Water Quality Trend Analyses for Selected Nevada Streams

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INTRODUCTION

The Nevada Division of Environmental Protection (NDEP) has maintained a number of long-term water quality monitoring sites on streams throughout the state, with data dating back to the 1960s at several locations. Long term monitoring data are used for multiple purposes:

- determine ambient water quality conditions
- support water quality standards review efforts
- assess health of streams
- support TMDL (Total Maximum Daily Loads) development
- determine trends in pollutant concentrations and/or loads over time.

This report presents the results of trend analyses using long term monitoring data as collected by NDEP and augmented with data from other agencies. These trend analyses results may be useful for examining the effectiveness of past water quality management actions (nonpoint source projects, discharge permits, etc.), and identifying any emerging or worsening problems which may need targeted attention.

METHODOLOGY

Site Selection

Following a cursory review of the available data, 38 long term sites on streams were selected for trend analysis. The focus was on sites maintained by NDEP as many of these sites have long periods of record dating back to the 1960s. However, some of the datasets were augmented with data from other agencies for the same site or nearby sites to improve the time coverage of the data. All selected sites had at least 10 years or more of water quality data.

Concentrations of water quality parameters are often correlated with streamflow. In these cases, including streamflow data into the trend analyses increases the statistical accuracy of the results. Therefore, most of the sites selected were at or near active USGS streamflow gaging stations.

Parameters Evaluated

The available water quality data for the selected sites were examined to determine which parameters were best suited for potential trend analyses. For a parameter to be considered suitable for trend analyses for this report, there needed to be a minimum number of censored values (less than 5 percent values of the values reported as "< Reporting Limit"). The parameters which most consistently had a minimum number of censored values across all the long term sites are as follows:

- Sulfate
- Total Dissolved Solids (TDS)
- Total Kjeldahl Nitrogen (TKN)
- Total Phosphorus (TP)

- Turbidity

Parameters such as chloride, e coli, nitrate+nitrite, orthophosphates, and total suspended solids were considered for possible use but the datasets were found to have too many censored values. Field parameters (dissolved oxygen (DO) and pH) were not included in the trend analyses. Both DO and pH may have significant diel fluctuations which could affect the trend analyses. No metals were included as most of the data is limited to 2 samples per year which was considered insufficient for this analysis.

Time Period of Data

If sufficient data were available for a site, two separate trend analyses were performed for a given parameter:

- Entire period of record (up to 2012)
- Most recent 20 years (1993-2012)
    - Note: Some sites may have less than 20 years of data

In both cases, data beyond 2012 was not used in these analyses. The NDEP water quality database is currently being redesigned and 2013 and later data are not readily available.

Trend Analysis Methods

Trends were determined by using the seasonal Kendall test (Hirsch et al., 1982; Hirsch and Slack, 1984) with statistical tests performed by a computer program developed by Helsel and others (2005). The seasonal Kendall test accounts for water quality variations due to flow and seasonal changes, which greatly enhances the statistical power of the test (Schertz et al., 1991).

The Seasonal Kendall test is generally recommended for use on datasets with little to no censoring (less than 5 percent of the data given as "< Reporting Limit") (Schertz et al., 1991). Censored values were assigned a value of ½ of the reporting limit. For datasets with more than 5 percent of the values being censored, no trend tests were performed.

If the time length of a gap in the data is greater than 1/3 of the total data time period, a step trend test is a more appropriate test than the seasonal Kendall test (Helsel and Hirsch, 1991). In these cases, no trend analyses were performed.

Input to the seasonal Kendall test program requires selection of the number of seasons in a given year. Many of the datasets used for this study had significant variations in sampling frequency. For example during some years, water quality sampling was performed monthly, but then later changed to quarterly. To compensate for these variations in data density, the number of seasons selected should be based upon the smallest sampling frequency (Schertz et al., 1991). For most analyses, 4 seasons per year were assumed for the seasonal Kendall tests.

The concentration of a given water quality parameter is often correlated with streamflow, complicating the ability to detect trends in the water quality. To account for this influence, the Kendall program by Helsel and others (2005) includes an option for adjusting water quality concentrations for streamflow effects with LOWESS (LOcally WEighted Scatterplot Smoothing) smoothed curves. For this study, a

LOWESS smoothing factor of 0.50 was used. For those water quality monitoring sites without concurrent streamflow data, no LOWESS smoothing was performed.

RESULTS

Table 1 provides a summary of the trend analyses results for the 38 selected streams sites in Nevada. Location maps for the trend analyses sites are provided in Attachment A. More details, such as number of data points, number of censored values, etc. are presented in Attachment B.

Of the 190 possible trend analyses (38 sites x 5 parameters) for those sites/parameters with more than 20 years, no tests were performed for 53 due to lack of data and/or unacceptable levels of censored data. For the 137 trend analyses that were performed, 54% indicated "No Trend", 28% indicated "Decreasing" trends, and 18% indicated "Increasing" trends. All the hydrographic basins had instances where "Increasing" trends were identified for those time periods greater than 20 years.

For the 1993-2012 period, no tests were performed for 36 of the possible 190 tests due to unacceptable levels of censored data. For the 154 trend analyses that were performed, 71% indicated "No Trend", 23% indicated "Decreasing" trends and 6% indicated "Increasing" trends. All hydrographic basins (except Carson River Basin and Walker River Basin) had instances where "Increasing" trends were identified for the 1993-2012 period.

Determining the causes of these increasing and decreasing trends can be challenging and typically requires more detailed investigations than provided in this report. However, there are a few instances where trends are linked to known discharge permit activities. For example in the 1980s, the discharge of treated wastewater effluent to the Carson River was eliminated. This change in wastewater management is likely a huge factor contributing to the decreasing trend for nutrients (TKN, TP) at some sites on the Carson River (Figure 1). Similarly in the Truckee River and the Las Vegas Wash, improved nutrient removal contributed to decreasing nutrients levels at some locations (Figures 2 and 3).

Figure 1. Carson River below Carson City, Total Phosphorus Trends (1968-2015)

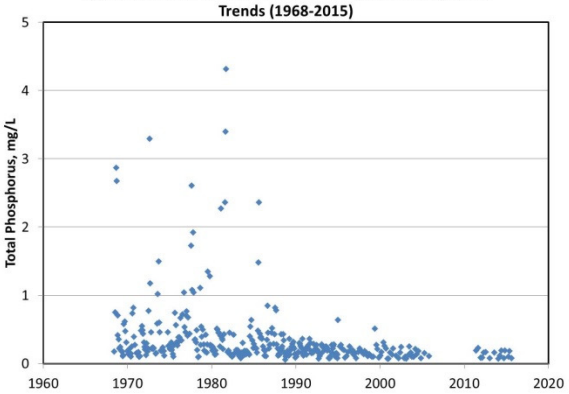

Figure 2. Truckee River near Lockwood, Total Phosphorus Trends (1973-2015)

