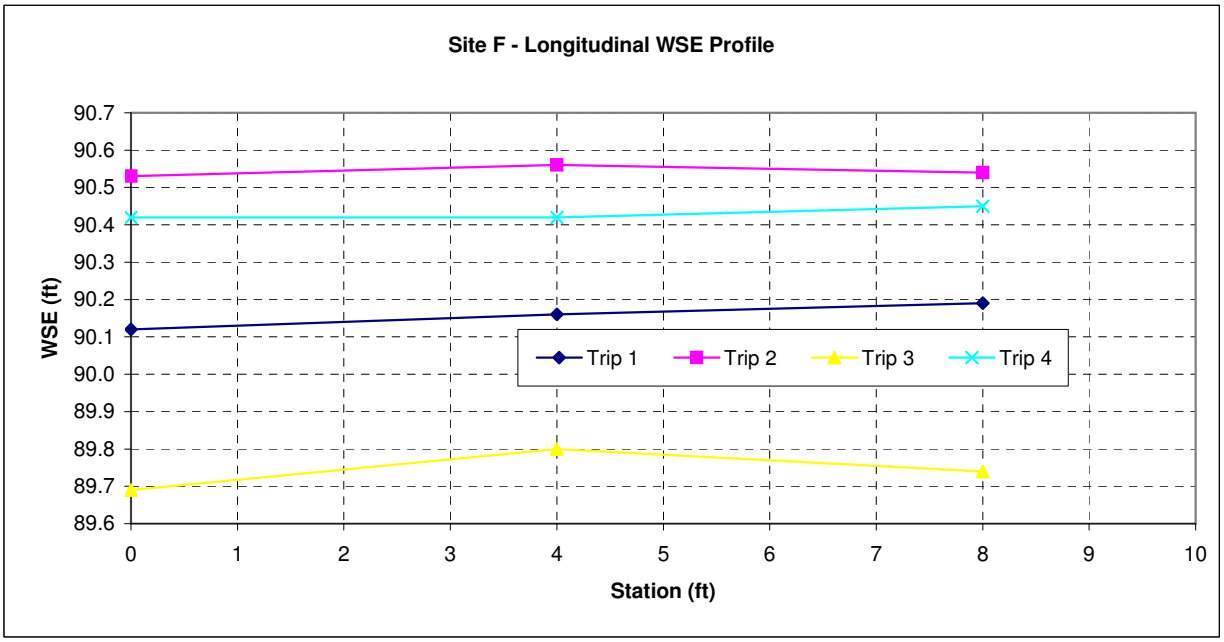
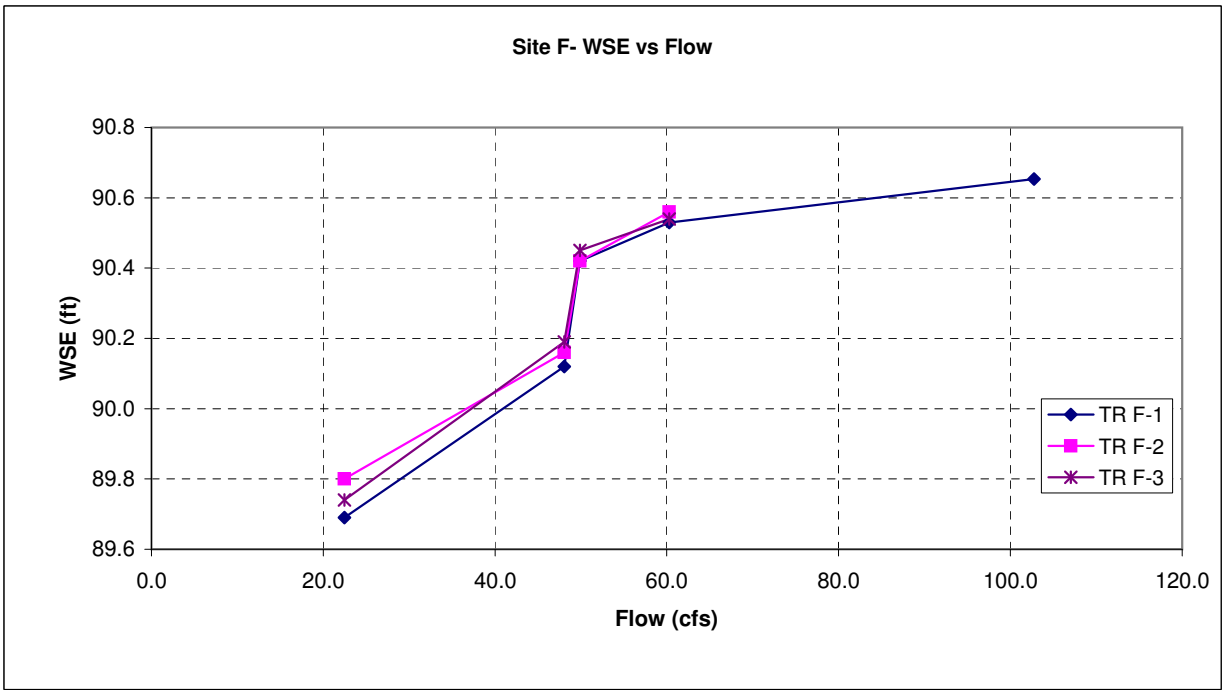
Reach: Canyon Reach
Stream: Cooper Creek
Site: Site F
Habitat Type: Cascade

			Q(cfs)									
			22.5	48.1	49.9	60.3	102.7					
			WSE (ft)					Vel-Depth Survey				
TR	length	Sta	Trip 3	Trip 1	Trip 4	Trip 2	Trip 5	Trip 3	Trip 1	Trip 4	Trip 2	Trip 5
TR F-1	-	0.0	89.69	90.12	90.42	90.53	90.65		Y			
TR F-2	4	4.0	89.80	90.16	90.42	90.56			Y			
TR F-3	4	8.0	89.74	90.19	90.45	90.54			Y			
Average WSE slope			0.62%	0.87%	0.38%	0.13%		Trip 5, TR F-1 has measured WSE				

