INSTRUCTION MANUAL FOR U.S. GEOLOGICAL SURVEY SEDIMENT OBSERVERS

By Gary P. Johnson

U.S. GEOLOGICAL SURVEY

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U.S. DEPARTMENT OF THE INTERIOR

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INSTRUCTION MANUAL FOR U.S. GEOLOGICAL SURVEY SEDIMENT OBSERVERS

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ABSTRACT

This instruction manual is intended for use by U.S. Geological Survey (USGS) Sediment Observers. An overview of the USGS Sediment Program is presented, and basic theory on sediment transport is explained. Step-by-step instructions on when and how to sample for sediment also are presented. USGS Sediment Observer safety issues are discussed and corrective actions are presented. An empty pouch is included at the back of the manual for miscellaneous supplies, such as extra sampler nozzles, thermometers, new gaskets, and markers to be supplied by USGS personnel distributing the manual. A plastic reference card also is included, which can be removed from the manual and kept at the sampling site. Only general guidelines are presented in the manual so space is provided for USGS personnel distributing the manual to fill in project specific instructions.

U.S. GEOLOGICAL SURVEY SEDIMENT DATA

The U.S. Geological Survey (USGS) was established by an act of Congress in 1879 with the responsibility for "classification of the public lands and examination of the geological structure, mineral resources, and products of the national domain" (Rabbitt, 1981). A Bureau in the U.S. Department of the Interior, the USGS has been the principal source of information about the Nation's physical resources—the configuration of the land surface; the character of the underlying rocks; and the quality, extent, and distribution of the water and mineral resources. As part of the mission of the USGS, earth-science data and information are collected and provided to enhance the availability of sufficient resources and to support the Nation's infrastructure for the prosperity of future generations (U.S. Geological Survey, 1993). Sediment data are just a small part of the earth-science data collected by the USGS.

The USGS collects and publishes sediment data for a variety of reasons at hundreds of sites in the United States. The USGS monitors sediment transport in streams, which range in size from very small creeks to the Mississippi River. This program is funded through direct appropriations by the U.S. Congress in

cooperation with local, State, and other Federal agencies. The quantity of water flowing past a site (water discharge) is determined, and water samples are collected at that site to determine the amount of sediment in a given volume of that water (suspended-sediment concentration). From these data, the total suspended-sediment load flowing past the site can be computed. These data generally are published in annual data reports for long-term stations or at the end of a study in a specific report in tables similar to that shown in figure 1.

Sediment data are needed by researchers, engineers, water-resources planners, and others for a wide variety of applications and are essential to monitoring the water quality of rivers. Carol Browner, the administrator of the U.S. Environmental Protection Agency, called sediment “the number 1 problem threatening America’s waterways” (U.S. Environmental Protection Agency, 1994). Sediment impairs fish respiration, plant productivity, and can limit the aesthetic and recreational usefulness of rivers and lakes. Researchers use USGS sediment data to determine whether changes in management practices for land in a particular watershed have affected erosion rates. Engineers who design marinas, bridges, locks, dams, hydro-power structures, and maintain navigational channels in rivers utilize USGS sediment data in their engineering design plans. USGS sediment data are often used in reservoir studies to monitor sediment loads into and out of reservoirs. This gives reservoir managers an indication of the remaining useful life of the reservoirs and helps with decision making about dredging or reservoir maintenance.

Because sediment concentrations in a stream vary with flow, time, and other factors, many samples must be collected to develop a relation between the sediment concentration and the corresponding water discharge. The feasibility of USGS personnel to frequently visit a site and collect many samples is usually impractical. Therefore, local residents are often contracted to collect these samples. These people are referred to as USGS Sediment Observers. Their role is vitally important to the continued success of the USGS Sediment Program.

This manual is intended as a tool for USGS Sediment Observers to explain why their job is so important and how to do their job correctly. Requirements and guidelines for Sediment Observers may vary at different USGS offices, so space is provided throughout the manual for completion by the USGS personnel distributing the manual.

FUNDAMENTALS OF SEDIMENT TRANSPORT

Data required to compute water discharge are collected by means of mechanical or electronic instruments, usually housed in a shelter near the stream (fig. 2). This equipment monitors the elevation, or gage height, of the water surface at that site. From these water-elevation data, USGS personnel determine how much water is flowing past that site over time (generally, as the gage height rises water discharge

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY

STATION NUMBER 05594100 KASKASKIA RIVER NEAR VENEDY STATION, IL STREAM SOURCE AGENCY USGS
LATITUDE 382702 LONGITUDE 0893739 DRAINAGE AREA 4393.00 DATUM 380.10 STATE 17 COUNTY 189

SEDIMENT DISCHARGE, SUSPENDED (TONS/DAY), WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994

DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
		APRIL			MAY			JUNE	
1	1630	45	197	27200	54	3960	2220	90	513
2	1490	44	175	29500	58	4620	2140	93	513
3	1400	42	160	28500	61	4620	2160	93	517
4	1360	41	151	22800	59	3600	2150	94	515
5	1280	41	142	19500	57	2940	2420	94	592
6	1340	49	180	17000	54	2440	2740	95	668
7	1590	60	264	15300	51	2100	2900	95	708
8	1790	74	360	14200	49	1870	3240	140	1200
9	1740	118	556	13800	47	1740	3440	257	2320
10	5020	327	5410	13600	45	1630	3760	179	1820
11	11000	551	16800	13000	45	1580	3660	139	1370
12	23400	290	18600	12800	46	1580	3490	110	1040
13	34500	149	13900	13000	47	1630	3340	100	899
14	27400	125	9050	12500	48	1600	3260	100	879
15	22900	118	7220	11900	49	1550	3330	100	901
16	19200	113	5760	11400	50	1530	3520	101	966
17	15900	111	4710	10900	51	1500	3640	139	1370
18	14000	107	4010	10400	51	1420	3730	186	1870
19	12500	116	3840	9560	47	1190	3630	157	1540
20	11500	118	3670	8720	55	1270	3590	131	1270
21	10600	100	2850	7840	68	1420	3570	127	1210
22	10100	80	2170	6750	95	1690	3410	126	1160
23	10700	63	1840	5550	83	1220	3160	125	1060
24	11500	51	1580	4710	75	932	3440	191	1840
25	12000	52	1690	4230	74	824	3710	226	2240
26	12200	57	1890	3930	72	751	3610	195	1940
27	12500	66	2230	3610	74	703	4540	394	4880
28	13700	186	7210	3330	77	673	4620	410	5100
29	18500	184	9080	3050	80	636	4300	339	3910
30	23800	78	4930	2780	83	599	3900	281	2930
31	---	---	---	2480	86	551	---	---	---
TOTAL	346540	---	130625	363840	---	54369	100620	---	47741