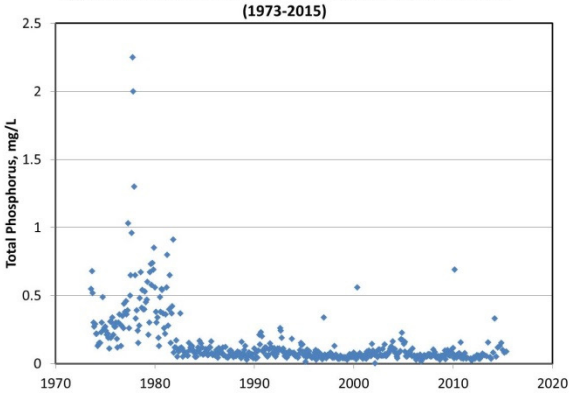

Figure 3. Las Vegas Wash near Lake Mead, Total Phosphorus Trends (1968 - 2015)

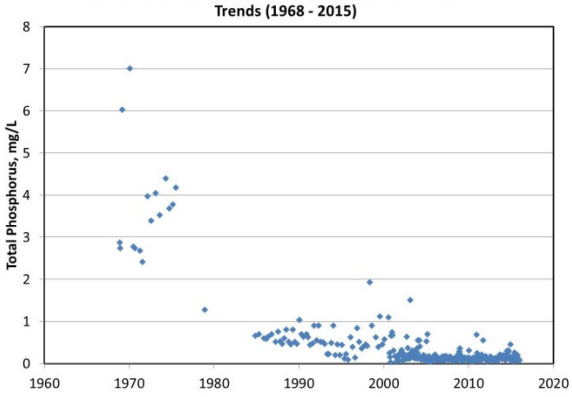

Table 1. Summary of Trend Analyses for Period of Record (beyond 20-Years) and Recent 20-year Period

Site ID	Description	Gage Data Available?	Time Period	Sulfate	TDS	TKN	TP	Turbidity
Carson River Basin								
C9	EF Carson R. at Riverview	Yes	P.O.R.		↓		↑	↔
			20-years		↔		↔	↔
C8	WF Carson R. at Paynesville	Yes	P.O.R.		↓		↓	↑
			20-years		↔		↓	↔
C13	Carson R. at Mexican Gage	Yes	P.O.R.	↔	↔	↔	↓	↑
			20-years	↔	↔	↔	↓	↔
C1	Carson R. at New Empire Bridge	Yes	P.O.R.	↔	↓	↓	↓	↑
			20-years	↔	↔	↓	↔	↔
C10	Carson R. at Weeks Bridge	Yes	P.O.R.	↓	↓	↔	↓	↑
			20-years	↓	↓	↔	↓	↔
C18	Carson R. bel. Lahontan Reservoir	Yes	P.O.R.	↔	↓	↔	↔	↔
			20-years	↔	↔	↓	↔	↔
Truckee River Basin								
3B	3rd Ck. at Lakeshore Dr.	Yes	P.O.R.		↔		↔	↔
			20-years		↔		↔	↓
INCL	Incline Ck. at Lakeshore Dr.	Yes	P.O.R.		↑		↔	↔
			20-years		↑		↔	↔
SB5	Steamboat Ck. at Rhodes Rd.	Yes	P.O.R.		↔	↓	↓	↑
			20-years		↔	↓	↔	↔
SB19	Steamboat Ck. at Cleanwater Way	Yes	P.O.R.		↑	↔	↔	
			20-years		↑	↔	↔	
T1	Truckee R. at Farad	Yes	P.O.R.	↓	↓	↔	↓	↔
			20-years	↔	↔	↓	↓	↔
T3	Truckee R. at E. McCarran Bridge	Yes	P.O.R.	↑	↑			↑
			20-years	↑	↑			↔
T4A	Truckee R. at Vista Gage	Yes	P.O.R.	↑	↑	↓	↓	↔
			20-years	↑	↔	↓	↔	↔
T6	Truckee R. at Wadsworth	Yes	P.O.R.	↑	↔	↔	↓	↑
			20-years	↔	↔	↔	↔	↔

↔ No trend ↑ Increasing ↓ Decreasing No test

Table 1. Summary of Trend Analyses for Period of Record (Beyond 20 years) and Recent 20-year Period (cont'd)

Site ID	Description	Gage Data Available?	Time Period	Sulfate	TDS	TKN	TP	Turbidity
Snake River Basin								
E16	Owyhee R. bel. Slaughterhouse Ck.	Yes	P.O.R.					
			20-years		↔	↔	↔	↓
E5	Bruneau R. at Mink Ranch	Yes	P.O.R.		↔		↔	↔
			20-years		↔			↔
E6	Jarbidge R. bel. Jarbidge	Yes	P.O.R.					
			20-years		↔			↔
E11	EF Jarbidge R. bel. Murphys	No	P.O.R.		↔			↔
			20-years		↔			↔
E8	Salmon Falls Creek	Yes	P.O.R.	↔	↔		↑	↑
			20-years	↔	↑			↔
Humboldt River Basin								
HS1	Marys R.	Yes	P.O.R.		↓		↔	↔
			20-years		↔		↔	↔
HS14	Maggie Ck. at SR 221	Yes	P.O.R.					
			20-years	↔	↔		↔	↓
HS15	NF Humboldt R. at North Fork Ranch	No	P.O.R.					
			20-years	↔	↔			↓
HS3A	SF Humboldt R. bel. Dixie Ck.	No	P.O.R.	↔	↔	↔		↔
			20-years	↔	↑			↓
HS4	Humboldt R. at Osino Ck.	Yes	P.O.R.	↑	↔	↔	↔	↑
			20-years	↑	↔	↔	↔	↔
HS5	Humboldt R. at Carlin	Yes	P.O.R.	↔	↔	↔	↓	↑
			20-years	↔	↔	↔	↓	↔
HS6	Humboldt R. at Palisade	Yes	P.O.R.	↔	↔	↔	↓	↔
			20-years	↔	↔	↔	↓	↔
HS7	Humboldt R. at Battle Mountain	Yes	P.O.R.	↔	↓	↔	↔	↔
			20-years	↔	↔	↔	↔	↔
HS8	Humboldt R. at Comus	Yes	P.O.R.	↔	↔	↔	↔	↑
			20-years	↔	↔	↔	↔	↔
HS9	Humboldt R. at Imlay	Yes	P.O.R.	↔	↔	↓	↔	↑
			20-years	↔	↔	↔	↔	↔
HS6	Humboldt R. bel. Rye Patch Res.	Yes	P.O.R.		↔	↑	↔	↔
			20-years	↔	↔	↑	↔	↔

↔ No trend ↑ Increasing ↓ Decreasing No test

Table 1. Summary of Trend Analyses for Period of Record and Recent 20-year Period (cont'd)

Site ID	Description	Gage Data Available?	Time Period	Sulfate	TDS	TKN	TP	Turbidity
Walker River Basin								
W7	W. Walker R. at Hudson Gage	Yes	P.O.R.					
			20-years	↓	↔	↓	↓	↓
EFS	E. Walker R. at Stateline	Yes	P.O.R.	↔	↔	↔	↔	↔
			20-years	↔	↔	↔	↔	↔
W4	Walker R. at Wabuska	Yes	P.O.R.		↓		↔	↑
			20-years	↔	↔	↔	↔	↔
Colorado River Basin								
CL3	Las Vegas Wash at Northshore Dr.	Yes	P.O.R.	↓	↓		↓	↔
			20-years	↓	↓		↓	↔
CL11	Muddy R. at Overton	Yes	P.O.R.	↓	↓	↓	↓	↑
			20-years	↓	↓	↓	↓	↑
CL6A	Virgin R. at Riverside	No	P.O.R.	↔	↓	↔	↔	↑
			20-years	↔	↔	↔		↔
CL2	Colorado R. at Willow Beach	Yes	P.O.R.	↓	↓	↔		↔
			20-years	↓	↓	↔		↔
CL1	Colorado R. near Laughlin	Yes	P.O.R.	↓	↓	↔		↔
			20-years	↓	↓	↓		↓

↔ No trend ↑ Increasing ↓ Decreasing No test

References

Helsel, D.R. and R.M. Hirsch. 1992. Statistical methods in water resources: Studies in Environmental Science 49. New York: Elsevier.

