# Scour and Fill In a Stream Channel, East Fork River, Western Wyoming

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By EDMUND D. ANDREWS

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# METRIC CONVERSIONS

U.S. customary units used in this report may be expressed as metric units by use of the following conversion factors:

| *To convert U.S. customary units* | *Multiply by* | *Top obtain metric units* |
|---|---|---|
| inch (in.) | 25.40 | millimeter (mm) |
| foot (ft) | 0.3048 | meter |
| mile (mi) | 1.609 | kilometer |
| square mile ($mi^2$) | 2.590 | square kilometer |
| cubic foot per second ($ft^3/s$) | 0.02832 | cubic meter per second |
| pound per second (lb/s) | 0.45 | kilogram per second |
| pound per foot per second ((lb/ft)/s) | 1.49 | kilogram per meter per second |

# SCOUR AND FILL IN A STREAM CHANNEL, EAST FORK RIVER, WESTERN WYOMING

By EDMUND D. ANDREWS

ABSTRACT

Frequent soundings of 11 cross sections located on the East Fork River, western Wyoming, during a spring flood revealed two sequences of channel scour and fill. All sections either scoured or filled at the flood crests relative to their low flow condition. The sections which scoured at high flow (called scouring sections) generally tended to fill at low flow. Conversely, the sections which filled at high flow (called filling sections) generally tended to scour at low flow. The critical discharge at which the character of a section changed from scouring to filling or vice-versa was approximately the bankfull discharge. Therefore, at any discharge except bankfull, some sections were accumulating bed material (fill), while others were being depleted of bed material (scour).

The mean at-a-station hydraulic geometry of the East Fork River agrees with the theoretical minimum-variance hydraulic geometry. Thus, on the average, the East Fork River accommodates a change in discharge by mutually minimizing the adjustment of velocity, width, and depth. The hydraulic geometry of every cross section, however, deviated from the mean of the reach, and the associated sequence of scour and fill was a consequence of the deviation. The scouring sections had larger velocity and smaller width and roughness hydraulic exponents than the mean of the reach. Consequently, the sediment-transport rate varied more rapidly with discharge in the scouring sections than the mean of the reach. Hence, these sections had relatively large sediment-transport rates and scoured when discharge exceeded bankfull, and relatively small sediment-transport rates and filled when discharge was less than bankfull. Conversely, the filling sections had smaller velocity and larger width and roughness hydraulic exponents than the mean of the reach. Consequently, the sediment-transport rate varied with discharge in the filling sections less rapidly than the mean of the reach. These sections had relatively small sediment-transport rates and filled when discharge exceeded bankfull, and relatively large sediment-transport rates and scoured when discharge was less than bankfull.

## INTRODUCTION

The hydraulic characteristics of a self-formed alluvial channel are not uniquely determined by its water and sediment discharge. That is, there are more dependent variables—velocity, width, depth, roughness, and slope—than there are independent variables and relations linking them. Langbein (1964) contended, however, that an alluvial channel tends toward a hydraulic condition in which a change in the independent variables is distributed among the dependent variables in such a way as to minimize the change required by any one variable. This hydraulic condition was shown to be the most probable and agrees well with the empirical mean hydraulic condition.

An alluvial stream is constantly remaking its channel as it meanders across its flood plain. Periodic channel features, such as bends, straight reaches, riffles, and pools, as well as chance encounters with random features, such as differences in bank material, vegetation, or an outcrop of resistant bedrock, may constrain the free adjustment of one or more hydraulic variables and thus prevent the hydraulic characteristics of a particular reach from adjusting to the most probable condition. Consequently, through any appreciable length of channel, significant variation in channel width, depth, roughness, slope, and velocity is found. Each section of channel, however, appears to be in quasi-equilibrium with the imposed water and sediment discharge.

As a result of the variation in hydraulic characteristics, the transport rate of bedload sediment may not be the same for all cross sections at a given discharge. When there is a difference between the inflow and outflow of the bed material in a reach, bed material either will be stored or will be depleted, and the mean bed elevation will change accordingly. Such changes in bed elevation during the passage of a flood are commonly termed scour and fill. Scour and fill are not solely a redistribution of bed material along the channel affected by longitudinal differences in the bedload-transport rate. They are also important short-term hydraulic adjustments that tend to smooth out irregularities and thereby maintain the channel in quasi-equilibrium.

Scour and fill are frequently observed at streamflow gaging stations and bridge crossings; however, little is known about the process or the hydraulics controlling it. Because the measurement of channel hydraulic characteristics is normally limited to a cross section rather than an extensive length of channel, it is not known whether scour and fill are localized phenomena or are more or less continuous along the stream. Similarly, the hydraulic characteristics associated with scour and fill are poorly understood. This paper reports on an investigation of scour and fill as a hydraulic adjustment to the variation in discharge and sediment load.

Appreciation is expressed to Luna B. Leopold for many thoughtful discussions and for providing the unique measurements of bedload transport which made this investigation possible. I wish to thank W. W. Emmett and C.

F. Nordin of the U.S. Geological Survey, who provided most of the field equipment, as well as some data, and Thomas Lisle who assisted with most of the fieldwork, and offered many helpful suggestions.

## PREVIOUS OBSERVATIONS OF SCOUR AND FILL

Substantial channel scour is observed at some streamflow gaging stations as flood discharge increases. In a few instances, 60 percent or more of the increase in depth is due to scouring of the river bed. Perhaps the best known examples of channel scour are those documented for the gaging stations on the Colorado River near Grand Canyon, Ariz., and on the Rio Grande at Bernalillo, N. Mex. Leopold and Maddock (1953*a*) discussed in considerable detail the at-a-station hydraulic geometries and the associated patterns of channel scour and fill at these gaging stations. An important feature of the phenomena at the Grand Canyon gaging station is that the cross section filled as the discharge increased from low flow, to approximately 12,000 $ft^3/s$, and then scoured continuously as the discharge increased to the flood crest of approximately 120,000 $ft^3/s$. After the flood crest, the section continued to scour slowly, so that the mean bed elevation at a given discharge after the flood crest was significantly below the mean bed elevation at the same discharge before the flood crest. When the flood had subsided, the cross section began to fill, and by the following spring, the bed elevation had returned to the preflood level.

A slightly different sequence of scour and fill was observed at the Bernalillo gaging station. No fill was observed prior to the flood crest. Instead, the section scoured progressively as discharge increased and the maximum depth of scour occurred at the flood crest. As discharge decreased, the section filled, so that by the time the flood had subsided, the mean bed elevation had returned to nearly the preflood level.

In considering river-bed scour in a reach of the middle Rio Grande, including the Bernalillo gaging station, Lane and Borland (1954) contended that the depth of scour typically observed at gaging-station cross sections could not be representative of any significant length of channel. They noted that the average annual volume of material entering the Elephant Butte Reservoir downstream from the gaging stations corresponded to less than 0.1 foot of material removed from the channel upstream, whereas the average depth of scour at the gaging stations was nearly 5 feet. Therefore, the material scoured from one cross section must be deposited as fill in a cross section some short distance downstream. In particular, they believed that channel scour was limited to contracted reaches, and inferred that the scoured material would be deposited where the channel widened. Channel scour appears to more common than it really is, they asserted, because gaging stations are usually located in contracted reaches.

Previously, Leopold and Maddock (1953*b*) had shown that the suspended-sediment load of the middle Rio Grande increased downstream between tributaries. Furthermore, they showed that the river bed was generally at a lower elevation after the spring flood. Therefore, they concluded that some scour, though not necessarily as much as observed at the gaging stations, occurred throughout long reaches of the channel.

Uncertainty over channel behavior arises because most of our information regarding rivers is collected at isolated cross sections. Only limited data are normally collected about the hydraulic geometry of the immediate reach near a gaging station. Even fewer data are collected concerning the channel more than a few channel widths upstream or downstream from the gaging station. Emmett and Leopold (1965) discussed three streams—one ephemeral and two perennial—for which channel scour and fill had been studied at several cross sections. All three studies indicate that scour was more or less continuous through the study reaches at floodflows and therefore was independent of channel configuration, riffles and pools, straight reaches, and bends.

The Arroyo de los Frijoles is an ephemeral sand-bedded channel near Santa Fe, N. Mex. (Leopold and others, 1966). Scour chains installed at 51 cross sections showed that scour occurred throughout a reach of 6 miles during a flood. Scour chains are a simple and efficient method to record the maximum depth of scour through a reach of channel; however, they have a particular drawback. As the authors noted, "The observations are deficient in not showing what was happening in the reach at any one instance of time. Therefore, one cannot be sure that scour at some cross sections was not accompanied by fill at others and then the process reversed at a different discharge." Some investigators, notably Colby (1964*b*), believed that the maximum depth of scour recorded by scour chains is not always indicative of a change in the mean bed elevation of the cross section. Lateral migration of sand bars and antidunes (Foley, 1975) have been suggested as possible explanations for the observed depth and longitudinal continuity of the channel scour.

Emmett and Leopold (1965) also discussed data from two perennial streams, the Popo Agie River near Hudson, Wyo., and the Rio Grande del Ranchos near Talpa, N. Mex. Their data were obtained at cross sections surveyed once at high flow in the spring, and again during low flow later in the summer. A comparison of the two surveys showed that the mean bed elevation through the reach was generally lower at high flow than at low flow. As they had observed previously on the Arroyo de los Frijoles, the depth and continuity of scour did not appear to be associated with channel configuration or with width of the cross sections.

## STUDY APPROACH

The purpose of this study was to describe the sequence of scour and fill during a flood at several cross sections, located every few channel widths along a reach of stream. Data also were collected on the hydraulic characteristics of each section in an attempt to relate scour and fill to specific flow conditions.

A bedload trap was constructed on the East Fork River near Boulder, Wyo., in the spring of 1973. A description of its main features and 4 years of data have been published by Leopold and Emmett (1976, 1977). In order to utilize these unique measurements, a study reach was selected for this investigation in the vicinity of the bedload trap. Because scour and fill are a local depletion and accumulation of bed material, knowledge of the bedload-sediment discharge and its variation along the channel is essential to an understanding of the process.

The East Fork River is a major tributary of the Green River, and drains approximately 194 square miles along the southwest flank of the Wind River Mountains. The study area lies close to the mountain front within a belt of Pleistocene outwash terraces (fig. 1). The East Fork River has a typical snowmelt runoff, with strong diurnal fluctuations and multiple seasonal peaks (fig. 2). The 1974 peak discharge of nearly 1,600 ft³/s has a recurrence interval of approximately 5 years.

The East Fork River has a sinuous channel with prominent sandy point bars. Medium to coarse sand is the predominant bed material, although gravel bars are important channel features. The streambanks are typically stratified with a basal member of gravel (median diameter=21–45 mm), overlain by sand, silt, and a thick grass sod. The gravel layer is poorly consolidated and therefore easily eroded where streamflow impinges upon the bank, especially along the outside of a bend. Although gravel constitutes approximately 25 percent of the channel bed, as will be discussed in detail later, medium to coarse gravel-sized material constitutes less than 8 percent of the bedload discharge of the East Fork River (W. W. Emmett, written commun., 1977).

Eleven cross sections were established in a study reach of approximately 1,400 feet (fig. 3). The cross sections were monumented and surveyed with rod and level on May 8, 1974, before the spring flood. At floodflow, it was impossible to wade the stream; therefore, cableways were installed at each section. The sections were sounded at stations spaced every 2 feet across the channel by measuring the depth of flow with a wading rod from a light aluminum boat attached to the cableway. The mean bed elevation of a cross section on a given day was computed by subtracting the flow depth from the water-surface elevation at each station, summing across the channel bed, and dividing by the number of stations. The accumulation of bed material in a section, as shown by an increase in the mean bed elevation with respect to the initial survey on May 8, 1974, was classified as fill. The depletion of bed material in a section, as shown by a decrease in the bed elevation with respect to the initial survey, was classified as scour. Most sections were sounded daily during periods when the daily peak discharges were

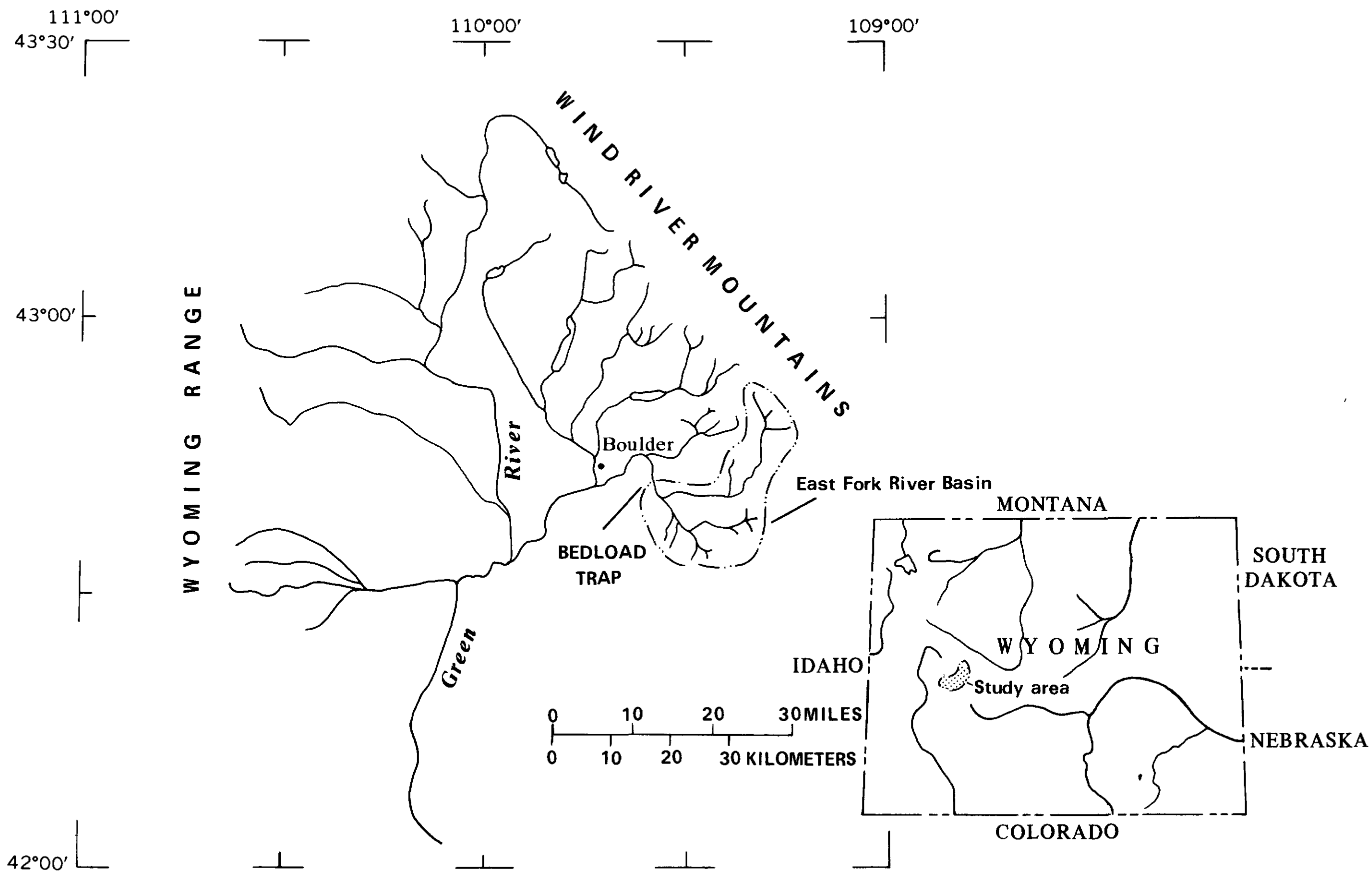



FIGURE 1.—Location of study area.

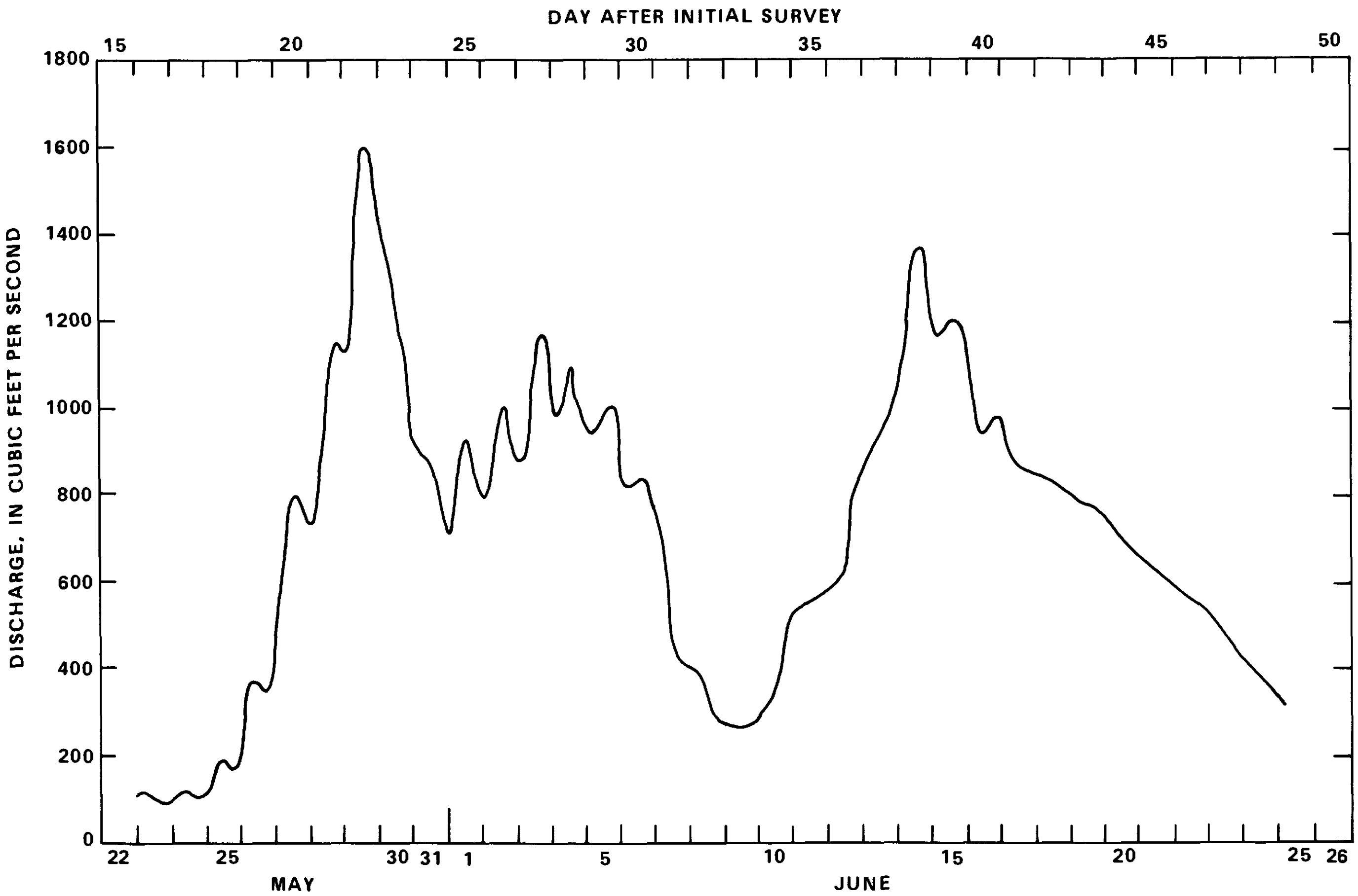



FIGURE 2.—Snowmelt hydrograph at the bedload trap gage, May-June, 1974.

changing rapidly, and every second or third day when the daily peaks were about equal. The cross-section survey data are summarized in table 4 at the end of the report.

A cantilever-type gage plate was installed at each cross section to determine water-surface elevation. The channel area was determined for each survey by planimetering a plot of the cross section. A stage-discharge relation was determined for each cross section by correlating the stage at each section with discharge measured at the road bridge. Because the cross-sectional area, width, discharge, and slope were known, it was possible to compute the hydraulic geometry of each cross section.

An approximation regarding overbank flow was made so that the hydraulic characteristics of the sections could be determined for discharges exceeding the bankfull stage of 820 ft$^3$/s. At the flood crest, the flood plain was covered to a depth of a foot or more. By and large, however, this was standing water, with nearly the entire discharge flowing between the tops of the channel banks. Hence, the hydraulic geometry for each cross section has been calculated from the cross-sectional area and width of flowing water, using the entire discharge as measured at the road bridge where the flow was confined. In general, the interface between flowing and standing water was within the projection of the banks above the surface of the flood plain.

The water-surface slope through the study reach was surveyed on 17 occasions, covering the entire range of flood discharges from 40 to 1,600 ft$^3$/s. Total-energy slopes between adjacent cross sections were computed for each survey and are summarized in table 5 at the end of the report. The mean energy slope ($S_e$) through the entire study reach was computed for each survey by a least-squares method. Although the mean energy slope of the study reach varied from survey to survey, no systematic variation with discharge was apparent. The average mean energy slope through 1,360 feet of the study reach was 0.00084.

# OBSERVATIONS OF SCOUR AND FILL

## SCOURING CROSS SECTIONS

Significant scour was measured in 6 of the 11 cross sections at the major flood crests. These will be referred to as scouring sections and are indicated by an "*S*" added to the section number. Two slightly different sequences of scour and fill were measured in the scouring sections during the

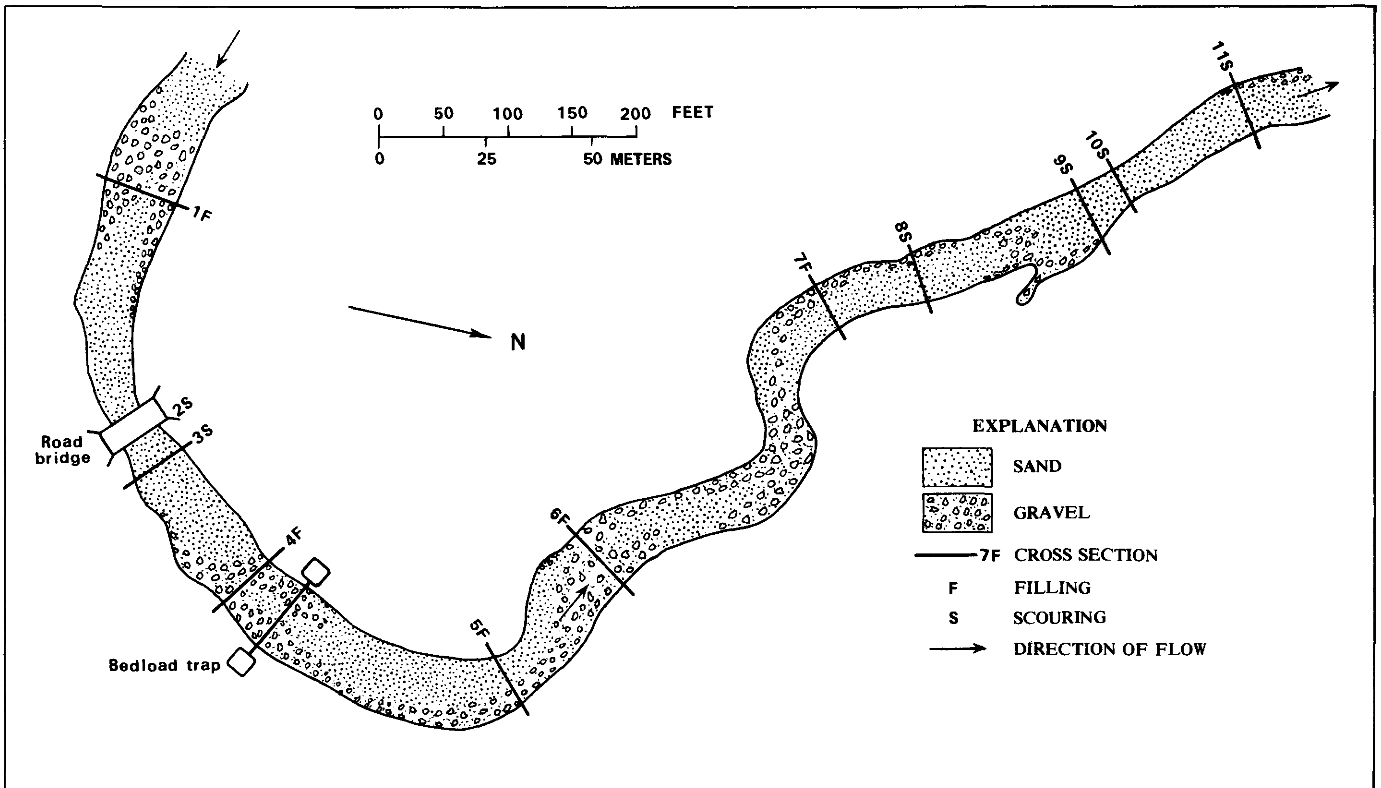



FIGURE 3.—Location of cross sections in the study reach.

1974 flood. Sections *8S*, *9S*, *10S*, and *11S* responded to the flood discharge in a manner similar to that of the Colorado River near Grand Canyon. Initially, these four sections filled as the discharge increased from 200 to approximately 800 $ft^3/s$. As soon as the discharge exceeded the bankfull stage, these sections proceeded to scour. Data were not collected at section *8S* during the first flood crest. However, because section *8S* filled as the discharge increased to 800 $ft^3/s$, and subsequently scoured during the second major flood crest, it has been associated with sections *9S*, *10S*, and *11S*. Sections *2S* and *3S* responded to the flood discharge in a similar manner to that measured in the Rio Grande at Bernalillo, N. Mex. No fill was observed at any time in either section *2S* or *3S* during the 1974 flood. Both of these sections scoured progressively as discharge increased and then filled as discharge decreased.

The sequence of scour and fill measured at section *9S* during the initial rise in stage on May 26–29 is illustrated in figure 4. The initial survey was made on May 8 at a discharge of 200 $ft^3/s$, and the mean bed elevation on that day was chosen as the datum to which resurveys were compared. The discharge remained fairly constant until May 26, when a rapid rise in stage began (fig. 2). On May 27, the discharge had increased to 822 $ft^3/s$, and section *9S* had filled with sand. The increase in mean bed elevation was +0.16 foot. By the next day, May 28, the discharge had increased to 1,150 $ft^3/s$, and section *9S* had scoured to a gravel bed. The mean bed elevation on May 28 was −0.41 foot, relative to the May 8 survey. Cross sections *10S* and *11S* responded to the rapidly increasing discharge between May 26–29 in the same way as did section *9S*.

The changes in mean bed elevation at sections *8S*, *9S*, *10S*, and *11S* during the entire 1974 flood are shown in figures 5, 6, and 7 which are based on data in table 6 at the end of the report. Each resurvey of a section has been numbered by the consecutive days since the initial survey of May 8 (day 1). Two major flood crests occurred on May 29 (day 22), and June 14 (day 38). A smaller crest passed through the study reach on June 3 (day 27). The section records are complicated by varying degrees of hysteresis similar to that observed in the Colorado River near Grand Canyon. The depth of scour or fill at a given discharge was frequently different during the increasing stage than it was during the decreasing stage. In spite of some obvious discrepancies, the sequence of scour and fill was generally similar in sections *8S*, *9S*, *10S*, and *11S*. After a slight net fill had accumulated as the initial increase in stage began, sections *8S*, *9S*, *10S*, and *11S* scoured as flood crests passed through the study reach. With the exception of section *8S*, these sections then filled as discharge decreased. Three distinct hysteresis loops (days 1–24, 24–31, and 34–46) associated with the two major and one minor flood crests are shown in figures 5*B* (sec. *9S*), 6*A* (sec. *10S*), and 6*B* (sec. *11S*). Each loop depicts scour as discharge increased and fill as discharge decreased.

