Current Condition of Streams on the Blacksburg Ranger District, George Washington - Jefferson National Forest, Virginia

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Introduction - In Spring 1999 we began stream habitat surveys on the Blacksburg Ranger District (BRD), George Washington - Jefferson National Forest (GW - JNF) to quantify current stream conditions. Habitat in over 60 miles of stream (23 streams) was classified and inventoried between 26 May and 13 August 1999 using Basinwide Visual Estimation Techniques (BVET [Doloff et. al 1993]).

We modified standard BVET methods to measure stream habitat parameters identified in the George Washington (GW) forest plan. Included in the forest plan is an outline of the desired-future-condition (DFC) for all the streams within the GW based on physical habitat. The pertinent DFCs for the GW include woody debris loading of 78 to 186 pieces per kilometer and 30 to 70 percent of the total stream habitat in pools. The use of BVET allowed us to estimate woody debris loading, percentage of pool and riffle area, and the width of the riparian area of streams in the BRD. Further, we were able to map the distribution of woody debris, and Rosgen's channel type in all streams surveyed.

The purpose of this report is to describe the current conditions of BRD streams in a format useful to the BRD and the GW-JNF. The enclosed information is intended as a baseline for BRD managers involved in habitat improvement projects or land use decisions.

Methods - Two-stage visual estimation techniques were used to quantify habitat and DFCs in selected BRD streams. During the first stage, all habitat units were classified and the surface area and depth were estimated. Sampling strata were based on naturally occurring habitat units such as pools (an area in the stream with low water velocity, streambed gradient less than zero, and a smooth water surface), riffles (an area in the stream with moderately steep gradient, shallow water, relatively high velocity, and turbulent surface), glides (an area in the stream with moderate to low water velocity, gradient at or near zero, and uniform depth), cascades (an area in the stream with very high velocity, turbulent surface, and steep gradient), and braids (an area in the stream where multiple channels occur regardless of habitat type). Surveys began at confluences for streams confined to the BRD and at the downstream USFS boundary for all other streams. Surveys were terminated when we encountered an upstream USFS property boundary or determined the stream to be intermittent.

Habitat in each stream was classified and inventoried by a two-person crew. One crew member identified each habitat unit by type, estimated surface area, estimated the average and maximum depth, and substrate composition for each habitat unit. This crew member also determined whether or not embeddedness (an area on the stream bottom where larger substratum was embedded by at least 35% or more of smaller substratum) was present in pools. Average depth of each habitat unit was estimated by taking depth measurements at various places across the channel profile with a graduated staff marked in 5cm increments. The length (0.1m) of each habitat unit was measured with a hip chain.

Another crew member classified and inventoried large woody debris (LWD) within the stream channel, and Rosgen's channel type associated with each habitat unit. This crew member also recorded the data on a Husky Hunter field computer. LWD was divided into four classes: 1) less than 5m long, less than 55 cm in diameter,
2) less than 5m long, greater than 55cm in diameter, 3) greater than 5m long, less than 55cm in diameter, and 4) greater than 5m long, greater than 55cm in diameter. All LWD less than 1m long and less than 10cm in diameter were omitted from the survey. Rosgen's channel types were restricted to A, B, C, D, and F (pers. comm. Gary Kappesser, GW-JNF Hydrologist). This was performed following the guidelines found in Rosgen, 1996.

The first unit of each habitat type selected for intensive sampling (accurate measurement of surface area - second stage sampling) was determined randomly. Additional units were selected systematically (one unit out of 10 for each habitat type). The width of these systematically selected habitat units was measured with a 30-m measuring tape at intervals ranging from about 1 m to 15 m. Interval size was determined by the length and the morphology of the unit (e.g., intervals of measured widths increased with increasing unit length).

The relationship between the estimated surface area and the measured surface area typically is strongly and positively correlated when the estimates are made by experienced personnel; thus, visual estimates were corrected by multiplying all estimates by a calibration ratio (Hankin and Reeves 1988). The calibration ratio (Q), the estimated true total area (M) and the variance of the area estimator V(M) were calculated separately for each habitat type and each stream.

In each of the systematically selected riffles we also estimated the stream channel width (m) at bankfull and riparian width (m) as described by Harrelson et. al 1994. We used this information to describe the channel and flood plain associated with each stream. Temperature (Celsius) and channel gradient (%) were also measured at different intervals in each stream.

The corrected estimates of habitat area were computed using a Microsoft Excel spreadsheet macro created by Craig Roghair (140 Cheatham Hall, VA Tech, Blacksburg, VA 24061-0321) based on BVET calculations found in Dolloff et. al 1993. Data were summarized using Quattro Pro and Excel spreadsheets.

**User's Guide** - Stream Summaries are organized by U. S. Geological Survey Topographic Quadrangle. Data for each stream section were collected, analyzed, and presented separately. Glides and cascades were included with pools and riffles summaries respectively, unless otherwise specified (i.e. percent of pool habitat called as glide). Each stream or stream section summary contains: 1) synopsis of stream characteristics; 2) boxplots of maximum and average depth for pools and riffles, and average residual pool depth; 3) LWD size graph; 4) LWD distribution graph; 5) substrate composition for pools and riffles; 6) boxplot of riparian measurements; 7) percent pools and riffles graph; and 8) distribution of Rosgen's channel type. GW-JNF DFCs are indicated on all pertinent graphs.

We also included references tables of all streams surveyed which will allow managers to quickly assess the present condition of BRD streams in relation to pertinent DFCs. Streams are arranged by DFC parameters (percent pool habitat and LWD pieces per kilometer) in descending order. DFCs are indicated within each table.
Literature Cited


Acknowledgments

We would like to thank the following people for their contributions to this report: George Annis, Dave Baxter, Mike Mabe, Kristen MacQuarrie, Jesse Overcash, Matt Stengel, and Jeff Strottman.
Reference Tables

Table 1. Large woody debris (LWD) pieces per kilometer in streams on the Blacksburg Ranger District. Streams above the double line meet GW-JNF DFCs.

<table>
<thead>
<tr>
<th>Stream</th>
<th>LWD per kilometer</th>
<th>Kilometers Surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dismal Creek</td>
<td>559.9</td>
<td>8.5</td>
</tr>
<tr>
<td>Little Stony Creek</td>
<td>483.7</td>
<td>6.2</td>
</tr>
<tr>
<td>Nobusiness Creek</td>
<td>437.4</td>
<td>9.3</td>
</tr>
<tr>
<td>Laurel Creek</td>
<td>411.1</td>
<td>2.4</td>
</tr>
<tr>
<td>Pearis Thompson Branch</td>
<td>387.8</td>
<td>2.4</td>
</tr>
<tr>
<td>Standrock Branch</td>
<td>366.3</td>
<td>1.8</td>
</tr>
<tr>
<td>Laurel Branch</td>
<td>363.0</td>
<td>1.9</td>
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<tr>
<td>Mill Creek</td>
<td>343.4</td>
<td>4.4</td>
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<td>304.4</td>
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<tr>
<td>Nettle Hollow</td>
<td>278.5</td>
<td>1.2</td>
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<tr>
<td>White Rock Branch</td>
<td>254.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Poverty Creek</td>
<td>202.4</td>
<td>8.7</td>
</tr>
<tr>
<td>South Fork of Potts Creek</td>
<td>201.7</td>
<td>2.9</td>
</tr>
<tr>
<td>War Spur Branch</td>
<td>200.8</td>
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<td>Pineswamp Branch</td>
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<td>Big Stony Creek</td>
<td>120.0</td>
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<td>Straley Branch</td>
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<td>1.3</td>
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<tr>
<td>North Fork of Stony Creek</td>
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<td>8.4</td>
</tr>
<tr>
<td>Craig Creek</td>
<td>96.4</td>
<td>10.2</td>
</tr>
<tr>
<td>Johns Creek</td>
<td>85.7</td>
<td>3.1</td>
</tr>
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</table>

LWD ≥ 78 pieces per kilometer

<table>
<thead>
<tr>
<th>Stream</th>
<th>LWD</th>
<th>Kilometers Surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lee Hollow</td>
<td>77.1</td>
<td>2.5</td>
</tr>
<tr>
<td>Dixon Branch</td>
<td>69.5</td>
<td>3.4</td>
</tr>
<tr>
<td>Whitewash Hollow</td>
<td>63.6</td>
<td>3.4</td>
</tr>
</tbody>
</table>
Table 2. Percent pool habitat of streams surveyed on the Blacksburg Ranger District. Streams above the double line meets GW-JNF DFCs.

