STREAM BANK EROSION OF TRIBUTARIES IN THE SOUTHERN BLUE RIDGE MOUNTAINS

by

JAMES COLIN ROGERS

(Under the Direction of David S. Leigh)

ABSTRACT

Deforestation followed by soil erosion and subsequent deposition of alluvium in valleys played a critical role in the formation of an historical terrace (Leigh 2010). This terrace adds significant amount of sediment to the tributaries of the Southern Blue Ridge as streams laterally erode the terrace banks. This study examines the contribution of total sediment yield derived solely from eroded historical terrace banks in small watersheds (<20 km^2) by using floodplain widths as proxies for long-term lateral erosion rates. The bank-derived sediment yield estimates are modeled from the predicted floodplain widths and erodible terrace bank heights with linear regression. Total stream length is a good predictor of both lateral erosion rates and erodible bank heights. Lateral migration and sediment yield results compare favorably to independent yield measurements from five independent watersheds in the region. Modeled estimates fall within 50 percent or better of the observed values at 17.25 to 26.42 tonnes/km^2/yr.

INDEX WORDS: Stream lateral migration, Stream bank erosion, Stream bank sediment yield, Watershed sediment yield, Watershed morphometry, Watershed characteristics, Blue Ridge, Mountain streams, Modeling, Stream morphology

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JAMES COLIN ROGERS

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JAMES COLIN ROGERS

Major Professor: David S. Leigh

Committee: C. Rhett Jackson
Marguerite Madden

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
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DEDICATION

I complete this work is in honor of my grandparents GC Clark, Francis Clark, Gayle Rogers, and James Rogers. Without their support and encouragement my education would have surly lacked. This work also honors my wife, friend, and coach Karin Rogers.

Oh, oh deep water, black and cold like the night
I stand with arms wide open,
I've run a twisted mile
I'm a stranger in the eyes of the Maker

I could not see for the fog in my eyes
I could not feel for the fear in my life
And from across the great divide, In the distance I saw a light
Jean Baptiste walking to me with the Maker

My body is bent and broken by long and dangerous sleep
I can't work the fields of Abraham and turn my head away
I'm not a stranger in the hands of the Maker

Brother John, have you seen the homeless daughters
Standing there with broken wings
I have seen the flaming swords
there over east of Eden

Burning in the eyes of the Maker
Oh, river rise from your sleep...

-Daniel Lanois

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CHAPTER ONE

INTRODUCTION

Stream banks potentially add a significant percentage of sediment to the overall sediment yield in forested drainage basins (Nanson & Hickin, 1986; Meade et al., 1990; Reid, 1993; Reid & Dunne, 1996; Knighton, 1998; Walling & Fang, 2003). It is well understood that excess sedimentation in rivers and streams negatively influence aquatic communities. In more extreme situations, excess sediment can alter the channel hydraulics and geomorphology. These extreme impacts have a profound effect on the native ecology and socioeconomics of a location (Reid, 1993, Walters et al., 2003). The historical land use has had, and continues to have, a considerable effect on the rivers and streams of the Southern Blue Ridge region (Swank et al., 2001, Price and Leigh, 2006a; Price and Leigh 2006b, Leigh, 2010; Harden, 2004, Whol, 2006). In the southern Appalachians sediment is stored on historical terraces in the smaller tributaries (basin areas of <20 km) and acts as an important sediment source for locations downstream (Harden, 2004; Leigh, 2010). As these tributaries reach their erosional equilibrium with stream power, lateral migration becomes an important factor in sediment movement and storage through the local system (Harden et al., 2009). Understanding sediment movement is a critical component in stream management, reconstruction and restoration (Harden et al., 2009). It is well known that large sediment inputs from discrete events (such as timber harvests) that move through watersheds have lag and residence times that are critical to fluvial processes and form (Swank et al., 2001; Montgomery, 1999; Madej and Ozaki, 1996; Kelsey 1982). Yet, studies that examine watershed-wide disturbances and how these associated sediment pulses affect and attenuate downstream sections are few. Further understanding of these local processes also gives great insight to watershed process, watershed management, stream restoration, and sediment budgeting.

This study examines the importance of erosional stream banks of tributaries to the Little Tennessee River. Specifically, estimates of total sediment yield from stream banks is made at a drainage basin scale using the geomorphic floodplain width as an indicator of past long-term lateral migration rates. The result of stream lateral migration is bank erosion. This research statistically relates stream bank erosion and lateral migration to watershed morphology. From this relationship, a basin wide sediment yield model is developed that estimates stream bank sediment inputs from tributaries.

The primary objective of this study is to develop and test a regional field-based model for estimating sediment sourcing from stream banks over decadal to centennial timescales. The basic research questions are:

- Can the pace of lateral migration be accurately estimated using floodplain width as a proxy for long-term lateral migration rates?
- Can these scale-dependent observations be applied over an entire watershed?
- Are there measurable watershed characteristics that statistically correlate to variable rates of lateral stream migration?

- Can a model be constructed to verifiably predict drainage basin sediment yield based on measurements of floodplain widths predicted from scalars such as basin size, land cover characteristics, and morphometric characteristics of the watershed?

Background & Literature Review

Lateral migration erodes into stream banks on the outside bends of meanders and strongly relates to sediment transport and depositional processes as a point bar is deposited on the inside of the meander bend (Hooke, 1979). Langbein and Leopold (1966) found that these processes, though continuously shifting, result in a dynamic equilibrium of slope, discharge, and sediment inputs. Deforestation, agriculture, urbanization, and reforestation (Murgatroyd & Ternan, 1983) disrupt the stability of these meandering systems. This disruption can take place by bank destabilization, flow variation, channel straightening (Dunne & Leopold, 1978), and sediment loading (Shumm, 1977). Thus, lateral migration is dependent on forces of resistance and forces of encouragement (Simon & Castro, 2003).

Lateral migration is the consequence of erosional and depositional processes attempting equilibrium (Langbein & Leopold, 1966). These factors are driven by stream power, slope, and discharge (Knighton, 1998). Migration rates are at their highest along the apices of meander bends (Knighton, 1998) where cut banks are erosional features that are correlated to the direction and rate of lateral stream movement. Rates of stream bank erosion tend to increase downstream (Knighton 1998; Reid & Dunne, 1996; Hooke, 1980) as channels get progressively larger. Bank erosion primarily is brought about by two geomorphic mechanisms, including hydraulic force (of the stream) and mass wasting (gravitational forces acting on banks) (Knighton, 1998). Other influences on bank erosion rates include frost action, bank moisture, and corrasion (Knighton, 1998). Elements of lateral movement in large rivers have been extensively studied (Wolman, 1959; Hooke, 1979; Hooke, 1980; Thorne, 1982; Murgatroyd and Ternan, 1983; Lawler, 1993; Lawler, 1999; Simon et al., 2000; Harden, 2009). However, the lateral migration of small streams is not as well understood, especially in relation to modeling bank erosion processes and past and current land use (Harden et al., 2009). Pizzuto and O'Neal (2009) recorded increased rates of lateral migration following mill dam removal using comparative aerial photography. These findings uphold Walter and Merits (2008) similar findings of increased migration rates after dam removal. However, Pizzuto and O'Neal found that increased rates of bank erosion were not explained wholly by dam removal. Harden (2009) also found that stream bank erosion could act independently to the hydraulic force of flowing water. Her 2009 study indicates that bank undercutting can be active even when flows are low as a result of drought.

As streams migrate laterally, their banks experience erosion of sediment. The amount of erosion is dependent on stream geometry and the structure and material properties of the banks (Knighton, 1998). Nanson and Hickin (1986) recognized that the amount of erosion is a function of stream size and sediment size of the eroding bank. These authors further noted that total stream power correlates better with bank erosion than does discharge. Hooke (1980) noted that approximate square-root relationship exists between bank erosion rates and stream basin area. Inner portions of the meander bend (point bars) are constructed laterally in the direction of stream movement. As this migration occurs, the distance between the point bar bank and the cut bank (channel width) is static as long as the channel is in equilibrium (Dunne & Leopold, 1978).

Streams adjust sinuosity, and/or gradient, as a response to sediment inputs, tectonic change, and climatic fluctuations. Banks tend to be less susceptible to failure on low order streams than on banks of higher order streams (Reid & Dunne, 1996; Hooke, 1980). This is due to a typical fining of bank material and increasing bank height in the downstream direction (Knighton, 1998). Complex response also plays a role in adding bank failure due to tractive and gravitational forces acting on banks.

Lateral stream movement is maximized in the apices meander bends and minimized in the straight portions of the stream (Knighton 1998; Dunne & Leopold, 1978). Dunne and Leopold (1978) further recognized that bankfull flows are most effective in forming and changing meander bends and result in the average shape of channels. However, recent research in the same region as this study has shown that the highest median erosions rates are at and below the water line (Harden et al., 2009). By and large, lateral movement is an integrated response to variations in discharge, sediment loadings, bank material, and stream slope.

