Summary of Stream Temperature Metrics for the Carson River

A supporting document for the Carson River Report Card

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Carson River at Genoa Lane (looking upstream)

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Introduction

In support of its Clean Water Act responsibilities, the Nevada Division of Environmental Protection (NDEP) – Bureau of Water Quality Planning (BWQP) is developing a Carson River Watershed Assessment or Report Card. Drawing upon numerous studies and monitoring efforts, the Report Card will provide a compilation of current knowledge about the chemical, physical and biological health of the Carson River watershed with a focus on aquatic life uses from the Nevada/California stateline to Lahontan Reservoir. It is hoped that the Report Card will be a valuable tool for educating the public, agencies and decisionmakers on the state of the river (from a Clean Water Act perspective), thereby providing direction for their future actions and decisions. The Report Card will also be a key planning tool for BWQP in possible future steps, such as standards revisions, comprehensive Total Maximum Daily Loads (TMDLs), watershed plan development and restoration projects.

The purpose of this report is to summarize statistics on daily water temperature data that have been collected on the East and West forks and the Carson River from Carson City and upstream sites. The intent is for these data and statistics to be used in followup temperature assessment documents.

Methodology

Continuous and/or daily minimum/maximum temperature data collected by Nevada Department of Wildlife (NDOW), U.S. Geological Survey (USGS), Desert Research Institute (DRI) (Latham, 2006; Garner, 2007; Susfalk, 2007) and Nevada Division of Environmental Protection (NDEP) for a variety of projects were compiled for 24 sites on the East Fork Carson, West Fork Carson and Carson River above Brunswick Canyon near Carson City (Table 1; Figure 1). The data used in this report were collected using various instrumentation. At some locations, temperature logging devices such as shown in Figure 2 were used. Other locations used multi-parameter sondes (Figures 3 and 4) which collected temperature along with other parameters such as dissolved oxygen, pH, turbidity, etc. Some of the data were not included in this analysis if there were wide fluctuations in the daily data indicating that the logging device may have been out of the water due to low flow conditions.

For each year of data at each site, the following metrics were calculated:

- MDMT - Maximum daily maximum temperature
- MWMT – Maximum weekly maximum temperature (Maximum average of maximum daily temperatures over any seven-day period)
- MDAT - Maximum daily average temperature
- MWAT – Maximum weekly average temperature (Maximum average of average daily temperatures over any seven-day period)
- Maximum Delta – Maximum temperature change in a day

In addition, the dates at which the MDMT and MDAT occurred were also determined.

Table 1. List of Temperature Monitoring Sites Used in Study

Site ID	Stream	Site	River Miles from Stateline	River Miles from Confluence	Period of Record	UTM Easting (NAD 83)	UTM Northing (NAD 83)	Data Source
WF-1	WF Carson River	Paynesville	-2.50		2001-04	258856	4299210	NDEP; DRI
WF-2		Above Confluence	14.24		2004	255430	4320164	NDEP
EF-1	EF Carson River	Sheep Bridge	3.72		2000-01	265764	4301588	NDOW
EF-2		USGS Gage 10309000	5.84		1954-65, 1967-72, 1994—1996, 2002-04	265332	4303042	USGS
EF-3		Washoe Bridge	9.26		2004-05	266650	4306460	DRI
EF-4		USFWS Fish Hatchery	10.20		2002-03	265888	4307478	NDEP
EF-5		Above Lutheran Bridge	14.70		2003-05	261988	4312571	NDEP
EF-6		Above Highway 88	17.00		2003-05	259192	4314440	NDEP
EF-7		Above Confluence	21.60		2003-04	255534	4320149	NDEP
C-1	Carson River	Above Genoa Lane		0.04	2004	255444	4320291	NDEP
C-2		Willow Bend		0.30	2003	255524	4320618	DRI
C-3		Genoa Lakes Golf Course (DRI, Garner)		2.12	2005-06	255452	4322558	DRI
C-4		Lippencott Ski Ranch		5.96	2005-06	258999	4325341	DRI
C-5		Cradlebaugh Bridge		6.44	2004-05	259467	4325745	NDEP; DRI
C-6		Sunridge Golf Course		8.87	2005	260334	4328534	DRI
C-7		V&T Railroad Crossing		10.3	2005	261841	4329787	DRI
C-8		McTarnahan Bridge		12.41	2006	263997	4331383	DRI
C-9		Mexican Gage		13.64	2001-03	265417	4332193	NDEP
C-10		Foerschler Ranch		14.40	2005-06	266313	4332681	DRI
C-11		Riverview Park		18.00	2005-06	266219	4337639	DRI
C-12		Empire Golf Course		19.85	2005	266232	4339981	DRI
C-13		Morgan Mill Road		20.33	2005	266305	4340470	DRI
C-14		Deer Run Road (NDOW)		20.91	1995, 2000, 2003	267143	4340373	NDEP; NDOW, USGS
C-15		Brunswick Bridge		21.82	2000	267714	4339731	DRI