<table>
<thead>
<tr>
<th>Stream</th>
<th>Percent Pool Habitat</th>
<th>Kilometers Surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dismal Creek</td>
<td>83.2</td>
<td>8.5</td>
</tr>
<tr>
<td>Craig Creek</td>
<td>73.6</td>
<td>10.2</td>
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<tr>
<td>North Fork of Stony Creek</td>
<td>71.5</td>
<td>8.4</td>
</tr>
<tr>
<td>Poverty Creek</td>
<td>70.5</td>
<td>8.7</td>
</tr>
<tr>
<td>Little Stony Creek</td>
<td>60.5</td>
<td>6.2</td>
</tr>
<tr>
<td>Nobusiness Creek</td>
<td>58.7</td>
<td>9.3</td>
</tr>
<tr>
<td>Pearis Thompson Branch</td>
<td>52.4</td>
<td>2.4</td>
</tr>
<tr>
<td>White Rock Branch</td>
<td>49.9</td>
<td>4.5</td>
</tr>
<tr>
<td>South Fork of Potts Creek</td>
<td>49.6</td>
<td>2.9</td>
</tr>
<tr>
<td>Big Stony Creek</td>
<td>48.7</td>
<td>13.7</td>
</tr>
<tr>
<td>Whitewash Hollow</td>
<td>47.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Straley Branch</td>
<td>46.8</td>
<td>1.3</td>
</tr>
<tr>
<td>Mill Creek</td>
<td>44.3</td>
<td>4.4</td>
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<tr>
<td>Laurel Creek</td>
<td>44.0</td>
<td>2.4</td>
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<tr>
<td>Standrock Branch</td>
<td>42.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Dixon Branch</td>
<td>41.9</td>
<td>1.2</td>
</tr>
<tr>
<td>Nettle Hollow</td>
<td>39.6</td>
<td>1.2</td>
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<tr>
<td>Lee Hollow</td>
<td>38.3</td>
<td>1.5</td>
</tr>
<tr>
<td>Unnamed Tributary of White Rock Branch</td>
<td>30.5</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Pool Habitat ≥ 30%

<table>
<thead>
<tr>
<th>Stream</th>
<th>Percent Pool Habitat</th>
<th>Kilometers Surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johns Creek</td>
<td>27.3</td>
<td>3.1</td>
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<tr>
<td>War Spur Branch</td>
<td>27.0</td>
<td>3.5</td>
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<tr>
<td>Laurel Branch</td>
<td>24.5</td>
<td>1.9</td>
</tr>
<tr>
<td>Pineswamp Branch</td>
<td>15.9</td>
<td>0.6</td>
</tr>
</tbody>
</table>
Stream Summaries
Craig Springs and McDonalds Mill Quadrangles
Stream: Craig Creek
District: Blacksburg
Quadrangle: Looney
Sample Date: 07/11/1999
Downstream Starting Point: Forest Service boundary
Total Distance Surveyed: 10.2 kilometres
Percent of Total Area - Pools: 73.6%
Number of Pools: 367
Number of Pools per kilometer: 36.0
Total Pool Area: 44069.0 sq. meters + 2026.8
Mean Pool Area: 120.1 sq. meters
Correction Factor: 0.99
Mean Maximum Depth: 50.8 cm
Mean Average Depth: 35.8 cm
Mean Average Residual Pool Depth: 11.0 cm
Percent of Total Area - Riffles: 26.4%
Number of Riffles: 209
Number of Riffles per kilometer: 20.5
Total Riffle Area: 15836.4 sq. meters + 2257.6
Mean Riffle Area: 75.8 sq. meters
Correction Factor: 0.99
Mean Maximum Depth: 22.0 cm
Mean Average Depth: 12.8 cm
Number of Large Woody Debris Pieces per kilometer: 96.4
Wood < 5 m and < 55 cm: 43.7
Wood < 5 m and > 55 cm: 3.6
Wood > 5 m and < 55 cm: 35.1
Wood > 5 m and > 55 cm: 14.0
Mean Channel Width: 8.8 m
Mean Riparian Width: 79.5 m
Mean Maximum Riparian Distance (either side): 59.4 m
Mean Minimum Riparian Distance (either side): 11.3 m
Maximum Riparian Width (Total): 199.3 m
Minimum Riparian Width (Total): 17.0 m
Craig Creek Continued.

Percent of Pool Habitat Surveyed as Glides: 38.2%

Rosgen's Channel Type Frequency:
- Channel Type A: 0.0%
- Channel Type B: 10.6%
- Channel Type C: 89.4%
- Channel Type D: 0.0%

Percent Pools with ≥ 35% Embeddedness: 18.8%

Average Channel Gradient: 3.9
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Distribution and Abundance of Large Woody Debris

Craig Creek

Total LWD

LWD > 5 m > 55 cm

Number of Pieces

Distance (m)
Riparian Width
Stream: Craig Creek
Number of Measurements: 15
Mean Width: 79.5m  Std Dev: 56.9
Max: 199.3m  Min: 17.0m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Craig Creek
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area in Pool Habitat
Craig Creek
Rosgen's Channel Type Distribution

Distance (m)

Channel Type

A

B

C
Stream: Lee Hollow
District: Blacksburg
Quadrangle: Craig Springs
Sample Date: 07/09/1999
Downstream Starting Point: Confluence with Craig Creek
Total Distance Surveyed: 1.5 kilometers

Percent of Total Area - Pools: 38.3%
Number of Pools: 124
Number of Pools per kilometer: 82.7
Total Pool Area: 1168.1 sq. meters ± 200.4
Mean Pool Area: 9.4 sq. meters
Correction Factor: 1.01
Mean Maximum Depth: 30.6 cm
Mean Average Depth: 15.8 cm
Mean Average Residual Pool Depth: 10.0 cm

Percent of Total Area - Riffles: 61.7%
Number of Riffles: 101
Number of Riffles per kilometer: 67.3
Total Riffle Area: 1880.1 sq. meters ± 293.4
Mean Riffle Area: 18.6 sq. meters
Correction Factor: 1.14
Mean Maximum Depth: 16.7 cm
Mean Average Depth: 6.6 cm

Number of Large Woody Debris Pieces per kilometer: 75.9
Wood < 5 m and < 55 cm: 59.6
Wood < 5 m and > 55 cm: 1.4
Wood > 5 m and < 55 cm: 12.2
Wood > 5 m and > 55 cm: 2.7

Mean Channel Width: 3.6 m
Mean Riparian Width: 16.3 m
Mean Maximum Riparian Distance (either side): 10.6 m
Mean Minimum Riparian Distance (either side): 2.1 m
Maximum Riparian Width (Total): 33.5 m
Minimum Riparian Width (Total): 6.2 m
Lee Hollow Continued.

Percent of Pool Habitat Surveyed as Glides: 2.4%

Rosgen’s Channel Type Frequency:
  Channel Type A: 54.1%
  Channel Type B: 45.9%
  Channel Type C: 0.0%
  Channel Type D: 0.0%

Percent Pools with \( \geq 35\% \) Embeddedness: 7.3%

Average Channel Gradient: 7.3
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Lee Hollow

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number of Pieces per Kilometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>75.9</td>
</tr>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>2.7</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>12.2</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>1.4</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>59.6</td>
</tr>
</tbody>
</table>
Distribution and Abundance of Large Woody Debris

Number of Pieces

Distance (m)

Total LWD

LWD > 5 m > 55 cm

Lee Hollow
Riparian Width
Stream: Lee Hollow
Number of Measurements: 8
Mean Width: 16.3m  Std Dev: 8.4
Max: 33.5m  Min: 6.2m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Lee Hollow
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area in Pool Habitat

Pool Area 38.3%
Riffle Area 61.7%

30% 70%
Lee Hollow
Rosgen's Channel Type Distribution

Channel Type

Distance (m)
Stream: Whitewash Hollow
District: Blacksburg
Quadrangle: McDonalds Mill
Sample Date: 05/27/99
Downstream Starting Point: Confluence with Craig Creek
Total Distance Surveyed: 0.7 kilometers
  Percent of Total Area - Pools: 47.0%
  Number of Pools: 82
  Number of Pools per kilometer: 117.1
  Total Pool Area: 605.2 sq. meters ± 140.3
  Mean Pool Area: 7.4 sq. meters
  Correction Factor: 1.08
  Mean Maximum Depth: 26.1 cm
  Mean Average Depth: 14.1 cm
  Mean Average Residual Pool Depth: 10.2 cm
  Percent of Total Area - Riffles: 53.0%
  Number of Riffles: 57
  Number of Riffles per kilometer: 81.4
  Total Riffle Area: 683.9 sq. meters ± 157.1
  Mean Riffle Area: 12.0 sq. meters
  Correction Factor: 1.15
  Mean Maximum Depth: 11.2 cm
  Mean Average Depth: 5.3 cm
Number of Large Woody Debris Pieces per kilometer: 59.9
  Wood < 5 m and < 55 cm: 21.3
  Wood < 5 m and > 55 cm: 9.3
  Wood > 5 m and < 55 cm: 21.3
  Wood > 5 m and > 55 cm: 8.0
Mean Channel Width: 3.4 m
Mean Riparian Width: 19.1 m
  Mean Maximum Riparian Distance (either side): 12.3 m
  Mean Minimum Riparian Distance (either side): 3.4 m
  Maximum Riparian Width (Total): 30.4 m
  Minimum Riparian Width (Total): 10.8 m
Whitewash Hollow Continued.

Percent of Pool Habitat Surveyed as Glides: 17.0%

Rosgen's Channel Type Frequency:
  Channel Type A: 28.9%
  Channel Type B: 63.4%
  Channel Type C: 7.7%
  Channel Type D: 0.0%

Percent Pools with >35% Embeddedness: 22.0%

Average Channel Gradient: 8.0
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Whitewash Hollow

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number of Pieces per Kilometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>60.0</td>
</tr>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>8.0</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>21.3</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>9.3</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>21.3</td>
</tr>
</tbody>
</table>
Distribution and Abundance of Large Woody Debris

Whitewash Hollow

Number of Pieces

LWD > 5 m > 55 cm

Distance (m)
Riparian Width
Stream: Whitewash Hollow
Number of Measurements: 5
Mean Width: 19.1m  Std Dev: 8.9
Max: 30.4m  Min: 10.8m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Whitewash Hollow
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area in Pool Habitat
Whitewash Hollow
Rosgen's Channel Type Distribution

Distance (m)

Channel Type

A
B
C
Eggleston Quadrangle
Stream: Little Stony Creek
District: Blacksburg
Quadrangle: Eggleston
Sample Date: 06/03/99
Downstream Starting Point: Forest Service Boundary below parking lot

Total Distance Surveyed: 6.2 kilometers

Percent of Total Area - Pools: 60.5%
Number of Pools: 335
Number of Pools per kilometer: 54.0
Total Pool Area: 24404.0 sq. meters ± 1578.3
Mean Pool Area: 72.8 sq. meters
Correction Factor: 1.03
Mean Maximum Depth: 74.8 cm
Mean Average Depth: 58.6 cm
Mean Average Residual Pool Depth: 42.1 cm

Percent of Total Area - Riffles: 39.5%
Number of Riffles: 220
Number of Riffles per kilometer: 35.5
Total Riffle Area: 15922.9 sq. meters ± 848.1
Mean Riffle Area: 72.4 sq. meters
Correction Factor: 0.99
Mean Maximum Depth: 31.7 cm
Mean Average Depth: 19.2 cm

Number of Large Woody Debris Pieces per kilometer: 483.6
Wood < 5 m and < 55 cm: 235.3
Wood < 5 m and > 55 cm: 24.3
Wood > 5 m and < 55 cm: 164.5
Wood > 5 m and > 55 cm: 59.5

Mean Channel Width: 14.3 m
Mean Riparian Width: 43.0 m

Mean Maximum Riparian Distance (either side): 23.5 m
Mean Minimum Riparian Distance (either side): 5.2 m
Maximum Riparian Width (Total): 105.3 m
Minimum Riparian Width (Total): 25.5 m
Little Stony Creek Continued.

