



File Code: 2500
Date: March 6, 2017

Linda Bassi
Section Chief
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, CO 80203

Dear Ms. Bassi:

The U.S.D.A. Forest Service ("Forest Service") is writing this letter to formally communicate its recommendation for an instream flow water right on Little Sand Creek pursuant to the rules of the Colorado Instream Flow and Natural Lake Level Program. The stream is located in Colorado Water Division 7.

Natural Environment: The natural resource values which contribute to the overall natural environment to be preserved in Little Sand Creek include hybrid cutthroat trout and brook trout, aquatic macroinvertebrates, riparian vegetation, wetlands, and water-dependent wildlife. Little Sand Creek is tributary to Weminuche Creek and it serves as important spawning habitat for the resident brown trout fishery in Weminuche Creek.

Location and Land Status: Little Sand Creek is located approximately 21 miles northwest of the town of Pagosa Springs. Little Sand Creek is tributary to Weminuche Creek which is tributary to the Piedra River. The recommended reach is approximately 8.1 miles in length and is entirely located on lands managed by the San Juan National Forest.

Segment:

Upper Terminus Headwaters:

Latitude: 37°31'20.811" N Longitude: 107°19'7.512" W

Lower Terminus Confluence Weminuche Creek:

Latitude: 37°26'6.393" N Longitude: 107°14'30.419" W

Biological Summary: Little Sand Creek is a cold-water, moderate-to-high gradient mountain stream which flows through a forested landscape. The upper and middle portions of the reach are confined and exhibit low sinuosity, with little to no floodplain. Portions of the mid and upper watershed burned in 2012 during the Little Sand Wildfire. The lower portion of the reach is lower gradient, is more sinuous, and has a developed floodplain with associated wetlands and meadows. Numerous beaver ponds exist in the lower portions of the reach. In general, the condition of Little Sand Creek is good.



Fisheries surveys were conducted by Colorado Parks and Wildlife (CPW) and the Forest Service in 1976 and 1999. The stream contains a self-sustaining population of hybridized cutthroat trout (*Oncorhynchus clarki spp.*) and brook trout (*Salvelinus fontinalis*).

Riparian vegetation is a key component of stream health for Little Sand Creek. The riparian corridor is in good condition and provides abundant woody debris, shade, cover, nutrients, and aquatic habitat. It is comprised of a mix of conifers, aspen, alder, willow, and narrowleaf cottonwood. Numerous beaver dams have created habitat complexity and associated wetlands.

R2Cross Analysis: The Forest Service collected standard R2Cross data at several riffle cross sections in Little Sand Creek in 2016. Data was collected and analyzed using the methodology described in the June 2006 CWCB R2Cross Manual and was processed using the 2008 version of the R2Cross model.

R2Cross can be run using a constant Manning's n that is calculated by the program, or Manning's n can be defined using field measurements of channel roughness. The R2Cross model results using a constant Manning's n roughness coefficient are valid or "in range" when the model output yields summer and winter flow recommendations between 0.4 and 2.5 times the stream discharge measured at the time of field survey.

The Forest Service collected standard pebble count data at each R2Cross cross section on Little Sand Creek in order to calculate Manning's n roughness coefficient. Pebble counts were used to calculate Manning's n only where initial analysis indicated R2Cross model results were not "in range". For Little Sand Creek where model results were not in range, the R2Cross field data was processed using the R2Cross model subroutine for a Thorne-Zevenbergen Staging Table. This allowed full utilization of the R2Cross field data collected in 2016. The table below shows a combination of model outputs using the fixed Manning's n subroutine and outputs from the user-defined Thorne-Zevenbergen Manning's n subroutine.

R2Cross Model Results for Little Sand Creek				
LOCATION	DATE OF DATA COLLECTION	CHANNEL TOP-WIDTH	2 OF 3 INSTREAM FLOW CRITERIA (WINTER)	3 OF 3 INSTREAM FLOW CRITERIA (SUMMER)
Cross Section 2	7/14/2016	23.07 feet	*3.2 cfs	*4.4 cfs
Cross Section 3	7/14/2016	18.86 feet	1.1 cfs	*7.6 cfs
Cross Section 4	8/31/2016	26.70 feet	*3.3 cfs	*16.3 cfs
Cross Section 5	8/31/2016	14.99 feet	1.4 cfs	*2.7 cfs
Cross Section 6	8/31/2016	17.98 feet	0.6 cfs	*2.0 cfs
		Average	1.9 cfs	6.6 cfs

*Results calculated using the R2Cross Thorne-Zevenbergen Subroutine.

Biologic Instream Flow Recommendation: For the reach of Little Sand Creek from its headwaters to the confluence with Weminuche Creek, the Forest Service recommends the following:

Biological Instream Flow Recommendation Little Sand Creek	
TIME PERIOD	FLOW AMOUNT
January 1 – February 28	1.5 cfs
March 1 – March 31	1.9 cfs
April 1 – April 15	3.6 cfs
April 16 – July 31	6.6 cfs
August 1 – September 15	3.0 cfs
September 16 – September 30	2.4 cfs
October 1 – November 30	3.0 cfs
December 1 – December 31	1.5 cfs

Based on currently available data and information the FS has determined, these are the minimum flow amounts needed for fish population survival and to preserve the natural environment (described above) to a reasonable degree in the subject reach of Little Sand Creek.

Water Availability: Little Sand Creek is a free flowing stream with no existing water rights or diversions and it has no stream gage record. The CWCBC conducts the analysis to determine if water is available for an instream flow appropriation.

The final assessment of water availability could result in reductions of the recommended flow amounts and/or modifications of the Forest Service flow recommendation duration. If this is the case, and future investigations indicate additional water is available, the Forest Service would recommend appropriating the additional water up to the recommended flow amounts and duration to preserve the natural environment to a reasonable degree.

Relationship to Land Management Plans: Forest Service watershed and aquatic habitat conservation is based on several key federal laws that set a consistent land-and-water stewardship vision (see Appendix). These laws direct Forest Service actions to protect watersheds and aquatic habitat through sound management. In addition, the San Juan Forest Plan calls for Little Sand Creek to be managed to provide ecological conditions sufficient to support a diversity of native and desired non-native fish species, and other aquatic biota in the long-term. The Forest Plan also directs that the management of riparian areas and wetlands maintain or restore the composition, structure, and function of these ecosystems. In addition, aquatic habitat should support well-distributed populations of vertebrate and invertebrate species.

Establishing an instream flow water right on Little Sand Creek utilizing the Colorado Instream

Flow and Natural Lake Level Program, would assist in meeting the Forest Service management obligations and Forest Plan direction summarized above. Thank you for considering the Forest Service recommendation for Little Sand Creek. If you have any questions regarding our instream flow recommendation, please feel free to contact me or Forest Hydrologist Kelly Palmer at (970) 385-1232 or at kapalmer@fs.fed.us.

Sincerely,



KARA L. CHADWICK
Forest Supervisor

cc: Maribeth Gustafson, Steve Lohr, Anthony Madrid, Kelly Palmer

Appendix A

LAWS, REGULATION, AND POLICY GUIDING U.S. FOREST SERVICE AQUATIC RESOURCE MANAGEMENT

Forest Service watershed and aquatic habitat conservation is based on several key federal laws (listed below in chronological order) that set a consistent land-and-water stewardship vision. These laws direct Forest Service actions to protect watersheds and aquatic habitat through sound management. Brief summaries of these laws and their direction for management related to watersheds and aquatic habitat are included below. Federal regulations contain the current interpretations and direction specific to these laws.

- 1. Organic Administration Act of 1897 (16 U.S.C. 475).** This law defines original National Forest purposes to improve and protect the forest, secure favorable conditions of water flows, and furnish a continuous supply of timber. Years of concern about watershed damage led to creation of the National Forest System. Watersheds must be cared for to sustain their hydrologic function as "sponge-and-filter" systems that absorb and store water and naturally regulate runoff. The goals are good vegetation and ground cover, streams in dynamic equilibrium with their channels and flood plains, and natural conveyance of water and sediment.
- 2. Multiple Use-Sustained Yield Act of 1960 (16 U.S.C. 528).** This law expands National Forest purposes to include watershed, wildlife and fish, outdoor recreation, range, and timber and to sustain native ecosystems. Renewable surface resources are to be managed for multiple use and sustained yield of the several products and services that they provide. The principles of multiple use and sustained yield include the provision that the productivity of the land shall not be impaired.
- 3. Endangered Species Act of 1973 (16 U.S.C. 1531-1536, 1538-1540).** This law conserves endangered and threatened species of wildlife, fish, and plants and the ecosystems on which they depend. Federal agencies must conserve endangered and threatened species and cooperate with State and local agencies to resolve resource issues (Section 2). Each Federal agency shall, with the consultation and help of the Secretary of Interior, ensure that any action authorized, funded, or done by the agency is unlikely to jeopardize the continued existence of any endangered or threatened species or result in adverse modification of their critical habitat (Section 7).
- 4. National Forest Management Act of 1976 (16 U.S.C. 1600-1602, 1604, 1606, 1608-1614).** The Forest Service must be a leader in conserving natural resources (Section 2). Programs must protect and, where appropriate, improve the quality of soil and water (Section 5). The overall goal of managing the National Forest System is to sustain the multiple uses of its renewable resources in perpetuity while maintaining the long-term productivity of the land. Maintaining or restoring the health of the land enables the National Forest System to provide a sustainable flow of uses, benefits, products, services and visitor opportunities (36 CFR 219.1 (2005)). The overall goal of the ecological element of sustainability is to provide a framework to contribute to sustaining native ecological systems by providing ecological conditions to support a diversity of native plant and animal species (36 CFR 219.10 (2005)).

Ecological conditions are the components of the biological and physical environment that can affect diversity of plant and animal communities and the productive capacity of ecological systems. These components could include the abundance and distribution of aquatic and terrestrial habitats, roads and other structural developments, human uses, and invasive, exotic species (36 CFR 219.16 (2005)).

5. Federal Land Policy and Management Act of 1976 (43 U.S.C. 1752). Rights-of-way for water diversion, storage, and/or distribution systems, and other uses must include terms and conditions to protect the environment and otherwise comply with the requirements of Section 505, including section (a) (ii): “minimize damage to scenic and esthetic values and fish and wildlife habitat and otherwise protect the environment”.

6. Clean Water Act of 1977 (33 U.S.C. 1251, 1254, 1323, 1324, 1329, 1342, 1344). This series of laws was written to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (Section 101). Congress sought to sustain the integrity of water quality and aquatic habitat so that waters of the United States will support diverse, productive, stable aquatic ecosystems with a balanced range of aquatic habitats. All issues are framed by the intent of Congress to improve and preserve the quality of the Nation's waters (540 F.2d 1023; 543 F.2d 1198; 612 F.2d 1231; 97 S.Ct 1340; 97 S.Ct 1672).

Waters of the United States include perennial and intermittent streams, lakes, wetlands, and their tributaries. Aquatic ecosystems are waters of the United States that serve as habitat for interrelated and interacting communities and populations of plants and animals (40 CFR 230.3). Impacts to flow patterns, temperature, dissolved oxygen, sediment, and pollutant levels must be controlled (33 U.S.C. 1311 and 1314; 843 F.2d 1194; 753 F.2d 759). Physical features needed to support existing uses for anti-degradation include substrate, cover, flow, depth, pools, and riffles (40 CFR 131.10, 230.10, and 230.11).

7. Forest Plans. The purpose of the San Juan National Forest Land and Resource Management Plan (Forest Plan) is to provide strategic guidance for future management of all National Forest System lands managed by the San Juan National Forest. It provides a framework for informed decision making, while guiding resource management programs, practices, uses, and projects.

To ensure the long-term sustainability of ecosystems, humans must manage within the physical and biological capabilities of the land, maintain all of the ecological components and processes, and not irreversibly alter ecosystem integrity and resilience. The concept of sustainability is a fundamental component of the Forest Plan and is guided by the Multiple-Use Sustained-Yield Act (MUSY) and the Federal Land Policy and Management Act (FLPMA). Ecological sustainability is intended to provide the ecological conditions that maintain or restore the diversity of native ecosystems and natural disturbance processes. This in turn will maintain suitable habitats for a wide range of plant and animal species and provide for the diversity and viability of plant and animal species, populations and communities.

For lands managed by the USFS, the Planning Rule in 36 CFR 219.19 specifically requires that "[f]ish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area," and "[f]or planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure [sic] its continued existence is well distributed in the planning area." Regulation 36 CFR 219.26 requires that "[f]orest planning shall provide for diversity of plant and animal communities and tree species consistent with the overall multiple-use objectives of the planning area. Such diversity shall be considered throughout the planning process." In addition, the FLPMA specifies that special uses granted by the Secretary of Agriculture are subject to terms and conditions that "minimize damage to fish and wildlife habitat and otherwise protect the environment." Agency actions should avoid or minimize impacts to species whose viability has been identified as a concern. USFS actions must not result in loss of population viability or create significant trends toward federal listing (FSM 2670.32).

For riparian area and wetland ecosystems, aquatic ecosystems, and terrestrial ecosystems, specific management direction has been developed that is intended to address the legal, regulatory, and policy requirements for species diversity and population viability. The process applied was to identify a range of key ecosystem elements, determine the importance of those elements to maintaining species diversity and population viability (e.g. limiting factors), define desired future conditions and land management objectives for those elements, and ensure that appropriate management standards and guidelines are in place that address the ecological needs of species and populations. In general, management standards have been developed for those elements determined to have an overriding influence on species diversity or long-term population viability, while other elements that have less influence are typically addressed through the application of guidelines.

SAND CREEK, LITTLE

Southwest Region

Code No. 38108 XX

Section No. 1

Date: October 28, 1976

Primary Drainage: Weminuche Creek, Piedra River

Major Drainage: San Juan River, Code No. 40-SJ

Terminus: Lower

Location: Confluence with Weminuche Creek

T 37 N, R 4 W, Sec. 25

Width: 10 ft. Elevation: 7700 ft.

Terminus: Upper

Location: Headwaters

T 38 N, R 4 W, Sec. 17

Width: 1.0 ft. Elevation: 10,630 ft.

