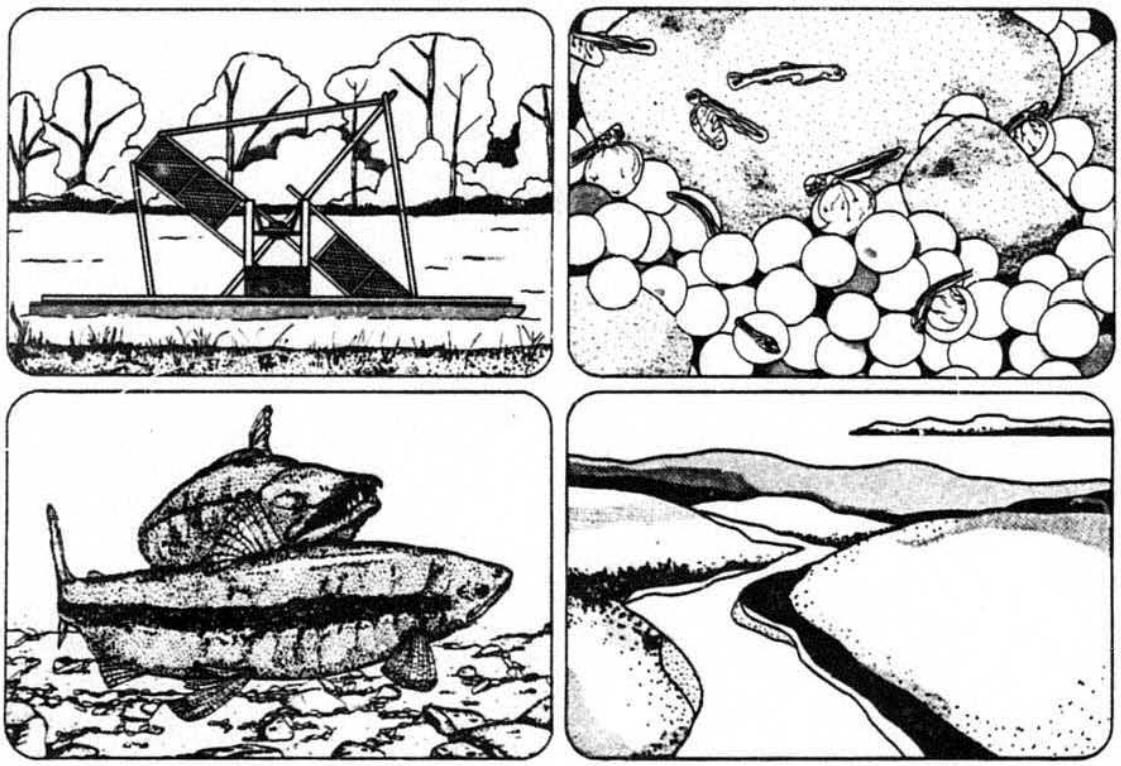

ALASKA DEPARTMENT OF FISH AND GAME
SUSITNA HYDRO AQUATIC STUDIES

REPORT NO. 3 PART II, Chapter 7, Appendices

AQUATIC HABITAT AND INSTREAM FLOW INVESTIGATIONS (MAY-OCTOBER 1983)

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ALASKA DEPARTMENT OF FISH AND GAME
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REPORT NO. 3 PART II, Chapter 7, Appendices

AQUATIC HABITAT AND INSTREAM FLOW INVESTIGATIONS (MAY-OCTOBER 1983)

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APPENDIX 7A

Salmon Spawning Utilization Data From Sloughs And Side Channels

Table 7-A-1 Habitat data collected at chum salmon redds.

LOCATION	DATE	DEPTH (FT)	WATER VELOCITY (FT/S)	SUBSTRATE		WATER TEMPERATURE (C)		REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
				PRIMARY	SECONDARY	INTRAGRAVEL	SURFACE			
SLOUGH 9	830906	.90	.30	COBBLE	LARGE GRAVEL	5.6	6.3	1	PRESENT	6
SLOUGH 9	830906	1.30	.02	RUBBLE	LARGE GRAVEL	5.2	6.3	2	PRESENT	3
SLOUGH 9	830906	1.00	.25	COBBLE	LARGE GRAVEL	4.7	6.2	3	PRESENT	10
SLOUGH 9	830906	1.30	.35	RUBBLE	LARGE GRAVEL	4.3	6.6	4	PRESENT	3
SLOUGH 9	830906	1.10	.10	COBBLE	SAND	4.6	6.5	5	PRESENT	3
SLOUGH 9	830906	1.00	.35	SAND	LARGE GRAVEL	4.3	6.7	6	UNKNOWN	
SLOUGH 9	830906	1.20	.35	SMALL GRAVEL	RUBBLE	4.3	6.8	7	UNKNOWN	
SLOUGH 9	830906	1.10	.30	LARGE GRAVEL	RUBBLE	4.1	6.8	8	UNKNOWN	
SLOUGH 9	830906	.70	.05	LARGE GRAVEL	SMALL GRAVEL	4.1	5.9	9	PRESENT	4
SLOUGH 9	830906	.65	.80	RUBBLE	SMALL GRAVEL	4.0	7.4	10	UNKNOWN	
SLOUGH 9	830906	.70	.50	RUBBLE	SMALL GRAVEL	4.1	7.4	11	UNKNOWN	
SLOUGH 9	830906	.60	.70	RUBBLE	SMALL GRAVEL	4.2	7.4	12	UNKNOWN	
SLOUGH 9	830906	.75	1.15	RUBBLE	SMALL GRAVEL	4.0	7.5	13	UNKNOWN	
SLOUGH 9	830906	.90	1.10	COBBLE	SMALL GRAVEL	3.9	7.5	14	UNKNOWN	
SLOUGH 9	830906	.60	1.20	LARGE GRAVEL	SMALL GRAVEL	4.1	7.6	15	UNKNOWN	
SLOUGH 9	830906	1.00	.55	RUBBLE	SMALL GRAVEL	4.0	7.8	16	UNKNOWN	
SLOUGH 9	830906	.80	.60	SAND	RUBBLE	4.0	7.9	17	UNKNOWN	
SLOUGH 9	830906	.50	.55	SMALL GRAVEL	RUBBLE	4.6	7.9	18	UNKNOWN	
SLOUGH 9	830906	.50	.45	COBBLE	SMALL GRAVEL	3.6	7.6	19	UNKNOWN	
SLOUGH 9	830906	.90	.45	COBBLE	SMALL GRAVEL	3.9	7.7	20	UNKNOWN	
SLOUGH 9	830906	1.00	.45	RUBBLE	SMALL GRAVEL	3.9	8.0	21	UNKNOWN	
SLOUGH 9	830906	.60	.10	SAND	RUBBLE	4.4	8.2	22	UNKNOWN	
SLOUGH 9	830906	.75	0.00	RUBBLE	SMALL GRAVEL	4.8	8.8	23	UNKNOWN	
SLOUGH 9	830906	.60	0.00	LARGE GRAVEL	SMALL GRAVEL	4.7	8.8	24	UNKNOWN	
SLOUGH 9	830906	1.00	.25	RUBBLE	LARGE GRAVEL	6.2	7.1	25	UNKNOWN	
SLOUGH 9	830906	1.50	.20	LARGE GRAVEL	RUBBLE	5.9	7.1	26	UNKNOWN	

Table 7-A-1 Continued

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE PRIMARY	SUBSTRATE SECONDARY	WATER TEMPERATURE (C) INTRAGRAVEL	WATER TEMPERATURE (C) SURFACE	REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
SLOUGH 9	830906	.40	0.00	SMALL GRAVEL	RUBBLE	5.7	6.9	27	UNKNOWN	
SLOUGH 9	830906	.70	.70	SMALL GRAVEL	RUBBLE	5.2	7.3	28	UNKNOWN	
SLOUGH 9	830906	.60	.40	LARGE GRAVEL	SMALL GRAVEL	5.5	7.3	29	UNKNOWN	
SLOUGH 9	830906	.55	.55	RUBBLE	SMALL GRAVEL	6.9	8.8	30	UNKNOWN	
SLOUGH 9	830906	.60	.15	LARGE GRAVEL	SMALL GRAVEL	5.6	7.3	31	UNKNOWN	
SLOUGH 8A	830815	1.60	.23	RUBBLE	LARGE GRAVEL	6.0	9.2	1		
SLOUGH 8A	830815	1.30	.25	RUBBLE	LARGE GRAVEL	6.2	9.3	2		
SLOUGH 8A	830815	1.40	.25	RUBBLE	LARGE GRAVEL	5.2	9.1	3		
SLOUGH 8A	830815	1.40	.30	RUBBLE	LARGE GRAVEL	5.0	9.6	4		
SLOUGH 8A	830815	1.30	.50	RUBBLE	LARGE GRAVEL	5.6	9.1	5		
SLOUGH 8A	830815	1.00	.45	RUBBLE	LARGE GRAVEL	6.4	9.1	6		
SLOUGH 8A	830815	1.10	.65	RUBBLE	SMALL GRAVEL	5.4	9.1	7		
SLOUGH 8A	830816	1.55	0.00	RUBBLE	LARGE GRAVEL	5.3	10.0	8	UNKNOWN	
SLOUGH 8A	830816	1.50	.08	SMALL GRAVEL	RUBBLE	5.8	10.3	9	UNKNOWN	
SLOUGH 8A	830902	.90	.05	LARGE GRAVEL	RUBBLE	4.7	9.7	10	UNKNOWN	
SLOUGH 8A	830902	.90	0.00	LARGE GRAVEL	RUBBLE	4.9	9.8	11	UNKNOWN	
SLOUGH 8A	830902	1.00	0.00	LARGE GRAVEL	RUBBLE	5.8	9.4	12	UNKNOWN	
SLOUGH 8A	830902	1.20	.05	RUBBLE	SMALL GRAVEL	5.9	10.2	13	UNKNOWN	
SLOUGH 8A	830902	1.00	.20	RUBBLE	LARGE GRAVEL	7.2	10.3	14	UNKNOWN	
SLOUGH 8A	830902	2.80	0.00	LARGE GRAVEL	SMALL GRAVEL		10.2	15	UNKNOWN	
4TH OF JULY CREEK MOUTH	830817	1.00	.60	LARGE GRAVEL	RUBBLE	10.6	11.6	1	UNKNOWN	
4TH OF JULY CREEK MOUTH	830817	1.70	.75	COBBLE	RUBBLE	11.5	11.6	2	UNKNOWN	

Table 7-A-1 Continued

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE PRIMARY	SUBSTRATE SECONDARY	WATER TEMPERATURE (C) INTRAGRAVEL	WATER TEMPERATURE (C) SURFACE	REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
4TH OF JULY CREEK MOUTH	830817	1.60	.70	LARGE GRAVEL	RUBBLE	11.2	11.6	3	UNKNOWN	
4TH OF JULY CREEK MOUTH	830817	2.20	.60	LARGE GRAVEL	RUBBLE	10.2	11.6	4		
4TH OF JULY CREEK MOUTH	830817	2.00	.60	LARGE GRAVEL	RUBBLE	10.8	11.7	5		
4TH OF JULY CREEK MOUTH	830817	2.30	.60	LARGE GRAVEL	RUBBLE	10.7	11.6	6		
4TH OF JULY CREEK MOUTH	830817	2.10	.10	COBBLE	RUBBLE	11.0	11.9	7		
4TH OF JULY CREEK MOUTH	830817	1.00	.25	SMALL GRAVEL	LARGE GRAVEL	11.3	11.9	8		
4TH OF JULY CREEK MOUTH	830817	1.00	.25	RUBBLE	LARGE GRAVEL	11.3	11.9	9		
4TH OF JULY CREEK MOUTH	830817	1.70	.20	RUBBLE	LARGE GRAVEL	11.2	11.8	10		
4TH OF JULY CREEK MOUTH	830818	1.10	1.35	RUBBLE	COBBLE	11.8	12.2	12	UNKNOWN	
4TH OF JULY CREEK MOUTH	830818	1.50	.10	SMALL GRAVEL	SAND	10.4	12.0	13	UNKNOWN	
4TH OF JULY CREEK MOUTH	830818	1.70	2.10	LARGE GRAVEL	SMALL GRAVEL	7.5	12.3	14	UNKNOWN	
4TH OF JULY CREEK MOUTH	830818	1.90	4.50	RUBBLE	COBBLE	8.1	12.3	15	UNKNOWN	
4TH OF JULY CREEK MOUTH	830822	2.20	1.30	RUBBLE	LARGE GRAVEL	9.7	11.2	16		
4TH OF JULY CREEK MOUTH	830822	2.00	1.00	RUBBLE	LARGE GRAVEL	11.1	11.3	17		
4TH OF JULY CREEK MOUTH	830822	1.80	1.40	RUBBLE	SAND	11.0	11.3	18		
4TH OF JULY CREEK MOUTH	830822	2.00	1.80	RUBBLE	LARGE GRAVEL	9.3	11.3	19		
4TH OF JULY CREEK MOUTH	830822	1.30	2.20	RUBBLE	LARGE GRAVEL	9.8	11.2	20		
4TH OF JULY CREEK MOUTH	830822	.90	2.00	RUBBLE	LARGE GRAVEL	11.4	11.3	21	UNKNOWN	
4TH OF JULY CREEK MOUTH	830822	1.20	3.10	RUBBLE	LARGE GRAVEL	11.3	11.3	22	UNKNOWN	
4TH OF JULY CREEK MOUTH	830822	1.70	2.00	RUBBLE	COBBLE	11.4	11.3	23	UNKNOWN	
4TH OF JULY CREEK MOUTH	830828	.70	.40			9.5	10.7	24		
4TH OF JULY CREEK MOUTH	830828	1.70	2.50			9.4	10.7	25		
4TH OF JULY CREEK MOUTH	830828	.90	.80			9.0	10.6	26		

Table 7-A-1 Continued

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE PRIMARY	SUBSTRATE SECONDARY	WATER TEMPERATURE (C) INTRAGRAVEL	WATER TEMPERATURE (C) SURFACE	REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
4TH OF JULY CREEK MOUTH	830828	.70	.75			8.7	10.6	27		
4TH OF JULY CREEK MOUTH	830828	.60	1.20			10.1	10.7	28		
4TH OF JULY CREEK MOUTH	830828	1.10	.10			5.7	10.8	29		
SIDE CHANNEL 250 FT ABOVE 4TH OF JULY	830823	1.60	2.40	LARGE GRAVEL	RUBBLE		8.8	1	UNKNOWN	
SLOUGH 9A	830910	.93	.60	RUBBLE	LARGE GRAVEL	6.7	6.0	1	PRESENT	20
SLOUGH 9A	830910	1.12	0.00	RUBBLE	LARGE GRAVEL	6.3	6.1	2	UNKNOWN	
SLOUGH 9A	830910	1.30	.40	RUBBLE	LARGE GRAVEL	6.4	6.0	3	PRESENT	15
SLOUGH 9A	830910	.90	.62	LARGE GRAVEL	RUBBLE	6.2	6.3	4	UNKNOWN	
SLOUGH 9A	830910	.60	1.80	LARGE GRAVEL	RUBBLE	5.8	6.0	5	UNKNOWN	
SLOUGH 9A	830910	1.45	0.00	COBBLE	LARGE GRAVEL	5.1	6.7	6	PRESENT	30
SLOUGH 9A	830910	1.63	.62	RUBBLE	LARGE GRAVEL	5.1	6.7	7	PRESENT	10
SLOUGH 9A	830910	1.20	.28	RUBBLE	LARGE GRAVEL	4.3	8.2	8	UNKNOWN	
SLOUGH 9A	830910	1.30	.10	RUBBLE	LARGE GRAVEL	4.6	7.5	9	UNKNOWN	
SLOUGH 9A	830910	1.38	0.00	LARGE GRAVEL	SMALL GRAVEL	4.4	7.0	10	UNKNOWN	
SLOUGH 9A	830910	1.41	0.00	LARGE GRAVEL	SMALL GRAVEL	4.7	7.1	11	UNKNOWN	
SLOUGH 9A	830910	1.31	0.00	LARGE GRAVEL	SMALL GRAVEL	4.6	6.9	12	UNKNOWN	
SLOUGH 9A	830910	1.10	0.00	LARGE GRAVEL	RUBBLE	4.7	6.9	13	UNKNOWN	
SLOUGH 9A	830910	1.00	0.00	RUBBLE	COBBLE	4.7	6.9	14	UNKNOWN	
SLOUGH 9A	830910	.90	.50	RUBBLE	LARGE GRAVEL	4.4	8.4	15	UNKNOWN	
SLOUGH 9A	830910	1.40	.10	RUBBLE	LARGE GRAVEL	5.8	8.5	16	UNKNOWN	
SLOUGH 9A	830910	1.54	.10	COBBLE	RUBBLE	8.2	8.7	17	UNKNOWN	
SLOUGH 9A	830910	1.10	.20	RUBBLE	LARGE GRAVEL	4.8	8.6	18	UNKNOWN	
SLOUGH 9A	830910	1.10	.10	RUBBLE	LARGE GRAVEL	4.0	8.5	19	UNKNOWN	
SLOUGH 9A	830910	1.30	.15	RUBBLE	COBBLE	5.3	8.5	20	UNKNOWN	

Table 7-A-1 Continued

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE		WATER TEMPERATURE (C)		REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
				PRIMARY	SECONDARY	INTRAGRAVEL	SURFACE			
SLOUGH 9A	830910	1.48	.08	RUBBLE	COBBLE	4.1	8.5	21	UNKNOWN	
SLOUGH 9A	830910	1.80	.15	COBBLE	BOULDER	7.3	8.7	22	UNKNOWN	
SLOUGH 9A	830910	1.00	0.00	RUBBLE	LARGE GRAVEL	4.8	8.1	23	PRESENT	10
SLOUGH 9A	830910	.90	0.00	RUBBLE	LARGE GRAVEL	3.9	8.5	24	PRESENT	10
SLOUGH 11	830811	1.60	.18	SMALL GRAVEL	RUBBLE	6.2	7.2	21		
SLOUGH 11	830816	1.95	.20	RUBBLE	LARGE GRAVEL	4.4	9.2	8	UNKNOWN	
SLOUGH 11	830816	2.10	.20	RUBBLE	SMALL GRAVEL	7.2	9.1	9	UNKNOWN	
SLOUGH 11	830816	1.20	.20	LARGE GRAVEL	SMALL GRAVEL	4.6	8.9	10	UNKNOWN	
SLOUGH 11	830816	1.20	.20	LARGE GRAVEL	SMALL GRAVEL	5.4	8.9	11	UNKNOWN	
SLOUGH 11	830816	.65	.10	LARGE GRAVEL	SMALL GRAVEL	5.4	8.3	12	UNKNOWN	
SLOUGH 11	830820	.45	.20	LARGE GRAVEL	SMALL GRAVEL	3.7	5.3	1	UNKNOWN	
SLOUGH 11	830820	.60	.40	LARGE GRAVEL	RUBBLE	4.3	5.6	2	UNKNOWN	
SLOUGH 11	830820	.60	1.40	LARGE GRAVEL	RUBBLE	5.0	5.6	3	UNKNOWN	
SLOUGH 11	830820	.50	.20	LARGE GRAVEL	RUBBLE	3.8	5.4	4	UNKNOWN	
SLOUGH 11	830820	.70	.05	LARGE GRAVEL	RUBBLE	3.8	4.8	5	UNKNOWN	
SLOUGH 11	830820	2.20	0.00	LARGE GRAVEL	RUBBLE	3.2	5.9	6	UNKNOWN	
SLOUGH 11	830820	2.10	0.00	LARGE GRAVEL	RUBBLE	3.1	5.9	7	UNKNOWN	
SLOUGH 11	830820	2.10	0.00	LARGE GRAVEL	RUBBLE	3.2	5.9	13	UNKNOWN	
SLOUGH 11	830820	1.70	0.00	LARGE GRAVEL	RUBBLE	3.2	5.8	14	UNKNOWN	
SLOUGH 11	830820	1.40	.18	LARGE GRAVEL	RUBBLE	3.5	5.7	15	UNKNOWN	
SLOUGH 11	830820	.80	0.00	LARGE GRAVEL	RUBBLE	3.2	5.0	16	UNKNOWN	
SLOUGH 11	830820	1.20	0.00	LARGE GRAVEL	SMALL GRAVEL	3.1	4.5	17	UNKNOWN	
SLOUGH 11	830820	2.10	.08	RUBBLE	LARGE GRAVEL	2.9	4.6	18	UNKNOWN	

Table 7-A-1 Continued

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE PRIMARY	SUBSTRATE SECONDARY	WATER TEMPERATURE (C) INTRAGRAVEL	WATER TEMPERATURE (C) SURFACE	REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
SLOUGH 11	830820	1.90	.08	SMALL GRAVEL	LARGE GRAVEL	2.9	4.6	19	UNKNOWN	
SLOUGH 11	830820	1.90	.10	LARGE GRAVEL	RUBBLE	2.9	4.7	20	UNKNOWN	
SLOUGH 11	830827	.95	.10				8.0	22	UNKNOWN	
SLOUGH 11	830827	1.00	.10				8.0	23	UNKNOWN	
SLOUGH 11	830827	.60	.05				8.5	24	UNKNOWN	
SLOUGH 11	830827	1.50	.10				8.0	25	UNKNOWN	
SLOUGH 11	830827	1.00	.05				8.0	26	UNKNOWN	
SLOUGH 11	830827	2.00	.05				8.0	27	UNKNOWN	
SLOUGH 11	830827	2.10	.05				8.0	28	UNKNOWN	
SLOUGH 11	830827	2.60	0.00				8.0	29	UNKNOWN	
SLOUGH 11	830827	.60	0.00				7.0	30	UNKNOWN	
SLOUGH 11	830827	1.50	0.00				8.5	31	UNKNOWN	
SLOUGH 11	830827	1.50	0.00				8.0	32	UNKNOWN	
SLOUGH 11	830827	2.00	.05				8.0	33	UNKNOWN	
SLOUGH 11	830827	1.90	0.00				8.0	34	UNKNOWN	
SLOUGH 11	830827	2.50	0.00				9.5	35	UNKNOWN	
SLOUGH 11	830910	1.55	0.00	RUBBLE	LARGE GRAVEL	3.6	7.2	36	UNKNOWN	
SLOUGH 11	830910	1.40	0.00	RUBBLE	LARGE GRAVEL	3.7	6.6	37	UNKNOWN	
SLOUGH 11	830910	1.63	0.00	RUBBLE	LARGE GRAVEL	3.5	6.9	38	UNKNOWN	
SLOUGH 11	830910	1.50	0.00	RUBBLE	COBBLE	4.0	7.0	39	UNKNOWN	
SLOUGH 11	830910	2.00	0.00	COBBLE	BOULDER			40	UNKNOWN	
SLOUGH 11	830910	.70	.15	SMALL GRAVEL	LARGE GRAVEL			41	UNKNOWN	
SLOUGH 11	830910	.96	.10	COBBLE	RUBBLE			42	UNKNOWN	
SLOUGH 11	830910	.60	0.00	COBBLE	RUBBLE			43	UNKNOWN	

Table 7-A-1 Continued

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE		WATER TEMPERATURE (C)		REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
				PRIMARY	SECONDARY	INTRAGRAVEL	SURFACE			
SLOUGH 11	830910	1.52	0.00	RUBBLE	COBBLE			44	UNKNOWN	
SLOUGH 11	830910	1.10	0.00	RUBBLE	COBBLE			45	UNKNOWN	
SLOUGH 11	830910	1.18	0.00	RUBBLE	COBBLE			46	UNKNOWN	
SLOUGH 11	830911	.40	.75	LARGE GRAVEL	SMALL GRAVEL			47	UNKNOWN	
SLOUGH 11	830911	.24	.35	LARGE GRAVEL	SMALL GRAVEL			48	UNKNOWN	
SLOUGH 11	830911	.90	0.00	RUBBLE	COBBLE			49	UNKNOWN	
SLOUGH 11	830911	1.20	.05	LARGE GRAVEL	RUBBLE			50	UNKNOWN	
SLOUGH 11	830911	1.70	0.00	RUBBLE	LARGE GRAVEL			51	PRESENT	
SLOUGH 11	830911	2.90	0.00	RUBBLE	LARGE GRAVEL			52	PRESENT	10
SLOUGH 11 SIDE CHANNEL (UPPER)	830823	1.50	2.10	RUBBLE	LARGE GRAVEL		9.1	1	UNKNOWN	
SLOUGH 11 SIDE CHANNEL (UPPER)	830823	2.30	2.40	SAND	RUBBLE		9.1	2	UNKNOWN	
INDIAN RIVER (MOUTH)	830820	1.40	.60	RUBBLE	LARGE GRAVEL	8.5	8.2	1		
INDIAN RIVER (MOUTH)	830820	1.20	.15	RUBBLE	LARGE GRAVEL	8.4	8.7	2		
INDIAN RIVER (MOUTH)	830820	1.90	.42	RUBBLE	LARGE GRAVEL	8.8	8.2	3		
SLOUGH 17	830820	.70	.20	LARGE GRAVEL	RUBBLE	5.0	5.4	1	PRESENT	60
SLOUGH 17	830820	.80	.40	LARGE GRAVEL	RUBBLE	5.1	5.2	2	PRESENT	65
SLOUGH 17	830901	1.70	0.00	LARGE GRAVEL	RUBBLE	4.8	5.0	4	UNKNOWN	
SLOUGH 17	830901	1.50	0.00	LARGE GRAVEL	SMALL GRAVEL	4.7	4.8	5	UNKNOWN	
SLOUGH 17	830901	1.90	0.00	RUBBLE	COBBLE	4.1	4.8	6	UNKNOWN	
SLOUGH 17	830901	2.60	0.00	RUBBLE	COBBLE		5.0	7	UNKNOWN	

Table 7-A-1 Continued

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE		WATER TEMPERATURE (C)		REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
				PRIMARY	SECONDARY	INTRAGRAVEL	SURFACE			
SLOUGH 20	830819	.60	1.00	RUBBLE	LARGE GRAVEL	5.8	9.8	1	PRESENT	10
SLOUGH 20	830819	.70	.90	RUBBLE	SMALL GRAVEL	5.5	10.1	2	PRESENT	15
SLOUGH 20	830819	.70	1.10	LARGE GRAVEL	SMALL GRAVEL	6.1	9.2	3	UNKNOWN	
SLOUGH 20	830819	.60	1.10	LARGE GRAVEL	SMALL GRAVEL	5.8	9.2	4	UNKNOWN	
SLOUGH 20	830819	.70	1.00	LARGE GRAVEL	SMALL GRAVEL	6.4	9.2	5	UNKNOWN	
SLOUGH 20	830819	.70	1.00	SMALL GRAVEL	LARGE GRAVEL	6.0	9.2	6	UNKNOWN	
SLOUGH 20	830819	.90	1.05	LARGE GRAVEL	SMALL GRAVEL	7.1	9.2	7	UNKNOWN	
SLOUGH 20	830819	.50	1.60	LARGE GRAVEL	SMALL GRAVEL	8.1	9.6	8	UNKNOWN	
SLOUGH 20	830904	.70	.50	RUBBLE	LARGE GRAVEL	4.7	6.8	9	PRESENT	20
SLOUGH 20	830904	.90	.20	RUBBLE	LARGE GRAVEL	6.5	6.6	10	UNKNOWN	
SLOUGH 20	830904	1.10	.50	LARGE GRAVEL	SMALL GRAVEL	6.9	6.5	11	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.40	.50	LARGE GRAVEL	SMALL GRAVEL	4.8	5.8	31	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.40	.10	LARGE GRAVEL	SMALL GRAVEL	4.0	5.9	32	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.40	0.00	RUBBLE	SMALL GRAVEL	4.0	5.7	33	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.50	.65	COBBLE	BOULDER	4.3	6.1	34	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.60	.25	RUBBLE	LARGE GRAVEL	5.8	6.1	35	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.70	.15	LARGE GRAVEL	RUBBLE	5.0	6.0	36	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.60	.40	RUBBLE	SMALL GRAVEL	4.1	6.0	37	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.35	.25	COBBLE	LARGE GRAVEL	4.5	6.3	38	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.80	.05	RUBBLE	LARGE GRAVEL	4.3	6.3	39	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.95	.08	RUBBLE	LARGE GRAVEL	4.0	6.3	40	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.65	.10	COBBLE	LARGE GRAVEL	4.1	6.0	41	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.65	.08	RUBBLE	LARGE GRAVEL	4.1	5.9	42	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	1.00	.03	RUBBLE	LARGE GRAVEL	4.0	6.1	43	UNKNOWN	

Table 7-A-1 Continued

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE PRIMARY	SUBSTRATE SECONDARY	WATER TEMPERATURE (C) INTRAGRAVEL	WATER TEMPERATURE (C) SURFACE	REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
SLOUGH 21 (SLOUGH ONLY)	830831	.50	.10	LARGE GRAVEL	RUBBLE	4.1	6.2	44	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.60	.50	RUBBLE	LARGE GRAVEL	4.2	6.1	45	PRESENT	
SLOUGH 21 (SLOUGH ONLY)	830831	.50	.30	LARGE GRAVEL	SMALL GRAVEL	4.3	6.2	46	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.80	.30	BOULDER	SAND	4.2	6.2	47	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.65	.35	SMALL GRAVEL	RUBBLE	4.1	6.0	48	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.65	.35	LARGE GRAVEL	BOULDER	4.3	6.1	49	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.20	.08	RUBBLE	LARGE GRAVEL	3.9	8.2	1	PRESENT	6
SLOUGH 21 MODELING SITE	830819	1.90	.05	COBBLE	RUBBLE	4.3	8.9	2	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	.90	.09	COBBLE	RUBBLE	4.8	7.5	3	PRESENT	15
SLOUGH 21 MODELING SITE	830819	1.20	.09	LARGE GRAVEL	RUBBLE	3.7	7.4	4	PRESENT	4
SLOUGH 21 MODELING SITE	830819	1.20	.20	RUBBLE	LARGE GRAVEL	3.8	5.7	5	PRESENT	5
SLOUGH 21 MODELING SITE	830819	.50	.10	COBBLE	RUBBLE	3.6	5.7	6	PRESENT	3
SLOUGH 21 MODELING SITE	830819	1.60	.12	COBBLE	RUBBLE	4.2	8.7	7	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.20	.32	COBBLE	RUBBLE	3.8	9.1	8	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.20	.25	LARGE GRAVEL	RUBBLE	3.8	9.5	9	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	.80	.50	RUBBLE	LARGE GRAVEL	4.4	9.5	10	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	.80	.42	RUBBLE	LARGE GRAVEL	4.7	9.7	11	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.20	.40	RUBBLE	LARGE GRAVEL	5.3	9.7	12	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.10	.40	RUBBLE	LARGE GRAVEL	4.0	9.1	13	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	.80	.40	RUBBLE	LARGE GRAVEL	4.5	9.0	14	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.52	.10	LARGE GRAVEL	RUBBLE	4.4	8.9	15	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.00	.10	RUBBLE	LARGE GRAVEL	4.4	10.5	16	PRESENT	3
SLOUGH 21 MODELING SITE	830819	2.30	.15	COBBLE	RUBBLE	3.9	9.0	17	PRESENT	18
SLOUGH 21 MODELING SITE	830819	.92	.20	RUBBLE	LARGE GRAVEL	4.6	8.6	18	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	.90	.12	RUBBLE	COBBLE	4.1	8.7	19	UNKNOWN	

Table 7-A-1 Continued

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE		WATER TEMPERATURE (C)		REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
				PRIMARY	SECONDARY	INTRAGRAVEL	SURFACE			
SLOUGH 21 (SLOUGH ONLY)	830831	.50	.10	LARGE GRAVEL	RUBBLE	4.1	6.2	44	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.60	.50	RUBBLE	LARGE GRAVEL	4.2	6.1	45	PRESENT	
SLOUGH 21 (SLOUGH ONLY)	830831	.50	.30	LARGE GRAVEL	SMALL GRAVEL	4.3	6.2	46	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.80	.30	BOULDER	SAND	4.2	6.2	47	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.65	.35	SMALL GRAVEL	RUBBLE	4.1	6.0	48	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.65	.35	LARGE GRAVEL	BOULDER	4.3	6.1	49	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.20	.08	RUBBLE	LARGE GRAVEL	3.9	8.2	1	PRESENT	6
SLOUGH 21 MODELING SITE	830819	1.90	.05	COBBLE	RUBBLE	4.3	8.9	2	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	.90	.09	COBBLE	RUBBLE	4.8	7.5	3	PRESENT	15
SLOUGH 21 MODELING SITE	830819	1.20	.09	LARGE GRAVEL	RUBBLE	3.7	7.4	4	PRESENT	4
SLOUGH 21 MODELING SITE	830819	1.20	.20	RUBBLE	LARGE GRAVEL	3.8	5.7	5	PRESENT	5
SLOUGH 21 MODELING SITE	830819	.50	.10	COBBLE	RUBBLE	3.6	5.7	6	PRESENT	3
SLOUGH 21 MODELING SITE	830819	1.60	.12	COBBLE	RUBBLE	4.2	8.7	7	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.20	.32	COBBLE	RUBBLE	3.8	9.1	8	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.20	.25	LARGE GRAVEL	RUBBLE	3.8	9.5	9	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	.80	.50	RUBBLE	LARGE GRAVEL	4.4	9.5	10	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	.80	.42	RUBBLE	LARGE GRAVEL	4.7	9.7	11	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.20	.40	RUBBLE	LARGE GRAVEL	5.3	9.7	12	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.10	.40	RUBBLE	LARGE GRAVEL	4.0	9.1	13	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	.80	.40	RUBBLE	LARGE GRAVEL	4.5	9.0	14	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.52	.10	LARGE GRAVEL	RUBBLE	4.4	8.9	15	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.00	.10	RUBBLE	LARGE GRAVEL	4.4	10.5	16	PRESENT	3
SLOUGH 21 MODELING SITE	830819	2.30	.15	COBBLE	RUBBLE	3.9	9.0	17	PRESENT	18
SLOUGH 21 MODELING SITE	830819	.92	.20	RUBBLE	LARGE GRAVEL	4.6	8.6	18	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	.90	.12	RUBBLE	COBBLE	4.1	8.7	19	UNKNOWN	

Table 7-A-1 Continued

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE		WATER TEMPERATURE (C)		REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
				PRIMARY	SECONDARY	INTRAGRAVEL	SURFACE			
SLOUGH 21 MODELING SITE	830819	.75	.25	LARGE GRAVEL	RUBBLE	4.6	9.5	20	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.12	.32	LARGE GRAVEL	RUBBLE	4.3	9.0	21	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.15	.22	LARGE GRAVEL	RUBBLE	4.7	8.8	22	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	2.40	.09	SMALL GRAVEL	RUBBLE	5.5	11.0	23	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.70	.09	SMALL GRAVEL	RUBBLE	4.5	10.0	24	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.40	0.00	SMALL GRAVEL	LARGE GRAVEL	4.7	10.6	25	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.19	.10	SMALL GRAVEL	LARGE GRAVEL	5.3	10.2	26	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.73	.10	LARGE GRAVEL	RUBBLE	5.6	11.0	27	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.19	.09	RUBBLE	SMALL GRAVEL	4.3	10.9	28	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	.60	.20	LARGE GRAVEL	RUBBLE	5.4	10.4	29	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.10	.20	RUBBLE	LARGE GRAVEL	4.1	9.2	30	PRESENT	15
SLOUGH 21 SIDE CHANNEL	830824	1.10	4.30	RUBBLE	COBBLE	6.7	9.2	1	PRESENT	
SLOUGH 21 SIDE CHANNEL	830824	1.10	2.60	COBBLE	RUBBLE	7.1	9.1	2	PRESENT	
SLOUGH 22	830819	.50	.65	LARGE GRAVEL	SMALL GRAVEL	5.8	7.4	1	UNKNOWN	
SLOUGH 22	830819	.60	.60	LARGE GRAVEL	RUBBLE	6.2	7.5	2	UNKNOWN	
SLOUGH 22	830819	.80	.55	RUBBLE	LARGE GRAVEL	6.1	7.0	3	UNKNOWN	
SLOUGH 22	830819	1.00	.55	RUBBLE	COBBLE	5.2	6.9	4	UNKNOWN	
SLOUGH 22	830819	1.20	.50	RUBBLE	COBBLE	5.9	7.0	5	UNKNOWN	
SLOUGH 22	830819	1.00	.55	LARGE GRAVEL	RUBBLE	5.2	7.1	6	UNKNOWN	
SLOUGH 22	830819	1.00	.55	RUBBLE	COBBLE	5.1	8.6	7	UNKNOWN	
SLOUGH 22	830819	1.20	.55	LARGE GRAVEL	COBBLE	5.8	8.6	8	UNKNOWN	
SLOUGH 22	830819	1.10	.55	RUBBLE	LARGE GRAVEL	6.1	8.9	9	UNKNOWN	
SLOUGH 22	830819	1.70	.55	COBBLE	BOULDER	5.6	9.2	10	UNKNOWN	
SLOUGH 22	830819	1.90	.55	COBBLE	RUBBLE	5.6	9.2	11	UNKNOWN	

Table 7-A-1 Continued

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE		WATER TEMPERATURE (C)		REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
				PRIMARY	SECONDARY	INTRAGRAVEL	SURFACE			
SLOUGH 22	830819	1.70	.55	COBBLE	RUBBLE	5.3	9.4	12	UNKNOWN	

Table 7-A-2 Habitat data collected at pink salmon redds.

