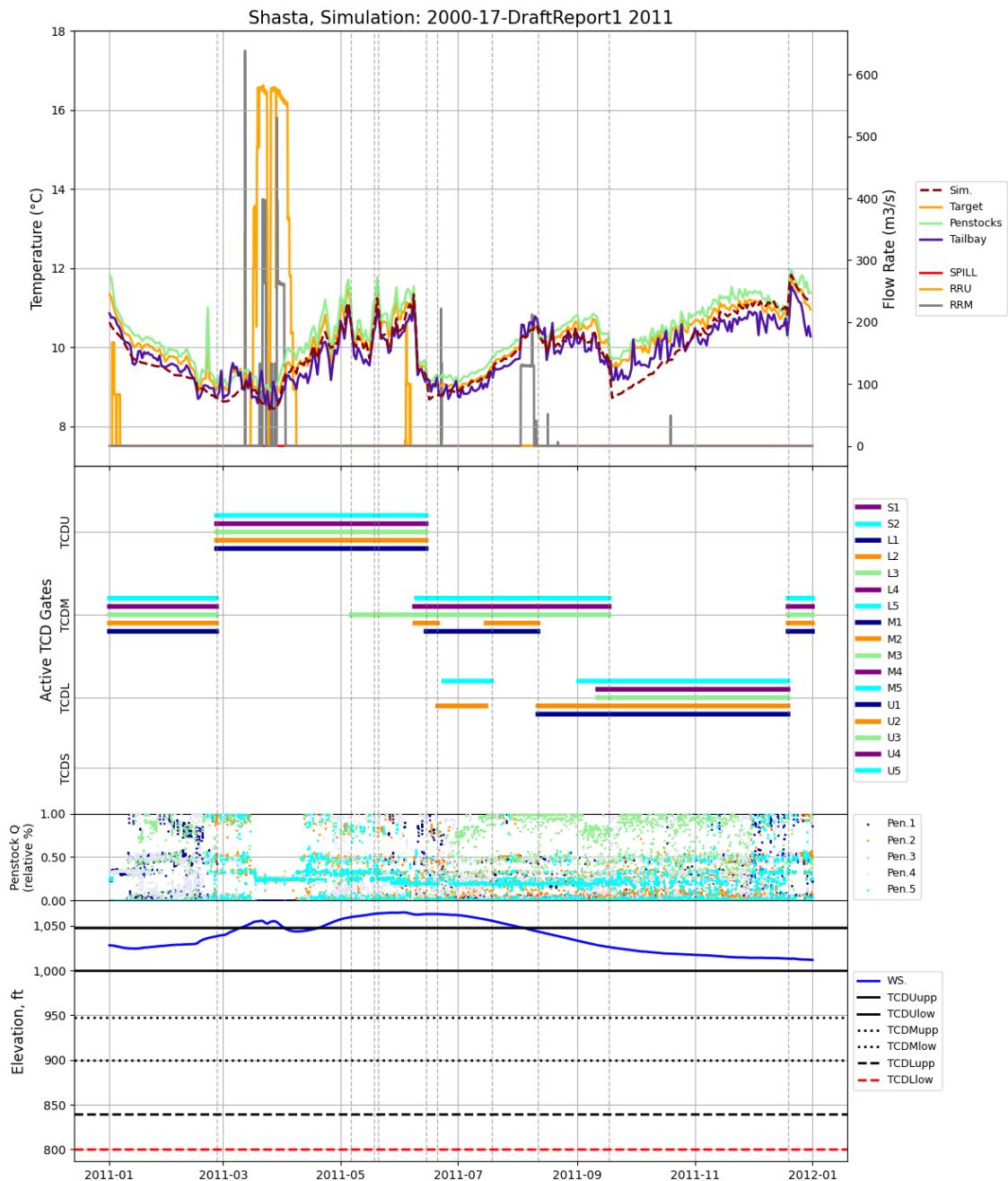


Figure 50. Shasta Temperature Outflow 2011

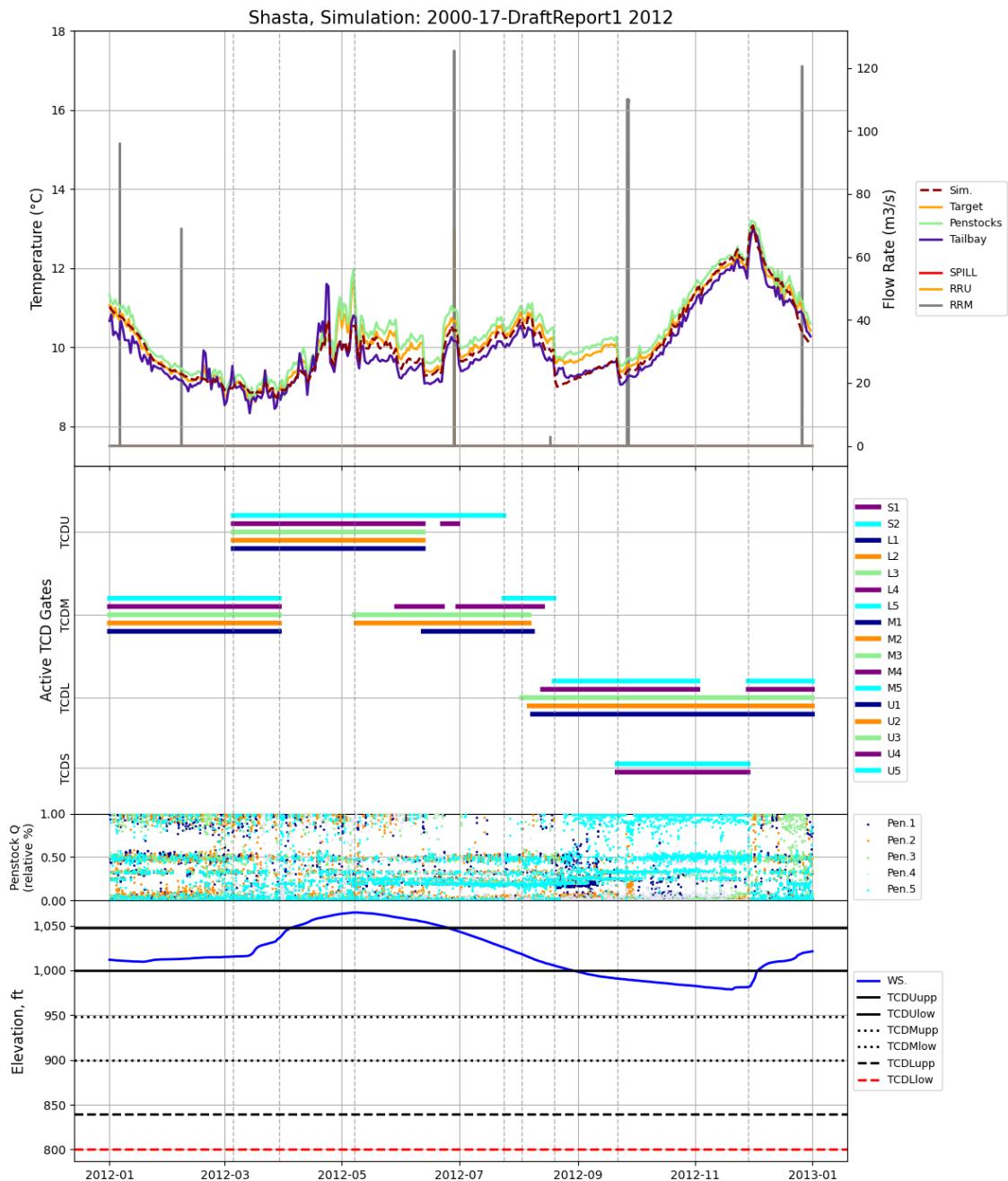


Figure 51. Shasta Temperature Outflow 2012

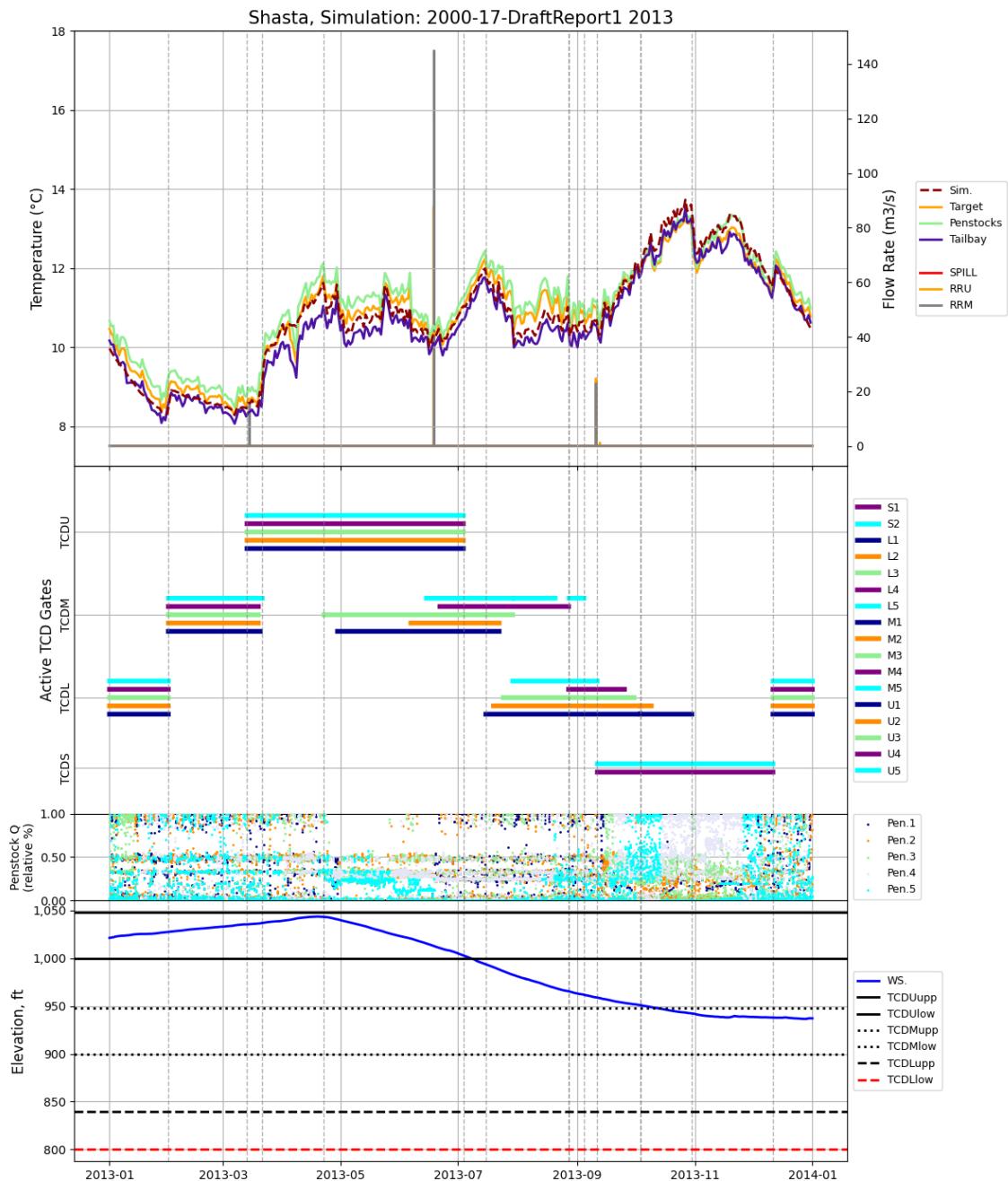


Figure 52. Shasta Temperature Outflow 2013

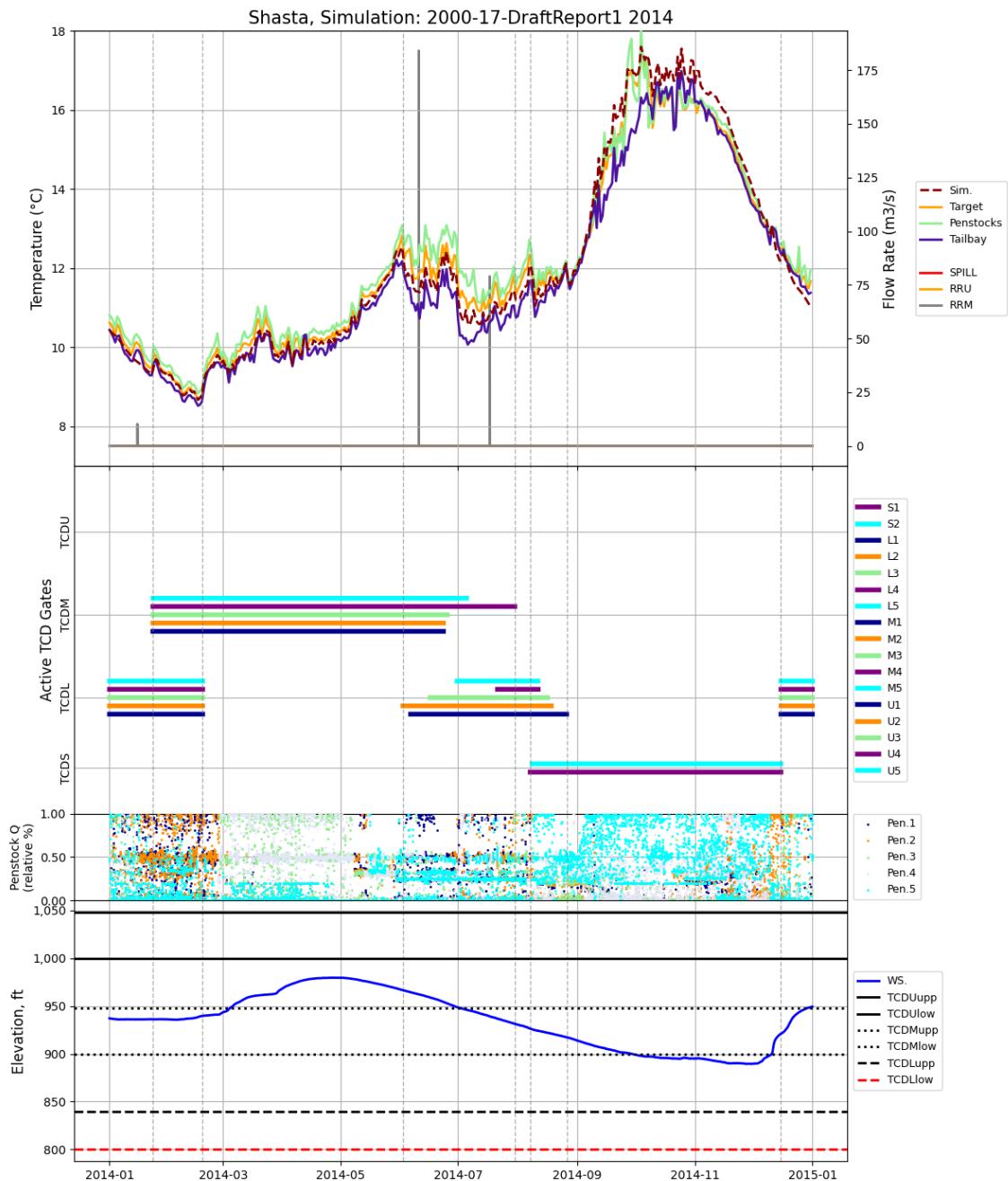


Figure 53. Shasta Temperature Outflow 2014

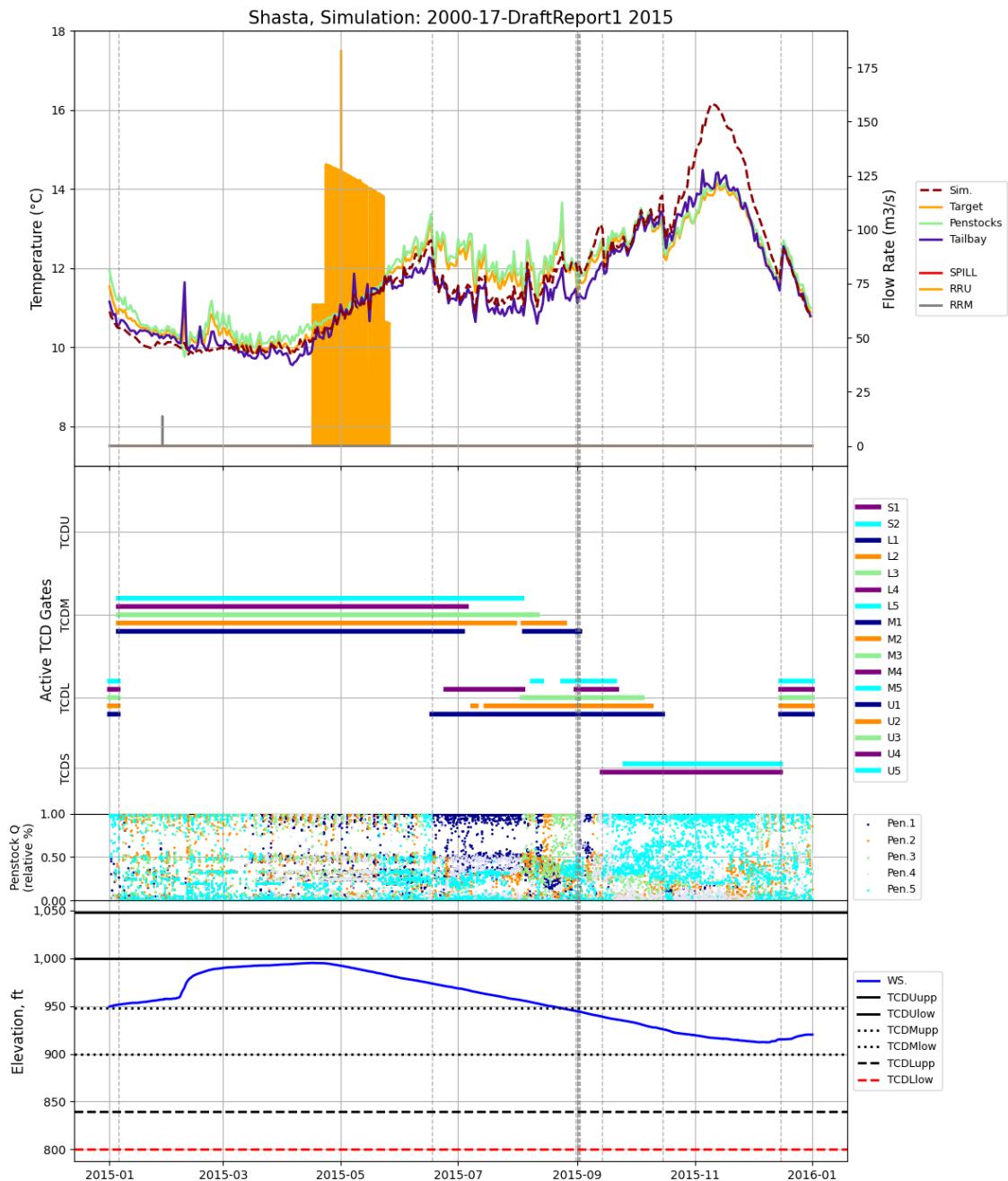


Figure 54. Shasta Temperature Outflow 2015

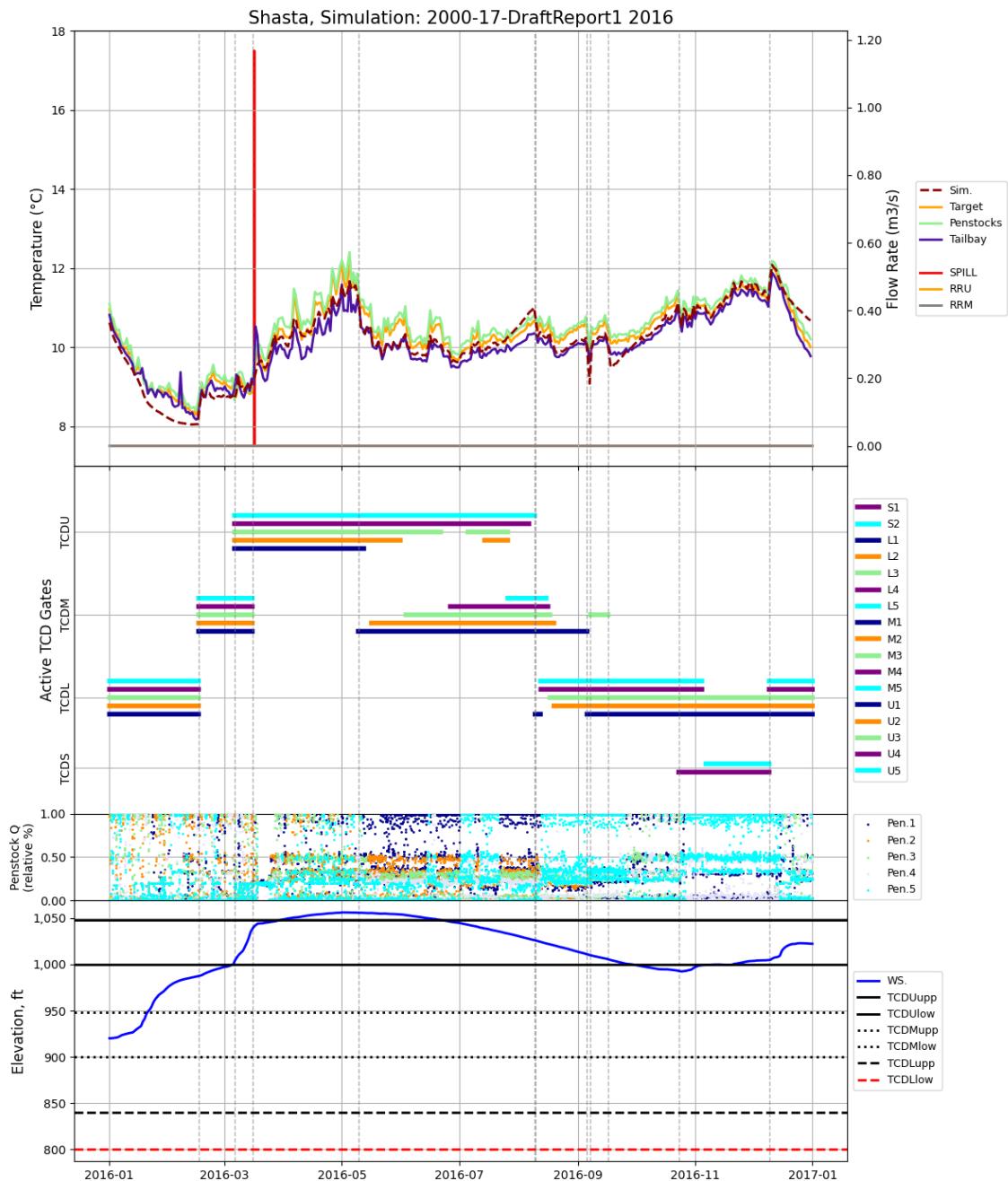


Figure 55. Shasta Temperature Outflow 2016

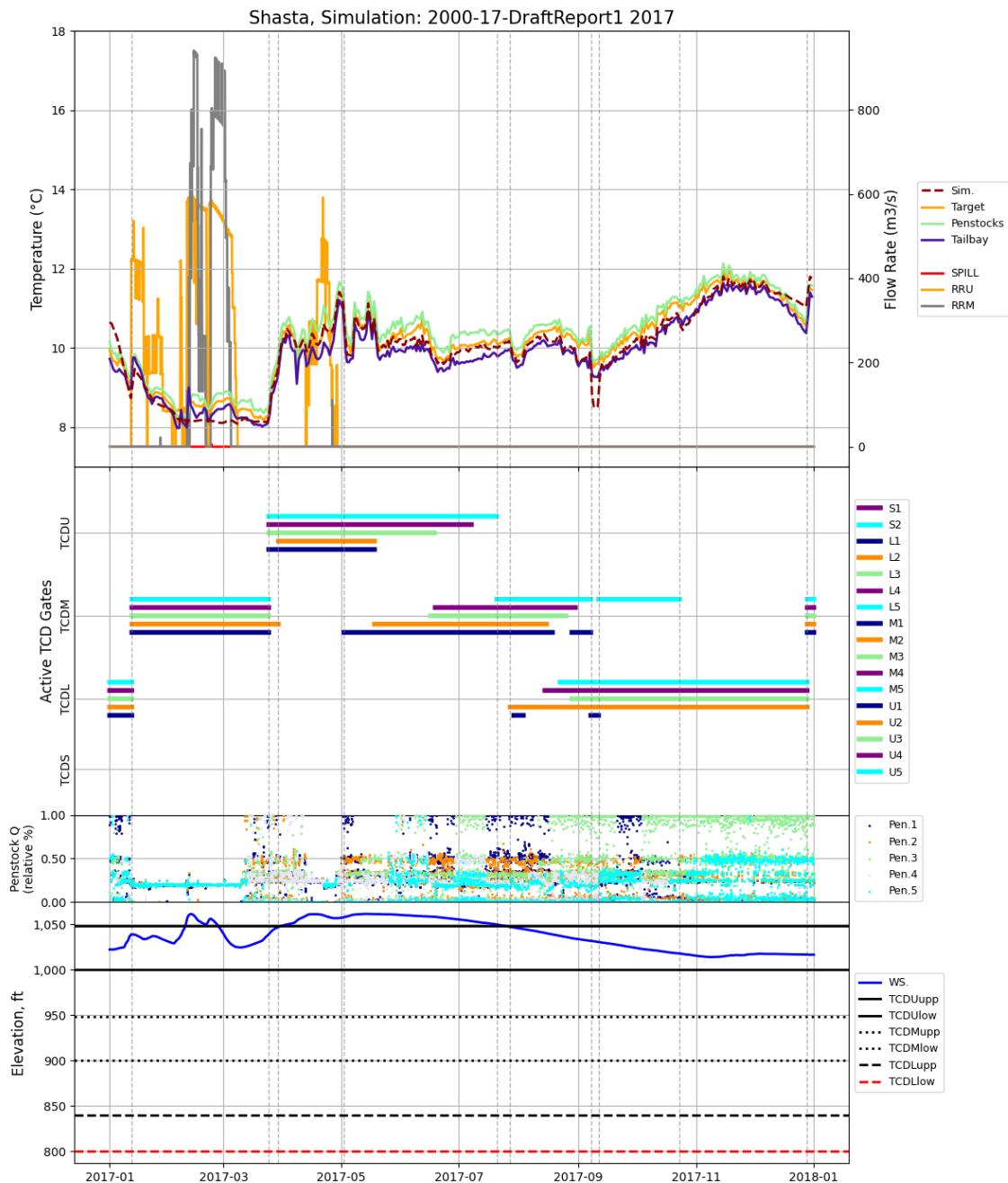


Figure 56. Shasta Temperature Outflow 2017

Shasta Lake Outflow Temperature

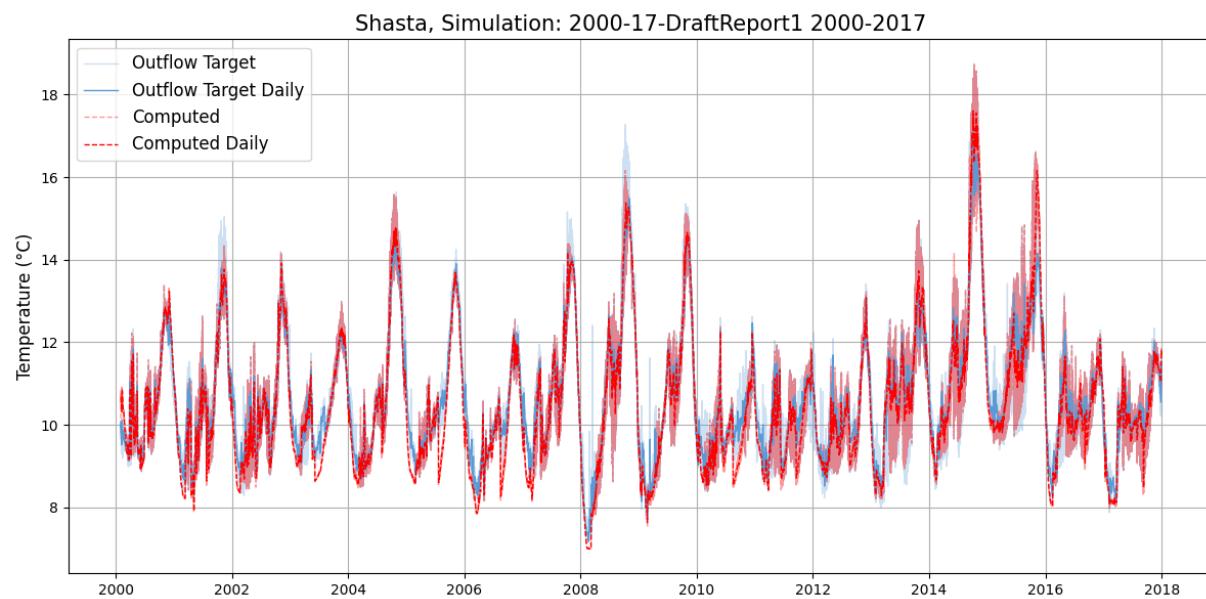


Figure 57. Shasta Lake Outflow Temperature 2000-2017

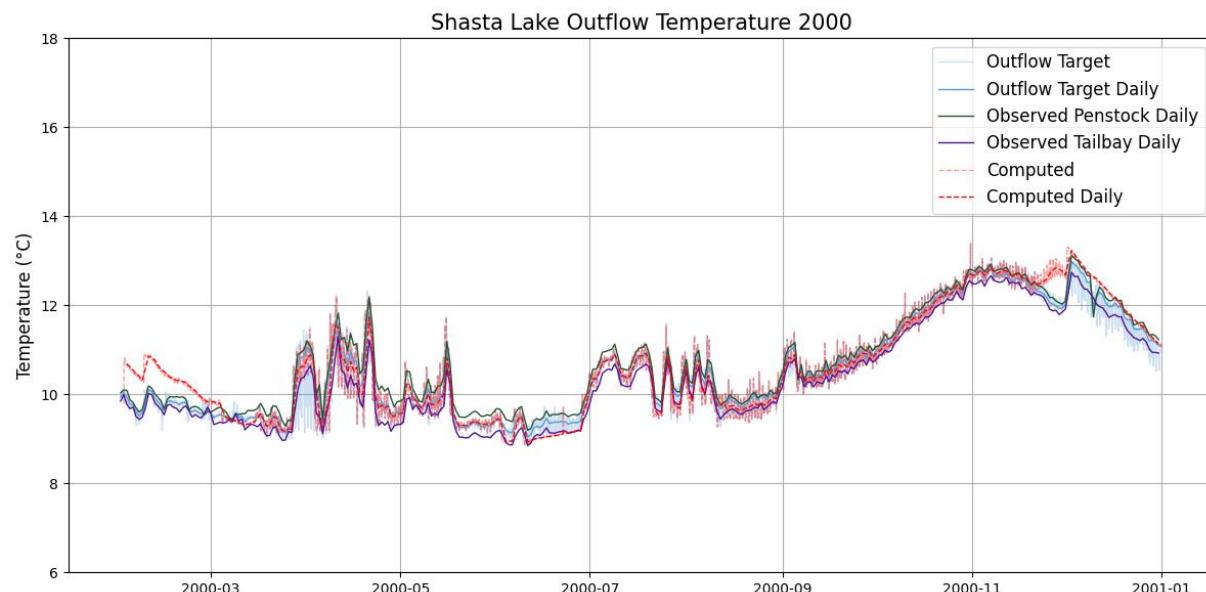


Figure 58. Shasta Lake Outflow Temperature 2000

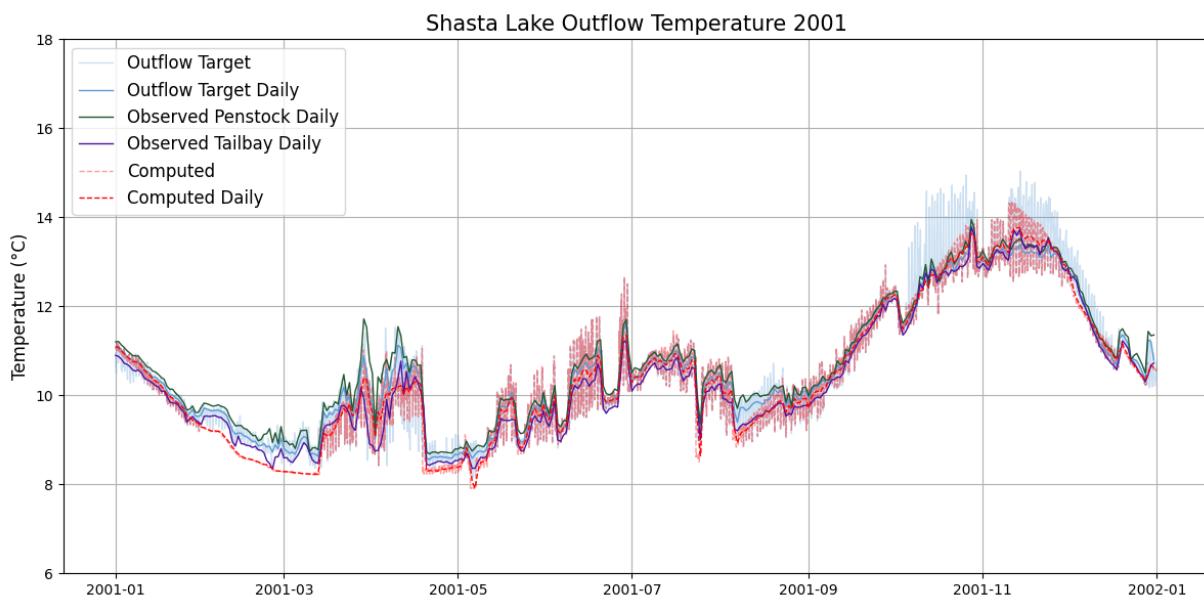


Figure 59. Shasta Lake Outflow Temperature 2001

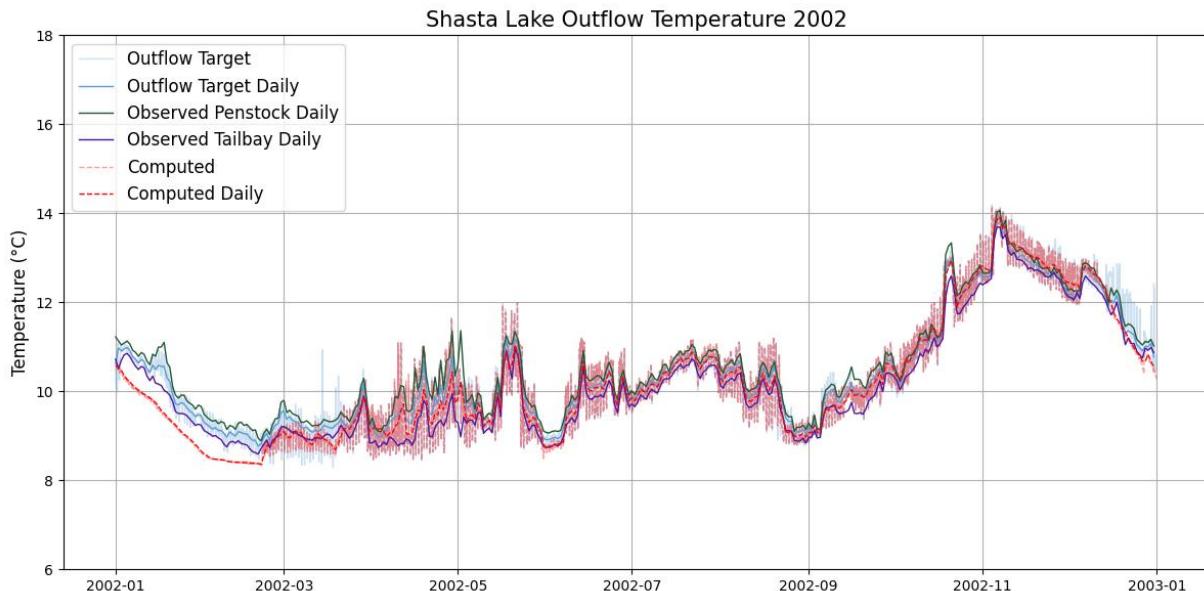


Figure 60. Shasta Lake Outflow Temperature 2002

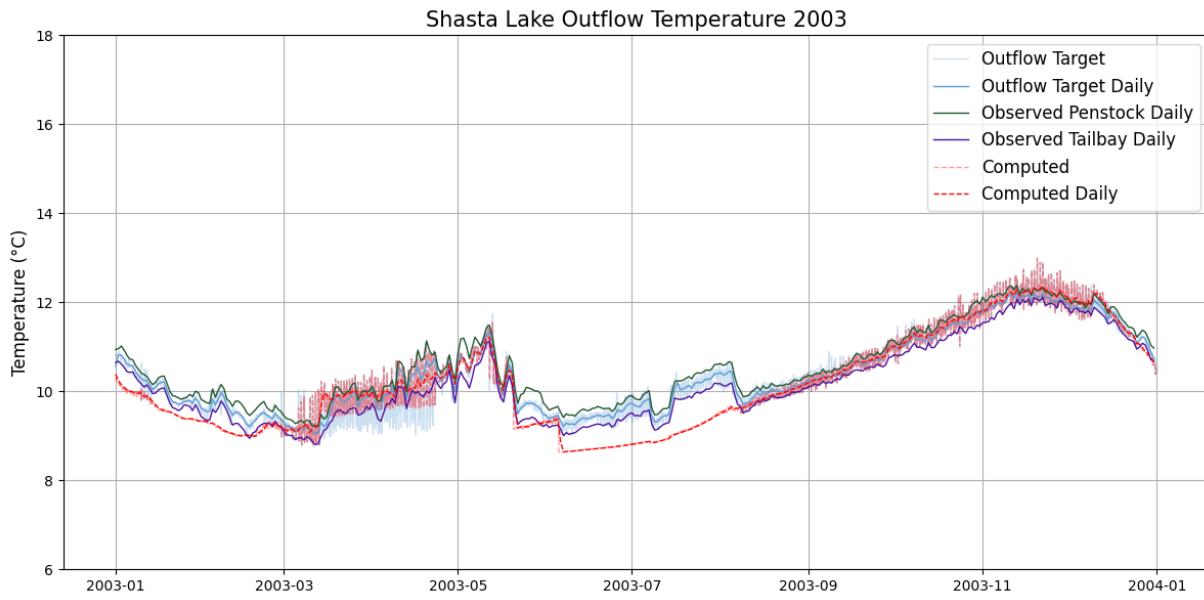


Figure 61. Shasta Lake Outflow Temperature 2003

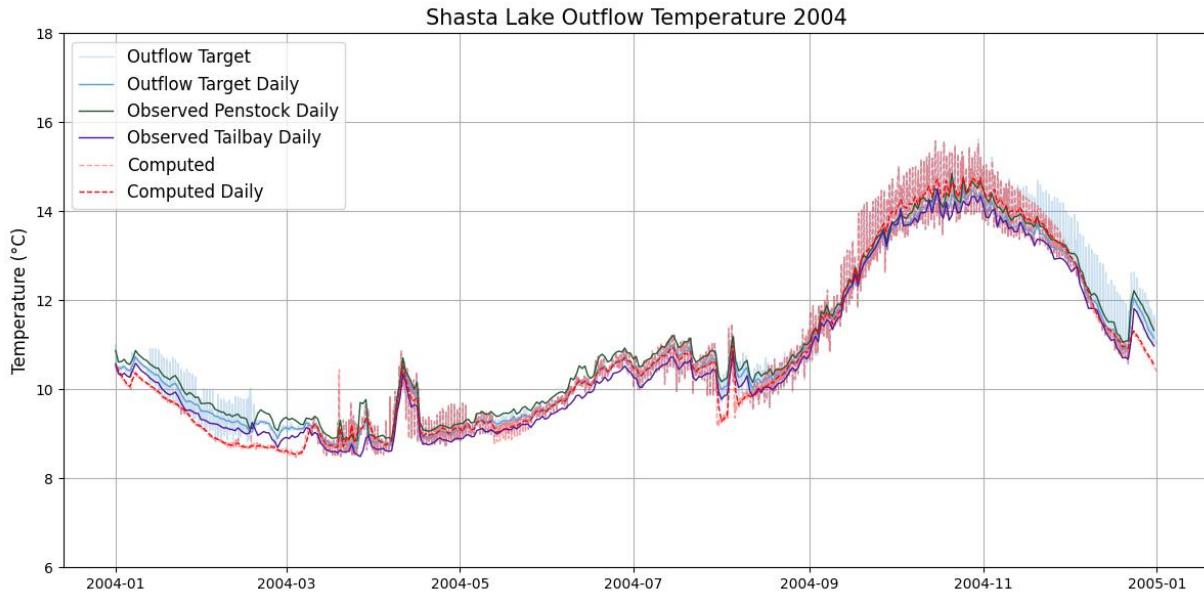


Figure 62. Shasta Lake Outflow Temperature 2004

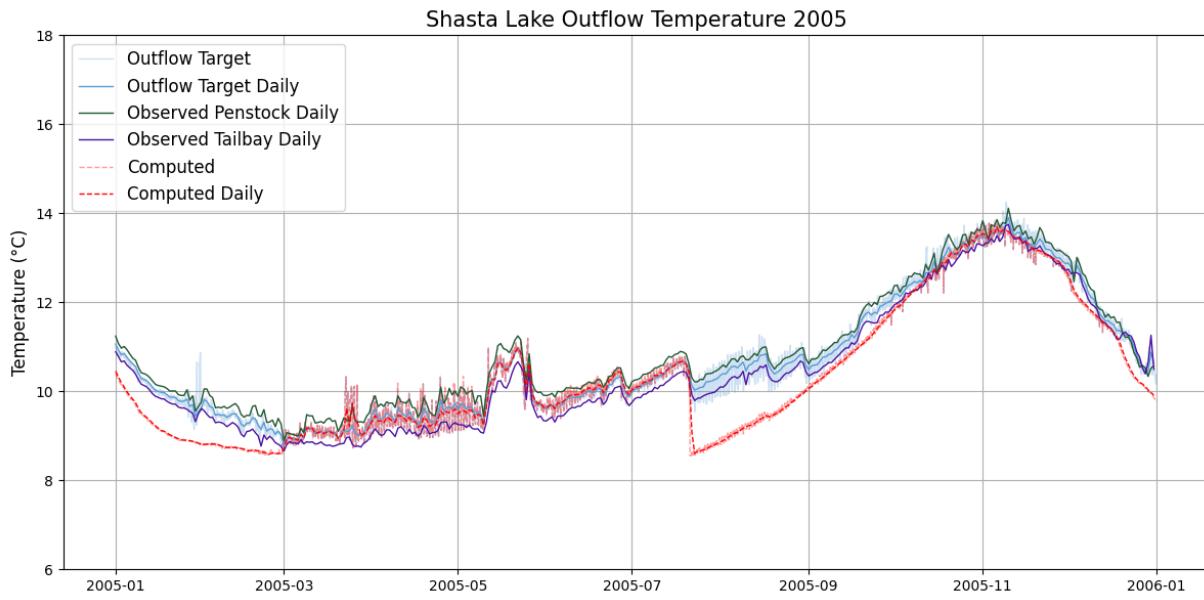


Figure 63. Shasta Lake Outflow Temperature 2005

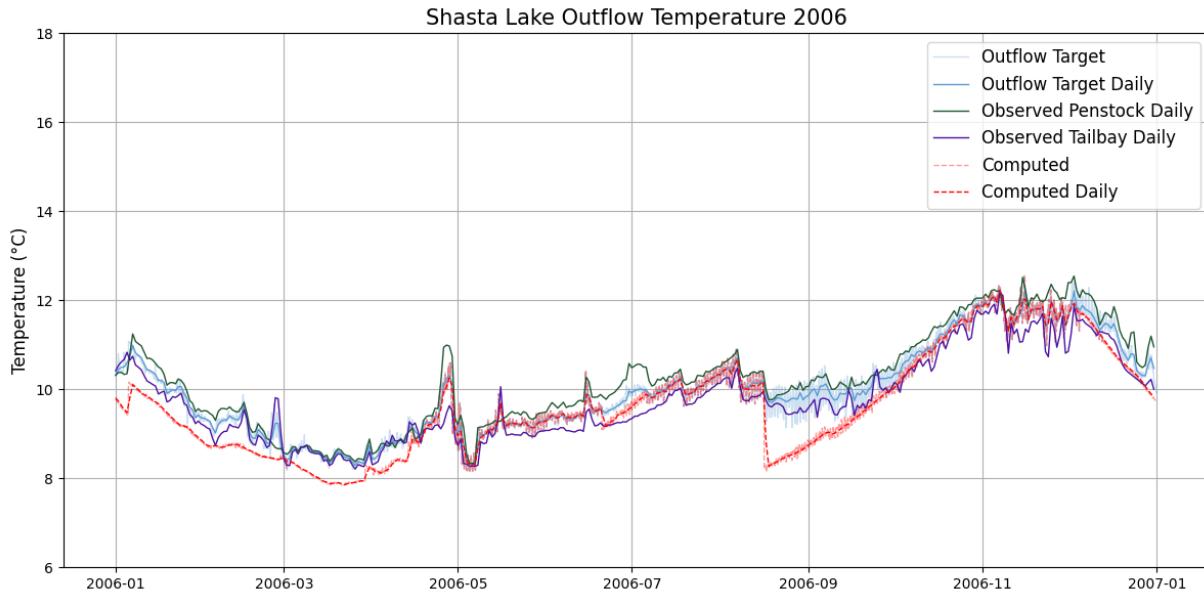


Figure 64. Shasta Lake Outflow Temperature 2006

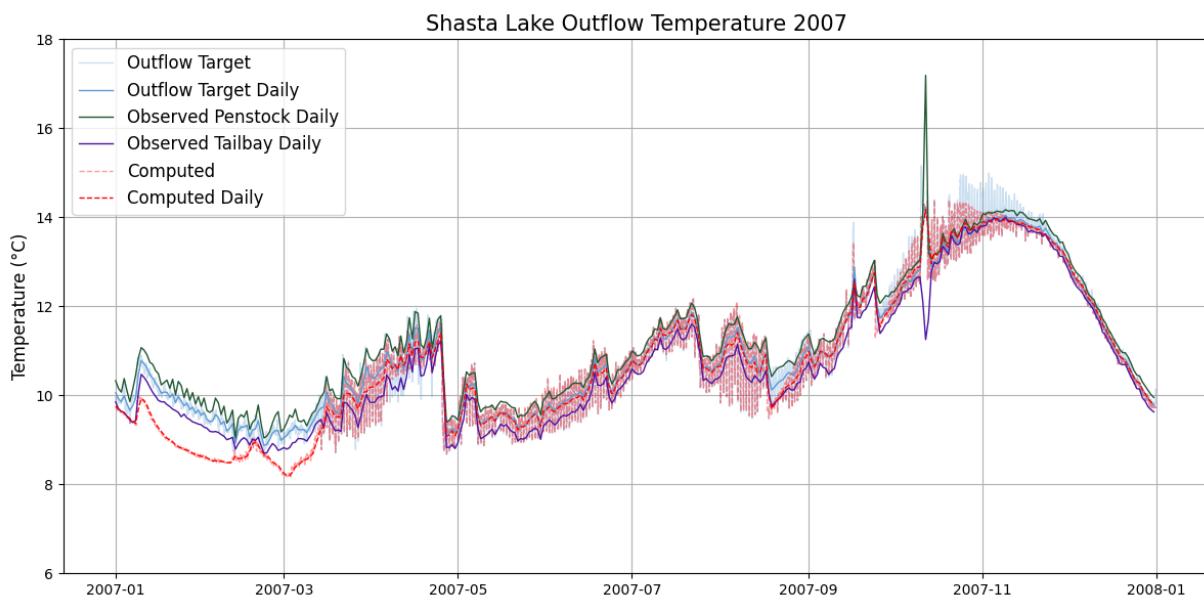


Figure 65. Shasta Lake Outflow Temperature 2007

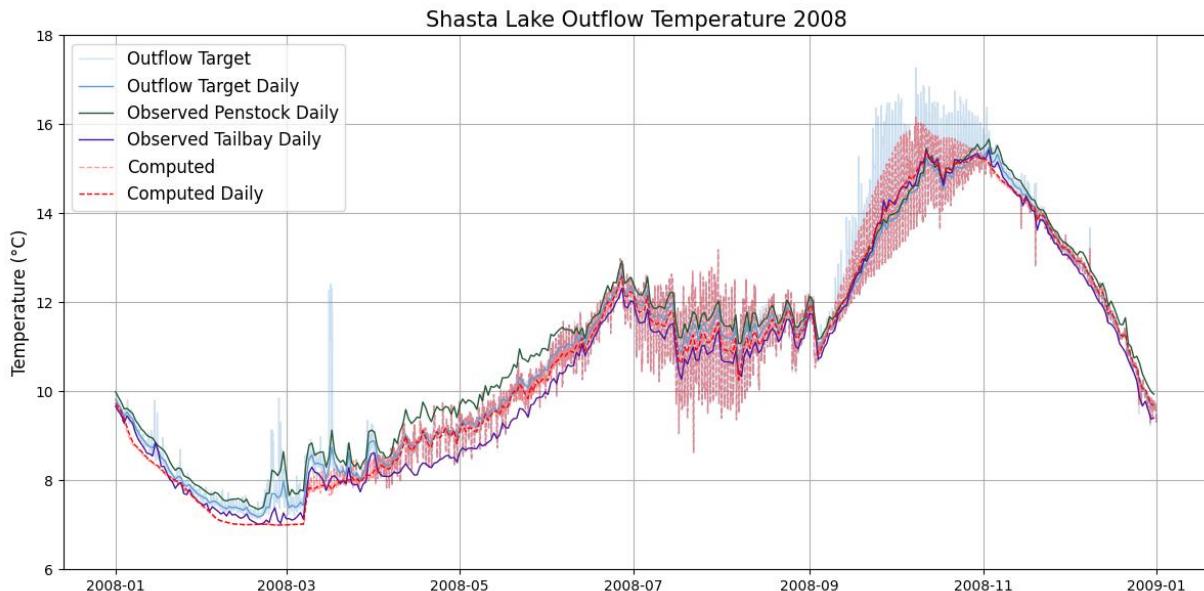


Figure 66. Shasta Lake Outflow Temperature 2008

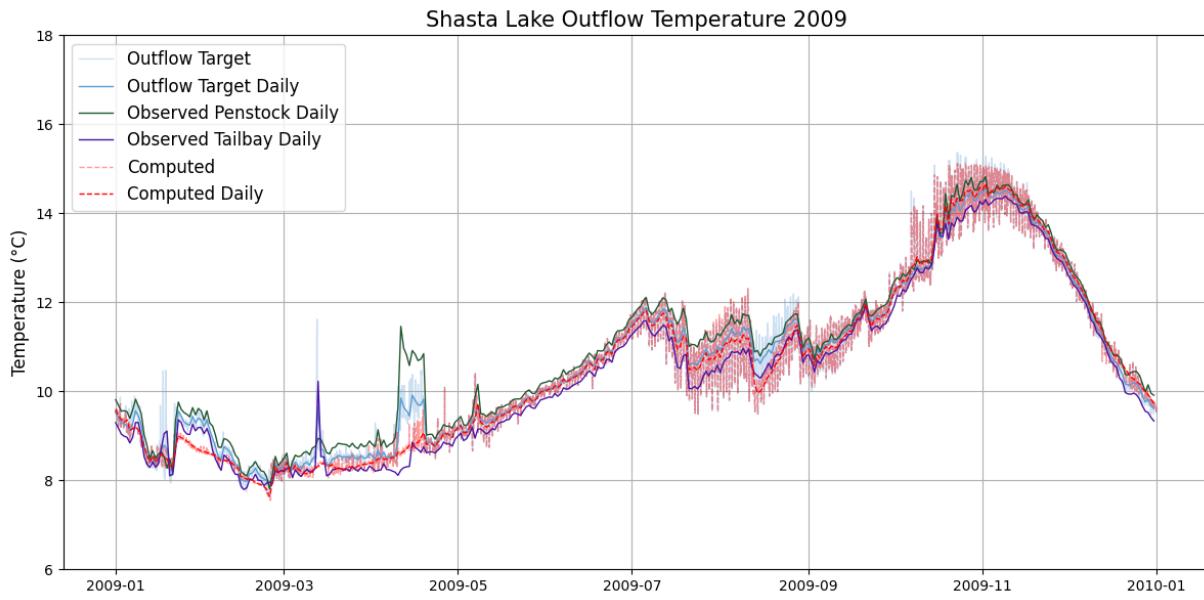


Figure 67. Shasta Lake Outflow Temperature 2009

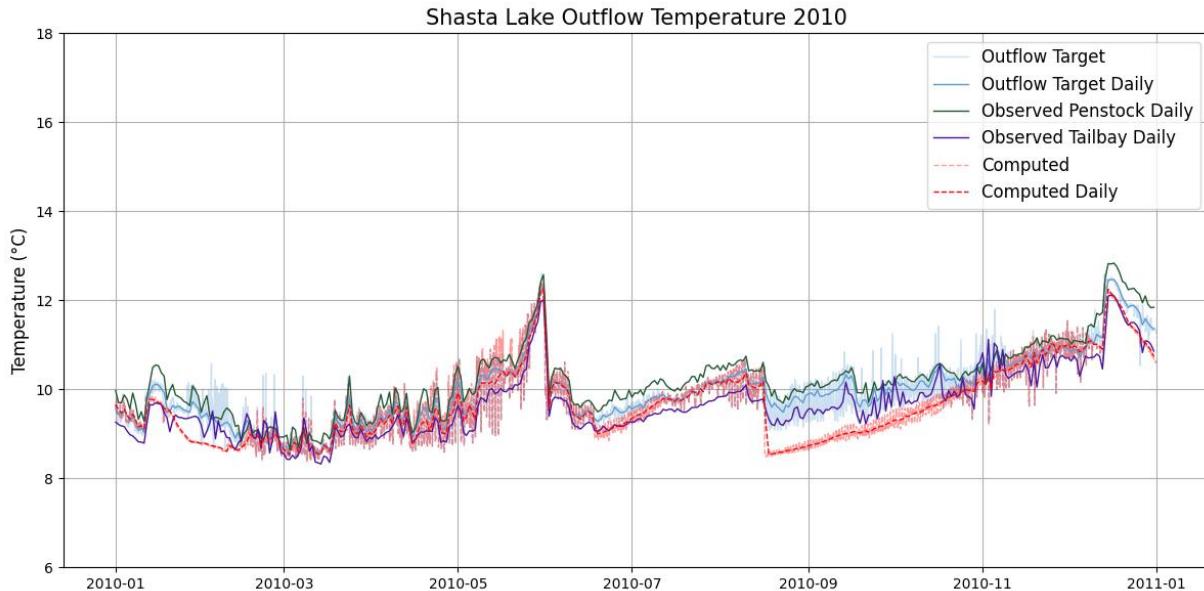


Figure 68. Shasta Lake Outflow Temperature 2010

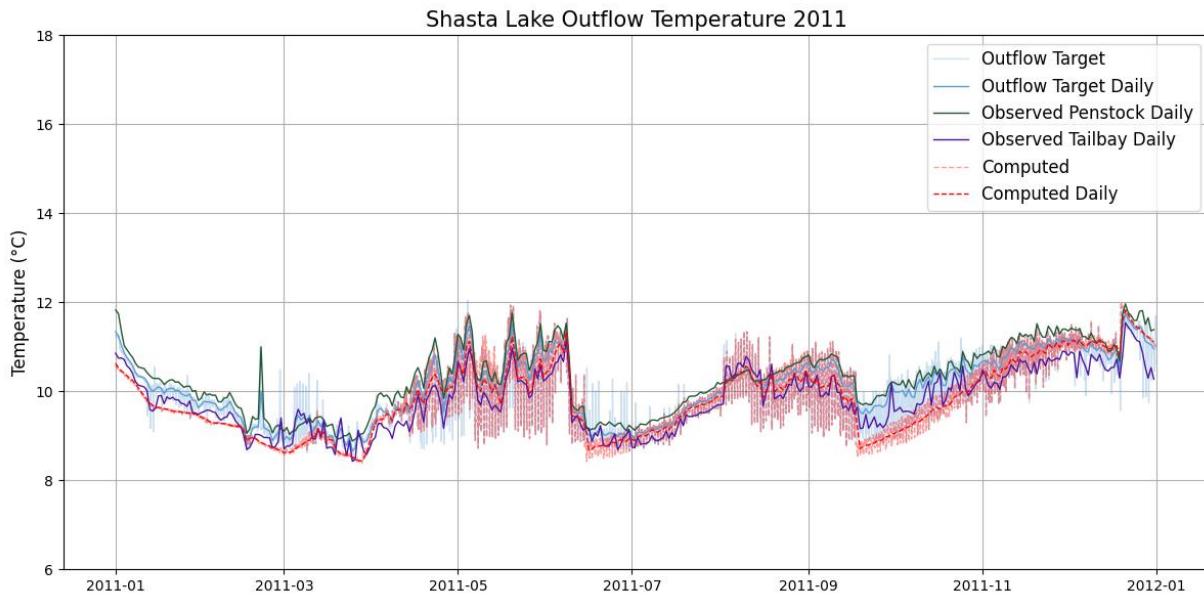


Figure 69. Shasta Lake Outflow Temperature 2011

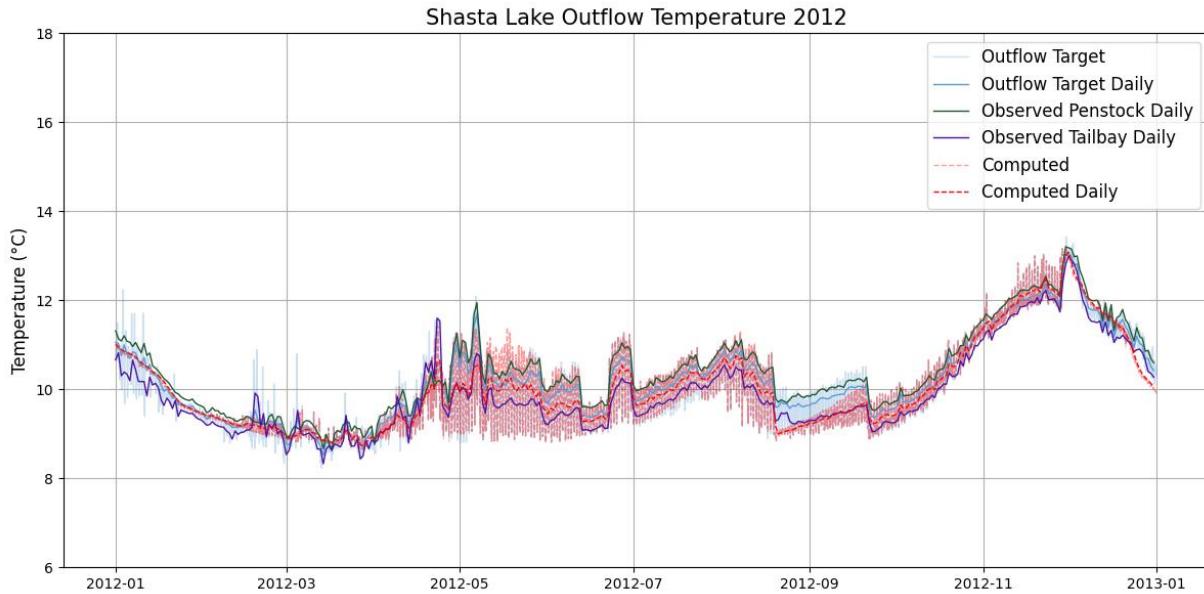


Figure 70. Shasta Lake Outflow Temperature 2012

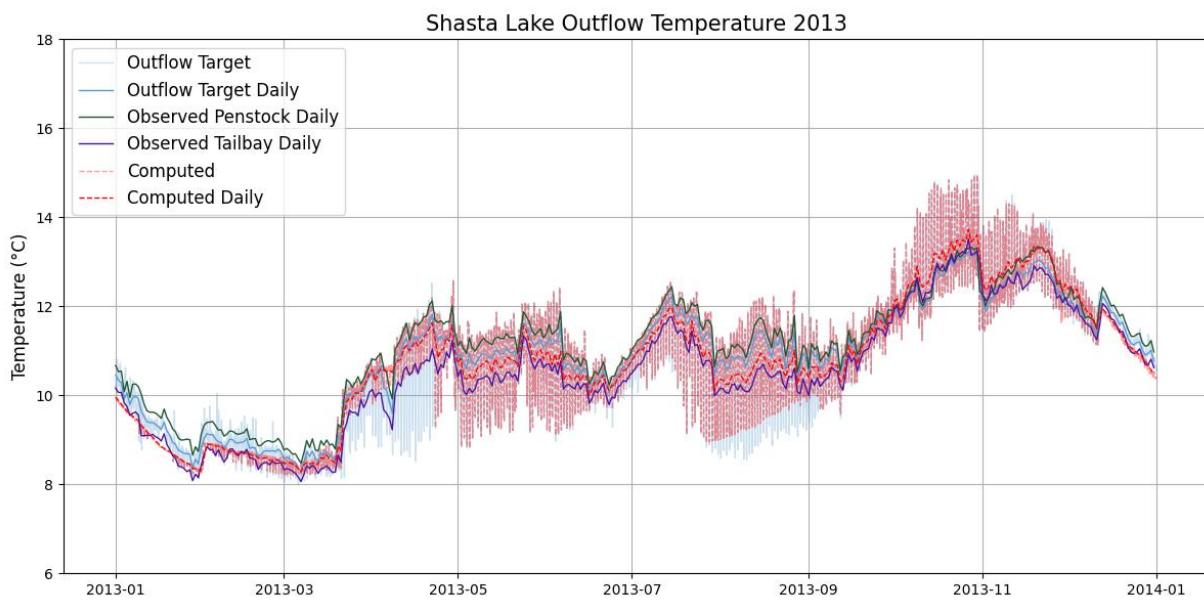


Figure 71. Shasta Lake Outflow Temperature 2013

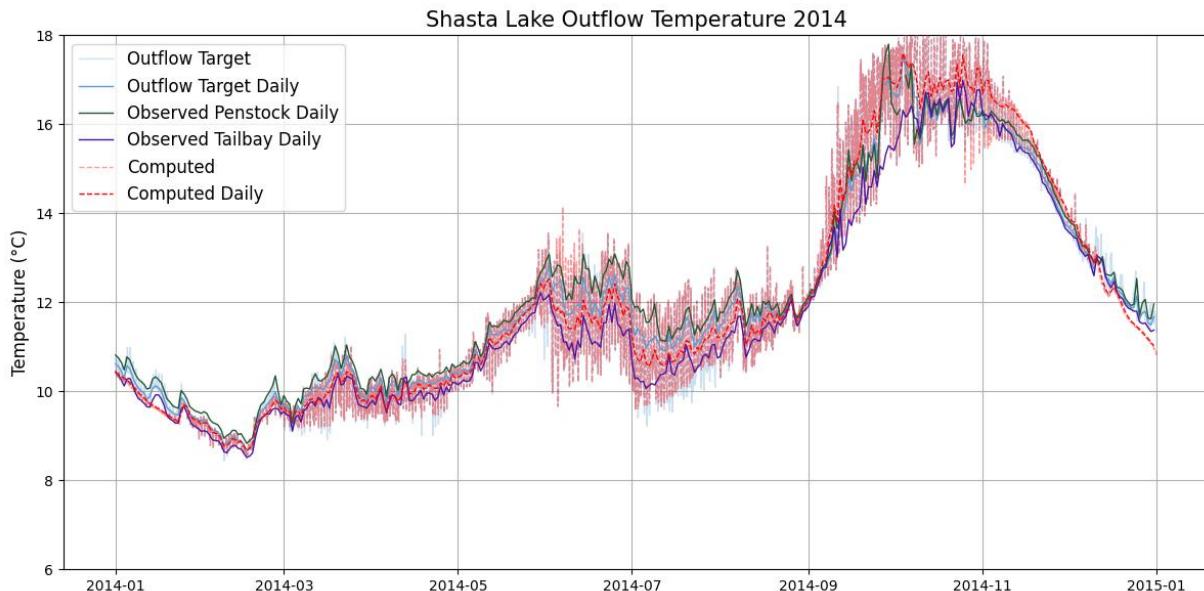


Figure 72. Shasta Lake Outflow Temperature 2014

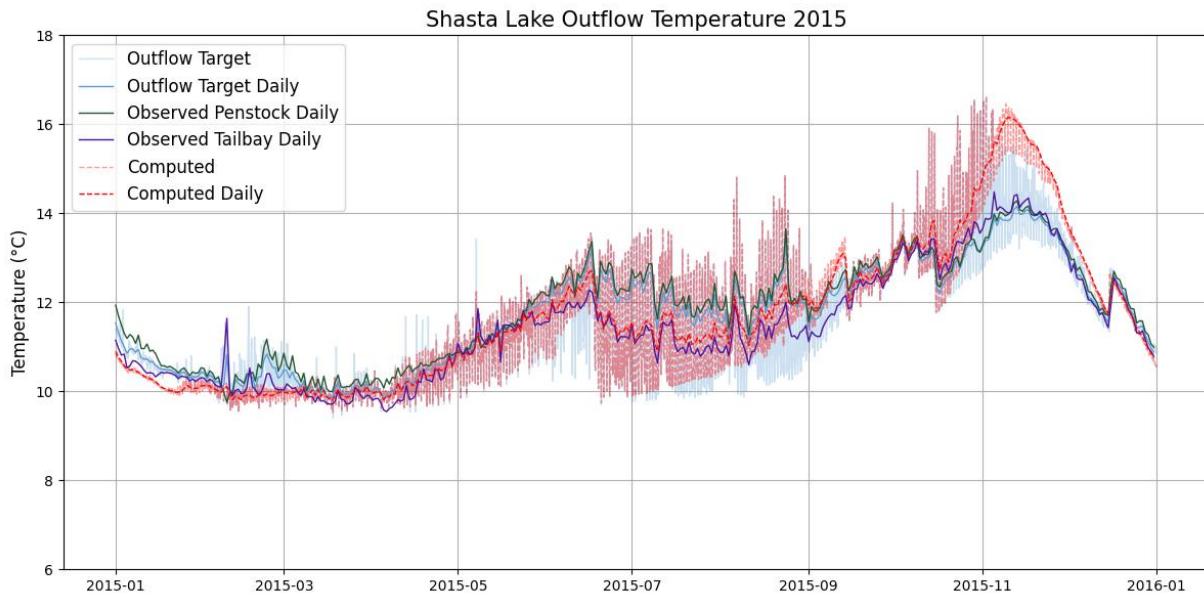


Figure 73. Shasta Lake Outflow Temperature 2015

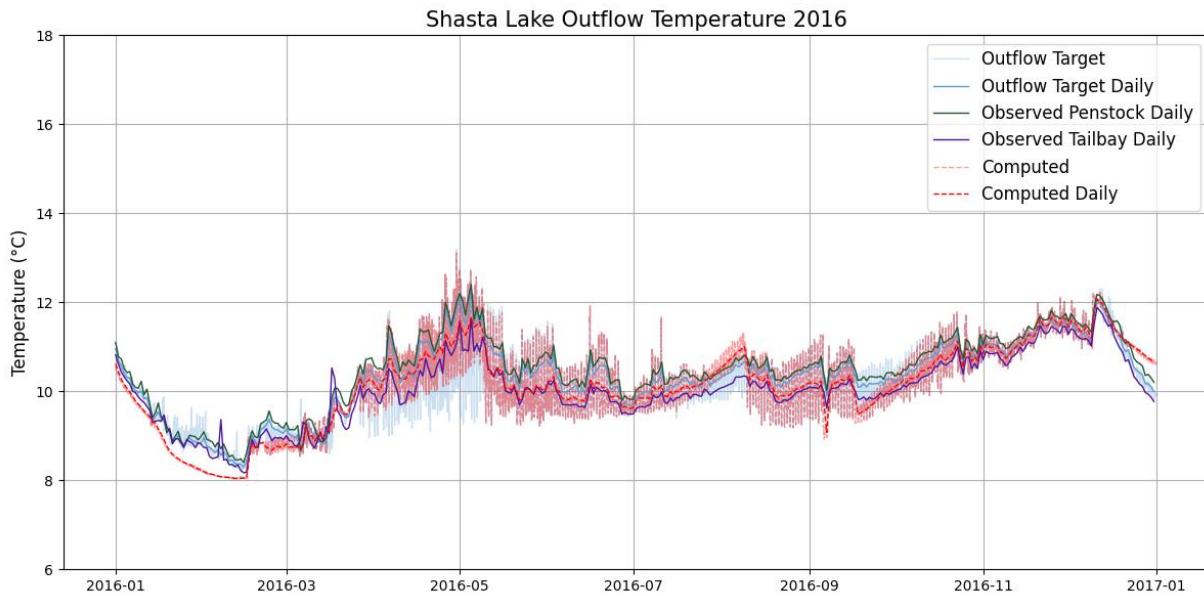


Figure 74. Shasta Lake Outflow Temperature 2016

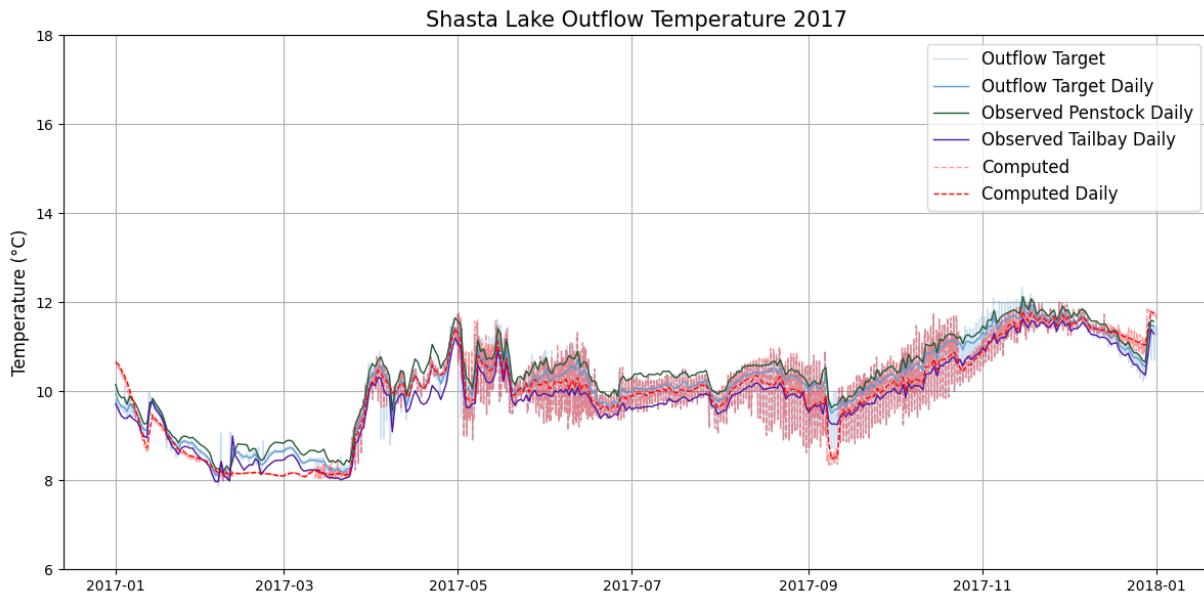


Figure 75. Shasta Lake Outflow Temperature 2017

Table 23. Shasta Lake Outflow Temperature Error Statistics

Statistics	2000	2001	2002	2003	2004	2005
Mean Bias (°C)	0.10	-0.15	-0.14	-0.20	-0.14	-0.33
MAE (°C)	0.15	0.17	0.16	0.24	0.15	0.35
RMSE (°C)	0.29	0.31	0.31	0.39	0.31	0.55
Nash-Sutcliffe (NSE)	0.93	0.96	0.94	0.83	0.97	0.84
COUNT	8,015	8,760	8,760	8,760	8,784	8,760