Helsel, D.R., D.K. Mueller, and J.R. Slack. 2005. Computer Program for the Kendall Family of Trend Tests. USGS Scientific Investigations Report 2005-5275.

Hirsch, R.M., J.R. Slack, and R.A. Smith. 1982. Techniques of trend analysis for monthly water quality data. Water Resources Research v. 18, p. 107-121.

Hirsch, R.M. and J.R. Slack. 1984. A nonparametric trend test for seasonal data with serial dependence. Water Resources Research v. 20, p. 727-732.

Schertz, T.L, R.B. Alexander, and D.J. Ohe. 1991. The Computer Program EStimate TREND (ESTREND), A System for the Detection of Trends in Water-Quality Data. USGS Water-Resources Investigations Report 91-4040.

ATTACHMENT A

LOCATION MAPS

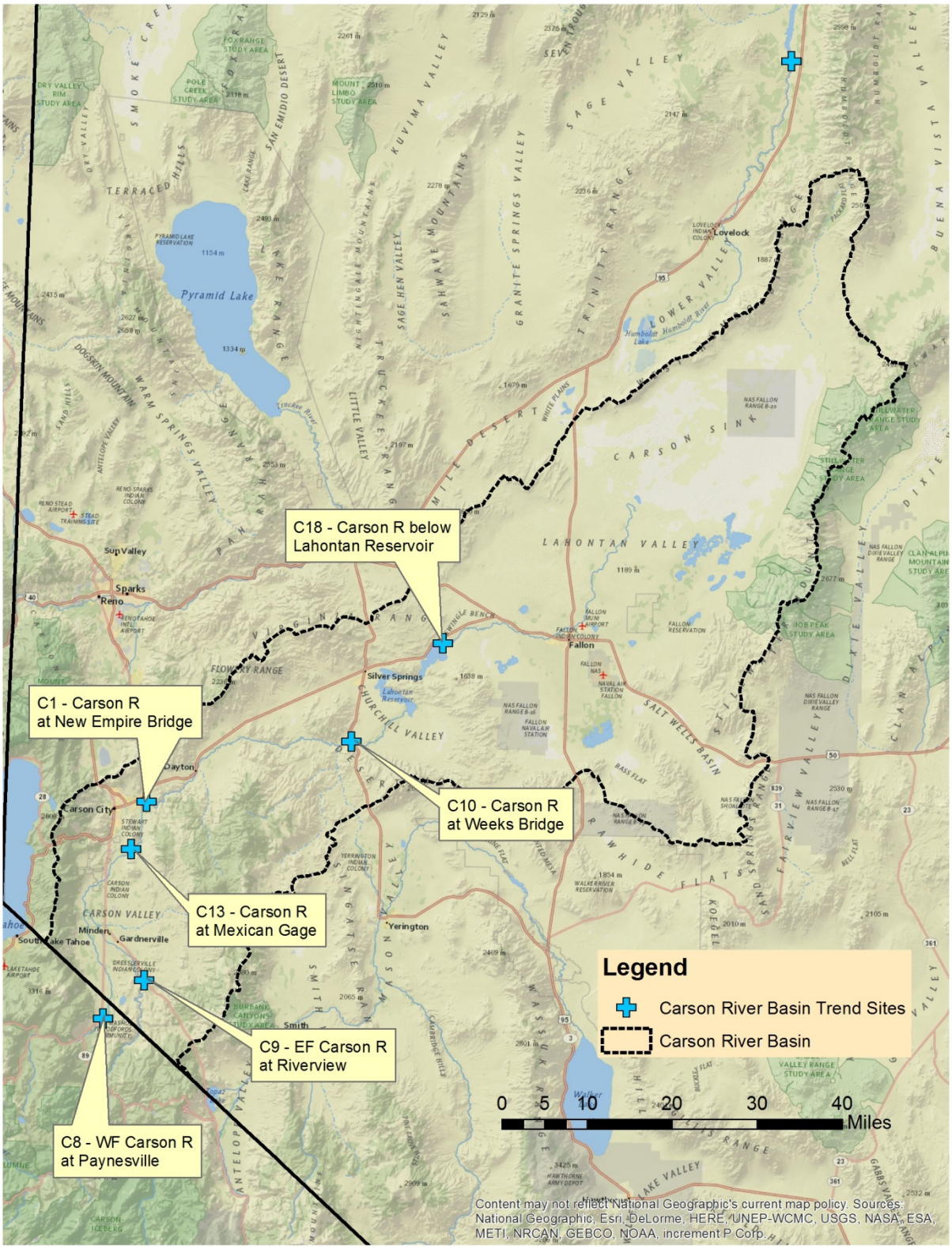

Figure A-1. Carson River Basin Trend Analyses Sites

Figure A-2. Truckee River Basin Trend Analyses Sites

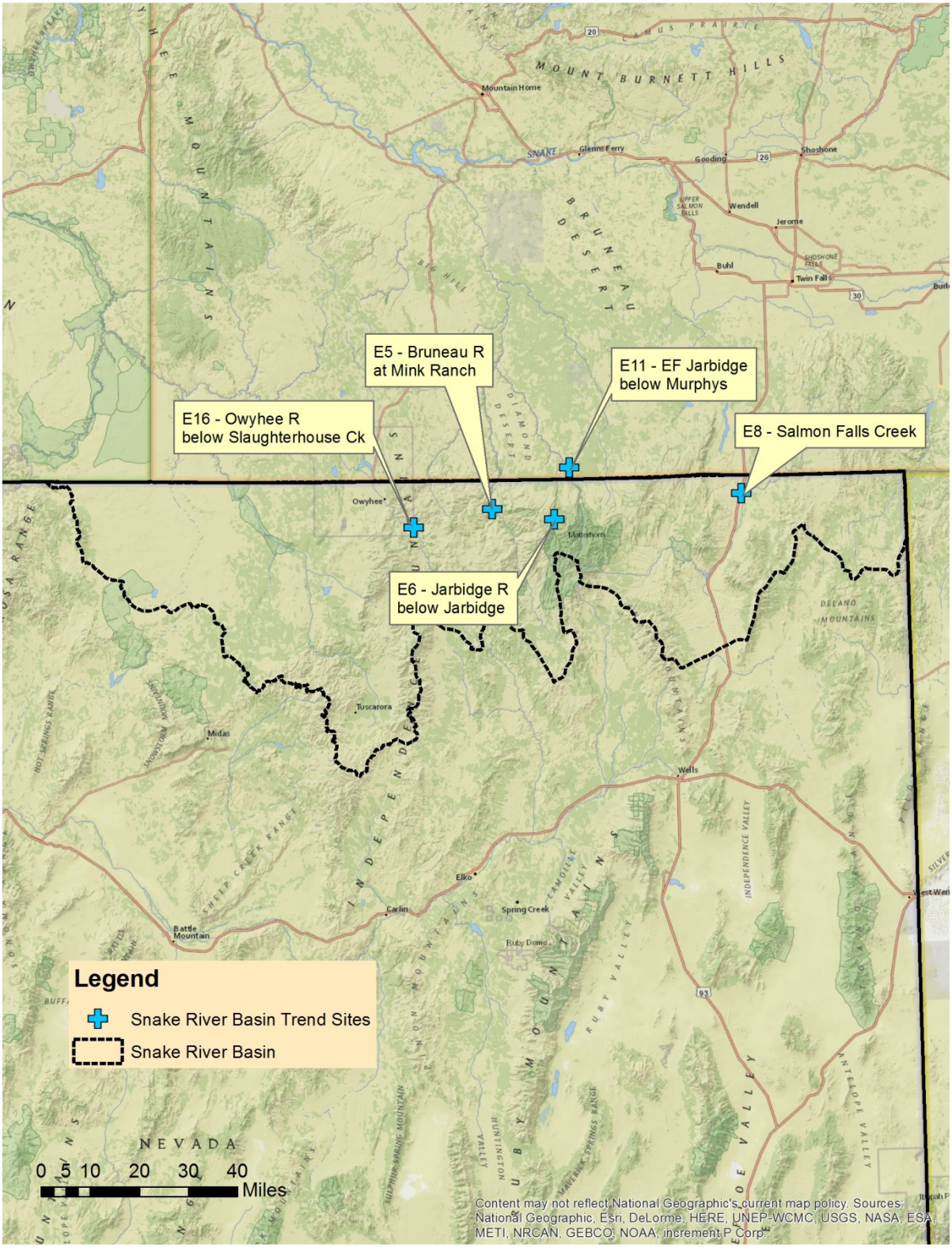

Figure A-3. Snake River Basin Trend Analyses Sites

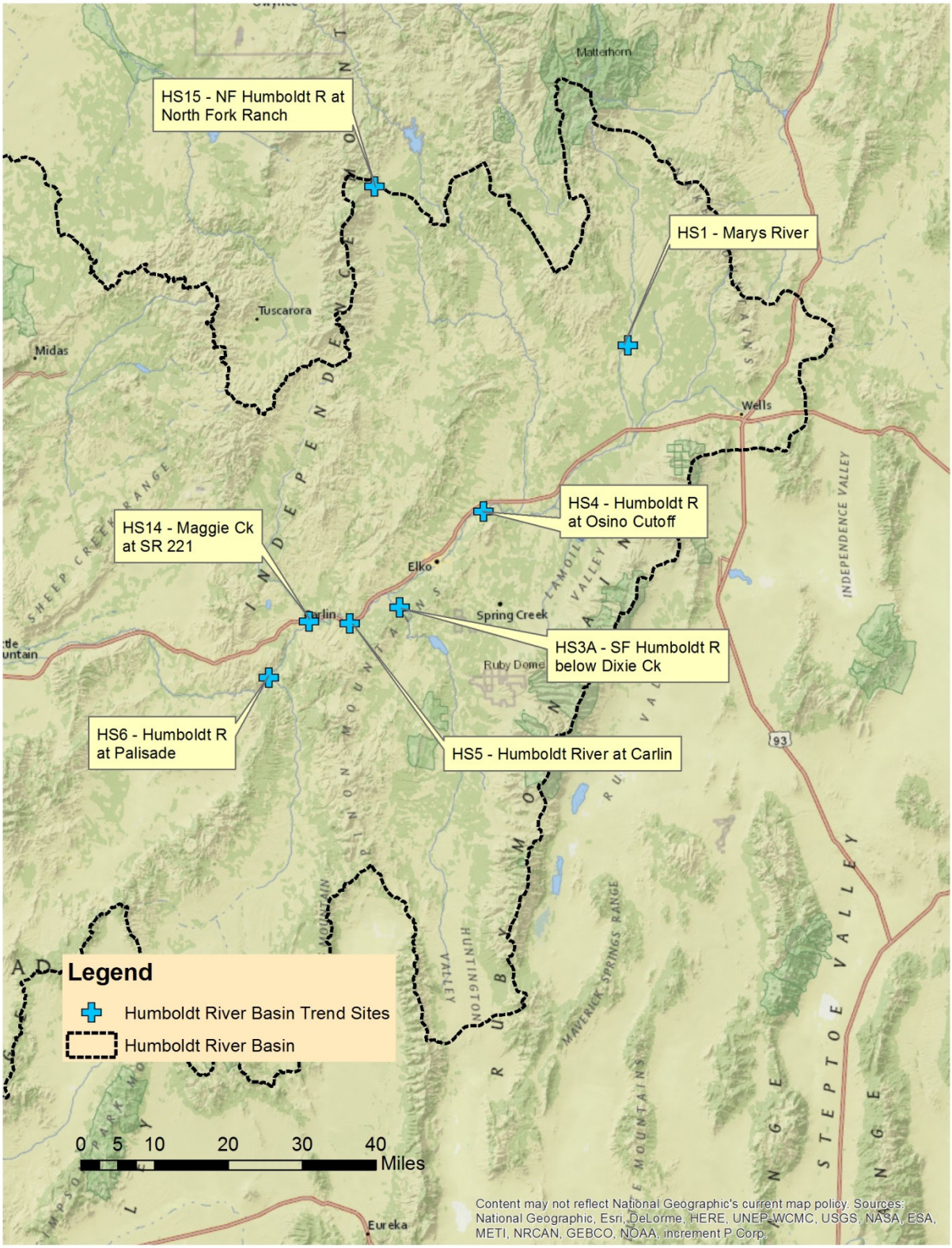

Figure A-4. Upper Humboldt River Basin Trend Analyses Sites

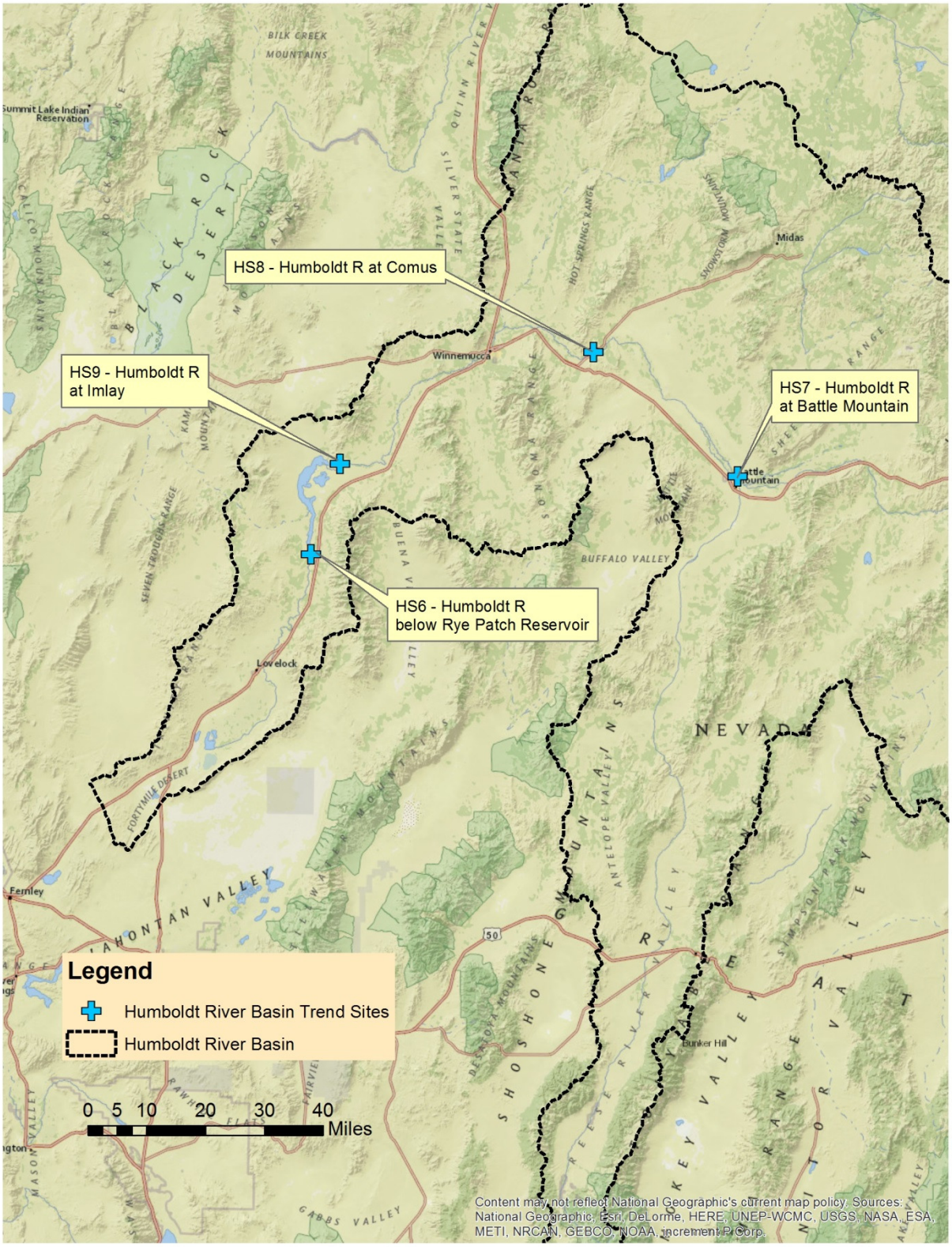

Figure A-5. Lower Humboldt River Basin Trend Analyses Sites

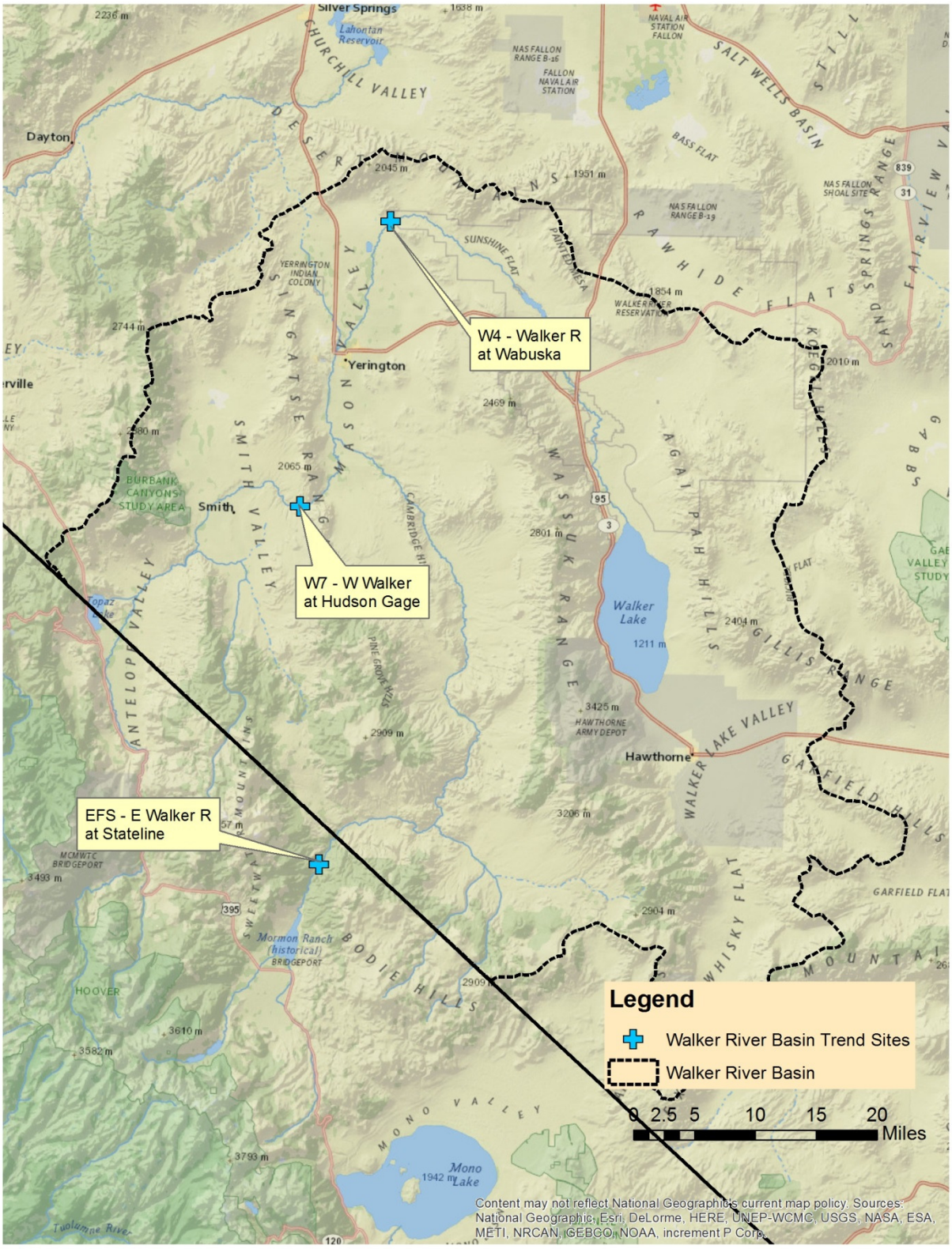

Figure A-6. Walker River Basin Trend Analyses Sites

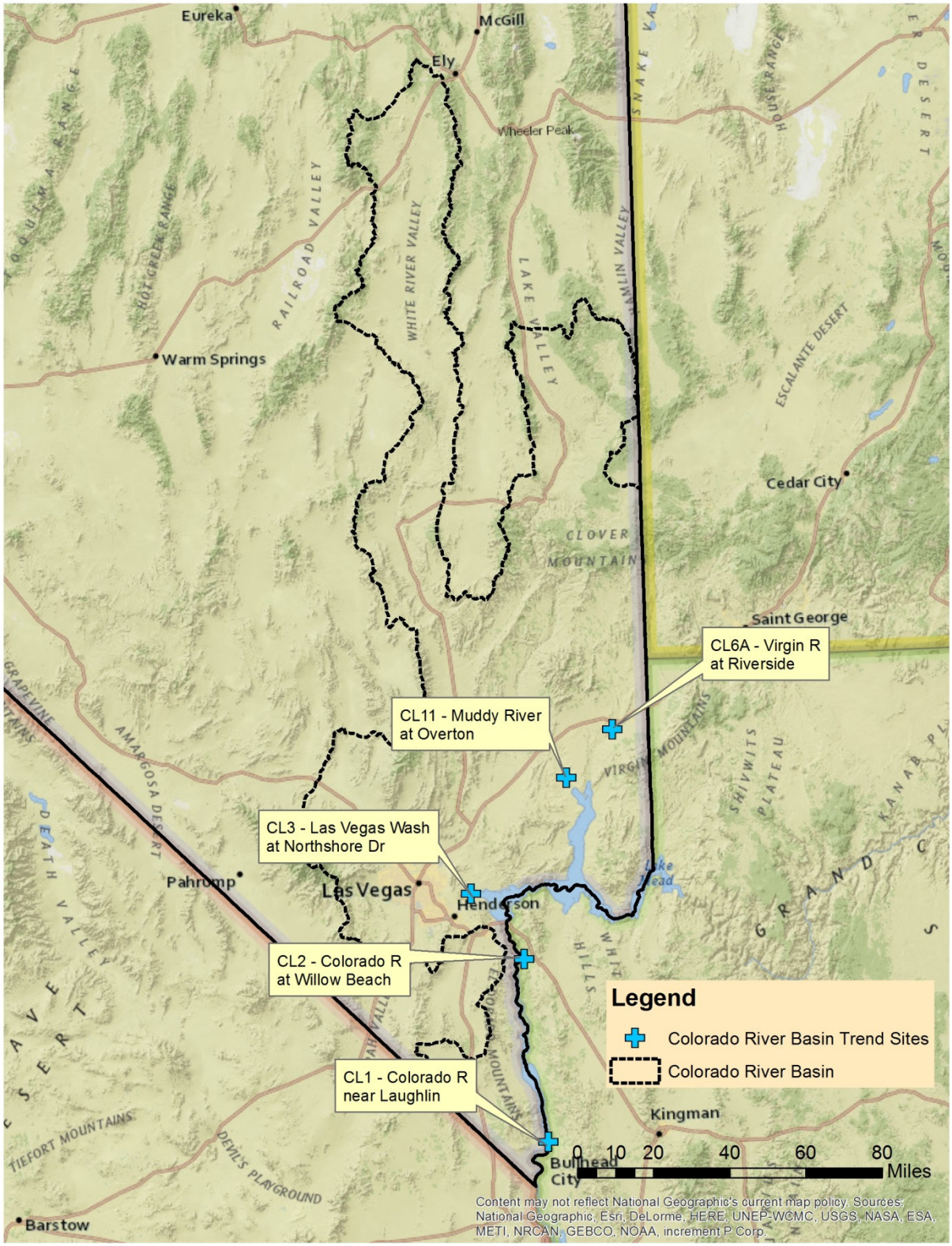

Figure A-7. Colorado River Basin Trend Analyses Sites

ATTACHMENT B

DETAILED SUMMARY OF TREND ANALYSES

