

**Comparison of Stream Habitat Conditions in the Daniel Boone
National Forest, KY, 1991 to 2004**



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Background

In the early 1990's the Daniel Boone National Forest (DBNF) developed a stream inventory work plan and associated techniques manual (Walker and Bishop 1991) with four primary objectives: 1) test a stream inventory system to determine applicability to the DBNF and other National Forests in the Southern Region; 2) inventory habitat, fish, macroinvertebrates, channel stability, valley segment types, and riparian vegetation in two reference streams within each of the three major physiographic regions spanned by the DBNF; 3) Use information from the reference streams to classify other streams within each respective physiographic region by 1995; and 4) monitor the effects of timber harvesting and road building on stream channel stability, fish habitat, and riparian vegetation. Personnel from the DBNF inventoried numerous stream reaches using the stream inventory work plan between 1991 and 1994. The original intent was to repeat the inventories every 3-5 years to provide a measure of change in conditions at each site. However the DBNF was unable to repeat inventories at regular intervals.

In 2004 the DBNF requested the assistance of the USDA Forest Service, Southern Research Station, Center for Aquatic Technology Transfer (CATT) with re-sampling of 18 of the original stream reaches and six new reaches. The objectives of the 2004 inventories were to characterize existing stream habitat and fish populations, and where possible to compare results with data collected in the 1990's. Methods used to collect fish in 2004 were nearly identical to those used in the original inventory (Walker and Bishop 1991). Habitat methods used during both inventory periods were based on visual estimation of habitat attributes (Hankin and Reeves 1998), however in 2004 several of the original attributes were either modified or eliminated and new attributes were added to the inventory. Despite the changes, several similar habitat attributes can be compared between inventories. Here we present all habitat data collected during the 2004 inventories and comparable data collected during the original inventories. Fish data collected in 2004 were provided to the DBNF for analysis and will be presented in a future report. The full 1990's dataset is available through the DBNF.

Sites

In the early 1990's seven watersheds with varying levels of management intensity were inventoried from mouth to headwater. Streams within each of these watersheds were divided into reaches based on changes in stream habitat and riparian conditions and valley geomorphic characteristics as determined from aerial photos, topographic maps, and observations made during habitat inventories. Additional inventory reaches were selected based on physiographic characteristics (Smalley 1986). In 2004 we visited 18 previously inventoried stream reaches and six new stream reaches to perform stream habitat inventories (Table 1, Figure 1).

Methods

Inventories in both the 1990's and 2004 were based on visual estimation of stream habitat attributes (Hankin and Reeves 1998), however in 2004 several of the original attributes were either modified or eliminated and new attributes were added to the inventory. Despite the changes, several similar habitat attributes are comparable between years. Here we present the 2004 to stream habitat inventory protocol and describe habitat attributes from the original inventories used for comparison.

In 2004, two-stage visual estimation techniques were used to quantify habitat within each reach. 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), substrate composition, and percent fines. 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 (Appendix B). 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. Percent fines was the percent of surface area of the stream bed that consisted of sand, silt, or clay substrate particles (particles < 2 mm diameter). In addition, several attributes of road-stream crossings (location, type, size, etc.) were recorded, where encountered.

The second crew member classified and inventoried large woody debris (LWD) within the stream channel, determined the Rosgen's channel type (Appendix B) associated with each habitat unit, and recorded data on a Husky fex21 data logger. LWD was assigned to one of four size classes (Appendix B). All woody debris less than 1.0 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 and averaged. In each of the systematically selected (second stage) riffles we also estimated the bankfull stream channel width and riparian width, measured channel gradient and water temperature, and took a digital photograph. 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 an elevation equal to two-times maximum bankfull depth as described by Rosgen (1996). Gradient was estimated by using a clinometer to site from the downstream to the upstream end of the selected riffle. Water temperature was measured with a thermometer in flowing water out of direct sunlight.

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 for all inventories (Hankin and Reeves 1988). Analyses were completed with Microsoft Excel using formulas found in Dolloff et al. (1993). Data were summarized using Excel spreadsheets and SigmaPlot graphics software.

Several of the stream attributes described above were comparable to data collected in the 1990's including: estimated habitat unit area, average depth, riffle crest depth (RCD), substrate composition, and large woody debris (LWD), however there were differences in field techniques between inventories. During the initial inventory unit length was visually estimated, not measured with a hipchain. The RCD was recorded only for pools, not for glides and pools. The total number of pieces of LWD > 3.6 m in long and > 30 cm in diameter was recorded, not the total number of pieces > 1.0 m long and > 10 cm in diameter, and there were no LWD size classes. Given those differences we were able to make comparisons of pool: riffle ratio, substrate, depth, residual depth (for pools only) and total LWD.

Results

We were able to make comparisons between 1990's and 2004 data for a total of 18 stream reaches. The proportion of pools to riffles increased by more than 10% in 10 reaches and decreased by more than 10% in three reaches (Table 3). Average depth of riffles increased in more than half of all reaches, whereas average pool depth and residual pool depth both decreased in all reaches (Figure 2, Table3).

Half of the reaches surveyed in the 1990's had sand/silt as the most common subdominant substrate in pools (Figure 3). In 2004, half of the surveyed reaches had sand/silt as the most common dominant substrate in pools. Rubble was the most common subdominant substrate in riffles in the 1990's and cobble and gravel were most common in 2004. Sand/silt and gravel were more common as subdominant substrates in 2004 than the 1990's.

Total LWD ranged from 13 to 317 pieces per km in the 22 stream reaches. Total LWD counts were expectedly higher in the majority of streams in 2004 (see discussion below). However, total LWD counts decreased in four streams in 2004 (Table 4).

The four streams inventoried for the first time in 2004 showed a similar range in conditions to the 18 streams used for comparison between years. Three of the four streams had sand as the most common dominant substrate in pools. Total LWD ranged from 66 to 139 pieces per km.

Discussion

Comparison of 2004 habitat inventories to data collected in the 1990's suggests that over the past decade inventoried reaches have trended away from channels with deep, small surface area pools towards channels with shallow, large surface area glides. We found increases in the proportion of total surface area covered by slow water habitat units in 10 of 18 reaches and decreases in average pool depths and residual pool depths in all reaches. Loss of residual depth was greater than 30 cm in over half of all inventory reaches. While average pool depth is subject to change with fluctuating water levels, calculation of residual pool depth corrects for such fluctuations, thus changes in residual depths reflect actual changes in pool morphology. Furthermore, average riffle depth increased in over 50% of reaches and total wetted surface area increased for four streams with identical inventory lengths between years (War Fork, Rebel Trace, Tickey Fork, and Brierfield Branch 2) suggesting that water levels in the majority of streams were at or above levels encountered during the initial inventories.

One possible explanation for loss of pool depth is deposition of fine sediment in pools. We observed an increase in the prevalence of fine substrate particles as a proportion of total substrates in pools between the 1990's and 2004 inventories. In the 1990's half of the inventoried reaches had sand/silt as the most common subdominant substrate category in pools. By 2004, sand/silt became the dominant substrate category in half of the inventoried reaches. Riffles also trended towards smaller substrates with cobbles and gravels increasing in proportion at the expense of rubble and boulders as the most common dominant substrates, and with increases in gravels and sand/silt and decreases in rubble and boulder as the most common subdominant substrates. These trends are particularly disturbing considering that 4 of 5 new inventory reaches contained sand/silt as the most common dominant substrate in pools with the 5th stream containing sand/silt as the most common subdominant substrate in riffles. Increase in fine sediment affects both the physical structure of streams and their ecology. As fine sediments increase pools fill and lose residual volume and riffles become embedded (Kappesser 2002). Such changes have been documented to have negative effects on many aquatic organisms including macroinvertebrates (Lemley 1982, Erman and Erman 1984), fish (Berkman and Rabeni 1987, Burkhead and Jelks 2001, Haro and Brusven 1994), amphibians (Corn and Bury 1989) and mussels (Box and Mossa 1999). Residual pools provide important refuges for fish, amphibians, especially in streams prone to annual drying. Other effects include loss of interstitial habitat, decreased reproductive success, decreased feeding efficiency, changes in predator-prey relationships and changes in community structure (Waters 1995).

Potential sources of fine sediment on the DBNF are numerous and include historic land use, off-highway vehicle (OHV) use, roads, and trails. Historically, many streams in Eastern Kentucky were straightened and channelized to provide for expanding agricultural fields. Channel straightening typically

reduces pool volume and increases stream sedimentation (Knighton 1998). OHV use can also increase stream sedimentation (Riedel 2006) and was noted at several inventory sites. OHV use on National Forests has grown substantially over the past decade. The Chief of the Forest Service has cited unmanaged recreation, particularly OHV use as one of the four major threats to the health of National Forests. On the DBNF it appears that in some areas OHV traffic is overwhelming efforts to regulate use. Road and trail maintenance, designation of use areas, closure of sensitive areas, user education, enforcement, and use monitoring should be the foundation of efforts to decrease effects of OHV use on DBNF streams.

The amount of LWD in streams can also have large influences on channel morphology and stream ecology. Woody debris plays a major role in creating habitat diversity for macroinvertebrates and fishes by forming of pools, retaining organic matter, and providing cover (Benke and Wallace 2003, Dolloff and Warren 2003). In 2004 we counted all pieces of LWD greater than 1 m long and 10 cm in diameter, whereas during the initial inventory only pieces greater than 3.6 m long and 30 cm in diameter were counted. Since smaller size classes typically comprise the majority of LWD we expected large increases in the total LWD in 2004. However, four streams showed decreases in LWD (War Fork, Hawk Creek Tributary, Bear Creek upper, and Katies Creek) and one stream (Rebel Trace) increased by only 1 piece per km.

LWD is recruited to streams by several mechanisms including mortality, blowdown, fire, bank erosion, landslides and ice storms (Benda et al. 2003). Lack of recruitment could be related to the temporally and spatially sporadic nature of many of these mechanisms or to riparian and upland characteristics of each stream. Forest management can affect LWD recruitment by changing riparian and upland characteristics through activities such as timber harvest and road and trail construction. Our results warrant a review of recent management activities in these reaches to determine if lack of LWD recruitment is related to management practices or simply to variability in natural processes contributing LWD to the stream channel.

Our results provide information that can be used to determine trends in the inventoried reaches. Such data are useful for project-level monitoring in the inventoried watersheds, but the monitoring design does not allow us to extend our results to other streams in the DBNF. For example, our results show that in many reaches fine sediments became more prevalent, which may lead to management actions to mitigate sediment inputs in these watersheds. However, questions regarding the status and trends of fine sediments in other streams across the Forest remain unanswered.

Monitoring programs based on 'rotating panel designs' involve visiting a number of randomly selected sites on an annual basis, and revisiting some or all of the sites on a fixed rotation (Hixon et al. 2004, Reeves et al. 2003). Such designs allow extrapolation of results beyond sampled reaches, allowing Forests to characterize streams and detect change at the Forest level. In addition to providing information needed for Forest planning, Forest-level monitoring can be used to provide context to project-level

monitoring needed to meet many regulatory or legal obligations. Given that one of the original purposes of the DBNF monitoring program was to extrapolate data from inventoried streams to other streams on the Forest, future monitoring should incorporate both project-level and Forest-level efforts.

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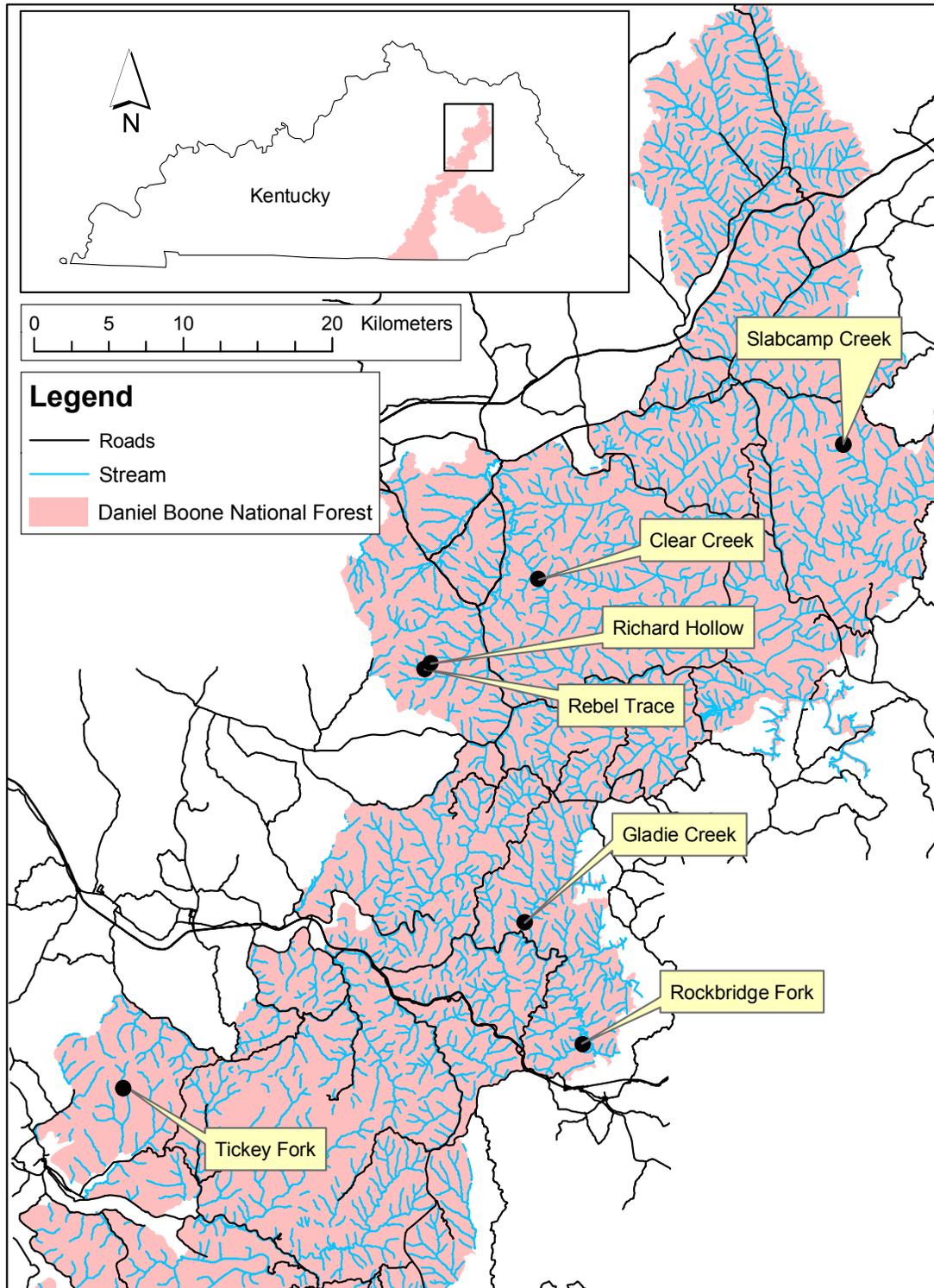


Figure 1a. Location of sites sampled in the northern portion of the DBNF in summer 2004.

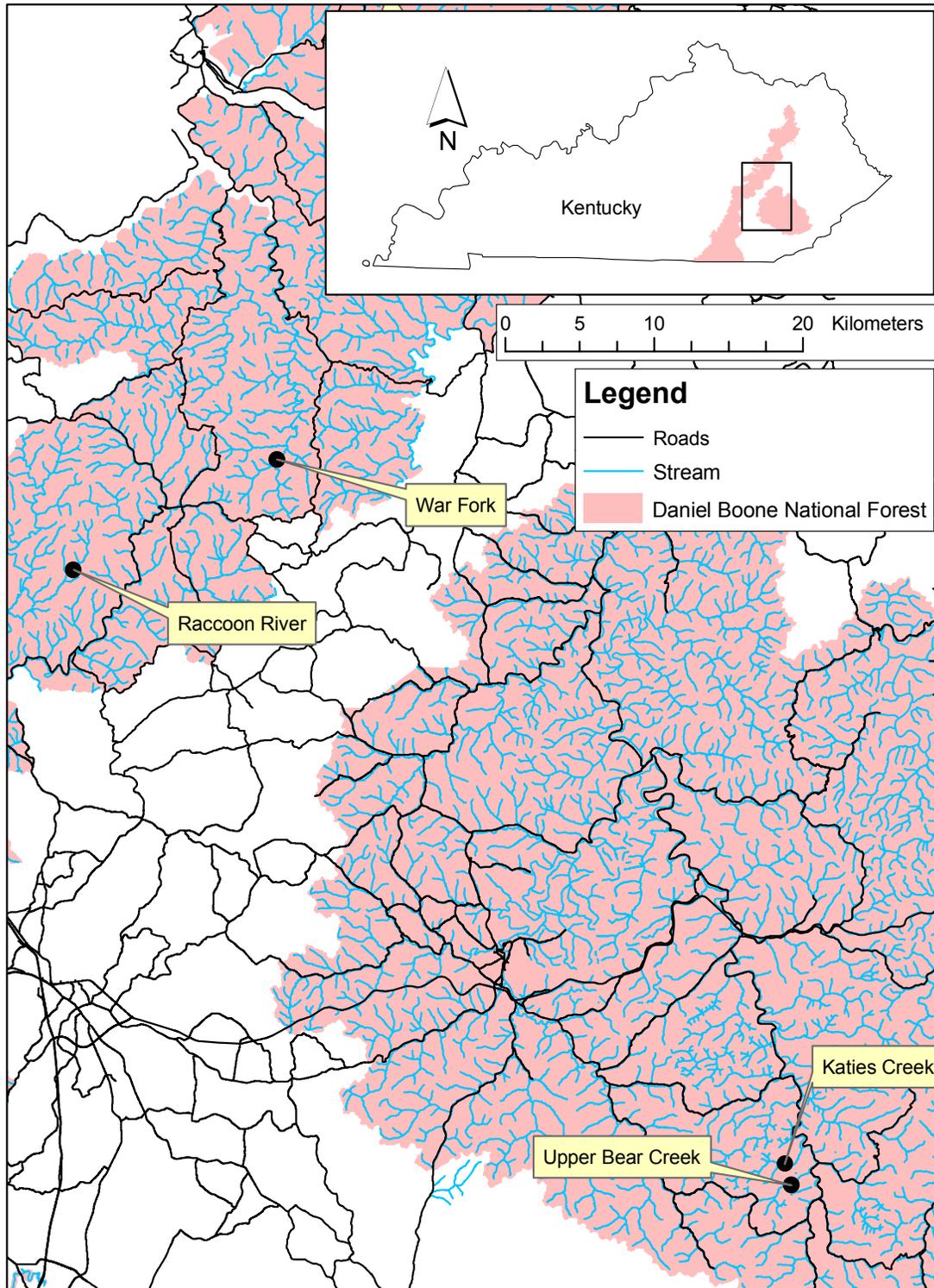


Figure 1b. Location of sites sampled in the central portion of the DBNF in summer 2004.

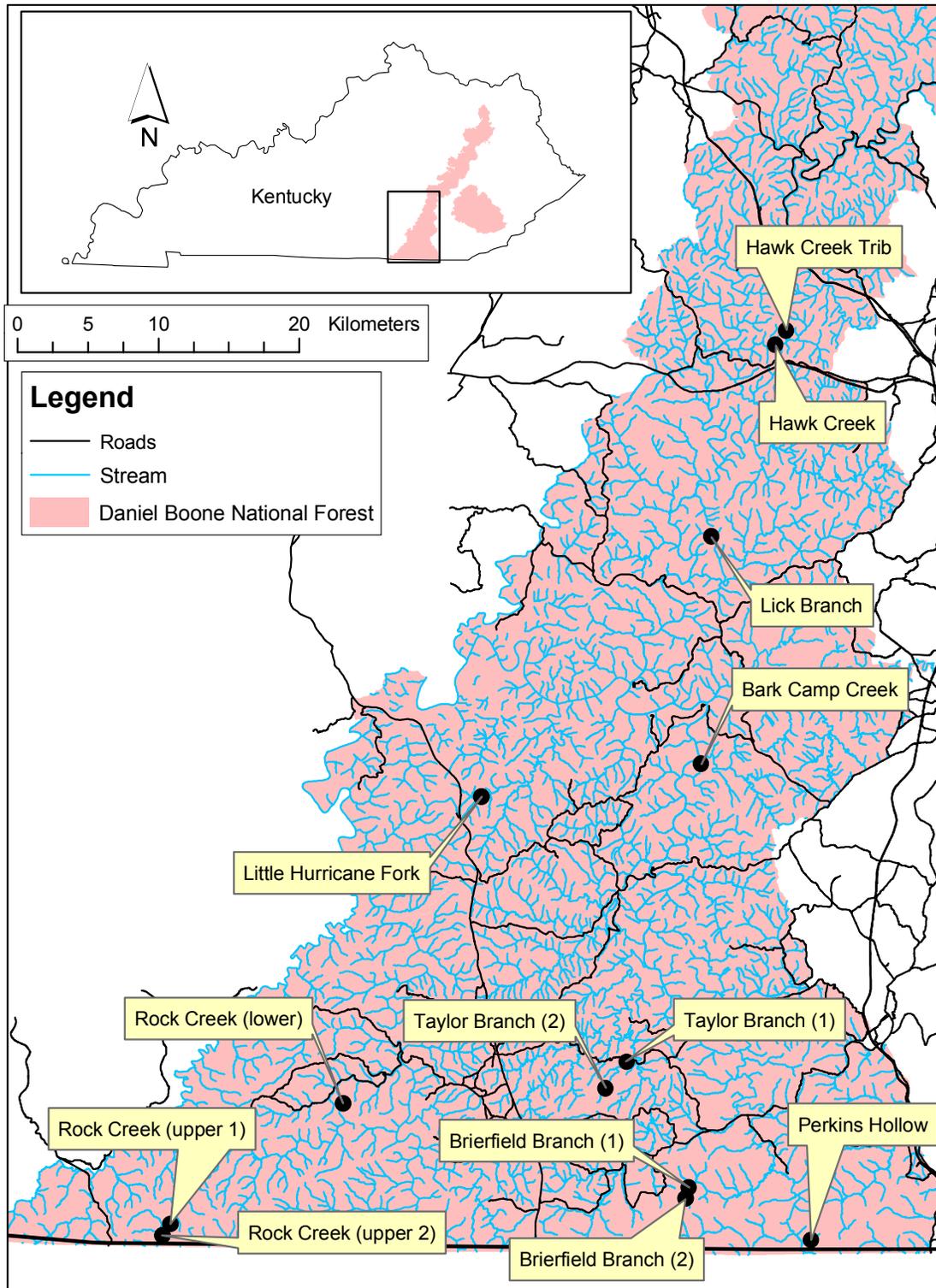


Figure 1c. Location of sites sampled in the southern portion of the DBNF in summer 2004.

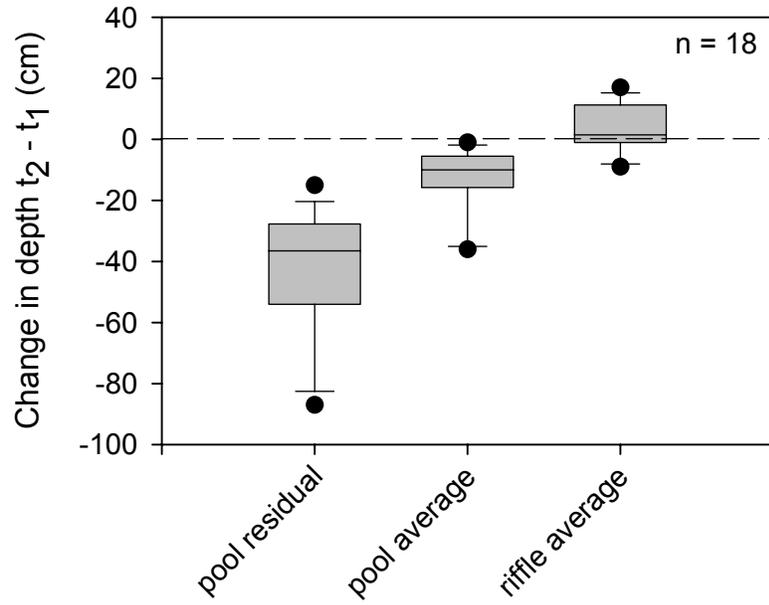
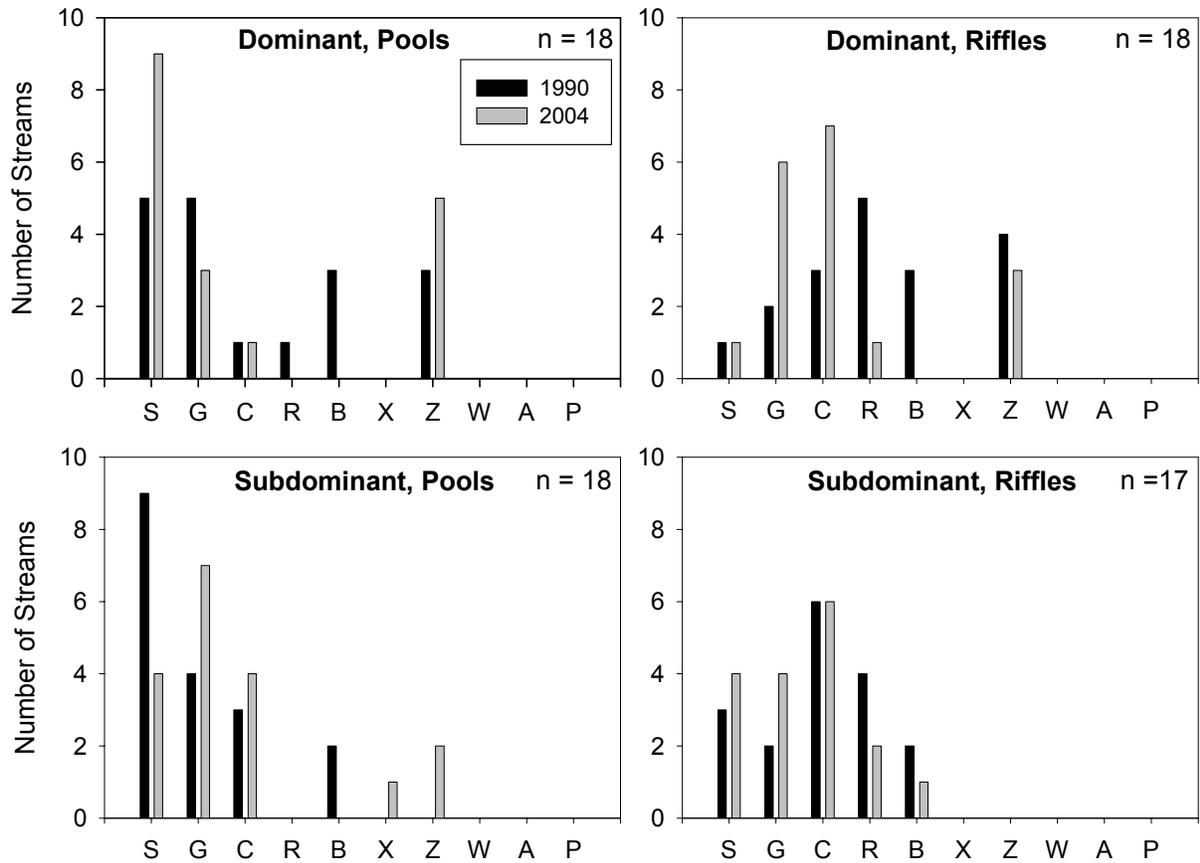


Figure 2. Change in residual pool depth, average pool depth, and average riffle depth from 1990's to 2004 inventories. Glides were excluded from 2004 data prior to calculation of residual pool depth (residual depth was not recorded for glides in 1990's data).



Type	Code	Size (mm)
Silt/Sand	S	< 7
Gravel	G	8-73
Cobble	C	74-149
Rubble	R	150-302
Boulder	B	303-914
Big Boulder	X	>914
Bedrock	Z	
Wood	W	
Ash	A	
Pumice	P	

Figure 3. Counts of the most frequently encountered dominant and subdominant substrates in pool and riffle habitats for streams surveyed on the DBNF in the 1990's and 2004.

Table 1. Streams selected for habitat inventories in 1990's and 2004 on the DBNF.

Stream	District	Quad	Survey Distance (km)	
			1990s	2004
War Fork	Berea	McKee	1.2	1.2
Raccoon Creek	Berea	Sandgap	0.9	0.8
Lick Branch	London	Ano	1.3	2.0
Hawk Creek	London	Bernstadt	not surveyed	1.1
Hawk Creek Trib	London	Bernstadt	0.7	0.9
Barkcamp Creek	London	Sawyer	3.1	1.0
Clear Creek	Morehead	Saltlick	1.5	1.6
Slabcamp Creek	Morehead	Wrigley	0.7	0.8
Rebel Trace	Morehead/Stanton	Frenchburg	0.9	0.9
Richard Hollow	Morehead/Stanton	Frenchburg	not surveyed	0.9
Katie's Creek	Redbird	Creekville	0.5	1.1
Upper Bear Creek	Redbird	Creekville	1.2	1.3
Little Hurricane Fork	Somerset	Hail	1.3	1.5
Gladie Creek	Stanton	Pomeroyton	1.4	1.1
Rockbridge Fork	Stanton	Pomeroyton	not surveyed	0.8
Tickey Fork	Stanton/Berea	Irvine/Clay City	0.9	0.9
Rock Creek (lower)	Stearns	Barthell	0.8	0.8
Rock Creek (upper 1)	Stearns	Barthell SW	not surveyed	1.4
Rock Creek (upper 2)	Stearns	Barthell SW	0.5	0.8
Brierfield Branch (1)	Stearns	Hollyhill	not surveyed	0.4
Brierfield Branch (2)	Stearns	Hollyhill	1.1	1.0
Perkins Hollow	Stearns	Jellico West	2.2	1.9
Taylor Branch (1)	Stearns	Whitley City	not surveyed	1.3
Taylor Branch (2)	Stearns	Whitley City	1.7	1.3

Table 2. Comparison of pool area, pool average depth, pool residual depth and riffle average depth from habitat inventories performed on DBNF streams in the 1990's and those performed in 2004. Inventories performed in the 1990's used methods described in Walker and Bishop 1991. Inventories performed in 2004 used methods described in the present report. Pool residual depth in 1990's is for pools only; glides are not included. Pool residual depth in 2004 is shown as pools only, with pools and glides combined in parentheses.

Stream	Pool Area (%)		Pool Ave. Depth (cm)		Pool Residual Depth (cm)		Riffle Ave. Depth (cm)	
	1990's	2004	1990's	2004	1990's	2004	1990's	2004
Berea District								
War Fork	69	66	59	53	79	36(31)	14	25
Raccoon Creek	52	31	36	34	43	22(16)	8	20
London District								
Lick Branch	57	67	14	10	42	7(6)	6	6
Hawk Creek	NA	66	NA	52	NA	36(33)	NA	22
Hawk Creek Trib	37	23	26	16	40	12(9)	5	10
Barkcamp Creek	49	81	71	50	110	28(31)	15	19
Morehead District								
Clear Creek	77	88	46	38	66	39(33)	6	6
Slabcamp Creek	58	90	35	21	41	17(16)	6	5
Morehead/Stanton District								
Rebel Trace	NC	NC	44	16	56	25 ¹ (25)	3	5
Richard Hollow	NA	NC	NA	22	NA	10 ² (8)	NA	5
Redbird District								
Katie's Creek	25	52	56	20	99	12(12)	13	8
Upper Bear Creek	28	41	74	39	96	30(29)	21	13
Somerset District								
Little Hurricane Fork	46	64	39	27	71	21(19)	8	10
Stanton District								
Gladie Creek	80	63	54	53	139	70 ³ (36)	8	25
Rockbridge Fork	NA	65	NA	24	NA	17(13)	NA	10
Stanton/Berea District								
Tickey Fork	9	30	25	15	52	12(9)	8	9
Stearns District								
Rock Creek (lower)	NC	38	94	81	95	51(42)	27	39
Rock Creek (upper 1)	NA	35	NA	52	NA	21	NA	29
Rock Creek (upper 2)	NC	71	107	99	135	120(105)	22	37
Brierfield Branch (1)	NA	59	NA	16	NA	16(12)	NA	5
Brierfield Branch (2)	31	43	24	12	48	10(7)	4	4
Perkins Hollow	22	16	29	20	47	15(11)	10	9
Taylor Branch (1)	NA	66	NA	18	NA	6	NA	7
Taylor Branch (2)	34	54	22	18	49	14(9)	15	6

¹ no pools with residual depths; all riffles were underground

² only one pool with residual depth recorded; riffles downstream of all but one pool were underground

³ only one pool with residual depth recorded; rest of pools recorded as glides

Table 3. Comparison of total large woody debris (LWD) results from habitat inventories performed on DBNF streams in the 1990's and those performed in 2004. Inventories performed in the 1990's counted all pieces greater than 3.6 m long and > 30 cm diameter. Surveys in 2004 counted all pieces > 1 m long and > 10 cm in diameter. Inventories performed in 2004 used methods described in the present report.

Stream	Total LWD (n/km)	
	1990's	2004
Berea District		
War Fork	33	23
Raccoon Creek	15	70
London District		
Lick Branch	47	81
Hawk Creek	NA	66
Hawk Creek Trib	186	179
Barkcamp Creek	32	153
Morehead District		
Clear Creek	66	150
Slabcamp Creek	34	189
Morehead/Stanton District		
Rebel Trace	36	37
Richard Hollow	NA	128
Redbird District		
Katie's Creek	35	13
Upper Bear Creek	30	21
Somerset District		
Little Hurricane Fork	14	156
Stanton District		
Gladie Creek	34	85
Rockbridge Fork	NA	139
Stanton/Berea District		
Tickey Fork	54	62
Stearns District		
Rock Creek (lower)	20	39
Rock Creek (upper 1)	NA	47
Rock Creek (upper 2)	56	97
Brierfield Branch (1)	NA	106
Brierfield Branch (2)	14	60
Perkins Hollow	20	155
Taylor Branch (1)	NA	96
Taylor Branch (2)	92	337

Table 4. The most frequently encountered dominant and subdominant substrates in pool and riffle habitats for streams surveyed on the DBNF in the 1990's and 2004.

Stream	Pools		Pools		Riffles		Riffles	
	Dominant		Subdominant		Dominant		Subdominant	
	1990's	2004	1990's	2004	1990's	2004	1990's	2004
Berea District								
War Fork	G	C	C	G	R	C	C	C
Raccoon Creek	R	S	B	G	R	C	B	G
London District								
Lick Branch	S	S	S	Z	S	S	S	S
Hawk Creek	NA	S	NA	G	NA	C	NA	G
Hawk Creek Trib	S	Z	S	S	Z	Z	R	G
Barkcamp Creek	B	Z	S	S	B	Z	S	S
Morehead District								
Clear Creek	G	G	G	G	G	G	G	S
Slabcamp Creek	S	G	C	C	C	G	R	C
Morehead/Stanton District								
Rebel Trace	G	S	S	G	G	G	NONE	S
Richard Hollow	NA	G	NA	G	NA	G	NA	S
Redbird District								
Katie's Creek	Z	Z	S	G	Z	C	C	C
Upper Bear Creek	Z	Z	S	C	Z	Z	R	C
Somerset District								
Little Hurricane Fork	Z	Z	B	C	R	G	C	C
Stanton District								
Gladie Creek	S	S	C	G	C	C	C	G
Rockbridge Fork	NA	S	NA	S	NA	C	NA	S
Stanton/Berea District								
Tickey Fork	B	S	G	S	B	C	G	G
Stearns District								
Rock Creek (lower)	B	S	S	X	B	R	S	B
Rock Creek (upper 1)	NA	R	NA	G	NA	R	NA	C
Rock Creek (upper 2)	C	S	S	S	C	C	B	R
Brierfield Branch (1)	NA	S	NA	G	NA	C	NA	G
Brierfield Branch (2)	G	S	G	G	R	G	C	C
Perkins Hollow	G	G	G	C	R	G	C	R
Taylor Branch (1)	NA	S	NA	S	NA	Z	NA	S
Taylor Branch (2)	S	S	S	Z	Z	C	R	S

Type	Code	Size (mm)
Silt/Sand	S	< 7
Gravel	G	8-73
Cobble	C	74-149
Rubble	R	150-302
Boulder	B	303-914
Big Boulder	X	>914
Bedrock	Z	
Wood	W	
Ash	A	
Pumice	P	

Appendix A: Stream Habitat 1990's vs. 2004

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**Berea District
McKee Quadrangle**

Stream:	War Fork		
District:	Berea		
USGS Quadrangle:	McKee		
	1993		2004
Survey Date:	6/02/1993		07/08/04
Total Distance Surveyed (km)*:	1.2		1.2

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	69	66	31	34
Total Area (m ²):	4941±434	6465±1575	2179±NC	3389±2255
Correction Factor Applied:	1.07	1.01	0.93	1.09
Number of Paired Samples:	2	3	1	3
Total Count:	23	16	20	16
Number per km:	20	14	18	14
Mean Area (m ²):	215	404	109	212
Mean Maximum Depth (cm):	NA	93	NA	41
Mean Average Depth (cm):	59	53	14	25
Mean Residual Depth (cm)*:	79	31	--	--
Percent Surveyed as Glides:	57	31	--	--
Percent Surveyed as Runs:	--	--	NA	0
Percent Surveyed as Cascades:	--	--	0	0
Percent with > 35% Fines:	NA	44	NA	6

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected; NC = could not calculate

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	15
1 - 5 m long, > 55 cm diameter:	NA	0
> 5 m long, 10 cm – 55 cm diameter:	NA	8
> 5 m long, > 55 cm diameter:	NA	0
Total:	33	23

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	100
C:	0
D:	0
E:	0
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	6.3
Median Water Temperature (C):	20

*recorded in 2004 only

*Berea District
McKee Quadrangle*

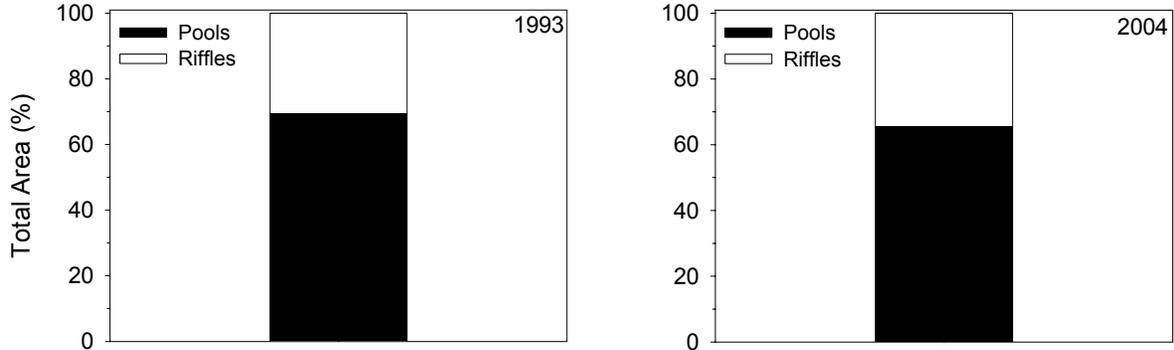


Figure A3. Estimated area of War in pools and riffles as calculated using BVET techniques.

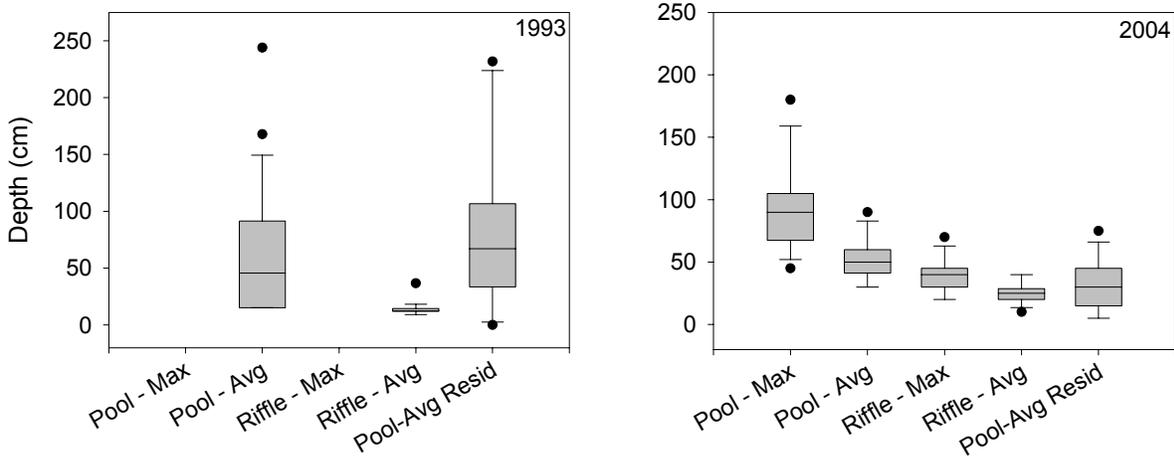


Figure A4. Maximum and average depths for pools and riffles and residual depths in War Fork. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

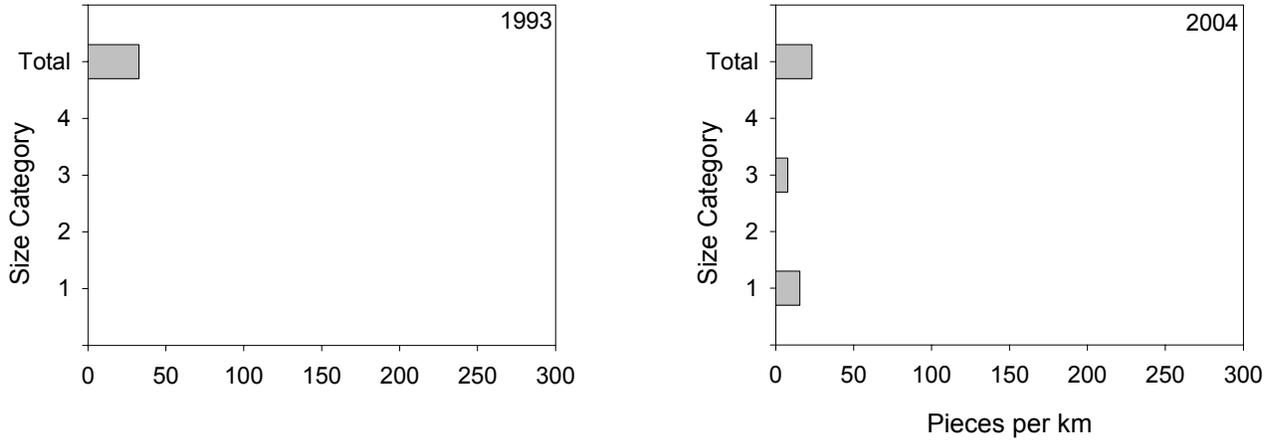


Figure A5. LWD per kilometer in War Fork. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: < 5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

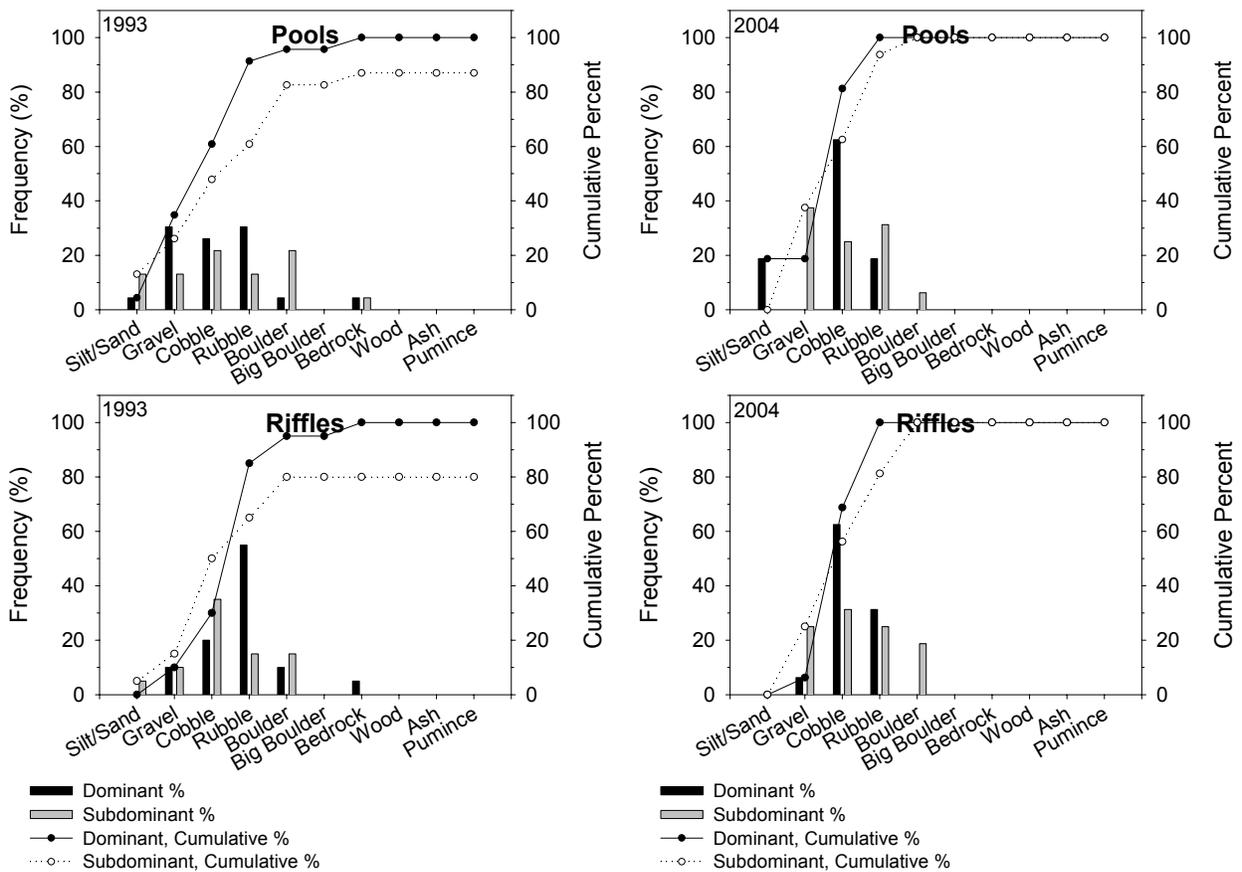


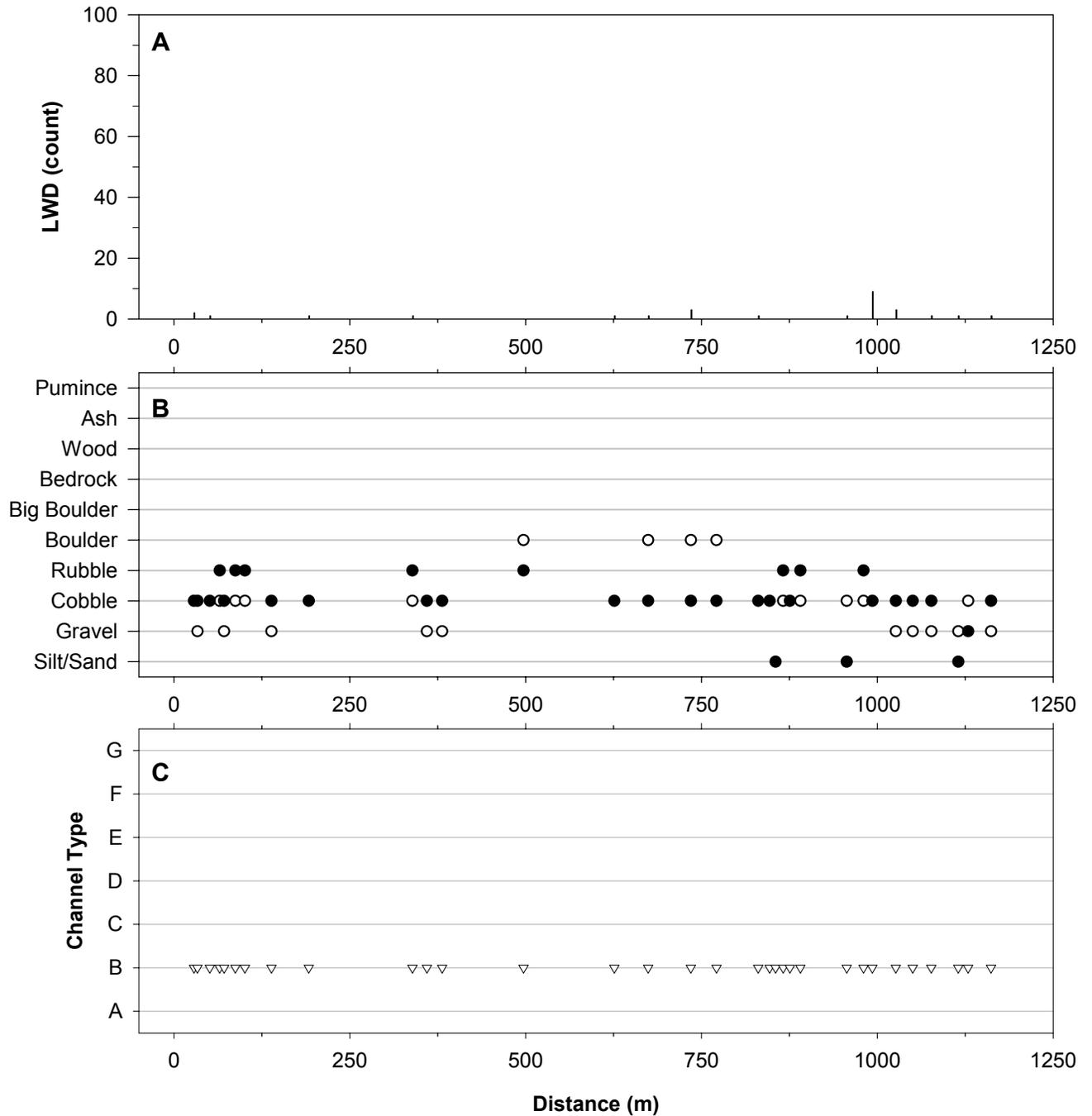
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in War Fork.