Statistics	2006	2007	2008	2009	2010	2011
Mean Bias (°C)	-0.30	-0.17	-0.15	-0.08	-0.23	-0.13
MAE (°C)	0.31	0.19	0.15	0.10	0.25	0.19
RMSE (°C)	0.47	0.37	0.36	0.26	0.43	0.32
Nash-Sutcliffe (NSE)	0.79	0.94	0.98	0.98	0.73	0.82
COUNT	8,760	8,760	8,784	8,760	8,760	8,760

Statistics	2012	2013	2014	2015	2016	2017
Mean Bias (°C)	-0.02	-0.00	-0.01	0.11	-0.03	-0.04
MAE (°C)	0.10	0.11	0.09	0.26	0.15	0.11
RMSE (°C)	0.21	0.24	0.20	0.50	0.28	0.23

Statistics	2012	2013	2014	2015	2016	2017
Nash-Sutcliffe (NSE)	0.96	0.97	0.99	0.87	0.89	0.94
COUNT	8,784	8,760	8,760	8,760	8,784	8,760

Table 24. Shasta Lake Outflow Temperature MeanBias, invalid when +- .75

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.62	0.07	0.09	0.02	-0.15	-0.01	-0.01	0.01	0.00	0.17	0.30
2001	-0.03	-0.47	-0.34	-0.20	-0.08	0.02	-0.02	-0.14	0.02	-0.24	-0.14	-0.16
2002	-0.68	-0.50	-0.19	0.01	-0.04	-0.02	0.01	-0.01	-0.02	0.01	-0.00	-0.24
2003	-0.42	-0.37	0.08	0.08	-0.14	-0.61	-0.82	-0.19	-0.01	-0.00	0.00	-0.01
2004	-0.37	-0.51	-0.12	0.00	-0.05	0.00	-0.02	-0.16	0.00	0.00	-0.05	-0.46
2005	-0.82	-0.61	0.00	-0.01	0.01	0.07	-0.46	-1.11	-0.40	-0.12	-0.15	-0.41
2006	-0.67	-0.52	-0.46	-0.26	0.00	-0.09	-0.03	-0.62	-0.60	-0.09	-0.00	-0.33
2007	-0.81	-0.64	-0.34	-0.00	0.02	0.02	0.01	-0.08	-0.02	-0.05	-0.12	-0.02
2008	-0.25	-0.47	-0.52	-0.01	-0.05	-0.06	0.01	-0.01	-0.15	-0.18	-0.14	-0.00
2009	-0.23	-0.15	-0.20	-0.31	0.00	-0.00	0.01	-0.13	0.01	-0.00	-0.00	0.07
2010	-0.28	-0.34	-0.02	-0.00	0.04	-0.12	-0.05	-0.46	-0.78	-0.43	-0.06	-0.27
2011	-0.37	-0.32	-0.31	0.02	0.04	-0.14	-0.00	0.01	-0.28	-0.40	-0.01	0.15
2012	0.07	0.00	0.03	-0.06	0.10	0.01	0.03	-0.13	-0.10	0.02	-0.00	-0.14
2013	-0.29	-0.17	0.06	0.30	0.02	0.03	0.02	0.11	0.04	0.00	0.00	-0.16
2014	-0.19	-0.04	-0.01	-0.01	0.00	0.02	0.07	0.01	0.00	0.04	0.28	-0.25
2015	-0.38	-0.37	-0.10	-0.01	-0.01	0.12	0.05	0.31	0.26	0.11	1.22	0.10
2016	-0.44	-0.38	-0.04	0.18	0.08	0.01	0.07	0.13	-0.16	-0.00	0.00	0.21
2017	-0.03	-0.28	-0.21	0.05	0.01	-0.00	0.00	0.01	-0.11	-0.07	-0.03	0.19
All	-0.36	-0.31	-0.15	-0.01	-0.00	-0.05	-0.06	-0.14	-0.13	-0.08	0.05	-0.08

Table 25. Shasta Lake Outflow Temperature MAE, invalid over 1.0

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.62	0.14	0.12	0.02	0.16	0.05	0.04	0.02	0.00	0.17	0.30
2001	0.06	0.47	0.35	0.25	0.12	0.02	0.05	0.15	0.02	0.24	0.14	0.21
2002	0.70	0.50	0.20	0.05	0.05	0.05	0.01	0.03	0.04	0.01	0.00	0.28
2003	0.42	0.37	0.10	0.08	0.18	0.61	0.82	0.19	0.01	0.00	0.00	0.07

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	0.37	0.51	0.14	0.01	0.05	0.00	0.05	0.18	0.00	0.00	0.05	0.46
2005	0.82	0.61	0.00	0.01	0.02	0.07	0.50	1.11	0.40	0.12	0.15	0.41
2006	0.67	0.52	0.47	0.27	0.01	0.11	0.04	0.62	0.60	0.09	0.00	0.33
2007	0.81	0.64	0.35	0.08	0.02	0.02	0.01	0.11	0.05	0.05	0.12	0.02
2008	0.25	0.47	0.52	0.01	0.05	0.06	0.01	0.02	0.15	0.18	0.14	0.00
2009	0.26	0.18	0.21	0.32	0.00	0.00	0.01	0.16	0.02	0.00	0.00	0.07
2010	0.31	0.34	0.02	0.03	0.05	0.14	0.06	0.47	0.78	0.44	0.06	0.28
2011	0.39	0.32	0.31	0.08	0.09	0.15	0.01	0.02	0.29	0.40	0.01	0.18
2012	0.17	0.09	0.08	0.09	0.14	0.02	0.03	0.16	0.12	0.02	0.00	0.27
2013	0.30	0.17	0.11	0.31	0.02	0.03	0.02	0.11	0.04	0.00	0.01	0.18
2014	0.19	0.04	0.03	0.02	0.01	0.06	0.07	0.01	0.00	0.05	0.29	0.31
2015	0.38	0.37	0.10	0.02	0.02	0.12	0.05	0.31	0.26	0.11	1.22	0.25
2016	0.44	0.38	0.08	0.18	0.11	0.01	0.07	0.13	0.16	0.01	0.00	0.22
2017	0.28	0.30	0.21	0.06	0.08	0.00	0.00	0.01	0.11	0.07	0.03	0.19
All	0.40	0.38	0.19	0.11	0.06	0.09	0.10	0.21	0.17	0.10	0.13	0.22

Table 26. Shasta Lake Outflow Temperature RMSE, invalid over 1.5

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.66	0.27	0.32	0.04	0.22	0.11	0.13	0.05	0.00	0.34	0.39
2001	0.12	0.49	0.46	0.35	0.21	0.03	0.16	0.26	0.03	0.48	0.27	0.32
2002	0.74	0.55	0.29	0.10	0.08	0.09	0.03	0.08	0.10	0.02	0.02	0.45
2003	0.45	0.42	0.20	0.17	0.26	0.66	0.85	0.32	0.05	0.02	0.00	0.12
2004	0.42	0.55	0.28	0.02	0.09	0.02	0.17	0.32	0.01	0.01	0.16	0.64
2005	0.84	0.64	0.01	0.04	0.03	0.08	0.82	1.16	0.42	0.19	0.20	0.47
2006	0.70	0.57	0.49	0.35	0.04	0.18	0.10	0.89	0.68	0.14	0.00	0.39
2007	0.86	0.69	0.51	0.17	0.03	0.02	0.03	0.20	0.13	0.15	0.21	0.05
2008	0.31	0.61	0.88	0.06	0.14	0.13	0.02	0.08	0.36	0.34	0.24	0.03
2009	0.39	0.26	0.37	0.58	0.00	0.00	0.02	0.29	0.03	0.03	0.02	0.13
2010	0.44	0.53	0.05	0.06	0.12	0.22	0.13	0.68	0.84	0.54	0.21	0.36
2011	0.41	0.42	0.41	0.17	0.17	0.34	0.06	0.05	0.47	0.50	0.03	0.30

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	0.29	0.21	0.17	0.18	0.24	0.04	0.06	0.29	0.21	0.03	0.02	0.36
2013	0.37	0.24	0.25	0.58	0.02	0.06	0.06	0.22	0.13	0.02	0.05	0.23
2014	0.27	0.10	0.08	0.06	0.04	0.18	0.15	0.02	0.02	0.18	0.35	0.40
2015	0.40	0.52	0.20	0.09	0.08	0.32	0.09	0.51	0.45	0.31	1.35	0.32
2016	0.50	0.44	0.17	0.31	0.28	0.02	0.13	0.24	0.29	0.02	0.00	0.34
2017	0.37	0.37	0.28	0.17	0.15	0.03	0.00	0.02	0.32	0.18	0.10	0.29
All	0.50	0.49	0.36	0.27	0.14	0.22	0.29	0.44	0.35	0.25	0.36	0.35

Shasta Lake Outflow

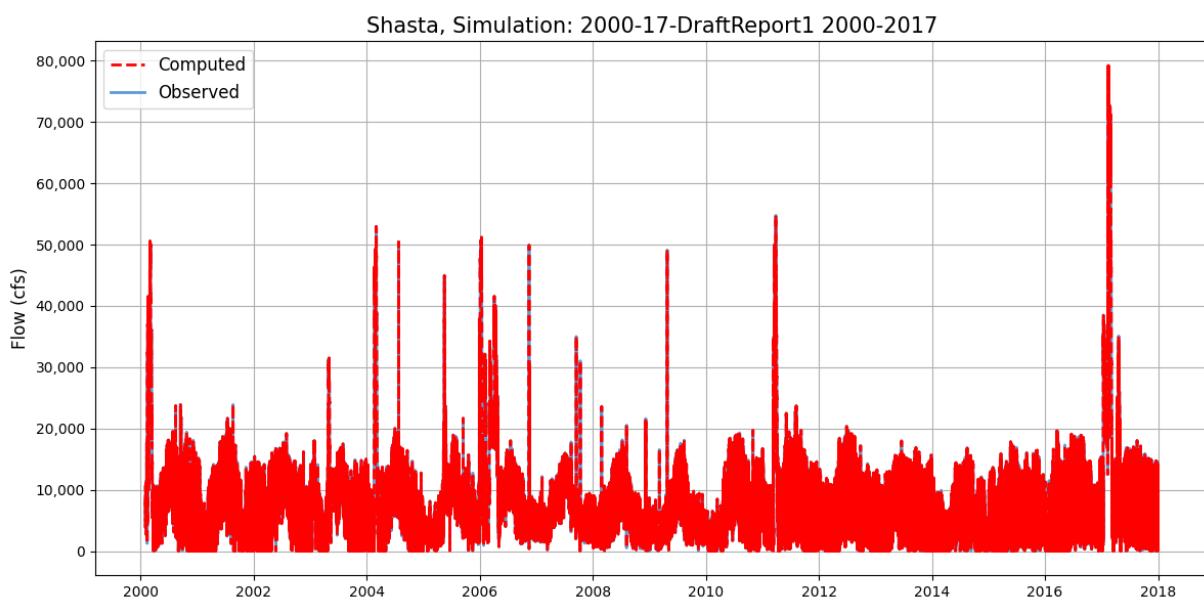


Figure 76. Shasta Lake Outflow 2000-2017

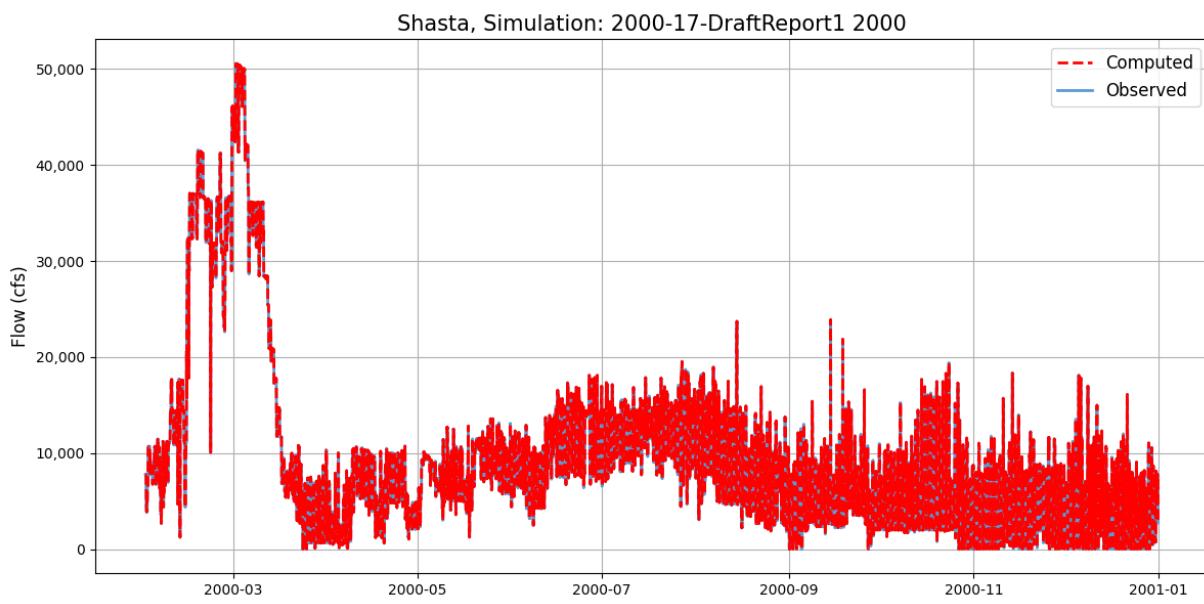


Figure 77. Shasta Lake Outflow 2000

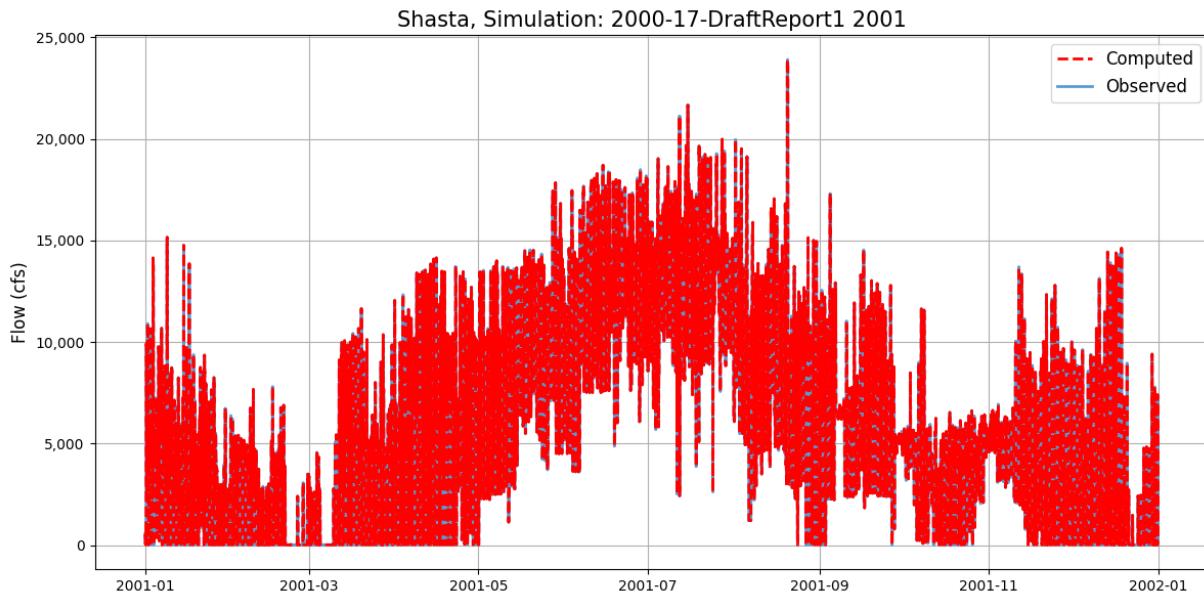


Figure 78. Shasta Lake Outflow 2001

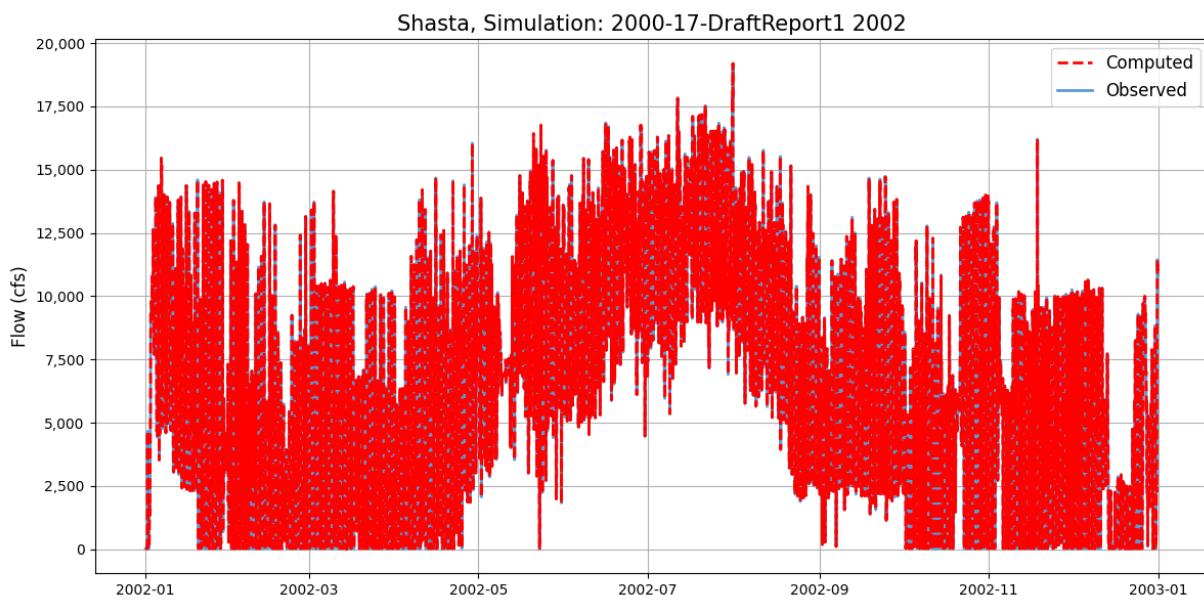


Figure 79. Shasta Lake Outflow 2002

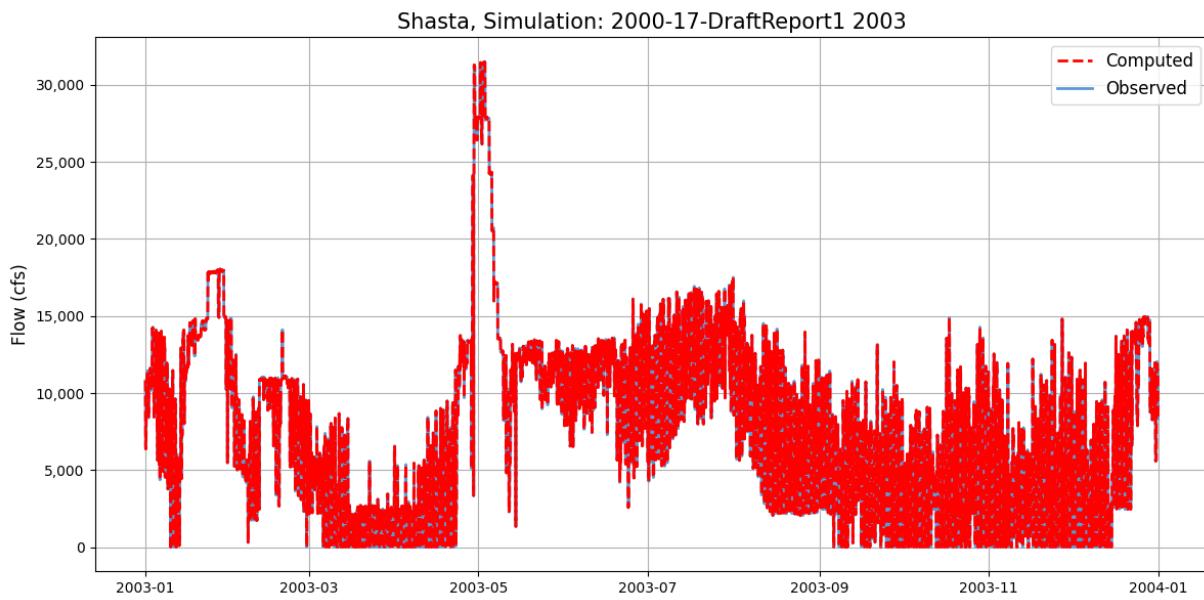


Figure 80. Shasta Lake Outflow 2003

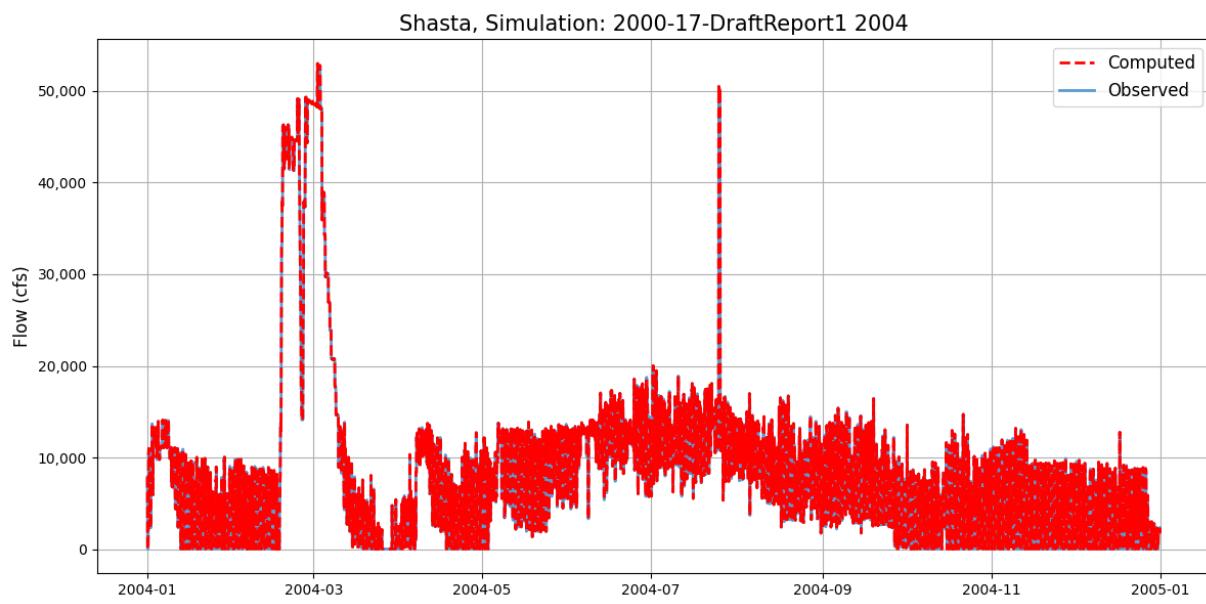


Figure 81. Shasta Lake Outflow 2004

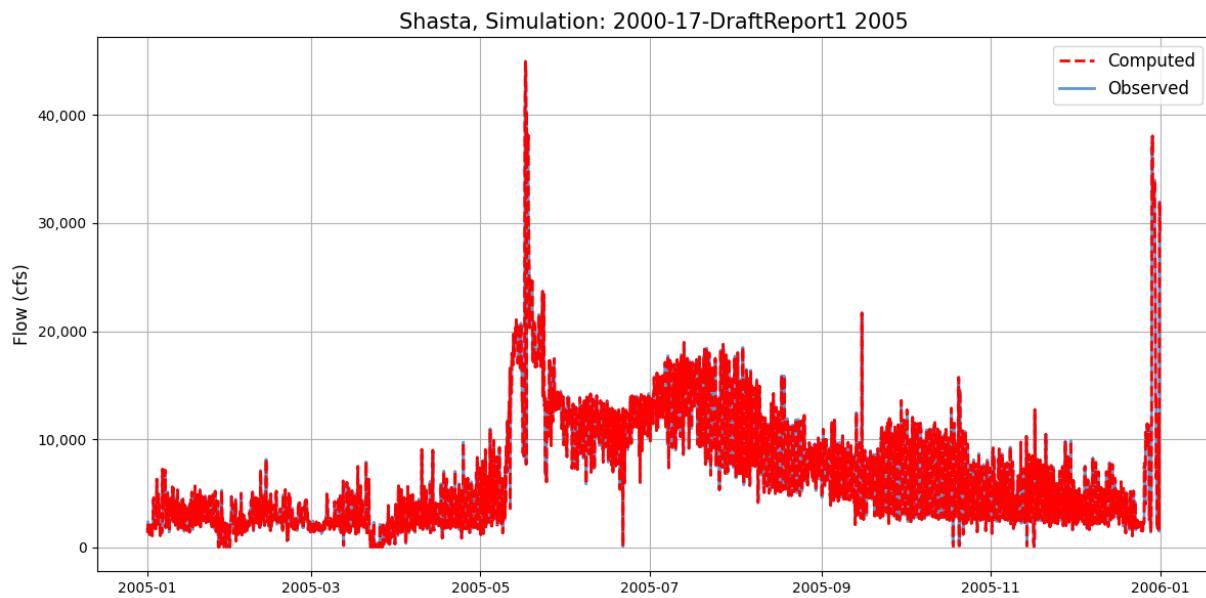


Figure 82. Shasta Lake Outflow 2005

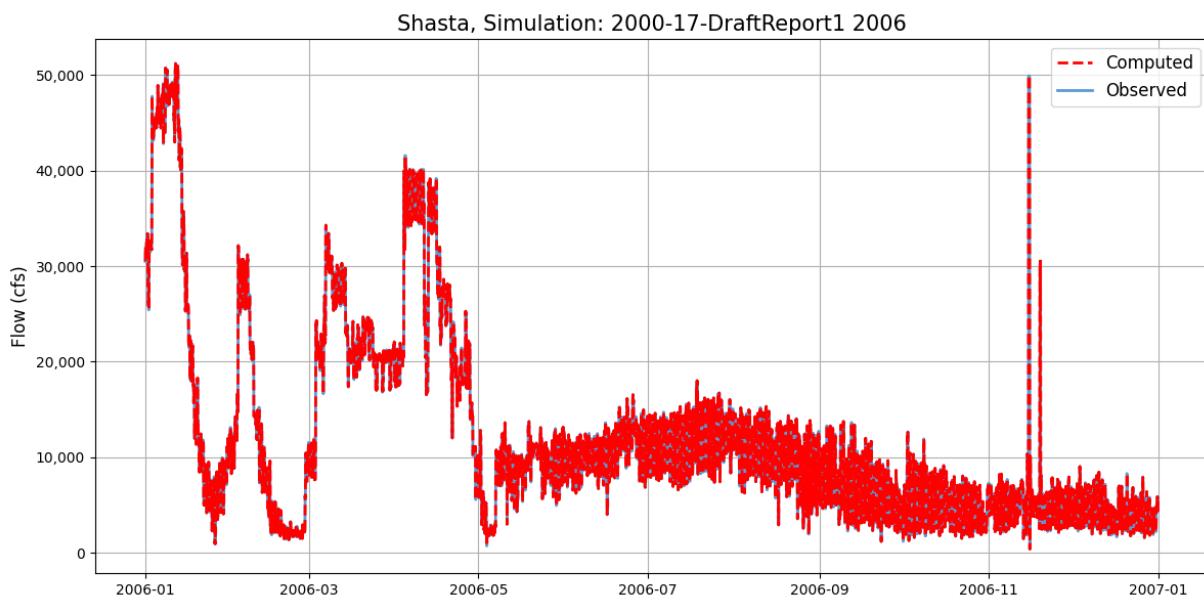


Figure 83. Shasta Lake Outflow 2006

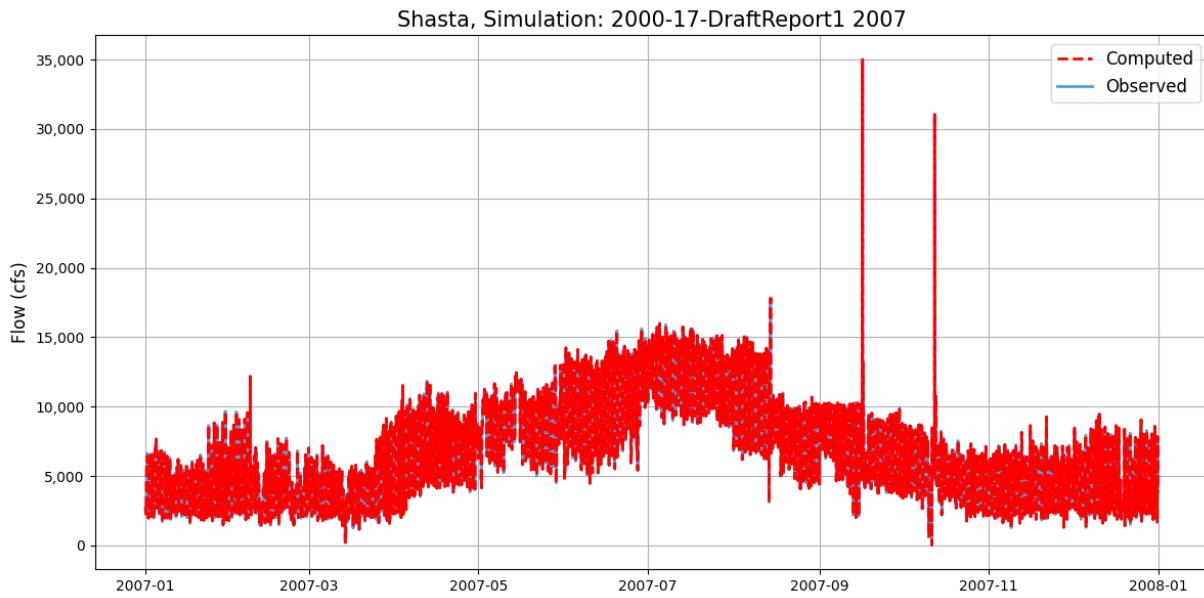


Figure 84. Shasta Lake Outflow 2007

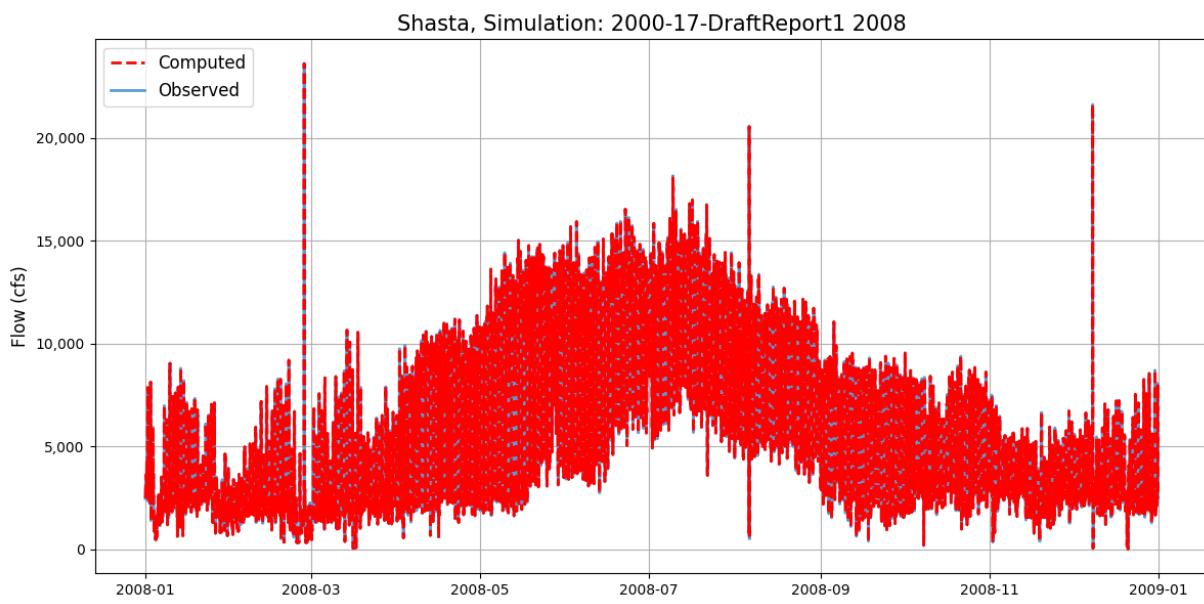


Figure 85. Shasta Lake Outflow 2008

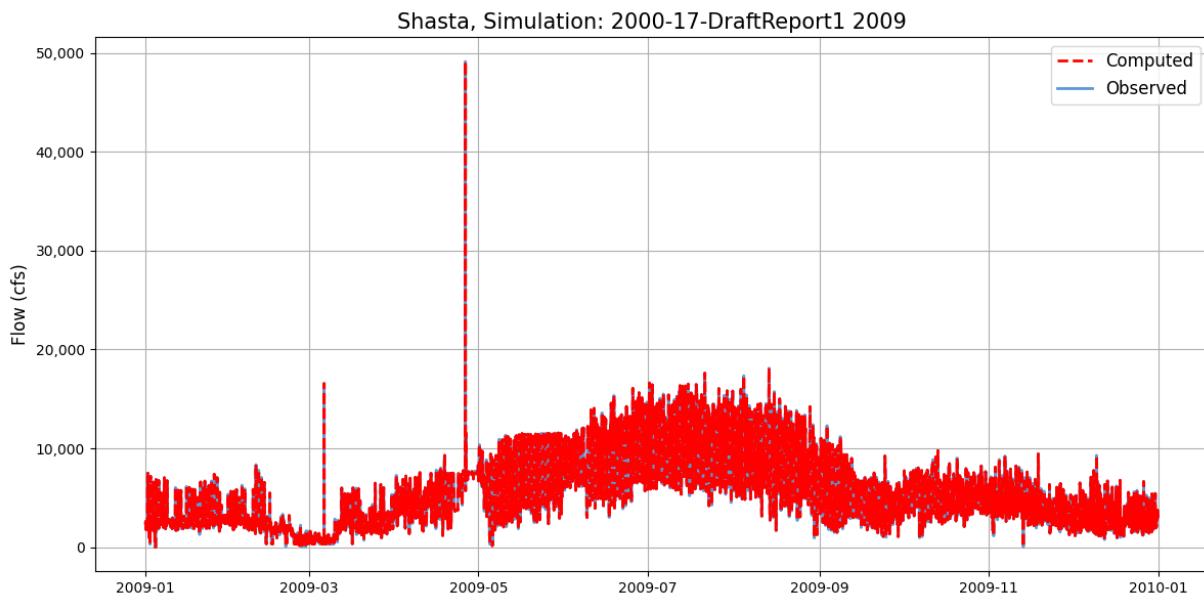


Figure 86. Shasta Lake Outflow 2009

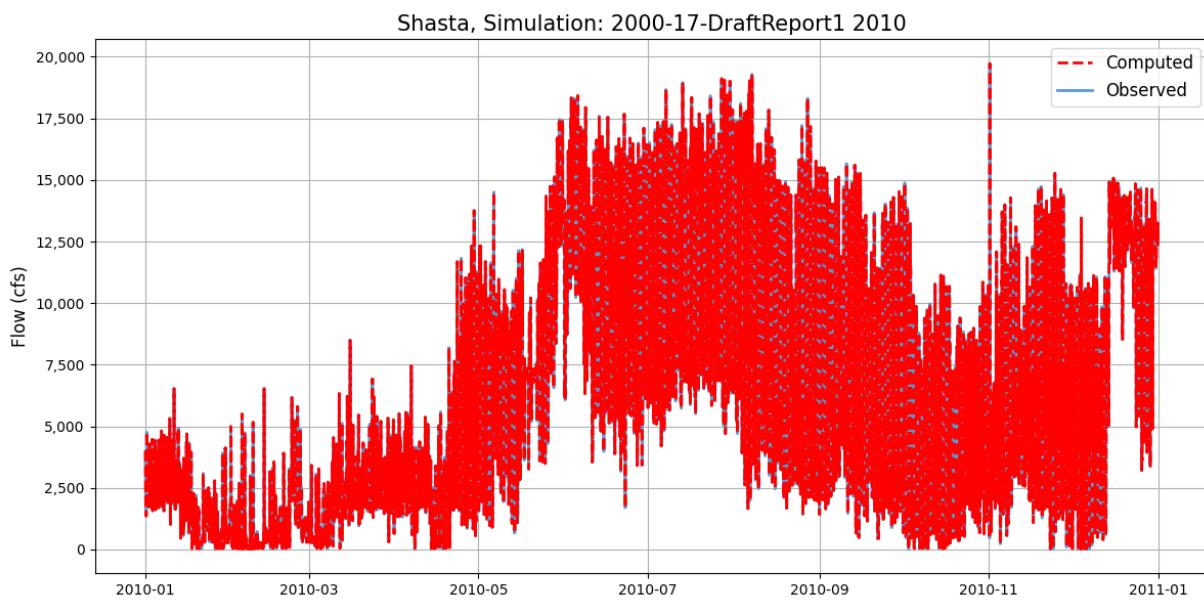


Figure 87. Shasta Lake Outflow 2010

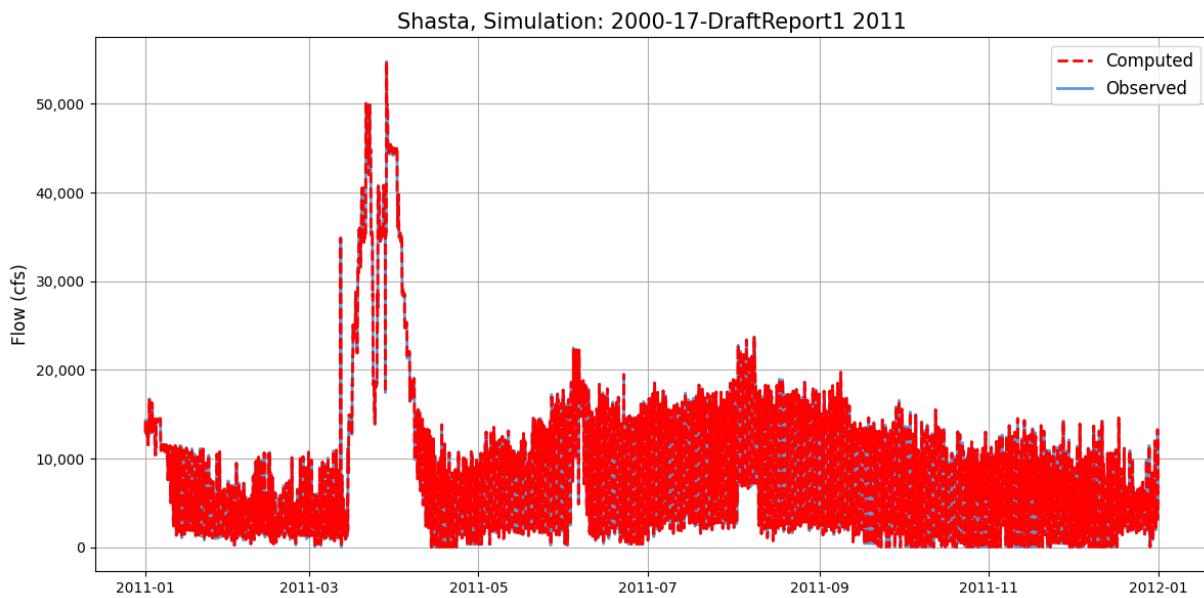


Figure 88. Shasta Lake Outflow 2011

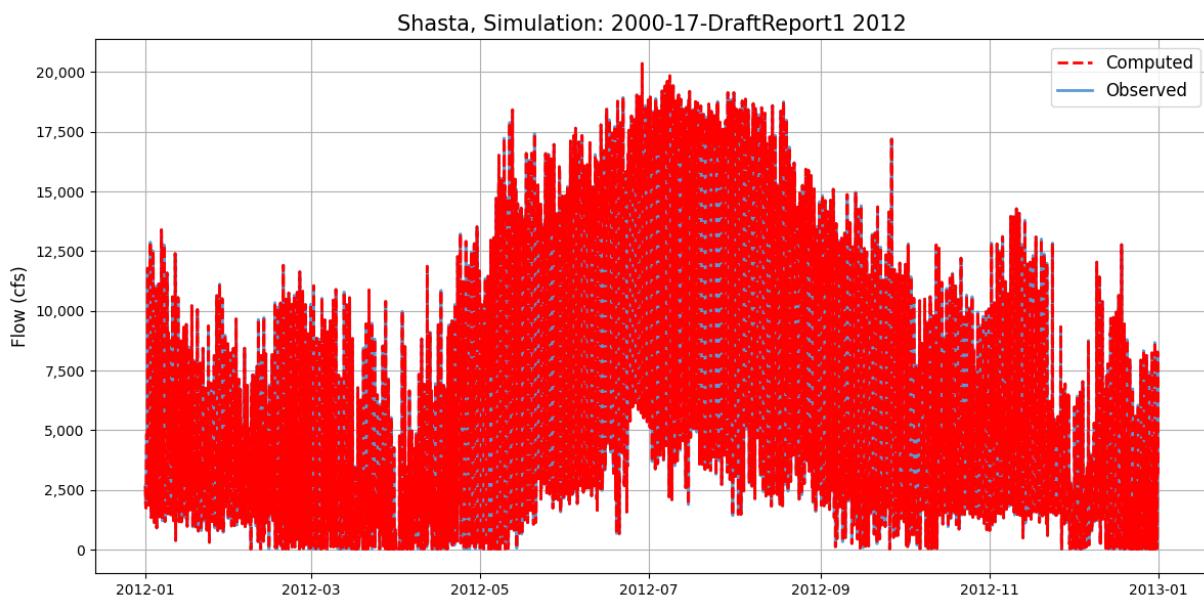


Figure 89. Shasta Lake Outflow 2012

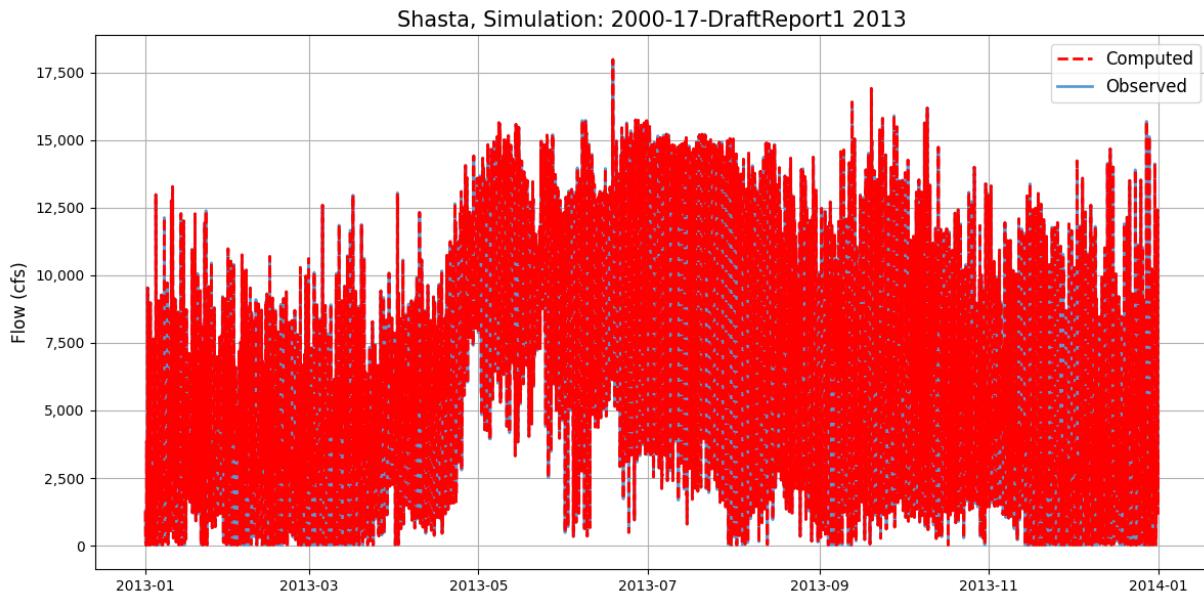


Figure 90. Shasta Lake Outflow 2013

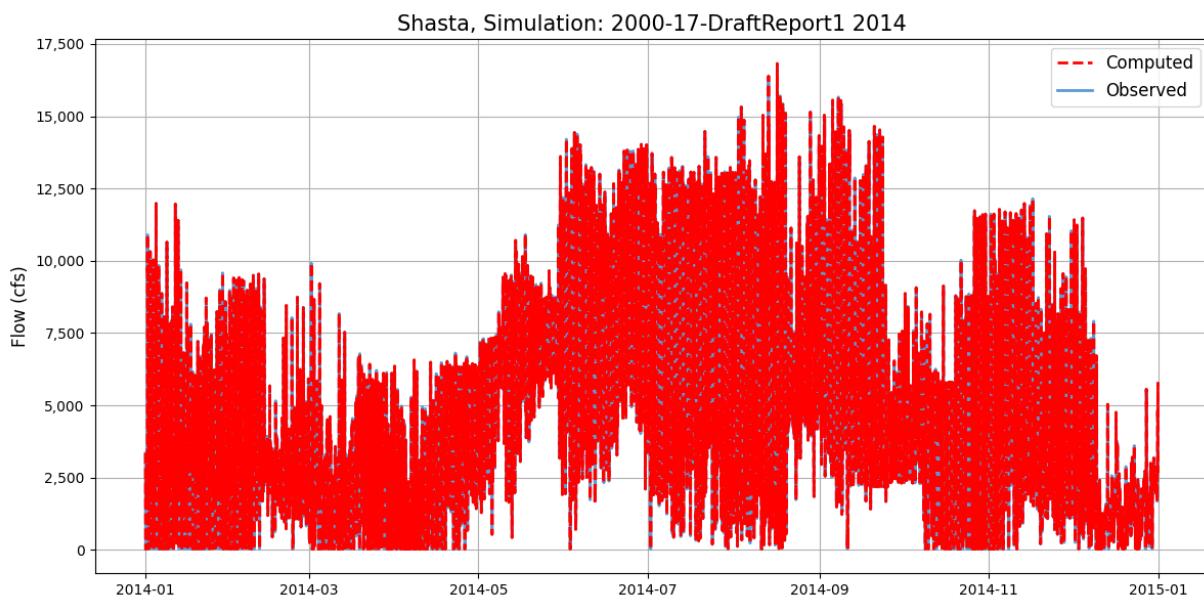


Figure 91. Shasta Lake Outflow 2014

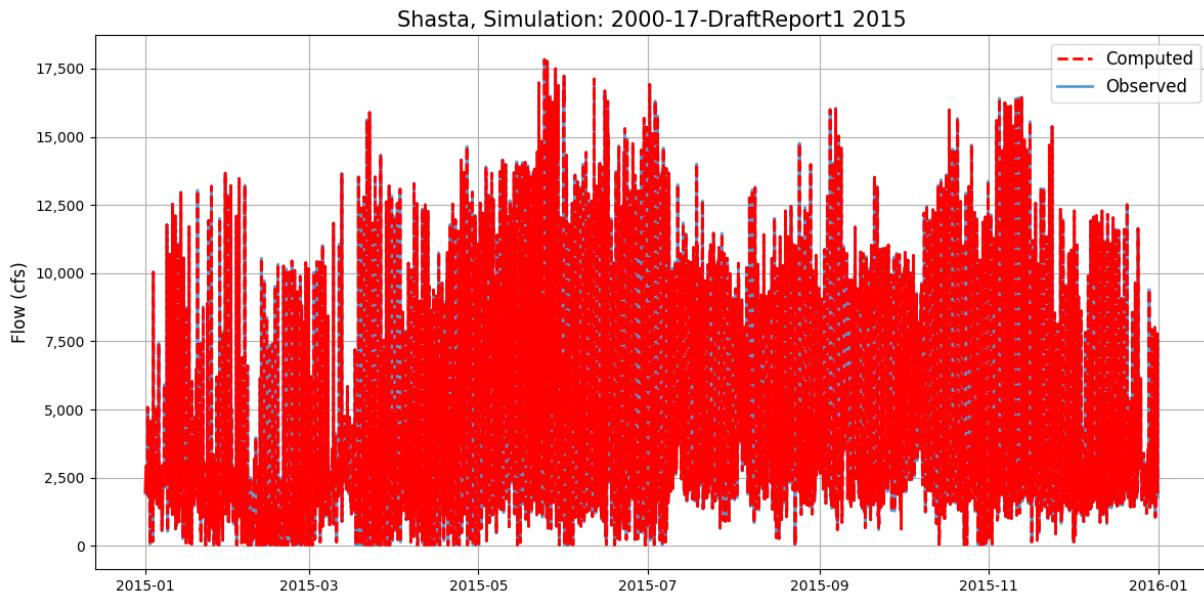


Figure 92. Shasta Lake Outflow 2015

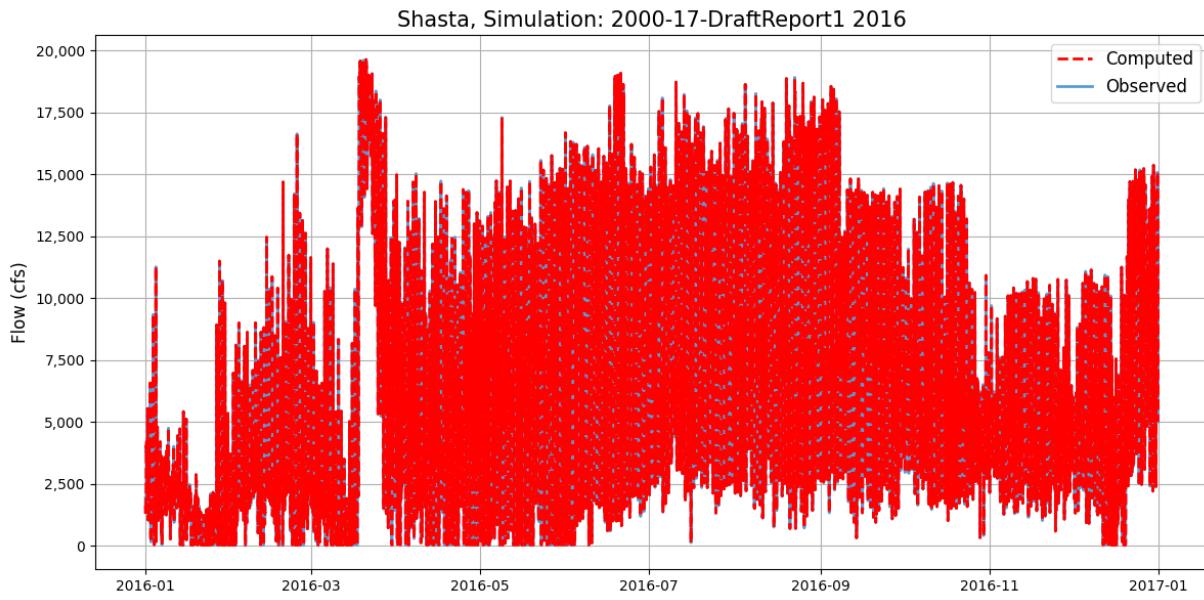


Figure 93. Shasta Lake Outflow 2016

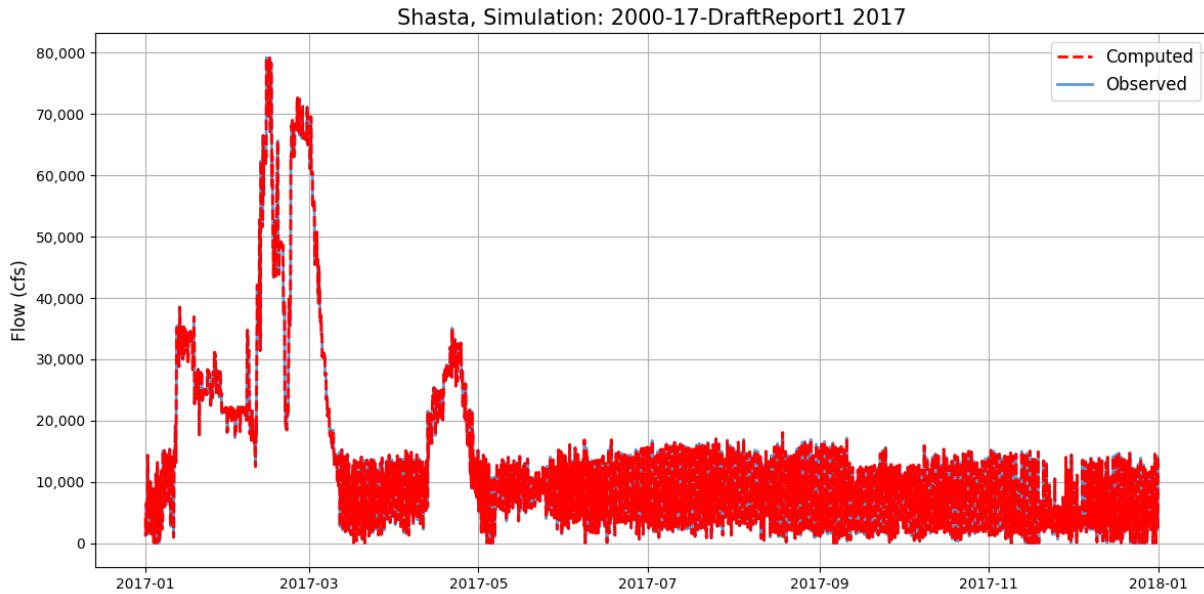


Figure 94. Shasta Lake Outflow 2017

Table 27. Shasta Outflow Error Statistics

Statistics	2000	2001	2002	2003	2004	2005
Mean Bias (cfs)	-0.18	0.00	0.00	0.00	0.00	0.00
MAE (cfs)	1.02	0.00	0.24	0.00	0.00	0.00
RMSE (cfs)	34.74	0.00	12.34	0.00	0.00	0.00

Statistics	2000	2001	2002	2003	2004	2005
Nash-Sutcliffe (NSE)	1.00	1.00	1.00	1.00	1.00	1.00
COUNT	8,040	8,760	8,760	8,760	8,784	8,760

Statistics	2006	2007	2008	2009	2010	2011
Mean Bias (cfs)	0.00	0.00	0.00	0.00	0.00	0.00
MAE (cfs)	0.00	0.00	0.00	0.00	0.00	0.00
RMSE (cfs)	0.00	0.00	0.00	0.00	0.00	0.00
Nash-Sutcliffe (NSE)	1.00	1.00	1.00	1.00	1.00	1.00
COUNT	8,760	8,760	8,784	8,760	8,760	8,760

Statistics	2012	2013	2014	2015	2016	2017
Mean Bias (cfs)	0.00	0.00	0.00	0.00	-0.07	0.32
MAE (cfs)	0.00	0.00	0.00	0.00	0.08	0.32
RMSE (cfs)	0.00	0.00	0.05	0.00	6.85	30.18
Nash-Sutcliffe (NSE)	1.00	1.00	1.00	1.00	1.00	1.00
COUNT	8,784	8,760	8,760	8,760	8,784	8,760

Table 28. Shasta Outflow MeanBias

Table 29. Shasta Outflow MAE

Table 30. Shasta Outflow RMSE

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	118.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2001	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2002	0.00	0.00	0.00	0.00	42.35	0.46	0.00	0.00	0.00	0.00	0.00	0.00
2003	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2012	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2013	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	23.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2017	103.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All	25.76	28.18	0.04	0.00	9.98	0.11	0.00	0.00	0.00	0.00	0.00	0.00

Shasta Reservoir Elevation

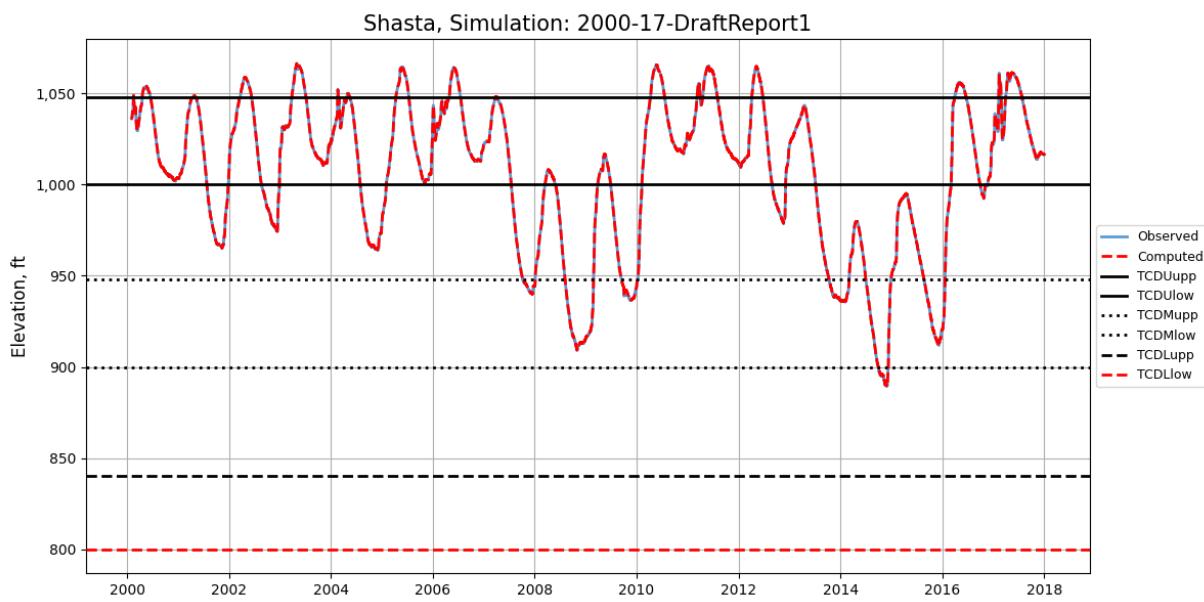


Figure 95. Shasta Elevation

Keswick

Keswick Reservoir Temperatures

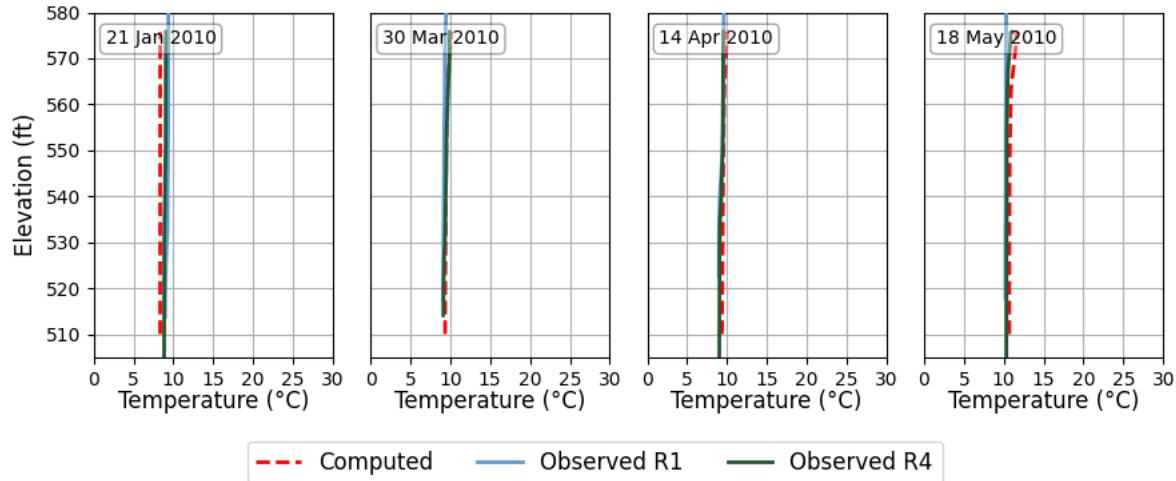


Figure 96. Keswick 2010: 1 of 1

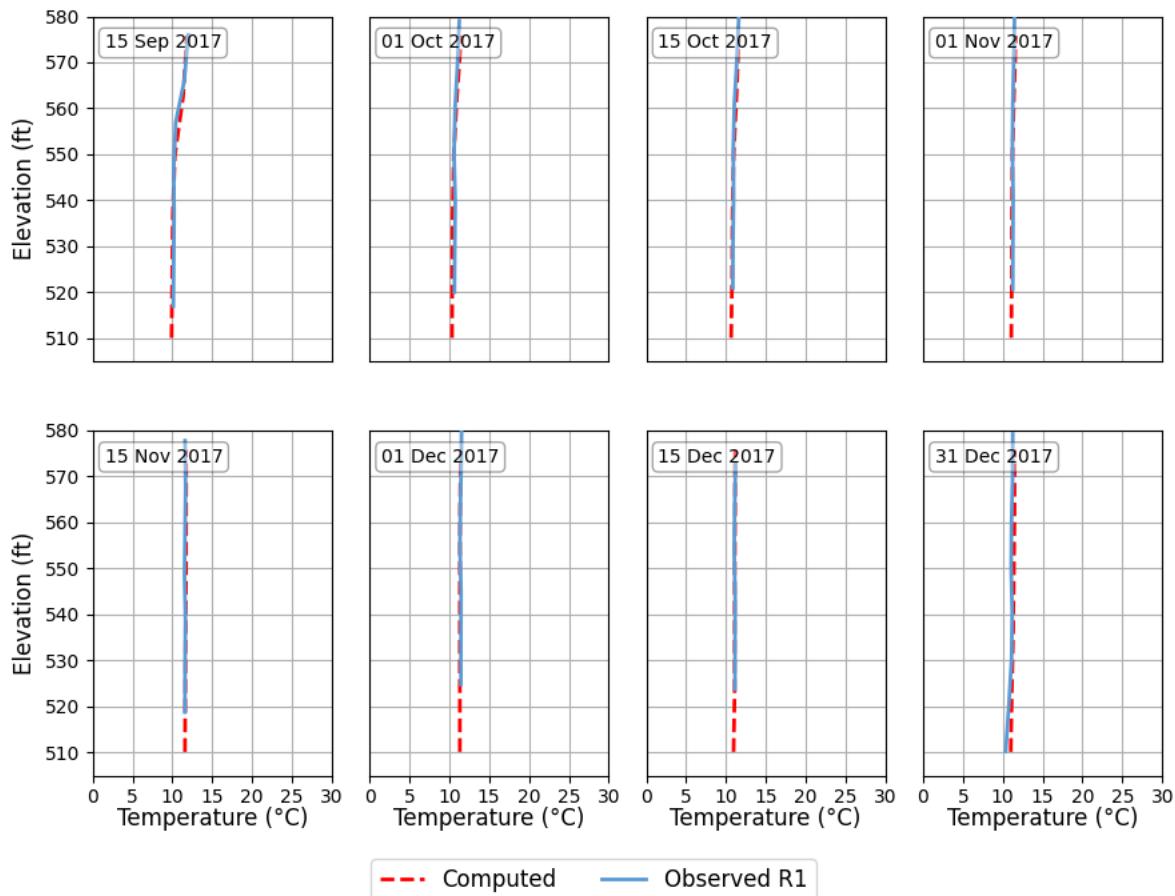


Figure 97. Keswick 2017: 1 of 1

Table 31. Keswick Reservoir Profile Statistics 2010

Statistics	21Jan2010	30Mar2010	14Apr2010	18May2010
Mean Bias ($^{\circ}\text{C}$)	-0.91	0.32	0.29	0.62
MAE ($^{\circ}\text{C}$)	0.91	0.32	0.29	0.62
RMSE ($^{\circ}\text{C}$)	0.92	0.35	0.32	0.66
Nash-Sutcliffe (NSE)	-41.49	-21.14	-0.84	-661.14

Table 32. Keswick Reservoir Profile Statistics 2017

Statistics	15Sep2017	01Oct2017	15Oct2017	01Nov2017	15Nov2017	01Dec2017
Mean Bias (°C)	0.00	-0.07	0.03	-0.00	0.09	-0.09
MAE (°C)	0.17	0.21	0.12	0.12	0.09	0.09
RMSE (°C)	0.20	0.23	0.13	0.13	0.10	0.10
Nash-Sutcliffe (NSE)	0.89	-1.50	0.48	-4.66	-8.24	-3.71

Statistics	15Dec2017	31Dec2017
Mean Bias ($^{\circ}\text{C}$)	-0.00	0.29
MAE ($^{\circ}\text{C}$)	0.04	0.29
RMSE ($^{\circ}\text{C}$)	0.05	0.32
Nash-Sutcliffe (NSE)	-0.42	-0.96

Table 33. Keswick Profile Temperature NSE, invalid under .65

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	-40.35	-	-21.23	-0.84	-651.77	-	-	-	-	-	-	-
2011	-	-	-	-	-	-	-	-	-	-	-	-
2012	-	-	-	-	-	-	-	-	-	-	-	-
2013	-	-	-	-	-	-	-	-	-	-	-	-
2014	-	-	-	-	-	-	-	-	-	-	-	-
2015	-	-	-	-	-	-	-	-	-	-	-	-
2016	-	-	-	-	-	-	-	-	-	-	-	-
2017	-	-	-	-	-	-	-	-	0.88	0.13	0.51	0.30
All	-40.35	-	-21.23	-0.84	-651.77	-	-	-	0.88	0.13	0.51	0.30

Table 34. Keswick Profile Temperature MeanBias, invalid when +- .75

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-	-	-	-	-	-
2004	-	-	-	-	-	-	-	-	-	-	-	-
2005	-	-	-	-	-	-	-	-	-	-	-	-
2006	-	-	-	-	-	-	-	-	-	-	-	-
2007	-	-	-	-	-	-	-	-	-	-	-	-
2008	-	-	-	-	-	-	-	-	-	-	-	-
2009	-	-	-	-	-	-	-	-	-	-	-	-
2010	-0.91	-	0.32	0.29	0.61	-	-	-	-	-	-	-
2011	-	-	-	-	-	-	-	-	-	-	-	-
2012	-	-	-	-	-	-	-	-	-	-	-	-
2013	-	-	-	-	-	-	-	-	-	-	-	-
2014	-	-	-	-	-	-	-	-	-	-	-	-
2015	-	-	-	-	-	-	-	-	-	-	-	-
2016	-	-	-	-	-	-	-	-	-	-	-	-
2017	-	-	-	-	-	-	-	-	0.00	-0.02	0.04	0.07

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
All	-0.91	-	0.32	0.29	0.61	-	-	-	0.00	-0.02	0.04	0.07

Table 35. Keswick Profile Temperature MAE, invalid over 1.0

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-	-	-	-	-	-
2004	-	-	-	-	-	-	-	-	-	-	-	-
2005	-	-	-	-	-	-	-	-	-	-	-	-
2006	-	-	-	-	-	-	-	-	-	-	-	-
2007	-	-	-	-	-	-	-	-	-	-	-	-
2008	-	-	-	-	-	-	-	-	-	-	-	-
2009	-	-	-	-	-	-	-	-	-	-	-	-
2010	0.91	-	0.32	0.29	0.61	-	-	-	-	-	-	-
2011	-	-	-	-	-	-	-	-	-	-	-	-
2012	-	-	-	-	-	-	-	-	-	-	-	-
2013	-	-	-	-	-	-	-	-	-	-	-	-
2014	-	-	-	-	-	-	-	-	-	-	-	-
2015	-	-	-	-	-	-	-	-	-	-	-	-
2016	-	-	-	-	-	-	-	-	-	-	-	-
2017	-	-	-	-	-	-	-	-	0.17	0.16	0.10	0.14
All	0.91	-	0.32	0.29	0.61	-	-	-	0.17	0.16	0.10	0.14

Table 36. Keswick Profile Temperature RMSE, invalid over 1.5

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	-	-	-	-	-	-	-	-	-	-	-	-
2005	-	-	-	-	-	-	-	-	-	-	-	-
2006	-	-	-	-	-	-	-	-	-	-	-	-
2007	-	-	-	-	-	-	-	-	-	-	-	-
2008	-	-	-	-	-	-	-	-	-	-	-	-
2009	-	-	-	-	-	-	-	-	-	-	-	-
2010	0.92	-	0.34	0.32	0.65	-	-	-	-	-	-	-
2011	-	-	-	-	-	-	-	-	-	-	-	-
2012	-	-	-	-	-	-	-	-	-	-	-	-
2013	-	-	-	-	-	-	-	-	-	-	-	-
2014	-	-	-	-	-	-	-	-	-	-	-	-
2015	-	-	-	-	-	-	-	-	-	-	-	-
2016	-	-	-	-	-	-	-	-	-	-	-	-
2017	-	-	-	-	-	-	-	-	0.20	0.19	0.12	0.20
All	0.92	-	0.34	0.32	0.65	-	-	-	0.20	0.19	0.12	0.20