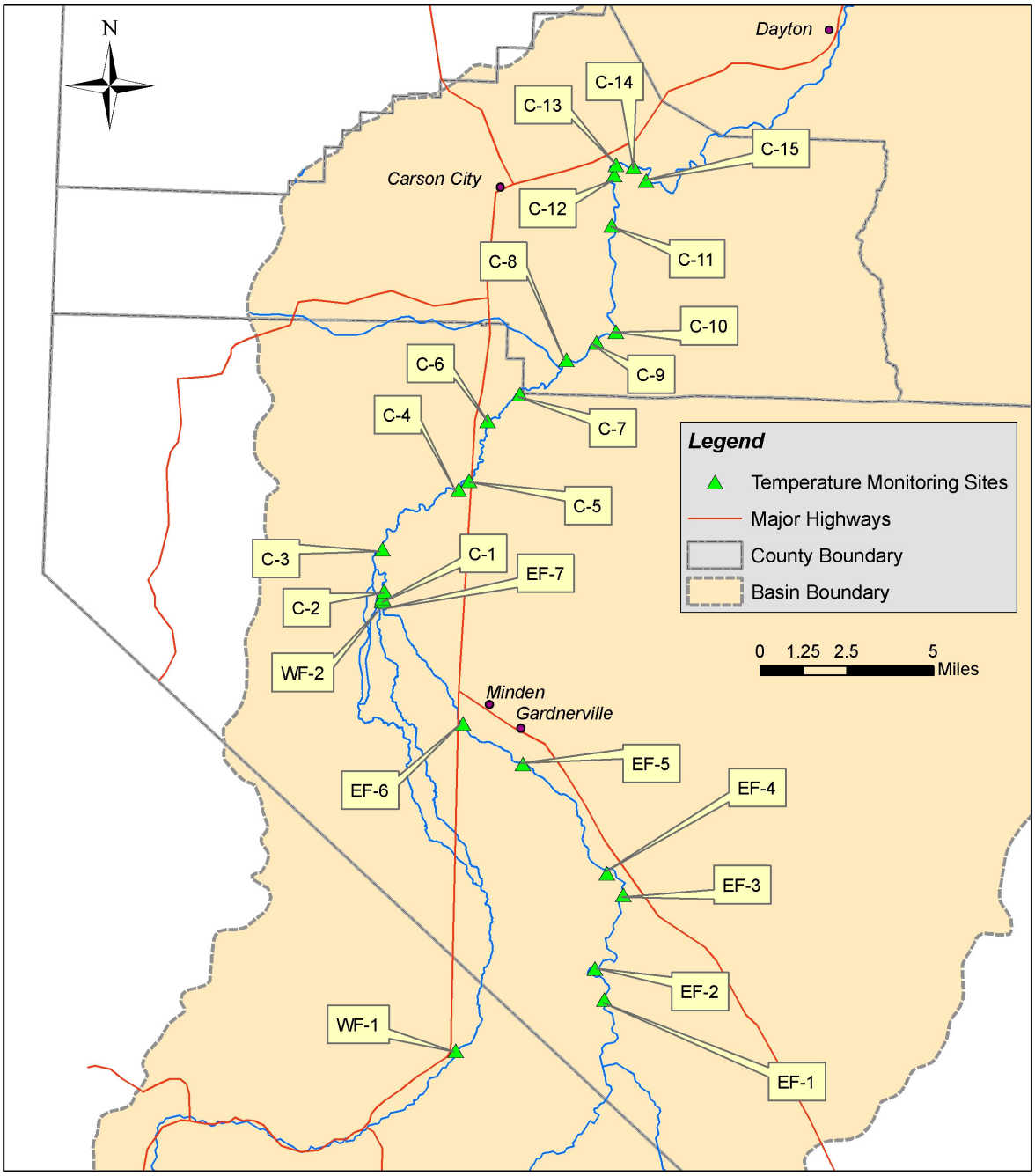


Figure 1. Temperature Monitoring Sites

Figure 2. Intialization of HOBO Water Temp Pro prior to deployment (Photograph by R. Pahl, 2005)

Figure 3. Dissolved Oxygen and Temperature Sonde Deployment by Desert Research Institute – Carson River at Cradlebaugh Bridge (photograph by Z. Latham, 2004)

Figure 4. Turbidity Sonde Deployment by Desert Research Institute – Carson River at Genoa Lakes Golf Course (Photograph by R. Susfalk, 2004)

Results

Table 2 provides a summary of the temperature metric ranges for MDMT, MWMT, MDAT and MWAT for each of the 24 sites. Appendix A provides a more detailed breakdown of these metrics and other pertinent information. The following discussion presents some observations about these metrics, the data and temperature relationships.

Compliance with Standards

The existing temperature water quality standards for the Carson River system are summarized in Table 3. More background on these standards is provided by Pahl (2004). For this study, maximum temperatures were compared to the May through September standards to evaluate the frequency of excursions. All of the 24 monitoring sites measured temperature levels in excess of May-September temperature standards to varying degrees (see Appendix A). However, the upper sites tend to have lower temperatures and less frequent standards exceedances. Nevertheless, the EF Carson River (EF-2) prior to entering Carson Valley still experiences considerable standards excursions, ranging from no excursion days in 1965, 1967, 1969 and 1995 to 110 days with excursions in 1994. Overall during the months of June, July and August, the standards were exceeded in 35% of the days (Figure 5). It is interesting to note that the WF Carson River appears have cooler temperatures than the EF Carson River as they both enter the Carson Valley. For the years 2002-04, Site EF-2 experienced a total of 198 days with exceedances of the temperature criteria, while Site WF-1 experienced only 25 days with exceedances.

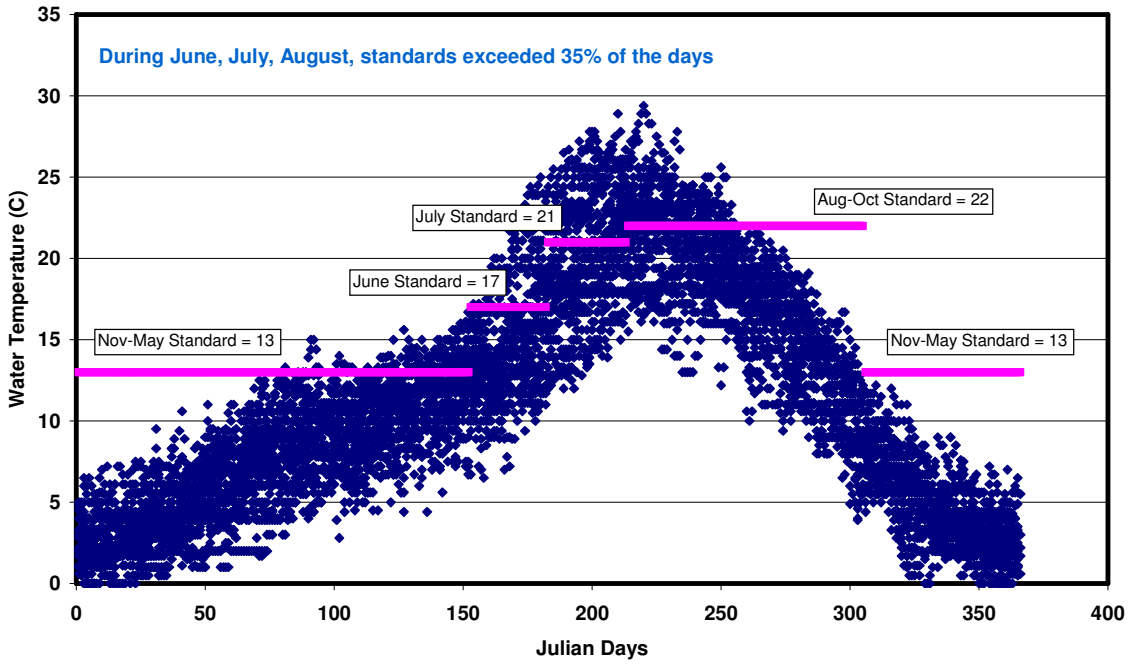
Table 2. Summary of Temperature Metrics (° C)