Vegetation type and density affect stream migration rates. At the stream bank scale, the roots of live vegetation can lessen migration rates (Knighton, 1998; Leopold & Wolman, 1960; Leopold et al., 1960). At the basin scale, vegetation affects the hydrology and sedimentation (Dunne & Leopold, 1978; Reid, 1993), which in turn influences bank erosion rates.

Bank soil characteristics also affect erosion. Bank erosion generally is controlled by the particle size and the moisture content of the soil. Generally, moist banks erode more readily as well as banks that experience the effects of frost action of ice needle formation and from the effect of freeze and thaw (Wolman, 1959; Knighton, 1998). Banks consisting of finer soil particles (clays) that experience repeated wetting and drying can expand and contract causing bank failure along fissures and cracks (Thorne, 1982). Dry cohesive banks (such as silty and clayey banks) tend to resist erosion. In addition, banks consisting of larger gravels and cobbles can resist specific flow dynamics. Humans and/or hillslope processes occasionally add larger riprap particles to the stream banks. Riprap resists hydraulic tractive forces by shielding the banks from further erosion. Massive (unconsolidated) coarse (gravely and sandy) banks erode more readily than massive, fine (silty and clayey) banks (Knighton, 1998). In consolidated banks, the erodibility of the bank is dependent on the weakest constituent of the matrix (Thorne & Tovey, 1981). Similarly, stratified banks are as stable as the weakest component of the strata. For example, sand horizons are less resistant to hydraulic force, thereby leading to mass failure of horizons above. Reductions in sedimentation can cause stream incision, and thus raise sediment inputs due to the increase in bank area. However, this can subsequently lead to higher sediment transport and higher sediment yields from the enlarged banks, which is essentially a complex response mechanism (Shumm, 1977). In the process of meandering, streams may cut into terraces, which would also increase bank area and sediment inputs. This too may change sediment yield characteristics and change the morphology of stream meanders over the drainage network.

Anthropogenic effects on bank erosion typically center on land use and water use practices. These independent variables affect streams at both the watershed scale and the stream scale. At the watershed scale, land use change affects runoff and discharge characteristics. Forested catchments tend to have lower flood discharges and flood frequencies (Knighton, 1998; Slaymaker, 2000). Catchments that undergo widespread deforestation experience increases in flood discharges and flood frequencies (Swank et al., 2001). Deforested basins also experience increases in sediment transport and deposition and will usually result in channel instability (Dunne & Leopold, 1978; Knighton, 1998). Furthermore, watersheds that are rapidly urbanizing initially undergo increases in sediment movement during the construction phase, and as construction wanes, urbanized watersheds experience reductions in available ground water and increases in flood frequency and magnitude (Wolman, 1967). These effects are proportional to the amount of impervious area. Deforestation can also lead to mass wasting in higher gradient landscapes (Dunne & Leopold, 1978). Human induced changes adjacent to streams also affect streams at larger scales. Tree removal from the riparian zone destabilizes cut banks and removes sources of large woody debris. This potentially can result in a reduction in the geomorphic complexity of streams by reducing the pool areas and increasing the riffle area along the length of the stream (Slaymaker, 2000). This typically results in a reduction of aquatic habitat (Slaymaker, 2000). Damming impacts sediment inputs to streams by disrupting the flow regime and channel morphology (Knighton, 1998). Pastoral activities in proximity to streams also lead to significant changes in channel morphology. Sediment inputs from destabilized banks may also increase due to trampling of livestock (Trimble & Mendel, 1995).

Other independent variables that affect channel form are climate and geology. Streams adjust to variations through time as sediment loads and discharges change from climatic forcing mechanisms. Geology affects stream slope via tectonic uplift or subsidence, while regional geologic variation and slope can affect sediment characteristics.

Study Area Location and History

The study sites all fall within the southern portion of the Blue Ridge physiographic province. These sites are all within the watersheds of Skeenah and Coweeta Creeks, which lie within Macon County, North Carolina (See: Figure 1.1: Map of study area). These tributary watersheds drain into the Upper Little Tennessee River, which drains portions of northeast Georgia and portions of western North Carolina. The Upper Little Tennessee Rivers flows north to Lake Fontana where it becomes the Little Tennessee River until its confluence with the Tennessee River near Knoxville. These waters ultimately drain into the Gulf of Mexico via the Ohio and Mississippi Rivers. The Universal Transverse Mercator (UTM) Zone 17 coordinates of the Upper Little Tennessee River confluence of Skeenah Creek is Easting 283046, Northing 3887929; and the confluence with Coweeta Creek is Easting 282790, Northing 3884779.

Before the extensive harvesting of old growth forests, the Southern Appalachian region had been somewhat altered by human influences from the Late Archaic until the present time (Delcourt et al.,1986), but Native American impacts would have been primarily limited to bottomlands following the advent of agriculture. During the turn of the twentieth century, extensive harvesting of old growth forests for timber peaked in the

Southern Appalachian Mountains of the United States (Ayers & Ashe, 1904; Glenn, 1911; Eller, 1982; Yarnell, 1998). The forests of the entire region were completely harvested by the 1940's (Yarnell, 1998). Change in land use disrupted many natural systems, some of which are still in the process of recovery (Leigh; 2010). People were also affected by these disruptions in the form of increases in the size, duration, and frequency of flooding. The historic floodplain received much sedimentation from timber harvesting due to the erosive nature of timber harvesting on mountain slopes (Glenn, 1911; See Figures 1.2 – 1.5). Today, evidence of this disruption is apparent in the hydrologic system, the sedimentological structure, and the geomorphologic characteristics of floodplains and terraces in the Southern Blue Ridge (Leigh and Rogers, 2007; Leigh, 2010).

The areas of the Blue Ridge Mountains of north Georgia and western North Carolina would be almost completely forested if it were not for human impacts on land cover (Yarnell, 1998). Although much of the area has reforested since the timber boom era, human impacts are still viewed as increasing in this area in recent times. Active agriculture, occasional forest clearance, and intensifying urban development disrupt the continuity of the forested sections.

The Skeenah and Coweeta watersheds were selected for this study and are located in the Blue Ridge Province of the Southern Appalachians of western North Carolina (See Figure 1.1: Study area map). While both the Skeenah and Coweeta watersheds were extensively logged in the late 19^{th} and early 20^{th} centuries, land containing the Coweeta watershed was purchased in 1918 by the U.S. Forest Service for the purposes of conservation and forest management (See: Figures 1.2 and 1.3).

Today the Coweeta Creek basin represents a mostly forested (97%) basin while Skeenah represents an urbanizing basin (73% forested; NLCD 2001; See Figures: 1.6-1.11) largely via vacation-home development. The forested sections generally are limited to the upland periphery in the Skeenah Creek basin, in which the USDA Forest Service prohibits development. The Coweeta Creek basin, like the Skeenah Creek basin, underwent vast forest clearance in the late 1800s and early 1900s; however, large portions of the basin are now forested and used for scientific research. The close proximity of these basins is ideal for a comparison study of ongoing landscape disturbance since the time of timber harvest (Price and Leigh, 2006).

Physically these watersheds are dominated by typical characteristics of the Southern Appalachian Mountains. In the modern climatic regime, deciduous hardwood forests represent the dominant land cover both currently and prehistorically (Roosevelt, 1902; Yarnell 1998). The geology of the bedrock in the study area is comprised of biotite gneiss and quartz dioritic gneiss (Robinson et al., 1993). The 30-year (1971-2000) average precipitation at the Coweeta Experiment Station's low elevation station (at 685.5 m above sea level) is 175.23 cm per year, with a monthly high of 17.04 cm during the month of February, and the average 30-year annual temperature is 13º Celsius. Average 30-year monthly temperatures for January and July are 2.5º Celsius and 22.5º Celsius respectively (NCDC, 2011).

CHAPTER TWO

RESEARCH METHODS

Data were collected in the Skeenah and Coweeta Creek drainage basins in Macon County, North Carolina (Figure 1.1: Map of study area; Table 2.1: Coweeta and Skeenah drainage basin characteristics) from August 2005 to May 2007. All channel data were collected during stream discharges representative of local baseflow conditions as indicated by USGS online stream hydrograph data from the Prentiss gage on the Little Tennessee River (2005-2007).