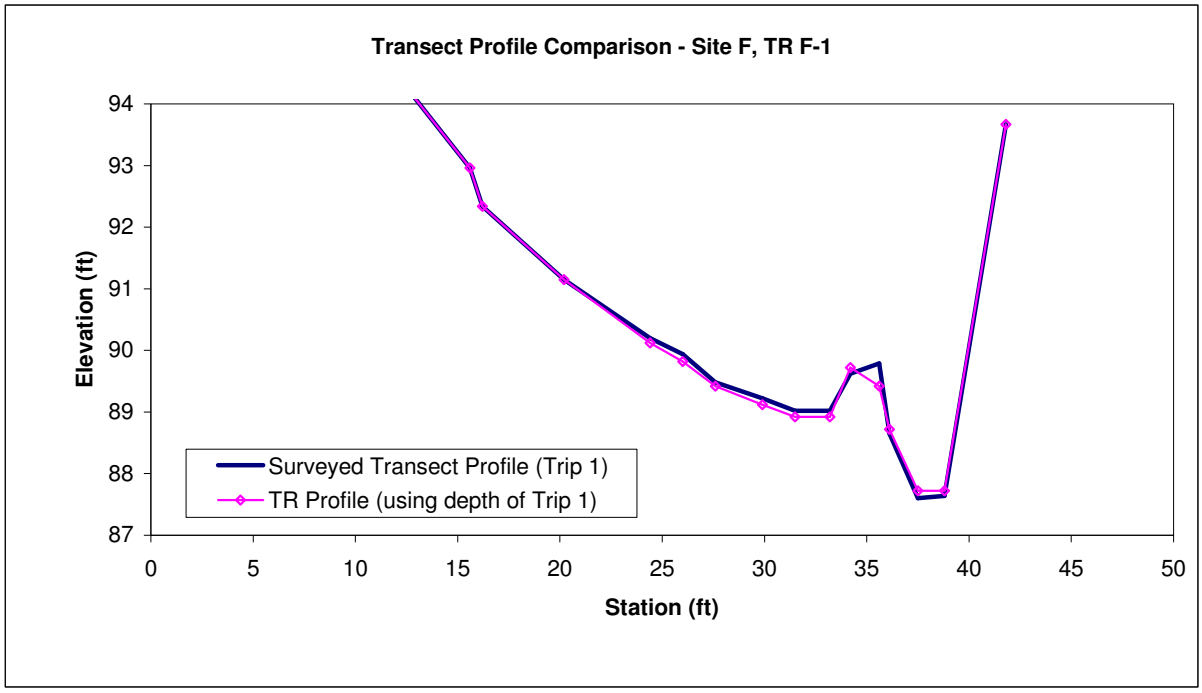




Transect Profile Comparison - Site F, TR F-1

Trip 1								Trip 5					
Sta (ft)	HI (ft)	FS (ft)	Elev (ft)	Depth (ft)	Velocity (ft/s)	q (cfs)	Bed Elev (ft)	Depth (ft)	Velocity (ft/s)	q (cfs)	Bed Elev (ft)	subs	code
10	98.12	2.80	95.32				95.32					org	0
15.6	98.12	5.16	92.96				92.96					org	0
16.2	98.12	5.78	92.34				92.34					org	0
20.2	98.12	6.97	91.15				91.15					45	4
24.4	98.12	7.92	90.2	0.00	0.00	0.00	90.12	**No flow (vel-depth) measurement during Trip 5**				16	3
26	98.12	8.18	89.94	0.30	0.30	0.14	89.82					16	3
27.6	98.12	8.64	89.48	0.70	1.60	2.18	89.42					32	3
29.9	98.12	8.9	89.22	1.00	2.40	4.68	89.12					32	3
31.5	98.12	9.1	89.02	1.20	2.60	5.15	88.92					45	4
33.2	98.12	9.1	89.02	1.20	2.90	4.70	88.92					64	4
34.2	98.12	8.5	89.62	0.40	3.70	1.78	89.72					bed	8
35.6	98.12	8.33	89.79	0.70	3.00	2.00	89.42					bed	8
36.1	98.12	9.47	88.65	1.40	3.00	3.99	88.72					bed	8
37.5	98.12	10.52	87.6	2.40	4.00	12.96	87.72					bed	8
38.8	98.12	10.48	87.64	2.40	4.90	7.64	87.72					bed	8
41.8	98.12	4.45	93.67				93.67					bed	8