Estimated Flow: 1.0 cfs

pH: 7.3 pHTH: 0 ppm MO: 41 ppm

Hardness: 86 ppm Conductivity: 94 Mohm/cm

Stream Profile: No

Water Temperature @14:45 - 31°F

SECTION SUMMARY

Meander Factor: 1.05 Length: 7.8 Miles

Width: 5 ft. Flow: Normal

Acreage: 5.0

County: Hinsdale Miles: 7.8

Beaver Dams: Numerous

Physical Stream Damage: None

Accessibility:

4-Wheel Drive: 0.3 Miles

Established Trail: 6.0 Miles

No Established Trail: 1.5 Miles

Land Status:

USFS: 7.8 Miles

Stocking:

None: 7.8 Miles

Aquatic Vegetation:
Filamentous Algae: Absent
Watercress: No
Stream Size:
Minor Stream 4' - 9'
Gradient: 7.1%
Fishery Value: Unknown
Fishery Value - Limiting Factors:
Low Temperatures - A-15
Excessive Siltation - E-1

FISH SAMPLING

Only Station

Elevation: 9367 ft.
Sampling Method: Electro-fishing - 50'
Length: 50 ft.
Sampling: Adequate
Scales Collected: No
Estimated % of Fish Biomass:
Game Fish: 100%

ELECTRO-FISHING RECORD

Station #2: Upper Road Crossing USFS 631
Distance: 50 ft. Width: 4 ft.
Equipment Used: Battery Back Pack
Personnel: Smith, Weiler, Lashmett, Vigil, Hawkins, Warner

SIZE LENGTH IN INCHES									
Sta.	Species	1	2	3	4	5	6	Total	Average
1	Cutthroat			2				2	3.4

Comments: Station #2: Cutthroat - 20 g

CDOW STREAM SURVEY (1991 REVISION)
LEVEL 2: FIELD SURVEY SUMMARY

STREAM: Sand Creek, Little SEC#: 1 WATER CODE: 38108 CDOW REGION: WE
SURVEYORS: M. Japhet, M. Reid, C. Ellis, D. Chacon, N. Tallowich DATE OF SURVEY: 08/24/99
SURVEY LOCATION: T R S ELEVATION: 9,390 ft. STATION #:1
UTM ZONE: 13 S UTM X: 029698 UTM Y: 4152982

LOCATION DESCRIPTION: above FS Road 631

STREAM FLOW PROFILE (Y or N): N IF YES-DATE AND TYPE:
HABITAT EVALUATION (Y or N): N IF YES-DATE AND TYPE:
WATER CHEMISTRY ANALYSIS (Y or N): N IF YES-ATTACH SEPARATE ANALYSIS SHEET

FISH PRESENT (Y or N): Y POP. EST. METHOD: two-pass removal STATION LENGTH: 500 (FEET)
AVG. WIDTH: 7.8 (FEET) TOTAL STATION AREA: 0.09 (ACRES)
FLOW (CFS) AT TIME OF SURVEY: NA METHOD:
LIMITING FACTORS TO FISHERY: none

COMMENTS: No fish migration barriers found were found at this station. DWM Reid reports brook trout present in beaver ponds on Little Sand Creek about 1/4 mile below this station. No record of fish stocking exists for Little Sand Creek, although stocking in the upper end of the drainage could have easily been accomplished via Forest Service Road 631. Ten of the fish caught in this survey were collected for genetic testing; the remainder were returned to the water. Two fish had a few spots on the head and all fish had numerous, evenly distributed spots, suggesting rainbow trout influence. Trout biomass and density estimates shown below are based on Seber-Le Cren population estimate for trout > or = 10 cm (4 in) where C1=22, C2=3, N=25.5, and 95% confidence limit = + or - 1.8.

LENGTH FREQUENCY RECORD (CM)

SPECIES	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	UP
NAT				2	1	3	10	2	7	3																
INCHES	2		4		6		8		10		12		14		16		18		20							

SUMMARY INFORMATION

SPECIES	NO. FISH CAUGHT	AVG. LENGTH	LENGTH RANGE	AVG. WEIGHT (Grams)	WEIGHT RANGE (Grams)	% TOTAL CATCH	BIOMASS lb/Acre	DENSITY	
								No./Acre	Conf. Int.
NAT	28	14 cm (5.5 in)	6.8-20 cm (2.7-8 in)	30 g.	5-95 g.	100 %	22.6	283	278-303 (95%)

FISH COLLECTION RECORD

STREAM NAME: Little Sand Creek CODE #: 38108 STATION #: 1
LOCATION: above FS Road 631 DATE: 08/24/99
UTM ZONE: 13 S E 029648 N 4152982 T R S
COUNTY: Hinsdale TOPO MAP NAME: Granite Lake
PERSONNEL: M. Japhet, M. Reid, C. Ellis, D. Chacon, N. Tallowich LENGTH OF STATION: 500 ft
AVG. WIDTH: 7.8 ft ACREAGE: 0.089 POP EST MADE? Yes
COLLECTION CODE NO.: MJ-99-LSC

SPECIMEN RECORD

SPECIMEN CODE	SPECIES	LENGTH (cm)	WEIGHT (g)	SPECIMEN CODE	SPECIES	LENGTH (cm)	WEIGHT (g)
01	NAT	17.8	50				
02	NAT	20	95				
03	NAT	18.5	75				
04	NAT	17.5	60				
05	NAT	16.5	50				
06	NAT	19.5	75				
07	NAT	17.7	60				
08	NAT	16.2	50				
09	NAT	13.7	30				
10	NAT	12.8	20				

COMMENTS: No record of stocking exists for Little Sand Creek, however easy vehicle access to the headwaters at this location should not rule out undocumented stocking in the past. No fish migration barriers were found. DWM Reid reports brook trout present in beaver ponds on Little Sand Creek about 1/4 mile below this station. Specimen Nos. 03 and 06 have a few spots on head suggesting possible rainbow trout hybridization. All trout specimens had numerous, evenly distributed spots, even towards the front of the fish, again suggesting rainbow trout influence.

ELECTROFISHING RECORD

STREAM NAME: Sand Creek, Little CODE #: 38108 STATION # 1
 LOCATION: above FS road 631 crossing DATE: 8/24/99
 PERSONNEL: Japhet, Reid, Ellis Chacon, Tallowich LENGTH OF STATION: 500
 AVG. WIDTH 7.8 FT ACREAGE 0.09 ELEVATION 9390.4 POP EST MADE? ☒ Yes ☐ No

UTM 13S 029648
4152982

FISH SAMPLE

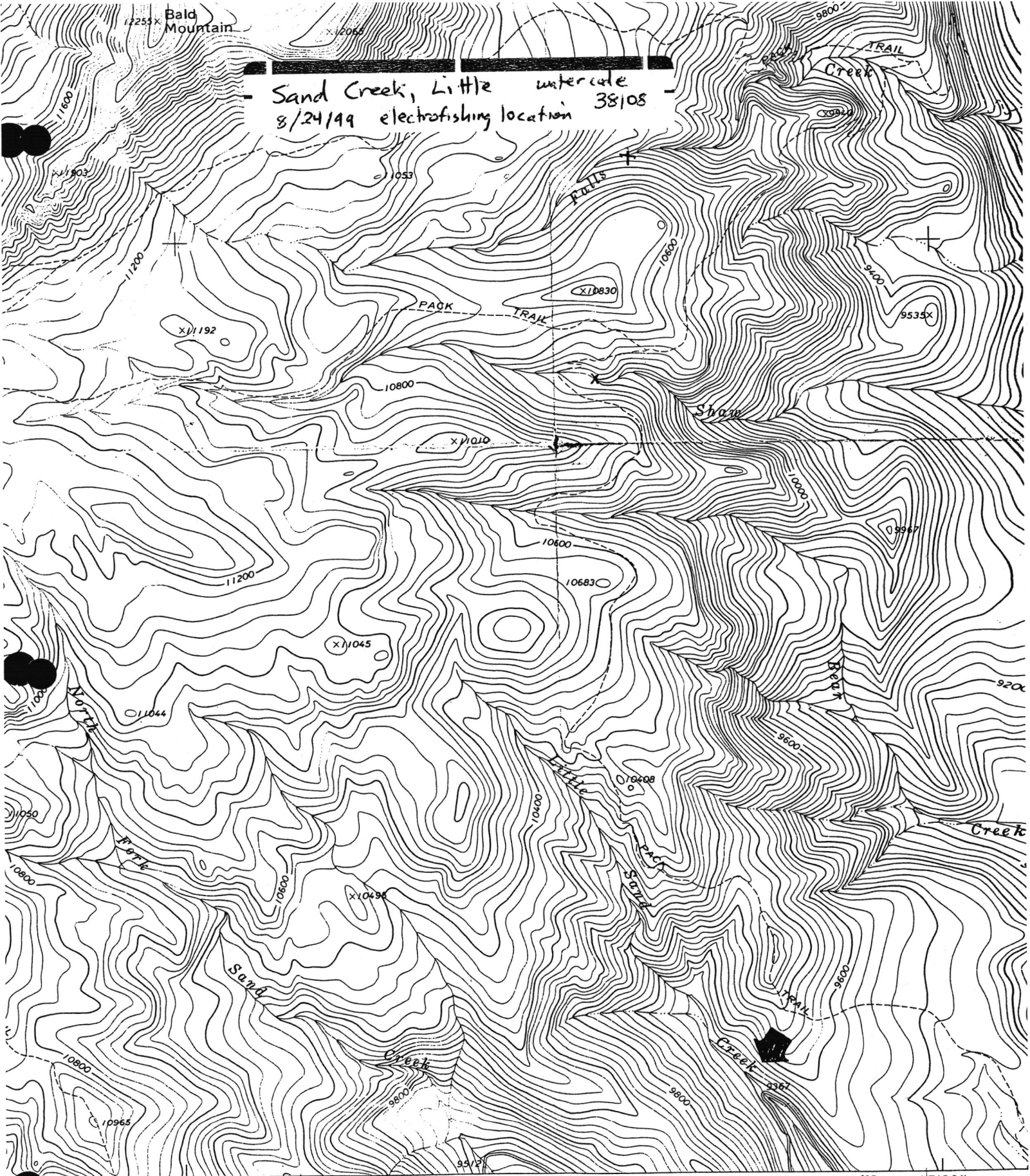
SPECIES	LENGTH (cm)	WGT (g)	SPECIES	LENGTH (cm)	WGT (g)	SPECIES	LENGTH (cm)	WGT (g)	SPECIES	LENGTH (cm)	WGT (g)
NAT	17	55							NAT	17	40
	13	15								14.8	35
	15	30								11	15
	13.5	20								8.8	5
	12.8	20									
	12.8	15									
	11.2	10									
	13	15									
	13.5	25									
	11.3	10									
	6.5	5									
	12.8	15									
	6.8	5									
	12.3	15									
01	17.8	55									
02	20	95									
03	18.5	75									
04	17.5	60									
05	16.5	50									
06	19.5	75									
07	17.7	60									
08	16.2	50									
09	13.7	30									
10	12.8	20									

10.3
8.8
5.4
6.4
7.8
widths

no apparent fish barriers found

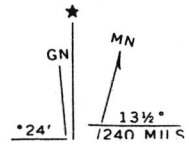
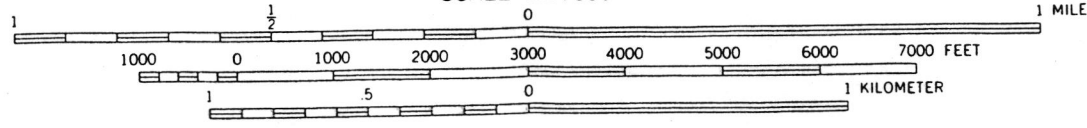
Bald Mountain

Sand Creek, Little interlake
8/24/49 electrofishing location 38108



20' 294 295 (BEAR MOUNTAIN) 296 297 17'30"

SCALE 1:24000





COLORADO WATER
CONSERVATION BOARD

FIELD DATA
FOR
INSTREAM FLOW DETERMINATIONS



LOCATION INFORMATION

STREAM NAME: <u>LITTLE SAND</u>		CROSS-SECTION NO.: <u>X52</u>	
CROSS-SECTION LOCATION: <u>upstream of X51, downstream of X53</u>			
DATE: <u>7/14/16</u>	OBSERVERS: <u>KAMPE, CADENABE, SEERACH, PORTER</u>		
LEGAL DESCRIPTION:	% SECTION: <u>SE</u>	SECTION: <u>13</u>	TOWNSHIP: <u>37 (N/S)</u>
COUNTY: <u>Hinsdale</u>	WATERSHED: <u>San Juan</u>	WATER DIVISION: <u>7</u>	PM: <u>NMCPM</u>
USGS: <u>OAK BRUSH RIDGE</u>		DOW WATER CODE: <u>38108</u>	
USFS: <u>SNF - Visitors Map</u>			

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO	METER TYPE: <u>MARSA MC-BURNEY</u>			
METER NUMBER:	DATE RATED:	CALIB/SPIN: <u>20C</u>	TAPE WEIGHT: <u>lbs/foot</u>	TAPE TENSION: <u>lbs</u>
CHANNEL BED MATERIAL SIZE RANGE		PHOTOGRAPHS TAKEN: <u>YES/NO</u>	NUMBER OF PHOTOGRAPHS: <u>4</u>	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)	
⊗ Tape @ Stake LB	0.0		
⊗ Tape @ Stake RB	0.0		
① WS @ Tape LB/RB	0.0	7.6 6.04	15.6 6.09
② WS Upstream	12.2 ftL	6.00	6.36
③ WS Downstream			
SLOPE	0.0295		

SKETCH

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED YES/NO	DISTANCE ELECTROFISHED: <u>ft</u>	FISH CAUGHT YES/NO	WATER CHEMISTRY SAMPLED YES/NO														
LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)																	
SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL
AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME																	

COMMENTS

<u>UTM: 13S 0301536 4145623</u>	

LRF 2.1 4.89

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: <u>LITTLE SAND</u>				CROSS-SECTION NO: <u>X82</u>		DATE: <u>7/14/16</u>		SHEET <u>1</u> OF <u>2</u>			
BEGINNING OF MEASUREMENT		EDGE OF WATER LOOKING DOWNSTREAM 10.0 AT STAKE		LEFT / RIGHT		Gage Reading: <u> </u> ft		TIME <u>14:05 - 14:50</u>			
Stake Grassline (G) Waterline (W) Rock	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)		Area (ft ²)	Discharge (cfs)
								At Point	Mass in Vertical At Point		
BM			5.20								
TOP	0.8		4.24								
ROP	0.8		4.33								
(G)	2.1		4.89								
	2.7		5.10								
	2.8		5.48								
	3.4		5.91								
	4.8		5.82								
	5.7		5.95								
	6.2		5.98								
TOR	6.7		5.78								
(W) LEW(w)	7.3		6.04								
	7.6		6.12	0.1					0		
	7.9		6.14	0.1					0		
	8.2		6.12	0					0		
	8.5		6.07	0					0		
	8.8		6.09	0.1					0.06		
	9.1		6.16	0.1					0		
	9.4		6.31	0.2					0		
	9.7		6.30	0.2					0.10		
	10.0		6.25	0.2					0.59		
	10.3		6.24	0.1					1.22		
	10.6		6.08	0.15					0.47		
Rock	10.9		6.35	0					0		
	11.2		6.36	0.20					0.48		
	11.5		6.38	0.30					0.85		
	11.8		6.36	0.20					1.82		
	12.1		6.22	0.20					1.53		
	12.4		6.40	0.25					0		
	12.7		6.30	0.30					0.45		
	13.0		6.33	0.35					0.94		
	13.3		6.39	0.30					1.41		
	13.6		6.31	0.25					1.46		
	13.9		6.32	0.20					0.16		
	14.2		6.37	0.30					0.94		
	14.5		6.33	0.25					0.63		
	14.8		6.24	0.10					0		
	15.1		6.23	0.10					0		
	15.4		6.12	0.05					0		
(W) REW(w)	15.7		6.06	-					-		
	16.1		6.01								
	17.0		6.04								
TOTALS											

End of Measurement	Time:	Gage Reading <u> </u> ft	CALCULATIONS PERFORMED BY:	CALCULATIONS CHECKED BY:
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CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



LOCATION INFORMATION

STREAM NAME: <i>Little sand</i>		CROSS-SECTION NO.: <i>X52</i>	
CROSS-SECTION LOCATION: <i>upstream of x51, downstream of x53</i>			
DATE: <i>7/14/16</i>	OBSERVERS: <i>Kampf, Cadiente, Seebach, Porter</i>		
LEGAL DESCRIPTION:	% SECTION: <i>SE</i>	SECTION: <i>13</i>	TOWNSHIP: <i>37</i> DIS: <i>0/S</i>
COUNTY: <i>Hinsdale</i>	WATERSHED: <i>San Juan</i>	RANGE: <i>4</i>	E/W: <i>NW</i>
USGS: <i>Oakbrush Ridge</i>		WATER DIVISION: <i>7</i>	DOW WATER CODE: <i>38108</i>
USFS: <i>STNF</i>			