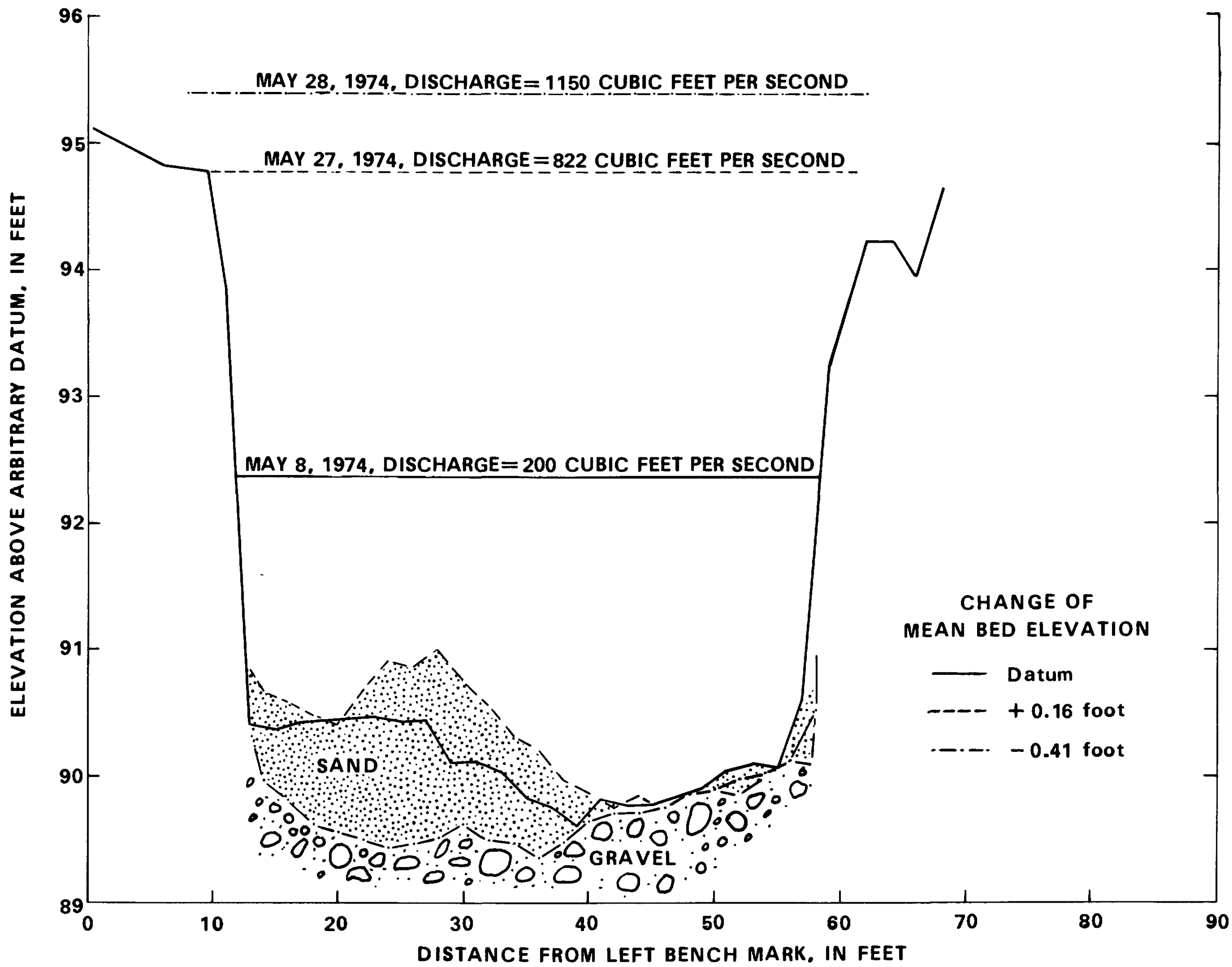



FIGURE 4.—Scouring cross section *9S*. Data from tables 4 and 6.

Section *2S* was located on the downstream side of the road bridge, and section *3S* was located 25 feet farther downstream in a reach of the channel modified by the construction of the bridge and by a berm along the left bank. These sections had a slightly different sequence of scour and fill than that measured in the four self-formed scouring sections. The variation in mean bed elevation during the 1974 flood at section *2S* is shown in figure 7*A* and at section *3S* in figure 7*B*. Neither section ever accumulated a net fill relative to the initial survey of May 8 (day 1). Both sections scoured progressively as discharge increased and then filled as discharge decreased.

## FILLING CROSS SECTIONS

Significant fill was measured in 5 of the 11 sections at the major flood crests. These will be referred to as filling sections and are indicated by an "*F*" added to the section number. The sequence of scour and fill in the filling sections was the inverse of that measured in the scouring sections. Sections *5F*, *6F*, and *7F* scoured slightly as the discharge increased to the bankfull stage and then filled as the flood crests passed through the study reach. Sections *1F* and *4F* filled progressively as discharge increased from low flow to the flood crests. In general, the filling sections scoured as discharge decreased.

The sequence of scour and fill measured at section *6F* during the initial rise in stage is illustrated in figure 8. The section was first surveyed on May 8 at a discharge of 200 ft³/s and the mean bed elevation on this day was chosen as the datum. On May 27, section *6F* was sounded as the discharge crested at 820 ft³/s. The channel bed had scoured slightly, and the mean bed elevation was −0.07 foot below the May 8 survey. The predominance of gravel-size bed material in sec-

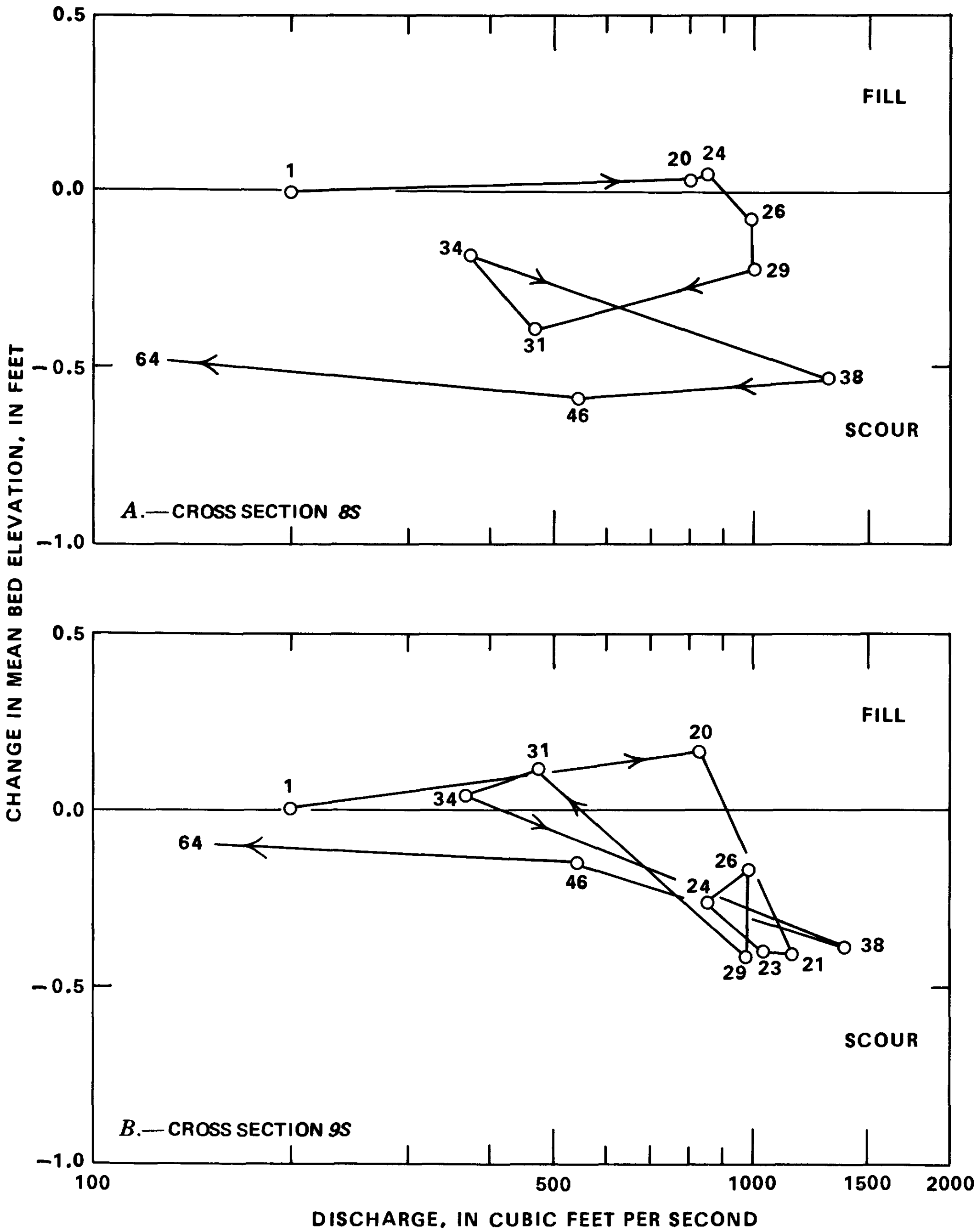



FIGURE 5.—Variation in mean bed elevation of scouring cross sections *8S(A)* and *9S(B)* during the 1974 spring flood. Each resurvey is identified by the number of consecutive days since the initial survey on May 8. Data from table 6.

tion *6F* probably limited the depth of scour. The following day, May 28, section *6F* was sounded again during a discharge of 1,140 $ft^3/s$, as shown in figure 8. This survey showed that an extensive fill of sand had accumulated against the right bank and the mean bed elevation was +0.27 foot above that observed on May 8.

The variations of mean bed elevation measured at sections *1F, 4F, 5F, 6F,* and *7F* during the entire spring flood are shown in figures 9, 10, and 11. The common characteristic of these sections was a net fill at discharges greater than 820 $ft^3/s$. The records, however, differ in other details. Sections *5F, 6F,* and *7F* scoured initially as discharge increased from

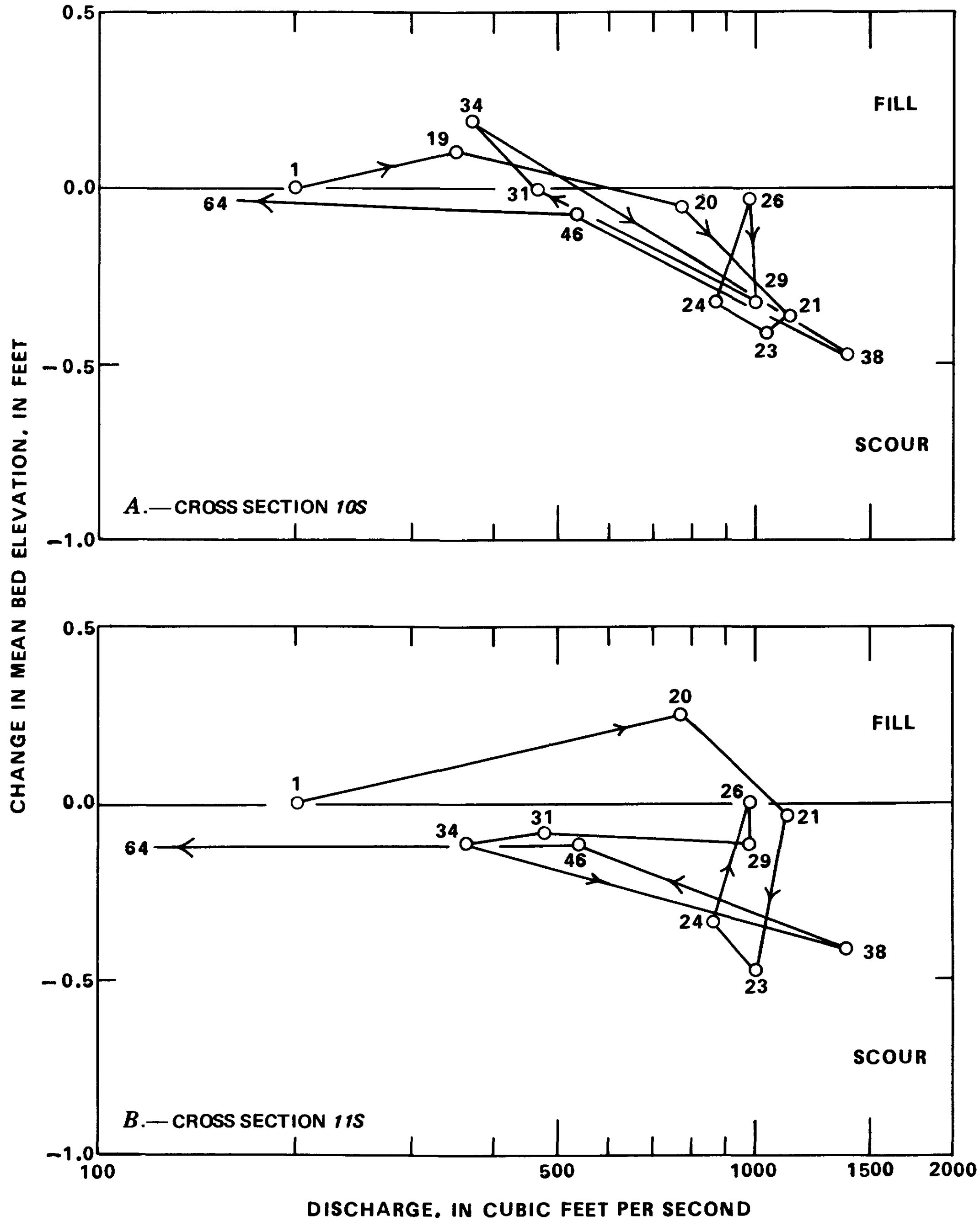



FIGURE 6.—Variation in mean bed elevation of scouring cross sections *10S(A)* and *11S(B)* during the 1974 spring flood. Each resurvey is identified by the number of consecutive days since the initial survey on May 8. Data from table 6.

200 to 800 ft³/s, and then filled as the flood crest passed through the study reach. In contract, no net scour was observed at any discharge in either sections *1F* or *4F*.

The tendency to scour as discharge decreased also varied among the filling sections. Sections *4F*, *5F*, and *6F* scoured whenever the discharge decreased, with few exceptions. The effects of the three flood peaks on days 22, 27, and 38 were particularly apparent at section *4F* (fig. *9B*). As each peak approached, section *4F* filled; it then scoured as discharge decreased after the peak. Although the data are not as complete for sections *5F* and *6F*, the sequence of scour at flows less than 820 ft³/s and of fill at flows greater than 820 ft³/s is

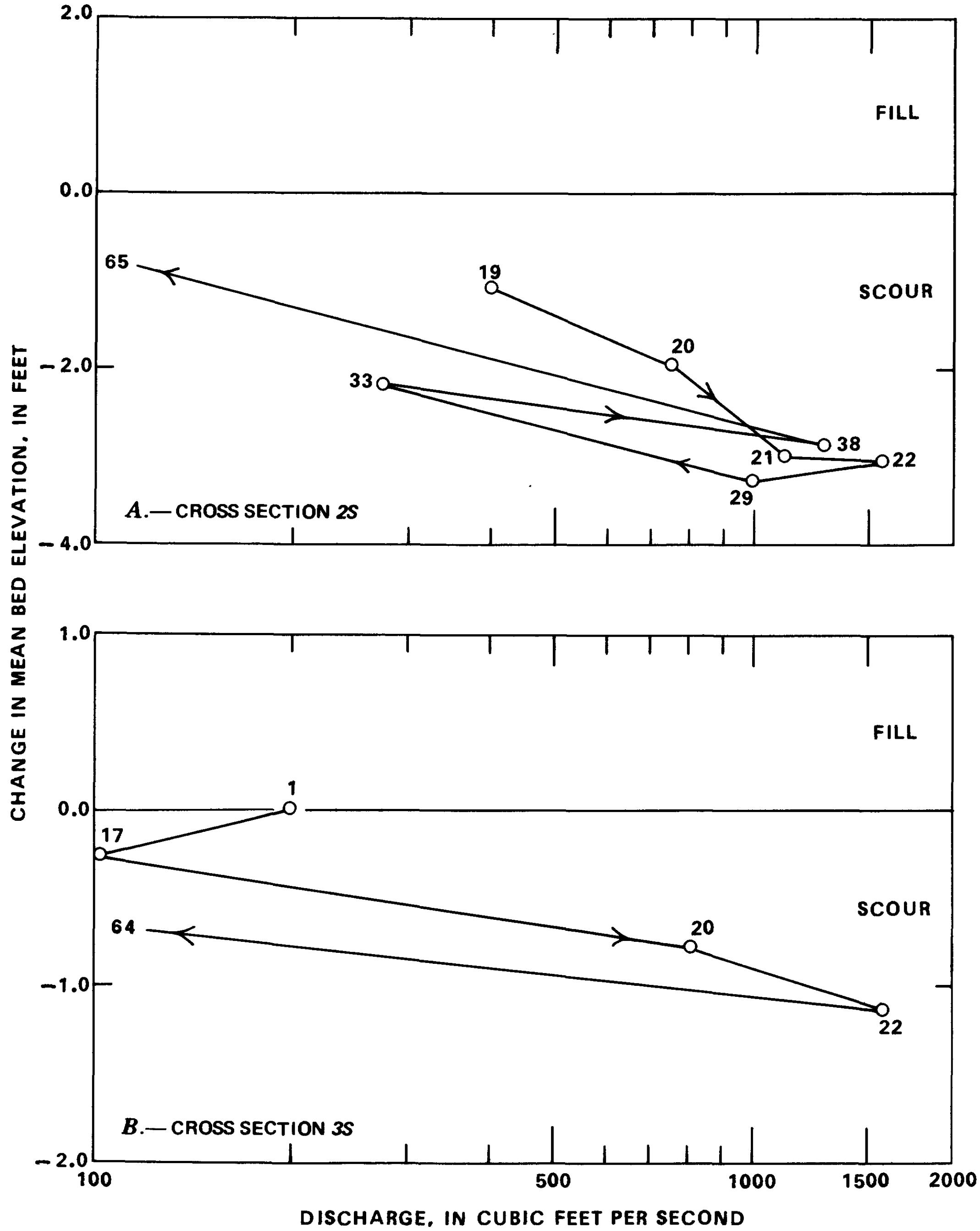



FIGURE 7.—Variation in mean bed elevation of scouring cross sections *2S(A)* and *3S(B)* during the 1974 spring flood. Each resurvey is identified by the number of consecutive days since the initial survey on May 8. Data from table 6.

shown in figures 10*A* and 10*B*. In contrast, sections *1F* and *7F* had only a slight tendency to scour as discharge decreased.

All cross sections were surveyed for the last time on July 10, 1974 (day 64), when the discharge was 40 ft$^3$/s. Figures 5–7 and 9–11 indicate that the mean bed elevation of every scouring and filling section was tending to return to its preflood (May 8) level. Only sections *4F* and *10S*, however, had completely returned to their preflood conditions. The mean bed elevation of every other section, except *1F*, was scoured from −0.10 to −0.40 foot below its preflood level. Thus, it appears that immediately after the spring flood, the East Fork River study reach was generally scoured and thus depleted in bed material relative to its preflood condition.

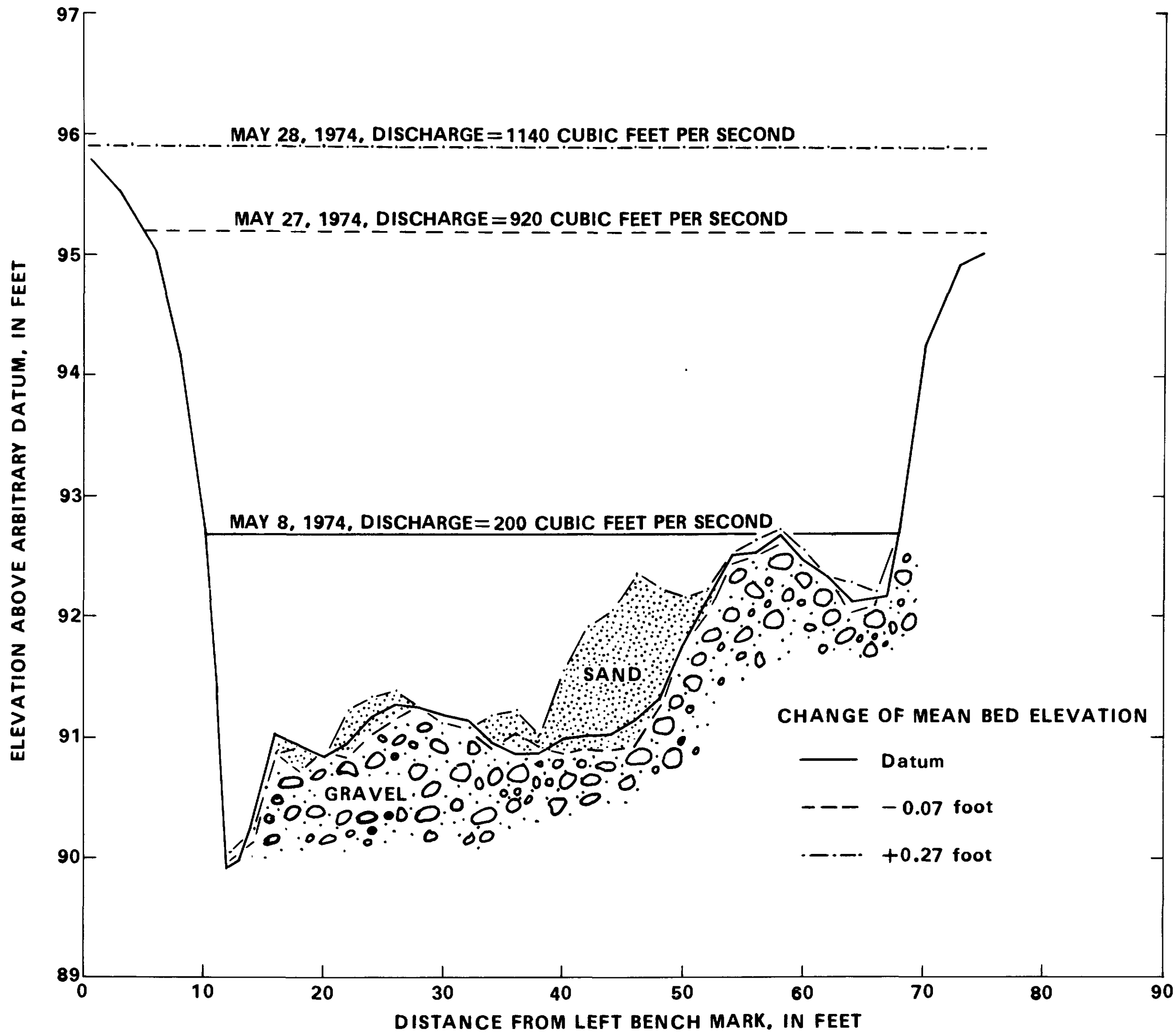



FIGURE 8.—Filling cross section *6F*. Data from tables 4 and 6.

The supply of sand to the East Fork River was discussed by Andrews (1977). It was shown that the East Fork River channel is relatively depleted in sediment at the end of the snowmelt flood. During the summer months, Muddy Creek, a small tributary upstream of the bedload trap, supplies a quantity of sediment to the East Fork River channel equal to approximately one-half of its annual sediment load. The addition of this material is probably responsible for the replenishment of sand-sized bed material within the study reach. When several of the sections were resurveyed during May 1975, the mean bed elevation of every section had returned to within a few hundredths of a foot of its preflood elevation of the preceding year.

The measurements of scour and fill made by several previous investigators have already been summarized. Data from the East Fork River are in good agreement with most of their measurements. Although some of the previous data appear to be contradictory, this is due largely to differences in the type, frequency, and areal extent of the measurements. For example, scour-chain data commonly have shown that most cross sections scour below their preflood level at some time or another during a flood—regardless of channel configuration. Had scour chains been installed at the cross sections along the East Fork River, similar results would have been recorded. Net scour, in fact, was observed in all except two of the sections along the East Fork River. However, the

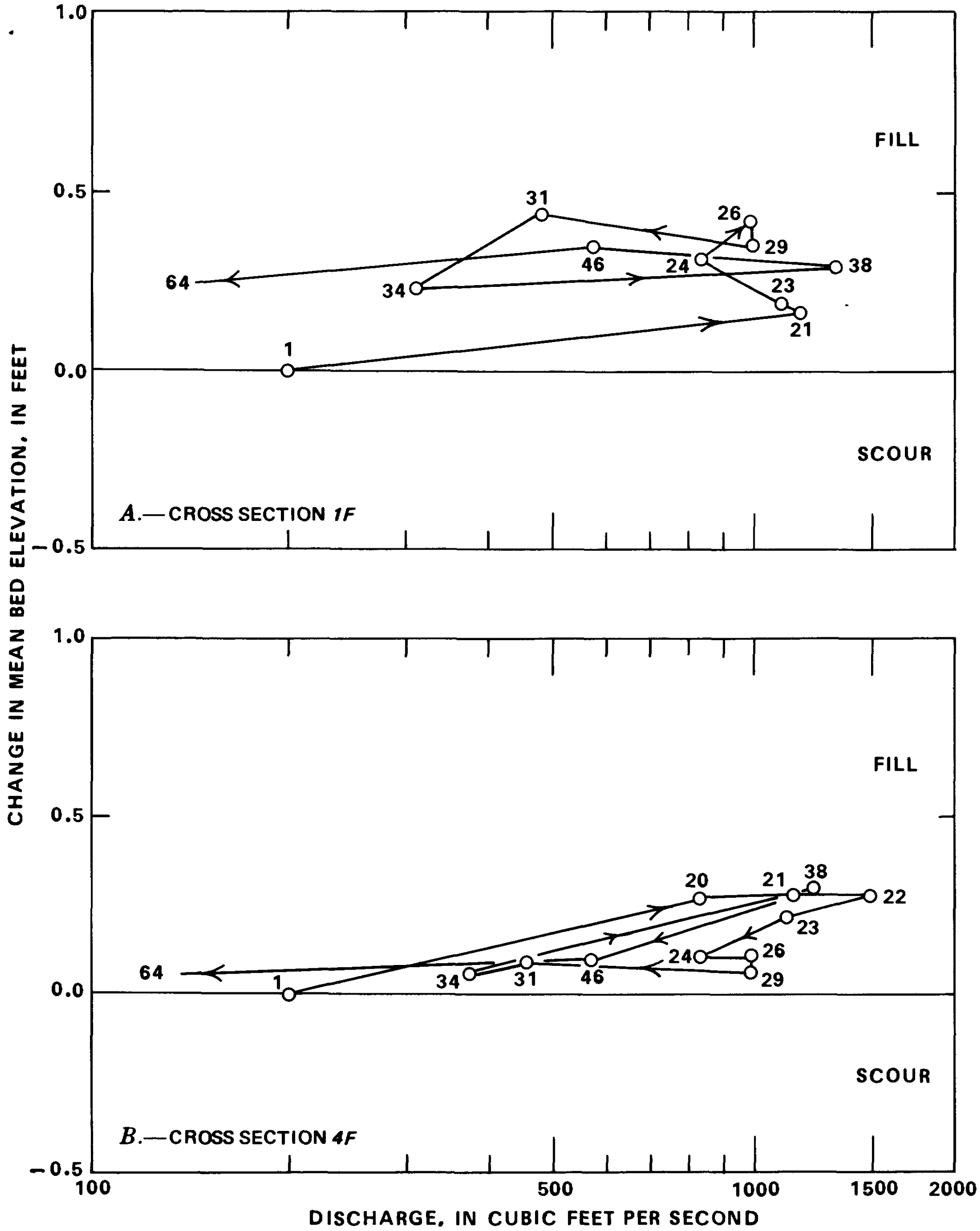



FIGURE 9.—Variation in mean bed elevation of filling cross sections *1F(A)* and *4F(B)* during the 1974 spring flood. Each resurvey is identified by the number of consecutive days since the initial survey on May 8. Data from table 6.

sections did not scour at the same discharge. Sections *5F, 6F,* and *7F* initially scoured below their preflood level and then accumulated a net fill when the discharge exceeded 820 $ft^3/s$. Conversely, sections *8S, 9S, 10S,* and *11S* initially filled and then scoured below their preflood level when the discharge exceeded 820 $ft^3/s$. Thus, whereas most of the sections along the East Fork River scoured below their preflood bed elevation, scour did not occur simulataneously in all sections.

