

## Instructions

Start by filling in all the general information you can here in the blue cells.

The sheets are linked so information entered here will be used by in the following worksheets.

There is no required order to filling out the other worksheets although they generally build and you will probably want to skip around.

Units:  English  
 SI

## Reach

stream name: **Aravaipa Creek**

drainage area (sq.mi.): **537**

channel type: **C5**

## Location

watershed: **Aravaipa Canyon**

location: **Aravaipa Creek at the Nature Conservancy Guest House**

state: **AZ**

county: **Graham**

	degrees	minutes	second
latitude:	<b>32.879</b>		
longitude:	<b>110.396</b>		

## Survey

date: **April 17, 2005**

observers: **Dave Smith**

notes: Three cross-sections were measured. One was to confirm bankfull elevation. Cross-section 1 is permanently monumented; cross-section 3 needs to be extended slightly higher to be made permanent (outside of flood prone area). Longpro was done primarily for overall water surface slope. The major bed features were surveyed in the fish survey area.

Summary				
Stream:	Aravaipa Creek			
Watershed:	Aravaipa Canyon			
Location:	Aravaipa Creek at the Nature Conservancy Guest House			
Latitude:	32.87900			
Longitude:	110.39600			
State:	AZ			
County:	Graham			
Date:	April 17, 2005			
Observers:	Dave Smith			
Channel type:	C5			
Drainage area (sq.mi.):	537			
notes:	Three cross-sections were measured. One was to confirm bankfull elevation. Cross-section 1 is permanently monumented; cross-section 3 needs to be extended slightly higher to be made permanent (outside of flood prone area). Longpro was done primarily for overall water surface slope. The major bed features were surveyed in the fish survey area.			
Dimension		bankfull channel		
		typical	min	max
floodplain:	width flood prone area (ft)	301.3	256.0	346.6
	low bank height (ft)	---	---	---
riffle-run:	x-area bankfull (sq.ft.)	143.2	141.6	146.0
	width bankfull (ft)	72.4	58.3	86.0
	mean depth (ft)	1.98	1.7	2.4
	max depth (ft)	3.4	2.8	4.1
	hydraulic radius (ft)	2.0		
pool:	x-area pool (sq.ft.)	---	---	---
	width pool (ft)	---	---	---
	max depth pool (ft)	---	---	---

hydraulic radius (ft)	---			
<b>dimensionless ratios:</b>	<b>typical</b>	<b>min</b>	<b>max</b>	
width depth ratio	36.6	23.9	50.7	
entrenchment ratio	4.2	3.5	4.8	
riffle max depth ratio	1.7	1.4	2.0	
bank height ratio	---	---	---	
pool area ratio	---	---	---	
pool width ratio	---	---	---	
pool max depth ratio	---	---	---	
<b>hydraulics:</b>	<b>typical</b>	<b>min</b>	<b>max</b>	
discharge rate (cfs)		---	---	
channel slope (%)	1.1			
	<b>riffle-</b>			
	<b>run</b>	<b>min</b>	<b>max</b>	<b>pool</b>
velocity (ft/s)	---	---	---	---
Froude number	---	---	---	---
shear stress (lbs/sq.ft.)	1.366	1.151	1.629	---
shear velocity (ft/s)	0.840	0.771	0.917	---
stream power (lb/s)	---	---	---	---
unit stream power (lb/ft/s)	---	---	---	---
relative roughness	---	---	---	---
friction factor $u/u^*$	---	---	---	---
threshold grain size ( $t^*=0.06$ ) (mm)	64.8	56.6	80.1	-
Shield's parameter	---	-	-	-
<b>Pattern</b>	<b>typical</b>	<b>min</b>	<b>max</b>	
meander length (ft)	---	---	---	
belt width (ft)	---	---	---	
amplitude (ft)	---	---	---	
radius (ft)	---	---	---	
arc angle (degrees)	---	---	---	
stream length (ft)	---	---	---	
valley length (ft)	---	---	---	
Sinuosity	---	---	---	
Meander Length Ratio	---	---	---	
Meander Width Ratio	---	---	---	
Radius Ratio	---	---	---	
<b>Profile</b>	<b>typical</b>	<b>min</b>	<b>max</b>	
pool-pool spacing (ft)	---	---	---	
riffle length (ft)	242.3	43.0	353.0	
pool length (ft)	23.0	---	---	
run length (ft)	6.0	---	---	
glide length (ft)	11.0	10.0	12.0	
channel slope (%)	1.1			
riffle slope (%)	0.83	0.47	1.3	
pool slope (%)	3.5	---	---	
run slope (%)	4.5	---	---	

glide slope (%)	1	0.4	1.7
measured valley slope (%)	---		
valley slope from sinuosity (%)	---		
Riffle Length Ratio	3.3	0.6	4.9
Pool Length Ratio	0.3	---	---
Run Length Ratio	0.1	---	---
Glide Length Ratio	0.2	0.1	0.2
Riffle Slope Ratio	0.8	0.4	1.2
Pool Slope Ratio	3.2	---	---
Run Slope Ratio	4.1	---	---
Glide Slope Ratio	0.9	0.4	1.5
Pool Spacing Ratio	---	---	---
<b>Channel Materials</b>			
D16 (mm)	---	---	---
D35 (mm)	---	---	---
D50 (mm)	---	---	---
D65 (mm)	---	---	---
D84 (mm)	---	---	---
D95 (mm)	---	---	---
mean (mm)	---		---
dispersion	---		---
skewness	---		---
Shape Factor	---		---
% Silt/Clay	---	---	---
% Sand	---	---	---
% Gravel	---	---	---
% Cobble	---	---	---
% Boulder	---	---	---
% Bedrock	---	---	---
% Clay Hardpan	---	---	---
% Detritus/Wood	---	---	---
% Artificial	---	---	---
Largest Mobile (mm)	---		---

**Data Base  
Format**

All values of this reach are in one column for the purpose of creating data bases.

stream: Aravaipa Creek  
watershed: Aravaipa Canyon  
location: Aravaipa Creek at the Nature Conservancy Guest House  
latitude: 32.87900  
longitude: 110.39600  
county: Graham  
date: April 17, 2005  
observers: Dave Smith  
channel type: C5

drainage area: 537

units: English

notes: Three cross-sections were measured. One was to confirm ba  
overall water surface slope. The major bed features were su

Channel  
Materials

**Largest Mobile****Shape Factor****Bed Surface D16**

Bed Surface D35

Bed Surface D50

Bed Surface D65

Bed Surface D84

Bed Surface D95

Bed Surface mean

Bed Surface

dispersion

Bed Surface

skewness

Bed Surface %

Silt/Clay

Bed Surface % Sand

Bed Surface % Gravel

Bed Surface %

Cobble

Bed Surface %

Boulder

Bed Surface %

Bedrock

Bed Surface % Clay

Hardpan

Bed Surface %

Detritus/Wood

Bed Surface %

Artificial

**Bank D16**

Bank D35

Bank D50

Bank D65

Bank D84

Bank D95

Bank % Silt/Clay

Bank % Sand

Bank % Gravel

Bank % Cobble

Bank % Boulder

Bank % Bedrock

Bank % Clay Hardpan

Bank %

Detritus/Wood

Bank % Artificial

**Sub-pavement D16**

Sub-pavement D35

Sub-pavement D50  
 Sub-pavement D65  
 Sub-pavement D84  
 Sub-pavement D95  
 Sub-pavement %  
     Silt/Clay  
 Sub-pavement %  
     Sand  
 Sub-pavement %  
     Gravel  
 Sub-pavement %  
     Cobble  
 Sub-pavement %  
     Boulder

**Channel D16**

Channel D35  
 Channel D50  
 Channel D65  
 Channel D84  
 Channel D95  
 Channel mean  
 Channel dispersion  
 Channel skewness  
 Channel % Silt/Clay  
     Channel % Sand  
     Channel % Gravel  
     Channel % Cobble  
     Channel % Boulder  
 Channel % Bedrock  
     Channel % Clay  
     Hardpan  
     Channel %  
     Detritus/Wood  
 Channel % Artificial

Profile

**pool-pool spacing**

pool-pool spacing min  
 pool-pool spacing  
     max

**riffle length**

riffle length min  
 riffle length max

**pool length**

pool length min  
 pool length max

**run length**

run length min  
 run length max

**glide length**

glide length min  
 glide length max

channel slope (%)  
     **riffle slope (%)**  
 riffle slope (%) min  
 riffle slope (%) max  
     **pool slope (%)**  
 pool slope (%) min  
 pool slope (%) max  
     **run slope (%)**  
 run slope (%) min  
 run slope (%) max  
     **glide slope (%)**  
 glide slope (%) min  
 glide slope (%) max  
     **measured valley  
 slope (%)**  
     **valley slope from  
 sinuosity (%)**  
**Riffle Length Ratio**  
 Riffle Length Ratio  
     min  
     Riffle Length Ratio  
     max  
**Pool Length Ratio**  
 Pool Length Ratio min  
     Pool Length Ratio  
     max  
**Run Length Ratio**  
 Run Length Ratio min  
 Run Length Ratio max  
**Glide Length Ratio**  
     Glide Length Ratio  
     min  
     Glide Length Ratio  
     max  
**Riffle Slope Ratio**  
 Riffle Slope Ratio min  
 Riffle Slope Ratio max  
**Pool Slope Ratio**  
     Pool Slope Ratio min  
     Pool Slope Ratio max  
**Run Slope Ratio**  
     Run Slope Ratio min  
     Run Slope Ratio max  
**Glide Slope Ratio**  
     Glide Slope Ratio min  
     Glide Slope Ratio max  
**Pool Spacing Ratio**  
     Pool Spacing Ratio  
     min  
     Pool Spacing Ratio  
     max