Site Selection and Pilot Sampling

Data were collected in the Skeenah and Coweeta Creek drainage basins in Macon County, North Carolina (Figure 1.1: Map of study area; Table 2.1: Coweeta and Skeenah drainage basin characteristics) from August 2005 to May 2007. All channel data were collected during stream discharges representative of local baseflow conditions as indicated by USGS online stream hydrograph data from the Prentiss gage on the Little Tennessee River (2005-2007). Sampled reaches were initially selected in a pilot study using Jenks Natural Breaks Classification Method as a stratified method based on Shreve stream ordering system within each basin (Shreve, 1967). If *in situ* flow conditions indicated rapid increases or decreases in discharge, then data collection was postponed. A weighted stratified method was used as a sampling strategy to ensure adequate representation of the first order streams. These streams represent greater than 50 percent of the total stream length within the drainage networks that typify the Blue Ridge Mountain province. The stream network was delineated by using a United States Geological Survey 10 meter horizontal resolution Digital Elevation Model (DEM) stream-initiation threshold watershed area of 400 pixels (4 ha) in the ArcView 3.3 (2003) extension "Basin 1" (Petras, 2003), which objectively delineates stream networks. To ensure discharge and morphological consistency, reaches were selected at least five meters downstream and five meters upstream from manmade structures and did not intersect any other stream, pipe, or culvert along the surveyed length. Spatial auto correlation is avoided by only sampling reaches separated by stream confluences or nodes. Sites were further selected for sampling based on encouraging diversity among the reach data but not over-sampling any one dominant characteristic. For example, it is typical for landowners to encourage livestock stream accessibility while other streams are characteristically or intentionally inaccessible to livestock. In addition, the relative relief of the study area dictates that some streams are higher in elevation than others are. This may correlate with a climatic variation in temperature and precipitation within some of the smaller basins.

Field Sampling and Data Collection

A total of 41 reaches were selected and sampled between June 2005 and June 2007. Three additional reach datasets were used from 2003 from an independent and compatible study (Price and Leigh, 2006). Specific site location, identification, and basic description are available in Table 2.2 Basic Basin Characteristics. More detailed basin characteristics are located in Appendix C: Site Data. In order to adequately characterize the geomorphic form of an individual stream channel, the surveyed reach length was determined by multiplying the average wetted width by 30 (Kondolf et al., 2003). This length was measured through the length of the stream's thalweg. Data were collected at intervals of two times wetted width along 16 transects perpendicular to the direction of flow. Beginning at the furthest downstream transect (0x) of the study reach channel, bank, and floodplain characteristics were collected (See: Appendix B Variable Descriptions) at each transect compiling 16 sets of cross-sectional data to the upstream end of the reach (30x). The primary channel characteristics collected were geomorphic floodplain width (if present, measured horizontally from top of bank to the break in slope; Fitzpatrick et al., 1998) and bank height (measured vertically from water surface to top of bank; Fitzpatrick et al., 1998). For the sake of completeness, other channel, bank, and floodplain characteristics were also collected to provide a complete cross-sectional survey at each of the 16 transects. A full description of these and other characteristics is available in Appendix B, (See: Variable Descriptions). All data were collected using a combination of referenced methodology from United States federal agencies, including but not limited to the US Geological Survey (Fitzpatrick et al., 1998), the US Department of Agriculture (Harrelson et al., 1994), and the Environmental Protection Agency (Kaufmann et al., 1999).

A variety of equipment was used for channel data collection. A surveyor's measuring tape was used to measure distance along the study reach. Cross-sectional and floodplain width were measured using a rigid surveyor's stadia rod held perpendicular to the primary direction of flow. Bank height data also were measured using a surveyor's stadia rod with a conventional carpenter's bubble level to find the right-angle equal to the height of the top of the measured bank. Bank slope was measured perpendicular to the primary direction of stream flow. This conventional angle finder was also used to find the slope of the stream bank. In the cases where stream bank angles were compound, a weighted average of the angles was calculated based on proportional length of each angle. Bank vegetation was assessed by estimating the leaf area coverage as a percent of the length of bank equal to the study reach's wetted width. Erosional averages were collected per reach by visually estimating the percent of erosional surfaces present at the particular cross section. Bank soil texture was collected and numerical values of sand, silt, and clay were assigned based on the center of mass of the textural classes in the USDA soil texture triangle (Soil Survey Division Staff, 1993). Thalweg depths also were collected from the water surface to the deepest point in the stream along the cross section.

GIS and Drainage Basin Sampling

In an attempt to show relationships between stream bank erosion rates and basin-wide characteristics, spatial data were sampled for the respective drainage basins. These datasets were subdivided into groups consisting of morphometric, stream network, or land use variables. The geographic information system (GIS) ESRI's ArcView 3.3® (2002) was used to generate, collect and study these drainage basin characteristics upstream from each study reach at 0x, which is the basin outlet point. The respective basin's area, perimeter, drainage network, and outlet elevation were collected using ArcView® in conjunction with Basin1 (Petras, 2003). From this dataset, 19 drainage basin morphometric and 13 stream network variables were calculated (See: Appendix B Variable Descriptions) and tabulated using Excel® 2003 and 2007. Basin1 (Petras, 2003) was also used to generate the drainage network for each basin along with stream segment designations according to the Shreve stream order (Shreve, 1967). Utilizing a digital elevation model (DEM) with a grid cell size (resolution) of 10 meters, a stream drainage threshold for initiation of 400 pixels (4 ha) was used (USGS, 2000; Bolstad, 2006). A 10 meter resolution DEM is satisfactory in the generation of stream networks, watershed boundaries and hillslopes (Zhang et al, 2007). This combination of DEM resolution and drainage threshold has been verified by field reconnaissance during the data collection phase of research. A varying set of 16 land use characteristics were also collected (See: Appendix B Variable Descriptions) for each basin (NLCD, 2001). These characteristics are represented as a percentage of total land use of each study basin.

Statistics

Rates of lateral migration derived from floodplain width were correlated to basin characteristics as previously described. These widths are the observed lateral distance the stream has traveled since floodplain initiation (See Equation 2.1). Bank heights were also modeled for the purpose of estimating the erosional bank height above the floodplain elevation. The erodible bank height is defined as the total observed height of the terrace stream bank minus the observed height of the floodplain above the channel bed (See Equation 2.2).

$$Rate\ of\ Lateral\ Migration\ = \\ Floodplain\ Width\ \div Years\ Since\ Floodplain\ Initiation$$

Equation 2.1

$$\textit{Erodible Terrace Bank Height} = \textit{Terrace Stream Bank} - \textit{Floodplain Bank Height}$$

Equation 2.2

Multiplying this segment-specific height by the length of the GIS-derived segment provides an estimate of the area of the eroded bank within an individual stream segment. Descriptive statistics were calculated using Excel® (2003) for each of the reach and basin variables per site, as well as between sites. Inferential statistics and normality testing were calculated using SigmaStat® (1997). Proportional (percent) data were transformed using the arcsine-square-root function. A value of one was added to all of the observations that contain zero values for the sake of sufficiently testing the normality of the dataset.

The Spearman Rank-Order correlation coefficient was used to initiate a process of eliminating non-correlated variables to both of the dependent variables (floodplain width and erodible terrace bank height). A confidence interval of less than 0.05 was used as a threshold of determining whether the variable would be eliminated. In some cases, an independent variable would correlate with only one of the dependent variables (See: Appendix D Spearman Rank-Order Correlation Test). Of the remaining variables, transforms were applied in an attempt to normalize the datasets. Transforms used were log base 10, log base 2, natural log (base 2.718281828), square, square root, and reciprocal.

All transformed and non-transformed variables were checked for normality (See: Appendix E Kolmogorov-Smirnov Goodness-of-Fit Normality Test). The Kolmogorov-

Smirnov Goodness-of-Fit test for a single sample was used to determine if a dataset was drawn from a population with a normal distribution. Variables that demonstrated normal distributions indicated by a confidence interval of greater than 0.05 were used for correlation analysis. The transformed variable within the same independent variable with the highest confidence interval was selected in cases where multiple transforms exhibited normal distribution. These highest scoring variables demonstrate the most normality in the independent variable set. A hierarchy of transforms is preferred in the case that a multiple transformed variable would tie for the most normal distribution. The hierarchy from most preferred transform to least is: no transform, log base 10, natural log, log base 2, square root, square, and reciprocal (See: Appendix E Kolmogorov-Smirnov Goodness-of-Fit Normality Test). In this case, the transformed variable with the most normal distribution would be chosen for testing for correlation.

Of the remaining normal variables, the Pearson Product-Moment Correlation Coefficient was then calculated. For results of these correlations see Pearson table (Appendix F: Pearson Product Moment Test). Variables with a confidence interval of less than 0.05 and correlation coefficients of greater than 0.80 for erodible terrace bank heights and 0.60 for floodplain widths were determined as adequate for predicting each respective dependent variable.

Modeling

A watershed-wide model was created by statistically correlating observed stream reach variables (obtained from empirical field data) with associated basin characteristics. The average value of the measured floodplain widths represents the minimum distance the stream migrated laterally over time since the modern floodplain surface was established circa A.D. 1915 (±21 years) (Price & Leigh, 2006; Leigh & Webb 2006) (See Equation 2.1). Floodplain initiation began between 112 and 70 years before 2006 as determined by Leigh (2010), which was the second year of the field data collection of these widths. Thus, the floodplain width is a proxy for lateral migration rates, such that a 5-meter wide floodplain represents a minimal lateral migration rate of about 5 meters per 100 years, or roughly equivalent to 5 cm/yr. It is important to note that the estimate of lateral migration distance provides a minimum rate, because it assumes unidirectional migration, which under a more natural geomorphic regime is not always the case. With regards to this project, floodplain width is the dependent variable (y) predicted for each stream segment. These floodplain widths are predicted using linear regression techniques (see Equation 2.3).

$$y = a + bx$$

Equation 2.3

The dependent variable is based on independent variables (x) of the particular stream segment's drainage basin characteristics (e.g. total stream length, basin area, and forested land use percent).