Site ID	Stream	Site	Period of Record	MDMT	MWMT	MDAT	MWAT	Max. Daily Change	Max. WQS
WF-1	WF Carson River	Paynesville (NDEP)	2001-04	22.1 – 22.9	21.4 – 21.8	18.7 – 19.2	18.0 – 18.7	7.3 – 8.4	22
WF-2		Above Confluence	2004	26.5	24.3	22.2	20.4	13.8	23
EF-1	EF Carson River	Sheep Bridge	2000-01	26.5 – 26.8	24.3 – 25.8	22.0 – 22.2	20.4 – 21.4	10.2 – 10.7	22
EF-2		USGS Gage 10309000	1954-65, 1967-72, 1994—1996, 2002-04	18.9 – 29.4	18.0 – 28.6	17.0 – 24.8	16.4 – 23.7	7.2 - 10.6	22
EF-3		Washoe Bridge	2004-05	24.5 – 26.9	23.5 – 25.8	20.8 – 22.6	20.1 – 22.0	8.3 – 11.8	22
EF-4		USFWS Fish Hatchery	2002-03	26.0 – 26.3	25.0 – 25.3	22.3 – 22.9	21.4 – 21.6	8.8 9.2	22
EF-5		Above Lutheran Bridge	2003-05	25.5 – 28.9	25.1 – 27.9	22.0 – 24.3	21.0 – 23.1	9.4 – 11.4	22
EF-6		Above Highway 88	2003-05	25.5 – 28.4	24.2 – 26.6	20.4 – 22.6	19.6 – 21.3	10.8 – 13.2	22
EF-7		Above Confluence	2003-04	28.7 – 29.1	27.5 – 28.0	22.9 -24.1	21.7 – 23.2	13.4 – 14.6	23
C-1	Carson River	Above Genoa Lane	2004	29.9	28.4	22.7	21.7	16.2	23
C-2		Willow Bend	2003	29.4	28.4	24.6	23.8	15.0	23
C-3		Genoa Lakes Golf Course (DRI, Garner)	2005-06	26.9 – 27.3	26.3 – 26.5	23.8 – 24.3	23.5 – 22.8	9.1 – 10.2	23
C-4		Lippencott Ski Ranch	2005-06	28.4 – 29.8	27.1 – 28.4	24.3 – 24.5	23.6 – 23.8	13.0 – 16.0	23
C-5		Cradlebaugh Bridge	2004-05	29.6 - 30.5	28.8 - 29.4	24.0 – 24.8	23.1 – 23.9	13.8 – 13.9	23
C-6		Sunridge Golf Course	2005	29.3	28.2	25.2	23.6	13.6	23
C-7		V&T Railroad Crossing	2005	29.3	28.4	24.3	23.6	13.0	23
C-8		McTarnahan Bridge	2006	29.3	28.3	25.6	24.7	13.6	23
C-9		Mexican Gage	2001-03	32.8 – 33.2	30.8 – 31.4	25.5 – 26.7	24.2 – 25.9	16.3 – 16.6	23
C-10		Foerschler Ranch	2005-06	29.3 – 29.6	28.2 – 28.3	24.6 – 25.5	23.7 – 24.8	10.9 – 11.4	23
C-11		Riverview Park	2005-06	27.9 – 29.8	27.0 – 28.5	25.3 – 25.6	24.4 – 24.7	9.8 – 11.8	23
C-12		Empire Golf Course	2005	29.6	28.5	26.0	24.5	12.0	23
C-13		Morgan Mill Road	2005	30.0	28.5	26.1	24.6	10.8	23
C-14a		Deer Run Road (USGS)	1995	26.5	25.0	24.0	22.4	7.0	23
C-14b		Deer Run Road (NDOW)	2000	30.2	28.8	26.1	24.7	10.1	23
C-14c		Deer Run Road (NDEP)	2003	31.0	29.7	27.4	26.5	10.5	23
C-15		Brunswick Bridge	2005	29.8	28.0	25.6	24.8	9.8	28

Table 3. Temperature Criteria (° C) for Carson River

Waterbody	Reach	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WF Carson River	Stateline	13				13	17	21	22			13	
Bryant Creek	Stateline to confluence												
EF Carson River	Stateline to Muller Lane												
	Muller Lane to confluence					17		23					
WF Carson River	Above confluence												
Carson River	Confluence to Cradlebaugh												
	Cradlebaugh to Mexican Gage												
	Mexican Gage to Deer Run Rd	18					23					18	
	Deer Run Rd to Dayton Bridge	11			24			28				11	
	Dayton Bridge to Weeks												
	Weeks to Lahontan Reservoir												

Figure 5. EF-2: USGS 10309000 - EF Carson near Gardnerville - Daily Max. Temperatures (1953-72, 1993-97, 2002-04)



Temperature Variability

The temperature metrics (MDMT, MWMT, MDAT, MWAT) presented in this report show some variation from year to year. For example, Site EF-2 has MDMT values ranging from 18.9° C in 1967 to 29.4° C in 1960. Fluctuations in flow are believed to be a significant determinant of these metrics. As shown in Figure 6 and 7, inverse relationships exist between MDMT values and streamflow for the East Fork Carson River sites (above Carson Valley) and the Carson River sites.

When the EF-2 data are examined on a daily basis, inverse relationships between streamflow and maximum daily temperatures are shown for May through September (Figures 8-12). Generally, the highest temperatures at EF-2 occur during July and August. The 24 years of data suggest that when flows drop below 350 cfs in July and below 200 in August, excursions of the temperature standards will begin to occur.

Figure 6. Comparison of MDMT Values for EF Carson River Sites Upstream of Carson Valley to Annual Streamflow

