

Appendix 2. Regression analysis results for estimating chloride concentration

All data were collected using U.S. Geological Survey (USGS) protocols and are stored in the USGS National Water Information System (NWIS) database (<http://waterdata.usgs.gov/nwis>). The regression models are based on measurements of specific conductance and turbidity and concurrent chloride samples collected from November 2008 to September 2009. Continuous water-quality data were collected at 5-minute intervals using a YSI model 6920 V2 multiparameter water-quality monitor with a 6560 specific conductance and water temperature sensor, and a 6136 optical turbidity sensor.

Specific conductance and turbidity values are instantaneous unit values temporally corresponding to the collection of the chloride samples. Samples were collected throughout the range of continuously observed hydrologic conditions. Summary statistics and the complete model-calibration dataset are provided. A comparison of cross-section mean and corresponding time-series monitor readings is archived at the Wisconsin Water Science Center and is available by request to Austin Baldwin (akbaldwi@usgs.gov).

Chloride at Little Menomonee River near Freistadt, WI (04087050)

Sample data on 2/16/2009 were not used in the regression development because there was a program change and the sonde data were lost.

MODEL SUMMARY—Summary of final regression results for estimating chloride concentrations at Little Menomonee River near Freistadt, WI.

$$\text{Log}_{10} (\text{Chloride}) = -4.16 + 1.99 \log_{10} (\text{SC}) + 0.1511 \log_{10} (\text{Turb}),$$

Where:

Chloride = chloride concentration in mg/L

SC = Specific Conductance in $\mu\text{S}/\text{cm}$ at 25°C ; and

Turb = Turbidity (YSI 6136) in NTU

Model Information (in log units unless otherwise specified):

Number of measurements = 39,

Root-mean-squared error (RMSE) = 0.10

Model standard percentage error (MPSE) = +25 and -20 percent

90-percent prediction intervals (based on units in mg/L) = ± 39 percent

Adjusted coefficient of determination ($\text{Adj } R^2$) = 0.74

Sum of squared error = 0.34

PRESS = 0.38

Coefficients:

	Coefficient	Standard error	t statistic	p-value
Intercept	-4.16	0.662	-6.28	<0.0001
$\text{Log}_{10} (\text{SC})$	1.99	0.218	9.11	<0.0001
$\text{Log}_{10} (\text{Turb})$	0.151	0.037	4.04	0.0003

Correlation matrix of coefficients:

	Intercept	$\log_{10} (\text{SC})$	$\log_{10} (\text{Turb})$
Intercept	1	-0.998	-0.831
$\text{Log}_{10} (\text{SC})$	-0.998	1	0.802
$\text{Log}_{10} (\text{Turb})$	-0.831	0.802	1

Duan's bias correction factor = 1.02

Table 2-1. Model-calibration dataset for Little Menomonee River near Freistadt, Wisconsin.[mg/L, milligrams per liter; NTU, Nephelometric turbidity units; $\mu\text{S}/\text{cm}$, microsiemens per centimeter; $^{\circ}\text{C}$, degrees Celsius]

Date	Time	Chloride (mg/L)	Turbidity (NTU)	Specific conductance ($\mu\text{S}/\text{cm}$ at 25 $^{\circ}\text{C}$)	Date	Time	Chloride (mg/L)	Turbidity (NTU)	Specific conductance ($\mu\text{S}/\text{cm}$ at 25 $^{\circ}\text{C}$)
11/20/2008	9:45	44	1.2	877	4/27/2009	1:30	24	80.0	447
12/17/2008	11:30	85	2.1	1,060	5/9/2009	7:25	41	81.0	638
12/27/2008	13:05	130	11.2	1,123	5/9/2009	13:30	30	54.0	573
12/28/2008	1:05	120	52.3	838	5/9/2009	19:30	33	15.0	636
12/28/2008	7:15	110	45.0	749	5/14/2009	2:30	24	270.0	485
1/20/2009	10:55	57	0.7	963	5/20/2009	9:00	48	4.5	787
2/7/2009	18:50	80	19.7	822	6/8/2009	5:20	35	120.0	569
2/9/2009	22:40	85	11.3	937	6/16/2009	8:45	50	12.0	805
2/10/2009	10:45	69	38.0	697	6/19/2009	2:50	28	290.0	510
2/10/2009	14:40	50	113.3	556	6/19/2009	8:50	34	89.0	605
2/10/2009	20:40	42	46.0	520	7/16/2009	10:05	51	19.0	786
2/11/2009	2:40	49	21.3	599	8/19/2009	10:00	46	8.8	786
3/2/2009	7:10	62	4.2	935	9/15/2009	9:30	44	10.0	799
3/7/2009	12:55	77	130.0	762	MINIMUM		23	0.7	384
3/7/2009	18:05	52	220.0	538	MAXIMUM		130	290.0	1,123
3/8/2009	7:05	51	62.0	613	MEAN		53	73.8	684
3/8/2009	19:00	26	210.0	384	MEDIAN		48	51.0	638
3/9/2009	0:30	33	140.0	455	STANDARD				
3/10/2009	3:20	43	68.0	570	DEVIATION		26	79.0	188
3/10/2009	8:15	34	94.0	454					
3/10/2009	20:15	32	51.0	485					
3/24/2009	10:40	57	2.8	844					
4/23/2009	9:45	63	2.1	875					
4/25/2009	15:10	53	100.0	676					
4/26/2009	5:30	35	180.0	517					
4/26/2009	19:30	23	200.0	413					