The action of stream meandering is indicative of both lateral and vertical floodplain accretion. As stated earlier, this indicates that sediment sourced from erosional banks is being deposited further downstream on the floodplains. The heights of these floodplains represent a re-deposition from the upstream erosional bank, at least in part. Because a portion of the bank height is re-deposited on the floodplain, the net loss of sediment (or sediment yield) is represented by the bank heights ***above*** the level of the prevailing floodplain. Thus, this erodible terrace bank height above the floodplain's top of bank represents the erodible bank scarps (See: Figure 2.1 Schematic of erodible bank height). Just as floodplain widths are predicted, erodible terrace bank heights are also predicted (as dependent variables y) using linear regression techniques (see Equation 2.3. These bank heights (y) are based on independent variables (x) of the particular stream segment's drainage basin characteristics (e.g. total stream length, basin area, forested land use percent) as indicated by Equation 2.3 where (a) and (b) are constants.

Using a GIS, these modeled lateral migration rates and modeled erodible terrace bank height values were used with the particular segment length to compute a volumetric yield of bank sediment from the respective stream segment (see Equation 2.4).

$$\begin{aligned}&Volumemtric\ yield\ for\ each\ segment\\&= Segment\ length\\&\times (Floodplain\ width\ \div\ Median\ Age\ of\ Floodplain\ Initiaion)\\&\times Erodible\ Terrace\ Bank\ Height\ Above\ Floodplain\end{aligned}$$

Equation 2.4

Where *segment length* is the individual stream segment out of the entire stream network and is defined using a GIS. The dependent variable *floodplain width* is modeled using an independent variable. This width is then divided by the *median age of floodplain initiation or 91 years* (± 21 years). Erodible terrace bank height above floodplain is the average terrace height minus the floodplain height within a reach (See: Figure 2.1 Schematic of Erodible Bank Height).

The individual stream segment yields were then accumulated downstream for the entire tributary basin. These volumetric amounts were then converted to a mass based on an average soil density of 1.3 grams per cubic centimeter for the respective tributary's basin (Price et al., 2010). To verify the sediment yield model, comparable sediment yield observations were sought from published sources of independent studies from the region. In order to isolate sediment inputs from banks and minimize other sediment inputs from more human activities (such as agriculture, construction, urbanizing influences), the drainage basins should be nearly, if not completely, forested. Although banks contribute the majority of sediment yield values, other natural sources would also include tree throws, mass wasting processes, freeze thaw processes, and animal burrowing. Observed results of the chosen comparative watershed sediment yield studies were published by Clyde Simmons (1993) and Dan Royall (2000 & 2003). In all, five drainage basins were selected from these studies as potentially suitable for validating the efficacy of the estimated basin sediment yields. This process was completed by applying the modeling methods to the respective study basins and, thusly, generated the estimated basin sediment. These estimated yields were then compared to observed yield results.

In order to possibly improve models with additional variables multiple linear regression techniques also were used to predict erodible terrace bank heights and floodplain widths (See Equation 2.5).

$$y = a + b_1 * x_1 + b_2 * x_2 \ldots + b_p * x_p$$

Equation 2.5

Both forward and backward stepwise multiple regression were used to assess the viability of including multiple independent variables to predict floodplain widths and erodible terrace bank heights. The multiple regression models use only the remaining independent variables after the process of elimination mentioned previously. The independent variables, which have the best r-squared values, were chosen for the model. In order to exclude multicollinearity within the regression model variables that were evaluated as too similar (with regard to changing with basin scale, basin land use, basin relief or any similar statistically significant collinear component) were left out of the multiple regression model when covariance of variables exceed an r-value of 0.80.

CHAPTER THREE

RESULTS

The dependent variables used in the models were the erodible terrace bank height (bank height above the geomorphic floodplain) and the geomorphic floodplain width. A total of 75 independent variables were collected in the field or generated using a GIS to test for significant predictors of those dependent variables. The independent variables represent four general categories including basin morphometry, basin stream network, basin land use, and stream reach. A process of elimination was used to pare down the independent variables to a variable or a set of variables that best predict the dependent variables, erodible terrace bank height, and floodplain width.

Statistical Selection of Predictors

A first round of variable elimination uses the Spearman Rank Order correlation. A confidence interval (p- value) of less than 0.05 is used as the threshold for accepting the independent variable. Of the 75 independent variables, 39 either increased or decreased significantly with the dependent variable floodplain width and 51 changed with the dependent variable erodible terrace bank height (See: Appendix D Spearman Rank-Order Correlation Test).

In the paring process the Kolmogorov-Smirnov test was used next and a confidence interval threshold of greater than 0.05 (p-value) indicated that the variable was drawn from a normally distributed population in conjunction with the associated transformation. As they pertain to the dependent variable erodible terrace bank height, out of the 51 independent variables that passed the Spearman Rank-Order Test, 20 have normal distributions. Regarding floodplain width, of the 39 independent variables that passed the Spearman Rank-Order Test, 19 have normal distributions. It is important to note that the independent variable floodplain width itself is most normal using a log base 2 transformation (See Appendix E Kolmogorov-Smirnov Goodness-of-Fit Normality Test).

Of the remaining independent variables that were shown to have the most normal distribution with the most preferred transform, the Pearson Product Moment test was used to find the best correlation for both of the dependent variables floodplain width and erodible terrace bank height. For the dependent variable erodible terrace bank height, 19 of the remaining 20 variables passed the Pearson Product Moment test with a confidence interval of <0.05. Correlation coefficients (r-value) of greater than 0.80 arbitrarily were taken to indicate that the independent variable sufficiently correlates with erodible terrace bank height. For this set, eight of the remaining 19 independent variables correlated with erodible terrace bank height (See: Appendix F Pearson Product Moment Test). The stream network variables of the log base 10 of total stream segment lengths and the non-transformed maximum stream segment length showed the strongest correlations with a r-values of 0.84. The watershed morphometric variables of the natural log of drainage basin perimeter and the log base 10 of (drainage) basin length correlated with the dependent variable erodible terrace bank height with an r-value of 0.84 and 0.83 respectively (See: Table 3.1 Table of correlates). It is important to note that the land use variables failed to correlate with either floodplain width or erodible terrace bank height.

For the dependent variable, log base 2 of the dependent variable floodplain width, 11 of the 19 independent variables passed with a confidence interval of less than 0.05. Of these 11 remaining variables, all of the correlation coefficients (r-value) fell below 0.63. Therefore, correlates with r-values between 0.60 and 0.63 arbitrarily were selected as potential predictors of floodplain width. These values represent the best attained r-values for the dependent variable log base 2 of floodplain width. For this set, 8 of these remaining 11 independent variables correlated with the log base 2 of floodplain width (See: Table 3.1 Table of correlates). The stream network variable of the non-transformed maximum stream segment length showed the strongest correlation with an r-value of 0.63. The watershed morphometric variables including the log base 10 of the basin relief ratio and the log base 10 of the relative relief both showed the next strongest correlation with an r-value of 0.62. The morphometric variables, the log base 10 of drainage (basin) area and the log base 10 of basin length, passed with an r-value of 0.61. The stream network variables, natural log of the stream length longest path of segments and the log base 10 of total stream segment lengths, also passed with an r-value of 0.61. The morphometric variable the log base 10 of the basin perimeter had an r-value of 0.60 (See table: 3.1 Table of correlates).

Modeled Results

A bi-variate regression model was created using different independent variables that were normally distributed and shows good correlation with the two dependent variables floodplain width and erodible terrace bank height. Of the independent variables, the log base 10 of total stream length was used to predict both erodible terrace bank height and floodplain width. This variable was chosen because of the relative ease of replication using a GIS. In addition, total stream length represents a linear scalar function that is most compatible with the prediction of stream bank erosion, which fundamentally is a linear process occurring along a length of stream. Although the maximum stream segment length was slightly superior to total stream length as a predictor of floodplain width (r-value of 0.63 vs. 0.61), total stream length was preferred as a more functionally correlated variable having greater likelihood of reproducibility outside of the study area. Furthermore, total stream length was more normally distributed that the maximum stream segment length. The log base 10 of total stream length predicts terrace banks heights using the following equation:

$$y = -0.4462 + (0.4203 * x)$$

Equation 3.3

Here, y, is the modeled erodible terrace bank height and x is the log base 10 of total stream length upstream measured using a GIS from the midpoint of the particular modeled segment. The r-squared value of this regression model is 0.68 and the F-statistic is 88.63. The P-value is less than 0.0001 (See Figure: 3.1 Total stream length erodible terrace bank height regression scatter plots and residuals). Maximum modeled erodible terrace bank heights from all five validation watersheds ranged from 1.2 to 1.9 meters. Mean erodible bank terrace heights were modeled from 0.57 to 0.71 meters

(See: Table 3.2 Total stream length modeled floodplain widths & erodible terrace bank heights).

