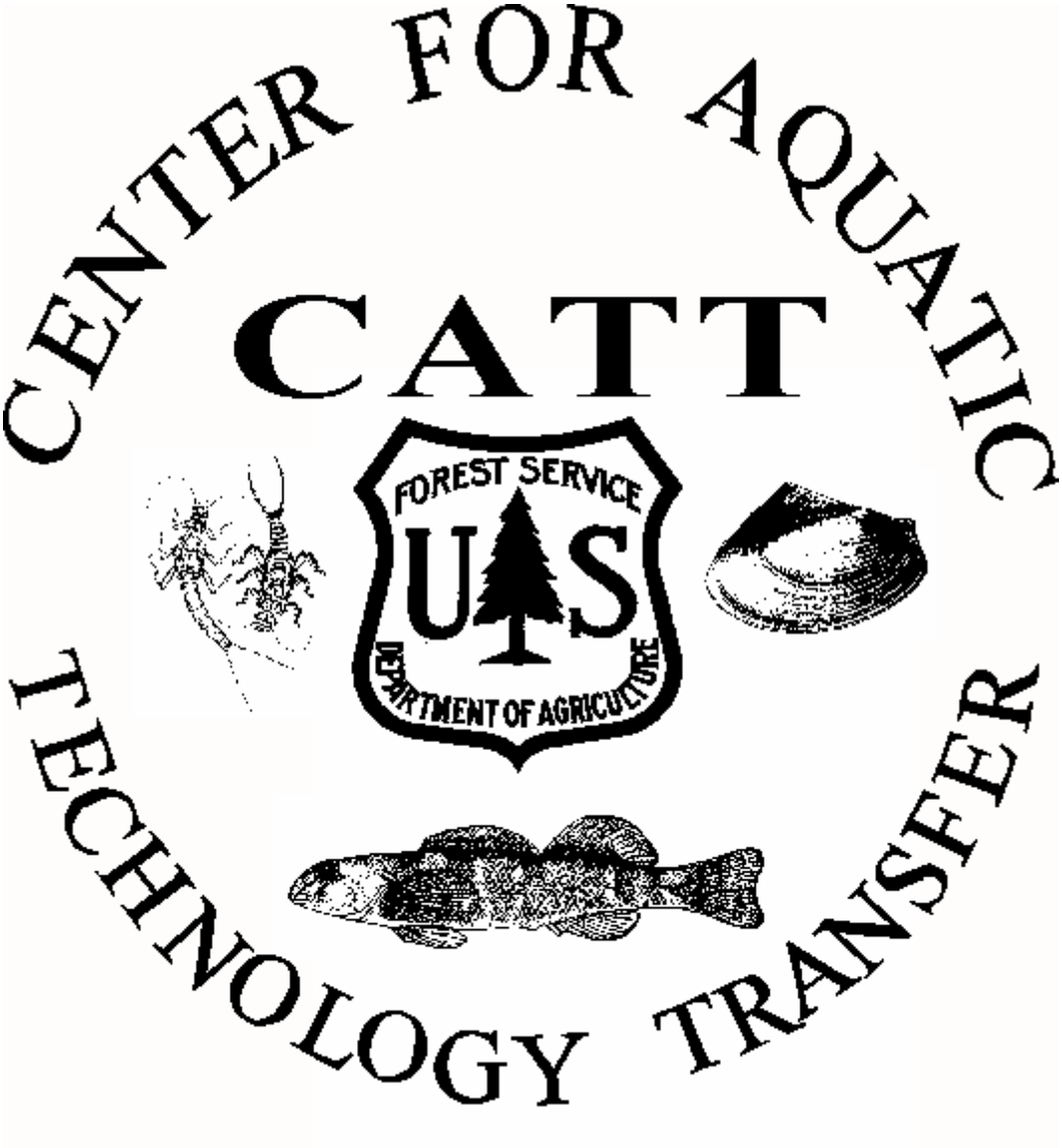
Current Condition of Streams in the North Fork Shenandoah River Drainage, Dry River Ranger District, George Washington-Jefferson National Forest, VA



