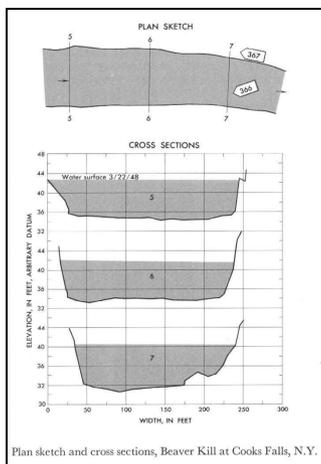


Beaver Kill at Cooks Falls, N.Y (Barnes)



Study Reach.--Section 5 is about 2,700 ft downstream from gage.

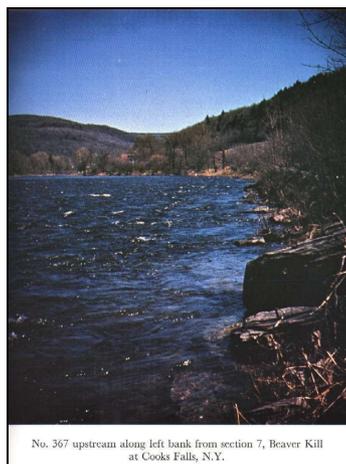
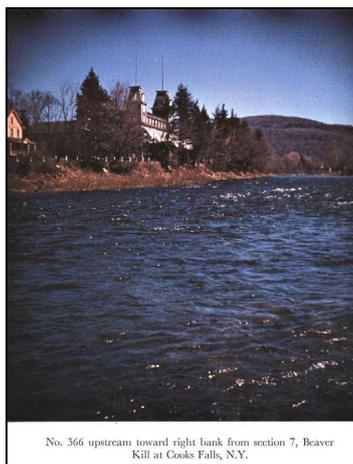
Gage Reference Location.--Lat 41°56'50", long 74°58'45", on left bank 125 ft downstream from highway bridge in Cooks Falls, Delaware County, and 5.5 miles downstream from Willowemoc Creek.

Drainage Area.--241 sq mi.

Gage Datum and Elevations of Reference Points.--Not available.

Stage, Discharge Measurements and Computed n-Values.--Gage height were 11.69 ft at gage; 42.65 ft (different datum) at section 5. Peak discharge was 15,500 cfs on Mar. 22, 1948.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
3/22/1948	15493.5	1650.0	7.27	9.39	0.003381	0.033

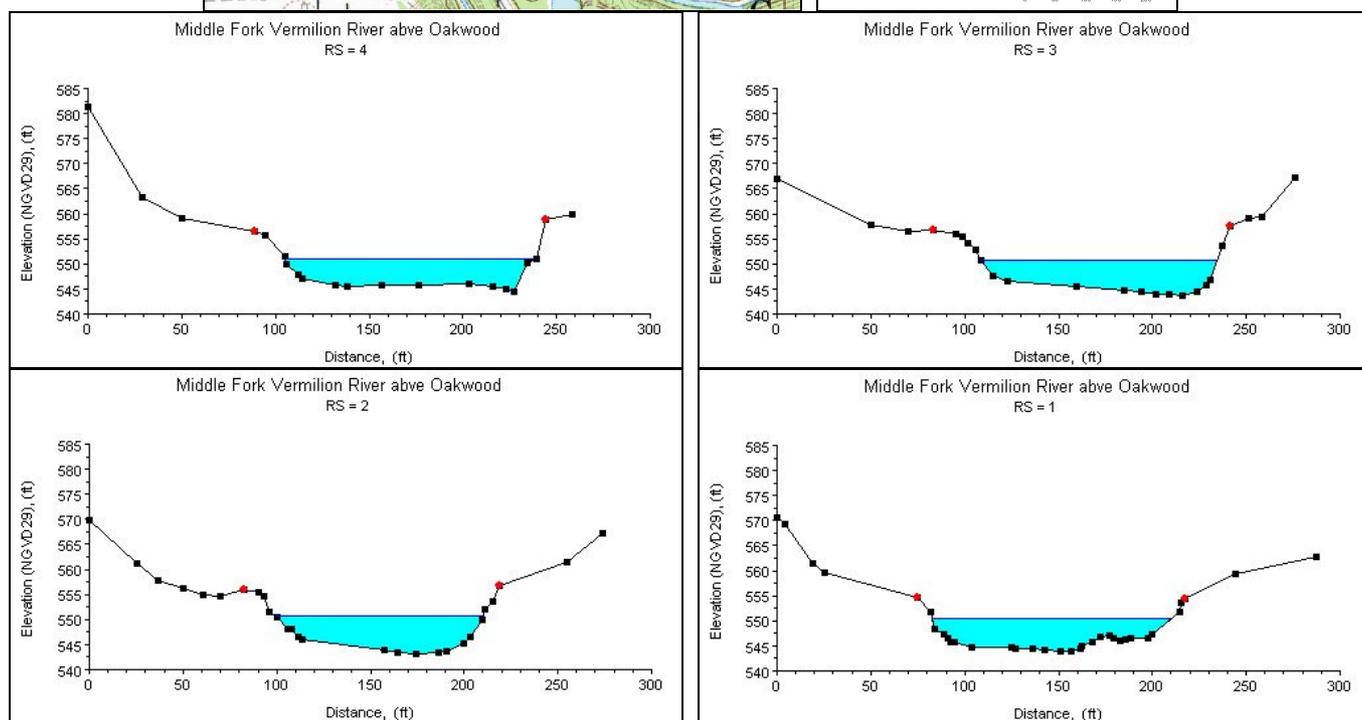
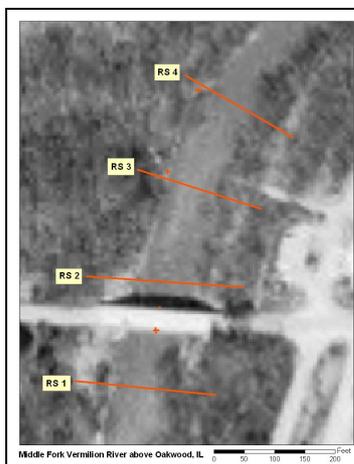
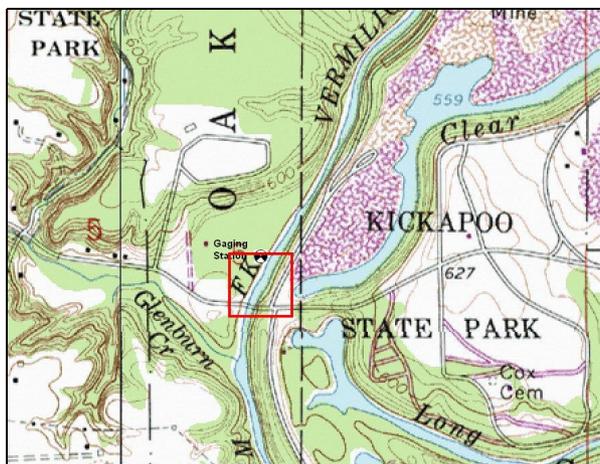


Description of Channel.--Bed consists of coarse gravel and cobbles with scattered boulders. Light brush is on both banks and some trees are near water's edge on right bank.

Estimated n-Values using Cowan s Approach.--

Key words.--

Middle Fork Vermilion River Above Oakwood, IL



Study Reach.--The channel reach under consideration is natural. A study reach, approximately 400 ft long, is selected upstream of the Kickapoo State Park Road bridge, as shown in the quadrangle map on the top left. The reach starts from 100 ft downstream of the Kickapoo State Park Road bridge and extends approximately 300 ft upstream. There are four surveyed cross sections (surveyed by the U.S. Geological Survey in May 2003) available for describing channel geometries in the study reach (see plots above). The channel alignment, approximate variations in channel width and bank conditions, and locations of the cross sections are shown in the aerial photo on the top right. Cross-sectional geometries vary gradually from upstream to downstream.

Gage Location.--Lat 40°08'14", long 87°44'45", in NE1/4 SW1/4, sec.5, T.19N., R.12W., Vermilion County, Hydrologic Unit 05120109, on right bank 150 ft upstream from Kickapoo State Park Road bridge, 1.0 mi upstream from Interstate Hwy 74 bridge, 2.0 mi northeast of Oakwood, and at river mi 31.7. The USGS streamgage-station number is 03336645.

Drainage Area.--432 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 544.42 ft; staff gage 1 is located 300 ft upstream from the bridge on the right bank, elevation of brass screw = 549.664 ft; staff gage 2 is located 150 ft upstream from the bridge on the right bank, elevation of brass screw = 549.446 ft; reference point for n-value study RP-N1 is the top of the nut on the concrete anchor on the upstream side of the bridge at midchannel near station 90, elevation = 570.508 ft; a wire-weight gage (WWG) is attached to the downstream face of the Park Road bridge. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were read from the two staff gages at the upstream portion of the study reach, RP-N1 on the upstream side of the bridge and the WWG before, during, and after each discharge measurement. Stage readings from the gage house also were referenced for checking the readings. Discharge measurements were made using the conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
4/25/2003	148.0	135.5	1.56	1.13	0.002240	0.025
5/15/2003	565.0	233.1	2.29	2.45	0.000560	0.023
6/12/2003	3070.0	626.4	4.98	4.91	0.000769	0.033
3/29/2004	3380.0	667.0	5.25	5.08	0.000769	0.031



0333645 Middle Fork Vermilion River above Oakwood, IL
Low flow, looking Upstream 08/18/04



03336645 Middle Fork Vermilion River above Oakwood, IL
Looking Downstream from gage 04/25/03



03336645 Middle Fork Vermilion River above Oakwood, IL
Looking Downstream from bridge 05/15/03
n = 0.023



03336645 Middle Fork Vermilion River above Oakwood, IL
Looking Upstream from bridge 05/15/03
n = 0.023



03336645 Middle Fork Vermilion River above Oakwood, IL
Looking Downstream from bridge 06/12/03
n = 0.033



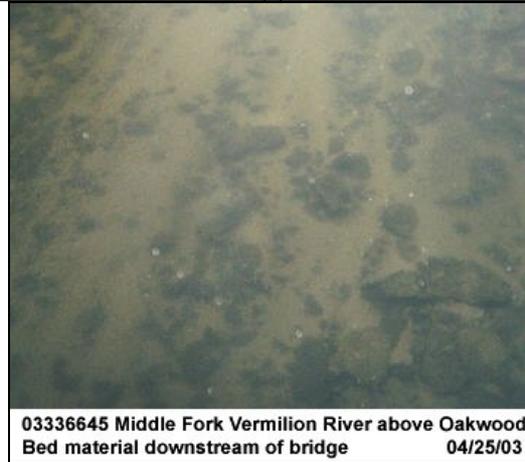
03336645 Middle Fork Vermilion River above Oakwood, IL
Looking Upstream from bridge 06/12/03
n = 0.033



03336645 Middle Fork Vermilion River above Oakwood, IL
Looking Downstream from bridge 03/29/04



03336645 Middle Fork Vermilion River above Oakwood, IL
Looking Upstream from bridge 03/29/04



03336645 Middle Fork Vermilion River above Oakwood
Bed material downstream of bridge 04/25/03

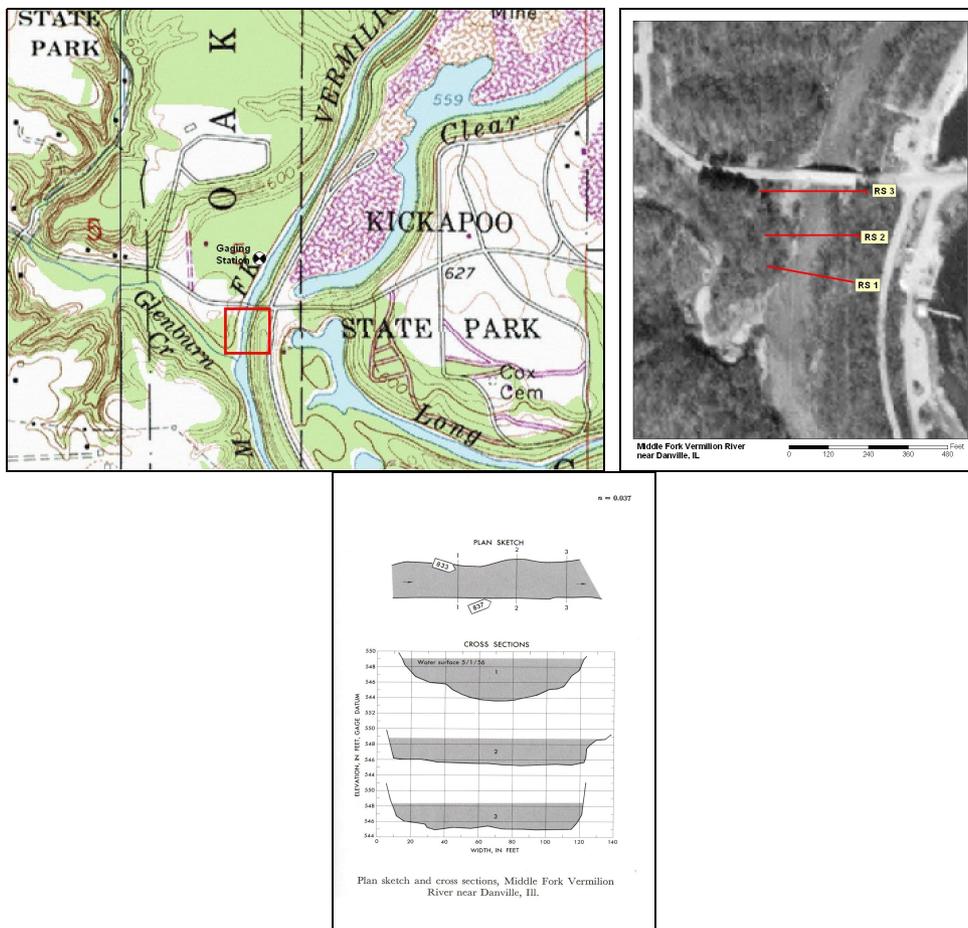
Description of Channel.--This channel is natural. The streambed consists primarily of sand-gravel-cobble mixtures from the upstream end to downstream of staff gage 2 and RP-N1. Downstream from RP-N1, the study reach consists of bedrock and scattered boulders to the end of the reach. The bottom width of the channel varies between 100 and 120 ft. The channel is trapezoidal and subject to debris accumulation at the bridge on the right side of the channel. The banks are about 13 ft in height and have a top width between 135 and 160 ft. Banks are steep with alluvial sand deposits at toe, slightly eroded surface, and patches of bushes and tall trees on top of the bank. The study reach is fairly straight.

Floods.--Maximum discharge, 15,500 ft³/s, Apr. 13, 1994, gage height, 20.46 ft.

Estimated n-Values using Cowan s Approach.--0.031 ~ 0.046

Key words.--

Middle Fork Vermilion River near Danville, IL



Study Reach.--The study reach is located from the downstream side of bridge on Kickapoo State Park Road to above Glenburn Creek. The bridge is downstream of the site at Middle Fork Vermilion River above Oakwood. Note that this site was studied by Barnes and only his data are reported here. The reach starts from 260 ft downstream of the Kickapoo State Park Road bridge and extends to approximately 30 ft downstream of the bridge, as shown in quadrangle map on the top left. Barnes report included three cross sections for this study reach (see plots above). The channel alignment, approximate variations in channel width and bank conditions, and locations of the cross sections are shown in the aerial photo on the top right. The length of the study reach is 230 ft.

Gage Location.--Lat 40°08'12", long 87°44'44", in NE1/4 SW1/4, sec.5, T.19N., R.12W., Vermilion County, Hydrologic Unit 05120109, at downstream side of bridge on Kickapoo State Park Road, 1.0 mi upstream from Interstate Hwy 74 bridge, 2.0 mi northeast of Oakwood, and at mi 31.7. Section 1 is 30 ft downstream from bridge.

Drainage Area.--432 sq mi.

Gage Datum and Elevations of Reference Points.--Gage is 544.42 ft above NGVD of 1929.

Stage, Discharge Measurements, and Computed n-Values.--High water marks were used to define the water-surface profile at sections 1, 2, and 3 in Barnes report. The n-values reported in Barnes report are listed in the following table.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness
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		Area (ft ²)			<i>n</i>
5/1/1956	1620.0	378.7	3.22	0.003100	0.037



03336850 Middle Fork Vermilion River near Danville, IL
Looking Downstream from left bank
n = 0.037



03336850 Middle Fork Vermilion River near Danville, IL
Looking Downstream from right bank
n = 0.037

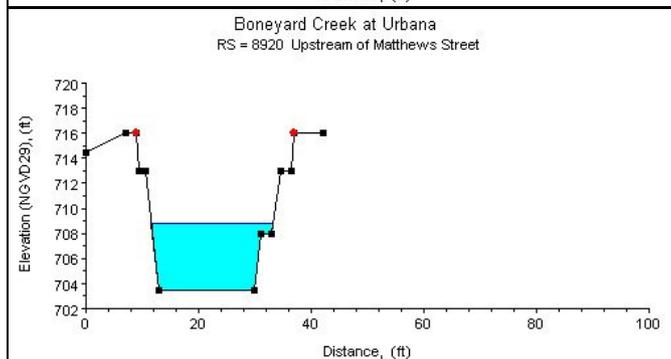
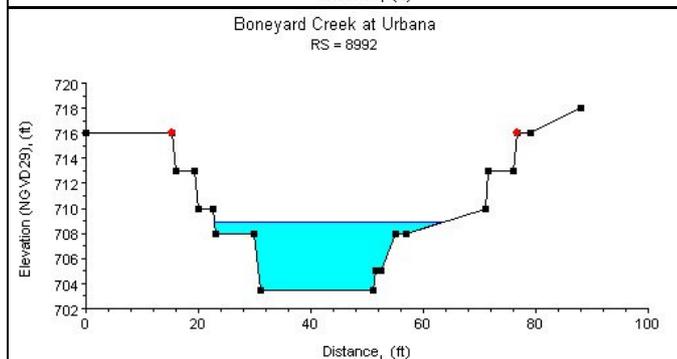
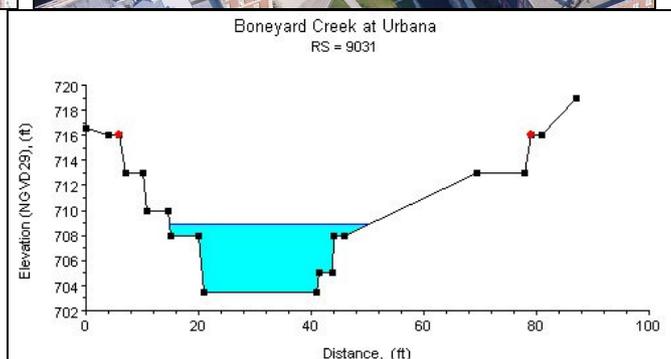
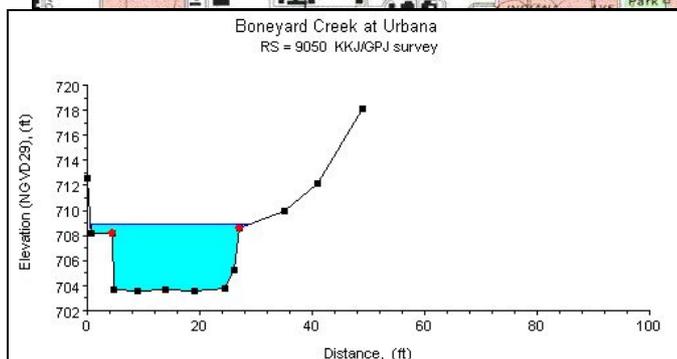
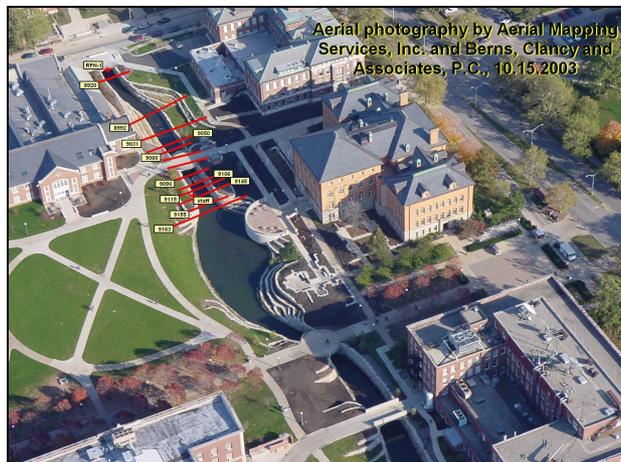
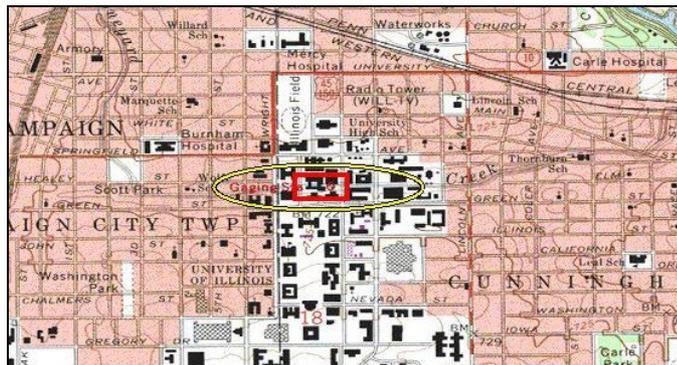
Description of Channel.--This channel is natural. The streambed consists of sand-gravel mixture with scattered boulders. Cross sections are generally in a wide rectangular shape. The bottom width of the channel is about 100 ft. The banks are approximately 6 ft high and have a top width varying from 100 to 120 ft. Banks consist of sand-gravel mixtures with a steep slope. The top of the banks are lined with trees and small underbrush and alluvial sand deposits at toe of the bank. The study reach is straight.

Floods.--Maximum discharge, 15,500 ft³/s, Apr. 13, 1994, gage height, 20.46 ft.

Estimated n-Values using Cowan s Approach.--0.031 ~ 0.046

Key words.--

Boneyard Creek at Urbana, IL



Study Reach.--The channel under consideration is constructed in an urban setting, as shown in the quadrangle map on the top left. The study reach, approximately 225 ft long, begins at a staff gage located on the left bank 45 ft upstream from the gage house and extends downstream to the upstream side of Matthews Street bridge. Eighteen surveyed cross sections (surveyed by Berns, Clancy, and Associates, in July 2000) are available for describing the geometries of the study reach. The channel alignment, approximate variations in channel width and bank conditions, and locations of cross sections are shown in the aerial photo on the top right.

Gage Location.--Lat 40°06' 40", long 88°13' 35", in NW1/4 NE1/4 sec.18, T.19N., R.9E., Champaign County, Hydrologic Unit 05120109, on right bank 300 ft upstream from Matthews St. on University of Illinois campus in Urbana, and at river mile 1.2. The USGS streamgage-station number is 03337000.

Drainage Area.--4.46 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of the gage is 694.00 ft. A staff gage is located at the upstream end, elevation of brass screw=708.456 ft; RP-N1 is the top of the handrail above the center upright on the guardrail on the upstream side of Matthews Street bridge, elevation=718.141ft. All elevations are in NGVD 1929

convention.

Stage, Discharge Measurement, and Computed n-Values.--Water-surface elevations were measured by reading the staff near the gage and by tape down from the reference point on Matthews Street bridge before, during, and after each discharge measurement. Discharge measurements were made using an acoustic Doppler current profiler (ADCP). When possible, multiple discharge measurements were made during a rise and recession to provide data for calculating n-values over a range in stage. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

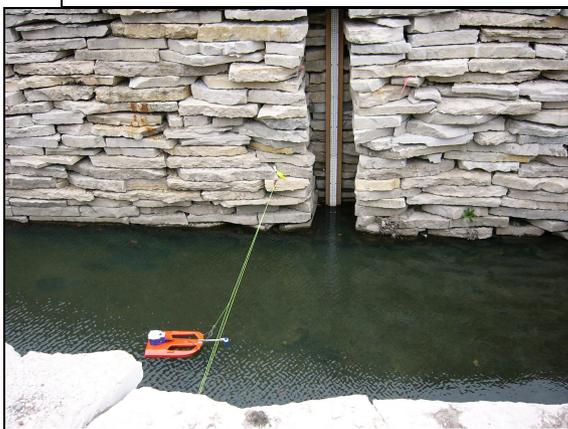
Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
10/18/2004	96.2	49.7	1.97	1.96	0.001911	0.043
10/18/2004	112.0	53.0	2.07	2.14	0.001867	0.040
3/26/2004	243.0	82.3	2.80	3.13	0.000755	0.053



03337000 Boneyard Creek at Urbana, IL
Looking Downstream from staff gage



03337000 Boneyard Creek at Urbana, IL
Close of right bank, terraced bank



03337000 Boneyard Creek at Urbana, IL
Close up of lannon stone



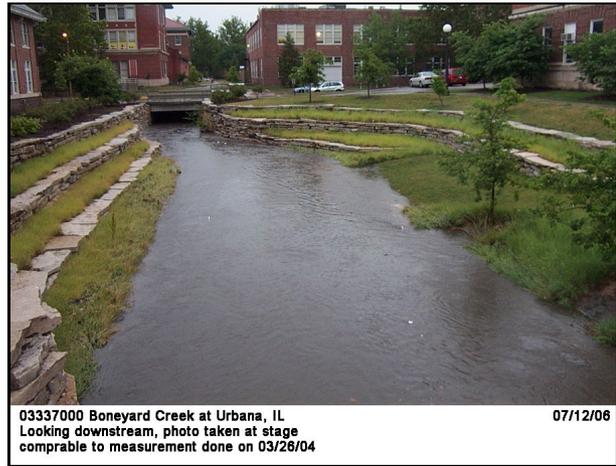
03337000 Boneyard Creek at Urbana, IL
Looking Upstream from Matthews Ave

08/29/03



03337000 Boneyard Creek at Urbana, IL
Looking Upstream from Mathews St bridge

08/29/03



03337000 Boneyard Creek at Urbana, IL
Looking downstream, photo taken at stage
comprable to measurement done on 03/26/04

07/12/08

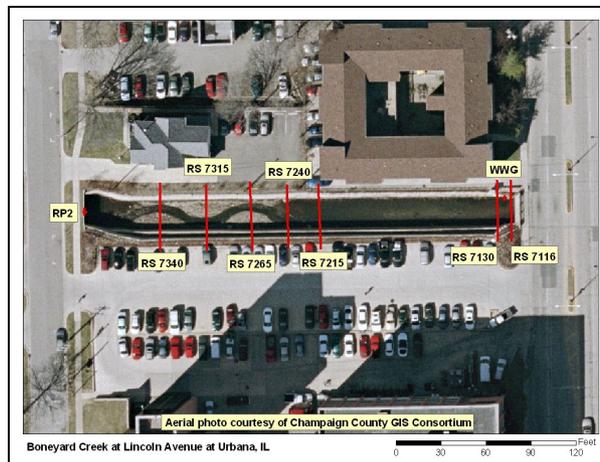
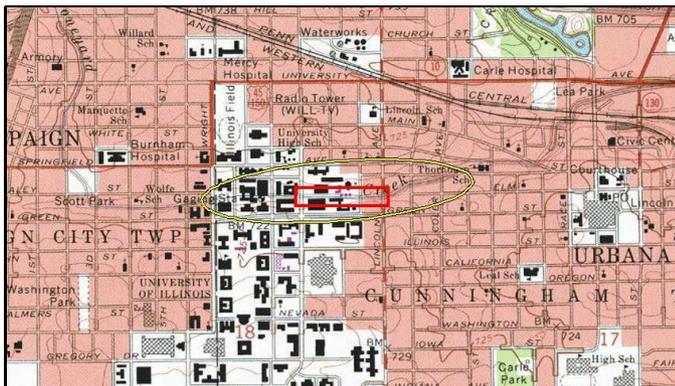
Description of the Channel.--This channel is constructed, straight, and varies gradually. The streambed consists of precast concrete revetment pavers with randomly placed 12- to 15- inch rounded river boulders extending 6 to 8 inches above the surface of the pavers. The pavers are gravel filled. Low flow is constricted by a prefabricated Parshall Flume with a 2-ft opening, located in the reach on the upstream side of Kingshighway bridge. The elevation of the crest of the flume is 703.69 ft. The flume becomes submerged at a stage of about 10.74 ft. Dense seasonal growth of aquatic plants and algae occurs on the channel bottom. Urban debris, such as bicycles and assorted garbage, accumulates and dissipates during events. Banks are constructed from layers of lannon stones; the bank surface is jagged and irregular. The banks are from 13- to 19- ft high. The bottom width is from about 18 to 20 ft. The upstream end of the reach is a rectangular channel from near the gage to the downstream side of Kingshighway bridge. Downstream, the channel is a steep-sided trapezoid with terraced banks until Matthews Street. The top width of the channel varies from 20 ft in the upstream rectangular section to 90 ft at the widest point in the trapezoidal section downstream. Cross-sectional geometries vary gradually and continuously from upstream to downstream.

Floods.--Maximum discharge, 946 ft³/s, from rating based on two indirect measurements, August 12, 1993, gage height, 9.93 ft. (datum then in use), from flood marks, as a result of 6.3 inches of rain in a 3-hour period.

Estimated n-Values using Cowan s Approach.--0.034 - 0.044

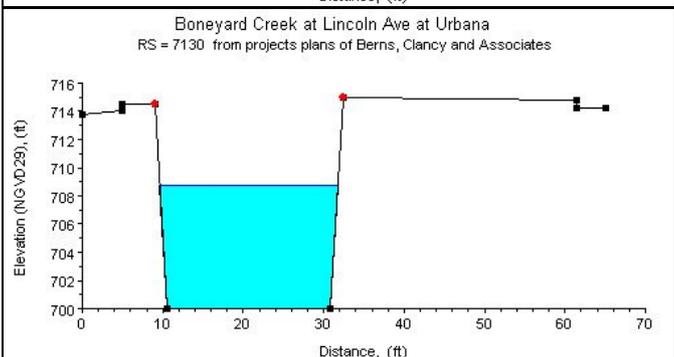
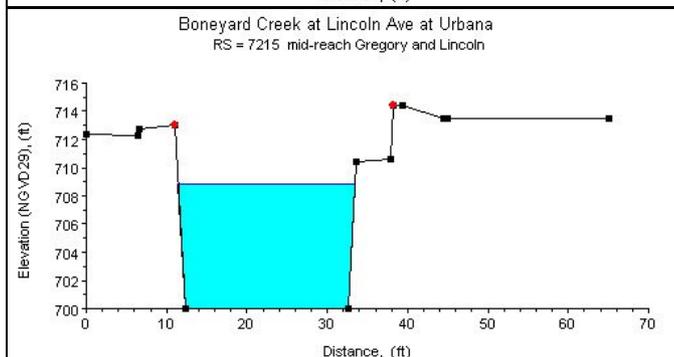
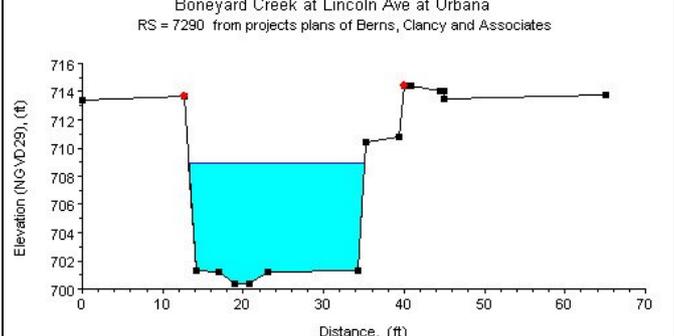
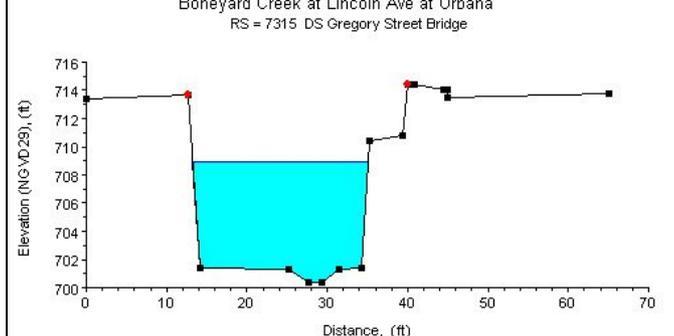
Key words.--

Boneyard Creek at Lincoln Avenue at Urbana, IL



Boneyard Creek at Lincoln Ave at Urbana

Boneyard Creek at Lincoln Ave at Urbana



Study Reach.--The channel reach under consideration is constructed in an urban setting, as shown in quadrangle map on the top left. The study reach, approximately 300 ft long, is located from the downstream side of Gregory Street bridge to the upstream side of Lincoln Avenue bridge. Nine surveyed cross sections (surveyed by Berns, Clancy, and Associates, in July 2000) are available for describing the channel geometries in the study reach (see plots above). The channel alignment, approximate variations in channel width and bank conditions, and locations of cross sections are shown in the aerial photo on the top right.

Gage Location.--Lat 40°06' 41", long 88°13' 10", in NE1/4 NE1/4 sec.18, T.19N., R.9E., Champaign County, Hydrologic Unit 05120109, on left bank 17 ft upstream from Lincoln Avenue in Urbana, and at river mile 1.4. The USGS streamgage-station number is 03337100.

Drainage Area.--4.78 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of the gage is 694.00 ft. Reference point RP-2 is a bolt in downstream face of Gregory St. bridge, elevation = 715.448 ft; a wire-weight-gage (WWG) is located on the left bank upstream from Lincoln Avenue bridge. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured from RP-2 and from the WWG before, during, and after the discharge measurement. Discharge measurements were made using either the conventional current-meter method or tethered boat acoustic Doppler current profiler (ADCP). When the ADCP was used, a series of bridge measurements were made, and the time for each section was recorded to the nearest minute. When possible, multiple discharge measurements were made during a rise and recession to provide data for calculating n-values over a range in stage. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
3/26/2004	236.0	79.3	2.83	3.02	0.001550	0.045
7/9/2003	453.7	125.5	3.89	3.64	0.001400	0.043
7/9/2003	506.4	146.2	4.27	3.48	0.001081	0.041
6/26/2007	540.0	165.0	4.59	3.28	0.001319	0.052
7/9/2003	590.9	165.5	4.60	3.58	0.000844	0.037
7/9/2003	608.4	169.1	4.65	3.61	0.000878	0.038
6/26/2007	653.0	153.3	4.39	4.28	0.001554	0.042



03337100 Boneyard Creek at Lincoln at Urbana, IL
Low flow, looking Downstream from Gregory St



03337100 Boneyard Creek at Lincoln at Urbana, IL
Low flow, looking Downstream from Gregory St



03337100 Boneyard Creek at Lincoln at Urbana, IL
Low flow, looking Downstream from Gregory St



03337100 Boneyard Creek at Lincoln at Urbana, IL
Looking Downstream from Gregory St

07/09/03
n = 0.034 - 0.037



03337100 Boneyard Creek at Lincoln at Urbana, IL
Looking Downstream from Gregory St
07/09/03
n = 0.034 - 0.037



03337100 Boneyard Creek at Lincoln at Urbana, IL
Looking upstream from Lincoln Ave
07/12/06



03337100 Boneyard Creek at Lincoln at Urbana, IL
Looking Downstream from Gregory St
06/26/2007



03337100 Boneyard Creek at Lincoln at Urbana, IL
Looking Downstream from Gregory St
06/26/2007



03337100 Boneyard Creek at Lincoln at Urbana, IL
Looking Upstream from Lincoln Ave
06/26/2007

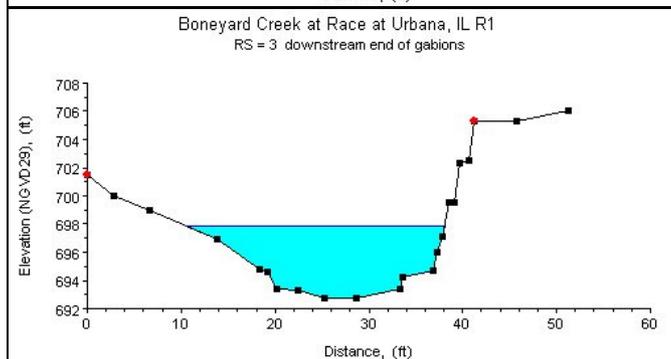
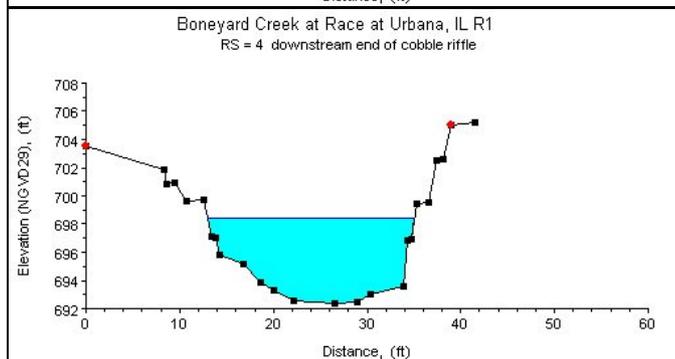
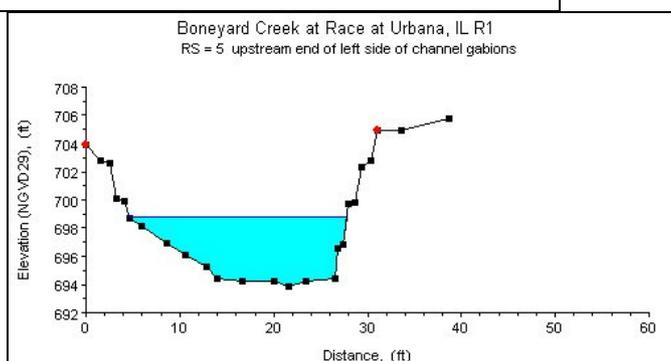
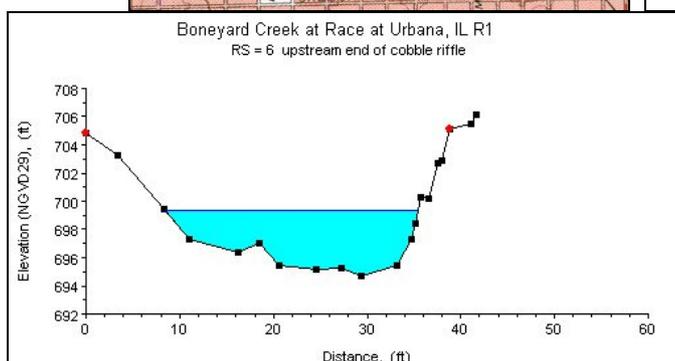
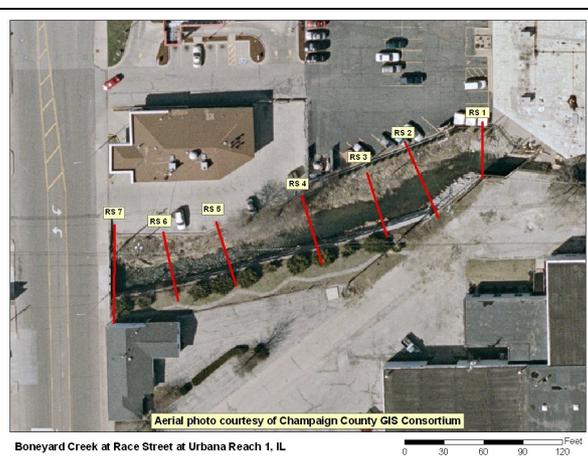
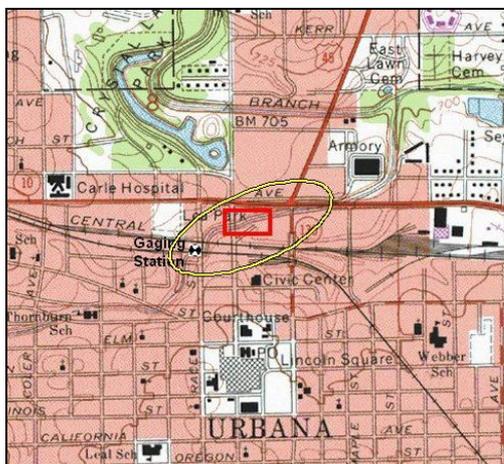
Description of Channel.--This channel is constructed with cross sections in a rectangular shape in a uniform straight reach. The bed material consists of precast concrete revetment pavers with medium gravel infill. Medium and coarse gravel accumulates and migrates along the channel bed. A low-flow meander was constructed in a 60-ft long section starting at the downstream side of Gregory Street bridge at the upstream end of the reach. Aquatic weeds and thick algae grow in the channel bed during the warm months and in low-flow conditions. The bottom width of the channel is about 20 ft. The banks are constructed from modular concrete block retaining walls with one terrace on the right bank and the left bank nearly vertical. The banks are approximately 14 ft high and have a top width of about 22 ft.

Floods.--None

Estimated n-Values using Cowan s Approach.--0.027 - 0.039

Key words.--

Boneyard Creek at Race Street at Urbana, IL Reach 1



Study Reach.--The channel reach under consideration is constructed in an urban setting, as shown in the quadrangle map on the top left. The study reach, about 310 ft long, begins at the downstream side of Broadway Avenue and extends downstream to an abandoned bridge. Seven surveyed cross sections (surveyed by the U.S. Geological Survey in August 2004) are available for describing the channel geometries in the study reach. The channel alignment, approximate variations in channel width and bank conditions, and locations of cross sections are shown in the aerial photo on the top right. Cross-sectional plots at four river stations (RSs), as shown above, are selected to illustrate the variation in cross-sectional geometry.

Gage Location.--Lat 40°06'53", long 88°12'33", in SW1/4 SE1/4 sec.08, T.19N., R.9E., Champaign County, Hydrologic Unit 05120109, on left bank at upstream side of Race Street bridge in Urbana, 0.7 mi upstream from Saline Branch, at river mi 0.1. The USGS streamgage-station number is 03337250.