*Berea District
McKee Quadrangle*

Stream features found on War Fork during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		ABOUT 200M ABOVE ROUTE 4 BRIDGE. ROCK STRUCTURE (WALL?) TO LEFT OF STREAM. BRIDGE NOT VISIBLE FROM START POINT.
SCH	145.6		IN ON RIGHT. DRY.
SCH	172.2	2.5	IN ON LEFT.
SCH	195.7		OUT ON LEFT.
SCH	426.2	2.5	IN ON RIGHT
SCH	499		OUT ON RIGHT
TRIB	605.7		IN ON LEFT. DRY. PASSES UNDER ROAD THROUGH TWO METAL PIPES.
SEEP	708.4		
SCH	855.3	2	IN ON LEFT
FORD	894		
SCH	900.7		OUT ON LEFT

*Berea District
McKee Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in War Fork, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrate. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Berea District
Sandgap Quadrangle*

Stream:	Raccoon Creek	
District:	Berea	
USGS Quadrangle:	Sandgap	
	1991	2004
Survey Date:	6/27-10/25/1991	7/8/2004
Total Distance Surveyed (km)*:	1.1	1.2

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1991	2004	1991	2004
Percent of Total Stream Area:	52	31	48	69
Total Area (m ²):	1527±66	1362±335	1424±17	3032±2185
Correction Factor Applied:	0.99	1.02	1.02	0.98
Number of Paired Samples:	7	4	7	3
Total Count:	34	17	37	16
Number per km:	39	20	43	19
Mean Area (m ²):	45	80	38	190
Mean Maximum Depth (cm):	NA	59	NA	36
Mean Average Depth (cm):	36	34	8	20
Mean Residual Depth (cm)*:	43	16	--	--
Percent Surveyed as Glides:	32	35	--	--
Percent Surveyed as Runs:	--	--	NA	0
Percent Surveyed as Cascades:	--	--	0	0
Percent with > 35% Fines:	NA	71	NA	19

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1991	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	32
1 - 5 m long, > 55 cm diameter:	NA	1
> 5 m long, 10 cm – 55 cm diameter:	NA	30
> 5 m long, > 55 cm diameter:	NA	7
Total:	15	70

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	0
C:	0
D:	0
E:	0
F:	100
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	5.0
Median Water Temperature (C):	20

*recorded in 2004 only

*Berea District
Sandgap Quadrangle*

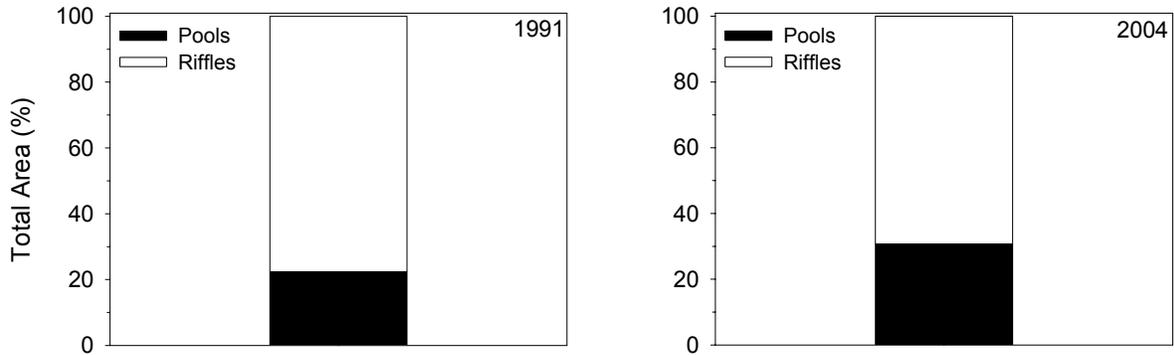


Figure A3. Estimated area of Raccoon Creek in pools and riffles as calculated using BVET techniques.

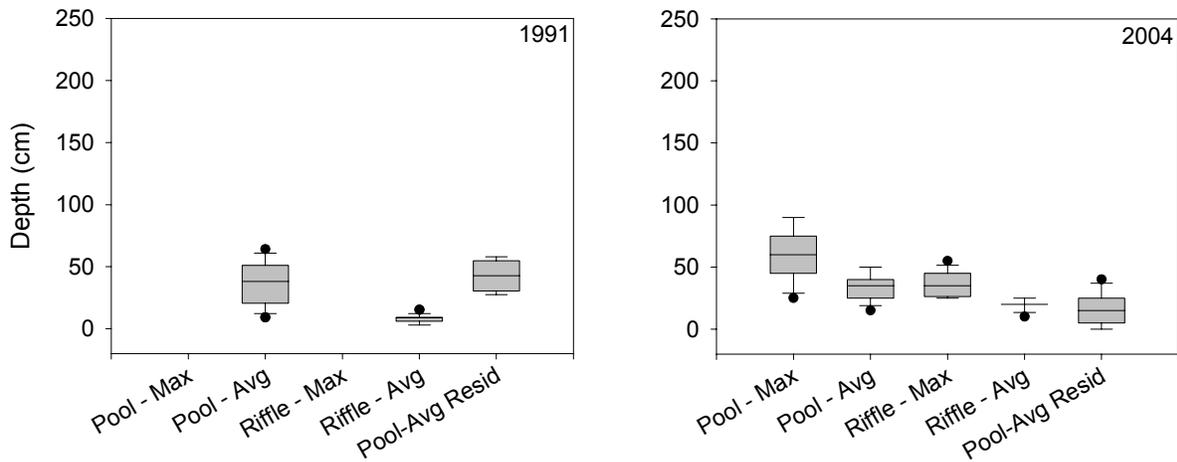


Figure A4. Maximum and average depths for pools and riffles and residual depths in Raccoon Creek. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

**Berea District
Sandgap Quadrangle**

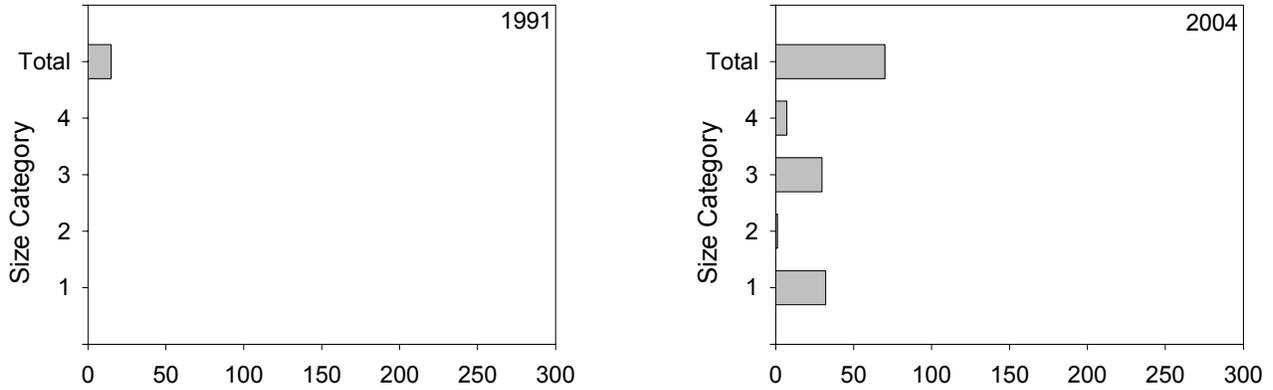


Figure A5. LWD per kilometer in Raccoon Creek. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: < 5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

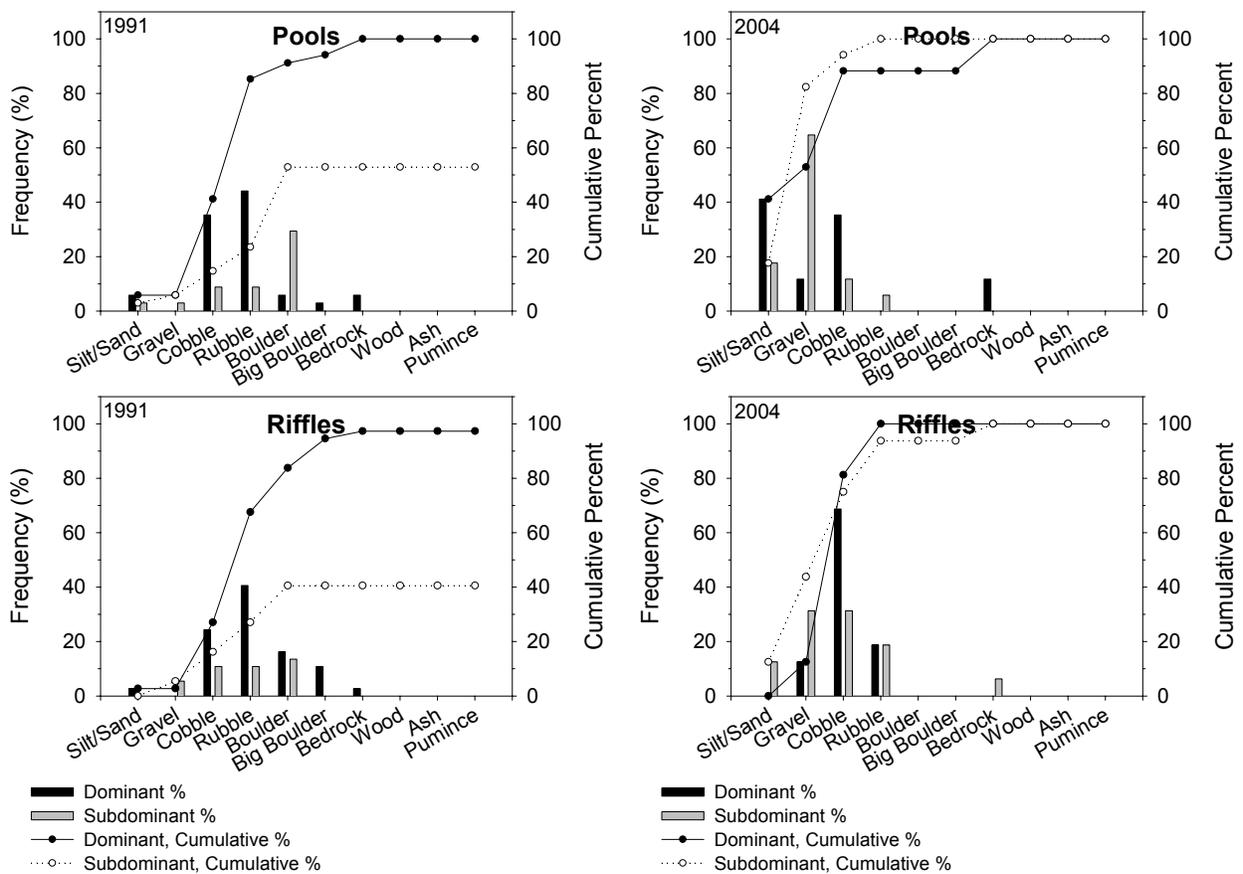


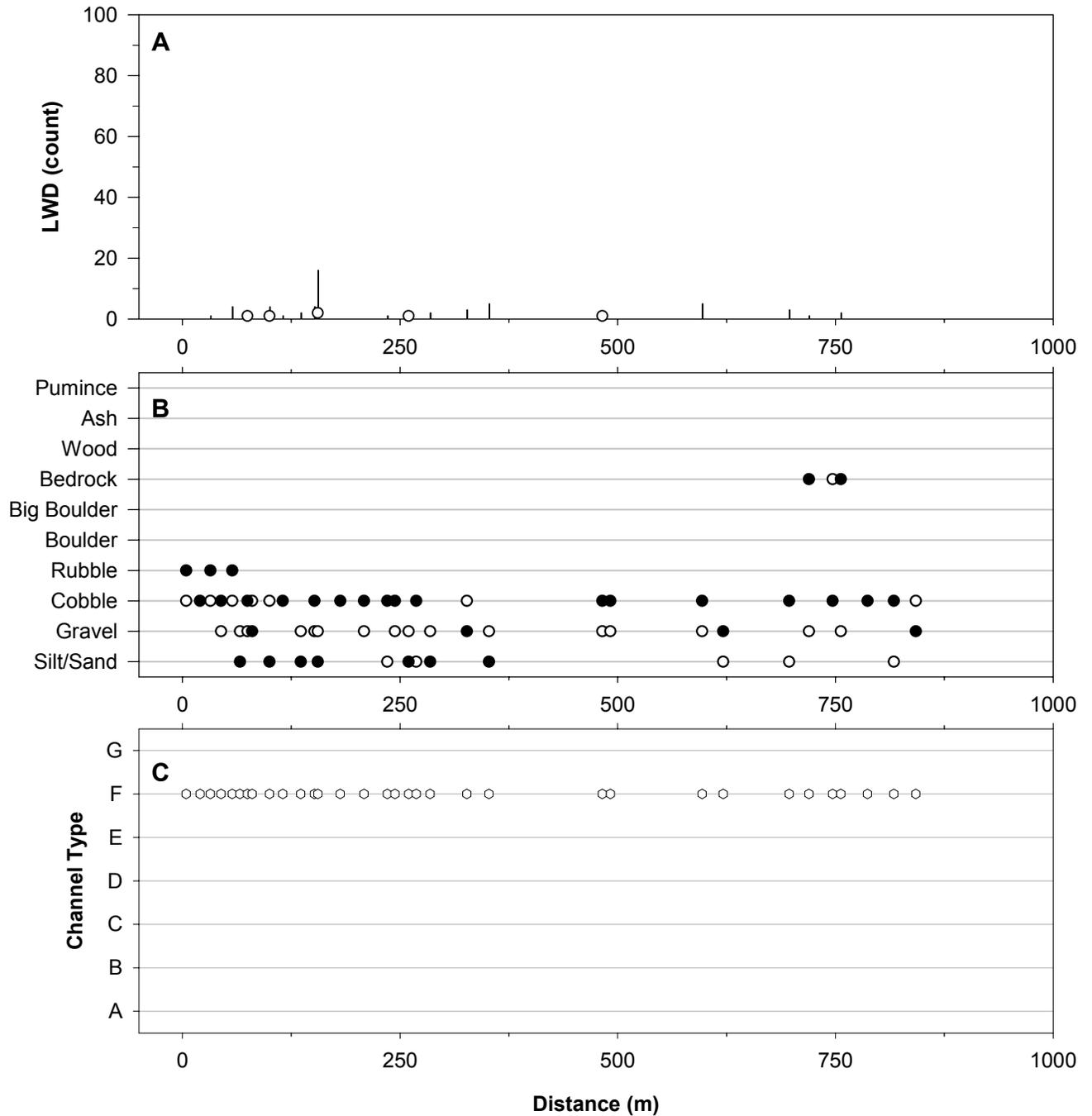
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Raccoon Creek.

*Berea District
Sandgap Quadrangle*

Stream features found on Raccoon Creek during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		CONFLUENCE OF RACCOON CREEK AND UNNAMED TRIB
TRIB	817		

*Berea District
Sandgap Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Raccoon Creek, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*London District
Ano Quadrangle*

Stream:	Lick Branch		
District:	London		
USGS Quadrangle:	Ano		
	1993		2004
Survey Date:	6/28/1993		7/10/2004
Total Distance Surveyed (km)*:	1.3		2.0

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	57	67	43	33
Total Area (m ²):	1369±555	2290±201	1050±198	1141±529
Correction Factor Applied:	0.99	0.98	1.30	0.96
Number of Paired Samples:	5	9	8	5
Total Count:	71	81	71	47
Number per km:	57	40	0	23
Mean Area (m ²):	19	28	15	24
Mean Maximum Depth (cm):	NA	20	NA	11
Mean Average Depth (cm):	14	10	6	6
Mean Residual Depth (cm)*:	42	6	--	--
Percent Surveyed as Glides:		62	--	--
Percent Surveyed as Runs:	--	--	0	0
Percent Surveyed as Cascades:	--	--	0	0
Percent with > 35% Fines:	NA	90	NA	85

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	54
1 - 5 m long, > 55 cm diameter:	NA	5
> 5 m long, 10 cm – 55 cm diameter:	NA	20
> 5 m long, > 55 cm diameter:	NA	2
Total:	47	81

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	0
C:	0
D:	0
E:	100
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	1.0
Median Water Temperature (C):	20

*recorded in 2004 only

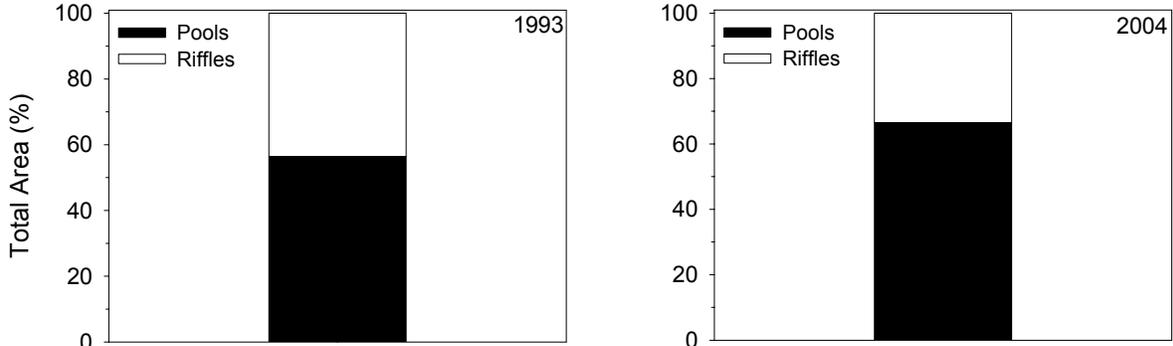


Figure A3. Estimated area of Lick Branch in pools and riffles as calculated using BVET techniques.

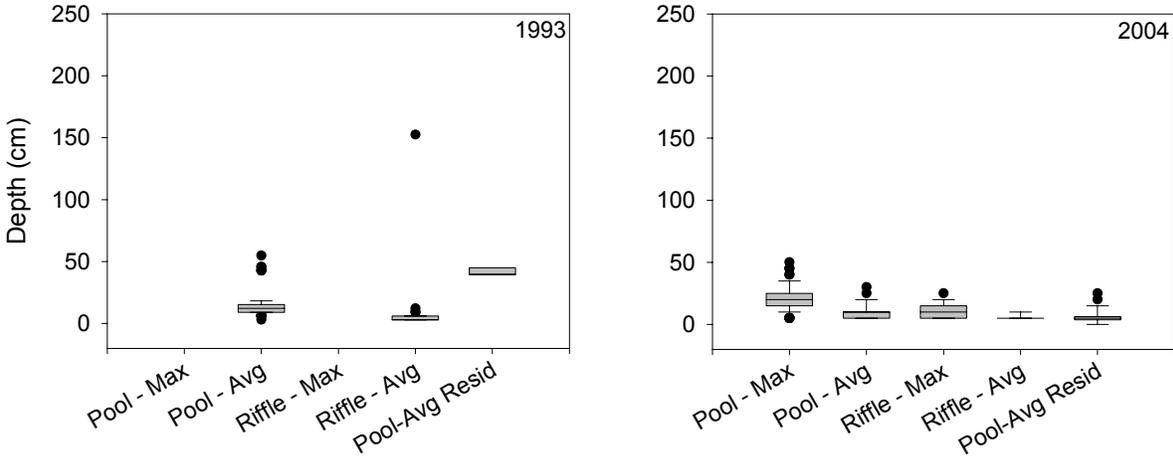


Figure A4. Maximum and average depths for pools and riffles and residual depths in Lick Branch. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

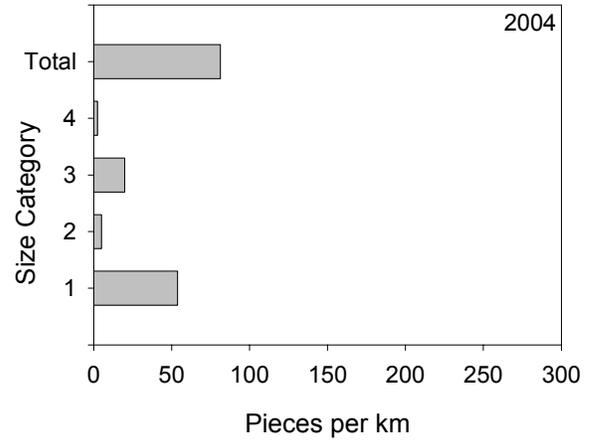
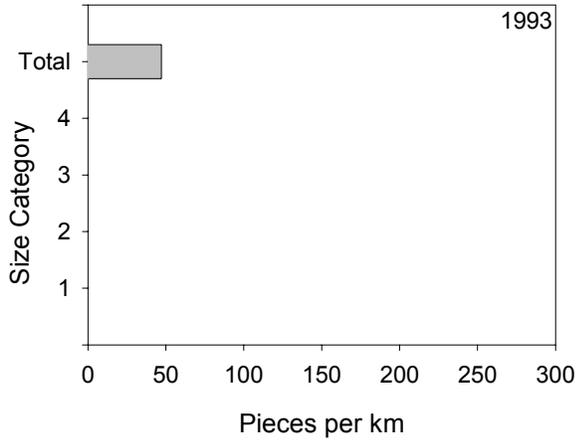


Figure A5. LWD per kilometer in Lick Branch. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diamet

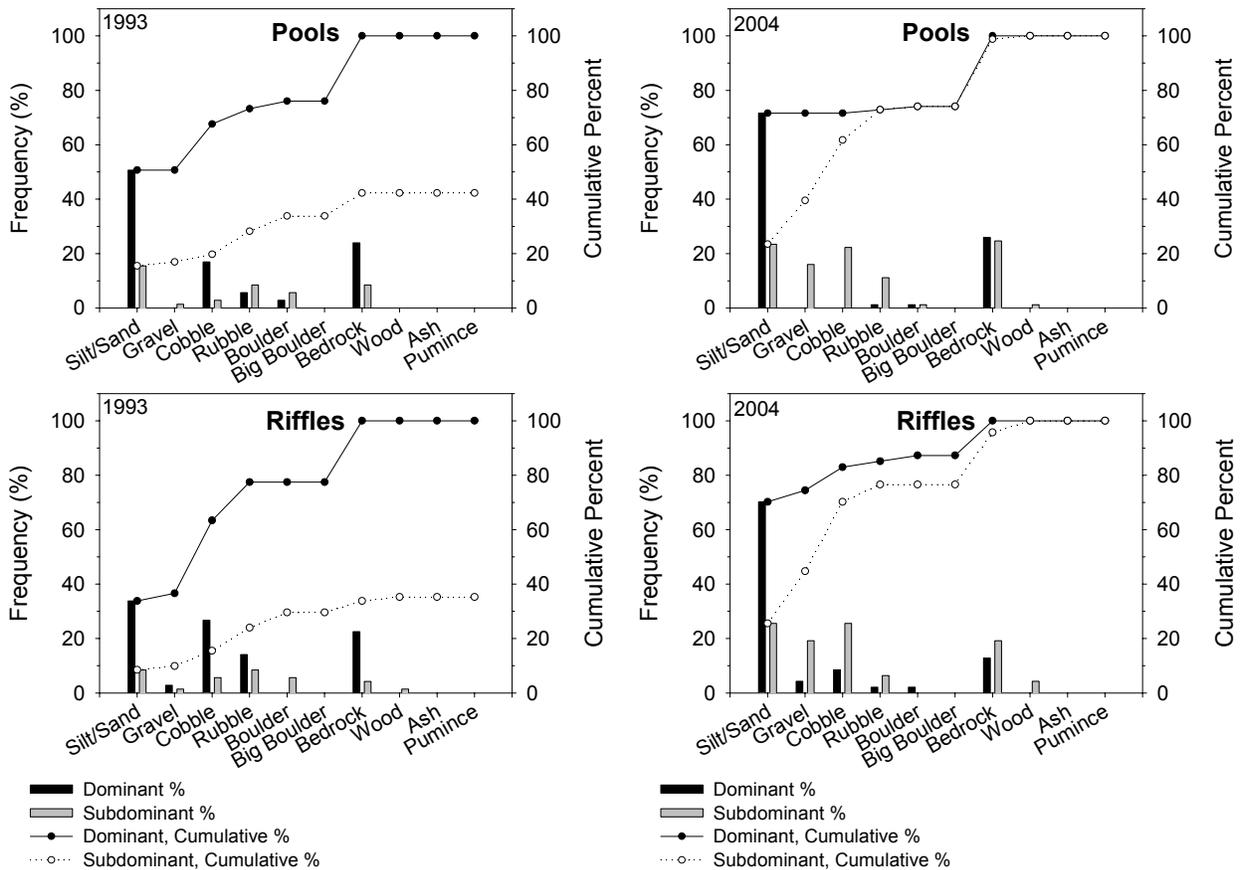
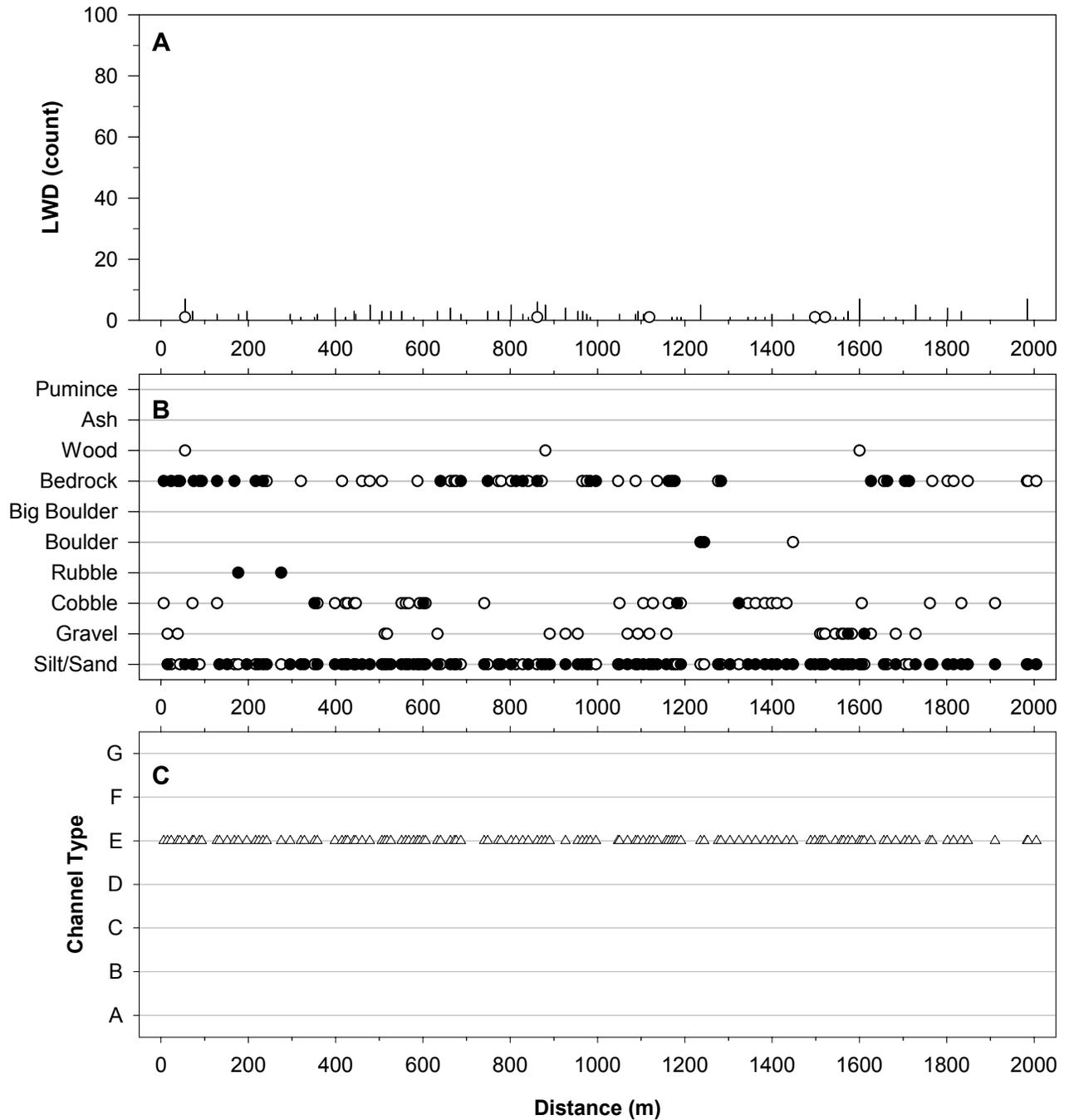


Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Lick Branch.

*London District
Ano Quadrangle*

Stream features found on Lick Branch during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		ABOVE 119B NEAR CULVERT
TRIB	38.3	1.5	IN ON LEFT DRY
UNGR	64.2		From 55.1 m to 64.2 m
SCH	177.1		DRY, IN ON RIGHT
SCH	187		DRY, OUT ON RIGHT
UNGR	203.9		From 196.4 m to 203.9 m
SCH	216.7		DRY, IN ON RIGHT
TRIB	430.2		DRY, IN ON RIGHT
UNGR	553		From 551.2 m to 553 m
TRIB	578.8		DRY, IN ON RIGHT
TRIB	597.2		DRY, IN ON RIGHT
TRIB	745.3	2.5	IN ON LEFT
UNGR	846.3		From 846.3 m to 846.3 m
TRIB	929		DRY, IN ON LEFT
UNGR	940		From 926.7 m to 940 m
UNGR	1110.4		From 1104.7 m to 1110.4 m
TRIB	1194.8		DRY, IN ON RIGHT
UNGR	1250.1		From 1244.2 m to 1250.1 m
TRIB	1383.4		DRY, IN ON RIGHT
UNGR	1621		From 1610.9 m to 1621 m; STREAM GOES UNDERNEATH SHEET OF ROCK
UNGR	1665.8		From 1663.4 m to 1665.8 m
TRIB	1670	1	IN ON RIGHT
UNGR	1694.5		From 1683.0 m to 1694.5 m
UNGR	1717		From 1713.6 m to 1717 m
UNGR	1838.9		From 1833.5 m to 1838.9 m
UNGR	1866.8		From 1848.1 m to 1866.8 m
TRIB	2005	25	IN ON LEFT



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Lick Branch 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

**London District
Bernstadt Quadrangle**

Stream:	Hawk Creek		
District:	London		
USGS Quadrangle:	Bernstadt		
	1993		2004
Survey Date:	not surveyed		7/11/2004
Total Distance Surveyed (km)*:	--		1.1

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	NA	66	NA	34
Total Area (m ²):	NA	4565±1199	NA	2342±218
Correction Factor Applied:	NA	0.95	NA	0.84
Number of Paired Samples:	NA	2	NA	2
Total Count:	NA	22	NA	20
Number per km:	NA	20	NA	18
Mean Area (m ²):	NA	208	NA	117
Mean Maximum Depth (cm):	NA	82	NA	35
Mean Average Depth (cm):	NA	52	NA	22
Mean Residual Depth (cm)*:	NA	33	NA	--
Percent Surveyed as Glides:	NA	32	NA	--
Percent Surveyed as Runs:	NA	--	NA	0
Percent Surveyed as Cascades:	NA	--	NA	0
Percent with > 35% Fines:	NA	86	NA	65

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	42
1 - 5 m long, > 55 cm diameter:	NA	1
> 5 m long, 10 cm – 55 cm diameter:	NA	16
> 5 m long, > 55 cm diameter:	NA	7
Total:	NA	66

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	0
C:	0
D:	0
E:	0
F:	100
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	6.0
Median Water Temperature (C):	21.5

*recorded in 2004 only

*London District
Bernstadt Quadrangle*

Not surveyed in 1990s.

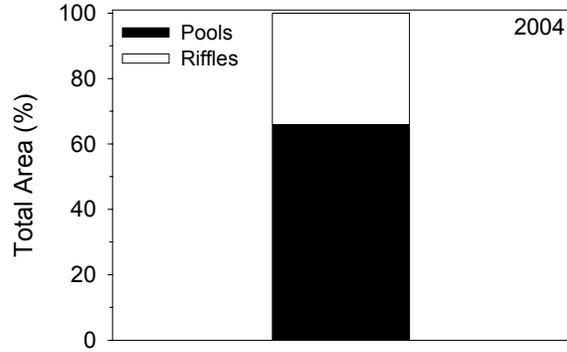


Figure A3. Estimated area of Hawk Creek in pools and riffles as calculated using BVET techniques.

Not surveyed in 1990s.

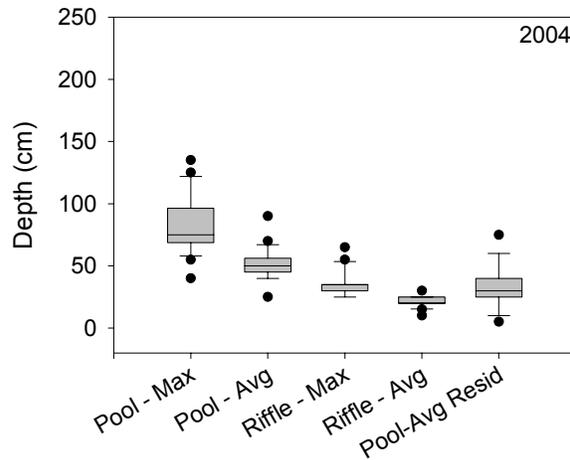


Figure A4. Maximum and average depths for pools and riffles and residual depths in Hawk Creek. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

*London District
Bernstadt Quadrangle*

Not surveyed in 1990s.

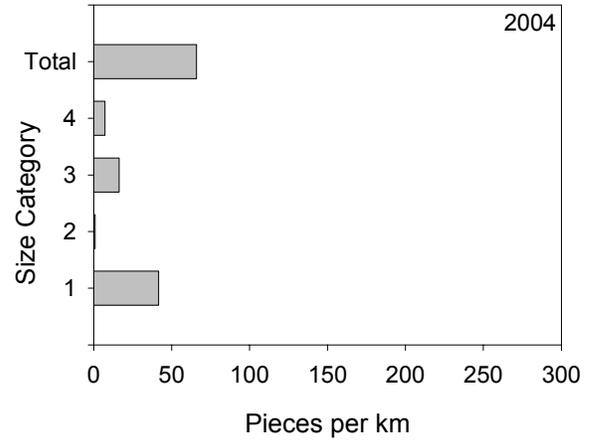


Figure A5. LWD per kilometer in Hawk Creek. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: <5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

Not surveyed in 1990s.

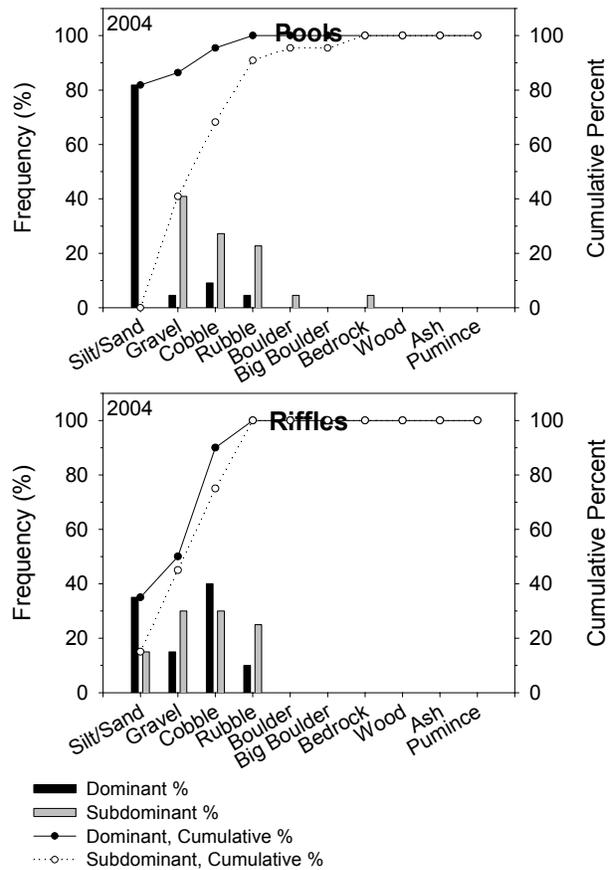


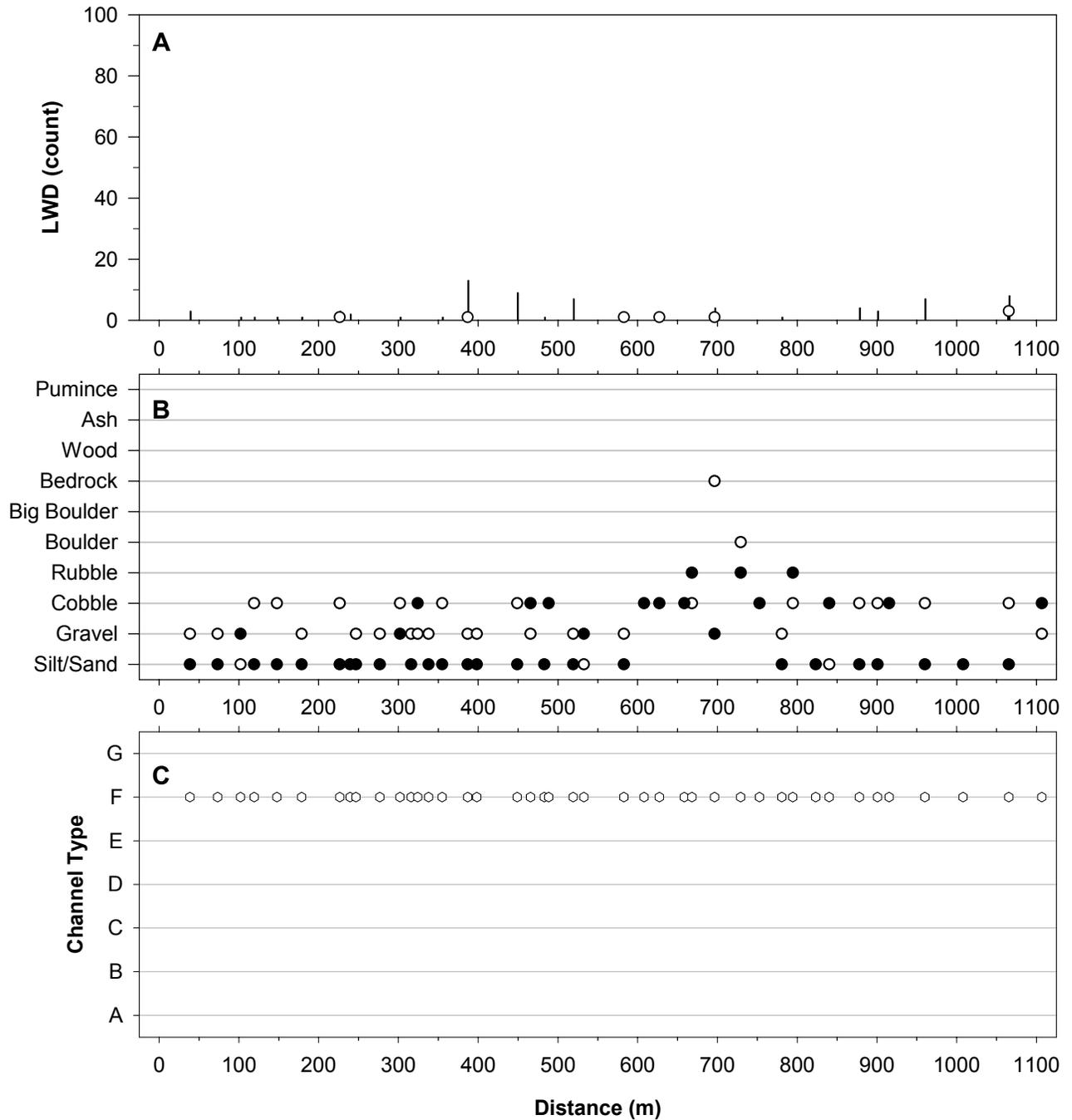
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Hawk Creek.