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE		WATER TEMPERATURE (C)		REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
				PRIMARY	SECONDARY	INTRAGRAVEL	SURFACE			
4TH OF JULY CREEK MOUTH	830817	1.80	.35	LARGE GRAVEL	RUBBLE	11.2	11.9	1		
4TH OF JULY CREEK MOUTH	830817	.70	.20	LARGE GRAVEL	RUBBLE	11.1	11.8	2		
4TH OF JULY CREEK MOUTH	830818	.50	.35	SMALL GRAVEL	LARGE GRAVEL	12.0	12.3	3	UNKNOWN	
4TH OF JULY CREEK MOUTH	830818	.30	.65	LARGE GRAVEL	RUBBLE	12.4	12.3	4	UNKNOWN	
4TH OF JULY CREEK MOUTH	830818	.70	4.30	RUBBLE	LARGE GRAVEL	12.8	12.4	5	UNKNOWN	
4TH OF JULY CREEK MOUTH	830822	1.50	2.60	RUBBLE	LARGE GRAVEL	10.8	10.9	6		
4TH OF JULY CREEK MOUTH	830822	.80	2.40	RUBBLE	LARGE GRAVEL	10.8	11.4	7	UNKNOWN	
4TH OF JULY CREEK MOUTH	830822	.70	2.70	RUBBLE	LARGE GRAVEL	11.4	11.4	8	UNKNOWN	
4TH OF JULY CREEK MOUTH	830822	1.40	2.10	LARGE GRAVEL	SMALL GRAVEL	11.5	11.4	9	UNKNOWN	
4TH OF JULY CREEK MOUTH	830822	1.50	2.50	RUBBLE	LARGE GRAVEL	11.5	11.4	10	UNKNOWN	
4TH OF JULY CREEK MOUTH	830822	1.40	3.00	LARGE GRAVEL	SMALL GRAVEL	11.5	11.4	11	UNKNOWN	
4TH OF JULY CREEK MOUTH	830822	1.30	3.00	LARGE GRAVEL	RUBBLE	11.5	11.4	12	UNKNOWN	
SLOUGH 11	830827	1.00	.05				8.0	1	UNKNOWN	
SLOUGH 11	830827	.75	0.00				8.0	2	UNKNOWN	
SLOUGH 11	830827	2.50	0.00				9.5	3	UNKNOWN	
SLOUGH 11	830827	1.40	0.00				8.5	4	UNKNOWN	

Table 7-A-3 Habitat data collected at sockeye salmon redds.

LOCATION	DATE	DEPTH (FT)	WATER VELOCITY (FT/S)	SUBSTRATE		WATER TEMPERATURE (C)		REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
				PRIMARY	SECONDARY	INTRAGRAVEL	SURFACE			
SLOUGH 8A W. FORK B/L TR. #1	830909	.60		RUBBLE	COBBLE	5.9	10.4	1	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	.70		RUBBLE	COBBLE	5.7	10.5	2	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	.75		LARGE GRAVEL	COBBLE	4.7	7.2	3	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	.90		LARGE GRAVEL	RUBBLE	6.6	9.3	4	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	.70		LARGE GRAVEL	RUBBLE	5.0	9.3	5	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	.60		RUBBLE	COBBLE	6.5	9.8	6	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	.60		LARGE GRAVEL	RUBBLE	5.1	9.8	7	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	.60		RUBBLE	COBBLE	4.4	9.5	8	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	.40		RUBBLE	BOULDER	5.0	8.8	9	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	.90		SMALL GRAVEL	LARGE GRAVEL	5.7	8.0	10	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	1.00		LARGE GRAVEL	RUBBLE	6.1	7.9	11	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	1.50		RUBBLE	COBBLE	6.5	8.9	12	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	1.00		LARGE GRAVEL	RUBBLE	5.1	8.9	13	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	1.00		LARGE GRAVEL	RUBBLE	5.3	8.7	14	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	1.10		RUBBLE	COBBLE	6.4	9.0	15	UNKNOWN	
SLOUGH 8A W. FORK B/L TR. #1	830909	1.90		LARGE GRAVEL	COBBLE	5.1	9.0	16	UNKNOWN	
SLOUGH 11	830910	1.68	0.00	RUBBLE	COBBLE			1	UNKNOWN	
SLOUGH 11	830910	1.10	0.00	SAND	LARGE GRAVEL			2	PRESENT	15
SLOUGH 11	830910	.92	0.00	RUBBLE	COBBLE			3	UNKNOWN	
SLOUGH 11	830910	.92	.20	RUBBLE	SAND			4	UNKNOWN	
SLOUGH 11	830910	.62	.70	LARGE GRAVEL	SMALL GRAVEL			5	UNKNOWN	
SLOUGH 11	830911	2.00	0.00	RUBBLE	COBBLE			6	UNKNOWN	
SLOUGH 11	830911	.60	0.00	LARGE GRAVEL	SAND			7	UNKNOWN	
SLOUGH 11	830911	.50	0.00	RUBBLE	LARGE GRAVEL			8	UNKNOWN	

Table 7-A-3 Continued

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE PRIMARY	SUBSTRATE SECONDARY	WATER TEMPERATURE (C) INTRAGRAVEL	WATER TEMPERATURE (C) SURFACE	REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
SLOUGH 11	830911	1.20	.10	RUBBLE	LARGE GRAVEL			9	PRESENT	1
SLOUGH 11	830911	.80	.05	LARGE GRAVEL	RUBBLE			10	UNKNOWN	
SLOUGH 11	830911	.60	0.00	RUBBLE	COBBLE			11	UNKNOWN	
SLOUGH 11	830911	1.30	0.00	LARGE GRAVEL	RUBBLE			12	PRESENT	
SLOUGH 11	830911	1.60	0.00	RUBBLE	LARGE GRAVEL			13	PRESENT	
SLOUGH 11	830911	1.30	0.00	LARGE GRAVEL	SAND			14	PRESENT	
SLOUGH 11	830911	1.00	0.00	SMALL GRAVEL	SAND			15	UNKNOWN	
SLOUGH 11	830911	.70	0.00	LARGE GRAVEL	RUBBLE			16	UNKNOWN	
SLOUGH 11	830911	.90	0.00	SMALL GRAVEL	LARGE GRAVEL			17	UNKNOWN	
SLOUGH 11	830911	.60	0.00	SMALL GRAVEL	RUBBLE			18	UNKNOWN	
SLOUGH 17	830901	2.30	0.00	LARGE GRAVEL	SMALL GRAVEL	4.0	4.9	1	UNKNOWN	
SLOUGH 17	830901	2.30	0.00	LARGE GRAVEL	SMALL GRAVEL	4.5	5.0	2	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.40	.20	RUBBLE	LARGE GRAVEL	5.0	5.6	2	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.40	.90	COBBLE	LARGE GRAVEL	4.6	6.3	3	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.30	.01	RUBBLE	LARGE GRAVEL	4.3	7.0	4	PRESENT	
SLOUGH 21 (SLOUGH ONLY)	830831	.50	.10	LARGE GRAVEL	SMALL GRAVEL	4.7	6.6	5	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.25	.30	LARGE GRAVEL	SMALL GRAVEL	4.3	6.1	6	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.45	.20	BOULDER	LARGE GRAVEL	4.0	6.4	7	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.50	0.00	BOULDER	SMALL GRAVEL	4.1	5.1	8	PRESENT	
SLOUGH 21 (SLOUGH ONLY)	830831	.80	.05	COBBLE	LARGE GRAVEL	4.7	6.2	9	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.90	.15	RUBBLE	LARGE GRAVEL	4.6	6.1	10	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.40	.40	RUBBLE	LARGE GRAVEL	4.4	6.1	11	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.70	.15	BOULDER	LARGE GRAVEL	4.1	6.1	12	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.70	.10	BOULDER	LARGE GRAVEL	4.2	6.2	13	UNKNOWN	

Table 7-A-3 Continued

LOCATION	DATE	DEPTH (FT)	WATER VELO-CITY (FT/S)	SUBSTRATE		WATER TEMPERATURE (C)		REDD NO.	UPWELLING	DISTANCE (FT) TO UPWELLING
				PRIMARY	SECONDARY	INTRAGRAVEL	SURFACE			
SLOUGH 21 (SLOUGH ONLY)	830831	.50	.15	BOULDER	SMALL GRAVEL	4.1	6.0	14	PRESENT	
SLOUGH 21 (SLOUGH ONLY)	830831	.40	.15	RUBBLE	LARGE GRAVEL	4.5	6.1	15	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.40	.20	COBBLE	LARGE GRAVEL	4.3	6.0	16	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.50	.25	COBBLE	SMALL GRAVEL	4.3	6.2	17	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.40	.25	BOULDER	LARGE GRAVEL	4.1	6.3	18	UNKNOWN	
SLOUGH 21 (SLOUGH ONLY)	830831	.50	.45	COBBLE	LARGE GRAVEL	4.1	6.4	19	PRESENT	
SLOUGH 21 (SLOUGH ONLY)	830831	.50	.45	LARGE GRAVEL	SMALL GRAVEL	4.6	6.1	20	UNKNOWN	
SLOUGH 21 MODELING SITE	830819	1.30	.15	RUBBLE	COBBLE	4.0	8.7	1	UNKNOWN	

APPENDIX 7B

Summary Of Variance Statistics And Tests For Various Groupings Of Chum And Sockeye Salmon Utilization Depth Histograms

Table 7-B-1 Summary of variance statistics and tests for various groupings for chum salmon utilization depth histograms.

HISTOGRAM LABEL	INCREMENT SIZE	INCREMENT START	VARIANCE	df
A	0.1	0.0	106.9729	28
B	0.2	0.0	405.8857	14
C	0.2	0.1	474.7967	13
D	0.3	0.0	892.9000	9
E	0.3	0.1	916.0111	9
F	0.3	0.2	828.8182	10

LEVENE'S TEST

F STATISTIC	df	PROB
6.030000	5,83	0.0001

PAIRWISE COMPARISONS

PAIR	df	F VALUE	PROB
A,B	14,28	3.794285	0.0013
A,C	13,28	4.438476	0.0005
A,D	9,28	8.346974	0.0000
A,E	9,28	8.563020	0.0000
A,F	10,28	7.747927	0.0000
B,C	13,14	1.169779	0.3900
B,D	9,14	2.199880	0.0900
B,E	9,14	2.256820	0.0830
B,F	10,14	2.041999	0.1100
C,D	9,13	1.880594	0.1500
C,E	9,13	1.929270	0.1400
C,F	10,13	1.745628	0.1700
D,E	9,9	1.025883	0.4900
D,F	9,10	1.077317	0.4500
E,F	9,10	1.105201	0.4400

Table 7-8-2 Summary of variance statistics and tests for various groupings for chum salmon utilization velocity histograms.

HISTOGRAM LABEL	INCREMENT SIZE	INCREMENT START	VARIANCE	df
A	0.1	0.0	330.5182	44
B	0.1	0.1	605.9720	43
C	0.2	0.0	1114.7900	21
D	0.2	0.1	1289.5519	21
E	0.3	0.0	2004.1714	14
F	0.3	0.1	1949.3625	15
G	0.3	0.2	2948.0286	14

LEVENE'S TEST

F STATISTIC	df	PROB
3.090000	6,172	0.0068

PAIRWISE COMPARISONS

PAIR	df	F VALUE	PROB
A,B	43,44	1.833400	0.0240
A,C	21,44	3.372855	0.0003
A,D	21,44	3.901606	0.0001
A,E	14,44	6.063725	0.0000
A,F	15,44	5.897898	0.0000
A,G	14,44	8.919414	0.0000
B,C	21,43	1.839672	0.0450
B,D	21,43	2.128072	0.0180
B,E	14,43	3.307366	0.0013
B,F	15,43	3.216918	0.0014
B,G	14,43	4.864958	0.0000
C,D	21,21	1.156767	0.3700
C,E	14,21	1.797802	0.1100
C,F	15,21	1.748637	0.1200
C,G	14,21	2.644470	0.0220
D,E	14,21	1.554161	0.1800
D,F	15,21	1.511659	0.1900
D,G	14,21	2.286088	0.0150
E,F	14,15	1.028116	0.4800
E,G	14,14	1.470946	0.2400
F,G	14,15	1.512304	0.2200

Table 7-B-3 Summary of variance statistics and tests for various groupings for sockeye salmon utilization depth histograms.

HISTOGRAM LABEL	INCREMENT SIZE	INCREMENT START	VARIANCE	df
A	0.1	0.0	8.5385	26
B	0.2	0.0	29.1044	13
C	0.2	0.1	29.4121	13
D	0.3	0.0	63.8778	9
E	0.3	0.1	61.4333	9
F	0.3	0.2	53.7500	8

LEVENE'S TEST

F STATISTIC	df	PROB
5.470000	5,78	0.0002

PAIRWISE COMPARISONS

PAIR	df	F VALUE	PROB
A,B	13,26	3.408623	0.0038
A,C	13,26	3.444659	0.0035
A,D	9,26	7.481181	0.0000
A,E	9,26	7.194895	0.0000
A,F	8,26	6.295045	0.0002
B,C	13,13	1.010572	0.4900
B,D	9,13	2.194781	0.0960
B,E	9,13	2.110792	0.1100
B,F	8,13	1.846800	0.1600
C,D	9,13	2.171821	0.0990
C,E	9,13	2.088710	0.1100
C,F	8,13	1.827480	0.1600
D,E	9,9	1.039790	0.4800
D,F	9,8	1.188424	0.4100
E,F	9,8	1.142946	0.4300

Table 7-B-4 Summary of variance statistics and tests for various groupings for sockeye salmon utilization velocity histograms.

HISTOGRAM LABEL	INCREMENT SIZE	INCREMENT START	VARIANCE	df
A	0.1	0.0	50.2778	9
B	0.1	0.1	136.1944	8
C	0.2	0.0	113.3667	5
D	0.2	0.1	223.0000	4
E	0.3	0.0	217.5833	3
F	0.3	0.1	250.9167	3
G	0.3	0.2	452.9167	3

LEVENE'S TEST

F STATISTIC	df	PROB
1.250000	6,35	0.3035

APPENDIX 7C

Weighted Usable Area Data For Sloughs And Side Channels

Table 7-C-1. Weighted Usable Area (ft^2) (WUA), gross surface area (ft^2) and percent usable area for various flows (cfs) in Slough 8A using four different curve sets.

CHUM

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
70	82,817	28,134	33.97	62,616	75.61	7,420	8.96	388.84	0.47
60	81,428	26,084	32.03	59,619	73.22	7,332	9.00	450.52	0.55
50	79,966	23,633	29.55	55,810	69.79	7,251	9.07	531.01	0.66
40	78,354	21,341	27.24	51,316	65.49	7,152	9.13	642.38	0.82
20	72,799	13,010	17.87	36,759	50.47	4,426	6.08	845.79	1.16
15	71,963	11,810	16.41	34,299	47.66	3,990	5.55	922.15	1.28
10	71,042	10,455	14.72	31,110	43.79	3,358	4.73	969.01	1.36
5	68,582	8,857	12.92	26,290	38.33	2,479	3.62	919.09	1.34

SOCKEYE

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
70	82,817	50,848	61.40	45,765	55.26	9,997	12.07	552.11	0.67
60	81,428	50,288	61.76	45,371	55.72	9,860	12.11	807.55	0.99
50	79,966	49,283	61.63	43,964	54.98	9,532	11.92	1,090.50	1.36
40	78,354	46,439	59.27	41,479	52.94	8,888	11.34	1,099.94	1.40
20	72,799	31,689	43.53	34,125	46.88	5,868	8.06	1,098.27	1.51
15	71,963	29,154	40.51	27,735	38.54	5,476	7.61	1,192.27	1.66
10	71,042	25,921	36.49	17,095	24.06	5,009	7.05	956.78	1.35
5	68,582	21,255	30.99	7,347	10.71	4,157	6.06	751.88	1.10

Table 7-C-2. Weighted Usable Area (ft^2) (WUA), gross surface area (ft^2) and percent usable area for various flows (cfs) in Slough 9 using four different curve sets.

CHUM

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
600	139,586	21,957	15.73	54,126	38.78	9,974	7.15	492.83	0.35
300	124,909	23,961	19.18	72,569	58.10	10,889	8.72	442.16	0.35
150	113,357	21,961	19.37	75,363	66.48	11,008	9.71	936.49	0.83
50	94,606	11,663	12.33	54,656	57.77	9,991	10.56	2,357.07	2.49
20	82,399	8,216	9.97	39,540	47.99	8,062	9.78	3,220.52	3.91
5	65,241	861	1.32	22,876	35.06	3,409	5.23	3,417.17	5.24

SOCKEYE

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
600	139,586	21,709	15.55	60,180	43.11	5,096	3.65	323.59	0.23
300	124,909	31,405	25.14	77,666	62.18	7,672	6.14	336.62	0.27
150	113,357	33,421	29.48	82,062	72.39	7,978	7.04	728.07	0.64
50	94,606	26,170	27.66	58,466	61.80	7,795	8.24	2,221.19	2.35
20	82,399	16,673	20.23	26,489	32.15	7,527	9.14	3,081.19	3.74
5	65,241	10,422	15.98	7,851	12.04	6,493	9.95	1,326.73	2.03

Table 7-C-3. Weighted Usable Area (ft^2) (WUA), gross surface area (ft^2) and percent usable area for various flows (cfs) in Slough 21 using four different curve sets.

CHUM

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
400	90,253	8,559	9.48	56,586	62.70	14,981	16.60	819.47	0.91
250	86,963	11,872	13.65	64,312	73.95	18,575	21.36	591.32	0.68
100	79,924	12,674	15.82	63,534	79.49	21,743	27.20	1,265.08	1.58
50	76,390	7,713	10.10	56,003	73.31	19,117	25.03	2,426.23	3.18
10	62,533	3,451	5.52	35,738	57.15	11,498	18.39	4,995.18	7.99
7	59,145	2,871	4.86	29,609	50.06	9,723	16.44	5,463.74	9.24
5	54,253	2,757	5.08	24,142	44.50	8,261	15.23	5,269.05	9.71

SOCKEYE

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
400	90,253	7,932	8.79	30,676	33.99	4,001	4.43	259.53	0.29
250	86,963	11,058	12.72	39,133	45.00	6,298	7.24	250.50	0.29
100	79,924	16,066	20.10	44,068	55.14	10,282	12.87	869.39	1.09
50	76,390	15,640	20.47	33,575	43.95	12,000	15.71	1,830.11	2.40
10	62,533	8,101	12.96	7,191	11.50	6,770	10.83	1,586.24	2.54
7	59,145	6,870	11.62	4,666	7.89	5,702	9.64	1,396.26	2.36
5	54,253	5,896	10.87	4,043	7.45	4,850	8.94	1,152.08	2.12

Table 7-C-4. Weighted Usable Area (ft^2) (WUA), gross surface area (ft^2) and percent usable area for various flows (cfs) in Side Channel 10 using four different curve sets.

CHUM

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
100	97,764	13,543	13.85	41,809	42.77	5,682	5.81	346.94	0.35
75	89,839	9,166	10.20	34,545	38.45	4,842	5.39	378.56	0.42
50	80,229	4,569	5.70	25,973	32.37	3,380	4.21	515.75	0.64
20	67,316	1,963	2.92	14,080	20.92	1,224	1.82	1,131.72	1.68
5	49,966	108	0.22	5,843	11.70	0	0	2,150.49	4.30

SOCKEYE

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
100	97,764	29,495	30.17	63,944	65.41	7,535	7.71	591.36	0.60
75	89,839	28,375	31.58	59,745	66.50	8,597	9.57	938.59	1.04
50	80,229	26,784	33.39	54,187	67.54	9,841	12.27	618.64	0.77
20	67,316	13,179	19.58	39,686	58.96	4,427	6.58	1,338.00	1.99
5	49,966	3,870	7.75	23,254	46.54	0	0	958.94	1.92

Table 7-C-5. Weighted Usable Area (ft^2) (WUA), gross surface area (ft^2) and percent usable area for various flows (cfs) in Upper Side Channel 11 using four different curve sets.

CHUM

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
250	118,241	20,043	16.95	72,079	60.96	17,562	14.85	733.11	0.62
150	106,615	18,522	17.37	67,168	63.00	16,231	15.22	929.22	0.87
100	95,888	16,777	17.50	61,927	64.58	15,816	16.50	1,229.85	1.28
50	82,881	12,044	14.53	49,335	59.53	13,719	16.55	2,917.48	3.52
20	68,874	6,266	9.10	30,829	44.76	9,263	13.45	5,488.29	7.97
5	49,293	1,915	3.89	13,201	26.78	3,869	7.85	3,784.88	7.68

SOCKEYE

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
250	118,241	18,379	15.54	57,071	48.27	12,767	10.80	906.66	0.77
150	106,615	22,712	21.30	55,733	52.28	17,886	16.76	682.07	0.64
100	95,888	25,438	26.53	52,485	54.74	21,410	22.33	807.58	0.84
50	82,881	23,043	27.80	47,314	57.09	20,223	24.40	1,937.17	2.34
20	68,874	16,938	24.59	28,966	42.06	15,885	23.06	7,464.56	10.84
5	49,293	8,375	16.99	9,432	19.14	7,852	15.93	1,500.58	3.04

Table 7-C-6. Weighted Usable Area (ft^2) (WUA), gross surface area (ft^2) and percent usable area for various flows (cfs) in Side Channel 21 using four different curve sets.

CHUM

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
1500	248,133	53,792	21.68	107,757	43.43	1,565	0.63	2,557.41	1.03
1000	220,051	64,979	29.53	108,018	49.09	2,151	0.98	972.09	0.44
700	204,889	63,216	30.85	106,121	51.79	2,777	1.36	681.76	0.33
300	172,519	61,211	35.48	95,048	55.09	4,251	2.46	589.92	0.34
100	138,433	18,330	13.24	46,789	33.80	4,180	3.02	903.14	0.65
80	135,827	17,959	13.22	44,758	32.95	4,055	2.99	933.58	0.69
60	130,476	15,982	12.25	41,215	31.59	3,860	2.96	1,038.79	0.80
40	126,013	13,907	11.04	35,616	28.26	3,521	2.79	1,267.11	1.01
20	117,473	9,489	8.08	27,770	23.64	2,914	2.48	1,526.21	1.30

SOCKEYE

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
1500	248,133	50,618	20.40	96,147	38.75	4,699	1.89	1,562.67	0.63
1000	220,051	62,070	28.21	114,738	52.14	3,540	1.61	634.22	0.29
700	204,889	71,848	35.07	126,840	61.91	869	0.42	554.44	0.27
300	172,519	77,734	45.06	141,090	81.78	2,192	1.27	328.45	0.19
100	138,433	65,10[illegible]	47.07	109,834	79.34	4,035	2.91	459.33	0.33
80	135,827	65,0[illegible]3	47.93	106,252	78.23	4,456	3.28	604.02	0.44
60	130,476	62,[illegible]15	47.61	100,041	76.67	4,867	3.73	796.61	0.61
40	126,013	55,798	44.28	87,142	69.15	5,154	4.09	2,237.89	1.78
20	117,473	44,505	37.89	49,912	42.49	4,728	4.03	2,255.57	1.92

Table 7-C-7. Weighted Usable Area (ft^2) (WUA), gross surface area (ft^2) and percent usable area for various flows (cfs) in Lower Side Channel 11 using four different curve sets.

CHUM

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
2000	309,144	127,633	41.29	---	---	---	---	4,772.26	4.43
1500	297,546	125,082	42.04	---	---	---	---	4,325.75	3.22
1000	294,781	167,990	56.99	---	---	---	---	6,559.83	2.34
700	276,435	173,041	62.60	---	---	---	---	8,578.91	1.45
400	206,527	97,312	47.12	---	---	---	---	9,146.16	1.57

SOCKEYE

FLOW	GROSS SURFACE AREA	SUBSTRATE		UPWELLING		JOINT		UTILIZATION	
		WUA	PERCENT	WUA	PERCENT	WUA	PERCENT	WUA	PERCENT
2000	309,144	119,923	38.79	---	---	---	---	515.13	0.98
1500	297,546	104,362	35.07	---	---	---	---	734.18	1.12
1000	294,781	176,549	59.89	---	---	---	---	1,982.08	0.71
700	276,435	192,696	69.71	---	---	---	---	2,983.34	0.25
400	206,527	115,038	55.70	---	---	---	---	2,019.24	0.17

APPENDIX 7D

Weighted Usable Area Plots For Sloughs And Side Channels

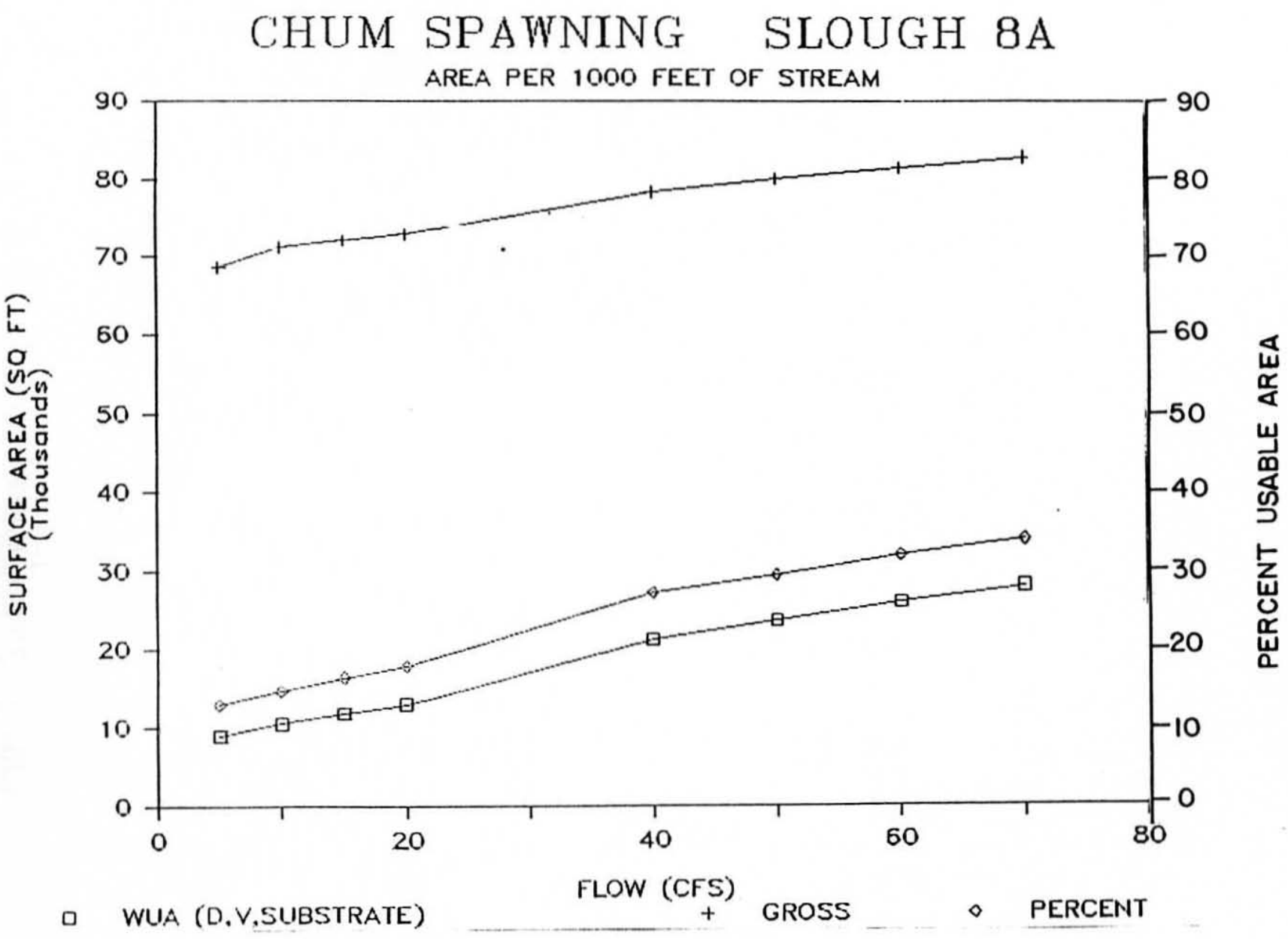

Figure 7-D-1 Weighted usable area plots using substrate curve set for chum salmon in Slough 8A.

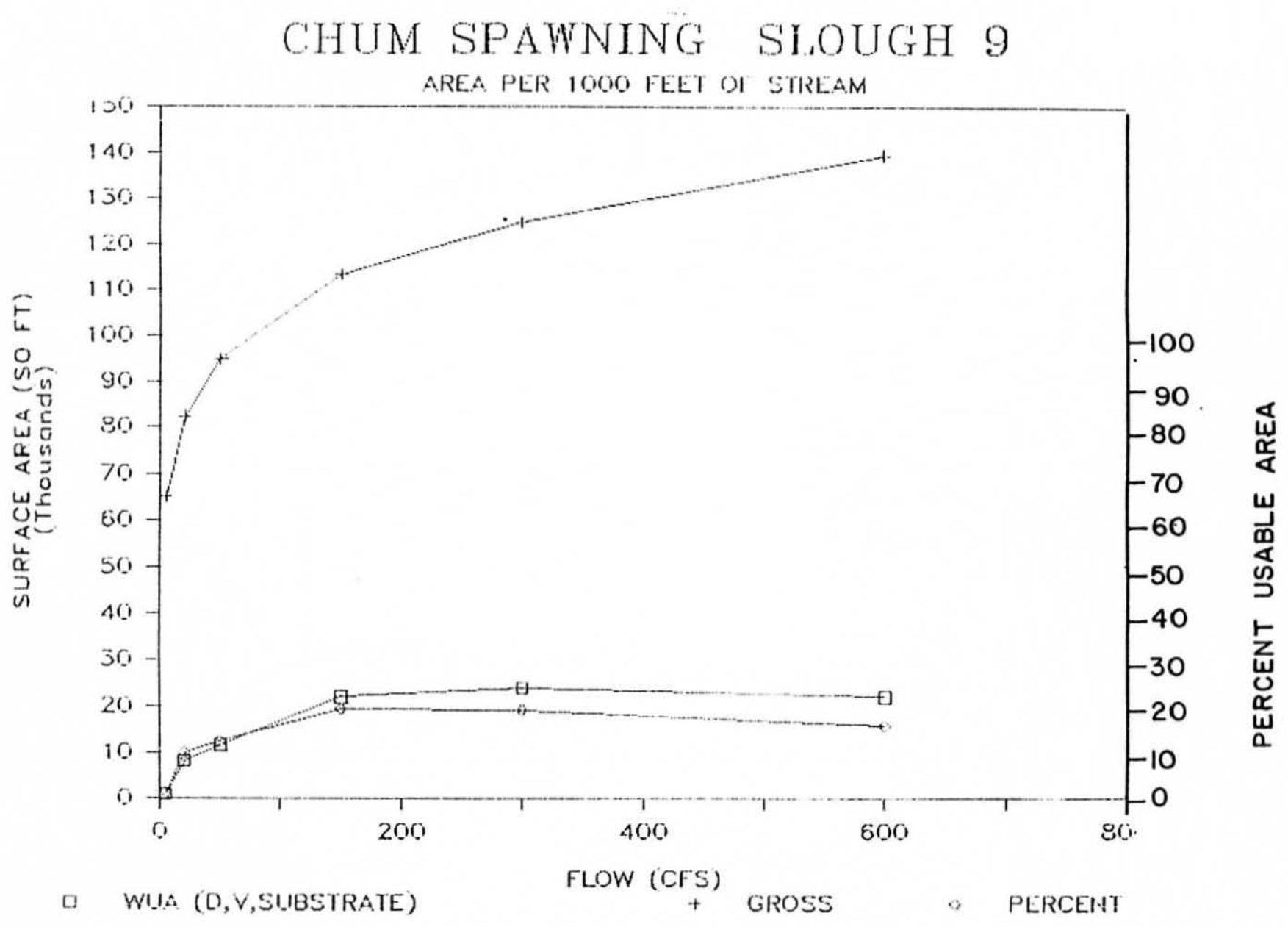

Figure 7-D-2 Weighted usable area plots using substrate curve set for chum salmon in Slough 9.