Drainage Area.--6.86 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of the gage is 694.00 ft. A reference point for n-value study, RP-N2, is the top of the nut on the concrete anchor on the 2nd concrete upright from the right on the guardrail

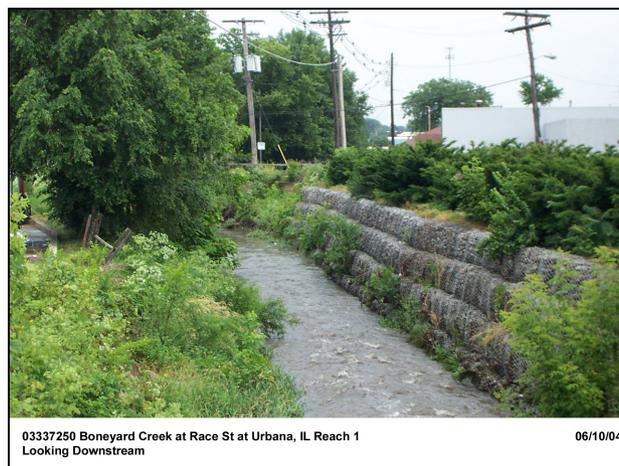
on the downstream side of Broadway Avenue bridge, elevation = 709.544 ft; RP-N1 is the top of the nut on the concrete anchor in the upstream side of bridge deck on the abandoned bridge 312 ft downstream from Broadway Avenue located on the right bank near the junction of the bridge deck and the retaining wall, elevation=704.872 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured from the two RP-Ns before, during and after each discharge measurement. Discharge measurements were made using the conventional current-meter method. Because the stage rises and falls quickly, measurements were made using quarter counts and recording the time for each section to the nearest minute. When possible, multiple discharge measurements were made during a rise and recession to provide data for calculating n-values over a range in stage. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
6/10/2004	108.0	56.5	2.20	2.15	0.006082	0.078
6/10/2004	129.0	59.7	2.28	2.42	0.006106	0.072
6/15/2004	136.0	62.8	2.36	2.37	0.006549	0.080
6/10/2004	157.0	65.9	2.43	2.64	0.005819	0.068
6/15/2004	158.0	67.0	2.46	2.57	0.006327	0.075
8/25/2004	164.0	70.5	2.55	2.53	0.006186	0.078
8/25/2004	174.0	71.8	2.58	2.63	0.006218	0.076
6/15/2004	190.0	73.7	2.62	2.80	0.006002	0.071
6/10/2004	205.0	73.7	2.61	3.06	0.005524	0.061
6/15/2004	236.0	83.5	2.83	3.05	0.005748	0.068
6/15/2004	320.0	97.8	3.14	3.50	0.005361	0.062
6/15/2004	391.0	102.5	3.23	4.06	0.005801	0.057



03337250 Boneyard Creek at Race St at Urbana, IL Reach 1
Low Flow, Looking Upstream



03337250 Boneyard Creek at Race St at Urbana, IL Reach 1
Looking Downstream

06/10/04



03337250 Boneyard Creek at Race St at Urbana, IL, Reach 1
Looking Downstream 06/10/04



03337250 Boneyard Creek at Race St at Urbana, IL
Looking Downstream 06/10/04



03337250 Boneyard Creek at Race Street at Urbana, IL, Reach 1
From Broadway St bridge, looking at right bank gabion boxes 6/10/04



03337250 Boneyard Creek at Race St at Urbana, IL, Reach 1
Looking Downstream 06/15/04



033372500 Boneyard Creek at Race St at Urbana, IL, Reach 1
Looking Upstream 06/15/04

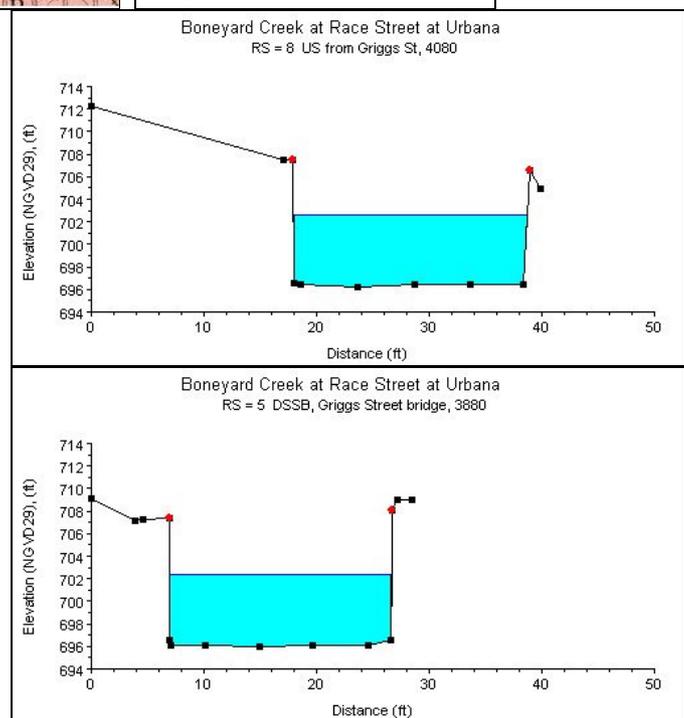
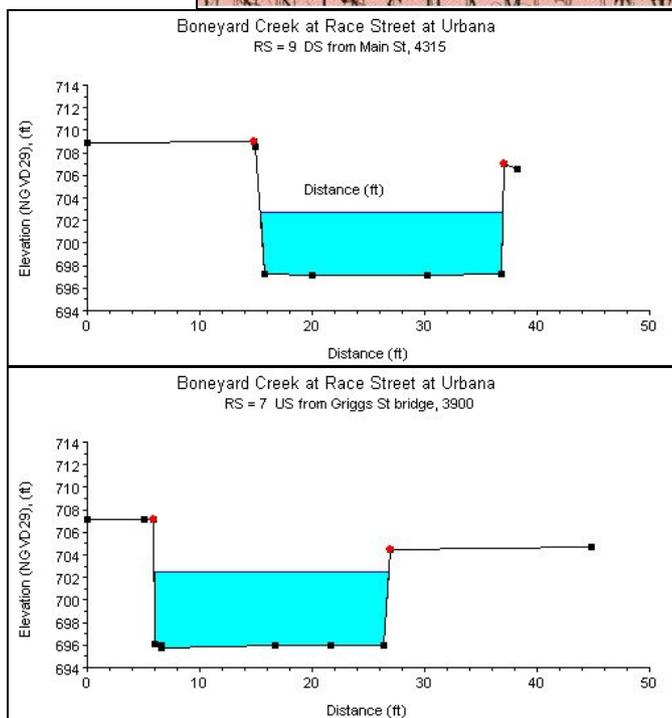
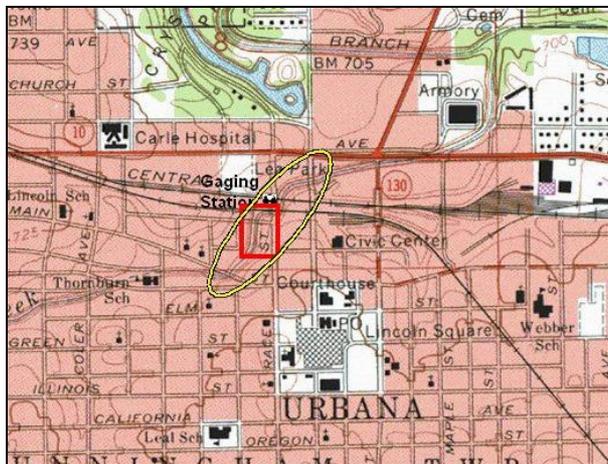
Description of Channel.--This channel is constructed with portions of the bank covered with gabion boxes. Bed material is primarily coarse gravel and cobbles with some sand deposits at the downstream end. The channel is subject to the accumulation and dissipation of urban debris, such as bicycles, shopping carts and assorted garbage. The banks are steep and vary in height from 10 ft to 13 ft. The left bank material varies from stacked concrete rubble at the extreme upstream end of the study reach to a 65 ft length of offset layers of gabion boxes at mid-reach to rubble and grouted riprap at the extreme downstream end. The right bank is lined with offset layers of gabion boxes, covered with occasional sparse and scattered weed growth. Weeds, flexible long-stem grasses, and grape vines grow abundantly on the left side of the channel and left bank. The width of the bed is about 20 ft and the top width is generally about 35 ft. Cross sections are of trapezoidal shape but with unequal slopes of each side. The study reach is straight.

Floods.--Maximum gage height, 10.72 ft., Aug. 19, 2002.

Estimated n-Values using Cowan s Approach.--0.056 - 0.064

Key words.--

Boneyard Creek at Race Street at Urbana, IL Reach 2



Study Reach.--The channel reach is constructed in an urban setting, as shown in quadrangle map on the top left. The study reach, approximately 855 ft long, is between Main Street and Race Street bridges. Ten cross sections (surveyed by Berns, Clancy, and Associates, in June 1997) are available for describing the channel geometries in the study reach. The channel alignment, approximate variations in channel width and bank conditions, and locations of cross sections are shown in the aerial photo on the top right. Because of the similarities in cross sectional geometries, cross sectional plots at river stations (RS) 8, 7, 5, and 4, as plotted above, are selected as representative cross sections.

Gage Location.--Lat 40°06'53", long 88°12'33", in SW1/4 SE1/4 sec.08, T.19N., R.9E., Champaign County, Hydrologic Unit 05120109, on left bank at upstream side of Race Street bridge in Urbana, 0.7 mi upstream from Saline Branch, at river mi 0.1. The USGS streamgage station number is 03337250.

Drainage Area.--6.86 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of the gage is 694.00 ft. A reference point for n-value study, RP-N1, is two file marks on the middle fence post on the upstream side of Griggs Street bridge, elevation = 711.811 ft. A wire-weight gage (WWG) is located at downstream end of the study reach attached to the upstream side

of Race Street sidewalk bridge. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured from RP-N1 and the WWG before, during, and after each discharge measurement. Discharge measurements were made using the conventional current-meter method. Because the stage rises and falls quickly, measurements were made using quarter counts and recording the time for each section to the nearest minute. When possible, multiple discharge measurements were made during a rise and recession to provide data for calculating n-values over a range in stage. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
8/29/2003	199.0	56.7	2.19	3.61	0.000560	0.021
8/29/2003	262.0	66.9	2.49	4.01	0.000560	0.021
10/24/2001	285.0	71.8	2.63	4.02	0.001140	0.026
10/24/2001	322.0	75.0	2.72	4.34	0.001060	0.024
8/29/2003	340.0	76.1	2.74	4.55	0.000720	0.021
8/29/2003	390.0	87.5	3.04	4.52	0.000720	0.023
8/29/2003	542.0	103.3	3.41	5.30	0.001000	0.024
8/29/2003	542.0	104.6	3.43	5.24	0.001000	0.024
8/29/2003	563.0	108.9	3.53	5.24	0.000720	0.023



03337250 Boneyard Creek at Race Street at Urbana, IL Reach 2
Base conditions, looking upstream from Race St bridge

09/24/03



03337250 Boneyard Creek at Race Street at Urbana, IL Reach 2
From Race St, looking Upstream

08/03



03337250 Boneyard Creek at Race St at Urbana, IL Reach 2
From Griggs St, looking Upstream

08/03



03337250 Boneyard Creek at Race St at Urbana, IL
From Griggs St, looking Downstream

08/03



03337250 Boneyard Creek at Race St at Urbana, IL
Looking Upstream from Race St bridge 08.28.03



03337250 Boneyard Creek at Race Street at Urbana, IL Reach 2
Upstream of Race St bridge 08/29/03



03337250 Boneyard Creek at Race St at Urbana, IL Reach 2
Looking Upstream from Griggs St bridge 08/29/03
n = 0.022 - 0.026



03337250 Boneyard Creek at Race St at Urbana, IL Reach 2
Looking Upstream from Griggs St bridge 08/29/03
n = 0.022 - 0.026



03337250 Boneyard Creek at Race St at Urbana, IL Reach 2
Looking Upstream from Griggs St bridge 08/29/03
n = 0.022 - 0.026

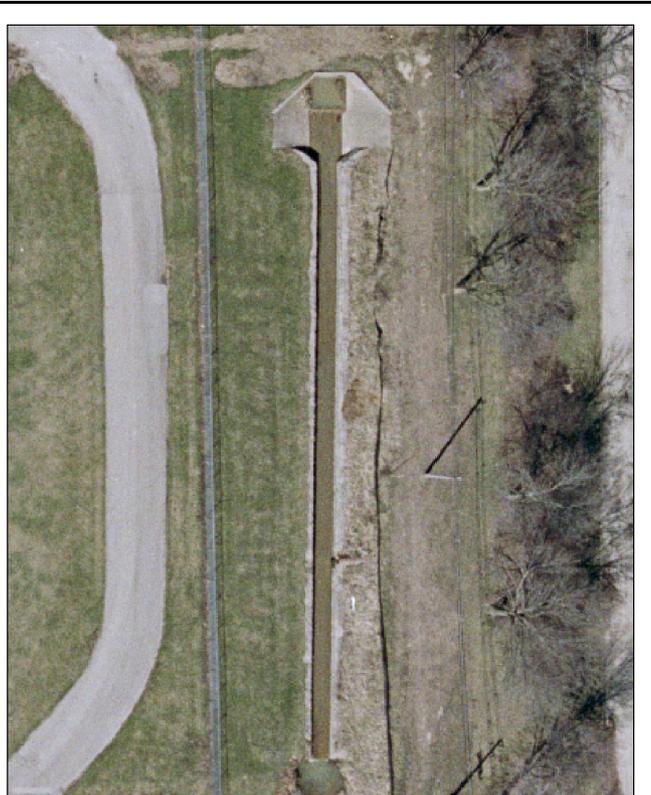
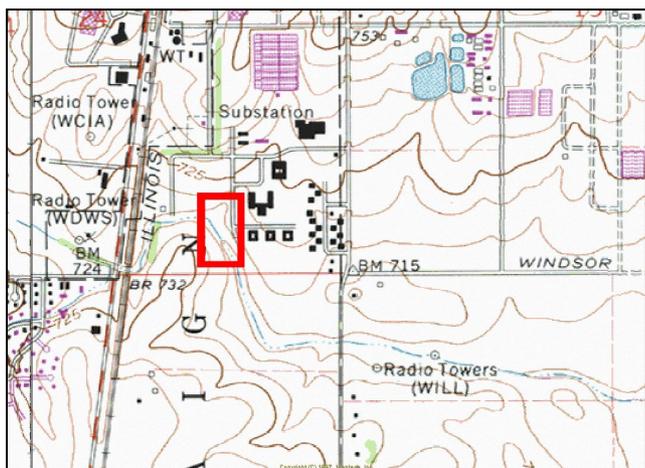
Description of Channel.--This channel is constructed with steel sheet-piling as sidewalls. The vertical steel pilings are about 16 ft high; concrete sills about 2 ft high support the bottom of the pilings. The bed material consists of concrete with sand-and-silt deposits. The width of the bed is about 20 ft. The reach has a rectangular cross-sectional geometry. The channel is subject to the accumulation and dissipation of urban debris, such as bicycles, shopping carts, and assorted garbage. The study reach contains a straight reach followed by a 90 o bend at the downstream end.

Floods.--Maximum gage height, 10.72 ft., Aug. 19, 2002.

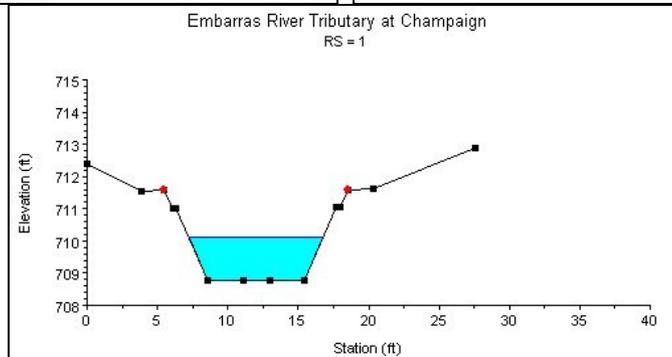
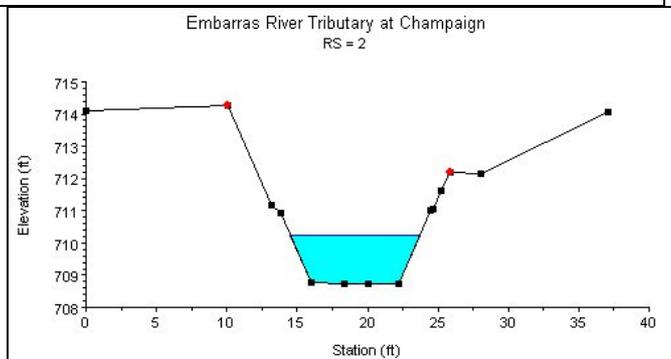
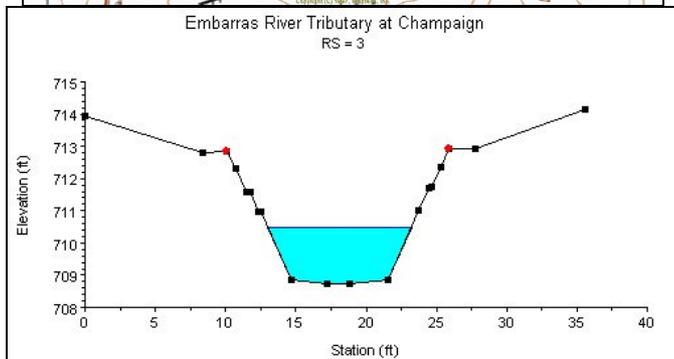
Estimated n-Values using Cowan s Approach.--0.021 - 0.026

Key words.--

Embarras River Tributary at Champaign, IL



Embarras Tributary at Champaign, IL



Study Reach.--The reach under consideration is a rectangular concrete drainage channel in an urban setting, as shown in quadrangle map on the top left. The study reach, about 200 ft long, is located south of Gerty St., to the west and parallel to Griffith Drive. Three cross sections (surveyed by USGS, in February 2006) are available for describing the channel geometries considered in the study, and locations of cross sections are shown in the aerial photo on the top right. Because of the similarities in cross sectional geometries, cross sectional plots at river stations (RS) 1, 2, and 3,

as plotted above, are selected as representative cross sections.

Gage Location.--Lat 40°05'09"N, long 88°14'36"W (NAD of 1983), in NW1/4 SW1/4 SE1/4 sec.24, T.9N, R.8E, M.3, Champaign County, Hydrologic Unit 05120112, chiseled square on top left side of concrete wing-wall, abt.200 ft. south of Gerty St., and south-west of the intersection of Gerty St. and Griffith Drive. Enters the Embarrass River at mile 192.8. The USGS streamgage-station number is 03343200.

Drainage Area.--undetermined (due to subsurface tiles)

Gage Datum and Elevations of Reference Points.--No gage is established at this site. A reference point, RM-1, about 200ft south of Gerty St., is a chiseled square on the top left side of the concrete wing-wall, above the main pipe outfall, elevation = 719.875 ft. RP-N2 is a bolt on the left-inside wall of the concrete channel, located about 10 ft. upstream from the end of the reach, elevation = 710.928 ft. RP-N3 is a bolt on the left-inside wall of the concrete channel, located about 20 ft. downstream from the beginning of the channel, elevation = 710.901 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements and Computed n-Values.--Water levels are read with an engineered-rule at both bolts. Flows are measured by wading in the concrete channel, downstream of the RP-N2 bolt at near the end of the channel. When possible, multiple discharge measurements were made during a rise and recession to provide data for calculating n-values over a range in stage. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
3/8/2006	3.5	2.7	0.35	1.39	0.001316	0.019
3/8/2006	3.8	2.9	0.37	1.38	0.001422	0.021
3/8/2006	5.0	3.1	0.40	1.69	0.001525	0.018
7/20/2006	8.2	3.8	0.47	2.23	0.001417	0.014
7/20/2006	8.2	3.8	0.47	2.23	0.001417	0.014
7/20/2006	11.7	4.8	0.57	2.53	0.001863	0.015
4/6/2006	37.7	10.8	1.04	3.56	0.002698	0.019
4/6/2006	41.1	11.3	1.07	3.69	0.002512	0.018
4/6/2006	43.4	11.8	1.10	3.75	0.002698	0.018
4/6/2006	45.3	12.1	1.12	3.81	0.002389	0.018
4/6/2006	45.3	12.3	1.13	3.74	0.002420	0.018
4/6/2006	45.4	12.3	1.13	3.75	0.002409	0.018



03343200 Embarras Tributary at Champaign, IL
Looking upstream from downstream end

03/08/06



03343200 Embarras Tributary at Champaign, IL
Looking downstream from upstream end

03/08/06



03343200 Embarras Tributary at Champaign, IL
Looking Downstream

06/26/2007



03343200 Embarras Tributary at Champaign, IL
Looking Downstream

06/26/2007



03343200 Embarras Tributary at Champaign, IL
Looking Upstream

06/26/2007

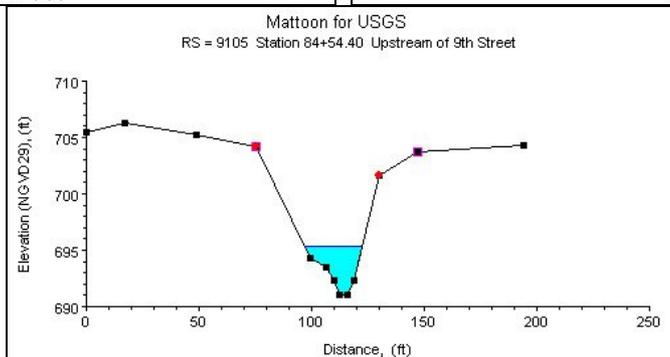
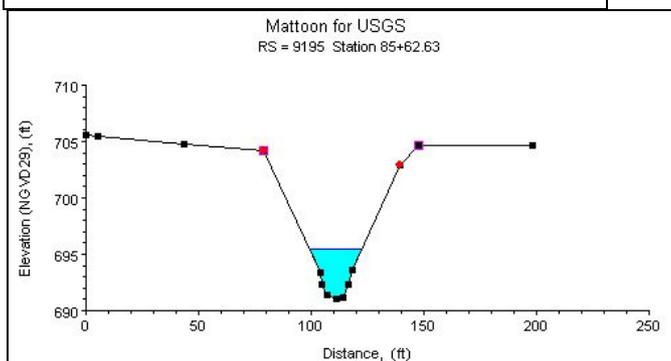
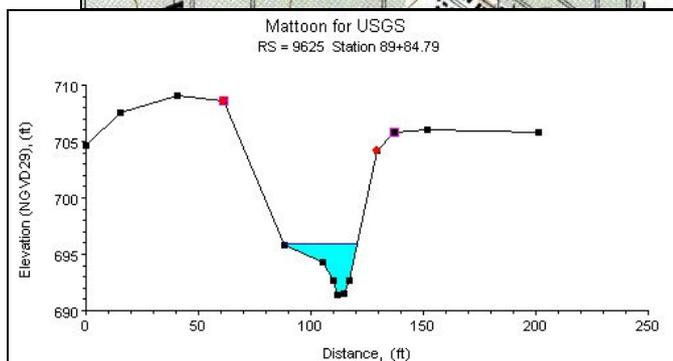
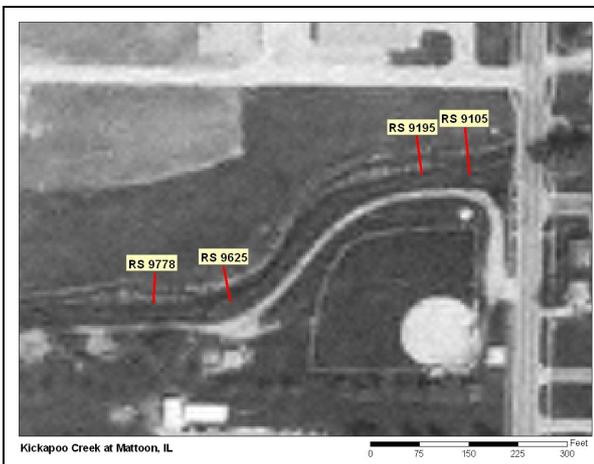
Description of Channel.--This channel is located downstream of a six foot diameter culvert pipe, which collects run-off from portions of the University of Illinois campus and Research Park. The study reach begins after a stilling basin, approximately 20 ft downstream of the pipe outlet. The stilling basin is concrete-padded, with a broad-crested weir at downstream end. There is a second culvert-pipe outfall on the left-side, approximately 110 ft downstream of the total channel length. The flow contributions from this pipe may necessitate moving the study reach upstream within the channel to exclude its effects. The bed material consists of depositional silt, sand, and muck with algal and light grass growth; the upstream end has some flag-stones layers, with each successive layer set-back a few inches from the one below. The study reach has a rectangular cross-sectional geometry. Bed and lower banks are concrete-lined with flag-stone layered on the upper banks of both sides. Occasional bed depositions consist of silt and fine sand and algal growth occurs during warm seasons.

Floods.--

Estimated n-Values Using Cowan s Approach.--

Key words.--

Kickapoo Creek at Mattoon, IL



Study Reach.--The channel reach under consideration is a dredged ditch in an urban area. The study reach selected extends from the upstream side of the South 9th Street bridge to about 650 ft upstream from the bridge. The reach under consideration and the study reach are presented in the quadrangle map on the top left. Four surveyed cross sections (surveyed by the Illinois Department of Natural Resources, in February 2003) are available in the study reach (see plots above). The channel alignment, approximate channel width and bank conditions, and locations of the cross sections are shown in the aerial photo on the top right. Channel geometries are illustrated with cross-sectional plots at river stations (RS) 9625, 9195, and 9105.

Gage Location.--There is no USGS streamflow gage at this location. The study reach is upstream of South 9th Street in Mattoon; Coles County, Hydrologic Unit 05120112, Illinois. The site can be reached by driving about 5 mi west off Interstate 57 from Mattoon Exit, then turn south on 9th Street in Mattoon. The USGS streamgage-station number is 03343800.

Drainage Area.--** sq mi.

Gage Datum and Elevations of Reference Points.--Reference points (RP-N) were established for n-value study. The base reference mark RM-1 is a chiseled square on the upstream side of the 9th Street left bridge abutment; elevation = 705.280 ft; obtained from a previous IDNR survey. RP-N1 is two file marks on the upstream side of the 9th Street bridge between 5th and 6th vertical slats from the right edge of water, elevation = 707.942 ft; RP-N2 is two file marks on top of a pounded-in fence post at left edge of the water, about 135 ft upstream of the bridge, elevation = 693.195ft; RP-N3 is two file marks on the second collar of a 6 in diameter iron pipe, at right bank approximately 400 ft upstream of bridge face, elevation = 699.050ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--The water-surface elevations were measured at the three RP-Ns before, during, and after a discharge measurement. Discharge measurements were made using the conventional current-meter method. When stage rose or fell quickly during an event, a shortened discharge method was used and multiple discharge measurements were made. Water-surface elevations were recorded consecutively covering the full range discharge measurements.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
1/5/2005	148.0	60.6	2.12	2.45	0.000954	0.032
1/5/2005	152.0	61.0	2.13	2.49	0.000886	0.031
1/5/2005	154.0	60.7	2.12	2.54	0.000927	0.030



03343800 Kickapoo Creek at Mattoon, IL
Looking Upstream, overgrown grass at bend 06/15/04



03343800 Kickapoo Creek at Mattoon, IL
Looking Upstream from RP3 07/21/03



03343800 Kickapoo Creek at Mattoon, IL
Looking Upstream, overgrown grass 06/15/04



03343800 Kickapoo Creek at Mattoon, IL
Looking Upstream from S 9th St bridge 07/21/03



03343800 Kickapoo Creek at Mattoon, IL
Looking Upstream 01/05/05



03343800 Kickapoo Creek at Mattoon, IL
Looking Upstream from S 9th St bridge 01/05/05



03343800 Kickapoo Creek at Mattoon, IL
Looking Downstream from RP3 01/05/05



03343800 Kickapoo Creek at Mattoon, IL
Looking Upstream from RP3 01/05/05

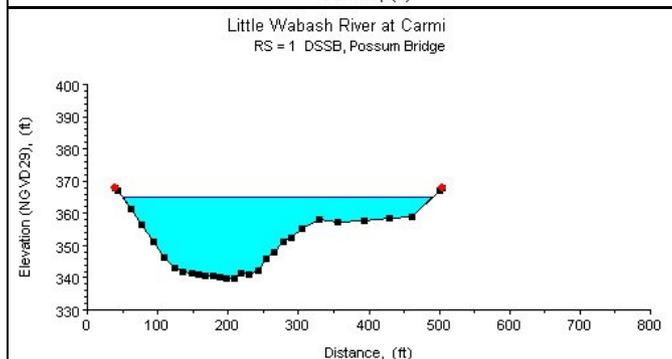
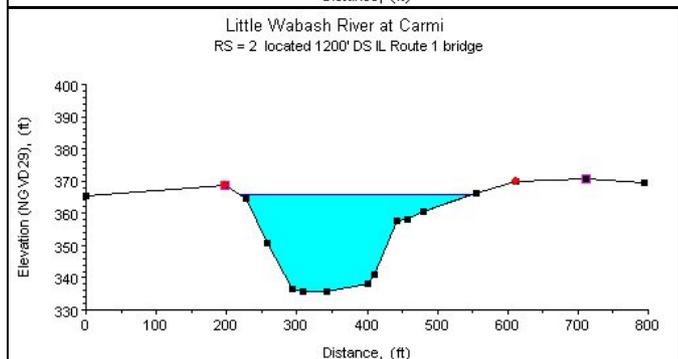
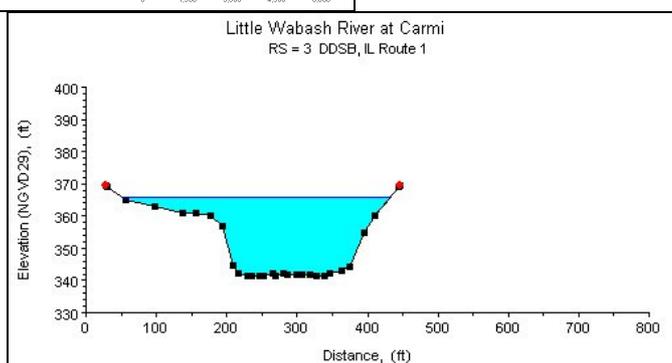
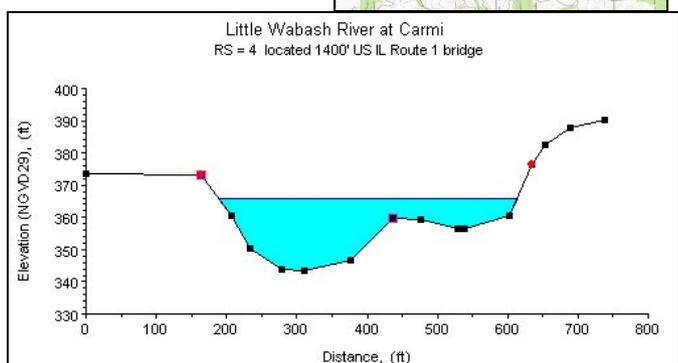
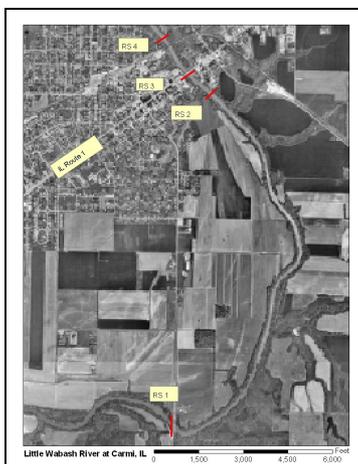
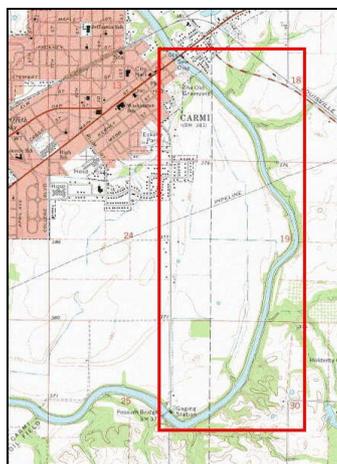
Description of Channel.--This channel is constructed grass with trapezoidal cross sections. Overall, the study reach covers a meandering reach of the channel. Portions of the bank have collapsed and the wastes deposited as berms at the toe of the bank. With berms formed at different locations, a small meandering channel is shaped within the bottom to convey base flow during dry seasons. Streambed consists of sands (medium to coarse sizes) in the center and loose silt/clay at submerged border areas at both banks. Above the main channel, the banks and bed are covered with dense tall grasses. The top width of the excavated channel is around 40 ft and bottom width from around 15 to 20 ft. Banks are around 15 ft high.

Floods.--Non-recorded; not a regular USGS streamgage-station

Estimated n-Values using Cowan s Approach.--0.047 - 0.052

Key words.--

Little Wabash River at Carmi, IL



Study Reach.--The channel reach under consideration is natural and meandering. The study reach selected, approximately 2.9 miles long, extends from Main Street Bridge in Carmi to Possum Bridge, as shown in quadrangle map on the top left. Four surveyed cross sections (surveyed by the Illinois Department of Transportation (survey date unknown) and the U.S. Geological Survey in April 1993) are available at this site for evaluating the channel geometries (see plots above). The channel alignment, approximate variations in channel width and bank conditions, and locations of cross sections are shown in the aerial photo on the top right.

Gage Location.--Lat 38°03'40", long 88°09'35", in NW1/4 SE1/4 sec.25, T.5S., R.9E., White County, Hydrologic Unit 05120114, on right bank at downstream side of Possum Bridge, 2.3 mi south of Main Street Bridge in Carmi and 7.8 mi downstream from Skillet Fork. The base gage can be reached by driving about 1-3/4 mi south on oiled road extension of Church Street in Carmi. The auxiliary gage is located at lat 38 05 32 , long 88 09 22 , in NE1/4 sec. 13, T.5 S., R. 9 E., White County, at the Main Street Bridge in Carmi, and 5.0 mi downstream from Skillet Fork. The USGS streamgage-station number for the base gage is 03381500.

Drainage Area.--3,102 sq mi.

Gage Datum and Elevations of Reference Points.--This is a slope station site where the auxiliary gage is located at Main Street bridge 2.8 mi upstream from the base gage. Datum of both the base and auxiliary gages is 339.91 ft. A wire-weight gage (WWG) is located on the downstream handrail of Main Street bridge at the upstream auxiliary station. Prior to the installation of the auxiliary station WWG, a reference point (RP-9) was used to measure stage. RP-9 is the head of a bolt located 30 ft from the gagehouse on the downstream side of Main Street bridge, elevation=385.249 ft. A WWG is attached to the downstream side of Possum Bridge at the base gage. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Stage and discharge data for the n-value studies were retrieved from measured discharge records for this slope station site. Water surface elevations were measured upstream at RP-9 or the WWG and at the downstream WWG before and after each discharge measurement. Discharge measurements were made using the conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
2/18/1992	1560.0	862.5	5.44	2.15	0.000079	0.034
7/16/1997	1940.0	1092.0	6.50	2.02	0.000077	0.036
8/28/1989	2470.0	1429.2	7.96	1.88	0.000076	0.039
12/13/1974	3890.0	1984.6	10.06	2.05	0.000081	0.038
2/21/2002	4610.0	2063.8	10.34	2.33	0.000091	0.035
1/6/1992	4740.0	2203.9	10.81	2.23	0.000079	0.035
4/25/1990	5810.0	2825.2	12.36	2.10	0.000075	0.038
11/18/1992	6530.0	3256.0	11.34	2.02	0.000077	0.036
1/6/1988	8310.0	4055.7	11.94	2.05	0.000088	0.039
6/17/2003	9140.0	4725.4	12.76	1.93	0.000093	0.043
1/14/1975	10200.0	5647.9	13.97	1.81	0.000100	0.050
6/2/2004	11800.0	5812.8	14.19	2.03	0.000095	0.043
6/30/2000	12100.0	5889.6	14.28	2.06	0.000104	0.045
2/4/1997	13100.0	6924.6	14.08	1.93	0.000097	0.044





03381500 Little Wabash River at Carmi, IL
Looking Downstream

03381500 Little Wabash River at Carmi Auxillary, IL
Looking Downstream



03381500 Little Wabash River at Carmi, IL
Looking Downstream

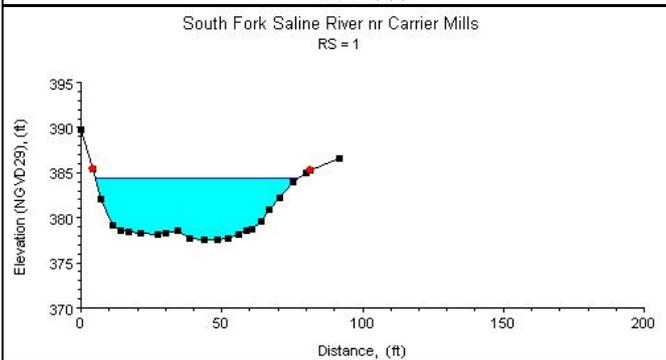
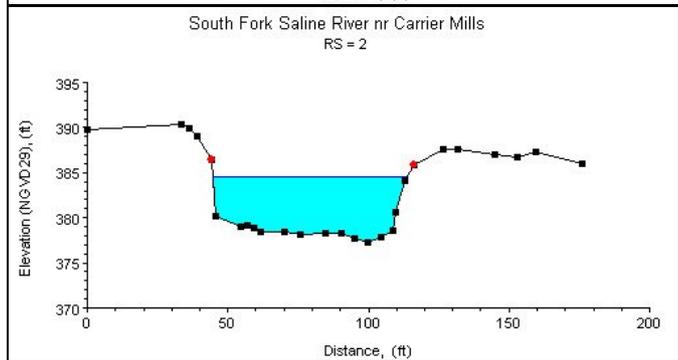
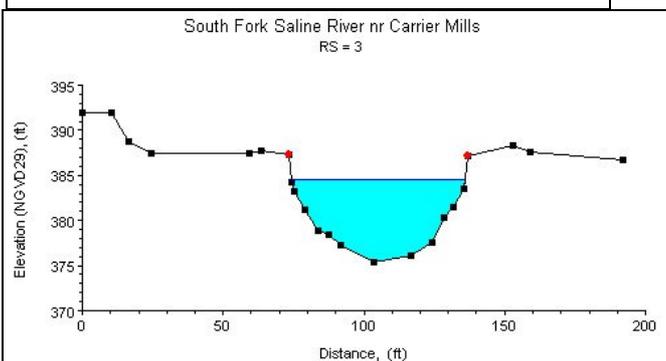
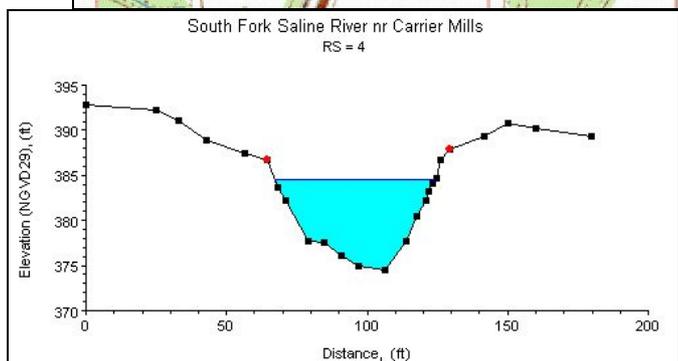
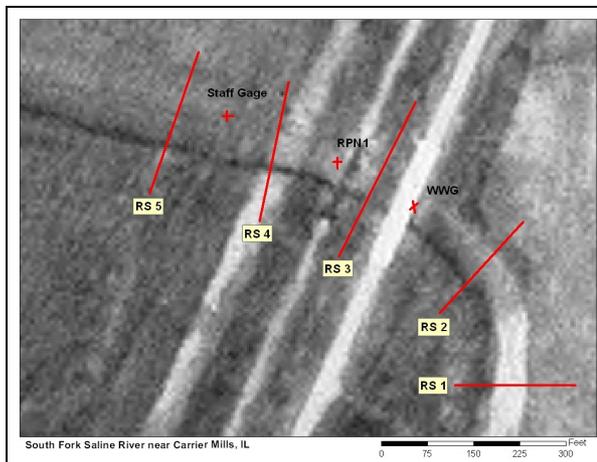
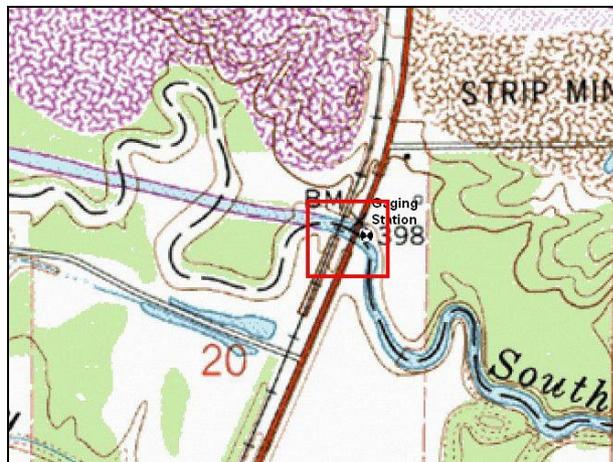
Description of Channel.--This stream is a natural channel. The bed material is composed of smooth rock and gravel, free of vegetation. The bank face is a clay and sand mixture, covered with exposed tree roots, brush and weeds. Overflow occurs at about 30 ft of stage. Measurements for this study did not exceed 30 ft of stage. The study reach can be described as having a slight meander.

Floods.--Maximum stage known 36.70 feet May 13, 1961. Flood of January 1937, 36.23 feet. Flood of May 25, 1943, 34.20 ft. Flood of Jan. 11, 1950, 35.23 ft. Flood of May 23, 1990, 34.38 ft.

Estimated n-Values using Cowan s Approach.--0.047

Key words.--

South Fork Saline River near Carrier Mills, IL



Study Reach.--The channel reach under consideration is a dredged channel with heavy vegetation coverage. The study reach selected, approximately 750 ft long, is located from 400 ft upstream of the USGS streamgage-station to 350 ft downstream of the station. The study reach represents a transition from a straightened dredged channel to a natural meandering channel segment downstream, as shown in the quadrangle map on the top left. Five surveyed cross sections (surveyed by the U.S. Geological Survey in April 2003) are available for evaluating channel geometries of the study reach. The channel alignment and approximate variations in channel width and bank conditions are shown in the aerial photo on the top right. Cross-sectional geometries vary gradually and continuously from upstream to downstream (see plots above).

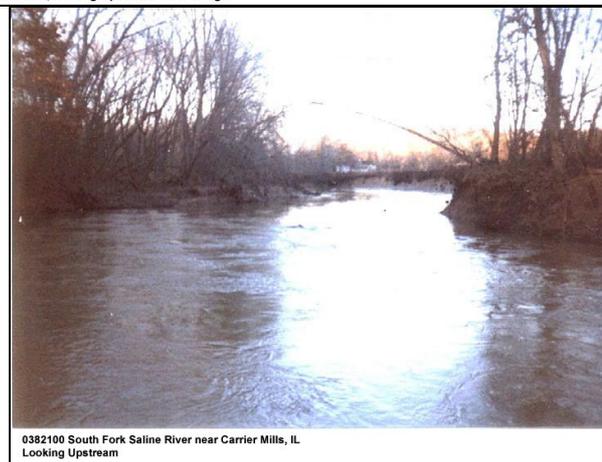
Gage Location.--Lat 37°38'16", long 88°40'40", in SW1/4 NE1/4 sec.20, T.10S., R.5E., hydrologic unit 05140204, on right bank at downstream side of bridge on U. S. Route 45, 150 ft downstream from railroad bridge, 4.5 mi southwest of Carrier Mills, Saline County and at river mi 42.4. The USGS streamgage-station number is 03382100.

Drainage Area.--147 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 375.63 ft. A staff gage is set up at about 350 ft upstream from the gage, elevation of brass screw = 382.807 ft. Reference point for n-values study RP-N1 is two file marks on the steel plate of the 13th vertical from the left on the guardrail, at midchannel on the upstream side of the bike-path trestle, elevation = 407.882 ft. There is a wire-weight gage (WWG) attached to the downstream side of the U.S. Route 45 bridge. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured at the staff gage, RP-N1 and WWG before and after each discharge measurement. Discharge measurements were made using the conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
5/8/2003	742.0	380.1	5.05	2.18	0.000354	0.029
11/2/2004	1290.0	571.1	6.70	2.46	0.000562	0.042
5/5/2003	1450.0	584.8	6.85	2.70	0.000425	0.034



Description of Channel.--This channel is natural with a 90° bend. The bend represents a transition from a straightened dredged channel to a natural meandering channel. The bed materials consist of hard clay and shale overlain in spots with fine sediments from strip mining upstream. Channel geometry is generally trapezoidal with bed encroachment showing at upstream portion of the study reach. The bottom width of the channel widens from about 40 ft upstream to as much as 60 ft downstream. The left-bank height is about 14 ft and right bank height is approximately 10 ft before any overflow to the flood plains occurs. Top width of the channel ranges from about 50 ft to nearly 70 ft.

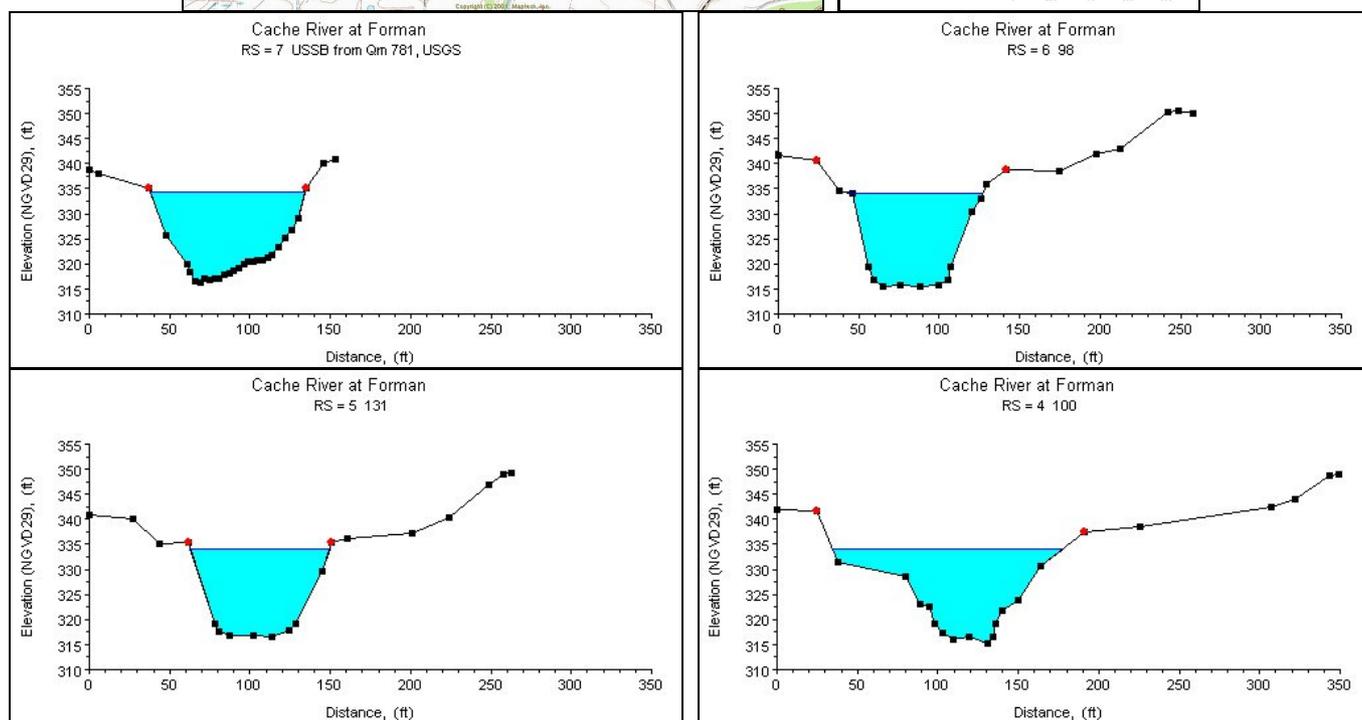
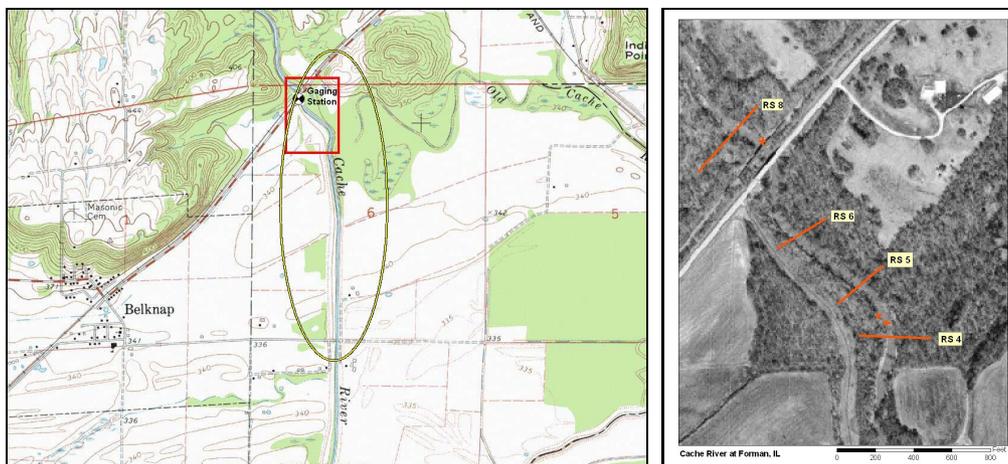
Bank faces are covered with grasses and exposed tree roots. The top of the right bank is wooded and brushy along the channel, with grass in the flood plains. The left flood plain is a cultivated field. Bank slope is steep and both banks are eroded up to the tree line.