*London District
Bernstadt Quadrangle*

Stream features found on Hawk Creek during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		3 KM DOWNNSTREAM OF 4094 BRIDGE.
BRIDGE	1045		

*London District
Bernstadt Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Hawk Creek, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*London District
Bernstadt Quadrangle*

Stream:	Hawk Creek Tributary	
District:	London	
USGS Quadrangle:	Bernstadt	
	1993	2004
Survey Date:	6/7/1993	07/11/04
Total Distance Surveyed (km)*:	0.7	0.9

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	37	23	63	77
Total Area (m ²):	390±225	465±25	653±1194	1516±813
Correction Factor Applied:	0.86	0.92	0.76	0.92
Number of Paired Samples:	2	4	2	4
Total Count:	24	25	28	23
Number per km:	34	28	39	25
Mean Area (m ²):	16	19	23	66
Mean Maximum Depth (cm):	NA	29	NA	20
Mean Average Depth (cm):	26	16	5	10
Mean Residual Depth (cm)*:	40	9	--	--
Percent Surveyed as Glides:	54	32	--	--
Percent Surveyed as Runs:	--	--	0	0
Percent Surveyed as Cascades:	--	--	0	0
Percent with > 35% Fines:	NA	68	NA	43

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	140
1 - 5 m long, > 55 cm diameter:	NA	1
> 5 m long, 10 cm – 55 cm diameter:	NA	36
> 5 m long, > 55 cm diameter:	NA	2
Total:	186	179

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	100
B:	0
C:	0
D:	0
E:	0
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	2.0
Median Water Temperature (C):	19

*recorded in 2004 only

*London District
Bernstadt Quadrangle*

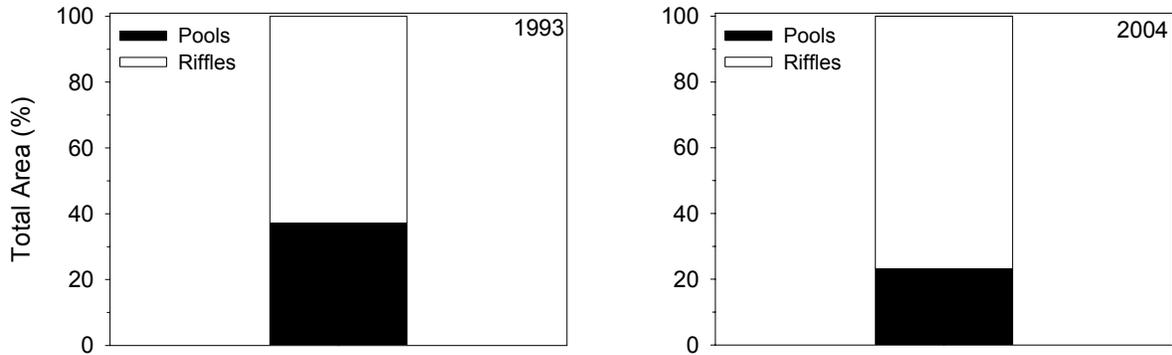


Figure A3. Estimated area of Hawk Creek Tributary in pools and riffles as calculated using BVET techniques.

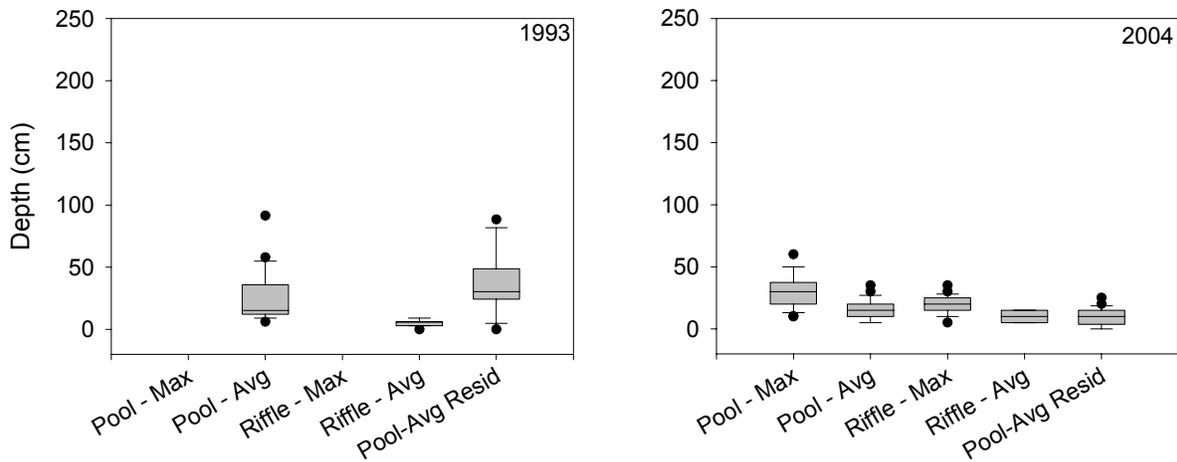


Figure A4. Maximum and average depths for pools and riffles and residual depths in Hawk Creek Tributary. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

*London District
Bernstadt Quadrangle*

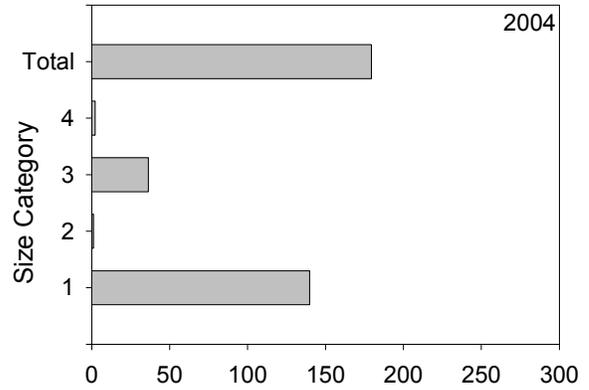
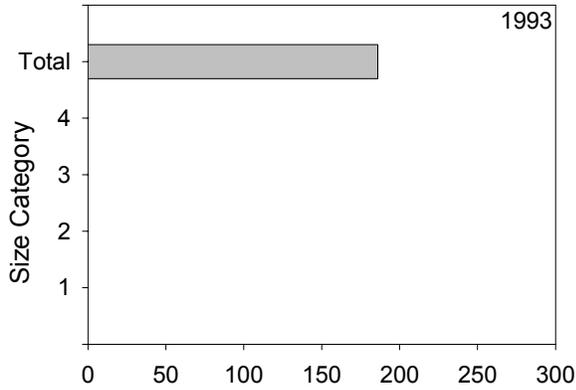


Figure A5. LWD per kilometer in Hawk Creek Tributary. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: <5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

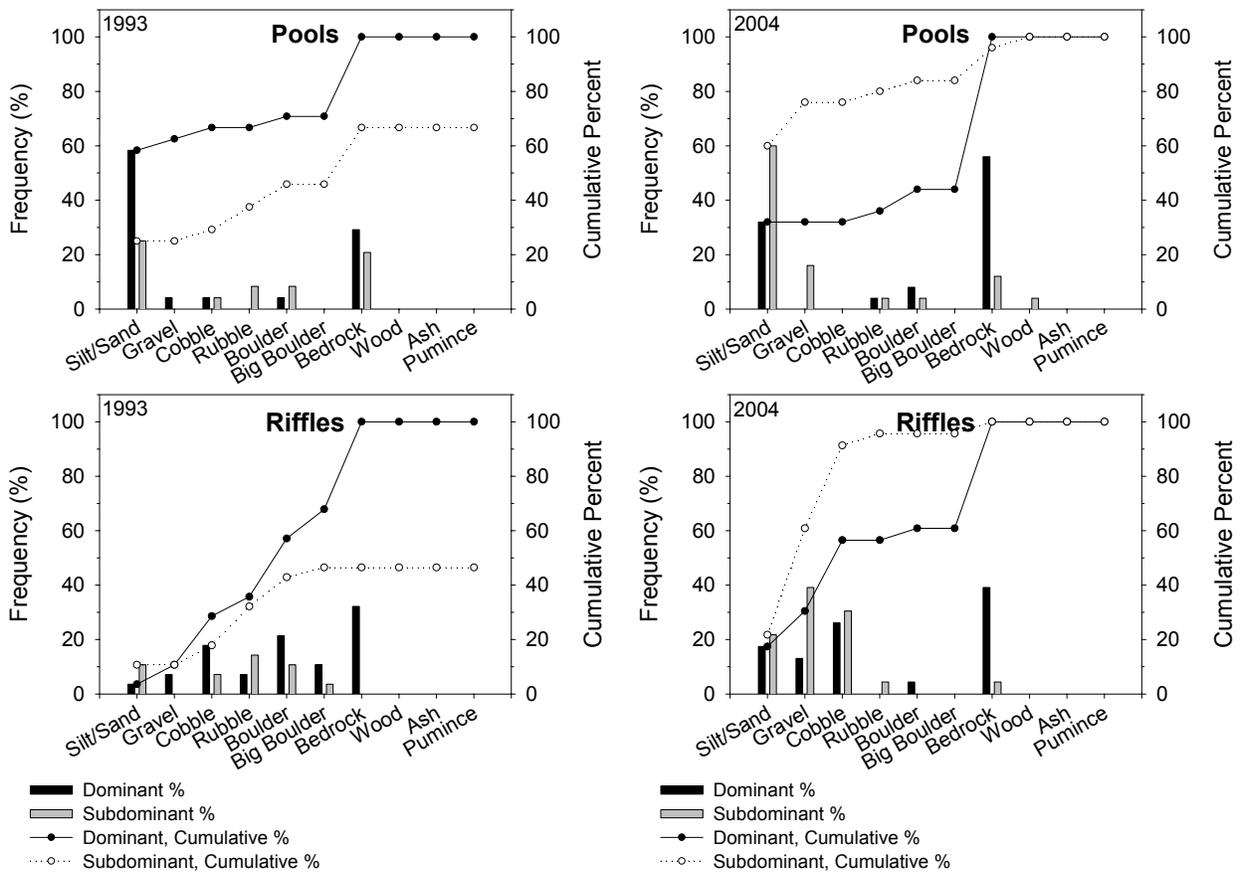


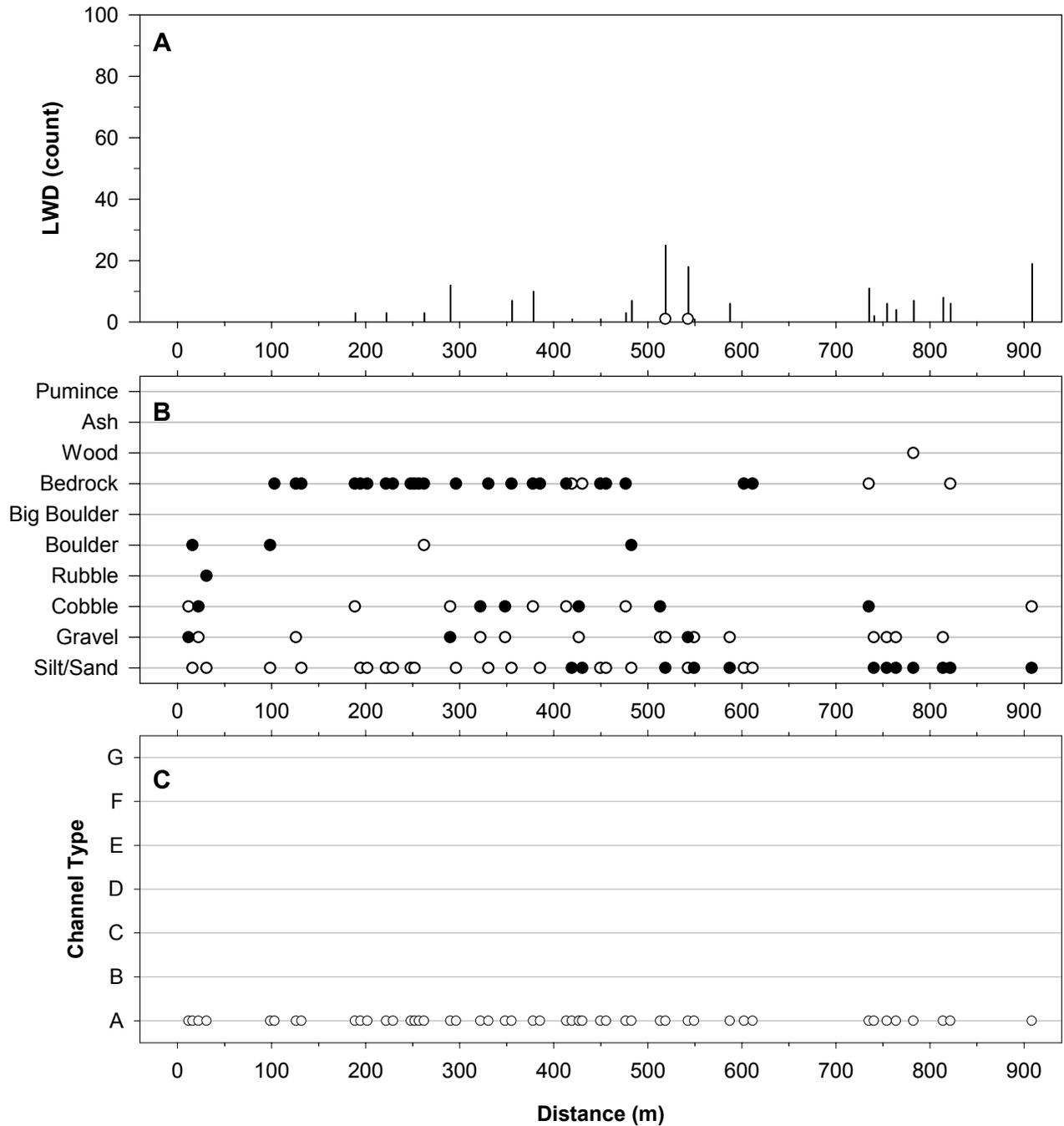
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Hawk Creek Tributary.

*London District
Bernstadt Quadrangle*

Stream features found on Hawk Creek Tributary during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		ABOVE 4094 BRIDGE
TRAIL	40.8		ENTERS ON LEFT
TRAIL	312.1		ENTERS ON LEFT
TRIB	415.2		IN ON LEFT

*London District
Bernstadt Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Hawk Creek Tributary, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*London District
Sawyer Quadrangle*

Stream:	Barkcamp Creek	
District:	London	
USGS Quadrangle:	Sawyer	
	1993	2004
Survey Date:	07/20/93	7/10/04
Total Distance Surveyed (km)*:	3.1	1.0

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	49	81	51	19
Total Area (m ²):	13842±5872	7062±2592	14208±2722	1646±667
Correction Factor Applied:	0.88	0.97	1.27	0.95
Number of Paired Samples:	5	5	7	3
Total Count:	61	25	70	13
Number per km:	20	24	23	12
Mean Area (m ²):	227	282	203	127
Mean Maximum Depth (cm):	NA	93	NA	38
Mean Average Depth (cm):	71	50	15	19
Mean Residual Depth (cm)*:	110	31	--	--
Percent Surveyed as Glides:	62	36	--	--
Percent Surveyed as Runs:	--	--	0	0
Percent Surveyed as Cascades:	--	--	3	23
Percent with > 35% Fines:	NA	32	NA	0

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	18
1 - 5 m long, > 55 cm diameter:	NA	1
> 5 m long, 10 cm – 55 cm diameter:	NA	128
> 5 m long, > 55 cm diameter:	NA	7
Total:	32	153

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	14
B:	86
C:	0
D:	0
E:	0
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	6.5
Median Water Temperature (C):	21

*recorded in 2004 only

*London District
Sawyer Quadrangle*

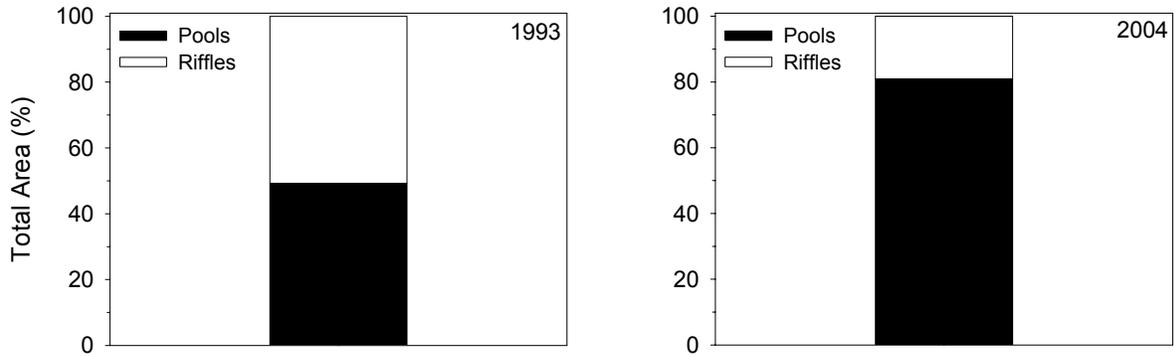


Figure A3. Estimated area of Barkcamp Creek in pools and riffles as calculated using BVET techniques.

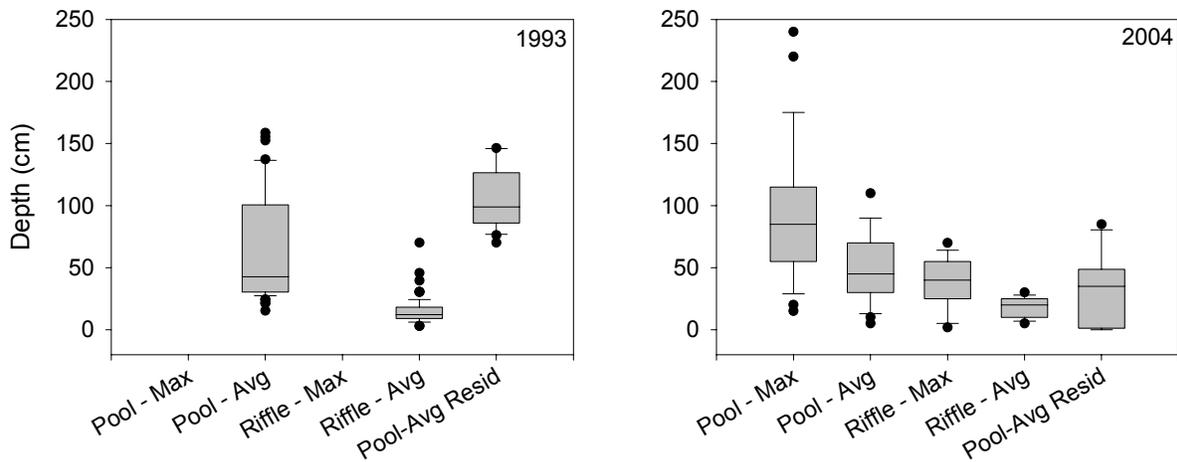


Figure A4. Maximum and average depths for pools and riffles and residual depths in Barkcamp Creek. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

*London District
Sawyer Quadrangle*

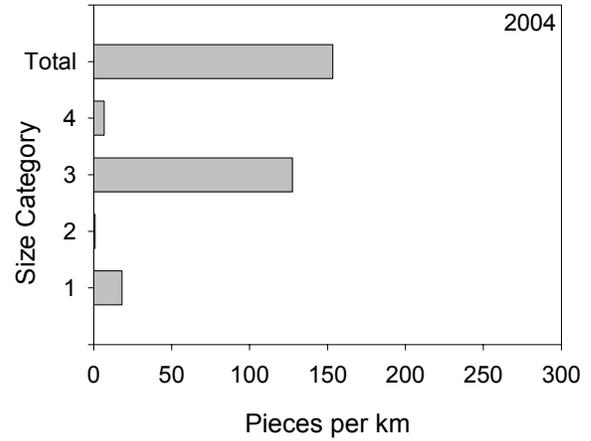
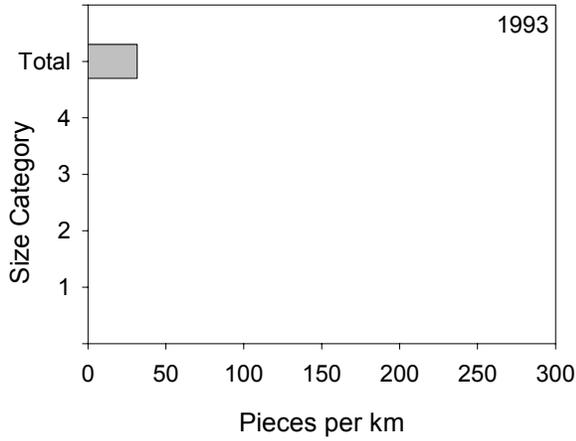


Figure A5. LWD per kilometer in Barkcamp Creek. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: < 5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

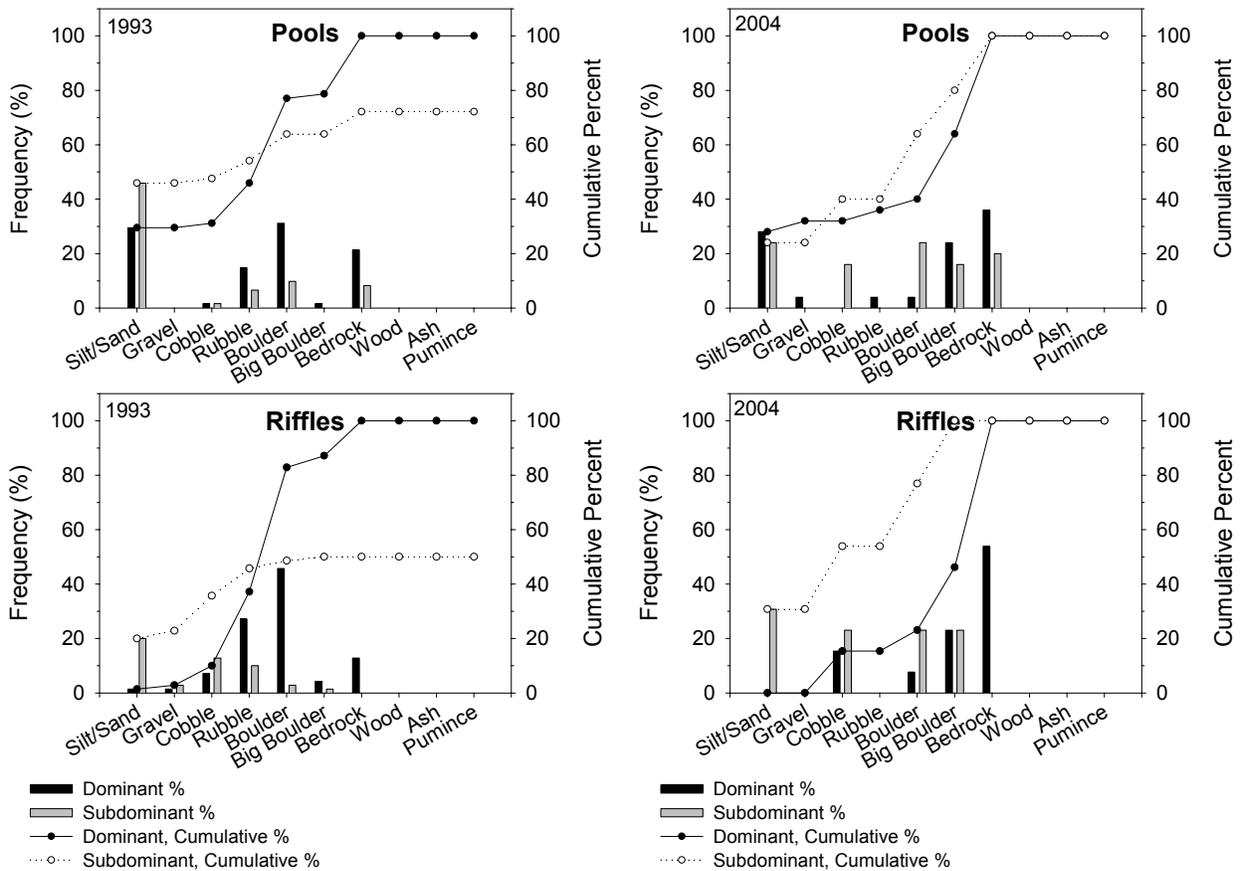
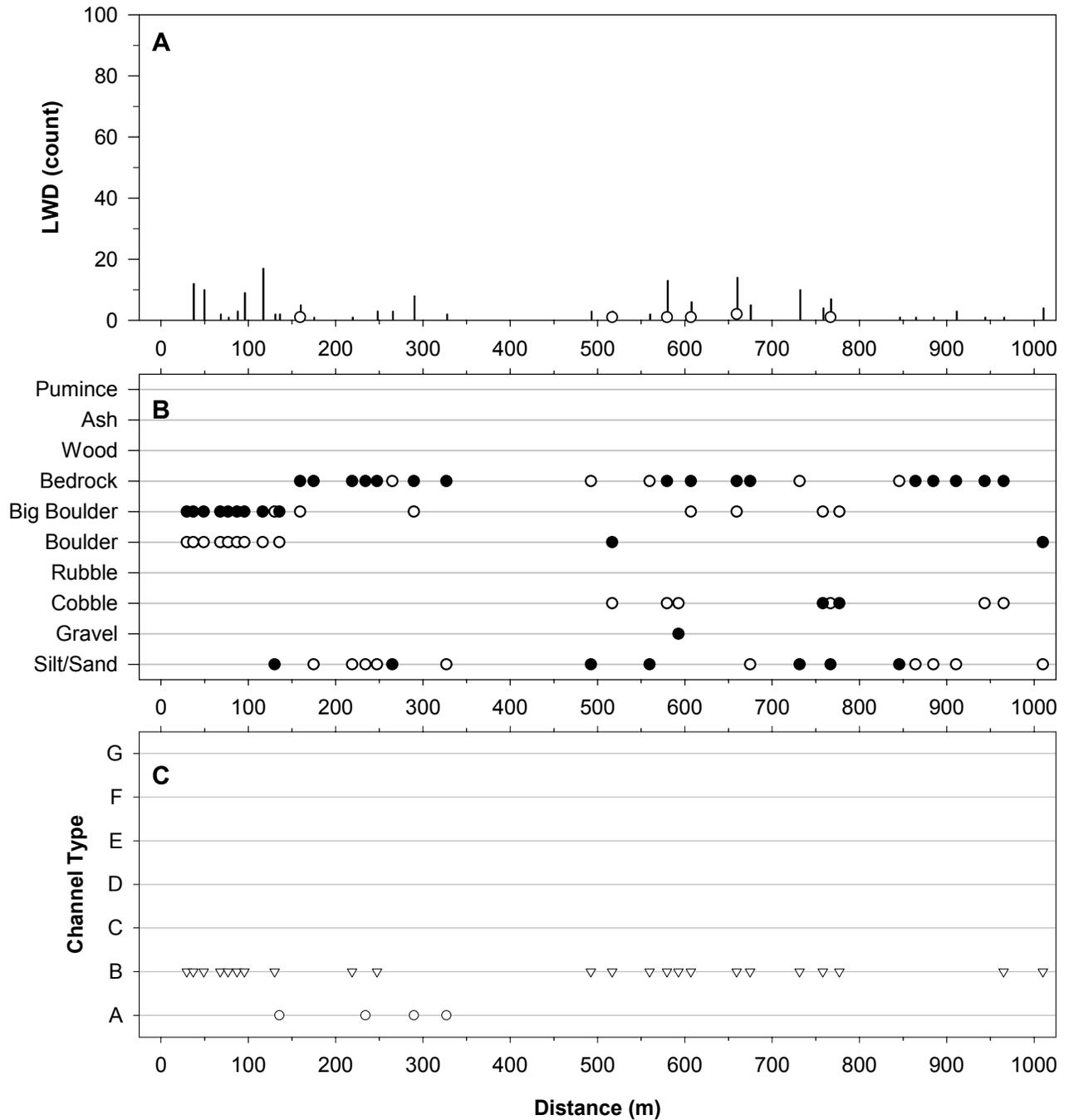


Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Barkcamp Creek.

*London District
Sawyer Quadrangle*

Stream features found on Barkcamp Creek during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		CONFLUENCE WITH BACK WATER OF CUMBERLAND LAKE
FALL	195.4		2.5M HIGH
TRIB	583.2	1.5	IN ON RIGHT
SCH	733		SCH IN ON L
SCH	788.6		SCH OUT ON LEFT



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Barkcamp Creek, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Morehead District
Saltlick Quadrangle*

Stream:	Clear Creek	
District:	Morehead	
USGS Quadrangle:	Saltlick	
	1993	2004
Survey Date:	7/8-7/30/1993	7/9/2004
Total Distance Surveyed (km)*:	1.5	1.6

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	77	88	23	12
Total Area (m ²):	4142±357	7427±463	1244±2509	996±368
Correction Factor Applied:	1.07	1.00	1.51	1.11
Number of Paired Samples:	4	8	3	4
Total Count:	47	36	38	21
Number per km:	32	23	26	13
Mean Area (m ²):	88	206	33	47
Mean Maximum Depth (cm):	NA	66	NA	13
Mean Average Depth (cm):	46	38	6	6
Mean Residual Depth (cm)*:	66	33	--	--
Percent Surveyed as Glides:	49	22	--	--
Percent Surveyed as Runs:	--	--	0	0
Percent Surveyed as Cascades:	--	--	0	0
Percent with > 35% Fines:	NA	39	NA	0

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	54
1 - 5 m long, > 55 cm diameter:	NA	0
> 5 m long, 10 cm – 55 cm diameter:	NA	88
> 5 m long, > 55 cm diameter:	NA	8
Total:	66	150

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	18
C:	82
D:	0
E:	0
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	2.5
Median Water Temperature (C):	18

*recorded in 2004 only

*Morehead District
Saltlick Quadrangle*

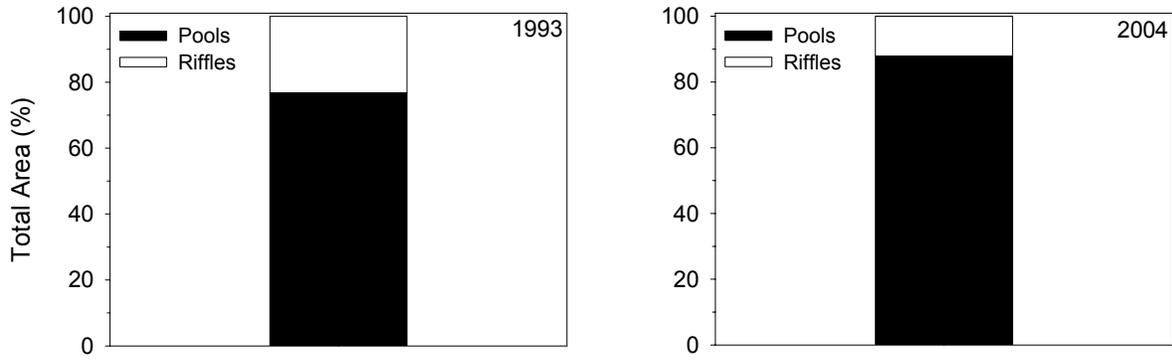


Figure A3. Estimated area of Clear Creek in pools and riffles as calculated using BVET techniques.

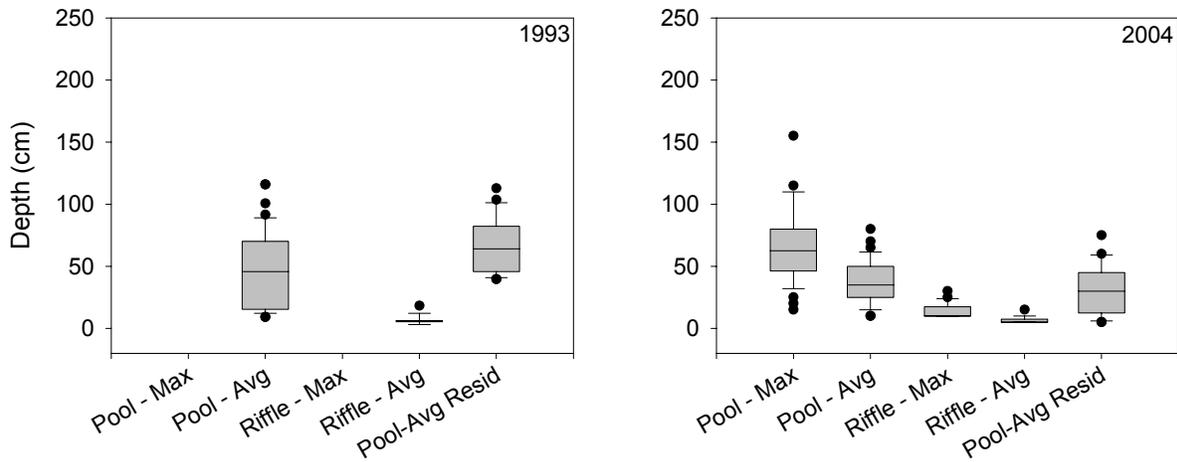


Figure A4. Maximum and average depths for pools and riffles and residual depths in Clear Creek. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

**Morehead District
Saltlick Quadrangle**

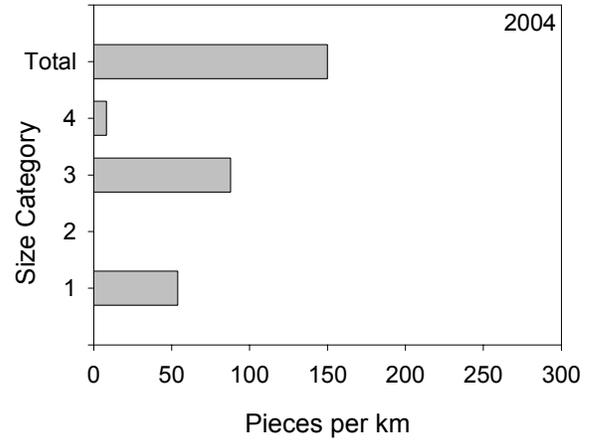
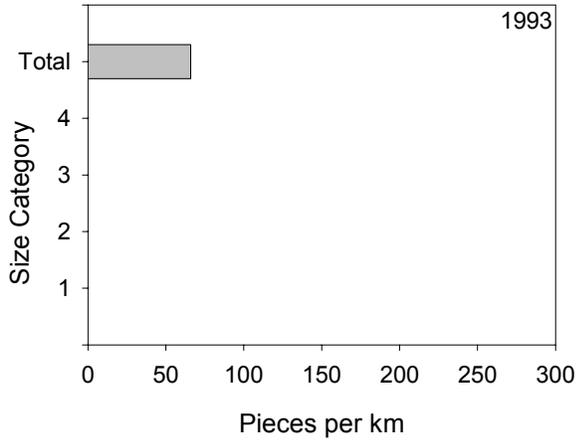


Figure A5. LWD per kilometer in Clear Creek. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: < 5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

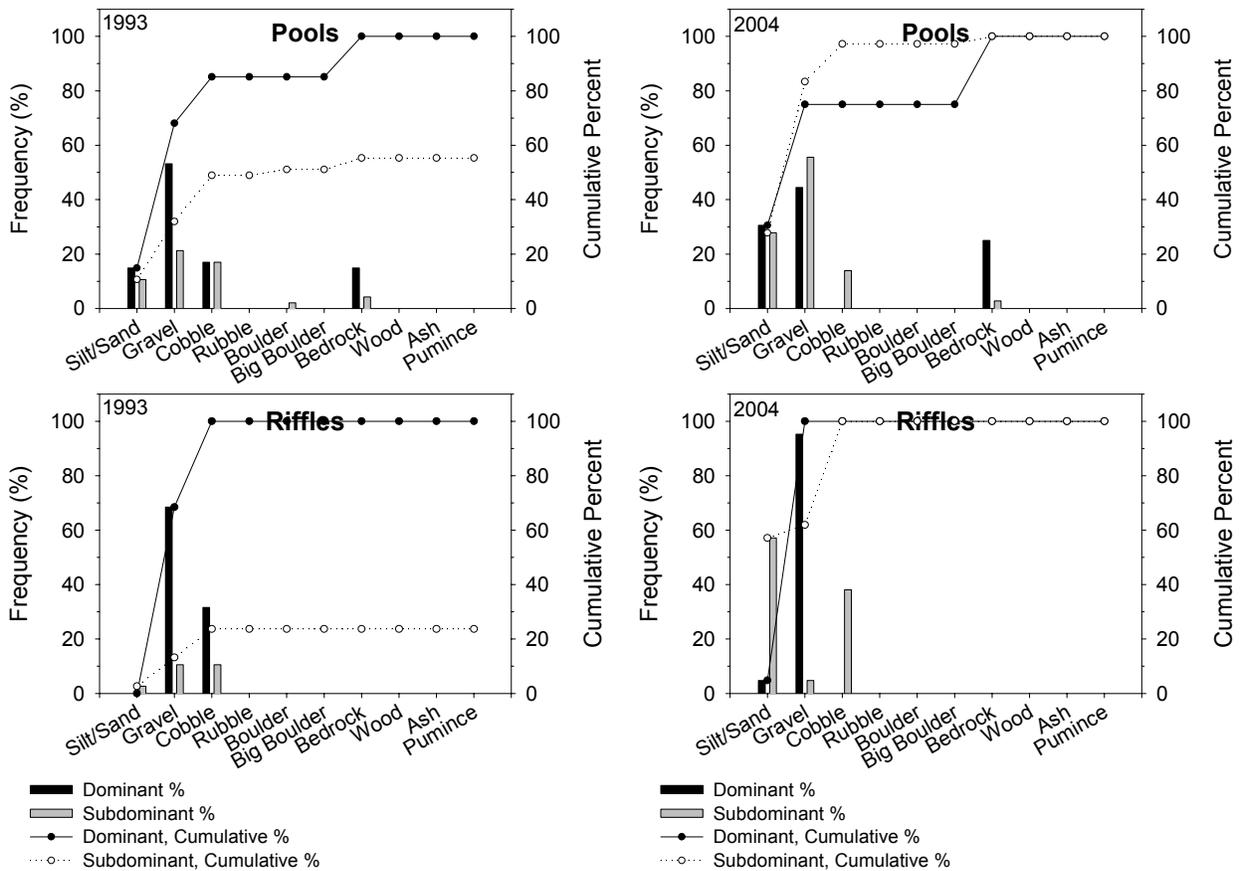


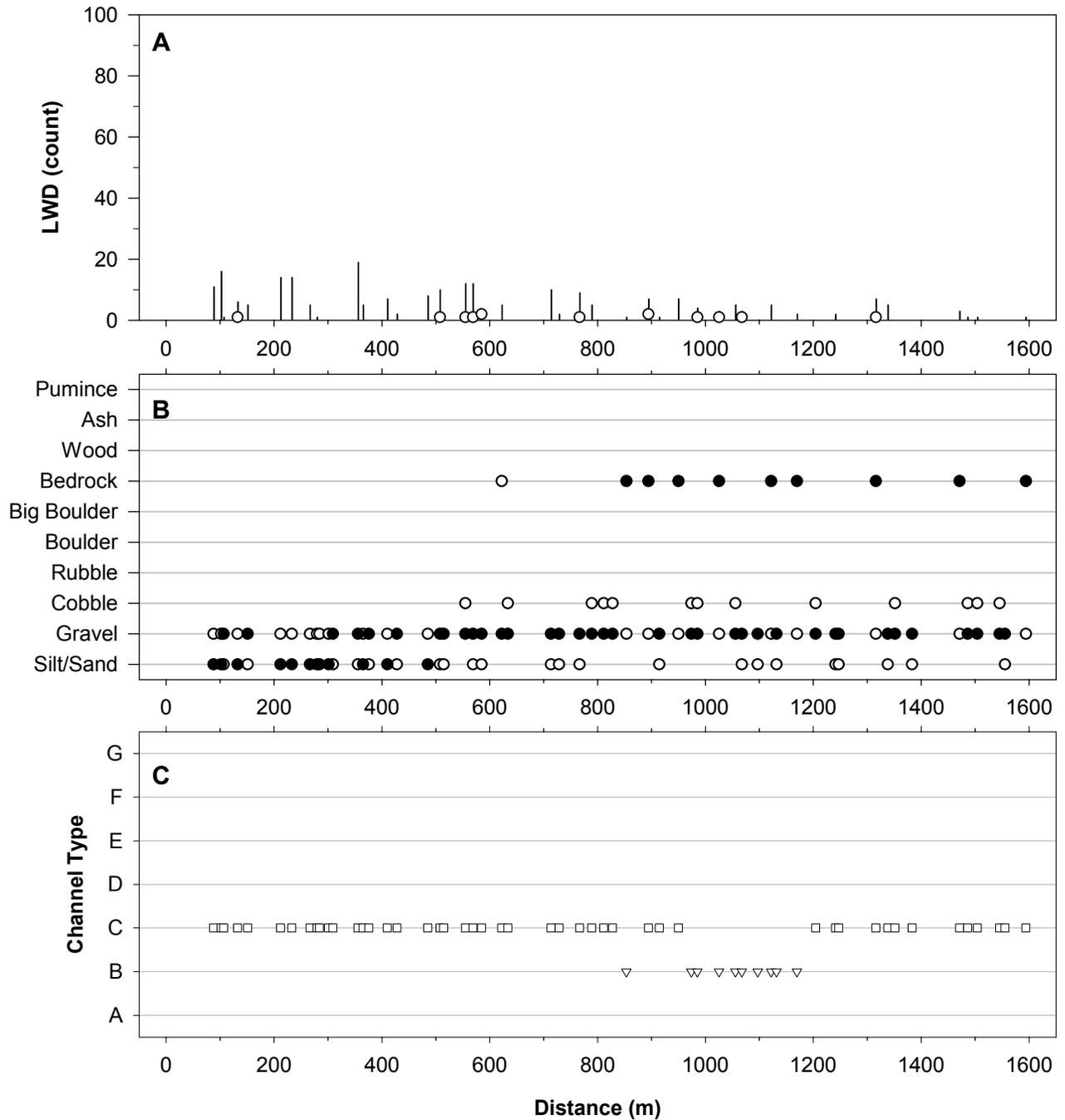
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Clear Creek.

*Morehead District
Saltlick Quadrangle*

Stream features found on Clear Creek during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		WHERE CLEAR CREEK FLOWS INTO THE LAKE, TO THE WEST OF BOAT RAMP OFF FOREST SERVICE ROAD 129A
FORD	425.5		ROAD CROSSING, NATURAL SUBSTRATE
SCH	455.6		IN ON RIGHT
SCH	576.5		OUT ON RIGHT
BRG	808.9		TRAIL CROSSING
TRIB	1094.7	0.3	IN ON LEFT
TRIB	1119.8	0.3	IN ON RIGHT
TRIB	1237.1	0.2	IN ON RIGHT
TRIB	1457.6		IN ON LEFT
FORD	1555.1		FOOT TRAIL CROSSING
TRIB	1581.8	0.3	IN ON RIGHT

*Morehead District
Saltlick Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Clear Creek, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Morehead District
Wrigley Quadrangle*

Stream:	Slabcamp Creek	
District:	Morehead	
USGS Quadrangle:	Wrigley	
	1992	2004
Survey Date:	6/10-6/30/1992	7/9/2004
Total Distance Surveyed (km)*:	0.7	0.8

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	58	90	42	10
Total Area (m ²):	797±504	1517±343	572±536	167±0
Correction Factor Applied:	1.18	1.02	1.13	0.80
Number of Paired Samples:	2	7	2	2
Total Count:	28	38	28	13
Number per km:	40	48	40	16
Mean Area (m ²):	28	40	20	13
Mean Maximum Depth (cm):	NA	39	NA	10
Mean Average Depth (cm):	35	21	6	5
Mean Residual Depth (cm)*:	41	16	--	--
Percent Surveyed as Glides:	36	32	--	--
Percent Surveyed as Runs:	--	--	0	0
Percent Surveyed as Cascades:	--	--	0	0
Percent with > 35% Fines:	NA	47	NA	0

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	75
1 - 5 m long, > 55 cm diameter:	NA	0
> 5 m long, 10 cm – 55 cm diameter:	NA	110
> 5 m long, > 55 cm diameter:	NA	4
Total:	34	189

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	49
C:	51
D:	0
E:	0
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	1.0
Median Water Temperature (C):	20

*recorded in 2004 only

*Morehead District
Wrigley Quadrangle*

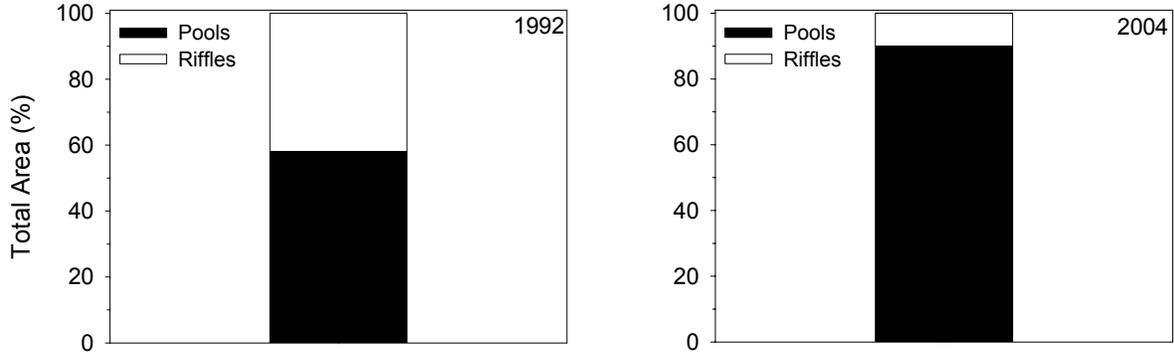


Figure A3. Estimated area of Slabcamp Creek in pools and riffles as calculated using BVET techniques.

