Prepared in cooperation with the
IOWA DEPARTMENT OF TRANSPORTATION and the
IOWA HIGHWAY RESEARCH BOARD (Project HR-456)

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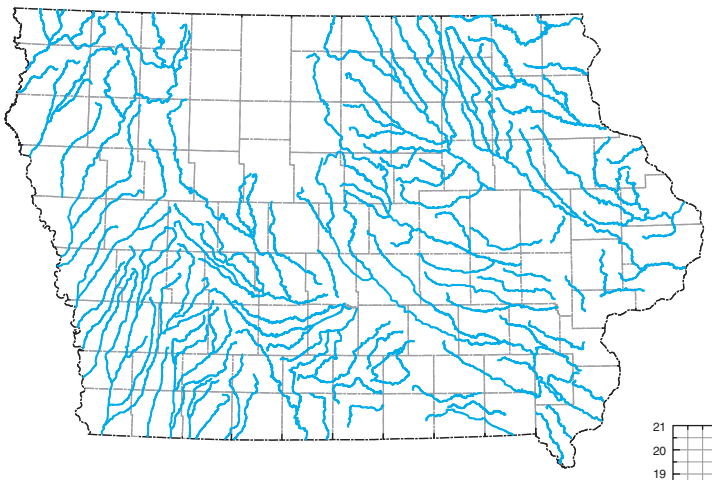
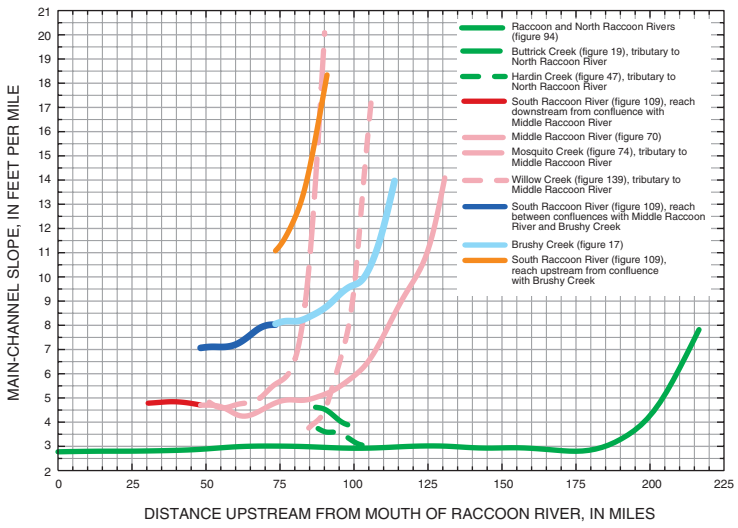
Water-Resources Investigations Report 03–4120





U.S. Department of the Interior
U.S. Geological Survey

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By David A. Eash

U.S. GEOLOGICAL SURVEY

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Iowa City, Iowa
2003

U.S. DEPARTMENT OF THE INTERIOR
GALE A. NORTON, Secretary

U.S. GEOLOGICAL SURVEY
Charles G. Groat, Director

For additional information write to:

District Chief
U.S. Geological Survey, WRD
Room 269 Federal Building
P. O. Box 1230
400 South Clinton Street
Iowa City, IA 52244

Copies of this report can be purchased from:

U.S. Geological Survey
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Multiply	By	To obtain
inch	25.4	millimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
square mile (mi^2)	2.590	square kilometer
foot per mile (ft/mi)	0.1894	meter per kilometer
cubic foot per second (ft^3/s)	0.02832	cubic meter per second

Vertical coordinate information is referenced to the National Geodetic Vertical Datum of 1929 (NGVD29).

Main-Channel Slopes of Selected Streams in Iowa for Estimation of Flood-Frequency Discharges

By David A. Eash

Abstract

This report describes a statewide study conducted to develop main-channel slope (MCS) curves for 138 selected streams in Iowa with drainage areas greater than 100 square miles. MCS values determined from the curves can be used in regression equations for estimating flood-frequency discharges. Multivariable regression equations previously developed for two of the three hydrologic regions defined for Iowa require the measurement of MCS. Main-channel slope is a difficult measurement to obtain for large streams using 1:24,000-scale topographic maps. The curves developed in this report provide a simplified method for determining MCS values for sites located along large streams in Iowa within hydrologic Regions 2 and 3.

The curves were developed using MCS values quantified for 2,058 selected sites along 138 selected streams in Iowa. A geographic information system (GIS) technique and 1:24,000-scale topographic data were used to quantify MCS values for the stream sites. The sites were selected at about 5-mile intervals along the streams. River miles were quantified for each stream site using a GIS program. Data points for river-mile and MCS values were plotted and a best-fit curve was developed for each stream.

An adjustment was applied to all 138 curves to compensate for differences in MCS values between manual measurements and GIS quantifications. The multivariable equations for Regions 2 and 3 were developed using manual measurements of MCS. A comparison of manual measurements and GIS quantifications of MCS indicates that manual measurements typically produce greater values of MCS compared to GIS quantifications. Median differences between manual measurements and GIS quantifications of MCS are 14.8 and 17.7 percent for Regions 2 and 3, respectively. Comparisons of percentage differences between flood-frequency discharges calculated using MCS values of manual measurements and GIS quantifications indicate that use of GIS values of MCS for Region 3 substantially underestimate flood discharges. Mean and median percentage differences for 2- to 500-year recurrence-interval flood discharges ranged from 5.0 to 5.3 and 4.3 to 4.5 percent, respectively, for Region 2 and ranged from 18.3 to 27.1 and 12.3 to 17.3 percent for Region 3.

The MCS curves developed from GIS quantifications were adjusted by 14.8 percent for streams located in Region 2 and by 17.7 percent for streams located in Region 3. Comparisons of percentage differences between flood discharges calculated using MCS values of manual measurements and adjusted-GIS quantifications for Regions 2 and 3 indicate that the flood-discharge estimates are comparable. For Region 2, mean percentage differences for 2- to 500-year recurrence-interval flood discharges ranged between 0.6 and 0.8 percent and median differences were 0.0 percent. For Region 3, mean and median differences ranged between 5.4 to 8.4 and 0.0 to 0.3 percent, respectively.

A list of selected stream sites presented with each curve provides information about the sites including river miles, drainage areas, the location of U.S. Geological Survey streamflow-gaging stations, and the location of streams

crossing hydrologic region boundaries or the Des Moines Lobe landform region boundary. Two examples are presented for determining river-mile and MCS values, and two techniques are presented for computing flood-frequency discharges.

INTRODUCTION

Reliable estimates of flood-frequency discharges are essential for the economical planning and safe design of bridges, dams, levees, and other structures located along rivers and streams and for the effective management of flood plains. Techniques that are as accurate as possible, while being relatively easy to apply, are needed to estimate flood-frequency discharges at ungaged stream sites in Iowa. Regression analyses performed on data collected at streamflow-gaging stations are used to develop equations to estimate flood-frequency discharges at ungaged sites. The equations are developed by relating flood-frequency discharges to significant basin characteristics for selected gaging stations.

Regression equations for estimating flood-frequency discharges for streams in Iowa were previously developed for three hydrologic regions defined for the State (Eash, 2001). Figure 1 shows the three hydrologic regions. In Eash (2001), one-variable equations that include drainage area (DA) as the explanatory variable were developed for each of the three regions. Three-variable equations were developed for Region 2 that include DA, main-channel slope (MCS), and the ratio of basin area within the Des Moines Lobe landform region to total area of the basin (DML); two-variable equations were developed for Region 3 that include DA and MCS. Two sets of flood-frequency estimation equations were published for Regions 2 and 3 because one-variable equations are considered easy for users to apply and the predictive accuracies of multivariable equations are greater. Standard error of prediction for the one-variable equations ranges from about 34 to 45 percent and for the multivariable equations from about 31 to 42 percent.

Tables 1–3 list the equations with the greatest predictive accuracies for each of the three hydrologic regions in Iowa (Eash, 2001). Depending on which region a stream site is located within, these equations require the measurement of one to three basin characteristics for the estimation of flood-frequency discharges. Measurements of DA can be determined for many stream sites directly or interpolated indirectly from Larimer (1957). Drainage area also can be determined by planimetering or digitizing basin boundaries from topographic maps. Figure 2 shows the location of the Des Moines Lobe landform region. Measurements of DML can be obtained for stream sites located within Region 2 by delineating the basin boundary for the stream site in figure 2 and determining the ratio of basin area within the Des Moines Lobe landform region (shaded area shown in figure 2) to total area of the basin.

The USGS has compiled all of the current (as of 2002) regression equations for estimating flood-frequency discharges for rural, unregulated watersheds in all the States, the Commonwealth of Puerto Rico, and the island of Tutuilla, America Samoa (from 52 flood-frequency estimation reports) into a computer program titled the National Flood Frequency (NFF) Program (Ries and Crouse, 2002). The two most prevalent watershed/climatic characteristics included in the regression equations in the NFF program were DA and MCS. Drainage area was included in all 52 flood-frequency reports and MCS was included in 27 of the reports. Main-channel slope is a significant characteristic in the estimation of flood-frequency discharges nationwide, and in particular in the upper Midwest, where MCS is a significant characteristic in the estimation of flood discharges in Iowa and all adjacent States (Alexander and Wilson, 1995; Eash, 2001; Krug and others, 1992; Lorenz and others, 1997; Sando, 1998; Soenksen and others, 1999; and David Soong, U.S. Geological Survey, Illinois District, written commun., December 2002).

Measurements of MCS can be made for stream sites in Iowa located within Regions 2 or 3 by following the technique for manual, topographic-map measurements presented in the “Manual Measurements” section of this report. Measurements of MCS are determined using 1:24,000-scale topographic data (Office of Water Data Coordination, 1978) because this scale provides more accurate measurements of MCS than smaller scale data, such as 1:100,000 or 1:250,000. MCS is a difficult manual measurement to obtain for large streams using 1:24,000-scale topographic maps. A simplified method for determining MCS values for sites located on large streams is needed to facilitate the application of the multivariable equations.

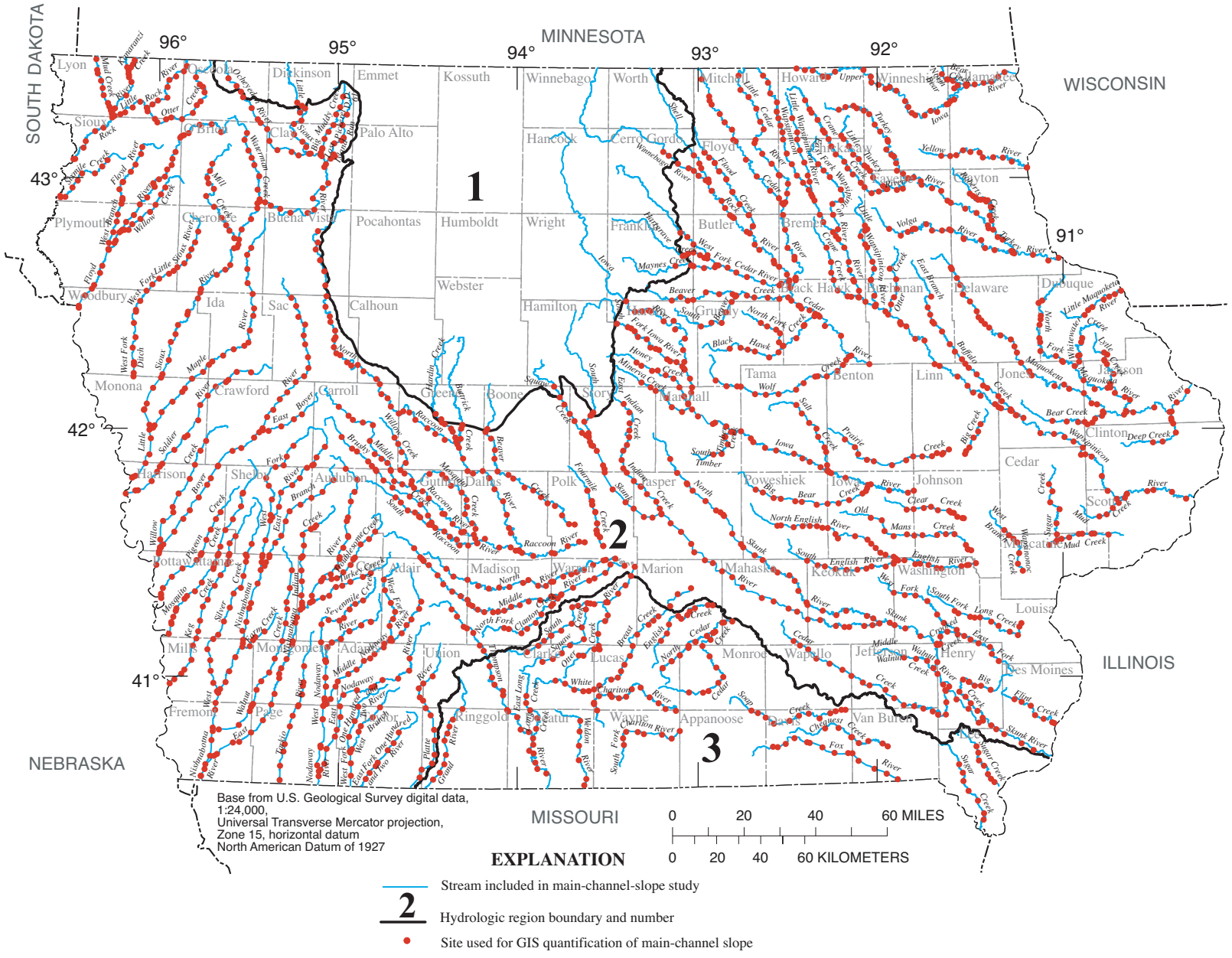

Figure 1. Location of streams and sites in Iowa used to develop main-channel-slope curves.

Table 1. Flood-frequency estimation equations for Region 1

[Data from Eash (2001, table 3). SEE, standard error of estimate; SEP, average standard error of prediction; EYR, equivalent years of record; Q, peak discharge, in cubic feet per second for recurrence interval, in years, indicated as subscript; DA, drainage area, in square miles]

Estimation equation	SEE (percent)	SEP (percent)	EYR (years)
(One-variable equations; number of streamflow-gaging stations = 26)			
$Q_2 = 33.8\ DA^{.656}$	35.3	41.4	4.2
$Q_5 = 60.8\ DA^{.658}$	32.0	39.4	5.8
$Q_{10} = 80.1\ DA^{.660}$	31.1	39.0	7.7
$Q_{25} = 105\ DA^{.663}$	31.3	39.2	10.1
$Q_{50} = 123\ DA^{.666}$	32.0	39.8	11.5
$Q_{100} = 141\ DA^{.669}$	33.1	40.5	12.5
$Q_{200} = 159\ DA^{.672}$	34.5	41.4	13.2
$Q_{500} = 183\ DA^{.676}$	36.5	42.7	13.7

Table 2. Flood-frequency estimation equations for Region 2

[Data from Eash (2001, table 4). SEE, standard error of estimate; SEP, average standard error of prediction; EYR, equivalent years of record; Q, peak discharge, in cubic feet per second for recurrence interval, in years, indicated as subscript; DA, drainage area, in square miles; MCS, main-channel slope, in feet per mile; DML, Des Moines Lobe, ratio of basin area within Des Moines Lobe landform region to total area of basin]

Estimation equation	SEE (percent)	SEP (percent)	EYR (years)
(Three-variable equations; number of streamflow-gaging stations = 188)			
$Q_2 = 52.2\ DA^{.677}\ MCS^{.316}\ (DML+1)^{-.753}$	37.3	41.7	4.6
$Q_5 = 144\ DA^{.616}\ MCS^{.305}\ (DML+1)^{-.653}$	25.4	34.5	11.3
$Q_{10} = 225\ DA^{.590}\ MCS^{.306}\ (DML+1)^{-.601}$	21.6	32.0	19.9
$Q_{25} = 337\ DA^{.567}\ MCS^{.309}\ (DML+1)^{-.567}$	20.4	31.3	29.5
$Q_{50} = 430\ DA^{.554}\ MCS^{.311}\ (DML+1)^{-.555}$	21.2	31.9	33.2
$Q_{100} = 531\ DA^{.542}\ MCS^{.313}\ (DML+1)^{-.549}$	22.6	32.9	34.3
$Q_{200} = 641\ DA^{.532}\ MCS^{.316}\ (DML+1)^{-.545}$	24.6	34.4	33.7
$Q_{500} = 800\ DA^{.519}\ MCS^{.320}\ (DML+1)^{-.542}$	27.8	36.5	31.7

Table 3. Flood-frequency estimation equations for Region 3

[Data from Eash (2001, table 5). SEE, standard error of estimate; SEP, average standard error of prediction; EYR, equivalent years of record; Q, peak discharge, in cubic feet per second for recurrence interval, in years, indicated as subscript; DA, drainage area, in square miles; MCS, main-channel slope, in feet per mile]

Estimation equation	SEE (percent)	SEP (percent)	EYR (years)
(Two-variable equations; number of streamflow-gaging stations = 27)			
$Q_2 = 7.75\ DA^{.888}\ MCS^{.977}$	29.4	38.0	5.2
$Q_5 = 22.6\ DA^{.805}\ MCS^{.939}$	22.2	33.3	11.5
$Q_{10} = 40.0\ DA^{.761}\ MCS^{.910}$	19.6	31.6	18.9
$Q_{25} = 72.3\ DA^{.715}\ MCS^{.875}$	18.0	30.8	29.2
$Q_{50} = 108\ DA^{.683}\ MCS^{.845}$	17.8	30.9	35.2
$Q_{100} = 158\ DA^{.652}\ MCS^{.809}$	18.6	31.6	38.5
$Q_{200} = 232\ DA^{.621}\ MCS^{.769}$	19.9	32.8	39.2
$Q_{500} = 382\ DA^{.580}\ MCS^{.709}$	22.4	34.8	37.4

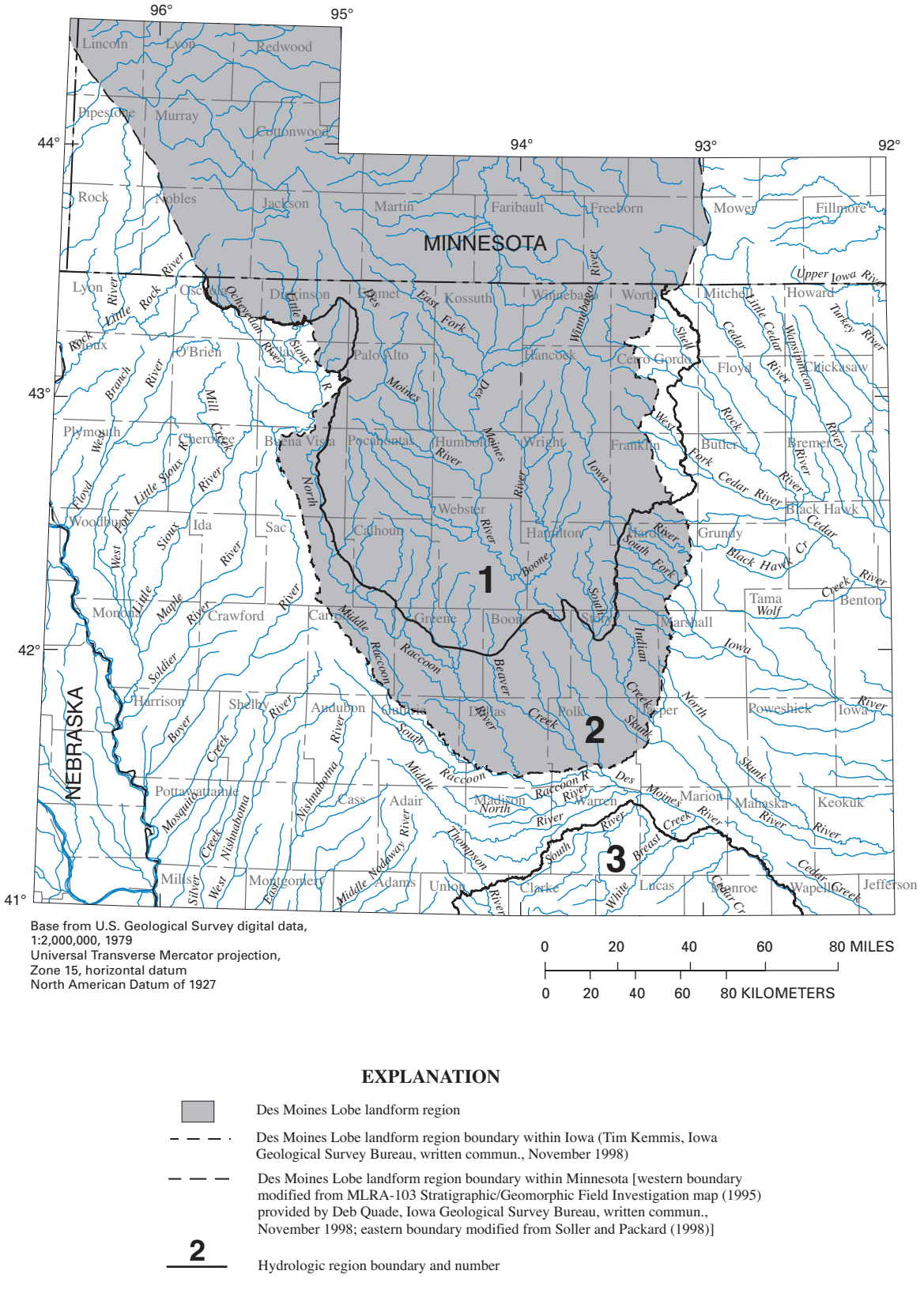

Figure 2. Des Moines Lobe landform region and hydrologic regions in Iowa (from Eash, 2001, figure 12).

In response to the need to provide users with a simplified method for determining MCS values for sites located along large streams in Iowa within Regions 2 and 3, the U.S. Geological Survey (USGS), in cooperation with the Iowa Department of Transportation and the Iowa Highway Research Board, initiated a statewide study in 2001 to develop curves for determining MCS values for sites along large, unregulated streams in Iowa within Regions 2 and 3.

Purpose and Scope

The purposes of this report are to: (1) present the results of geographic information system (GIS) techniques using 1:24,000-scale digital topographic data to quantify MCS at selected sites along large, unregulated streams in Iowa with drainage areas greater than 100 mi^2 that are located in hydrologic Regions 2 and 3; (2) present best-fit curves developed for selected streams showing relations between GIS quantifications of MCS and river miles, and river-mile information for selected stream sites; and (3) present comparisons of manual measurements of MCS used to develop regression equations and GIS quantifications of MCS to determine whether adjustment factors are needed for applying the GIS quantifications of MCS to the regression equations. This report provides users with a simplified method for determining MCS values for sites located along large streams in Iowa within Regions 2 and 3. If a stream site within Region 2 or 3 is not located along one of the streams selected for inclusion in this report or is located upstream from one of the MCS curves developed in this report, a manual measurement of MCS using 1:24,000-scale topographic data will be needed (see the five measurement steps listed in the section "Manual Measurements").

Acknowledgments

The author gratefully acknowledges Todd Noah, Assistant GIS Coordinator, Iowa Department of Transportation, for providing a GIS data layer of roads in Iowa used for determining "911" street names; and the following USGS personnel: Ed Fischer, for his work to develop computer programs to compile and format data for the main-channel slope graphs and lists of sites; Mark Delperdang, for his work to digitize 1:24,000-scale main channels, quantify MCS values for stream sites using GIS software, compile data for the MCS graphs and lists, and prepare maps for this report; Gina Renzi, for her work to digitize 1:24,000-scale main channels, compile data for the tables, MCS graphs and lists, and prepare tables for this report; Andy Fish and Brian Lanning, for their work to digitize 1:24,000-scale main channels and quantify MCS values for stream sites using GIS software; Dan Christiansen, for his work to digitize 1:24,000-scale main channels and compile data for the tables; and Kymm Barnes, for her work to develop a GIS program to select main channels and determine river miles for each selected stream site.

MAIN-CHANNEL-SLOPE MEASUREMENT METHODS

Two different methods have been used to measure MCS for streamflow-gaging stations in Iowa. Manual measurements using topographic maps have traditionally been used to measure MCS. These measurements can be tedious and time-consuming to obtain, especially for larger streams, and different methods have been used over the years to measure main-channel length (MCL). Improvements in computer technology and the availability of digital topographic data in the last decade have enabled the use of GIS technology to automate the quantification of MCS. A geographic information system provides an efficient and consistent method of quantifying MCS. Information in this section describes both manual measurements and GIS quantifications and compares MCS values determined using the methods.

The equation for calculating main-channel slope (MCS) is:

$$MCS = (E_{85} - E_{10}) / (0.75\ MCL), \qquad (1)$$

where

MCS = an index of the slope, in feet per mile, of the main channel;

E_{85} = the streambed elevation, in feet, at 85 percent of the main-channel length upstream from the stream site;

E_{10} = the streambed elevation, in feet, at 10 percent of the main-channel length upstream from the stream site;

MCL = main-channel length, in miles, measured along the main channel from the stream site to where the main-channel extension meets the basin divide.

Manual Measurements

Main-channel slope measurements were identified as significant basin characteristics in the development of flood-frequency estimation equations by Benson (1959, 1962). In his 1959 paper, Benson correlated different measurements of channel slope to flood-frequency-discharge data for streamflow-gaging stations in New England. Benson determined that the slope between 10 and 85 percent of the total length of the main channel provided the best correlation with the flood-frequency discharges.

Manual measurements of MCS for 178 streamflow-gaging stations in Iowa began in the early 1960's by Schwob (1966). Early measurements of MCS were determined by a combination of methods. For large streams, 0.25-mi chords on 1:250,000-scale topographic maps were used to measure MCL. Schwob (1966) noted that for small streams, larger scale topographic maps (1:24,000 or 1:62,500) or soil maps were used, and that streambed elevations for calculating MCS were determined from topographic maps whenever possible. For streams with drainage areas less than 100 mi^2, elevations were obtained by rough leveling if large-scale topographic maps were not available. Schwob (1966) presented MCS curves for 27 large rivers in Iowa (rivers with drainage areas greater than 700 mi^2).

Manual measurements of MCL from 1:24,000-scale topographic maps were initially determined for streamflow-gaging stations in Iowa using dividers graduated at 0.1-mi units (Burmeister, 1970). Divider-method measurements of MCL are listed in table 6 (in the "Supplemental Data" section) under the map-scale column as "24k." Beginning in the late 1980's, graph paper overlain on 1:24,000-scale topographic maps on a light table was used to measure MCL by aligning the ruling on the graph paper along the main channel. The graph-paper method produces a greater value for MCL compared to the divider method because the majority of the sinuosity of the channel is included in the graph-paper-method measurement. Graph-paper-method measurements of MCL are listed in tables 6 and 7 under the map-scale column as "24kg." As part of the most recent flood-frequency estimation study (Eash, 2001), manual measurements of MCS (using the graph-paper method) were obtained for gaging stations that had not previously been measured. The MCS data set used to develop the multivariable regression equations for Regions 2 and 3 (tables 2 and 3) included manual measurements of MCS that were determined during the early 1960's to 1998.

Figure 3 illustrates the technique for manual, topographic-map measurement of MCS for the Rapid Creek tributary near Iowa City streamflow-gaging station (station number 05453950). The manual measurement of MCS involves five steps:

1. Using 1:24,000-scale topographic maps, identify the location of the stream site for which the flood-frequency estimate is to be made. Determine the main channel of the stream network from the stream site upstream to the basin divide. At each stream fork, follow the fork that contributes the greater drainage area. At the upstream end, extend the main channel of the stream to the basin divide. Figure 3 shows the main channel and the main-channel extension highlighted for the example basin.
2. Measure the total length of the main channel, in miles, from stream site to basin divide. Figure 3 shows that the MCL for the example basin is 4.0 mi.
3. Locate two points on the main channel, one that is 10 percent of the total length of the main channel (0.10 MCL) upstream from the stream site, and the other that is 85 percent of the total length (0.85 MCL), or 15 percent of the total length downstream from where the main channel meets the basin divide. Figure 3 shows the location of the 0.10-MCL and 0.85-MCL points on the main channel.
4. For both of the 0.10- and 0.85-MCL points, locate the nearest elevation-contour lines on the topographic map that cross the main channel upstream and downstream from each point.Usingthe elevations determined for these contour lines, interpolate an elevation for each of the 0.10-MCL and 0.85-MCL points. Figure 3 shows that the 700-ft and 690-ft contours are the nearest contour lines crossing the main channel upstream and downstream from the 0.10 MCL point, and an elevation (E_{10}) of 696 ft was interpolated for the 0.10 MCL point. Likewise, 790-ft and 780-ft

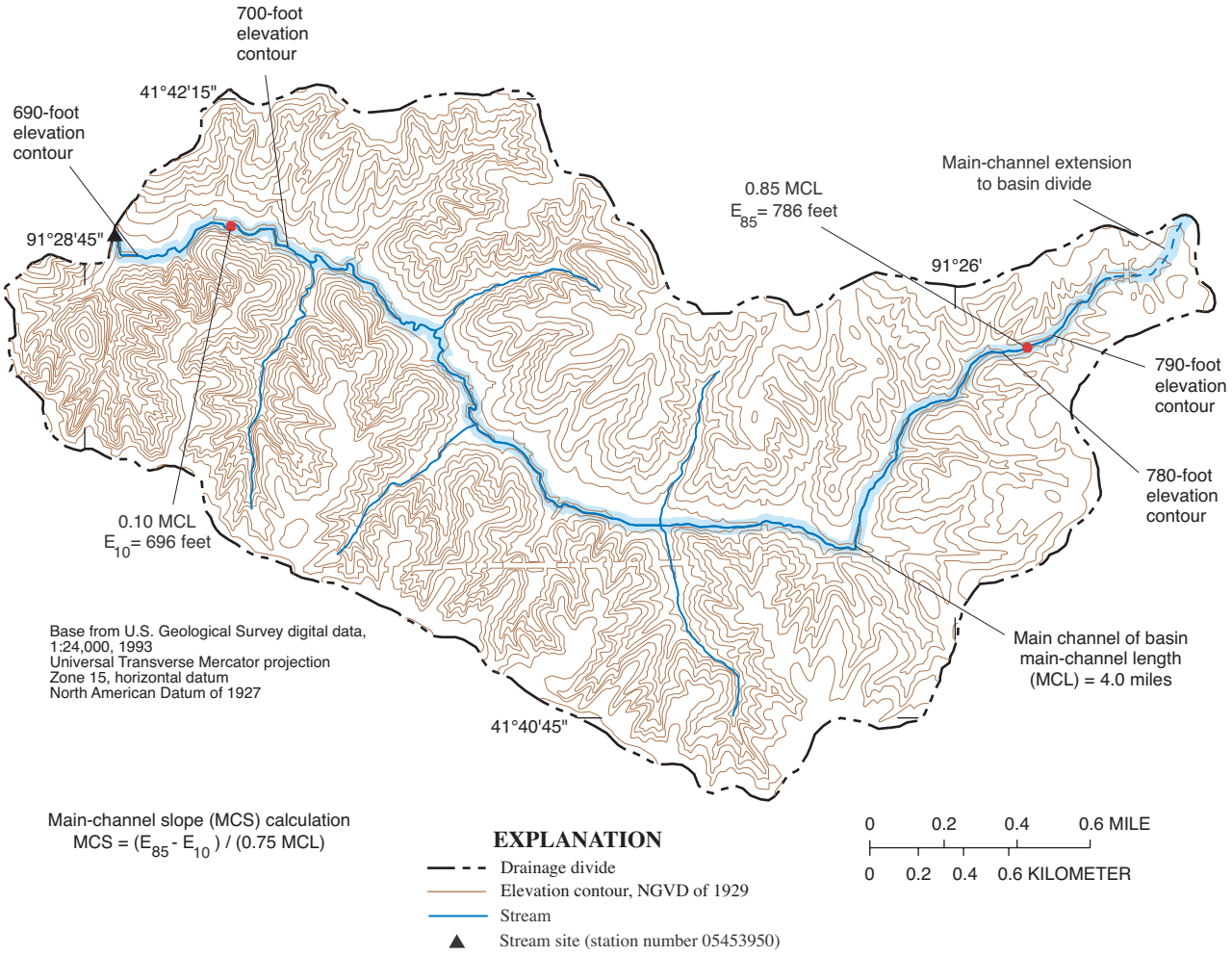

Figure 3. Topographic-map measurements for calculating main-channel slope (from Eash, 2001, figure 17).

contours are the nearest contour lines upstream and downstream from the 0.85 MCL point, and an elevation (E_{85}) of 786 ft was interpolated for the 0.85 MCL point.

5. For the example basin shown in figure 3, the manual measurement of MCS from 1:24,000-scale topographic maps is calculated using equation 1:

$$MCS = (E_{85} - E_{10}) / (0.75\ MCL)$$

$$MCS = (786 - 696) / (0.75 \times 4.0)$$

$$MCS = 90/3.0 = 30.0\ ft/mi$$

Geographic Information System Quantifications

Geographic information system quantifications of MCS for 164 streamflow-gaging stations in Iowa began in the early 1990's (Eash, 1993) with the use of Basinsoft, a computer program developed by the USGS to quantify selected drainage-basin characteristics (Majure and Soenksen, 1991; Eash, 1994). Early GIS quantifications of MCS were determined using two scales of digital data. Main-channel length quantifications were determined using 1:100,000-scale digital line graph (DLG) hydrography or stream-network data and elevations E_{10} and E_{85} were determined using hypsography or elevation-contour data created from 1:250,000-scale digital elevation model (DEM) data.

Following the redevelopment of Basinsoft in 1994 (Harvey and Eash, 1996), elevations E_{10} and E_{85}

were determined using DEM (raster) data instead of hypsography (vector) data. As part of the 2001 flood-frequency estimation study (Eash, 2001), GIS quantifications of MCS were determined for 291 streamflow-gaging stations in Iowa and adjacent States by using Basinsoft. The MCL values were quantified using 1:100,000-scale DLG hydrography data. Elevations E_{10} and E_{85} were quantified using DEM data created from 1:100,000-scale DLG hypsography and hydrography data.

For this report, GIS quantifications of MCS were determined using Basinsoft for 2,058 selected stream sites in Iowa (fig. 1). These sites include 126 continuous-record and high-flow, partial-record (crest-stage) streamflow-gaging stations (tables 6–7 in the "Supplemental Data" section). MCL values were quantified using main channels digitized from 1:24,000-scale digital raster graphic (DRG) data. Elevations E_{10} and E_{85} were determined using 30-meter (1:24,000-scale) DEM data. In this report, GIS quantifications of MCS were determined using a larger scale of data (1:24,000) than was used in previous studies (1:250,000 and 1:100,000; Eash, 1993, 2001).

A GIS quantification of MCS using Basinsoft requires the generation of four source-data layers—three coverages representing the drainage-divide, hydrography, and hypsography, and one lattice-elevation model of a drainage basin. The blue lines shown in figure 3 compose the hydrography data layer for the basin, the brown lines compose the hypsography data layer, and the black dashed line composes the drainage-divide data layer. Not shown in figure 3 is the lattice-elevation-model data layer, which is a grid of elevations generated from 30-meter DEM data.

A Basinsoft quantification of MCS involves four user-interactive steps. Each step launches an automated process:

1. The arc segments of the hydrography data layer (blue lines in fig. 3) are oriented in a downstream direction by selecting the location of the stream site within the stream network (black triangle in fig. 3).
2. The main channel is extended to the basin divide by digitizing an arc from the basin divide to the upstream end of the main channel. This main-channel extension arc is shown as a dashed blue line in figure 3.
3. All arc segments representing the main channel are assigned a code within the hydrography data layer by selecting the upstream and downstream ends of the main channel. The arc segments coded as main-channel segments by Basinsoft are highlighted in figure 3.
4. A route system is developed based on the arc segments coded as the main channel by initiating the main Basinsoft program. The lengths of these arc segments are added to quantify MCL. The 10 and 85 percent distances from the downstream end of the main channel are computed and nodes are placed at those positions along the route (red dots in fig. 3). The nodes are converted to points and elevations (E_{10} and E_{85}) are quantified for each point from the lattice-elevation-model data layer.

For the example basin shown in figure 3, the GIS quantification of MCS from 1:24,000-scale digital topographic data is calculated using equation 1:

$$MCS = (E_{85} - E_{10}) / (0.75\ MCL)$$

$$MCS = (778.4 - 692.5) / (0.75 \times 4.20)$$

$$MCS = 85.9/3.15 = 27.3\ ft/mi$$

Comparison of Manual Measurements and Geographic Information System Quantifications

Manual measurements of MCS have been investigated for use in regression analyses for four flood-frequency estimation studies conducted for Iowa by Schwob (1966), Lara (1973, 1987), and Eash (2001). GIS quantifications of MCS have been investigated for use in two studies conducted for Iowa by Eash (1993, 2001). In the 2001 study, both manual measurements and GIS quantifications (1:100,000 scale) of MCS were investigated for use in regression analyses; the manual measurements of MCS were better correlated with flood-frequency discharges and they were used to develop the regression equations for Regions 2 and 3 (tables 2 and 3).

Tables 6 and 7 (in the "Supplemental Data" section at the end of the report) compare manual measurements and GIS quantifications of MCS, MCL, and E_{85}–E_{10} for selected streamflow-gaging stations in Regions 2 and 3, respectively. GIS quantifications of MCS listed in tables 6 and 7 were determined as part of this report. The MCS values listed in table 6

were compiled for 99 gaging stations in Iowa of the 188 total gaging stations used to develop the regression equations for Region 2 (table 2). Table 7 lists MCS values for all 27 gaging stations used to develop the regression equations for Region 3 (table 3).

Tables 6 and 7 indicate that manual measurements typically produce greater values of MCS compared to GIS quantifications. Percentage differences between manual measurements and GIS quantifications of MCS, MCL, and E_{85}–E_{10} are listed in tables 6 and 7. Summary statistics for the mean, median, minimum, and maximum percentage differences are listed at the end of each table. Mean percentage differences between manual measurements and GIS quantifications of MCS are 19.7 and 27.9 percent (tables 6 and 7, respectively), and median differences are 14.8 and 17.7 percent. A comparison of mean and median differences for MCL and E_{85}–E_{10} indicate that differences in the values of MCL explain the majority of the differences between manual and GIS values of MCS. Differences between values of E_{85}–E_{10} are relatively low compared to differences between values of MCL.

Tables 6 and 7 also list the map scale, if known, that was used for manual measurements of MCS. While all the GIS quantifications of MCS listed in tables 6 and 7 were determined in this report using the same scale of topographic data and the same quantification method (Basinsoft), manual measurements of MCS listed in tables 6 and 7 were determined using various scales of topographic maps and different methods of measuring MCL.

Differences in MCS values between manual measurements or GIS quantifications depend primarily on two factors involving MCL. The first factor is the scale of topographic data used for the determination of MCL. Because MCL is a map-scale dependent measurement, the value of MCL is affected substantially by the scale of the topographic data used in the measurement. MCL is longer when measured using larger scale maps. The second factor is the method used to determine MCL. Given the same scale of main-channel line work, differences in MCL values are due to the amount of sinuosity that is included in the measurement. Different values of MCL may be obtained depending on whether dividers, graph paper, or GIS methods of measurement are used. The divider method of measuring MCL does not attempt to include all of the sinuosity of the main channel, and MCL values measured using dividers are typically less than values obtained using graph-paper or GIS methods of measurement. Because MCL is in the denominator of the MCS calculation (equation 1), the lesser the value determined for MCL, the greater the value calculated for MCS.

The graph-paper method of measuring MCL attempts to include the majority of the sinuosity of the main channel. The GIS technique for quantifying MCL includes all of the sinuosity of the main channel represented at the scale of the topographic data. Table 8 (in the "Supplemental Data" section at the end of the report) compares manual measurements and GIS quantifications of MCS using 1:24,000-scale topographic data for 23 streamflow-gaging stations in Iowa for which manual measurements of MCL were made using the graph-paper method. Mean and median percentage differences listed at the end of table 8 between manual measurements and GIS quantifications of MCS are 0.6 and 1.3 percent, respectively. Mean and median differences between manual measurements and GIS quantifications of MCL are –0.3 and –1.2 percent, respectively.

The Wilcoxon signed-rank test was computed (S-PLUS software; MathSoft, Inc., 1997) to determine the statistical difference between median manual measurements of MCS and median GIS quantifications of MCS for the 23 streamflow-gaging stations listed in table 8. The test indicates that there is not a significant difference between manual measurements and GIS quantifications of MCS for the gaging stations listed in table 8. Using a 95-percent level of significance for the two-tailed Wilcoxon signed-rank test, the p-value is 0.3303 (a p-value greater than 0.05 generally indicates there is not a significant difference). This test indicates that manual measurements and GIS quantifications of MCS are comparable if made using the same scale of topographic data and if the graph-paper method is used to manually measure MCL.

MAIN-CHANNEL-SLOPE CURVES

In response to the need to provide users with a simplified method for determining MCS values for sites located along large streams in Iowa in Regions 2 and 3, MCS curves were developed for selected streams. GIS quantifications of MCS for selected sites along these streams were used to develop best-fit curves. The curve developed for each selected stream

provides users with a simplified method for determining MCS values.

Selection of Streams and Sites

Unregulated, large streams located in hydrologic Regions 2 and 3 with drainage areas greater than 100 mi^2 were selected for inclusion in this report. Streams located within Region 1 were not included in this report because MCS is not included in the regression equations for Region 1 (table 1). Regulated stream reaches were not included in this report because the regression equations (tables 1–3) are not applicable for regulated streams. Streams overlying Regions 1 and 2 were included for the reach within Region 2, if the reach length within Region 2 is longer than 5 mi. Figure 1 shows the location of the 138 streams selected for inclusion in this report.

Main channels selected for streams in this report begin at the mouth for 123 of the streams. Main channels begin at the Iowa-Missouri State line for 10 of the streams that flow from Iowa to Missouri. Main channels begin at a county line for four of the streams (Chariton, Iowa, and South Fork Chariton Rivers, and West Fork Ditch; figs. 23, 52, 107, and 133, respectively) because of streamflow regulation downstream. The main channel of the Cedar River also begins at a county line. The Cedar River (fig. 22) downstream from the Buchanan-Black Hawk County line was not included in this report because drainage areas for this reach exceed the maximum value used to develop the regression equations for Region 2 (Eash, 2001). The Des Moines River was not included in this report because the reach within Region 2 is regulated.

Main-channel length was quantified for each selected stream from the beginning of the main channel to the basin divide. At each stream fork, the fork that contributes the greater drainage area was selected. Different stream names were encountered for different reaches of 17 of the main channels, and therefore, 17 of the MCS curves are labeled with more than one stream name.

Sites were selected along each of the 138 selected streams for GIS quantifications of MCS. Sites were selected at all primary highways and county lines crossing the selected stream, and at all USGS streamflow-gaging stations located on the stream. Additional stream sites, located primarily at road crossings, also were selected to obtain points along the stream at about 5-mi intervals. For some streams with few road crossings, points are spaced at greater than 5-mi intervals; and for some streams where primary highway or county-line crossings, or gaging stations are located near each other, points are spaced at less than 5-mi intervals. Figure 1 shows the location of the 2,058 stream sites selected for inclusion in this report for the quantification of MCS.

Sites along the selected streams were selected for MCS quantifications if their drainage areas were greater than approximately 20–30 mi^2. Although MCL's were quantified to basin divides, MCS values were not quantified for stream reaches with drainage areas less than approximately 20–30 mi^2. Stream sites used for MCS quantifications (shown as red dots in fig. 1) do not extend to the basin divides (upstream end of blue lines in fig. 1).

Development of Curves

Main-channel slope values were quantified using GIS at each of the selected sites along each of the selected streams. River miles were quantified from the beginning point of each stream to each site selected along the stream by use of a GIS program. River-mile and MCS values were plotted and a best-fit curve was developed for each stream. Figure 4 illustrates the development of a MCS curve for the Thompson River in south-central Iowa (fig. 117). The black dots show the river-mile and MCS values quantified using GIS for this report. The black line shows the best-fit MCS curve that was developed for this data set.

Best-fit MCS curves were developed for all 138 streams using a cubic smoothing spline (S-PLUS software; MathSoft, Inc., 1997). For one stream (North Fork Black Hawk Creek, fig. 82), a hand-drawn French curve was used in addition to the splined curve to the develop the best-fit curve.

Best-fit curves were visually evaluated for each stream and modified as necessary by adjusting the degrees of freedom used in the spline. Best-fit curves were evaluated by (1) selecting the point or GIS value of MCS plotting the furthest from the curve, (2) determining a MCS value from the curve for the same river mile as the point, and (3) calculating a 100-year recurrence-interval discharge for both MCS values and their percentage difference. Upon evaluation of the fit of a curve, if the percentage difference between the 100-year flood estimates was considered too large, the

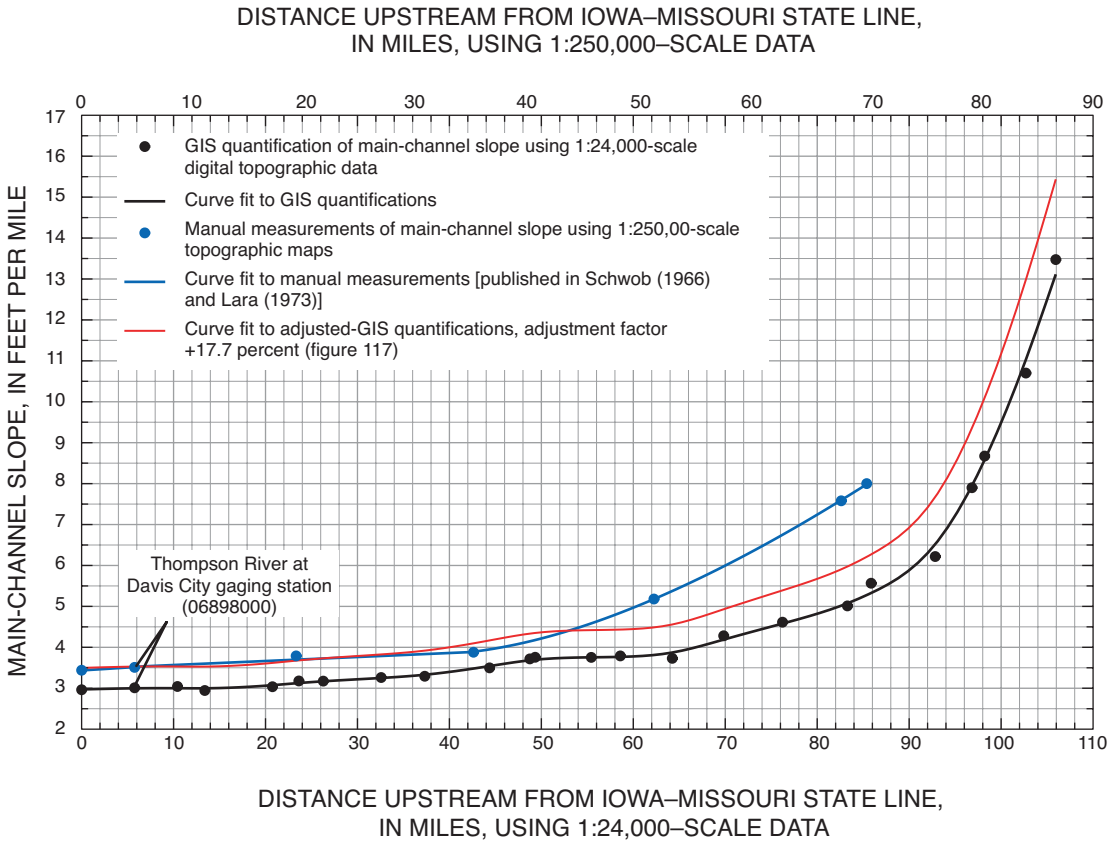

Figure 4. Examples of curves developed using main-channel-slope values determined from manual measurements, GIS quantifications, and adjusted-GIS quantifications.

degrees of freedom were adjusted and the curve was replotted.

For example, (1) the black dot shown in figure 4 at river mile 105.94 plots the furthest away from the curve (black line) with an MCS value of 13.47 ft/mi; (2) the MCS value determined from the curve for the same river mile is 13.11 ft/mi; and (3) using a drainage area of 33.4 mi^2 for this site and the regression equation for Region 2 for the 100-year recurrence-interval flood (table 2), the MCS value of the GIS quantification produces an estimate of 8,030 ft^3/s and the MCS value of the curve produces an estimate of 7,960 ft^3/s. The difference between these two estimates is 0.9 percent, which is considered acceptable accuracy for this report.

A balance between smooth-looking curves and low-percentage differences was sought in the development of each curve. Absolute values of percentage differences between 100-year flood estimates determined using GIS values plotting the furthest from the curves and values from the curves were calculated for each of the 138 curves. The mean and median of the absolute values of percentage differences calculated for the 138 curves are both 1.1 percent. The minimum and maximum percentage differences are 0.0 and 2.9 percent, respectively. These statistics indicate that 100-year flood estimates calculated using MCS values determined from the best-fit curves should produce estimates similar to those calculated using MCS values quantified by GIS.

For comparison purposes, the blue line in figure 4 shows the MCS curve presented for the Thompson River by Schwob (1966) and Lara (1973). The blue dots show the river-mile and MCS values that were measured from 1:250,000-scale topographic maps. River miles measured using 1:250,000-scale data are listed across the top of figure 4 because they differ from river miles measured using 1:24,000-scale data. The MCS values determined for the Thompson River at Davis City streamflow-gaging station

(station number 06898000, fig. 117) are shown in the lower left-hand corner of figure 4 and are listed in table 7.

The MCS curves developed for three of the streams (Middle Nodaway, South Raccoon, and West Fork Cedar Rivers; figs. 69, 109, and 132, respectively) are discontinuous because different main channels were used for different reaches with the same stream name. Figures 5 and 6 illustrate a discontinuous curve for the South Raccoon River in west-central Iowa. Figure 5 shows MCS curves and figure 6 shows main channels of selected streams in the Raccoon River Basin. The red, dark blue, and orange lines shown in figures 5 and 6 represent data for the South Raccoon River. The main channel of the South Raccoon River begins at river mile 30.46 and it is shown as the red line in figures 5 and 6. The main channel of the Middle Raccoon River begins at river mile 48.18 and it is shown as the pink line in figures 5 and 6. Because the drainage area of the Middle Raccoon River (609 mi^2) is greater than that for the South Raccoon River (377 mi^2) at their confluence, the main channel of the South Raccoon River downstream from the mouth of the Middle Raccoon River (red line in fig. 6) includes the Middle Raccoon River (pink line in figure 6). The red curve shown in figure 5 for the South Raccoon River includes MCL and E_{85}–E_{10} quantifications for the Middle Raccoon River and this is the reason that the red and pink curves shown in figure 5 are continuous, and the red and dark blue curves are discontinuous. The main channel of Brushy Creek begins at river mile 73.49 and it is shown as the light blue line in figures 5 and 6. Because the drainage area of Brushy Creek (142 mi^2) is greater than that for the South Raccoon River at their confluence (122 mi^2), the main channel of the South Raccoon River between the confluences with the Middle Raccoon River and Brushy Creek (dark blue line in fig. 6) includes Brushy Creek (light blue line in fig. 6). The dark blue curve in figure 5 includes MCL and E_{85}–E_{10} quantifications for Brushy Creek and this is the reason the dark blue and light blue curves shown in figure 5 are continuous and the dark blue and orange curves are discontinuous.

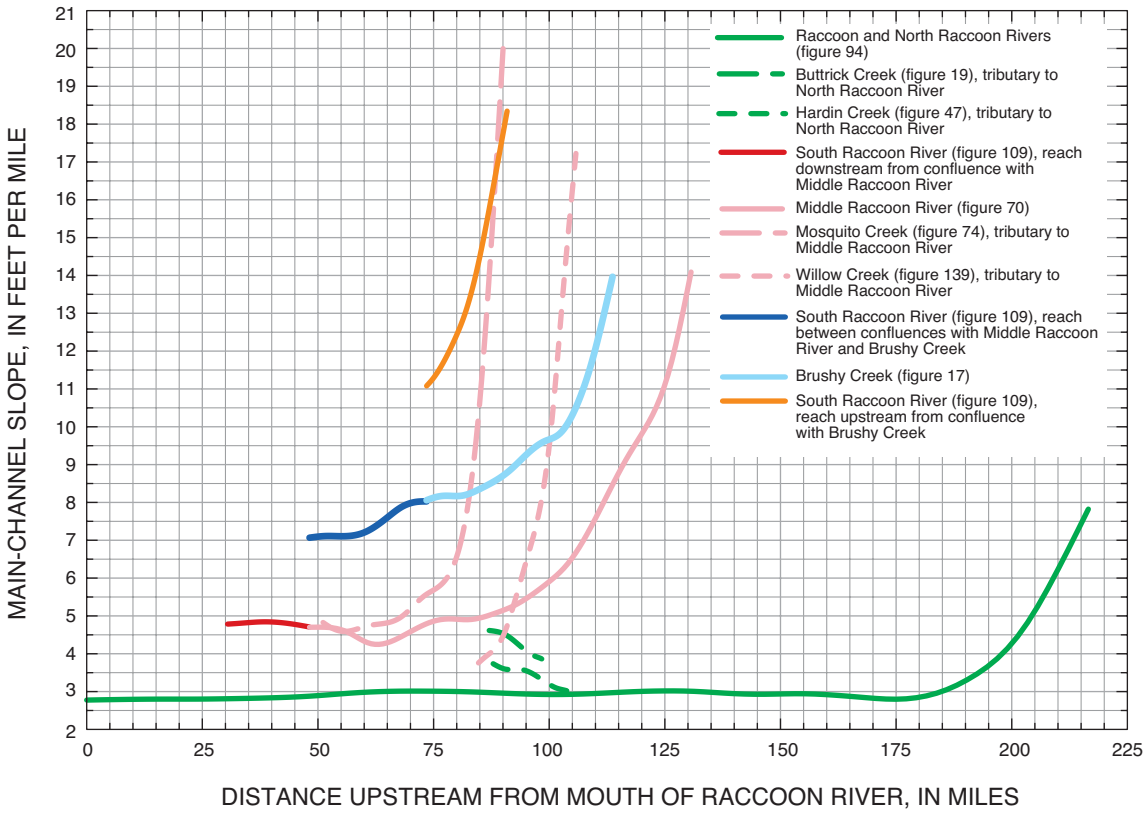

Figure 5. Main-channel-slope curves of selected streams in the Raccoon River Basin.

Figure 6. Main channels of selected streams in the Raccoon River Basin.

Figure 6 shows the boundary between hydrologic Regions 1 and 2 as a solid black line. The main channels of Hardin and Buttrick Creeks, which are both tributaries to the North Raccoon River, are shown as dashed green lines in figure 6. Figure 5 shows that MCS curves for these two creeks (dashed green lines) were only developed for the reaches located within Region 2 even though their main channels are in Regions 1 and 2. Likewise, MCS curves for other streams in Regions 1 and 2 were only developed for the reaches located in Region 2. Figure 1 shows several streams overlying Regions 1 and 2.

Figure 6 shows the boundary of the Des Moines Lobe landform region as a dashed black line. Main channels of the North Raccoon River and tributaries (green lines in fig. 6) are within the Des Moines Lobe landform region and the MCS curves for these streams (green lines in fig. 5) have relatively low MCS values compared to other streams in the Raccoon River Basin. Main channels of the South Raccoon River, upstream from the confluence with the Middle Raccoon River, and Brushy Creek (dark blue, orange, and light blue lines in fig. 6) are outside of the Des Moines lobe landform region and the MCS curves for these streams (dark blue, orange, and light blue lines in fig. 5) have relatively high MCS values compared to other streams in the Raccoon River Basin. Figures 5 and 6 illustrate the effect the Des Moines Lobe landform region has on MCS.

Adjustment of Curves

An adjustment was applied to all 138 MCS curves to compensate for differences in MCS values between manual measurements and GIS quantifications. Table 4 lists a statistical summary of percentage differences between flood-frequency discharge estimates calculated for Regions 2 and 3, using manual measurements and GIS quantifications of MCS for the same streamflow-gaging stations listed in tables 6 and 7. Flood estimates were calculated for 2- to 500-year recurrence intervals, and percentage differences between the flood estimates were calculated. The summary statistics presented in table 4 list the mean, median, minimum, and maximum percentage differences for each recurrence interval.

For example, the first streamflow-gaging station listed in table 6 (Upper Iowa River at Decorah, station number 05387500) has an MCS value of 6.25 ft/mi for the manual measurement and an MCS value of 4.84 ft/mi for the GIS quantification. Using the regression equation for Region 2 (table 2) for the 100-year recurrence-interval flood, the MCS value for the manual measurement produces an estimate of 27,700 ft^3/s and the MCS value for the GIS quantification produces an estimate of 25,600 ft^3/s. The difference between these two 100-year flood estimates is 8.2 percent. Flood-discharge estimates and percentage differences were calculated for all of the gaging stations listed in tables 6 and 7. For Region 2, mean and median percentage differences ranged between 5.0 to 5.3 and

Table 4. Statistical summary of percentage differences between flood-frequency discharge estimates for selected streamflow-gaging stations in Regions 2 and 3 calculated using manual measurements and GIS quantifications of main-channel slope

	Percentage difference for indicated recurrence interval (years)							
	2	5	10	25	50	100	200	500
[Region 2; number of streamflow gaging stations = 99 (table 6)]								
Mean	5.2	5.0	5.0	5.0	5.1	5.3	5.2	5.2
Median	4.5	4.3	4.3	4.4	4.4	4.4	4.5	4.5
Minimum	–15.6	–15.1	–15.1	–15.3	–15.4	–15.4	–15.6	–15.8
Maximum	61.9	59.2	59.4	60.2	60.6	61.4	61.9	62.9
[Region 3; number of streamflow-gaging stations = 27 (table 7)]								
Mean	27.1	25.7	24.8	23.5	22.5	21.8	20.1	18.3
Median	17.3	16.6	16.0	15.5	15.1	14.1	13.1	12.3
Minimum	–25.1	–24.3	–23.7	–22.8	–22.4	–21.2	–20.4	–18.8
Maximum	142.2	133.8	127.2	120.3	115.0	108.5	100.9	89.1

4.3 to 4.5 percent, respectively (table 4); and for Region 3, mean and median differences ranged between 18.3 to 27.1 and 12.3 to 17.3 percent, respectively (table 4).

Because the application of GIS values of MCS in regression equations for Region 3 appears to substantially underestimate flood-frequency discharges compared to the manual values of MCS used to develop the equations, an adjustment factor was applied to the MCS curves developed for Region 3. Although the Region 2 regression equations are not as sensitive as the Region 3 equations to differences in MCS values, an adjustment factor also was applied to the curves developed for Region 2 for consistency. The Region 3 equations are more sensitive to differences in MCS values because the exponents on the MCS variables are greater for Region 3 than for Region 2 (tables 2 and 3).

The median percentage difference between manual and GIS values of MCS of 14.8 percent for Region 2 (table 6) and 17.7 percent for Region 3 (table 7) were used for the adjustments. Figure 4 illustrates how the adjustment was applied to the MCS curve developed for the Thompson River (fig. 117). Following development of the original MCS curve (black line in fig. 4), MCS values used to plot this curve were multiplied by the adjustment factor to create an adjusted curve (red line in fig. 4). Because the majority of the Thompson River is within Region 3, an adjustment of +17.7 percent was applied to the black line shown in figure 4. The adjusted curve parallels the original curve and plots with MCS values that are 17.7 percent greater than those originally quantified using GIS.

Table 5 lists a statistical summary of percentage differences between flood-frequency discharge estimates calculated for Regions 2 and 3, using manual measurements and adjusted-GIS quantifications of MCS for the same streamflow-gaging stations listed in tables 6–7. Table 5 is similar to table 4, except that GIS quantifications of MCS for Region 2 were adjusted by +14.8 percent from the GIS values listed in table 6 and GIS quantifications of MCS for Region 3 were adjusted by +17.7 percent from the GIS values listed in table 7.

For example, applying an adjustment factor of +14.8 percent to the GIS value of MCS for the first streamflow-gaging station listed in table 6 (Upper Iowa River at Decorah, station number 05387500) produces an adjusted-GIS value of 5.56 ft/mi. The 100-year flood estimate using the adjusted-GIS value of MCS is 26,700 ft^3/s. Compared to the 27,700 ft^3/s estimated for the manual measurement of MCS, the percentage difference between these two estimates is 3.7 percent.

Flood-frequency discharge estimates determined using adjusted-GIS values of MCS and percentage differences were calculated for all of the streamflow-gaging stations listed in tables 6 and 7. For Region 2, mean percentage differences ranged between 0.6 to 0.8 percent and median differences are 0.0 percent (table 5). For Region 3, mean and median

Table 5. Statistical summary of percentage differences between flood-frequency discharge estimates for selected streamflow-gaging stations in Regions 2 and 3 calculated using manual measurements and adjusted-GIS quantifications of main-channel slope

	Percentage difference for indicated recurrence interval (years)							
	2	5	10	25	50	100	200	500
[Region 2; number of streamflow gaging stations = 99 (table 6); adjustment of +14.8 percent applied to GIS quantifications]								
Mean	0.7	0.6	0.7	0.7	0.7	0.8	0.7	0.7
Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Minimum	–19.2	–18.6	–18.6	–18.8	–18.9	–19.0	–19.2	–19.4
Maximum	55.0	52.6	52.8	53.5	53.9	54.5	55.0	55.8
[Region 3; number of streamflow-gaging stations = 27 (table 7); adjustment of +17.7 percent applied to GIS quantifications]								
Mean	8.4	7.9	7.6	7.2	6.8	6.8	5.9	5.4
Median	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Minimum	–36.2	–35.1	–34.1	–33.1	–32.3	–30.9	–29.5	–27.8
Maximum	105.9	100.5	96.0	90.9	87.4	82.7	76.5	68.5

differences ranged between 5.4 to 8.4 and 0.0 to 0.3 percent, respectively (table 5). Table 5 indicates that MCS values determined from the adjusted curves and applied to the regression equations for Regions 2 and 3 (tables 2 and 3) should calculate flood-frequency discharge estimates comparable to the estimates used to develop the regression equations.

Presentation of Curves

Table 9 (in the "Supplemental Data" section at the end of the report) lists the river-mile and MCS values quantified for 2,058 selected sites along 138 selected streams using GIS and 1:24,000-scale topographic data. Using the data values listed in table 9, best-fit curves were developed for each stream, and these curves were then adjusted for presentation. Figures 7–144 (in the "Supplemental Data" section at the end of the report) present MCS curves developed for the selected streams in Iowa. These curves were adjusted by 14.8 percent for streams in Region 2 and by 17.7 percent for streams in Region 3, and MCS values determined from these curves can be used in the regression equations for Regions 2 and 3 (tables 2 and 3). Below each curve is a list of selected sites for the stream reach. Figure numbers and river miles listed in table 9 and figures 7–144 allow cross reference for determining MCS values quantified for selected stream sites.

An explanation of the list elements in the list of sites presented with each MCS curve in figures 7–144 follows:

River-mile values were quantified using 1:24,000-scale topographic data and a GIS program. River miles measured from the mouth to the drainage divide provide a total length for the stream.

Drainage area values, if known, are listed as square miles (mi^2).

If data or information for a list element is not determined or not available, a double dash (--) is listed.

The site list provides information about the stream site such as a road name or county-line names. If an active or discontinued USGS streamflow-gaging station is located at the stream site, it is noted in parentheses with the USGS station number and information on the type of data collected at the gage. Information on the type of data collected at the gage, if known, is listed as one of four designations [cont, for a continuous-record gage; csg, for a high-flow, partial-record (crest-stage) gage; low, for a low-flow partial-record gage (Lara, 1979); and qw, for a water-quality gage]. Only the primary type of data collected for the gage is presented in the list, even though additional types of data may be available for the gage. For example, in figure 7 a gage is listed at river mile 10.30 at 4th Street crossing Bear Creek. The notation designating a gaging station at this site is "(05417700, cont)." This notation designates that the station number for this gage is 05417700 and the primary type of data collected at this site was continuous-record streamflow data.

The gages listed in figures 7–144 also are listed in the USGS National Water Information System (NWIS) data base, and users may obtain additional information concerning types of data collected and the years for which data were collected at these gages from <http://waterdata.usgs.gov/ia/nwis/inventory> by selecting site number and entering the USGS station number on the following screen. The Bear Creek gage (station number 05417700, fig. 7) listed in the example above is a discontinued gage for which daily streamflow data were collected from 1957 to 1976 and water-quality data were collected from 1966 to 1975. Information on the period of record of gages and other types of data collected at gages is not included in figures 7–144, and the user is referred to the NWIS data base for additional information for gages. No data type is listed for some gages in the NWIS data base; therefore, no data type is presented for some gages in figures 7–144.

Stream sites presented in the lists are designated by a legal description derived from their respective locations using Public Land Survey System coordinates (township, range, section, and subsection). Within the section, the subsection in which the site is located is listed as one of nine designations (C, center; E, east; N, north; NE, northeast; NW, northwest; S, south; SE, southeast; SW, southwest; W, west). For example, 84N 1E 13 C refers to a stream-site location in Township 84 North, Range 1 East, in the center of section 13.

The public address "911" street names listed in figures 7–144 are the names obtained from the GIS data layer "Iowa DOT BaseRecord Data," for the data layer item "NINEONEONE." This data layer, provided to the USGS by Todd Noah, Assistant GIS Coordinator, Iowa Department of Transportation (written commun., April 2001), was updated through

September 2000. No “911” street names were listed for some roads in the data layer, and therefore, no “911” street names are listed for some roads in figures 7–144.

The curves are presented alphabetically by stream names. For curves with more than one stream name, the downstream name is listed first in the table of contents. If a stream name is not found in the table of contents, figure 1 can be used to determine the downstream name. For example, an MCS value is needed for a stream site on the North Raccoon River, but the North Raccoon River is not listed alphabetically in the table of contents. Figure 1 shows the North Raccoon River is tributary to the Raccoon River. The table of contents lists an MCS curve for the Raccoon and North Raccoon Rivers in figure 94.

Where streams cross hydrologic region boundaries (Regions 1 and 2, or Regions 2 and 3) or the Des Moines Lobe landform region boundary, river miles and legal descriptions are shown in the list of sites with the figure to designate the locations of the boundary crossings. For example, figure 94 lists boundary crossings at river miles 30.56 and 220.67. These boundary crossings are included in the lists to aid users in the determination of hydrologic regions for the application of regression equations (tables 1–3) and for the determination of values for the DML variable for Region 2 (table 2). MCS values were not determined for the majority of the boundary crossings presented in the figure lists.

ESTIMATION OF FLOOD-FREQUENCY DISCHARGES USING MAIN-CHANNEL-SLOPE CURVES

The MCS curves presented in figures 7–144 are applicable for determining MCS values for stream sites located along 138 streams in Iowa. The MCS values determined from the curves can be used in the regression equations for hydrologic Regions 2 and 3 (tables 2 and 3) for the estimation of flood-frequency discharges. If a stream site within Region 2 or 3 is not located along one of the 138 selected streams or is located upstream from one of the MCS curves, a manual measurement of MCS using 1:24,000-scale topographic maps will be needed (see the five manual measurement steps listed in the section “Manual Measurements”).

Several techniques for estimating flood-frequency discharges for streams in Iowa are presented by Eash (2001), and the user is referred to the 2001 flood-frequency estimation report for a complete description of the techniques. The techniques are presented for determining (1) regional regression estimates for ungaged sites on ungaged streams, (2) weighted estimates for gaged sites, and (3) weighted estimates for ungaged sites on gaged streams. The technique for determining regional regression estimates for ungaged sites on ungaged streams requires determining which of four possible examples applies to the location of the stream site and its basin. Illustrations for applying both the one-variable and multivariable regression equations are provided for the estimation techniques. The user also is referred to the section “Accuracy and Limitations of Regional Regression Estimates” in the 2001 report for a discussion on the applicability and accuracy of the regional equations listed in tables 1–3.

To determine an MCS value for a stream site using information in this report, the user first determines whether the stream site is located along a stream for which an MCS curve was developed. Figure 1 shows, and the table of contents lists, streams for which MCS curves were developed. If an MCS curve is available for the stream site, the user next determines a river-mile value for the stream site. The following two examples illustrate the two possible methods for determining river-mile values and two of the techniques for estimating flood-frequency discharges.

Example 1

This example illustrates how a river-mile value can be determined for a stream site when the stream site is listed in figures 7–144. The 100-year flood-discharge estimate for U.S. Highway 34 crossing Walnut Creek northwest of Red Oak in Montgomery County, in the NE 1/4, sec. 23, T. 72 N., R. 39 W. will be determined. Figure 1 shows that Walnut Creek in Montgomery County is a stream included in the report and that its basin is located in hydrologic Region 2. The table of contents lists an MCS curve for Walnut Creek beginning in Fremont County as figure 124. An inspection of the stream site list in figure 124 shows U.S. Highway 34 listed as a stream site at river mile 26.96. From the MCS curve (fig. 124) an MCS value of 6.65 ft/mi is determined for river mile 26.96.

A drainage area of 108 mi^2 is listed for the U.S. Highway 34 stream site in figure 124. Figure 2 shows that Walnut Creek basin is not in the Des Moines Lobe landform region. Streamflow-gaging stations listed in figure 124 do not indicate that Walnut Creek is a gaged stream (gage types of "cont" or "csg" indicate that a stream is gaged and that log-Pearson Type III flood-frequency estimates may be available for the site). This stream site is determined to be an ungaged site on an ungaged stream with a single-region basin that is not in the Des Moines Lobe landform region. The technique for estimating a flood-frequency discharge for this site is similar to example 1B in the 2001 report (Eash, 2001).

1. Figure 1 is used to determine which hydrologic region the basin is located within and select the appropriate multivariable regional regression equation from tables 1–3. If the basin is located within Region 1, only the one-variable equations are applicable.
2. The drainage area (DA), the main-channel slope (MCS), and the ratio of basin area within the Des Moines Lobe landform region to total area of the basin (DML) are determined for the stream site. Values of MCS can be determined for sites along selected streams in Iowa from figures 7–144 in this report. Measurements of DML can be obtained for stream sites located within Region 2 by delineating the basin boundary for the stream site in figure 2 and determining the ratio of basin area within the Des Moines Lobe landform region to total area of the basin (shaded area shown in figure 2).

For the U.S. Highway 34 stream site, the basin is located within Region 2. The 100-year flood-estimation equation listed for Region 2 in table 2 is:

$$Q_{100} = 531\ DA^{.542}\ MCS^{.313}\ (DML+1)^{-.549} \qquad (2)$$

Drainage area for the basin was determined to be 108 mi^2 and MCS for the basin was determined to be 6.65 ft/mi. Because the basin is located completely outside of the Des Moines Lobe landform region, the value for DML was determined to be 0.00. The flood-discharge estimate is calculated using equation 2:

$$Q_{100} = 531\ (108)^{.542}\ (6.65)^{.313}\ (0.00+1)^{-.549}$$

$$Q_{100} = 12{,}200\ ft^3/s$$

Example 2

This example illustrates how a river-mile value can be determined for a stream site when a stream is included in figures 7–144 and the stream site is not included in the list of sites in the figure. The 50-year flood-discharge estimate for County Road E53 crossing Buttrick Creek east of Jefferson in Greene County, in the NW 1/4, sec. 12, T. 83 N., R. 30 W. will be determined. Figure 1 shows that Buttrick Creek in Greene County is a stream included in the report and that its basin crosses a hydrologic region boundary (boundary between Regions 1 and 2). The table of contents lists an MCS curve for Buttrick Creek beginning in Greene County as figure 19. An inspection of the list of stream sites in figure 19 does not show County Road E53 included as a stream site. An inspection of maps and the list of stream sites in figure 19 shows that U.S. Highway 30 is the nearest site listed with a river-mile value (river mile 8.75) to the County Road E53 site and that U.S. Highway 30 is upstream from County Road E53. Using a 1:24,000-scale topographic map to measure river miles along Buttrick Creek between County Road E53 and U.S. Highway 30, a distance of 1.92 miles is measured between these two sites. A river-mile value of 6.83 is determined for County Road E53 crossing Buttrick Creek. From the MCS curve (fig. 19), an MCS value of 4.19 ft/mi is determined for river mile 6.83.

A drainage area of 202 mi^2 is listed for the U.S. Highway 30 stream site. The drainage area between County Road E53 and U.S. Highway 30 is measured to be 4.4 mi^2, and a drainage area of 206 mi^2 is determined for County Road E53 crossing Buttrick Creek. Figure 2 shows that the entire Buttrick Creek Basin is in the Des Moines Lobe landform region. Streamflow-gaging stations listed in figure 19 do not indicate that Buttrick Creek is a gaged stream (gage types of "cont" or "csg" indicate that a stream is gaged and that log-Pearson Type III flood-frequency estimates may be available for the site). This stream site is determined to be an ungaged site on an ungaged stream with a mixed-region basin that is in the Des Moines Lobe landform region. The technique for estimating a flood-frequency discharge for this site is similar to example 4B in the 2001 report (Eash, 2001).

1. Figure 1 in this report is used to determine which hydrologic regions the basin is located within and select the appropriate multi-variable regression equation for each region from tables 1–3. If a portion of the basin is located within Region 1, then only the one-variable equations are applicable for the portion in Region 1.
2. The drainage area (DA), the main-channel slope (MCS), and the ratio of basin area within the Des Moines Lobe landform region to total area of the basin (DML) are determined for the stream site. The drainage area of the basin within each hydrologic region is determined. Values of MCS can be determined for stream sites along selected streams in Iowa from figures 7–144. Measurements of DML can be obtained for stream sites located within Region 2 by delineating the basin boundary for the stream site in figure 2 and determining the ratio of basin area within the Des Moines Lobe landform region to total area of the basin (shaded area shown in figure 2).

Flood-frequency discharge estimates for stream sites with basins in more than one hydrologic region can be improved by calculating a mixed-region flood-frequency estimate. A flood-frequency estimate is calculated using each regional equation, and a mixed-region estimate is calculated from the regional estimates by using equation 3:

$$Q_{t(mr)} = (DA_{Region\ x} / DA_{Total})\ (Q_{t(Region\ x)}) + (DA_{Region\ y} / DA_{Total})\ (Q_{t(Region\ y)}), \quad (3)$$

where

$Q_{t(mr)}$ = the mixed-region discharge estimate for recurrence interval t, in cubic feet per second;

$DA_{Region\ x}$, $DA_{Region\ y}$ = the area of the basin within Region x or y, respectively, in square miles;

DA_{Total} = the total area of the basin, in square miles; and

$Q_{t(Region\ x)}$, $Q_{t(Region\ y)}$ = the regression estimate for recurrence interval t, computed using Region x or y regional equations, respectively, in cubic feet per second.

For the County Road E53 stream site, the basin is located within Regions 1 and 2. The 50-year flood-estimation equations listed for Regions 1 and 2 in tables 1 and 2 are:

$$Q_{50} = 123\ DA^{.666} \text{ (Region 1, only one-variable equation is applicable)} \quad (4)$$

$$Q_{50} = 430\ DA^{.554}\ MCS^{.311}\ (DML+1)^{-.555} \text{ (Region 2)} \quad (5)$$

Drainage area for the basin was determined to be 206 mi^2. By overlaying the basin boundary on figures 1 or 2 and by inspecting the list of stream sites in figure 19, it was determined that approximately 196 mi^2 of the drainage area is located within Region 1 and 10 mi^2 is located within Region 2. The MCS for the entire basin was determined to be 4.19 ft/mi. By overlaying the basin boundary on figure 2, it was determined that the entire drainage area is located within the Des Moines Lobe landform region. The DML was calculated to be 1.00. The flood-discharge estimate for each hydrologic region is calculated using equations 4 and 5:

$Q_{50} = 123\ (206)^{.666}$ (Region 1, only one-variable equation is applicable)

$Q_{50} = 4{,}280\ ft^3/s$ (Region 1)

$Q_{50} = 430\ (206)^{.554}\ (4.19)^{.311}\ (1.00+1)^{-.555}$ (Region 2)

$Q_{50} = 8{,}750\ ft^3/s$ (Region 2)

The mixed-region (mr) estimate calculated from the two regional estimates using equation 3 is:

$Q_{50(mr)} = (196 / 206)\ (4{,}280) + (10 / 206)\ (8{,}750)$

$Q_{50(mr)} = 4{,}500\ ft^3/s$

SUMMARY

Reliable estimates of flood-frequency discharges are essential for the economical planning and safe design of bridges, dams, levees, and other structures located along rivers and streams and for the effective management of flood plains. Multivariable regression equations for estimating flood-frequency discharges were previously developed for two of the three hydrologic regions defined for Iowa. The multivariable equations require the measurement of main-channel slope (MCS), which is a difficult measurement to obtain for large streams using 1:24,000-scale topographic maps. In response to the need to provide users with a simplified method for determining MCS values for sites located along large streams in Iowa within Regions 2 and 3, the USGS, in cooperation with the Iowa Department of Transportation and the Iowa

Highway Research Board, initiated a statewide study in 2001.

This report (1) presents the results of geographic information system (GIS) techniques using 1:24,000-scale digital topographic data to quantify MCS at 2,058 selected sites along 138 large, unregulated streams in Iowa with drainage areas greater than 100 mi^2 that are located in hydrologic Regions 2 and 3; (2) presents best-fit curves developed for selected streams showing relations between GIS quantifications of MCS and river miles, and river-mile information for selected stream sites; and (3) presents comparisons of manual measurements of MCS (used to develop regression equations) and GIS quantifications of MCS to determine whether adjustment factors are needed for applying the GIS values of MCS to the regression equations. If a stream site within Region 2 or 3 is not located along one of the streams selected for inclusion in this report or is located upstream from one of the MCS curves developed in this report, a manual measurement of MCS using 1:24,000-scale topographic data will be needed.

Two different methods have been used to measure MCS for streamflow-gaging stations in Iowa. MCS has been manually measured using topographic maps since the early 1960's. Various scales of maps and methods of measuring main-channel length (MCL) have been used over the years in the measurement of MCS. These manual measurements of MCS were used to develop the multivariable regression equations for Regions 2 and 3. The technique for obtaining a manual, topographic-map measurement of MCS is illustrated for an example stream site.

Main-channel slope has been quantified using GIS and Basinsoft (a computer program to quantify drainage-basin characteristics) and digital topographic data since the early 1990's. Different scales of digital data and methods of measuring streambed elevations at 10 and 85 percent of the MCL (E_{10} and E_{85}) have been used. Geographic information system was used to quantify MCS values for stream sites selected for this report because it provides an efficient and consistent method of quantification. The procedure for quantifying MCS using Basinsoft is described for an example stream site.

A comparison of manual measurements and GIS quantifications of MCS for streamflow-gaging stations in Regions 2 and 3 indicates that manual measurements typically produce lesser values of MCL and greater values of MCS compared to GIS quantifications. Mean percentage differences between manual measurements and GIS quantifications of MCS are 19.7 and 27.9 percent for Regions 2 and 3, respectively, and median differences are 14.8 and 17.7 percent. Differences in MCS values obtained using manual measurements or GIS quantifications depend primarily on (1) the scale of topographic data used for the determination of MCL and (2) the method used to determine MCL. A comparison test indicates that there is not a significant difference between manual measurements and GIS quantifications of MCS if the same scale of topographic data is used and if the graph-paper method is used to manually measure MCL.

One hundred and thirty-eight unregulated streams located within Regions 2 and 3 with drainage areas greater than 100 mi^2 were selected for inclusion in this report. Main channels were digitized for all 138 streams using 1:24,000-scale topographic data. Sites were selected for GIS quantifications of MCS at about 5-mi intervals along each of the selected streams. The MCS values were quantified at 2,058 selected sites along the 138 streams. River miles were quantified from the beginning point of each stream to each site selected along the stream by use of a GIS program. Data points for river-mile and MCS values were plotted and a best-fit MCS curve was developed for each stream. Visual fits of the curves to the data points were evaluated by comparing the percentage difference between 100-year flood discharges calculated using the MCS value of the data point plotting the furthest from each curve and the MCS value determined from each curve. The mean and median of the absolute values of the percentage differences calculated for the 100-year floods for the 138 curves are both 1.1 percent, and the maximum difference is 2.9 percent.

An adjustment was applied to all 138 curves to compensate for differences in MCS values between manual measurements and GIS quantifications. Comparisons of percentage differences between flood-frequency discharges calculated using MCS values of manual measurements (values used to develop the regression equations for Regions 2 and 3) and GIS quantifications indicate that use of GIS values of MCS for Region 3 substantially underestimate flood discharges. Mean and median percentage differences for 2- to 500-year recurrence-interval flood discharges

ranged from 5.0 to 5.3 and 4.3 to 4.5 percent, respectively, for Region 2 and ranged from 18.3 to 27.1 and 12.3 to 17.3 percent for Region 3. The regression equations for Region 3 are more sensitive to differences in MCS values because the exponents on the MCS variables are greater for Region 3 than for Region 2.

The MCS curves developed for streams located within Region 2 were adjusted by 14.8 percent, and streams located within Region 3 were adjusted by 17.7 percent. Comparisons of percentage differences between flood discharges calculated using MCS values of manual measurements and GIS values adjusted by 14.8 percent for Region 2 and 17.7 percent for Region 3 indicate that the flood-discharge estimates are comparable. For Region 2, mean percentage differences for 2- to 500-year recurrence-interval flood discharges ranged between 0.6 to 0.8 percent and median differences were 0.0 percent. For Region 3, mean and median differences ranged between 5.4 to 8.4 and 0.0 to 0.3 percent, respectively.

Figures at the end of the report present adjusted MCS curves for the 138 selected streams in Iowa. The MCS values determined from these curves can be used in the regression equations for Regions 2 and 3 for the estimation of flood-frequency discharges. A list of selected stream sites presented with each curve provides information about the sites that may aid users in the determination of river miles, drainage areas, the location of USGS streamflow-gaging stations, and the location of streams crossing hydrologic region boundaries or the Des Moines Lobe landform region boundary. Two examples are presented for determining river-mile and MCS values, and two techniques are presented for computing flood-frequency discharges.

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SUPPLEMENTAL DATA

Table 6. Comparison of manual measurements and GIS quantifications of main-channel slope for selected streamflow-gaging stations in Region 2

[Station number, U.S. Geological Survey streamflow-gaging station number; DA, drainage area; DML, Des Moines Lobe, ratio of basin area within Des Moines Lobe landform region to total area of basin; MCS, main-channel slope; MCL, main-channel length; E_{85}, streambed elevation at 85 percent length of MCL; E_{10}, streambed elevation at 10 percent length of MCL; mi^2, square miles; ft/mi, feet per mile; %, percent; 250k, 1:250,000-scale topographic maps; --, not determined; 24kg, 1:24,000-scale topographic maps using graph-paper method to measure MCL; 24k, 1:24,000-scale topographic maps using divider method to measure MCL; mix, MCS determined using more than one scale of topographic maps or using topographic maps and water-surface-elevation profiles; pro, MCS determined from water-surface-elevation profile]

Station number	Station name	DA (mi^2)	DML	Manual measurements				GIS quantifications using 1:24,000-scale digital topographic data			Percentage difference between manual measurements and GIS quantifications		
				Map scale	MCS (ft/mi)	MCL (mi)	E_{85}–E_{10} (ft)	MCS (ft/mi)	MCL (mi)	E_{85}–E_{10} (ft)	MCS (%)	MCL (%)	E_{85}–E_{10} (%)
05387500	Upper Iowa River at Decorah, IA	511	0.00	250k	6.25	83.0	389	4.84	97.8	355	29.1	-15.1	9.6
05388000	Upper Iowa River near Decorah, IA	568	0.00	250k	6.13	87.0	400	4.80	102	368	27.7	-14.7	8.7
05388250	Upper Iowa River near Dorchester, IA	770	0.00	250k	5.68	--	--	5.02	136	514	13.1	--	--
05389000	Yellow River at Ion, IA	221	0.00	250k	13.4	36.2	363	12.1	43.6	395	10.7	-17.0	-8.1
05411600	Turkey River at Spillville, IA	177	0.00	250k	6.93	32.2	167	5.43	40.2	164	27.6	-19.9	1.8
05411700	Crane Creek near Lourdes, IA	75.8	0.00	250k	8.22	19.8	122	5.82	24.9	109	41.2	-20.5	11.9
05412100	Roberts Creek above Saint Olaf, IA	70.7	0.00	24kg	8.13	30.5	186	7.86	30.6	180	3.4	-0.3	3.3
05412500	Turkey River at Garber, IA	1,545	0.00	250k	5.58	112	469	4.64	144	501	20.3	-22.2	-6.4
05414500	Little Maquoketa River near Durango, IA	130	0.00	24k	17.6	24.0	316	17.1	24.1	309	2.9	-0.4	2.3
05417000	Maquoketa River near Manchester, IA	305	0.00	24k	8.1	31.9	194	6.07	38.5	175	33.4	-17.1	10.9
05417700	Bear Creek near Monmouth, IA	61.3	0.00	--	8.24	32.5	201	6.04	33.5	152	36.4	-3.0	32.2
05418450	North Fork Maquoketa River at Fulton, IA	516	0.00	24kg	4.57	88.1	302	4.51	88.4	299	1.3	-0.3	1.0
05418500	Maquoketa River near Maquoketa, IA	1,553	0.00	24k	4.1	106	326	3.66	122	335	12.0	-13.1	-2.7
05420560	Wapsipinicon River near Elma, IA	95.2	0.00	--	6.47	--	--	4.26	40.2	129	51.9	--	--
05420640	Little Wapsipinicon Rivers at Elma, IA	37.3	0.00	250k	9.73	12.7	93	10.2	15.8	121	-4.6	-19.6	-23.1
05420650	Little Wapsipinicon River near New Hampton, IA	95	0.00	--	5.50	45.0	186	5.79	34.3	149	-5.0	31.2	24.8
05420690	East Fork Wapsipinicon River near New Hampton, IA	30.3	0.00	--	32.0	--	--	6.97	16.9	88.4	359.1	--	--
05420850	Little Wapsipinicon River near Oran, IA	94.1	0.00	24k	4.70	--	--	4.87	35.6	130	-3.5	--	--
05421000	Wapsipinicon River at Independence, IA	1,048	0.00	250k	3.58	106	284	2.70	140	282	32.6	-24.3	0.7
05422000	Wapsipinicon River near De Witt, IA	2,330	0.00	mix	2.69	230	466	2.20	279	461	22.3	-17.6	1.1
05451500	Iowa River at Marshalltown, IA	1,532	0.81	mix	2.67	146	292	2.59	153	298	3.1	-4.6	-2.0
05451700	Timber Creek near Marshalltown, IA	118	0.00	250k	7.56	15.0	85	6.92	20.4	106	9.2	-26.5	-19.8
05452000	Salt Creek near Elberon, IA	201	0.00	250k	8.00	25.0	152	5.77	32.1	139	38.6	-22.1	9.4
05452500	Iowa River near Belle Plaine, IA	2,455	0.51	pro	2.45	209	385	2.50	212	398	-2.0	-1.4	-3.3

Table 6. Comparison of manual measurements and GIS quantifications of main-channel slope for selected streamflow-gaging stations in Region 2—Continued

[Station number, U.S. Geological Survey streamflow-gaging station number; DA, drainage area; DML, Des Moines Lobe, ratio of basin area within Des Moines Lobe landform region to total area of basin; MCS, main-channel slope; MCL, main-channel length; E_{85}, streambed elevation at 85 percent length of MCL; E_{10}, streambed elevation at 10 percent length of MCL; mi^2, square miles; ft/mi, feet per mile; %, percent; 250k, 1:250,000-scale topographic maps; --, not determined; 24kg, 1:24,000-scale topographic maps using graph-paper method to measure MCL; 24k, 1:24,000-scale topographic maps using divider method to measure MCL; mix, MCS determined using more than one scale of topographic maps or using topographic maps and water-surface-elevation profiles; pro, MCS determined from water-surface-elevation profile]

Station number	Station name	DA (mi^2)	DML	Manual measurements				GIS quantifications using 1:24,000-scale digital topographic data			Percentage difference between manual measurements and GIS quantifications		
				Map scale	MCS (ft/mi)	MCL (mi)	E_{85}–E_{10} (ft)	MCS (ft/mi)	MCL (mi)	E_{85}–E_{10} (ft)	MCS (%)	MCL (%)	E_{85}–E_{10} (%)
05453000	Big Bear Creek at Ladora, IA	189	0.00	250k	7.02	36.2	191	5.77	37.4	162	21.7	-3.2	17.9
05453100	Iowa River at Marengo, IA	2,794	0.45	pro	2.30	229	395	2.38	232	413	-3.4	-1.3	-4.4
05454300	Clear Creek near Coralville, IA	98.1	0.00	--	7.00	22.0	115	5.58	27.8	116	25.4	-20.9	-0.9
05455100	Old Mans Creek near Iowa City, IA	201	0.00	mix	3.91	387.6	113	4.10	44.3	136	-4.6	-12.9	-16.9
05455140	North English River near Montezuma, IA	31	0.00	--	5.67	--	--	9.69	11.3	82.4	-41.5	--	--
05455150	North English River near Malcom, IA	34	0.00	--	5.67	20.0	85.0	8.24	12.4	76.6	-31.2	61.3	11.0
05455200	North English River near Guernsey, IA	68.7	0.00	--	7.59	--	--	6.92	21.0	109	9.7	--	--
05455210	North English River at Guernsey, IA	81.5	0.00	--	5.63	--	--	6.51	23.0	112	-13.5	--	--
05455500	English River at Kalona, IA	573	0.00	250k	4.20	65.8	207	3.79	72.8	207	10.8	-9.6	0.0
05457700	Cedar River at Charles City, IA	1,054	0.27	250k	3.45	92.8	240	2.98	106	238	15.8	-12.5	0.0
05458000	Little Cedar River near Ionia, IA	306	0.00	mix	5.05	62.2	236	3.94	79.7	236	28.2	-22.0	0.0
05458500	Cedar River at Janesville, IA	1,661	0.17	mix	2.96	138	307	2.74	155	319	8.0	-11.0	-3.8
05458900	West Fork Cedar River at Finchford, IA	846	0.37	mix	5.00	69.0	261	3.79	90.5	257	31.9	-23.8	1.6
05460500	Shellrock River at Marble Rock, IA	1,318	0.65	mix	4.10	78.4	241	3.57	87.7	235	14.8	-10.6	2.6
05462000	Shellrock River at Shell Rock, IA	1,746	0.49	mix	3.60	109	293	3.21	120	290	12.1	-9.2	1.0
05463000	Beaver Creek at New Hartford, IA	347	0.15	250k	7.60	42.8	243	5.56	55.2	230	36.7	-22.5	5.7
05463090	Black Hawk Creek at Grundy Center, IA	56.9	0.00	24kg	7.01	18.3	96	6.81	19.2	98.2	2.9	-4.7	-2.2
05463500	Black Hawk Creek at Hudson, IA	303	0.00	250k	6.20	33.4	154	4.27	46.1	148	45.2	-27.5	4.1
05464000	Cedar River at Waterloo, IA	5,146	0.29	mix	2.80	158	332	2.72	175	358	2.9	-9.7	-7.3
05464560	Prairie Creek at Blairstown, IA	87	0.00	--	7.02	--	--	6.03	18.1	81.9	16.4	--	--
05464640	Prairie Creek at Fairfax, IA	178	0.00	24kg	4.14	37.0	115	3.91	37.9	111	5.9	-2.4	3.6
05470000	South Skunk River near Ames, IA	315	1.00	mix	7.34	48.2	265	6.39	49.5	237	14.9	-2.6	11.8
05470500	Squaw Creek at Ames, IA	204	1.00	250k	8.87	32.8	218	6.04	39.5	179	46.9	-17.0	21.8
05471000	South Skunk River below Squaw Creek near Ames, IA	556	1.00	250k	6.63	53.7	267	5.91	55.2	245	12.2	-2.7	9.0
05471050	South Skunk River at Colfax, IA	803	0.96	mix	4.64	85.3	297	4.18	87.1	273	11.0	-2.1	8.8
05471200	Indian Creek near Mingo, IA	276	1.00	250k	6.36	45.3	216	5.48	53.9	222	16.1	-16.0	-2.7

Table 6. Comparison of manual measurements and GIS quantifications of main-channel slope for selected streamflow-gaging stations in Region 2—Continued

[Station number, U.S. Geological Survey streamflow-gaging station number; DA, drainage area; DML, Des Moines Lobe, ratio of basin area within Des Moines Lobe landform region to total area of basin; MCS, main-channel slope; MCL, main-channel length; E_{85}, streambed elevation at 85 percent length of MCL; E_{10}, streambed elevation at 10 percent length of MCL; mi^2, square miles; ft/mi, feet per mile; %, percent; 250k, 1:250,000-scale topographic maps; --, not determined; 24kg, 1:24,000-scale topographic maps using graph-paper method to measure MCL; 24k, 1:24,000-scale topographic maps using divider method to measure MCL; mix, MCS determined using more than one scale of topographic maps or using topographic maps and water-surface-elevation profiles; pro, MCS determined from water-surface-elevation profile]

Station number	Station name	DA (mi^2)	DML	Manual measurements				GIS quantifications using 1:24,000-scale digital topographic data			Percentage difference between manual measurements and GIS quantifications		
				Map scale	MCS (ft/mi)	MCL (mi)	E_{85}–E_{10} (ft)	MCS (ft/mi)	MCL (mi)	E_{85}–E_{10} (ft)	MCS (%)	MCL (%)	E_{85}–E_{10} (%)
05471500	South Skunk River near Oskaloosa, IA	1,635	0.68	mix	3.63	129	351	3.28	131	322	10.7	-1.5	9.0
05472090	North Skunk River near Baxter, IA	52.2	0.09	24kg	11.1	22.0	183	9.05	22.7	154	22.7	-3.1	18.8
05472500	North Skunk River near Sigourney, IA	730	0.01	250k	3.29	97.6	241	2.76	110	227	19.2	-11.3	6.2
05473000	Skunk River at Coppock, IA	2,916	0.38	pro?	2.22	210	350	2.25	212	358	-1.3	-0.9	-2.2
05473300	Cedar Creek near Batavia, IA	252	0.00	24kg	3.81	32.6	93	3.63	34.3	93	5.0	-5.0	0.0
05473400	Cedar Creek near Oakland Mill, IA	530	0.00	24kg	2.57	80.5	155	2.59	82.5	160	-0.8	-2.4	-3.1
05473500	Big Creek near Mount Pleasant, IA	106	0.00	250k	5.32	20.5	82	4.12	25.3	78	29.1	-19.0	5.1
05474000	Skunk River at Augusta, IA	4,303	0.26	pro?	1.92	264	380	1.90	266	379	1.1	-0.8	0.3
05481950	Beaver Creek near Grimes, IA	358	1.00	--	4.40	68.8	224	4.33	71.2	231	1.6	-4.5	-3.0
05482300	North Raccoon River near Sac City, IA	700	0.95	250k	3.50	42.3	111	2.56	61.7	118	36.7	-31.4	-5.9
05482500	North Raccoon River near Jefferson, IA	1,619	0.97	250k	2.98	121	270	2.56	135	260	16.4	-10.4	3.8
05483450	Middle Raccoon River near Bayard, IA	375	0.62	24kg	4.25	61.2	195	4.41	61.6	204	-3.6	-0.6	-4.4
05484000	South Raccoon River at Redfield, IA	994	0.42	250k	5.12	81.2	312	4.18	95.2	298	22.5	-14.7	4.7
05484500	Raccoon River at Van Meter, IA	3,441	0.80	250k	2.71	173	353	2.44	199	364	11.1	-13.1	-3.0
05485640	Fourmile Creek at Des Moines, IA	92.7	1.00	24k	7.62	30.3	173	7.33	29.7	163	4.0	2.0	6.1
05486000	North River near Norwalk, IA	349	0.00	mix	7.11	60.0	320	5.42	83.8	341	31.2	-28.4	-6.2
05486490	Middle River near Indianola, IA	503	0.00	mix	5.68	87.7	374	4.68	113	396	21.4	-22.4	-5.6
05488000	White Breast Creek near Knoxville, IA	380	0.00	250k	4.48	52.0	175	4.08	80.7	247	9.8	-35.6	-29.1
05489150	Little Muchakinock Creek at Oskaloosa, IA	9.12	0.00	24kg	16.3	6.28	77	16.3	6.46	79	0.0	-2.8	-2.5
05489490	Bear Creek at Ottumwa, IA	22.9	0.00	24kg	11.8	13.5	120	13.8	14.8	153	-14.5	-8.8	-21.6
06483270	Rock River at Rock Rapids, IA	788	0.20	250k	6.33	64.2	305	3.97	3.97	301	59.4	-36.5	1.3
06483430	Otter Creek at Sibley, IA	29.9	0.25	--	10.0	14.2	106	6.38	23.0	110	56.7	-38.3	-3.6
06483460	Otter Creek near Ashton, IA	88.0	0.12	--	9.65	21.1	153	5.95	33.6	150	62.2	-37.2	2.0
06483500	Rock River near Rock Valley, IA	1,592	0.14	250k	5.79	87.2	379	4.05	128	390	43.0	-32.0	-2.8
06600100	Floyd River at Alton, IA	268	0.00	mix	5.49	48.2	199	4.25	59.6	190	29.2	-19.1	4.7
06600300	West Branch Floyd River near Struble, IA	180	0.00	24k	4.18	37.6	118	4.19	37.4	118	-0.2	0.5	0.0
06600500	Floyd River at James, IA	886	0.00	mix	4.38	90.8	298	3.79	106	301	15.6	-14.3	-1.0

Table 6. Comparison of manual measurements and GIS quantifications of main-channel slope for selected streamflow-gaging stations in Region 2—Continued

[Station number, U.S. Geological Survey streamflow-gaging station number; DA, drainage area; DML, Des Moines Lobe, ratio of basin area within Des Moines Lobe landform region to total area of basin; MCS, main-channel slope; MCL, main-channel length; E_{85}, streambed elevation at 85 percent length of MCL; E_{10}, streambed elevation at 10 percent length of MCL; mi^2, square miles; ft/mi, feet per mile; %, percent; 250k, 1:250,000-scale topographic maps; --, not determined; 24kg, 1:24,000-scale topographic maps using graph-paper method to measure MCL; 24k, 1:24,000-scale topographic maps using divider method to measure MCL; mix, MCS determined using more than one scale of topographic maps or using topographic maps and water-surface-elevation profiles; pro, MCS determined from water-surface-elevation profile]

Station number	Station name	DA (mi^2)	DML	Manual measurements				GIS quantifications using 1:24,000-scale digital topographic data			Percentage difference between manual measurements and GIS quantifications		
				Map scale	MCS (ft/mi)	MCL (mi)	E_{85}–E_{10} (ft)	MCS (ft/mi)	MCL (mi)	E_{85}–E_{10} (ft)	MCS (%)	MCL (%)	E_{85}–E_{10} (%)
06602020	West Fork ditch at Hornick, IA	403	0.00	250k	6.50	56.0	273	4.81	71.8	259	35.1	-22.0	5.4
06605000	Ocheyedan River near Spencer, IA	426	0.46	250k	5.65	55.0	233	5.07	63.4	241	11.4	-13.2	-3.3
06605600	Little Sioux River at Gillette Grove, IA	1,334	0.66	mix	2.98	79.2	177	2.23	101	169	33.6	-21.6	4.7
06605850	Little Sioux River at Linn Grove, IA	1,548	0.62	mix	1.81	102	138	2.00	129	193	-9.5	-20.9	-28.5
06606600	Little Sioux River at Correctionville, IA	2,500	0.39	mix	1.99	169	253	1.66	210	261	19.9	-19.5	-3.1
06606700	Little Sioux River near Kennebec, IA	2,738	0.36	mix	1.93	203	294	1.51	247	280	27.8	-17.8	5.0
06607200	Maple River at Mapleton, IA	669	0.00	250k	4.83	67.8	246	3.34	84.9	212	44.6	-20.1	16.0
06608500	Soldier River at Pisgah, IA	407	0.00	250k	8.11	49.2	299	6.54	54.9	269	24.0	-10.4	11.2
06609500	Boyer River at Logan, IA	871	0.00	250k	3.56	92.9	248	3.28	102	252	8.5	-8.9	-1.6
06609560	Willow Creek near Soldier, IA	29.1	0.00	24kg	13.2	13.6	135	13.0	13.6	119	1.5	0.0	13.4
06610520	Mosquito Creek near Earling, IA	32.0	0.00	mix	13.4	--	--	10.6	12.8	102	26.4	--	--
06610600	Mosquito Creek at Neola, IA	131	0.00	mix	7.30	--	--	8.12	37.9	231	-10.1	--	--
06807410	West Nishnabotna River at Hancock, IA	609	0.00	250k	5.65	51.6	219	5.09	62.3	238	11.0	-17.2	-8.0
06808500	West Nishnabotna River at Randolph, IA	1,326	0.00	250k	4.78	91.1	327	4.12	106	329	16.0	-14.1	-0.6
06809210	East Nishnabotna River near Atlantic, IA	436	0.00	250k	5.56	45.7	191	5.01	53.4	201	11.0	-14.4	-5.0
06809500	East Nishnabotna River at Red Oak, IA	894	0.00	250k	4.68	74.2	261	4.22	84.5	268	10.9	-12.2	-2.6
06810000	Nishnabotna River above Hamburg, IA	2,806	0.00	250k	4.44	108	359	3.89	124	362	14.1	-12.9	-0.8
06811840	Tarkio River at Stanton, IA	49.3	0.00	--	11.2	15.7	132	7.99	18.1	108	40.2	-13.3	22.2
06818598	Platte River near Stringtown, IA	51.7	0.00	24kg	7.08	17.0	90	7.10	17.2	91	-0.3	-1.2	-1.1
06818750	Platte River near Diagonal, IA	217	0.00	24kg	5.75	38.0	164	4.74	38.2	136	21.3	-0.5	20.6
06819185	East Fork 102 River at Bedford, IA	85.4	0.00	250k	7.50	24.0	135	5.45	25.2	103	37.6	-4.8	31.1
06819190	East Fork 102 River near Bedford, IA	92.1	0.00	250k	7.75	26.0	151	5.76	27.8	120	34.5	-6.5	25.8
									Mean		19.7	-11.8	2.1
									Median		14.8	-12.9	0.8
									Minimum		-41.5	-38.3	-29.1
									Maximum		359.1	61.3	32.2

Table 7. Comparison of manual measurements and GIS quantifications of main-channel slope for selected streamflow-gaging stations in Region 3

[Station number, U.S. Geological Survey streamflow-gaging station number; DA, drainage area; MCS, main-channel slope; MCL, main-channel length; E_{85}, streambed elevation at 85 percent length of MCL; E_{10}, streambed elevation at 10 percent length of MCL; mi^2, square miles; ft/mi, feet per mile; %, percent; 250k, 1:250,000-scale topographic maps; --, not determined; 24kg, 1:24,000-scale topographic maps using graph-paper method to measure MCL; 62.5k, 1:62,500-scale topographic maps]

Station number	Station name	DA (mi^2)	Manual measurements				GIS quantifications using 1:24,000-scale digital topographic data			Percentage difference between manual measurements and GIS quantifications		
			Map scale	MCS (ft/mi)	MCL (mi)	E_{85}–E_{10} (ft)	MCS (ft/mi)	MCL (mi)	E_{85}–E_{10} (ft)	MCS (%)	MCL (%)	E_{85}–E_{10} (%)
05487470	South River near Ackworth, IA	460	250k	6.68	41.9	210	6.18	48.4	224	8.1	-13.4	-6.3
05487600	South White Beast Creek near Osceola, IA	28	--	17.0	--	--	12.9	9.79	95	31.8	--	--
05487800	White Breast Creek at Lucas, IA	128	--	7.90	28.6	169	5.24	42.3	166	50.8	-32.4	1.8
05487980	White Breast Creek near Dallas, IA	342	--	4.78	41.2	148	4.23	71.3	226	13.0	-42.2	-34.5
05488200	English Creek near Knoxville, IA	90.1	24kg	5.63	33.6	142	5.60	34.0	143	0.5	-1.2	-0.7
05488620	Coal Creek near Albia, IA	13.5	24kg	19.8	6.66	99	19.1	6.78	97	3.7	-1.8	2.1
05489000	Cedar Creek near Bussey, IA	374	250k	5.74	43.0	185	4.34	54.9	179	32.3	-21.7	3.4
05489350	South Avery Creek near Blakesburg, IA	33.1	24kg	11.2	14.2	120	10.8	14.3	116	3.7	-0.7	3.4
05491000	Sugar Creek near Keokuk, IA	105	250k	5.76	31.7	137	4.25	40.4	129	35.5	-21.5	6.2
05494300	Fox River at Bloomfield, IA	87.7	250k	8.30	19.0	118	7.05	21.9	116	17.7	-13.2	1.7
05494500	Fox River at Cantril, IA	161	250k	6.82	41.0	210	5.63	44.1	186	21.1	-7.0	12.9
05495000	Fox River at Wayland, MO	400	--	4.50	--	--	4.04	92.0	279	11.4	--	--
05495600	South Wyaconda River near West Grove, IA	4.69	--	26.9	--	--	19.6	4.24	62	37.2	--	--
05496000	Wyaconda River above Canton, MO	393	--	4.50	--	--	4.08	80.9	248	10.3	--	--
05497000	North Fabius River at Monticello, MO	452	--	4.80	--	--	3.99	76.0	227	20.3	--	--
06897000	East Fork Big Creek near Bethany, MO	95	--	7.24	--	--	5.14	42.4	163	40.9	--	--
06897950	Elk Creek near Decatur City, IA	52.5	24kg	11.6	13.5	117	15.6	10.4	121	-25.6	29.8	-3.3
06898000	Thompson River at Davis City, IA	701	250k	3.51	84.3	222	3.01	110	248	16.6	-23.4	-10.5
06898400	Weldon River near Leon, IA	104	250k	12.0	--	--	6.28	27.4	129	91.1	--	--
06899000	Weldon River at Mill Grove, MO	494	--	5.05	50.2	190	4.60	61.4	211	9.8	-18.2	-10.0
06900000	Medicine Creek near Galt, MO	225	--	5.00	--	--	4.58	55.8	192	9.2	--	--
06903400	Chariton River near Chariton, IA	182	--	6.00	--	--	2.43	48.9	89.1	146.9	--	--
06903500	Honey Creek near Russell, IA	13.2	62.5k	12.2	7.43	68	9.75	9.04	66	25.1	-17.8	3.0
06903700	South Fork Chariton River near Promise City, IA	168	24kg	5.82	25.9	113	5.79	27.1	118	0.5	-4.4	-4.2
06903900	Chariton River near Rathbun, IA	549	250k	3.7	--	--	2.12	91.8	146	74.5	--	--
06903990	Cooper Creek at Centerville, IA	47.8	24kg	6.81	24.9	127	7.00	26.2	137	-2.7	-5.0	-7.3
06904000	Chariton River near Centerville, IA	708	250k	3.42	53.8	184	2.03	108	165	68.5	-50.2	11.5
								Mean		27.9	-14.4	-1.8
								Median		17.7	-13.4	1.7
								Minimum		-25.6	-50.2	-34.5
								Maximum		146.9	29.8	12.9

Table 8. Comparison of manual measurements and GIS quantifications of main-channel slope using 1:24,000-scale topographic data for selected streamflow-gaging stations in Iowa

[Station number, U.S. Geological Survey streamflow-gaging station number; DA, drainage area; MCS, main-channel slope; MCL, main-channel length, E_{85}, streambed elevation at 85 percent length of MCL; E_{10}, streambed elevation at 10 percent length of MCL; Region, hydrologic region; mi^2, square miles; ft/mi, feet per mile; %, percent]

Station number	Station name	Region	DA (mi^2)	Manual measurements[a]			GIS quantifications[b]			Percentage difference between manual measurements and GIS quantifications		
				MCS (ft/mi)	MCL (mi)	E_{85}–E_{10} (ft)	MCS (ft/mi)	MCL (mi)	E_{85}–E_{10} (ft)	MCS (%)	MCL (%)	E_{85}–E_{10} (%)
05412100	Roberts Creek above Saint Olaf	2	70.7	8.13	30.5	186	7.86	30.6	180	3.4	-0.3	3.3
05418450	North Fork Maquoketa River at Fulton	2	516	4.57	88.1	302	4.51	88.4	299	1.3	-0.3	1.0
05463090	Black Hawk Creek at Grundy Center	2	56.9	7.01	18.3	96	6.81	19.2	98.2	2.9	-4.7	-2.2
05464640	Prairie Creek at Fairfax	2	178	4.14	37.0	115	3.91	37.9	111	5.9	-2.4	3.6
05472090	North Skunk River near Baxter	2	52.2	11.1	22.0	183	9.05	22.7	154	22.7	-3.1	18.8
05473300	Cedar Creek near Batavia	2	252	3.81	32.6	93	3.63	34.3	93	5.0	-5.0	0.0
05473400	Cedar Creek near Oakland Mills	2	530	2.57	80.5	155	2.59	82.5	160	-0.8	-2.4	-3.1
05481680	Beaver Creek at Beaver	1	38.5	8.32	18.8	117	9.30	17.0	119	-10.5	10.6	-1.7
05482135	North Raccoon River near Newell	1	233	3.37	31.2	79	3.28	31.5	77	2.7	-1.0	2.6
05483318	Brushy Creek near Templeton	2	45	8.60	15.5	100	9.91	15.7	116	-13.2	-1.3	-13.8
05483450	Middle Raccoon River near Bayard	2	375	4.25	61.2	195	4.41	61.6	204	-3.6	-0.6	-4.4
05483600	Middle Raccoon River at Panora	2	440	4.07	74.4	227	3.70	73.6	204	10.0	1.1	11.3
05488200	English Creek near Knoxville	3	90.1	5.63	33.6	142	5.60	34.0	143	0.5	-1.2	-0.7
05488620	Coal Creek near Albia	3	13.5	19.8	6.66	99	19.1	6.78	97	3.7	-1.8	2.1
05489150	Little Muchakinock Creek at Oskaloosa	2	9.12	16.3	6.28	77	16.3	6.46	79	0.0	-2.8	-2.5
05489350	South Avery Creek near Blakesburg	3	33.1	11.2	14.2	120	10.8	14.3	116	3.7	-0.7	3.4
05489490	Bear Creek at Ottumwa	2	22.9	11.8	13.5	120	13.8	14.8	153	-14.5	-8.8	-21.6
06609560	Willow Creek near Soldier	2	29.1	13.2	13.6	135	13.0	13.6	132	1.5	0.0	2.3
06818598	Platte River near Stringtown	2	51.7	7.08	17.0	90	7.10	17.2	91	-0.3	-1.2	-1.1
06818750	Platte River near Diagonal	2	217	5.75	38.0	164	4.74	38.2	136	21.3	-0.5	20.6
06897950	Elk Creek near Decatur City	3	52.5	11.6	13.5	117	15.6	10.4	121	-25.6	29.8	-3.3
06903700	South Fork Chariton River near Promise City	3	168	5.82	25.9	113	5.79	27.1	118	0.5	-4.4	-4.2
06903990	Cooper Creek at Centerville	3	47.8	6.81	24.9	127	7.00	26.2	137	-2.7	-5.0	-7.3
								Mean		0.6	-0.3	0.1
								Median		1.3	-1.2	-0.7
								Minimum		-25.6	-8.8	-21.6
								Maximum		22.7	29.8	20.6

[a]Main-channel length measured using graph paper method (Eash, 2001).
[b]Main-channel slope measured using Basinsoft (Harvey and Eash, 1996).