Floods.--Jan. 31, 1982, 5160 ft³/s, (gage height 16.32 ft).

Estimated n-Values using Cowan s Approach.--0.027 - 0.038

Key words.--

Cache River at Forman, IL



Study Reach.--The channel reach under consideration is a straightened, dredged ditch located at the downstream side of an abandoned railroad bridge and extending to the County Road 200N bridge, as shown in quadrangle map on the top left. The study reach selected, 1300 ft long, extends from a point 300 ft upstream from the Belknap Road bridge to 1000 ft downstream. The study reach represents a transition from a natural meandering reach to a straightened, dredged reach. Four surveyed cross sections (surveyed by the Illinois Department of Natural Resources, in May 2003) are available for describing channel geometries in the study reach (see plots above). The channel alignment, approximate variations in channel and width and bank conditions, and locations of cross sections are shown in the aerial photo on the top right.

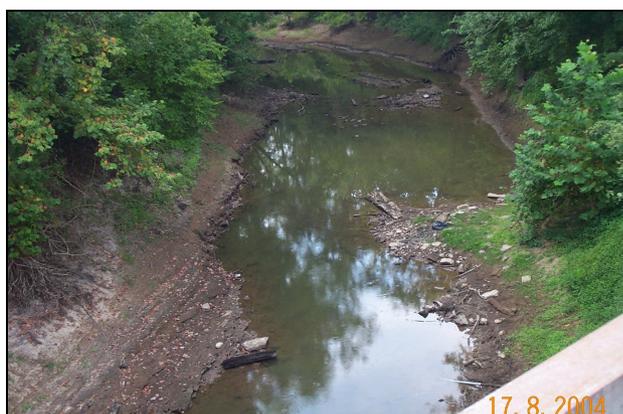
Gage Location.--Lat 37°20'11", long 88°55'26" in NE1/4 NW1/4 sec.6, T.14S., R.3E., Johnson County, on downstream side of Belknap-Forman county highway bridge, 1.2 mi southwest of Forman and at river mi 8.1. The USGS streamgage-station number is 03612000.

Drainage Area.--244 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 308.47 ft. Reference point for n-value study, RP-N2, is two file marks on the steel plate at 31st upright post from the right on guardrail on downstream side of bike path trestle, elevation = 345.422 ft. A wire-weight gage (WWG) is attached to the handrail of the highway bridge at downstream end. Upper staff gage located 1000 ft downstream of gage on right bank, elevation of brass screw = 328.247 ft. Lower staff gage located 1,000 ft downstream of gage on right bank, elevation of brass screw = 324.594 ft. RP-N1 is at two file marks located on vertical I-beam on upstream side of bridge located about 1 mi downstream of gage on County Road 200N, elevation = 347.930 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations at the upstream RP-N2, WWG, and staff gages and the downstream RP-N1 were measured before and after each discharge measurement. Discharge measurements were made using the conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
1/13/2005	2640.0	1070.5	10.27	2.47	0.000225	0.046
5/5/2003	2740.0	1251.1	11.13	2.20	0.000314	0.066
1/26/1999	2790.0	1205.0	10.91	2.32	0.000386	0.066



03612000 Cache River at Forman, IL
Low flow, control
08/17/04



03612000 Cache River at Forman, IL
Looking Downstream
12/02/03



03612000 Cache River at Forman, IL
Looking Upstream

Description of Channel.--Overall, the channel is a deep, dredged ditch. Localized channel scouring, bed deposition, and bank failures are observed in the original trapezoidal channel sections. The streambed is composed of clay-sand mixtures, gravel, and scattered boulders. The bottom width of the channel is approximately 30 ft. The bank heights are

about 20 ft. with a top width of about 100 ft. Bank slope is steep. The bank faces are covered with dense grasses, with brush and trees on top of the banks and on the flood plains. There is little flood plain on the left-hand-side of the channel and flood plains on the right-hand-side of the bank are limited by a levee approximately 200 ft away from the bankline. Overflowing to the flood plains occurs at a stage of about 22 ft. Also, backwater from the Ohio River may reach the channel under consideration when the staff gages at Metropolis and Lock 53 exceed approximately 30 ft. Therefore, over-the-bank events and those susceptible to backwater effects were not used. The study reach is considered as straight.

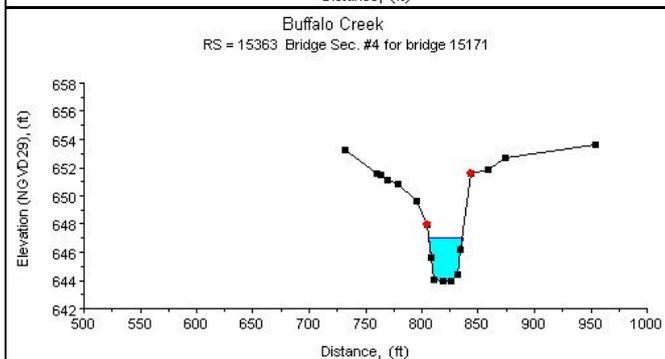
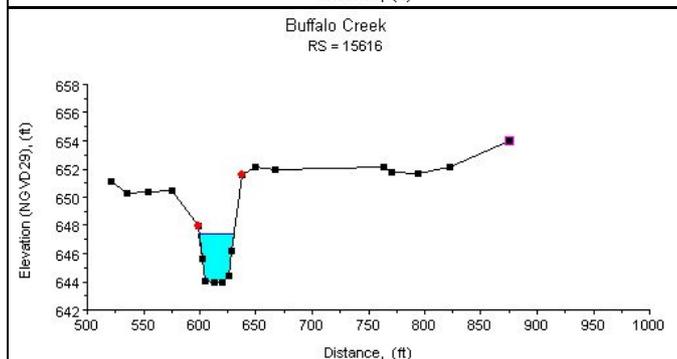
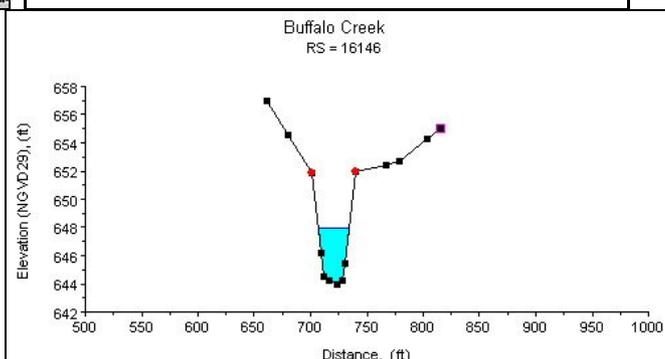
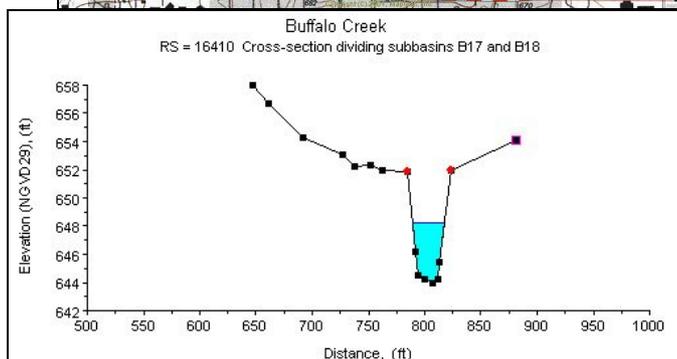
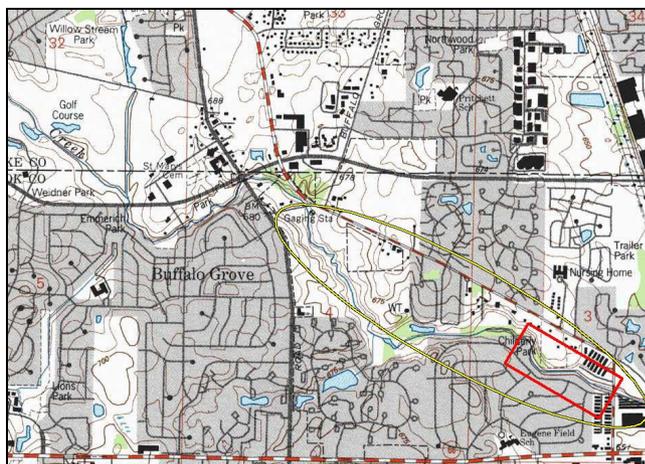
Floods.--Maximum gage height 42.29 ft Mar. 12, 1935 (9,630 ft³/s), site then in use, current datum. Maximum gage height at present site, 37.65 ft, current datum, on Mar. 11, 1964 (8,040 ft³/s).

Estimated n-Values using Cowan s Approach.--0.043 - 0.055

Key words.--

Bank: vegetation flexible grasses, young trees with heavy under growth (make sure this is the condition for in-channel flows .-- this is true for the upper end of the reach, further down the trees are at the top of the banks)

Buffalo Creek near Wheeling, IL



Study Reach.--The channel reach under consideration is meandering and dredged channel. The study reach selected, about 1950 ft long, is located between the Childerly Park pedestrian bridge and Elmhurst Road bridge, as shown in quadrangle map on the top left. Ten surveyed cross sections (surveyed by the Illinois Department of Natural Resources, in April and May 2003) are available for describing the channel geometries. The channel alignment, approximate variations in channel width and bank conditions, and locations of surveyed cross sections are shown in the aerial photo on the top right. Four representative cross sections at river station (RS) 16410, 16146, 15616, and 15363 are plotted above.

Gage Location.--Lat 42°09 06 , long 87°57 26 , in NE1/4 NW1/4 sec.4, T.42N., R11E., Cook County. Hydrologic Unit 07120004. On left bank at downstream side of bridge on Short Aptakisic Road, 1.0 mi downstream from unnamed tributary, 2.5 mi west of Wheeling, and at mile 5.0. The USGS streamgage-station number is 05528500.

Drainage Area.--19.6 sq mi.

Gage Datum and Elevations of Reference Points.--Gage datum is 658.60 ft. Reference points (RP-N) for n-value studies are listed below. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured from RP-Ns before and after a discharge measurement. Discharges were measured using the standard current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft³/s)	Average Cross Section Area (ft²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
7/12/2000	42.4	27.8	1.31		0.001400	0.043
9/19/2001	256.0	85.4	2.71	3.01	0.001400	0.032

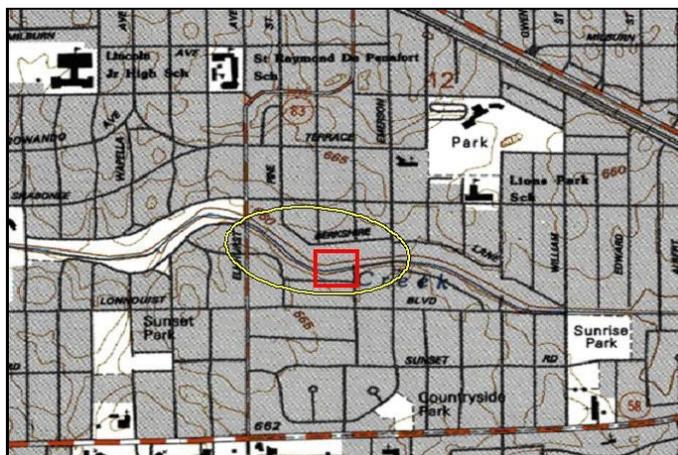
Description of Channel.--This channel is dredged. Cross sections of the study reach are a trapezoidal shape. The channel meanders mildly. The bed material consists of silt, gravel and rocks. Channel bottom width is about 20 ft with an average top width of approximately 50 ft. The left bank is mostly covered with grass, where as the right bank is heavily covered with willows and other brush. The banks are about 10 ft in height and begin to overtop into the flood plain at about 4 ft of stage.

Floods.--Maximum discharge, 887 ft³/s on July 22, 1982, gage height, 7.94 ft.

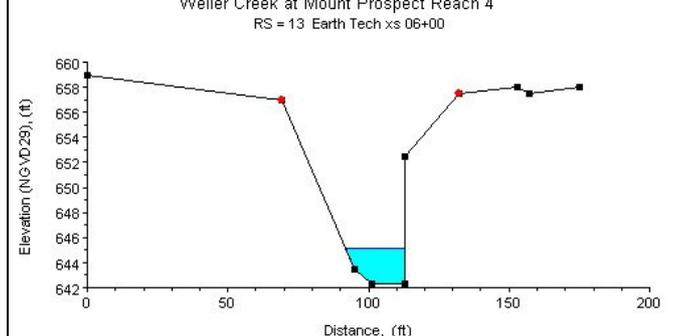
Estimated n-Values using Cowan s Approach.--0.035 ~ 0.054

Keywords.--

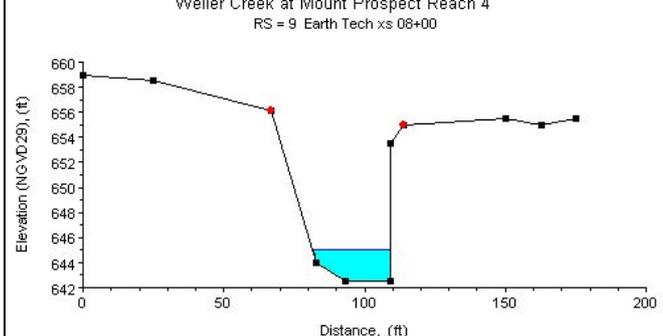
Weller Creek at Emerson St at Mt Prospect, IL (Reach 4)



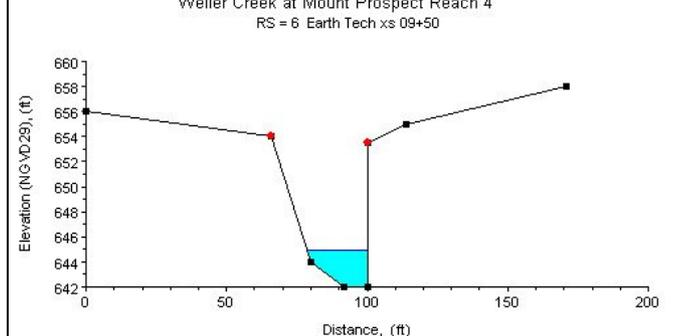
Weller Creek at Mount Prospect Reach 4
RS = 13 Earth Tech xs 06+00



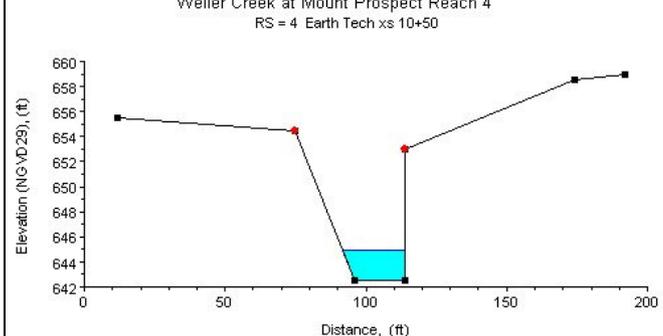
Weller Creek at Mount Prospect Reach 4
RS = 9 Earth Tech xs 08+00



Weller Creek at Mount Prospect Reach 4
RS = 6 Earth Tech xs 09+50



Weller Creek at Mount Prospect Reach 4
RS = 4 Earth Tech xs 10+50



Study Reach.--The channel under consideration is constructed in an urban setting, located from the downstream side of the South Elmhurst Road bridge to the upstream side of the Emerson Street bridge, as shown in the quadrangle map on the top left. The study reach selected begins on the upstream side of the Main Street pedestrian footbridge and extends 700 ft upstream. Fifteen surveyed cross sections (surveyed by Earth Tech, in July 2001) are available for evaluating the longitudinal and cross-sectional characteristics in the study reach. The channel alignment, approximate variations in channel width and bank conditions, and locations of cross sections in the study reach are shown in the aerial photo on the top right. The general shapes of cross sections in the study reach are presented with four cross sections plotted above.

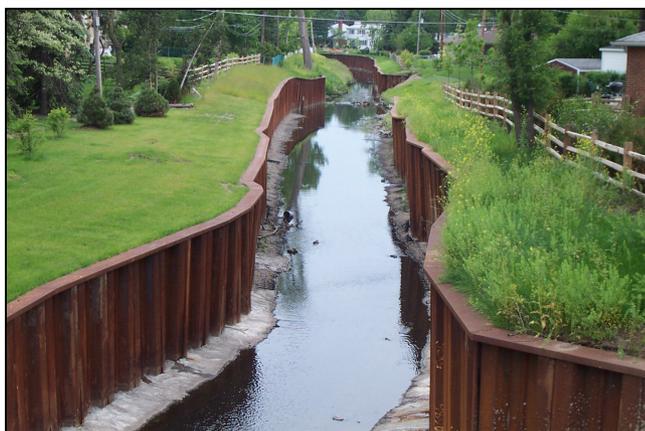
Gage Location.-- The location of discharge measurement is lat 42°03 12 , long 87°56 06 . This study reach is at NW1/4 SE1/4 SW1/4 sec.12, T.41N., R.11E., Cook County, Hydrologic Unit 07120004, on right bank 10 ft upstream from bridge on State Highway 58 (Golf Road) in Des Plaines, 2 mi west of US Highway 45 and at river mi 3.0. The USGS streamgage-station number is 05529980.

Drainage Area.--12.04 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 634.02 ft. Three reference points (RP-N) were established for the n-values project. All elevations are in NGVD 1929 convention. RP-N7 is two file marks on the streamward side on top of the steel sheer fence on the right bank about 40 ft downstream from Elmhurst Road bridge, elevation = 657.131 ft. RP-N6 is two file marks on the streamward side on top of the steel sheer fence on the left bank about 45 ft downstream from Elmhurst Road bridge (alternate tapedown reference point if stage is too low for PR-7), elevation = 653.221 ft. RP-N5 is a bolt in the concrete guardrail on the upstream side of Emerson Street bridge located about midchannel, elevation = 657.989 ft.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were made by taping down from RP-N5 on the upstream side of Emerson Street bridge and from RP-N7 on the right bank about 40 ft downstream from Elmhurst Road bridge or from RP-N6 on the left bank about 45 ft downstream from Elmhurst Road Bridge. Discharge measurements are made using the conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
5/2/2006	8.8	27.8	1.18	0.36	0.001881	0.013
6/26/2006	52.0	44.6	1.72	1.25	0.001953	0.025
1/12/2005	81.5	54.9	2.01	1.58	0.001910	0.032
4/25/2007	82.3	52.5	1.95	1.67	0.001880	0.023
4/25/2007	83.6	54.1	2.00	1.64	0.001868	0.025
1/12/2005	87.5	56.3	2.05	1.65	0.001916	0.032



05529980 Weller Creek at Emerson St at Mt Prospect, IL (Reach 4)
Looking Downstream from footbridge

06/03/03



05529980 Weller Creek at Emerson St at Mt Prospect, IL (Reach 4)
Looking Downstream from Rte 83 bridge

06/03/03



05529980 Weller Creek at Emerson St at Mt Prospect, IL (Reach 4)
Looking Upstream from footbridge 06/03/03



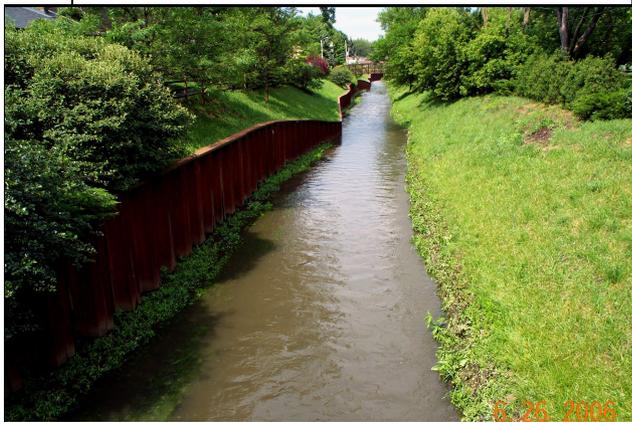
05529980 Weller Creek at Emerson St at Mt Prospect, IL (Reach 4)
Looking downstream from bridge 05/02/06



05529980 Weller Creek at Emerson St at Mt Prospect, IL (Reach 4)
Looking upstream from footbridge 05/02/06



05529980 Weller Creek at Emerson St at Mt Prospect, IL (Reach 4)
Looking downstream 06/26/06



05529980 Weller Creek at Emerson St at Mt Prospect, IL (Reach 4)
Looking upstream 06/26/06



05529980 Weller Creek at Emerson St at Mt Prospect, IL (Reach 4)
Looking downstream 06/26/06

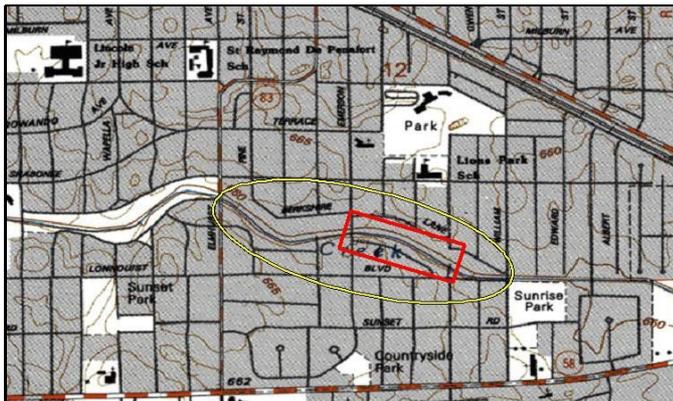
Description of Channel.--This channel is constructed. The streambed material consists of coarse sand and gravel in 12-inch monoslab pavers. Steel sheet piling lines both banks from the downstream side of Elmhurst bridge to about 300 ft downstream, after which the banks are short grass on the left-hand side (looking downstream) and sheet piling on the other. The study reach starts with this bank conditions; steel sheet pilings are on one side and grass on the other side of the bank. The study reach bends to the left about 500 ft downstream from Elmhurst Road. Overall cross sections are non-uniform in the study reach. Cross sections can be described as trapezoidal at the downstream end. The bottom width ranges from 15 to 25 ft. The top bank-width varies from approximately 70 ft at the upstream end to 35 ft downstream; and the bank heights are about 13 ft. Longitudinal bottom profile shows a riffle-pool structure in the study reach.

Floods.--Maximum discharge during period of record, 1,590 ft³/s on June 10, 1967, gage height, 15.09 ft.

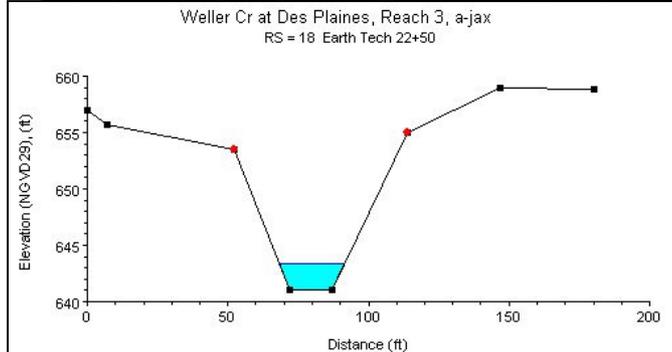
Estimated n-Values using Cowan s Approach.--0.037 ~ 0.045

Key words.--

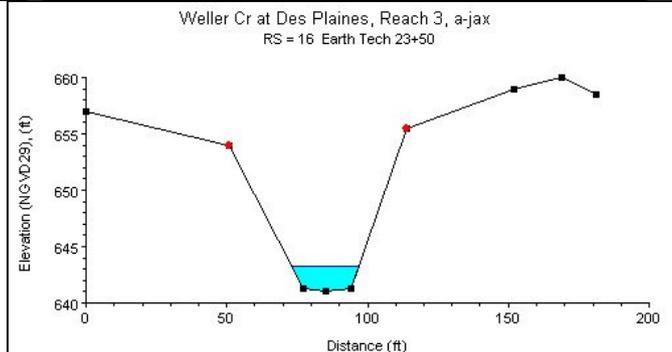
Weller Creek at School St at Mt Prospect, IL (Reach 3)



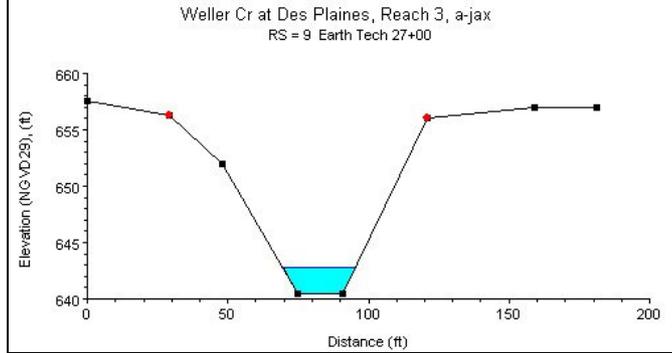
Weller Cr at Des Plaines, Reach 3, a-jax
RS = 18 Earth Tech 22+50



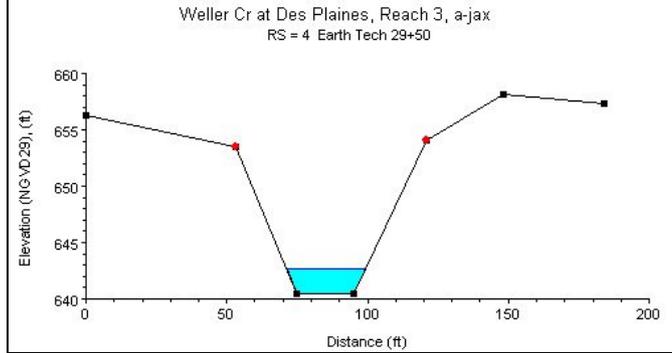
Weller Cr at Des Plaines, Reach 3, a-jax
RS = 16 Earth Tech 23+50



Weller Cr at Des Plaines, Reach 3, a-jax
RS = 9 Earth Tech 27+00



Weller Cr at Des Plaines, Reach 3, a-jax
RS = 4 Earth Tech 29+50



Study Reach.--The channel under consideration is constructed in an urban setting. The study reach selected, 1100 ft long, is located from the Emerson Street bridge to the School Street pedestrian footbridge, as shown in the quadrangle map on the top left. Cross-sectional geometries, as described by 22 surveyed cross sections (surveyed by Earth Tech, in July 2001) vary gradually and continuously from upstream to downstream. The general shapes of cross sections in the study reach are plotted above. The alignment of the study reach, approximate variations in channel width and bank conditions, and locations of the surveyed cross sections are shown in the aerial photo on the top right.

Gage Location.--The location of discharge measurement is lat 42°03 10 , long 87°55 54 . This study reach is at SE1/4 SE1/4 SW1/4 sec.12, T.41N., R.11E., Cook County, Hydrologic Unit 07120004, on right bank 10 ft upstream from bridge on State Highway 58 (Golf Road) in Des Plaines, 2 mi west of US Highway 45 and at mile 3.0. USGS streamgage-station number is 05529985.

Drainage Area.--11.6 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 634.02 ft. Reference points (RP-N) were established for the n-values project. RP-N5 is a bolt in the concrete guardrail on the upstream side of Emerson Street

bridge located about midchannel, elevation = 657.989 ft.; RP-N4 is two file marks on the upstream side of the bridge deck frame accessed through an opening in the bridge deck catwalk located just under the "X" formed by the guardrail diagonals on the School Street pedestrian bridge, elevation = 654.999 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements and Computed n-Values.--Water-surface elevations are made by taping down from RP-N4 on the upstream side of the School Street pedestrian bridge and from RP-N5 on the upstream side of Emerson Street bridge before and after a discharge. Discharge measurements are made on the downstream side of Emerson Street Bridge. Wading measurements are made in the vicinity of the bridge. Discharge measurements are made using the conventional current-meter method where total discharge is the summation of the products of the subsection areas of the stream cross section and their respective average velocities. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
5/2/2006	8.4	18.9	0.96	0.50	0.001432	0.076
6/26/2006	62.0	33.3	1.48	2.05	0.000900	0.026
4/25/2007	66.6	34.2	1.50	2.14	0.000928	0.025
4/25/2007	73.4	36.0	1.56	2.23	0.000907	0.025
1/12/2005	88.0	41.8	1.73	2.29	0.000855	0.026
1/12/2005	89.9	40.6	1.73	2.42	0.000855	0.026



05529985 Weller Creek at School St at Mt Prospect, IL (Reach 3)
From downstream, looking upstream 05/02/06



05529985 Weller Creek at School St at Mt Prospect, IL (Reach 3)
Looking Downstream from bridge at bed 06/03/03



05529985 Weller Creek at School St at Mt Prospect, IL (Reach 3)
From footbridge (upstream), looking downstream 05/02/06



05529985 Weller Creek at School St at Mt Prospect, IL (Reach 3)
Looking downstream from upstream of bridge 06/26/06



05529985 Weller Creek at School St at Mt Prospect, IL (Reach 3)
Looking downstream



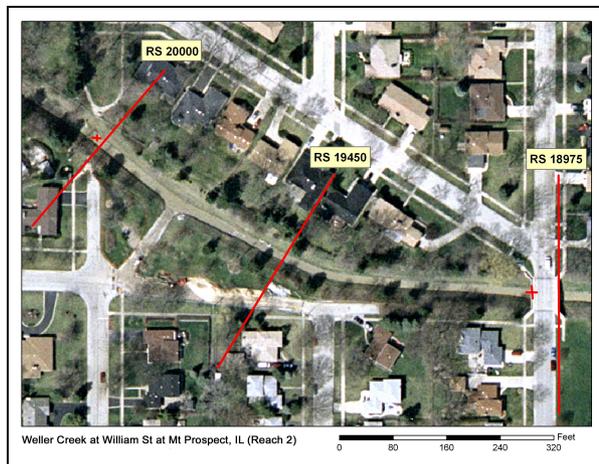
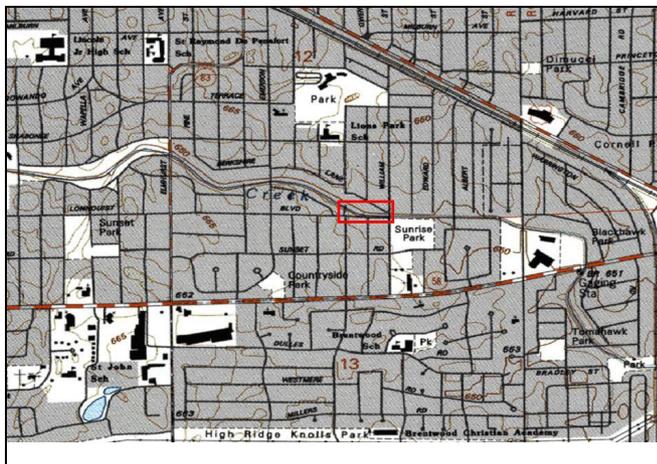
Description of Channel.--This channel has been modified. Streambed material consists of coarse sand and gravel. The bank consists of interlocking 24-inch A-jacks at the toe with tall grass and weeds anchored in geoweb fabric. The bottom width of the channel ranges from 10 to 20 ft. Top width is from about 50 to 70 ft. The banks are steep with an average height of about 14 ft. The cross sections are fairly uniform and nearly trapezoidal. The channel curves gently to the right the entire reach.

Floods.--Maximum discharge during period of record, 1,590 ft³/s on June 10, 1967, gage height, 15.09 ft.

Estimated n-Values using Cowan s Approach.--

Key words.--

Weller Creek at William St at Mt Prospect, IL (Reach 2)



Study Reach.--The channel reach under consideration is a constructed channel in an urban setting, as shown on the quadrangle map at the top left. The study reach, about 730 ft long, is located from just upstream of the South School Street bridge to the South William Street bridge. Three surveyed cross sections (surveyed by the U.S. Corps of Engineers in May 2003) are available for describing the channel geometries in the study reach. The channel alignment, approximate variations in channel width and bank conditions, and locations of cross sections are shown in the aerial photo on the top right. Cross-sectional plots at four river stations (RSs), as shown above, are selected to illustrate the variation in cross-sectional geometry.

Gage Location.--The location of discharge measurement is lat 41°03 06 , long 87°55 43 . This study reach is at SW1/4 SW1/4 SE1/4 sec.12, T.41N., R.11E., Cook County, Hydrologic Unit 07120004, on right bank 10 ft upstream from bridge on State Highway 58 (Golf Road) in Des Plaines, 2 mi west of US Highway 45 and at mile 3.0. The USGS streamgage-station number is 05529990.

Drainage Area.--12.69 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 634.02 ft.; RP4 is two filemarks on the upstream side of the bridge deck frame accessed through an opening in the bridge deck catwalk located just under the "X" formed by the guardrail diagonals on the School Street pedestrian bridge, elevation = 654.999 ft.; RP3 is a bolt in the concrete guardrail on the upstream side of the South Williams Street bridge located about midchannel, elevation = 656.515 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water surface elevations are made by taping down from RP-3 on the upstream side of Williams Street bridge and from RP-4 on the upstream side of the School Street pedestrian bridge. Discharge measurements are made on the upstream side of Williams Street Bridge. Wading measurements are made in the vicinity of the upstream side of the bridge. When possible, multiple discharge measurements were made during a rise and recession to provide data for calculating n-values over a range in stage. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
5/2/2006	8.1	8.2	0.60	1.00	0.000999	0.029
4/25/2007	59.1	23.5	1.41	2.52	0.001358	0.024

4/25/2007	62.4	24.7	1.46	2.54	0.001382	0.024
6/26/2006	63.7	27.7	1.58	2.32	0.001542	0.029



05529990 Weller Creek at William St at Mt Prospect, IL (Reach 2)
From upstream, looking downstream 05/02/06



05529990 Weller Creek at William St at Mt Prospect, IL (Reach 2)
Looking Upstream at cement bank protection (at School St) 06/03/03



05529990 Weller Creek at William St at Mt Prospect, IL (Reach 2)
From downstream, looking upstream 05/02/06



05529990 Weller Creek at William St at Mt Prospect, IL (Reach 2)
Looking upstream 06/26/06



05529990 Weller Creek at William St at Mt Prospect, IL (Reach 2)
Looking downstream 06/26/06



05529990 Weller Creek at William St at Mt Prospect, IL (Reach 2)
Closeup of cement biostructure at School St 06/03/03



05529990 Weller Creek at William St at Mt Prospect, IL (Reach 2) 06/03/03
Looking at bed material at School St



05529990 Weller Creek at William St at Mt Prospect, IL (Reach 2) 06/03/03
Looking Downstream from School St



05529990 Weller Creek at William St at Mt Prospect, IL (Reach 2) 06/03/03
Looking Upstream at bed and bank material



05529990 Weller Creek at William St at Mt Prospect, IL (Reach 2) 06/03/03
Looking Upstream of Williams, cement



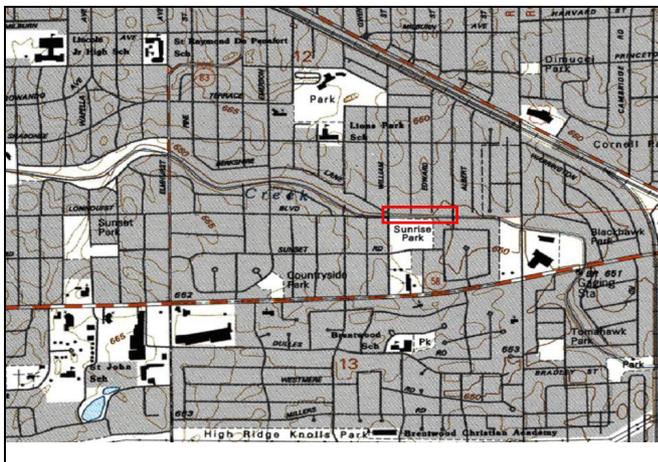
Description of Channel.--This channel has been modified. The streambed material consists of coarse sand and gravel in 12 inch monoslab pavers. The bank consists of 12 inch monoslab pavers over geoweb fabric with tall grass and weeds anchored in the geoweb. Small brushy willows have begun to take root in scattered clumps along the bank. The cross sections are fairly uniform and nearly trapezoidal. The channel is straight upstream and downstream of a gentle bend to the left, which occurs about 500 feet downstream from the School Street footbridge.

Floods.--Maximum discharge during period of record, 1,590 ft³/s on June 10, 1967, gage height, 15.09 ft.

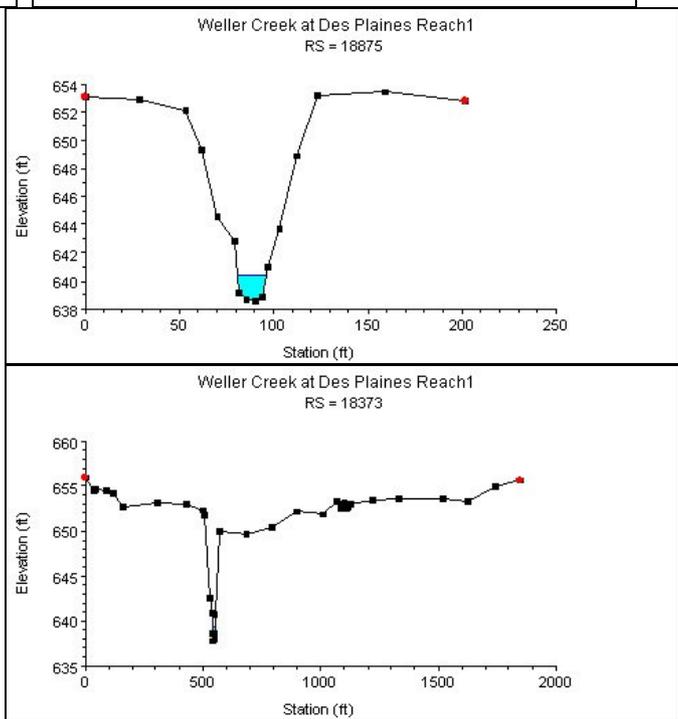
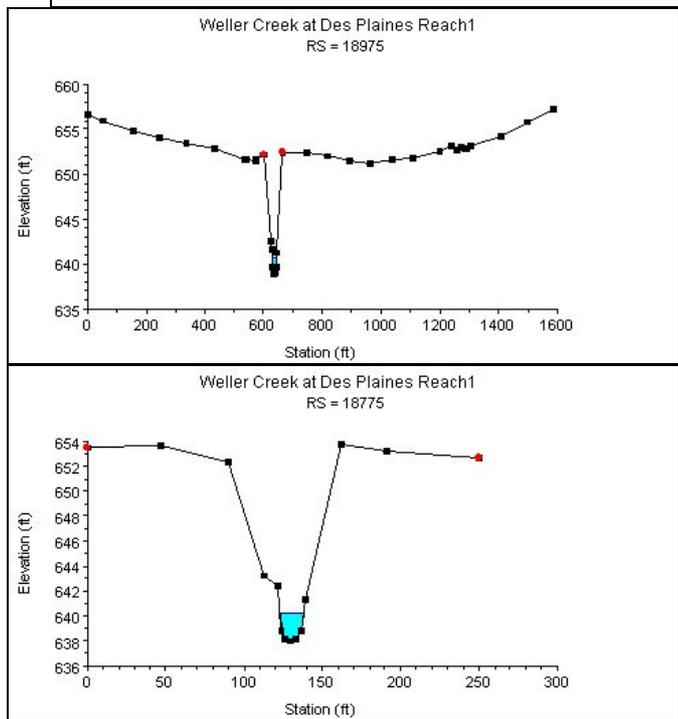
Estimated n-Values using Cowan s Approach.--

Key words.--

Weller Creek at George St at Mt Prospect, IL (Reach 1)



05529995 Weller Creek at George St at Mt Prospect, IL (Reach 1) 0 75 150 225 300 Feet



Study Reach.--The channel reach under consideration is constructed in an urban setting, as shown in the quadrangle map on the top left. The study reach, about 980 ft long, is located from South William Street bridge to South George Street bridge. Four surveyed cross sections (surveyed by the U.S. Corps of Engineers, May 2003) are available for describing the channel geometries in the study reach. The channel alignment, approximate variations in channel width and bank conditions, and locations of cross sections are shown in the aerial photo on the top right. Cross-sectional plots at four river stations (RSs), as shown above, are selected to illustrate the variation in cross-sectional geometry.

Gage Location.--The location of discharge measurement is lat 42°03 05 , long 87°55 30 . This study reach is at SW1/4 SE1/4 SE1/4 sec.12, T.41N., R.11E., Cook County, Hydrologic Unit 07120004, on right bank 10 ft upstream from bridge on State Highway 58 (Golf Road) in Des Plaines, 2 mi west of US Highway 45 and at mile 3.0. The study reach is located upstream from the gagehouse. The USGS streamgage-station number is 05529995.