The log base ten of total stream lengths also was used to model floodplain widths. The log base 10 of the total stream length predicted the log base 2 of floodplain widths using the following equation:

$$y = -3.9568 + (0.9720 * \mathrm{x})$$

Equation 3.4

Here, y, is the log base 2 of floodplain width and x is the log base 10 of total stream length upstream measured using a GIS from the midpoint of the modeled segment. The r-squared value of this regression model is 0.37 and the F-statistic is 24.27. The P-value is also less than 0.0001 (See Figure: 3.2 Total stream length floodplain width regression scatter plots and residuals). The model log base 2 of floodplain (y) width was reversed log base 2 by using the equation:

$$floodplain\ width = 2^{y}$$

Equation 3.5

Where, y, equals the modeled log base 2 of floodplain width, derived above in Equation 3.5. Total stream length predicted maximum lateral migration rates were 3.2 cm/yr for both of the two largest of the three validation drainage basins (See: Table 3.3 Total stream length modeled lateral migration rates). The modeled maximum lateral migration rate of the smallest of the five validation drainage basins is 1.1 cm/yr and the mean migration rates of the five basins range from 0.5 to 0.6 cm/yr. Note that all of these rates represent the median rates between the two floodplain initiation dates and include plus or minus errors presented in Table 3.3 (Total stream length modeled lateral migration rates).

Sediment yield rates also were modeled for these five validation drainage basins by simply multiplying the modeled lateral migration rate times the modeled erodible terrace bank height times the length of each segment, these volumetric amounts are produced for each of the stream segments within each validation drainage basins. These volumes are then multiplied by the average soil density of the area and these volumes are accumulated downstream to the basin outlet. These products are available in Table 3.4, Total stream length modeled sediment yields. For the smallest Deer Lake drainage basin, modeled sediment yield amounts were 17.9 tonnes/km^2/yr. . These amounts represent the median erodible terrace bank sediment yields between the two potential floodplain initiation dates. The plus or minus error in Table 3.4 is calculated by adding half of the difference between the modeled high and low rates (associated with either the floodplain initiation date of minus 112 or 70 years before the study year 2006) of the respective drainage basin. The same is true for the two larger validation drainage basins Cataloochee and Nantahala Drainage basins.(see: Table 3.4 Total stream length modeled sediment yields). The same is true for the larger validation drainage basins Cataloochee and Nantahala Drainage basins. Modeled yields for Cataloochee and Nantahala are 25.9 tonnes/km^2/yr and 26.4 tonnes/km^2/yr, respectively.

A multivariate approach using forward stepwise regression produced a better model for the dependent variable, log base 2 of floodplain width. However, for the dependent variable erodible terrace bank height none of the other normally distributed independent variables would improve upon the bi-variate model presented above. Once again, total stream lengths (stream segment lengths total) was forced onto the model because of the relative ease of collection and replicability of acquiring these data. The multivariate equation for the log base 2 of floodplain widths is:

$$y = -4.0823 + (0.5165 * x_1) - (2.3085 * x_2)$$

Equation 3.6

where y is the log base 2 of floodplain width, x_1 is the forced independent variable of total stream length from the midpoint of the modeled segment, and x_2 is the modeled segment's basin relief ratio. The basin relief ratio is the ratio of the drainage basin's total relief to the drainage basin's basin length of the associated stream segment (See: Appendix B Variable Descriptions). The r-squared value for the multivariate regression model is 0.43. The basin relief ratio improves the r-squared by 0.06 (6 percent) relative to the bi-variate model using only total stream length. The F-statistic of the multivariate model is not as strong as the total stream length bi-variate model at 15.23 and the P-value is less than 0.0001. Once again, the model log base 2 of floodplain (y) width was reversed log base 2 by using the equation 3.5 above.

CHAPTER FOUR

DISCUSSION

Overview of Results

This study indicates that sediment yield from stream banks can be modeled at the watershed scale. It is understood that the model is limited to smaller stream tributaries (< 20 km^2) of the Southern Blue Ridge. The areal extent of this watershed model is inherently limited to the approximate area of the study watersheds where the empirical data of the models are derived.

The bi-variate linear regression model with a normally distributed predictor, total stream length, showed promising results. First, the independent as well as the dependent variables all have normal distributions so that the data are properly suited for parametric regression analysis. Scatter plots of the regression model for erodible terrace bank height show a moderate to strong positive correlation with the independent variable total stream length (r-squared value of 0.68). The shape of the scatter suggests a much tighter positive linear relationship between the dependent and independent variables (See: Figure 3.1, Erodible terrace bank height regression scatter plots, and residuals). From the total stream length model, the maximum modeled erodible bank heights for all five of the validation drainage basins ranged from approximately 120 to 190 cm (from the smallest to the largest basin). Mean erodible terrace bank heights values range from 57 to 71 cm.

In terms of modeling floodplain width, the bi-variate model was less successful than the terrace bank model (r-squared value of 0.37). The residual plots also indicate a random distribution around zero. Maximum modeled floodplain widths range from 91 to 277 cm across all five basin from smallest to largest. The mean modeled floodplain widths were from 39 to 55 cm for the validation watersheds.

The lateral migration rates predicted from total stream length indicated that this model was producing realistic results (See Total Stream Length Table 3.3 Modeled lateral migration rates), based on comparisons to direct observations of bank erosion rates in the region (Harden 2009, Rhoads et al., 2009). For the smallest validation watershed (Deer Lake at an area of 2.38 km^2) the maximum rates of lateral migration range from 0.81 to 1.3 centimeters per year. The mean modeled rate (based on floodplain initiation in the year of 1915) was 0.52 cm/yr (or approximately 0.08 $cm/km^2/yr$) for the three smaller watersheds and 0.56 cm/yr (or approximately 0.004 $cm/km^2/yr$) for the two larger watersheds. Considering all five watersheds, these mean modeled rates were 0.54 cm/yr, which compares very favorably with Harden's (2009) observed rates from 0.5 to 1 cm/yr using bank pins. The average of the maximum modeled rates of all five watersheds (depending on a date of floodplain initiation of 122 or 70 years before 2006) ranged from 1.58 to 2.52 cm/yr. This amount ranges from 0.99 to 1.58 cm/yr for the smallest three watersheds and 2.46 to 3.93 cm/yr for the largest two watersheds. Harden's maximum observed rates averaged at 9.2 cm/yr and the mean rates were 2.0 cm/yr. Based on comparing channel migration based on successional aerial imagery, Rhoads et al (2009) found somewhat higher rates of 1 to 36 cm/yr with an average of 4 cm/yr.

Modeled sediment yields from the also showed promising results (See Table 4.1 Comparative sediment yields and maps Figures 4.1 – 4.5). With regards to the smallest of the validation watersheds, Deer Lake watershed (2.38 km^2; See: Figure 4.1, Map of Deer Lake bank sediment yields), modeled total sediment yields from stream banks were 17.85 tonnes/km^2/yr while the observed suspended sediment was 29.7 tonnes/km^2/yr. Though these amounts are somewhat similar, Royall (2003) indicates that his observed amounts are higher than expected based on what is typically observed from this region. Royall explains that evidence of mass wasting events along with the gradual destruction of sediment trapping debris dams (relics from the time of forest harvest), may have increased sediment yields through time for this Deer Lake basin. Considerably lower sediment yields were recorded for the remaining smaller watersheds. Thompson Lake (3.83 km^2; See: Figure 4.2, Map of Lake Thompson bank sediment yields) and Beetree (14.14 km^2; See: Figure 4.3, Map of Beetree Creek bank sediment yields) watersheds had observed sediment yields (note: Beetree is suspended sediment yield only) of 8.3 and 10.9 tonnes/km^2/yr respectively. The modeled sediment yields for these respective watersheds are higher at 17.25 and 19.23 tonnes/km^2/yr. Again, It is important to note that the Beetree watershed observations are of suspended sediment and do not include bedload yield from either bank or colluvial sources. For the next largest drainage basin of the Cataloochee River (127.43 km^2; See: Figure 4.4, Map of Cataloochee River bank sediment yields), modeled yield results were 25.88 tonnes/km^2/yr and the observed suspended sediment yield values were 20.25 tonnes/km^2/yr. For the largest drainage basin of the five validation basins, Nantahala River (134.24 km^2; See: Figure 4.5, Map of Nantahala River bank sediment yields) modeled yield results were 26.42 tonnes/km²/yr and the observed suspended sediment yield values were 14.95 tonnes/km²/yr. It is important to note that the largest three watersheds (Beetree, Cataloochee and, Nantahala) observed yields are of only suspended sediment load. In contrast, the modeled estimates include bank material that inherently becomes bed material once eroded. As expected, these modeled amounts are somewhat higher than that of the suspended sediment observations.