Table 9. River-mile and main-channel-slope values quantified for selected sites along selected streams in Iowa using a geographic information system technique and 1:24,000-scale topographic data and used to develop unadjusted main-channel-slope curves for figures 7–144

[MCS, main-channel slope; ft/mi, feet per mile; -- , no data]

River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)
Figure 7. Bear Creek, beginning at mouth in Jackson County.									
0.00	6.09	5.06	6.28	10.30	6.04	16.55	6.82	29.47	10.14
1.06	6.28	6.65	5.79	12.94	6.49	23.33	8.02	43.82	--
Figure 8. Bear and North Bear Creeks, beginning at mouth of Bear Creek in Allamakee County.									
0.00	18.04	4.17	18.57	11.60	20.80	14.98	20.58	24.20	--
0.48	18.27	9.17	20.37	11.91	20.34	18.72	29.07	--	--
Figure 9. Beaver Creek, beginning at mouth in Black Hawk County.									
0.00	5.10	15.35	5.75	31.11	6.92	48.70	--	--	--
1.55	5.03	18.39	6.02	36.64	7.52	48.71	7.75	--	--
4.76	5.10	23.18	6.30	43.02	8.09	53.67	7.96	--	--
9.87	5.56	24.57	6.48	45.52	7.70	65.04	--	--	--
Figure 10. Beaver Creek, beginning at mouth in Polk County.									
0.00	3.98	16.66	4.71	31.75	4.97	50.90	7.52	60.47	9.30
1.80	4.21	19.25	4.72	34.08	5.10	55.76	8.10	77.49	--
6.26	4.33	22.24	4.75	40.40	5.74	59.04	8.46	--	--
12.96	4.45	25.20	4.79	47.18	6.71	59.75	--	--	--
Figure 11. Big Bear Creek, beginning at mouth in Iowa County.									
0.00	5.23	3.45	5.20	14.99	6.36	24.54	6.89	34.55	8.28
1.06	5.16	8.10	5.77	18.12	6.51	28.87	7.97	36.91	10.54
2.25	5.30	11.42	5.51	22.57	6.71	30.98	7.42	45.54	--
Figure 12. Big Creek, beginning at mouth in Henry County.									
0.00	3.92	11.65	3.73	24.84	4.12	31.38	4.69	50.18	--
1.84	3.86	14.84	3.86	27.37	3.94	34.91	5.76	--	--
6.80	3.81	19.60	4.14	27.50	3.93	39.15	7.43	--	--
Figure 13. Big Creek, beginning at mouth in Linn County.									
0.00	8.68	3.13	10.03	10.72	14.02	21.71	--	--	--
1.11	9.20	7.63	11.85	14.95	17.46	--	--	--	--
Figure 14. Big Muddy Creek, beginning at mouth in Clay County.									
0.00	5.72	3.55	6.23	14.91	7.59	26.77	9.65	--	--
0.81	5.86	7.59	6.34	20.28	7.87	34.96	--	--	--
3.19	6.29	11.46	6.32	23.44	9.26	--	--	--	--
Figure 15. Black Hawk Creek, beginning at mouth in Black Hawk County.									
0.00	3.68	5.90	4.09	19.46	4.49	33.75	6.02	45.90	8.27
0.57	3.74	6.41	4.13	23.16	4.74	36.82	5.71	58.65	--
0.81	3.83	12.52	4.27	27.81	5.28	39.42	6.81	--	--
Figure 16. Boyer River, beginning at mouth in Pottawattamie County.									
0.00	3.29	15.70	3.28	40.33	3.31	62.28	3.53	88.76	4.99
3.30	3.35	18.93	3.36	43.26	3.35	65.20	3.50	94.62	5.26
3.81	3.34	23.56	3.36	48.44	3.55	69.31	3.77	100.01	7.28
3.97	3.35	27.80	3.56	50.59	3.27	72.18	4.00	105.50	9.59
5.23	3.33	30.02	3.41	52.14	3.48	75.28	4.05	109.28	12.86
6.42	3.39	34.03	3.19	55.57	3.61	79.88	4.65	118.19	--
11.14	3.29	34.31	3.20	58.32	3.46	84.42	4.44	--	--
Figure 17. Brushy Creek, beginning at mouth in Guthrie County.									
0.00	6.94	7.65	7.01	21.44	8.08	26.93	8.41	35.34	9.91
0.98	7.11	11.68	7.35	24.95	8.26	28.72	8.33	40.22	12.25
3.47	7.22	18.01	7.64	25.47	8.71	33.34	9.52	51.01	--
Figure 18. Buffalo and East Branch Buffalo Creeks, beginning at mouth of Buffalo Creek in Jones County.									
0.00	4.55	13.30	4.57	26.83	4.72	42.87	4.87	54.42	5.90
0.43	4.62	15.01	4.64	28.88	4.67	47.69	5.13	61.71	6.29
5.19	4.60	20.08	4.67	32.72	4.60	48.69	4.89	78.54	--
8.29	4.72	24.46	4.80	36.69	4.80	51.52	5.06	--	--

Table 9. River-mile and main-channel-slope values quantified for selected sites along selected streams in Iowa using a geographic information system technique and 1:24,000-scale topographic data and used to develop unadjusted main-channel-slope curves for figures 7–144—Continued

[MCS, main-channel slope; ft/mi, feet per mile; -- , no data]

River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)
Figure 19. Buttrick Creek, beginning at mouth in Greene County.									
0.00	3.99	8.75	3.39	10.26	3.44	--	--	--	--
3.36	4.00	10.22	3.44	50.15	--	--	--	--	--
Figure 20. Cedar Creek, beginning at mouth in Henry County.									
0.00	2.38	20.65	2.63	40.76	3.37	56.96	4.42	72.72	6.70
4.43	2.59	27.24	2.94	44.59	3.60	60.06	4.98	75.35	8.11
10.16	2.49	33.13	3.18	50.05	3.77	64.21	5.06	77.80	7.81
15.19	2.52	37.30	3.40	52.65	3.63	68.49	5.24	86.93	--
Figure 21. Cedar Creek, beginning at mouth in Mahaska County.									
0.00	3.87	8.80	4.34	23.22	5.30	37.60	7.10	51.64	10.77
2.66	3.86	13.35	4.59	29.31	5.57	42.45	7.52	63.75	--
3.19	3.90	18.17	5.20	34.20	6.67	45.64	8.25	--	--
Figure 22. Cedar River, beginning at Buchanan-Black Hawk County line.									
0.00	2.59	33.35	2.71	57.42	2.75	87.51	2.98	126.64	2.95
6.65	2.61	34.26	2.72	58.88	2.79	95.24	2.98	131.56	2.93
14.72	2.63	34.69	2.73	63.67	2.82	105.08	3.14	132.95	2.87
21.72	2.68	42.75	2.73	70.61	2.78	113.73	2.88	134.36	2.87
26.28	2.72	46.07	2.74	77.20	2.92	114.97	2.92	141.02	2.96
26.84	2.73	46.59	2.74	82.08	2.94	118.24	2.72	145.25	3.19
30.60	2.67	46.88	2.75	83.79	2.88	122.99	2.82	201.68	--
Figure 23. Chariton River, beginning at Wayne-Lucas County line.									
0.00	2.30	23.98	2.57	43.64	2.60	55.00	5.24	--	--
7.63	2.33	30.59	2.38	44.80	2.84	55.48	5.46	--	--
12.19	2.42	35.25	2.31	49.54	3.66	58.45	6.58	--	--
17.83	2.43	39.06	2.39	54.79	5.15	66.74	--	--	--
Figure 24. Chequest Creek, beginning at mouth in Van Buren County.									
0.00	5.04	11.06	5.55	20.91	6.48	27.78	7.05	48.96	--
3.20	5.05	17.34	5.91	21.18	6.50	33.88	7.58	--	--
Figure 25. Clanton and North Fork Clanton Creeks, beginning at mouth of Clanton Creek in Warren County.									
0.00	7.04	4.11	7.92	20.57	9.22	32.35	7.41	--	--
1.37	7.29	10.15	7.75	24.32	9.73	45.57	--	--	--
3.31	7.71	15.97	8.82	29.88	8.04	--	--	--	--
Figure 26. Clear Creek, beginning at mouth in Johnson County.									
0.00	4.87	4.80	5.65	10.27	5.93	20.00	9.28	--	--
0.44	4.95	5.79	5.74	13.48	7.35	22.41	12.14	--	--
2.79	5.58	6.50	5.93	16.10	8.84	30.60	--	--	--
Figure 27. Crane Creek, beginning at mouth in Black Hawk County.									
0.00	2.96	3.23	2.89	10.32	3.23	17.53	3.62	27.63	5.51
0.24	2.98	5.04	2.77	14.61	3.52	21.46	4.21	39.81	--
Figure 28. Crane Creek, beginning at mouth in Fayette County.									
0.00	4.45	13.44	4.14	27.78	4.67	40.72	5.82	56.04	11.13
4.31	4.32	17.63	4.43	31.71	4.74	46.13	6.79	65.66	--
7.29	4.31	20.63	4.17	35.43	4.84	50.10	7.62	--	--
11.04	4.22	23.20	4.09	39.47	5.60	51.81	7.96	--	--
Figure 29. Crooked and West Fork Crooked Creeks, beginning at mouth of Crooked Creek in Jefferson County.									
0.00	2.91	3.47	2.91	20.37	3.33	41.24	4.95	59.48	--
0.56	2.94	9.13	3.34	26.52	3.61	46.50	6.31	--	--
1.06	2.97	15.17	3.11	35.05	3.82	51.06	7.48	--	--
Figure 30. Deep Creek, beginning at mouth in Jackson County.									
0.00	5.63	3.12	5.69	7.99	6.26	18.28	8.13	--	--
2.59	5.54	4.62	5.95	14.22	8.07	31.07	--	--	--

Table 9. River-mile and main-channel-slope values quantified for selected sites along selected streams in Iowa using a geographic information system technique and 1:24,000-scale topographic data and used to develop unadjusted main-channel-slope curves for figures 7–144—Continued

[MCS, main-channel slope; ft/mi, feet per mile; -- , no data]

River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)
Figure 31. East Boyer River, beginning at mouth in Crawford County.									
0.00	8.54	2.13	8.90	10.62	11.11	23.06	--	--	--
0.34	8.84	6.21	9.49	13.27	11.95	--	--	--	--
Figure 32. East Branch West Nishnabotna River, beginning at mouth in Pottawattamie County.									
0.00	6.23	5.21	5.69	13.48	6.67	24.71	9.21	37.11	19.59
1.71	5.85	5.75	5.80	17.98	7.44	28.59	10.46	42.90	--
3.00	5.49	10.28	6.51	21.06	8.84	32.36	13.62	--	--
Figure 33. East Fork Crooked Creek, beginning at mouth in Washington County.									
0.00	2.39	7.86	2.73	18.86	4.81	27.04	9.94	--	--
3.31	2.62	12.75	3.52	22.93	7.08	35.21	--	--	--
Figure 34. East Fork One Hundred and Two River, beginning at Iowa-Missouri State line in Taylor County.									
0.00	5.88	6.51	5.76	10.30	5.90	17.69	6.29	34.35	--
4.41	5.89	9.13	5.45	14.99	6.61	22.11	8.69	--	--
Figure 35. East Fork Wapsipinicon River, beginning at mouth in Bremer County.									
0.00	4.49	8.83	4.69	17.76	4.97	29.76	6.50	37.28	8.92
2.67	4.46	13.37	4.67	22.59	5.26	33.63	6.97	50.55	--
Figure 36. East Nishnabotna River, beginning at mouth in Fremont County.									
0.00	3.88	31.95	4.23	59.66	5.11	83.99	5.55	105.83	7.97
3.55	3.66	38.14	4.22	62.37	4.85	84.54	5.63	110.31	9.94
4.69	3.70	39.35	4.13	66.87	5.00	87.69	6.02	115.24	13.78
10.67	3.78	41.83	4.17	69.24	5.01	91.35	6.49	122.68	--
12.53	4.04	46.27	4.65	74.33	5.10	91.61	6.50	--	--
17.04	4.11	51.34	4.52	74.64	5.14	96.40	6.29	--	--
22.35	4.08	52.31	4.54	78.33	5.04	97.51	6.43	--	--
28.12	4.28	57.86	4.58	81.48	5.77	102.32	7.29	--	--
Figure 37. East Nodaway River, beginning at mouth in Page County.									
0.00	4.06	12.40	3.92	26.28	4.17	41.13	3.69	75.06	--
0.67	4.12	14.51	3.99	30.49	4.27	46.56	4.01	--	--
2.71	3.76	18.79	4.08	36.79	3.79	53.48	5.73	--	--
7.16	3.84	21.91	4.19	37.73	3.88	60.14	7.99	--	--
Figure 38. English Creek, beginning at mouth in Marion County.									
0.00	4.54	12.73	5.60	21.22	7.25	34.39	12.72	--	--
2.27	4.62	15.10	5.71	28.32	9.51	46.68	--	--	--
8.54	5.25	19.43	6.33	31.18	10.57	--	--	--	--
Figure 39. English and North English Rivers, beginning at mouth of English River in Washington County.									
0.00	3.44	21.93	4.01	38.85	4.92	52.25	5.84	68.84	6.92
3.18	3.40	25.05	4.07	41.51	5.17	58.52	6.15	70.90	7.33
3.87	3.43	28.35	4.13	43.08	5.37	60.27	6.49	73.65	7.37
6.66	3.39	33.61	4.40	45.04	5.29	63.48	6.25	77.45	8.24
15.44	3.77	36.60	4.44	46.80	5.60	65.04	5.93	78.50	9.69
17.03	3.79	38.09	4.85	48.44	5.53	66.84	6.51	89.85	--
Figure 40. Farm Creek, beginning at mouth in Mills County.									
0.00	8.74	4.52	9.80	9.90	19.62	--	--	--	--
2.48	8.94	5.77	10.67	18.11	--	--	--	--	--
Figure 41. Flint Creek, beginning at mouth in Des Moines County.									
0.00	5.80	6.31	6.30	14.12	7.86	22.02	13.68	--	--
0.97	6.11	10.14	7.91	18.68	11.03	30.66	--	--	--
Figure 42. Flood Creek, beginning at mouth in Butler County.									
0.00	4.74	12.45	4.88	30.28	6.33	40.87	8.43	--	--
2.82	4.73	18.80	5.00	34.71	6.40	52.69	--	--	--
7.67	4.68	25.09	5.64	38.07	6.93	53.45	--	--	--

Table 9. River-mile and main-channel-slope values quantified for selected sites along selected streams in Iowa using a geographic information system technique and 1:24,000-scale topographic data and used to develop unadjusted main-channel-slope curves for figures 7–144—Continued

[MCS, main-channel slope; ft/mi, feet per mile; -- , no data]

River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)
Figure 43. Floyd River, beginning at mouth in Woodbury County.									
0.00	3.75	13.86	3.93	36.28	3.98	60.24	4.62	84.71	6.00
0.07	3.76	17.27	3.97	40.26	3.94	63.39	4.67	86.06	5.80
0.41	3.77	23.12	3.84	45.34	4.03	67.84	5.24	88.66	6.54
0.49	3.77	26.76	3.90	49.75	4.00	71.16	5.23	95.36	6.75
4.14	3.87	27.90	3.97	55.31	4.25	74.05	5.36	101.35	7.66
7.23	3.89	31.32	4.00	56.25	4.31	77.88	5.74	108.86	8.61
8.94	3.79	32.25	3.90	56.75	4.36	84.15	6.06	114.87	--
Figure 44. Fourmile Creek, beginning at mouth in Polk County.									
0.00	7.31	5.16	7.33	13.47	8.30	23.54	8.58	--	--
1.93	--	6.21	7.36	16.76	8.48	34.83	--	--	--
3.55	7.34	8.78	7.69	18.19	8.50	--	--	--	--
Figure 45. Fox River, beginning at Iowa-Missouri State line in Van Buren County.									
0.00	4.93	13.82	5.60	26.35	6.95	39.12	9.76	--	--
1.37	5.02	16.63	5.56	30.19	6.81	41.62	10.18	--	--
4.87	5.10	17.97	5.84	30.98	7.05	43.70	10.64	--	--
8.70	5.63	22.12	5.91	35.11	8.31	52.84	--	--	--
Figure 46. Grand River, beginning at Iowa-Missouri State line in Ringgold County.									
0.00	6.26	6.92	6.97	16.77	7.63	23.95	7.99	--	--
0.22	6.30	9.65	7.07	19.07	7.92	28.69	8.29	--	--
3.99	6.73	12.40	7.09	21.19	7.98	42.48	--	--	--
Figure 47. Hardin Creek, beginning at mouth in Greene County.									
0.00	3.29	5.95	3.18	12.11	2.79	15.41	2.71	55.57	--
2.64	3.05	8.20	3.05	13.75	2.60	18.36	2.54	--	--
Figure 48. Hartgrave Creek, beginning at mouth in Butler County.									
0.00	6.39	2.97	6.51	7.71	7.01	10.22	7.23	--	--
1.11	6.27	5.52	6.72	8.99	7.05	45.73	--	--	--
Figure 49. Honey Creek, beginning at mouth in Marshall County.									
0.00	7.97	10.47	8.60	17.96	10.28	25.31	11.37	--	--
2.99	8.38	13.60	8.82	19.91	9.97	33.49	--	--	--
6.43	8.59	15.11	--	23.47	11.64	35.97	--	--	--
Figure 50. Indian Creek, beginning at mouth in Cass County.									
0.00	6.00	3.68	6.82	15.05	7.96	22.06	9.59	28.09	12.21
0.80	6.57	7.89	7.04	15.67	8.19	25.68	9.95	38.42	--
1.62	6.52	11.01	7.43	18.69	8.13	27.13	11.63	--	--
Figure 51. Indian and East Indian Creeks, beginning at mouth of Indian Creek in Jasper County.									
0.00	5.25	8.53	5.50	14.47	5.52	27.30	5.94	41.74	6.58
0.24	5.28	8.80	--	18.10	5.73	30.30	5.98	48.49	9.02
2.22	5.10	11.52	5.48	20.55	5.65	33.90	5.98	52.87	11.92
4.69	5.14	11.67	5.50	23.39	5.97	38.63	6.36	65.46	--
Figure 52. Iowa River, beginning at Johnson-Iowa County line.									
0.00	2.27	50.82	2.45	95.58	2.54	127.57	2.43	164.94	1.39
2.17	2.29	56.32	2.47	100.36	2.59	131.77	2.48	167.64	1.40
12.15	2.33	61.11	2.49	101.09	2.52	137.63	2.45	172.90	1.41
21.83	2.38	69.99	2.54	107.27	2.52	140.48	--	175.66	--
33.23	2.42	75.01	2.54	111.79	2.60	144.44	2.32	253.53	--
41.38	2.50	81.66	2.55	115.22	2.57	149.98	2.20	--	--
42.00	2.42	83.22	2.57	116.74	2.48	155.48	1.80	--	--
42.67	2.45	88.44	2.54	121.29	2.45	161.98	1.33	--	--
46.32	2.42	91.50	2.55	125.09	2.40	162.44	1.33	--	--
Figure 53. Kanaranzi Creek, beginning at mouth in Lyon County.									
0.00	5.25	3.80	5.35	7.80	5.49	--	--	--	--
1.88	5.28	6.46	5.52	66.07	--	--	--	--	--

Table 9. River-mile and main-channel-slope values quantified for selected sites along selected streams in Iowa using a geographic information system technique and 1:24,000-scale topographic data and used to develop unadjusted main-channel-slope curves for figures 7–144—Continued

[MCS, main-channel slope; ft/mi, feet per mile; -- , no data]

River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)
Figure 54. Keg Creek, beginning at mouth in Mills County.									
0.00	5.18	9.32	5.98	20.83	6.80	38.24	6.90	46.10	8.15
1.82	5.33	13.47	6.68	24.89	6.78	42.78	7.59	49.57	9.34
4.33	5.56	15.68	6.78	27.78	6.35	43.50	7.60	52.42	9.00
5.87	5.47	17.75	6.81	33.72	7.11	45.55	7.69	64.80	--
Figure 55. Little Cedar River, beginning at mouth in Chickasaw County.									
0.00	3.94	12.89	3.93	29.18	4.29	45.34	4.50	66.86	7.23
1.24	4.01	13.21	3.94	30.61	4.40	51.10	4.86	87.33	--
4.20	4.01	17.89	4.11	36.65	4.66	55.43	5.23	--	--
7.61	3.94	23.58	4.10	39.61	4.73	60.98	5.69	--	--
Figure 56. Little Maquoketa River, beginning at mouth in Dubuque County.									
0.00	12.97	6.84	17.15	15.39	25.18	20.14	34.58	--	--
4.13	15.46	9.84	18.82	17.92	30.12	30.22	--	--	--
Figure 57. Little Rock River, beginning at mouth in Lyon County.									
0.00	4.57	9.65	4.82	24.08	6.00	39.86	6.62	77.57	--
0.76	4.50	13.69	4.96	28.33	6.45	44.44	6.53	--	--
2.91	4.46	17.21	5.22	33.48	6.36	47.30	7.00	--	--
5.07	4.67	21.07	6.11	36.81	6.39	50.68	7.52	--	--
Figure 58. Little Sioux River, beginning at mouth in Harrison County.									
0.00	1.67	32.12	1.59	82.69	1.84	123.61	1.93	185.26	2.45
0.47	1.68	33.22	1.60	86.32	1.82	126.79	1.88	191.71	2.78
1.11	1.64	38.03	1.54	89.81	1.91	131.77	1.96	197.59	2.88
5.89	1.62	43.72	1.66	96.94	1.87	139.38	2.00	202.03	2.99
8.83	1.64	46.93	1.68	97.95	1.84	148.43	2.01	207.41	3.04
13.41	1.57	52.06	1.72	98.84	1.81	152.45	2.06	211.23	3.03
17.24	1.59	58.80	1.66	105.80	1.87	159.11	2.11	216.85	3.33
21.66	1.51	59.84	1.66	111.09	1.95	164.22	2.29	220.69	3.60
21.86	1.51	67.31	1.80	117.42	1.92	167.38	2.23	224.29	3.74
23.69	1.53	69.97	1.77	119.77	1.88	175.24	2.27	226.26	3.79
28.47	1.56	72.14	1.79	120.89	1.90	180.27	2.28	268.49	--
Figure 59. Little Turkey River, beginning at mouth in Fayette County.									
0.00	4.39	11.78	4.47	22.31	5.24	30.04	5.10	41.96	7.46
4.34	4.57	14.16	5.03	24.42	5.03	32.90	4.70	44.36	9.43
8.27	4.37	19.42	4.86	25.91	4.88	37.64	6.01	53.25	--
Figure 60. Little Wapsipinicon River, beginning at mouth in Buchanan County.									
0.00	4.21	11.22	4.59	19.19	4.87	31.85	6.09	40.55	7.27
0.61	4.18	11.47	4.55	25.96	5.29	35.99	6.37	54.81	--
4.55	4.26	16.14	4.78	27.71	5.36	38.74	7.18	--	--
Figure 61. Little Wapsipinicon River, beginning at mouth in Chickasaw County.									
0.00	5.08	7.71	5.79	18.69	7.43	26.27	10.23	42.04	--
5.07	5.41	13.51	6.15	23.43	8.56	32.23	13.71	--	--
Figure 62. Long and East Long Creeks, beginning at mouth of Long Creek in Decatur County.									
0.00	6.00	11.29	7.68	19.04	9.30	33.11	--	--	--
5.14	6.13	16.26	8.24	21.39	9.92	--	--	--	--
Figure 63. Long and South Fork Long Creeks, beginning at mouth of Long Creek in Louisa County.									
0.00	3.74	9.04	4.09	25.37	5.40	35.56	6.32	--	--
1.58	3.72	16.31	4.82	28.21	5.58	37.42	6.47	--	--
4.95	4.06	19.43	5.50	31.06	5.68	50.35	--	--	--
Figure 64. Lost Island Outlet, Pickerel Run, and Joint drainage ditch 61, beginning at mouth of Lost Island Outlet in Clay County.									
0.00	5.63	5.13	5.45	12.89	7.11	22.94	9.61	--	--
3.20	5.63	6.41	5.47	15.38	7.41	29.60	--	--	--
4.89	5.41	10.29	6.22	19.45	9.50	--	--	--	--

Table 9. River-mile and main-channel-slope values quantified for selected sites along selected streams in Iowa using a geographic information system technique and 1:24,000-scale topographic data and used to develop unadjusted main-channel-slope curves for figures 7–144—Continued

[MCS, main-channel slope; ft/mi, feet per mile; -- , no data]

River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)
Figure 65. Lytle Creek, beginning at mouth in Jackson County.									
0.00	7.14	5.94	8.40	16.69	11.38	20.12	12.49	34.01	--
1.38	7.61	14.52	10.60	17.02	11.90	22.52	13.92	--	--
Figure 66. Maple River, beginning at mouth in Monona County.									
0.00	3.33	15.98	3.34	32.61	3.60	54.33	4.05	78.86	6.15
1.18	3.37	17.70	3.25	37.10	3.53	60.28	4.31	85.44	9.01
1.92	3.39	22.28	3.43	41.79	3.70	63.27	4.87	88.59	10.80
6.43	3.34	26.62	3.40	46.56	3.81	67.98	4.76	100.85	--
11.26	3.38	30.47	3.70	48.85	3.80	71.57	5.13	--	--
Figure 67. Maquoketa River, beginning at mouth in Jackson County.									
0.00	3.33	40.26	3.94	81.50	5.14	109.40	6.44	131.32	8.23
2.20	3.35	44.30	3.96	83.00	5.12	111.18	6.07	134.74	8.87
7.15	3.39	47.06	4.07	87.54	5.29	113.26	6.30	138.98	8.77
11.22	3.47	53.45	4.14	92.17	5.39	114.76	6.34	139.73	9.36
19.51	3.47	59.02	4.19	94.40	5.92	117.04	6.84	149.66	--
27.60	3.66	61.86	4.38	97.09	4.98	121.34	7.47	--	--
31.72	3.67	66.84	4.58	101.58	5.38	125.52	7.34	--	--
Figure 68. Maynes Creek, beginning at mouth in Butler County.									
0.00	7.32	5.26	7.53	10.49	7.67	43.53	--	--	--
0.79	7.30	9.55	7.51	16.11	8.06	--	--	--	--
Figure 69. Middle Nodaway River, beginning at mouth in Montgomery County.									
0.00	4.72	12.51	5.33	25.99	6.24	34.01	5.47	60.62	--
0.79	4.79	15.25	5.55	27.06	6.19	38.03	6.02		--
2.91	4.84	18.72	5.81	28.91	6.72	40.60	6.37	--	--
6.86	4.92	20.76	6.22	28.91	5.06	46.30	7.28	--	--
8.52	5.14	22.58	6.15	29.44	5.10	49.42	8.90	--	--
Figure 70. Middle Raccoon River, beginning at mouth in Dallas County.									
0.00	4.08	18.16	3.70	40.65	4.55	55.22	5.33	76.56	9.36
1.56	4.05	19.25	3.95	44.14	4.50	58.39	5.89	78.37	9.75
7.55	4.14	26.74	4.29	48.41	4.87	63.55	6.97	82.49	12.69
8.60	4.11	30.23	4.41	48.80	4.93	68.63	8.22	91.80	--
12.88	3.45	34.36	4.09	51.98	5.28	72.24	8.77	--	--
Figure 71. Middle River, beginning at mouth in Warren County.									
0.00	4.38	28.80	4.78	57.72	4.97	84.29	5.36	109.21	8.35
5.24	4.60	29.40	4.81	60.87	4.90	89.87	5.68	113.85	10.50
9.31	4.63	35.36	4.93	66.30	4.84	94.77	5.86	127.60	--
13.15	4.70	40.99	5.00	69.46	4.68	99.47	6.84	--	--
14.79	4.68	45.29	5.18	73.06	4.92	104.15	7.34	--	--
19.82	4.72	49.29	4.91	75.10	4.97	107.23	7.76	--	--
23.62	4.74	53.09	4.77	78.38	5.33	108.02	8.42	--	--
Figure 72. Mill Creek, beginning at mouth in Cherokee County.									
0.00	4.22	11.80	4.10	30.30	5.10	45.39	7.88	65.72	--
2.75	4.25	17.67	4.43	37.20	5.97	50.01	10.86	--	--
7.38	4.10	24.15	4.71	41.42	6.91	54.03	13.44	--	--
Figure 73. Minerva Creek, beginning at mouth in Marshall County.									
0.00	8.60	8.09	9.38	12.19	9.97	20.64	11.12	36.40	--
3.96	8.81	11.57	--	18.22	10.22	24.72	11.67	--	--
Figure 74. Mosquito Creek, beginning at mouth in Dallas County.									
0.00	4.27	4.80	3.95	16.84	4.23	31.94	7.31	44.68	--
0.32	--	9.70	4.21	22.04	5.01	33.98	8.92	--	--
2.03	4.00	13.46	4.19	26.96	5.33	38.97	17.83	--	--

Table 9. River-mile and main-channel-slope values quantified for selected sites along selected streams in Iowa using a geographic information system technique and 1:24,000-scale topographic data and used to develop unadjusted main-channel-slope curves for figures 7–144—Continued

[MCS, main-channel slope; ft/mi, feet per mile; -- , no data]

River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)
Figure 75. Mosquito Creek, beginning at mouth in Pottawattamie County.									
0.00	6.33	7.84	6.34	24.64	8.12	31.93	7.76	49.99	11.53
2.96	6.27	11.93	7.19	25.50	8.20	36.92	9.13	62.51	--
3.48	6.33	13.18	7.09	26.68	8.30	40.77	9.53	--	--
5.15	6.27	16.02	7.11	29.11	7.89	45.32	10.24	--	--
7.06	6.41	19.26	7.44	29.68	8.34	49.73	10.63	--	--
Figure 76. Mud Creek, beginning at mouth in Lyon County.									
0.00	5.35	4.69	5.66	13.98	5.66	23.99	7.72	--	--
0.78	5.44	8.22	5.48	17.20	6.33	25.28	7.96	--	--
2.36	5.51	10.98	5.47	18.66	6.33	42.47	--	--	--
Figure 77. Mud Creek, beginning at mouth in Muscatine County.									
0.00	3.05	5.09	3.80	11.31	3.86	18.65	5.80	27.89	--
1.79	3.52	9.54	4.12	16.36	5.57	23.13	10.17	--	--
Figure 78. Mud Creek, beginning at mouth in Scott County.									
0.00	5.06	4.79	5.86	10.25	7.78	21.91	--	--	--
1.72	5.19	7.48	6.68	13.00	9.88	--	--	--	--
Figure 79. Nishnabotna and West Nishnabotna Rivers, beginning at Iowa-Missouri State line in Fremont County.									
0.00	3.96	21.42	4.12	46.20	4.54	75.94	4.80	105.18	6.07
1.33	3.84	23.44	4.24	49.53	4.56	76.51	4.83	109.33	6.83
3.84	3.89	27.68	4.10	52.96	4.64	81.42	4.96	111.03	7.64
5.45	3.91	30.25	4.07	57.59	4.84	87.57	5.34	111.50	8.28
8.19	4.03	34.22	4.33	59.40	4.95	92.84	5.64	114.00	8.84
12.60	4.16	38.91	4.39	65.57	5.09	97.17	5.95	119.14	13.92
16.15	4.15	44.71	4.44	73.16	5.01	101.19	6.28	127.90	--
Figure 80. Nodaway and West Nodaway Rivers, beginning at Iowa-Missouri State line in Page County.									
0.00	4.33	12.00	4.68	26.33	4.99	44.29	5.49	62.94	7.66
2.93	4.40	20.17	4.83	29.82	4.78	48.16	6.06	66.78	9.00
6.09	4.47	24.03	4.73	32.47	5.02	51.74	6.24	78.17	--
11.51	4.63	25.66	4.94	37.33	5.08	58.12	7.56	--	--
Figure 81. North Cedar Creek, beginning at mouth in Marion County.									
0.00	5.63	9.80	6.79	15.33	8.00	23.79	9.57	37.65	--
3.28	6.00	14.69	7.65	20.13	9.22	28.27	13.19	--	--
Figure 82. North Fork Black Hawk Creek, beginning at mouth in Grundy County.									
0.00	3.51	5.52	4.18	12.15	4.23	25.09	--	--	--
2.23	4.12	7.72	4.43	15.95	10.03	--	--	--	--
Figure 83. North Fork Maquoketa River, beginning at mouth in Jackson County.									
0.00	4.33	12.37	4.57	44.24	5.48	62.33	7.05	72.57	7.90
0.27	4.35	16.94	4.65	44.58	5.55	63.90	7.11	79.15	8.33
5.93	4.50	22.12	5.08	47.50	5.58	69.41	7.34	80.67	10.47
8.24	4.51	29.40	5.13	57.30	6.28	71.52	7.35	96.61	--
Figure 84. North River, beginning at mouth in Polk County.									
0.00	4.38	22.83	5.42	40.61	6.43	65.67	6.60	95.65	11.07
4.06	4.53	26.27	5.53	45.81	6.87	71.73	6.17	106.62	--
4.98	4.57	31.53	5.76	50.50	7.24	78.66	6.43	--	--
9.03	4.67	36.60	6.09	53.96	7.30	85.01	7.24	--	--
15.99	4.95	37.44	6.16	59.77	7.56	90.78	8.30	--	--
Figure 85. North Skunk River, beginning at mouth in Keokuk County.									
0.00	2.49	40.34	3.27	65.61	3.85	92.27	5.84	106.64	9.22
3.62	2.52	41.28	3.34	72.72	4.34	92.72	5.97	106.95	9.05
7.55	2.70	48.13	3.29	76.49	4.53	93.76	6.04	112.03	10.63
19.60	2.76	53.61	3.51	80.84	4.91	95.07	6.30	118.04	13.87
25.66	2.95	57.27	3.51	82.01	4.78	99.28	7.09	125.21	--
33.80	3.16	63.44	3.81	86.34	5.42	104.09	8.53	129.65	--

Table 9. River-mile and main-channel-slope values quantified for selected sites along selected streams in Iowa using a geographic information system technique and 1:24,000-scale topographic data and used to develop unadjusted main-channel-slope curves for figures 7–144—Continued

[MCS, main-channel slope; ft/mi, feet per mile; -- , no data]

River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)
Figure 86. Ocheyedan River, beginning at mouth in Clay County.									
0.00	4.88	12.87	5.05	22.94	5.55	32.84	5.31	40.98	5.85
4.88	5.07	16.83	5.19	24.32	5.43	34.61	5.37	68.29	--
8.37	5.03	20.34	5.30	28.25	5.63	36.67	5.44	--	--
Figure 87. Old Mans Creek, beginning at mouth in Johnson County.									
0.00	4.04	3.14	4.03	15.82	4.22	28.28	5.42	39.81	7.80
1.10	3.85	8.83	4.10	22.51	4.98	32.32	6.61	43.09	9.33
1.34	3.87	12.17	4.33	25.71	5.28	36.35	6.88	53.09	--
Figure 88. Otter Creek, beginning at mouth in Buchanan County.									
0.00	6.98	7.82	8.28	14.78	9.82	28.98	--	--	--
4.63	7.71	11.36	8.99	18.99	11.37	--	--	--	--
Figure 89. Otter Creek, beginning at mouth in Lyon County.									
0.00	5.14	7.68	5.45	20.07	5.55	29.78	5.95	40.35	6.38
1.71	5.17	12.37	5.54	23.90	5.72	35.25	6.18	45.35	6.67
5.97	5.30	15.03	5.77	26.89	5.86	38.64	6.34	63.35	--
Figure 90. Otter Creek, beginning at mouth in Warren County.									
0.00	5.36	7.01	5.68	18.27	7.64	23.17	9.53	30.00	12.79
4.79	5.95	12.17	6.70	19.64	7.95	28.09	11.35	41.37	--
Figure 91. Pigeon Creek, beginning at mouth in Pottawattamie County.									
0.00	8.07	3.12	9.05	16.27	10.57	23.14	11.84	33.59	14.36
0.91	8.60	7.23	9.14	18.43	10.63	26.59	11.34	44.08	--
1.39	8.69	11.04	9.93	19.10	11.35	30.49	11.76	--	--
Figure 92. Platte River, beginning at Iowa-Missouri State line in Taylor County.									
0.00	3.65	10.37	4.03	20.45	4.92	32.57	5.33	40.40	7.12
4.19	3.97	13.04	4.34	24.80	5.46	34.09	5.66	44.00	8.41
6.75	4.15	17.36	4.74	28.92	5.36	38.40	7.10	55.55	--
Figure 93. Prairie Creek, beginning at mouth in Linn County.									
0.00	3.91	5.16	4.05	13.94	4.57	28.07	5.65	37.32	7.87
2.59	4.10	7.22	3.95	17.24	4.28	30.31	6.03	41.67	10.01
3.18	4.15	10.51	3.91	22.03	4.70	34.81	6.86	48.41	--
Figure 94. Raccoon and North Raccoon Rivers, beginning at mouth of Raccoon River in Polk County.									
0.00	2.41	44.07	2.47	96.71	2.54	144.88	2.48	179.78	2.50
2.56	2.42	49.70	2.47	101.60	2.53	147.82	2.51	186.20	2.55
8.60	2.43	54.87	2.58	106.89	2.55	152.69	2.64	190.95	2.86
13.95	2.44	60.26	2.63	111.53	2.56	157.10	2.63	196.54	3.28
15.66	2.46	64.49	2.61	117.06	2.63	161.76	2.49	201.09	3.59
24.38	2.41	69.14	2.64	120.00	2.62	163.44	2.50	204.82	4.11
29.32	2.44	73.17	2.58	124.12	2.61	166.37	2.56	208.66	5.17
30.46	2.46	75.37	2.62	128.38	2.63	168.95	2.48	210.77	5.49
30.55	2.46	80.62	2.63	131.24	2.71	169.83	2.53	216.56	6.98
30.56	--	85.00	2.61	135.49	2.59	172.43	2.38	220.67	--
39.84	2.48	92.61	2.56	138.47	2.53	177.74	2.39	228.02	--
Figure 95. Roberts Creek, beginning at mouth in Clayton County.									
0.00	8.87	11.00	7.93	17.64	8.44	22.50	8.56	29.17	10.37
3.39	8.55	11.22	7.86	18.81	8.58	25.82	9.53	41.78	--
5.78	8.00	16.87	8.06	21.10	7.92	27.33	10.06	--	--
Figure 96. Rock River, beginning at mouth in Sioux County.									
0.00	3.79	15.55	4.01	30.10	3.97	46.04	3.94	147.63	--
0.67	3.81	19.38	4.05	36.59	3.86	46.49	3.97	--	--
6.54	3.93	26.43	3.96	43.14	3.96	49.25	3.99	--	--
9.21	4.04	27.58	3.90	44.83	3.89	54.06	4.13	--	--

Table 9. River-mile and main-channel-slope values quantified for selected sites along selected streams in Iowa using a geographic information system technique and 1:24,000-scale topographic data and used to develop unadjusted main-channel-slope curves for figures 7–144—Continued

[MCS, main-channel slope; ft/mi, feet per mile; -- , no data]

River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)
Figure 97. Salt Creek, beginning at mouth in Benton County.									
0.00	5.04	8.02	5.44	18.42	7.12	30.32	9.87	--	--
0.36	5.08	9.98	5.77	22.07	7.26	42.09	--	--	--
2.82	5.06	15.02	6.31	26.33	8.21	--	--	--	--
Figure 98. Sevenmile Creek, beginning at mouth in Montgomery County.									
0.00	6.63	10.69	7.28	19.63	7.70	30.70	12.02	--	--
0.28	6.73	14.33	7.36	23.64	8.21	39.68	--	--	--
5.56	6.74	18.03	7.78	27.27	10.32	--	--	--	--
Figure 99. Shell Rock River, beginning at mouth in Black Hawk County.									
0.00	3.13	11.66	3.24	37.43	3.41	54.59	3.41	131.15	--
1.15	3.15	20.24	3.30	38.20	3.44	59.97	3.09	--	--
3.88	3.22	22.57	3.29	40.85	3.64	61.99	3.06	--	--
8.04	3.25	29.51	3.41	43.45	3.57	65.90	2.83	--	--
10.73	3.21	36.80	3.39	50.64	3.40	69.46	--	--	--
Figure 100. Silver Creek, beginning at mouth in Mills County.									
0.00	5.91	10.04	6.56	22.98	6.75	37.88	7.58	48.57	8.46
0.54	6.10	13.35	6.42	27.28	6.93	42.18	7.35	65.66	--
3.27	6.36	16.95	6.61	31.53	7.53	44.18	6.91	--	--
6.95	5.86	18.79	6.92	34.32	7.01	44.81	7.05	--	--
Figure 101. Sixmile Creek, beginning at mouth in Sioux County.									
0.00	6.72	2.68	6.94	11.78	7.62	22.31	9.23	30.34	11.91
0.86	6.69	8.27	6.80	15.69	8.16	26.86	9.89	38.13	--
Figure 102. Skunk and South Skunk Rivers, beginning at mouth of Skunk River at Lee-Des Moines County line.									
0.00	1.86	53.04	2.17	111.87	2.66	168.16	3.54	211.73	5.18
6.15	1.89	57.61	2.25	116.88	2.75	172.37	3.69	216.21	5.39
10.41	1.90	64.41	2.25	125.25	2.85	175.01	3.78	218.06	5.60
17.00	1.93	64.57	2.25	129.94	2.95	179.41	3.75	218.57	5.44
19.86	1.97	72.33	2.25	134.33	3.09	183.27	3.80	219.81	5.68
21.81	1.98	80.20	2.40	137.07	3.04	189.78	4.18	221.66	5.91
27.65	1.99	84.83	2.43	142.23	3.17	192.24	4.10	223.01	5.74
32.94	2.04	88.93	2.46	145.86	3.28	195.94	4.08	227.42	6.39
37.82	2.05	94.72	2.53	152.46	3.34	198.92	4.44	230.62	6.66
42.84	2.05	98.96	2.50	157.20	3.46	204.03	4.57	231.04	6.69
44.91	2.07	101.91	2.57	160.76	3.56	209.50	4.92	232.22	6.54
48.02	2.14	108.75	2.60	165.64	3.57	210.54	5.07	276.88	--
Figure 103. Soap Creek, beginning at mouth in Wapello County.									
0.00	5.16	5.60	5.09	22.08	7.07	35.90	10.00	52.07	--
1.17	4.97	11.28	5.80	26.35	7.72	39.23	12.31	--	--
2.91	5.05	17.34	6.79	31.84	9.33	41.66	13.49	--	--
Figure 104. Soldier River, beginning at mouth in Harrison County.									
0.00	5.73	12.33	6.54	26.29	7.80	41.17	9.50	53.32	12.78
3.04	5.96	13.97	6.64	27.35	7.68	44.68	9.55	57.99	15.12
3.77	6.03	15.23	6.76	32.97	8.34	48.12	11.75	67.22	--
8.72	6.23	20.71	7.23	37.48	9.14	49.14	11.31	--	--
Figure 105. South Beaver Creek, beginning at mouth in Butler County.									
0.00	5.23	2.80	5.53	12.23	6.43	23.29	10.24	37.35	--
0.22	5.15	7.33	6.04	17.52	8.21	32.17	--	--	--
Figure 106. South English River, beginning at mouth in Washington County.									
0.00	4.04	5.68	4.28	18.17	5.18	32.29	7.68	49.03	--
1.66	4.20	11.91	4.40	23.47	6.15	34.36	7.97	--	--
2.17	4.21	13.91	4.70	28.91	6.90	37.89	10.43	--	--

Table 9. River-mile and main-channel-slope values quantified for selected sites along selected streams in Iowa using a geographic information system technique and 1:24,000-scale topographic data and used to develop unadjusted main-channel-slope curves for figures 7–144—Continued

[MCS, main-channel slope; ft/mi, feet per mile; -- , no data]

River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)
Figure 107. South Fork Chariton River, beginning at Appanoose-Wayne County line.									
0.00	4.45	6.86	5.79	14.14	6.06	21.22	6.60	33.93	--
3.60	4.77	12.15	5.80	17.56	5.83	24.31	7.10	--	--
Figure 108. South Fork Iowa River, beginning at mouth in Hardin County.									
0.00	4.12	5.46	4.05	16.48	3.27	33.73	3.85	64.53	--
0.80	4.37	6.76	3.91	21.35	3.12	35.86	3.92	--	--
3.08	4.13	11.16	3.50	26.18	3.44	41.18	4.69	--	--
4.01	--	12.82	3.23	31.56	3.85	41.59	--	--	--
Figure 109. South Raccoon River, beginning at mouth in Dallas County.									
0.00	4.19	17.68	4.08	29.71	6.25	43.03	9.70	54.44	12.56
1.48	4.15	17.72	4.08	34.67	6.60	44.26	9.74	57.66	14.40
3.47	4.17	17.72	6.14	37.46	6.92	48.59	10.60	60.44	15.98
7.60	4.26	21.14	6.23	40.94	7.02	49.11	10.78	71.87	--
14.30	4.18	25.31	6.18	43.03	6.94	51.66	11.37	--	--
Figure 110. South River, beginning at mouth in Warren County.									
0.00	5.14	9.55	6.03	22.88	6.55	39.88	8.28	52.54	15.37
2.83	5.48	13.68	6.18	24.79	6.42	40.04	8.22	62.04	--
2.90	--	17.64	6.47	31.52	7.54	43.36	9.12	--	--
6.27	5.69	18.78	6.42	35.72	7.60	46.89	10.99	--	--
Figure 111. Squaw Creek, beginning at mouth in Story County.									
0.00	5.75	2.47	6.04	10.52	6.34	18.39	5.82	23.89	5.81
0.82	5.84	7.65	6.23	14.79	6.15	18.57	--	41.96	--
Figure 112. Squaw Creek, beginning at mouth in Warren County.									
0.00	7.31	7.98	7.93	17.62	8.33	25.91	11.39	41.75	--
2.34	7.34	11.62	8.27	22.13	9.72	29.35	12.25	--	--
Figure 113. Sugar Creek, beginning at mouth in Muscatine County.									
0.00	4.32	6.92	4.91	19.12	6.08	28.48	9.56	38.01	--
4.17	5.01	11.88	5.35	23.70	8.02	31.13	14.17	--	--
Figure 114. Sugar Creek, tributary to the Des Moines River, beginning at mouth in Lee County.									
0.00	4.36	9.06	4.22	19.93	4.24	28.38	5.06	45.24	--
4.86	4.25	14.22	4.31	24.33	4.49	33.00	5.42	--	--
Figure 115. Sugar Creek, tributary to the Mississippi River, beginning at mouth in Lee County.									
0.00	5.35	3.40	5.73	10.08	6.46	17.07	7.20	29.66	--
1.96	5.54	5.89	5.63	13.06	6.43	19.34	7.30	--	--
Figure 116. Tarkio River, beginning at Iowa-Missouri State line in Page County.									
0.00	6.93	9.74	7.34	20.20	8.15	26.85	8.74	35.46	9.15
1.25	7.06	11.90	7.44	23.36	8.55	29.43	7.99	47.50	--
5.42	7.49	17.06	8.20	23.70	8.37	30.44	8.17	--	--
Figure 117. Thompson River, beginning at Iowa-Missouri State line in Decatur County.									
0.00	2.96	26.28	3.17	55.43	3.75	83.28	5.01	105.94	13.47
5.76	3.01	32.58	3.26	58.59	3.79	85.86	5.57	115.72	--
10.43	3.04	37.32	3.29	64.24	3.73	92.83	6.22	--	--
13.40	2.95	44.37	3.50	69.82	4.28	96.83	7.90	--	--
20.76	3.04	48.74	3.72	76.22	4.61	98.21	8.67	--	--
23.62	3.18	49.33	3.76	79.97	--	102.69	10.70	--	--
Figure 118. Timber and South Timber Creeks, beginning at mouth of Timber Creek in Marshall County.									
0.00	6.06	3.77	7.02	12.32	9.83	24.01	--	--	--
3.59	6.92	7.36	7.40	15.97	13.25	--	--	--	--
Figure 119. Troublesome Creek, beginning at mouth in Cass County.									
0.00	5.98	7.68	6.50	13.77	6.21	24.69	11.91	--	--
2.77	5.77	10.77	6.42	18.24	7.56	35.22	--	--	--
4.34	6.06	13.06	6.06	21.41	9.92	--	--	--	--

Table 9. River-mile and main-channel-slope values quantified for selected sites along selected streams in Iowa using a geographic information system technique and 1:24,000-scale topographic data and used to develop unadjusted main-channel-slope curves for figures 7–144—Continued

[MCS, main-channel slope; ft/mi, feet per mile; -- , no data]

River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)
Figure 120. Turkey Creek, beginning at mouth in Cass County.									
0.00	7.33	4.22	8.03	10.83	8.44	15.46	10.36	21.93	11.92
0.19	7.18	6.15	8.25	12.72	8.63	19.32	10.62	32.93	--
Figure 121. Turkey River, beginning at mouth in Clayton County.									
0.00	4.49	40.36	4.50	78.22	4.63	105.18	5.12	133.71	7.53
5.24	4.41	47.10	4.49	83.59	4.88	110.30	5.25	137.55	8.77
12.96	4.53	52.36	4.52	87.06	4.46	110.82	5.43	141.19	9.28
21.16	4.64	58.47	4.39	90.07	4.86	115.89	5.37	148.42	--
21.84	4.70	59.65	4.40	92.04	4.93	119.69	5.48	--	--
29.16	4.43	64.38	4.52	95.19	4.78	124.08	5.86	--	--
33.79	4.55	68.86	4.58	99.25	4.92	127.62	6.27	--	--
39.09	4.57	74.23	4.95	101.14	5.00	132.10	6.71	--	--
Figure 122. Upper Iowa River, beginning at mouth in Allamakee County.									
0.00	4.98	24.37	5.07	52.49	4.80	83.40	4.46	115.20	4.61
3.25	4.96	31.27	4.96	56.98	4.84	87.32	4.69	119.42	4.48
5.44	4.99	36.58	4.85	59.11	4.87	91.52	4.30	122.54	5.28
8.61	5.01	37.68	4.85	63.16	4.77	94.10	4.11	127.42	5.81
12.01	4.98	38.57	4.85	67.68	4.65	98.61	4.18	130.89	6.40
14.98	4.89	44.02	4.87	73.88	4.82	104.55	4.04	134.57	6.72
18.28	5.02	48.53	4.84	78.99	4.39	109.18	4.11	154.73	--
Figure 123. Volga River, beginning at mouth in Clayton County.									
0.00	6.69	19.18	6.98	35.85	7.60	55.87	6.91	64.76	8.00
0.52	6.75	27.52	7.37	38.42	7.44	56.33	6.77	69.98	9.58
9.33	6.86	27.78	7.40	42.04	7.03	56.77	6.63	81.12	--
14.67	6.97	34.93	7.51	45.92	7.46	61.11	7.40	--	--
Figure 124. Walnut Creek, beginning at mouth in Fremont County.									
0.00	5.63	14.77	5.49	23.38	5.98	42.25	6.13	58.52	6.99
1.90	5.54	15.29	5.61	26.96	5.72	46.51	6.61	66.63	--
7.95	5.66	16.15	5.53	31.48	5.57	48.71	7.05	--	--
13.49	5.50	20.44	5.99	37.06	6.23	53.44	6.97	--	--
Figure 125. Walnut and Middle Walnut Creeks, beginning at mouth of Walnut Creek in Jefferson County.									
0.00	5.82	5.85	6.74	11.23	8.88	15.84	12.29	27.26	--
Figure 126. Wapsinonoc and West Branch Wapsinonoc Creeks, beginning at mouth of Wapsinonoc Creek in Muscatine County.									
0.00	3.79	7.84	4.48	15.99	5.37	23.00	10.98	--	--
3.98	4.37	13.66	5.32	19.75	7.02	31.72	--	--	-
Figure 127. Wapsipinicon River, beginning at mouth at Scott-Clinton County line.									
0.00	2.26	69.12	2.34	132.32	2.53	189.44	3.04	254.11	4.19
3.59	2.21	73.30	2.35	134.64	2.55	193.57	3.10	257.23	4.26
10.34	2.25	79.34	2.33	144.48	2.61	199.66	3.19	260.74	4.27
18.19	2.20	89.95	2.46	149.46	2.66	204.59	3.29	264.22	4.70
20.57	2.18	92.68	2.41	155.19	2.75	207.95	3.28	267.79	4.90
29.17	2.23	92.88	2.40	157.30	2.71	213.80	3.37	273.51	5.52
34.60	2.22	94.95	2.42	157.99	2.70	216.92	3.42	278.98	6.14
38.41	2.26	98.88	2.34	158.30	2.70	223.77	3.41	284.30	7.01
45.01	2.23	100.02	2.35	164.79	2.78	225.13	3.47	288.03	9.46
54.28	2.25	101.61	2.36	169.57	2.80	228.24	3.48	297.48	--
56.79	2.27	110.83	2.54	173.90	2.88	232.60	3.65	--	--
58.14	2.30	115.10	2.49	179.58	2.94	236.95	3.74	--	--
60.76	2.26	118.68	2.46	183.76	2.99	242.19	3.72	--	--
65.19	2.33	123.58	2.60	184.50	2.96	247.90	3.69	--	--
Figure 128. Waterman Creek, beginning at mouth in O'Brien County.									
0.00	7.29	5.51	6.57	18.27	5.70	25.90	6.63	33.52	8.72
0.75	7.36	11.77	6.17	22.03	6.01	30.49	7.05	43.98	--

Table 9. River-mile and main-channel-slope values quantified for selected sites along selected streams in Iowa using a geographic information system technique and 1:24,000-scale topographic data and used to develop unadjusted main-channel-slope curves for figures 7–144—Continued

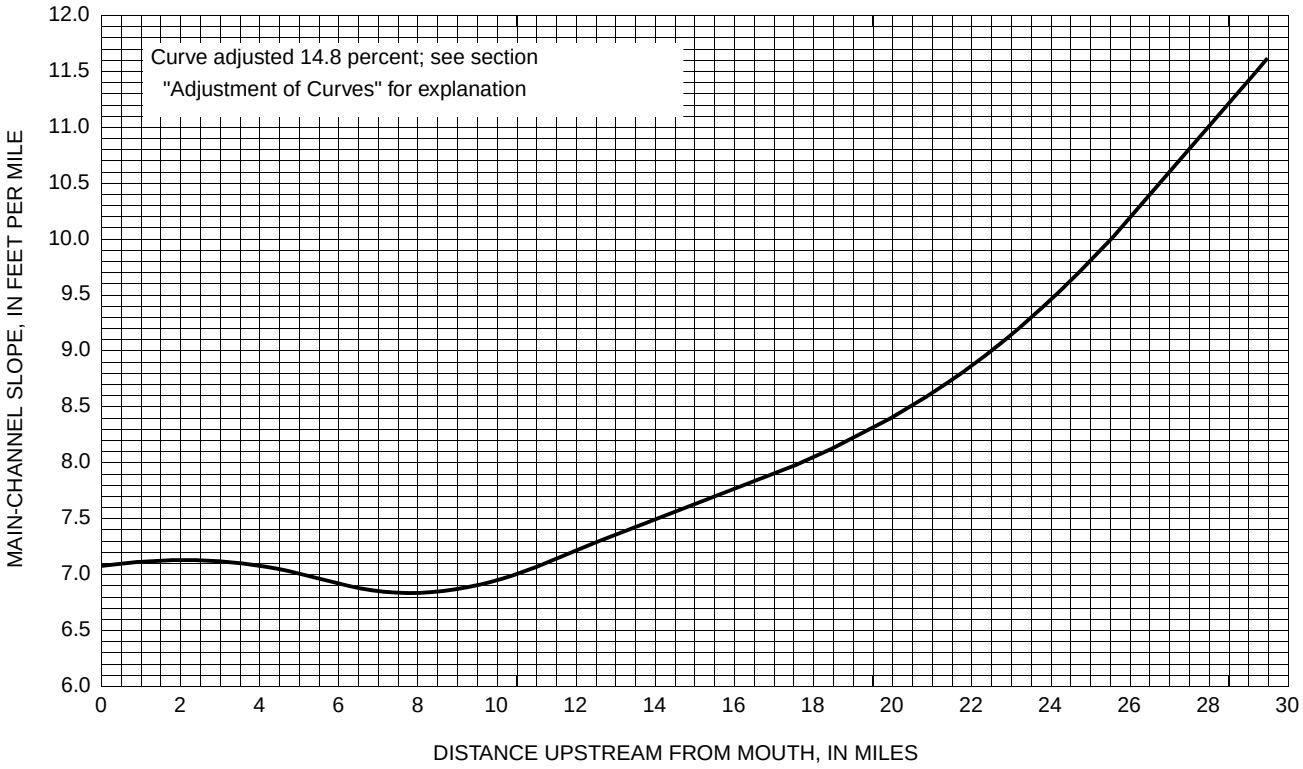
[MCS, main-channel slope; ft/mi, feet per mile; -- , no data]

River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)
Figure 129. Weldon River, beginning at Iowa-Missouri State line in Decatur County.									
0.00	5.71	3.22	6.08	14.56	5.98	24.73	6.61	--	--
1.16	5.78	10.00	6.28	19.30	5.87	37.44	--	--	--
Figure 130. West Branch Floyd River, beginning at mouth in Plymouth County.									
0.00	4.07	9.95	4.07	18.50	4.21	26.99	3.91	45.63	6.59
0.06	4.08	12.35	4.00	19.33	3.92	32.98	4.25	55.65	--
2.17	3.78	16.76	4.03	23.44	4.16	36.22	4.11	--	--
6.00	4.04	18.27	4.19	26.82	3.88	41.95	4.90	--	--
Figure 131. West Branch One Hundred and Two River, beginning at mouth in Taylor County.									
0.00	5.63	7.55	5.77	15.53	7.49	30.01	--	--	--
0.94	5.51	10.17	6.02	19.86	7.78	--	--	--	--
Figure 132. West Fork Cedar River, beginning at mouth in Black Hawk County.									
0.00	3.09	5.36	3.79	19.59	4.25	33.72	5.00	50.65	5.90
1.77	3.13	6.33	3.86	25.20	4.46	39.72	5.46	54.27	5.91
1.77	3.69	12.91	4.15	29.51	4.81	46.69	5.71	95.81	--
Figure 133. West Fork Ditch and West Fork Little Sioux River, beginning at Monona-Woodbury County line.									
0.00	4.84	12.40	5.29	32.49	6.20	46.40	6.48	64.95	10.05
0.99	4.81	17.61	5.34	36.38	6.13	50.14	6.49	72.77	--
3.24	4.97	21.83	5.75	39.39	6.71	53.95	6.67	--	--
4.02	5.01	22.33	5.80	43.02	6.29	57.05	7.04	--	--
8.64	4.99	26.72	5.77	44.71	6.23	60.63	8.79	--	--
Figure 134. West Fork Middle Nodaway River, beginning at mouth in Adair County.									
0.00	6.76	4.31	7.26	9.54	8.62	18.96	11.99	29.98	--
0.67	6.97	7.31	7.24	14.48	9.74	22.14	16.09	--	--
Figure 135. West Fork One Hundred and Two River, beginning at Iowa-Missouri State line in Taylor County.									
0.00	5.22	6.76	5.89	15.04	5.75	26.10	7.23	--	--
3.22	5.39	9.83	5.58	20.61	6.45	39.06	--	--	--
Figure 136. West Fork West Nishnabotna River, beginning at mouth in Shelby County.									
0.00	5.73	5.91	6.44	13.81	7.46	20.67	8.05	27.79	12.11
0.84	5.96	11.38	6.19	18.22	7.61	23.43	8.96	37.31	--
Figure 137. White Breast Creek, beginning at mouth in Marion County.									
0.00	4.11	18.55	3.95	41.01	4.98	60.61	6.46	79.73	10.54
5.67	4.14	20.72	4.23	43.96	5.13	62.60	6.60	91.99	--
11.33	4.08	26.43	4.23	47.30	5.07	64.82	6.82	--	--
12.46	--	31.72	4.50	49.68	5.24	69.09	7.68	--	--
16.08	3.82	36.60	4.89	56.49	6.09	74.05	8.25	--	--
Figure 138. Whitewater Creek, beginning at mouth in Jones County.									
0.00	7.69	6.13	7.89	15.09	10.38	31.68	--	--	--
3.21	7.98	6.59	7.74	18.34	11.76	--	--	--	--
Figure 139. Willow Creek, beginning at mouth in Guthrie County.									
0.00	3.26	5.56	3.86	10.81	5.88	18.50	12.33	28.74	--
1.38	3.46	7.64	4.67	15.61	8.31	21.07	14.94	--	--
Figure 140. Willow Creek, beginning at mouth in Harrison County.									
0.00	8.25	7.70	9.33	17.65	10.07	32.94	12.98	--	--
0.16	8.28	11.82	9.87	23.69	11.40	36.58	14.67	--	--
2.35	8.59	13.42	9.54	28.04	13.12	46.54	--	--	--
Figure 141. Willow Creek, beginning at mouth in Plymouth County.									
0.00	6.43	2.79	6.61	9.68	6.63	17.33	6.94	25.97	6.38
0.70	6.54	5.87	7.24	13.61	6.73	23.01	7.01	36.57	--
Figure 142. Winnebago River, beginning at mouth in Floyd County.									
0.00	2.65	4.54	2.44	9.55	2.38	14.38	--	20.21	2.07
1.32	2.56	7.00	2.49	13.61	2.32	17.81	2.18	105.82	--

Table 9. River-mile and main-channel-slope values quantified for selected sites along selected streams in Iowa using a geographic information system technique and 1:24,000-scale topographic data and used to develop unadjusted main-channel-slope curves for figures 7–144—Continued

[MCS, main-channel slope; ft/mi, feet per mile; -- , no data]

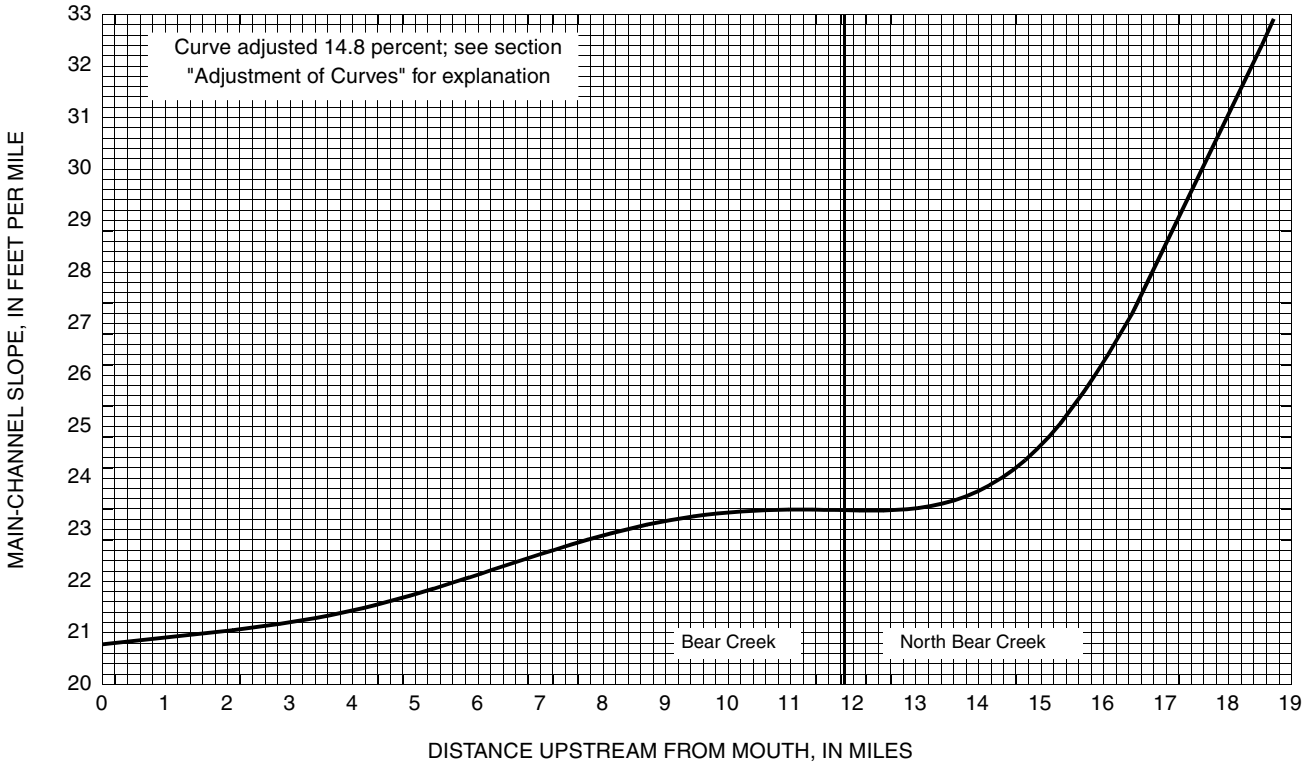
River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)	River mile	MCS (ft/mi)
Figure 143. Wolf Creek, beginning at mouth in Black Hawk County.									
0.00	3.17	12.11	3.37	28.01	3.89	50.54	4.92	71.82	--
3.04	3.13	16.48	3.35	34.64	3.98	51.95	5.12	--	--
4.87	3.18	17.48	3.41	39.71	4.47	57.88	8.27	--	--
7.78	3.34	23.09	3.79	44.13	4.87	61.93	9.27	--	--
Figure 144. Yellow River, beginning at mouth in Allamakee County.									
0.00	10.61	16.50	13.21	26.64	15.68	38.11	16.90	53.37	--
0.07	10.74	20.13	13.74	30.86	17.75	40.69	15.47	--	--
9.73	12.08	24.60	15.36	34.30	16.72	44.04	16.95	--	--



List of sites used to quantify main-channel slopes of Bear Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	111	Mouth of Bear Creek	84N 1E 13 C	--
1.06	--	State Highway 64	84N 1E 23 NE	--
5.06	--	33rd Street	84N 1E 27 SW	33rd St
6.65	70.9	50th Avenue	84N 1E 33 NW	50th Ave
10.30	61.3	4th Street (05417700, cont)	84N 1E 31 SE	4th St
12.94	57.9	Jackson-Jones County line	84N 1E 30 SW	--
16.55	51.2	Bear Creek Road	84N 1W 26 SW	Bear Creek Rd
23.33	--	State Highway 136, Wyoming	84N 1W 29 SW	--
29.47	23.8	100th Avenue	84N 2W 27 NW	100th Ave
43.82	--	Drainage divide	--	--

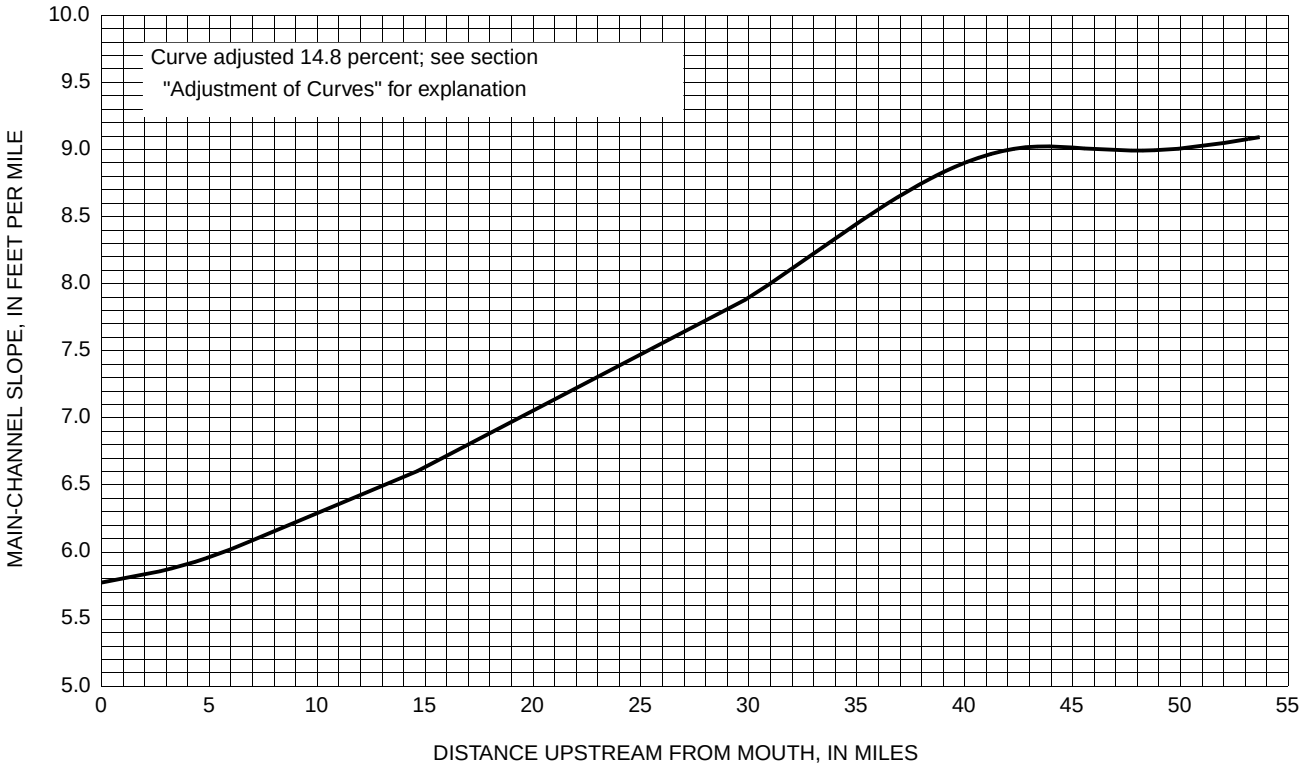
Figure 7. Bear Creek, beginning at mouth in Jackson County.



List of sites used to quantify main-channel slopes of Bear and North Bear Creeks
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	118	Mouth of Bear Creek	99N 6W 1 NW	--
0.48	118	State Highway 76 (05388320, low)	99N 6W 2 NE	--
4.17	67.4	County Road A26	99N 6W 4 NE	Bear Creek Dr
9.17	--	Willow Drive	100N 6W 32 N	Willow Dr
11.60	55.4	Allamakee-Winneshiek County line	100N 6W 30 SW	--
11.91	53.4	County Road A24 (05388300, low)	100N 7W 25 SE	Quandahl Rd
14.98	28.5	North Bear Road	100N 7W 23 NW	North Bear Rd
18.72	11.5	Iowa-Minnesota State line	100N 7W 11 N	--
24.20	--	Drainage divide	--	--

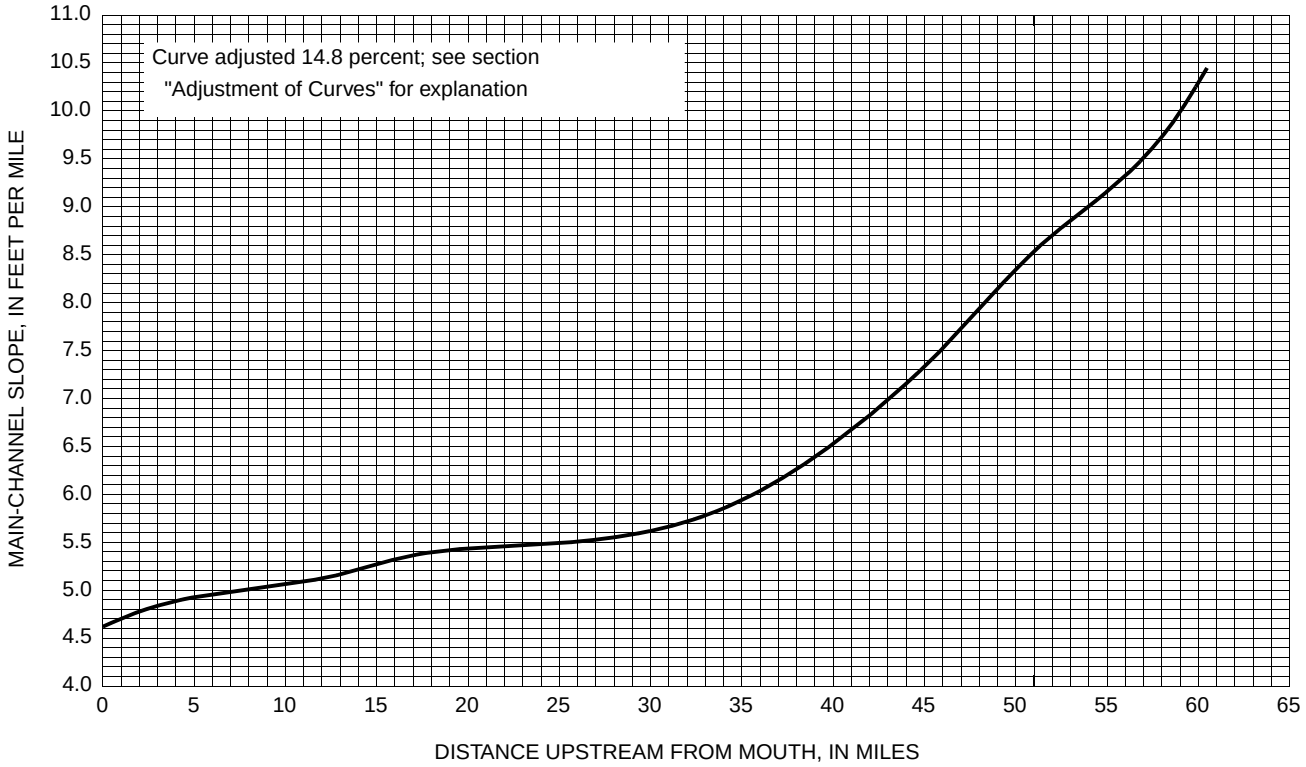
Figure 8. Bear and North Bear Creeks, beginning at mouth of Bear Creek in Allamakee County.



List of sites used to quantify main-channel slopes of Beaver Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	391	Mouth of Beaver Creek	90N 14W 34 SE	--
1.55	--	County Road T75	90N 14W 28 SW	Union Rd N
4.76	369	Black Hawk-Butler County line	90N 14W 31 NE	--
9.87	347	County Road T55, New Hartford (05463000, cont)	90N 15W 28 SE	Utica Ave
15.35	--	Ridge Avenue	90N 16W 25 SW	Ridge Ave
18.39	314	County Road T47	90N 16W 27 NW	Sinclair Ave
23.18	--	State Highway 14, Parkersburg	90N 16W 30 NW	6th St
24.57	145	Liberty Avenue (05462770, qw)	90N 17W 24 SW	Liberty Ave
31.11	121	County Road T25, Aplington	90N 17W 20 SW	10th St
36.64	--	County Road T16, Austinville	90N 18W 22 C	Dodge Ave
43.02	55.5	Butler-Franklin County line, County Road C65 (05462700, low)	90N 18W 31 W	Franklin Ave
45.52	--	County Road S56, Ackley	90N 19W 35 S	Franklin St
48.70	--	Des Moines Lobe landform region boundary	90N 19W 28 SW	--
48.71	--	Tulip Avenue	90N 19W 28 S	Tulip Ave
53.67	27.5	County Road S55	90N 19W 31 SW	Spruce Ave
65.04	--	Drainage divide	--	--

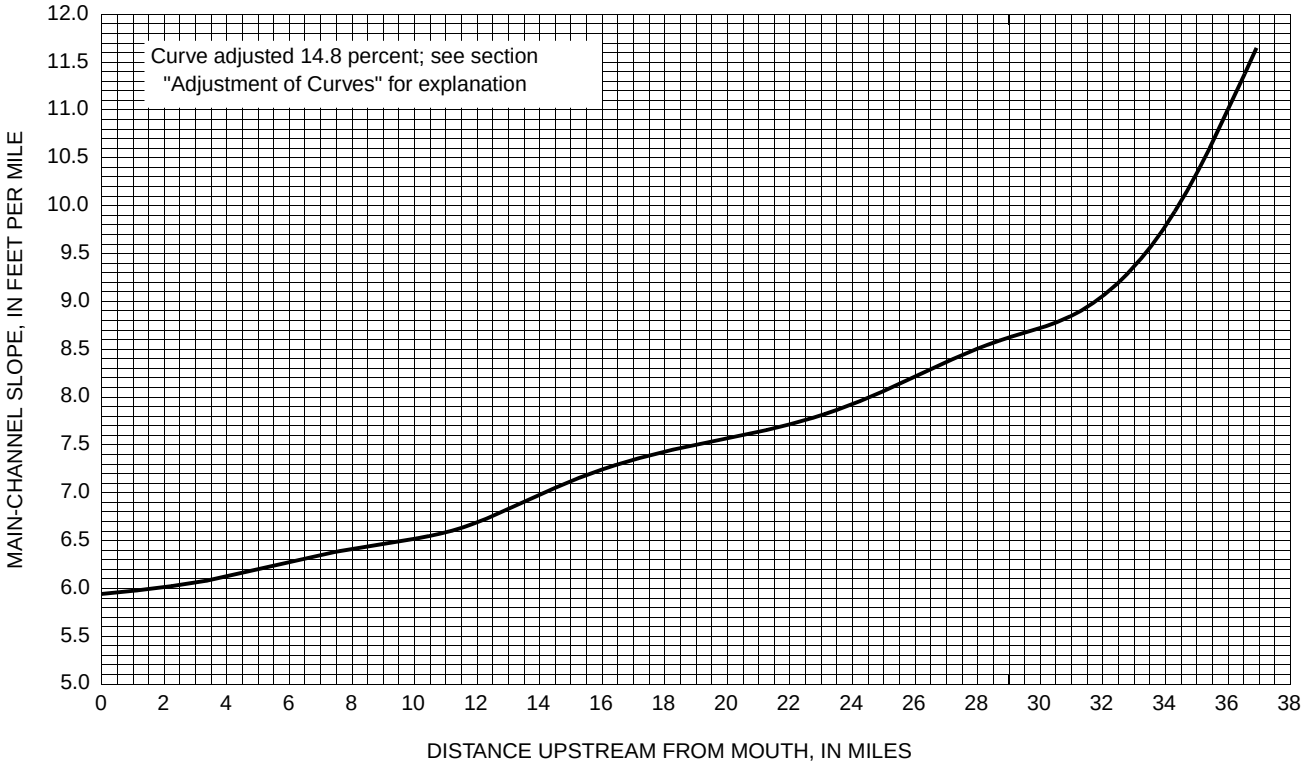
Figure 9. Beaver Creek, beginning at mouth in Black Hawk County.



List of sites used to quantify main-channel slopes of Beaver Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	372	Mouth of Beaver Creek, Johnston	79N 24W 17 C	--
1.80	--	State Highway 28, Johnston	79N 25W 13 NE	Merle Hay Rd
6.26	358	NW 70th Avenue, Johnston (05481950, cont)	80N 25W 35 SW	NW 70th Ave
12.96	--	State Highway 141	80N 25W 21 NW	--
16.66	324	Polk-Dallas County line	80N 25W 18 SW	--
19.25	314	County Road F31 (05481900, low)	80N 26W 2 SW	190th St
22.24	295	U Avenue	81N 26W 33 NW	U Ave
25.20	--	Ranger Avenue (05481860, qw)	81N 27W 25 N	Ranger Ave
31.75	--	State Highway 141	81N 27W 9 SW	--
34.08	193	U.S. Highway 169	81N 27W 8 NW	--
40.40	183	Dallas-Boone County line	81N 28W 3 NE	--
47.18	175	305th Street (05481800, low)	82N 28W 15 W	305th St
50.90	--	County Road E57	82N 28W 3 NW	280th St
55.76	--	County Road P54	83N 28W 16 SW	C Ave
59.04	84.5	230th Street (05481700, low)	83N 28W 6 S	230th St
59.75	--	Hydrologic Regions 1 and 2 boundary	83N 28W 6 SW	--
60.47	38.5	U.S. Highway 30, Beaver (05481680, csg)	83N 28W 6 NE	--
77.49	--	Drainage divide	--	--

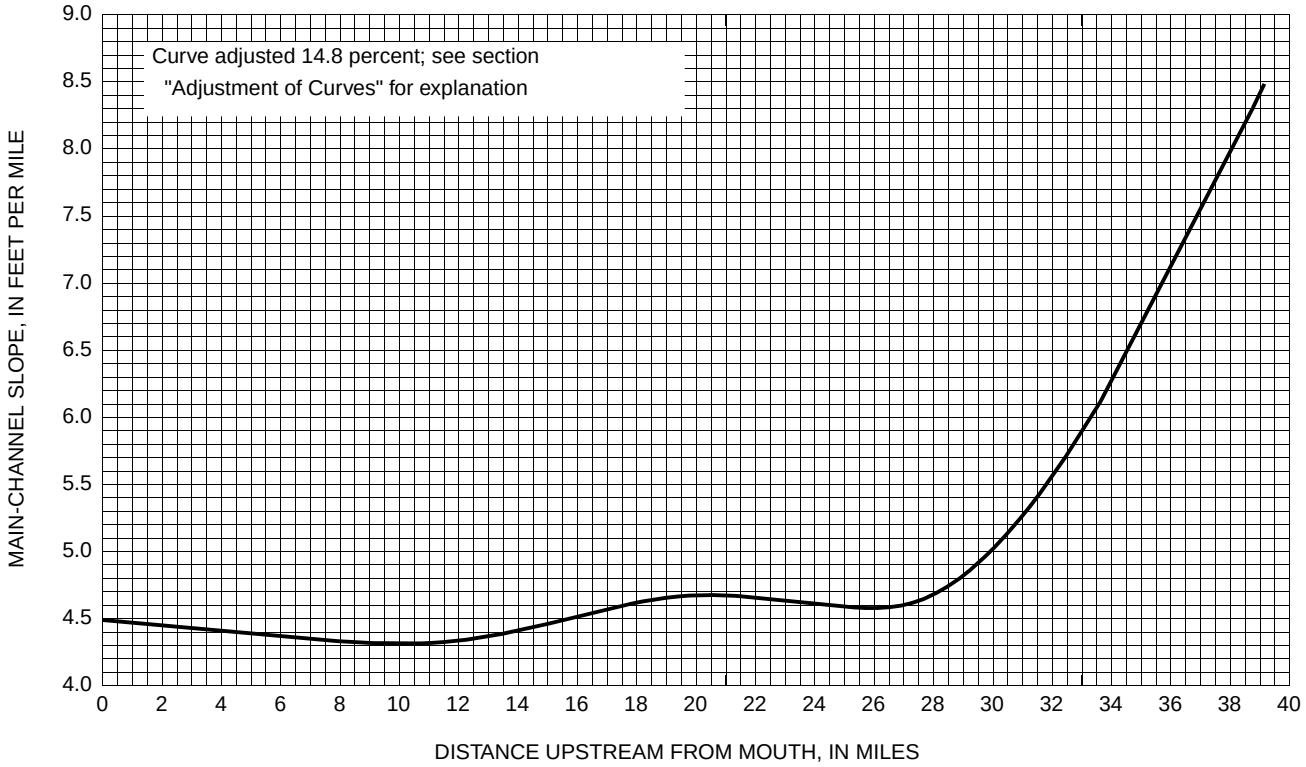
Figure 10. Beaver Creek, beginning at mouth in Polk County.



List of sites used to quantify main-channel slopes of Big Bear Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	222	Mouth of Big Bear Creek	81N 11W 24 SW	--
1.06	--	State Highway 212, Marengo	81N 11W 26 W	--
2.25	--	U.S. Highway 6	81N 11W 35 NE	--
3.45	--	160th Street	80N 11W 3 NW	160th St
8.10	189	County Road V52, Ladora (05453000, cont)	80N 11W 7 SW	G Ave
11.42	177	County Road V38	80N 12W 15 SW	D Ave
14.99	167	Iowa-Poweshiek County line, State Highway 419	80N 12W 18 SW	County Line
18.12	130	State Highway 21	80N 13W 15 SW	--
22.57	77.9	County Road V18, Brooklyn (05452700, low)	80N 14W 14 NE	Center St
24.54	--	U.S. Highway 6	80N 14W 15 NW	--
28.87	48.7	120th Street	80N 15W 12 NW	120th St
30.98	--	U.S. Highway 63	80N 15W 3 SW	--
34.55	--	70th Street	81N 15W 31 SW	70th St
36.91	--	50th Street	81N 16W 26 SW	50th St
45.54	--	Drainage divide	--	--

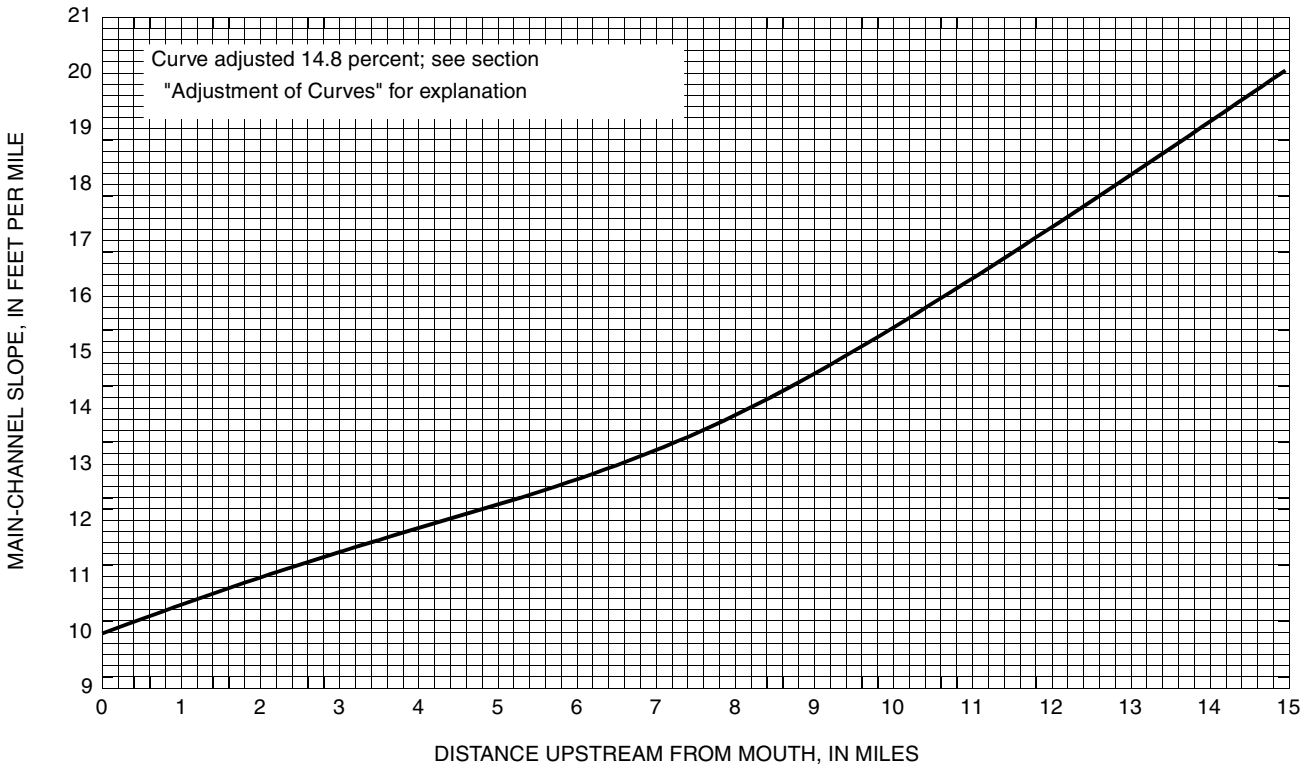
Figure 11. Big Bear Creek, beginning at mouth in Iowa County.