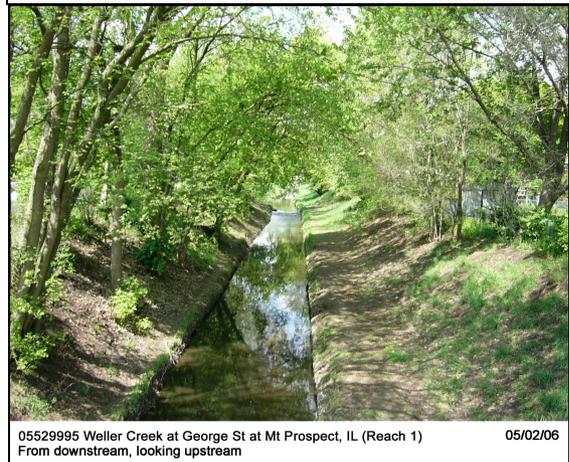
Drainage Area.--12.81 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 634.02 ft.; RP2 is a bolt in the concrete guardrail on the downstream side of Williams Street bridge located about midchannel, elevation = 656.492 ft.; RP1 is

a bolt in the concrete guardrail on the upstream side of George Street bridge located about midchannel, elevation = 654.325 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water surface elevations are made by taping down from RP-1 on the upstream side of George Street bridge, and from RP-2 on the downstream side of Williams Street bridge. Discharge measurements are made from the downstream side of Williams Street Bridge. Wading measurements are made in the vicinity of the downstream side of the bridge. For extreme low flows the reach is considered to extend from the George Street bridge until the first riffle, about 270 ft upstream of the bridge. When possible, multiple discharge measurements were made during a rise and recession to provide data for calculating n-values over a range in stage. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
5/2/2006	8.4	11.3	0.81	0.78	0.001450	0.092
4/25/2007	48.4	22.3	1.38	2.21	0.001330	0.044
4/25/2007	51.2	23.2	1.43	2.25	0.001340	0.044
6/26/2006	60.6	28.3	1.65	2.17	0.001330	0.050





05529995 Weller Creek at George St at Mt Prospect, IL (Reach 1)
Looking downstream 06/26/06



05529995 Weller Creek at George St at Mt Prospect, IL (Reach 1)
Looking downstream at riffle 05/26/06



05529995 Weller Creek at George St at Mt Prospect, IL (Reach 1)
Downstream end of reach, bed and bank material 06/03/03

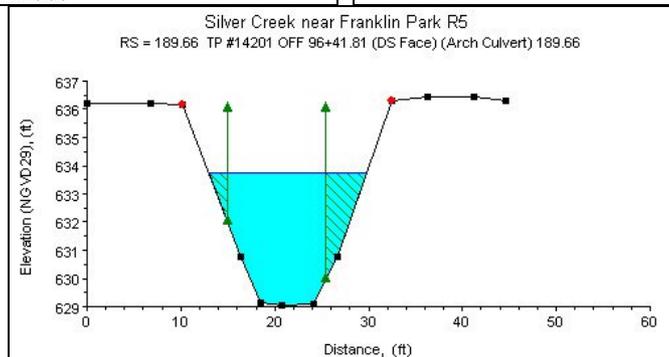
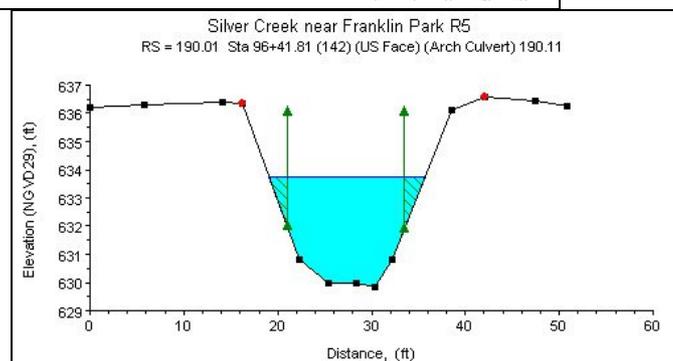
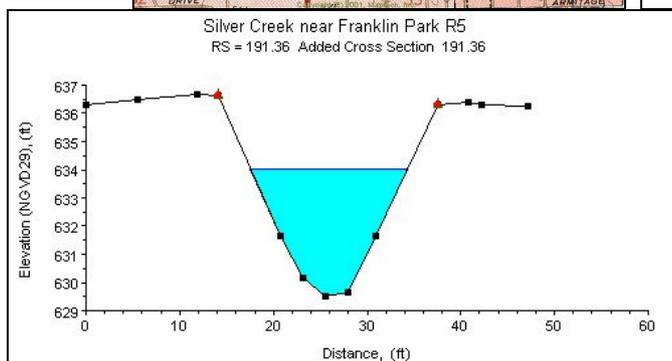
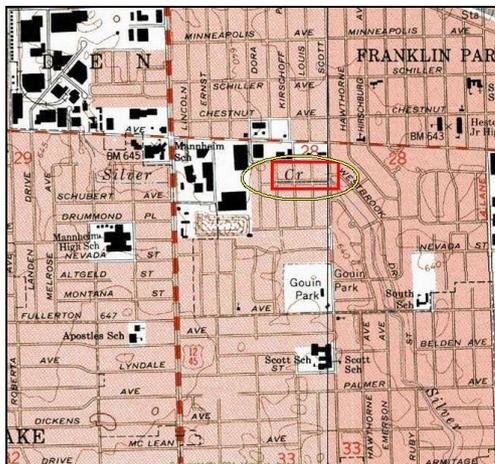
Description of Channel.--This channel has been modified. The streambed material consists of coarse sand and gravel in 12 inch monoslab pavers. The bank consists of gabion boxes at the toe with predominantly short grass and weeds up the banks. The cross sections are fairly uniform and nearly trapezoidal. Light tree cover occurs just upstream of George Street bridge. The channel is straight.

Floods.--Maximum discharge during period of record, 1,590 ft³/s on June 10, 1967, gage height, 15.09 ft.

Estimated n-Values using Cowan s Approach.--

Key words.--

Silver Creek at Scott Ave at Franklin Park, IL (Reach 5)



Study Reach.--The channel reach under consideration is a constructed channel in an urban area. The study reach, 575 ft long, is located between the downstream side of Park Street bridge (a culvert) to the upstream side of Scott Street bridge, as shown in the quadrangle map on the top left. Six surveyed cross sections (surveyed by the Illinois Department of Natural Resources in 1995) are available to evaluate channel geometries in the study reach. The channel alignment, approximate variations in channel width and bank conditions, and locations of surveyed cross sections are shown in the aerial photo on the top right. The general shape of the cross sections varies gradually and continuously from upstream to downstream (see plots above).

Gage Location.--The location of discharge measurement is lat $41^{\circ}55'42''$, long $87^{\circ}52'30''$. The general location is NW1/4 NW1/4 SE1/4 sec.28, T.40N, R.12E, Cook County, Hydrologic Unit 07120004. The USGS streamgage-station number is 05530670.

Drainage Area.--8.51 sq mi.

Gage Datum and Elevations of Reference Points.--Reference points (RP-N) were established for the n-value study. RP-N10 is two file marks on the center I-beam on the downstream side of Park Street bridge, elevation=639.12 ft.

RP-N9 is two file marks on the center I-beam on the upstream side of Louis Street bridge, elevation=639.90 ft. RP-N8 is two file marks on the center I-beam on the downstream side of Louis Street bridge, elevation=639.86 ft. RP-N7 is the top of a bolt in the left upstream concrete culvert abutment on Scott Street, elevation=636.65 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevation was measured from the reference point before and after the discharge measurements. Discharge measurements were made using acoustic Doppler current profiler (ADCP) or using the conventional current-meter method. At medium to high flows, discharges are measured from Scott Street bridge or Louis Street bridge. The culvert openings may become the control at high water stage and affect the water-surface elevation readings at upstream. Therefore, no events are collected for stages above **** ft. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness n
5/2/2006	19.6	26.7	1.96	0.77	0.001098	0.105
6/26/2006	30.6	31.3	2.20	1.04	0.001108	0.086
4/25/2007	89.0	44.2	2.76	2.17	0.001256	0.053
4/25/2007	89.0	44.4	2.77	2.15	0.001257	0.053
1/13/2005	134.0	50.7	3.13	2.97	0.001217	0.042



05530670 Silver Creek at Scott Ave at Franklin Park, IL (Reach 5) 06/03/03
Looking downstream from Louis St



05530670 Silver Creek at Scott Ave at Franklin Park, IL (Reach 5) 06/03/03
Looking upstream at Louis St grouted riprap



05530670 Silver Creek at Scott Ave at Franklin Park, IL (Reach 5) 05/02/06
From upstream end, looking downstream



05530670 Silver Creek at Scott Ave at Franklin Park, IL (Reach 5) 05/02/06
From downstream, looking upstream



05530670 Silver Creek at Scott Ave at Franklin Park, IL (Reach 5)
From Louis St, looking downstream 05/02/06



05530670 Silver Creek at Scott Ave at Franklin Park, IL (Reach 5)
Looking Upstream 01/13/05



05530670 Silver Creek at Scott Ave at Franklin Park, IL (Reach 5)
Looking Downstream 01/13/05



05530670 Silver Creek at Scott Ave at Franklin Park, IL (Reach 5)
Looking upstream 06/26/06



05530670 Silver Creek at Scott Ave at Franklin Park, IL (Reach 5)
Looking downstream 06/26/06



05530670 Silver Creek at Scott Ave at Franklin Park, IL (Reach 5)
Bed material, Louis St grouted riprap 06/03/03

Description of Channel.--This channel is artificial with grouted riprap banks and bed. The channel bed has cobbles on top of sand and is subject to algae growth, especially during warm periods. Channel cross sections are trapezoidal in shape with a top width of about 30 ft. The grouted concrete banks are moderately steep and have large weeds growing in through the cracks.

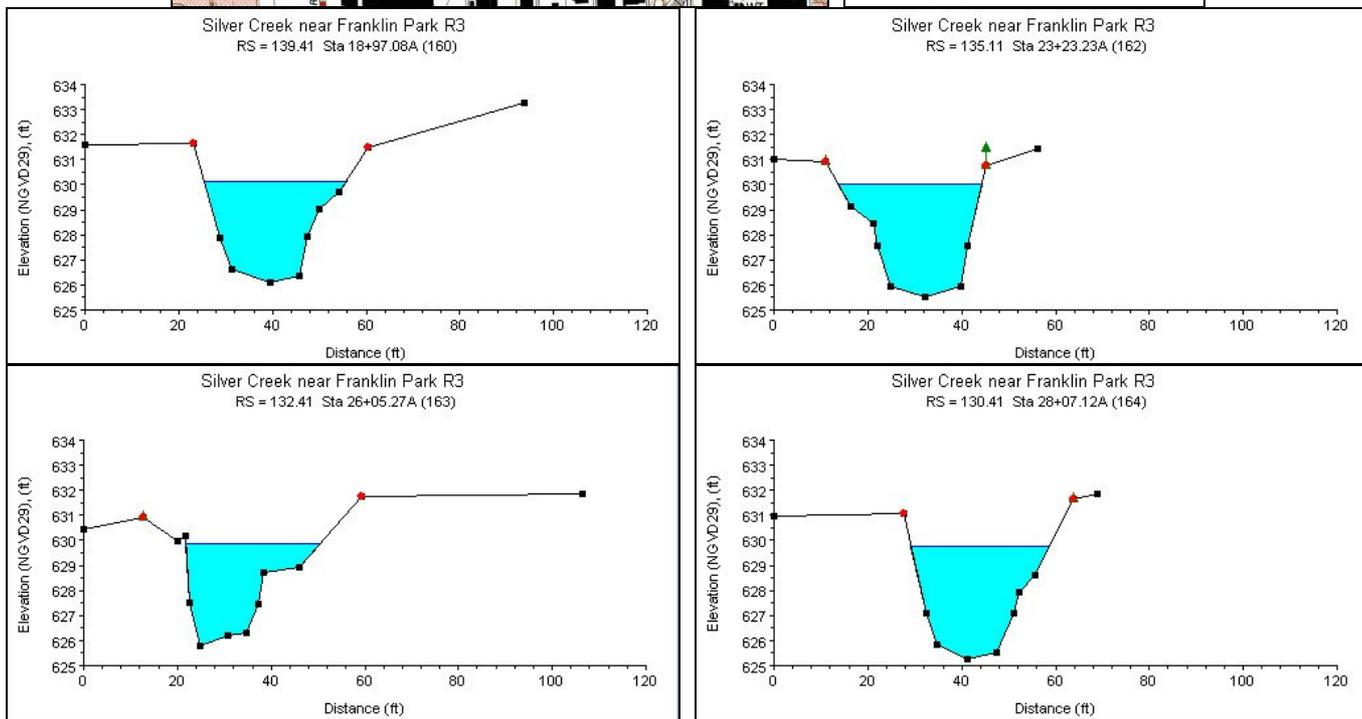
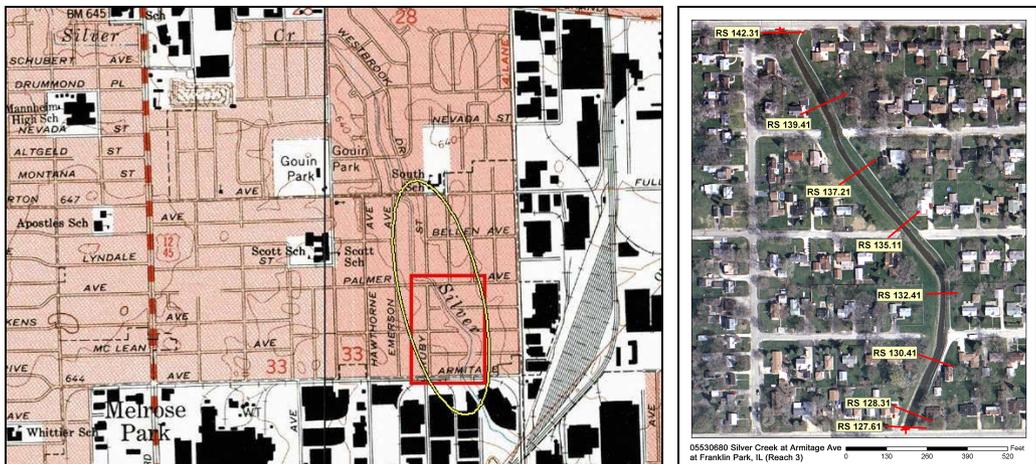
Floods.--Maximum discharge, 15,500 ft³/s, Apr. 13, 1994, gage height, 20.46 ft.

Estimated n-Values using Cowan s Approach.--

Key words.--

Size (aspect ratio) .--

Silver Creek at Armitage Ave at Franklin Park, IL (Reach 3)



Study Reach.--The channel reach under consideration contains luncker structure at the toe of the bank and is in an urban environment. A study reach, 900 ft long, was selected located between the downstream side of Palmer Street bridge to the upstream side of Armitage Avenue bridge, as shown in the quadrangle map on the top left. Five surveyed cross sections (surveyed by the Illinois Department of Natural Resources in 1995) are available for evaluating the longitudinal and cross-sectional characteristics in the reach. Locations of these surveyed cross sections can be seen in the aerial photograph on the top right. The general shapes of channel geometries are represented using main channel cross sections at river station (RS) 139.41, 135.21, 132.41, and 130.41 (see plots above). Shape of the luncker structure is not included. The luncker structures at this location are wooden rectangular box with a 1 ft height and a 3 ft depth that are continuous in the study reach.

Gage Location.--The location of discharge measurement is lat 41°54 54 , long 87°52 04 .General location is at NW1/4 NE1/4 SE1/4 sec.33, T.40N, R.12E Cook County, Hydrologic Unit 07120004. USGS streamgage-station number is 05530680.

Drainage Area.--9.54 sq mi.

Gage Datum and Elevations of Reference Points.--Two reference points (RP-N) were established for the n-values study. The upstream reference point, RP-N6, is the top of a bolt located on the downstream face of Palmer Avenue bridge left of mid-channel, elevation=639.53 ft. Downstream, RP-N5 is two file marks located on the outer edge of the right-most green gate brace on the upstream face of Armitage Street bridge, elevation=633.68 ft. Elevations are reported in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--The water-surface elevations were measured from reference points set on bridges and measured with a weighted tape before, during, and after a discharge measurement. Discharge measurements were made using the conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
5/2/2006	20.3	29.8	1.49	0.71	0.000259	0.046
6/26/2006	37.0	36.6	1.72	1.05	0.000315	0.038
4/25/2007	95.9	66.5	2.19	1.48	0.000239	0.028
1/13/2005	172.0	84.2	2.50	2.09	0.000330	0.026



05530680 Silver Creek at Armitage Ave at Franklin Park, IL (Reach 3) 06/19/97
Low flow, looking Downstream at luncker structures



05530680 Silver Creek at Armitage Ave at Franklin Park, IL (Reach 3) 06/03/03
Looking Upstream from Dickerson Rd



05530680 Silver Creek at Armitage Ave at Franklin Park, IL (Reach 3) 06/03/03
Looking at luncker structures



05530680 Silver Creek at Armitage Ave at Franklin Park, IL (Reach 3) 05/02/06
From upstream end, looking downstream



05530680 Silver Creek at Armitage Ave at Franklin Park, IL (Reach 3)
From downstream end, looking upstream 05/02/06



05530680 Silver Creek at Armitage Ave at Franklin Park, IL (Reach 3)
Looking Downstream from Palmer Rd 01/13/05



05530680 Silver Creek at Armitage Ave at Franklin Park, IL (Reach 3)
Looking Downstream from Palmer Rd 01/13/05



05530680 Silver Creek at Armitage Ave at Franklin Park, IL (Reach 3)
Looking downstream from bridge 06/26/06

Description of Channel.--This channel is constructed and contains luncker structures at the toe of the bank. Bed material consists of small to large cobbles in a sand-gravel mixture. Above the luncker structures, the banks are grass and weed covered. Channel cross sections are a trapezoidal shaped with bottom width (between lunckers) approximately 14 ft, top width 40 ft, and bank height 5 ft. The stream is straight.

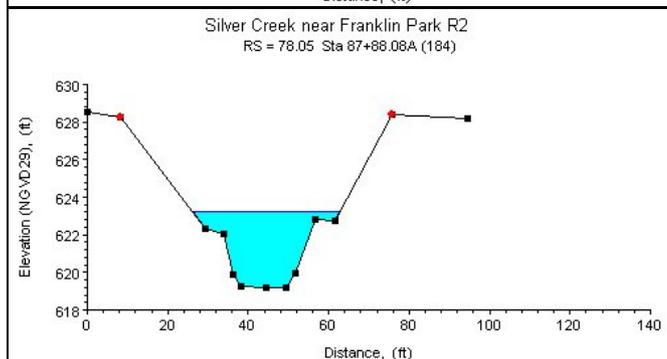
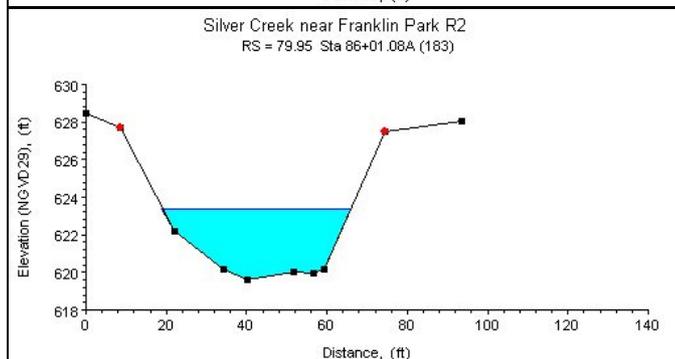
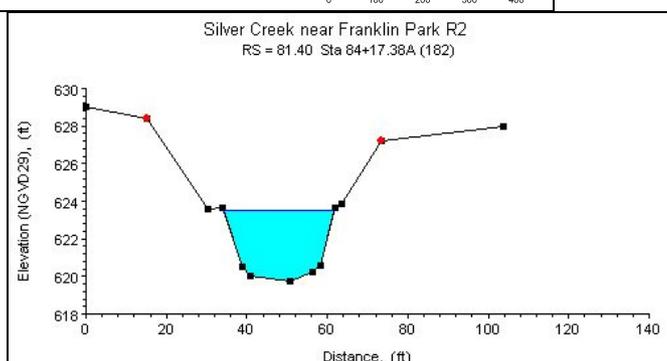
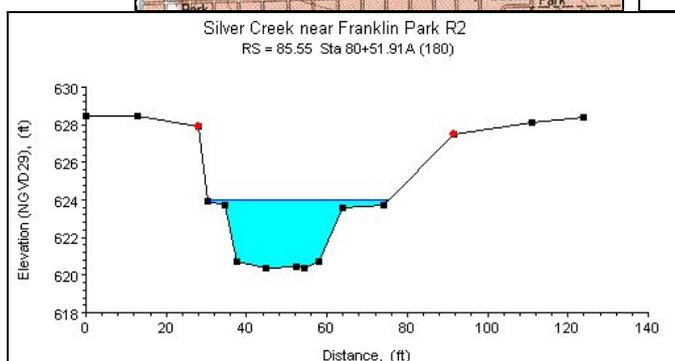
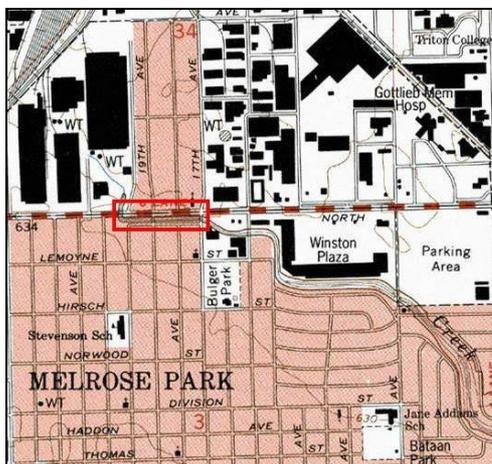
Floods.--Maximum discharge, 15,500 ft³/s, Apr. 13, 1994, gage height, 20.46 ft.

Estimated n-Values using Cowan s Approach.--0.027 ~ 0.035

Key words.--

Size (w/d aspect ratio) .-- 8

Silver Creek at 17th Ave at Melrose Park, IL (Reach 2)



Study Reach.--The reach under consideration is a constructed straight channel in an urban area. The selected study reach, 1070 ft long, is located between downstream of 20th Avenue (Jewel Drive) bridge and upstream side of 17th Avenue bridge, as shown in the quadrangle map on the top left. Eight surveyed cross sections (surveyed by the Illinois Department of Natural Resources in 1995) are available for evaluating the channel geometries of the study reach. The alignment of the study reach, approximate variations in channel width and bank conditions, and locations of surveyed cross sections are shown in the aerial photo on the top right. The general channel shapes of the study reach are represented by four selected cross sections as plotted above.

Gage Location.--The location of discharge measurement is lat $41^{\circ}54'27''$, long $87^{\circ}51'17''$. The location of this study reach is at NW1/4 NW1/4 NE1/4 sec.3, T.39N, R.12E, Cook County, Hydrologic Unit 07120004. The USGS streamgage-station number is 05530690.

Drainage Area.--10.64 sq mi. (at downstream of study reach)

Gage Datum and Elevations of Reference Points.--The upstream reference point (RP-N4) is two file marks on the 9th I-beam from the right located on the downstream face of North Avenue bridge, elevation=631.06 ft. The

downstream reference point (RP-N3) is the top of a bolt located on the upstream face of 17th Avenue bridge, elevation 631.21 ft. Elevations are reported in NGVD 1929 convention.

Stage, Discharge Measurements and Computed n-Values.--Water-surface elevations are measured by tape down from the upstream and downstream reference points before, during and after each discharge measurement. Discharges are measured from the downstream side of Broadway Avenue or from the upstream side of 17th Avenue bridge. Discharge measurements are made using acoustic Doppler current profiler (ADCP) or using conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
5/2/2006	24.9	39.6	1.48	0.65	0.002172	0.144
6/26/2006	39.0	47.7	1.71	0.85	0.001890	0.112
4/26/2007	112.0	59.1	1.95	1.99	0.001435	0.046
4/25/2007	116.0	59.9	1.96	2.03	0.001428	0.046
1/13/2005	176.0	90.0	2.53	2.05	0.001224	0.047



05530690 Silver Creek at 17th Ave at Melrose Park, IL (Reach 2)
Looking upstream from 17th Ave 06/03/03



05530690 Silver Creek at 17th Ave at Melrose Park, IL (Reach 2)
Looking Upstream from Broadway 01/13/05



05530690 Silver Creek at 17th Ave at Melrose Park, IL (Reach 2)
Looking Downstream from Broadway 01/13/05



05530690 Silver Creek at 17th Ave at Melrose Park, IL (Reach 2)
Looking Upstream at downstream side of Broadway bridge 01/13/05



05530690 Silver Creek at 17th Ave at Melrose Park, IL (Reach 2)
From upstream, looking downstream 05/02/06



05530690 Silver Creek at 17th Ave at Melrose Park, IL (Reach 2)
From downstream end, looking upstream 05/02/06



05530690 Silver Creek at 17th Ave at Melrose Park, IL (Reach 2)
Looking upstream from bridge 06/26/06



05530690 Silver Creek at 17th Ave at Melrose Park, IL (Reach 2)
Looking downstream from bridge 06/26/06



05530690 Silver Creek at 17th Ave at Melrose Park, IL (Reach 2)
Bed material at 17th Ave

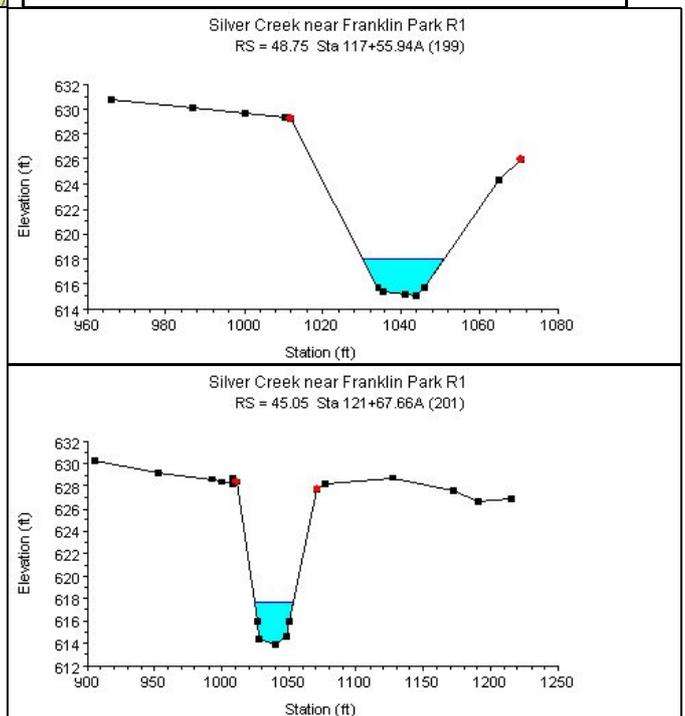
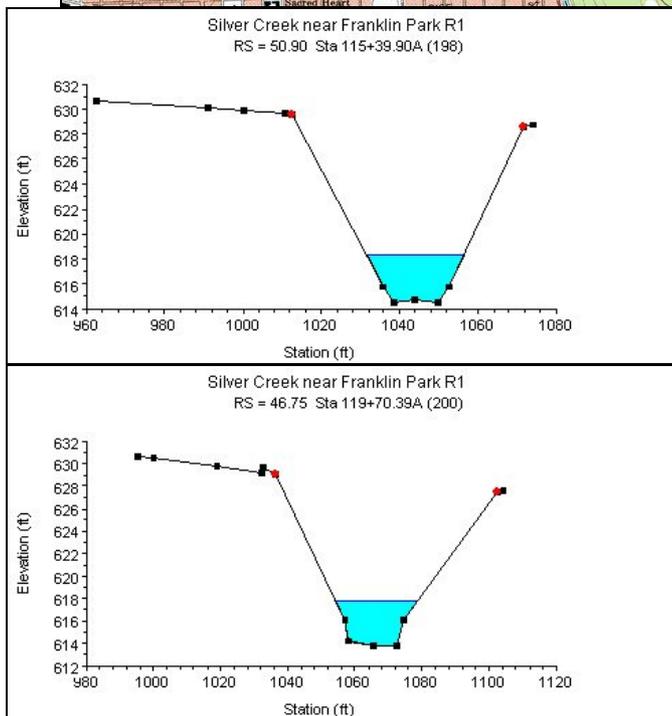
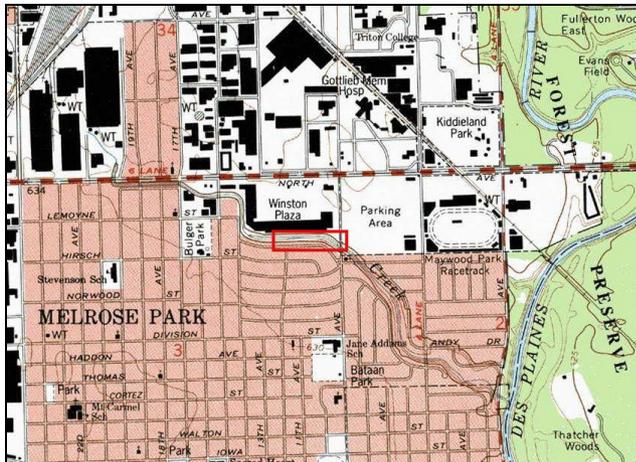
Description of Channel.--This channel is constructed and contains grass banks. Bed material consists of coarse sand, gravel, and cobbles. The banks are grass covered. Thick algae grows on the channel bed, especially during warm periods. Channel cross sections are trapezoidal in shape with mild bank slope and a top width of about 40 ft. The study reach is straight.

Floods.--Maximum discharge, 15,500 ft³/s, Apr. 13, 1994, gage height, 20.46 ft.

Estimated n-Values using Cowan s Approach.--

Key words.--

Silver Creek at Melrose Park, IL (Reach 1)



Study Reach.--The study reach is located between the downstream side of a footbridge off of the corner of Park and 12th Avenues (behind Winston Plaza) to upstream side of 9th Avenue. The length of the reach is 950 ft.

Gage Location.--The location of discharge measurement is lat 41°54 17 , long 87°50 42 . This study reach is at SW1/4 NW1/4 NW1/4 sec.2, T.39N, R.12E, Cook County, Hydrologic Unit 07120004. USGS streamgage-station number is 05530700.

Drainage Area.--11.16 sq mi.

Gage Datum and Elevations of Reference Points.--The upstream reference point (RP-N2) is located on the downstream face of the foot bridge, elevation= 632.34ft. The downstream reference point (RP-N1) is located on the upstream face of the 9th Avenue bridge, elevation=631.27ft. Elevation are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Discharges are measured from upstream of 9th Avenue bridge. At low-water stages as depth less than 1 foot, discharges are measured by wading at a section upstream of the 9th Avenue bridge. At medium and high flows discharges are measured from the bridge. For extreme slow-moving

water, a discharge can be measured just downstream of the riffles below the footbridge. The water surface elevations are measured from reference points set on bridges and measured with a weighted tape. Discharge measurements are made using the conventional current meter method where total discharge is the summation of the products of the subsection areas of the stream cross section and their respective average velocities.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
5/2/2006	24.9	38.9	1.49	0.72	0.001993	0.136
6/26/2006	43.4	44.3	1.62	1.09	0.001991	0.093
4/25/2007	125.0	75.3	2.29	2.00	0.001077	0.042
4/25/2007	132.0	76.2	2.31	2.08	0.001105	0.041



05530700 Silver Creek at Melrose Park, IL (Reach 1)
Looking Downstream from upstream of 9th St footbridge 06/03/03



05530700 Silver Creek at Melrose Park (Reach 1)
Looking Upstream from 9th St, canopy 06/03/03



05530700 Silver Creek at Melrose Park, IL (Reach 1)
Looking downstream from upstream at 9th St footbridge 10/16/03



05530700 Silver Creek at Melrose Park, IL (Reach 1)
Looking downstream from upstream at 9th St footbridge 05/02/06



05530700 Silver Creek at Melrose Park, IL (Reach 1)
Looking downstream from upstream (below 9th St footbridge) 05/02/06



05530700 Silver Creek at Melrose Park, IL (Reach 1)
Looking downstream from bridge 06/26/06



05530700 Silver Creek at Melrose Park, IL (Reach 1)
Looking downstream from bridge 06/26/06



05530700 Silver Creek at Melrose Park, IL (Reach 1)
Bed material downstream of 9th St 06/03/03



05530700 Silver Creek at Melrose Park (Reach 1)
Bed near footbridge upstream of 9th St 06/03/03

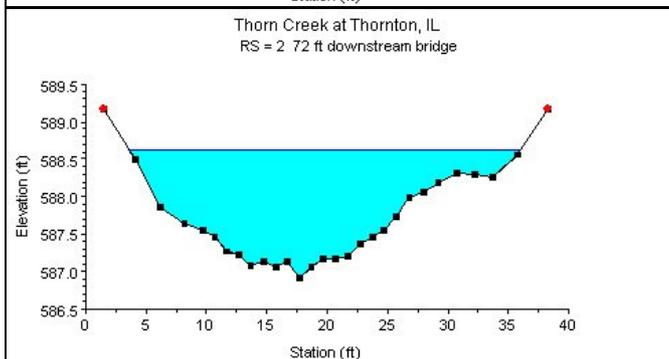
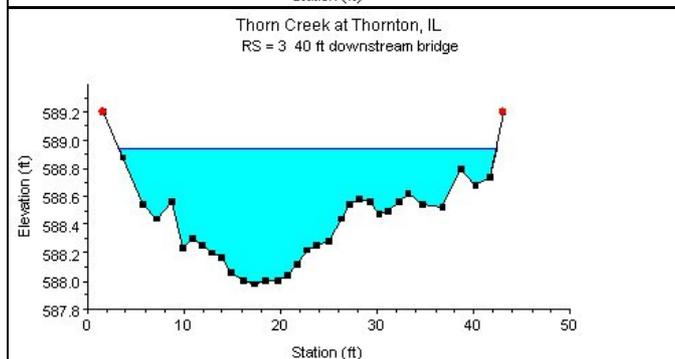
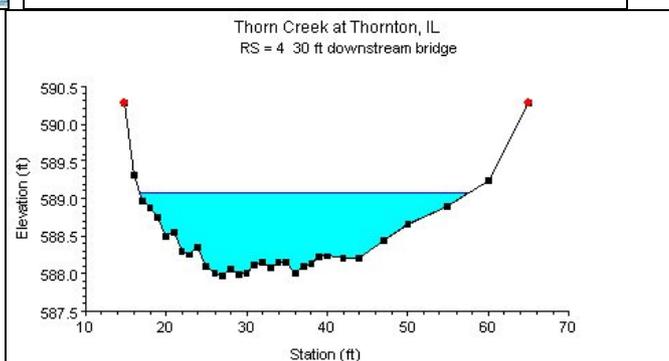
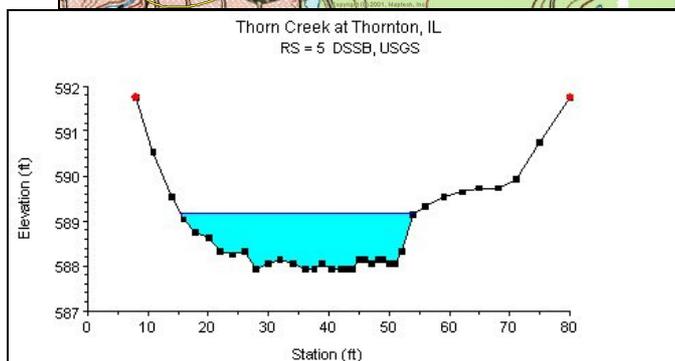
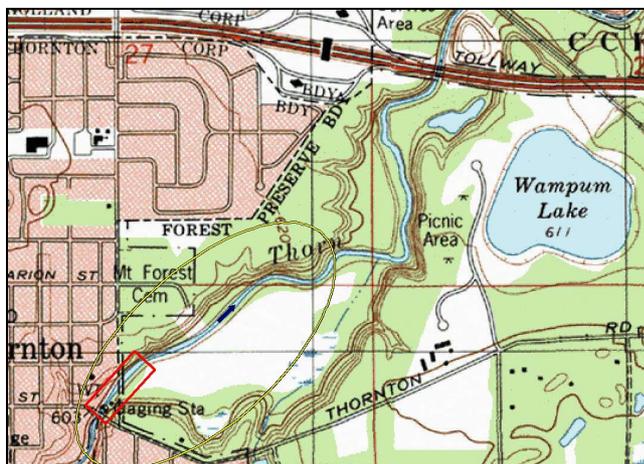
Description of Channel.--The study reach is slightly meandering with alternating pools and riffles. Cross sectional shape is basically trapezoidal. Top width varies around 40 ft., bank height about 15 ft., and bottom width around 20 ft. Channel bed consists of sand, gravel, matrix of cobbles, and drifted debris; the bank slope is steep and bank materials vary as alternating sections in cobbles in firm clay to matted tree roots with light tree coverage. Trees on top of banks are dense but with diameters less than 1 foot, in general. Canopy cover overhangs the channel and touches the water surface at low flows.

Floods.--Maximum discharge, 15,500 ft³/s, Apr. 13, 1994, gage height, 20.46 feet.

Estimated n-Values using Cowan s Approach.--

Key words.--

Thorn Creek at Thornton, IL



Study Reach.--The channel under consideration is meandering and natural in a forest preserve, as shown in the quadrangle map on the top left. The study reach selected extends from the USGS gage on Margaret Street bridge to 600 ft downstream from the gage. Three cross sections (surveyed by the U.S. Geological Survey in April 2001, and reconstructed from a measurement done in February 1999) are used for evaluating channel characteristics at this site. The alignment of the study reach, approximate variations in channel width and bank conditions, and locations of the surveyed cross sections are shown in the aerial photo on top-right. Cross-sectional geometries are shown in the cross section plots above.

Gage Location.--Lat $41^{\circ}34'06''$, long $87^{\circ}36'28''$, in SE1/4 NW1/4 sec.34, T.36N., R.14E., Cook County, Hydrologic Unit 07120003, on right bank at downstream side of bridge on Margaret Street in Thornton, 1.0 mi downstream from North Creek, and at mile 4.2. The USGS streamgage-station number is 05536275.

Drainage Area.--104 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 586.43 ft. A wire-weight gage (WWG) is located on the downstream guardrail of Margaret Street bridge. Reference points (RP-N) were established for the

n-values project.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured by reading the WWG and by tapedown from reference points along the channel during the discharge measurement. Discharge measurements were made using the conventional current-meter method.

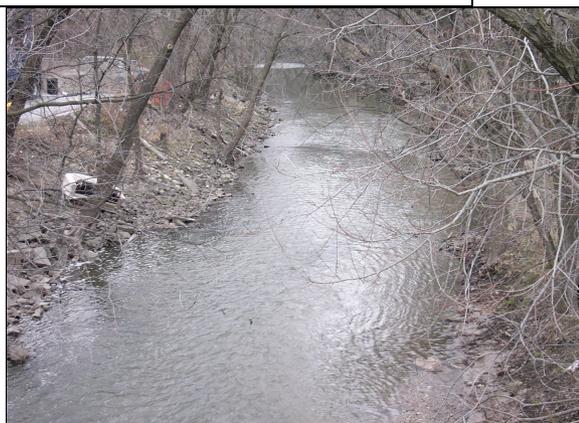
Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
10/21/1998	33.8	47.3	1.21	0.84	0.000926	0.041



05536275 Thorn Creek at Thornton, IL
Looking Upstream



05536275 Thorn Creek at Thornton, IL
Looking Downstream



05536275 Thorn Creek at Thornton, IL
Looking Downstream from gage

120403

Description of Channel.--This is a natural channel in a forest preserve. The streambed is composed of sand and gravel on rock riffles. The streambed is subject to considerable aquatic vegetation during the growing seasons. The banks are steep and thickly wooded. The channel is subject to accumulation and dissipation of woody debris as well as urban debris, such as small appliances, tires and assorted garbage. The study reach is straight.

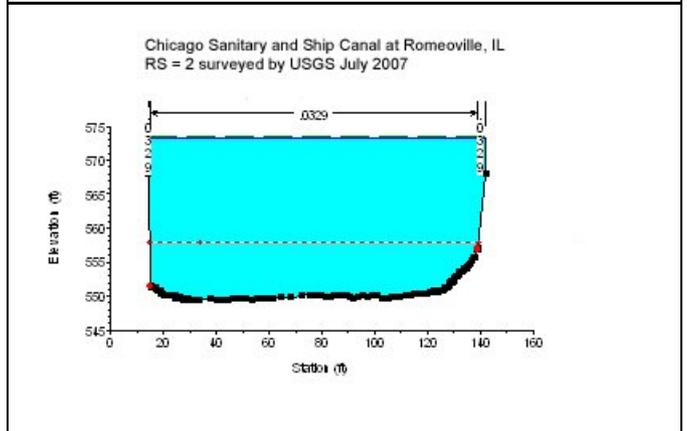
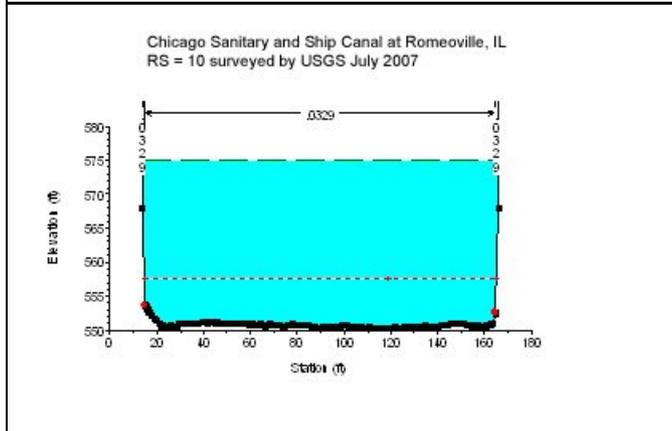
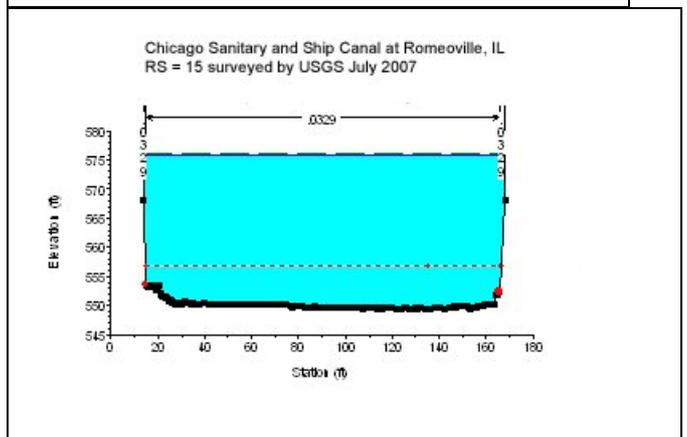
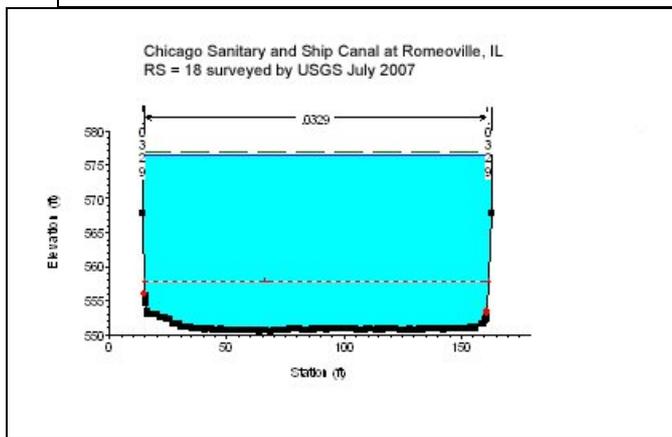
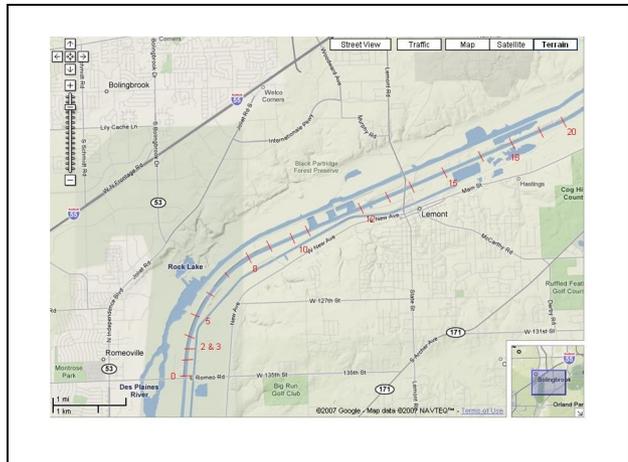
Floods.--Maximum discharge during period of record, 4,700 ft³/s on July 13, 1957, gage height, 16.00 ft; maximum gage height, 17.06 ft on June 14, 1981. Flood of Apr. 5, 1947, reached a stage of 14.34 ft. (from flood mark), discharge, 4,200 ft³/s.

Estimated n-Values using Cowan s Approach.--0.022 ~ 0.035

Key words.--

Size (w/d aspect ratio) .--

Chicago Sanitary and Ship Canal at Romeoville, IL



Study Reach.--The channel reach under consideration is an excavated channel through rock outcrop. The study reach, as shown in the satellite map (taken from Google map) on the top left, is about 5.9 mile long on the Chicago Sanitary and Ship Canal (CSSC). The study reach is defined by two USGS streamflow gaging stations. At upstream, the USGS streamflow gage at Lemont is 1.5 mile upstream from the Lemont Road bridge; at downstream, the USGS streamflow gaging station at Romeoville Road is at East Romeoville Road bridge. Twenty-one cross sections surveyed by USGS in July 2007 are available for describing the channel geometries in the study reach. A terrain map (also taken from Google map) on the top right illustrates the approximate variations in channel width and locations of these cross sections. Because most cross sections have similar geometries, cross sectional plots for river stations (RS) 2, 10, 15, and 18, as plotted above, are selected as representative cross sections.

Gage Location.--The downstream Romeoville gage, USGS streamflow gaging station number 05536995, is located at Lat 41°38'27", long 88°03'34" (NAD of 1983), in SE1/4 SW1/4 sec.35, T.37N., R.1 E., Will County, Hydrologic Unit

07120004, on left bank 40 ft upstream from bridge on East Romeoville Road (135th Street) in Romeoville, 5.2 mi upstream from Lockport Lock and Dam, and at river mile 6.2 of CSSC (Illinois Waterway mile 296.2). The upstream Lemont gage, USGS streamflow gaging station number 05536890, is established in March 2004, to replace discharge measurements at Romeoville. The gage location is at Lat 41°41'29", long 87°57'52" (NAD of 1983), at CSSC river mile 12.0, and Illinois Waterway river mile 302.0.