Table B-1. Detailed Summary of Trend Analyses

Site ID	Name	Gaging Station	Sulfate				Total Dissolved Solids				Total Kjeldahl Nitrogen				Total Phosphorus				Turbidity			
			Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend
Carson River Basin																						
C9	EF Carson R at Riverview	10309000 – EF Carson R nr. Gardnerville, NV	1992-2012	72	6	No test	1966-2012	373	0	Decreasing	1973-2012	266	43	No test	1968-2012	367	0	Increasing	1969-2012	356	0	No trend
			1993-2012	70	6	No test	1993-2012	93	0	No trend	1993-2012	93	10	No test	1993-2012	93	0	No trend	1993-2012	91	0	No trend
C8	WF Carson R at Paynesville	10310000 – WF Carson R at Paynesville, CA	1992-2012	81	53	No test	1966-2012	388	0	Decreasing	1973-2012	273	37	No test	1968-2012	373	10	Decreasing	1969-2012	364	0	Increasing
			1993-2012	79	53	No test	1993-2012	103	0	No trend	1993-2012	103	13	No test	1993-2012	103	0	Decreasing	1993-2012	101	0	No trend
C13	Carson R at Mexican Gage	10311000 – Carson R at Carson City, NV	1992-2012	78	1	No trend	1975-2012	283	0	No trend	1975-2012	269	2	No trend	1975-2012	285	1	Decreasing	1975-2012	281	0	Increasing
			1993-2012	76	1	No trend	1993-2012	100	0	No trend	1993-2012	100	1	No trend	1993-2012	100	0	Decreasing	1993-2012	98	0	No trend
C1	Carson R at New Empire Bridge	1031400 - Carson R at Deer Run Road	1992-2012	68	1	No trend	1979-2012	190	0	Decreasing	1979-2012	189	0	Decreasing	1979-2012	190	0	Decreasing	1979-2012	188	0	Increasing