List of sites used to quantify main-channel slopes of Big Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	167	Mouth of Big Creek	70N 5W 19 SW	--
1.84	164	310th Street (05473550, qw)	70N 5W 18 SW	310th St
6.80	140	285th Street (05473530, --)	70N 6W 2 SE	285th St
11.65	130	U.S. Highway 218 (05473520, --)	71N 6W 27 SW	--
14.84	--	County Road H46	71N 6W 17 SE	Oakland Mills Rd
19.60	--	U.S. Highway 34	71N 7W 7 W	--
24.84	106	Hickory Avenue (05473500, cont)	72N 6W 29 NW	Hickory Ave
27.37	58.0	Iowa Avenue (05473450, cont)	72N 6W 28 SE	Iowa Ave
27.50	--	U.S. Highway 218	72N 6W 28 SE	--
31.38	--	Kentucky Avenue	72N 6W 35 SW	Kentucky Ave
34.91	37.4	Marsh Avenue	72N 5W 31 SW	Marsh Ave
39.15	23.5	230th Street	71N 5W 9 NE	230th St
50.18	--	Drainage divide	--	--

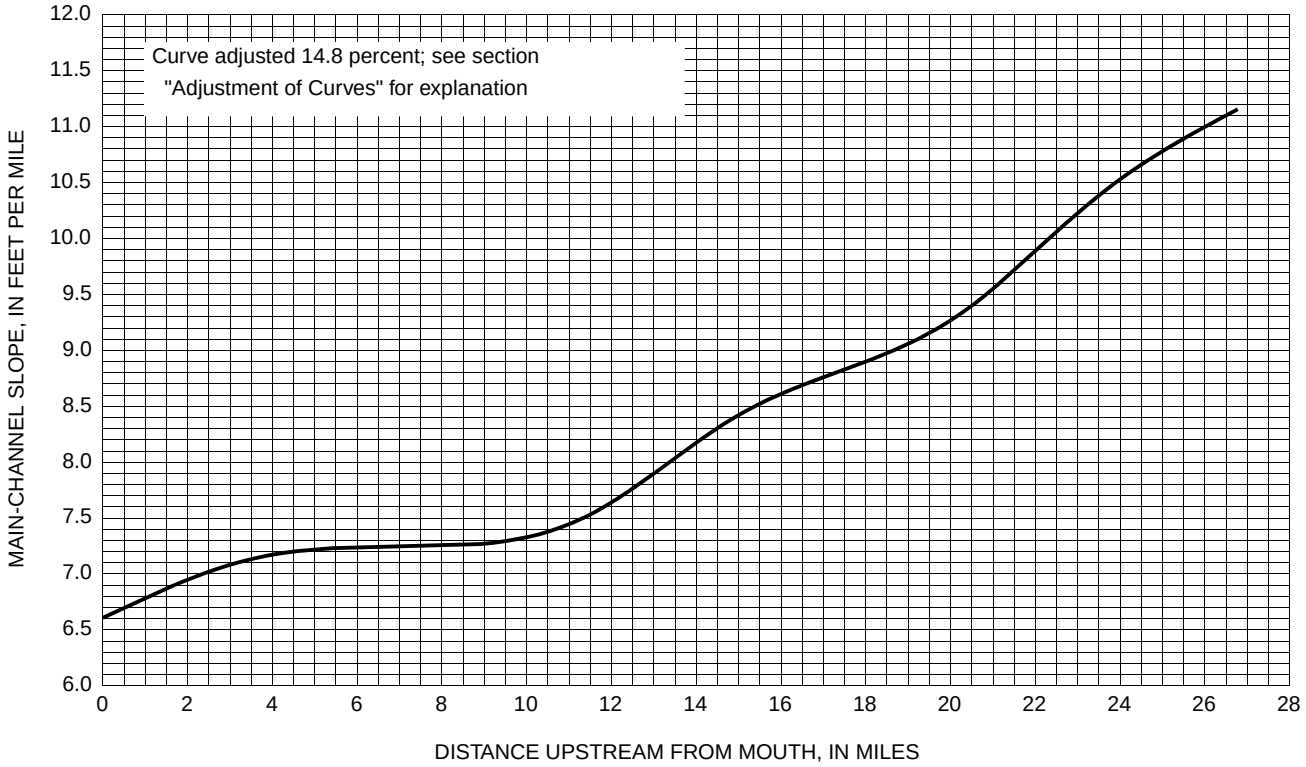
Figure 12. Big Creek, beginning at mouth in Henry County.



List of sites used to quantify main-channel slopes of Big Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	111	Mouth of Big Creek	82N 6W 9 N	--
1.11	--	U.S. Highway 151 and State Highway 13	82N 6W 4 NE	--
3.13	81.2	Big Creek Road, Bertram (05464750, low)	83N 6W 34 NE	Big Creek Rd
7.63	--	Red Haw Road	83N 6W 14 SE	Red Haw Rd
10.72	--	County Road E45	83N 5W 6 SW	Secrist Rd
14.95	--	U.S. Highway 151	84N 5W 30 SE	--
21.71	--	Drainage divide	--	--

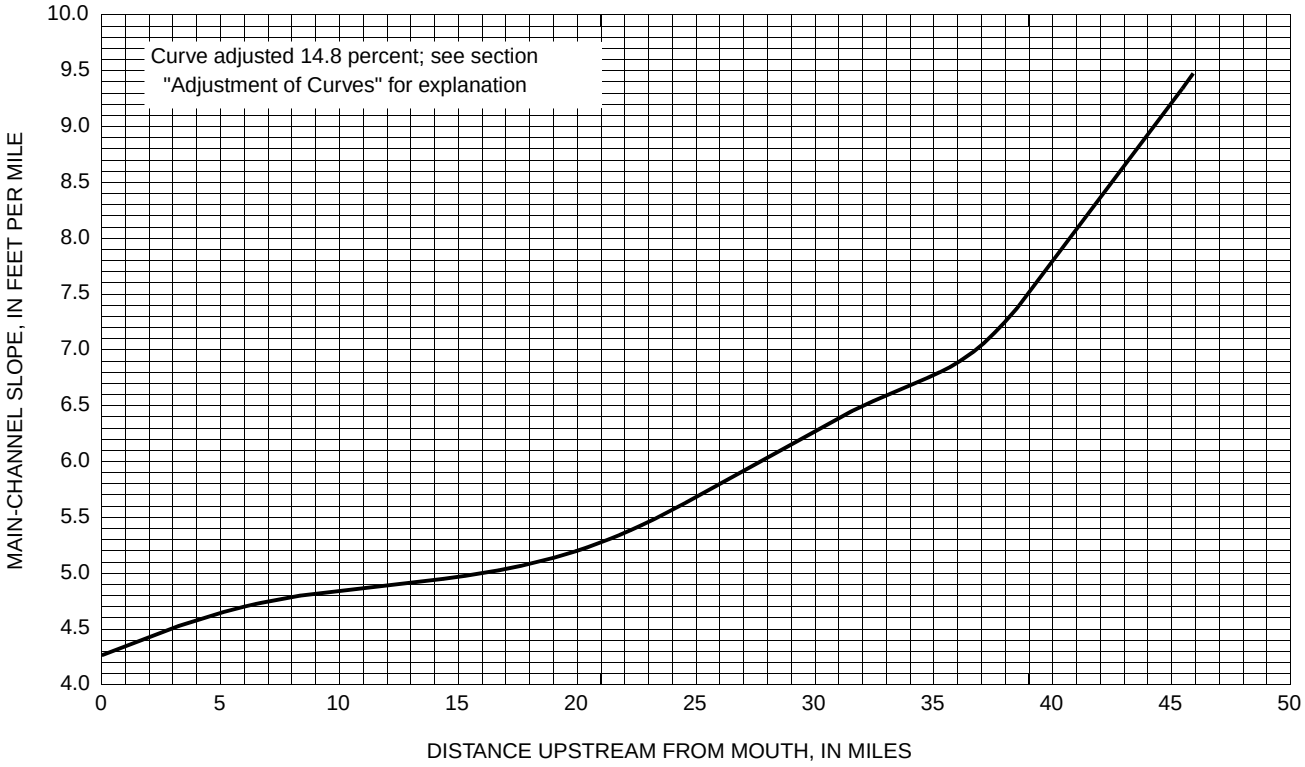
Figure 13. Big Creek, beginning at mouth in Linn County.



List of sites used to quantify main-channel slopes of Big Muddy Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	103	Mouth of Big Muddy Creek	96N 36W 15 SW	--
0.81	102	County Road B24 (06605300, low)	96N 36W 15 NW	350th St
3.19	66.6	340th Street	96N 36W 10 N	340th St
3.55	--	Des Moines Lobe landform region boundary	96N 36W 3 SE	--
7.59	59.7	310th Street (06605200, low)	97N 36W 26 NW	310th St
11.46	--	290th Street	97N 36W 13 NW	290th St
14.91	51.4	Clay-Dickinson County line, 270th Street	97N 35W 6 N	270th St
20.28	44.8	County Road A48	98N 35W 20 NW	240th St
23.44	27.2	County Road A34	98N 35W 9 NW	220th St
26.77	15.4	190th Street	99N 35W 27 NW	190th St
34.96	--	Drainage divide	--	--

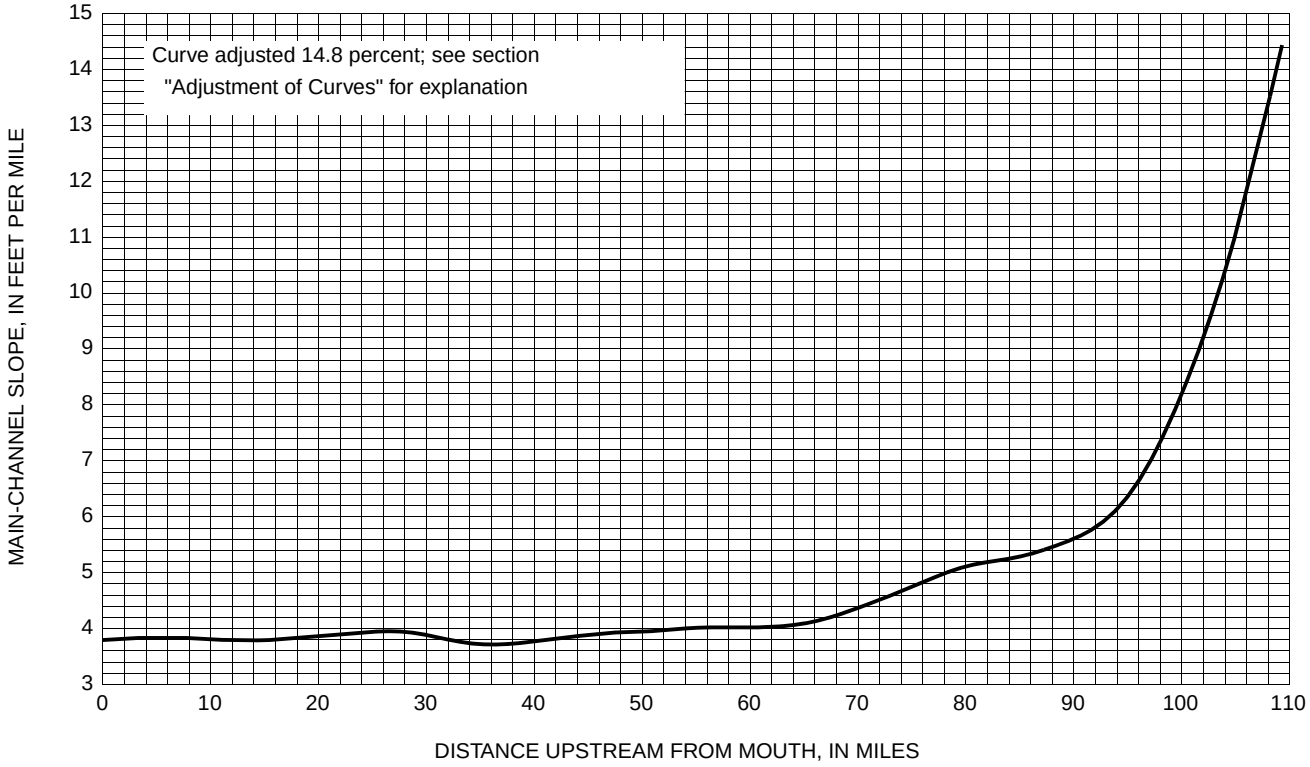
Figure 14. Big Muddy Creek, beginning at mouth in Clay County.



List of sites used to quantify main-channel slopes of Black Hawk Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	344	Mouth of Black Hawk Creek, Waterloo	89N 13W 22 W	--
0.57	--	U.S. Highway 218, Waterloo	89N 13W 22 SE	Washington St
0.81	--	University Avenue, Waterloo	89N 13W 27 NE	University Ave
5.90	--	U.S. Highway 20, Waterloo	88N 14W 1 SE	--
6.41	327	Ranchero Road, Waterloo (05463510, qw)	88N 14W 12 NE	Ranchero Rd
12.52	303	State Highway 58, Hudson (05463500, cont)	88N 14W 27 NE	Hudson Rd
19.46	278	Black Hawk-Grundy County line, County Road T69	87N 14W 6 W	Grundy Rd
23.16	145	242nd Street (05463320, --)	87N 15W 14 NE	242nd St
27.81	135	V Avenue, Reinbeck (05463300, low)	87N 15W 21 SW	V Ave
33.75	82.0	R Avenue (05463110, --)	87N 16W 14 NW	R Ave
36.82	71.0	P Avenue (05463100, low)	87N 16W 9 W	P Ave
39.42	56.9	State Highway 14, Grundy Center (05463090, csg)	87N 16W 7 NW	4th St
45.90	--	County Road T29	87N 17W 10 NW	K Ave
58.65	--	Drainage divide	--	--

Figure 15. Black Hawk Creek, beginning at mouth in Black Hawk County.



List of sites used to quantify main-channel slopes of the Boyer River
[See section "Presentation of Curves" for explanation of list elements]

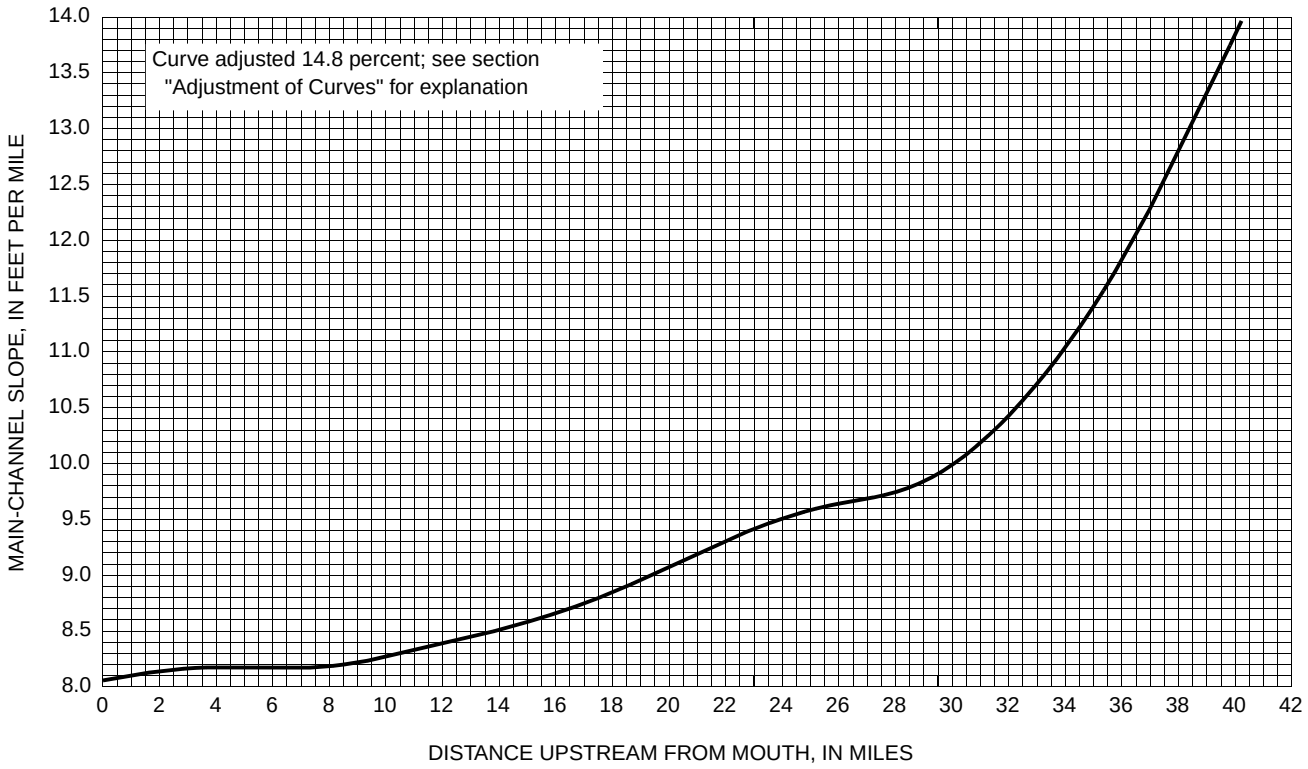
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	1,188	Mouth of Boyer River	77N 44W 20 SE	--
3.30	1,084	State Highway 362, Loveland (06609670, low)	77N 44W 4 C	--
3.81	--	Pottawattamie-Harrison County line	77N 44W 4 N	--
3.97	--	Interstate 29	78N 44W 33 SE	--
5.23	935	Chicago Central and Pacific Railroad (06609550, low)	78N 44W 28 SE	--
6.42	931	State Highway 183	78N 44W 22 SE	--
11.14	--	290th Street	78N 43W 6 C	290th St
15.70	871	U.S. Highway 30, Logan (06609500, cont)	79N 42W 19 NW	--
18.93	--	Parker Trail	79N 42W 4 SW	Parker Trl
23.56	811	U.S. Highway 30, Woodbine (06609480, --)	80N 42W 23 N	--
27.80	--	155th Street	81N 41W 31 C	155th St
30.02	732	U.S. Highway 30 (06609450, --)	81N 41W 20 SE	--
34.03	--	State Highway 37, Dunlap	81N 41W 3 N	--
34.31	678	Harrison-Crawford County line	82N 41W 34 SE	--
40.33	--	Nelson Park Road	82N 40W 8 S	Nelson Park Rd
43.26	--	U.S. Highway 30	82N 40W 3 SE	--
48.44	--	U.S. Highway 30	83N 39W 20 S	--
50.59	517	Lincoln Way (06609400, qw)	83N 39W 16 NE	Lincoln Way

Figure 16. Boyer River, beginning at mouth in Pottawattamie County.

List of sites used to quantify main-channel slopes of the Boyer River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
52.14	--	U.S. Highway 59, Denison	83N 39W 10 NE	--
55.57	--	K Avenue	84N 39W 26 NE	K Ave
58.32	290	County Road, Deloit (06609280, --)	84N 38W 7 SE	County Road
62.28	--	F Avenue	85N 38W 33 NW	F Ave
65.20	260	D Avenue (06609278, --)	85N 38W 23 NW	D Ave
69.31	210	Crawford-Sac County line, A Avenue (06609275, --)	85N 37W 6 N	A Ave
72.18	189	Karr Avenue	86N 37W 27 NW	Karr Ave
75.28	--	County Road D59	86N 37W 14 NW	360th St
79.88	132	U.S. Highway 71 (06609265, --)	87N 37W 34 NE	--
84.42	--	U.S. Highway 71	87N 37W 10 W	--
88.76	99.0	County Road D37	88N 37W 33 N	270th St
94.62	--	240th Street	88N 37W 16 NE	240th St
100.01	67.5	U.S. Highway 20 (06609260, low)	88N 37W 6 NE	--
105.50	--	County Road D15	89N 37W 22 N	190th St
109.28	19.5	County Road M43	89N 37W 4 SW	Gard Ave
118.19	--	Drainage divide	--	--

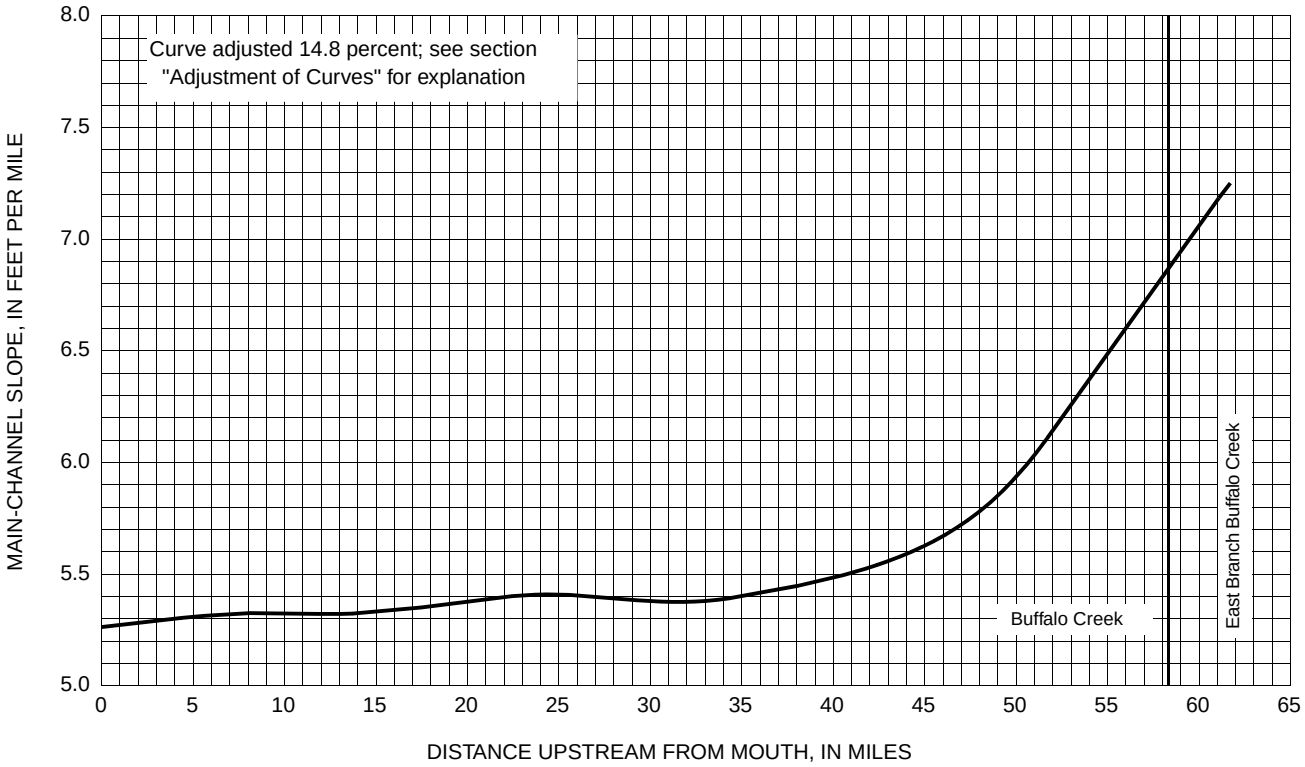
Figure 16. Boyer River, beginning at mouth in Pottawattamie County—Continued



List of sites used to quantify main-channel slopes of Brushy Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	142	Mouth of Brushy Creek	79N 31W 22 NE	--
0.98	142	245th Street (05483330, low)	79N 31W 15 C	245th St
3.47	--	State Highway 44	79N 31W 4 SE	--
7.65	--	State Highway 25	80N 31W 19 NE	--
11.68	116	County Road N70	80N 32W 10 N	Justice Rd
18.01	102	County Road F24	81N 33W 35 NW	150th Rd
21.44	95.5	County Road N46	81N 33W 21 NW	Chestnut Rd
24.95	--	Guthrie-Audubon County line, Swift Avenue	81N 34W 1 NE	Swift Ave
25.47	83.1	Audubon-Carroll County line	82N 34W 36 SE	--
26.93	--	State Highway 141	82N 34W 35 NE	--
28.72	68.1	320th Street (05483320, low)	82N 34W 22 SE	320th St
33.34	51.8	County Road E57	82N 34W 7 NW	290th St
35.34	45.0	U.S. Highway 71 (05483318, csg)	82N 35W 1 NW	--
40.22	24.1	County Road N18	83N 35W 21 NW	Ivy Ave
51.01	--	Drainage divide	--	--

Figure 17. Brushy Creek, beginning at mouth in Guthrie County.



List of sites used to quantify main-channel slopes of Buffalo and East Branch Buffalo Creeks
[See section "Presentation of Curves" for explanation of list elements]

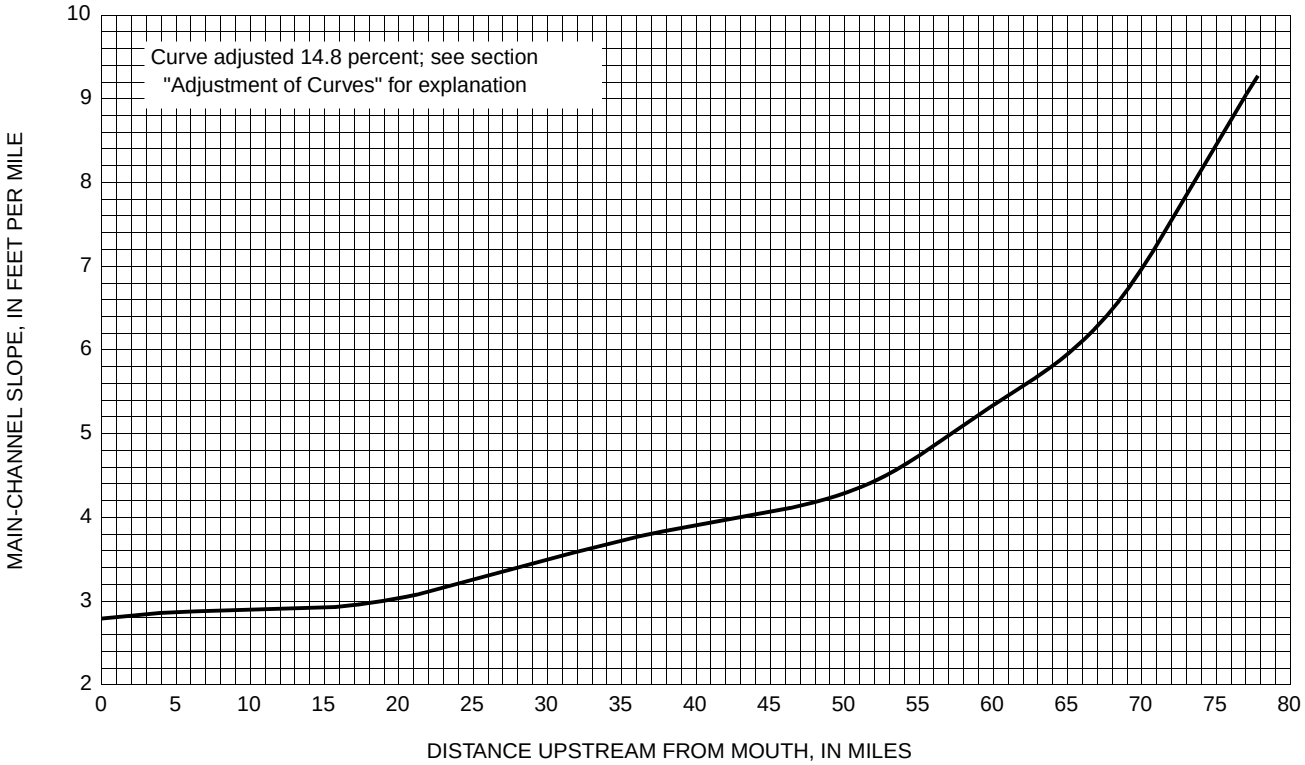
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	232	Mouth of Buffalo Creek, Anamosa	84N 4W 10 NW	--
0.43	231	County Road E28, Anamosa (05421720, --)	84N 4W 3 SW	Cherry St
5.19	217	Freemont Road (05421700, low)	85N 4W 30 SE	Freemont Rd
8.29	203	Jones-Linn County line	85N 4W 19 NW	--
13.30	189	County Road X20 (05421682, --)	85N 5W 3 SW	Prairieburg Rd
15.01	185	County Road E16 (05421680, --)	85N 5W 5 NE	Sawyer Rd
20.08	--	Red Bridge Road	86N 5W 19 NW	Red Bridge Rd
24.46	--	State Highway 13, Coggon	86N 6W 10 NE	--
26.83	142	Linn-Delaware County line	86N 6W 4 NE	Linn-Delaware Rd
28.88	138	120th Avenue (05421660, --)	87N 6W 28 SW	120th Ave
32.72	--	Delaware-Buchanan County line	87N 6W 18 SW	--
36.69	103	County Road D47 (05421630, --)	87N 7W 2 SE	285th St
42.87	--	250th Street	88N 7W 21 NE	250th St
47.69	--	U.S. Highway 20	88N 7W 6 SW	--
48.69	71.4	State Highway 939, Winthrop (05421600, csg)	88N 8W 1 NE	--
51.52	68.2	County Road W45 (05421550, csg)	89N 8W 25 NE	Slater Ave
54.42	--	180th Street	89N 8W 12 SE	180th St
61.71	--	150th Street	90N 7W 31 NW	150th St
78.54	--	Drainage divide	--	--

Figure 18. Buffalo and East Branch Buffalo Creeks, beginning at mouth of Buffalo Creek in Jones County.

List of sites used to quantify main-channel slopes of Buttrick Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	218	Mouth of Buttrick Creek	83N 30W 26 SE	--
3.36	215	250th Street (05483210, qw)	83N 30W 24 N	250th St
8.75	202	U.S. Highway 30 (05483200, low)	84N 30W 36 SE	--
10.22	--	Hydrologic Regions 1 and 2 boundary	84N 30W 25 SE	--
10.26	196	Confluence of East and West Buttrick Creeks	84N 30W 25 SE	--
50.15	--	Drainage divide	--	--

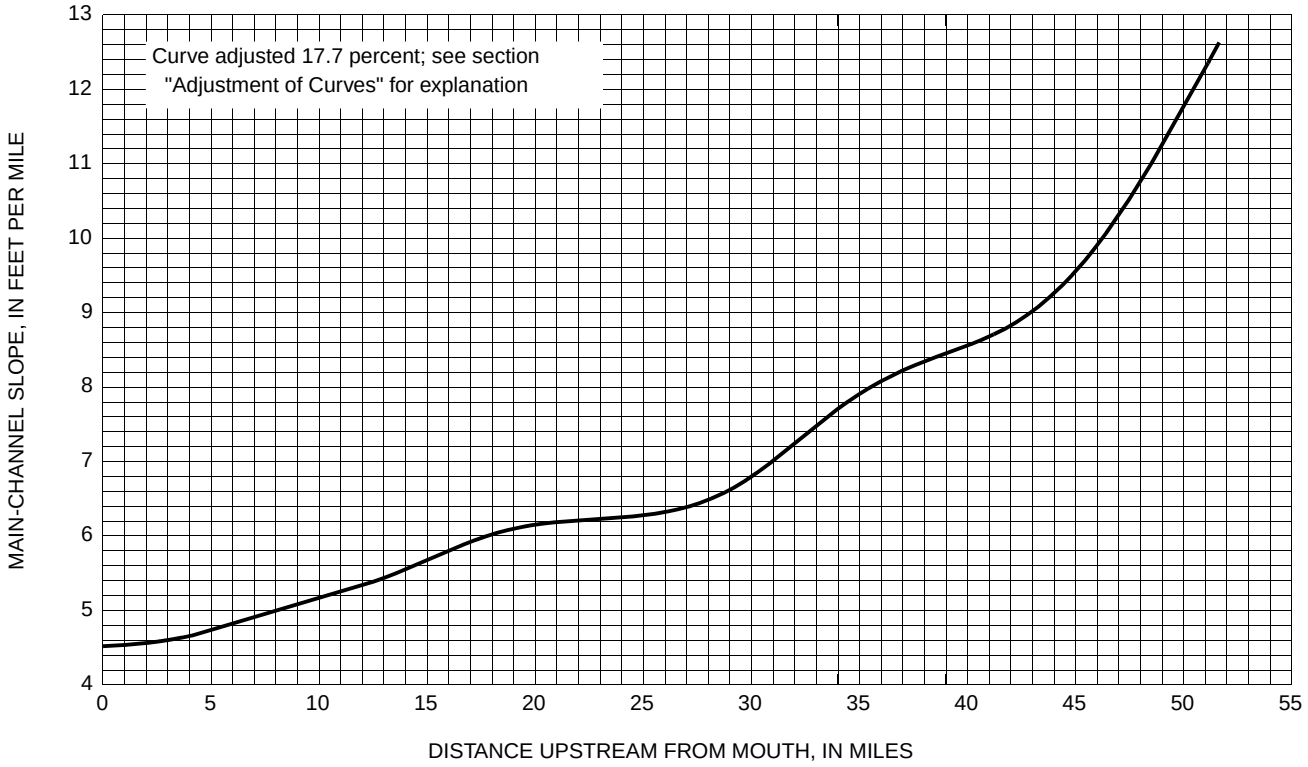
Figure 19. Buttrick Creek, beginning at mouth in Greene County.



List of sites used to quantify main-channel slopes of Cedar Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	565	Mouth of Cedar Creek	71N 7W 9 NW	--
4.43	530	County Road H46 (05473400, cont)	71N 7W 28 NW	260th St
10.16	512	County Road J6W	70N 7W 9 SW	Agency Rd
15.19	440	Henry-Van Buren County line	70N 7W 7 SW	--
20.65	435	County Road W40	70N 8W 2 S	Willow Rd
27.24	--	Van Buren-Jefferson County line	70N 8W 5 NE	--
33.13	--	County Road W30	71N 9W 36 NW	Stockport Rd
37.30	381	Osage Avenue	71N 9W 28 S	Osage Ave
40.76	344	State Highway 1 (05473320, --)	71N 10W 13 SW	--
44.59	323	County Road H43	71N 10W 3 SW	Libertyville Rd
50.05	284	Fir Avenue	72N 11W 36 NW	Fir Ave
52.65	252	U.S. Highway 34 (05473300, csg)	72N 11W 27 SW	--
56.96	165	Jefferson-Wapello County line	72N 11W 18 SW	--
60.06	--	County Road V43	72N 12W 3 S	Competine Rd
64.21	--	County Road V37	73N 12W 31 NW	Agency Hedrick Rd
68.49	73.6	County Road V5H (05473200, low)	73N 13W 21 SW	Highland Center Rd
72.72	50.5	State Highway 149	73N 13W 7 NW	--
75.35	40.4	Wapello-Mahaska County line	73N 14W 3 NE	--
77.80	26.4	Trenton Avenue	74N 14W 28 SW	Trenton Ave
86.93	--	Drainage divide	--	--

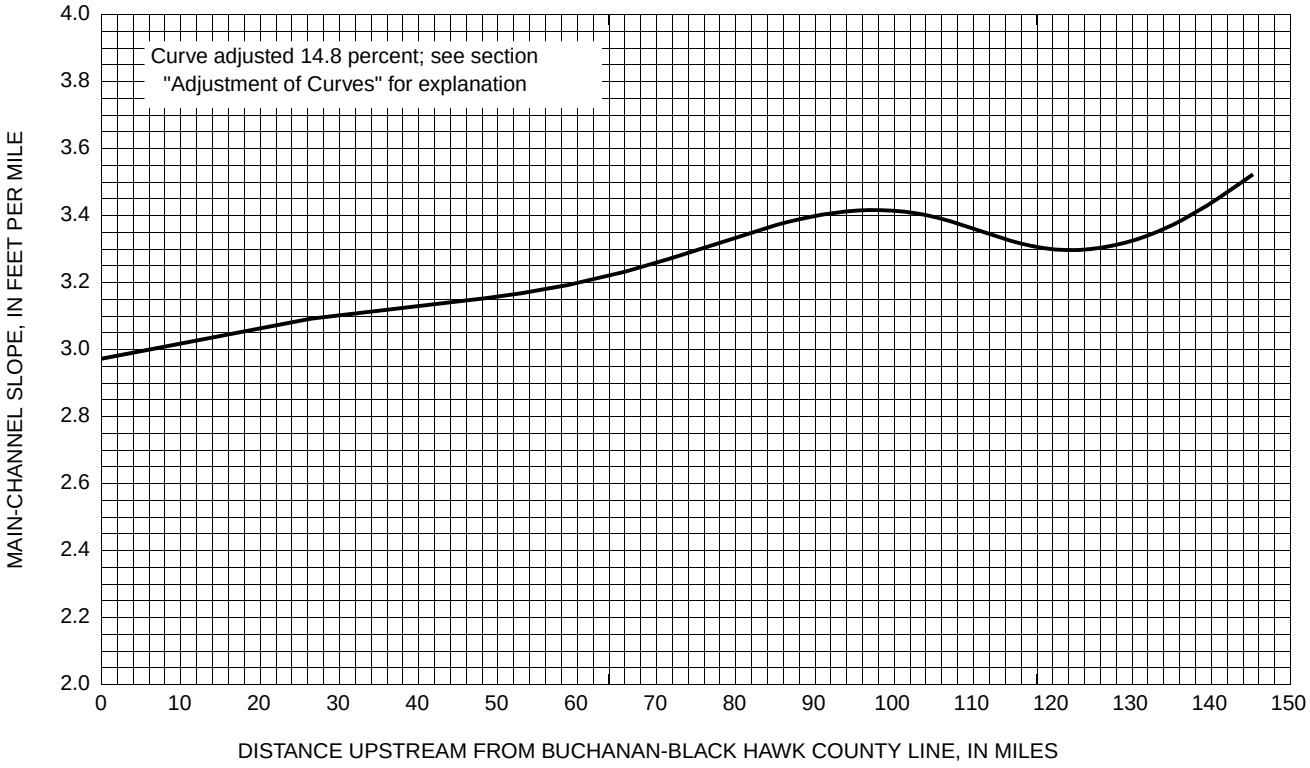
Figure 20. Cedar Creek, beginning at mouth in Henry County.



List of sites used to quantify main-channel slopes of Cedar Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	423	Mouth of Cedar Creek	75N 17W 33 NE	--
2.66	--	Ashland Avenue (05489030, qw)	75N 17W 31 NE	Ashland Ave
3.19	419	Mahaska-Marion County line	75N 17W 31 W	--
8.80	374	State Highway 156 (05489000, cont)	74N 18W 11 SW	--
13.35	241	State Highway 5 (05488750, qw)	74N 18W 28 NE	--
18.17	232	Marion-Monroe County line, Wyoming Street	74N 18W 31 SW	Wyoming St
23.22	211	130th Street (05488700, qw)	73N 18W 16 SW	130th St
29.31	137	602nd Avenue	72N 18W 2 NW	602nd Ave
34.20	127	188th Trail	72N 17N 18 SW	188th Trl
37.60	102	U.S. Highway 34 (05488600, qw)	72N 18W 26 NE	--
42.45	73.6	227th Street	71N 18W 4 SW	227th St
45.64	--	County Road T13	71N 18W 6 SE	560th Ave
51.64	23.9	County Road S70, Melrose (05488550, low)	71N 19W 4 SE	520th Ave
63.75	--	Drainage divide	--	--

Figure 21. Cedar Creek, beginning at mouth in Mahaska County.



List of sites used to quantify main-channel slopes of the Cedar River
[See section "Presentation of Curves" for explanation of list elements]

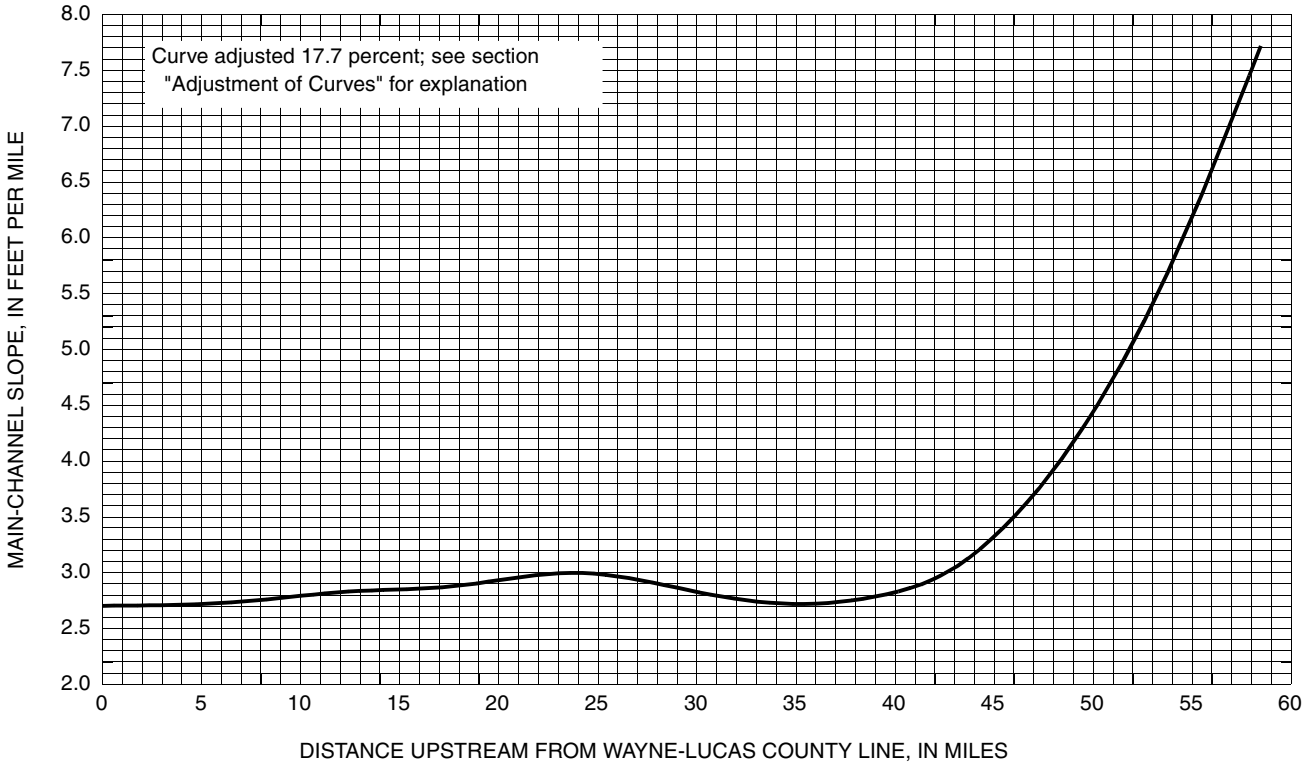
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	5,814	Buchanan-Black Hawk County line	87N 11W 36 SE	--
6.65	5,360	Brandon Road (05464090, --)	87N 11W 19 NE	Brandon Rd
14.72	5,240	County Road D38, Gilbertville (05464020, qw)	88N 12W 23 SW	Washburn Rd E
21.72	--	Interstate 380, Waterloo	88N 13W 12 NE	--
26.28	5,146	USGS gage at end of East Seventh Street, Waterloo (05464000, cont)	89N 13W 25 NW	--
26.84	--	U.S. Highway 63, Waterloo	89N 13W 23 SE	E Mullan Ave
30.60	--	U.S. Highway 218, Waterloo	89N 13W 16 SW	Washington St
33.35	--	State Highway 58, Cedar Falls	89N 13W 18 NW	--
34.26	--	State Highway 57, Cedar Falls	89N 14W 12 NE	1st St
34.69	4,734	Franklin Street, Cedar Falls (05463050, qw)	89N 14W 12 NW	Franklin St
42.75	4,315	County Road C57	90N 14W 15 NW	Cedar-Wapsi Rd W
46.07	--	Black Hawk-Bremer County line, Janesville	90N 14W 2 N	7th St (Old IA 969)
46.59	1,661	USGS gage at end of East Barrick Road, Janesville (05458500, cont)	91N 14W 35 SW	--
46.88	--	U.S. Highway 218	91N 14W 35 NW	--
57.42	1,549	State Highway 3, Waverly	91N 14W 2 NW	Bremer Ave

Figure 22. Cedar River, beginning at Buchanan-Black Hawk County line.

List of sites used to quantify main-channel slopes of the Cedar River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
58.88	1,547	County Road V14, Waverly (05458300, cont)	92N 14W 35 SW	Horton Rd
63.67	1,534	County Road C33	92N 14W 21 NW	190th St
70.61	--	State Highway 188, Plainfield	93N 14W 29 NE	--
77.20	1,443	Bremer-Chickasaw County line	93N 14W 5 NW	--
82.08	1,113	State Highway 346, Nashua (05457770, --)	94N 14W 18 SE	Veterans Dr
83.79	1,080	Chickasaw-Floyd County line	94N 14W 7 NW	--
87.51	1,075	Ripley Bridge Drive, Midway (05457750, qw)	95N 15W 34 NE	Ripley Bridge Dr
95.24	1,054	U.S. Highway 18, Charles City (05457700, cont)	95N 16W 12 NE	Brantingham St
105.08	990	U.S. Highway 218, Floyd (05457650, qw)	96N 16W 16 SE	Monroe St
113.73	--	105th Street	97N 17W 24 NE	105th St
114.97	888	Floyd-Mitchell County line	97N 17W 24 NW	--
118.24	--	County Road T38	97N 17W 2 NE	Lancer Ave
122.99	831	State Highway 9	98N 17W 28 NE	--
126.64	826	County Road A43, Mitchell (05457500, cont)	98N 17W 8 SE	Hickory Ave
131.56	813	County Road T26	99N 18W 36 NW	Foothill Ave
132.95	804	County Road A38, St. Ansgar (05457470, --)	99N 18W 26 N	420th St
134.36	--	County Road	99N 18W 14 SW	Hwy 105
141.02	656	County Road A19, Otranto (05457350, low)	100N 18W 28 NW	480th St
145.25	584	Iowa-Minnesota State line	100N 18W 8 NW	State Line St
201.68	--	Drainage divide	--	--

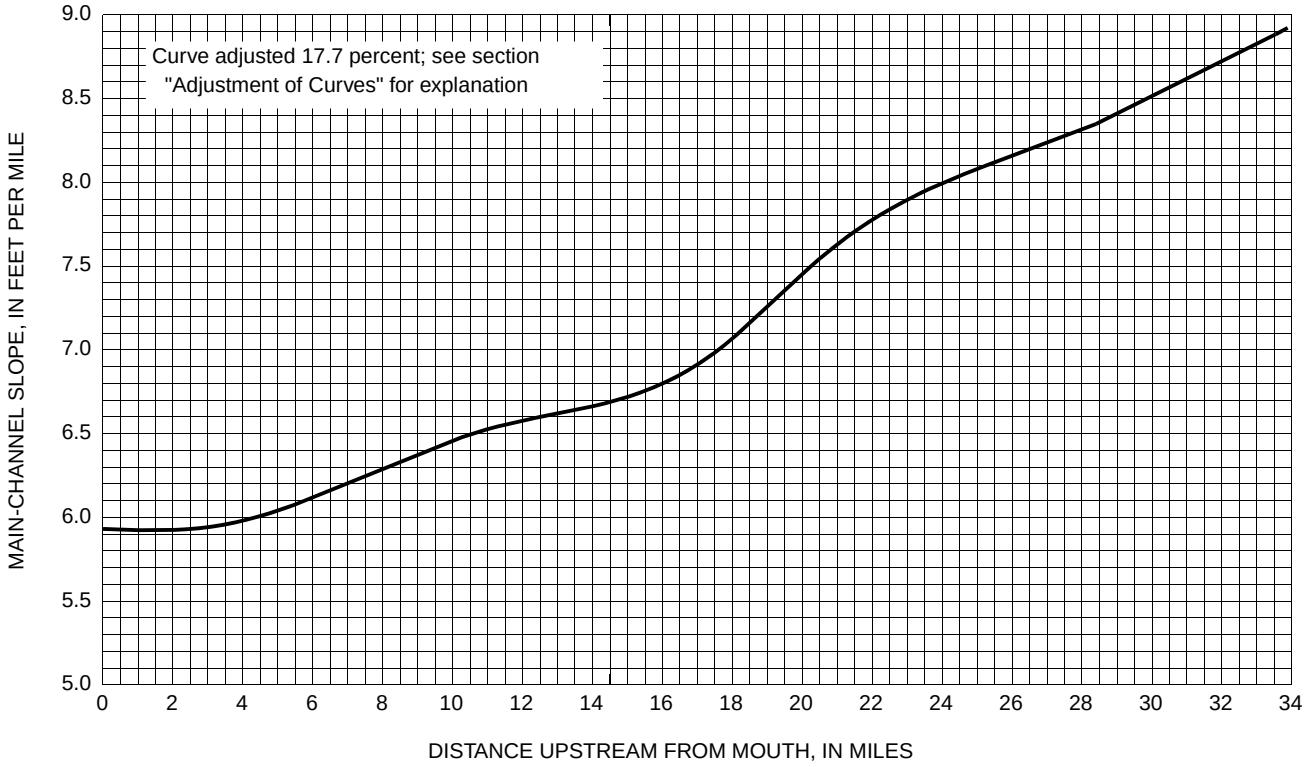
Figure 22. Cedar River, beginning at Buchanan-Black Hawk County line—Continued.



List of sites used to quantify main-channel slopes of the Chariton River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	--	Wayne-Lucas County line	71N 20W 36 SE	--
7.63	--	County Road S56	71N 20W 33 SW	--
12.19	--	County Road S50	71N 20W 19 SW	--
17.83	182	County Road S43 (06903400, cont)	71N 21W 15 NE	--
23.98	104	State Highway 14 (06903340, qw)	72N 21W 32 SW	--
30.59	92.9	County Road	71N 22W 2 N	--
35.25	82.6	County Road S23	71N 22W 15 NW	--
39.06	--	County Road	71N 22W 17 NW	--
43.64	71.0	Abandoned County Road bridge (06903300, low)	71N 23W 13 NW	--
44.80	--	U.S. Highway 65 (06903290, --)	71N 23W 11 NE	--
49.54	--	County Road H50	71N 23W 17 NW	--
54.79	--	Lucas-Clarke County line	71N 23W 19 SW	--
55.00	--	Church Street (06903200, qw)	71N 24W 25 NE	Church St
55.48	--	Clarke-Lucas County line	71N 23W 30 NW	--
58.45	22.0	Lucas-Wayne County line, Watrous Street	70N 23W 6 NE	Watrous St
66.74	--	Drainage divide	--	--

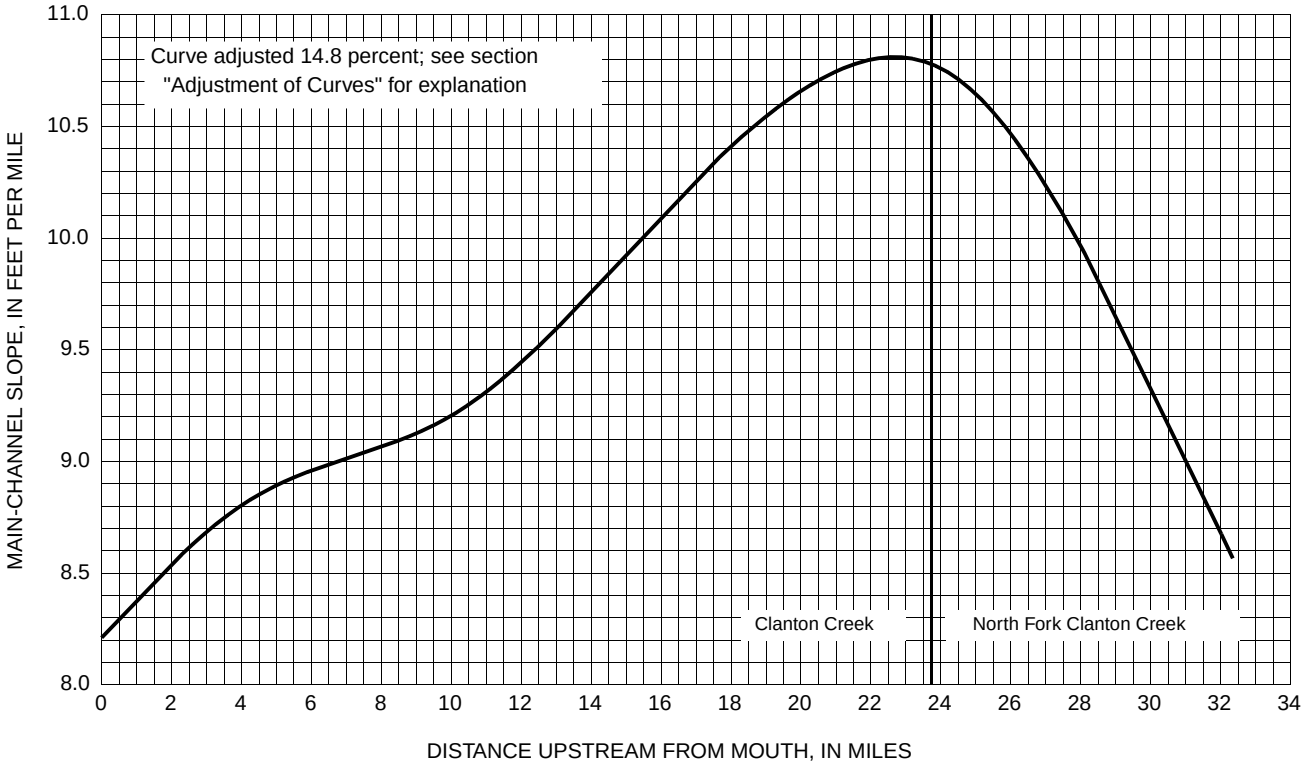
Figure 23. Chariton River, beginning at Wayne-Lucas County line.



List of sites used to quantify main-channel slopes of Chequest Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	125	Mouth of Chequest Creek	69N 10W 27 NE	--
3.20	123	Ivy Trail (05490400, low)	69N 10W 21 S	Ivy Trl
11.06	108	County Road V64	69N 11W 14 S	Rte V64
17.34	95.1	205th Road	69N 11W 20 NE	205th Rd
20.91	85.5	Van Buren-Davis County line	69N 11W 7 SW	--
21.18	85.0	Yoke Boulevard (05490300, low)	69N 12W 12 SE	Yoke Blvd
27.78	41.0	County Road V42	70N 12W 33 NW	160th St
33.88	--	Quince Boulevard	70N 13W 35 N	Quince Blvd
48.96	--	Drainage divide	--	--

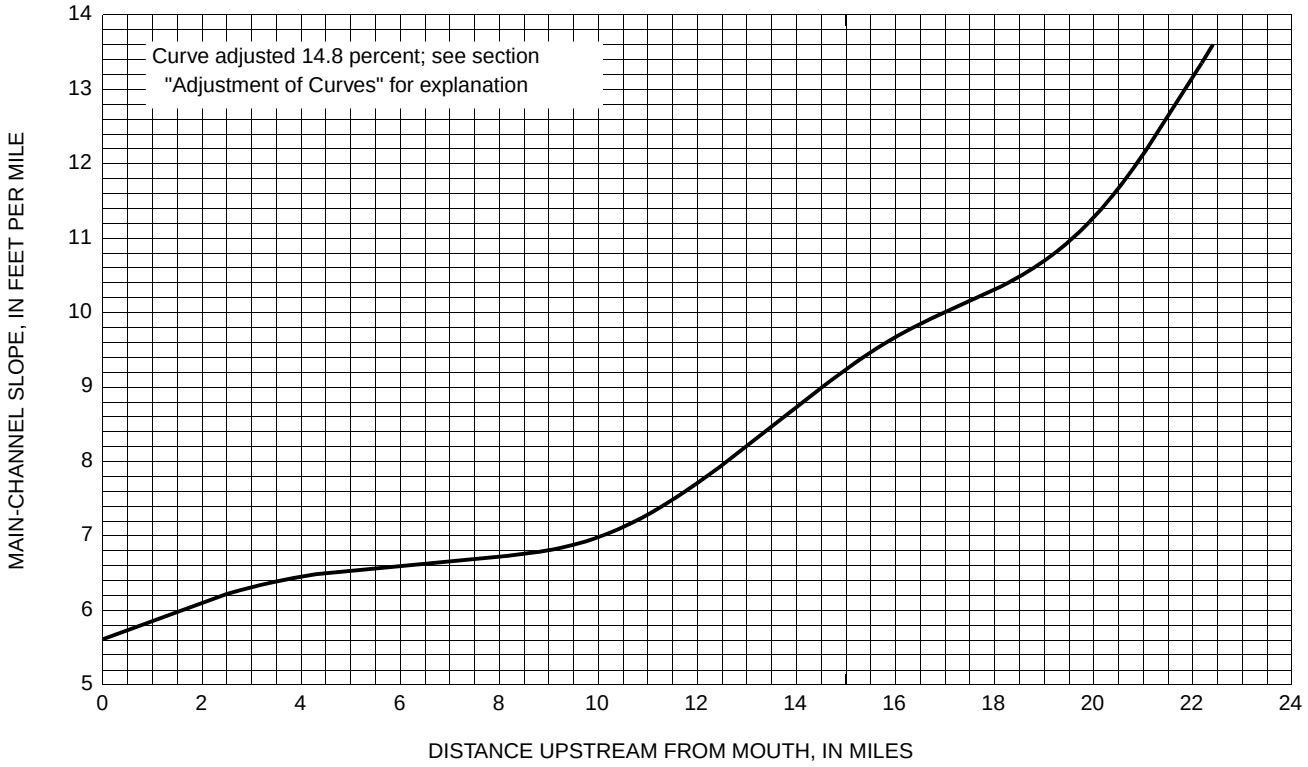
Figure 24. Chequest Creek, beginning at mouth in Van Buren County.



List of sites used to quantify main-channel slopes of Clanton and North Fork Clanton Creeks
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	160	Mouth of Clanton Creek	76N 25W 28 N	--
1.37	159	28th Avenue (05486350, low)	76N 25W 32 NE	28th Ave
3.31	--	Interstate 35	75N 25W 6 C	--
4.11	151	Warren-Madison County line	75N 25W 7 NW	--
10.15	--	County Road G50	75N 26W 22 NW	Saint Charles Rd
15.97	--	Settlers Trail	75N 26W 32 C	Settlers Trl
20.57	84.5	County Road G68, East Peru (05486300, low)	74N 27W 11 NE	Emerson St
24.32	--	Clanton Creek Trail	74N 27W 15 NW	Clanton Creek Trl
29.88	29.5	County Road P71	74N 28W 12 NE	Clark Tower Rd
32.35	--	U.S. Highway 169	74N 28W 2 S	--
45.57	--	Drainage divide	--	--

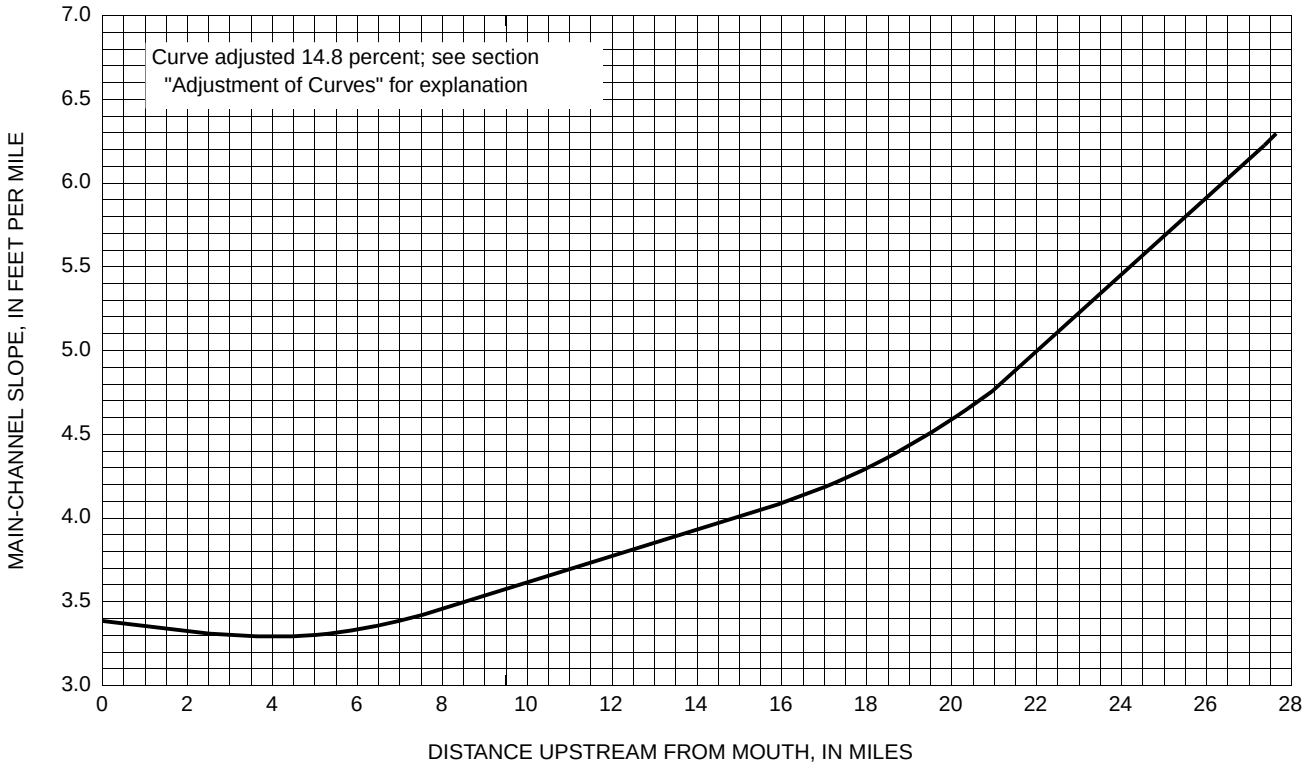
Figure 25. Clanton and North Fork Clanton Creeks, beginning at mouth of Clanton Creek in Warren County.



List of sites used to quantify main-channel slopes of Clear Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	105	Mouth of Clear Creek, Coralville	79N 6W 8 NE	--
0.44	--	U.S. Highway 6, Coralville	79N 6W 8 NW	2nd St
2.79	98.1	Camp Cardinal Road (05454300, cont)	79N 7W 1 SE	22nd Ave
4.80	84.5	340th Street (05454280, --)	80N 7W 36 SW	340th St
5.79	--	Interstate 80	80N 7W 35 NW	--
6.50	--	Interstate 380	80N 7W 34 NE	--
10.27	74.1	Copi Road	80N 7W 30 SE	Copi Rd
13.48	58.4	Echo Avenue (05454220, cont)	80N 8W 23 SE	Echo Ave
16.10	55.0	County Road W38, Oxford (05454200, low)	80N 8W 28 NE	Chambers Ave
20.00	41.1	Johnson-Iowa County line	80N 8W 30 NW	Johnson Iowa Rd
22.41	24.5	W Avenue	80N 9W 26 W	W Ave
30.60	--	Drainage divide	--	--

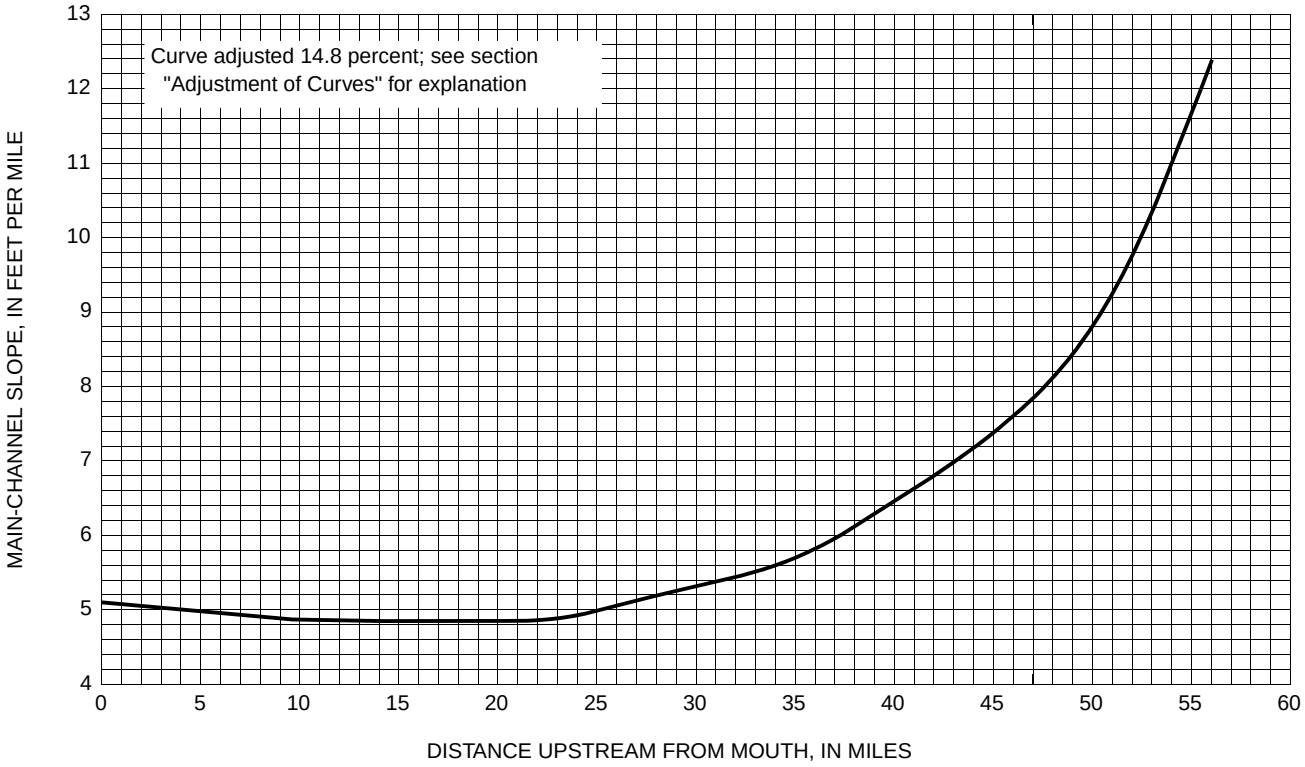
Figure 26. Clear Creek, beginning at mouth in Johnson County.



List of sites used to quantify main-channel slopes of Crane Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	109	Mouth of Crane Creek	90N 11W 26 SW	--
0.24	109	Wheeler Road (05420830, --)	90N 11W 27 SE	Wheeler Rd
3.23	--	State Highway 281, Dunkerton	90N 11W 29 SE	Canfield Rd
5.04	101	Pilot Grove Road North (05420820, low)	90N 11W 29 SW	Pilot Grove Rd N
10.32	81.3	Bennington Road East	90N 12W 23 NW	Bennington Rd E
14.61	63.6	Black Hawk-Bremer County line, Marquis Road (05420800, low)	90N 12W 3 NW	Marquis Rd E
17.53	--	County Road C50	91N 12W 28 NW	260th St
21.46	45.5	State Highway 3 (05420780, --)	91N 12W 9 NW	--
27.63	--	County Road C33	92N 12W 20 NW	190th St
39.81	--	Drainage divide	--	--

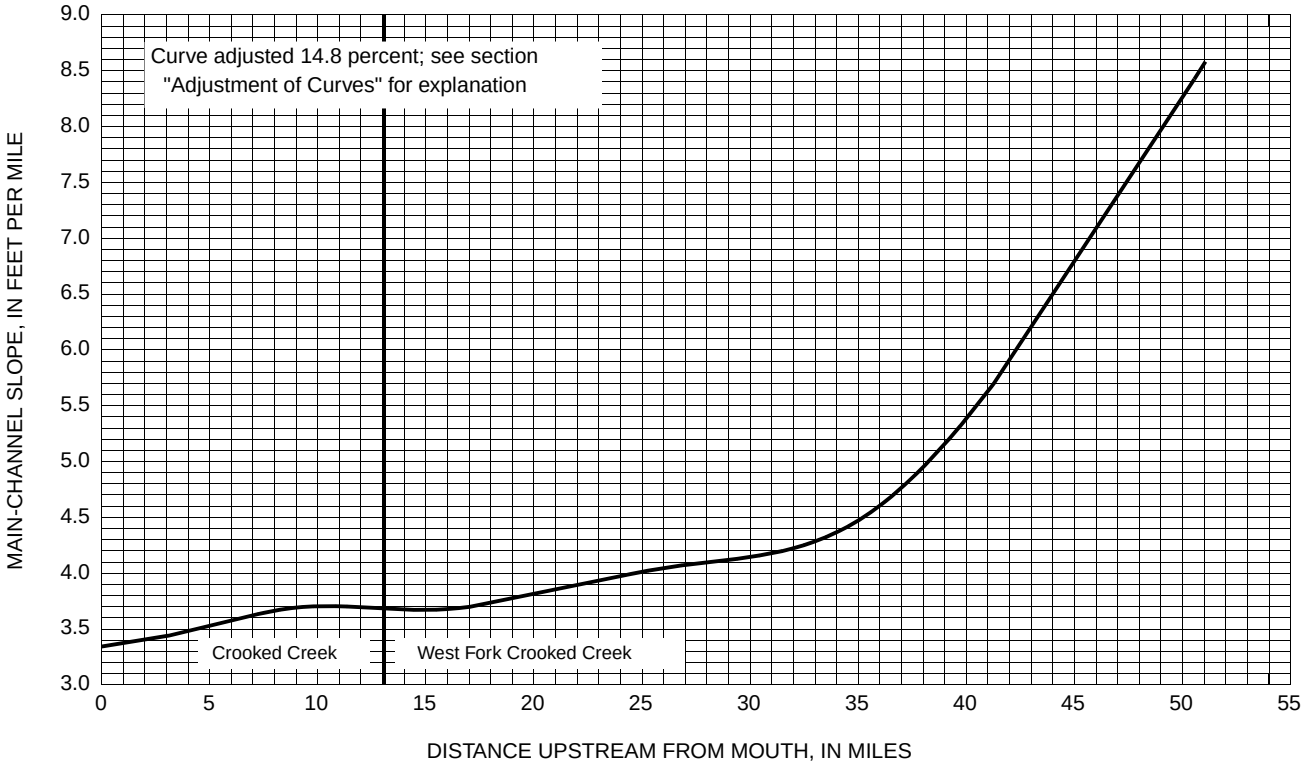
Figure 27. Crane Creek, beginning at mouth in Black Hawk County.



List of sites used to quantify main-channel slopes of Crane Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	214	Mouth of Crane Creek	95N 9W 31 NW	--
4.31	--	U Avenue	95N 10W 34 SE	U Ave
7.29	176	State Highway 193	94N 10W 4 NE	--
11.04	148	Fayette-Chickasaw County line	95N 10W 30 NW	--
13.44	--	Windsor Road	95N 11W 24 NE	Windsor Rd
17.63	135	State Highway 24, Lawler	95N 11W 4 SE	South St
20.63	128	180th Street	96N 11W 32 NW	180th St
23.20	119	160th Street	96N 11W 19 NW	160th St
27.78	108	Pembroke Road	96N 12W 11 NW	Pembroke Rd
31.71	97.7	County Road B22, Jerico	97N 12W 33 NE	120th St
35.43	90.5	Chickasaw-Howard County line, County Road B16	97N 12W 21 NW	100th St
39.47	--	State Highway 63	97N 12W 8 NW	--
40.72	75.8	County Road B17 (05411700, csg)	97N 12W 6 NW	185th St
46.13	59.5	155th Street	98N 13W 23 E	155th St
50.10	41.1	135th Street	98N 13W 10 C	135th St
51.81	--	125th Street	98N 13W 4 E	125th St
56.04	17.4	State Highway 9, Saratoga	99N 13W 29 NE	--
65.66	--	Drainage divide	--	--

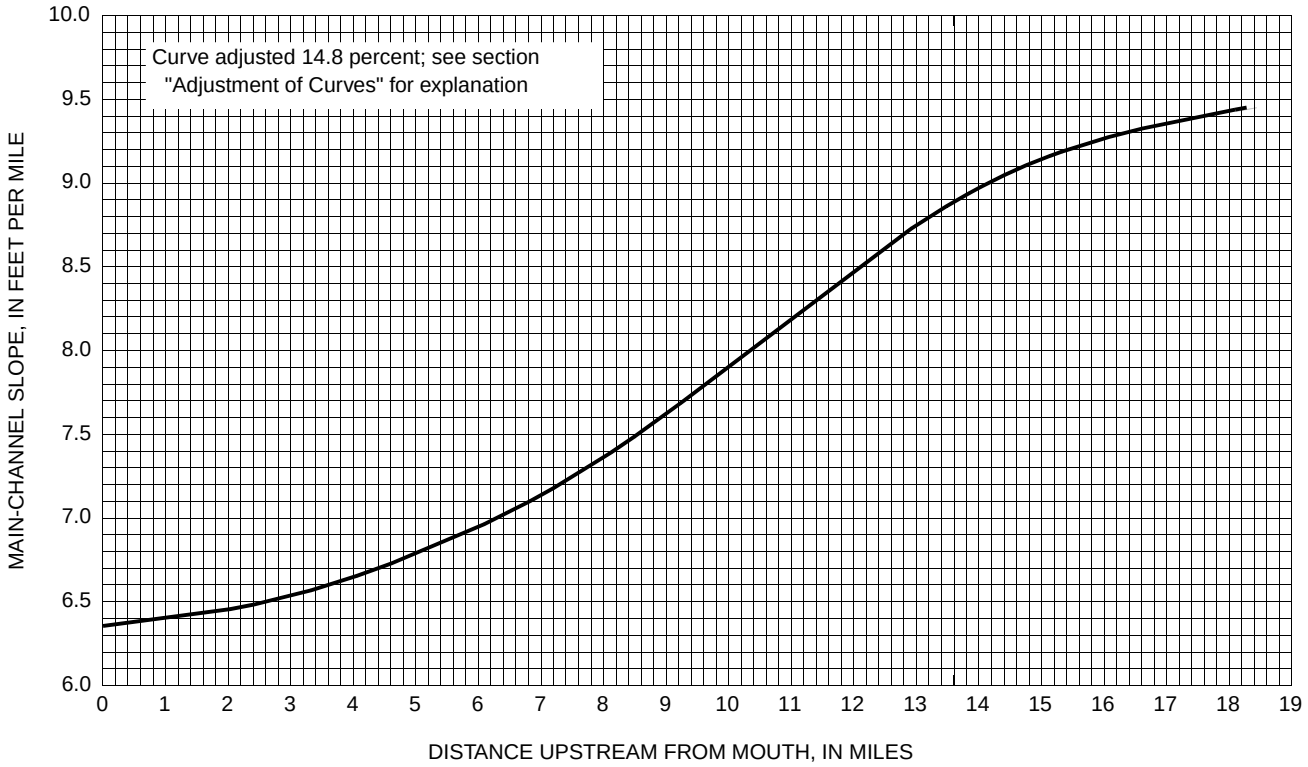
Figure 28. Crane Creek, beginning at mouth in Fayette County.



List of sites used to quantify main-channel slopes of Crooked and West Fork Crooked Creeks
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	286	Mouth of Crooked Creek	73N 8W 1 NE	--
0.56	284	State Highway 78, Coppock (05473060, qw)	73N 7W 6 NW	--
1.06	--	Henry-Washington County line	73N 7W 6 NE	--
3.47	259	320th Street (05473050, low)	74N 7W 30 NE	320th St
9.13	--	County Road W55	74N 7W 16 SE	Wayland Rd
15.17	--	Sockum Ridge Road	74N 7W 13 NE	Sockum Ridge Rd
20.37	--	County Road W55	74N 7W 5 NE	Wayland Rd
26.52	94.1	State Highyway 1	75N 8W 24 SE	--
35.05	69.0	State Highway 92	75N 8W 3 N	--
41.24	--	County Road W38	76N 8W 30 W	Ginkgo Ave
46.50	--	Dogwood Avenue	76N 9W 27 NW	Dogwood Ave
51.06	19.1	Washington-Keokuk County line, County Road V15	76N 9W 19 SW	Keokuk Washington Rd
59.48	--	Drainage divide	--	--

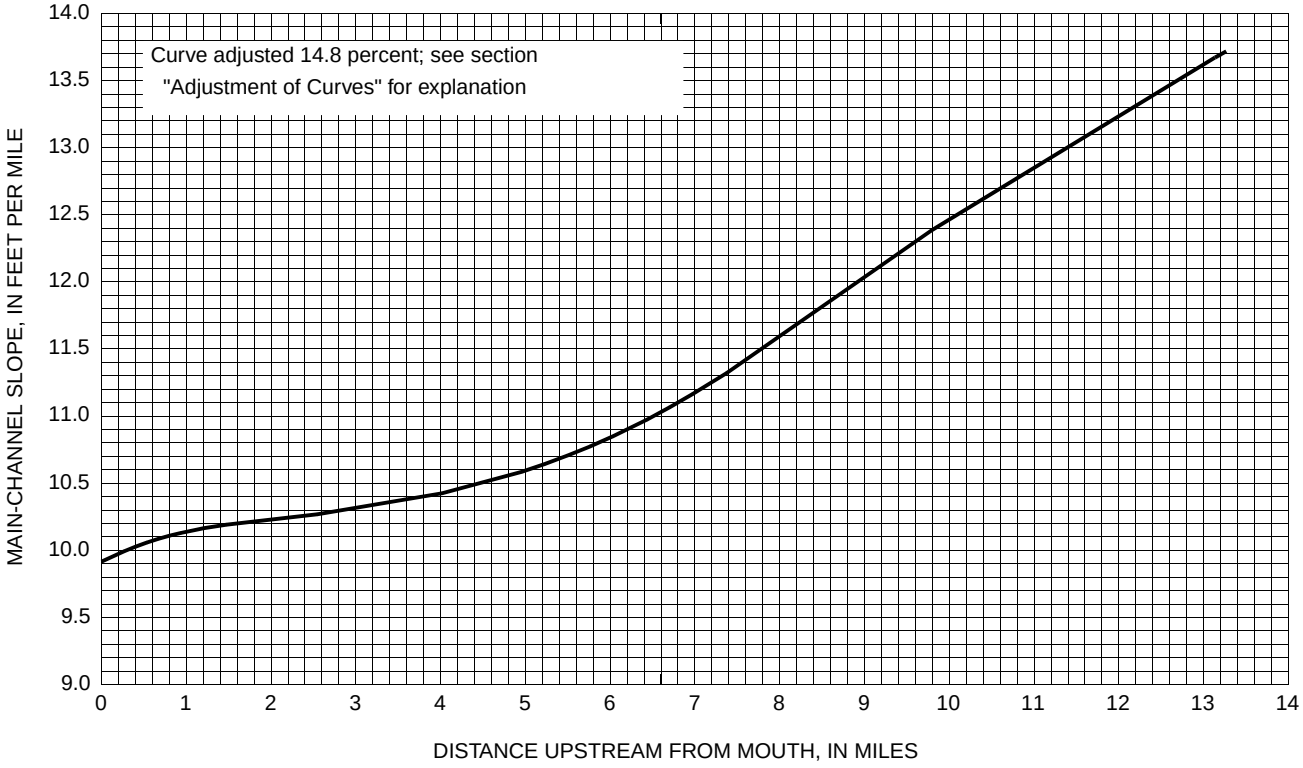
Figure 29. Crooked and West Fork Crooked Creeks, beginning at mouth of Crooked Creek in Jefferson County.



List of sites used to quantify main-channel slopes of Deep Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	143	Mouth of Deep Creek	84N 5E 18 C	--
2.59	--	State Highway 64	84N 5E 30 W	--
3.12	91.9	17th Street (05418700, low)	84N 5E 31 NW	17th St
4.62	88.3	Jackson-Clinton County line	84N 5E 31 SE	--
7.99	67.7	125th Street (05418650, low)	83N 5E 17 C	125th St
14.22	41.9	State Highway 136, Charlotte	83N 4E 27 SE	--
18.28	29.6	290th Avenue	83N 4E 32 NE	290th Ave
31.07	--	Drainage divide	--	--

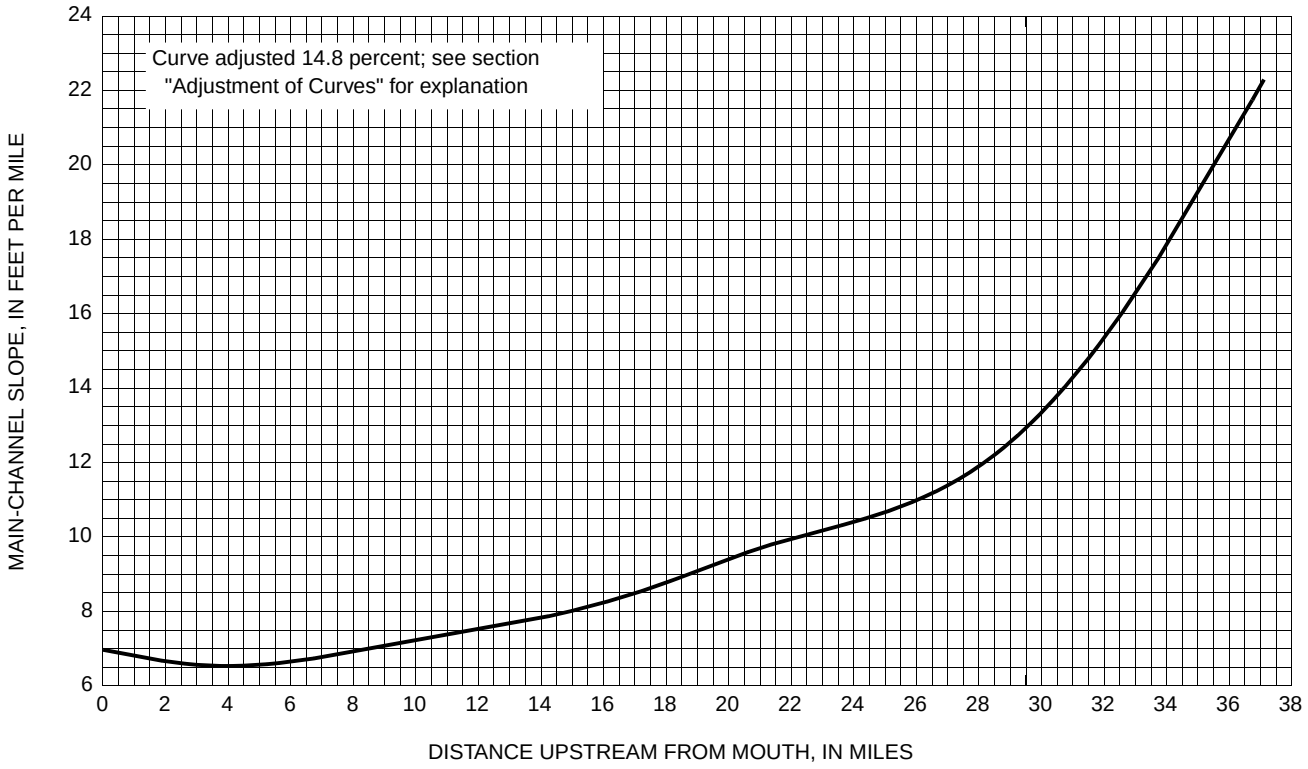
Figure 30. Deep Creek, beginning at mouth in Jackson County.



List of sites used to quantify main-channel slopes of the East Boyer River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	131	Mouth of East Boyer River, Denison	83N 39W 10 SE	--
0.34	130	U.S. Highway 30, Denison (06609350, low)	83N 39W 10 SE	--
2.13	127	County Road M36, Denison (06609345, --)	83N 39W 13 N	Donna Reed Rd
6.21	--	County Road M38	83N 38W 3 W	310th St
10.62	65.4	County Road M55, Vail (06609300, low)	84N 37W 30 C	County Rd
13.27	--	U.S. Highway 30	84N 37W 21 NE	--
23.06	--	Drainage divide	--	--

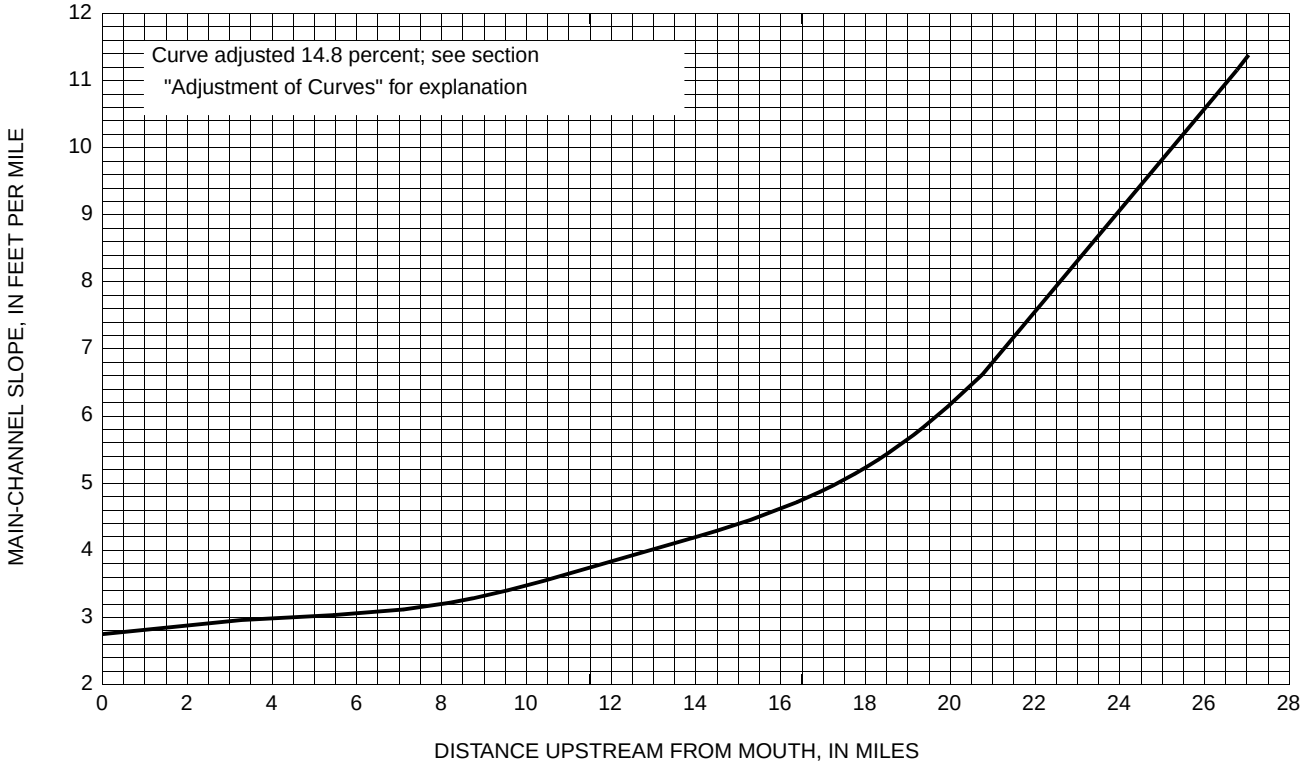
Figure 31. East Boyer River, beginning at mouth in Crawford County.



List of sites used to quantify main-channel slopes of the East Branch West Nishnabotna River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	227	Mouth of East Branch West Nishnabotna River	77N 39W 29 NW	--
1.71	--	U.S. Highway 59	77N 39W 21 N	--
3.00	223	State Highway 83, Avoca (06807400, low)	77N 39W 16 NE	--
5.21	--	Interstate 80	77N 39W 3 E	--
5.75	204	Pottawattamie-Shelby County Line	77N 39W 3 NE	--
10.28	183	450th Street (06807390, --)	78N 39W 13 W	450th St
13.48	--	Quince Road	78N 39W 5 SW	Quince Rd
17.98	151	State Highway 44 (06807380, low)	79N 38W 23 NE	--
21.06	--	County Road M47	79N 37W 6 NW	Road M47
24.71	--	County Road M56	80N 37W 27 NW	Road M56
28.59	70.3	Shelby-Audubon County line, Yellowwood Road (06807360, low)	80N 37W 13 NE	Yellowwood Rd
32.36	--	Dove Avenue	80N 36W 3 E	Dove Ave
37.11	17.2	Goldfinch Avenue	81N 35W 19 NW	Goldfinch Ave
42.90	--	Drainage divide	--	--

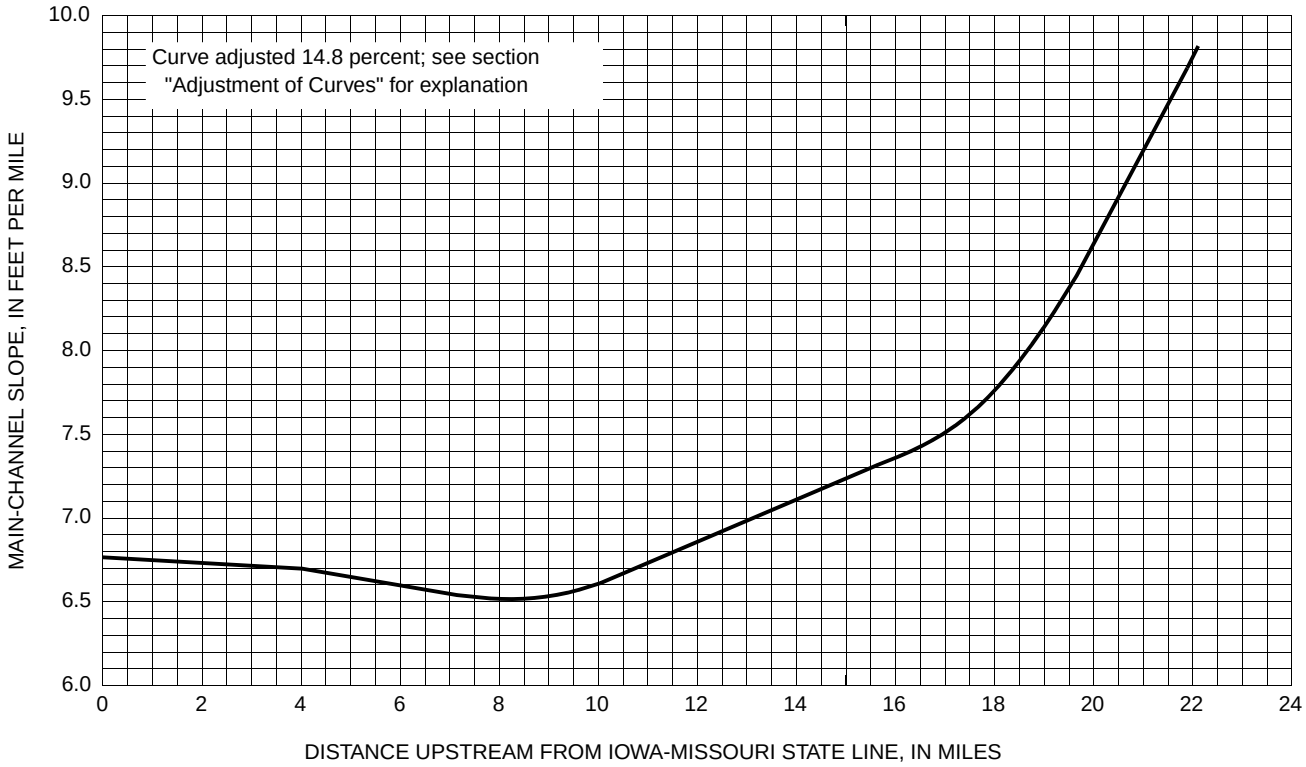
Figure 32. East Branch West Nishnabotna River, beginning at mouth in Pottawattamie County.



List of sites used to quantify main-channel slopes of East Fork Crooked Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	122	Mouth of East Fork Crooked Creek	74N 7W 24 NE	--
3.31	--	320th Street	74N 6W 29 N	320th St
7.86	--	U.S. Highway 218	74N 6W 27 SW	--
12.75	--	Washington-Henry County line	74N 6W 36 S	--
18.86	65.3	County Road W66 (05473020, low)	73N 5W 9 NE	Oasis Ave
22.93	--	130th Street, Winfield	73N 5W 22 NW	130th St
27.04	--	State Highway 78	73N 5W 36 NW	--
35.21	--	Drainage divide	--	--

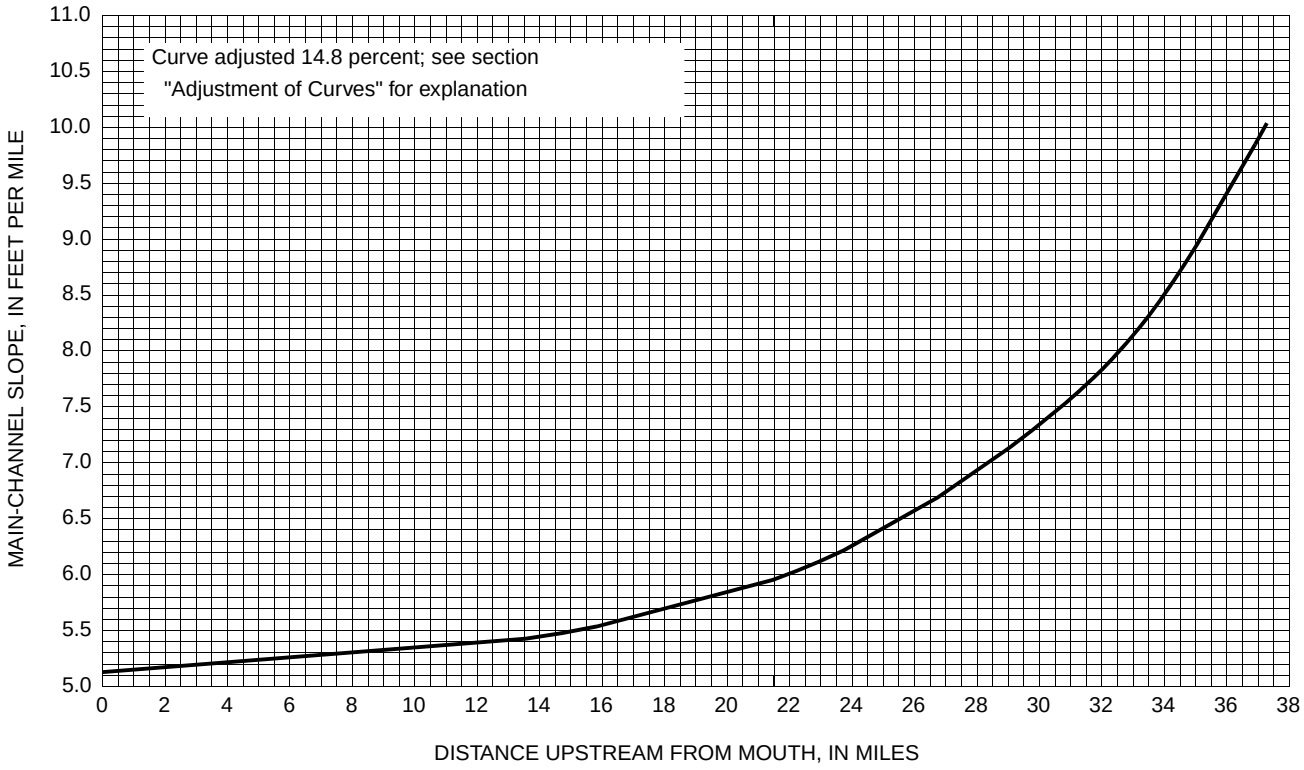
Figure 33. East Fork Crooked Creek, beginning at mouth in Washington County.



List of sites used to quantify main-channel slopes of the East Fork One Hundred and Two River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	111	Iowa-Missouri State line	67N 34W 31 NW	--
4.41	--	308th Way	67N 34W 17 SE	308th Way
6.51	92.1	County Road J55 (06819190, cont)	67N 34W 9 NE	290th St
9.13	85.4	County Road N44, Bedford (06819185, cont)	68N 34W 35 NE	Linwood Ave
10.30	--	State Highway 2	68N 34W 25 NW	--
14.99	60.4	220th Street (06819180, low)	68N 33W 4 NW	220th St
17.69	--	County Road J35, Conway	69N 33W 26 NW	200th St
22.11	--	State Highway 49	69N 33W 12 N	--
34.35	--	Drainage divide	--	--

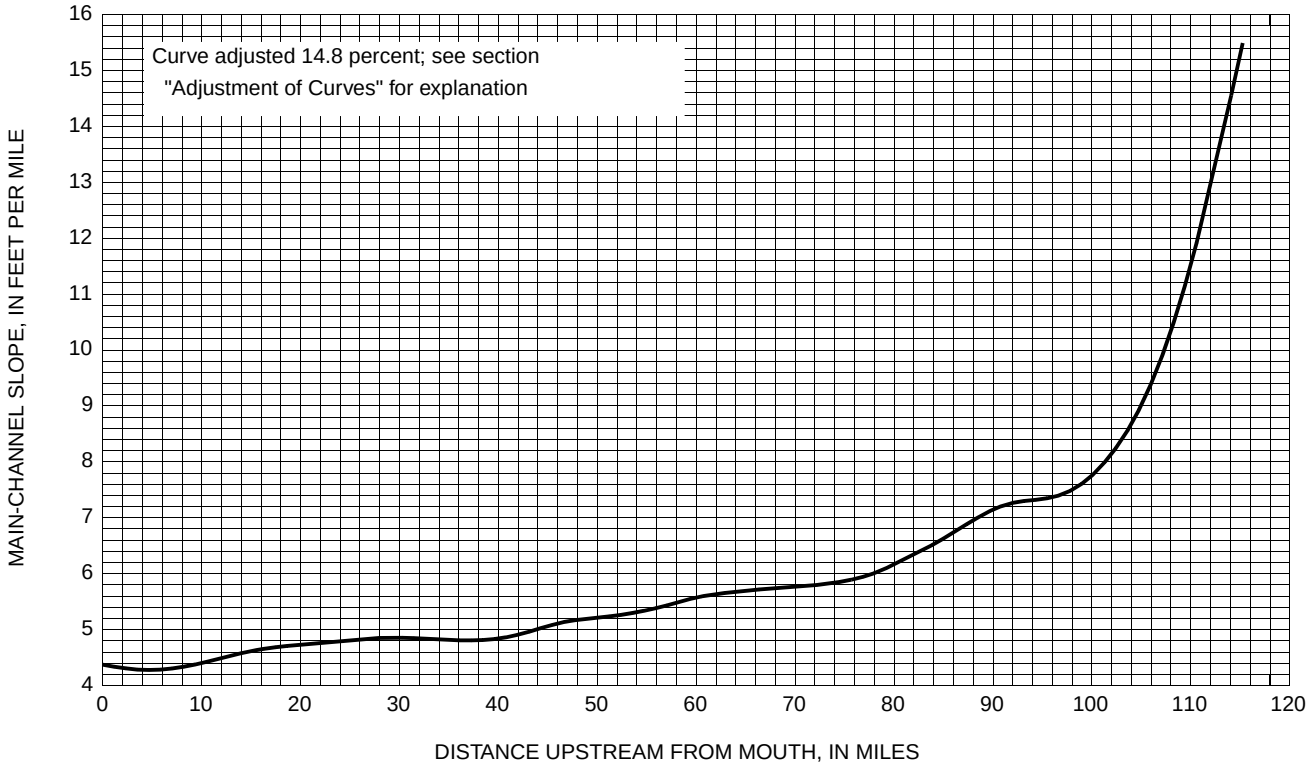
Figure 34. East Fork One Hundred and Two River, beginning at Iowa-Missouri State line in Taylor County.



List of sites used to quantify main-channel slopes of the East Fork Wapsipinicon River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	148	Mouth of East Fork Wapsipinicon River	93N 12W 34 SE	--
2.67	144	State Highway 93 (05420720, low)	93N 12W 26 NW	--
8.83	123	Bremer-Chickasaw County line (05420710, --)	93N 12W 3 NW	310th St
13.37	97.1	280th Street	94N 12W 22NW	280th St
17.76	83.5	U.S. Highway 18, Fredericksburg (05420705, --)	94N 12W 13 NW	--
22.59	62.2	County Road B54 (05420700, low)	95N 12W 36 NW	240th St
29.76	--	State Highway 24	95N 12W 9 NW	--
33.63	30.3	U.S. Highway 63 (05420690, csg)	96N 12W 31 SE	--
37.28	21.8	County Road B33	96N 13W 25 NW	170th St
50.55	--	Drainage divide	--	--

Figure 35. East Fork Wapsipinicon River, beginning at mouth in Bremer County.