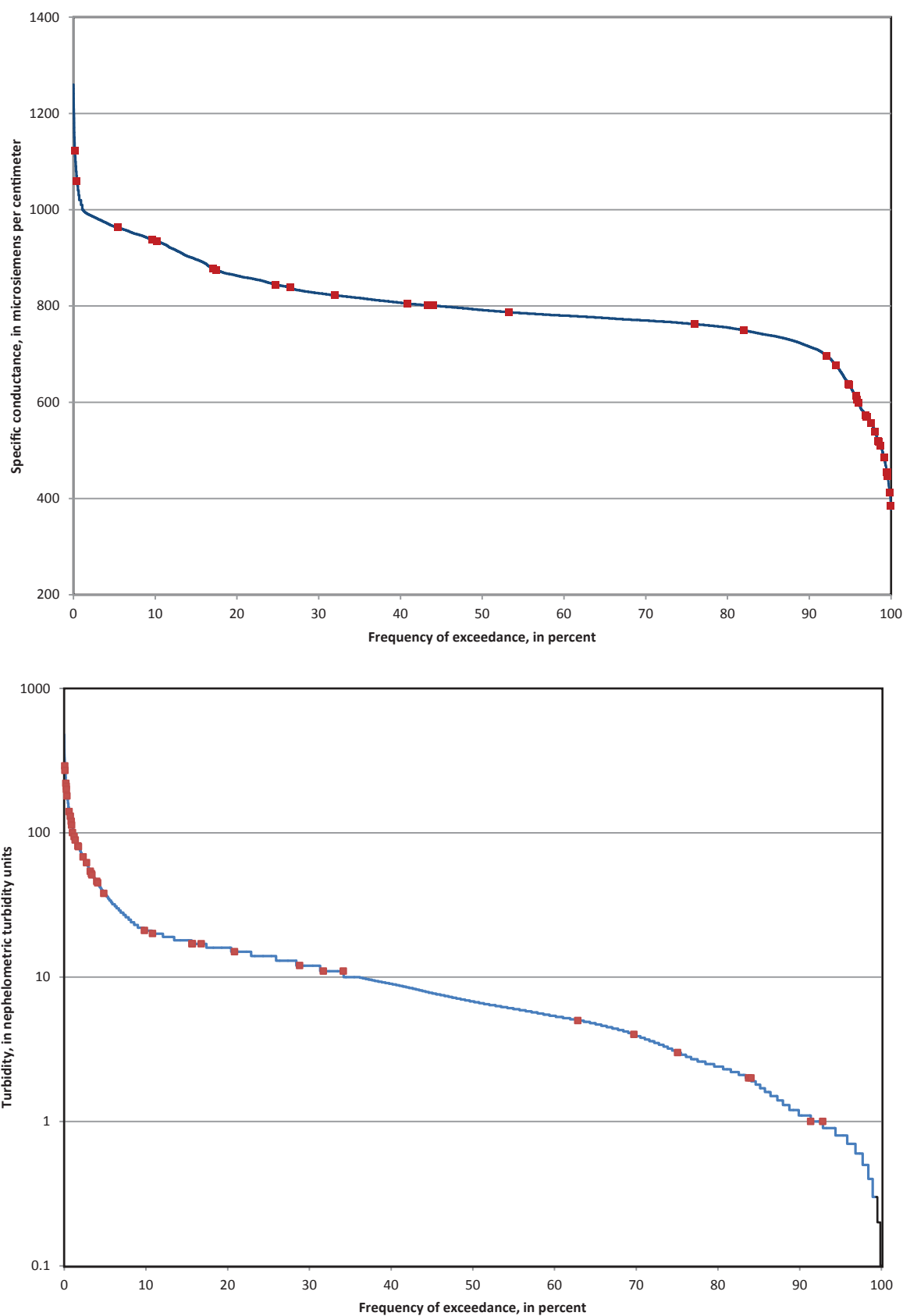


Figure 2-1. Duration curves for specific conductivity and turbidity (November 2008–September 2010) and corresponding values associated with chloride concentration samples collected November 2008 to September 2009 at U.S. Geological Survey streamgage on Little Menomonee River near Freistadt, Wisconsin.

Chloride at Little Menomonee River near Freistadt, Wisconsin, November 2008–September 2009

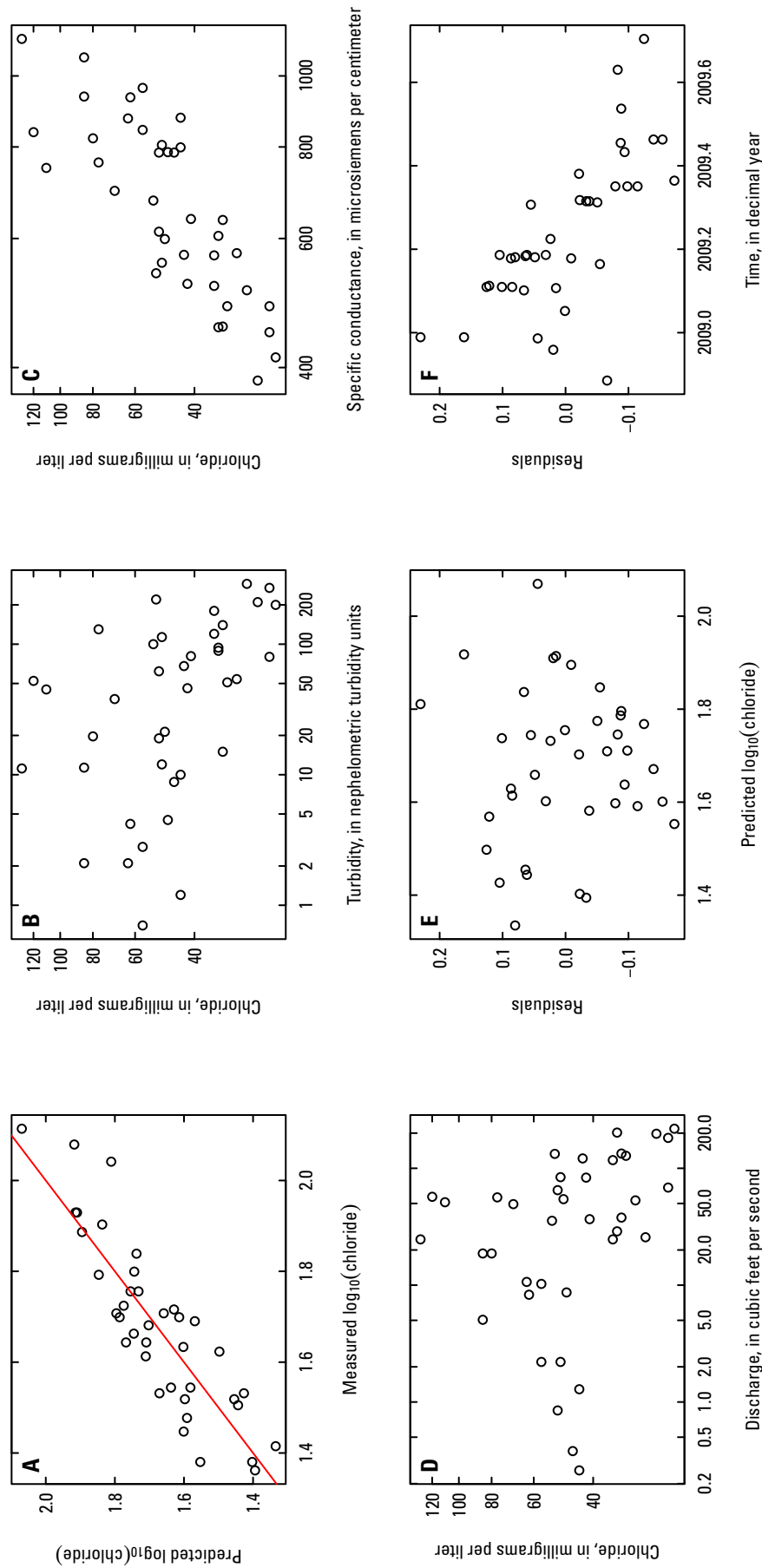


Figure 2-2. U.S. Geological Survey streamgauge on Little Menomonee River near Freistadt, Wisconsin, November 2008 to September 2009. *A*, Relation between measured and predicted $\log_{10}$ (chloride concentration). *B*, Relation between turbidity and chloride concentration in $\log_{10}$ space. *C*, Relation between specific conductance and chloride concentration in $\log_{10}$ space. *D*, Relation between discharge and chloride concentration in $\log_{10}$ space. *E*, Relation between predicted $\log_{10}$ (chloride concentration) and regression residuals. *F*, Relation between time and chloride regression residuals. *G*, Probability plot of chloride regression residuals.

Chloride at Menomonee River at Menomonee Falls, WI (04087030)

Summary of final regression results for estimating chloride concentrations at Menomonee River at Menomonee Falls, WI.

$$\text{Log}_{10}(\text{Chloride}) = -1.63 + 1.28 \log_{10}(\text{SC}),$$

Where:

Chloride = chloride concentration in mg/L

SC = Specific Conductance in $\mu\text{S}/\text{cm}$ at 25° C

Model Information (in log units unless otherwise specified):

Number of measurements = 59,

Root-mean-squared error (RMSE) = 0.073

Model standard percentage error (MPSE) = +18 and -15 percent

90-percent prediction intervals (based on units in mg/L) = +/- 29 percent

Adjusted coefficient of determination ($\text{Adj } R^2$) = 0.94

Sum of squared error = 0.30

PRESS = 0.32

Coefficients:

	Coefficient	Standard error	t statistic	p-value
Intercept	-1.63	0.120	-13.56	<0.0001
$\text{Log}_{10}(\text{SC})$	1.29	0.041	31.20	<0.0001

Correlation matrix of coefficients:

	Intercept	$\log_{10}(\text{SC})$
Intercept	1	-0.997
$\text{Log}_{10}(\text{SC})$	-0.997	1

Duan's bias correction factor = **1.01**

Table 2-2. Model-calibration dataset for Little Menomonee River at Menomonee Falls, Wisconsin.[mg/L, milligrams per liter; μ S/cm, microsiemens per centimeter; °C, degrees Celsius]