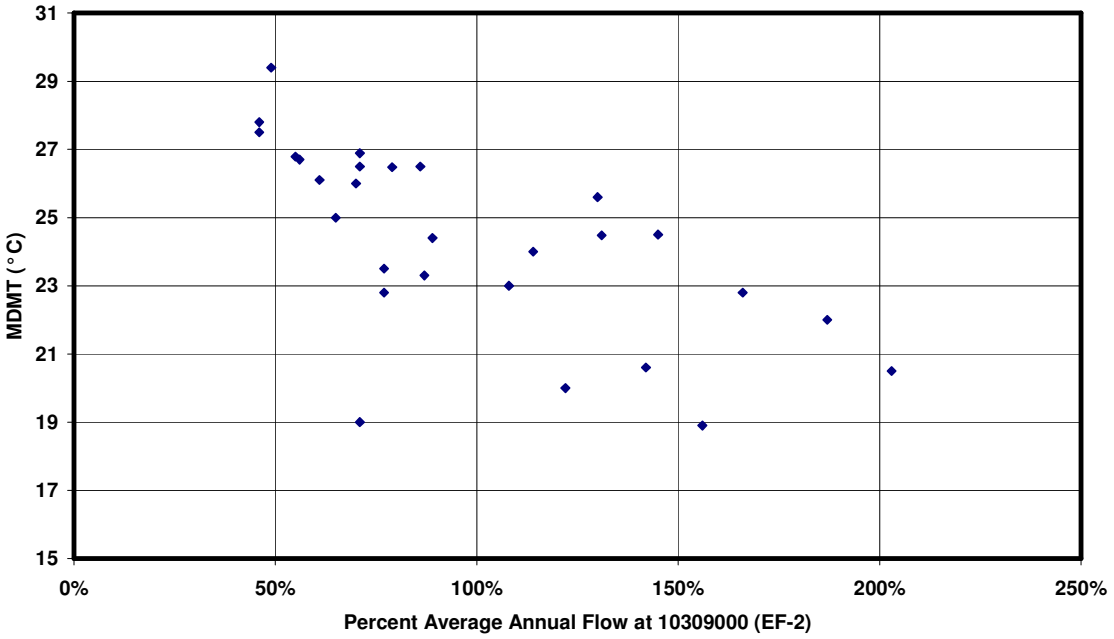


Figure 7. Comparison of MDMT Values for Carson River Sites to Annual Streamflow

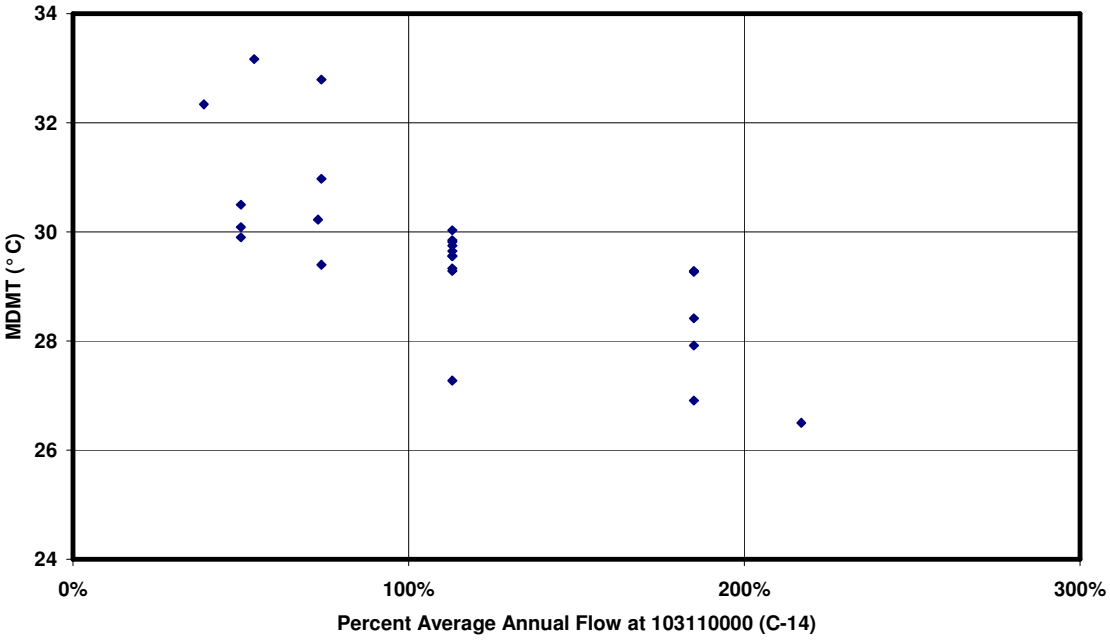


Figure 8. EF-2: Comparison of Maximum Daily May Temperatures and Streamflow

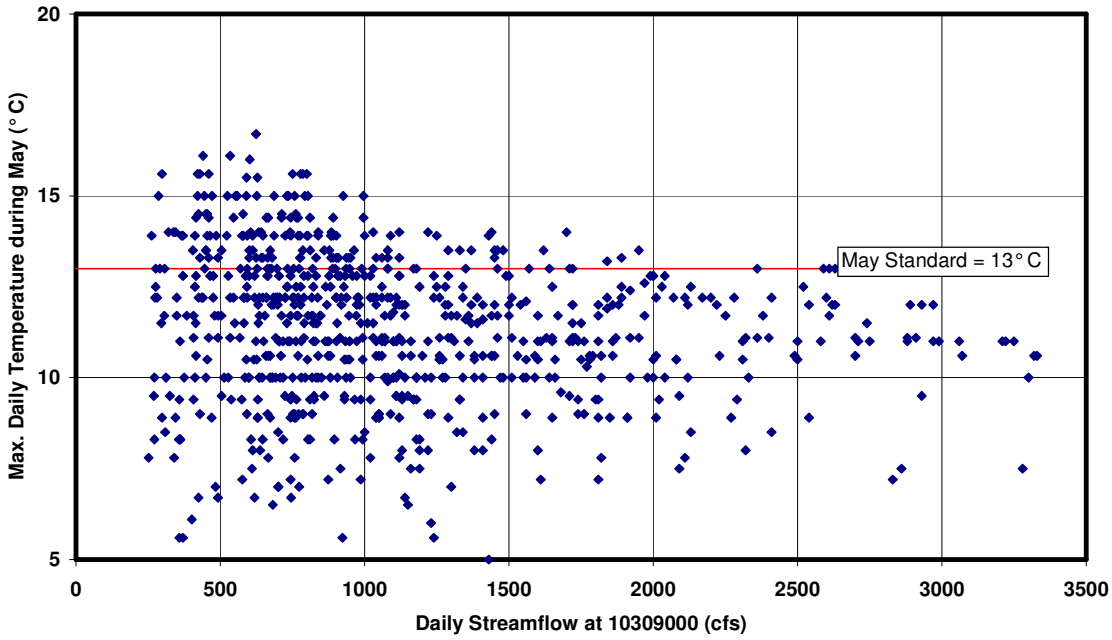


Figure 9. EF-2: Comparison of Maximum Daily June Temperatures and Streamflow