Figure 1. Example of published U.S. Geological Survey sediment data (From WRD Data Report IL-94-1, 1995).

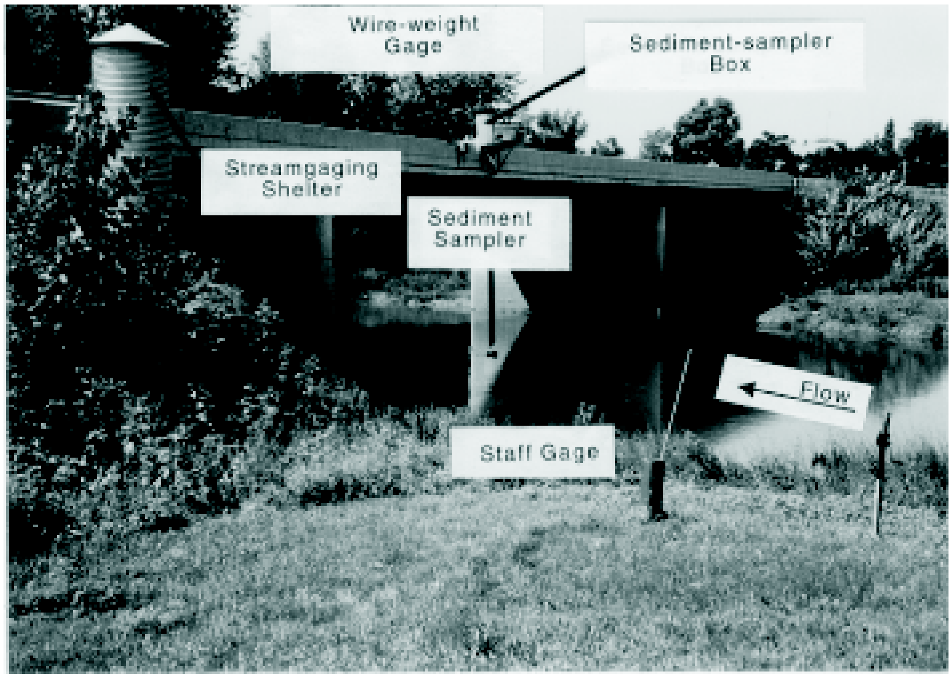

Figure 2. Stream-gaging shelter and equipment.

increases). This equipment generally is operated and maintained by USGS personnel, so USGS Sediment Observers do not need to be concerned with this equipment unless otherwise instructed.

A person familiar with rivers has probably noticed that the clarity of the water can vary greatly, especially if the person has compared clear water under low-flow conditions to sediment-laden water under flood conditions. During floods, the water usually becomes cloudier or dirtier. As water discharge increases in a river, the sediment concentration generally increases also. This is shown in figure 3. The light line without symbols represents the water discharge, and the darker line connecting the circles represents the sediment concentration in the stream. The circles represent samples that were collected by a USGS Sediment Observer. Notice how sharply the water discharge and sediment concentrations can increase. As a result, many sediment-concentration samples must be collected during floods to match the sediment concentration with the corresponding water discharge to compute the total suspended-sediment load at the site. Also, notice in figure 3 that the sediment concentration increases quickly and peaks before the water discharge peaks. By the time the water discharge peaks (fig. 3), the sediment concentration already has decreased appreciably. This generally is the case at most sites and illustrates the importance of collecting samples during the beginning of a flood.