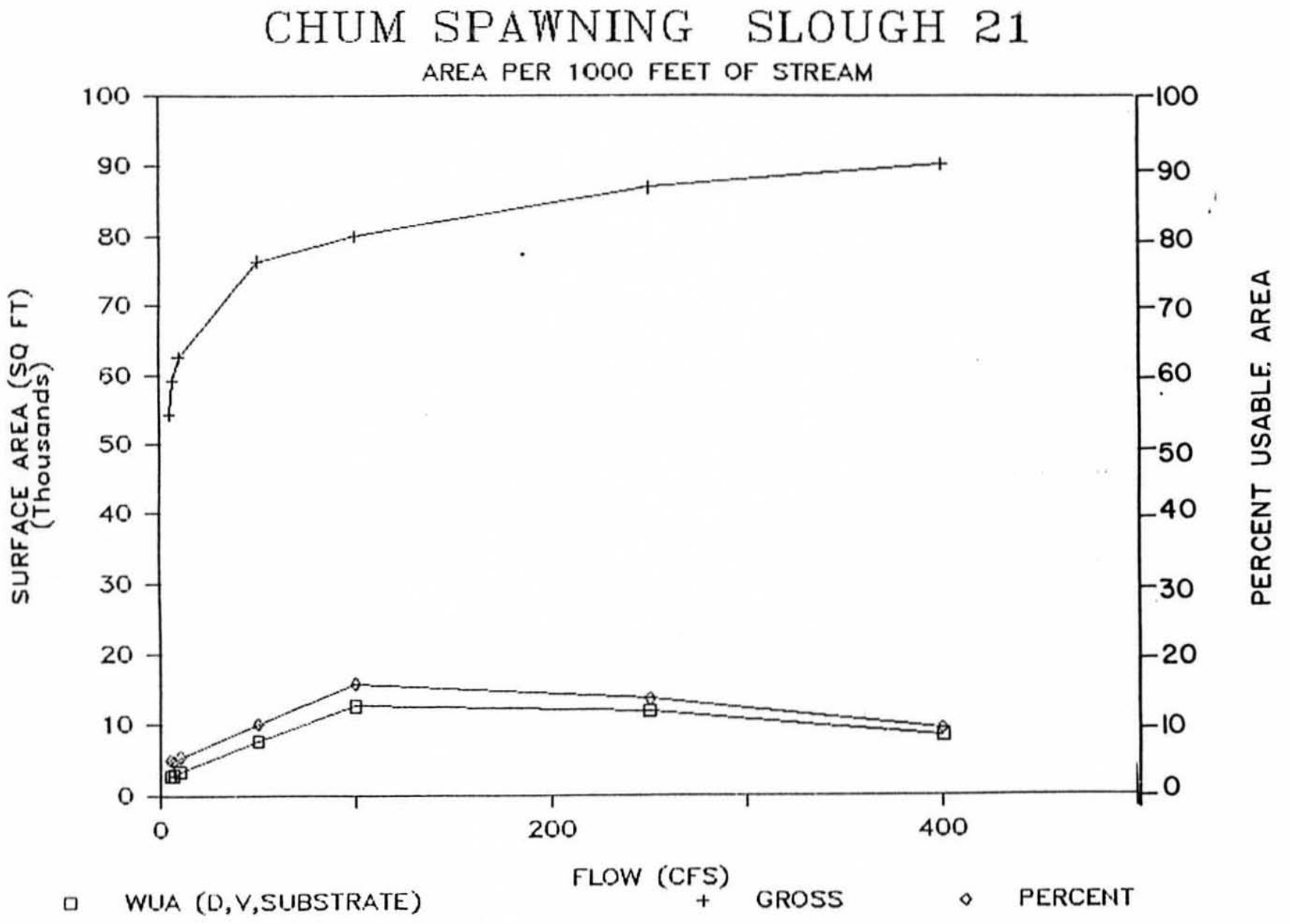

Figure 7-D-3 Weighted usable area plots using substrate curve set for chum salmon in Slough 21.

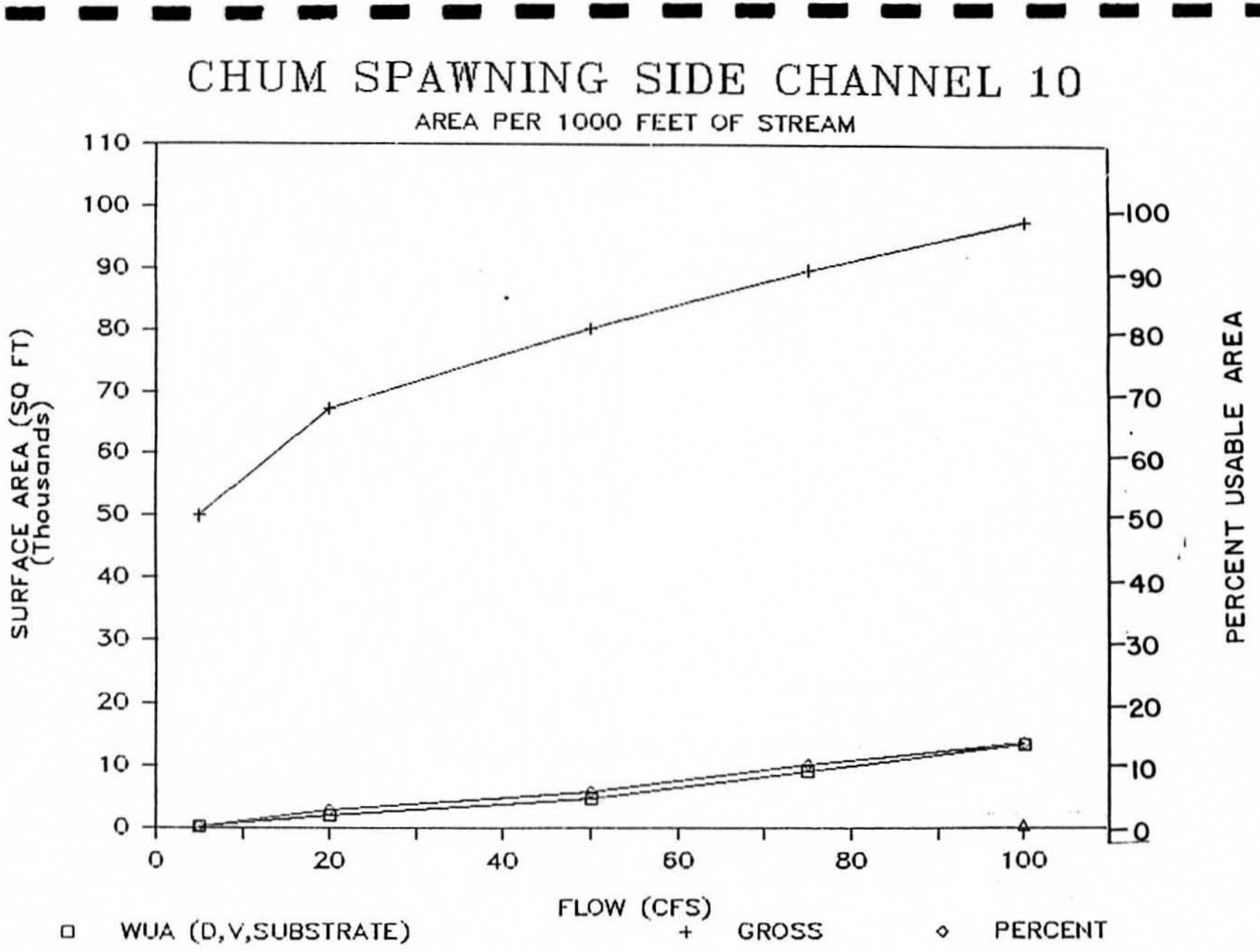

Figure 7-D-4 Weighted usable area plots using substrate curve set for chum salmon in Side Channel 10.

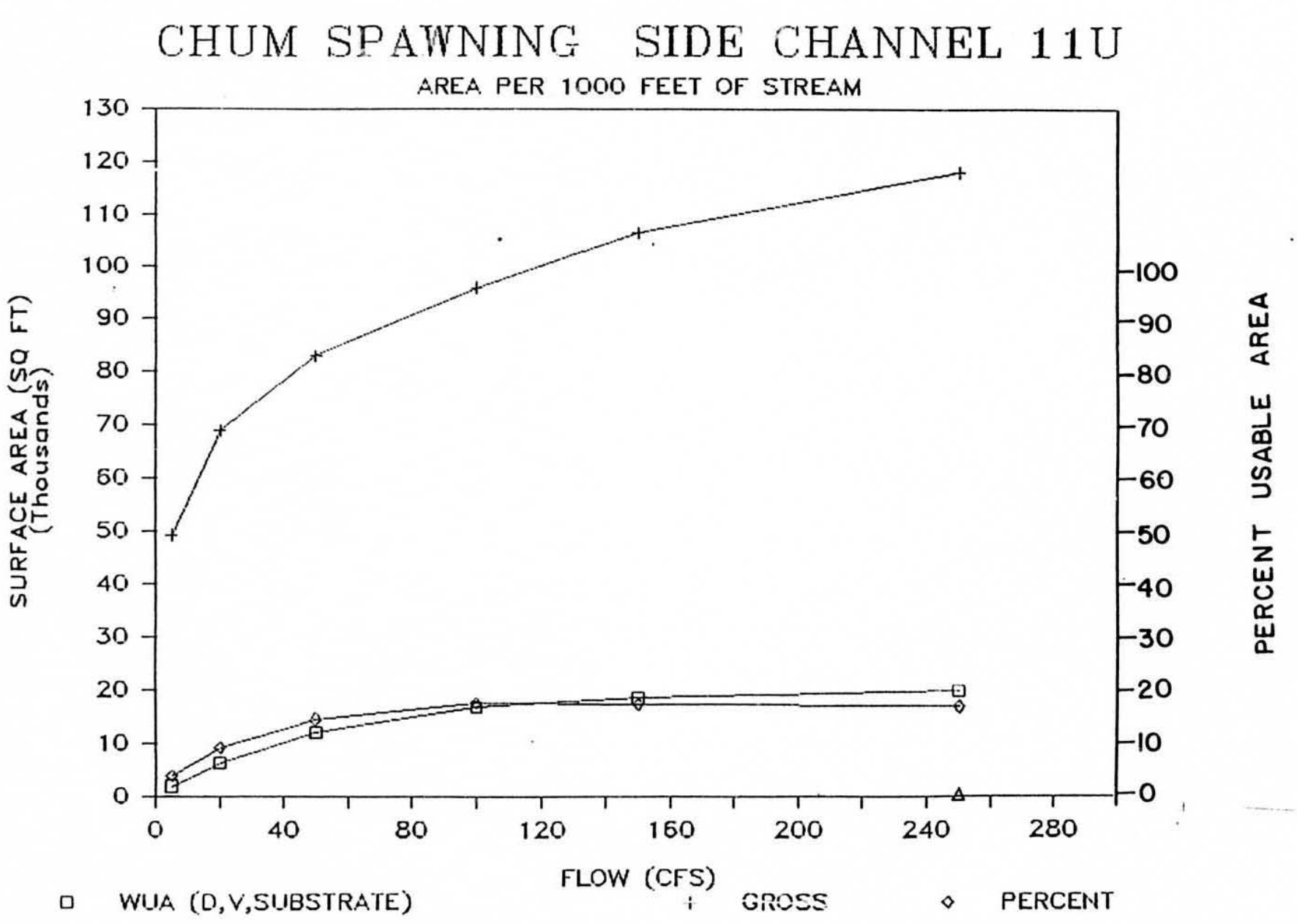

Figure 7-D-5 Weighted usable area plots using substrate curve set for chum salmon in Upper Side Channel 11.

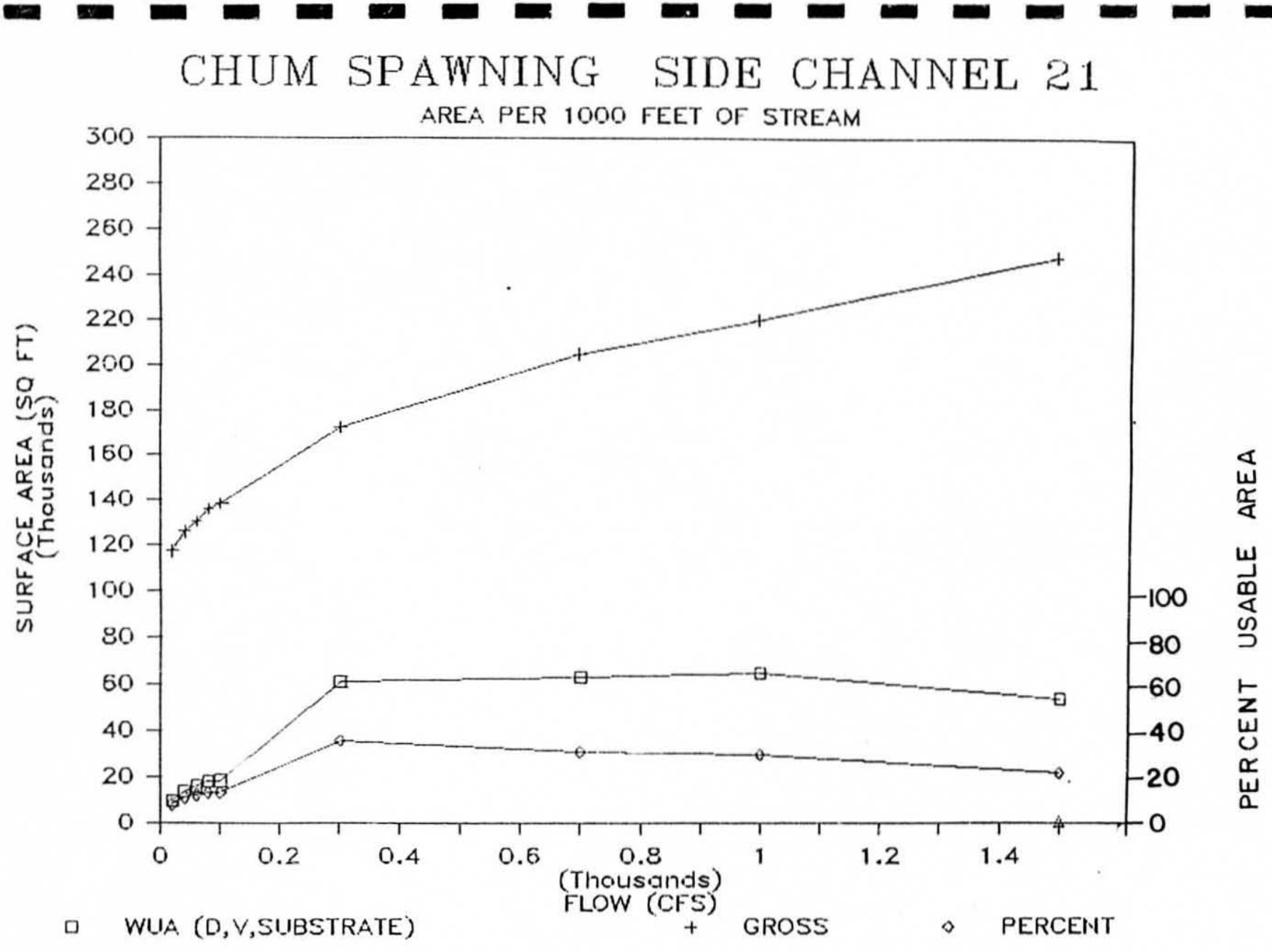

Figure 7-D-6 Weighted usable area plots using substrate curve set for chum salmon in Side Channel 21.

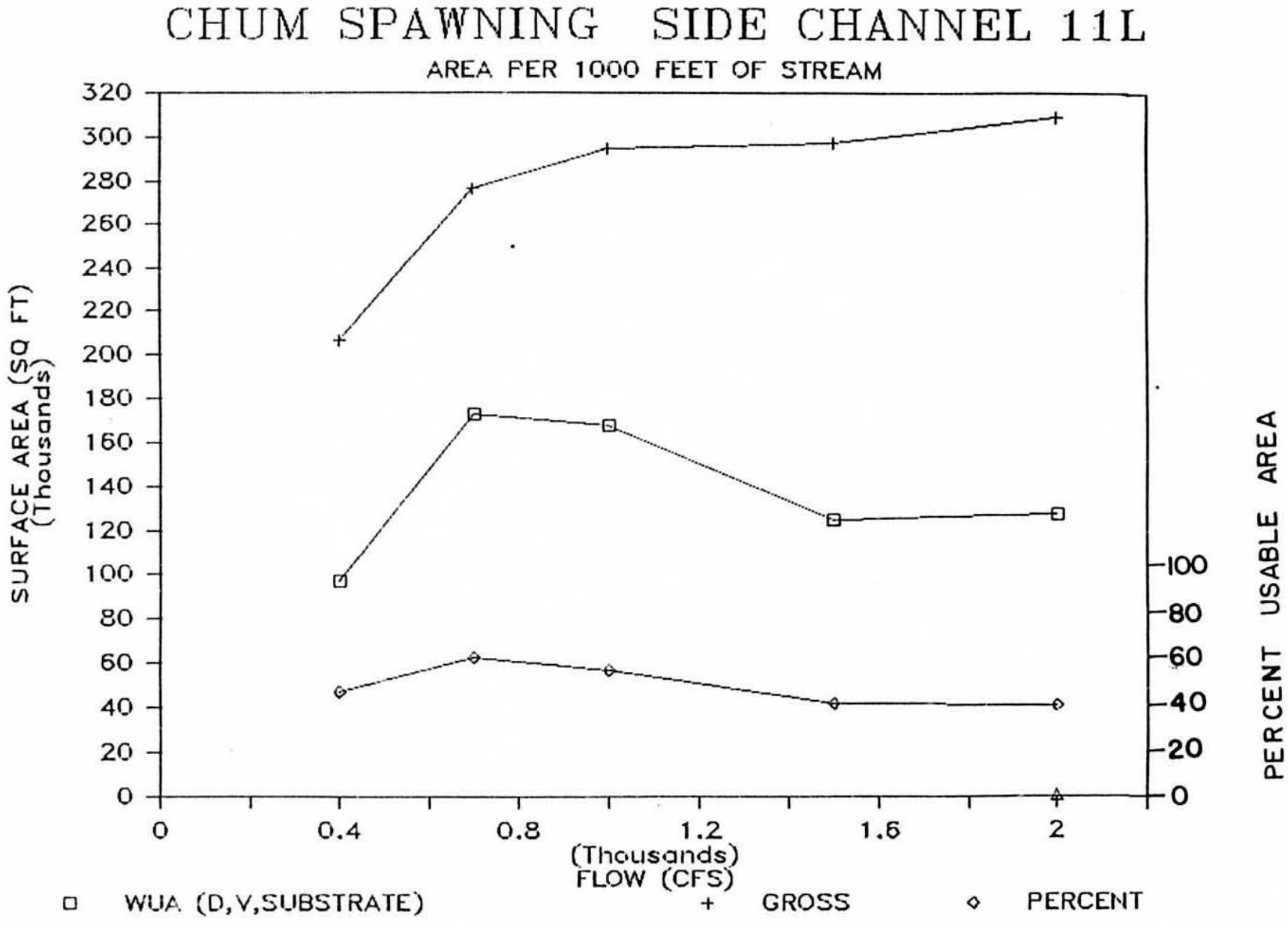

Figure 7-D-7 Weighted usable area plots using substrate curve set for chum salmon in Lower Side Channel 11.

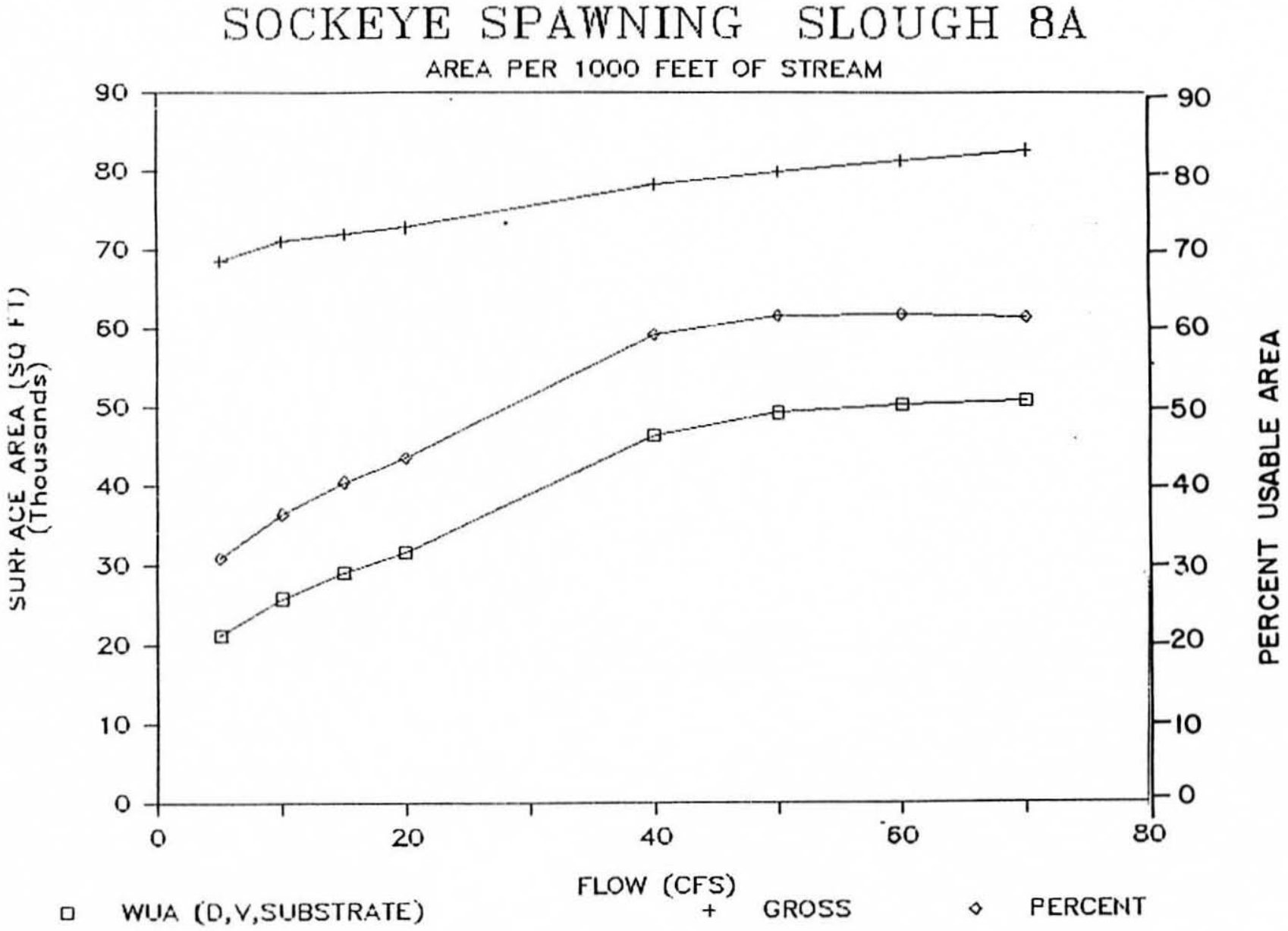

Figure 7-D-8 Weighted usable area plots using substrate curve set for sockeye salmon in Slough 8A.

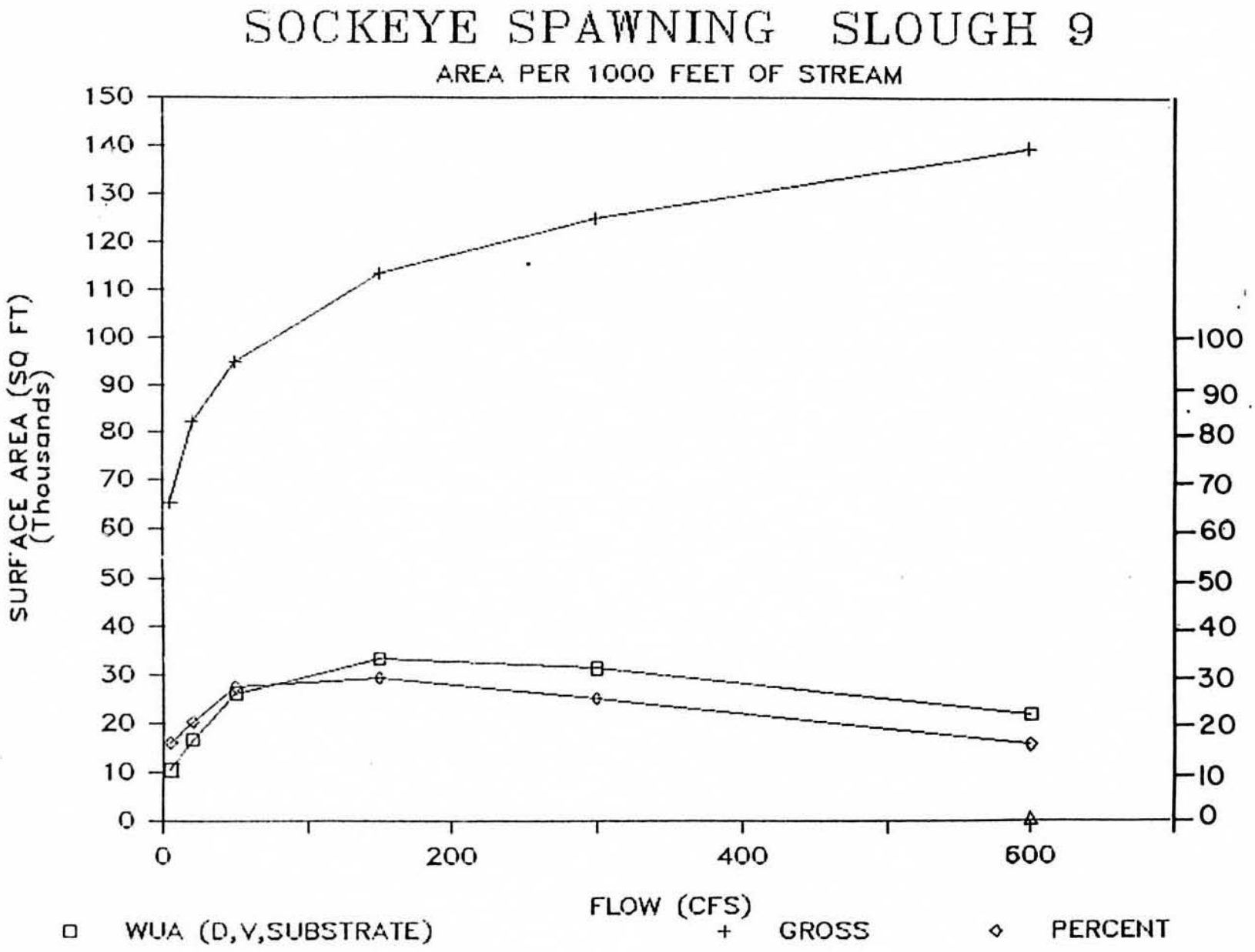

Figure 7-D-9 Weighted usable area plots using substrate curve set for sockeye salmon in Slough 9.

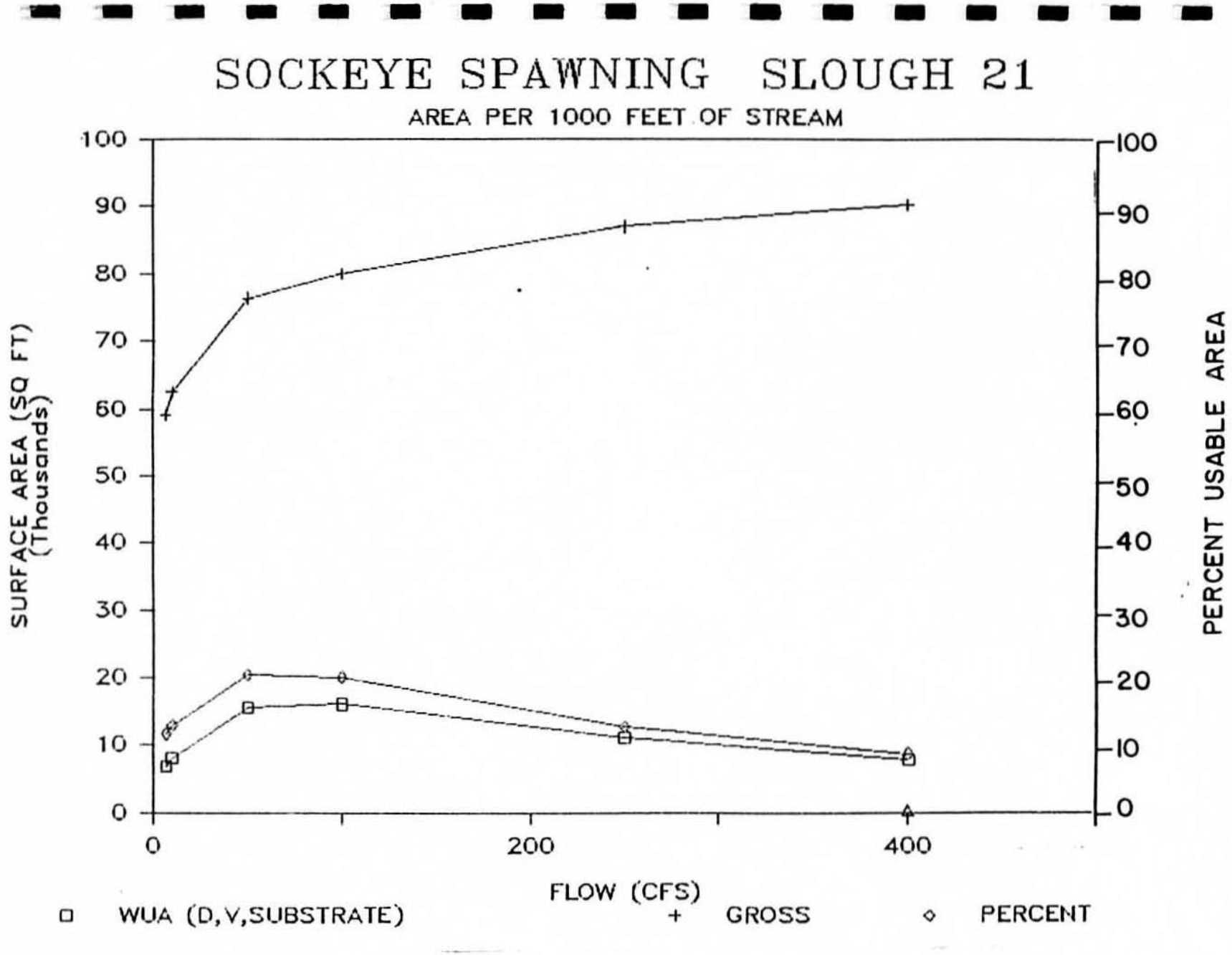

Figure 7-D-10 Weighted usable area plots using substrate curve set for sockeye salmon in Slough 21.

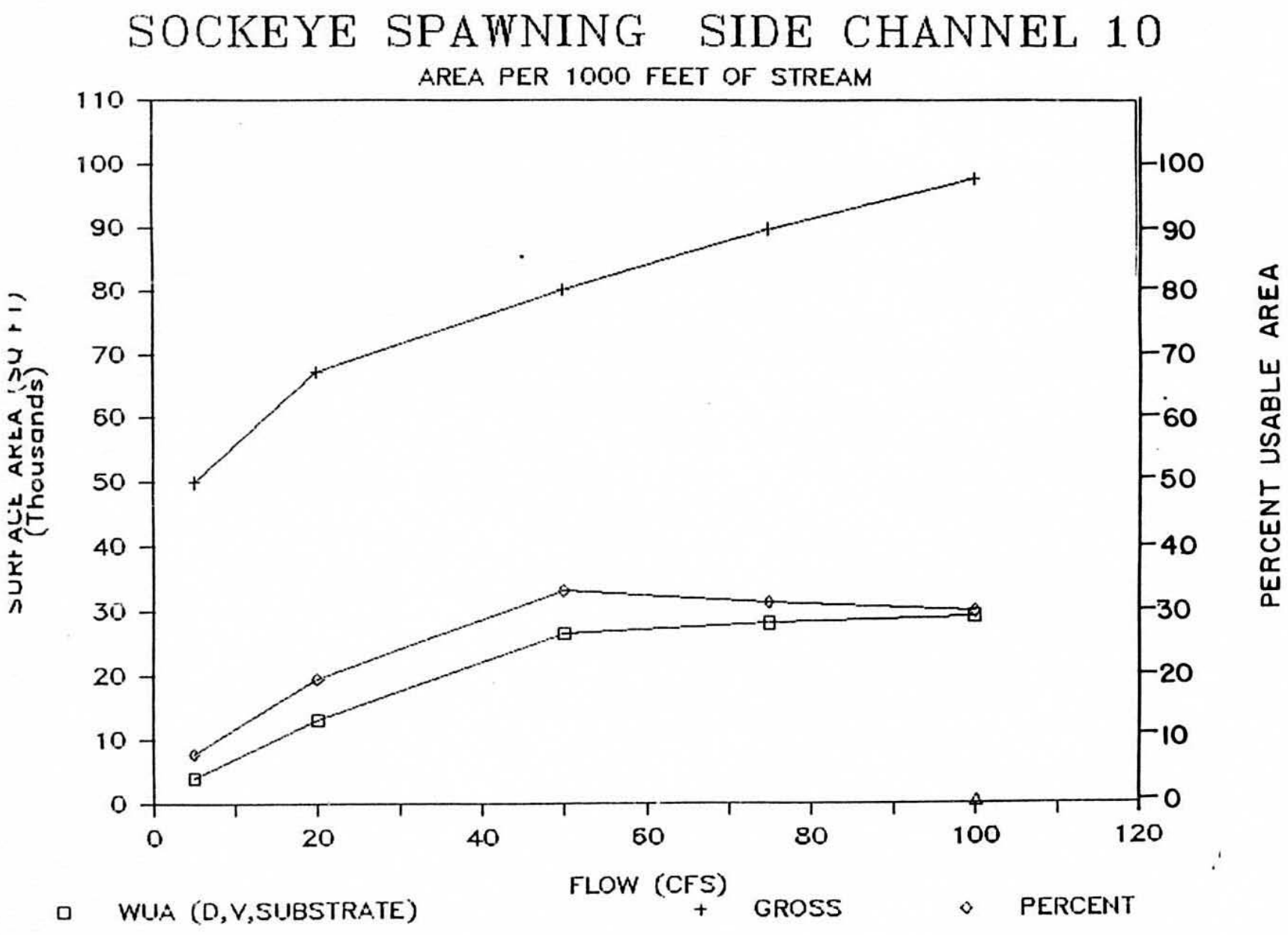

Figure 7-D-11 Weighted usable area plots using substrate curve set for sockeye salmon in Side Channel 10.