**meander length**

meander length min

meander length max

**belt width**

belt width min

belt width max

**amplitude**

amplitude min

amplitude max

**radius**

radius min

radius max

**arc angle (degrees)**

arc angle (degrees)

min

arc angle (degrees)

max

**stream length****valley length****Sinuosity****Meander Width Ratio**

Meander Width Ratio

min

Meander Width Ratio

max

**Meander Length****Ratio**

Meander Length Ratio

min

Meander Length Ratio

max

**Radius Ratio**

Radius Ratio min

Radius Ratio max

**Floodplain****width flood prone****area**

width flood prone area

min

width flood prone area

max

**low bank height**

low bank height min

low bank height max

**entrenchment ratio**

entrenchment ratio

min

entrenchment ratio

max

**bank height ratio**

bank height ratio min

bank height ratio max

Bankfull Channel  
Dimensions

**x-area bankfull**  
x-area bankfull min  
x-area bankfull max  
**width bankfull**  
width bankfull min  
width bankfull max  
**mean depth**  
mean depth min  
mean depth max  
**max depth**  
max depth min  
max depth max  
**hydraulic radius**  
x-area pool  
x-area pool min  
x-area pool max  
**width pool**  
width pool min  
width pool max  
**max depth pool**  
max depth pool min  
max depth pool max  
**hydraulic radius**  
**pool**

**Width/Depth Ratio**  
Width/Depth Ratio  
min  
Width/Depth Ratio  
max  
**Riffle Max Depth**  
**Ratio**  
Riffle Max Depth  
Ratio min  
Riffle Max Depth  
Ratio max  
**Pool Area Ratio**  
Pool Area Ratio min  
Pool Area Ratio max  
**Pool Width Ratio**  
Pool Width Ratio min  
Pool Width Ratio max  
**Pool Max Depth**  
**Ratio**  
Pool Max Depth Ratio  
min  
Pool Max Depth Ratio  
max

Bankfull Channel  
Hydraulics:

**discharge rate, Q**

**channel slope (%)**  
**velocity**  
 velocity (ft/sec) pool  
**Froude number**  
 Froude number pool  
**shear stress**  
 shear stress (lbs/ft sq)  
 pool  
**shear velocity**  
 shear velocity pool  
**stream power**  
**unit stream power**  
**relative roughness**  
 relative roughness  
 pool  
**friction factor  $u/u^*$**   
 friction factor  $u/u^*$  pool  
**threshold grain size**

**Longitudinal Slope Profile**

**This Worksheet**

- 1) Enter survey data in the table to the right.
- 2) Above the columns for distance and water depth, chose data types.
- 3) Enter benchmark elevation. (100 if unknown)
- 4) The first row of data will be the backsight to the benchmark. (0 if no benchmark was used)
- 5) The table's second row will be the first point of the profile. Note that the first point of the profile should have a distance of 0 and no azimuth.
- 6) Identify only the upstream end of bed features in the "bed feature" column. This will allow average lengths and slopes to be calculated. These are provided as a reference only and must be checked.
- 7) After entering all survey data fill in the values below.

**Bankfull width**

bankfull width (ft)

**Lengths**

			min	max
pool-pool spacing (ft)	<input type="text" value="---"/>	---	<input type="text"/>	<input type="text"/>
rifle length (ft)	<input type="text" value="242.3"/>	242.3	<input type="text"/>	<input type="text"/>
pool length (ft)	<input type="text" value="23.0"/>	23.0	<input type="text"/>	<input type="text"/>
run length (ft)	<input type="text" value="6.0"/>	6.0	<input type="text"/>	<input type="text"/>
glide length (ft)	<input type="text" value="11.0"/>	11.0	<input type="text"/>	<input type="text"/>

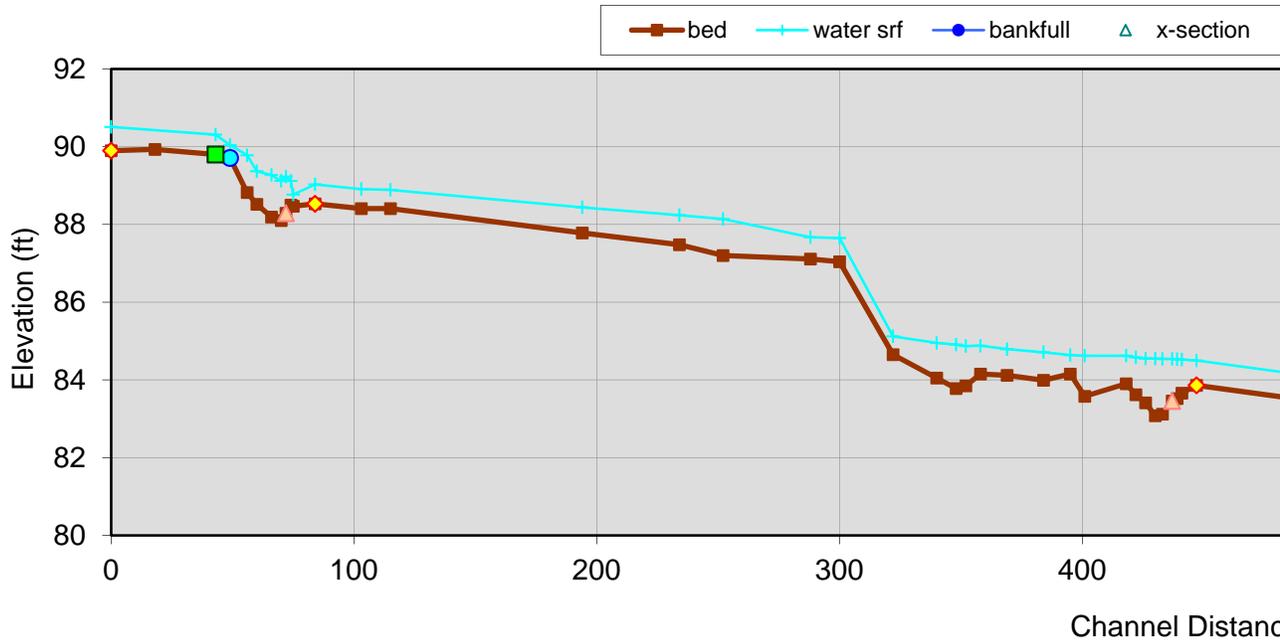
**Slopes**

channel slope (%)	<input type="text" value="1.1"/>	1.1	<input type="text"/>	<input type="text"/>
rifle slope (%)	<input type="text" value="0.83"/>	0.83	<input type="text"/>	<input type="text"/>

pool slope (%)	3.5		
run slope (%)	4.5		
glide slope (%)	1		
measured valley slope (%)			

Reference Reach		Hints		
Stream:	Aravaipa Creek			
Watershed:	Aravaipa Canyon			
Location:	Aravaipa Creek at the Nature Conservancy Guest House			
Latitude:	32.8790			
Longitude:	110.3960			
County:	Graham			
Date:	April 17, 2005			
Observers:	Dave Smith			
Channel Type:	C5			
Drainage Area (sq.mi)	537			
Profile Summary				
	typical	min	max	
bankfull width (ft)	72.4			
pool-pool spacing (ft)	---	---	---	
riffle length (ft)	242.3	43.0	353.0	
pool length (ft)	23.0	---	---	
run length (ft)	6.0	---	---	
glide length (ft)	11.0	10.0	12.0	
channel slope (%)	1.1			
riffle slope (%)	0.83	0.47	1.3	
pool slope (%)	3.5	---	---	
run slope (%)	4.5	---	---	
glide slope (%)	1	0.4	1.7	
measured valley slope (%)	---			
valley slope from sinuosity (%)	---			
Riffle Length Ratio	3.3	0.6	4.9	
Pool Length Ratio	0.3	---	---	
Run Length Ratio	0.1	---	---	
Glide Length Ratio	0.2	0.1	0.2	
Riffle Slope Ratio	0.8	0.4	1.2	
Pool Slope Ratio	3.2	---	---	
Run Slope Ratio	4.1	---	---	
Glide Slope Ratio	0.9	0.4	1.5	
Pool Spacing Ratio	---	---	---	
Longitudinal Slope Profile				

Aravaipa Creek



	slope (%)	slope ratio
reach	1.1	---
rifle	0.83 (0.47 - 1.3)	0.8 (0.4 - 1.2)
pool	3.5	3.2
run	4.5	4.1
glide	1 (0.4 - 1.7)	0.9 (0.4 - 1.5)

notes	cross section ID	bed feature	continuous data		Benchmark Elevation			FS
			station	station	BS	HI	FS	
back sight to benchmark					5.46	95.32		
		r	0			95.32		5.4
			18			95.32		5.3
		n	43			95.32		5.5
		p	49			95.32		5.6
			56			95.32		6.0