## HYDRAULIC GEOMETRY OF SCOURING AND FILLING CROSS SECTIONS

Two general sequences of scour and fill have been described. It has been shown that at any discharge during the flood, some sections were filling while others were scouring. Then later, at a larger or smaller discharge, the sections which had

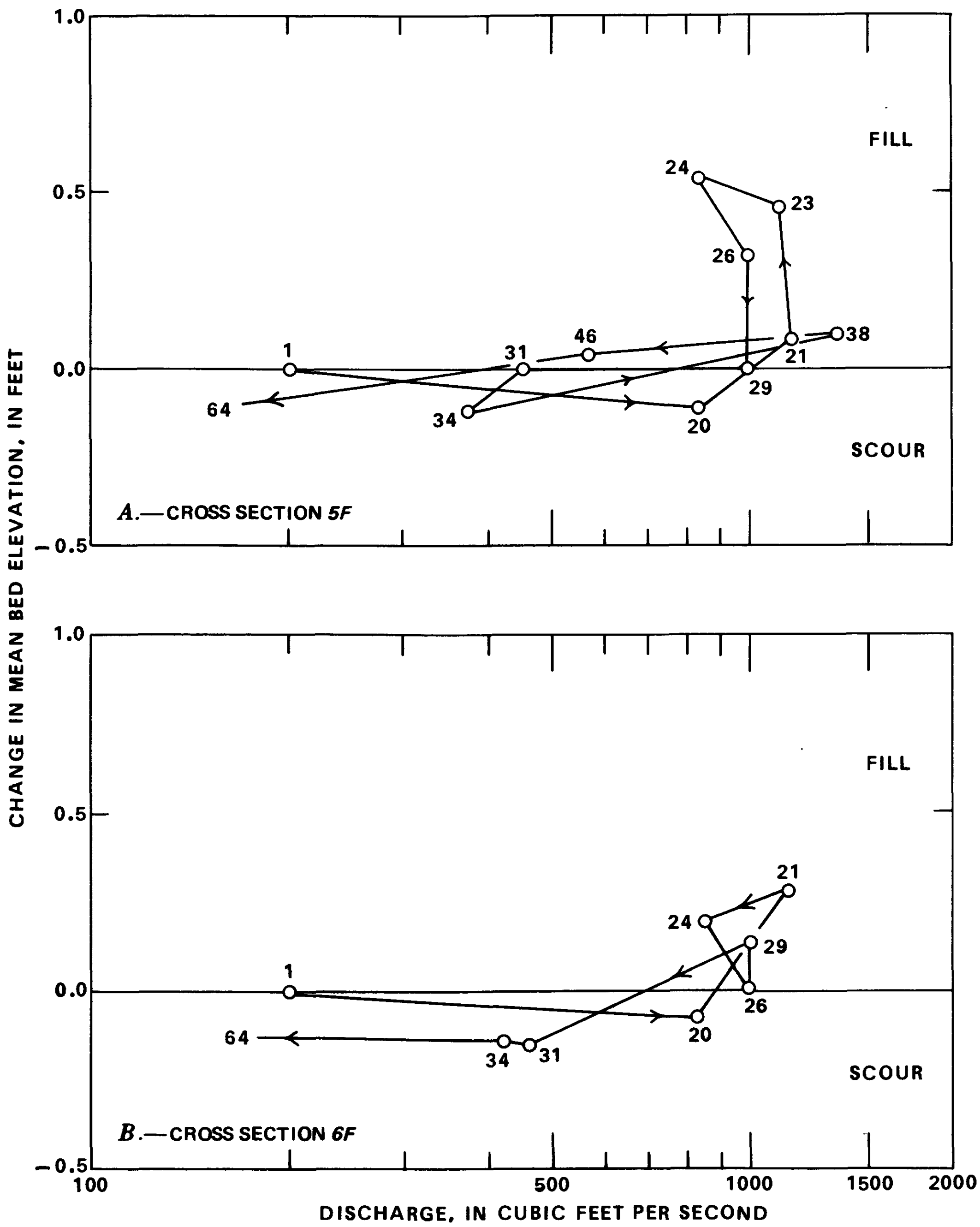



FIGURE 10.—Variation in mean bed elevation of filling cross sections *5F(A)* and *6F(B)* during the 1974 spring flood. Each resurvey is identified by the number of consecutive days since the initial survey on May 8. Data from table 6.

filled, scoured; and the sections which had scoured, filled. It is logical, therefore, to examine the relation between the sequence of scour and fill at a section and the local hydraulic characteristics of the channel. This may be done using hydraulic geometry.

Leopold and Maddock (1953*a*) found that the variation of the hydraulic factors, mean velocity ($\bar{u}$), width ($w$), mean depth ($\bar{d}$), and friction factor ($ff$) with increasing discharge at a section could be described broadly by a set of simple power equations:

$$\bar{u} = kQ^m,$$
$$w = aQ^b,$$
$$\bar{d} = cQ^f,$$

and

$$ff = eQ^y.$$

These relations are called the "hydraulic geometry" of the cross section. The hydraulic exponents, *m, b, f,* and *y*, describe the rate of change of the hydraulic variables, $\bar{u}$, *w*, $\bar{d}$, and *ff*, in order to accommodate changes of water discharge, *Q*.

The hydraulic geometries of sections *6F* and *10S* are compared in figure 12. Several important differences between the hydraulic characteristics of the two sections are shown. First, the width of the filling section increased more rapidly with discharge ($b$=0.21) than the scouring section ($b$=0.06). Hydraulic roughness expressed by the Darcy-Weisbach friction factor decreased rapidly with increasing discharge in the scouring section ($y$=−0.62). In contrast, roughness decreased only slightly with increasing discharge in the filling section ($y$=−0.05). Mean depth varied with discharge at approximately the same rate in both sections *6F* ($f$=0.51) and *10S* ($f$=0.42). Probably the most striking difference between the hydraulic characteristics of sections *6F* and *10S* is shown by the mean velocity versus discharge relations. Sections *6F* and *10S* had the same mean velocity at a discharge of approximately 500 ft³/s. Mean velocity increased slowly with discharge in filling section *6F* ($m$=0.28), relative to scouring section *10S* ($m$=0.52). Thus, at discharges less than approximately 500 ft³/s, section *6F* had a greater mean velocity than did section *10S*. At discharges greater than approximately 500 ft³/s, the relation was reversed, and the mean velocity through section *10S* exceeded that of section *6F*. This discharge-related reversal of mean velocity is significant because empirically, velocity is the single hydraulic variable most closely related to the sediment-transport rate.

The hydraulic exponents of velocity, depth, width, and friction factor for the 11 cross sections are listed in table 1. The mean hydraulic exponents for the entire study reach are also shown. The distinctions drawn between the hydraulic exponents of sections *6F* and *10S* are true for all scouring and filling sections. The velocity exponent ($m$) of every filling section was less than the mean value for the study reach, whereas the velocity exponent of every scouring section was greater than the mean value of the study reach. Likewise, every filling section had a width exponent ($b$) greater than the reach mean—with one exception, section *1F*—and the scouring sections had width exponents less than the mean of the study reach, with the exception of sections *2S* and *3S*. The filling sections had friction factor exponents larger than the mean; whereas scouring sections had friction factor exponents smaller than the mean. The depth exponent ($f$) varied from section to section, but, as noted previously, did not appear to be significantly different in scouring as compared to filling sections.

In summary,

$$m_{\text{filling}} < m_{\text{mean}} < m_{\text{scouring}} ,$$
$$f_{\text{filling}} \approx f_{\text{mean}} \approx f_{\text{scouring}} ,$$
$$b_{\text{filling}} > b_{\text{mean}} > b_{\text{scouring}} ,$$

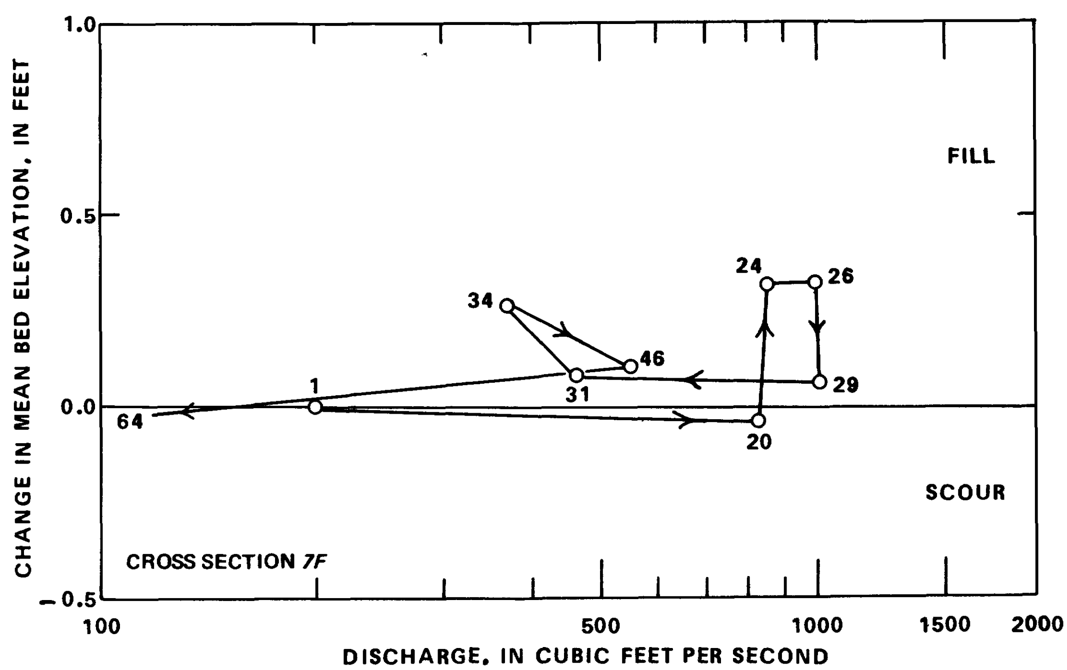



FIGURE 11.—Variation in mean bed elevation of filling cross section *7F* during the 1974 spring flood. Each resurvey is identified by the number of consecutive days since the initial survey on May 8. Data from table 6.

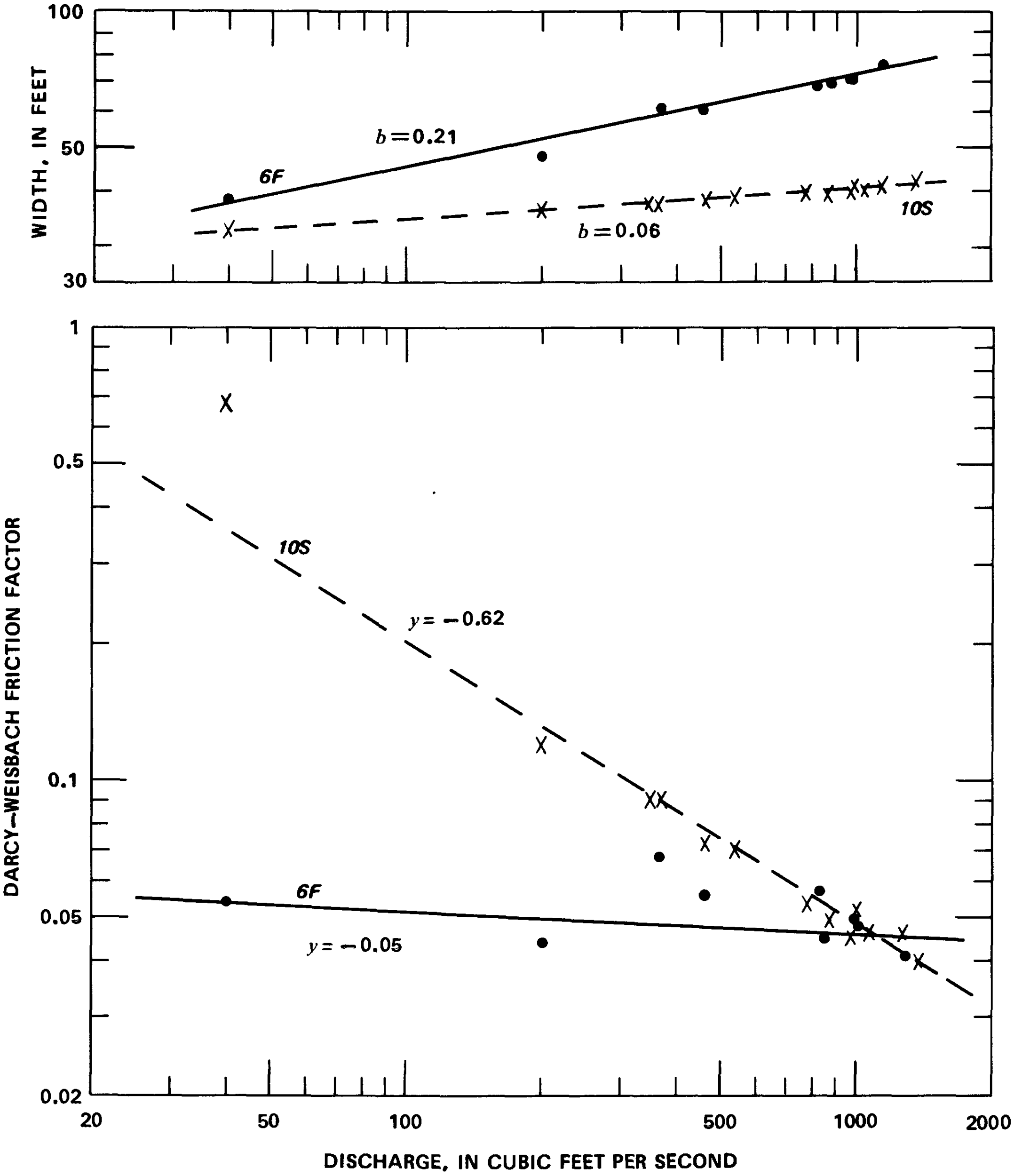



FIGURE 12. (above and facing page).—Comparison of the hydraulic geometries of cross sections *6F* and *10S*. Data from table 6.

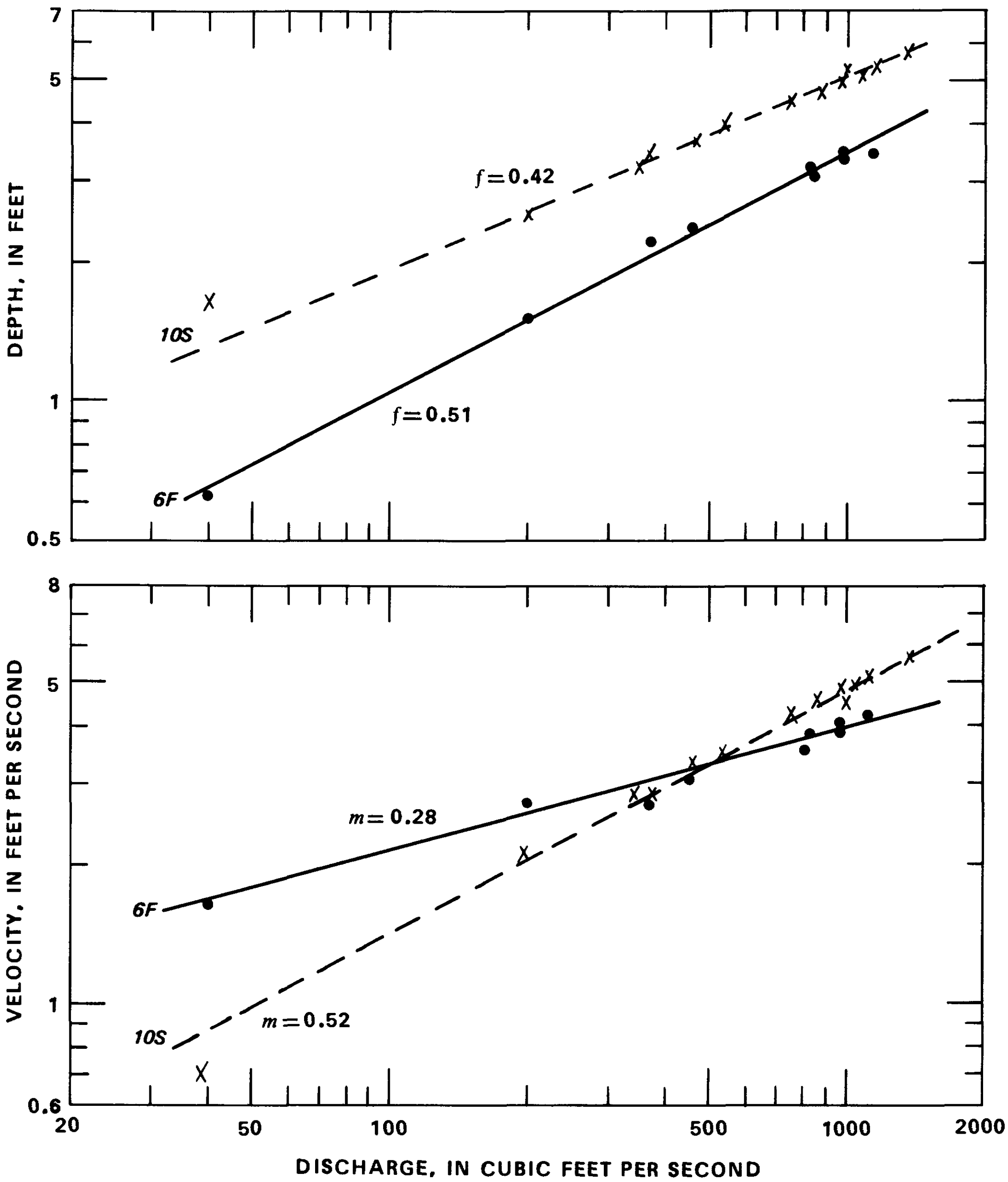
and

$$y_{\text{filling}} > y_{\text{mean}} > y_{\text{scouring}}.$$

Thus, the filling and scouring sections had distinctly different hydraulic geometries.

The discussion thus far has focused on the hydraulic geometries of the cross sections, because the purpose was to relate changes in the hydraulic factors with discharge to changes in bed elevation with discharge. It is also worthwhile to compare the relative values of width, depth, velocity, and friction factor in scouring and filling sections. Section *10S* was deeper and narrower than section *6F* during the entire range of flood discharge (fig. 12). Section *10S* was relatively rough during small flows but became significantly smoother as discharge increased; whereas section *6F* was relatively smooth at all discharges. There was a reversal in the relative magnitudes of mean velocity through the two sections as discharge increased. Mean velocity increased with discharge in both sections, but at significantly different rates. Hence, during smaller discharges, section *6F* had a greater mean velocity than did section *10S*. At larger discharges, however, section *10S* had a greater mean velocity than did section *6F*.

The hydraulic characteristics of the 11 cross sections at a




discharge of 820 $ft^3/s$—the mean bankfull discharge of the study reach—are compared in table 2. The scouring sections were narrower and deeper than the mean condition of the reach, with the exception of section *3S*. Conversely, the filling sections were wider and shallower than the mean condition of the reach. Broadly, this distinction between scouring and filling sections was true for the range of flood discharges.

Mean velocity at bankfull discharge varies from section to section, although there is no apparent difference in the bankfull mean velocity between scouring and filling sections. Owing to the difference in velocity exponents as previously discussed, the filling sections had a greater mean velocity at smaller discharges, and scouring sections had a greater mean velocity at larger discharges.

## RIFFLES AND POOLS

Previous investigators have reported significantly different hydraulic geometries for adjacent riffles and pools. Keller (1971) measured the variation in velocity 0.05 foot above the bed of a riffle and a pool over a range of discharges. At the smallest discharge, the bottom velocity of the riffle was much

TABLE 1.—*Hydraulic exponents of selected East Fork River cross sections*

| Cross-section number | Hydraulic exponents[1] | | | |
|---|---|---|---|---|
| | *m* | *f* | *b* | *y*[2] |
| *1F* | 0.30 | 0.60 | 0.10 | 0.00 |
| *2S* | .45 | .35 | .20 | -.55 |
| *3S* | .44 | .41 | .15 | -.47 |
| *4F* | .24 | .61 | .16 | .13 |
| *5F* | .33 | .45 | .23 | -.21 |
| *6F* | .28 | .51 | .21 | -.05 |
| *7F* | .32 | .45 | .23 | -.19 |
| *8S* | .40 | .57 | .08 | -.23 |
| *9S* | .48 | .48 | .04 | -.48 |
| *10S* | .52 | .42 | .06 | -.62 |
| *11S* | .43 | .49 | .08 | -.37 |
| Mean exponents | 0.38 | 0.48 | 0.14 | -0.28 |
| Mean exponents of streams in mid-western United States[3] | 0.34 | 0.40 | 0.26 | -0.24 |
| Minimum variance exponents[4] | 0.35 | 0.42 | 0.25 | -0.28 |

[1] $\bar{u} \propto Q^m$, $\bar{d} \propto Q^f$, $w \propto Q^b$, $ff \propto Q^y$.
[2] Computed by assuming a constant energy slope.
[3] Leopold and Maddock (1953).
[4] Langbein (1964, p. 308).

TABLE 2.—*Bankfull hydraulic characteristics of selected East Fork River cross sections*[1]

| Cross-section number | Velocity (ft/s) | Depth (ft) | Width (ft) | Roughness |
|---|---|---|---|---|
| *1F* ........... | 3.15 | 3.05 | 86 | 0.067 |
| *2S* ........... | 3.15 | 4.82 | 54 | .11 |
| *3S* ........... | 2.95 | 4.30 | 65 | .11 |
| *4F* ........... | 4.25 | 2.95 | 66 | .035 |
| *5F* ........... | 3.93 | 3.30 | 64 | .046 |
| *6F* ........... | 3.70 | 3.25 | 68 | .051 |
| *7F* ........... | 3.65 | 3.57 | 63 | .058 |
| *8S* ........... | 3.95 | 3.95 | 52 | .055 |
| *9S* ........... | 3.75 | 4.40 | 50 | .068 |
| *10S* ........... | 4.49 | 4.73 | 39 | .051 |
| *11S* ........... | 3.85 | 4.10 | 52 | .060 |
| Mean values.... | 3.71 | 3.86 | 60 | .061 |

[1] Velocity, depth, width, and roughness were calculated from the respective hydraulic geometry relations, using the mean-bankfull discharge (820 $ft^3/s$) of the study reach.

greater than that of the pool. The bottom velocity of the pool, however, increased more rapidly with discharge, so that at the largest discharge observed, the bottom velocities through the riffle and the pool were equal.

Richards (1976*a*) compared the hydraulic geometries of two pairs of adjacent riffles and pools. The velocity exponents ($m$) of the pools were larger than those of the riffles. These observations, however, were limited to a relatively small range of discharges, and hence the mean velocity through the riffles was always greater than it was through the pools. No consistent relation between either the depth or the width exponents of riffles and pools was shown. Richards (1976*b*) compared the width and depth of six riffles and pools. The riffles tended to be wider and shallower than the pools at all discharges.

The cross sections along the East Fork River were selected to be representative of the full range of channel characteristics between riffles and pools within the study reach. The water-surface and bed profiles of the study reach at a discharge of 85 $ft^3/s$ are shown in figure 13. Section *6F* was identified as a riffle on the basis of a steep water-surface slope, a topographic high in the bed, and coarse bed material. Section *10S* was identified as a pool on the basis of a flat water-surface slope, a topographic low in the bed, and fine bed material. The distinctive hydraulic geometries of sections *6F* and *10S* (fig. 12) are in agreement with the observations of previous investigations. Section *6F*—a riffle— was wider and shallower at all flood discharges than was section *10S*—a pool. Section *6F* had a smaller velocity and larger width and roughness exponents than did section *10S*. The depth exponents of the sections were similar. The data are particularly significant in that they include a large range of discharges and show that the mean velocity of the pool, in fact, exceeded that of the riffle at approximately the bankfull discharge.

Most of the cross sections were neither riffle nor pool. Their water-surface slope, bed topography, and bed-material size were intermediate between those of sections *6F* and *10S*. However, the hydraulic geometries of all filling sections deviated from the mean hydraulic geometry of the study reach in the same way as did section *6F*. Whereas the hydraulic geometries of all scouring sections deviated from the mean hydraulic geometry of the study reach in the same way as did section *10S*. Thus, the filling sections had rifflelike hydraulic geometries, and the scouring sections had poollike hydraulic geometries (table 1). It must be stressed that most of the filling and scouring sections were not riffles and pools by conventional definitions. Their hydraulic geometries did, however, deviate from the mean hydraulic geometry of the reach in the same manner as did riffles and pools.

The factors which cause the difference in the hydraulic geometries of the scouring and filling cross sections are not well understood; and hence a complete explanation cannot be given at this time. It is possible, however, to outline some of the important factors. The pool-and-riffle sequence is probably the most common channel feature of streams whose sediment load includes some gravel. Langbein and Leopold (1968) have shown that coarse particles in transport will be concentrated into waves. The crests of these waves are riffles and the troughs are pools. Because these gravel waves will form whenever a limited supply of gravel is being transported, the pool-and-riffle sequence may be regarded as a primary channel feature.

The data for the East Fork River show that there is a systematic longitudinal variation in channel morphology and bed material associated with the pool-and-riffle sequence. These differences in channel characteristics are probably responsible in large measure for the different hydraulic geometries of the scouring and filling cross sections. At small discharges, the scouring (poollike) sections were relatively deep and rough, and had small velocities. Because the rate of change of velocity with increasing discharge was large compared to the rate of change of depth, there must have been a concomitant increase in slope and (or) decrease in roughness with increasing discharge. On the basis of the data collected for this investigation, it was concluded that slope did not change with discharge in the cross sections studied. Therefore, the scouring sections must have become significantly smoother as discharge increased. Consequently, the relatively rapid rate of change of velocity with discharge in the scouring sections was due to both increasing depth and decreasing roughness.

In contrast, the filling sections were relatively shallow and smooth, and had large velocities at small discharges. With increasing discharge, the rate of change of velocity was approximately proportional to the square root of the rate of change of depth. Because slope did not change with discharge, the channel roughness of the filling sections remained nearly constant as discharge increased.