United States Department of Agriculture Forest Service
Southern Research Station
Center for Aquatic Technology Transfer

1650 Ramble Rd.
Blacksburg, VA 24060-6349

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Introduction

Throughout the summer of 2002 we conducted stream habitat surveys on North Fork Shenandoah River drainage streams within the Dry River Ranger District, George Washington-Jefferson National Forest (GWJNF), Virginia, to quantify stream habitat conditions. Over 78 kilometers (49 miles) of stream habitat (35 streams) were classified and inventoried between 27 May and 23 August 2002, using Basinwide Visual Estimation Techniques (BVET) (Dolloff et. al 1993). We were unable to complete surveys on six streams due to lack of water or stream access problems (see Index of Stream Summaries). A multi-year drought likely increased the number of dewatered sections we encountered in many streams (see features tables associated with each survey), and also affected water depth and surface area estimates, and habitat unit counts (Herger et al. 1996, Hilderbrand et al. 1999).

We modified standard BVET methods to measure stream habitat parameters identified in the GWJNF forest plan. Included in the forest plan is an outline of the desired-future-condition (DFC) for all the streams within the GWJNF. The pertinent DFCs for the GWJNF include: woody debris loading - 78 to 186 pieces per kilometer, and percent pool habitat - 30 to 70 percent of the total stream habitat.

The purpose of this report is to describe the current condition of Dry River Ranger District streams in a format useful to the Dry River Ranger District and the GWJNF. The enclosed report is intended to provide baseline information for Forest planning, habitat improvement projects, and land use decisions.

Methods

Surveys began at confluences for streams contained within National Forest boundaries and at the downstream USFS boundary for all other streams. Surveys were terminated when we encountered an upstream USFS boundary, or when the wetted channel was < 1 m average wetted width for > 500 m.

Two-stage visual estimation techniques were used to quantify habitat and DFCs in selected Dry River Ranger District streams. During the first stage habitat was stratified into similar groups based on naturally occurring habitat units including pools (areas in the stream with concave bottom profile, gradient equal to zero, greater than average depth, and smooth water surface), and riffles (areas in the stream with convex bottom profile, greater than average gradient, less than average depth, and turbulent water surface). Glides (areas in the stream similar to pools, but with average depth and flat bottom profile) were identified during the survey but were grouped with pools for data analysis. Runs (areas in the stream similar to riffles but with average depth, less turbulent flow, and flat bottom profile) and cascades (areas in the stream with > 12% gradient, high velocity, and exposed bedrock or boulders) were grouped with riffles for data analysis.

Habitat in each stream was classified and inventoried by a two-person crew. One crew member identified each habitat unit by type (as described above), estimated average wetted width, average and maximum depth, riffle crest depth (RCD), and substrate composition for each habitat unit, and determined

if pool substrates were embedded. The length (0.1 m) of each habitat unit was measured with a hip chain. Average wetted width was visually estimated. Average and maximum depth of each habitat unit were estimated by taking depth measurements at various places across the channel profile with a graduated staff marked in 5 cm increments. The RCD was estimated by measuring water depth at the deepest point in the hydraulic control between riffles and pools. The RCD was subtracted from average pool depth to obtain an estimate of residual pool depth. Substrates were assigned to one of nine size classes (see Appendix A). Dominant substrate (covered greatest amount of surface area in habitat unit) and subdominant substrate (covered 2nd greatest amount of surface area in habitat unit) were visually estimated. Substrate was considered to be embedded if sand, silt, or clay filled the interstitial spaces between larger size substrates over greater than 35% of the surface area of the stream bed in a given habitat unit.

The second crew member classified and inventoried large woody debris (LWD) within the stream channel, determined the Rosgen's channel type (see Appendix A) associated with each habitat unit, and recorded data on a Husky Fex21 data logger. LWD was assigned to one of four size classes (see Appendix A). All woody debris less than 1 m long and less than 10 cm in diameter were omitted from the survey. Rosgen's channel type was visually estimated using criteria found in Rosgen (1996).