List of sites used to quantify main-channel slopes of the East Nishnabotna River
[See section "Presentation of Curves" for explanation of list elements]

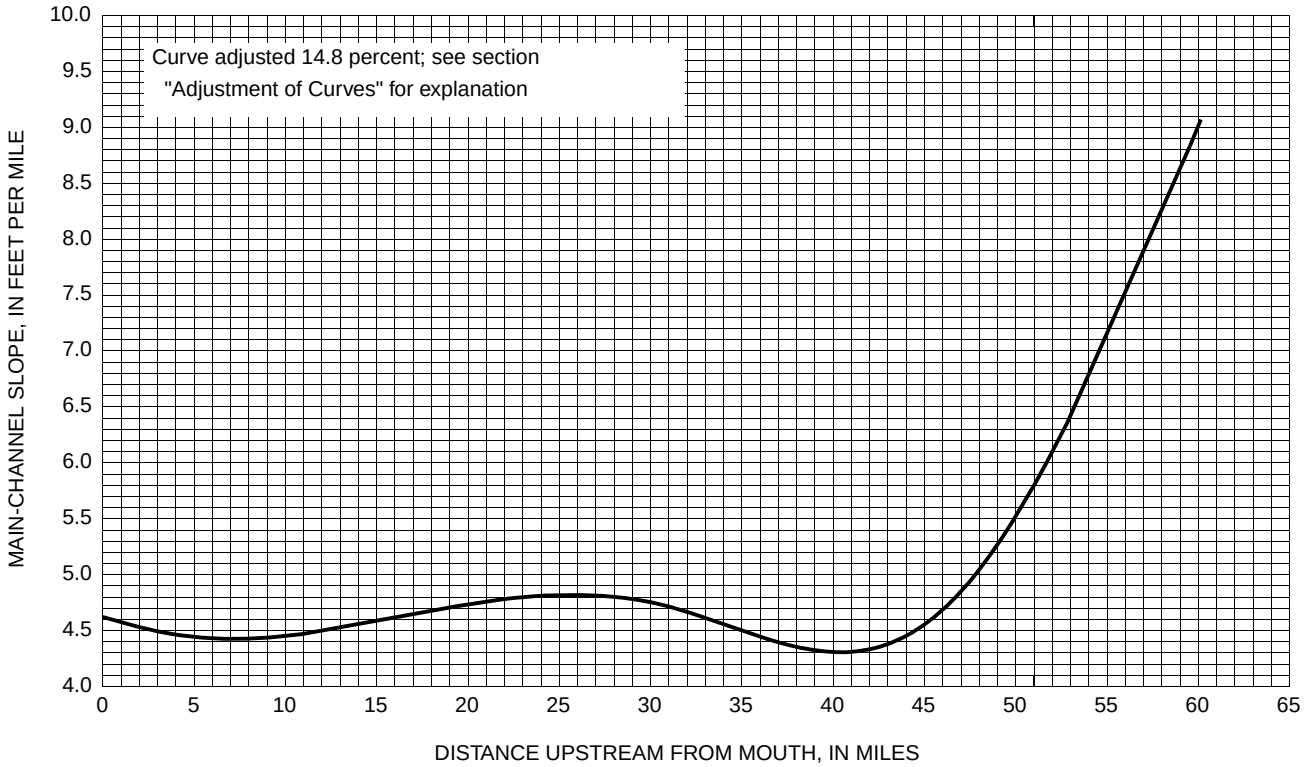
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	1,148	Mouth of East Nishnabotna River	67N 42W 2 NE	--
3.55	1,106	County Road J46, Riverton (06809900, --)	68N 41W 29 NW	250th St
4.69	--	County Road L68, Riverton	68N 41W 20 NE	330th Ave
10.67	1,082	County Road M16 (06809800, low)	69N 40W 30 SE	370th Ave
12.53	--	State Highway 2	69N 40W 28 SE	--
17.04	1,019	Fremont-Page County line, U.S. Highway 59 (06809750, --)	69N 40W 13 NE	--
22.35	--	150th Street, Essex	70N 39W 27 SW	150th St
28.12	953	Page-Montgomery County line	70N 39W 1 NW	--
31.95	--	County Road H46	71N 38W 19 NW	250th St
38.14	894	Coolbaugh Street, Red Oak (06809500, cont)	72N 38W 29 SE	205th St
39.35	--	U.S. Highway 34, Red Oak	72N 38W 20 NW	--
41.83	888	State Highway 48	72N 38W 8 SE	--
46.27	--	County Road H20, Stennett	73N 38W 34 N	150th St
51.34	--	State Highway 48, Elliott	73N 38W 11 NE	--
52.31	837	Montgomery-Pottawattamie County line	73N 38W 1 NW	--

Figure 36. East Nishnabotna River, beginning at mouth in Fremont County.

List of sites used to quantify main-channel slopes of the East Nishnabotna River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
57.86	--	State Highway 92	74N 38W 1 SE	--
59.66	789	Pottawattamie-Cass County line	75N 38W 36 NE	--
62.37	778	State Highway 48 (06809450, low)	75N 37W 19 NE	--
66.87	574	U.S. Highway 6 (06809330, low)	75N 37W 10 NE	--
69.24	436	Lansing Road (06809210, cont)	76N 37W 35 NW	Lansing Rd
74.33	382	County Road G30, Atlantic (06809200, low)	76N 36W 6 SE	6th St
74.64	--	State Highway 83, Atlantic	76N 36W 6 SE	2nd St
78.33	--	Great River Road	77N 36W 27 SW	Great River Rd
81.48	237	U.S. Highways 6 and 71	77N 36W 14 SE	--
83.99	--	Interstate 80	77N 36W 1 SE	--
84.54	224	Cass-Audubon County line	77N 36W 1 NE	--
87.69	--	320th Street, Brayton	78N 35W 19 NE	320th St
91.35	--	U.S. Highway 71, Exira	78N 35W 4 SW	--
91.61	195	County Road F58, Exira (06808900, low)	78N 35W 4 NW	Littlefield Dr
96.40	--	U.S. Highway 71	79N 35W 15 NE	--
97.51	--	State Highway 44	79N 35W 11 SW	--
102.32	--	County Road F32	80N 35W 23 NE	190th St
105.83	66.7	Mockingbird Avenue (06808850, low)	80N 34W 6 NW	Mockingbird Ave
110.31	--	130th Street	81N 34W 19 NE	130th St
115.24	15.2	Audubon-Carroll County line	81N 35W 3 NW	--
122.68	--	Drainage divide	--	--

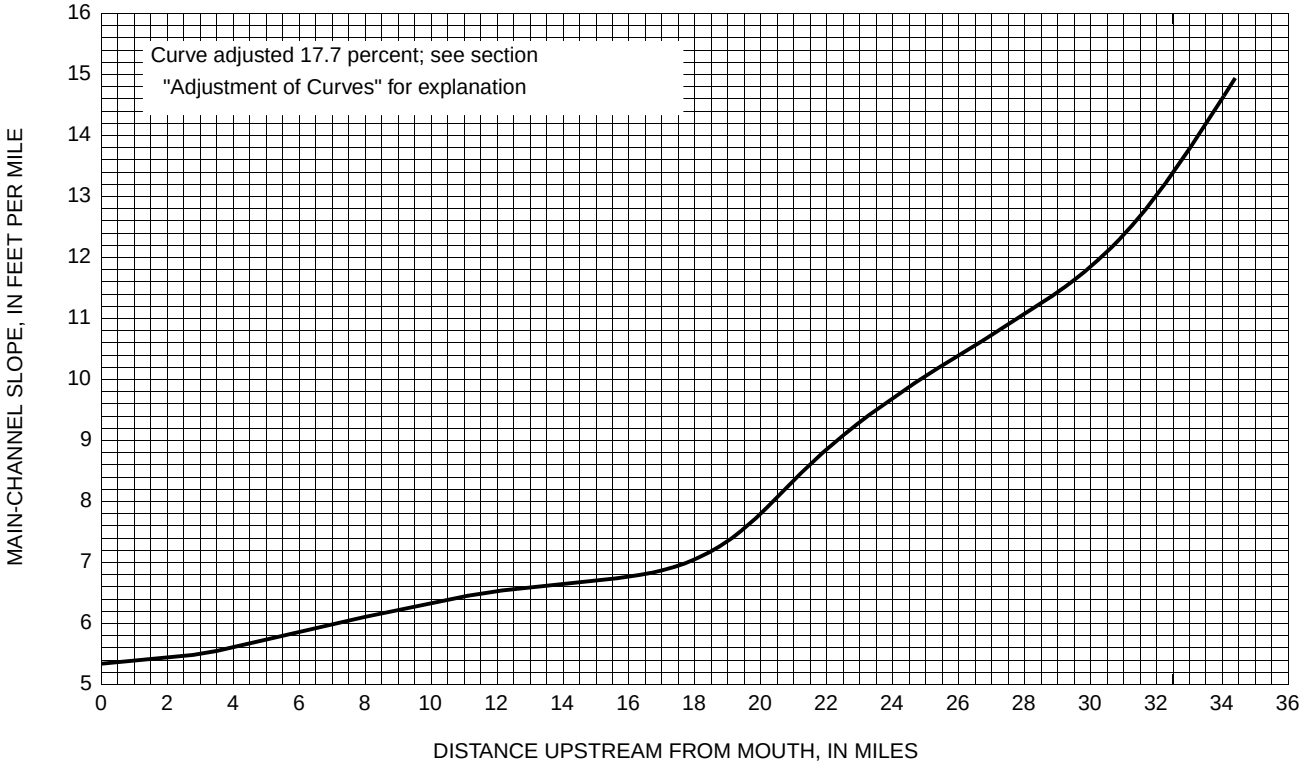
Figure 36. East Nishnabotna River, beginning at mouth in Fremont County—Continued.



List of sites used to quantify main-channel slopes of the East Nodaway River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	334	Mouth of East Nodaway River	67N 36W 7 N	--
0.67	333	County Road J53 (06817100, low)	67N 36W 6 SE	Teak Ave
2.71	--	260th Street	68N 36W 33 NW	260th St
7.16	--	State Highway 2	68N 36W 4 N	--
12.40	299	County Road J31	69N 36W 13 C	Willow Ave
14.51	291	Page-Taylor County line	69N 36W 1 SE	Taylor-Page Road
18.79	--	County Road J20	70N 35W 20 NW	130th St
21.91	251	Taylor-Adams County line	70N 35W 6 NE	Adams-Taylor Rd
26.28	242	County Road N26, Nodaway	71N 35W 17 SE	Birch Ave
30.49	--	Fig Avenue	71N 35W 12 N	Fig Ave
36.79	--	U.S. Highway 34	71N 34W 3 NW	--
37.73	165	State Highway 148, Corning	71N 34W 2 NW	Quincy Ave
41.13	--	Mulberry Avenue	72N 33W 30N	Mulberry Ave
46.56	--	County Road N61, Prescott	72N 33W 23 SE	Quince Ave
53.48	--	Tulip Avenue	72N 32W 9 NW	Tulip Ave
60.14	54.2	140th Avenue (06817050, low)	73N 32W 28 NW	140th Ave
75.06	--	Drainage divide	--	--

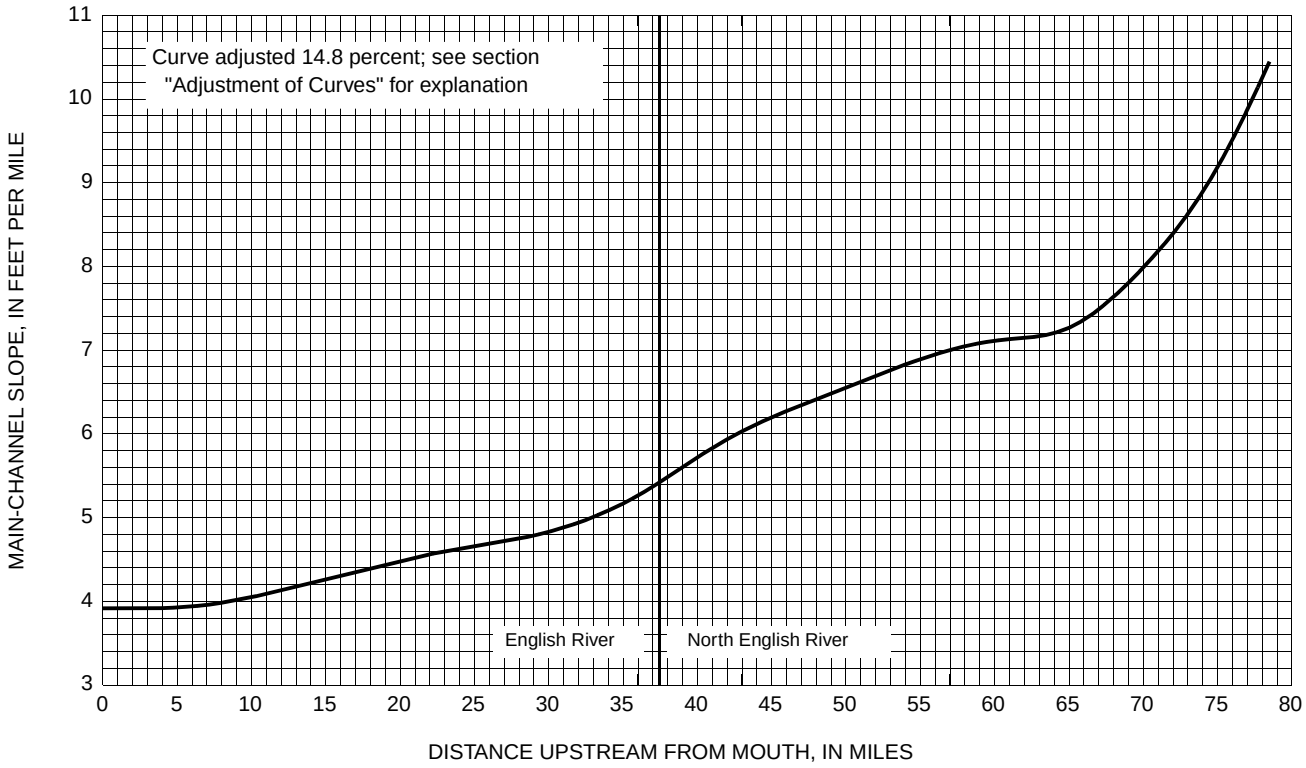
Figure 37. East Nodaway River, beginning at mouth in Page County.



List of sites used to quantify main-channel slopes of English Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	112	Mouth of English Creek	75N 18W 3 SW	--
2.27	108	County Road T17 (05488300, low)	75N 18W 5 E	Hwy T17
8.54	--	Old Highway 92	75N 19W 11 NW	Old Hwy 92
12.73	90.1	State Highway 92 (05488200, cont)	75N 19W 16 SE	--
15.10	--	State Highway 5	75N 19W 21 NW	--
19.43	73.0	135th Place	75N 19W 30 C	135th Pl
21.22	--	State Highway 14	75N 20W 24 S	--
28.32	57.4	County Road G62	74N 20W 4 NE	Quebec St
31.18	46.3	County Road G76	74N 20W 16 C	Hwy G76
34.39	--	78th Avenue (05488180, qw)	74N 20W 30 SE	78th Ave
46.68	--	Drainage divide	--	--

Figure 38. English Creek, beginning at mouth in Marion County.



List of sites used to quantify main-channel slopes of the English and North English Rivers
[See section "Presentation of Curves" for explanation of list elements]

List of sites used to quantify main-channel slopes of the English and North English Rivers—Continued

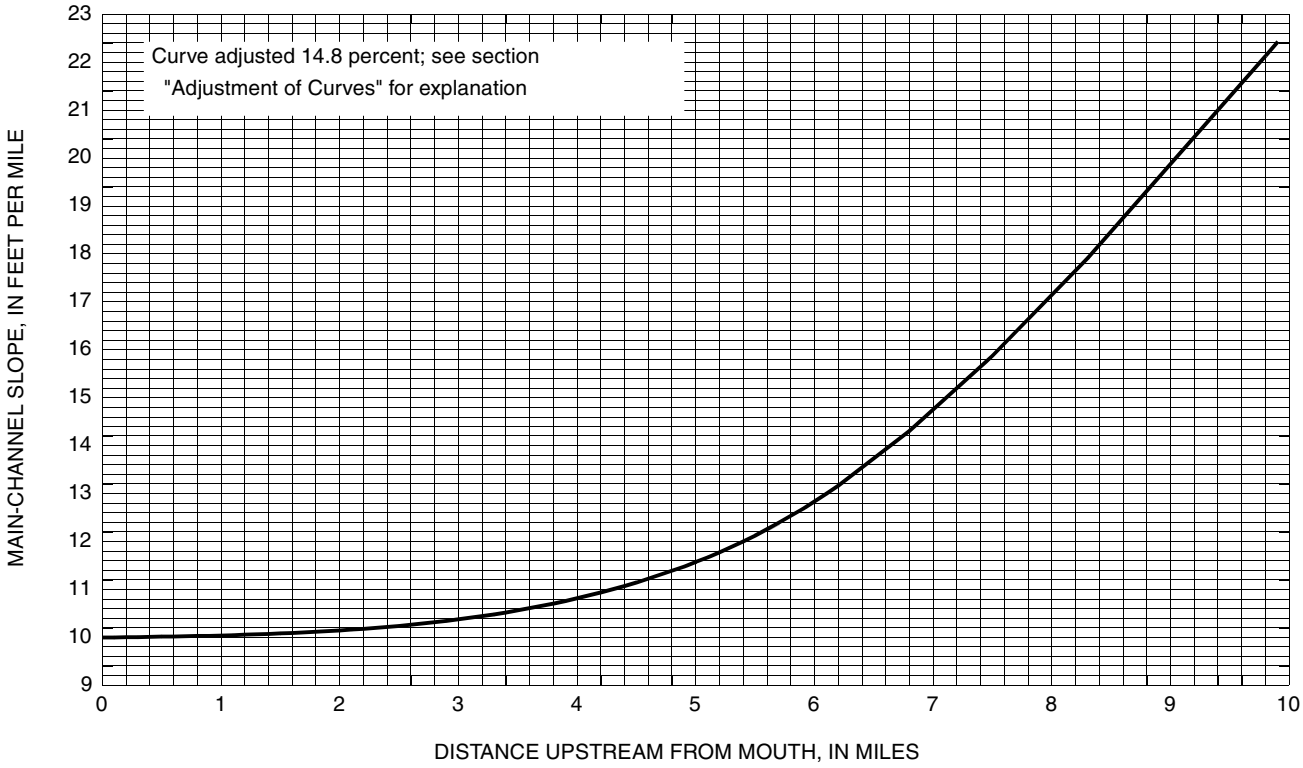
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	638	Mouth of English River	77N 6W 11 SE	--
3.18	--	State Highway 923	77N 6W 15 NW	--
3.87	--	U.S. Highway 218	77N 6W 16 N	--
6.66	626	County Road W61, Riverside	77N 6W 17 SW	Riverside Road
15.44	599	Nutmeg Avenue	77N 7W 17 SW	Nutmeg Ave
17.03	573	State Highway 1, Kalona (05455500, cont)	77N 8W 13 SE	--
21.93	--	State Highway 22	77N 8W 10 SE	--
25.05	472	Hickory Avenue (05455470, --)	77N 8W 8 SW	Hickory Ave
28.35	--	County Road W38	77N 8W 7 SW	Ginkgo Ave
33.61	455	County Road W21	77N 9W 3 SW	Dogwood Ave
36.60	449	Between dead-end roads, Birch Avenue (05455455, --)	77N 9W 5 SE	Birch Ave
38.09	--	Washington-Iowa County line	77N 9W 6 N	--
38.85	310	County Road W18 (05455272, --)	78N 9W 31 SW	S Ave
41.51	302	County Road F67 (05455270, qw)	78N 10W 27 SE	PP Ave
43.08	296	Abandoned bridge, OO Avenue (05455265, --)	78N 10W 28 C	OO Ave

Figure 39. English and North English Rivers, beginning at mouth of English River in Washington County.

List of sites used to quantify main-channel slopes of the English and North English Rivers—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
45.04	221	310th Street (05455250, low)	78N 10W 17 SW	310th St
46.80	215	State Highway 149	78N 10W 7 SW	--
48.44	210	County Road F52 (05455248, --)	78N 11W 1 SW	F52 Trl
52.25	178	County Road V52 (05455244, --)	79N 11W 32 SE	H Ave
58.52	163	Abandoned bridge, CC Ave (05455240, --)	78N 12W 4 NE	CC Ave
60.27	117	Abandoned bridge, BB Avenue (05455220, --)	79N 12W 33 NW	BB Ave
63.48	93.7	Iowa-Poweshiek County line	79N 12W 19 SW	Poweshiek/Iowa Rd
65.04	88.9	235th Street (05455215, --)	79N 13W 23 C	235th St
66.84	81.5	State Highway 21, Guernsey (05455210, csg)	79N 13W 22 NW	--
68.84	68.7	County Raod V21 (05455200, csg)	79N 13W 17 SW	200th St
70.90	61.0	180th Street (05455190, --)	79N 14W 13 SW	180th St
73.65	40.2	155th Street	79N 14W 21 N	155 St
77.45	34.0	U.S. Highway 63 (05455150, csg)	79N 15W 13 SW	--
78.50	31.0	110th Street (05455140, csg)	79N 15W 14 SW	110th St
89.85	--	Drainage divide	--	--

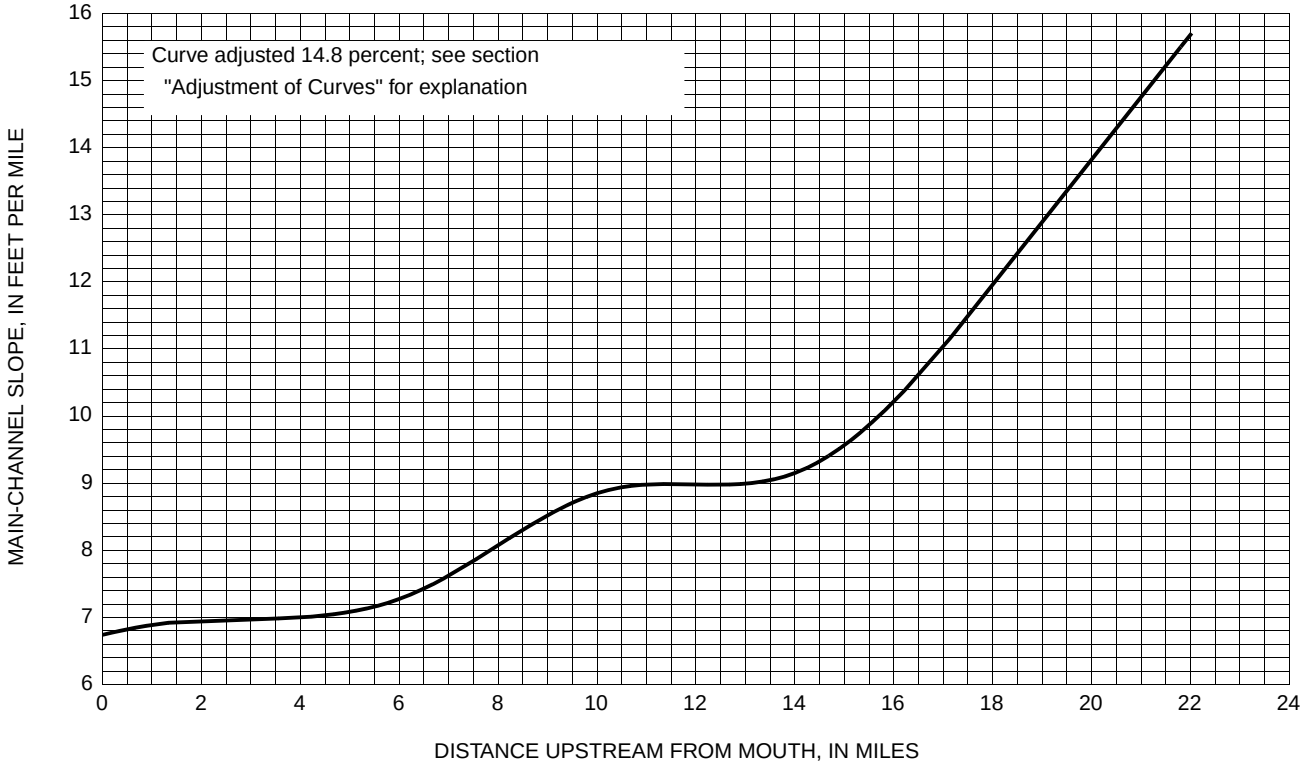
Figure 39. English and North English Rivers, beginning at mouth of English River in Washington County—Continued.



List of sites used to quantify main-channel slopes of Farm Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	122	Mouth of Farm Creek	73N 40W 9 SE	--
2.48	--	State Highway 59	73N 40W 12 SW	--
4.52	104	Mills-Pottawattamie County line, Applewood Avenue (06807440, low)	74N 40W 36 SE	Applewood Ave
5.77	--	425th Street	74N 39W 31 N	425th St
9.90	9.9	County Road M37	74N 39W 22 W	450th St
18.11	--	Drainage divide	--	--

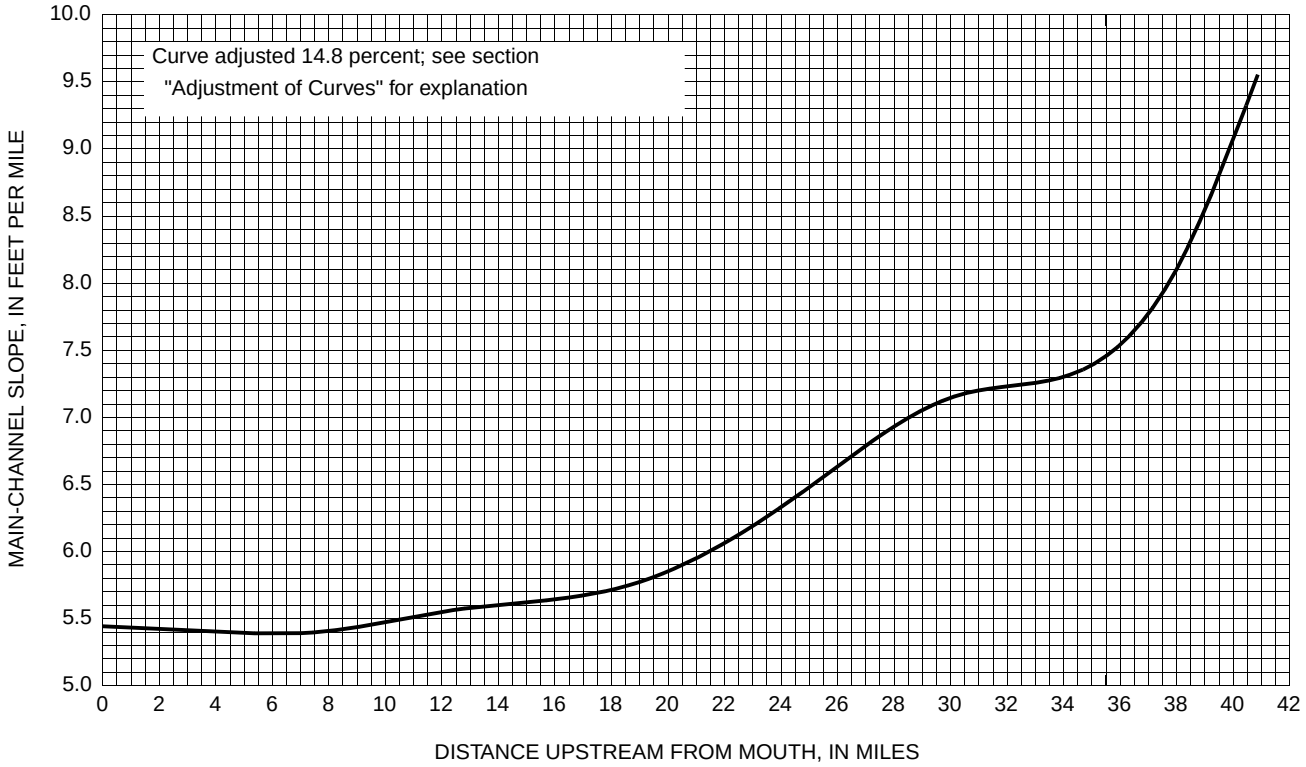
Figure 40. Farm Creek, beginning at mouth in Mills County.



List of sites used to quantify main-channel slopes of Flint Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	148	Mouth of Flint Creek, Burlington	70N 2W 28 W	--
0.97	--	State Highway 99, Burlington (05469710, --)	70N 2W 29 NE	--
6.31	125	U.S. Highway 61	70N 3W 24 NW	--
10.14	107	Flint Bottom Road (05469700, low)	70N 3W 16 NE	Flint Bottom Rd
14.12	93.4	154th Avenue	71N 3W 32 SE	154th Ave
18.68	63.3	County Road H50	71N 4W 25 W	165th St
22.02	23.4	Diamond Road	71N 4W 22 SW	Diamond Rd
30.66	--	Drainage divide	--	--

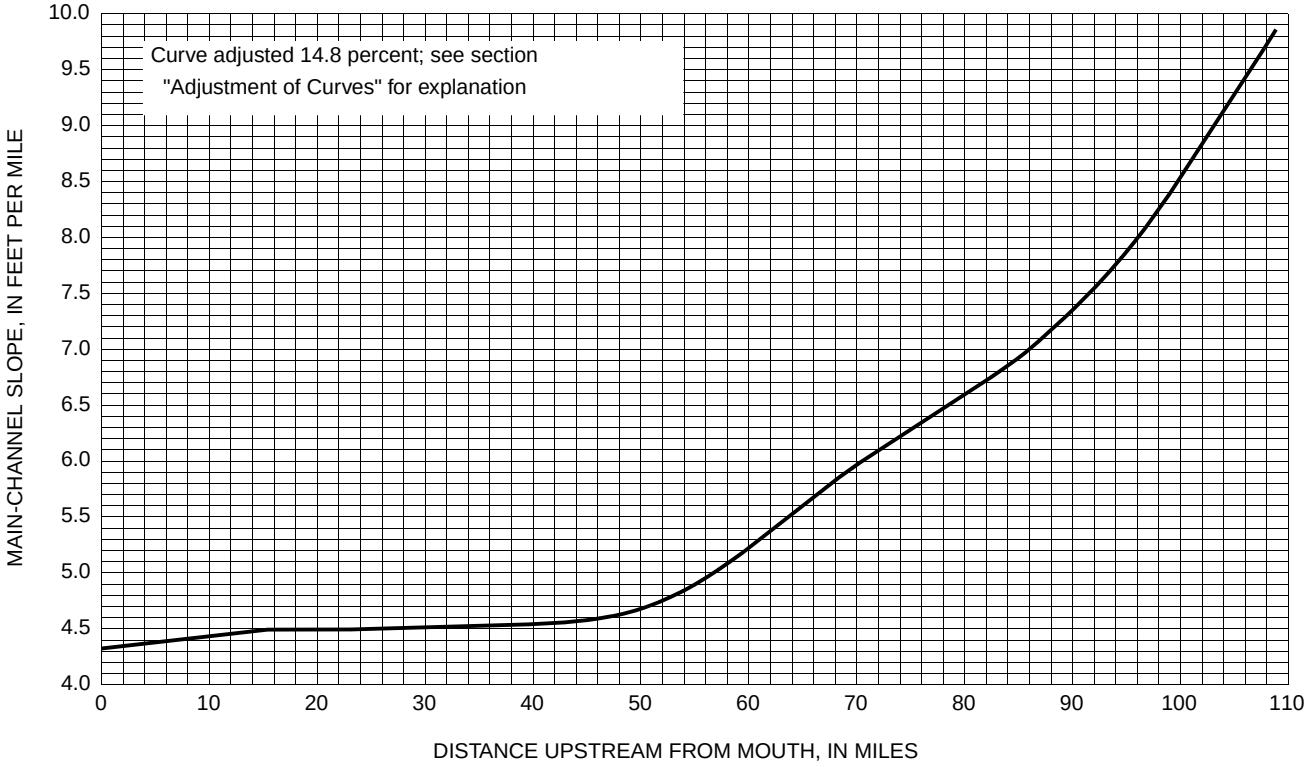
Figure 41. Flint Creek, beginning at mouth in Des Moines County.



List of sites used to quantify main-channel slopes of Flood Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	152	Mouth of Flood Creek	93N 16W 27 SW	--
2.82	145	130th Street (05461400, low)	93N 16W 23 NE	130th St
7.67	127	Butler-Floyd County line (05461390, cont)	94N 16W 34 SE	Floyd Line St
12.45	--	280th Street	94N 16W 17 SW	280th St
18.80	67.9	State Highway 14	95N 17W 36 SW	--
25.09	59.3	State Highway 147 (05461300, low)	95N 17W 15 NW	--
30.28	47.9	Holly Street	96N 17W 32 SW	Holly St
34.71	--	U.S. Highway 18, Rudd	96N 18W 24 E	--
38.07	--	State Highway 122	96N 18W 14 NW	--
40.87	21.3	County Road T12	96N 18W 3 W	Dancer St
52.69	--	Hydrologic Regions 1 and 2 Boundary	98N 19W 36 NE	--
53.45	--	Drainage divide	--	--

Figure 42. Flood Creek, beginning at mouth in Butler County.



List of sites used to quantify main-channel slopes of the Floyd River
[See section "Presentation of Curves" for explanation of list elements]

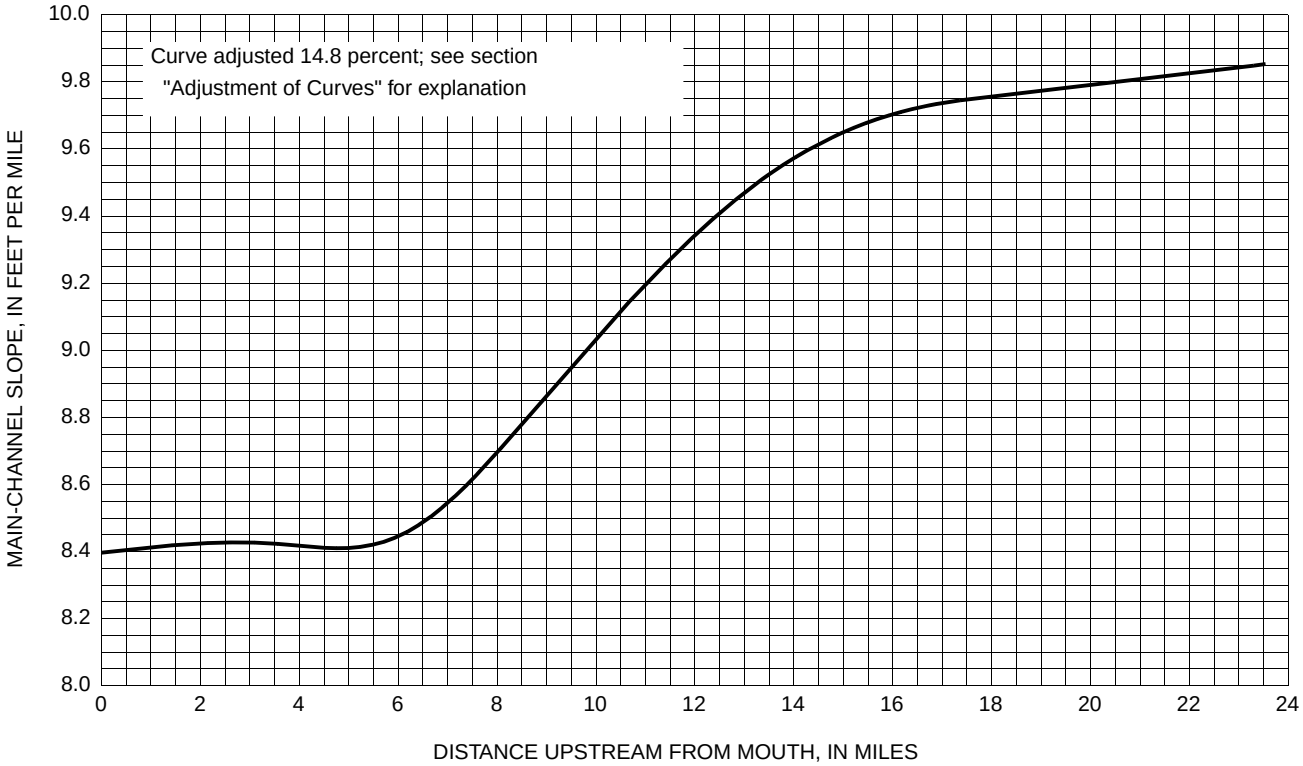
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	921	Mouth of Floyd River, Sioux City	89N 47W 33 SE	--
0.07	921	Interstate 29, Sioux City	89N 47W 33 SE	--
0.41	921	Dace Avenue, Sioux City (06600520, qw)	89N 47W 33 NE	Dace Ave
0.49	--	State Highway 12, Sioux City	89N 47W 33 NE	Gordon Dr
4.14	--	U.S. Highway 75, Sioux City	89N 47W 14 NE	Lewis Blvd
7.23	887	Woodbury-Plymouth County line	89N 46W 6 NW	--
8.94	886	County Road C70, James (06600500, cont)	90N 46W 30 SE	C70 Rd
13.86	--	County Road C60, Hinton	90N 46W 9 C	C60 Rd
17.27	--	Jasmine Road	91N 46W 34 W	Jasmine Rd
23.12	--	County Road C44, Merrill	91N 46W 11 NE	230th St
26.76	489	County Road C38 (06600200, low)	92N 45W 31 NW	C38 Rd
27.90	--	U.S. Highway 75	92N 45W 30 NE	--
31.32	--	State Highway 3, Le Mars	92N 45W 17 N	Plymouth St
32.25	478	U.S. Highway 75, Le Mars (06600180, low)	92N 45W 9 W	5th Ave
36.28	--	150th Street	93N 45W 34 NW	150th St

Figure 43. Floyd River, beginning at mouth in Woodbury County.

List of sites used to quantify main-channel slopes of the Floyd River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
40.26	--	County Road C16	93N 45W 24 NW	130th St
45.34	292	Plymouth-Sioux County line	93N 44W 6 NE	--
49.75	278	490th Street	94N 44W 28 NE	490th St
55.31	268	South County Road, Alton (06600100, cont)	94N 44W 11 NE	So Co Rd
56.25	--	State Highway 60, Alton	94N 44W 2 N	3rd Ave
56.75	--	State Highway 10, Alton	94N 44W 2 NW	--
60.24	249	County Road L14	95N 44W 25 SE	Kingbird Ave
63.39	--	430th Street	95N 43W 29 NE	430th St
67.84	--	410th Street	95N 43W 16 NW	410th St
71.16	--	395th Street, Hospers	95N 43W 3 C	395th St
74.05	--	380th Street	96N 43W 34 NE	380th St
77.88	165	County Road B30 (06600060, low)	96N 43W 23 N	360th St
84.15	--	U.S. Highway 18, Sheldon	97N 43W 36 NE	--
84.71	79.5	Sioux-O'Brien County line, County Road L26	97N 43W 25 SE	McKinley Ave
86.06	--	State Highway 60, Sheldon	97N 42W 30 NE	--
88.66	64.0	County Road L32 (06600020, low)	97N 42W 21 SW	Nest Ave
95.36	50.2	Olive Avenue	97N 42W 12 NW	Olive Ave
101.35	--	County Road B14	97N 41W 9 NW	280th St
108.86	--	State Highway 59	97N 41W 24 NW	--
114.87	--	Drainage divide	--	--

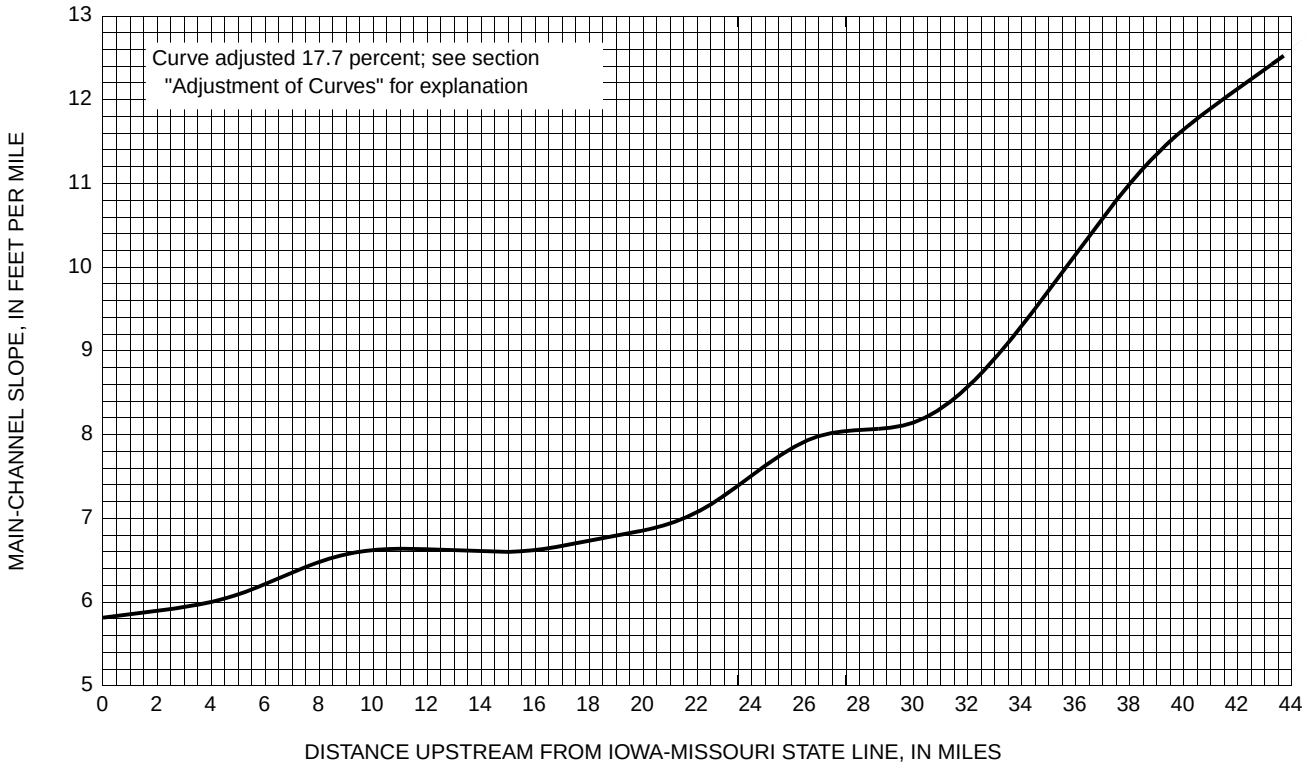
Figure 43. Floyd River, beginning at mouth in Woodbury County—Continued.



List of sites used to quantify main-channel slopes of Fourmile Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	121	Mouth of Fourmile Creek	78N 23W 16 NW	--
1.93	--	Des Moines Lobe landform region boundary	78N 23W 5 SW	--
3.55	95.9	State Highway 163, Des Moines (05485650, qw)	78N 23W 5 N	E University Ave
5.16	92.7	Easton Boulevard, Des Moines (05485640, cont)	79N 23W 32 NE	Easton Blvd
6.21	--	U.S. Highway 6, Des Moines	79N 23W 29 NW	E Euclid Ave
8.78	--	Interstate 80	79N 23W 17 NE	--
13.47	--	County Road F38, Ankeny	80N 23W 32 NW	NE 78 Ave
16.76	59.3	State Highway 931, Ankeny (05485600, low)	80N 23W 18 SW	--
18.19	--	Interstate 35, Ankeny	80N 23W 7 SW	--
23.54	--	U.S. Highway 69	81N 24W 36 NW	--
34.83	--	Drainage divide	--	--

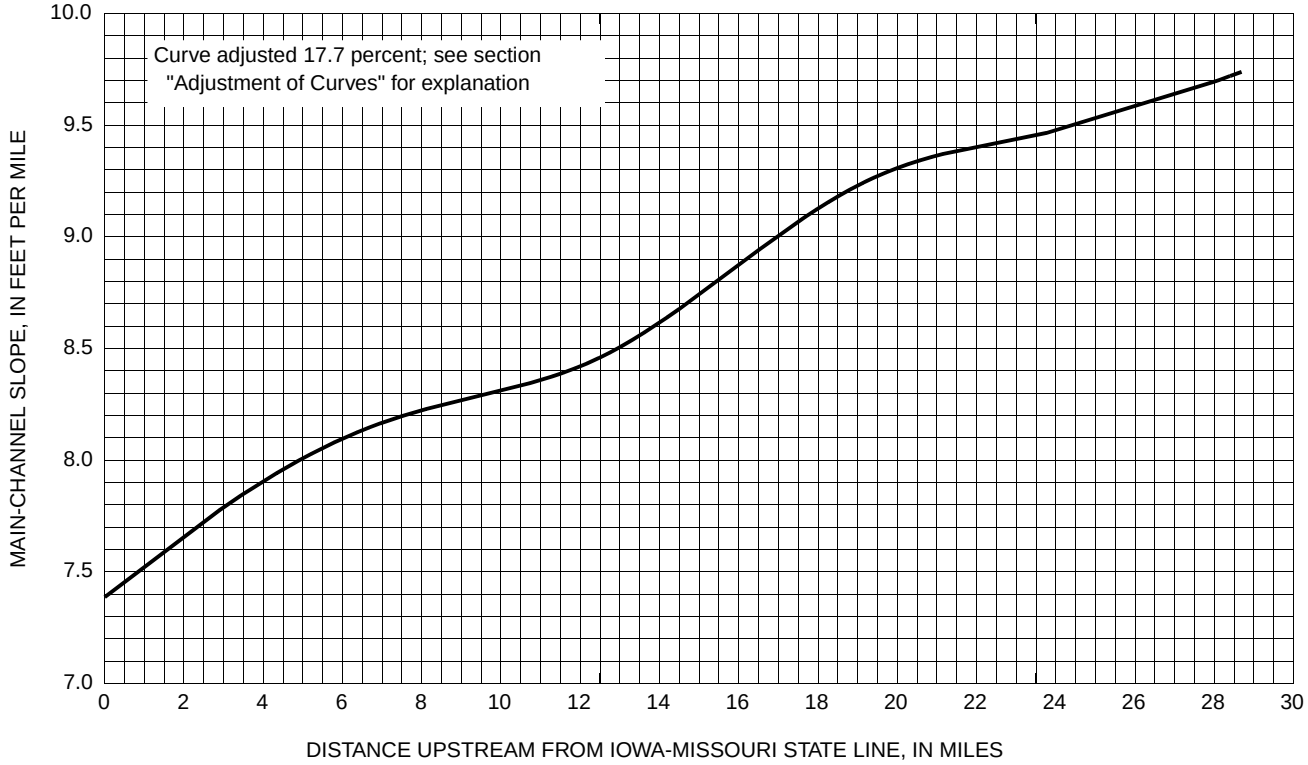
Figure 44. Fourmile Creek, beginning at mouth in Polk County.



List of sites used to quantify main-channel slopes of the Fox River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	188	Iowa-Missouri State line	67N 9W 17 SE	--
1.37	--	County Road J56, Mount Sterling (05494600, qw)	67N 9W 7 C	West Rd
4.87	173	Jersey Avenue	68N 10W 34 S	Jersey Ave
8.70	161	State Highway 2 (05494500, cont)	68N 10W 30 SW	--
13.82	146	County Road V56 (05494450, qw)	68N 11W 17 NE	Rte V56
16.63	134	Van Buren-Davis County line	68N 11W 6 NW	--
17.97	--	County Road V50	68N 12W 2 NE	Wheat Ave
22.12	117	County Road V42	68N 12W 5 NE	Timber Ave
26.35	--	County Road J40 (05494350, qw)	69N 13W 27 E	215th Ave
30.19	--	U.S. Highway 63, Bloomfield	69N 13W 19 NE	--
30.98	87.7	County Road V20, Bloomfield (05494300, cont)	69N 14W 13 SE	Lilac Ave
35.11	75.5	Ice Avenue	69N 14W 9 SW	Ice Ave
39.12	--	Flora Avenue (05494250, qw)	69N 15W 24 NE	Flora Ave
41.62	--	Driftwood Boulevard (05494200, qw)	69N 15W 27 NW	Driftwood Blvd
43.70	--	Cedar Avenue	69N 15W 28 NW	Cedar Ave
52.84	--	Drainage divide	--	--

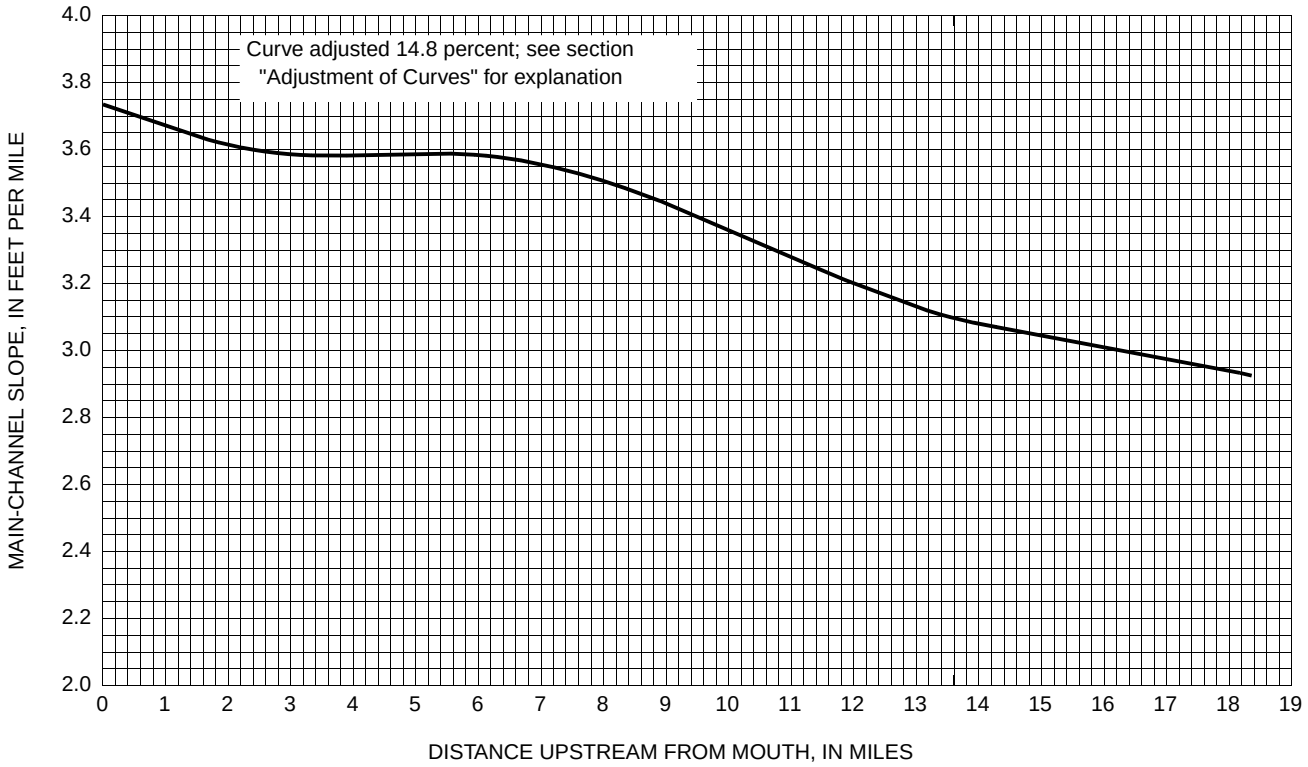
Figure 45. Fox River, beginning at Iowa-Missouri State line in Van Buren County.



List of sites used to quantify main-channel slopes of the Grand River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	206	Iowa-Missouri State line	67N 31W 30 SE	--
0.22	206	County Road (06896150, low)	67N 31W 29 SW	--
3.99	195	County Road J55	67N 31W 15NW	--
6.92	185	County Road	67N 31W 1 NW	--
9.65	--	County Road J43	68N 30W 19 SW	--
12.40	--	State Highway 2	68N 30W 7 NE	--
16.77	90.6	County Road	69N 30 19 NW	--
19.07	--	State Highway 66	69N 30W 6 SE	--
21.19	67.5	County Road J23, Knowlton (06896100, low)	70N 30W 29 SE	--
23.95	43.1	County Road J20	70N 30W 21 N	--
28.69	22.3	Ringgold-Union County line, Shannon City	70N 30W 1 NW	1st St (Old IA 260)
42.48	--	Drainage divide	--	--

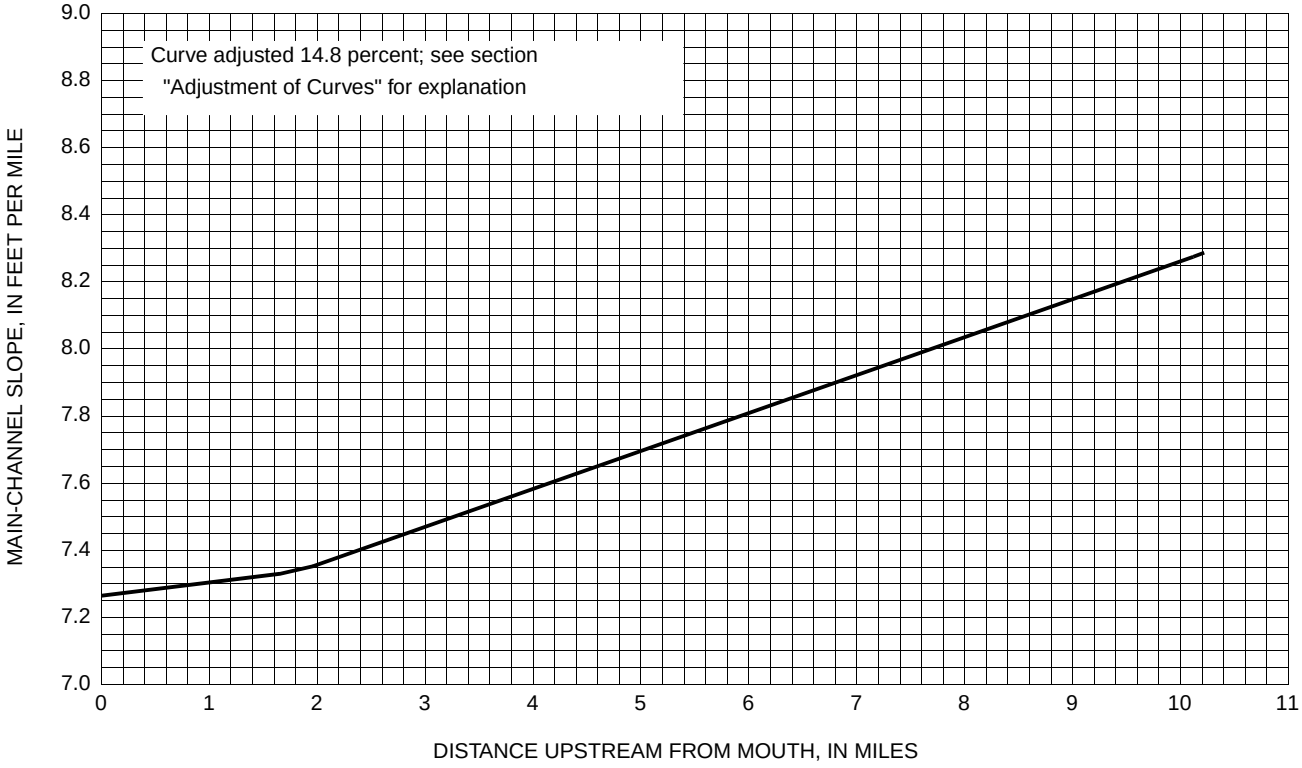
Figure 46. Grand River, beginning at Iowa-Missouri State line in Ringgold County.



List of sites used to quantify main-channel slopes of Hardin Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	168	Mouth of Hardin Creek	83N 30W 23 SW	--
2.64	--	243rd Street	83N 30W 14 SW	243rd St
5.95	161	Parkland Avenue (05483050, low)	83N 30W 10 NW	Parkland Ave
8.20	159	U.S. Highway 30	83N 30W 4 NE	--
12.11	--	State Highway 4	84N 30W 29 SW	--
13.75	--	Hydrologic Regions 1 and 2 boundary	84N 30W 30 NW	--
15.41	107	M Avenue	84N 30W 19 NW	M Ave
18.36	101	180th Street (05482900, csg)	84N 31W 14 NW	180th St
55.57	--	Drainage divide	--	--

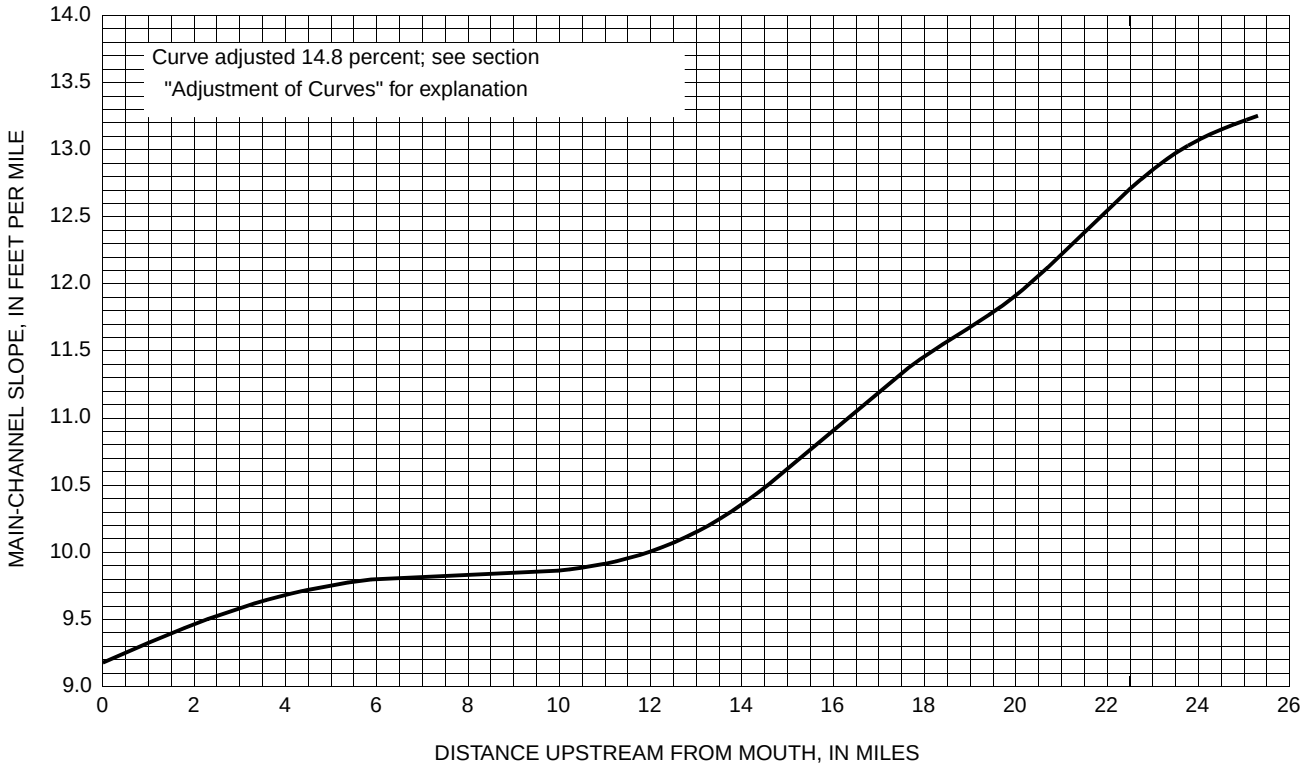
Figure 47. Hardin Creek, beginning at mouth in Greene County.



List of sites used to quantify main-channel slopes of Hartgrave Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	185	Mouth of Hartgrave Creek	92N 18W 34 SE	--
1.11	183	County Road T16 (05458785, --)	92N 18W 33 SE	Douglas Ave
2.97	--	State Highway 3	92N 18W 32 NE	South St
5.52	176	Butler-Franklin County line, Franklin Avenue	92N 18W 30 NW	Franklin Ave
7.71	168	Wren Avenue	92N 19W 26 C	Wren Ave
8.99	--	Hydrologic Regions 1 and 2 boundary	92N 19W 34 NE	--
10.22	161	Vine Avenue (05458780, low)	92N 19W 34 NW	Vine Ave
45.73	--	Drainage divide	--	--

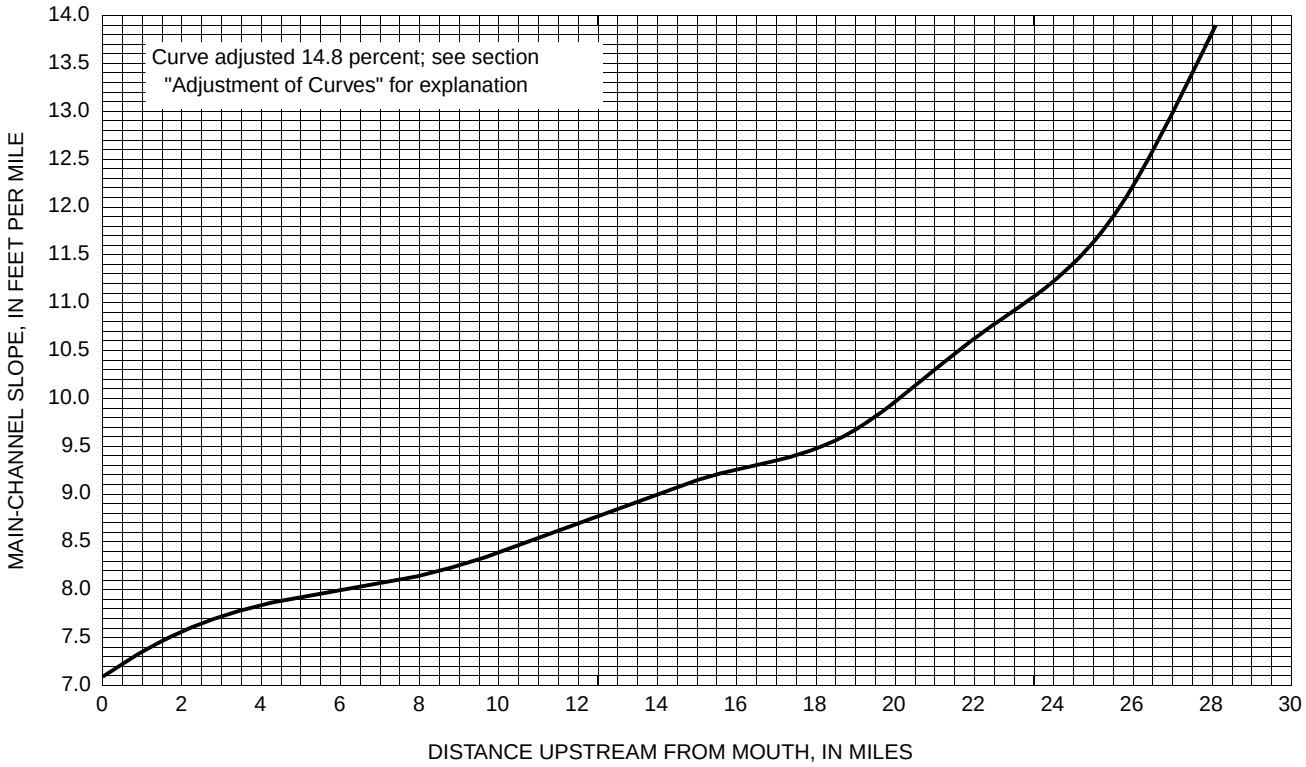
Figure 48. Hartgrave Creek, beginning at mouth in Butler County.



List of sites used to quantify main-channel slopes of Honey Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	110	Mouth of Honey Creek	85N 19W 27 W	--
2.99	95.6	County Road E18 (05451350, low)	85N 19W 16 W	Marble Rd
6.43	--	Marshall-Hardin County line	85N 19W 6 NE	--
10.47	--	County Road D65	86N 20W 24 W	Co Hwy D65
13.60	66.5	County Road S57 (05451300, low)	86N 20W 16 E	Co Hwy S57
15.11	--	Des Moines Lobe landform region boundary	86N 20W 17 SE	--
17.96	57.6	295th Street	86N 20W 7 NE	295th St
19.91	42.6	M Avenue	86N 21W 12 NW	M Ave
23.47	--	U.S. Highway 65, Hubbard	87N 21W 33 SW	--
25.31	20.1	State Highway 175	87N 21W 31 N	--
33.49	--	Hydrologic Regions 1 and 2 boundary	87N 22W 18 SW	--
35.97	--	Drainage divide	--	--

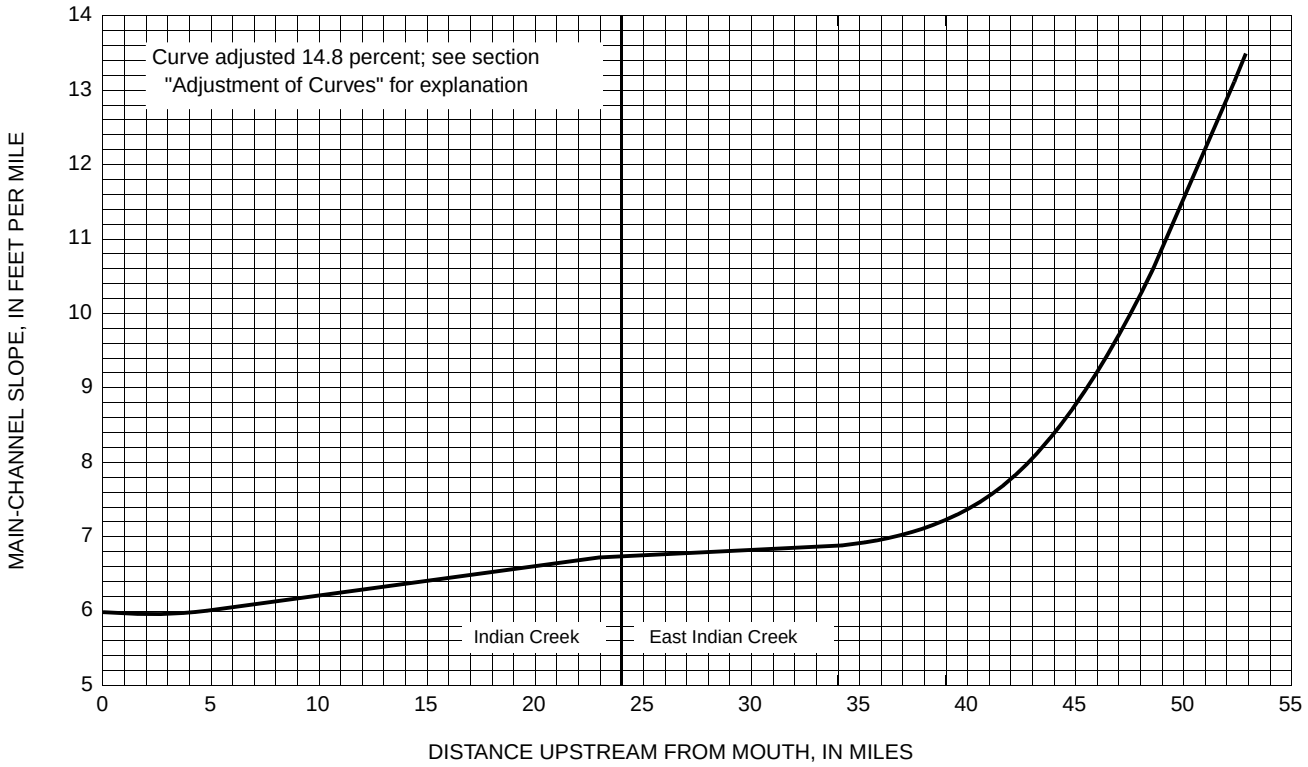
Figure 49. Honey Creek, beginning at mouth in Marshall County.



List of sites used to quantify main-channel slopes of Indian Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	184	Mouth of Indian Creek	75N 37W 17 NE	--
0.80	183	Nishna Valley Road (06809400, low)	75N 37W 8 SW	Nishna Valley Rd
1.62	--	U.S. Highway 6	75N 37W 8 NW	--
3.68	175	Lansing Road	76N 37W 32 NW	Lansing Rd
7.89	--	County Road G30	76N 37W 8 NW	Highland Rd
11.01	--	State Highway 83	77N 37W 29 NW	--
15.05	--	Interstate 80	77N 37W 6 E	--
15.67	117	Cass-Shelby County line	77N 37W 5 NW	--
18.69	67.4	400th Street (06809350, low)	78N 37W 20 N	400th St
22.06	--	County Road F58	78N 37W 5 NW	660th St
25.68	31.4	Shelby-Audubon County line, Yellowwood Road	79N 37W 36 NE	Yellowwood Rd
27.13	--	State Highway 173, Kimballton	79N 36W 30 SE	S Main St
28.09	--	State Highway 44, Kimballton	79N 36W 29 NW	--
38.42	--	Drainage divide	--	--

Figure 50. Indian Creek, beginning at mouth in Cass County.



List of sites used to quantify main-channel slopes of Indian and East Indian Creeks
[See section "Presentation of Curves" for explanation of list elements]

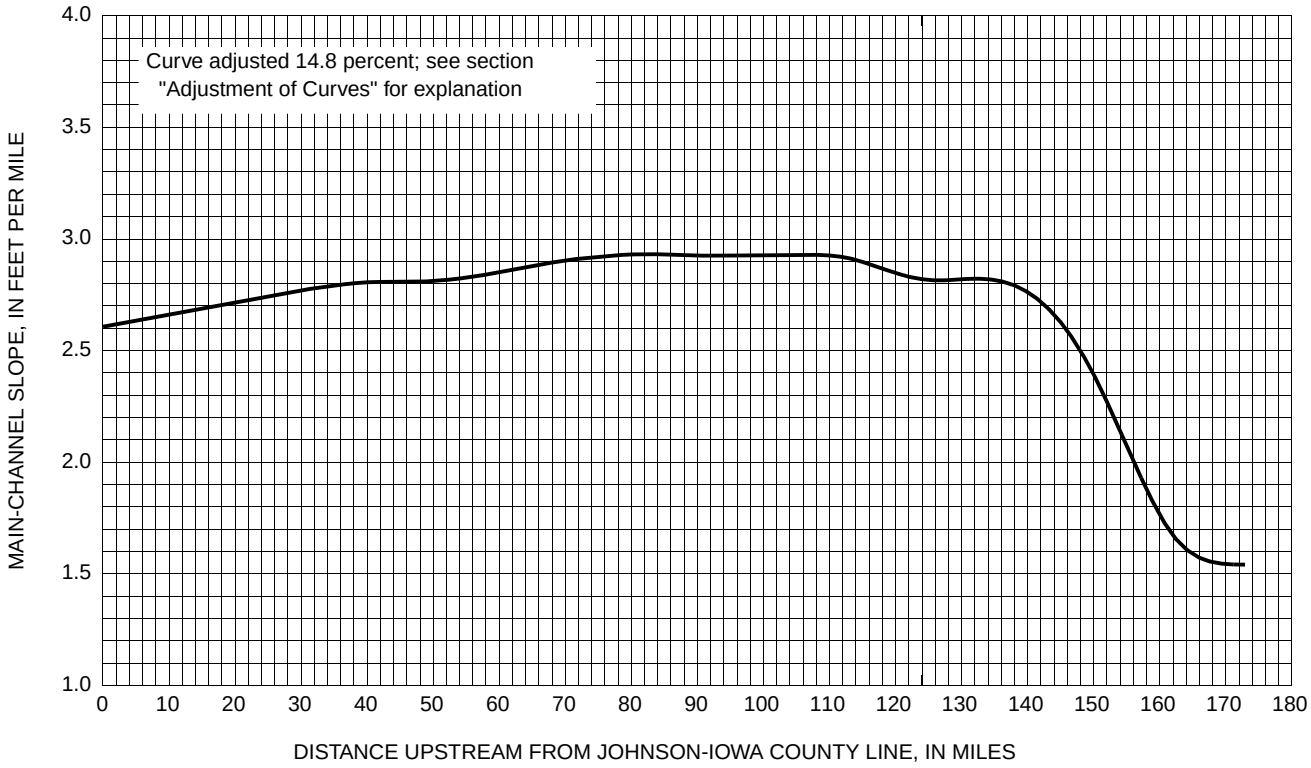
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	413	Mouth of Indian Creek	80N 20W 32 NE	--
0.24	--	Interstate 80	80N 20W 32 NE	--
2.22	410	North 19th Avenue West (05471370, --)	80N 20W 29 SW	N 19th Ave W
4.69	395	North 51st Avenue West	80N 20W 18 NW	N 51st Ave W
8.53	285	County Road F24, Mingo (05471250, --)	80N 21W 3 NE	Hwy F-24 W
8.80	--	Des Moines Lobe landform region boundary	81N 21W 34 SW	--
11.52	276	State Highway 117 (05471200, cont)	81N 21W 28 NW	--
11.67	--	U.S. Highway 65	81N 21W 20 SE	--
14.47	247	Jasper-Polk County line	81N 21W 18 NW	--
18.10	219	Polk-Story County line	82N 22W 34 SE	--
20.55	--	State Highway 210, Maxwell	82N 22W 27 SW	--
23.39	203	County Road E63 (05471180, low)	82N 22W 16 C	305th St
27.30	126	County Road S27 (05471120, qw)	83N 22W 34 SW	650th Ave
30.30	121	260th Street	83N 22W 27 NE	260th St
33.90	--	U.S. Highway 30	83N 22W 14 NE	--

Figure 51. Indian and East Indian Creeks, beginning at mouth of Indian Creek in Jasper County.

List of sites used to quantify main-channel slopes of Indian and East Indian Creeks—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
38.63	65.7	220th Street (05471100, low)	83N 22W 2 NE	220th St
41.74	51.8	200th Street	84N 22W 26 NE	200th St
48.49	37.2	170th Street	84N 22W 11 NE	170th St
52.87	26.3	650th Avenue	85N 22W 27 SW	650th Ave
65.46	--	Drainage divide	--	--

Figure 51. Indian and East Indian Creeks, beginning at mouth of Indian Creek in Jasper County—Continued.



List of sites used to quantify main-channel slopes of the Iowa River
[See section "Presentation of Curves" for explanation of list elements]

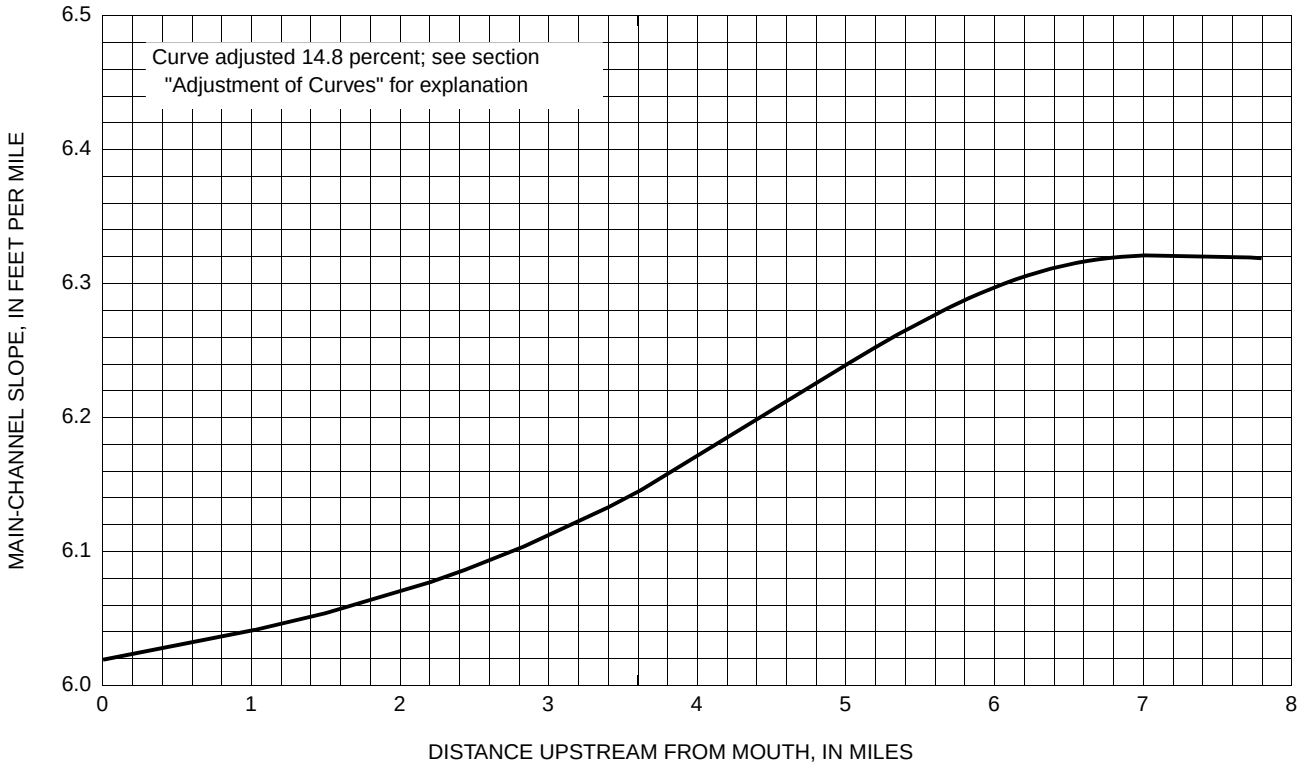
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	2,904	Johnson-Iowa County line	81N 9W 36 NE	--
2.17	2,864	U.S. Highway 151 (05453180, qw)	81N 9W 35 SW	--
12.15	2,842	State Highway 220	81N 10W 36 NW	--
21.83	2,794	County Road V66, Marengo (05453100, cont)	81N 11W 24 NE	M Ave
33.23	--	F Avenue	81N 12W 12 NW	F Ave
41.38	2,455	State Highway 21 (05452500, cont)	81N 12W 5 NW	--
42.00	--	Iowa-Benton County line	81N 12W 6 N	--
42.67	--	Benton-Tama County line	82N 13W 36 SE	--
46.32	--	380th Street	82N 13W 26 NW	380th St
50.82	2,076	County Road V18, Chelsea	82N 13W 19 NE	Hwy V18
56.32	--	360th Street	82N 14W 13 NW	360th St
61.11	2,009	P Avenue (05451820, qw)	82N 14W 4 SE	P Ave
69.99	1,987	U.S. Highway 63, Tama (05451810, qw)	83N 15W 34 SE	State St
75.01	1,882	County Road E49	83N 15W 31 NE	Hwy E49
81.66	--	County Road T47, Montour	83N 16W 22 SW	E Ave

Figure 52. Iowa River, beginning at Johnson-Iowa County line.

List of sites used to quantify main-channel slopes of the Iowa River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
83.22	1,830	U.S. Highway 30	83N 16W 16 NE	--
88.44	1,800	Tama-Marshall Co. line, Abbott Ave.	83N 16W 6 NW	Abbott Ave
91.50	--	Three Bridge Road	83N 17W 3 SE	Three Bridge Rd
95.58	1,635	County Road E35	84N 17W 29 SE	Main St Rd
100.36	1,532	State Highway 14, Marshalltown (05451500, cont)	84N 18W 23 SE	N 3rd Ave
101.09	1,500	Center Street, Marshalltown (05451490, qw)	84N 18W 26 NW	Airport Rd
107.27	1,466	State Highway 330 (05451460, qw)	84N 19W 13 NE	--
111.79	1,288	County Road E23	85N 19W 27 SW	148th St
115.22	1,170	County Road E18 (05451285, qw)	85N 19W 11 NW	Marble Rd
116.74	1,139	Marshall-Hardin County line	85N 19W 2 NW	--
121.29	1,122	County Road D65	86N 19W 22 SE	Co Hwy D65
125.09	1,090	County Road D55 (05451275, qw)	86N 19W 4 SW	290th St
127.57	779	County Road D53	87N 19W 28 SW	270th St
131.77	765	State Highway 175, Eldora	87N 19W 8 NE	Eddington Ave
137.63	--	County Road D35, Steamboat Rock (05450400, qw)	88N 19W 28 NW	Main St
140.48	--	Des Moines Lobe landform region boundary	88N 19W 16 NE	--
144.44	722	County Road D25	88N 20W 12 SE	170th St
149.98	714	RR Avenue	89N 19W 31 NE	RR Ave
155.48	702	OO Avenue	89N 20W 34 NE	OO Ave
161.98	--	U.S. Highways 20 and 65, Iowa Falls	89N 21W 13 SE	Oak St
162.44	665	Washington Avenue, Iowa Falls (05450000, cont)	89N 21W 13 SE	Washington Ave
164.94	646	State Highway 941	89N 21W 15 SE	--
167.64	638	State Highway 941	89N 21W 17 SE	--
172.90	614	Hardin-Franklin County line	89N 22W 1 NW	--
175.66	--	Hydrologic Regions 1 and 2 boundary	90N 22W 35 SE	--
253.53	--	Drainage divide	--	--

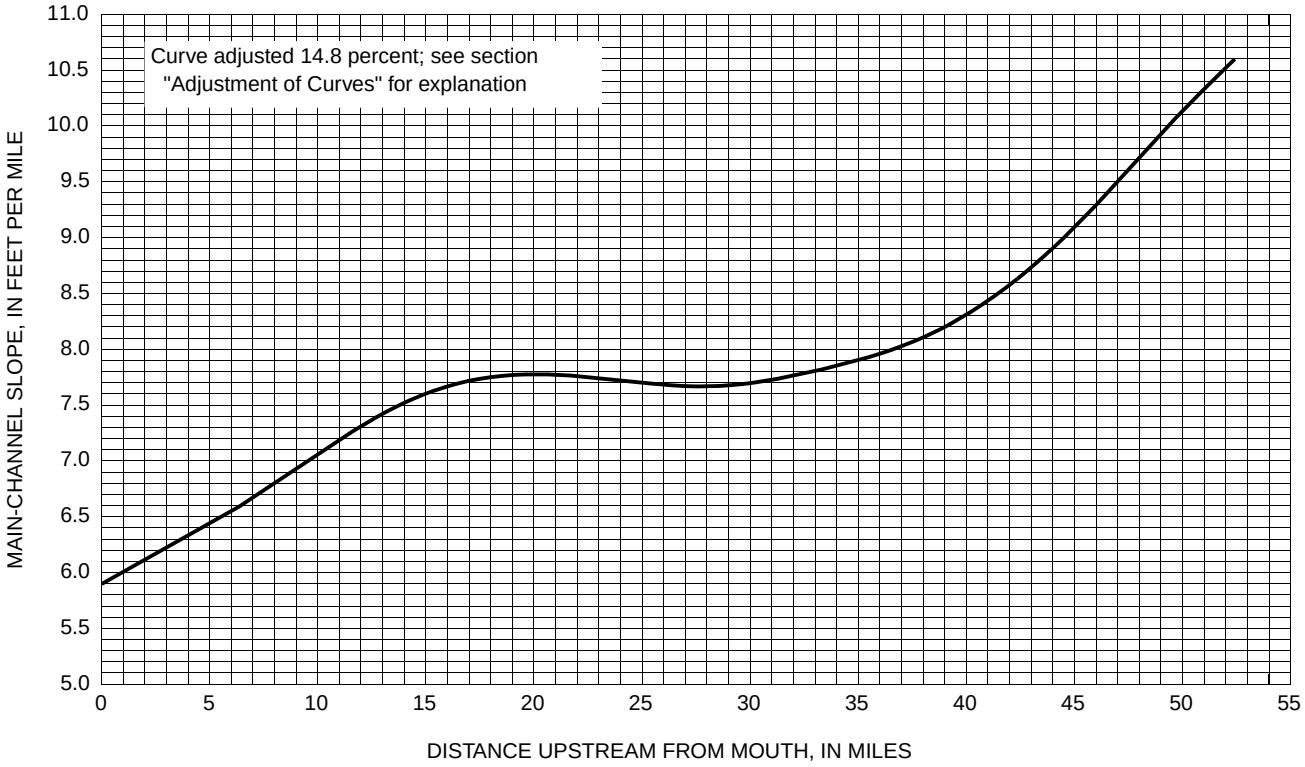
Figure 52. Iowa River, beginning at Johnson-Iowa County line.



List of sites used to quantify main-channel slopes of Kanaranzi Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	205	Mouth of Kanaranzi Creek	100N 45W 28 SW	--
1.88	203	County Road K52 (06483260, low)	100N 45W 22 SW	Harrison St
3.80	--	County Road A16	100N 45W 15 SE	120th St
6.46	197	Southwest corner of section 11	100N 45W 11 SW	--
7.80	--	Iowa-Minnesota State line, 100th St	100N 45W 11 NE	100th St
66.07	--	Drainage divide	--	--

Figure 53. Kanaranzi Creek, beginning at mouth in Lyon County.



List of sites used to quantify main-channel slopes of Keg Creek
[See section "Presentation of Curves" for explanation of list elements]

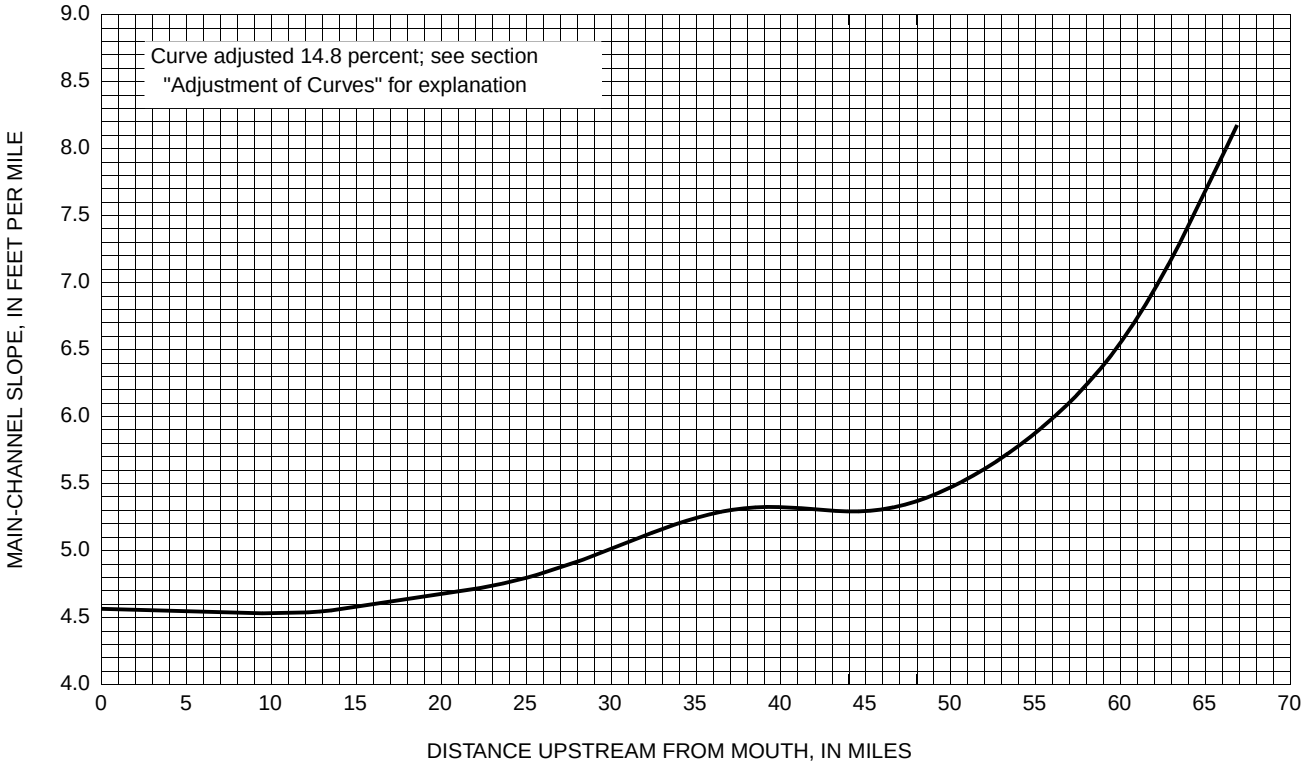
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	--	Mouth of Keg Creek	71N 43W 6 SE	--
1.82	--	Interstate 29	72N 43W 33 W	--
4.33	190	Kane Avenue (06805900, low)	72N 43W 27 NE	Kane Ave
5.87	--	U.S. Highway 34, Glenwood	72N 43W 14 SE	--
9.32	163	County Road H20	72N 42W 6 NE	Gaston Ave
13.47	149	County Road L45	73N 42W 17 NW	250th St
15.68	137	Mills-Pottawattamie County line, Applewood Avenue	73N 42W 5 NE	Applewood Ave
17.75	131	Pioneer Trail (06805800, low)	74N 42W 28 NW	Pioneer Trail
20.83	--	State Highway 92	74N 42W 9 NE	--
24.89	--	U.S. Highway 6	75N 42W 22 NW	--
27.78	91.4	Honeysuckle Road	75N 42W 11 NE	Honeysuckle Rd
33.72	81.0	County Road G30	76N 41W 19 NE	Magnolia Rd
38.24	70.5	Rosewood Road	76N 41W 4 NW	Rosewood Rd
42.78	59.6	County Road L66, Minden (06805700, low)	77N 41W 15 SE	County Rd
43.50	--	State Highway 83	77N 41W 14 NW	--

Figure 54. Keg Creek, beginning at mouth in Mills County.

List of sites used to quantify main-channel slopes of Keg Creek—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
45.55	--	Interstate 80	77N 41W 2 NW	--
46.10	50.4	Pottawattamie-Harrison County line, York Road	77N 41W 2 N	York Rd
49.57	--	315th Street	78N 41W 23 N	315th St
52.42	29.4	Harrison-Shelby County line, Dogwood Road	78N 41W 1 SE	Dogwood Ave
64.80	--	Drainage divide	--	--

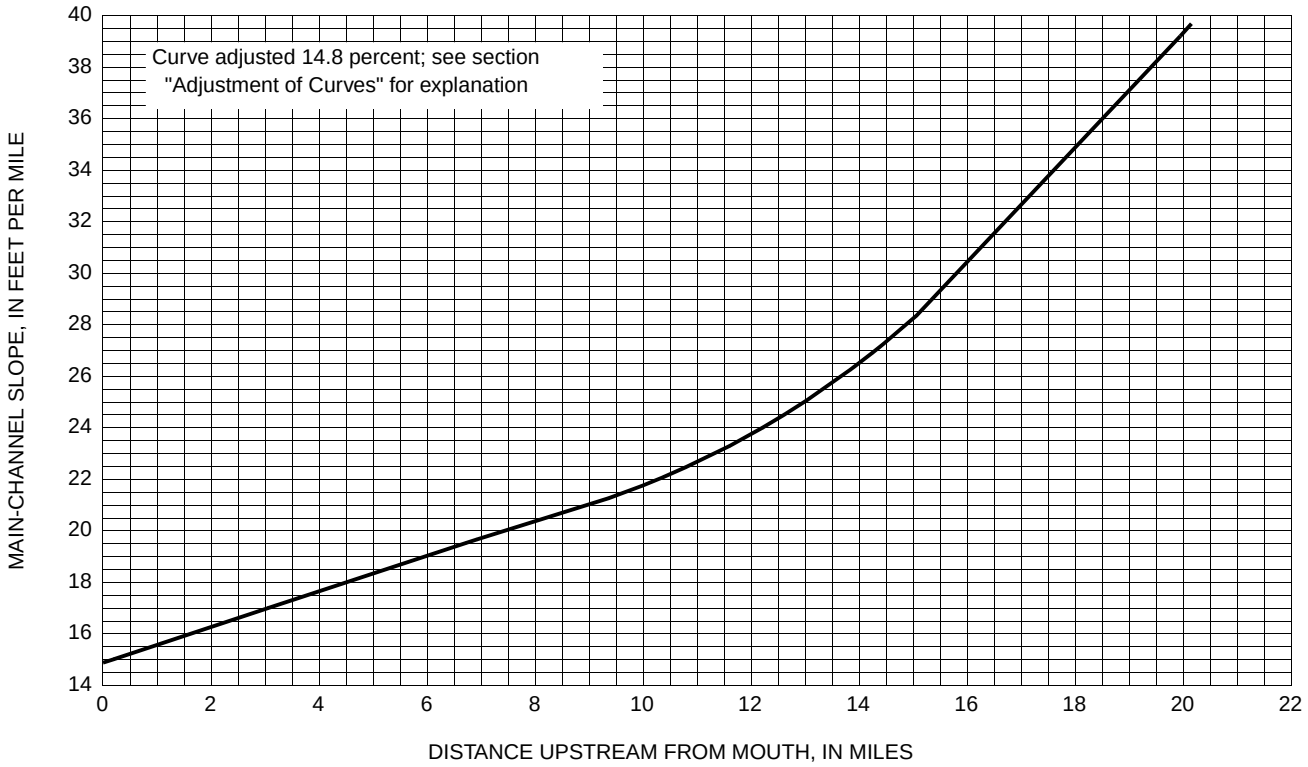
Figure 54. Keg Creek, beginning at mouth in Mills County—Continued.



List of sites used to quantify main-channel slopes of the Little Cedar River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	323	Mouth of Little Cedar River	94N 14W 20 NW	--
1.24	--	State Highway 346	94N 14W 17 E	--
4.20	--	250th Street	94N 14W 4 NW	250th St
7.61	306	County Road B57 (05458000, cont)	95N 14W 21 NE	220th St
12.89	280	U.S. Highway 18 (05457990, --)	95N 14W 6 SW	200th St
13.21	279	Chickasaw-Floyd County line	95N 14W 6 SW	--
17.89	270	170th Street	96N 15W 23 SW	170th St
23.58	--	140th Street	96N 15W 8 N	140th St
29.18	234	110th Street (05457950, qw)	97N 16W 24 SW	110th St
30.61	227	Floyd-Mitchell County line	97N 16W 24 N	--
36.65	200	County Road A57	97N 15W 5 NW	340th St
39.61	193	State Highway 9 (05457900, --)	98N 15W 19 SE	--
45.34	126	County Road T54	98N 16W 1 NE	Shadow Ave
51.10	100	County Road A31, Little Cedar (05457850, --)	99N 16W 15 SE	430th St
55.43	--	450th Street	99N 16W 8 N	450th St
60.98	77.3	County Road A19 (05457800, low)	100N 16W 19 NE	490th St
66.86	50.6	Iowa-Minnesota State line	100N 16W 9 NW	State Line St
87.33	--	Drainage divide	--	--

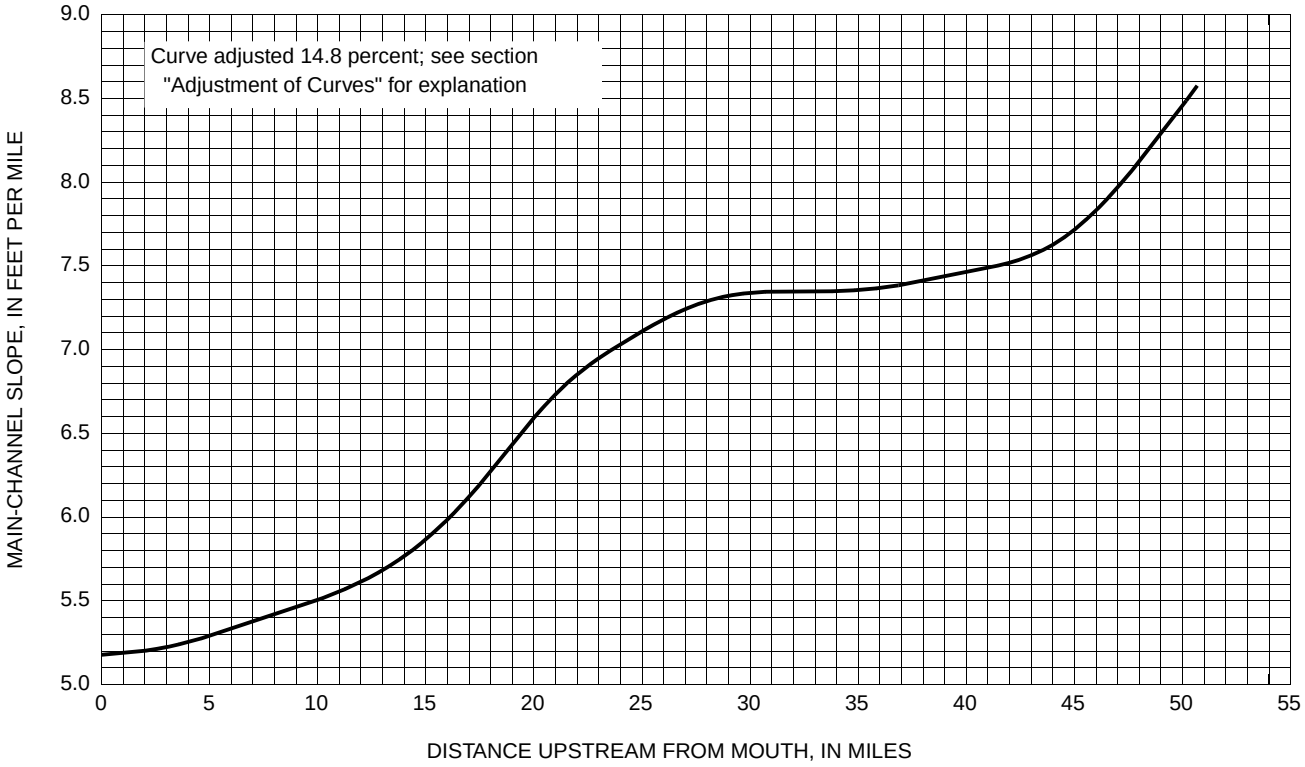
Figure 55. Little Cedar River, beginning at mouth in Chickasaw County.



List of sites used to quantify main-channel slopes of the Little Maquoketa River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	157	Mouth of Little Maquoketa River	90N 2E 25 SW	--
4.13	139	U.S. Highway 52	90N 2E 34 SW	--
6.84	130	Clay Hill Road (05414500, cont)	89N 2E 5 NE	Clay Hill Rd
9.84	--	County Road Y21	89N 2E 6 SW	Cedar Ridge Rd
15.39	--	Asbury Road	89N 1E 16 SE	Asbury Rd
17.92	39.6	Potter Hill Drive (05414350, csg)	89N 1E 20 SE	Potter Hill Dr
20.14	--	Lattnerville Lane	89N 1E 31 NE	Lattnerville Ln
30.22	--	Drainage divide	--	--

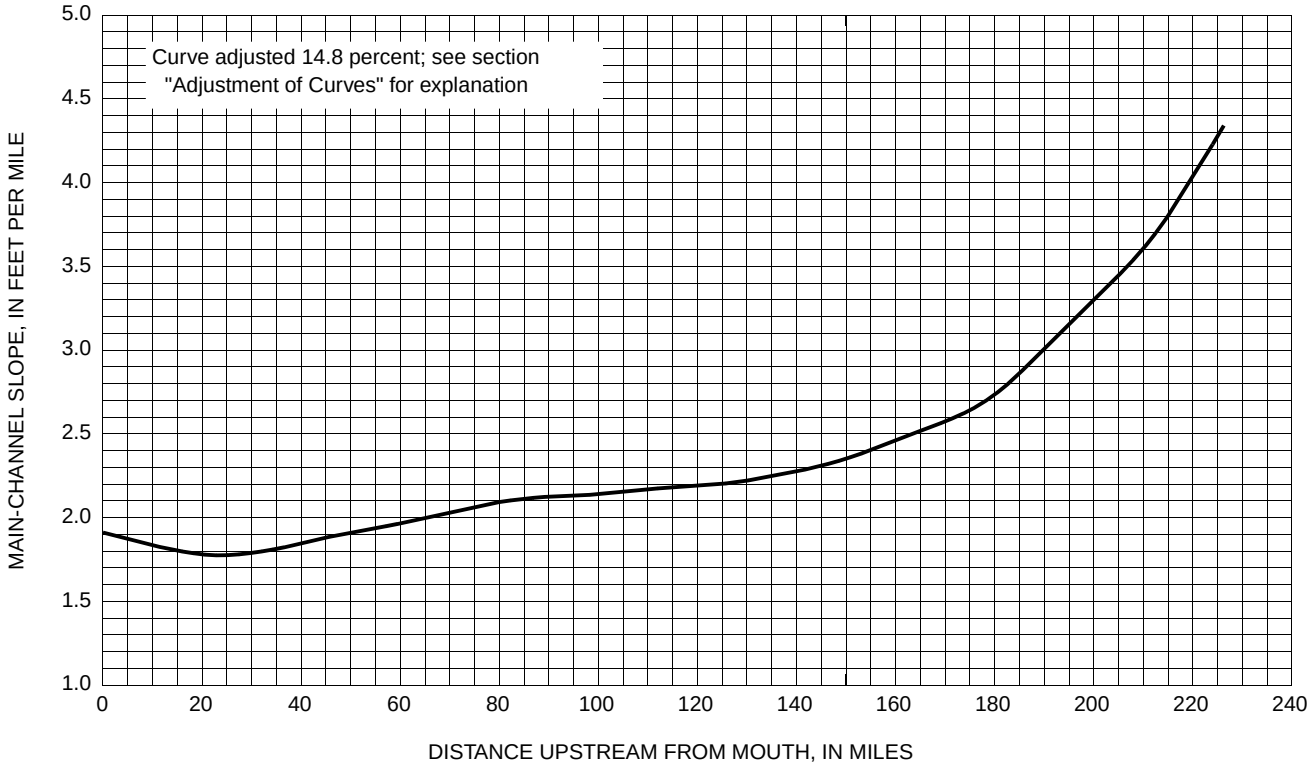
Figure 56. Little Maquoketa River, beginning at mouth in Dubuque County.