Drainage Area.--739 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of the Lemont gage is 551.76 ft above NAVD 1988. PR-1 is two file marks in aluminum angle bolted to wall on right bank located upstream 1.5 mi upstream from the Lemont Rd. bridge, elevation = 584.15 ft. A staff gage is located 5.9 mi downstream at Romeoville, elevation of bolt = 581.64 ft. All elevations are in NAVD 1988 convention. The Romeoville gage was discontinued and all equipment removed on May 10, 2006.

Stage, Discharge Measurements and Computed n-Values.--Discharge measurements are made with an acoustic Doppler current profiler (ADCP) by boat near the Lemont gage or downstream near the Romeoville gage. To minimize the backwater effects from Lockport Lock and Dam, data for the n-value study were selected from the ADCP measurements taken during the period when gates at Lock Port were all open and that both the Lemont gage and the Romeoville were in operation. Water-surface slope for each selected event was determined by taking difference in water surface elevations between the Lemont and Romeoville gages at the time of discharge measurement and dividing by the distance. The computed n-values are listed in the following table.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
1/14/2005	10771.0	3599.0	18.42	3.05	0.000070	0.029
1/14/2005	12133.0	3585.0	18.36	3.44	0.000089	0.029
1/12/2005	13130.0	3426.0	17.74	3.90	0.000118	0.029
1/13/2005	14657.0	3668.0	18.68	4.06	0.000127	0.030





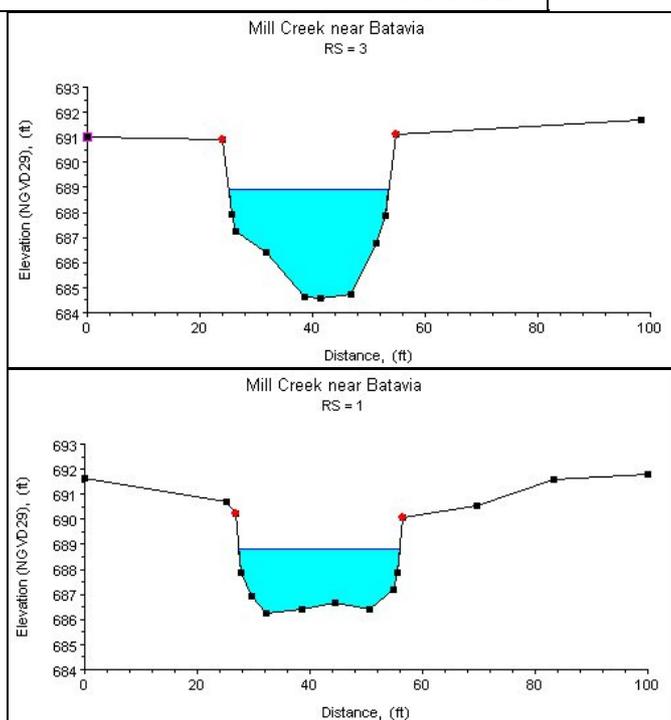
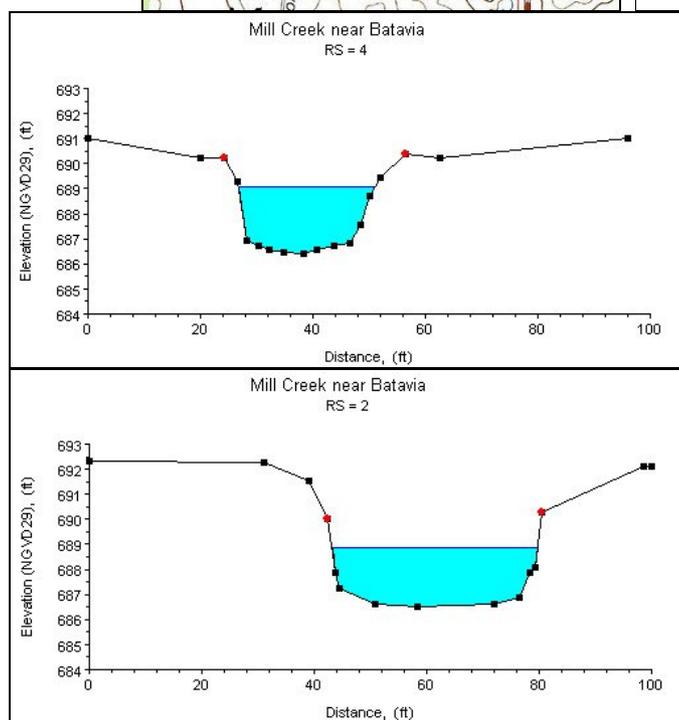
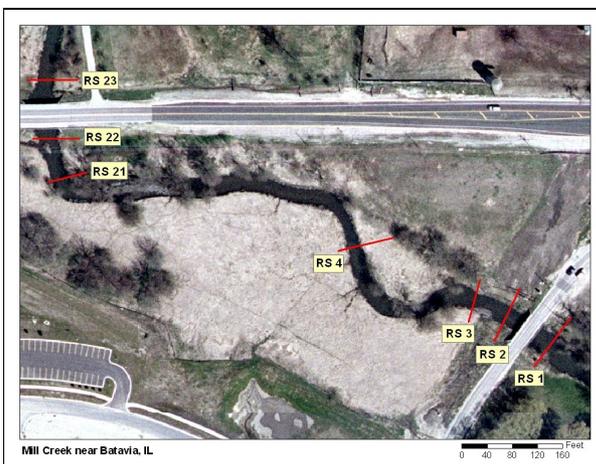
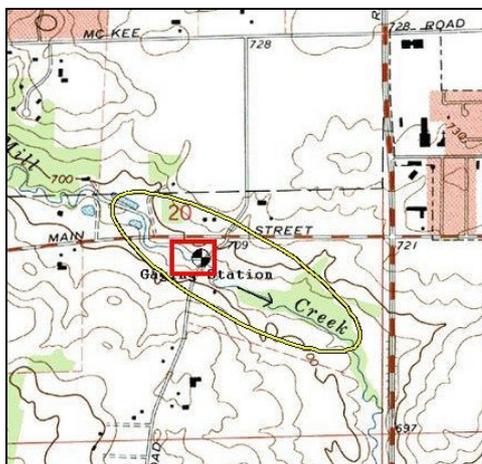
Description of Channel.--The reach is mostly straight with a mild bend towards south near Romeoville. Cross sections generally are in a rectangular shape. The canal was constructed by using dynamite to cut an opening in the limestone outcrop. Bed material consists of bedrock and coarse gravel. Bank material is limestone bedrock. The banks are near vertical walls approximately 30 feet in height with top widths varying between 140 feet and 180 feet approximately.

Floods.--Maximum discharge, 19,466 ft³/s, Feb. 21, 1997, gage height. 23.95 ft.

Estimated n-Values Using Cowan s Approach.--

Key words.--

Mill Creek near Batavia, IL



Study Reach.--The channel reach under consideration is a meandering, natural river, as shown in quadrangle map on the top left. Seven surveyed cross sections (surveyed by the Illinois Department of Natural Resources, in May 2003) are available in a reach from the Main Street bridge (upstream) to the Deer Path Road bridge (downstream). The study reach, approximately 400 ft long, was selected at the lower portion of this segment that starts from river station (RS) number RS1 upstream passing RS4, where bank vegetation is considered to be consistent in this lower reach. Bank conditions in the vicinity of Main Street were modified during the n-values study. The variations in channel alignment, width and bank conditions, as well as the locations of surveyed cross sections can be viewed in the aerial photo on the top right. Cross-sectional geometries, as described by the 4 downstream surveyed cross sections, are shown in the cross-sectional plot above.

Gage Location.--Lat $41^{\circ}50'45''$, long $88^{\circ}20'57''$, in NW1/4 NW1/4 SE1/4 sec.20, T.39N., R.8E., Kane County, Hydrologic Unit 07120007, on left bank at bridge on Deer Path road, 1.0 mi west of Batavia, and at river mi².9. The USGS streamgage-station number is 05551330.

Drainage Area.--27.6 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 685.00 ft. A wire-weight gage (WWG) is attached to the upstream side of Deer Path Road bridge. A reference point for the n-values study (RP-N1) is two file marks on the 2nd I-beam from the left on the downstream side of Main Street bridge upstream from the gage, elevation = 698.794 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations are measured from the WWG and from RP-N1 before and after each discharge measurement. Water-surface slope for the study reach is determined to be equal to that between the Main Street bridge and Deep Path Road bridge. Discharge measurements are made using the conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
5/26/2004	30.1	51.1	1.72	0.63	0.000405	0.074
3/11/2002	63.8	68.7	2.20	0.97	0.000603	0.064
3/22/2007	89.9	75.0	2.35	1.24	0.000792	0.077
12/11/2003	102.0	92.4	2.74	1.14	0.000468	0.047



05551330 Mill Creek near Batavia, IL
Low flow, looking Downstream from Deerpath Rd
09/28/04



05551330 Mill Creek near Batavia, IL
Low flow, bed material at gage
09/28/04



05551330 Mill Creek near Batavia, IL
Low flow, looking Downstream
12/11/03
n = 0.047



05551330 Mill Creek near Batavia, IL
Looking upstream, a riffle past gage
10/17/03



05551330 Mill Creek near Batavia, IL
Looking upstream from downstream end

05/16/06



05551330 Mill Creek near Batavia, IL
Looking downstream from Deerpath Rd

05/16/06



05551330 Mill Creek near Batavia, IL
Looking Upstream

12/11/03

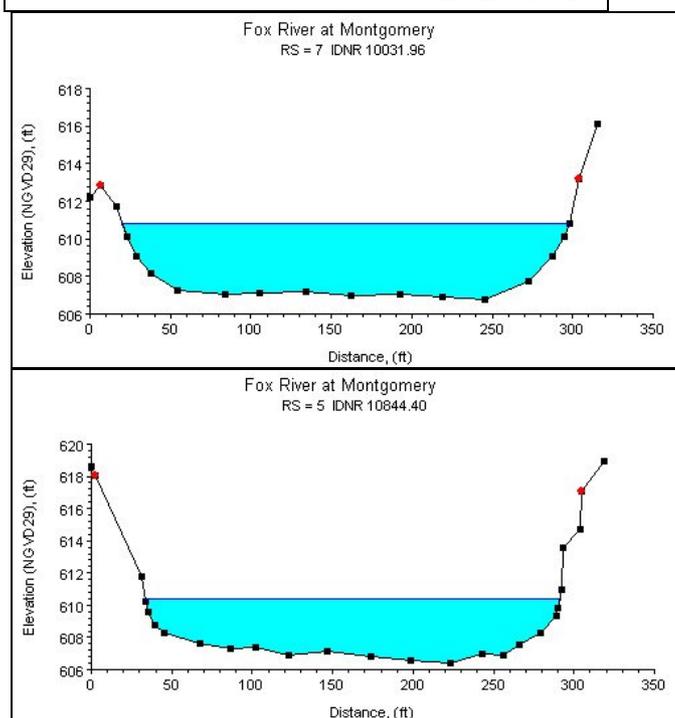
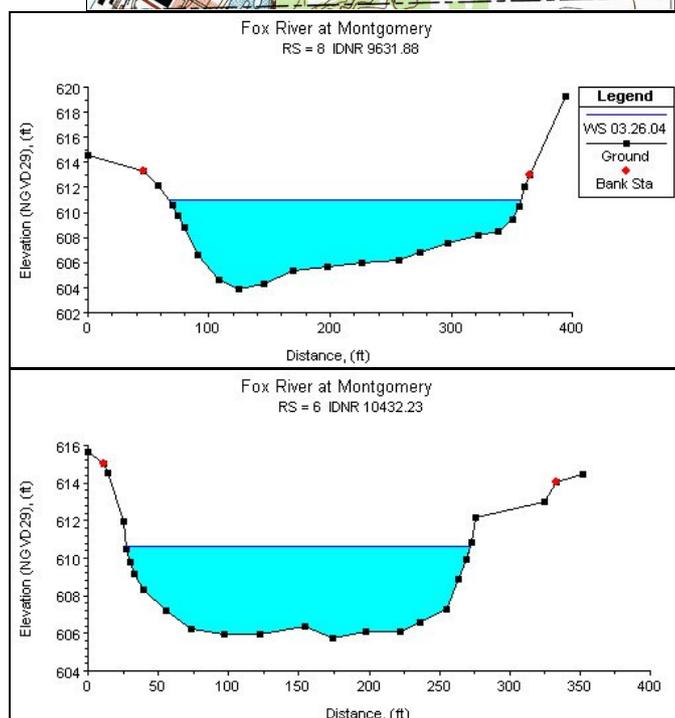
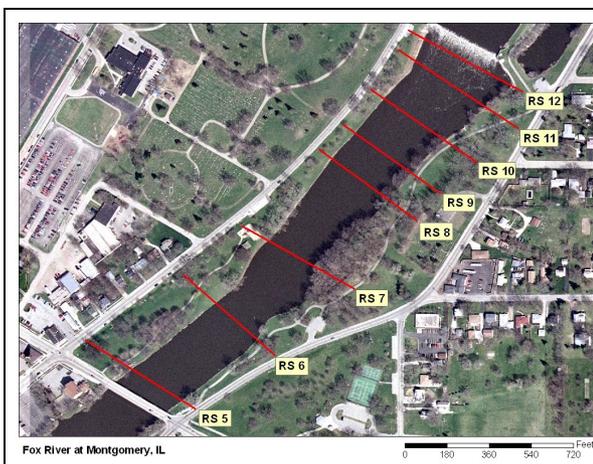
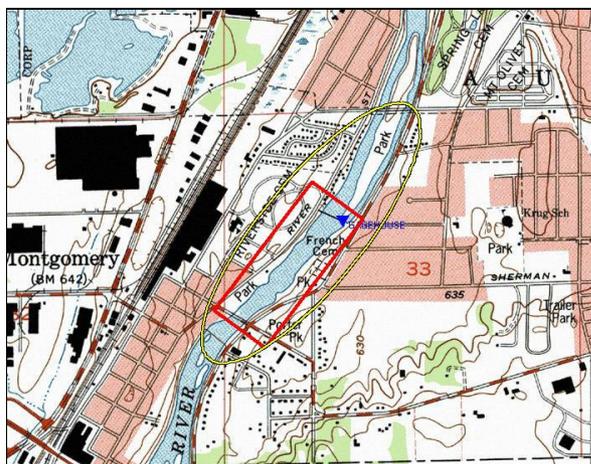
Description of Channel.--This channel is natural. The streambed is composed of shifting sand and silt with scattered gravel and cobble riffles in the reach upstream from the Deer Path Road bridge. From upstream to downstream in the study reach, bank materials are mostly clay-sand mixes; tall, flexible weeds (2 ~ 4 ft) grow at the water's edge and in open area on the flood plains. Clusters of young trees are moderately distributed at water's edge and on the flood plain. Channel geometry is generally in trapezoidal shape with average bottom width approximately 25 ft; bank heights are from 4- to 6- ft. Top width is approximately 30 ft. Note that the channel downstream from the Main Street bridge is subject to beaver dams and woody debris jams. The study reach includes a complete cycle of meandering bends.

Floods.--Maximum discharge, 1,080 ft³/s, Apr. 23, 1999, gage height, 7.52 ft.

Estimated n-Values using Cowan's Approach.--0.043 ~ 0.069

Key words.--

Fox River at Montgomery, IL



Study Reach.--The channel reach under consideration is wide and natural river. A study reach, approximately 2,110 ft long, is selected that begins about 100 ft downstream from the USGS gage house and extends to the upstream side of Mill Street bridge, as shown in quadrangle map on the top left. Eight surveyed cross sections (surveyed by Illinois Department of Natural Resources, in September 2003) are available for describing the channel geometries of the study reach. The channel alignment, approximate variations in channel width and bank conditions, and locations of cross sections are shown in the aerial photo on the top right. Four cross sections at river station (RS) 8, 7, 6, and 5 (see plots above) are considered representative for general cross sectional-shapes in the study reach.

Gage Location.--Lat 41°43'46", long 88°20'19", in NW1/4 SE1/4 sec.33, T.38N., R.8E., Kane County, Hydrologic Unit 07120007, on left bank at dam, 0.4 mi upstream from Mill Street bridge, 0.2 mi east of Montgomery, 3.2 mi upstream from Waubensee Creek, and at river mile 45.9. The USGS streamgage-station number is 05551540.

Drainage Area.--1732 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 603.520 ft; a tailwater wire-weight gage (WWG) is located on the downstream side of the left dam abutment near the gage house. A reference point for the

n-value study, RP-N1, is located at the downstream end of the study reach on the upstream side of the Mill Street bridge. RP-N1 is the top of a nut on the concrete anchor 130 ft from the left end of the bridge, elevation=626.889 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured using the tailwater WWG at the upstream end of the study reach and at RP-N1 at the downstream end before and after each discharge measurement. Discharge measurements were made using the conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
7/9/2004	1440.0	895.2	3.10	1.68	0.000328	0.033
2/1/2006	1700.0	973.2	3.34	1.81	0.000314	0.031
6/2/2006	2165.0	905.9	3.43	2.45	0.000350	0.028
3/26/2004	2230.0	1141.1	3.82	2.02	0.000371	0.032
12/11/2003	2360.0	1168.5	3.90	2.09	0.000348	0.031
3/16/2006	3540.0	1109.1	4.12	3.24	0.000257	0.020
5/19/2004	4640.0	1518.0	4.89	3.14	0.000290	0.022
5/21/2004	4790.0	1608.0	5.13	3.07	0.000386	0.026



05551540 Fox River at Montgomery, IL
Low flow, looking Downstream from dam 09/28/04



05551540 Fox River at Montgomery, IL
Low flow, looking Upstream from Mill St bridge 09/28/04



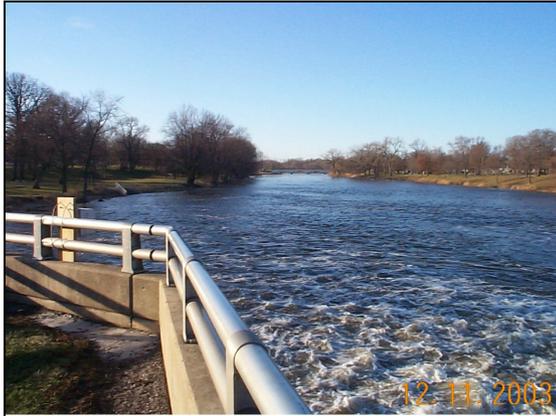
05551540 Fox River at Montgomery, IL
Looking downstream from dam 06/02/06



05551540 Fox River at Montgomery, IL
Looking upstream from Mill Street bridge 06/02/06



05551540 Fox River at Montgomery, IL
Looking Downstream from dam 03/26/04



05551540 Fox River at Montgomery, IL
Looking Downstream from dam 12/11/03



05551540 Fox River at Montgomery, IL
Looking Downstream from dam 05/19/04



05551540 Fox River at Montgomery, IL
Looking Upstream from Mill St bridge 05/19/04



05551540 Fox River at Montgomery, IL
Looking Downstream from dam 05/21/04



05551540 Fox River at Montgomery, IL
Looking downstream from dam 03/16/06



05551540 Fox River at Montgomery, IL
Looking across river at dam 03/16/06



05551540 Fox River at Montgomery, IL
Upstream side of bridge 03/16/06

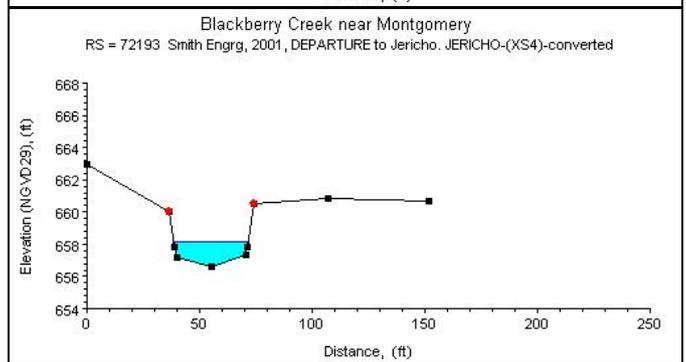
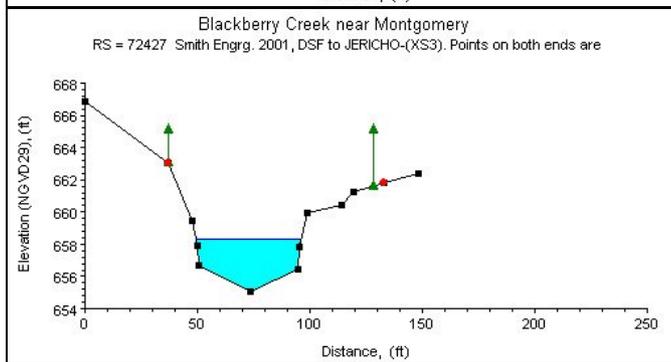
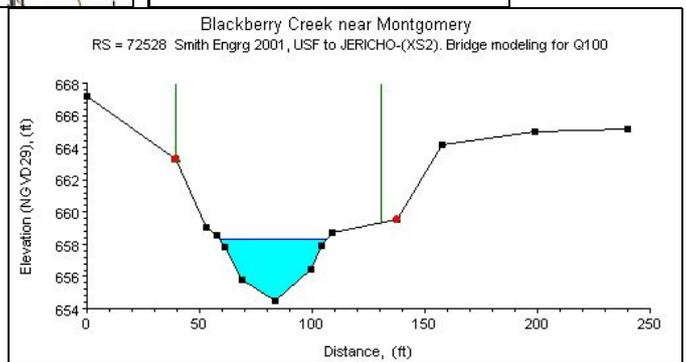
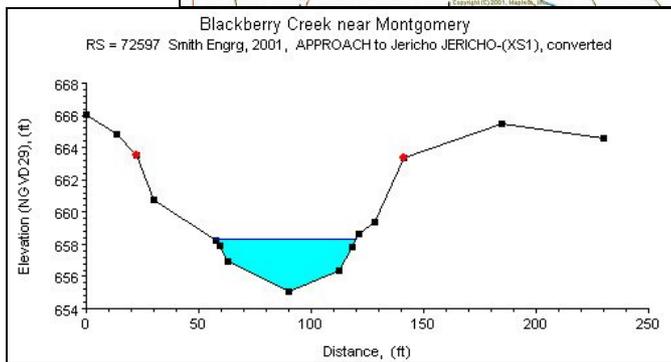
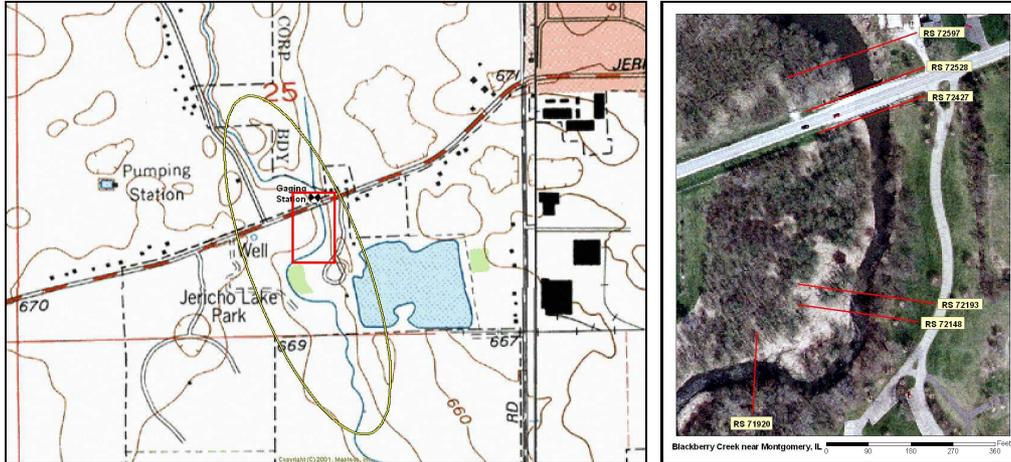
Description of Channel.--This channel is a straight and natural with cross sections generally in wide, rectangular shape. Bed material consists of mixtures of sand, gravel, medium to large cobbles, and scattered small boulders. The bottom width of the channel is approximately 250 ft. Bank materials for stages below bank points are primarily gravel and coarse-sand mixtures. Above the bank points, flood plains are predominantly weeds and tall grass with sparse mature trees. Bank heights vary between 5 to 10 ft, and top width is about 300 ft.

Floods.-- Maximum discharge since Oct. 2002 was 8,800 ft³/s, May 31, 2004, gage height 13.92 ft.

Estimated n-Values using Cowan s Approach.--0.035

Key words.--

Blackberry Creek near Montgomery, IL



Study Reach.--The channel under consideration is natural with wooded banks, as shown in quadrangle map on the top left. The study reach, approximately 700 ft long, is located from the upstream side of Jericho Road bridge and extends downstream. Six surveyed cross sections (surveyed by the U.S. Geological Survey, Illinois Department of Natural Resources, and Smith Engineering in 2001 and the Illinois Department of Transportation, in April 2003) are available for describing the characteristics of channel geometry. The alignment of the study reach, approximate variations in channel width and bank conditions, and locations of surveyed cross sections are shown in the aerial photo on the top right. Changes in cross-sectional geometries are illustrated with the cross-sectional plots at four river stations (RS) as shown above.

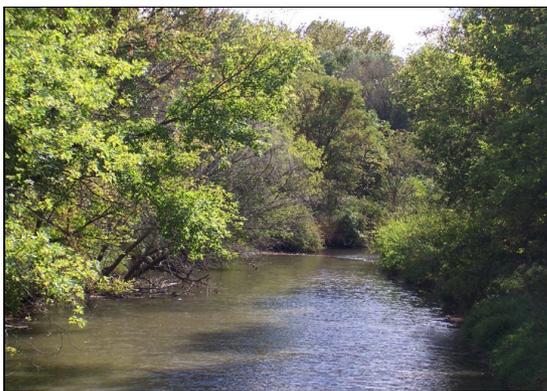
Gage Location.--Lat $41^{\circ}44'27''$, long $88^{\circ}23'00''$, in NW1/4 SE1/4 sec.25, T.38N., R.7E., Kane County, Hydrologic Unit 07120007, on right bank at bridge on Jericho Road, 1.0 mi west of Montgomery, and at river mile 13.0. The USGS streamgage-station number is 05551675.

Drainage Area.--55.0 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 654.00 ft; a wire-weight gage (WWG) is attached to the upstream side of Jericho Road bridge; reference point for n-value study, RP-N1 is a nail in tree about 250 ft downstream of the bridge on the left bank, elevation = 622.627 ft; RP-N2 is a nail in tree about 200 ft downstream of RP-N1 on the right bank, elevation = 621.168 ft; RP-N3 is a nail in tree about 100 ft downstream of RP-N2 on the left bank, elevation = 622.021 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured at the wire-weight gage (WWG) and at all RP-Ns before and after the discharge measurement. Discharge measurements were made using the conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

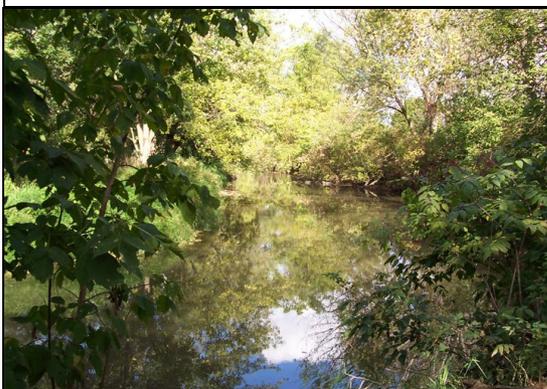
Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
10/28/1998	80.3	78.6	1.68	1.35	0.000410	0.032



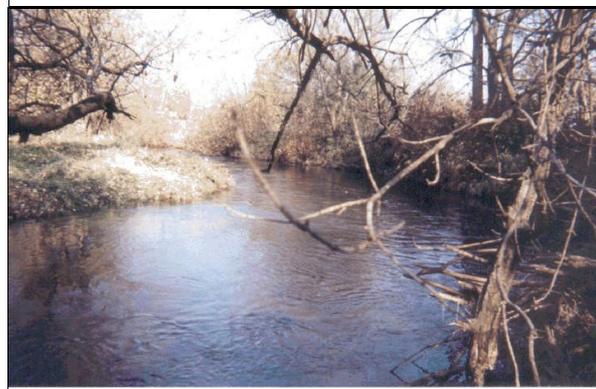
05551675 Blackberry Creek near Montgomery, IL
Low flow, looking Downstream from bridge 09/28/04



05551675 Blackberry Creek near Montgomery, IL
Looking Downstream



05551675 Blackberry Creek near Montgomery, IL
Low flow, looking Upstream 09/28/04



05551675 Blackberry Creek near Montgomery, IL
Looking Upstream

Description of Channel.--This channel is natural with heavily wooded banks. The bed materials consist of shifting sand, silt and gravels. The banks are lined with sparse trees, dense grass, and brush. The channel cross section is approximately trapezoid with low, mildly sloped banks. The bottom width of the channel is approximately 25 ft. The bank height varies around 6 ft. The top width of the channel is about 50 ft. The slope of the left bank of the study reach (downstream from the gage) is steeper than the right bank. The study reach can be described as a bend with sharp bends directly upstream and downstream. Debris jams accumulate and dissipate in the channel. At times, the low-water control becomes the foundation for beaver dams. Within the study reach, overflow from the Creek to

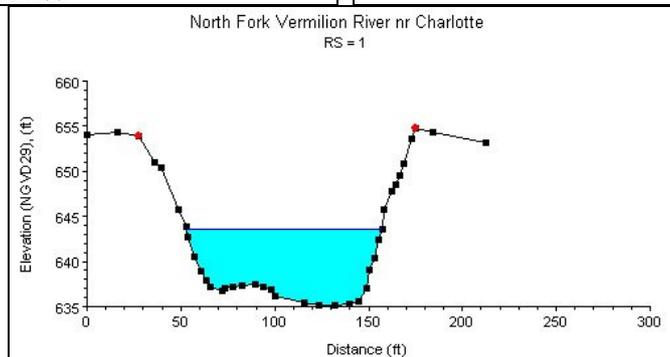
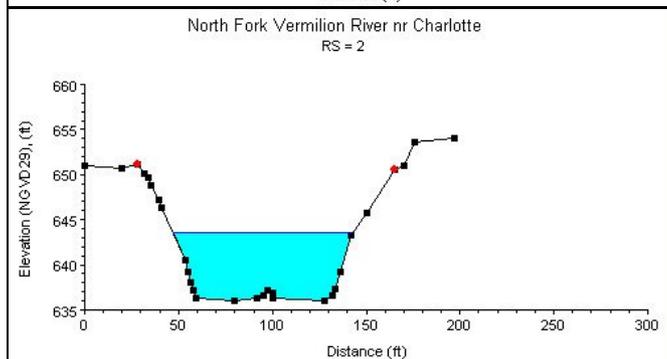
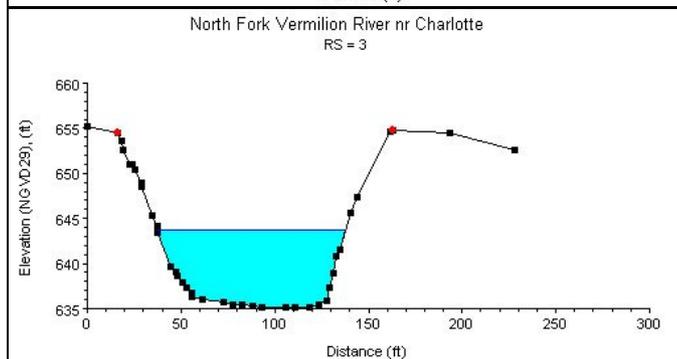
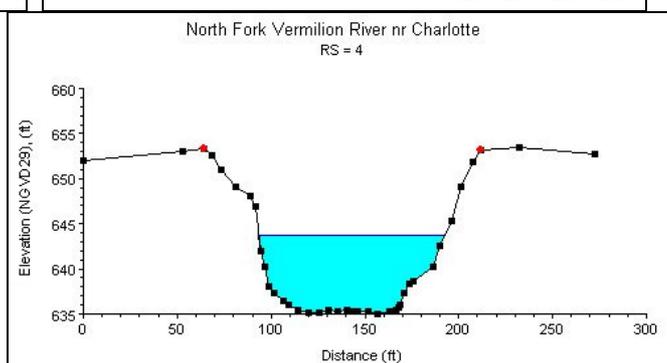
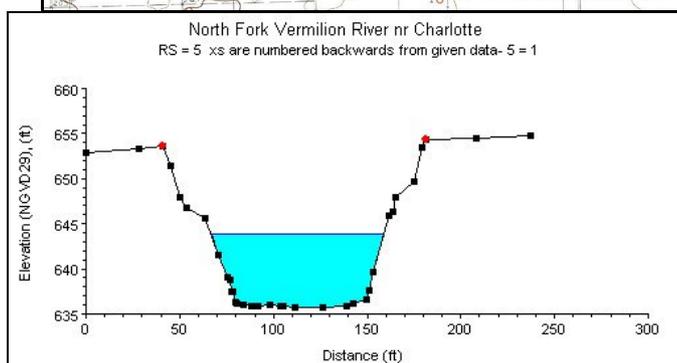
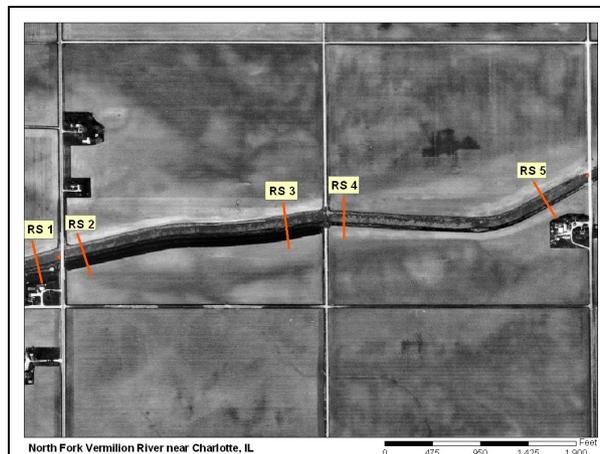
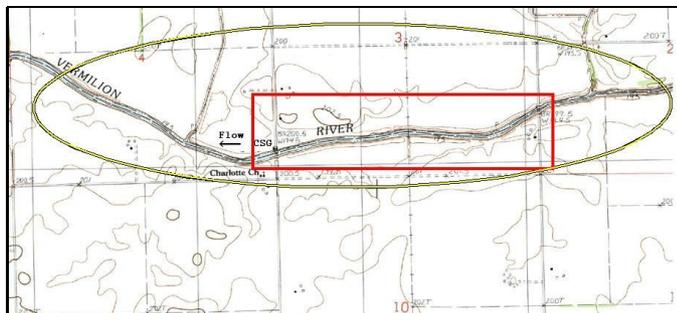
Jericho Lake can occur at the downstream end of the study reach when stages are higher than 6.5 ft by way of a small open ditch. The overflow may affect the stage reading at RP-Ns downstream from the ditch. Therefore, high flood events were not used for study at this site.

Floods.--Maximum discharge, 1,040 ft³/s, Apr.23, 1999, gage height, 8.61 ft.

Estimated n-Values using Cowan s Approach.--0.048 - 0.07

Key words.--

North Fork Vermilion River near Charlotte, IL



Study Reach.--The reach under consideration is dredged channel in agricultural fields with grass cover on both banks. The study reach, 5,324 ft long, is located from 200 ft downstream of Country Road 3400E bridge to 200 ft downstream of County Road 3300E bridge, as shown in quadrangle map on the top left. There are five surveyed cross sections (surveyed by the U.S. Geological Survey in January 2003) available for evaluating the characteristics of channel geometry in the study reach. The alignment of channel, approximate variations in channel width and bank conditions, and locations of surveyed cross sections are shown in the aerial photo on the top right. General shapes of

cross sections in the study reach are plotted above.

Gage Location.--Lat 40°50'08", long 88°17'56", in the SE1/4 SE1/4 sec.4, T.27N., R.8E. Livingston Co., Hydrologic Unit 07130002, at bridge on County Highway 3, 1.2 mi northwest of Charlotte, and 5.5 mi north of Chatsworth. The USGS streamgage-station number is 05554000.

Drainage Area.--186 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 638.00 ft. A reference point (RP-N) was established for the n-value study. RP-N1 is two file marks on the 9th upright I-beam from the right edge of water on the downstream side of the bridge on County Road 3400E, elevation = 659.975 ft. A reference mark (RM-9) is two file marks on the right downstream corner of the 21st vertical I-beam from the right edge of water on the downstream side of the bridge on county Road 3300E, elevation = 660.432 ft. All elevations are in 1929 NGVD convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured by tape down from RP-N1 and RM-9 before and after each discharge measurement. A corresponding water surface slope was calculated by dividing the difference in water-surface elevation with reach length between the two points. Discharge measurements were made using the conventional current meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low flow to high flow in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
4/1/2004	603.0	386.2	4.20	1.57	0.000064	0.020
5/15/2003	1180.0	615.9	6.08	1.92	0.000078	0.023
6/1/2004	1190.0	666.2	6.45	1.79	0.000064	0.023





05554000 North Fork Vermilion River near Charlotte, IL
Looking Upstream from 3300E
05/15/03
n = 0.023



05554000 North Fork Vermilion River near Charlotte, IL
Looking Downstream from 3300E
05/15/03
n = 0.023



05554000 North Fork Vermilion River near Charlotte, IL
Looking Downstream from 3400E
05/15/03
n = 0.023



05554000 North Fork Vermilion River near Charlotte, IL
Low flow, looking downstream from 3300E
7/12/2007



05554000 North Fork Vermilion River near Charlotte, IL
Low flow, looking upstream from 3300E
7/12/2007



05554000 North Fork Vermilion River near Charlotte, IL
Low flow, Looking upstream from 3400E
7/12/2007

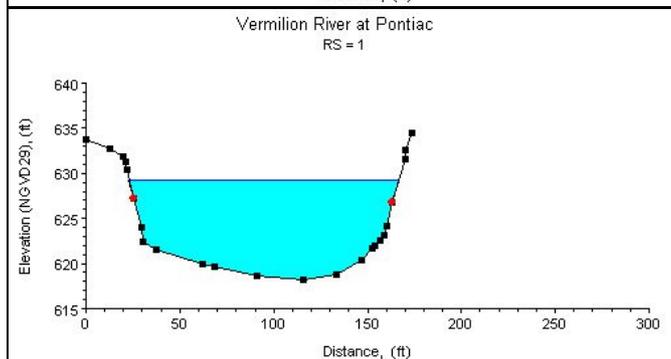
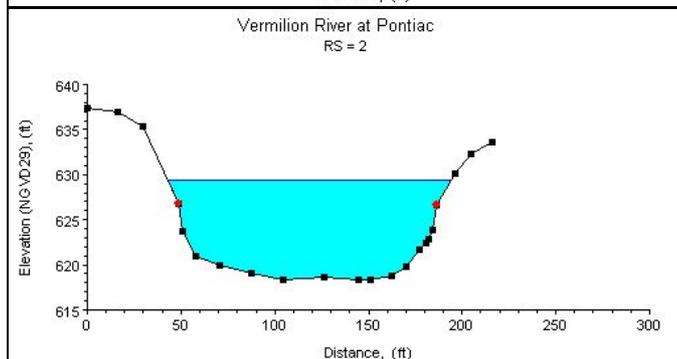
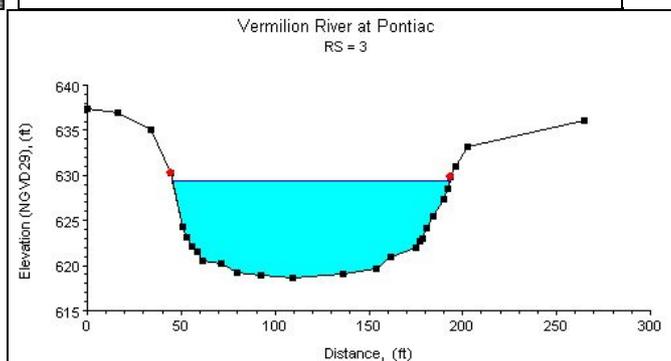
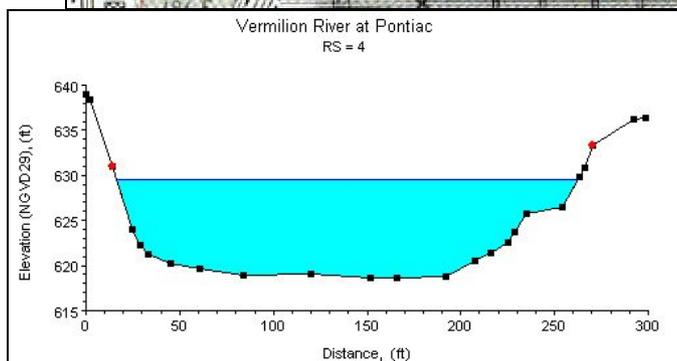
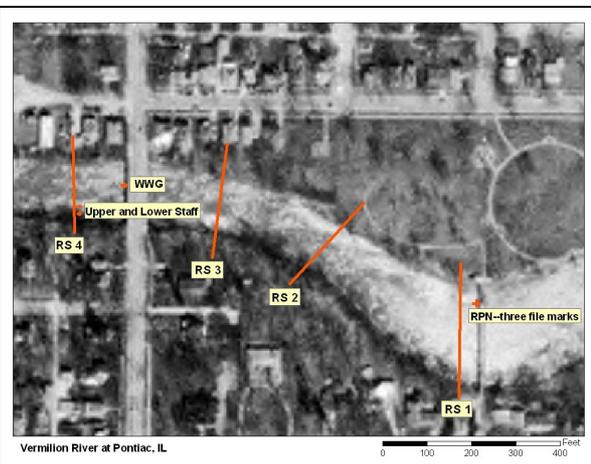
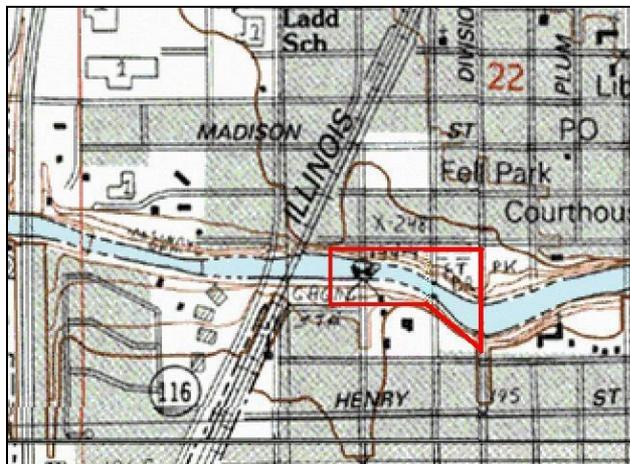
Description of Channel.--This channel is a dredged, well-maintained grass channel. Dredged material has been distributed evenly over the banks. There are no appreciable levees or spoil banks. The bed material consists of soft silt with streaks of gravel. Channel geometries are trapezoidal and are fairly uniform from upstream to downstream. Tall grass and dense weeds spread on both banks. The bottom width of the channel is approximately 70 ft. The banks are about 30 ft in height and have a top width of about 140 ft. Bank slope is steep and the channel is fairly straight.

Floods.--Maximum discharge, 4,900 ft³/s, March 11, 1990, gage height, 16.88 ft; maximum gage height, 17.09 ft, Oct. 3, 1986, discharge, 4,900 ft³/s.

Estimated n-Values using Cowan s Approach.--0.025 ~ 0.044

Key words.--

Vermilion River at Pontiac, IL



Study Reach.--The channel under consideration is natural in urban setting. The study reach, approximately 940 ft long, is located from the pedestrian footbridge in Humiston Riverside Park to 130 ft downstream of the gage on Vermillion Street bridge, as shown in quadrangle map on the top left. Four surveyed cross sections (surveyed by the U.S. Geological Survey in June 2003) are available for describing the channel characteristics of the study reach. The alignment of study reach, approximate variations in channel width and bank conditions, and locations of surveyed cross sections are shown in the aerial photo on the top right. Cross-sectional geometries, as described by four surveyed cross sections, vary gradually and continuously from upstream to downstream (see plots above).

Gage Location.--Lat 40°52'40", long 88°38'10", in SE1/4 SW1/4 sec.22, T.28N., R.5E., Livingston County, Hydrologic Unit 07130002, near center of span on downstream side of bridge on Vermillion Street in Pontiac, 0.1 mi upstream from State Highway 116, 0.8 mi upstream from Turtle Creek, and at river mi 60.3. The USGS streamgage-station number is 05554500.