Because the physical configuraton of the streambed was not measured in the present investigation, changes in the streambed associated with changes in the computed values of roughness must be inferred. The filling sections had a gravel or mixed sand-and-gravel bed at small discharges; whereas the scouring sections had a predominantly sand bed, as shown in figure 3. Throughout the study reach, the areas of sand bed were formed into dunes. In the scouring sections, these dunes were 0.6 to 1.0 foot high, whereas in the filling sections, they were 0.2 to 0.4 foot high. The smaller dunes in the filling sections were probably due to the shallower, faster flow and the thinner deposit of sand-size bed material compared to that of the scouring sections. Because of the larger

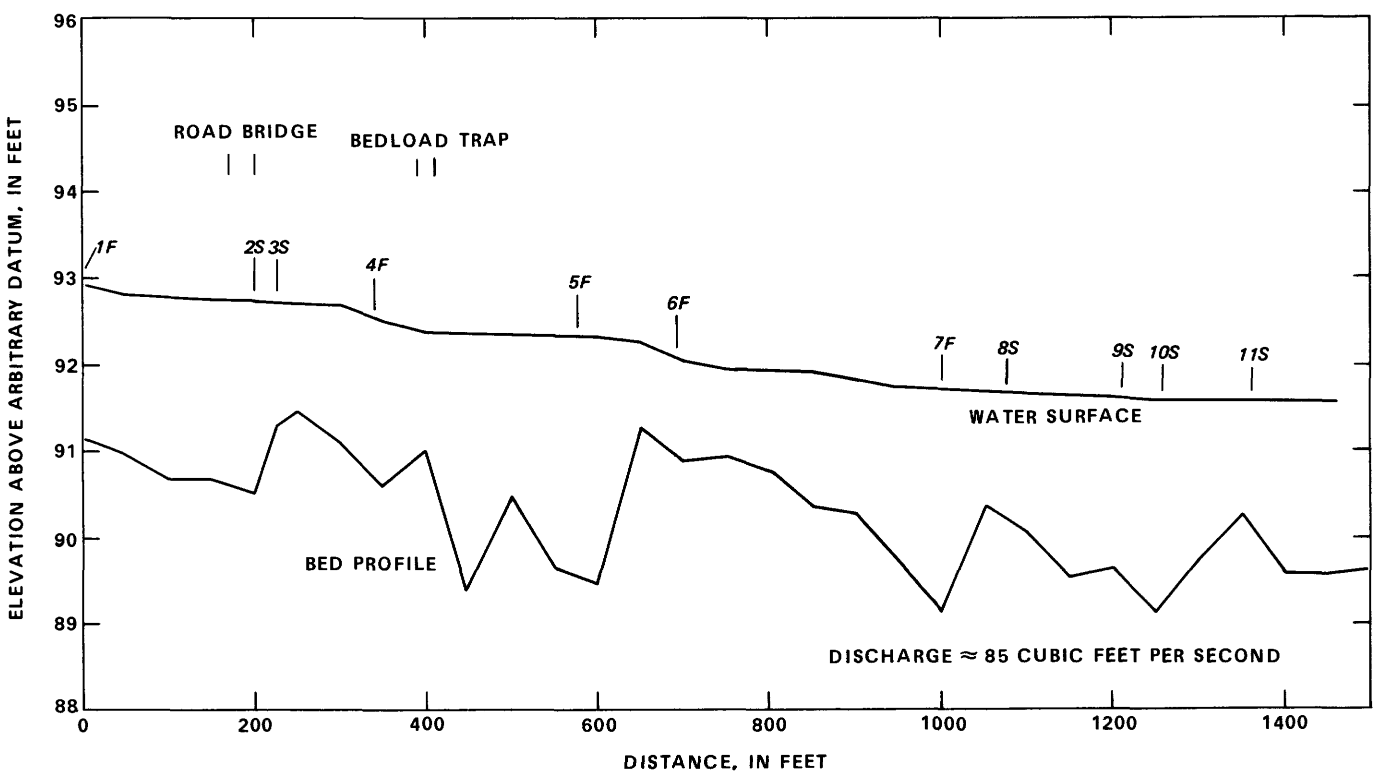



FIGURE 13.—Water-surface and bed profiles of the study reach.

dunes and greater part of the streambed covered by dunes, the scouring sections were significantly rougher at small discharges than were the filling sections. As discharge increased, the dunes in the scouring sections probably flattened and were definitely eliminated at the time of flood crests, because these sections scoured to a gravel bed. Thus, the relative bed roughness of the scouring sections decreased significantly with increasing discharge, as indicated by the computed values of roughness. In contrast, the height of dunes in the filling sections probably increased as sand accumulated on the bed. Mean depth, however, also increased with discharge so that the relative bed roughness of the filling sections remained about constant, as indicated by the computed values of roughness.

In summary, for the cross sections studied in this investigation, the redistribution of sand-size bed material from the scouring to the filling sections appears to be associated with significant changes in streambed configuration. These changes, in turn, affect channel roughness and probably account for the different rates of change of velocity with discharge in the scouring and filling sections.

## BEDLOAD-TRANSPORT RATE VERSUS DISCHARGE RELATIONS OF SCOURING AND FILLING CROSS SECTIONS

The process of scour and fill in an alluvial channel is due to a local depletion or accumulation of bed material. An increase in the mean bed elevation of a given reach can occur only when the volume of material transported into the reach exceeds the volume of material transported out of the reach. Conversely, a decrease in the mean bed elevation results when the volume of material transported out of the reach is greater than the supply. Whether a particular cross section scours or fills depends on the transport rate of bed material through the cross section compared to the rest of the channel—and especially the short reach immediately upstream. Several examples of cross sections that scour within one range of discharge and that fill within another have already been cited. Such occurrences must be the consequence of a relatively large bedload-transport rate compared to the rest of the channel for the discharges at which scour occurs. Conversely, the cross section must fill over the range of discharge when its bedload-tranport rate is small compared to that of the rest of the channel. In order to account for the pattern of scour and fill through the study reach, the rate of change of bedload transport with discharge (that is, the slope of the bedload-transport rate versus discharge relation) must vary from section to section. To confirm this hypothesis, a relation between discharge and bedload-transport rate was computed for each section by correlating flow conditons at the section with the flow conditions and bedload-transport rate measured at the bedload trap.

Empirically, fluid velocity has been found to correlate well with the bedload-transport rate. The transport rate of bedload material per foot of width is expressed as a function of mean velocity in figure 14. Plots of this type have been used before, notably by Colby (1964*a*) and Maddock (1969), and have proven to be a simple, effective way to represent bedload-transport data. For the range of mean velocities, depths, and bed-material sizes found in the study reach, the effect of depth on the bedload-transport rate is insignificant and may be ignored (Colby, 1964*a*).

The scatter of data in Figure 14 is due in part to variations in the grain size of transported material. During the initial increase in stage, when appreciable quantities of bedload began to move, the median grain size in transport was approximately 0.60 mm. As discharge increased, the size of bedload material also increased to a maximum of 1.5 mm at

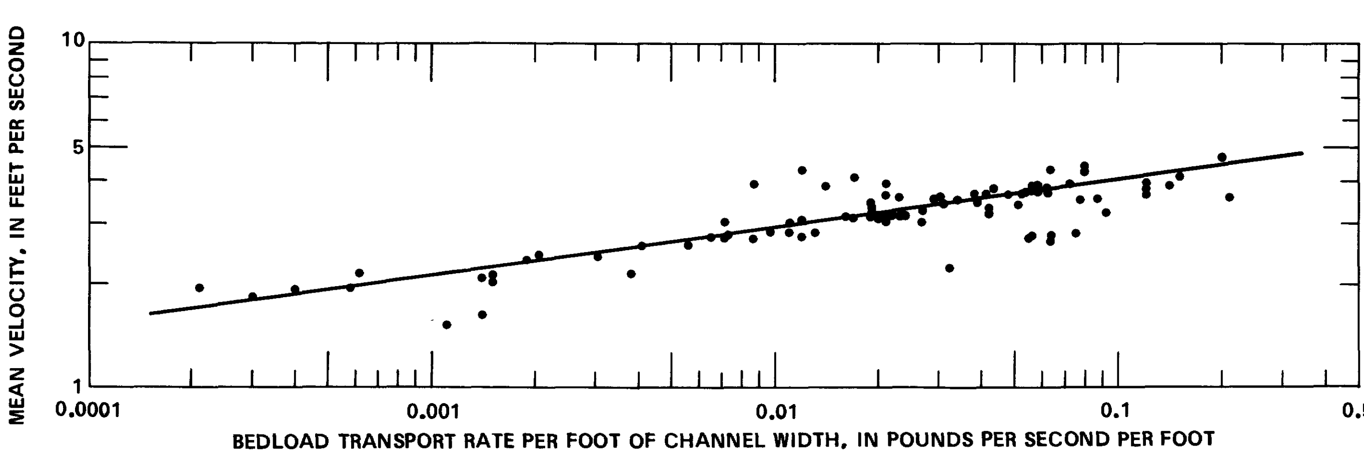



FIGURE 14.—Unit bedload-transport rate versus mean velocity relation from the bedload trap. Sediment loads are expressed as dry weight. Data from Leopold and Emmett (1976, 1977).

the flood crest. With decreasing discharge, grain size decreased, but slowly, as compared to the coarsening which occurred during the increasing discharge. Thus, after the initial increase in discharge, the median grain size at the smallest transport rate was 0.90 mm. Subsequent increases and decreases in discharge follow the relation traced by decreasing discharge after the initial increase.

A possible source for the comparatively finer material transported during the initial increase is indicated by the sequence of scour and fill already described. The last survey on July 10, 1974, showed that the mean bed elevation of all cross sections except *1F* and *10S* was below their preflood level.

By the spring of 1975, however, the mean bed elevation of every cross section had returned to its preflood level of a year before. As much as 0.5 foot of material had been deposited in some sections by low flow during the year.

R. H. Meade (written commun., 1977) systematically measured the thickness of sand-size bed material in the East Fork River channel for a distance of nearly 2.5 miles upstream from the bedload trap. The streambed was normally stratified by sediment size. The surface layer, approximately 0.3 foot thick, was significantly finer—median diameter=0.5 mm—than the underlying material—median diameter=1-2 mm.

Scour of this relatively finer surficial material during the initial increase in discharge probably accounts qualitatively for the smaller median diameter of material transported during the first few days of the spring flood.

A relation between discharge ($Q$) and unit bedload-transport rate ($i_b$) may be derived for each cross section by combining the velocity versus discharge relation of the section with the relation between mean velocity and bedload-transport rate per foot of channel width measured at the bedload trap (shown by the trend line in fig. 14). In order to compute the whole channel bedload-transport rate through a cross section for any given discharge, the transport rate per foot of width ($i_b$) must be multiplied by the active bed width of the section. Choosing the active bed width is subject to some error. In all instances, the determination of active bed width was made by noting the break in slope between bed and bank, and the intersection between bed material and bank material. The width of bed is assumed to remain constant through the spring flood.

The relations between discharge and whole-channel bedload-transport rate, $I_b$, for the eight cross sections located in self-formed reaches of the channel are compared in figure 15. This figure confirms the supposition that the cross sections have different bedload-transport rate versus discharge relations. The $I_b$ versus $Q$ relations of the scouring cross sections are characterized by having steeper slopes than the filling cross sections. This is a direct result of the relatively large velocity exponents of the scouring sections. At discharges greater than 800 ft³/s, the scouring cross sections have a greater bedload-transport rate than the filling cross sections, as one would expect. Conversely, at discharges less than 800 ft³/s, the scouring cross sections have lesser bedload-transport rates than the filling cross sections. This agrees with the observation that cross sections *8S, 9S, 10S,* and *11S* filled at discharges between 200 and 800 ft³/s, while sections *5F, 6F,* and *7F* scoured slightly. No scour was observed in section *1F,* and this is compatible with its relatively small bedload-transport rate at any discharge. Thus, the bedload-transport rate versus discharge relations computed for the eight self-formed cross sections agree well with the observed sequence of scour and fill in the sections.

## CROSS SECTIONS IN AN ALTERED REACH OF CHANNEL

The $I_b$ versus $Q$ relations computed for cross sections *2S, 3S,* and *4F* are not consistent with the scour and fill recorded at these sections. These sections were located in a reach of channel modified by the construction of the road bridge and a berm along the left bank (fig. 3). The $I_b$ versus $Q$ relations for sections *2S* and *3S* do not agree with the large observed depth of scour. On the other hand, cross section *4F* filled, in spite of a large computed $I_b$ versus $Q$ relation.

The cross-channel velocity distribution provides at least a part of the explanation for the apparently small bedload transport through cross sections *2S* and *3S.* In most natural cross sections, the horizontal velocity distribution is relatively uniform. However, at section *2S,* and to a lesser extent at section *3S,* the horizontal velocity distribution was nonuniform. Flow was concentrated by the bridge piers so that the velocity was very large between the piers and small around and behind them. Discharge measurements were made from the road bridge, so that the velocity is known in 2-foot-wide verticals. When the whole channel bedload-transport rate is calculated from the velocity in each vertical and then summed across the channel, rather than using the mean velocity of the entire cross section, the bedload-transport rate versus discharge relation for section *2S* is more than doubled, and then agrees with its scouring character. This is true because the whole channel bedload-transport rate is proportional to the mean flow velocity to some power $z$,

$$i_b \propto (\overline{u})^z.$$

In general,

$$(\overline{u})^\xi < \frac{1}{N}\sum_1^N (u_i)^\xi$$

even though $\overline{u}$ is defined by

$$(\overline{u}) = \frac{1}{N}\sum_1^N (u_i).$$

where $u_i$=mean flow velocity in feet per second in the $i$th vertical, and $N$=number of verticals. Thus, bedload-transport

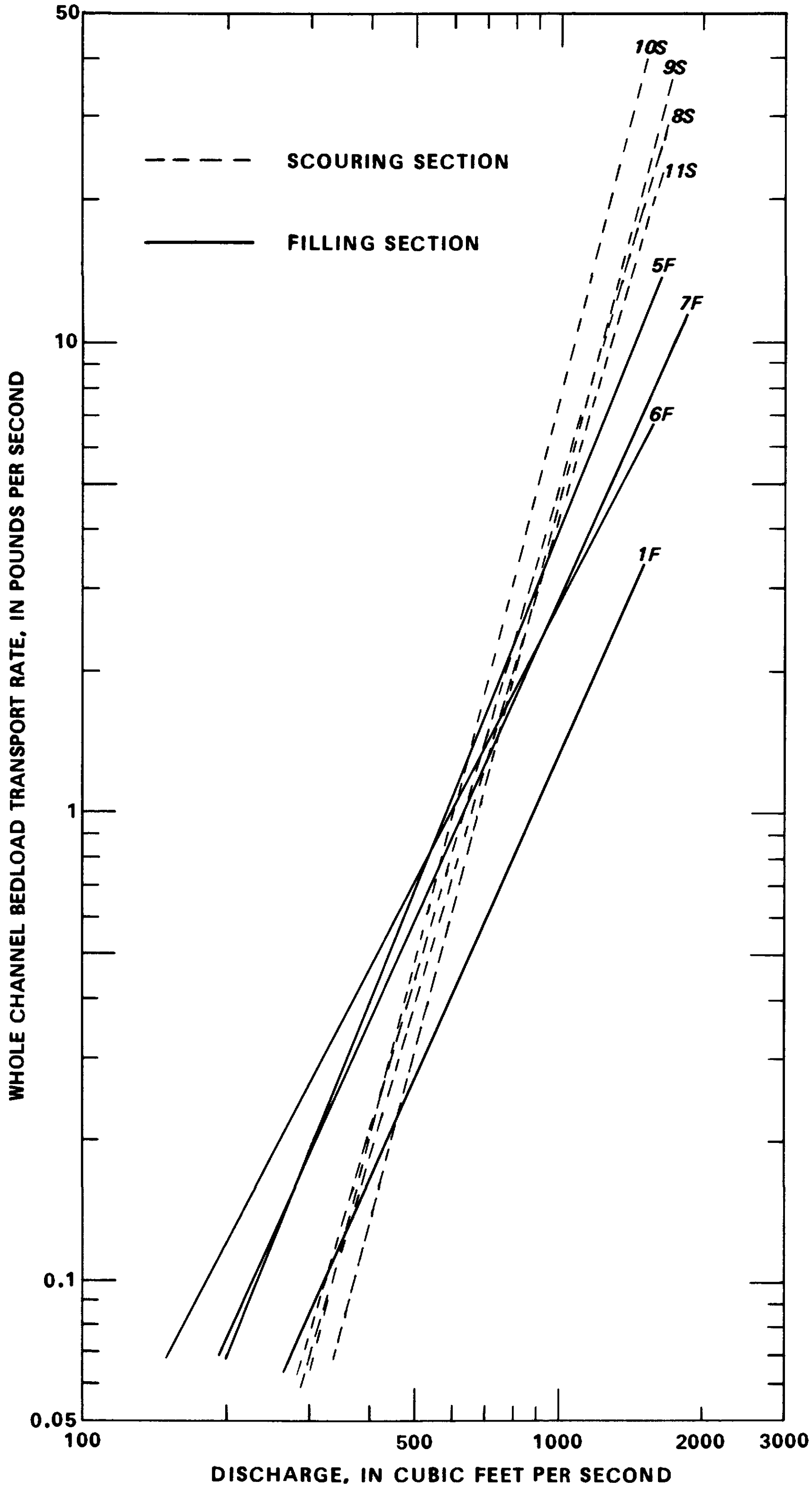



FIGURE 15.—Whole channel bedload-transport rate versus discharge relations for self-formed cross sections.

relations based upon a correlation with mean velocity will tend to underestimate the transport rate where there is an appreciable cross-channel variation of velocity.

When the cross-channel velocity distribution is fairly uniform, the mean velocity can be used to calculate the bedload-transport rate without appreciable error. However, for cross sections which have widely variable velocity, the calculated transport rate is much too small. In the instance of section *2S*, the bedload-transport rate at the flood crest, calculated by summing verticals, is approximately 13 lb/s. This value is comparable to the maximum transport rates calculated for the other scouring cross sections (fig. 15).

Cross section *4F* was located 140 feet downstream from the road bridge. The section filled during increasing discharge and scoured during decreasing discharge. Cross section *4F* also has the characteristics of the other filling cross sections, including small velocity and large width and roughness exponents.

Although the bedload-transport rate did not increase rapidly with discharge, the ordinate intercept was much larger than any of the other bedload-transport rate versus discharge relations. Therefore, the bedload-transport rate was greater through cross section *4F* than the mean of the study reach for most discharges, and only approximated the bedload-transport rate through the scouring cross sections near the flood crest. In view of these very large transport rates, it appears inconsistent that section *4F* would accumulate sediment (fill). However, owing to the large volume of material scoured from beneath the road bridge as discharge increased, the supply of bedload sediment to section *4F* was much larger than was the average condition of the study reach. Thus, cross section *4F* appears to be a filling section which has adjusted to the large volume of sediments scoured from beneath the road bridge.

A bedload-sediment budget between cross sections *1F* and *4F* from May 26 to May 29 supports this supposition (table 3). The sediment loads transported past these two sections were calculated from the respective $I_b$ versus $Q$ relations and the flood hydrograph (fig. 2). Approximately 730 tons of bedload sediment were transported through cross section *1F* and 986 tons through cross section 4F during the initial three days of the first flood crest. In order to estimate the volume of bed material scoured and filled within the reach during this period, it was assumed that the depth of scour and fill and channel width varied linearly through the reach, that the depth of scour was symmetrical about the road bridge, from 25 feet upstream to 25 feet downstream, and that the transition from fill to scour occurred halfway between section *1F* and the road bridge. Based on these assumptions and the computed changes in mean bed elevation at each section, a net estimated scour of 231 tons occurred between cross sections *1F* and *4F* from May 26 to May 29. The computed inflow of bedload sediment plus the volume of material derived from within the reach, approximately 961 tons, is comparable to the computed outflow, approximately 986 tons. Although these calculations are only estimates, the good numerical agreement indicates that the relation between the bedload-transport rate and mean velocity shown in figure 14 was the same for all sections, and that the hydraulic characteristics of section *4F* have adjusted to provide the mean velocity necessary to transport the larger sediment load supplied to it.

TABLE 3.—*Estimated bedload-sediment*[1] *budget between cross sections* 1F *and* 4F, *May 26-29, 1974*

| Interval[2] | Mean daily discharge ($ft^3/s$) | Inflow of bedload-sediment through section *1F* (tons) | Bed material scoured from within reach[3] [4] (tons) | Outflow of bedload-sediment through section *4F*[5] (tons) |
|---|---|---|---|---|
| May 26-27 | 516 | 146 | 112 | 258 |
| May 27-28 | 808 | 240 | 81 | 326 |
| May 28-29 | 1,290 | 344 | 38 | 402 |
| TOTAL | | 730 | 231 | 986 |

[1]Dry weight.

[2]Noon to noon.

[3]The quantities of bedload-sediment transport through sections *1F* and *4F* were calculated by combining the unit bedload-transport rate versus mean velocity relation measured at the bedload trap on May 25-29 with the respective mean velocity versus discharge relations of the sections.

[4]The volume of bed material scoured and filled between sections *1F* and *4F* was calculated by assuming that both the depth of scour and fill and channel width varied linearly through the reach, the depth of scour was symmetrical about the road bridge, from 25 feet upstream to 25 feet downstream, and the transition from fill to scour occurred halfway between section *1F* and the road bridge.

[5]Specific density of bed material is 1.3.

## SUMMARY AND CONCLUSIONS

The mean at-a-station hydraulic geometry of the East Fork River agrees with the theoretical minimum variance hydraulic geometry. Thus, on the average, the East Fork River accommodates a change in discharge by mutually minimizing the adjustment of velocity, width, and depth. The hydraulic geometry of a given cross section, however, may deviate significantly from the mean reach and minimum variance condition. Periodic channel features, such as riffles and pools, plus chance encounters with differences in bank material, vegetation, or a bedrock outcrop, limit the free adjustment of one or more hydraulic variables. The effects of a constraint placed upon the adjustment of one variable are absorbed by all the other hydraulic variables, so as to minimize the adjustment made by any one. Thus, the hydraulic geometry of a section is deflected from the minimum variance condition. The hydraulic geometries of the 11 cross sections along the East Fork River, in fact, were distributed about the mean reach and minimum variance condition.

The cross sections occur in two distinctive groups, each with a characteristic hydraulic geometry and sequence of scour and fill. Significant scour was observed in six sections at the flood crests. These sections had larger velocity and smaller width and roughness exponents than the mean reach condition. The scouring sections also tended to be narrower and deeper than the mean reach condition for the entire range of flood discharges. Significant fill was measured in five cross sections at the flood crests. These sections had smaller velocity and larger width and roughness exponents than the mean reach condition. The filling sections tended to be wider and shallower than the mean reach condition. Filling and scouring sections had similar depth exponents.

The most significant hydraulic difference between the scouring and filling sections was an inversion in the relative magnitude of velocity through the respective sections as discharge increased. At discharges less than approximately 500 $ft^3/s$, the filling sections had a larger velocity than did the scouring sections. As indicated by the respective velocity exponents, velocity increased more rapidly with discharge in the scouring sections than in the filling sections. Thus, at discharges greater than bankfull stage, 820 $ft^3/s$, the scouring sections had a larger velocity than the filling sections.

Sediment-transport rates measured at the bedload trap were well correlated with mean velocity. Therefore, a relation between discharge and whole-channel bedload-transport rate was computed for each section by combining the velocity versus discharge relation of the section with the velocity versus bedload-transport rate relation at the bedload trap. The sequence of scour and fill measured at a section and the computed relation between discharge and whole-channel bedload-transport rate are in good agreement. The whole-channel bedload-transport rate ($I_b$) was similar in most cross sections at discharges near bankfull stage, 820 $ft^3/s$. However, the slopes of the bedload-transport relations ($I_b$ versus $Q$) of the scouring sections were steeper than those of the filling sections. Consequently, the scouring sections had relatively large sediment-transport rates and scoured when discharge exceeded bankfull stage and they had relatively small sediment-transport rates and filled when discharge was less than bankfull stage. Conversely, the filling sections had relatively small sediment-transport rates and filled when discharge exceeded bankfull stage, and they had relatively large sediment-transport rates and scoured when discharge was less than bankfull stage.

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TABLES 4, 5, 6

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May–July 1974*

CROSS SECTION NO. 1

| Date | May 8 | May 28 | May 30 | May 31 | June 2 | June 5 | June 7 | June 10 | June 14 | June 22 | July 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 93.43 | 96.63 | 96.27 | 95.66 | 96.05 | 96.08 | 94.46 | 94.25 | 96.88 | 94.90 | 92.38 |
| Discharge ($ft^3/s$) | 200 | 1,150 | 1,080 | 814 | 975 | 975 | 480 | 303 | 1,300 | 560 | 40 |
| | ELEVATION, IN FEET | | | | | | | | | | |
| Distance, in feet | | | | | | | | | | | |
| 0 | 96.05 | 96.09 | | | | | | | | | 96.06 |
| 1 | | | | | | | | | | | |
| 2 | 95.54 | 95.69 | | | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | 95.51 | 95.70 | | | | | | | | | |
| 5 | | | | | | | | | | | 95.51 |
| 6 | 95.21 | 95.35 | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | 94.58 | | | | | | | | | 94.63 |
| 9 | 94.37 | | | | | | | | | | |
| 10 | | 94.43 | | | | | | | | | |
| 11 | 94.31 | | | | | | | | | | 94.44 |
| 12 | 94.10 | 94.45 | 94.39 | 94.48 | | 94.39 | | | | | |
| 13 | | | | | | | | | | | |
| 14 | 93.36 | 92.86 | 93.95 | 93.68 | 93.86 | 93.85 | 93.86 | 93.83 | 93.90 | 93.86 | 93.72 |
| 15 | | | | | | | | | | | |
| 16 | 92.90 | 93.30 | 93.05 | 93.21 | 93.19 | 93.10 | 93.39 | 93.45 | 93.46 | 93.18 | 93.18 |
| 17 | 91.60 | | | | | | | | | | 91.63 |
| 18 | | 91.71 | 91.57 | 91.55 | 91.57 | 91.56 | 91.54 | 91.58 | 91.60 | 91.57 | 91.60 |
| 19 | 91.50 | | | | | | | | | | |
| 20 | | 91.73 | 91.57 | 91.64 | 91.63 | 91.63 | 91.58 | 91.63 | 91.72 | 91.62 | 91.60 |
| 21 | 91.53 | | | | | | | | | | |
| 22 | | 91.82 | 91.79 | 91.83 | 91.67 | 91.85 | 91.70 | 91.78 | 91.80 | 91.68 | 91.71 |
| 23 | 91.77 | | | | | | | | | | |
| 24 | | 91.91 | 91.86 | 91.86 | 91.80 | 91.88 | 91.92 | 91.89 | 91.91 | 91.80 | 91.70 |
| 25 | 91.78 | | | | | | | | | | |
| 26 | | 91.83 | 91.86 | 91.89 | 91.84 | 91.80 | 91.84 | 91.82 | 91.88 | 91.85 | 91.74 |
| 27 | 91.76 | | | | | | | | | | |
| 28 | | 91.85 | 92.91 | 91.96 | 91.83 | 91.86 | 91.92 | 91.88 | 91.93 | 91.90 | 91.83 |
| 29 | 91.81 | | | | | | | | | | |
| 30 | | 91.95 | 91.97 | 91.98 | 91.99 | 91.90 | 91.98 | 91.92 | 91.92 | 92.00 | 91.94 |
| 31 | 91.93 | | | | | | | | | | |
| 32 | | 92.08 | 92.11 | 92.10 | 92.08 | 92.04 | 92.07 | 91.99 | 92.10 | 91.98 | 92.02 |
| 33 | 92.01 | | | | | | | | | | |
| 34 | | 92.24 | 92.27 | 92.20 | 92.20 | 92.20 | 92.17 | 92.21 | 92.26 | 92.10 | 92.14 |
| 35 | 92.23 | | | | | | | | | | |
| 36 | | 92.61 | 92.49 | 92.48 | 92.55 | 92.53 | 92.48 | 92.47 | 92.58 | 92.32 | 92.37 |
| 37 | 92.52 | | | | | | | | | | |
| 38 | | 92.73 | 92.55 | 92.77 | 92.63 | 92.72 | 92.70 | 92.66 | 92.72 | 92.57 | 92.67 |
| 39 | 92.63 | | | | | | | | | | |
| 40 | | 92.79 | 92.72 | 92.74 | 92.69 | 92.73 | 92.68 | 92.67 | 92.73 | 92.62 | 92.69 |
| 41 | 92.77 | | | | | | | | | | |
| 42 | | 93.07 | 93.19 | 93.18 | 93.02 | 93.08 | 92.99 | 93.03 | 93.10 | 93.02 | 92.93 |
| 43 | 92.86 | | | | | | | | | | |
| 44 | | 93.16 | 93.27 | 93.22 | 93.21 | 93.24 | 93.14 | 93.13 | 93.20 | 93.11 | 93.13 |
| 45 | 93.06 | | | | | | | | | | |
| 46 | | 93.17 | 93.23 | 93.31 | 93.26 | 93.28 | 93.36 | 93.25 | 93.28 | 93.29 | 93.23 |
| 47 | 93.09 | | | | | | | | | | |
| 48 | | 93.15 | 93.21 | 93.23 | 93.20 | 93.23 | 93.18 | 93.18 | 93.28 | 93.17 | 93.17 |
| 49 | 93.09 | | | | | | | | | | |
| 50 | | 93.23 | 93.33 | 93.31 | 93.19 | 93.26 | 93.24 | 93.23 | 93.33 | 93.14 | 93.22 |
| 51 | 93.09 | | | | | | | | | | |
| 52 | | 93.21 | 93.29 | 93.33 | 93.22 | 93.23 | 93.22 | 93.23 | 93.21 | 93.21 | 93.26 |
| 53 | 93.16 | | | | | | | | | | |
| 54 | | 93.23 | 93.32 | 93.33 | 93.19 | 93.21 | 93.21 | 93.20 | 93.33 | 93.06 | 93.26 |
| 55 | 93.06 | | | | | | | | | | |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 1--Continued

