

Appendix 3. Regression analysis results for estimating total suspended solids 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 turbidity and concurrent total suspended solids 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. Turbidity values are instantaneous unit values temporally corresponding to the collection of the total suspended solids 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).

Total suspended solids at Little Menomonee River near Freistadt, WI (04087050)

Samples collected on 2/26/2009 were not used in the regression analysis. From inspection of the scatter plots, these samples appear to be outliers.

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

$$\text{Log}_{10}(\text{Suspended Solids}) = 0.334 + 0.910 \log_{10}(\text{Turb}),$$

Where:

Suspended Solids = total suspended solids concentration in mg/L

Turb = Turbidity (YSI 6136), in NTU

Model Information (in log units unless otherwise specified):

Number of measurements = 39,

Root-mean-squared error (RMSE) = 0.17

Model standard percentage error (MPSE) = +46 and -32 percent

90-percent prediction intervals (based on units in mg/L) = +/- 74 percent

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

Sum of squared error = 1.01

PRESS = 1.25

Coefficients:

	Coefficient	Standard error	t statistic	p-value
Intercept	0.334	0.063	5.31	<0.001
$\text{Log}_{10}(\text{Turb})$	0.910	0.038	23.84	<0.001

Correlation matrix of coefficients:

	Intercept	$\log_{10}(\text{Turb})$
Intercept	1	-0.908
$\text{Log}_{10}(\text{Turb})$	-0.908	1

Duan's bias correction factor = 1.08

Table 3-1. Model-calibration dataset for Little Menomonee River near Freistadt, Wisconsin.

[mg/L, milligrams per liter; NTU, Nephelometric turbidity units]

Date	Time	Total suspended solids (mg/L)	Turbidity (NTU)	Date	Time	Total suspended solids (mg/L)	Turbidity (NTU)
11/20/2008	9:45	2	1.2	4/23/2009	9:45	6	2.1
12/17/2008	11:30	2	2.1	4/25/2009	15:10	130	100.0
12/27/2008	13:05	13	11.2	4/26/2009	5:30	330	180.0
12/28/2008	1:05	100	52.3	4/26/2009	19:30	310	200.0
12/28/2008	7:15	42	45.0	4/27/2009	1:30	100	80.0
1/20/2009	10:55	7	0.7	5/9/2009	7:25	110	81.0
2/7/2009	18:50	37	19.7	5/9/2009	13:30	75	54.0
2/9/2009	22:40	18	11.3	5/9/2009	19:30	24	15.0
2/10/2009	10:45	67	38.0	5/14/2009	2:30	410	270.0
2/10/2009	14:40	220	113.3	5/20/2009	9:00	14	4.5
2/10/2009	20:40	92	46.0	6/8/2009	5:20	220	120.0
2/11/2009	2:40	31	21.3	6/16/2009	8:45	18	12.0
3/2/2009	7:10	5	4.2	6/19/2009	2:50	360	290.0
3/7/2009	12:55	180	130.0	6/19/2009	8:50	160	89.0
3/7/2009	18:05	410	220.0	7/16/2009	10:05	17	17.0
3/8/2009	7:05	84	62.0	8/19/2009	10:00	10	17.0
3/8/2009	19:00	320	210.0	9/15/2009	9:30	13	17.0
3/9/2009	0:30	170	140.0	MINIMUM		2	0.7
3/10/2009	3:20	100	68.0	MAXIMUM		410	290.0
03/10/2009	8:15	160	94.0	MEAN		113	74.2
3/10/2009	20:15	44	51.0	MEDIAN		75	51.0
3/24/2009	10:40	9	2.8	STANDARD DEVIATION		123	78.7

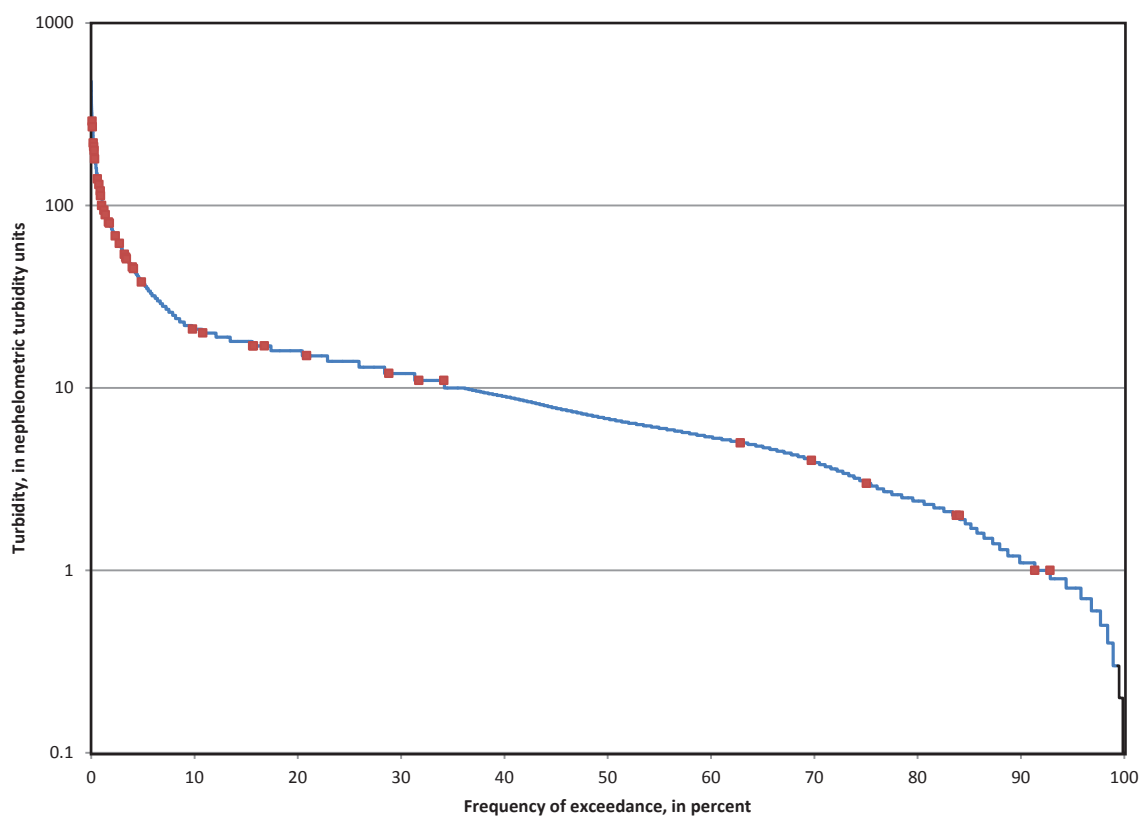


Figure 3-1. Duration curve for turbidity (November 2008–September 2010) and corresponding values associated with total suspended solids concentration samples collected November 2008 to September 2009 at U.S. Geological Survey streamgage on Little Menomonee River near Freistadt, Wisconsin.