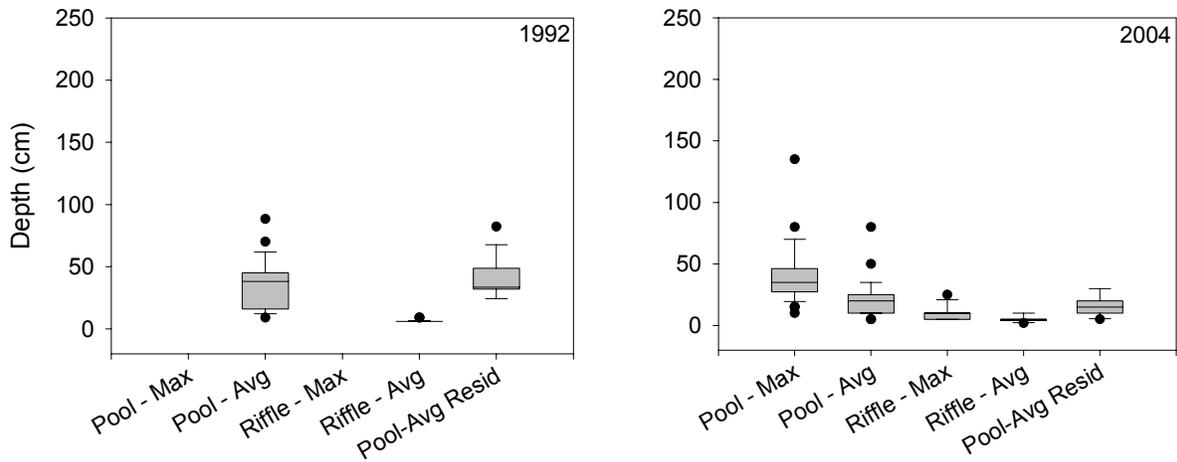


Figure A4. Maximum and average depths for pools and riffles and residual depths in Slabcamp Creek. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

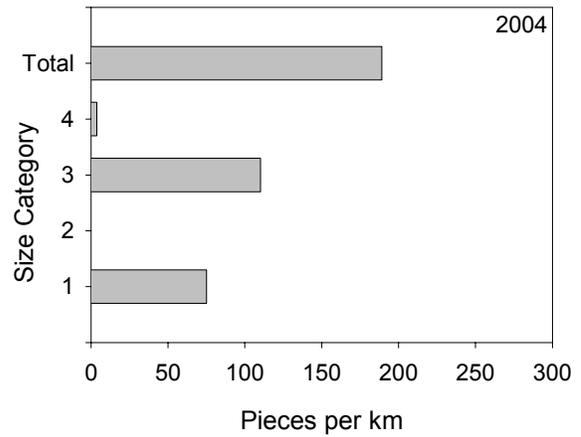
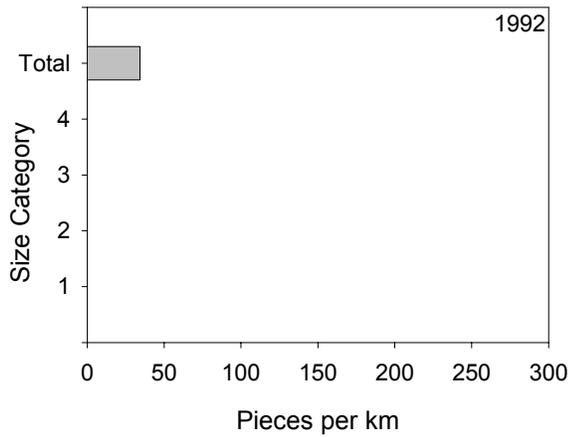


Figure A5. LWD per kilometer in Slabcamp Creek. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: < 5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

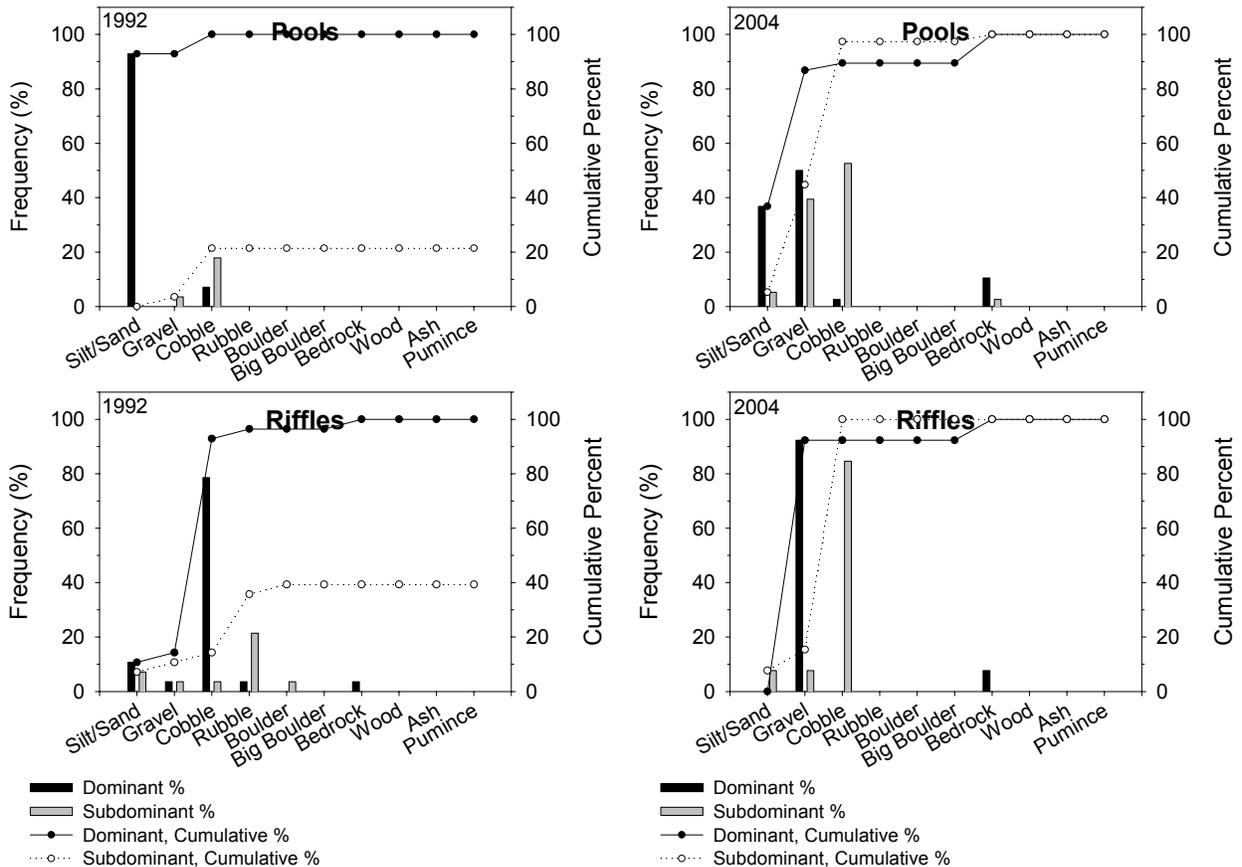


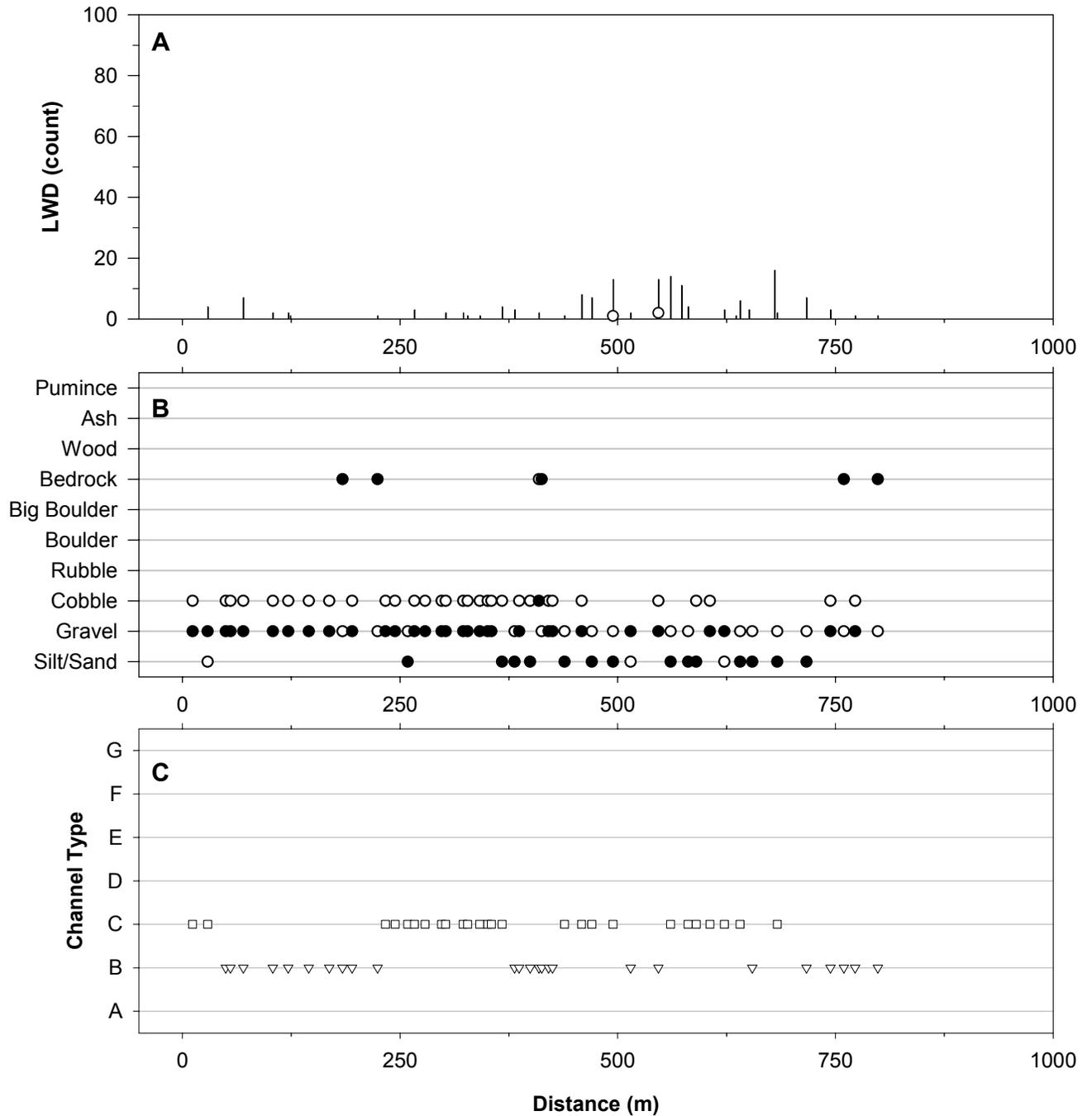
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Slabcamp Creek.

*Morehead District
Wrigley Quadrangle*

Stream features found on Slabcamp Creek during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		AT THE CONFLUENCE OF SLABCAMP CREEK AND JONES BRANCH JUST SOUTH OF ROAD
FORD	34.6		ROAD CROSSING, LANE/FORREST SERVICE RIGHT OF WAY
TRIB	340.5		IN ON RIGHT, DRY, NATURAL BREAK
TRIB	386.7		IN ON RIGHT, DRY
TRIB	465.5	1.5	IN ON RIGHT
SCH	546.6		IN ON RIGHT
SCH	691.6		OUT ON RIGHT
TRIB	713.3	0.2	IN ON RIGHT

*Morehead District
Wrigley Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Slabcamp Creek, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Morehead/Stanton District
Frenchburg Quadrangle*

Morehead/Stanton
Frenchburg

Stream:	Rebel Trace	
District:	Morehead/Stanton	
USGS Quadrangle:	Frenchburg	
	1993	2004
Survey Date:	6/30/1993	7/08/2004
Total Distance Surveyed (km)*:	0.9	0.9

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	NC	NC	NC	NC
Total Area (m ²):	465±NC	635±88	NC±NC	NC±NC
Correction Factor Applied:	0.93	1.06	NC	NC
Number of Paired Samples:	1	6	0	0
Total Count:	16	32	3	1
Number per km:	19	35	3	1
Mean Area (m ²):	29	20	NC	NC
Mean Maximum Depth (cm):	NA	31	NA	10
Mean Average Depth (cm):	44	16	3	5
Mean Residual Depth (cm)*:	56	25	--	--
Percent Surveyed as Glides:	19	6	--	--
Percent Surveyed as Runs:	--	--	NA	0
Percent Surveyed as Cascades:	--	--	0	0
Percent with > 35% Fines:	NA	25	NA	0

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected; NC = could not calculate

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	235
1 - 5 m long, > 55 cm diameter:	NA	0
> 5 m long, 10 cm – 55 cm diameter:	NA	62
> 5 m long, > 55 cm diameter:	NA	10
Total:	36	307

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	0
C:	100
D:	0
E:	0
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	0.5
Median Water Temperature (C):	NA

*recorded in 2004 only

*Morehead/Stanton District
Frenchburg Quadrangle*

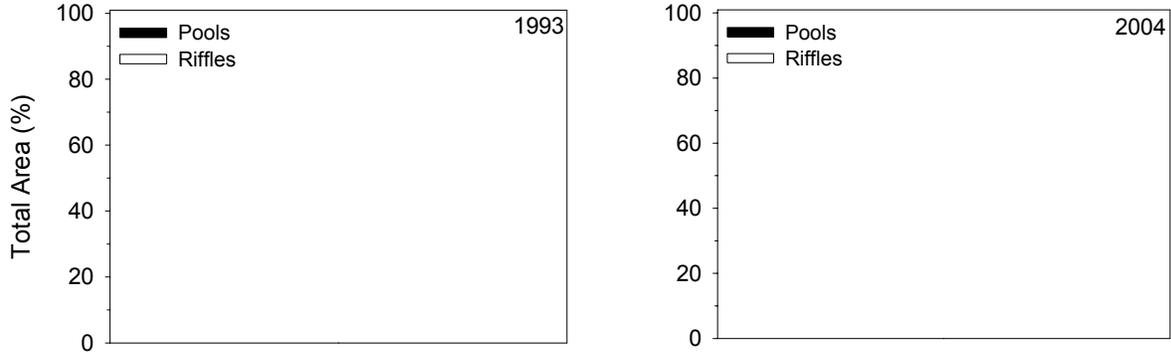


Figure A3. Estimated area of Rebel Trace in pools and riffles as calculated using BVET techniques.

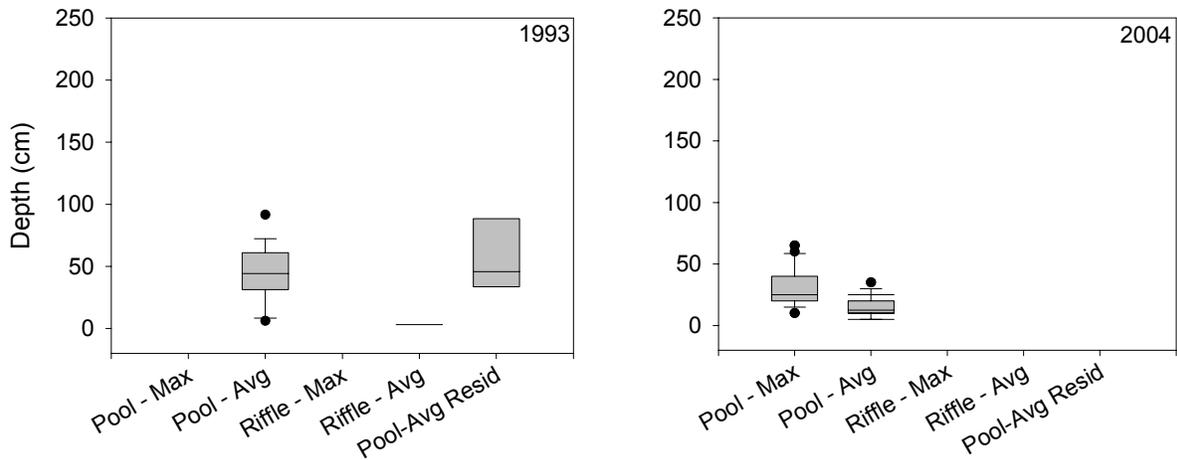


Figure A4. Maximum and average depths for pools and riffles and residual depths in Rebel Trace. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

*Morehead/Stanton District
Frenchburg Quadrangle*

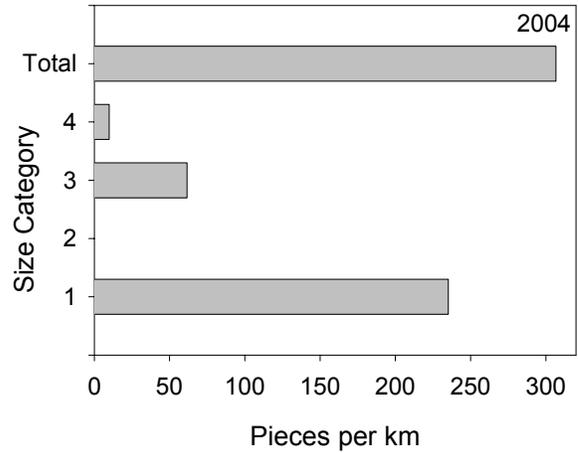
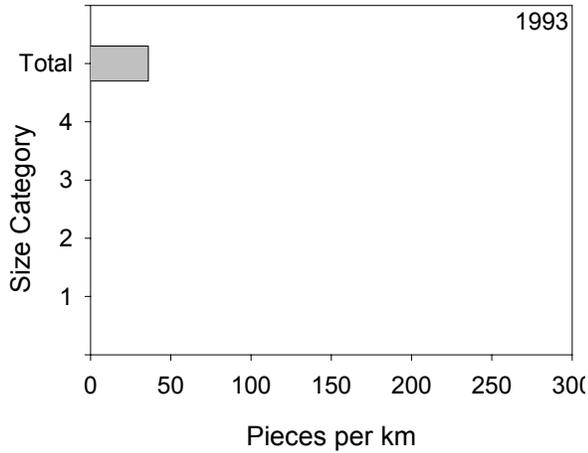


Figure A5. LWD per kilometer in Rebel Trace. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: < 5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

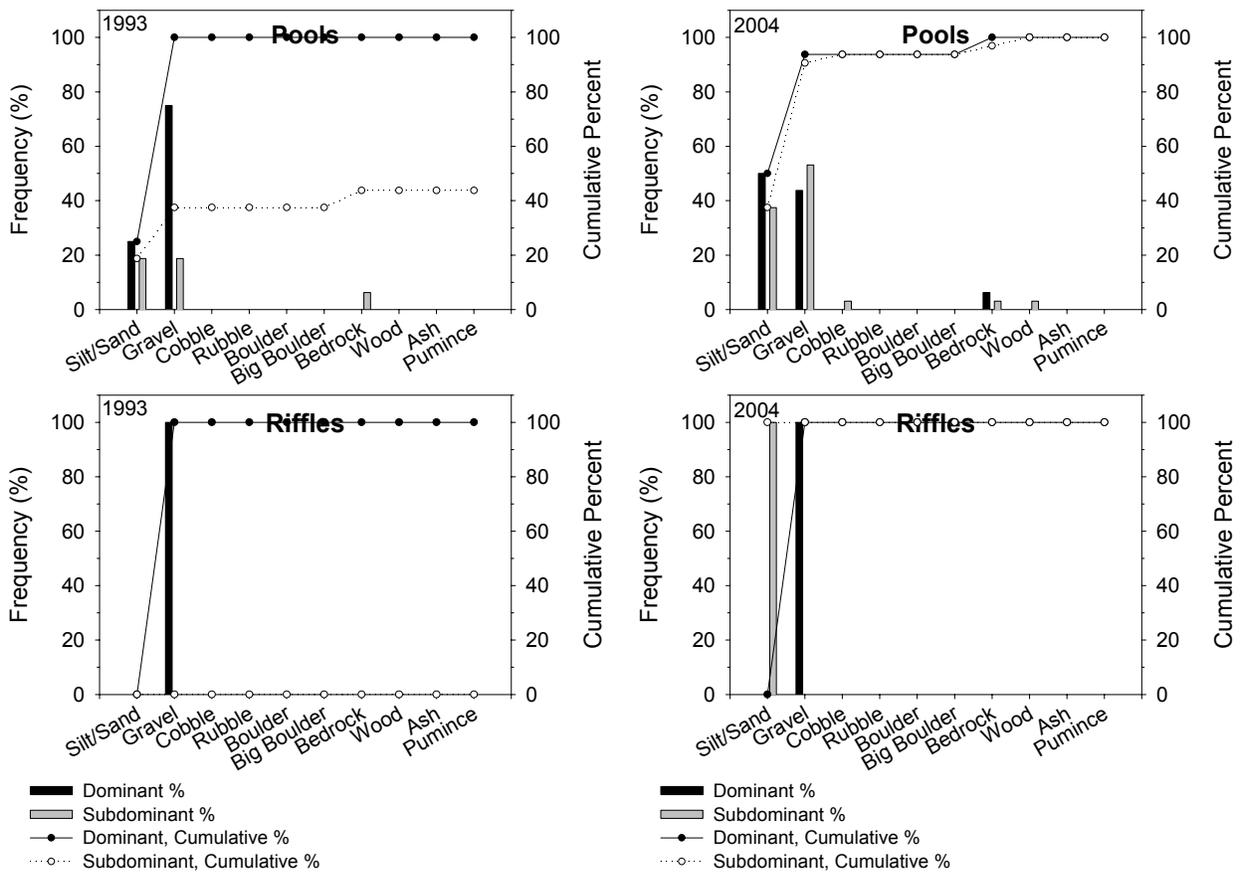


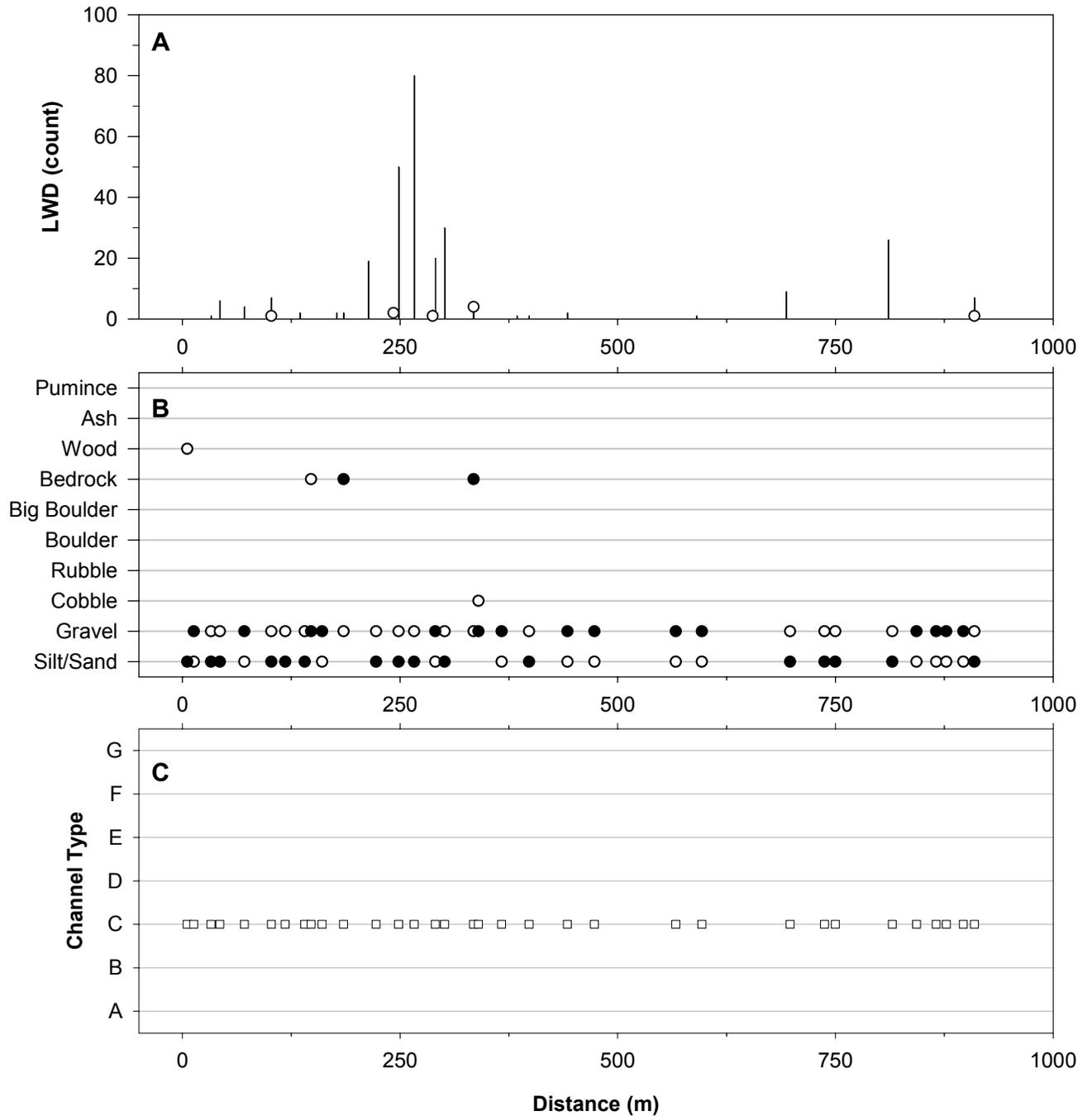
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Rebel Trace.

*Morehead/Stanton District
Frenchburg Quadrangle*

Stream features found on Rebel Trace during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		INTERSECTION OF ROAD 1239 AND REBEL TRACE
UNGR	36.7		
UNGR	68.8		
UNGR	90.6		
UNGR	135		
UNGR	141.9		
UNGR	158.2		
UNGR	177.2		
UNGR	213.8		
UNGR	242.3		
UNGR	259.6		
UNGR	287.4		
UNGR	298.4		
UNGR	325.1		
UNGR	337.2		
UNGR	356.3		
UNGR	384.2		
UNGR	426.6		
UNGR	466.4		
UNGR	562.7		STREAM CHANNEL SPLITS INTO THREE DRY CHANNELS THAT APPEAR TO HAVE BEEN CREATED DUE TO FLOODING
UNGR	590.6		
UNGR	693.5		
UNGR	730.2		
UNGR	743.7		
UNGR	810.8		
UNGR	834.6		
UNGR	855.5		
UNGR	872.3		
UNGR	879.1		

*Morehead/Stanton District
Frenchburg Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Rebel Trace, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Morehead/Stanton District
Frenchburg Quadrangle*

Stream:	Richard Hollow	
District:	Morehead/Stanton	
USGS Quadrangle:	Frenchburg	
	1990s	2004
Survey Date:	NOT SURVEYED	7/08/2004
Total Distance Surveyed (km)*:	NA	0.9

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1990s	2004	1990s	2004
Percent of Total Stream Area:	NA	NC	NA	NC
Total Area (m ²):	NA	1283±202	NA	NC±NC
Correction Factor Applied:	NA	1.03	NA	NC
Number of Paired Samples:	NA	7	NA	0
Total Count:	NA	36	NA	2
Number per km:	NA	39	NA	2
Mean Area (m ²):	NA	36	NA	NC
Mean Maximum Depth (cm):	NA	46	NA	8
Mean Average Depth (cm):	NA	22	NA	5
Mean Residual Depth (cm)*:	NA	8	--	--
Percent Surveyed as Glides:	NA	25	--	--
Percent Surveyed as Runs:	--	--	NA	0
Percent Surveyed as Cascades:	--	--	NA	0
Percent with > 35% Fines:	NA	25	NA	0

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected; NC = could not calculate

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	62
1 - 5 m long, > 55 cm diameter:	NA	0
> 5 m long, 10 cm – 55 cm diameter:	NA	66
> 5 m long, > 55 cm diameter:	NA	1
Total:	NA	128

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	18
C:	82
D:	0
E:	0
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	1.0
Median Water Temperature (C):	NC

*recorded in 2004 only

*Morehead/Stanton District
Frenchburg Quadrangle*

Not surveyed in 1990s.

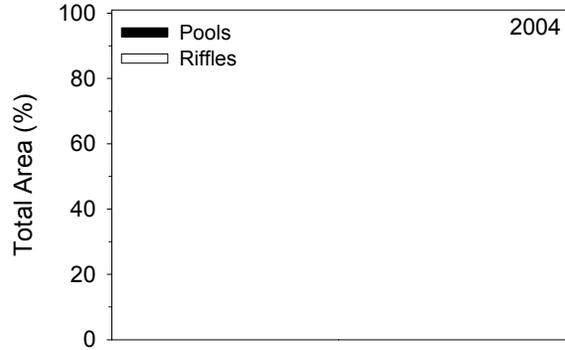


Figure A3. Estimated area of Richard Hollow in pools and riffles as calculated using BVET techniques.

Not surveyed in 1990s.

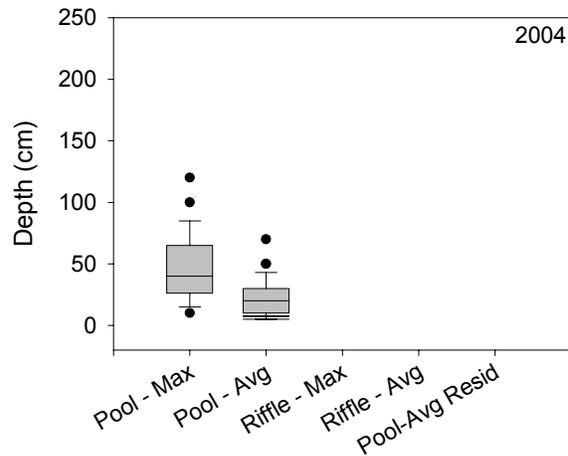


Figure A4. Maximum and average depths for pools and riffles and residual depths in Richard Hollow. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

**Morehead/Stanton District
Frenchburg Quadrangle**

Not surveyed in 1990s.

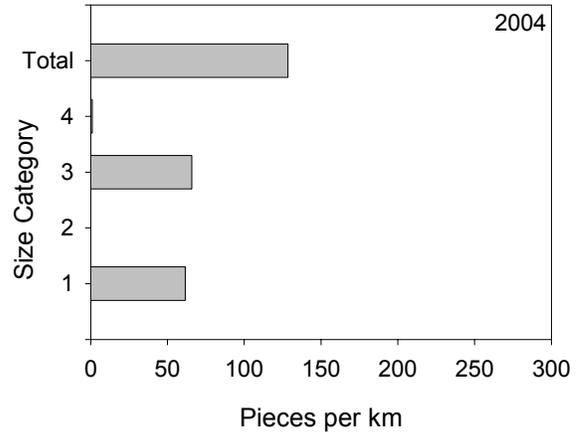


Figure A5. LWD per kilometer in Richard Hollow. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: <5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

Not surveyed in 1990s.

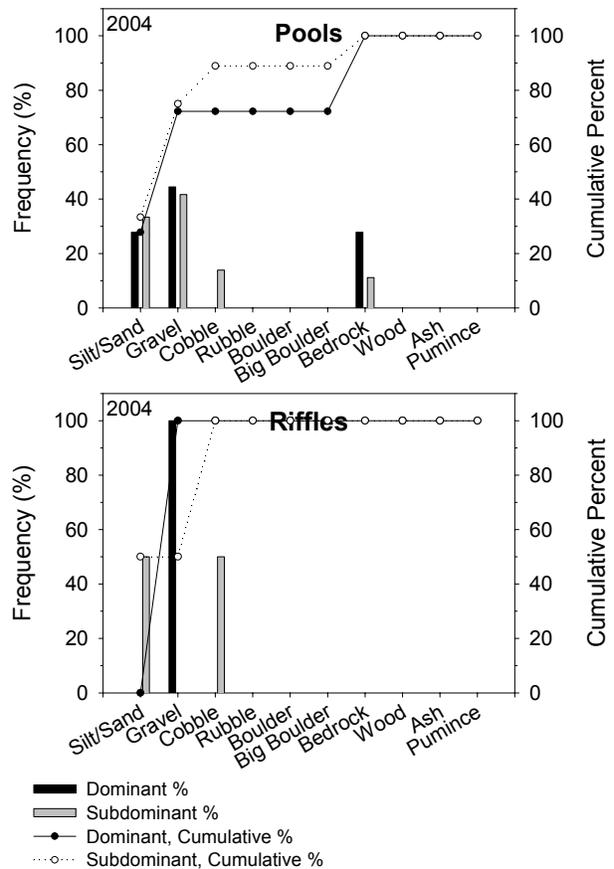


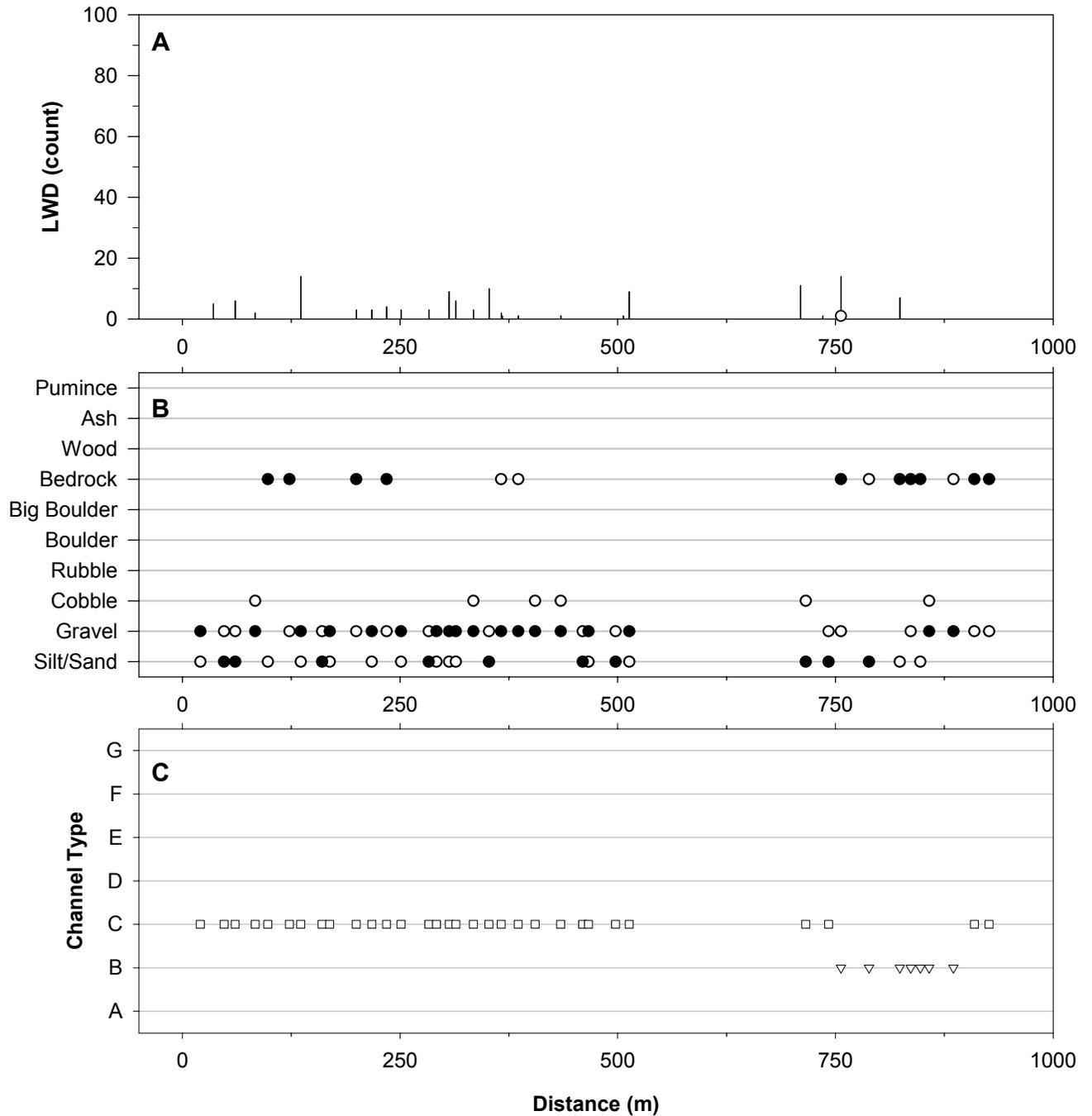
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Richard Hollow.

*Morehead/Stanton District
Frenchburg Quadrangle*

Stream features found on Richard Hollow during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		INTERSECTION OF ROAD 1239 AND REBEL TRACE
SCH	405.4		
SCH	537.8		
TRIB	302.7	3	
TRIB	405.4		
TRIB	445.8	3	
TRIB	976.9	0.5	

*Morehead/Stanton District
Frenchburg Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Richard Hollow, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Redbird District
Creekville Quadrangle*

Stream:	Katie's Creek	
District:	Redbird	
USGS Quadrangle:	Creekville	
	1992	2004
Survey Date:	6/15-7/10/1992	7/09/2004
Total Distance Surveyed (km)*:	0.5	1.1

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	25	52	75	48
Total Area (m ²):	698±672	2334±1060	2085±NC	2130±326
Correction Factor Applied:	1.08	1.30	1.25	1.07
Number of Paired Samples:	2	4	1	3
Total Count:	7	21	9	19
Number per km:	14	19	18	17
Mean Area (m ²):	100	111	232	112
Mean Maximum Depth (cm):	NA	42	NA	19
Mean Average Depth (cm):	56	20	13	8
Mean Residual Depth (cm)*:	99	12	--	--
Percent Surveyed as Glides:	71	33	--	--
Percent Surveyed as Runs:	--	--	NA	0
Percent Surveyed as Cascades:	--	--	0	0
Percent with > 35% Fines:	NA	19	NA	16

*Residual depth measured only in pools in initial survey, pools and glides in 2004

NA = data not collected; NC = could not calculate

Large Woody Debris Size Classes*	Pieces per km	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	5
1 - 5 m long, > 55 cm diameter:	NA	0
> 5 m long, 10 cm – 55 cm diameter:	NA	5
> 5 m long, > 55 cm diameter:	NA	3
Total:	35	13

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	0
C:	0
D:	0
E:	0
F:	100
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	3.0
Median Water Temperature (C):	20

*recorded in 2004 only

*Redbird District
Creekville Quadrangle*

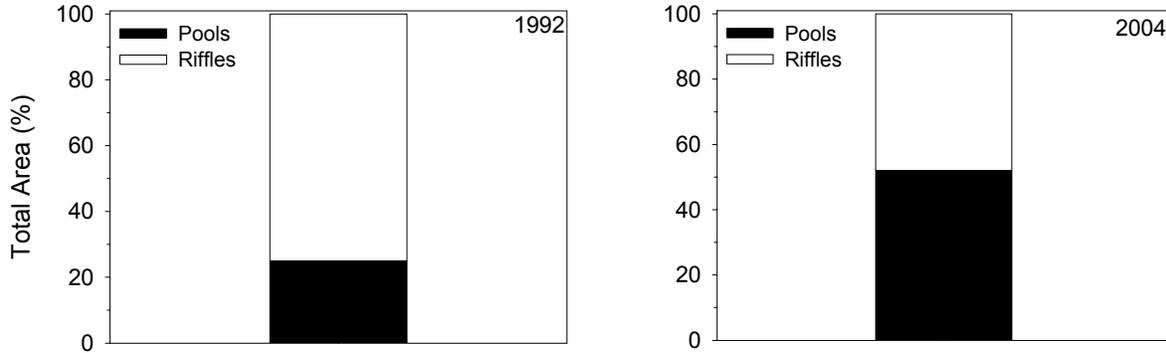


Figure A3. Estimated area of Katie's Creek in pools and riffles as calculated using BVET techniques.

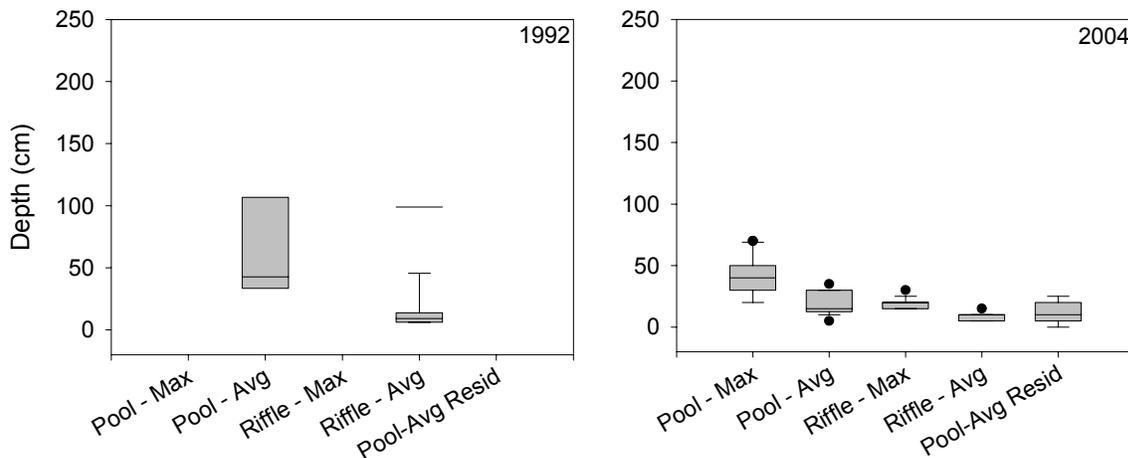


Figure A4. Maximum and average depths for pools and riffles and residual depths in Katie's Creek. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

**Redbird District
Creekville Quadrangle**

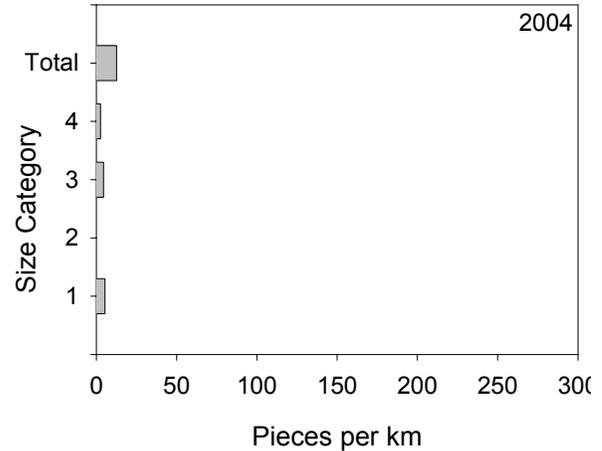
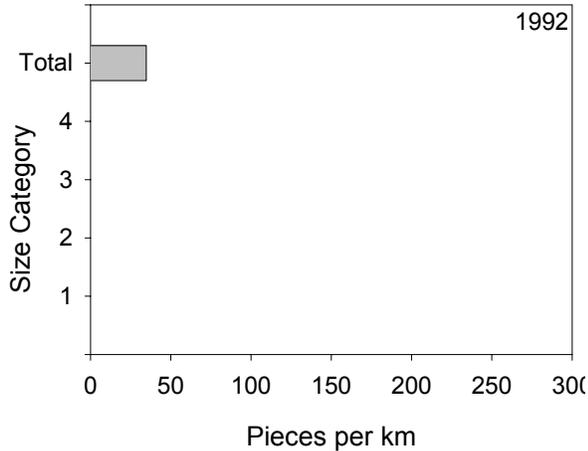


Figure A5. LWD per kilometer in Katie's Creek. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: < 5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

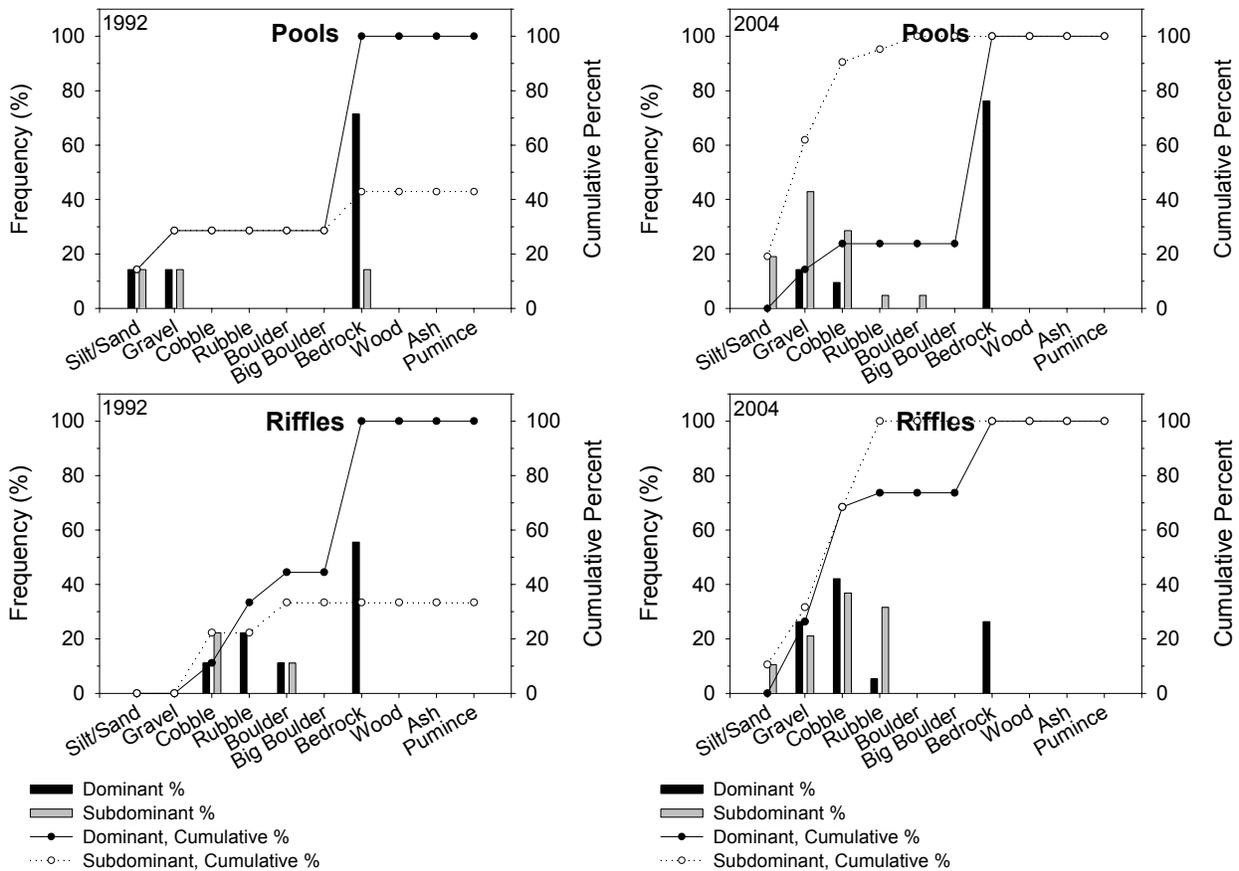


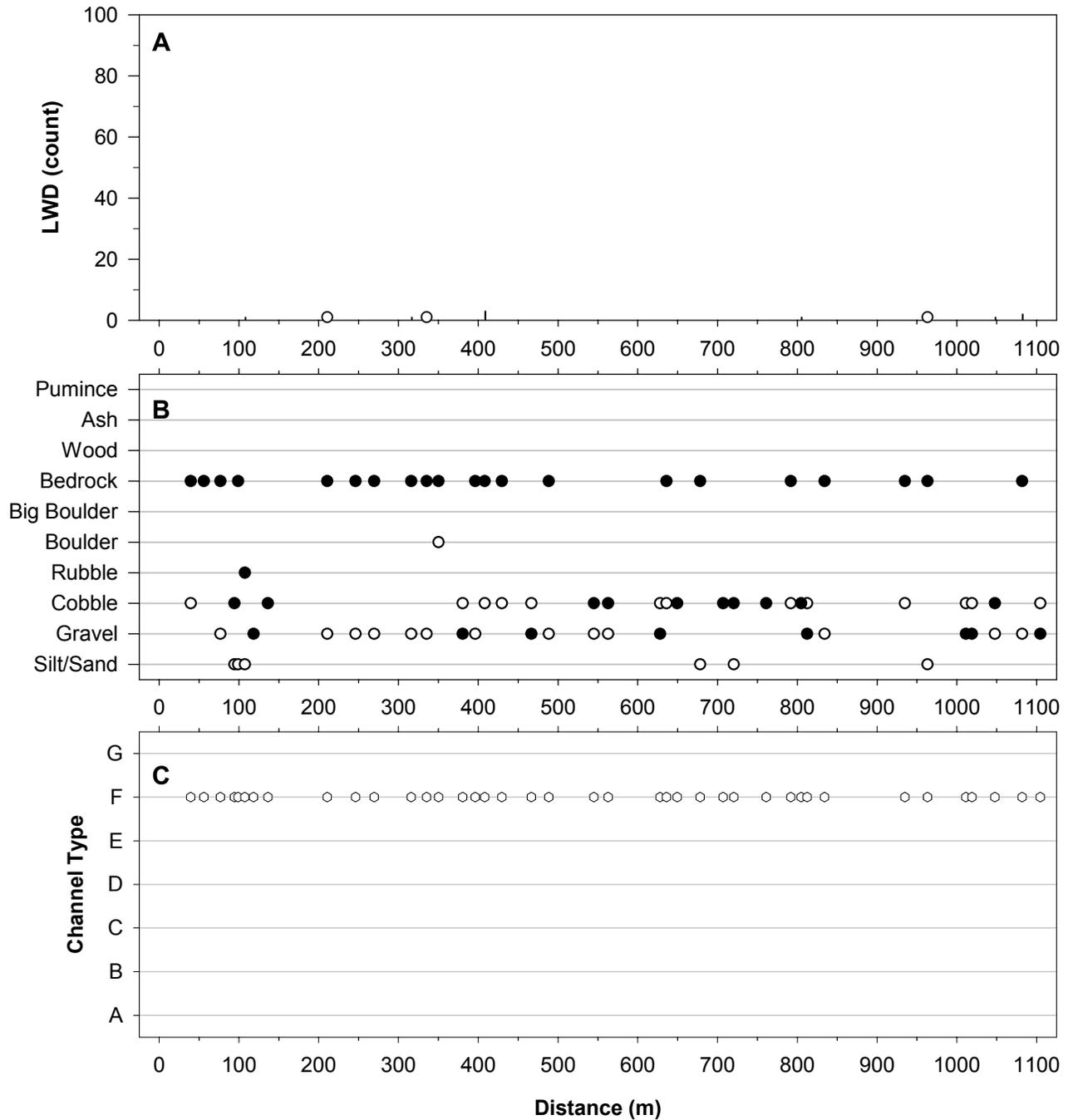
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Katie's Creek.