| Date | May 8 | May 28 | May 30 | May 31 | June 2 | June 5 | June 7 | June 10 | June 14 | June 22 | July 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 93.43 | 96.63 | 96.27 | 95.66 | 96.05 | 96.08 | 94.46 | 94.25 | 96.88 | 94.90 | 92.38 |
| Discharge ($ft^3/s$) | 200 | 1,150 | 1,080 | 814 | 975 | 975 | 480 | 303 | 1,300 | 560 | 40 |
| ELEVATION, IN FEET | | | | | | | | | | | |
| Distance, in feet | | | | | | | | | | | |
| 56 | | 93.15 | 93.19 | 93.49 | 93.17 | 93.30 | 93.19 | 93.26 | 93.30 | 93.18 | 93.31 |
| 57 | 93.02 | | | | | | | | | | |
| 58 | | 93.10 | 93.18 | 93.47 | 93.42 | 93.58 | 93.20 | 93.25 | 93.23 | 93.15 | 93.28 |
| 59 | 93.00 | | | | | | | | | | |
| 60 | | 93.03 | 93.02 | 93.42 | 93.45 | 93.47 | 93.19 | 93.17 | 93.18 | 93.12 | 93.20 |
| 61 | 92.86 | | | | | | | | | | |
| 62 | | 92.73 | 92.78 | 93.21 | 93.49 | 93.47 | 93.03 | 92.80 | 93.06 | 92.90 | 92.84 |
| 63 | 92.51 | | | | | | | | | | |
| 64 | | 92.42 | 92.60 | 93.24 | 92.87 | 93.03 | 93.03 | 92.60 | 92.88 | 92.80 | 92.42 |
| 65 | 92.14 | | | | | | | | | | |
| 66 | | 92.31 | 92.44 | 93.09 | 92.81 | 92.90 | 92.95 | 92.43 | 92.68 | 92.60 | 92.10 |
| 67 | 91.82 | | | | | | | | | | |
| 68 | | 92.01 | 91.91 | 92.85 | 93.01 | 92.76 | 92.99 | 92.41 | 92.37 | 92.70 | 91.93 |
| 69 | 91.60 | | | | | | | | | | |
| 70 | | 91.94 | 91.72 | 92.46 | 92.98 | 92.23 | 92.84 | 92.13 | 92.12 | 92.69 | 91.79 |
| 71 | 91.49 | | | | | | | | | | |
| 72 | | 91.67 | 91.60 | 91.64 | 92.75 | 91.93 | 92.68 | 92.37 | 91.93 | 92.58 | 91.69 |
| 73 | 91.40 | | | | | | | | | | |
| 74 | | 91.61 | 91.65 | 91.44 | 92.62 | 91.86 | 92.74 | 92.17 | 91.88 | 92.25 | 91.64 |
| 75 | 91.31 | | | | | | | | | | |
| 76 | | 91.50 | 91.42 | 91.57 | 92.44 | 91.66 | 92.54 | 91.64 | 91.80 | 92.18 | 91.39 |
| 77 | 91.19 | | | | | | | | | | |
| 78 | | 91.47 | 91.40 | 91.76 | 92.05 | 92.01 | 92.33 | 91.33 | 91.88 | 92.15 | 91.25 |
| 79 | 91.19 | | | | | | | | | | |
| 80 | | 91.50 | 91.39 | 91.61 | 92.00 | 91.81 | 92.46 | 91.71 | 91.70 | 92.17 | 91.25 |
| 81 | 91.21 | | | | | | | | | | |
| 82 | | 91.49 | 91.30 | 91.43 | 91.96 | 92.00 | 92.15 | 91.63 | 91.68 | 91.92 | 91.22 |
| 83 | 91.27 | | | | | | | | | | |
| 84 | | 91.57 | 91.35 | 91.46 | 91.67 | 91.88 | 92.11 | 91.63 | 91.76 | 92.10 | 91.28 |
| 85 | 91.37 | | | | | | | | | | |
| 86 | | 91.75 | 91.57 | 91.61 | 91.63 | 91.79 | 92.10 | 91.78 | 91.86 | 92.18 | 91.53 |
| 87 | 91.53 | | | | | | | | | | |
| 88 | 92.80 | 92.85 | 92.39 | 92.34 | 92.37 | 92.29 | 92.28 | 92.25 | 92.25 | 92.90 | 91.89 |
| 89 | 93.57 | | | | | | | | | | 93.46 |
| 90 | 94.16 | 93.85 | 94.19 | 94.06 | 94.19 | 94.22 | 94.46 | | 94.28 | 94.17 | |
| 91 | | | | | | | | | | | |
| 92 | 94.73 | 94.77 | 94.79 | 94.86 | 94.82 | 94.83 | | | 94.96 | | 94.87 |
| 93 | | | | | | | | | | | |
| 94 | | 94.72 | | | | | | | 94.70 | | |
| 95 | 94.44 | | | | | | | | | | |
| 96 | | 94.59 | | | | | | | | | 94.55 |
| 97 | | | | | | | | | | | |
| 98 | | 94.69 | | | | | | | | | |
| 99 | | | | | | | | | | | |
| 100 | | 94.61 | | | | | | | | | |
| 101 | | | | | | | | | | | |
| 102 | | | | | | | | | | | |
| 103 | | | | | | | | | | | |
| 104 | 94.70 | | | | | | | | | | 94.65 |
| 105 | | | | | | | | | | | |
| 106 | | | | | | | | | | | |
| 107 | | | | | | | | | | | |
| 108 | 95.89 | | | | | | | | | | 95.64 |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 2

| Date | May 26 | May 27 | May 28 | May 29 | June 5 | June 9 | June 14 | July 11 |
|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 94.11 | 95.50 | 96.33 | 97.00 | 96.10 | 93.60 | 96.60 | 92.26 |
| Discharge ($ft^3/s$) | 398 | 759 | 1,120 | 1,580 | 1,000 | 275 | 1,280 | 40 |
| ELEVATION, IN FEET | | | | | | | | |
| Distance, in feet | | | | | | | | |
| 0 | | | | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | 95.30 | 96.50 | | | | |
| 5 | | | | | | | | |
| 6 | | | 95.30 | 96.00 | | | | |
| 7 | | | | | | | | |
| 8 | | | 94.80 | 95.00 | | | | |
| 9 | | | | | | | | |
| 10 | | 95.00 | 94.80 | 94.60 | 95.30 | | | |
| 11 | | | | | | | | |
| 12 | | 94.70 | 94.50 | 94.60 | 95.30 | | | |
| 13 | | | | | | | | |
| 14 | | 94.30 | 95.30 | 94.60 | 94.30 | | | |
| 15 | | | | | | | | |
| 16 | | 94.40 | 94.40 | 94.30 | 93.10 | | | |
| 17 | | | | | | | | |
| 18 | | 94.60 | 94.80 | 94.40 | 93.50 | | | |
| 19 | | | | | | | | |
| 20 | | 94.50 | 94.40 | 94.90 | 95.10 | | | |
| 21 | | | | | | | | 94.89 |
| 22 | | 94.20 | 94.40 | 94.50 | 94.70 | | 95.10 | |
| 23 | | | | | | | | |
| 24 | 93.10 | 92.30 | 93.50 | 93.30 | 93.60 | 93.30 | 93.70 | 93.47 |
| 25 | | | | | | | | 92.20 |
| 26 | 91.80 | 91.60 | 91.60 | 92.10 | 92.00 | 91.70 | 92.10 | 92.20 |
| 27 | | | | | | | | |
| 28 | 91.10 | 90.70 | 91.10 | 90.70 | 90.90 | 90.60 | 91.10 | 91.37 |
| 29 | | | | | | | | |
| 30 | 91.10 | 90.30 | 90.00 | 88.80 | 89.90 | 91.50 | 89.80 | 91.32 |
| 31 | | | | | | | | |
| 32 | 90.30 | 88.70 | 88.50 | 88.40 | 88.60 | 88.50 | 88.70 | 91.32 |
| 33 | | | | | | | | |
| 34 | 90.00 | 88.50 | 87.80 | 87.30 | 87.40 | 88.50 | 88.30 | 91.25 |
| 35 | | | | | | | | |
| 36 | 90.10 | 88.30 | 87.80 | 86.70 | 86.50 | 88.20 | 87.90 | 91.33 |
| 37 | | | | | | | | |
| 38 | 89.80 | 88.40 | 87.70 | 86.70 | 86.80 | 88.60 | 87.30 | 91.14 |
| 39 | | | | | | | | |
| 40 | 89.60 | 88.50 | 87.10 | 86.70 | 86.50 | 88.70 | 86.90 | 90.98 |
| 41 | | | | | | | | |
| 42 | 89.80 | 88.70 | 87.10 | 87.40 | 86.40 | 88.60 | 87.10 | 91.03 |
| 43 | | | | | | | | |
| 44 | 90.10 | 89.00 | 87.40 | 87.50 | 86.20 | 88.70 | 87.30 | 91.53 |
| 45 | | | | | | | | |
| 46 | 89.90 | 88.70 | 86.70 | 87.30 | 85.80 | 88.00 | 86.70 | 91.48 |
| 47 | | | | | | | | |
| 48 | 89.50 | 88.50 | 86.30 | 86.50 | 86.30 | 87.40 | 86.30 | 91.49 |
| 49 | | | | | | | | |
| 50 | 89.50 | 88.00 | 86.20 | 87.30 | 86.70 | 87.00 | 86.90 | 90.53 |
| 51 | | | | | | | | |
| 52 | 89.40 | 87.70 | 87.00 | 87.70 | 88.10 | 88.30 | 87.40 | 90.06 |
| 53 | | | | | | | | |
| 54 | 89.20 | 88.20 | 87.90 | 90.10 | 88.30 | 89.30 | 89.00 | 89.61 |
| 55 | | | | | | | | |
| 56 | 90.30 | 90.30 | 89.50 | 90.60 | 90.70 | 90.70 | 89.70 | 90.68 |
| 57 | | | | | | | | |
| 58 | 90.50 | 91.20 | 91.10 | 91.40 | 91.30 | 91.30 | 91.30 | 91.24 |
| 59 | | | | | | | | |
| 60 | 91.40 | 91.70 | 91.90 | 92.00 | 92.10 | 92.10 | 92.00 | |
| 61 | | | | | | | | |
| 62 | 91.60 | 91.60 | 91.90 | 92.10 | 92.00 | 92.20 | 92.00 | 92.20 |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 3

| Date | May 8 | May 24 | May 27 | May 29 | July 10 |
|---|---|---|---|---|---|
| Water surface elevation (feet) | 93.26 | 92.67 | 95.59 | 96.85 | 92.26 |
| Discharge ($ft^3/s$) | 200 | 104 | 810 | 1,560 | 40 |
| | | | ELEVATION, IN FEET | | |
| Distance, in feet | | | | | |
| 0 | 96.33 | | | | 96.31 |
| 1 | | | | | |
| 2 | 96.29 | | | | |
| 3 | | | | | |
| 4 | 96.31 | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | 96.19 | | | | 96.25 |
| 9 | | | | | |
| 10 | | | | | |
| 11 | 95.36 | | | | 95.33 |
| 12 | 94.19 | | 94.73 | | |
| 13 | | | | | 94.13 |
| 14 | 94.18 | | 94.39 | | |
| 15 | | | | | |
| 16 | 93.61 | | 94.50 | | |
| 17 | | | | | |
| 18 | 94.65 | | 94.73 | | |
| 19 | | | | | 94.99 |
| 20 | | | 94.75 | | |
| 21 | 94.65 | | | | |
| 22 | | | 94.71 | | |
| 23 | | | | | |
| 24 | 93.83 | | 93.92 | 94.97 | 93.88 |
| 25 | 93.23 | | | | 92.15 |
| 26 | 91.78 | 92.48 | 92.23 | 93.90 | 92.15 |
| 27 | 91.55 | | | | |
| 28 | | 92.26 | 91.29 | 93.23 | 90.38 |
| 29 | 91.96 | | | | |
| 30 | 91.72 | 91.57 | 91.26 | 91.65 | 90.05 |
| 31 | 91.39 | | | | |
| 32 | | 91.07 | 91.32 | 90.85 | 90.05 |
| 33 | 90.97 | | | | |
| 34 | | 91.17 | 91.22 | 90.37 | 90.48 |
| 35 | 90.90 | | | | |
| 36 | | 91.11 | 91.02 | 90.29 | 90.87 |
| 37 | 90.89 | | | | |
| 38 | | 90.96 | 91.27 | 90.45 | 90.99 |
| 39 | 90.80 | | | | |
| 40 | | 90.96 | 90.94 | 90.45 | 91.11 |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

| CROSS SECTION NO. 3--Continued | | | | | |
|---|---|---|---|---|---|
| Date | May 8 | May 24 | May 27 | May 29 | July 10 |
| Water surface elevation (feet) | 93.26 | 92.67 | 95.59 | 96.85 | 92.26 |
| Discharge ($ft^3/s$) | 200 | 104 | 810 | 1,560 | 40 |
| ELEVATION, IN FEET | | | | | |
| Distance, in feet | | | | | |
| 41 | 90.89 | | | | |
| 42 | | 90.74 | 90.94 | 90.07 | 91.35 |
| 43 | 90.81 | | | | |
| 44 | | 90.72 | 90.47 | 89.99 | 91.47 |
| 45 | 90.79 | | | | |
| 46 | | 90.71 | 90.32 | 89.55 | 91.55 |
| 47 | 90.96 | | | | |
| 48 | | 90.64 | 90.37 | 89.35 | 91.57 |
| 49 | 90.94 | | | | |
| 50 | | 90.64 | 89.93 | 89.65 | 91.59 |
| 51 | 90.54 | | | | |
| 52 | | 90.60 | 89.51 | 89.45 | 91.48 |
| 53 | 90.63 | | | | |
| 54 | | 90.62 | 89.71 | 89.15 | 90.96 |
| 55 | 90.91 | | | | |
| 56 | | 90.65 | 89.52 | 89.01 | 90.96 |
| 57 | 91.07 | | | | |
| 58 | | 90.66 | 88.78 | 88.65 | 90.70 |
| 59 | 91.05 | | | | |
| 60 | | 90.57 | 88.44 | 88.41 | 89.97 |
| 61 | 90.88 | | | | |
| 62 | | 90.25 | 88.23 | 88.61 | 89.00 |
| 63 | 90.97 | | | | |
| 64 | | 88.82 | 88.57 | 88.55 | 88.12 |
| 65 | 90.97 | | | | |
| 66 | | 89.37 | 88.79 | 88.35 | 87.67 |
| 67 | 90.86 | | | | |
| 68 | | 89.87 | 89.79 | 88.45 | 88.09 |
| 69 | 90.72 | | | | |
| 70 | | 90.92 | 90.76 | 88.41 | 90.83 |
| 71 | 90.94 | | | | |
| 72 | 92.65 | 92.67 | 92.54 | | 91.23 |
| 73 | 93.29 | | | | 92.24 |
| 74 | 94.04 | | 94.13 | | |
| 75 | 93.83 | | 95.59 | | |
| 76 | | | | | 94.81 |
| 77 | 96.69 | | | | 96.37 |
| 78 | 97.11 | | | | |
| 79 | | | | | |
| 80 | 97.73 | | | | 97.65 |
| 81 | | | | | |
| 82 | | | | | |
| 83 | | | | | |
| 84 | 98.05 | | | | |
| 85 | | | | | |
| 86 | 98.02 | | | | 97.99 |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 4

| Date | May 8 | May 27 | May 28 | May 29 | May 30 | May 31 | June 2 | June 5 | June 7 | June 10 | June 14 | June 22 | July 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 93.12 | 95.51 | 96.25 | 96.77 | 96.14 | 95.47 | 95.88 | 95.89 | 94.30 | 93.97 | 96.51 | 94.70 | 92.08 |
| Discharge ($ft^3/s$) | 200 | 814 | 1,150 | 1,480 | 1,100 | 822 | 985 | 980 | 448 | 371 | 1,220 | 560 | 40 |
| ELEVATION, IN FEET | | | | | | | | | | | | | |
| Distance, in feet | | | | | | | | | | | | | |
| 0 | 96.07 | | | | | | | | | | | | 96.10 |
| 1 | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | 95.43 |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | 95.82 | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | 94.64 |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | 94.04 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | 92.44 |
| 30 | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | 92.96 |
| 37 | | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | 94.97 |
| 41 | | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | | |
| 47 | 96.59 | | | | | | | | | | | | |
| 48 | | | 96.15 | | | | | | | | | | 94.26 |
| 49 | | 95.51 | | | | | | | | | | | |
| 50 | 94.54 | 94.83 | 95.07 | | 94.51 | | | | | | | | |
| 51 | | | | | | | | | | | | | |
| 52 | | 94.36 | 94.44 | | 94.36 | 94.30 | 94.84 | 94.31 | 94.30 | | 94.36 | | 94.01 |
| 53 | 93.97 | | | | | | | | | | | | |
| 54 | | 93.80 | 93.33 | 93.91 | 93.84 | 93.55 | 93.85 | 93.66 | 93.94 | 93.84 | 93.56 | 93.85 | 93.80 |
| 55 | | | | | | | | | | | | | |
| 56 | 93.17 | 93.45 | 92.18 | 93.22 | 93.29 | 93.22 | 93.47 | 93.45 | 93.58 | 93.68 | 93.53 | 93.60 | 93.43 |
| 57 | 92.36 | | | | | | | | | | | | |
| 58 | 91.82 | 92.20 | 92.16 | 93.21 | 92.29 | 91.95 | 92.18 | 92.05 | 92.17 | 92.21 | 92.51 | 92.21 | 92.08 |
| 59 | | | | | | | | | | | | | |
| 60 | 91.80 | 92.07 | 92.12 | 92.87 | 92.62 | 92.29 | 92.06 | 92.13 | 92.00 | 91.88 | 93.04 | 91.94 | 91.94 |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 4--Continued

| Date | May 8 | May 27 | May 28 | May 29 | May 30 | May 31 | June 2 | June 5 | June 7 | June 10 | June 14 | June 22 | July 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 93.12 | 95.51 | 96.25 | 96.77 | 96.14 | 95.47 | 95.88 | 95.89 | 94.30 | 93.97 | 96.51 | 94.70 | 92.08 |
| Discharge ($ft^3/s$) | 200 | 814 | 1,150 | 1,480 | 1,100 | 822 | 985 | 980 | 448 | 371 | 1,220 | 560 | 40 |
| | ELEVATION, IN FEET | | | | | | | | | | | | |
| Distance, in feet | | | | | | | | | | | | | |
| 61 | | | | | | | | | | | | | |
| 62 | 91.77 | 92.01 | 92.40 | 92.58 | 92.59 | 92.32 | 92.17 | 91.77 | 91.80 | 91.74 | 92.89 | 91.88 | 91.67 |
| 63 | | | | | | | | | | | | | |
| 64 | 91.76 | 91.81 | 92.55 | 92.66 | 92.56 | 92.35 | 92.16 | 91.91 | 91.88 | 91.81 | 92.66 | 91.82 | 91.68 |
| 65 | | | | | | | | | | | | | |
| 66 | 92.00 | 92.33 | 92.77 | 92.75 | 92.49 | 92.27 | 92.08 | 92.10 | 92.05 | 91.97 | 92.61 | 92.02 | 91.86 |
| 67 | | | | | | | | | | | | | |
| 68 | 92.25 | 92.58 | 92.55 | 92.34 | 92.36 | 92.34 | 92.39 | 92.31 | 92.25 | 92.29 | 92.41 | 92.18 | 92.16 |
| 69 | | | | | | | | | | | | | |
| 70 | 92.34 | 92.64 | 92.50 | 92.47 | 92.33 | 92.28 | 92.27 | 92.23 | 92.25 | 92.24 | 92.66 | 92.27 | 92.12 |
| 71 | | | | | | | | | | | | | |
| 72 | 92.50 | 92.58 | 92.57 | 92.63 | 92.60 | 92.41 | 92.50 | 92.52 | 92.67 | 92.50 | 92.81 | 92.33 | 92.21 |
| 73 | | | | | | | | | | | | | |
| 74 | 92.60 | 92.73 | 92.68 | 92.74 | 92.72 | 92.62 | 92.66 | 92.74 | 92.73 | 92.69 | 92.91 | 92.72 | 92.42 |
| 75 | | | | | | | | | | | | | |
| 76 | 92.61 | 92.73 | 92.67 | 92.69 | 92.79 | 92.69 | 92.73 | 92.74 | 92.80 | 92.79 | 92.76 | 92.76 | 92.56 |
| 77 | | | | | | | | | | | | | |
| 78 | 92.65 | 92.79 | 92.77 | 92.80 | 92.68 | 92.57 | 92.70 | 92.69 | 92.73 | 92.68 | 92.71 | 92.65 | 92.60 |
| 79 | | | | | | | | | | | | | |
| 80 | 92.69 | 92.76 | 92.90 | 93.22 | 92.84 | 92.64 | 92.76 | 92.79 | 92.75 | 92.69 | 92.62 | 92.67 | 92.52 |
| 81 | | | | | | | | | | | | | |
| 82 | 92.43 | 92.61 | 92.65 | 92.95 | 92.67 | 92.55 | 92.59 | 92.57 | 92.68 | 92.61 | 92.61 | 92.63 | 92.57 |
| 83 | | | | | | | | | | | | | |
| 84 | 92.20 | 92.73 | 92.37 | 93.09 | 92.42 | 92.47 | 92.38 | 92.38 | 92.36 | 92.47 | 92.47 | 92.49 | 92.39 |
| 85 | | | | | | | | | | | | | |
| 86 | 91.99 | 92.53 | 92.17 | 92.36 | 92.20 | 92.08 | 92.12 | 92.13 | 92.17 | 92.11 | 92.16 | 92.20 | 92.22 |
| 87 | | | | | | | | | | | | | |
| 88 | 91.82 | 92.26 | 91.95 | 91.68 | 91.86 | 91.86 | 91.88 | 91.89 | 91.95 | 91.92 | 91.99 | 91.93 | 91.92 |
| 89 | | | | | | | | | | | | | |
| 90 | 91.60 | 92.13 | 91.87 | 91.66 | 91.72 | 91.63 | 91.72 | 91.71 | 91.72 | 91.71 | 91.76 | 91.76 | 91.71 |
| 91 | | | | | | | | | | | | | |
| 92 | 91.53 | 91.76 | 92.07 | 91.20 | 91.64 | 91.55 | 91.58 | 91.58 | 91.57 | 91.58 | 91.61 | 91.70 | 91.54 |
| 93 | | | | | | | | | | | | | |
| 94 | 91.45 | 91.75 | 91.80 | 91.27 | 91.42 | 91.47 | 91.44 | 91.51 | 91.52 | 91.42 | 91.49 | 91.58 | 91.47 |
| 95 | | | | | | | | | | | | | |
| 96 | 91.37 | 91.71 | 91.88 | 91.24 | 91.31 | 91.27 | 91.29 | 91.28 | 91.28 | 91.26 | 91.28 | 91.25 | 91.36 |
| 97 | | | | | | | | | | | | | |
| 98 | 91.24 | 91.53 | 91.50 | 91.06 | 91.24 | 91.25 | 91.26 | 91.31 | 91.28 | 91.19 | 91.23 | 91.32 | 91.15 |
| 99 | | | | | | | | | | | | | |
| 100 | 91.05 | 91.43 | 91.25 | 91.04 | 91.24 | 91.19 | 91.20 | 91.17 | 91.15 | 91.14 | 91.15 | 91.20 | 91.17 |
| 101 | | | | | | | | | | | | | |
| 102 | 90.94 | 91.09 | 91.05 | 90.94 | 91.02 | 91.04 | 91.06 | 91.00 | 91.05 | 91.02 | 91.08 | 91.09 | 91.04 |
| 103 | | | | | | | | | | | | | |
| 104 | 91.05 | 91.03 | 91.00 | 90.89 | 91.04 | 90.95 | 91.00 | 91.01 | 91.02 | 90.98 | 91.03 | 91.08 | 90.96 |
| 105 | | | | | | | | | | | | | |
| 106 | 91.28 | 91.29 | 91.31 | 91.38 | 91.42 | 91.35 | 91.38 | 91.39 | 91.48 | 91.30 | 91.37 | 91.29 | 91.10 |
| 107 | | | | | | | | | | | | | |
| 108 | 92.05 | 92.03 | 92.13 | 92.11 | 92.12 | 92.15 | 92.18 | 92.24 | 92.22 | 92.08 | 92.10 | 92.13 | 91.54 |
| 109 | | | | | | | | | | | | | 92.03 |
| 110 | | 92.79 | 92.84 | 92.91 | 92.85 | 92.83 | 92.83 | 92.84 | 93.04 | 93.12 | 92.91 | 92.96 | |
| 111 | 93.12 | | | | | | | | | | | | |
| 112 | | 94.16 | 93.85 | | 93.89 | 94.27 | 94.15 | 94.16 | 94.30 | 93.99 | 94.39 | 94.45 | 93.12 |
| 113 | 94.63 | | | | | | | | | | | | |
| 114 | | 95.09 | 95.00 | | 94.94 | | 94.98 | 95.64 | | | 95.67 | | 94.18 |
| 115 | 95.58 | 95.51 | 96.25 | | 95.40 | 95.47 | | | | | | | 95.33 |
| 116 | 97.95 | | | | | | | | | | | | |
| 117 | | | | | | | | | | | | | 95.72 |
| 118 | 98.36 | | | | | | | | | | | | 98.11 |
| 119 | | | | | | | | | | | | | |
| 120 | 98.36 | | | | | | | | | | | | 98.35 |
| 121 | | | | | | | | | | | | | |
| 122 | | | | | | | | | | | | | 98.36 |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 5

| Date | May 8 | May 27 | May 28 | May 30 | May 31 | June 2 | June 5 | June 7 | June 10 | June 14 | June 22 | July 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 92.87 | 95.37 | 96.10 | 95.86 | 95.43 | 95.65 | 95.80 | 94.25 | 93.94 | 96.44 | 94.65 | 91.86 |
| Discharge ($ft^3/s$) | 200 | 822 | 1,140 | 1,070 | 834 | 985 | 990 | 450 | 371 | 1,330 | 555 | 40 |
| | ELEVATION, IN FEET | | | | | | | | | | | |
| Distance, in feet | | | | | | | | | | | | |
| 0 | 95.78 | | | | | | | | | | | 95.77 |
| 1 | | | | | | | | | | | | |
| 2 | 95.66 | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | 95.62 |
| 5 | | | | | | | | | | | | |
| 6 | | | 95.74 | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | 95.68 | | | | | | | | | 95.61 |
| 9 | 95.53 | | | | | | | | | | | |
| 10 | | 95.37 | 95.50 | 95.65 | | 95.58 | 95.65 | | | 95.56 | | |
| 11 | 95.04 | | | | | | | | | | | |
| 12 | 95.00 | 95.21 | 95.24 | 95.15 | 95.45 | 95.28 | 95.39 | | | 95.38 | | 95.19 |
| 13 | | | | | | | | | | | | |
| 14 | 93.96 | 94.37 | 95.02 | 94.97 | 94.89 | 94.64 | 94.30 | 94.25 | | 94.42 | 94.50 | |
| 15 | | | | | | | | | 93.94 | | | |
| 16 | 93.88 | 94.03 | 94.46 | 95.08 | 94.95 | 94.73 | 94.23 | 93.83 | 93.78 | 94.18 | 93.60 | 93.28 |
| 17 | | | | | | | | | | | | |
| 18 | 93.79 | 93.59 | 94.63 | 94.91 | 94.79 | 94.46 | 94.52 | 93.74 | 93.63 | 93.80 | 93.36 | 93.04 |
| 19 | | | | | | | | | | | | |
| 20 | 93.69 | 93.59 | 94.29 | 94.60 | 94.43 | 94.16 | 93.68 | 93.50 | 93.42 | 93.44 | 93.51 | 92.96 |
| 21 | | | | | | | | | | | | |
| 22 | 93.59 | 93.53 | 94.24 | 94.37 | 94.24 | 94.14 | 93.78 | 93.50 | 93.38 | 94.06 | 93.44 | 93.02 |
| 23 | | | | | | | | | | | | |
| 24 | 93.49 | 93.33 | 93.63 | 94.44 | 94.11 | 94.13 | 93.70 | 93.53 | 93.15 | 94.03 | 93.47 | 92.86 |
| 25 | | | | | | | | | | | | |
| 26 | 93.36 | 92.80 | 93.69 | 94.38 | 94.31 | 94.10 | 93.38 | 93.45 | 92.92 | 93.86 | 93.45 | 92.70 |
| 27 | | | | | | | | | | | | |
| 28 | 93.27 | 92.29 | 93.69 | 94.33 | 94.25 | 93.90 | 93.26 | 93.30 | 92.86 | 93.61 | 93.13 | 92.60 |
| 29 | | | | | | | | | | | | |
| 30 | 93.11 | 92.72 | 93.33 | 93.79 | 94.07 | 93.44 | 93.19 | 93.07 | 92.76 | 93.19 | 92.67 | 92.39 |
| 31 | | | | | | | | | | | | |
| 32 | 92.96 | 92.15 | 93.02 | 93.26 | 93.99 | 93.29 | 92.99 | 92.67 | 92.60 | 92.74 | 93.01 | 92.16 |
| 33 | | | | | | | | | | | | |
| 34 | 92.65 | 92.29 | 92.11 | 93.12 | 93.84 | 92.90 | 92.63 | 92.87 | 92.36 | 92.19 | 92.90 | 92.04 |
| 35 | | | | | | | | | | | | |
| 36 | 92.18 | 92.20 | 91.81 | 92.97 | 93.48 | 92.93 | 92.44 | 92.83 | 92.35 | 92.26 | 92.85 | 91.80 |
| 37 | | | | | | | | | | | | |
| 38 | 91.95 | 91.90 | 91.58 | 92.63 | 93.01 | 92.96 | 91.86 | 92.22 | 91.96 | 92.14 | 92.40 | 91.68 |
| 39 | | | | | | | | | | | | |
| 40 | 91.47 | 91.67 | 91.70 | 92.00 | 92.19 | 92.36 | 91.41 | 91.64 | 91.67 | 92.04 | 91.90 | 91.62 |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