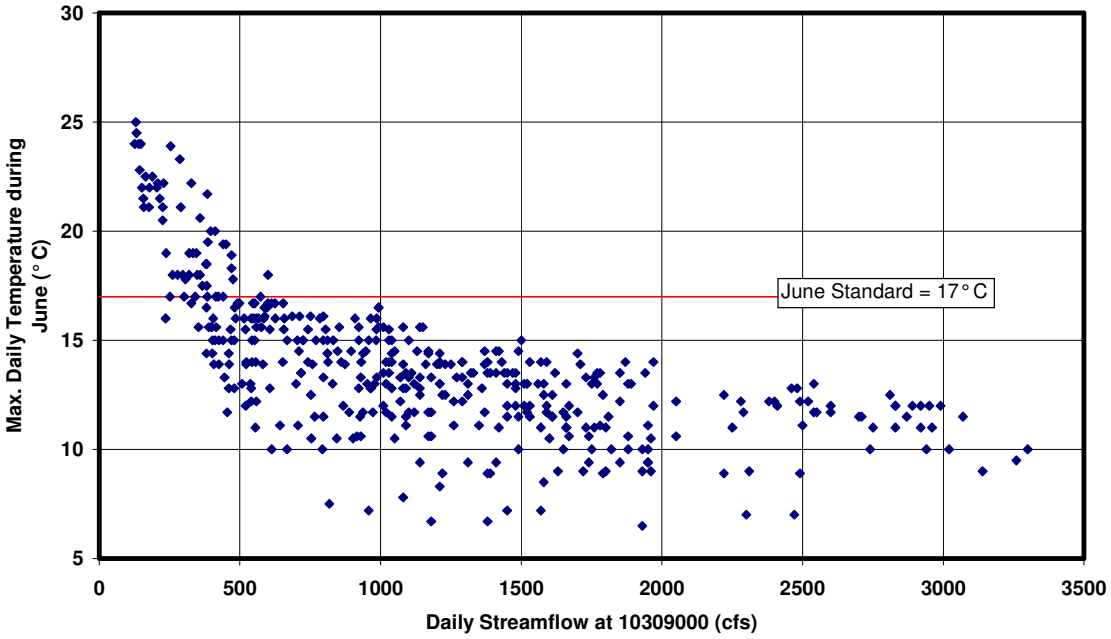


Figure 10. EF-2: Comparison of Maximum Daily July Temperatures and Streamflow

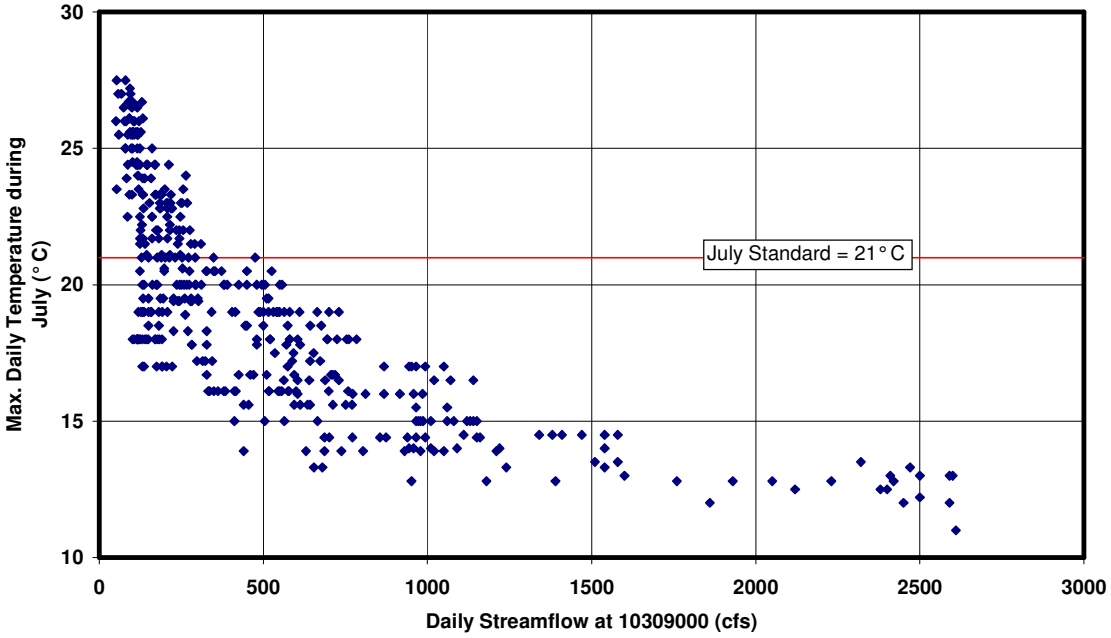


Figure 11. EF-2: Comparison of Maximum Daily August Temperatures and Streamflow

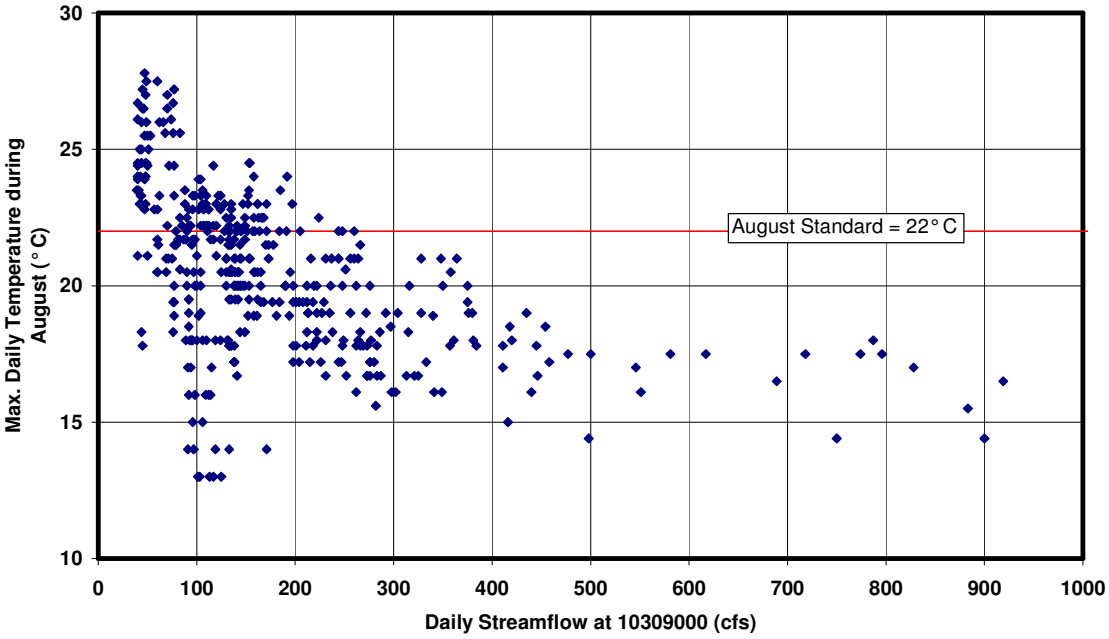
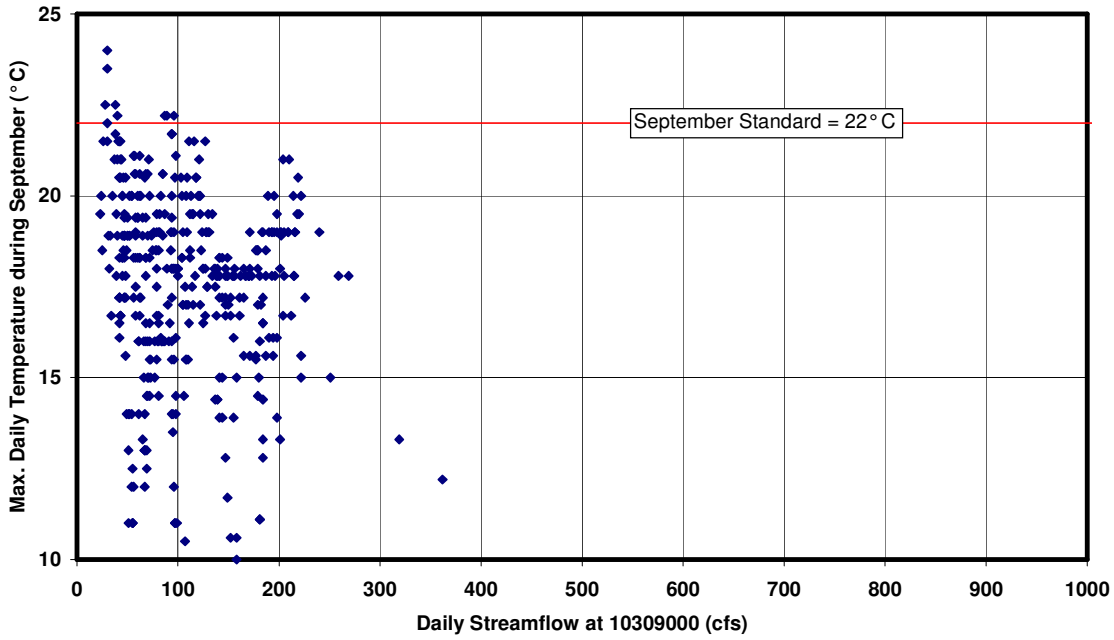