Drainage Area.--579 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 619.45 ft. A reference point (RP-N1) is the center mark of three file marks located on the downstream side of the footbridge, elevation of center mark = 645.086 ft. A wire-weight gage (WWG) is attached to downstream side of Vermillion Street bridge. Two staff gages are located 130 ft downstream from Vermillion Street. Elevation of brass screw on the upper staff gage is 631.207 ft; elevation of brass screw on the lower staff gage is 626.619 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured from RP-N1 on the footbridge, the WWG and staff gages before and after a discharge measurement. Discharge measurements are made using the conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
5/21/2003	488.0	610.8	4.07	0.84	0.000080	0.033
3/31/2004	1900.0	970.6	6.02	2.05	0.000251	0.034
6/1/2004	3550.0	1365.3	7.88	2.73	0.000286	0.032



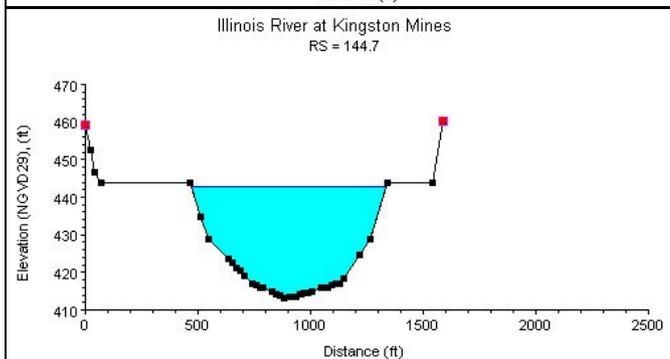
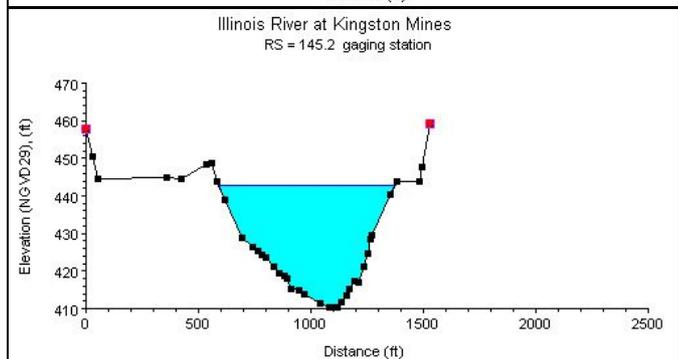
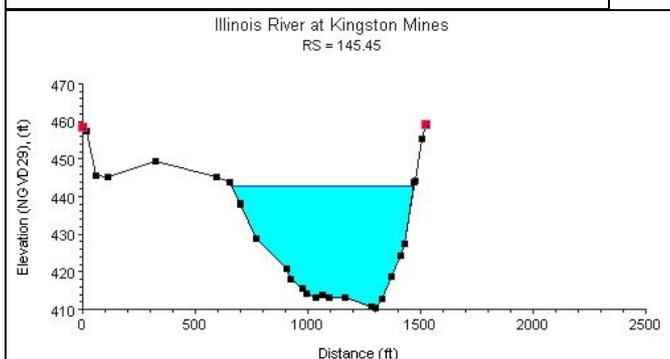
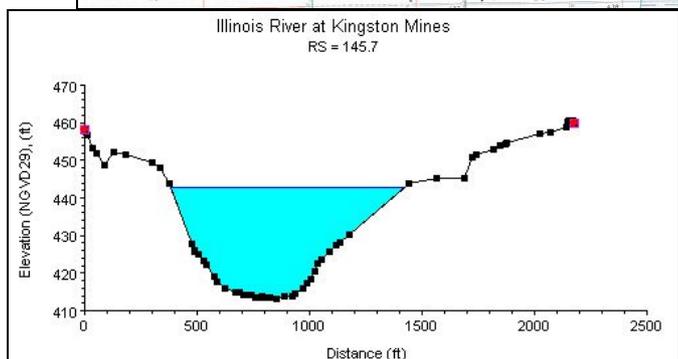
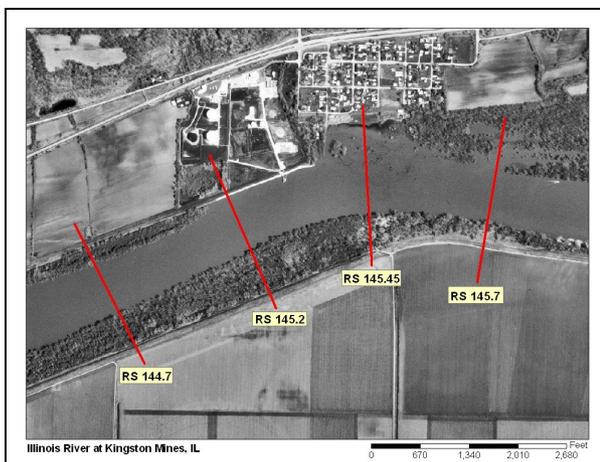
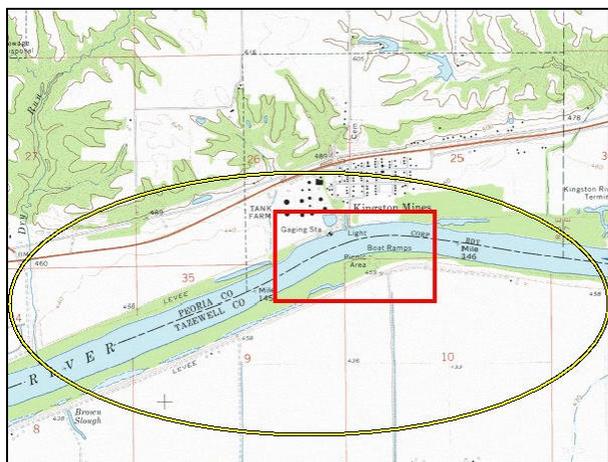
Description of Channel.--This channel is natural in an urban setting. Bed material consists of a gravel and cobble mix with sparse patches of drift debris. The earth banks have sparse spreads of bushes and grasses. Some areas along the bank are lined with riprap. Channel geometry is of trapezoidal shape, becoming narrower in the downstream direction. The bottom width of the channel ranges from 180 ft at the upstream end to 100 ft at the downstream end. The banks are about 10 ft high. Top width varies from nearly 256 ft at the upstream end to about 138 ft at the downstream end. The channel has a mild meander.

Floods.--Maximum discharge, 13,100 ft³/s, Dec. 4, 1982, gage height, 19.16 ft.

Estimated n-Values using Cowan s Approach.--0.046 - 0.05

Key words.--

Illinois River at Kingston Mines, IL



Study Reach.--The channel reach under consideration is free-flowing in the upper part of a navigation pool (the La Grange Pool on the Illinois River for this case). The study reach is a relatively straight channel (approximately 5,820 ft long) and is represented by the channel segment centered on the USGS streamflow gage at Kingston Mines, as shown in the quadrangle map on the top left. Eleven cross sections (surveyed by the U.S. Army Corps of Engineers, in August 1998) are available for describing the channel geometry and its variation in the channel segment. The channel alignment, approximate variations in channel width and bank conditions, and locations of cross sections in the study reach are shown in the aerial photo on the top-right. Four cross sections, as shown in the cross-sectional plots above and centered on the USGS gage, are used to represent geometries in the study reach.

Gage Location.--Lat 40°33'11", long 89°46'38", in SE1/4 SE1/4 sec.26, T.7N., R.6E., Peoria County, Hydrologic Unit 07130003, on right bank at Kingston Mines, 2.3 mi downstream from Mackinaw River and at river mi 145.4. The USGS streamgage-station number is 05568500.

Drainage Area.--15,818 sq mi.

Gage Datum and Elevations of Reference Points.--This is a slope station site. Datum of base gage at Kingston Mines is 428.00 ft. The auxiliary gage is located at Illinois River at Copperas Creek, 8.6 miles downstream. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Since 1993, discharge measurements have been made with an acoustic Doppler current profiler (ADCP) by boat near the base (Kingston Mines) gage or near the auxiliary gage for most stages. Events for the n-value study were selected from the actual ADCP measurements and those confined to the main channel only (stage readings at both gages were below 19 ft). Water-surface slope for each selected event was determined by taking difference in water surface elevations between the base and auxiliary gage at the time of discharge measurement and dividing by the distance. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
10/23/2002	4090.0	8048.3	12.04	0.51	0.000003	0.019
7/31/2002	6220.0	8738.3	12.79	0.72	0.000004	0.017
1/9/1997	13600.0	11632.8	15.67	1.18	0.000013	0.021
5/9/1997	15500.0	12324.7	16.31	1.27	0.000013	0.020
6/13/2000	19500.0	13526.2	17.39	1.45	0.000010	0.016
4/3/2002	19600.0	14199.5	17.97	1.39	0.000013	0.020
8/11/1981	24200.0	17312.9	20.49	1.41	0.000010	0.019
5/22/1979	25700.0	17099.6	20.33	1.51	0.000013	0.020
12/19/1990	25800.0	17028.2	20.28	1.52	0.000018	0.023
6/24/1998	27300.0	18841.2	17.28	1.46	0.000011	0.020
5/21/1991	28500.0	17181.3	20.39	1.67	0.000017	0.021
10/24/2001	28800.0	15897.4	19.38	1.82	0.000013	0.016
4/11/1984	29400.0	18365.3	19.54	1.61	0.000016	0.021
3/29/1978	31300.0	18015.8	20.98	1.75	0.000018	0.029
11/18/1992	32000.0	17234.2	20.42	1.87	0.000019	0.019
4/16/1991	33200.0	17459.7	20.58	1.91	0.000023	0.021
1/13/1998	33700.0	17600.8	20.68	1.92	0.000022	0.020





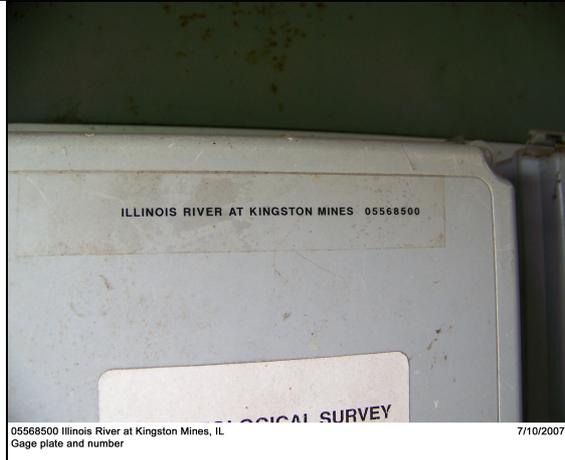
05568500 Illinois River at Kingston Mines, IL
Looking Downstream

06/01/01



05568500 Illinois River at Kingston Mines, IL
Looking Upstream

06/01/01



05568500 Illinois River at Kingston Mines, IL
Gage plate and number

7/10/2007

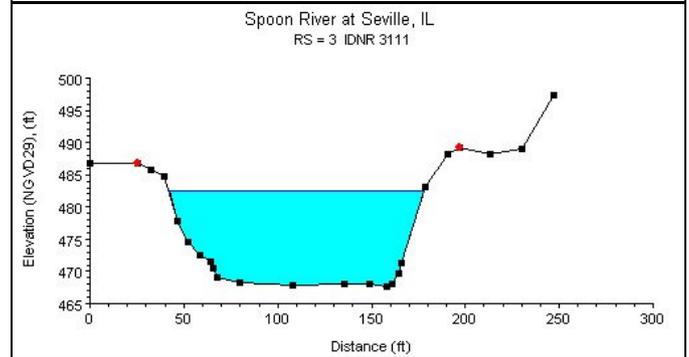
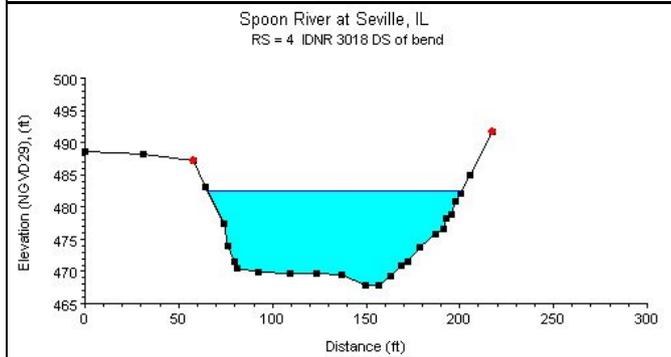
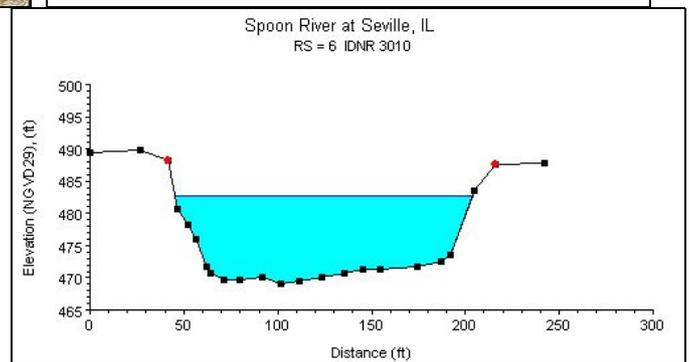
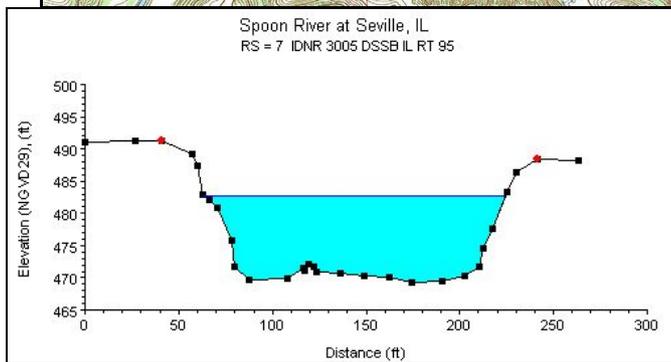
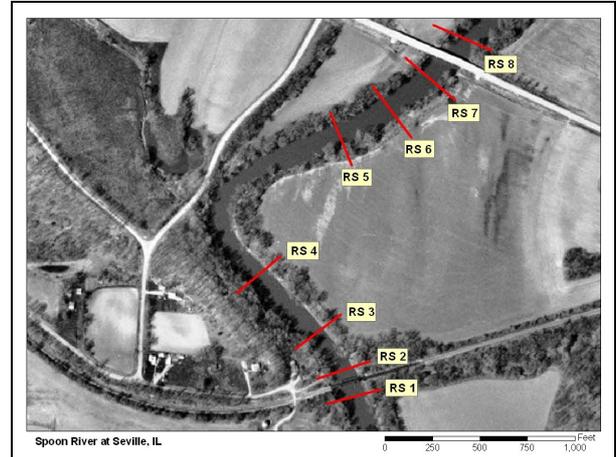
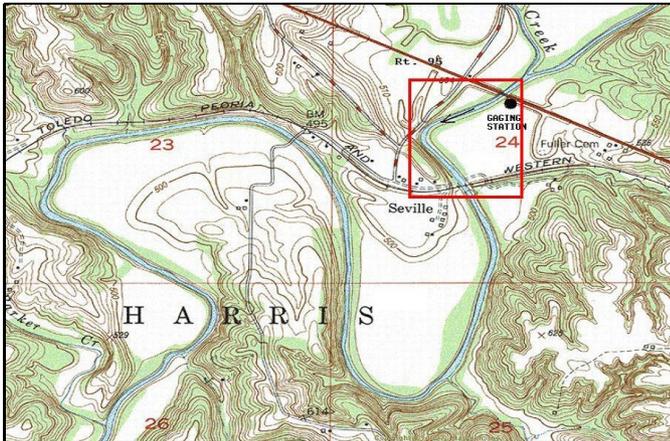
Description of Channel.--This is a natural, straight channel in the free-flowing (upper) reach of a navigation pool. Bed materials consist of soft sand and mixture of silts and clays. Both banks are protected with riprap that consists of large cobbles, as shown in channel photos above. Seasonal seedlings grow sparsely above the normal water edge. The overall cross section consists of a main channel and flood plains on both sides. The main channel is wide and semi-circular with main channel width at bank points level approximately 820 ft and average depth to top of banks is around 30 ft. Flood plains are restricted by levees.

Floods.--Maximum discharge, 88,800 ft³/s, Dec. 7, 1982, gage height, 23.86 feet; maximum gage-height, 26.02 feet, May 25, 1943.

Estimated n-Values using Cowan s Approach.--0.022

Key words.--

Spoon River at Seville, IL



Study Reach.--The channel reach under consideration is the meandering natural river, shown in the quadrangle map on the top left. A study reach, approximately 2,850 ft long, was selected as the segment extending from 150 ft upstream of the USGS gage to 200 ft downstream of an abandoned bridge about 2,500 ft downstream from the highway. There are eight surveyed cross sections (surveyed by the Illinois Department of Natural Resources, August 2003) available for evaluating the channel geometries in the study reach. The alignment of the study reach, approximate variations in channel width and bank conditions, and locations of surveyed cross sections are shown in the aerial photo on the top right. Cross-sectional plots at four locations, river station (RS) 7, 6, 4, and 3 are considered representative of the study reach (see plots above).

Gage Location.--Lat 40°29'24", long 90°20'25", SE1/4 NW1/4 sec.24, T.6N., R.1E., Fulton County, Hydrologic Unit 07130005, on left bank at downstream side of State Highway 95 bridge, 0.5 mi upstream from a railroad bridge, 0.5 mi northeast of Seville, 0.1 mi downstream from Shaw Creek, and at river mi 39.2. The USGS streamage-station number is 05570000.

Drainage Area.--1,636 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of the gage is 467.04 ft. A wire-weight gage (WWG) is located on the downstream side of State Highway 95 bridge. The WWG located on the downstream side of the abandoned bridge was removed in early 2006. TRP-1 was established on the downstream side of the abandoned bridge as two file marks on the bridge railing, near the previous location of the old WWG. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured at the upstream WWG and downstream TRP-1 before and after each discharge measurement. Discharge measurements are made using the conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
3/23/2004	682.0	476.5	3.79	1.47	0.000116	0.019
7/13/2004	1500.0	723.6	5.38	2.10	0.000168	0.023
4/13/2005	1760.0	854.6	6.15	2.08	0.000176	0.025
5/7/2002	1810.0	842.9	6.09	2.17	0.000160	0.024
2/14/2005	2920.0	1049.8	7.28	2.80	0.000184	0.023
4/17/2006	3120.0	1163.9	7.91	2.70	0.000189	0.026
2/16/2005	4090.0	1324.0	8.76	3.11	0.000188	0.025
5/13/2003	4360.0	1541.4	9.86	2.85	0.000172	0.028
11/3/2004	5070.0	1738.3	10.75	2.93	0.000200	0.032





05570000 Spoon River at Seville, IL
Low flow, looking upstream from left bank
7/10/2007



05570000 Spoon River at Seville, IL
Low flow, looking downstream at abandoned bridge
7/10/2007



05570000 Spoon River at Seville, IL
Looking at right bank



05570000 Spoon River at Seville, IL
Looking Downstream from bridge
04/13/05



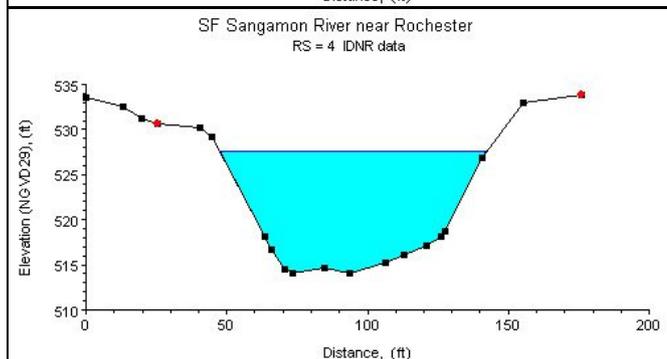
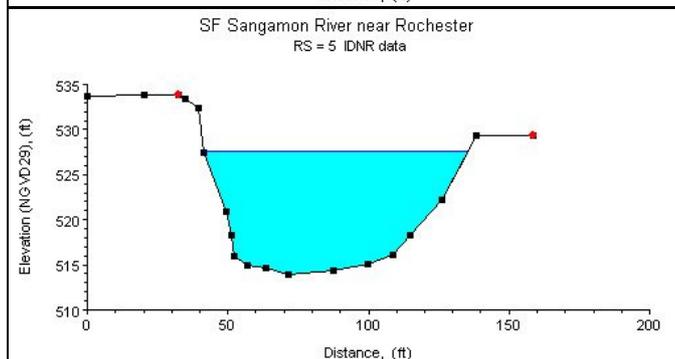
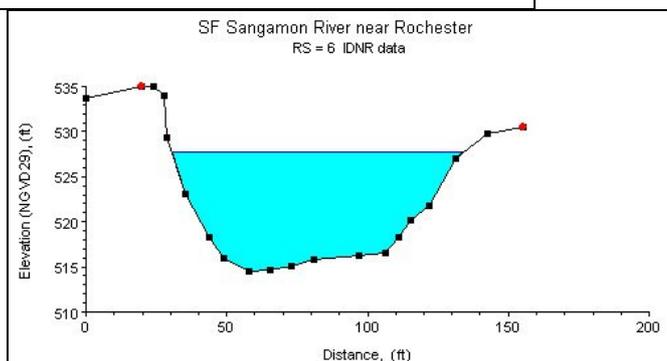
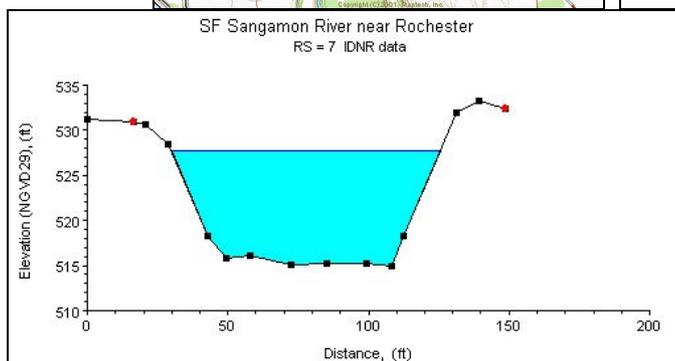
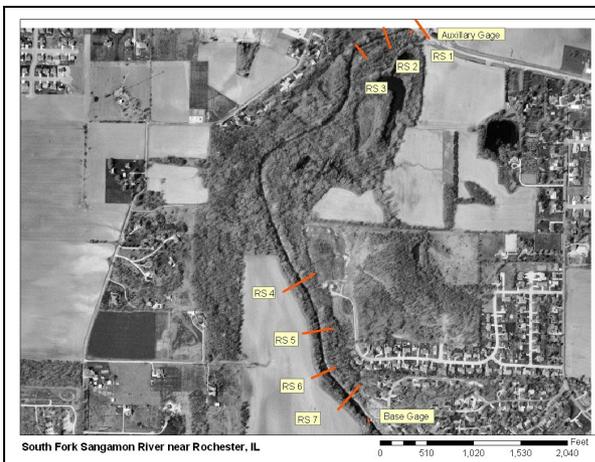
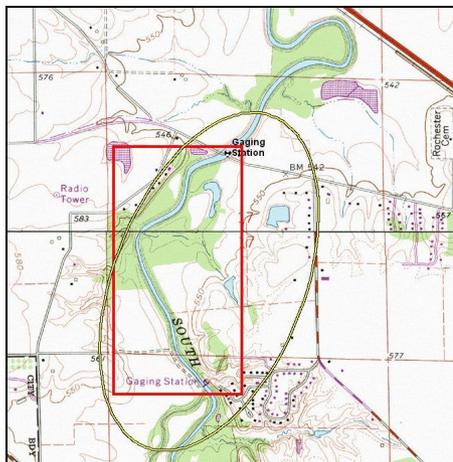
Description of Channel.--This channel is natural. The bed materials consist of primarily silt, sand, and a moderate spread of gravels. The channel can be described as trapezoidal in shape. The bottom width of the channel averages about 150 ft. The banks are generally firm soil densely lined with trees on the upper portion of the banks, so much so that the trees overhang the river. The bank heights are approximately 20 ft and very steep in some places. The top width is about 175 ft. Overall cross sections can be considered relatively uniform in the study reach. The study reach is meandering with one sharp bend greater than 90 degrees.

Floods.--Maximum discharge, 37,300 ft³/s, Aug. 22, 1924, gage height, 30.77 ft, from graph based on gage readings; maximum gage height, 33.10 ft, July 26, 1993, discharge 34,700 ft³/s. Flood of 1883 reached a stage of 33.0 ft, ice jam, discharge not determined.

Estimated n-Values using Cowan s Approach.--0.035 - 0.05

Key words.--

South Fork Sangamon River near Rochester, IL



Study Reach.--The channel reach under consideration is the meandering reach of a natural channel. The study reach selected, approximately 5,540 ft long, is located from Penacook Drive (upstream) to the West Main Street bridge (downstream), as shown in the quadrangle map on the top left. Seven surveyed cross sections (surveyed by the Illinois Department of Natural Resources in January and February 2004) are available for describing channel geometries in the study reach. The channel alignment, approximate variations in channel width and bank conditions, and locations of the surveyed cross sections are shown in the aerial photo on the top right. Cross sections at river stations (RS) 7, 6, 5, and 4 are plotted above.

Gage Location.--Lat 39°44'32", long 89°34'02", in NE1/4 NW1/4 sec.20, T.15N., R.4W., Sangamon County, Hydrologic Unit 07130007, on right bank at city of Springfield dam, 100 ft downstream from Horse Creek, 1.7 mi southwest of Rochester, and at river mi 7.4. The auxiliary gage is located at lat 39(45' 14", long 89(33' 56", in NE1/4NW1/4 sec.17, T.15 N., R.4 W., Sangamon County, Hydrologic Unit 07130007, on the right bank, 1.3 mi downstream from Horse Creek, 1.5 mi west of Rochester. The USGS streamgage station number for the base gage is 05576000.

Drainage Area.--867 sq mi.

Gage Datum and Elevations of Reference Points.--This is a slope station site where the auxiliary gage is located 1.3 mi downstream from the base station on the upstream side of the bridge on West Main Street. Datum of both base and auxiliary gages is 511.30 ft. A wire-weight gage (WWG) is mounted on the handrail of the pump house platform at the base gage, and a WWG is attached to the upstream side of West Main Street bridge at the auxiliary gage. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Stage and discharge data suitable for n-value analysis were retrieved from measured discharge and corresponding water-surface elevations at the base and auxiliary gages. Discharge measurements were made using the conventional current-meter method. Discharges corresponding to a stage above 15 ft at the auxiliary gage were not used because of concerns over varying degrees by backwater effects, caused by the combination of the bridge opening at the auxiliary gage, the flood plains downstream and at the gage, and low water-surface slopes. Only in-channel flows were selected for the present study. The computed n-values are listed in the following table. Whenever possible, the computed n--values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft³/s)	Average Cross Section Area (ft²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
3/25/2003	123.0	191.7	2.87	0.65	0.000091	0.042
12/17/2003	229.0	275.3	3.78	0.84	0.000099	0.041
10/22/2001	252.0	279.7	3.83	0.91	0.000100	0.039
4/5/2001	269.0	309.4	4.14	0.88	0.000099	0.042
1/16/2002	291.0	269.9	3.72	1.09	0.000110	0.033
3/8/1999	342.0	385.9	4.87	0.90	0.000084	0.042
4/1/1997	367.0	356.8	4.60	1.04	0.000090	0.036
3/26/1996	575.0	414.9	5.13	1.40	0.000122	0.033
2/19/1998	603.0	481.8	5.71	1.26	0.000079	0.032
4/19/1995	756.0	540.9	6.20	1.41	0.000106	0.035
2/13/2002	805.0	516.6	6.01	1.57	0.000115	0.032
8/19/1998	851.0	588.1	6.59	1.46	0.000110	0.036
6/28/2002	871.0	559.8	6.36	1.57	0.000121	0.034
5/10/1999	1170.0	725.1	7.61	1.63	0.000120	0.037
6/15/1994	1470.0	788.7	8.05	1.88	0.000100	0.030
6/11/1993	1800.0	928.6	8.92	1.96	0.000102	0.032
5/12/1995	2010.0	1083.7	9.61	1.88	0.000095	0.034



05576000 South Fork Sangamon River near Rochester, IL
Gage house downstream of bridge 7/11/2007



05576000 South Fork Sangamon River near Rochester, IL
Low flow, looking Downstream 07/21/04



05576000 South Fork Sangamon River near Rochester, IL
Low flow, looking Downstream at channel from gage 07/21/04



05576000 South Fork Sangamon River near Rochester, IL
Low flow, looking downstream 7/11/2007



05576000 South Fork Sangamon River near Rochester, IL
Low flow, looking upstream 7/11/2007



05576000 South Fork Sangamon River near Rochester, IL
Looking Downstream from bridge



05576000 South Fork Sangamon River near Rochester, IL
Looking Downstream from base gage



05576000 South Fork Sangamon River near Rochester, IL
Looking Upstream from bridge



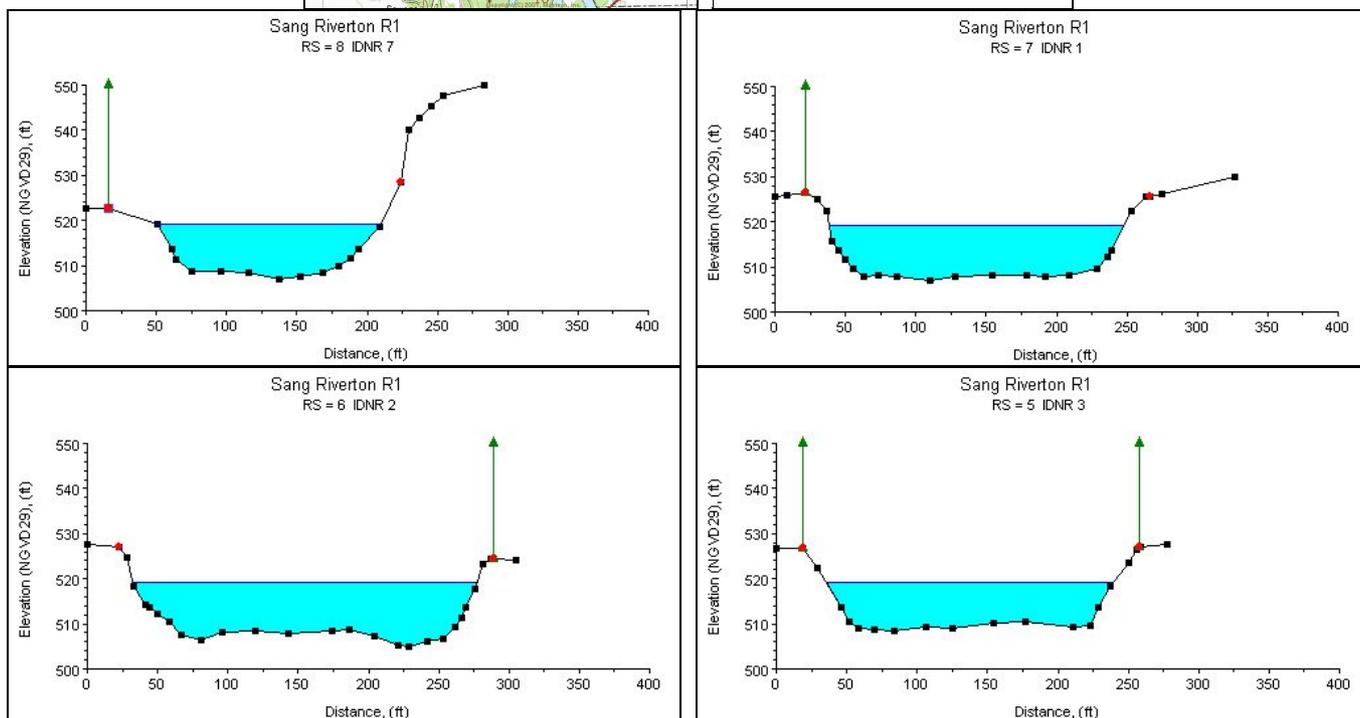
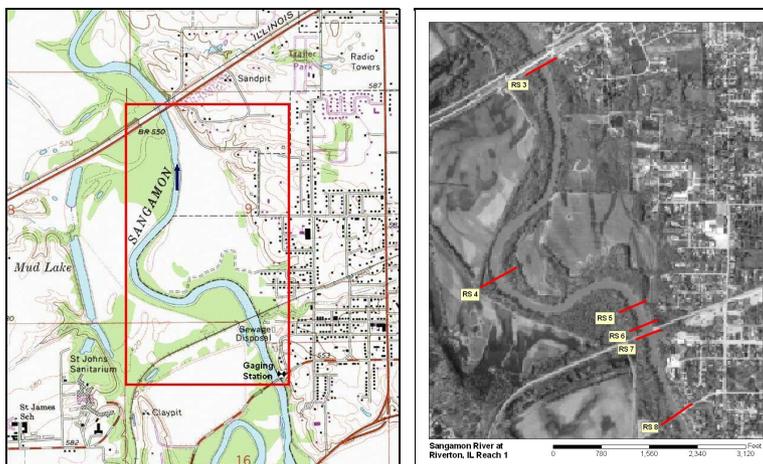
Description of Channel.--This channel is natural affected by urban areas. The streambed consists of rock, concrete rubble, and mixtures of sand and silt/clay. Tall vegetation grows on top of the banks and on the flood plains on both sides of the channel. From upstream (base gage) to downstream, cross sections are generally in trapezoidal shape but becoming narrower and deeper in downstream direction. The bottom width varies from approximately 60 ft at the upstream end to 40 ft at the downstream end; top width varies from approximately 100 ft upstream to 120 ft downstream. Bank height varies from 15 ft upstream to 20 ft downstream. The study reach is subject to the accumulation of debris. The study reach can be described as a meandering reach containing a nearly 90-degree bend.

Floods.--Maximum discharge, 20,300 ft³/s, Apr. 14, 1994, gage height, 32.40 ft; maximum gage height, 33.65 ft, May 13, 2002, discharge 14,100 ft³/s.

Estimated n-Values using Cowan s Approach.--0.033 - 0.055

Key words.--

Sangamon River at Riverton Reach 1, IL



Study Reach.--The reach under consideration is the meandering, natural river. A study reach, approximately 8600 ft long, extends from the abandoned Old River Road bridge to the upstream side of State Highway 54 bridge, as shown in the quadrangle map on the top left. Six surveyed cross sections (surveyed by the Illinois Department of Natural Resources, in December 2003) are available for evaluating the channel geometries in the study reach. The channel alignment, approximate variations in channel width and bank conditions, and locations of surveyed cross sections are shown in the aerial photo on the top right. Cross-sectional geometries vary gradually from upstream to downstream (see plots above). The alignment of the study reach, approximate variations in channel width and bank conditions, and locations of the surveyed cross sections are shown in the aerial photo on the top right.

Gage Location.--Lat 39°50'35", long 89°32'50" (revised WY2000), NW1/4 NE1/4 sec.16, T.16N., R.4W., Sangamon County, Hydrologic Unit 07130008, at right abutment on former U.S. Highway 36 bridge in Riverton, 2.2 mi downstream from Sugar Creek, 5.6 mi upstream from Fancy Creek, and at river mi 83.1. The USGS streamgage-station number is 05576500.

Drainage Area.--2,618 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 508.38 ft. A wire-weight gage (WWG) is attached to the downstream, streamward side of the bridge abutment of the Old River Road abandoned bridge; a reference point for n-value study (RP-N1) is established at the top of the nut on the concrete anchor on the upstream side of Highway 54 bridge, elevation=551.769 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements and Computed n-Values.--Water-surface elevations are measured from the WWG and from RP-N1 before, during, and after a discharge measurement. Discharge measurements are made using the conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
7/20/2004	676.0	688.5	4.43	1.13	0.000132	0.034
3/23/2004	1100.0	897.2	5.43	1.40	0.000137	0.031
9/1/2004	1680.0	1080.4	6.01	1.75	0.000135	0.025
10/19/2004	2580.0	1427.5	7.41	1.98	0.000149	0.027
3/27/2002	3590.0	1738.6	8.55	2.22	0.000149	0.027
5/28/2004	5060.0	2334.4	10.18	2.29	0.000149	0.030



05576500 Sangamon River at Riverton, IL Reach 1
Looking Downstream from gage house



05576500 Sangamon River at Riverton, IL Reach 1
Looking Downstream from WWG2 03/23/04



05576500 Sangamon River at Riverton, IL Reach 1
Looking Upstream from Rte 54 bridge 03/23/04



05576500 Sangamon River at Riverton, IL Reach 1
Looking Downstream towards old bridge pier site



05576500 Sangamon River at Riverton, IL Reach 1
Looking Upstream toward railroad trestle



05576500 Sangamon River at Riverton, IL Reach 1
Looking Upstream from Rte 54 bridge

03/27/02

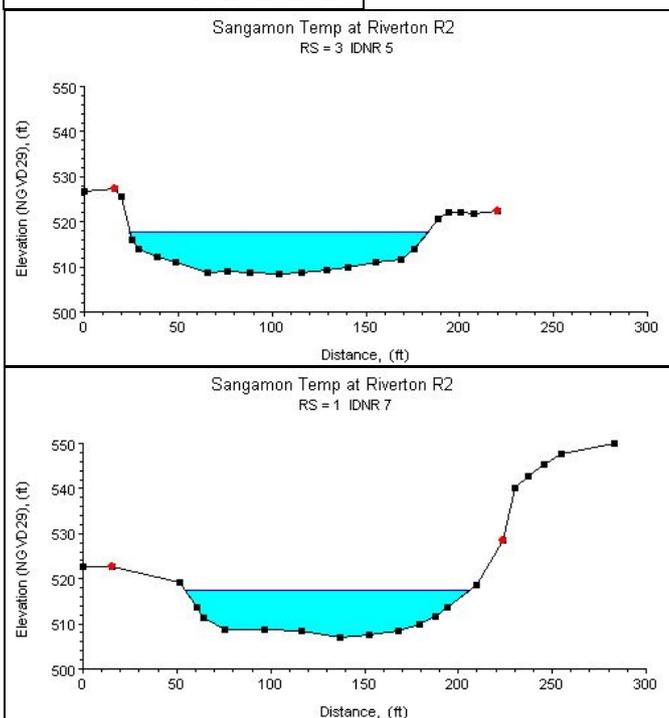
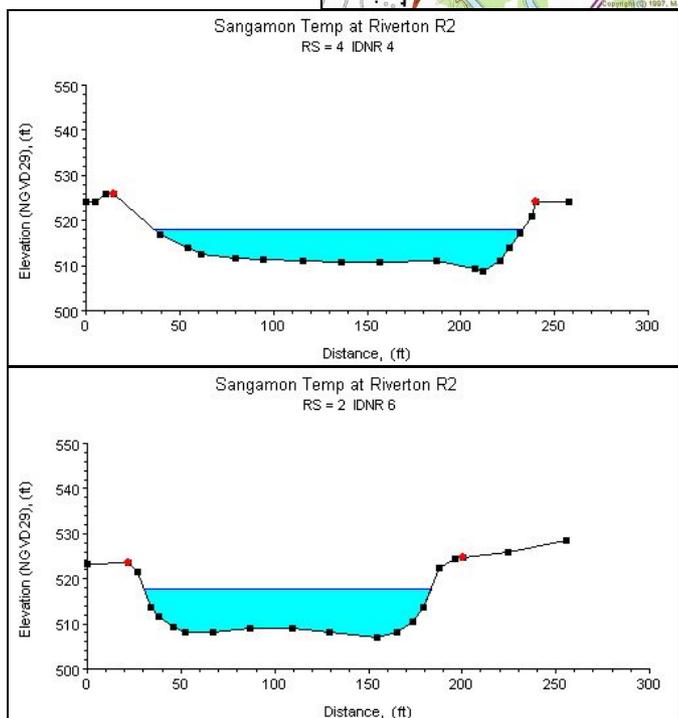
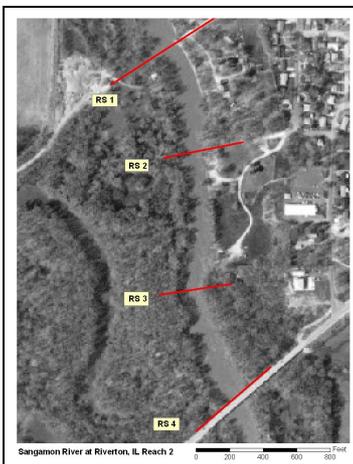
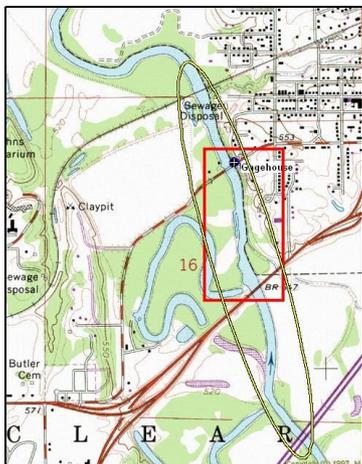
Description of Channel.--This channel is natural and meandering. Bed material consists of sand and gravel. The banks are bare earth, shales, clay and sand. The cross sectional shape is generally trapezoidal except for the upstream meandering reach. Channel widens in downstream direction. In the downstream straight reach, bottom width about 150 ft and top width is about 200 ft, with a bank height around 15 ft. Sandbars were observed on the relatively flat streambed

Floods.--Maximum discharge, 68,700 ft³/s, May 19, 1943, gage height, 31.52 ft, from graph based on gage readings.

Estimated n-Values using Cowan s Approach.--0.039 ~ 0.044

Key words.--

Sangamon River at Riverton Reach 2, IL



Study Reach.--The channel under consideration is a straight, natural river as shown in quadrangle map on the top left. The selected study reach, 2210 ft long, is located between the downstream side of the Old Route 36 bridge (as upstream) and the upstream site of the abandoned Old River Road bridge (as downstream). Four surveyed cross sections (surveyed by the Illinois Department of Natural Resources, in December 2003) are available for evaluating the channel geometries in the study reach (see plots above). The alignment of the study reach, approximate variations in channel width and bank conditions, and locations of the surveyed cross sections are shown in the aerial photo on the top right.

Gage Location.--Lat 39°50'35", long 89°32'50"(revised WY2000), NW1/4 NE1/4 sec.16, T.16N., R.4W., Sangamon County, Hydrologic Unit 07130008, at right abutment on former U.S. Highway 36 bridge in Riverton, 2.2 mi downstream from Sugar Creek, 5.6 mi upstream from Fancy Creek, and at river mi 83.1. The USGS streamgage-station number is 05576500.