| CROSS SECTION NO. 5--Continued | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | May 8 | May 27 | May 28 | May 30 | May 31 | June 2 | June 5 | June 7 | June 10 | June 14 | June 22 | July 10 |
| Water surface elevation (feet) | 92.87 | 95.37 | 96.10 | 95.86 | 95.43 | 95.65 | 95.80 | 94.25 | 93.94 | 96.44 | 94.65 | 91.86 |
| Discharge ($ft^3/s$) | 200 | 822 | 1,140 | 1,070 | 834 | 985 | 990 | 450 | 371 | 1,330 | 555 | 40 |
| ELEVATION, IN FEET | | | | | | | | | | | | |
| Distance, in feet | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | |
| 42 | 91.18 | 91.49 | 90.98 | 91.44 | 91.77 | 91.74 | 91.08 | 91.43 | 91.41 | 91.44 | 91.60 | 91.46 |
| 43 | | | | | | | | | | | | |
| 44 | 91.03 | 90.80 | 90.94 | 91.07 | 91.48 | 91.22 | 90.72 | 90.94 | 91.04 | 91.12 | 91.42 | 91.23 |
| 45 | | | | | | | | | | | | |
| 46 | 90.76 | 90.75 | 90.92 | 91.13 | 91.23 | 90.81 | 90.52 | 90.35 | 90.36 | 90.79 | 90.75 | 90.93 |
| 47 | | | | | | | | | | | | |
| 48 | 90.53 | 90.63 | 90.59 | 90.62 | 90.58 | 90.36 | 90.27 | 90.18 | 90.09 | 90.34 | 90.61 | 90.58 |
| 49 | | | | | | | | | | | | |
| 50 | 90.37 | 90.35 | 90.14 | 89.97 | 89.99 | 89.85 | 89.85 | 89.87 | 89.98 | 89.94 | 89.93 | 90.13 |
| 51 | | | | | | | | | | | | |
| 52 | 90.07 | 89.99 | 89.48 | 89.66 | 89.71 | 89.56 | 89.52 | 89.56 | 89.62 | 89.57 | 89.55 | 89.72 |
| 53 | | | | | | | | | | | | |
| 54 | 89.70 | 89.34 | 89.38 | 89.60 | 89.55 | 89.48 | 89.46 | 89.50 | 89.49 | 89.52 | 89.35 | 89.38 |
| 55 | | | | | | | | | | | | |
| 56 | 89.42 | 89.47 | 89.56 | 89.62 | 89.53 | 89.57 | 89.50 | 89.59 | 89.49 | 89.54 | 89.59 | 89.38 |
| 57 | | | | | | | | | | | | |
| 58 | 89.49 | 89.67 | 89.65 | 89.83 | 89.80 | 89.75 | 89.63 | 89.73 | 89.74 | 89.82 | 89.87 | 89.64 |
| 59 | | | | | | | | | | | | |
| 60 | 89.87 | 90.03 | 89.96 | 90.07 | 89.99 | 89.93 | 89.86 | 90.09 | 89.94 | 89.96 | 89.93 | 89.81 |
| 61 | | | | | | | | | | | | |
| 62 | 90.09 | 90.11 | 90.06 | 90.38 | 90.28 | 90.26 | 90.24 | 90.31 | 90.24 | 90.19 | 90.31 | 90.09 |
| 63 | | | | | | | | | | | | |
| 64 | 90.33 | 90.49 | 90.61 | 90.69 | 90.68 | 90.66 | 90.55 | 90.49 | 90.58 | 90.74 | 90.70 | 90.44 |
| 65 | | | | | | | | | | | | |
| 66 | 90.82 | 91.00 | 91.03 | 91.20 | 91.01 | 91.07 | 91.01 | 91.05 | 91.09 | 91.12 | 91.11 | 90.87 |
| 67 | | | | | | | | | | | | |
| 68 | 91.53 | 91.60 | 91.68 | 91.68 | 91.59 | 91.59 | 91.48 | 91.60 | 91.59 | 91.59 | 91.56 | 91.37 |
| 69 | | | | | | | | | | | | |
| 70 | 92.00 | 91.96 | 91.51 | 92.50 | 92.43 | 92.32 | 92.44 | 91.95 | 91.79 | 92.25 | 91.85 | 91.65 |
| 71 | | | | | | | | | | | | |
| 72 | 93.05 | 92.27 | 93.18 | 93.25 | 93.28 | 93.36 | 92.80 | 93.12 | 92.99 | 93.19 | 92.70 | 92.62 |
| 73 | | | | | | | | | | | | |
| 74 | 93.34 | 93.64 | 93.46 | 93.58 | 93.22 | 93.55 | 93.59 | 93.69 | 93.78 | 93.57 | 93.75 | 93.03 |
| 75 | | | 94.06 | 96.00 | 93.78 | | | | | | | |
| 76 | 96.33 | 94.28 | | | | | | 94.25 | 93.94 | 96.16 | | |
| 77 | | | | | | | | | | | | 96.11 |
| 78 | 96.60 | | | | | | | | | | | |
| 79 | | | | | | | | | | | | 96.54 |
| 80 | | | | | | | | | | | | |
| 81 | | | | | | | | | | | | |
| 82 | | | | | | | | | | | | |
| 83 | | | | | | | | | | | | |
| 84 | | | | | | | | | | | | 96.17 |
| 85 | 96.10 | | | | | | | | | | | |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 6

| Date | May 8 | May 27 | May 28 | May 31 | June 2 | June 5 | June 7 | June 10 | July 10 |
|---|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 92.68 | 95.20 | 95.90 | 95.26 | 95.50 | 95.56 | 93.94 | 93.71 | 91.39 |
| Discharge ($ft^3/s$) | 200 | 822 | 1,140 | 846 | 985 | 995 | 460 | 371 | 40 |
| ELEVATION, IN FEET | | | | | | | | | |
| Distance, in feet | | | | | | | | | |
| 0 | 95.83 | | | | | | | | 95.86 |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | 95.52 | | | | | | | | |
| 4 | | | 95.50 | | 95.47 | 95.42 | | | 95.45 |
| 5 | | 95.20 | | 95.26 | | | | | |
| 6 | 95.02 | 95.06 | 95.12 | 95.02 | 95.00 | 95.06 | | | |
| 7 | | | | | | | | | |
| 8 | 94.16 | 94.54 | 94.58 | 94.34 | 94.27 | 94.30 | | | 94.10 |
| 9 | | | | | | | | | |
| 10 | 92.74 | 93.82 | 93.62 | 93.28 | 92.94 | 93.16 | 93.74 | 93.55 | 89.85 |
| 11 | 91.39 | | | | | | | | |
| 12 | 89.91 | 89.97 | 90.04 | 90.12 | 89.98 | 90.69 | 89.99 | 89.99 | 89.97 |
| 13 | 89.98 | | | | | | | | |
| 14 | 90.25 | 90.13 | 90.25 | 90.63 | 90.52 | 90.84 | 90.09 | 90.11 | 90.19 |
| 15 | 90.69 | | | | | | | | |
| 16 | 91.01 | 90.89 | 90.86 | 90.93 | 90.88 | 90.94 | 90.63 | 90.71 | 90.77 |
| 17 | | | | | | | | | |
| 18 | 90.94 | 90.73 | 90.93 | 91.09 | 90.88 | 91.09 | 90.77 | 90.76 | 90.70 |
| 19 | | | | | | | | | |
| 20 | 90.84 | 90.89 | 90.84 | 90.93 | 90.74 | 91.11 | 90.59 | 90.60 | 90.65 |
| 21 | | | | | | | | | |
| 22 | 90.95 | 90.83 | 91.22 | 91.19 | 90.91 | 91.08 | 90.84 | 90.78 | 90.66 |
| 23 | | | | | | | | | |
| 24 | 91.18 | 91.04 | 91.33 | 91.18 | 91.19 | 90.96 | 90.97 | 90.85 | 90.63 |
| 25 | | | | | | | | | |
| 26 | 91.28 | 91.16 | 91.38 | 91.08 | 90.99 | 91.04 | 90.66 | 90.63 | 90.67 |
| 27 | | | | | | | | | |
| 28 | 91.29 | 91.28 | 91.25 | 90.90 | 91.01 | 91.08 | 90.94 | 90.76 | 90.76 |
| 29 | | | | | | | | | |
| 30 | 91.19 | 91.14 | 91.13 | 91.20 | 90.95 | 90.88 | 91.12 | 90.85 | 90.84 |
| 31 | | | | | | | | | |
| 32 | 91.15 | 91.09 | 91.08 | 91.08 | 90.86 | 91.15 | 90.89 | 90.89 | 90.82 |
| 33 | | | | | | | | | |
| 34 | 90.95 | 90.92 | 91.18 | 91.14 | 90.98 | 91.31 | 90.84 | 90.82 | 90.91 |
| 35 | | | | | | | | | |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 6--Continued

| Date | May 8 | May 27 | May 28 | May 31 | June 2 | June 5 | June 7 | June 10 | July 10 |
|---|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 92.68 | 95.20 | 95.90 | 95.26 | 95.50 | 95.56 | 93.94 | 93.71 | 91.39 |
| Discharge ($ft^3/s$) | 200 | 822 | 1,140 | 846 | 985 | 995 | 460 | 371 | 40 |
| | ELEVATION, IN FEET | | | | | | | | |
| Distance, in feet | | | | | | | | | |
| 36 | 90.87 | 91.03 | 91.22 | 91.08 | 90.98 | 91.30 | 90.86 | 90.93 | 90.94 |
| 37 | | | | | | | | | |
| 38 | 90.99 | 90.92 | 91.01 | 91.04 | 90.95 | 91.26 | 90.85 | 90.85 | 90.92 |
| 39 | | | | | | | | | |
| 40 | 91.00 | 90.88 | 91.58 | 91.25 | 91.31 | 91.29 | 90.99 | 90.91 | 90.97 |
| 41 | | | | | | | | | |
| 42 | 91.03 | 90.92 | 91.93 | 91.48 | 91.08 | 91.19 | 91.07 | 91.10 | 90.98 |
| 43 | | | | | | | | | |
| 44 | 91.03 | 90.90 | 92.06 | 91.86 | 91.17 | 91.26 | 91.08 | 91.11 | 91.03 |
| 45 | | | | | | | | | |
| 46 | 91.15 | 90.95 | 92.38 | 91.94 | 91.60 | 91.42 | 91.09 | 91.18 | 91.06 |
| 47 | | | | | | | | | |
| 48 | 91.31 | 91.28 | 92.25 | 91.96 | 91.68 | 91.48 | 91.26 | 91.36 | 91.32 |
| 49 | | | | | | | | | |
| 50 | 91.78 | 91.78 | 92.15 | 92.21 | 91.77 | 91.86 | 91.63 | 91.73 | 91.74 |
| 51 | | | | | | | | | |
| 52 | 92.14 | 92.09 | 92.23 | 92.40 | 92.15 | 92.24 | 92.08 | 92.19 | 92.07 |
| 53 | | | | | | | | | |
| 54 | 92.51 | 92.47 | 92.52 | 92.66 | 92.50 | 92.46 | 92.41 | 92.55 | 92.44 |
| 55 | | | | | | | | | |
| 56 | 92.56 | 92.53 | 92.65 | 92.71 | 92.63 | 92.61 | 92.47 | 92.61 | 92.52 |
| 57 | | | | | | | | | |
| 58 | 92.67 | 92.62 | 92.73 | 92.81 | 92.65 | 92.66 | 92.62 | 92.66 | 92.10 |
| 59 | | | | | | | | | |
| 60 | 92.47 | 92.53 | 92.56 | 92.62 | 92.51 | 92.46 | 92.49 | 92.51 | 92.45 |
| 61 | | | | | | | | | |
| 62 | 92.35 | 92.33 | 92.32 | 92.43 | 92.30 | 92.38 | 92.38 | 92.44 | 92.27 |
| 63 | | | | | | | | | |
| 64 | 92.13 | 92.07 | 92.30 | 92.31 | 92.18 | 92.26 | 92.26 | 92.34 | 92.11 |
| 65 | | | | | | | | | |
| 66 | | 92.10 | 92.21 | 92.26 | 92.12 | 92.14 | 92.09 | 92.08 | 92.02 |
| 67 | 92.18 | | | | | | | | 92.21 |
| 68 | 92.71 | 92.92 | 93.25 | 93.30 | 93.29 | 93.18 | 93.19 | 92.71 | |
| 69 | | | | | | | | | |
| 70 | 94.20 | 94.28 | 94.25 | 94.02 | 94.58 | 94.28 | 93.94 | 93.71 | 94.07 |
| 71 | | | | | | | | | |
| 72 | | 94.88 | 94.97 | | 94.88 | | | | |
| 73 | 94.92 | | | | | | | | 94.88 |
| 74 | | 94.92 | 95.09 | | | | | | |
| 75 | 95.01 | | | | | | | | 94.95 |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

| CROSS SECTION NO. 7 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | May 8 | May 27 | May 31 | June 2 | June 5 | June 7 | June 10 | June 22 | July 10 |
| Water surface elevation (feet) | 92.48 | 95.09 | 95.03 | 95.48 | 95.51 | 93.82 | 93.51 | 94.17 | 91.24 |
| Discharge ($ft^3/s$) | 200 | 818 | 846 | 985 | 1,000 | 460 | 371 | 548 | 40 |
| ELEVATION, IN FEET | | | | | | | | | |
| Distance, in feet | | | | | | | | | |
| 0 | 95.65 | | | | | | | | 95.62 |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | 95.72 |
| 5 | 95.74 | | | | | | | | |
| 6 | 94.28 | 94.21 | 93.53 | 93.76 | 93.45 | 93.82 | | 93.97 | 94.06 |
| 7 | 93.30 | | | | | | 93.51 | | |
| 8 | | 93.80 | 93.26 | 92.70 | 92.68 | 92.82 | 93.01 | 92.95 | 92.45 |
| 9 | 93.44 | | | | | | | | |
| 10 | 92.06 | 92.22 | 91.96 | 91.86 | 91.81 | 91.70 | 92.21 | 91.99 | 91.63 |
| 11 | | | | | | | | | |
| 12 | 91.25 | 91.53 | 91.38 | 91.40 | 91.29 | 91.39 | 91.39 | 91.34 | 91.06 |
| 13 | | | | | | | | | |
| 14 | 90.46 | 90.76 | 90.80 | 90.88 | 90.70 | 90.85 | 90.90 | 90.95 | 90.74 |
| 15 | | | | | | | | | |
| 16 | 89.99 | 90.17 | 90.45 | 90.40 | 90.44 | 90.44 | 90.54 | 90.64 | 90.17 |
| 17 | | | | | | | | | |
| 18 | 89.78 | 90.11 | 90.22 | 90.17 | 90.06 | 90.17 | 90.20 | 90.25 | 89.94 |
| 19 | | | | | | | | | |
| 20 | 89.57 | 89.58 | 89.85 | 89.90 | 89.84 | 89.87 | 89.93 | 89.89 | 89.63 |
| 21 | | | | | | | | | |
| 22 | 89.46 | 89.54 | 89.73 | 89.60 | 89.61 | 89.64 | 89.64 | 89.70 | 89.45 |
| 23 | | | | | | | | | |
| 24 | 89.44 | 89.65 | 89.73 | 89.66 | 89.62 | 89.74 | 89.53 | 89.67 | 89.50 |
| 25 | | | | | | | | | |
| 26 | 89.46 | 89.96 | 89.85 | 89.78 | 89.69 | 89.72 | 89.61 | 89.79 | 89.67 |
| 27 | | | | | | | | | |
| 28 | 89.88 | 90.01 | 89.98 | 89.84 | 89.93 | 89.87 | 89.81 | 89.92 | 89.84 |
| 29 | | | | | | | | | |
| 30 | 90.15 | 90.15 | 90.14 | 89.99 | 89.99 | 89.82 | 90.12 | 89.95 | 90.00 |
| 31 | | | | | | | | | |
| 32 | 90.35 | 90.18 | 90.69 | 90.10 | 90.12 | 89.97 | 90.36 | 90.19 | 90.18 |
| 33 | | | | | | | | | |
| 34 | 90.64 | 90.13 | 91.18 | 90.48 | 90.16 | 90.22 | 90.66 | 90.42 | 90.26 |
| 35 | | | | | | | | | |
| 36 | 90.35 | 90.09 | 90.88 | 90.81 | 90.24 | 90.22 | 90.64 | 90.47 | 90.34 |
| 37 | | | | | | | | | |
| 38 | 90.75 | 90.19 | 91.81 | 91.18 | 90.63 | 90.40 | 90.41 | 90.52 | 90.53 |
| 39 | | | | | | | | | |
| 40 | 90.89 | 90.27 | 91.13 | 91.43 | 90.69 | 90.72 | 90.78 | 90.57 | 90.57 |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 7--Continued

| Date | May 8 | May 27 | May 31 | June 2 | June 5 | June 7 | June 10 | June 22 | July 10 |
|---|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 92.48 | 95.09 | 95.03 | 95.48 | 95.51 | 93.82 | 93.51 | 94.17 | 91.24 |
| Discharge ($ft^3/s$) | 200 | 818 | 846 | 985 | 1,000 | 460 | 371 | 548 | 40 |
| ELEVATION, IN FEET | | | | | | | | | |
| Distance, in feet | | | | | | | | | |
| 41 | | | | | | | | | |
| 42 | 90.83 | 90.61 | 91.28 | 91.48 | 90.83 | 90.82 | 91.30 | 90.58 | 90.58 |
| 43 | | | | | | | | | |
| 44 | 91.02 | 90.74 | 91.05 | 91.27 | 90.98 | 90.87 | 91.71 | 90.70 | 90.74 |
| 45 | | | | | | | | | |
| 46 | 91.11 | 90.92 | 91.16 | 91.54 | 90.96 | 90.96 | 91.81 | 90.79 | 90.89 |
| 47 | | | | | | | | | |
| 48 | 91.18 | 90.97 | 91.28 | 91.68 | 91.09 | 91.22 | 91.51 | 91.12 | 90.80 |
| 49 | | | | | | | | | |
| 50 | 91.24 | 91.19 | 91.45 | 91.87 | 91.51 | 91.70 | 91.76 | 91.57 | 91.10 |
| 51 | | | | | | | | | |
| 52 | 91.16 | 91.56 | 91.46 | 92.23 | 91.86 | 91.92 | 91.91 | 92.17 | 90.80 |
| 53 | | | | | | | | | 91.50 |
| 54 | 91.80 | 91.85 | 91.85 | 92.81 | 92.36 | 92.34 | 92.26 | 92.72 | |
| 55 | 92.99 | | | | | | | | 92.95 |
| 56 | | 93.28 | 93.33 | 93.30 | | | 93.21 | 93.29 | |
| 57 | | | | | | | | | |
| 58 | | 93.37 | 93.33 | | | | 93.23 | 93.40 | 93.20 |
| 59 | | | | | | | | | |
| 60 | | 93.34 | 93.46 | | | | | | |
| 61 | | | | | | | 93.26 | | |
| 62 | | 93.37 | 93.68 | | | | | | |
| 63 | | | | | | | | | |
| 64 | 93.22 | 93.63 | 93.73 | | | | | | |
| 65 | | | | | | | | | 93.40 |
| 66 | | 93.77 | 94.13 | | | 93.82 | | | |
| 67 | | | | | | | | | |
| 68 | 93.88 | 94.09 | | | | | | | |
| 69 | | | | | | | | | |
| 70 | | 94.39 | | | | | | | |
| 71 | | | | | | | | | 94.35 |
| 72 | | 94.54 | | | | | | | |
| 73 | | | | | | | | | |
| 74 | | 94.73 | | | | | | | |
| 75 | | | | | | | | | |
| 76 | 94.81 | 94.95 | | | | | | | |
| 77 | | 95.09 | | | | | | | |
| 78 | 95.04 | | | | | | | | 95.04 |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 8

| Date | May 8 | May 27 | May 31 | June 2 | June 5 | June 7 | June 10 | June 14 | June 22 | July 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 92.39 | 94.85 | 94.74 | 95.20 | 95.26 | 93.70 | 93.39 | 95.92 | 93.96 | 91.20 |
| Discharge ($ft^3/s$) | 200 | 818 | 846 | 985 | 1,000 | 465 | 369 | 1,300 | 540 | 40 |
| ELEVATION, IN FEET | | | | | | | | | | |
| Distance, in feet | | | | | | | | | | |
| 0 | 95.56 | | | | | | | | | 95.58 |
| 1 | | | | | | | | | | |
| 2 | | | | | | | | | | |
| 3 | | | | | | | | | | |
| 4 | | | | | | | | | | 95.45 |
| 5 | 95.36 | | | | | | | | | |
| 6 | | | | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | 95.13 | | | | | | | | | 95.11 |
| 9 | | | | | | | | | | |
| 10 | | 94.85 | 94.74 | 94.57 | 94.54 | | | | | |
| 11 | 93.60 | | | | | 93.70 | | | | 93.50 |
| 12 | 91.00 | 93.21 | 93.02 | 93.20 | 93.21 | 92.78 | 92.57 | 92.98 | 93.12 | 91.38 |
| 13 | 90.95 | | | | | | | | | 91.20 |
| 14 | | 91.35 | 90.93 | 91.07 | 90.88 | 91.17 | 91.14 | 91.01 | 91.04 | 90.83 |
| 15 | 90.73 | | | | | | | | | |
| 16 | | 90.70 | 90.69 | 90.65 | 90.16 | 90.12 | 90.57 | 90.30 | 90.34 | 90.05 |
| 17 | 90.62 | | | | | | | | | |
| 18 | | 90.53 | 90.49 | 90.08 | 89.76 | 90.11 | 89.71 | 90.06 | 89.63 | 89.56 |
| 19 | 90.31 | | | | | | | | | |
| 20 | | 90.26 | 90.24 | 89.76 | 89.68 | 89.62 | 89.58 | 89.72 | 89.46 | 89.48 |
| 21 | 89.93 | | | | | | | | | |
| 22 | | 90.13 | 89.76 | 89.20 | 89.00 | 89.27 | 89.51 | 89.24 | 88.96 | 89.38 |
| 23 | 89.75 | | | | | | | | | |
| 24 | | 89.94 | 89.88 | 88.77 | 88.86 | 88.92 | 89.55 | 88.88 | 88.84 | 89.29 |
| 25 | 89.57 | | | | | | | | | |
| 26 | | 89.90 | 89.79 | 89.02 | 88.81 | 89.00 | 89.69 | 89.07 | 88.81 | 89.20 |
| 27 | 89.59 | | | | | | | | | |
| 28 | | 89.98 | 89.89 | 89.22 | 89.21 | 89.20 | 89.84 | 89.17 | 88.99 | 89.50 |
| 29 | 89.62 | | | | | | | | | |
| 30 | | 89.95 | 89.93 | 89.58 | 89.46 | 89.18 | 89.53 | 89.29 | 89.26 | 89.52 |
| 31 | 89.76 | | | | | | | | | |
| 32 | | 90.04 | 90.19 | 89.90 | 89.86 | 89.47 | 89.77 | 89.52 | 89.26 | 89.59 |
| 33 | 89.99 | | | | | | | | | |
| 34 | | 90.05 | 90.13 | 90.24 | 90.04 | 89.85 | 89.84 | 89.91 | 89.38 | 89.73 |
| 35 | 90.05 | | | | | | | | | |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

| CROSS SECTION NO. 8--Continued | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | May 8 | May 27 | May 31 | June 2 | June 5 | June 7 | June 10 | June 14 | June 22 | July 10 |
| Water surface elevation (feet) | 92.39 | 94.85 | 94.74 | 95.20 | 95.26 | 93.70 | 93.39 | 95.92 | 93.96 | 91.20 |
| Discharge ($ft^3/s$) | 200 | 818 | 846 | 985 | 1,000 | 465 | 369 | 1,300 | 540 | 40 |
| ELEVATION, IN FEET | | | | | | | | | | |
| Distance, in feet | | | | | | | | | | |
| 36 | | 90.09 | 90.42 | 90.72 | 89.98 | 89.97 | 90.29 | 89.97 | 89.74 | 89.94 |
| 37 | 90.34 | | | | | | | | | |
| 38 | | 90.15 | 90.69 | 90.52 | 90.12 | 89.90 | 90.09 | 89.90 | 89.92 | 90.07 |
| 39 | 90.37 | | | | | | | | | |
| 40 | | 90.12 | 90.96 | 90.48 | 90.57 | 89.82 | 90.29 | 89.77 | 89.80 | 90.22 |
| 41 | 90.29 | | | | | | | | | |
| 42 | | 90.17 | 90.72 | 90.18 | 90.86 | 89.83 | 90.52 | 89.60 | 89.88 | 90.38 |
| 43 | 90.31 | | | | | | | | | |
| 44 | | 90.46 | 90.13 | 90.20 | 90.76 | 90.07 | 90.27 | 89.60 | 89.74 | 90.46 |
| 45 | 90.57 | | | | | | | | | |
| 46 | | 90.52 | 90.54 | 90.44 | 90.64 | 89.88 | 90.18 | 89.58 | 90.01 | 90.29 |
| 47 | 90.84 | | | | | | | | | |
| 48 | | 90.56 | 90.17 | 90.48 | 90.70 | 90.39 | 90.27 | 89.75 | 90.21 | 90.19 |
| 49 | 90.94 | | | | | | | | | |
| 50 | | 90.58 | 90.34 | 90.80 | 90.76 | 90.65 | 90.62 | 89.92 | 90.37 | 90.16 |
| 51 | 90.83 | | | | | | | | | |
| 52 | | 90.69 | 90.84 | 90.92 | 90.98 | 90.87 | 90.85 | 90.24 | 90.46 | 90.14 |
| 53 | 91.08 | | | | | | | | | |
| 54 | | 90.87 | 90.86 | 91.22 | 91.11 | 91.11 | 90.71 | 90.70 | 90.46 | 90.58 |
| 55 | 91.30 | | | | | | | | | |
| 56 | 92.23 | 91.73 | 91.28 | 91.38 | 91.53 | 92.58 | 91.21 | 91.24 | 91.14 | 91.38 |
| 57 | | | | | | | | | | |
| 58 | 92.35 | 92.94 | 92.48 | 92.67 | 92.83 | 92.77 | 92.73 | 92.32 | 92.58 | 92.33 |
| 59 | 93.40 | 94.85 | | | | 93.00 | 93.39 | | | |
| 60 | 94.80 | | 94.74 | 94.89 | 94.91 | | | 94.86 | 93.96 | 94.77 |
| 61 | 94.78 | | | | | | | | | |
| 62 | | | | | | | | 94.85 | | 94.81 |
| 63 | | | | | | | | | | |
| 64 | | | | | | | | | | 94.43 |
| 65 | | | | | | | | | | |
| 66 | | | | | | | | | | 93.92 |
| 67 | | | | | | | | | | |
| 68 | | | | | | | | | | |
| 69 | | | | | | | | | | |
| 70 | | | | | | | | | | 93.99 |
| 71 | | | | | | | | | | |
| 72 | | | | | | | | | | |
| 73 | | | | | | | | | | 94.43 |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