Percent of Pool Habitat Surveyed as Glides: 22.6%

Rosgen's Channel Type Frequency:
  Channel Type A: 0.0%
  Channel Type B: 91.9%
  Channel Type C: 8.1%
  Channel Type D: 0.0%

Percent Pools with > 35% Embeddedness: 9.0%

Average Channel Gradient: 10.9
Little Stony Creek

Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Little Stony Creek

Large Woody Debris

- Total: 483.7
- > 5 m > 55 cm: 59.5
- > 5 m < 55 cm: 164.5
- < 5 m > 55 cm: 24.3
- < 5 m < 55 cm: 235.3

Number of Pieces per Kilometer
Little Stony Creek
Substrate Composition

Pools

Riffles

Frequency (%) vs. Cumulative Percent

Dominant
Subdominant

Dominate
Subdominant
Riparian Width
Stream: Little Stony Creek
Number of Measurements: 21
Mean Width: 43.1m  Std Dev: 24.2
Max: 105.3m  Min: 13.3m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Little Stony Creek
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area in Pool Habitat

Pool Area 60.5%
Riffle Area 39.5%
Little Stony Creek
Rosgen's Channel Type Distribution

\begin{figure}
\centering
\includegraphics[width=\textwidth]{channel_type_distribution.png}
\end{figure}
Stream: Poverty Creek
District: Blacksburg
Quadrangle: Eggleston/Newport
Sample Date: 05/26/99
Downstream Starting Point: Forest Service Boundary
Total Distance Surveyed: 8.7 kilometers
   Percent of Total Area - Pools: 70.5%
   Number of Pools: 289
   Number of Pools per kilometer: 33.2
   Total Pool Area: 31568.5 sq. meters ± 2881.5
   Mean Pool Area: 109.2 sq. meters
   Correction Factor: 1.02
   Mean Maximum Depth: 46.1 cm
   Mean Average Depth: 24.7 cm
   Mean Average Residual Pool Depth: 15.7 cm
   Percent of Total Area - Riffles: 29.5%
   Number of Riffles: 216
   Number of Riffles per kilometer: 24.8
   Total Riffle Area: 13181.8 sq. meters ± 1796.8
   Mean Riffle Area: 61.0 sq. meters
   Correction Factor: 1.05
   Mean Maximum Depth: 16.1 cm
   Mean Average Depth: 8.5 cm
Number of Large Woody Debris Pieces per kilometer: 202.4
   Wood < 5 m and < 55 cm: 109.4
   Wood < 5 m and > 55 cm: 24.7
   Wood > 5 m and < 55 cm: 47.2
   Wood > 5 m and > 55 cm: 21.1
Mean Channel Width: 7.2 m
Mean Riparian Width: 71.5 m
   Mean Maximum Riparian Distance (either side): 48.3 m
   Mean Minimum Riparian Distance (either side): 16.0 m
   Maximum Riparian Width (Total): 107.7 m
   Minimum Riparian Width (Total): 26.1 m
Poverty Creek Continued.

Percent of Pool Habitat Surveyed as Glides: 6.9%

Rosgen's Channel Type Frequency:
  Channel Type A: 0.0%
  Channel Type B: 2.8%
  Channel Type C: 97.2%
  Channel Type D: 0.0%

Percent Pools with > 35% Embeddedness: 14.9%

Average Channel Gradient: 3.4
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Poverty Creek

Number of Pieces per Kilometer

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number of Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>202.4</td>
</tr>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>21.1</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>47.2</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>24.7</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>109.4</td>
</tr>
</tbody>
</table>
Distribution and Abundance of Large Woody Debris

Poverty Creek

Total LWD

LWD > 5 m > 55 cm

Distance (m)

Number of Pieces
Poverty Creek
Substrate Composition

Pools

Frequency (%)

Cumulative Percent

<table>
<thead>
<tr>
<th>Organic</th>
<th>Clay</th>
<th>Silt</th>
<th>Sand</th>
<th>Sm. Gravel</th>
<th>Lg. Gravel</th>
<th>Cobble</th>
<th>Boulder</th>
<th>Bedrock</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Dominant</th>
<th>Subdominant</th>
</tr>
</thead>
</table>

Riffles

Frequency (%)

Cumulative Percent

<table>
<thead>
<tr>
<th>Organic</th>
<th>Clay</th>
<th>Silt</th>
<th>Sand</th>
<th>Sm. Gravel</th>
<th>Lg. Gravel</th>
<th>Cobble</th>
<th>Boulder</th>
<th>Bedrock</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Dominant</th>
<th>Subdominant</th>
</tr>
</thead>
</table>
Riparian Width
Stream: Poverty Creek
Number of Measurements: 17
Mean Width: 71.5m  Std Dev: 22.5
Max: 107.7m    Min: 26.1m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Poverty Creek
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area in Pool Habitat

Pool Area 70.5%
Riffle Area 29.5%

30% 70%
Poverty Creek
Rosgen's Channel Type Distribution

Distance (m)
Stream: Straley Branch
District: Blacksburg
Quadrangle: Eggleston
Sample Date: 06/02/99
Downstream Starting Point: Confluence with Poverty Creek
Total Distance Surveyed: 1.3 kilometers

Percent of Total Area - Pools: 46.8%
Number of Pools: 82
Number of Pools per kilometer: 63.1
Total Pool Area: 1243.6 sq. meters ± 110.6
Mean Pool Area: 15.2 sq. meters
Correction Factor: 1.02
Mean Maximum Depth: 28.0 cm
Mean Average Depth: 15.8 cm
Mean Average Residual Pool Depth: 12.2 cm

Percent of Total Area - Riffles: 53.2%
Number of Riffles: 64
Number of Riffles per kilometer: 49.2
Total Riffle Area: 1415.6 sq. meters ± 135.9
Mean Riffle Area: 22.1 sq. meters
Correction Factor: 1.06
Mean Maximum Depth: 15.4 cm
Mean Average Depth: 7.8 cm

Number of Large Woody Debris Pieces per kilometer: 113.5
Wood < 5 m and < 55 cm: 72.3
Wood < 5 m and > 55 cm: 10.1
Wood > 5 m and < 55 cm: 26.4
Wood > 5 m and > 55 cm: 4.7

Mean Channel Width: 5.6 m
Mean Riparian Width: 22.4 m

Mean Maximum Riparian Distance (either side): 15.4 m
Mean Minimum Riparian Distance (either side): 1.4 m
Maximum Riparian Width (Total): 36.7 m
Minimum Riparian Width (Total): 7.1 m
Straley Branch Continued.

Percent of Pool Habitat Surveyed as Glides: 12.3%

Rosgen’s Channel Type Frequency:
  - Channel Type A: 37.2%
  - Channel Type B: 45.5%
  - Channel Type C: 17.3%
  - Channel Type D: 0.0%

Percent Pools with ≥ 35% Embeddedness: 7.3%

Average Channel Gradient: 8.2
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Straley Branch

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number of Pieces per Kilometer</th>
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<tbody>
<tr>
<td>Total</td>
<td>113.4</td>
</tr>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>4.7</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>26.4</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>10.1</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>72.3</td>
</tr>
</tbody>
</table>
Distribution and Abundance of Large Woody Debris

Total LWD

Straley Branch

Number of Pieces

LWD > 5 m > 55 cm

Distance (m)
Straley Branch
Substrate Composition

Pools

Riffles
Riparian Width
Stream: Straley Branch
Number of Measurements: 5
Mean Width: 22.5m  Std Dev: 12.8
Max: 36.7m  Min: 7.1m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Straley Branch
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area in Pool Habitat

Pool Area 46.8%

Riffle Area 53.2%
Straley Branch
Rosgen's Channel Type Distribution

Distance (m)

Channel Type

A
B
C
Mechanicsburg and Narrows Quadrangles
Stream: Dismal Creek
District: Blacksburg
Quadrangle: Mechanicsburg/White Gate
Sample Date: 06/30/99
Downstream Starting Point: Forest Service Boundary
Total Distance Surveyed: 8.5 kilometers
  Percent of Total Area - Pools: 83.2%
  Number of Pools: 343
  Number of Pools per kilometer: 40.4
  Total Pool Area: 38072.9 sq. meters ± 4293.4
  Mean Pool Area: 111.0 sq. meters
  Correction Factor: 1.03
  Mean Maximum Depth: 38.7 cm
  Mean Average Depth: 28.6 cm
  Mean Average Residual Pool Depth: 30.6 cm
  Percent of Total Area - Riffles: 16.8%
  Number of Riffles: 144
  Number of Riffles per kilometer: 16.9
  Total Riffle Area: 7684.3 sq. meters ± 626.9
  Mean Riffle Area: 53.4 sq. meters
  Correction Factor: 1.03
  Mean Maximum Depth: 16.2 cm
  Mean Average Depth: 8.7 cm
Number of Large Woody Debris Pieces per kilometer: 559.9
  Wood < 5 m and < 55 cm: 298.2
  Wood < 5 m and > 55 cm: 33.0
  Wood > 5 m and < 55 cm: 162.4
  Wood > 5 m and > 55 cm: 66.3
Mean Channel Width: 9.4 m
Mean Riparian Width: 31.1 m
  Mean Maximum Riparian Distance (either side): 18.3 m
  Mean Minimum Riparian Distance (either side): 3.4 m
  Maximum Riparian Width (Total): 59.0 m
  Minimum Riparian Width (Total): 16.4 m
Dismal Creek Continued.