Drainage Area.--2,618 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 508.38 ft. A reference point for n-values study (RP-N2) is established as the top of the nut on the bolt in the 30th I-beam from the left end of the bridge on the downstream side of Old Route 36 bridge, elevation=550.028 ft; a wire-weight-gage (WWG) is attached to the downstream, streamward side of the bridge abutment of the Old River Road abandoned bridge. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured from RP-N2 and the WWG before and after each discharge measurement. Water-surface slope was derived by dividing the difference in water-surface elevations by the distance between them. Discharge measurements were made using the conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
7/20/2004	676.0	540.2	3.72	1.28	0.000199	0.040
3/23/2004	1100.0	741.7	4.85	1.50	0.000181	0.039
9/1/2004	1680.0	911.7	5.75	1.85	0.000199	0.037
10/19/2004	2580.0	1229.6	7.35	2.11	0.000195	0.037
5/28/2004	5060.0	2018.9	10.27	2.51	0.000195	0.038



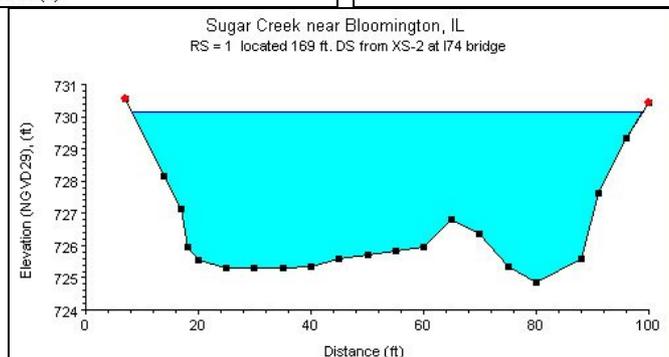
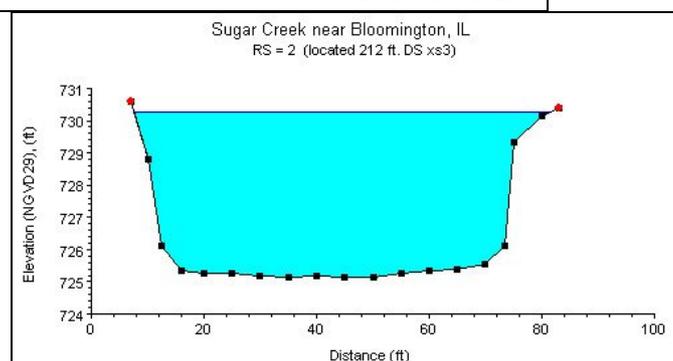
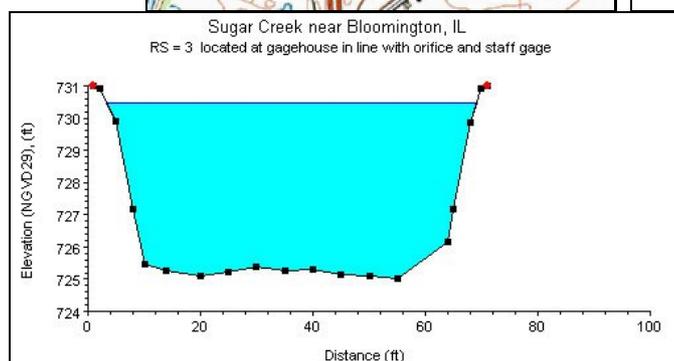
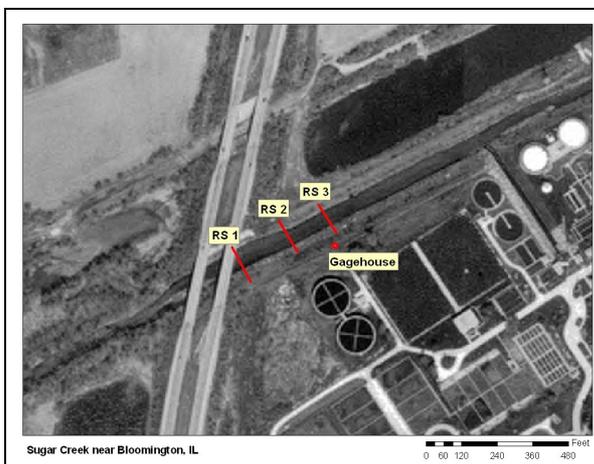
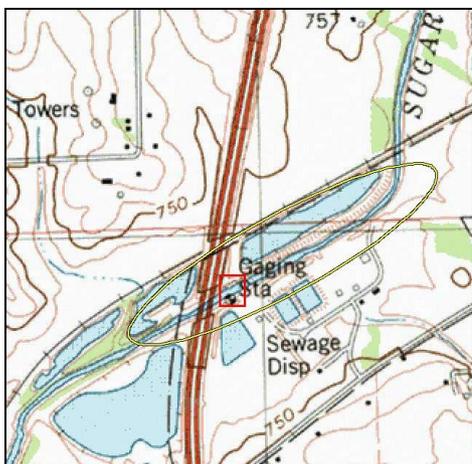
Description of Channel.--This is a natural channel in a straight reach. Bed material consists of sand and gravel. The banks are bare earth, shales, clay, and sand. Cross-sectional geometry is of trapezoidal shape and longitudinal variations are from deeper and wider at upstream to shallower and narrower at downstream. The bottom width ranges from approximately 100 to 150 ft; bank height varies from 16 to 12 ft; and top width of the channel varies approximately from 200 to 250 ft. Sandbars were observed on the relatively flat streambed. The channel has wide flood plains but only in-channel events are used in the study.

Floods.--Maximum discharge, 68,700 ft³/s, May 19, 1943, gage height, 31.52 ft, from graph based on gage readings.

Estimated n-Values using Cowan s Approach.--0.034

Key words.--

Sugar Creek near Bloomington, IL



Study Reach.--The channel reach under consideration is the artificially straightened river, as shown in the quadrangle map on the top left. The study reach selected, approximately 450 ft long, is a segment upstream of the I74 bridge extending from the USGS gage house at upstream to upstream of I74 bridge at the downstream end. Three surveyed cross sections (surveyed by the U.S. Geological Survey in September 2004) are available to define channel geometries at this site (see plots above). The alignment of the study reach, approximate variations in channel width and bank conditions, and locations of the surveyed cross sections are shown in the aerial photo on the top right.

Gage Location.--Lat 40°28'16", long 89°01'48" (NAD of 1927), in NE1/4 NW1/4 sec.7, T.23N., R.2E., McLean County, Hydrologic Unit 07130009, on left bank at Bloomington-Normal Sanitary District sewage-treatment plant, 450 ft upstream from Interstate 74 bridge, 0.4 mi west of Bloomington, and at river mi 48.8. The USGS streamgage-station number is 05580950.

Drainage Area.--34.4 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of the gage is 725.11 ft. A staff gage is installed at upper end of the reach, elevation of brass screw=730.020 ft. A reference point (RP-C1L), is two file marks on top of outer

edge of lower bracket of crest-stage gage (CSG-1) located 450 ft downstream from the staff gage, elevation=732.966 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were determined by reading the staff gage at the upstream end, by tape down from the RP-C1L at the downstream end and also were determined from levels run to high water marks. Discharge measurements were made either using the conventional current-meter method or tethered boat acoustic Doppler current profiler (ADCP). The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
7/10/2003	1290.0	317.9	4.04	4.09	0.000236	0.020
7/10/2003	1360.0	327.0	4.10	4.19	0.000236	0.021



05580950 Sugar Creek near Bloomington, IL
Low flow, looking downstream 7/10/2007



05580950 Sugar Creek near Bloomington, IL
Low flow, looking upstream 7/10/2007



05580950 Sugar Creek near Bloomington, IL
Low flow, looking at right bank 7/11/2007



05580950 Sugar Creek near Bloomington, IL
Low flow, looking at bed material 7/10/2007



05580950 Sugar Creek near Bloomington, IL
Looking Downstream from gage



05580950 Sugar Creek near Bloomington, IL
Looking Upstream from gage



05580950 Sugar Creek near Bloomington, IL
Looking Downstream, stage visualization

07/10/03



05580950 Sugar Creek near Bloomington, IL
Looking Downstream, stage visualization

07/10/03



05580950 Sugar Creek near Bloomington, IL
Looking at right bank

07/10/03



05580950 Sugar Creek near Bloomington, IL
Looking downstream

07/10/03



05580950 Sugar Creek near Bloomington, IL
Looking Upstream

07/10/03

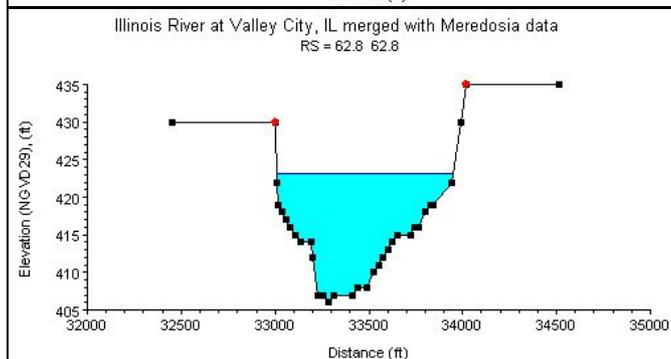
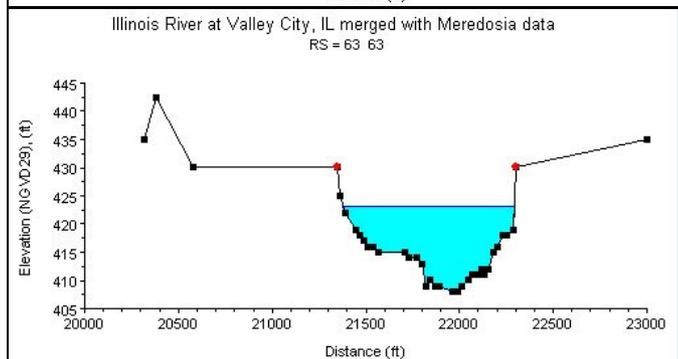
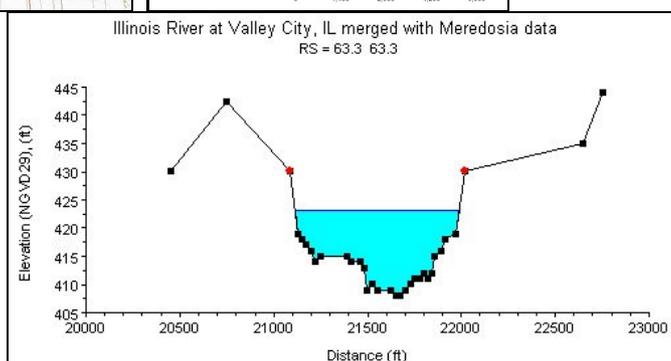
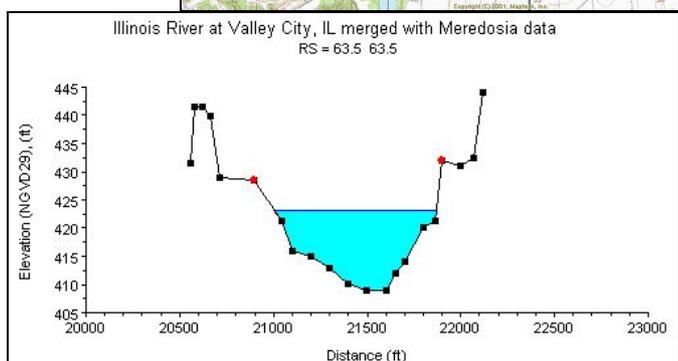
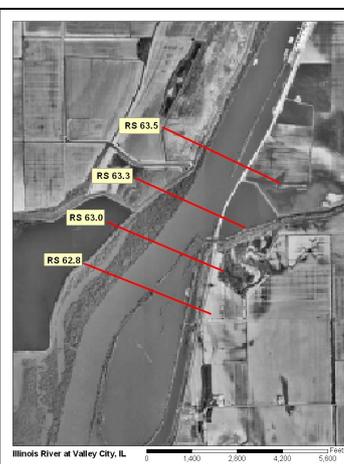
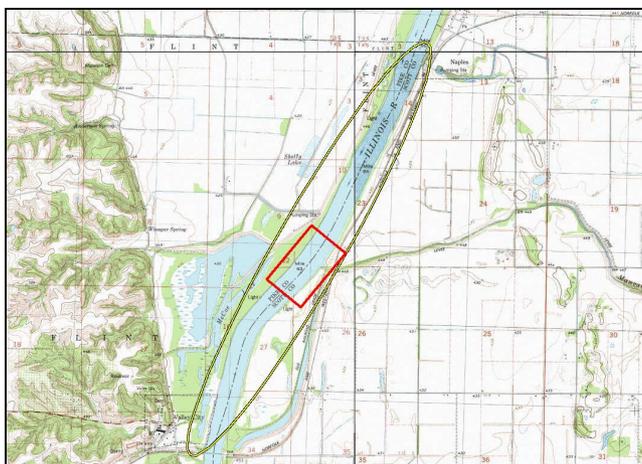
Description of Channel.--The study reach represents a channelized, straightened river in a suburban environment. The streambed material is sand and gravel with scattered small cobbles. Tall grasses and sparse small brush line both banks. Appreciable amounts of algae grow in the channel during summer months. The channel has moderately steep-sloping banks about 6 ft high. The top width varies from 70 ft to 90 ft. The channel bed has a flat bottom about 65 ft wide. The cross-sectional shape is trapezoidal. The channel is straight.

Floods.--Maximum discharge, 6,600 ft³/s, Dec. 3, 1982, gage height, 14.02 ft, from floodmark.

Estimated n-Values using Cowan s Approach.--0.022 - 0.035

Key words.--

Illinois River at Valley City, IL



Study Reach.--The reach under consideration is a free-flowing navigation channel. The study reach, approximately 3,700 ft long, is located from the State Highway 104 bridge near Meredosia to the County Road 10 bridge near Valley City, as shown in the quadrangle map shown in the top left. There are 24 surveyed cross sections (surveyed by the U.S. Army Corps of Engineers, in August 1998) available for describing the channel geometry, four of them are in the study reach. The channel alignment, approximate variations in channel width and bank conditions, and locations of the four cross sections are shown in the aerial photo on the top right. The general shapes of cross sections in the study reach are plotted above.

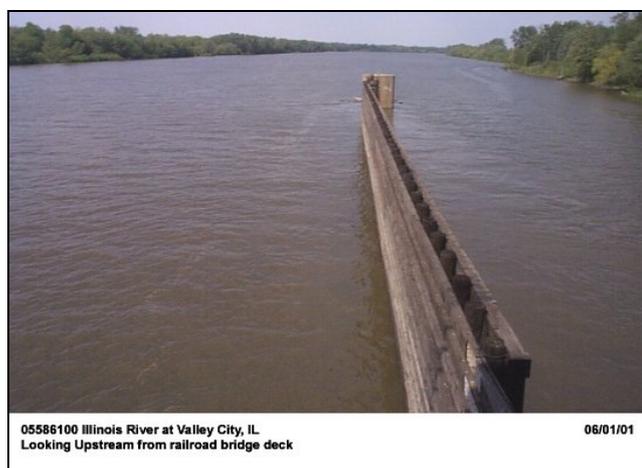
Gage Location.--Lat 39°42'12", long 90°38'43", in SE1/4 NW1/4 sec.34, T.15N., R.14W., Scott County, Hydrologic Unit 07130011, on upstream side of Norfolk & Southern Corporation Railroad bridge at Flints Creek, 0.4 mi east of Valley City, 1.8 mi downstream from Mauvaise Terre Creek, and at river mi 61.3. The USGS streamgage-station number is 05586100.

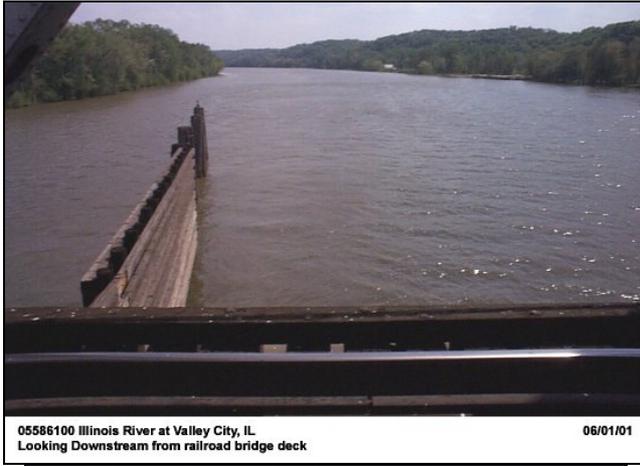
Drainage Area.--26,743 sq mi.

Gage Datum and Elevations of Reference Points.--This is a slope station site where the auxiliary gage is located at Illinois River at Meredosia, 9.5 miles upstream. Datum of both base and auxiliary gages is 418.00 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Since water year 1993, discharge measurements have been made by boat using an acoustic Doppler current profiler (ADCP) in the vicinity of the Valley City gage but away from the shear fence of the railroad bridge. Events for the n-value study were selected from the actual ADCP measurements that represent main-channel flows and free of backwater effects from the Upper Mississippi River (river stage at Grafton on the Mississippi River is lower than that at Valley City on the Illinois River by 2 ft).

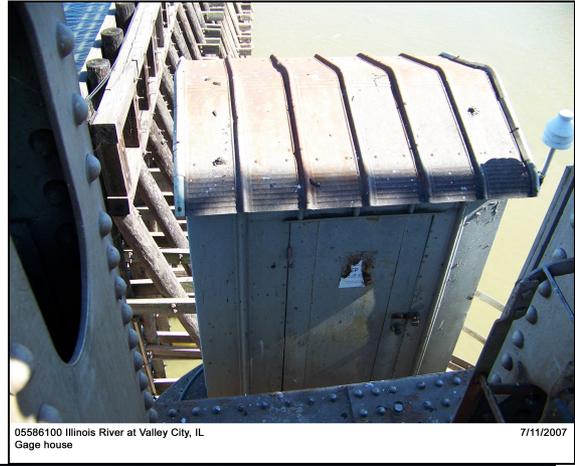
Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
10/9/2003	4290.0	6495.3	8.37	0.66	0.000002	0.014
10/24/2002	5700.0	6565.8	8.43	0.87	0.000002	0.011
1/9/2003	5770.0	6216.5	8.14	0.93	0.000006	0.015
8/22/2003	7340.0	6782.7	8.59	1.09	0.000004	0.011
7/24/2001	8830.0	7092.9	8.81	1.25	0.000006	0.012
9/6/2001	10500.0	7205.6	8.89	1.46	0.000008	0.012
8/1/2002	10500.0	7507.8	9.11	1.40	0.000008	0.012
1/29/2002	10700.0	7385.6	9.02	1.46	0.000011	0.015
4/24/2003	11400.0	7523.9	9.12	1.52	0.000007	0.011
10/4/2000	11700.0	7101.2	8.82	1.65	0.000015	0.015
1/24/2001	14500.0	8758.3	10.06	1.66	0.000011	0.014
12/13/2001	15900.0	9105.4	10.35	1.75	0.000016	0.016
7/10/2003	19400.0	9143.8	10.38	2.12	0.000020	0.015
3/5/2007	60000.0	23906.4	11.08	2.57	0.000038	0.017





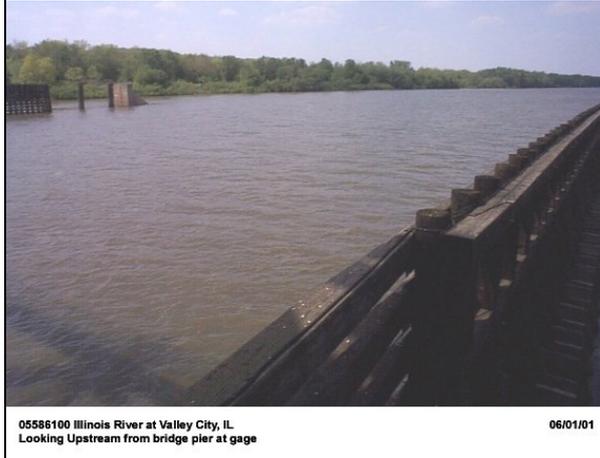
05586100 Illinois River at Valley City, IL
Looking Downstream from railroad bridge deck

06/01/01



05586100 Illinois River at Valley City, IL
Gage house

7/11/2007



05586100 Illinois River at Valley City, IL
Looking Upstream from bridge pier at gage

06/01/01



05586100 Illinois River at Valley City, IL
Low flow, looking upstream from railroad bridge

7/11/2007

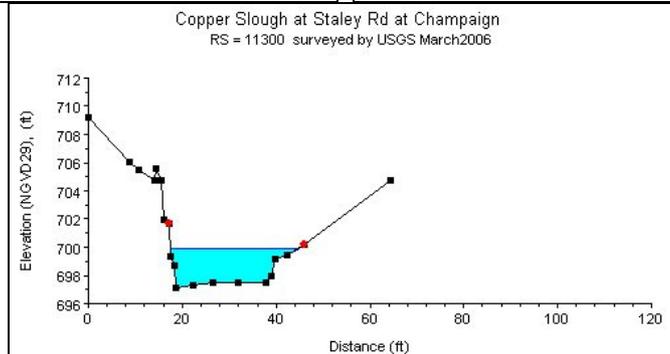
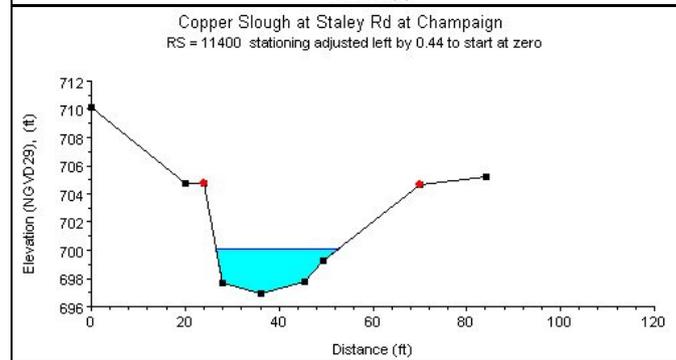
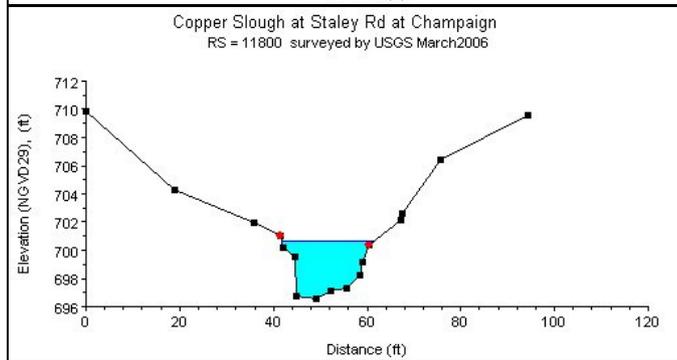
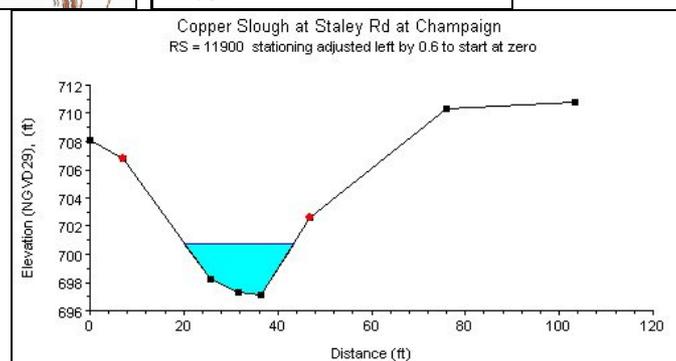
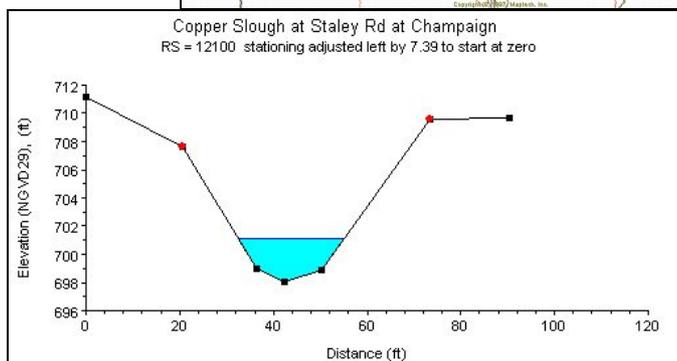
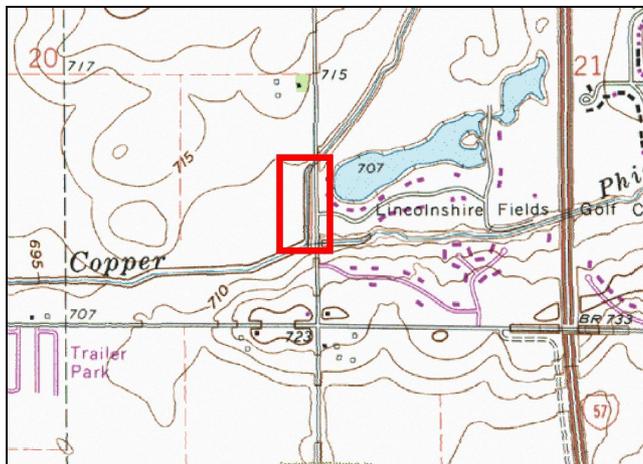
Description of Channel.--This channel is natural in the navigable river. The streambed at Valley City consists of silt, sand, and gravel. Cross-sectional geometry is a wide semicircle. Bank materials also are mixtures of silt, sand, and gravels with dense shrubs and trees on top of the bank. The average channel width at bank points is approximately 1000 ft with an average depth 22 ft. The study reach is straight except for a small bend in the lower portion. Longitudinal variation in channel width and cross-sectional shape is gradual.

Floods.--Maximum stage known, 27.00 ft. (8 a.m. to 12 p.m.) on May 26, 1943 at Valley City. Maximum discharge, 123,000 ft³/s, May 26-28, 1943, gage height, 28.61, May 26, 1943 at Meredosia. Flood of July 27, 1993, reached a stage of 25.95 ft., caused by backwater from the flooding on the Mississippi River. Flood stage occurs at a stage of 14.0 ft.

Estimated n-Values using Cowan s Approach.--0.016 - 0.020

Key words.--

Copper Slough at Staley Road at Champaign, IL



Study Reach.--The channel reach under consideration is a constructed channel in an urban setting, as shown on the quadrangle map at the top left. The study reach, about 750 ft. long, is located just downstream of the Staley Road bridge and upstream of the confluence with Phinney Branch. Four cross sections (surveyed by Clark-Dietz, Inc. in January 2005) are available for describing the channel geometries in the study reach. The channel alignment, approximate variations in channel width and bank conditions, and locations of cross sections are shown in the aerial photo on the top right. Because of the similarities in cross sectional geometries, cross sectional plots are river stations

(RS) 11900, 11800, 11400, and 11300, as plotted above, are selected as representative cross sections.

Gage Location.--Lat 40°05'20.5"N, long 88°18'50.7"W (NAD of 1983), in SW1/4 NW1/4 SW1/4 sec. 21, T.19N., R.08E., M.3, Champaign County, Hydrologic Unit 07140201, on right upstream side of bridge on Staley Road, immediately north of Lake Point Dr., 0.35 mi. north of Windsor Road (CR 1400 North), 0.6 mi. south of Kirby Avenue, and at river mile 2.3. The USGS streamgage-station number is 05590060.

Drainage Area.--8.26 sq mi.

Gage Datum and Elevations of Reference Points.--No gage is established at this site. Staff gage 2 is located 245 ft. downstream of the bridge, elevation of brass screw = 702.5675 ft. Staff gage 1 is located 488 ft. downstream of the bridge, elevation of brass screw = 702.428 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements and Computed n-Values.--Low-water measurements are made by wading at a cross section upstream of the confluence with Phinney Branch, near the RP-N2. High-stage measurements are made from the Staley Road bridge sidewalk. When possible, multiple discharge measurements were made during a rise and recession to provide data for calculating n-values over a range in stage. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
1/26/2007	7.8	9.6	0.61	0.90	0.000724	0.049
4/11/2007	36.1	17.6	0.99	2.16	0.000911	0.027
4/11/2007	36.8	17.3	0.97	2.25	0.000911	0.026
4/11/2007	37.2	17.0	0.96	2.31	0.000935	0.025
4/11/2007	38.1	17.5	0.98	2.30	0.000911	0.026
4/11/2007	38.5	17.3	0.97	2.35	0.000935	0.025
7/11/2006	63.1	28.9	1.43	2.24	0.001598	0.041
7/11/2006	64.4	30.6	1.50	2.13	0.001516	0.043
4/6/2006	152.0	53.0	2.06	2.88	0.001535	0.035
4/6/2006	156.0	53.6	2.07	2.93	0.001405	0.034
4/6/2006	156.3	53.8	2.07	2.92	0.001462	0.034
4/6/2006	164.2	53.3	2.06	3.10	0.001535	0.032
6/26/2007	371.0	135.0	3.26	2.77	0.000958	0.039



05590060 Copper Slough at Staley Rd at Champaign, IL
Gabion boxes, west of Staley Rd. 04/28/06



05590060 Copper Slough at Staley Rd at Champaign, IL
Looking downstream, below Staley Road 04/28/06



05590060 Copper Slough at Staley Rd at Champaign, IL
Looking downstream 04/28/06



05590060 Copper Slough at Staley Rd at Champaign, IL
Looking downstream below Staley Road 01/26/07



05590060 Copper Slough at Staley Rd at Champaign, IL
Looking upstream 04/28/06



05590060 Copper Slough at Staley Rd at Champaign, IL
Looking Downstream 06/26/2007



05590060 Copper Slough at Staley Rd at Champaign, IL
Looking Downstream 06/26/2007

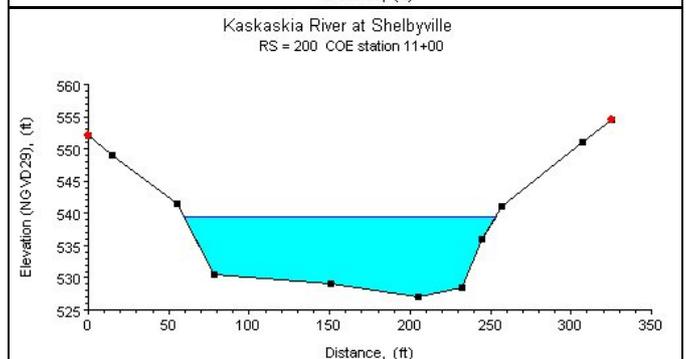
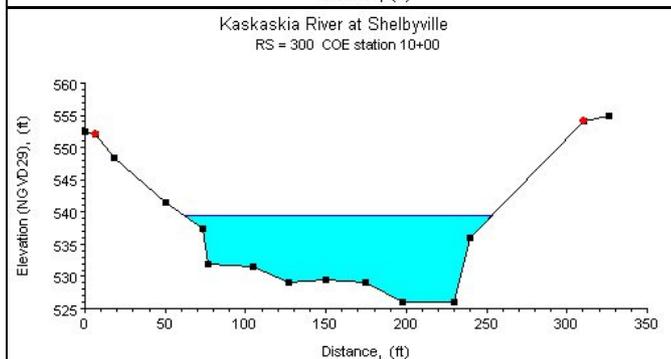
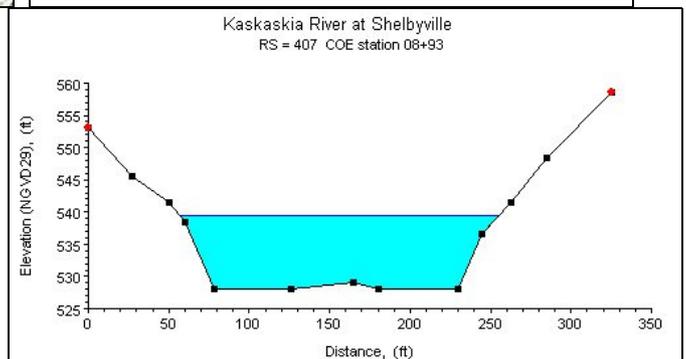
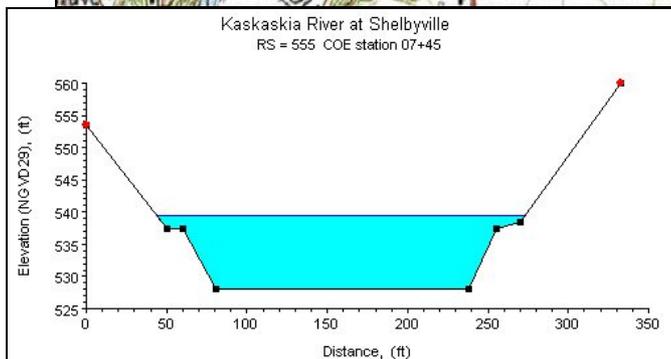
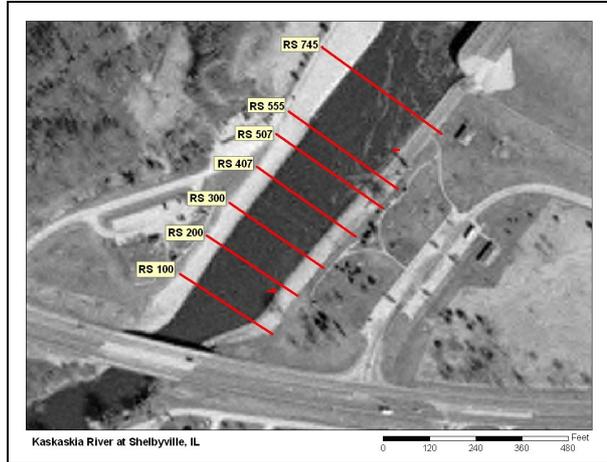
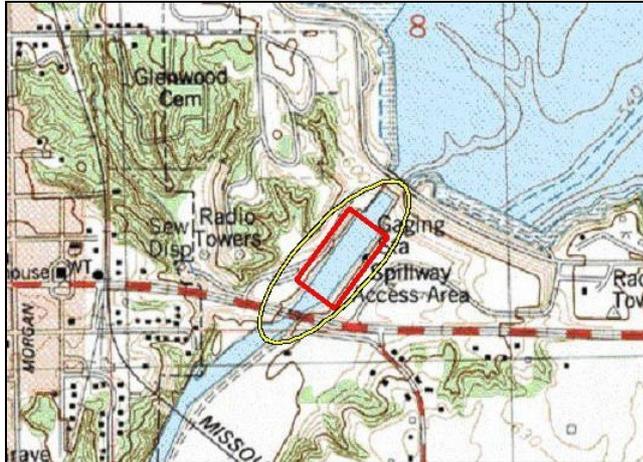
Description of Channel.--This channel has concrete sidewalls along the north end of the reach but reverts to a grassy embankment for the downstream portion. The bed material consists of mud, sand, gravel, and small cobbles. The low water control is the channel. Higher stages are controlled downstream of Staley Road by gabion boxes on both banks and a grassed, earthen berm above the gabions. The right-side berm is generally mowed as needed. The bed is filled with gravel, sand, and small cobbles. Banks are wire gabion boxes filled with crushed rocks stacked three tiers high.

Floods.--

Estimated n-Values Using Cowan s Approach.--

Key words.--

Kaskaskia River at Shelbyville, IL



Study Reach.--The channel reach under consideration is constructed with riprap on both bank. The study reach, approximately 600 ft long, extends from upstream of the gage house to the upstream side of the State Highway 16 Bridge, as shown in the quadrangle map on the top left. Seven surveyed cross sections are available to describe the channel geometries. The channel alignment, approximate variations in channel width and bank conditions, and locations of surveyed cross sections are shown in the aerial photo on the top right. Cross-sectional geometries vary gradually and continuously from upstream to downstream. Seven surveyed cross sections (surveyed by the U.S. Army Corps of Engineers 1980) are available to describe channel geometry. The general shapes of cross sections in the study reach are illustrated with four selected cross section, (see plots above).

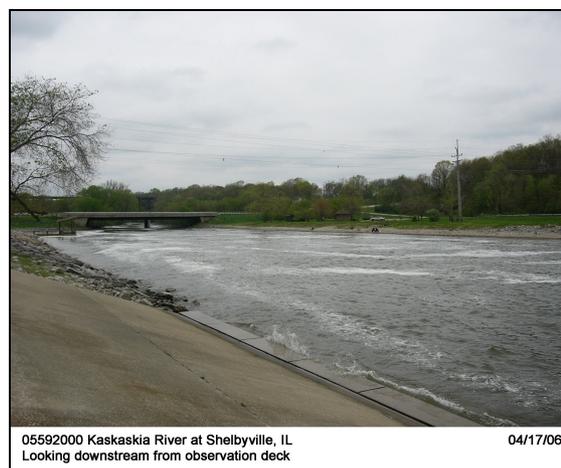
Gage Location.--Lat 39°24'26", long 88°46'53" (revised WY 2000), in SE1/4 SW1/4 sec.8, T.11N., R.4E., Shelby County, on left bank 700 ft upstream from bridge on State Highway 16 in Shelbyville, 700 ft downstream from Shelbyville dam, 0.5 mi upstream from railroad bridge, and 7 mi upstream from Robinson Creek, and at river mi 197.5. The USGS streamgage-station number is 05592000.

Drainage Area.--1,054 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 530.00 ft. Reference point. RP-4, is two file marks on the top of the upstream side of the ladder at the cleanout doorsill of the stilling well at the USGS station, elevation=554.935 ft; reference point for n-value study, RP-N1, is the top of the lag bolt on the streamward side of the downstream, streamward post of the observation deck 450 ft downstream of the gage, elevation=547.31 ft; RP-N2 is the top of the nut on concrete anchor bolt set in the downstream face of the concrete guardrail on the bridge for the east bound lanes of State Highway 16 at station number 122, elevation=565.834 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured at the gage house and RP-Ns at midway, and downstream of the study reach for each discharge measurement. Corresponding water-surface slopes were obtained by dividing the differences in water-surface elevations by the distance between the selected locations. Discharge measurements were made using the conventional current meter or tethered boat acoustic Doppler current profiler (ADCP). Because this site has stable stage-discharge rating curve, discharge for an event could be determined from the rating curve if the surveyed water stage is within the range of stable rating. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
11/21/2003	724.0	1709.8	8.70	0.42	0.000023	0.071
7/21/2004	988.0	1831.5	9.09	0.54	0.000023	0.056
4/19/2004	1490.0	2081.5	9.82	0.71	0.000034	0.053
1/6/2004	2880.0	2780.6	11.51	1.04	0.000115	0.078
1/6/2004	2930.0	2806.5	11.57	1.05	0.000115	0.077
1/13/2004	3110.0	2915.8	11.82	1.07	0.000115	0.076
1/16/2004	3280.0	2903.1	11.79	1.13	0.000092	0.063
4/17/2006	3775.0	3050.3	12.12	1.24	0.000082	0.070





05592000 Kaskaskia River at Shelbyville, IL
Looking upstream, from observation deck
04/17/06



05592000 Kaskaskia River at Shelbyville, IL
Looking upstream from observation deck
04/17/06



05592000 Kaskaskia River at Shelbyville, IL
Looking Downstream
01/16/04
n = 0.063



05592000 Kaskaskia River at Shelbyville, IL
Looking Downstream
03/05/04



05592000 Kaskaskia River at Shelbyville, IL
Looking Downstream from gage house
01/13/04
n = 0.076



05592000 Kaskaskia River at Shelbyville, IL
Looking Downstream from gage house
01/06/04
n = 0.077



05592000 Kaskaskia River at Shelbyville, IL
Looking Upstream from bridge
01/06/04
n = 0.077

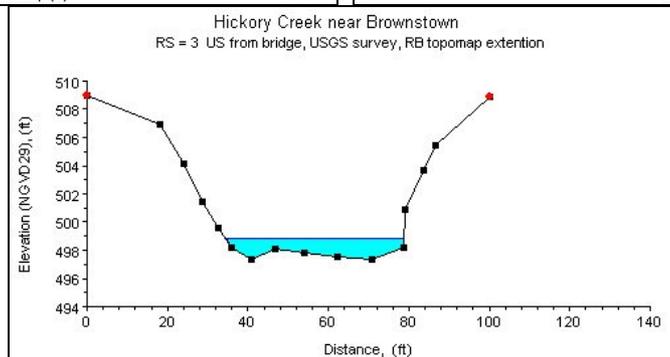
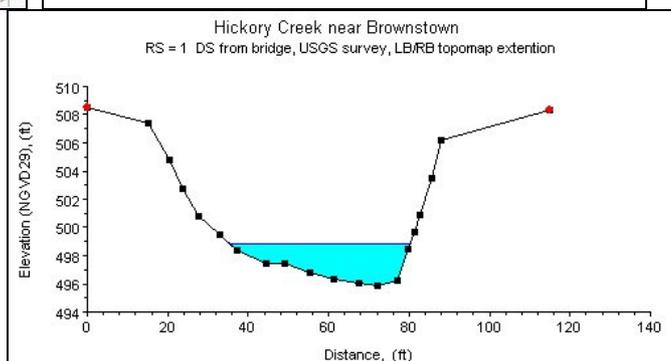
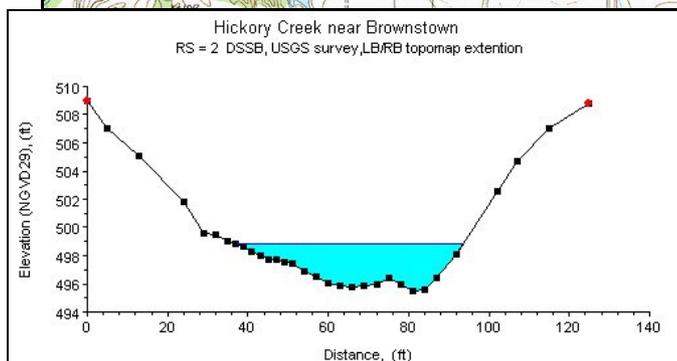
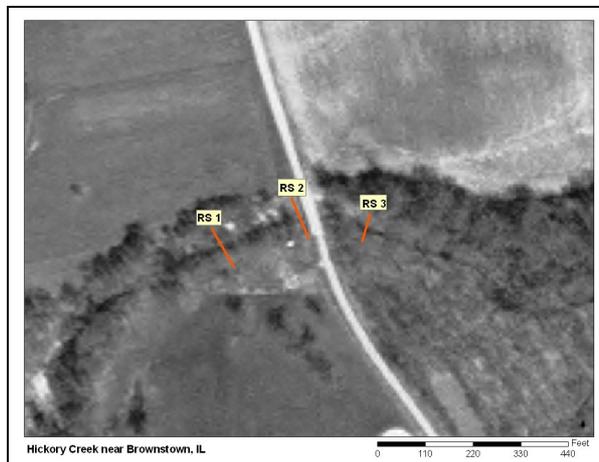
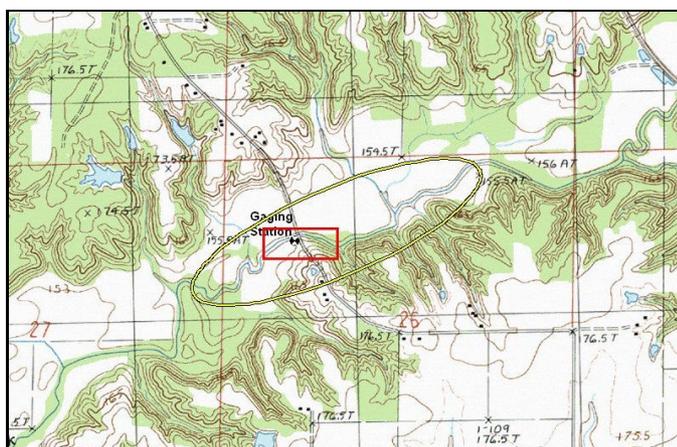
Description of Channel.--This channel is constructed with riprap paved banks. Bed materials consist of boulders and cobbles and bank material consists of boulder and cobble sized riprap. The banks are about 30 ft high and have a top width of about 325 ft. The cross-sectional shape is trapezoidal with a bottom width approximately 150 ft. The study reach is straight.

Floods.--Maximum stage during period of record, 22.37 ft (discharge, 25,900 ft³/s) June 29, 1957. Maximum daily discharge since construction of Shelbyville Reservoir, 5,580 ft³/s on Mar. 22, 1998, gage height, 12.99 ft, datum then in use. Maximum stage since construction of Shelbyville Reservoir, 13.16 ft, Mar. 20, 1982, datum then in use. Flood of June 1, 2002, gage height 17.65 ft, present datum, discharge, 4,920 ft³/s.

Estimated n-Values using Cowan s Approach.--0.09

Key words.--

Hickory Creek near Brownstown, IL



Study Reach.--The channel under consideration is natural and meandering in a rural area. The study reach, 300 ft long, is slightly off center of the county bridge, as shown in the quadrangle map on the top left. There are three cross sections (surveyed by the U.S. Geological Survey in March 2000) available for describing geometric characteristics in the study reach (see plots above). The channel alignment, approximate channel width and bank conditions, and locations of channel cross sections are presented in the aerial photo on the top right.

Gage Location.--Lat 38°56'12", long 88°57'10", in NW1/4 NW1/4 sec.26, T.5N.,R.2E., Fayette County, Hydrologic Unit 07140202, on left bank at downstream side of county bridge, about 4 mi south of Brownstown, 4.3 mi above Little Hickory Creek, and at river mi 12.0. The USGS streamgage-station number is 05592575.