| CROSS SECTION NO. 9 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | May 8 | May 27 | May 28 | May 30 | May 31 | June 2 | June 5 | June 7 | June 10 | June 14 | June 22 | July 10 |
| Water surface elevation (feet) | 92.38 | 94.79 | 95.40 | 95.17 | 94.69 | 95.12 | 95.12 | 93.69 | 93.38 | 95.75 | 93.91 | 91.20 |
| Discharge ($ft^3/s$) | 200 | 822 | 1,150 | 1,050 | 858 | 985 | 1,000 | 470 | 367 | 1,390 | 538 | 40 |
| ELEVATION, IN FEET | | | | | | | | | | | | |
| Distance, in feet | | | | | | | | | | | | |
| 0 | 95.12 | | 95.22 | | | | | | | | | 95.06 |
| 1 | | | | | | | | | | | | |
| 2 | | | 95.28 | | | | | | | | | 95.11 |
| 3 | | | | | | | | | | | | |
| 4 | | | 94.80 | | | | | | | | | 94.77 |
| 5 | | | | | | | | | | | | |
| 6 | 94.82 | | 94.85 | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | 94.93 | | | | | | | | | 94.99 |
| 9 | 94.79 | | | | | | | | | | | 94.91 |
| 10 | | 94.63 | 95.40 | | 94.69 | 94.92 | 94.72 | | | 94.77 | | |
| 11 | 93.84 | | | | | | | | | | | |
| 12 | 92.41 | 93.29 | 92.13 | 93.17 | 93.44 | 93.12 | 93.20 | 93.69 | 93.38 | 93.28 | 93.22 | 93.36 |
| 13 | 90.42 | | | | | | | | | | | 90.18 |
| 14 | | 90.69 | 89.98 | 90.15 | 90.01 | 90.56 | 90.03 | 90.57 | 90.70 | 89.92 | 90.11 | 90.08 |
| 15 | 90.39 | | | | | | | | | | | |
| 16 | | 90.60 | 89.82 | 89.84 | 90.16 | 90.53 | 89.86 | 90.84 | 90.88 | 89.84 | 90.19 | 90.38 |
| 17 | 90.43 | | | | | | | | | | | |
| 18 | | 90.47 | 89.62 | 89.65 | 90.10 | 90.42 | 89.72 | 90.82 | 90.86 | 89.71 | 90.16 | 90.46 |
| 19 | 90.45 | | | | | | | | | | | |
| 20 | | 90.41 | 89.59 | 89.52 | 90.19 | 89.94 | 89.55 | 90.86 | 90.88 | 89.60 | 90.09 | 90.56 |
| 21 | 90.46 | | | | | | | | | | | |
| 22 | | 90.70 | 89.50 | 89.41 | 90.09 | 89.90 | 89.54 | 90.94 | 90.81 | 89.57 | 90.13 | 90.85 |
| 23 | 90.48 | | | | | | | | | | | |
| 24 | | 90.91 | 89.44 | 89.47 | 89.99 | 89.89 | 89.72 | 90.89 | 90.90 | 89.65 | 90.46 | 90.43 |
| 25 | 90.44 | | | | | | | | | | | |
| 26 | | 90.89 | 89.47 | 89.47 | 89.87 | 89.75 | 89.72 | 90.84 | 90.48 | 89.54 | 90.41 | 90.40 |
| 27 | 90.47 | | | | | | | | | | | |
| 28 | | 91.01 | 89.53 | 89.49 | 89.65 | 89.98 | 89.52 | 90.79 | 90.45 | 89.56 | 90.36 | 90.34 |
| 29 | 90.13 | | | | | | | | | | | |
| 30 | | 90.79 | 89.62 | 89.53 | 89.63 | 89.93 | 89.61 | 90.57 | 90.28 | 89.52 | 90.09 | 90.29 |
| 31 | 90.13 | | | | | | | | | | | |
| 32 | | 90.59 | 89.50 | 89.57 | 89.67 | 89.92 | 89.56 | 90.07 | 90.03 | 89.47 | 90.03 | 90.20 |
| 33 | 90.05 | | | | | | | | | | | |
| 34 | | 90.31 | 89.47 | 89.57 | 89.65 | 89.86 | 89.47 | 89.77 | 89.54 | 89.49 | 89.73 | 90.10 |
| 35 | 89.83 | | | | | | | | | | | |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 9--Continued

| Date | May 8 | May 27 | May 28 | May 30 | May 31 | June 2 | June 5 | June 7 | June 10 | June 14 | June 22 | July 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 92.38 | 94.79 | 95.40 | 95.17 | 94.69 | 95.12 | 95.12 | 93.69 | 93.38 | 95.75 | 93.91 | 91.20 |
| Discharge ($ft^3/s$) | 200 | 822 | 1,150 | 1,050 | 858 | 985 | 1,000 | 470 | 367 | 1,390 | 538 | 40 |
| ELEVATION, IN FEET | | | | | | | | | | | | |
| Distance, in feet | | | | | | | | | | | | |
| 36 | | 90.21 | 89.37 | 89.51 | 89.54 | 89.57 | 89.49 | 89.54 | 89.82 | 89.41 | 89.63 | 89.96 |
| 37 | 89.79 | | | | | | | | | | | |
| 38 | | 89.99 | 89.49 | 89.47 | 89.57 | 89.66 | 89.50 | 89.81 | 89.74 | 89.47 | 89.53 | 89.66 |
| 39 | 89.60 | | | | | | | | | | | |
| 40 | | 89.87 | 89.65 | 89.64 | 89.67 | 89.70 | 89.57 | 89.79 | 89.68 | 89.63 | 89.66 | 89.50 |
| 41 | 89.82 | | | | | | | | | | | |
| 42 | | 89.79 | 89.71 | 89.67 | 89.71 | 89.68 | 89.71 | 89.69 | 89.78 | 89.66 | 89.71 | 89.64 |
| 43 | 89.78 | | | | | | | | | | | |
| 44 | | 89.84 | 89.71 | 89.77 | 89.78 | 89.74 | 89.75 | 89.81 | 89.81 | 89.73 | 89.79 | 89.69 |
| 45 | 89.79 | | | | | | | | | | | |
| 46 | | 89.76 | 89.75 | 89.77 | 89.82 | 89.82 | 89.77 | 89.82 | 89.78 | 89.77 | 89.73 | 89.74 |
| 47 | 89.84 | | | | | | | | | | | |
| 48 | | 89.92 | 89.88 | 89.82 | 89.89 | 89.89 | 89.80 | 89.94 | 89.78 | 89.86 | 89.96 | 90.05 |
| 49 | 89.91 | | | | | | | | | | | |
| 50 | | 89.90 | 89.90 | 89.92 | 89.91 | 89.92 | 89.81 | 89.97 | 89.73 | 89.88 | 89.83 | 89.83 |
| 51 | 90.06 | | | | | | | | | | | |
| 52 | | 89.89 | 90.00 | 90.02 | 89.86 | 89.93 | 89.74 | 89.97 | 89.78 | 89.94 | 89.81 | 89.83 |
| 53 | 90.10 | | | | | | | | | | | |
| 54 | | 90.00 | 89.99 | 89.89 | 89.87 | 89.90 | 89.74 | 89.93 | 89.86 | 89.86 | 89.83 | 89.85 |
| 55 | 90.06 | | | | | | | | | | | |
| 56 | | 90.11 | 90.12 | 90.32 | 89.87 | 90.12 | 89.82 | 89.82 | 89.80 | 90.40 | 89.81 | 89.91 |
| 57 | 90.60 | | | | | | | | | | | |
| 58 | | 90.10 | 90.52 | 90.34 | 90.45 | 90.54 | 90.34 | 90.48 | 90.58 | 90.48 | 90.44 | 90.43 |
| 59 | 93.25 | | | | | | | | 93.38 | | | 90.80 |
| 60 | | 93.79 | 93.76 | 93.79 | 93.81 | 93.78 | 93.75 | 93.69 | | 93.97 | 93.91 | 93.60 |
| 61 | 94.10 | | | | | | | | | | | |
| 62 | 94.24 | 94.23 | 94.23 | 94.17 | 94.18 | 94.24 | 94.12 | | | 94.25 | | 94.18 |
| 63 | | | | | | | | | | | | |
| 64 | | 94.25 | 94.23 | | | | | | | | | 94.27 |
| 65 | | | | | | | | | | | | |
| 66 | | 93.96 | 93.88 | | | | | | | | | 94.07 |
| 67 | | | | | | | | | | | | |
| 68 | | 94.66 | 93.78 | | | | | | | | | 93.78 |
| 69 | | | | | | | | | | | | |
| 70 | | 94.11 | 94.18 | | | | | | | | | 94.07 |
| 71 | | | | | | | | | | | | |
| 72 | | 94.17 | 94.18 | | | | | | | | | |
| 73 | | | | | | | | | | | | 94.13 |
| 74 | | 94.22 | 94.18 | | | | | | | | | |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 10

| Date | May 8 | May 26 | May 27 | May 28 | May 30 | May 31 | June 2 | June 5 | June 7 | June 10 | June 14 | June 22 | July 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 92.24 | 93.13 | 94.54 | 95.34 | 95.06 | 94.60 | 94.99 | 95.08 | 93.59 | 93.27 | 95.68 | 93.84 | 96.19 |
| Discharge ($ft^3/s$) | 200 | 350 | 774 | 1,130 | 1,040 | 866 | 985 | 1,000 | 462 | 367 | 1,370 | 535 | 40 |
| ELEVATION, IN FEET | | | | | | | | | | | | | |
| Distance, in feet | | | | | | | | | | | | | |
| 0 | 95.07 | | | | | | | | | | | | 95.18 |
| 1 | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | 94.99 |
| 3 | 94.66 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | 94.08 | | | 94.18 | | | | | | | | | 94.11 |
| 6 | | | | 94.22 | | | | | | | | | |
| 7 | 94.09 | | | | | | | | | | | | 93.99 |
| 8 | 94.52 | | | 94.36 | | | 94.51 | | | | | | |
| 9 | | | | | | | | | | | | | 94.55 |
| 10 | 94.31 | | 94.50 | 94.57 | 94.57 | 94.45 | 94.47 | | | | 94.58 | | |
| 11 | 93.53 | | | | | | | | | | | | 93.65 |
| 12 | | 92.33 | 93.57 | 93.69 | 93.86 | 93.77 | 92.40 | 92.18 | 92.85 | 92.60 | 92.24 | 92.84 | 91.15 |
| 13 | 90.70 | | | | | | | | | | | | |
| 14 | 90.35 | 90.41 | 90.23 | 90.21 | 90.22 | 90.20 | 90.17 | 90.30 | 90.28 | 90.51 | 90.17 | 90.53 | 90.28 |
| 15 | | | | | | | | | | | | | |
| 16 | 89.79 | 89.73 | 89.91 | 89.87 | 89.52 | 89.78 | 89.77 | 89.63 | 89.64 | 89.79 | 90.03 | 89.66 | 90.02 |
| 17 | | | | | | | | | | | | | |
| 18 | 89.45 | 89.61 | 89.25 | 89.36 | 89.26 | 89.31 | 89.03 | 89.20 | 88.87 | 89.56 | 88.80 | 89.08 | 89.28 |
| 19 | | | | | | | | | | | | | |
| 20 | 89.40 | 89.65 | 89.00 | 89.04 | 89.03 | 89.00 | 88.93 | 89.19 | 89.44 | 89.62 | 88.93 | 89.06 | 89.28 |
| 21 | | | | | | | | | | | | | |
| 22 | 89.58 | 89.74 | 89.65 | 88.92 | 88.80 | 88.89 | 88.71 | 88.97 | 89.54 | 89.52 | 88.63 | 89.09 | 89.36 |
| 23 | | | | | | | | | | | | | |
| 24 | 89.85 | 89.73 | 89.63 | 88.87 | 88.88 | 88.99 | 89.48 | 89.08 | 89.54 | 89.37 | 88.76 | 89.36 | 89.45 |
| 25 | | | | | | | | | | | | | |
| 26 | 89.81 | 89.70 | 89.65 | 89.06 | 88.96 | 89.32 | 89.79 | 89.12 | 89.80 | 89.39 | 88.83 | 89.59 | 89.59 |
| 27 | | | | | | | | | | | | | |
| 28 | 89.79 | 89.63 | 89.70 | 89.06 | 89.12 | 89.16 | 89.89 | 89.11 | 89.71 | 89.77 | 89.08 | 89.54 | 89.58 |
| 29 | | | | | | | | | | | | | |
| 30 | 89.32 | 89.60 | 89.65 | 89.21 | 89.11 | 89.25 | 89.79 | 89.18 | 89.79 | 90.27 | 89.08 | 89.78 | 89.65 |
| 31 | | | | | | | | | | | | | |
| 32 | 89.44 | 89.62 | 89.60 | 89.08 | 89.06 | 89.20 | 89.89 | 89.18 | 89.44 | 90.22 | 89.08 | 89.80 | 89.68 |
| 33 | | | | | | | | | | | | | |
| 34 | 89.40 | 89.45 | 89.50 | 89.16 | 89.06 | 89.10 | 89.94 | 89.18 | 89.51 | 89.54 | 89.10 | 89.61 | 89.15 |
| 35 | | | | | | | | | | | | | |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 10--Continued

| Date | May 8 | May 26 | May 27 | May 28 | May 30 | May 31 | June 2 | June 5 | June 7 | June 10 | June 14 | June 22 | July 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 92.24 | 93.13 | 94.54 | 95.34 | 95.06 | 94.60 | 94.99 | 95.08 | 93.59 | 93.27 | 95.68 | 93.84 | 96.19 |
| Discharge ($ft^3/s$) | 200 | 350 | 774 | 1,130 | 1,040 | 866 | 985 | 1,000 | 462 | 367 | 1,370 | 535 | 40 |
| ELEVATION, IN FEET | | | | | | | | | | | | | |
| Distance, in feet | | | | | | | | | | | | | |
| 36 | 89.31 | 89.43 | 89.15 | 89.07 | 88.98 | 89.05 | 89.57 | 89.23 | 89.59 | 89.65 | 89.16 | 89.34 | 89.65 |
| 37 | | | | | | | | | | | | | |
| 38 | 89.09 | 89.26 | 89.00 | 89.07 | 89.06 | 89.12 | 89.22 | 89.13 | 89.22 | 89.57 | 89.18 | 89.14 | 89.48 |
| 39 | | | | | | | | | | | | | |
| 40 | 89.30 | 89.38 | 89.05 | 89.03 | 89.05 | 89.08 | 89.16 | 88.96 | 89.19 | 89.47 | 89.08 | 89.19 | 89.20 |
| 41 | | | | | | | | | | | | | |
| 42 | 89.06 | 89.29 | 89.18 | 89.22 | 89.16 | 89.19 | 89.14 | 89.14 | 89.17 | 89.22 | 89.03 | 89.29 | 89.11 |
| 43 | | | | | | | | | | | | | |
| 44 | 89.55 | 89.43 | 89.67 | 89.75 | 89.76 | 89.60 | 89.69 | 89.60 | 89.63 | 89.57 | 89.60 | 89.82 | 89.59 |
| 45 | | | | | | | | | | | | | |
| 46 | 90.26 | 90.23 | 90.28 | 90.55 | 90.24 | 90.50 | 90.57 | 90.33 | 90.68 | 90.27 | 90.03 | 90.34 | 90.06 |
| 47 | | | | | | | | | | | | | |
| 48 | 91.44 | 90.52 | 90.95 | 91.57 | 92.03 | 91.05 | 90.99 | 91.95 | 92.23 | 91.09 | 90.78 | 92.06 | 91.03 |
| 49 | 93.44 | 93.13 | | | | | | | | 93.27 | | | 93.58 |
| 50 | | | 93.69 | 93.83 | 93.54 | 93.75 | 93.84 | 93.71 | | | 93.83 | | |
| 51 | 93.71 | | | | | | | | | | | | |
| 52 | | | 93.82 | 93.90 | 94.06 | 93.88 | 93.84 | 94.03 | | | 93.93 | | 93.92 |
| 53 | 93.84 | | | | | | | | | | | | |
| 54 | | | 93.82 | 93.66 | | | 93.87 | | | | | | |
| 55 | | | | | | | | | | | | | 93.89 |
| 56 | | | 92.45 | 93.56 | | | | | | | | | 93.59 |
| 57 | | | | | | | | | | | | | |
| 58 | | | 93.65 | 93.72 | | | | | | | | | |
| 59 | | | | | | | | | | | | | 93.77 |
| 60 | | | | | | | | | | | | | |
| 61 | | | | | | | | | | | | | |
| 62 | | | | | | | | | | | | | |
| 63 | | | | | | | | | | | | | |
| 64 | | | | | | | | | | | | | 92.84 |
| 65 | | | | | | | | | | | | | |
| 66 | | | | | | | | | | | | | |
| 67 | | | | | | | | | | | | | |
| 68 | | | | | | | | | | | | | |
| 69 | | | | | | | | | | | | | |
| 70 | | | | | | | | | | | | | 94.34 |
| 71 | | | | | | | | | | | | | |
| 72 | | | | | | | | | | | | | |
| 73 | | | | | | | | | | | | | |
| 74 | | | | | | | | | | | | | 94.79 |

TABLE 4.—*Soundings of cross sections, Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION NO. 11

| Date | May 8 | May 27 | May 28 | May 30 | May 31 | June 2 | June 5 | June 7 | June 10 | June 14 | June 22 | July 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water surface elevation (feet) | 92.25 | 94.57 | 95.28 | 95.05 | 94.61 | 95.00 | 95.10 | 93.61 | 93.24 | 95.66 | 93.81 | 91.18 |
| Discharge ($ft^3/s$) | 200 | 800 | 1,120 | 1,030 | 866 | 985 | 1,000 | 475 | 365 | 1,370 | 535 | 40 |
| | | | | | | ELEVATION, IN FEET | | | | | | |
| Distance, in feet | | | | | | | | | | | | |
| 0 | 95.34 | | | | | | | | | | | 95.36 |
| 1 | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | 95.44 |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | 95.39 |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | 95.13 | 94.26 | | | | 93.37 | | 93.45 | 93.24 | | | 94.98 |
| 9 | | | 94.93 | | 94.61 | | | | | | | |
| 10 | 92.82 | 93.72 | 92.76 | 92.82 | 94.20 | 94.18 | 94.10 | 93.61 | 92.84 | 92.79 | 92.99 | |
| 11 | 92.28 | | | | | | | | | | | |
| 12 | | 91.17 | 90.57 | 92.43 | 91.08 | 92.68 | 90.92 | 91.74 | 92.69 | 90.81 | 91.46 | 91.10 |
| 13 | 90.76 | | | | | | | | | | | |
| 14 | | 90.66 | 90.50 | 90.52 | 90.69 | 90.61 | 90.56 | 90.61 | 90.59 | 90.48 | 90.59 | 90.53 |
| 15 | 90.34 | | | | | | | | | | | |
| 16 | | 90.29 | 90.12 | 90.21 | 90.12 | 90.20 | 90.10 | 90.17 | 90.28 | 90.06 | 90.23 | 90.12 |
| 17 | 90.01 | | | | | | | | | | | |
| 18 | | 89.94 | 89.75 | 89.75 | 89.88 | 89.86 | 89.88 | 89.93 | 89.82 | 89.78 | 89.97 | 89.84 |
| 19 | 89.64 | | | | | | | | | | | |
| 20 | | 89.19 | 89.23 | 88.95 | 89.10 | 89.18 | 89.21 | 89.28 | 89.41 | 89.17 | 89.31 | 89.15 |
| 21 | 89.58 | | | | | | | | | | | |
| 22 | | 89.15 | 88.63 | 88.65 | 88.67 | 88.97 | 88.71 | 88.69 | 88.66 | 88.49 | 88.72 | 88.62 |
| 23 | 89.76 | | | | | | | | | | | |
| 24 | | 89.29 | 88.68 | 88.32 | 88.48 | 88.35 | 88.82 | 88.65 | 88.43 | 88.36 | 88.49 | 88.60 |
| 25 | 89.74 | | | | | | | | | | | |
| 26 | | 89.42 | 88.92 | 88.23 | 88.32 | 88.70 | 89.05 | 88.83 | 88.64 | 88.24 | 88.41 | 88.93 |
| 27 | 89.79 | | | | | | | | | | | |
| 28 | | 89.67 | 89.48 | 88.30 | 88.59 | 89.25 | 89.20 | 89.01 | 88.86 | 88.35 | 88.93 | 89.14 |
| 29 | 89.34 | | | | | | | | | | | |
| 30 | | 89.73 | 89.60 | 88.55 | 88.52 | 89.40 | 89.45 | 89.46 | 89.06 | 88.79 | 89.16 | 89.46 |
| 31 | 89.68 | | | | | | | | | | | |
| 32 | | 89.95 | 89.81 | 88.63 | 89.11 | 89.70 | 89.72 | 89.74 | 89.52 | 89.16 | 89.51 | 89.71 |
| 33 | 89.70 | | | | | | | | | | | |
| 34 | | 90.19 | 90.09 | 89.05 | 89.61 | 90.05 | 89.75 | 90.06 | 90.08 | 89.19 | 89.76 | 90.00 |
| 35 | 89.61 | | | | | | | | | | | |
| 36 | | 90.39 | 90.30 | 89.22 | 89.79 | 90.19 | 90.05 | 90.13 | 90.32 | 89.54 | 90.24 | 90.11 |
| 37 | 90.21 | | | | | | | | | | | |
| 38 | | 90.47 | 90.41 | 89.64 | 90.11 | 90.48 | 90.12 | 90.29 | 90.49 | 89.74 | 90.33 | 90.15 |
| 39 | 90.44 | | | | | | | | | | | |
| 40 | | 90.69 | 90.33 | 90.05 | 90.14 | 90.62 | 90.42 | 90.45 | 90.29 | 90.11 | 90.53 | 90.30 |
| 41 | 90.42 | | | | | | | | | | | |
| 42 | | 90.87 | 90.45 | 90.30 | 90.30 | 90.55 | 90.52 | 90.67 | 90.51 | 90.41 | 90.91 | 90.50 |
| 43 | 90.37 | | | | | | | | | | | |
| 44 | | 91.09 | 90.83 | 90.57 | 90.56 | 90.94 | 90.69 | 90.83 | 90.72 | 90.64 | 90.96 | 90.67 |
| 45 | 90.47 | | | | | | | | | | | |
| 46 | | 91.12 | 90.80 | 90.65 | 90.73 | 91.05 | 90.80 | 90.83 | 90.81 | 90.73 | 90.91 | 90.80 |
| 47 | 90.64 | | | | | | | | | | | |
| 48 | | 91.54 | 90.86 | 90.75 | 90.77 | 91.20 | 90.82 | 90.83 | 91.05 | 90.77 | 90.94 | 90.86 |
| 49 | 90.79 | | | | | | | | | | | |
| 50 | | 91.59 | 90.95 | 90.92 | 90.97 | 91.24 | 90.90 | 90.91 | 91.04 | 90.85 | 90.97 | 90.92 |
| 51 | 90.87 | | | | | | | | | | | |
| 52 | | 91.70 | 91.16 | 90.93 | 90.76 | 91.41 | 90.92 | 90.91 | 91.04 | 90.85 | 91.03 | 90.92 |
| 53 | 90.89 | | | | | | | | | | | |
| 54 | | 91.45 | 91.47 | 91.17 | 90.99 | 91.30 | 91.10 | 91.11 | 91.10 | 90.87 | 90.96 | 90.82 |
| 55 | 90.86 | | | | | | | | | | | |
| 56 | | 92.39 | 92.19 | 92.55 | 92.61 | 92.25 | 92.51 | 92.86 | 92.42 | 92.20 | 92.29 | 91.19 |
| 57 | 92.89 | | | | | | | 93.61 | 93.24 | | | |
| 58 | | 93.61 | 93.60 | 93.71 | 93.69 | 93.64 | 93.82 | | | | 93.81 | 93.52 |
| 59 | 93.69 | | | | | | | | | | | |
| 60 | | 93.93 | 93.85 | 93.99 | 93.84 | 93.95 | 93.99 | | | | | |
| 61 | 93.92 | | | | | | | | | | | 93.86 |
| 62 | | | 93.84 | | | 93.90 | | | | | | |

TABLE 5.—*Summary data of total energy slopes, Bedload Trap reach, East Fork River, May-July 1974*

| Date | | May 8 | | | May 26 | | | May 27 | | | May 28 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Discharge ($ft^3/s$) | | 200 | | | 385 | | | 750 | | | 1,150 | | |
| Cross section no. | Distance (feet) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) |
| 1 | 0 | 93.43 | 93.50 | | 94.33 | 94.43 | | 95.72 | 95.89 | | 96.63 | 96.82 | |
| | | | | 0.18 | | | 0.26 | | | 0.25 | | | 0.23 |
| 2 | 200 | | | | | | | | | | | | |
| 3 | 225 | 93.26 | 93.32 | | 94.09 | 94.17 | | 95.51 | 95.64 | | 96.41 | 96.59 | |
| | | | | .06 | | | ---- | | | ---- | | | ---- |
| 4 | 340 | 93.12 | 93.26 | | 94.05 | 94.25 | | 95.40 | 95.67 | | 96.28 | 96.61 | |
| | | | | .29 | | | .12 | | | .21 | | | .26 |
| 5 | 572 | 92.87 | 92.97 | | 94.00 | 94.13 | | 95.26 | 95.46 | | 96.05 | 96.35 | |
| | | | | .17 | | | .17 | | | .16 | | | .22 |
| 6 | 690 | 92.68 | 92.80 | | 93.82 | 93.96 | | 95.11 | 95.31 | | 95.86 | 96.13 | |
| | | | | .24 | | | .30 | | | .19 | | | .10 |
| 7 | 996 | 92.48 | 92.56 | | 93.54 | 93.66 | | 94.92 | 95.12 | | 95.77 | 96.03 | |
| | | | | .09 | | | .12 | | | .26 | | | .15 |
| 8 | 1,072 | 92.39 | 92.47 | | 93.44 | 93.57 | | ----- | ----- | | 95.57 | 95.88 | |
| | | | | .03 | | | .07 | | | ---- | | | .15 |
| 9 | 1,212 | 92.38 | 92.44 | | 93.40 | 93.50 | | 94.63 | 94.86 | | 95.43 | 95.73 | |
| | | | | .13 | | | .04 | | | .05 | | | ---- |
| 10 | 1,254 | 92.24 | 92.31 | | 93.32 | 93.46 | | 94.52 | 94.81 | | 95.36 | 95.80 | |
| | | | | .02 | | | .07 | | | .09 | | | ---- |
| 11 | 1,360 | 92.23 | 92.29 | | 93.27 | 93.39 | | 94.49 | 94.72 | | 95.36 | 95.67 | |
| Mean Energy[1] Slope of reach ($\bar{S}_e$) | | $\bar{S}_e$ = 0.00093 | | | $\bar{S}_e$ = 0.00078 | | | $\bar{S}_e$ = 0.00098 | | | $\bar{S}_e$ = 0.00085 | | |

| Date | | May 29 | | | May 30 | | | May 31 | | | June 1 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Discharge ($ft^3/s$) | | 1,600 | | | 1,240 | | | 886 | | | 910 | | |
| Cross section no. | Distance (feet) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) |
| 1 | 0 | 97.25 | 97.48 | | 96.58 | 96.79 | | 95.84 | 96.01 | | 95.89 | 96.06 | |
| | | | | 0.28 | | | 0.17 | | | 0.14 | | | 0.04 |
| 2 | 200 | | | | | | | | | | | | |
| 3 | 225 | 96.96 | 97.20 | | 96.51 | 96.60 | | 95.73 | 95.87 | | 95.87 | 96.02 | |
| | | | | .09 | | | ---- | | | ---- | | | .01 |
| 4 | 340 | 96.79 | 97.11 | | 96.35 | 96.69 | | 95.67 | 95.93 | | 95.72 | 96.01 | |
| | | | | .12 | | | .20 | | | .16 | | | .54 |
| 5 | 572 | 96.60 | 96.99 | | 96.17 | 96.49 | | 95.48 | 95.77 | | ----- | ----- | |
| | | | | .34 | | | .22 | | | .18 | | | ---- |
| 6 | 690 | 96.34 | 96.65 | | 96.00 | 96.27 | | 95.36 | 95.59 | | ----- | ----- | |
| | | | | .19 | | | .21 | | | .21 | | | ---- |
| 7 | 996 | ----- | ----- | | 95.79 | 96.06 | | 95.14 | 95.38 | | 95.24 | 95.47 | |
| | | | | ---- | | | .31 | | | .26 | | | .38 |
| 8 | 1,072 | 96.05 | 96.46 | | ----- | ----- | | 94.85 | 95.12 | | ----- | ----- | |
| | | | | .17 | | | ---- | | | .16 | | | ---- |
| 9 | 1,212 | 95.88 | 96.29 | | 95.43 | 95.75 | | 94.73 | 94.96 | | 94.85 | 95.09 | |
| | | | | ---- | | | ---- | | | ---- | | | .02 |
| 10 | 1,254 | 95.81 | 96.37 | | 95.35 | 95.82 | | 94.66 | 94.96 | | 94.75 | 95.07 | |
| | | | | .17 | | | .12 | | | .07 | | | .07 |
| 11 | 1,360 | 95.78 | 96.20 | | 95.36 | 95.70 | | 94.66 | 94.89 | | 94.75 | 95.00 | |
| | | $\bar{S}_e$ = 0.00091 | | | $\bar{S}_e$ = 0.00085 | | | $\bar{S}_e$ = 0.00092 | | | $\bar{S}_e$ = 0.00085 | | |