*Redbird District
Creeksville Quadrangle*

Stream features found on Katie's Creek during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		SECOND PLACE WHERE 1706 FORDS KATIE'S CREEK.
SCH	85.3	2.5	IN ON LEFT
SCH	119		OUT ON LEFT
SEEP	270.3		IN ON LEFT
FORD	444		1706
FORD	592.4		1706
FORD	646.5		ATV TRAIL-ON MAP
FORD	699.3		ATV TRAIL-ON MAP
FORD	880		ATV TRAIL-ON MAP
TRIB	1011.3		IN ON RIGHT. DRY.

*Redbird District
Creeksville Quadrangle*



Distribution and abundance of LWD, distribution substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Katie's Creek, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).o

*Redbird District
Creeksville Quadrangle*

Stream:	Upper Bear Creek	
District:	Redbird	
USGS Quadrangle:	Creeksville	
	1992	2004
Survey Date:	6/10-6/17/1992	7/07/2004
Total Distance Surveyed (km)*:	1.2	1.3

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	28	41	72	59
Total Area (m ²):	1922±2874	2650±484	4853±1860	3885±604
Correction Factor Applied:	1.19	1.08	1.08	0.96
Number of Paired Samples:	2	6	2	5
Total Count:	16	31	23	26
Number per km:	13	24	19	20
Mean Area (m ²):	120	85	211	149
Mean Maximum Depth (cm):	NA	59	NA	30
Mean Average Depth (cm):	74	39	21	13
Mean Residual Depth (cm)*:	96	29	--	--
Percent Surveyed as Glides:	44	3	--	--
Percent Surveyed as Runs:	--	--	NA	31
Percent Surveyed as Cascades:	--	--	70	8
Percent with > 35% Fines:	NA	23	NA	4

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected

Large Woody Debris Size Classes*	Pieces per km	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	13
1 - 5 m long, > 55 cm diameter:	NA	2
> 5 m long, 10 cm – 55 cm diameter:	NA	6
> 5 m long, > 55 cm diameter:	NA	1
Total:	30	21

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	14
B:	86
C:	0
D:	0
E:	0
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	3.0
Median Water Temperature (C):	20

*recorded in 2004 only

*Redbird District
Creeksville Quadrangle*

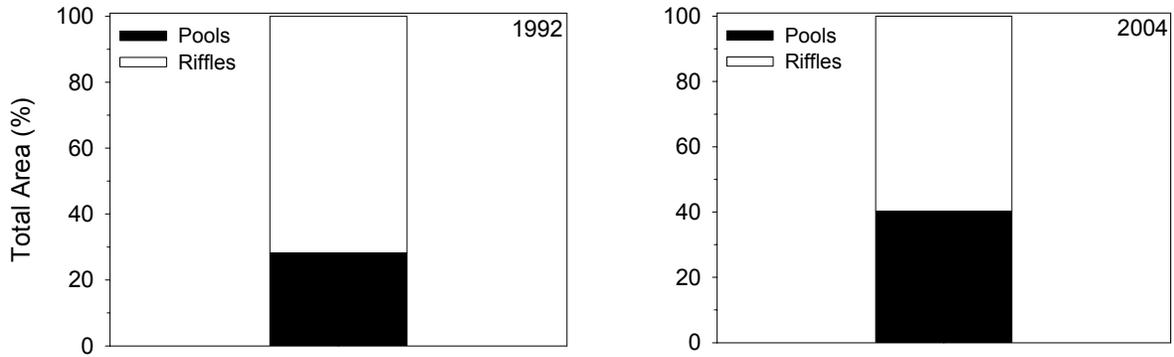


Figure A3. Estimated area of Upper Bear Creek in pools and riffles as calculated using BVET techniques.

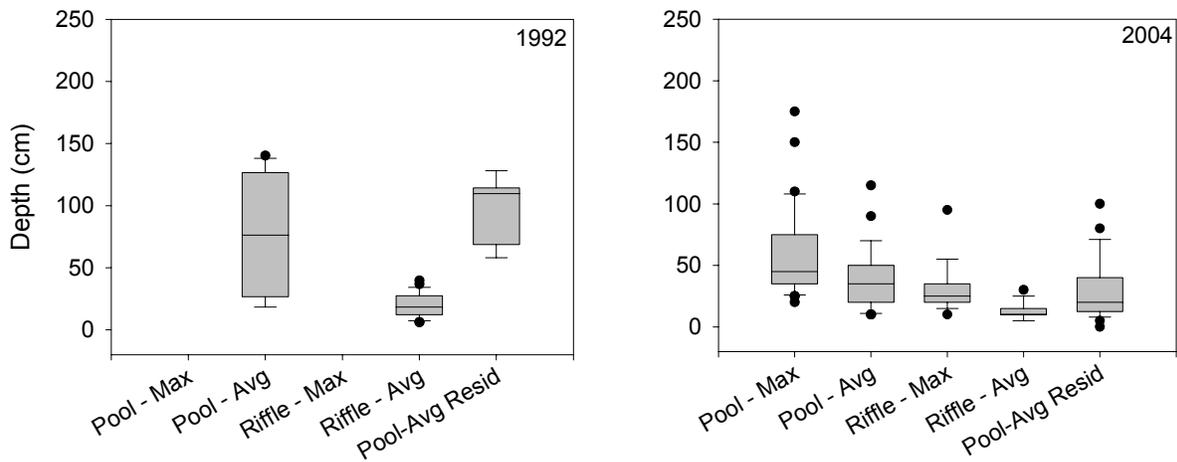


Figure A4. Maximum and average depths for pools and riffles and residual depths in Upper Bear Creek. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

*Redbird District
Creekville Quadrangle*

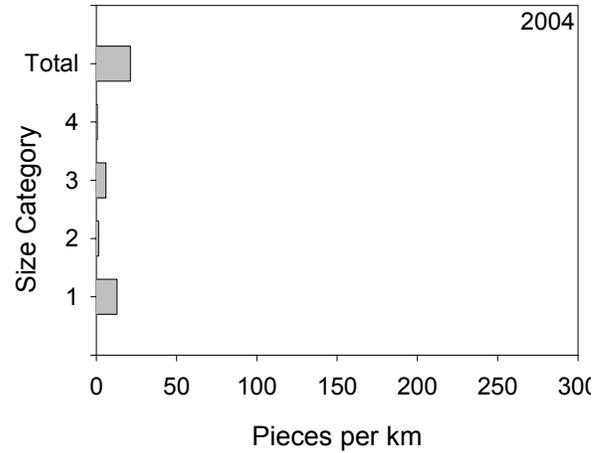
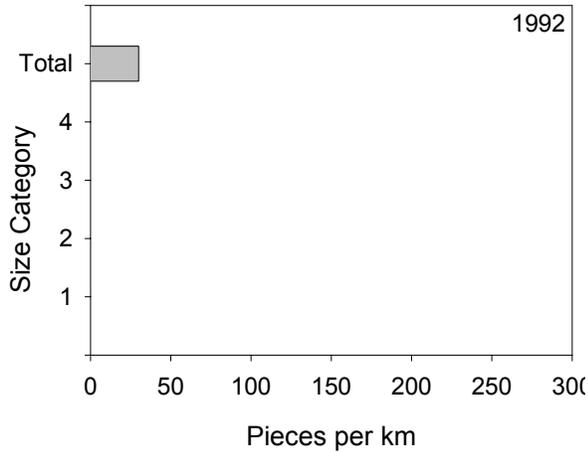


Figure A5. LWD per kilometer in Upper Bear Creek. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: <5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

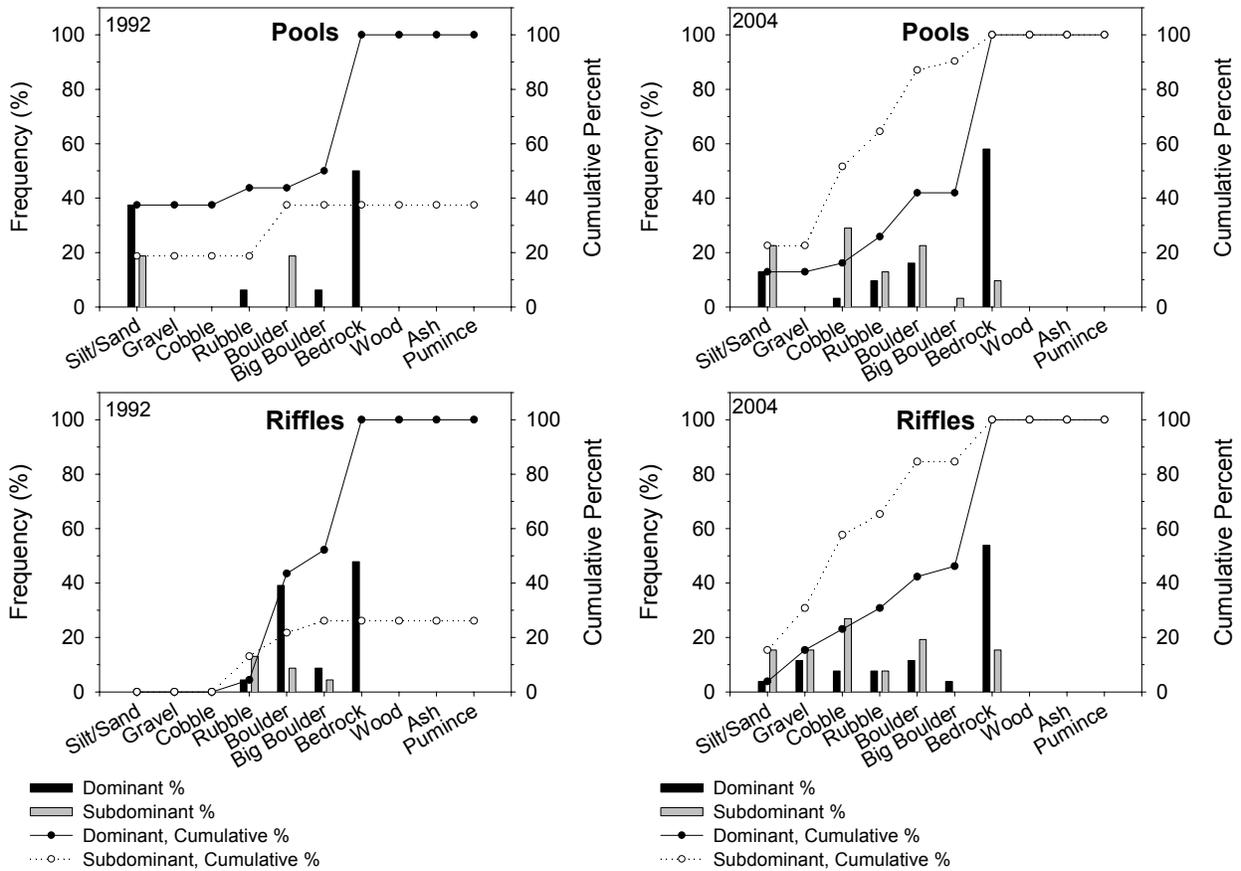


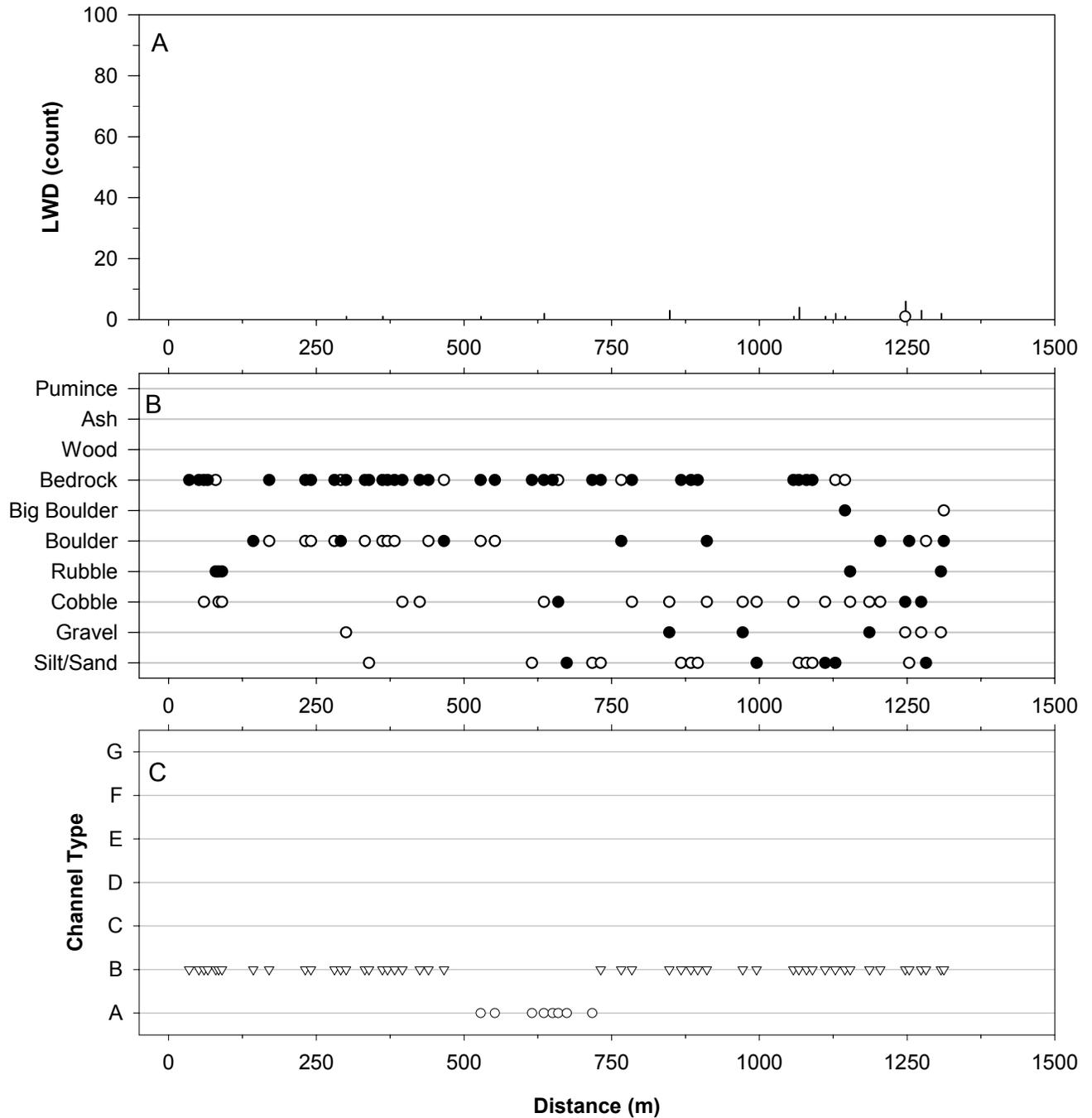
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Upper Bear Creek.

*Redbird District
Creeksville Quadrangle*

Stream features found on Upper Bear Creek during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		NEAR 28" LOG NEAR 1507
SEEP	300		IN ON LEFT OFF OF STEEP CLIFF
SEEP	351		IN ON LEFT OFF OF STEEP CLIFF
SEEP	560		IN ON LEFT OFF OF STEEP CLIFF
SEEP	717.3		IN ON RIGHT
SCH	800	1.5	IN ON RIGHT
SCH	849.3	1.5	OUT ON RIGHT
SCH	916.8	1	IN ON RIGHT
SCH	927.2	2	IN ON RIGHT
SCH	960.8	2	OUT ON RIGHT
SCH	1237	1	
SCH	1258.8	1.5	OUT ON RIGHT

*Redbird District
Creeksville Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Upper Bear Creek, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

**Somerset District
Hail Quadrangle**

Stream:	Little Hurricane Fork	
District:	Somerset	
USGS Quadrangle:	Hail	
	1993	2004
Survey Date:	7/12-7/15/1993	7/11/2004
Total Distance Surveyed (km)*:	1.4	1.5

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	46	64	54	36
Total Area (m ²):	3107±894	4049±434	3662±282	2272±273
Correction Factor Applied:	1.20	0.95	1.20	0.95
Number of Paired Samples:	5	11	5	7
Total Count:	47	56	50	38
Number per km:	35	38	37	26
Mean Area (m ²):	66	72	73	60
Mean Maximum Depth (cm):	NA	48	NA	18
Mean Average Depth (cm):	39	27	8	10
Mean Residual Depth (cm)*:	71	19	--	--
Percent Surveyed as Glides:	79	23	--	--
Percent Surveyed as Runs:	--	--	NA	0
Percent Surveyed as Cascades:	--	--	2	0
Percent with > 35% Fines:	NA	32	NA	0

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected; NC = could not calculate

Large Woody Debris Size Classes*	Pieces per km	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	61
1 - 5 m long, > 55 cm diameter:	NA	2
> 5 m long, 10 cm – 55 cm diameter:	NA	79
> 5 m long, > 55 cm diameter:	NA	14
Total:	14	156

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	65
C:	10
D:	0
E:	0
F:	26
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	3.5
Median Water Temperature (C):	17

*recorded in 2004 only

*Somerset District
Hail Quadrangle*

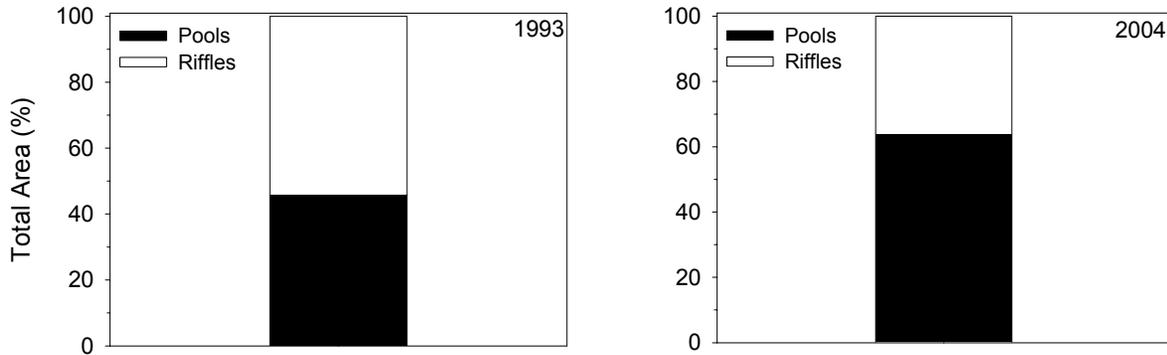


Figure A3. Estimated area of Little Hurricane Fork in pools and riffles as calculated using BVET techniques.

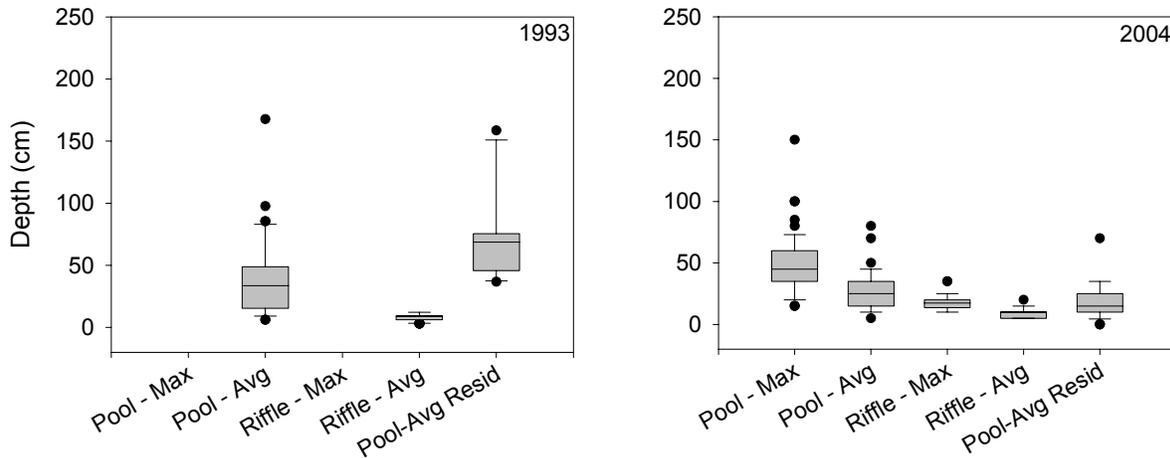


Figure A4. Maximum and average depths for pools and riffles and residual depths in Little Hurricane Fork. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

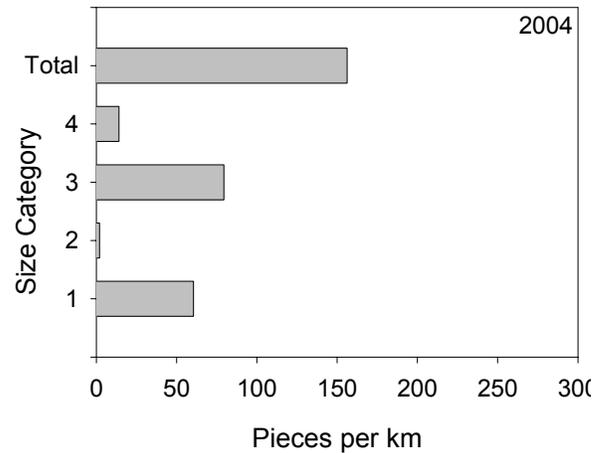
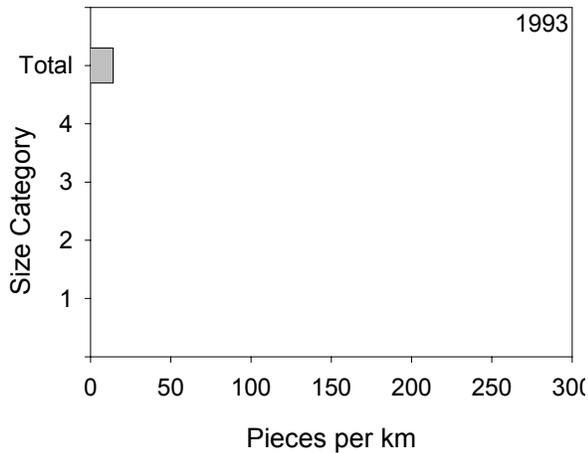


Figure A5. LWD per kilometer in Little Hurricane Fork. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: <5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

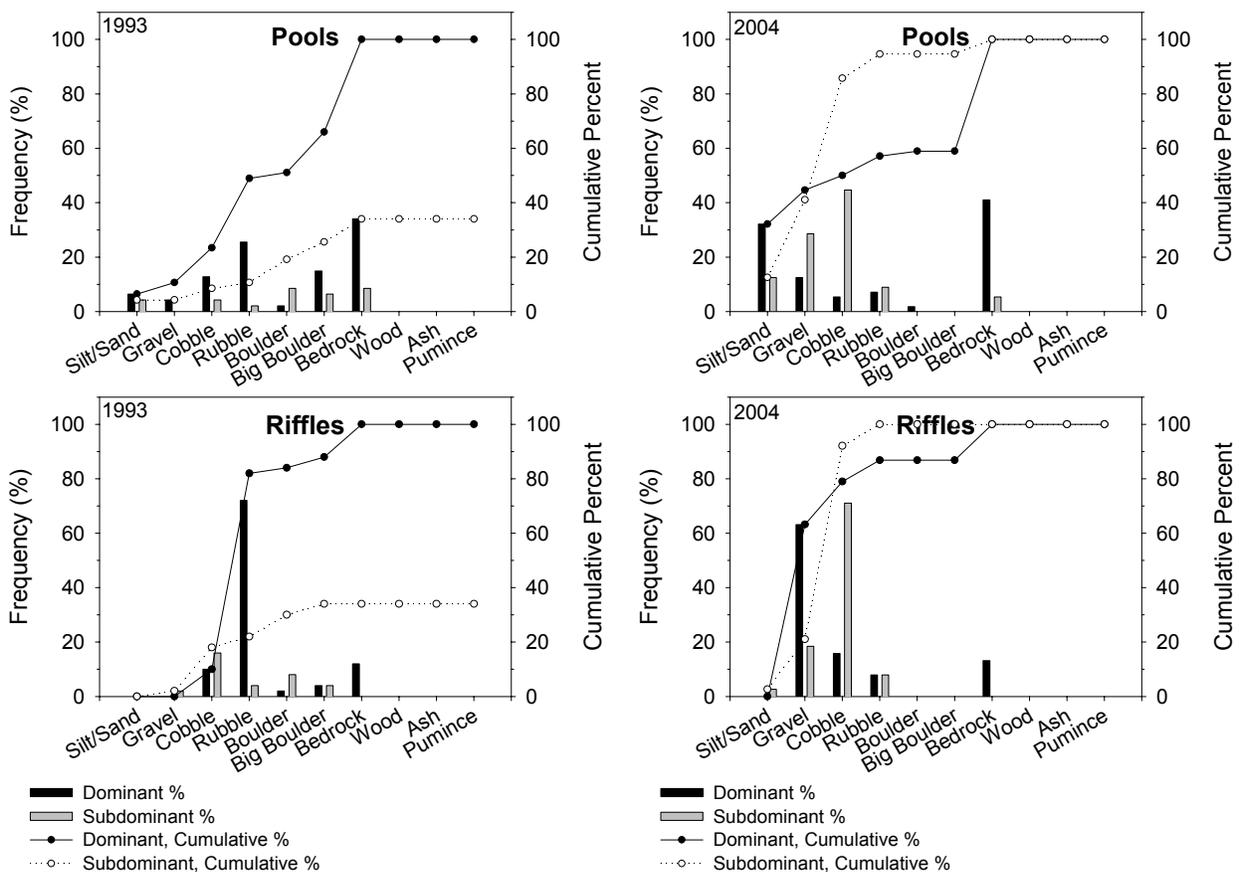


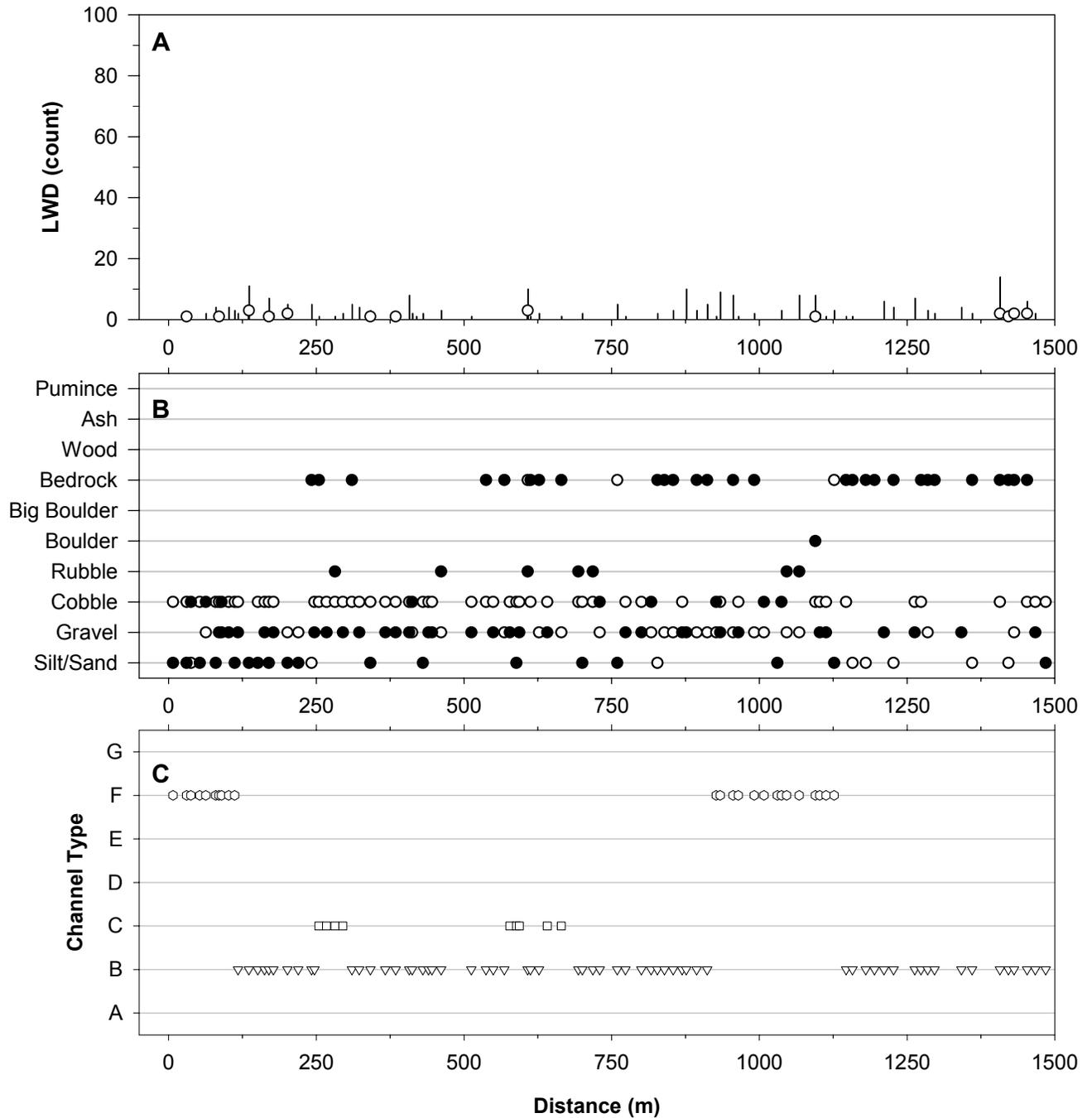
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Little Hurricane Fork.

*Somerset District
Hail Quadrangle*

Stream features found on Little Hurricane Fork during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		4085205N 725375E
SCH	373.5		IN ON LEFT
SCH	403.4		OUT ONLEFT
UNGR	419.3		From 412.4 m to 419.3 m
SCH	493.3		IN ON RIGHT
SCH	512.4		OUT ON RIGHT
TRIB	568.2	0.2	IN ON LEFT
TRIB	742.5		BOTH TRIBS IN ON LEFT, LITTLE DRIBBLE OF WATER FALLING APPROX 7M
TRIB	754.3		
TRIB	830.4		IN ON LEFT, DRY
TRIB	896.8	0.25	IN ON RIGHT
TRIB	1030.5	0.3	IN ON RIGHT
FALL	1137.1		1M HIGH
TRIB	1328		IN ON LEFT, 18M DROP, WATER DRIBBLING OVER LIP

*Somerset District
Hail Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Little Hurricane Fork, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Stanton District
Pomeroyton Quadrangle*

Stream:	Gladie Creek	
District:	Stanton	
USGS Quadrangle:	Pomeroyton	
	1993	2004
Survey Date:	7/23/1993	7/07/2004
Total Distance Surveyed (km)*:	1.4	1.1

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	80	63	20	37
Total Area (m ²):	12024±NC	5961±NC	2938±3569	3437±460
Correction Factor Applied:	1.23	0.93	1.17	1.07
Number of Paired Samples:	1	1	2	2
Total Count:	25	8	21	9
Number per km:	17	7	15	8
Mean Area (m ²):	481	745	140	382
Mean Maximum Depth (cm):	NA	98	NA	39
Mean Average Depth (cm):	54	53	8	25
Mean Residual Depth (cm)*:	139	36	--	--
Percent Surveyed as Glides:	76	63	--	--
Percent Surveyed as Runs:	--	--	NA	33
Percent Surveyed as Cascades:	--	--	0	0
Percent with > 35% Fines:	NA	75	NA	11

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected; NC = could not calculate

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	35
1 - 5 m long, > 55 cm diameter:	NA	0
> 5 m long, 10 cm – 55 cm diameter:	NA	46
> 5 m long, > 55 cm diameter:	NA	3
Total:	34	85

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	41
C:	59
D:	0
E:	0
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	7.5
Median Water Temperature (C):	21

*recorded in 2004 only

*Stanton District
Pomeroyton Quadrangle*

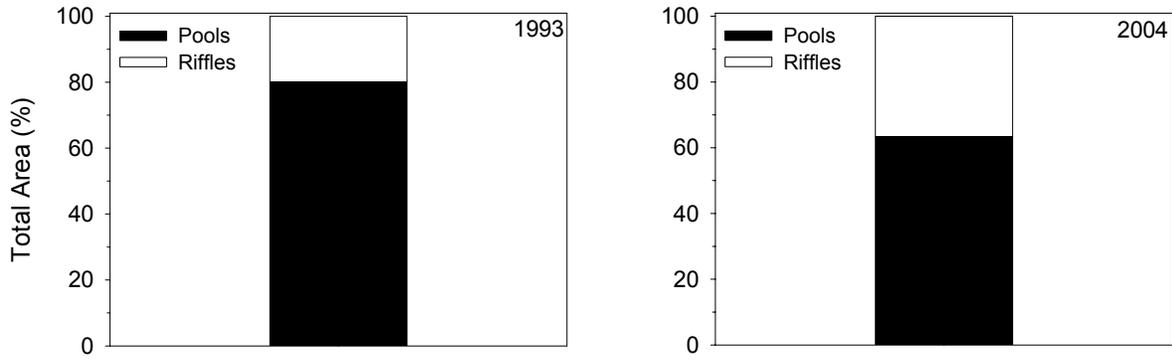


Figure A3. Estimated area of Gladie Creek in pools and riffles as calculated using BVET techniques.

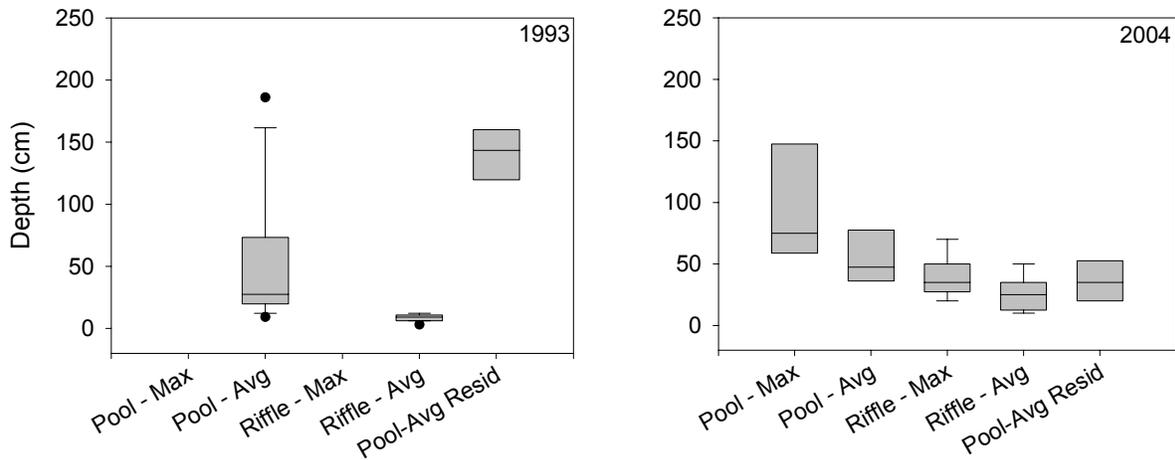


Figure A4. Maximum and average depths for pools and riffles and residual depths in Gladie Creek. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

**Stanton District
Pomeroyton Quadrangle**

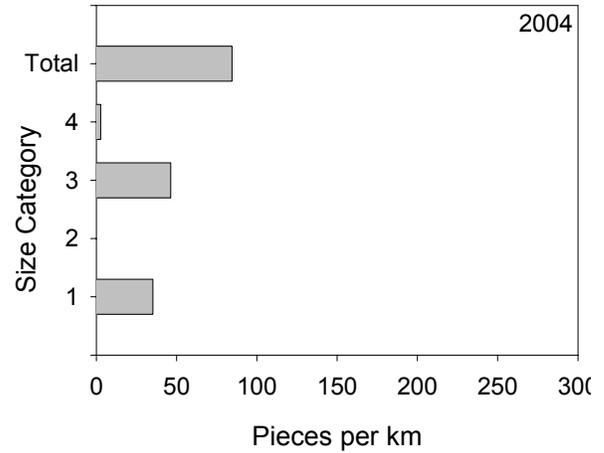
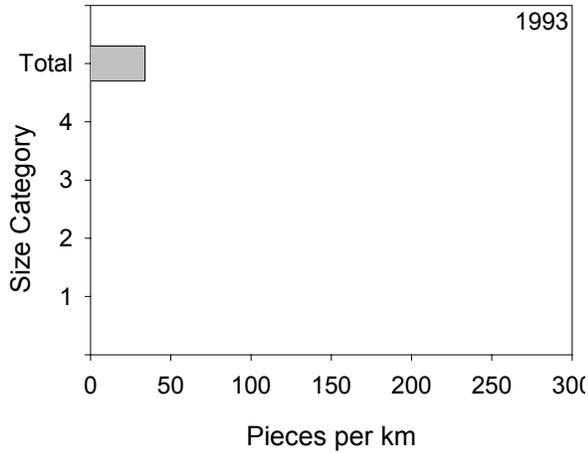


Figure A5. LWD per kilometer in Gladie Creek. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: < 5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

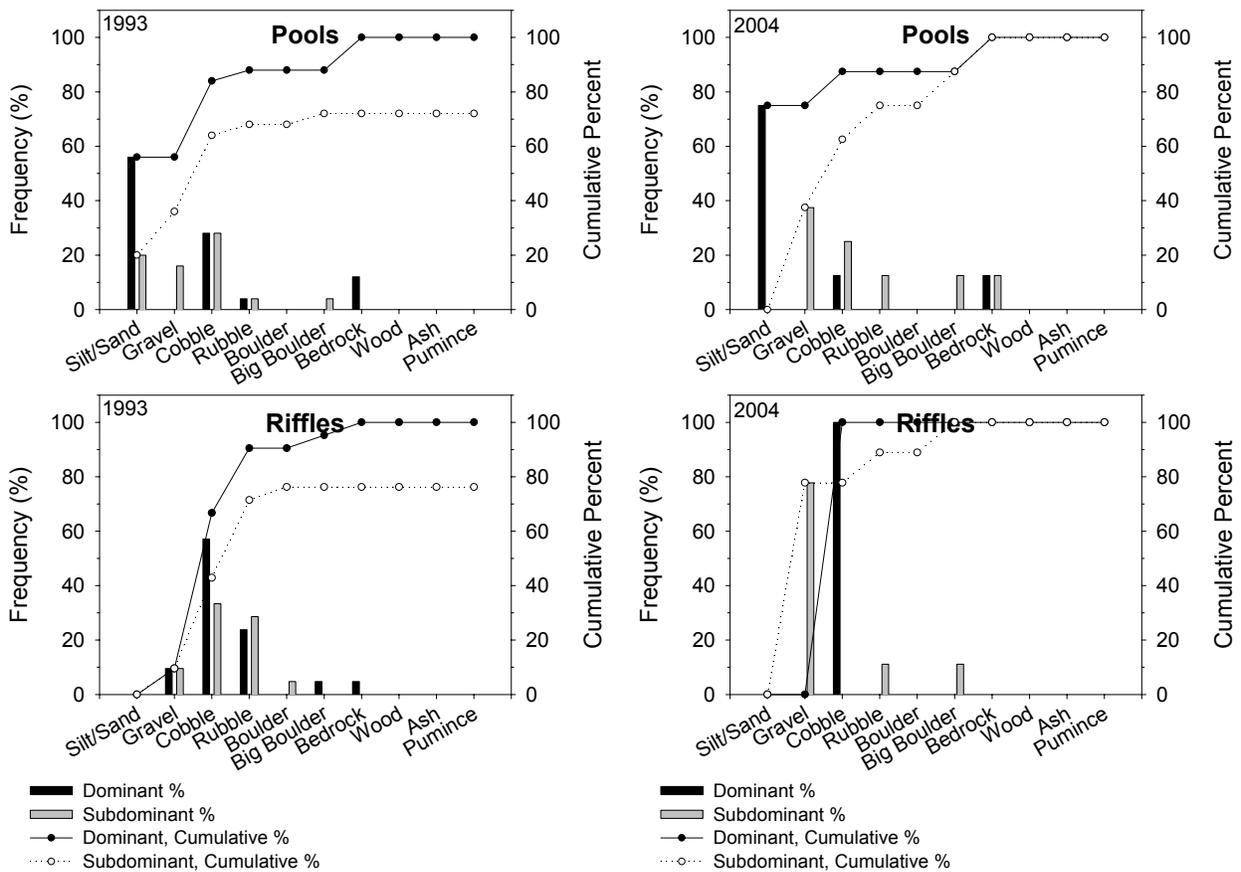


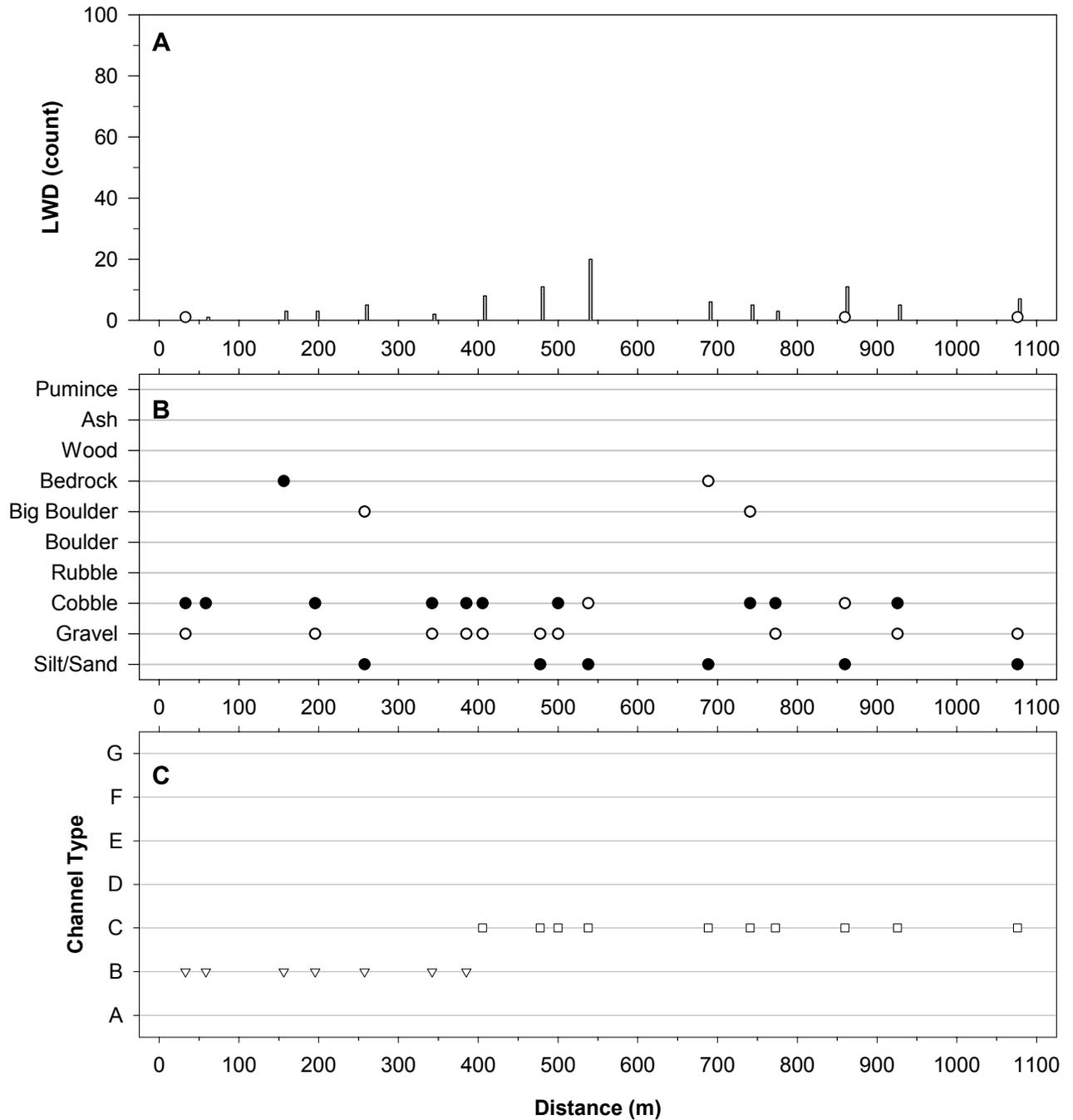
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Gladie Creek.