Percent of Pool Habitat Surveyed as Glides: 80.3%

Rosgen's Channel Type Frequency:

- Channel Type A: 0.0%
- Channel Type B: 0.0%
- Channel Type C: 100%
- Channel Type D: 0.0%

Percent Pools with ≥ 35% Embeddedness: 19.2%

Average Channel Gradient: 7.7
Dismal Creek

Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Distribution and Abundance of Large Woody Debris

Number of Pieces

Distance (m)

Total LWD

Dismal Creek

LWD > 5 m > 55 cm
Riparian Width
Stream: Dismal Creek
Number of Measurements: 16
Mean Width: 31.2 m  Std Dev: 11.8
Max: 59.0m  Min: 16.4m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Dismal Creek
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area in Pool Habitat
Dismal Creek
Rosgen's Channel Type Distribution

Channel Type

Distance (m)

0  1000  2000  3000  4000  5000  6000  7000  8000

A  B  C
Stream: Mill Creek
District: Blacksburg
Quadrangle: Narrows
Sample Date: 08/09/99
Downstream Starting Point: Forest Service Boundary
Total Distance Surveyed: 4.4 kilometers

Percent of Total Area - Pools: 44.3%
Number of Pools: 151
Number of Pools per kilometer: 34.3
Total Pool Area: 4779.2 sq. meters ± 339.5
Mean Pool Area: 31.7 sq. meters
Correction Factor: 0.93
Mean Maximum Depth: 51.6 cm
Mean Average Depth: 37.5 cm
Mean Average Residual Pool Depth: 10.0 cm

Percent of Total Area - Riffles: 55.7%
Number of Riffles: 125
Number of Riffles per kilometer: 28.4
Total Riffle Area: 5999.8 sq. meters ± 945.9
Mean Riffle Area: 48.0 sq. meters
Correction Factor: 1.03
Mean Maximum Depth: 20.4 cm
Mean Average Depth: 10.6 cm

Number of Large Woody Debris Pieces per kilometer: 343.4
Wood < 5 m and < 55 cm: 206.6
Wood < 5 m and > 55 cm: 31.2
Wood > 5 m and < 55 cm: 74.4
Wood > 5 m and > 55 cm: 31.2

Mean Channel Width: 7.9 m
Mean Riparian Width: 16.7 m
Mean Maximum Riparian Distance (either side): 6.7 m
Mean Minimum Riparian Distance (either side): 2.1 m
Maximum Riparian Width (Total): 20.9 m
Minimum Riparian Width (Total): 11.6 m
Mill Creek Continued.

Percent of Pool Habitat Surveyed as Glides: 17.5%

Rosgen's Channel Type Frequency:
  - Channel Type A: 62.7%
  - Channel Type B: 37.3%
  - Channel Type C: 0.0%
  - Channel Type D: 0.0%

Percent Pools with > 35% Embeddedness: 13.2%

Average Channel Gradient: 14.5
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Mill Creek

Large Woody Debris

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Pieces per Kilometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>31.2</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>74.4</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>31.2</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>206.6</td>
</tr>
</tbody>
</table>

Total: 343.4
Distribution and Abundance of Large Woody Debris

![Graph showing the distribution and abundance of large woody debris in Mill Creek. The graph plots the number of pieces against distance (m). The x-axis represents distance from 0 to 4500 m, and the y-axis represents the number of pieces from 0 to 100. The graph includes bars indicating the number of pieces for total LWD and LWD > 5 m > 55 cm.](image-url)
Riparian Width
Stream: Mill Creek
Number of Measurements: 13
Mean Width: 16.6m    Std Dev: 3.1
Max: 20.9m      Min: 11.6m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Mill Creek
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area
in Pool Habitat
Mill Creek
Rosgen's Channel Type Distribution

Channel Type

Distance (m)

0 500 1000 1500 2000 2500 3000 3500 4000 4500
Stream: Nobusiness Creek
District: Blacksburg
Quadrangle: Narrows
Sample Date: 08/23/1999
Downstream Starting Point: Forest Service boundary
Total Distance Surveyed: 9.3 kilometers
  Percent of Total Area - Pools: 58.7%
  Number of Pools: 470
  Number of Pools per kilometer: 50.5
  Total Pool Area: 18244.8 sq. meters ± 619.7
  Mean Pool Area: 38.8 sq. meters
  Correction Factor: 0.94
  Mean Maximum Depth: 39.3 cm
  Mean Average Depth: 28.3 cm
  Mean Average Residual Pool Depth: 21.9 cm
  Percent of Total Area - Riffles: 41.3%
  Number of Riffles: 323
  Number of Riffles per kilometer: 34.7
  Total Riffle Area: 12822.1 sq. meters ± 856.7
  Mean Riffle Area: 39.7 sq. meters
  Correction Factor: 0.93
  Mean Maximum Depth: 19.4 cm
  Mean Average Depth: 10.7 cm
Number of Large Woody Debris Pieces per kilometer: 437.2
  Wood < 5 m and < 55 cm: 311.6
  Wood < 5 m and > 55 cm: 10.8
  Wood > 5 m and < 55 cm: 90.7
  Wood > 5 m and > 55 cm: 24.1
Mean Channel Width: 5.4 m
Mean Riparian Width: 17.2 m
  Mean Maximum Riparian Distance (either side): 8.7 m
  Mean Minimum Riparian Distance (either side): 3.1 m
  Maximum Riparian Width (Total): 47.4 m
  Minimum Riparian Width (Total): 9.7 m
Nobusiness Creek Continued.

**Percent of Pool Habitat Surveyed as Glides:** 29.3%

**Rosgen's Channel Type Frequency:**
- Channel Type A: 12.6%
- Channel Type B: 83.2%
- Channel Type C: 4.2%
- Channel Type D: 0.0%

**Percent Pools with ≥ 35% Embeddedness:** 2.6%

**Average Channel Gradient:** 5.3
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Nobusiness Creek

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number of Pieces per Kilometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>437.4</td>
</tr>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>24.1</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>90.9</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>10.8</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>311.6</td>
</tr>
</tbody>
</table>
Distribution and Abundance of Large Woody Debris

![Graph showing the distribution and abundance of large woody debris (LWD) along Nobusiness Creek. The x-axis represents distance in meters, ranging from 0 to 9000. The y-axis represents the number of pieces, ranging from 0 to 160. The graph includes data for total LWD and LWD > 5 m > 55 cm.](image)
Nobusiness Creek Substrate Composition

**Pools**

- Dominant
- Subdominant

**Riffles**

- Dominant
- Subdominant
Riparian Width
Stream: Nobusiness Creek
Number of Measurements: 25
Mean Width: 17.6m   Std Dev: 8.3
Max: 47.4m       Min: 9.7m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Nobusiness Creek
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area
in Pool Habitat

Pool Area
58.7%

Riffle Area
41.3%

30%

70%
Nobusiness Creek
Rosgen's Channel Type Distribution
Stream: Pearis Thompson Branch
District: Blacksburg
Quadrangle: Mechanicsburg
Sample Date: 06/28/99
Downstream Starting Point: Confluence with Dismal Creek
Total Distance Surveyed: 2.4 kilometers
Percent of Total Area - Pools: 52.4%
Number of Pools: 140
Number of Pools per kilometer: 58.3
Total Pool Area: 1896.2 sq. meters ± 186.7
Mean Pool Area: 13.5 sq. meters
Correction Factor: 0.97
Mean Maximum Depth: 20.3 cm
Mean Average Depth: 13.9 cm
Mean Average Residual Pool Depth: 12.8 cm
Percent of Total Area - Riffles: 47.6%
Number of Riffles: 93
Number of Riffles per kilometer: 38.8
Total Riffle Area: 1719.8 sq. meters ± 152.2
Mean Riffle Area: 18.5 sq. meters
Correction Factor: 1.13
Mean Maximum Depth: 10.3 cm
Mean Average Depth: 5.4 cm
Number of Large Woody Debris Pieces per kilometer: 387.7
Wood < 5 m and < 55 cm: 211.6
Wood < 5 m and > 55 cm: 19.4
Wood > 5 m and < 55 cm: 129.5
Wood > 5 m and > 55 cm: 27.2
Mean Channel Width: 3.1 m
Mean Riparian Width: 23.4 m
  Mean Maximum Riparian Distance (either side): 14.5 m
  Mean Minimum Riparian Distance (either side): 5.8 m
Maximum Riparian Width (Total): 37.7 m
Minimum Riparian Width (Total): 11.8 m
Pearis Thompson Branch Continued.