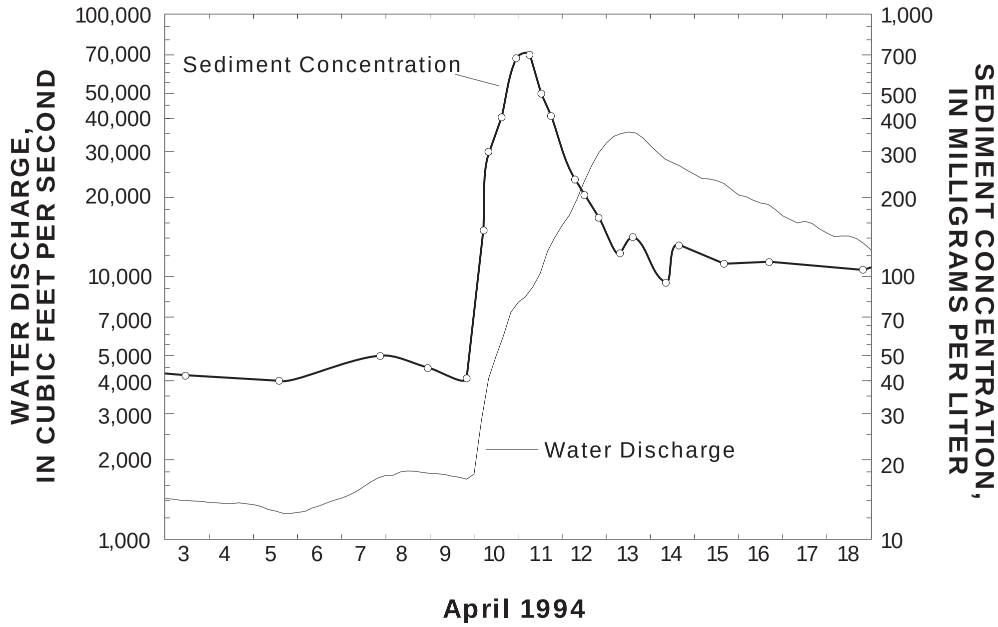

Figure 3. Relation of water discharge and sediment concentration with time, Kaskaskia River near Venedy Station, Illinois, April 1994.

Most of the suspended-sediment load flowing past a site is transported during floods, when the water discharge is very high. For example (figs. 1 and 3), notice that on April 5, the water discharge was relatively low for this station, 1,280 cubic feet per second (ft^3/s). The concentration of suspended sediment in the water was 41 milligrams of sediment in every 1liter of water (mg/L). This computes to a suspended-sediment load of 142 tons for the day. Now look at April 11, just 6 days later, after some periods of heavy rain. The water discharge has increased to 11,000 ft^3/s (relatively high for this station), and the concentration of sediment in the water has increased to 551 mg/L. The suspended-sediment load was calculated at 16,800 tons for the day. Notice that more sediment was transported on April 11 (the high-flow day) than would be transported during 118 consecutive days at the rate measured on April 5 (the low-flow day). For this reason, USGS Sediment Observer samples collected during floods are critical for computing and publishing the sediment records at these sites. Without sufficient samples during a flood, USGS personnel must estimate sediment concentrations for parts or all of the period of flooding.

THE U.S. GEOLOGICAL SURVEY SEDIMENT OBSERVER’S DUTIES

When to Sample

Sampling schedules may vary at different sampling sites. USGS personnel should inform the USGS Sediment Observer of the sampling strategy to follow at the site. Commonly, Sediment Observers are instructed to take samples on a fixed schedule (for example, one sample per day, week, or month) or a schedule based on water discharge (for example, sample three times per day during a flood). The following page has been inserted to allow USGS personnel to fill in the sampling schedule for the Sediment Observer.

<u>Sampling Schedule</u>

Please follow the sampling schedule listed below:

How to Sample

Each time a site is visited the USGS Sediment Observer should follow the steps listed below:

1. Along with every sample collected, a reading of the water elevation or gage height should be determined and recorded. Two types of devices commonly used to measure gage height are shown in figure 4. The staff gage is graduated every 0.02 feet, and is read by observing the water level against the graduations. The wire-weight gage consists of a drum wound with a single layer of cable, a bronze weight at the end of the cable, a graduated disc, and a counter housed in a cast aluminum box. The wire-weight gage is set so that when the bottom of the weight is at the water surface, the gage height is indicated by the combined readings of the counter (in feet) and the graduated disc (in tenths and hundredths of feet). To read the wire-weight gage, the Sediment Observer should open the box, grasp the handle, release the clasp, slowly lower the weight until the bottom of the weight is in contact with the water surface, and read the counter and graduated disc. In choppy water, the correct gage height is the average elevation of the peaks and troughs of the waves.
2. After determining and recording the gage height, the sediment sampler should be inspected. During sampling, water flows into the nozzle. The air in the bottle, displaced by the water, exits through an exhaust tube and out the side of the sampler (fig. 5). If either the nozzle or exhaust path are blocked or damaged, the sampler will not work properly. The Sediment Observer should check for and remove any obstructions in the nozzle or exhaust path, including ice accumulation during the winter. If either the exhaust path or nozzle is plugged with ice, a simple way to unclog them is to immerse the sampler into the water for a few minutes to thaw the ice. A small wire generally can be used to remove other small obstructions. The gasket inside the sampler head (fig. 5) also should be checked and cleaned or, if necessary, replaced to ensure a tight seal around the bottle mouth when the bottle is in position for sampling. Replacement gaskets may be stored in the pouch at the back of this manual. To replace a gasket, pry out the old gasket and insert a new one.
3. Now a clean bottle can be inserted into the sampler. Depending on the type of sampler provided, the Sediment Observer either will need to pull back a spring-loaded handle at the rear of the sampler (fig. 5) and insert the bottle (bottle mouth forward towards nozzle) or open the hinged head of the sampler, insert the bottle, and close the sampler head.
4. The sampler should then be lowered into the water so the nozzle is just above the water surface, allowing the fins on the rear of the sampler to orient the sampler to point into the direction of flow (figs. 2 and 5). Debris floating down the