The first unit of each habitat type selected for intensive (second stage) sampling (i.e. accurate measurement of wetted width) was determined randomly. Additional units were selected systematically (every 10th habitat unit type for streams >1000 m and every 5th habitat unit type for streams <500 m). The wetted width of each systematically selected habitat unit was measured with a meter tape across at least three transects. In each of the systematically selected (second stage) riffles we also estimated the bankfull stream channel width and riparian width as described by Harrelson et al. (1994), and measured channel gradient. We estimated bankfull channel width by measuring the width of the bankfull channel perpendicular to flow. We estimated riparian width by measuring from the edge of the bankfull channel to the intersection with the nearest landform at a predetermined flood stage. The flood stage was calculated from a formula specific to Virginia streams, based on watershed area. Gradient was estimated by using a clinometer to site from the downstream to the upstream end of the selected riffle.

We used the ratio of measured to estimated area to develop a calibration ratio, which allowed us to correct visual estimates and estimate stream area with confidence intervals (Hankin and Reeves 1988). BVET calculations were computed with a Microsoft Excel spreadsheet using formulas found in Dolloff et al. (1993). Data were summarized using Excel spreadsheets and SigmaPlot graphics software.

Literature Cited

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User's Guide

Stream summaries are organized in alphabetical order by U. S. Geological Survey (USGS) 1:24,000 Topographic Quadrangle, and then by stream name. The upper right hand corner of each page in the 'Stream Summaries' section contains the USGS quadrangle name for the selected stream.

Data for each stream section were collected, analyzed, and presented separately. Each stream or stream section summary contains:

1. several tables summarizing stream characteristics;
2. figures showing frequency of substrate types, area in pools and riffles, average, maximum, and residual depths, and LWD per kilometer;
3. table describing features encountered on the stream;
4. figures showing the distribution of LWD, substrate types, and Rosgen's channel types.

GWJNF's DFCs are indicated on all pertinent tables and graphs.

We also included several summary tables (see 'Summary Tables' section) that summarize all data collected. The tables allow managers to quickly compare between Dry River Ranger District streams.

Summary Tables

Survey information and summary of general stream habitat characteristics for streams surveyed using the BVET habitat survey on the Dry River District during summer 2002. NA = data was not recorded. No access = stream was not surveyed due to lack of access. 'Length' is total survey length, 'Width' is mean bankfull channel width, 'Gradient' is mean channel gradient, and 'Temperature' is mean water temperature.