*Stanton District
Pomeroyton Quadrangle*

Stream features found on Gladie Creek during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		AT THE UPSTREAM END OF THE BRIDGE CROSSING, FOREST SERVICE ROAD 715
SCH	405.4		
SCH	537.8		
TRIB	302.7	3	
TRIB	405.4		
TRIB	445.8	3	
TRIB	976.9	0.5	

*Stanton District
Pomeroyton Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Gladie Creek, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Stanton District
Pomeroyton Quadrangle*

Stream:	Rockbridge Fork	
District:	Stanton	
USGS Quadrangle:	Pomeroyton	
	1990s	2004
Survey Date:	NOT SURVEYED	7/07/2004
Total Distance Surveyed (km)*:	NA	0.8

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	NA	65	NA	35
Total Area (m ²):	NA	2962±1377	NA	1572±1657
Correction Factor Applied:	NA	0.85	NA	1.04
Number of Paired Samples:	NA	3	NA	2
Total Count:	NA	13	NA	10
Number per km:	NA	16	NA	12
Mean Area (m ²):	NA	228	NA	157
Mean Maximum Depth (cm):	NA	37	NA	16
Mean Average Depth (cm):	NA	24	NA	10
Mean Residual Depth (cm)*:	NA	13	--	--
Percent Surveyed as Glides:	NA	46	--	--
Percent Surveyed as Runs:	--	--	NA	20
Percent Surveyed as Cascades:	--	--	NA	0
Percent with > 35% Fines:	NA	54	NA	10

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	44
1 - 5 m long, > 55 cm diameter:	NA	0
> 5 m long, 10 cm – 55 cm diameter:	NA	86
> 5 m long, > 55 cm diameter:	NA	8
Total:	NA	139

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	91
C:	0
D:	0
E:	0
F:	9
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	5.3
Median Water Temperature (C):	19.5

*recorded in 2004 only

*Stanton District
Pomeroyton Quadrangle*

Not surveyed in 1990s.

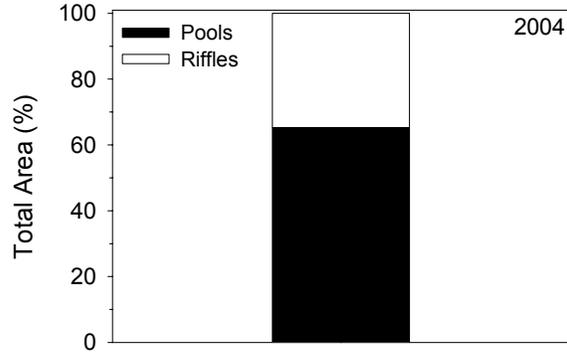


Figure A3. Estimated area of Rockbridge Fork in pools and riffles as calculated using BVET techniques.

Not surveyed in 1990s.

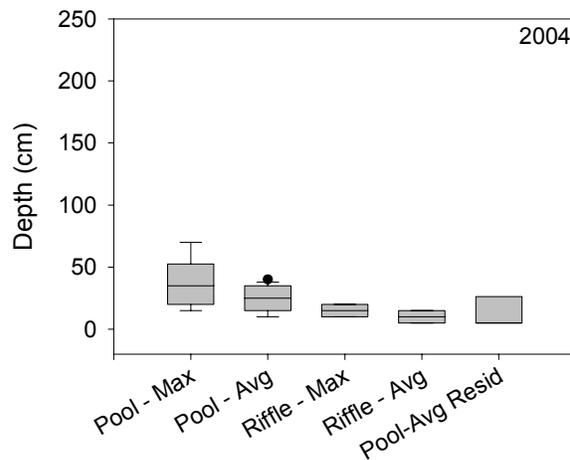


Figure A4. Maximum and average depths for pools and riffles and residual depths in Rockbridge Fork. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

*Stanton District
Pomeroyton Quadrangle*

Not surveyed in 1990s.

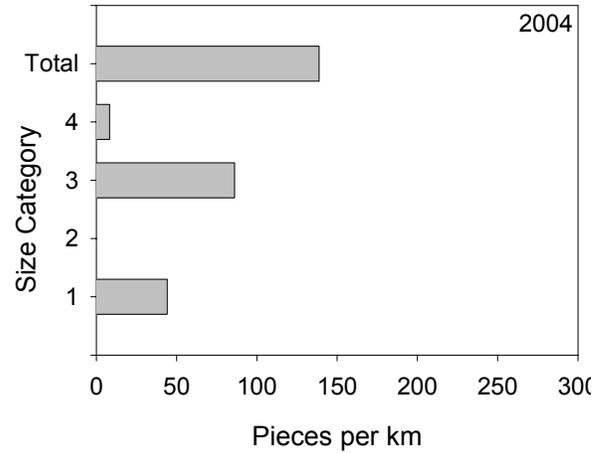


Figure A5. LWD per kilometer in Rockbridge Fork. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: <5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

Not surveyed in 1990s.

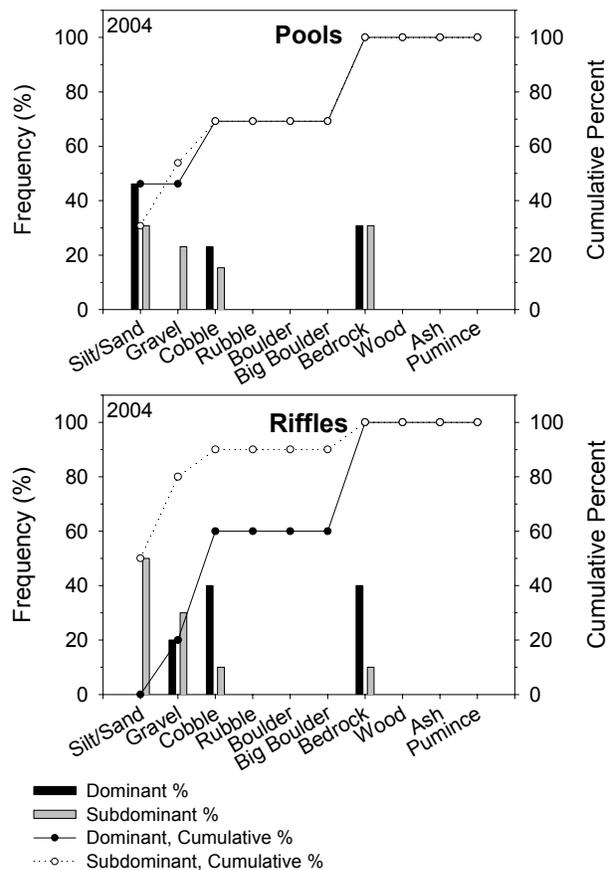


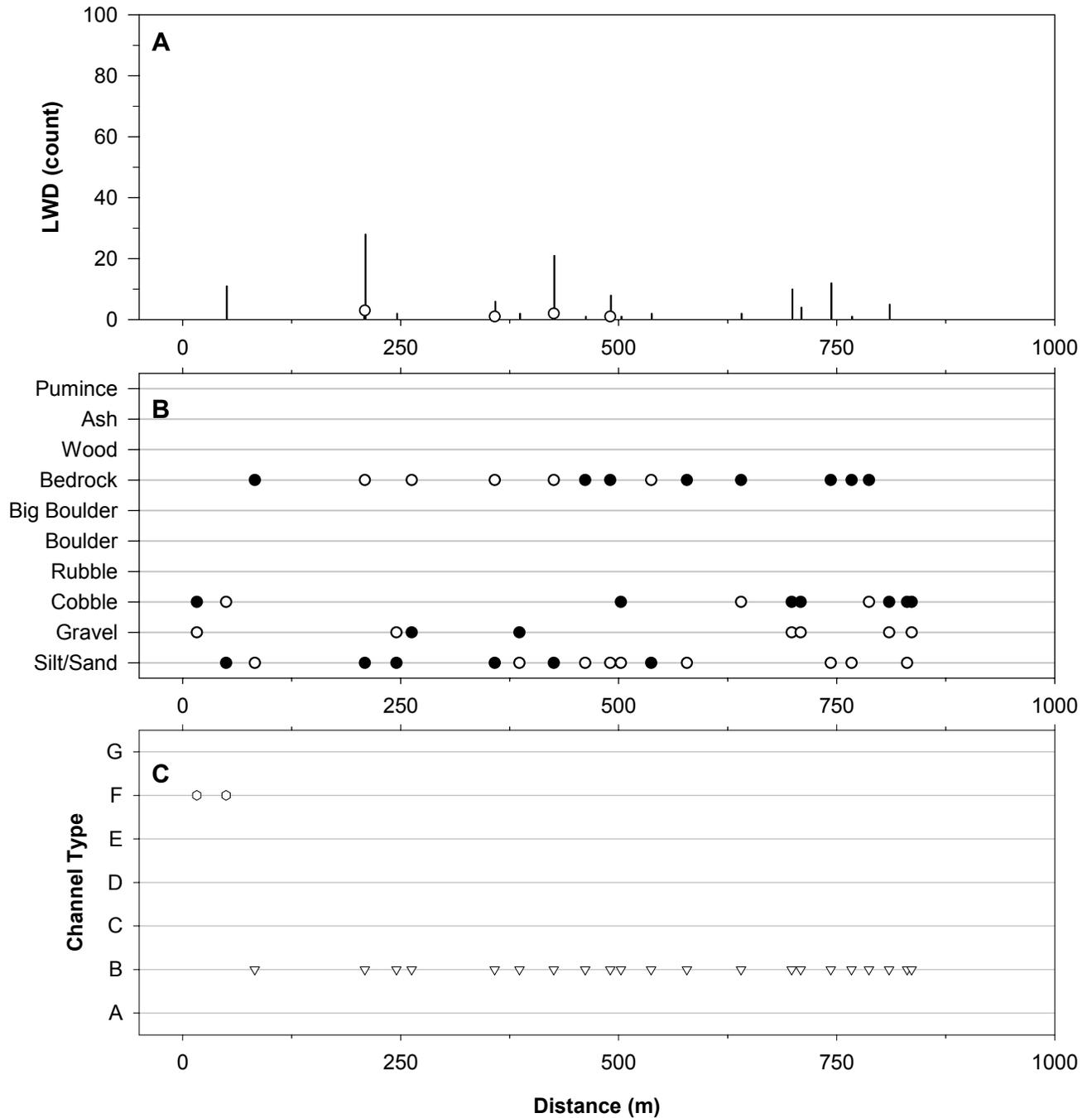
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Rockbridge Fork.

*Stanton District
Pomeroyton Quadrangle*

Stream features found on Rockbridge Fork during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		AT THE CONFLUENCE OF ROCKBRIDGE FORK AND CAMP BEAR BRANCH, JUST UPSTREAM FROM ROCKBRIDGE
FALL	58.2	5.5	6M HIGH
TRIB	499.1		IN ON LEFT

*Stanton District
Pomeroyton Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Rockbridge Fork, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Stanton/Berea District
Irvine/Clay City Quadrangle*

Stream:	Tickey Fork	
District:	Stanton/Berea	
USGS Quadrangle:	Irvine/Clay City	
	1993	2004
Survey Date:	6/28/1993	7/08/2004
Total Distance Surveyed (km)*:	0.9	0.9

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	9	30	91	70
Total Area (m ²):	199±52	780±43	1903±291	1793±201
Correction Factor Applied:	0.86	1.04	1.10	1.16
Number of Paired Samples:	2	7	2	7
Total Count:	26	34	29	32
Number per km:	31	36	34	34
Mean Area (m ²):	8	23	66	56
Mean Maximum Depth (cm):	NA	30	NA	16
Mean Average Depth (cm):	25	15	8	9
Mean Residual Depth (cm)*:	52	9	--	--
Percent Surveyed as Glides:	77	47	--	--
Percent Surveyed as Runs:	--	--	NA	0
Percent Surveyed as Cascades:	--	--	0	0
Percent with > 35% Fines:	NA	50	NA	0

*Residual depth measured only in pools in initial survey, pools and glides in 2004

NA = data not collected

Large Woody Debris Size Classes*	Pieces per km	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	41
1 - 5 m long, > 55 cm diameter:	NA	1
> 5 m long, 10 cm – 55 cm diameter:	NA	20
> 5 m long, > 55 cm diameter:	NA	0
Total:	54	62

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	42
B:	0
C:	58
D:	0
E:	0
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	2.0
Median Water Temperature (C):	16

*recorded in 2004 only

*Stanton/Berea District
Irvine/Clay City Quadrangle*

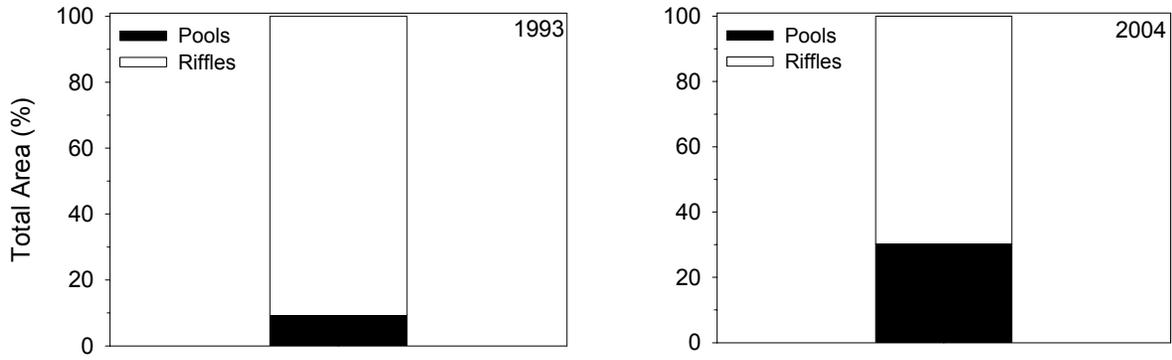


Figure A3. Estimated area of Tickey Fork in pools and riffles as calculated using BVET techniques.

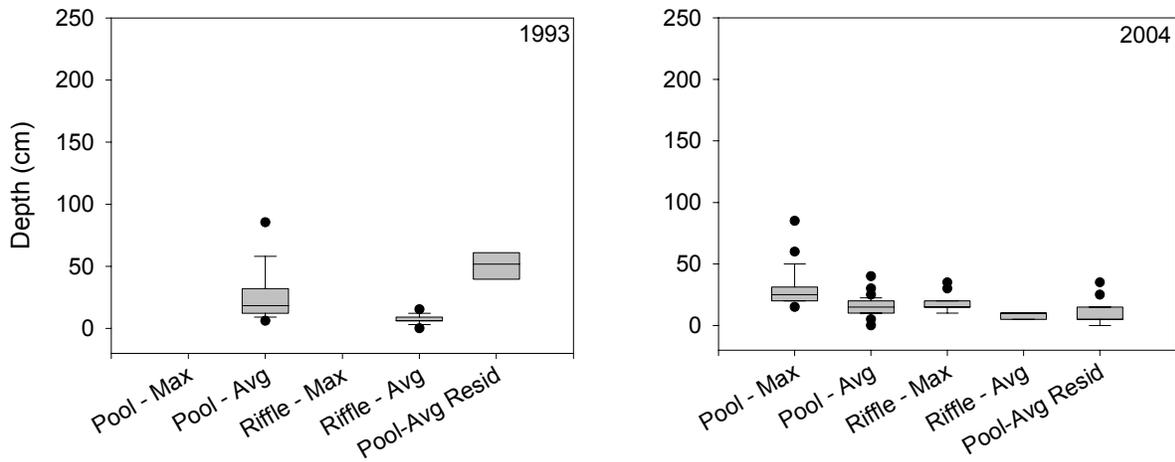


Figure A4. Maximum and average depths for pools and riffles and residual depths in Tickey Fork. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

*Stanton/Berea District
Irvine/Clay City Quadrangle*

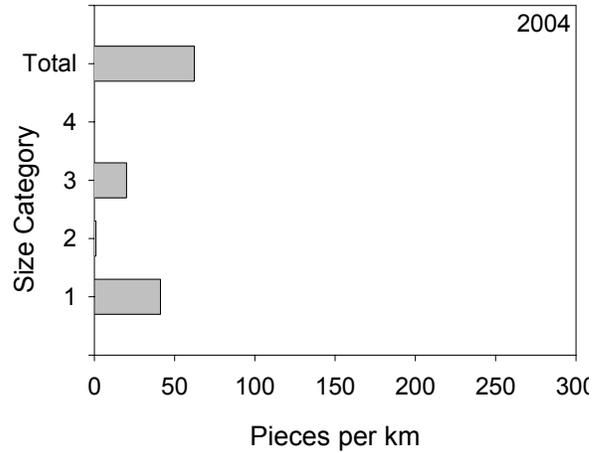
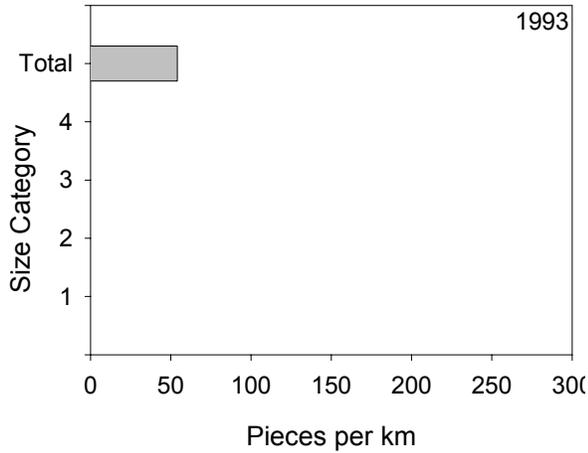


Figure A5. LWD per kilometer in Tickey Fork. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: < 5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

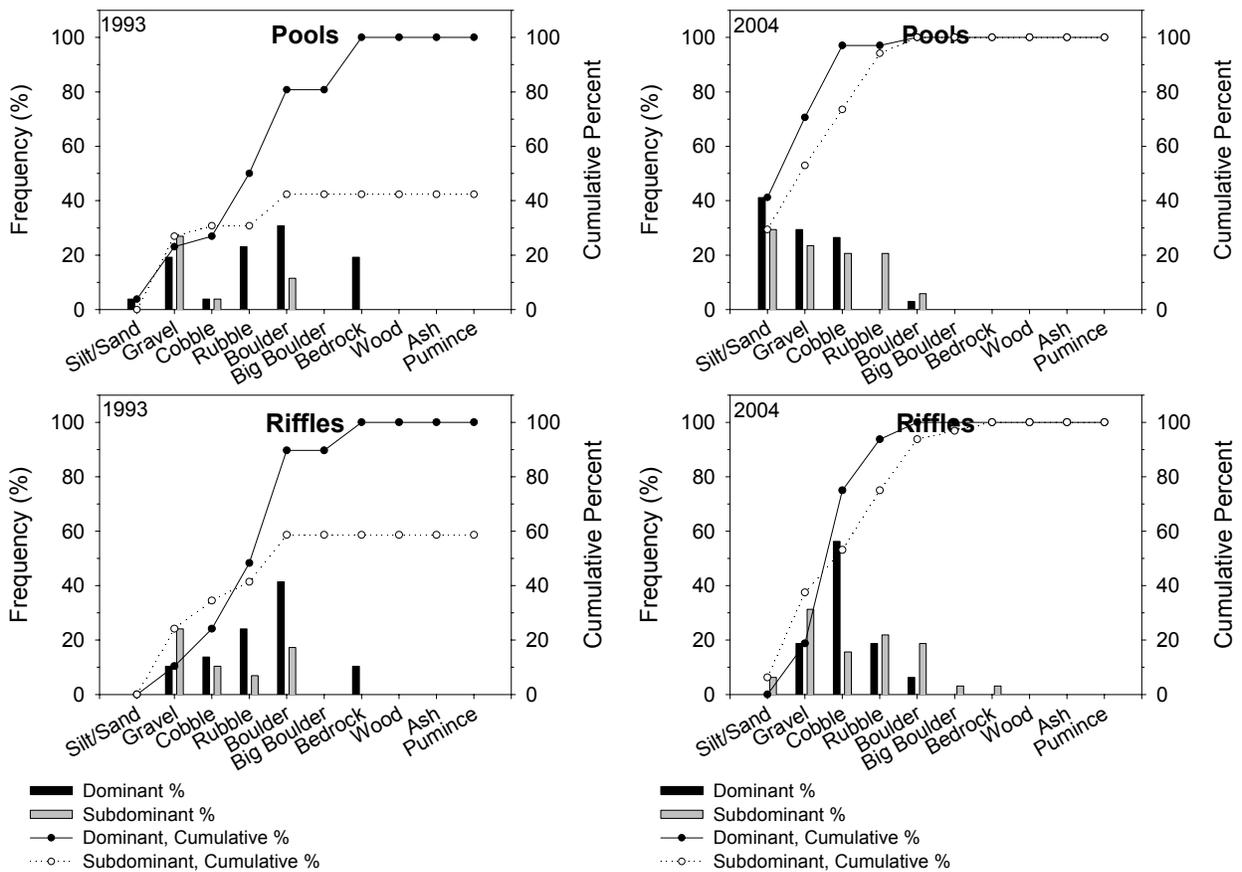


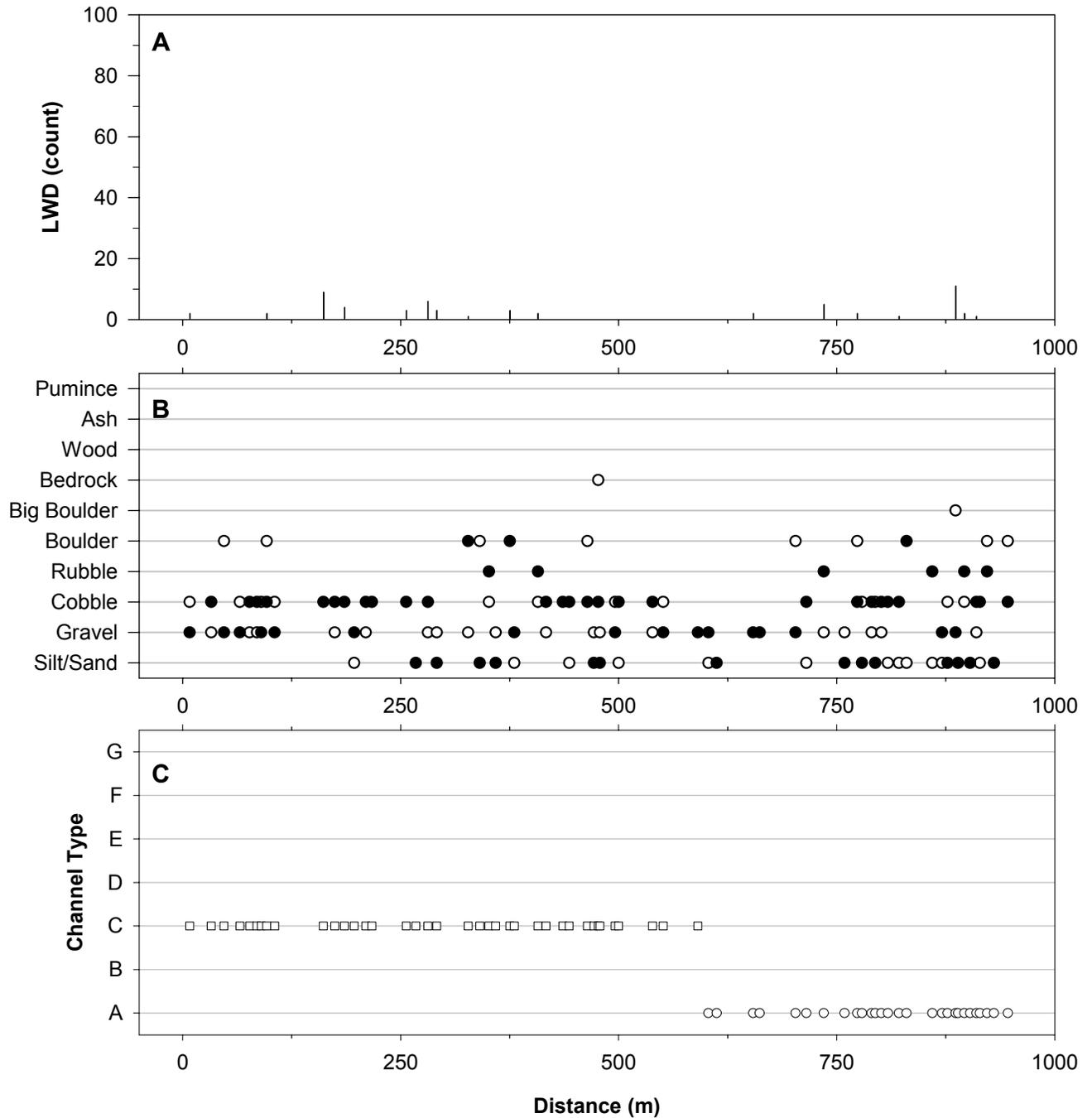
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Tickey Fork.

*Stanton/Berea District
Irvine/Clay City Quadrangle*

Stream features found on Tickey Fork during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		START AT 200/400M SOUTH OF FORD
FORD	444.1		ROAD CROSSING, ROAD TURNS INTO A TRAIL ON OTHER SIDE OF STREAM CHANNEL
FORD	499.9		ROAD CROSSING ON MAP
FORD	561.9		ROAD CROSSING WITH PRIMITIVE CAMPSITE ON LEFT SIDE OF STREAM BANK

*Stanton/Berea District
Irvine/Clay City Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Tickey Fork, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Stearns District
Barthell Quadrangle*

Stream:	Rock Creek (lower)	
District:	Stearns	
USGS Quadrangle:	Barthell	
	1993	2004
Survey Date:	6/24-7/21/1993	7/10/2004
Total Distance Surveyed (km)*:	0.8	0.8

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	NC	38	NC	62
Total Area (m ²):	NC	3912±1592	4648±NC	6367±2811
Correction Factor Applied:	NC	0.91	1.19	1.28
Number of Paired Samples:	0	2	1	3
Total Count:	16	8	14	15
Number per km:	20	10	18	19
Mean Area (m ²):	NC	489	332	424
Mean Maximum Depth (cm):	NA	136	NA	67
Mean Average Depth (cm):	94	81	27	39
Mean Residual Depth (cm)*:	95	42	--	--
Percent Surveyed as Glides:	50	38	--	--
Percent Surveyed as Runs:	--	--	NA	47
Percent Surveyed as Cascades:	--	--	0	0
Percent with > 35% Fines:	NA	25	NA	0

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected; NC = could not calculate

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	25
1 - 5 m long, > 55 cm diameter:	NA	0
> 5 m long, 10 cm – 55 cm diameter:	NA	14
> 5 m long, > 55 cm diameter:	NA	0
Total:	20	39

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	0
C:	0
D:	0
E:	0
F:	100
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	10.0
Median Water Temperature (C):	20

*recorded in 2004 only

*Stearns District
Barthell Quadrangle*

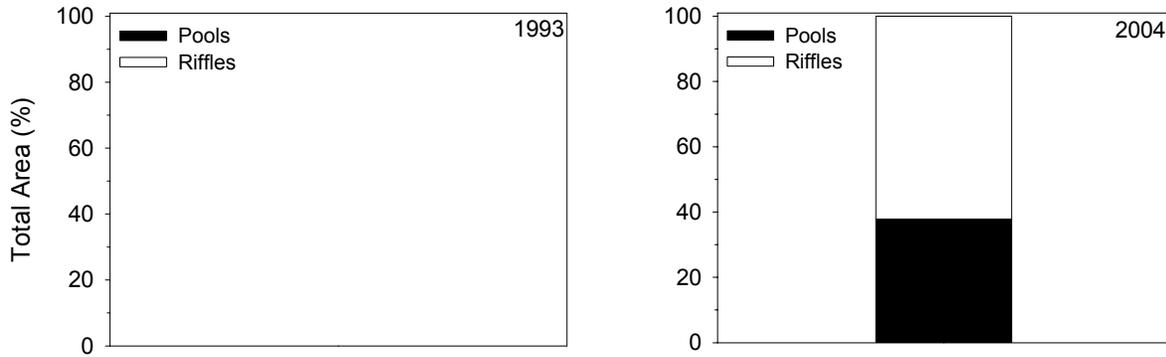


Figure A3. Estimated area of Rock Creek (lower) in pools and riffles as calculated using BVET techniques.

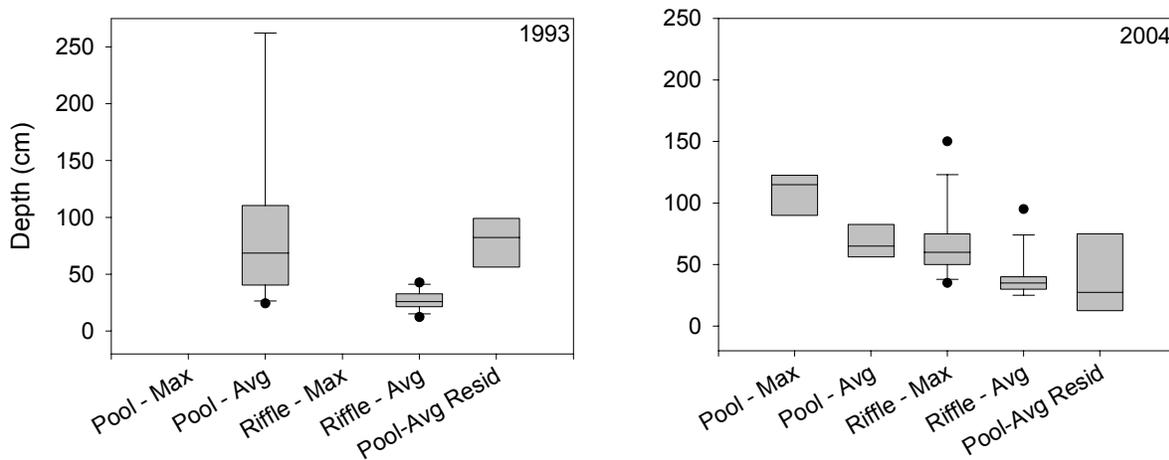


Figure A4. Maximum and average depths for pools and riffles and residual depths in Rock Creek (lower). During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

*Stearns District
Barthell Quadrangle*

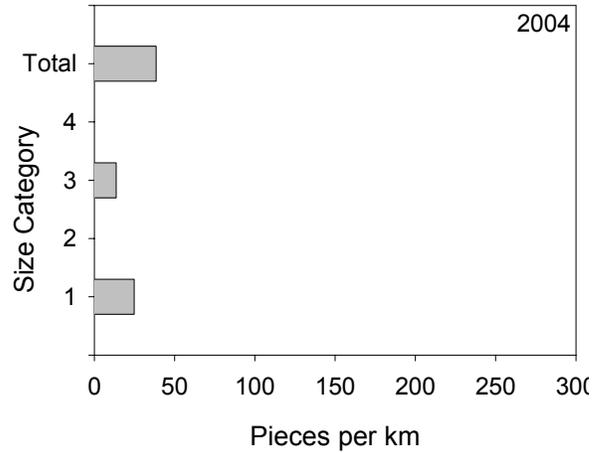
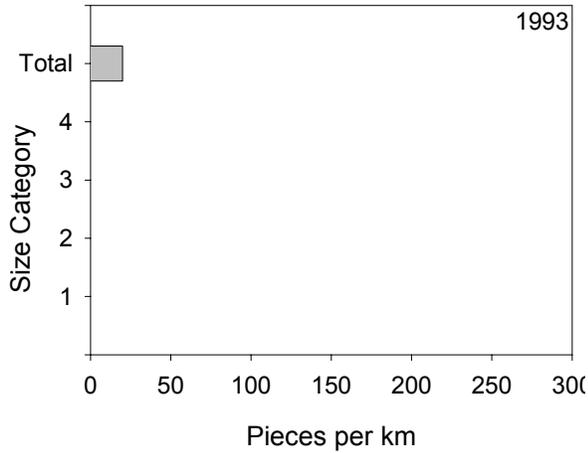


Figure A5. LWD per kilometer in Rock Creek (lower). During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: <5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

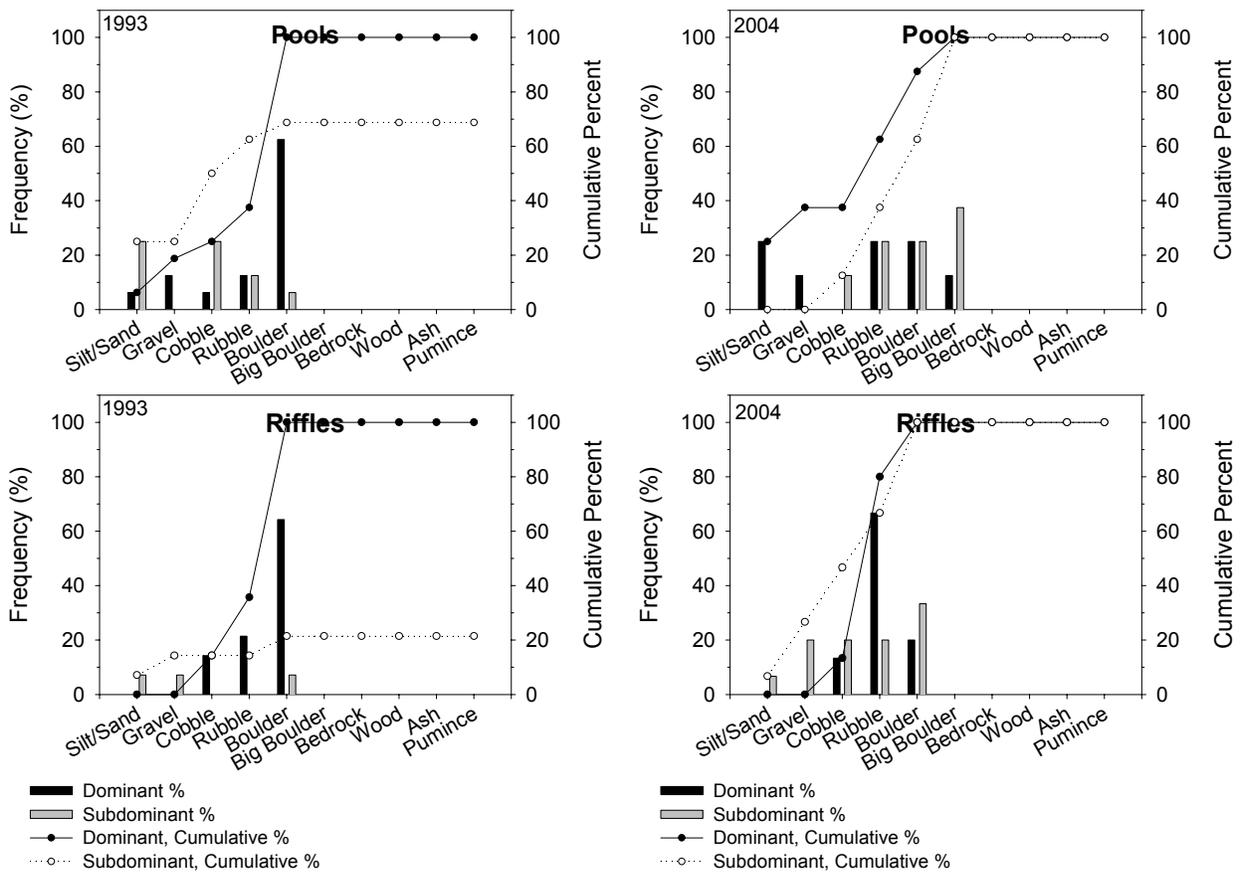


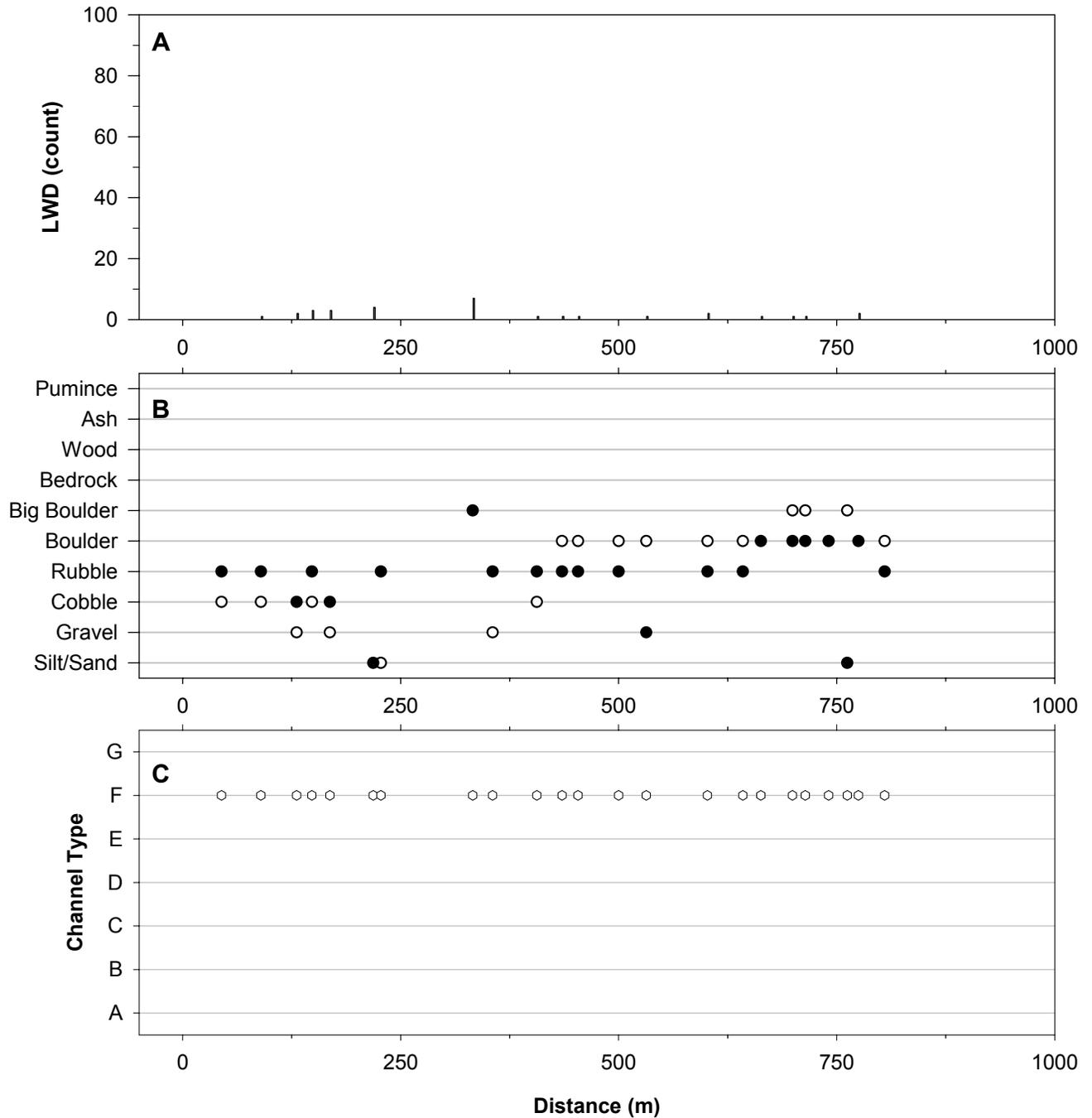
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Rock Creek (lower).

*Stearns District
Barthell Quadrangle*

Stream features found on Rock Creek (lower) during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		ABOVE BIG POOL AT THE BEGINNING OF RIFFLE RIGHT OFF 566 AT THE BEGINNING OF REACH
DAM	168.9		

*Stearns District
Barthell Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Rock Creek (lower), 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Stearns District
Barthell SW Quadrangle*

Stream:	Rock Creek (upper 1)		
District:	Stearns		
USGS Quadrangle:	Barthell SW		
	1990s		2004
Survey Date:	NOT SURVEYED		07/09/04
Total Distance Surveyed (km)*:	NA		1.4

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1990s	2004	1990s	2004
Percent of Total Stream Area:	NA	35	NA	65
Total Area (m ²):	NA	5283±NC	NA	9674±NC
Correction Factor Applied:	NA	1.18	NA	0.99
Number of Paired Samples:	NA	1	NA	3
Total Count:	NA	10	NA	34
Number per km:	NA	7	NA	24
Mean Area (m ²):	NA	528	NA	285
Mean Maximum Depth (cm):	NA	100	NA	46
Mean Average Depth (cm):	NA	52	NA	29
Mean Residual Depth (cm)*:	NA	21	--	--
Percent Surveyed as Glides:	NA	60	--	--
Percent Surveyed as Runs:	--	--	NA	44
Percent Surveyed as Cascades:	--	--	NA	0
Percent with > 35% Fines:	NA	20	NA	0

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected; NC = could not calculate

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1990s	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	35
1 - 5 m long, > 55 cm diameter:	NA	2
> 5 m long, 10 cm – 55 cm diameter:	NA	10
> 5 m long, > 55 cm diameter:	NA	1
Total:	NA	47

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	0
C:	0
D:	0
E:	0
F:	100
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	8.5
Median Water Temperature (C):	19

*recorded in 2004 only

*Stearns District
Barthell SW Quadrangle*

Not surveyed in 1990s.

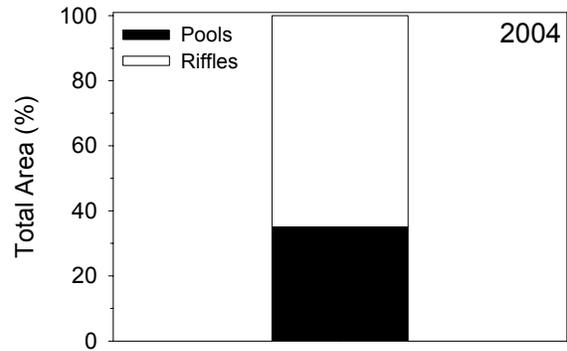


Figure A3. Estimated area of Rock Creek (upper 1) in pools and riffles as calculated using BVET techniques.

Not surveyed in 1990s.

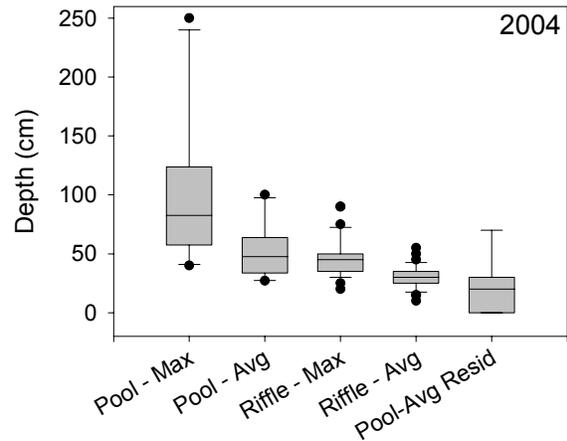


Figure A4. Maximum and average depths for pools and riffles and residual depths in Rock Creek (upper 1). During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

*Stearns District
Barthell SW Quadrangle*

Not surveyed in 1990s.

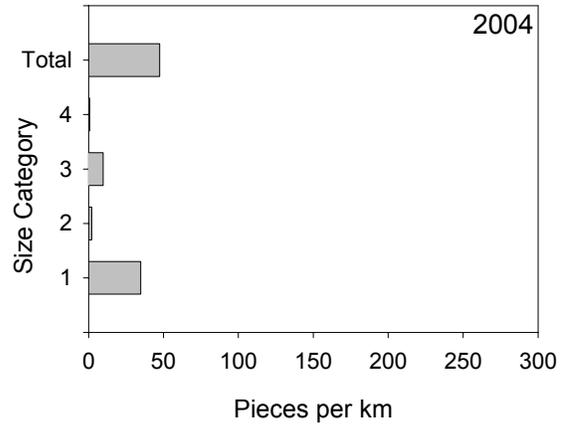


Figure A5. LWD per kilometer in Rock Creek (upper 1). During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: <5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

Not surveyed in 1990s.