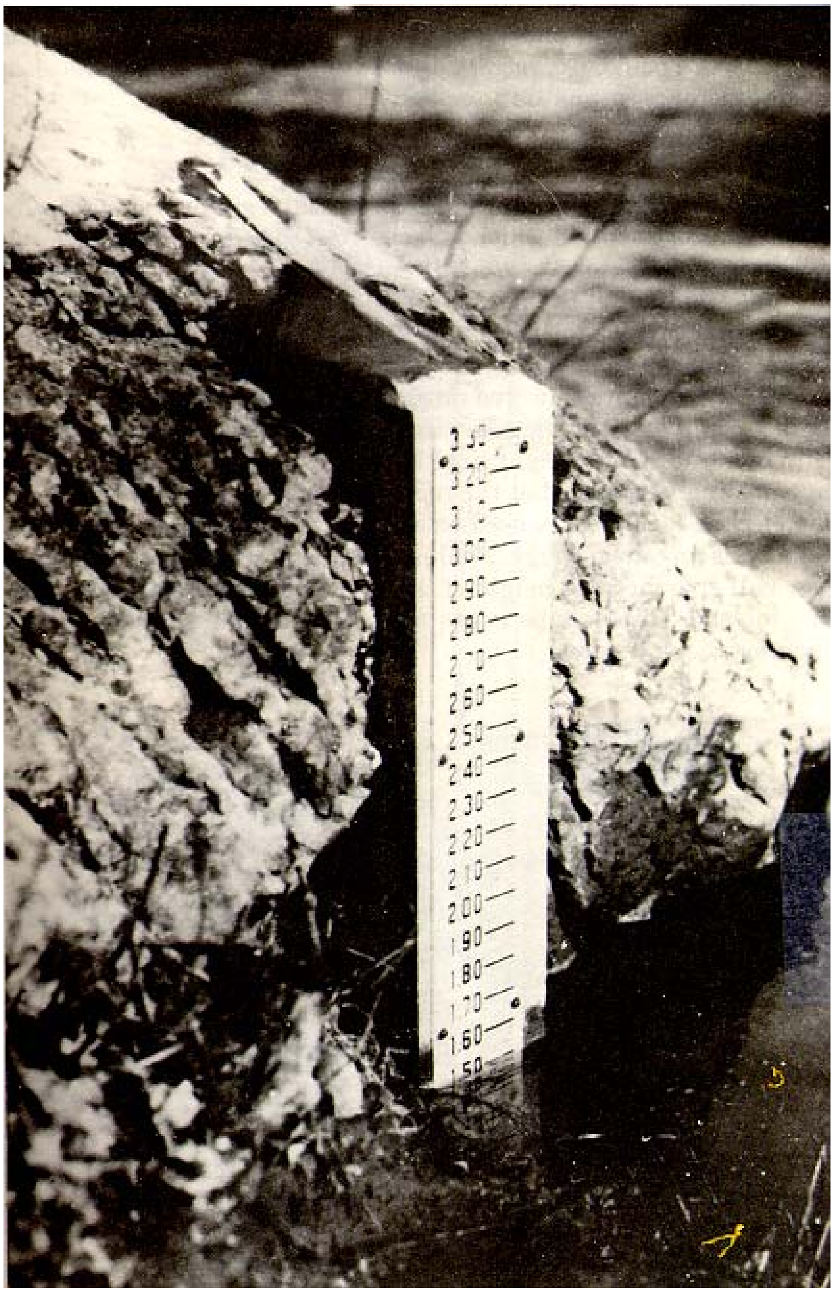

Figure 4. Staff and wire-weight gages.

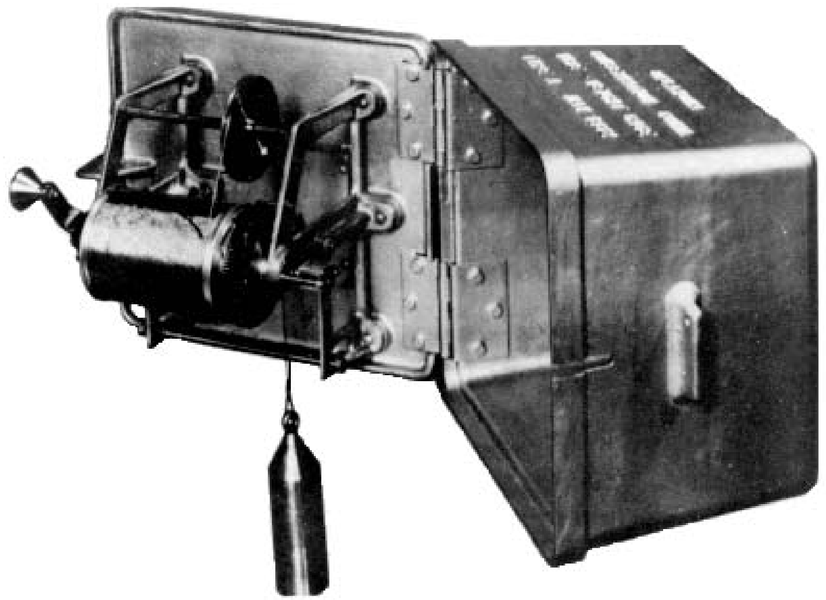

Figure 4. Continued.

stream that could catch on the sampler or cable should be avoided by raising the sampler to permit the debris to pass.

5. After the sampler is pointing upstream, the sampler should be lowered in the water at a constant rate until the sampler touches the bottom of the stream. During the lowering of the sampler in the water, air bubbles should be observed exiting the sampler's exhaust outlet (fig. 5). If no bubbles are observed, either the nozzle or exhaust path are blocked, and no sample is being collected. Additionally, if bubbles are exiting from around the bottle mouth, the gasket needs to be checked and/or replaced as discussed in step 2. When the sampler touches the bottom, it IMMEDIATELY should be raised at a constant rate until it is out of the water. Sediment concentrations generally vary by depth in the water column (fig. 6). Sediment particles (especially the larger, heavier particles) tend to settle to the bottom and, thus, make concentrations near the stream bottom higher than near the water surface. If a constant cranking rate is not used then more water will be collected from the water column where the cranking rate was slower, and the sampled area where the cranking rate was faster will not be represented as well in the sample. In soft bottom or sand bed channels, an unrepresentative sample of the sediment concentration may be collected if the nozzle is allowed to plunge into the bed. Therefore, it may be necessary to determine how deep the water is so the sampler can be lowered to just above