TR Q (cfs)= **45.2**

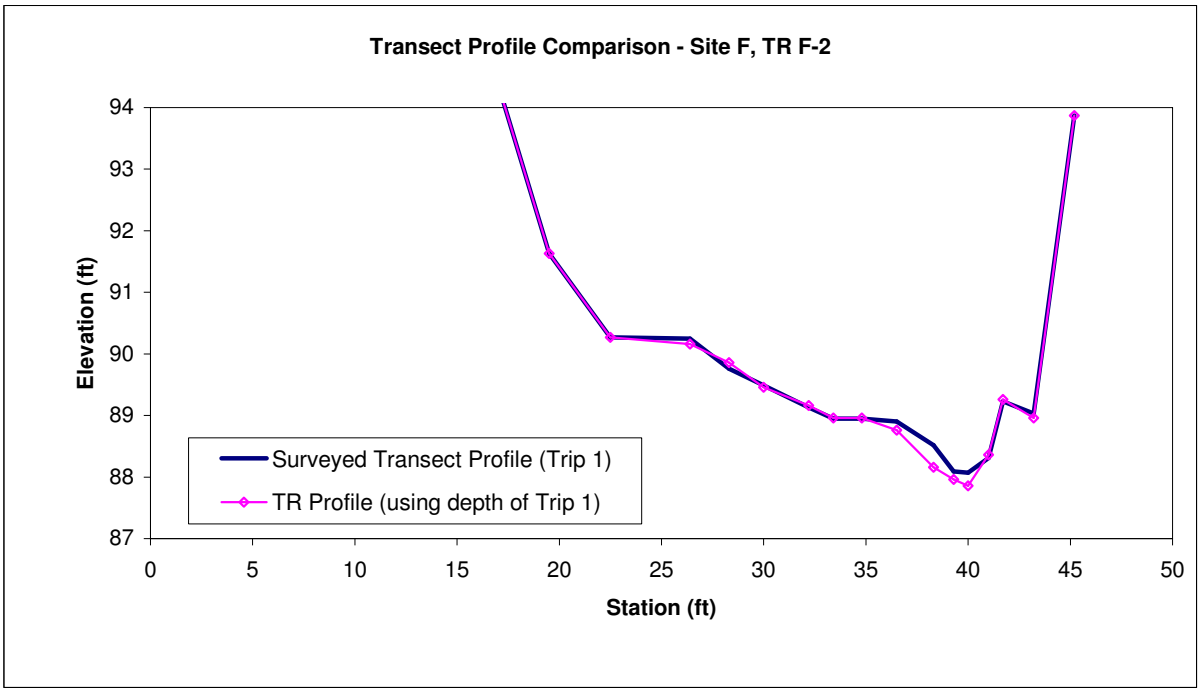


Transect Profile Comparison - Site F, TR F-2

Trip 1								Trip 5					
Sta (ft)	HI (ft)	FS (ft)	Elev (ft)	Depth (ft)	Velocity (ft/s)	q (cfs)	Bed Elev (ft)	Depth (ft)	Velocity (ft/s)	q (cfs)	Bed Elev (ft)	subs	code
16.2	98.12	2.86	95.26				95.26					bed	8
19.5	98.12	6.49	91.63				91.63					2	1
22.5	98.12	7.85	90.27				90.27					23	3
26.4	98.12	7.87	90.25	0.00	0.00	0.00	90.16					32	3
28.3	98.12	8.36	89.76	0.30	0.00	0.00	89.86					11	3
30	98.12	8.63	89.49	0.70	0.90	1.23	89.46					8	2
32.2	98.12	8.99	89.13	1.00	2.00	3.40	89.16					2	1
33.4	98.12	9.17	88.95	1.20	2.40	3.74	88.96					11	3
34.8	98.12	9.17	88.95	1.20	2.30	4.28	88.96					90	5
36.5	98.12	9.22	88.9	1.40	2.20	5.39	88.76					64	4
38.3	98.12	9.6	88.52	2.00	2.80	7.84	88.16					256	6
39.3	98.12	10.03	88.09	2.20	3.30	6.17	87.96					bed	8
40	98.12	10.05	88.07	2.30	3.70	7.23	87.86					bed	8
41	98.12	9.81	88.31	1.80	4.20	6.43	88.36					bed	8
41.7	98.12	8.89	89.23	0.90	2.20	2.18	89.26					bed	8
43.2	98.12	9.09	89.03	1.20	0.70	0.63	88.96					bed	8
45.2	98.12	4.25	93.87				93.87					bed	8

No flow (vel-depth) measurement during Trip 5

TR Q (cfs)= **48.5**

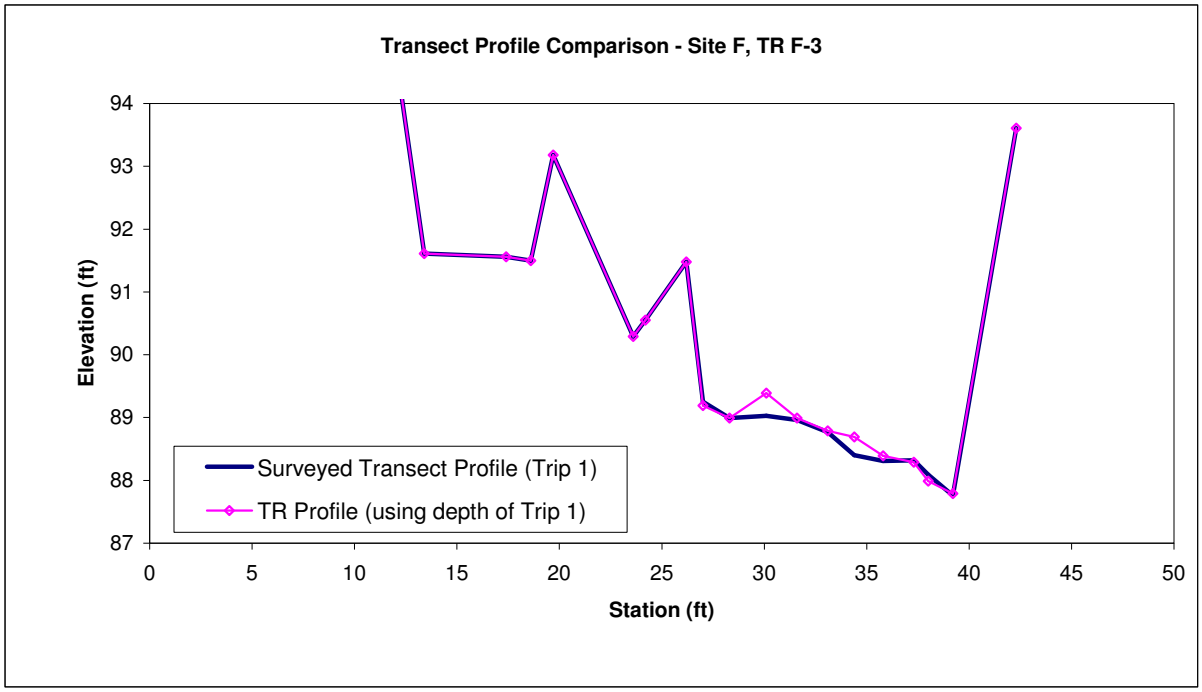


Transect Profile Comparison - Site F, TR F-3

Trip 1								Trip 5					
Sta (ft)	HI (ft)	FS (ft)	Elev (ft)	Depth (ft)	Velocity (ft/s)	q (cfs)	Bed Elev (ft)	Depth (ft)	Velocity (ft/s)	q (cfs)	Bed Elev (ft)	subs	code
10	98.12	2.17	95.95				95.95					org	0
11.8	98.12	2.86	95.26				95.26					org	0
13.4	98.12	6.51	91.61				91.61					bed	8
17.4	98.12	6.56	91.56				91.56					3	2
18.6	98.12	6.62	91.5				91.50					4	2
19.7	98.12	4.94	93.18				93.18					2048	7
23.6	98.12	7.83	90.29				90.29					2048	7
24.2	98.12	7.57	90.55				90.55					sand	1
26.2	98.12	6.64	91.48				91.48					2048	7
27	98.12	8.87	89.25	1.00	1.50	0.98	89.19					16	3
28.3	98.12	9.13	88.99	1.20	2.00	3.72	88.99					16	3
30.1	98.12	9.09	89.03	0.80	1.40	1.85	89.39					16	3
31.6	98.12	9.16	88.96	1.20	2.60	4.68	88.99					45	4
33.1	98.12	9.35	88.77	1.40	2.70	5.29	88.79					128	5
34.4	98.12	9.72	88.4	1.50	4.80	9.72	88.69					180	6
35.8	98.12	9.81	88.31	1.80	3.00	7.83	88.39					256	6
37.3	98.12	9.8	88.32	1.90	4.20	8.78	88.29					256	6
38	98.12	10.03	88.09	2.20	3.10	6.48	87.99					180	6
39.2	98.12	10.36	87.76	2.40	0.10	0.14	87.79					90	5
42.3	98.12	4.51	93.61				93.61					bed	8

No flow (vel-depth) measurement during Trip 5

TR Q (cfs)= **49.5**



Reach: Canyon Reach
Stream Cooper Creek
Site: Site F
Habitat Type: Cascade

(1) Field Data

(a) Field data were collected in five trips between 5/2003 and 5/2004.
(b) Flow data were only collected in Trip 1 on 5/11/2003 and in Trip 5 on 5/5/2004.
(c) WSE data were collected in all five trips.
(d) Because no flows were measured in Trip 2 to Trip 4, flows of these three trips were estimated. These estimated flows are plotted along with measured flows and WSEs in worksheet "Measured hydraulics". The plots showed inconsistent flow vs WSE relationships, such as water flowing uphill, indicating errors in estimated flows and/or surveyed WSE.

(2) WSE Calibration

WSE: Average WSE is used as the representative transect WSE.

Dischrage: Trip 1 Q = Average discharge of TR F-2 and TR F-3. TR F-1 was considered as outliers.
Trip 5 Q = No flow was measured in Trip 5, and because Site E iwas adajcent to Site F, E's flow of Trip 5 was used for F.