List of sites used to quantify main-channel slopes of the Little Rock River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	474	Mouth of Little Rock River	98N 46W 35 SW	--
0.76	474	County Road K42 (06483490, low)	98N 46W 36 W	Garfield St
2.91	471	County Road A52 (06483487, --)	98N 45W 31 NE	260th St
5.07	--	U.S. Highway 75	98N 45W 29 NE	--
9.65	--	County Road K52	98N 45W 15 SE	Hickory St
13.69	--	County Road K60	98N 45W 12 NE	Indian St
17.21	416	County Road K64 (06483485, --)	98N 44W 17 SE	Jackson St
21.07	199	230th Street (06483400, low)	98N 44W 15 NE	230th St
24.08	195	County Road L14, George (06483390, --)	98N 44W 2 SE	Virginia St
28.33	181	County Road A34	98N 43W 5 NE	210th St
33.48	--	County Road A22	99N 43W 20 NE	180th St
36.81	--	160th Street	99N 43W 9 NW	160th St
39.86	134	State Highway 9 (06483380, low)	99N 43W 3 NE	--
44.44	125	Lyon-Osceola County line, McKinley Street	100N 43W 25 NE	McKinley St
47.30	--	120th Street	100N 42W 19 NE	120th St
50.68	92.0	Iowa-Minnesota State line, County Road (06483360, low)	100N 42W 7 NW	--
77.57	--	Drainage divide	--	--

Figure 57. Little Rock River, beginning at mouth in Lyon County.



List of sites used to quantify main-channel slopes of the Little Sioux River
[See section "Presentation of Curves" for explanation of list elements]

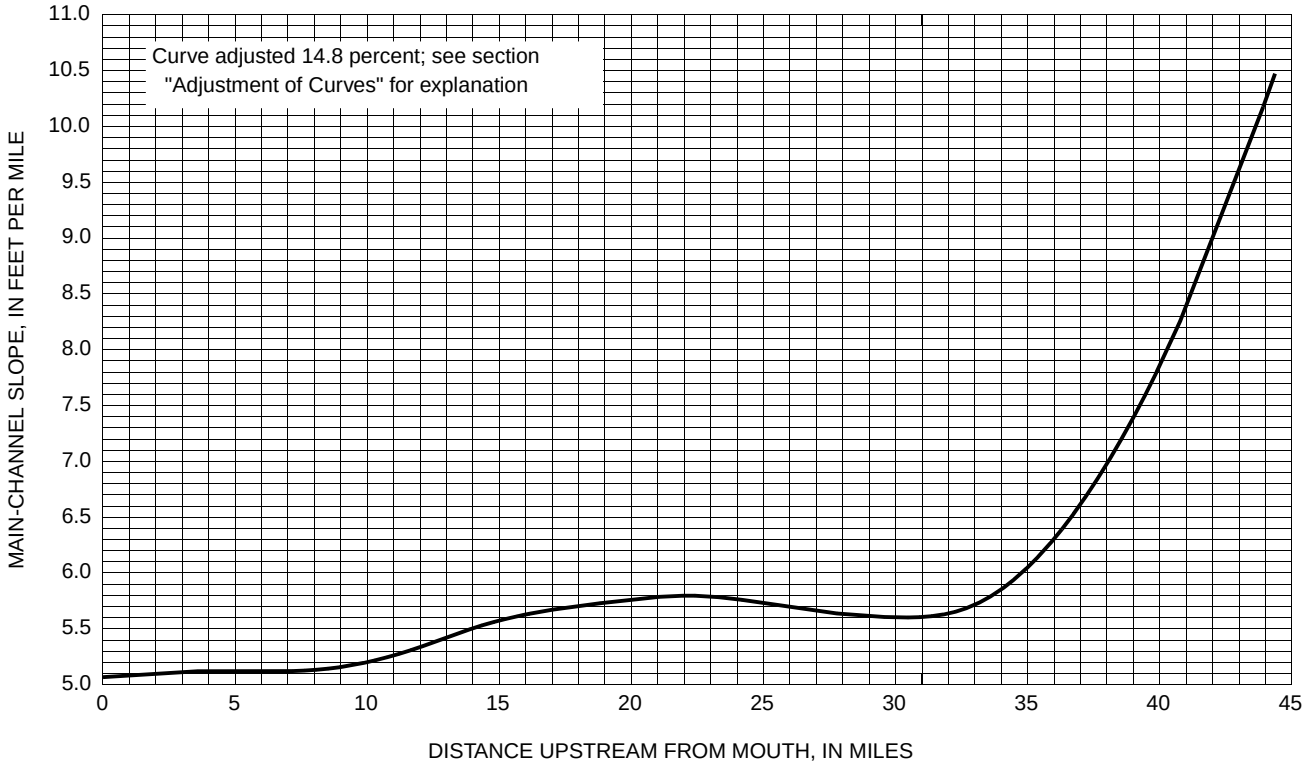
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	--	Mouth of Little Sioux River	81N 45W 27 NE	--
0.47	--	Interstate 29	81N 45W 23 SW	--
1.11	3,600	County Road K45, River Sioux (06607513, qw)	81N 45W 23 SE	Austin Ave
5.89	--	Harrison-Monona County line	81N 44W 5 NW	--
8.83	--	County Road E60 (06607510, cont)	82N 44W 21 NW	Co Rd E60
13.41	3,526	County Road E54 (06607500, cont)	83N 44W 33 NE	270th St
17.24	--	State Highway 175	83N 44W 9 NW	--
21.66	--	Equalizer ditch, joins Little Sioux River and Monona-Harrison ditch	84N 44W 19 NW	--
21.86	2,738	Larpenteur Memorial Road (06606700, cont)	84N 44W 18 SW	Larpenteur Memorial Rd
23.69	--	Nutmeg Avenue	84N 44W 7 NE	Nutmeg Ave
28.47	--	County Road E16	85N 44W 16 SE	Co Rd E16
32.12	2,697	Monona-Woodbury County line	85N 44W 2 NE	--
33.22	2,686	State Highway 141, Smithland	86N 44W 36 NW	--
38.03	2,663	County Road D54, Oto	86N 43W 7 NE	290th St

Figure 58. Little Sioux River, beginning at mouth in Harrison County.

List of sites used to quantify main-channel slopes of the Little Sioux River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
43.72	2,624	County road	87N 43W 8 SW	--
46.93	--	County Road D38, Anthon	88N 43W 33 SW	220th St
52.06	2,554	Mason Avenue	88N 43W 21 NE	Mason Ave
58.80	2,500	State Highway 31, Correctionville (06606600, cont)	88N 43W 1 NW	--
59.84	--	U.S. Highway 20, Correctionville	89N 42W 34 SW	--
67.31	2,416	Woodbury-Ida County line	89N 42W 12 SE	--
69.97	2,385	Ida-Cherokee County line	89N 41W 6 N	--
72.14	2,383	County Road C66, Washta	90N 41W 31 NE	Main St
82.69	--	County Road L51, Quimby	90N 41W 1 SW	L Ave
86.32	2,269	County road	91N 40W 32 NW	--
89.81	2,205	County Road C44	91N 40W 28 NE	580th St
96.94	--	U.S. Highway 59, Cherokee	92N 40W 34 NE	S 2nd St
97.95	2,173	State Highway 977, Cherokee (06606400, low)	92N 40W 35 N	--
98.84	--	State Highway 3, Cherokee	92N 40W 26 NE	--
105.80	1,861	480th Street	92N 40W 1 NE	480th St
111.09	1,842	County Road C16	93N 39W 21 NW	450th St
117.42	1,813	Cherokee-Obrien County line	93N 39W 3 NE	--
119.77	--	State Highway 10	94N 39W 27 SE	--
120.89	1,803	Abandoned bridge, Yellow Avenue (06606100, low)	94N 39W 26 NW	--
123.61	1,644	Obrien-Clay County line	94N 39W 25 NE	--
126.79	1,640	State Highway 10, Peterson	94N 38W 32 NE	--
131.77	1,629	Clay-Buena Vista County line	94N 38W 35 SW	--
139.38	1,548	County Road M36, Linn Grove (06605850, cont)	93N 37W 5 SW	80th Ave
148.43	1,519	U.S. Highway 71, Sioux Rapids	93N 37W 1 SE	--
152.45	1,507	Buena Vista-Clay County line	93N 36W 5 NE	--
159.11	1,494	County Road B63	94N 36W 20 NW	480th St
164.22	1,366	County Road M50	95N 36W 35 SW	260th Ave
167.38	1,334	County Road B53, Gillett Grove (06605600, cont)	95N 36W 25 C	435th St
175.24	1,312	County Road B40	95N 36W 2 NW	390th St
180.27	--	U.S. Highway 18	96N 36W 22 N	--
185.26	990	U.S. Highways 71 and 18, Spencer (06605100, cont)	96N 36W 18 NW	N Grand Ave
191.71	546	210th Avenue	96N 37W 1 W	210th Ave
197.59	541	U.S. Highway 18	97N 37W 34 NE	--
202.03	--	300th Street	97N 37W 20 N	300th St
207.41	513	Clay-Dickinson County line	97N 37W 5 NW	--
211.23	502	County Road A43	98N 37W 34 N	260th St
216.85	333	225th Street (06603900, low)	98N 37W 11 C	225th St
220.69	--	190th Avenue	98N 37W 15 SW	190th Ave
224.29	--	Hydrologic Regions 1 and 2, and Des Moines Lobe landform region boundaries	98N 37W 3 N	--
226.26	310	210th Street	98N 37W 4 NW	210th St
268.49	--	Drainage divide	--	--

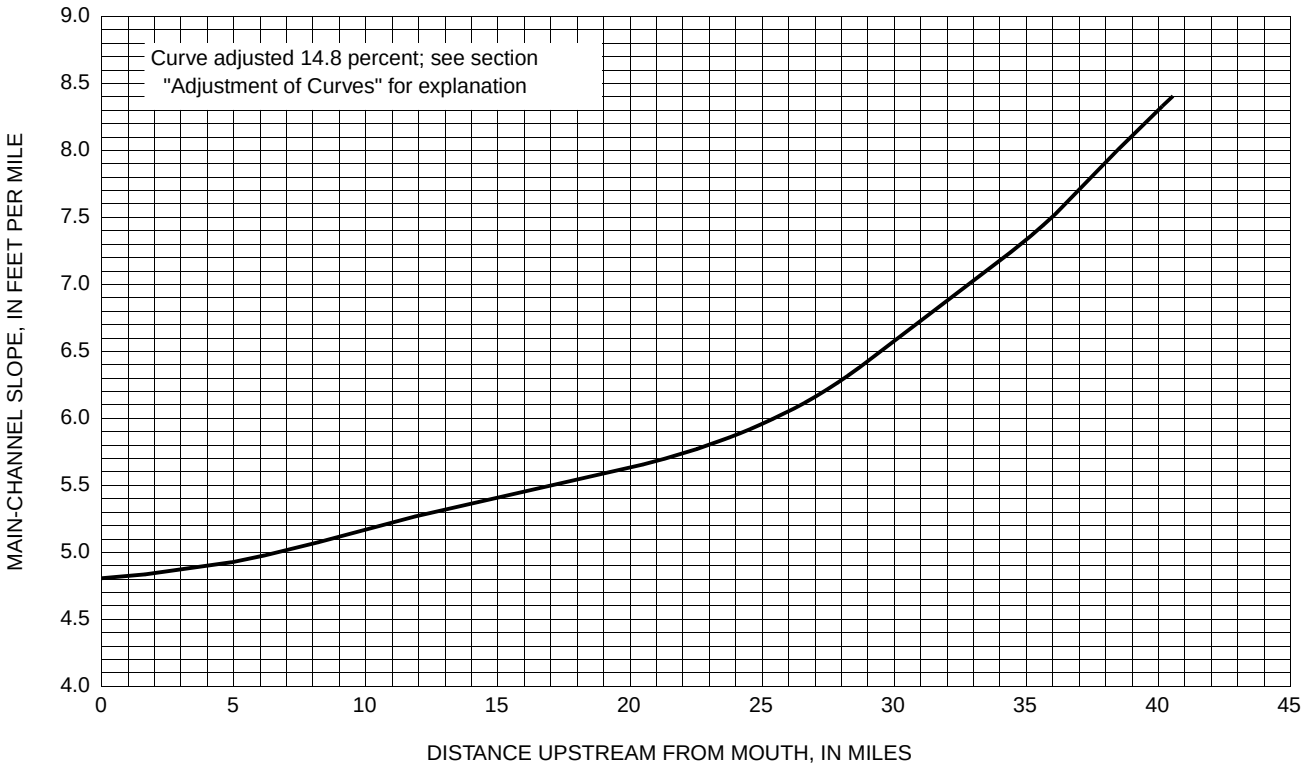
Figure 58. Little Sioux River, beginning at mouth in Harrison County—Continued.



List of sites used to quantify main-channel slopes of the Little Turkey River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	355	Mouth of Little Turkey River	95N 8W 18 NW	--
4.34	--	County Road B44	95N 9W 26 SE	Nature Rd
8.27	335	275th Street	95N 9W 34 NW	275th St
11.78	319	Sunset Road (05411800, low)	95N 9W 30 SW	Sunset Rd
14.16	102	Spruce Road (05411620, low)	95N 10W 25 NW	Spruce Rd
19.42	--	State Highway 193, Waucoma	95N 10W 9 SW	Riverview Dr
22.31	80.7	Fayette-Winneshiek County line	95N 10W 5 NW	--
24.42	--	State Highway 24	96N 10W 30 SE	--
25.91	72.4	Winneshiek-Chickasaw County line	96N 10W 30 NW	--
30.04	--	County Road B33	96N 11W 14 S	160th St
32.90	54.7	County Road V56	96N 11W 10 NW	Union Rd
37.64	37.9	County Road B22	97N 11W 32 NE	120th St
41.96	30.5	Chickasaw-Howard County line, County Road B16	97N 11W 19 NW	100th St
44.36	23.8	200th Street	97N 12W 13 NE	200th St
53.25	--	Drainage divide	--	--

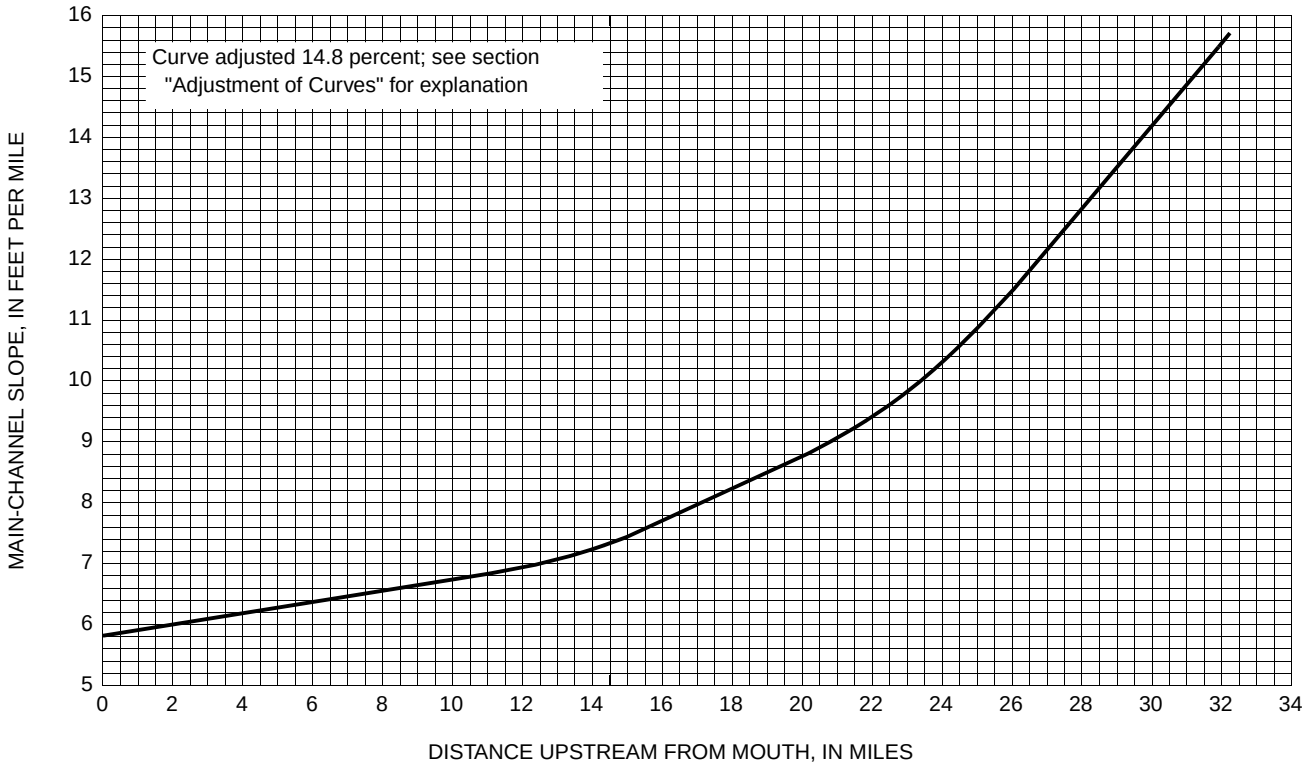
Figure 59. Little Turkey River, beginning at mouth in Fayette County.



List of sites used to quantify main-channel slopes of the Little Wapsipinicon River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	206	Mouth of Little Wapsipinicon River, Littleton	89N 10W 9 NE	--
0.61	147	Clayton Boulevard (05420900, low)	89N 10W 4 SE	Clayton Blvd
4.55	144	145th Street (05420860, low)	90N 10W 28 C	145th St
11.22	--	State Highway 281, Fairbank	90N 10W 5 NW	Main St
11.47	125	Buchanan-Fayette County line	90N 10W 5 NW	--
16.14	99.2	40th Street	91N 10W 21 NW	40th St
19.19	94.1	State Highway 3 (05420850, csg)	91N 10W 9 NW	--
25.96	--	County Road C33	92N 10W 19 N	100th St
27.71	57.4	Fayette-Bremer County line, County Road V62 (05420840, low)	92N 10W 18 NW	Y Ave
31.85	49.9	160th Street	92N 11W 2 NE	160th St
35.99	41.4	Bremer-Fayette County line	93N 11W 25 NE	--
38.74	--	State Highway 93	93N 10W 30 NE	150th St
40.55	26.0	Fayette-Bremer County line, 160th Street	93N 10W 19 NE	160th St
54.81	--	Drainage divide	--	--

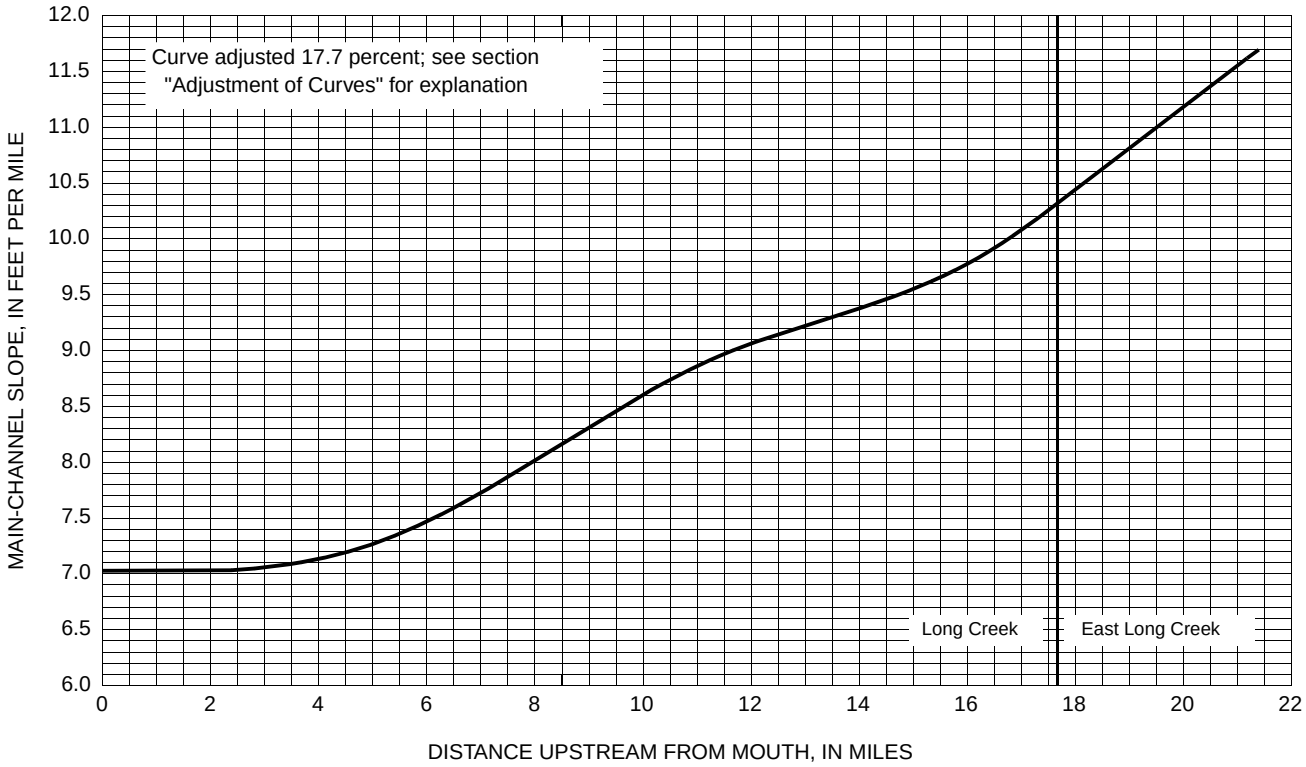
Figure 60. Little Wapsipinicon River, beginning at mouth in Buchanan County.



List of sites used to quantify main-channel slopes of the Little Wapsipinicon River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	125	Mouth of Little Wapsipinicon River	94N 13W 3 NW	--
5.07	--	County Road B57	95N 13W 16 SE	220th St
7.71	95.0	U.S. Highway 18 (05420650, csg)	95N 13W 9 NW	--
13.51	79.0	165th Street, North Washington	96N 13W 20 W	165th St
18.69	50.9	130th Street	96N 14W 1 NE	130th St
23.43	45.7	Chickasaw-Howard County line, 100th Street	97N 14W 24 NW	100th St
26.27	37.3	County Road B17, Elma (05420640, csg)	97N 14W 12 NW	190th St
32.23	19.0	County Road A46	98N 14W 22NE	150th St
42.04	--	Drainage divide	--	--

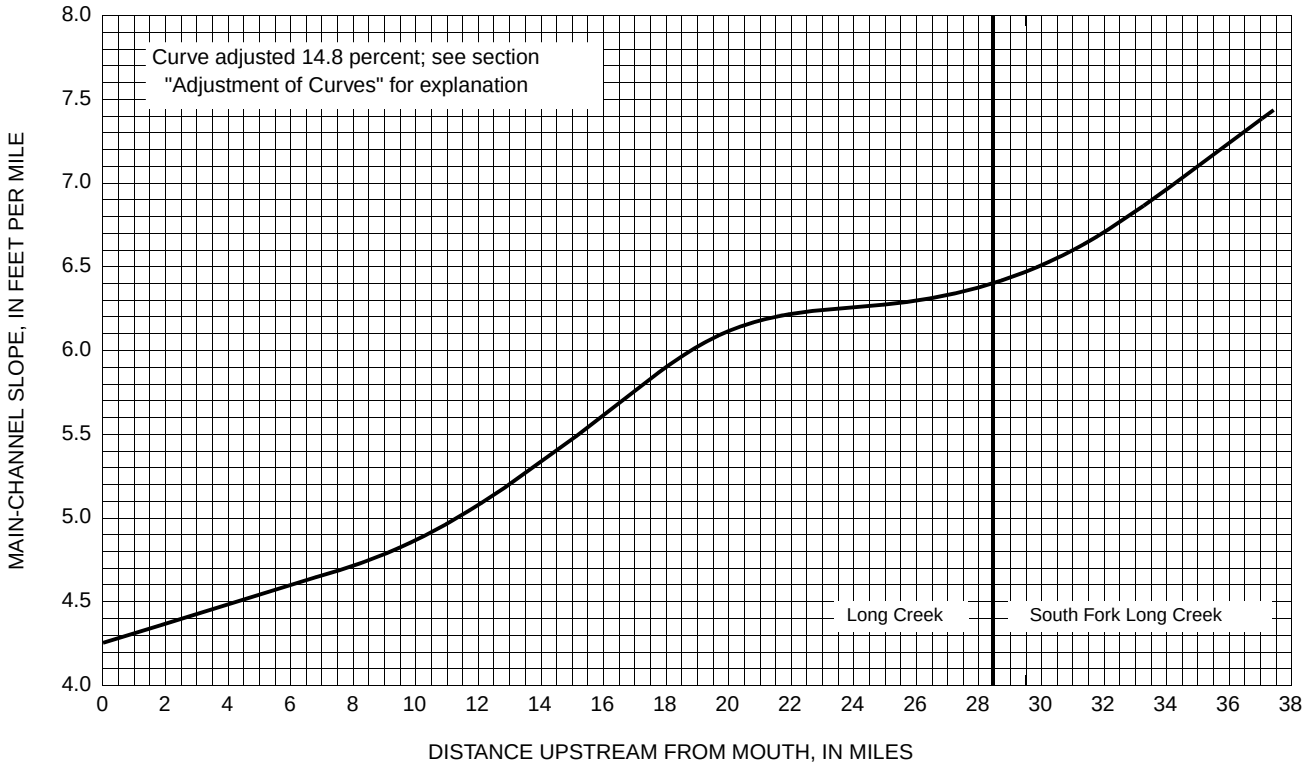
Figure 61. Little Wapsipinicon River, beginning at mouth in Chickasaw County.



List of sites used to quantify main-channel slopes of Long and East Long Creeks
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	124	Mouth of Long Creek	69N 26W 8 SW	--
5.14	117	County Roads J20 and R34 (06897940, low)	70N 26W 32 NE	--
11.29	--	County road	70N 26W 16 NW	--
16.26	51.2	Decatur-Clarke County line	70N 26W 6 NW	--
19.04	--	Church Street	71N 27W 26 NE	Church St
21.39	21.0	County Road H45	71N 27W 14 N	Elk St
33.11	--	Drainage divide	--	--

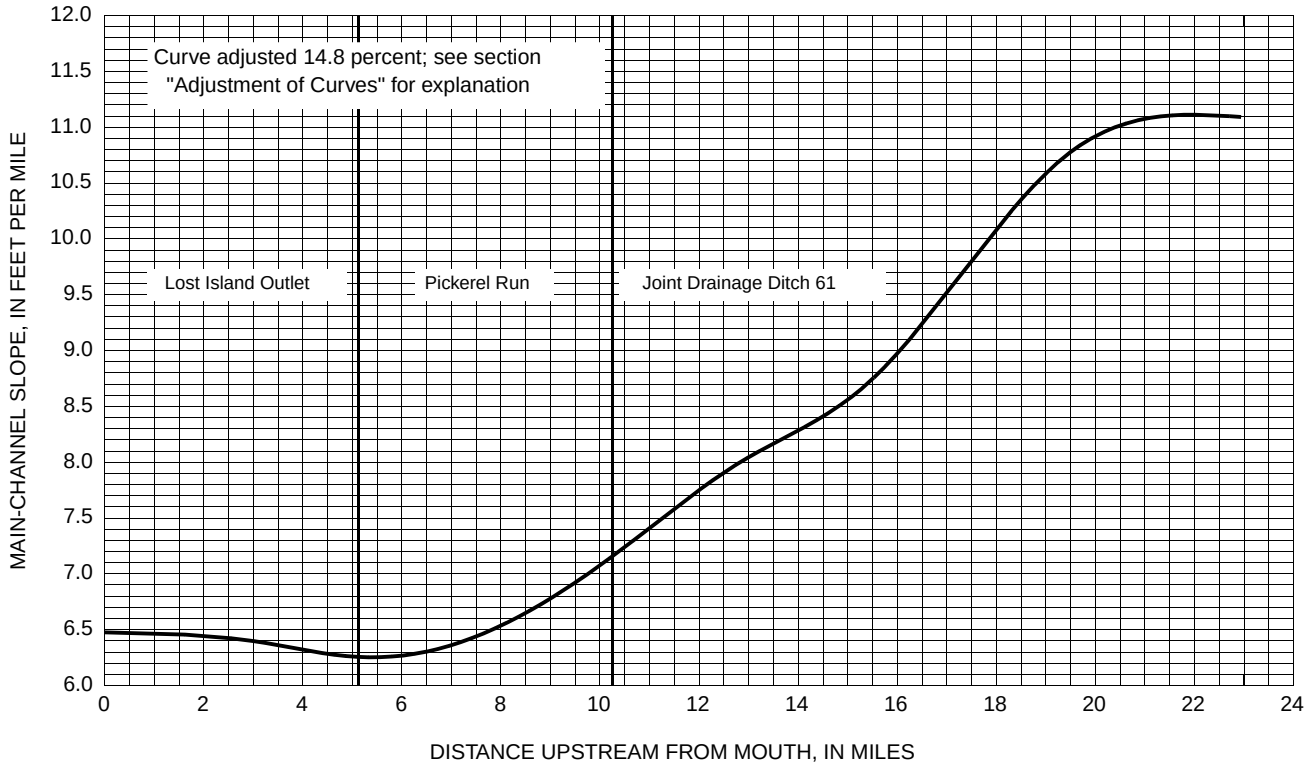
Figure 62. Long and East Long Creeks, beginning at mouth of Long Creek in Decatur County.



List of sites used to quantify main-channel slopes of Long and South Fork Long Creeks
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	--	Mouth of Long Creek	74N 4W 1 C	--
1.58	155	115th Street (05465310, qw)	74N 4W 11 E	115th St
4.95	146	County Road X37 (05465300, low)	74N 4W 23 S	County Rd X 37
9.04	--	Q Avenue	74N 4W 16 SW	Q Ave
16.31	90.7	County Road X17	74N 5W 12 NW	County Rd X 17
19.43	82.2	County Road G52	74N 5W 3 NW	County Rd G 52
25.37	71.9	Louisa-Washington County line	75N 5W 30 SW	--
28.21	68.4	Yucca Avenue (05465200, low)	75N 6W 26 SE	Yucca Ave
31.06	31.3	U.S. Highway 218 (05465180, --)	75N 6W 27 SW	--
35.56	--	County Road G6W	75N 6W 19 SW	Spruce Ave
37.42	16.4	State Highway 92 (05465175, --)	75N 7W 23 NE	--
50.35	--	Drainage divide	--	--

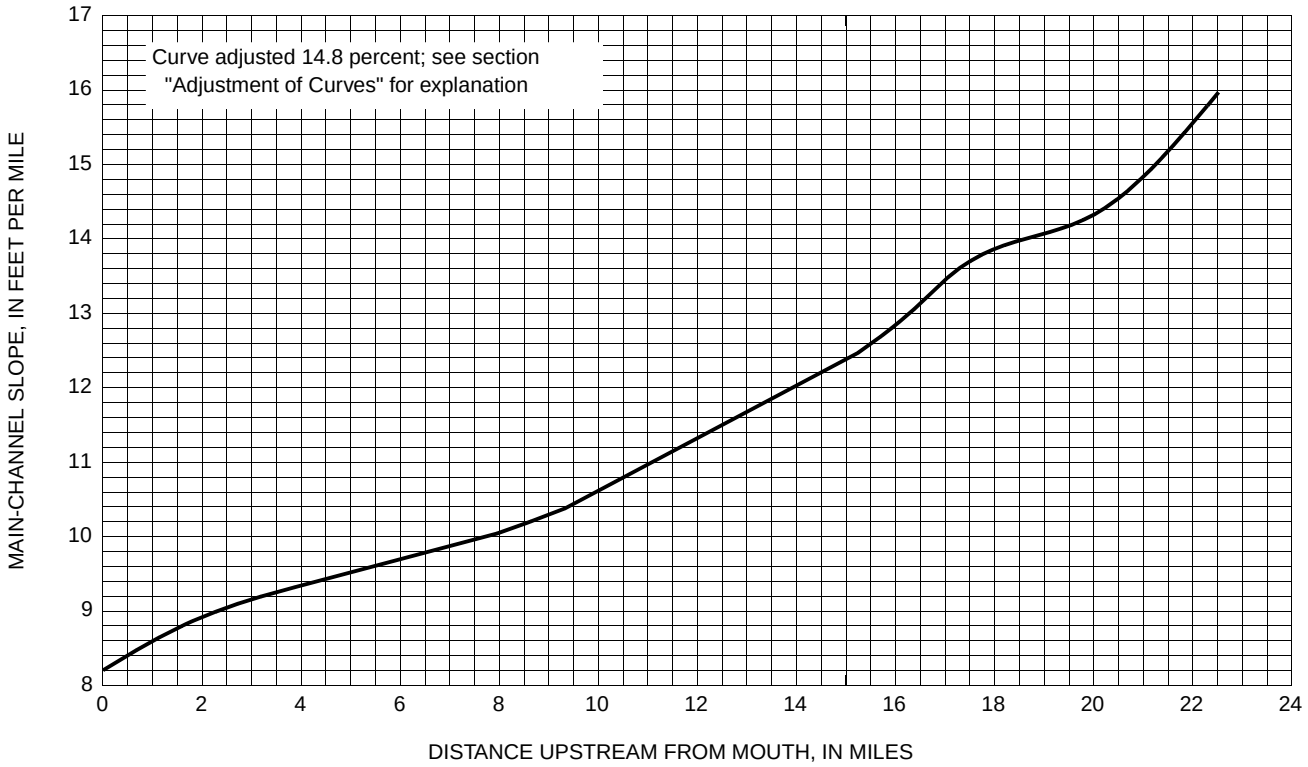
Figure 63. Long and South Fork Long Creeks, beginning at mouth of Long Creek in Louisa County.



List of sites used to quantify main-channel slopes of Lost Island Outlet, Pickerel Run, and Joint drainage ditch 61
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	156	Mouth of Lost Island Outlet	96N 36W 35 NE	--
3.20	151	County Road M54 (06605500, low)	96N 35W 19 SW	280th Ave
4.89	--	U.S. Highway 18, Dickens	96N 35W 19 NE	--
5.13	103	Mouth of Pickerel Run	96N 35W 17 SW	--
6.41	--	Des Moines Lobe landform region boundary	96N 35W 18 NE	--
10.29	80.7	290th Avenue	97N 35W 32 NW	290th Ave
12.89	75.7	County Road N14 (06605400, low)	97N 35W 27 NW	310th Ave
15.38	45.6	Mouth of Joint drainage ditch 61,Trumbull Lake	97N 35W 22 SE	--
19.45	26.2	Clay-Dickinson County line, 270th Street	97N 35W 3 NW	270th St
22.94	19.0	County Road A48	98N 35W 23 NW	240th St
29.60	--	Drainage divide	--	--

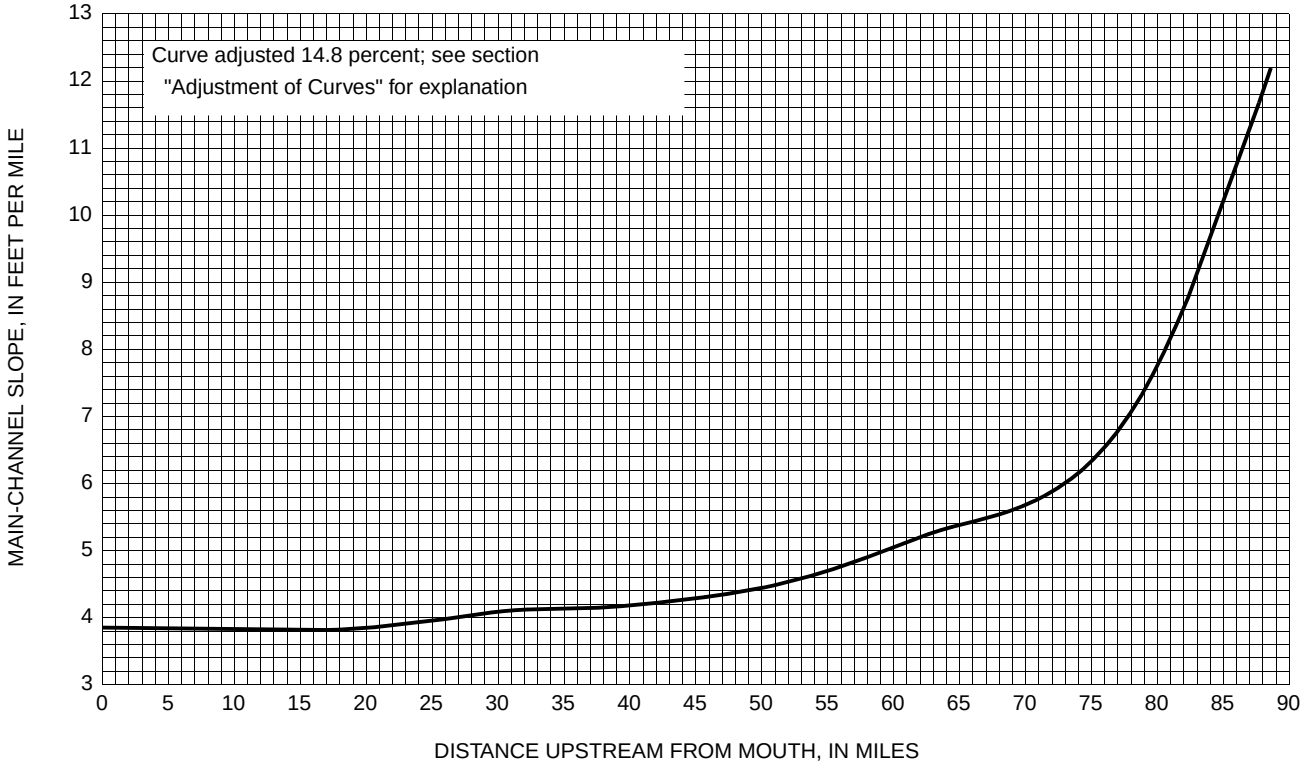
Figure 64. Lost Island Outlet, Pickerel Run, and Joint drainage ditch 61, beginning at mouth of Lost Island Outlet in Clay County.



List of sites used to quantify main-channel slopes of Lytle Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	116	Mouth of Lytle Creek	85N 2E 8NE	--
1.38	114	188th Street (05418350, low)	85N 2E 5 C	188th St
5.94	--	County Road D61	86N 2E 21 SE	Bellevue-Cascade Rd
14.52	--	287th Street	86N 2E 6 SE	287th St
16.69	62.7	Jackson-Dubuque County line	86N 2E 6 NW	--
17.02	62.7	Washington Mills Road (05418300, low)	87N 1E 36 SE	Washington Mills Rd
20.12	57.3	Lyons Road	87N 2E 30 NE	Lyons Rd
22.52	41.8	Below mouth of Prairie Creek	87N 1E 24 SE	--
34.01	--	Drainage divide	--	--

Figure 65. Lytle Creek, beginning at mouth in Jackson County.



List of sites used to quantify main-channel slopes of the Maple River
[See section "Presentation of Curves" for explanation of list elements]

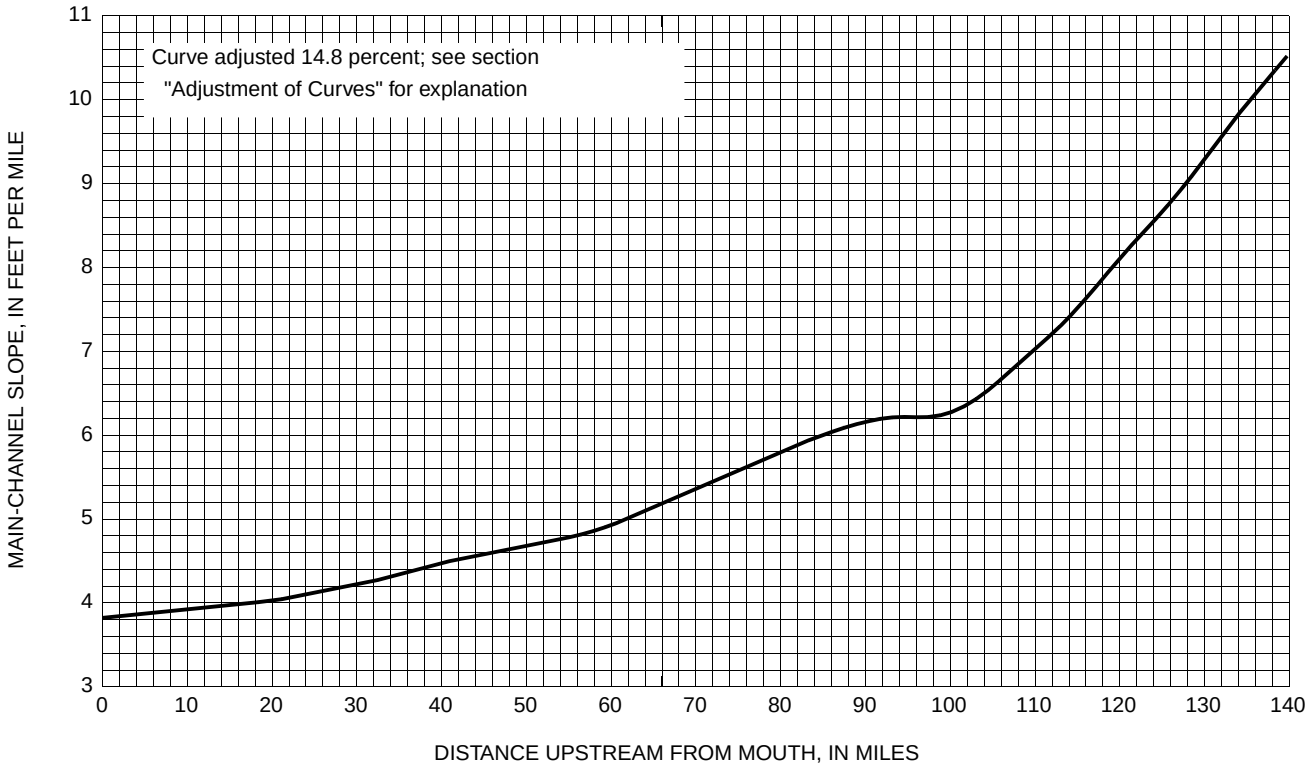
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	742	Mouth of Maple River	83N 44W 17 SE	--
1.18	741	County Road L14 (06607400, low)	83N 44W 10 SW	Larpenteur Memorial Rd
1.92	734	State Highway 175, Turin (06607300, cont)	83N 44W 10NW	--
6.43	722	County Road L20, Castana	84N 44W 24 N	L20
11.26	--	State Highway 175	84N 43W 4 SW	--
15.98	669	State Highway 175, Mapleton (06607200, cont)	85N 43W 23 SE	--
17.70	--	State Highway 141, Mapleton	85N 42W 14 SE	4th St
22.28	628	Monona-Woodbury County line	85N 42W 5 N	--
26.62	--	320th Street, Danbury	86N 42W 26 N	320th St
30.47	567	Woodbury-Ida County line	86N 41W 18 W	--
32.61	--	290th Street	86N 41W 7 NE	290th St
37.10	--	County Road L51, Battle Creek	87N 41W 35 NW	Dodge Ave
41.79	451	German Avenue	87N 40W 20 NW	German Ave
46.56	--	U.S. Highway 59 and State Highway 175, Ida Grove	87N 40W 15 NE	--

Figure 66. Maple River, beginning at mouth in Monona County.

List of sites used to quantify main-channel slopes of the Maple River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
48.85	364	Keystone Avenue (06606900, low)	87N 40W 12 NW	Keystone Ave
54.33	--	200th Street	88N 40W 25 NW	200th St
60.28	--	U.S. Highway 20	88N 39W 6 NW	--
63.27	--	County Road D15, Galva	89N 39W 27 NE	140th St
67.98	182	Ida-Cherokee County line	89N 39W 3 NW	--
71.57	--	630th Street	90N 39W 20 NE	630th St
78.86	--	590th Street	91N 39W 32 N	590th St
85.44	85.2	550th Street (06606800, low)	91N 39W 8 NW	550th St
88.59	--	State Highway 3	92N 39W 33 N	--
100.85	--	Drainage divide	--	--

Figure 66. Maple River, beginning at mouth in Monona County—Continued.



List of sites used to quantify main-channel slopes of the Maquoketa River
[See section "Presentation of Curves" for explanation of list elements]

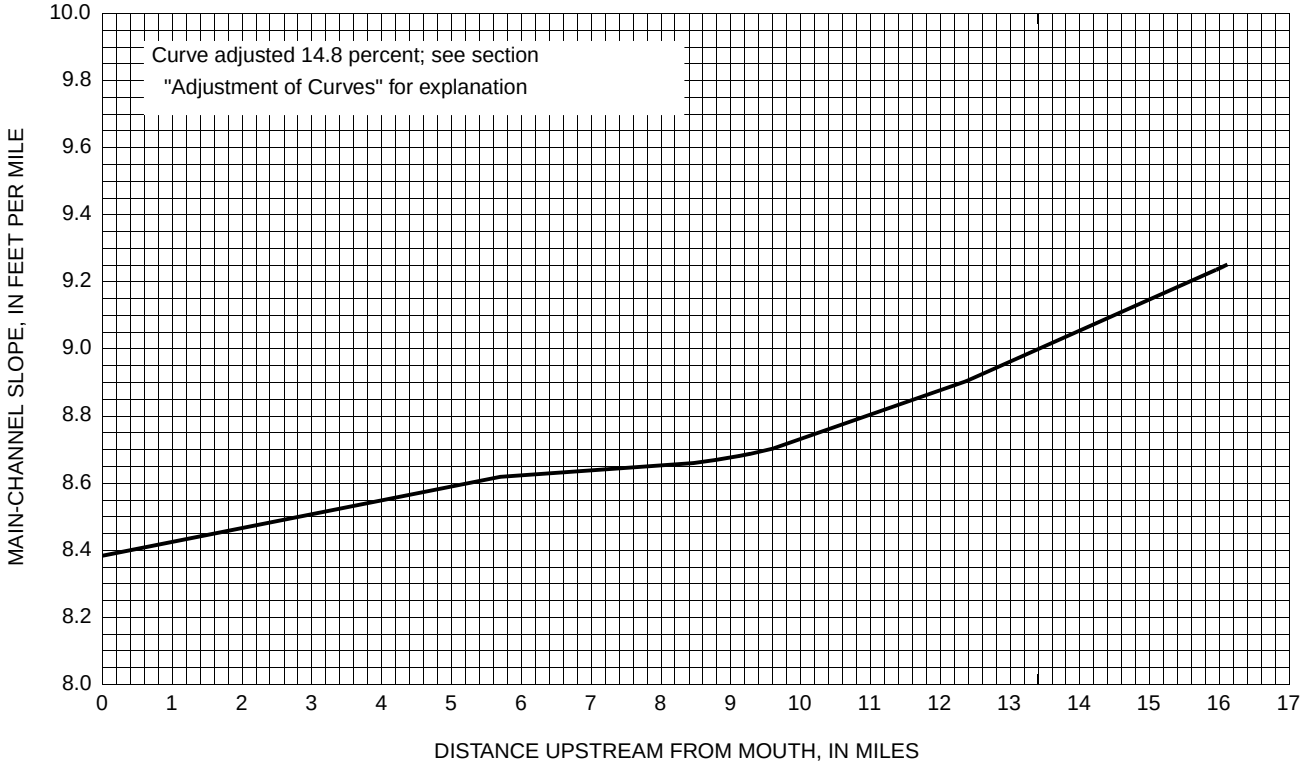
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	1,879	Mouth of Maquoketa River	85N 6E 7 SW	--
2.20	1,875	U.S. Highway 52 (05418720, --)	85N 5E 23 NE	--
7.15	1,861	County Road Z34	84N 5E 4 NW	435th Ave
11.22	--	County Road Z20, Spragueville	84N 4E 13 SE	387th Ave
19.51	--	County Road E23Y	84N 4E 8 NE	Iron Bridge Rd
27.60	1,553	State Highway 62 (05418500, cont)	84N 3E 17 NE	--
31.72	--	U.S. Highway 61, Maquoketa	84N 2E 24 NW	--
40.26	938	74th Street (05418000, cont)	84N 1E 13 NW	74th St
44.30	812	County Road Y34	84N 1E 3 NE	50th Ave
47.06	--	30th Avenue	85N 1E 33 SW	30th Ave
53.45	748	Jackson-Jones County line	85N 1E 18 SW	--
59.02	--	Temple Hill Road	85N 1W 8 SE	Temple Hill Rd
61.86	704	State Highway 136 (05417600, low)	85N 1W 6 N	--
66.84	692	Ebys Mill Road	85N 2W 3 SE	Ebys Mill Rd
81.50	--	U.S. Highway 151, Monticello	86N 3W 22 C	Main St

Figure 67. Maquoketa River, beginning at mouth in Jackson County.

List of sites used to quantify main-channel slopes of the Maquoketa River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
83.00	600	State Highway 38	86N 3W 16 NE	--
87.54	526	Jones-Delaware County line	86N 3W 6 N	--
92.17	--	County Road D47, Hopkinton	87N 4W 24 NW	Marion St
94.40	454	295th Street (05417560, low)	87N 4W 11 NE	295th St
97.09	--	Quarter Road	88N 4W 34 E	Quarter Rd
101.58	347	County Road X31 (05417500, cont)	88N 4W 30 NE	230th Ave
109.40	--	County Road X21	88N 5W 15 NE	240th St
111.18	305	Discontinued gage near Pin Oak County Park (05417000, cont)	88N 5W 9 NE	--
113.26	275	U.S. Highway 20 (05416900, cont)	89N 5W 33 SW	--
114.76	--	State Highway 13, Manchester	89N 5W 29 SW	West Main St
117.04	--	195th Street	89N 5W 19 NE	195th St
121.34	--	165th Street	89N 6W 1 W	165th St
125.52	--	County Road C64, Dundee	90N 6W 23 W	Richland St
131.32	61.1	Backbone State Park Road (05416300, low)	90N 6W 9 SW	Backbone
134.74	42.6	Delaware-Clayton County line, 400th St	90N 6W 5 NW	400th St
138.98	19.0	Clayton-Fayette County line	91N 6W 19 W	--
139.73	--	State Highway 3	91N 7W 13 SE	--
149.66	--	Drainage divide	--	--

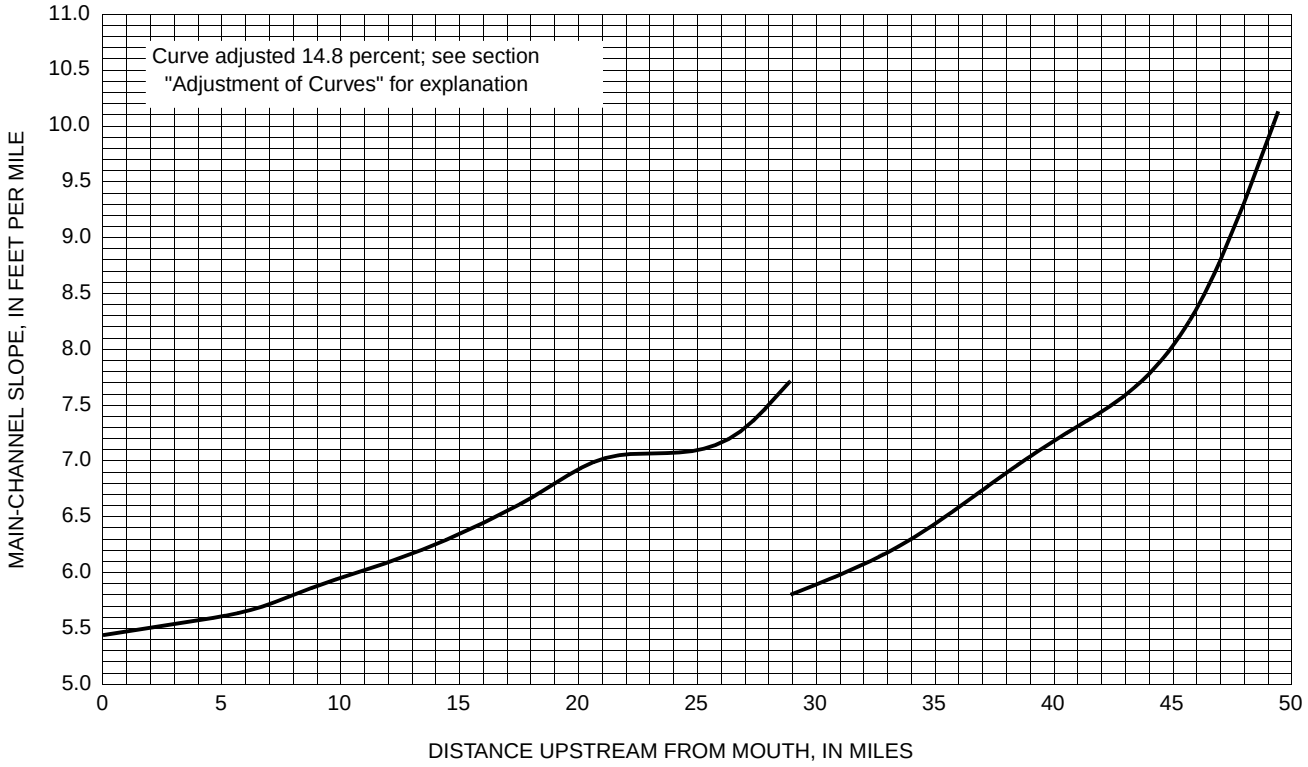
Figure 67. Maquoketa River, beginning at mouth in Jackson County—Continued.



List of sites used to quantify main-channel slopes of Maynes Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	135	Mouth of Maynes Creek	91N 17W 7 SW	--
0.79	--	Grand Avenue (05458870, qw)	91N 17W 18 NW	Grand Ave
5.26	121	County Road T16 (05458850, low)	91N 18W 15 SW	Douglas Ave
9.55	115	Butler-Franklin County line, Franklin Avenue	91N 18W 18 NW	Franklin Ave
10.49	--	Hydrologic Regions 1 and 2 boundary	91N 19W 12 SW	--
16.11	97.8	County Road S56 (05458820, --)	91N 19W 18 NE	Thrush Ave
43.53	--	Drainage divide	--	--

Figure 68. Maynes Creek, beginning at mouth in Butler County.



List of sites used to quantify main-channel slopes of the Middle Nodaway River
[See section "Presentation of Curves" for explanation of list elements]

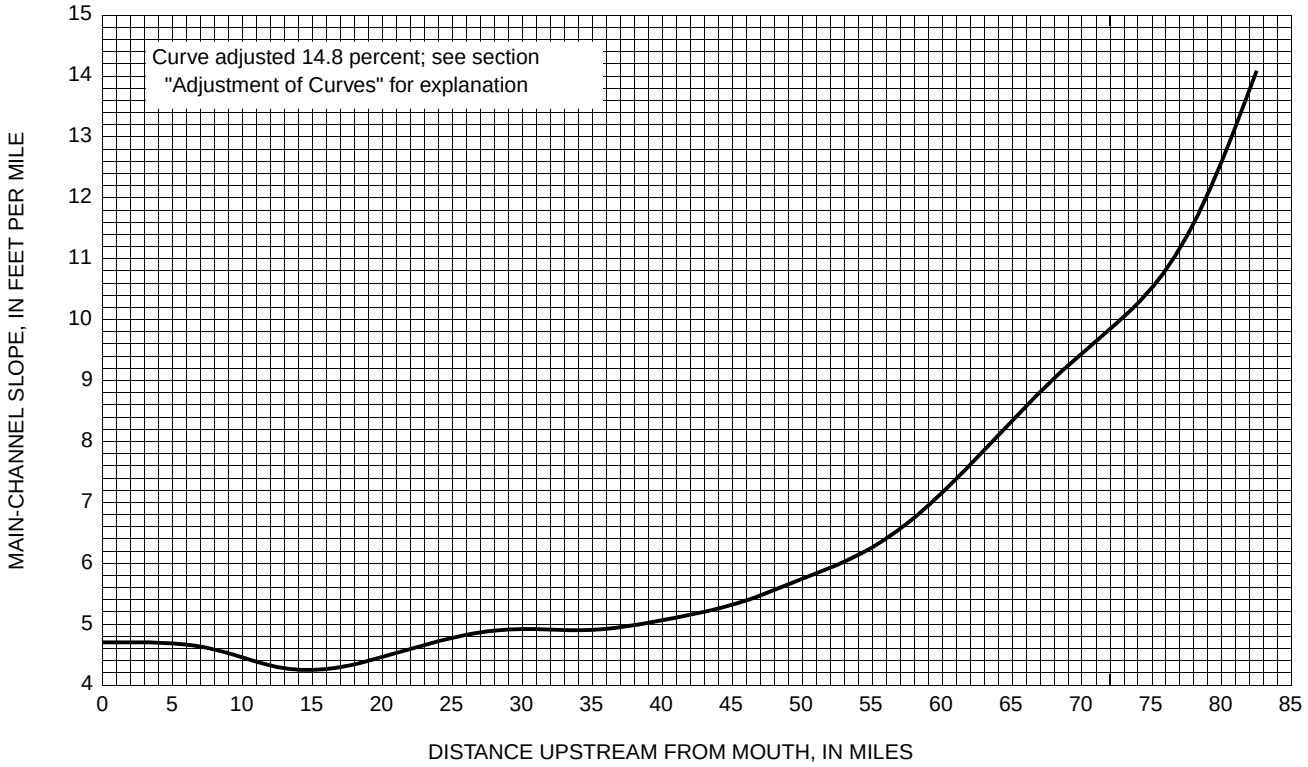
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	341	Mouth of Middle Nodaway River	71N 36W 33 SW	--
0.79	341	U.S. Highway 71 (06816900, low)	71N 36W 33 NE	--
2.91	--	County Road H54, Villisca	71N 36W 24 NW	Third St
6.86	--	U.S. Highway 34	71N 36W 1 C	--
8.52	318	Montgomery-Adams County line, County Road H34	72N 35W 31 NE	210th St
12.51	--	190th Street	72N 35W 15 SW	190th St
15.25	--	County Road N28, Carbon	72N 35W 12 W	B St
18.72	274	County Road H24	73N 34W 32 NE	150th St
20.76	--	State Highway 148	73N 34W 27 NW	--
22.58	256	Juniper Avenue	73N 34W 14 SW	Juniper Ave
25.99	--	110th Street	73N 33W 7 NE	110th St
27.06	225	Adams-Adair County line	73N 33W 6 NE	--
28.91	--	Downstream of mouth of West Fork Middle Nodaway River	74N 33W 33 N	--
28.91	--	Upstream of mouth of West Fork Middle Nodaway River	74N 33W 33 N	--
29.44	89.3	Delta Avenue (06816600, low)	74N 33W 33 NE	Delta Ave
34.01	79.6	County Road G61	74N 33W 24 NE	310th St

Figure 69. Middle Nodaway River, beginning at mouth in Montgomery County.

List of sites used to quantify main-channel slopes of the Middle Nodaway River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
38.03	61.7	County Road N72	74N 32W 5 SW	Fontanelle Rd
40.60	48.2	County Road G49	75N 32W 33 NW	270th St
46.30	35.6	State Highway 92	75N 32W 14 N	--
49.42	27.8	220th Street	75N 32W 1 NW	220th St
60.62	--	Drainage divide	--	--

Figure 69. Middle Nodaway River, beginning at mouth in Montgomery County—Continued.



List of sites used to quantify main-channel slopes of the Middle Raccoon River
[See section "Presentation of Curves" for explanation of list elements]

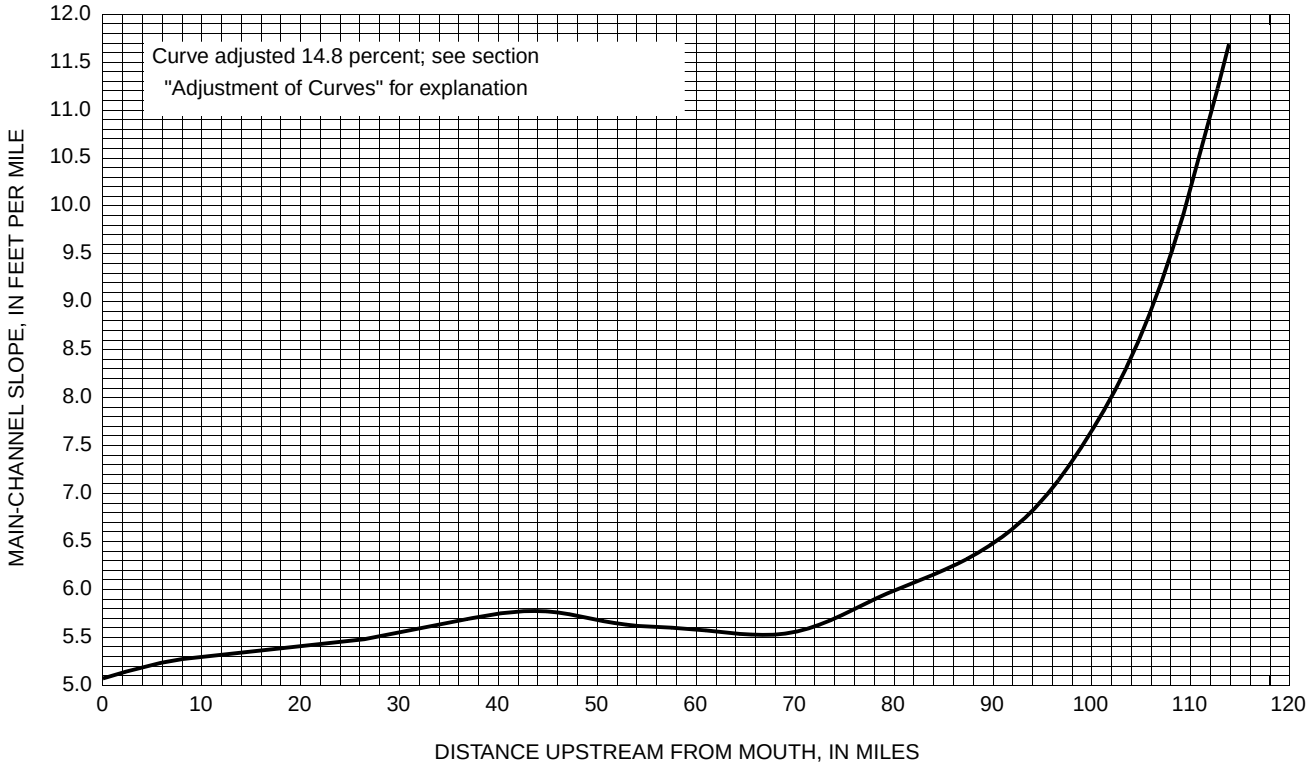
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	609	Mouth of Middle Raccoon River	78N 29W 9 NE	--
1.56	609	County Road F59, Redfield (05483660, low)	78N 29W 4 NW	Thomas St
7.55	--	Amarillo Avenue	79N 29W 30 SE	Amarillo Ave
8.60	484	Dallas-Guthrie County line	79N 29W 31 NW	--
12.88	--	248th Trail	79N 30W 15 SE	248th Tr
18.16	440	Soldier Trail, Panora (05483600, cont)	79N 30W 5 NW	River Rd
19.25	--	State Highway 44	80N 30W 31 SE	--
26.74	--	County Road P18	80N 31W 9 SE	180th Tr
30.23	375	State Highway 25 (05483450, cont)	81N 31W 32 SW	--
34.36	--	150th Street	81N 32W 35 NE	150th St
40.65	--	140th Street	81N 32W 29 NW	140th St
44.14	--	County Road N56	81N 33W 24 NW	Fig Ave
48.41	--	State Highway 141	81N 33W 2 NW	--
48.80	223	Guthrie-Carroll County line, Coon Rapids	81N 33W 3 NE	--
51.98	--	County Road N44	82N 33W 27 NW	Velvet Ave

Figure 70. Middle Raccoon River, beginning at mouth in Dallas County.

List of sites used to quantify main-channel slopes of the Middle Raccoon River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
55.22	--	Twilight Avenue	82N 33W 17 SW	Twilight Ave
58.39	200	295th Street	82N 34W 12 SW	295th St
63.55	--	260th Street	83N 34W 26 NW	260th St
68.63	138	215th Street (05483360, low)	84N 34W 35 SE	215th St
72.24	74.3	County Road N33 (05483350, low)	84N 34W 29 SE	Olympic Ave
76.56	56.0	U.S. Highway 71, Carroll	84N 35W 26 NE	Lincoln St
78.37	55.0	U.S. Highway 30, Carroll (05483345, --)	84N 35W 15 SE	--
82.49	--	Hawthorn Avenue	84N 35W 5 W	Hawthorn Ave
91.80	--	Drainage divide	--	--

Figure 70. Middle Raccoon River, beginning at mouth in Dallas County—Continued.



List of sites used to quantify main-channel slopes of the Middle River
[See section "Presentation of Curves" for explanation of list elements]

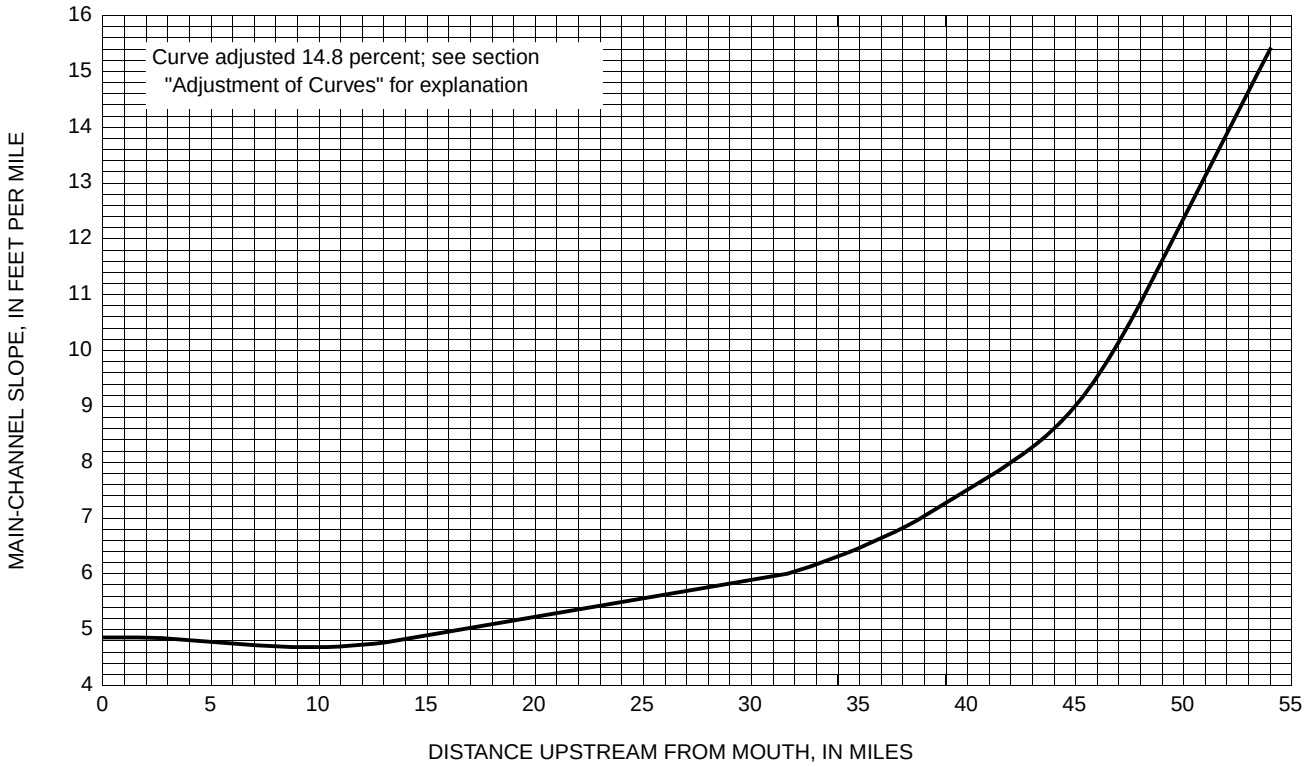
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	558	Mouth of Middle River	77N 22W 9 SW	--
5.24	--	State Highway 5	77N 23W 11 NW	--
9.31	524	160th Avenue	77N 23W 22 SW	160th Ave
13.15	--	U.S. Highways 65 and 69	77N 23W 31 NW	--
14.79	503	115th Avenue (05486490, cont)	77N 24W 35 S	115th Ave
19.82	--	70th Avenue	76N 24W 18 NW	70th Ave
23.62	451	State Highway 92, Martensdale (05486400, low)	76N 25W 21 SE	--
28.80	--	Interstate 35	76N 25W 30 S	--
29.40	285	Warren-Madison County line, Warren Street	76N 25W 30 W	Warren St
35.36	275	Valleyview Trail	76N 26W 33 NE	Valleyview Trl
40.99	265	Quail Ridge Trail	76N 27W 36 NW	Quail Ridge Trl
45.29	257	Hollwell Bridge Trail	75N 27W 4 E	Hollwell Bridge Trl
49.29	248	County Road P51	75N 27W 7 N	Clark Tower Rd
53.09	--	U.S. Highway 169	75N 28W 14 NE	--
57.72	--	Pammel Road, Pammel State Park	75N 28W 16 NE	Pammel Rd

Figure 71. Middle River, beginning at mouth in Warren County.

List of sites used to quantify main-channel slopes of the Middle River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
60.87	--	Harmon Avenue	75N 28W 17 SW	Harmon Ave
66.30	--	Elderberry Avenue	75N 29W 14 SE	Elderberry Ave
69.46	--	County Road P53	75N 29W 10 SW	Deer Run Ave
73.06	--	State Highway 92	75N 29W 5 S	--
75.10	164	Adair-Madison Avenue (05486150, low)	75N 29W 6 C	Adair-Madison Ave
78.38	161	Madison-Adair County line	76N 29W 31 NW	Adair-Madison Ave
84.29	--	200th Street	76N 30W 26 NW	200th St
89.87	--	190th Street	76N 30W 20 NE	190th St
94.77	--	County Road G27	76N 31W 12 NW	170th St
99.47	--	145th Street	77N 31W 27 C	145th St
104.15	--	State Highway 25	77N 31W 8 SW	--
107.23	--	Interstate 80	77N 32W 1 C	--
108.02	72.8	Adair-Guthrie County line, 350th Street (05486100, low)	77N 32N 1 NW	350th St
109.21	--	State Highway 925	78N 32W 35 C	--
113.85	30.8	320th Street	78N 32W 21 NE	320th St
127.60	--	Drainage divide	--	--

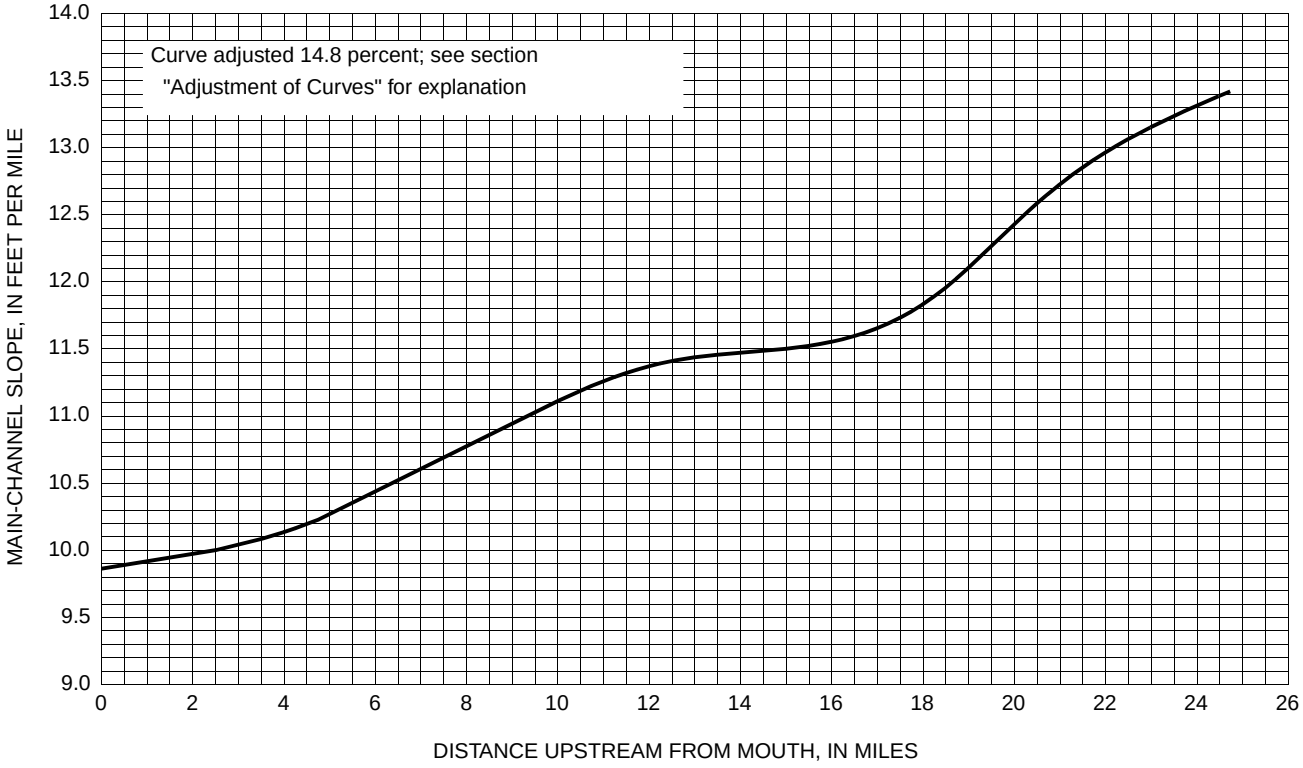
Figure 71. Middle River, beginning at mouth in Warren County—Continued.



List of sites used to quantify main-channel slopes of Mill Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	294	Mouth of Mill Creek	92N 40W 14 SE	--
2.75	292	U.S. Highway 59 (06606300, low)	92N 40W 15 C	--
7.38	--	High Country Road	92N 40W 4 SW	High Country Rd
11.80	263	470th Street	93N 40W 32 NW	470th St
17.67	--	County Road C16	93N 41W 24 NE	450th St
24.15	179	Cherokee-OBrien County line	93N 41W 3 NE	--
30.30	--	480th Street	94N 41W 20 NW	480th St
37.20	--	State Highway 10, Paullina	94N 41W 10 NE	--
41.42	--	Polk Avenue	95N 41W 32 E	Polk Ave
45.39	61.6	430th Street (06606200, low)	95N 41W 29 NE	430th St
50.01	--	410th Street	95N 41W 16 NW	410th St
54.03	--	County Road B40	95N 41W 4 NE	390th St
65.72	--	Drainage divide	--	--

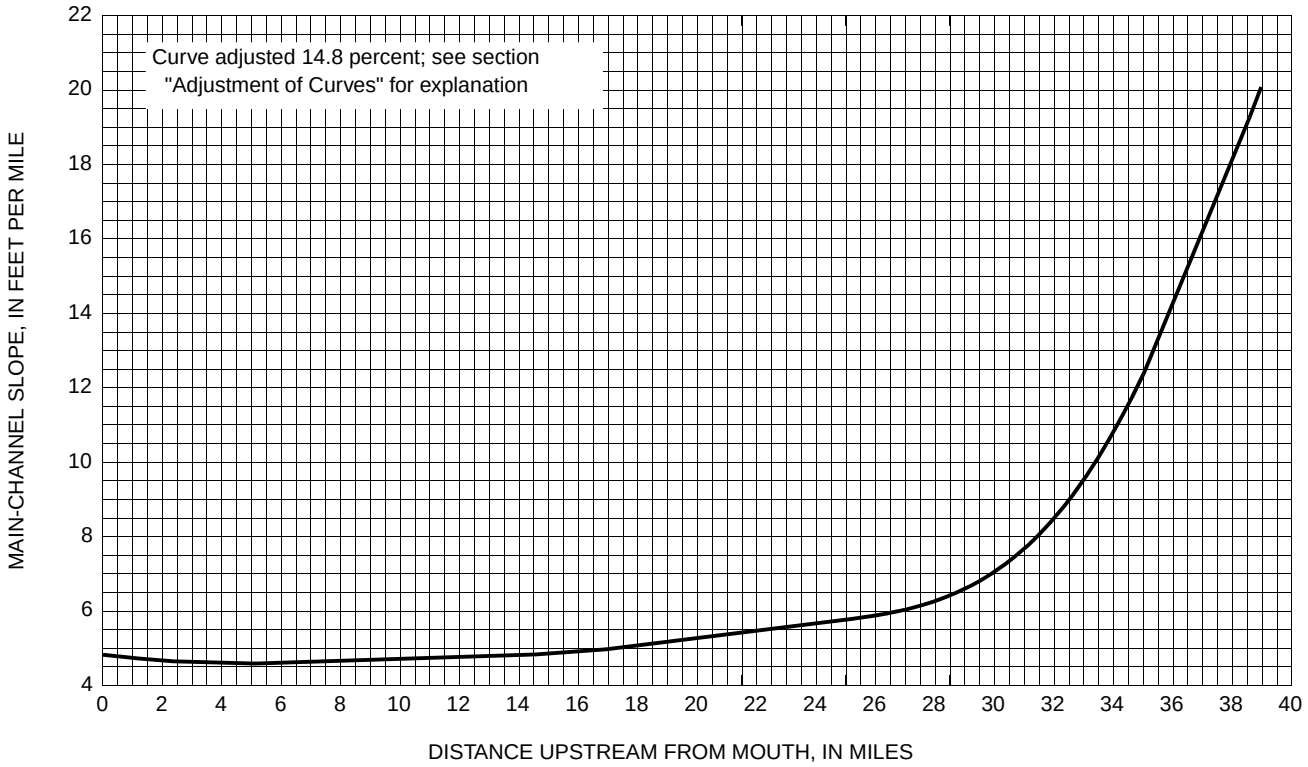
Figure 72. Mill Creek, beginning at mouth in Cherokee County.



List of sites used to quantify main-channel slopes of Minerva Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	164	Mouth of Minerva Creek	84N 19W 2 NW	--
3.96	148	County Road S62 (05451450, low)	84N 19W 5 S	Hopkins Ave
8.09	69.6	155th Street (05451400, low)	85N 20W 35 C	155th St
11.57	--	Des Moines Lobe landform region boundary	85N 20W 22 NW	--
12.19	61.7	County Road E18	85N 20W 15 SW	Marble Rd
18.22	32.4	Marshall-Story County line	85N 20W 7 NW	--
20.64	30.1	Story-Hardin County line, 100th Street	85N 21W 2 N	100th St
24.72	18.2	U.S. Highway 65	86N 21W 28 W	--
36.40	--	Drainage divide	--	--

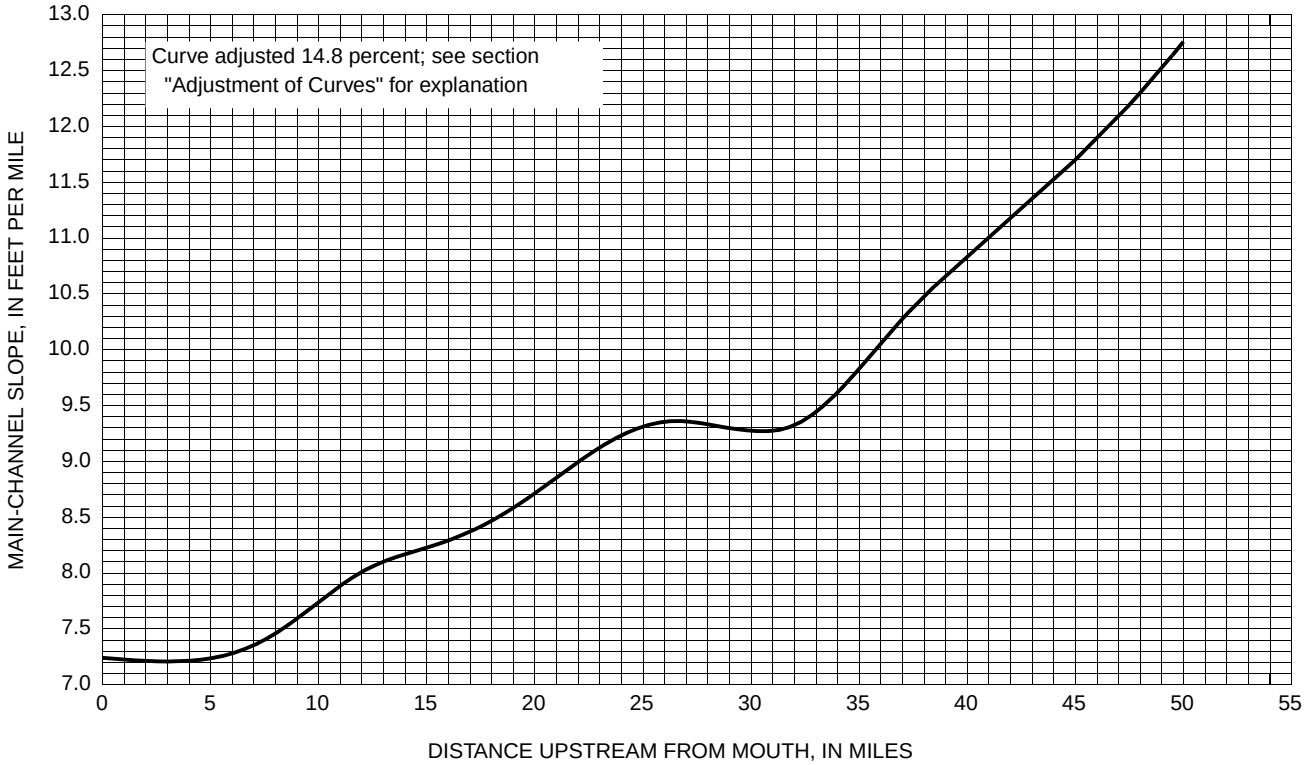
Figure 73. Minerva Creek, beginning at mouth in Marshall County.



List of sites used to quantify main-channel slopes of Mosquito Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	113	Mouth of Mosquito Creek	79N 29W 34 SE	--
0.32	--	Des Moines Lobe landform region boundary	79N 29W 34 NE	--
2.03	110	280th Street (05483640, low)	79N 29W 27 NE	280th St
4.80	--	D Avenue	79N 29W 15 W	D Ave
9.70	74.5	State Highway 44	79N 29W 5 NW	--
13.46	67.4	220th Street (05483620, low)	80N 29W 20 S	220th St
16.84	--	200th Street	80N 29W 17 NW	200th St
22.04	58.3	Dallas-Guthrie County line	80N 29W 6 NW	--
26.96	45.7	Victory Avenue	81N 30W 27 NW	Victory Ave
31.94	--	State Highway 4	81N 30W 17 N	--
33.98	--	State Highway 141	81N 30W 7 N	--
38.97	--	State Highway 141	81N 31W 4 SE	--
44.68	--	Drainage divide	--	--

Figure 74. Mosquito Creek, beginning at mouth in Dallas County.



List of sites used to quantify main-channel slopes of Mosquito Creek
[See section "Presentation of Curves" for explanation of list elements]

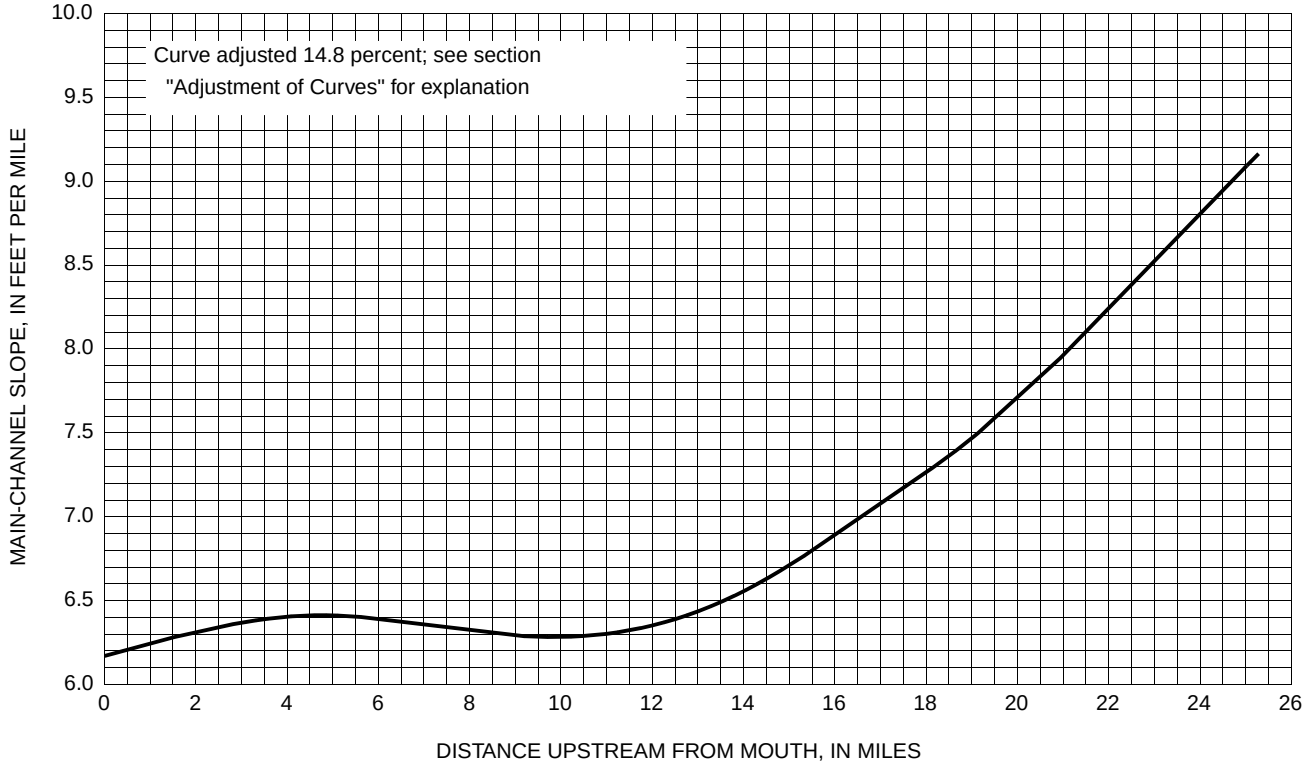
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	267	Mouth of Mosquito Creek	74N 43W 30 SW	--
2.96	--	Interstate 29, Council Bluffs	74N 43W 18 NE	--
3.48	230	State Highway 92, Council Bluffs	74N 43W 7 SE	Omaha Bridge Rd
5.15	--	Interstate 80, Council Bluffs	74N 43W 5 NW	--
7.06	211	College Road, Council Bluffs (06610650, low)	75N 43W 29 E	College Road
7.84	--	U.S. Highway 6, Council Bluffs	75N 43W 20 SE	Kanesville Blvd
11.93	201	State Highway 191	75N 43W 2 SW	--
13.18	--	State Highway 191	75N 43W 2 NE	--
16.02	173	Juniper Road	76N 43W 29 SW	Juniper Rd
19.26	161	Third Street, Underwood	76N 42W 16 NE	Third St
24.64	131	State Highway 244, Neola (06610600, csg)	77N 42W 25 NE	--
25.50	128	State Highway 191, Neola	77N 41W 19 SW	Front St
26.68	--	State Highway 191	77N 41W 18 SW	--
29.11	--	Interstate 680	77N 41W 5 W	--

Figure 75. Mosquito Creek, beginning at mouth in Pottawattamie County.

List of sites used to quantify main-channel slopes of Mosquito Creek—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
29.68	114	Pottawattamie-Harrison County line	77N 41W 5 NW	--
31.93	108	325th Street	78N 41W 29 NE	325th St
36.92	80.8	Harrison-Shelby County line, 280th Street	78N 41W 3 NW	280th St
40.77	63.9	State Highway 44, Portsmouth (06610550, low)	79N 40W 16 SW	--
45.32	--	1380th Street	80N 40W 35 NW	1380th St
49.73	32.0	Discontinued USGS gage (06610520, cont)	80N 40W 11 SE	--
49.99	--	State Highway 191	80N 40W 11 NE	--
62.51	--	Drainage divide	--	--

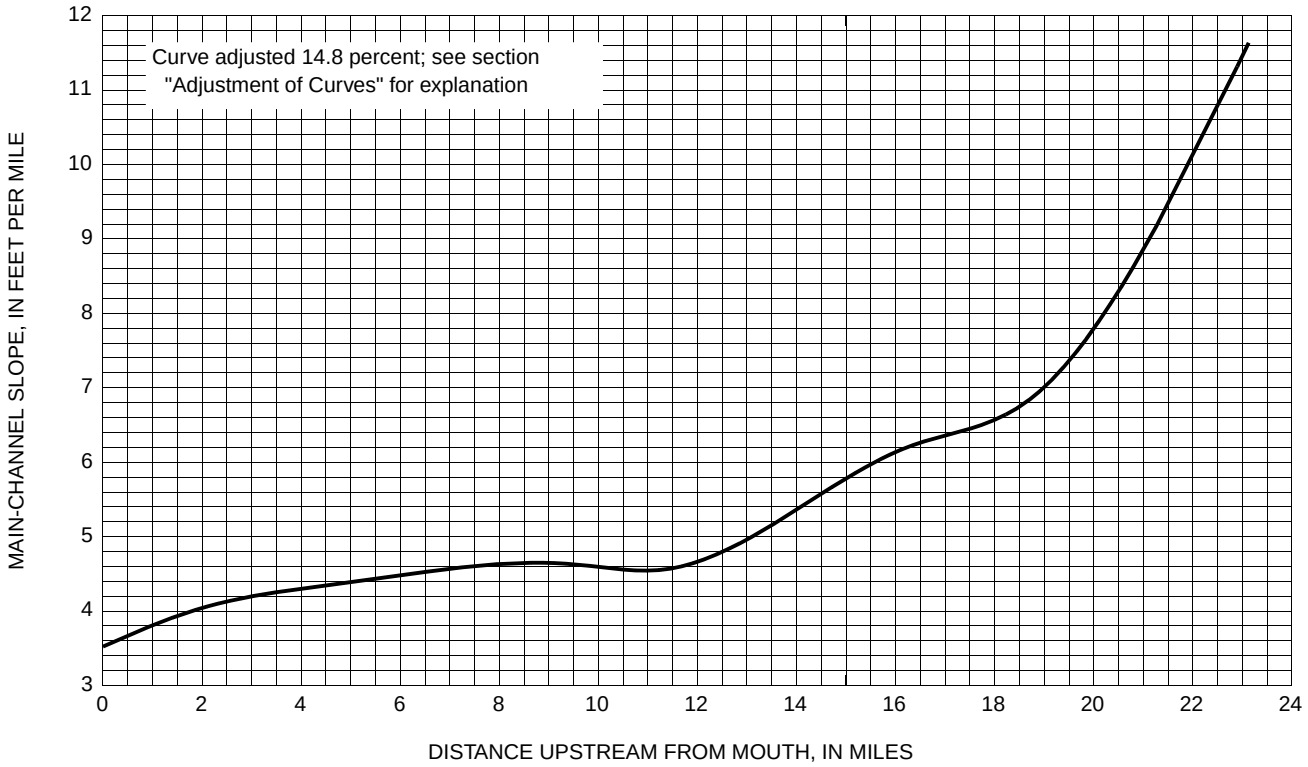
Figure 75. Mosquito Creek, beginning at mouth in Pottawattamie County—Continued.



List of sites used to quantify main-channel slopes of Mud Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	138	Mouth of Mud Creek	98N 46W 26 NW	--
0.78	138	250th Street (06483330, low)	98N 46W 27 NE	250th St
2.36	129	County Road A42 (06483325, --)	98N 46W 22 NW	240th St
4.69	126	230th Street	98N 46W 16 NE	230th St
8.22	111	County Road A34, Alvord	98N 46W 5 NE	210th St
10.98	101	190th Street	99N 46W 29 NW	190th St
13.98	--	170th Street	99N 46W 18 NE	170th St
17.20	--	State Highway 9, Lester	99N 47W 1 NE	--
18.66	63.7	County Road A18 (06483320, low)	100N 47W 36 NW	140th St
23.99	40.0	County Road K30	100N 47W 13 NW	110th St
25.28	--	Iowa-Minnesota State line	100N 47W 12 N	--
42.47	--	Drainage divide	--	--

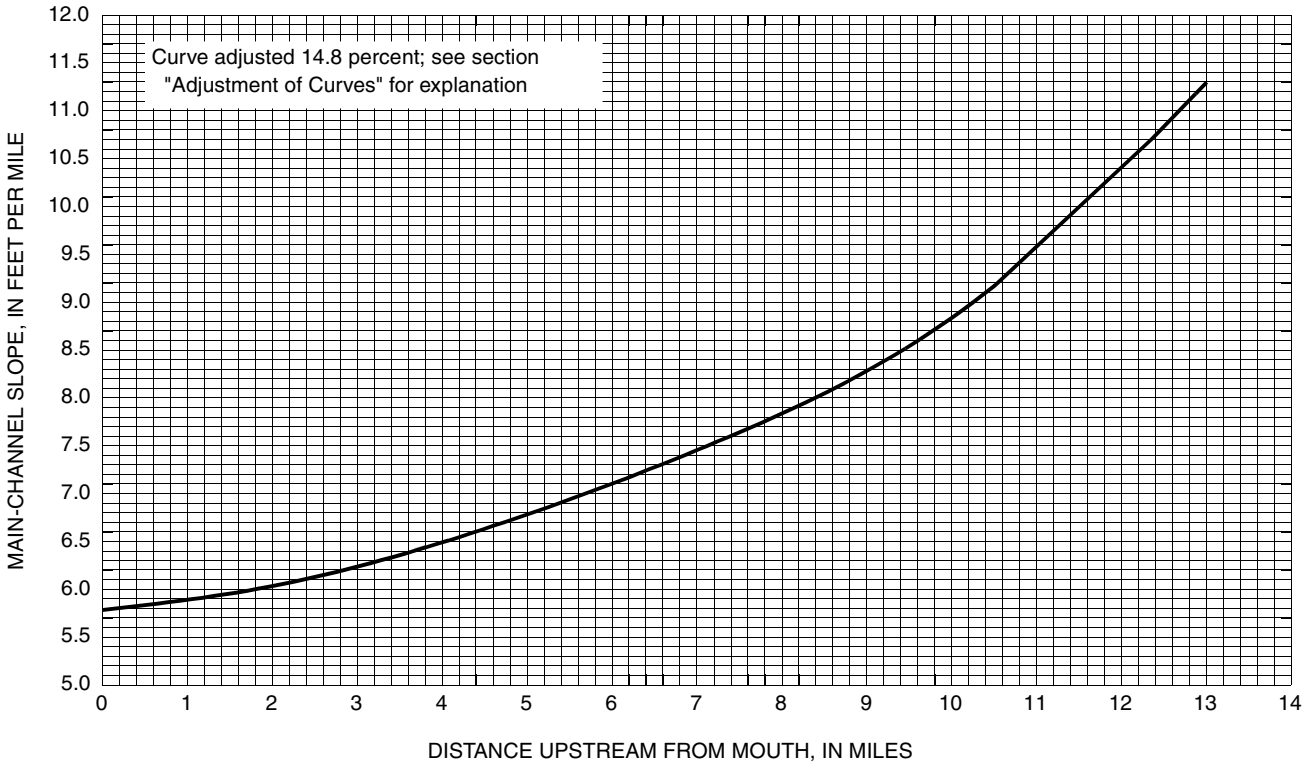
Figure 76. Mud Creek, beginning at mouth in Lyon County.



List of sites used to quantify main-channel slopes of Mud Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	105	Mouth of Mud Creek	78N 2W 10 SE	--
1.79	102	U.S. Highway 6 and State Highway 38 (05464900, low)	78N 2W 12 NW	--
5.09	--	County Road Y14	78N 1W 5 SW	Taylor St
9.54	--	Muscatine-Cedar County line	78N 1W 3 NE	--
11.31	--	Cedar-Muscatine County line	78N 1W 2 NE	--
16.36	--	Muscatine-Scott County line, State Hwy 927	78N 1E 5 NW	--
18.65	--	Scott-Muscatine County line, State Hwy 927	78N 1E 4 NW	--
23.13	8.3	Muscatine-Scott County line, Walcott	78N 1E 1 NE	--
27.89	--	Drainage divide	--	--

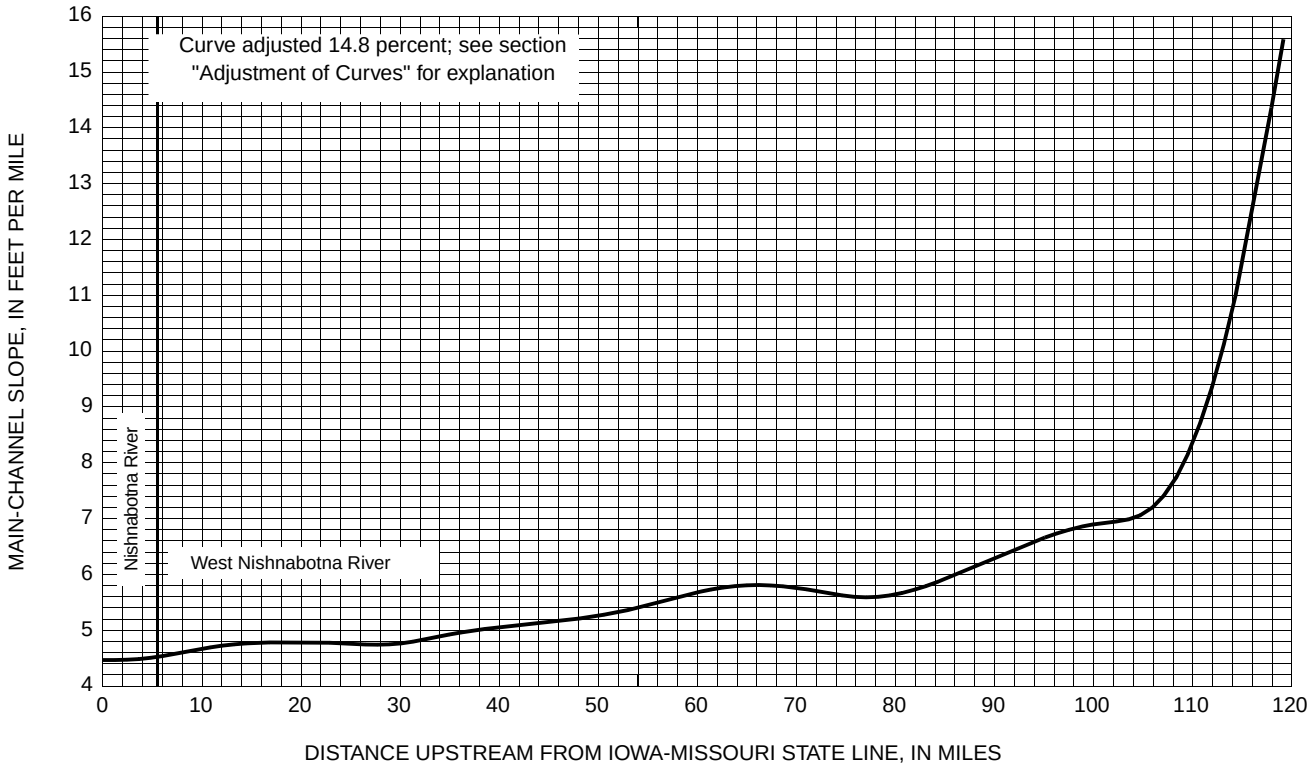
Figure 77. Mud Creek, beginning at mouth in Muscatine County.



List of sites used to quantify main-channel slopes of Mud Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	128	Mouth of Mud Creek	80N 2E 12 NW	--
1.72	119	River Camp Road (05421870, qw)	80N 2E 14 NE	River Camp Rd
4.79	115	90th Avenue	80N 2E 21 SE	90th Ave
7.48	109	75th Avenue (05421850, low)	80N 2E 29 SW	75th Ave
10.25	--	State Highway 130	79N 1E 1 SE	--
13.00	--	35th Avenue	79N 1E 10 N	35th Ave
21.91	--	Drainage divide	--	--

Figure 78. Mud Creek, beginning at mouth in Scott County.