Date	Time	Chloride (mg/L)	Specific conductance (μ S/cm at 25 °C)	Date	Time	Chloride (mg/L)	Specific conductance (μ S/cm at 25 °C)
11/20/2008	9:15	130	1,130	5/10/2009	10:25	110	810
12/17/2008	12:00	250	1,450	5/13/2009	23:00	60	703
12/27/2008	0:35	840	3,487	5/20/2009	9:30	110	901
12/27/2008	6:15	960	3,700	6/8/2009	3:15	71	547
12/27/2008	14:20	560	2,347	6/8/2009	3:25	41	354
12/27/2008	20:20	400	1,873	6/8/2009	9:35	110	670
12/28/2008	8:20	300	1,320	6/16/2009	10:15	140	990
1/20/2009	9:55	190	1,270	6/19/2009	0:10	72	529
2/16/2009	11:00	160	1,110	6/19/2009	0:50	24	252
2/26/2009	15:05	370	1,860	6/19/2009	2:00	42	361
2/26/2009	18:15	280	1,370	6/20/2009	2:00	110	758
2/27/2009	0:15	250	1,180	7/16/2009	9:30	180	984
3/2/2009	7:15	190	1,170	8/7/2009	19:35	83	573
3/7/2009	9:30	180	976	8/8/2009	9:05	46	327
3/7/2009	15:30	190	969	8/19/2009	9:00	190	1,090
3/8/2009	10:30	150	848	8/25/2009	18:20	120	600
3/8/2009	14:00	140	745	8/25/2009	18:45	46	314
3/9/2009	2:00	120	708	8/26/2009	1:30	88	523
3/24/2009	10:00	160	1,010	8/26/2009	1:55	53	340
3/25/2009	5:25	210	1,070	9/15/2009	9:30	190	1,120
4/19/2009	23:00	150	866	9/22/2009	13:15	110	685
4/20/2009	11:15	210	1,090	9/22/2009	14:05	33	308
4/20/2009	23:15	200	1,120	9/22/2009	15:20	120	733
4/23/2009	9:15	150	1,050	9/27/2009	19:25	120	658
4/25/2009	10:50	110	756	9/27/2008	21:30	95	583
4/25/2009	11:00	80	642	9/28/2009	5:55	100	592
4/26/2009	5:00	120	749	MINIMUM		24	252
4/26/2009	16:00	96	671	MAXIMUM		960	3,700
4/27/2009	4:00	90	657	MEAN		171	957
5/9/2009	1:05	94	744	MEDIAN		120	758
5/9/2009	1:15	72	654	STANDARD DEVIATION		167	636
5/9/2009	10:25	110	749				
5/9/2009	22:25	120	839				

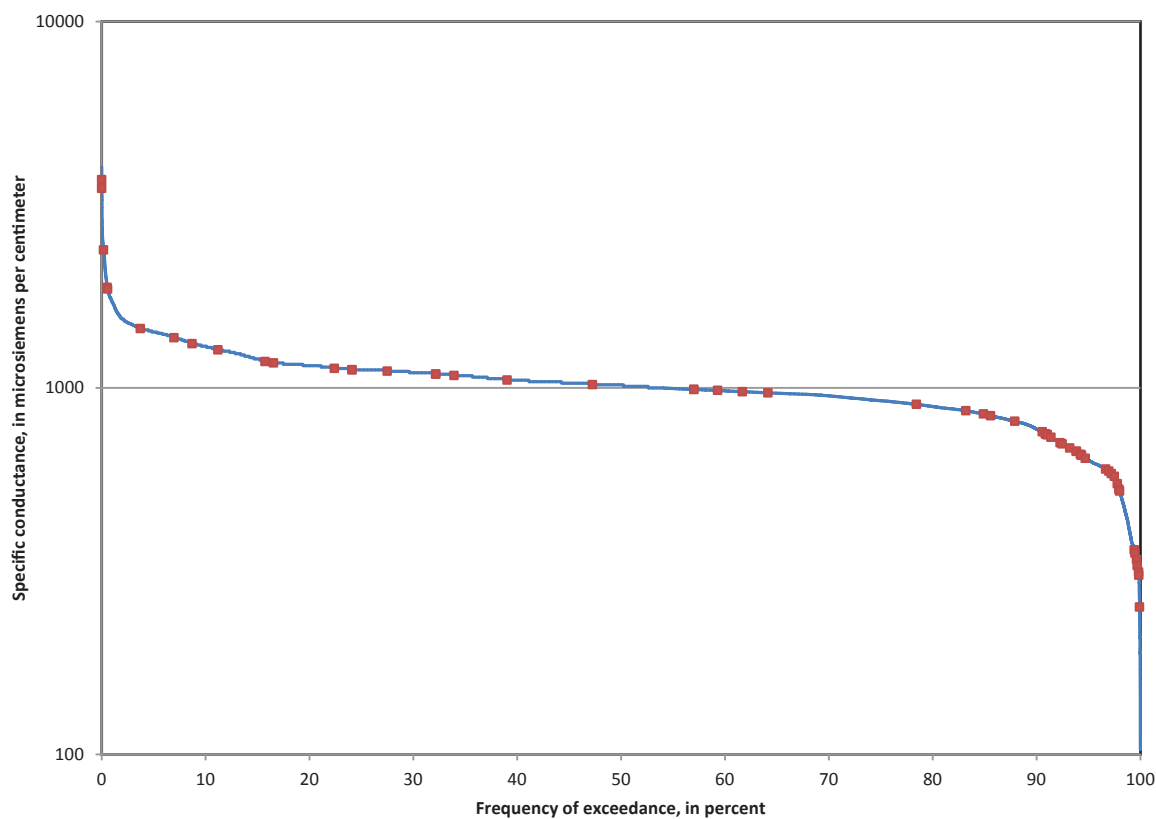


Figure 2-3. Duration curve for specific conductivity (November 2008–September 2010) and corresponding values associated with chloride concentration samples collected November 2008 to September 2009 at U.S.Geological Survey streamgage on Menomonee River at Menomonee Falls, Wisconsin.

Chloride at Menomonee River at Menomonee Falls, Wisconsin, November 2008–September 2009