Stream	Quad	Survey Date	Length (km)	Width (m)	Gradient (%)	Temperature (^{o}C)
Capon Run	Bergton	06/03/02	1.2	11	2	24
Crab Run	Bergton	no access				
N.F. Shenandoah River	Bergton	06/30/02	0.5	21	2	20
Rattlesnake Run	Bergton	no access				
Siever Run	Bergton	no access				
Sirks Run	Bergton	06/05/02	1.1	11	3	NA
Spring Run	Bergton	06/11/02	4.3	7	7	14
Spruce Run	Bergton	no access				
Beech Lick Run	Cow Knob	06/27/02	1.2	3	9	NA
Camp Rader Run	Cow Knob	07/15/02	2.0	6	5	16
Carr Run	Cow Knob	06/28/02	3.2	5	5	NA
Clay Lick Hollow	Cow Knob	06/29/02	3.1	4	9	NA
Cold Spring River	Cow Knob	06/13/02	1.1	7	4	19
Cold Spring Run	Cow Knob	06/28/02	1.0	3	16	16
Dull Hunt Hollow	Cow Knob	06/27/02	3.0	7	3	16
German River	Cow Knob	06/26/02	2.8	5	7	15
Seventy Buck Lick Run	Cow Knob	06/30/02	1.7	4	5	17
Snake Hollow	Cow Knob	06/27/02	0.5	4	9	NA
Straight Hollow Run	Cow Knob	06/12/02	3.0	6	6	17
Sumac Run	Cow Knob	06/27/02	1.6	4	7	16
Blue Lick Run	Fulks Run	06/25/02	1.6	6	6	19
Camp Hollow	Fulks Run	06/30/02	1.5	5	5	18
Gate Run	Fulks Run	06/04/02	3.8	6	3	15
Grove Hollow	Fulks Run	06/12/02	1.6	3	6	18
Lairs Run	Fulks Run	07/15/02	4.9	6	5	17
Little Dry River	Fulks Run	06/03/02	0.1	23	1	19
Marshall Run	Fulks Run	06/26/02	5.0	6	4	17
Martin Lick Run	Fulks Run	06/06/02	4.1	5	5	18
Mud Lick Run	Fulks Run	06/26/02	1.1	3	4	18
Rocky Spur Hollow	Fulks Run	06/11/02	1.7	4	6	18
Root Run	Fulks Run	06/13/02	2.4	5	5	17
Bennett Run	Milam	06/06/02	1.2	5	3	18
Overly Run	Milam	06/10/02	1.2	5	5	20
Overly Run (upper)	Milam	06/10/02	0.6	3	6	NA
Black Lick Run	Singers Glen	06/11/02	1.0	5	6	20
Buck Lick Run	Singers Glen	06/05/02	5.2	6	3	16
Cross Mountain Run	Singers Glen	06/10/02	1.4	5	7	20
Hogpen Run	Singers Glen	06/03/02	2.2	8	3	17
Little Hogpen Run	Singers Glen	06/04/02	0.5			
Shoemaker River	Singers Glen	no access				
Slate Lick Branch (lower)	Singers Glen	06/12/02	1.9	6	3	17
Slate Lick Branch (upper)	Singers Glen	06/12/02	4.1	6	4	16

Summary of pool habitat characteristics for streams surveyed using the BVET habitat survey on the Dry River District during summer 2002. The GWJNF DFC is between 30% and 70% of total stream area in pools. Highlighted streams are outside the DFC range. Asterisk indicates confidence interval could not be calculated. 'Total Area (%)' is percent of total stream surface area in pools (includes glides), 'Total Area (m^2)' is surface area of stream in pools, 'Mean Area' is mean surface area of individual pools, 'Mean Max Depth' is the mean maximum depth of all pools, 'Mean Ave Depth' is mean average depth of all pools, 'Mean Resid Depth' is mean residual depth of all pools, 'Glides' is percent of pool habitat units surveyed as glides, '>35% Embed' is percent of pools with greater than 35% of substrate materials embedded.