Percent of Pool Habitat Surveyed as Glides: 74.4%

Rosgen's Channel Type Frequency:
  Channel Type A: 0.0%
  Channel Type B: 100%
  Channel Type C: 0.0%
  Channel Type D: 0.0%

Percent Pools with > 35% Embeddedness: 9.3%

Average Channel Gradient: 9.4
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Pearis Thompson Branch

Number of Pieces per Kilometer

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number of Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>387.8</td>
</tr>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>27.2</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>129.5</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>19.4</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>211.6</td>
</tr>
</tbody>
</table>
Distribution and Abundance of Large Woody Debris

Distance (m)

Number of Pieces

LWD > 5 m > 55 cm

Total LWD

Pears Thompson Branch
Riparian Width
Stream: Pearis Thompson Branch
Number of Measurements: 11
Mean Width: 23.4m  Std Dev: 8.6
Max: 37.7m  Min: 11.8m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Pearis Thompson Branch
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area in Pool Habitat
Pearis Thompson Branch
Rosgen's Channel Type Distribution
Stream: Standrock Branch
District: Blacksburg
Quadrangle: Mechanicsburg
Sample Date: 08/14/89
Downstream Starting Point: Confluence with Dismal Creek
Total Distance Surveyed: 1.8 kilometers

Percent of Total Area - Pools: 42.8%
Number of Pools: 83
Number of Pools per kilometer: 46.1
Total Pool Area: 1488.8 sq. meters ± 143.9
Mean Pool Area: 17.9 sq. meters
Correction Factor: 0.94
Mean Maximum Depth: 23.2 cm
Mean Average Depth: 16.5 cm
Mean Average Residual Pool Depth: 15.3 cm
Percent of Total Area - Riffles: 57.2%
Number of Riffles: 70
Number of Riffles per kilometer: 38.9
Total Riffle Area: 1987.2 sq. meters ± 103.4
Mean Riffle Area: 28.4 sq. meters
Correction Factor: 1.04
Mean Maximum Depth: 11.9 cm
Mean Average Depth: 6.8 cm

Number of Large Woody Debris Pieces per kilometer: 366.3
Wood < 5 m and < 55 cm: 227.5
Wood < 5 m and > 55 cm: 16.3
Wood > 5 m and < 55 cm: 105.1
Wood > 5 m and > 55 cm: 17.4

Mean Channel Width: 3.9 m
Mean Riparian Width: 24.9 m
Mean Maximum Riparian Distance (either side): 18.8 m
Mean Minimum Riparian Distance (either side): 2.2 m
Maximum Riparian Width (Total): 65.6 m
Minimum Riparian Width (Total): 8.7 m
Standrock Branch Continued.

Percent of Pool Habitat Surveyed as Glides: 59.6%

Rosgen's Channel Type Frequency:
  Channel Type A: 9.2%
  Channel Type B: 87.7%
  Channel Type C: 3.1%
  Channel Type D: 0.0%

Percent Pools with > 35% Embeddedness: 4.8%

Average Channel Gradient: 10.0
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Standrock Branch

Large Woody Debris

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Pieces per Kilometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>366.3</td>
</tr>
<tr>
<td>$&gt; 5 \text{m} \leq 55 \text{cm}$</td>
<td>17.4</td>
</tr>
<tr>
<td>$&gt; 5 \text{m} &lt; 55 \text{cm}$</td>
<td>105.1</td>
</tr>
<tr>
<td>$&lt; 5 \text{m} \leq 55 \text{cm}$</td>
<td>16.3</td>
</tr>
<tr>
<td>$&lt; 5 \text{m} &lt; 55 \text{cm}$</td>
<td>227.5</td>
</tr>
</tbody>
</table>
Distribution and Abundance of Large Woody Debris

Number of Pieces

Distance (m)

Total LWD

Standrock Branch

LWD > 5 m > 55 cm
Standrock Branch
Substrate Composition

**Pools**

**Riffles**
Riparian Width
Stream: Standrock Branch
Number of Measurements: 8
Mean Width: 24.8m  Std Dev: 20.8
Max: 65.6m  Min: 8.7m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Standrock Branch
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area in Pool Habitat

Pool Area 42.8%
Riffle Area 57.2%

30% 70%
Standrock Branch
Rosgen's Channel Type Distribution
Interior and Linside Quadrangles
Stream: Big Stony Creek  
District: Blacksburg  
Quadrangle: Linside/Interior  
Sample Date: 06/30/99  
Downstream Starting Point: Forest Service Boundary

Total Distance Surveyed: 13.7 kilometers

- Percent of Total Area - Pools: 48.7%
- Number of Pools: 307
- Number of Pools per kilometer: 22.4
- Total Pool Area: 62919.5 sq. meters + 4894.3
- Mean Pool Area: 204.9 sq. meters
- Correction Factor: 0.91
- Mean Maximum Depth: 66.2 cm
- Mean Average Depth: 48.4 cm
- Mean Average Residual Pool Depth: 28.4 cm

Percent of Total Area - Riffles: 51.3%

- Number of Riffles: 199
- Number of Riffles per kilometer: 14.5
- Total Riffle Area: 66249.1 sq. meters + 8731.4
- Mean Riffle Area: 332.9 sq. meters
- Correction Factor: 1.06
- Mean Maximum Depth: 35.4 cm
- Mean Average Depth: 21.0 cm

Number of Large Woody Debris Pieces per kilometer: 120.0

- Wood < 5 m and < 55 cm: 57.6
- Wood < 5 m and > 55 cm: 7.9
- Wood > 5 m and < 55 cm: 39.1
- Wood > 5 m and > 55 cm: 15.4

Mean Channel Width: 16.0 m

Mean Riparian Width: 67.2 m

- Mean Maximum Riparian Distance (either side): 47.0 m
- Mean Minimum Riparian Distance (either side): 4.2 m
- Maximum Riparian Width (Total): 186.1 m
- Minimum Riparian Width (Total): 20.9 m
Big Stony Creek Continued.

Percent of Pool Habitat Surveyed as Glides: 5.2%

Rosgen's Channel Type Frequency:
- Channel Type A: 0.0%
- Channel Type B: 25.5%
- Channel Type C: 74.4%
- Channel Type D: 0.0%

Percent Pools with ≥ 35% Embeddedness: 0.0%

Average Channel Gradient: 5.4
Big Stony Creek

Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Big Stony Creek

Number of Pieces per Kilometer

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number of Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>120.0</td>
</tr>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>15.5</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>39.1</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>7.9</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>57.6</td>
</tr>
</tbody>
</table>
Distribution and Abundance of Large Woody Debris

Big Stony Creek

Total LWD

Number of Pieces

LWD > 5 m > 55 cm

Distance (m)
Big Stony Creek Substrate Composition

Pools

Riffles
Riparian Width
Stream: Big Stony Creek
Number of Measurements: 16
Mean Width: 67.2m   Std Dev: 49.6
Max: 186.1m        Min: 20.9m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Big Stony Creek
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area
in Pool Habitat

Pool Area
48.7%

Riffle Area
51.3%

30% 70%
Big Stony Creek
Rosgen's Channel Type Distribution
Stream: Dixon Branch  
District: Blacksburg  
Quadrangle: Interior  
Sample Date: 06/30/99  
Downstream Starting Point: Confluence with North Fork of Stony Creek  
Total Distance Surveyed: 1.2 kilometers
  
  Percent of Total Area - Pools: 41.9%  
Number of Pools: 111  
Number of Pools per kilometer: 92.5  
Total Pool Area: 1145.0 sq. meters ± 83.5  
Mean Pool Area: 10.3 sq. meters  
Correction Factor: 0.99  
Mean Maximum Depth: 30.2 cm  
Mean Average Depth: 15.3 cm  
Mean Average Residual Pool Depth: 10.1 cm
  
  Percent of Total Area - Riffles: 58.1%  
Number of Riffles: 75  
Number of Riffles per kilometer: 62.5  
Total Riffle Area: 1585.2 sq. meters ± 109.6  
Mean Riffle Area: 21.1 sq. meters  
Correction Factor: 1.06  
Mean Maximum Depth: 15.3 cm  
Mean Average Depth: 6.0 cm
  
Number of Large Woody Debris Pieces per kilometer: 63.5  
Wood < 5 m and < 55 cm: 40.7  
Wood < 5 m and > 55 cm: 0.8  
Wood > 5 m and < 55 cm: 16.1  
Wood > 5 m and > 55 cm: 5.9
  
Mean Channel Width: 3.7 m  
Mean Riparian Width: 34.8 m  
  
  Mean Maximum Riparian Distance (either side): 24.3 m  
Mean Minimum Riparian Distance (either side): 6.8 m  
Maximum Riparian Width (Total): 49.1 m  
Minimum Riparian Width (Total): 23.4 m
Dixon Branch Continued.

Percent of Pool Habitat Surveyed as Glides: 11.5%

Rosgen's Channel Type Frequency:
  Channel Type A: 1.6%
  Channel Type B: 92.0%
  Channel Type C: 6.4%
  Channel Type D: 0.0%

Percent Pools with ≥35% Embeddedness: 5.4%

Average Channel Gradient: 9.8
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Dixon Branch

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number of Pieces per Kilometer</th>
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<tr>
<td>Total</td>
<td>63.6</td>
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<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>5.9</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>16.1</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>0.9</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>40.7</td>
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</tbody>
</table>

DFC
Distribution and Abundance of Large Woody Debris

![Graph showing distribution and abundance of large woody debris.](image)

- **Total LWD**
- **Dixon Branch**
- **LWD > 5 m > 55 cm**

**Distance (m)**

- 0
- 150
- 300
- 450
- 600
- 750
- 900
- 1050
- 1200

**Number of Pieces**

- 0
- 20
- 40
- 60
- 80
- 100
Dixon Branch
Substrate Composition

Pools

Riffles

Cumulative Percent

Frequency (%)
Riparian Width
Stream: Dixon Branch
Number of Measurements: 6
Mean Width: 34.8m  Std Dev: 10.6
Max: 49.1m  Min: 23.4m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Dixon Branch
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area
in Pool Habitat

Pool Area
41.9%

Riffle Area
58.1%

30%

70%
Dixon Branch
Rosgen's Channel Type Distribution

Channel Type

Distance (m)
Stream: Laurel Branch
District: Blacksburg
Quadrangle: Interior/Linside
Sample Date: 06/28/99
Downstream Starting Point: Forest Service Boundary
Total Distance Surveyed: 1.9 kilometers
  Percent of Total Area - Pools: 24.5%
  Number of Pools: 120
  Number of Pools per kilometer: 63.2
  Total Pool Area: 1219.3 sq. meters ± 299.4
  Mean Pool Area: 10.2 sq. meters
  Correction Factor: 1.09
  Mean Maximum Depth: 26.5 cm
  Mean Average Depth: 16.8 cm
  Mean Average Residual Pool Depth: 10.1 cm
  Percent of Total Area - Riffles: 75.5%
  Number of Riffles: 106
  Number of Riffles per kilometer: 55.8
  Total Riffle Area: 3751.8 sq. meters ± 368.6
  Mean Riffle Area: 35.4 sq. meters
  Correction Factor: 1.05
  Mean Maximum Depth: 14.8 cm
  Mean Average Depth: 5.8 cm
Number of Large Woody Debris Pieces per kilometer: 363.0
  Wood < 5 m and < 55 cm: 260.4
  Wood < 5 m and > 55 cm: 22.4
  Wood > 5 m and < 55 cm: 67.2
  Wood > 5 m and > 55 cm: 13.0
Mean Channel Width: 4.8 m
Mean Riparian Width: 15.2 m
  Mean Maximum Riparian Distance (either side): 7.7 m
  Mean Minimum Riparian Distance (either side): 2.7 m
  Maximum Riparian Width (Total): 20.3 m
  Minimum Riparian Width (Total): 8.8 m
Laurel Branch Continued.