Drainage Area.--44.2 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 493.37 ft. A wire-weight gage attached to downstream handrail of the bridge on County Road 1575. A reference point for the n-value study, (RP-N5) is a nail in overhanging tree about 150 ft upstream from the bridge on the left bank; elevation = 502.95 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured by tape down at RP-N5 and by reading the WVG at the county bridge before and after the discharge measurements. In addition, a series of high water marks were obtained along the study reach. Corresponding water-surface slope was determined by dividing the water-surface elevations by the distances between pairs of high water marks and/or the reference point. Discharge measurements were made with conventional current-meter method. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
1/25/1999	77.6	84.4	1.67	1.05	0.000022	0.028
1/22/1999	2980.0	764.1	6.74	4.03	0.002254	0.061



05592575 Hickory Creek near Brownstown, IL
Low flow, control 09/08/04



05592575 Hickory Creek near Brownstown, IL
Looking Upstream



05592575 Hickory Creek near Brownstown, IL
Looking Downstream

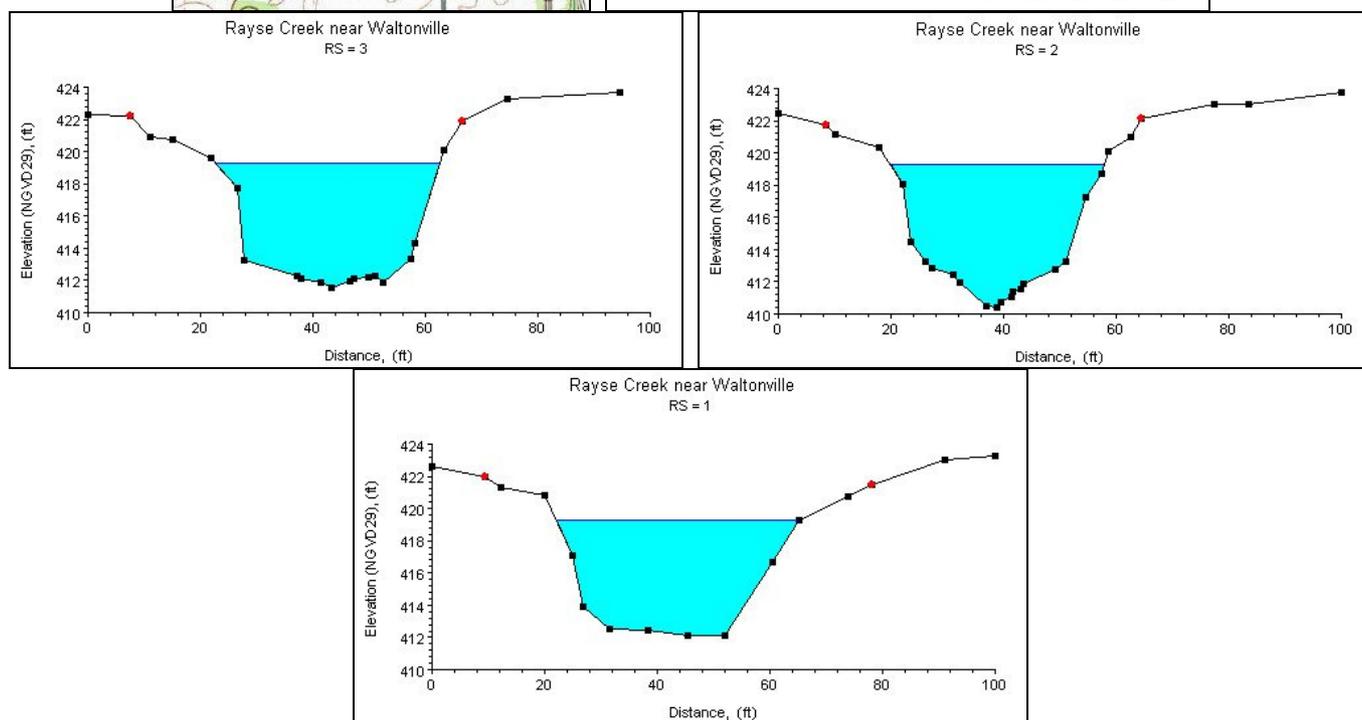
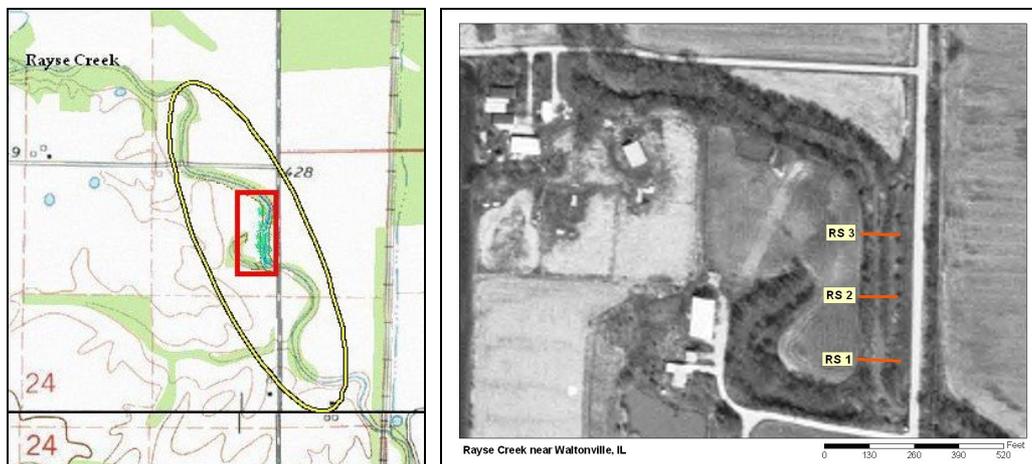
Description of Channel.--This channel is a natural channel. The study reach is located in a meandering section. The bed material consists of medium sized gravels. Channel cross section can be described as trapezoidal. The width of the channel bottom is approximately 40 ft and approximately 80 ft at the top of the bank. Bank height is approximately 10 ft. Both bank faces are lined with grass and trees grow on top of the banks. Beyond the initial line of trees, the vegetation becomes less dense on the floodplain.

Floods.--Flood of May 13, 2002, reached a stage of 16.73 ft; discharge of 6,850 ft³/s.

Estimated n-Values using Cowan s Approach.--0.038 ~ 0.055

Key words.--

Rayse Creek near Waltonville, IL



Study Reach.--The channel under consideration is a meandering reach of a natural channel, as shown in the quadrangle map on the top left. The study reach is 310 ft long and extends about 400 ft upstream from the bridge on County Road 600E. Three surveyed cross sections (surveyed by the U.S. Geological in April of 2003) are available for characterizing the channel geometry in the study reach (see plots above). The alignment of the study reach, approximate variations in channel width and bank conditions, and locations of the surveyed cross sections are shown in the aerial photo on the top right.

Gage Location.--Lat $38^{\circ}15'14''$, long $89^{\circ}02'23''$, in NE1/4 NE1/4 sec.24, T.3S., R.1E., on right bank at upstream side of bridge on County Road 600E, 1.2 mi. downstream from Knob Creek, 2.4 mi downstream from Novak Creek, 3.0 mi north of Waltonville, Jefferson County, and at mile 6.7. The USGS streamgage-station number is 05595730.

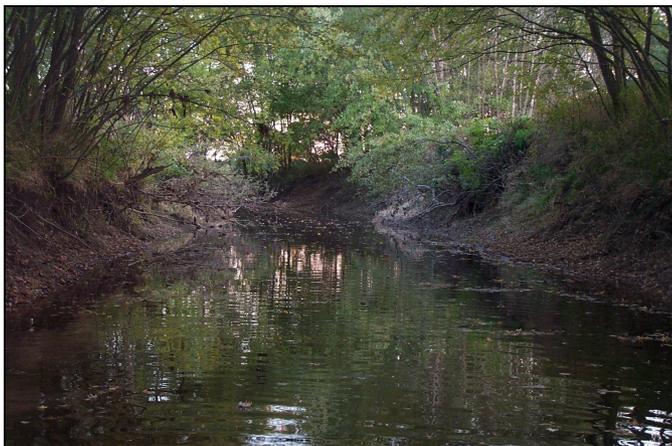
Drainage Area.--88.0 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 412.00 ft. Staff gage 1 is located 400 ft upstream of the gage house, elevation of brass screw = 416.838 ft. Staff gage 2 is located about 180 ft upstream of the gage house, elevation of brass screw = 416.977 ft. A wire-weight gage (WWG) is attached to the upstream side of the

bridge on 600E. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured from the staff gages and the WWG before and after each discharge measurement. Discharge measurements were made using the conventional current-meter method. Discharges at very high stages were not used for n-values studies because of a flow diversion 0.5 mi upstream of the gage and flow over the road. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
1/25/1999	82.4	85.9	2.57	0.97	0.000438	0.053
5/8/2003	315.0	174.8	4.27	1.80	0.000173	0.028
5/8/2003	561.0	250.3	5.07	2.24	0.000173	0.027
5/9/2003	846.0	345.9	5.15	2.45	0.000500	0.041
4/7/2006	908.0	343.7	5.13	2.64	0.000438	0.035



05595730 Rayse Creek near Waltonville, IL
Looking Upstream from right bank 01/25/99



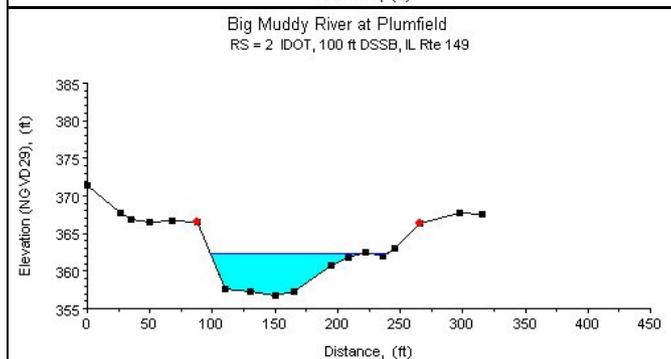
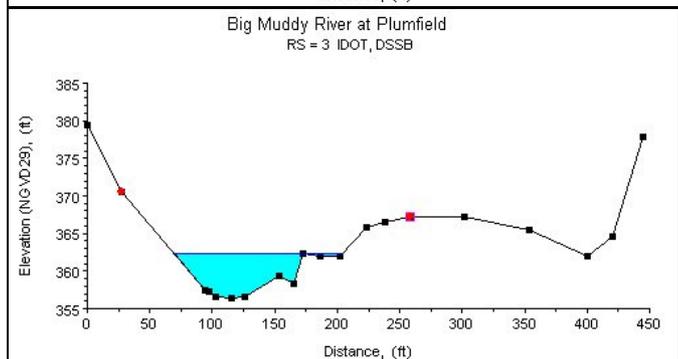
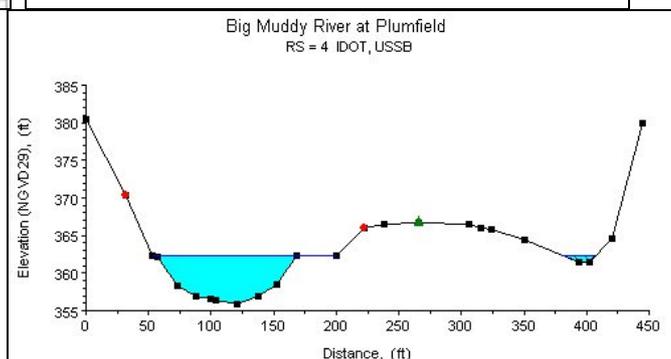
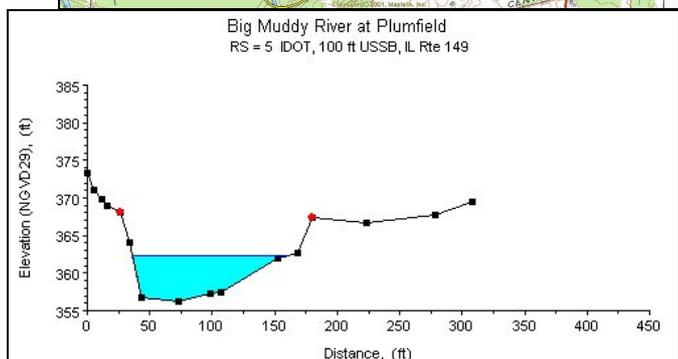
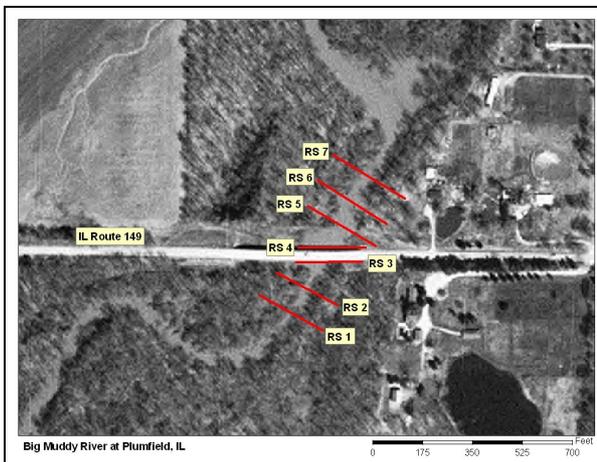
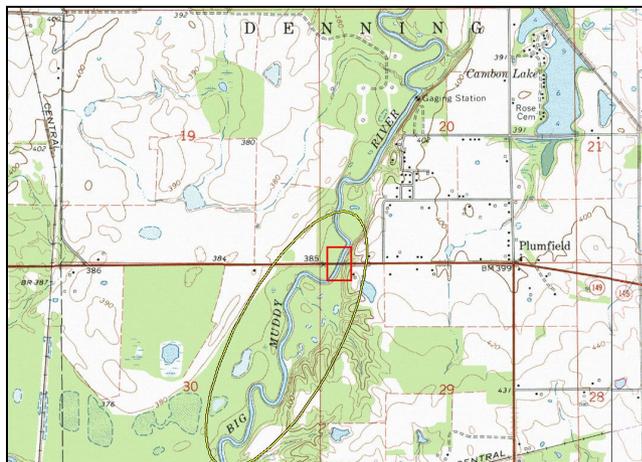
Description of Channel.--The channel is a straightened reach of a natural channel. Streambed consists of silt, clay, and gravel mixtures. The streambed is subject to growth of aquatic vegetation during the spring through fall months. Bank material consists of bare earth with tree roots. Cross sections are generally in trapezoidal shape with encroachment occurring at the center of the channel. Bottom width is approximately 25 ft; banks are about 10 ft high and have a top width of about 60 ft. Both banks are fairly steep. Canopy cover overhangs the channel. Channel is subject to log and debris jams throughout the year.

Floods.--Nov. 14, 1993; gage height 17.73 ft; discharge 21,200 ft³/s, based on indirect measurement of contracted openings on Nov. 22-23, 1993.

Estimated n-Values using Cowan s Approach.--0.031 ~ 0.054

Key words.--

Big Muddy River at Plumfield, IL



Study Reach.--The reach under consideration has a series of bends, as shown in the quadrangle map on the top left. The study reach selected, approximately 535 ft long, is centered on the bridge on State Highway 149. There are seven surveyed cross sections (surveyed by the Illinois Department of Transportation, in December 1997) available for evaluating the channel geometry in the study reach. The alignment of study reach, approximate variations in channel width and bank conditions, and locations of surveyed cross sections are shown in the aerial photo on the top right. Cross-sectional geometries vary gradually and continuously from upstream to downstream. The general shapes of cross sections in the study reach are represented with cross sections at river station (RS) 2, 3, 4, and 5 (see plots above).

Gage Location.--Lat $37^{\circ}54'05''$, long $89^{\circ}00'50''$, in NW1/4 sec.20, T.7S., R.2E., on left bank 0.8 mi upstream from bridge on State Highway 149, about 1.9 mi downstream from mouth of Middle Fork Big Muddy River, and about 0.8 mi north and west of intersection of Route 149 and Plumfield road, Franklin County. Auxiliary gage located at Zeigler, about 4 mi downstream. The auxiliary gage was discontinued September 30, 1991. The USGS streamgage-station number is 05597000.

Drainage Area.--794 sq mi.

Gage Datum and Elevations of Reference Points.--This is a slope station where the auxiliary gage is located at Zeigler, 4 mi downstream. Datum of gage is 353.24 ft. From November 13, 1938, to September 30, 1974, the datum at the auxiliary gage was 5.0 ft higher. The outside gage at the base gage consists of a series of staff gages mounted either on piers, or the landward side of the gage house, elevation of brass screw = 360.958 ft. A wire-weight gage (WWG) was located at Zeigler pump station, 4 mi downstream (datum = 353.24 ft). All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Stage and discharge data for the n-value studies were retrieved from measured discharge records for this slope station site. Water-surface elevations were measured from the staff gage at the base gage and from the WWG at Zeigler at the time of the discharge measurement. Discharge measurements were made using the conventional current-meter method. For the present n-value analysis, events of no over-the-bank flows were selected from record prior to September 30, 1991. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
11/27/1974	369.0	500.1	3.25	0.75	0.000140	0.051
8/19/1975	424.0	521.6	3.29	0.83	0.000140	0.047
9/10/1974	469.0	648.7	3.87	0.74	0.000148	0.055
12/12/1974	478.0	627.5	3.77	0.78	0.000144	0.051
6/10/1975	610.0	776.8	4.40	0.81	0.000148	0.055
1/20/1975	954.0	1178.3	5.65	0.86	0.000145	0.062





05597000 Big Muddy River at Plumfield, IL
Low flow, left bank downstream of bridge
7/24/2007



05597000 Big Muddy River at Plumfield, IL
Low flow, left bank upstream of bridge
7/24/2007



05597000 Big Muddy River at Plumfield, IL
Low flow, right bank downstream of bridge
7/24/2007



05597000 Big Muddy River at Plumfield, IL
Low flow, right bank upstream of bridge
7/24/2007



05597000 Big Muddy River at Plumfield, IL
Right bank looking Upstream



05597000 Big Muddy River at Plumfield, IL
Looking Downstream



05597000 Big Muddy River at Plumfield, IL
Center of channel looking Upstream

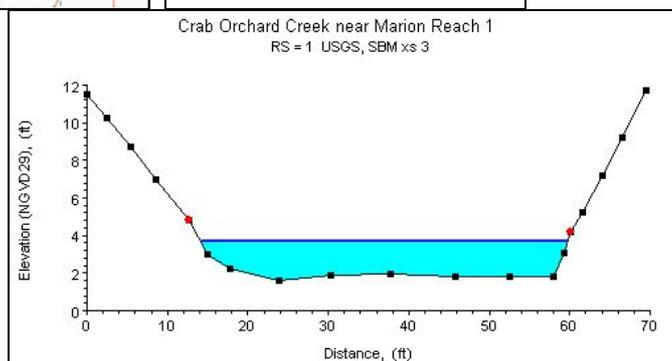
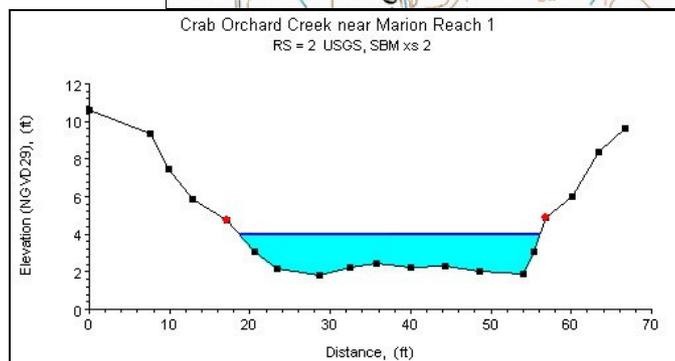
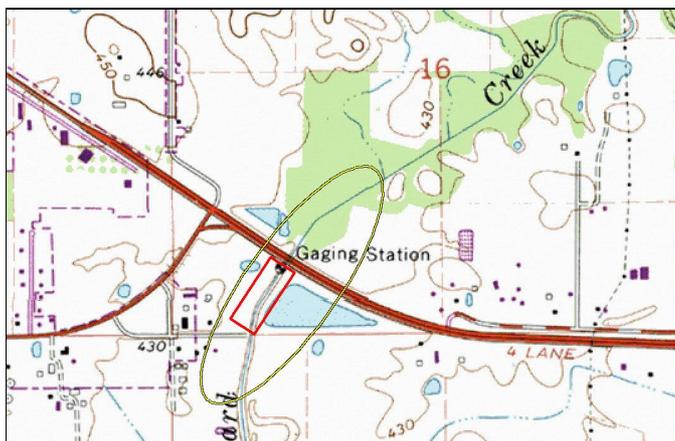
Description of Channel.--This channel is natural. The study reach can be described as in the straight section of a bend. General cross sectional geometry is in trapezoidal shape. The bed material consists of bedrock overlain with mud and silt. Bottom width of the channel is about 50 ft. The left bank is steeper than the right bank and wooded. The right bank is partially wooded. The bank height is approximately 12 ft. The top width varies from approximately 150 to 200 ft.

Floods.--May 10, 1961, 42,900 ft³/s; maximum gage height 29.67 ft, datum then in use; Maximum discharge since construction of Rend Lake, 14,200 ft³/s, May 1, 1996, gage height, 31.83 ft; Maximum gage height since construction of Rend Lake, 31.84 ft, May 4, 1983.

Estimated n-Values using Cowan s Approach.--0.035 ~ 0.039

Key words.--

Crab Orchard Creek near Marion, IL Reach 1



Study Reach.--The channel reach under consideration is a natural channel regulated in urban settings. The study reach, approximately 620 ft long, is a channelized portion of the stream located from the downstream side of the State Route 13 bridge to just above a drainage ditch leading out of the lake (approximately 800 ft downstream), as shown in the quadrangle map on the top left. Three surveyed channel cross sections (surveyed by the Illinois Department of Natural Resources in June 2005) are available for describing the channel geometries (see plots above). The alignment of the study reach, approximate variations in channel width and bank conditions, and locations of the three cross sections are shown in the aerial photo on the top right.

Gage Location.--Lat $37^{\circ}43'52''$, long $88^{\circ}53'21''$, in SW1/4 SW1/4 sec.16, T.9S., R.3E., on right bank at downstream side of bridge on State Route 13, 1.8 mi downstream from Buckley Creek, 2 mi east of the town square in Marion, Williamson County, and at river mi 32.9. The USGS streamgage-station number is 05597500.

Drainage Area.--31.7 sq mi.

Gage Datum Elevations of Reference Points.--Datum of gage is 415.82 ft. A wire-weight gage (WWG) is located on the downstream side of State Route 13 bridge. A reference point for n-value study, RP-N1 is two file marks located on the 3rd upright I-beam from the right edge of water on the upstream side of 900N Road bridge, elevation=430.874 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations at the USGS streamflow gage and the access road bridge were measured at the time of the discharge measurement. Water-surface slope was determined by dividing the difference in elevations and the distance between them. Discharge was measured using the conventional current meter method. Flow through a box culvert 500 ft east of the gage on Route 13 starts when stage in main channel reaches about 9.3 ft. The point of zero flow of the lake spillway is 7.8 ft gage datum. Events with stage higher than 7.8 ft were not used in the n-value study because of this concern. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the

measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
1/27/1999	23.3	37.7	1.18		0.000198	0.038



Description of Channel.--This channel is a dredged and straightened, located in an urban setting. The bed is composed of clay-sand-fine gravel mixtures. The channel is subject to heavy vegetation as well as scour and fill, and can be cluttered with logjams, debris jams, and beaver dams. The channel shape can be described as rectangular and the channel alignment is straight. Both banks are low, full of brush, and will overflow at about 11 ft. The bank face is covered with exposed tree roots and clay-sand mixtures. The left bank is a levee, which separates the creek from a borrow-pit lake. The right flood plain is grassy pasture.

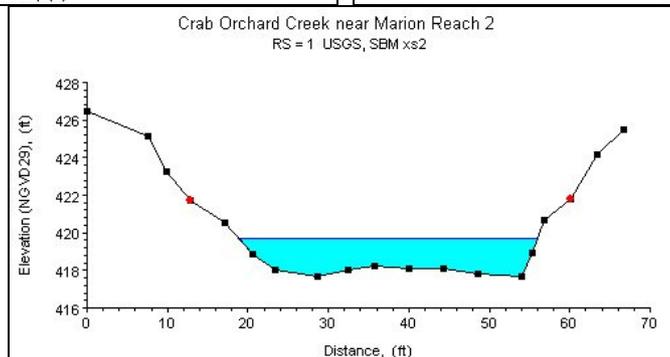
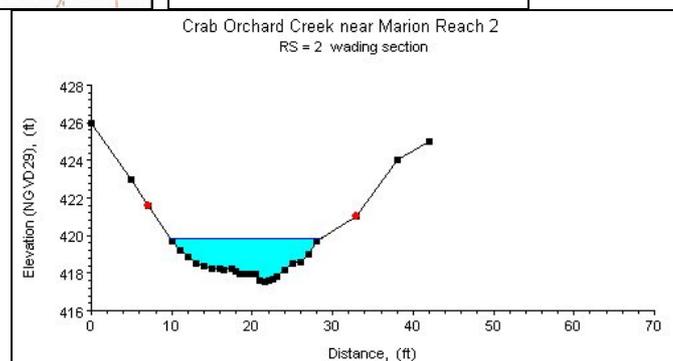
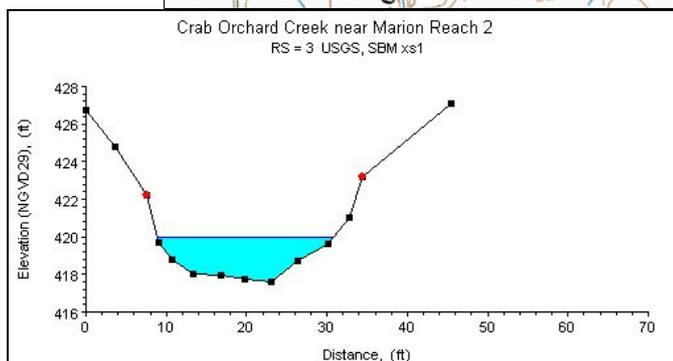
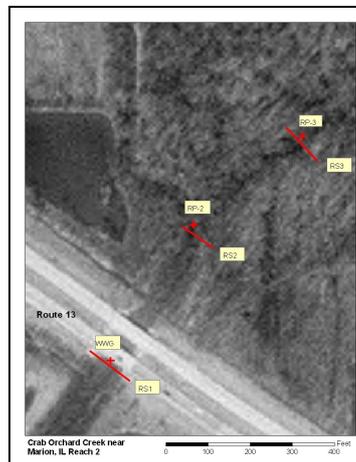
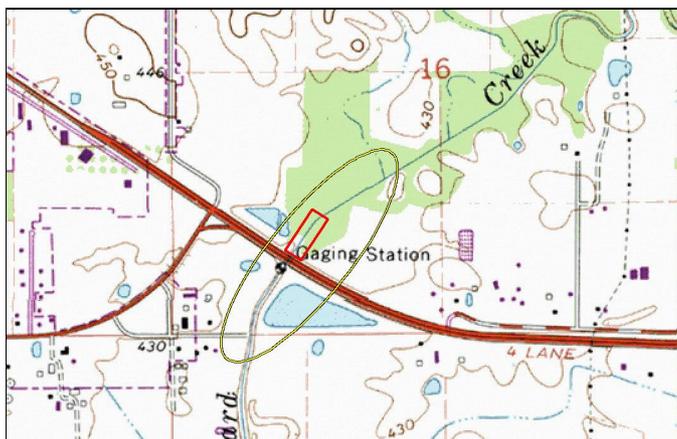
Floods.--Dec. 17, 2001, Discharge 9,430 ft³/s, gage height 13.63 ft; May 11, 1996, 9,270 ft³/s (gage height, 13.60 ft), determined by indirect measurement (contracted opening with culvert overflow).

Estimated n-Values using Cowan s Approach.--0.036 - 0.041

Key words.--

Size (w/d aspect ratio) .--

Crab Orchard Creek near Marion, IL Reach 2



Study Reach.--The channel reach under consideration is dredged in an urban setting. A study reach, approximately 600 ft long, is selected that extends upstream from the State Route 13 bridge as shown on the quadrangle map on the top left. Three surveyed cross sections (surveyed by the Illinois Department of Natural Resources in June 2005) are available for describing the channel geometries of the study reach (see plots above). The channel alignment, approximate variations in channel width and bank conditions, and locations of cross sections are shown in the aerial photo on the top right.

Gage Location.--Lat 37°43'52", long 88°53'21", in SW1/4 SW1/4 sec.16, T.9S., R.3E., on right bank at downstream side of bridge on State Route 13, 1.8 miles downstream from Buckley Creek, 2 mi east of the town square in Marion, Williamson County, and at river mile 32.9. The USGS streamgage-number is 05597500.

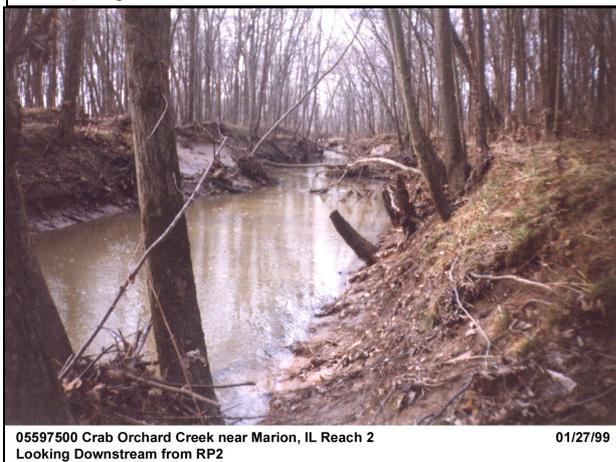
Drainage Area.--31.7 sq mi.

Gage Datum and Elevations of Reference Points.--Datum of gage is 415.82 ft. A wire-weight gage (WWG) is located on the downstream side of State Route 13 bridge. Reference points (RP) for the n-value study are located along the channel on the right bank. RP-2 is a nail in a tree located 795 ft upstream from the WWG, elevation=428.10

ft. RP-1 is a nail in a tree located 443 ft upstream from the WWG, elevation=429.21 ft. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements, and Computed n-Values.--Water-surface elevations were measured by tape down from the RP s and by reading the WWG at the time of discharge measurement. Discharge was measured using conventional current-meter methods. Flow through a box culvert 500 ft east of the gage on Route 13 starts when stage in main channel reaches about 9.3 ft. Because of this lateral diversion, events with stage higher than 9.0 ft were not used in the n-values study. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high state in order to illustrate contributing factors of n-value at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
1/27/1999	23.3	40.3	1.48	0.64	0.000664	0.056



Description of Channel.--This channel has been straightened and dredged. The channel bed consists of clay-sand-fine gravel mixtures. The bank face is a clay and sand mixture, covered with exposed tree roots and stumps. The top of the banks are covered with trees, brush, and weeds. Both banks are low and will overflow at a stage of about 11 ft. The channel shape can be described as rectangular and channel alignment is straight. The channel is subject to scour and fill. Often, the channel reach is cluttered with logjams, debris jams, and beaver dams.

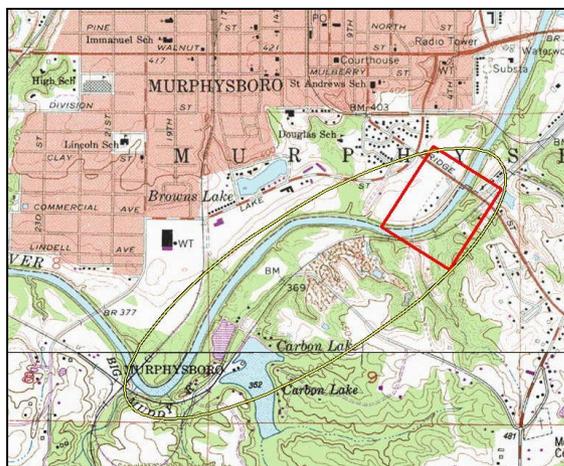
Floods.--Dec. 17, 2001, Discharge 9,430 ft³/s, gage height 13.63 ft; May 11, 1996, 9,270 ft³/s (gage height, 13.60 ft), determined by indirect measurement (contracted opening with culvert overflow).

Estimated n-Values using Cowan s Approach.--0.041 - 0.055

Key words.--

Size (w/d aspect ratio) .--

Big Muddy River at Murphysboro, IL



Study Reach.--The reach under consideration is a wide, natural meandering channel. The study reach, 8900 ft long, extends from the USGS auxiliary gage on Route 127 bridge to the USGS base gage, located just upstream of the South Twentieth Street bridge, as shown is the quadrangle map on the top left. The alignment of study reach, approximate variations in channel width and bank conditions, and locations of surveyed cross sections are shown in the aerial photo on the top right.

Gage Location.--Lat 37°44'55", long 89°20'45", in SE1/4 SE1/4 sec.8, T.9S., R.2W., Jackson County, on left bank just upstream from Lewis Creek, 0.2 mile upstream from South Twentieth Street bridge, at Murphysboro, and at river mile 36.0. The USGS streamgage station number is 05599500.

Drainage Area.--2,169 sq mi.

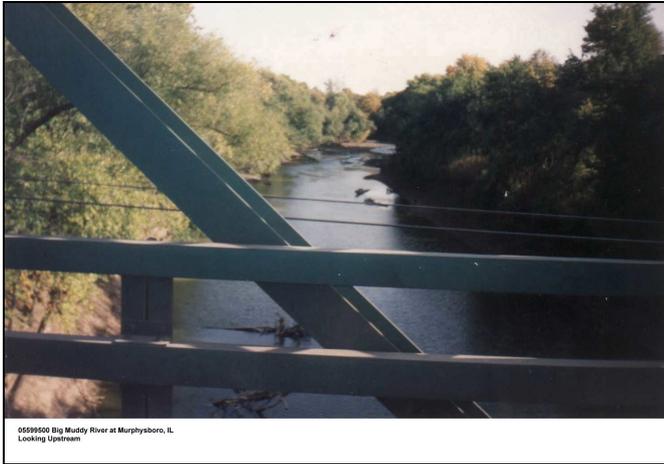
Gage Datum and Elevations of Reference Points.--This is a slope station where the auxiliary gage is located at Route 127 bridge, 1.5 miles upstream. Datum of gage is 335.50 ft. Reference gage is a low staff gage mounted on left concrete abutment on abandoned remains of the old railroad bridge, elevation of brass screw = 344.996 ft. At medium and high stages, outside water surface readings may be obtained by taping down from reference points, RP-7, which is at head of cadmium bolt in streamward face of right abutment on upstream end, elevation = 373.249 ft; or from RP-8, which is at head of cadmium bolt in streamward face of right abutment, elevation = 366.916 ft. A wire weight gage (WWG) is located on the upstream side of Rt. 127 bridge. All elevations are in NGVD 1929 convention.

Stage, Discharge Measurements and Computed n-Values.--Stage and discharge data for the n-value studies were retrieved from measured discharge records of this slope station site. Water surface elevations were measured from the WWG at the auxiliary gage and from the staff gage or from RP-7 or RP-8 at the base gage at the time of the discharge measurement. Discharge measurements are made using the conventional current-meter method. Because backwater from the Mississippi River could occur when the elevation at Grand Tower station reached or exceeded 338.6 ft (16.67 ft gage datum), events having such concerns were not selected. The computed n-values are listed in the following table. Whenever possible, the computed n-values are associated with a photo taken at the time of the measurement. The photos are arranged from low stage to high stage in order to illustrate contributing factors of n-values at a particular stage.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
3/17/1993	3500.0	2850.0	14.12		0.000025	0.036
5/5/1997	3570.0	3080.0	11.27		0.000026	0.034

3/16/1995	6190.0	3220.0	9.94
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0.000054	0.027
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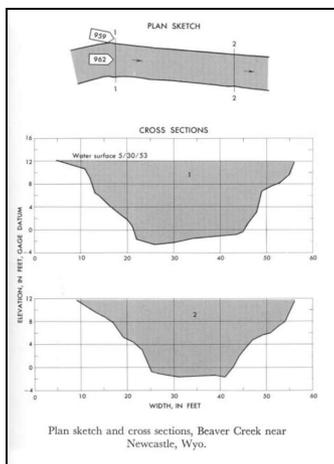
Description of Channel.--This channel is a natural channel. The bed material consists of bedrock overlain with mud and gravel. Low-water channel is subject to seasonal vegetation as well as scour and fill. Both banks are steeply sloped and wooded, overflowing at a stage of about 18 ft into cultivated flood plains. The study reach can be described as meandering, with three large bends.

Floods.--May 2, 1996, 33,800 cfs, gage height 36.33 ft; May 11, 1961, 33,300 cfs; maximum gage height, 37.97 ft May 12, 1961. During the Great Flood of the Mississippi River during the summer of 1993, the site went into reverse flow for several periods. The maximum reverse flow measured was -2,610 ft³/s on Aug. 6, 1993.

Estimated n-Values using Cowan s Approach.--

Key words.--

Beaver Creek near Newcastle, Wyo (Barnes)



Study Reach.--Section 1 is about 300 ft downstream from gage.

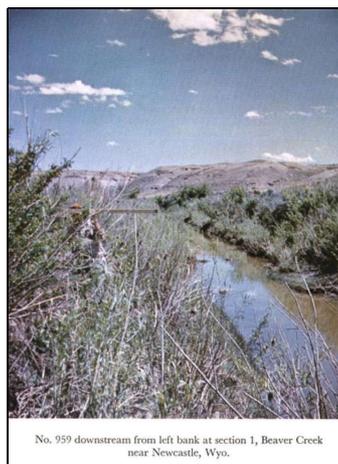
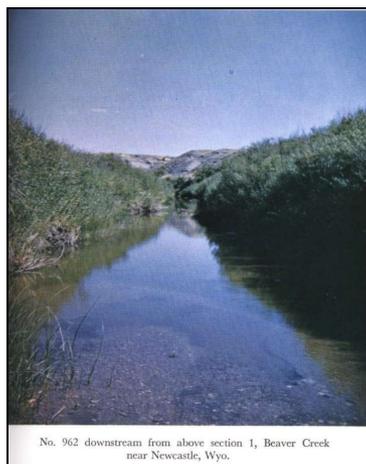
Gage Location.--Lat 43°32'05", long 104°07'00", in NW1/4 sec.18, T.41N., R.60W., at highway bridge, 2.5 miles down stream from Sheep Creek, and 23 miles south of Newcastle.

Drainage Area.--1,320 sq mi., approximately.

Gage Datum and Elevations of Reference Points.--Not available.

Stage, Discharge Measurements and Computed n-Values.--Gage height were 12.75 ft at gage; 11.98 ft at section 1. Peak discharge was 1,600 cfs on May 30, 1953.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
5/30/1953	1615.0	425.0	6.94	3.80	0.001237	0.043



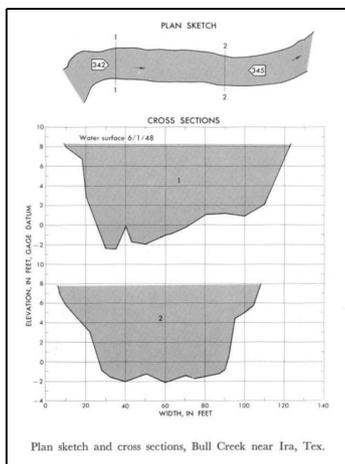
Description of Channel.--Bed is mostly sand and silt. Banks are irregular and have thick growth of brush. Channel curves about 20° to the right above the reach and straightens below it.

Floods.--

Estimated n-Values using Cowan s Approach.--

Key words.--

Bull Creek near Ira, Tex (Barnes)



Study Reach.--Section 1 is about 1,000 ft downstream from gage.

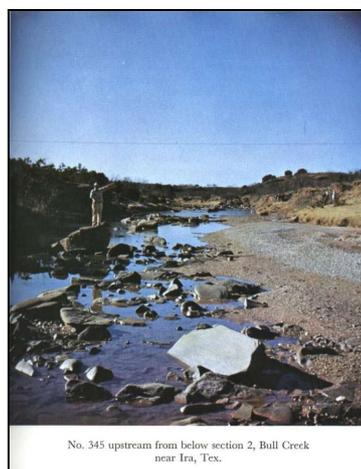
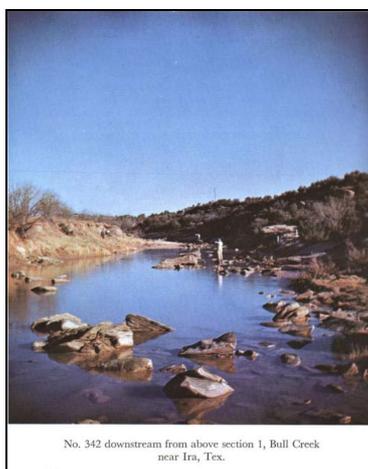
Gage Location.--Lat 32°36'02", long 101°05'40", on left bank 800 ft upstream from bridge on Farm to Market Road 2085, 1.9 miles upstream from Colorado River, 5.3 miles downstream from Chimney Creek, 5.5 miles west of Ira, Scurry County, 7.7 miles northwest of Cuthbert, and 8.3 miles downstream from Bull Creek diversion dam.

Drainage Area.--388 sq mi., approximate contributing area.

Gage Datum and Elevations of Reference Points.--

Stage, Discharge Measurements and Computed n-Values.--Gage height were 8.84 ft at gage; 8.26 ft at section 1. Peak discharge was 3,220 cfs on June 1, 1948.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
6/1/1948	3230.2	776.5	6.83	4.16	0.001206	0.041



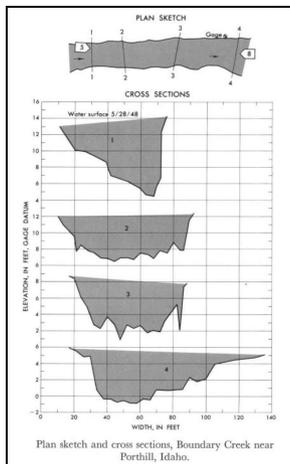
Description of Channel.--Bed is composed of sand, gravel, and small boulders with scattered large angular rocks. Banks are irregular and eroded, and have sparse cover of grass and scattered small trees. The channel reach between sections 1 and 2 is fairly straight. The channel curves sharply above the reach and moderately below it.

Floods.--

Estimated n-Values using Cowan s Approach.--

Key words.--

Boundary Creek near Porthill, Idaho (Barnes)



Study Reach.--Section 1 is 413 ft upstream from gage.

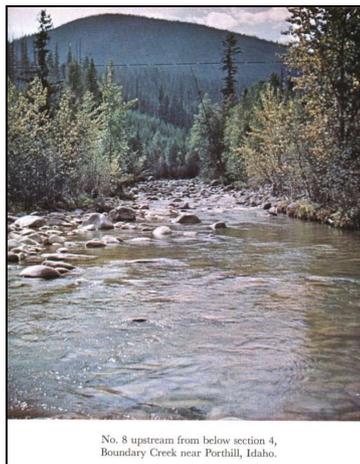
Gage Location.--Lat $48^{\circ}59'50''$, long $116^{\circ}34'05''$, in SW1/4 sec.11, T.65N., R.2W., on left bank near mouth of canyon, 0.2 mile south of international boundary, and 3 miles west of Porthill.

Drainage Area.--97 sq mi., approximately.

Gage Datum and Elevations of Reference Points.--

Stage, Discharge Measurements and Computed n-Values.--Gage height were 5.34 ft at gage; 13.60 ft at section 1. Peak discharge was 2,530 cfs on May 28, 1948.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
5/28/1948	2545.3	354.0	4.05	7.19	0.018664	0.073



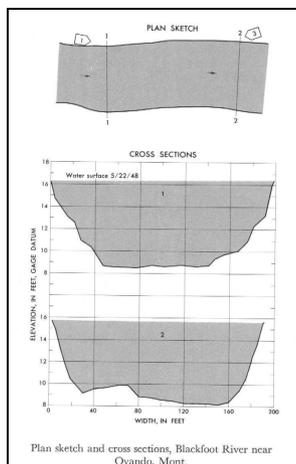
Description of Channel.--Bed consists of boulders; $d_{50} = 210$ mm, $d_{84} = 375$ mm. Banks are composed of boulders and have trees and brush along top.

Floods.--

Estimated n-Values using Cowan s Approach.--

Key words.--

Blackfoot River near Ovando, Mont (Barnes)



Study Reach.--Section 1 is about 0.25 mile upstream from gage.

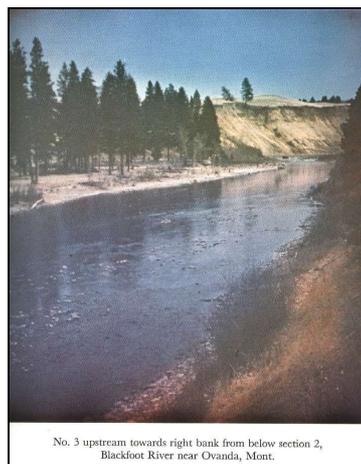
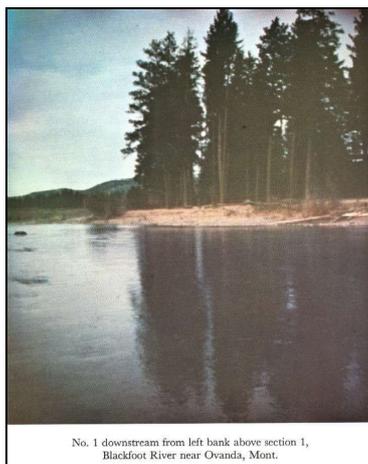
Gage Location.--Lat 47°01'10", long 113°13'40", in SE1/4 NW1/4 sec.34, T.15N., R.13W., on left bank 0.25 mile upstream from Monture Creek and 5 miles west of Ovando.

Drainage Area.--1,274 sq mi.

Gage Datum and Elevations of Reference Points.--

Stage, Discharge Measurements and Computed n-Values.--Gage height were 6.84 ft at gage; 16.34 ft at section 1. Peak discharge was 8,200 cfs on May 22, 1948.

Date of Observation	Discharge (ft ³ /s)	Average Cross Section Area (ft ²)	Hydraulic Radius (ft)	Mean Velocity (ft/s)	Slope	Coefficient of Roughness <i>n</i>
5/22/1948	8212.1	1185.0	6.05	6.93	0.002329	0.031



Description of Channel.--Bed is gravel and boulders; $d_{50} = 155$ mm, $d_{84} = 280$ mm. Banks consist of same material and are relatively free of vegetation.

Floods.--

Estimated n-Values using Cowan s Approach.--

Key words.--