Keswick Reservoir Outflow Temperature

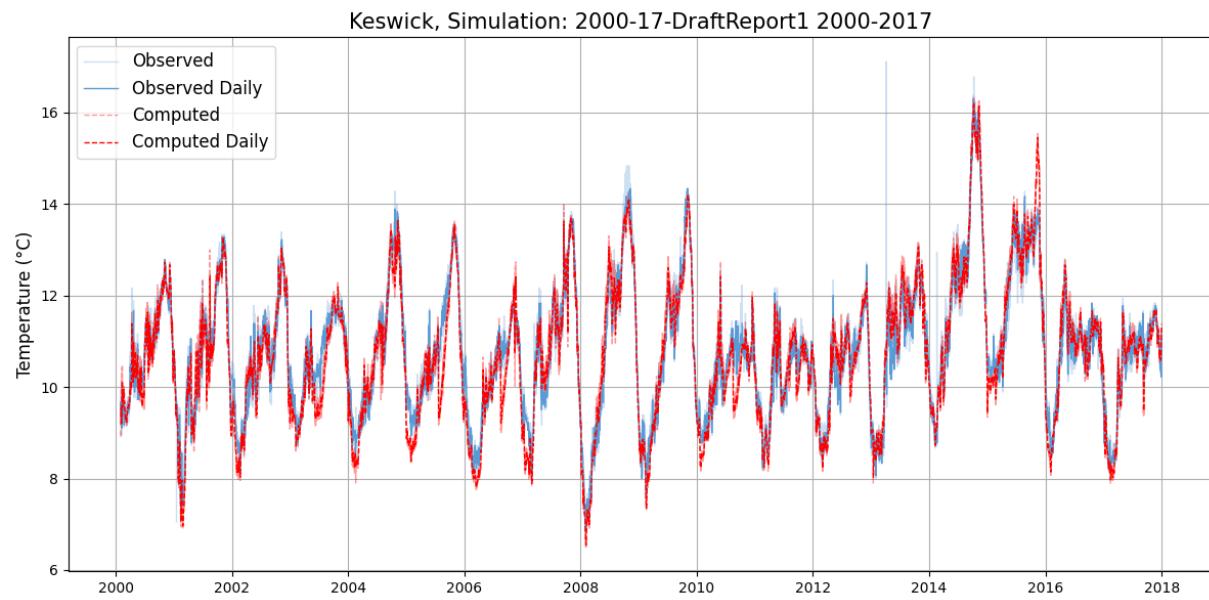


Figure 98. Keswick Reservoir Outflow Temperature 2000-2017

Keswick Reservoir Outflow Temperature

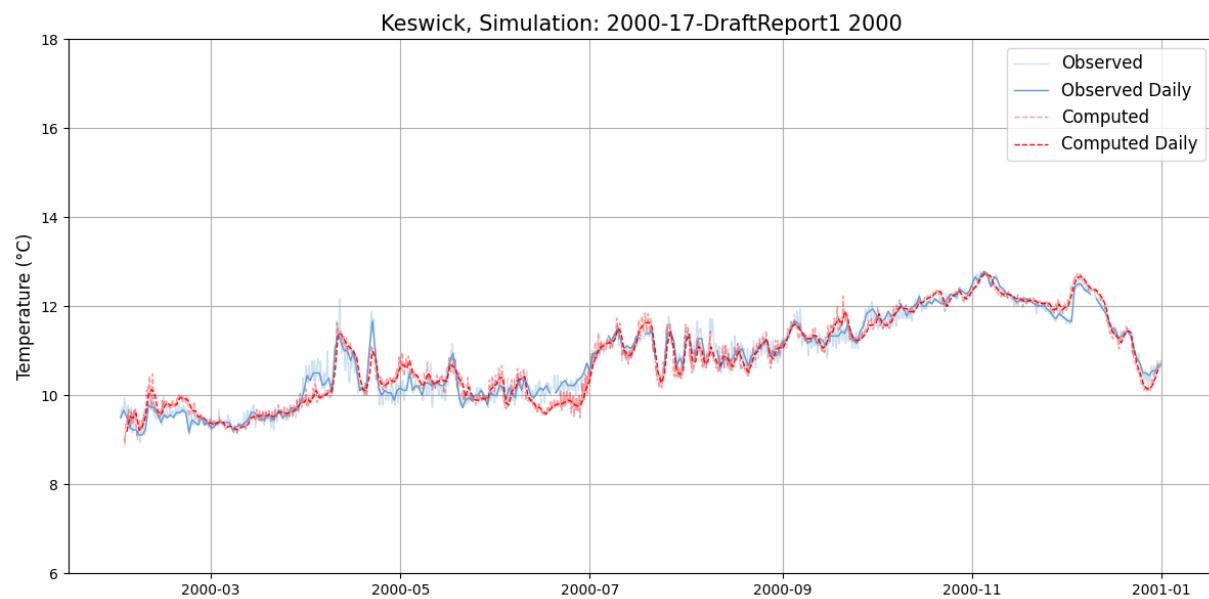


Figure 99. Keswick Reservoir Outflow Temperature 2000

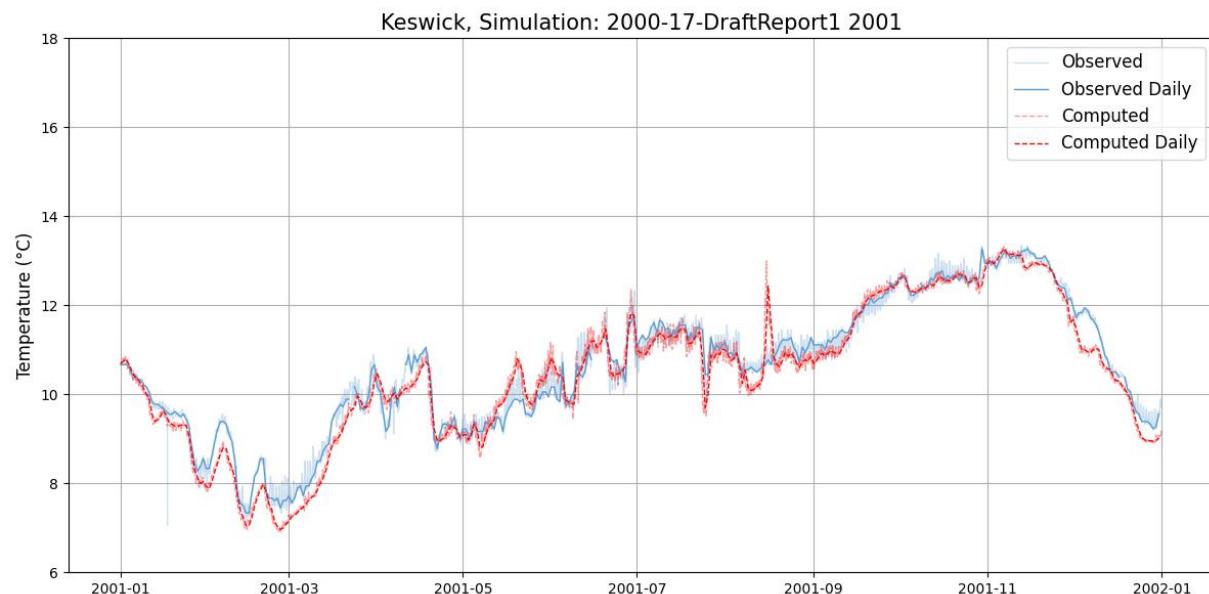


Figure 100. Keswick Reservoir Outflow Temperature 2001

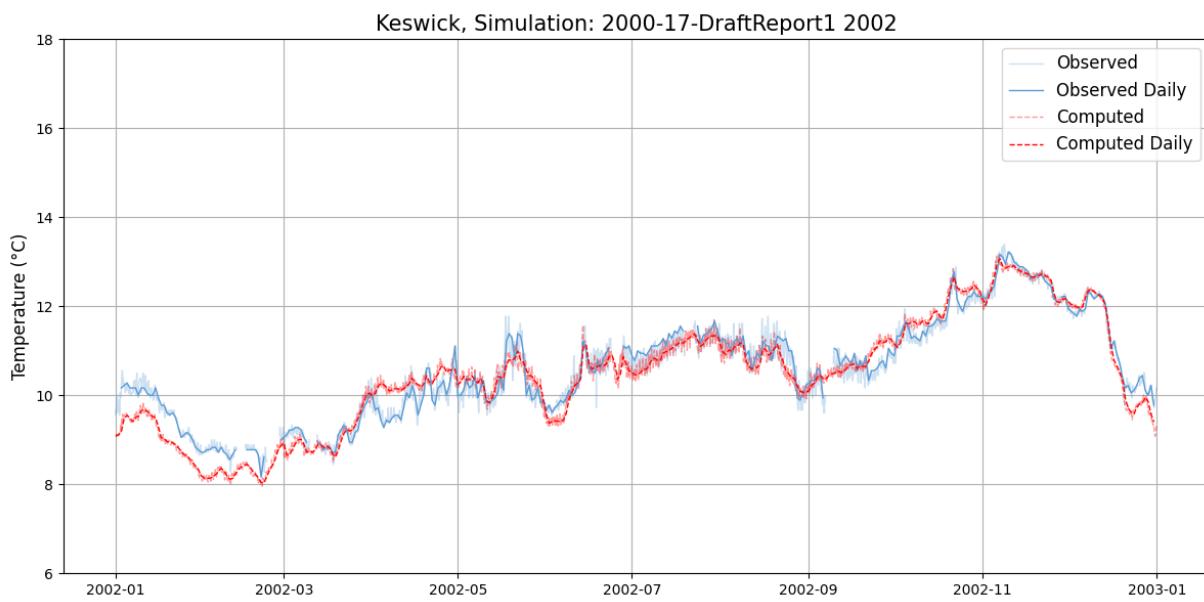


Figure 101. Keswick Reservoir Outflow Temperature 2002

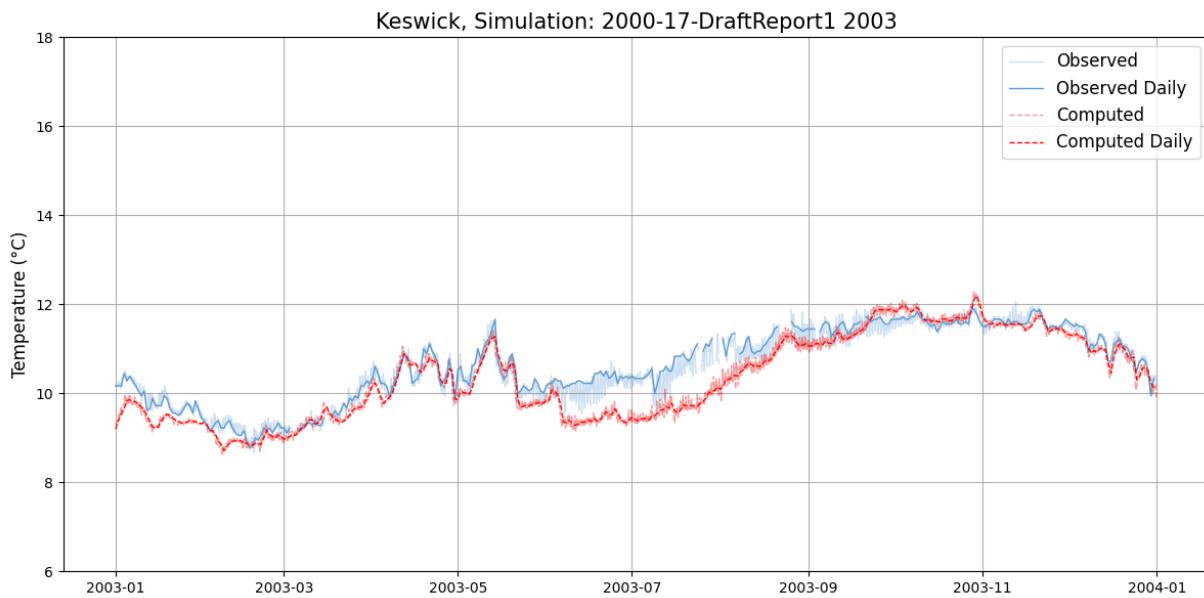


Figure 102. Keswick Reservoir Outflow Temperature 2003

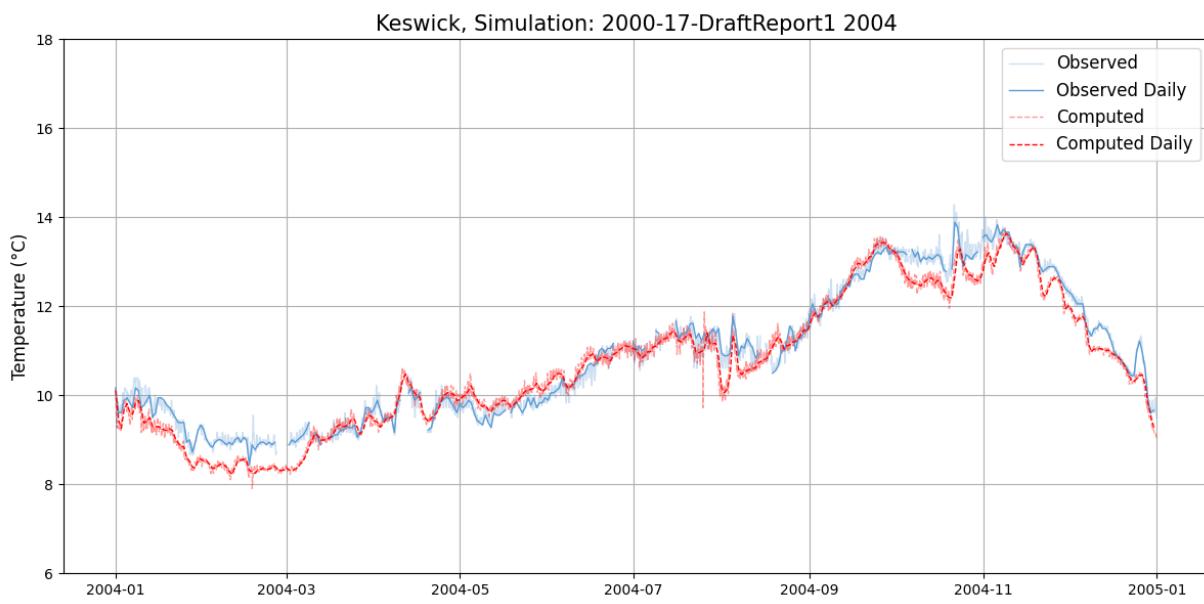


Figure 103. Keswick Reservoir Outflow Temperature 2004

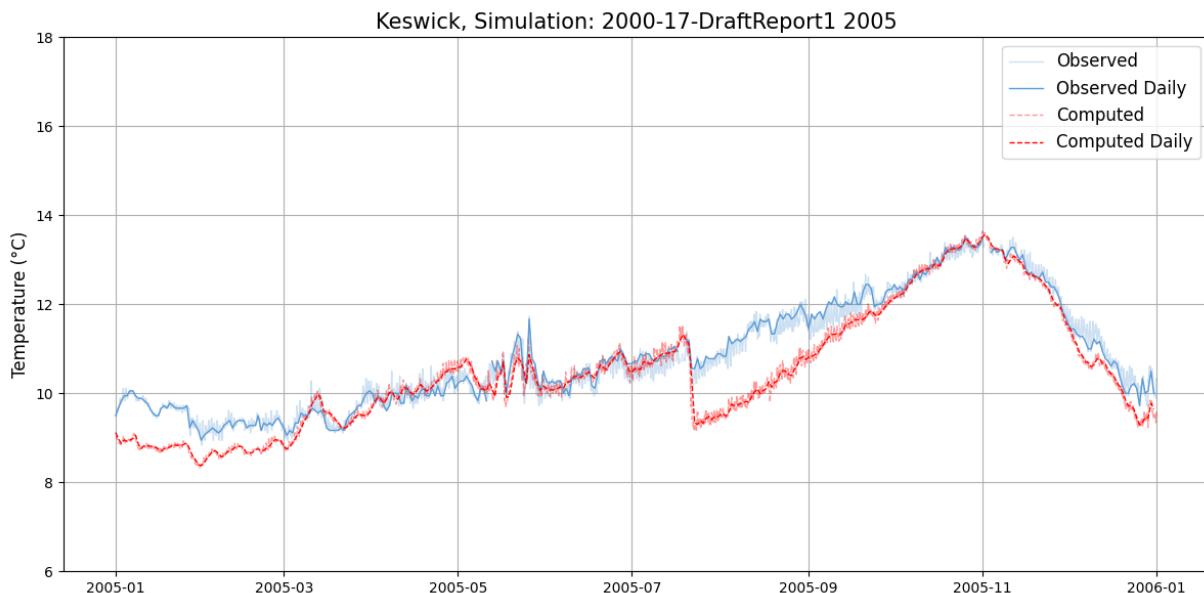


Figure 104. Keswick Reservoir Outflow Temperature 2005

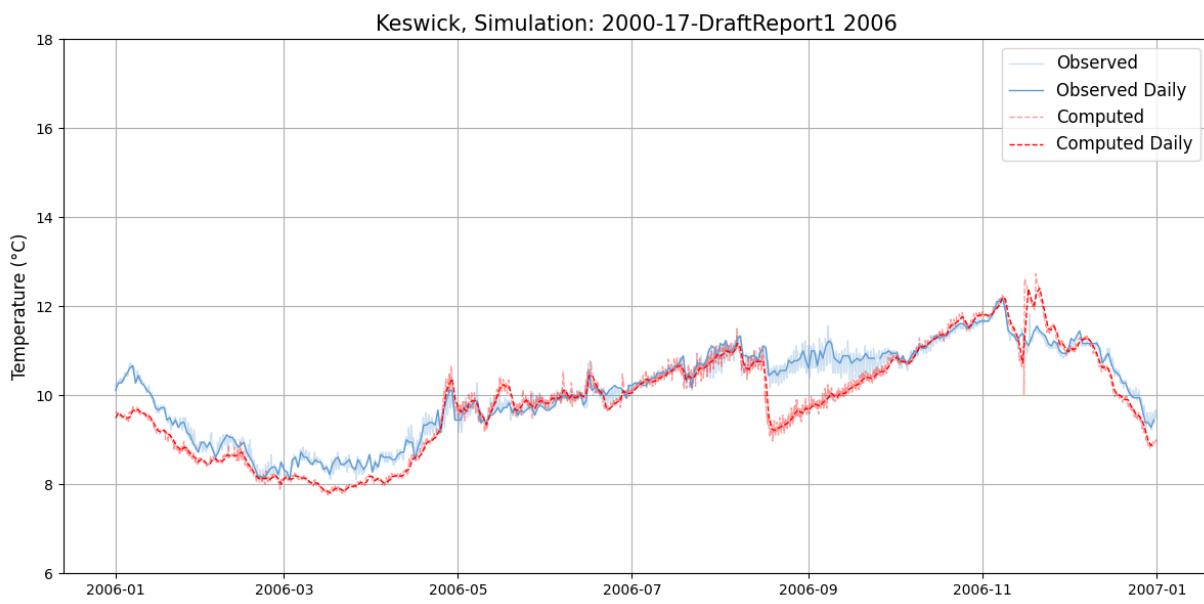


Figure 105. Keswick Reservoir Outflow Temperature 2006

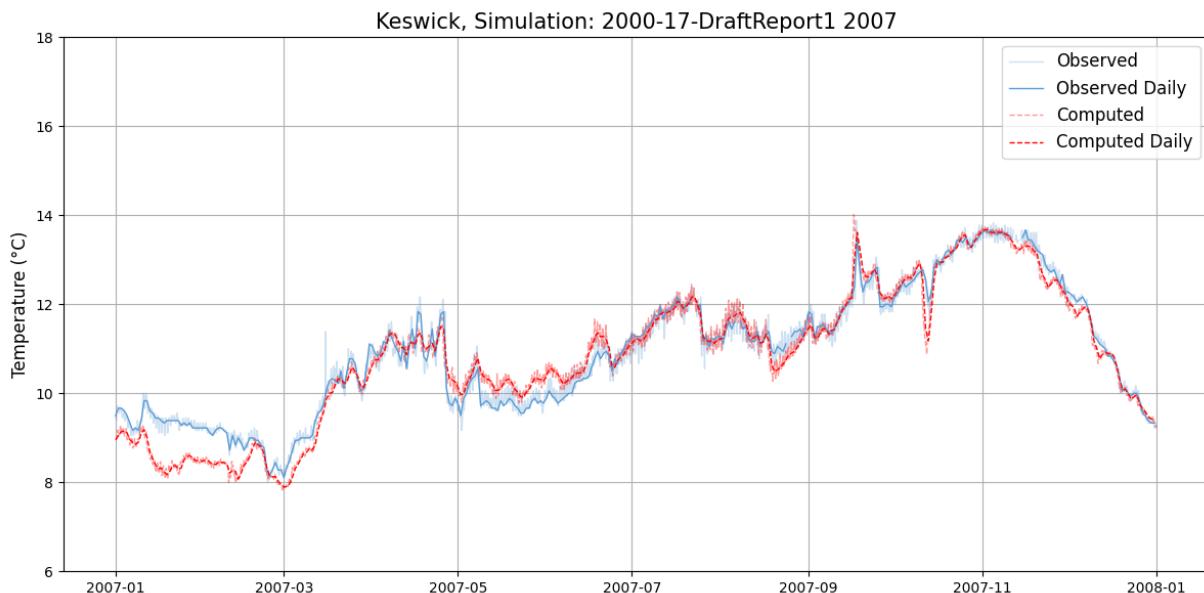


Figure 106. Keswick Reservoir Outflow Temperature 2007

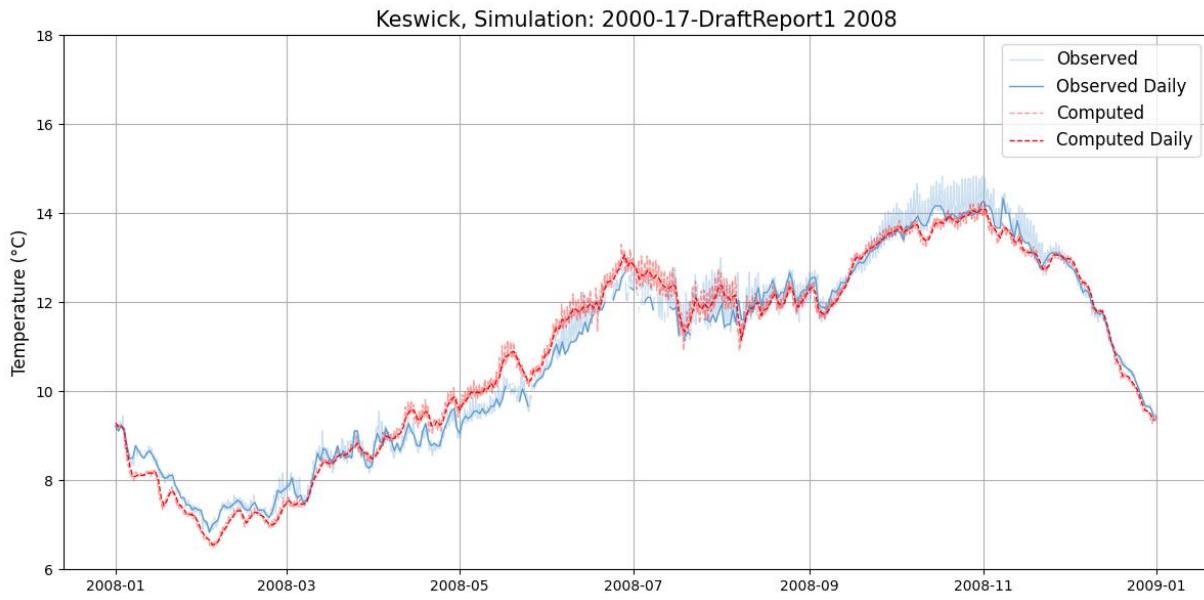


Figure 107. Keswick Reservoir Outflow Temperature 2008

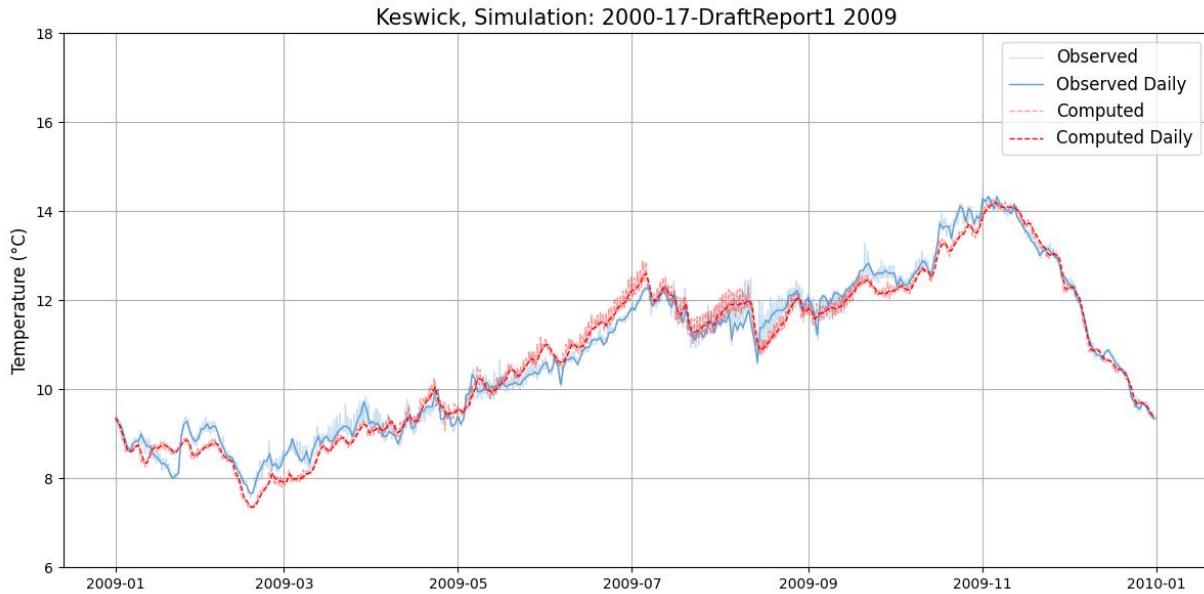


Figure 108. Keswick Reservoir Outflow Temperature 2009

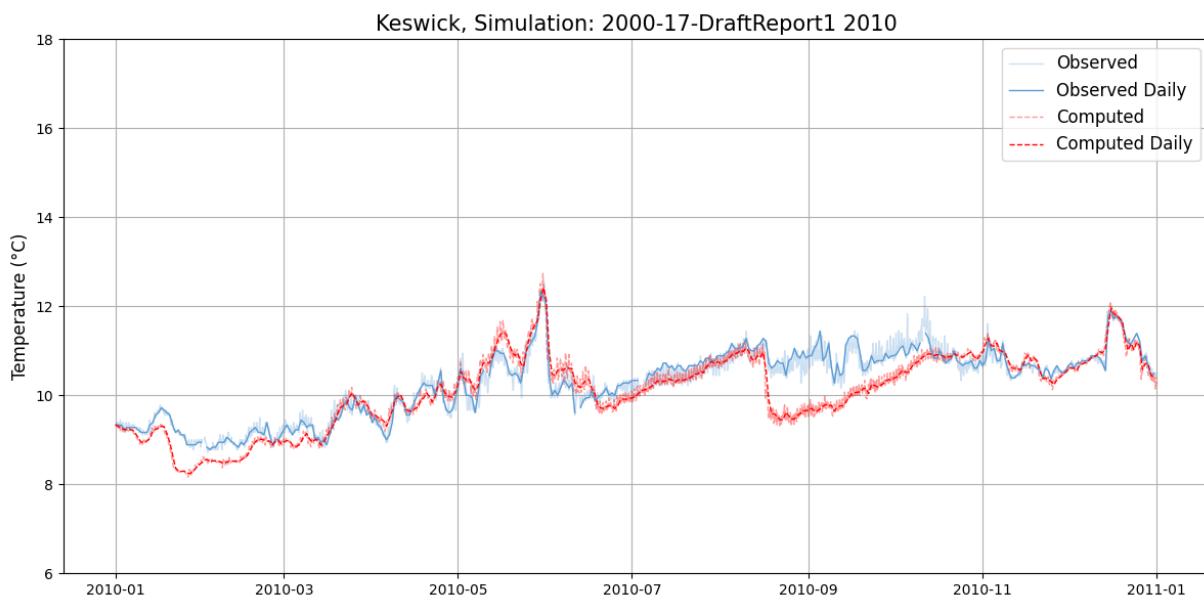


Figure 109. Keswick Reservoir Outflow Temperature 2010

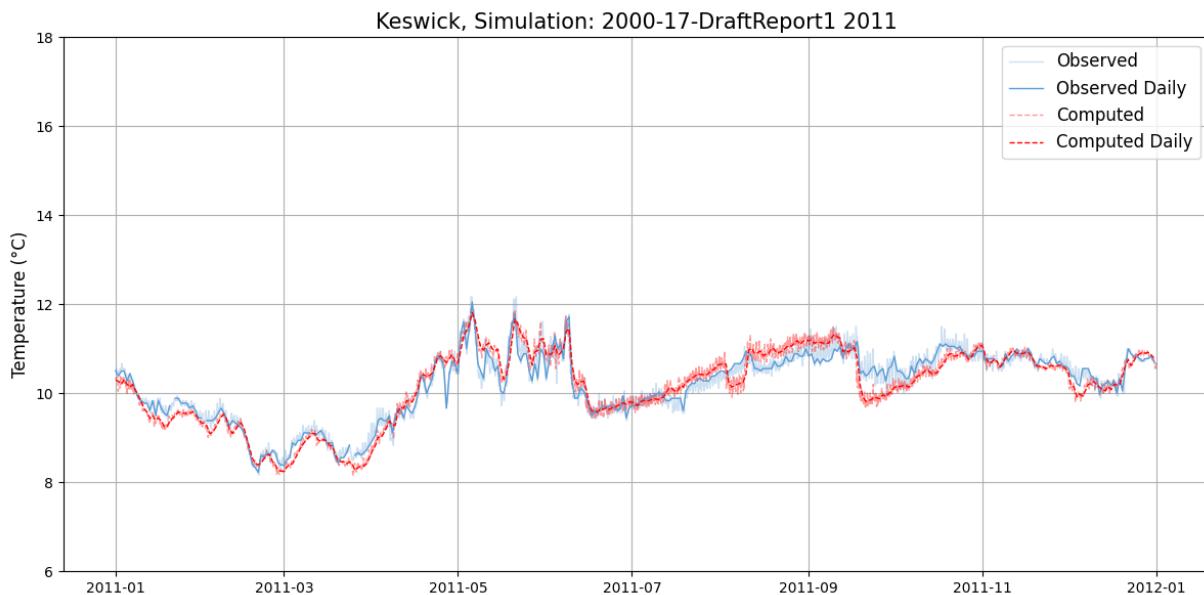


Figure 110. Keswick Reservoir Outflow Temperature 2011

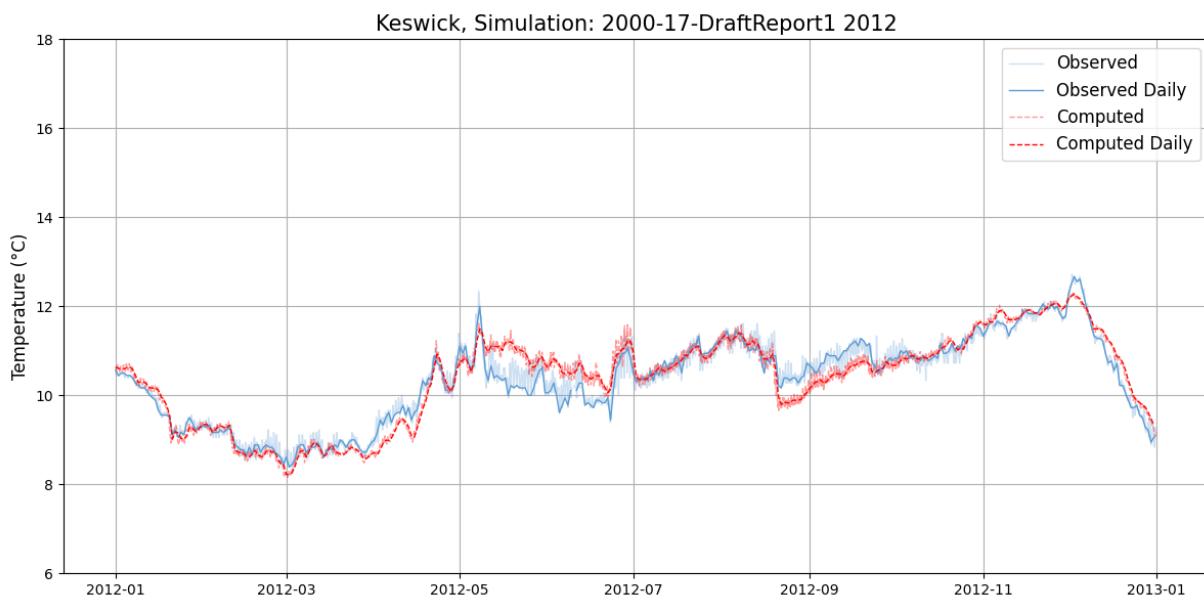


Figure 111. Keswick Reservoir Outflow Temperature 2012

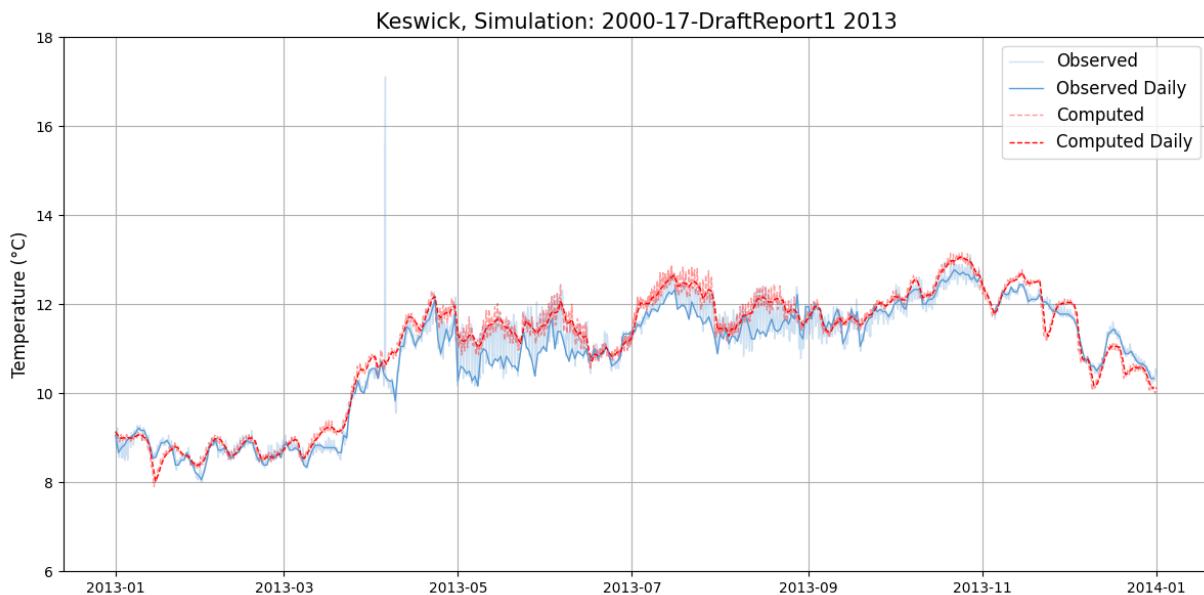


Figure 112. Keswick Reservoir Outflow Temperature 2013

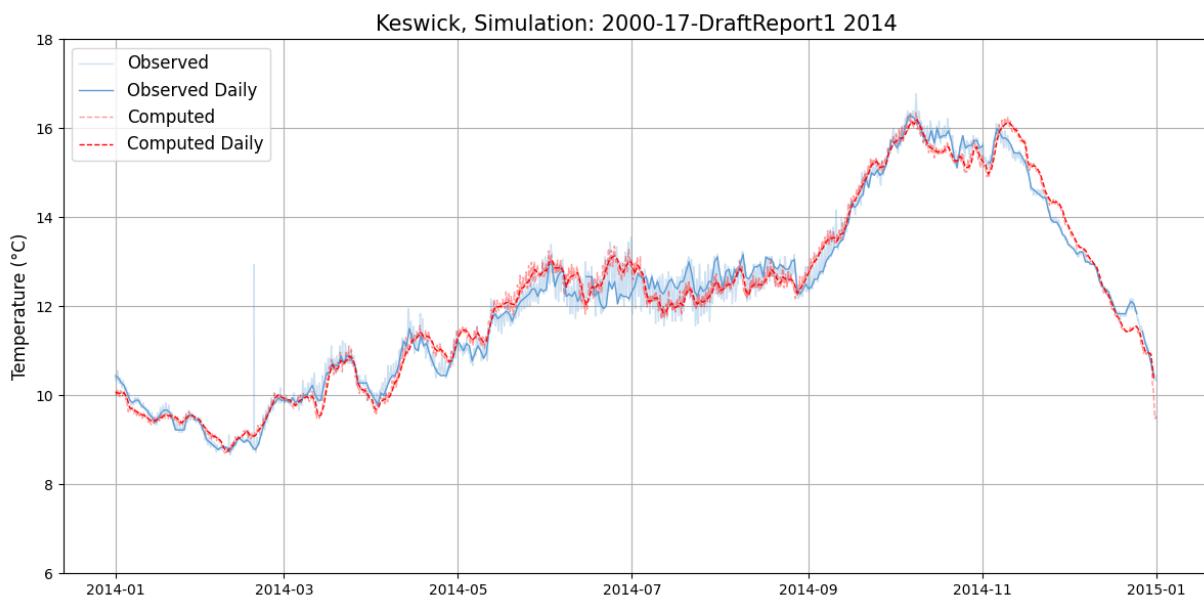


Figure 113. Keswick Reservoir Outflow Temperature 2014

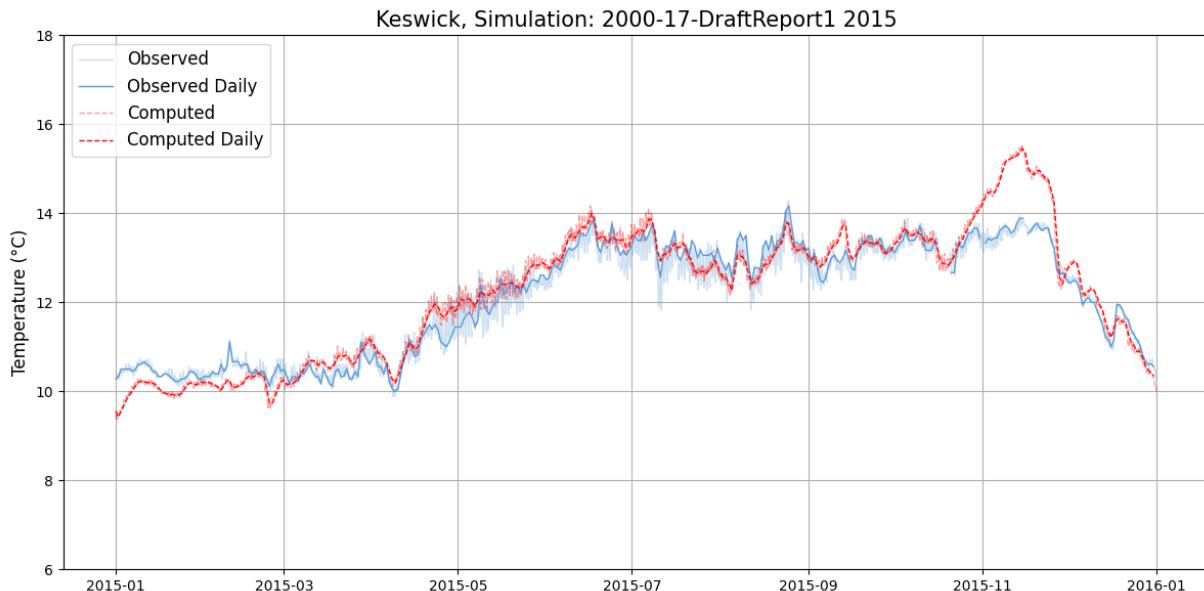


Figure 114. Keswick Reservoir Outflow Temperature 2015

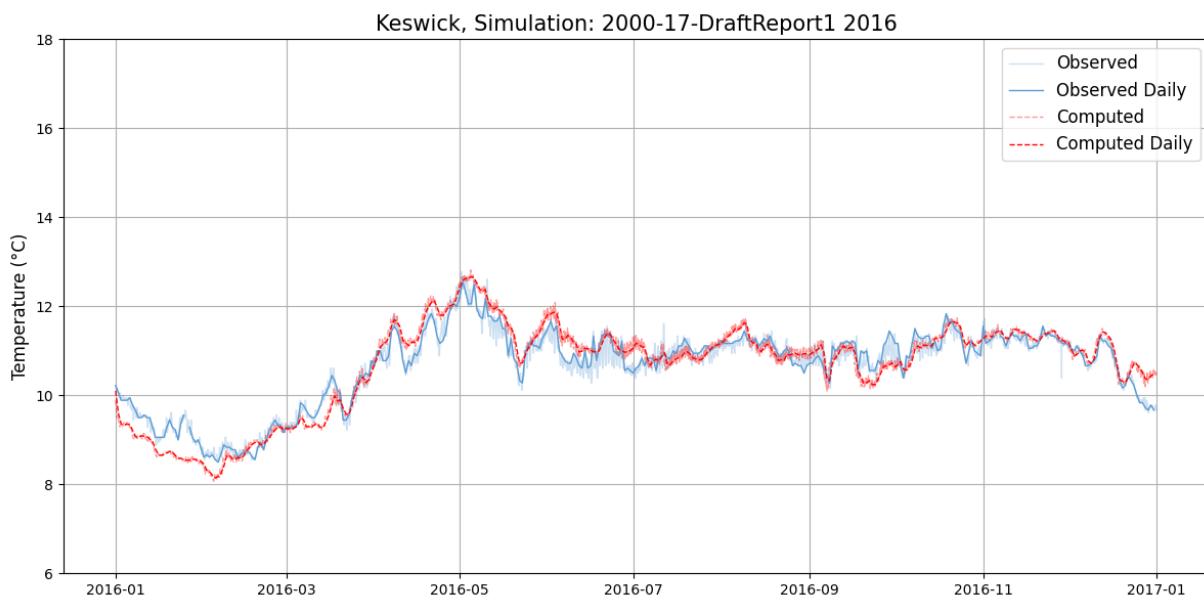


Figure 115. Keswick Reservoir Outflow Temperature 2016

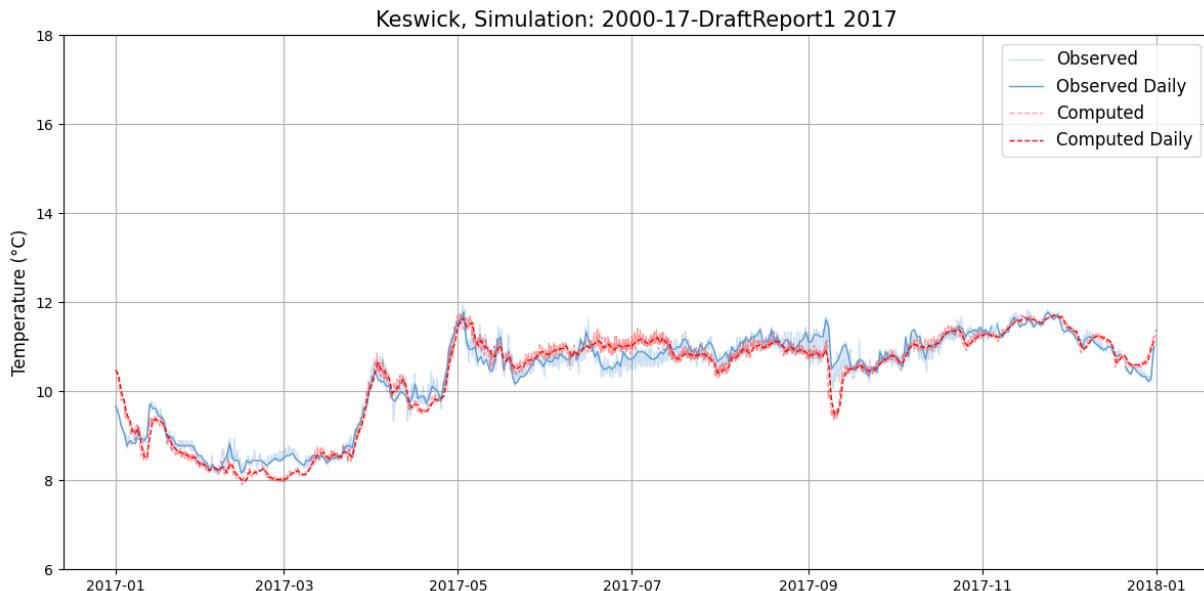


Figure 116. Keswick Reservoir Outflow Temperature 2017

Table 37. Keswick Temperature Outflow Error Statistics

Statistics	2000	2001	2002	2003	2004	2005
Mean Bias (°C)	-0.00	-0.16	-0.08	-0.25	-0.19	-0.34
MAE (°C)	0.19	0.29	0.30	0.32	0.32	0.45
RMSE (°C)	0.25	0.37	0.37	0.42	0.39	0.60

Statistics	2000	2001	2002	2003	2004	2005
Nash-Sutcliffe (NSE)	0.93	0.93	0.89	0.73	0.93	0.76
COUNT	8,015	8,760	8,760	8,760	8,784	8,760

Statistics	2006	2007	2008	2009	2010	2011
Mean Bias (°C)	-0.22	-0.10	-0.05	-0.06	-0.17	-0.03
MAE (°C)	0.35	0.30	0.30	0.25	0.33	0.22
RMSE (°C)	0.47	0.40	0.37	0.31	0.46	0.28
Nash-Sutcliffe (NSE)	0.78	0.92	0.97	0.97	0.63	0.87
COUNT	8,760	8,760	8,784	8,760	8,760	8,760

Statistics	2012	2013	2014	2015	2016	2017
Mean Bias (°C)	-0.00	0.14	0.02	0.15	0.04	-0.02
MAE (°C)	0.24	0.27	0.25	0.36	0.26	0.21
RMSE (°C)	0.31	0.37	0.31	0.49	0.34	0.27
Nash-Sutcliffe (NSE)	0.89	0.92	0.98	0.84	0.84	0.93
COUNT	8,784	8,760	8,760	8,760	8,784	8,760

Table 38. Keswick Outflow Temperature NSE, invalid under .65

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	-0.38	0.70	0.41	0.03	-3.16	0.34	-0.06	0.17	0.63	0.81	0.89
2001	0.89	0.32	0.78	0.75	0.38	0.65	0.07	-2.27	0.83	0.46	0.48	0.68
2002	-0.47	-6.76	0.65	-0.52	0.58	0.69	0.50	0.54	-0.74	0.59	0.78	0.84
2003	-1.57	-2.99	0.59	0.42	0.61	-11.48	-6.56	-1.73	-1.16	-1.11	-0.20	0.68
2004	-0.29	-19.72	-1.12	0.28	-1.62	0.47	-0.21	-0.85	0.90	-3.43	0.17	0.68
2005	-12.00	-18.22	0.25	-0.24	0.31	0.39	-11.79	-16.29	-1.05	0.89	0.72	-0.03
2006	-0.23	0.08	-8.34	0.13	-0.80	-0.14	0.57	-9.92	-8.80	0.86	-1.16	0.67
2007	-17.98	-1.65	0.83	0.63	-0.61	0.33	0.77	-0.15	0.61	0.56	0.67	0.96
2008	0.61	-1.02	0.67	-1.86	-1.07	0.49	-0.41	-0.03	0.89	-0.93	0.40	0.98
2009	0.08	0.28	-0.42	0.14	0.34	0.34	0.50	-0.20	0.47	0.76	0.92	0.98
2010	-3.51	-3.19	0.22	0.57	0.62	-0.84	0.08	-11.89	-10.60	-0.78	0.20	0.82
2011	0.40	0.84	-0.07	0.67	0.59	0.90	-0.39	-2.09	-0.78	0.06	-0.44	0.31

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	0.87	0.46	-0.35	0.52	-0.29	-0.09	0.73	0.09	-1.38	0.34	0.31	0.93
2013	0.21	0.45	0.74	0.14	-0.45	0.34	-0.06	-0.34	-0.37	0.33	-1.65	0.47
2014	0.68	0.72	0.63	0.58	0.64	-0.22	-0.01	-0.14	0.93	0.01	0.75	0.87
2015	-10.55	-2.96	-0.40	0.58	-0.45	0.05	-0.05	0.64	-0.47	-0.57	-10.99	0.82
2016	-1.58	-0.01	0.49	0.43	0.59	-0.99	-0.46	-0.13	-0.64	0.55	-0.16	0.51
2017	0.07	-3.84	0.76	0.69	0.55	-1.31	-2.26	0.24	-0.99	0.52	0.52	0.56
All	0.46	0.70	0.83	0.80	0.80	0.84	0.78	0.47	0.85	0.95	0.89	0.86

Table 39. Keswick Temperature Outflow MeanBias, invalid when +- .75

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.15	-0.03	-0.04	0.14	-0.23	-0.00	-0.12	0.04	0.05	0.03	0.00
2001	-0.19	-0.52	-0.38	-0.09	0.15	0.02	-0.17	-0.17	0.02	-0.08	-0.10	-0.45
2002	-0.61	-0.50	-0.07	0.35	0.06	-0.18	-0.12	-0.18	0.21	0.20	-0.02	-0.20
2003	-0.42	-0.26	-0.14	-0.10	-0.15	-0.66	-0.84	-0.37	-0.01	0.14	-0.09	-0.18
2004	-0.47	-0.56	-0.15	0.04	0.23	0.15	-0.12	-0.14	0.06	-0.54	-0.27	-0.36
2005	-0.89	-0.56	-0.09	0.09	-0.01	0.08	-0.34	-1.26	-0.41	0.04	-0.17	-0.54
2006	-0.59	-0.26	-0.43	-0.24	0.11	-0.02	-0.04	-0.62	-0.60	0.08	0.29	-0.29
2007	-0.75	-0.48	-0.24	0.04	0.32	0.22	0.04	-0.12	0.11	-0.03	-0.17	-0.13
2008	-0.33	-0.31	-0.12	0.31	0.47	0.32	0.09	-0.10	-0.04	-0.35	-0.32	-0.07
2009	-0.06	-0.35	-0.36	0.12	0.14	0.30	0.10	-0.13	-0.19	-0.25	0.02	-0.06
2010	-0.40	-0.30	-0.09	0.04	0.33	0.04	-0.08	-0.59	-0.85	-0.18	0.06	-0.03
2011	-0.22	-0.12	-0.21	0.12	0.19	0.05	0.16	0.15	-0.19	-0.20	-0.03	-0.08
2012	0.05	-0.09	-0.13	-0.28	0.29	0.36	0.03	-0.27	-0.29	0.07	0.12	0.13
2013	-0.03	0.04	0.26	0.30	0.21	0.11	0.25	0.21	0.17	0.19	0.09	-0.20
2014	-0.08	0.11	-0.15	-0.01	0.30	0.21	-0.11	-0.10	0.15	-0.22	0.27	-0.13
2015	-0.39	-0.31	0.16	0.24	0.26	0.27	0.16	-0.04	0.23	0.17	1.10	0.00
2016	-0.54	-0.13	-0.16	0.29	0.31	0.37	0.03	0.06	-0.13	0.07	0.08	0.22
2017	-0.04	-0.26	-0.11	-0.08	0.10	0.25	0.09	-0.11	-0.19	-0.01	-0.00	0.10
All	-0.35	-0.26	-0.14	0.06	0.19	0.09	-0.04	-0.22	-0.11	-0.05	0.05	-0.13

Table 40. Keswick Temperature Outflow MAE, invalid over 1.0

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.21	0.09	0.32	0.22	0.32	0.16	0.20	0.18	0.12	0.11	0.18
2001	0.21	0.52	0.40	0.28	0.28	0.28	0.23	0.37	0.17	0.14	0.18	0.45
2002	0.61	0.50	0.17	0.43	0.26	0.25	0.16	0.26	0.30	0.25	0.12	0.28
2003	0.42	0.26	0.19	0.21	0.23	0.66	0.84	0.38	0.24	0.15	0.12	0.19
2004	0.47	0.56	0.26	0.19	0.24	0.22	0.20	0.34	0.14	0.54	0.29	0.36
2005	0.89	0.56	0.21	0.19	0.27	0.16	0.56	1.26	0.41	0.10	0.20	0.54
2006	0.59	0.26	0.43	0.39	0.18	0.14	0.11	0.65	0.60	0.10	0.37	0.32
2007	0.75	0.49	0.27	0.28	0.33	0.27	0.15	0.25	0.23	0.18	0.21	0.15
2008	0.34	0.31	0.19	0.39	0.47	0.37	0.38	0.25	0.16	0.36	0.33	0.13
2009	0.31	0.35	0.36	0.20	0.22	0.31	0.21	0.29	0.24	0.26	0.13	0.11
2010	0.40	0.30	0.21	0.21	0.35	0.31	0.14	0.62	0.85	0.32	0.17	0.13
2011	0.22	0.15	0.21	0.24	0.29	0.16	0.21	0.29	0.35	0.23	0.11	0.18
2012	0.15	0.14	0.17	0.31	0.41	0.41	0.12	0.33	0.30	0.15	0.14	0.26
2013	0.21	0.10	0.28	0.43	0.38	0.23	0.29	0.31	0.25	0.22	0.27	0.26
2014	0.15	0.14	0.18	0.25	0.31	0.35	0.31	0.23	0.21	0.25	0.33	0.22
2015	0.39	0.32	0.23	0.28	0.37	0.29	0.31	0.21	0.28	0.23	1.14	0.23
2016	0.54	0.21	0.23	0.31	0.34	0.40	0.19	0.17	0.25	0.16	0.12	0.26
2017	0.27	0.27	0.17	0.20	0.21	0.28	0.26	0.13	0.25	0.15	0.09	0.18
All	0.41	0.31	0.24	0.28	0.30	0.30	0.27	0.36	0.30	0.22	0.25	0.25

Table 41. Keswick Temperature Outflow RMSE, invalid over 1.5

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.25	0.13	0.39	0.27	0.36	0.21	0.25	0.24	0.15	0.14	0.23
2001	0.26	0.56	0.44	0.35	0.34	0.37	0.33	0.48	0.21	0.19	0.22	0.51
2002	0.62	0.52	0.22	0.48	0.33	0.29	0.20	0.31	0.37	0.29	0.17	0.35
2003	0.45	0.30	0.24	0.25	0.28	0.71	0.88	0.44	0.28	0.18	0.16	0.21
2004	0.49	0.58	0.34	0.25	0.28	0.27	0.28	0.42	0.17	0.58	0.35	0.41
2005	0.90	0.57	0.26	0.24	0.32	0.20	0.75	1.28	0.44	0.12	0.23	0.58
2006	0.63	0.29	0.46	0.42	0.24	0.19	0.15	0.84	0.70	0.12	0.52	0.36

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	0.81	0.56	0.32	0.35	0.37	0.33	0.19	0.31	0.34	0.32	0.25	0.19
2008	0.37	0.35	0.24	0.42	0.51	0.42	0.46	0.33	0.21	0.42	0.39	0.16
2009	0.35	0.38	0.42	0.24	0.27	0.35	0.27	0.37	0.30	0.31	0.16	0.13
2010	0.49	0.34	0.26	0.25	0.40	0.36	0.17	0.80	0.90	0.41	0.19	0.18
2011	0.25	0.18	0.24	0.31	0.35	0.21	0.26	0.32	0.43	0.28	0.14	0.24
2012	0.17	0.18	0.20	0.37	0.49	0.48	0.16	0.40	0.33	0.19	0.17	0.30
2013	0.27	0.13	0.32	0.70	0.50	0.32	0.38	0.39	0.29	0.25	0.32	0.29
2014	0.18	0.22	0.23	0.30	0.34	0.43	0.38	0.28	0.26	0.29	0.37	0.29
2015	0.44	0.37	0.27	0.34	0.46	0.33	0.37	0.26	0.37	0.29	1.23	0.26
2016	0.57	0.26	0.31	0.36	0.39	0.45	0.25	0.21	0.31	0.20	0.15	0.36
2017	0.33	0.31	0.23	0.25	0.26	0.34	0.31	0.17	0.40	0.18	0.12	0.23
All	0.49	0.38	0.30	0.37	0.36	0.38	0.38	0.51	0.40	0.29	0.39	0.32