Total suspended solids at Little Menomonee River near Freistadt, Wisconsin, November 2008–September 2009

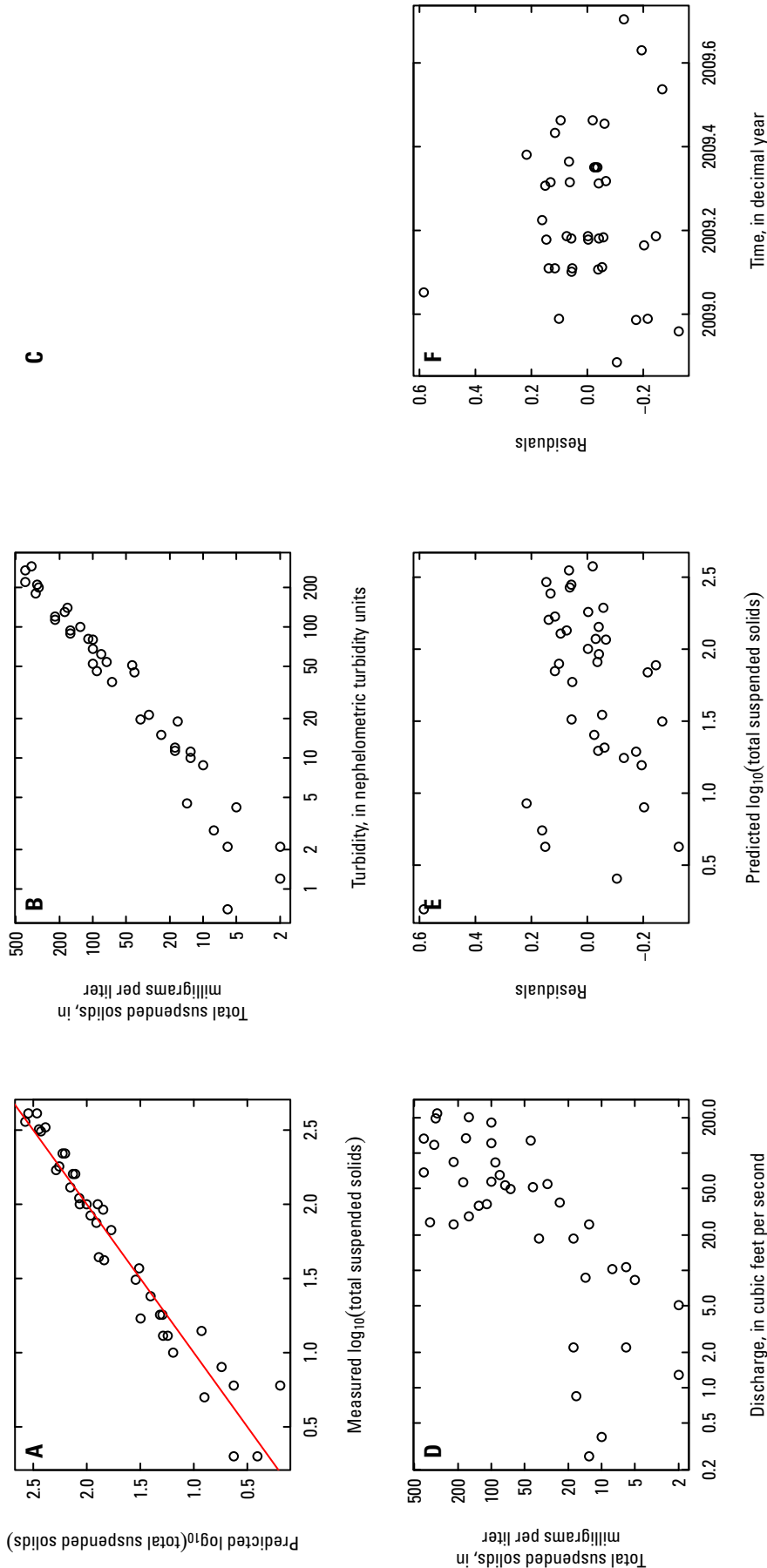


Figure 3-2. U.S. Geological Survey streamgauge on Little Menomonee River near Freistadt, Wisconsin, November 2008 to September 2009. *A*, Relation between measured and predicted $\log_{10}$ (total suspended solids concentration). *B*, Relation between turbidity and total suspended solids concentration in $\log_{10}$ space. *C*, No plot. *D*, Relation between discharge and total suspended solids concentration in $\log_{10}$ space. *E*, Relation between predicted $\log_{10}$ (total suspended solids concentration) and regression residuals. *F*, Relation between time and total suspended solids regression residuals. *G*, Probability plot of total suspended solids regression residuals.

Total suspended solids at Menomonee River at Menomonee Falls, WI (04087030)

MODEL SUMMARY—Summary of final regression results for estimating total suspended solids concentrations at Menomonee River at Menomonee Falls, WI.

$$\text{Log}_{10}(\text{Suspended Solids}) = 0.256 + 0.953 \log_{10}(\text{Turb}),$$

Where:

Suspended Solids = total suspended solids concentration in mg/L

Turb = Turbidity (YSI 6136), in NTU

Model Information (in log units unless otherwise specified):

Number of measurements = 59,

Root-mean-squared error (RMSE) = 0.16

Model standard percentage error (MPSE) = +43 and -30 percent

90-percent prediction intervals (based on units in mg/L) = +/- 69 percent

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

Sum of squared error = 1.40

PRESS = 1.54

Coefficients:

	Coefficient	Standard error	t statistic	p-value
Intercept	0.256	0.058	4.41	<0.0001
$\text{Log}_{10}(\text{Turb})$	0.953	0.038	25.19	<0.0001

Correlation matrix of coefficients:

	Intercept	$\log_{10}(\text{Turb})$
Intercept	1	-0.936
$\text{Log}_{10}(\text{Turb})$	-0.936	1

Duan's bias correction factor = **1.07**

Table 3-2. Model-calibration dataset for Menomonee River at Menomonee Falls, Wisconsin.

[mg/L, milligrams per liter; NTU, Nephelometric turbidity units]

Date	Time	Total suspended solids (mg/L)	Turbidity (NTU)	Date	Time	Total suspended solids (mg/L)	Turbidity (NTU)
11/20/2008	9:15	6	3.6	6/8/2009	3:15	180	91.0
12/17/2008	12:00	5	2.7	6/8/2009	3:25	500	220.0
12/27/2008	0:35	18	18.0	6/8/2009	9:35	51	28.0
12/27/2008	6:15	36	49.0	6/16/2009	10:15	20	13.0
12/27/2008	14:20	110	100.7	6/19/2009	0:10	250	160.0
12/27/2008	20:20	66	39.7	6/19/2009	0:50	200	110.0
12/28/2008	8:20	37	45.3	6/19/2009	2:00	110	66.0
1/20/2009	9:55	11	2.5	6/20/2009	2:00	28	21.0
2/16/2009	11:00	5	3.1	7/16/2009	9:30	5	5.0
2/26/2009	15:05	130	86.0	8/7/2009	19:35	76	46.0
2/26/2009	18:15	110	81.0	8/8/2009	9:05	150	80.0
2/27/2009	0:15	36	30.0	8/19/2009	9:00	4	3.2
3/2/2009	7:15	22	3.2	8/25/2009	18:20	250	210.0
3/7/2009	9:30	47	31.0	8/25/2009	18:45	120	85.0
3/7/2009	15:30	48	29.0	8/26/2009	1:30	20	30.0
3/8/2009	10:30	39	26.0	8/26/2009	1:55	50	48.0
3/8/2009	14:00	130	69.0	9/15/2009	9:30	6	2.8
3/9/2009	2:00	52	34.0	9/22/2009	13:15	88	62.0
3/24/2009	10:00	9	4.1	9/22/2009	14:05	270	130.0
3/25/2009	5:25	24	16.0	9/22/2009	15:20	36	21.0
4/19/2009	23:00	46	23.0	9/27/2009	19:25	100	81.0
4/20/2009	11:15	14	12.0	9/27/2008	21:30	99	51.0
4/20/2009	23:15	13	11.0	9/28/2009	5:55	10	12.0
4/23/2009	9:15	4	3.8	MINIMUM		4	2.5
4/25/2009	10:50	120	71.0	MAXIMUM		500	220.0
4/25/2009	11:00	350	170.0	MEAN		81	49.8
4/26/2009	5:00	44	27.0	MEDIAN		46	30.0
4/26/2009	16:00	50	34.0	STANDARD DEVIATION		95	50.9
4/27/2009	4:00	38	23.0				
5/9/2009	1:05	110	83.0				
5/9/2009	1:15	210	110.0				
5/9/2009	10:25	21	12.0				
5/9/2009	22:25	24	14.0				
5/10/2009	10:25	12	8.2				
5/13/2009	23:00	120	81.0				
05/20/2009	9:30	11	6.3				