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO	METER TYPE: <i>Marsh McBirney</i>		
METER NUMBER:	DATE RATED:	CALIB/SPIN: <i>SEC</i>	TAPE WEIGHT: <i>lbs/foot</i>
CHANNEL BED MATERIAL SIZE RANGE		TAPE TENSION: <i>lbs</i>	NUMBER OF PHOTOGRAPHS:
		PHOTOGRAPHS TAKEN: YES/NO	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
(X) Tape @ Stake LB	0.0	
(X) Tape @ Stake RB	0.0	
(1) WS @ Tape LB/RB	0.0	
(2) WS Upstream		
(3) WS Downstream		

SLOPE: _____

SKETCH:

LEGEND: Stake (circle), Station (dot), Photo (diamond), Direction of Flow (arrow)

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED YES/NO	DISTANCE ELECTROFISHED: _____ ft	FISH CAUGHT YES/NO	WATER CHEMISTRY SAMPLED YES/NO														
LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)																	
SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL
AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME																	

COMMENTS

STREAM NAME <u>LITTLE STAM</u>		CROSS-SECTION NO <u>XS 2</u>	DATE <u>7/14/16</u>	SHEET <u>2</u> OF <u>2</u>
BEGINNING OF MEASUREMENT	EDGE OF WATER LOOKING DOWNSTREAM (0.0 AT STAKE)	LEFT / RIGHT <u>LEFT</u>	Gage Reading. <u> </u> ft	TIME

[illegible]

PEBBLE COUNT DATA SHEET

Stream: *Little Sand Creek*

Date: *7/14/16*

Sampler: *Seebach*

Reach: *X52*

Notes: *Porter*

Comments:

Size Range (mm)	Habitat (r = riffle, p = pool, g = glide)	Count
<2		<i> </i> (27)
2.8		<i> </i> (2)
4		<i> </i> (1)
5.6		<i> </i> (4)
8		<i> </i> (2)
11		<i> </i> (4)
16	<i>1</i>	<i> </i> (2)
22.6		<i> </i> (1)
32		<i> </i> (5)
45		<i> </i> (10)
64		<i> </i> (12)
90		<i> 1</i> (16)
128		<i> 1</i> (11)
180		<i> </i> (5)
260		<i> </i> (2)
>260		<i> </i> (2)
Bedrock		
TOTAL D50		<i>Total: 106</i>



COLORADO WATER
 CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



LOCATION INFORMATION

CONSERVATION BOARD										CROSS-SECTION NO:																			
STREAM NAME: Little Sand Creek															X53														
CROSS-SECTION LOCATION: Upstream of X52																													
DATE: 7/14/16					OBSERVERS: Seebach, Porter, Cadiente, Kampf																								
LEGAL DESCRIPTION					SECTION: SE					SECTION: 13					TOWNSHIP: 37					RANGE: 4W					E/W: NMPM				
COUNTY: Hinsdale					WATERSHED: San Juan					WATER DIVISION: 7					DOW WATER CODE: 38108														
MAPS:					USGS: OAK BRUSH RIDGE																								
					USFS: SJNF - Visitors Map																								

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION		YES/NO	METER TYPE <i>Marsh McBirney</i>	
METER NUMBER.	DATE RATED.	CALIB/SPIN	TAPE WEIGHT	TAPE TENSION
CHANNEL BED MATERIAL SIZE RANGE		PHOTOGRAPHS TAKEN	YES/NO	NUMBER OF PHOTOGRAPHS. <i>4</i>

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE	ROD READING (ft)
Tape @ Stake LB	0.0	
Tape @ Stake RB	0.0	
WS @ Tape LB/RB	0.0	7.14 / 7.15
WS Upstream	21.65 ft	7.14 ft
WS Downstream	21.65 ft	7.24 ft
SLOPE	$0.1 / 21.65 = 0.00462 = 0.462\%$	

SKETCH

LEGEND:

- Stake (X)
- Station (1)
- Photo (1) →
- Direction of Flow ← →

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED YES/NO	DISTANCE ELECTROFISHED _____ M	FISH CAUGHT YES/NO	WATER CHEMISTRY SAMPLED YES/NO														
LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)																	
SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL
AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME																	

COMMENTS

Sunny, high 70s, 0-5mph wind	Cadente: stadia rod
	Kampf: rod-discharge
UTM: 135 2301536 4145653	Porter: notes
benchmark: 7.01	Seebach: auto-level

DISCHARGE/CROSS SECTION NOTES

STREAM NAME. Little Sand Creek

CROSS-SECTION NO
X53

DATE 7/14/16

SHEET 1 OF 2

BEGINNING OF MEASUREMENT

EDGE OF WATER LOOKING DOWNSTREAM
10.0 AT STAKE

LEFT / RIGHT

Gage Reading.

TIME 13:00 - 13:45

Stake Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inet (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)		Area (ft ²)	Discharge (cfs)
								At Point	Mean in Vertical		
LBTOP	2.4		5.73								
LBBOP	2.4		5.78								
	3.5		6.00								
	4.2		6.30								
LBF	4.6		6.32								
	5.3		6.58								
	5.7		7.00								
	6.3		7.12								
rock	6.8		7.03								
LEW	7.2		7.24								
	7.5		7.47	0.3					0.5		
	7.8		7.46	0.3					0.57		
rock	8.1		7.33	0.2					0.73		
rak	8.4		7.45	0.35					0.43		
	8.7		7.55	0.25					0.29		
top-rock	9.0		7.20	0					0		
	9.3		7.40	0.25					0.14		
	9.6		7.35	0.2					0.12		
	9.9		7.56	0.25					0.11		
	10.2		7.50	0.35					0.67		
	10.5		7.52	0.35					0.53		
	10.8		7.33	0.2					1.45		
	11.1		7.29	0.1					0.51		
	11.4		7.42	0.1					0.76		
	11.7		7.44	0.2					1.20		
	12.0		7.47	0.3					0.30		
	12.3		7.48	0.15					0.10		
	12.6		7.29	0.1					0.49		
	12.9		7.39	0.1					0.15		
	13.2		7.40	0.2					0.39		
	13.5		7.28	0.1					0.48		
rock	13.8		7.21	0.2					0.36		
	14.1		7.25	0.2					0.47		
	14.4		7.40	0.2					0.10		
	14.7		7.46	0.25					0.16		
	15.0		7.43	0.3					0.15		
	15.3		7.38	0.2					0.12		
	15.6		7.38	0					0		
	15.9		7.19	0					0		
REW	16.0		7.15								

End of Measurement

Time:

Gage Reading

CALCULATIONS PERFORMED BY.

CALCULATIONS CHECKED BY:

KBF 23.5 6.31



COLORADO WATER
CONSERVATION BOARD

FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



LOCATION INFORMATION

STREAM NAME: <u>Little Sand Creek</u>		CROSS-SECTION NO.: <u>XSS</u>	
CROSS-SECTION LOCATION: <u>upstream of XS2</u>			
DATE: <u>7/14/16</u>	OBSERVERS: <u>Seebach, Porter, Cadiente, Kampf</u>		
LEGAL DESCRIPTION:	SECTION: <u>SE</u>	SECTION: <u>13</u>	TOWNSHIP: <u>37 N/S</u>
COUNTY: <u>Hinsdale</u>	WATERSHED: <u>San Juan</u>	WATER DIVISION: <u>7</u>	DOW WATER CODE: <u>38108</u>
USGS: <u>Oakbrush Ridge</u>			
USFS: <u>SJNF</u>			

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION: YES/NO	METER TYPE: <u>Marsh M. Birney</u>						
METER NUMBER	DATE RATED	CALIB/STIM	SEC	TAPE WEIGHT	lbs/foot	TAPE TENSION	lbs
CHANNEL BED MATERIAL SIZE RANGE		PHOTOGRAPHS TAKEN YES/NO		NUMBER OF PHOTOGRAPHS			

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE	ROD READING (ft)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
① WS @ Tape LB/RB	0.0	
② WS Upstream		
③ WS Downstream		

SKETCH

LEGEND:
Stake
Station
Photo
Direction of Flow

SLOPE

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED YES/NO	DISTANCE ELECTROFISHED _____ ft	FISH CAUGHT YES/NO	WATER CHEMISTRY SAMPLED YES/NO														
LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)																	
SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL
AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME																	

COMMENTS

DISCHARGE/CROSS SECTION NOTES

NAME		CROSS-SECTION NO		DATE		SHEET					
Little sand creek		X33		7/14/16		2 OF 2					
BEGINNING OF MEASUREMENT		EDGE OF WATER LOOKING DOWNSTREAM (D.D. AT STAKE)		LEFT / RIGHT		Gage Reading		TIME			
								13:00-13:45			
Stake Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inet (ft)	Water Depth (ft)	Depth of Observ- ation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)		Area (ft ²)	Discharge (cfs)
								At Point	Mean in Vertical		
REW	16.0		7.15								
	16.7		6.94								
	18.0		7.08								
	18.5		7.11								
	19.6		7.00								
	20.2		6.76								
	22.3		6.56								
	23.0		6.43								
RBF	23.5		6.31								
	24.3		6.16								
RBTOP	24.9		6.00								
RBTOP	24.9		5.95								
TOTALS											
End of Measurement		Time:		Gage Reading		CALCULATIONS PERFORMED BY:		CALCULATIONS CHECKED BY:			

PEBBLE COUNT DATA SHEET

Stream: *Little Sand Creek*

Date: *7/14/16*

Sampler: *Seebach*

Reach: *X53*

Notes: *Porter*

Comments:

Size Range (mm)	Habitat (r = riffle, p = pool, g = glide)	Count
<2		<i> </i> (31)
2.8		<i> </i> (3)
4		<i> </i> (3)
5.6		<i> </i> (2)
8		<i> </i> (3)
11		<i> </i> (3)
16	<i>1</i>	<i> </i> (4)
22.6		<i> </i> (3)
32		<i> </i> (3)
45		<i> </i> (5)
64		<i> </i> (7)
90		<i> </i> (12)
128		<i> </i> (13)
180		<i> </i> (10)
260		<i> </i> (2)
>260		<i> </i> (4)
Bedrock		
TOTAL D50		<i>Total: 108</i>

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Little Sand CROSS-SECTION NO: X54 DATE: 8/31/2006 SHEET 1 OF 1

BEGINNING OF MEASUREMENT: _____ EDGE OF WATER LOOKING DOWNSTREAM (LEFT / RIGHT) (LEFT) Gage Reading: — TIME St. 1045 End 1110

Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inset (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)		Area (ft ²)	Discharge (cfs)
								At Point	Mean in Vertical		
BM			9.08								
LBP	3.0	3	5.45								
	5.5		6.63								
LBF	7.0		7.02								
	8.2		7.38								
	12.3		7.70								
	12.6		8.09								
	15.1		8.26								
	16.1		8.31								
	17.0		8.73								
LEW	18.8		9.30	0				0			
	19.3		9.45	0.1				0			
	19.8		9.44	0.15				0.36			
	20.3		9.52	0.2				0.50			
	20.8		9.56	0.2				0.12			
	21.3		9.56	0.1				0.53			
	21.8		9.57	0.2				0.24			
	22.3		9.56	0.2				0.12			
	22.8		9.65	0.3				0.32			
	23.3		9.67	0.3				0.43			
	23.8		9.61	0.1				0.39			
	24.3		9.56	0.3				1.02			
	24.8		9.57	0.25				0.95			
	25.3		9.59	0.15				1.03			
Rock	25.8		9.50	0.25				0.96			
	26.3		9.55	0.3				0.93			
	26.8		9.51	0.2				0.84			
	27.3		9.55	0.2				0.82			
	27.8		9.59	0.3				0.75			
	28.3		9.64	0.3				0.3			
	28.8		9.49	0.2				0.41			
	29.3		9.42	0.1				0.24			
	29.8		9.35	0.1				0			
REW	30.1		9.30	0				0			
	31.4		8.98							Stake	Station
	32.1		8.14							37.1	5.68
	32.6		7.80							39.4	5.46
	33.2		7.29							40.9	5.12
	33.5		7.07							46.9	4.13
R-BF	33.7		7.02								
	34.3		6.46								
	36.6		6.14								
TOTALS											
End of Measurement	Time:	Gage Reading	CALCULATIONS PERFORMED BY:				CALCULATIONS CHECKED BY:				

PEBBLE COUNT DATA SHEET

Stream: Little Sand

Reach: XS 4

Comments:

Date: 8/31/16

Sampler: D. Anderson, H. McIntyre

Notes: R. Sutton

Size Range (mm)	Habitat (r = riffle, p = pool, g = glide)	Count
<2		(36)
2.8		
4		
5.6		(2)
8		(6)
11		(18)
16		(18)
22.6		(15)
32		(9)
45		(15)
64		(12)
90		(11)
128		(5)
180		(1)
260		
>260		(3)
Bedrock		
TOTAL D50		151



FIELD DATA
FOR
INSTREAM FLOW DETERMINATIONS



COLORADO WATER
 CONSERVATION BOARD

LOCATION INFORMATION

CONSERVATION BOARD		CROSS-SECTION NO:	
STREAM NAME: Little Sands		R1 XS5	
CROSS-SECTION LOCATION Just Below XS 4 $\approx$ 10 meters, XS is in an area with some 25' to 30' trees. Left Bank BOP is next to an Alder			
DATE 8/31/16	OBSERVERS D. Anderson, F. Cadizante, M. Porter, H. McIntyre, R. Sutton, J. Vanderbilt		
LEGAL DESCRIPTION	% SECTION SE	SECTION 13	TOWNSHIP 37 N 13
			RANGE: 4 E 1/4
COUNTY Hinsdale	WATERSHED San Juan	WATER DIVISION 7	DOW WATER CODE 38108
MAP(S)	USGS: Oakbrush Ridge		
	USFS: SSNF		

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION		YES/NO	METER TYPE		Marsh McBirney	
METER NUMBER.		DATE RATED.		CALIB/SPIN	TAPE WEIGHT	TAPE TENSION
CHANNEL BED MATERIAL SIZE RANGE				PHOTOGRAPHS TAKEN	YES/NO	NUMBER OF PHOTOGRAPHS. 4

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE	NO	ROD READING (m)
⊗ Tape @ Stake LB	0.0		
⊗ Tape @ Stake RB	0.0		
① WS @ Tape LB/RB	0.0		
② WS Upstream	8.51	18 total	8.49
③ WS Downstream	8.65	X	8.65
SLOPE	0.16 / 18 = 0.008		

BRIDGE

AQUATIC SAMPLING SUMMARY

[illegible]