			60			95.32		6.0
			66			95.32		7.1
			70			95.32		7.2
		g	72			95.32		7.0
			74			95.32		6.8
			75			95.32		6.8
		r	84			95.32		6.7
			103			95.32		6.9
			115			95.32		6.9
			194			95.32		7.5
			234			95.32		7.8
			252			95.32		8.1
			288			95.32		8.2
			300			95.32		8.2
						95.32	4.73	
					2.17	92.76		
			322			92.76		8.1
			340			92.76		8.7
			348			92.76		8.9
			352			92.76		8.9
			358			92.76		8.0
			369			92.76		8.0
			384			92.76		8.7
			395			92.76		8.0
			401			92.76		9.1
			418			92.76		8.8
			422			92.76		9.1
			426			92.76		9.3
			430			92.76		9.0
			433			92.76		9.0
		g	437			92.76		9.0
			439			92.76		9.2
			441			92.76		9.0
		r	447			92.76		8.0
			487			92.76		9.2
			518			92.76		9.7
			555			92.76		10.0
			558			92.76		10.0
			561			92.76		10.0
			566			92.76		10.0
			592			92.76		10.0
			687			92.76		11.0
			778			92.76		11.0
		r	878			92.76		12.0

**This Worksheet**

- 1) This sheet will graph the distance and azimuth entered in the profile worksheet.
- 2) Fill in the values below using the graphed pattern, arial photos, topo maps, etc.
- 3) Before printing the graph, its width or height may need adjusting. "Square" the graph by clicking and dragging.

**Meander Length**

		min	max
meander length (ft)	<input style="width: 100%; height: 20px;" type="text"/>	<input style="width: 50%; height: 20px;" type="text"/>	<input style="width: 50%; height: 20px;" type="text"/>

**Meander Width**

belt width (ft)	<input style="width: 100%; height: 20px;" type="text"/>	<input style="width: 50%; height: 20px;" type="text"/>	<input style="width: 50%; height: 20px;" type="text"/>
amplitude (ft)	<input style="width: 100%; height: 20px;" type="text"/>	<input style="width: 50%; height: 20px;" type="text"/>	<input style="width: 50%; height: 20px;" type="text"/>

**Bends**

radius (ft)	<input style="width: 100%; height: 20px;" type="text"/>	<input style="width: 50%; height: 20px;" type="text"/>	<input style="width: 50%; height: 20px;" type="text"/>
arc angle (degrees)	<input style="width: 100%; height: 20px;" type="text"/>	<input style="width: 50%; height: 20px;" type="text"/>	<input style="width: 50%; height: 20px;" type="text"/>

**Sinuosity**

stream length (ft)	<input style="width: 100%; height: 20px;" type="text"/>
valley length (ft)	<input style="width: 100%; height: 20px;" type="text"/>

**Graph Format**

Z scale:

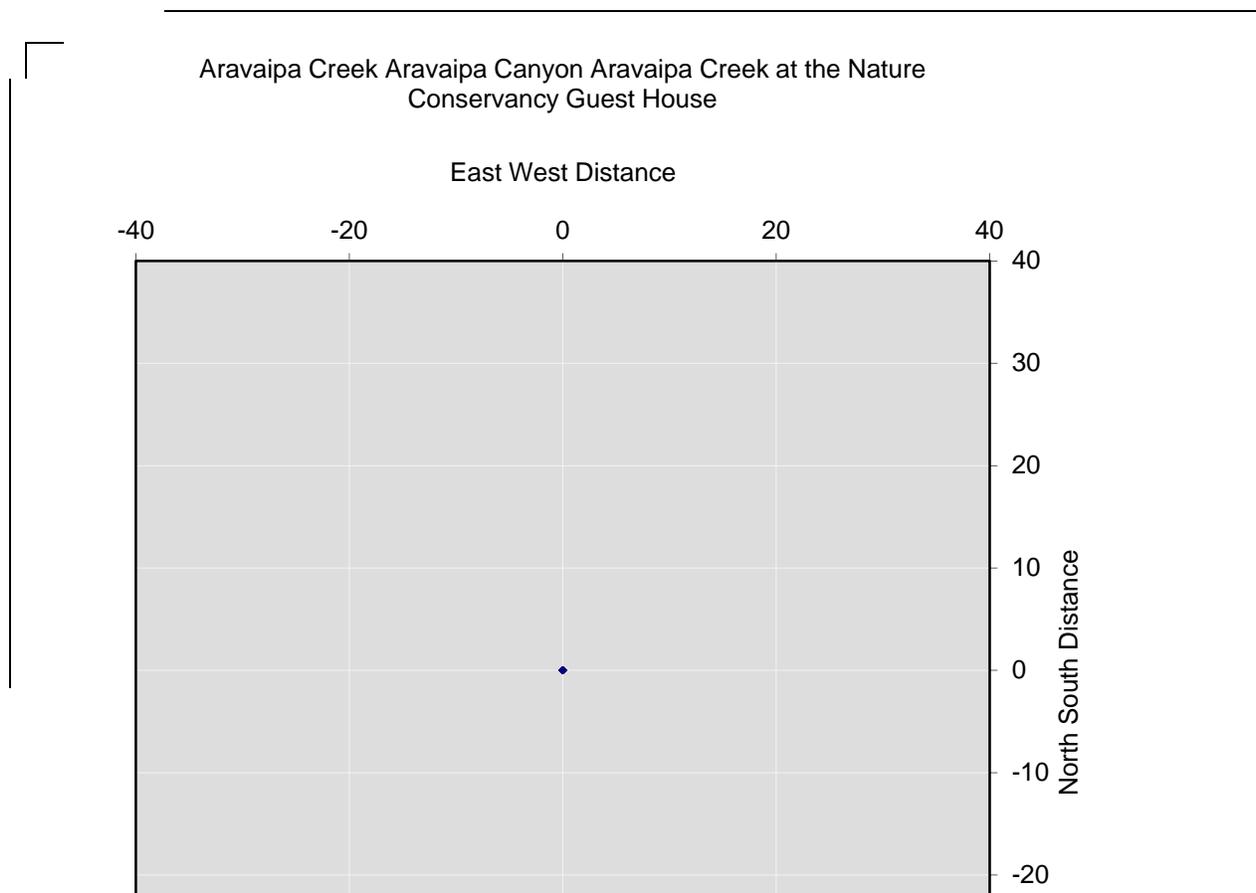
show banks

show centerline

**Reference Reach**

Stream:	Aravaipa Creek
Watershed:	Aravaipa Canyon
Location:	Aravaipa Creek at the Nature Conservancy Guest House

Latitude:	32.8790		
Longitude:	110.3960		
County:	Graham		
Date:	April 17, 2005		
Observers:	Dave Smith		
Channel Type:	C5		
Drainage Area (sq.mi):	537		
<b>Patter n</b>			
	typical	min	max
bankfull width (ft)	72.37		
meander length (ft)	---	---	---
belt width (ft)	---	---	---
amplitude (ft)	---	---	---
radius (ft)	---	---	---
arc angle (degrees)	---	---	---
stream length (ft)	---		
valley length (ft)	---		
Sinuosity	---		
Meander Length Ratio	---	---	---
Meander Width Ratio	---	---	---
Radius Ratio	---	---	---



Dimensions (ft)

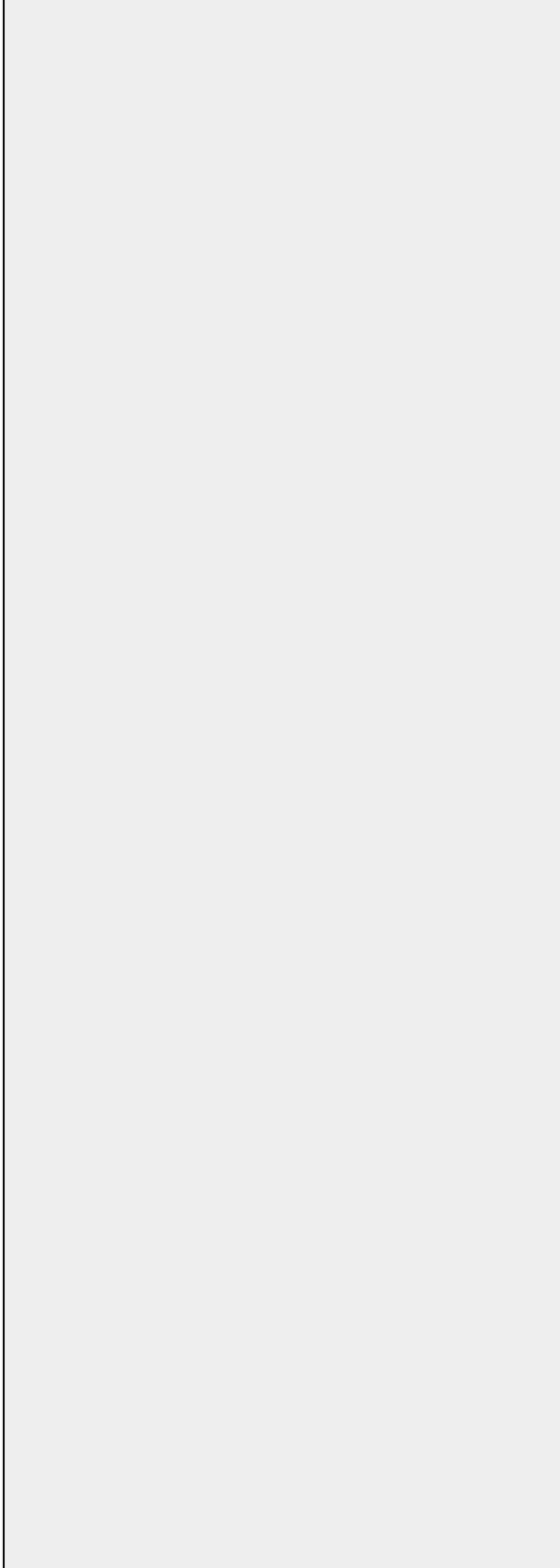
Bankfull Width: 72.4  
 Meander Length: ---  
 Belt Width: ---  
 Radius of Curvature: ---