TABLE 5.—*Summary data of total energy slopes, Bedload Trap reach, East Fork River, May-July 1974*—Continued

| Date | | June 2 | | | June 3 | | | June 4 | | | June 9 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Discharge ($ft^3/s$) | | 960 | | | 1,100 | | | 1,040 | | | 273 | | |
| Cross section no. | Distance (feet) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) |
| 1 | 0 | 96.03 | 96.20 | | 96.36 | 96.54 | | 96.21 | 96.39 | | ----- | ----- | |
| | | | | 0.09 | | | 0.09 | | | 0.16 | | | ---- |
| 2 | 200 | | | | | | | | | | | | |
| 3 | 225 | 95.96 | 96.11 | | 96.28 | 96.45 | | 96.07 | 96.23 | | 93.57 | 93.62 | |
| | | | | ---- | | | ---- | | | ---- | | | ---- |
| 4 | 340 | 95.83 | 96.13 | | 96.15 | 96.47 | | 96.01 | 96.32 | | 93.50 | 93.67 | |
| | | | | .08 | | | .13 | | | .12 | | | .12 |
| 5 | 572 | 95.78 | 96.05 | | 96.04 | 96.34 | | 95.91 | 96.20 | | 93.44 | 93.55 | |
| | | | | .43 | | | .21 | | | .19 | | | .55 |
| 6 | 690 | ----- | ----- | | 95.87 | 96.13 | | 95.76 | 96.01 | | ----- | ----- | |
| | | | | ---- | | | .15 | | | .05 | | | ---- |
| 7 | 996 | 95.39 | 95.62 | | 95.73 | 95.98 | | 95.72 | 95.96 | | ----- | ----- | |
| | | | | .24 | | | .18 | | | .31 | | | ---- |
| 8 | 1,072 | 95.11 | 95.38 | | 95.49 | 95.80 | | 95.36 | 95.65 | | 92.90 | 93.00 | |
| | | | | .09 | | | .16 | | | .13 | | | ---- |
| 9 | 1,212 | 95.04 | 95.29 | | 95.35 | 95.64 | | 95.26 | 95.53 | | 92.89 | 93.00 | |
| | | | | .02 | | | ---- | | | .09 | | | .07 |
| 10 | 1,254 | 94.91 | 95.27 | | 95.26 | 95.69 | | ----- | ----- | | 92.83 | 92.93 | |
| | | | | .09 | | | .09 | | | ---- | | | .02 |
| 11 | 1,360 | 94.91 | 95.18 | | 95.29 | 95.60 | | 95.15 | 95.44 | | 92.81 | 92.91 | |
| | | $\bar{S}_e$ = 0.00082 | | | $\bar{S}_e$ = 0.00076 | | | $\bar{S}_e$ = 0.00071 | | | $\bar{S}_e$ = 0.00073 | | |

| Date | | June 10 | | | June 12 | | | June 14 | | | June 22 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Discharge ($ft^3/s$) | | 369 | | | 850 | | | 1,380 | | | 556 | | |
| Cross section no. | Distance (feet) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) |
| 1 | 0 | 94.24 | 94.34 | | 95.83 | 95.99 | | 96.96 | 97.17 | | 94.92 | 95.04 | |
| | | | | 0.21 | | | 0.26 | | | 0.26 | | | 0.18 |
| 2 | 200 | | | | | | | | | | | | |
| 3 | 225 | 94.06 | 94.13 | | 95.59 | 95.73 | | 96.71 | 96.91 | | 94.77 | 94.86 | |
| | | | | ---- | | | ---- | | | ---- | | | ---- |
| 4 | 340 | 93.96 | 94.15 | | 95.57 | 95.86 | | 96.56 | 96.97 | | 94.72 | 94.96 | |
| | | | | .12 | | | .45 | | | .16 | | | .13 |
| 5 | 572 | 93.90 | 94.03 | | ----- | ----- | | 96.46 | 96.81 | | 94.65 | 94.83 | |
| | | | | .18 | | | ---- | | | .41 | | | .43 |
| 6 | 690 | 93.71 | 93.85 | | 95.19 | 95.41 | | ----- | ----- | | ----- | ----- | |
| | | | | .22 | | | ---- | | | ---- | | | ---- |
| 7 | 996 | 93.50 | 93.63 | | 95.21 | 95.43 | | 96.14 | 96.40 | | 94.22 | 94.40 | |
| | | | | .12 | | | .21 | | | .13 | | | .26 |
| 8 | 1,072 | 93.39 | 93.51 | | 94.97 | 95.22 | | 95.95 | 96.27 | | ----- | ----- | |
| | | | | .03 | | | .07 | | | .15 | | | ---- |
| 9 | 1,212 | 93.38 | 93.48 | | 94.93 | 95.15 | | 95.76 | 96.12 | | 93.99 | 94.14 | |
| | | | | .06 | | | .05 | | | ---- | | | .05 |
| 10 | 1,254 | 93.29 | 93.42 | | 94.80 | 95.10 | | 95.68 | 96.17 | | 93.89 | 94.09 | |
| | | | | .04 | | | .03 | | | .10 | | | .04 |
| 11 | 1,360 | 93.26 | 93.38 | | 94.82 | 95.07 | | 95.66 | 96.07 | | 93.88 | 94.05 | |
| | | $\bar{S}_e$ = 0.00073 | | | $\bar{S}_e$ = 0.00067 | | | $\bar{S}_e$ = 0.00083 | | | $\bar{S}_e$ = 0.00078 | | |

TABLE 5.—*Summary data of total energy slopes, Bedload Trap reach, East Fork River, May–July 1974*—Continued

| Date | | July 10 | | |
|---|---|---|---|---|
| Discharge ($ft^3/s$) | | 40 | | |
| Cross section no. | Distance (feet) | Water surface elevation (ft) | Total energy head (ft) | Energy head loss (ft) |
| 1 | 0 | 92.38 | 92.39 | |
| | | | | 0.07 |
| 2 | 200 | | | |
| 3 | 225 | 92.31 | 92.32 | |
| | | | | .23 |
| 4 | 340 | 92.08 | 92.09 | |
| | | | | .22 |
| 5 | 572 | 91.86 | 91.87 | |
| | | | | .45 |
| 6 | 690 | 91.39 | 91.42 | |
| | | | | .16 |
| 7 | 996 | 91.24 | 91.26 | |
| | | | | .05 |
| 8 | 1,072 | 91.20 | 91.21 | |
| | | | | ---- |
| 9 | 1,212 | 91.20 | 91.21 | |
| | | | | .01 |
| 10 | 1,254 | 91.19 | 91.20 | |
| | | | | .01 |
| 11 | 1,360 | 91.18 | 91.19 | |
| | | $\bar{S}_e$ = 0.00101 | | |

[1]The mean energy slope of the reach was calculated by a least-squares regression.

TABLE 6.—*Summary data of hydraulic characteristics of cross sections in the Bedload Trap reach, East Fork River, May-July 1974*

CROSS SECTION 1F

[Distance, 0 + 00 feet; active bed-stations, 18 to 86 feet]

| Date | Day no. | Water surface elevation (feet) | Discharge $Q$ ($ft^3/s$) | Area $A$ ($ft^2$) | Width $W$ (ft) | Depth[1] $\bar{d}$ (ft) | Velocity[2] $\bar{u}$ (ft/s) | Mean bed ele-vation (ft)[3] |
|---|---|---|---|---|---|---|---|---|
| May 8 | 1 | 93.43 | 200 | 96 | 74 | 1.30 | 2.08 | 92.13 |
| May 28 | 21 | 96.63 | 1,150 | 335 | 88 | 3.81 | 3.43 | 92.31 |
| May 30 | 23 | 96.27 | 1,080 | 306 | 87 | 3.52 | 3.53 | 92.32 |
| May 31 | 24 | 95.66 | 814 | 245 | 85 | 2.88 | 3.32 | 92.45 |
| June 2 | 26 | 96.05 | 975 | 272 | 86 | 3.16 | 3.58 | 92.55 |
| June 5 | 29 | 96.08 | 975 | 281 | 86 | 3.27 | 3.47 | 92.48 |
| June 7 | 31 | 94.46 | 435 | 139 | 78 | 1.78 | 3.13 | 92.58 |
| June 10 | 34 | 94.25 | 303 | 137 | 77 | 1.78 | 2.21 | 92.37 |
| June 14 | 38 | 96.88 | 1,300 | 352 | 89 | 3.96 | 3.69 | 92.43 |
| June 22 | 46 | 94.90 | 560 | 184 | 85 | 2.16 | 3.04 | 92.48 |
| July 10 | 64 | 92.38 | 40 | | | | | 92.23 |

CROSS SECTION 2S

[Distance, 2 + 00 feet; active bed-stations, 24 to 52 feet]

| Date | Day no. | Water surface elevation (feet) | Discharge $Q$ ($ft^3/s$) | Area $A$ ($ft^2$) | Width $W$ (ft) | Depth[1] $\bar{d}$ (ft) | Velocity[2] $\bar{u}$ (ft/s) | Mean bed ele-vation (ft)[3] |
|---|---|---|---|---|---|---|---|---|
| May 26 | 19 | 94.11 | 398 | 146 | 41 | 3.56 | 2.73 | 90.3 |
| May 27 | 20 | 95.50 | 759 | 250 | 54 | 4.63 | 3.04 | 89.2 |
| May 28 | 21 | 96.33 | 1,120 | 325 | 63 | 5.16 | 3.45 | 88.4 |
| May 29 | 22 | 97.00 | 1,580 | 358 | 63 | 5.68 | 4.42 | 88.3 |
| June 5 | 29 | 96.10 | 1,000 | 315 | 58 | 5.43 | 3.17 | 88.1 |
| June 9 | 33 | 93.60 | 275 | 156 | 40 | 3.90 | 1.76 | 89.2 |
| June 14 | 38 | 96.60 | 1,280 | 334 | 63 | 5.30 | 3.83 | 88.5 |
| July 10 | 64 | 92.26 | 40 | 43 | 37 | 1.16 | .93 | 91.4 |

CROSS SECTION 3S

[Distance, 2 + 25 feet; active bed-stations, 26 to 70 feet]

| Date | Day no. | Water surface elevation (feet) | Discharge $Q$ ($ft^3/s$) | Area $A$ ($ft^2$) | Width $W$ (ft) | Depth[1] $\bar{d}$ (ft) | Velocity[2] $\bar{u}$ (ft/s) | Mean bed ele-vation (ft)[3] |
|---|---|---|---|---|---|---|---|---|
| May 8 | 1 | 93.26 | 200 | 105 | 48 | 2.19 | 1.90 | 91.00 |
| May 24 | 17 | 92.67 | 104 | 88 | 47 | 1.87 | 1.18 | 90.75 |
| May 27 | 20 | 95.59 | 810 | 276 | 66 | 4.18 | 2.93 | 90.20 |
| May 29 | 22 | 96.85 | 1,560 | 400 | 69 | 5.80 | 3.90 | 89.86 |
| July 10 | 64 | 92.26 | 40 | 86 | 49 | 1.76 | .47 | 90.50 |

TABLE 6.—*Summary data of hydraulic characteristics of cross sections in the Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION 4F

[Distance, 3 + 40 feet; active bed-stations, 58 to 104 feet]

| Date | Day no. | Water surface elevation (feet) | Discharge $Q$ ($ft^3/s$) | Area $A$ ($ft^2$) | Width $W$ (ft) | Depth[1] $\bar{d}$ (ft) | Velocity[2] $\bar{u}$ (ft/s) | Mean bed ele-vation (ft)[3] |
|---|---|---|---|---|---|---|---|---|
| May 8 | 1 | 93.12 | 200 | 66 | 54 | 1.22 | 3.03 | 91.89 |
| May 27 | 20 | 95.51 | 814 | 194 | 66 | 2.94 | 4.20 | 92.16 |
| May 28 | 21 | 96.25 | 1,150 | 249 | 70 | 3.56 | 4.62 | 92.18 |
| May 29 | 22 | 96.77 | 1,480 | 278 | 71 | 3.92 | 5.32 | 92.18 |
| May 30 | 23 | 96.14 | 1,100 | 244 | 69 | 3.54 | 4.51 | 92.11 |
| May 31 | 24 | 95.74 | 822 | 203 | 66 | 3.08 | 4.05 | 92.00 |
| June 2 | 26 | 95.88 | 985 | 226 | 68 | 3.32 | 4.36 | 92.01 |
| June 5 | 29 | 95.89 | 980 | 230 | 68 | 3.38 | 4.26 | 91.98 |
| June 7 | 31 | 94.30 | 448 | 125 | 60 | 2.08 | 3.58 | 91.99 |
| June 10 | 34 | 93.97 | 371 | 111 | 58 | 1.91 | 3.34 | 91.95 |
| June 14 | 38 | 96.51 | 1,220 | 258 | 70 | 3.69 | 4.73 | 92.19 |
| June 22 | 46 | 94.70 | 560 | 153 | 62 | 2.47 | 3.66 | 91.99 |
| July 10 | 64 | 92.08 | 40 | | | | | 91.89 |

CROSS SECTION 5F

[Distance, 5 + 22 feet; active bed-stations, 16 to 66 feet]

| Date | Day no. | Water surface elevation (feet) | Discharge $Q$ ($ft^3/s$) | Area $A$ ($ft^2$) | Width $W$ (ft) | Depth[1] $\bar{d}$ (ft) | Velocity[2] $\bar{u}$ (ft/s) | Mean bed ele-vation (ft)[3] |
|---|---|---|---|---|---|---|---|---|
| May 8 | 1 | 92.87 | 200 | 78 | 39 | 2.00 | 2.56 | 91.66 |
| May 27 | 20 | 95.37 | 822 | 225 | 63 | 3.57 | 3.65 | 91.55 |
| May 28 | 21 | 96.10 | 1,140 | 261 | 70 | 3.73 | 4.37 | 91.75 |
| May 30 | 23 | 95.86 | 1,070 | 231 | 68 | 3.40 | 4.63 | 92.12 |
| May 31 | 24 | 95.43 | 834 | 193 | 63 | 3.06 | 4.32 | 92.20 |
| June 2 | 26 | 95.65 | 985 | 224 | 66 | 3.39 | 4.40 | 91.99 |
| June 5 | 29 | 95.80 | 990 | 244 | 66 | 3.70 | 4.06 | 91.66 |
| June 7 | 31 | 94.25 | 450 | 147 | 61 | 2.41 | 3.06 | 91.66 |
| June 10 | 34 | 93.94 | 371 | 137 | 60 | 2.28 | 2.71 | 91.54 |
| June 14 | 38 | 96.44 | 1,330 | 284 | 71 | 4.00 | 4.68 | 91.76 |
| June 22 | 46 | 94.65 | 555 | 170 | 63 | 2.70 | 3.26 | 91.71 |
| July 10 | 64 | 91.86 | 40 | 43 | 35 | 1.23 | .93 | 91.38 |

TABLE 6.—*Summary data of hydraulic characteristics of cross sections in the Bedload Trap reach, East Fork River, May–July 1974*—Continued

CROSS SECTION 6F

[Distance, 6 + 90 feet; active bed-stations, 12 to 42 feet]

| Date | Day no. | Water surface elevation (feet) | Discharge $Q$ ($ft^3/s$) | Area $A$ ($ft^2$) | Width $W$ (ft) | Depth[1] $\bar{d}$ (ft) | Velocity[2] $\bar{u}$ (ft/s) | Mean bed elevation (ft)[3] |
|---|---|---|---|---|---|---|---|---|
| May 8 | 1 | 92.68 | 200 | 73 | 48 | 1.52 | 2.74 | 91.13 |
| May 27 | 20 | 95.20 | 822 | 231 | 69 | 3.35 | 3.56 | 91.06 |
| May 28 | 21 | 95.90 | 1,140 | 266 | 76 | 3.50 | 4.29 | 91.40 |
| May 31 | 24 | 95.26 | 846 | 217 | 69 | 3.14 | 3.90 | 91.33 |
| June 2 | 26 | 95.50 | 985 | 249 | 70 | 3.56 | 3.96 | 91.14 |
| June 5 | 29 | 95.56 | 995 | 248 | 70 | 3.54 | 4.01 | 91.27 |
| June 7 | 31 | 93.94 | 460 | 150 | 61 | 2.46 | 3.07 | 90.98 |
| June 10 | 34 | 93.71 | 371 | 138 | 61 | 2.26 | 2.69 | 90.99 |
| July 10 | 64 | 91.39 | 40 | 25 | 39 | .64 | 1.60 | 90.96 |

CROSS SECTION 7F

[Distance, 9 + 96 feet; active bed-stations, 12 to 52 feet]

| Date | Day no. | Water surface elevation (feet) | Discharge $Q$ ($ft^3/s$) | Area $A$ ($ft^2$) | Width $W$ (ft) | Depth[1] $\bar{d}$ (ft) | Velocity[2] $\bar{u}$ (ft/s) | Mean bed elevation (ft)[3] |
|---|---|---|---|---|---|---|---|---|
| May 8 | 1 | 92.48 | 200 | 88 | 45 | 1.96 | 2.27 | 90.43 |
| May 27 | 20 | 95.09 | 818 | 229 | 64 | 3.58 | 3.57 | 90.40 |
| May 31 | 24 | 95.03 | 846 | 214 | 64 | 3.34 | 3.95 | 90.74 |
| June 2 | 26 | 95.48 | 985 | 247 | 65 | 3.80 | 3.99 | 90.75 |
| June 5 | 29 | 95.51 | 1,000 | 264 | 65 | 4.06 | 3.79 | 90.49 |
| June 7 | 31 | 93.82 | 460 | 155 | 60 | 2.58 | 2.97 | 90.50 |
| June 10 | 34 | 93.51 | 371 | 123 | 48 | 2.56 | 3.02 | 90.69 |
| June 22 | 46 | 94.17 | 548 | 169 | 63 | 2.68 | 3.24 | 90.53 |
| July 10 | 64 | 91.24 | 40 | 39 | 41 | .95 | 1.03 | 90.32 |

TABLE 6.—*Summary data of hydraulic characteristics of cross sections in the Bedload Trap reach, East Fork River, May–July 1974*—Continued

CROSS SECTION 8S

[Distance, 10 + 72 feet; active bed-stations, 14 to 54 feet]

| Date | Day no. | Water surface elevation (feet) | Discharge $Q$ ($ft^3/s$) | Area $A$ ($ft^2$) | Width $W$ (ft) | Depth[1] $\bar{d}$ (ft) | Velocity[2] $\bar{u}$ (ft/s) | Mean bed elevation (ft)[3] |
|---|---|---|---|---|---|---|---|---|
| May 8 | 1 | 92.39 | 200 | 90 | 47 | 1.91 | 2.20 | 90.32 |
| May 27 | 20 | 94.85 | 818 | 201 | 51 | 3.94 | 4.07 | 90.34 |
| May 31 | 24 | 94.74 | 846 | 200 | 52 | 3.85 | 4.17 | 90.36 |
| June 2 | 26 | 95.20 | 985 | 230 | 53 | 4.34 | 4.28 | 90.24 |
| June 5 | 29 | 95.26 | 1,000 | 240 | 53 | 4.53 | 4.17 | 90.10 |
| June 7 | 31 | 93.70 | 465 | 163 | 49 | 3.33 | 2.85 | 89.92 |
| June 10 | 34 | 93.39 | 369 | 143 | 48 | 2.98 | 2.58 | 90.13 |
| June 14 | 38 | 95.92 | 1,300 | 285 | 54 | 5.28 | 4.56 | 89.77 |
| June 22 | 46 | 93.96 | 540 | 186 | 50 | 3.72 | 2.90 | 89.74 |
| July 10 | 64 | 91.20 | 40 | 53 | 42 | 1.26 | .75 | 89.93 |

CROSS SECTION 9S

[Distance, 12 + 12 feet; active bed-stations, 14 to 58 feet]

| Date | Day no. | Water surface elevation (feet) | Discharge $Q$ ($ft^3/s$) | Area $A$ ($ft^2$) | Width $W$ (ft) | Depth[1] $\bar{d}$ (ft) | Velocity[2] $\bar{u}$ (ft/s) | Mean bed elevation (ft)[3] |
|---|---|---|---|---|---|---|---|---|
| May 8 | 1 | 92.38 | 200 | 104 | 47 | 2.21 | 1.92 | 90.13 |
| May 27 | 20 | 94.79 | 822 | 213 | 52 | 4.10 | 3.86 | 90.29 |
| May 28 | 21 | 95.40 | 1,150 | 270 | 54 | 5.00 | 4.26 | 89.72 |
| May 30 | 23 | 95.17 | 1,050 | 256 | 53 | 4.83 | 4.10 | 89.73 |
| May 31 | 24 | 94.69 | 858 | 226 | 52 | 4.35 | 3.80 | 89.87 |
| June 2 | 26 | 95.12 | 985 | 244 | 53 | 4.60 | 4.04 | 89.96 |
| June 5 | 29 | 95.12 | 1,000 | 256 | 53 | 4.83 | 3.91 | 89.71 |
| June 7 | 31 | 93.69 | 470 | 158 | 48 | 3.29 | 2.97 | 90.24 |
| June 10 | 34 | 93.38 | 367 | 146 | 47 | 3.11 | 2.51 | 90.17 |
| June 14 | 38 | 95.75 | 1,390 | 288 | 56 | 5.14 | 4.83 | 89.74 |
| June 22 | 46 | 93.91 | 538 | 181 | 49 | 3.69 | 2.97 | 89.98 |
| July 10 | 64 | 91.20 | 40 | 50 | 46 | 1.09 | .80 | 90.09 |

TABLE 6.—*Summary data of hydraulic characteristics of cross sections in the Bedload Trap reach, East Fork River, May-July 1974*—Continued

CROSS SECTION 10S

[Distance, 12 + 54 feet; active bed-stations, 18 to 42 feet]

| Date | Day no. | Water surface elevation (feet) | Discharge $Q$ ($ft^3/s$) | Area $A$ ($ft^2$) | Width $W$ (ft) | Depth[1] $\bar{d}$ (ft) | Velocity[2] $\bar{u}$ (ft/s) | Mean bed elevation (ft)[3] |
|---|---|---|---|---|---|---|---|---|
| May 8 | 1 | 92.24 | 200 | 93 | 36 | 2.58 | 2.15 | 89.45 |
| May 26 | 19 | 93.13 | 350 | 124 | 37.5 | 3.31 | 2.82 | 89.55 |
| May 27 | 20 | 94.54 | 774 | 179 | 39.5 | 4.53 | 4.32 | 89.39 |
| May 28 | 21 | 95.34 | 1,130 | 223 | 41 | 5.44 | 5.07 | 89.09 |
| May 30 | 23 | 95.06 | 1,040 | 210 | 40.5 | 5.19 | 4.95 | 89.04 |
| May 31 | 24 | 94.60 | 866 | 189 | 39.5 | 4.78 | 4.58 | 89.13 |
| June 2 | 26 | 94.99 | 985 | 200 | 40 | 5.00 | 4.93 | 89.42 |
| June 5 | 29 | 95.08 | 1,000 | 214 | 40.5 | 5.28 | 4.67 | 89.13 |
| June 7 | 31 | 93.59 | 462 | 140 | 38 | 3.68 | 3.30 | 89.45 |
| June 10 | 34 | 93.27 | 367 | 128 | 37.5 | 3.41 | 2.87 | 89.63 |
| June 14 | 38 | 95.68 | 1,370 | 244 | 42 | 5.81 | 5.61 | 88.98 |
| June 22 | 46 | 93.84 | 535 | 152 | 38 | 4.00 | 3.52 | 89.38 |
| July 10 | 64 | 91.19 | 40 | 55 | 33 | 1.67 | .73 | 89.42 |

CROSS SECTION 11S

[Distance, 13 + 60 feet; active bed-stations, 14 to 54 feet]

| Date | Day no. | Water surface elevation (feet) | Discharge $Q$ ($ft^3/s$) | Area $A$ ($ft^2$) | Width $W$ (ft) | Depth[1] $\bar{d}$ (ft) | Velocity[2] $\bar{u}$ (ft/s) | Mean bed elevation (ft)[3] |
|---|---|---|---|---|---|---|---|---|
| May 8 | 1 | 92.25 | 200 | 92 | 45 | 2.04 | 2.17 | 90.15 |
| May 27 | 20 | 94.57 | 800 | 189 | 52 | 3.63 | 4.23 | 90.40 |
| May 28 | 21 | 95.28 | 1,120 | 245 | 53 | 4.62 | 4.57 | 90.11 |
| May 30 | 23 | 95.05 | 1,030 | 250 | 52.5 | 4.76 | 4.12 | 89.68 |
| May 31 | 24 | 94.61 | 866 | 219 | 52 | 4.21 | 3.95 | 89.82 |
| June 2 | 26 | 95.00 | 985 | 219 | 52 | 4.21 | 4.50 | 90.15 |
| June 5 | 29 | 95.10 | 1,000 | 232 | 52.5 | 4.42 | 4.31 | 90.04 |
| June 7 | 31 | 93.61 | 475 | 154 | 49 | 3.14 | 3.08 | 90.07 |
| June 10 | 34 | 93.24 | 365 | 143 | 48 | 2.98 | 2.55 | 90.03 |
| June 14 | 38 | 95.66 | 1,370 | 276 | 53 | 5.21 | 4.96 | 89.74 |
| June 22 | 46 | 93.81 | 535 | 167 | 50 | 3.34 | 3.20 | 90.04 |
| July 10 | 64 | 91.18 | 40 | 47 | 44 | 1.07 | .85 | 90.01 |

[1] $\bar{d} = A/W$.

[2] $\bar{u} = Q/A$.

[3] The mean bed elevation was calculated by averaging the bed elevation at even-numbered stations over the width of active bed. For the occasional instances when a cross section was sounded at odd-numbered stations, the bed elevation at even-numbered stations has been determined by linear interpolation.

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