The Coweeta/Skeenah results are restricted to the tributary basins within the study region. This scalar restriction is critical to understanding the morphological process of sediment sourcing from stream banks. The model presented is inadequate for measuring lateral migration of larger streams and rivers draining basin approximately greater than 20 km² because of the absence of historic terraces in these associated larger river valleys (Leigh, 2010). However, the cumulative nature of these tributary sediment yields adds enough sediment to encourage sedimentation and vertical accretion on top of the historic floodplains during overbank flooding events of the downstream Mainstem river valley of the Upper Little Tennessee River. Subsequently, this sedimentation regime's net effect prevents the formation of widespread historic terraces.

Also of interest is the fact that all of the 18 land use variables failed to make it into the model. All but one of these variable either failed the Spearman Rank-Order test (See: Appendix D, Spearman Rank-Order Correlation Test) or was drawn from a population with a normal distribution (See: Appendix E, Kolmogorov-Smirnov Goodness-of-Fit Normality Test). Percent of deciduous forest was drawn from a population with a normal distribution but failed the Pearson Correlation Test (See:

Appendix F, Pearson Product Moment Test). Surprisingly, bank and near stream elements failed incorporation into the models as well. These variables are dominant riparian land use, bank slope, bank soil texture, bank vegetation cover, and banks that show active erosion. Also surprising, is that variables that encapsulate size and slope at the basin scale such as ruggedness number, drainage density, as well as many slope and gradient metrics did not predict these dependent variables a well.

Interestingly, one variable that correlates well with both erodible terrace bank heights and floodplain widths is the longest segment within the basin (0.84 r-value for erodible terrace bank height and 0.63 for floodplain width). This probably is another proxy for size, like total stream length (r-value of 0.84 for erodible terrace bank height and 0.61 for floodplain width corvarying with total stream length), but it was not chosen as a predictor because it may not be regionally as robust as total stream length (due to enigmas in structural control on stream segment lengths). In addition, the longest segment in a basin is not as intuitively obvious as a size metric for stream networks as total stream length. This longest segment metric probably performed well in the correlations because it did a good job of characterizing the total length of first order streams that constitute so much of the drainage network.

Sediment is frequently being captured in the smallest streams and stored by natural dams of small woody debris and leaves (Meyer et al., 2003). These small scale dams trap sediment as well as organic material (Webster et al., 1988). Not only do these dams fail and mobilize sediment, but also these small streams migrate and cut into terrace banks as well as into dam remnants. This further complicates the nature of the how the smallest headwater streams contribute to the sediment budgets of downstream basins.

As Walter and Merits (2008) and Pizzuto and O'Neal (2009) found, there is no doubt that the breaching of mill dams have had a critical role in channel form in the eastern United States. Pizzuto and O'Neal also found that increased rates of bank erosion were not completely explained by mill dam removal. Pizzuto and O'Neal go on to say that, these changes in rates may be related to local geomorphic processes, stochastic variations in bank erosion rates, mill dam effects not assessed by simple backwater computations, and/or changes in land use. This research finds that rates of sediment yield are roughly predicted by morphometric characteristics with in the basin. Certainly, the stochastic nature of both natural and human made processes within the basin make predicting bank erosion rates difficult. For instance, land use change through the period that this study uses as the divisor in calculating migration rates has been dynamic in the study area (Kirk, 2009). In a mountainous area such as the study area, complex response also surely plays a role in sediment yields as well as rates of lateral migration and sediment yield, as is demonstrated by Royall (2003). That is, the Wolf Creek basin experienced several mass wasting events potentially leading to the failure of the impoundment in 1977. This would surely partly explain the measured high sediment yields.

Potential errors not captured by the modeled floodplain widths and erodible terrace bank heights presented here are associated with channel form, stream process, and errors associated with the verification studies. With regards to the sediment yield model, a complete inventory of sediment yield sources and proportional contribution to total basin yield is not known. It is beyond the scope of this study to do the accounting of all the possible sources. However, this study does begin to address these yield amounts from stream banks.

Channel form errors source from generalized channel characteristics captured (or not) by the model. Errors include channel widening or narrowing thereby skewing lateral migration rates. Leigh (2010) found a statistically significant relationship between wider cannels and forested reaches, as well as narrower channel and pastured reaches. Other channel characteristics not captured by the model are human influences such as bank riprapping, channelization and dam building (as well as destruction). Dam building and destruction would affect sediment yield by significantly exceeding the modeled bank heights. This process would involve the breaching of the dam and the stream subsequently downcutting and meandering through the thick deposits of sediment behind the dam. In steeper locations within these basins, this type of meandering can also lead to the mobilization of sediment from colluvial landforms such as colluvial/alluvial fans and remnant debris flows.

Stream process errors not captured by the model are associated with floodplain accretion and unidirectional versus bidirectioinal stream migration. Vertical floodplain accretion would affect sediment yields from watersheds by trapping sediment on the surfaces of floodplains. However, it is expected that this effect would attenuate due to the approximately one hundred year time scale since floodplain initiation and the relatively short and infrequent flood durations and associated rates of floodplain vertical accretion. With regards to the directionality of stream migration these vectors are difficult, if not impossible, to determine. In addition, bidirectional lateral migration probably is attenuated but the long durational average of migration rates since the approximate floodplain initiation of one hundred years and because of the fact that bidirectional floodplain migration would not involve eroded terrace banks. Furthermore, other effects on watershed hydrology, such as periods of heavy rain or drought and vegetation dynamics, tend to be muted over the centennial time since floodplain initiation. However, it is suggested that as impacted areas recover from deforestation by through successional reforestation sediment discharges decrease as vegetation stabilize soil surfaces and trap portions of mobilized sediment (Royall, 2000).

Royall and Simmons address some of these error sources in their studies. However, measured error in the observations of Royall (2003 & 2000) and Simmons (1993) are not reported, but the authors do mention concerns of error. Simmons mentions the primary limitation with regards to the time scale of the study. He indicates that stream discharges were higher during the 1970-1979 study than the 30-year average (years 1950 to 1979). This would indicate that observed sediment yield values would be higher than that of the modeled yield presented here. In Royall (2000), the author indicates that the primary factor controlling sediment yield fluctuations is related to long-term hydrologic discharge from variation in precipitation. However, during the 29 years (1965-1995) of lake sediment accumulation, these discharges were broadly fluctuating, but mean discharges were more moderate for the period. In Royall (2003), the author addresses another potential source of error in assessing 50 years of lake sediment accumulation. At the end of the life of the dam, Royall points to evidence of dam failure resulting from a mass wasting event. He further states that this event lead to the unusually high sediment yields observed in his study.

Conclusion

Excess sediment is one of the primary stream pollutants in the world today. Understanding sources and dynamics of sediment is critical to minimizing its negative impacts. This study has isolated a relatively small geographic region to attempt to answer in part a critical question. That is, how much sediment do stream banks add to sediment yields? This study addresses that question by using a scalar basin-wide model that predicts sediment yields from terraced banks within tributaries of the Southern Blue Ridge.

This study exhibits moderate success in estimating stream bank-derived sediment yield, based on comparisons with known sediment yields in 100 percent forested basins where the stream channel is the primary source of sediment. First, this study has shown reasonable success with regards to sampling floodplain width, which serves as a proxy for long-term bank erosion rates. Modeled rates roughly fall within the ranges of the observed rates in the region. Second, these scale-dependent observations can be applied over an entire watershed with practical results. However, there is a limit to the size of drainage basins in which the modeled results are reliable. The model only applies to watersheds limited to less than 20 km^2. Third, total stream length generated using GIS techniques statistically correlate to variable rates of stream migration. Drainage basin relief ratio adds to the correlative power by using multiple regression techniques. Finally, this study has shown that a model can be constructed that verifiably predicts drainage basin sediment yield from erodible terrace banks based on field measurements of floodplain width. However, the design of this model is not only limited to watershed size but also is also limited to the Southern Blue Ridge physiographic province. Another limitation is that this model cannot model stochastic events through time including smaller scale change associated with changes in basin land use and larger scale change related to channel hydraulics and discharge.

This study supports the idea that sediment from the historic deforestation is still working its way through the entire drainage network in the region. Sediment yield sourced from tributaries is being actively deposited along the main stem river floodplains during overbank flood events. Hopefully variations of these techniques can be used in other regions as well as within larger watersheds and further expand the knowledge of how stream banks contribute to watershed sediment yields and overall sediment budgets. To fully explain watershed process, we as scientists must understand its scalar nature and limitations.