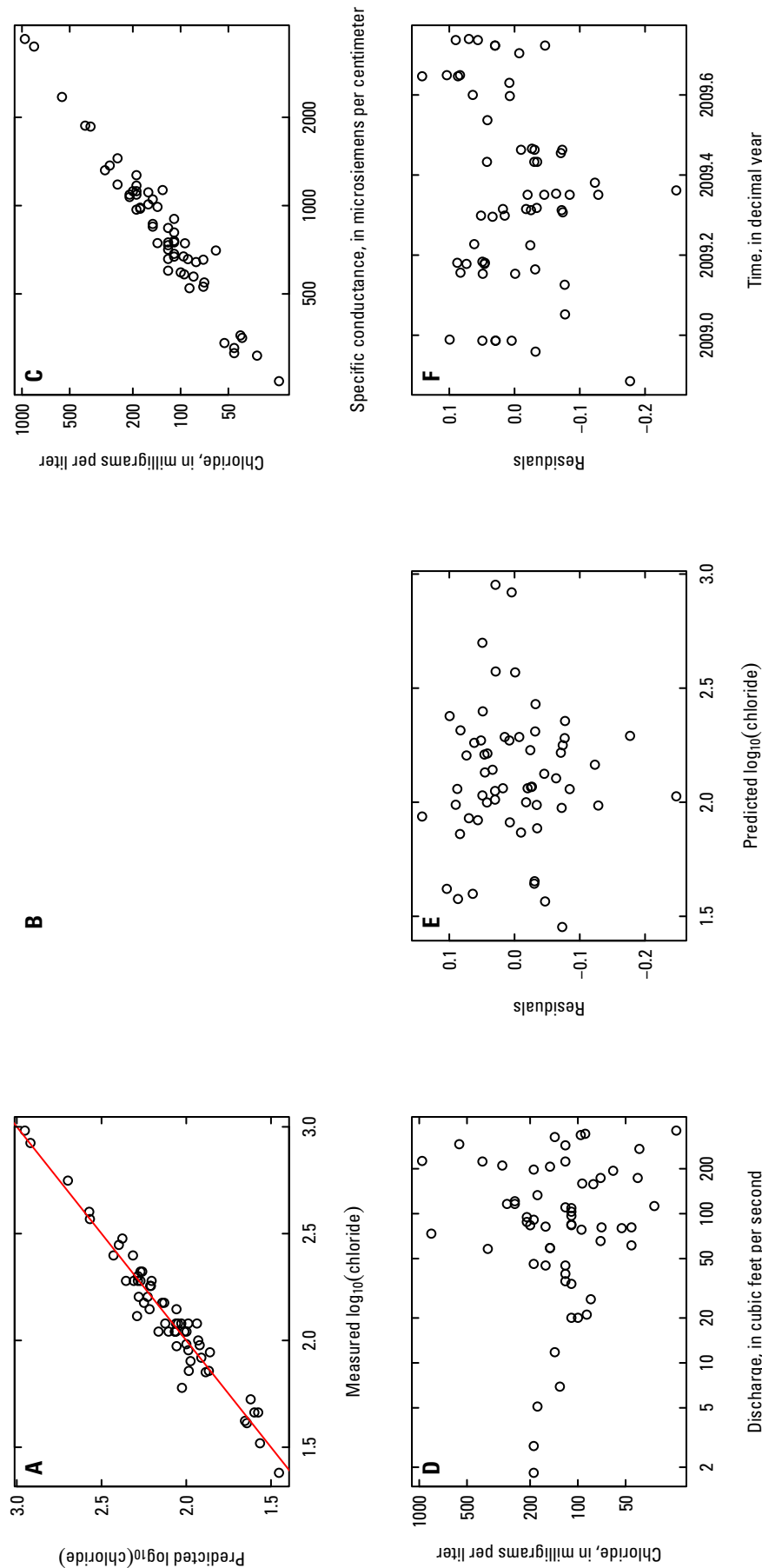


Figure 2-4. U.S. Geological Survey streamgauge on Menomonee River at Menomonee Falls, Wisconsin, November 2008 to September 2009. *A*, Relation between measured and predicted $\log_{10}$ (chloride concentration). *B*, No plot. *C*, Relation between specific conductance and chloride concentration in $\log_{10}$ space. *D*, Relation between discharge and chloride concentration in $\log_{10}$ space. *E*, Relation between predicted $\log_{10}$ (chloride concentration) and regression residuals. *F*, Relation between time and chloride regression residuals. *G*, Probability plot of chloride regression residuals.

Chloride at Honey Creek at Wauwatosa, WI (04087119)

Sample data from 5/20/2009 through 6/19/2009 were not used in the regression development because of excessive fouling of the YSI data sonde, followed by damage to the sonde and sampler line during an extreme flood event.

MODEL SUMMARY—Summary of final regression results for estimating chloride concentrations at Honey Creek at Wauwatosa, WI.

$$\text{Log}_{10}(\text{Chloride}) = -0.984 + 1.12 \log_{10}(\text{SC}),$$

Where:

Chloride = chloride concentration in mg/L

SC = Specific Conductance in $\mu\text{S}/\text{cm}$ at 25° C

Model Information (in log units unless otherwise specified):

Number of measurements = 70,

Root-mean-squared error (RMSE) = 0.23

Model standard percentage error (MPSE) = +71 and -42 percent

90-percent prediction intervals (based on units in mg/L) = +/- 121 percent

Adjusted coefficient of determination ($\text{Adj } R^2$) = 0.81

Sum of squared error = 3.70

PRESS = 3.88

Coefficients:

	Coefficient	Standard error	t statistic	p-value
Intercept	-.984	0.186	-5.29	<0.0001
$\text{Log}_{10}(\text{SC})$	1.99	0.218	9.11	<0.0001

Correlation matrix of coefficients:

	Intercept	$\log_{10}(\text{SC})$
Intercept	1	-0.989
$\text{Log}_{10}(\text{SC})$	-0.989	1

Duan's bias correction factor = 1.19

Table 2-3. Model-calibration dataset for Honey Creek at Wauwatosa, Wisconsin.[mg/L, milligrams per liter; μ S/cm, microsiemens per centimeter; °C, degrees Celsius]

Date	Time	Chloride (mg/L)	Specific conductance (μ S/cm at 25 °C)	Date	Time	Chloride (mg/L)	Specific conductance (μ S/cm at 25 °C)
12/17/2008	13:45	1,100	4,360	5/13/2009	20:30	310	1,580
1/20/2009	11:55	1,700	5,910	5/13/2009	20:50	59	281
2/10/2009	10:10	540	2,253	5/13/2009	21:10	26	181
2/10/2009	13:25	380	1,687	5/14/2009	0:55	17	190
2/10/2009	19:25	500	2,097	5/14/2009	2:40	46	124
2/11/2009	1:25	740	2,937	7/16/2009	11:00	190	1,050
2/11/2009	11:25	1,000	3,660	8/7/2009	17:10	180	938
2/11/2009	12:00	650	2,930	8/7/2009	20:20	27	241
2/11/2009	15:30	380	1,610	8/7/2009	23:05	41	305
2/12/2009	2:25	670	2,647	8/8/2009	9:10	24	179
2/16/2009	12:20	980	3,737	8/8/2009	9:30	17	150
3/7/2009	9:25	1,100	3,460	8/8/2009	19:55	140	715
3/7/2009	10:25	400	1,300	8/10/2009	1:50	30	153
3/7/2009	12:10	320	727	8/10/2009	4:10	11	181
3/7/2009	16:05	270	520	8/19/2009	12:40	200	1,120
3/7/2009	22:05	260	518	8/25/2009	20:55	270	1,360
3/8/2009	14:25	170	354	8/28/2009	22:05	65	390
3/9/2009	1:00	260	477	8/26/2009	4:05	34	276
3/10/2009	0:50	610	704	9/15/2009	10:45	250	1,670
3/10/2009	5:30	190	377	9/20/2009	20:20	240	1,240
3/10/2009	9:30	240	354	9/20/2009	21:55	140	724
3/10/2009	12:10	270	411	9/21/2009	3:55	59	431
3/10/2009	12:15	280	411	9/22/2009	13:25	260	1,350
3/24/2009	11:40	690	3,110	9/22/2009	14:05	31	237
3/25/2009	1:20	240	809	9/22/2009	22:40	57	378
3/25/2009	3:45	660	518	9/27/2009	20:20	120	533
3/31/2009	16:15	510	2,110	9/27/2009	21:00	16	134
3/31/2009	17:05	250	1,160	9/27/2009	23:35	23	182
4/19/2009	17:10	430	2,050	9/28/2009	2:30	47	323
4/19/2009	18:15	150	667	MINIMUM		11	124
4/20/2009	2:30	86	429	MAXIMUM		1,700	5,910
4/20/2009	17:20	260	1,460	MEAN		297	1,150
4/23/2009	10:45	460	2,340	MEDIAN		235	629
4/25/2009	10:50	510	2,380	STANDARD DEVIATION		321	1,185
4/25/2009	12:40	34	196				
4/25/2009	21:25	230	1,010				
4/26/2009	2:25	74	391				
4/26/2009	11:10	92	559				
4/26/2009	15:30	69	417				
4/26/2009	17:20	32	258				
4/26/2009	20:25	90	591				