			1993-2012	66	1	No trend	1993-2012	90	0	No trend	1993-2012	90	0	Decreasing	1993-2012	90	0	No trend	1993-2012	88	0	No trend
C10	Carson R at Weeks Bridge	10312000 – Carson R nr Ft Churchill	1992-2012	75	1	Decreasing	1968-2012	272	0	Decreasing	1985-2012	171	1	No trend	1968-2012	257	0	Decreasing	1968-2012	249	0	Increasing
			1993-2012	73	1	Decreasing	1993-2012	96	0	Decreasing	1993-2012	96	1	No trend	1993-2012	96	0	Decreasing	1993-2012	94	0	No trend
C18	Carson R below Lahontan Reservoir	10312150 – Carson R bel Lahontan Reservoir	1992-2012	69	0	No trend	1990-2012	119	0	Decreasing	1990-2012	119	0	No trend	1990-2012	119	0	No trend	1990-2012	117	0	No trend
			1993-2012	66	0	No trend	1993-2012	89	0	No trend	1993-2012	89	0	Decreasing	1993-2012	89	0	No trend	1993-2012	87	0	No trend
Truckee River Basin																						
3B	3rd Ck at Lakeshore Dr.	10336698 – Third Ck nr Crystal Bay, NV	1992-2012	76	53	No test	1969-2012	198	0	No trend	1978-2012	142	30	No test	1969-2012	196	6	No trend	1969-2012	195	1	No trend
			1993-2012	74	53	No test	1993-2012	82	0	No trend	1993-2012	82	30	No test	1993-2012	82	0	No trend	1993-2012	81	1	Decreasing
INCL	Incline Ck at Lakeshore Dr.	10336700 – Incline Ck nr Crystal Bay, NV	1992-2012	72	50	No test	1987-2012	141	0	Increasing	1987-2012	99	12	No test	1987-2012	99	0	No trend	1987-2012	99	0	No trend