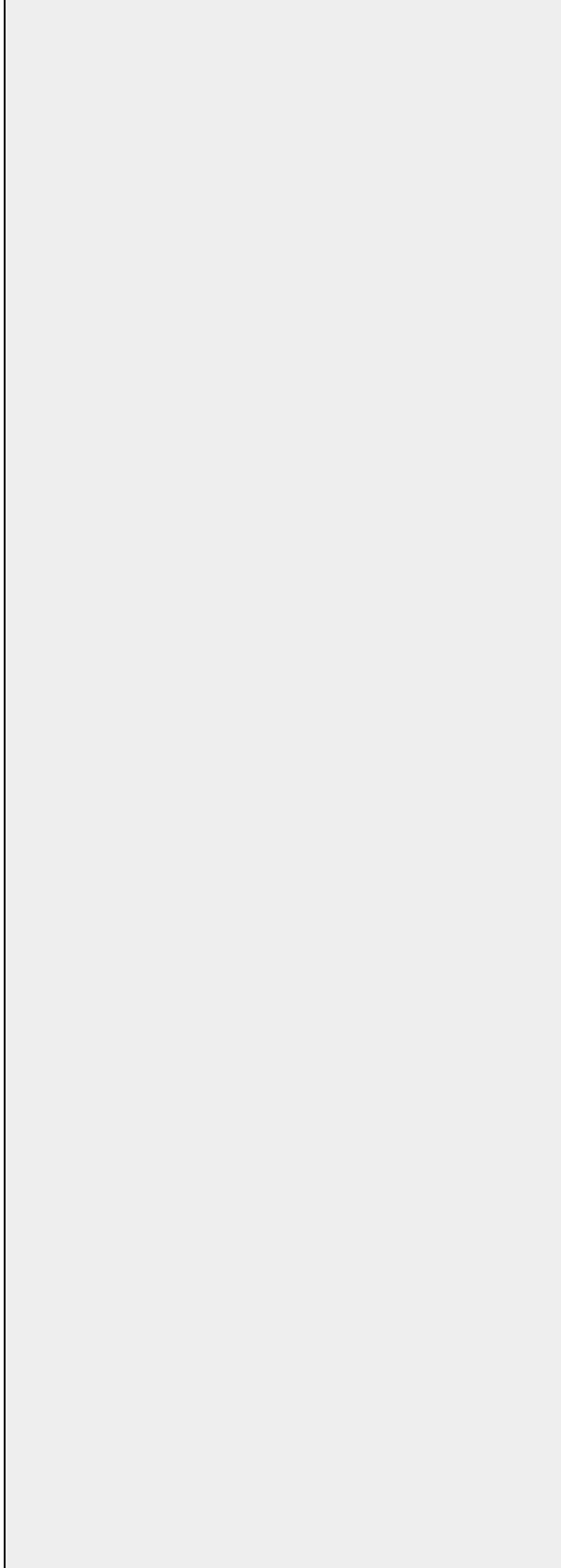
Ratios

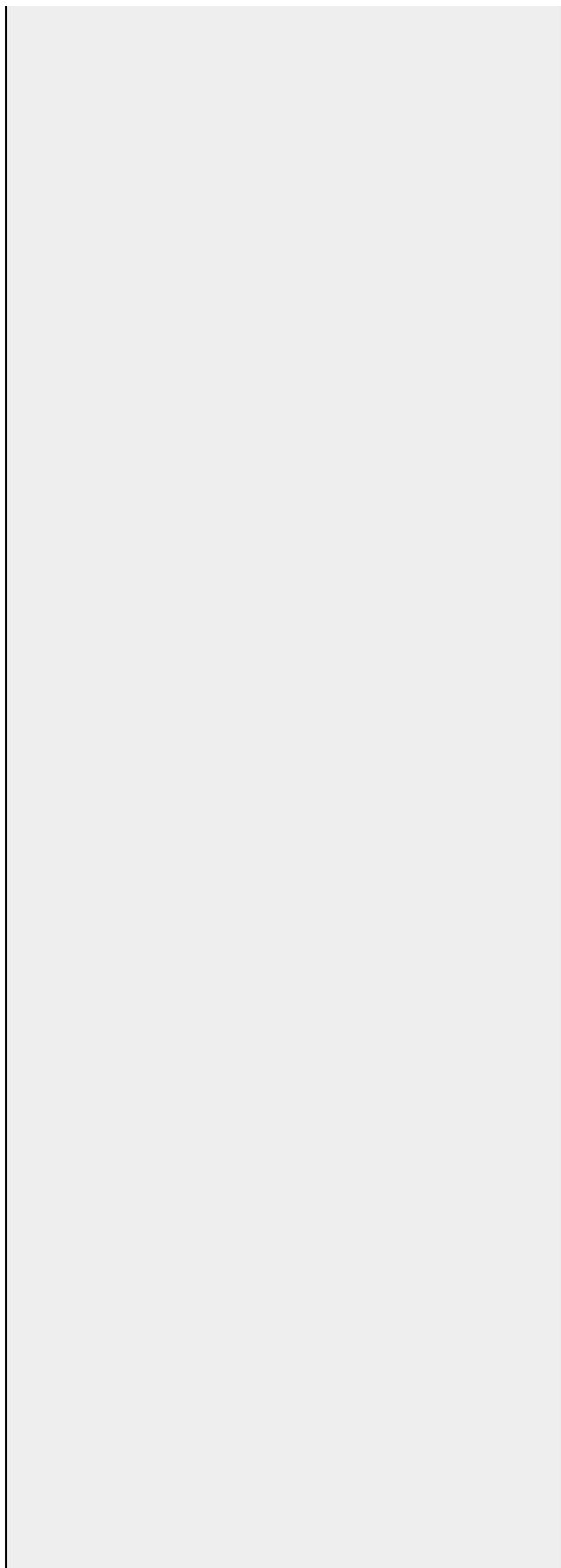
Sinuosity: ---  
 Meander Length Ratio: ---  
 Meander Width Ratio: ---  
 Radius / BkF Width: ---

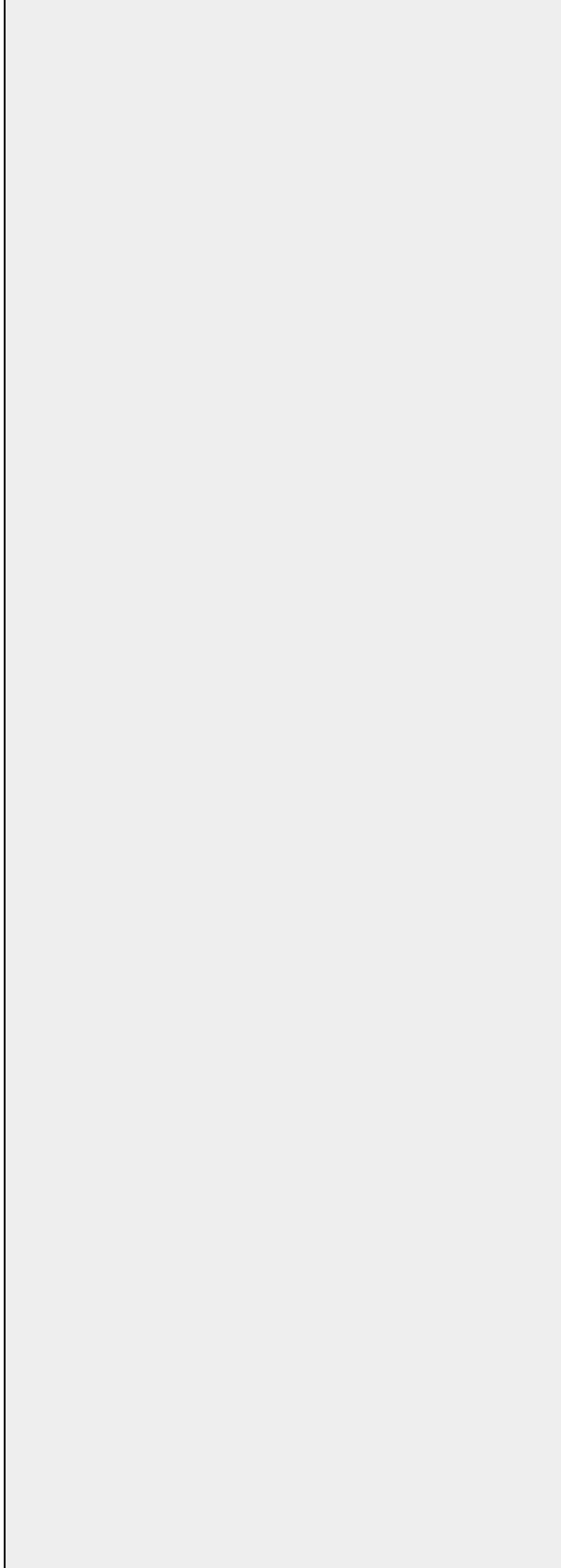
cross section		azimuth		
ID	staion	AZ	x	y
	0		0.0	0.0
	18	0	0.0	0.0
	43	---	0.0	0.0
	49	---	0.0	0.0
	56	---	0.0	0.0
	60	---	0.0	0.0
	66	---	0.0	0.0
	70	---	0.0	0.0
	72	---	0.0	0.0
	74	---	0.0	0.0
	75	---	0.0	0.0
	84	---	0.0	0.0
	103	---	0.0	0.0
	115	---	0.0	0.0
	194	---	0.0	0.0
	234	---	0.0	0.0