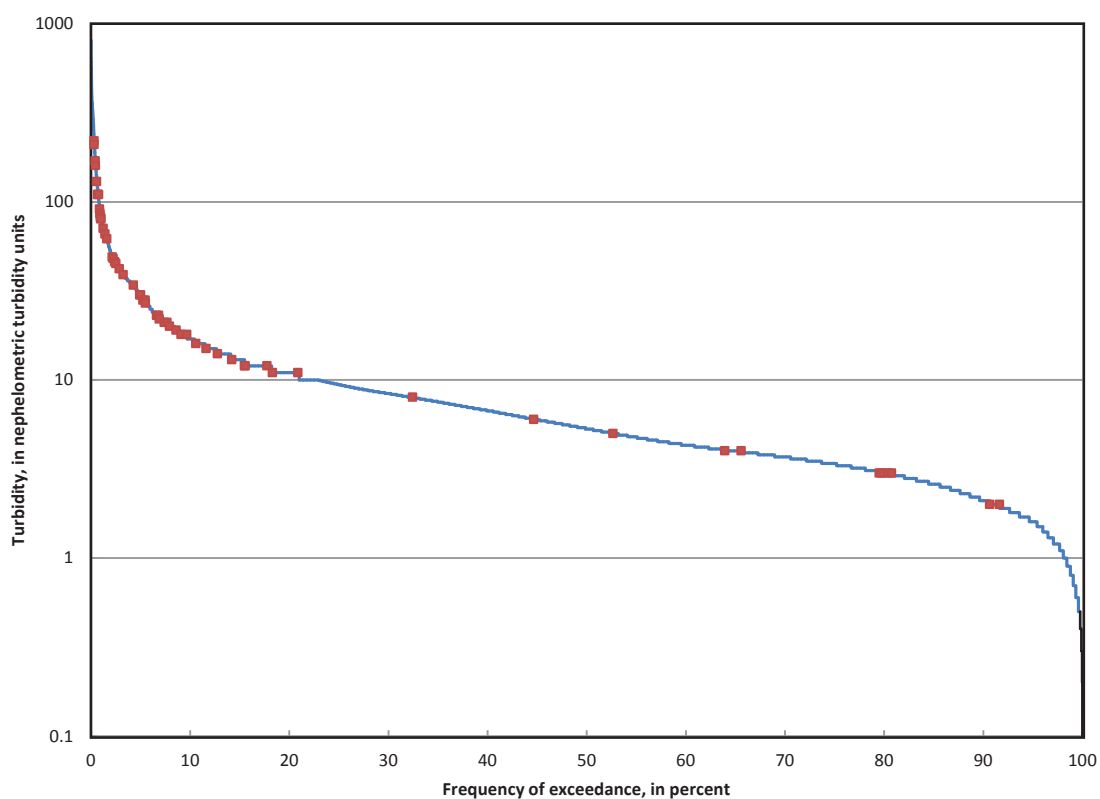


Figure 3-3. Duration curve for turbidity (November 2008–September 2010) and corresponding values associated with total suspended solids concentration samples collected November 2008 to September 2009 at U.S. Geological Survey streamgage on Menomonee River at Menomonee Falls, Wisconsin.

Total suspended solids at Menomonee River at Menomonee Falls, Wisconsin, November 2008–September 2009

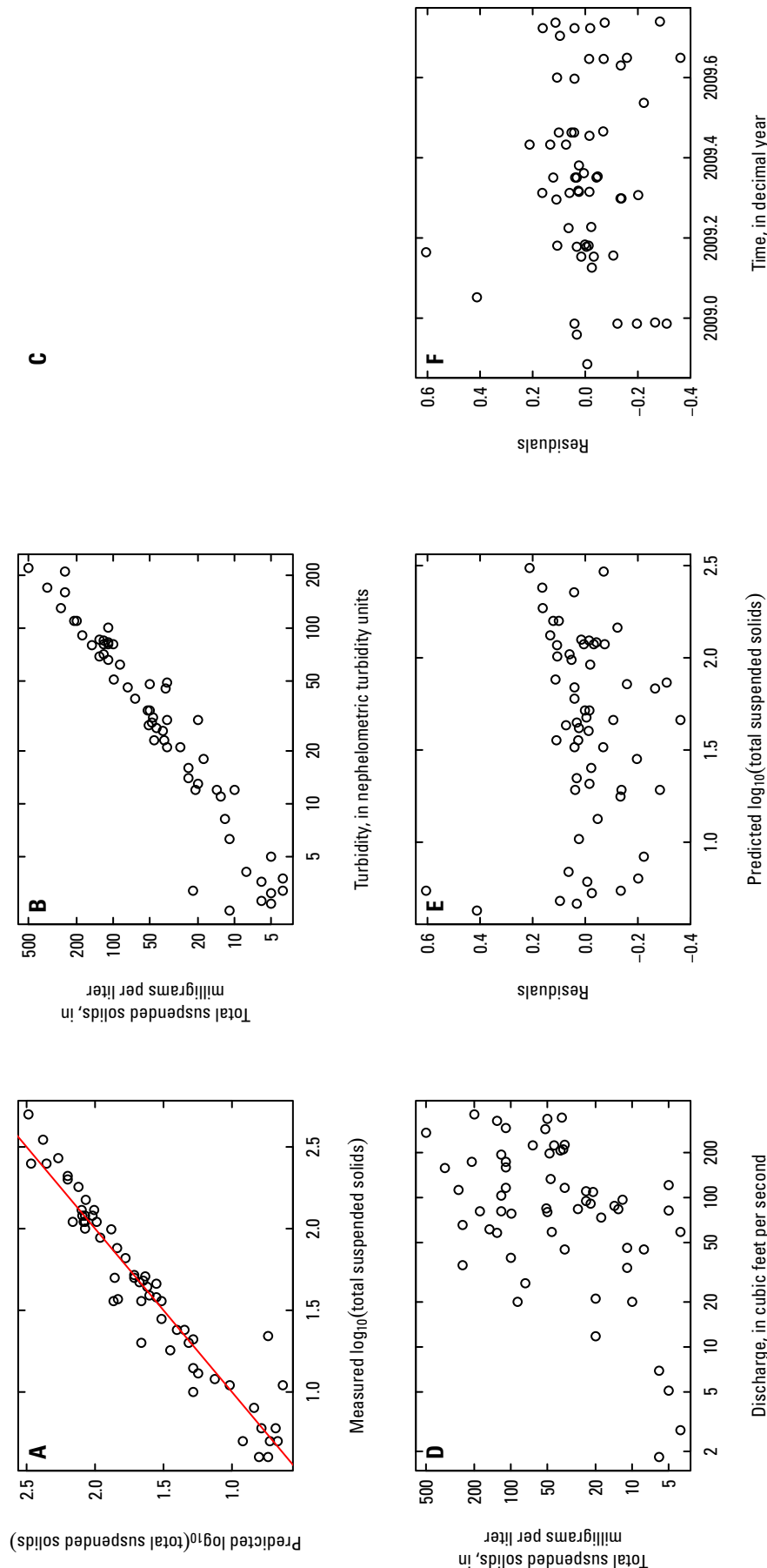


Figure 3-4. U.S. Geological Survey streamgauge on Menomonee River at Menomonee Falls, Wisconsin, November 2008 to September 2009. *A*, Relation between measured and predicted $\log_{10}$ (total suspended solids concentration). *B*, Relation between turbidity and total suspended solids concentration in $\log_{10}$ space. *C*, No plot. *D*, Relation between discharge and total suspended solids concentration in $\log_{10}$ space. *E*, Relation between predicted $\log_{10}$ (total suspended solids concentration) and regression residuals. *F*, Relation between time and total suspended solids regression residuals. *G*, Probability plot of total suspended solids regression residuals.