			1993-2012	70	50	No test	1993-2012	78	0	Increasing	1993-2012	78	12	No test	1993-2012	77	0	No trend	1993-2012	78	0	No trend
SB5	Steamboat Ck at Rhodes Rd	10349300 – Steamboat Ck at Steamboat, NV	1992-2012	171	16	No test	1987-2012	115	0	No trend	1987-2012	115	0	Decreasing	1987-2012	115	0	Decreasing	1987-2012	114	0	Increasing
			1993-2012	165	16	No test	1993-2012	83	0	No trend	1993-2012	83	0	Decreasing	1993-2012	83	0	No trend	1993-2012	82	0	No trend
SB19, Steamboat	Steamboat Ck at Cleanwater Way	10349980 – Steamboat Ck at Cleanwater Way nr Reno, NV					1992-2012	229	0	Increasing	1985-2012	327	0	No trend	1985-2012	345	0	No trend				
			2004-2012	27	0	No test	1993-2012	224	0	Increasing	1993-2012	224	0	No trend	1993-2012	238	0	No trend	2004-2012	27	0	No test
T1	Truckee R at Farad	10346000 – Truckee R at Farad, CA	1968-2012	521	0	Decreasing	1966-2012	611	0	Decreasing	1980-2012	384	0	No trend	1968-2012	532	9	Decreasing	1969-2012	515	0	No trend
			1993-2012	237	0	No trend	1993-2012	237	0	No trend	1993-2012	235	0	Decreasing	1993-2012	237	1	Decreasing	1993-2012	235	0	No trend
T3, McCarran	Truckee R at E McCarran Bridge	10348200 – Truckee R nr Sparks, NV	1977-2012	415	0	Increasing	1977-2012	425	0	Increasing	1980-2012	389	30	No test	1977-2012	438	114	No test	1977-2012	417	0	Increasing
			1993-2012	233	0	Increasing	1993-2012	236	0	Increasing	1993-2012	222	30	No test	1993-2012	235	114	No test	1993-2012	233	0	No trend