COMMENTS

Clear & Sunny Skys. $\approx 75^{\circ}\text{F}$

UTM - 0301084 4147213

DISCHARGE/CROSS SECTION NOTES

STREAM NAME		CROSS-SECTION NO		DATE		SHEET					
Little Sands		X55		8/31/16		1 OF 1					
BEGINNING OF MEASUREMENT		EDGE OF WATER LOOKING DOWNSTREAM (0.0 AT STAKE)		LEFT / RIGHT		Gage Reading		TIME			
								11:35 → 12:00			
Stake Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inlet (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)		Area (ft ²)	Discharge (cfs)
								At Point	Mean in Vertical Notes		
								Type	Station	Depth	
LBP	3.2	5	5.07							20.7	8.30
	4.2		5.45							21.4	8.42
	6.3		5.41							22.5	8.33
	7.3		5.94							23.0	8.11
	8.5		6.20							23.7	8.05
	9.0		6.37							24.0	7.75
RBP	9.3		6.58							24.4	7.61
	9.6		6.76							24.8	7.28
	10.0		7.04					RBF		25.0	7.06
	10.3		7.85							25.3	6.59
	10.7		8.18							26.1	6.47
	11.3		8.19							26.7	6.03
	11.5		8.05							28.1	5.52
	11.8		8.25							29.0	5.22
LEW	12.3		8.59					RBP		29.8	5.05
	12.6		9.23	0.6				0.48			
	12.9		9.33	0.6				0.63			
	13.2		9.46	0.7				0.42			
on rock	13.5		9.03	0.15				0.48			
on rock behind rock	13.8		8.84	0.15				0.34			
	14.1		9.00	0.35				0.61			
	14.4		9.05	0.35				0.54			
behind rock	14.7		8.93	0.35				0.09			
	15.0		8.96	0.30				0.78			
	15.3		8.94	0.30				0.88			
on rock	15.6		8.85	0.20				0.92			
"	15.9		8.72	0.20				0.78			
"	16.2		8.72	0.15				1.13			
"	16.5		8.65	0.10				0.91			
"	16.8		8.64	0.05				-			
	17.1		8.96	0.30				0.95			
	17.4		8.82	0.25				0.64			
behind rock	17.7		8.65	0.20				-			
"	18.0		8.83	0.25				-			
"	18.3		8.91	0.25				0.46			
"	18.6		8.90	0.15				0.33			
REW	19.0		8.58								
	19.5		8.51								
	19.8		8.65								
	20.5		8.57								
TOTALS											
End of Measurement		Time:		Gage Reading		CALCULATIONS PERFORMED BY:		CALCULATIONS CHECKED BY:			

-BF = 9.3, 25

REW - 19.0
LEW - 12.3

interval = .335

PEBBLE COUNT DATA SHEET

Stream: Little Sands

Date: 8/31/16

Sampler: H. McIntyre M. Porter

Reach: x55

Notes: R. Sutton

Comments:

Size Range (mm)	Habitat (r = riffle, p = pool, g = glide)	Count
<2		(35)
2.8		
4		
5.6		(2)
8		(1)
11		(1)
16		(10)
22.6		(9)
32		(13)
45		(10)
64		(12)
90		(8)
128		(12)
180		(7)
260		
>260		(4)
Bedrock		(1)
TOTAL D50		125



FIELD DATA
FOR
INSTREAM FLOW DETERMINATIONS



COLORADO WATER
 CONSERVATION BOARD

LOCATION INFORMATION

CONSERVATION BOARD										CROSS-SECTION NO.: RI X56									
STREAM NAME: Little Sands																			
CROSS-SECTION LOCATION										Lowest XS, just below XS 5 $\approx$ 8 miles, Steeper Slope on Left Bank also in 25'-30' trees. large Alder on Right Bank just above XS6									
DATE: 8/31/16		OBSERVERS: R. Sutton, H. McIntyre, M. Porter, F. Cardinale, J. Vanderbilt																	
LEGAL DESCRIPTION		SECTION: SE		SECTION: 13		TOWNSHIP: 37		RANGE: 4		E/W: E		M: M							
COUNTY: Hinsdale		WATERSHED: San Juan		WATER DIVISION: 7		DOW WATER CODE: 38108													
USGS: Oakbrush Ridge																			
USFS: SJNF																			

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION		YES/NO	METER TYPE		Marsh Mc Birney				
METER NUMBER.		DATE RATED.		CALIB/SPIN	____ INCH	TAPE WEIGHT	____ lbs/foot	TAPE TENSION	____ lbs
CHANNEL BED MATERIAL SIZE RANGE					PHOTOGRAPHS TAKEN		YES/NO	NUMBER OF PHOTOGRAPHS	

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE MM	ROD READING (M)
⊗ Tape @ Stake LB	0.0	
⊗ Tape @ Stake RB	0.0	
① WS @ Tape LB/RB	0.0	
② WS Upstream	10.80	7.62
③ WS Downstream	4.0	7.81
SLOPE	$(7.81 - 7.62) / 14.80 = 0.013$	

SKETCH

LEGEND:

Stake ⊗

Station (•)

Photo ◇

Direction of Flow →

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED YES/NO	DISTANCE ELECTROFISHED _____ M	FISH CAUGHT YES/NO	WATER CHEMISTRY SAMPLED YES/NO														
LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1.0-1.9, 2.0-2.9, ETC.)																	
SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL
AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME																	

COMMENTS

Some clouds over head, $\approx 75^{\circ}\text{F}$, clouds moved out and became sunny

UTM 0301089 414719E

22.4 - 11.47 REW
11.44

LEW 21.1
REW 11.1

.4

DISCHARGE/CROSS SECTION NOTES

STREAM NAME: Little Sands CROSS-SECTION NO: X56 DATE: 8/31/16 SHEET 1 OF 1

BEGINNING OF MEASUREMENT: EDGE OF WATER LOOKING DOWNSTREAM (0.0 AT STAKE) LEFT / RIGHT: Gage Reading: TIME: 12:35 → 13:05

Stake Grassline (G) Waterline (W) Rock	(3) Waterline (W) Rock	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)		Area (ft ²)	Discharge (cfs)
									At Point	Mean in Vertical		
BM				6.305								
LBP		3.3		4.10								
		4.6		4.71								
		6.0		5.59								
LBF		7.0		6.11								
		7.8		6.81								
		8.5		7.24								
		9.0		7.46								
		10.0		7.52								
LEW		11.1		7.72								
		11.5		7.75	0.05							
rock		11.9		7.94	0.10				0.13			
		12.3		7.86	0.20				0.19			
rock		12.7		7.93	0.05							
behind rock		13.1		7.92	0.20				0.17			
		13.5		8.04	0.30				0.57			
		13.9		8.15	0.30				0.42			
		14.3		8.20	0.40				0.15			
		14.7		8.0	0.35				0.63			
		15.1		8.07	0.30				0.60			
		15.5		8.20	0.40				0.91			
		15.9		8.21	0.50				0.67			
on rock		16.3		8.14	0.25				0.26			
Rock		16.7		7.90	0.25				0.16			
		17.1		8.01	0.40				0.27			
		17.5		8.14	0.30				0.13			
rock		17.9		7.96	0.15				0.30			
		18.3		7.95	0.15				0.18			
		18.7		7.98	0.20				0.52			
rock		19.1		8.03	0.10				0.01			
behind rock		19.5		8.06	0.30							
		19.9		8.0	0.20				0.03			
		20.3		8.03	0.25				0.21			
		20.7		7.95	0.10				0.02			
REW		21.1		7.73								
		22.1		7.53								
		23.1		7.06								
		24.0		6.79								
RBF		24.9		6.34								
RBF		25.0		6.13								
		25.3		5.15								
TOTALS												

Typ	Station	Depth
	26.0	4.89
	26.9	4.72
	28.0	4.65
	29.0	4.60
RBP	29.8	4.63
BM	—	6.305

End of Measurement Time: Gage Reading: CALCULATIONS PERFORMED BY: CALCULATIONS CHECKED BY:

PEBBLE COUNT DATA SHEET

Stream: Little Sand

Date: 8/31/2016

Sampler: Foster, McIntyre

Reach: X56

Notes: I. Cadiante

Comments:

Size Range (mm)	Habitat (r = riffle, p = pool, g = glide)	Count
		(37)
<2		
2.8		
4		(2)
5.6		(7)
8		(8)
11		(14)
16		(8)
22.6		(12)
32		(13)
45		(10)
64		(8)
90		(7)
128		(3)
180		(5)
260		
>260		(6)
Bedrock		
TOTAL D50		140

Note:Enter Total Count and Stream Description (Name, Date, etc.)
Check Cell Notes (Alt.+R ,N (under FORMULA)) for specific information.

Pebble Count Worksheet and Summary

COMMENTS:

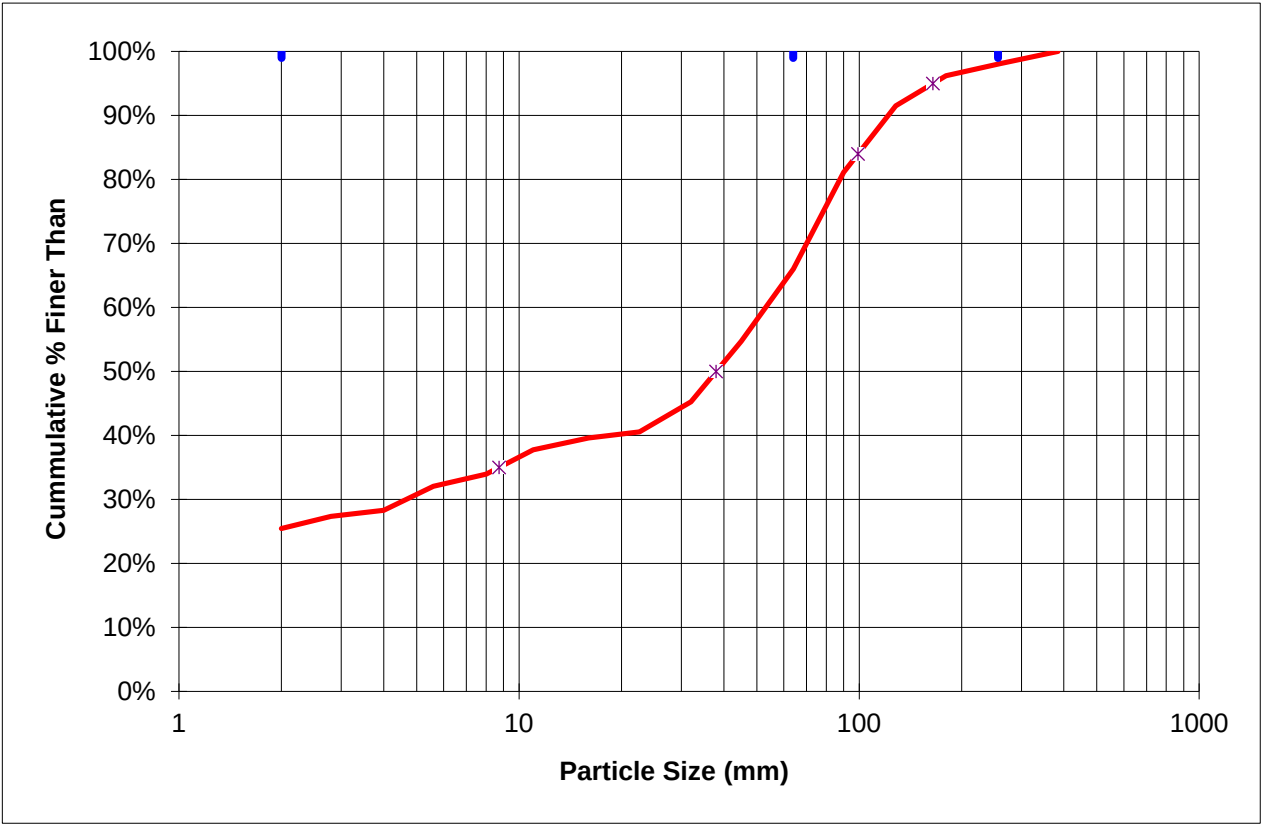
Particle Size (mm)	% finer than	Total Count
<2	25%	27
2 - 2.8	27%	2
2.8 - 4	28%	1
4 - 5.6	32%	4
5.6 - 8	34%	2
8 - 11	38%	4
11 - 16	40%	2
16 - 22.6	41%	1
22.6 - 32	45%	5
32 - 45	55%	10
45 - 64	66%	12
64 - 90	81%	16
90 - 128	92%	11
128 - 180	96%	5
180 - 260	98%	2
>260	100%	2

STREAM NAME: Little Sand Creek
ID NUMBER: R1XS2
DATE: 7/11/2016
CREW: Seebach/Porter

Particle Size Distribution (mm)

D15	D35	D50	D84	D95
#N/A	8.7	37.9	99.2	164.7

D84 in Ft for 0.3254634
R2Cross



Note:Enter Total Count and Stream Description (Name, Date, etc.)
Check Cell Notes (Alt.+R ,N (under FORMULA)) for specific information.

Pebble Count Worksheet and Summary

COMMENTS:

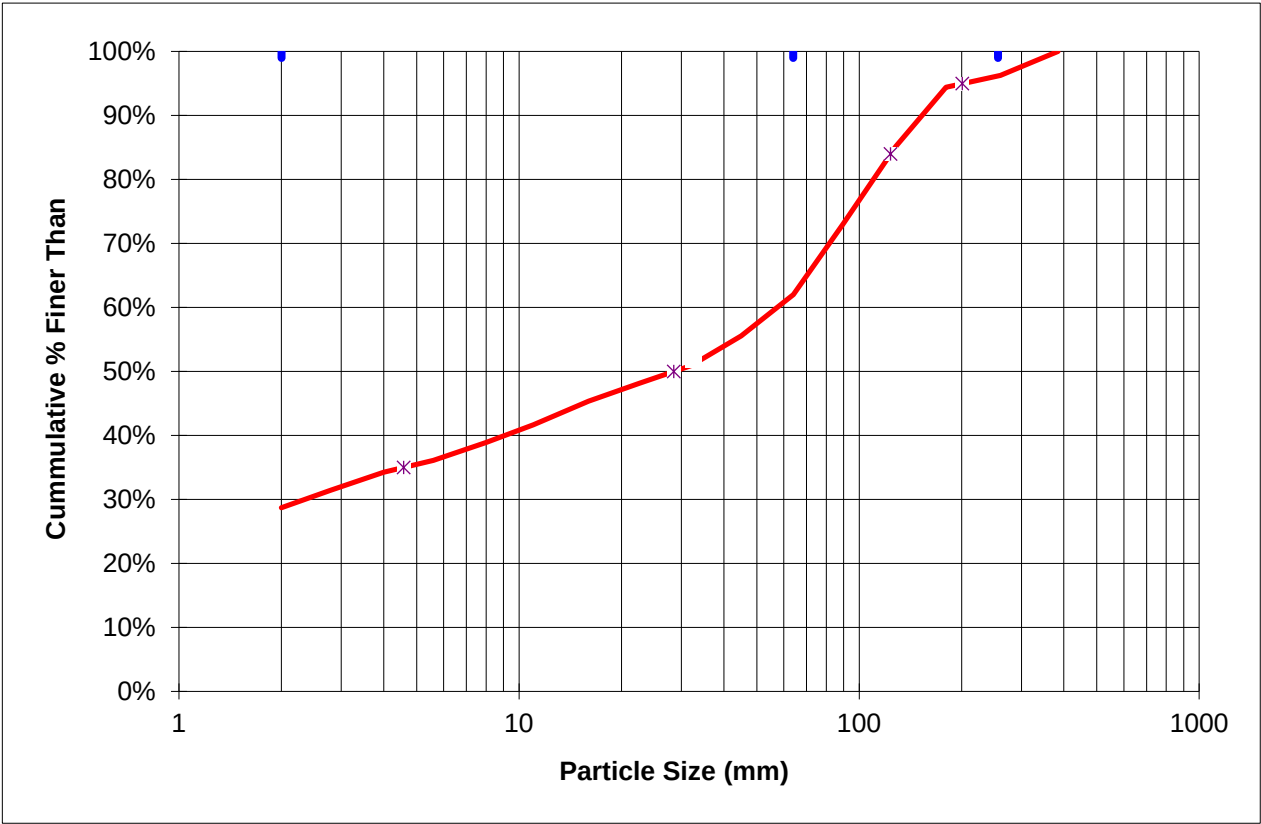
Particle Size (mm)	% finer than	Total Count
<2	29%	31
2 - 2.8	31%	3
2.8 - 4	34%	3
4 - 5.6	36%	2
5.6 - 8	39%	3
8 - 11	42%	3
11 - 16	45%	4
16 - 22.6	48%	3
22.6 - 32	51%	3
32 - 45	56%	5
45 - 64	62%	7
64 - 90	73%	12
90 - 128	85%	13
128 - 180	94%	10
180 - 260	96%	2
>260	100%	4

STREAM NAME: Little Sand Creek
ID NUMBER: R1XS3
DATE: 7/11/2095
CREW: Seebach/Porter

Particle Size Distribution (mm)

D15	D35	D50	D84	D95
#N/A	4.6	28.5	123.6	201.0

D84 in Ft for 0.4056333
R2Cross



Note:Enter Total Count and Stream Description (Name, Date, etc.)
Check Cell Notes (Alt.+R ,N (under FORMULA)) for specific information.