Total suspended solids at Honey Creek at Wauwatosa, WI (04087119)

Sample data from 4/25/2009 at 12:40 through 4/26/2009, and sample data from 6/8/2009 were not used in the regression development because of excessive fouling of the data sonde. Sample data on 6/19/2009 were not used because of damage to the sonde and sampler line during an extreme flood event.

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

$\text{Log}_{10}(\text{Suspended Solids}) = 0.160 + 0.967 \log_{10}(\text{Turb})$,

Where:

Suspended Solids = total suspended solids concentration in mg/L

Turb = Turbidity (YSI 6136), in NTU

Model Information (in log units unless otherwise specified):

Number of measurements = 66,

Root-mean-squared error (RMSE) = 0.25

Model standard percentage error (MPSE) = +77 and -44 percent

90-percent prediction intervals (based on units in mg/L) = +/- 128 percent

Adjusted coefficient of determination ($\text{Adj } R^2$) = 0.86

Sum of squared error = 3.94

PRESS = 4.25

Coefficients:

	Coefficient	Standard error	t statistic	p-value
Intercept	0.160	0.085	1.88	0.0643
$\text{Log}_{10}(\text{Turb})$	0.967	0.047	20.39	<0.0001

Correlation matrix of coefficients:

	Intercept	$\log_{10}(\text{Turb})$
Intercept	1	-0.934
$\text{Log}_{10}(\text{Turb})$	-0.934	1

Duan's bias correction factor = **1.16**

Table 3-3. Model-calibration dataset for Honey Creek at Wauwatosa, Wisconsin.

[mg/L, milligrams per liter; NTU, Nephelometric turbidity units]

Date	Time	Total suspended solids (mg/L)	Turbidity (NTU)	Date	Time	Total suspended solids (mg/L)	Turbidity (NTU)
12/17/2008	13:45	1	1.8	5/13/2009	20:30	62	54.0
1/20/2009	11:55	3	1.7	5/13/2009	20:50	440	280.0
2/10/2009	10:10	31	46.0	5/13/2009	21:10	530	260.0
2/10/2009	13:25	130	123.3	5/14/2009	0:55	170	130.0
2/10/2009	19:25	100	82.0	5/14/2009	2:40	170	120.0
2/11/2009	1:25	36	41.3	5/20/2009	11:00	5	2.7
2/11/2009	11:25	12	21.3	6/16/2009	11:00	4	2.7
2/11/2009	12:00	220	97.0	7/16/2009	11:00	8	4.0
2/11/2009	15:30	230	210.0	8/7/2009	17:10	37	27.0
2/12/2009	2:25	27	32.7	8/7/2009	20:20	340	170.0
2/16/2009	12:20	41	53.3	8/7/2009	23:05	77	28.0
3/7/2009	9:25	13	74.0	8/8/2009	9:10	460	240.0
3/7/2009	10:25	310	210.0	8/8/2009	9:30	490	300.0
3/7/2009	12:10	350	140.0	8/8/2009	19:55	29	59.0
3/7/2009	16:05	110	71.0	8/10/2009	1:50	490	210.0
3/7/2009	22:05	70	46.0	8/10/2009	4:10	170	100.0
3/8/2009	14:25	180	140.0	8/19/2009	12:40	10	1.3
3/9/2009	1:00	75	32.0	8/25/2009	20:55	120	63.0
3/10/2009	0:50	36	40.0	8/28/2009	22:05	330	206.7
3/10/2009	5:30	60	50.0	8/26/2009	4:05	120	34.0
3/10/2009	9:30	46	55.0	9/15/2009	10:45	2	1.6
3/10/2009	12:10	23	33.0	9/20/2009	20:20	53	44.0
3/10/2009	12:15	21	31.0	9/20/2009	21:55	210	190.0
3/24/2009	11:40	5	1.8	9/21/2009	3:55	41	34.0
3/25/2009	1:20	230	280.0	9/22/2009	13:25	130	84.0
3/25/2009	3:45	60	183.3	9/22/2009	14:05	370	210.0
3/31/2009	16:15	75	61.0	9/22/2009	22:40	44	44.0
3/31/2009	17:05	300	390.0	9/27/2009	20:20	140	110.0
4/1/2009	3:00	24	27.0	9/27/2009	21:00	450	272.5
4/19/2009	17:10	30	17.0	9/27/2009	23:35	280	99.0
4/19/2009	18:15	200	117.5	9/28/2009	2:30	80	88.0
4/20/2009	2:30	50	34.3	MINIMUM		1	1.3
4/20/2009	17:20	10	18.5	MAXIMUM		530	390.0
4/23/2009	10:45	3	1.6	MEAN		136	94.8
4/25/2009	10:50	37	21.0	MEDIAN		73	57.0
				STANDARD DEVIATION		147	91.3

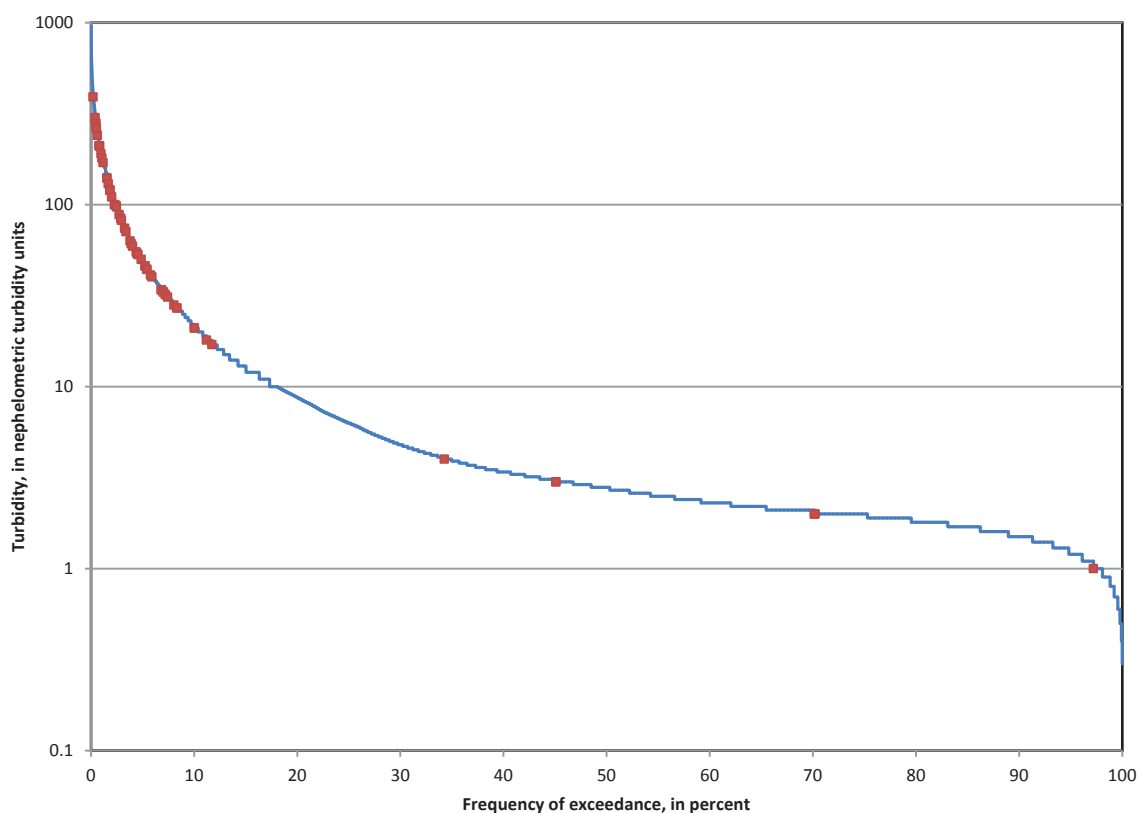


Figure 3-5. Duration curve for turbidity (November 2008–September 2010) and corresponding values associated with total suspended solids concentration samples collected November 2008 to September 2009 at U.S. Geological Survey streamgage on Honey Creek at Wauwatosa, Wisconsin.