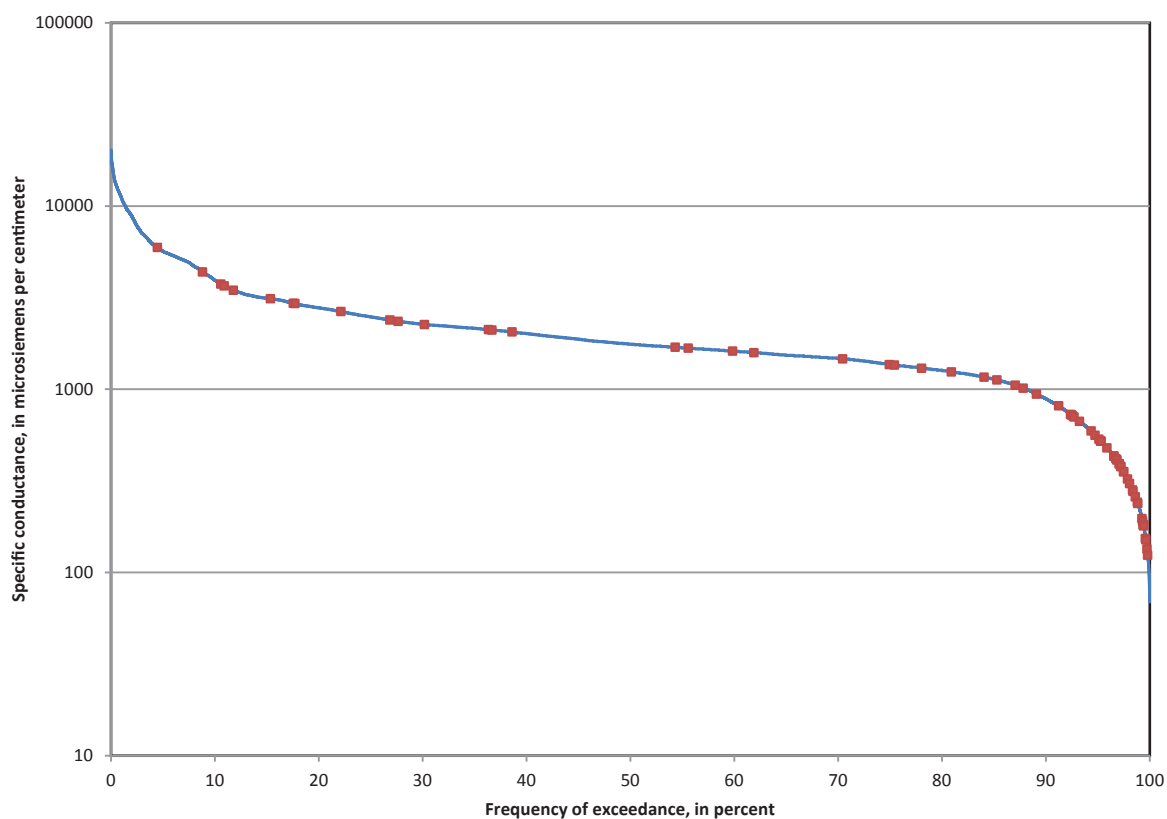


Figure 2-5. Duration curve for specific conductivity (November 2008–September 2010) and corresponding values associated with chloride concentration samples collected November 2008 to September 2009 at U.S. Geological Survey streamgage on Honey Creek at Wauwatosa, Wisconsin.

Chloride at Honey Creek at Wauwatosa, Wisconsin, November 2008–September 2009

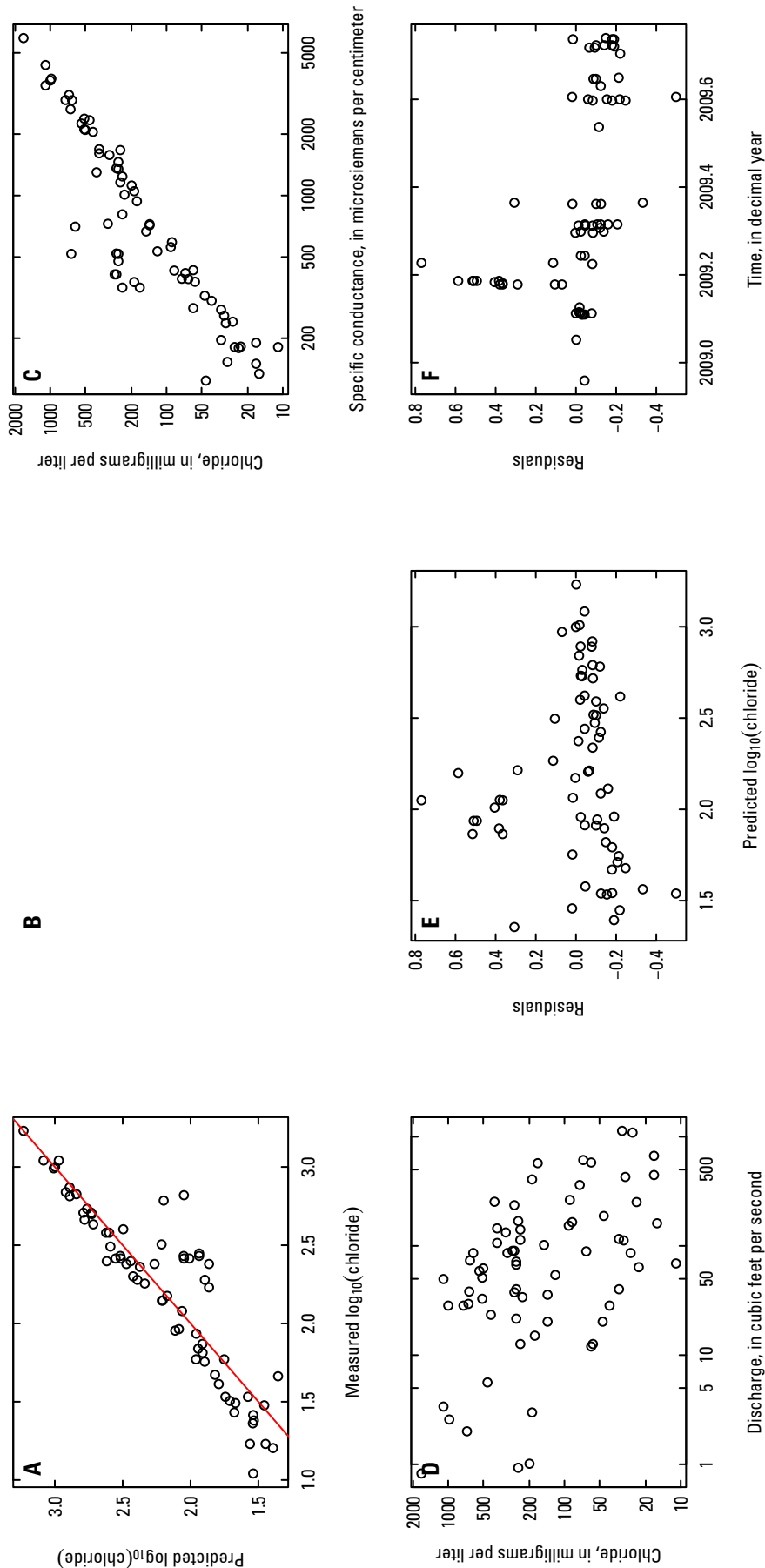


Figure 2-6. U.S. Geological Survey streamgauge on Honey Creek at Wauwatosa, Wisconsin, November 2008 to September 2009. *A*, Relation between measured and predicted $\log_{10}$ (chloride concentration). *B*, No plot. *C*, Relation between specific conductance and chloride concentration in $\log_{10}$ space. *D*, Relation between discharge and chloride concentration in $\log_{10}$ space. *E*, Relation between predicted $\log_{10}$ (chloride concentration) and regression residuals. *F*, Relation between time and chloride regression residuals. *G*, Probability plot of chloride regression residuals.

Chloride at Menomonee River at Wauwatosa, WI (04087120)

MODEL SUMMARY—Summary of final regression results for estimating chloride concentrations at Menomonee River at Wauwatosa, WI.

$$\text{Log}_{10}(\text{Chloride}) = -1.41 + 1.23 \log_{10}(\text{SC}),$$

Where:

Chloride = chloride concentration in mg/L

SC = Specific Conductance in $\mu\text{S}/\text{cm}$ at 25° C

Model Information (in log units unless otherwise specified):

Number of measurements = 101,

Root-mean-squared error (RMSE) = 0.115

Model standard percentage error (MPSE) = +30 and -23 percent

90-percent prediction intervals (based on units in mg/L) = +/- 47 percent

Adjusted coefficient of determination ($\text{Adj } R^2$) = 0.92

Sum of squared error = 1.30

PRESS = 1.35

Coefficients:

	Coefficient	Standard error	t statistic	p-value
Intercept	-1.41	0.111	-12.65	<0.0001
$\text{Log}_{10}(\text{SC})$	1.23	0.036	33.63	<0.0001

Correlation matrix of coefficients:

	Intercept	$\log_{10}(\text{SC})$
Intercept	1	-0.995
$\text{Log}_{10}(\text{SC})$	-0.995	1

Duan's bias correction factor = 1.03

Table 2-4. Model-calibration dataset for Menomonee River at Wauwatosa, Wisconsin.[mg/L, milligrams per liter; $\mu\text{S}/\text{cm}$, microsiemens per centimeter; $^{\circ}\text{C}$, degrees Celsius]