List of sites used to quantify main-channel slopes of the Nishnabotna and West Nishnabotna Rivers
[See section "Presentation of Curves" for explanation of list elements]

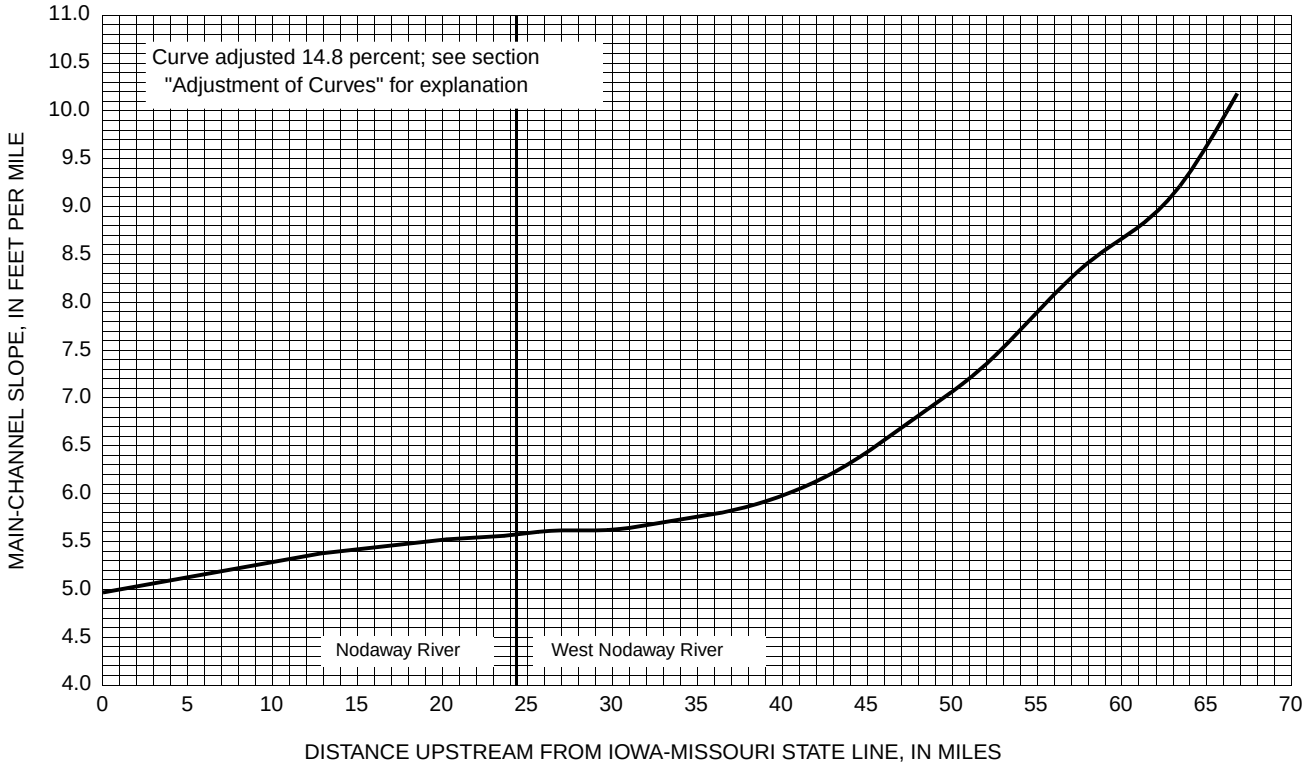
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	2,819	Iowa-Missouri State line	67N 42W 35 NW	--
1.33	--	U.S. Highway 275, Hamburg	67N 42W 22 SE	--
3.84	2,806	USGS gage (06810000, cont)	67N 42W 11 SE	--
5.45	1,649	Mouth of West Nishnabotna River	67N 42W 2 NE	--
8.19	1,645	County Road J46 (06808820, --)	68N 41W 19 SW	250th St
12.60	--	State Highway 2	69N 41W 29 SW	--
16.15	--	County Road J26	69N 41W 8 NW	170th St
21.42	1,326	State Highway 184, Randolph (06808500, cont)	70N 41W 17 NE	--
23.44	1,281	Fremont-Mills County line, Waubonsie Avenue	70N 41W 5 NE	Waubonsie Ave
27.68	974	County Road L68 (06807550, low)	71N 41W 15 NW	330th St
30.25	967	Marh Avenue (06807500, cont)	71N 41W 2 NW	Marh Ave
34.22	--	U.S. Highway 34	72N 41W 24 NW	--
38.91	--	County Road M16	73N 40W 30 SE	370th St
44.71	--	County Road H12	73N 40W 10 NW	Brothers Ave

Figure 79. Nishnabotna and West Nishnabotna Rivers, beginning at Iowa-Missouri State line in Fremont County.

List of sites used to quantify main-channel slopes of the Nishnabotna and West Nishnabotna Rivers—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
46.20	695	Mills-Pottawattamie County line	73N 40W 3 NW	--
49.53	--	County Road G66	74N 40W 21 SE	Pioneer Trail
52.96	--	State Highway 92, Carson	74N 40W 10 NE	--
57.59	--	U.S. Highway 6	75N 40W 23 NE	--
59.40	--	County Road G42, Oakland	75N 40W 11 SE	Oakland Ave
65.57	609	County Road G30, Hancock (06807410, cont)	76N 39W 18 NE	Mahogany Rd
73.16	357	State Highway 83, Avoca (06807340, low)	77N 39W 17 NE	--
75.94	--	Interstate 80	77N 39W 5 SE	--
76.51	350	Pottawattamie-Shelby County line	77N 39W 5 NE	--
81.42	--	U.S. Highway 59	78N 39W 9 SE	--
87.57	316	State Highway 44, Harlan (06807320, cont)	79N 38W 19 NE	Chatburn Ave
92.84	--	1400th Street	80N 38W 33 NE	1400th St
97.17	140	1800th Street	80N 38W 10 NW	1800th St
101.19	--	County Road F24, Irwin	81N 37W 31 NE	2000th St
105.18	80.6	2200th Street	81N 37W 21 NE	2200th St
109.33	70.6	Shelby-Crawford County line, 2500th Street	81N 37W 2 NE	2500th St
111.03	63.4	Crawford-Carroll County line, Aspen Avenue	82N 37W 36 NE	Aspen Ave
111.50	58.6	County Road E67 (06807260, low)	82N 36W 31 NW	330th St
114.00	43.4	State Highway 141, Manning	82N 36W 20 NW	6th St
119.14	--	280th Street	82N 36W 3 NW	280th St
127.90	--	Drainage divide	--	--

Figure 79. Nishnabotna and West Nishnabotna Rivers, beginning at Iowa-Missouri State line in Fremont County—Continued.



List of sites used to quantify main-channel slopes of the Nodaway and West Nodaway Rivers
[See section "Presentation of Curves" for explanation of list elements]

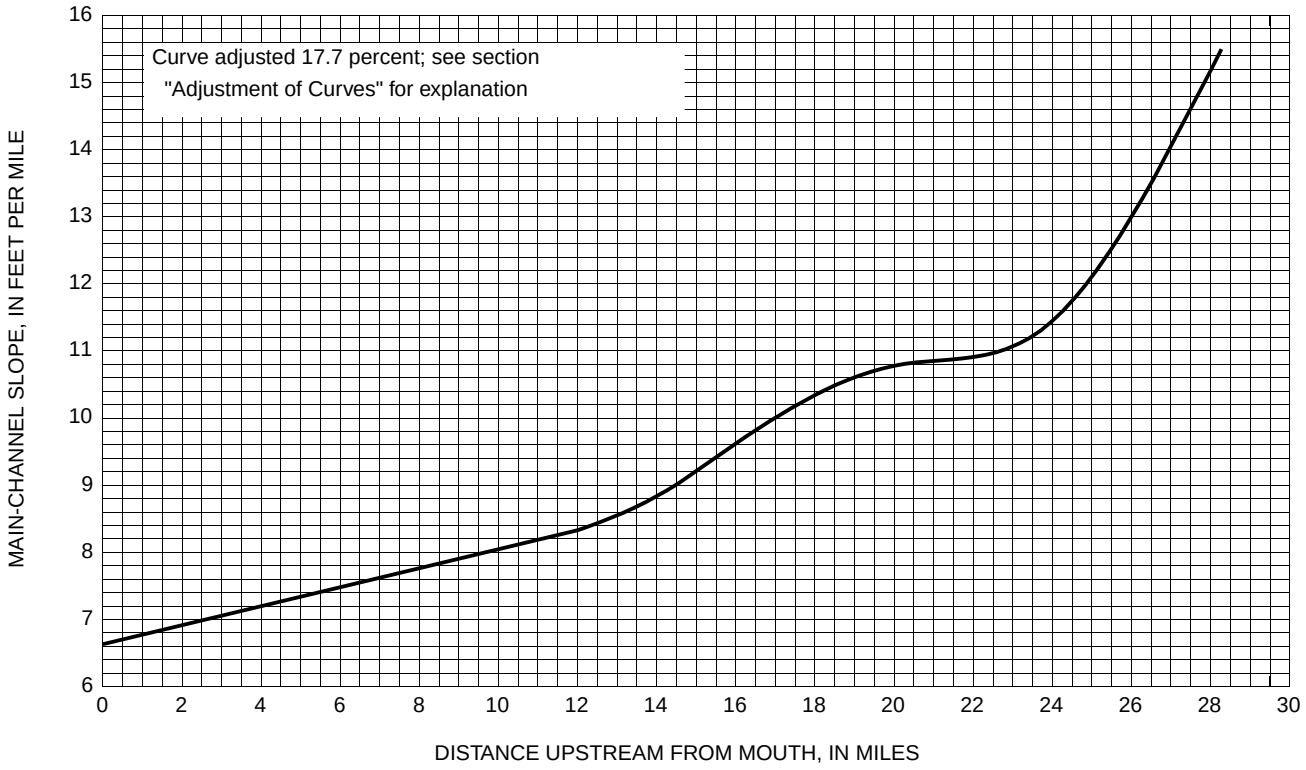
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	1,182	Iowa-Missouri State line, Braddyville	67N 36W 31 NW	--
2.93	1,135	Abandoned bridge, between 294th and 295th Lanes (06817200, low)	67N 36W 18 C	--
6.09	--	County Road J53, Shambaugh	68N 36W 31 W	265th St
11.51	--	State Highway 2, Clarinda	69N 36W 32 SE	--
12.00	762	210th Street, Clarinda (06817000, cont)	69N 36W 32 NE	210th St
20.17	--	County Road J20, Hepburn	70N 36W 20 SE	137th St
24.03	689	Page-Montgomery County line	71N 36W 33 SW	--
25.66	344	County Road H54, Villisca (06816550, low)	71N 36W 28 C	--
26.33	342	Burlington Northern Santa Fe Railroad, Villisca (06816500, cont)	71N 36W 21 SW	--
29.82	--	U.S. Highway 34	71N 36W 4 SE	--
32.47	--	County Road H34	72N 36W 28 N	200 St
37.33	--	County Road H24	73N 36W 33 C	155 St
44.29	--	U.S. Highway 71, Grant	73N 36W 9 NE	--
48.16	--	Montgomery-Cass County line	73N 36W 2 NW	--

Figure 80. Nodaway and West Nodaway Rivers, beginning at Iowa-Missouri State line in Page County.

List of sites used to quantify main-channel slopes of the Nodaway and West Nodaway Rivers—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
51.74	--	County Road C66	74N 35W 31 N	Yankton Rd
58.12	65.1	County Road N28 (06816300, low)	74N 35W 15 SW	690th St
62.94	--	County Road G53	74N 34W 6 SW	Tuscon Rd
66.78	23.4	State Highway 148 (06816290, csg)	75N 34W 33 SE	--
78.17	--	Drainage divide	--	--

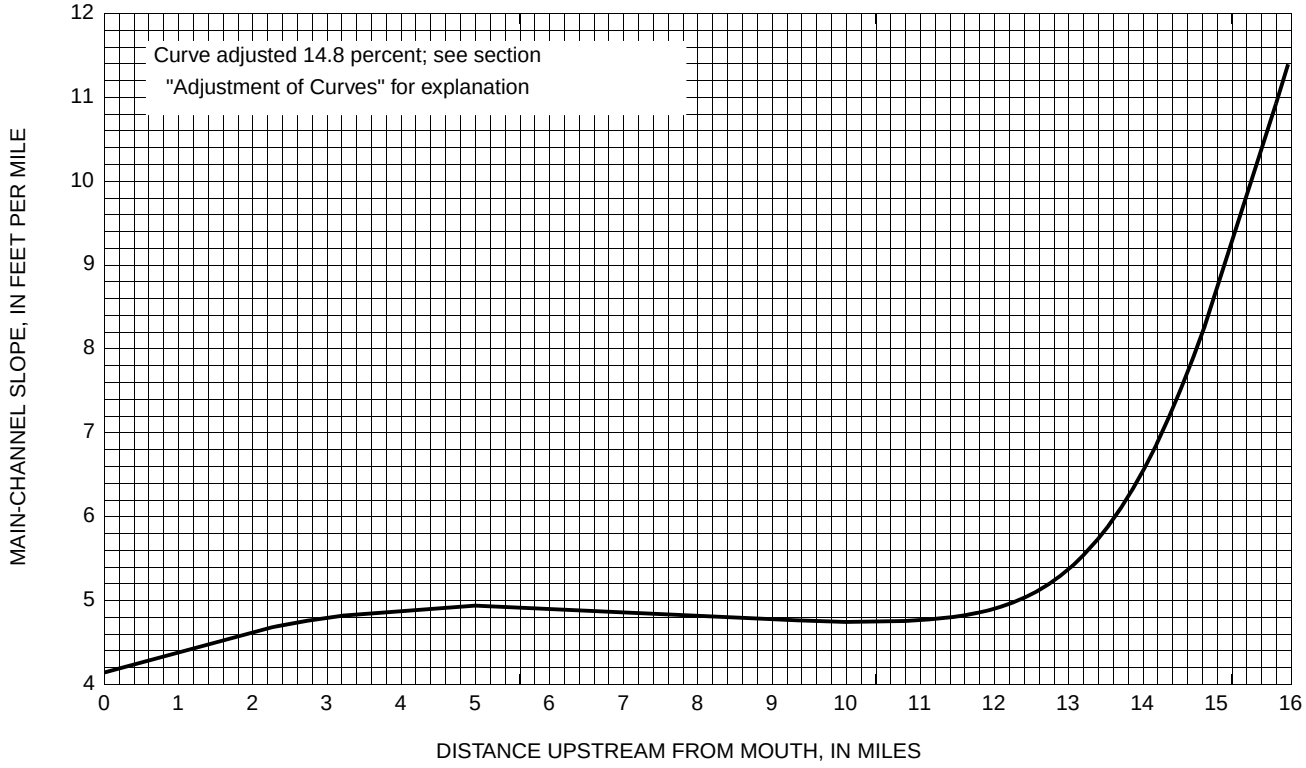
Figure 80. Nodaway and West Nodaway Rivers, beginning at Iowa-Missouri State line in Page County—Continued.



List of sites used to quantify main-channel slopes of North Cedar Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	127	Mouth of North Cedar Creek	74N 18W 15 N	--
3.28	--	State Highway 5	74N 18W 20 NE	--
9.80	111	170th Place (05488900, low)	74N 19W 26 S	170th Pl
14.69	62.3	Marion-Monroe County line	74N 19W 33 S	--
15.33	61.3	County Road H16 (05488800, low)	73N 19W 4 NE	105th St
20.13	43.2	Monroe-Lucas County line	73N 19W 18 SW	--
23.79	--	County Road	73N 20W 27 NE	--
28.27	21.5	County Road	72N 20W 5 NW	--
37.65	--	Drainage divide	--	--

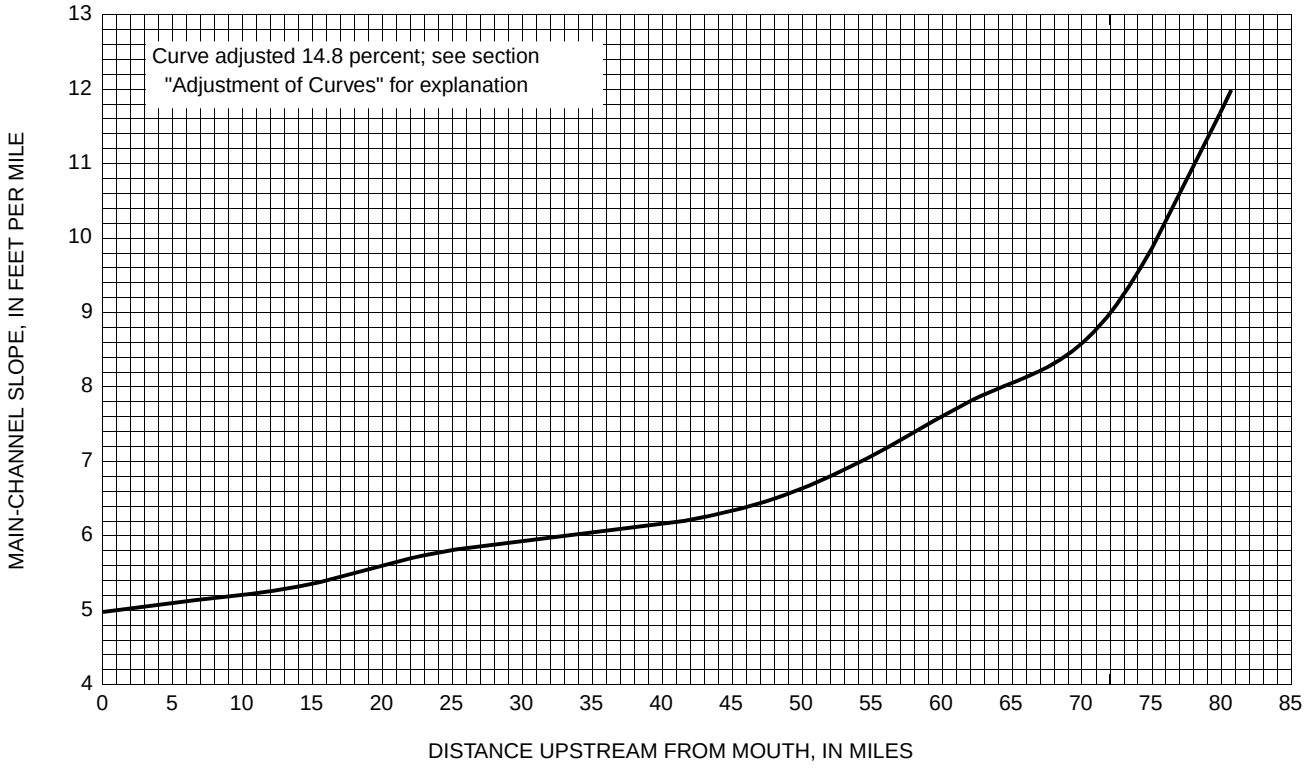
Figure 81. North Cedar Creek, beginning at mouth in Marion County.



List of sites used to quantify main-channel slopes of North Fork Black Hawk Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	119	Mouth of North Fork Black Hawk Creek	87N 15W 1 SE	--
2.23	107	County Road D35	88N 15W 35 E	215th Ave
5.52	--	County Road D25	88N 15W 24 NW	190th St
7.72	--	County Road T65	88N 15W 11 SW	X Ave
12.15	76.3	Usher Avenue, Dike (05463400, low)	88N 15W 8 N	Usher Ave
15.95	--	U.S. Highway 20	88N 16W 1 NE	--
25.09	--	Drainage divide	--	--

Figure 82. North Fork Black Hawk Creek, beginning at mouth in Grundy County.



List of sites used to quantify main-channel slopes of the North Fork Maquoketa River
[See section "Presentation of Curves" for explanation of list elements]

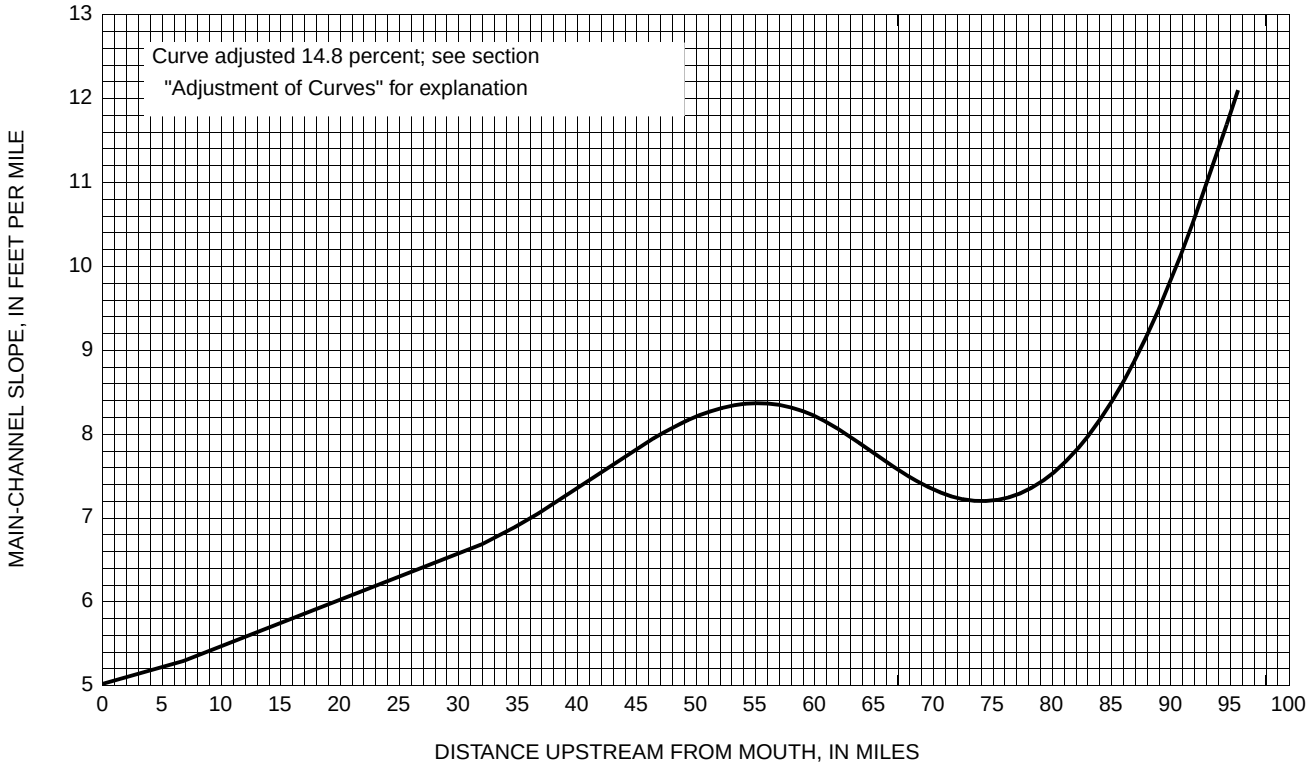
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	592	Mouth of North Fork Maquoketa River	84N 2E 13 NE	--
0.27	592	Rockdale Road (05418470, --)	84N 2E 13 NE	Rockdale Rd
5.93	--	212th Avenue	85N 3E 30 SE	212th Ave
8.24	516	U.S. Highway 61, Fulton (05418450, cont)	85N 2E 25 NE	--
12.37	505	County Road E17 (05418400, cont)	85N 2E 16 SE	150th St
16.94	--	109th Avenue	85N 2E 7 SE	109th Ave
22.12	358	60th Avenue	85N 1E 10 SW	60th Ave
29.40	343	Jackson-Jones County line	86N 1E 31 NW	--
44.24	207	Jones-Dubuque County line	86N 1W 6 NW	--
44.58	--	U.S. Highway 151, Cascade	87N 1W 31 SW	1st Ave W
47.50	196	State Highway 136 (05418150, --)	87N 2W 26 NW	--
57.30	168	Delaware-Dubuque County line	87N 2W 18 SW	--
62.33	158	Dubuque-Delaware County line	87N 2W 6W	--
63.90	152	County Road D35 (05418120, --)	88N 3W 36 NE	272nd St
69.41	125	Delaware-Dubuque County line	88N 3W 12 E	--
71.52	122	U.S. Highway 20, Dyersville (05418110, --)	88N 2W 6 NW	--

Figure 83. North Fork Maquoketa River, beginning at mouth in Jackson County.

List of sites used to quantify main-channel slopes of the North Fork Maquoketa River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
72.57	80.2	1st Avenue West, Dyersville (05418100, low)	89N 2W 31 NW	1st Ave W
79.15	36.0	Vaske Road	89N 2W 7 W	Vaske Rd
80.67	28.6	State Highway 136, New Vienna	89N 2W 5 SW	Columbus St
96.61	--	Drainage divide	--	--

Figure 83. North Fork Maquoketa River, beginning at mouth in Jackson County—Continued.



List of sites used to quantify main-channel slopes of the North River
[See section "Presentation of Curves" for explanation of list elements]

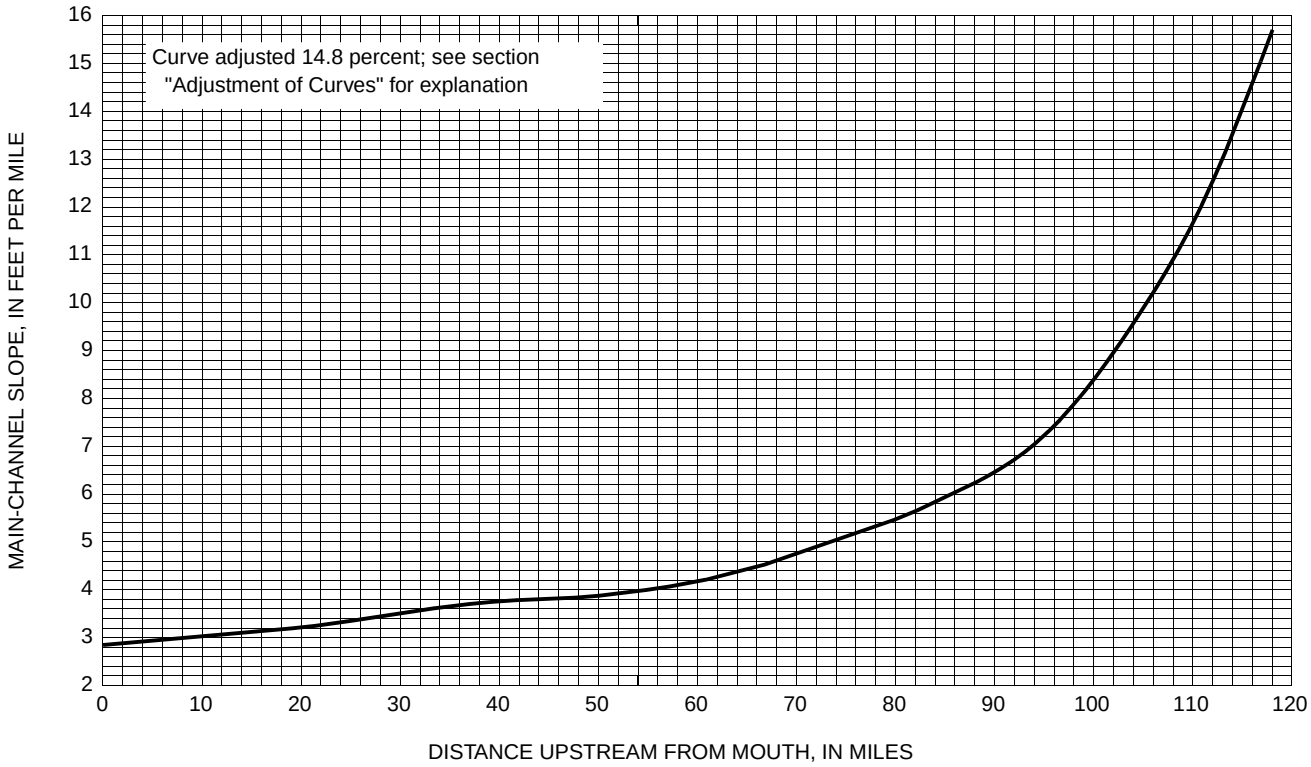
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	400	Mouth of North River	78N 23W 36 SE	--
4.06	--	Polk-Warren County line, Carlisle	78N 23W 34 SW	--
4.98	--	State Highway 5	77N 23W 4 N	--
9.03	387	U.S. Highways 65 and 69	77N 24W 12 SE	--
15.99	--	100th Avenue	77N 24W 22 NW	100th Ave
22.83	349	County Road R57 (05486000, cont)	77N 24W 20 SW	Hwy R57
26.27	--	State Highway 28	77N 25W 25 N	--
31.53	--	County Road R45	77N 25W 34 NW	43rd Ave
36.60	--	Interstate 35	76N 25W 6 C	--
37.44	265	Warren-Madison County line, County Road R35	76N 25W 6 NW	10th Ave
40.61	--	Windwood Trail	76N 26W 11 NW	Windwood Trl
45.81	--	Upland Trail	76N 26W 9 NW	Upland Trl
50.50	203	County Road R16 (05485900, low)	77N 27W 36 NW	Quail Ridge Ave
53.96	--	McBride Trail	76N 27W 3 NE	McBride Trl
59.77	116	U.S. Highway 169	76N 28W 12 NE	--
65.67	102	Ironwood Trail	76N 28W 10 SW	Ironwood Trl

Figure 84. North River, beginning at mouth in Polk County.

List of sites used to quantify main-channel slopes of the North River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
71.73	--	County Road P57	76N 29W 12 SW	Earlham Rd
78.66	68.9	County Road P53 (05485700, low)	76N 29W 9 NE	Pitzer Rd
85.01	55.9	Madison-Adair County line	77N 29W 31 SW	Adair-Madison Ave
90.78	26.4	County Road P28	77N 30W 28 SW	Stuart Rd
95.65	17.5	Sheldon Avenue	77N 30W 18 SW	Sheldon Ave
106.62	--	Drainage divide	--	--

Figure 84. North River, beginning at mouth in Polk County—Continued.



List of sites used to quantify main-channel slopes of the North Skunk River
[See section "Presentation of Curves" for explanation of list elements]

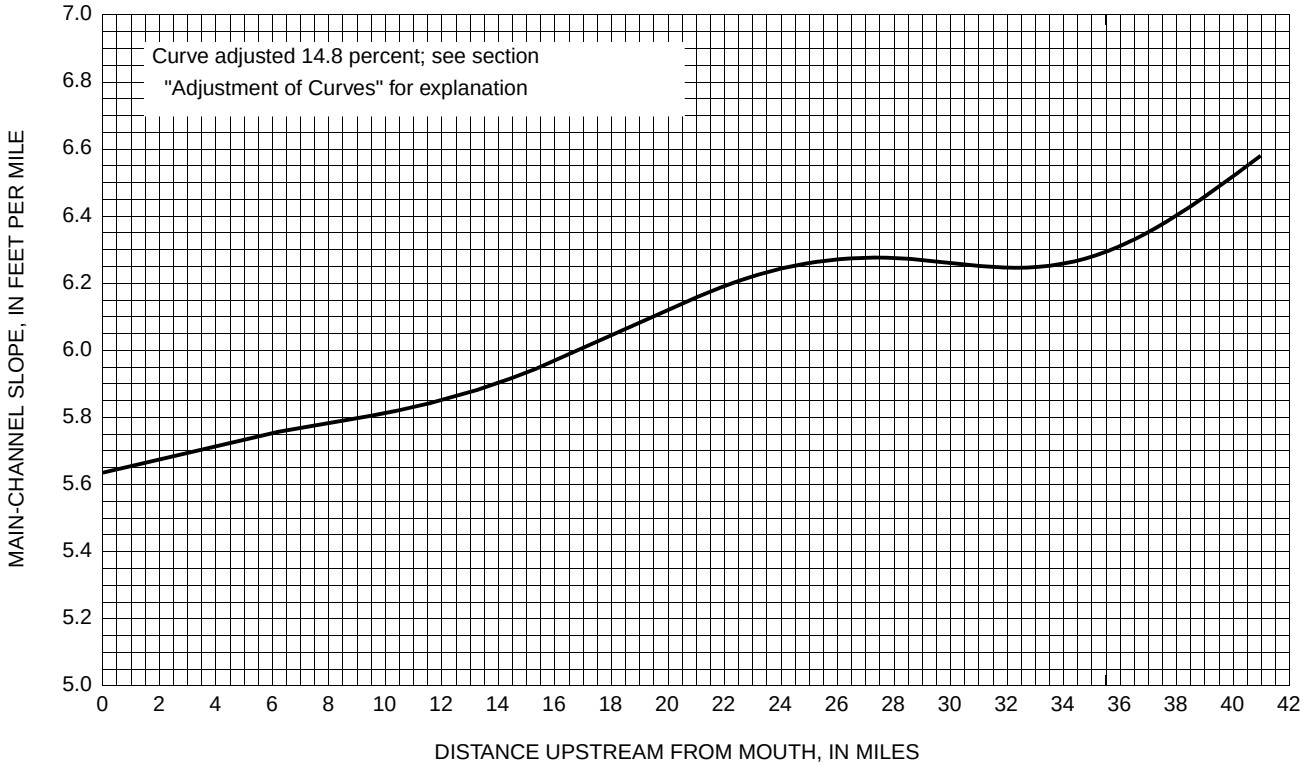
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	869	Mouth of North Skunk River	74N 10W 5 NE	--
3.62	--	County Road V57	75N 10W 30 SW	280th Ave
7.55	--	265th Avenue	75N 11W 26 NW	265th Ave
19.60	730	State Highway 149 (05472500, cont)	75N 12W 14 SE	--
25.66	--	180th Avenue	75N 12W 21 SW	180th Ave
33.80	621	State Highway 21	75N 13W 14 NW	--
40.34	606	Keokuk-Mahaska County line	75N 13W 6 SW	--
41.28	--	State Highway 92	75N 14W 1 NE	--
48.13	529	185th Street	76N 14W 15 SE	185th St
53.61	--	County Road V13	77N 14W 33 SW	Urbana Ave
57.27	--	Snyder Avenue	77N 14W 30 NE	Snyder Ave
63.44	443	County Road T65 (05472350, --)	77N 15W 22 NE	Parkin Ave
65.61	--	U.S. Highway 63	77N 15W 16 SE	--

Figure 85. North Skunk River, beginning at mouth in Keokuk County.

List of sites used to quantify main-channel slopes of the North Skunk River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
72.72	384	Mahaska-Poweshiek County line, State Highway 146	77N 16W 1 N	--
76.49	358	40th Street (05472300, low)	78N 16W 27 SW	40th St
80.84	287	Poweshiek-Jasper County line	78N 16W 18 W	--
82.01	--	State Highway 225	78N 17W 12 C	--
86.34	250	South 68th Avenue East	79N 17W 34 N	S 68th Ave E
92.27	180	South 12th Avenue East (05472200, --)	79N 17W 5 NW	S 12th Ave E
92.72	--	Interstate 80	80N 17W 31 SE	--
93.76	--	U.S. Highway 6	80N 17W 30 SW	--
95.07	--	State Highway 224, Kellogg	80N 18W 25 SW	East St
99.28	122	East 76th Street North	80N 18W 9 SW	E 76th St N
104.09	101	Clay Street (05472100, low)	81N 19W 35 NW	Clay St
106.64	52.5	State Highway 14	81N 19W 22 NW	--
106.95	52.2	County Road F17 (05472090, csg)	81N 19W 21 NE	Hwy 223 W
112.03	36.8	Jasper-Marshall County line, North 115th Avenue West	81N 19W 6 NW	N 115th Ave W
118.04	--	State Highway 330	82N 20W 14NW	--
125.21	--	Des Moines Lobe landform region boundary	83N 20W 20 NE	--
129.65	--	Drainage divide	--	--

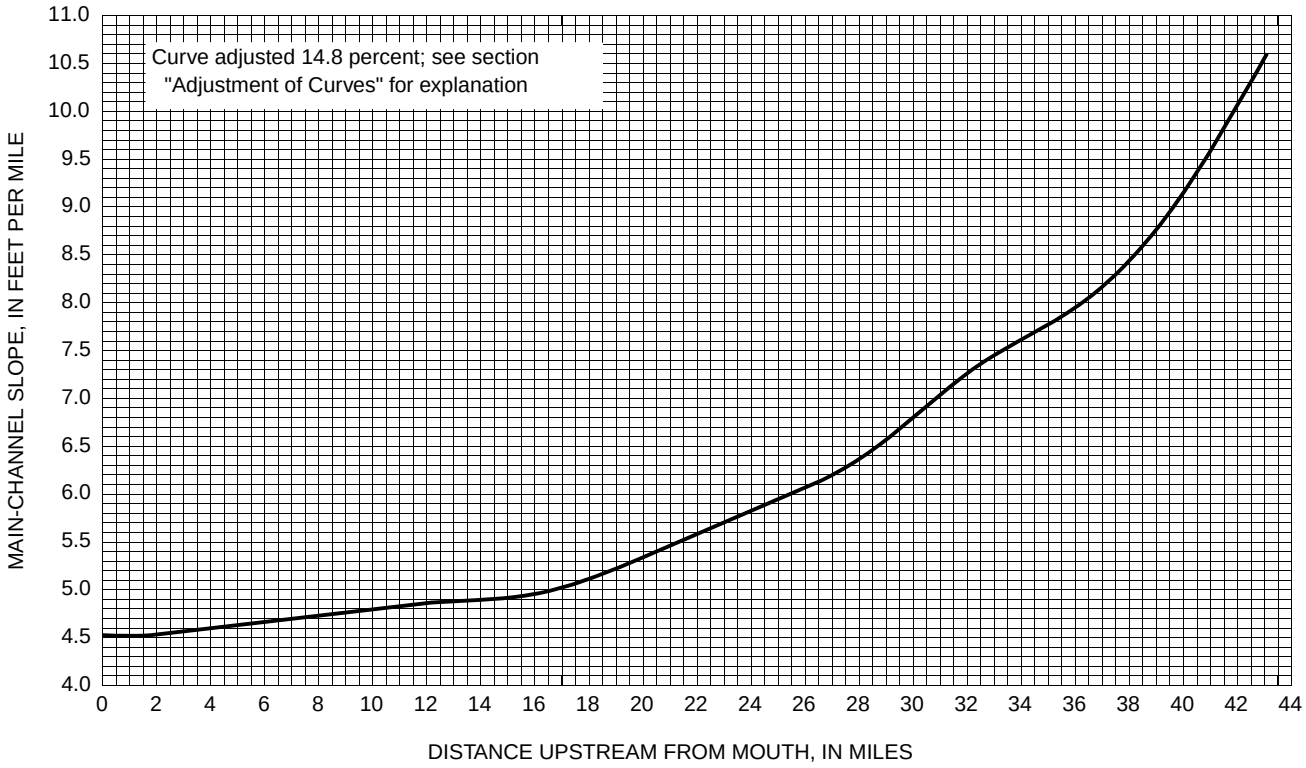
Figure 85. North Skunk River, beginning at mouth in Keokuk County—Continued.



List of sites used to quantify main-channel slopes of the Ocheyedan River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	434	Mouth of Ocheyedan River, Spencer	96N 37W 13 NE	--
4.88	426	County Road M38 (06605000, cont)	96N 37W 15 SW	190th Ave
8.37	417	350th Street	96N 37W 18 NE	350th St
12.87	300	County Road M27	96N 38W 10 W	130th Ave
16.83	--	U.S. Highway 18	97N 38W 31 NE	--
20.34	249	Clay-O'Brien County line	97N 38W 7 SW	--
22.94	229	O'Brien-Osceola County line	98N 39W 35 SW	--
24.32	226	260th Street (06604700, low)	98N 39W 34 NW	260th St
28.25	160	County Road M12, May City	98N 39W 8 SW	230th St
32.84	121	County Road A30	99N 40W 35 NE	200th St
34.61	--	Hydrologic Regions 1 and 2, and Des Moines Lobe landform region boundaries	99N 40W 23 SW	--
36.67	99.2	County Road A22	99N 40W 16 NE	170th St
40.98	73.5	State Highway 9 (06604510, csg)	99N 40W 6 NE	--
68.29	--	Drainage divide	--	--

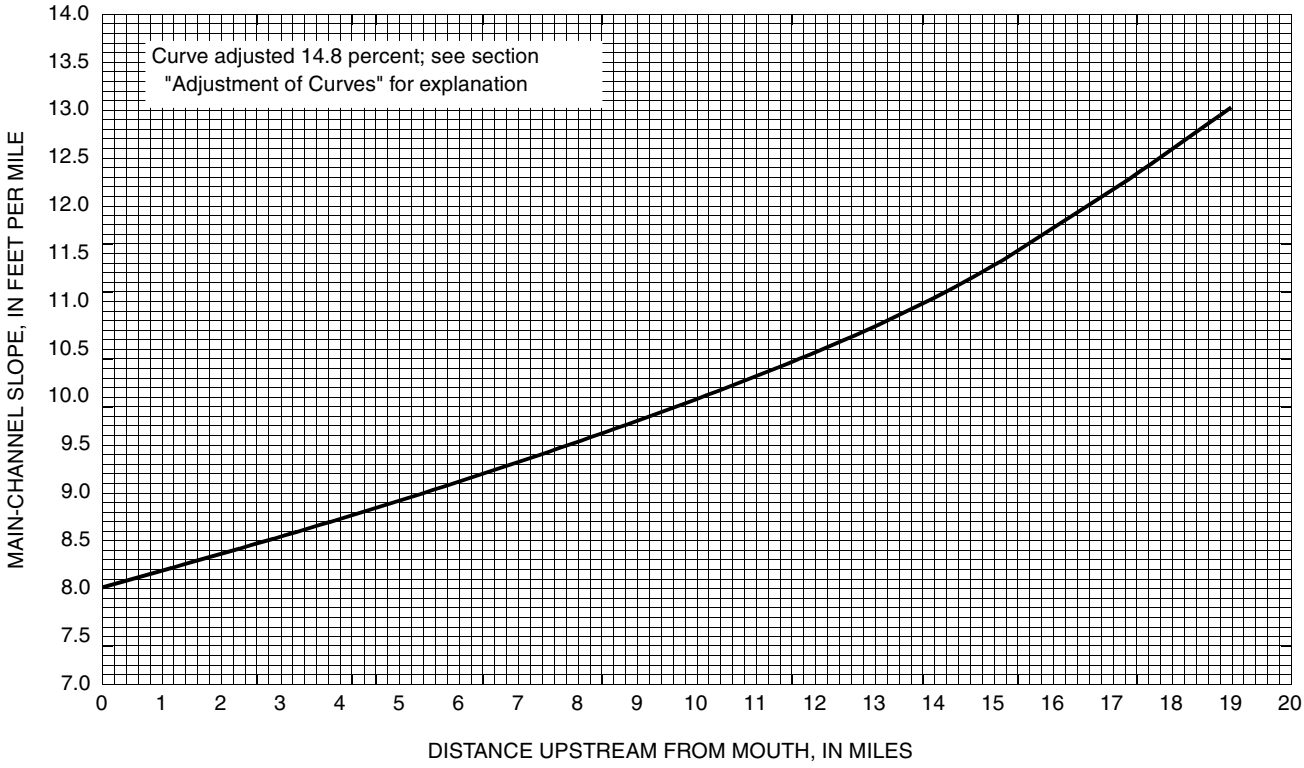
Figure 86. Ocheyedan River, beginning at mouth in Clay County.



List of sites used to quantify main-channel slopes of Old Mans Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	248	Mouth of Old Mans Creek	78N 6W 27 NE	--
1.10	247	State Highway 923 (05455130, --)	78N 6W 21 SE	--
1.34	--	U.S. Highway 218	78N 6W 21 SE	--
3.14	219	County Road F62 (05455120, --)	78N 6W 16 W	500th St
8.83	201	County Road W62 (05455100, cont)	79N 7W 36 W	Sharon Center Rd
12.17	180	State Highway 1	79N 7W 33 SE	--
15.82	136	Hazelwood Road	79N 7W 31 SW	Hazelwood Rd
22.51	--	Calkins Avenue	79N 8W 33 SW	Calkins Ave
25.71	119	Johnson-Iowa County line	79N 8W 31 SW	--
28.28	--	W Avenue	79N 9W 34 E	W Ave
32.32	81.2	SS Avenue (05455050, low)	79N 9W 31 SW	SS Ave
36.35	66.9	265th Street	79N 10W 27 E	265th St
39.81	--	State Highway 149, Williamsburg	79N 10W 10 W	Highland St
43.09	23.1	County Road V66	79N 10W 6 SW	M Ave
53.09	--	Drainage divide	--	--

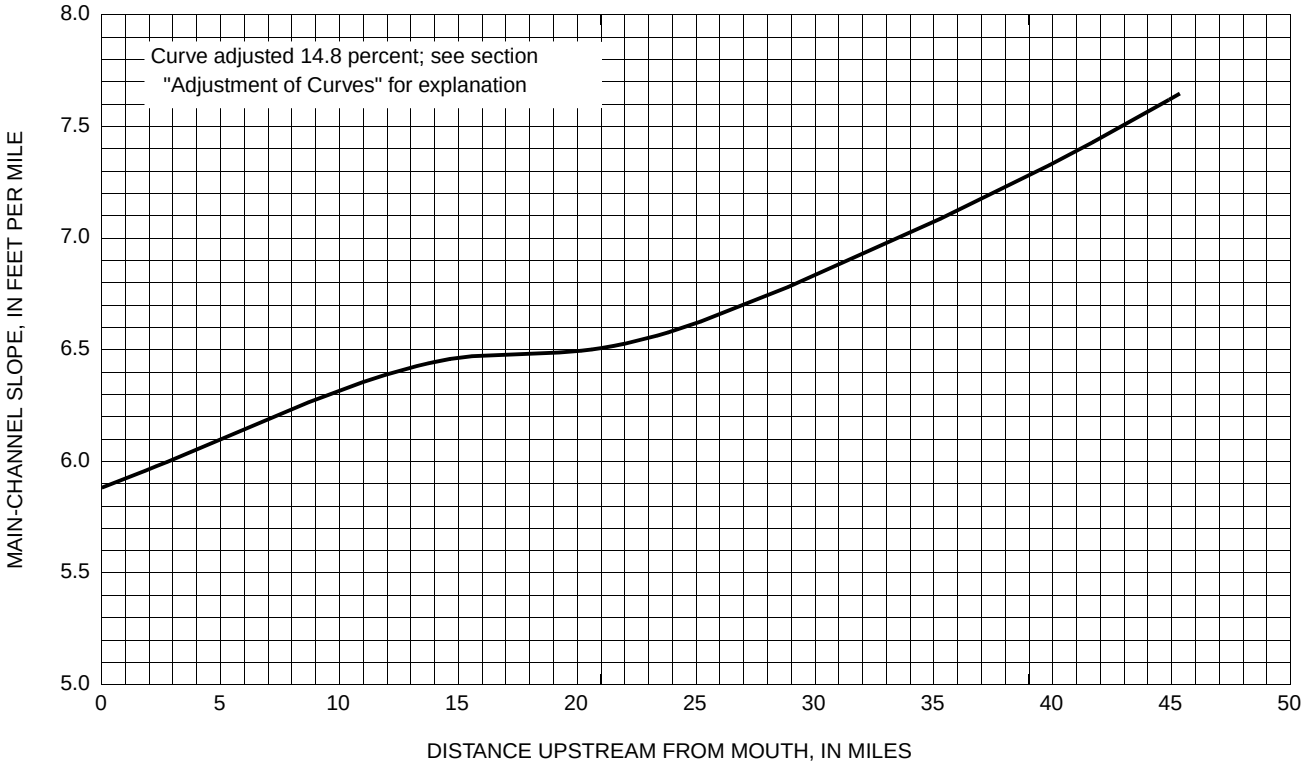
Figure 87. Old Mans Creek, beginning at mouth in Johnson County.



List of sites used to quantify main-channel slopes of Otter Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	107	Mouth of Otter Creek	89N 9W 19 SW	--
4.63	101	Abandoned bridge, 170th Street (05420940, low)	89N 9W 5 SW	170th St
7.82	71.1	150th Street	90N 9W 32 NE	150th St
11.36	55.7	125th Street	90N 9W 16 SE	125th St
14.78	41.3	Buchanan-Fayette County line, State Highway 281	90N 9W 4 N	--
18.99	32.6	40th Street	91N 9W 18 SW	40th St
28.98	--	Drainage divide	--	--

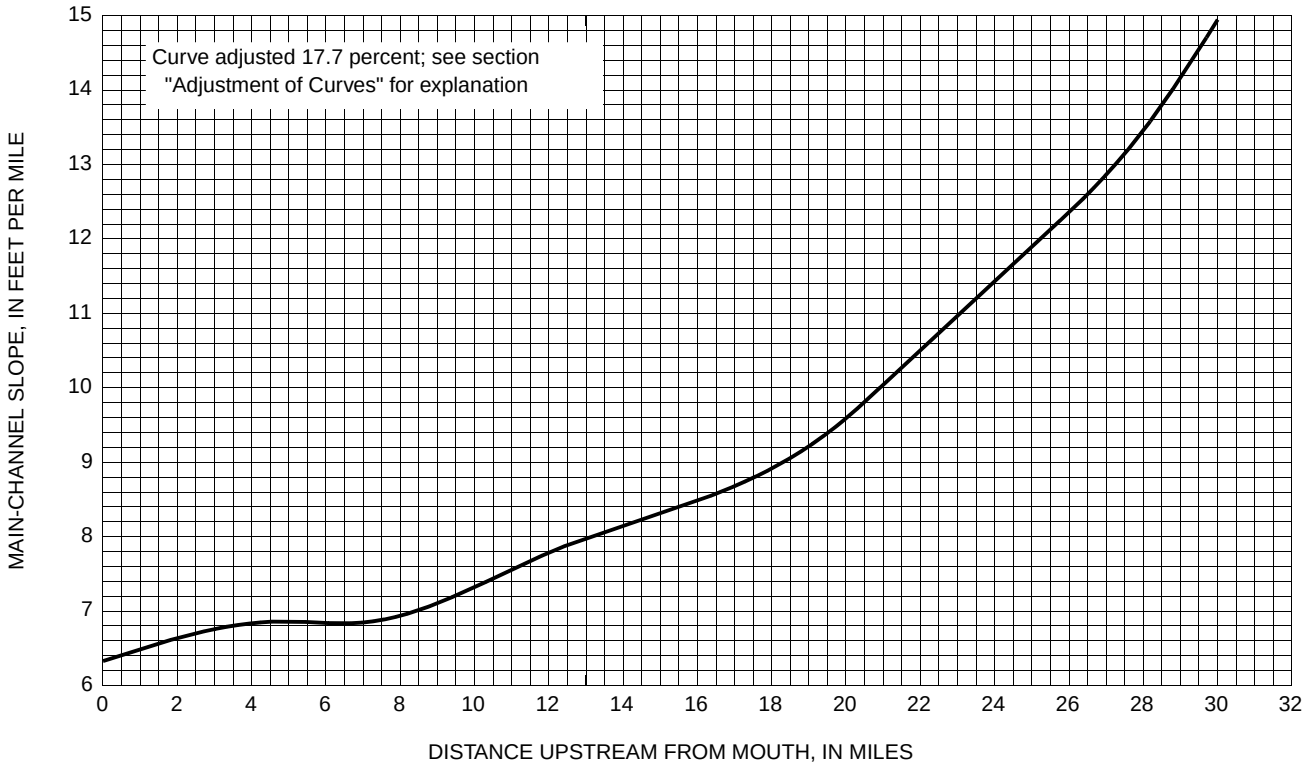
Figure 88. Otter Creek, beginning at mouth in Buchanan County.



List of sites used to quantify main-channel slopes of Otter Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	210	Mouth of Otter Creek	98N 44W 21 NW	--
1.71	208	250th Street (06483480, low)	98N 44W 28 NW	250th St
5.97	194	Lyon-Sioux County line, 270th Street	98N 44W 35 SW	270th St
7.68	--	County Road B14	97N 44W 1 SE	280th St
12.37	--	Sioux-Lyon County line	97N 43W 5 NE	--
15.03	129	Lily Street (06483470, low)	98N 43W 34 NW	Lily St
20.07	120	Lyon-Osceola County line, County Road L26	98N 43W 36 SE	McKinley St
23.90	107	County Road A52	98N 42W 27 NW	250th St
26.89	--	State Highway 60, Ashton	98N 42W 10 SE	--
29.78	88.0	County Roads A34 and L36 (06483460, csg)	98N 42W 1 SW	Olive St
35.25	--	Oriole Street	99N 42W 25 NE	Oriole St
38.64	--	State Highway 60, Sibley	99N 42W 13 S	--
40.35	29.9	County Road A22 (06483430, csg)	99N 42W 14 NE	170th St
45.35	--	State Highway 9	99N 42W 3 N	--
63.35	--	Drainage divide	--	--

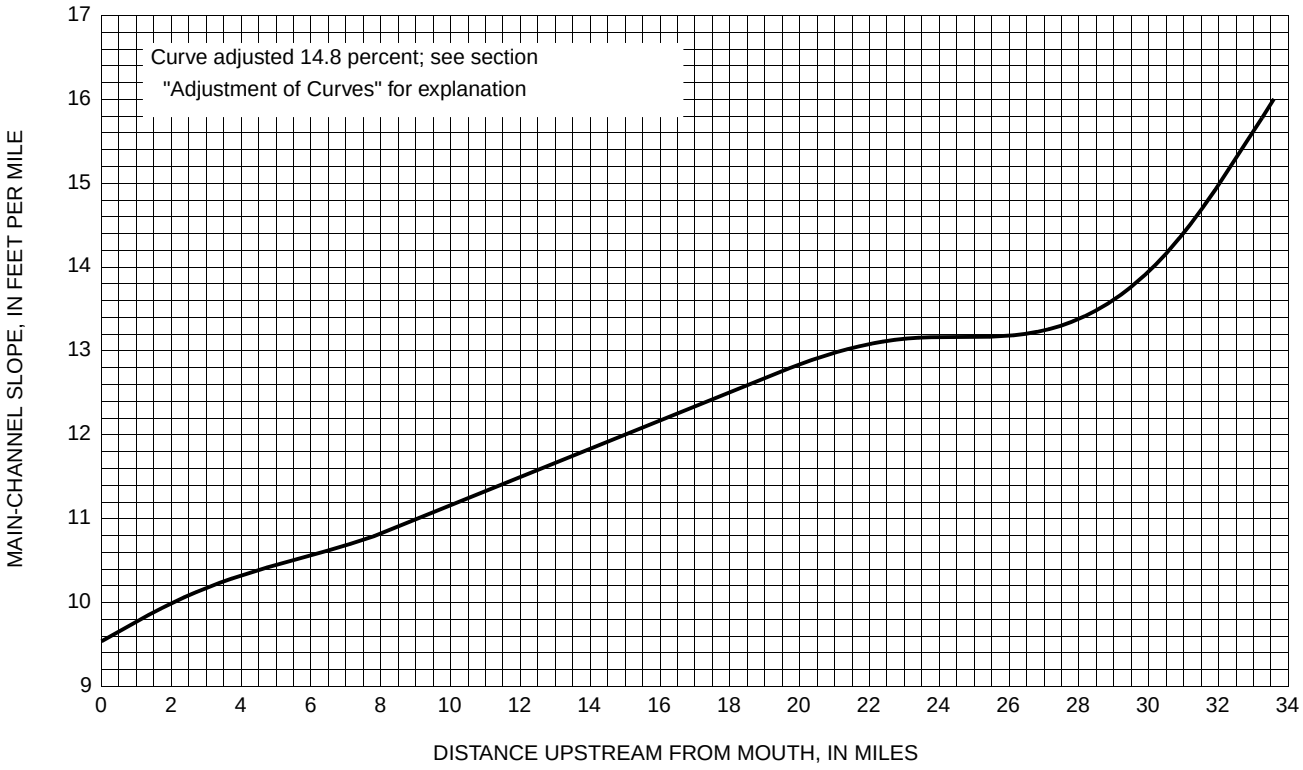
Figure 89. Otter Creek, beginning at mouth in Lyon County.



List of sites used to quantify main-channel slopes of Otter Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	168	Mouth of Otter Creek	76N 23W 34 SW	--
4.79	155	State Highway 205 (05487450, low)	75N 23W 22 NE	--
7.01	138	U.S. Highway 65	75N 23W 34 NW	--
12.17	114	Truman Street	74N 23W 17 SW	Truman St
18.27	104	Warren-Lucas County line, County road	74N 23W 32 SW	--
19.64	102	County Road (05487400, low)	73N 23W 5 S	--
23.17	46.5	Lucas-Clarke County line	73N 23W 6 SW	--
28.09	--	310th Avenue	73N 24W 15 SW	310th Ave
30.00	--	Pacific Street	73N 24W 17 SW	Pacific St
41.37	--	Drainage divide	--	--

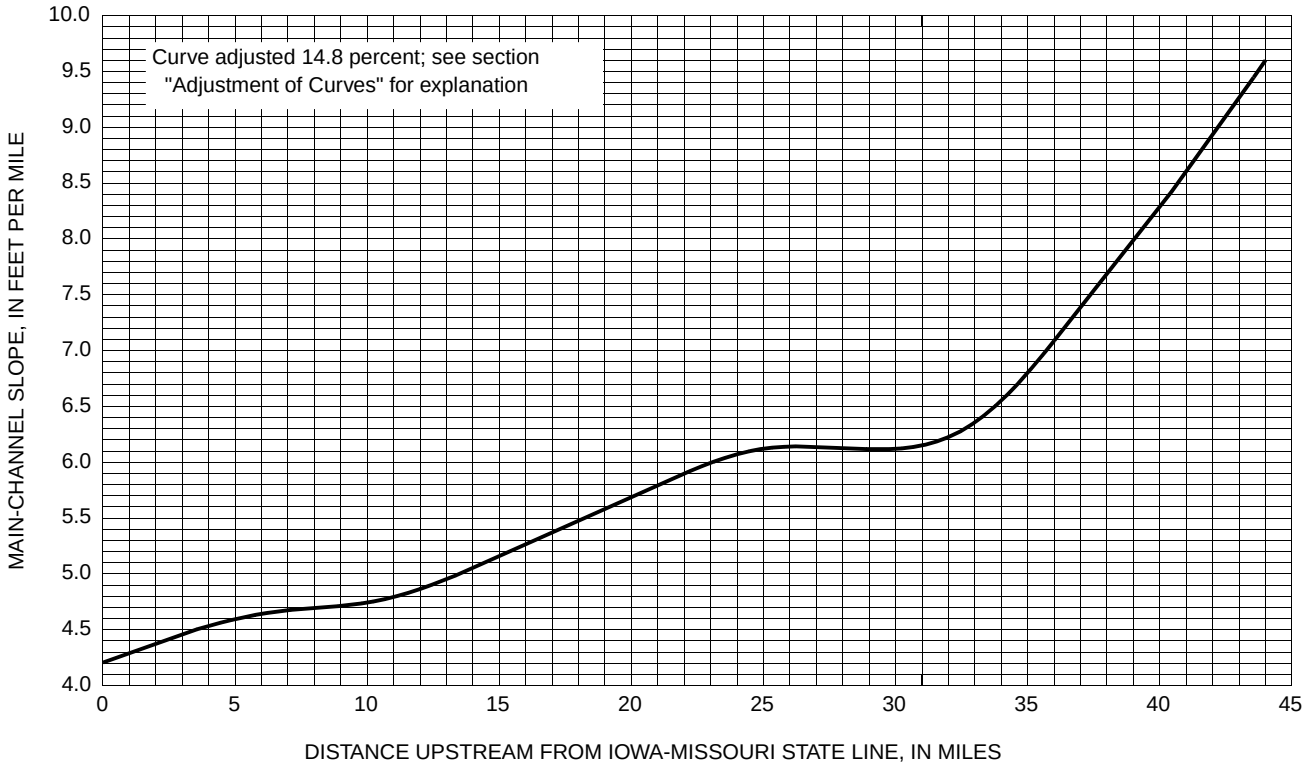
Figure 90. Otter Creek, beginning at mouth in Warren County.



List of sites used to quantify main-channel slopes of Pigeon Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	165	Mouth of Pigeon Creek	75N 44W 3 SE	--
0.91	163	River Road North (06609950, low)	75N 44W 3 NE	River Road N
1.39	--	Interstate 29	76N 44W 34 SE	--
3.12	--	State Highway 988	76N 44W 27 NE	--
7.23	--	State Highway 183	76N 43W 6 SW	--
11.04	--	210th Street	77N 43W 27 NW	210th St
16.27	66.6	County Road G14 (06609900, low)	77N 42W 17 NW	Westgate Rd
18.43	--	Interstate 680	77N 42W 4 C	--
19.10	56.5	Pottawattamie-Harrison County line	77N 42W 4 NE	--
23.14	--	305th Trail	78N 42W 15 NE	305th Trl
26.59	--	Taylor Avenue	78N 42W 2 NE	Taylor Ave
30.49	--	State Highway 44	79N 41W 22 N	--
33.59	--	230th Street	79N 41W 11 NE	230th St
44.08	--	Drainage divide	--	--

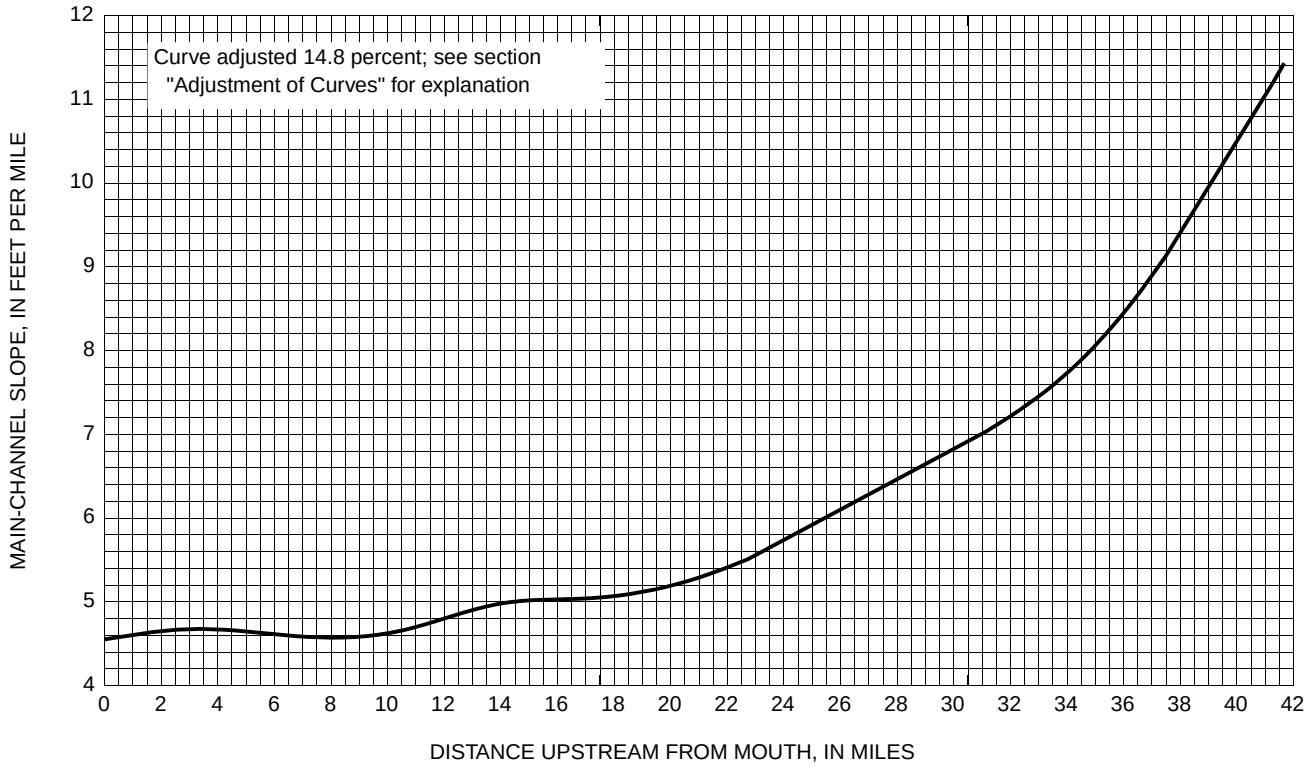
Figure 91. Pigeon Creek, beginning at mouth in Pottawattamie County.



List of sites used to quantify main-channel slopes of the Platte River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	282	Iowa-Missouri State line	67N 32W 28 SW	Missouri-Taylor St
4.19	--	County Road J55, Blockton	67N 32W 12 C	North St
6.75	255	Taylor-Ringgold County line, County Road P14	68N 32W 36 NE	--
10.37	247	County Road J43, Maloy	68N 31W 21 E	Co Rd N
13.04	236	State Highway 2	68N 31W 10 N	--
17.36	217	County road (06818750, cont)	69N 31W 22 NW	--
20.45	211	County Road J23	69N 31W 3 NW	--
24.80	179	County road (06818700, low)	70N 31W 16 NW	--
28.92	103	Ringgold-Union County line, County Road J13	70N 31W 6 NE	--
32.57	92.1	Union-Adams County line, State Highway 25	71N 31W 19 SW	--
34.09	77.9	County Road H45 (06818600, low)	71N 32W 13 SW	250th St
38.40	51.7	U.S. Highway 34 (06818598, csg)	71N 32W 2 E	--
40.40	36.1	Adams-Union County line	72N 32W 36 NE	Adams-Union Ave
44.00	28.1	190th Street	72N 31W 21 NE	190th St
55.55	--	Drainage divide	--	--

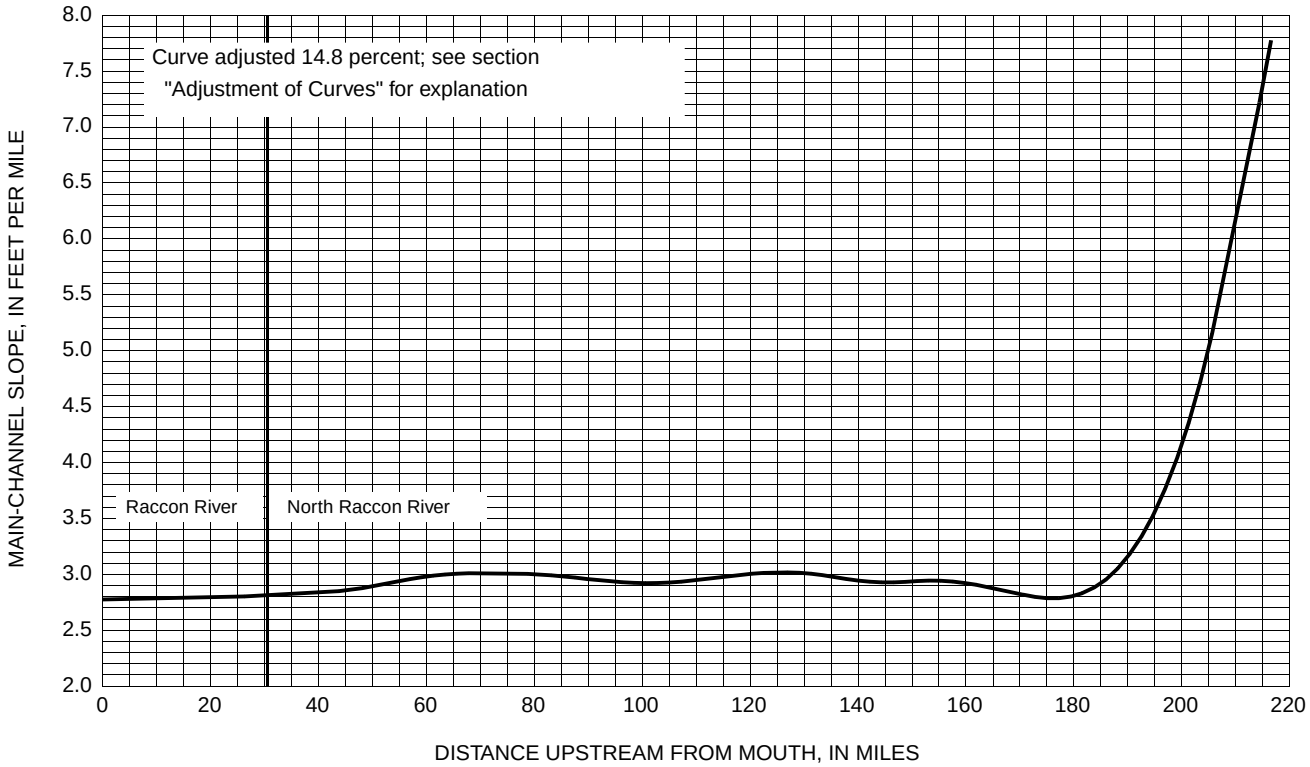
Figure 92. Platte River, beginning at Iowa-Missouri State line in Taylor County.



List of sites used to quantify main-channel slopes of Prairie Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	216	Mouth of Prairie Creek, Cedar Rapids	83N 7W 34 SE	--
2.59	--	Interstate 380, Cedar Rapids	82N 7W 4 SW	--
3.18	208	6th Street, Cedar Rapids (05464650, low)	82N 7W 9 NW	--
5.16	--	U.S. Highway 30, Cedar Rapids	82N 7W 6 SE	Lincoln Freeway
7.22	196	Old Bridge Road	82N 8W 12 SW	Old Bridge Rd
10.51	178	U.S. Highway 151, Fairfax (05464640, cont)	82N 8W 9 SW	Williams Blvd
13.94	171	Linn-Benton County line	82N 8W 7 SW	Linn Benton Rd
17.24	--	32nd Avenue	82N 9W 14 SE	32nd Ave
22.03	126	28th Avenue (05464600, low)	82N 9W 30 NW	28th Ave
28.07	--	County Road E66 (05464580, qw)	82N 10W 20 NW	77th Ave
30.31	87.0	State Highway 82, Blairstown (05464560, csg)	82N 11W 13 SW	Locust St
34.81	64.2	County Road E58 (05464550, low)	82N 11W 9 NE	75th St
37.32	--	U.S. Highway 30	83N 11W 32 NE	--
41.67	--	5th Avenue, Keystone	83N 12W 14 SW	5th Ave
48.41	--	Drainage divide	--	--

Figure 93. Prairie Creek, beginning at mouth in Linn County.



List of sites used to quantify main-channel slopes of the Raccoon and North Raccoon Rivers
[See section "Presentation of Curves" for explanation of list elements]

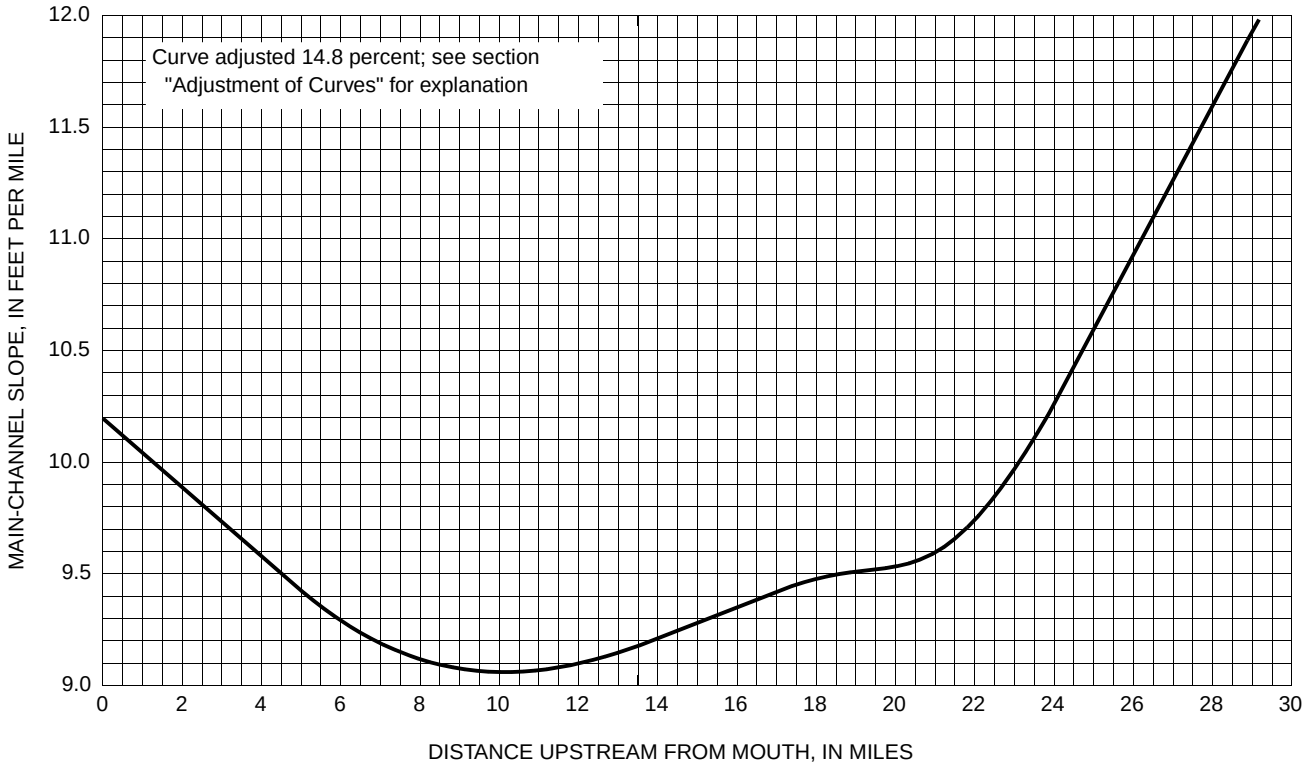
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	3,629	Mouth of Raccoon River, Des Moines	78N 24W 10 NW	--
2.56	3,625	Fleur Drive, Des Moines (05484900, cont)	78N 24W 8 NE	Fleur Dr
8.60	3,529	State Highway 28, Des Moines (05484650, cont)	78N 25W 14 NE	63rd St
13.95	--	Interstate 35, West Des Moines	78N 25W 30 SE	--
15.66	3,498	Polk-Dallas County line	78N 25W 30 NW	--
24.38	--	County Road F90, Booneville	78N 26W 30 SE	360th St
29.32	3,441	County Road R16, Van Meter (05484500, cont)	78N 27W 22 SW	Richland Rd
30.46	2,298	Mouth of North Raccoon River	78N 27W 21 NW	--
30.55	--	Interstate 80	78N 27W 21 NW	--
30.56	--	Des Moines Lobe landform region boundary	78N 27W 21 NW	--
39.84	2,281	U.S. Highway 6, Adel (05483305, --)	79N 27W 32 NE	--
44.07	--	U.S. Highway 169	79N 27W 20 SW	--
49.70	2,242	State Highway 44	79N 27W 6 NE	--
54.87	2,229	County Road F31	80N 28W 13 NE	Minburn Rd
60.26	--	County Road P58	81N 28W 34 NW	J Ave
64.49	2,169	State Highway 141 (05483300, qw)	81N 28W 8 C	--

Figure 94. Raccoon and North Raccoon Rivers, beginning at mouth of Raccoon River in Polk County.

List of sites used to quantify main-channel slopes of the Raccoon and North Raccoon Rivers—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
69.14	--	Between Dallas-Greene/Greene-Dallas Co. lines	82N 29W 36 SE	--
73.17	--	County Road P46, Dawson	81N 29W 3 SW	D Ave
75.37	2,045	Dallas-Greene County line	81N 29W 5 N	--
80.62	2,027	County Road E57	82N 29W 18 SW	305th
85.00	--	County Road P30	83N 30W 36 SW	R Ave
92.61	1,619	State Highway 4 (05482500, cont)	83N 30W 20 NW	--
96.71	1,596	County Road E53	83N 31W 11 SW	237th
101.60	--	U.S. Highway 30	83N 31W 4 NW	--
106.89	1,552	County Road E33	84N 32W 23 SE	Eaton Ave
111.53	--	County Road N65	84N 32W 10 SW	D Ave
117.06	--	175th	84N 32W 8 NW	175th
120.00	1,355	Greene-Carroll County line, County Road N58	84N 32W 18 NW	A Ave
124.12	--	County Road N50	84N 33W 3 NE	162nd St
128.38	1,256	County Road E19	85N 33W 21 SE	Velvet Ave
131.24	1,225	State Highway 286 (05482430, qw)	85N 33W 17 SW	--
135.49	1,182	Sac-Calhoun County line	85N 33W 6 N	--
138.47	--	County Road N37	86N 34W 25 SW	Janesville Ave
144.88	1,003	State Highway 175 (05482400, low)	86N 34W 17 E	--
147.82	852	Calhoun-Sac County line, County Road N28	86N 34W 6 SW	Dakota Ave
152.69	--	Xenia Avenue	86N 35W 11 NW	Xenia Ave
157.10	822	Wadsley Avenue	86N 35W 4 NE	Wadsley Ave
161.76	807	State Highway 196	87N 35W 29 NW	--
163.44	804	Taylor Avenue (05482340, --)	87N 36W 24 SE	Taylor Ave
166.37	700	County Road D46 (05482300, --)	87N 36W 13 NW	300th St
168.95	697	County Road D42	87N 36W 1 NW	280th St
169.83	--	Sierra Avenue (05482260, --)	88N 36W 36 NW	Sierra Ave
172.43	349	U.S. Highway 20, Sac City	88N 36W 24 W	E Main St
177.74	333	230th Street	88N 36W 11 NW	230th St
179.78	326	215th Street	89N 35W 31 SE	215th St
186.20	314	County Road D15	89N 36W 24 N	190th St
190.95	287	Sac-Buena Vista County line, 160th Street	89N 36W 1 NE	160th St
196.54	233	State Highway 7 (05482135, cont)	90N 36W 24 NW	--
201.09	--	County Road C49	91N 36W 36 NW	590th St
204.82	164	560th Street (05482120, low)	91N 36W 15 NE	560th St
208.66	--	State Highway 3	92W 36W 33 N	--
210.77	77.4	510th Street (05482100, low)	92N 36W 21 NE	510th St
216.56	--	County Road W50	93N 36W 34 SW	160th St
220.67	--	Hydrologic Regions 1 and 2 boundary	93N 35W 30 NW	--
228.02	--	Drainage divide	--	--

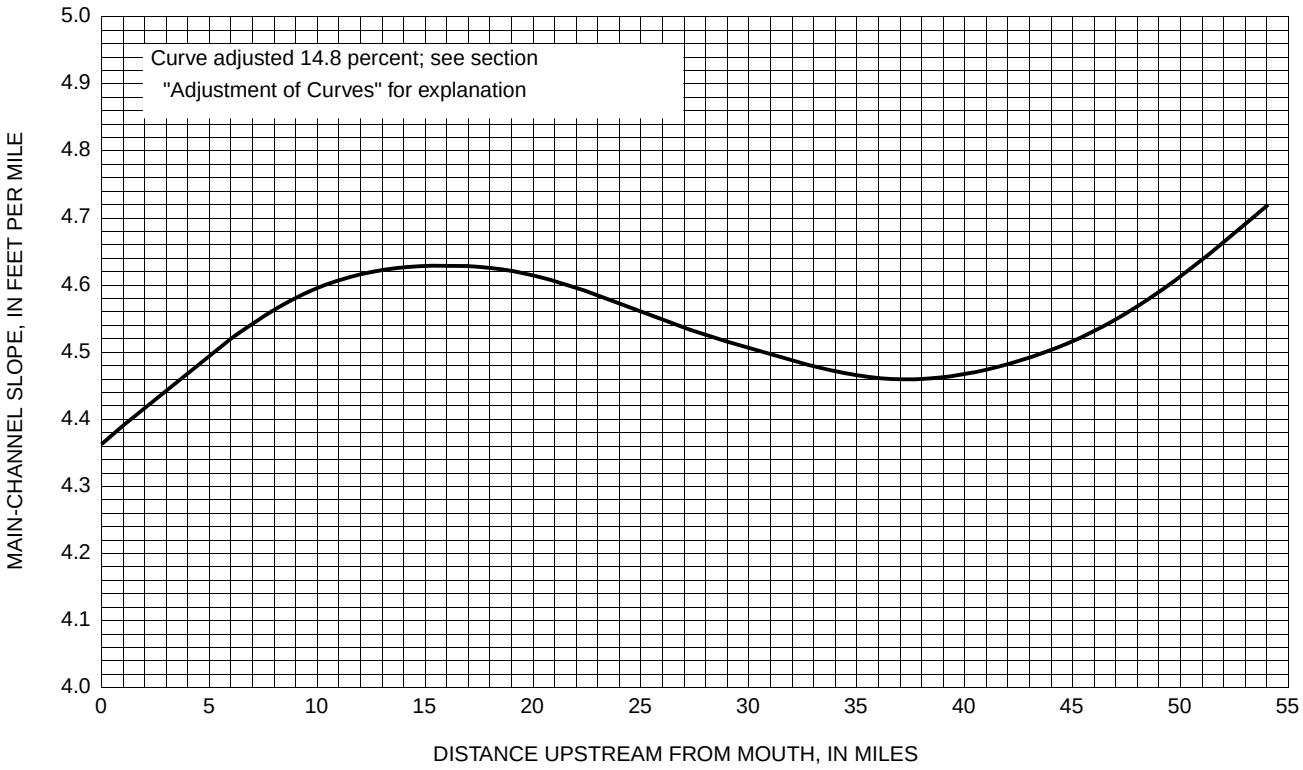
Figure 94. Raccoon and North Raccoon Rivers, beginning at mouth of Raccoon River in Polk County—Continued.



List of sites used to quantify main-channel slopes of Roberts Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	140	Mouth of Roberts Creek	93N 5W 25 SE	--
3.39	--	State Highway 13	93N 5W 13 NW	--
5.78	111	County Road X28	93N 5W 2 SE	Fawn Hollow Rd
11.00	101	County Road B65, St. Olaf (05412150, low)	94N 5W 25 SW	205th St
11.22	70.7	County Road X28, St. Olaf (05412100, cont)	94N 5W 25 NW	Main St
16.87	65.2	Farm field lane (05412093, qw)	94N 5W 14 SW	--
17.64	64.3	County Road B60 (05412092, qw)	94N 5W 15 SE	Farmersburg Rd
18.81	63.6	Essex Avenue (05412090, --)	94N 5W 15 N	Essex Ave
21.10	61.8	County Road X16 (05412080, qw)	94N 5W 16 N	Eagle Ave
22.50	30.4	Dolphin Avenue (05412050, qw)	94N 5W 17 NE	Dolphin Ave
25.82	28.8	Dave Avenue (05412048, qw)	94N 5W 8 SW	Dave Ave
27.33	26.0	172nd Street (05412046, qw)	94N 5W 7 NW	172nd St
29.17	18.2	County Road W70 (05412040, qw)	94N 6W 1 SW	165th St
41.78	--	Drainage divide	--	--

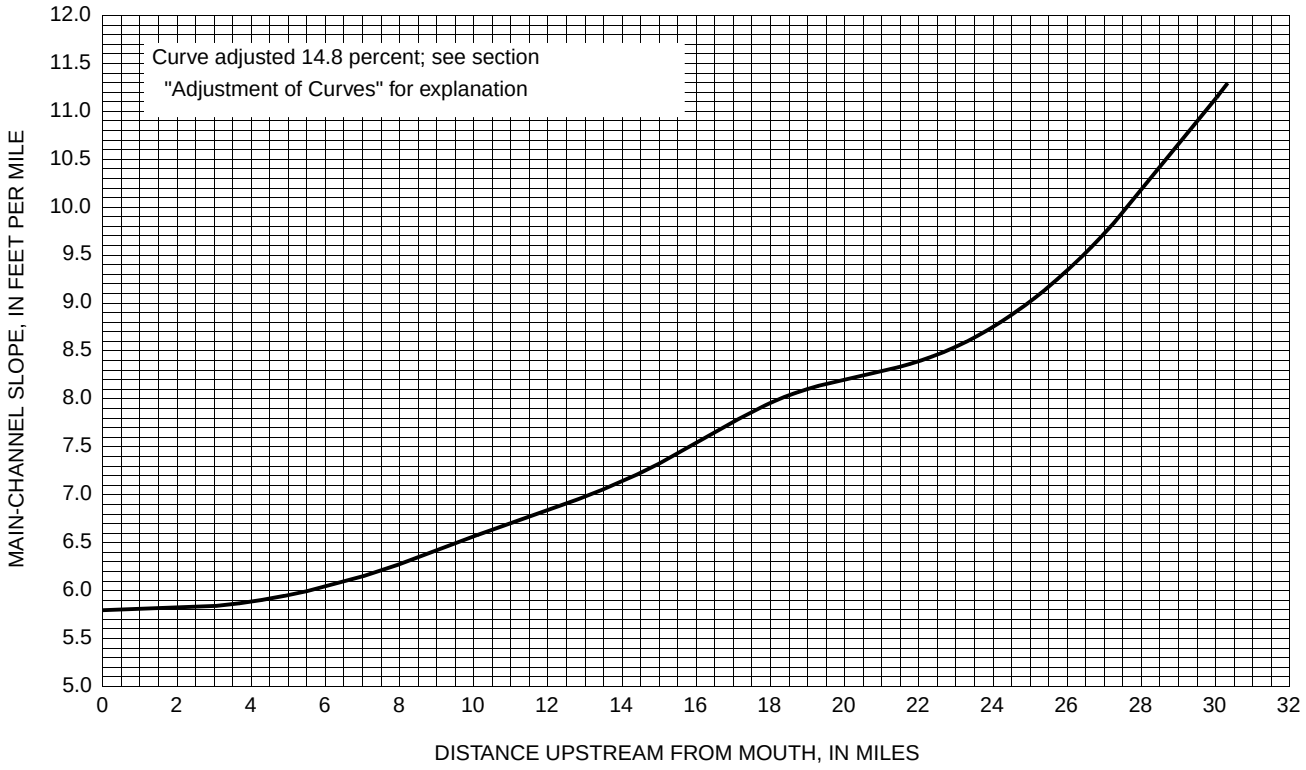
Figure 95. Roberts Creek, beginning at mouth in Clayton County.



List of sites used to quantify main-channel slopes of the Rock River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	1,688	Mouth of Rock River	95N 48W 1 NE	--
0.67	1,688	390th Street (06483600, --)	95N 47W 6 NW	390th St
6.54	1,681	County Road B30 (06483550, --)	96N 47W 16 SE	360th St
9.21	1,673	County Road B20	96N 47W 3 SW	340th St
15.55	1,600	U.S. Highway 18	97N 47W 25 NE	--
19.38	1,592	County Road K30, Rock Valley (06483500, cont)	97N 46W 16 SW	Elwood Ave
26.43	1,526	Sioux-Lyon County line	97N 46W 2 NW	--
27.58	1,050	County Road A52 (06483340, low)	98N 46W 35 NW	260th St
30.10	--	County Road K42	98N 46W 23 NE	Garfield St
36.59	--	U.S. Highway 75	99N 45W 32 SE	--
43.14	859	County Road A22 (06483300, low)	99N 45W 15 NW	170th St
44.83	853	USGS gage, Rock Rapids (06483290, cont)	99N 45W 4 SE	--
46.04	851	State Highway 9	99N 45W 4 NE	1st Ave/Main St
46.49	788	Discontinued USGS gage, Rock Rapids (06483270, cont)	100N 45W 33 SW	--
49.25	--	County Road A16	100N 45W 20 SE	Harding St
54.06	558	Iowa-Minnesota State line (06483100, low)	100N 45W 8 NE	--
147.63	--	Drainage divide	--	--

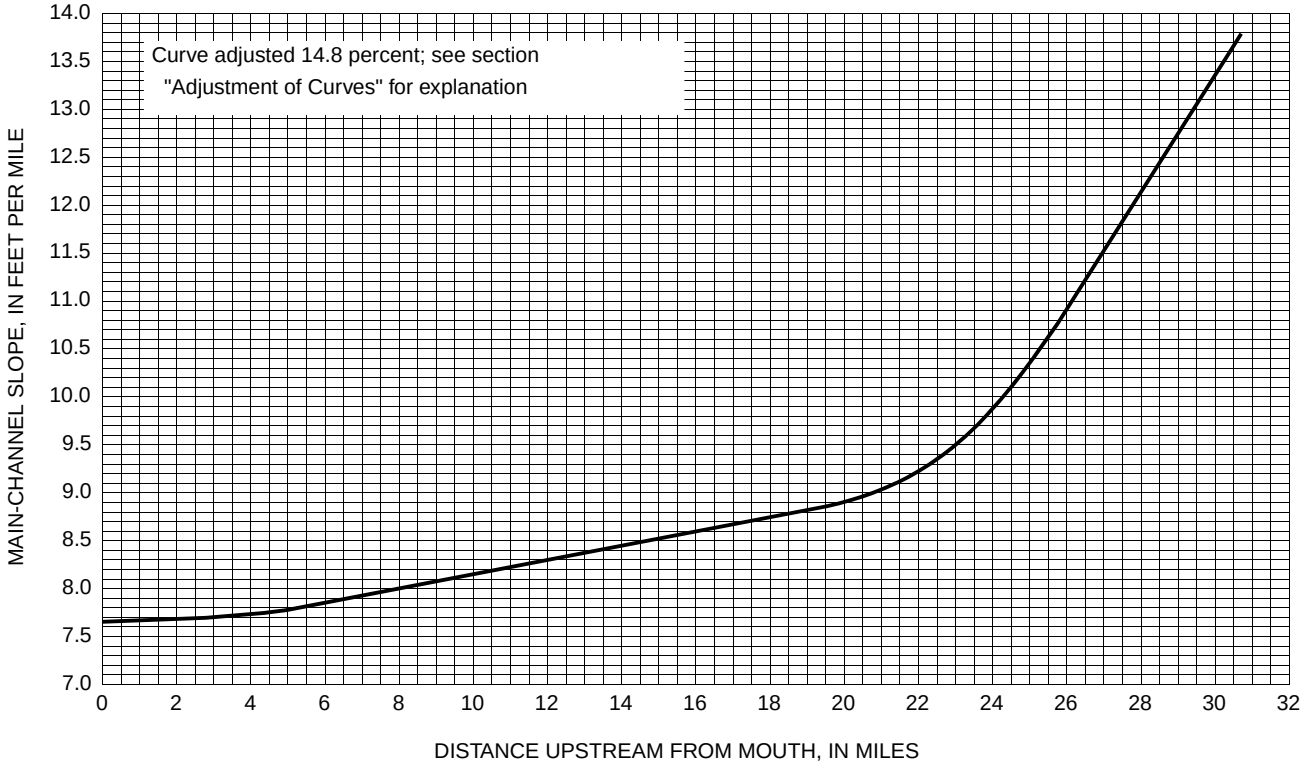
Figure 96. Rock River, beginning at mouth in Sioux County.



List of sites used to quantify main-channel slopes of Salt Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	223	Mouth of Salt Creek	82N 12W 31 SW	--
0.36	--	Benton-Tama County line	82N 12W 31 W	--
2.82	217	380th Street, Belle Plaine (05452020, qw)	82N 13W 25 NE	380th St
8.02	--	340th Street	82N 13W 1 N	340th St
9.98	201	U.S. Highway 30 (05452000, cont)	83N 13W 36 NW	--
15.02	167	County Road E44	83N 13W 15 N	Hwy E44
18.42	85.2	V Avenue (05451930, low)	84N 13W 33 SE	V Ave
22.07	49.6	County Road V18	84N 13W 29 NW	Hwy V18
26.33	33.4	R Avenue	84N 14W 12 NW	R Ave
30.32	22.1	PP Avenue	85N 14W 34 N	PP Ave
42.09	--	Drainage divide	--	--

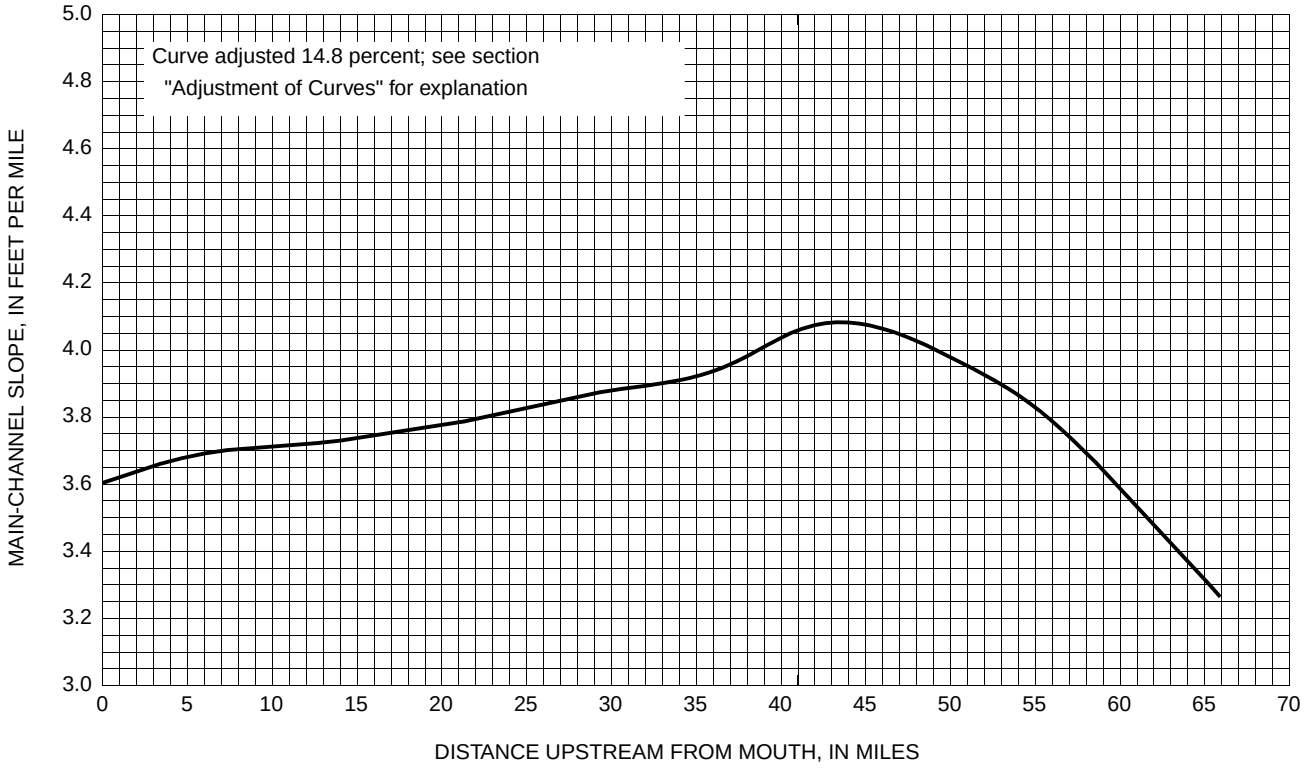
Figure 97. Salt Creek, beginning at mouth in Benton County.



List of sites used to quantify main-channel slopes of Sevenmile Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	124	Mouth of Sevenmile Creek	73N 36W 33 NW	--
0.28	124	T Avenue (06816400, low)	73N 36W 33 NW	T Ave
5.56	96.3	Montgomery-Cass County line, County Road N16	73N 36W 6 NE	100th St
10.69	84.7	State Highway 92	74N 36W 7 NE	--
14.33	60.8	U.S. Highway 71 and State Highway 92 (06816350, low)	75N 36W 33 SE	--
18.03	--	660th Street	75N 35W 31 SW	660th St
19.63	--	State Highway 92	75N 35W 32 NW	--
23.64	36.5	County Road N28	75N 35W 15 SW	690th St
27.27	29.3	Newport Road	75N 35W 11 NE	Newport Rd
30.70	--	Memphis Road	75N 34W 6 NE	Memphis Rd
39.68	--	Drainage divide	--	--

Figure 98. Sevenmile Creek, beginning at mouth in Montgomery County.



List of sites used to quantify main-channel slopes of the Shell Rock River
[See section "Presentation of Curves" for explanation of list elements]

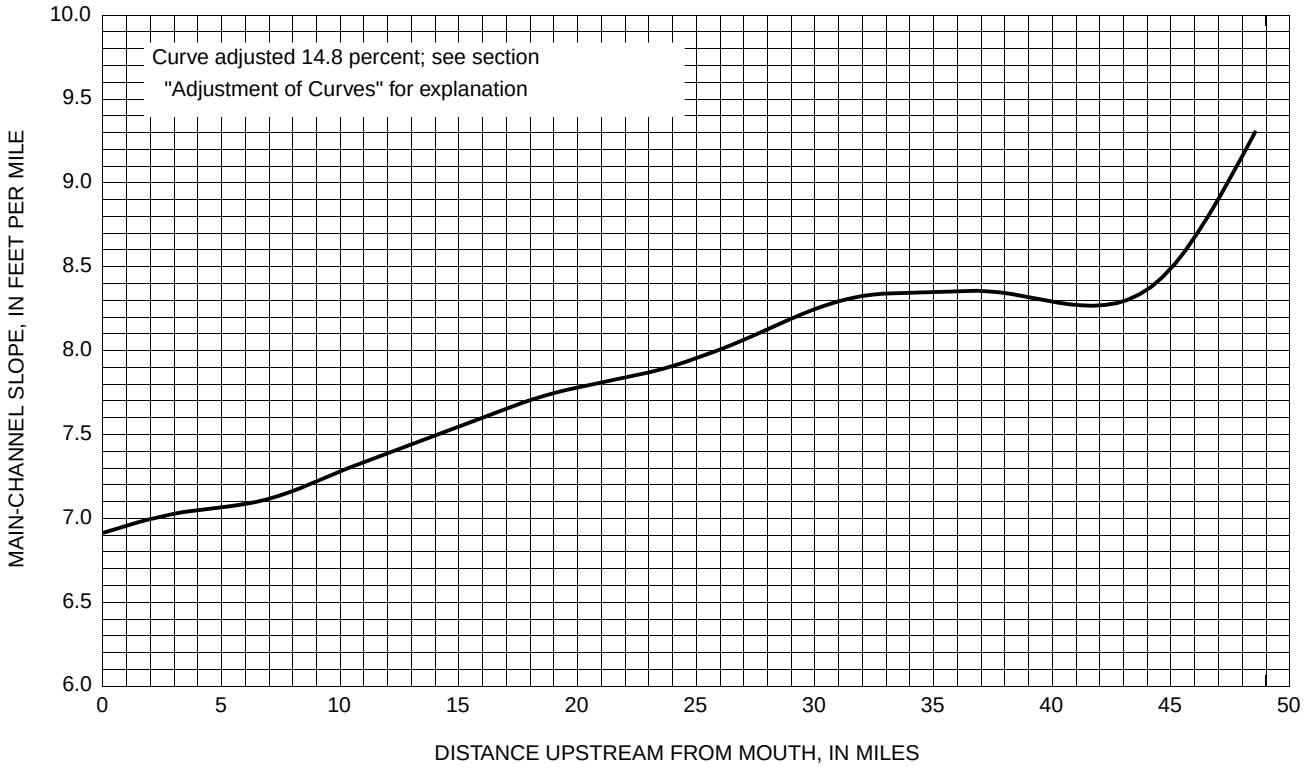
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	1,783	Mouth of Shell Rock River	90N 14W 4 C	--
1.15	1,782	Black Hawk-Bremer County line, Marquis Road West	90N 14W 4 NE	Marquis Rd W
3.88	--	265th Street	91N 14W 28 NW	265th St
8.04	1,752	Bremer-Butler County line	91N 14W 18 NW	--
10.73	1,746	County Road T63, Shell Rock (05462000, cont)	91N 15W 11 NE	Cherry St
11.66	--	State Highway 3	91N 15W 2 SW	--
20.24	--	State Highway 188, Clarksville	92N 15W 19 SW	--
22.57	1,626	County Road C33, Clarksville (05461500, cont)	92N 16W 13 NW	180th St
29.51	--	County Road T47	93N 16W 27 W	Packard Ave
36.80	1,357	Traer Street, Greene (05461000, cont)	93N 17W 1 SW	Traer St
37.43	--	State Highway 14, Greene	93N 17W 2 NE	--
38.20	--	Butler-Floyd County line	93N 17W 2 NW	--
40.85	1,341	290th Street	94N 17W 28 NE	290th St
43.45	1,318	County Road B60, Marble Rock (05460500, cont)	94N 17W 8 SE	Bradford St

Figure 99. Shell Rock River, beginning at mouth in Black Hawk County.