Total suspended solids at Honey Creek at Wauwatosa, Wisconsin, November 2008–September 2009

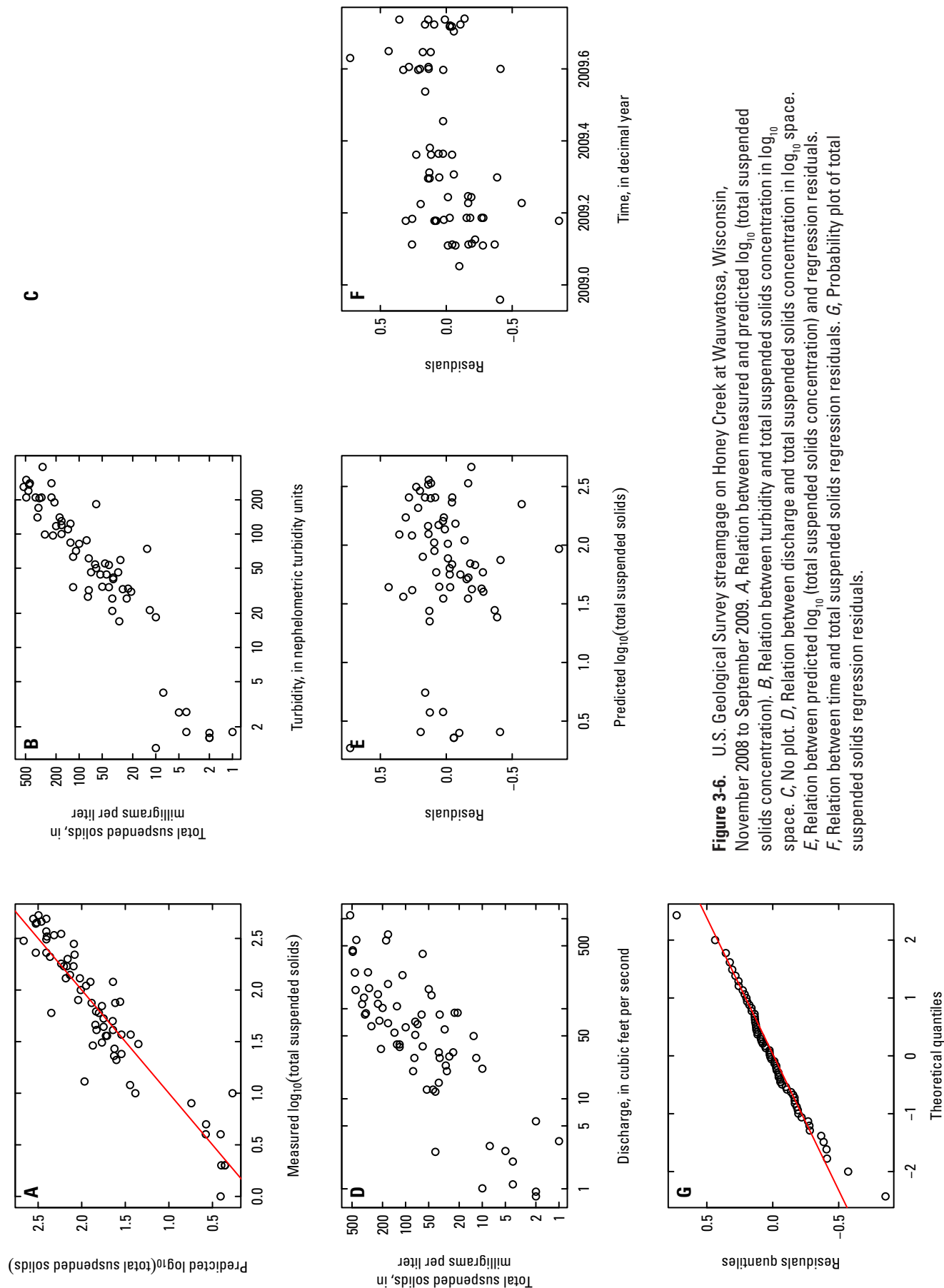


Figure 3-6. U.S. Geological Survey streamgauge on Honey Creek at Wauwatosa, Wisconsin, November 2008 to September 2009. *A*, Relation between measured and predicted $\log_{10}$ (total suspended solids concentration). *B*, Relation between turbidity and total suspended solids concentration in $\log_{10}$ space. *C*, No plot. *D*, Relation between discharge and total suspended solids concentration in $\log_{10}$ space. *E*, Relation between predicted $\log_{10}$ (total suspended solids concentration) and regression residuals. *F*, Relation between time and total suspended solids regression residuals. *G*, Probability plot of total suspended solids regression residuals.

Total suspended solids at Menomonee River at Wauwatosa, WI (04087120)

Samples collected on 6/8-6/9 2009 were not used in the regression analysis because the turbidity sensor readings were spiking excessively and the data quality was thought to be poor.

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

$$\text{Log}_{10}(\text{Suspended Solids}) = 0.567 + 0.779 \log_{10}(\text{Turb}),$$

Where:

Suspended Solids = total suspended solids concentration in mg/L

Turb = Turbidity (YSI 6136), in NTU

Model Information (in log units unless otherwise specified):

Number of measurements = 95,

Root-mean-squared error (RMSE) = 0.22

Model standard percentage error (MPSE) = +67 and -40 percent

90-percent prediction intervals (based on units in mg/L) = +/- 110 percent

Adjusted coefficient of determination ($\text{Adj } R^2$) = 0.77

Sum of squared error = 4.59

PRESS = 4.92

Coefficients:

	Coefficient	Standard error	t statistic	p-value
Intercept	0.567	0.074	7.67	<0.0001
$\text{Log}_{10}(\text{Turb})$	0.779	0.044	17.88	<0.0001

Correlation matrix of coefficients:

	Intercept	$\log_{10}(\text{Turb})$
Intercept	1	-0.951
$\text{Log}_{10}(\text{Turb})$	-0.951	1

Duan's bias correction factor = 1.15

Table 3-4. Model-calibration dataset for Menomonee River at Wauwatosa, Wisconsin.

[mg/L, milligrams per liter; NTU, Nephelometric turbidity units]