Figure 12. EF-2: Comparison of Maximum Daily September Temperatures and Streamflow



Relationships between Temperature Metrics

The available data indicates that the MWMT values are typically about 93% of the MDMT values (Figure 13). Figure 13 shows little scatter in the data, thus a high R^2 is calculated for the linear regression. However, a plot (Figure 14) between MDAT and MDMT shows more variability. The linear regression shows that MDAT values vary around 66% of the MDMT values.

Figure 13. Comparison of MDMT and MWMT

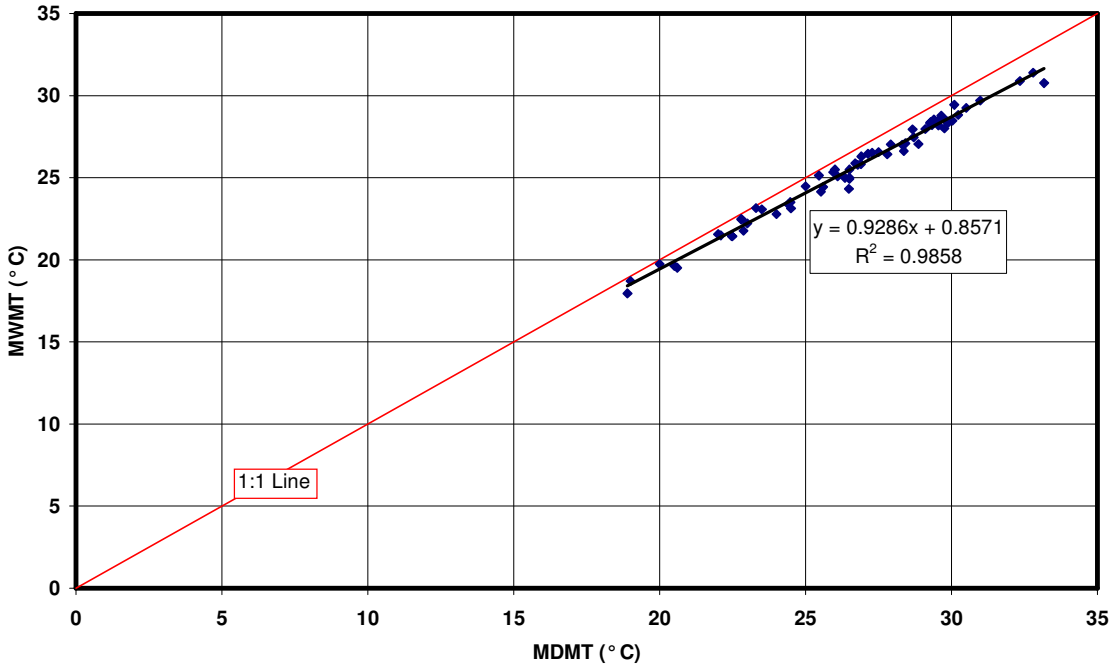
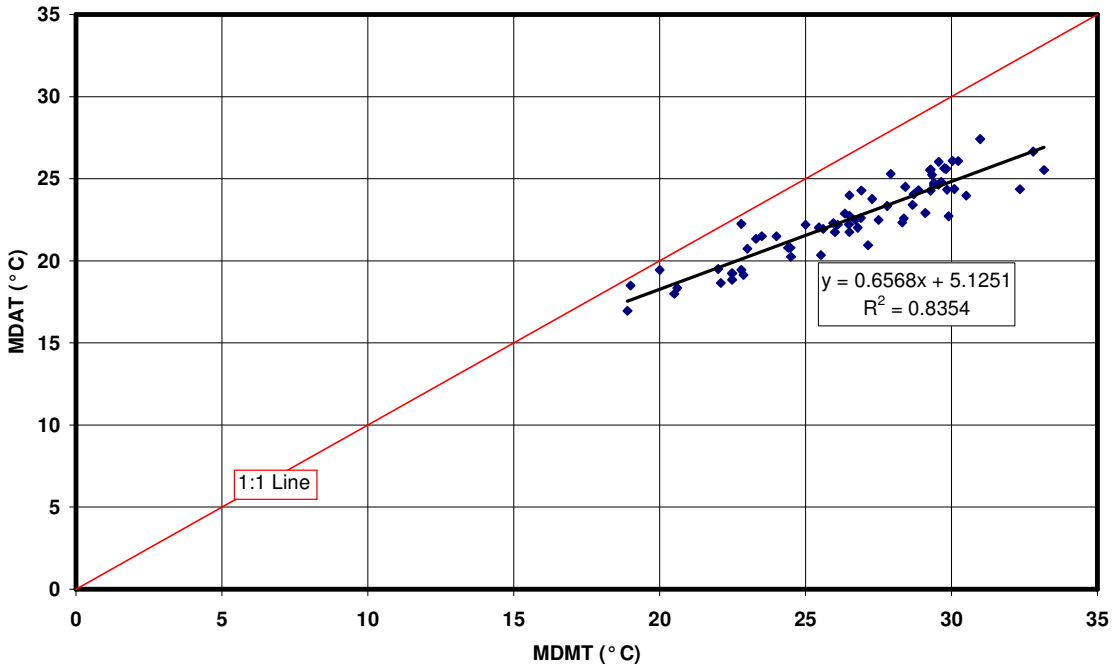


Figure 14. Comparison of MDMT and MDAT



Summary

This report has summarized temperature data compiled for 24 sites on the Upper Carson River system, with a focus on May-September conditions. Of all the sites, EF-2 (EF Carson River at USGS Gage 10309000) has the most extensive dataset with 24 years of data. The other sites have 4 years or less of detailed temperature data. Since EF-2 has the longest period of record, EF-2 data are the best indicators of temperature variability on the upper Carson River system. For example, maximum daily temperatures (MDMT) at EF-2 have been as low as 18.9° C during high flow years and as high as29.4° C during low flow years. Other sites have shown similar inverse relationships between temperatures and flows.