List of sites used to quantify main-channel slopes of the Shell Rock River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
50.64	1,267	Foothill Road	95N 18W 36 NW	Foothill Rd
54.59	--	East Main Avenue, Rockford	95N 18W 11 SW	E Main Ave
59.97	517	180th Street	96N 18W 33 NW	180th St
61.99	--	U.S. Highway 18	96N 18W 20 C	--
65.90	499	Floyd-Cerro Gordo County line	96N 18W 7 W	--
69.46	--	Hydrologic Regions 1 and 2 boundary	97N 19W 35 NE	--
131.15	--	Drainage divide	--	--

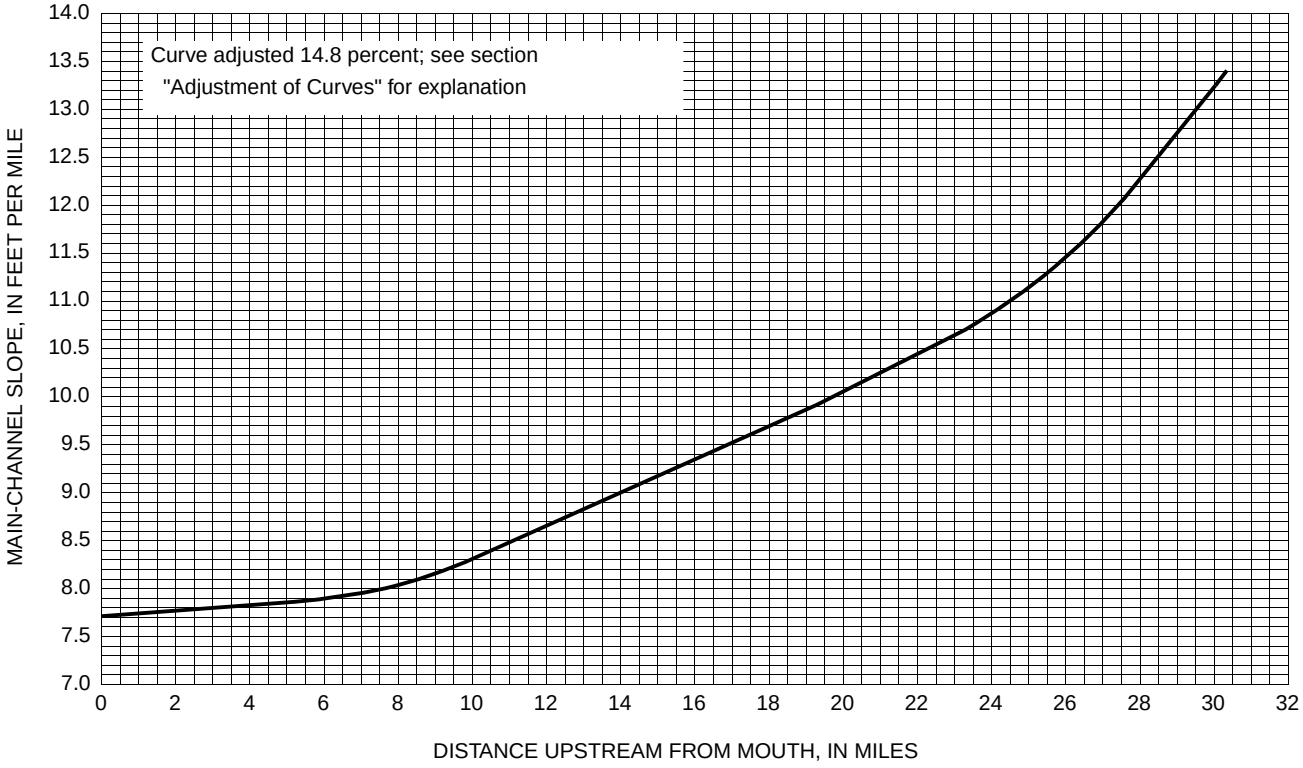
Figure 99. Shell Rock River, beginning at mouth in Black Hawk County—Continued.



List of sites used to quantify main-channel slopes of Silver Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	282	Mouth of Silver Creek	71N 41W 21 N	--
0.54	--	Orchard Avenue (06807900, low)	71N 41W 16 SW	Orchard Ave
3.27	--	County Road L63	71N 41W 5 NW	310th St
6.95	244	U.S. Highway 34	72N 41W 19 NW	--
10.04	221	County Road H20	72N 42W 1 NE	Gaston Ave
13.35	203	Dobney Avenue, Silver City	73N 42W 24 NW	Dobney Ave
16.95	--	Mills-Pottawattamie County line	73N 41W 6 NE	Applewood Ave
18.79	115	County Road L63 (06807650, low)	74N 41W 28 SW	320th St
22.98	--	State Highway 92	74N 41W 10 N	--
27.28	--	U.S. Highway 6	75N 41W 24 NW	--
31.53	--	Juniper Road	76N 40W 31 NE	Juniper Rd
34.32	--	County Road M16	76N 40W 21 NW	380th St
37.88	59.2	Rosewood Road (06807600, low)	76N 40W 4 NE	Rosewood Rd
42.18	--	State Highway 83	77N 40W 15 NW	--
44.18	--	Interstate 80	77N 40W 3 W	--
44.81	41.2	Pottawattamie-Shelby County line	77N 40W 3 NW	--
48.57	25.5	400th Street	78N 40W 23 NE	400th St
65.66	--	Drainage divide	--	--

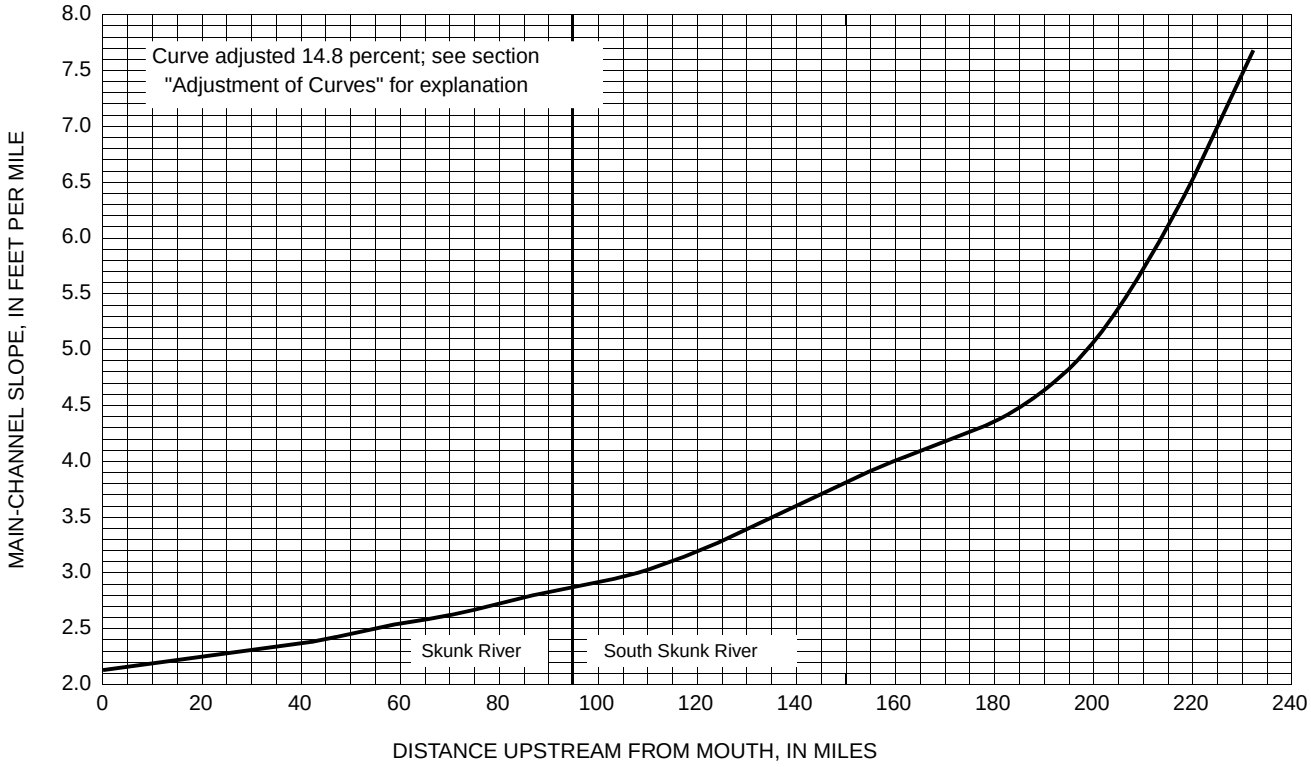
Figure 100. Silver Creek, beginning at mouth in Mills County.



List of sites used to quantify main-channel slopes of Sixmile Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	108	Mouth of Sixmile Creek	94N 48W 28 C	--
0.86	--	State Highway 12	94N 48W 28 SE	--
2.68	104	Birch Avenue (06484150, low)	94N 48W 26 SW	Birch Ave
8.27	--	County Road B58	94N 48W 12 SW	470th St
11.78	--	State Highway 10	94N 47W 5 NW	--
15.69	68.8	430th Street (06484100, low)	95N 47W 28 NW	430th St
22.31	48.6	Dove Avenue	95N 46W 19 SW	Dove Ave
26.86	26.3	Elwood Avenue	95N 46W 9 SW	Elwood Ave
30.34	18.6	County Road B40	95N 46W 3 N	390th St
38.13	--	Drainage divide	--	--

Figure 101. Sixmile Creek, beginning at mouth in Sioux County.



List of sites used to quantify main-channel slopes of the Skunk and South Skunk Rivers
[See section "Presentation of Curves" for explanation of list elements]

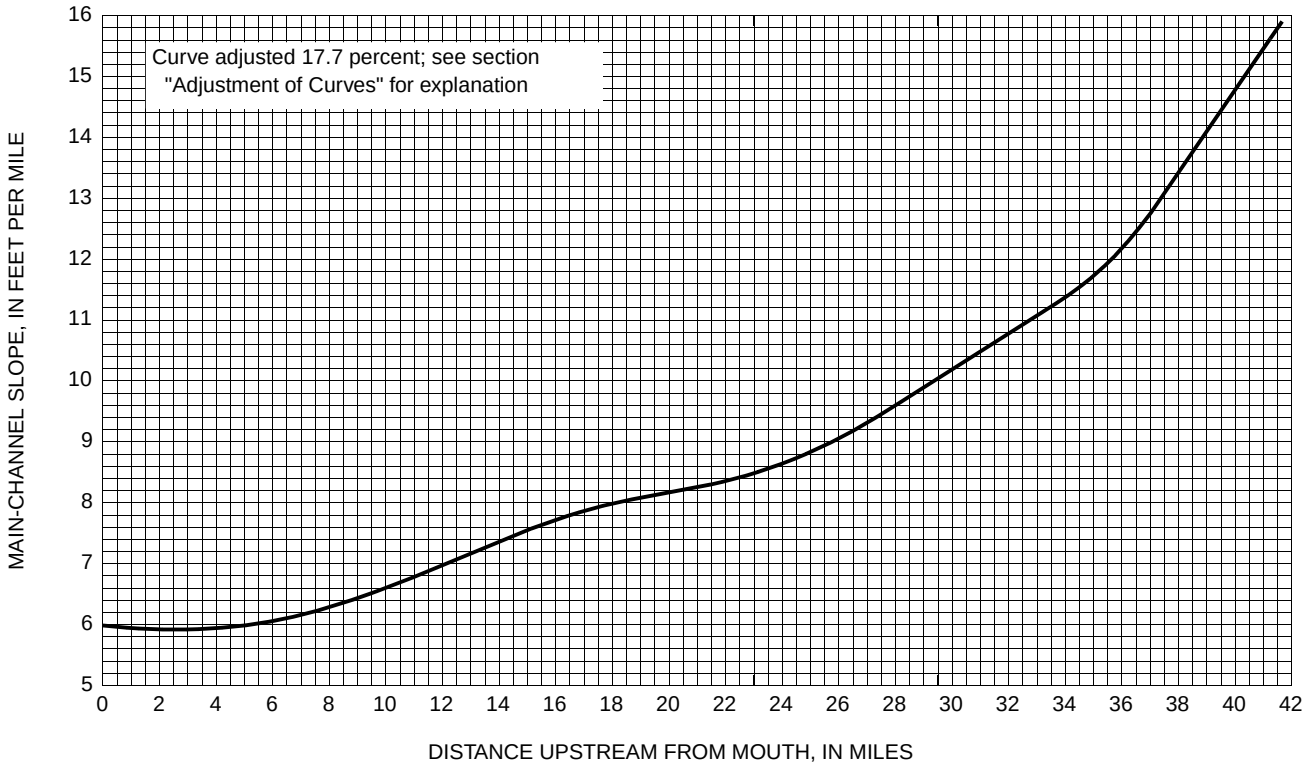
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	4,355	Mouth of Skunk River	68N 2W 8 S	--
6.15	4,334	U.S. Highway 61	69N 3W 33 SW	--
10.41	4,303	County Road X38, Augusta (05474000, cont)	69N 4W 26 NE	Main Rd
17.00	4,281	280th Avenue	69N 4W 7 NW	280th Ave
19.86	4,258	Lee-Des Moines-Henry County line	69N 5 W 2 NW	--
21.81	4,231	County Road X23, Lowell	70N 5W 28 SE	New London Rd
27.65	4,047	County Road W75	70N 6W 25 NW	Lexington Ave
32.94	4,013	U.S. Highway 218 (05473430, --)	70N 6W 4 NE	--
37.82	4,001	County Road W55, Oakland Mills (05473420, --)	71N 7W 24 SW	Franklin Ave
42.84	3,425	U.S. Highway 34, Rome	71N 7W 4 SW	--
44.91	3,422	Old Highway 34 (05473330, --)	71N 7W 3 NW	Old Highway 34
48.02	3,398	White Oak Road	72N 7W 32 NE	White Oak Rd
53.04	3,356	Henry-Jefferson County line	72N 7W 18 NW	--
57.61	3,237	County Road H28	73N 8W 36 NE	146th Blvd
64.41	2,916	State Highway 78, Coppock (05473000, cont)	73N 8W 1 NE	--
64.57	2,916	Jefferson-Washington County line	73N 8W 1 NE	--
72.33	2,884	State Highway 1 (05472700, --)	74N 8W 20 SW	--
80.20	2,854	County Road W21	74N 9W 10 SW	Dogwood Ave

Figure 102. Skunk and South Skunk Rivers, beginning at mouth of Skunk River at Lee-Des Moines County line.

List of sites used to quantify main-channel slopes of the Skunk and South Skunk Rivers—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
84.83	2,750	Washington-Keokuk County line	74N 9W 6 SW	--
88.93	2,741	County Road W15 (05472540, --)	74N 10W 2 NE	323rd Ave
94.72	2,709	Confluence of North and South Skunk Rivers	74N 10W 5 NE	--
98.96	1,837	County Road V67 (05472040, --)	74N 10W 6 SW	280th Ave
101.91	1,806	County Road V5G	74N 11W 3 SE	Co Rd V5G S
108.75	--	290th St	74N 12W 1 SE	290th St
111.87	1,786	State Highway 149 (05472030, --)	74N 12W 2 SW	--
116.88	--	180th Avenue	74N 12W 5 SE	180th Ave
125.25	1,740	State Highway 21	75N 13W 34 N	--
129.94	1,718	Keokuk-Mahaska County line	75N 13W 30 SW	--
134.33	1,697	County Road V13	75N 14W 15 SW	Ventura Ave
137.07	1,687	State Highway 92 (05472010, qw)	75N 14W 7 SE	--
142.23	1,652	County Road T65	76N 15W 33 SW	Oxford Ave
145.86	1,635	U.S. Highway 63 (05471500, cont)	76N 16W 25 SW	--
152.46	1,599	County Road T43	76N 17W 12 SE	Fisher Ave
157.20	1,539	State Highway 102	77N 17W 28 SE	--
160.76	1,440	Mahaska-Marion County line	77N 17W 19 NW	--
165.64	--	County Road T14	77N 18W 3 SE	Hwy T14
168.16	1,407	Marion-Jasper County line	77N 18W 5 NW	--
172.37	--	County Road S74	78N 19W 23 SW	Red Bridge Rd
175.01	1,363	County Road F62, Reasnor (05471390, --)	78N 19W 10 NW	Hwy F-62 E
179.41	1,281	State Highway 14 (05471380, --)	79N 19W 29 NW	--
183.27	1,260	Neptune Street	79N 20W 14 NW	Neptune St
189.78	803	State Highway 117, Colfax (05471050, cont)	79N 21W 1 SW	--
192.24	--	Interstate 80	79N 21W 4 NE	--
195.94	748	Jasper-Polk County line	80N 21W 30 NW	--
198.92	722	U.S. Highway 65	80N 22W 15 NE	--
204.03	688	County Roads F22 and S14	81N 22W 30 SW	NE Yodder Dr
209.50	649	Polk-Story County line	81N 23W 3 NE	--
210.54	--	State Highway 210	82N 23W 34 NE	--
211.73	615	320th Street, Cambridge (05471020, --)	82N 23W 27 NW	320th St
216.21	585	280th Street (05471008, --)	82N 23W 5 NW	280th St
218.06	--	Interstate 35	83N 23W 30 SE	--
218.57	--	County Road E57 (05471006, --)	83N 23W 30 NW	265th St
219.81	--	East end of Ken Maril Road (05471004, --)	83N 24W 24 E	--
221.66	556	U.S. Highway 30, Ames (05471000, cont)	83N 24W 13 NW	--
223.01	329	Lincoln Way, Ames (05470190, --)	83N 24W 12 NW	Lincoln Way
227.42	315	USGS gage, Ames (05470000, cont)	84N 24W 23 SW	--
230.62	--	180th Street (05469995, qw)	84N 24W 12 SE	180th St
231.04	--	Hydrologic Regions 1 and 2 boundary	84N 23W 7 SW	--
232.22	222	170th Street (05469980, qw)	84N 23W 7 N	170th St
276.88	--	Drainage divide	--	--

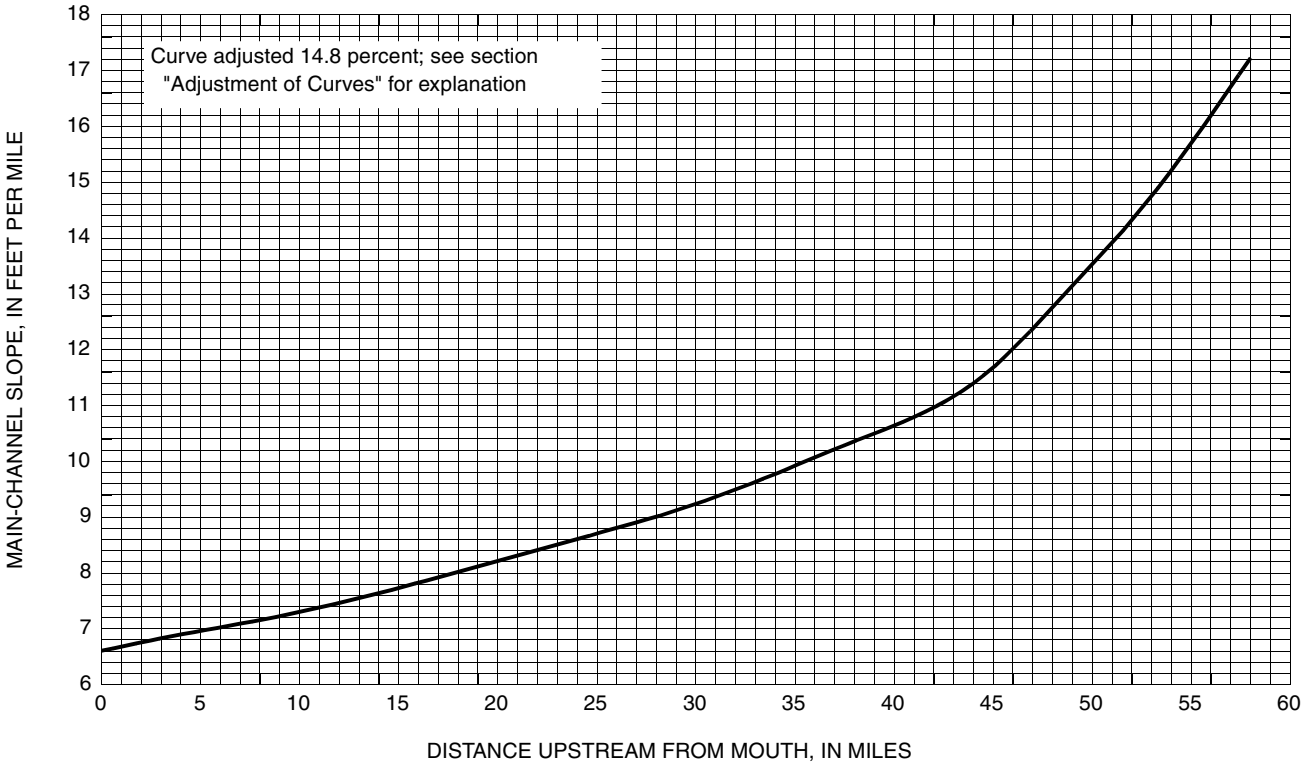
Figure 102. Skunk and South Skunk Rivers, beginning at mouth of Skunk River at Lee-Des Moines County line—Continued.



List of sites used to quantify main-channel slopes of Soap Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	253	Mouth of Soap Creek	71N 12W 35 SW	--
1.17	--	Wapello-Davis County line	71N 12W 34 SW	--
2.91	243	Tulip Avenue (05490100, low)	70N 12W 5 C	Tulip Ave
5.60	--	County Road J15	70N 12W 7 NW	Floris Ave
11.28	191	Peach Avenue	70N 13W 15 NW	Peach Ave
17.34	--	U.S. Highway 63	70N 14W 12 NE	--
22.08	--	Jewell Avenue	70N 14W 10 SW	Jewell Ave
26.35	136	Hill Boulevard	70N 14W 19 NE	Hill Blvd
31.84	97.3	Clay Avenue (05489900, low)	70N 15W 21 SW	Clay Ave
35.90	51.0	Davis-Appanoose County line	70N 15W 18 NW	--
39.23	34.9	313th Avenue	70N 16W 3 SE	313th Ave
41.66	26.5	Appanoose-Monroe County line	70N 16W 4 NW	--
52.07	--	Drainage divide	--	--

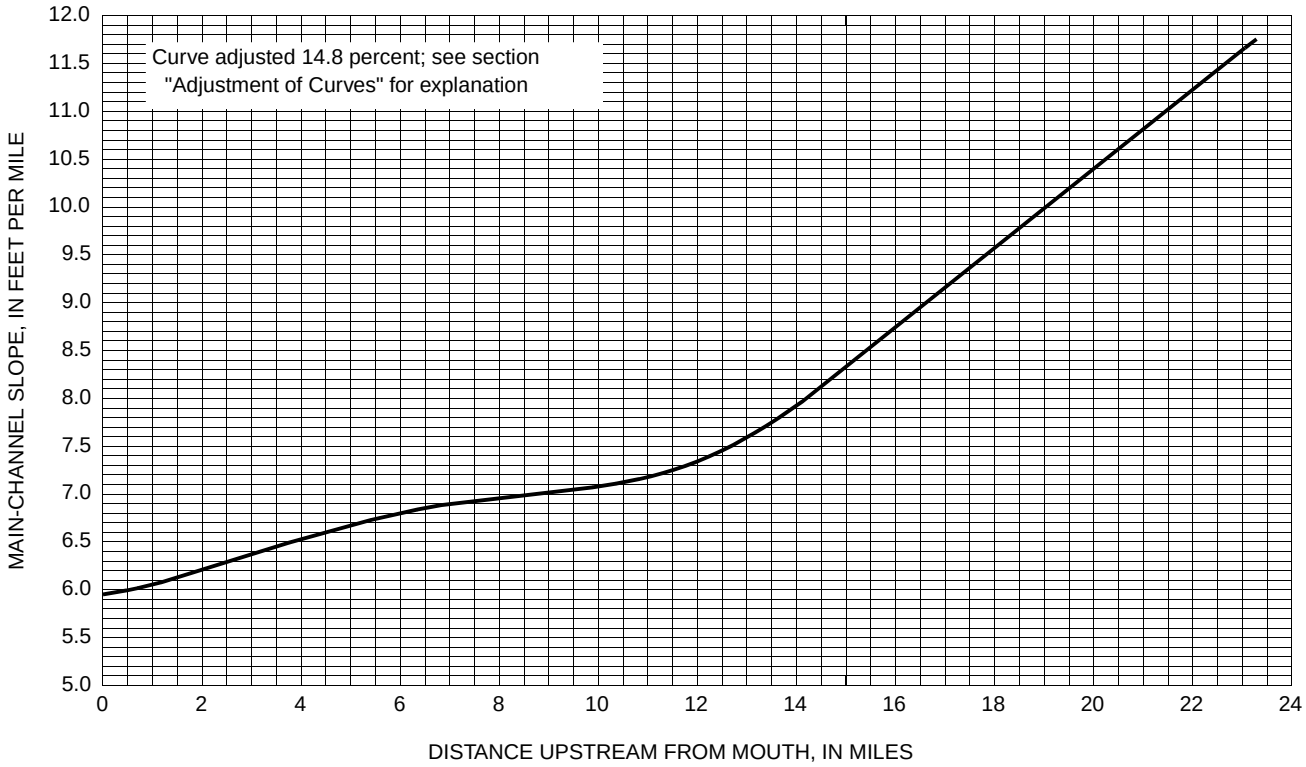
Figure 103. Soap Creek, beginning at mouth in Wapello County.



List of sites used to quantify main-channel slopes of the Soldier River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	445	Mouth of Soldier River	20N 12E 6 NE	--
3.04	--	Interstate 29	80N 45W 11 SE	--
3.77	440	County Road K45 (06608505, qw)	80N 45W 12 SW	Austin Ave
8.72	--	Geneva Place	81N 44W 34 NE	Geneva Pl
12.33	407	County Road F20, Pisgah (06608500, cont)	81N 44W 14 NE	County Rd
13.97	--	State Highway 183	81N 44W 1 SW	--
15.23	--	Harrison-Monona County line	81N 45W 1 NE	--
20.71	--	County Roads E54 and L16, Moorhead	82N 43W 15 NE	E54 Rd
26.29	281	Redwood Avenue	83N 42W 30 NW	Redwood Ave
27.35	--	State Highway 37, Soldier	83N 42W 19 SE	--
32.97	155	State Highway 183 (06608350, low)	84N 42W 34 SE	--
37.48	135	State Highway 141	84N 42W 11 NW	--
41.17	117	Monona-Crawford County line	85N 42W 25 SE	--
44.68	105	C Avenue	85N 41W 16 NW	C Ave
48.12	90.5	County Road L51 (06608300, low)	85N 41W 1 SW	150th St
49.14	59.1	Crawford-Ida County line	85N 41W 1 NE	--
53.32	--	Harvest Avenue	86N 40W 21 SW	Harvest Ave
57.99	--	U.S. Highway 59	86N 39W 19 SW	--
67.22	--	Drainage divide	--	--

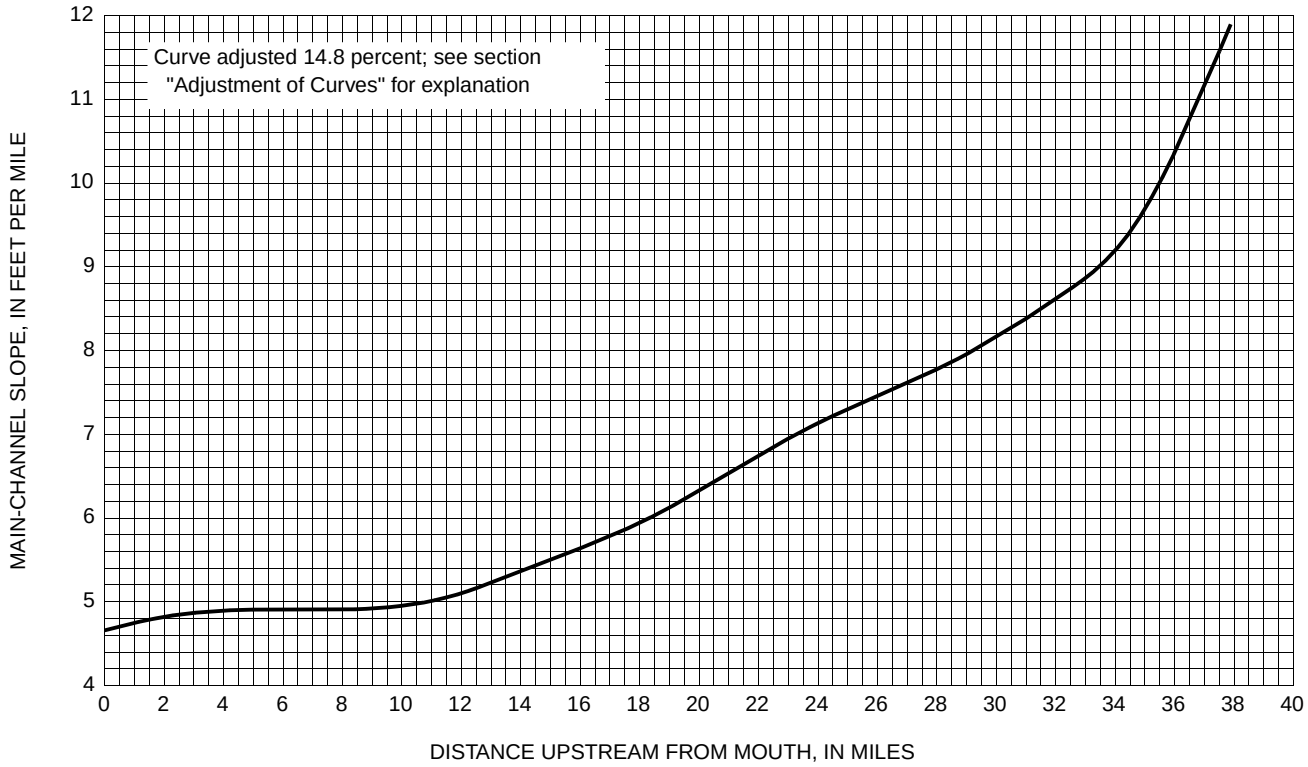
Figure 104. Soldier River, beginning at mouth in Harrison County.



List of sites used to quantify main-channel slopes of South Beaver Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	116	Mouth of South Beaver Creek	90N 17W 25 NE	--
0.22	--	U.S. Highway 20	90N 17W 25 E	--
2.80	114	Butler-Grundy County line, Westbrook Street (05462800, low)	90N 17W 35 SE	Westbrook St
7.33	--	County Road D17	89N 17W 22 NW	130th St
12.23	48.6	160th Street	88N 17W 6 NE	160th St
17.52	--	County Road T19	89N 18W 36 SW	F Ave
23.29	19.6	C Avenue	88N 18W 5 SW	C Ave
32.17	--	Des Moines Lobe landform region boundary	89N 19W 27 NE	--
37.35	--	Drainage divide	--	--

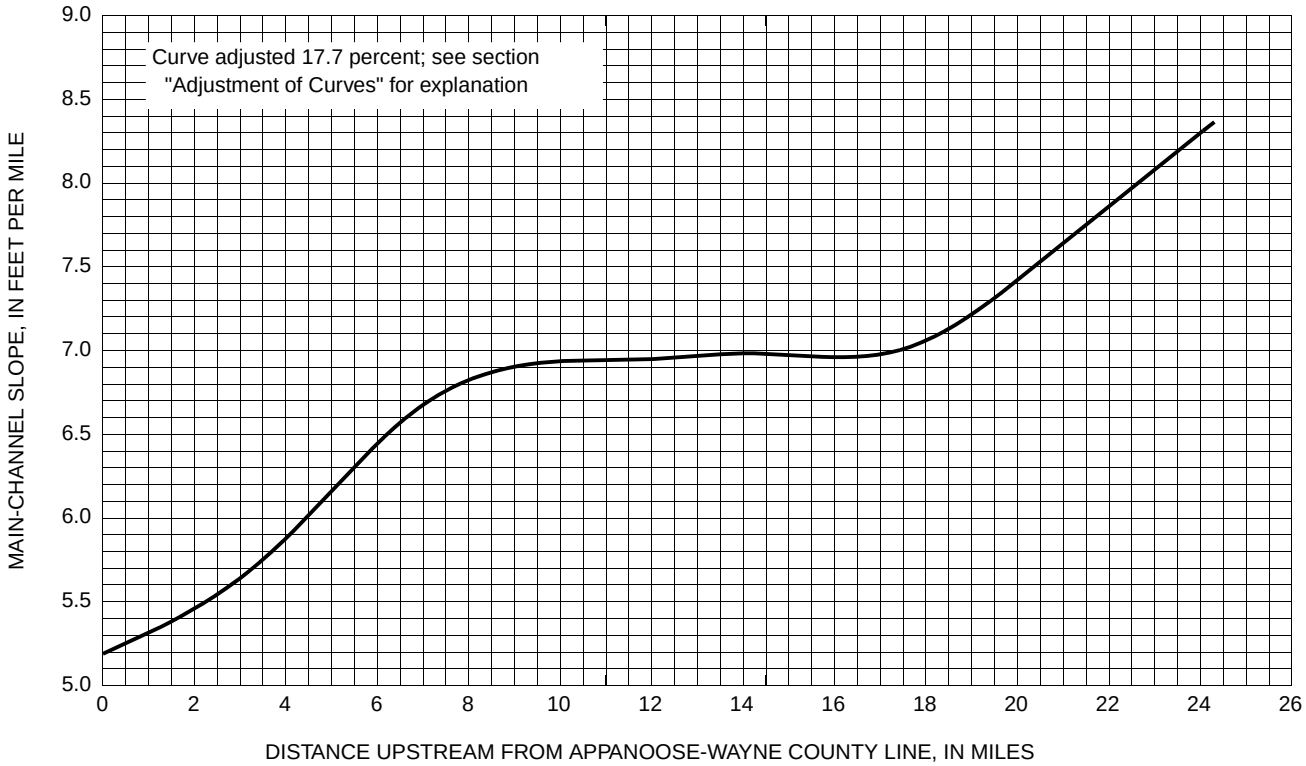
Figure 105. South Beaver Creek, beginning at mouth in Butler County.



List of sites used to quantify main-channel slopes of the South English River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	128	Mouth of South English River	77N 9W 6 NE	--
1.66	125	120th Street (05455450, low)	77N 9W 7 NW	120th St
2.17	--	Washington-Keokuk County line	77N 9W 7W	--
5.68	111	318th Avenue	77N 10W 15 NE	318th Ave
11.91	101	280th Avenue (05455430, --)	77N 10W 18 NW	280th Ave
13.91	--	State Highway 149	77N 11W 14 SE	--
18.17	88.5	240th Avenue (05455420, --)	77N 11W 21 NW	240th Ave
23.47	76.3	210th Avenue	77N 12W 24 NW	210th Ave
28.91	66.2	180th Avenue (05455400, low)	77N 12W 16 SW	180th Ave
32.29	49.5	150th Avenue	77N 13W 12 SW	150th Ave
34.36	--	State Highway 21	77N 13W 10 SW	--
37.89	23.1	Keokuk-Mahaska County line	77N 13W 6 NW	--
49.03	--	Drainage divide	--	--

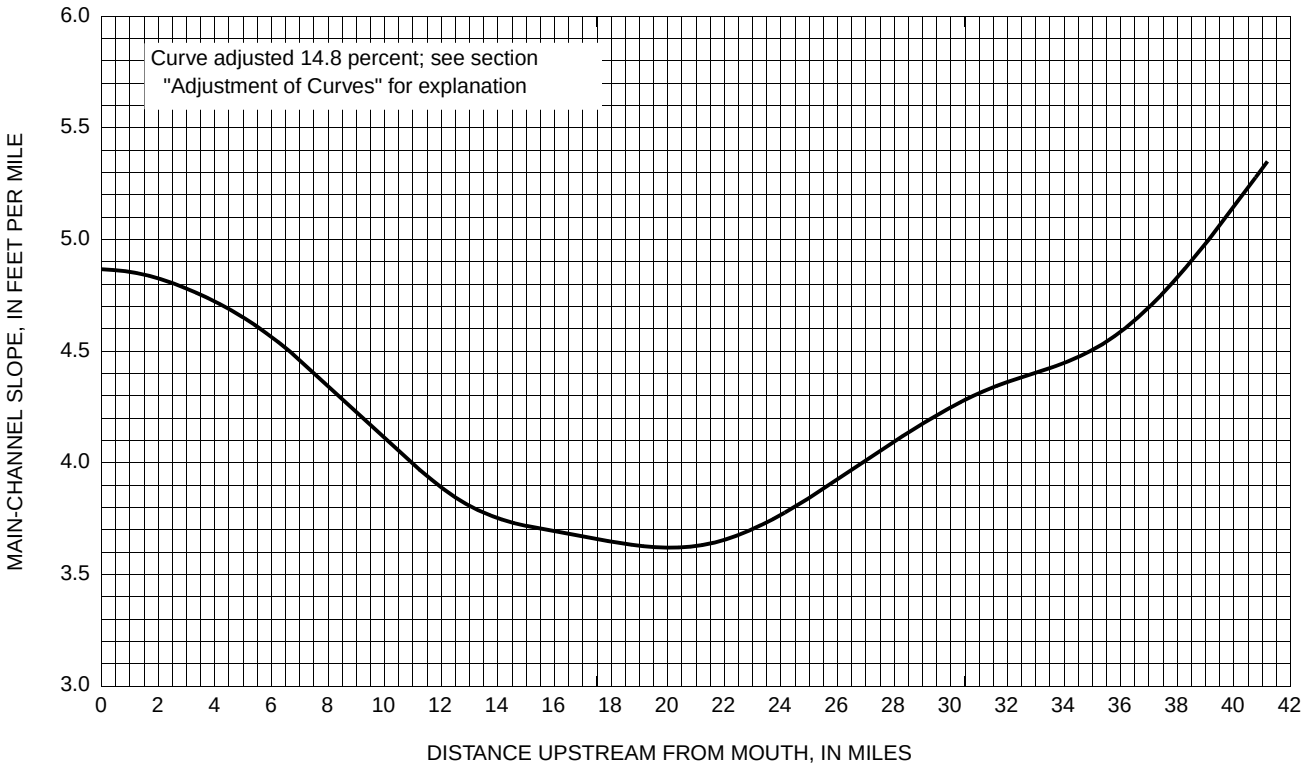
Figure 106. South English River, beginning at mouth in Washington County.



List of sites used to quantify main-channel slopes of the South Fork Chariton River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	208	Appanoose-Wayne County line	70N 20W 36 SE	--
3.60	--	County Road S56	69N 20W 10 SE	S56 Rd
6.86	168	County Road S50 (06903700, cont)	69N 20W 5 SW	200th St
12.15	80.2	150th Street	69N 21W 5 SE	150th St
14.14	68.1	State Highway 14 (06903650, low)	69N 21W 6 NW	--
17.56	58.0	County Road S23 (06903600, low)	70N 22W 34 SW	100th St
21.22	--	Ohio Street	69N 22W 9 SW	Ohio St
24.31	--	State Highway 2	69N 22W 21 SW	--
33.93	--	Drainage divide	--	--

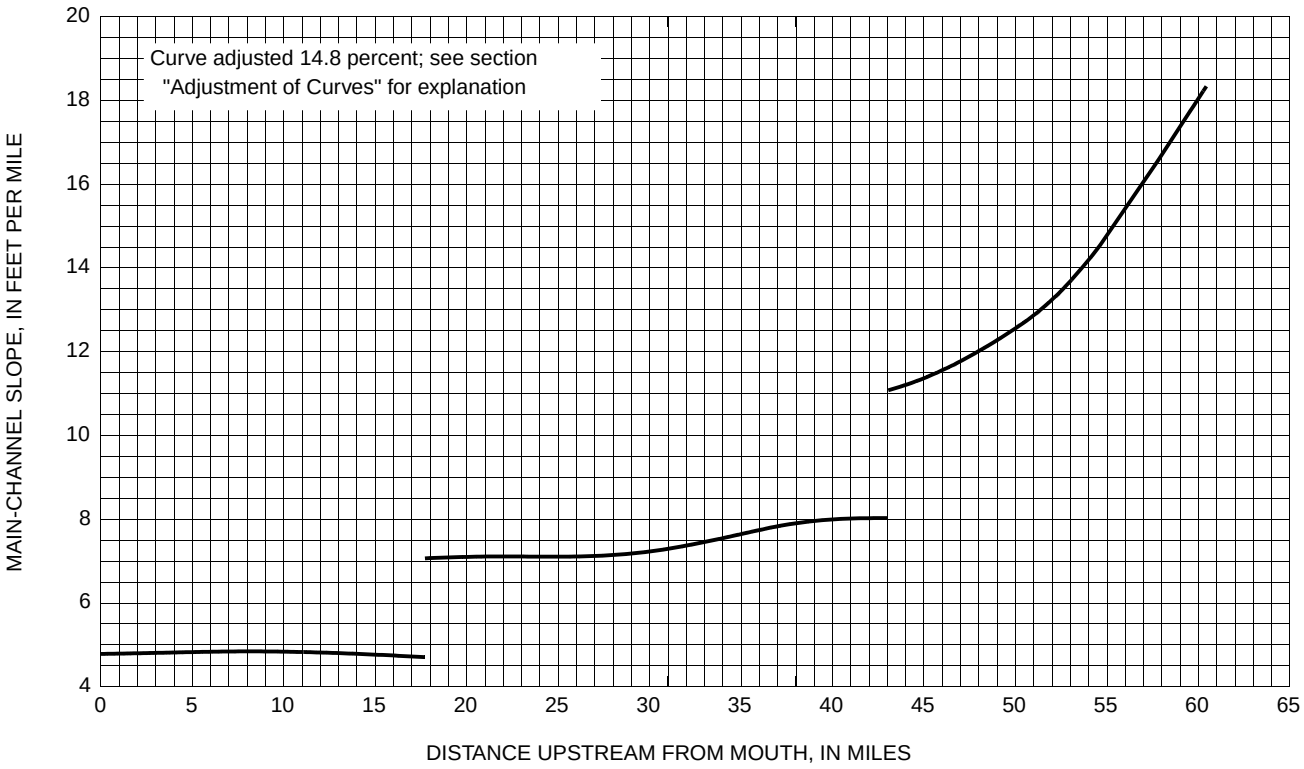
Figure 107. South Fork Chariton River, beginning at Appanoose-Wayne County line.



List of sites used to quantify main-channel slopes of the South Fork Iowa River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	309	Mouth of South Fork Iowa River	86N 19W 4 SW	--
0.80	--	State Highway 215	86N 19W 5 NE	--
3.08	306	T Avenue (05451270, qw)	87N 19W 30 SW	T Ave
4.01	--	Des Moines Lobe landform region boundary	87N 20W 25 SE	--
5.46	224	R Avenue (05451210, cont)	87N 20W 26 SW	R Ave
6.76	223	State Highway 299 (05451200, low)	87N 20W 27 N	--
11.16	130	State Highway 175	87N 20W 8 W	--
12.82	--	N Avenue (05451130, qw)	87N 20W 7 NW	N Ave
16.48	--	U.S. Highway 65	87N 21W 2 S	--
21.35	117	KK Avenue	88N 21W 27 C	KK Ave
26.18	109	I Avenue	88N 21W 20 SW	I Ave
31.56	100	H Avenue	88N 21W 18 NW	H Ave
33.73	--	U.S. Highway 20	88N 22W 12 W	--
35.86	--	State Highway 359	88N 22W 11 NW	--
41.18	79.5	C Avenue (05451100, low)	88N 22W 5 NW	C Ave
41.59	--	Hydrologic Regions 1 and 2 boundary	88N 22W 6 NE	--
64.53	--	Drainage divide	--	--

Figure 108. South Fork Iowa River, beginning at mouth in Hardin County.



List of sites used to quantify main-channel slopes of the South Raccoon River
[See section "Presentation of Curves" for explanation of list elements]

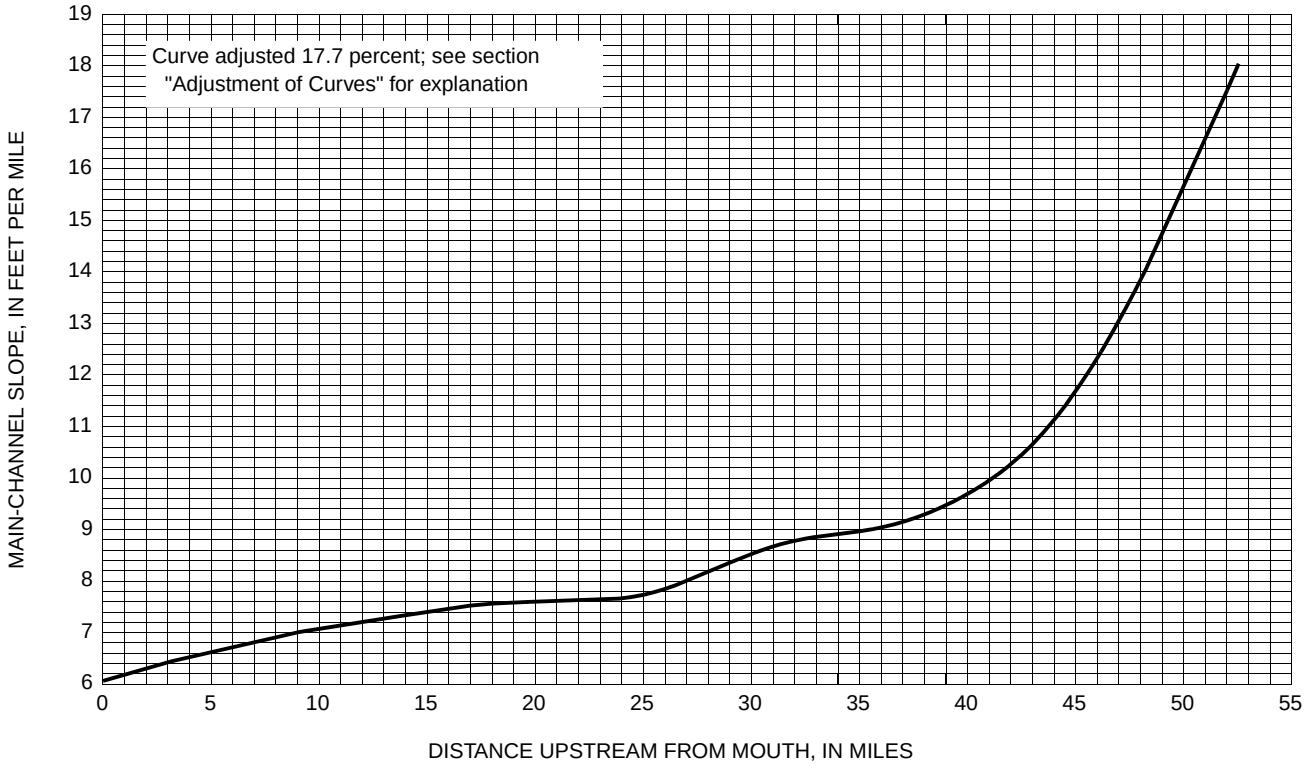
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	1,143	Mouth of South Raccoon River	78N 27W 21 NW	--
1.48	--	Interstate 80	78N 27W 20 NW	--
3.47	1,116	U.S. Highway 169	78N 27W 18 NW	--
7.60	--	County Road P58	78N 28W 16 NE	L Ave
14.30	994	H Avenue (05484000, cont)	78N 29W 2 NE	H Ave
17.68	--	U.S. Highway 6	78N 29W 9 NE	--
17.72	986	Downstream of mouth of Middle Raccoon River	78N 29W 9 NE	--
17.72	377	Upstream of mouth of Middle Raccoon River	78N 29W 9 NE	--
21.14	370	Dallas-Guthrie County line	78N 29W 7 SW	--
25.31	--	County Road F61	78N 30W 10 SE	310th St
29.71	--	Walnut Trail	78N 30W 4 SE	Walnut Trl
34.67	--	285th Street	78N 30W 6 NE	285th St
37.46	--	Tank Avenue	79N 30W 29 SW	Tank Ave
40.94	267	County Road F51 (05483340, low)	79N 31W 26 NE	Montieth Rd

Figure 109. South Raccoon River, beginning at mouth in Dallas County.

List of sites used to quantify main-channel slopes of the South Raccoon River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
43.03	264	Downstream of mouth of Brushy Creek	79N 31W 22 NE	--
43.03	122	Upstream of mouth of Brushy Creek	79N 31W 22 NE	--
44.26	--	Pecan Avenue	79N 31W 22 NW	Pecan Ave
48.59	84.0	State Highway 25, Guthrie Center (05483312, --)	79N 31W 7 NE	5th St
49.11	--	State Highway 44, Guthrie Center	79N 31W 6 SW	State St
51.66	77.2	Locust Avenue (05483310, low)	80N 32W 36 SW	Locust Ave
54.44	--	County Road N70	80N 32W 34 NW	Justice Rd
57.66	--	County Road F32	80N 32W 20 NW	190th Rd
60.44	--	Fir Avenue	80N 33W 12 C	Fir Ave
71.87	--	Drainage divide	--	--

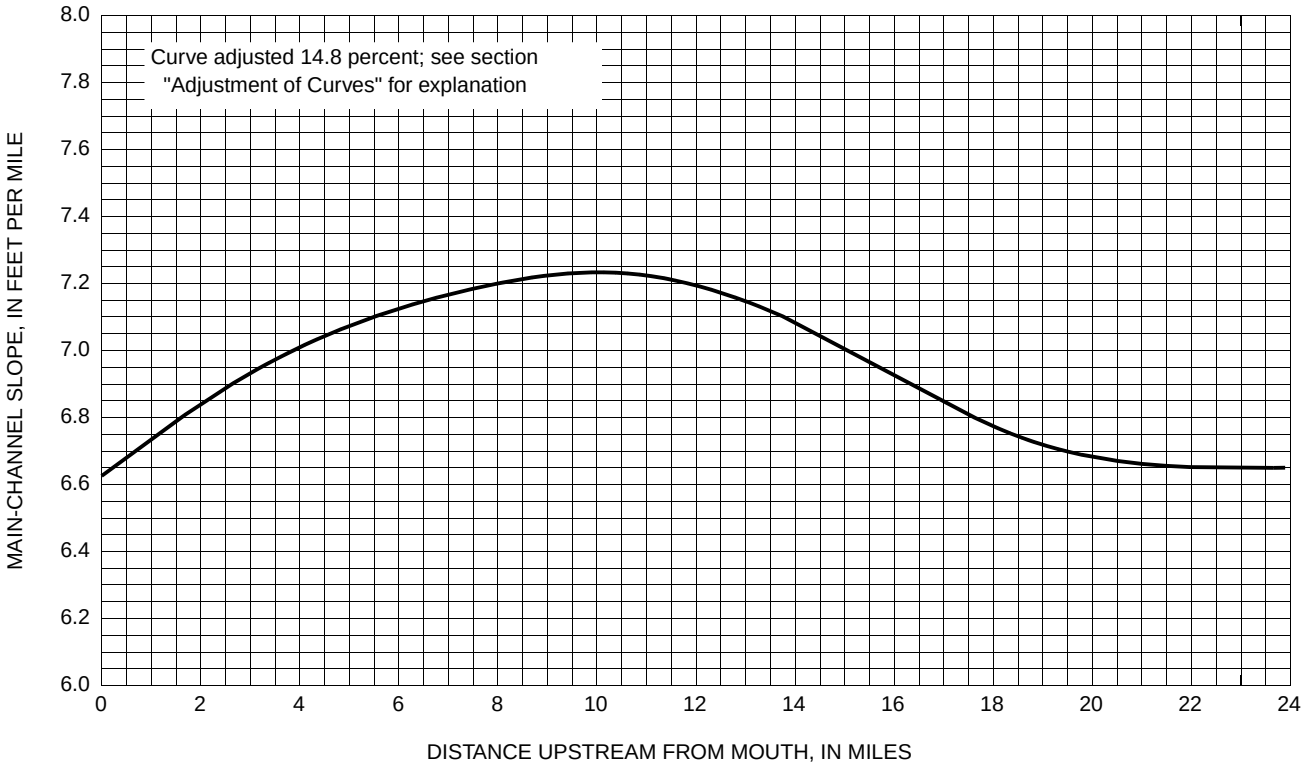
Figure 109. South Raccoon River, beginning at mouth in Dallas County—Continued.



List of sites used to quantify main-channel slopes of the South River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	590	Mouth of South River	77N 22W 12 SW	--
2.83	--	State Highway 5	77N 22W 26 NW	--
2.90	--	Hydrologic Regions 2 and 3 boundary	77N 22W 26 SW	--
6.27	--	215th Place	76N 22W 9 NE	215th Pl
9.55	474	State Highway 92	76N 22W 19 NE	--
13.68	460	168th Avenue (05487470, cont)	76N 23W 34 SE	168th Ave
17.64	--	U.S. Highway 65	75N 23W 6W	--
18.78	278	118th Avenue (05487200, low)	75N 24W 2 NE	118th Ave
22.88	--	County Road R57	75N 24W 5 S	85th Ave
24.79	--	County Road G50	75N 25W 12 NE	Monroe Pl
31.52	94.6	Quebec Street	74N 25W 1 NE	Quebec St
35.72	65.4	County Road G64 (05486700, low)	74N 25W 16 NE	Stone St
39.88	--	Interstate 35	74N 25W 19 NW	--
40.04	54.5	Warren-Madison County line	74N 25W 19 W	--
43.36	43.5	County Road R35	74N 26W 26 SW	Wildrose Ave
46.89	36.6	Madison-Clarke County line	74N 26W 33 S	--
52.54	23.6	County Road R21	73N 27W 12 SW	150th Ave
62.04	--	Drainage divide	--	--

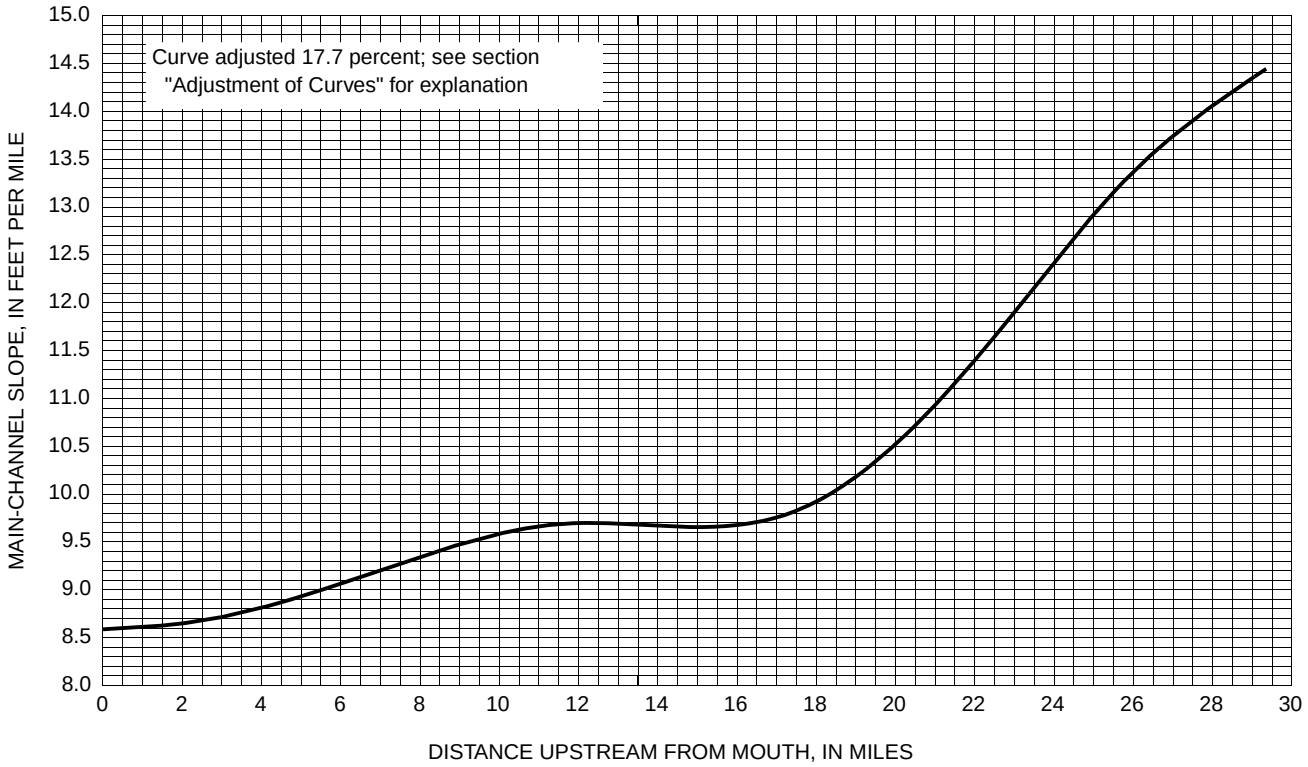
Figure 110. South River, beginning at mouth in Warren County.



List of sites used to quantify main-channel slopes of Squaw Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	227	Mouth of Squaw Creek, Ames	83N 24W 12 SW	--
0.82	225	U.S. Highway 69, Ames (05470800, --)	83N 24W 11 SE	S Duff Ave
2.47	204	Lincoln Way, Ames (05470500, cont)	83N 24W 3 S	Lincoln Way
7.65	170	County Road E26	84N 24W 20 W	Cameron School Rd
10.52	150	Story-Boone County line, County Road R38	84N 24W 7 W	500th Ave
14.79	--	150th Street	85N 25W 35 NW	150th St
18.39	--	County Road E18	85N 25W 22 NW	130th St
18.57	--	Hydrologic Regions 1 and 2 boundary	85N 25W 22 NW	--
23.89	62.5	Boone-Hamilton County line, 100th Street	85N 25W 5 N	100th St
41.96	--	Drainage divide	--	--

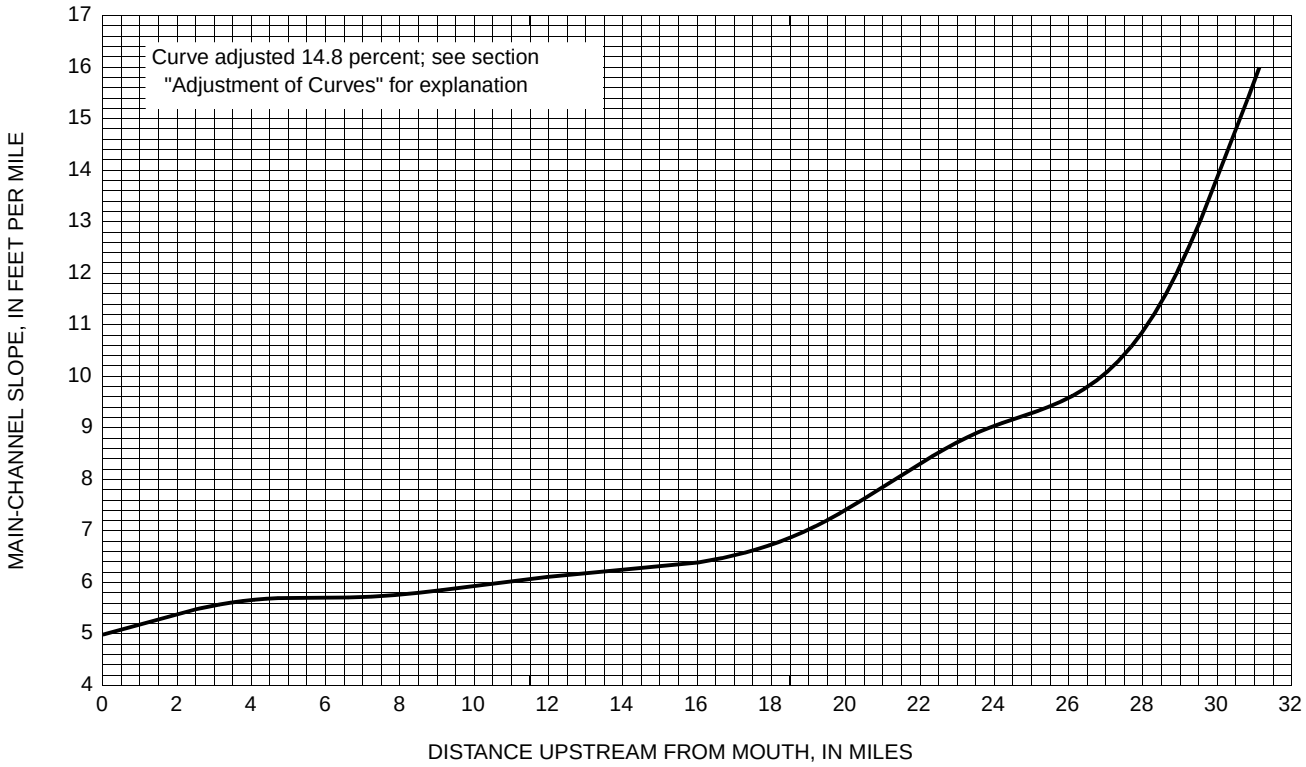
Figure 111. Squaw Creek, beginning at mouth in Story County.



List of sites used to quantify main-channel slopes of Squaw Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	136	Mouth of Squaw Creek	75N 24W 2 NW	--
2.34	134	Nevada Street (05487100, low)	75N 24W 15 NE	Nevada St
7.98	--	County Road G64	74N 24W 9 NE	Roosevelt St
11.62	--	County Road G76	74N 24W 27 NE	Hwy G76
17.62	79.6	Warren-Clarke County line	74N 25W 36 SW	--
22.13	60.8	250th Avenue (05486900, low)	73N 25W 16 NE	250th Ave
25.91	--	Interstate 35	73N 25W 19 S	--
29.35	21.0	195th Avenue	73N 26W 27 SE	195th Ave
41.75	--	Drainage divide	--	--

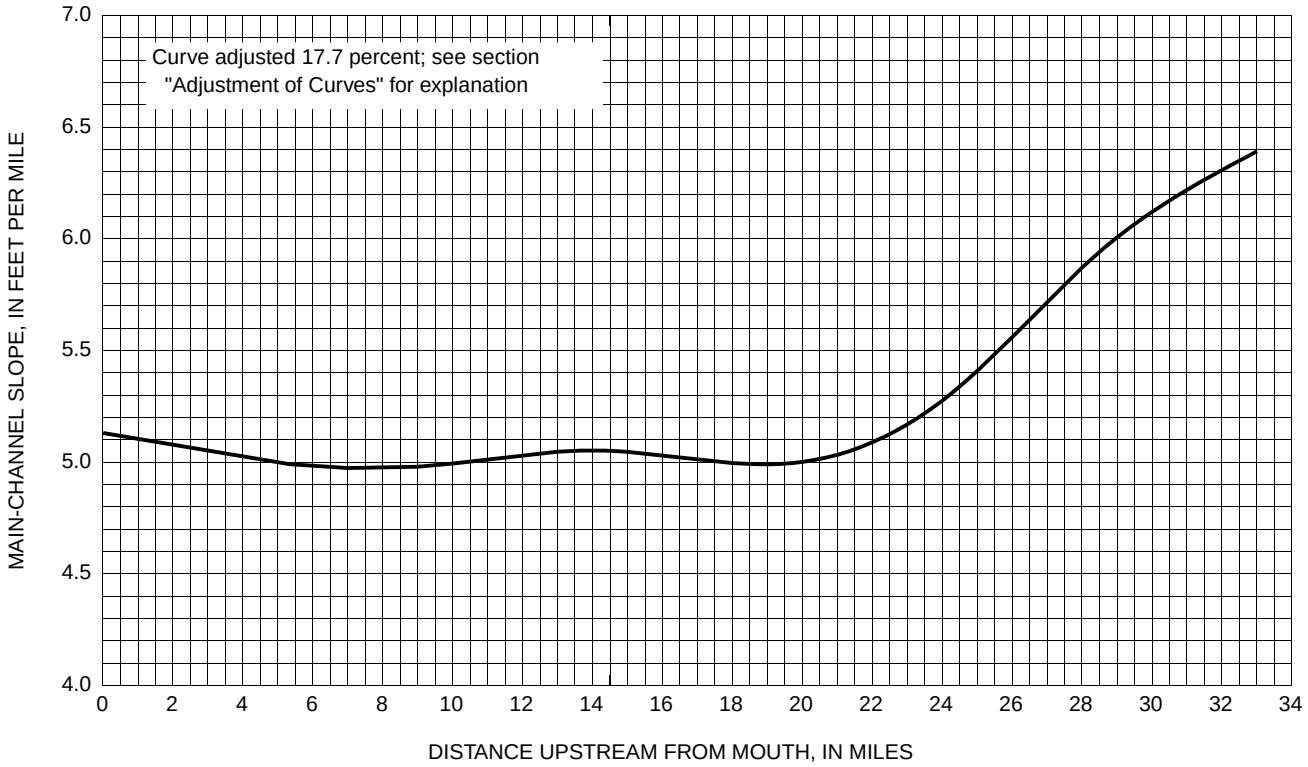
Figure 112. Squaw Creek, beginning at mouth in Warren County.



List of sites used to quantify main-channel slopes of Sugar Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	222	Mouth of Sugar Creek	78N 2W 17 SE	--
4.17	218	U.S. Highway 6 (05464920, low)	78N 2W 15 N	--
6.92	98.4	Muscatine-Cedar County line	78N 2W 3 NE	--
11.88	--	Interstate 80	79N 2W 15 SE	--
19.12	80.7	270th Street (05464850, low)	80N 2W 26 S	270th St
23.70	--	250th Street	80N 2W 20 NE	250th St
28.48	--	State Highway 130	80N 2W 4 N	--
31.13	19.3	200th Street	81N 2W 29 NE	200th St
38.01	--	Drainage divide	--	--

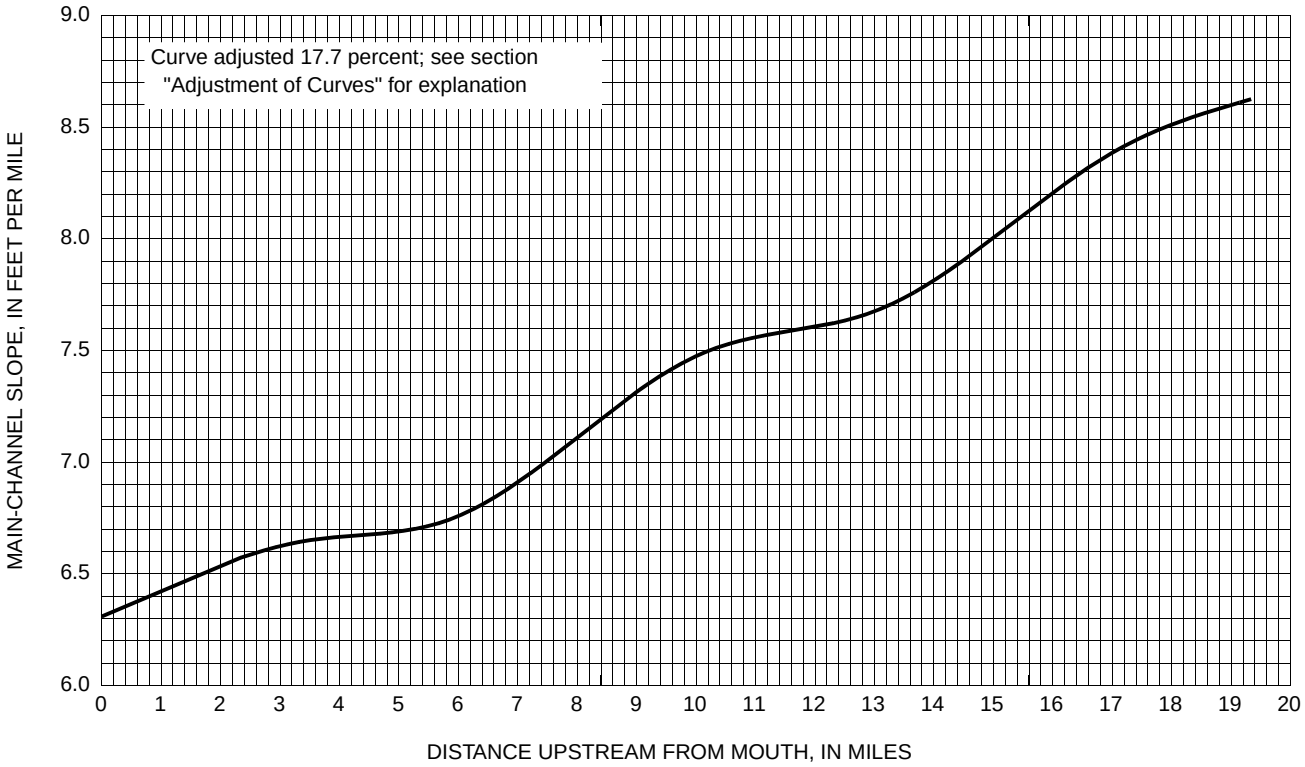
Figure 113. Sugar Creek, beginning at mouth in Muscatine County.



List of sites used to quantify main-channel slopes of Sugar Creek, tributary to the Des Moines River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	111	Mouth of Sugar Creek	65N 6W 25 N	--
4.86	105	County Road W62 (05491000, cont)	65N 5W 7 NW	Argyle Rd
9.06	92.5	White Plains Road	66N 5W 31 C	White Plains Rd
14.22	76.5	County Road J72	66N 6W 14 NE	300th St
19.93	62.3	194th Avenue (05490700, low)	67N 6W 33 NW	194th Ave
24.33	51.3	245th Street	67N 6W 18 E	245th St
28.38	40.8	State Highway 2	67N 6W 6 NE	--
33.00	25.5	County Road J56	68N 7W 24 SE	Primrose Rd
45.24	--	Drainage divide	--	--

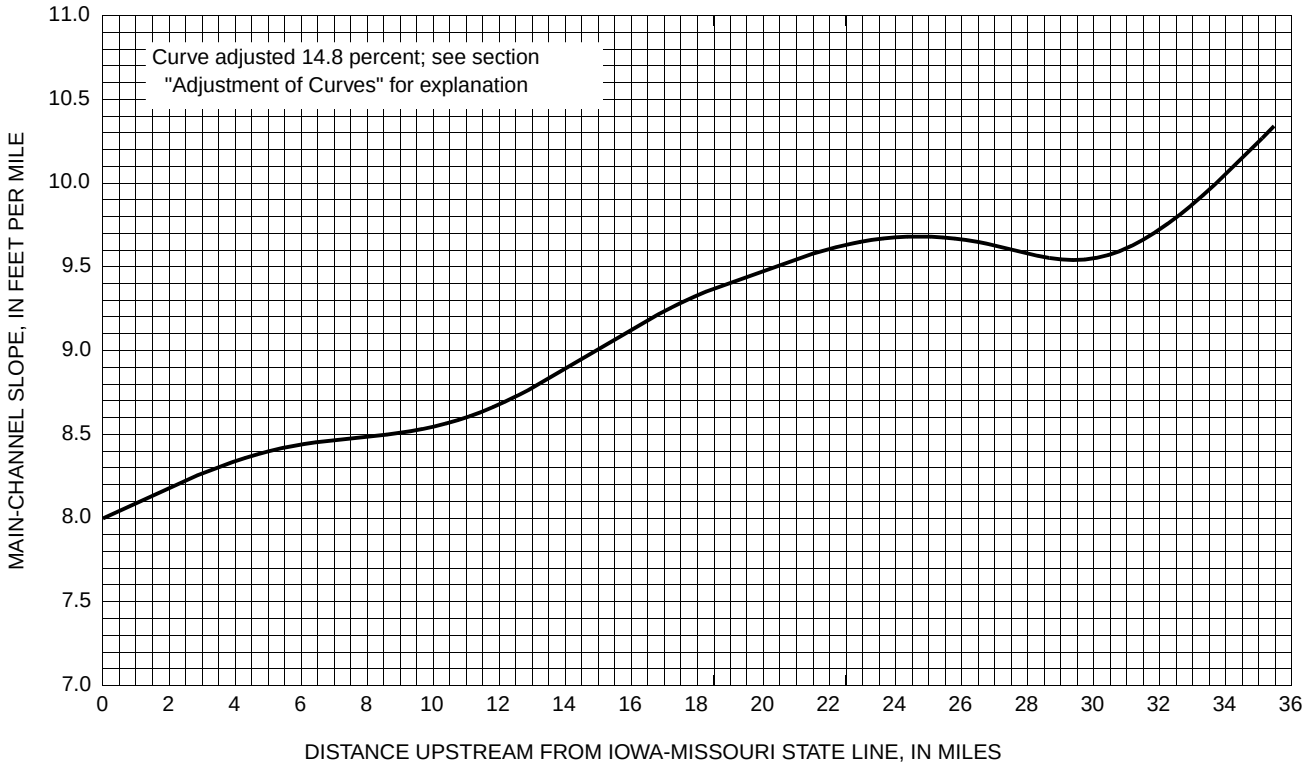
Figure 114. Sugar Creek, tributary to the Des Moines River, beginning at mouth in Lee County.



List of sites used to quantify main-channel slopes of Sugar Creek, tributary to the Mississippi River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	152	Mouth of Sugar Creek	67N 5W 26 NE	--
1.96	--	U.S. Highway 61	67N 5W 15 SW	--
3.40	109	235th Street (05474300, low)	67N 5W 9 SE	235th Street
5.89	105	State Highway 2	67N 5W 5 C	--
10.08	75.6	225th Avenue (05474200, low)	68N 5W 30 NE	225th Ave
13.06	--	Franklin Road	68N 6W 13 SW	Franklin Rd
17.07	--	State Highway 103	68N 6W 2 E	--
19.34	24.0	205th Avenue	69N 6W 26 S	205th Ave
29.66	--	Drainage divide	--	--

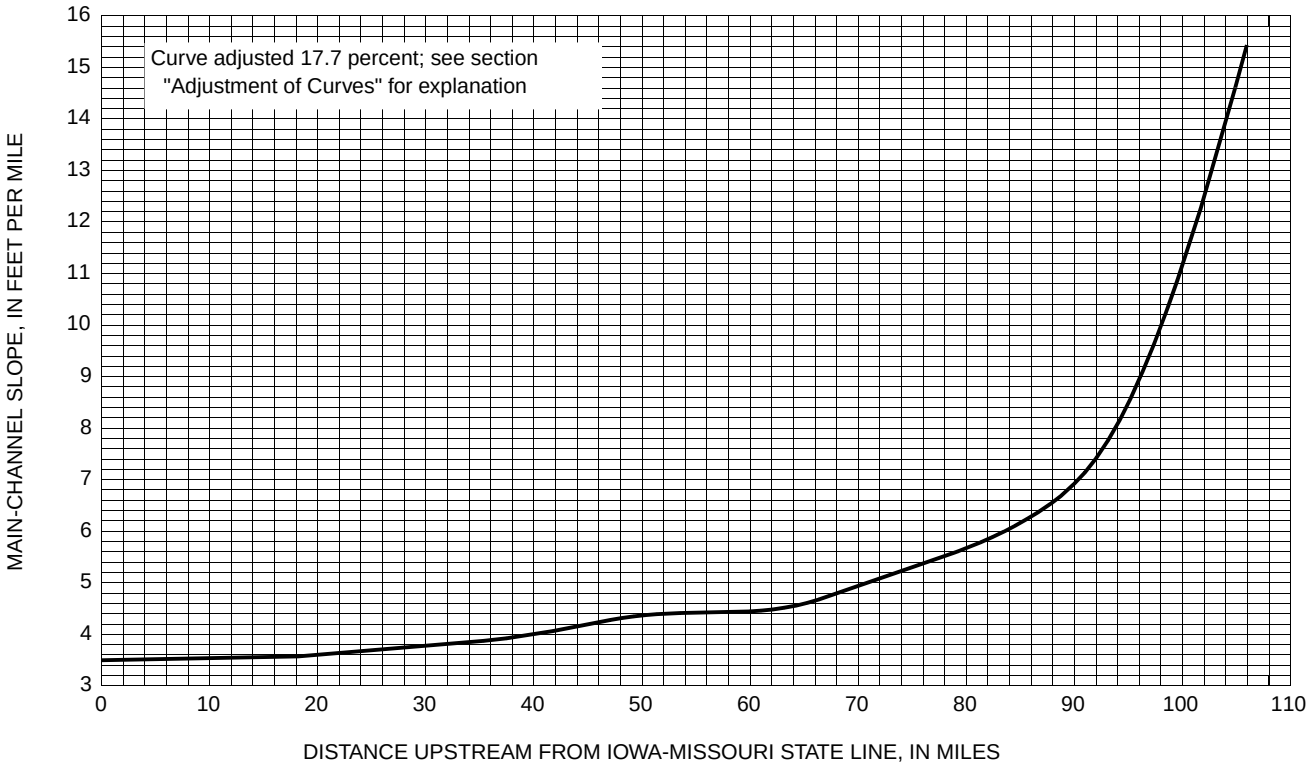
Figure 115. Sugar Creek, tributary to the Mississippi River, beginning at mouth in Lee County.



List of sites used to quantify main-channel slopes of the Tarkio River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	206	Iowa-Missouri State line, Blanchard	67N 38W 32 NW	--
1.25	200	County Road J64 (06812000, cont)	67N 38W 29 NE	310th St
5.42	175	County Road J52, Coin	67N 38W 5 NE	270th St
9.74	155	County Road J40 (06811900, low)	68N 38W 16 N	230th St
11.90	--	State Highway 2	69N 38W 34 N	--
17.06	80.3	160th Street	69N 38W 2 NE	160th St
20.20	74.7	130th Street	70N 38W 24 N	130th St
23.36	66.6	M Avenue (06811860, low)	70N 37W 5 NW	M Ave
23.70	66.6	Page-Montgomery County line	70N 37W 5 NW	--
26.85	53.5	County Road H46	71N 37W 21 NW	250th St
29.43	49.3	County Road H42, Stanton (06811840, cont)	71N 37W 4 W	225th St
30.44	--	U.S. Highway 34	72N 37W 33 NW	--
35.46	--	170th Street	72N 37W 9 NW	170th St
47.50	--	Drainage divide	--	--

Figure 116. Tarkio River, beginning at Iowa-Missouri State line in Page County.



List of sites used to quantify main-channel slopes of the Thompson River
[See section "Presentation of Curves" for explanation of list elements]

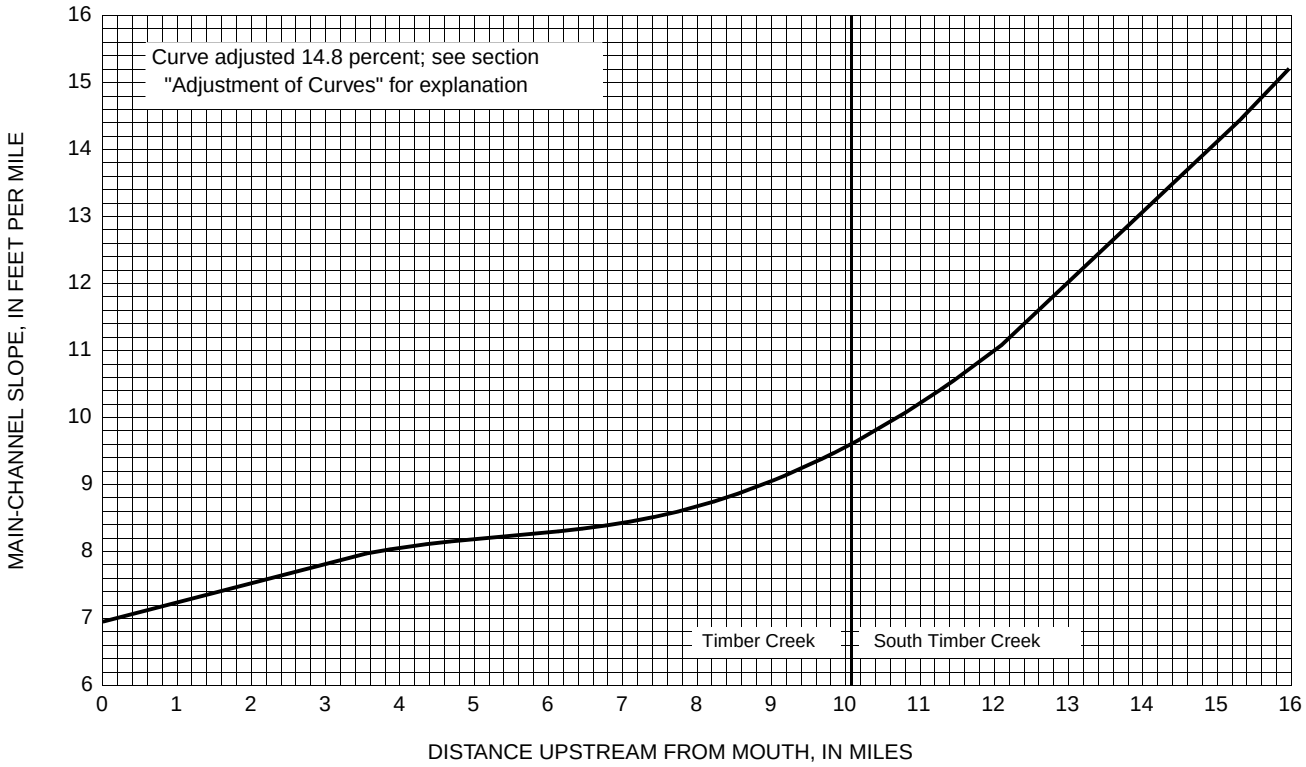
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	729	Iowa-Missouri State line	67N 26W 25 W	--
5.76	701	U.S. Highway 69, Davis City (06898000, cont)	68N 26W 35 SE	Bridge St
10.43	--	Interstate 35	68N 26W 28 SW	--
13.40	--	County Road R30	68N 26W 17 SE	--
20.76	--	County road	68N 26W 5 NW	--
23.62	--	State Highway 2	69N 26W 31 NW	--
26.28	--	County Road J34	69N 26W 20 SW	--
32.58	--	County road	69N 27W 1 NE	--
37.32	--	County Road J20, Grand River	70N 27W 34 SE	--
44.37	401	County Road R15 (06897900, low)	70N 27W 16 NW	--
48.74	393	Decatur-Ringgold County line	70N 27W 6 NW	--
49.33	--	Ringgold-Union County line	71N 28W 36 SE	--
55.43	--	County Road H45	71N 28W 11 S	Willow Ave
58.59	--	County Road P64	71N 28W 2 SW	Willow Ave
64.24	--	County Road H37	72N 28W 33 NE	210th St

Figure 117. Thompson River, beginning at Iowa-Missouri State line in Decatur County.

List of sites used to quantify main-channel slopes of the Thompson River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
69.82	231	U.S. Highway 34 (06897820, low)	72N 28W 17 SW	--
76.22	--	Wolf Creek Drive	73N 28W 31 SE	Wolf Creek Dr
79.97	--	Hydrologic Regions 2 and 3 boundary	73N 29W 24 SE	--
83.28	--	County Road H17	73N 29W 11 NE	Rea Rd
85.86	129	Union-Madison County line	74N 29W 34 SE	--
92.83	91.0	County Road G61	74N 29W 17 SE	Macksburg Rd
96.83	81.7	Madison-Adair County line	74N 29W 7 NW	--
98.21	80.0	York Avenue (06897770, low)	74N 30W 1 SW	York Ave
102.69	--	260th Street	75N 30W 27 NW	260th St
105.94	33.4	State Highway 92	75N 30W 17 NE	--
115.72	--	Drainage divide	--	--

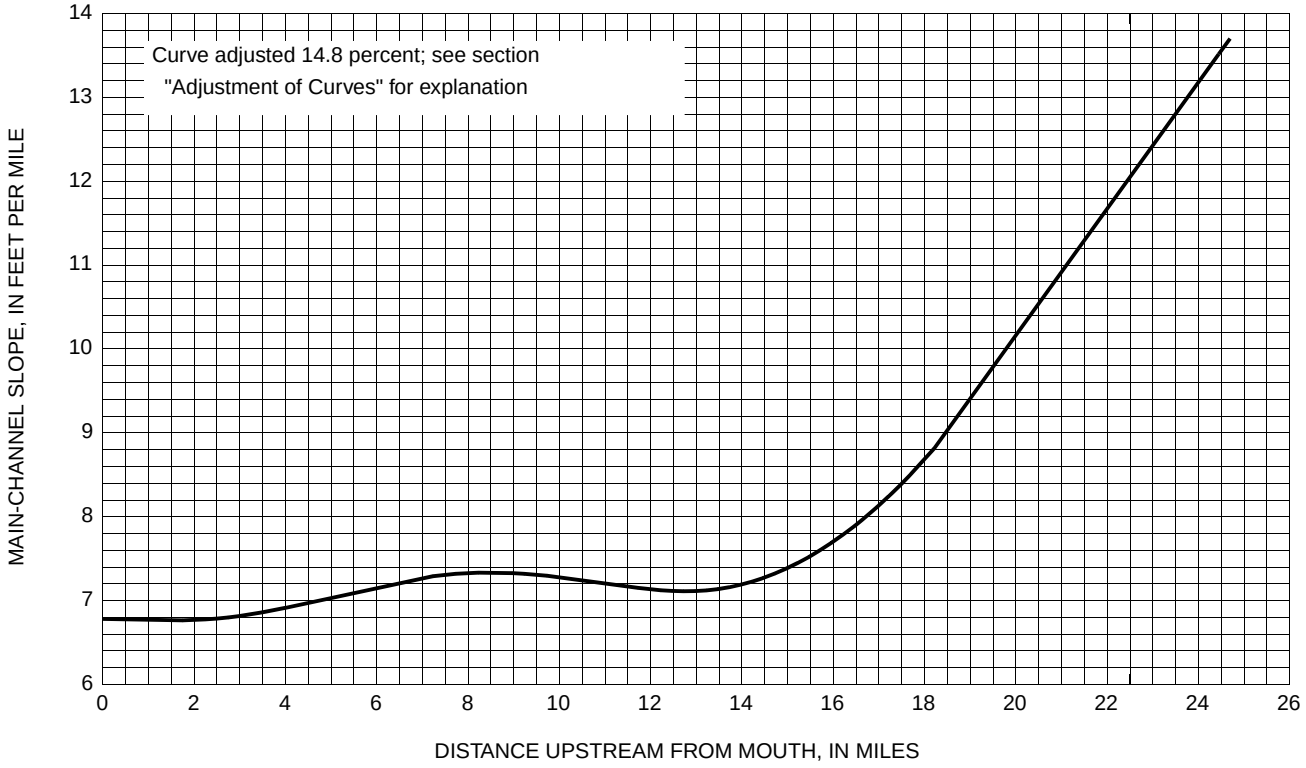
Figure 117. Thompson River, beginning at Iowa-Missouri State line in Decatur County--Continued.



List of sites used to quantify main-channel slopes of Timber and South Timber Creeks
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	124	Mouth of Timber Creek	83N 17W 3 NW	--
3.59	118	Shady Oaks Road (05451700, cont)	83N 17W 8 SW	Shady Oaks Rd
3.77	118	U.S. Highway 30	83N 17W 8 SW	--
7.36	62.0	County Road E49 (05451650, low)	83N 17W 21 SW	260th St
12.32	35.7	Smith Avenue, Ferguson	82N 17W 6 SW	Smith Ave
15.97	--	State Highway 14	82N 18W 2 SW	--
24.01	--	Drainage divide	--	--

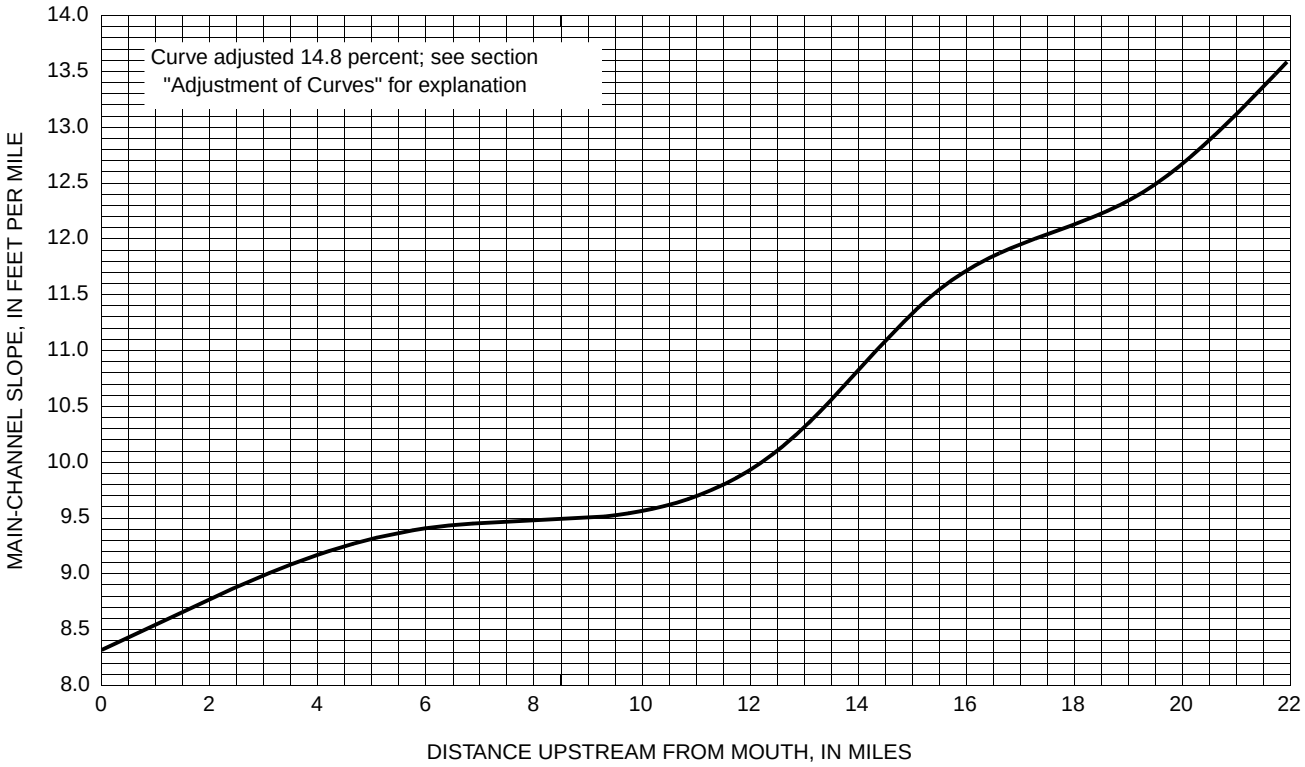
Figure 118. Timber and South Timber Creeks, beginning at mouth of Timber Creek in Marshall County.



List of sites used to quantify main-channel slopes of Troublesome Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	131	Mouth of Troublesome Creek	77N 36W 32 SW	--
2.77	128	635th Street (06809150, low)	76N 36W 3 NE	635th St
4.34	124	U.S. Highways 6 and 71 (06809140, --)	77N 36W 36 SW	--
7.68	118	Edgewood Road	77N 35W 29 NW	Edgewood Rd
10.77	--	County Road N28	77N 35W 16 NE	690th St
13.06	--	Interstate 80	77N 35W 3 NE	--
13.77	68.4	Cass-Audubon County line, Akron Road (06809100, low)	77N 35W 2 NW	Akron Rd
18.24	52.4	310th Street	78N 35W 13 NE	310th St
21.41	--	Quail Avenue	78N 34W 4 SW	Quail Ave
24.69	23.9	Audubon-Guthrie County line	79N 34W 36 NE	--
35.22	--	Drainage divide	--	--

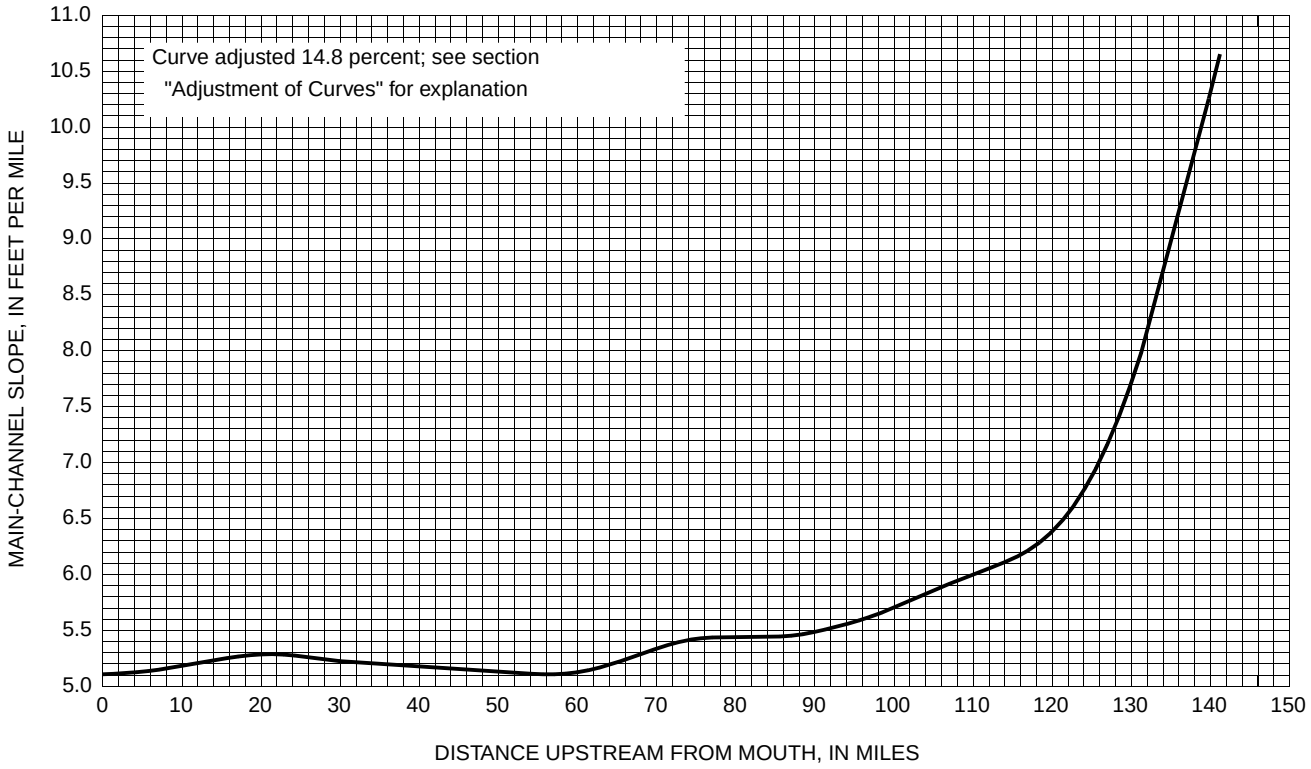
Figure 119. Troublesome Creek, beginning at mouth in Cass County.



List of sites used to quantify main-channel slopes of Turkey Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	134	Mouth of Turkey Creek	75N 37W 2 C	--
0.19	133	U.S. Highway 6 (06809300, low)	75N 37W 2 C	--
4.22	--	County Road N16	76N 36W 32 W	610th St
6.15	--	U.S. Highway 71	76N 36W 28 SE	--
10.83	--	Jackson Road	76N 36W 14 E	Jackson Rd
12.72	69.5	665th Street (06809250, low)	76N 35W 7 SE	665th St
15.46	52.8	County Road N28	76N 35W 3 SW	690th St
19.32	39.4	725th Street	77N 34W 31 C	725th St
21.93	27.3	State Highway 148, Anita	77N 34W 28 NE	Michigan St
32.93	--	Drainage divide	--	--

Figure 120. Turkey Creek, beginning at mouth in Cass County.



List of sites used to quantify main-channel slopes of the Turkey River
[See section "Presentation of Curves" for explanation of list elements]

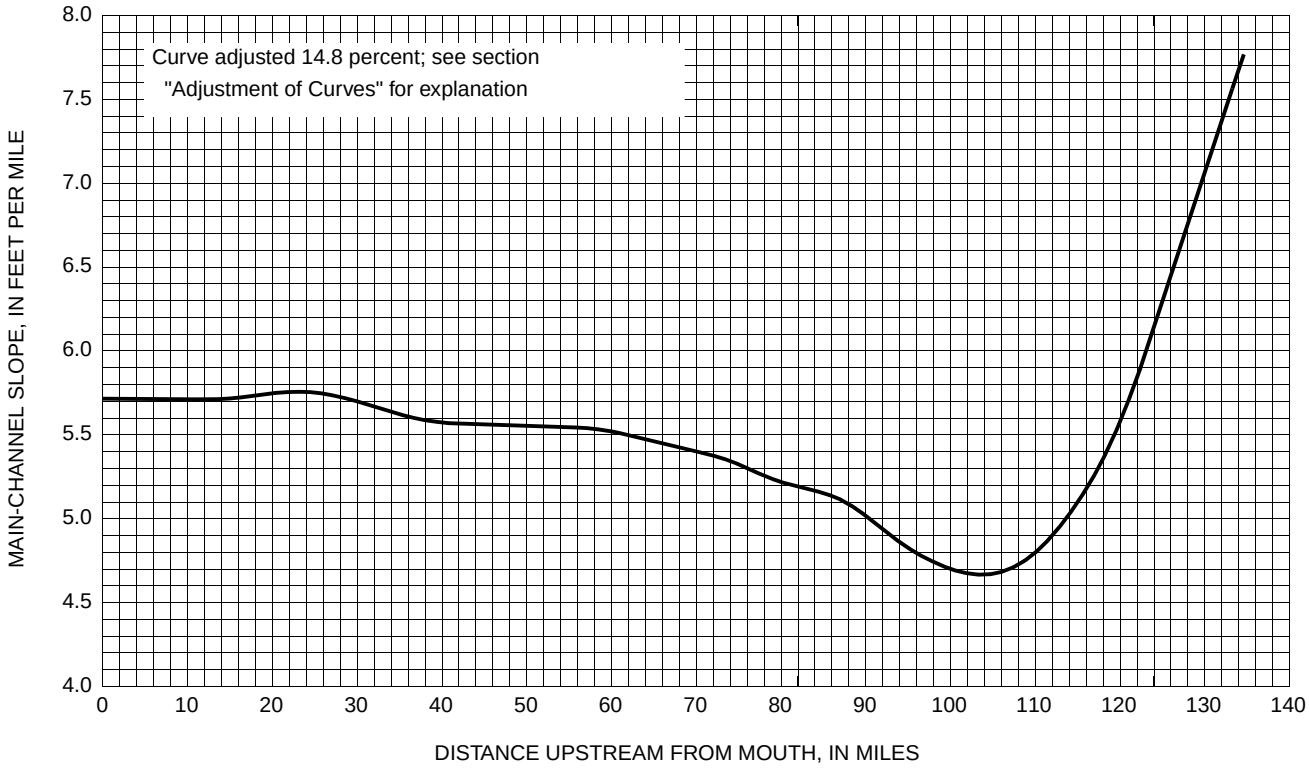
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	1,684	Mouth of Turkey River	91N 2W 12 NE	--
5.24	--	U.S. Highway 52	91N 2W 9 SE	--
12.96	1,606	County Roads C43 and X47, Osterdock	91N 3W 2 NE	Osterdock Rd
21.16	1,545	County Road C43, Garber (05412500, cont)	92N 4W 36 NW	Jupiter Rd
21.84	--	County Road C7X, Elkport	92N 4W 35 NE	Co Rd C7X
29.16	1,047	Mouth of Panther Creek	92N 4W 9 SW	--
33.79	--	Galaxy Road	92N 4W 6 SE	Galaxy Rd
39.09	903	State Highway 13 (05412020, cont)	93N 5W 26 NW	--
40.36	891	Bridge Street, Elkader (05412000, cont)	93N 5W 23 SW	Bridge St
47.10	875	North line of section 5	93N 5W 5 NW	--
52.36	852	County Road W70	94N 6W 26 SW	Cable Ave
58.47	814	Clayton-Fayette County line	94N 6W 18 SW	--
59.65	--	County Road B64, Elgin	94N 7W 13 NW	Agate Rd
64.38	--	U.S. Highway 18, Clermont	95N 7W 34 SW	Mill St
68.86	--	County Road B40	95N 7W 30 SE	Great River Rd

Figure 121. Turkey River, beginning at mouth in Clayton County.