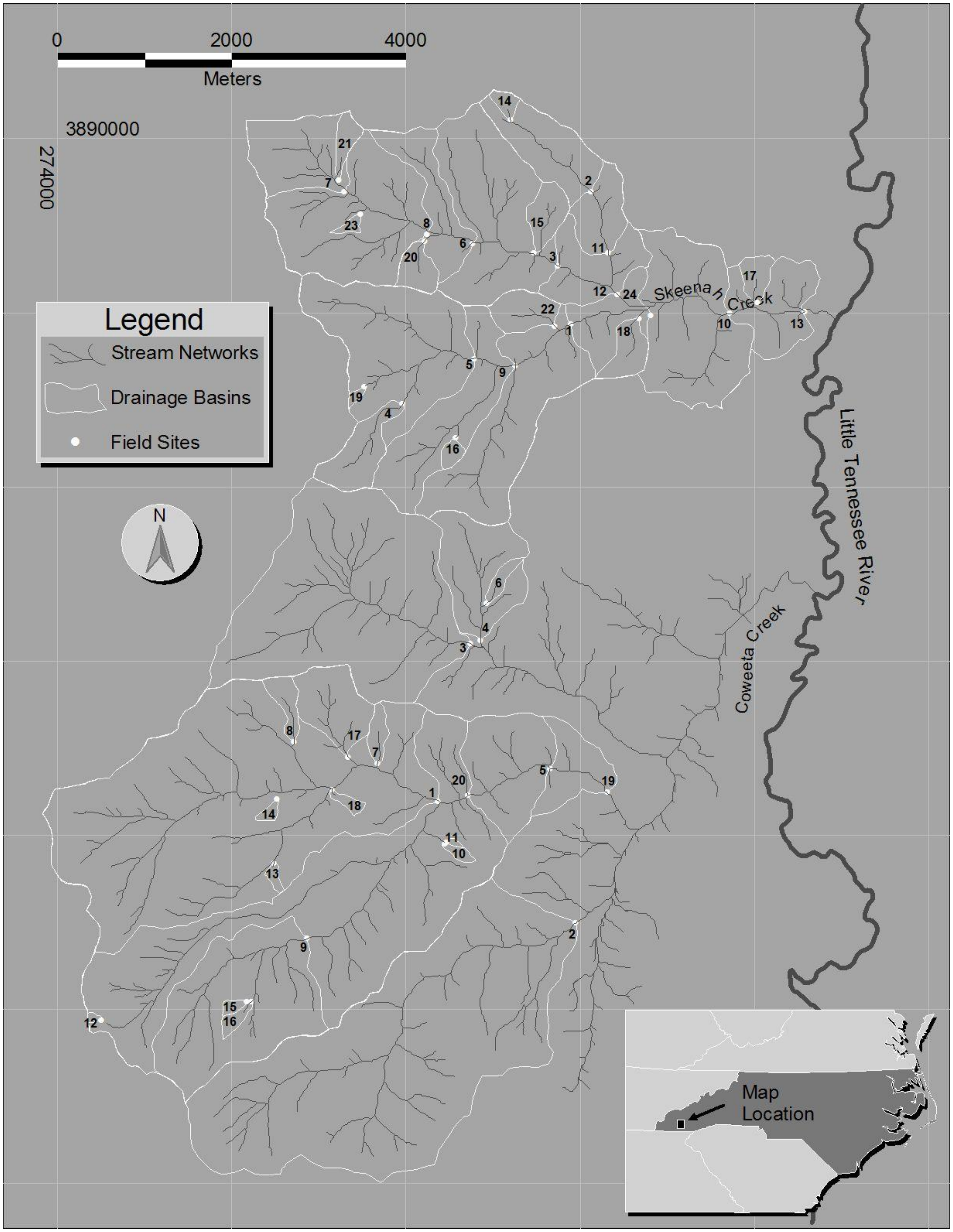


Figure 1.1: Map of study area. Includes sampled stream reach locations and the associated reach's drainage basin.

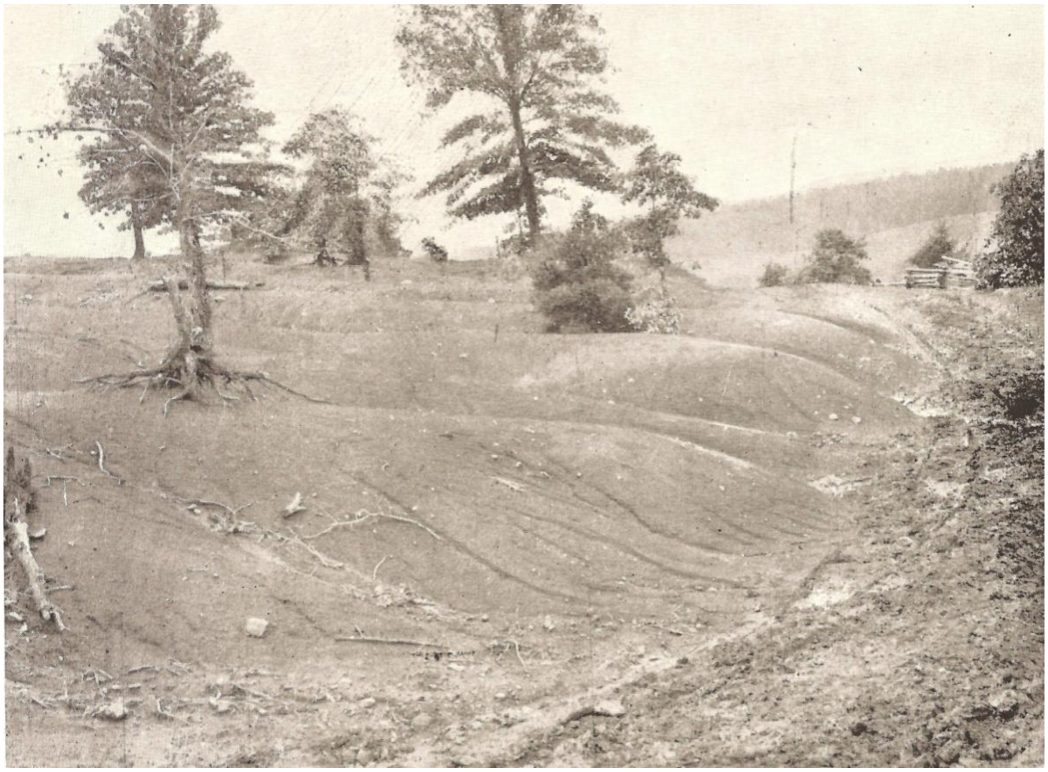


Figure 1.2, Photograph. Severely eroded slope following timber harvest in the Southern Appalachians. Notice exposed tree roots (Roosevelt, 1902)

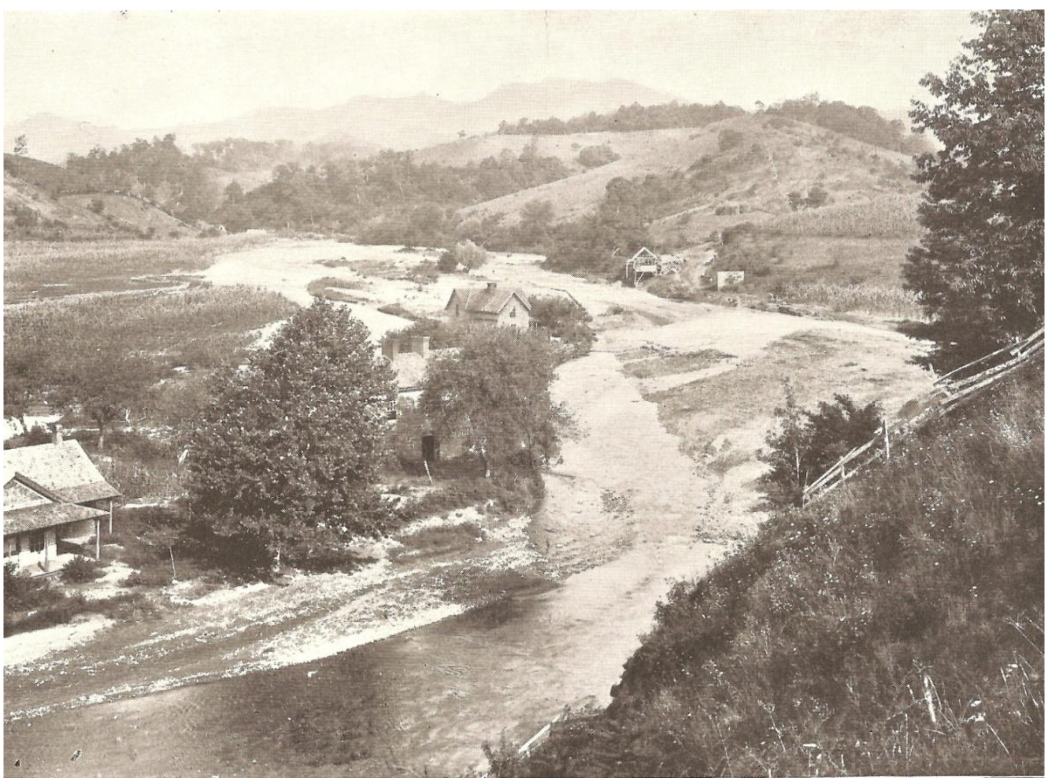


Figure 1.3, Mostly cleared slopes in this valley increased flooding circa 1900, Bakersville, NC (Roosevelt, 1902). Notice active sedimentation on floodplain and multi-thread flows indicative of flow/sediment disequilibrium.