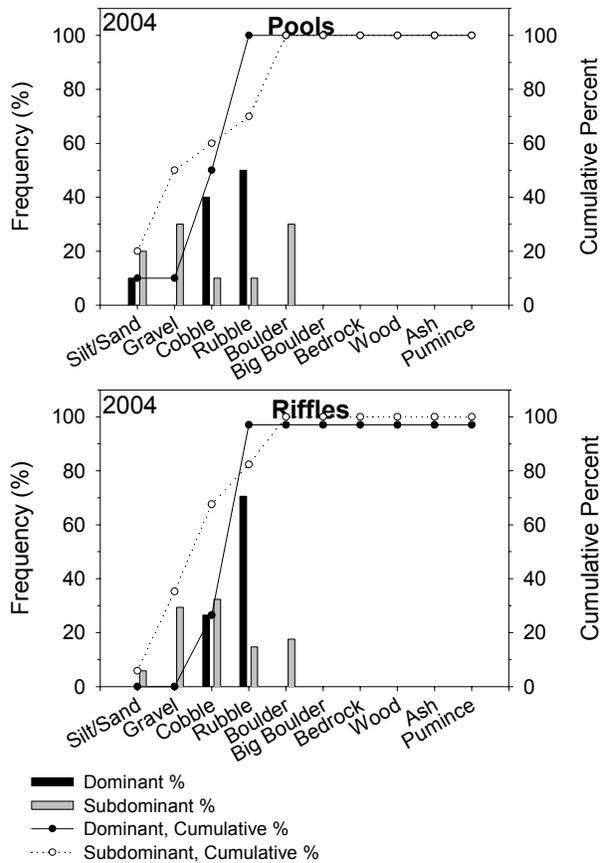


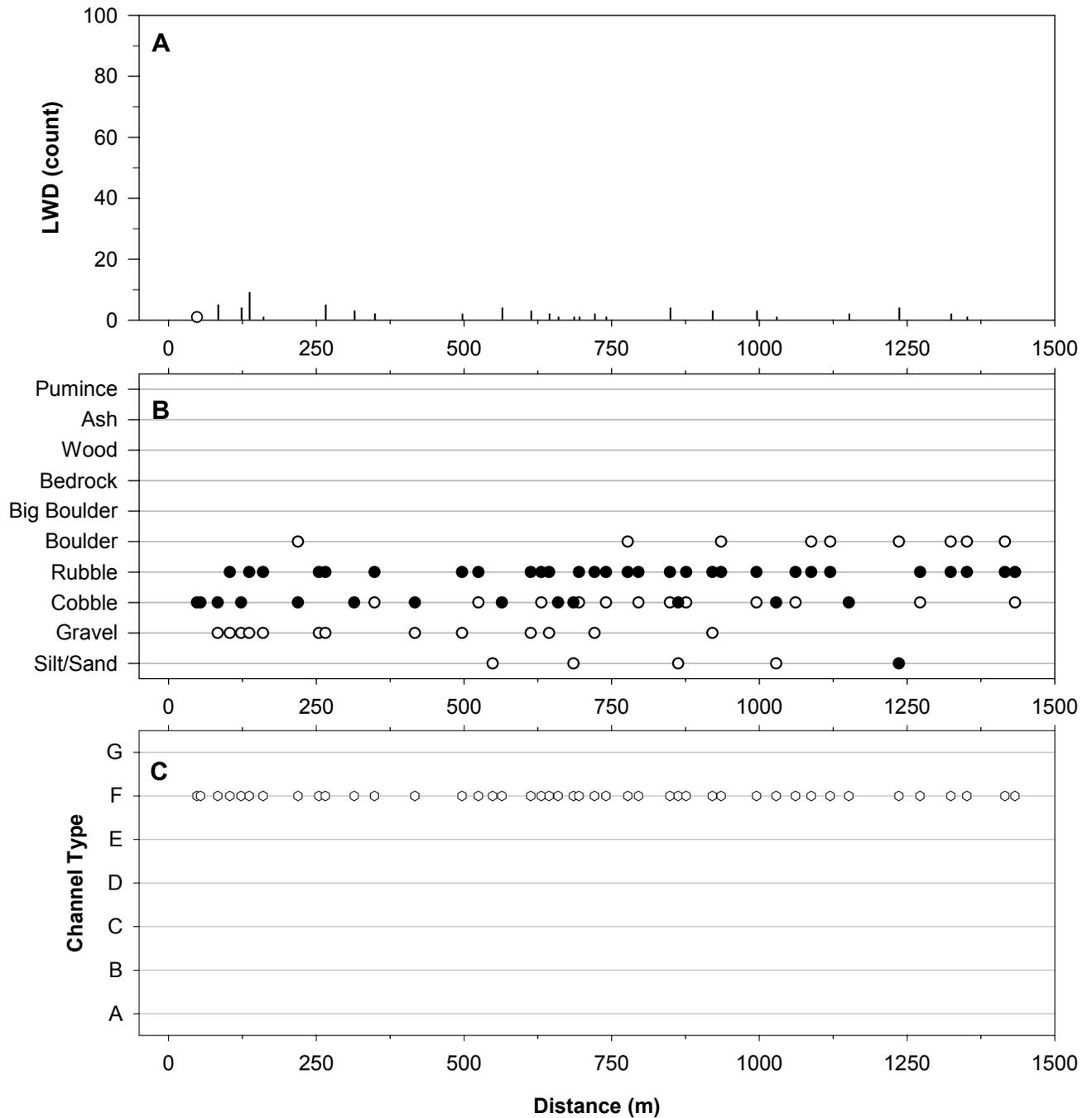
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Rock Creek (upper 1).

*Stearns District
Barthell SW Quadrangle*

Stream features found on Rock Creek (upper 1) during BVET habitat survey, 2004. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
SCH	55.6		IN ON LEFT
SCH	71.1		IN ON LEFT
SCH	95.7		IN ON LEFT
SCH	136.4		OUT ON LEFT
TRIB			COMES OUT OF A CULVERT THAT RUNS UNDER 137 ON RIGHT .5M
TRIB	197.7		
TRIB	268.9		IN ON RIGHT CULVERT UNDER 137 .6M
TRIB	348.5	0.8	IN ON RIGHT
SCH	509.6		IN ON RIGHT
TRIB	782.2		IN ON LEFT 1M
TRIB	898	0.35	IN ON LEFT
TRIB	1108		IN ON LEFT
			DRY CULVERT COMING OUT OF RIGHT BANK
OTR	1345.4		

*Stearns District
Barthell SW Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Rock Creek (upper 1), 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Stearns District
Barthell SW Quadrangle*

Stream:	Rock Creek (upper 2)	
District:	Stearns	
USGS Quadrangle:	Barthell SW	
	1993	2004
Survey Date:	6/24-7/21/1993	7/09/2004
Total Distance Surveyed (km)*:	0.5	0.8

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	NC	71	NC	29
Total Area (m ²):	NC±NC	6317±NC	1223±NC	2634±2142
Correction Factor Applied:	NC	0.97	1.08	0.88
Number of Paired Samples:	0	1	1	2
Total Count:	14	9	12	13
Number per km:	29	11	25	16
Mean Area (m ²):	NC	702	102	203
Mean Maximum Depth (cm):	NA	201	NA	61
Mean Average Depth (cm):	107	99	22	37
Mean Residual Depth (cm)*:	135	105	--	--
Percent Surveyed as Glides:	43	33	--	--
Percent Surveyed as Runs:	--	--	NA	54
Percent Surveyed as Cascades:	--	--	25	0
Percent with > 35% Fines:	NA	78	NA	0

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected; NC = could not calculate

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	71
1 - 5 m long, > 55 cm diameter:	NA	2
> 5 m long, 10 cm – 55 cm diameter:	NA	22
> 5 m long, > 55 cm diameter:	NA	2
Total:	56	97

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	0
C:	0
D:	0
E:	0
F:	100
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	7.5
Median Water Temperature (C):	20

*recorded in 2004 only

*Stearns District
Barthell SW Quadrangle*

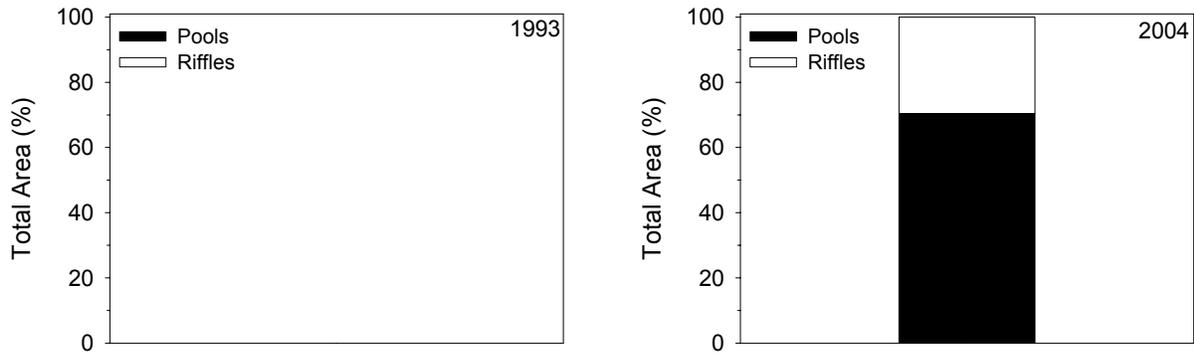


Figure A3. Estimated area of Rock Creek (upper 2) in pools and riffles as calculated using BVET techniques.

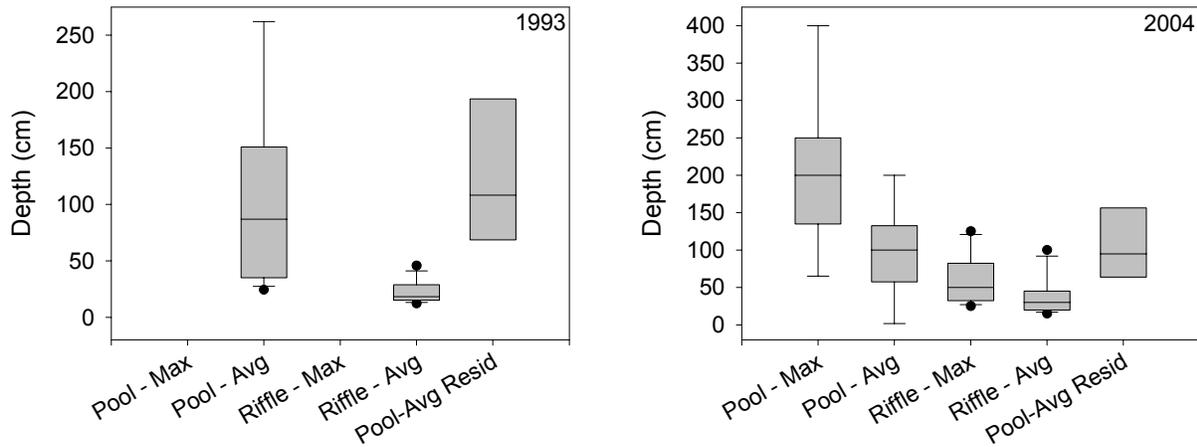


Figure A4. Maximum and average depths for pools and riffles and residual depths in Rock Creek (upper 2). During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

*Stearns District
Barthell SW Quadrangle*

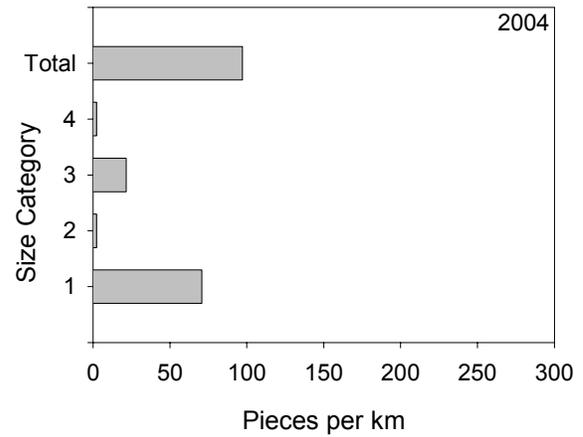
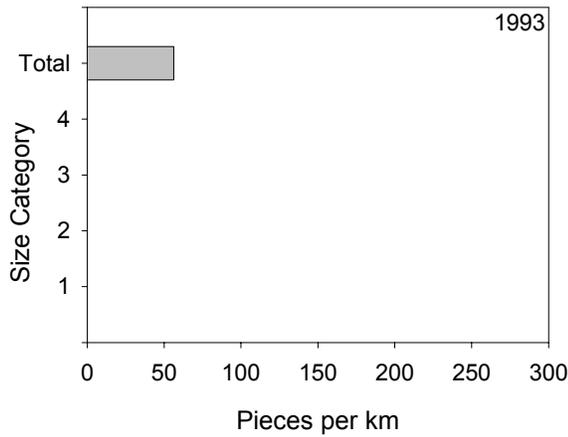


Figure A5. LWD per kilometer in Rock Creek (upper 2). During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: <5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

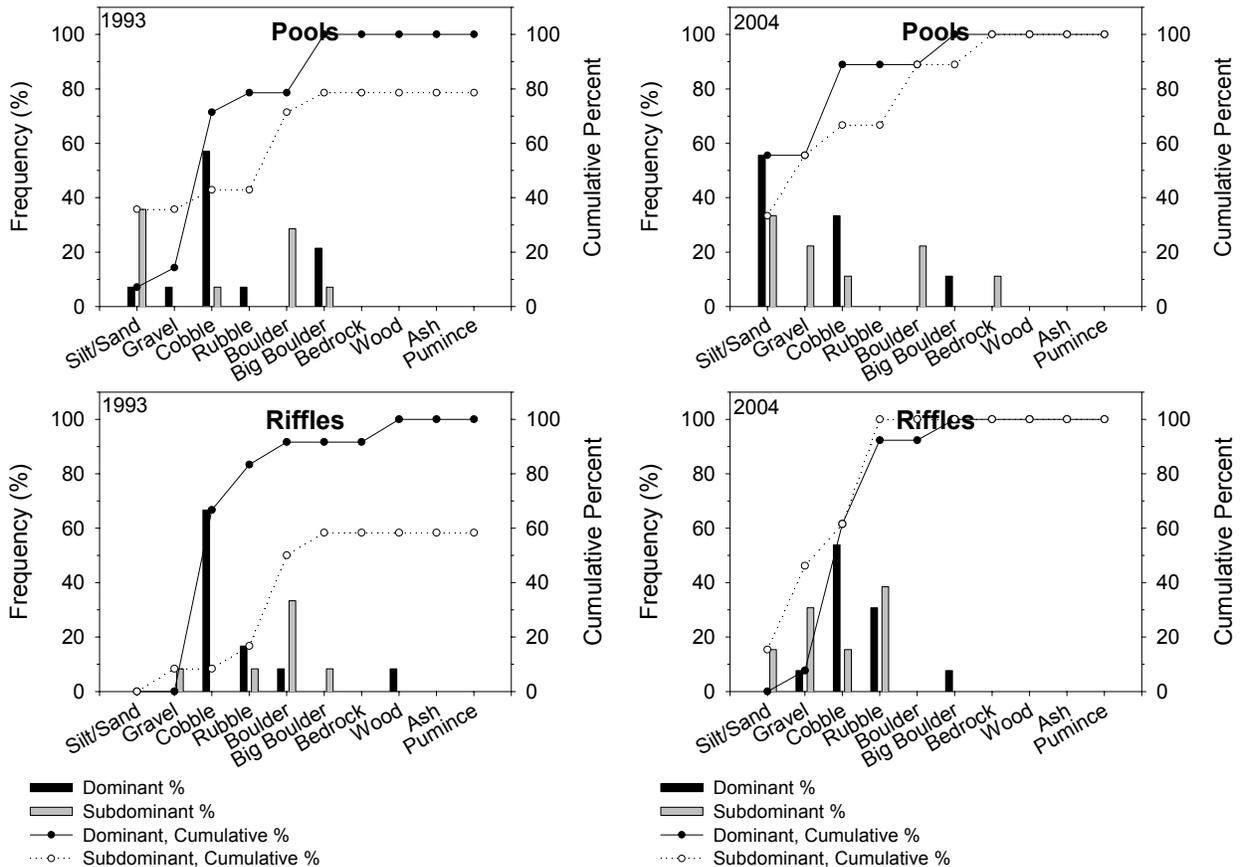


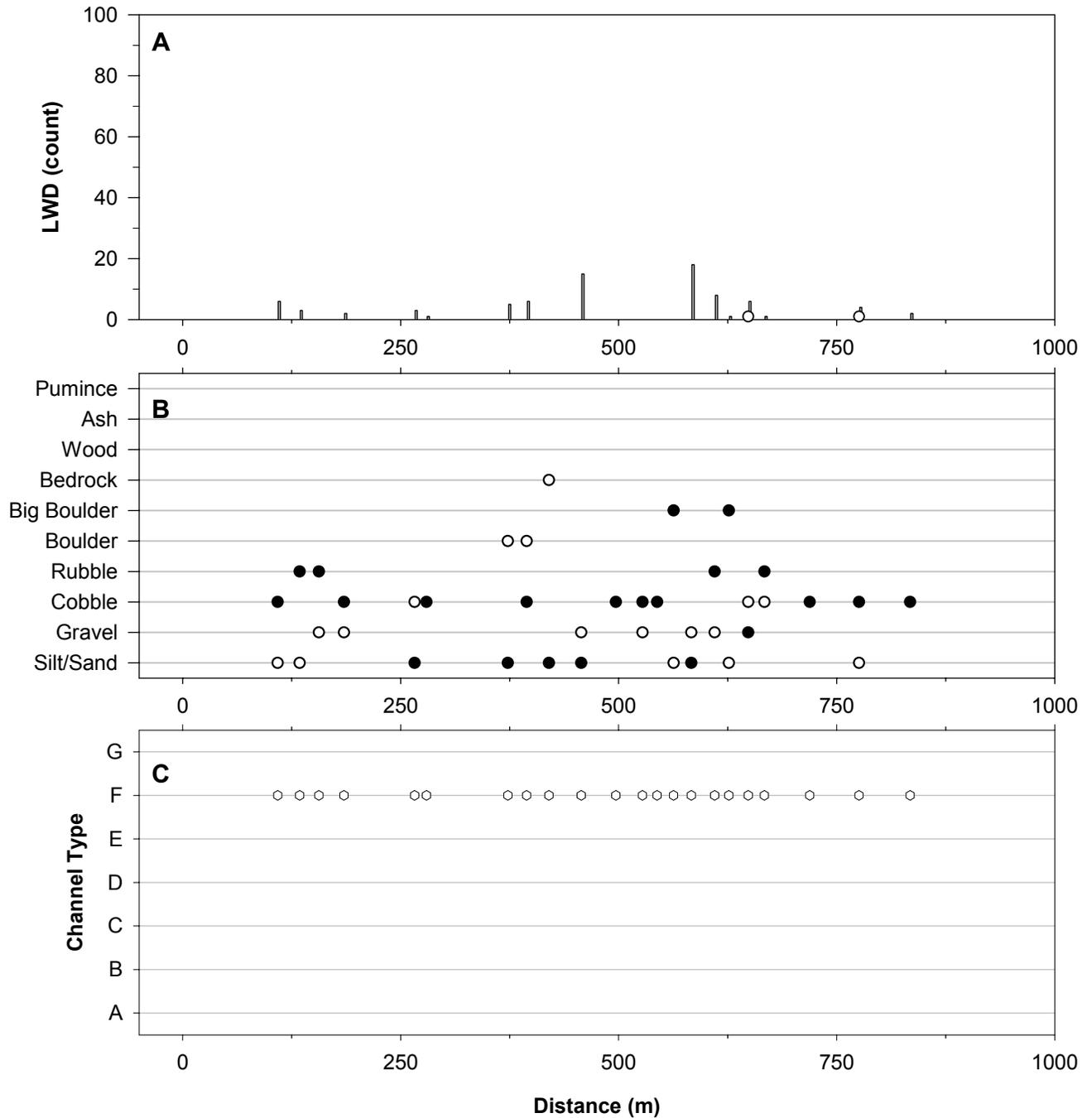
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Rock Creek (upper 2).

*Stearns District
Barthell SW Quadrangle*

Stream features found on Rock Creek (upper 2) during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		WHERE BIG BRANCH ENTERS ON RIGHT
TRIB	24	1.75	START SURVEY 14:45 7/9/04
TRIB	66	0.5	IN ON RIGHT
TRIB	322.9	0.25	IN ON LEFT
SCH	457		IN ON LEFT
SCH	470		OUT ON LEFT
TRIB	527.3		IN ON LEFT
SCH	544.0		POOL AROUND BOULDERS OUT ON RIGHT, SIDE POOL, DRY
SCH	626.2		CHANNEL INBETWEEN SIDE POOLS
SCH	648.5		IN ON RIGHT
SCH	667.0		OUT ON RIGHT
TRIB	674	0.4	IN ON LEFT

*Stearns District
Barthell SW Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Rock Creek (upper 2), 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Stearns District
Hollyhill Quadrangle*

Stream:	Brierfield Branch (1)	
District:	Stearns	
USGS Quadrangle:	Hollyhill	
	1990s	2004
Survey Date:	NOT SURVEYED	7/08/2004
Total Distance Surveyed (km)*:	NA	0.4

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	NA	59	NA	41
Total Area (m ²):	NA	470±90	NA	323±47
Correction Factor Applied:	NA	1.18	NA	1.19
Number of Paired Samples:	NA	4	NA	3
Total Count:	NA	23	NA	18
Number per km:	NA	57	NA	44
Mean Area (m ²):	NA	20	NA	18
Mean Maximum Depth (cm):	NA	32	NA	10
Mean Average Depth (cm):	NA	16	NA	5
Mean Residual Depth (cm)*:	NA	12	--	--
Percent Surveyed as Glides:	NA	43	--	--
Percent Surveyed as Runs:	--	--	NA	0
Percent Surveyed as Cascades:	--	--	NA	0
Percent with > 35% Fines:	NA	17	NA	0

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected

Large Woody Debris Size Classes*	Pieces per km	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	74
1 - 5 m long, > 55 cm diameter:	NA	0
> 5 m long, 10 cm – 55 cm diameter:	NA	30
> 5 m long, > 55 cm diameter:	NA	2
Total:	NA	106

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	0
C:	100
D:	0
E:	0
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	1.5
Median Water Temperature (C):	19

*recorded in 2004 only

*Stearns District
Hollyhill Quadrangle*

Not surveyed in 1990s.

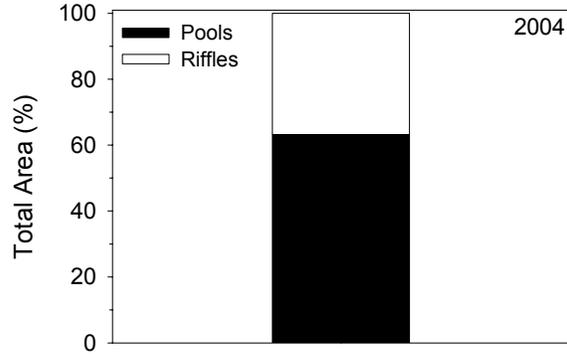


Figure A3. Estimated area of Brierfield Branch (1) in pools and riffles as calculated using BVET techniques.

Not surveyed in 1990s.

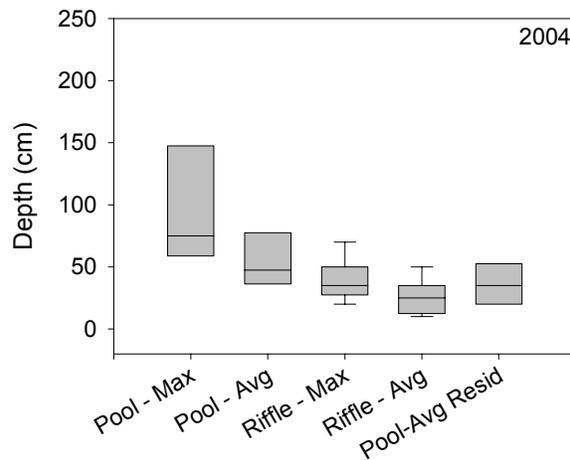


Figure A4. Maximum and average depths for pools and riffles and residual depths in Brierfield Branch (1). During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

Not surveyed in 1990s.

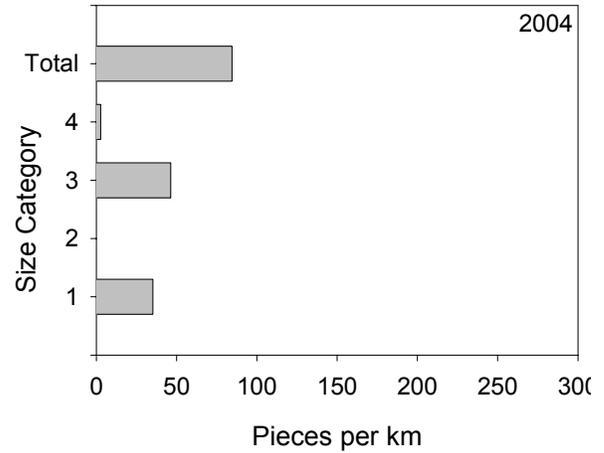


Figure A5. LWD per kilometer in Brierfield Branch (1). During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: <5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

Not surveyed in 1990s.

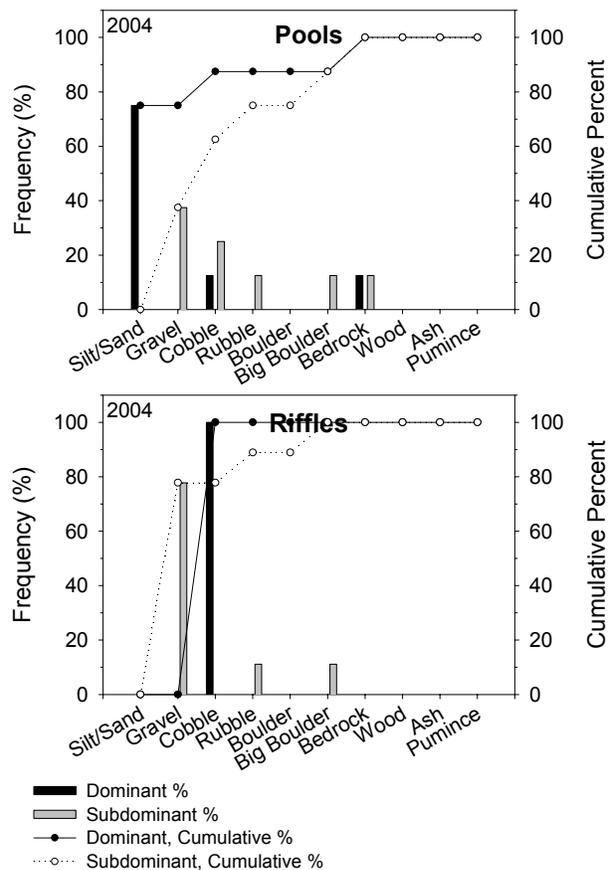
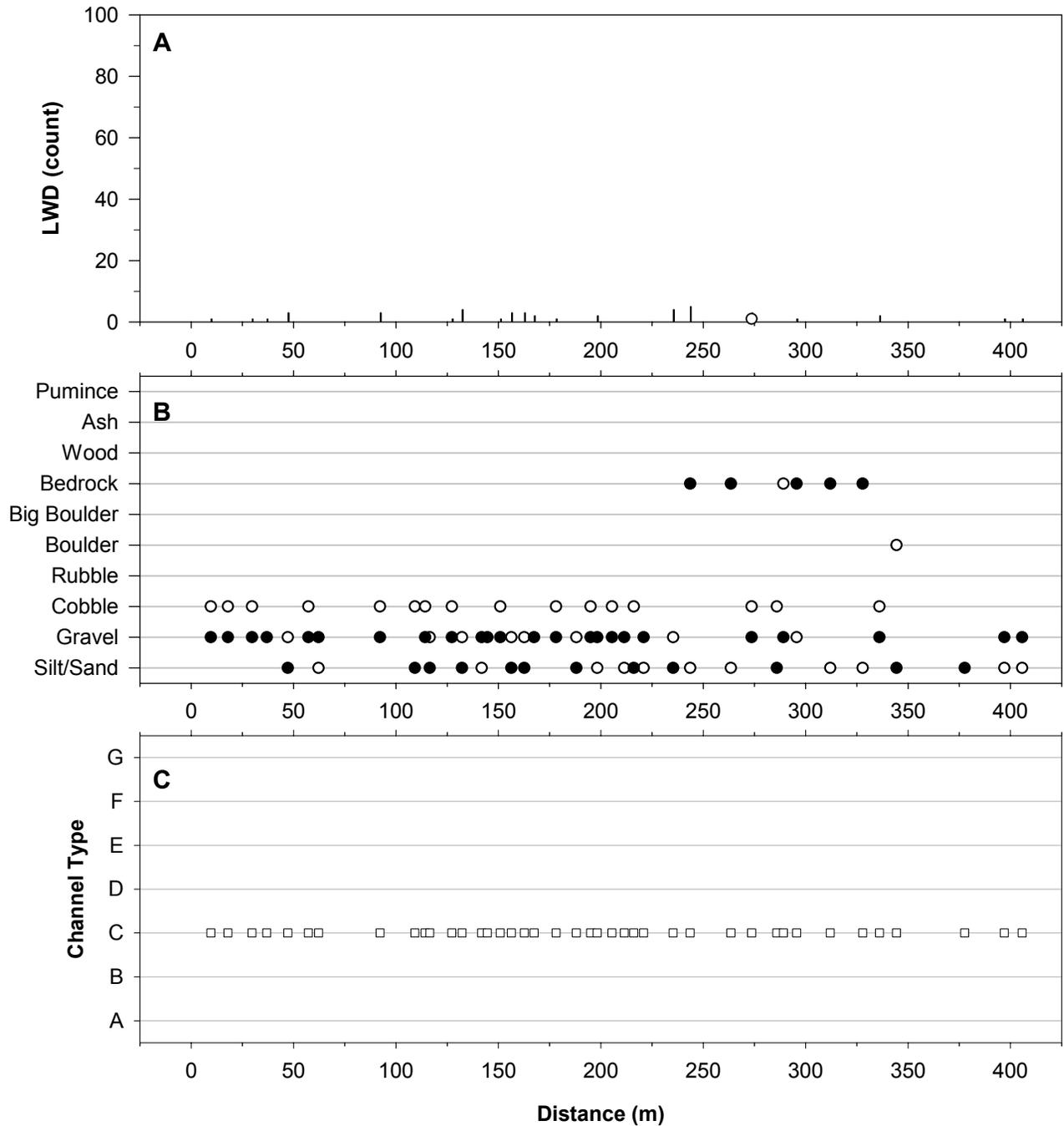


Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Brierfield Branch (1).

*Stearns District
Hollyhill Quadrangle*

Stream features found on Brierfield Branch (1) during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		MOUTH OF BRIERFIELD WHERE IT FLOWS INTO RIGGS BRANCH
SLID	230	10	RIGHT BANK GAVE WAY
SCH	334.2		IN ON LEFT
SCH	364		OUT ON LEFT



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Brierfield Branch (1), 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Stearns District
Hollyhill Quadrangle*

Stream:	Brierfield Branch (2)	
District:	Stearns	
USGS Quadrangle:	Hollyhill	
	1993	2004
Survey Date:	7/21/1993	7/08/2004
Total Distance Surveyed (km)*:	1.1	1.0

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	31	43	69	57
Total Area (m ²):	261±NC	575±278	575±NC	764±699
Correction Factor Applied:	0.88	1.16	1.24	1.01
Number of Paired Samples:	1	7	1	4
Total Count:	25	56	26	35
Number per km:	23	56	24	35
Mean Area (m ²):	10	10	22	22
Mean Maximum Depth (cm):	NA	25	NA	10
Mean Average Depth (cm):	24	12	4	4
Mean Residual Depth (cm)*:	48	7	--	--
Percent Surveyed as Glides:	64	46	--	--
Percent Surveyed as Runs:	--	--	NA	3
Percent Surveyed as Cascades:	--	--	0	0
Percent with > 35% Fines:	NA	64	NA	0

*Residual depth measured only in pools in initial survey, pools and glides in 2004
NA = data not collected; NC = could not calculate

Large Woody Debris Size Classes*	<u>Pieces per km</u>	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	42
1 - 5 m long, > 55 cm diameter:	NA	1
> 5 m long, 10 cm – 55 cm diameter:	NA	15
> 5 m long, > 55 cm diameter:	NA	2
Total:	14	60

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	2
B:	75
C:	23
D:	0
E:	0
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	1.0
Median Water Temperature (C):	19

*recorded in 2004 only

*Stearns District
Hollyhill Quadrangle*

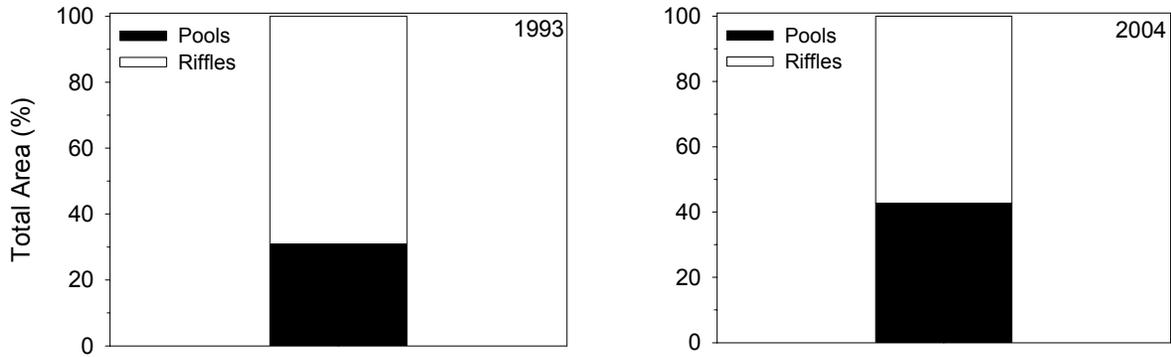


Figure A3. Estimated area of Brierfield Branch (2) in pools and riffles as calculated using BVET techniques.

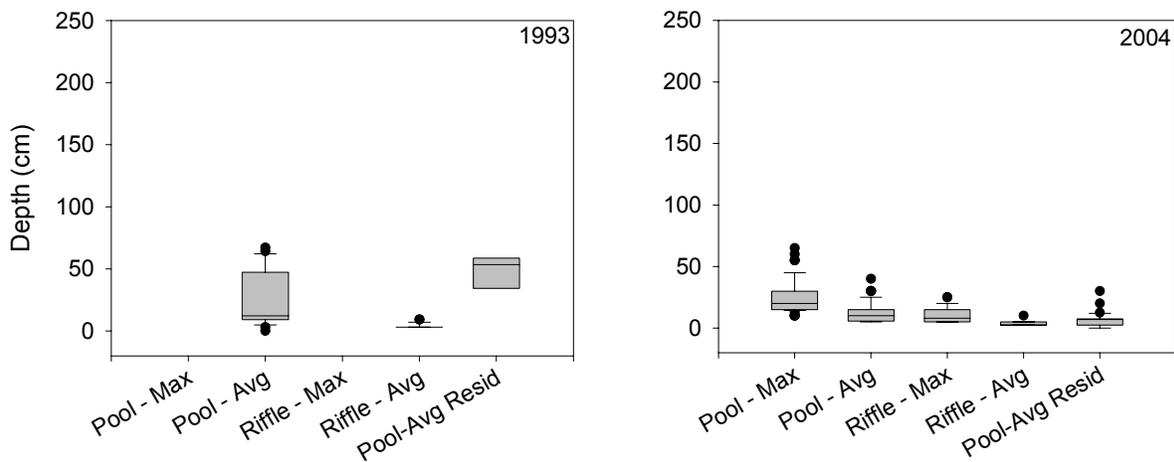


Figure A4. Maximum and average depths for pools and riffles and residual depths in Brierfield Branch (2). During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

*Stearns District
Hollyhill Quadrangle*

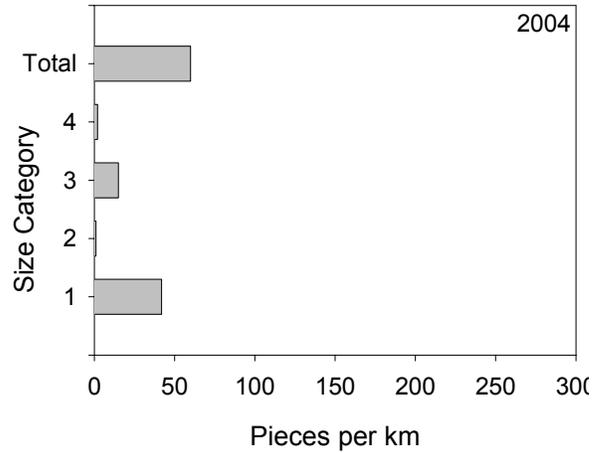
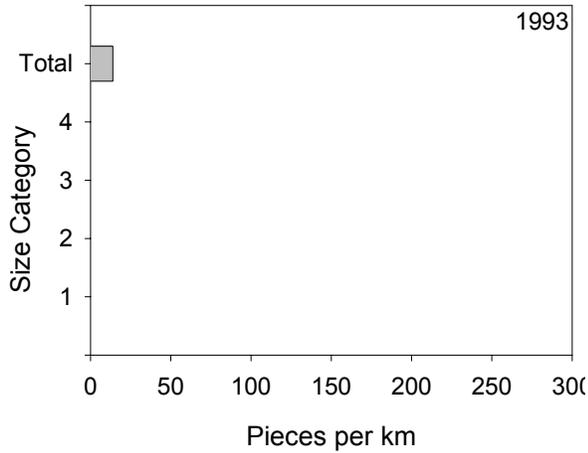


Figure A5. LWD per kilometer in Brierfield Branch (2). During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: <5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

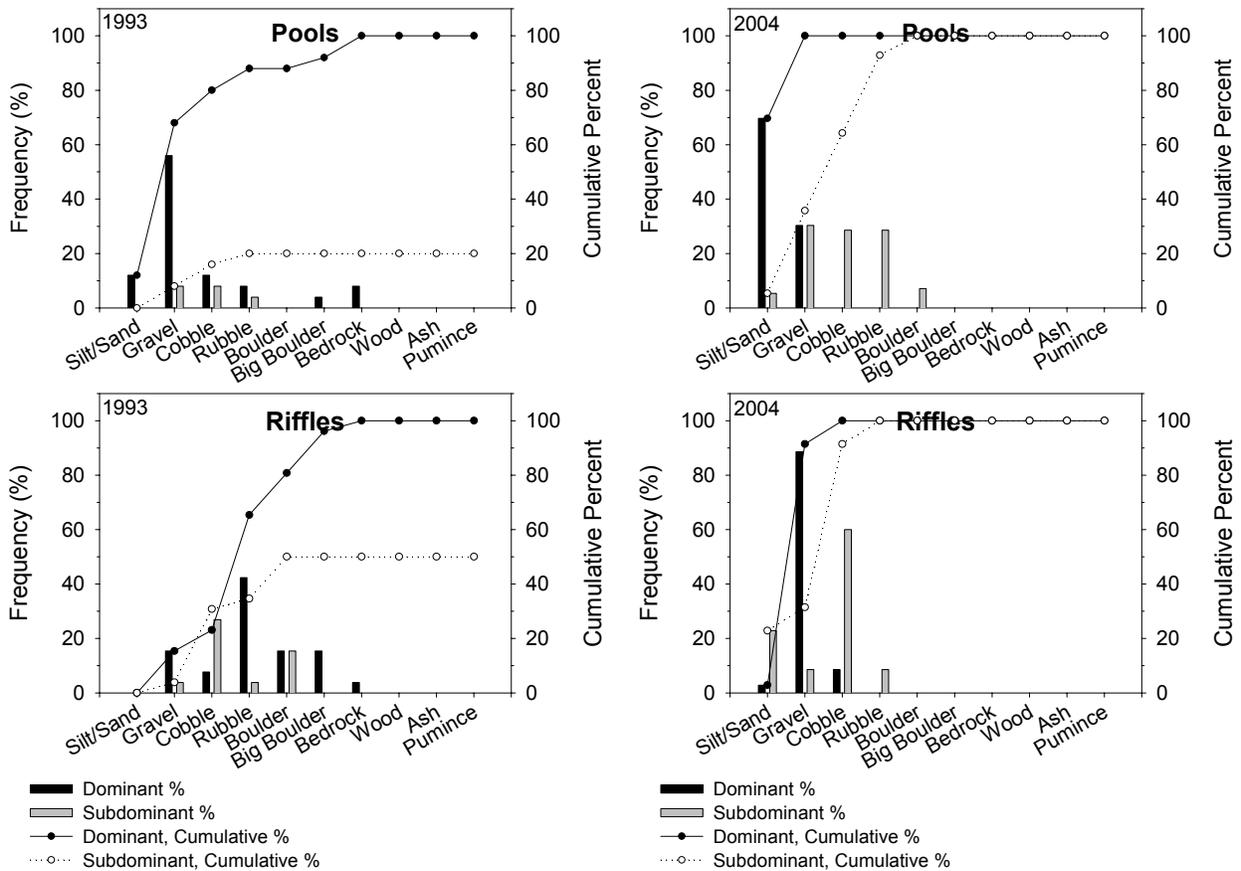


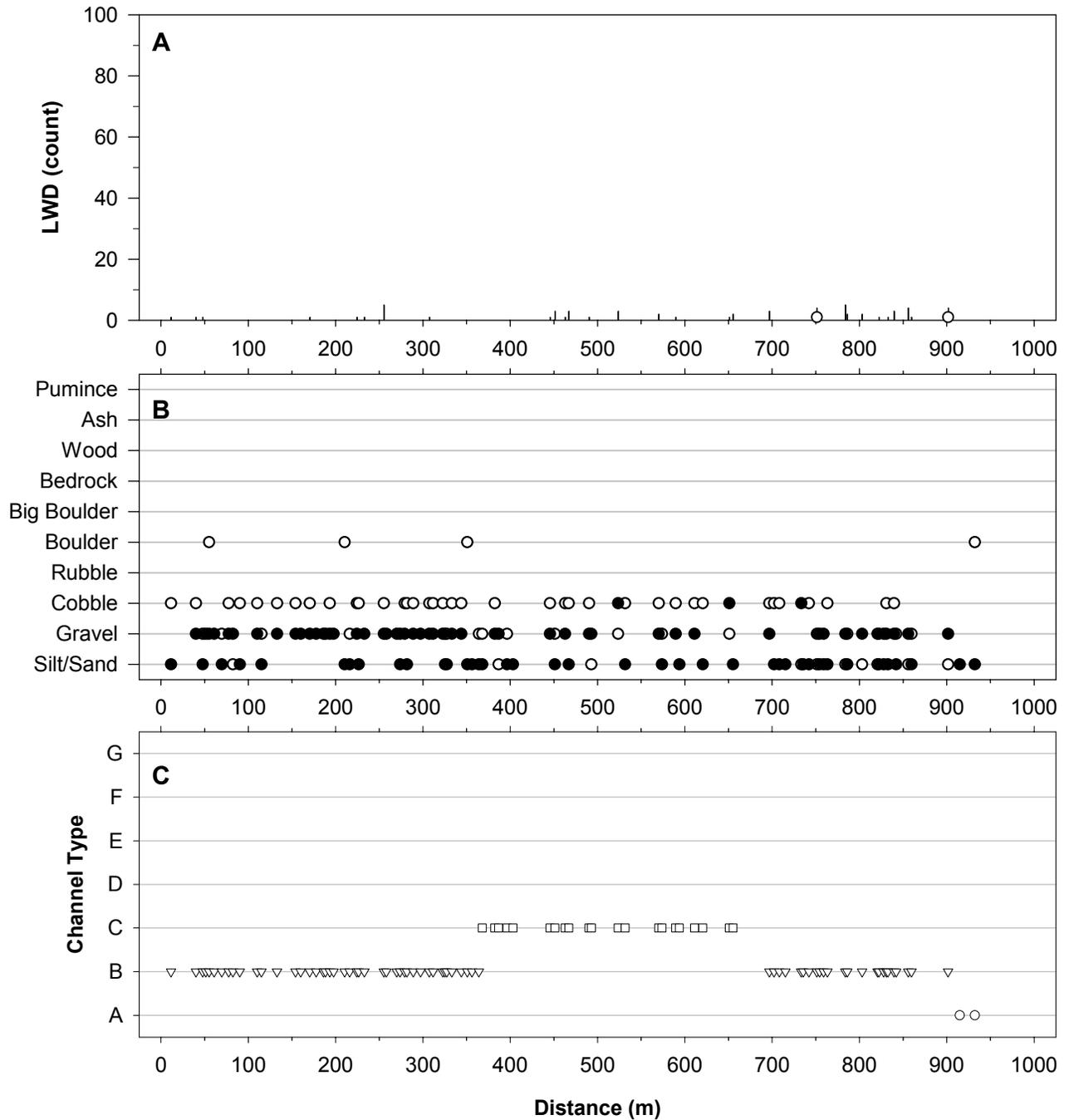
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Brierfield Branch (2).