Percent of Pool Habitat Surveyed as Glides: 0.0%

Rosgen's Channel Type Frequency:
  Channel Type A: 0.0%
  Channel Type B: 59.3%
  Channel Type C: 40.7%
  Channel Type D: 0.0%

Percent Pools with $\geq 35\%$ Embeddedness: 85.8%

Average Channel Gradient: 10.3
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Laurel Branch

Number of Pieces per Kilometer

Total
> 5 m > 55 cm: 13.0
> 5 m < 55 cm: 67.2
< 5 m > 55 cm: 22.4
< 5 m < 55 cm: 260.4
Distribution and Abundance of Large Woody Debris

Total LWD

Laurel Branch

Number of Pieces

Distance (m)

LWD > 5 m > 55 cm
Riparian Width
Stream: Laurel Branch
Number of Measurements: 8
Mean Width: 15.3m  Std Dev: 3.9
Max: 20.3m  Min: 8.8m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Laurel Branch
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area
in Pool Habitat
Laurel Branch
Rosgen's Channel Type Distribution

![Channel Type Distribution Graph](image-url)
Stream: Laurel Creek
District: Blacksburg
Quadrangle: Eggleston/Interior
Sample Date: 06/03/99
Downstream Starting Point: Confluence with Little Stony Creek
Total Distance Surveyed: 2.4 kilometers

Percent of Total Area - Pools: 44.0%
Number of Pools: 135
Number of Pools per kilometer: 56.3
Total Pool Area: 3563.9 sq. meters + 222.2
Mean Pool Area: 26.4 sq. meters
Correction Factor: 1.07
Mean Maximum Depth: 41.0 cm
Mean Average Depth: 27.1 cm
Mean Average Residual Pool Depth: 18.8 cm
Percent of Total Area - Riffles: 56.0%
Number of Riffles: 104
Number of Riffles per kilometer: 43.3
Total Riffle Area: 4530.9 sq. meters + 517.6
Mean Riffle Area: 43.6 sq. meters
Correction Factor: 1.07
Mean Maximum Depth: 20.1 cm
Mean Average Depth: 11.9 cm

Number of Large Woody Debris Pieces per kilometer: 411.1
Wood < 5 m and < 55 cm: 219.2
Wood < 5 m and > 55 cm: 101.2
Wood > 5 m and < 55 cm: 73.1
Wood > 5 m and > 55 cm: 17.6
Mean Channel Width: 4.6 m
Mean Riparian Width: 23.6 m

Mean Maximum Riparian Distance (either side): 15.9 m
Mean Minimum Riparian Distance (either side): 3.1 m
Maximum Riparian Width (Total): 65.4 m
Minimum Riparian Width (Total): 8.8 m
Laurel Creek Continued.

**Percent of Pool Habitat Surveyed as Glides:** 6.1%

**Rosgen's Channel Type Frequency:**
- Channel Type A: 0.0%
- Channel Type B: 23.6%
- Channel Type C: 76.4%
- Channel Type D: 0.0%

**Percent Pools with ≥ 35% Embeddedness:** 11.9%

**Average Channel Gradient:** 6.5
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Laurel Creek

![Bar Chart]

- **Total**: 411.1
- **> 5 m > 55 cm**: 17.6
- **> 5 m < 55 cm**: 73.1
- **< 5 m > 55 cm**: 101.2
- **< 5 m < 55 cm**: 219.2

**Number of Pieces per Kilometer**
Distribution and Abundance of Large Woody Debris

Laurel Creek

Number of Pieces

Total LWD

LWD > 5 m > 55 cm

Distance (m)
Laurel Creek
Substrate Composition

Pools

Riffles

Frequency (%)

Cumulative Percent

Cumulative Percent

Frequency (%)
Riparian Width
Stream: Laurel Creek
Number of Measurements: 10
Mean Width: 23.7m  Std Dev: 17.3
Max: 65.4m      Min:  8.8m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Laurel Creek
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area
in Pool Habitat

Pool Area
44.0%

Riffle Area
56.0%

30%

70%
Laurel Creek
Rosgen's Channel Type Distribution

Channel Type

Distance (m)
Stream: Nettle Hollow
District: Blacksburg
Quadrangle: Interior
Sample Date: 06/22/1999
Downstream Starting Point: Confluence with Big Stony Creek
Total Distance Surveyed: 1.2 kilometers
Percent of Total Area - Pools: 39.6%
Number of Pools: 72
Number of Pools per kilometer: 60
Total Pool Area: 1013.0 sq. meters ± 131.0
Mean Pool Area: 14.1 sq. meters
Correction Factor: 0.94
Mean Maximum Depth: 25.6 cm
Mean Average Depth: 18.4 cm
Mean Average Residual Pool Depth: 17.3 cm
Percent of Total Area - Riffles: 60.4%
Number of Riffles: 61
Number of Riffles per kilometer: 50.8
Total Riffle Area: 1547.3 sq. meters ± 138.9
Mean Riffle Area: 25.4 sq. meters
Correction Factor: 1.05
Mean Maximum Depth: 14.3 cm
Mean Average Depth: 7.6 cm
Number of Large Woody Debris Pieces per kilometer: 278.5
Wood < 5 m and < 55 cm: 156.9
Wood < 5 m and > 55 cm: 16.8
Wood > 5 m and < 55 cm: 88.0
Wood > 5 m and > 55 cm: 16.8
Mean Channel Width: 5.4 m
Mean Riparian Width: 20.8 m
Mean Maximum Riparian Distance (either side): 11.9 m
Mean Minimum Riparian Distance (either side): 3.5 m
Maximum Riparian Width (Total): 19.3 m
Minimum Riparian Width (Total): 0.3 m
Nettle Hollow Continued.

Percent of Pool Habitat Surveyed as Glides: 59.7%

Rosgen's Channel Type Frequency:
  Channel Type A: 51.6%
  Channel Type B: 48.4%
  Channel Type C: 0.0 %
  Channel Type D: 0.0 %

Percent Pools with ≥ 35% Embeddedness: 11.1%

Average Channel Gradient: 13.8
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Nettle Hollow

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number of Pieces per Kilometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>278.5</td>
</tr>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>16.8</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>88.0</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>16.8</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>156.9</td>
</tr>
</tbody>
</table>
Distribution and Abundance of Large Woody Debris

Number of Pieces

Total LWD

LWD > 5 m > 55 cm

Distance (m)

Nettle Hollow

0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300
Riparian Width
Stream: Nettle Hollow
Number of Measurements: 8
Mean Width: 20.8m  Std Dev: 7.6
Max: 32.9m      Min: 12.3m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Nettle Hollow
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area
in Pool Habitat

Pool Area
39.6%

Riffle Area
60.4%

30%
70%
Nettle Hollow
Rosgen's Channel Type Distribution

Distance (m)

Channel Type

A
B
C
Stream: North Fork of Stony Creek
District: Blacksburg
Quadrangle: Interior
Sample Date: 06/29/99
Downstream Starting Point: Forest Service Boundary
Total Distance Surveyed: 8.4 kilometers
  Percent of Total Area - Pools: 71.5%
  Number of Pools: 478
  Number of Pools per kilometer: 56.9
  Total Pool Area: 27498.1 sq. meters ± 2836.7
  Mean Pool Area: 57.5 sq. meters
  Correction Factor: 1.01
  Mean Maximum Depth: 44.9 cm
  Mean Average Depth: 23.9 cm
  Mean Average Residual Pool Depth: 9.1 cm
  Percent of Total Area - Riffles: 28.5%
  Number of Riffles: 321
  Number of Riffles per kilometer: 38.2
  Total Riffle Area: 14221.1 sq. meters ± 2462.3
  Mean Riffle Area: 44.3 sq. meters
  Correction Factor: 1.03
  Mean Maximum Depth: 20.6 cm
  Mean Average Depth: 11.3 cm

Number of Large Woody Debris Pieces per kilometer: 104.1
  Wood < 5 m and < 55 cm: 38.3
  Wood < 5 m and > 55 cm: 16.9
  Wood > 5 m and < 55 cm: 19.0
  Wood > 5 m and > 55 cm: 29.9

Mean Channel Width: 7.3 m
Mean Riparian Width: 106.8 m
  Mean Maximum Riparian Distance (either side): 84.0 m
  Mean Minimum Riparian Distance (either side): 15.5 m
  Maximum Riparian Width (Total): 220.9 m
  Minimum Riparian Width (Total): 14.6 m
North Fork of Stony Creek Continued.