Stream	Total Area (%)	Total Area (m^2)	Total Count (n)	# per km	Mean Area (m^2)	Mean Max Depth (cm)	Mean Ave Depth (cm)	Mean Resid Depth (cm)	Glides (%)	>35% Embed (%)
Capon Run	53	4159±762	24	20	173	53	33	10	17	8
Crab Run										
N.F. Shenandoah River	88	7332±14251	6	11	1222	65	38	10	50	0
Rattlesnake Run										
Siever Run										
Sirks Run	38	1705±339	37	35	46	38	25	7	27	8
Spring Run	20	1870±173	93	22	20	36	25	12	12	15
Spruce Run										
Beech Lick Run	20	158±11	28	24	6	21	11	2	14	79
Camp Rader Run	26	1105±343	37	19	30	41	25	11	14	14
Carr Run	27	934±81	82	26	11	30	17	7	20	18
Clay Lick Hollow	21	574±70	78	25	7	24	14	4	22	55
Cold Spring River	24	304±52	15	13	20	32	22	11	20	27
Cold Spring Run	25	191±16	53	53	4	16	10	9	15	79
Dull Hunt Hollow	25	1852±730	59	20	31	43	28	20	14	0
German River	23	1131±76	72	26	16	40	21	6	8	31
Seventy Buck Lick Run	36	591±95	47	27	13	31	17	7	13	28
Snake Hollow	12	37±*	5	9	7	33	19	9	40	80
Straight Hollow Run	12	719±258	37	12	19	38	27	16	0	5
Sumac Run	25	314±50	37	23	8	26	16	5	24	78
Blue Lick Run	29	487±129	53	34	9	22	14	11	8	4
Camp Hollow	18	641±58	54	36	12	25	15	14	9	13
Gate Run	23	2305±124	89	23	26	38	25	16	6	7
Grove Hollow	17	352±31	36	22	10	21	15	13	22	0
Lairs Run	33	1916±162	151	31	13	22	14	11	5	5
Little Dry River	42	408±*	3	26	136	87	57	55	0	0
Marshall Run	29	2592±150	150	30	17	30	19	16	13	3
Martin Lick Run	22	2213±112	102	25	22	28	18	13	14	0
Mud Lick Run	52	410±43	57	51	7	22	14	16	14	0
Rocky Spur Hollow	38	1225±139	59	35	21	28	19	14	10	5
Root Run	31	801±110	80	33	10	23	16	12	5	4
Bennett Run	19	1743±674	29	24	20	34	20	8	14	69
Overly Run	24	805±155	37	32	22	31	17	7	27	22
Overly Run (upper)	21	153±18	14	22	11	26	15	6	14	79
Black Lick Run	36	542±101	34	33	16	31	21	15	3	6
Buck Lick Run	48	6788±861	149	29	46	37	25	14	15	0
Cross Mountain Run	38	650±271	28	20	23	33	24	18	7	7
Hogpen Run	41	3164±475	42	19	75	42	28	18	7	10
Little Hogpen Run										
Shoemaker River										
Slate Lick Branch (lower)	50	4257±611	52	27	82	47	28	13	21	13
Slate Lick Branch (upper)	50	4782±640	80	20	60	49	30	16	8	16

Summary of riffle habitat characteristics for streams surveyed using the BVET habitat survey on the Dry River District during summer 2002. Asterisk indicates confidence interval could not be calculated. 'Total Area (%)' is percent of total stream surface area in riffles (includes runs and cascades), 'Total Area (m^2)' is surface area of stream in riffles, 'Mean Area' is mean surface area of individual riffles, 'Mean Max Depth' is the mean maximum depth of all riffles, 'Mean Ave Depth' is mean average depth of all riffles, 'Runs' is percent of riffle habitat units surveyed as runs, 'Cascades' is percent of riffle habitat units surveyed as cascades.

Stream	Total Area (%)	Total Area (m^2)	Count (n)	# per km	Mean Area (m^2)	Mean Max Depth (cm)	Mean Ave Depth (cm)	Runs (%)	Cascades (%)
Capon Run	47	3725±1933	22	18	169	28	16	0	0
Crab Run									
N.F. Shenandoah River	12	986±*	4	7	246	15	10	25	0
Rattlesnake Run									
Siever Run									
Sirks Run	62	2838±904	27	25	105	25	13	0	0
Spring Run	80	7508±1114	78	18	96	22	9	0	0
Spruce Run									
Beech Lick Run	80	651±135	24	20	27	14	5	0	0
Camp Rader Run	74	3208±1870	37	19	87	20	9	0	0
Carr Run	73	2469±306	71	22	35	14	5	3	0
Clay Lick Hollow	79	2135±443	72	23	30	13	5	3	0
Cold Spring River	76	954±338	14	13	68	18	7	7	0
Cold Spring Run	75	577±53	49	49	12	7	3	0	18
Dull Hunt Hollow	75	5548±4304	62	21	89	20	12	2	0
German River	77	3717±383	70	25	53	20	7	0	0
Seventy Buck Lick Run	64	1064±205	47	27	23	13	5	0	0
Snake Hollow	88	283±*	9	16	31	12	4	0	11
Straight Hollow Run	88	5090±3999	40	13	127	21	12	0	3
Sumac Run	75	951±482	35	22	27	12	4	3	0
Blue Lick Run	71	1218±209	47	30	26	12	4	2	0
Camp Hollow	82	2856±234	47	31	61	15	7	0	2
Gate Run	77	7762±1164	77	20	101	23	12	5	1
Grove Hollow	83	1720±236	35	22	49	13	6	11	0
Lairs Run	67	3882±525	117	24	33	10	4	1	0
Little Dry River	58	566±812	4	34	142	21	14	25	0
Marshall Run	71	6314±1032	121	24	52	14	8	4	1
Martin Lick Run	78	7722±1041	94	23	82	18	9	5	0
Mud Lick Run	48	376±38	27	24	14	10	5	33	0
Rocky Spur Hollow	62	1982±543	50	30	40	17	7	4	2
Root Run	69	1743±674	56	23	31	14	6	2	0
Bennett Run	81	2466±853	28	23	88	17	6	0	0
Overly Run	76	2544±290	32	28	79	16	5	0	0
Overly Run (upper)	79	566±180	14	22	40	12	5	7	0
Black Lick Run	64	958±88	33	32	29	15	10	0	0
Buck Lick Run	52	7497±1720	119	23	63	21	13	0	0
Cross Mountain Run	62	1074±219	26	19	41	13	7	0	4
Hogpen Run	59	4596±3333	39	18	118	16	8	0	0
Little Hogpen Run									
Shoemaker River									
Slate Lick Branch (lower)	50	4311±475	43	23	100	28	13	12	0
Slate Lick Branch (upper)	50	4842±1042	66	16	73	19	9	5	0