Slope: Use Trip 1's average WSE slope (from TR F-1 to TR F-3) = 0.87%

SZF:

TR	channel Invert (ft) Trip 1	Trip 5	SZF (ft)
TR F-1	87.72	-	87.72
TR F-2	87.72	-	87.72
TR F-3	87.72	-	87.72

Note: Invert is the lowest elevation of the transect.
SZF of upstream transect must be equal or greater than the SZF of downstream transect.

Level Loop and Headpins:

Date	Trip	BM-A	BM-B
5/11/2003	1		96.54
6/25/2003	2		96.54
9/18/2003	3		96.54
10/10/2003	4		96.54
5/5/2004	5	100.00	

(b) The BMs listed in the table were taken from Site E.
(a) Site F and Site E were very close, so Site E's BM was used for survey at Site F.

Calibration Flow:

This site has four complete sets (Trip 1 to Trip 4) of measured WSEs and one set (Trip 1) of velocity-depth surveys.

Flows for Trip 2 to Trip 4 were estimated and plotted along with all measured flows and WSEs in worksheet "Measured Hydraulics"
However, the graph "Site F - WSE vs Flow" showed inconsistent flow-WSE relationship.
Due to the inconsistency between flows and WSEs, it was decided to only use flows taken in Trip 1 for calibration.
Estimated flows and measured WSEs of Trip 2 to Trip 4 will not be included for calibration, but will be used for comparison.

WSE Calibration Method:

(1) MANSQ was used to calibrate WSE for TR F-1.
(2) WSP was selected to calibrate WSEs for TR F-2 to TR F-3. MANSQ results of TR F-1 was used as the boundary condition for WSP.

WSE Calibration Result:

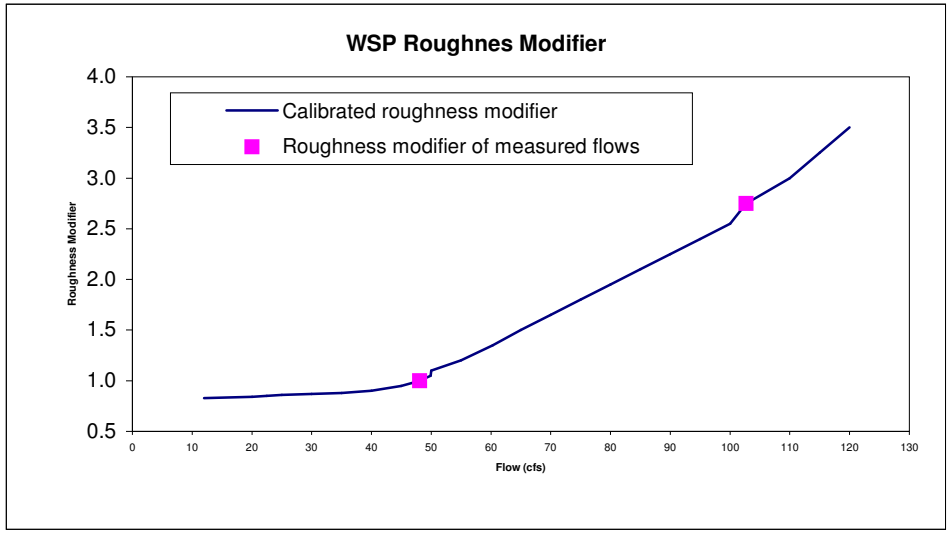
Trip	Survey Date	Q (cfs)	Modeling WSE(ft)			Calibrated WSE(ft)			ΔWSE (ft, measured-calib.)		
			TR-1	TR-2	TR-3	TR-1	TR-2	TR-3	TR-1	TR-2	TR-3
1	5/11/2003	48.1	90.12	90.16	90.19	90.12	90.23	90.23	0.00	-0.07	-0.04
2	6/25/2003	60.3	90.53	90.56	90.54	90.29	90.41	90.42			
3	9/18/2003	22.5	89.69	89.74	89.74	89.65	89.74	89.75			
4	10/10/2003	49.9	90.42	90.42	90.45	90.15	90.26	90.26			
5	5/5/2004	102.7	90.65			90.77	90.94	90.97	-0.12		

Note: (a) WSEs of Trip 2 to Trip 4 are listed in the table only for comparison, and not for calibration error calculation.
(b) No WSE measurements for TR F-2 and TR F-3 during Trip 5.

WSP Roughness Modifier

Flow	RAF
12	0.83
20	0.84
22.5	0.85
25	0.86
30	0.87
35	0.88
40	0.90
45.0	0.95
48.1	1.00
49.9	1.05
50.0	1.10
55	1.20
60.3	1.35
65	1.50
70	1.65
75.0	1.80
80	1.95
85	2.10
90	2.25

(*) The table on the left lists the Roughness Modifier used in the WSP WSE calibration.



95	2.40
100	2.55
102.7	2.75
110	3.00
115	3.25
120	3.50

Note: (a) The calibrated roughness modifier increases with increasing flow, as shown in the table and figure.
(b) This is an unusual trend compared to "normal" condition in which roughness modifier decreases when flow increases.
(c) This unual trend could be caused by the backwater effect.

(2) Calibrated Hydraulics

(a) For WSE calibration using MANSQ, β_{TR1}=0.00 and Trip 1 flow (48.1cfs) was used as the calibration flow. <-- This is actually calib flow #2 in the model. JK 12/14/04
(b) For velocity calibration, Trip 1's velocity profiles were used as the templates for calibration.
(c) Hydraulic calibration results are summarized in worksheets cTR F-y, where y=1, 2, and 3.
(d) WSE Calibration errors are generally within accetpable range.
(e) TR F-1, TR F-2 and TR F-3: WSE, transect average velocity (V), and wetted perimeter all have correct trends with flows.
(f) Manning's n, Froude number, and VAFs for all three transects appear to have little variations with flows.
Not able to determine what might have caused these three parameters to remain relatively constant as flow varies.
(g) Comparison of modeling and calibrated WSEs are shown in worksheet "SimWSE".
(h) PHABSIM model did not calculate wetted perimeter and Manning's, both of which were calculated outside the model.

(3) Velocity calibration

TR F-1: Trip 5's velocity profile was used as template for calibration.
Predicted velocity profile was reasonable, and no changes to the Manning's n calculated by PHABSIM were made.

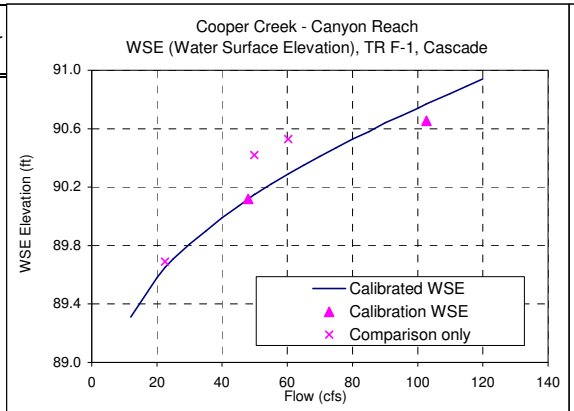
TR F-2: Trip 5's velocity profile was used as template for calibration.
Slightly adjusted Manning's n values calculated by PHABSIM to make the simulated velocity near the water edge more reasonable.