Table A-1. Detailed Summary of Trend Analyses (cont'd)

Site ID	Name	Gaging Station	Sulfate				Total Dissolved Solids				Total Kjeldahl Nitrogen				Total Phosphorus				Turbidity			
			Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend
Truckee River Basin																						
T4A	Truckee R at Vista Gage	10350000 – Truckee R at Vista, NV	1968-2012	524	0	Increasing	1968-2012	530	0	Decreasing	1980-2012	383	1	Decreasing	1973-2012	470	0	Decreasing	1973-2012	461	0	No trend
			1993-2012	238	0	Increasing	1993-2012	237	0	No trend	1993-2012	235	1	Decreasing	1993-2012	237	0	No trend	1993-2012	235	0	No trend
T6, Wadsworth	Truckee R at Wadsworth	10351600 – Truckee R bel Derby Dam nr Wadsworth, NV	1968-2012	520	0	Increasing	1966-2012	605	0	No trend	1980-2012	380	4	No trend	1968-2012	527	6	Decreasing	1969-2012	515	0	Increasing
			1993-2012	234	0	No trend	1993-2012	234	0	No trend	1993-2012	232	4	No trend	1993-2012	234	6	No trend	1993-2012	233	0	No trend
Snake River Basin																						
E16	Owyhee R bel Slaughterhouse Ck	13175100 – Owyhee R nr Mountain City, NV																				
			2000-2012	35	3	No test	2000-2012	34	0	No trend	2000-2012	35	0	No trend	2000-2012	35	0	No trend	2000-2012	35	0	Decreasing
E5	Bruneau R at Mink Ranch	13161500 – Bruneau R at Rowland, NV	1992-2012	35	2	No test	1967-2012	66	0	No trend	1978-2012	46	3	No test	1967-2012	65	3	No trend	1969-2012	56	0	No trend
			1993-2012	34	2	No test	1993-2012	34	0	No trend	1993-2012	34	3	No test	1993-2012	33	3	No test	1993-2012	33	0	No trend
E6	Jarbidge R bel Jarbidge	13162225 – Jarbidge R bel Jarbidge, NV																				
			1998-2012	41	10	No test	1998-2012	41	0	No trend	1998-2012	41	16	No test	1998-2012	41	28	No test	1998-2012	39	0	No trend
E11	EF Jarbidge bel Murphys	None	1992-2012	53	22	No test	1967-2012	78	0	No trend	1978-2012	66	11	No test	1968-2012	74	11	No test	1971-2012	71	0	No trend
			1993-2012	52	22	No test	1993-2012	51	0	No trend	1993-2012	52	11	No test	1993-2012	54	11	No test	1993-2012	50	0	No trend
E8	Salmon Falls Ck	13105000 – Salmon Falls Ck nr San Jacinto	1992-2012	54	2	No trend	1966-2012	89	0	No trend	1978-2012	68	5	No test	1966-2012	89	3	Increasing	1969-2012	79	0	Increasing
			1993-2012	53	2	No trend	1993-2012	54	0	Increasing	1993-2012	54	5	No test	1993-2012	54	3	No test	1993-2012	52	0	No trend
Humboldt River Basin																						
HS1	Marys R	10315500 – Marys R ab Hot Springs Ck nr Deeth, NV	1992-2012	59	4	No test	1975-2012	145	0	Decreasing	1978-2012	125	24	No test	1978-2012	145	0	No trend	1988-2012	83	0	No trend
			1993-2012	57	4	No test	1993-2012	65	0	No trend	1993-2012	65	10	No test	1993-2012	65	0	No trend	1993-2012	65	0	No trend
HS14	Maggie Ck at SR 221	10322000 – Maggie Ck at Carlin, NV																				
			1995-2012	74	0	No trend	1995-2012	77	0	No trend	1995-2012	77	8	No test	1995-2012	77	1	No trend	1995-2012	77	1	Decreasing
HS15	NF Humboldt R at North Fork Ranch	None																				
			1995-2012	54	0	No trend	1995-2012	57	0	No trend	1995-2012	58	7	No test	1995-2012	57	6	No test	1995-2012	57	1	Decreasing
HS3A	SF Humboldt R bel Dixie Ck	None	1992-2012	73	0	No trend	1975-2012	150	0	No trend	1978-2012	130	5	No trend	1978-2012	150	8	No test	1988-2012	97	2	No trend
			1993-2012	71	0	No trend	1993-2012	80	0	Increasing	1993-2012	80	5	No test	1993-2012	80	7	No test	1993-2012	80	2	Decreasing
HS4	Humboldt R at Osino Cutoff	10318500 – Humboldt R nr Elko, NV	1992-2012	64	0	Increasing	1975-2012	140	0	No trend	1978-2012	120	0	No trend	1978-2012	140	0	No trend	1975-2012	140	0	Increasing
			1993-2012	62	0	Increasing	1993-2012	68	0	No trend	1993-2012	68	0	No trend	1993-2012	68	0	No trend	1993-2012	68	0	No trend