Keswick Reservoir Outflow

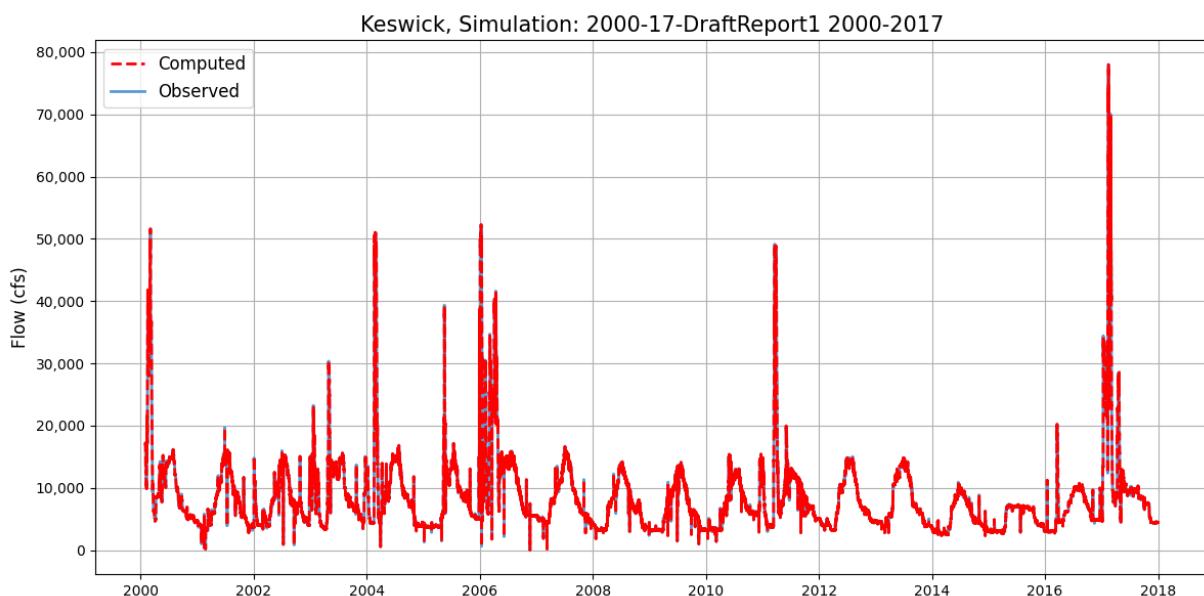


Figure 117. Keswick Reservoir Outflow 2000-2017

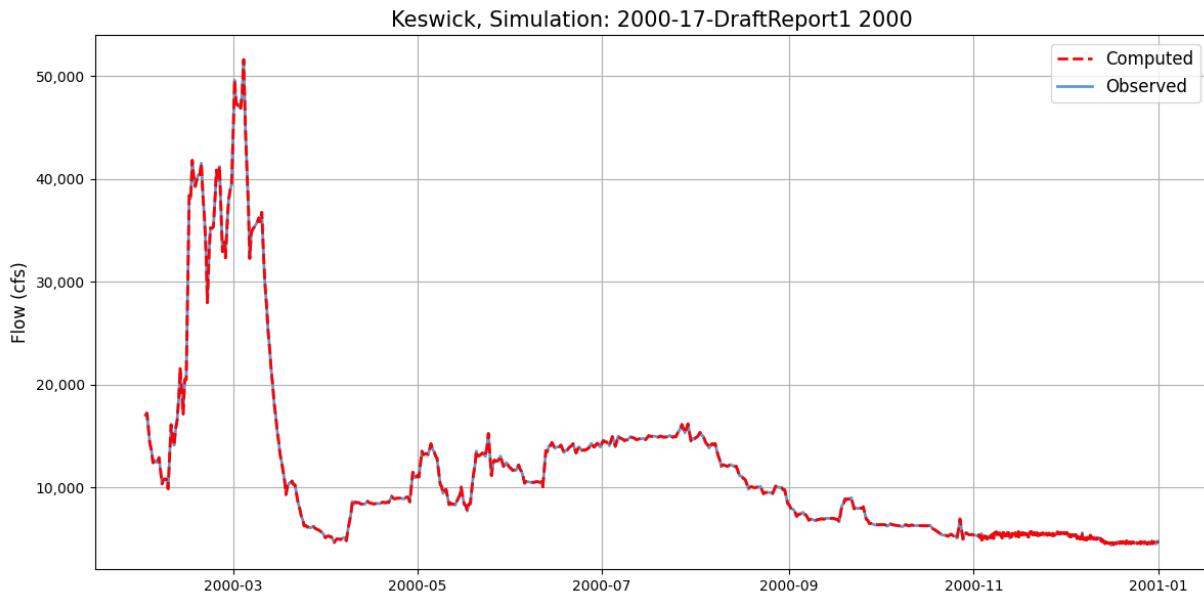


Figure 118. Keswick Reservoir Outflow 2000

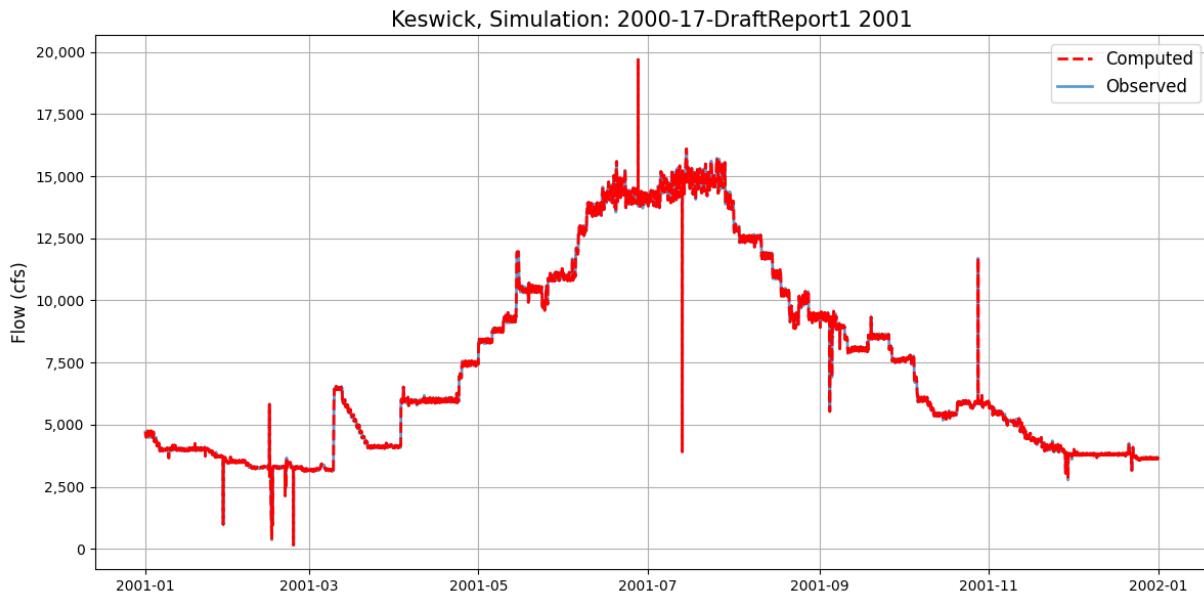


Figure 119. Keswick Reservoir Outflow 2001

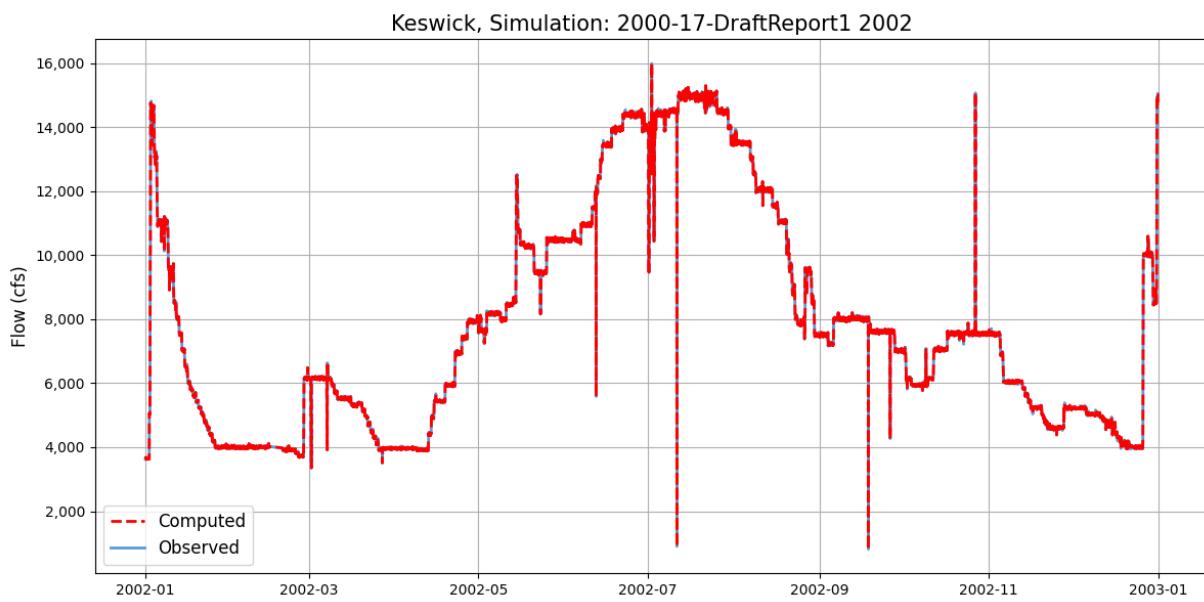


Figure 120. Keswick Reservoir Outflow 2002

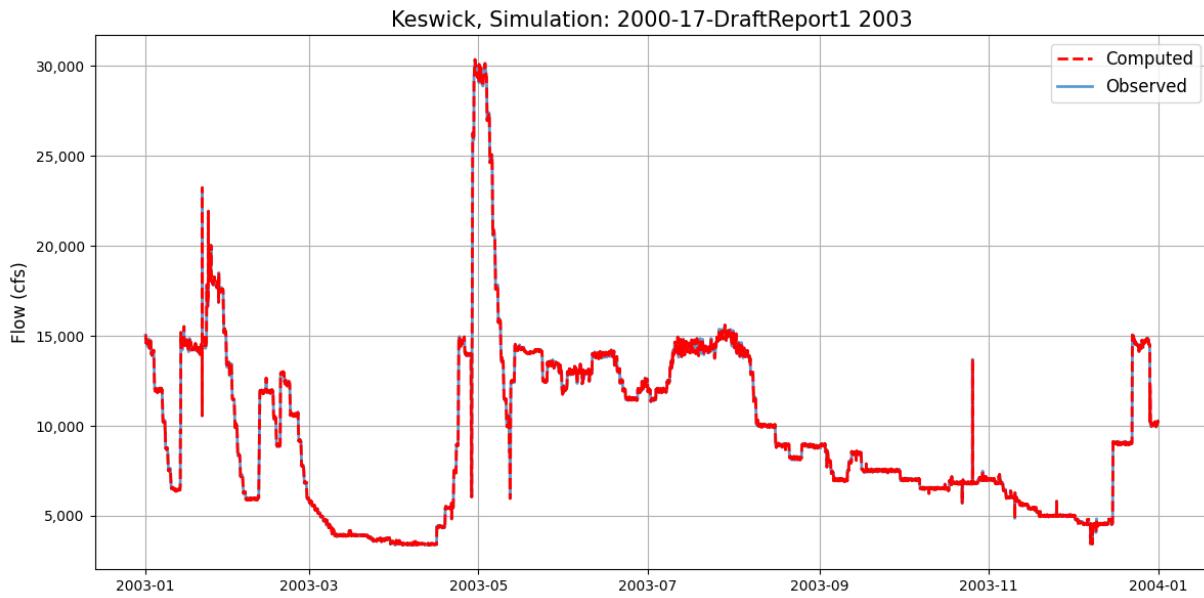


Figure 121. Keswick Reservoir Outflow 2003

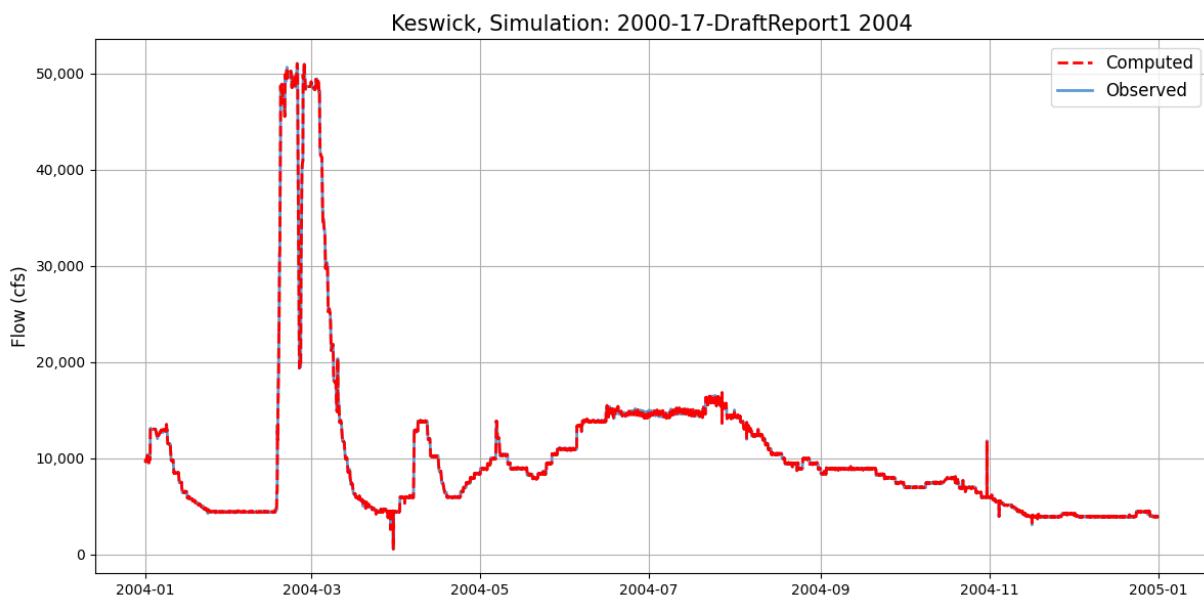


Figure 122. Keswick Reservoir Outflow 2004

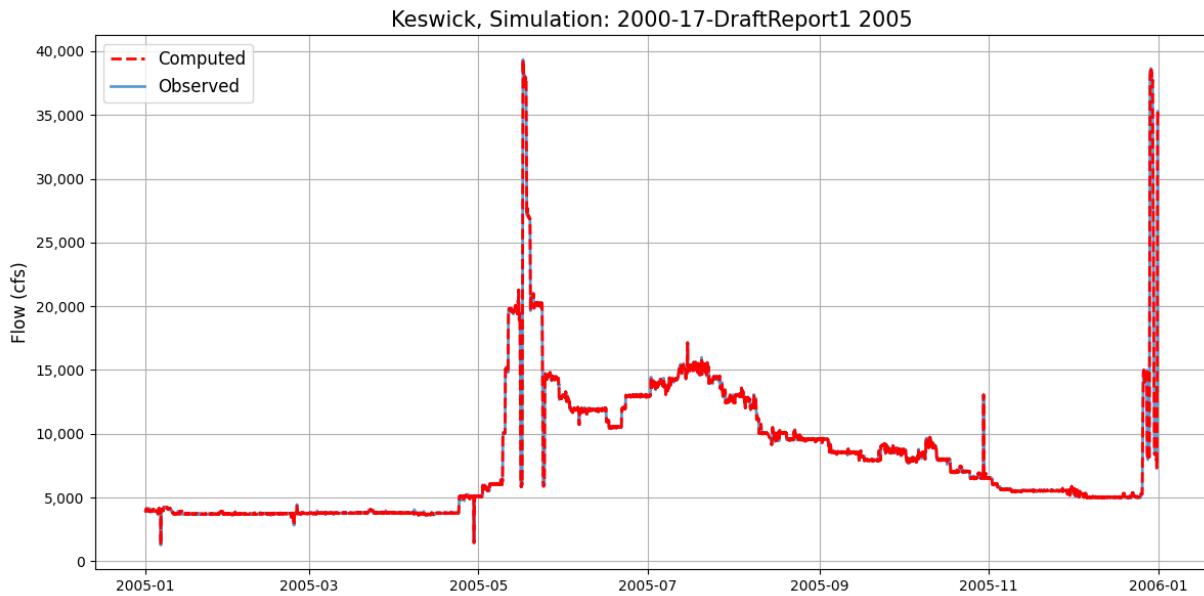


Figure 123. Keswick Reservoir Outflow 2005

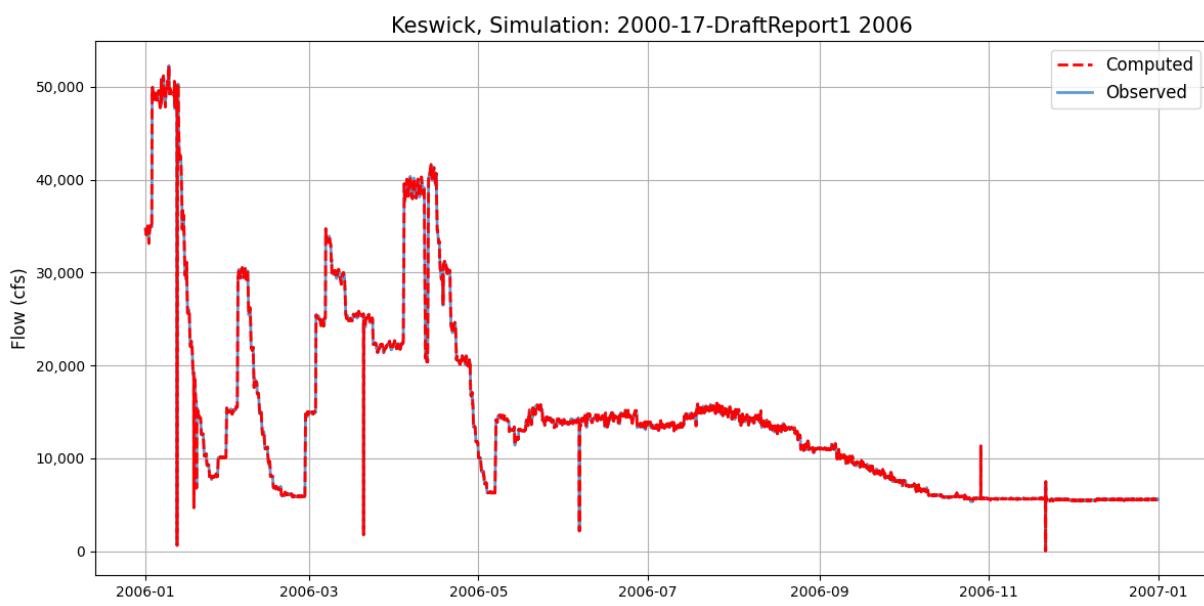


Figure 124. Keswick Reservoir Outflow 2006



Figure 125. Keswick Reservoir Outflow 2007

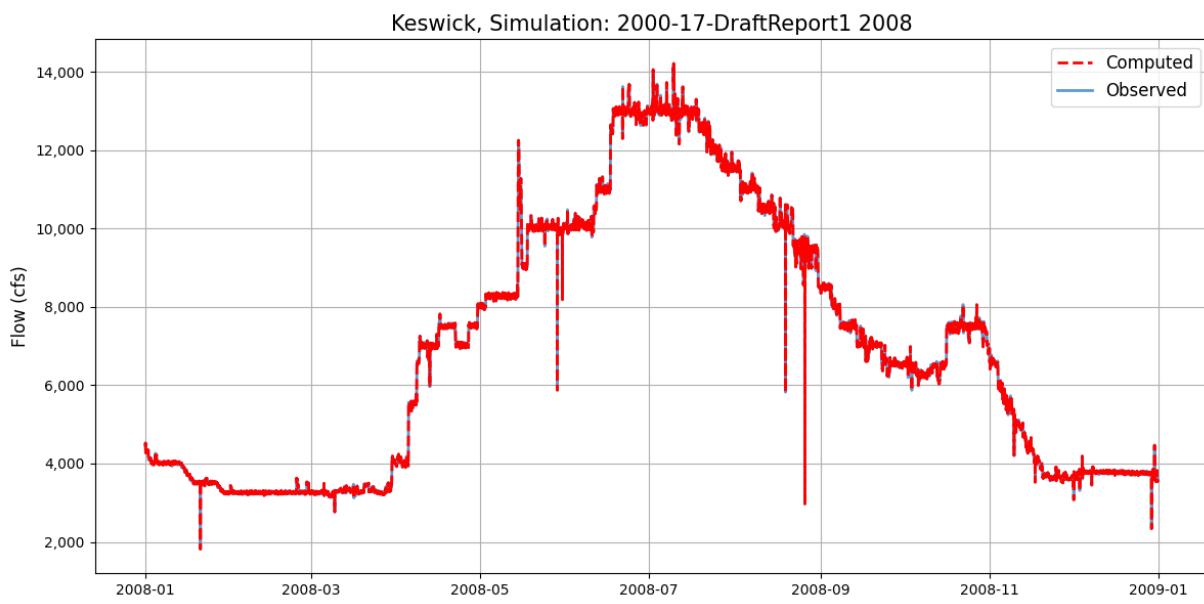


Figure 126. Keswick Reservoir Outflow 2008

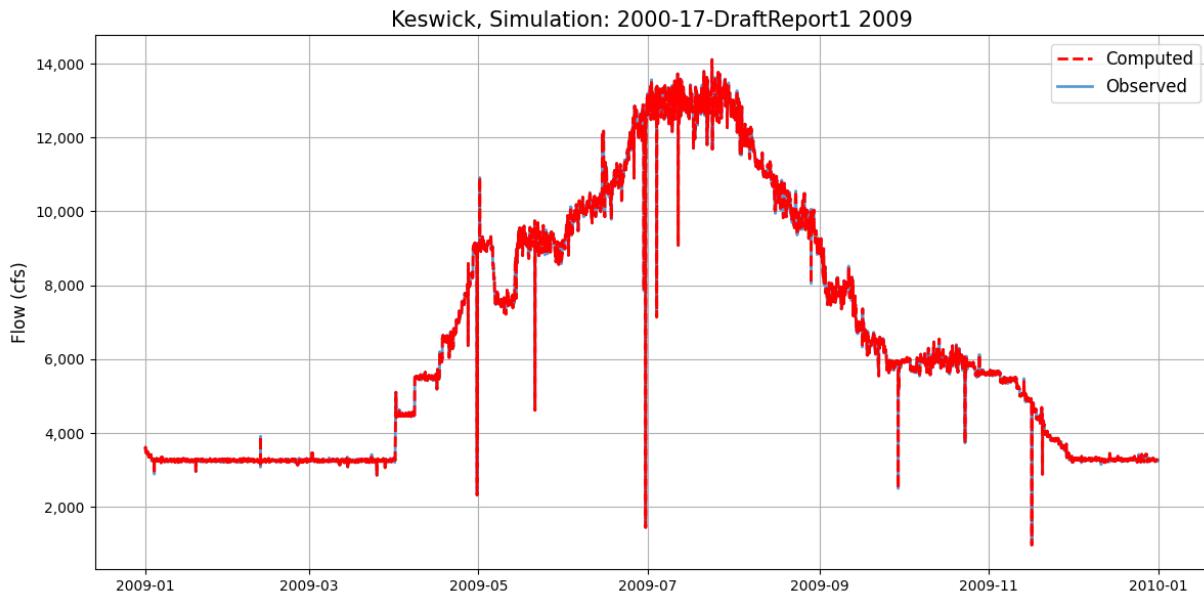


Figure 127. Keswick Reservoir Outflow 2009

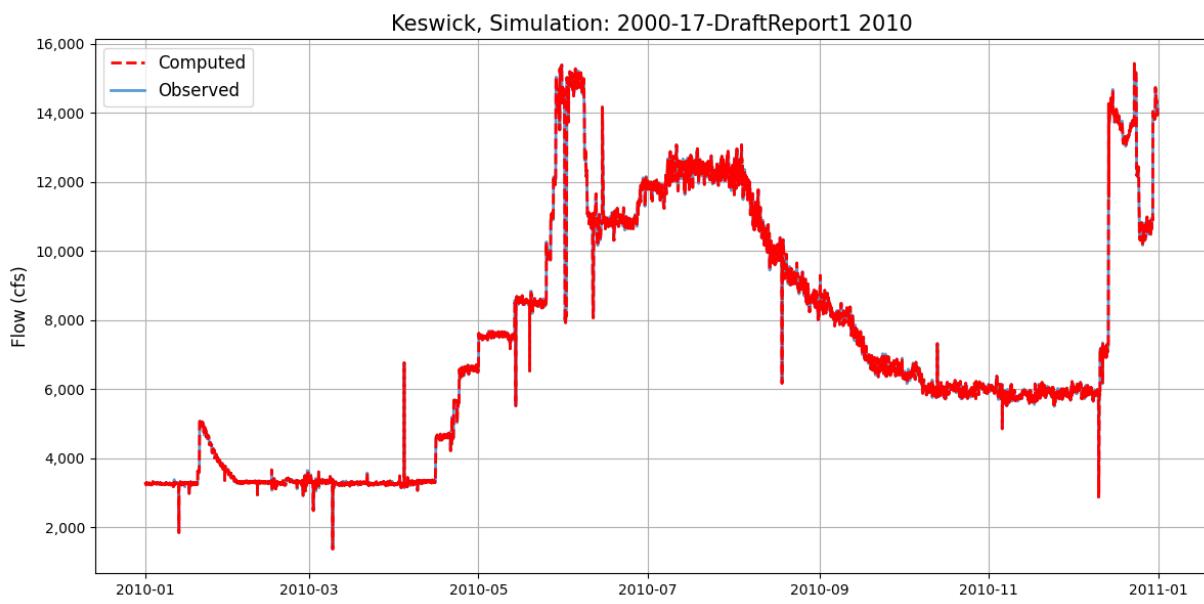


Figure 128. Keswick Reservoir Outflow 2010

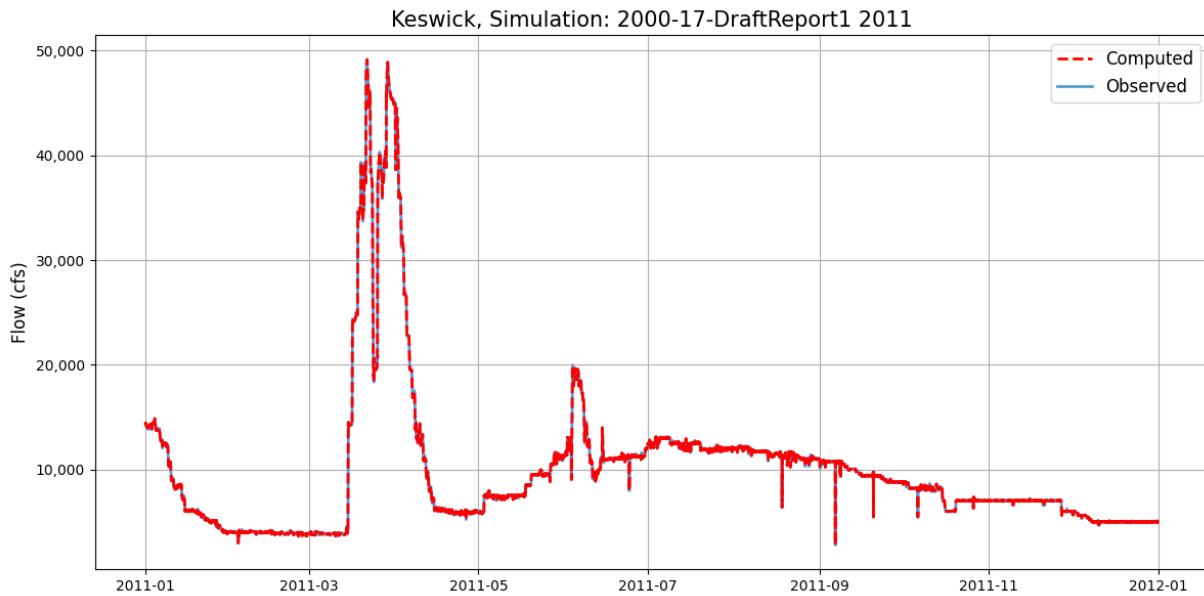


Figure 129. Keswick Reservoir Outflow 2011

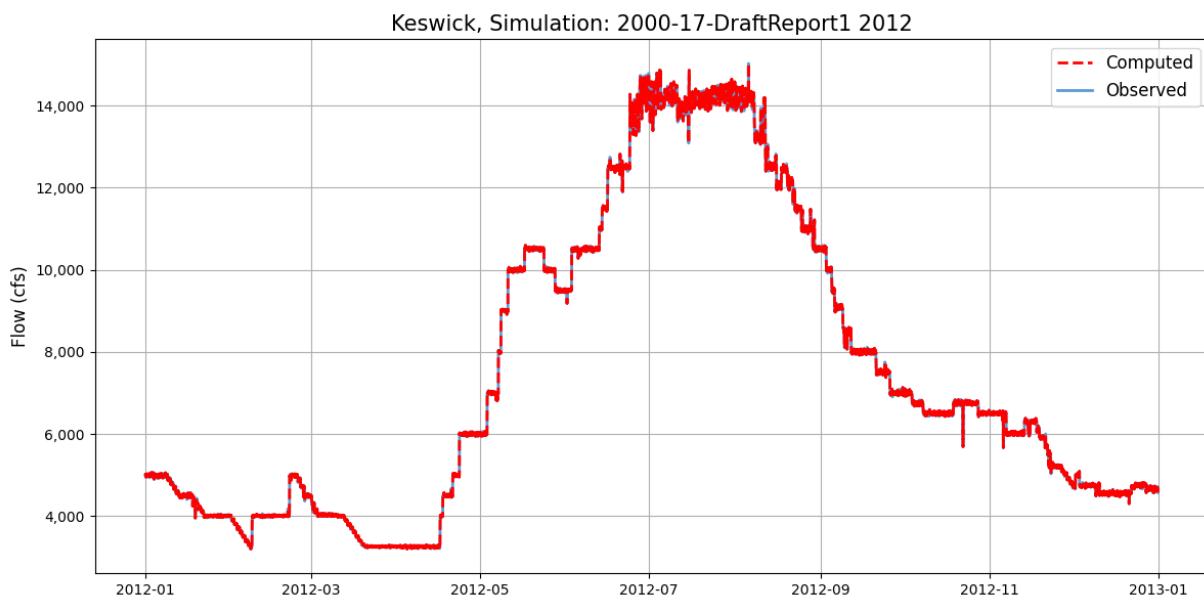


Figure 130. Keswick Reservoir Outflow 2012

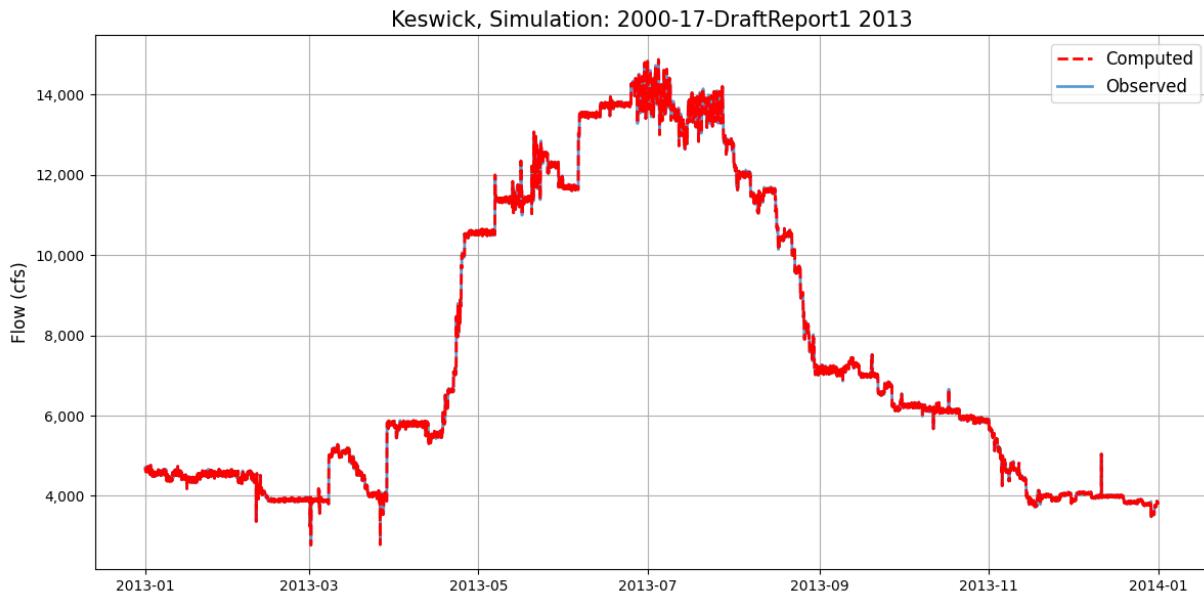


Figure 131. Keswick Reservoir Outflow 2013

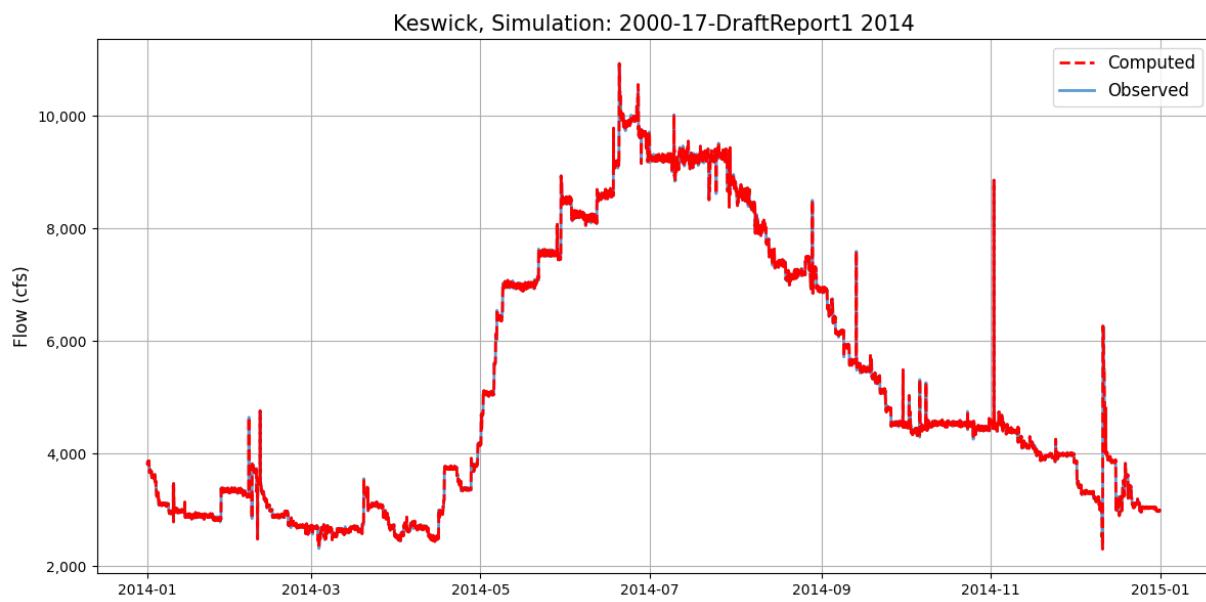


Figure 132. Keswick Reservoir Outflow 2014

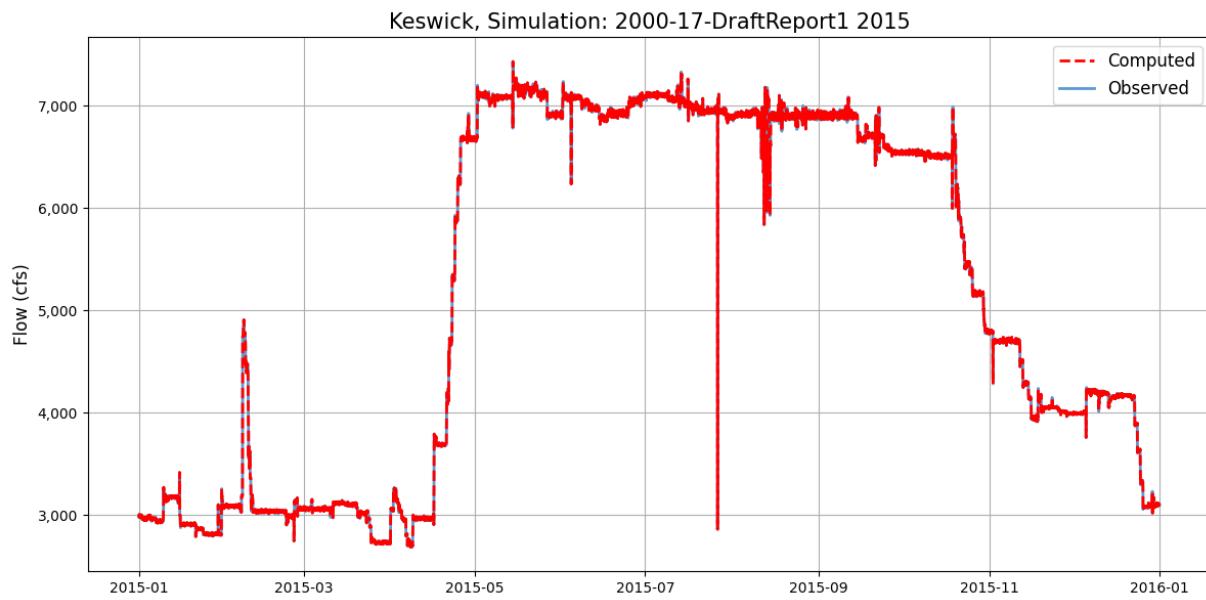


Figure 133. Keswick Reservoir Outflow 2015

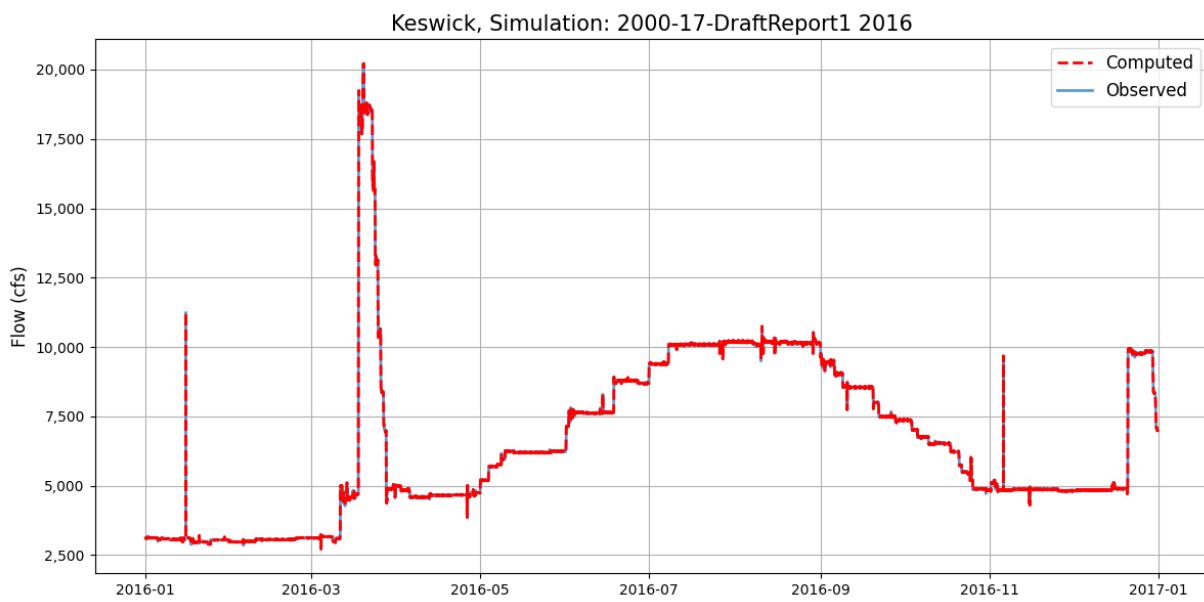


Figure 134. Keswick Reservoir Outflow 2016

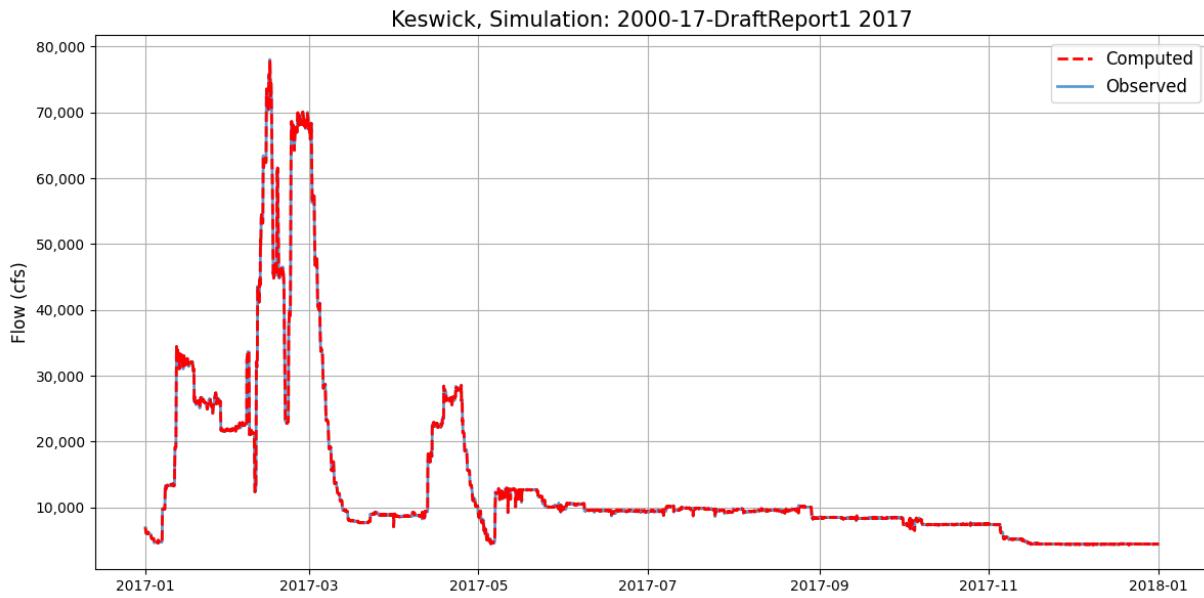


Figure 135. Keswick Reservoir Outflow 2017

Table 42. Keswick Outflow Error Statistics

Statistics	2000	2001	2002	2003	2004	2005
Mean Bias (cfs)	0.08	0.00	0.00	0.00	0.00	0.00
MAE (cfs)	0.12	0.00	0.00	0.00	0.00	0.00
RMSE (cfs)	2.61	0.00	0.00	0.00	0.00	0.00

Statistics	2000	2001	2002	2003	2004	2005
Nash-Sutcliffe (NSE)	1.00	1.00	1.00	1.00	1.00	1.00
COUNT	8,040	8,760	8,760	8,760	8,784	8,760

Statistics	2006	2007	2008	2009	2010	2011
Mean Bias (cfs)	0.00	0.00	0.00	0.00	0.00	0.00
MAE (cfs)	0.00	0.00	0.00	0.00	0.00	0.00
RMSE (cfs)	0.00	0.00	0.00	0.00	0.00	0.00
Nash-Sutcliffe (NSE)	1.00	1.00	1.00	1.00	1.00	1.00
COUNT	8,760	8,760	8,784	8,760	8,760	8,760

Statistics	2012	2013	2014	2015	2016	2017
Mean Bias (cfs)	0.00	0.00	0.00	0.00	0.00	0.00
MAE (cfs)	0.00	0.00	0.00	0.00	0.00	0.00
RMSE (cfs)	0.00	0.00	0.00	0.00	0.00	0.00
Nash-Sutcliffe (NSE)	1.00	1.00	1.00	1.00	1.00	1.00
COUNT	8,784	8,760	8,760	8,760	8,784	8,760

Table 43. Keswick Outflow MeanBias, invalid when +/- .75

Table 44. Keswick Outflow MAE, invalid over 1.0

Table 45. Keswick Outflow RMSE, invalid over 1.5

Keswick Reservoir Elevation

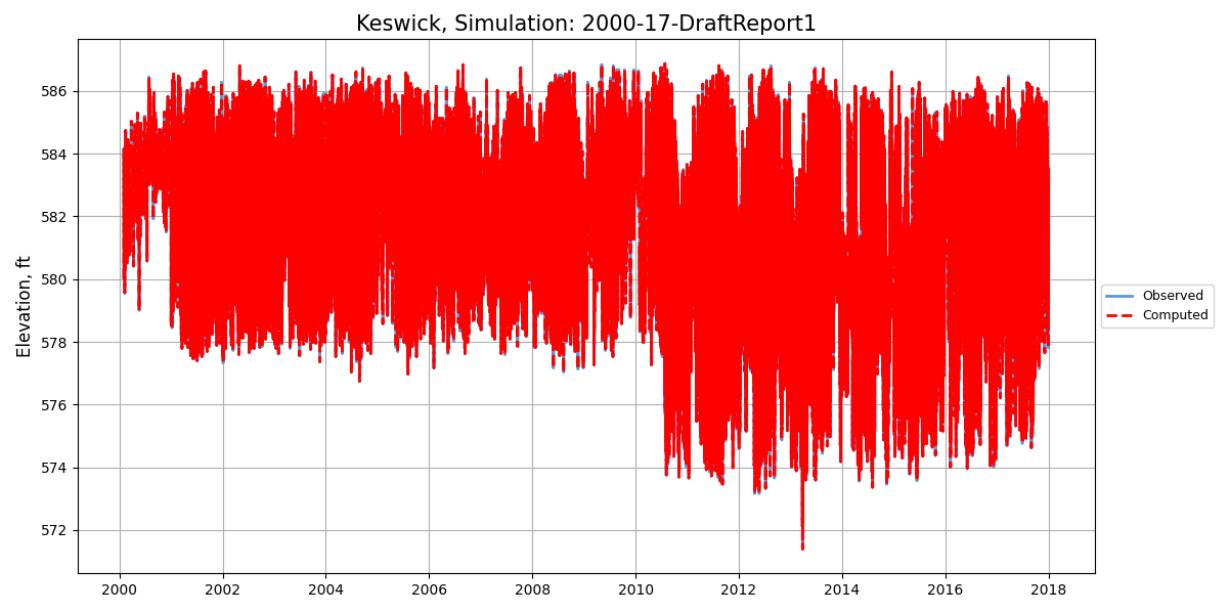


Figure 136. Keswick Elevation

Upper Sacramento

CCR Sacramento River above Clear Creek Temperature

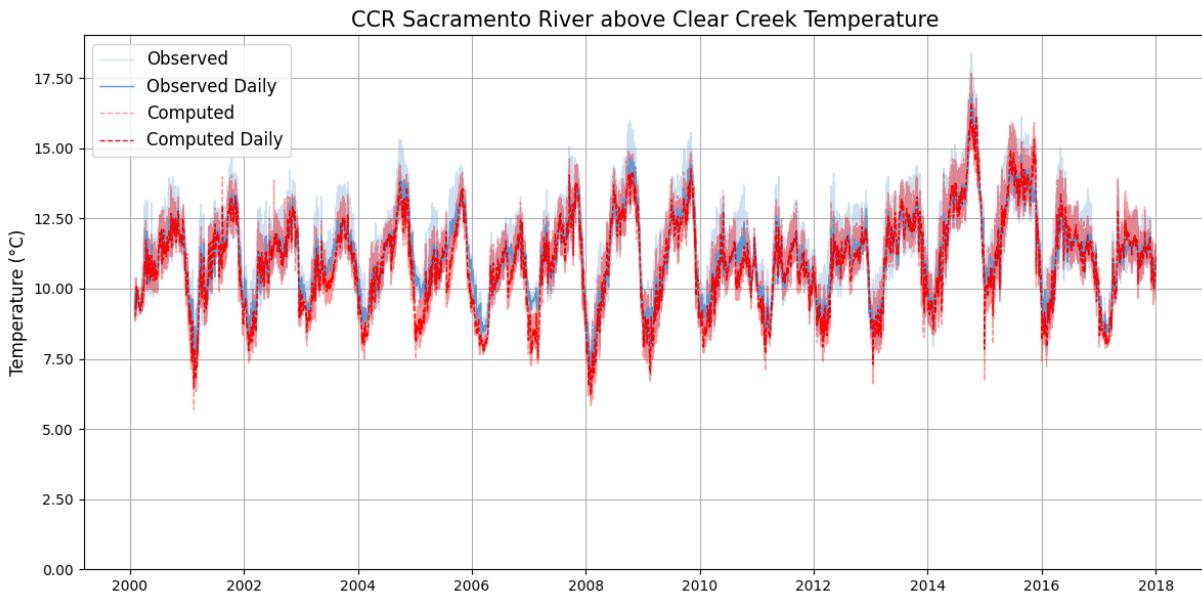


Figure 137. CCR Sacramento River above Clear Creek Temperature

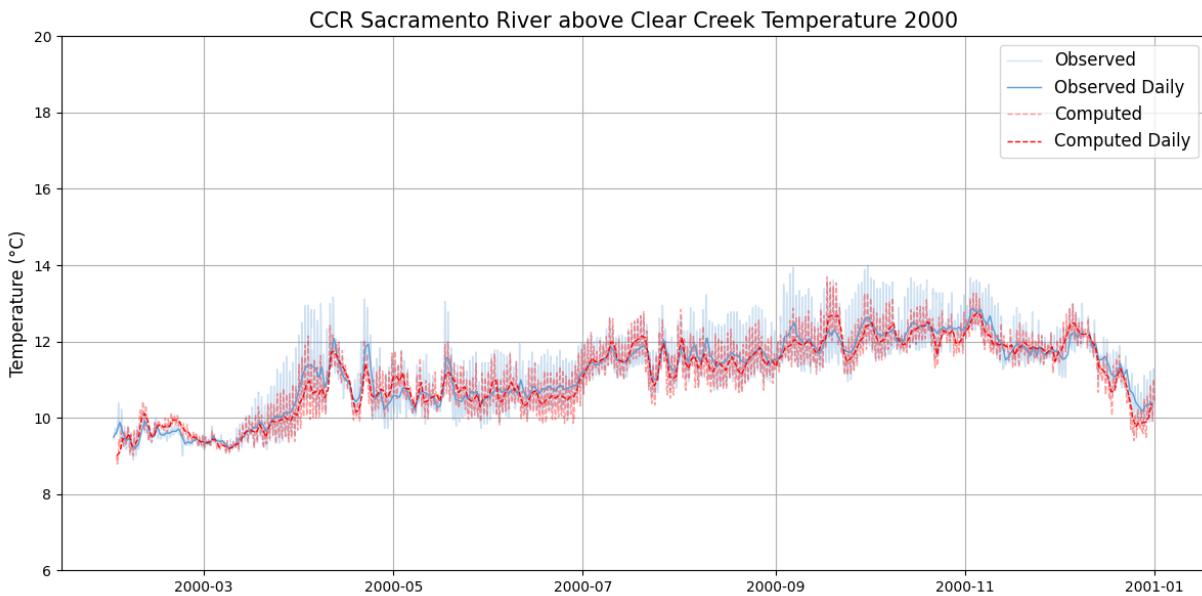


Figure 138. CCR Sacramento River above Clear Creek Temperature 2000

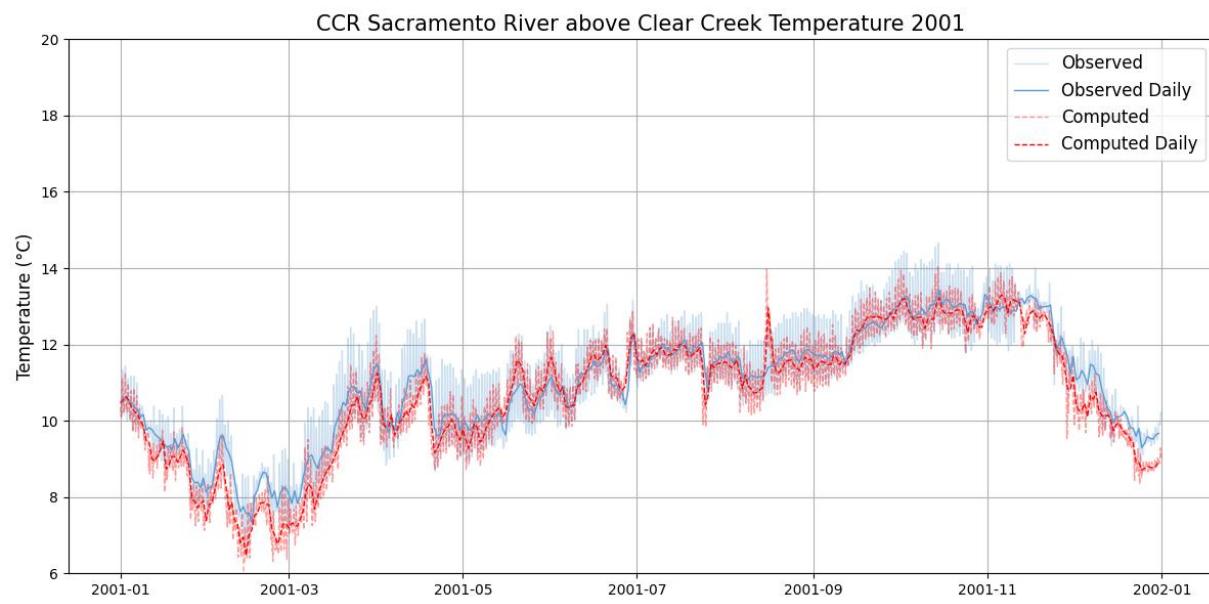


Figure 139. CCR Sacramento River above Clear Creek Temperature 2001

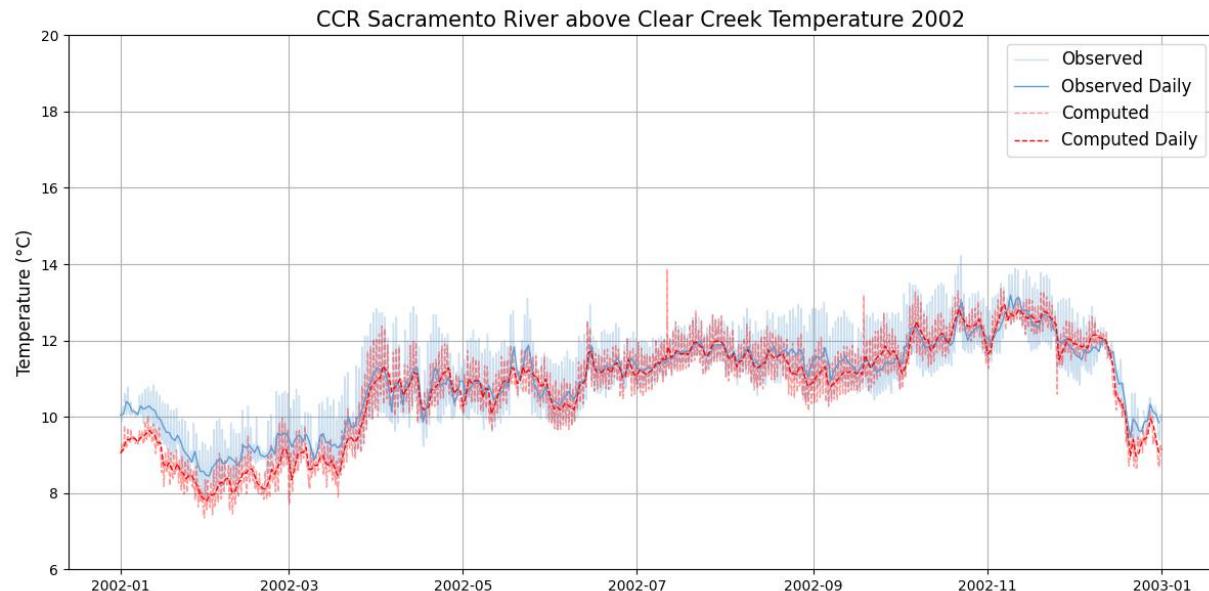


Figure 140. CCR Sacramento River above Clear Creek Temperature 2002

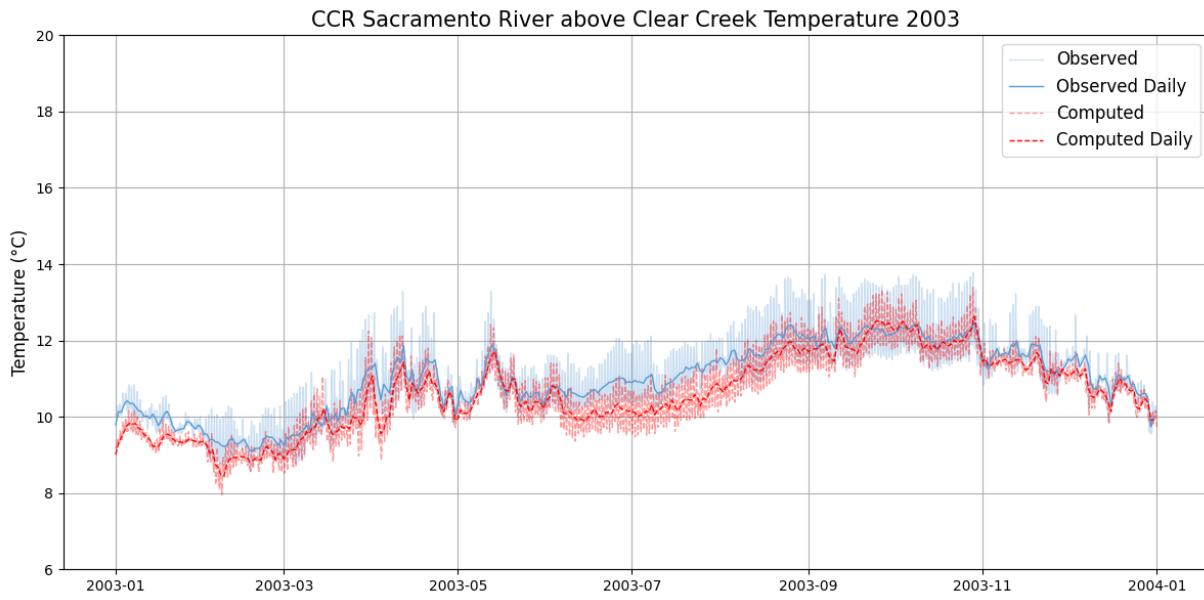


Figure 141. CCR Sacramento River above Clear Creek Temperature 2003

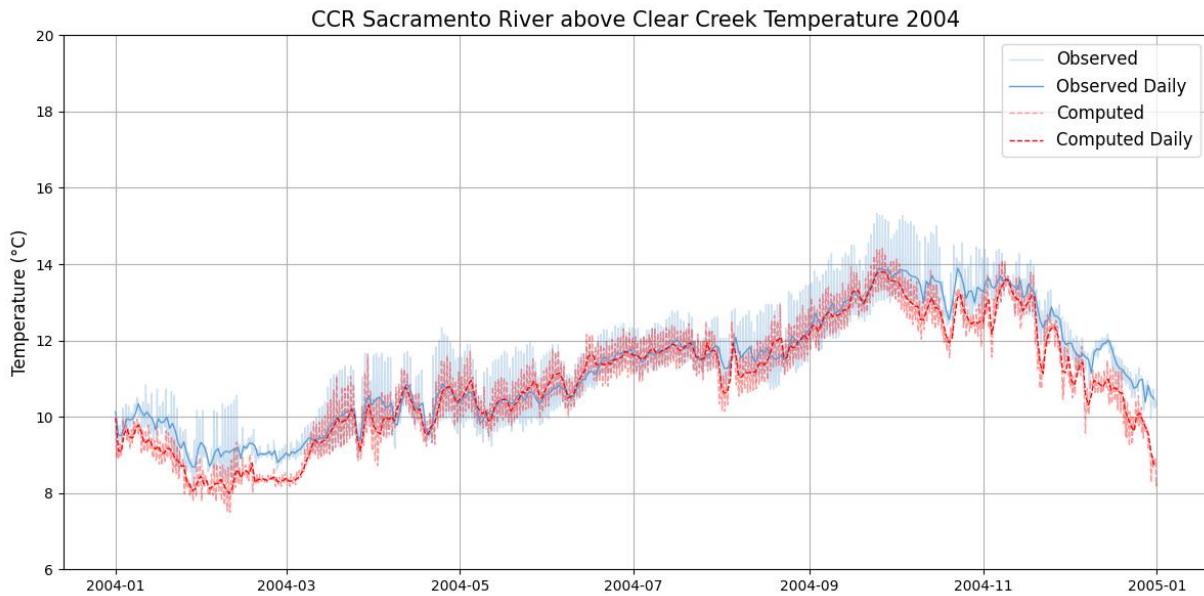


Figure 142. CCR Sacramento River above Clear Creek Temperature 2004

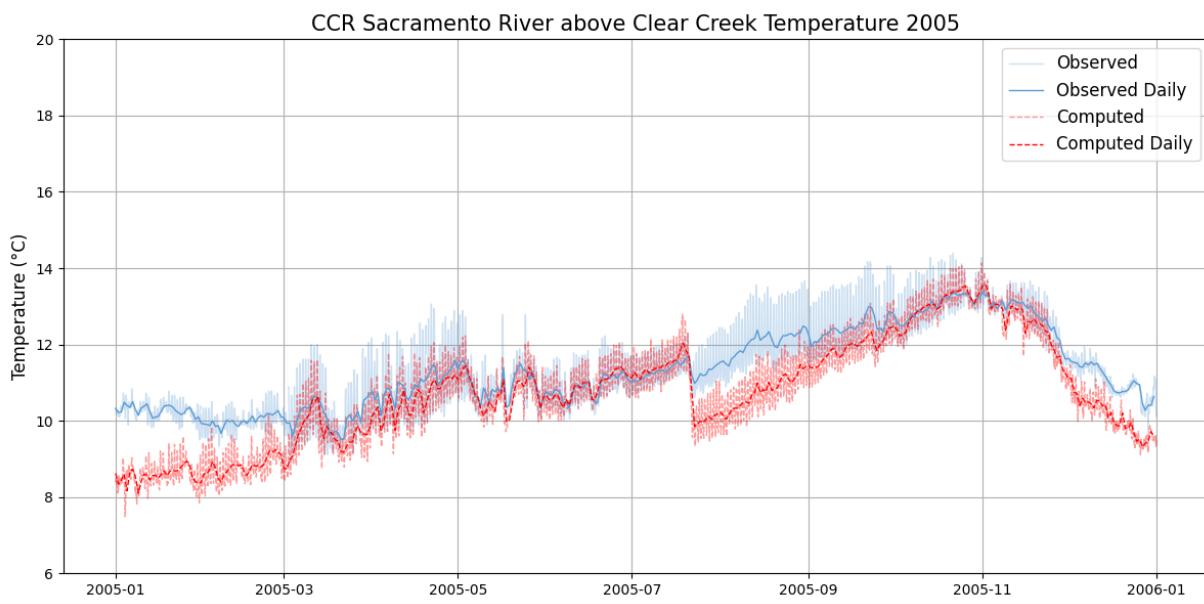


Figure 143. CCR Sacramento River above Clear Creek Temperature 2005

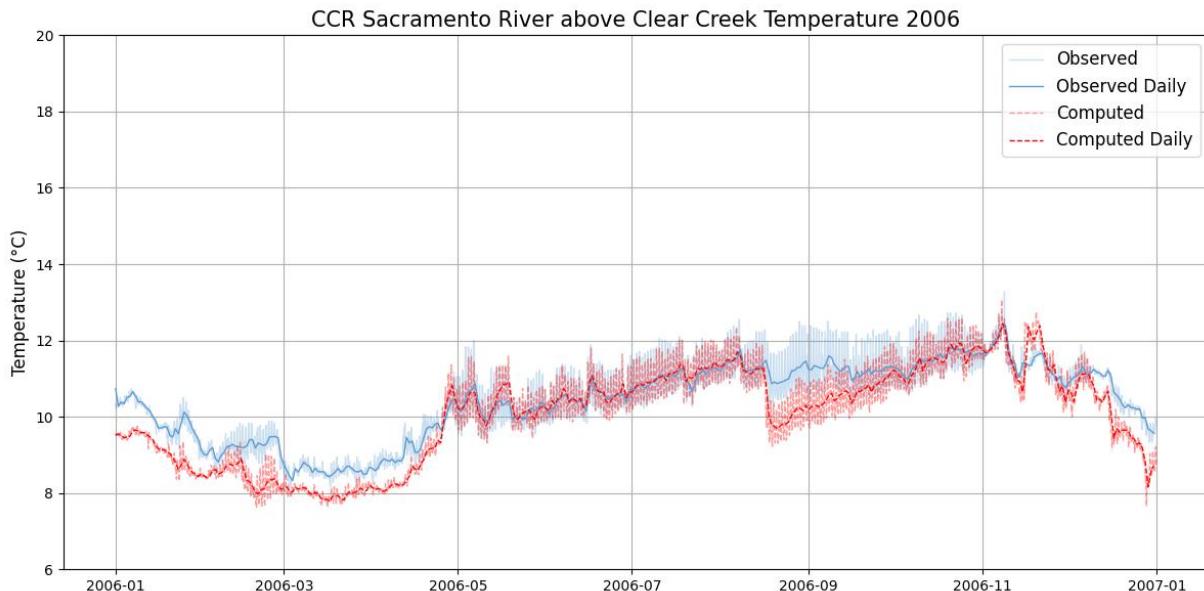


Figure 144. CCR Sacramento River above Clear Creek Temperature 2006

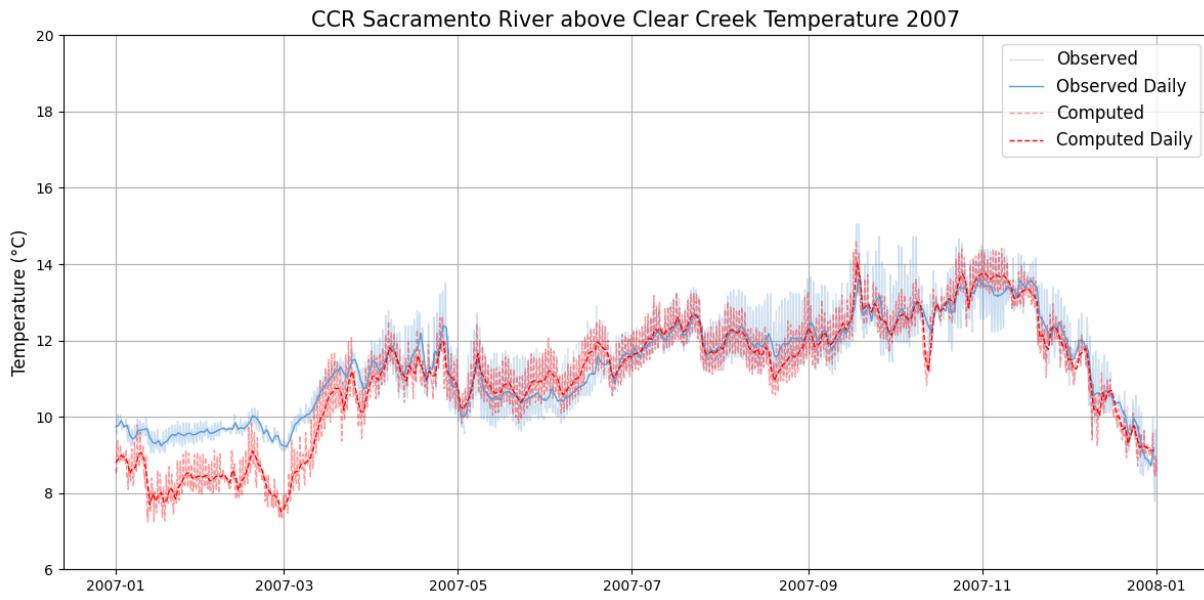


Figure 145. CCR Sacramento River above Clear Creek Temperature 2007

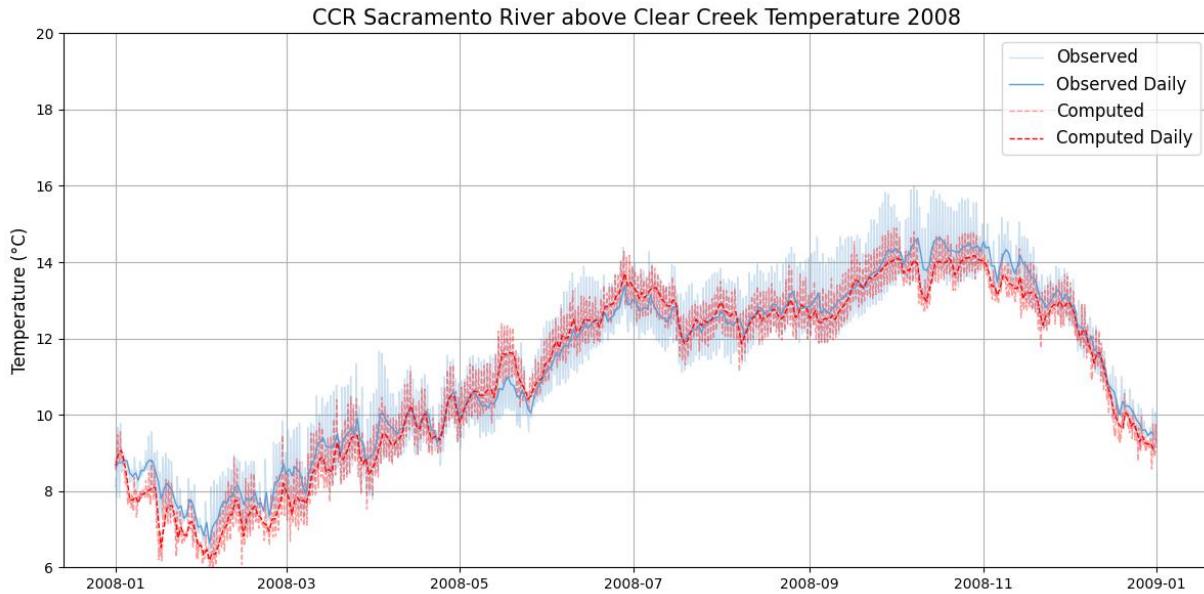


Figure 146. CCR Sacramento River above Clear Creek Temperature 2008

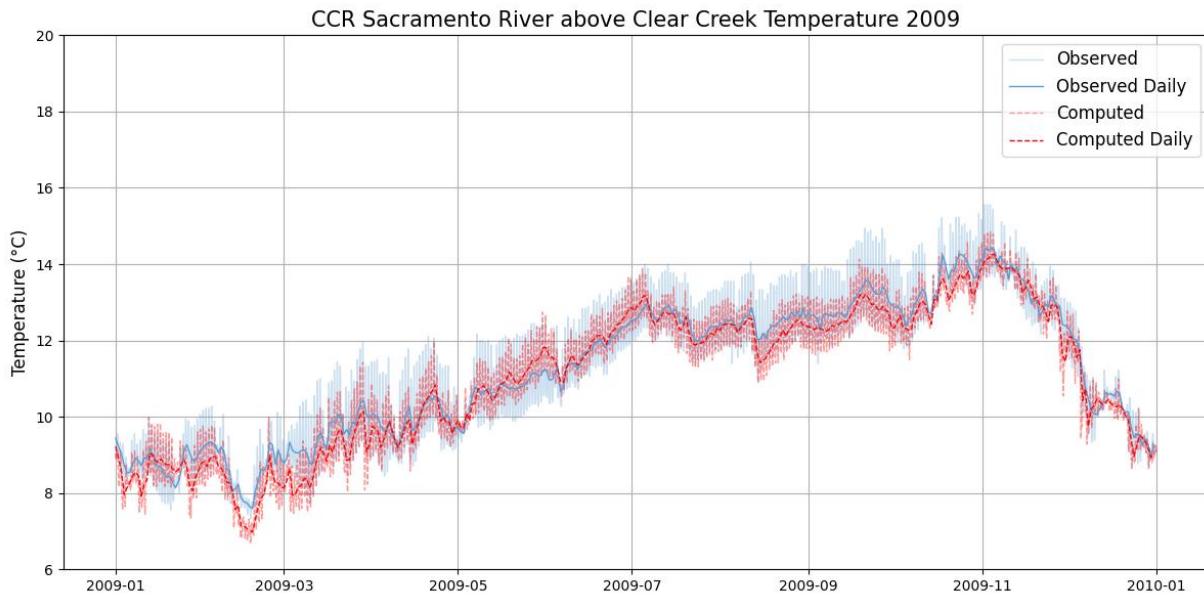


Figure 147. CCR Sacramento River above Clear Creek Temperature 2009

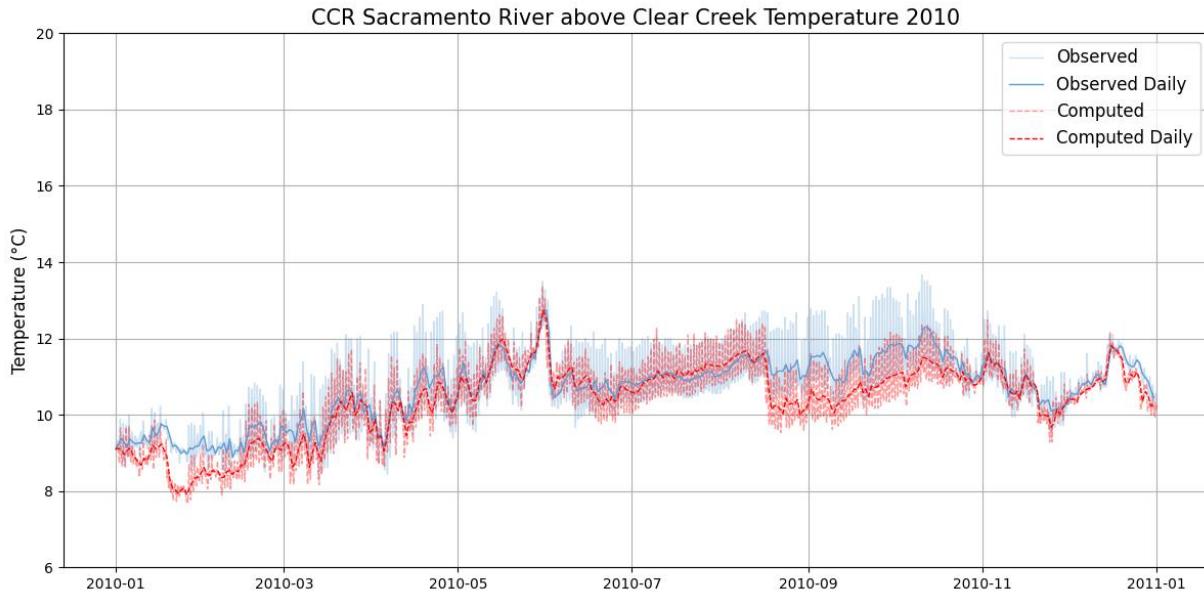


Figure 148. CCR Sacramento River above Clear Creek Temperature 2010

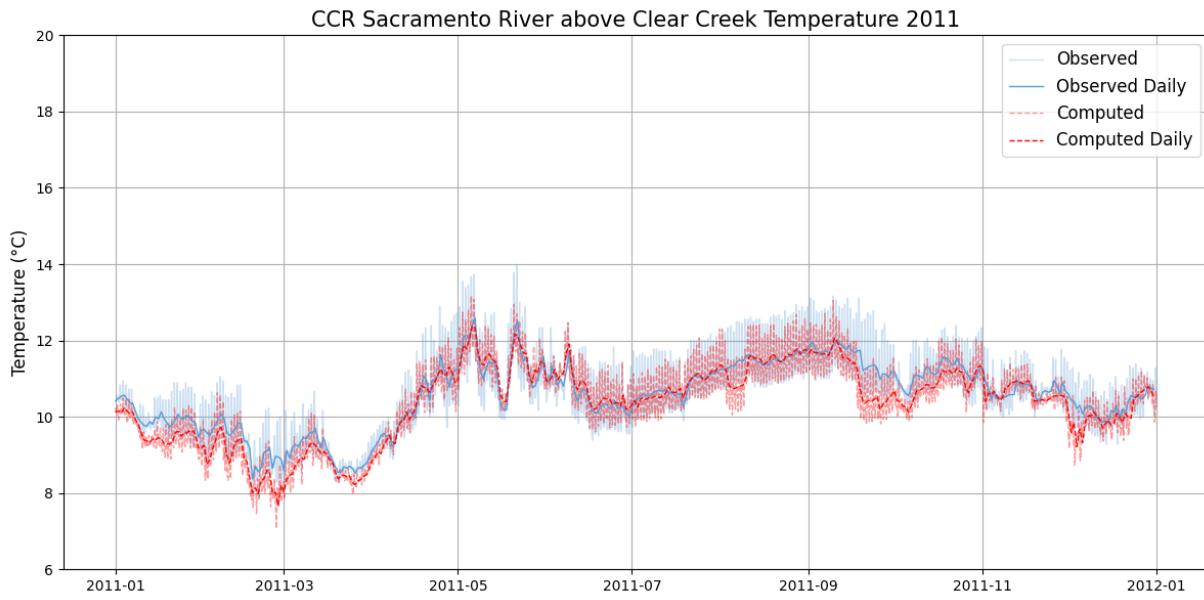


Figure 149. CCR Sacramento River above Clear Creek Temperature 2011

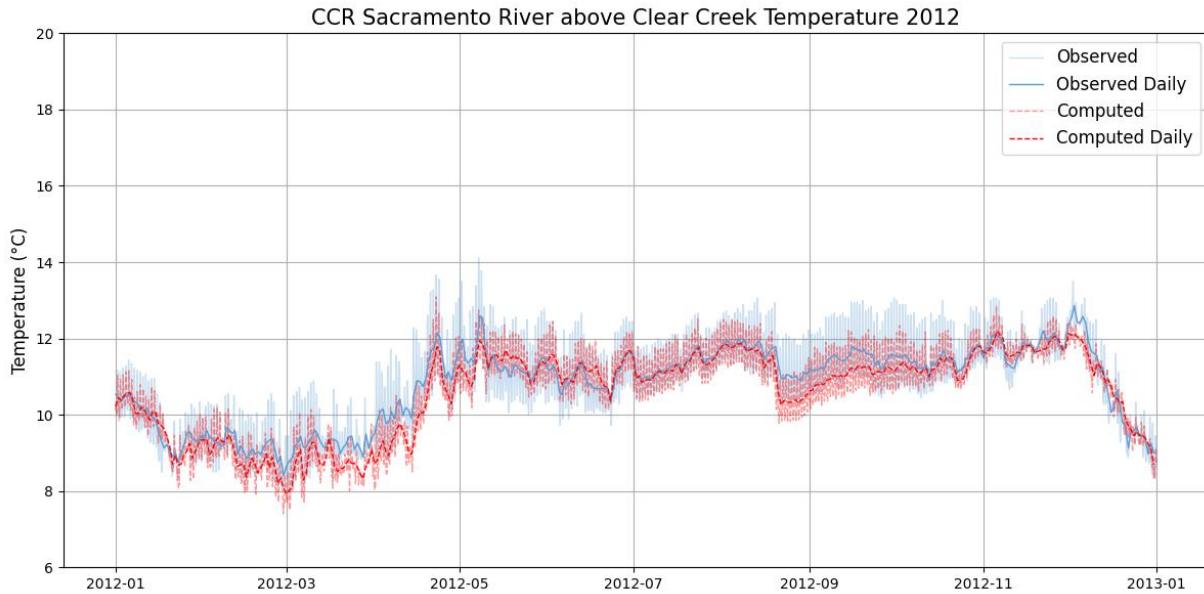


Figure 150. CCR Sacramento River above Clear Creek Temperature 2012

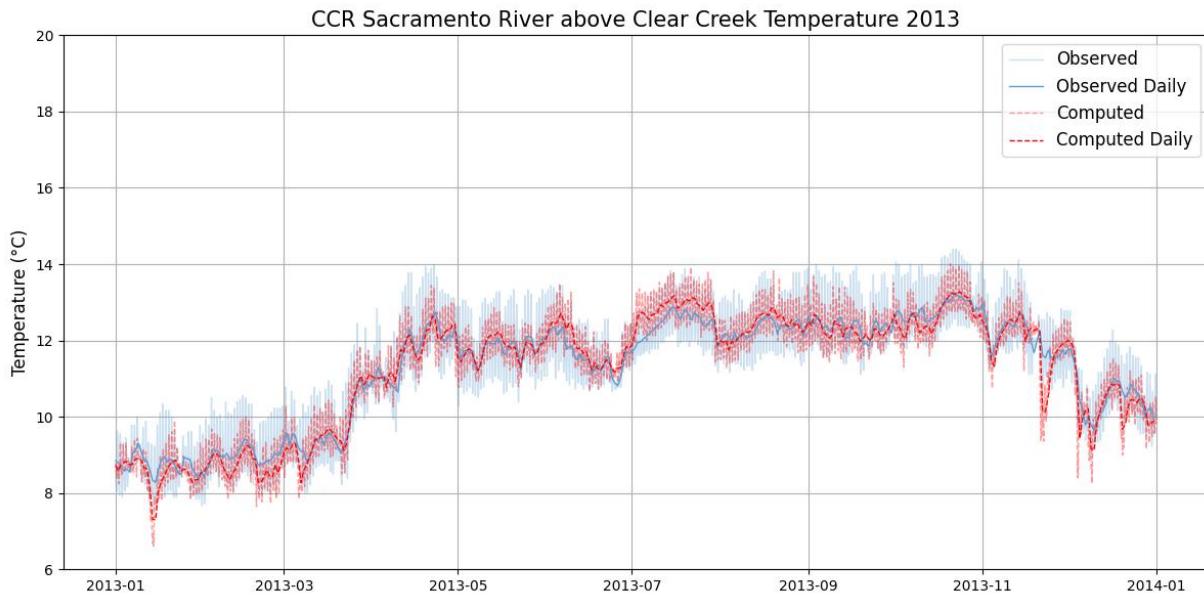


Figure 151. CCR Sacramento River above Clear Creek Temperature 2013

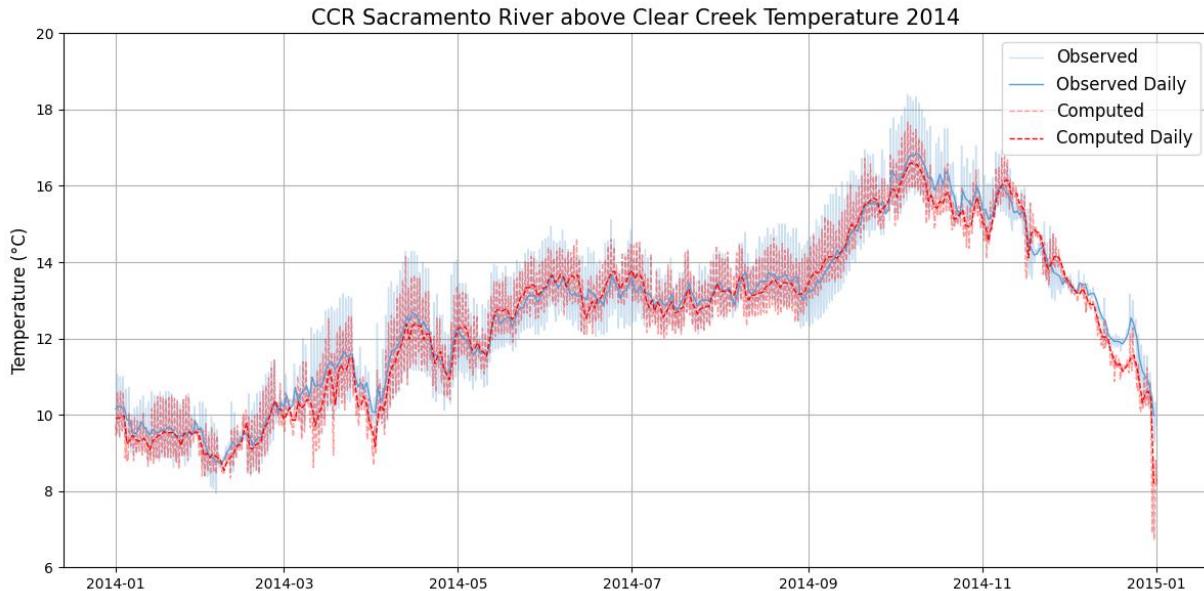


Figure 152. CCR Sacramento River above Clear Creek Temperature 2014

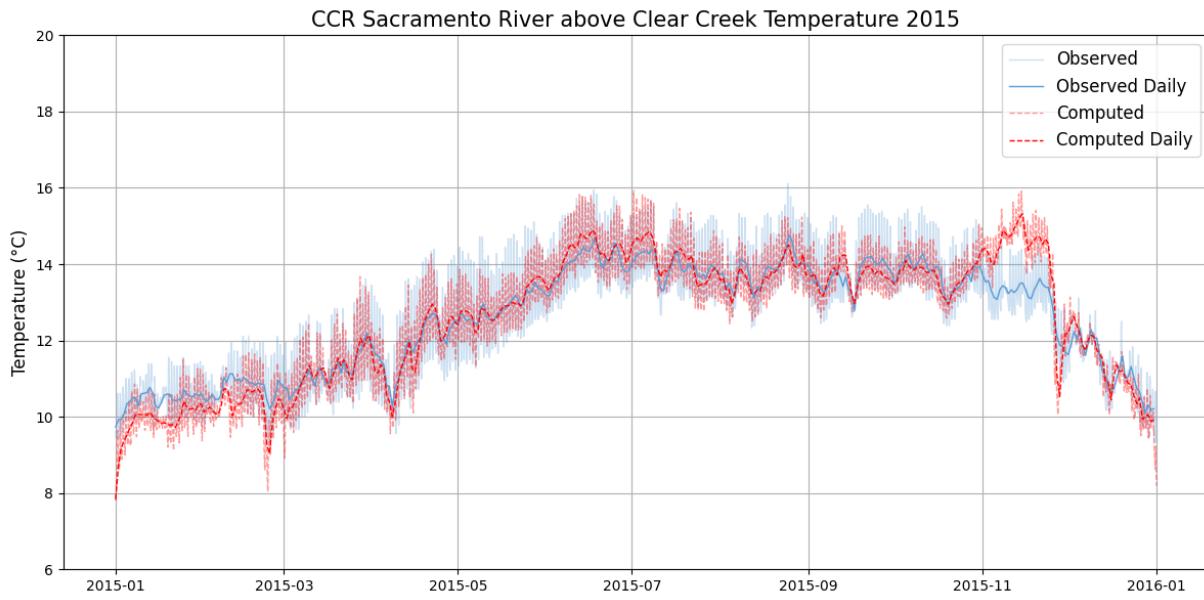


Figure 153. CCR Sacramento River above Clear Creek Temperature 2015

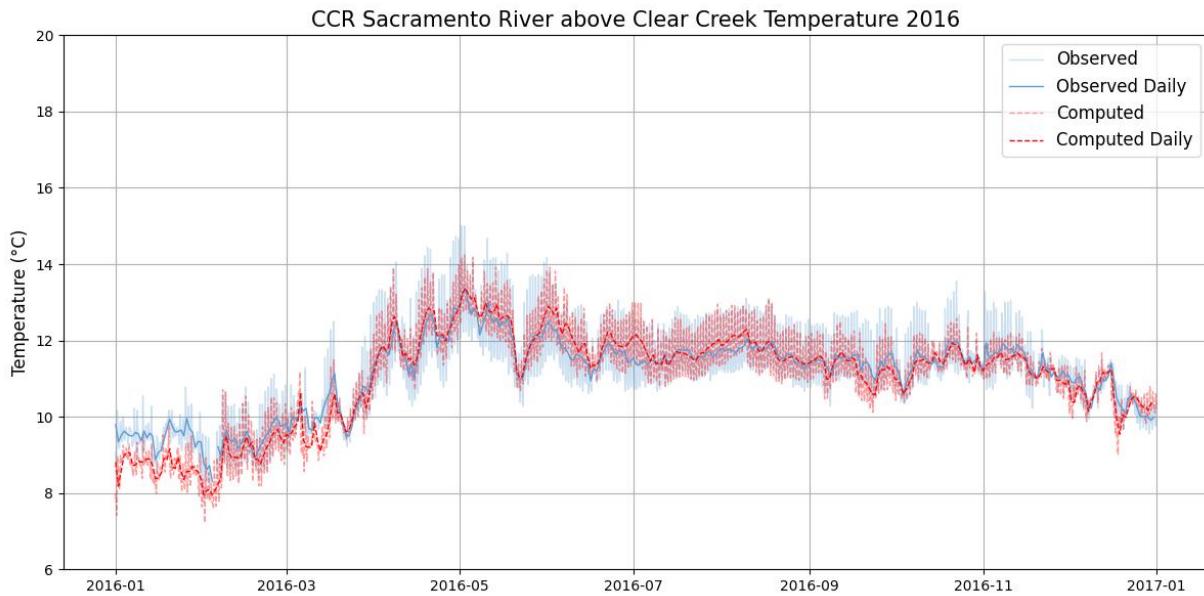


Figure 154. CCR Sacramento River above Clear Creek Temperature 2016

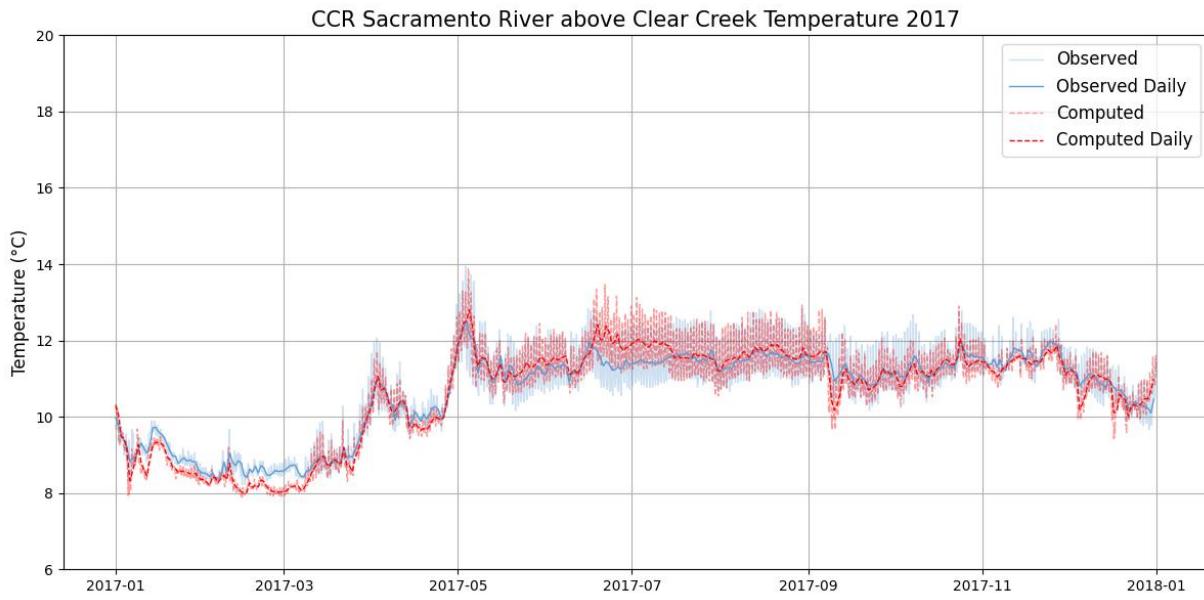


Figure 155. CCR Sacramento River above Clear Creek Temperature 2017

Table 46. CCR Sacramento River above Clear Creek Temperature Error Statistics

Statistics	2000	2001	2002	2003	2004	2005
Mean Bias (°C)	-0.06	-0.26	-0.20	-0.36	-0.34	-0.60
MAE (°C)	0.26	0.44	0.41	0.43	0.47	0.67
RMSE (°C)	0.35	0.56	0.50	0.52	0.60	0.87
Nash-Sutcliffe (NSE)	0.89	0.87	0.83	0.73	0.85	0.41
COUNT	8,016	8,760	8,760	8,760	8,784	8,760