Percent of Pool Habitat Surveyed as Glides: 12.6%

Rosgen's Channel Type Frequency:
  - Channel Type A: 0.0%
  - Channel Type B: 6.5%
  - Channel Type C: 93.5%
  - Channel Type D: 0.0%

Percent Pools with ≥ 35% Embeddedness: 31.6%

Average Channel Gradient: 4.2
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
North Fork Stony Creek

Legend:
- Total
- > 5 m > 55 cm
- > 5 m < 55 cm
- < 5 m > 55 cm
- < 5 m < 55 cm

Number of Pieces per Kilometer

DFC

Total: 104.2
> 5 m > 55 cm: 30.0
> 5 m < 55 cm: 19.0
< 5 m > 55 cm: 16.9
< 5 m < 55 cm: 38.0
Distribution and Abundance of Large Woody Debris

![Graph showing distribution and abundance of large woody debris along North Fork Stony Creek. The x-axis represents distance (m) and the y-axis represents the number of pieces. The graph indicates a varying distribution of woody debris along the creek, with some peaks and troughs.](image-url)
Riparian Width
Stream: North Fork Stony Creek
Number of Measurements: 24
Mean Width: 106.8m  Std Dev: 72.4
Max: 235.7m   Min: 14.6m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
North Fork Stony Creek
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area in Pool Habitat
North Fork Stony Creek
Rosgen's Channel Type Distribution
Stream: Pine Swamp Branch
District: Blacksburg
Quadrangle: Interior
Sample Date: 06/08/1999
Downstream Starting Point: Confluence with Big Stony Creek

Total Distance Surveyed: 0.6 kilometers
Percent of Total Area - Pools: 15.9%
Number of Pools: 34
Number of Pools per kilometer: 53.1
Total Pool Area: 381.3 sq. meters ± 54.7
Mean Pool Area: 11.2 sq. meters
Correction Factor: 1.18
Mean Maximum Depth: 28.7 cm
Mean Average Depth: 14.6 cm
Mean Average Residual Pool Depth: 7.6 cm
Percent of Total Area - Riffles: 84.1%
Number of Riffles: 32
Number of Riffles per kilometer: 50
Total Riffle Area: 1266.5 sq. meters ± 345.2
Mean Riffle Area: 39.8 sq. meters
Correction Factor: 1.40
Mean Maximum Depth: 16.7 cm
Mean Average Depth: 4.3 cm

Number of Large Woody Debris Pieces per kilometer: 194.3
Wood < 5 m and < 55 cm: 129.0
Wood < 5 m and > 55 cm: 26.4
Wood > 5 m and < 55 cm: 31.1
Wood > 5 m and > 55 cm: 7.8

Mean Channel Width: 3.2 m
Mean Riparian Width: 9.0 m
Mean Maximum Riparian Distance (either side): 4.4 m
Mean Minimum Riparian Distance (either side): 1.4 m
Maximum Riparian Width (Total): 0.3 m
Minimum Riparian Width (Total): 7.3 m
Pine Swamp Branch Continued.

Percent of Pool Habitat Surveyed as Glides: 0.0%

Rosgen's Channel Type Frequency:
   Channel Type A: 0.0%
   Channel Type B: 83.3%
   Channel Type C: 16.7%
   Channel Type D: 0.0%

Percent Pools with ≥ 35% Embeddedness: 5.9%

Average Channel Gradient: 18.3
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Pine Swamp Branch

Number of Pieces per Kilometer

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<th>Large Woody Debris</th>
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<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>120</th>
<th>140</th>
<th>160</th>
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<td>&gt; 5 m &gt; 55 cm</td>
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<tr>
<td>&gt; 5 m &lt; 55 cm</td>
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<td></td>
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<td>31.1</td>
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<td></td>
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<tr>
<td>&lt; 5 m &gt; 55 cm</td>
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<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>26.4</td>
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</tbody>
</table>
Distribution and Abundance of Large Woody Debris

Pine Swamp Branch

Number of Pieces

Distance (m)

Total LWD

LWD > 5 m > 55 cm
Riparian Width
Stream: Pine Swamp Branch
Number of Measurements: 4
Mean Width: 9.0m  Std Dev: 2.8
Max: 13.0m  Min: 6.6m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Pine Swamp Branch
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area in Pool Habitat

Pool Area 23.1%

Riffle Area 76.9%
Pine Swamp Branch
Rosgen's Channel Type Distribution

Channel Type

Distance (m)
Stream: Unnamed Tributary of White Rock Branch
District: Blacksburg
Quadrangle: Interior
Sample Date: 08/06/1999
Downstream Starting Point: Confluence with White Rocks Branch

Total Distance Surveyed: 1.0 kilometers
  Percent of Total Area - Pools: 30.5%
  Number of Pools: 41
  Number of Pools per kilometer: 43.2
  Total Pool Area: 776.4 sq. meters ± 65.8
  Mean Pool Area: 18.9 sq. meters
  Correction Factor: 0.85
  Mean Maximum Depth: 32.3 cm
  Mean Average Depth: 24.1 cm
  Mean Average Residual Pool Depth: 20.7 cm
  Percent of Total Area - Riffles: 69.5%
  Number of Riffles: 35
  Number of Riffles per kilometer: 36.8
  Total Riffle Area: 1772.0 sq. meters ± 126.2
  Mean Riffle Area: 50.6 sq. meters
  Correction Factor: 1.02
  Mean Maximum Depth: 15.7 cm
  Mean Average Depth: 9.6 cm

Number of Large Woody Debris Pieces per kilometer: 304.3
  Wood < 5 m and < 55 cm: 161.6
  Wood < 5 m and > 55 cm: 9.4
  Wood > 5 m and < 55 cm: 108.1
  Wood > 5 m and > 55 cm: 25.2

Mean Channel Width: 5.3 m

Mean Riparian Width: 41.4 m
  Mean Maximum Riparian Distance (either side): 31.1 m
  Mean Minimum Riparian Distance (either side): 5.0 m
  Maximum Riparian Width (Total): 80.6 m
  Minimum Riparian Width (Total): 22.0 m
Unnamed Tributary of White Rock Branch Continued.

Percent of Pool Habitat Surveyed as Glides: 42.0%

Rosgen's Channel Type Frequency:
  Channel Type A: 0.0%
  Channel Type B: 83.9%
  Channel Type C: 14.7%
  Channel Type D: 1.5%

Percent Pools with ≥ 35% Embeddedness: 68.3%

Average Channel Gradient: 4.6
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Unnamed Tributary of White Rock Branch

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number of Pieces per Kilometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>304.4</td>
</tr>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>25.2</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>108.1</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>9.5</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>161.6</td>
</tr>
</tbody>
</table>
Distribution and Abundance of Large Woody Debris

Unnamed Tributary of White Rock Branch

Number of Pieces

Distance (m)

Total LWD

LWD > 5 m > 55 cm

0 100 200 300 400 500 600 700 800 900 1000

0 10 20
Unnamed Tributary of White Rock Branch
Substrate Composition

**Pools**

**Riffles**
Riparian Width
Stream: Unnamed Tributary of White Rock Branch
Number of Measurements: 5
Mean Width: 41.4m  Std Dev: 23.5
Max: 80.6m  Min: 22.0m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Unnamed Tributary of White Rock Branch
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area
in Pool Habitat
Unnamed Tributary of White Rock Branch
Rosgen's Channel Type Distribution

Channel Type

Distance (m)
Stream: White Rocks Branch
District: Blacksburg
Quadrangle: Interior
Sample Date: 08/29/99
Downstream Starting Point: Confluence with Big Stony Creek
Total Distance Surveyed: 4.5 kilometers
Percent of Total Area - Pools: 49.9%
Number of Pools: 175
Number of Pools per kilometer: 38.9
Total Pool Area: 12413.6 sq. meters ± 642.9
Mean Pool Area: 70.9 sq. meters
Correction Factor: 1.02
Mean Maximum Depth: 40.4 cm
Mean Average Depth: 23.3 cm
Mean Average Residual Pool Depth: 10.2 cm
Percent of Total Area - Riffles: 50.1%
Number of Riffles: 131
Number of Riffles per kilometer: 29.1
Total Riffle Area: 12461.8 sq. meters ± 2826.5
Mean Riffle Area: 95.1 sq. meters
Correction Factor: 1.08
Mean Maximum Depth: 23.0 cm
Mean Average Depth: 11.5 cm
Number of Large Woody Debris Pieces per kilometer: 254.6
Wood < 5 m and < 55 cm: 172.3
Wood < 5 m and > 55 cm: 20.1
Wood > 5 m and < 55 cm: 51.4
Wood > 5 m and > 55 cm: 10.8
Mean Channel Width: 6.3 m
Mean Riparian Width: 31.3 m
Mean Maximum Riparian Distance (either side): 21.2 m
Mean Minimum Riparian Distance (either side): 3.8 m
Maximum Riparian Width (Total): 42.6 m
Minimum Riparian Width (Total): 11.5 m
White Rocks Branch Continued.