Date	Time	Chloride (mg/L)	Specific conductance ($\mu\text{S}/\text{cm}$ at 25 $^{\circ}\text{C}$)	Date	Time	Chloride (mg/L)	Specific conductance ($\mu\text{S}/\text{cm}$ at 25 $^{\circ}\text{C}$)
11/20/2008	10:30	180	1,250	5/9/2009	0:30	180	992
12/17/2008	12:30	450	2,120	5/9/2009	9:30	150	825
12/27/2008	1:15	2,300	6,520	5/9/2009	15:50	150	807
12/27/2008	3:45	2,100	6,890	5/13/2009	20:40	140	816
12/27/2008	5:50	1,800	6,126	5/13/2009	21:05	110	673
12/27/2008	6:05	1,900	6,100	5/13/2009	22:00	85	513
12/27/2008	10:15	1,300	4,640	5/14/2009	3:15	85	525
12/27/2008	14:00	820	3,040	5/20/2009	11:15	190	1,150
12/27/2008	14:45	580	2,350	6/8/2009	3:10	210	1,090
12/28/2008	7:45	480	1,960	6/8/2009	4:00	150	944
1/20/2009	12:10	470	2,370	6/8/2009	4:15	150	778
2/7/2009	11:25	920	3,520	6/8/2009	6:45	46	288
2/7/2009	13:25	990	3,620	6/8/2009	10:15	80	481
2/7/2009	13:40	1,000	3,590	6/9/2009	4:15	130	734
2/7/2009	19:40	670	2,616	6/16/2009	11:50	240	1,320
2/8/2009	13:40	640	2,593	6/19/2009	9:15	110	319
2/9/2009	1:40	480	2,163	6/19/2009	18:15	39	361
2/9/2009	19:40	460	2,110	6/19/2009	21:20	35	269
2/9/2009	22:00	520	2,320	6/20/2009	3:10	54	496
2/9/2009	23:15	460	2,100	7/16/2009	11:45	220	1,160
2/10/2009	7:20	440	2,080	8/7/2009	18:00	240	1,180
2/10/2009	11:00	470	2,190	8/7/2009	20:40	230	1,230
2/10/2009	17:05	410	1,913	8/8/2009	0:55	120	699
2/10/2009	23:25	350	1,753	8/8/2009	8:50	100	598
2/16/2009	12:45	320	1,770	8/8/2009	9:45	62	402
2/26/2009	14:35	620	2,840	8/8/2009	19:50	77	485
2/26/2009	19:00	630	1,610	8/9/2009	19:50	170	861
2/26/2009	19:45	630	1,320	8/10/2009	2:00	130	739
2/26/2009	22:50	330	1,160	8/10/2009	4:20	68	457
2/27/2009	4:50	280	1,590	8/19/2009	12:20	47	1,370
3/2/2009	7:20	270	1,670	8/25/2009	20:50	82	623
3/10/2009	0:15	260	1,220	8/25/2009	21:25	99	643
3/10/2009	5:50	210	981	8/25/2009	21:30	150	944
3/10/2009	11:45	200	958	8/26/2009	3:30	95	577
3/10/2009	14:50	200	938	8/27/2009	3:35	94	587
3/11/2008	1:10	180	892	9/15/2009	11:00	290	1,520
3/24/2009	11:55	280	1,460	9/20/2009	21:40	210	1,080
3/25/2009	1:30	280	1,350	9/21/2009	3:40	140	740
3/31/2009	17:00	330	1,720	9/22/2009	13:30	140	889
3/31/2009	17:35	310	1,620	9/22/2009	13:40	82	848
4/1/2009	5:35	280	1,520	9/22/2009	21:50	120	470
4/19/2009	19:10	270	1,350	9/22/2009	23:10	120	675
4/20/2009	5:05	190	899	9/27/2009	20:35	100	666
4/21/2009	5:05	270	1,300	9/27/2009	21:05	140	758
4/23/2009	11:00	250	1,320	9/27/2009	21:20	96	508
4/25/2009	11:15	240	1,250	09/28/209	0:05	29	235
4/25/2009	12:40	160	813	9/28/2009	2:35	57	386
4/25/2009	21:35	140	735	9/28/2009	20:35	100	584
4/26/2009	2:35	120	637	MINIMUM		29	235
4/26/2009	14:35	130	725	MAXIMUM		2,300	6,890
4/26/2009	16:00	80	498	MEAN		334	1,449
4/26/2009	17:10	63	430	MEDIAN		190	992
4/27/2009	0:30	86	564	STANDARD DEVIATION		418	1,308

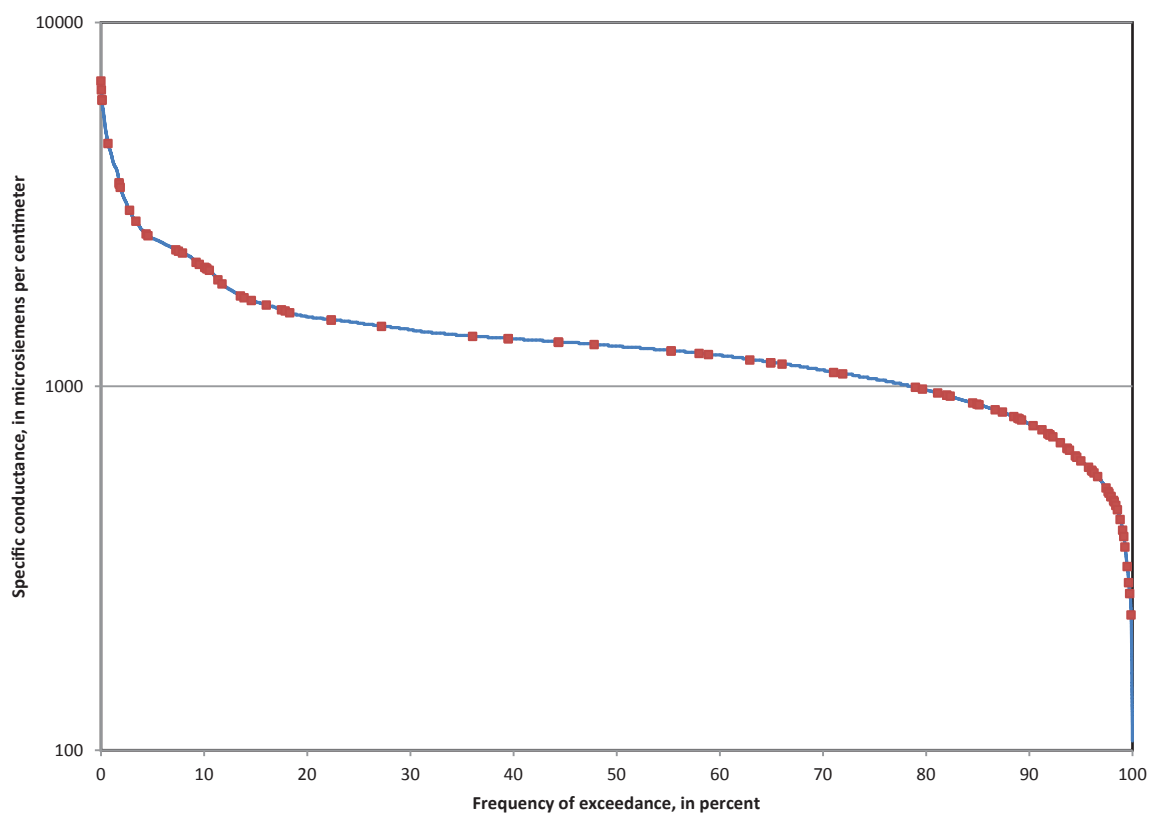


Figure 2-7. Duration curve for specific conductivity (November 2008–September 2010) and corresponding values associated with chloride concentration samples collected November 2008 to September 2009 at U.S. Geological Survey streamgage on Menomonee River at Wauwatosa, Wisconsin.