Summary of LWD per km and Rosgen's channel types for streams surveyed using the BVET habitat survey on the Dry River District during summer 2002. The GWJNF DFC for total LWD is between 78 and 186 pieces per km. Highlighted streams are outside the DFC range. NA = data not recorded. LWD sizes: 1) <5 m long, <55 cm diameter, 2) < 5 m long, >55 cm diameter, 3) >5 m long, <55 cm diameter, 4) >5 m long, >55 cm diameter. See Appendix A for description of Rosgen channel types.

Stream	Large Woody Debris per km					Rosgen's Channel Type						
	1	2	3	4	Total	A	B	C	D	E	F	G
Capon Run	11	7	0	3	20	0	0	100	0	0	0	0
Crab Run												
N.F. Shenandoah River	2	0	15	0	17	0	100	0	0	0	0	0
Rattlesnake Run												
Siever Run												
Sirks Run	38	44	23	18	122	0	100	0	0	0	0	0
Spring Run	53	45	15	30	143	41	59	0	0	0	0	0
Spruce Run												
Beech Lick Run	54	4	4	1	63	NA						
Camp Rader Run	40	10	7	10	66	NA						
Carr Run	31	15	33	18	96	23	34	0	0	0	0	44
Clay Lick Hollow	58	2	12	7	78	51	49	0	0	0	0	0
Cold Spring River	29	30	18	21	97	0	100	0	0	0	0	0
Cold Spring Run	101	4	54	22	181	98	2	0	0	0	0	0
Dull Hunt Hollow	84	0	16	0	100	0	100	0	0	0	0	0
German River	44	20	40	29	133	0	100	0	0	0	0	0
Seventy Buck Lick Run	22	14	24	15	75	21	20	0	0	0	0	60
Snake Hollow	38	2	7	2	49	100	0	0	0	0	0	0
Straight Hollow Run	52	3	18	14	86	23	70	6	0	0	0	0
Sumac Run	55	6	19	3	83	NA						
Blue Lick Run	110	6	96	13	226	0	90	0	0	0	0	10
Camp Hollow	42	2	14	13	73	0	100	0	0	0	0	0
Gate Run	69	24	7	17	118	0	100	0	0	0	0	0
Grove Hollow	63	2	46	8	119	0	100	0	0	0	0	0
Lairs Run	98	0	52	5	155	0	73	27	0	0	0	0
Little Dry River	9	0	43	9	60	0	100	0	0	0	0	0
Marshall Run	75	4	41	12	132	15	42	42	0	0	0	1
Martin Lick Run	70	11	44	20	146	1	99	0	0	0	0	0
Mud Lick Run	89	1	72	0	162	15	85	0	0	0	0	0
Rocky Spur Hollow	49	2	46	9	106	1	64	35	0	0	0	0
Root Run	65	2	49	12	128	0	100	0	0	0	0	0
Bennett Run	62	21	4	5	92	0	100	0	0	0	0	0
Overly Run	38	13	1	3	55	0	100	0	0	0	0	0
Overly Run (upper)	49	24	0	3	76	0	100	0	0	0	0	0
Black Lick Run	85	0	7	1	93	32	68	0	0	0	0	0
Buck Lick Run	66	0	12	0	78	0	73	0	0	0	0	27
Cross Mountain Run	51	0	6	0	58	82	18	0	0	0	0	0
Hogpen Run	47	0	12	0	58	0	100	0	0	0	0	0
Little Hogpen Run												
Shoemaker River												
Slate Lick Branch (lower)	196	49	4	10	259	NA						
Slate Lick Branch (upper)	71	35	3	8	117	26	0	74	0	0	0	0