Pebble Count Worksheet and Summary

COMMENTS:

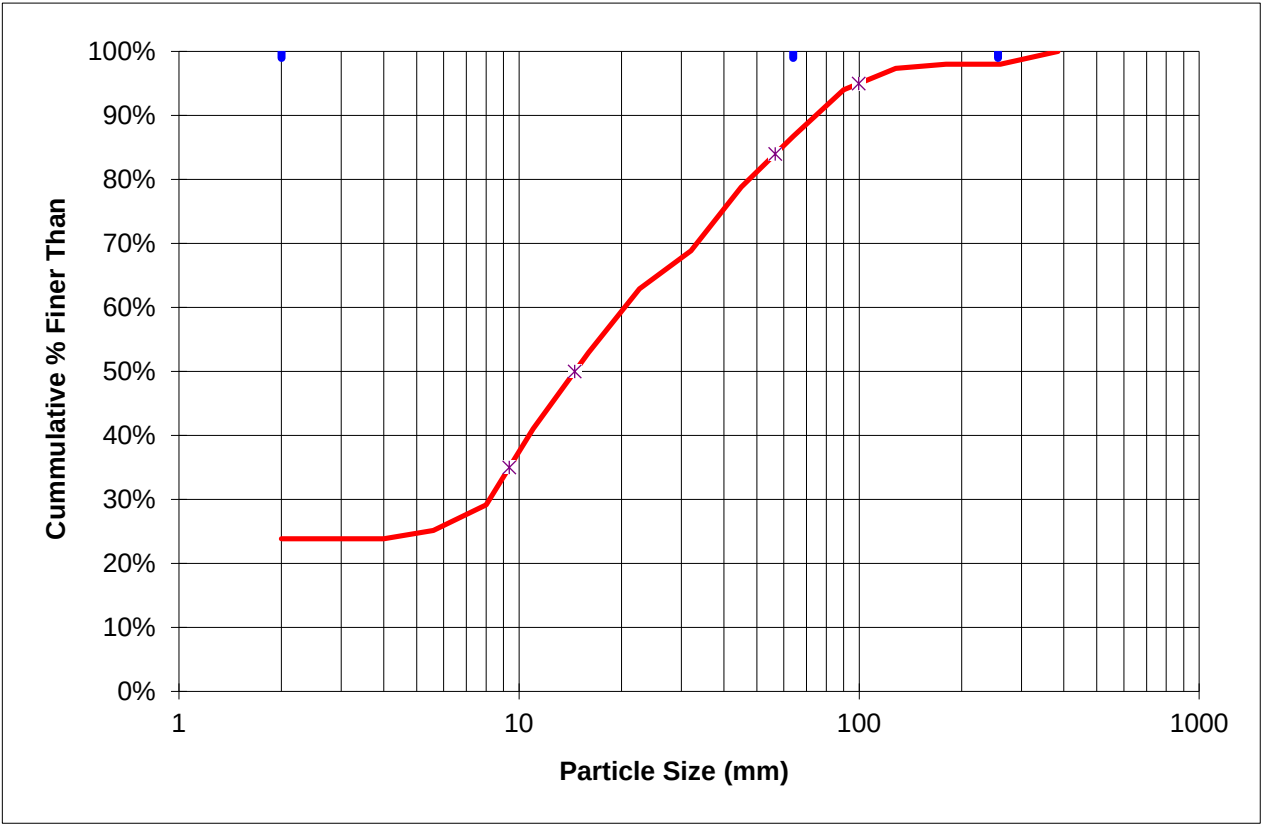
Particle Size (mm)	% finer than	Total Count
<2	24%	36
2 - 2.8	24%	0
2.8 - 4	24%	0
4 - 5.6	25%	2
5.6 - 8	29%	6
8 - 11	41%	18
11 - 16	53%	18
16 - 22.6	63%	15
22.6 - 32	69%	9
32 - 45	79%	15
45 - 64	87%	12
64 - 90	94%	11
90 - 128	97%	5
128 - 180	98%	1
180 - 260	98%	0
>260	100%	3

STREAM NAME: Little Sand Creek
ID NUMBER: R1XS4
DATE: 8/31/2016
CREW: Anderson&McIntyre/Sutton

Particle Size Distribution (mm)

D15	D35	D50	D84	D95
#N/A	9.4	14.6	56.6	99.7

D84 in Ft for 0.1858388
R2Cross



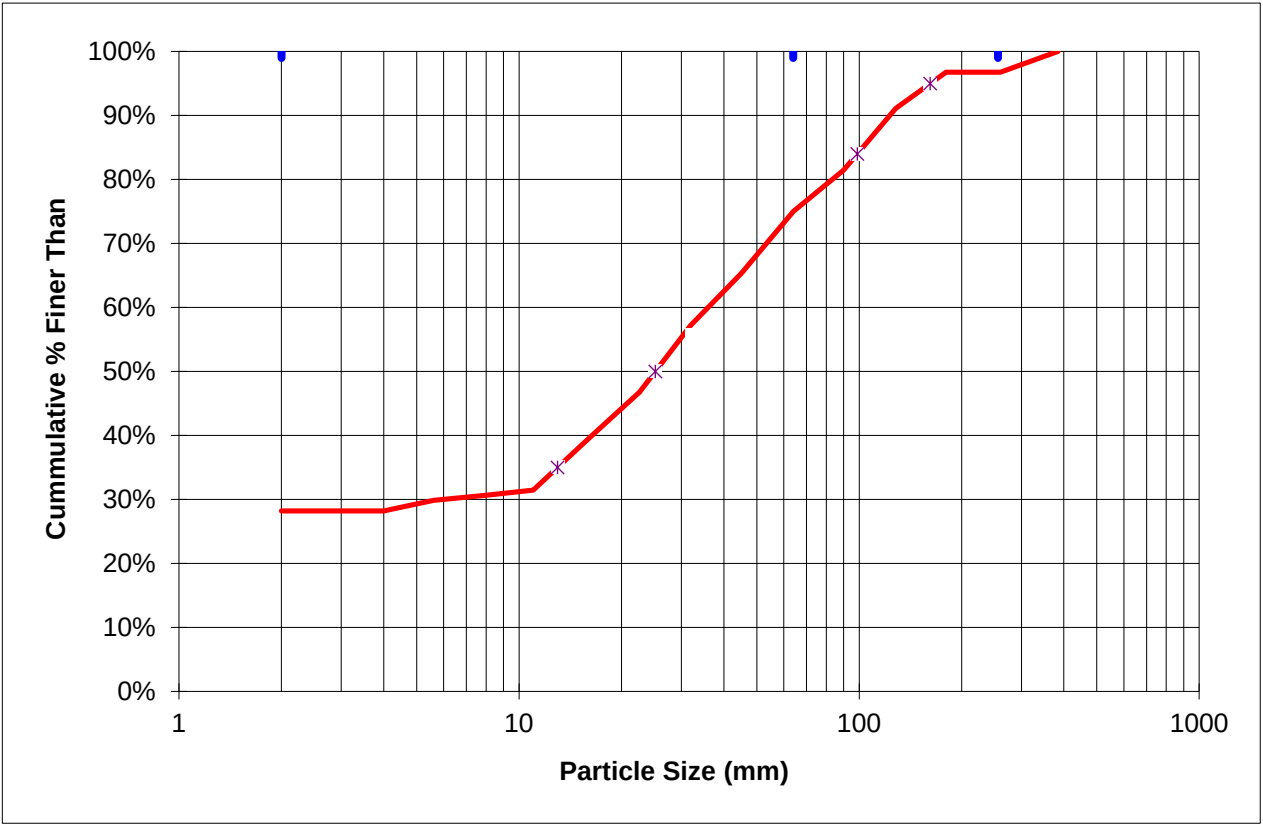
Note:Enter Total Count and Stream Description (Name, Date, etc.)
Check Cell Notes (Alt.+R ,N (under FORMULA)) for specific information.
Pebble Count Worksheet and Summary **COMMENTS:**

Particle Size (mm)	% finer than	Total Count
<2	28%	35
2 - 2.8	28%	0
2.8 - 4	28%	0
4 - 5.6	30%	2
5.6 - 8	31%	1
8 - 11	31%	1
11 - 16	40%	10
16 - 22.6	47%	9
22.6 - 32	57%	13
32 - 45	65%	10
45 - 64	75%	12
64 - 90	81%	8
90 - 128	91%	12
128 - 180	97%	7
180 - 260	97%	0
>260	100%	4

STREAM NAME: Little Sand Creek
ID NUMBER: R1XS5
DATE: 8/31/2016
CREW: McIntyre&Porter/Sutton

Particle Size Distribution (mm)	D15	D35	D50	D84	D95
	#N/A	13.0	25.2	98.7	161.7

D84 in Ft for 0.3239731
R2Cross



Note:Enter Total Count and Stream Description (Name, Date, etc.)
Check Cell Notes (Alt.+R ,N (under FORMULA)) for specific information.

Pebble Count Worksheet and Summary

COMMENTS:

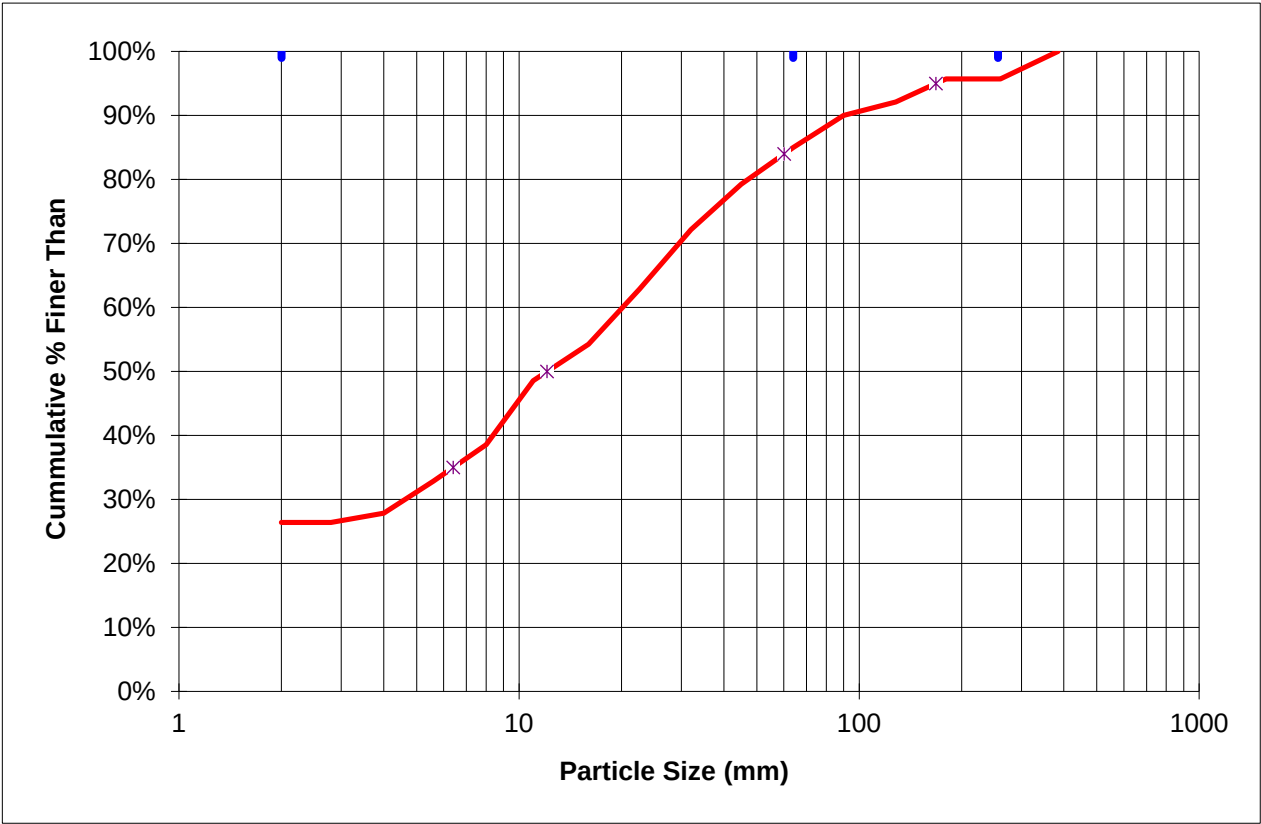
Particle Size (mm)	% finer than	Total Count
<2	26%	37
2 - 2.8	26%	0
2.8 - 4	28%	2
4 - 5.6	33%	7
5.6 - 8	39%	8
8 - 11	49%	14
11 - 16	54%	8
16 - 22.6	63%	12
22.6 - 32	72%	13
32 - 45	79%	10
45 - 64	85%	8
64 - 90	90%	7
90 - 128	92%	3
128 - 180	96%	5
180 - 260	96%	0
>260	100%	6

STREAM NAME: Little Sand Creek
ID NUMBER: R1XS6
DATE: 8/31/2016
CREW: Porter&McIntyre/Cadiente

Particle Size Distribution (mm)

D15	D35	D50	D84	D95
#N/A	6.4	12.1	60.2	168.1

D84 in Ft for 0.1974221
R2Cross



Data Input & Proofing

STREAM NAME: Little Sand Creek
 XS LOCATION: Reach 1
 XS NUMBER: 2
 DATE: 7/14/2016
 OBSERVERS: Kampf, Cadiente, Seebach, Porter

1/4 SEC: SE
 SECTION: 13
 TWP: 37 N
 RANGE: 4 W
 PM: NM

COUNTY: Archuleta
 WATERSHED: Little Sand
 DIVISION: 7
 DOW CODE:
 USGS MAP: Bear Park CO
 USFS MAP:

TAPE WT: 0.0106 lbs / ft
 TENSION: 99999 lbs

SLOPE: 0.0295 ft / ft

CHECKED BY: DATE

ASSIGNED TO: DATE

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
Total Data Points = 56								
1	S	0.80	4.33			0.00	0.00	0.00
	G	2.10	4.89			0.00	0.00	0.00
		2.70	5.1			0.00	0.00	0.00
		2.80	5.48			0.00	0.00	0.00
		3.40	5.91			0.00	0.00	0.00
		4.80	5.82			0.00	0.00	0.00
		5.70	5.95			0.00	0.00	0.00
		6.20	5.98			0.00	0.00	0.00
	R	6.70	5.78			0.00	0.00	0.00
	W	7.30	6.04			0.00	0.00	0.00
		7.60	6.12	0.10	0.00	0.03	0.00	6.02
		7.90	6.14	0.10	0.00	0.03	0.00	6.04
		8.20	6.12	0.00	0.00	0.00	0.00	0.00
		8.50	6.07	0.00	0.00	0.00	0.00	0.00
		8.80	6.09	0.10	0.06	0.03	0.00	5.99
		9.10	6.16	0.10	0.00	0.03	0.00	6.06
		9.40	6.31	0.20	0.00	0.06	0.00	6.11
		9.70	6.30	0.20	0.10	0.06	0.01	6.10
		10.00	6.25	0.20	0.59	0.06	0.04	6.05
		10.30	6.24	0.10	1.22	0.03	0.04	6.14
		10.60	6.08	0.15	0.47	0.05	0.02	5.93
		10.90	6.35	0.00	0.00	0.00	0.00	0.00
		11.20	6.36	0.20	0.48	0.06	0.03	6.16
		11.50	6.38	0.30	0.85	0.09	0.08	6.08
		11.80	6.36	0.20	1.82	0.06	0.11	6.16
		12.10	6.22	0.20	1.53	0.06	0.09	6.02
		12.40	6.40	0.25	0.00	0.08	0.00	6.15
		12.70	6.30	0.30	0.45	0.09	0.04	6.00
		13.00	6.33	0.35	0.94	0.11	0.10	5.98
		13.30	6.39	0.30	1.41	0.09	0.13	6.09
		13.60	6.31	0.25	1.46	0.08	0.11	6.06
		13.90	6.32	0.20	0.16	0.06	0.01	6.12
		14.20	6.37	0.30	0.94	0.09	0.08	6.07
		14.50	6.33	0.25	0.63	0.08	0.05	6.08
		14.80	6.24	0.10	0.00	0.03	0.00	6.14
		15.10	6.23	0.10	0.00	0.03	0.00	6.13
		15.40	6.12	0.05	0.00	0.02	0.00	6.07
	W	15.70	6.06			0.00	0.00	0.00
		16.10	6.01			0.00	0.00	0.00
		17.00	6.04			0.00	0.00	0.00
		17.90	5.88			0.00	0.00	0.00
		18.30	5.71			0.00	0.00	0.00
		19.00	5.60			0.00	0.00	0.00
		20.00	5.49			0.00	0.00	0.00
		21.40	5.27			0.00	0.00	0.00
		23.40	5.09			0.00	0.00	0.00
		25.10	5.02			0.00	0.00	0.00
1	G	25.20	4.84			0.00	0.00	0.00
		25.30	4.80			0.00	0.00	0.00
		25.50	4.64			0.00	0.00	0.00
		26.60	4.51			0.00	0.00	0.00
		27.20	4.29			0.00	0.00	0.00
		28.10	3.57			0.00	0.00	0.00
		28.30	3.34			0.00	0.00	0.00
		28.90	3.04			0.00	0.00	0.00
	S	29.40	2.92			0.00	0.00	0.00

Totals	1.38	0.92
--------	------	------

STREAM NAME: Little Sand Creek
 XS LOCATION: Reach 1
 XS NUMBER: 2

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.89	23.07	0.93	1.51	21.44	24.19	100.0%	0.89	44.42	2.07
	5.10	20.59	0.81	1.30	16.75	21.59	89.3%	0.78	31.74	1.90
	5.15	20.02	0.79	1.25	15.73	20.98	86.7%	0.75	29.15	1.85
	5.20	19.45	0.76	1.20	14.75	20.37	84.2%	0.72	26.69	1.81
	5.25	18.88	0.73	1.15	13.79	19.76	81.7%	0.70	24.35	1.77
	5.30	18.46	0.70	1.10	12.86	19.29	79.8%	0.67	22.02	1.71
	5.35	18.13	0.66	1.05	11.94	18.92	78.2%	0.63	19.73	1.65
	5.40	17.79	0.62	1.00	11.04	18.54	76.7%	0.60	17.55	1.59
	5.45	17.46	0.58	0.95	10.16	18.17	75.1%	0.56	15.48	1.52
	5.50	17.08	0.54	0.90	9.30	17.76	73.4%	0.52	13.56	1.46
	5.55	16.56	0.51	0.85	8.46	17.21	71.2%	0.49	11.82	1.40
	5.60	16.03	0.48	0.80	7.64	16.67	68.9%	0.46	10.20	1.33
	5.65	15.64	0.44	0.75	6.85	16.26	67.2%	0.42	8.64	1.26
	5.70	15.26	0.40	0.70	6.08	15.85	65.5%	0.38	7.20	1.18
	5.75	15.03	0.35	0.65	5.32	15.60	64.5%	0.34	5.83	1.10
	5.80	14.75	0.31	0.60	4.58	15.28	63.2%	0.30	4.60	1.00
	5.85	13.64	0.28	0.55	3.86	14.13	58.4%	0.27	3.65	0.94
	5.90	12.03	0.27	0.50	3.22	12.47	51.5%	0.26	2.93	0.91
	5.95	10.99	0.24	0.45	2.64	11.40	47.1%	0.23	2.24	0.85
	6.00	10.02	0.21	0.40	2.12	10.40	43.0%	0.20	1.65	0.78
	6.05	8.44	0.20	0.35	1.66	8.81	36.4%	0.19	1.23	0.74
WL	6.10	7.39	0.17	0.30	1.26	7.73	32.0%	0.16	0.85	0.67
	6.15	6.05	0.15	0.25	0.93	6.34	26.2%	0.15	0.58	0.62
	6.20	5.64	0.11	0.20	0.63	5.88	24.3%	0.11	0.32	0.51
	6.25	4.58	0.08	0.15	0.37	4.76	19.7%	0.08	0.15	0.41
	6.30	3.77	0.04	0.10	0.16	3.88	16.0%	0.04	0.04	0.27
	6.35	1.77	0.02	0.05	0.03	1.81	7.5%	0.02	0.00	0.14
	6.40	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

STREAM NAME: Little Sand Creek
 XS LOCATION: Reach 1
 XS NUMBER: 2

Thorne-Zevenbergen D84 Correction Applied
 User Supplied D84 =

0.33

STAGING TABLE

GL = lowest Grassline elevation corrected for sag

WL = Waterline corrected for variations in field measured water surface elevations and sag

Bathurst Formula Velocity

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	4.89	23.07	0.93	1.51	21.44	24.19	100.0%	0.89	225.66	10.52
	5.10	20.59	0.81	1.30	16.75	21.59	89.3%	0.78	142.79	8.53
	5.15	20.02	0.79	1.25	15.73	20.98	86.7%	0.75	127.06	8.08
	5.20	19.45	0.76	1.20	14.75	20.37	84.2%	0.72	112.56	7.63
	5.25	18.88	0.73	1.15	13.79	19.76	81.7%	0.70	99.23	7.20
	5.30	18.46	0.70	1.10	12.86	19.29	79.8%	0.67	85.26	6.63
	5.35	18.13	0.66	1.05	11.94	18.92	78.2%	0.63	71.64	6.00
	5.40	17.79	0.62	1.00	11.04	18.54	76.7%	0.60	59.58	5.39
	5.45	17.46	0.58	0.95	10.16	18.17	75.1%	0.56	48.97	4.82
	5.50	17.08	0.54	0.90	9.30	17.76	73.4%	0.52	39.97	4.30
	5.55	16.56	0.51	0.85	8.46	17.21	71.2%	0.49	32.79	3.88
	5.60	16.03	0.48	0.80	7.64	16.67	68.9%	0.46	26.53	3.47
	5.65	15.64	0.44	0.75	6.85	16.26	67.2%	0.42	20.70	3.02
	5.70	15.26	0.40	0.70	6.08	15.85	65.5%	0.38	15.81	2.60
	5.75	15.03	0.35	0.65	5.32	15.60	64.5%	0.34	11.52	2.17
	5.80	14.75	0.31	0.60	4.58	15.28	63.2%	0.30	8.17	1.79
	5.85	13.64	0.28	0.55	3.86	14.13	58.4%	0.27	6.15	1.59
	5.90	12.03	0.27	0.50	3.22	12.47	51.5%	0.26	4.85	1.51
	5.95	10.99	0.24	0.45	2.64	11.40	47.1%	0.23	3.49	1.32
	6.00	10.02	0.21	0.40	2.12	10.40	43.0%	0.20	2.39	1.13
	6.05	8.44	0.20	0.35	1.66	8.81	36.4%	0.19	1.71	1.03
WL	6.10	7.39	0.17	0.30	1.26	7.73	32.0%	0.16	1.08	0.86
	6.15	6.05	0.15	0.25	0.93	6.34	26.2%	0.15	0.69	0.74
	6.20	5.64	0.11	0.20	0.63	5.88	24.3%	0.11	0.33	0.53
	6.25	4.58	0.08	0.15	0.37	4.76	19.7%	0.08	0.14	0.37
	6.30	3.77	0.04	0.10	0.16	3.88	16.0%	0.04	0.04	0.24
	6.35	1.77	0.02	0.05	0.03	1.81	7.5%	0.02	0.00	0.12
	6.40	0.00	#DIV/0!	0.00	0.00	0.00	0.0%	#DIV/0!	#DIV/0!	#DIV/0!

0.2307

avg. depth 3.15 cfs
 % wet perim 4.39 cfs
 avg. velocity 1.60 cfs

Data Input & Proofing

STREAM NAME: Little Sand Creek
 XS LOCATION: Reach 1
 XS NUMBER: XS 3
 DATE: 7/14/2016
 OBSERVERS: Seebach, Porter, Cadiente, Kampf

1/4 SEC: SE
 SECTION: 13
 TWP: 37 N
 RANGE: 4 W
 PM: NMPM

COUNTY: Hinsdale
 WATERSHED: San Juan
 DIVISION: 7
 DOW CODE: 38108
 USGS MAP: Bear Park, CO
 USFS MAP: SJNF Visitors map

TAPE WT: 0.0106 lbs / ft
 TENSION: 99999 lbs

SLOPE: 0.00462 ft / ft

CHECKED BY: DATE

ASSIGNED TO: DATE

GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
Total Data Points = 49								
1	BOP	2.40	5.78			0.00	0.00	0.00
		3.50	6.00			0.00	0.00	0.00
		4.20	6.30			0.00	0.00	0.00
	G	4.60	6.32			0.00	0.00	0.00
		5.30	6.58			0.00	0.00	0.00
		5.70	7.00			0.00	0.00	0.00
		6.30	7.12			0.00	0.00	0.00
	R	6.80	7.03			0.00	0.00	0.00
	W	7.20	7.24			0.00	0.00	0.00
		7.50	7.47	0.30	0.50	0.09	0.05	7.17
		7.80	7.46	0.30	0.57	0.09	0.05	7.16
	R	8.10	7.33	0.20	0.73	0.06	0.04	7.13
	R	8.40	7.45	0.35	0.43	0.11	0.05	7.10
		8.70	7.55	0.25	0.29	0.08	0.02	7.30
	R	9.00	7.20	0.00	0.00	0.00	0.00	0.00
		9.30	7.40	0.25	0.14	0.08	0.01	7.15
		9.60	7.35	0.20	0.12	0.06	0.01	7.15
		9.90	7.56	0.25	0.11	0.08	0.01	7.31
		10.20	7.50	0.35	0.67	0.11	0.07	7.15
		10.50	7.52	0.35	0.53	0.11	0.06	7.17
		10.80	7.33	0.20	1.45	0.06	0.09	7.13
		11.10	7.29	0.10	0.51	0.03	0.02	7.19
		11.40	7.42	0.10	0.76	0.03	0.02	7.32
		11.70	7.44	0.20	1.20	0.06	0.07	7.24
		12.00	7.47	0.30	0.30	0.09	0.03	7.17
		12.30	7.48	0.15	0.10	0.05	0.00	7.33
		12.60	7.29	0.10	0.49	0.03	0.01	7.19
		12.90	7.39	0.10	0.15	0.03	0.00	7.29
		13.20	7.40	0.20	0.39	0.06	0.02	7.20
		13.50	7.28	0.10	0.48	0.03	0.01	7.18
	R	13.80	7.21	0.20	0.36	0.06	0.02	7.01
		14.10	7.25	0.20	0.47	0.06	0.03	7.05
		14.40	7.40	0.20	0.10	0.06	0.01	7.20
		14.70	7.46	0.25	0.16	0.08	0.01	7.21
		15.00	7.43	0.30	0.15	0.09	0.01	7.13
		15.30	7.38	0.20	0.12	0.06	0.01	7.18
		15.60	7.38	0.00	0.00	0.00	0.00	0.00
		15.90	7.19	0.00	0.00	0.00	0.00	0.00
	W	16.00	7.15			0.00	0.00	0.00
		16.70	6.94			0.00	0.00	0.00
		18.00	7.08			0.00	0.00	0.00
		18.50	7.11			0.00	0.00	0.00
		19.60	7.00			0.00	0.00	0.00
		20.20	6.76			0.00	0.00	0.00
		22.30	6.56			0.00	0.00	0.00
		23.00	6.43			0.00	0.00	0.00
	G	23.50	6.31			0.00	0.00	0.00
		24.30	6.16			0.00	0.00	0.00
	BOP	24.90	5.95			0.00	0.00	0.00

Totals	1.71	0.73
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STREAM NAME: Little Sand Creek
 XS LOCATION: Reach 1
 XS NUMBER: XS 3

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.32	18.86	0.78	1.24	14.62	20.03	100.0%	0.73	15.46	1.06
	6.34	18.70	0.76	1.22	14.18	19.86	99.2%	0.71	14.78	1.04
	6.39	18.35	0.72	1.17	13.25	19.50	97.4%	0.68	13.36	1.01
	6.44	17.99	0.69	1.12	12.34	19.13	95.5%	0.65	12.02	0.97
	6.49	17.59	0.65	1.07	11.45	18.71	93.4%	0.61	10.77	0.94
	6.54	17.19	0.62	1.02	10.58	18.29	91.3%	0.58	9.59	0.91
	6.59	16.63	0.59	0.97	9.73	17.72	88.5%	0.55	8.52	0.88
	6.64	16.06	0.56	0.92	8.92	17.13	85.5%	0.52	7.53	0.84
	6.69	15.49	0.52	0.87	8.13	16.53	82.5%	0.49	6.61	0.81
	6.74	14.92	0.49	0.82	7.37	15.94	79.6%	0.46	5.75	0.78
	6.79	14.61	0.45	0.77	6.63	15.60	77.9%	0.43	4.89	0.74
	6.84	14.44	0.41	0.72	5.91	15.40	76.9%	0.38	4.07	0.69
	6.89	14.27	0.36	0.67	5.19	15.20	75.9%	0.34	3.31	0.64
	6.94	14.05	0.32	0.62	4.48	14.95	74.6%	0.30	2.62	0.58
	6.99	13.25	0.29	0.57	3.80	14.10	70.4%	0.27	2.07	0.54
	7.04	11.84	0.27	0.52	3.17	12.67	63.3%	0.25	1.64	0.52
	7.09	9.99	0.26	0.47	2.62	10.78	53.8%	0.24	1.33	0.51
	7.14	9.01	0.24	0.42	2.15	9.78	48.8%	0.22	1.03	0.48
WL	7.19	8.78	0.19	0.37	1.71	9.53	47.6%	0.18	0.71	0.42
	7.24	8.11	0.16	0.32	1.28	8.79	43.9%	0.15	0.46	0.36
	7.29	7.47	0.12	0.27	0.89	8.07	40.3%	0.11	0.27	0.30
	7.34	6.28	0.09	0.22	0.55	6.74	33.6%	0.08	0.14	0.25
	7.39	4.35	0.06	0.17	0.28	4.64	23.2%	0.06	0.06	0.20
	7.44	2.54	0.04	0.12	0.11	2.70	13.5%	0.04	0.02	0.15
	7.49	0.95	0.03	0.07	0.03	1.02	5.1%	0.03	0.00	0.11
	7.54	0.13	0.01	0.02	0.00	0.14	0.7%	0.01	0.00	0.05