Chloride at Menomonee River at Wauwatosa, Wisconsin, November 2008–September 2009

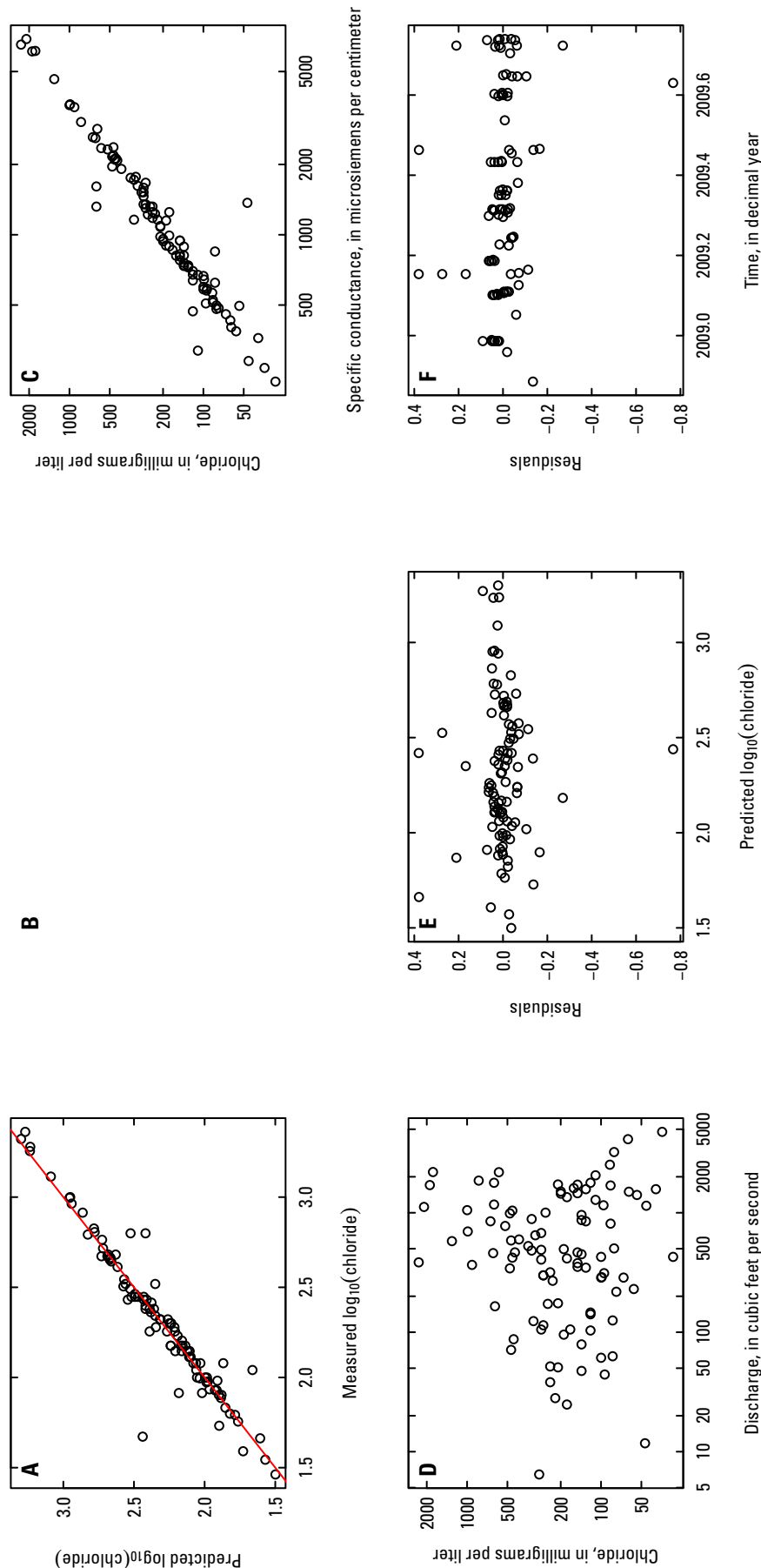


Figure 2-8. U.S. Geological Survey streamgauge on Menomonee River at Wauwatosa, Wisconsin, November 2008 to September 2009. *A*, Relation between measured and predicted $\log_{10}$ (chloride concentration). *B*, No plot. *C*, Relation between specific conductance and chloride concentration in $\log_{10}$ space. *D*, Relation between discharge and chloride concentration in $\log_{10}$ space. *E*, Relation between predicted $\log_{10}$ (chloride concentration) and regression residuals. *F*, Relation between time and chloride regression residuals. *G*, Probability plot of chloride regression residuals.

Chloride at Menomonee River at 16th Street at Milwaukee, WI (04087142)

MODEL SUMMARY—Summary of final regression results for estimating chloride concentrations at Menomonee River at 16th Street at Milwaukee, WI.

$$\text{Log}_{10}(\text{Chloride}) = -1.50 + 1.26 \log_{10}(\text{SC}),$$

Where:

Chloride = chloride concentration in mg/L

SC = Specific Conductance in $\mu\text{S}/\text{cm}$ at 25° C

Model Information (in log units unless otherwise specified):

Number of measurements = 79,

Root-mean-squared error (RMSE) = 0.074

Model standard percentage error (MPSE) = +18 and -16 percent

90-percent prediction intervals (based on units in mg/L) = +/- 29 percent

Adjusted coefficient of determination ($\text{Adj } R^2$) = 0.97

Sum of squared error = 0.42

PRESS = 0.44

Coefficients:

	Coefficient	Standard error	t statistic	p-value
Intercept	-1.50	0.078	-19.25	<0.0001
Log ₁₀ (SC)	1.26	0.026	47.86	<0.0001

Correlation matrix of coefficients:

	Intercept	log ₁₀ (SC)
Intercept	1	-0.994
Log ₁₀ (SC)	-0.994	1

Duan's bias correction factor = **1.01**

Table 2-5. Model-calibration dataset for Menomonee River at 16th Street at Milwaukee, Wisconsin.[mg/L, milligrams per liter; μ S/cm, microsiemens per centimeter; °C, degrees Celsius]

Date	Time	Chloride (mg/L)	Specific conductance (μ S/cm at 25 °C)	Date	Time	Chloride (mg/L)	Specific conductance (μ S/cm at 25 °C)
11/20/2008	11:45	110	942	4/26/2009	8:00	120	639
12/17/2008	14:15	520	2,480	4/26/2009	14:00	120	680
12/27/2008	9:35	1,100	4,033	4/26/2009	16:25	100	601
12/27/2008	12:35	1,400	4,763	4/26/2009	17:10	74	450
12/27/2008	15:35	700	2,340	4/26/2009	19:30	59	411
12/27/2008	21:35	510	2,053	4/26/2009	19:35	59	414
12/28/2008	0:35	540	2,200	5/13/2009	22:05	160	895
12/28/2008	6:35	520	2,130	5/14/2009	0:35	51	374
1/20/2009	12:40	150	1,740	5/14/2009	1:45	42	326
2/7/2009	11:40	250	1,493	5/14/2009	3:35	49	378
2/7/2009	20:40	920	3,476	5/20/2009	11:45	170	1,080
2/8/2009	5:40	730	2,880	6/8/2009	12:40	66	395
2/8/2009	14:40	680	2,843	6/8/2009	15:30	79	478
2/8/2009	23:40	690	2,753	6/9/2009	2:35	95	566
2/9/2009	17:40	520	2,300	6/9/2009	5:00	100	600
2/10/2009	5:40	480	2,210	6/16/2009	13:00	150	974
2/11/2009	17:40	320	1,570	6/19/2009	0:55	50	307
2/16/2009	13:40	360	1,873	6/19/2009	1:10	18	174
2/26/2009	16:00	420	2,090	6/19/2009	1:45	20	174
2/26/2009	19:00	480	2,110	6/19/2009	9:35	47	379
2/26/2009	22:00	280	1,090	6/19/2040	20:45	39	315
2/27/2009	4:00	300	1,240	6/20/2009	2:25	56	471
2/27/2009	12:00	370	1,550	7/16/2009	12:30	150	883
2/28/2009	12:00	320	1,860	8/8/2009	22:30	56	361
3/7/2009	11:10	300	1,710	8/9/2009	10:30	82	508
3/7/2009	14:10	270	1,420	8/19/2009	13:30	120	775
3/7/2009	23:10	290	1,290	8/26/2009	7:05	69	413
3/8/2009	12:10	280	1,300	8/26/2009	17:00	84	522
3/8/2009	18:10	160	743	8/26/2009	23:45	90	547
3/9/2009	0:10	240	1,100	9/15/2009	11:30	96	725
3/10/2009	8:15	200	938	9/23/2009	7:10	100	750
3/10/2009	12:55	210	1,020	9/24/2009	7:00	110	710
3/10/2009	13:00	210	1,030	9/28/2009	12:05	39	294
3/10/2009	20:30	200	991	09/28/209	18:05	76	472
3/11/2009	4:30	190	984	9/29/2009	0:05	72	481
3/24/2009	12:25	270	1,334	9/29/2009	3:05	75	492
4/1/2009	1:40	240	1,220	9/29/2009	5:00	72	541
4/20/2009	3:05	180	866	MINIMUM		18	174
4/20/2009	4:50	160	714	MAXIMUM		1,400	4,763
4/23/2009	11:15	240	1,220	MEAN		249	1,180
4/25/2009	13:20	240	1,190	MEDIAN		160	938
4/25/2009	20:00	120	611	STANDARD DEVIATION		254	910