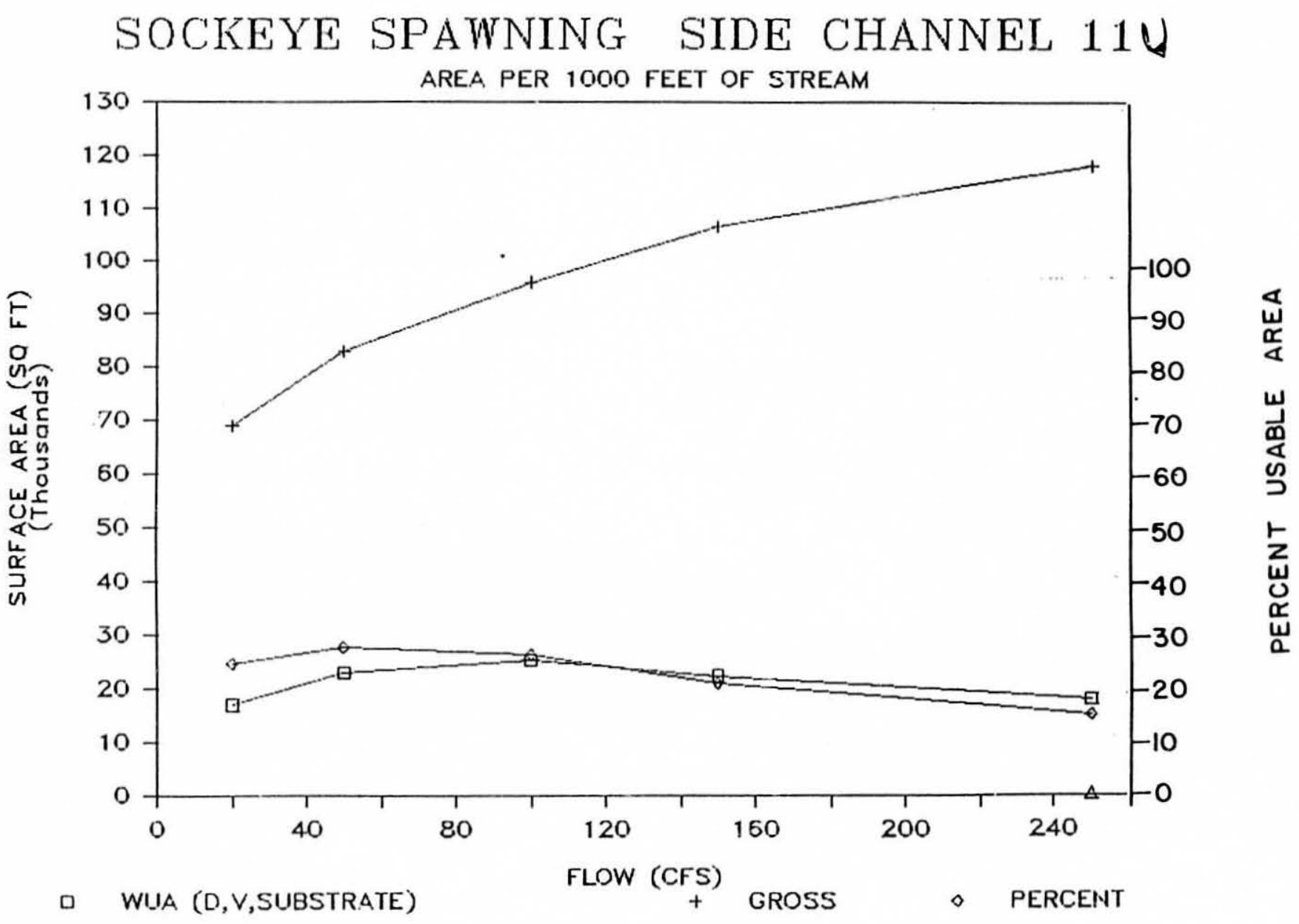

Figure 7-D-12 Weighted usable area plots using substrate curve set for sockeye salmon in Upper Side Channel 11.

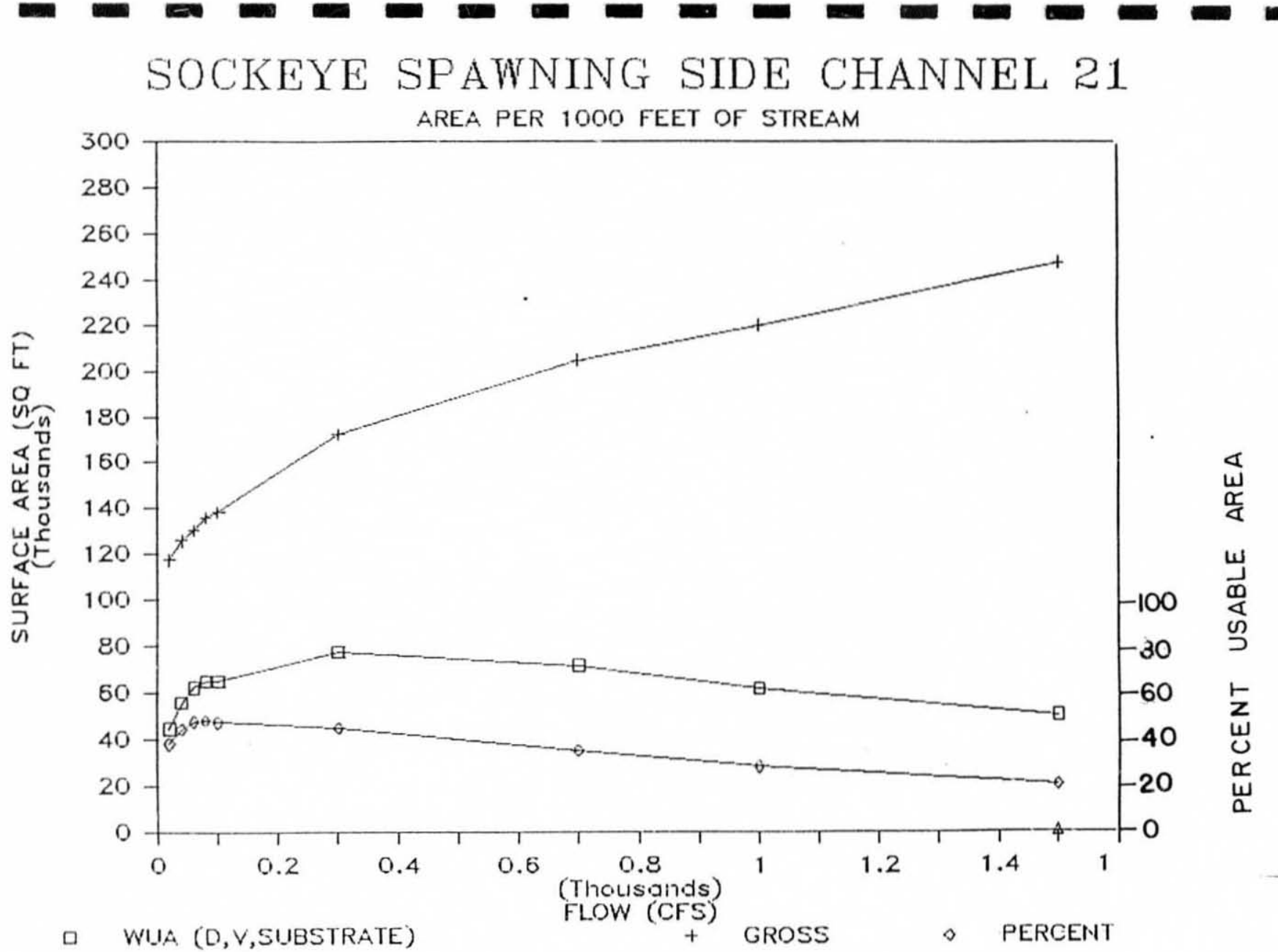

Figure 7-D-13 Weighted usable area plots using substrate curve set for sockeye salmon in Side Channel 21.

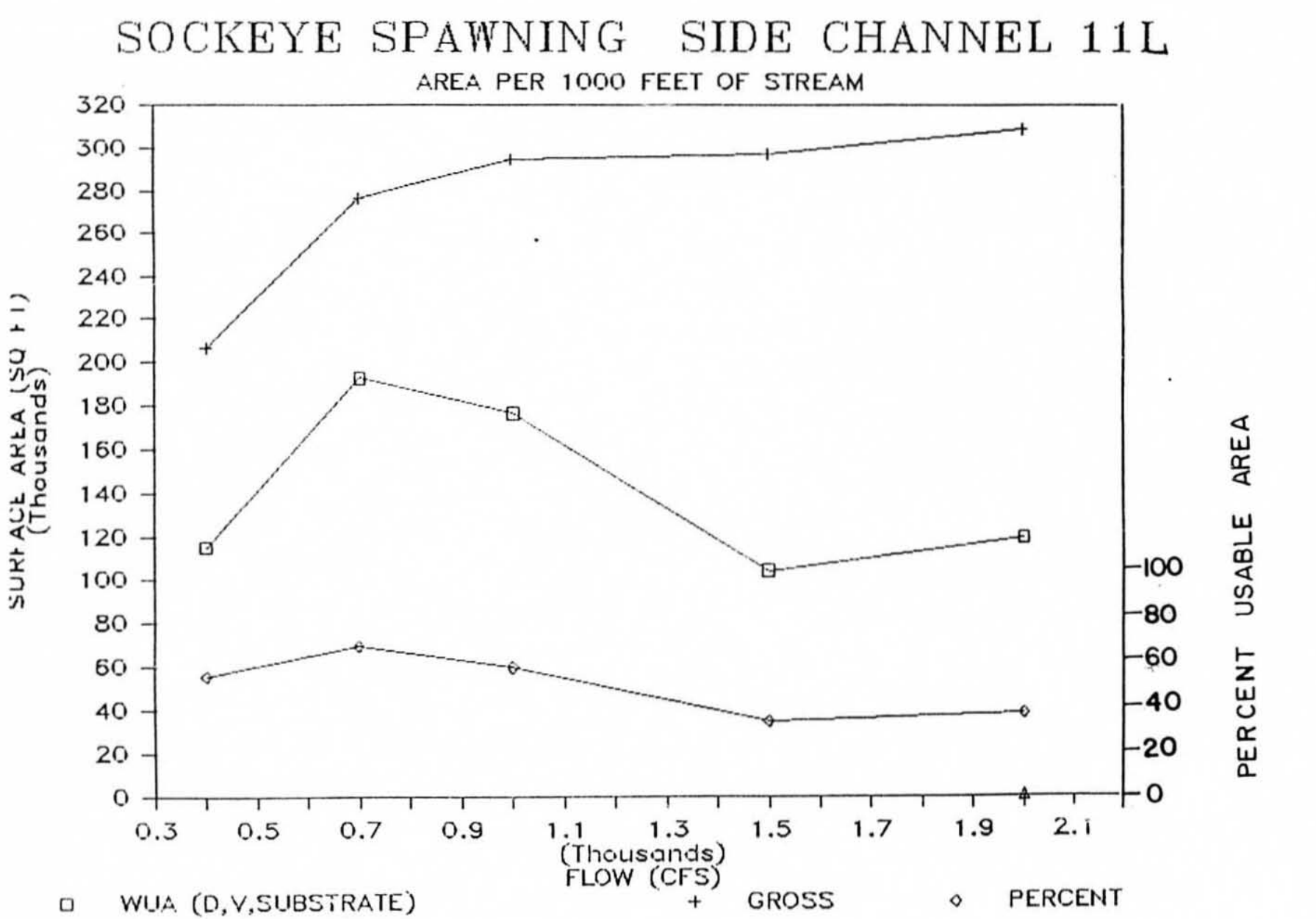

Figure 7-D-14 Weighted usable area plots using substrate curve set for sockeye salmon in Lower Side Channel 11.

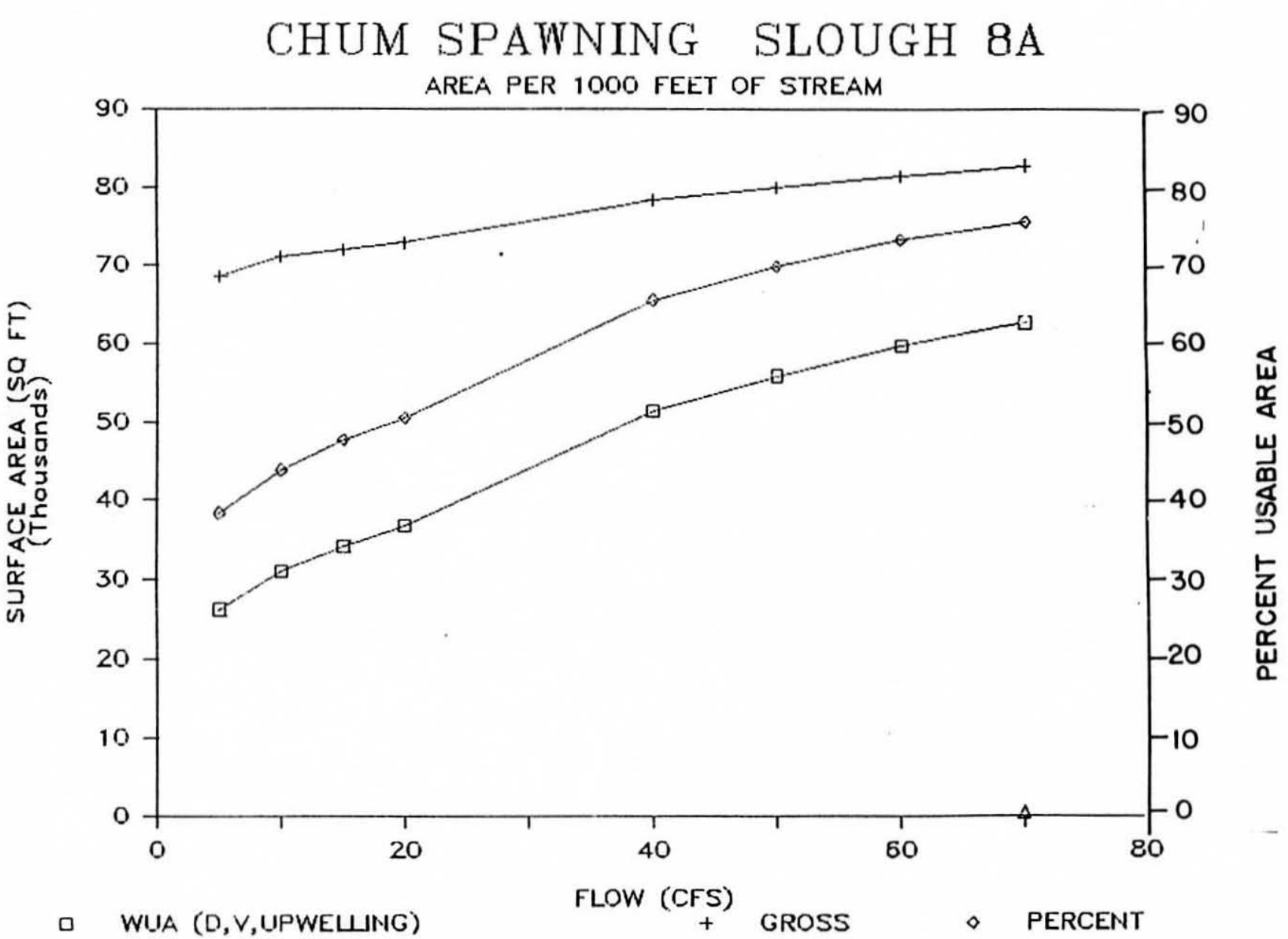

Figure 7-D-15 Weighted usable area plots using upwelling curve set for chum salmon in Slough 8A.

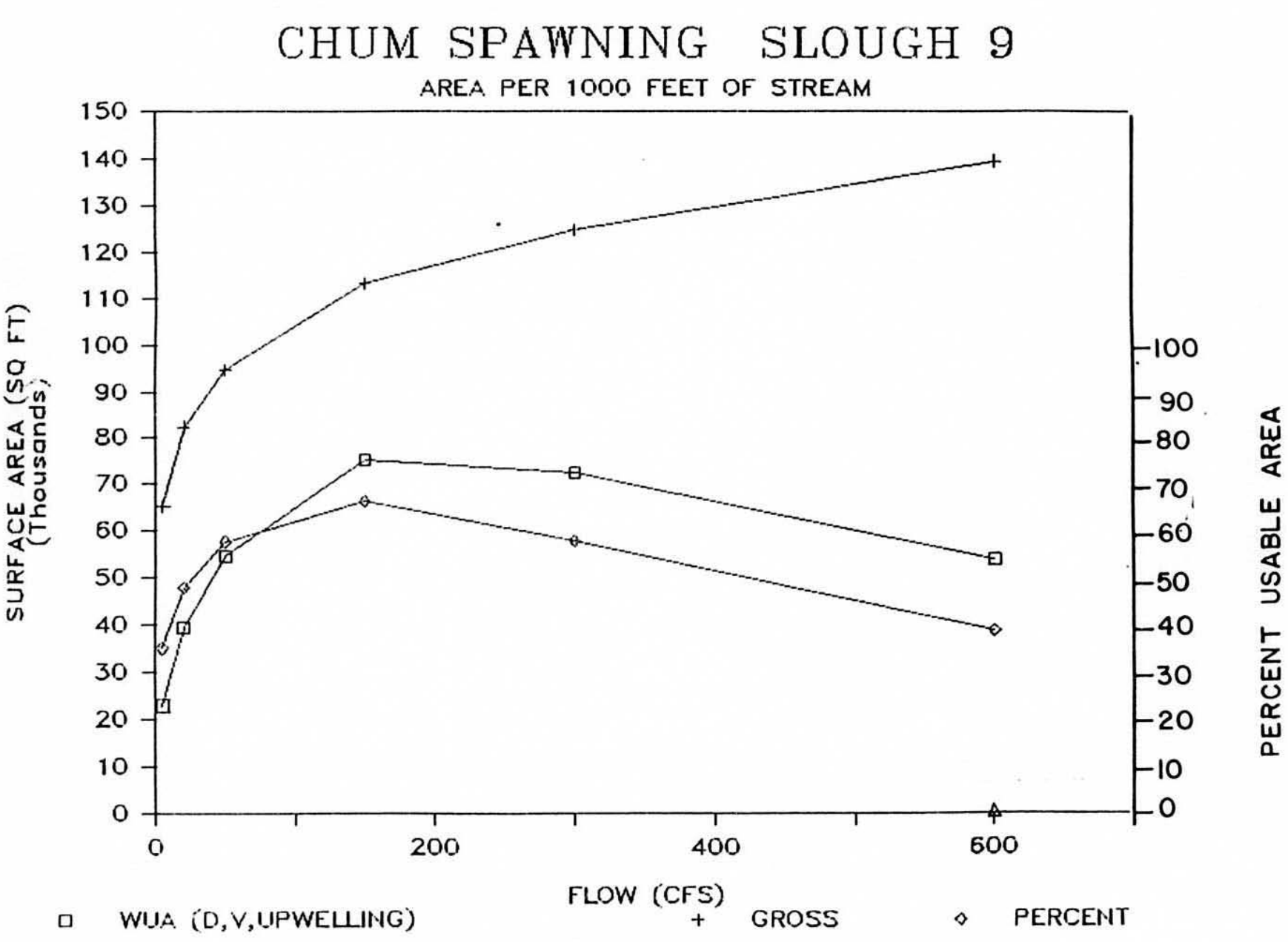

Figure 7-D-16 Weighted usable area plots using upwelling curve set for chum salmon in Slough 9.

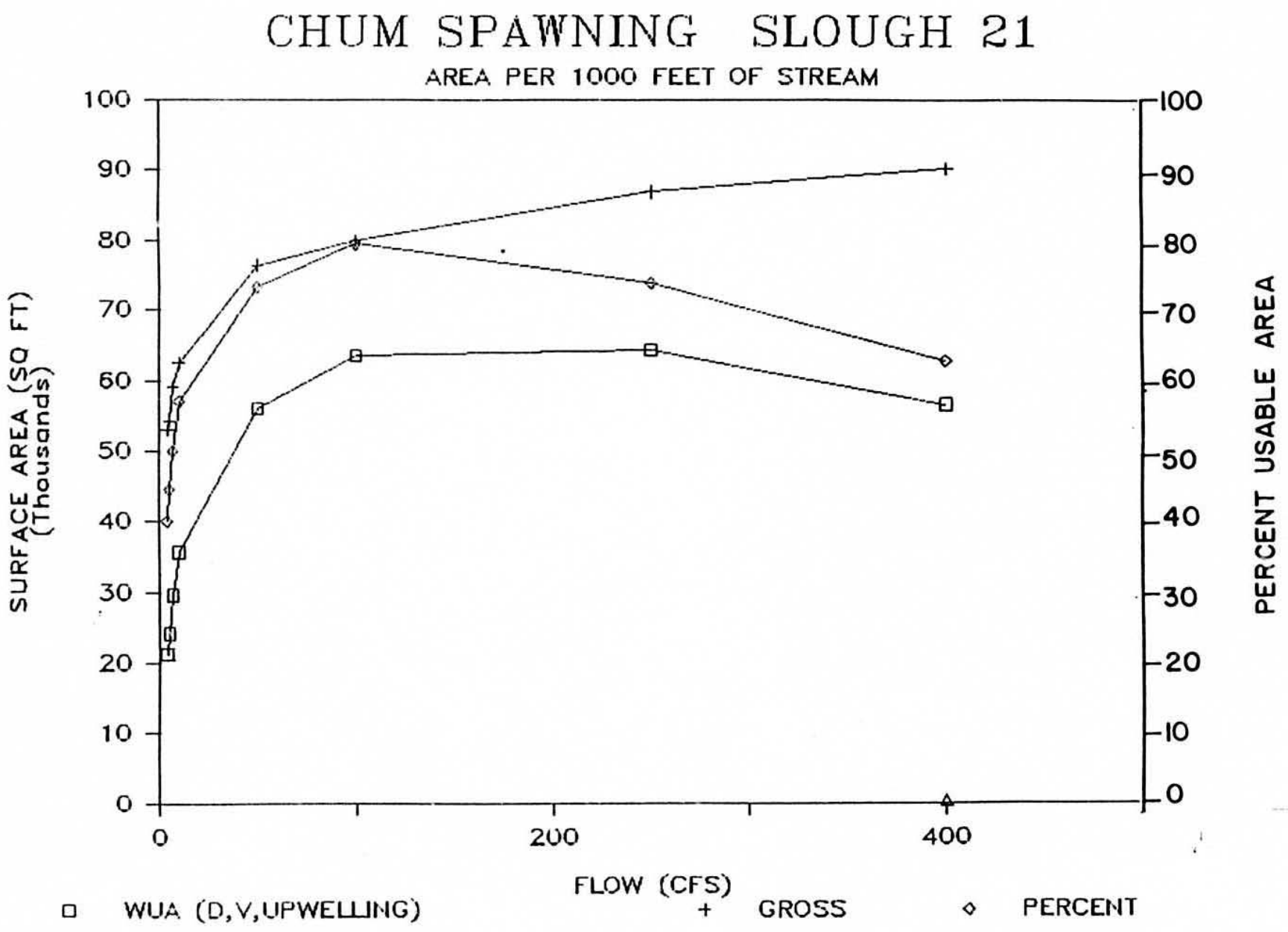

Figure 7-D-17 Weighted usable area plots using upwelling curve set for chum salmon in Slough 21.

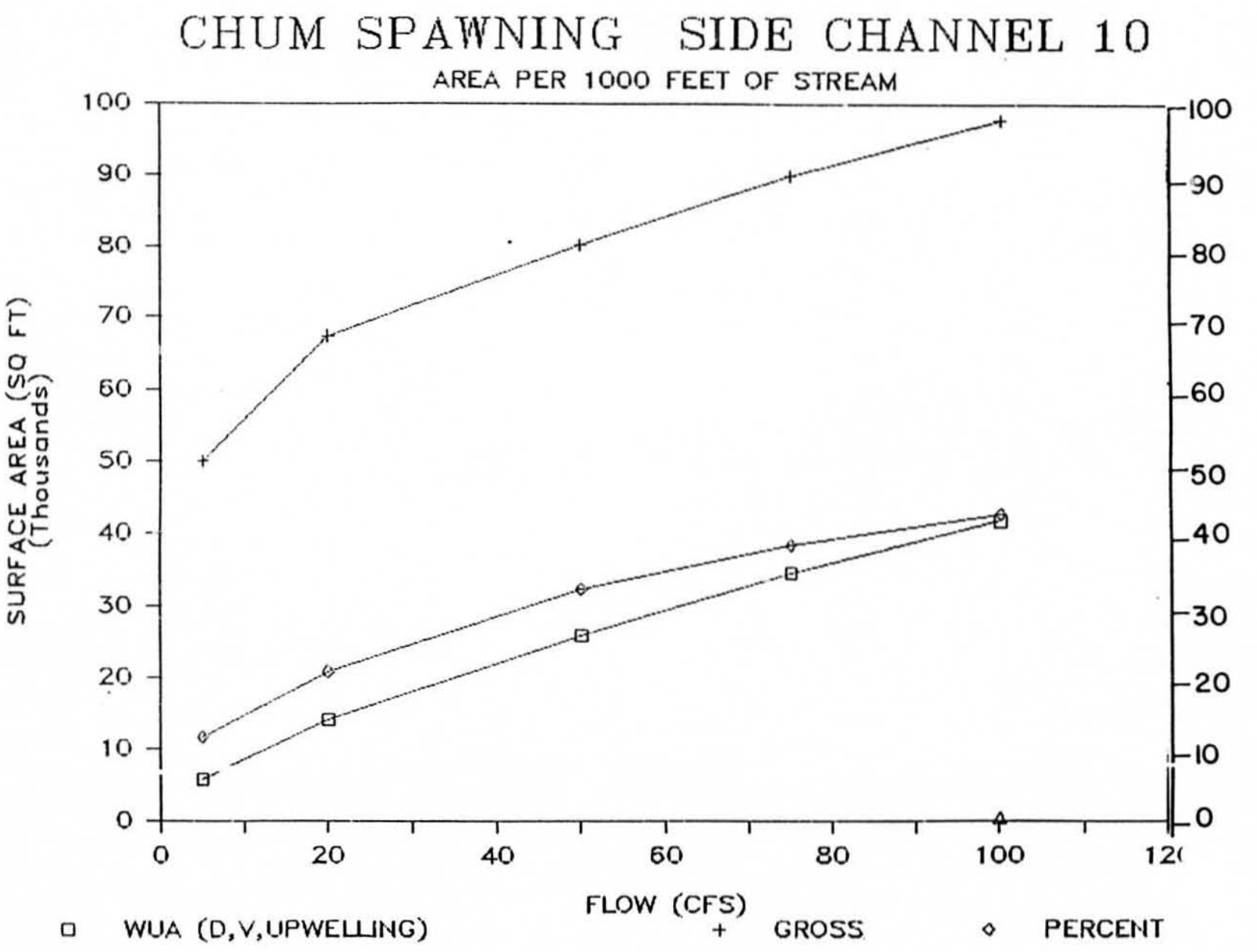

Figure 7-D-18 Weighted usable area plots using upwelling curve set for chum salmon in Side Channel 10.....

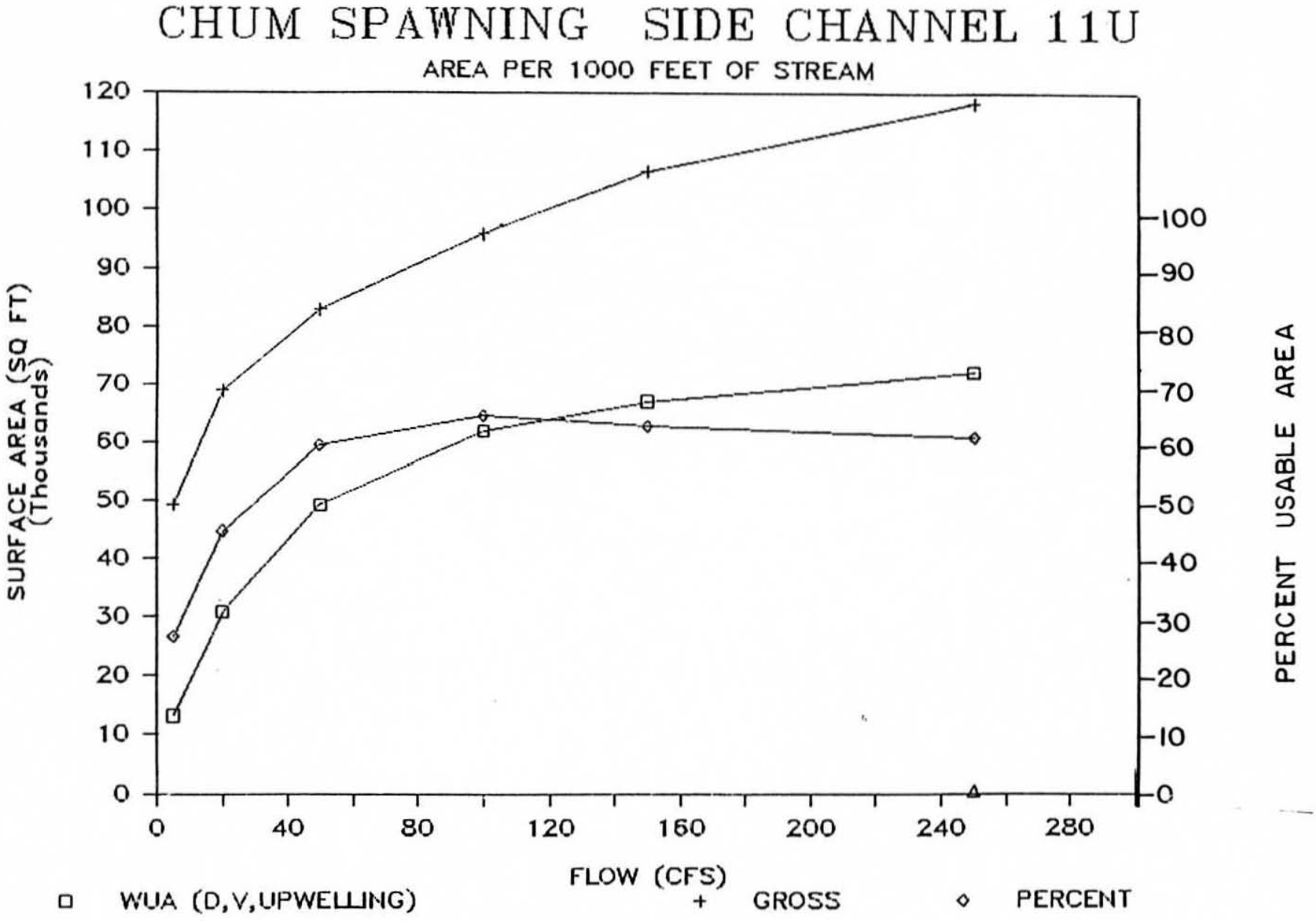

Figure 7-D-19 Weighted usable area plots using upwelling curve set for chum salmon in Upper Side Channel 11.

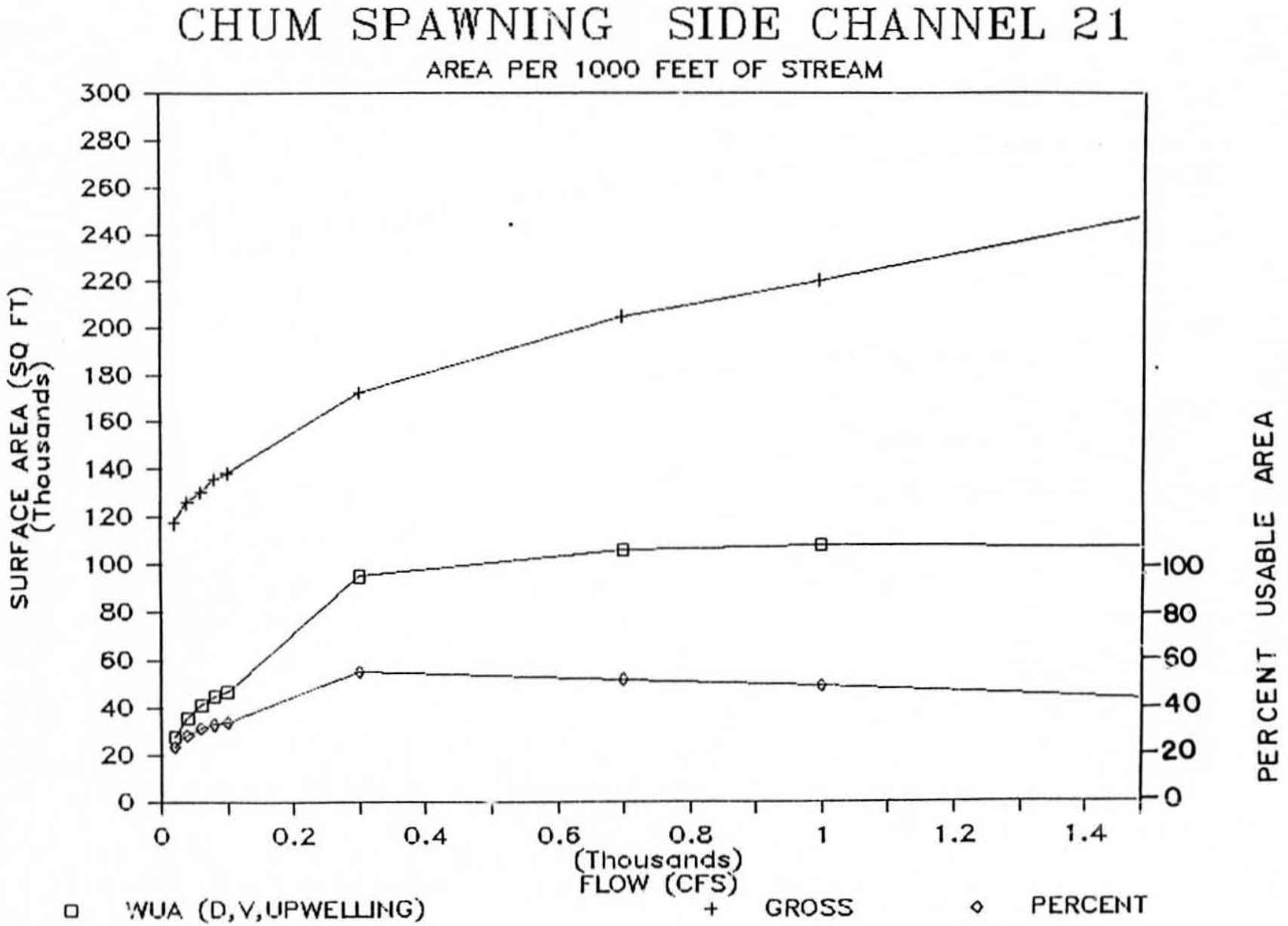

Figure 7-D-20 Weighted usable area plots using upwelling curve set for chum salmon in Side Channel 21.