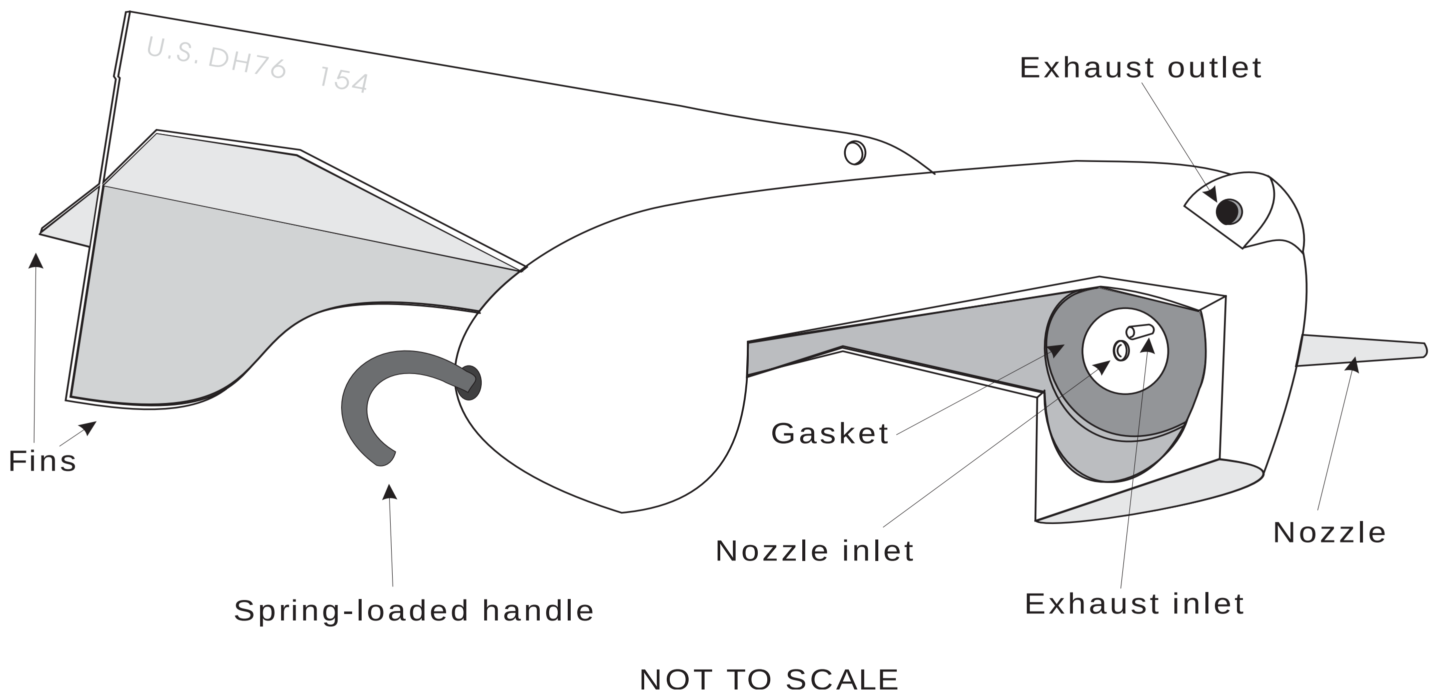

Figure 5. U.S. DH-76 suspended-sediment sampler.