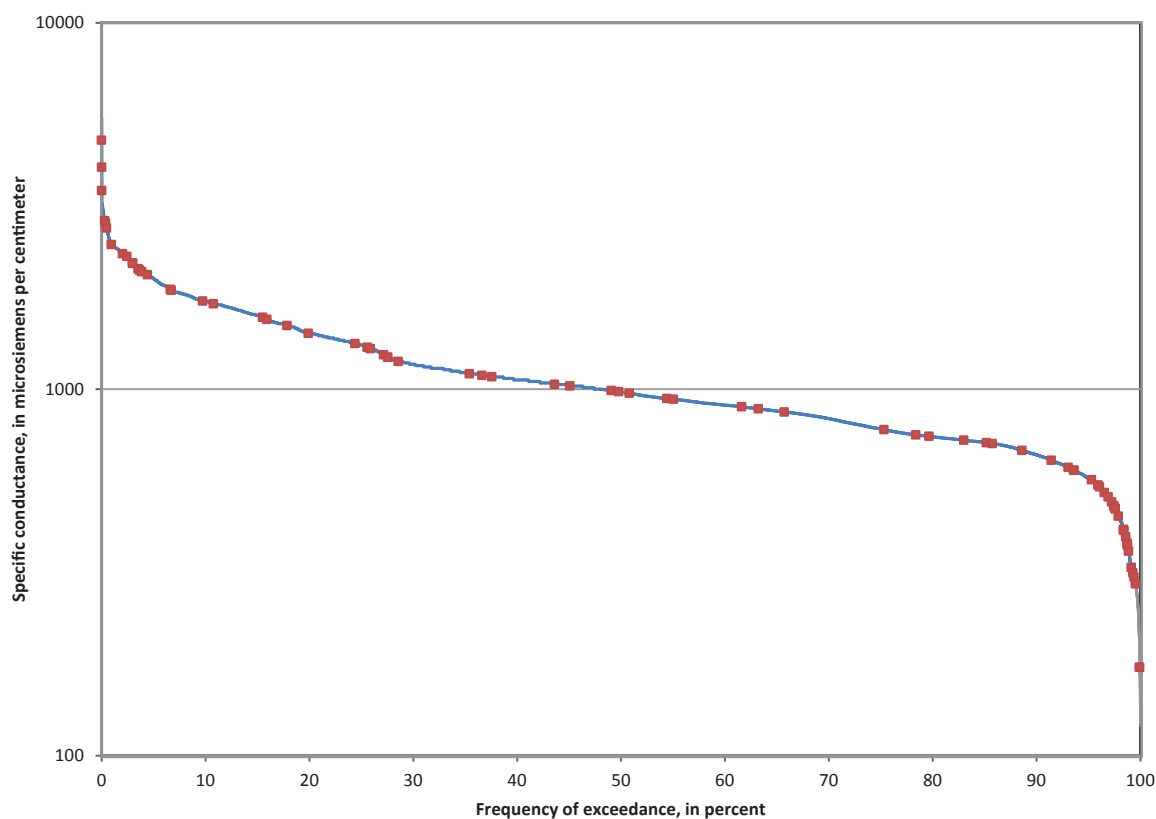


Figure 2-9. Duration curve for specific conductivity (November 2008–September 2010) and corresponding values associated with chloride concentration samples collected November 2008 to September 2009 at U.S. Geological Survey streamgage on Menomonee River at 16th Street at Milwaukee, Wisconsin.

Chloride at Menomonee River at 16th Street at Milwaukee, Wisconsin, November 2008–September 2009

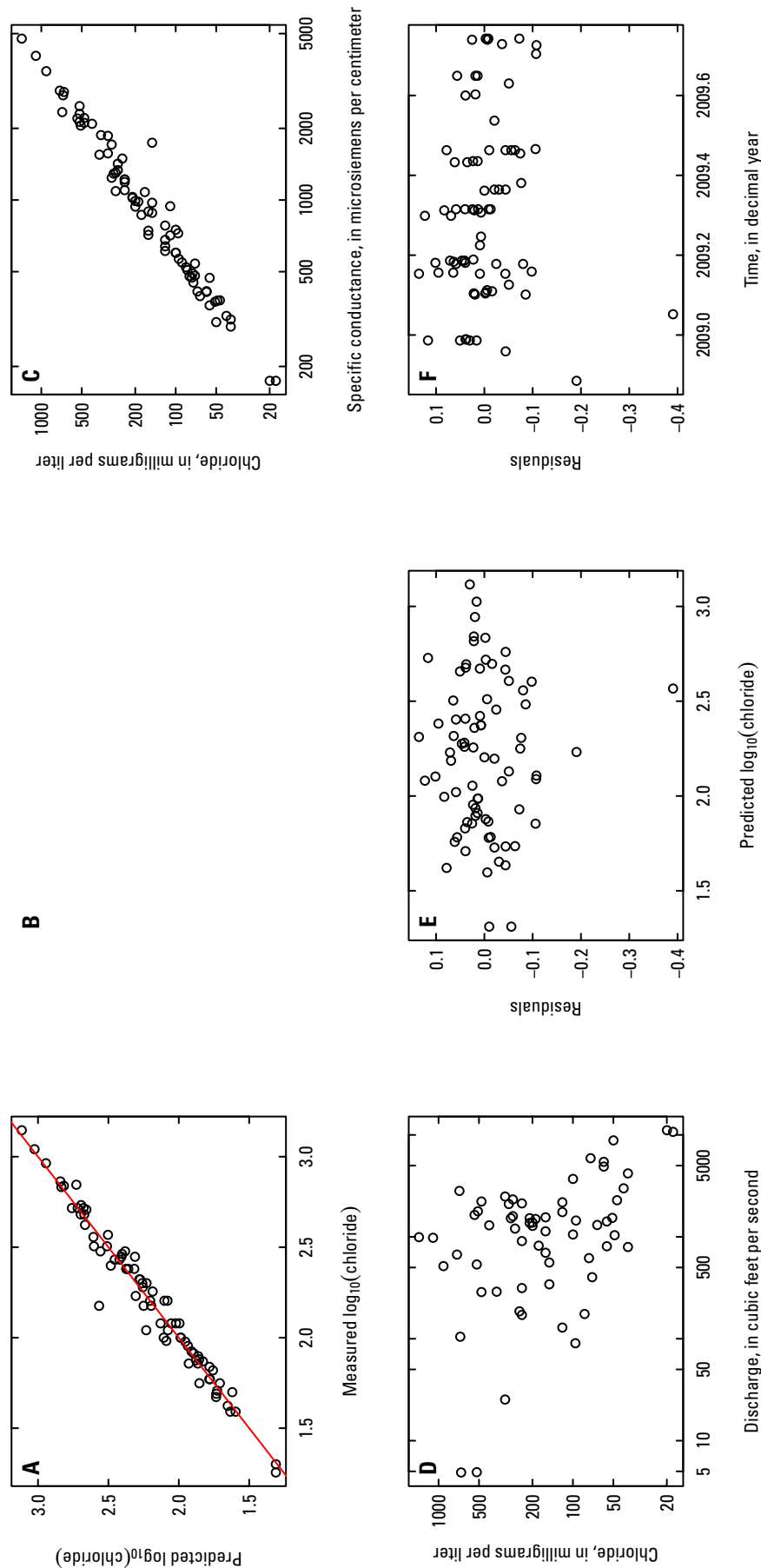


Figure 2-10. U.S. Geological Survey streamgauge on Menomonee River at 16th Street at Milwaukee, Wisconsin, November 2008 to September 2009. *A*, Relation between measured and predicted $\log_{10}$ (chloride concentration). *B*, No plot. *C*, Relation between specific conductance and chloride concentration in $\log_{10}$ space. *D*, Relation between discharge and chloride concentration in $\log_{10}$ space. *E*, Relation between predicted $\log_{10}$ (chloride concentration) and regression residuals. *F*, Relation between time and chloride regression residuals. *G*, Probability plot of chloride regression residuals.