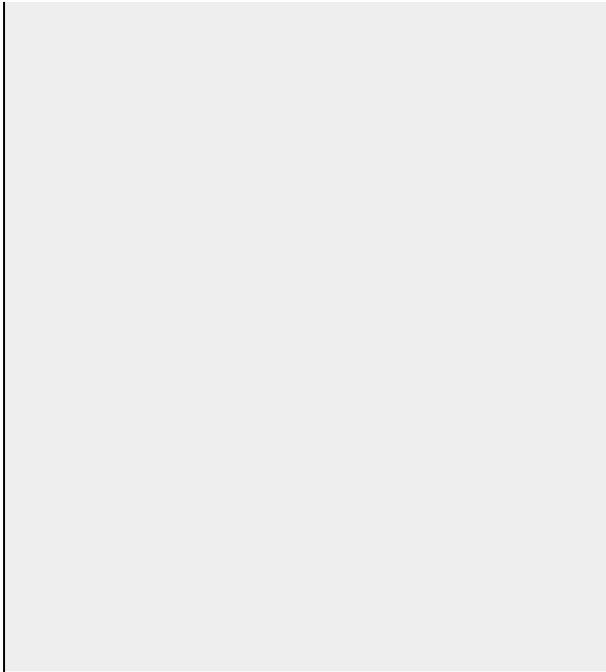












## Channel Material

### This Worksheet

---

Three types of data can be accommodated to the right on this sheet:

1. Individual stand alone pebble count for:

- > riffle surface,
- > channel bed or
- > bankfull
- channel.

2. Weighted pebble counts representing the channel surface with samples taken separately from distinct features or depositional areas.

- > bed features (riffle, pool, etc),
- > bed surface and bank surface,
- > facies or patches of distinct grain size.

3. Bulk sieve analysis for:

- >point bar samples,
- >bed sub-pavement or
- >bank material.

Surface material from this worksheet is linked to the Dimension worksheet where it is used to estimate roughness. Individual or weighted samples will link. If no bed surface is entered, riffle surface is used and then the bankfull channel.

Shape factor and Largest Particle may be entered far to the right of this worksheet.

Reference Reach				
Stream:	Aravaipa Creek			
Watershed:	Aravaipa Canyon			
Location:	Aravaipa Creek at the Nature Conservancy Guest House			
Latitude:	32.8790			
Longitude:	110.3960			
County:	Graham			
Date:	April 17, 2005			
Observers:	Dave Smith			
Channel Type:	C5			
Drainage Area (sq.mi)	537			
Channel Materials				
D16 (mm)	---	---	---	---
D35 (mm)	---	---	---	---
D50 (mm)	---	---	---	---
D65 (mm)	---	---	---	---
D84 (mm)	---	---	---	---
D95 (mm)	---	---	---	---
mean (mm)	---			---
dispersion	---			---
skewness	---			---
Shape Factor	---			---
% Silt/Clay	---	---	---	---
% Sand	---	---	---	---
% Gravel	---	---	---	---
% Cobble	---	---	---	---
% Boulder	---	---	---	---
% Bedrock	---	---	---	---
% Clay Hardpan	---	---	---	---
% Detritus/Wood	---	---	---	---
% Artificial	---	---	---	---
Largest Mobile (mm)	---			---

**1) Individual Pebble Count**

Two individual samples may be entered below. Select sample type for each.

Bankfull Channel		
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	
very fine sand	0.062 - 0.125	
fine sand	0.125 - 0.25	
medium sand	0.25 - 0.5	
coarse sand	0.5 - 1	
very coarse sand	1 - 2	
very fine gravel	2 - 4	
fine gravel	4 - 6	
fine gravel	6 - 8	
medium gravel	8 - 11	
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
total particle count:		0
bedrock -----		
clay hardpan -----		
detritus/wood -----		
artificial -----		
total count:		0
Note: _____		

Bankf
1
percent finer than



## 2) Weighted Pebble Count

### Feature Percent of Reach

#### Weighted pebble count by bed features

Material	Size Range (mm)	weighted
silt/clay	0 - 0.062	0.0
	0.062	
very fine sand	- 0.125	0.0
fine sand	0.125 - 0.25	0.0
	0.25	
medium sand	- 0.5	0.0
coarse sand	0.5 - 1	0.0
very coarse sand	1 - 2	0.0
very fine gravel	2 - 4	0.0
fine gravel	4 - 6	0.0
fine gravel	6 - 8	0.0
medium gravel	8 - 11	0.0
medium gravel	11 - 16	0.0
coarse gravel	16 - 22	0.0
coarse gravel	22 - 32	0.0
very coarse gravel	32 - 45	0.0
very coarse gravel	45 - 64	0.0
small cobble	64 - 90	0.0
medium cobble	90 - 128	0.0
	128	
large cobble	- 180	0.0
very large cobble	180 - 256	0.0
	256	
small boulder	- 362	0.0
	362	
small boulder	- 512	0.0
medium boulder	512 - 1024	0.0
	1024	
large boulder	- 2048	0.0
very large boulder	2048 - 4096	0.0
	4096	
total particle weighted count:		0

bedrock -----	0.0
clay hardpan -----	0.0
detritus/wood -----	0.0
artificial -----	0.0

total weighted count: 0.0

Note:

**Riffle**

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	
	0.062	
very fine sand	- 0.125	
fine sand	0.125 - 0.25	
	0.25	
medium sand	- 0.5	
coarse sand	0.5 - 1	
very coarse sand	1 - 2	
very fine gravel	2 - 4	
fine gravel	4 - 6	
fine gravel	6 - 8	
medium gravel	8 - 11	
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
	128	
large cobble	- 180	
very large cobble	180 - 256	
	256	
small boulder	- 362	
	362	
small boulder	- 512	
medium boulder	512 - 1024	
	1024	
large boulder	- 2048	
very large boulder	2048 - 4096	
	4096	

total particle count: 0

bedrock	-----	
clay hardpan	-----	
detritus/wood	-----	
artificial	-----	
total count:		0
Note: <span style="background-color: #cccccc; display: inline-block; width: 100px; height: 1em;"></span>		

Pool		
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	
	0.062	
very fine sand	- 0.125	
fine sand	0.125	
	- 0.25	
medium sand	0.25	
	- 0.5	
coarse sand	0.5 - 1	
very coarse sand	1 - 2	
very fine gravel	2 - 4	
fine gravel	4 - 6	
fine gravel	6 - 8	
medium gravel	8 - 11	
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
	128	
large cobble	- 180	
very large cobble	180	
	- 256	
	256	
small boulder	- 362	
	362	
small boulder	- 512	
medium boulder	512	
	- 1024	
	1024	
large boulder	- 2048	
very large boulder	2048	
	- 4096	

total particle count: 0

bedrock	-----	
clay hardpan	-----	
detritus/wood	-----	
artificial	-----	

total count: 0

Note: [Redacted]

Run	Material	Size Range (mm)	Count
	silt/clay	0 - 0.062	
	very fine sand	0.062 - 0.125	
	fine sand	0.125 - 0.25	
	medium sand	0.25 - 0.5	
	coarse sand	0.5 - 1	
	very coarse sand	1 - 2	
	very fine gravel	2 - 4	
	fine gravel	4 - 6	
	fine gravel	6 - 8	
	medium gravel	8 - 11	
	medium gravel	11 - 16	
	coarse gravel	16 - 22	
	coarse gravel	22 - 32	
	very coarse gravel	32 - 45	
	very coarse gravel	45 - 64	
	small cobble	64 - 90	
	medium cobble	90 - 128	
	large cobble	128 - 180	
	very large cobble	180 - 256	
	small boulder	256 - 362	
	small boulder	362 - 512	
	medium boulder	512 - 1024	
	large boulder	1024 - 2048	
	very large boulder	2048 - 4096	

total particle count: 0

bedrock	-----	
clay hardpan	-----	
detritus/wood	-----	
artificial	-----	

total count: 0

Note:

Glide		
Material	Size Range (mm)	Count
silt/clay	0 - 0.062	
very fine sand	0.062 - 0.125	
fine sand	0.125 - 0.25	
medium sand	0.25 - 0.5	
coarse sand	0.5 - 1	
very coarse sand	1 - 2	
very fine gravel	2 - 4	
fine gravel	4 - 6	
fine gravel	6 - 8	
medium gravel	8 - 11	
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
medium cobble	128 - 180	
large cobble	180 - 256	
large cobble	256 - 362	
small boulder	362 - 512	
small boulder	512 - 1024	
medium boulder	1024 - 2048	
large boulder	2048 - 4096	
large boulder	4096 - 8192	

		total particle count:	0
bedrock	-----		
clay hardpan	-----		
detritus/wood	-----		
artificial	-----		
		total count:	0
Note: <input type="text"/>			

**Dimension Worksheet Instructions:**

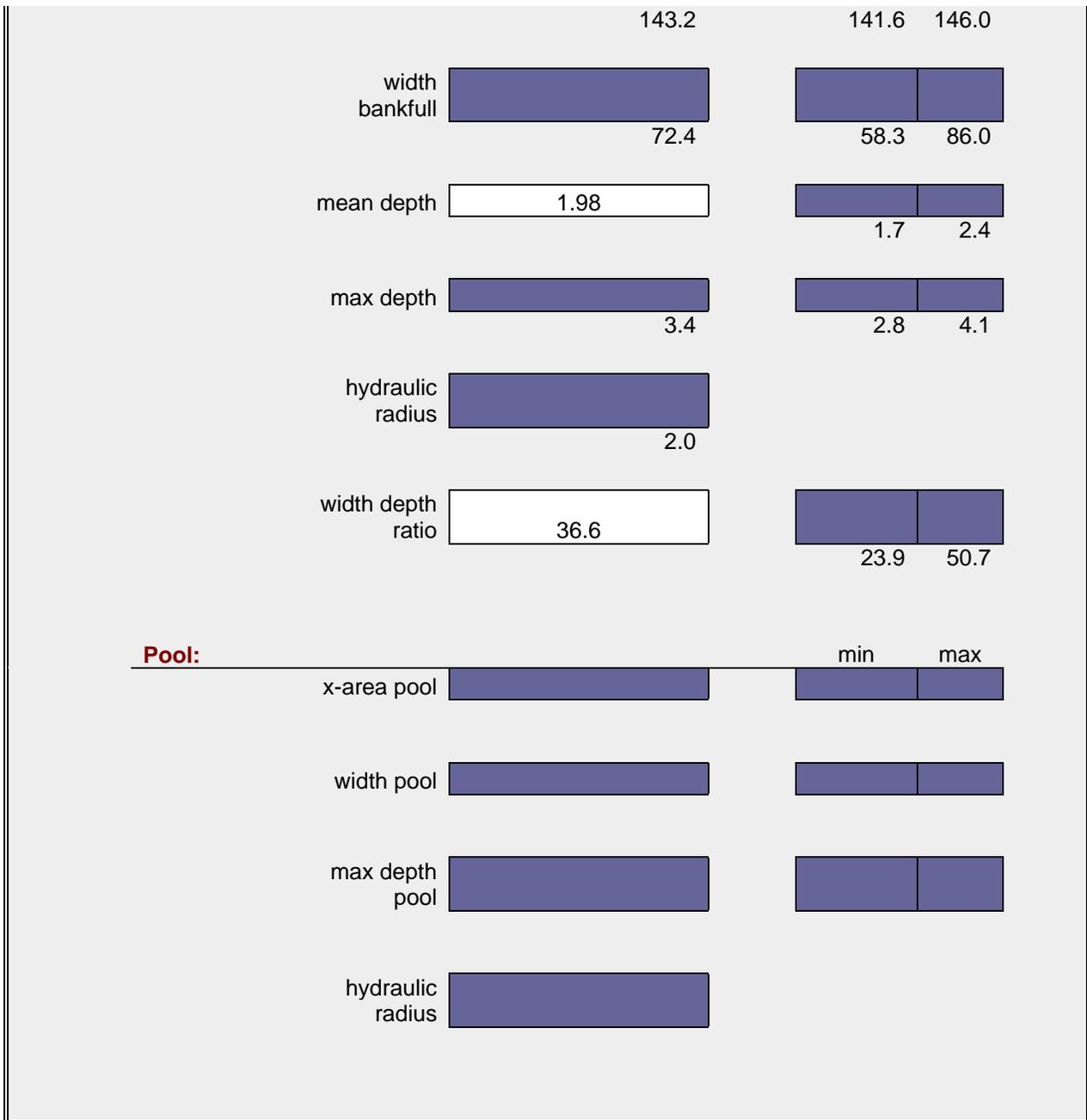
- 1) Start by entering the sections "Reference ID" used on the profile sheet.
- 2) Entering surveyed values for "Distance" and "FS" in the worksheets to the right.
- 3) The "BS" column can be ignored unless the instrument was moved in the midst of surveying a cross section, in which case a turning point FS and BS are entered.
- 4) The spreadsheet provides values inferred from the data entered however these should be checked. Values entered take precedence.

**Reach:**

		min	max
slope (%)	<input type="text" value="1.1"/>		
discharge rate	<input type="text"/>		
width flood prone area	<input type="text" value="301.3"/>	<input type="text" value="256.0"/>	<input type="text" value="346.6"/>
low bank height	<input type="text"/>	<input type="text" value="---"/>	<input type="text" value="---"/>

**Riffle - Run:**

		min	max
x-area bankfull	<input type="text"/>	<input type="text"/>	<input type="text"/>

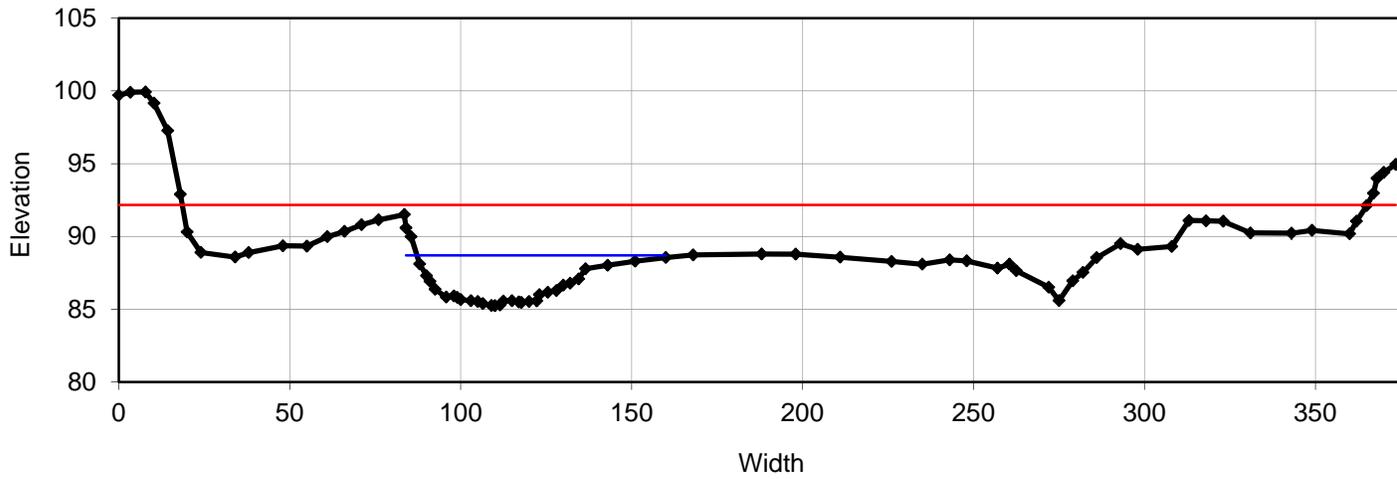


Reference Reach		hints
Stream:	Aravaipa Creek	
Watershed:	Aravaipa Canyon	
Location:	Aravaipa Creek at the Nature Conservancy Guest House	
Latitude:	32.8790	
Longitude:	110.3960	
County:	Graham	

Date:	April 17, 2005			
Observers:	Dave Smith			
Channel type:	C5			
Drainage area (sq.km)	537			
Dimension		bankfull channel		
		typical	min	max
floodplain :	width flood prone area (ft)	301.3	256.0	346.6
	low bank height (ft)	---	---	---
riffle - run	x-area bankfull (sq.ft)	143.2	141.6	146.0
	width bankfull (ft)	72.4	58.3	86.0
	mean depth (ft)	1.98	1.7	2.4
	max depth (ft)	3.4	2.8	4.1
	hydraulic radius (ft)	2.0		
pool:	x-area pool (sq.ft)	---	---	---
	width pool (ft)	---	---	---
	max depth pool (ft)	---	---	---
	hydraulic radius (ft)	---		
dimensionless ratios:		typical		
		l	min	max
	width depth ratio	36.6	23.9	50.7
	entrenchment ratio	4.2	3.5	4.8
	bank height ratio	---	---	---
	riffle max depth ratio	1.7	1.4	2.0
	pool area ratio	---	---	---
	pool width ratio	---	---	---
	pool max depth ratio	---	---	---
hydraulics:		bankfull channel		
		riffle-run & (range)		pool
	discharge rate (cfs)	---		
	channel slope (%)	1.1		
	velocity (ft/s)	---	---	---
	Froude number	---	---	---
	shear stress (lbs/sq.ft)	1.366	(1.15-1.63) (0.77-	---
	shear velocity (ft/s)	0.840	0.92)	---
	stream power (lb/s)	---	(-----)	
	unit stream power (lb/s/ft)	---	---	
	relative roughness	---	(-----)	
	friction factor u/u*	---	---	
	threshold grain size (t*=0.06) (mm)	64.8	(57-80)	-
	Shield's parameter	---		-