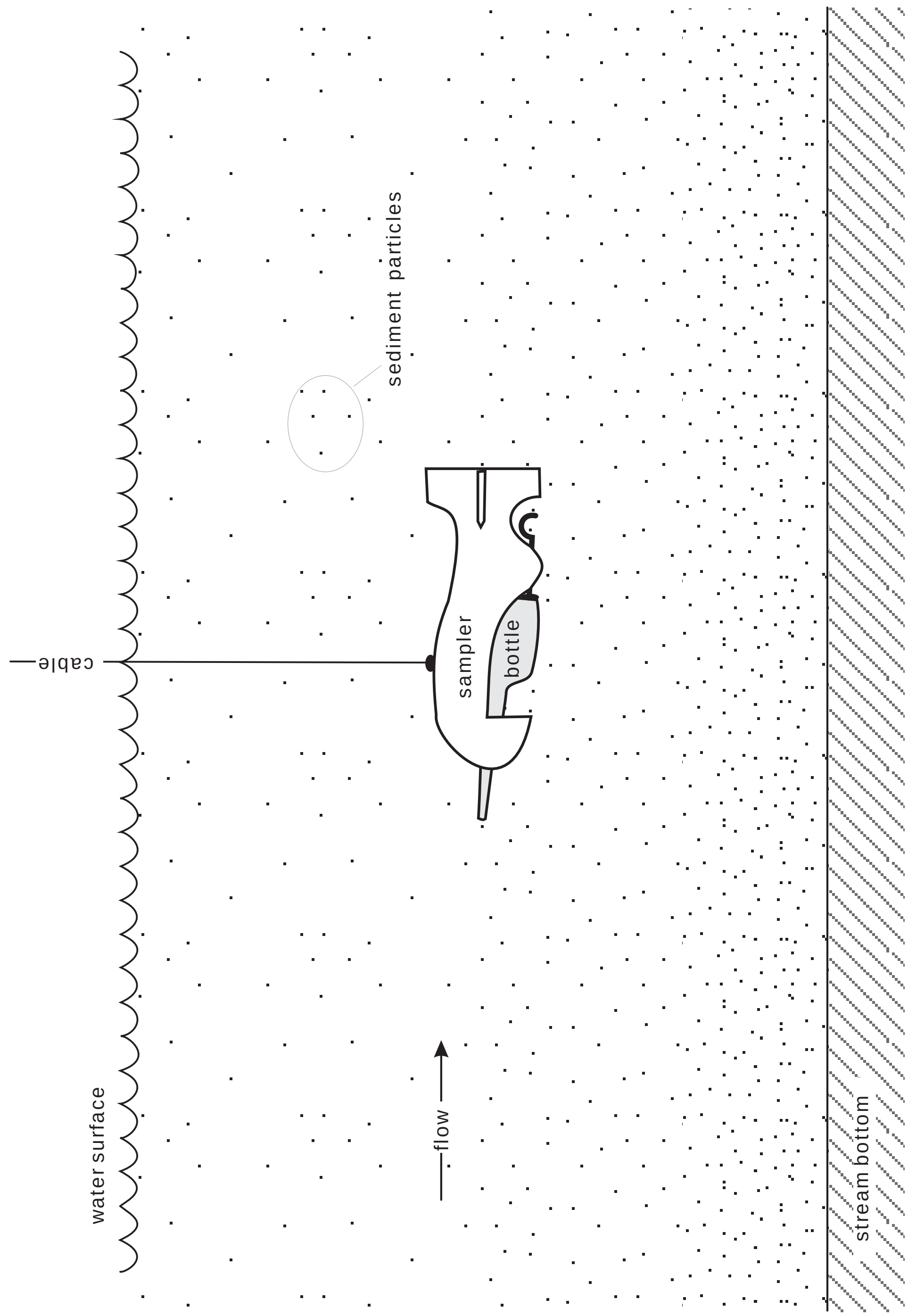

Figure 6. Side view of sampler in the water, and how sediment concentrations can vary by depth.

the bed and brought up before the sampler (and nozzle) plunges into the soft bottom and fine bed sediments are allowed to enter the bottle. The sampler should be lowered to the bottom without a bottle in the sampler. When the sampler reaches bottom, the reading of the dial on the cable reel indicates the point at which the cranking direction must be reversed during sample collection.

6. After sampling, the bottle should be retrieved from the sampler and the sample inspected. While retrieving the bottle, keep the sampler pointed upwards and be careful not to allow sample water to pour out of the nozzle. The bottle should be at least half full but not completely full after retrieval. If the bottle is completely full, it may have filled before the sampler passed through the entire water column, so the part of the column that was traversed after the bottle filled was not sampled and is not properly represented in the sample. Again, this is very important, because concentrations can vary greatly by depth in the stream (fig. 6). The amount of water filling the bottle can be controlled in two ways. The first is by inserting a different size nozzle (tighten nozzle only to hand tight!) in the sampler (the larger the nozzle diameter, the more water will be collected). Extra nozzles also may be stored in the pouch at the back of this manual. The second is by using a different cranking rate (for example, crank faster and the sampler is in the water for a shorter period of time and, thus, collects less water). It may take a few attempts to determine the correct combination of nozzle and cranking rate. After taking a few samples, the Sediment Observer should be able to determine from the gage height which nozzle to use and how fast to crank. If the bottle was over- or underfilled, a new, clean bottle must be inserted into the sampler, and another sample should be collected using a different combination of nozzle size and/or cranking rate.
7. The sampler and the sample should then be inspected for evidence of bed sediments. If the sampler has mud dripping off the bottom or mud visible in or around the nozzle, it may have plunged into the bottom of the stream and collected bed sediment. Larger than normal amounts of silt or sand in the sample also may be indicative of having plunged the sampler into the bottom. If it appears that the sample contains bed sediments, the Sediment Observer needs to sample again, but this time to a slightly more shallow depth.
8. Water temperature should be obtained by inserting the thermometer into the sample bottle, waiting for the reading to stabilize, and reading the temperature. Remove the thermometer and allow as much of the sample as possible to drip back into the bottle and cap the bottle.
9. Record the following information on both the log sheet and the sample bottle: station name, date, military time, gage height, water temperature, location (usually “Box” for Sediment Observer samples), and the Sediment Observer’s initials.The log sheet shown in figure 7 is completed correctly, and was the

SEDIMENT SAMPLE RECORD

Date picked up 4/19/94, GPJ

Station # 05594100 Stream and Location Kaskaskia River near Venedy Station, IL Project 00400

Date (M/D/Y)	Time (2400)	Gage Height (ft) (Staff)	Water Temp. (deg C)	Sample Location	Collector's Initials	Remark
4/1/94	1155	2.76	14.0	Box	LHJ	water holding steady
4/3/94	1100	2.79	14.5	Box	LHJ	
4/5/94	1400	2.73	14.5	Box	LHJ	
4/7/94	2100	2.95	14.5	Box	LHJ	
4/8/94	2200	3.12	14.5	Box	LHJ	light rain, more in forecast
4/10/94	0600	6.85	14.0	Box	SDJ	rain all day yesterday and today
4/10/94	0800	7.42	14.0	Box	LHJ	river rising fast
4/10/94	1500	8.11	15.0	Box	LHJ	river rising fast
4/10/94	2300	8.33	16.0	Box	LHJ	muddy water. lots of debris
4/11/94	0630	8.65	15.0	Box	LHJ	muddy water. lots of debris
4/11/94	1230	8.69	16.0	Box	LHJ	still coming up
4/11/94	1800	8.77	16.0	Box	LHJ	
4/12/94	0700	9.40	15.5	Box	LHJ	
4/12/94	1215	9.65	16.0	Box	SDJ	
4/12/94	2000	9.83	16.5	Box	LHJ	
4/13/94	0730	10.17	16.0	Box	LHJ	
4/13/94	1440	10.08	16.0	Box	LHJ	it looks like it has peaked
4/14/94	0825	9.76	15.5	Box	LHJ	dropping
4/14/94	1545	9.43	16.0	Box	SDJ	
4/15/94	1610	9.07	16.0	Box	LHJ	not near as muddy as a few days ago
4/16/94	1645	8.86	16.0	Box	LHJ	
4/18/94	1940	8.65	15.5	Box	LHJ	

picked up by GPJ, USGS

Figure 7. Sediment Observer's log sheet and sample bottle completed correctly.