Statistics	2006	2007	2008	2009	2010	2011
Mean Bias (°C)	-0.36	-0.30	-0.20	-0.20	-0.31	-0.19
MAE (°C)	0.47	0.51	0.42	0.38	0.43	0.33
RMSE (°C)	0.60	0.69	0.52	0.48	0.54	0.42
Nash-Sutcliffe (NSE)	0.67	0.74	0.95	0.93	0.70	0.83
COUNT	8,760	8,760	8,784	8,760	8,760	8,760

Statistics	2012	2013	2014	2015	2016	2017
Mean Bias (°C)	-0.20	-0.03	-0.13	0.00	-0.08	-0.04
MAE (°C)	0.36	0.34	0.35	0.41	0.35	0.26
RMSE (°C)	0.47	0.45	0.44	0.55	0.45	0.34

Statistics	2012	2013	2014	2015	2016	2017
Nash-Sutcliffe (NSE)	0.83	0.91	0.96	0.87	0.84	0.92
COUNT	8,784	8,760	8,760	8,760	8,784	8,760

Table 47. CCR Sacramento River above Clear Creek Temperature MeanBias, invalid when +- .75

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.10	-0.09	-0.18	0.08	-0.15	0.04	-0.14	-0.06	-0.11	-0.05	-0.13
2001	-0.36	-0.81	-0.60	-0.36	0.11	0.11	-0.07	-0.13	-0.03	-0.21	-0.20	-0.61
2002	-0.72	-0.65	-0.46	0.00	-0.04	-0.11	0.01	-0.19	-0.09	0.02	-0.01	-0.21
2003	-0.50	-0.40	-0.36	-0.44	-0.18	-0.57	-0.74	-0.45	-0.12	-0.06	-0.21	-0.24
2004	-0.61	-0.71	-0.30	-0.16	0.08	0.09	-0.04	-0.18	-0.09	-0.68	-0.49	-0.94
2005	-1.69	-1.19	-0.45	-0.36	-0.19	0.02	-0.32	-1.26	-0.53	0.00	-0.25	-0.95
2006	-0.83	-0.78	-0.58	-0.46	0.03	0.05	0.08	-0.57	-0.60	-0.03	0.06	-0.68
2007	-1.16	-1.30	-0.79	-0.21	0.17	0.20	0.05	-0.24	0.02	-0.02	-0.05	-0.16
2008	-0.54	-0.56	-0.45	-0.17	0.32	0.24	0.21	-0.09	-0.18	-0.46	-0.45	-0.23
2009	-0.23	-0.54	-0.57	-0.09	0.15	0.18	-0.07	-0.29	-0.33	-0.34	-0.13	-0.14
2010	-0.65	-0.50	-0.35	-0.27	0.04	-0.05	0.06	-0.40	-0.80	-0.48	-0.09	-0.21
2011	-0.40	-0.57	-0.32	-0.07	0.06	0.15	0.00	-0.11	-0.42	-0.30	-0.06	-0.23
2012	-0.05	-0.34	-0.51	-0.68	-0.05	0.15	-0.04	-0.33	-0.40	-0.12	-0.02	-0.09
2013	-0.21	-0.27	-0.02	-0.01	0.01	0.20	0.37	0.06	-0.06	-0.14	-0.12	-0.17
2014	-0.21	-0.07	-0.43	-0.24	0.17	0.11	-0.10	-0.10	0.10	-0.39	0.14	-0.54
2015	-0.55	-0.47	-0.03	-0.07	0.06	0.24	0.15	-0.12	-0.03	-0.04	0.98	-0.08
2016	-0.80	-0.32	-0.29	0.13	0.16	0.34	0.12	0.10	-0.17	-0.06	-0.15	-0.03
2017	-0.26	-0.38	-0.19	-0.09	0.11	0.33	0.20	0.12	-0.11	-0.06	-0.13	-0.04
All	-0.57	-0.54	-0.38	-0.21	0.06	0.08	-0.00	-0.24	-0.22	-0.19	-0.07	-0.32

Table 48. CCR Sacramento River above Clear Creek Temperature MAE, invalid over 1.0

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.20	0.15	0.39	0.28	0.27	0.19	0.28	0.34	0.27	0.22	0.31
2001	0.39	0.81	0.62	0.49	0.42	0.35	0.24	0.39	0.27	0.36	0.40	0.62
2002	0.72	0.66	0.48	0.43	0.38	0.28	0.16	0.31	0.38	0.34	0.32	0.42
2003	0.50	0.40	0.43	0.51	0.25	0.60	0.74	0.48	0.34	0.28	0.30	0.27

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	0.61	0.71	0.35	0.35	0.35	0.23	0.22	0.42	0.32	0.69	0.51	0.94
2005	1.69	1.19	0.50	0.42	0.29	0.16	0.54	1.26	0.53	0.17	0.30	0.95
2006	0.83	0.78	0.58	0.55	0.21	0.15	0.16	0.64	0.60	0.18	0.31	0.68
2007	1.16	1.30	0.83	0.33	0.27	0.27	0.16	0.36	0.31	0.34	0.35	0.35
2008	0.60	0.56	0.48	0.27	0.41	0.42	0.41	0.28	0.33	0.49	0.46	0.29
2009	0.41	0.55	0.58	0.35	0.35	0.33	0.27	0.37	0.37	0.37	0.32	0.29
2010	0.65	0.50	0.42	0.39	0.27	0.33	0.21	0.55	0.80	0.49	0.24	0.25
2011	0.40	0.57	0.32	0.26	0.30	0.26	0.18	0.27	0.49	0.35	0.24	0.33
2012	0.26	0.38	0.53	0.69	0.42	0.33	0.13	0.39	0.42	0.25	0.21	0.36
2013	0.37	0.36	0.30	0.36	0.38	0.30	0.41	0.28	0.27	0.28	0.43	0.40
2014	0.26	0.22	0.47	0.38	0.31	0.35	0.26	0.27	0.34	0.41	0.35	0.55
2015	0.55	0.47	0.25	0.35	0.39	0.33	0.32	0.25	0.31	0.25	1.16	0.31
2016	0.80	0.36	0.39	0.38	0.39	0.39	0.24	0.21	0.29	0.22	0.26	0.28
2017	0.31	0.38	0.24	0.21	0.27	0.39	0.30	0.19	0.26	0.21	0.19	0.25
All	0.62	0.58	0.44	0.39	0.33	0.32	0.29	0.40	0.39	0.33	0.36	0.44

Table 49. CCR Sacramento River above Clear Creek Temperature RMSE, invalid over 1.5

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.26	0.23	0.52	0.36	0.34	0.24	0.37	0.45	0.35	0.30	0.38
2001	0.48	0.89	0.73	0.62	0.52	0.44	0.34	0.53	0.33	0.45	0.50	0.70
2002	0.76	0.71	0.58	0.53	0.46	0.36	0.22	0.42	0.47	0.42	0.39	0.50
2003	0.53	0.47	0.55	0.65	0.31	0.66	0.79	0.57	0.42	0.36	0.38	0.33
2004	0.67	0.75	0.44	0.47	0.41	0.29	0.29	0.50	0.42	0.78	0.64	1.03
2005	1.71	1.21	0.61	0.54	0.37	0.20	0.75	1.30	0.61	0.21	0.36	1.00
2006	0.87	0.86	0.59	0.60	0.28	0.19	0.20	0.82	0.69	0.23	0.42	0.77
2007	1.21	1.34	0.94	0.43	0.32	0.34	0.21	0.45	0.43	0.47	0.46	0.43
2008	0.66	0.63	0.58	0.37	0.51	0.48	0.50	0.36	0.44	0.62	0.53	0.38
2009	0.50	0.60	0.69	0.44	0.42	0.38	0.34	0.46	0.48	0.47	0.42	0.41
2010	0.74	0.55	0.53	0.50	0.34	0.41	0.27	0.69	0.87	0.59	0.32	0.32
2011	0.45	0.65	0.38	0.35	0.37	0.31	0.23	0.35	0.62	0.40	0.30	0.44

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	0.33	0.47	0.63	0.80	0.51	0.40	0.16	0.49	0.49	0.33	0.28	0.45
2013	0.48	0.47	0.37	0.45	0.46	0.38	0.49	0.35	0.34	0.37	0.61	0.53
2014	0.34	0.28	0.56	0.48	0.35	0.42	0.31	0.33	0.41	0.50	0.43	0.72
2015	0.61	0.58	0.33	0.42	0.46	0.39	0.39	0.32	0.39	0.32	1.26	0.42
2016	0.85	0.42	0.51	0.45	0.46	0.46	0.32	0.26	0.37	0.30	0.35	0.35
2017	0.36	0.43	0.30	0.25	0.34	0.49	0.36	0.23	0.37	0.25	0.23	0.34
All	0.76	0.70	0.55	0.51	0.41	0.40	0.39	0.55	0.50	0.44	0.51	0.57

BSF Sacramento River at Balls Ferry Bridge Temperature

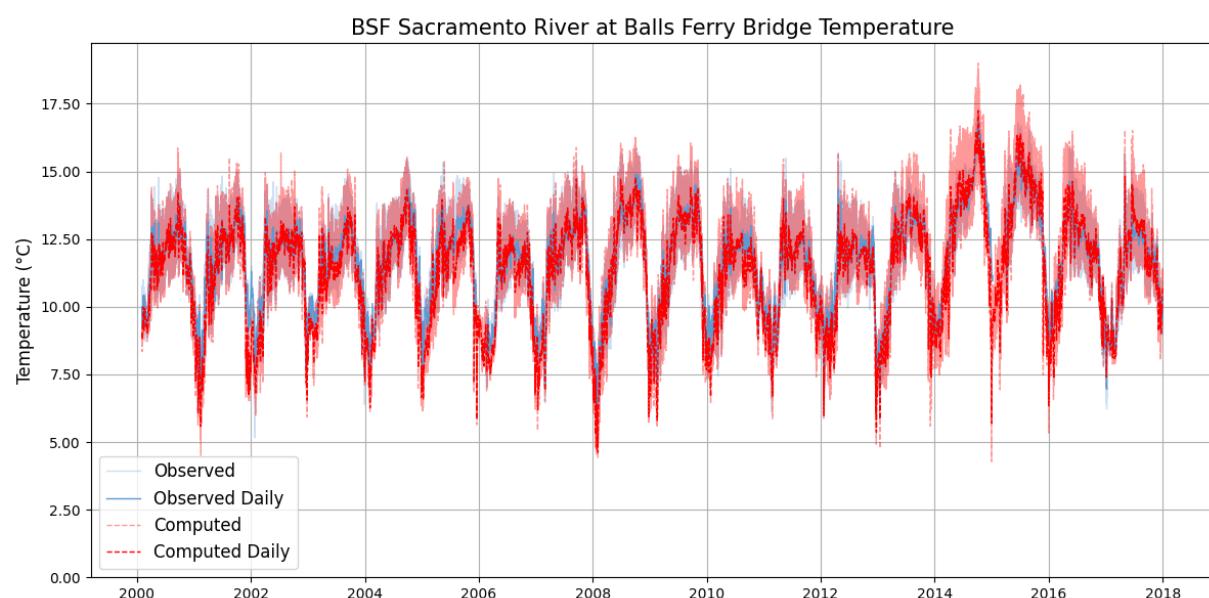


Figure 156. BSF Sacramento River at Balls Ferry Bridge Temperature

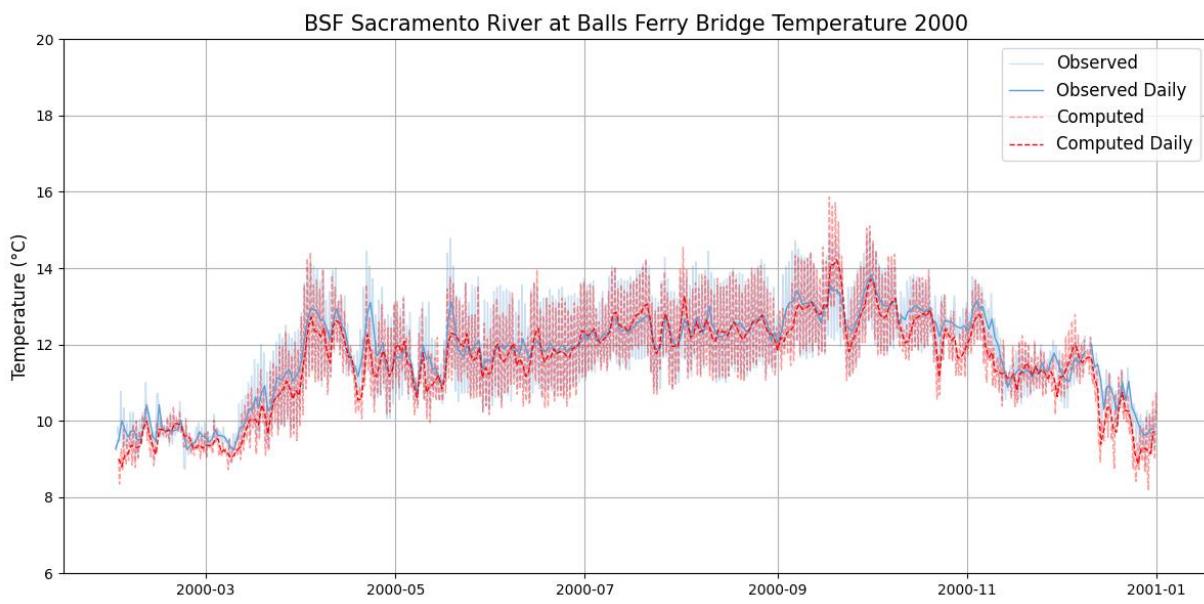


Figure 157. BSF Sacramento River at Balls Ferry Bridge Temperature 2000

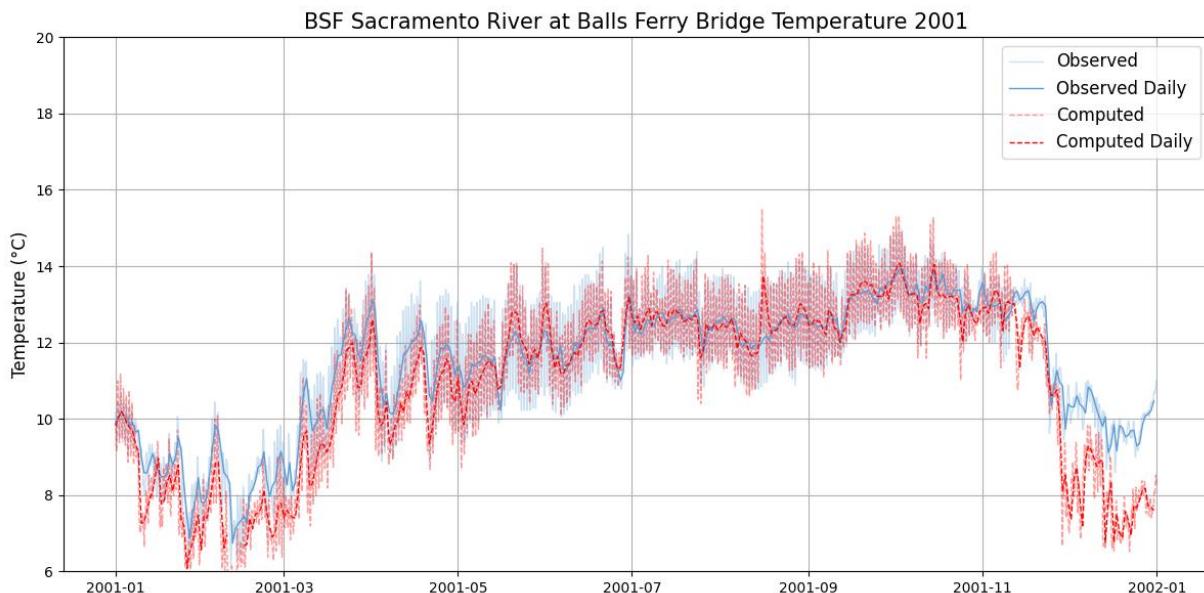


Figure 158. BSF Sacramento River at Balls Ferry Bridge Temperature 2001

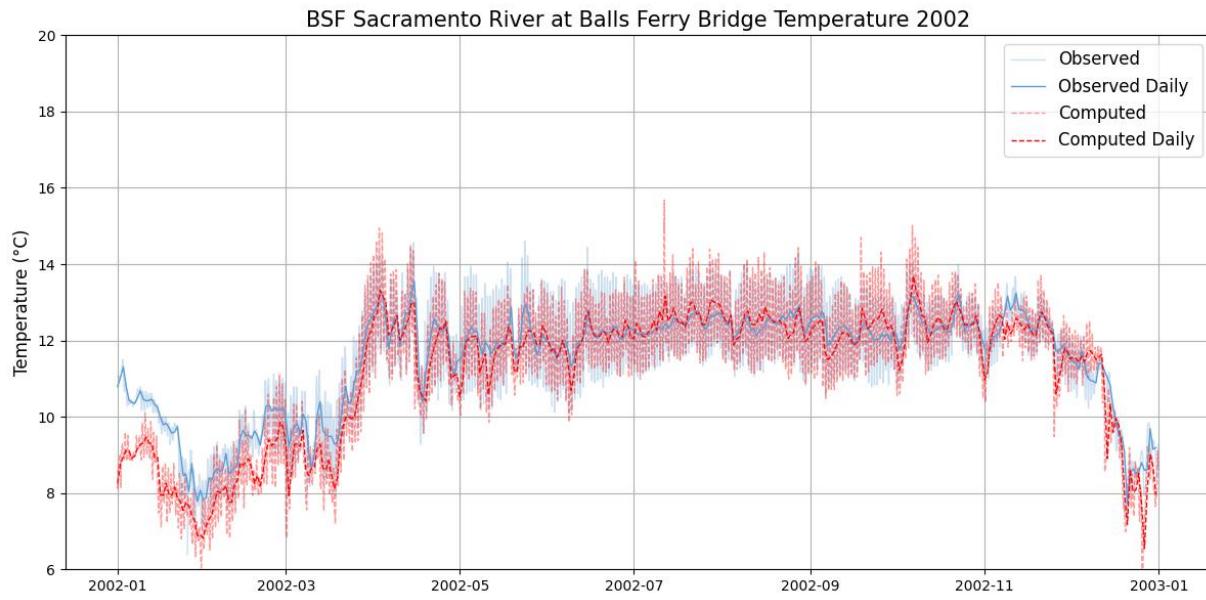


Figure 159. BSF Sacramento River at Balls Ferry Bridge Temperature 2002

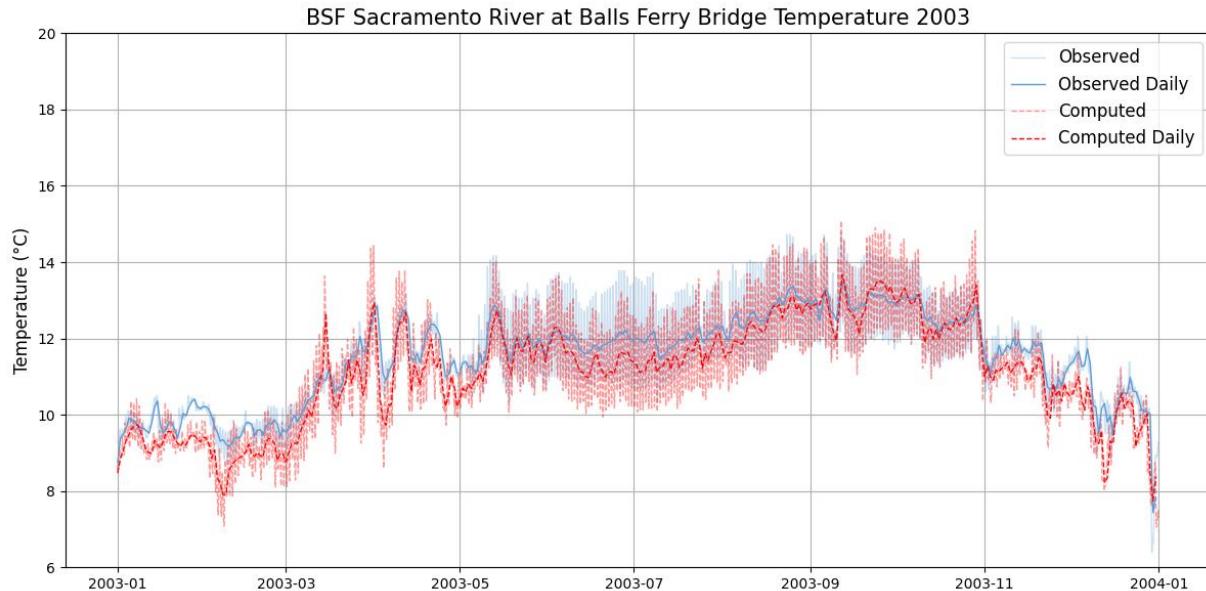


Figure 160. BSF Sacramento River at Balls Ferry Bridge Temperature 2003

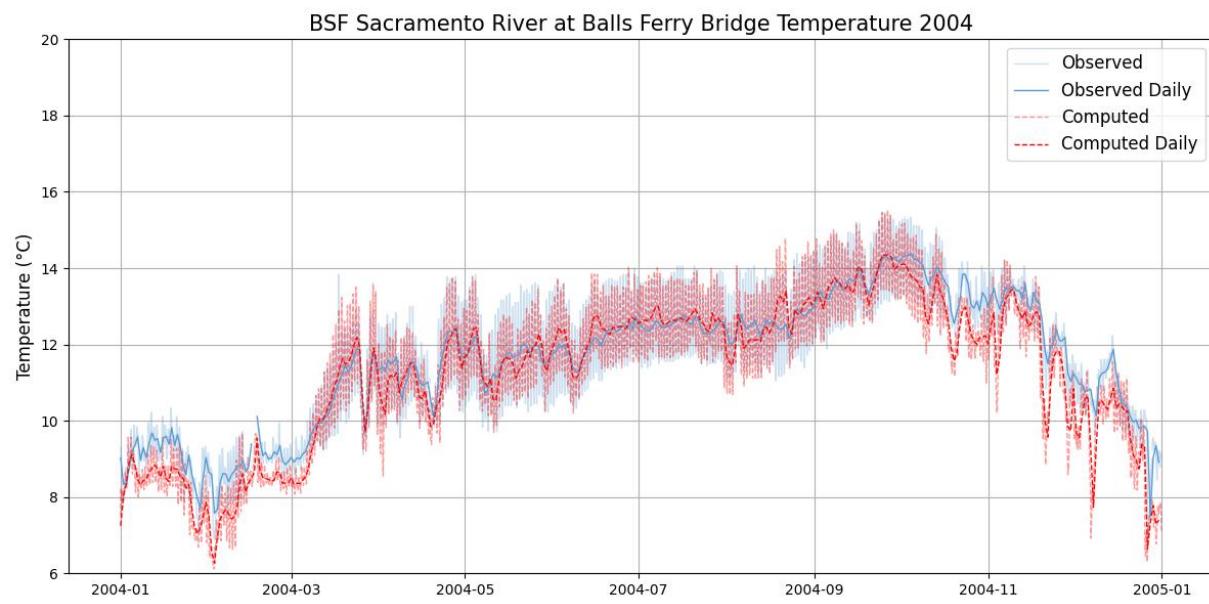


Figure 161. BSF Sacramento River at Balls Ferry Bridge Temperature 2004

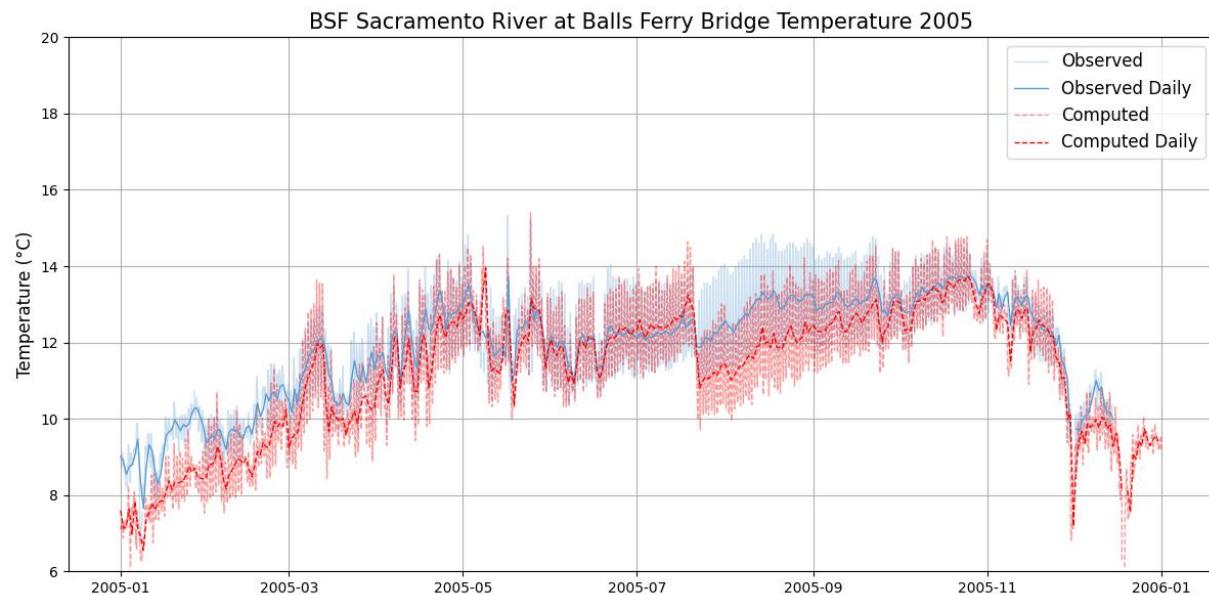


Figure 162. BSF Sacramento River at Balls Ferry Bridge Temperature 2005

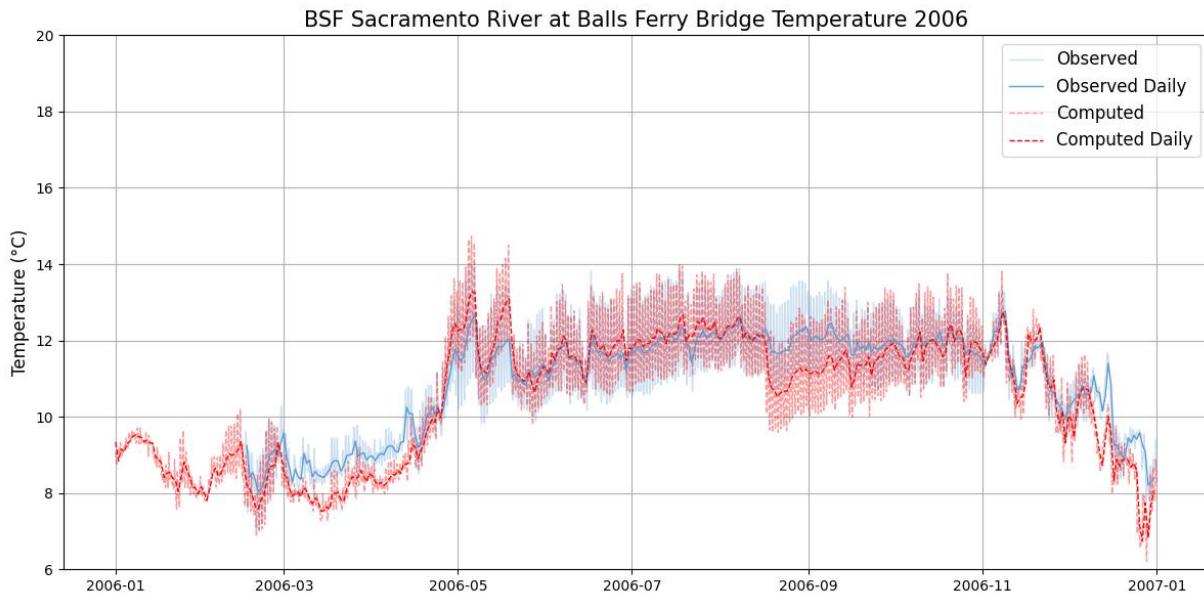


Figure 163. BSF Sacramento River at Balls Ferry Bridge Temperature 2006

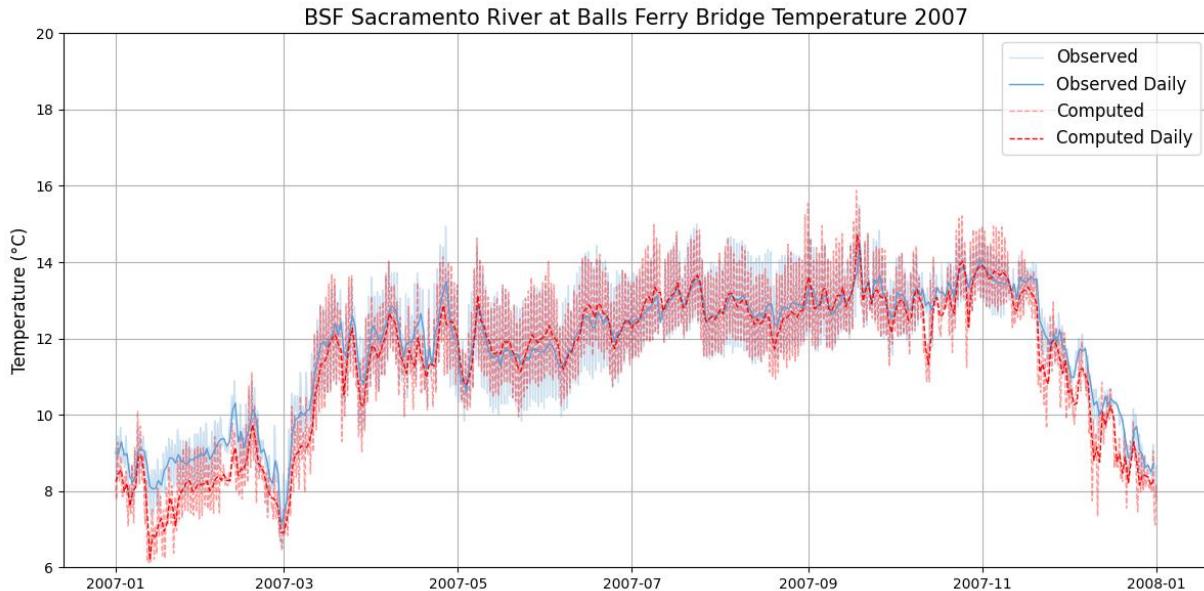


Figure 164. BSF Sacramento River at Balls Ferry Bridge Temperature 2007

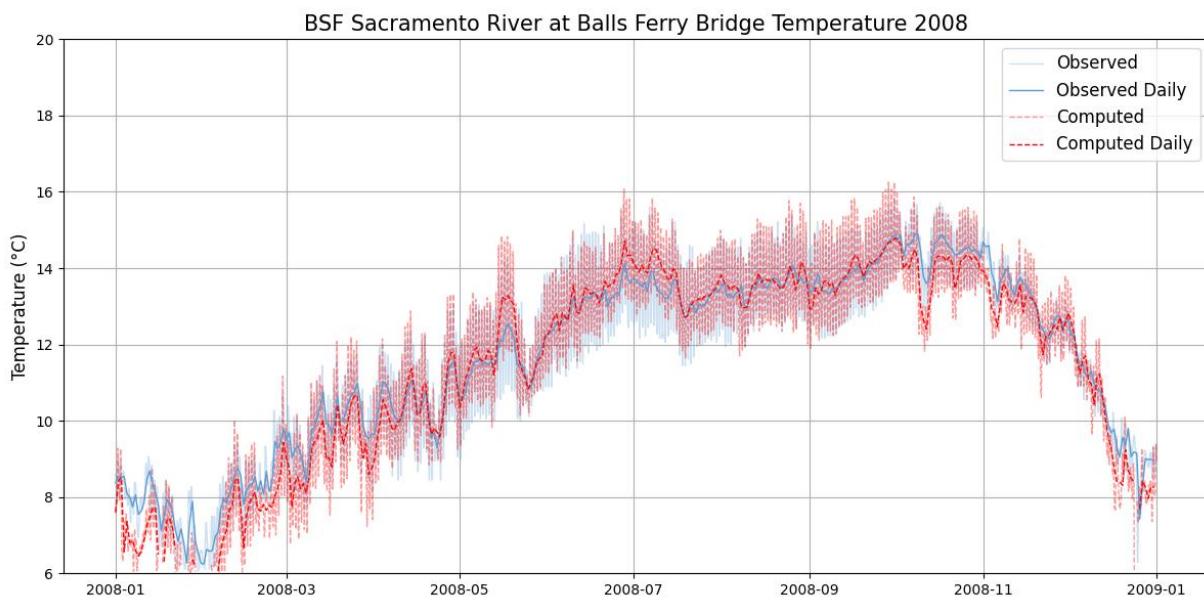


Figure 165. BSF Sacramento River at Balls Ferry Bridge Temperature 2008

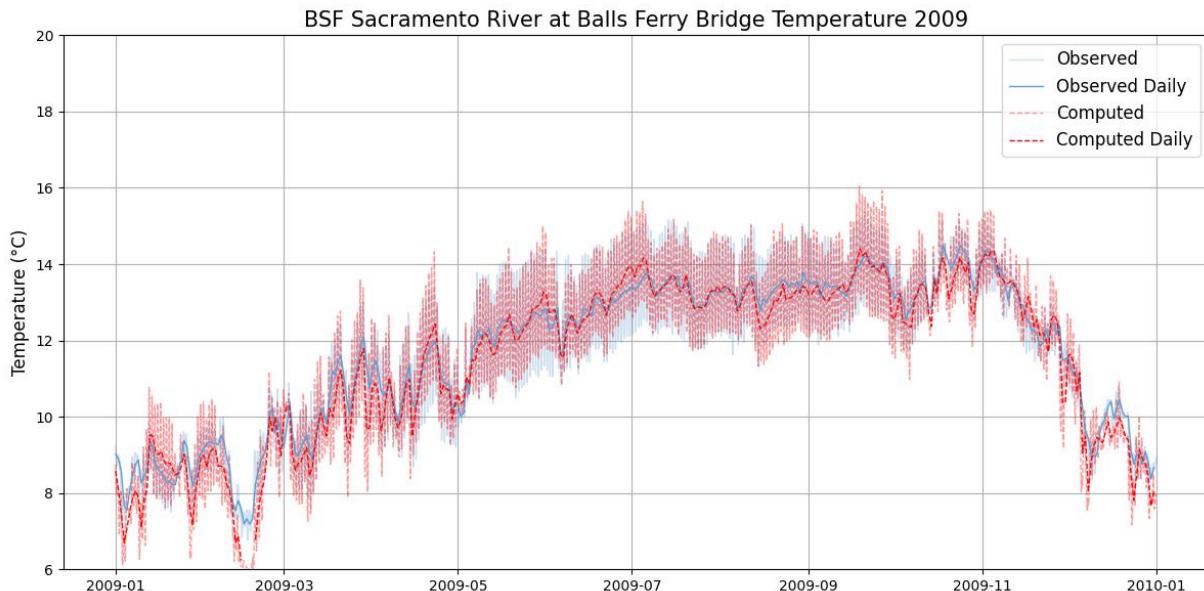


Figure 166. BSF Sacramento River at Balls Ferry Bridge Temperature 2009

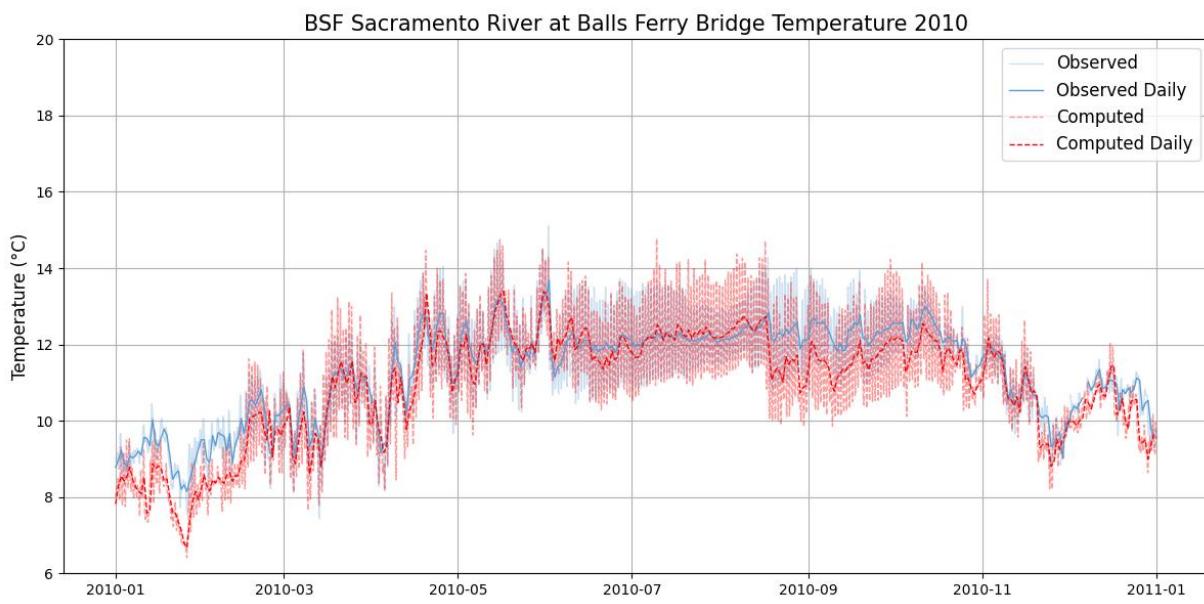


Figure 167. BSF Sacramento River at Balls Ferry Bridge Temperature 2010

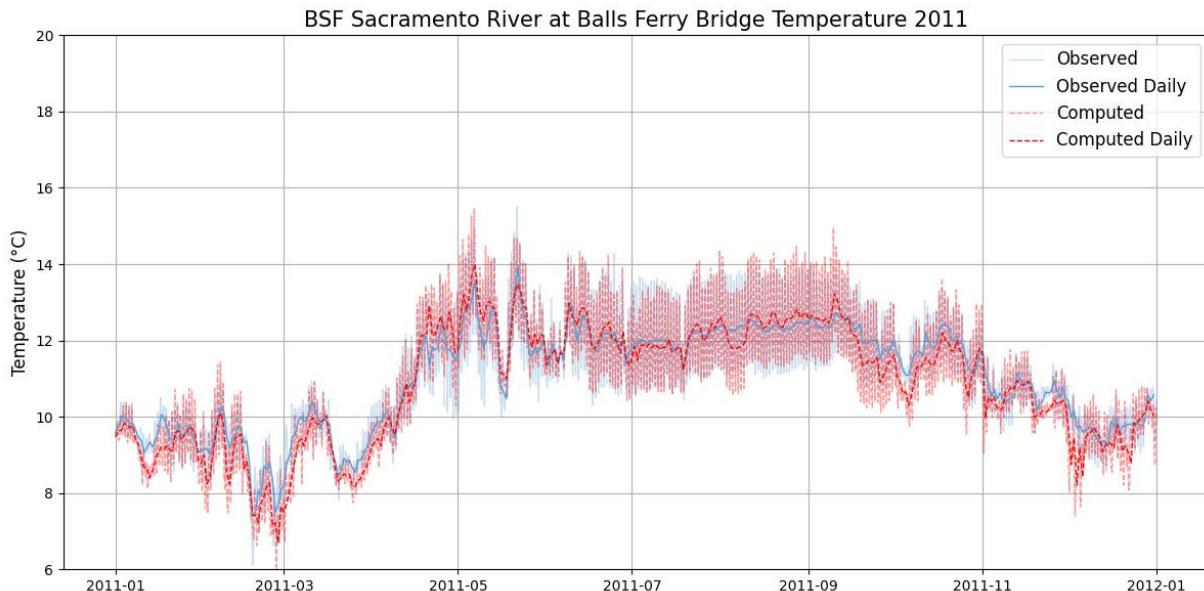


Figure 168. BSF Sacramento River at Balls Ferry Bridge Temperature 2011

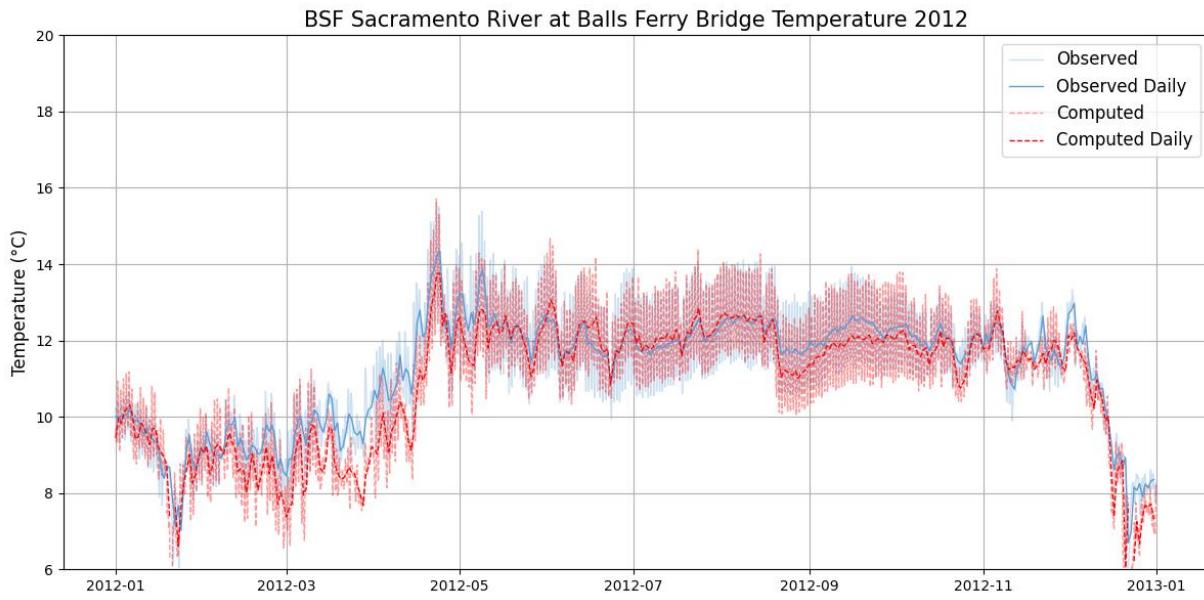


Figure 169. BSF Sacramento River at Balls Ferry Bridge Temperature 2012

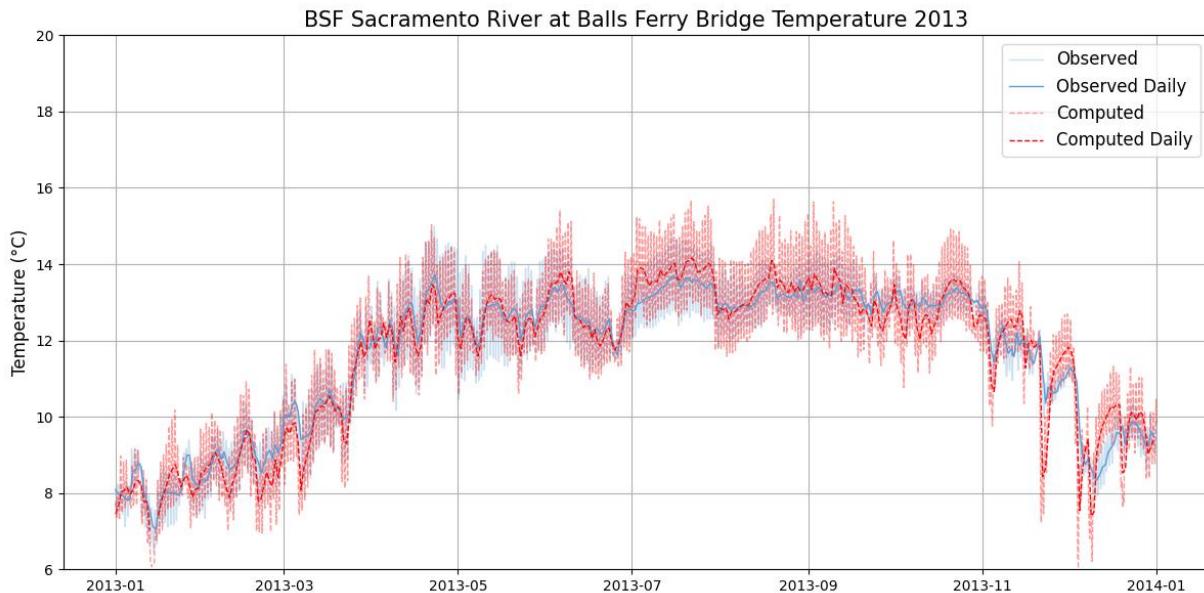


Figure 170. BSF Sacramento River at Balls Ferry Bridge Temperature 2013

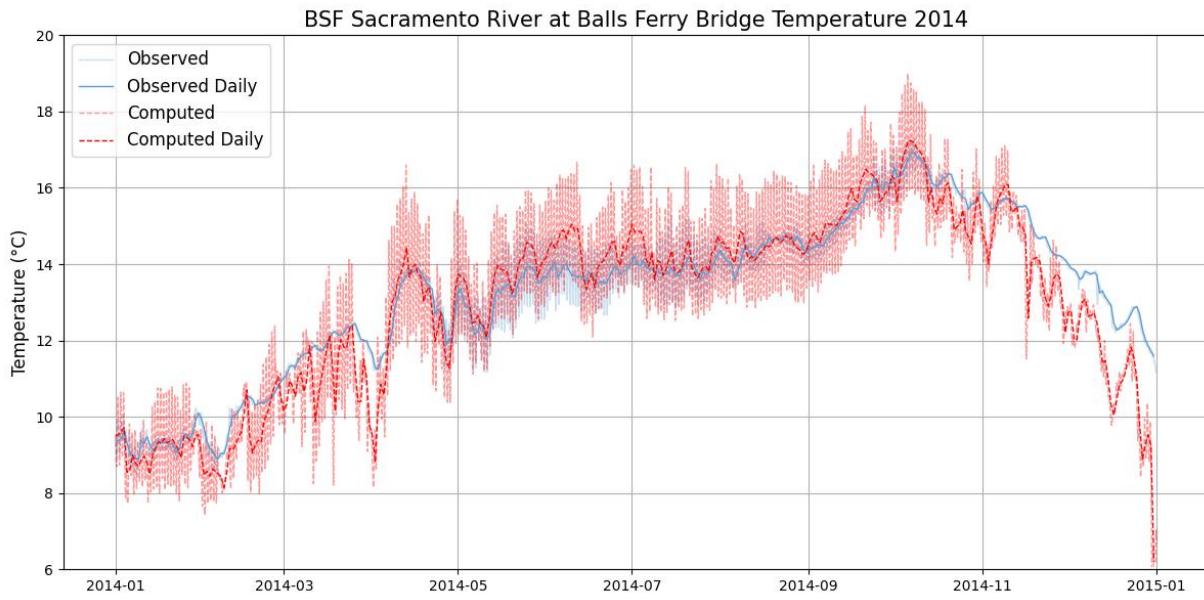


Figure 171. BSF Sacramento River at Balls Ferry Bridge Temperature 2014

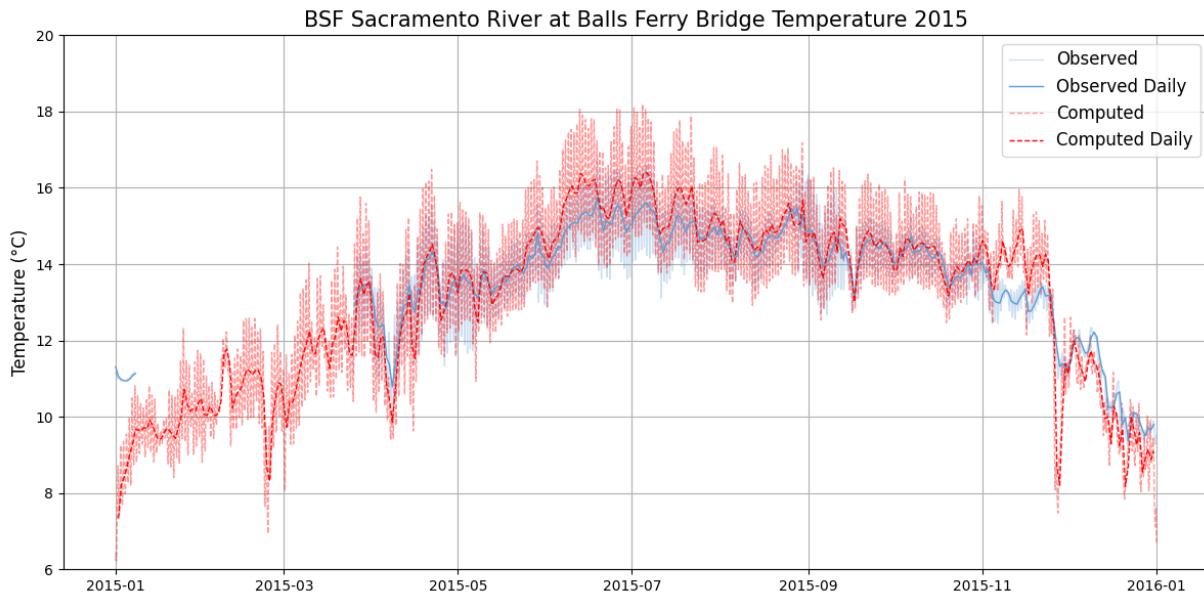


Figure 172. BSF Sacramento River at Balls Ferry Bridge Temperature 2015

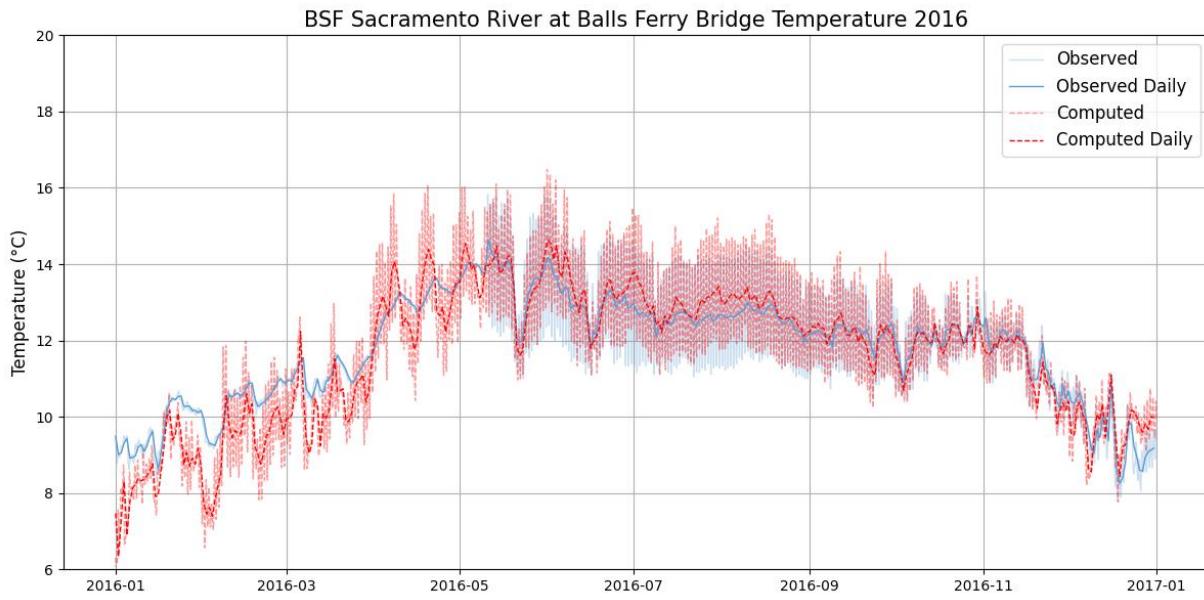


Figure 173. BSF Sacramento River at Balls Ferry Bridge Temperature 2016

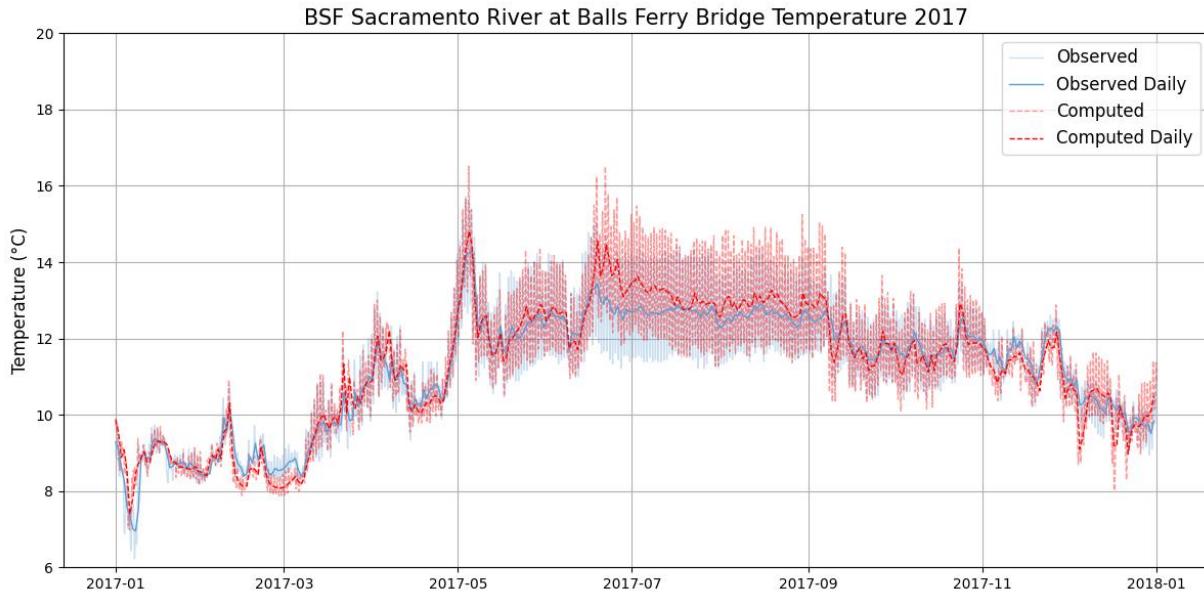


Figure 174. BSF Sacramento River at Balls Ferry Bridge Temperature 2017

Table 50. BSF Sacramento River at Balls Ferry Bridge Temperature Error Statistics

Statistics	2000	2001	2002	2003	2004	2005
Mean Bias (°C)	-0.21	-0.52	-0.31	-0.41	-0.34	-0.56
MAE (°C)	0.47	0.79	0.62	0.59	0.60	0.66
RMSE (°C)	0.59	1.03	0.78	0.71	0.76	0.83

Statistics	2000	2001	2002	2003	2004	2005
Nash-Sutcliffe (NSE)	0.80	0.67	0.74	0.70	0.82	0.70
COUNT	8,016	8,760	8,760	8,760	8,784	8,760

Statistics	2006	2007	2008	2009	2010	2011
Mean Bias (°C)	-0.25	-0.32	-0.24	-0.19	-0.36	-0.15
MAE (°C)	0.49	0.47	0.52	0.42	0.57	0.39
RMSE (°C)	0.63	0.62	0.68	0.55	0.71	0.49
Nash-Sutcliffe (NSE)	0.81	0.88	0.92	0.93	0.73	0.89
COUNT	8,760	8,760	8,784	8,760	8,760	8,760

Statistics	2012	2013	2014	2015	2016	2017
Mean Bias (°C)	-0.36	-0.04	-0.27	0.05	-0.17	0.05
MAE (°C)	0.57	0.53	0.92	0.70	0.60	0.35
RMSE (°C)	0.74	0.68	1.19	0.92	0.81	0.46
Nash-Sutcliffe (NSE)	0.79	0.87	0.66	0.65	0.72	0.92
COUNT	8,784	8,760	8,760	8,760	8,784	8,760

Table 51. BSF Sacramento River at Balls Ferry Bridge Temperature MeanBias, invalid when +- .75

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	-0.22	-0.35	-0.38	-0.17	-0.12	0.07	-0.05	-0.10	-0.34	-0.28	-0.35
2001	-0.65	-1.15	-0.94	-0.78	-0.01	0.05	0.02	0.07	0.01	-0.22	-0.56	-2.05
2002	-1.34	-0.79	-0.67	-0.22	-0.24	-0.06	0.17	-0.03	-0.02	-0.01	-0.22	-0.29
2003	-0.52	-0.73	-0.29	-0.65	-0.29	-0.47	-0.48	-0.29	-0.02	-0.08	-0.47	-0.64
2004	-0.71	-0.79	-0.08	-0.29	-0.08	0.15	0.12	-0.01	-0.03	-0.73	-0.74	-0.97
2005	-1.36	-0.92	-0.73	-0.55	-0.10	-0.10	-0.17	-1.10	-0.51	-0.21	-0.34	-0.58
2006	-	-0.40	-0.71	-0.34	0.34	0.15	0.21	-0.51	-0.55	-0.08	-0.11	-0.79
2007	-0.89	-0.74	-0.59	-0.39	0.14	0.10	0.05	-0.15	-0.02	-0.31	-0.33	-0.68
2008	-1.01	-0.78	-0.61	-0.06	0.25	0.23	0.30	0.02	0.03	-0.50	-0.32	-0.43
2009	-0.29	-0.65	-0.41	-0.15	-0.04	0.12	0.05	-0.24	-0.08	-0.29	0.01	-0.38
2010	-1.00	-0.63	-0.24	-0.28	-0.03	-0.01	0.05	-0.39	-0.71	-0.50	-0.17	-0.43
2011	-0.28	-0.49	-0.40	0.12	0.27	0.07	-0.03	0.03	-0.18	-0.38	-0.23	-0.34

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	-0.13	-0.56	-1.04	-0.99	-0.37	0.17	0.14	-0.22	-0.36	-0.24	-0.08	-0.65
2013	-0.12	-0.34	-0.24	-0.17	-0.12	0.06	0.38	0.15	-0.04	-0.21	0.00	0.14
2014	-0.23	-0.57	-0.80	-0.19	0.39	0.60	0.24	0.05	0.21	-0.34	-0.78	-1.91
2015	-2.48	-	-0.03	-0.30	0.10	0.61	0.48	0.10	0.10	0.07	0.46	-0.64
2016	-1.08	-0.99	-0.66	-0.00	-0.07	0.29	0.34	0.25	-0.05	-0.11	-0.22	0.27
2017	0.19	-0.25	-0.01	0.03	0.06	0.39	0.38	0.32	0.01	-0.12	-0.31	-0.08
All	-0.65	-0.65	-0.51	-0.31	0.00	0.12	0.13	-0.11	-0.13	-0.26	-0.26	-0.60

Table 52. BSF Sacramento River at Balls Ferry Bridge Temperature MAE, invalid over 1.0

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.31	0.39	0.65	0.49	0.49	0.34	0.46	0.56	0.52	0.41	0.50
2001	0.72	1.16	0.96	0.90	0.67	0.52	0.41	0.55	0.39	0.47	0.74	2.05
2002	1.36	0.80	0.70	0.64	0.62	0.47	0.35	0.47	0.55	0.51	0.40	0.60
2003	0.58	0.75	0.71	0.85	0.45	0.60	0.54	0.48	0.45	0.39	0.49	0.75
2004	0.74	0.79	0.39	0.57	0.57	0.39	0.35	0.49	0.43	0.76	0.76	0.99
2005	1.36	0.93	0.77	0.60	0.52	0.23	0.54	1.10	0.51	0.29	0.46	0.59
2006	-	0.48	0.71	0.59	0.46	0.24	0.27	0.59	0.58	0.32	0.33	0.83
2007	0.90	0.75	0.62	0.48	0.35	0.31	0.15	0.30	0.29	0.41	0.45	0.69
2008	1.02	0.82	0.67	0.34	0.36	0.36	0.40	0.26	0.34	0.58	0.48	0.62
2009	0.60	0.77	0.55	0.39	0.29	0.32	0.23	0.33	0.32	0.37	0.36	0.54
2010	1.00	0.74	0.44	0.52	0.33	0.37	0.33	0.70	0.80	0.66	0.37	0.52
2011	0.35	0.56	0.45	0.39	0.43	0.29	0.22	0.30	0.42	0.45	0.33	0.47
2012	0.44	0.64	1.05	1.02	0.54	0.46	0.21	0.36	0.54	0.44	0.36	0.77
2013	0.43	0.47	0.44	0.41	0.42	0.41	0.50	0.61	0.67	0.64	0.69	0.72
2014	0.67	0.79	1.10	1.09	0.66	0.81	0.60	0.89	0.76	0.79	0.96	1.91
2015	2.48	-	0.57	0.60	0.60	0.74	0.64	0.60	0.50	0.51	1.04	0.71
2016	1.09	1.16	0.89	0.96	0.52	0.42	0.40	0.32	0.30	0.26	0.31	0.59
2017	0.30	0.34	0.31	0.29	0.31	0.53	0.42	0.34	0.32	0.27	0.35	0.42
All	0.79	0.73	0.65	0.63	0.48	0.44	0.38	0.51	0.48	0.48	0.52	0.80

Table 53. BSF Sacramento River at Balls Ferry Bridge Temperaturee RMSE, invalid over 1.5

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.41	0.47	0.79	0.64	0.60	0.42	0.55	0.68	0.62	0.51	0.65
2001	0.88	1.27	1.09	1.07	0.82	0.63	0.51	0.70	0.48	0.55	1.00	2.19
2002	1.45	0.89	0.83	0.78	0.75	0.58	0.46	0.58	0.66	0.63	0.50	0.81
2003	0.65	0.86	0.87	0.98	0.56	0.71	0.64	0.56	0.54	0.47	0.56	0.92
2004	0.83	0.90	0.47	0.69	0.68	0.49	0.43	0.61	0.52	0.86	0.97	1.24
2005	1.44	0.99	0.89	0.73	0.72	0.29	0.68	1.15	0.59	0.35	0.56	0.69
2006	-	0.58	0.74	0.69	0.58	0.30	0.32	0.75	0.66	0.38	0.41	1.05
2007	1.02	0.83	0.72	0.60	0.42	0.38	0.20	0.39	0.39	0.56	0.60	0.84
2008	1.15	0.95	0.77	0.41	0.48	0.43	0.49	0.35	0.41	0.70	0.57	0.89
2009	0.74	0.89	0.69	0.49	0.34	0.39	0.29	0.42	0.39	0.46	0.49	0.67
2010	1.09	0.82	0.55	0.66	0.43	0.45	0.44	0.83	0.93	0.77	0.48	0.65
2011	0.44	0.67	0.52	0.53	0.52	0.36	0.29	0.35	0.53	0.52	0.41	0.63
2012	0.62	0.73	1.15	1.14	0.68	0.57	0.25	0.46	0.65	0.53	0.43	0.99
2013	0.56	0.58	0.56	0.51	0.50	0.51	0.64	0.74	0.79	0.75	0.94	0.91
2014	0.80	0.97	1.36	1.31	0.84	1.04	0.81	1.02	0.93	0.92	1.17	2.26
2015	2.66	-	0.66	0.72	0.73	0.97	0.81	0.75	0.62	0.61	1.32	0.87
2016	1.29	1.35	1.04	1.17	0.66	0.52	0.50	0.39	0.37	0.33	0.39	0.69
2017	0.52	0.39	0.42	0.39	0.39	0.68	0.50	0.42	0.42	0.34	0.41	0.54
All	1.00	0.87	0.81	0.80	0.61	0.59	0.51	0.65	0.61	0.60	0.71	1.09