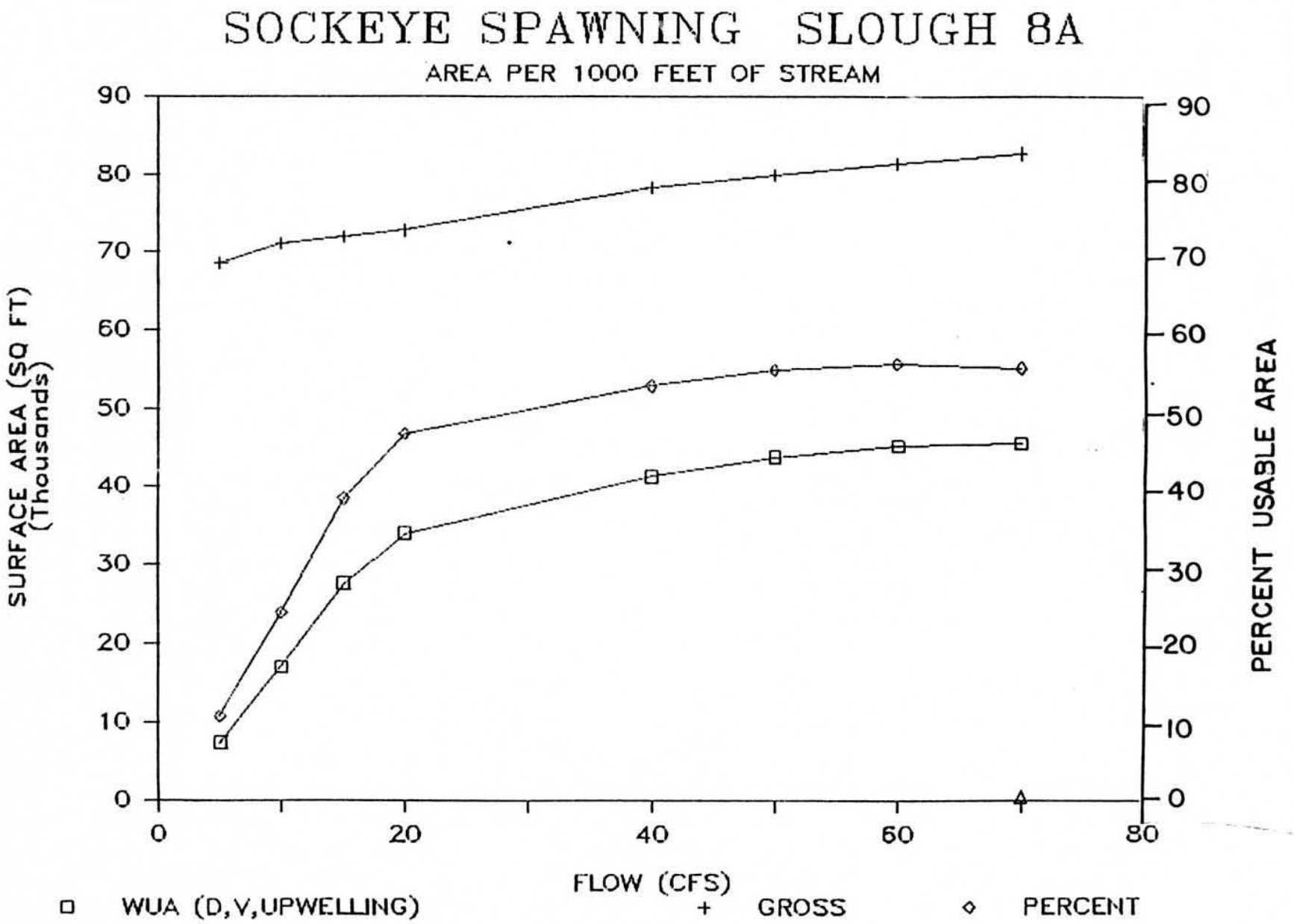

Figure 7-D-21 Weighted usable area plots using upwelling curve set for sockeye salmon in Slough 8A.....

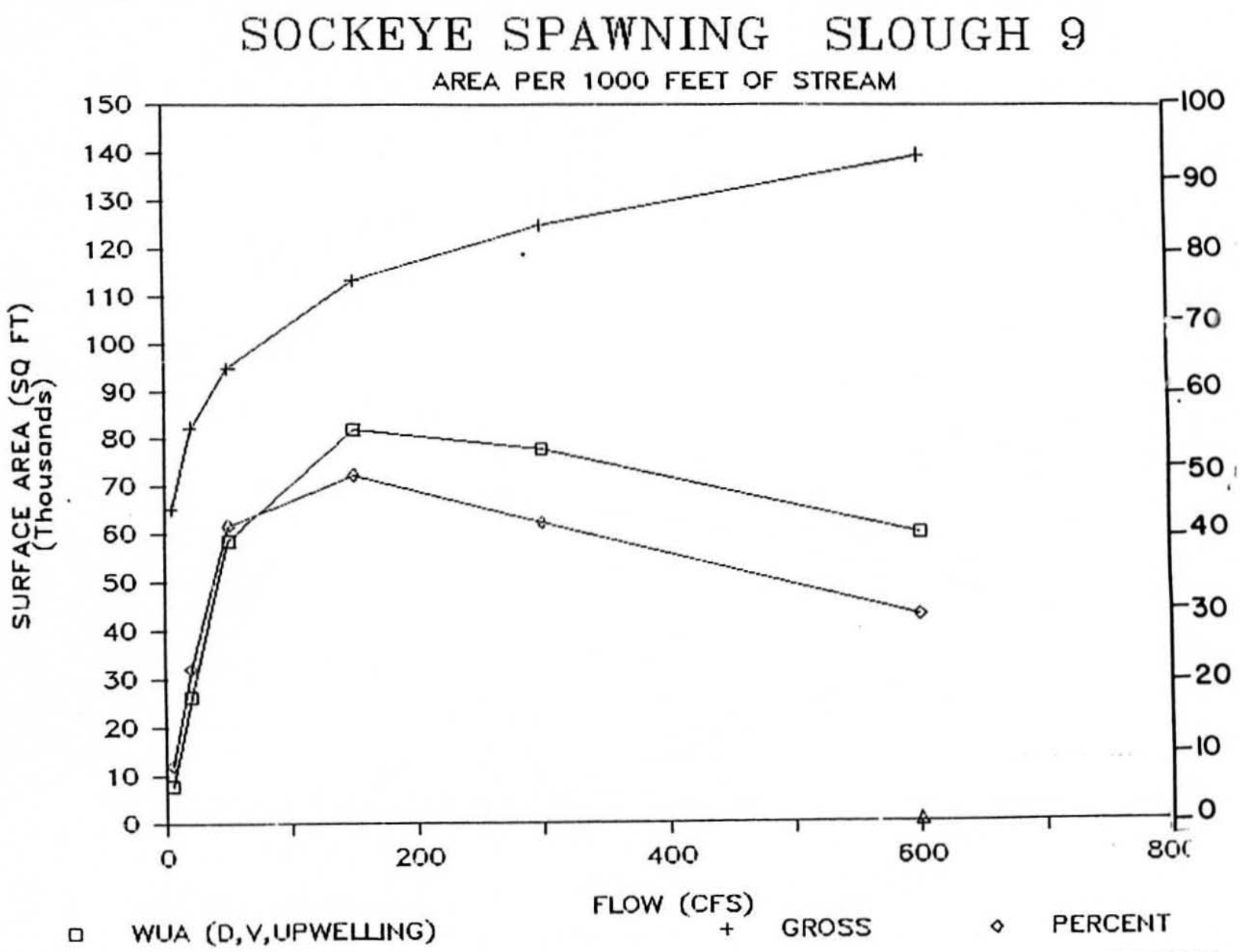

Figure 7-D-22 Weighted usable area plots using upwelling curve set for sockeye salmon in Slough 9.....

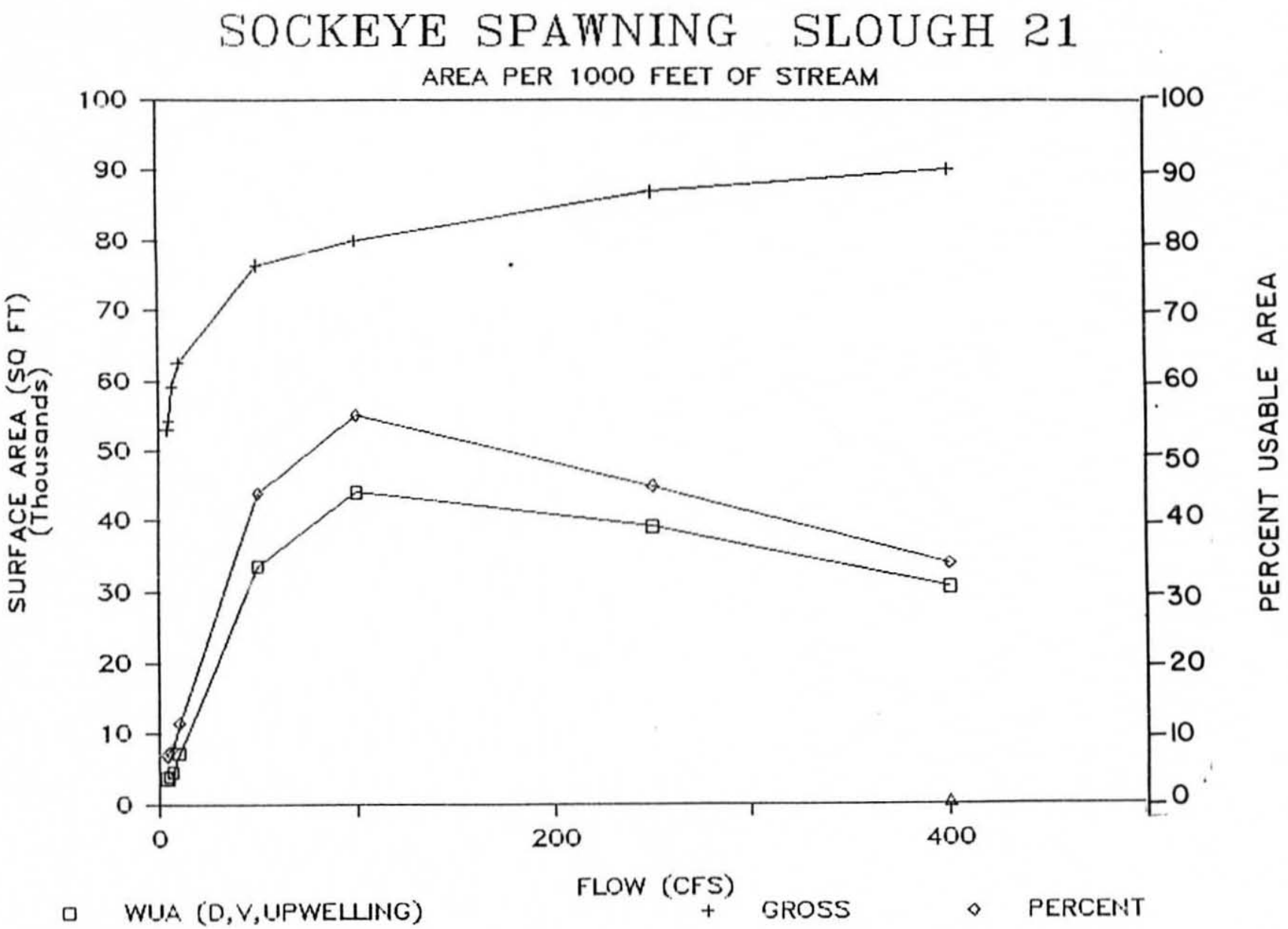

Figure 7-D-23 Weighted usable area plots using upwelling curve set for sockeye salmon in Slough 21.

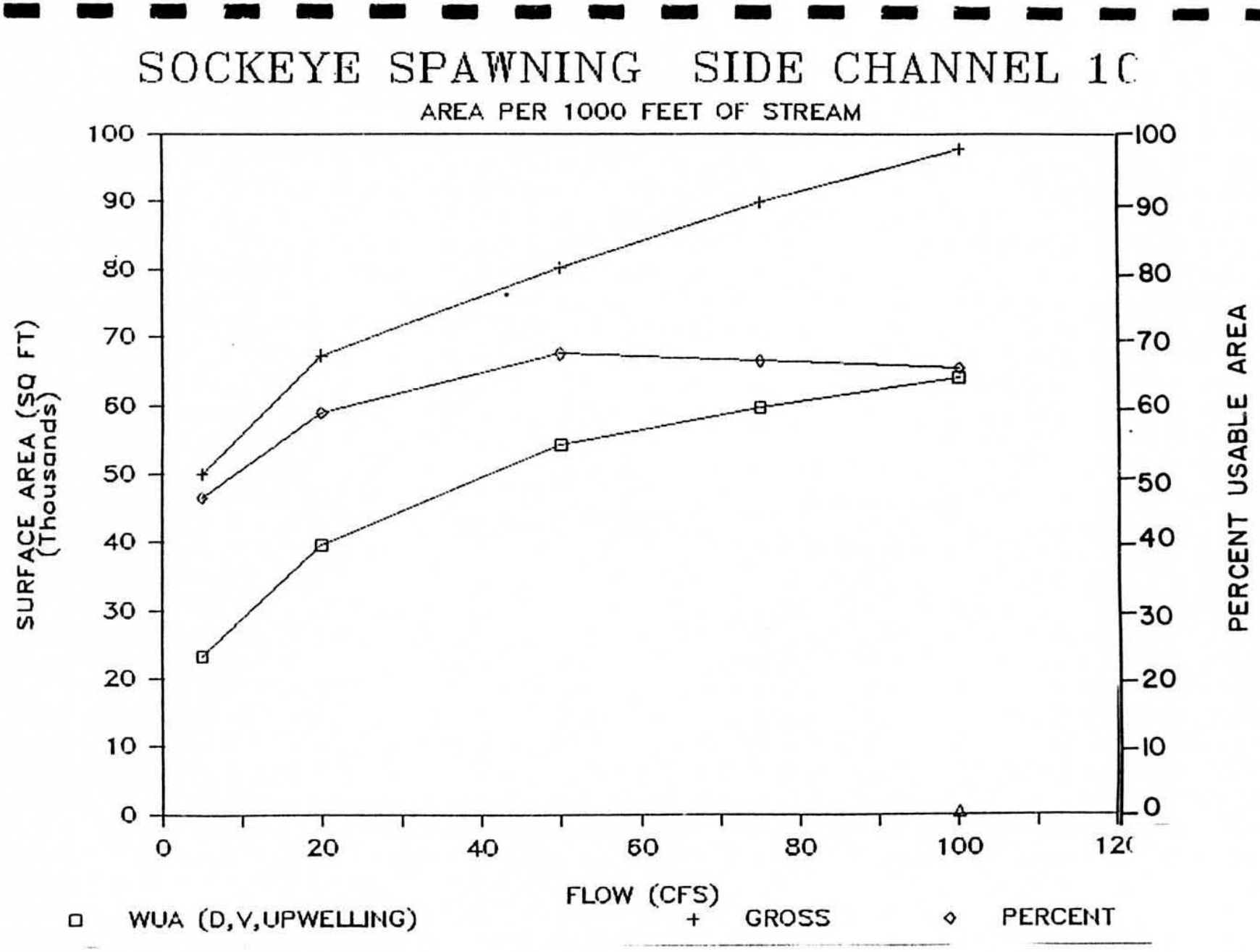

Figure 7-D-24 Weighted usable area plots using upwelling curve set for sockeye salmon in Side Channel 10.

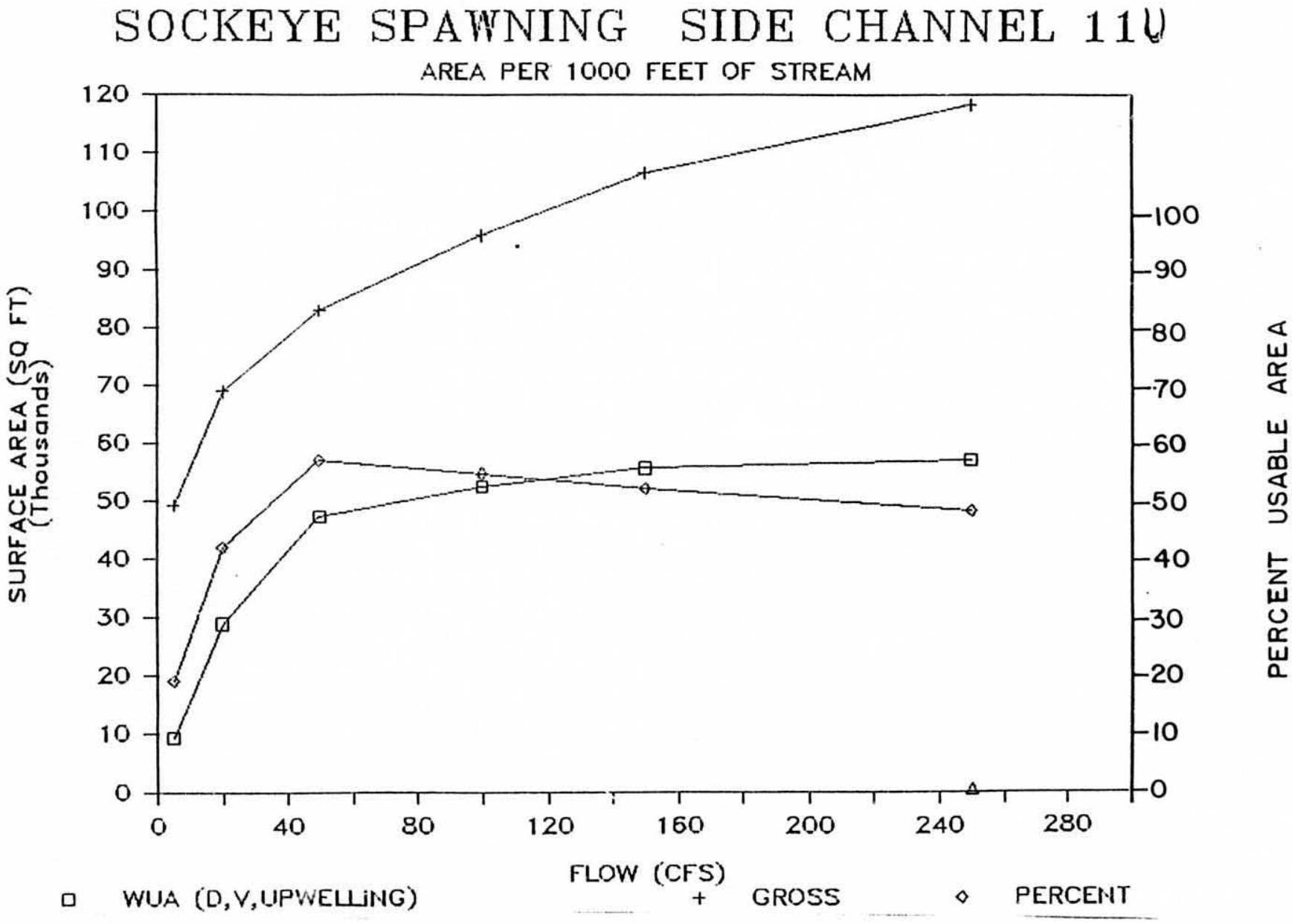

Figure 7-D-25 Weighted usable area plots using upwelling curve set for sockeye salmon in Upper Side Channel 11.

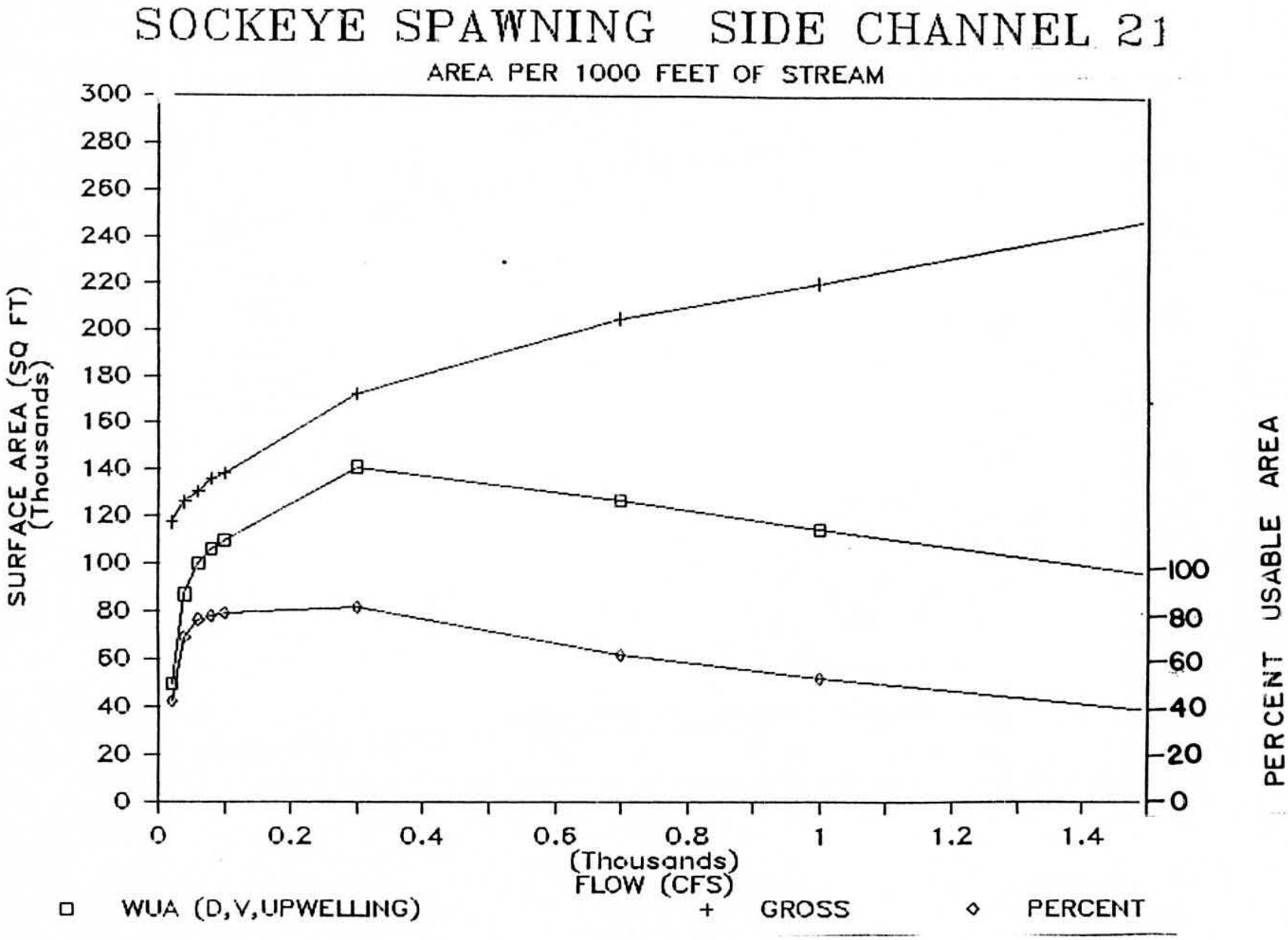

Figure 7-D-26 Weighted usable area plots using upwelling curve set for sockeye salmon in Side Channel 21.

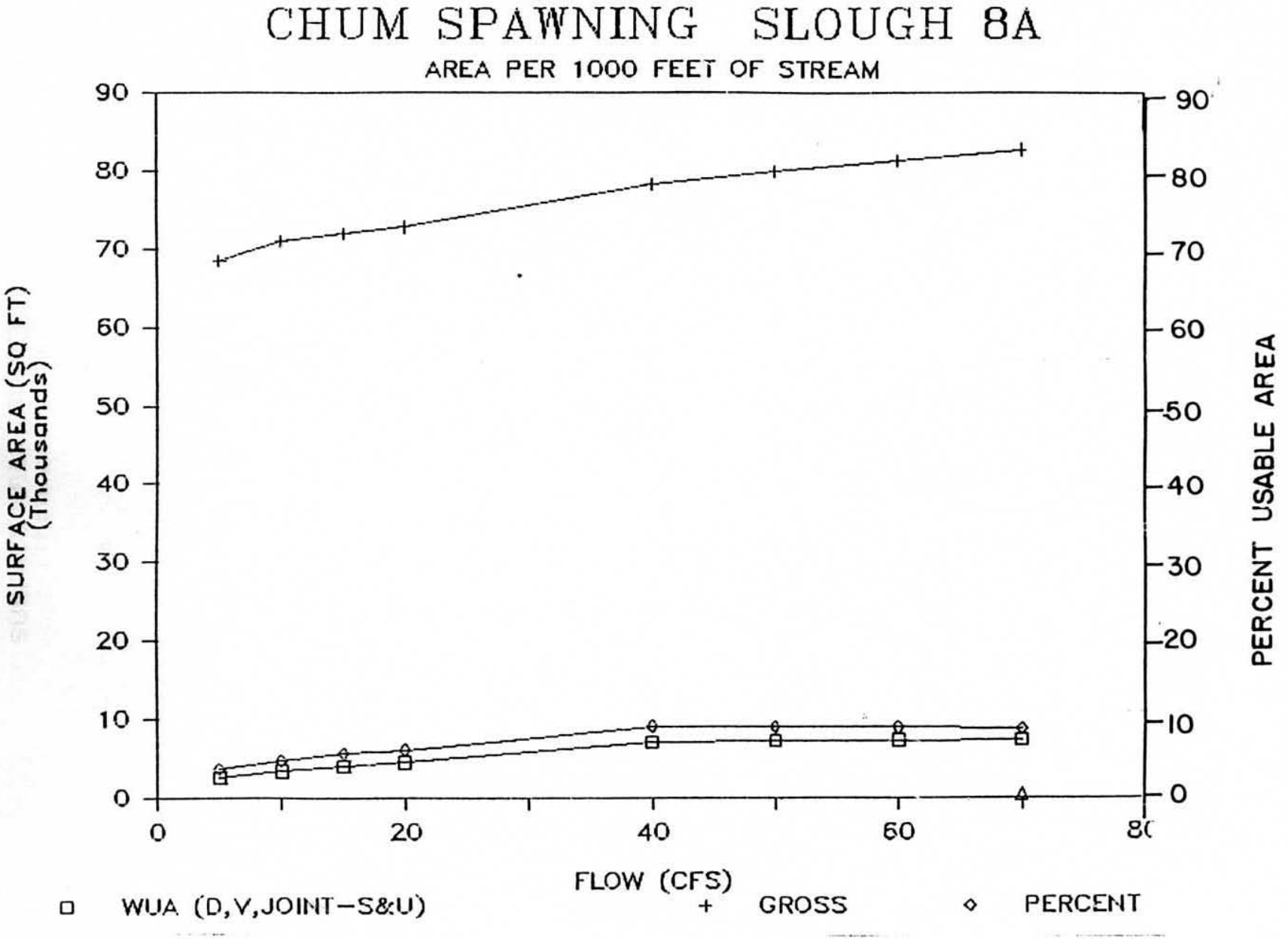

Figure 7-D-27 Weighted usable area plots using joint curve set for chum salmon spawning in Slough 8A.....

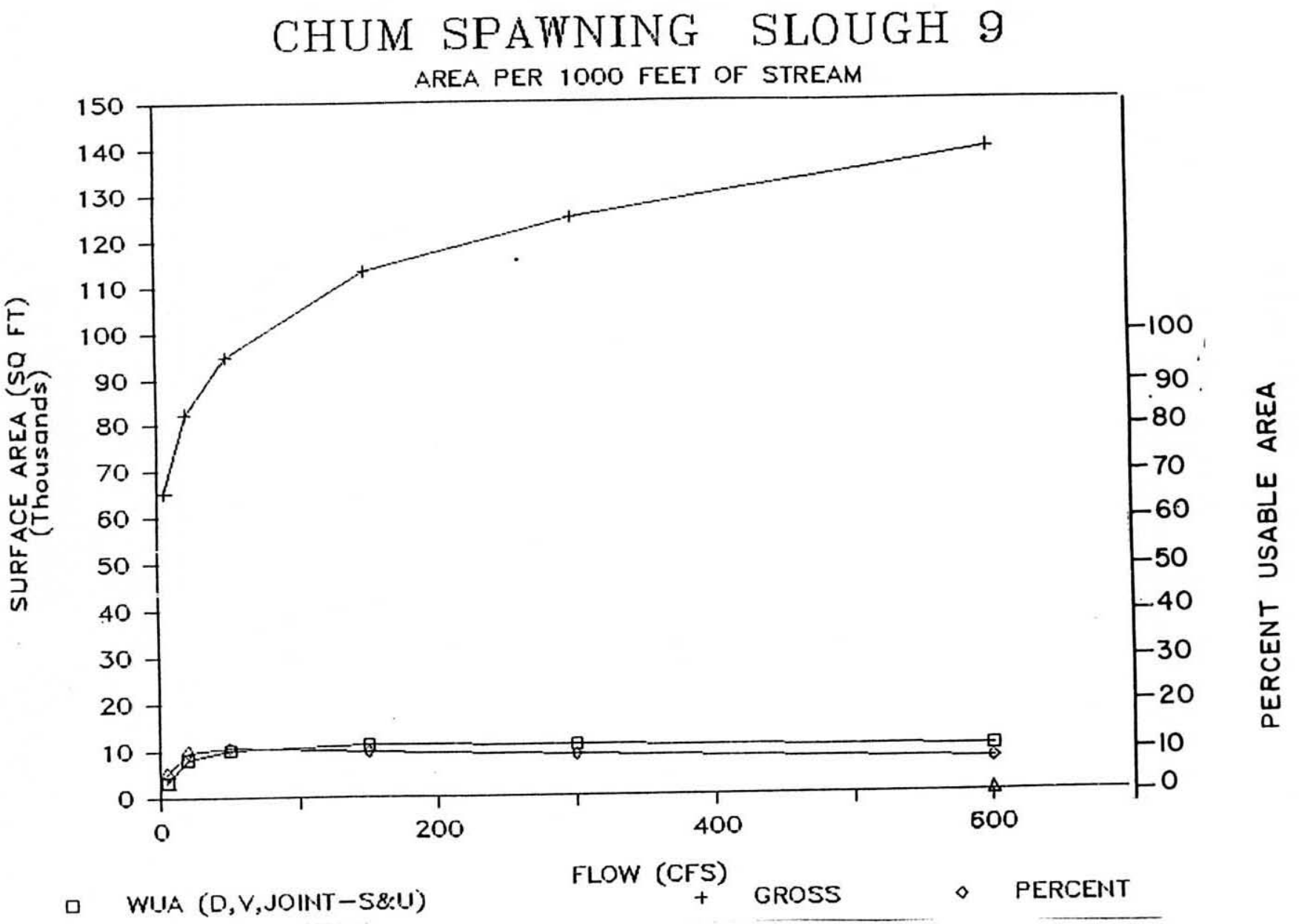

Figure 7-D-28 Weighted usable area plots using joint curve set for chum salmon spawning in Slough 9.

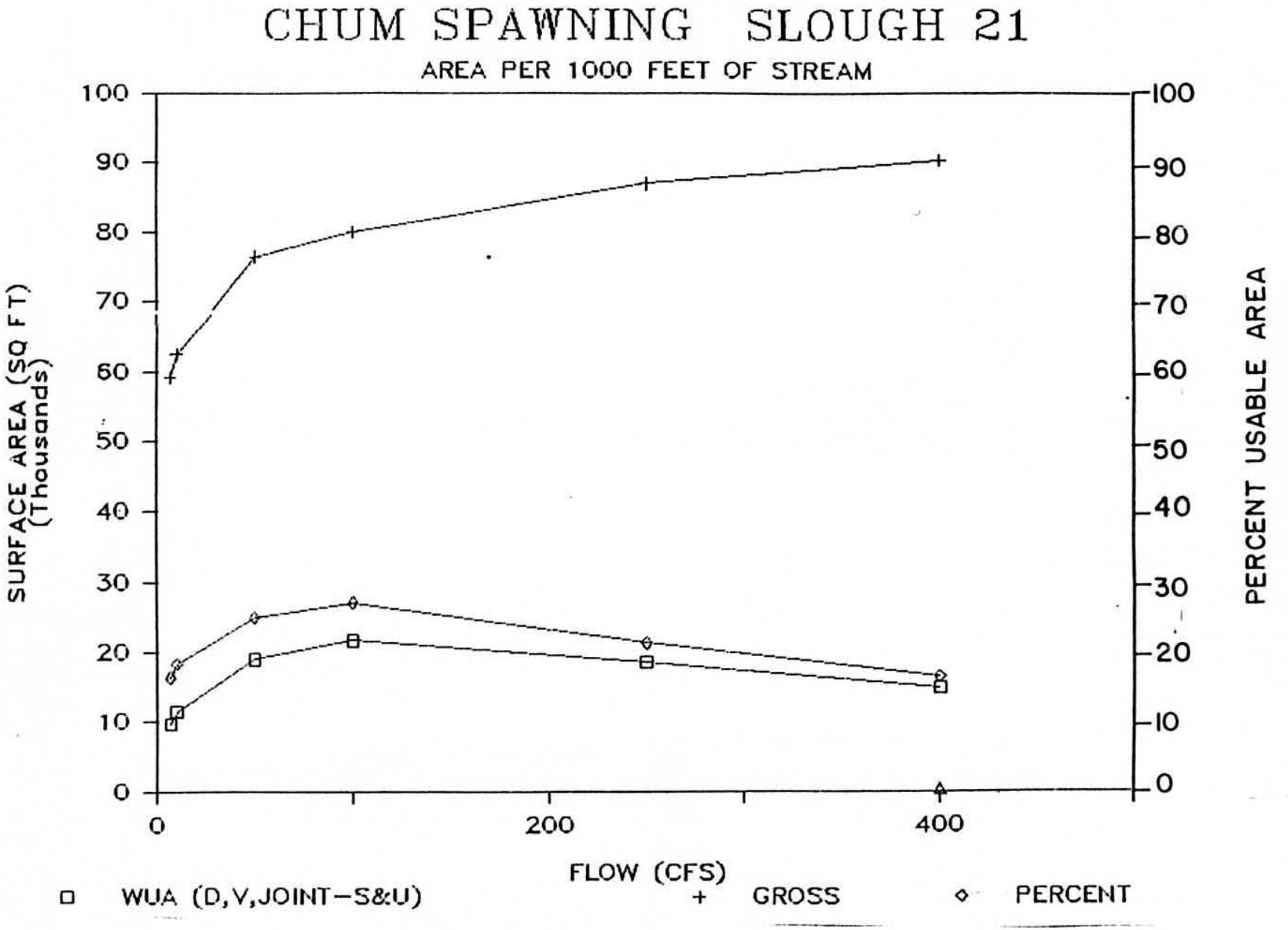

Figure 7-D-29 Weighted usable area plots using joint curve set for chum salmon spawning in Slough 21.