Cross Section 1

Aravaipa Creek, Riffle



Bankfull Dimensions

141.6	x-section area (ft.sq.)
72.8	width (ft)
1.9	mean depth (ft)
3.5	max depth (ft)
73.7	wetted parimeter (ft)
1.9	hyd radi (ft)
37.4	width-depth ratio

Flood Dimensions

346.6	W flood prone area (ft)
4.8	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

Bankfull Flow

---	velocity (ft/s)
---	discharge rate (cfs)
---	Froude number

Flow Resistance

---	Manning's roughne
---	D'Arcy-Weisbach fr
---	resistance factor u
---	relative roughness

**Cross Section**

BM15

reference ID	1	
instrument height	103.5	---
longitudinal station		---

**Bankfull Stage**

FS		---
elevation	88.7	---

**Low Bank Height**

FS		---
elevation		

**Flood Prone Area**

width fpa	346.6
-----------	-------

**Channel Slope**

percent slope	1.1
---------------	-----

**Flow Resistance**

Manning's "n"		---
D'Arcy - Weisbach "f"		---

**Note:**

Permanently monumented cross section. Bench mark is large flat rock next to road. Marked with black "X".

Distance

(ft)

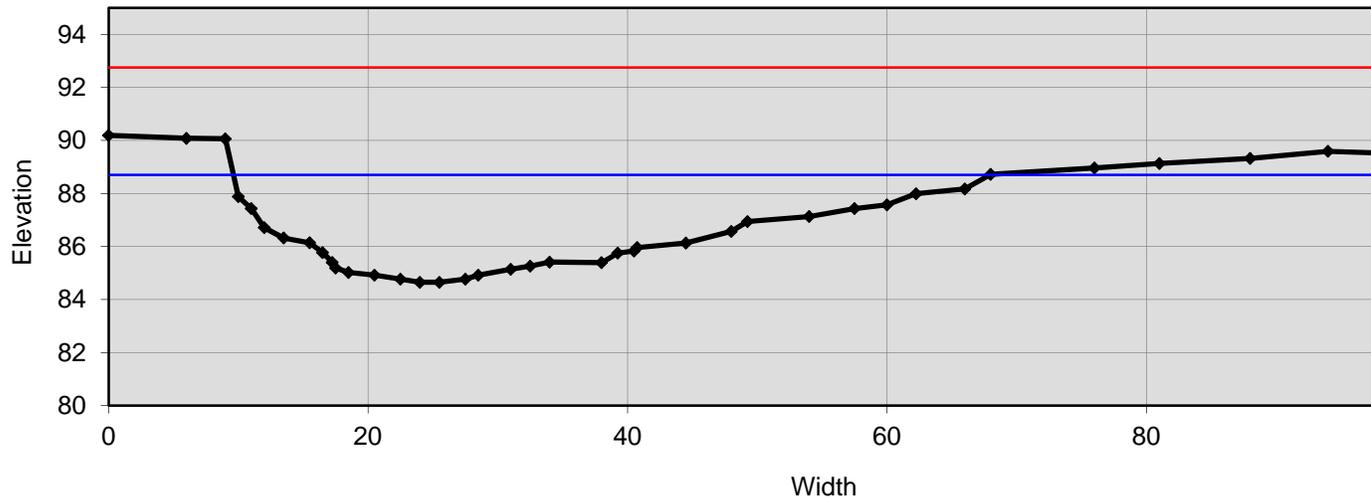
0
3.4
7.8
10.3
14.3
18
20
24
34
38
48
55
61
66
71
76
83.5
84
85.5
88
90
91
92.5
95.75
98
99
100
103
105
106.5
109
110
111.5
112.5
115
117
117.75
120
122.25
123

	125.5
	128
	130
	132
	134.5
	136.5
	143
	151
	160
	168
	188
	198
	211
	226
	235
	243
	248
	257
	260.5
	262.5
	272
	275
	279
	282
	286
	293
	298
	308
	313
	318
	323
	331
	343
	349
	360
	362
	365
	367
	368
	370
	373.5

FPA	TRUE	BKHT	TRUE		
92.16		x lf bk	y lf bk	x rt bk	y rt bk
0	92.16	0	#N/A	160	#N/A
373.5	92.2	85.5	#N/A	373.5	#N/A

**Cross Section 2**

Aravaipa Creek, Riffle



Bankfull Dimensions

142.0	x-section area (ft.sq.)
58.3	width (ft)
2.4	mean depth (ft)
4.1	max depth (ft)
59.8	wetted parimeter

Flood Dimensions

---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

2.4 (ft)  
 23.9 hyd radi (ft)  
 width-depth ratio

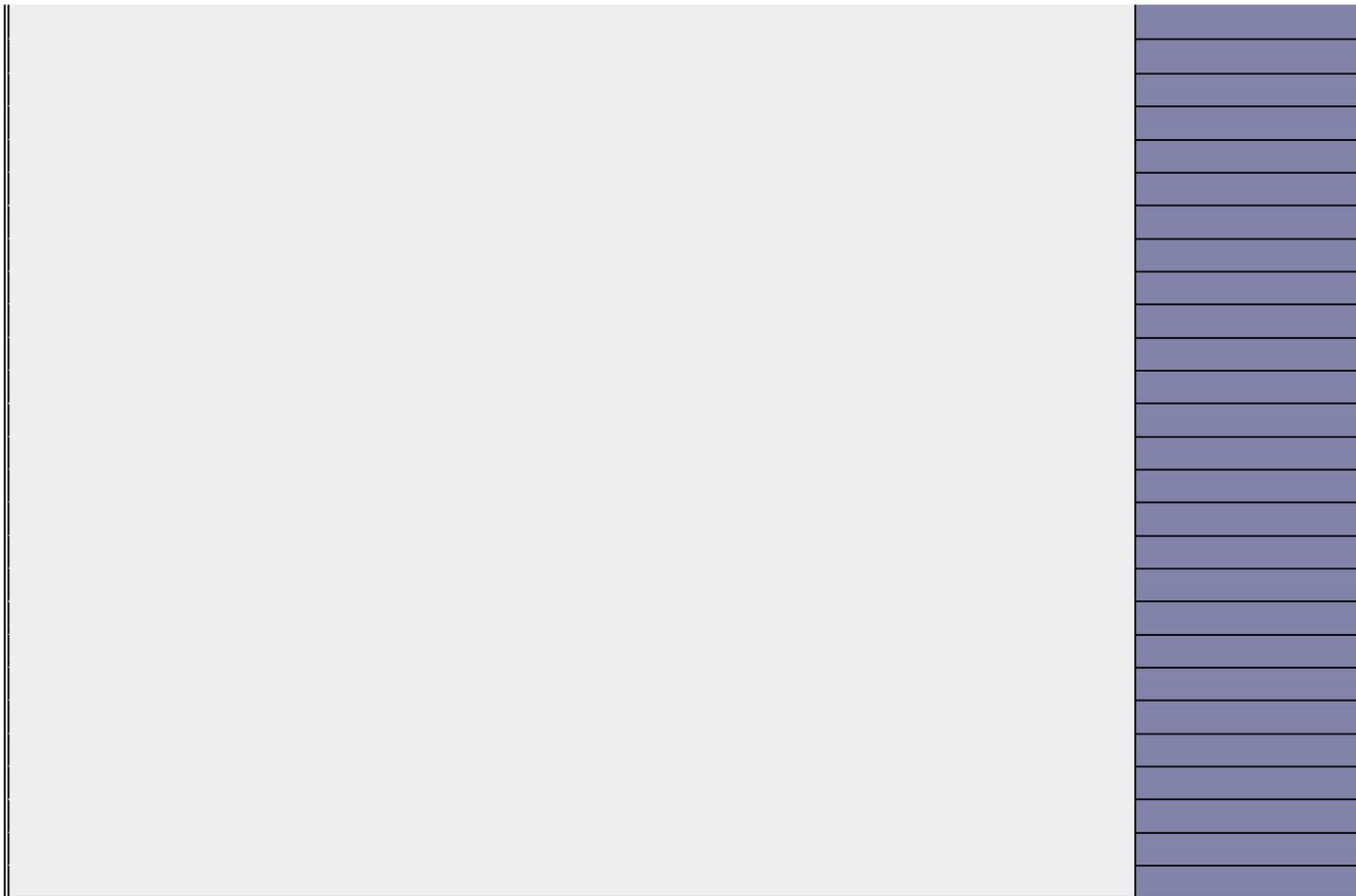
Bankfull Flow		Flow Resistance	
---	velocity (ft/s)	---	Manning's roughness
---	discharge rate (cfs)	---	D'Arcy-Weisbach friction
---	Froude number	---	resistance factor $f$
		---	relative roughness

			Distance (ft)
<b>Cross Section</b>			0
	reference ID	2	6
	instrument height	95.64	9
	longitudinal station		10
<b>Bankfull Stage</b>			11
	FS elevation	88.7	12
			13.5
<b>Low Bank Height</b>			15.5
	FS elevation		16.5
			17.25
<b>Flood Prone Area</b>			17.5
	width fpa	106.0	18.5
			20.5
<b>Channel Slope</b>			22.5
	percent slope	1.1	24
			25.5
<b>Flow Resistance</b>			27.5
	Manning's "n"		28.5
	D'Arcy - Weisbach "f"		31
			32.5
			34
			38
			39.25
			40.5
			40.75
			44.5
			48

**Note:**

Active channel narrow, full of herbaceous vegetation. Non-permanent monuments, bankfull channel measure only.