Summary of riparian width calculations for streams surveyed using the BVET habitat survey on the Dry River District during summer 2002. The left riparian width, right riparian width, and bankfull channel widths were added together before values for 'Riparian Width Total' were calculated. Left and right riparian widths were pooled together before values for 'Riparian Left & Right Width' were calculated.

Stream	Riparian Width Total (m)					Riparian Left & Right Width (m)				
	Mean	Max	75th	25th	Min	Mean	Max	75th	25th	Min
Capon Run	40	56	46	34	22	14	35	24	4	2
Crab Run										
N.F. Shenandoah River	56	56	56	56	56	17	22	20	15	12
Rattlesnake Run										
Siever Run										
Sirks Run	43	79	58	26	14	16	37	27	3	1
Spring Run	23	41	31	15	10	8	33	11	3	1
Spruce Run										
Beech Lick Run	10	17	13	6	5	3	13	4	1	1
Camp Rader Run	16	19	19	14	10	5	10	6	2	1
Carr Run	20	41	21	16	5	7	20	12	2	1
Clay Lick Hollow	21	44	24	15	8	9	26	13	4	1
Cold Spring River	25	39	32	18	12	9	27	10	3	2
Cold Spring Run	9	13	11	7	6	3	8	5	1	1
Dull Hunt Hollow	20	22	21	19	16	6	14	9	2	1
German River	13	17	15	11	7	4	10	6	2	1
Seventy Buck Lick Run	12	18	14	10	5	4	13	5	1	0
Snake Hollow	5	5	5	5	5	1	1	1	1	1
Straight Hollow Run	15	22	16	11	10	4	12	6	1	0
Sumac Run	15	18	17	14	12	6	12	8	3	1
Blue Lick Run	13	19	16	11	7	4	7	6	1	1
Camp Hollow	11	13	13	10	5	3	6	5	1	0
Gate Run	17	28	23	11	7	6	21	7	2	1
Grove Hollow	9	16	9	6	6	3	10	4	1	0
Lairs Run	28	109	26	12	10	11	77	16	2	1
Little Dry River	124	149	137	112	100	51	120	87	3	3
Marshall Run	29	50	40	14	10	11	32	16	3	1
Martin Lick Run	21	34	26	16	8	8	22	8	3	2
Mud Lick Run	9	12	10	7	6	3	6	4	1	1
Rocky Spur Hollow	14	20	19	9	9	5	15	6	3	1
Root Run	18	34	19	14	10	6	16	11	1	1
Bennett Run	14	35	13	9	9	5	23	5	1	0
Overly Run	25	46	33	14	8	10	40	12	1	0
Overly Run (upper)	19	27	24	15	8	8	14	12	5	1
Black Lick Run	12	22	13	8	7	4	14	4	2	1
Buck Lick Run	21	50	28	11	8	7	30	11	1	0
Cross Mountain Run	14	24	16	11	8	5	17	4	2	1
Hogpen Run	19	40	20	11	10	5	18	5	2	2
Little Hogpen Run										
Shoemaker River										
Slate Lick Branch (lower)	90	120	108	82	42	42	80	68	15	11
Slate Lick Branch (upper)	28	58	32	18	10	12	36	16	4	2