Date	Time	Total suspended solids (mg/L)	Turbidity (NTU)	Date	Time	Total suspended solids (mg/L)	Turbidity (NTU)
11/20/2008	10:30	5	1.9	4/27/2009	0:30	94	76.0
12/17/2008	12:30	5	6.8	5/9/2009	0:30	66	37.0
12/27/2008	1:15	56	25.0	5/9/2009	9:30	37	17.0
12/27/2008	3:45	78	46.0	5/9/2009	15:50	21	15.0
12/27/2008	5:50	87	66.0	5/13/2009	20:40	120	68.0
12/27/2008	6:05	94	63.0	5/13/2009	21:05	250	150.0
12/27/2008	10:15	150	89.0	5/13/2009	22:00	250	140.0
12/27/2008	14:00	260	180.0	5/14/2009	3:15	110	86.0
12/27/2008	14:45	260	190.0	5/20/2009	11:15	11	4.8
12/28/2008	7:45	51	36.0	6/16/2009	11:50	17	9.6
1/20/2009	12:10	20	1.5	6/19/2009	9:15	150	84.0
2/7/2009	11:25	92	72.3	6/19/2009	18:15	75	52.0
2/7/2009	13:25	120	105.0	6/19/2009	21:20	190	150.0
2/7/2009	13:40	230	110.0	6/20/2009	3:10	120	45.0
2/7/2009	19:40	65	46.3	7/16/2009	11:45	9	3.5
2/8/2009	13:40	22	26.0	8/7/2009	18:00	57	32.0
2/9/2009	1:40	13	12.0	8/7/2009	20:40	110	60.0
2/9/2009	19:40	140	64.0	8/8/2009	0:55	59	37.0
2/9/2009	22:00	210	140.0	8/8/2009	8:50	120	74.0
2/9/2009	23:15	110	140.0	8/8/2009	9:45	390	210.0
2/10/2009	7:20	47	45.7	8/8/2009	19:50	66	48.0
2/10/2009	11:00	230	100.0	8/9/2009	19:50	51	39.0
2/10/2009	17:05	110	70.7	8/10/2009	2:00	150	110.0
2/10/2009	23:25	42	41.3	8/10/2009	4:20	77	99.0
2/16/2009	12:45	80	4.8	8/19/2009	12:20	13	2.7
2/26/2009	14:35	36	66.0	8/25/2009	20:50	120	68.0
2/26/2009	19:00	38	140.0	8/25/2009	21:25	140	110.0
2/26/2009	19:45	130	170.0	8/25/2009	21:30	170	96.0
2/26/2009	22:50	210	130.0	8/26/2009	3:30	76	47.0
2/27/2009	4:50	230	70.0	8/27/2009	3:35	20	18.0
3/2/2009	7:20	6	7.3	9/15/2009	11:00	7	2.8
3/10/2009	0:15	31	34.0	9/20/2009	21:40	120	69.0
3/10/2009	5:50	46	38.0	9/21/2009	3:40	46	51.0
3/10/2009	11:45	38	38.0	9/22/2009	13:30	97	56.0
3/10/2009	14:50	51	41.0	9/22/2009	13:40	280	71.0
3/11/2008	1:10	28	45.5	9/22/2009	21:50	260	56.0
3/24/2009	11:55	11	1.1	9/22/2009	23:10	76	53.0
3/25/2009	1:30	57	38.0	9/27/2009	20:35	160	100.0
3/31/2009	17:00	19	14.0	9/27/2009	21:05	270	150.0
3/31/2009	17:35	38	33.0	9/27/2009	21:20	330	180.0
4/1/2009	5:35	33	20.0	09/28/2009	0:05	110	70.0
4/19/2009	19:10	26	17.0	9/28/2009	2:35	65	62.0
4/20/2009	5:05	48	24.0	9/28/2009	20:35	55	25.0
4/21/2009	5:05	12	7.1	MINIMUM		5	1.1
4/23/2009	11:00	6	1.4	MAXIMUM		390	210.0
4/25/2009	11:15	41	22.0	MEAN		105	65.9
4/25/2009	12:40	370	160.0	MEDIAN		76	53.0
4/25/2009	21:35	100	77.0	STANDARD DEVIATION		93	52.1
4/26/2009	2:35	87	68.0				
4/26/2009	14:35	50	36.0				
4/26/2009	16:00	300	150.0				
4/26/2009	17:10	360	190.0				

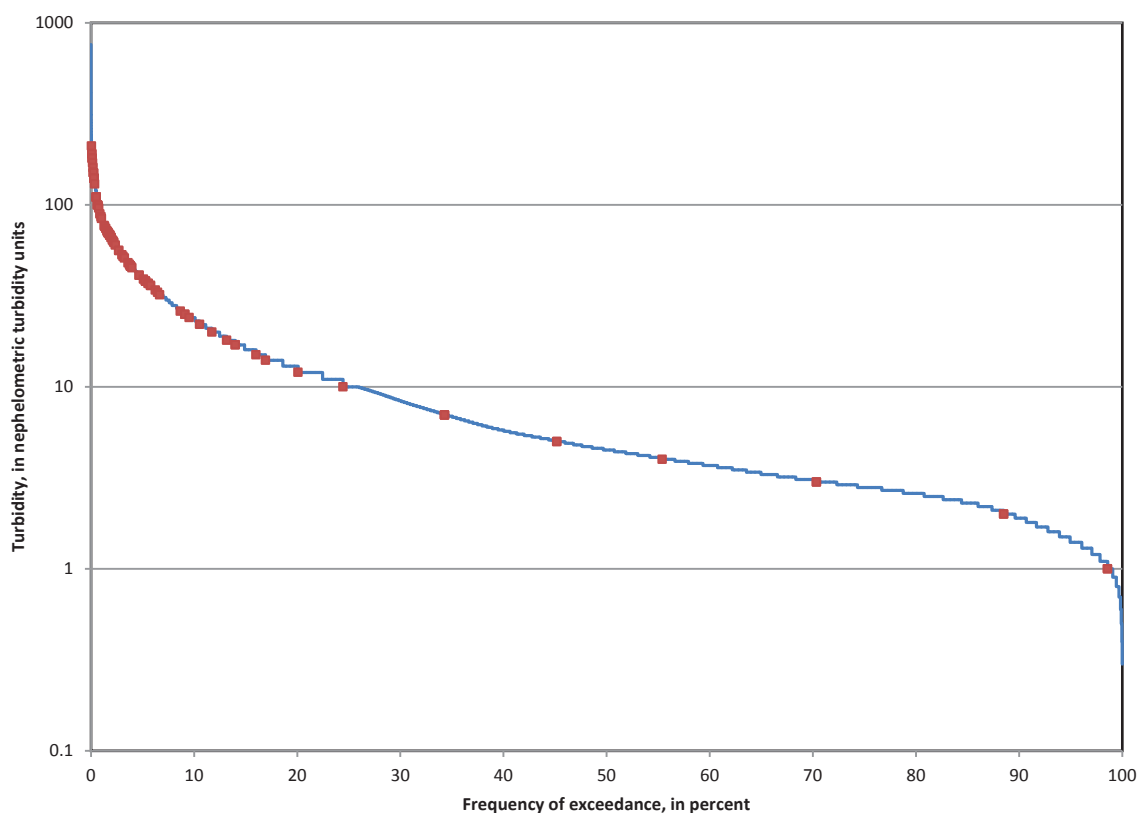


Figure 3-7. Duration curve for turbidity (November 2008–September 2010) and corresponding values associated with total suspended solids concentration samples collected November 2008 to September 2009 at U.S. Geological Survey streamgage on Menomonee River at Wauwatosa, Wisconsin.

Total suspended solids at Menomonee River at Wauwatosa, Wisconsin, November 2008–September 2009