*Stearns District
Hollyhill Quadrangle*

Stream features found on Brierfield Branch (2) during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		800M FROM CONFLUENCE OF BRIERFIELD AND BRIGGS BRANCH
SCH	18.4		IN ON RIGHT
SCH	34.5		OUT ON RIGHT
TRIB	451.1	1.0	IN ON RIGHT
TRIB	901.1		IN ON RIGHT
TRIB	937		IN ON RIGHT

*Stearns District
Hollyhill Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Brierfield Branch (2), 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Stearns District
Jellico West Quadrangle*

Stream:	Perkins Hollow	
District:	Stearns	
USGS Quadrangle:	Jellico West	
	1993	2004
Survey Date:	6/09/1993	7/07/2004
Total Distance Surveyed (km)*:	2.2	1.9

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	22	16	78	84
Total Area (m ²):	743±1306	787±190	2677±739	4032±1167
Correction Factor Applied:	1.18	1.04	0.94	1.31
Number of Paired Samples:	2	5	2	6
Total Count:	30	53	39	69
Number per km:	14	28	18	36
Mean Area (m ²):	24	15	69	58
Mean Maximum Depth (cm):	NA	34	NA	22
Mean Average Depth (cm):	29	20	10	9
Mean Residual Depth (cm)*:	47	11	--	--
Percent Surveyed as Glides:	57	38	--	--
Percent Surveyed as Runs:	--	--	NA	17
Percent Surveyed as Cascades:	--	--	0	6
Percent with > 35% Fines:	NA	26	NA	1

*Residual depth measured only in pools in initial survey, pools and glides in 2004

NA = data not collected

Large Woody Debris Size Classes*	Pieces per km	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	66
1 - 5 m long, > 55 cm diameter:	NA	0
> 5 m long, 10 cm – 55 cm diameter:	NA	86
> 5 m long, > 55 cm diameter:	NA	3
Total:	20	155

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	33
B:	15
C:	52
D:	0
E:	0
F:	0
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	2.0
Median Water Temperature (C):	18

*recorded in 2004 only

*Stearns District
Jellico West Quadrangle*

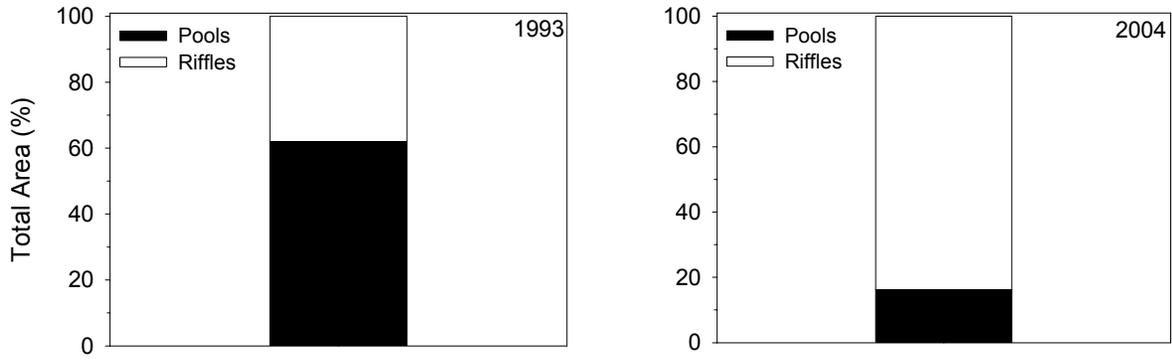


Figure A3. Estimated area of Perkins Hollow in pools and riffles as calculated using BVET techniques.

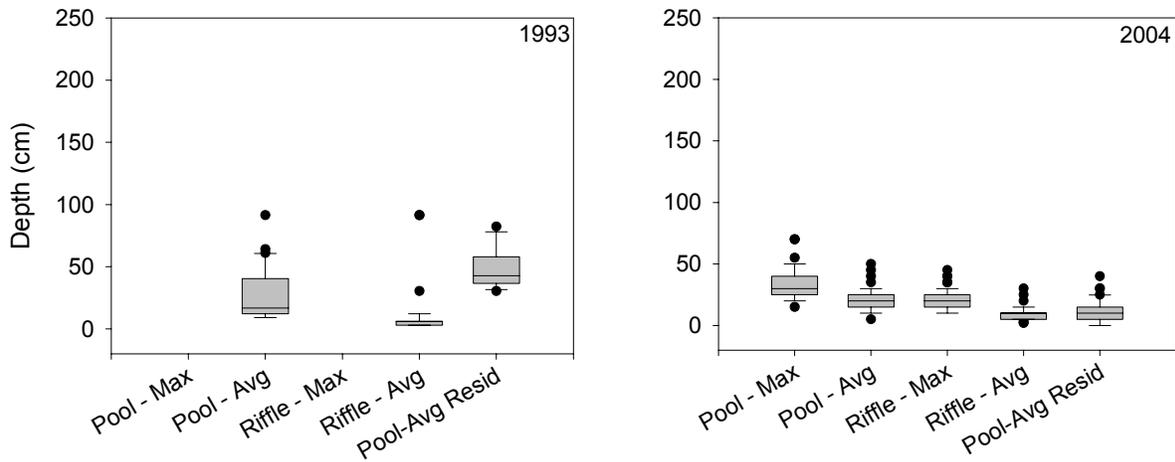


Figure A4. Maximum and average depths for pools and riffles and residual depths in Perkins Hollow. During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

*Stearns District
Jellico West Quadrangle*

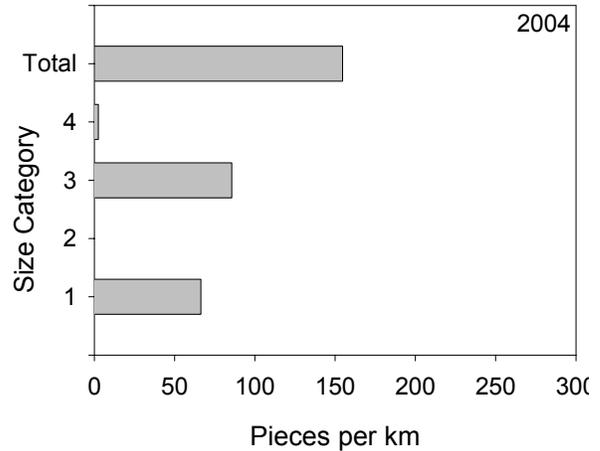
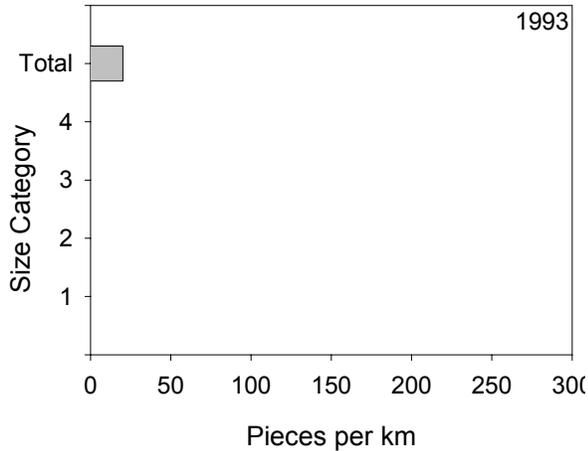


Figure A5. LWD per kilometer in Perkins Hollow. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: < 5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

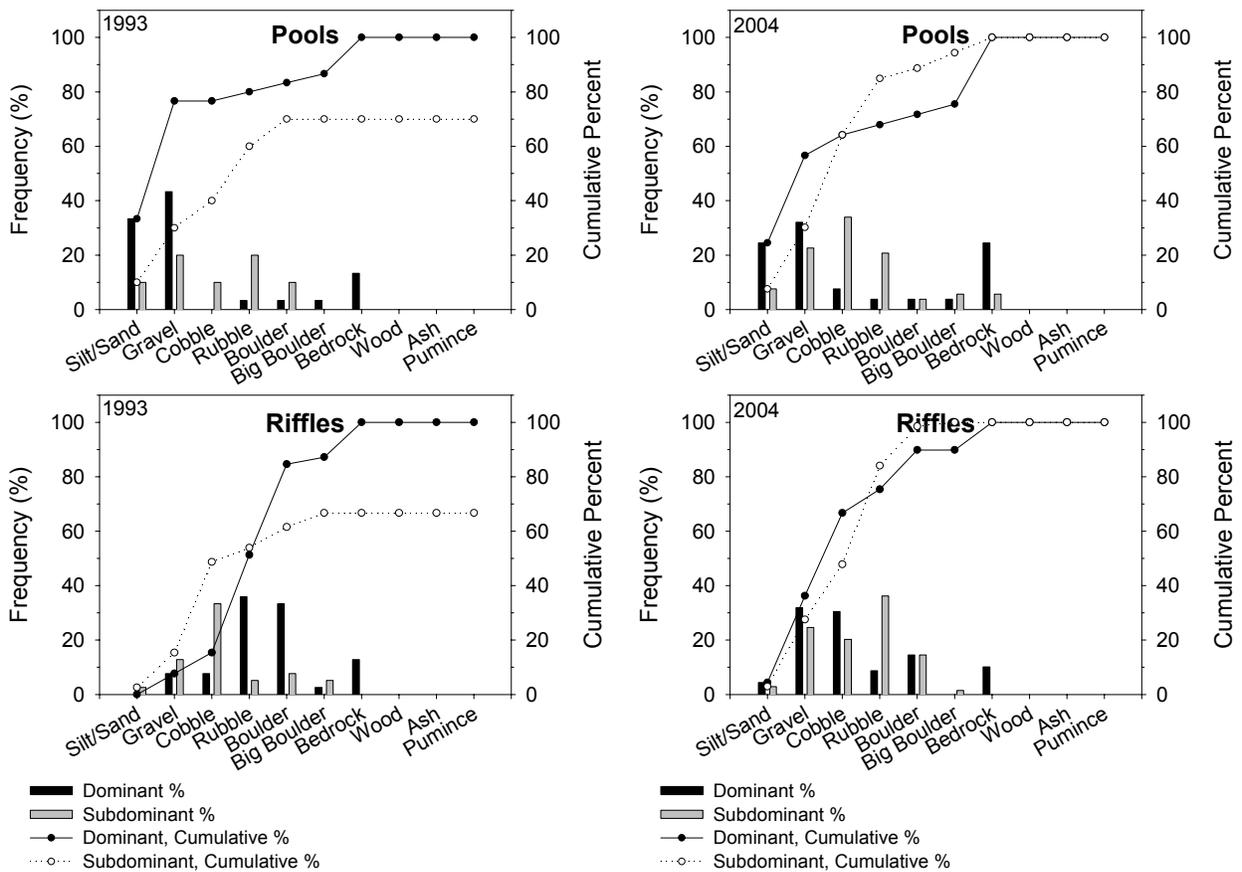


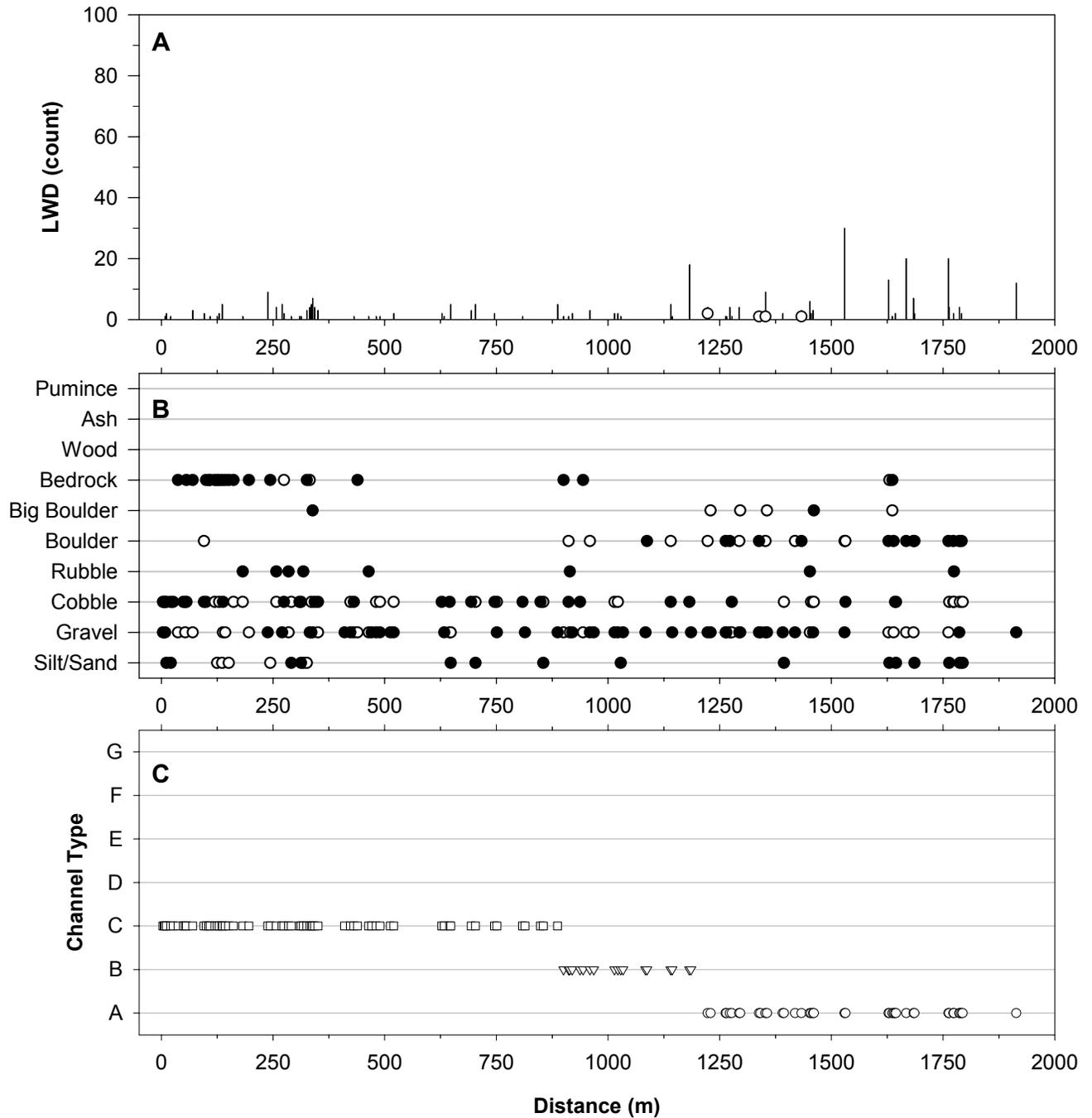
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Perkins Hollow.

*Stearns District
Jellico West Quadrangle*

Stream features found on Perkins Hollow during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		WHERE 502 CROSSES STREAM
SCH	3.6		IN ON RIGHT
SCH	11.3		OUT ON RIGHT
TRIB	110.8	0.3	IN ON LEFT
SCH	136		IN ON RIGHT
SCH	143		OUT ON RIGHT
FORD	151		ROAD CROSSING
SCH	336		IN ON RIGHT
SCH	343		OUT ON RIGHT
SCH	427.8		IN ON LEFT
SCH	447.8		OUT ON LEFT
TRIB	520	2	UNKNOWN
SCH	661		IN ON RIGHT
SCH	679.9		OUT ON RIGHT
SCH	691.7		IN ON RIGHT
SCH	703.3		OUT ON RIGHT
TRIB	742		ON LEFT
FORD	835		JEEP TRAIL
SLIDE	900.4		ON RIGHT, STEEP SLOPE AND STREAM EROSION
FORD	923.4		
TRIB	1011.4	0.5	IN ON LEFT
SLIDE	1022.2		
SCH	1050		IN ON RIGHT
SCH	1070		OUT RIGHT
SCH	1084		IN LEFT
SCH	1115.5		OUT RIGHT
TRIB	1255	0.5	IN LEFT
TRIB	1400	0.5	ON LEFT
TRIB	1420.2	0.25	ON RIGHT
SCH	1433		OUT RIGHT
SCH	1476.5		IN LEFT
SCH	1491		OUT LEFT
SCH	1514.5		IN LEFT
TRIB	1633.8	1	IN ON LEF/T
UNGR	1670		From 1667 m to 1670 m

*Stearns District
Jellico West Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Perkins Hollow, 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Stearns District
Whitley City Quadrangle*

Stream:	Taylor Branch (1)	
District:	Stearns	
USGS Quadrangle:	Whitley City	
	1990s	2004
Survey Date:	NOT SURVEYED	7/8/04
Total Distance Surveyed (km)*:	NA	1.3

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1990s	2004	1990s	2004
Percent of Total Stream Area:	NA	66	NA	34
Total Area (m ²):	±	3639±685	±	1846±260
Correction Factor Applied:	NA	1.00	NA	1.09
Number of Paired Samples:	NA	5	NA	3
Total Count:	NA	56	NA	37
Number per km:	NA	43	NA	28
Mean Area (m ²):	NA	65	NA	50
Mean Maximum Depth (cm):	NA	31	NA	17
Mean Average Depth (cm):	NA	18	NA	7
Mean Residual Depth (cm)*:	NA	6	--	--
Percent Surveyed as Glides:	NA	70	--	--
Percent Surveyed as Runs:	--	--	NA	24
Percent Surveyed as Cascades:	--	--	NA	0
Percent with > 35% Fines:	NA	95	NA	11

*Residual depth measured only in pools in initial survey, pools and glides in 2004

NA = data not collected

Large Woody Debris Size Classes*	Pieces per km	
	1990s	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	74
1 - 5 m long, > 55 cm diameter:	NA	0
> 5 m long, 10 cm – 55 cm diameter:	NA	22
> 5 m long, > 55 cm diameter:	NA	0
Total:	NA	96

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	0
C:	0
D:	0
E:	0
F:	100
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	3.5
Median Water Temperature (C):	19

*recorded in 2004 only

*Stearns District
Whitley City Quadrangle*

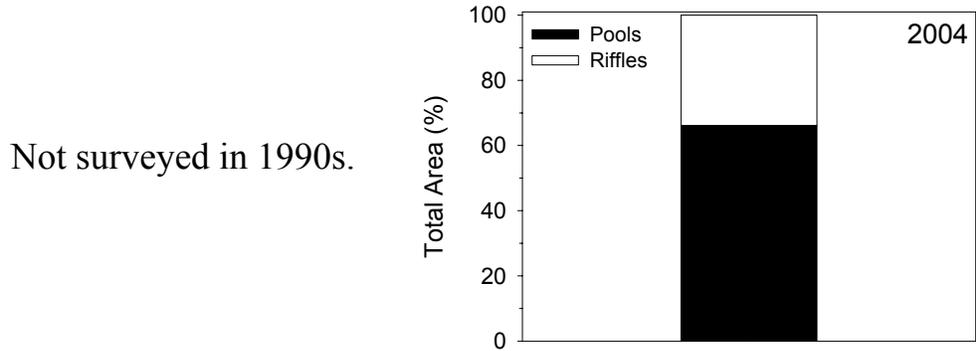


Figure A3. Estimated area of Taylor Branch (1) in pools and riffles as calculated using BVET techniques.

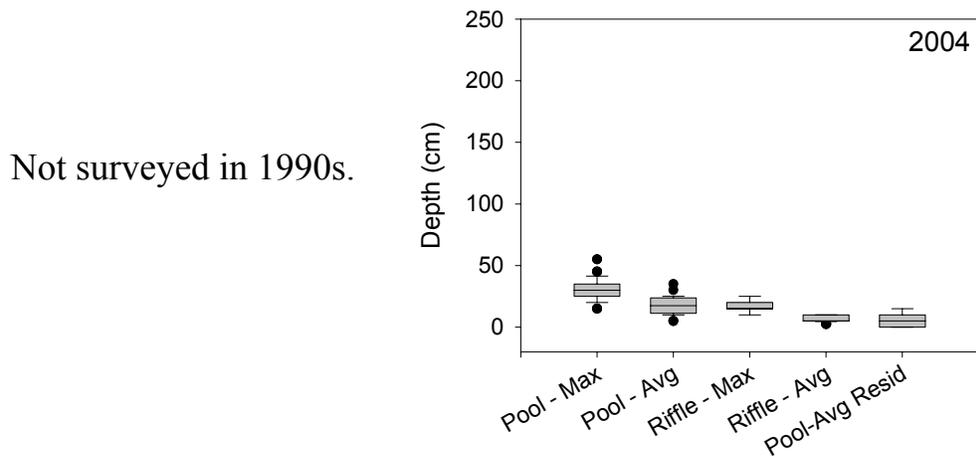


Figure A4. Maximum and average depths for pools and riffles and residual depths in Taylor Branch (1). During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

Not surveyed in 1990s.

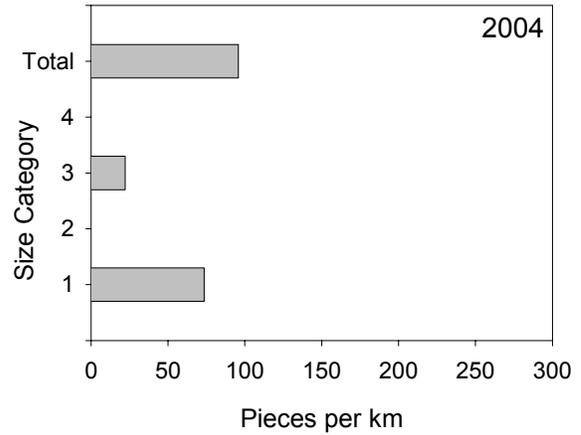


Figure A5. LWD per kilometer in Taylor Branch (1). During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: <5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

Not surveyed in 1990s.

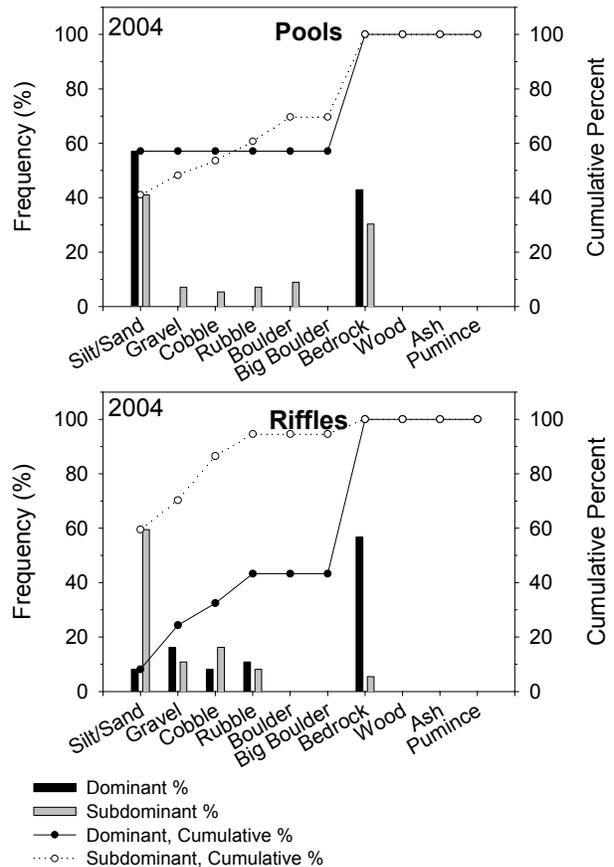


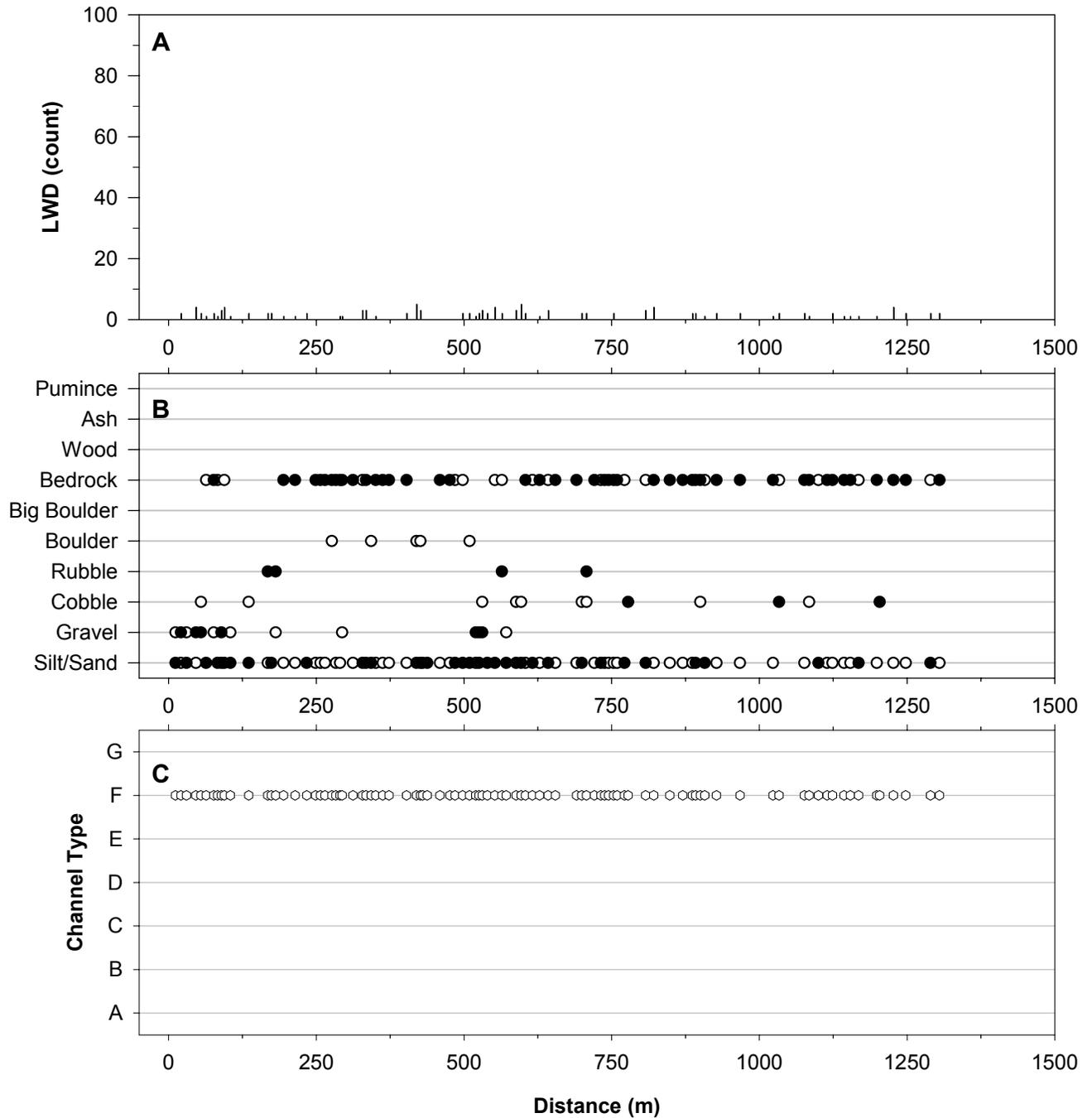
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Taylor Branch (1).

*Stearns District
Whitley City Quadrangle*

Stream features found on Taylor Branch (1) during BVET habitat survey, 2004. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT			CONFLUENCE OF MARSH CREEK AND TAYLOR BRANCH
TRIB	133.8	0.5	IN LEFT
V	468.8		OPEN BOX WITH SUSPENDED PLATFORM RUNNING THROUGH WITH WATER RUNNING UNDER, CONCRETE AND STONE, 25CM PERCH, ENDS AT 480.2, 3X3M, RECENTLY EXTENDED LENGTH AND PLATFORM BUILT
OTR	516.2		BARBED WIRE ACROSS STREAM
TRIB	644.9	1	IN ON RIGHT
TRIB	697		ON LEFT
SEEP	697		ON RIGHT
TRIB	1084	0.5	ON LEFT
TRIB	1219.4	0.2	ON LEFT

*Stearns District
Whitley City Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Taylor Branch (1), 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

*Stearns District
Whitley City Quadrangle*

Stream:	Taylor Branch (2)	
District:	Stearns	
USGS Quadrangle:	Whitley City	
	1993	2004
Survey Date:	6/17/1993	7/10/2004
Total Distance Surveyed (km)*:	1.7	1.3

*Calculated as sum of individual habitat unit length estimates for initial inventory; measured with hipchain in 2004

	<u>Pools</u>		<u>Riffles</u>	
	1993	2004	1993	2004
Percent of Total Stream Area:	34	54	66	46
Total Area (m ²):	1693±156	1633±204	3216±251	1377±227
Correction Factor Applied:	1.14	0.96	1.03	0.95
Number of Paired Samples:	6	7	6	5
Total Count:	65	73	69	56
Number per km:	38	55	41	42
Mean Area (m ²):	26	22	47	25
Mean Maximum Depth (cm):	NA	30	NA	16
Mean Average Depth (cm):	22	18	15	6
Mean Residual Depth (cm)*:	49	9	--	--
Percent Surveyed as Glides:	82	66	--	--
Percent Surveyed as Runs:	--	--	NA	29
Percent Surveyed as Cascades:	--	--	0	2
Percent with > 35% Fines:	NA	99	NA	25

*Residual depth measured only in pools in initial survey, pools and glides in 2004

NA = data not collected

Large Woody Debris Size Classes*	Pieces per km	
	1993	2004
1 - 5 m long, 10 cm – 55 cm diameter:	NA	244
1 - 5 m long, > 55 cm diameter:	NA	1
> 5 m long, 10 cm – 55 cm diameter:	NA	88
> 5 m long, > 55 cm diameter:	NA	4
Total:	92	337

*1990 counted all wood > 3.6 m long and > 30 cm diameter with no size classes

Rosgen's Channel Type*	Frequency (%)
A:	0
B:	0
C:	0
D:	0
E:	0
F:	100
G:	0

*recorded in 2004 only

Other Stream Attributes*	
Median Wetted Width, Riffles (m):	2.0
Median Water Temperature (C):	20

*recorded in 2004 only

*Stearns District
Whitley City Quadrangle*

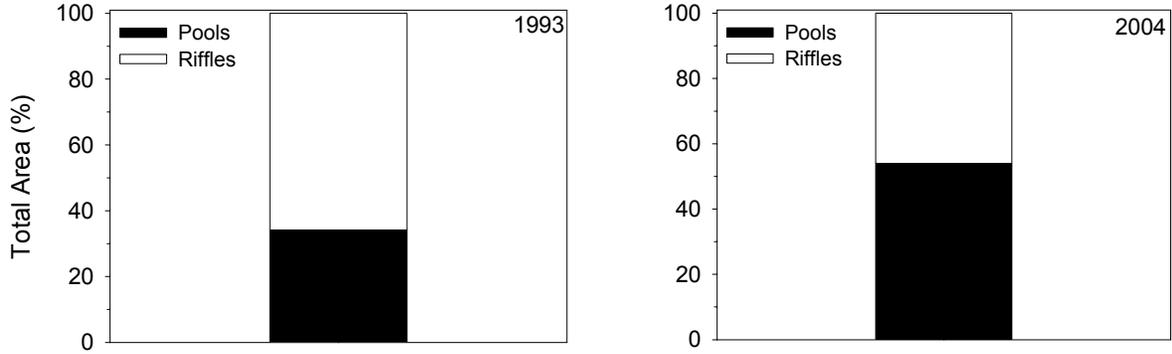


Figure A3. Estimated area of Taylor Branch (2) in pools and riffles as calculated using BVET techniques.

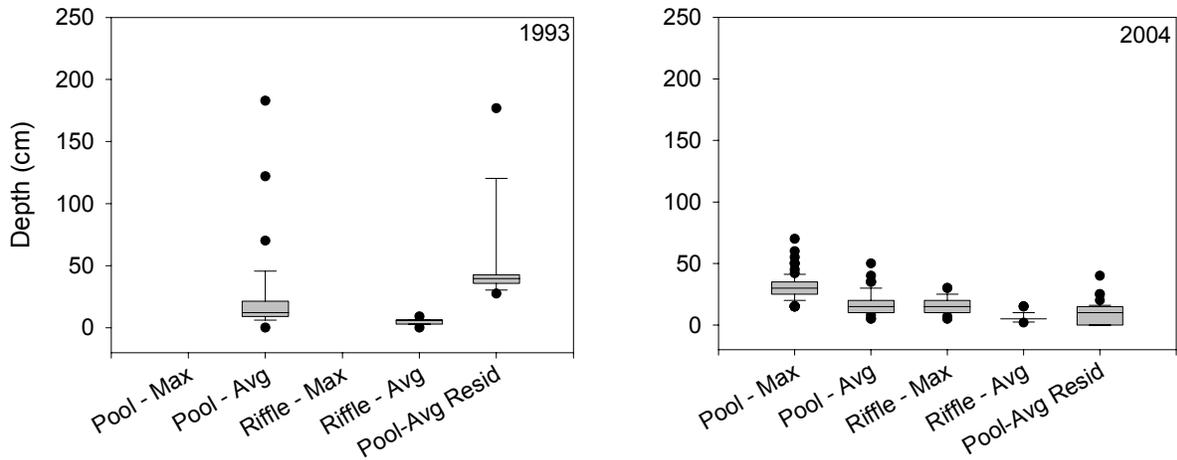


Figure A4. Maximum and average depths for pools and riffles and residual depths in Taylor Branch (2). During initial survey maximum depths were not recorded and residual depths were recorded for pools only, not for both pools and glides as in 2004. The top and bottom of the boxes represent the 25th and 75th percentiles, the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles, and closed circles represent the entire range of the data.

**Stearns District
Whitley City Quadrangle**

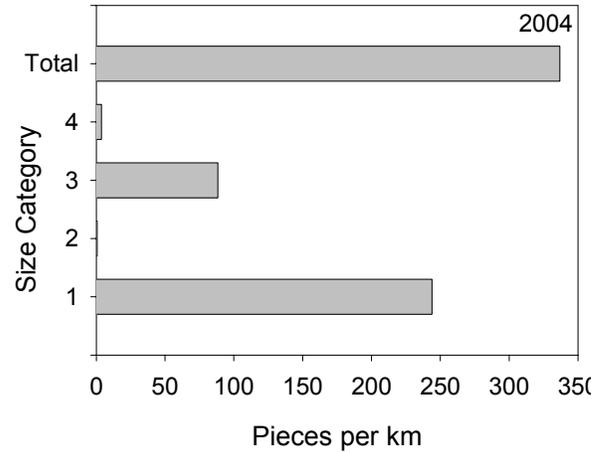
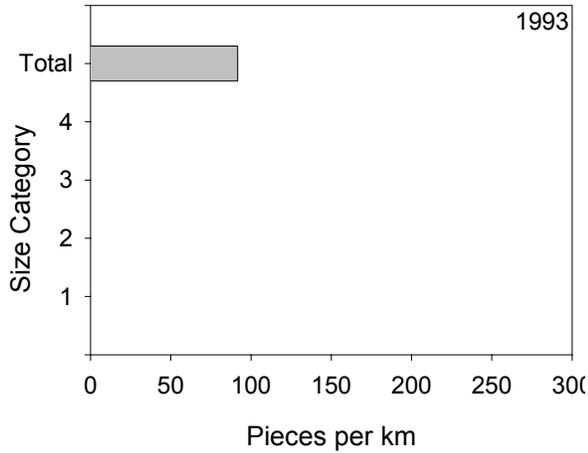


Figure A5. LWD per kilometer in Taylor Branch (2). During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter. LWD size classes for 2004: Size 1: < 5 m long, 10-55 cm diameter; Size 2: <5 m long, > 55 cm diameter; Size 3: > 5 m long, 10-55 cm diameter; Size 4: > 5 m long, > 55 cm diameter. During initial survey LWD recorded as total number of pieces >3.6 m long, >30 cm diameter.

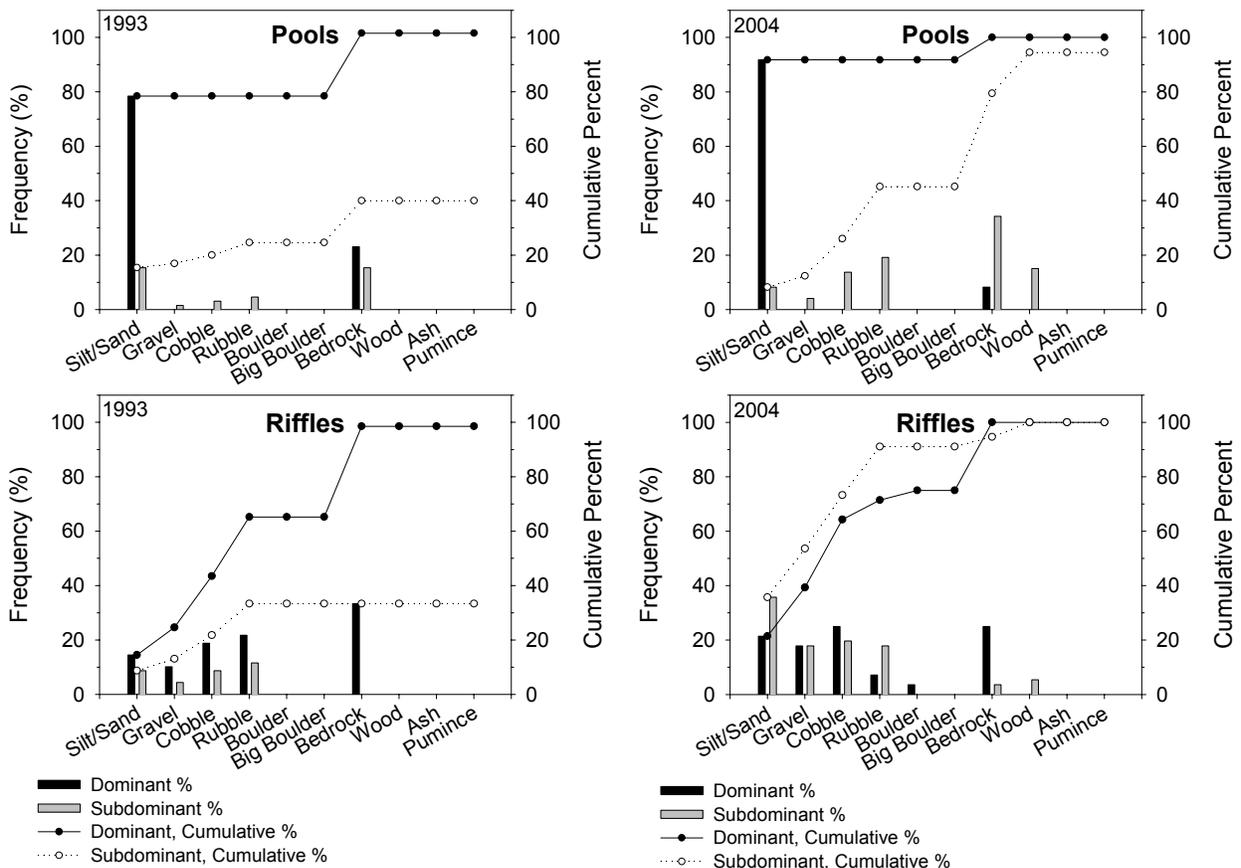


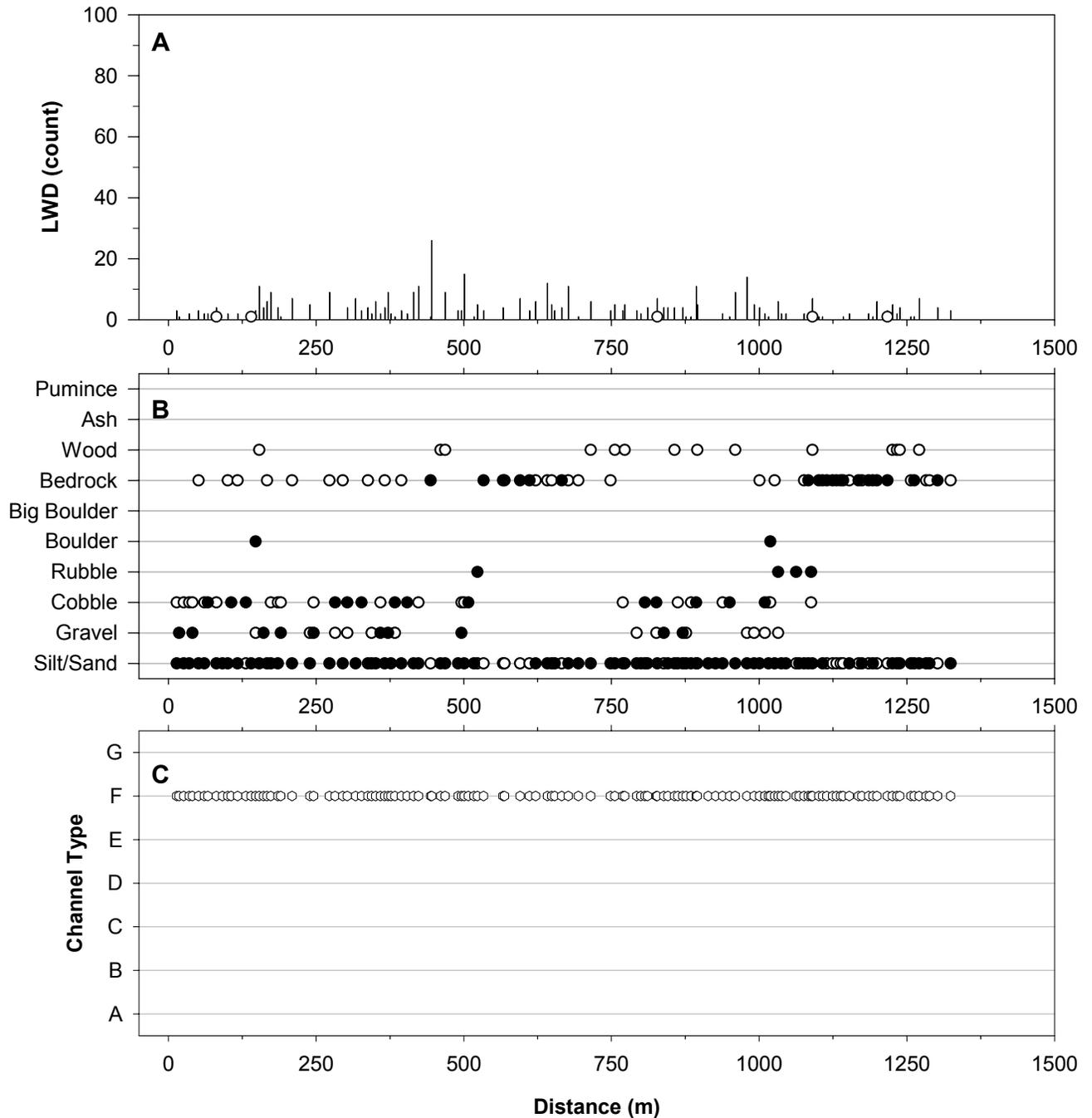
Figure A1. Frequency (percent) and cumulative percent of dominant and subdominant substrate occurrence in pools and riffles in Taylor Branch (2).

*Stearns District
Whitley City Quadrangle*

Stream features found on Taylor Branch (2) during BVET habitat survey, 2004. Similar data are not available for initial inventory. Distance is meters from start of survey.

Stream Feature	Distance (m)	Width (m)	Comments
START POINT	0		UPSTREAM OF LARGE DOWNED TREE, STEEP BANK ON RIGHT FLAT ON LEFT FOR ABOUT 30M
SCH	13		HIP CHAIN MALFUNCTION, REPLACED BACK TO 0, SCH IN ON LEFT
SCH	20.8		OUT LEFT
TRIB	263.2	2	ON LEFT
TRIB	318.2		ON RIGHT
UNGR	383.9		
UNGR	445.6		BIG LOG JAM
TRIB	484.3		ON LEFT
TRIB	688.1		ON LEFT
SCH	780.0		IN ON LEFT
SCH	786.5		OUT LEFT

*Stearns District
Whitley City Quadrangle*



Distribution and abundance of LWD, distribution of substrates, and distribution of Rosgen's channel types (Rosgen 1996) in Taylor Branch (2), 2004. Similar data are not available for initial inventory. LWD, substrate, and channel type were recorded for each habitat unit in the stream. X-axis indicates distance upstream from National Forest boundary. Vertical bars on (A) indicate total count of LWD; open circles represent the amount of the total LWD that was >5 m in length, >55 cm in diameter (size 4). Closed circles on (B) are dominant substrates, open circles are subdominant substrates. See Appendix B for substrate sizes. See Appendix B for channel type descriptions from (C).

Appendix B: Habitat Inventory Categories

Size classes used to categorize large woody debris during BVET habitat surveys on the DBNF, 2004. Woody debris < 1.0 m in length or < 10 cm in diameter were omitted. All woody debris > 3.6 m long and 30 cm diameter were counted in the 1990's with no size classes.

Size Class	Length (m)	Diameter (cm)
1	< 5	10-55
2	< 5	> 55
3	> 5	10-55
4	> 5	> 55

Size classes used to categorize substrate particles during BVET habitat surveys on the DBNF, 1990's and 2004. Size was visually estimated on the intermediate axis (b-axis).

Type	Code	Size (mm)
Silt/Sand	S	< 7
Gravel	G	8-73
Cobble	C	74-149
Rubble	R	150-302
Boulder	B	303-914
Big Boulder	X	>914
Bedrock	Z	Solid parent material
Wood	W	
Ash	A	
Pumice	P	

Bankfull channel characteristics used to determine Rosgen channel types in the field during BVET habitat surveys on the DBNF, 2004. Rosgen determinations were not made in the field in the 1990's.

Channel Type	A	B	C	D	E	F	G
Entrenchment	< 1.4	1.4 – 2.2	> 2.2	n/a	> 2.2	< 1.4	< 1.4
W/D Ratio	< 12	> 12	> 12	> 40	< 12	> 12	< 12
Slope (%)	4 – 9.9	2 – 3.9	< 2	< 4	< 2	< 2	2 – 3.9