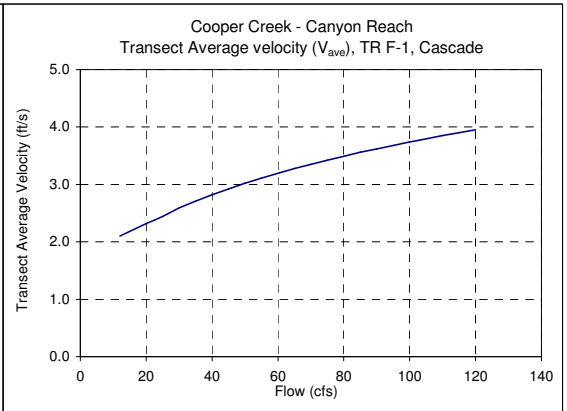
TR F-3: Trip 5's velocity profile was used as template for calibration.
Predicted velocity profile was reasonable, and no changes to the Manning's n calculated by PHABSIM were made.

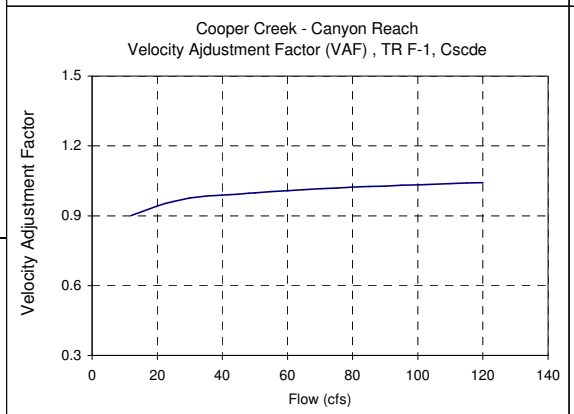
The comparison of simulated and measured velocity profiles are included in worksheet "VelComp", which shows the simulated profiles resemble the measured ones.

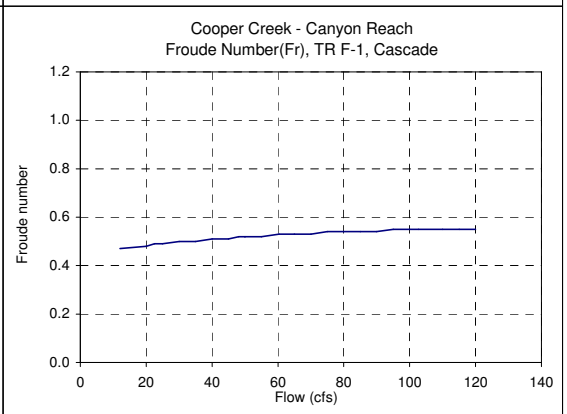
Reach Canyon Reach
Stream: Cooper Creek
Transect : F-3
Habitat: Cascade

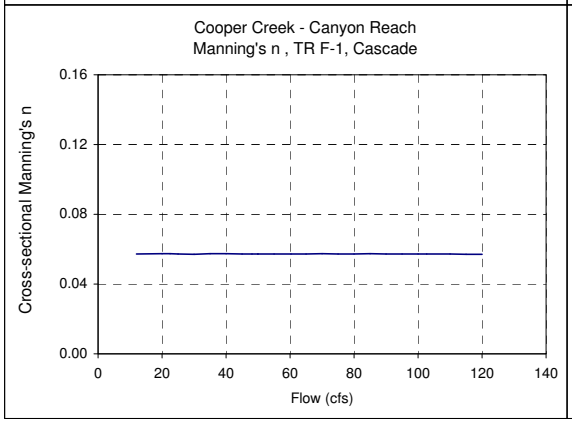
Modeling Q (cfs)	Modeling WSE (ft)	Simul. Q (cfs)	Cal'd WSE (ft)	VAF	Froude Number	Velocity (ft/s)	Manning's n	wetted perimeter (ft)
48.1	90.12	12	89.31	0.90	0.47	2.10	0.057	10.9
60.3	90.53	20	89.58	0.94	0.48	2.32	0.057	14.1
22.5	89.69	22.5	89.65	0.95	0.49	2.38	0.057	14.9
49.9	90.42	25	89.71	0.96	0.49	2.44	0.057	15.6
102.7	90.65	30	89.81	0.98	0.50	2.59	0.057	16.2
		35	89.90	0.98	0.50	2.71	0.058	16.7
		40	89.99	0.99	0.51	2.82	0.057	17.3
		45	90.07	0.99	0.51	2.92	0.057	17.9
		48.1	90.12	1.00	0.52	2.98	0.057	18.2
		49.9	90.15	1.00	0.52	3.02	0.057	18.3
		50	90.15	1.00	0.52	3.02	0.057	18.3
		55	90.22	1.00	0.52	3.11	0.057	18.7
		60.3	90.29	1.01	0.53	3.20	0.057	19.1
		65	90.35	1.01	0.53	3.28	0.057	19.4
		70	90.41	1.02	0.53	3.35	0.057	19.7
		75	90.47	1.02	0.54	3.42	0.057	20.1
		80	90.53	1.02	0.54	3.49	0.057	20.4
		85	90.58	1.03	0.54	3.56	0.057	20.6
		90	90.64	1.03	0.54	3.62	0.057	21
		95	90.69	1.03	0.55	3.68	0.057	21.2
		100	90.74	1.03	0.55	3.74	0.057	21.5
		102.7	90.77	1.03	0.55	3.77	0.057	21.6
		110	90.84	1.04	0.55	3.85	0.057	22
		115	90.89	1.04	0.55	3.90	0.057	22.3
		120	90.94	1.04	0.55	3.95	0.057	22.6