JLF Sacramento River at Jellies Ferry Temperature

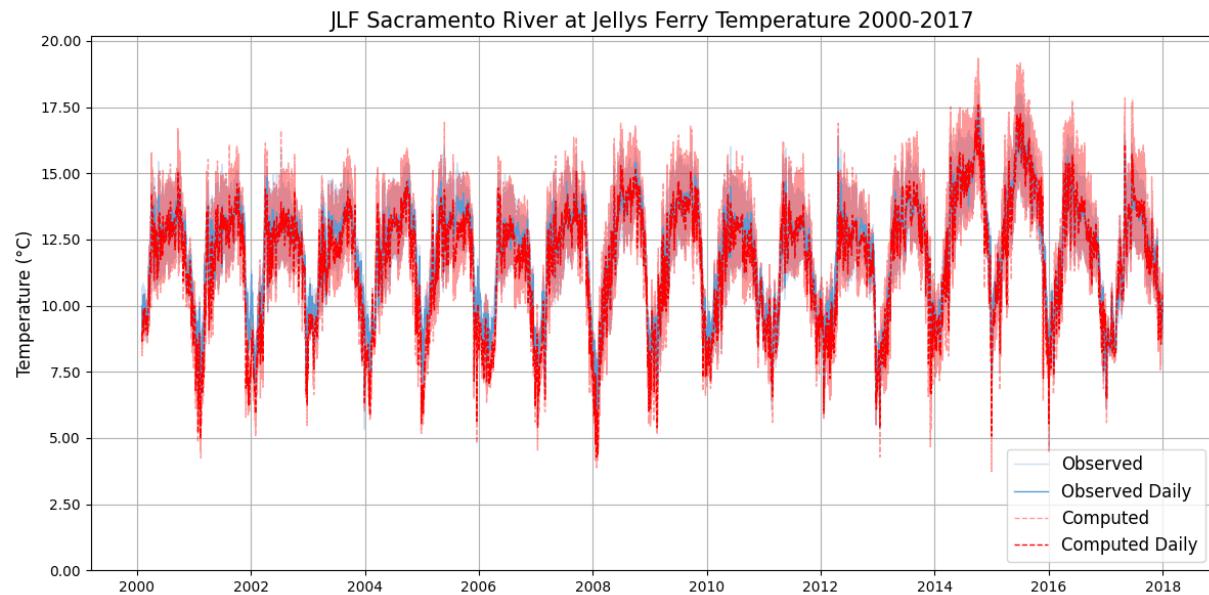


Figure 175. JLF Sacramento River at Jellies Ferry Temperature 2000-2017

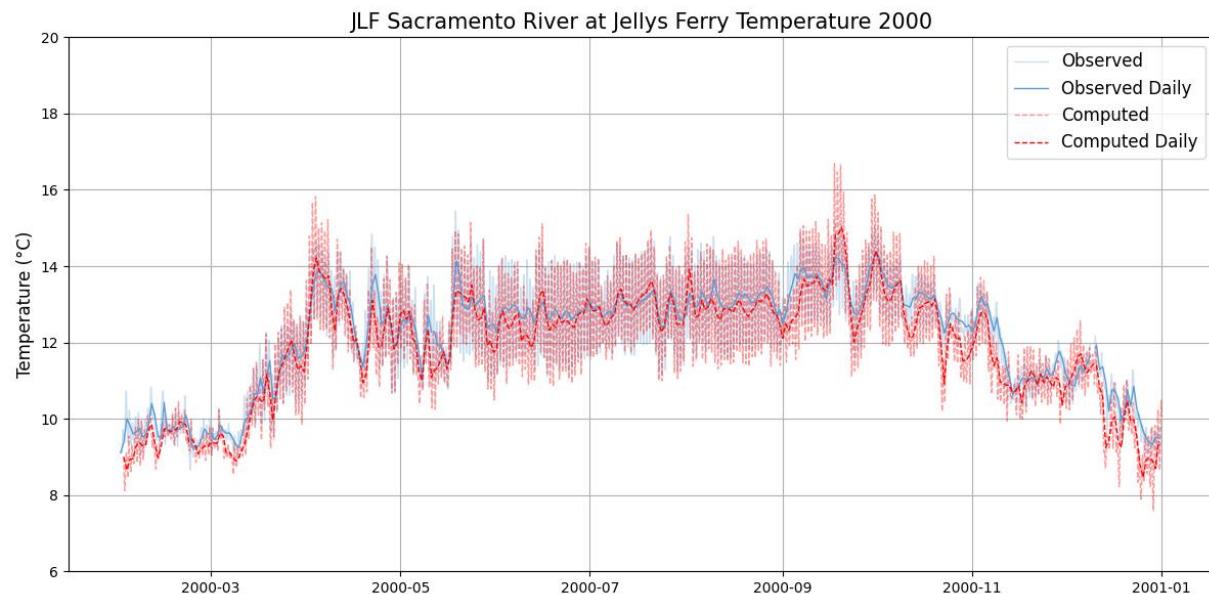


Figure 176. JLF Sacramento River at Jellies Ferry Temperature 2000

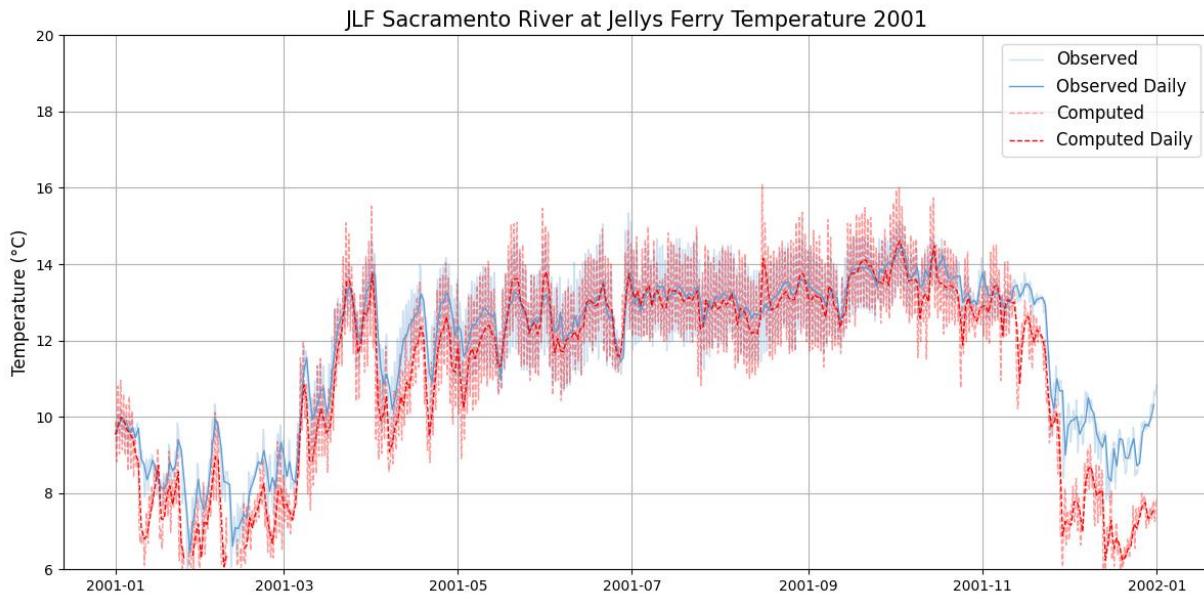


Figure 177. JLF Sacramento River at Jellies Ferry Temperature 2001

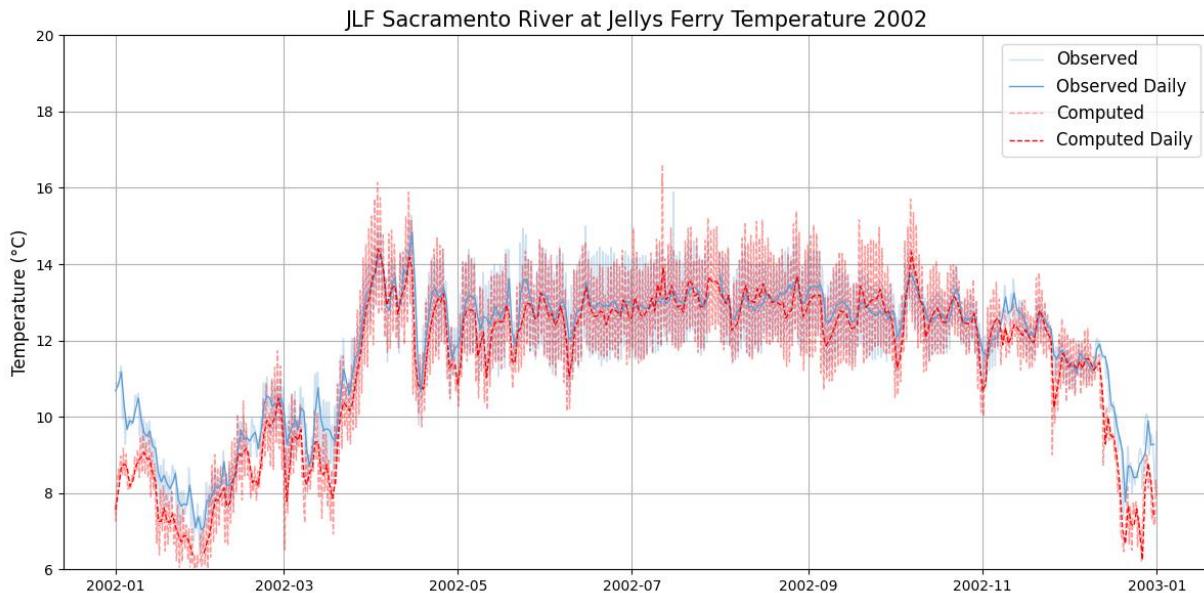


Figure 178. JLF Sacramento River at Jellies Ferry Temperature 2002

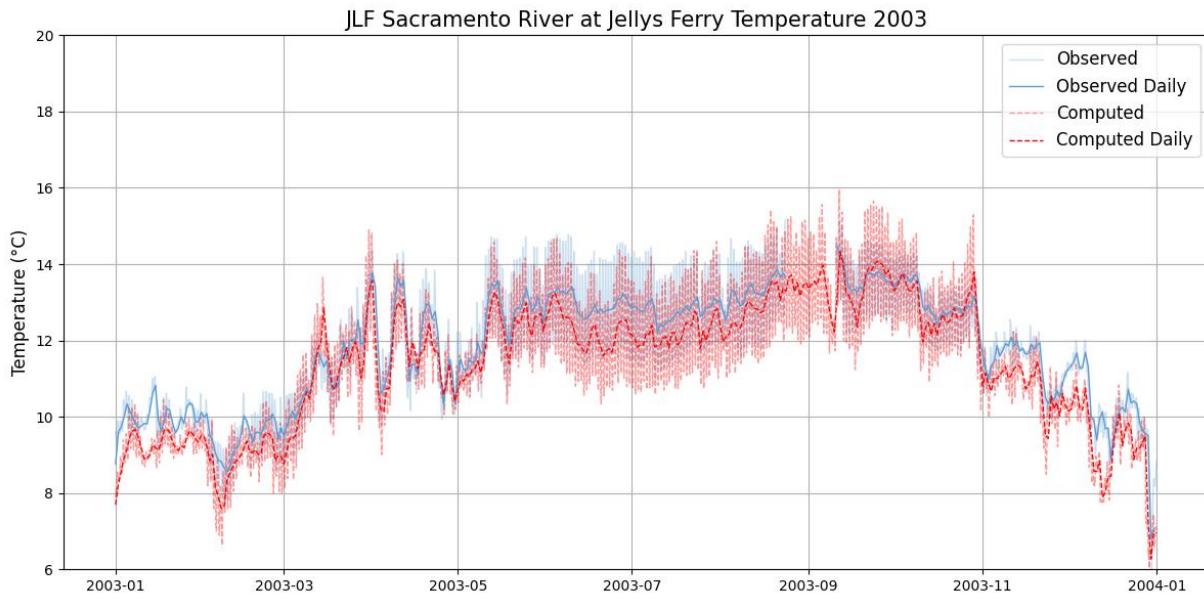


Figure 179. JLF Sacramento River at Jellies Ferry Temperature 2003

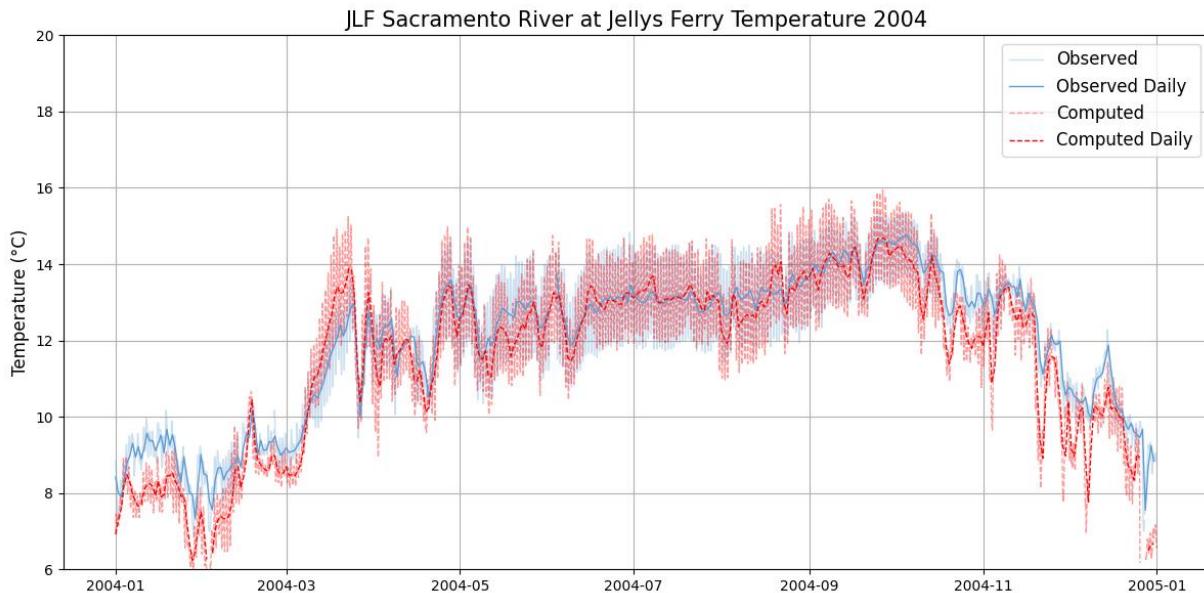


Figure 180. JLF Sacramento River at Jellies Ferry Temperature 2004

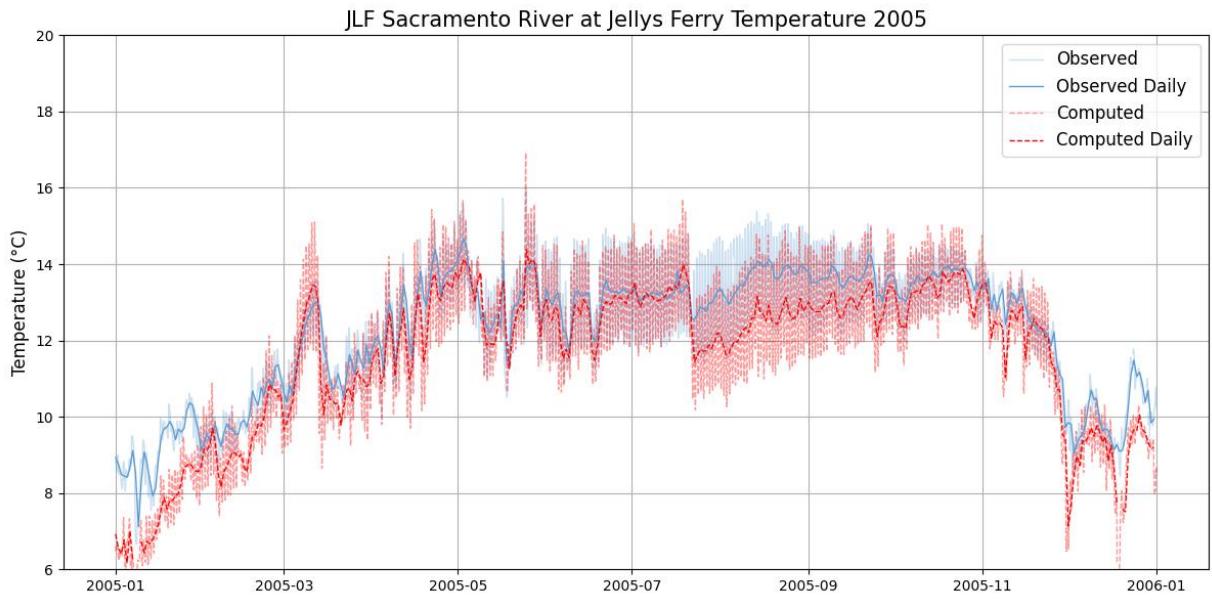


Figure 181. JLF Sacramento River at Jellies Ferry Temperature 2005

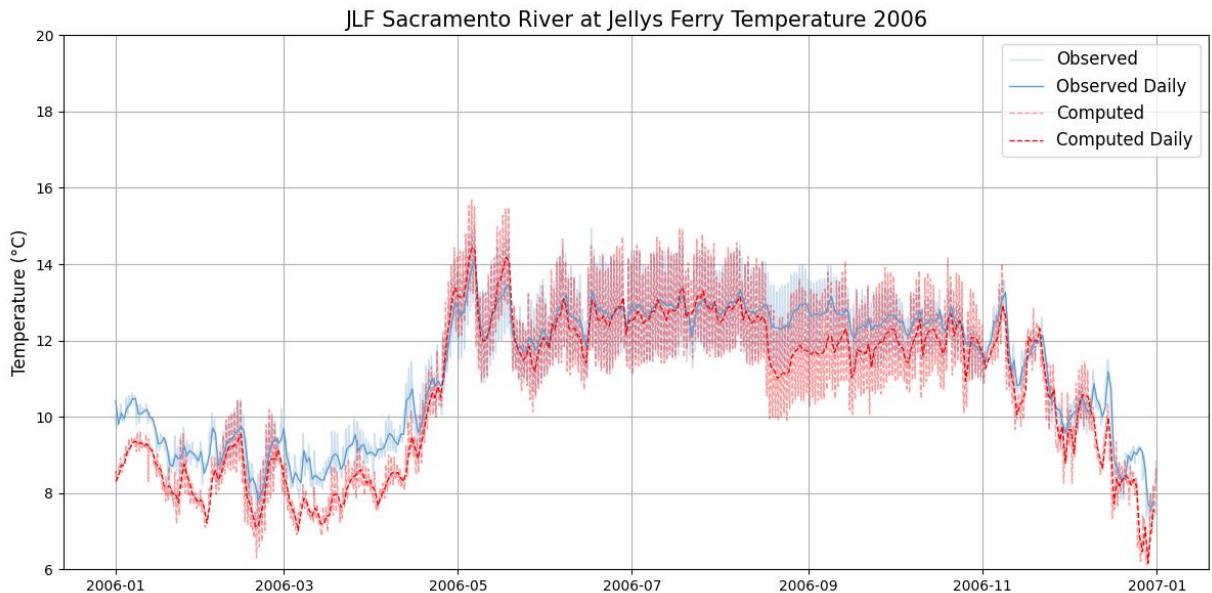


Figure 182. JLF Sacramento River at Jellies Ferry Temperature 2006

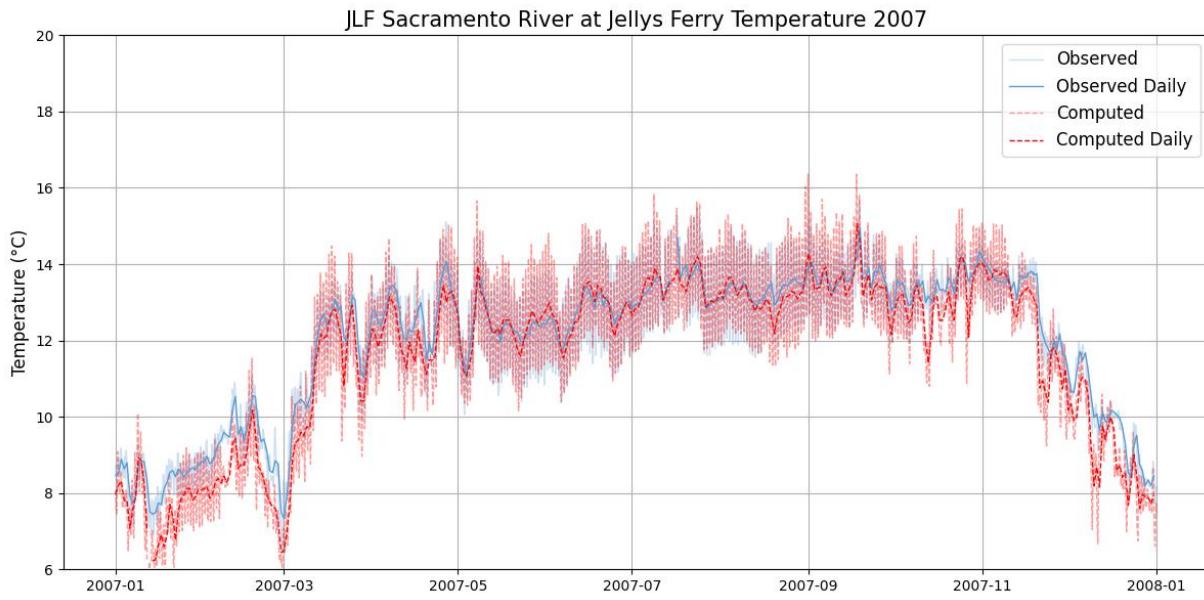


Figure 183. JLF Sacramento River at Jellies Ferry Temperature 2007

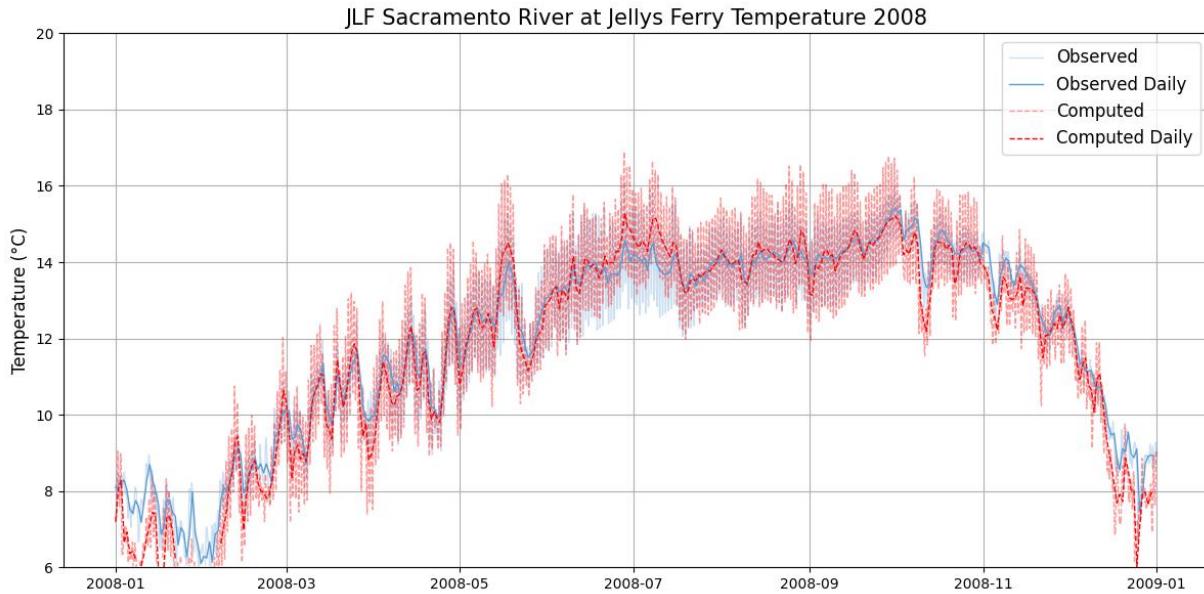


Figure 184. JLF Sacramento River at Jellies Ferry Temperature 2008

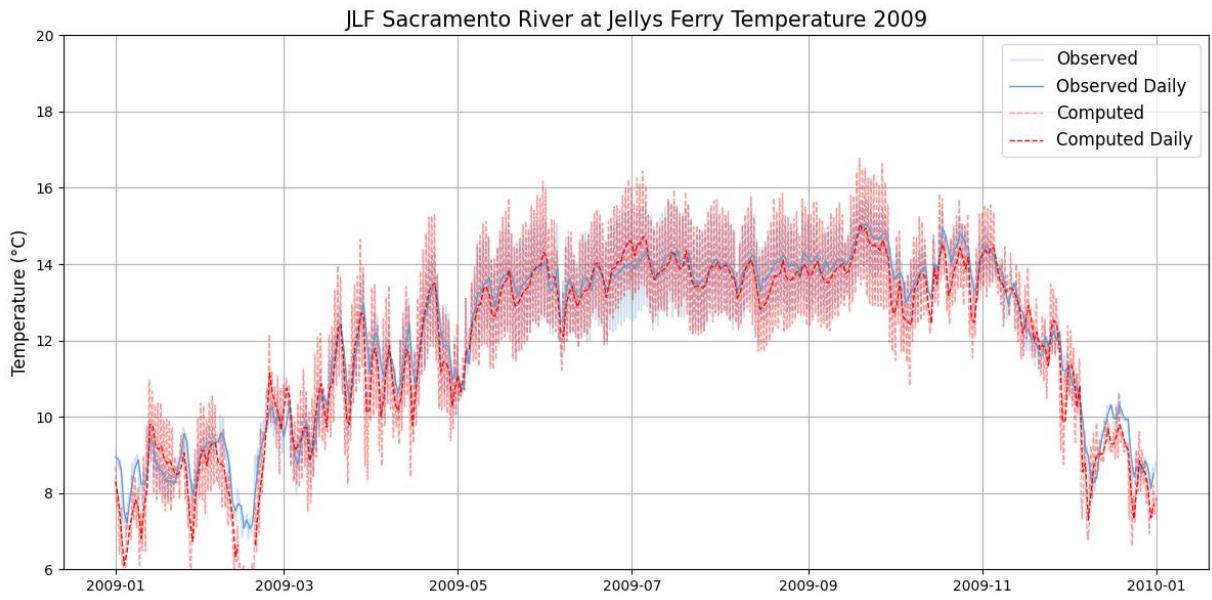


Figure 185. JLF Sacramento River at Jellys Ferry Temperature 2009

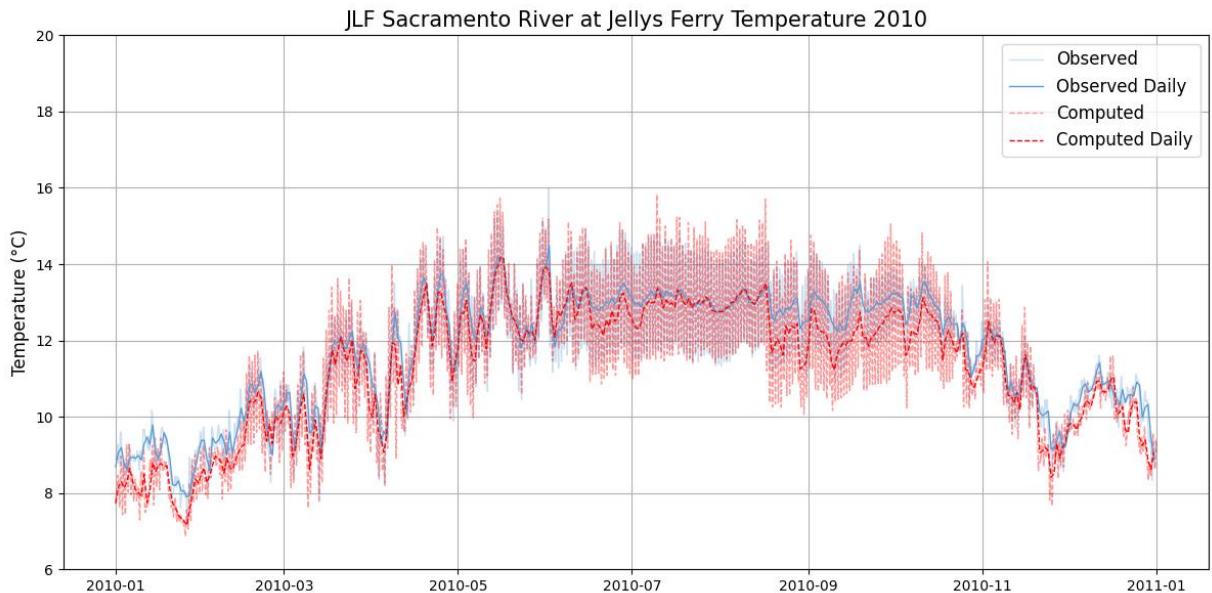


Figure 186. JLF Sacramento River at Jellys Ferry Temperature 2010

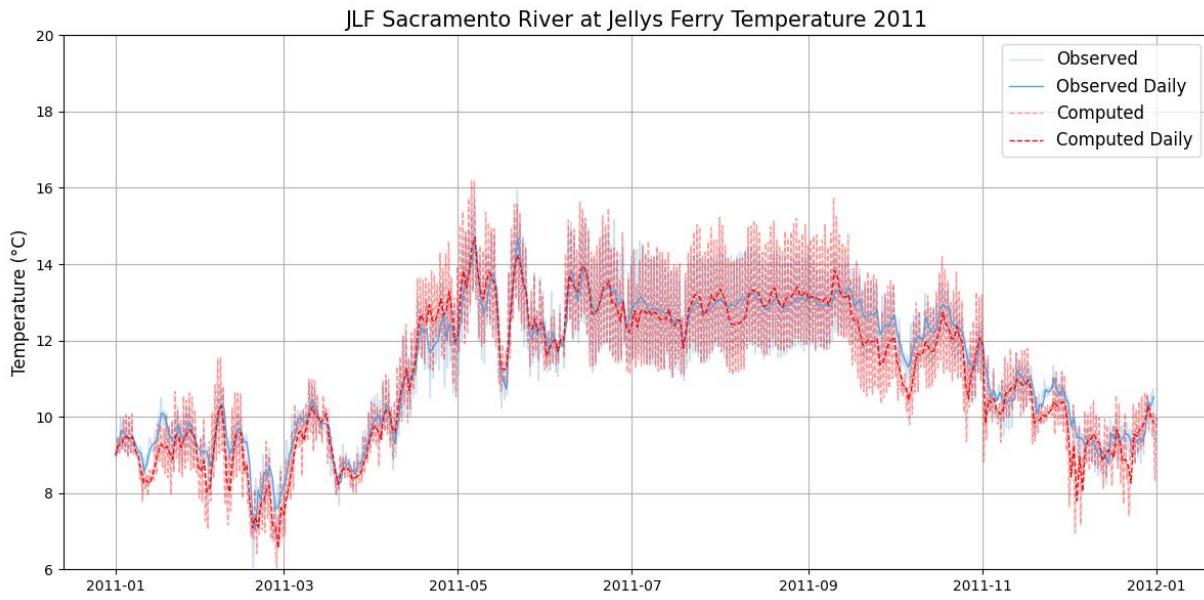


Figure 187. JLF Sacramento River at Jellies Ferry Temperature 2011

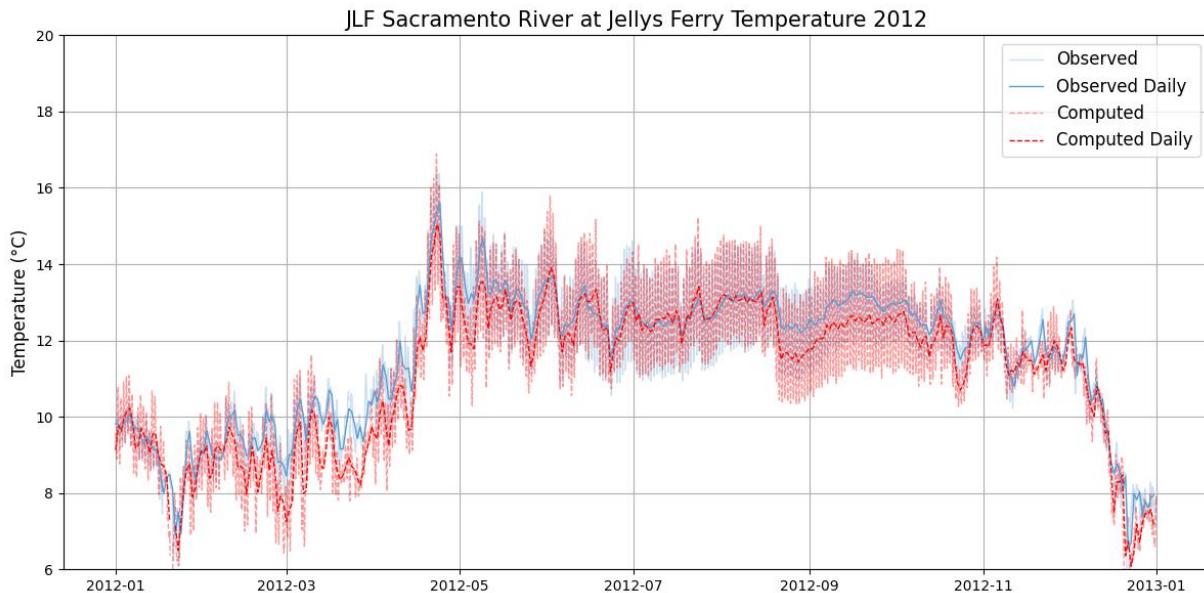


Figure 188. JLF Sacramento River at Jellies Ferry Temperature 2012

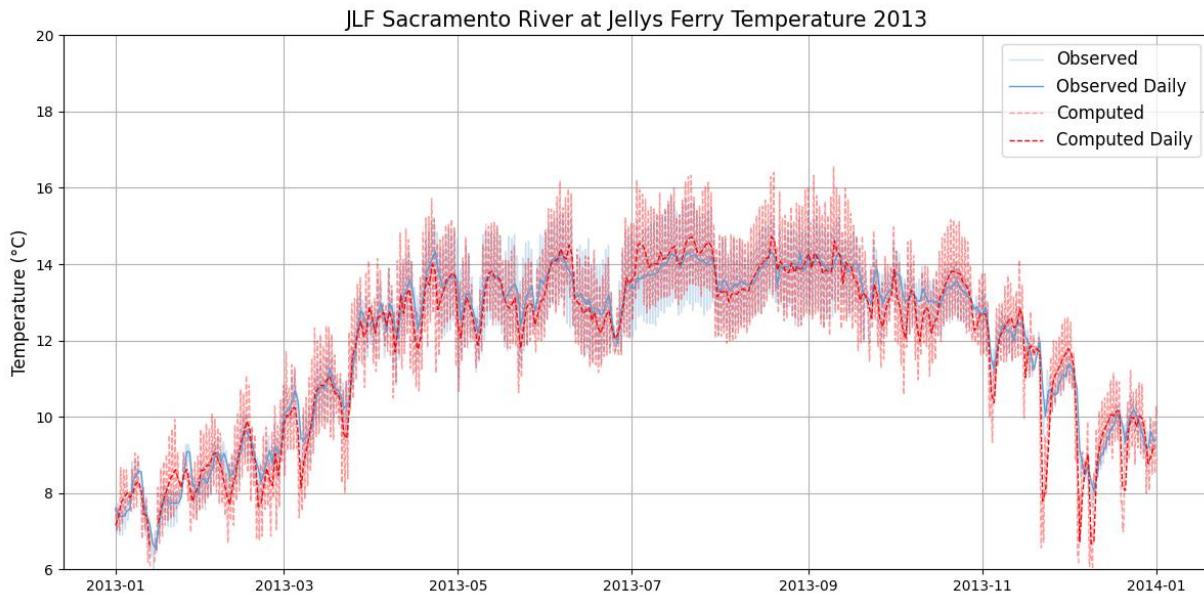


Figure 189. JLF Sacramento River at Jellies Ferry Temperature 2013

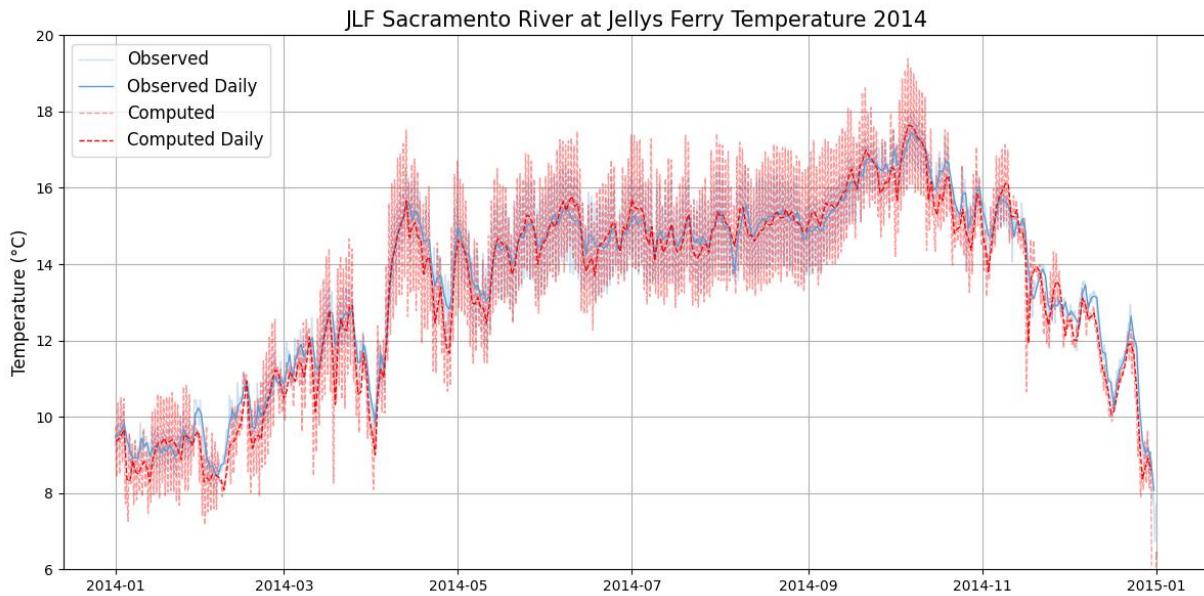


Figure 190. JLF Sacramento River at Jellies Ferry Temperature 2014

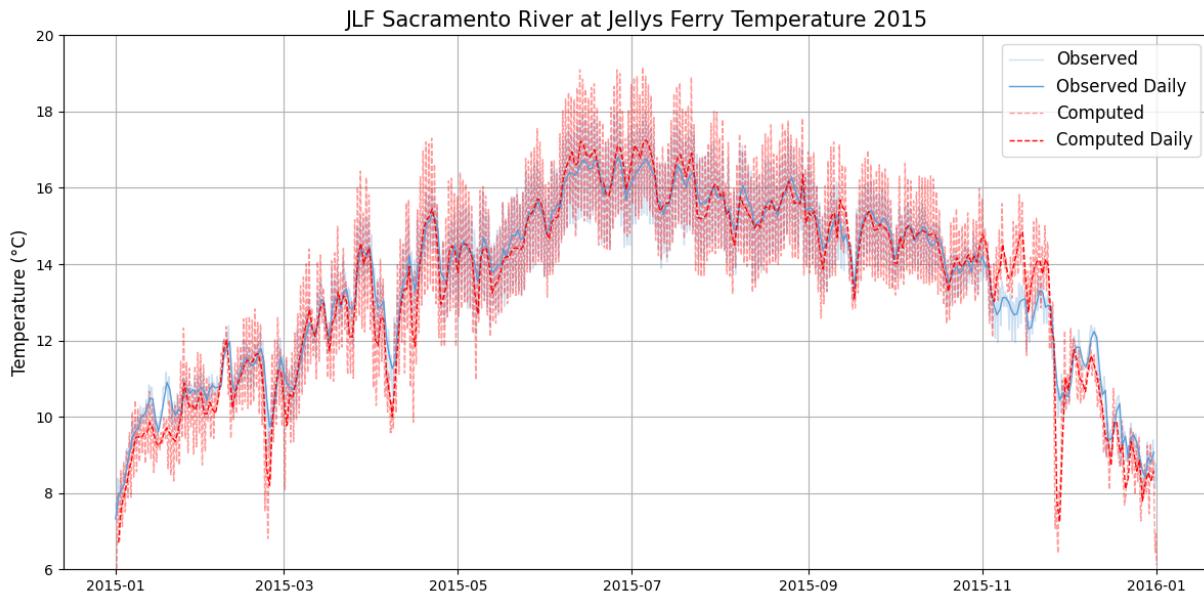


Figure 191. JLF Sacramento River at Jellies Ferry Temperature 2015

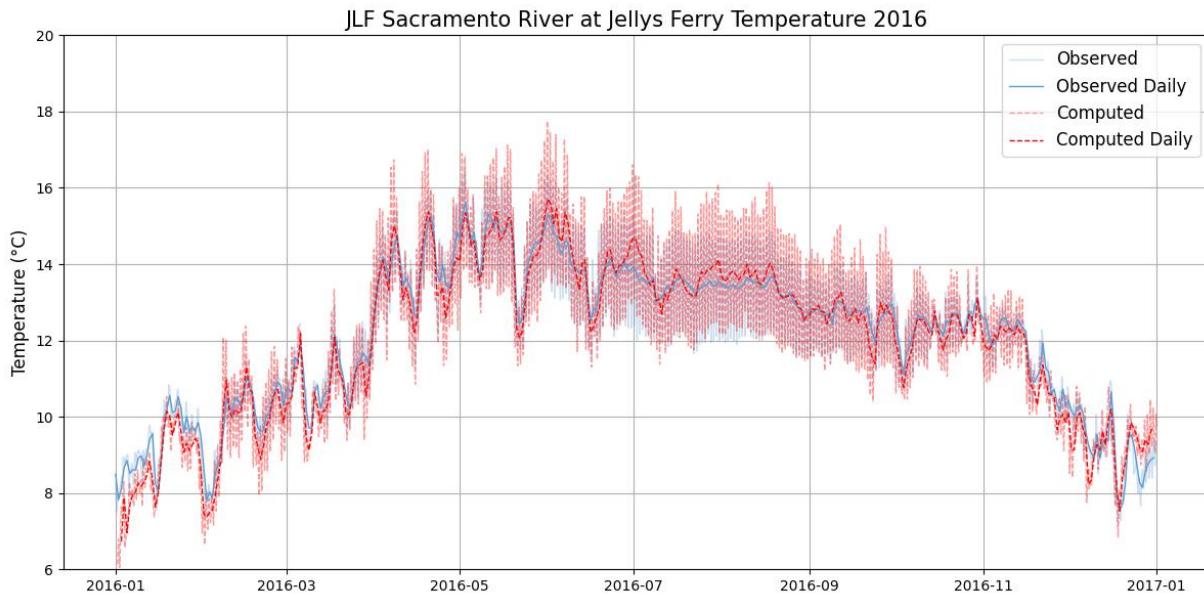


Figure 192. JLF Sacramento River at Jellies Ferry Temperature 2016

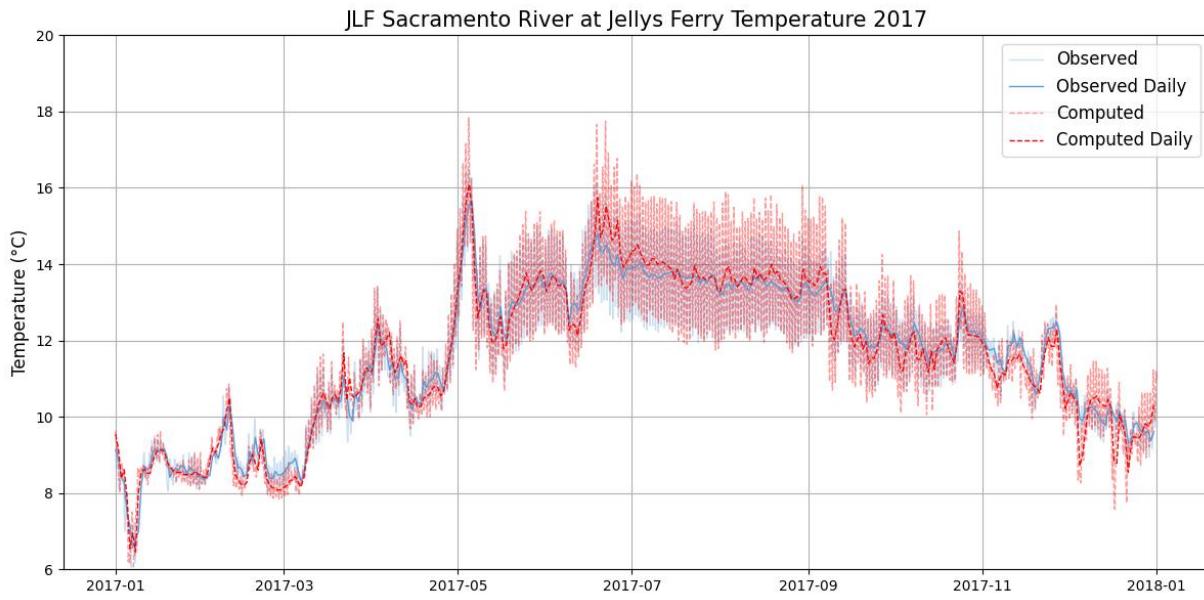


Figure 193. JLF Sacramento River at Jellys Ferry Temperature 2017

Table 54. JLF Sacramento River at Jellys Ferry Temperature Error Statistics

Statistics	2000	2001	2002	2003	2004	2005
Mean Bias (°C)	-0.27	-0.64	-0.41	-0.49	-0.43	-0.65
MAE (°C)	0.53	0.87	0.67	0.64	0.72	0.76
RMSE (°C)	0.65	1.13	0.84	0.77	0.91	0.97
Nash-Sutcliffe (NSE)	0.81	0.70	0.79	0.77	0.78	0.70
COUNT	8,016	8,760	8,760	8,760	8,784	8,760

Statistics	2006	2007	2008	2009	2010	2011
Mean Bias (°C)	-0.51	-0.40	-0.27	-0.25	-0.39	-0.17
MAE (°C)	0.63	0.56	0.60	0.53	0.53	0.43
RMSE (°C)	0.78	0.72	0.77	0.68	0.66	0.55
Nash-Sutcliffe (NSE)	0.81	0.87	0.91	0.91	0.85	0.91
COUNT	8,760	8,760	8,784	8,760	8,760	8,760

Statistics	2012	2013	2014	2015	2016	2017
Mean Bias (°C)	-0.42	-0.13	-0.21	-0.12	-0.13	-0.03
MAE (°C)	0.58	0.47	0.54	0.56	0.44	0.36
RMSE (°C)	0.74	0.63	0.68	0.73	0.56	0.47

Statistics	2012	2013	2014	2015	2016	2017
Nash-Sutcliffe (NSE)	0.85	0.92	0.92	0.90	0.92	0.94
COUNT	8,784	8,760	8,760	8,760	8,784	8,760

Table 55. JLF Sacramento River at Jellys Ferry Temperature MeanBias, invalid when +- .75

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	-0.31	-0.25	-0.22	-0.27	-0.22	-0.01	-0.20	-0.17	-0.44	-0.39	-0.46
2001	-0.84	-1.27	-0.53	-1.04	-0.25	-0.10	-0.07	-0.09	-0.10	-0.35	-0.90	-2.16
2002	-1.17	-0.55	-0.74	-0.34	-0.43	-0.24	0.05	-0.08	-0.13	-0.12	-0.29	-0.86
2003	-0.73	-0.58	-0.14	-0.37	-0.38	-0.71	-0.60	-0.48	-0.06	-0.19	-0.61	-0.91
2004	-1.03	-0.75	0.38	-0.35	-0.37	-0.03	0.09	-0.17	-0.12	-0.78	-0.83	-1.18
2005	-1.66	-0.70	-0.40	-0.49	-0.12	-0.34	-0.33	-1.20	-0.66	-0.31	-0.55	-1.05
2006	-0.95	-0.61	-0.98	-0.62	0.09	-0.18	-0.03	-0.66	-0.74	-0.34	-0.31	-0.75
2007	-0.81	-0.93	-0.57	-0.51	-0.00	-0.01	0.06	-0.17	-0.17	-0.46	-0.46	-0.77
2008	-1.26	-0.50	-0.25	-0.20	0.00	0.18	0.28	0.03	-0.06	-0.37	-0.42	-0.63
2009	-0.37	-0.60	-0.09	-0.39	-0.14	0.02	-0.00	-0.27	-0.26	-0.45	-0.06	-0.45
2010	-0.72	-0.43	-0.38	-0.29	-0.13	-0.21	-0.14	-0.36	-0.71	-0.53	-0.28	-0.45
2011	-0.32	-0.48	-0.19	0.25	0.10	-0.03	-0.03	-0.02	-0.30	-0.44	-0.31	-0.30
2012	-0.14	-0.64	-0.96	-0.77	-0.62	-0.09	0.05	-0.36	-0.53	-0.41	-0.16	-0.45
2013	-0.02	-0.22	-0.18	-0.27	-0.28	-0.07	0.29	-0.02	-0.16	-0.21	-0.18	-0.24
2014	-0.27	-0.34	-0.39	-0.40	-0.13	0.02	-0.08	0.01	0.06	-0.32	-0.07	-0.57
2015	-0.51	-0.31	-0.13	-0.42	-0.18	0.18	0.15	-0.10	-0.06	0.03	0.47	-0.51
2016	-0.67	-0.23	-0.25	-0.18	-0.15	0.15	0.15	0.13	-0.09	-0.19	-0.28	0.10
2017	0.02	-0.16	0.03	0.05	-0.03	0.11	0.13	0.17	-0.11	-0.13	-0.35	-0.10
All	-0.67	-0.53	-0.33	-0.36	-0.18	-0.09	-0.00	-0.21	-0.25	-0.33	-0.33	-0.65

Table 56. JLF Sacramento River at Jellys Ferry Temperature MAE, invalid over 1.0

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.38	0.39	0.60	0.55	0.53	0.38	0.53	0.67	0.63	0.51	0.62
2001	0.94	1.27	0.69	1.08	0.72	0.55	0.43	0.55	0.47	0.59	1.02	2.16
2002	1.17	0.65	0.83	0.69	0.67	0.53	0.37	0.51	0.58	0.50	0.52	0.96
2003	0.73	0.60	0.53	0.56	0.51	0.79	0.64	0.60	0.55	0.51	0.63	0.96

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	1.04	0.82	0.70	0.62	0.65	0.42	0.39	0.55	0.49	0.83	0.87	1.21
2005	1.68	0.76	0.66	0.64	0.49	0.36	0.51	1.20	0.68	0.43	0.69	1.07
2006	0.95	0.63	0.98	0.79	0.37	0.28	0.25	0.69	0.77	0.54	0.48	0.85
2007	0.87	0.94	0.72	0.59	0.37	0.30	0.18	0.36	0.42	0.58	0.61	0.78
2008	1.29	0.75	0.60	0.46	0.43	0.42	0.44	0.34	0.46	0.61	0.60	0.77
2009	0.78	0.89	0.61	0.61	0.35	0.33	0.26	0.40	0.51	0.57	0.45	0.65
2010	0.74	0.56	0.59	0.52	0.29	0.40	0.27	0.50	0.79	0.66	0.45	0.52
2011	0.40	0.65	0.29	0.41	0.36	0.30	0.28	0.33	0.56	0.57	0.43	0.55
2012	0.53	0.76	1.00	0.82	0.66	0.37	0.21	0.43	0.62	0.53	0.38	0.61
2013	0.47	0.53	0.53	0.48	0.40	0.32	0.36	0.35	0.44	0.53	0.63	0.65
2014	0.62	0.57	0.66	0.76	0.40	0.40	0.40	0.44	0.51	0.61	0.52	0.59
2015	0.64	0.56	0.60	0.79	0.43	0.43	0.41	0.38	0.46	0.42	1.05	0.59
2016	0.70	0.49	0.35	0.49	0.46	0.42	0.38	0.34	0.41	0.33	0.40	0.55
2017	0.26	0.34	0.29	0.30	0.32	0.46	0.34	0.35	0.42	0.39	0.41	0.49
All	0.81	0.67	0.61	0.62	0.47	0.42	0.36	0.49	0.54	0.55	0.59	0.81

Table 57. JLF Sacramento River at Jellys Ferry Temperature RMSE, invalid over 1.5

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.50	0.46	0.73	0.71	0.65	0.45	0.63	0.79	0.74	0.63	0.77
2001	1.16	1.45	0.85	1.26	0.88	0.66	0.52	0.69	0.56	0.69	1.32	2.27
2002	1.30	0.77	0.99	0.85	0.81	0.65	0.49	0.63	0.71	0.61	0.63	1.17
2003	0.83	0.70	0.66	0.71	0.63	0.91	0.76	0.71	0.65	0.62	0.72	1.13
2004	1.14	0.98	0.84	0.76	0.79	0.50	0.47	0.68	0.58	0.95	1.13	1.51
2005	1.79	0.85	0.83	0.78	0.63	0.44	0.69	1.27	0.78	0.51	0.89	1.33
2006	0.99	0.78	1.01	0.91	0.45	0.35	0.32	0.86	0.87	0.64	0.56	1.07
2007	1.02	1.01	0.82	0.70	0.44	0.38	0.23	0.47	0.50	0.72	0.79	0.95
2008	1.43	0.92	0.73	0.57	0.54	0.50	0.56	0.45	0.54	0.72	0.69	1.02
2009	0.94	1.03	0.79	0.75	0.43	0.40	0.32	0.49	0.60	0.68	0.60	0.81
2010	0.83	0.65	0.73	0.67	0.39	0.48	0.34	0.67	0.90	0.77	0.57	0.63
2011	0.50	0.75	0.38	0.54	0.45	0.37	0.36	0.41	0.69	0.66	0.53	0.72

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	0.71	0.89	1.12	0.95	0.80	0.45	0.26	0.57	0.74	0.63	0.46	0.83
2013	0.62	0.63	0.64	0.60	0.50	0.40	0.45	0.43	0.54	0.65	0.94	0.92
2014	0.73	0.67	0.81	0.89	0.49	0.50	0.48	0.53	0.61	0.73	0.70	0.83
2015	0.75	0.73	0.73	0.95	0.53	0.53	0.52	0.45	0.55	0.51	1.32	0.75
2016	0.89	0.57	0.45	0.60	0.56	0.53	0.49	0.42	0.50	0.40	0.48	0.65
2017	0.37	0.40	0.38	0.38	0.44	0.59	0.41	0.47	0.54	0.48	0.49	0.64
All	1.00	0.83	0.76	0.78	0.60	0.53	0.47	0.63	0.66	0.66	0.79	1.07