(1) Velocity = 13.025
 (0.2) depth = 0.774
 (50) % WP = 1.102

STREAM NAME: Little Sand Creek
 XS LOCATION: Reach 1
 XS NUMBER: XS 3

Thorne-Zevenbergen D84 Correction Applied
 User Supplied D84 =

enter to
 4 decimal
 place ✓
 0.41

GL = lowest Grassline elevation corrected for sag

STAGING TABLE

WL = Waterline corrected for variations in field measured water surface elevations and sag

Velocity based on test of R/D84>1

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.32	18.86	0.78	1.24	14.62	20.03	100.0%	0.73	23.41	1.60
	6.34	18.70	0.76	1.22	14.18	19.86	99.2%	0.71	22.20	1.57
	6.39	18.35	0.72	1.17	13.25	19.50	97.4%	0.68	19.74	1.49
	6.44	17.99	0.69	1.12	12.34	19.13	95.5%	0.65	17.44	1.41
	6.49	17.59	0.65	1.07	11.45	18.71	93.4%	0.61	15.31	1.34
	6.54	17.19	0.62	1.02	10.58	18.29	91.3%	0.58	13.33	1.26
	6.59	16.63	0.59	0.97	9.73	17.72	88.5%	0.55	11.59	1.19
	6.64	16.06	0.56	0.92	8.92	17.13	85.5%	0.52	10.00	1.12
	6.69	15.49	0.52	0.87	8.13	16.53	82.5%	0.49	8.54	1.05
	6.74	14.92	0.49	0.82	7.37	15.94	79.6%	0.46	7.21	0.98
	6.79	14.61	0.45	0.77	6.63	15.60	77.9%	0.43	5.89	0.89
	6.84	14.44	0.41	0.72	5.91	15.40	76.9%	0.38	5.34	0.90
	6.89	14.27	0.36	0.67	5.19	15.20	75.9%	0.34	3.93	0.76
	6.94	14.05	0.32	0.62	4.48	14.95	74.6%	0.30	2.81	0.63
	6.99	13.25	0.29	0.57	3.80	14.10	70.4%	0.27	2.08	0.55
	7.04	11.84	0.27	0.52	3.17	12.67	63.3%	0.25	1.59	0.50
	7.09	9.99	0.26	0.47	2.62	10.78	53.8%	0.24	1.28	0.49
	7.14	9.01	0.24	0.42	2.15	9.78	48.8%	0.22	0.93	0.43
WL	7.19	8.78	0.19	0.37	1.71	9.53	47.6%	0.18	0.57	0.33
	7.24	8.11	0.16	0.32	1.28	8.79	43.9%	0.15	0.34	0.26
	7.29	7.47	0.12	0.27	0.89	8.07	40.3%	0.11	0.18	0.20
	7.34	6.28	0.09	0.22	0.55	6.74	33.6%	0.08	0.08	0.15
	7.39	4.35	0.06	0.17	0.28	4.64	23.2%	0.06	0.03	0.11
	7.44	2.54	0.04	0.12	0.11	2.70	13.5%	0.04	0.01	0.06
	7.49	0.95	0.03	0.07	0.03	1.02	5.1%	0.03	0.00	0.02
	7.54	0.13	0.01	0.02	0.00	0.14	0.7%	0.01	0.00	0.00

(1) Velocity = 7.59
 (2) depth = 0.642
 (50%) % WP = 1.014

Data Input & Proofing

GL=1 FEATURE

STREAM NAME:	Little Sand
XS LOCATION:	Reach 1
XS NUMBER:	XS4
DATE:	8/31/2016
OBSERVERS:	Porter, Cadiente, Vanderbilt, McIntyre, Anderson, Sutton

1/4 SEC:	SE
SECTION:	13
TWP:	37 North
RANGE:	4 West
PM:	NM

COUNTY:	Hinsdale
WATERSHED:	San Juan
DIVISION:	7
DOW CODE:	38108
USGS MAP:	Oakbrush Ridge
USFS MAP:	SJNF

TAPE WT:	0.0106	lbs / ft
TENSION:	99999	lbs

SLOPE: ft / ft

CHECKED BY:.....DATE.....

ASSIGNED TO:DATE.....

LBOP

LBF

LEW

ROCK

REW

RBF

RBOF

VERT WATER

DIST	DEPTH	DEPTH	VEL
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Total Data Points = 45

VEL

A

Q

Tape to Water

Totals	2.24	1.27
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STREAM NAME: Little Sand
 XS LOCATION: Reach 1
 XS NUMBER: XS4

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	7.02	26.70	1.68	2.65	44.74	28.02	100.0%	1.60	102.42	2.29
	8.34	15.77	1.02	1.33	16.09	16.36	58.4%	0.98	26.65	1.66
	8.39	15.62	0.98	1.28	15.30	16.18	57.7%	0.95	24.71	1.61
	8.44	15.47	0.94	1.23	14.53	15.99	57.1%	0.91	22.83	1.57
	8.49	15.31	0.90	1.18	13.76	15.81	56.4%	0.87	21.01	1.53
	8.54	15.16	0.86	1.13	12.99	15.62	55.7%	0.83	19.26	1.48
	8.59	15.01	0.82	1.08	12.24	15.44	55.1%	0.79	17.57	1.44
	8.64	14.86	0.77	1.03	11.49	15.25	54.4%	0.75	15.95	1.39
	8.69	14.71	0.73	0.98	10.75	15.07	53.8%	0.71	14.39	1.34
	8.74	14.55	0.69	0.93	10.02	14.87	53.1%	0.67	12.91	1.29
	8.79	14.35	0.65	0.88	9.30	14.64	52.3%	0.64	11.51	1.24
	8.84	14.15	0.61	0.83	8.59	14.41	51.4%	0.60	10.19	1.19
	8.89	13.94	0.57	0.78	7.89	14.18	50.6%	0.56	8.94	1.13
	8.94	13.72	0.52	0.73	7.19	13.93	49.7%	0.52	7.76	1.08
	8.99	13.39	0.49	0.68	6.52	13.58	48.5%	0.48	6.69	1.03
	9.04	13.06	0.45	0.63	5.85	13.23	47.2%	0.44	5.70	0.97
	9.09	12.72	0.41	0.58	5.21	12.88	46.0%	0.40	4.77	0.92
	9.14	12.39	0.37	0.53	4.58	12.54	44.7%	0.37	3.93	0.86
	9.19	12.05	0.33	0.48	3.97	12.19	43.5%	0.33	3.15	0.79
	9.24	11.72	0.29	0.43	3.38	11.84	42.2%	0.29	2.45	0.73
	9.29	11.39	0.25	0.38	2.80	11.49	41.0%	0.24	1.83	0.65
WL	9.34	10.96	0.20	0.33	2.24	11.05	39.4%	0.20	1.30	0.58
	9.39	10.45	0.16	0.28	1.70	10.53	37.6%	0.16	0.85	0.50
	9.44	9.92	0.12	0.23	1.20	9.99	35.7%	0.12	0.49	0.41
	9.49	8.73	0.08	0.18	0.74	8.79	31.4%	0.08	0.24	0.32
	9.54	6.89	0.05	0.13	0.33	6.93	24.7%	0.05	0.07	0.22
	9.59	2.39	0.04	0.08	0.10	2.42	8.6%	0.04	0.02	0.19
	9.64	0.89	0.02	0.03	0.02	0.90	3.2%	0.02	0.00	0.12

STREAM NAME: Little Sand
 XS LOCATION: Reach 1
 XS NUMBER: XS4

Thorne-Zevenbergen D84 Correction Applied
 User Supplied D84 =

0.19

GL = lowest Grassline elevation corrected for sag

STAGING TABLE

WL = Waterline corrected for variations in field measured water surface elevations and sag

Velocity based on test of R/D84>1

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	7.02	26.70	1.68	2.65	44.74	28.02	100.0%	1.60	255.75	5.72
	8.34	15.77	1.02	1.33	16.09	16.36	58.4%	0.98	60.73	3.78
	8.39	15.62	0.98	1.28	15.30	16.18	57.7%	0.95	55.92	3.65
	8.44	15.47	0.94	1.23	14.53	15.99	57.1%	0.91	51.28	3.53
	8.49	15.31	0.90	1.18	13.76	15.81	56.4%	0.87	46.83	3.40
	8.54	15.16	0.86	1.13	12.99	15.62	55.7%	0.83	42.56	3.28
	8.59	15.01	0.82	1.08	12.24	15.44	55.1%	0.79	38.47	3.14
	8.64	14.86	0.77	1.03	11.49	15.25	54.4%	0.75	34.57	3.01
	8.69	14.71	0.73	0.98	10.75	15.07	53.8%	0.71	30.85	2.87
	8.74	14.55	0.69	0.93	10.02	14.87	53.1%	0.67	27.33	2.73
	8.79	14.35	0.65	0.88	9.30	14.64	52.3%	0.64	24.07	2.59
	8.84	14.15	0.61	0.83	8.59	14.41	51.4%	0.60	20.99	2.44
	8.89	13.94	0.57	0.78	7.89	14.18	50.6%	0.56	18.11	2.30
	8.94	13.72	0.52	0.73	7.19	13.93	49.7%	0.52	15.43	2.15
	8.99	13.39	0.49	0.68	6.52	13.58	48.5%	0.48	13.05	2.00
	9.04	13.06	0.45	0.63	5.85	13.23	47.2%	0.44	10.85	1.85
	9.09	12.72	0.41	0.58	5.21	12.88	46.0%	0.40	8.85	1.70
	9.14	12.39	0.37	0.53	4.58	12.54	44.7%	0.37	7.05	1.54
	9.19	12.05	0.33	0.48	3.97	12.19	43.5%	0.33	5.45	1.37
	9.24	11.72	0.29	0.43	3.38	11.84	42.2%	0.29	4.04	1.20
	9.29	11.39	0.25	0.38	2.80	11.49	41.0%	0.24	2.83	1.01
WL	9.34	10.96	0.20	0.33	2.24	11.05	39.4%	0.20	1.84	0.82
	9.39	10.45	0.16	0.28	1.70	10.53	37.6%	0.16	1.09	0.64
	9.44	9.92	0.12	0.23	1.20	9.99	35.7%	0.12	0.53	0.45
	9.49	8.73	0.08	0.18	0.74	8.79	31.4%	0.08	0.24	0.32
	9.54	6.89	0.05	0.13	0.33	6.93	24.7%	0.05	0.07	0.22
	9.59	2.39	0.04	0.08	0.10	2.42	8.6%	0.04	0.01	0.14
	9.64	0.89	0.02	0.03	0.02	0.90	3.2%	0.02	0.00	0.05

(1) Velocity = 2.78
 (.267) depth = 3.34
 (.50) % WP = 16.32

Data Input & Proofing		GL=1	FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	Tape to Water
STREAM NAME: Little Sand			LBOP	3.20	5.07			0.00	0.00	0.00
XS LOCATION: Reach 1				4.20	5.45			0.00	0.00	0.00
XS NUMBER: XS 5				6.30	5.41			0.00	0.00	0.00
DATE: 8/31/2016				7.30	5.94			0.00	0.00	0.00
OBSERVERS: Anderson, Cadiente, Porter, McIntyre, Sutton, Vanderbilt				8.50	6.20			0.00	0.00	0.00
				9.00	6.37			0.00	0.00	0.00
1/4 SEC: SE		1	LBF	9.30	6.58			0.00	0.00	0.00
SECTION: 13				9.60	6.76			0.00	0.00	0.00
TWP: 37 North				10.00	7.04			0.00	0.00	0.00
RANGE: 4 West				10.30	7.85			0.00	0.00	0.00
PM: NM				10.70	8.18			0.00	0.00	0.00
				11.30	8.19			0.00	0.00	0.00
COUNTY: Hinsdale				11.50	8.05			0.00	0.00	0.00
WATERSHED: San Juan				11.80	8.25			0.00	0.00	0.00
DIVISION: 7			LEW	12.30	8.59	0.00	0.00	0.00	0.00	0.00
DOW CODE: 38108				12.60	9.23	0.60	0.48	0.18	0.09	8.63
USGS MAP: Oakbrush Ridge				12.90	9.33	0.60	0.63	0.18	0.11	8.73
USFS MAP: SJNF				13.20	9.46	0.70	0.42	0.21	0.09	8.76
TAPE WT: 0.0106 lbs / ft			ROCK	13.50	9.03	0.15	0.48	0.05	0.02	8.88
TENSION: 99999 lbs			ROCK	13.80	8.84	0.15	0.34	0.05	0.02	8.69
				14.10	9.00	0.35	0.61	0.11	0.06	8.65
				14.40	9.05	0.35	0.54	0.11	0.06	8.70
SLOPE: 0.008 ft / ft			ROCK	14.70	8.93	0.35	0.09	0.11	0.01	8.58
				15.00	8.96	0.30	0.78	0.09	0.07	8.66
				15.30	8.94	0.30	0.88	0.09	0.08	8.64
CHECKED BY: DATE:			ROCK	15.60	8.85	0.20	0.92	0.06	0.06	8.65
ASSIGNED TO: DATE:			ROCK	15.90	8.72	0.20	0.78	0.06	0.05	8.52
			ROCK	16.20	8.72	0.15	1.13	0.05	0.05	8.57
			ROCK	16.50	8.65	0.10	0.91	0.03	0.03	8.55
			ROCK	16.80	8.64	0.05	0.00	0.02	0.00	8.59
				17.10	8.96	0.30	0.95	0.09	0.09	8.66
				17.40	8.82	0.25	0.64	0.07	0.05	8.57
			ROCK	17.70	8.65	0.20	0.00	0.06	0.00	8.45
			ROCK	18.00	8.83	0.25	0.00	0.08	0.00	8.58
			ROCK	18.30	8.91	0.25	0.46	0.08	0.03	8.66
			ROCK	18.60	8.90	0.15	0.33	0.05	0.02	8.75
			REW	19.00	8.58	0.00	0.00	0.00	0.00	0.00
				19.50	8.51			0.00	0.00	0.00
				19.80	8.65			0.00	0.00	0.00
				20.50	8.57			0.00	0.00	0.00
				20.70	8.30			0.00	0.00	0.00
				21.40	8.42			0.00	0.00	0.00
				22.50	8.33			0.00	0.00	0.00
				23.00	8.11			0.00	0.00	0.00
				23.70	8.05			0.00	0.00	0.00
				24.00	7.75			0.00	0.00	0.00
				24.40	7.61			0.00	0.00	0.00
				24.80	7.28			0.00	0.00	0.00
		1	RBF	25.00	7.06			0.00	0.00	0.00
				25.30	6.59			0.00	0.00	0.00
				26.10	6.47			0.00	0.00	0.00
				26.70	6.03			0.00	0.00	0.00
				28.10	5.52			0.00	0.00	0.00
				29.00	5.22			0.00	0.00	0.00
			RBOP	29.80	5.05			0.00	0.00	0.00
Total Data Points = 55										
Totals								1.79	0.97	