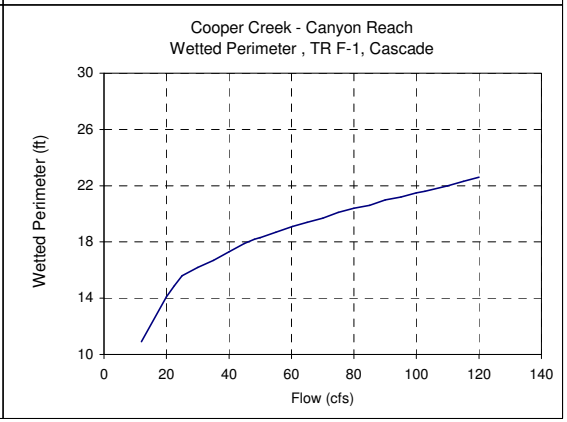






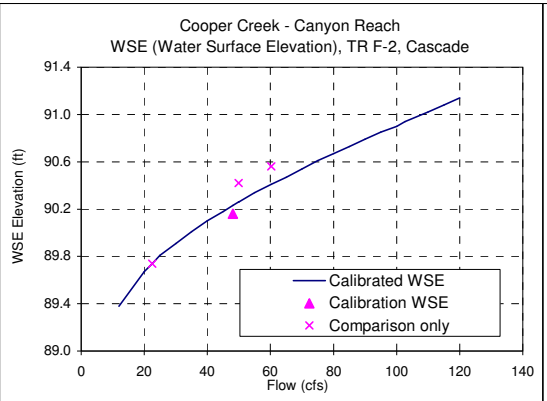


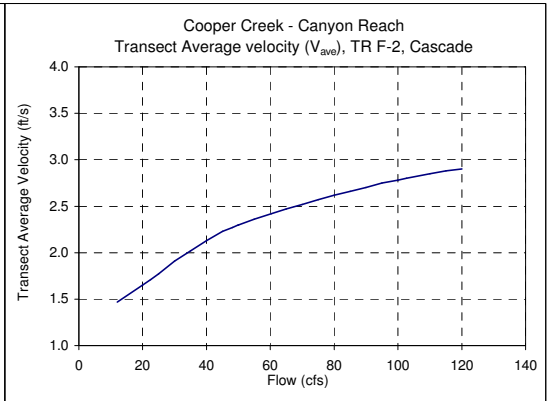


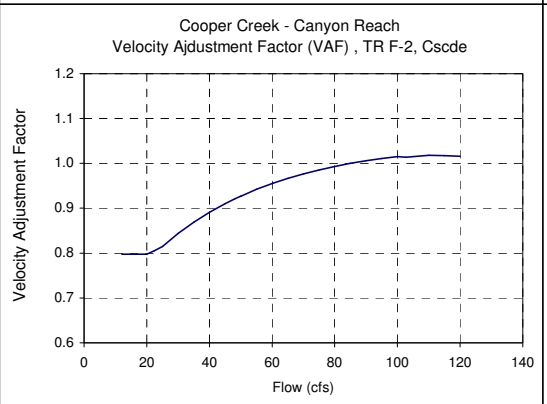


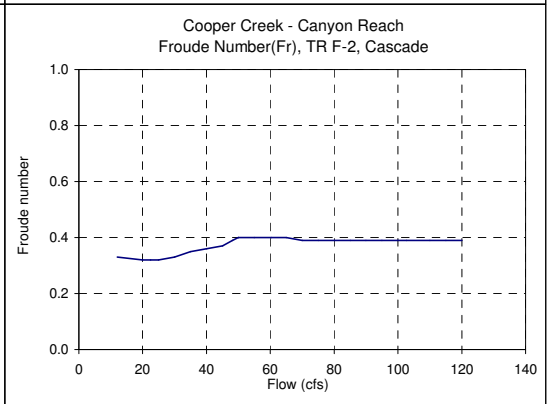
Reach Canyon Reach
Stream: Cooper Creek
Transect : F-2
Habitat: Cascade

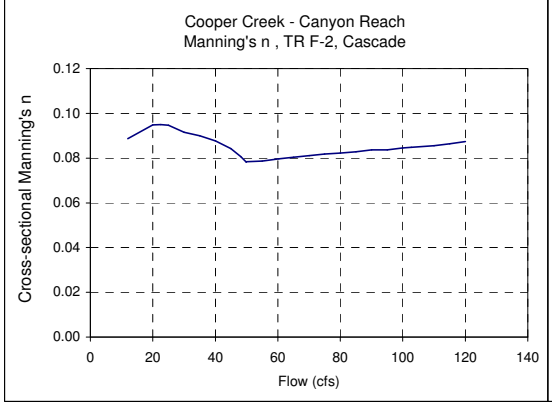
Modeling Q (cfs)	Modeling WSE (ft)	Simul. Q (cfs)	Cal'd WSE (ft)	VAF	Froude Number	Velocity (ft/s)	Manning's n	wetted perimeter (ft)
48.1	90.16	12	89.38	0.80	0.33	1.47	0.089	13.8
60.3	90.56	20	89.67	0.80	0.32	1.65	0.095	15.6
22.5	89.74	22.5	89.74	0.81	0.32	1.71	0.095	16
49.9	90.42	25	89.81	0.81	0.32	1.77	0.095	16.4
102.7	0.00	30	89.91	0.84	0.33	1.91	0.092	17.1
		35	90.01	0.87	0.35	2.02	0.090	17.8
		40	90.10	0.89	0.36	2.13	0.088	18.5
		45	90.18	0.91	0.37	2.23	0.084	19.7
		48.1	90.23	0.92	0.39	2.27	0.081	21.5
		49.9	90.26	0.93	0.40	2.30	0.078	22.6
		50	90.26	0.93	0.40	2.30	0.078	22.6
		55	90.34	0.94	0.40	2.36	0.079	23.2
		60.3	90.41	0.96	0.40	2.42	0.080	23.4
		65	90.47	0.97	0.40	2.47	0.080	23.7
		70	90.54	0.98	0.39	2.52	0.081	23.9
		75	90.61	0.99	0.39	2.57	0.082	24.1
		80	90.67	0.99	0.39	2.62	0.082	24.3
		85	90.73	1.00	0.39	2.66	0.083	24.6
		90	90.79	1.01	0.39	2.70	0.084	24.7
		95	90.85	1.01	0.39	2.75	0.084	24.9
		100	90.90	1.02	0.39	2.78	0.085	25.1
		102.7	90.94	1.01	0.39	2.80	0.085	25.2
		110	91.02	1.02	0.39	2.85	0.086	25.5
		115	91.08	1.02	0.39	2.88	0.086	25.6
		120	91.14	1.02	0.39	2.90	0.087	25.8