Percent of Pool Habitat Surveyed as Glides: 0.7%

Rosgen's Channel Type Frequency:
  Channel Type A: 0.0%
  Channel Type B: 15.6%
  Channel Type C: 84.4%
  Channel Type D: 0.0%

Percent Pools with ≥ 35% Embeddedness: 48.0%

Average Channel Gradient: 4.3
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
White Rock Branch

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number of Pieces per Kilometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>254.5</td>
</tr>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>10.8</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>51.4</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>20.1</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>172.3</td>
</tr>
</tbody>
</table>
Distribution and Abundance of Large Woody Debris

Number of Pieces

Distance (m)

Total LWD

White Rock Branch

LWD > 5 m > 55 cm
Riparian Width
Stream: White Rock Branch
Number of Measurements: 9
Mean Width: 31.2m  Std Dev: 10.5
Max: 42.6m  Min: 11.5m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
White Rock Branch
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area in Pool Habitat

Pool Area 49.9%
Riffle Area 50.1%

30% 70%
White Rock Branch
Rosgen's Channel Type Distribution

Channel Type

Distance (m)
Waiteville Quadrangle
Stream: Johns Creek
District: Blacksburg
Quadrangle: Wait/Newport
Sample Date: 07/28/1999
Downstream Starting Point: Forest Service Boundary
Total Distance Surveyed: 3.1 kilometers
  Percent of Total Area - Pools: 27.3%
  Number of Pools: 81
  Number of Pools per kilometer: 26.1
  Total Pool Area: 2982.3 sq. meters ± 380.9
  Mean Pool Area: 36.8 sq. meters
  Correction Factor: 0.98
  Mean Maximum Depth: 43.2 cm
  Mean Average Depth: 31.6 cm
  Mean Average Residual Pool Depth: 21.1 cm
Percent of Total Area - Riffles: 72.7%
  Number of Riffles: 67
  Number of Riffles per kilometer: 21.6
  Total Riffle Area: 7929.4 sq. meters ± 608.8
  Mean Riffle Area: 118.3 sq. meters
  Correction Factor: 1.05
  Mean Maximum Depth: 20.6 cm
  Mean Average Depth: 11.9 cm
Number of Large Woody Debris Pieces per kilometer: 85.7
  Wood < 5 m and < 55 cm: 45.0
  Wood < 5 m and > 55 cm: 5.5
  Wood > 5 m and < 55 cm: 28.7
  Wood > 5 m and > 55 cm: 6.5
Mean Channel Width: 9.0 m
Mean Riparian Width: 53.5 m
  Mean Maximum Riparian Distance (either side): 40.6 m
  Mean Minimum Riparian Distance (either side): 3.9 m
  Maximum Riparian Width (Total): 101.8 m
  Minimum Riparian Width (Total): 0.6 m
Johns Creek Continued.

Percent of Pool Habitat Surveyed as Glides: 9.9%

Rosgen's Channel Type Frequency:
  Channel Type A: 0.0%
  Channel Type B: 0.6%
  Channel Type C: 99.4%
  Channel Type D: 0.0%

Percent Pools with > 35% Embeddedness: 7.4%

Average Channel Gradient: 8.0
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
Johns Creek

Number of Pieces per Kilometer

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>85.7</td>
</tr>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>6.5</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td></td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>28.7</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>45.0</td>
</tr>
</tbody>
</table>
Johns Creek
Substrate Composition

Pools

Riffles
Riparian Width
Stream: Johns Creek
Number of Measurements: 7
Mean Width: 53.5m  Std Dev: 51.9
Max: 166.5m  Min: 14.1m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
Johns Creek
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area
in Pool Habitat
Johns Creek
Rosgen's Channel Type Distribution
Stream: South Fork Potts Creek
District: Blacksburg
Quadrangle: Waiteville
Sample Date: 08/08/1999
Downstream Starting Point: Forest Service Boundary
Total Distance Surveyed: 2.9 kilometers

Percent of Total Area - Pools: 49.6%
Number of Pools: 164
Number of Pools per kilometer: 56.6
Total Pool Area: 3074.8 sq. meters ± 214.3
Mean Pool Area: 18.7 sq. meters
Correction Factor: 1.03
Mean Maximum Depth: 25.6 cm
Mean Average Depth: 18.9 cm
Mean Average Residual Pool Depth: 15.8 cm
Percent of Total Area - Riffles: 50.4%
Number of Riffles: 134
Number of Riffles per kilometer: 46.2
Total Riffle Area: 3127.0 sq. meters ± 324.6
Mean Riffle Area: 23.3 sq. meters
Correction Factor: 0.99
Mean Maximum Depth: 11.0 cm
Mean Average Depth: 6.5 cm

Number of Large Woody Debris Pieces per kilometer: 201.7
Wood < 5 m and < 55 cm: 147.6
Wood < 5 m and > 55 cm: 5.8
Wood > 5 m and < 55 cm: 42.2
Wood > 5 m and > 55 cm: 6.1

Mean Channel Width: 4.5 m
Mean Riparian Width: 23.3 m
Mean Maximum Riparian Distance (either side): 15.6 m
Mean Minimum Riparian Distance (either side): 3.5 m
Maximum Riparian Width (Total): 0.2 m
Minimum Riparian Width (Total): 21.4 m
South Fork Potts Creek Continued.

Percent of Pool Habitat Surveyed as Glides: 53.6%

Rosgen's Channel Type Frequency:
   Channel Type A: 0.0%
   Channel Type B: 97.7%
   Channel Type C: 2.3%
   Channel Type D: 0.0%

Percent Pools with ≥ 35% Embeddedness: 12.2%

Average Channel Gradient: 5.7
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
South Fork Potts Creek

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number of Pieces per Kilometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>201.7</td>
</tr>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>6.1</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>42.2</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>5.8</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>147.7</td>
</tr>
</tbody>
</table>
Distribution and Abundance of Large Woody Debris

South Fork Potts Creek

Number of Pieces

Distance (m)

Total LWD

LWD > 5 m > 55 cm
South Fork Potts Creek
Substrate Composition

**Pools**

- **Frequency (%)**
- **Cumulative Percent**
- **Organic**
- **Clay**
- **Silt**
- **Sand**
- **Sm. Gravel**
- **Lg. Gravel**
- **Cobble**
- **Boulder**
- **Bedrock**

**Riffles**

- **Frequency (%)**
- **Cumulative Percent**
- **Organic**
- **Clay**
- **Silt**
- **Sand**
- **Sm. Gravel**
- **Lg. Gravel**
- **Cobble**
- **Boulder**
- **Bedrock**
Riparian Width
Stream: South Fork Potts Creek
Number of Measurements: 13
Mean Width: 23.3m  Std Dev: 8.1
Max: 33.7m       Min: 9.4m

South Fork Potts Creek

Total Riparian Width (m)

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
South Fork Potts Creek
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area
in Pool Habitat
South Fork Potts Creek
Rosgen's Channel Type Distribution
Stream: War Spur Branch
District: Blacksburg
Quadrangle: Waitsville
Sample Date: 06/01/99
Downstream Starting Point: Forest Service Boundary
Total Distance Surveyed: 3.5 kilometers
  Percent of Total Area - Pools: 27.0%
  Number of Pools: 238
  Number of Pools per kilometer: 68.0
  Total Pool Area: 2106.4 sq. meters ± 113.6
  Mean Pool Area: 8.85 sq. meters
  Correction Factor: 1.10
  Mean Maximum Depth: 36.5 cm
  Mean Average Depth: 19.7 cm
  Mean Average Residual Pool Depth: 13.2 cm
Percent of Total Area - Riffles: 73.0%
  Number of Riffles: 214
  Number of Riffles per kilometer: 61.1
  Total Riffle Area: 5708.9 sq. meters ± 202.8
  Mean Riffle Area: 26.7 sq. meters
  Correction Factor: 1.10
  Mean Maximum Depth: 18.3 cm
  Mean Average Depth: 7.7 cm
Number of Large Woody Debris Pieces per kilometer: 200.8
  Wood < 5 m and < 55 cm: 122.6
  Wood < 5 m and > 55 cm: 5.8
  Wood > 5 m and < 55 cm: 55.1
  Wood > 5 m and > 55 cm: 17.3
Mean Channel Width: 4.5 m
Mean Riparian Width: 39.2 m
  Mean Maximum Riparian Distance (either side): 31.3 m
  Mean Minimum Riparian Distance (either side): 3.4 m
  Maximum Riparian Width (Total): 213.9 m
  Minimum Riparian Width (Total): 10.4 m
War Spur Branch Continued.

Percent of Pool Habitat Surveyed as Glides: 0%

Rosgen's Channel Type Frequency:

- Channel Type A: 60.2%
- Channel Type B: 34.0%
- Channel Type C: 5.8%
- Channel Type D: 0.0%

Percent Pools with ≥35% Embeddedness: 0.8%

Average Channel Gradient: 16.1
Box plots representing maximum and average depths for pools and riffles, and average residual pool depths for this stream. The boxes enclose the middle 50% of the observations, the bar in the center of the boxes represent the median, and the capped lines extending above and below the boxes represent the 90% and 10% quantiles.
War Spur Branch

<table>
<thead>
<tr>
<th>Large Woody Debris</th>
<th>Number of Pieces per Kilometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>200.8</td>
</tr>
<tr>
<td>&gt; 5 m &gt; 55 cm</td>
<td>17.3</td>
</tr>
<tr>
<td>&gt; 5 m &lt; 55 cm</td>
<td>55.1</td>
</tr>
<tr>
<td>&lt; 5 m &gt; 55 cm</td>
<td>5.8</td>
</tr>
<tr>
<td>&lt; 5 m &lt; 55 cm</td>
<td>122.6</td>
</tr>
</tbody>
</table>
Riparian Width
Stream: War Spur Branch
Number of Measurements: 12
Mean Width: 39.2m  Std Dev: 57.0
Max: 213.9m  Min: 10.4m

Box plot of total riparian width. The box encloses the middle 50% of the observations, the bar in the center of the box represents the median, and the capped lines extending above and below the box represent the 90% and 10% quantiles.
War Spur Branch
Pool:Riffle Ratio
DFC: 30 - 70% of the Stream Area in Pool Habitat
War Spur Branch
Rosgen's Channel Type Distribution
Appendix 1a. Substrate classification criteria.

SUBSTRATE CLASSES
1. organic debris
2. clay
3. silt
4. silt - 2mm sand
5. 2-10mm small gravel
6. 1-10cm large gravel
7. 11-30cm cobble
8. 30cm boulder
9. bedrock

Appendix 1b. Large woody debris (LWD) classification criteria.

LWD SIZE CLASSES
1. < 5 m (length) and < 55 cm (diameter)
2. < 5 m (length) and > 55 cm (diameter)
3. > 5 m (length) and < 55 cm (diameter)
4. > 5 m (length) and > 55 cm (diameter)

Appendix 1c. Rosgen's channel type criteria, table from Rosgen 1996.