SBB Sac River at Bend Bridge Temperature

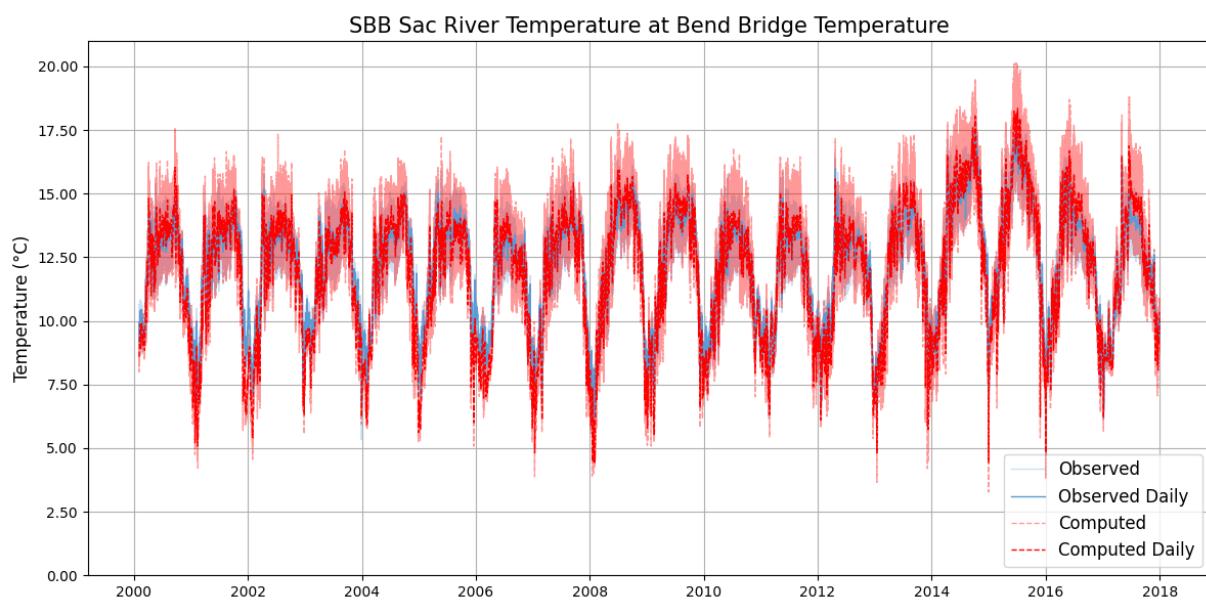


Figure 194. SBB Sac River Temperature at Bend Bridge Temperature

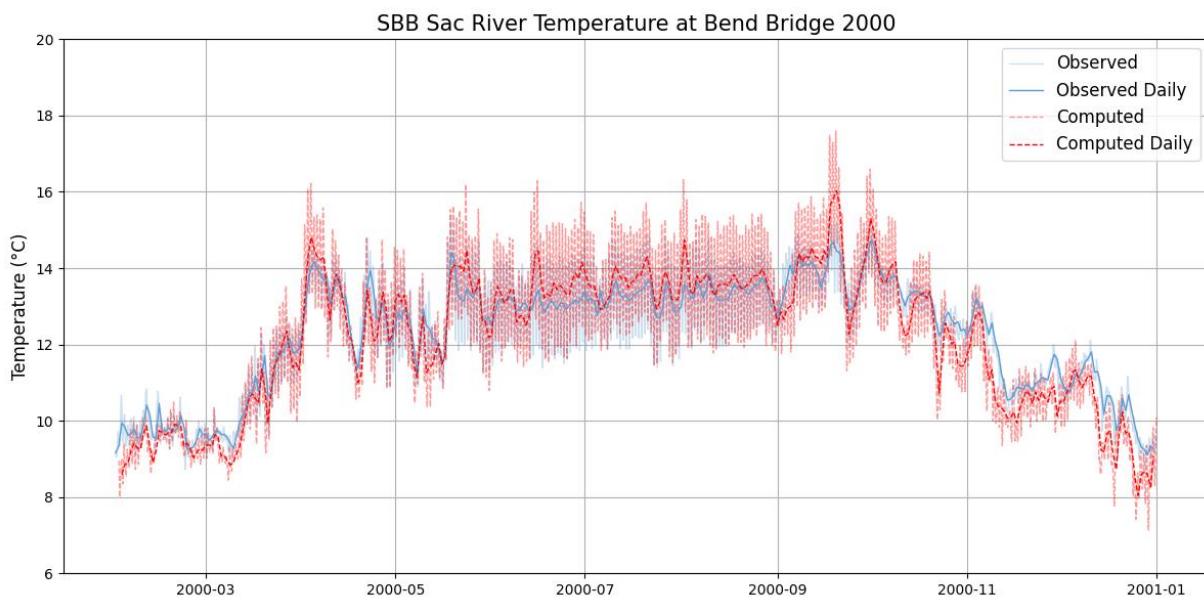


Figure 195. SBB Sac River Temperature at Bend Bridge Temperature 2000

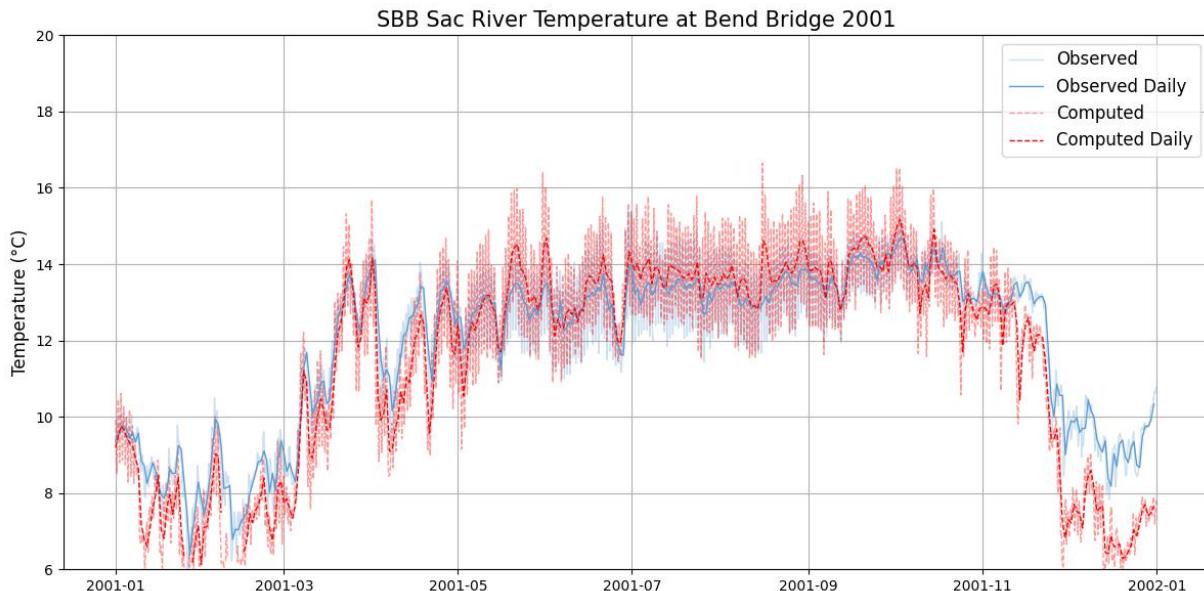


Figure 196. SBB Sac River Temperature at Bend Bridge Temperature 2001

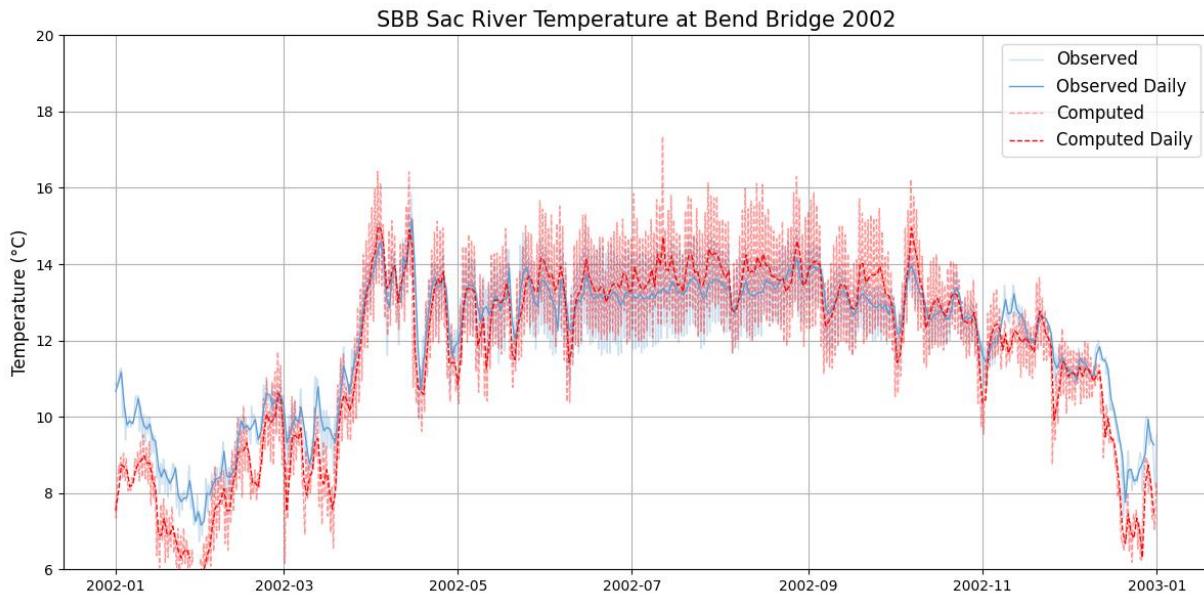


Figure 197. SBB Sac River Temperature at Bend Bridge Temperature 2002

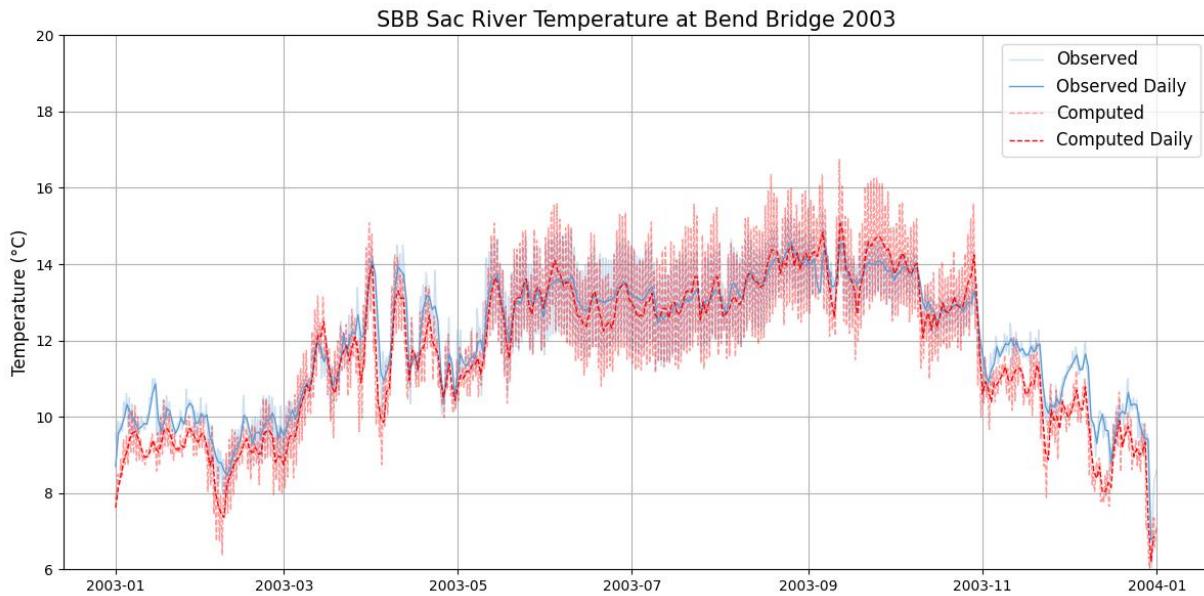


Figure 198. SBB Sac River Temperature at Bend Bridge Temperature 2003

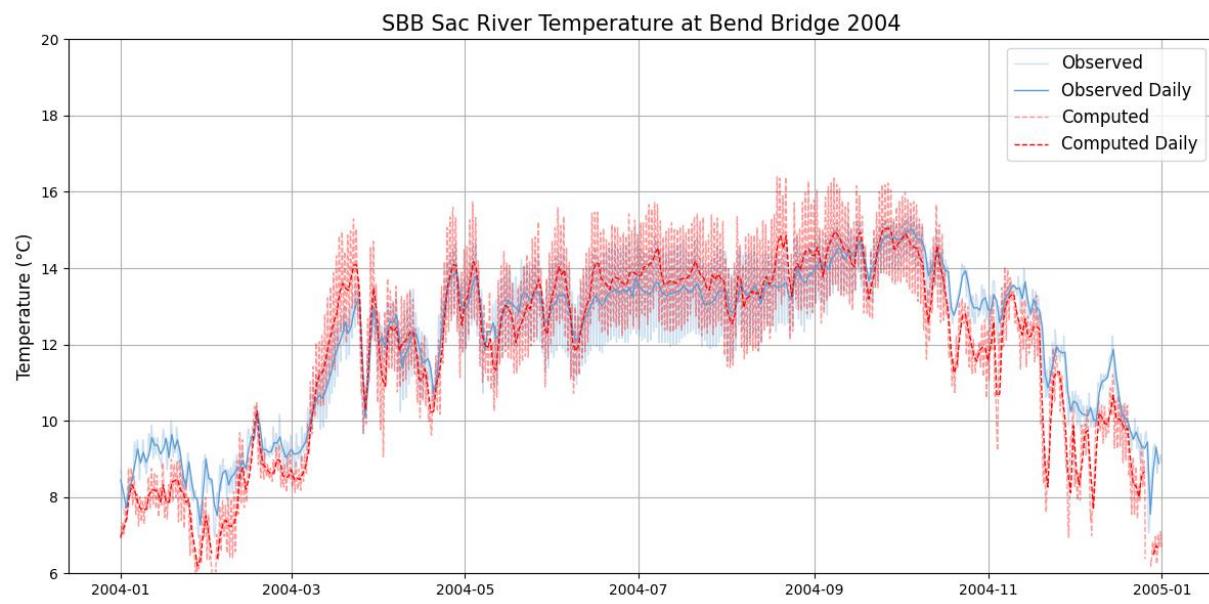


Figure 199. SBB Sac River Temperature at Bend Bridge Temperature 2004

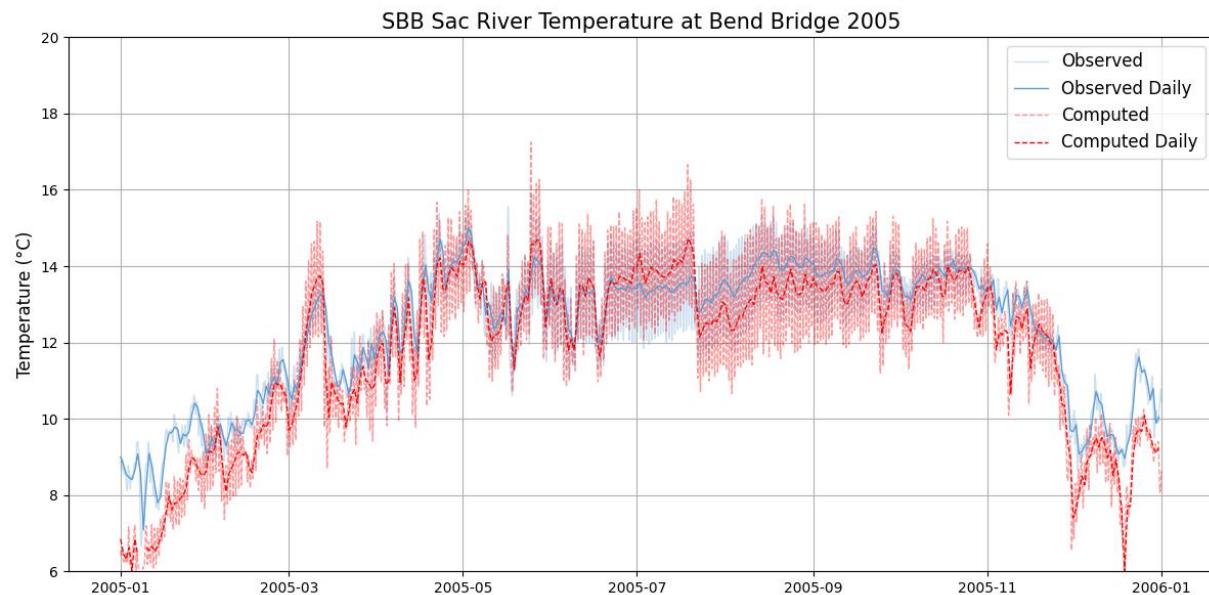


Figure 200. SBB Sac River Temperature at Bend Bridge Temperature 2005

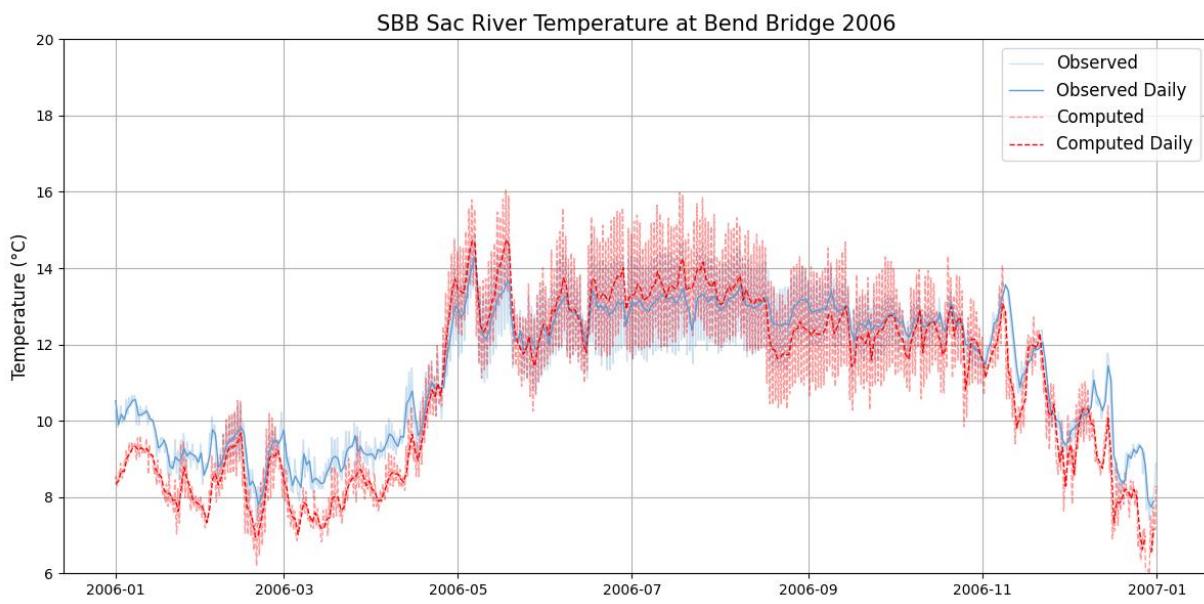


Figure 201. SBB Sac River Temperature at Bend Bridge Temperature 2006

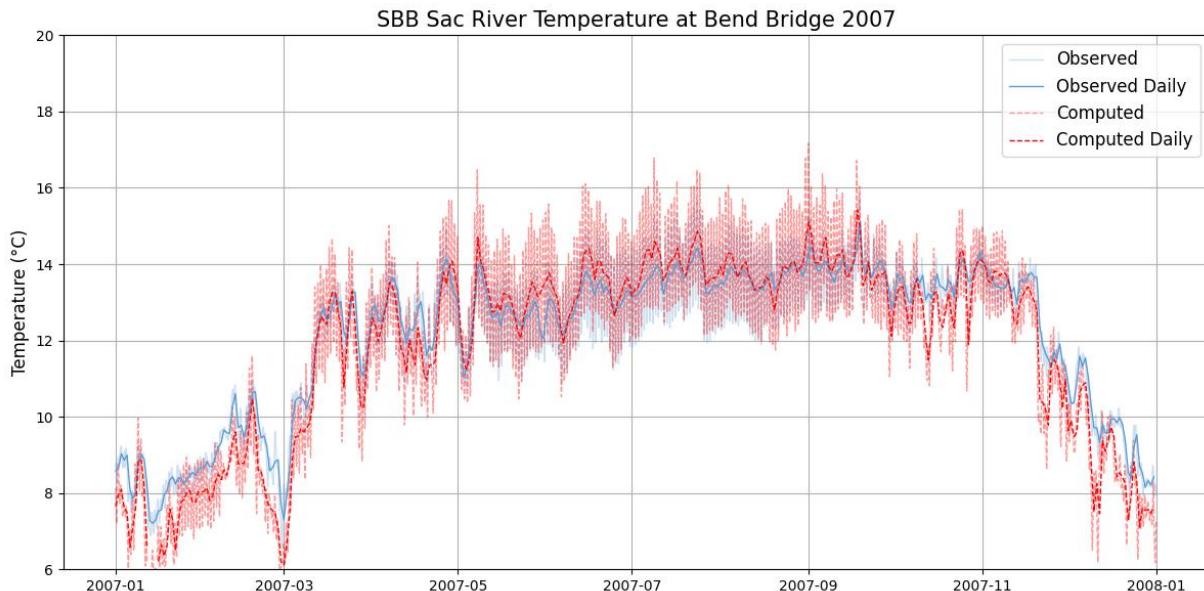


Figure 202. SBB Sac River Temperature at Bend Bridge Temperature 2007

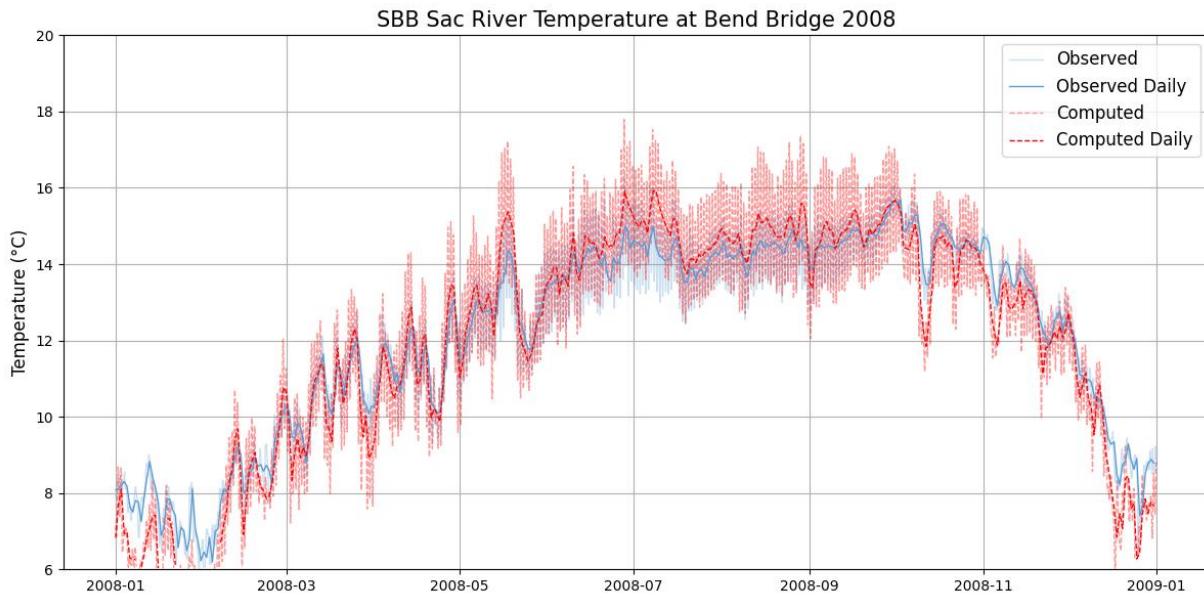


Figure 203. SBB Sac River Temperature at Bend Bridge Temperature 2008

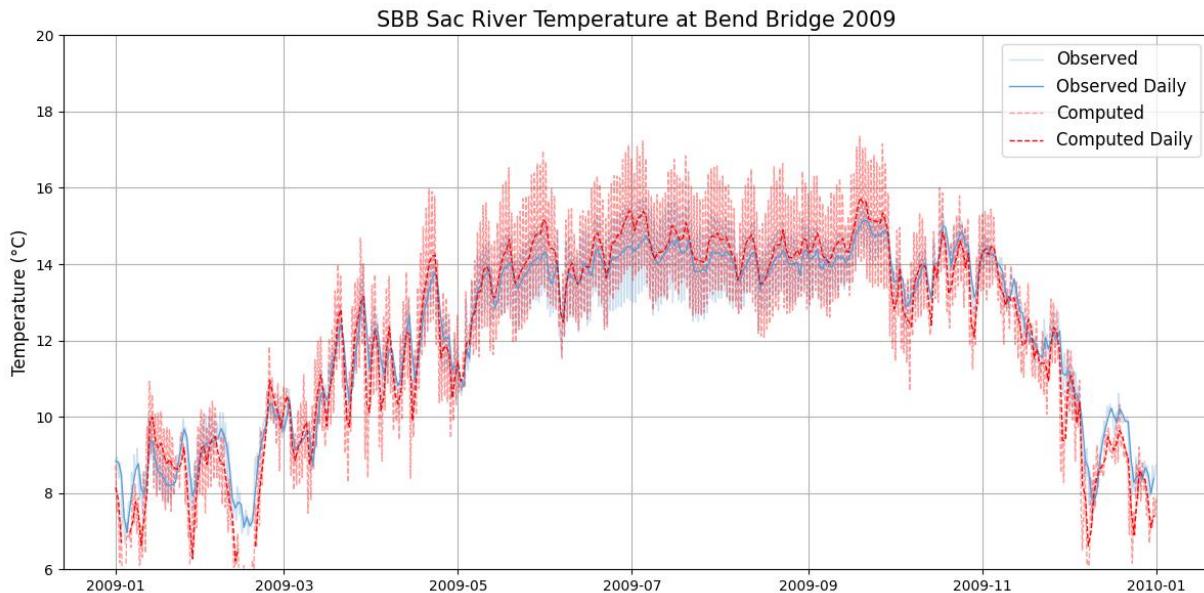


Figure 204. SBB Sac River Temperature at Bend Bridge Temperature 2009

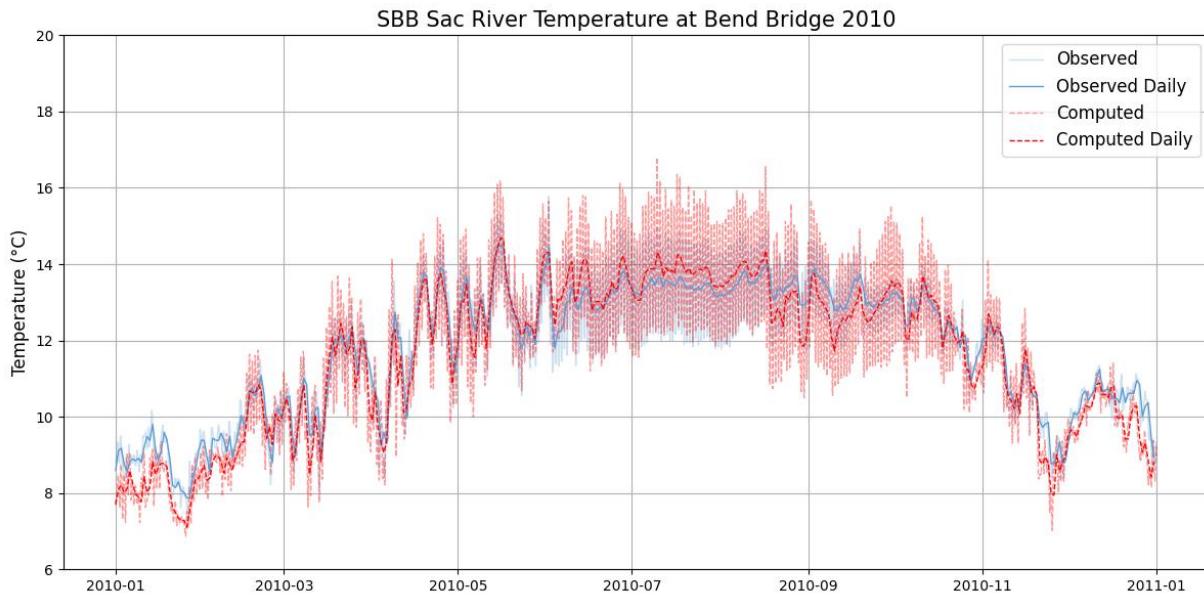


Figure 205. SBB Sac River Temperature at Bend Bridge Temperature 2010

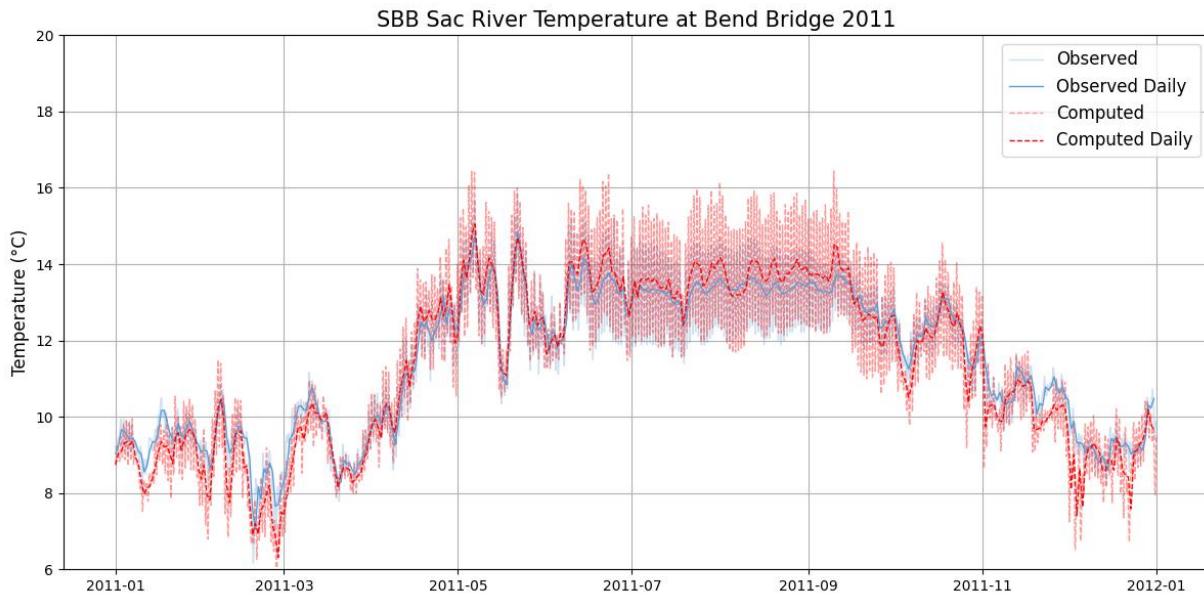


Figure 206. SBB Sac River Temperature at Bend Bridge Temperature 2011

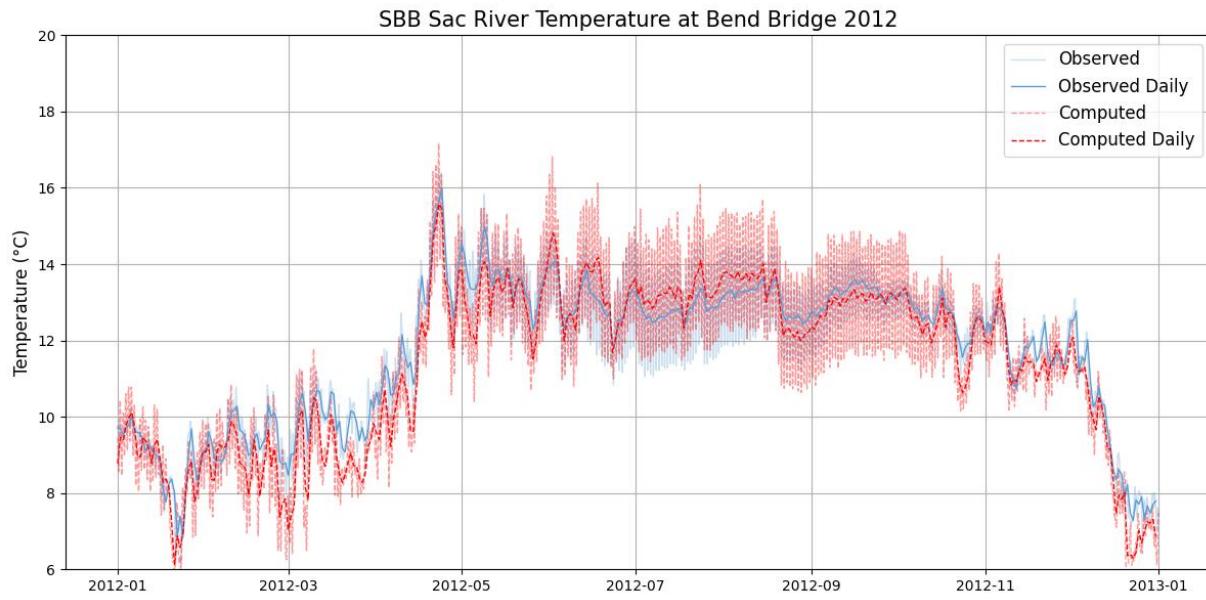


Figure 207. SBB Sac River Temperature at Bend Bridge Temperature 2012

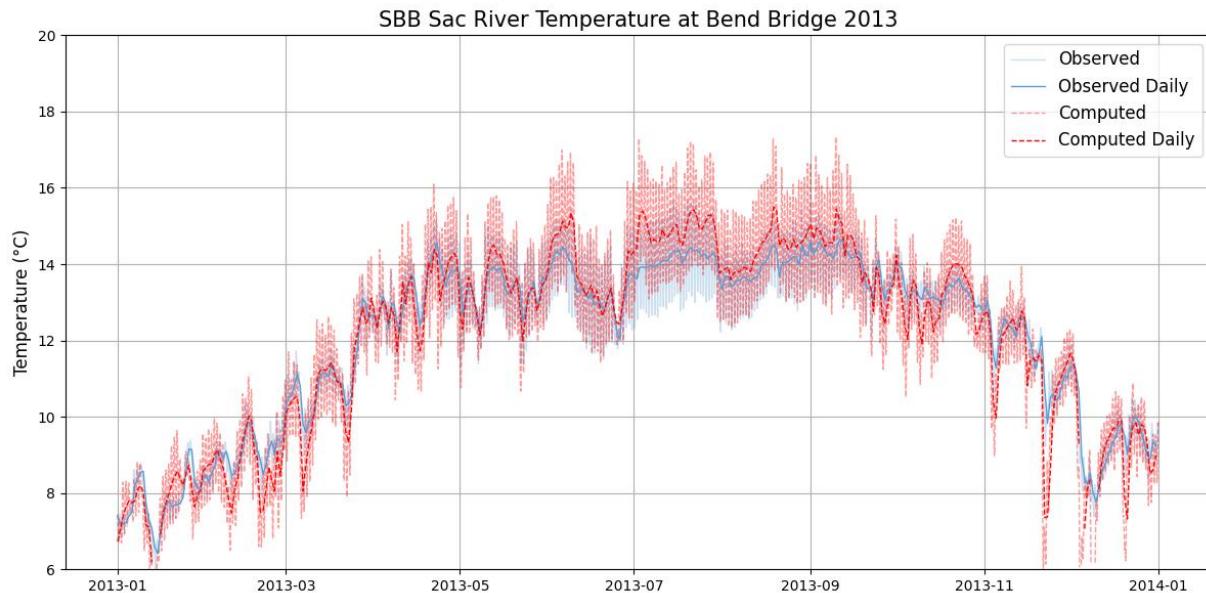


Figure 208. SBB Sac River Temperature at Bend Bridge Temperature 2013

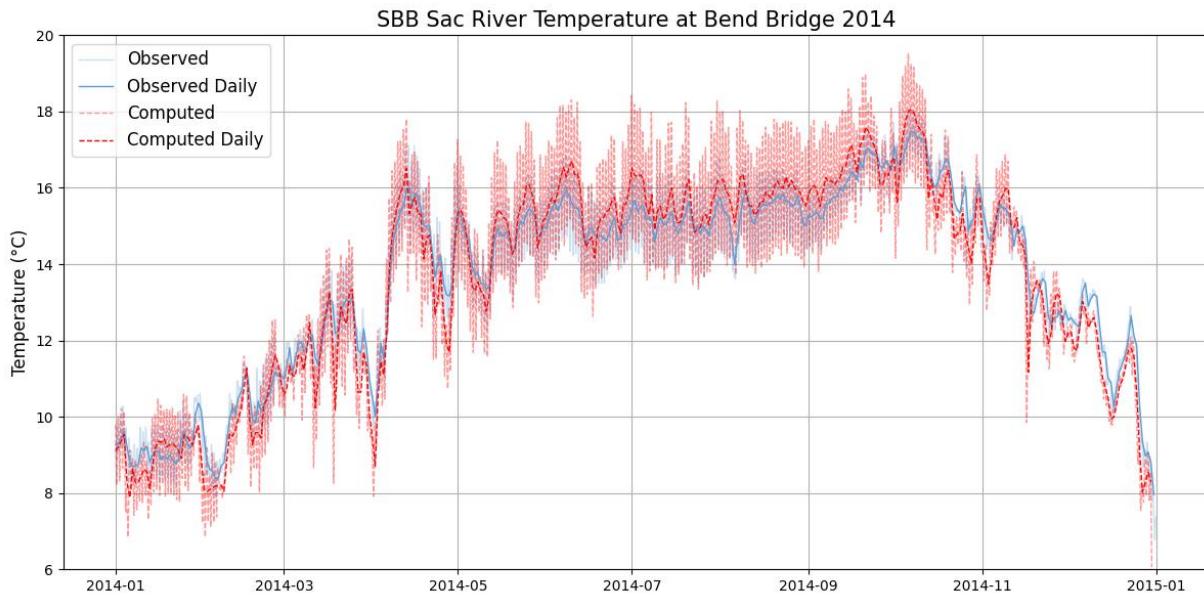


Figure 209. SBB Sac River Temperature at Bend Bridge Temperature 2014

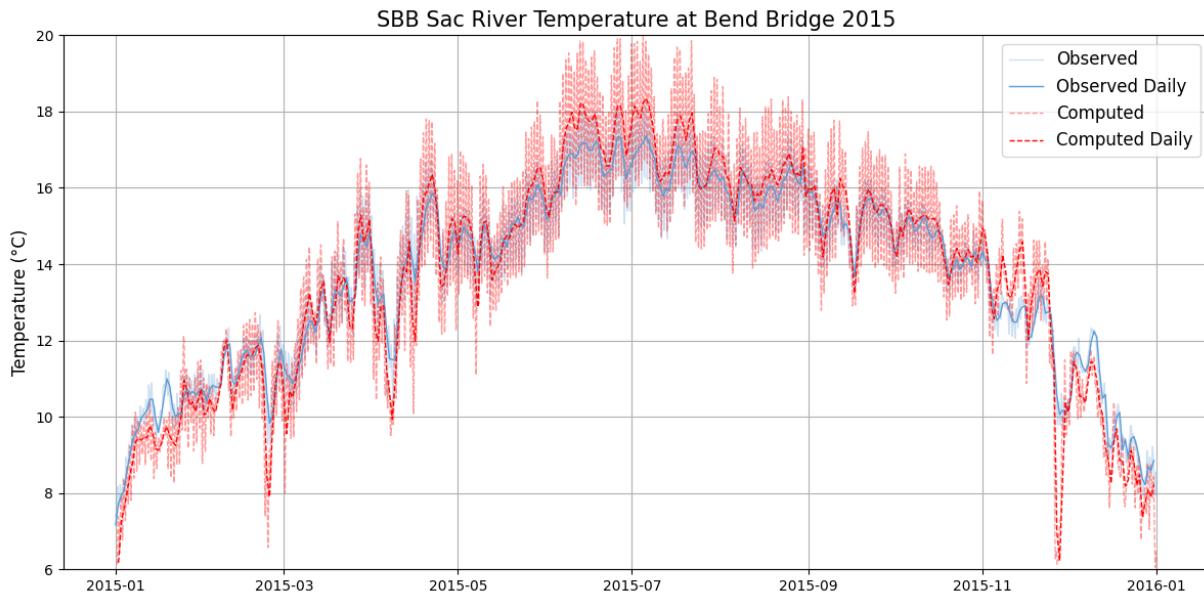


Figure 210. SBB Sac River Temperature at Bend Bridge Temperature 2015

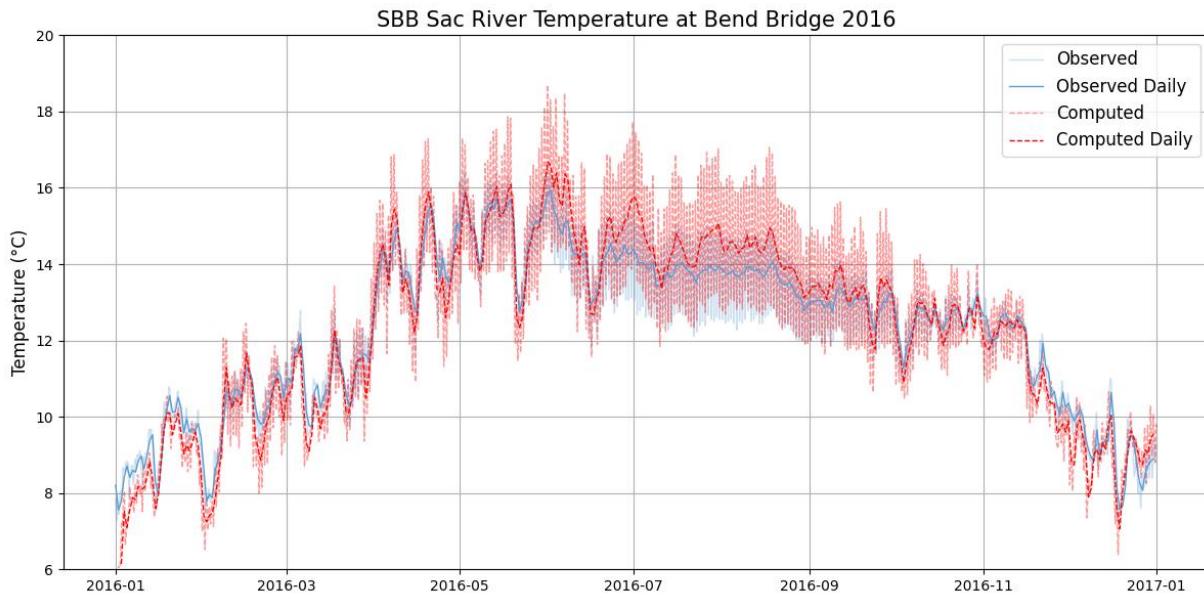


Figure 211. SBB Sac River Temperature at Bend Bridge Temperature 2016

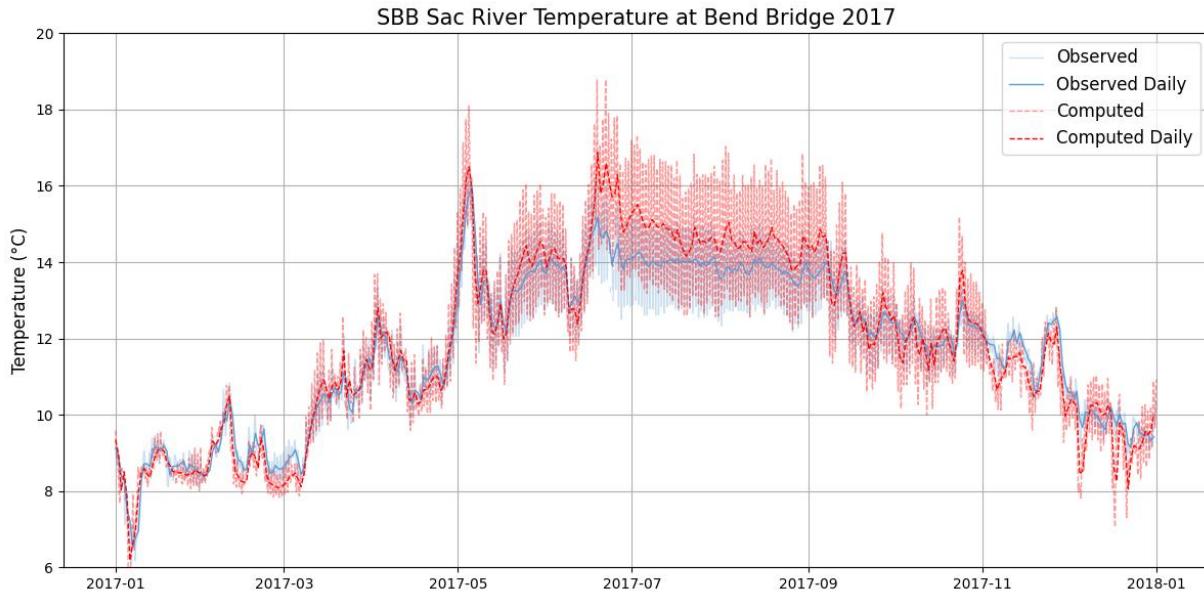


Figure 212. SBB Sac River Temperature at Bend Bridge Temperature 2017

Table 58. SBB Sac River at Bend Bridge Temperature Error Statistics

Statistics	2000	2001	2002	2003	2004	2005
Mean Bias ($^{\circ}\text{C}$)	-0.11	-0.47	-0.29	-0.33	-0.32	-0.53
MAE ($^{\circ}\text{C}$)	0.60	0.92	0.76	0.61	0.78	0.76
RMSE ($^{\circ}\text{C}$)	0.74	1.17	0.95	0.75	0.97	0.97

Statistics	2000	2001	2002	2003	2004	2005
Nash-Sutcliffe (NSE)	0.78	0.70	0.74	0.81	0.77	0.72
COUNT	8,015	8,760	8,760	8,760	8,784	8,760

Statistics	2006	2007	2008	2009	2010	2011
Mean Bias (°C)	-0.38	-0.30	-0.18	-0.09	-0.17	-0.10
MAE (°C)	0.70	0.66	0.73	0.65	0.56	0.49
RMSE (°C)	0.84	0.84	0.92	0.83	0.69	0.63
Nash-Sutcliffe (NSE)	0.79	0.83	0.87	0.87	0.85	0.89
COUNT	8,760	8,760	8,784	8,760	8,760	8,760

Statistics	2012	2013	2014	2015	2016	2017
Mean Bias (°C)	-0.30	-0.01	-0.06	0.01	0.01	0.12
MAE (°C)	0.63	0.62	0.68	0.69	0.57	0.52
RMSE (°C)	0.78	0.82	0.86	0.89	0.72	0.68
Nash-Sutcliffe (NSE)	0.84	0.87	0.88	0.87	0.88	0.89
COUNT	8,784	8,760	8,760	8,760	8,784	8,760

Table 59. SBB Sac River Temperature at Bend Bridge Temperature MeanBias, invalid when +- .75

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	-0.37	-0.26	-0.04	0.00	0.33	0.36	0.23	0.17	-0.33	-0.64	-0.64
2001	-0.91	-1.24	-0.48	-0.97	0.15	0.26	0.36	0.38	0.20	-0.24	-1.01	-2.20
2002	-1.54	-0.75	-0.77	-0.21	-0.18	0.22	0.51	0.28	0.24	0.01	-0.38	-0.92
2003	-0.71	-0.58	-0.19	-0.60	-0.16	-0.18	-0.02	-0.05	0.21	0.00	-0.72	-0.94
2004	-1.05	-0.76	0.39	-0.26	-0.15	0.33	0.45	0.29	0.10	-0.82	-1.05	-1.30
2005	-1.65	-0.71	-0.44	-0.49	-0.03	0.04	0.17	-0.72	-0.41	-0.31	-0.65	-1.19
2006	-1.05	-0.64	-0.99	-0.52	0.29	0.30	0.46	-0.27	-0.38	-0.24	-0.54	-1.04
2007	-0.97	-0.96	-0.47	-0.40	0.30	0.31	0.34	0.11	0.02	-0.45	-0.47	-0.96
2008	-1.37	-0.46	-0.32	-0.05	0.26	0.35	0.57	0.42	0.18	-0.48	-0.53	-0.77
2009	-0.37	-0.65	-0.06	-0.18	0.27	0.34	0.34	0.25	0.28	-0.33	-0.32	-0.64
2010	-0.73	-0.27	-0.21	-0.21	0.00	0.34	0.34	-0.14	-0.36	-0.12	-0.20	-0.50
2011	-0.43	-0.62	-0.26	0.17	0.12	0.28	0.30	0.30	0.08	-0.25	-0.44	-0.43

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	-0.19	-0.65	-0.91	-0.73	-0.47	0.21	0.43	0.03	-0.19	-0.31	-0.25	-0.62
2013	-0.12	-0.37	-0.20	-0.15	0.04	0.35	0.78	0.45	0.11	-0.19	-0.42	-0.40
2014	-0.22	-0.33	-0.42	-0.30	0.12	0.44	0.40	0.44	0.34	-0.29	-0.15	-0.76
2015	-0.56	-0.38	0.05	-0.29	0.07	0.62	0.58	0.27	0.12	0.12	0.22	-0.68
2016	-0.70	-0.28	-0.27	-0.10	-0.02	0.56	0.64	0.59	0.24	-0.11	-0.31	-0.12
2017	-0.08	-0.23	0.00	0.03	0.19	0.59	0.75	0.65	0.20	-0.02	-0.46	-0.26
All	-0.75	-0.57	-0.32	-0.29	0.04	0.32	0.43	0.20	0.06	-0.24	-0.46	-0.80

Table 60. SBB Sac River Temperature at Bend Bridge Temperature MAE, invalid over 1.0

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.42	0.44	0.59	0.57	0.63	0.49	0.59	0.73	0.66	0.68	0.75
2001	1.00	1.25	0.72	1.04	0.73	0.60	0.59	0.67	0.52	0.59	1.13	2.20
2002	1.54	0.82	0.91	0.70	0.64	0.59	0.58	0.59	0.63	0.53	0.61	1.00
2003	0.72	0.60	0.55	0.69	0.47	0.51	0.43	0.46	0.63	0.53	0.73	0.98
2004	1.06	0.81	0.73	0.58	0.61	0.51	0.56	0.60	0.51	0.92	1.08	1.32
2005	1.67	0.81	0.77	0.73	0.49	0.30	0.58	0.77	0.54	0.50	0.79	1.20
2006	1.05	0.68	0.99	0.79	0.48	0.39	0.50	0.51	0.59	0.56	0.70	1.10
2007	1.02	0.99	0.79	0.64	0.54	0.42	0.37	0.40	0.49	0.66	0.70	0.97
2008	1.40	0.81	0.74	0.56	0.56	0.55	0.62	0.54	0.57	0.74	0.74	0.93
2009	0.92	0.92	0.76	0.72	0.52	0.46	0.40	0.45	0.61	0.61	0.61	0.82
2010	0.75	0.52	0.66	0.60	0.38	0.49	0.40	0.54	0.72	0.60	0.50	0.55
2011	0.51	0.80	0.36	0.39	0.39	0.40	0.38	0.45	0.53	0.52	0.53	0.66
2012	0.58	0.83	1.01	0.83	0.63	0.44	0.45	0.46	0.60	0.59	0.47	0.67
2013	0.56	0.71	0.67	0.56	0.41	0.46	0.78	0.52	0.53	0.61	0.81	0.84
2014	0.74	0.64	0.77	0.91	0.53	0.61	0.54	0.62	0.65	0.73	0.62	0.77
2015	0.72	0.65	0.75	0.92	0.52	0.72	0.69	0.52	0.56	0.50	1.02	0.72
2016	0.73	0.58	0.42	0.61	0.57	0.69	0.70	0.62	0.51	0.37	0.48	0.55
2017	0.30	0.39	0.37	0.36	0.47	0.75	0.78	0.68	0.54	0.48	0.51	0.58
All	0.90	0.73	0.69	0.68	0.53	0.53	0.55	0.56	0.58	0.59	0.71	0.92

Table 61. SBB Sac River Temperature at Bend Bridge Temperature RMSE, invalid over 1.5

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.54	0.52	0.74	0.74	0.77	0.61	0.69	0.88	0.77	0.83	0.90
2001	1.20	1.46	0.88	1.22	0.89	0.71	0.72	0.83	0.62	0.71	1.41	2.28
2002	1.62	0.98	1.08	0.86	0.77	0.72	0.75	0.74	0.78	0.67	0.75	1.18
2003	0.82	0.71	0.67	0.88	0.57	0.62	0.54	0.56	0.79	0.65	0.83	1.13
2004	1.16	0.96	0.87	0.73	0.73	0.64	0.66	0.77	0.61	1.05	1.36	1.57
2005	1.79	0.93	0.95	0.90	0.63	0.37	0.66	0.88	0.64	0.58	0.98	1.39
2006	1.09	0.83	1.03	0.91	0.59	0.50	0.62	0.65	0.68	0.66	0.88	1.30
2007	1.19	1.09	0.92	0.76	0.73	0.54	0.47	0.52	0.60	0.80	0.91	1.14
2008	1.53	0.98	0.90	0.71	0.74	0.68	0.78	0.72	0.69	0.88	0.87	1.14
2009	1.09	1.09	0.95	0.90	0.68	0.59	0.53	0.60	0.78	0.73	0.78	0.99
2010	0.85	0.60	0.81	0.74	0.49	0.59	0.54	0.69	0.83	0.69	0.63	0.68
2011	0.59	0.93	0.48	0.49	0.50	0.51	0.51	0.57	0.67	0.61	0.65	0.85
2012	0.73	1.00	1.16	0.97	0.79	0.58	0.54	0.55	0.68	0.68	0.55	0.85
2013	0.74	0.87	0.83	0.69	0.50	0.63	0.88	0.70	0.68	0.74	1.13	1.16
2014	0.88	0.80	0.96	1.07	0.66	0.76	0.71	0.79	0.83	0.88	0.82	1.01
2015	0.87	0.87	0.91	1.12	0.65	0.91	0.88	0.64	0.69	0.61	1.39	0.86
2016	0.94	0.70	0.53	0.76	0.70	0.88	0.88	0.80	0.66	0.44	0.55	0.68
2017	0.40	0.46	0.45	0.43	0.63	1.00	0.94	0.88	0.69	0.60	0.60	0.75
All	1.09	0.91	0.85	0.85	0.67	0.68	0.69	0.71	0.72	0.72	0.92	1.16

SBB Sac River at Bend Bridge Flow

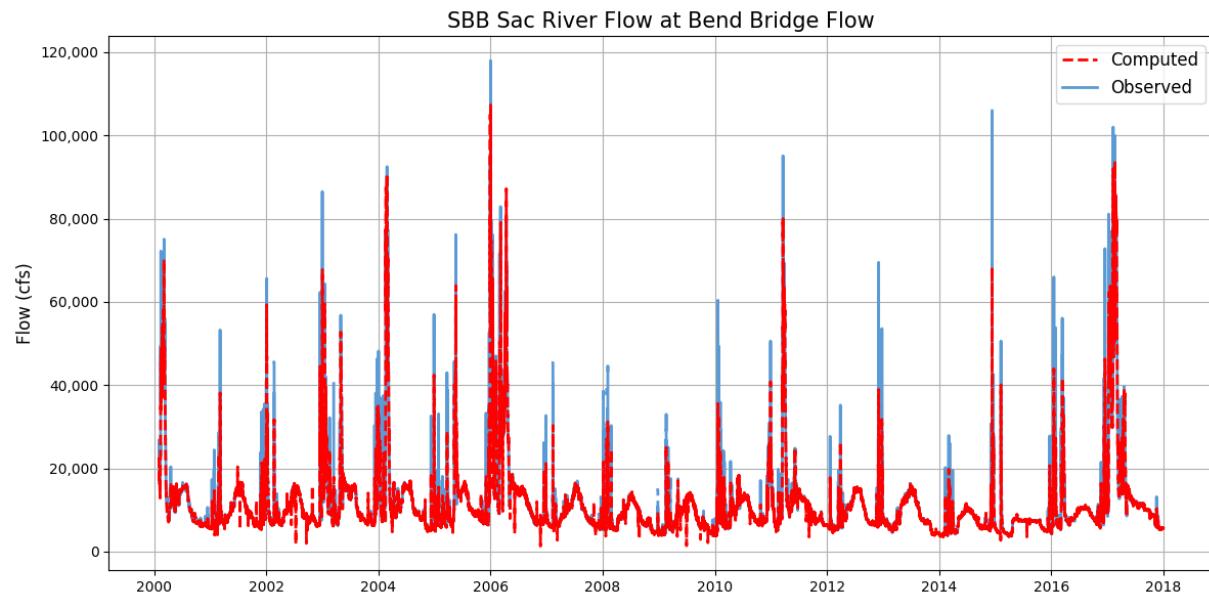


Figure 213. SBB Sac River Flow at Bend Bridge Flow

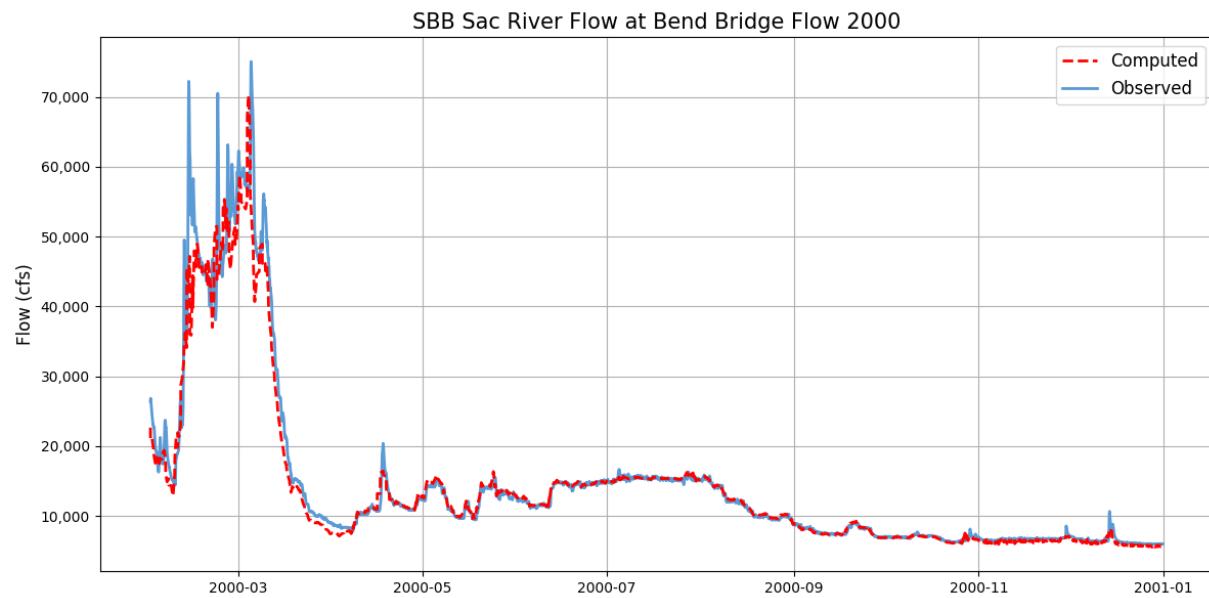


Figure 214. SBB Sac River Flow at Bend Bridge Flow 2000

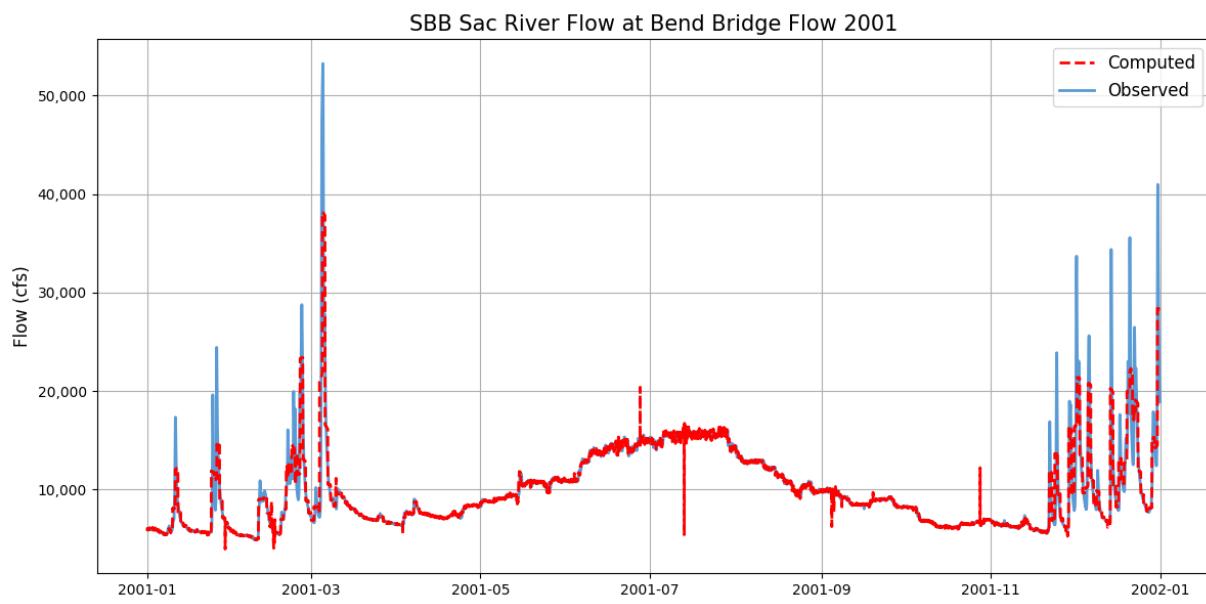


Figure 215. SBB Sac River Flow at Bend Bridge Flow 2001

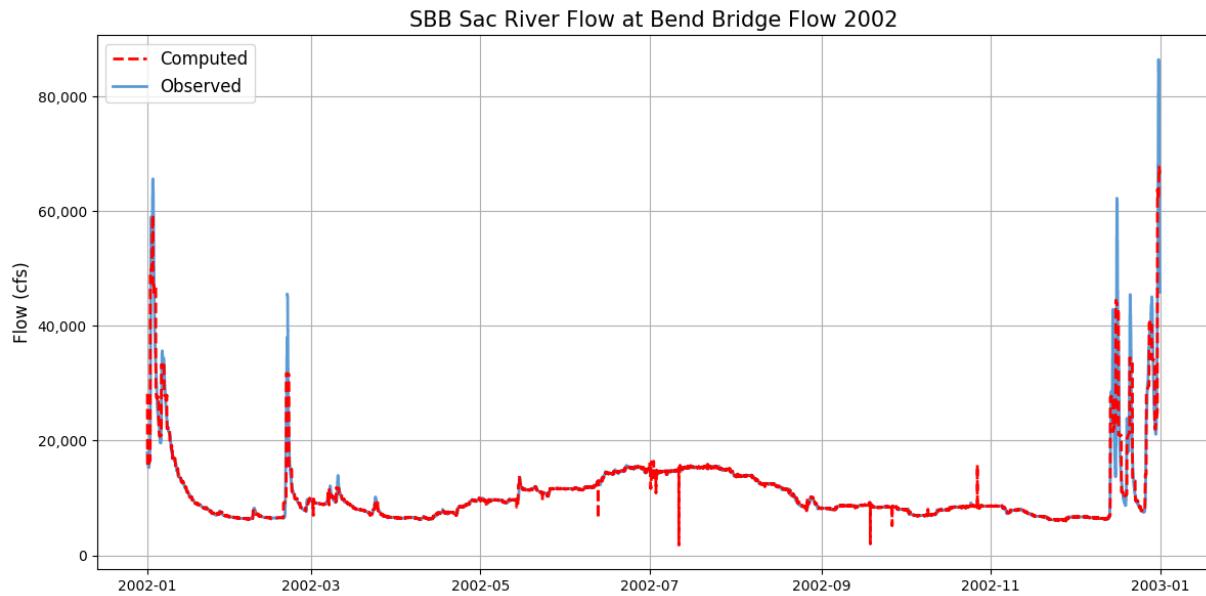


Figure 216. SBB Sac River Flow at Bend Bridge Flow 2002

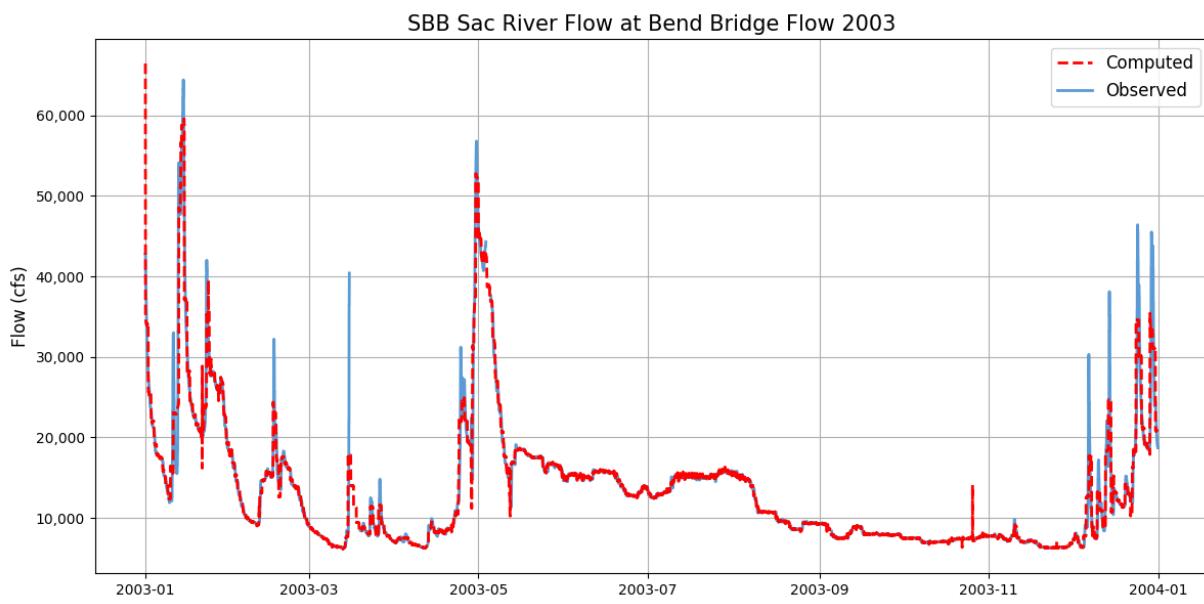


Figure 217. SBB Sac River Flow at Bend Bridge Flow 2003

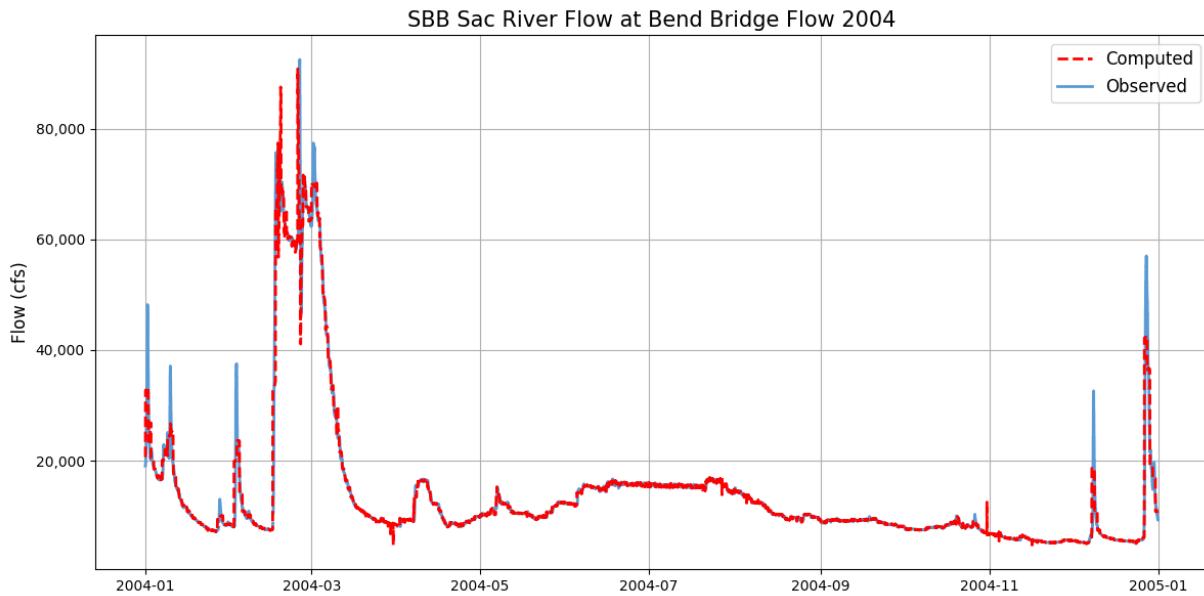


Figure 218. SBB Sac River Flow at Bend Bridge Flow 2004

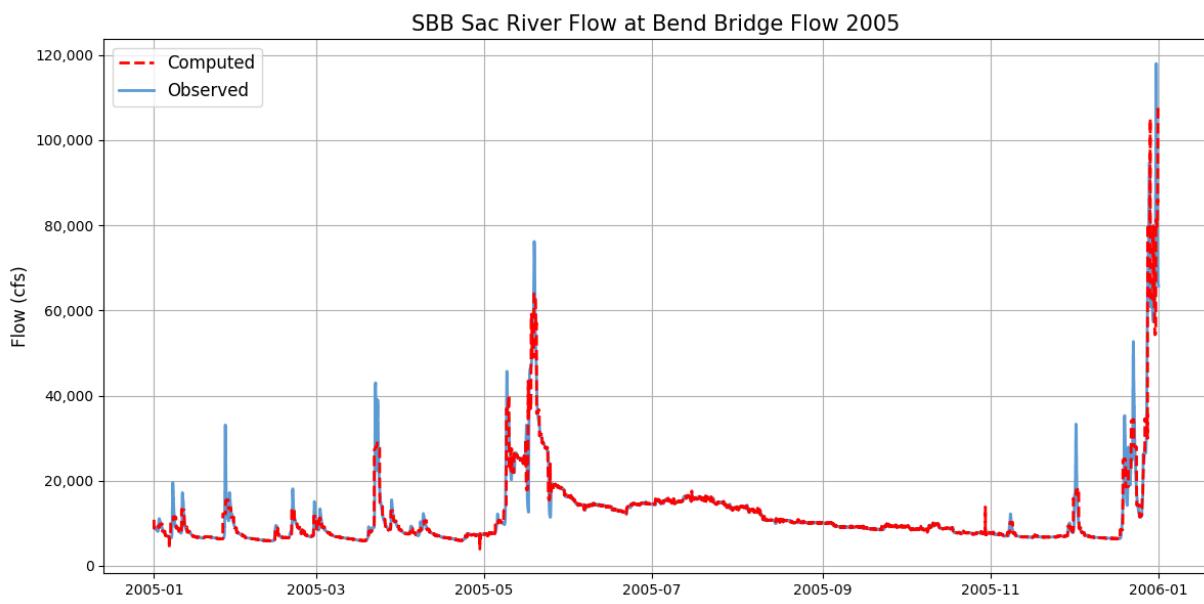


Figure 219. SBB Sac River Flow at Bend Bridge Flow 2005

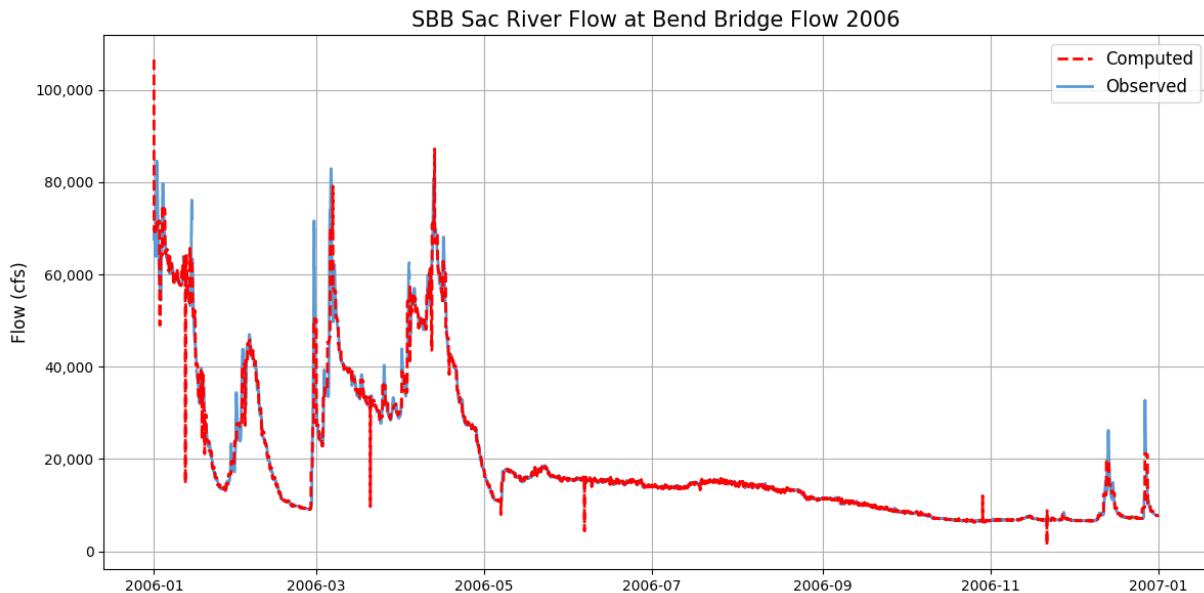


Figure 220. SBB Sac River Flow at Bend Bridge Flow 2006

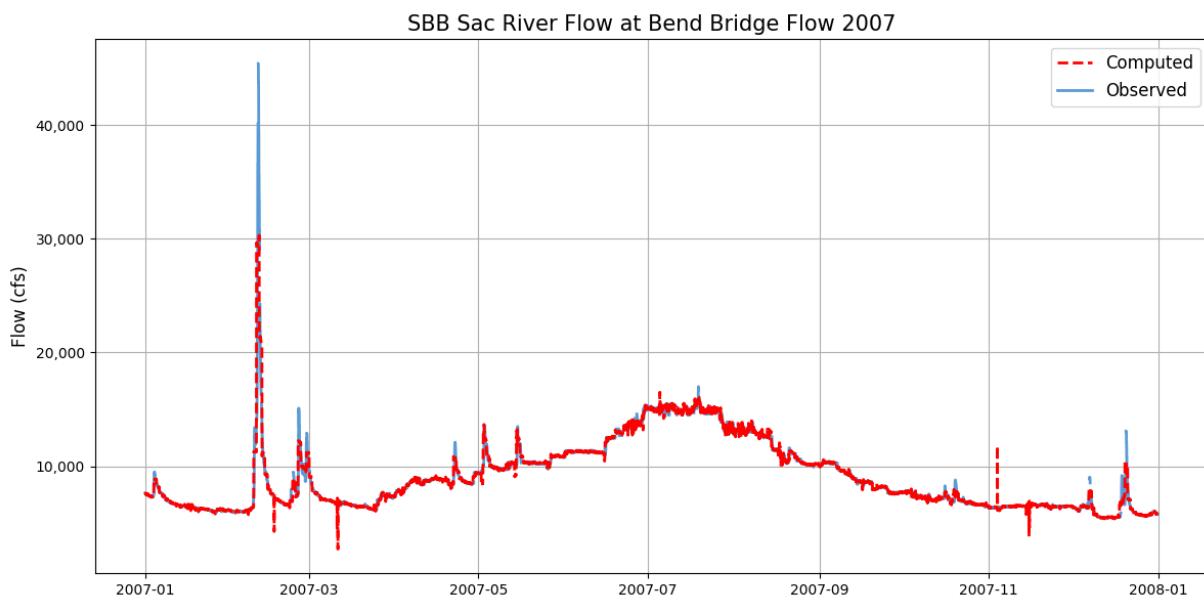


Figure 221. SBB Sac River Flow at Bend Bridge Flow 2007

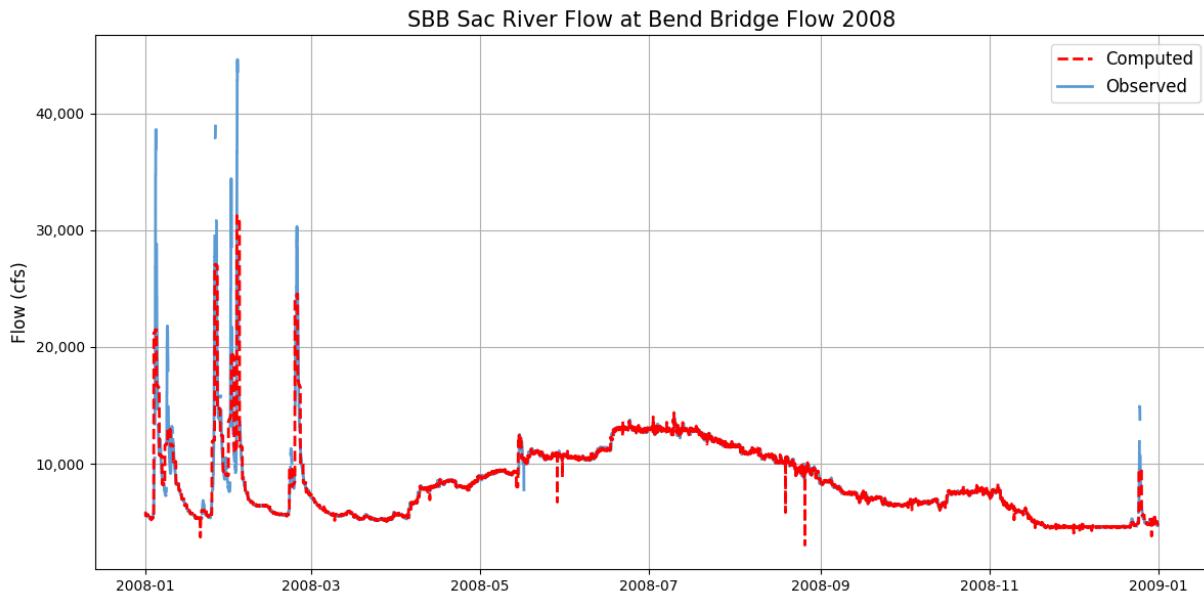


Figure 222. SBB Sac River Flow at Bend Bridge Flow 2008

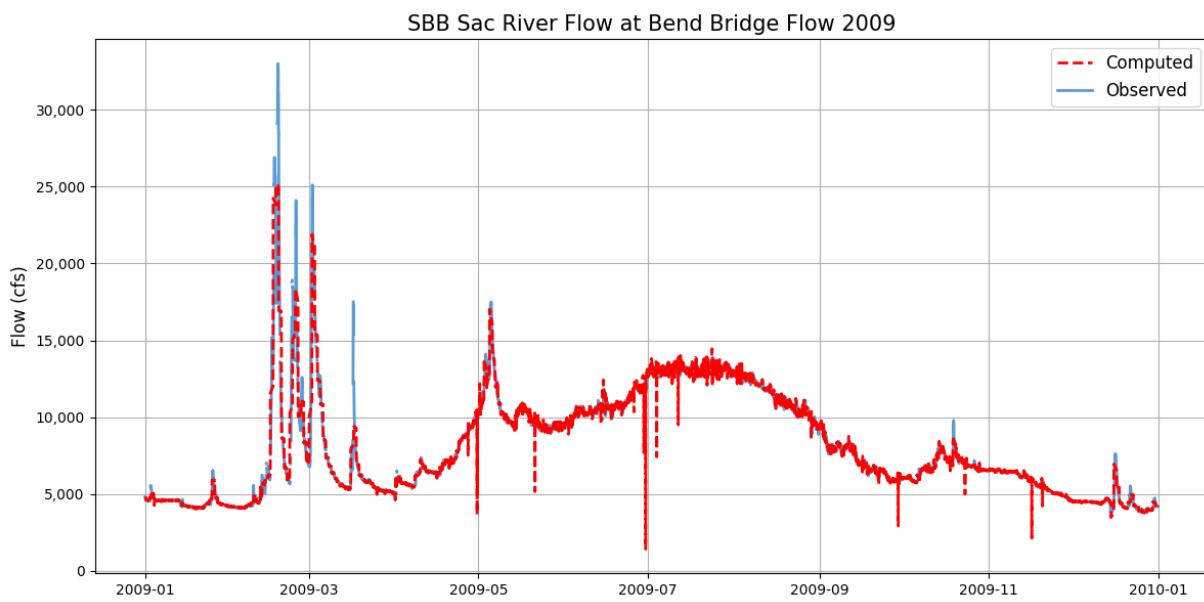


Figure 223. SBB Sac River Flow at Bend Bridge Flow 2009

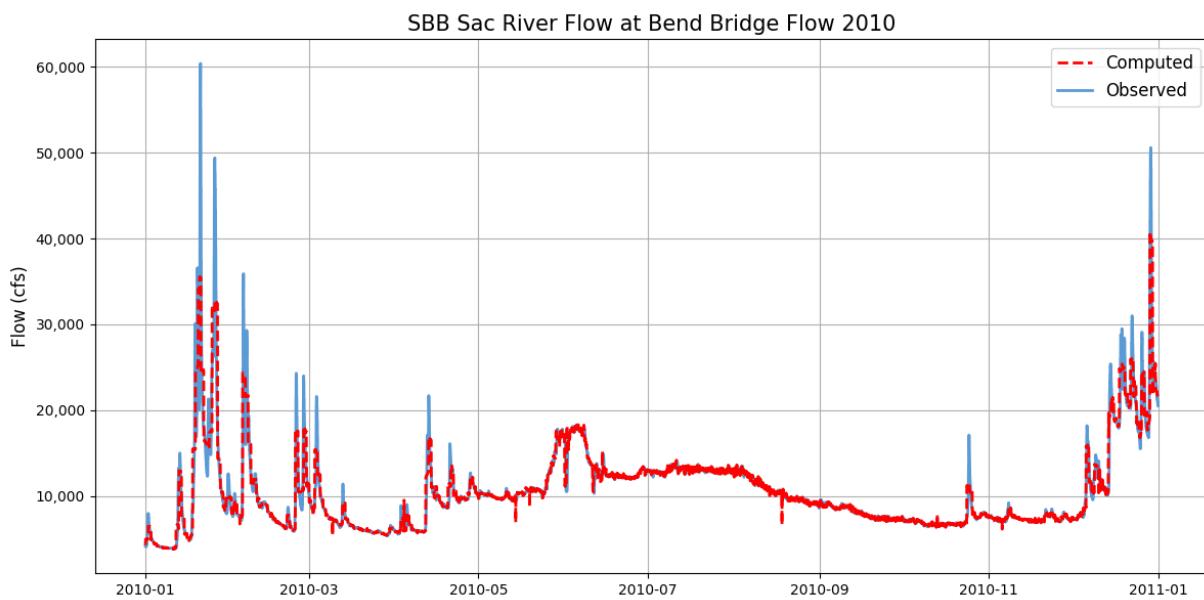


Figure 224. SBB Sac River Flow at Bend Bridge Flow 2010

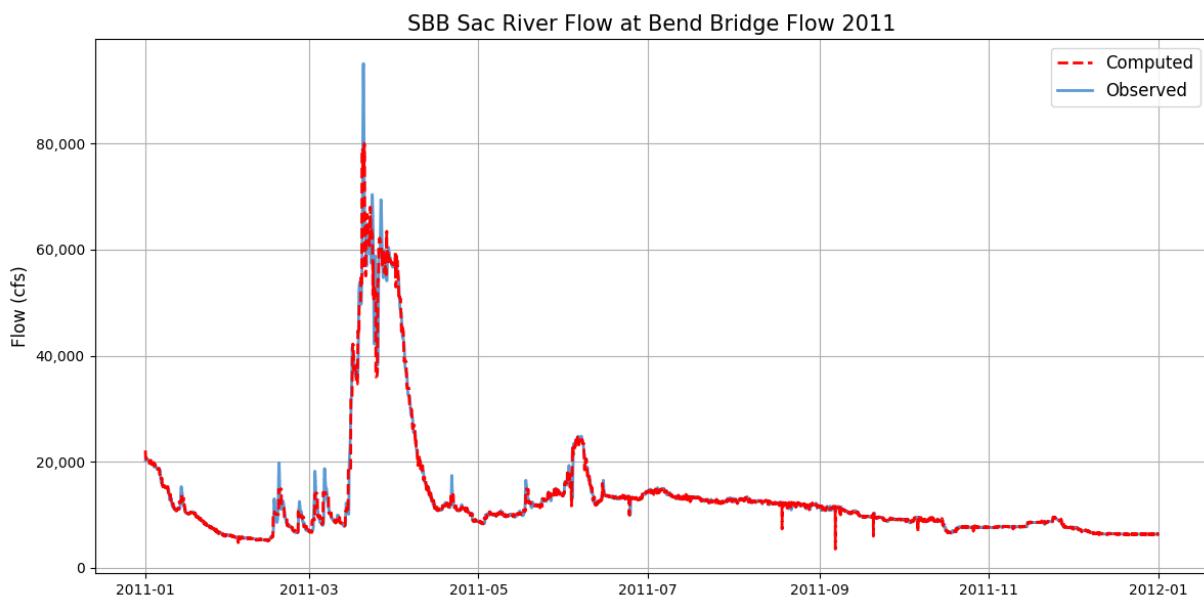


Figure 225. SBB Sac River Flow at Bend Bridge Flow 2011

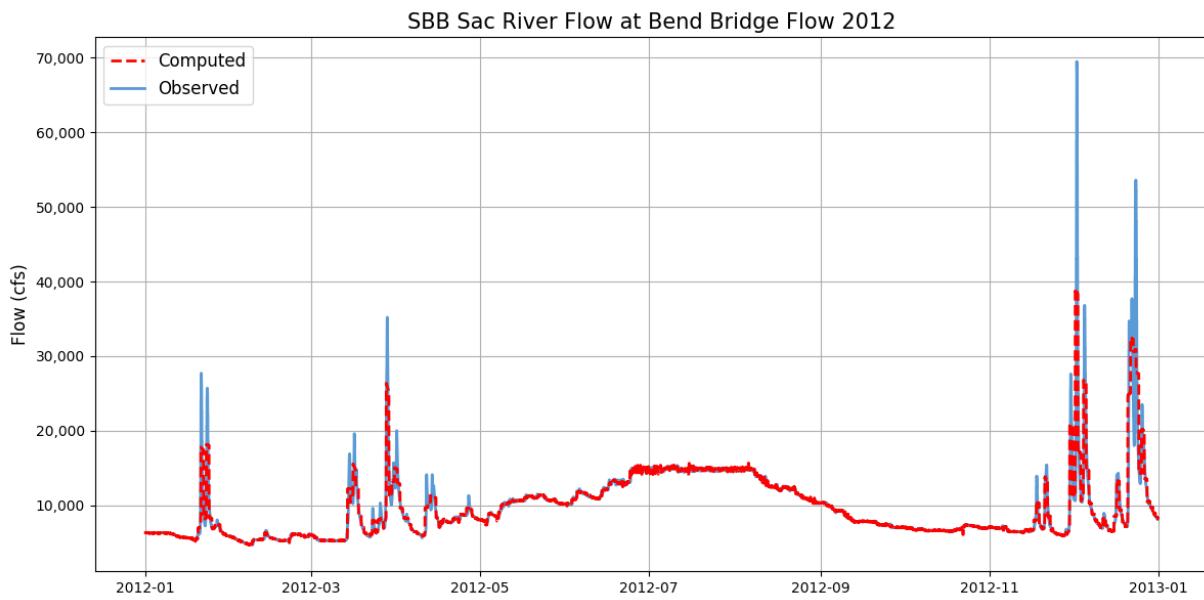


Figure 226. SBB Sac River Flow at Bend Bridge Flow 2012

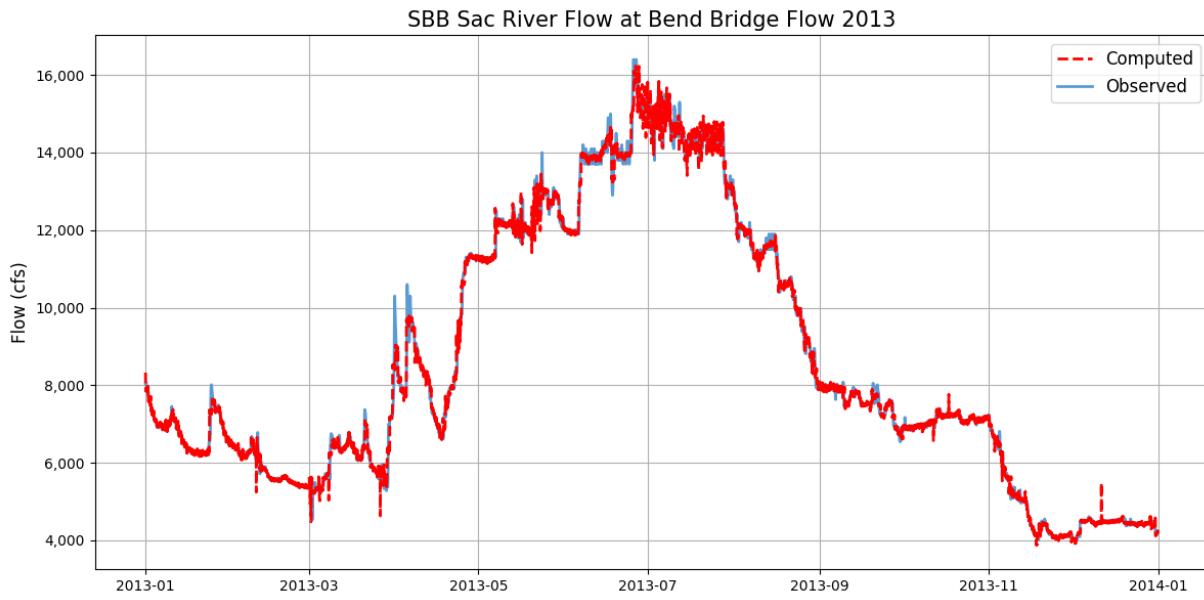


Figure 227. SBB Sac River Flow at Bend Bridge Flow 2013

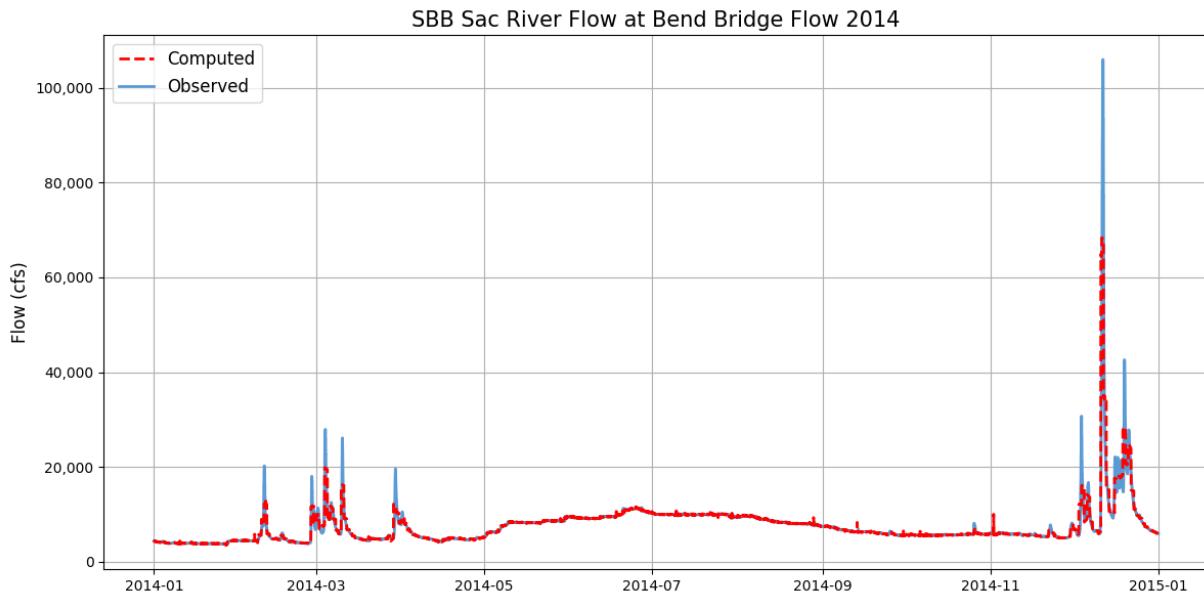


Figure 228. SBB Sac River Flow at Bend Bridge Flow 2014

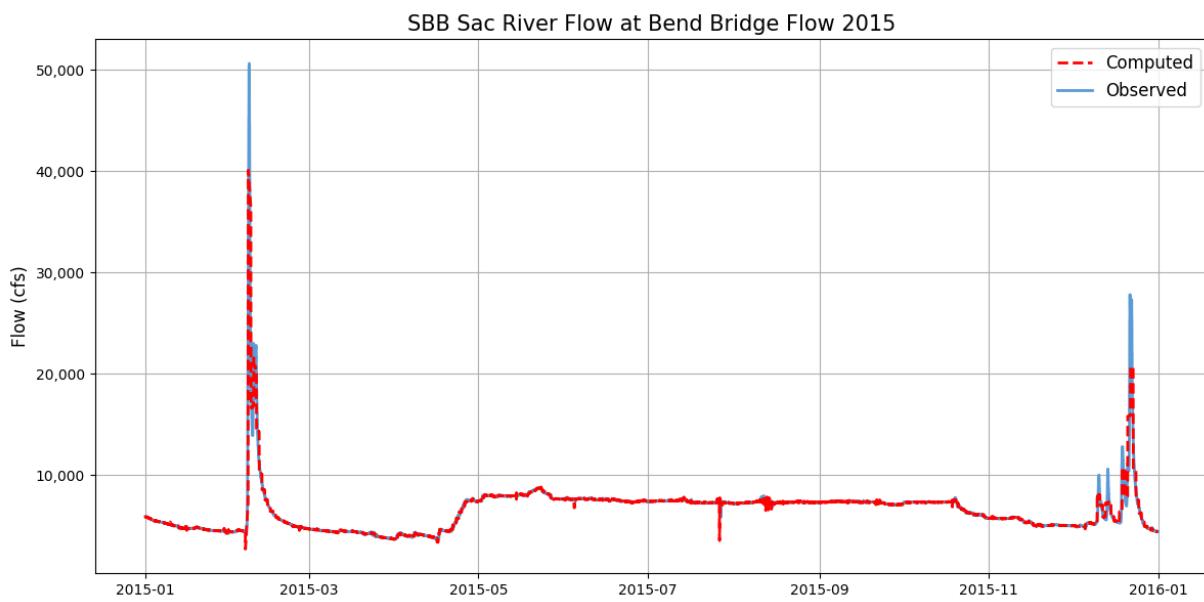


Figure 229. SBB Sac River Flow at Bend Bridge Flow 2015

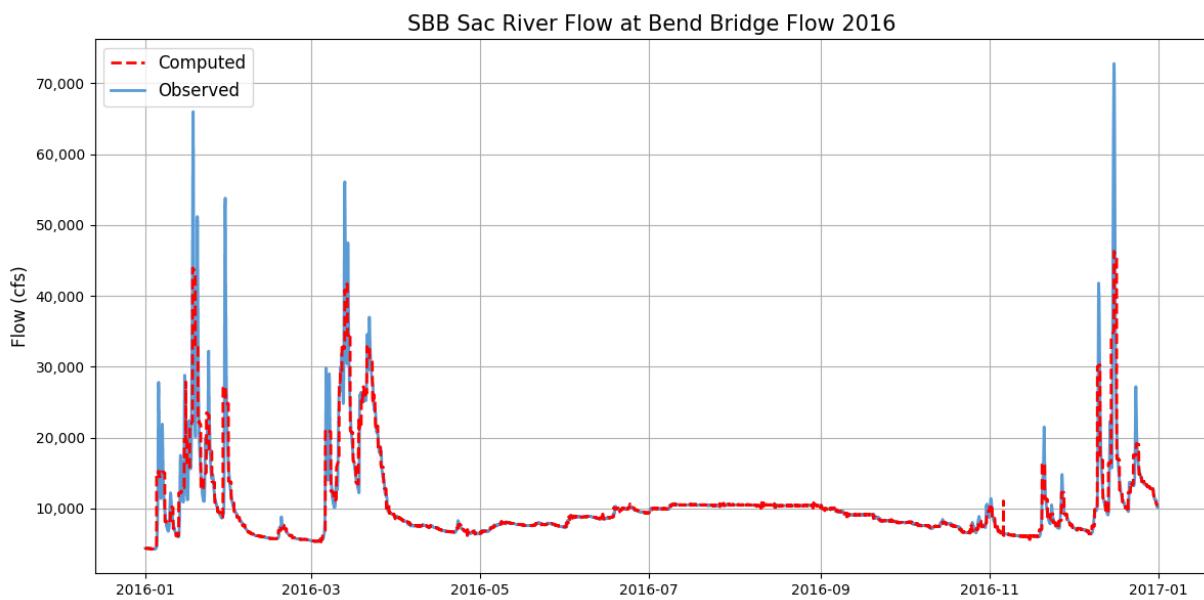


Figure 230. SBB Sac River Flow at Bend Bridge Flow 2016

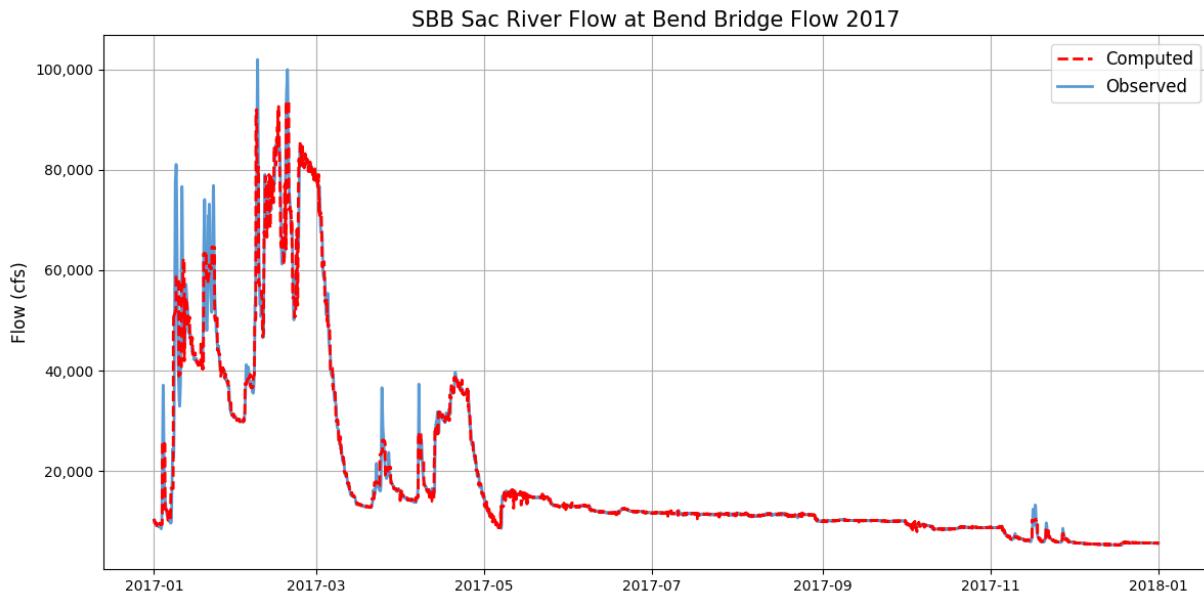


Figure 231. SBB Sac River Flow at Bend Bridge Flow 2017

Table 62. SBB Sac River at Bend Bridge Flow Error Statistics

Statistics	2000	2001	2002	2003	2004	2005
Mean Bias (cfs)	-509.63	-2.34	-3.75	1.21	3.75	-6.13
MAE (cfs)	1,032.49	538.25	444.35	591.83	607.74	747.22
RMSE (cfs)	2,734.14	1,687.42	1,819.16	1,764.20	2,283.36	2,740.84
Nash-Sutcliffe (NSE)	0.95	0.85	0.93	0.95	0.97	0.92
COUNT	8,040	8,760	8,760	8,760	8,784	8,760