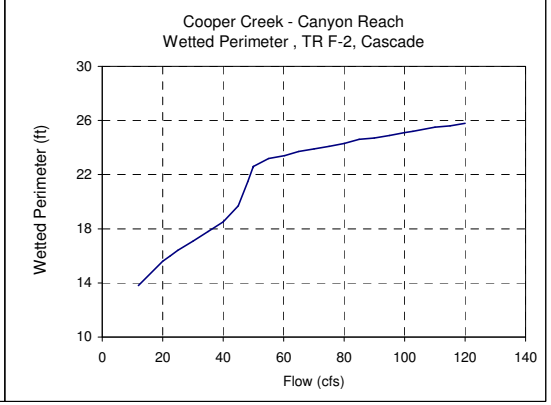






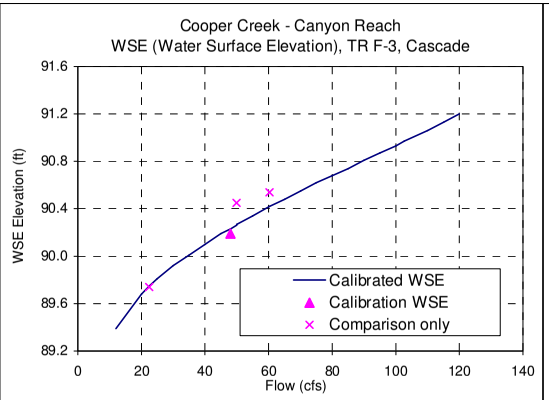


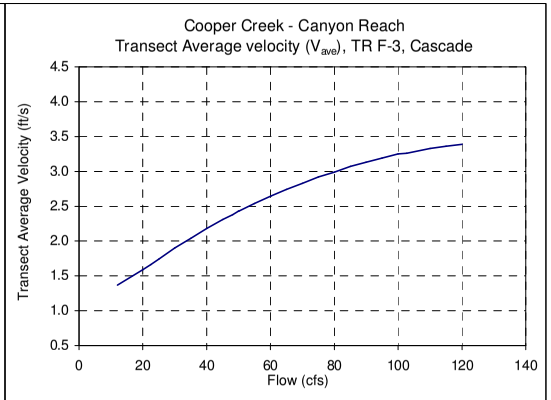


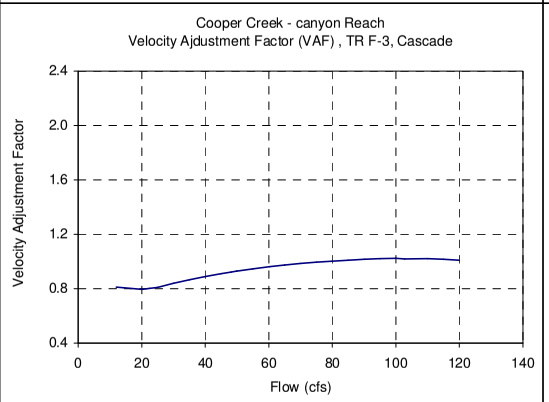


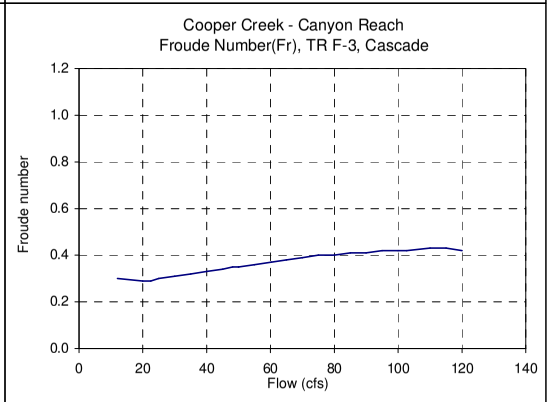
Reach Canyon Reach
Stream: Cooper Creek
Transect : F-3
Habitat: Cascade

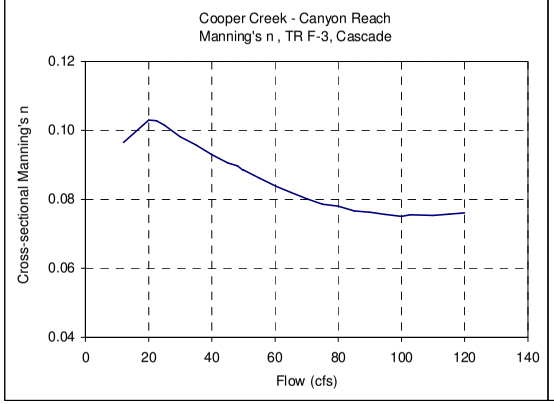
Modeling Q (cfs)	Modeling WSE (ft)	Simul. Q (cfs)	Cal'd WSE (ft)	VAF	Froude Number	Velocity (ft/s)	Manning's n	wetted perimeter (ft)
48.1	90.19	12	89.39	0.81	0.30	1.37	0.096	14.5
60.3	90.54	20	89.68	0.79	0.29	1.59	0.103	15.1
22.5	89.74	22.5	89.75	0.80	0.29	1.66	0.103	15.3
49.9	90.45	25	89.81	0.81	0.30	1.74	0.102	15.4
		30	89.92	0.84	0.31	1.90	0.098	15.6
		35	90.01	0.87	0.32	2.04	0.096	15.8
		40	90.10	0.89	0.33	2.18	0.093	16
		45	90.19	0.91	0.34	2.31	0.091	16.2
		48.1	90.23	0.92	0.35	2.38	0.090	16.3
		49.9	90.26	0.93	0.35	2.43	0.088	16.4
		50	90.27	0.93	0.35	2.43	0.089	16.4
		55	90.34	0.95	0.36	2.54	0.086	16.8
		60.3	90.42	0.96	0.37	2.65	0.084	17.3
		65	90.48	0.97	0.38	2.74	0.082	17.7
		70	90.55	0.99	0.39	2.83	0.080	18.2
		75	90.62	0.99	0.40	2.92	0.079	18.6
		80	90.68	1.00	0.40	2.99	0.078	18.9
		85	90.74	1.01	0.41	3.07	0.077	19.3
		90	90.81	1.02	0.41	3.13	0.076	19.6
		95	90.87	1.02	0.42	3.19	0.076	20
		100	90.93	1.02	0.42	3.25	0.075	20.3
		102.7	90.97	1.02	0.42	3.26	0.076	20.5
		110	91.06	1.02	0.43	3.33	0.075	20.9
		115	91.13	1.02	0.43	3.36	0.076	21.2
		120	91.20	1.01	0.42	3.39	0.076	21.5