Exceedances of the temperature water quality standards are common throughout the study area with the most frequent problems occurring in the lower reaches. The West Fork Carson River at Site WF-1 experienced some of the coolest temperatures in the study area. For the years 2002-04, Site EF-2 experienced a total of 198 days with exceedances of the temperature criteria, while Site WF-1 experienced only 25 days with exceedances.

References

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Latham, Z.B. 2005. Dissolved Oxygen Dynamics in the Carson River, Nevada. Master's Thesis, University of Nevada Reno & Desert Research Institute.

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Susfalk, R. 2007. Publication Pending. Desert Research Institute.

APPENDIX A – Temperature Data Summary

Table A-1. Detailed Summary of Temperature Monitoring Sites and Associated Metrics

Site ID	Stream	Site	Rver Mile	Year	Time of Peak	No. days with Max. Temperature Exceeding Standards						MDMT (°C)	MWMT (°C)	MDAT (°C)	MWAT (°C)	Maximum Delta	% of Average Water Year - West Fork Carson (USGS 10310000)	% of Average Water Year - East Fork Carson (USGS 10309000)	% of Average Water Year - Carson River (USGS 10311000)
						May	June	July	Aug	Sept	Total								
WF-1	WF Carson River	Paynesville (NDEP)	-2.50	2001	8/12	No data	No data	0	2	0	2	22.5	21.4	19.2	18.5	7.7	44%		
WF-1	WF Carson River	Paynesville (NDEP)	-2.50	2002	7/10	No data	0	10	0	0	10	22.1	21.5	18.7	18.4	8.4	67%		
WF-1	WF Carson River	Paynesville (NDEP)	-2.50	2003	7/21	No data	No data	5	0	0	5	22.5	21.4	19.2	18.7	7.3	81%		
WF-1	WF Carson River	Paynesville (NDEP)	-2.50	2004	7/28	No data	No data	9	1	0	10	22.5	21.4	18.9	18.0	7.6	61%		
WF-1	WF Carson River	Paynesville (DRI)	-2.50	2004	7/28	5	18	12	2	0	37	22.9	21.8	19.1	18.3	8.0	61%		
WF-2	WF Carson River	Above Confluence	14.24	2004	7/25	No data	No data	8	26	11	45	28.3	27.0	22.3	21.1	13.8			
EF-1	EF Carson River	Sheep Bridge	3.72	2000	7/31	No data	No data	24	25	1	50	26.5	24.3	22.2	20.4	10.2		79%	
EF-1	EF Carson River	Sheep Bridge	3.72	2001	8/7	No data	0	26	30	9	65	26.8	25.8	22.0	21.4	10.7		55%	
EF-2	EF Carson River	USGS 10309000	5.84	1954	7/31	1	12	5	10	3	31	22.8	22.5	22.3	21.8	4.5		77%	
EF-2	EF Carson River	USGS 10309000	5.84	1955	8/4	No data	No data	13	31	11	55	26.1	25.1	22.2	21.5	10.5		61%	
EF-2	EF Carson River	USGS 10309000	5.84	1956	8/13	3	0	1	9	1	14	22.8	22.5	19.5	19.1	7.3		166%	
EF-2	EF Carson River	USGS 10309000	5.84	1957	7/16	5	8	21	24	6	64	23.3	23.2	21.4	20.6	8.9		87%	
EF-2	EF Carson River	USGS 10309000	5.84	1958	8/12	0	0	4	26	1	31	25.6	24.4	22.0	21.3	7.8		130%	
EF-2	EF Carson River	USGS 10309000	5.84	1959	7/21	12	24	27	25	9	97	26.7	25.9	22.5	21.7	10.6		56%	
EF-2	EF Carson River	USGS 10309000	5.84	1960	8/7	18	23	29	10	0	80	29.4	28.6	24.8	23.7	10.0		49%	
EF-2	EF Carson River	USGS 10309000	5.84	1961	8/21	18	18	31	26	1	94	27.8	26.4	23.4	22.1	10.6		46%	
EF-2	EF Carson River	USGS 10309000	5.84	1962	8/16	0	0	12	21	3	36	24.4	23.4	20.8	19.5	9.4		89%	
EF-2	EF Carson River	USGS 10309000	5.84	1963	7/28	2	0	0	0	0	2	20.0	19.7	19.5	18.9	6.6		122%	
EF-2	EF Carson River	USGS 10309000	5.84	1964	7/17	10	1	19	15	0	45	25.0	24.5	22.2	21.6	7.8		65%	
EF-2	EF Carson River	USGS 10309000	5.84	1965	8/6	0	0	0	0	0	0	20.6	19.5	18.4	17.2	7.2		142%	
EF-2	EF Carson River	USGS 10309000	5.84	1967	8/13	0	0	0	0	0	0	18.9	18.0	17.0	16.4	7.8		156%	
EF-2	EF Carson River	USGS 10309000	5.84	1968	7/10	3	3	0	0	0	6	19.0	18.7	18.5	18.1	5.0		71%	
EF-2	EF Carson River	USGS 10309000	5.84	1969	8/14	0	0	0	0	0	0	22.0	21.6	19.5	18.9	7.0		187%	
EF-2	EF Carson River	USGS 10309000	5.84	1970	7/19	6	0	4	5	0	15	24.0	22.8	21.5	20.3	7.5		114%	
EF-2	EF Carson River	USGS 10309000	5.84	1971	8/4	0	0	1	5	0	6	23.0	22.2	20.8	20.5	5.5		108%	
EF-2	EF Carson River	USGS 10309000	5.84	1972	8/6	2	4	10	8	0	24	23.5	23.1	21.5	21.2	5.5		77%	
EF-2	EF Carson River	USGS 10309000	5.84	1994	7/20	22	22	31	31	4	110	27.5	26.6	22.5	21.6	12.0		46%	
EF-2	EF Carson River	USGS 10309000	5.84	1995	8/23	0	0	0	0	0	0	20.5	19.6	18.0	16.8	7.5		203%	
EF-2	EF Carson River	USGS 10309000	5.84	1996	8/10	0	1	10	15	0	26	24.5	23.1	20.3	19.8	9.5		145%	
EF-2	EF Carson River	USGS 10309000	5.84	2002	7/28	7	No data	26	26	2	61	26.0	25.5	21.8	21.0	10.0		70%	