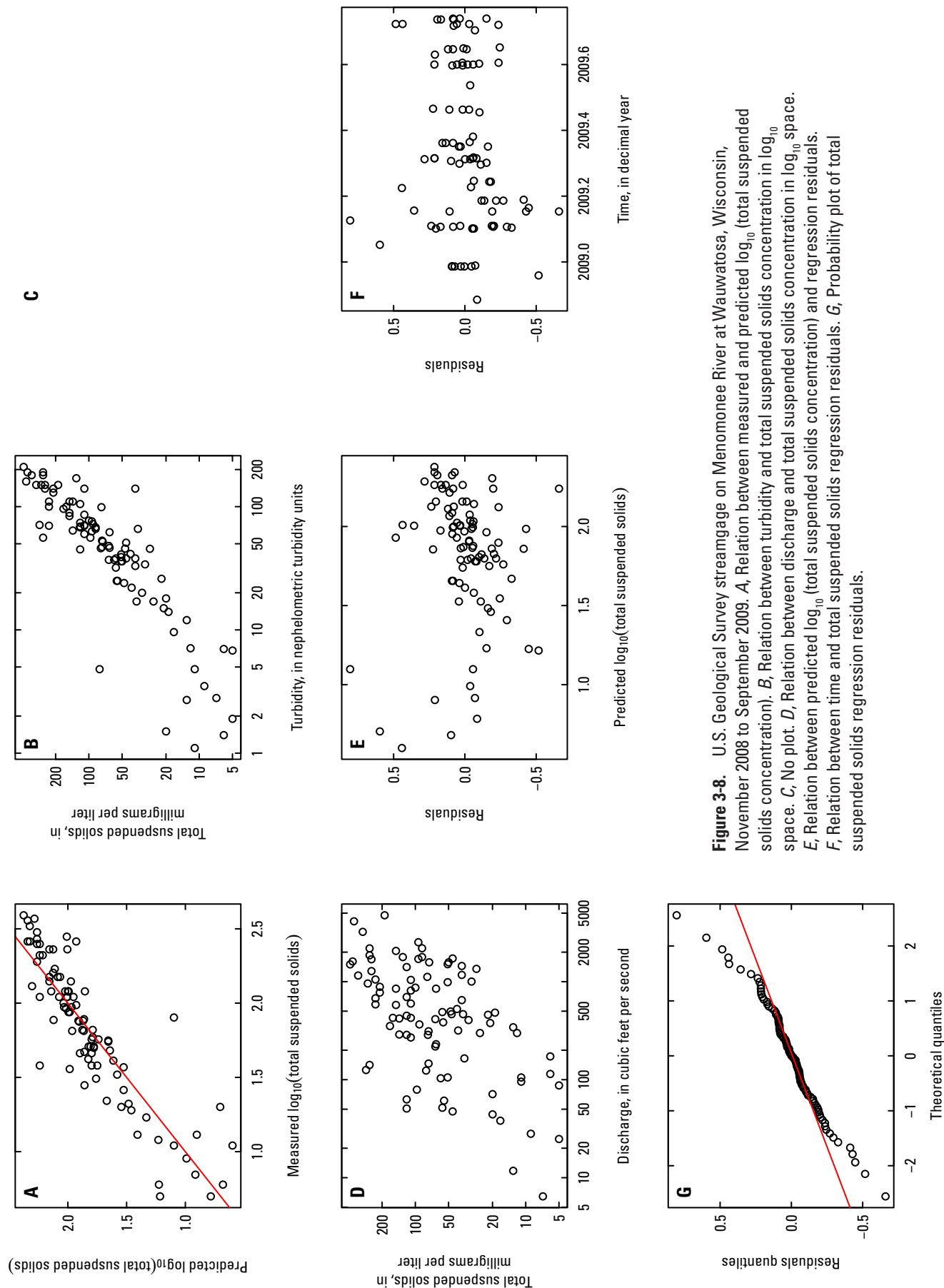


Figure 3-8. U.S. Geological Survey streamgauge on Menomonee River at Wauwatosa, Wisconsin, November 2008 to September 2009. *A*, Relation between measured and predicted $\log_{10}$ (total suspended solids concentration). *B*, Relation between turbidity and total suspended solids concentration in $\log_{10}$ space. *C*, No plot. *D*, Relation between discharge and total suspended solids concentration in $\log_{10}$ space. *E*, Relation between predicted $\log_{10}$ (total suspended solids concentration) and regression residuals. *F*, Relation between time and total suspended solids regression residuals. *G*, Probability plot of total suspended solids regression residuals.

Total suspended solids at Menomonee River at 16th Street at Milwaukee, WI (04087142)

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

$$\text{Log}_{10}(\text{Suspended Solids}) = 0.108 + 0.974 \log_{10}(\text{Turb}),$$

Where:

Suspended Solids = total suspended solids concentration in mg/L

Turb = Turbidity (YSI 6136), in NTU

Model Information (in log units unless otherwise specified):

Number of measurements = 79,

Root-mean-squared error (RMSE) = 0.21

Model standard percentage error (MPSE) = +62 and -38 percent

90-percent prediction intervals (based on units in mg/L) = +/- 100 percent

Adjusted coefficient of determination ($\text{Adj } R^2$) = 0.85

Sum of squared error = 3.39

PRESS = 3.61

Coefficients:

	Coefficient	Standard error	t statistic	p-value
Intercept	0.108	0.078	1.49	0.1416
$\text{Log}_{10}(\text{Turb})$	0.974	0.046	21.32	<0.0001

Correlation matrix of coefficients:

	Intercept	$\log_{10}(\text{Turb})$
Intercept	1	-0.946
$\text{Log}_{10}(\text{Turb})$	-0.946	1

Duan's bias correction factor = 1.12

Table 3-5. Model-calibration dataset for Menomonee River at 16th Street at Milwaukee, Wisconsin.

[mg/L, milligrams per liter; NTU, Nephelometric turbidity units]

Date	Time	Total suspended solids (mg/L)	Turbidity (NTU)	Date	Time	Total suspended solids (mg/L)	Turbidity (NTU)
11/20/2008	11:45	6	3.1	4/26/2009	8:00	48	48.0
12/17/2008	14:15	7	7.3	4/26/2009	14:00	31	39.0
12/27/2008	9:35	22	20.0	4/26/2009	16:25	190	82.0
12/27/2008	12:35	50	52.3	4/26/2009	17:10	460	210.0
12/27/2008	15:35	260	153.3	4/26/2009	19:30	340	210.0
12/27/2008	21:35	95	77.3	4/26/2009	19:35	320	190.0
12/28/2008	0:35	84	58.7	5/13/2009	22:05	42	35.0
12/28/2008	6:35	49	44.0	5/14/2009	0:35	73	67.0
1/20/2009	12:40	8	5.4	5/14/2009	1:45	93	93.0
2/7/2009	11:40	5	3.6	5/14/2009	3:35	71	70.0
2/7/2009	20:40	68	78.7	5/20/2009	11:45	11	5.0
2/8/2009	5:40	22	34.7	6/8/2009	12:40	37	42.0
2/8/2009	14:40	16	28.3	6/8/2009	15:30	37	50.0
2/8/2009	23:40	17	28.0	6/9/2009	2:35	29	32.7
2/9/2009	17:40	30	12.7	6/9/2009	5:00	24	31.3
2/10/2009	5:40	36	98.0	6/16/2009	13:00	11	5.3
2/11/2009	17:40	78	69.3	6/19/2009	0:55	1,800	530.0
2/16/2009	13:40	10	8.1	6/19/2009	1:10	1,000	400.0
2/26/2009	16:00	12	8.2	6/19/2009	1:45	820	340.0
2/26/2009	19:00	220	200.0	6/19/2009	9:35	110	95.0
2/26/2009	22:00	170	130.0	6/19/2009	20:45	230	160.0
2/27/2009	4:00	85	85.0	6/20/2009	2:25	95	84.0
2/27/2009	12:00	13	51.0	7/16/2009	12:30	12	4.9
2/28/2009	12:00	35	19.0	8/8/2009	22:30	36	24.0
3/7/2009	11:10	97	19.0	8/9/2009	10:30	19	17.0
3/7/2009	14:10	97	89.0	8/19/2009	13:30	9	4.7
3/7/2009	23:10	58	54.0	8/26/2009	7:05	15	15.0
3/8/2009	12:10	34	35.0	8/26/2009	17:00	12	13.0
3/8/2009	18:10	120	90.0	8/26/2009	23:45	15	14.0
3/9/2009	0:10	66	61.0	9/15/2009	11:30	6	2.9
3/10/2009	8:15	60	47.0	9/23/2009	7:10	12	7.1
3/10/2009	12:55	35	41.0	9/24/2009	7:00	11	9.2
3/10/2009	13:00	38	42.0	9/28/2009	12:05	22	28.0
3/10/2009	20:30	38	41.0	09/28/2009	18:05	22	30.0
3/11/2009	4:30	23	29.0	9/29/2009	0:05	14	30.0
3/24/2009	12:25	11	4.0	9/29/2009	3:05	11	17.0
4/1/2009	1:40	30	34.0	9/29/2009	5:00	14	16.0
4/20/2009	3:05	12	12.0	MINIMUM		5	2.9
4/20/2009	4:50	12	14.0	MAXIMUM		1,800	530.0
4/23/2009	11:15	7	5.7	MEAN		105	63.8
4/25/2009	13:20	26	30.0	MEDIAN		35	35.0
4/25/2009	20:00	57	61.0	STANDARD DEVIATION		249	88.4