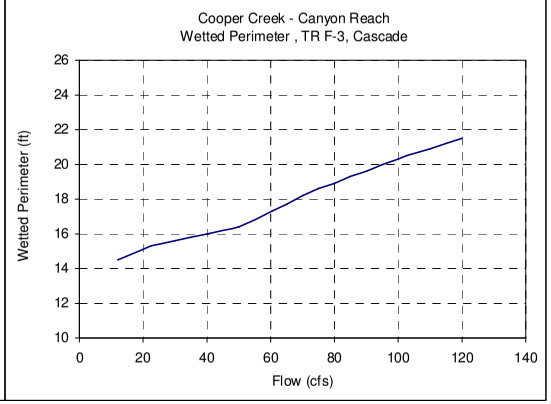


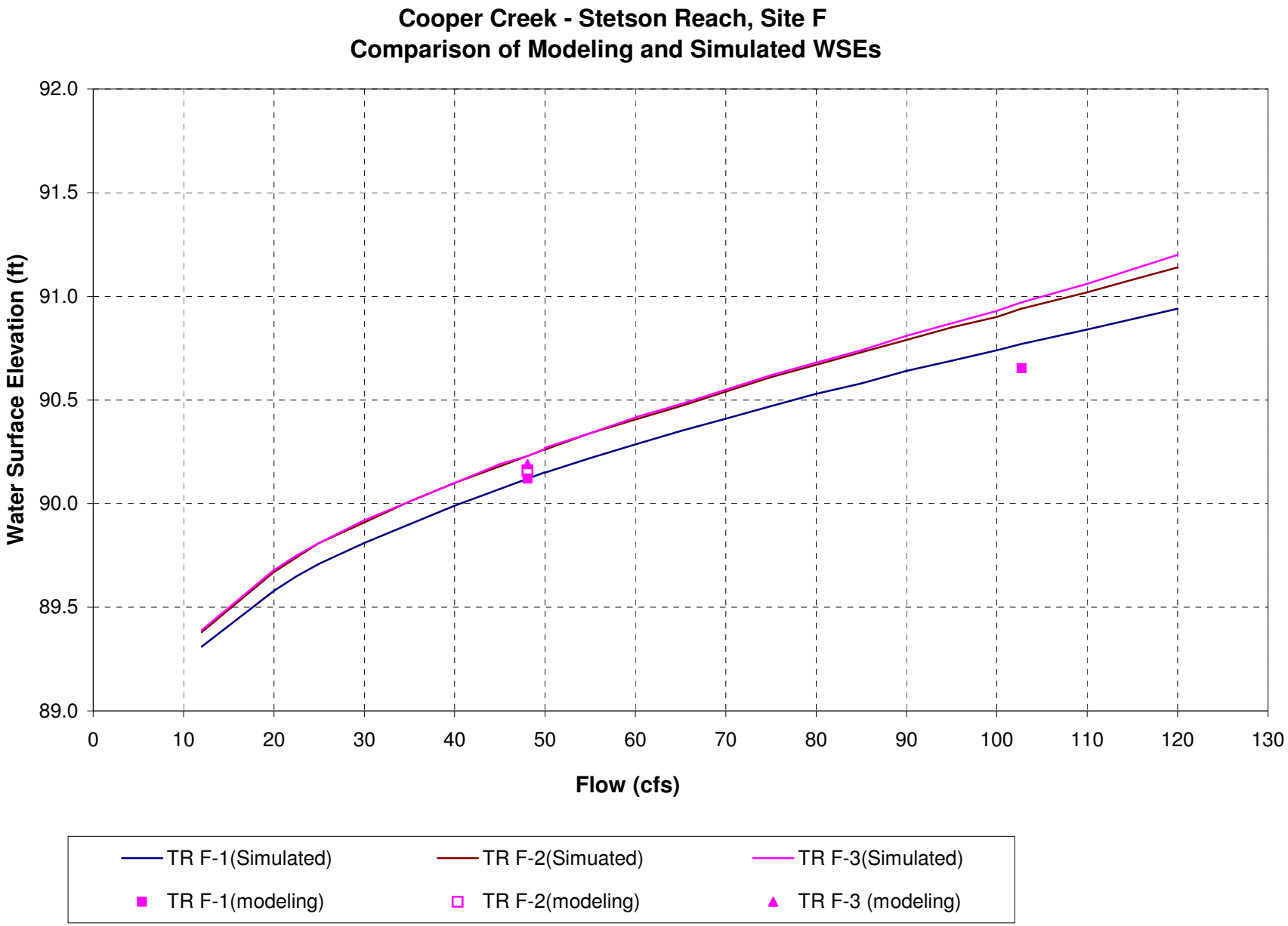






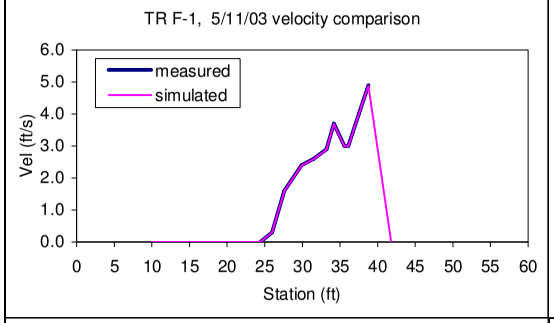


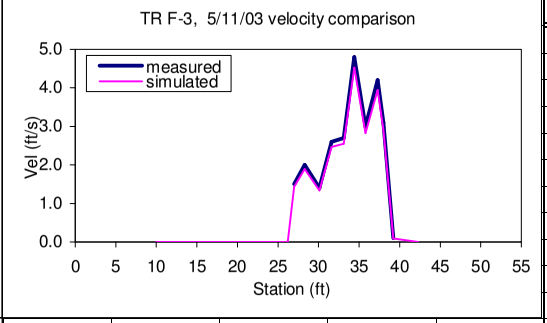


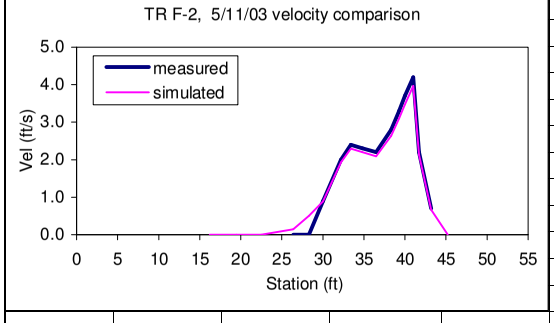

Cooper Creek - Stetson Reach, Site F
Comparison of Modeling and Simulated WSEs
Water Surface Elevation (ft)
92.0
91.5
91.0
90.5
90.0
89.5
89.0
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Flow (cfs)
TR F-1(Simulated)
TR F-2(Simuated)
TR F-3(Simulated)
TR F-1(modeling)
TR F-2(modeling)
TR F-3 (modeling)

Reach:	**Canyon Reach**
Stream:	**Cooper Creek**
Habitat:	**Cascade**
CalibrationFlow:	**5/11/2003 (Q=48.1cfs)**

Comparison of Measured and Simulated Velocity Profile







TR F-1			TR F-2			TR F-3		
Sta	meas.	simul.	Sta	meas.	simul.	Sta	meas.	simul.
10.0		0.00	16.2		0.00	10.0		0.00
15.6		0.00	19.5		0.00	11.8		0.00
16.2		0.00	22.5		0.00	13.4		0.00
20.2		0.00	26.4	0.00	0.14	17.4		0.00
24.4	0.00	0.00	28.3	0.00	0.50	18.6		0.00
26.0	0.30	0.30	30.0	0.90	0.88	19.7		0.00
27.6	1.60	1.59	32.2	2.00	1.93	23.6		0.00
29.9	2.40	2.39	33.4	2.40	2.30	24.2		0.00
31.5	2.60	2.59	34.8	2.30	2.20	26.2		0.00
33.2	2.90	2.89	36.5	2.20	2.09	27.0	1.50	1.43
34.2	3.70	3.69	38.3	2.80	2.64	28.3	2.00	1.90
35.6	3.00	2.99	39.3	3.30	3.10	30.1	1.40	1.34
36.1	3.00	2.99	40.0	3.70	3.48	31.6	2.60	2.46
37.5	4.00	3.99	41.0	4.20	3.97	33.1	2.70	2.55
38.8	4.90	4.88	41.7	2.20	2.13	34.4	4.80	4.53
41.8		0.00	43.2	0.70	0.67	35.8	3.00	2.82
			45.2		0.00	37.3	4.20	3.95
						38.0	3.10	2.91
						39.2	0.10	0.09
						42.3		0.00