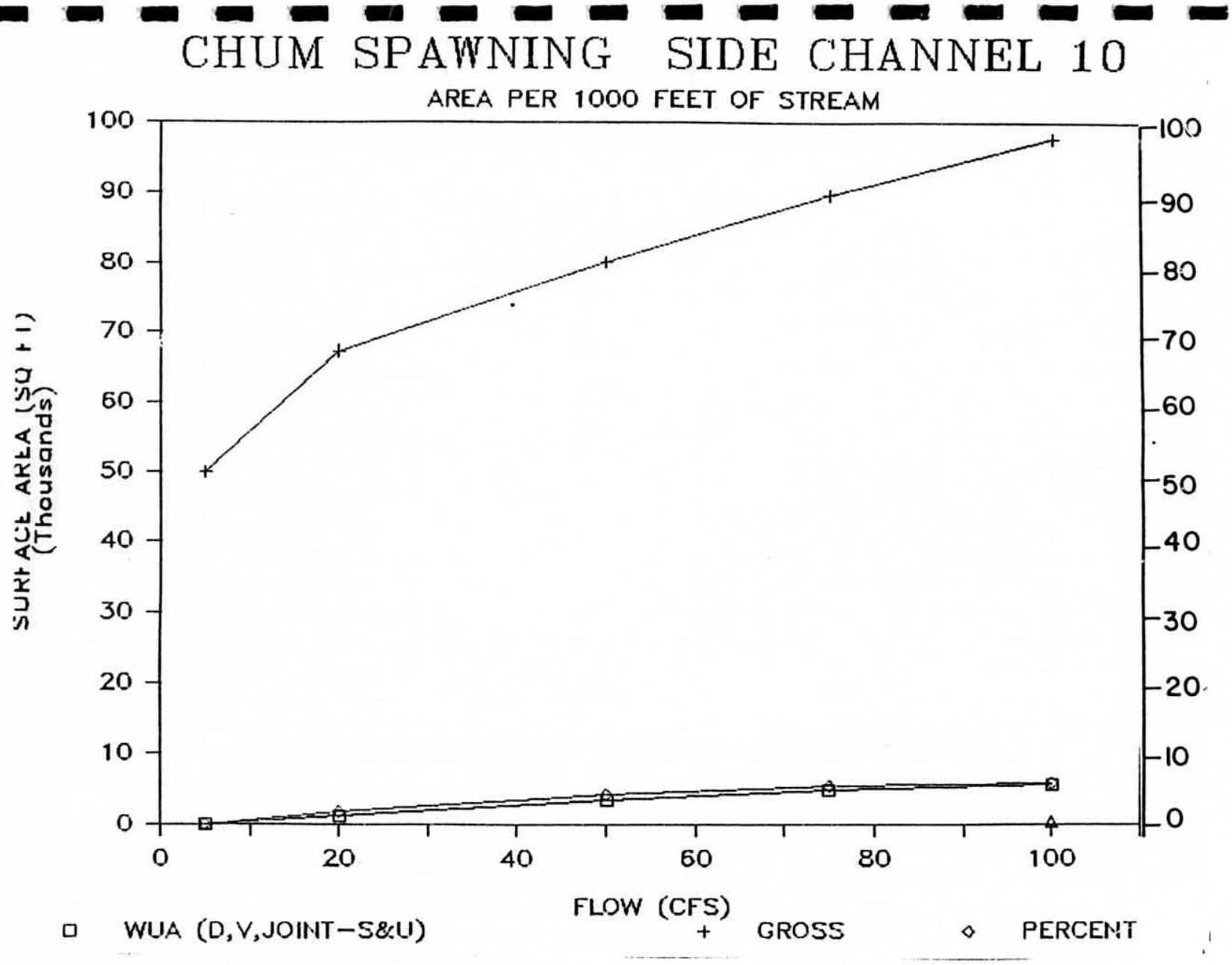

Figure 7-D-30 Weighted usable area plots using joint curve set for chum salmon spawning in Side Channel 10.

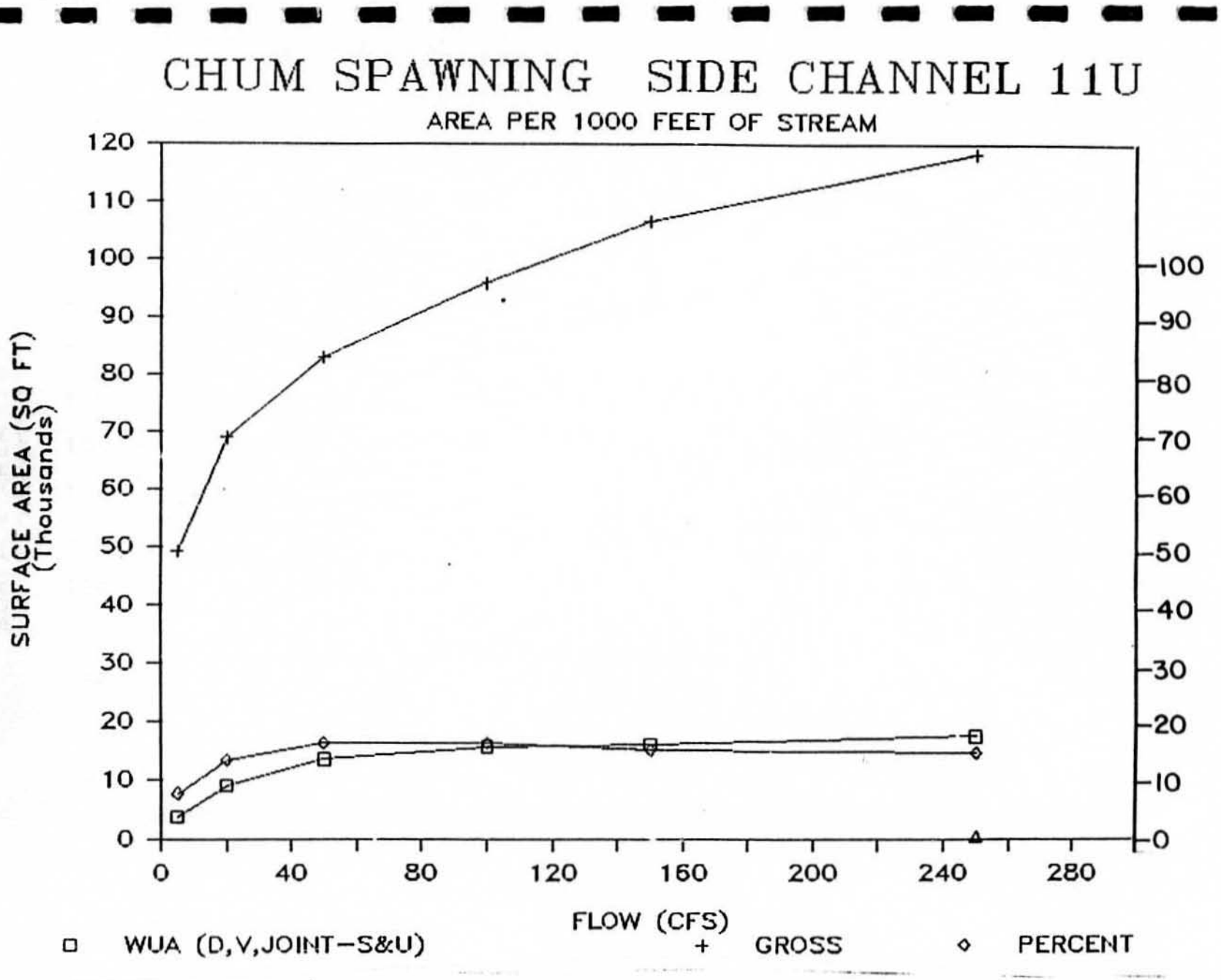

Figure 7-D-31 Weighted usable area plots using joint curve set for chum salmon spawning in Upper Side Channel 11.

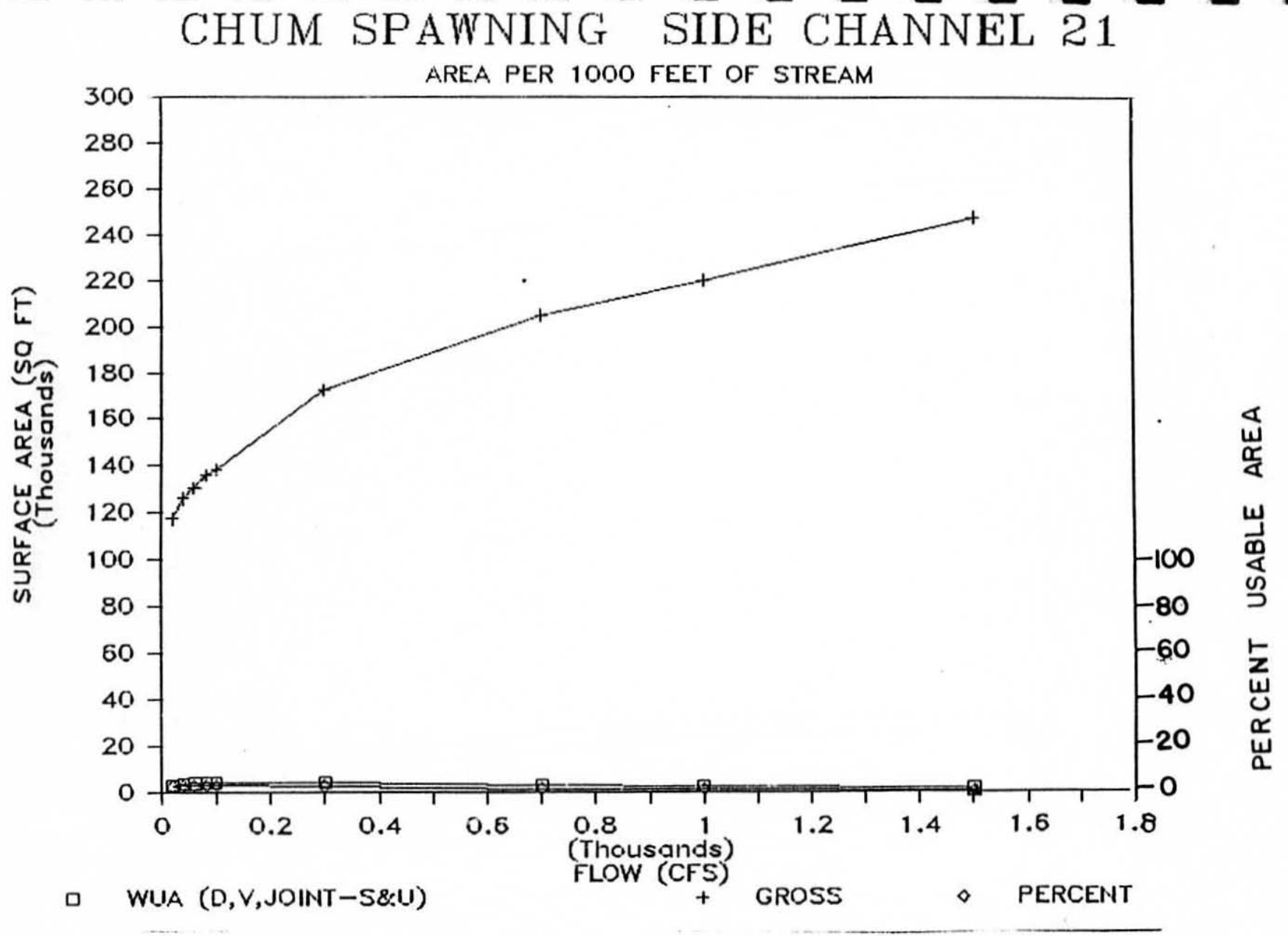

Figure 7-D-32 **Weighted usable area plots using joint curve set for chum salmon spawning in Side Channel 21.**

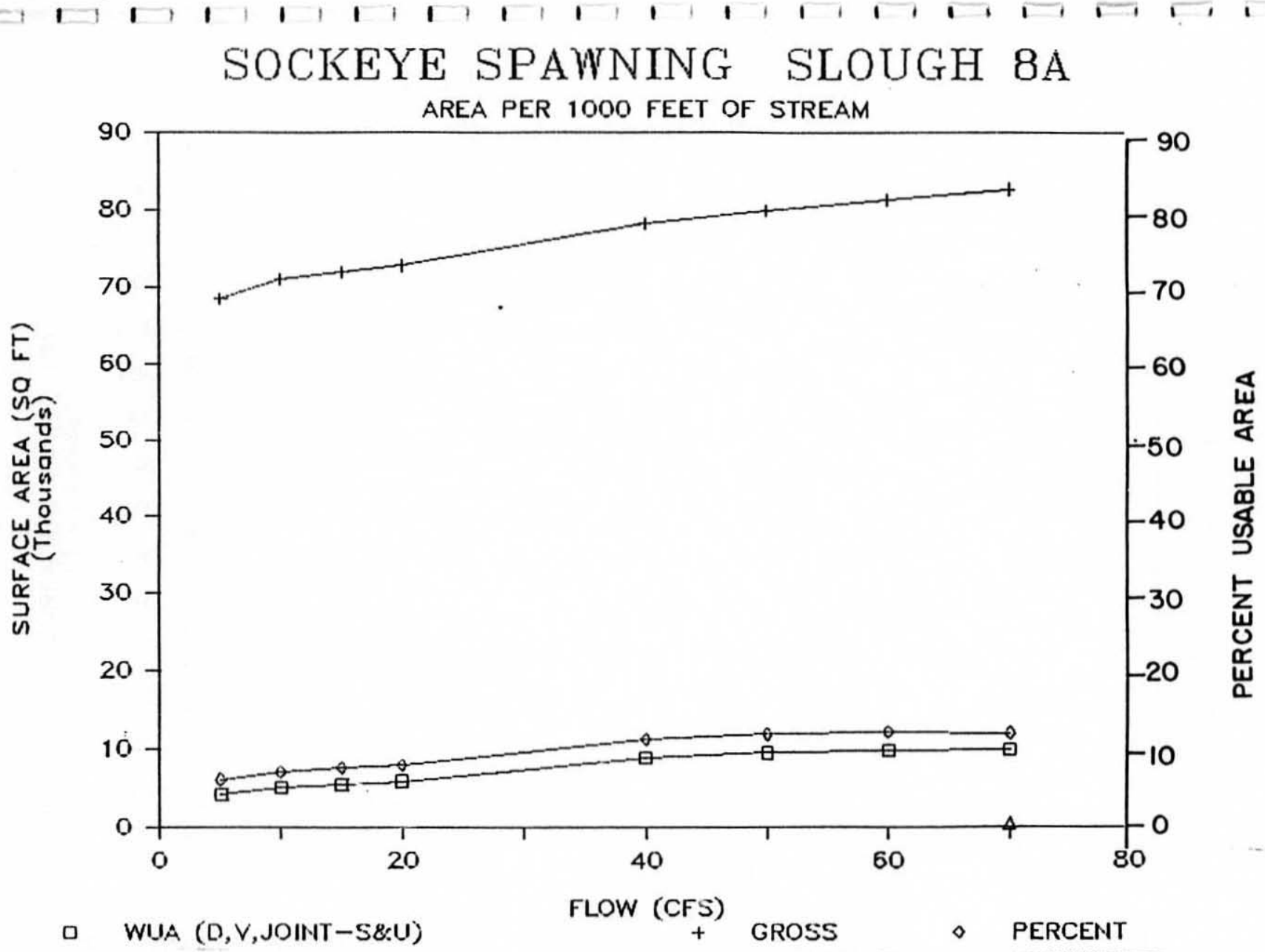

Figure 7-D-33 Weighted usable area plots using joint curve set for sockeye salmon spawning in Slough 8A.

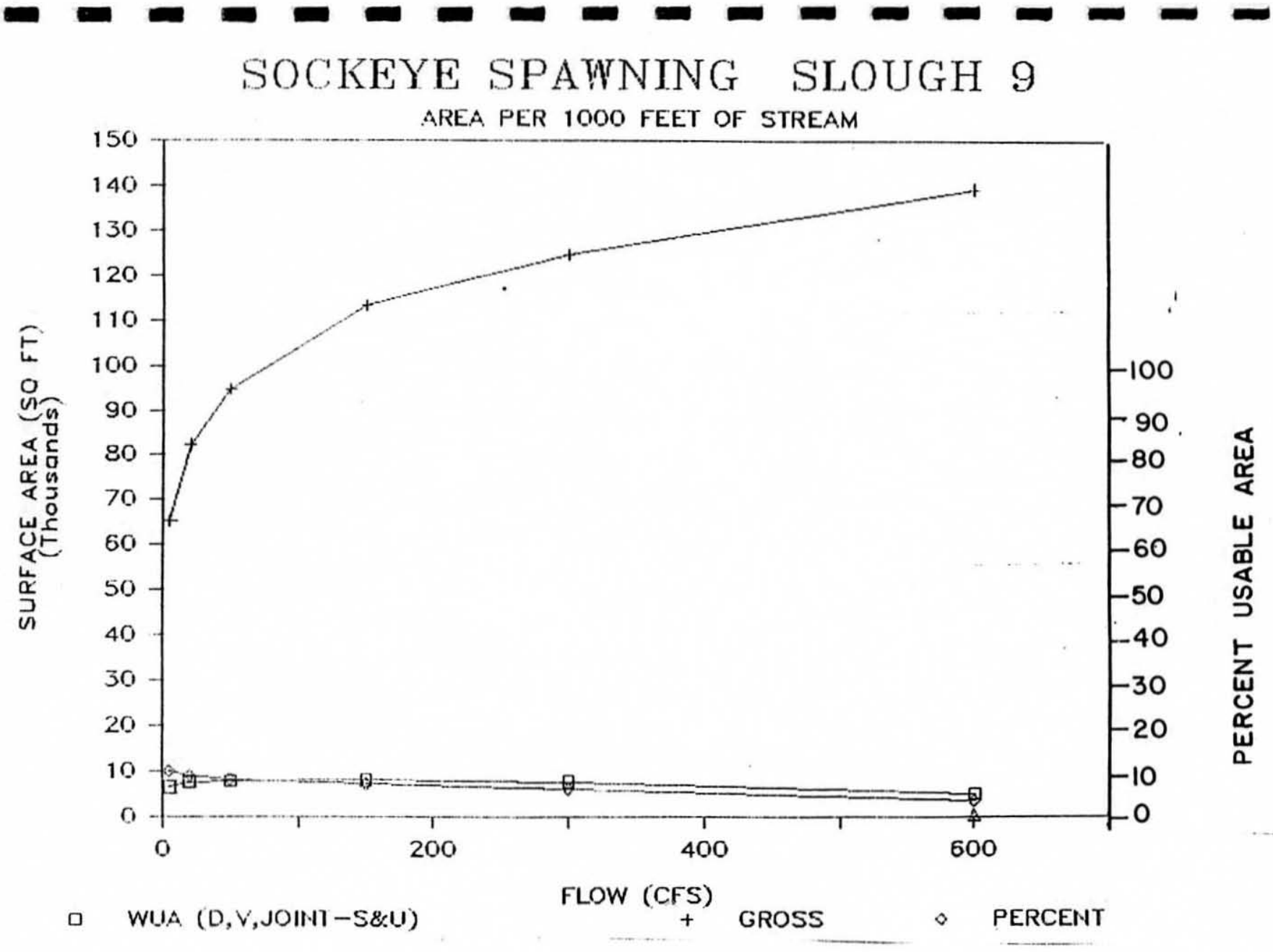

Figure 7-D-34 Weighted usable area plots using joint curve set for sockeye salmon spawning in Slough 9.

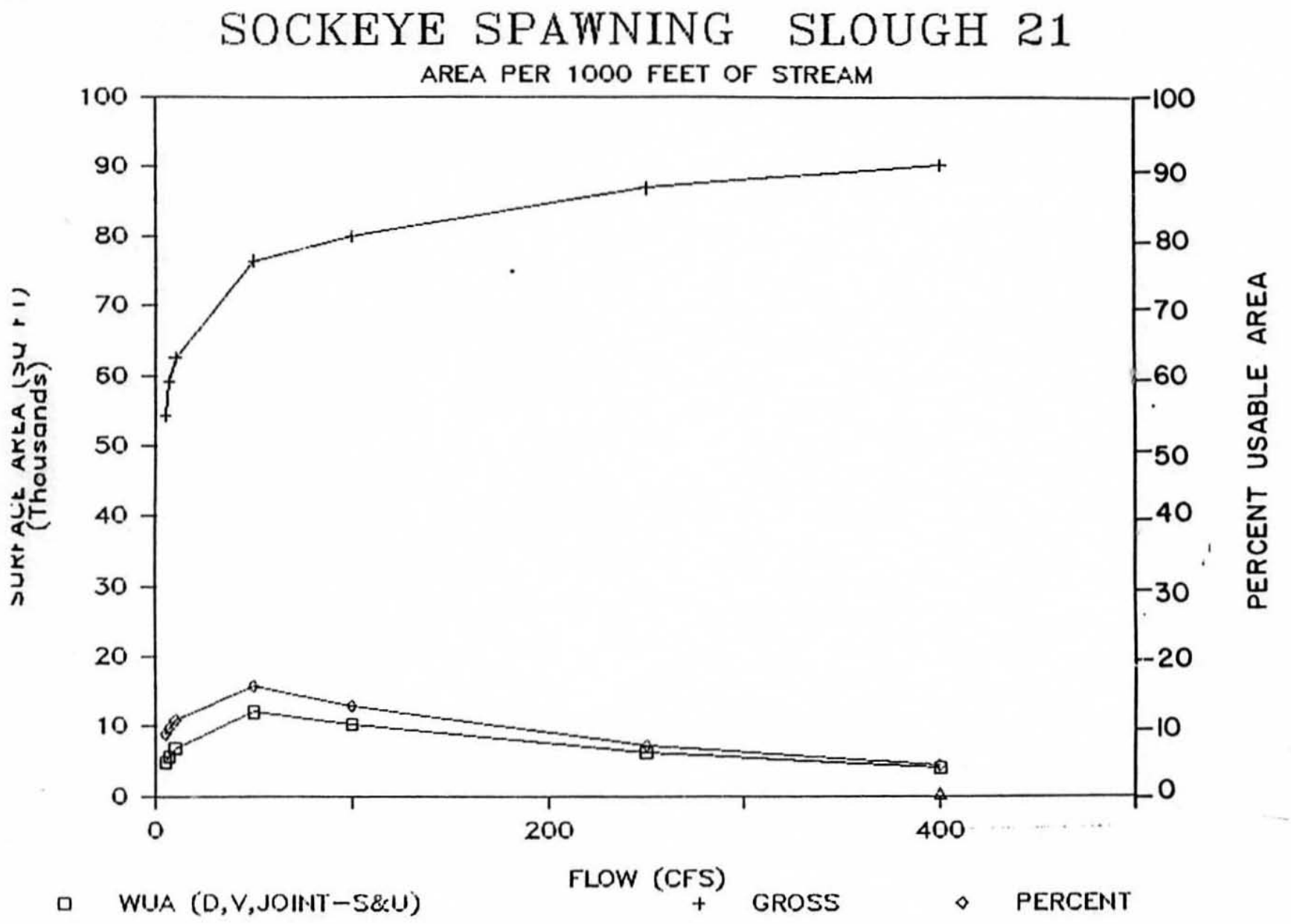

Figure 7-D-35 Weighted usable area plots using joint curve set for sockeye salmon spawning in Slough 21.

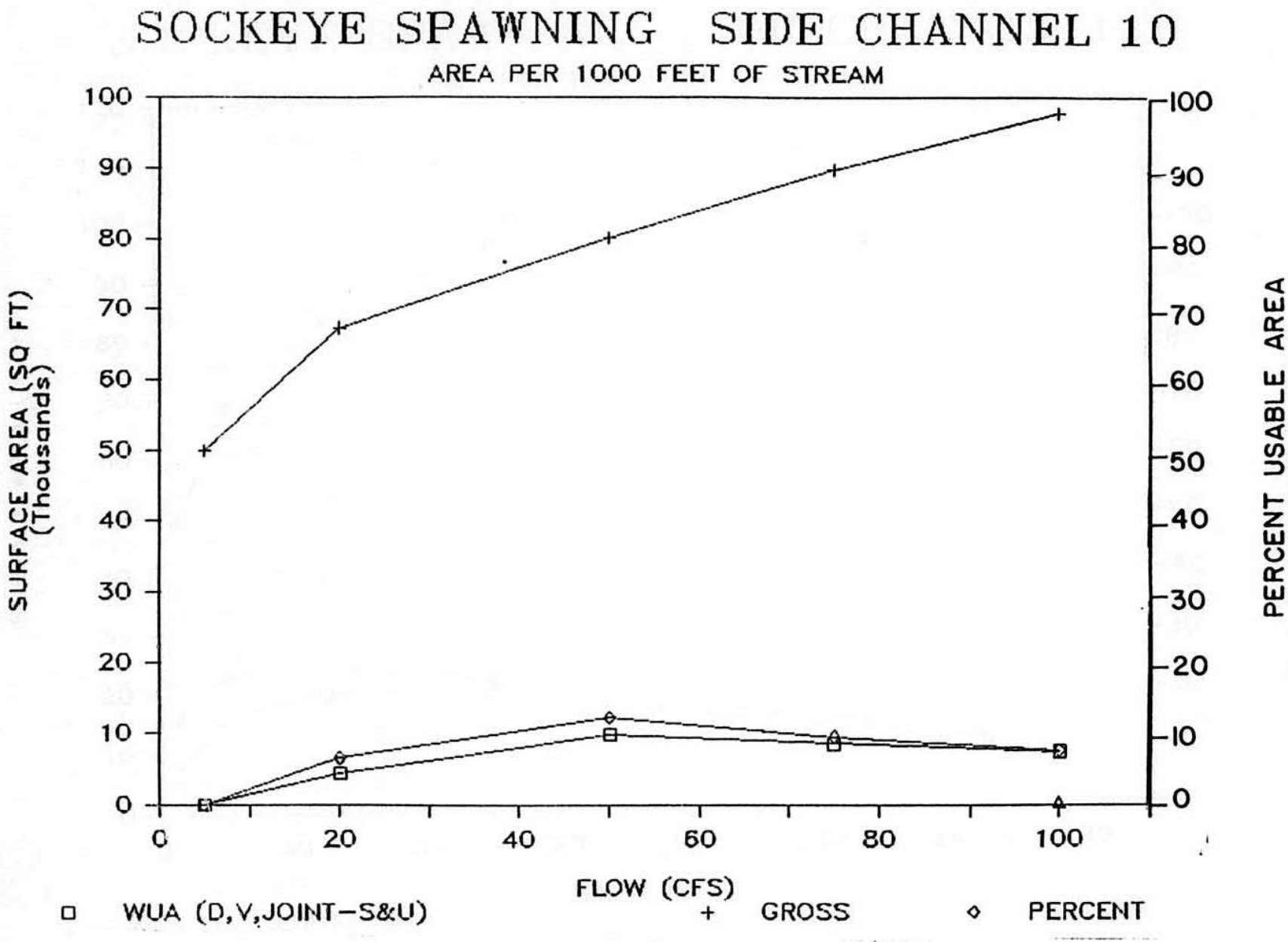

Figure 7-D-36 Weighted usable area plots using joint curve set for sockeye salmon spawning in Side Channel 10.

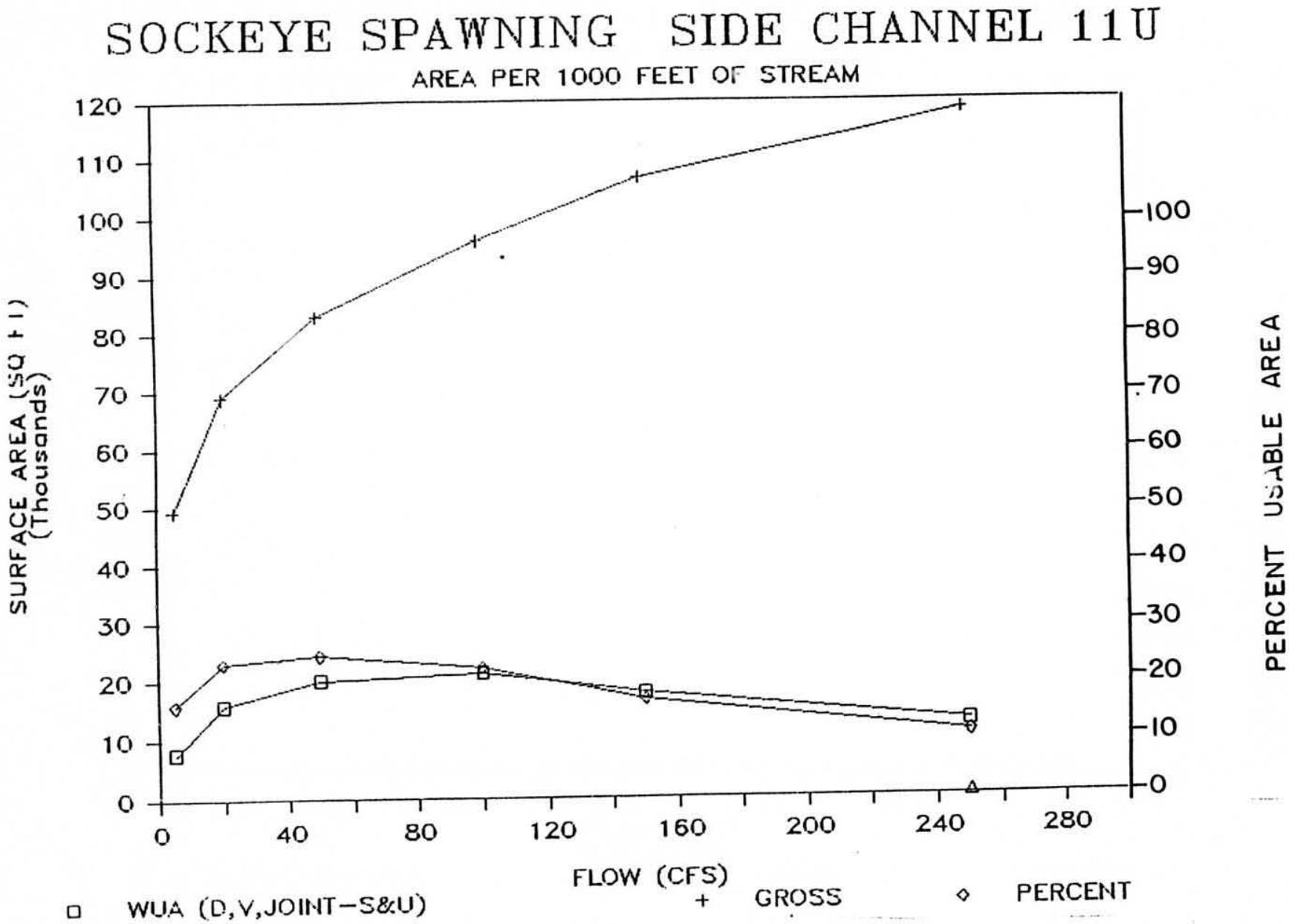

Figure 7-D-37 Weighted usable area plots using joint curve set for sockeye salmon spawning in Upper Side Channel 11.

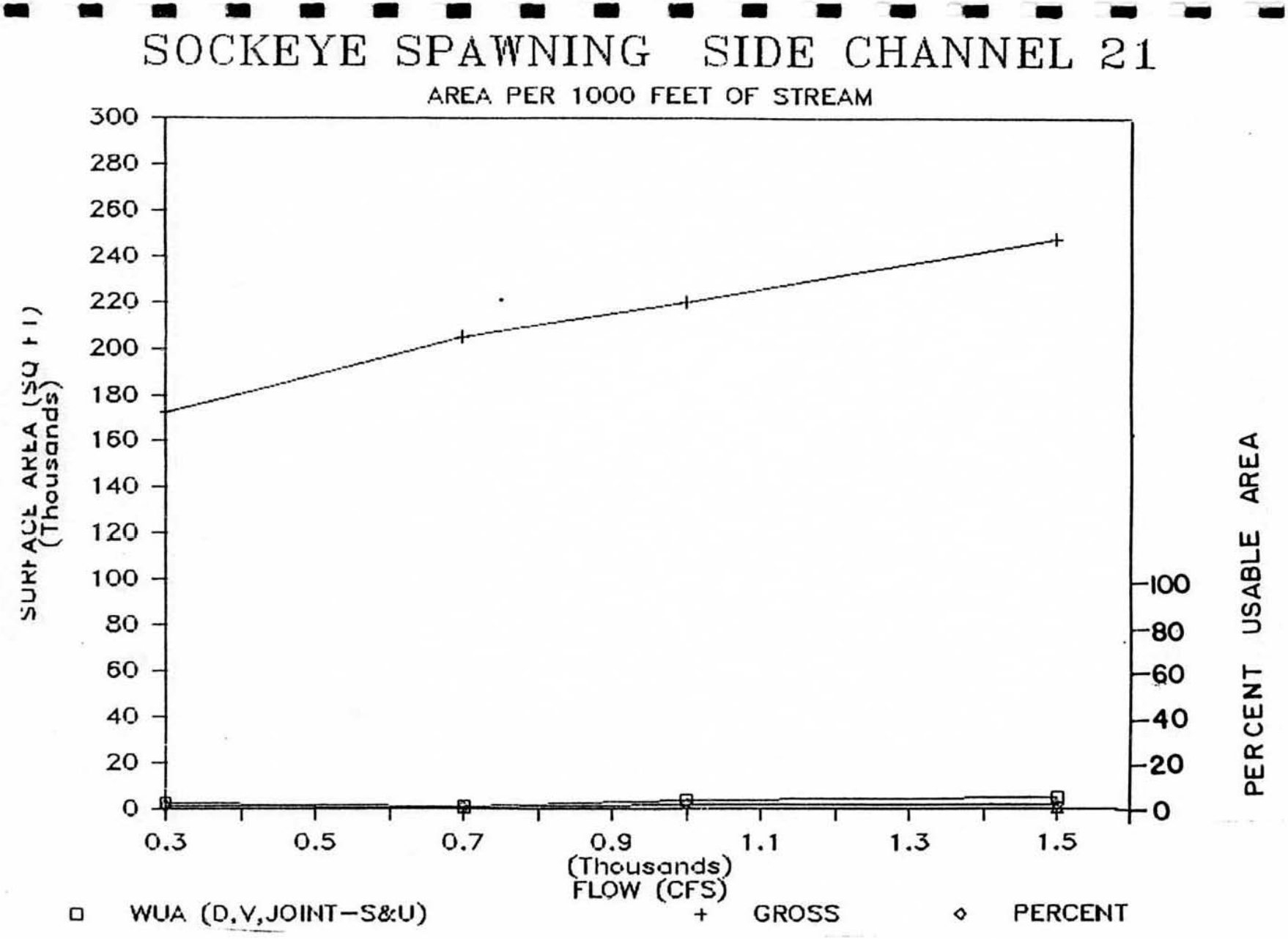

Figure 7-D-38 Weighted usable area plots using joint curve set for sockeye salmon spawning in Side Channel 21.