Table A-1. Detailed Summary of Trend Analyses (cont'd)

Site ID	Name	Gaging Station	Sulfate				Total Dissolved Solids				Total Kjeldahl Nitrogen				Total Phosphorus				Turbidity			
			Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend
Humboldt River Basin																						
HS5	Humboldt R at Carlin	10321000 – Humboldt R nr Carlin, NV	1992-2012	69	0	No trend	1975-2012	156	0	No trend	1978-2012	136	0	No trend	1978-2012	156	0	Decreasing	1975-2012	156	0	Increasing
			1993-2012	67	0	No trend	1993-2012	75	0	No trend	1993-2012	75	0	No trend	1993-2012	75	0	Decreasing	1993-2012	75	0	No trend
HS6	Humboldt R at Palisade	10322500 – Humboldt R at Palisade, NV	1992-2012	80	0	No trend	1975-2012	162	0	No trend	1978-2012	144	2	No trend	1978-2012	163	0	Decreasing	1975-2012	162	0	No trend
			1993-2012	78	0	No trend	1993-2012	85	0	No trend	1993-2012	85	2	No trend	1993-2012	85	0	Decreasing	1993-2012	85	0	No trend
HS7	Humboldt R at Battle Mountain	10325000 – Humboldt R at Battle Mountain	1992-2012	57	0	No trend	1975-2012	106	0	Decreasing	1978-2012	86	0	No trend	1978-2012	106	0	No trend	1975-2012	106	0	No trend
			1993-2012	56	0	No trend	1993-2012	64	0	No trend	1993-2012	64	0	No trend	1993-2012	64	0	No trend	1993-2012	64	0	No trend
HS8	Humboldt R at Comus	10327500 – Humboldt R at Comus, NV	1992-2012	76	0	No trend	1975-2012	156	0	No trend	1978-2012	138	0	No trend	1978-2012	156	0	No trend	1975-2012	155	0	Increasing
			1993-2012	74	0	No trend	1993-2012	82	0	No trend	1993-2012	82	0	No trend	1993-2012	82	0	No trend	1993-2012	81	0	No trend
HS9	Humboldt R at Imlay	10333000 – Humboldt R nr Imlay, NV	1992-2012	59	0	No trend	1975-2012	144	0	No trend	1978-2012	126	1	Decreasing	1978-2012	144	0	No trend	1975-2012	143	0	Increasing
			1993-2012	58	0	No trend	1993-2012	66	0	No trend	1993-2012	66	1	No trend	1993-2012	66	0	No trend	1993-2012	65	0	No trend
H6	Humboldt R bel Rye Patch Reservoir	10335000 – Humboldt R nr Rye Patch, NV					1988-2012	66	0	No trend	1988-2012	66	0	Increasing	1988-2012	66	0	No trend	1988-2012	66	0	No trend
			1995-2012	57	0	No trend	1993-2012	62	0	No trend	1993-2012	62	0	Increasing	1993-2012	62	0	No trend	1993-2012	62	0	No trend
Walker River Basin																						
W7	W Walker R at Hudson Gage	10300000 – W Walker R nr Hudson, NV																				
			1995-2012	62	1	Decreasing	1994-2012	70	0	No trend	1994-2012	70	0	Decreasing	1994-2012	70	0	Decreasing	1994-2012	68	0	Decreasing
EFS	E Walker R at Stateline	10293000 – E Walker R nr Bridgeport, NV	1992-2012	73	1	No trend	1977-2012	184	0	No trend	1978-2012	181	0	No trend	1978-2012	184	0	No trend	1977-2012	182	0	No trend
			1993-2012	70	1	No trend	1993-2012	83	0	No trend	1993-2012	83	0	No trend	1993-2012	83	0	No trend	1993-2012	81	0	No trend
W4	Walker R at Wabuska	10301500 – Walker R nr Wabuska					1967-2012	183	0	Decreasing					1968-2012	168	0	No trend	1969-2012	163	0	Increasing
			1994-2012	70	0	No trend	1994-2012	78	0	No trend	1994-2012	78	1	No trend	1994-2012	78	0	No trend	1994-2012	76	0	No trend
Colorado River Basin																						
CL3, LW0.55, LW0.8, LW0.9	Las Vegas Wash at Northshore Dr	09419790 – LV Wash bel Lake Las Vegas bel Henderson; 09419800 – LV Wash bel Lake Las Vegas nr Boulder City	1992-2012	372	0	Decreasing	1992-2012	384	0	Decreasing	1992-2012	393	90	No test	1992-2012	384	0	Decreasing	1992-2012	211	3	No trend
			1993-2012	370	0	Decreasing	1993-2012	380	0	Decreasing	1993-2012	389	90	No test	1993-2012	380	0	Decreasing	1993-2012	207	3	No trend
Cl11, MR8.0	Muddy R at Overton	09419507 – Muddy R at Lewis Ave at Overton, NV (NOT USED – insufficient data)	1992-2012	153	3	Decreasing	1976-2012	200	0	Decreasing	1978-2012	120	2	Decreasing	1976-2012	258	2	Decreasing	1976-2012	205	0	Increasing
			1993-2012	151	3	Decreasing	1993-2012	157	0	Decreasing	1993-2012	83	2	Decreasing	1993-2012	215	2	Decreasing	1993-2012	163	0	Increasing

Table A-1. Detailed Summary of Trend Analyses (cont'd)

Site ID	Name	Gaging Station	Sulfate				Total Dissolved Solids				Total Kjeldahl Nitrogen				Total Phosphorus				Turbidity			
			Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend	Date Range	No. of Values	No. of Censored Values	Trend
Colorado River Basin																						
CL6A, VR49.3	Virgin R at Riverside	None	1992-2012	160	3	No trend	1974-2012	201	0	Decreasing	1985-2012	112	3	No trend	1974-2012	199	9	No trend	1974-2012	198	0	Increasing
			1993-2012	158	3	No trend	1993-2012	163	0	No trend	1993-2012	86	3	No trend	1993-2012	161	9	No test	1993-2012	160	0	No trend
CL2, CR329.7, CR330.2	Colorado R at Willow Beach	09421500 – Colorado R bel Hoover Dam, AZ-NV	1992-2012	53	0	Decreasing	1967-2012	120	0	Decreasing	1978-2005	82	0	No trend	1968-2012	122	37	No test	1968-2012	106	2	No trend
			1993-2012	51	0	Decreasing	1993-2012	51	0	Decreasing	1993-2012	49	0	No trend	1993-2012	63	31	No test	1993-2012	48	2	No trend
CL1, CR274.1, CR274.23	Colorado R nr Laughlin	09423000 – Colorado R bel Davis Dam, AZ-NV	1992-2012	93	0	Decreasing	1967-2012	181	0	Decreasing	1985-2012	101	2	No trend	1969-2012	124	40	No test	1970-2012	123	0	No trend
			1993-2012	91	0	Decreasing	1993-2012	117	0	Decreasing	1993-2012	75	2	Decreasing	1993-2012	70	34	No test	1993-2012	72	0	Decreasing