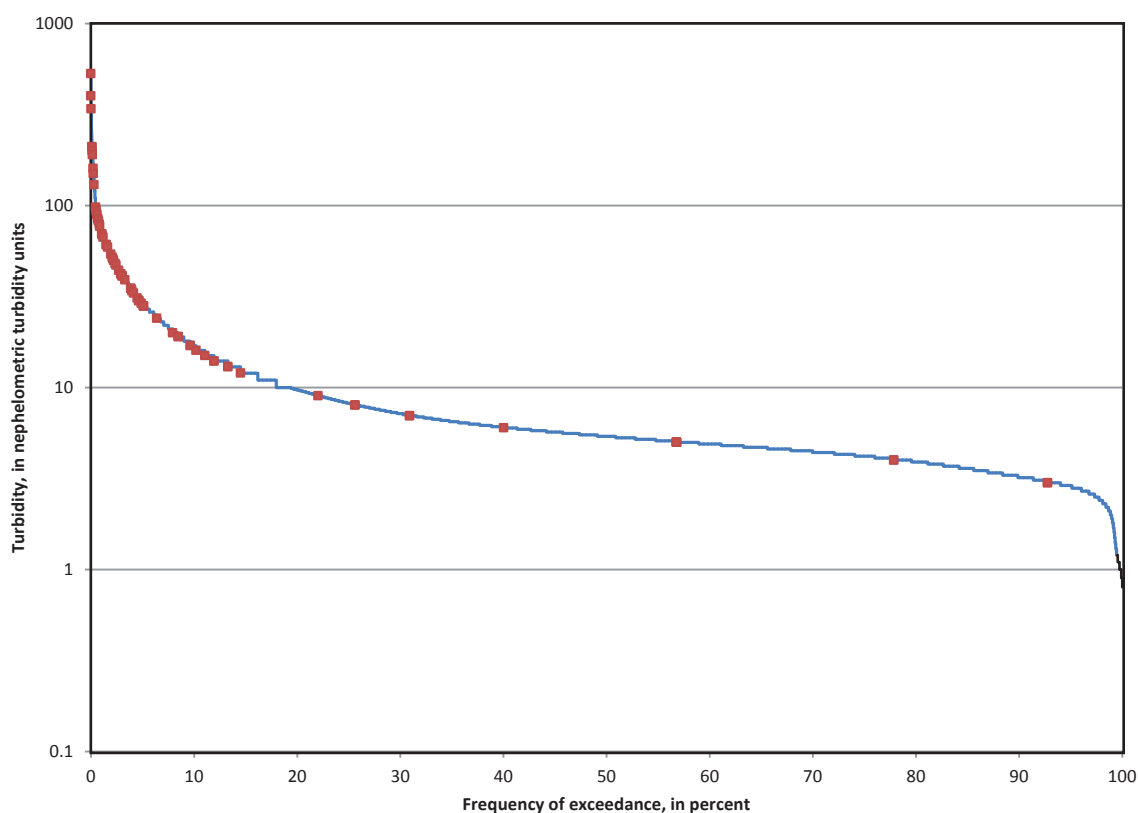


Figure 3-9. Duration curve for turbidity (November 2008–September 2010) and corresponding values associated with total suspended solids concentration samples collected November 2008 to September 2009 at U.S. Geological Survey streamgage on Menomonee River at 16th Street at Milwaukee, Wisconsin.

Total suspended solids at Menomonee River at 16th Street at Milwaukee, Wisconsin, November 2008–September 2009

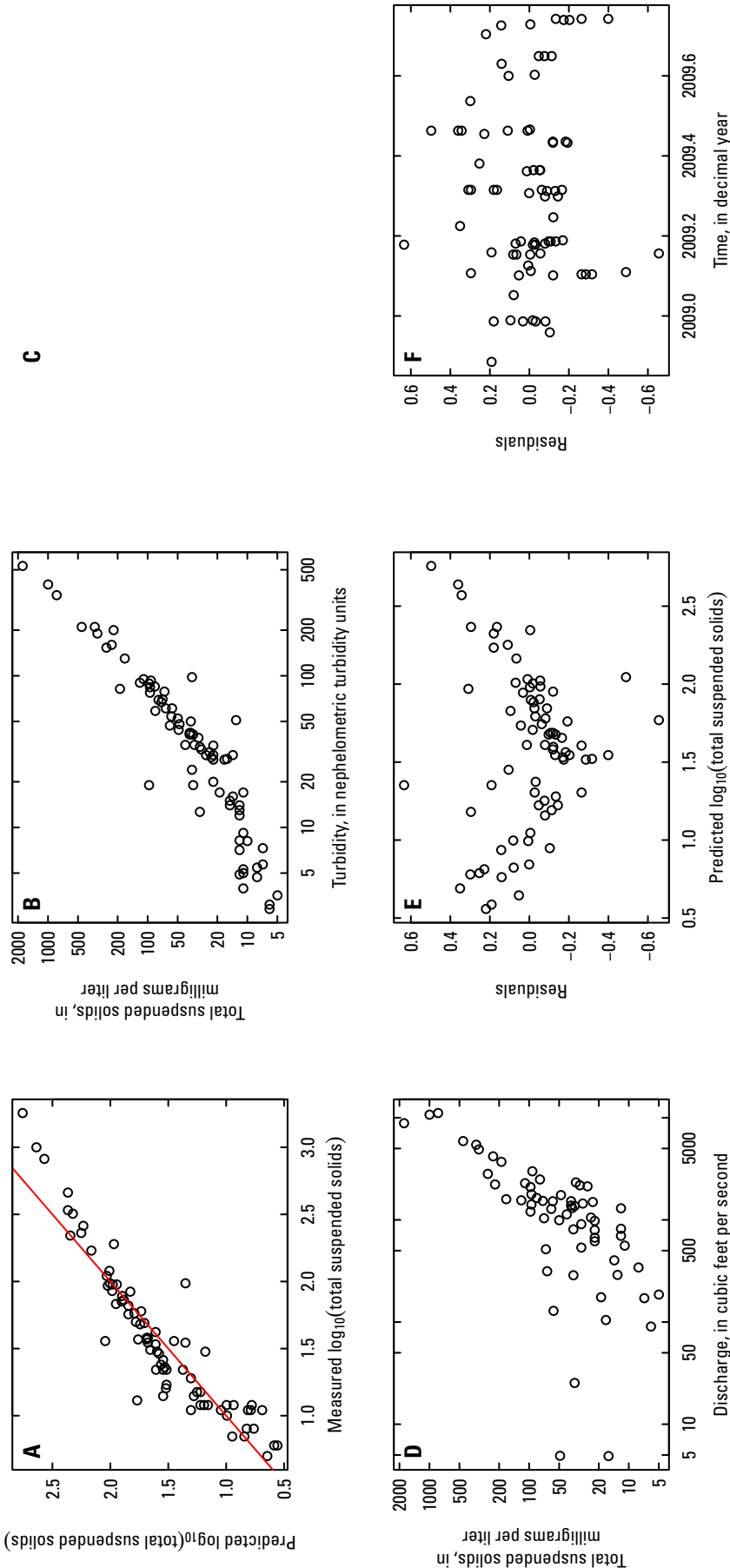


Figure 3-10. U.S. Geological Survey streamgauge on Menomonee River at 16th Street at Milwaukee, Wisconsin, November 2008 to September 2009. *A*, Relation between measured and predicted $\log_{10}$ (total suspended solids concentration). *B*, Relation between turbidity and total suspended solids concentration in $\log_{10}$ space. *C*, No plot. *D*, Relation between discharge and total suspended solids concentration in $\log_{10}$ space. *E*, Relation between predicted $\log_{10}$ (total suspended solids concentration) and regression residuals. *F*, Relation between time and total suspended solids regression residuals. *G*, Probability plot of total suspended solids regression residuals.