STREAM NAME: Little Sand
 XS LOCATION: Reach 1
 XS NUMBER: XS 5

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	7.06	14.99	1.44	2.40	21.65	17.71	100.0%	1.22	36.11	1.67
	7.64	14.09	0.94	1.82	13.19	16.18	91.4%	0.82	16.79	1.27
	7.69	13.93	0.90	1.77	12.49	15.98	90.2%	0.78	15.46	1.24
	7.74	13.77	0.86	1.72	11.80	15.77	89.1%	0.75	14.18	1.20
	7.79	13.68	0.81	1.67	11.11	15.63	88.3%	0.71	12.91	1.16
	7.84	13.61	0.77	1.62	10.43	15.51	87.6%	0.67	11.68	1.12
	7.89	13.51	0.72	1.57	9.75	15.37	86.8%	0.63	10.51	1.08
	7.94	13.40	0.68	1.52	9.08	15.22	85.9%	0.60	9.39	1.03
	7.99	13.29	0.63	1.47	8.41	15.07	85.1%	0.56	8.32	0.99
	8.04	13.18	0.59	1.42	7.75	14.92	84.2%	0.52	7.31	0.94
	8.09	12.53	0.57	1.37	7.10	14.22	80.3%	0.50	6.53	0.92
	8.14	12.02	0.54	1.32	6.49	13.65	77.1%	0.48	5.77	0.89
	8.19	11.11	0.53	1.27	5.90	12.69	71.6%	0.47	5.17	0.88
	8.24	10.92	0.49	1.22	5.35	12.47	70.4%	0.43	4.44	0.83
	8.29	10.73	0.45	1.17	4.81	12.26	69.2%	0.39	3.76	0.78
	8.34	10.18	0.42	1.12	4.28	11.66	65.9%	0.37	3.21	0.75
	8.39	9.17	0.41	1.07	3.80	10.60	59.9%	0.36	2.80	0.74
	8.44	8.52	0.40	1.02	3.36	9.90	55.9%	0.34	2.39	0.71
	8.49	8.41	0.35	0.97	2.94	9.75	55.1%	0.30	1.93	0.66
	8.54	8.02	0.32	0.92	2.53	9.31	52.6%	0.27	1.55	0.61
	8.59	7.34	0.29	0.87	2.14	8.59	48.5%	0.25	1.24	0.58
WL	8.64	6.71	0.27	0.82	1.79	7.90	44.6%	0.23	0.97	0.54
	8.69	5.86	0.25	0.77	1.48	6.95	39.2%	0.21	0.77	0.52
	8.74	5.08	0.24	0.72	1.21	6.06	34.2%	0.20	0.60	0.50
	8.79	4.66	0.21	0.67	0.97	5.53	31.2%	0.17	0.44	0.46
	8.84	4.21	0.18	0.62	0.74	4.98	28.1%	0.15	0.31	0.41
	8.89	3.46	0.16	0.57	0.55	4.10	23.1%	0.13	0.21	0.38
	8.94	2.43	0.17	0.52	0.41	2.96	16.7%	0.14	0.16	0.39
	8.99	1.54	0.20	0.47	0.31	1.99	11.3%	0.16	0.13	0.43
	9.04	1.07	0.23	0.42	0.25	1.45	8.2%	0.17	0.11	0.45
	9.09	0.92	0.22	0.37	0.20	1.25	7.1%	0.16	0.09	0.43
	9.14	0.87	0.18	0.32	0.16	1.13	6.4%	0.14	0.06	0.39
	9.19	0.81	0.14	0.27	0.11	1.02	5.7%	0.11	0.04	0.34
	9.24	0.72	0.10	0.22	0.08	0.88	5.0%	0.09	0.02	0.28
	9.29	0.54	0.08	0.17	0.04	0.66	3.7%	0.07	0.01	0.24
	9.34	0.36	0.06	0.12	0.02	0.45	2.5%	0.05	0.00	0.19
	9.39	0.21	0.04	0.07	0.01	0.26	1.5%	0.03	0.00	0.14
	9.44	0.06	0.01	0.02	0.00	0.07	0.4%	0.01	0.00	0.06

(1) Velocity = 8.59
 (0.2) depth = 0.40
 (50) % WP = 1.35

STREAM NAME: Little Sand
 XS LOCATION: Reach 1
 XS NUMBER: XS 5

Thorne-Zevenbergen D84 Correction Applied
 User Supplied D84 =

0.32

GL = lowest Grassline elevation corrected for sag

STAGING TABLE

WL = Waterline corrected for variations in field measured water surface elevations and sag

Velocity based on test of R/D84>1

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	7.06	14.99	1.44	2.40	21.65	17.71	100.0%	1.22	81.85	3.78
	7.64	14.09	0.94	1.82	13.19	16.18	91.4%	0.82	35.20	2.67
	7.69	13.93	0.90	1.77	12.49	15.98	90.2%	0.78	32.12	2.57
	7.74	13.77	0.86	1.72	11.80	15.77	89.1%	0.75	29.16	2.47
	7.79	13.68	0.81	1.67	11.11	15.63	88.3%	0.71	26.25	2.36
	7.84	13.61	0.77	1.62	10.43	15.51	87.6%	0.67	23.45	2.25
	7.89	13.51	0.72	1.57	9.75	15.37	86.8%	0.63	20.81	2.13
	7.94	13.40	0.68	1.52	9.08	15.22	85.9%	0.60	18.32	2.02
	7.99	13.29	0.63	1.47	8.41	15.07	85.1%	0.56	15.97	1.90
	8.04	13.18	0.59	1.42	7.75	14.92	84.2%	0.52	13.77	1.78
	8.09	12.53	0.57	1.37	7.10	14.22	80.3%	0.50	12.14	1.71
	8.14	12.02	0.54	1.32	6.49	13.65	77.1%	0.48	10.56	1.63
	8.19	11.11	0.53	1.27	5.90	12.69	71.6%	0.47	9.36	1.59
	8.24	10.92	0.49	1.22	5.35	12.47	70.4%	0.43	7.85	1.47
	8.29	10.73	0.45	1.17	4.81	12.26	69.2%	0.39	6.46	1.34
	8.34	10.18	0.42	1.12	4.28	11.66	65.9%	0.37	5.37	1.25
	8.39	9.17	0.41	1.07	3.80	10.60	59.9%	0.36	4.62	1.21
	8.44	8.52	0.40	1.02	3.36	9.90	55.9%	0.34	3.85	1.14
	8.49	8.41	0.35	0.97	2.94	9.75	55.1%	0.30	3.32	1.13
	8.54	8.02	0.32	0.92	2.53	9.31	52.6%	0.27	2.41	0.95
	8.59	7.34	0.29	0.87	2.14	8.59	48.5%	0.25	1.81	0.84
WL	8.64	6.71	0.27	0.82	1.79	7.90	44.6%	0.23	1.31	0.73
	8.69	5.86	0.25	0.77	1.48	6.95	39.2%	0.21	1.00	0.68
	8.74	5.08	0.24	0.72	1.21	6.06	34.2%	0.20	0.74	0.61
	8.79	4.66	0.21	0.67	0.97	5.53	31.2%	0.17	0.48	0.50
	8.84	4.21	0.18	0.62	0.74	4.98	28.1%	0.15	0.29	0.39
	8.89	3.46	0.16	0.57	0.55	4.10	23.1%	0.13	0.18	0.33
	8.94	2.43	0.17	0.52	0.41	2.96	16.7%	0.14	0.14	0.33
	8.99	1.54	0.20	0.47	0.31	1.99	11.3%	0.16	0.13	0.42
	9.04	1.07	0.23	0.42	0.25	1.45	8.2%	0.17	0.12	0.50
	9.09	0.92	0.22	0.37	0.20	1.25	7.1%	0.16	0.09	0.43
	9.14	0.87	0.18	0.32	0.16	1.13	6.4%	0.14	0.05	0.31
	9.19	0.81	0.14	0.27	0.11	1.02	5.7%	0.11	0.02	0.20
	9.24	0.72	0.10	0.22	0.08	0.88	5.0%	0.09	0.01	0.12
	9.29	0.54	0.08	0.17	0.04	0.66	3.7%	0.07	0.00	0.07
	9.34	0.36	0.06	0.12	0.02	0.45	2.5%	0.05	0.00	0.04
	9.39	0.21	0.04	0.07	0.01	0.26	1.5%	0.03	0.00	0.01
	9.44	0.06	0.01	0.02	0.00	0.07	0.4%	0.01	0.00	0.00

(1) Velocity = 2.66
 (0.2) depth = 0.42
 (50) % WP = 2.03

STREAM NAME: Little Sand
 XS LOCATION: Reach 1
 XS NUMBER: XS6

Constant Manning's n

GL = lowest Grassline elevation corrected for sag

STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.13	17.98	1.50	2.08	27.04	19.21	100.0%	1.41	32.31	1.19
	6.78	16.27	0.98	1.43	15.91	17.03	88.6%	0.93	14.48	0.91
	6.83	16.06	0.94	1.38	15.11	16.79	87.4%	0.90	13.40	0.89
	6.88	15.81	0.91	1.33	14.31	16.52	86.0%	0.87	12.37	0.86
	6.93	15.56	0.87	1.28	13.53	16.25	84.6%	0.83	11.39	0.84
	6.98	15.31	0.83	1.23	12.75	15.98	83.2%	0.80	10.44	0.82
	7.03	15.06	0.80	1.18	11.99	15.71	81.8%	0.76	9.53	0.79
	7.08	14.83	0.76	1.13	11.25	15.46	80.5%	0.73	8.66	0.77
	7.13	14.65	0.72	1.08	10.51	15.24	79.3%	0.69	7.80	0.74
	7.18	14.46	0.68	1.03	9.78	15.03	78.2%	0.65	6.99	0.71
	7.23	14.27	0.64	0.98	9.06	14.82	77.1%	0.61	6.21	0.69
	7.28	14.06	0.59	0.93	8.36	14.58	75.9%	0.57	5.48	0.66
	7.33	13.84	0.55	0.88	7.66	14.34	74.7%	0.53	4.80	0.63
	7.38	13.62	0.51	0.83	6.97	14.10	73.4%	0.49	4.15	0.59
	7.43	13.40	0.47	0.78	6.30	13.86	72.1%	0.45	3.54	0.56
	7.48	12.95	0.43	0.73	5.63	13.40	69.7%	0.42	3.01	0.53
	7.53	12.08	0.41	0.68	5.01	12.51	65.1%	0.40	2.59	0.52
	7.58	11.57	0.38	0.63	4.42	11.98	62.4%	0.37	2.16	0.49
	7.63	11.04	0.35	0.58	3.85	11.45	59.6%	0.34	1.77	0.46
	7.68	10.52	0.32	0.53	3.31	10.91	56.8%	0.30	1.42	0.43
	7.73	9.95	0.28	0.48	2.80	10.34	53.8%	0.27	1.12	0.40
WL	7.78	9.46	0.25	0.43	2.32	9.83	51.2%	0.24	0.84	0.36
	7.83	9.27	0.20	0.38	1.85	9.61	50.0%	0.19	0.59	0.32
	7.88	8.90	0.16	0.33	1.39	9.22	48.0%	0.15	0.38	0.27
	7.93	7.79	0.12	0.28	0.97	8.06	42.0%	0.12	0.22	0.23
	7.98	6.11	0.10	0.23	0.62	6.34	33.0%	0.10	0.13	0.20
	8.03	4.19	0.09	0.18	0.36	4.36	22.7%	0.08	0.06	0.18
	8.08	2.55	0.08	0.13	0.19	2.66	13.8%	0.07	0.03	0.17
	8.13	1.77	0.05	0.08	0.09	1.82	9.5%	0.05	0.01	0.13
	8.18	0.91	0.02	0.03	0.02	0.93	4.8%	0.02	0.00	0.07

STREAM NAME: Little Sand
 XS LOCATION: Reach 1
 XS NUMBER: XS6

Thorne-Zevenbergen D84 Correction Applied
 User Supplied D84 =

0.20

GL = lowest Grassline elevation corrected for sag

STAGING TABLE

WL = Waterline corrected for variations in field measured water surface elevations and sag

Velocity based on test of R/D84>1

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG. DEPTH (FT)	MAX. DEPTH (FT)	AREA (SQ FT)	WETTED PERIM. (FT)	PERCENT WET PERIM (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG. VELOCITY (FT/SEC)
GL	6.13	17.98	1.50	2.08	27.04	19.21	100.0%	1.41	180.69	6.68
	6.78	16.27	0.98	1.43	15.91	17.03	88.6%	0.93	76.04	4.78
	6.83	16.06	0.94	1.38	15.11	16.79	87.4%	0.90	69.89	4.63
	6.88	15.81	0.91	1.33	14.31	16.52	86.0%	0.87	64.09	4.48
	6.93	15.56	0.87	1.28	13.53	16.25	84.6%	0.83	58.54	4.33
	6.98	15.31	0.83	1.23	12.75	15.98	83.2%	0.80	53.23	4.17
	7.03	15.06	0.80	1.18	11.99	15.71	81.8%	0.76	48.17	4.02
	7.08	14.83	0.76	1.13	11.25	15.46	80.5%	0.73	43.32	3.85
	7.13	14.65	0.72	1.08	10.51	15.24	79.3%	0.69	38.63	3.68
	7.18	14.46	0.68	1.03	9.78	15.03	78.2%	0.65	34.19	3.49
	7.23	14.27	0.64	0.98	9.06	14.82	77.1%	0.61	29.99	3.31
	7.28	14.06	0.59	0.93	8.36	14.58	75.9%	0.57	26.09	3.12
	7.33	13.84	0.55	0.88	7.66	14.34	74.7%	0.53	22.44	2.93
	7.38	13.62	0.51	0.83	6.97	14.10	73.4%	0.49	19.05	2.73
	7.43	13.40	0.47	0.78	6.30	13.86	72.1%	0.45	15.92	2.53
	7.48	12.95	0.43	0.73	5.63	13.40	69.7%	0.42	13.24	2.35
	7.53	12.08	0.41	0.68	5.01	12.51	65.1%	0.40	11.18	2.23
	7.58	11.57	0.38	0.63	4.42	11.98	62.4%	0.37	9.09	2.06
	7.63	11.04	0.35	0.58	3.85	11.45	59.6%	0.34	7.23	1.88
	7.68	10.52	0.32	0.53	3.31	10.91	56.8%	0.30	5.59	1.69
	7.73	9.95	0.28	0.48	2.80	10.34	53.8%	0.27	4.19	1.50
WL	7.78	9.46	0.25	0.43	2.32	9.83	51.2%	0.24	2.98	1.29
	7.83	9.27	0.20	0.38	1.85	9.61	50.0%	0.19	2.00	1.08
	7.88	8.90	0.16	0.33	1.39	9.22	48.0%	0.15	1.08	0.78
	7.93	7.79	0.12	0.28	0.97	8.06	42.0%	0.12	0.58	0.59
	7.98	6.11	0.10	0.23	0.62	6.34	33.0%	0.10	0.30	0.48
	8.03	4.19	0.09	0.18	0.36	4.36	22.7%	0.08	0.14	0.38
	8.08	2.55	0.08	0.13	0.19	2.66	13.8%	0.07	0.06	0.32
	8.13	1.77	0.05	0.08	0.09	1.82	9.5%	0.05	0.02	0.18
	8.18	0.91	0.02	0.03	0.02	0.93	4.8%	0.02	0.00	0.07

(1) Velocity = 1.75
 (0.2) depth = 2.0
 (50) % wt = 2.0