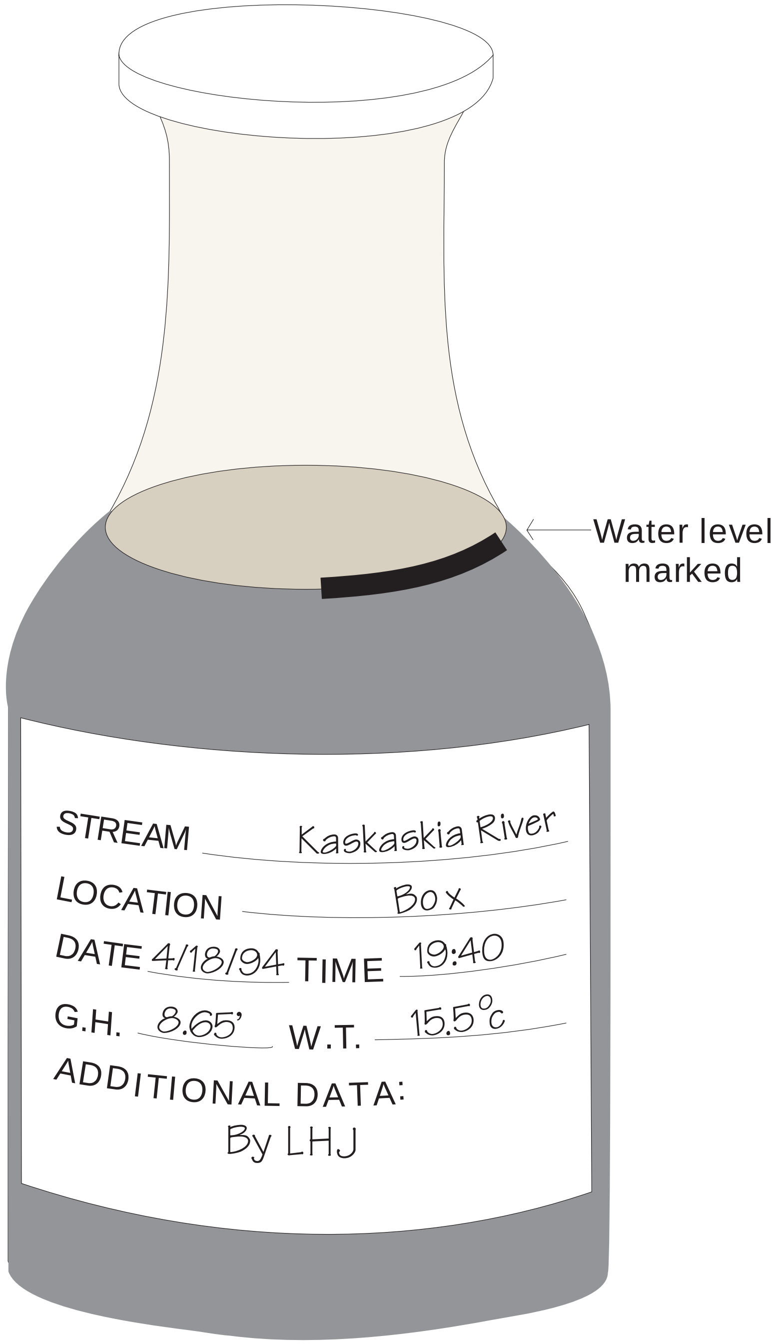

Figure 7. Continued.

record of the samples shown in figure 3. Any other observations also may be recorded in the remarks column on the log sheet (fig. 7).

10. The Sediment Observer may be asked to mark the water line on the side of the bottle with a marker, supplied by USGS personnel, to permit a later check for evaporation (fig. 7).
11. Finally, store the sample bottles out of direct sunlight and in an area where they will not freeze. This is done to minimize algal growth and prevent bottle breakage because of freezing.

Communication with the U.S. Geological Survey

USGS personnel will visit each sediment site at least once every 6 weeks. At this time, any samples that have been collected and the log sheets from those samples will be collected. USGS personnel may contact the Sediment Observer to set up a meeting at the site or to have bottles and log sheets left in the gage house at the site. The Sediment Observer generally will be paid on a quarterly basis; that is, every 3 months, but this payment schedule can vary. While at the site, USGS personnel also will restock the Sediment Observer's supply of bottles, nozzles, gaskets, log sheets, markers, thermometers, or other supplies. Many of these supplies can be stored in the pouch included with this instruction manual.

Safety

If conditions are too dangerous to sample (for example, if there is ice, heavy rain, or dense fog), then the Sediment Observer should not sample. In addition, if the Sediment Observer feels that any needed equipment or the sampling location is inherently unsafe or needs maintenance to be safe, then again, the Sediment Observer should not sample. The Sediment Observer should never risk injury to collect a sample. Instead, the Sediment Observer should contact USGS personnel and discuss their concerns and possible corrective actions. The Sediment Observer should contact USGS personnel <u>at</u> <u>any</u> <u>time</u> with questions, concerns, problems, or requests for supplies. The next page should be completed with information on how the USGS person distributing this manual can be contacted. Arrangements commonly are made so that the Sediment Observer can either call collect or be reimbursed for the phone call.

USGS Contact Person(s):

Phone number(s):

Address(es):

SUMMARY

Sediment data are collected on many rivers throughout the United States by USGS Sediment Observers. The data are used by researchers, engineers, water-resources planners, and others for a variety of reasons. Data collected by USGS Sediment Observers are critical to the continued success of the USGS Sediment Program. This manual was written to be a reliable reference for these Sediment Observers and to ensure that they use standard data-collection methods. An overview of the USGS Sediment Program was presented and basic theory on sediment transport, which every Sediment Observer should know, was explained. A one-step procedure describing when and how to sample also was presented. USGS Sediment Observer safety issues were discussed and corrective actions were presented. Blank spaces were left throughout the manual for USGS personnel distributing the manual to insert project specific instructions and information. A small, plastic instruction card for use in the field is included, which can be removed from the manual and stored at the sampling site. Finally, a pouch is included in the manual and the USGS person distributing this manual should fill it with miscellaneous supplies for the Sediment Observer.