Statistics	2006	2007	2008	2009	2010	2011
Mean Bias (cfs)	6.00	0.97	-0.69	1.75	-0.63	0.69
MAE (cfs)	798.70	202.82	326.55	273.42	612.46	466.95
RMSE (cfs)	2,288.64	738.74	1,292.68	749.00	1,701.98	1,396.33
Nash-Sutcliffe (NSE)	0.98	0.94	0.87	0.95	0.89	0.98
COUNT	8,760	8,760	8,784	8,760	8,760	8,760

Statistics	2012	2013	2014	2015	2016	2017
Mean Bias (cfs)	-0.17	0.31	-0.19	0.12	-0.24	0.24
MAE (cfs)	463.57	122.89	400.91	152.02	724.24	871.37
RMSE (cfs)	1,800.74	206.74	2,070.52	783.45	2,587.98	2,675.37

Statistics	2012	2013	2014	2015	2016	2017
Nash-Sutcliffe (NSE)	0.85	1.00	0.83	0.91	0.83	0.98
COUNT	8,784	8,760	8,760	8,760	8,784	8,760

Table 63. SBB Sac River Flow at Bend Bridge Flow MeanBias

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	-2,476.	-3,001.	-98.19	361.87	126.89	33.29	146.61	-21.52	-94.15	-300.84	-336.07
2001	-1.35	-2.59	2.97	2.34	0.56	-1.83	1.22	-1.66	-0.94	-1.92	-8.99	-15.53
2002	25.22	-16.19	4.74	0.87	0.94	0.05	1.68	0.08	-2.65	-0.05	-0.12	-59.95
2003	56.57	1.84	-28.71	-68.59	57.79	3.61	0.13	0.34	-0.54	-0.15	-1.18	-9.58
2004	11.35	23.34	20.64	0.42	-0.48	0.83	2.05	-0.64	-2.56	-0.22	-0.66	-8.33
2005	5.20	-6.02	4.40	3.13	-0.67	2.88	2.17	1.53	-1.62	-0.55	-1.47	-81.39
2006	62.64	-29.76	59.96	-30.13	-1.18	3.05	-0.59	-0.12	-1.03	-1.05	10.24	-5.58
2007	1.56	-4.69	5.52	0.89	4.07	2.75	12.04	-1.70	-2.50	-0.85	0.60	-5.65
2008	-43.85	48.62	4.13	1.14	-0.74	3.23	3.75	-2.90	-4.37	-3.02	-0.16	-9.34
2009	-0.61	17.41	1.31	5.70	0.98	2.12	0.46	0.15	-2.76	0.44	-0.19	-1.00
2010	-5.37	-2.22	6.42	-1.76	2.04	2.52	1.18	-0.06	-1.62	-1.25	0.17	-7.68
2011	7.41	-1.68	-8.37	9.09	0.43	1.92	1.49	0.24	-1.88	-0.01	-0.64	0.22
2012	-0.47	0.37	-12.00	12.18	1.66	1.27	0.65	0.74	-2.82	-0.37	-16.33	12.88
2013	2.20	0.69	-0.28	0.94	0.25	0.20	1.10	-0.09	-1.16	-0.66	0.76	-0.19
2014	-0.36	-5.94	-0.46	5.89	0.13	0.24	0.41	0.06	-0.27	0.03	-1.82	-0.65
2015	1.81	-0.85	0.62	0.38	0.17	0.39	0.32	-0.03	-1.10	-0.22	-0.20	0.03
2016	-10.19	9.84	-1.83	2.42	0.95	1.32	0.21	0.31	-1.94	-4.39	1.76	-0.51
2017	-4.45	-1.15	1.36	2.48	3.07	1.46	0.74	-0.12	-0.43	-0.55	0.14	0.24
All	6.53	-141.91	-167.83	-8.55	24.26	8.59	3.39	8.07	-2.88	-5.97	-18.21	-29.57

Table 64. SBB Sac River Flow at Bend Bridge Flow MAE

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	4,966.4	3,729.6	637.97	497.04	224.14	212.45	225.97	156.17	154.73	307.39	377.57
2001	595.02	797.28	1,092.8	106.58	167.67	256.59	341.17	182.11	117.16	94.25	568.16	2,088.4
2002	997.00	540.75	211.69	89.91	156.06	140.34	219.93	149.55	87.16	97.20	72.91	2,504.3
2003	1,775.7	583.77	419.76	889.45	499.93	164.22	214.47	159.97	85.15	75.27	91.89	2,044.8

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	1,045.5	2,861.6	784.10	275.91	212.77	237.42	282.90	150.70	88.20	147.76	83.84	1,203.5
2005	939.98	283.54	754.94	210.07	2,196.5	148.39	241.01	157.54	107.37	150.11	167.34	3,469.6
2006	2,354.8	1,438.4	1,801.3	1,815.7	305.93	233.93	207.51	208.70	167.38	83.77	84.93	665.82
2007	82.33	819.63	110.74	135.93	230.30	150.50	287.71	183.29	77.99	129.03	78.55	195.33
2008	1,626.3	1,041.4	62.75	114.69	197.16	134.28	159.15	202.27	98.20	123.48	81.55	122.82
2009	73.47	1,080.1	461.36	158.89	273.89	271.58	317.63	264.20	189.24	138.41	69.46	118.60
2010	2,201.2	1,024.3	322.02	540.54	237.68	472.50	243.32	254.43	186.54	291.38	152.99	1,427.0
2011	277.55	416.02	2,643.1	637.06	292.85	548.08	187.86	193.31	140.17	131.86	65.02	49.58
2012	490.72	70.36	828.49	410.17	128.38	212.58	232.04	169.95	75.78	43.90	380.40	2,472.2
2013	81.02	50.57	168.71	162.27	146.24	186.51	277.06	138.21	92.58	42.38	84.07	39.19
2014	43.76	483.05	862.57	113.76	88.09	105.39	97.39	82.75	81.22	70.59	125.95	2,626.4
2015	35.06	690.74	28.74	91.47	52.82	39.66	64.17	67.19	38.10	46.14	34.75	674.30
2016	3,488.1	109.30	1,934.6	70.79	48.07	100.40	45.29	44.41	62.29	162.97	388.73	2,122.8
2017	3,943.9	3,509.2	1,221.0	935.99	323.88	98.47	104.38	95.93	30.70	100.43	250.84	25.33
All	1,180.0	1,162.3	985.96	412.48	337.53	207.82	206.94	162.29	104.55	115.68	173.36	1,244.8

Table 65. SBB Sac River Flow at Bend Bridge Flow RMSE

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	7,275.1	5,382.3	1,000.7	595.13	323.00	295.15	266.21	204.97	231.86	348.79	477.85
2001	1,581.0	1,477.6	3,624.2	166.13	289.71	386.93	570.00	240.02	216.01	238.90	1,476.9	3,571.3
2002	2,759.6	1,834.6	419.08	137.91	337.74	303.52	645.80	222.66	300.62	300.45	105.22	5,193.2
2003	3,564.9	1,148.8	1,675.2	2,237.6	888.36	224.84	279.65	238.74	121.76	264.36	157.48	3,692.2
2004	2,464.6	6,472.8	1,548.6	535.57	388.21	351.66	344.62	207.61	121.60	302.87	133.76	3,599.3
2005	2,330.9	707.95	2,314.3	435.39	4,438.4	245.01	317.68	240.18	160.06	298.79	362.95	7,524.1
2006	4,323.2	3,393.7	4,055.4	3,174.2	519.95	524.43	260.27	276.46	227.23	233.94	151.33	1,856.4
2007	124.00	2,407.8	246.53	250.29	479.17	257.82	375.07	275.66	114.45	228.30	261.99	507.61
2008	3,480.4	2,756.0	85.80	173.43	422.65	189.21	237.15	382.58	131.34	167.00	119.95	453.96
2009	137.91	2,193.6	1,219.8	333.90	456.94	552.54	474.06	334.03	265.18	225.76	170.47	258.54
2010	4,441.4	2,120.6	918.01	1,083.0	410.89	1,045.2	303.07	336.32	239.45	759.74	220.28	2,496.0
2011	446.80	922.15	4,398.1	935.72	453.96	1,125.8	245.37	314.52	373.08	218.48	123.82	75.02

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	1,573.3	120.29	1,705.6	788.31	193.61	292.71	285.29	233.24	114.24	70.98	1,056.5	5,560.4
2013	136.35	87.88	304.97	244.86	252.62	285.00	338.92	180.84	122.84	60.70	119.70	67.00
2014	73.81	1,337.1	1,973.5	194.42	154.04	182.04	151.40	122.89	137.39	165.35	265.29	6,687.0
2015	62.21	2,240.2	44.79	136.30	83.33	59.49	220.54	128.64	58.30	81.39	54.37	1,606.4
2016	6,000.8	215.59	3,478.3	139.07	73.03	164.46	81.34	86.85	103.79	318.60	830.82	5,484.4
2017	7,031.9	5,458.4	2,136.0	1,623.8	609.70	152.93	151.77	133.61	48.25	194.26	539.04	41.07
All	3,194.3	3,133.4	2,548.4	1,111.0	1,137.6	466.87	338.97	246.29	190.17	284.36	524.59	3,681.7

RDB Sac River at Red Bluff Div Dam Temperature

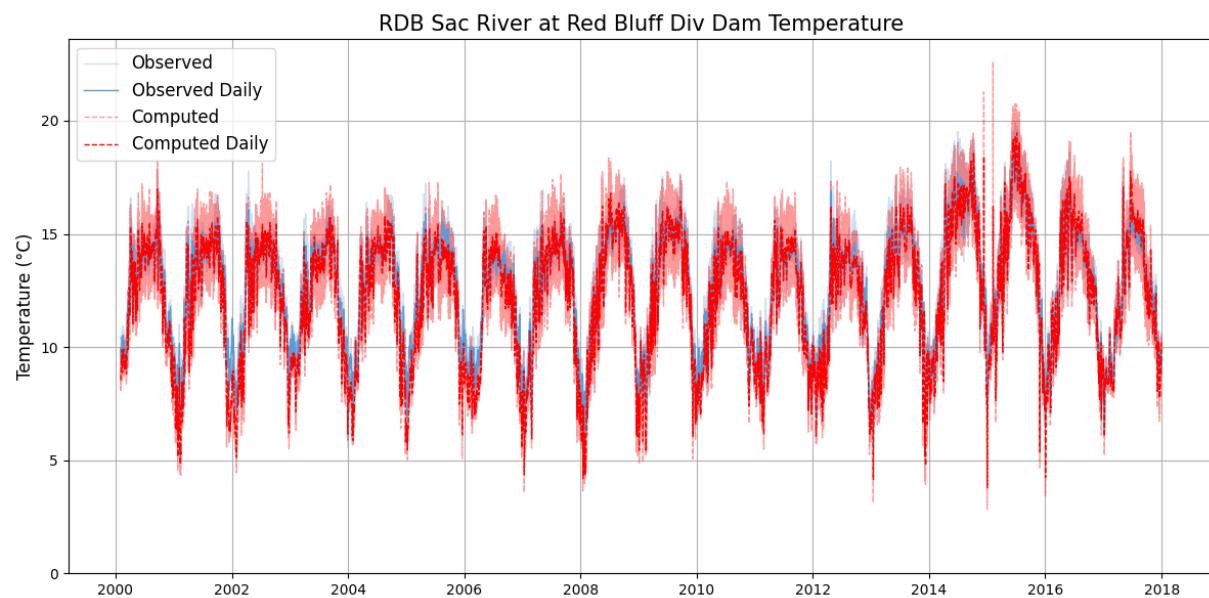


Figure 232. RDB Sac River at Red Bluff Div Dam Temperature

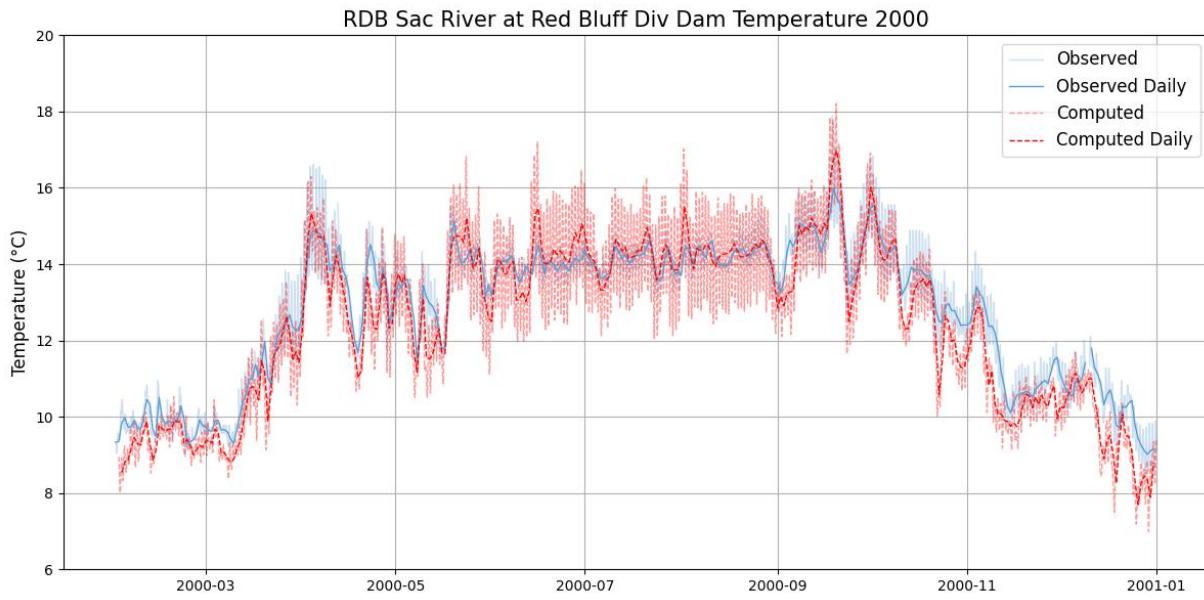


Figure 233. RDB Sac River at Red Bluff Div Dam Temperature 2000

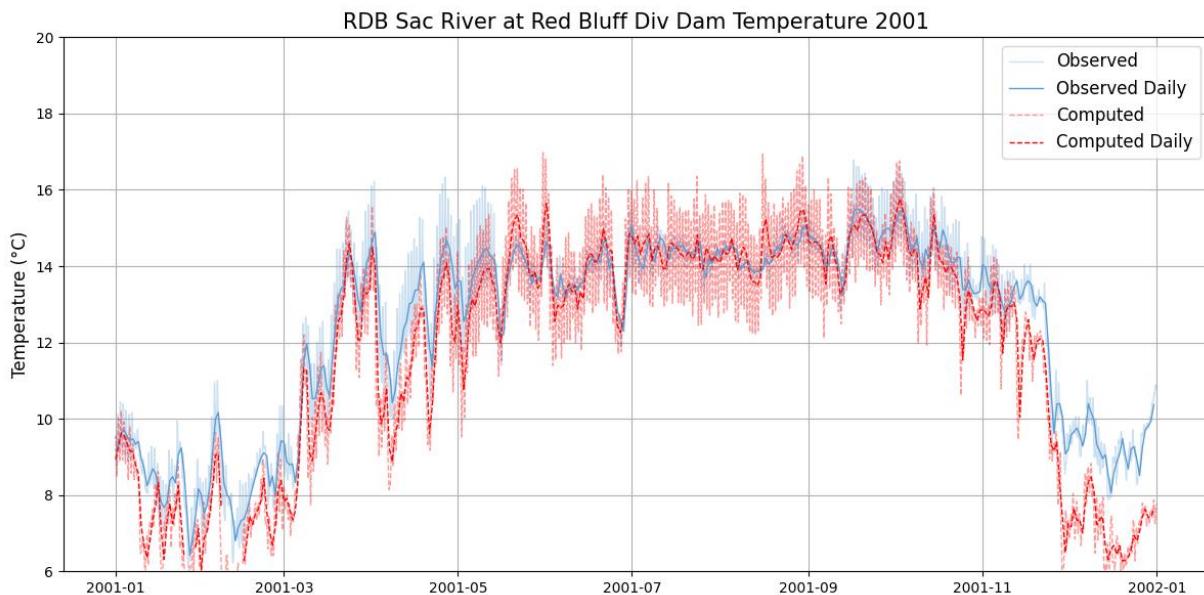


Figure 234. RDB Sac River at Red Bluff Div Dam Temperature 2001

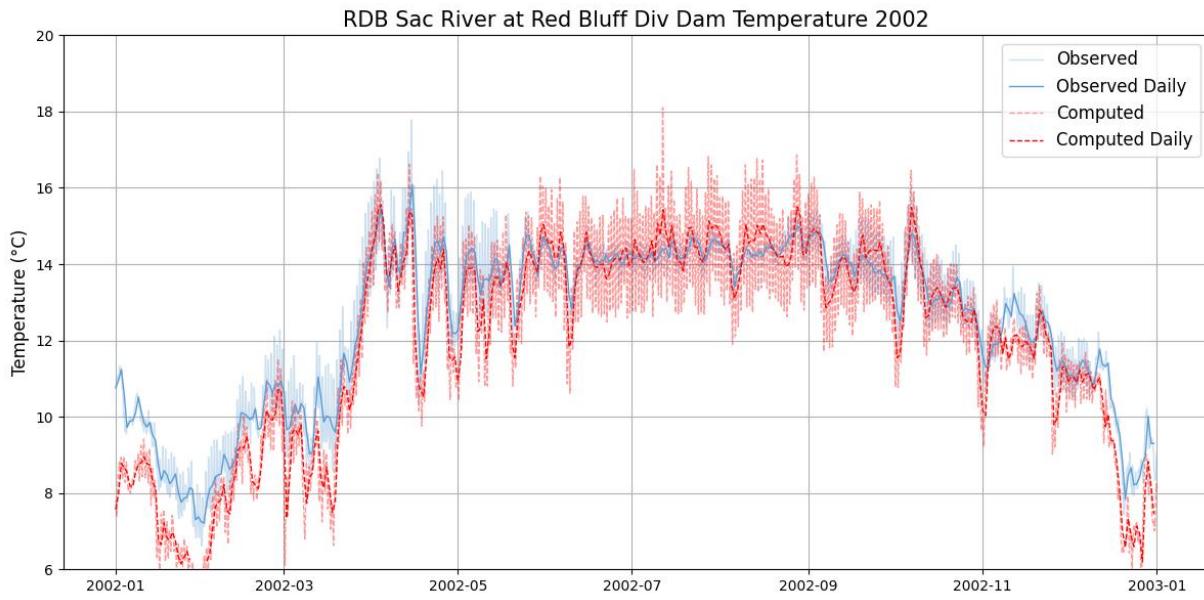


Figure 235. RDB Sac River at Red Bluff Div Dam Temperature 2002

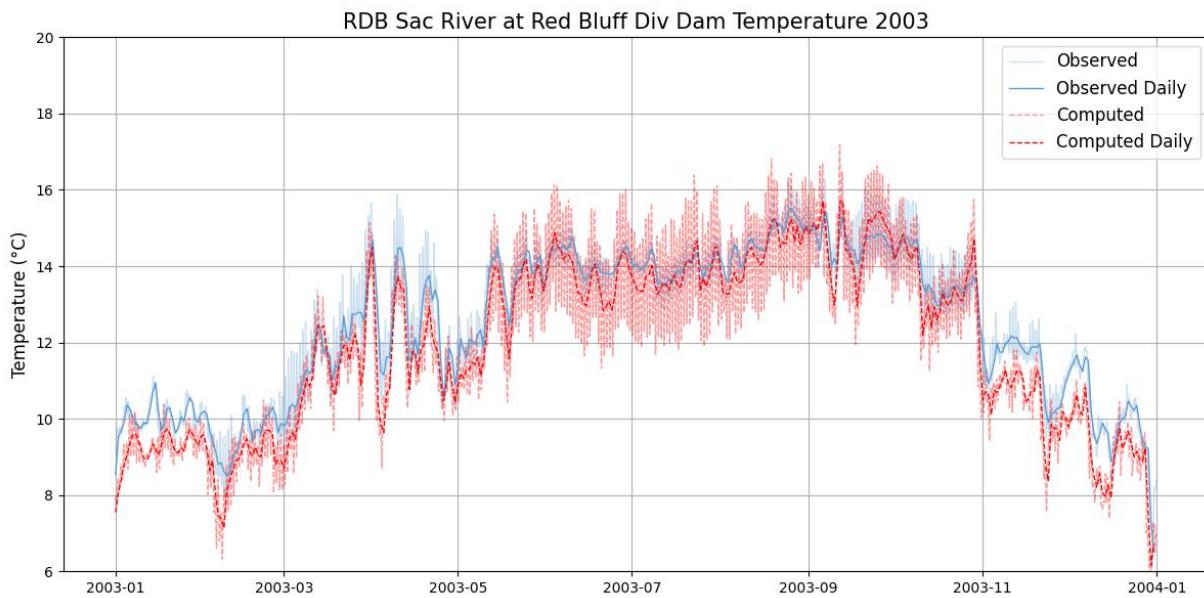


Figure 236. RDB Sac River at Red Bluff Div Dam Temperature 2003

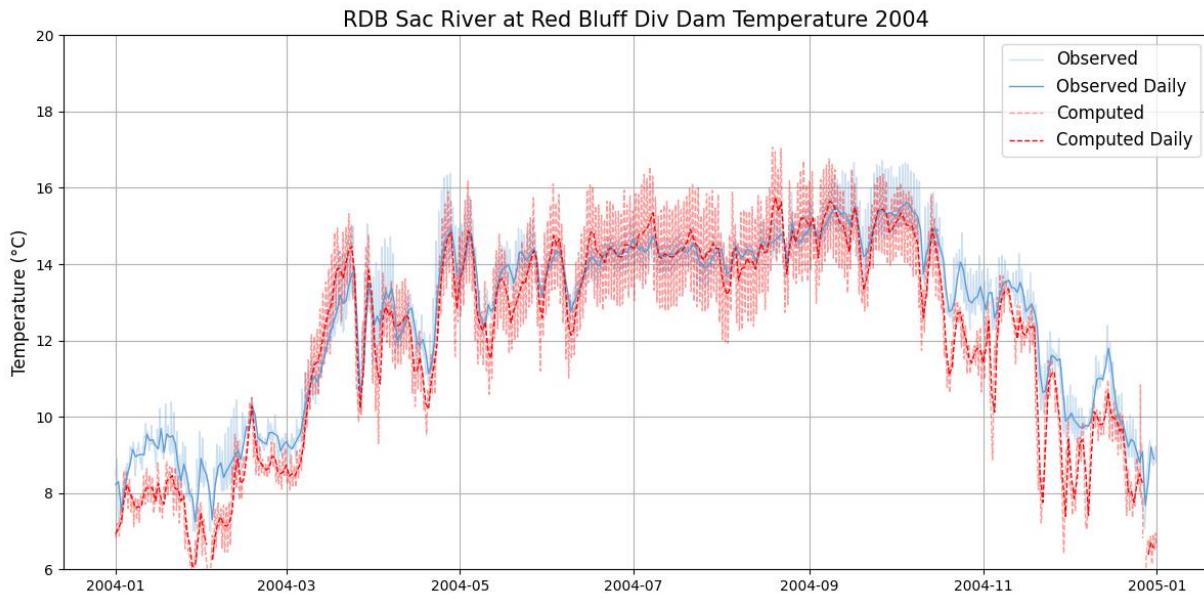


Figure 237. RDB Sac River at Red Bluff Div Dam Temperature 2004

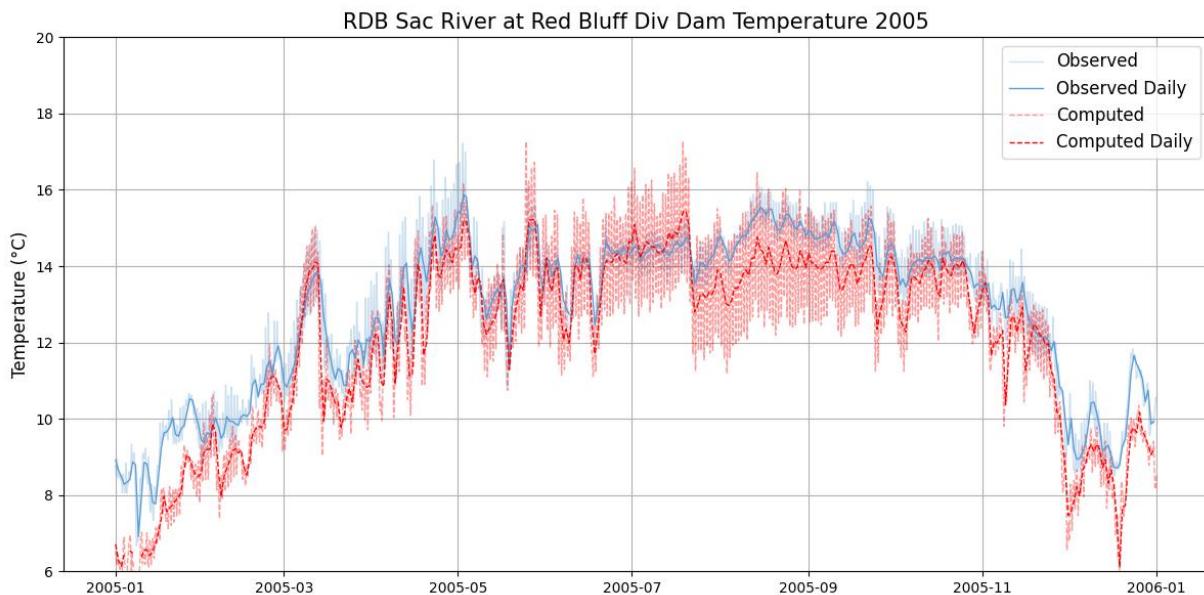


Figure 238. RDB Sac River at Red Bluff Div Dam Temperature 2005

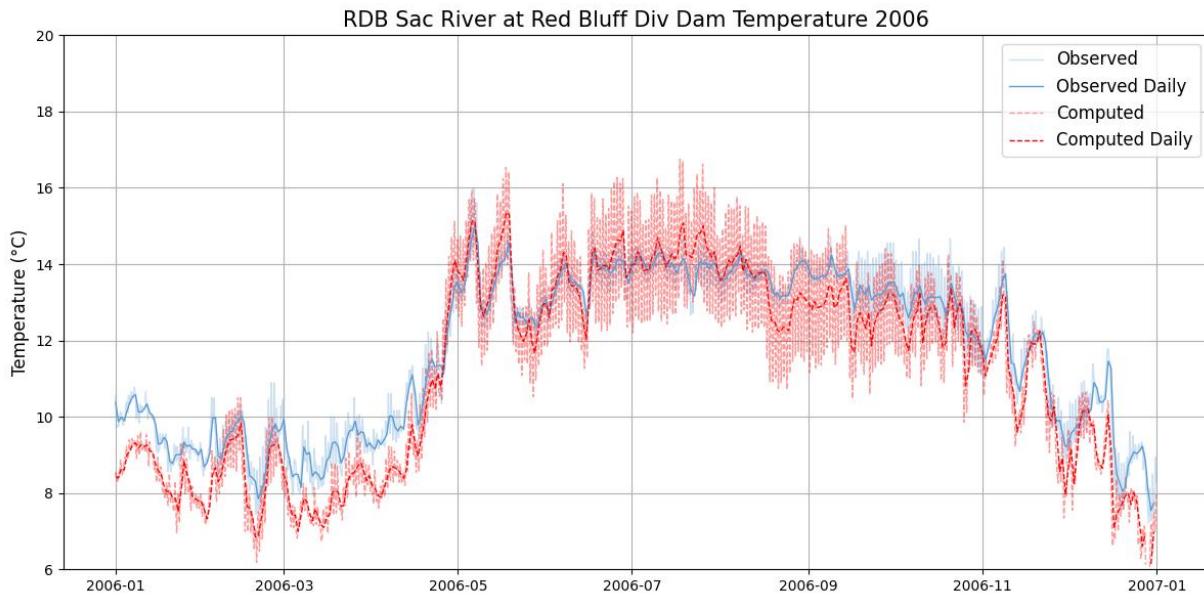


Figure 239. RDB Sac River at Red Bluff Div Dam Temperature 2006

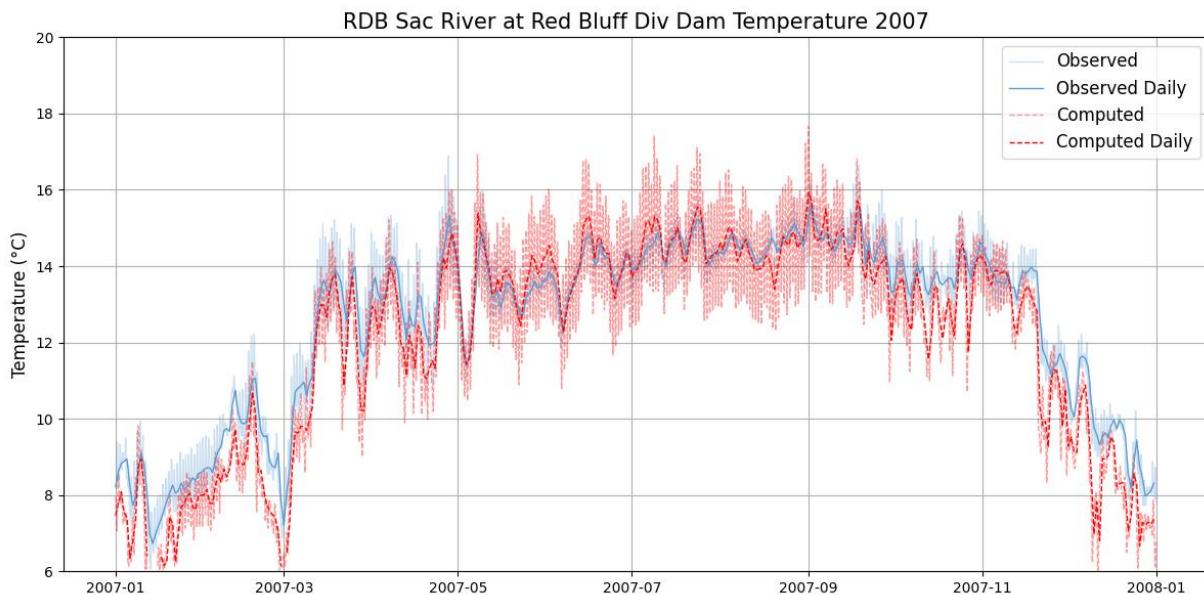


Figure 240. RDB Sac River at Red Bluff Div Dam Temperature 2007

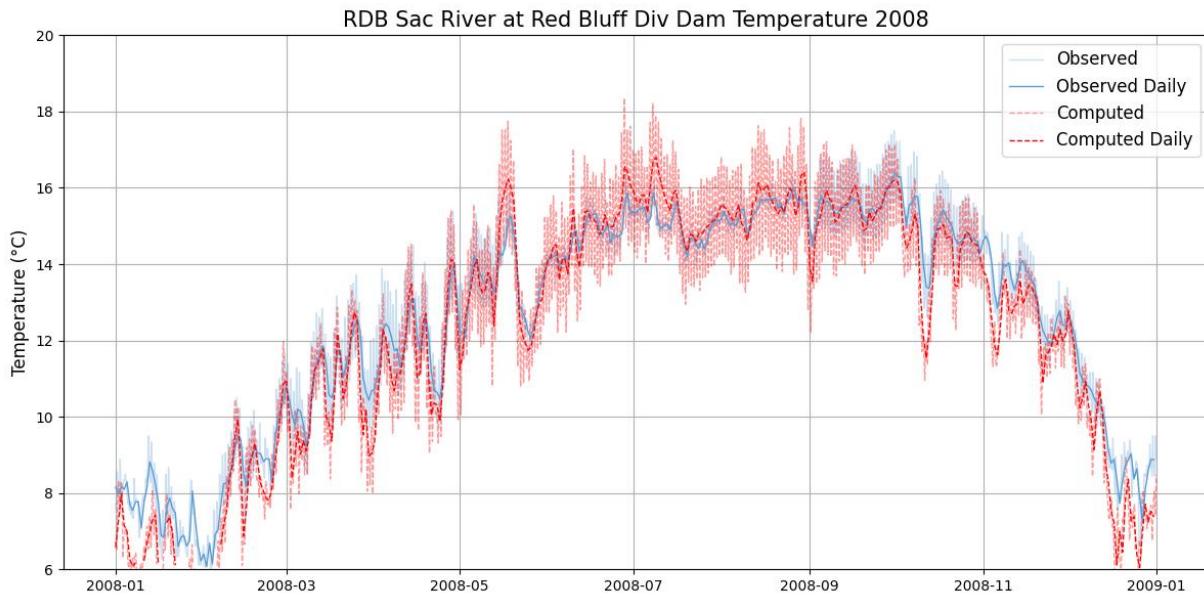


Figure 241. RDB Sac River at Red Bluff Div Dam Temperature 2008

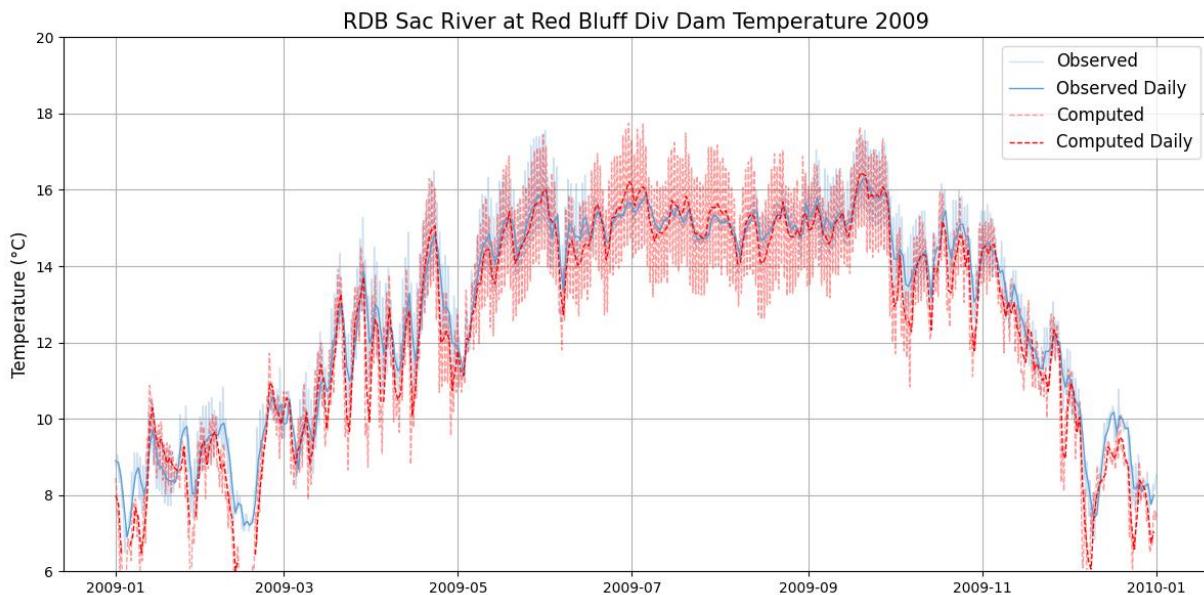


Figure 242. RDB Sac River at Red Bluff Div Dam Temperature 2009

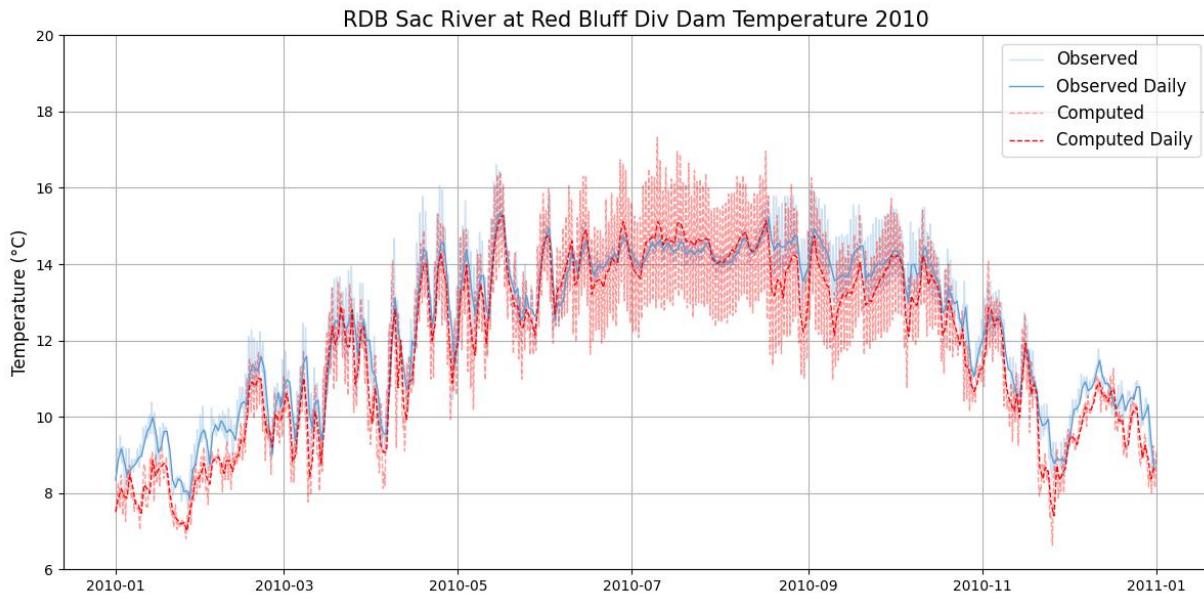


Figure 243. RDB Sac River at Red Bluff Div Dam Temperature 2010

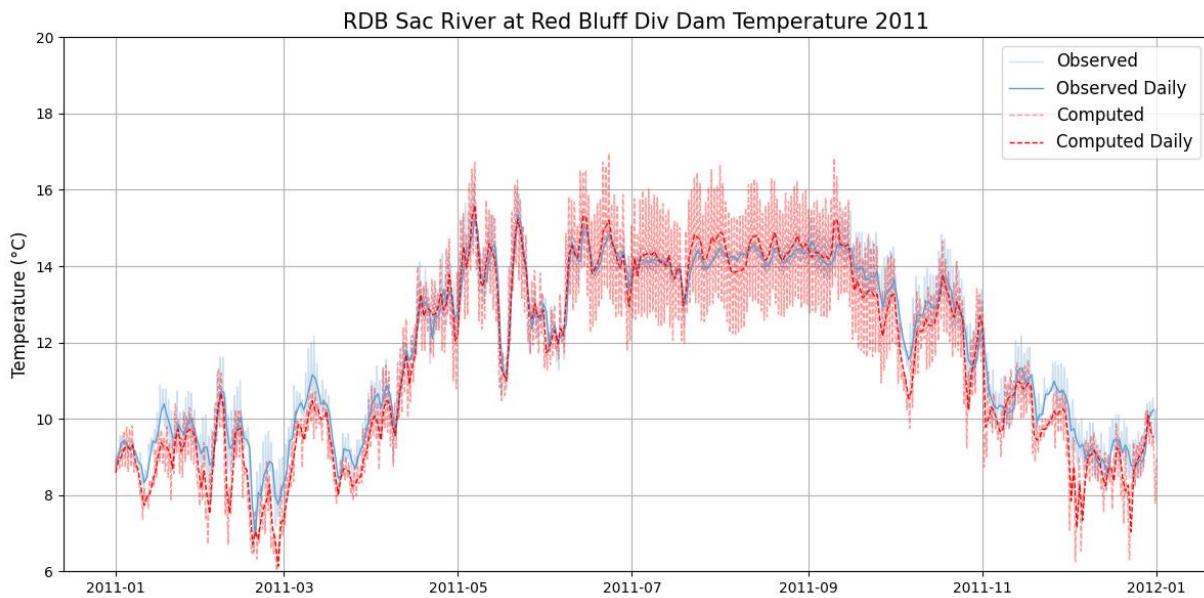


Figure 244. RDB Sac River at Red Bluff Div Dam Temperature 2011

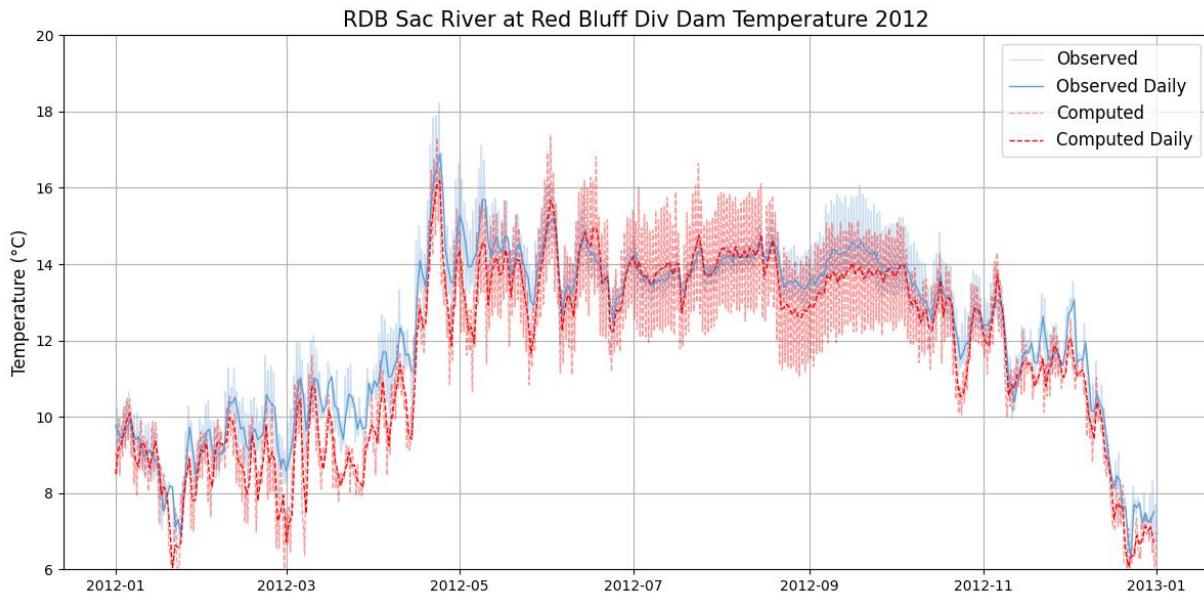


Figure 245. RDB Sac River at Red Bluff Div Dam Temperature 2012

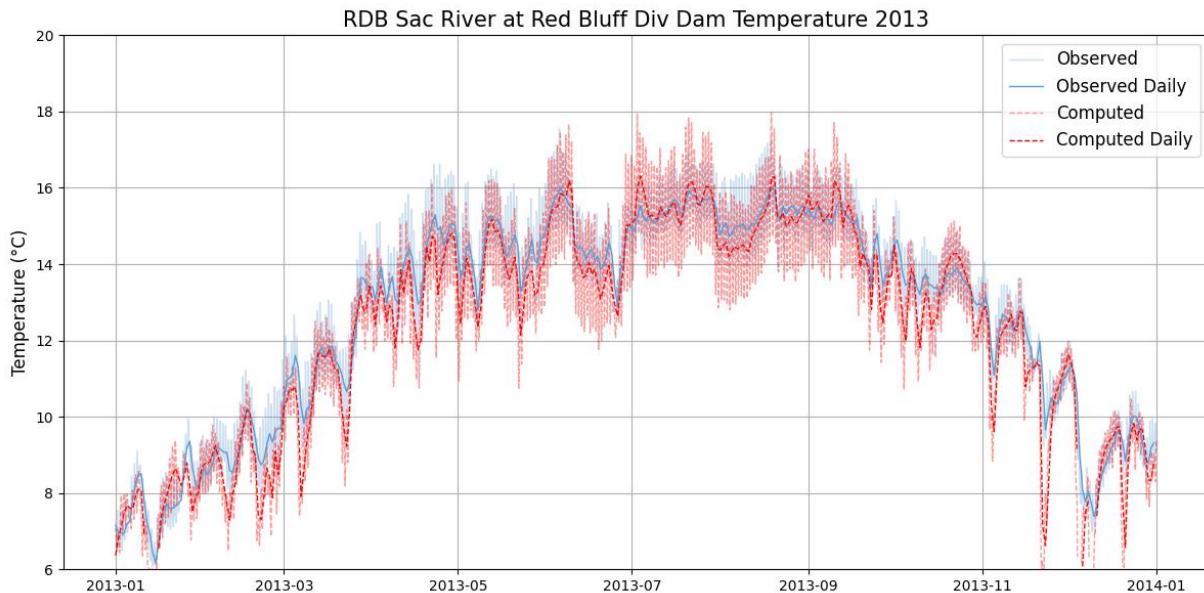


Figure 246. RDB Sac River at Red Bluff Div Dam Temperature 2013

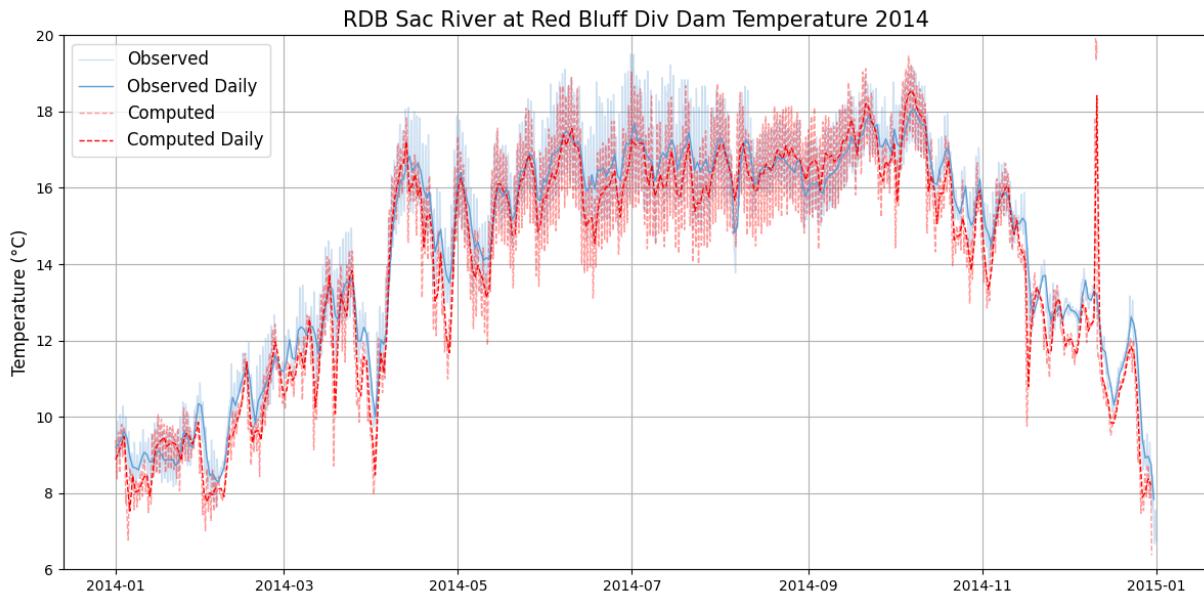


Figure 247. RDB Sac River at Red Bluff Div Dam Temperature 2014

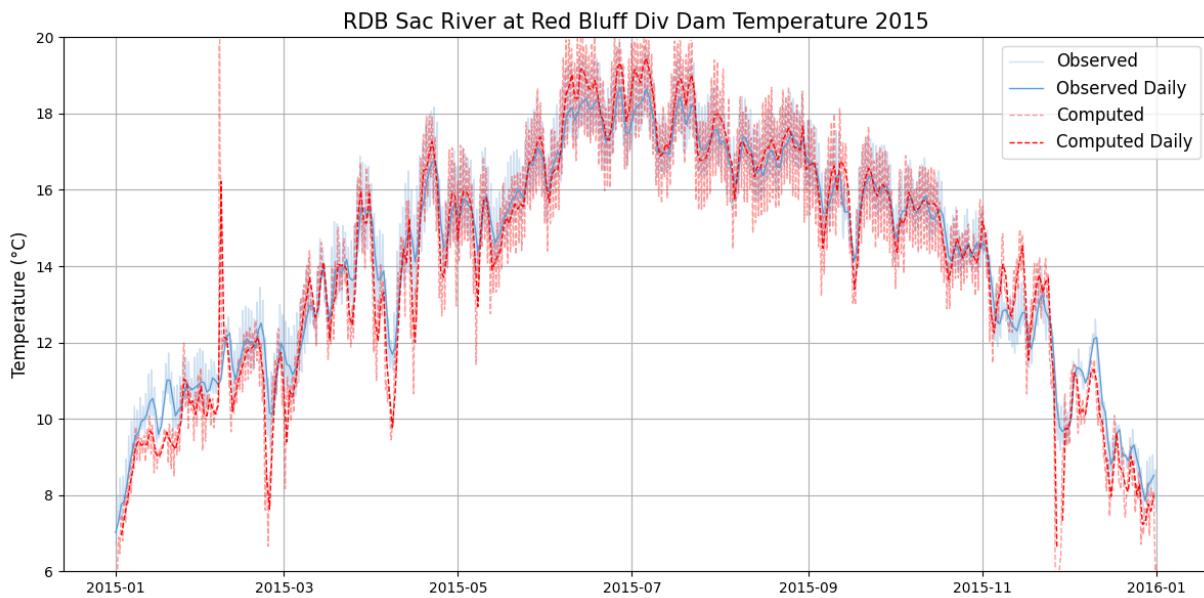


Figure 248. RDB Sac River at Red Bluff Div Dam Temperature 2015

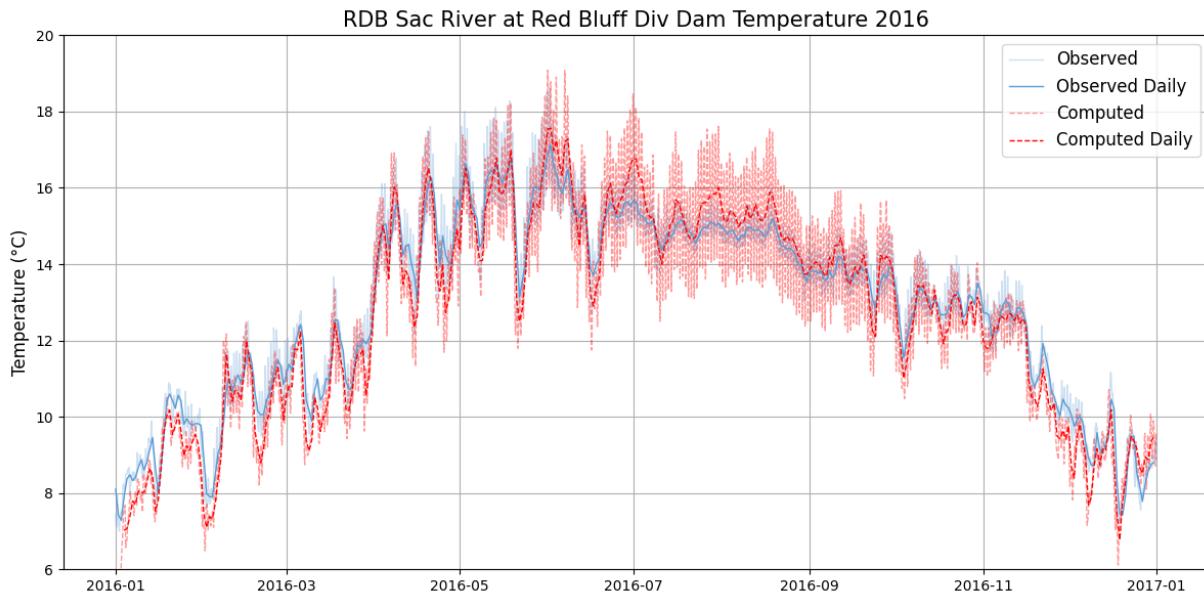


Figure 249. RDB Sac River at Red Bluff Div Dam Temperature 2016

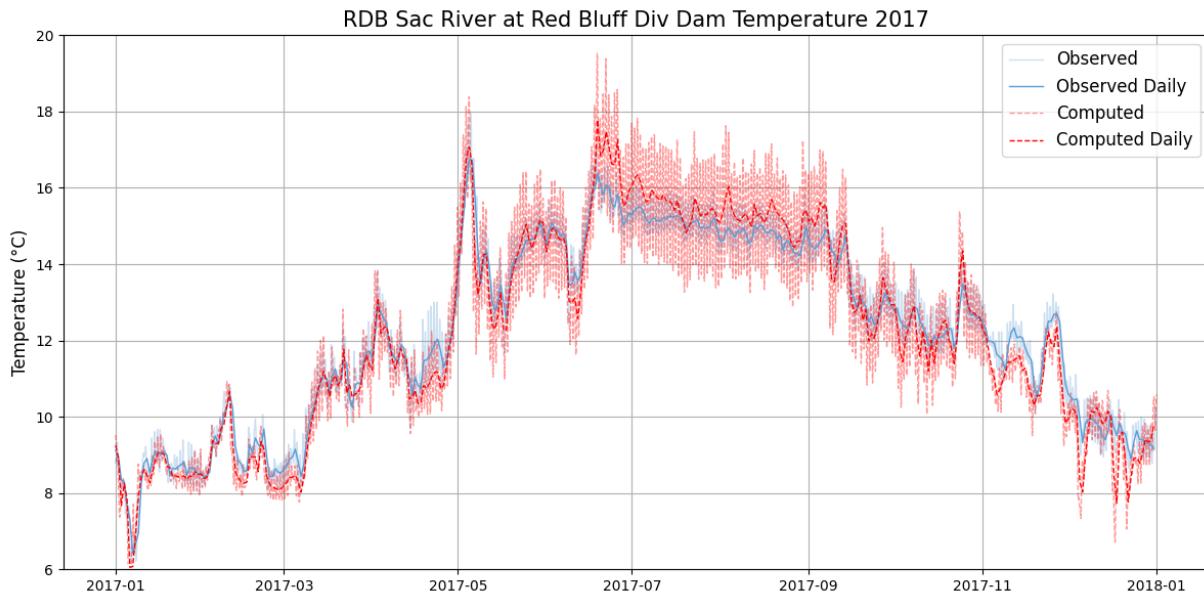


Figure 250. RDB Sac River at Red Bluff Div Dam Temperature 2017

Table 66. RDB Sac River at Red Bluff Div Dam Temperature Error Statistics

Statistics	2000	2001	2002	2003	2004	2005
Mean Bias ($^{\circ}\text{C}$)	-0.30	-0.70	-0.52	-0.53	-0.50	-0.75
MAE ($^{\circ}\text{C}$)	0.81	1.09	0.96	0.86	0.94	1.02
RMSE ($^{\circ}\text{C}$)	0.98	1.35	1.17	1.03	1.14	1.25

Statistics	2000	2001	2002	2003	2004	2005
Nash-Sutcliffe (NSE)	0.70	0.69	0.69	0.72	0.74	0.63
COUNT	8,015	8,760	8,760	8,760	8,784	8,760

Statistics	2006	2007	2008	2009	2010	2011
Mean Bias (°C)	-0.54	-0.49	-0.37	-0.36	-0.43	-0.27
MAE (°C)	0.96	0.98	0.94	0.89	0.88	0.78
RMSE (°C)	1.13	1.17	1.14	1.10	1.06	0.95
Nash-Sutcliffe (NSE)	0.69	0.73	0.84	0.83	0.72	0.80
COUNT	8,760	8,760	8,784	8,760	8,760	8,760

Statistics	2012	2013	2014	2015	2016	2017
Mean Bias (°C)	-0.52	-0.36	-0.37	-0.14	-0.18	-0.06
MAE (°C)	0.90	0.85	0.84	0.84	0.81	0.74
RMSE (°C)	1.10	1.10	1.08	1.11	0.99	0.93
Nash-Sutcliffe (NSE)	0.75	0.83	0.85	0.85	0.83	0.85
COUNT	8,784	8,760	8,760	8,760	8,784	8,760

Table 67. RDB Sac River at Red Bluff Div Dam Temperature MeanBias, invalid when +- .75

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	-0.47	-0.39	-0.41	-0.22	0.15	0.07	0.08	-0.05	-0.58	-0.72	-0.82
2001	-1.02	-1.32	-0.68	-1.37	-0.20	-0.03	0.01	0.11	-0.17	-0.46	-1.18	-2.16
2002	-1.72	-0.85	-1.00	-0.61	-0.52	-0.09	0.21	0.06	-0.08	-0.17	-0.47	-0.98
2003	-0.79	-0.71	-0.39	-0.92	-0.48	-0.36	-0.20	-0.31	0.02	-0.24	-0.91	-1.03
2004	-1.10	-0.89	0.22	-0.53	-0.44	0.06	0.20	0.02	-0.17	-0.98	-1.19	-1.17
2005	-1.79	-0.85	-0.66	-0.73	-0.39	-0.33	-0.08	-1.04	-0.79	-0.53	-0.79	-1.12
2006	-1.11	-0.70	-1.17	-0.71	0.08	0.09	0.36	-0.33	-0.68	-0.51	-0.66	-1.15
2007	-1.00	-1.11	-0.73	-0.62	0.23	0.18	0.14	-0.16	-0.27	-0.67	-0.70	-1.22
2008	-1.44	-0.56	-0.54	-0.27	0.07	0.20	0.40	0.12	-0.04	-0.62	-0.69	-0.99
2009	-0.54	-0.81	-0.24	-0.50	-0.17	-0.16	0.07	-0.11	-0.14	-0.57	-0.46	-0.75
2010	-0.90	-0.64	-0.45	-0.44	-0.30	-0.01	0.18	-0.37	-0.61	-0.54	-0.54	-0.61
2011	-0.46	-0.79	-0.54	-0.11	-0.00	0.08	0.21	0.09	-0.20	-0.43	-0.48	-0.55

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	-0.28	-0.81	-1.18	-1.02	-0.88	-0.07	0.08	-0.25	-0.49	-0.38	-0.27	-0.67
2013	-0.15	-0.53	-0.43	-0.59	-0.57	-0.29	0.10	-0.26	-0.15	-0.37	-0.62	-0.61
2014	-0.19	-0.42	-0.61	-0.45	-0.35	-0.51	-0.53	0.07	0.17	-0.40	-0.53	-0.66
2015	-0.60	-0.35	-0.06	-0.51	-0.14	0.39	0.35	0.10	0.01	-0.09	-0.04	-0.65
2016	-0.74	-0.37	-0.51	-0.30	-0.29	0.18	0.36	0.35	0.13	-0.25	-0.47	-0.21
2017	-0.15	-0.27	-0.14	-0.27	-0.11	0.26	0.40	0.50	0.08	-0.14	-0.62	-0.35
All	-0.83	-0.70	-0.53	-0.57	-0.25	-0.01	0.12	-0.08	-0.19	-0.45	-0.63	-0.88

Table 68. RDB Sac River at Red Bluff Div Dam Temperature MAE, invalid over 1.0

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.52	0.63	0.83	0.89	0.95	0.83	0.87	0.82	0.80	0.76	0.94
2001	1.08	1.32	0.91	1.42	0.99	0.80	0.82	0.88	0.71	0.72	1.28	2.16
2002	1.72	0.90	1.09	0.92	0.92	0.86	0.94	0.89	0.81	0.66	0.71	1.03
2003	0.81	0.78	0.60	1.03	0.79	0.93	0.97	0.82	0.85	0.69	0.92	1.09
2004	1.12	0.93	0.83	0.82	0.83	0.80	0.85	0.89	0.70	1.08	1.22	1.19
2005	1.79	0.91	0.94	0.98	0.80	0.91	0.99	1.19	0.96	0.74	0.91	1.13
2006	1.11	0.84	1.17	1.02	0.81	0.90	1.01	0.97	0.98	0.77	0.75	1.22
2007	1.07	1.14	1.00	0.93	0.94	0.91	0.92	0.92	0.89	0.88	0.89	1.23
2008	1.46	0.86	0.88	0.90	0.91	0.91	0.88	0.89	0.78	0.88	0.77	1.08
2009	0.97	0.97	0.88	1.06	0.82	0.91	0.95	0.90	0.80	0.86	0.70	0.88
2010	0.91	0.74	0.84	0.89	0.84	0.94	1.07	1.12	0.98	0.78	0.76	0.66
2011	0.56	0.98	0.57	0.62	0.79	0.83	0.95	0.96	0.90	0.77	0.65	0.77
2012	0.65	0.94	1.27	1.16	1.12	0.89	0.97	0.95	0.86	0.71	0.54	0.71
2013	0.70	0.78	0.80	0.91	0.88	0.91	0.91	0.86	0.82	0.80	0.87	0.94
2014	0.56	0.56	0.87	0.96	0.85	0.95	1.01	0.87	0.75	0.81	0.78	1.07
2015	0.69	0.97	0.70	1.11	0.77	0.90	0.89	0.80	0.79	0.61	1.16	0.77
2016	0.80	0.66	0.72	0.91	0.82	0.95	1.04	1.00	0.86	0.56	0.58	0.70
2017	0.39	0.42	0.48	0.61	0.97	0.99	1.02	1.02	0.85	0.74	0.67	0.66
All	0.97	0.85	0.85	0.95	0.88	0.91	0.95	0.93	0.84	0.77	0.83	1.02

Table 69. RDB Sac River at Red Bluff Div Dam Temperature RMSE, invalid over 1.5

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	-	0.65	0.77	1.00	1.07	1.12	0.95	1.01	0.99	0.95	0.97	1.13
2001	1.37	1.62	1.12	1.71	1.21	0.95	0.96	1.03	0.85	0.93	1.57	2.22
2002	1.80	1.07	1.39	1.21	1.15	1.02	1.12	1.04	0.96	0.81	0.90	1.25
2003	0.90	0.95	0.78	1.26	0.95	1.10	1.12	0.97	1.01	0.86	1.05	1.24
2004	1.23	1.10	1.00	1.02	0.99	0.93	0.97	1.06	0.83	1.25	1.64	1.42
2005	1.90	1.03	1.19	1.25	1.00	1.07	1.17	1.50	1.20	0.89	1.14	1.30
2006	1.16	0.99	1.23	1.13	0.97	1.07	1.19	1.16	1.20	0.95	0.93	1.50
2007	1.31	1.30	1.21	1.12	1.10	1.05	1.07	1.06	1.05	1.08	1.18	1.46
2008	1.64	1.04	1.10	1.09	1.13	1.08	1.05	1.03	0.90	1.12	0.96	1.29
2009	1.25	1.17	1.16	1.30	0.98	1.07	1.09	1.04	0.93	1.06	0.92	1.17
2010	1.01	0.85	1.07	1.09	1.02	1.11	1.22	1.33	1.20	0.93	0.95	0.78
2011	0.68	1.19	0.66	0.76	0.95	1.01	1.10	1.09	1.06	0.93	0.84	1.03
2012	0.85	1.19	1.47	1.36	1.36	1.04	1.11	1.12	1.07	0.85	0.67	0.88
2013	0.93	0.97	1.04	1.12	1.08	1.07	1.05	1.01	1.00	0.97	1.40	1.47
2014	0.71	0.73	1.11	1.16	1.01	1.15	1.21	1.02	0.88	0.97	1.09	1.61
2015	0.84	1.69	0.89	1.35	0.94	1.07	1.07	0.94	0.93	0.73	1.63	0.91
2016	1.06	0.84	0.89	1.10	1.00	1.13	1.22	1.14	1.00	0.67	0.71	0.88
2017	0.57	0.54	0.58	0.74	1.16	1.21	1.17	1.19	1.03	0.90	0.80	0.90
All	1.20	1.09	1.07	1.17	1.07	1.07	1.11	1.11	1.01	0.95	1.12	1.31

Sacramento River

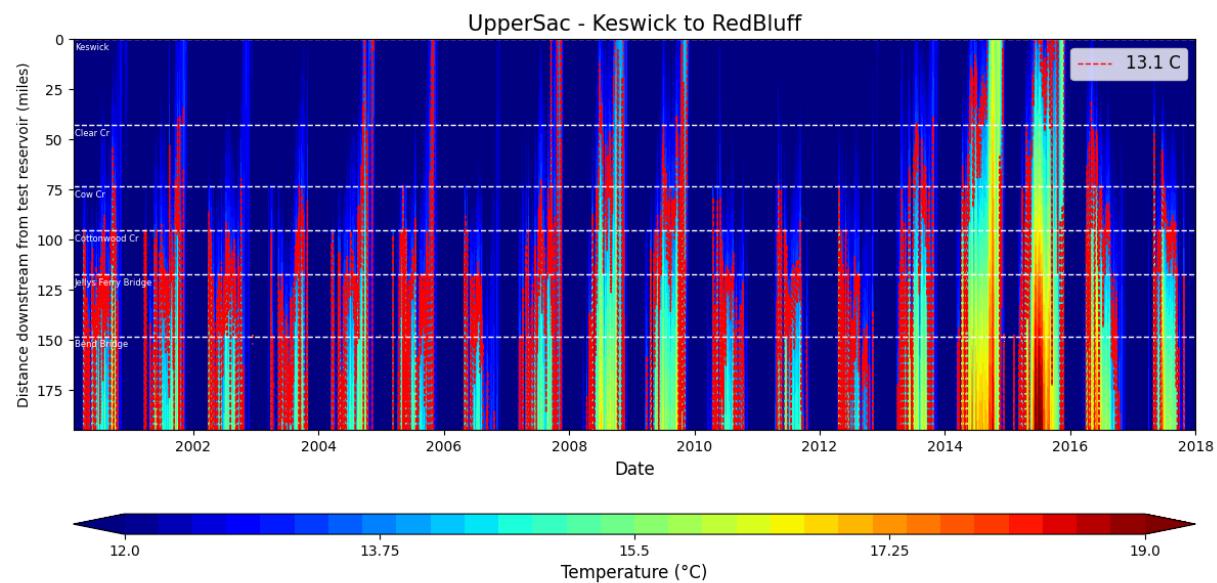


Figure 251.