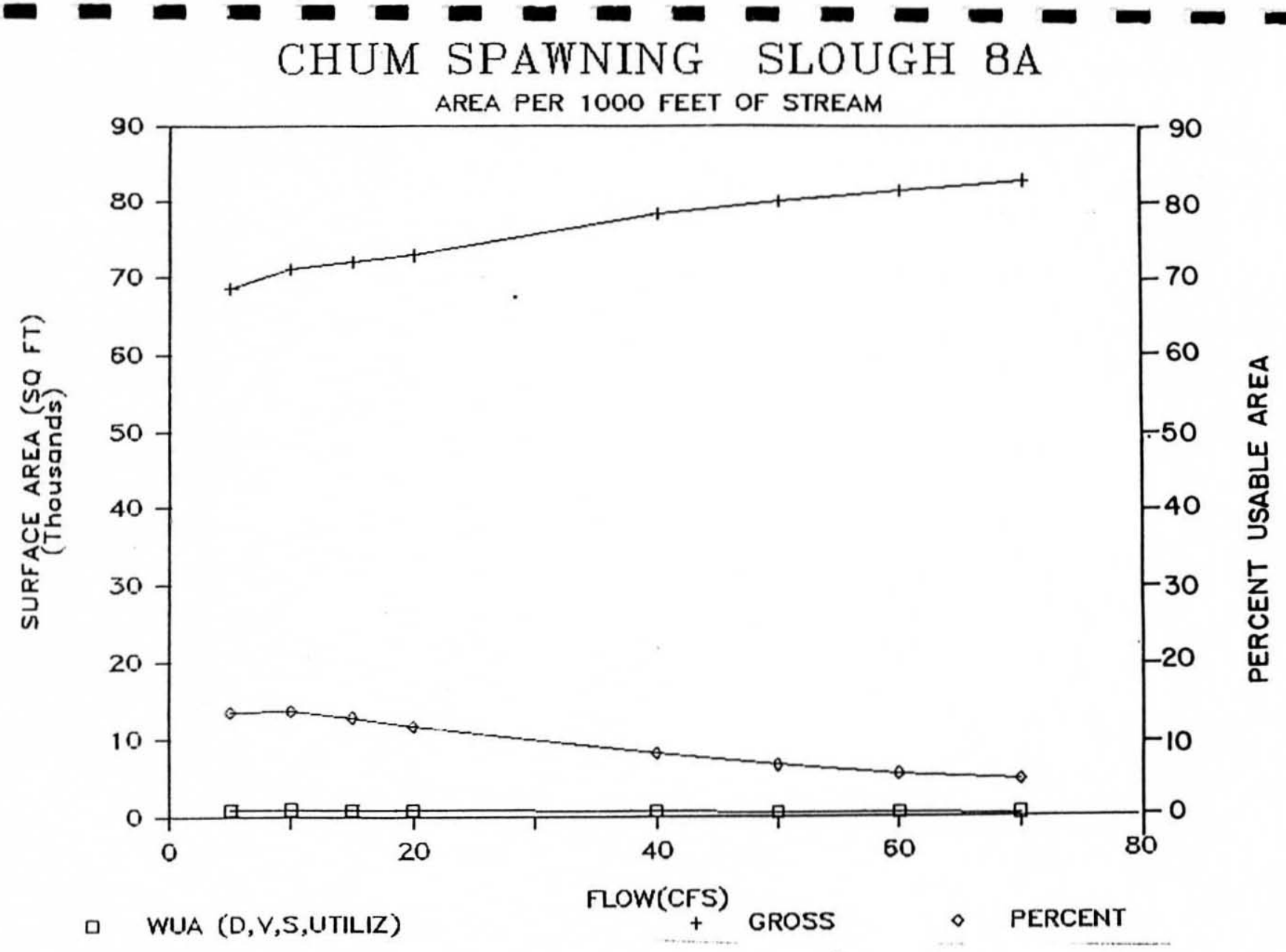

Figure 7-D-39 Weighted usable area plots using utilized curve set for chum salmon spawning in Slough 8A.

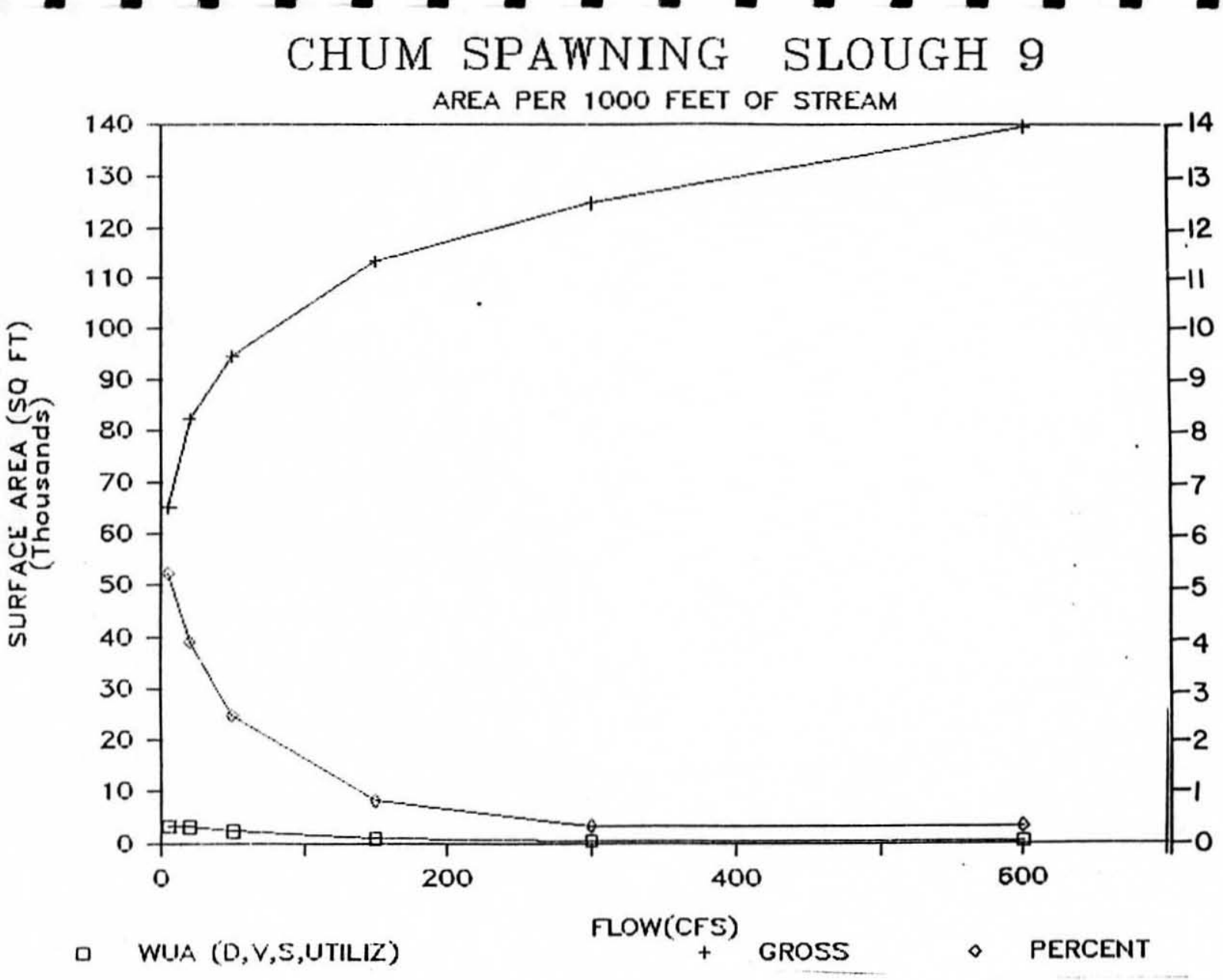

Figure 7-D-40 Weighted usable area plots using utilizable curve set for chum salmon spawning in Slough 9..

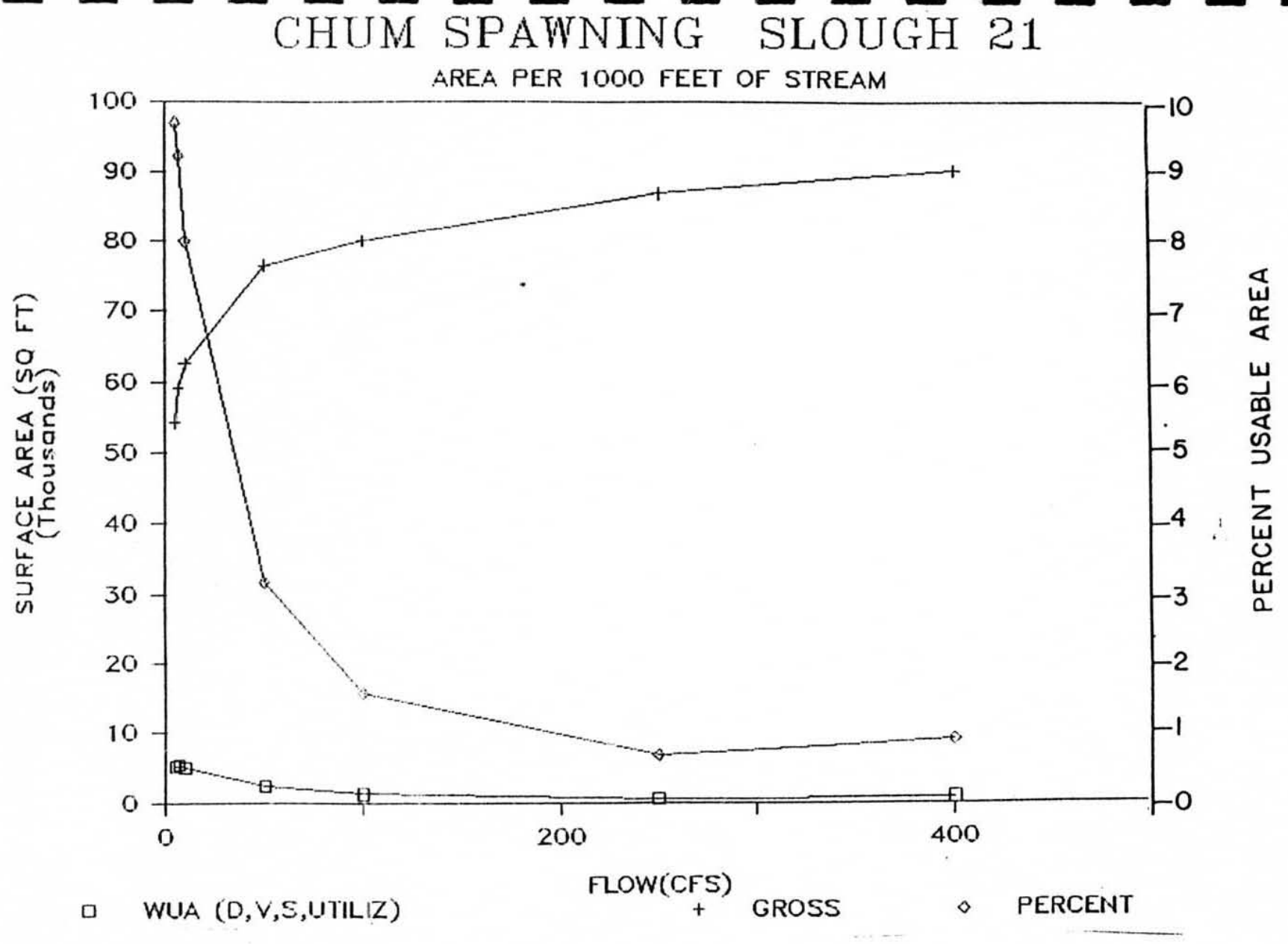

Figure 7-D-41 Weighted usable area plots using utilized curve set for chum salmon spawning in Slough 21.

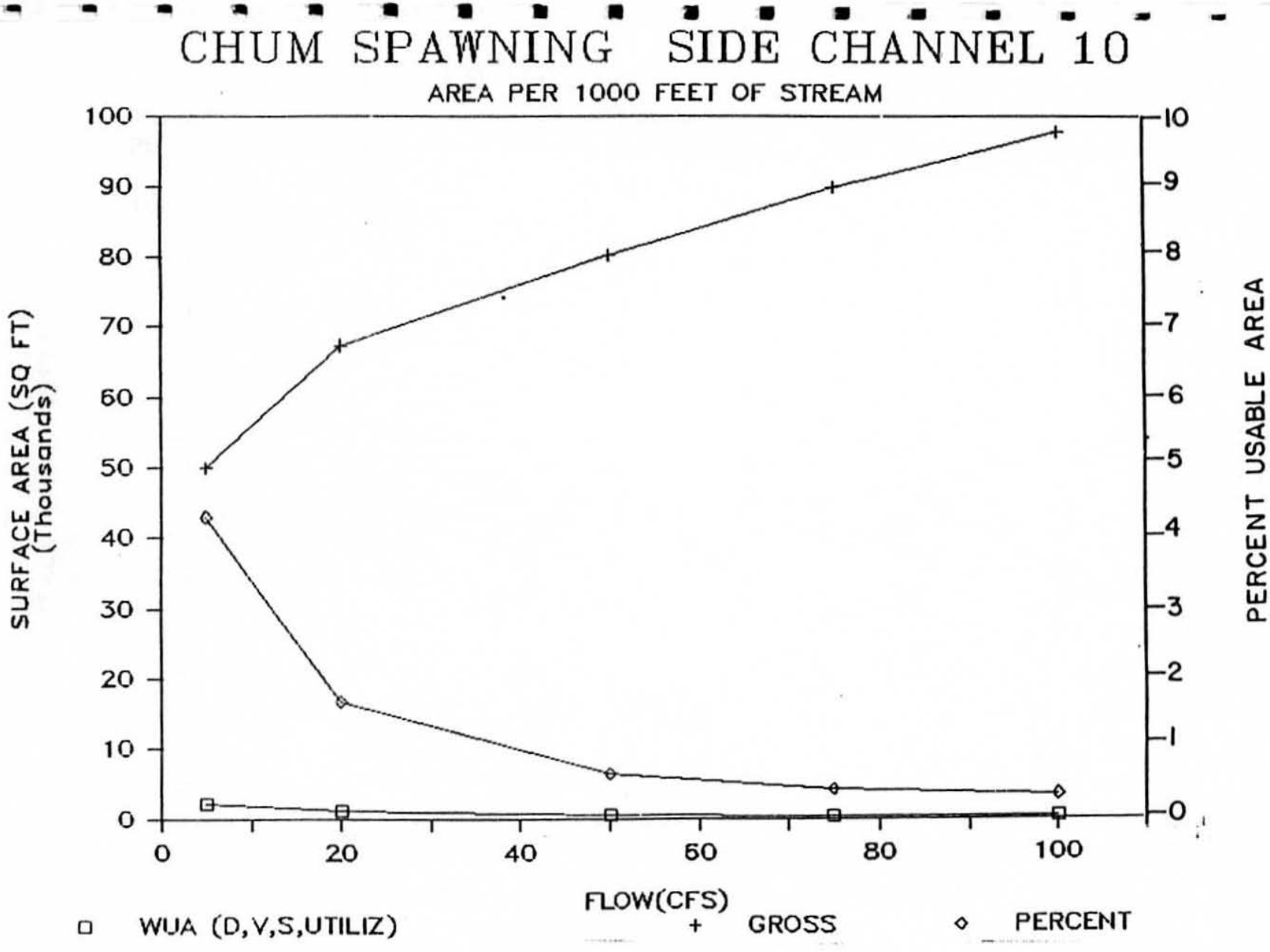

Figure 7-D-42 Weighted usable area plots using utilized curve set for chum salmon spawning in Side Channel 10.

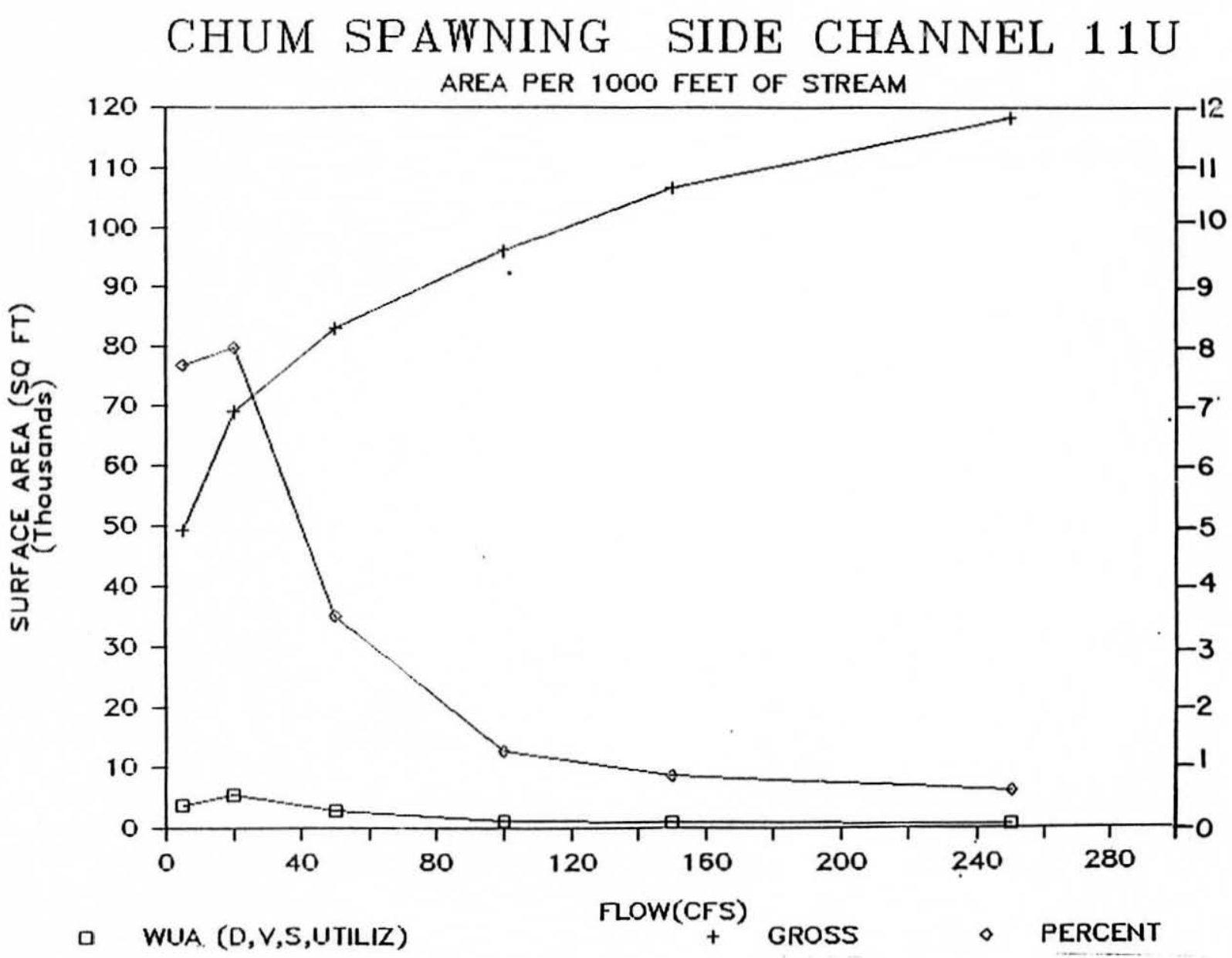

Figure 7-D-43 Weighted usable area plots using utilized curve set for chum salmon spawning in Upper Side Channel 11.

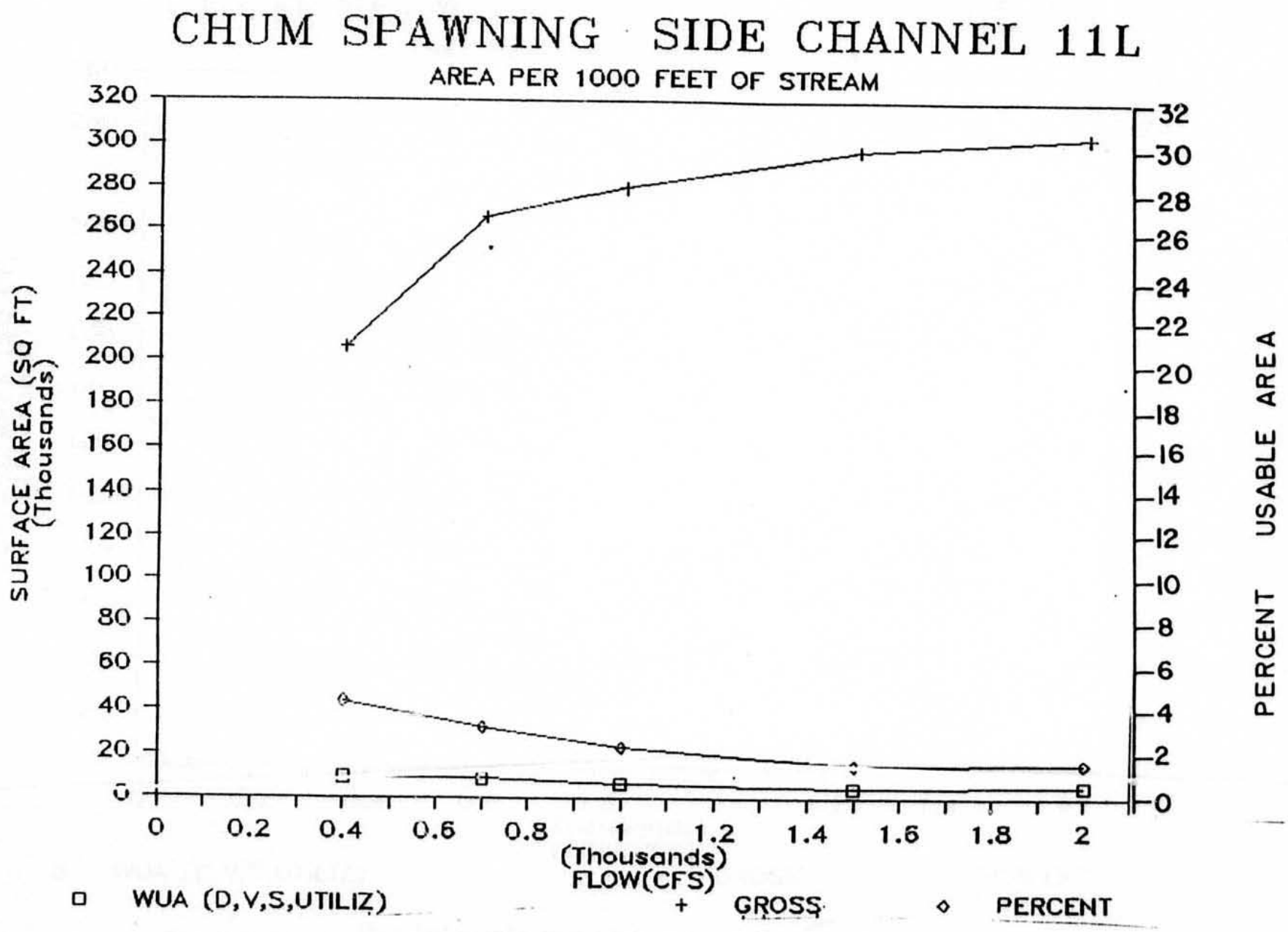

Figure 7-D-44 Weighted usable area plots using utilized curve set for chum salmon spawning in Lower Side Channel 11.

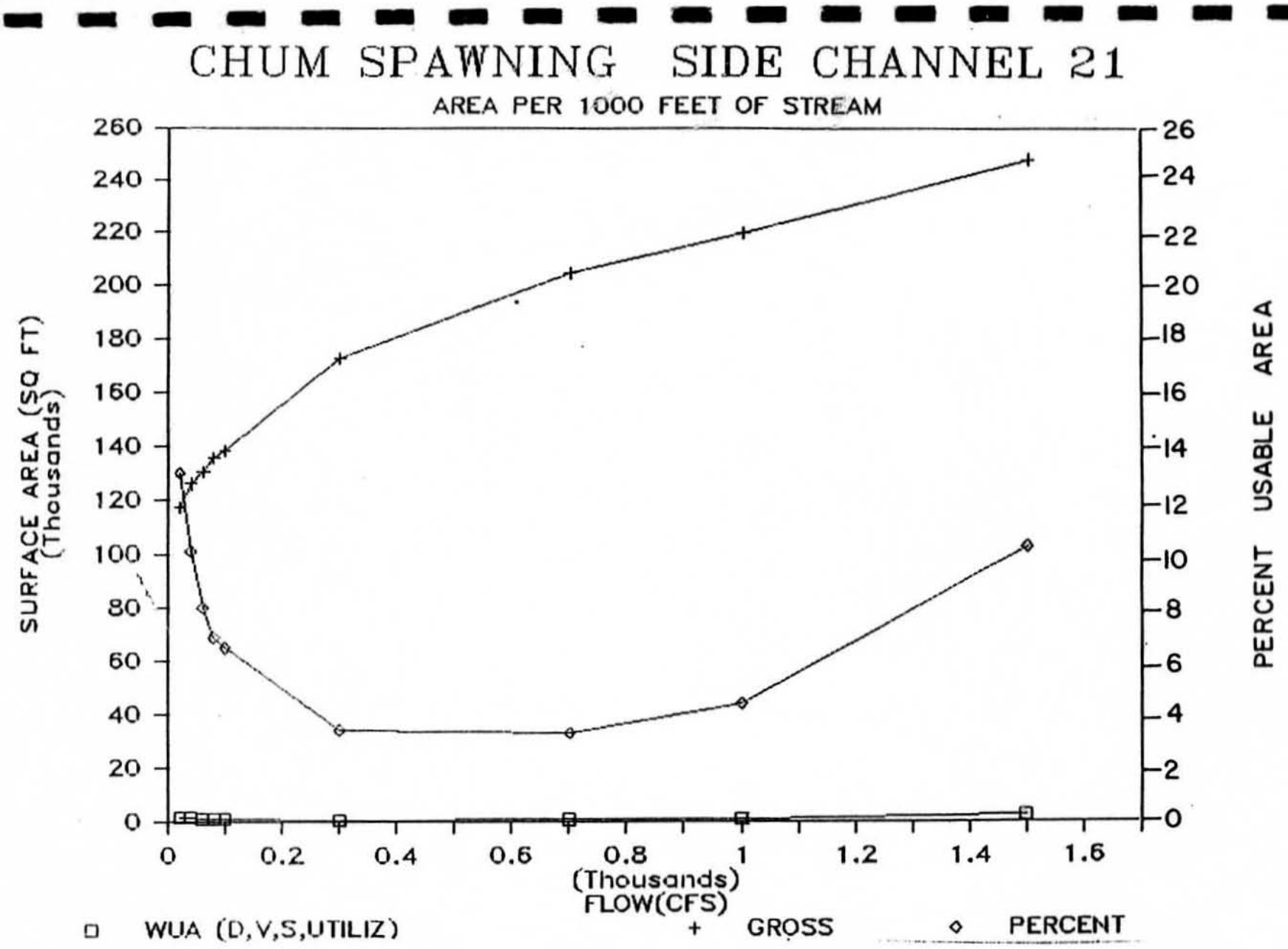

Figure 7-D-45 Weighted usable area plots using utilized curve set for chum salmon spawning in Side Channel 21.

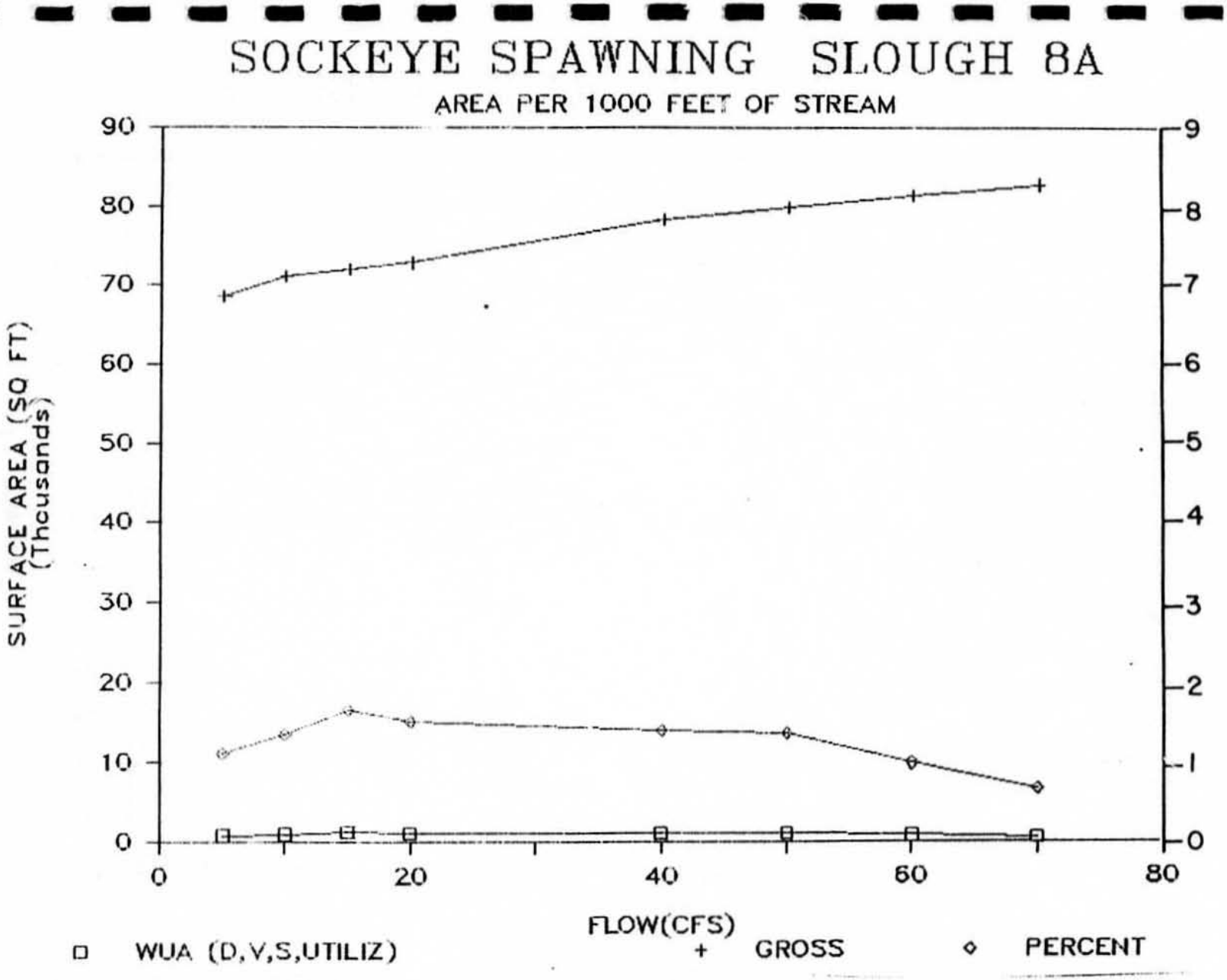

Figure 7-D-46 Weighted usable area plots using utilized curve set for sockeye salmon spawning in Slough 8A.....