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STEP-BY-STEP INSTRUCTIONS

If conditions are too dangerous to sample (for example, if there is ice, heavy rain, or dense fog), then you should not sample. In addition, if you feel that any needed equipment or the sampling location is inherently unsafe or needs maintenance to be safe, then again, do not sample. You should never risk injury to collect a sample. Instead, you should contact USGS personnel and discuss your concerns and possible corrective actions. You should contact USGS personnel at any time if you have questions, concerns, problems, or need supplies. You either can call collect or you will be reimbursed for the phone call to the number listed on the reverse side of this card.

1. **Obtain a gage height:** Along with every sample collected, determine and record the water elevation or gage height. The staff gage is graduated every 0.02 feet and is read by observing the water level against the graduations. To read the wire-weight gage: open the box, grasp the handle, release the clasp, slowly lower the weight to where the bottom of the weight is in contact with the water surface, and read the counter and graduated disc. In choppy water, the correct gage height is the average elevation of the peaks and troughs of the waves.
2. **Inspect the sampler:** After reading the gage height, inspect the sampler. Check for damage and remove any obstructions in the nozzle or exhaust path, including ice accumulation during the winter. If either the exhaust path or nozzle is plugged with ice, a simple way to unclog them is to immerse the sampler into the water for a few minutes to thaw the ice. To clear other debris, a small wire generally will remove the obstruction. Also, the gasket inside the sampler head also should be checked, cleaned, or replaced to ensure a tight seal around the bottle mouth when the bottle is in position for sampling. To replace a gasket, pry out the old gasket and insert a new one.
3. **Insert a bottle:** Now a clean bottle can be inserted into the sampler. Depending on the type of sampler provided, you'll either need to pull back a spring-loaded handle at the rear of the sampler and insert the bottle, or open the hinged head of the sampler, insert the bottle, and close the sampler head.
4. **Lower sampler to the water:** Let the sampler down into the water so the nozzle is just above the water surface, allowing the fins on the rear of the sampler to orient the sampler to point into the direction of flow. Debris floating down the stream that could catch on the sampler or cable should be avoided by raising the sampler to permit the debris to pass.
5. **Collect a sample:** After the sampler is pointing upstream, lower the sampler in the water at a constant rate until the sampler touches the bottom of the stream. When it touches the bottom, IMMEDIATELY begin to raise the sampler at a constant rate until it is out of the water. In soft bottom or sand bed channels, an unrepresentative sample may be collected if the nozzle is allowed to plunge into the bed. Therefore, it may be necessary to determine how deep the water is so the sampler can be lowered to just above the bed, and the sampler brought up before the sampler (and nozzle) plunges into the soft bottom and fine bed sediments are allowed to enter the bottle. The sampler should be lowered to the bottom without a bottle in the sampler. When the sampler reaches

bottom, the reading of the dial on the cable reel indicates the point at which the cranking direction must be reversed during sample collection.

6. **Inspect your sample:** After sampling, retrieve the bottle from the sampler. Keep the sampler pointed upwards and be careful not to allow sample water to pour out of the nozzle. The bottle should be at least half full but not completely full after retrieval. If the bottle is completely full, it may have filled before the sampler passed through the entire water column, so the part of the column that was traversed after the bottle filled was not sampled and is not properly represented in the sample. This is very important because concentrations can vary greatly by the depth in the stream. The amount of water filling the bottle can be controlled in two ways. The first is by inserting a different size nozzle (tighten the nozzle only to hand tight!) in the sampler (the larger the nozzle diameter, the more water will be collected). The second is by using a different cranking rate (for example, crank faster and the sampler is in the water for a shorter period of time and, thus, collects less water). It may take a few attempts to determine the correct combination of nozzle and cranking rate. After taking a few samples, you should be able to determine from the gage height which nozzle to use and how fast to crank. If the bottle was over- or underfilled, a new, clean bottle must be inserted into the sampler. Collect another sample using a different combination of nozzle size and/or cranking rate.
7. **Inspect for bed sediment:** The sampler and the sample should be inspected for evidence of bed sediments. If the sampler has mud dripping off the bottom or mud visible in or around the nozzle, it may have plunged into the bottom of the stream and collected bed sediment. Larger than normal amounts of silt or sand in the sample also may be indicative of having plunged the sampler into the bottom.
8. **Resample:** If the bottle was over- or underfilled, or sank into the bottom, a new, clean bottle must be reinserted into the sampler and another sample collected using a different size nozzle and/or cranking rate, and/or sampling to a slightly more shallow depth if bottom sediments were apparent in the sample.
9. **Obtain water temperature:** Obtain a water temperature by inserting the thermometer into the sample, wait for the reading to stabilize, and read the temperature. Remove the thermometer and cap the bottle.
10. **Record sample data:** Record the following information on both the log sheet and the sample bottle: station name, date, time, gage height, water temperature, location (usually “Box” for Sediment Observer samples), and your initials. Any other observations also may be recorded in the remarks column on the log sheet.
11. **Store the sample bottle:** You may be asked to mark the water line on the side of the bottle with a marker, supplied by USGS personnel, to permit a later check for evaporation. Finally, store sample bottles out of direct sunlight and in an area where they will not freeze. This is done to minimize algal growth and prevent bottle breakage because of freezing.

USGS Contact Person(s):____

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