FPA	TRUE	BKHT	TRUE		
92.75		x lf bk	y lf bk	x rt bk	y rt bk
0	92.75	0	#N/A	68	#N/A
106	92.8	9	#N/A	106	#N/A

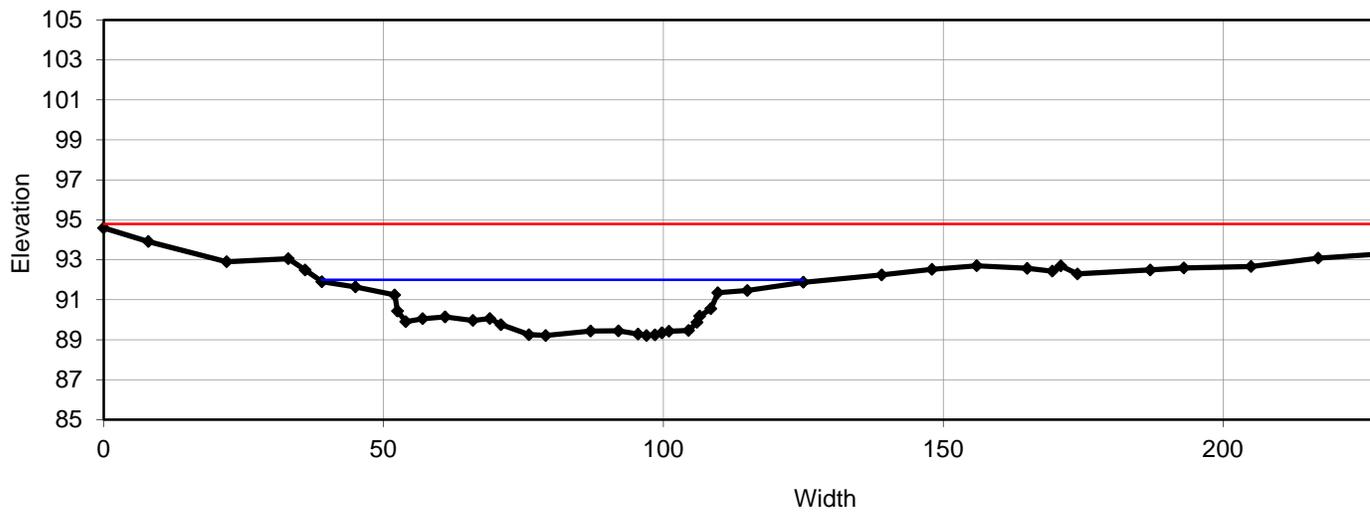


1  
 21.6  
 57.6  
 50.5  
 108.6  
 135.  
 20.  
 17.3  
 6.3  
 12.7  
 14.9  
 15.6  
 19.7



**Cross Section 3**

Aravaipa Creek, Riffle



**Bankfull Dimensions**

146.0	x-section area (ft.sq.)
86.0	width (ft)
1.7	mean depth (ft)
2.8	max depth (ft)
87.1	wetted perimeter (ft)
1.7	hyd radi (ft)
50.7	width-depth ratio

**Flood Dimensions**

256.0	W flood prone area (ft)
3.0	entrenchment ratio
---	low bank height (ft)
---	low bank height ratio

**Bankfull Flow**

---	velocity (ft/s)
-----	-----------------

**Flow Resistance**

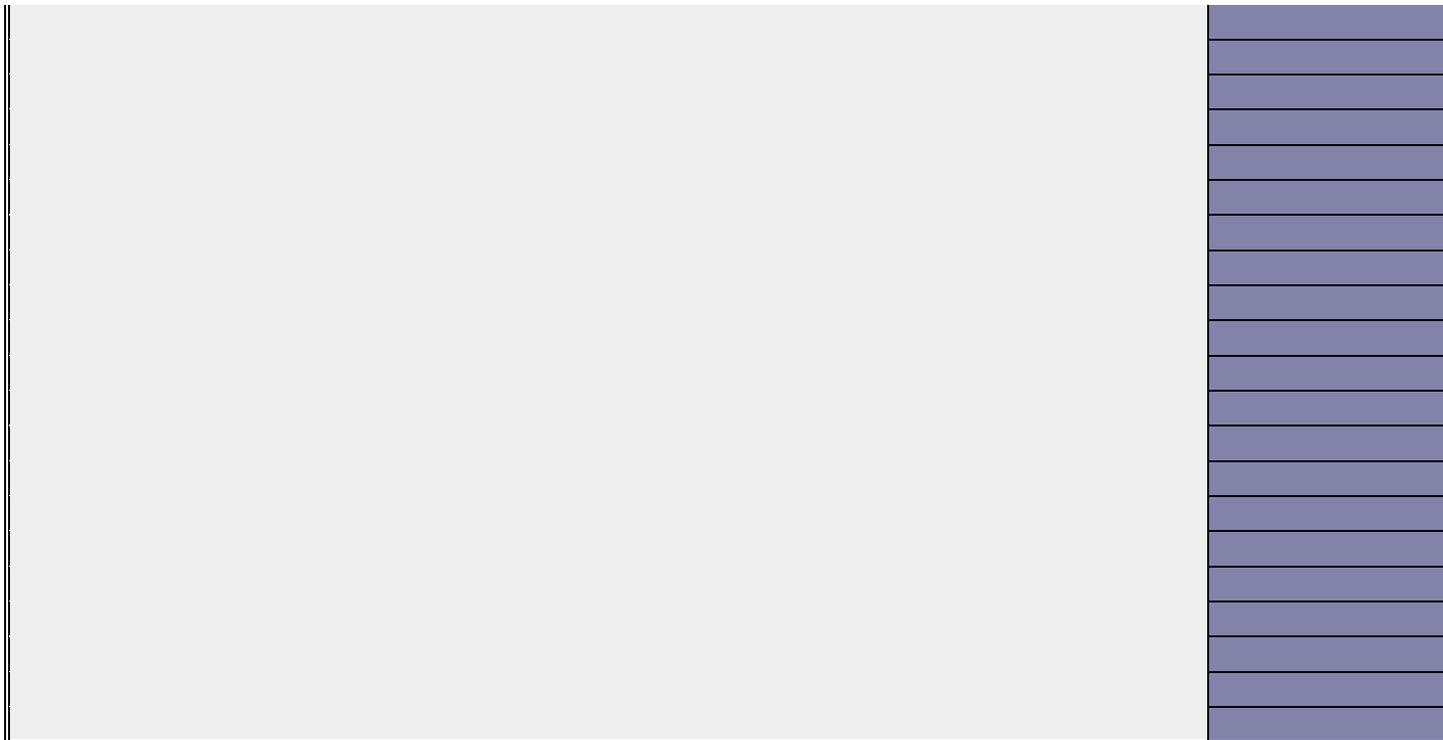
---	Manning's roughness
-----	---------------------

--- discharge rate (cfs)  
 --- Froude number

--- D'Arcy-Weisbach fr  
 --- resistance factor u  
 --- relative roughness

		Distance
		(ft)
<b>Cross Section</b>		0
	Riffle	8
reference ID	3	22
instrument height	99.06	33
longitudinal station		36
<b>Bankfull Stage</b>		39
FS		45
elevation	92	52
<b>Low Bank Height</b>		52.5
FS		54
elevation		57
<b>Flood Prone Area</b>		61
width fpa	256	66
	256.0	69
<b>Channel Slope</b>		71
percent slope		76
	1.1	79
<b>Flow Resistance</b>		87
Manning's "n"		92
D'Arcy - Weisbach "f"		95.5
		97
<b>Note:</b>		98.5
Active channel wide, full of herbaceous vegetation. Monuments need to be extended slightly higher.		99.75
		101
		104.5
		106
		106.5
		108.5
		109.75
		115
		125
		139
		148





FPA	TRUE	BKHT	TRUE		
94.79		x lf bk	y lf bk	x rt bk	y rt bk
0	94.79	0	#N/A	125	#N/A
256	94.8	39	#N/A	256	#N/A

	-255	8
	-235	9
	-215	5.5
	-200	6.8
	-52.2	5.4
	0	4.8
	5.43	5.2
	9.59	10.02
	12.48	10.95
	27.07	10.95
	30.04	9.6
	32.14	7.1
	33.73	6.8
	39.81	7.05
	51.36	7.8
	64.87	3.9