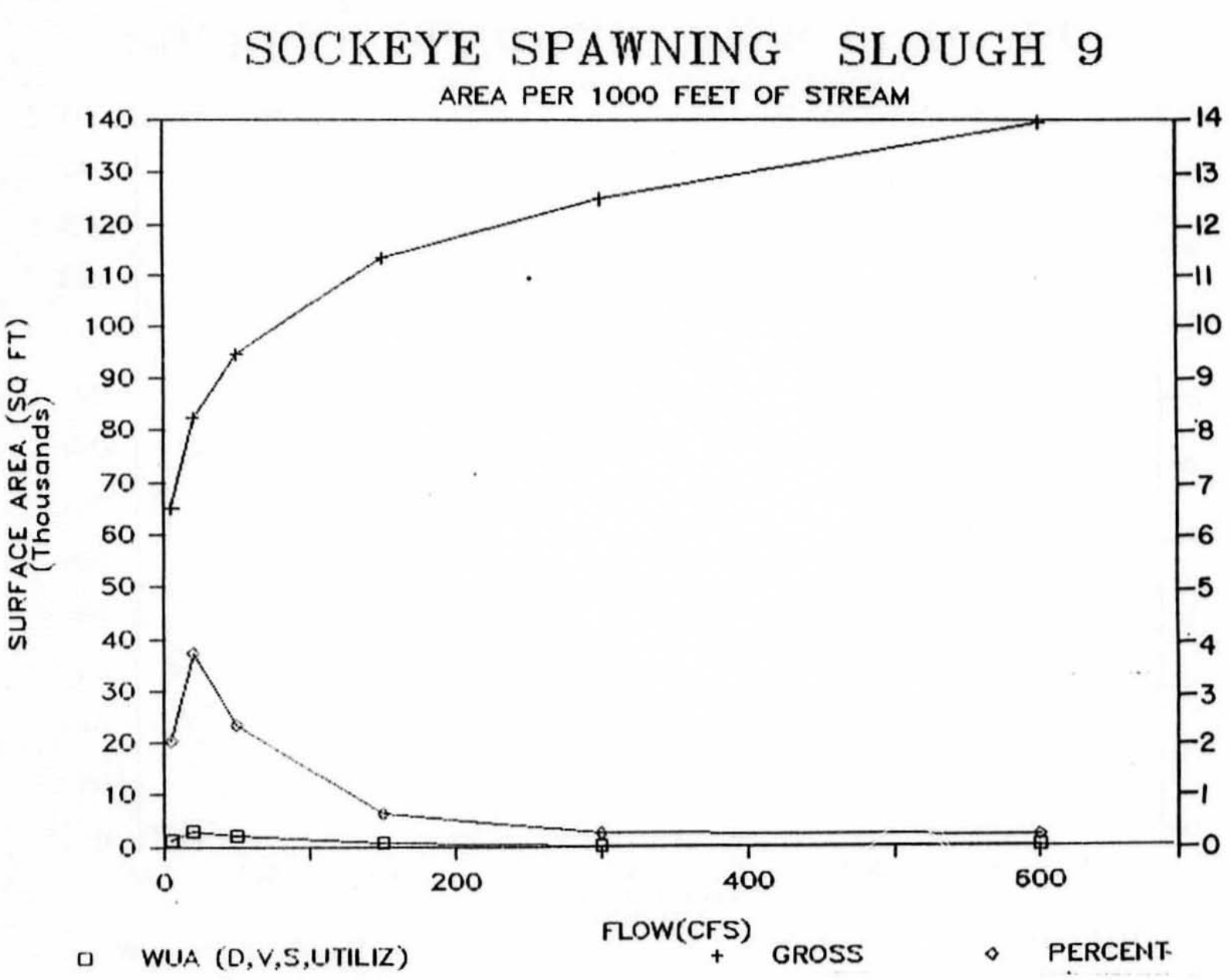

Figure 7-D-47 Weighted usable area plots using utilized curve set for sockeye salmon spawning in Slough 9.....

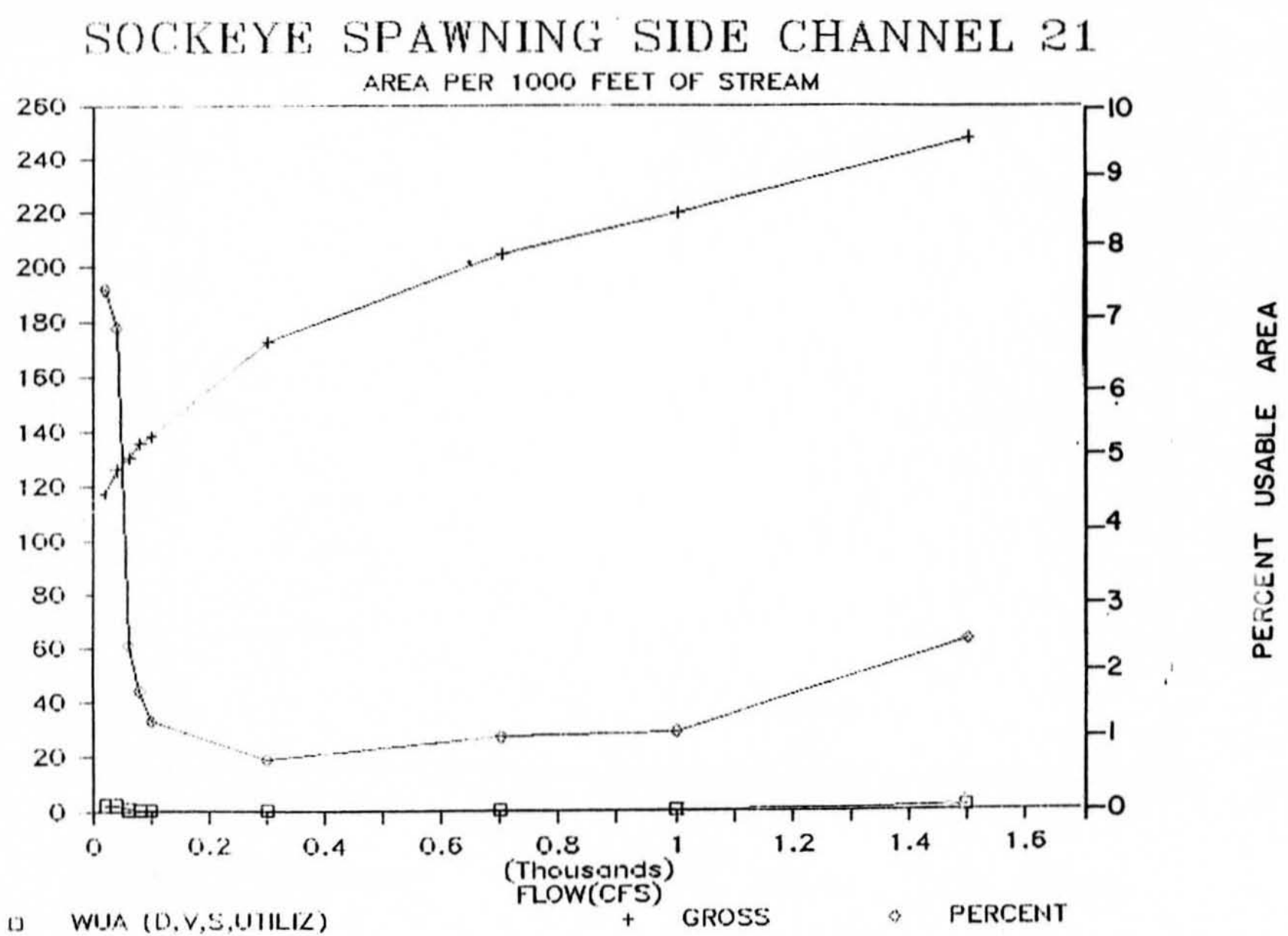

Figure 7-D-48 : Weighted usable area plots using utilizable curve set for sockeye salmon spawning in Side Channel 21.....

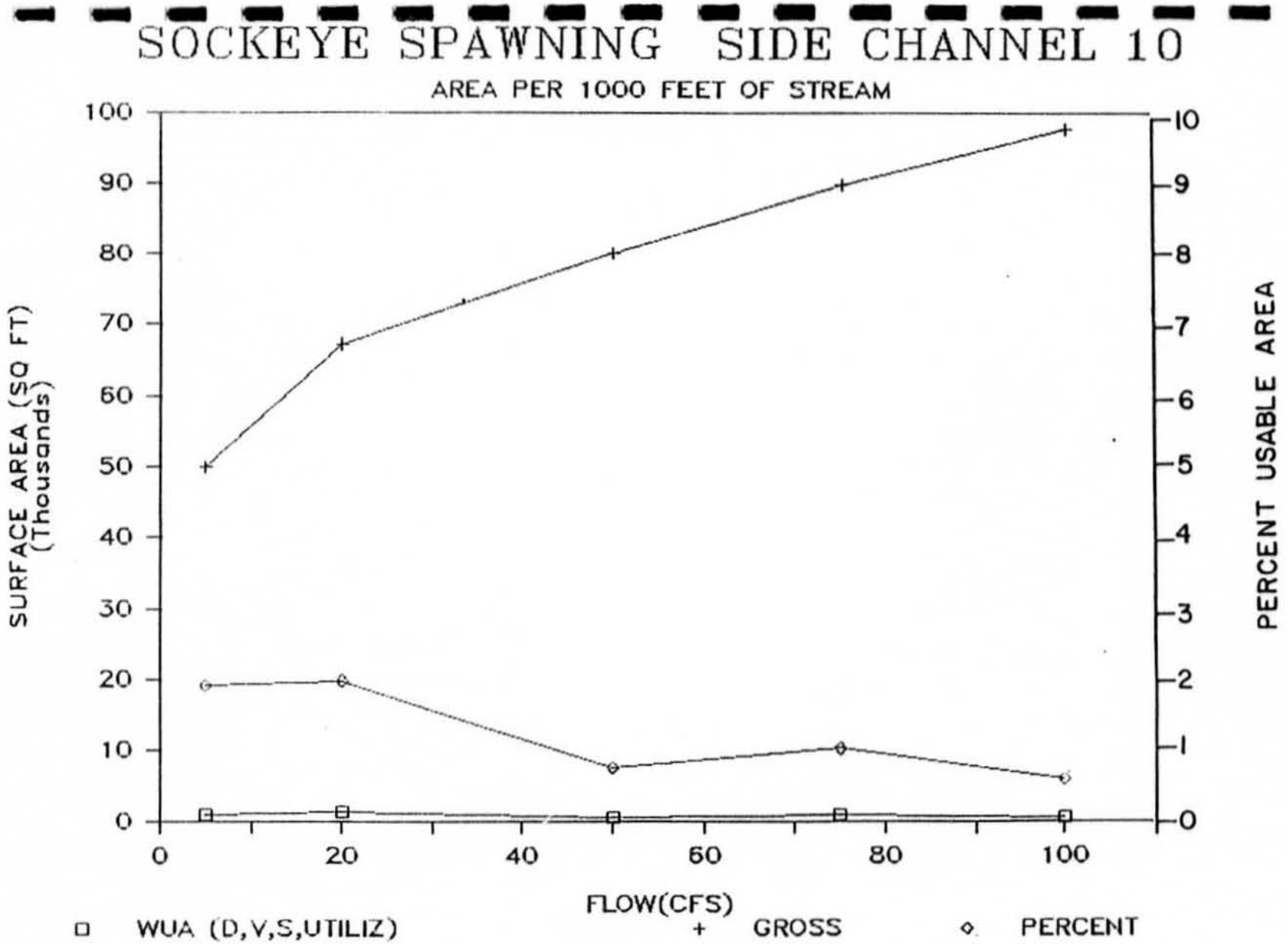

Figure 7-D-49 Weighted usable area plots using utilized curve set for sockeye salmon spawning in Side Channel 10.....

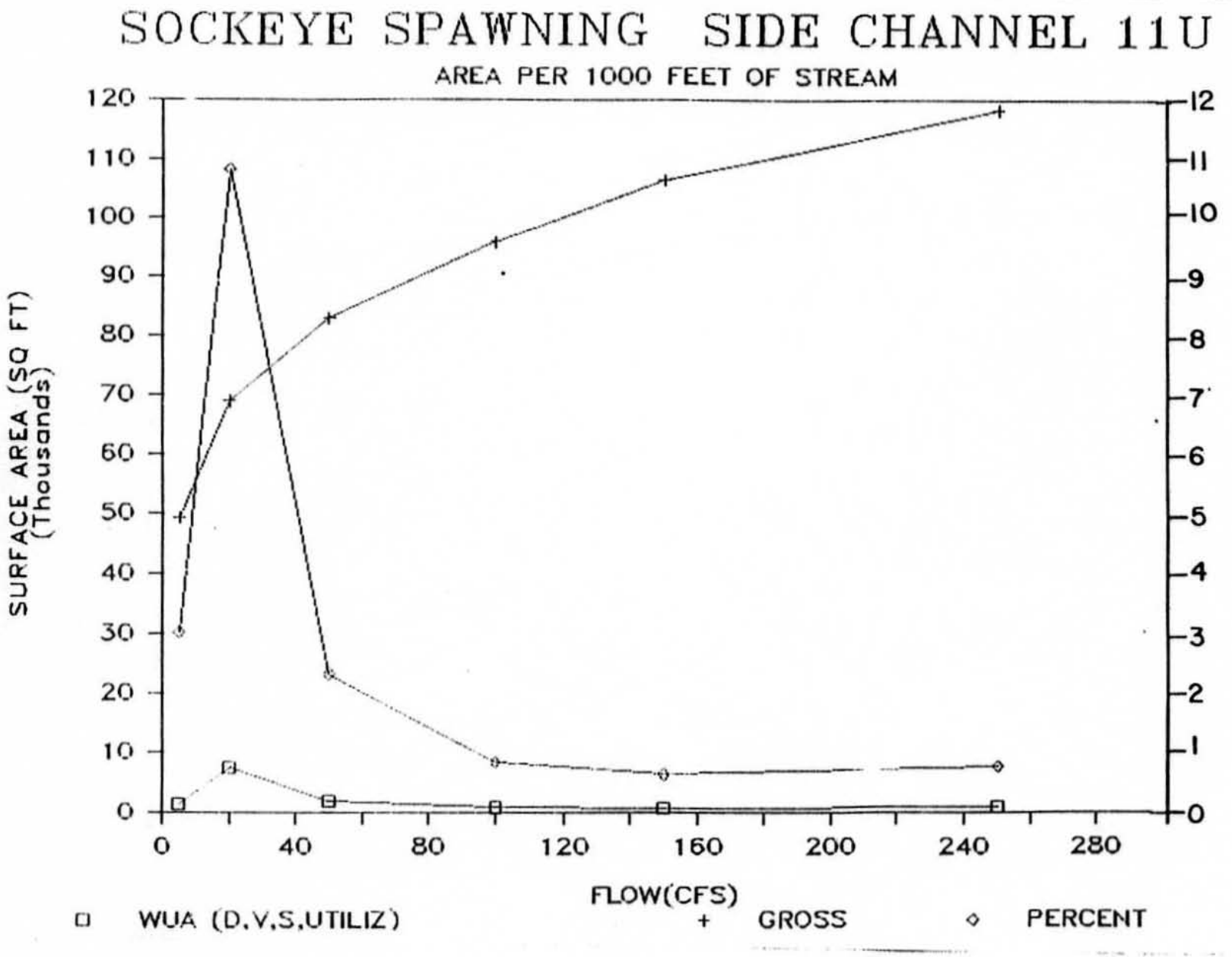

Figure 7-D-50 Weighted usable area plots using utilized curve set for sockeye salmon spawning in Upper Side Channel 11.

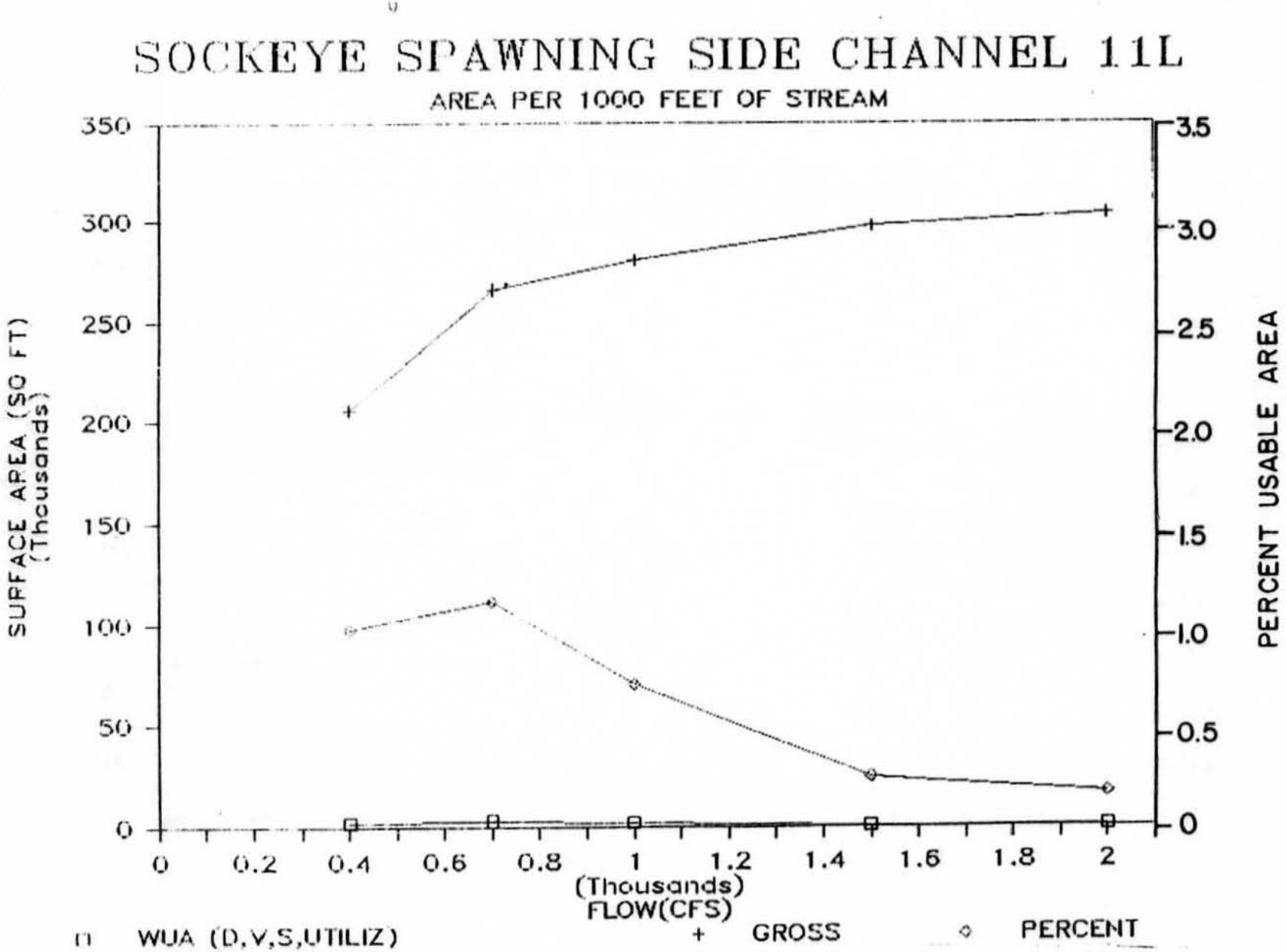

Figure 7-D-51 Weighted usable area plots using utilized curve set for sockeye salmon spawning in Lower Side Channel 11.

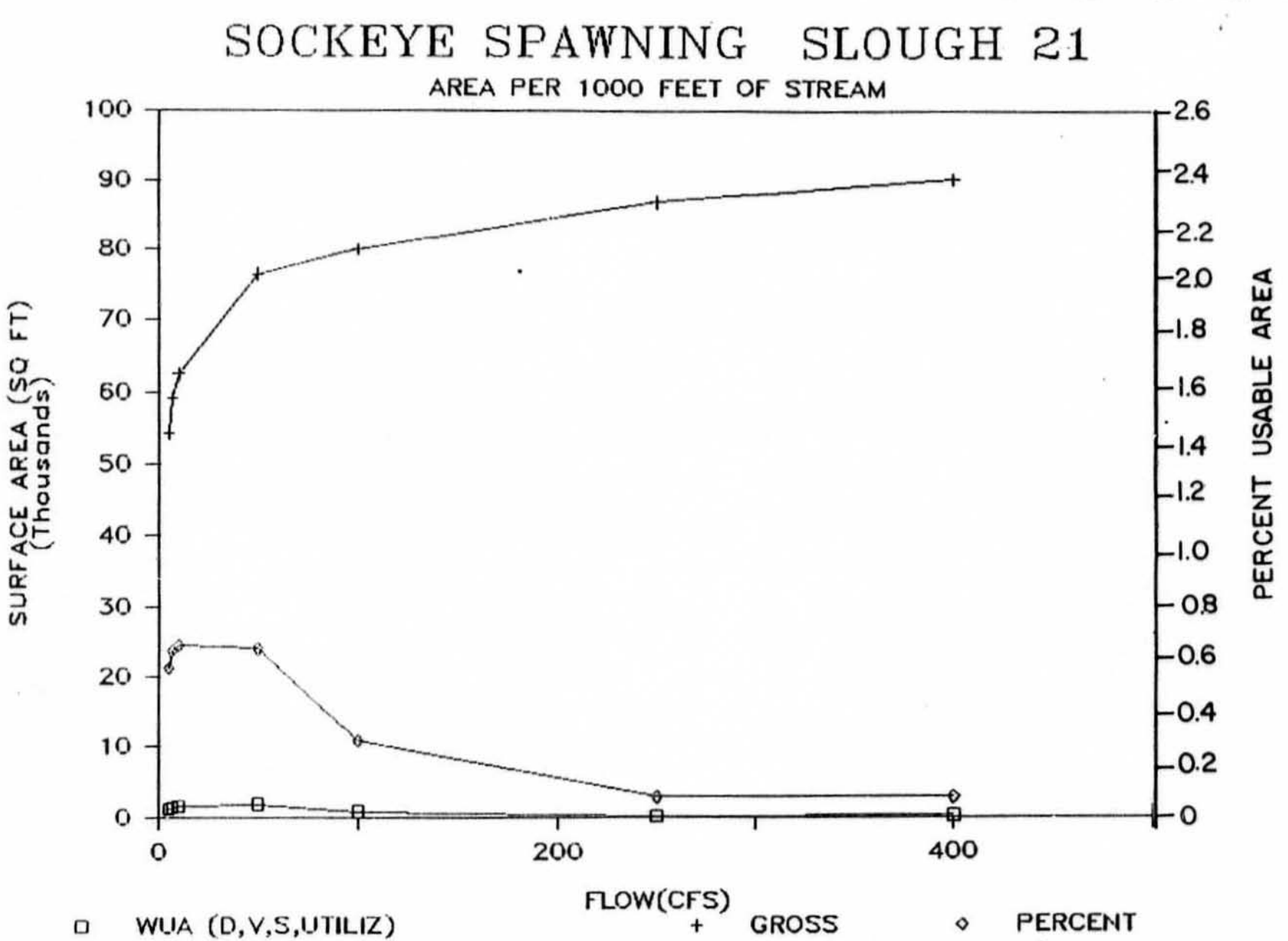

Figure 7-D-52 Weighted usable area plots using utilized curve set for sockeye salmon spawning in Side Channel 21.....

APPENDIX 7E

Flow Chart And Outline Of Salmon Spawning Habitat Analysis

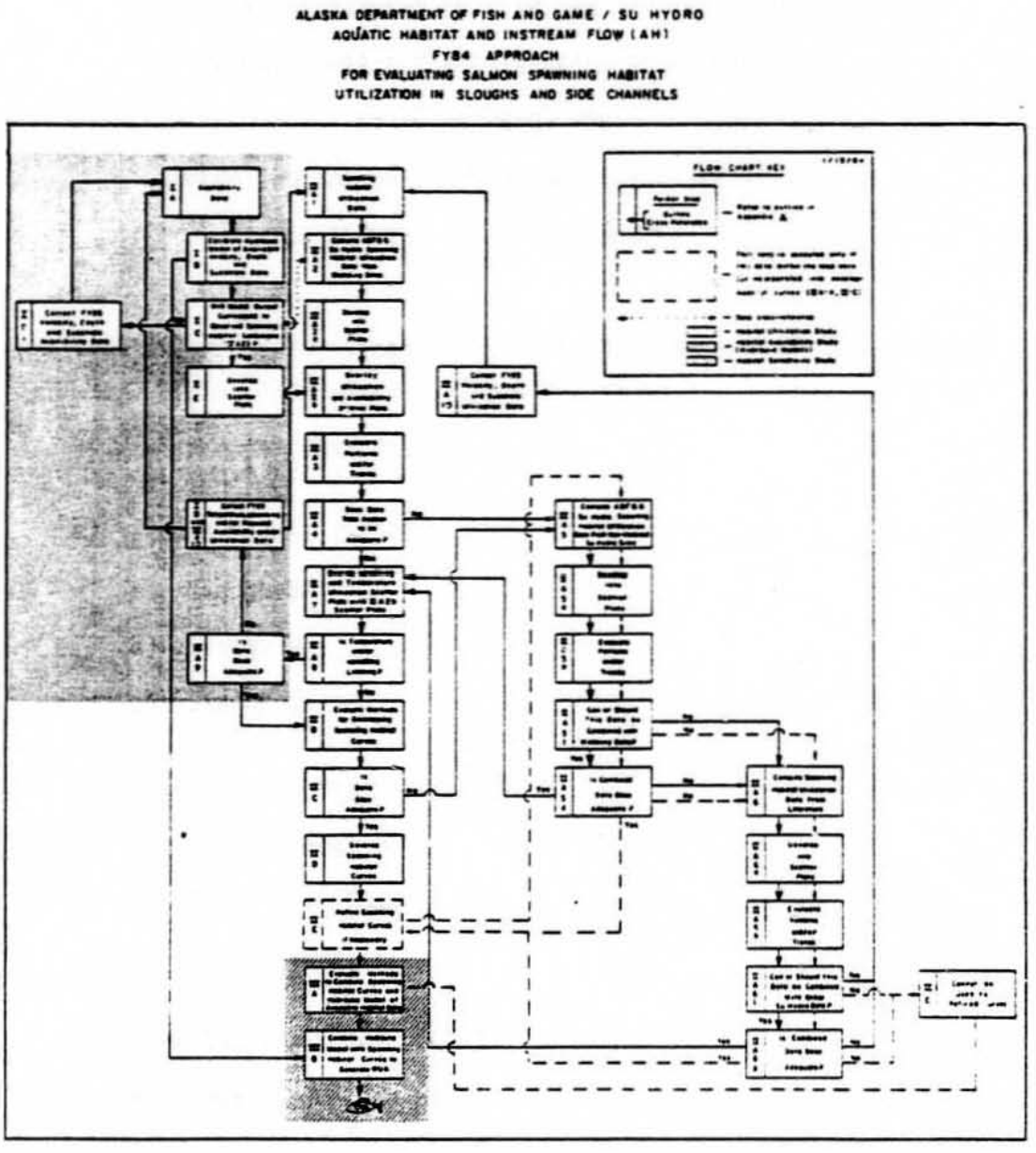

Figure 7-E-1 Flow diagram of salmon spawning habitat analysis.

FLOW CHART ATTACHMENT

ALASKA DEPARTMENT OF FISH AND GAME/SU HYDRO

AQUATIC HABITAT AND INSTREAM FLOW (AH)

FY 84 APPROACH FOR

EVALUATING SALMON SPAWNING HABITAT UTILIZATION

IN SLOUGHS AND SIDE CHANNELS

I. Availability Model Assessment (Includes An Assessment Of Flow Related Velocity, Depth, And Substrate Characteristics.)[1]

A. Hydraulic Model Data Sites.

1) Slough Models (IFG-4)

a) Slough 8A

b) Slough 9

c) Slough 21

2) Side Channel Models (IFG-4)

a) Side Channel 10

b) Upper Side Channel 11

c) Side Channel 21

3) Side Channel Model (IFG-2)

a) Lower Side Channel 11

B. Calibration by EWT&A and ADF&G.

C. Evaluate Whether Model Output Corresponds To The Range Of Flows Which Occurred When Spawning Habitat Utilization Conditions Were Measured.

1) Determine slough flows which occurred during the periods when redd measurements were recorded at each modeling site (see II-A-2).

---

[1] See also IV-2

2) Determine if hydraulic model output for these flows can be generated in order to determine available depth, velocity, and substrate characteristics, or whether additional data must be collected.

D. Collect The Following FY85 Availability Data If Required:

1) velocity, depth, and substrate;

2) surface and intragravel water temperature; and,

3) upwelling presence or absence.

E. Develop Scatter Plots Of Available Habitat Which Illustrate Depth Versus Velocity With Substrate Indicated As Acceptable (+) Or Unacceptable (-).

FLOW CHART ATTACHMENT

II. Spawning Habitat Utilization Assessment (Includes An Assessment Of Point Specific Velocity, Depth, Substrate, Temperature And Upwelling Characteristics At Redd Locations.)

A. Spawning Habitat Utilization Data Base Source Evaluation To Assess Which Spawning Habitat Utilization Data Sets Can Or Should Be Used And/Or Combined To Develop Adult Salmon Spawning Habitat Curves.

1) Sites and data sets are listed below. Number in parenthesis indicates the number of redd observations. An asterisk (*) indicates that a hydraulic model is available for the site.

Chum

1982 Field Data
- Slough 9* (45)
- Slough 8A* (37)
- Slough 21* (34)
- Slough 11 (15)

1983 Field Data
- Slough 9* (31)
- Slough 8A* (15)
- Slough 21* (49)
- Side Channel 21* (2)
- Upper Side Channel 11* (2)
- Slough 11 (15)
- Other sloughs [sloughs 9A(24), 17(6), 20(11), 22(12)]
- Mouth of 4th of July Creek (28)
- Mouth of Indian River (3)

Sockeye

1982 Field Data
- Slough 8A* (1)
- Slough 11 (23)

1983 Field Data
- Slough 8A* (16)
- Slough 21* (20)
- Slough 11 (22)
- Slough 17 (2)

Chinook**

1983 Field Data
- Portage Creek (136)
- Indian River (125)

Pink**

1982 and 1983 Field Data
- Insufficient Data (15)

Coho**

1982 and 1983 Field Data
- Insufficient Data (0)

Other

Literature Data
- Bradley Lake
- Terror Lake
- Chakachamna
- Willow Creek
- Other sources if available

** See Chapter 9

2) Compile spawning habitat utilization data from ADF&G Su Hydro modeling sites (*) and reduce above data into a scatter plot format for evaluation and overlay on scatter plots of available habitat from section I-E above.

   a) Scatter plots of spawning habitat utilization data will be developed which illustrate:

      i) depths vs velocities with acceptable (+) or unacceptable substrate (-);

      ii) depths vs differences in surface and intragravel water temperature and;

      iii) depths vs velocities with upwelling presence (+) or absence (-).

   b) Spawning habitat utilization scatter plots from a-i above will be overlayed on scatter plots of available habitat from I-E above.

3) Evaluate trends shown by scatter plots.

4) Evaluate whether spawning habitat utilization data from modeling sites above (II-A-2) are sufficient to develop adequate curves; or, will it be necessary to combine these data with non-modeling site (II-A-5) and/or literature data (I-A-6)? If data are sufficient, continue to Step II-A-7 or if insufficient proceed to step II-A-5 following solid line processes only.

5) Compile ADF&G spawning habitat utilization data for non-modeled sites to evaluate whether these data can be combined with data from modeling sites for use in developing spawning habitat curves.

   a) Develop scatter plots of non-modeling sites data.

   b) Evaluate trends shown by scatter plots.

   c) Compare the above (II-A-5-a) spawning habitat utilization scatter plots to scatter plots of ADF&G Su Hydro modeling sites (II-A-2) to determine whether these data can be combined; and, if so, continue to step 5-d. If the data can not be combined, proceed to step II-A-6 to evaluate the use of literature data.

   d) Determine if the combined data bases are adequate and if they are, continue to step II-A-7. If they are insufficient, proceed to step II-A-6 to consider the use of literature data.

6) Compile spawning habitat utilization data from literature sources to evaluate whether these data can be combined with data from modeling sites for use in developing habitat curves.

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a) Develop scatter plots of literature data.

b) Evaluate trends shown by scatter plots.

c) Compare the above (II-A-6-a) spawning habitat utilization scatter plots to scatter plots of ADF&G Su Hydro modeling sites (II-A-2) to determine whether these data can be combined and if so continue to step 6-d. If they cannot be combined, additional field data must be collected if FY85 (II-A-10).

d) Determine if the combined data bases are adequate and if they are, continue to step II-A-7. If they are insufficient, collect additional field data in FY85 (II-A-10).

7) Overlay utilization scatter plots of temperature and upwelling from II-A-2-a-ii and iii above and velocity, depth and substrate scatter plots of utilized and available spawning habitat from II-A-2-b (II-A-5-d and II-A-6-d data would also be included if these loops were required) above.

8) Evaluate trends shown by these scatter plots to determine if temperature and/or upwelling are limiting. If they are limiting, proceed to step II-A-9 and if not, continue to II-B.

9) Evaluate whether a portion or all of the:

a) temperature, upwelling, velocity, depth and substrate spawning habitat utilization data are adequate;

b) whether temperature and upwelling availability data are required; and

c) whether to continue to the combined step II-A-10 and I-D or to II-B.

10) Collect FY85 spawning habitat utilization data if required:

a) velocity, depth and substrate;

b) surface and intragravel water temperature; and

c) upwelling presence or absence.

B. Evaluate Whether the Following Approaches or a Combination of Them Can or Should Be Used to Develop Spawning Habitat Curves:

- Standard U.S. Fish and Wildlife Service IFG approach (Bovee and Cochnauer 1977);
- Baldrige and Amos (1981);
- Voos (1980);
- Previtt (1982);
- ADF&G (1983) AH technique; and
- Other possible approaches or combinations of the above.

C. If data base appears adequate continue to step II-D; if data are inadequate, proceed to step II-A-5 following solid line process only. This only applies if II-A-5 and II-A-6 were not incorporated into development of curves at step II-A-4.

D. Develop Spawning Habitat Curves.

E. If data from II-A-5 and II-A-6 Were Not Incorporated Into Initial Development Of Curves Proceed to Step II-A-5 Following Dashed Line Processes Only To Determine If These Data Can Be Used To Refine Curves. If Previously Used Or If It Is Determined That These Data Should Not Be Used For This Purpose, Continue To Step III-A.

FLOW CHART ATTACHMENT

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Baldrige, J. E., and D. Amos. 1981. A technique for determining fish habitat suitability criteria: A comparison between habitat utilization and availability. American Fisheries Society, Portland, Oregon.

Bovee, K. D., and T. Cochnauer. 1977. Development and evaluation of weighted criteria, probability-of-use curves for instream flow assessments: fisheries. Instream Flow Information Paper No. 3. Cooperative Instream Flow Group, Fort Collins, Colorado.

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FLOW CHART ATTACHMENT

III. Habitat Model [Combination of Spawning Habitat Curves and Calibrated Hydraulic Models To Determine Weighted Usable Area (WUA)]

A. Evaluation of Linkage Approaches of Spawning Habitat Curves with Hydraulic Models.

1) WUA Calculation Technique Evaluation

a) IFG WUA calculations:

i) standard calculation with three matrices

ii) lowest limiting factor

iii) Geometric mean

b) Multi-variate calculation

2) Consider calculation of WUA using optimum, preferred, utilized, and available categories of ADF&G AH, 1983 analysis.

B. Use Habitat Model to Generate WUA.

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IV. Miscellaneous (These Items Are Not Included In Flow Chart.)

1) Assess whether spawning habitat utilization behavior criteria can be evaluated and combined with other spawning habitat utilization data, i.e., Fanning (F), Quivering (Q), Aggression (A) and Holding (H). This task has been assigned a low priority but may be useful for determining "outliers" in spawning habitat utilization data sets (II-A-3).

2) Availability data sets for temperature and upwelling are not available. Cost effective methods for collecting and analyzing these data are being evaluated in the event it is necessary to input these data into the model in the future.

3) The evaluation of tributary mouth hydraulic and spawning habitat availability and utilization data will be treated independently of this analysis.

4) Develop changes in hydraulic and habitat models to enable the RJ staff to incorporate juvenile habitat data for their analysis.