EF-2	EF Carson River	USGS 10309000	5.84	2003	7/21	4	5	23	28	4	64	26.5	24.9	22.8	21.7	10.0		86%	
EF-2	EF Carson River	USGS 10309000	5.84	2004	7/25	8	19	28	18	No data	73	26.5	25.5	21.8	21.3	10.0		71%	
EF-3	EF Carson River	Washoe Bridge	9.26	2004	7/20	16	20	29	24	9	98	26.9	25.8	22.6	22.0	11.8		71%	
EF-3	EF Carson River	Washoe Bridge	9.26	2005	8/4	0	0	15	25	0	40	24.5	23.5	20.8	20.1	8.3		131%	
EF-4	EF Carson River	USFWS Fish Hatchery	10.20	2002	7/31	No data	No data	28	29	5	62	26.0	25.3	22.3	21.4	9.2		70%	
EF-4	EF Carson River	USFWS Fish Hatchery	10.20	2003	7/21	No data	No data	15	28	5	48	26.3	25.0	22.9	21.6	8.8		86%	
EF-5	EF Carson River	Above Lutheran Bridge	14.70	2003	7/22	No data	No data	14	29	9	52	28.9	27.0	24.3	23.1	11.1		86%	
EF-5	EF Carson River	Above Lutheran Bridge	14.70	2004	7/20	No data	No data	25	30	12	67	28.7	27.9	23.4	23.1	11.4		71%	
EF-5	EF Carson River	Above Lutheran Bridge	14.70	2005	8/8	No data	No data	3	30	6	39	25.5	25.1	22.0	21.0	9.4		131%	
EF-6	EF Carson River	Above Hwy 88	17.00	2003	7/29	No data	No data	14	28	22	64	28.4	26.6	22.6	21.3	12.6		86%	
EF-6	EF Carson River	Above Hwy 88	17.00	2004	8/10	No data	No data	24	30	18	72	27.1	26.5	21.0	20.7	13.2		71%	
EF-6	EF Carson River	Above Hwy 88	17.00	2005	8/4	No data	No data	4	16	2	22	25.5	24.2	20.4	19.6	10.8		131%	
EF-7	EF Carson River	Above Confluence	21.60	2003	7/20	No data	No data	15	28	2	45	28.7	27.5	24.1	23.2	13.4		86%	
EF-7	EF Carson River	Above Confluence	21.60	2004	8/8	No data	No data	8	28	1	37	29.1	28.0	22.9	21.7	14.6		71%	
C-1	Carson River	Above Genoa Lane	0.04	2004	8/8	No data	No data	8	30	16	54	29.9	28.4	22.7	21.7	16.2			50%
C-2	Carson River	Willow Bend	0.30	2003	9/2	No data	No data	7	29	24	60	29.4	28.4	24.6	23.8	15.0			74%
C-3	Carson River	Genoa Lakes Golf Course	2.12	2005	8/4	No data	No data	11	29	1	41	27.3	26.5	23.8	22.8	10.2			113%
C-3	Carson River	Genoa Lakes Golf Course	2.12	2006	7/24	No data	No data	19	30	10	59	26.9	26.3	24.3	23.5	9.1			185%
C-4	Carson River	Lippencott Ski Ranch	5.96	2005	8/20	No data	No data	11	31	16	58	29.8	28.4	24.3	23.6	16.0			113%
C-4	Carson River	Lippencott Ski Ranch	5.96	2006	8/13	No data	No data	17	31	13	61	28.4	27.1	24.5	23.8	13.0			185%
C-5	Carson River	Cradlebaugh Bridge (DRI)	6.44	2004	7/5	No data	21	21	No data	No data	42	30.5	29.3	24.0	23.1	13.8			50%
C-5	Carson River	Cradlebaugh Bridge (DRI)	6.44	2005	8/4	No data	No data	10	31	9	50	29.6	28.8	24.8	23.9	13.9			113%
C-5	Carson River	Cradlebaugh Bridge (NDEP)	6.44	2004	7/23	No data	No data	25	27	1	53	30.1	29.4	24.4	23.7	13.9			50%
C-6	Carson River	Sunridge Golf Course	8.87	2005	8/8	No data	No data	10	29	6	45	29.3	28.2	25.2	23.6	13.6			113%
C-7	Carson River	VNT	10.30	2005	8/8	No data	No data	9	30	9	48	29.3	28.4	24.3	23.6	13.0			113%
C-8	Carson River	McTarnahan Bridge	12.41	2006	7/26	No data	No data	12	31	13	56	29.3	28.3	25.6	24.7	13.6			185%
C-9	Carson River	Mexican Gage	13.64	2001	7/25	No data	No data	18	31	19	68	32.3	30.9	24.4	23.4	17.8			39%
C-9	Carson River	Mexican Gage	13.64	2002	7/10	No data	10	30	31	20	91	33.2	30.8	25.5	24.2	16.6			54%
C-9	Carson River	Mexican Gage	13.64	2003	7/21	No data	No data	14	30	20	64	32.8	31.4	26.7	25.9	16.3			74%
C-10	Carson River	Foerschler Ranch	14.40	2005	7/27	No data	No data	9	11	No data	20	29.6	28.2	24.6	23.7	10.9			113%
C-10	Carson River	Foerschler Ranch	14.40	2006	7/26	No data	No data	17	31	11	59	29.3	28.3	25.5	24.8	11.4			185%
C-11	Carson River	Riverview Park	18.00	2005	8/4	No data	No data	8	31	8	47	29.8	28.5	25.6	24.4	11.8			113%
C-11	Carson River	Riverview Park	18.00	2006	7/24	No data	No data	12	30	9	51	27.9	27.0	25.3	24.7	9.8			185%
C-12	Carson River	Empire Golf Course	19.85	2005	8/4	No data	No data	13	31	9	53	29.6	28.5	26.0	24.5	12.0			113%
C-13	Carson River	Morgan Mill Road	20.33	2005	8/7	No data	No data	13	30	9	52	30.0	28.5	26.1	24.6	10.8			113%
C-14	Carson River	Deer Run Road (USGS)	20.91	1995	8/23	0	0	0	13	No data	13	26.5	25.0	24.0	22.4	7.0			217%
C-14	Carson River	Deer Run Road (NDOW)	20.91	2000	7/31	No data	2	28	29	0	59	30.2	28.8	26.1	24.7	10.1			73%
C-14	Carson River	Deer Run Road (NDEP)	20.91	2003	7/30	No data	No data	13	31	7	51	31.0	29.7	27.4	26.5	10.5			74%
C-15	Carson River	Brunswick Bridge	21.82	2005	7/31	0	0	4	3	0	7	29.8	28.0	25.6	24.8	9.8			113%

= incomplete data for month