List of sites used to quantify main-channel slopes of the Turkey River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
74.23	--	Ironwood Road	95N 8W 22 SE	Ironwood Rd
78.22	--	County Road B40	95N 8W 15 SE	Great River Rd
83.59	641	County Road B40 (05411850, cont)	95N 8W 8 SE	Great River Rd
87.06	--	State Highway 150	95N 8W 18 NW	--
90.07	--	Orange Road	95N 9W 2 SE	Orange Rd
92.04	264	Fayette-Winneshiek County line	95N 9W 3 NW	--
95.19	250	123rd Street	96N 9W 21 SE	123rd St
99.25	--	County Road B32	96N 9W 16 NW	Co Rd B32
101.14	--	State Highway 24, Fort Atkinson	96N 9W 8 SE	1st St
105.18	--	160th Street	96N 9W 6 NW	160th St
110.30	--	State Highway 325, Spillville	97N 9W 19 SE	--
110.82	177	County Road W14, Spillville (05411600, cont)	97N 9W 19 NE	Main St
115.89	134	210th Street	97N 10W 11 NE	210th St
119.69	--	230th Street	98N 10W 34 NW	230th St
124.08	--	Madison Road	98N 10W 17 NE	Madison Rd
127.62	95.9	Winneshiek-Howard County line, 345th Avenue	98N 10W 7 NW	345th Ave
132.10	87.0	County Road V58 (05411560, low)	98N 11W 2 NW	Willow Ave
133.71	--	Valley Avenue, Vernon Springs	99N 11W 34 SW	Valley Ave
137.55	72.9	Mouth of North Branch Turkey River	99N 11W 31 SW	--
141.19	--	County Road V46	98N 12W 1 SW	Robin Ave
148.42	--	Drainage divide	--	--

Figure 121. Turkey River, beginning at mouth in Clayton County—Continued.



List of sites used to quantify main-channel slopes of the Upper Iowa River
[See section "Presentation of Curves" for explanation of list elements]

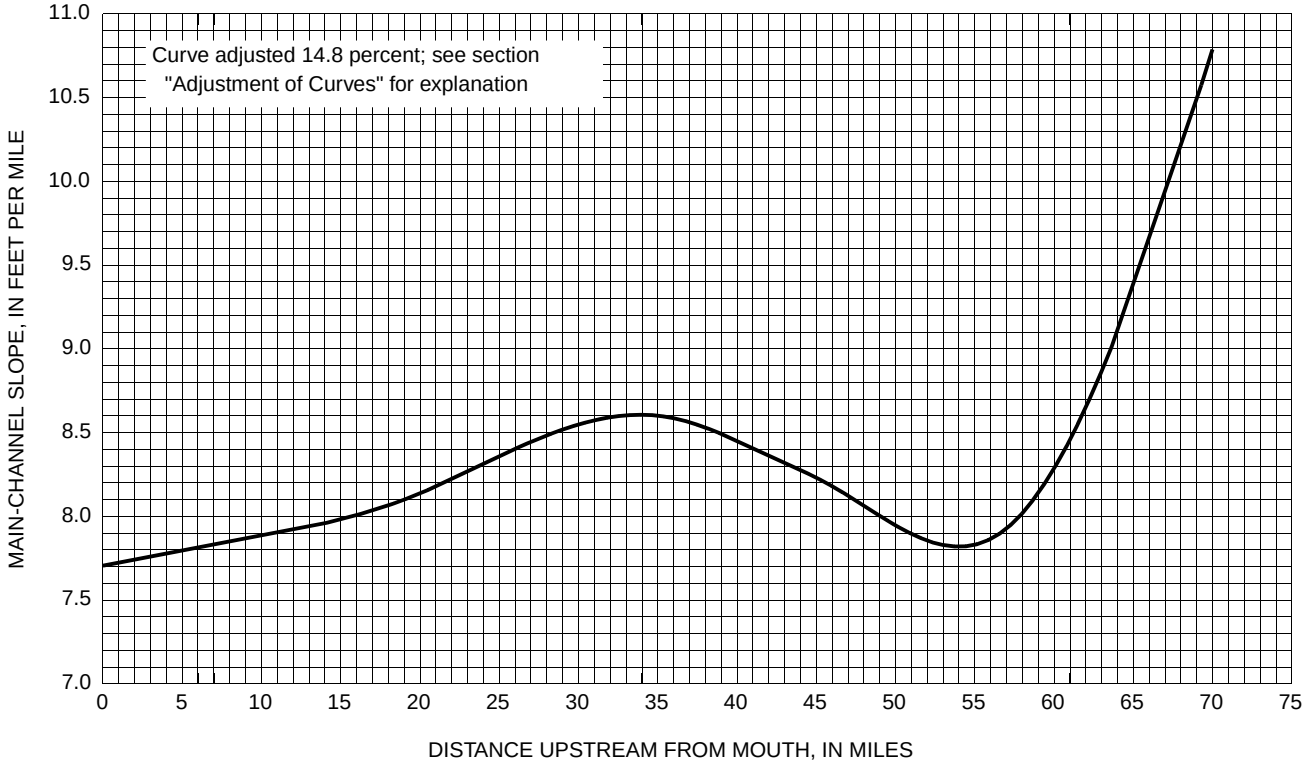
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	--	Mouth of Upper Iowa River	100N 4W 19 NE	--
3.25	1,005	State Highway 26 (05388340, low)	100N 4W 15 SE	--
5.44	987	Morgan Bridge Road	100N 4W 28 NW	Morgan Bridge Rd
8.61	--	Hartley Drive	100N 4W 31 NW	Hartley Dr
12.01	--	County Road X6A	100N 5W 34 SE	Hartley Dr
14.98	--	Green Leaf Road	99N 5W 5 NW	Green Leaf Rd
18.28	770	State Highway 76 (05388250, cont)	99N 6W 1 NW	--
24.37	--	Iverson Bridge Road	99N 6W 8 NE	Iverson Bridge Rd
31.27	731	County Road W60	99N 6W 29 NE	Ellingson Bridge Rd
36.58	--	Ferris Mill Road	99N 6W 30 S	Ferris Mill Rd
37.68	651	Allamakee-Winneshiek County line	99N 6W 31 NW	--
38.57	--	Lundy Bridge Road	99N 7W 36 SE	Lundy Bridge Rd
44.02	--	143rd Avenue	98N 7W 9 SE	143rd Ave
48.53	--	River Road	98N 7W 7 NE	River Rd
52.49	568	Clay Hill Road, Freeport (05388000, cont)	98N 8W 13 NE	Clay Hill Rd

Figure 122. Upper Iowa River, beginning at mouth in Allamakee County.

List of sites used to quantify main-channel slopes of the Upper Iowa River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
56.98	511	College Drive, Decorah (05387500, cont)	98N 8W 16 SW	College Dr
59.11	--	U.S. Highway 52	98N 8W 8 SW	--
63.16	--	County Road W20	98N 8W 6 NW	Bluffton Rd
67.68	420	Scenic River Road	99N 9W 25 E	Scenic River Rd
73.88	367	County Road W20, Bluffton (05387440, cont)	99N 9W 10 NE	Bluffton Rd
78.99	361	Chimney Rock Road	99N 9W 5 NE	Chimney Rock Rd
83.40	333	Cattle Creek Road	99N 9W 6 S	Cattle Creek Rd
87.32	287	Coldwater Creek Road	100N 10W 35 SE	Coldwater Creek Rd
91.52	--	State Highway 139, Kendallville	100N 10W 33 NE	--
94.10	273	360th Street (05387400, low)	100N 10W 21 C	360th St
98.61	248	Winneshiek-Howard County line, 345th Avenue	100N 10W 7 SW	345th Ave
104.55	224	Minnesota-Iowa State line	100N 11W 11 NW	--
109.18	--	Iowa-Minnesota State line	100N 11W 8 NW	--
115.20	203	Quail Avenue	100N 12W 14 NW	Quail Ave
119.42	--	County Road V36	100N 12W 21 SW	Oak Ave
122.54	--	Mill Road	100N 12W 19 C	Mill Rd
127.42	141	U.S. Highway 63, Chester (05387300, low)	100N 13W 10 SE	Main St
130.89	110	Howard Avenue	100N 13W 8 C	Howard Ave
134.57	84.2	Iowa-Minnesota State line	100N 14W 12 NW	--
154.73	--	Drainage divide	--	--

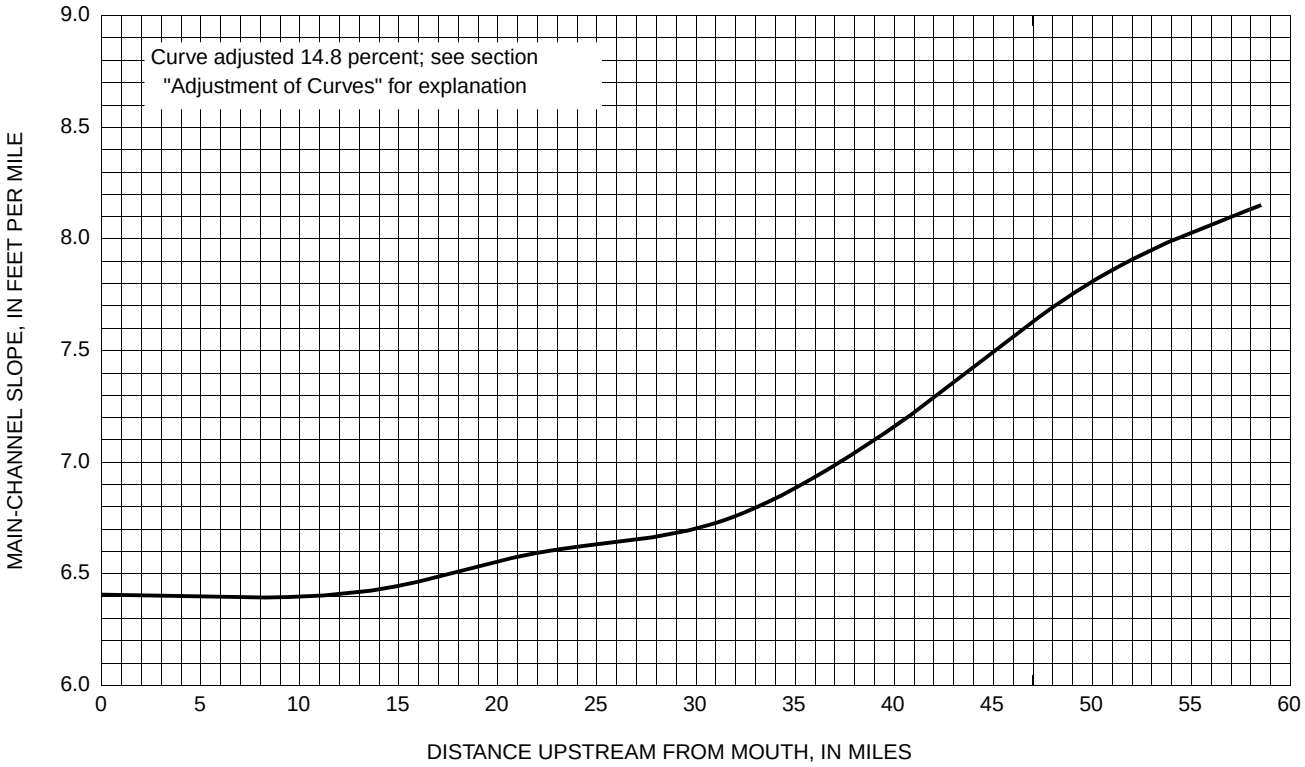
Figure 122. Upper Iowa River, beginning at mouth in Allamakee County—Continued.



List of sites used to quantify main-channel slopes of the Volga River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	403	Mouth of Volga River	92N 4W 26 SE	--
0.52	--	County Road X3C	92N 4W 26 SE	Grandview Rd
9.33	348	County Road X21, Littleport (05412400, cont)	92N 5W 25 SE	Littleport Rd
14.67	--	Evergreen Road, Mederville	92N 5W 22 SW	Evergreen Rd
19.18	--	State Highway 13, Osborne	92N 5W 9 SW	--
27.52	--	County Road C2W, Volga City	92N 6W 10 NE	Co Rd C2W
27.78	261	Cass Street, Volga City	92N 6W 10 NW	Cass St
34.93	--	Clayton-Fayette County line	93N 6W 30 SW	--
35.85	--	Acorn Road	93N 7W 25 C	Acorn Rd
38.42	--	County Road W51, Wadena	93N 7W 27 S	Mill St
42.04	167	Fox Road	93N 7W 30 SE	Fox Rd
45.92	--	Heron Road	93N 8W 13 SW	Heron Rd
55.87	--	Main Street, Fayette	93N 8W 28 NW	Main St
56.33	130	State Highway 150, Fayette (05412340, --)	93N 8W 29 NE	--
56.77	--	State Highway 93, Fayette	93N 8W 29 NW	--
61.11	--	M Avenue	93N 8W 30 SW	M Ave
64.76	53.0	County Road W25 (05412200, low)	93N 9W 35 SW	O Ave
69.98	--	State Highway 93	93N 9W 30 NE	--
81.12	--	Drainage divide	--	--

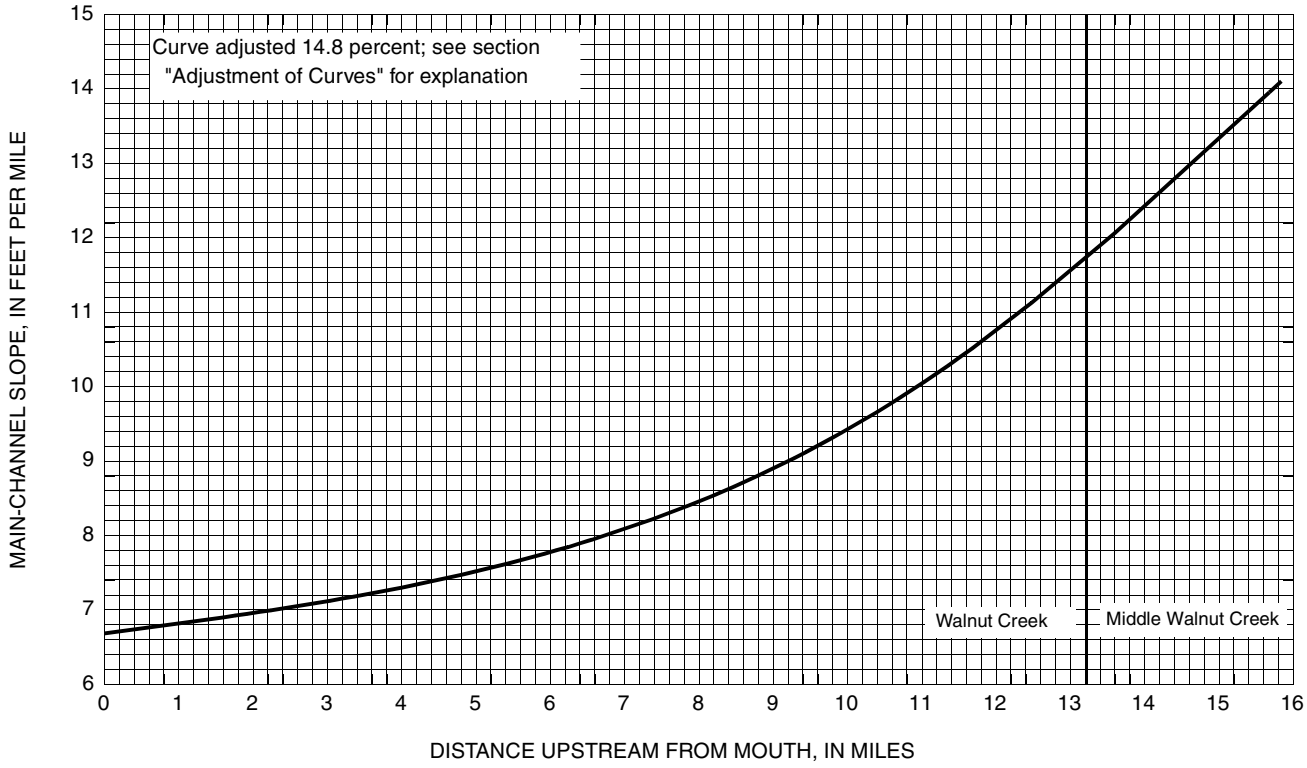
Figure 123. Volga River, beginning at mouth in Clayton County.



List of sites used to quantify main-channel slopes of Walnut Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	223	Mouth of Walnut Creek	69N 41W 8 SW	--
1.90	222	County Road L68 (06808800, low)	69N 41W 9 E	330th Ave
7.95	--	160th Street	69N 40W 4 N	160th St
13.49	--	State Highway 184	70N 40W 12 S	--
14.77	--	U.S. Highway 59	70N 40W 1 SE	--
15.29	161	Fremont-Page County line	70N 40W 1 NE	--
16.15	159	Page-Montgomery County line	70N 39W 6 NW	--
20.44	140	240th Street (06808700, low)	71N 39W 17 NW	240th St
23.38	--	County Road M37	72N 39W 33 C	Boxelder Ave
26.96	108	U.S. Highway 34	72N 39W 23 NE	--
31.48	--	County Road H20	73N 38W 30 SW	150th St
37.06	82.4	Montgomery-Pottawattamie County line	73N 38W 4 NW	100th St
42.25	70.4	State Highway 92	74N 38W 9 NE	--
46.51	61.2	Hackberry Road (06808600, low)	75N 38W 22 NW	Hackberry Rd
48.71	--	U.S. Highway 6	75N 38W 9 NE	--
53.44	37.4	Magnolia Road	76N 38W 22 NE	Magnolia Rd
58.52	--	State Highway 83	77N 38W 26 NW	--
66.63	--	Drainage divide	--	--

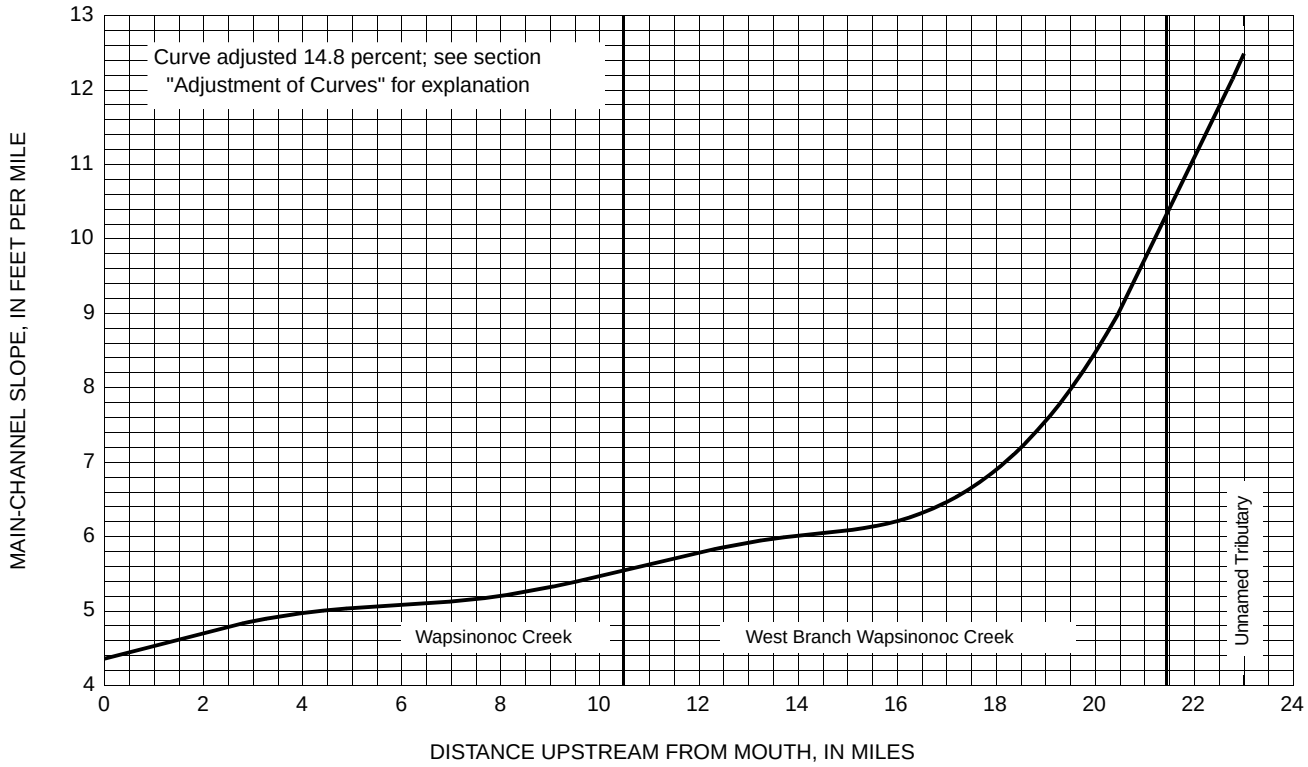
Figure 124. Walnut Creek, beginning at mouth in Fremont County.



List of sites used to quantify main-channel slopes of Walnut and Middle Walnut Creeks
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	102	Mouth of Walnut Creek	72N 8W 2 NE	--
5.85	66.3	County Road W40 (05473100, low)	73N 8W 27 SW	Germanville Rd
11.23	53.8	Spruce Avenue	73N 8W 19 SW	Spruce Ave
15.84	--	Orange Boulevard	73N 9W 21 SE	Orange Blvd
27.26	--	Drainage divide	--	--

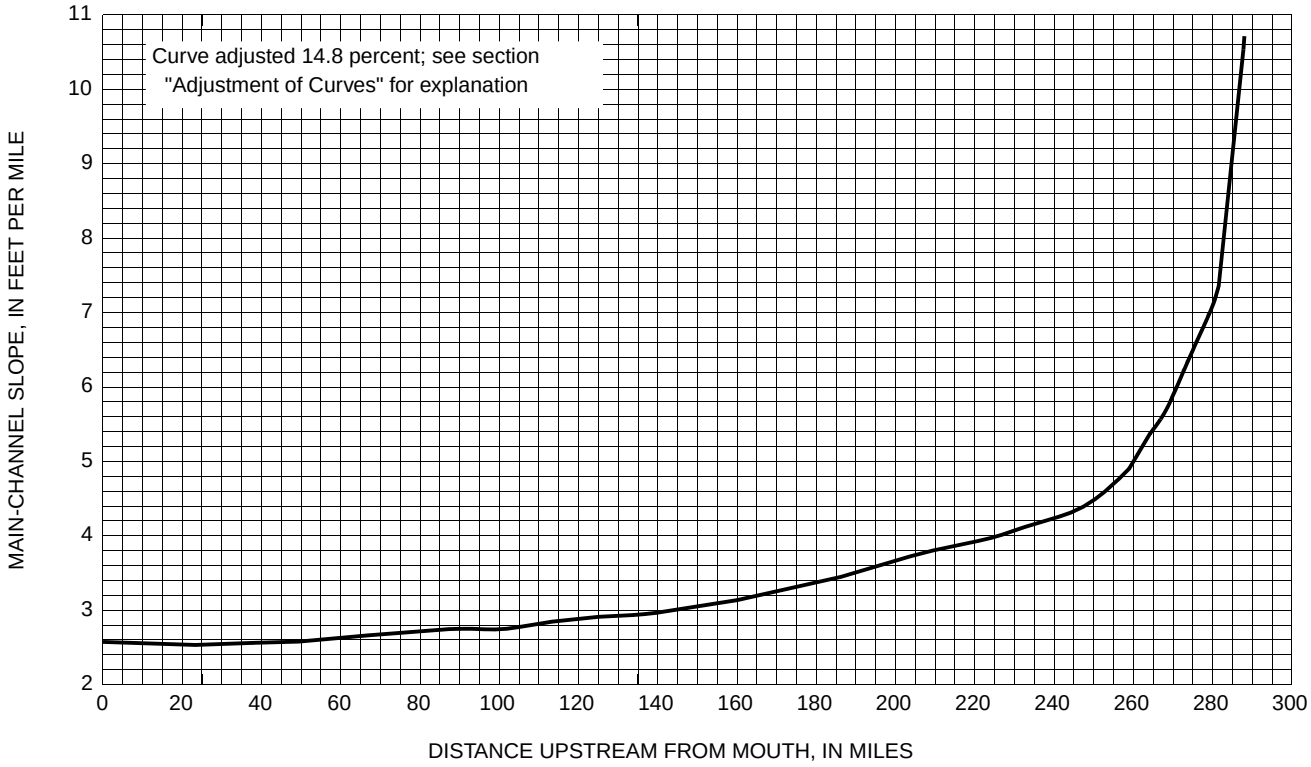
Figure 125. Walnut and Middle Walnut Creeks, beginning at mouth of Walnut Creek in Jefferson County.



List of sites used to quantify main-channel slopes of Wapsinonoc and West Branch Wapsinonoc Creeks
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	189	Mouth of Wapsinonoc Creek	77N 3W 19 SW	--
3.98	161	State Highway 22 (05464980, qw)	77N 4W 11 SE	--
7.84	111	County Road F70	78N 4W 36 NW	155th St
13.66	54.1	County Road F62, West Liberty (05464950, low)	78N 4W 14 NE	121st St
15.99	46.6	U.S. Highway 6, West Liberty (05464948, --)	78N 4W 10 NE	--
19.75	--	Muscatine-Cedar County line	78N 4W 4 NW	--
23.00	17.7	County Road X30, Downey	79N 4W 29 SW	Baker Ave
31.72	--	Drainage divide	--	--

Figure 126. Wapsinonoc and West Branch Wapsinonoc Creeks, beginning at mouth of Wapsinonoc Creek in Muscatine County.



List of sites used to quantify main-channel slopes of the Wapsipinicon River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	2,540	Mouth of Wapsipinicon River	80N 5E 13 SE	--
3.59	2,536	U.S. Highway 67	80N 5E 22 NE	--
10.34	2,484	County Road Z30 (05422110, --)	80N 4E 12 NE	240th Ave
18.19	2,330	State Highway 956 (05422000, cont)	80N 4E 6 NE	--
20.57	--	U.S. Highway 61	80N 3E 1 SW	--
29.17	2,207	County Road Y52 (05421880, --)	80N 2E 12 NW	115th Ave
34.60	2,082	End of Buena Vista Road (05421840, --)	80N 2E 16 NW	--
38.41	2,053	60th Avenue	80N 2E 6 NW	60th Ave
45.01	1,928	U.S. Highway 30	81N 1E 14 N	--
54.28	1,834	County Road E63, Toronto (05421780, --)	82N 1E 17 NE	118th Ave
56.79	1,821	Clinton-Cedar County line	82N 1E 7 SW	--
58.14	1,820	County Road Y24, Massillon (05421770, --)	82N 1E 11 SE	Hoover Hwy
60.76	1,809	Cedar-Jones County line	83N 1W 36 SW	--
65.19	1,792	County Road X64, Oxford Mills (05421760, low)	83N 1W 28 NE	Co Rd X-64
69.12	--	County Road X75	83N 1W 18 SW	65th Ave
73.30	1,732	100th Avenue	83N 2W 15 NW	100th Ave

Figure 127. Wapsipinicon River, beginning at mouth at Scott-Clinton County line.

List of sites used to quantify main-channel slopes of the Wapsipinicon River—Continued

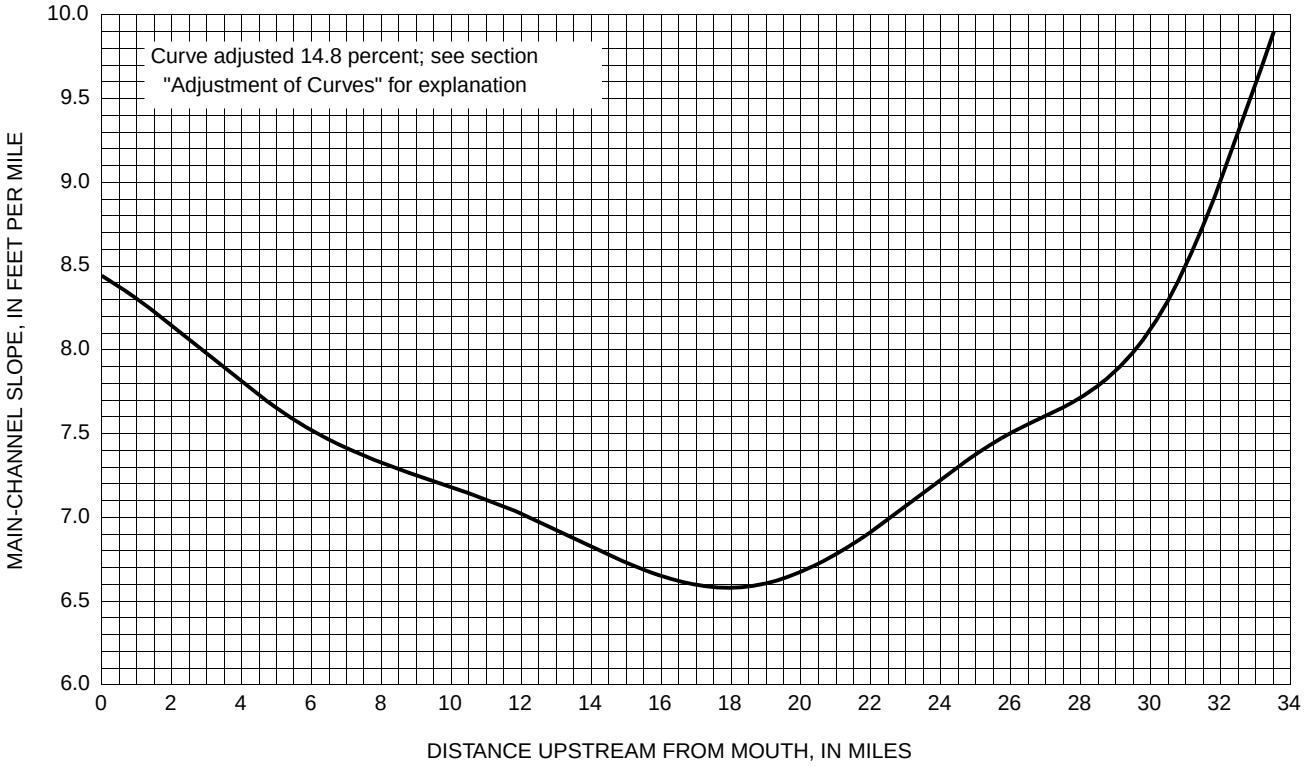
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
79.34	--	State Highway 38, Olin	83N 3W 12 S	--
89.95	1,585	Lands Road	84N 3W 19 NE	Lands Rd
92.68	1,575	Shoe Road (05421740, --)	84N 4W 13 SW	Shoe Rd
92.88	--	U.S. Highway 151	84N 4W 14 SE	--
94.95	1,562	County Road E34, Anamosa	84N 4W 10 NE	Co Rd E-34
98.88	1,324	County Road X28, Stone City (05421500, cont)	84N 4W 6 NE	Co Rd X-28
100.02	--	Jones-Linn County line	84N 4W 6 NW	--
101.61	--	Matsell Park Road	85N 5W 36 SW	Matsell Park Rd
110.83	1,294	County Road E28	85N 5W 20 NW	Boy Scouts Rd
115.10	1,274	Jordans Grove Road	85N 6W 14 NE	Jordans Grove Rd
118.68	1,263	State Highway 13, Central City (05421400, csg)	85N 6W 3 NE	--
123.58	--	Sutton Road, Paris	86N 6W 19 SE	Sutton Rd
132.32	1,215	County Road W45, Troy Mills	86N 7W 5 SE	Troy Mills Rd
134.64	1,210	Linn-Buchanan County line	86N 7W 6 NW	--
144.48	1,141	County Road W35, Quasequeton (05421330, --)	88N 7W 34 SE	Water St
149.46	--	Nolan Avenue	88N 8W 32 NW	Nolan Ave
155.19	--	U.S. Highway 20	88N 9W 11 SW	--
157.30	--	State Highway 150, Independence	88N 9W 4 SE	3rd Ave SE
157.99	1,048	USGS gage at end of 6th Street, Independence (05421000, cont)	88N 9W 4 NE	--
158.30	--	State Highway 939, Independence	89N 9W 34 SW	1st St W
164.79	--	Otterville Boulevard, Otterville	89N 10W 13 S	Otterville Blvd
169.57	899	County Road D16, Littleton (05420910, --)	89N 10W 9 SE	175th St
173.90	676	Buchanan-Black Hawk County line	89N 10W 6 NW	--
179.58	553	Bennington Road East	90N 11W 23 NW	Bennington Rd E
183.76	545	State Highway 281 (05420770, --)	90N 11W 4 SE	--
184.50	544	Black Hawk-Bremer County line	90N 11W 4 NE	--
189.44	535	County Road C50 (05420760, --)	91N 11W 20 NE	252nd St
193.57	--	State Highway 3	91N 11W 8 NW	--
199.66	511	County Road C33	92N 11W 19 NW	190th St
204.59	498	County Road C28, Tripoli (05420740, low)	92N 12W 2 SE	165th St
207.95	343	State Highway 93 (05420680, cont)	93N 12W 27 SW	--
213.80	--	County Road C16, Frederika	93N 12W 18 NW	120th St
216.92	325	Bremer-Chickasaw County line, U.S. Highway 63	94N 13W 36 SW	--
223.77	296	State Highway 346 (05420665, --)	94N 13W 15 NE	--
225.13	291	260th Street (05420660, low)	94N 13W 10 NW	260th St
228.24	161	County Road B54 (05420580, low)	95N 13W 33 NW	240th St
232.60	--	County Road B57	95N 13W 19 NE	220th St
236.95	145	U.S. Highway 18 (05420570, --)	95N 14W 1 SW	--
242.19	--	County Road B33	96N 14W 27 NE	170th St
247.90	120	County Road B28	96N 14W 9 NW	140th St

Figure 127. Wapsipinicon River, beginning at mouth at Scott-Clinton County line—Continued.

List of sites used to quantify main-channel slopes of the Wapsipinicon River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
254.11	102	Chickasaw-Howard County line, 100th Street	97N 14W 20 NW	100th St
257.23	95.2	County Road B17 (05420560, cont)	97N 14W 8 NW	190th St
260.74	--	170th Street	98N 14W 31 NE	170th St
264.22	77.6	Howard-Mitchell County line, County Road T68	98N 14W 18 SW	Addison Ave
267.79	72.3	390th Street (05420540, low)	98N 15W 12 NE	390th St
273.51	62.4	State Highway 9, Riceville	99N 15W 25 E	--
278.98	44.6	440th Street	99N 15W 15 NE	440th St
284.30	--	County Road A23	100N 15W 34 NW	470th St
288.03	--	490th Street	100N 15W 20 NE	490th St
297.48	--	Drainage divide	--	--

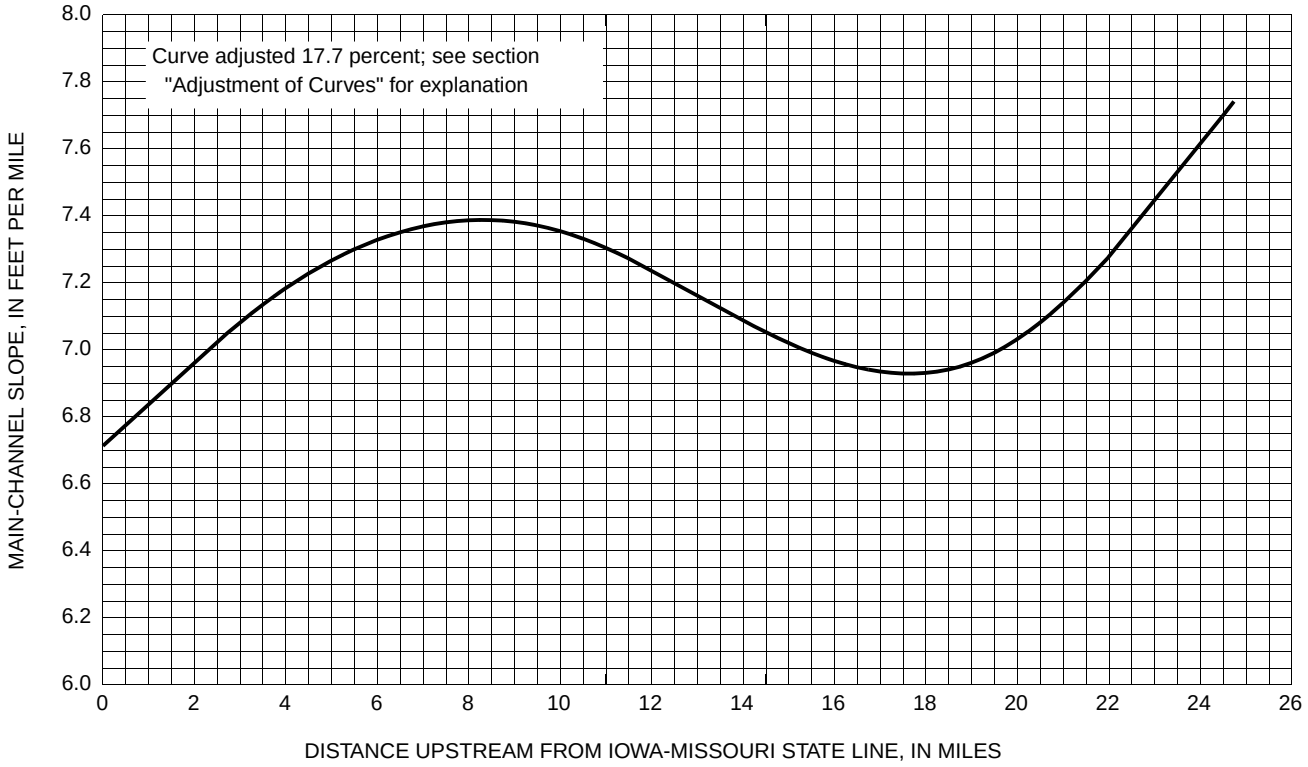
Figure 127. Wapsipinicon River, beginning at mouth at Scott-Clinton County line—Continued.



List of sites used to quantify main-channel slopes of Waterman Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	140	Mouth of Waterman Creek	94N 39W 26 N	--
0.75	139	Waterman Boulevard (06606000, low)	94N 39W 23C	Waterman Blvd
5.51	--	County Road B53	94N 39W 3 SE	Wilson Ave
11.77	82.7	County Road B46	95N 39W 23 NW	420th St
18.27	58.4	Abandoned bridge, 390th Street (06605900, low)	95N 39W 4 NE	--
22.03	--	370th Street	96N 39W 29 NE	370th St
25.90	50.1	350th Street	96N 39W 18 NE	350th St
30.49	28.7	U.S. Highway 18 (06605890, csg)	97N 40W 36 NE	--
33.52	18.8	300th Street	97N 39W 19 NW	300th St
43.98	--	Drainage divide	--	--

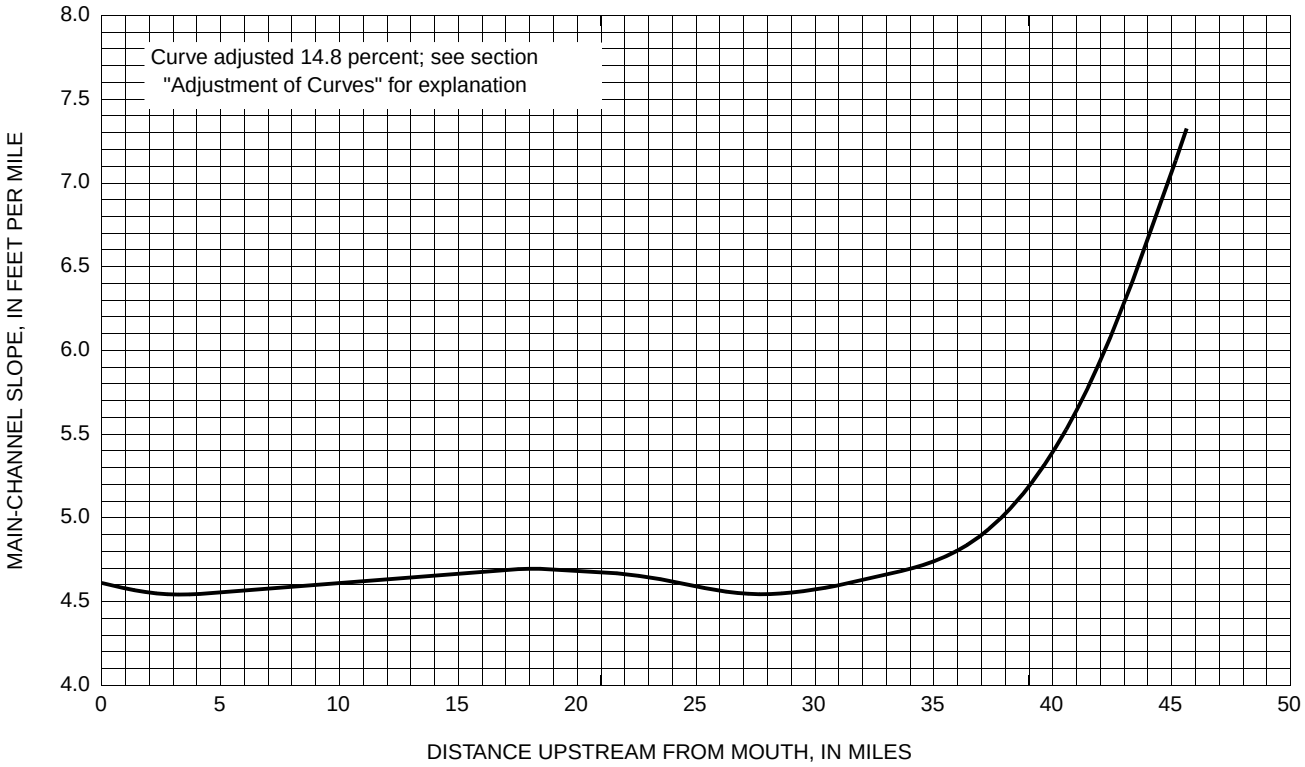
Figure 128. Waterman Creek, beginning at mouth in O'Brien County.



List of sites used to quantify main-channel slopes of the Weldon River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	240	Iowa-Missouri State line	67N 24W 28 W	--
1.16	228	County Road J66 (06898450, low)	67N 24W 22 NW	--
3.22	--	County Road R52	67N 24W 10 NE	--
10.00	104	County Road J46 (06898400, cont)	68N 24W 17 NE	--
14.56	72.4	State Highway 2 (06898300, low)	69N 24W 20 SE	--
19.30	36.5	County Road J20	70N 24W 33 SW	--
24.73	--	County Road J22	70N 24W 16 SW	--
37.44	--	Drainage divide	--	--

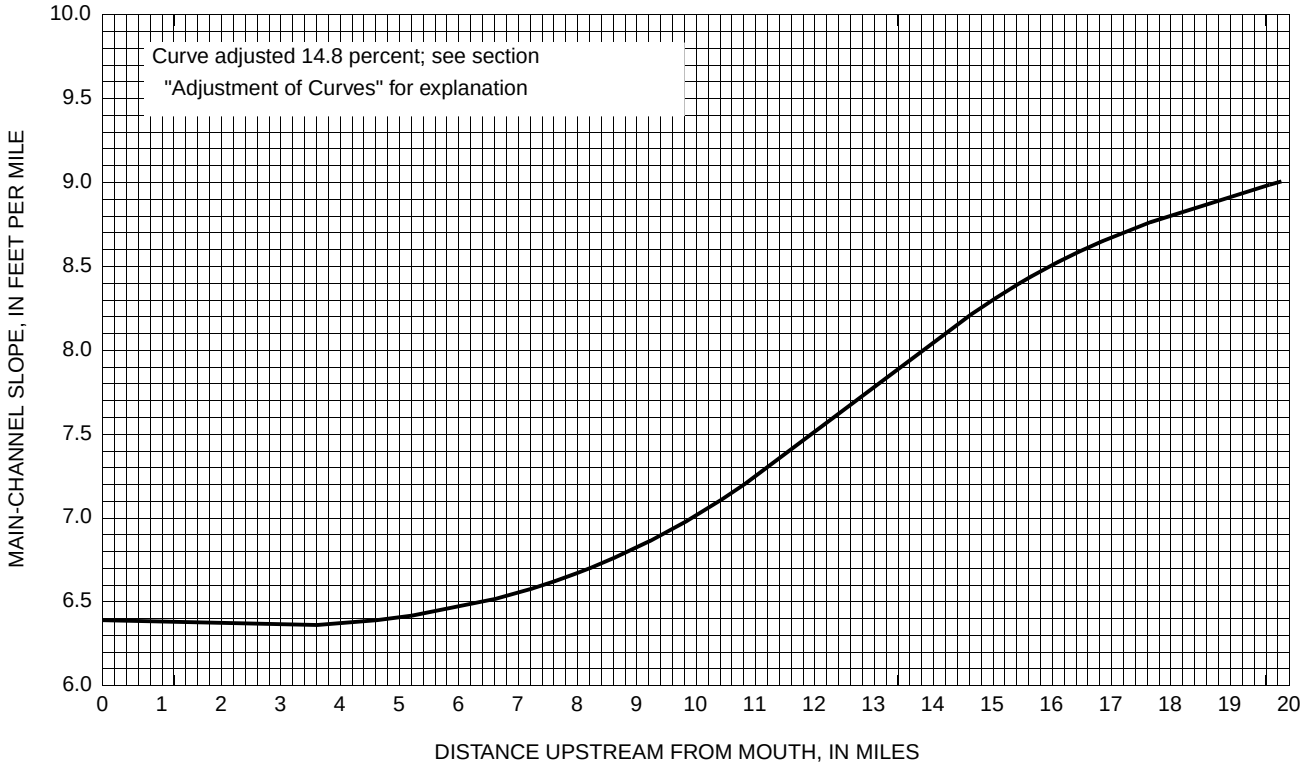
Figure 129. Weldon River, beginning at Iowa-Missouri State line in Decatur County.



List of sites used to quantify main-channel slopes of the West Branch Floyd River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	281	Mouth of West Branch Floyd River	91N 46W 2 SE	--
0.06	--	U.S. Highway 75, Merrill	91N 46W 2 SE	--
2.17	232	County Road C38 (06600400, low)	92N 46W 35 NE	Co Rd C38
6.00	225	State Highway 3	92N 46W 13 NE	--
9.95	--	150th Street	93N 45W 31 NE	150th St
12.35	209	130th Street	93N 45W 19 NE	130th St
16.76	194	Plymouth-Sioux County line, 100th Street	93N 45W 5 NE	100th St
18.27	180	County Road B62 (06600300, cont)	94N 45W 32 NE	500th St
18.50	--	U.S. Highway 75	94N 45W 29 SE	--
19.33	--	U.S. Highway 75	94N 45W 28 NW	--
23.44	140	County Road B58, Maurice	94N 45W 17 NW	470th St
26.82	125	State Highway 10	94N 45W 5 NE	--
26.99	--	U.S. Highway 75	95N 45W 32 SE	--
32.98	91.2	County Road B46	95N 45W 23 NW	420th St
36.22	69.3	County Road B40	95N 45W 12 NW	400th St
41.95	59.7	County Road B30 (06600250, low)	96N 44W 30 NE	370th St
45.63	34.8	350th Street	96N 44W 17 NW	350th St
55.65	--	Drainage divide	--	--

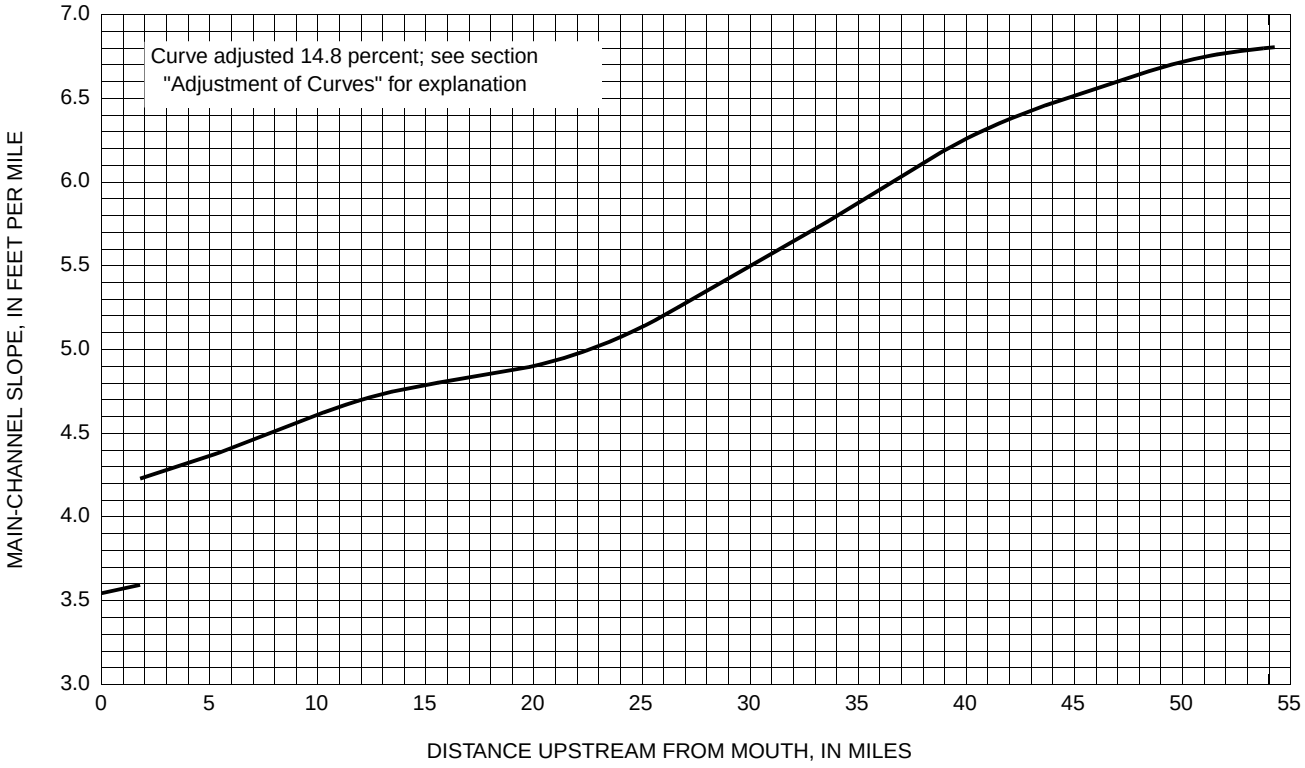
Figure 130. West Branch Floyd River, beginning at mouth in Plymouth County.



List of sites used to quantify main-channel slopes of the West Branch One Hundred and Two River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	125	Mouth of West Branch 102 River	68N 35W 10 NW	--
0.94	123	220th Street (06819140, low)	69N 35W 35 SW	220th St
7.55	106	Abandoned Bridge, 170th Street (06819120, low)	69N 34W 7 NW	170th St
10.17	52.2	Granite Avenue (06819100, low)	70N 34W 31 SE	Granite Ave
15.53	41.0	State Highway 148	70N 34W 14 SW	--
19.86	24.5	Taylor-Adams County line	70N 33W 6 NW	Adams-Taylor St
30.01	--	Drainage divide	--	--

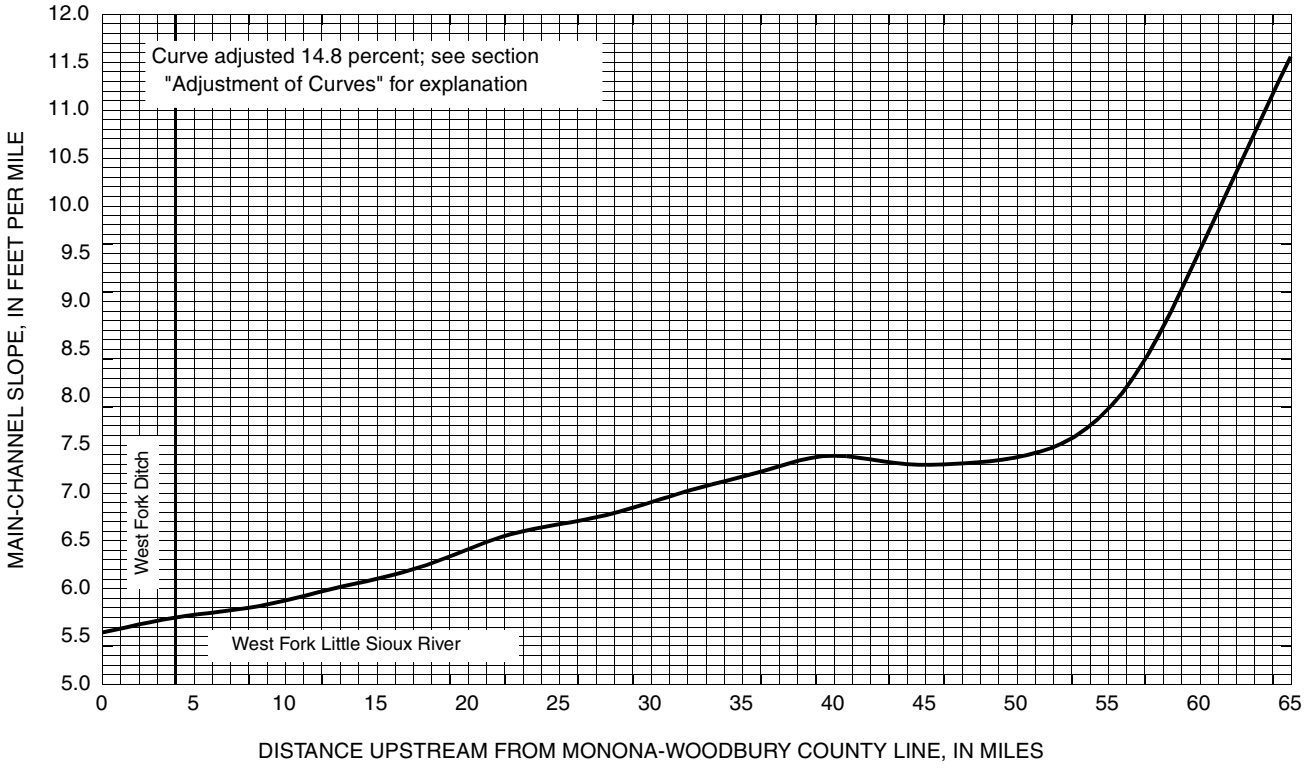
Figure 131. West Branch One Hundred and Two River, beginning at mouth in Taylor County.



List of sites used to quantify main-channel slopes of the West Fork Cedar River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	2,639	Mouth of West Fork Cedar River	90N 14W 16 NE	--
1.77	--	Downstream of mouth of Shell Rock River	90N 14W 4 SE	--
1.77	--	Upstream of mouth of Shell Rock River	90N 14W 4 SE	--
5.36	846	County Road C55, Finchford (05458900, cont)	90N 14W 6 SE	Finchford Rd
6.33	--	Black Hawk-Butler County line	90N 14W 7 NW	--
12.91	--	County Road T55	90N 15W 5 C	Temple Ave
19.59	770	County Road T47 (05458890, --)	91N 16W 33 NE	Sinclair Ave
25.20	736	State Highway 14 (05458884, --)	91N 16W 19 SW	--
29.51	705	Jackson Avenue (05458878, --)	91N 17W 15 NE	Jackson Ave
33.72	691	County Road T25 (05458875, --)	91N 17W 7 SE	Hickory Ave
39.72	298	State Highway 3, Dumont	92N 18W 34 NE	--
46.69	285	Butler-Franklin County line, Franklin Avenue	92N 18W 7 SW	Franklin Ave
50.65	--	200th Street	92N 19W 2 NW	200th St
54.27	--	Hydrologic Regions 1 and 2 boundary	93N 19W 28 SW	--
95.81	--	Drainage divide	--	--

Figure 132. West Fork Cedar River, beginning at mouth in Black Hawk County.



List of sites used to quantify main-channel slopes of West Fork Ditch and West Fork Little Sioux River
[See section "Presentation of Curves" for explanation of list elements]

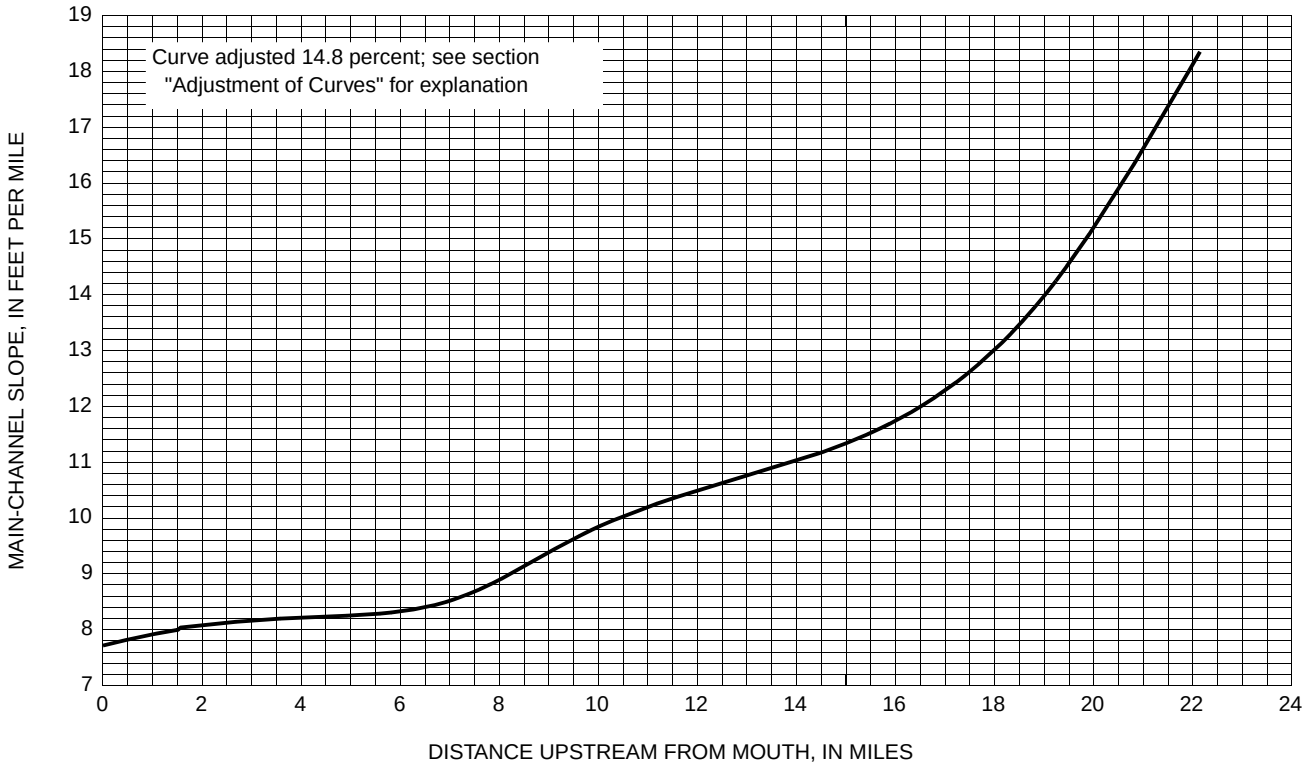
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	--	Monona-Woodbury County line, 100th Street	86N 45W 33 SE	100th St
0.99	403	State Highway 141 (06602020, cont)	86N 45W 27 SW	--
3.24	399	Humbolt Street (06602000, cont)	86N 45W 16 SE	Humbolt St
4.02	395	State Highway 982	86N 45W 9 SE	--
8.64	383	County Road	87N 45W 21 S	--
12.40	372	230th Street	87N 45W 10 NW	230th St
17.61	359	Abandoned bridge, 190th Street	88N 45W 21 NE	--
21.83	344	Abandoned bridge, 160th Street (06601900, low)	89N 44W 31 SE	--
22.33	--	U.S. Highway 20, Moville	89N 44W 31 E	--
26.72	--	Humbolt Street	89N 44W 17 SE	Humbolt St
32.49	241	Woodbury-Plymouth County line	89N 44W 3 NE	--
36.38	219	Quorn Road, Kingsley (06601700, low)	90N 44W 25 NW	Quorn Rd
39.39	--	State Highway 140	90N 43W 17 NW	--
43.02	147	County Road C60	90N 43W 10 NE	Co Rd C60
44.71	135	Tamarack Avenue (06601600, low)	90N 43W 1 NW	Tamarack Ave
46.40	--	Plymouth-Cherokee County line, A Avenue	91N 43W 36 NE	A Ave

Figure 133. West Fork Ditch and West Fork Little Sioux River, beginning at Monona-Woodbury County line.

List of sites used to quantify main-channel slopes of West Fork Ditch and West Fork Little Sioux River—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
50.14	45.8	580th Street	91N 42W 29 NE	580th St
53.95	--	560th Street	91N 42W 10 SW	560th St
57.05	--	540th Street	91N 42W 3 NE	540th St
60.63	27.4	520th Street	92N 42W 26 NE	520th St
64.95	--	State Highway 3	92N 42W 1 SW	--
72.77	--	Drainage divide	--	--

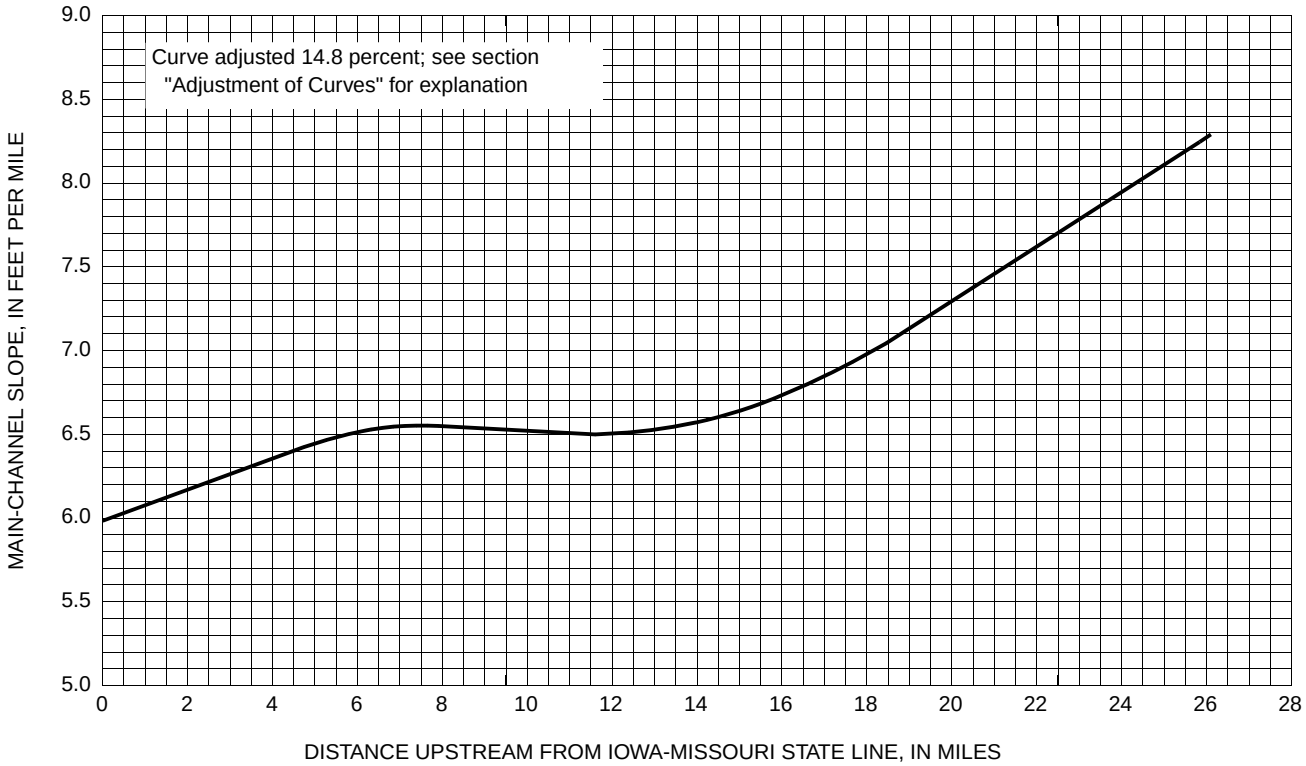
Figure 133. West Fork Ditch and West Fork Little Sioux River, beginning at Monona-Woodbury County line—Continued.



List of sites used to quantify main-channel slopes of the West Fork Middle Nodaway River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	129	Mouth of West Fork Middle Nodaway River	74N 33W 33 N	--
0.67	128	330th Street (06816800, low)	74N 33W 28 C	330th St
4.31	--	County Road G63	74N 33W 9 NW	290th St
7.31	--	State Highway 92	75N 33W 34 NW	--
9.54	--	250th Street	75N 33W 22 NE	250th St
14.48	67.9	225th Street (06816700, low)	75N 33W 4 C	225th St
18.96	--	County Road G35	76N 33W 19 NE	190th St
22.14	14.4	County Road G27	76N 33W 6 N	160th St
29.98	--	Drainage divide	--	--

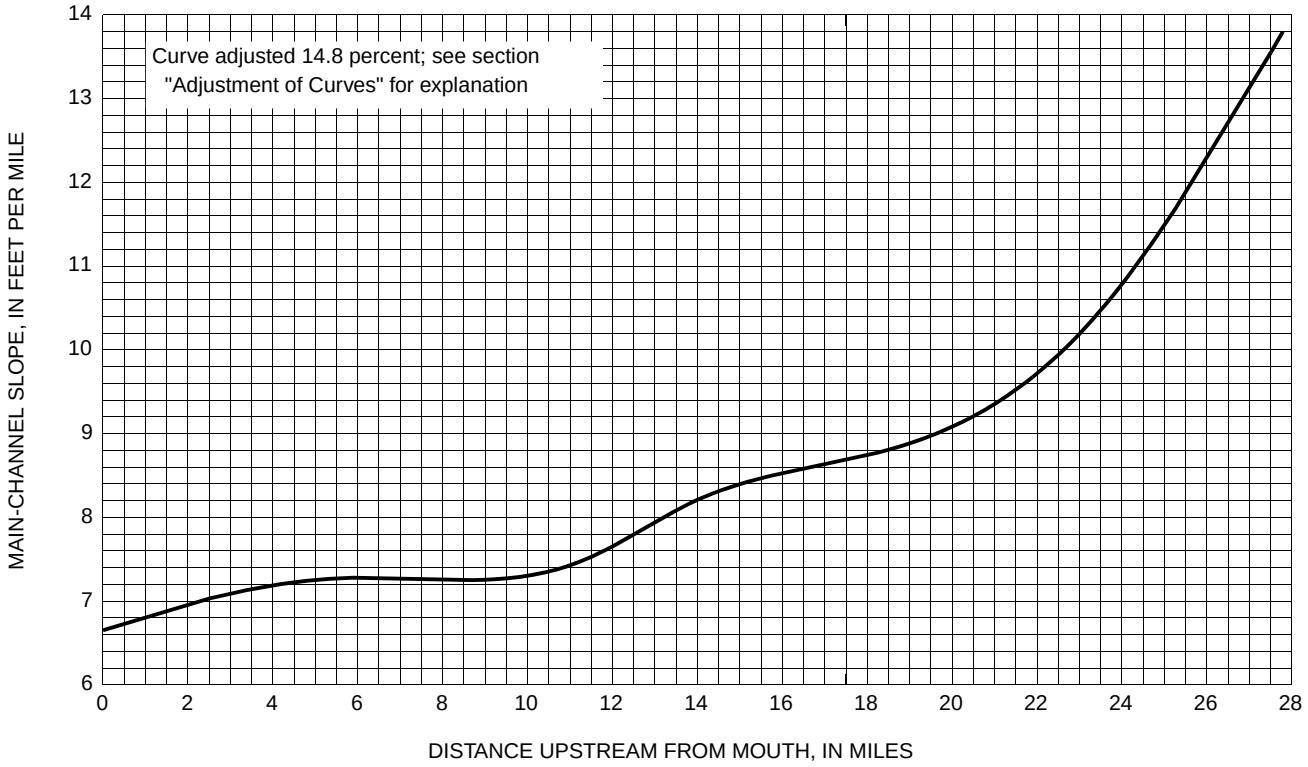
Figure 134. West Fork Middle Nodaway River, beginning at mouth in Adair County.



List of sites used to quantify main-channel slopes of the West Fork One Hundred and Two River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	212	Iowa-Missouri State line	67N 35W 27 S	--
3.22	--	County Road J55	67N 35W 10 S	300th St
6.76	--	265th Street	68N 35W 27 W	265th St
9.83	183	State Highway 2 (06819150, low)	68N 35W 10 NW	--
15.04	--	185th Street	69N 35W 15 C	185th St
20.61	--	140th Street	70N 35W 25 NW	140th St
26.10	17.9	Taylor-Adams County line	70N 35W 1 NE	Adams-Taylor St
39.06	--	Drainage divide	--	--

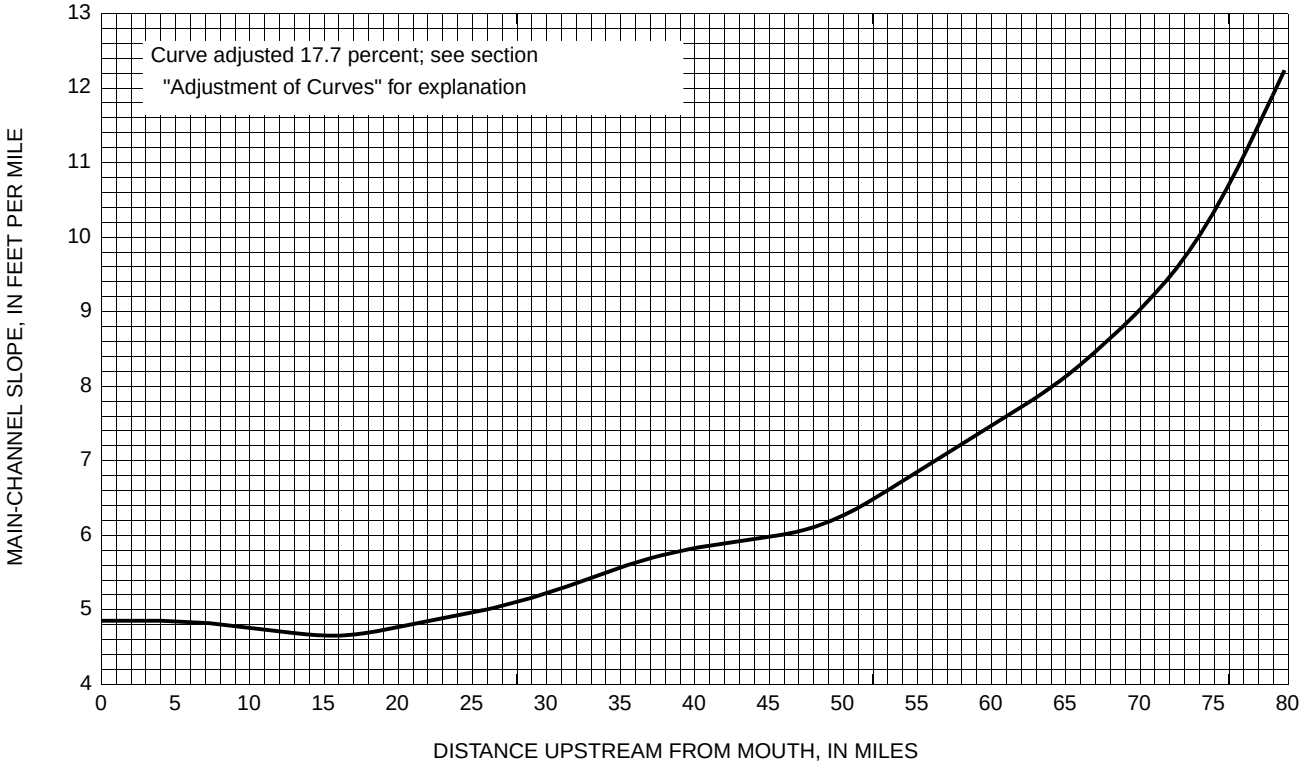
Figure 135. West Fork One Hundred and Two River, beginning at Iowa-Missouri State line in Taylor County.



List of sites used to quantify main-channel slopes of the West Fork West Nishnabotna River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	151	Mouth of West Fork West Nishnabotna River	79N 38W 17 NW	--
0.84	146	County Road M36, Harlan (06807300, low)	79N 38W 7 NE	Mulberry Rd
5.91	--	County Road F32	80N 38W 18 SE	F32 Rd
11.38	--	Linden Road	81N 39W 36 NE	Linden Rd
13.81	--	Linden Road, Defiance	81N 39W 24 NW	Linden Rd
18.22	71.5	Shelby-Crawford County line, County Road F16	81N 38W 5 NE	F16 Rd
20.67	64.2	320th Street (06807280, low)	82N 38W 35 W	320th St
23.43	--	State Highway 141	82N 38W 14 SE	--
27.79	--	County Road E53	82N 37W 6 NE	S Ave
37.31	--	Drainage divide	--	--

Figure 136. West Fork West Nishnabotna River, beginning at mouth in Shelby County.



List of sites used to quantify main-channel slopes of White Breast Creek
[See section "Presentation of Curves" for explanation of list elements]

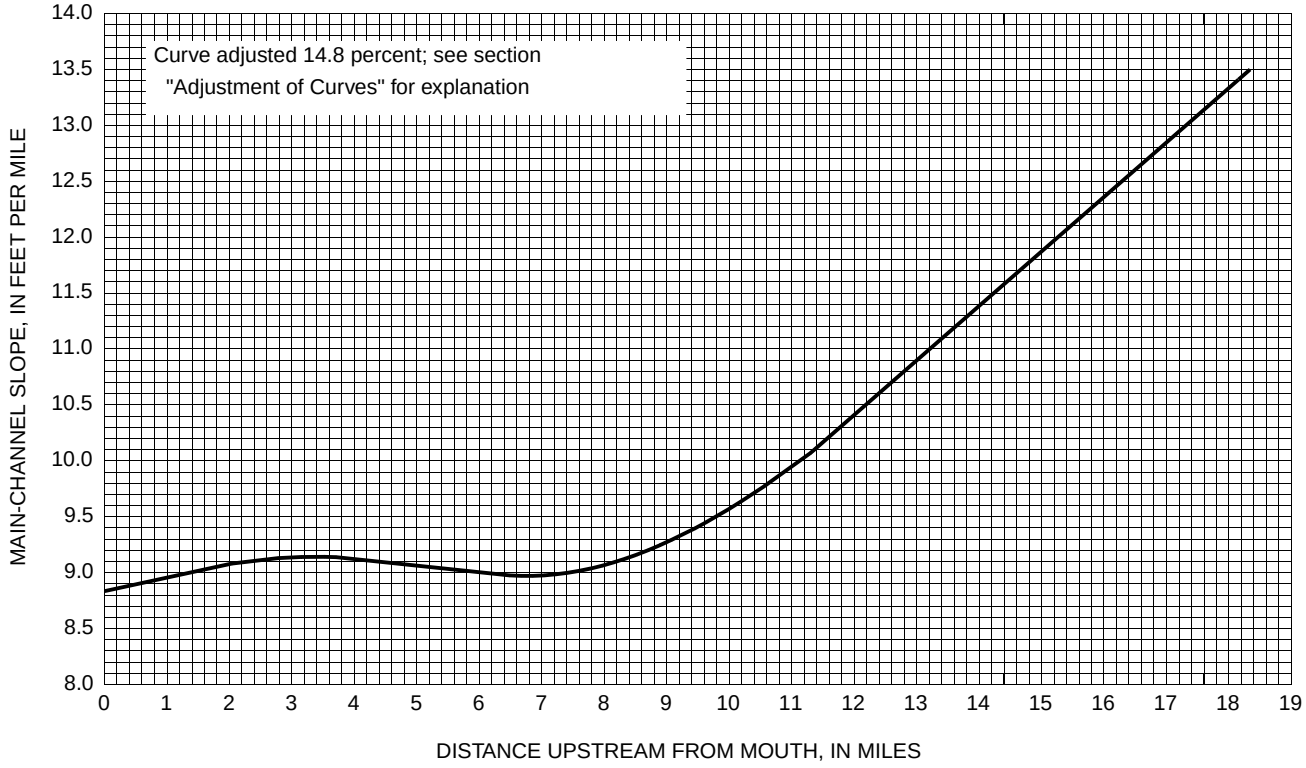
River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	430	Mouth of White Breast Creek	76N 19W 10 SW	--
5.67	403	State Highway 14	76N 20W 24 C	--
11.33	380	State Highways 5 and 92 (05488000, cont)	75N 20W 3 SW	--
12.46	--	Hydrologic Regions 1 and 2 boundary	75N 20W 9 SE	--
16.08	357	70th Avenue	75N 20W 19 SW	70th Ave
18.55	--	State Highway 181	75N 21W 26 SE	--
20.72	342	Quebec Drive (05487980, cont)	74N 21W 3 NW	Quebec Dr
26.43	--	Marion-Warren County line, 10th Avenue	74N 21W 18 SW	10th Ave
31.72	243	Warren-Lucas County line, County road (05487900, low)	74N 22W 35 SE	--
36.60	--	County Road S23	73N 22W 14 SW	--
41.01	--	County road	73N 22W 33 NE	--
43.96	--	County road (05487810, qw)	73N 22W 5 SW	--
47.30	133	U.S. Highway 34	72N 22W 18 SW	--
49.68	128	U.S. Highway 65, Lucas (05487800, csg)	72N 23W 23 NE	--
56.49	--	County road	72N 23W 32 NE	--
60.61	88.9	Lucas-Clarke County line	71N 23W 6 NE	--

Figure 137. White Breast Creek, beginning at mouth in Marion County.

List of sites used to quantify main-channel slopes of White Breast Creek—Continued

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
62.60	82.9	330th Avenue (05487700, qw)	71N 24W 2 SE	330th Ave
64.82	--	310th Avenue (05487695, qw)	71N 24W 3 SW	310th Ave
69.09	--	285th Avenue	71N 24W 6 NE	285th Ave
74.05	--	260th Avenue	72N 25W 26 SW	260th Ave
79.73	--	U.S. Highway 69, Osceola	72N 25W 20 SW	--
91.99	--	Drainage divide	--	--

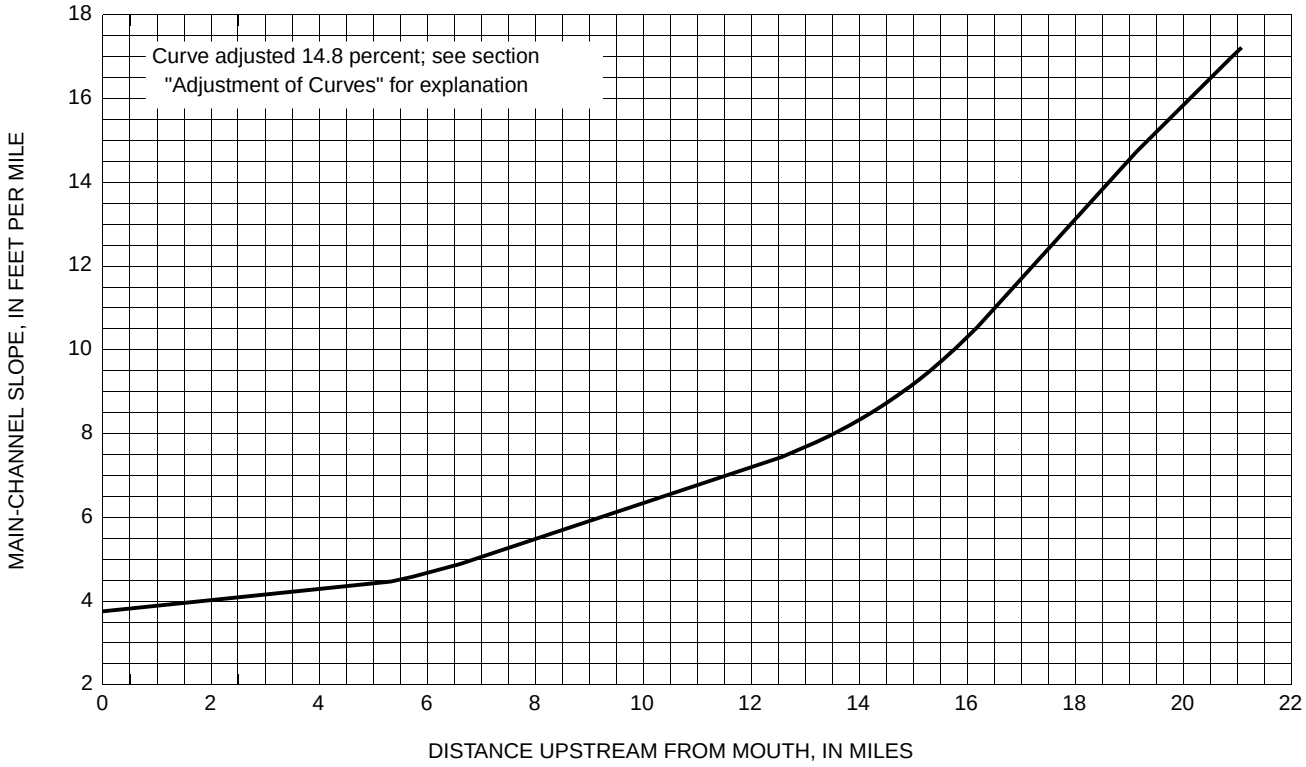
Figure 137. White Breast Creek, beginning at mouth in Marion County—Continued.



List of sites used to quantify main-channel slopes of Whitewater Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	114	Mouth of Whitewater Creek	86N 1W 10 NE	--
3.21	98.8	Jones-Dubuque County line	86N 1W 2 NE	--
6.13	91.9	U.S. Highway 151 (05418200, low)	87N 1W 26 NE	--
6.59	--	Simon Road	87N 1W 25 NW	Simon Rd
15.09	--	North Cascade Road	87N 1W 1 C	North Cascade Rd
18.34	16.8	East Pleasant Grove Road	88N 1W 36 NE	E Pleasant Grove Rd
31.68	--	Drainage divide	--	--

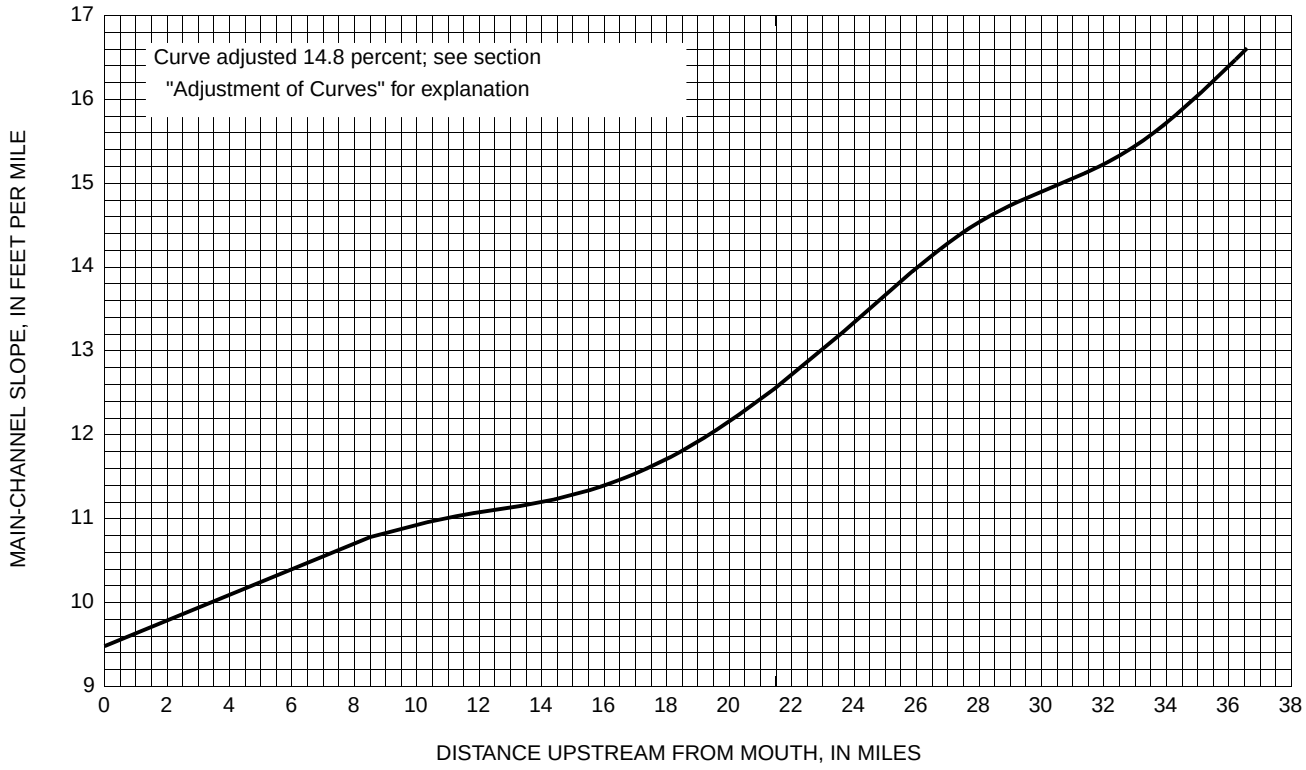
Figure 138. Whitewater Creek, beginning at mouth in Jones County.



List of sites used to quantify main-channel slopes of Willow Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	114	Mouth of Willow Creek, Des Moines Lobe landform region boundary	81N 32W 22 SE	--
1.38	112	County Road F20 (05483400, low)	81N 32W 14 SW	130th St
5.56	--	State Highway 141	81N 32W 8 NE	--
7.64	92.1	Guthrie-Greene County line	81N 32W 6 NE	--
10.81	51.8	320th Street (05483380, low)	82N 32W 21 SW	320th St
15.61	--	County Road E57	82N 32W 7 NE	290th St
18.50	35.9	Greene-Carroll County line, County Road N58	83N 32W 30 SW	A Ave
21.07	20.2	County Road E53	83N 33W 23 NE	250th St
28.74	--	Drainage divide	--	--

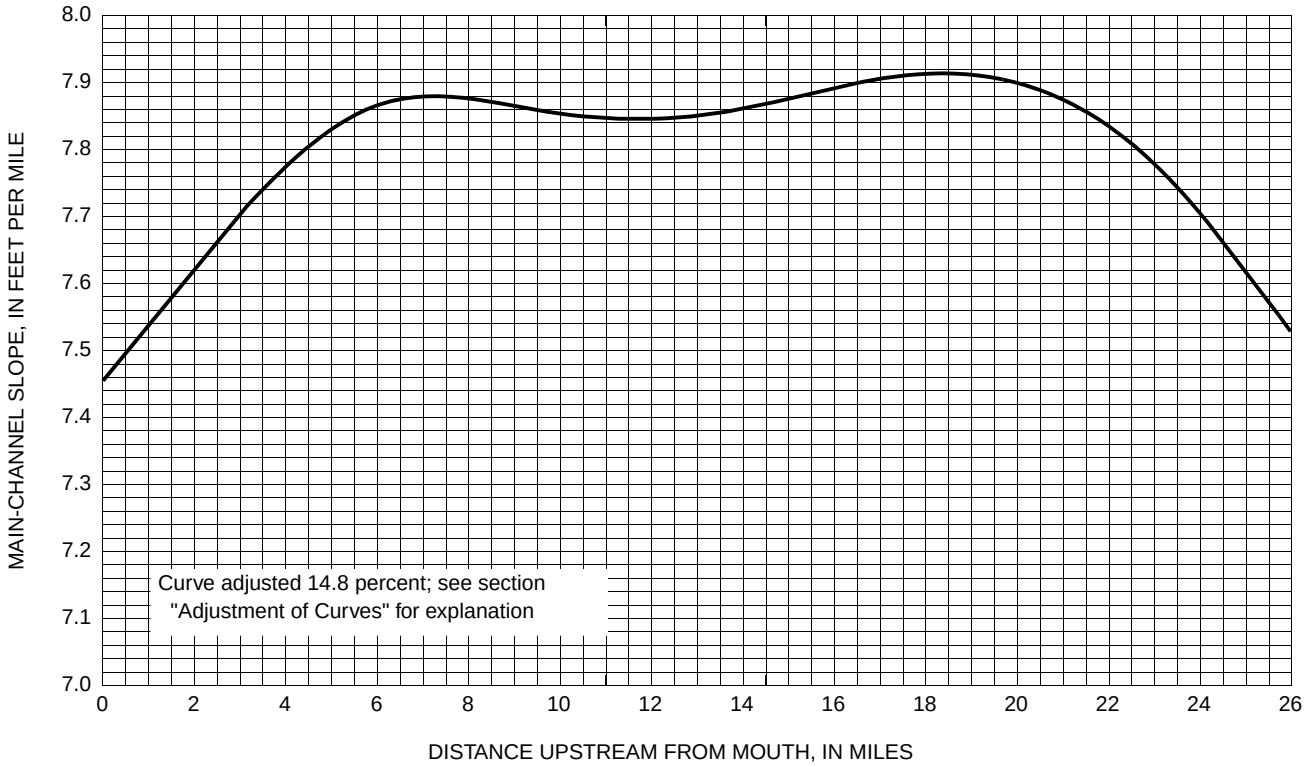
Figure 139. Willow Creek, beginning at mouth in Guthrie County.



List of sites used to quantify main-channel slopes of Willow Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	146	Mouth of Willow Creek	78N 44W 28 SE	--
0.16	146	Abandoned road (06609620, low)	78N 44W 28 SE	--
2.35	--	U.S. Highway 30, Missouri Valley	78N 44W 16 SE	Erie St
7.70	129	County Road F50 (06609600, cont)	79N 43W 30 NE	260th St
11.82	118	235th Trail	79N 43W 10 C	235th Trl
13.42	--	State Highway 127	79N 43W 3 NW	--
17.65	--	180th Street	80N 43W 14 NW	180th St
23.69	67.0	Panora Avenue (06609580, low)	81N 42W 29 NE	Panora Ave
28.04	53.9	Harrison-Monona County line, 340th Street	81N 42W 3 NW	340th St
32.94	29.1	State Highway 37 (06609560, csg)	82N 42W 11 S	--
36.58	--	Monona-Crawford County line, 100th Street	83N 42W 36 NE	100th St
46.54	--	Drainage divide	--	--

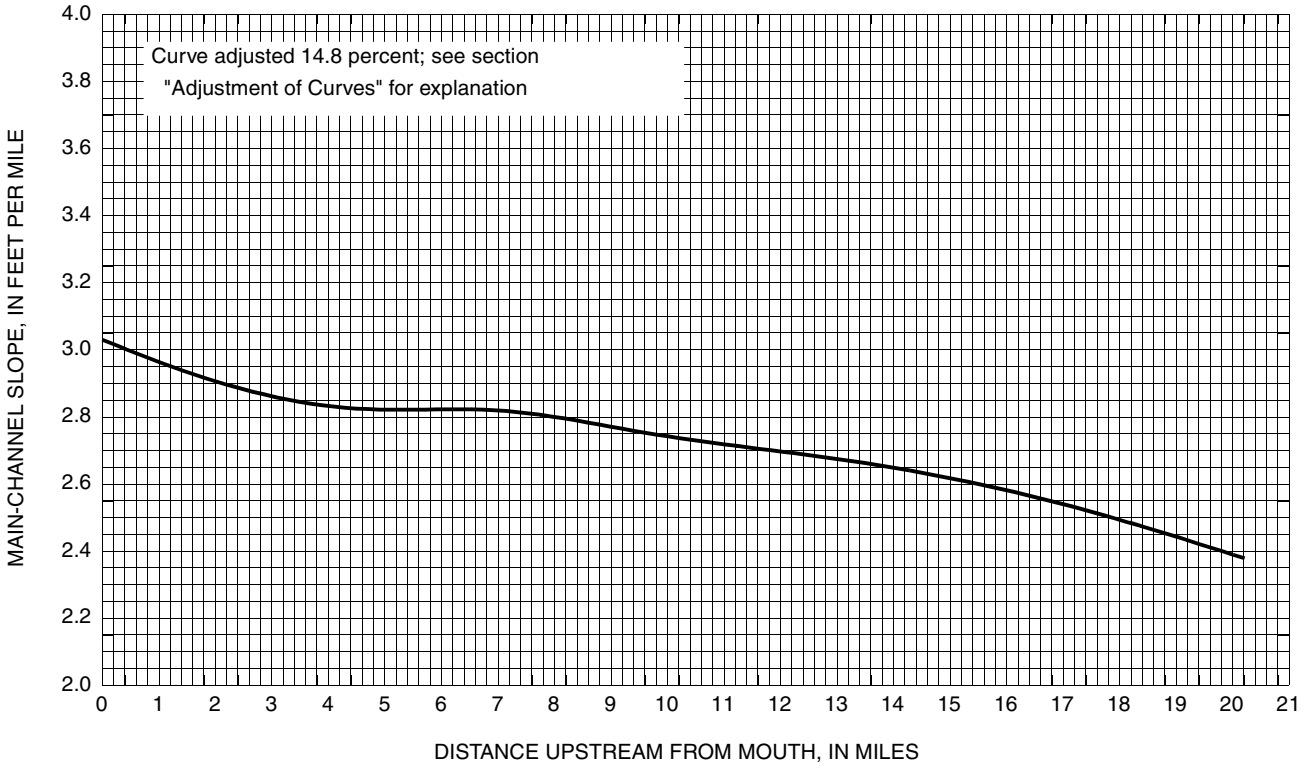
Figure 140. Willow Creek, beginning at mouth in Harrison County.



List of sites used to quantify main-channel slopes of Willow Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	156	Mouth of Willow Creek, Le Mars	92N 45W 9 NW	--
0.70	156	4th Avenue Northeast, Le Mars (06600160, low)	92N 45W 9 NE	4th Ave NE
2.79	--	Marble Avenue	92N 45W 11 NW	Marble Ave
5.87	65.2	Nature Avenue (06600140, low)	93N 45W 36 W	Nature Ave
9.68	61.4	140th Street	93N 44W 29 NW	140th St
13.61	53.2	120th Street	93N 44W 15 NE	120th St
17.33	38.3	Plymouth-Sioux County line	93N 44W 1 NW	--
23.01	23.4	480th Street	94N 43W 19 NE	480th St
25.97	--	State Highway 10	94N 43W 8 NE	--
36.57	--	Drainage divide	--	--

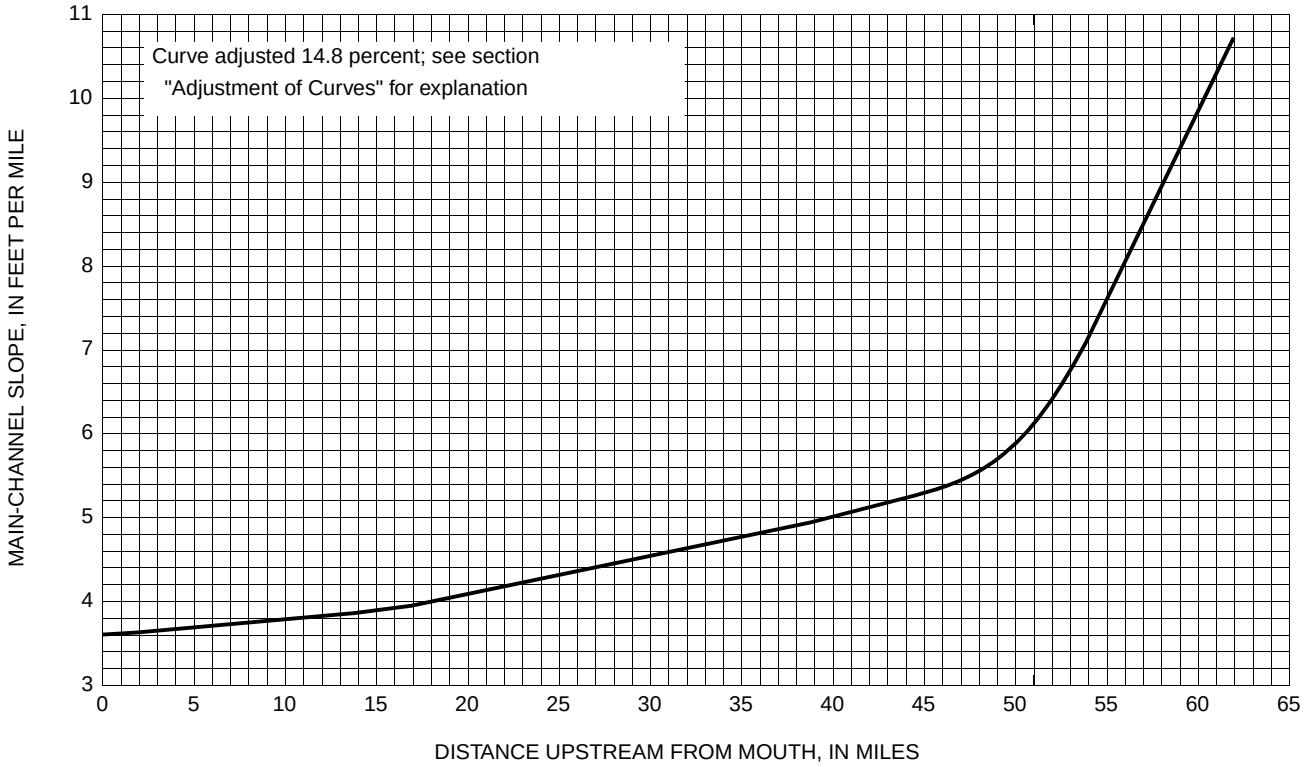
Figure 141. Willow Creek, beginning at mouth in Plymouth County.



List of sites used to quantify main-channel slopes of the Winnebago River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	700	Mouth of Winnebago River	95N 18W 14 SE	--
1.32	--	8th Street Southwest, Rockford (05460300, --)	95N 18W 15 NW	8th St SW
4.54	--	200th Street	95N 18W 8 NW	200th St
7.00	--	Floyd-Cerro Gordo County line, County Road S70	96N 18W 31 SW	Zinnia
9.55	677	Wren Avenue	96N 19W 35 N	Wren Ave
13.61	--	U.S. Highway 18	96N 20W 20 SE	--
14.38	--	Hydrologic Regions 1 and 2 boundary	96N 20W 20 NW	--
17.81	632	State Highway 122, Mason City (05460220, --)	96N 20W 11 E	4th St SE
20.21	526	13th Street Northeast, Mason City (05459500, cont)	96N 20W 3 NW	13th St NE
105.82	--	Drainage divide	--	--

Figure 142. Winnebago River, beginning at mouth in Floyd County.



List of sites used to quantify main-channel slopes of Wolf Creek
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	328	Mouth of Wolf Creek	87N 11W 19 C	--
3.04	327	U.S. Highway 218, La Porte City (05464250, low)	87N 12W 25 SW	4th St
4.87	324	Black Hawk-Benton County line	86N 12W 35 S	--
7.78	314	13th Avenue	86N 12W 10 SW	13th Ave
12.11	299	Benton-Tama County line, County Road V37 (05464220, cont)	86N 12W 19 NW	V37
16.48	--	State Highway 21	86N 13W 22 N	--
17.48	287	V Avenue (05464200, low)	86N 13W 21 NE	V Ave
23.09	--	150th Street	86N 13W 25 S	150th St
28.01	--	U.S. Highway 63, Traer	85N 14W 3 S	Main St
34.64	--	County Road T69	85N 15W 11 S	K Ave
39.71	122	County Road T55	85N 15W 17 NW	Hwy T55
44.13	110	E Avenue	85N 16W 11 SW	E Ave
50.54	64.2	Tama-Grundy, County line	86N 16W 31 SW	--
51.95	63.2	M Avenue (05464100, low)	86N 17W 36 SW	M Ave
57.88	46.6	J Avenue	86N 17W 33 SW	J Ave
61.93	16.7	State Highway 14	86N 18W 23 NW	--
71.82	--	Drainage divide	--	--

Figure 143. Wolf Creek, beginning at mouth in Black Hawk County.

List of sites used to quantify main-channel slopes of the Yellow River
[See section "Presentation of Curves" for explanation of list elements]

River mile	Drainage area (mi^2)	Site	Township, range, section, and subsection	Public address "911" street name
0.00	241	Mouth of Yellow River	96N 3W 34 SE	--
0.07	--	State Highway 76	96N 3W 34 S	--
9.73	221	County Road X36, Ion (05389000, cont)	96N 4W 24 SW	Ion Rd
16.50	204	Old Sixteen Road	96N 4W 16 SE	Old Sixteen Rd
20.13	179	Suttle Creek Road, Volney	96N 4W 18 SW	Suttle Creek Rd
24.60	--	County road	96N 5W 15 SW	--
26.64	115	Smithfield Drive	96N 5W 9 NW	Smithfield Dr
30.86	78.7	Williams Creek Road	96N 6W 12 NE	Williams Creek Rd
34.30	59.5	County Road W60 (05388800, low)	96N 6W 3NE	Old Stage Rd
38.11	--	State Highway 51	96N 6W 8 SW	--
40.69	35.4	Allamakee-Winneshiek County line	96N 6W 18 NW	--
44.04	--	130th Avenue	96N 7W 10 S	130th Ave
53.37	--	Drainage divide	--	--

Figure 144. Yellow River, beginning at mouth in Allamakee County.