Figure 1.4, Sedimentation across the Catawba River Lowlands (Roosevelt, 1902)

Figure 1.5, Sedimentation across the Catawba River Lowlands caused by floods in May 1901. Notice buried soil (Roosevelt, 1902)

Figure 1.6 SK20 Widow's Reach. 1st Shreve order with a higher gradient and managed lawn.

Figure 1.7 CW15 Talking Reach. 1st Shreve order in higher gradient forested area.

Figure 1.8 SK3 Crazy Horse Reach. 38th Shreve order with rip rapped banks and open access to livestock.

Figure 1.9 SK13 Barking Dog Reach. 105th Shreve order with historic terrace and active geomorphic floodplain

Figure 1.10 SK5 Hungry Dog Reach. 18th Shreve order with actively eroding bank.

Figure 1.11 CW17 Rodo Reach. Sixth Shreve order lower gradient in a forested basin

Table 2.1: Coweeta and Skeenah Drainage basin characteristics

Basin Characteristics	Coweeta	Skeenah
Drainage Area (km²)	40	18
Perimeter (km)	29	22
Maximum Elevation (masl)	1591	1085
Minimum Elevation (masl)	640	622
Total Relief (m)	951	463
Average Slope (%)	47	26
Forested Land Use (%)	95	73
Impervious Surfaces (%)	0.21	0.55

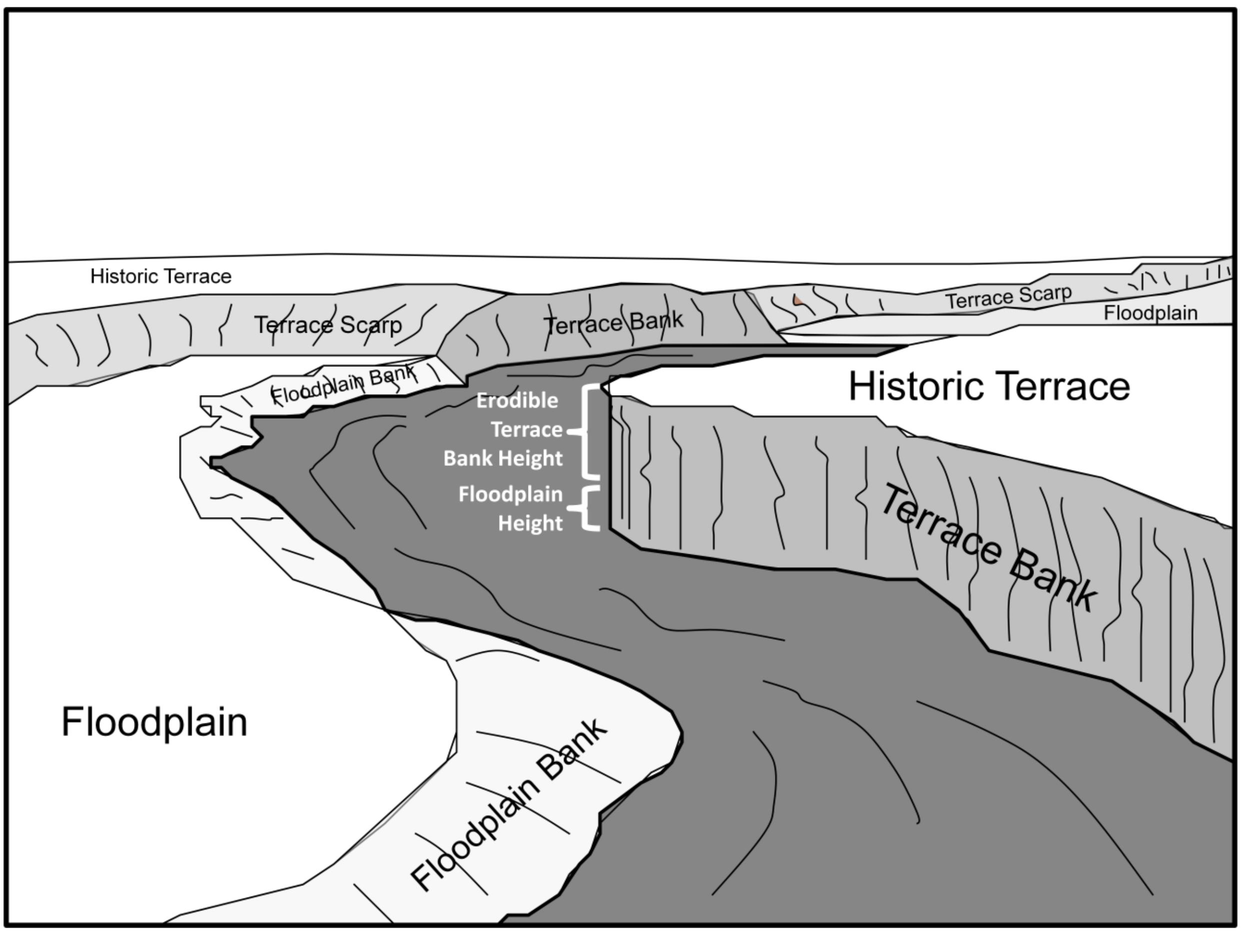


Figure 2.1 Schematic of erodible bank height

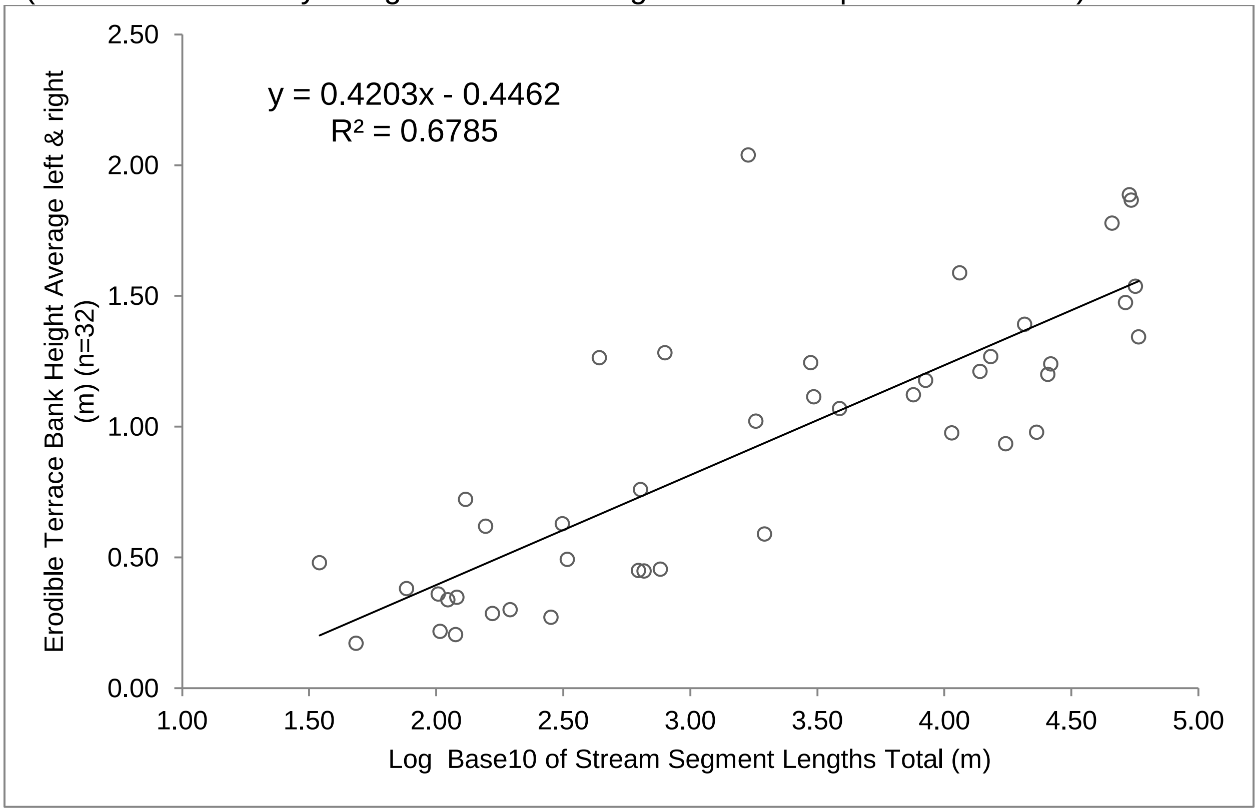
Table 2.2: Basic basin characteristics

Site ID	Site Name	UTM Coordinates at 0x Easting, Northing		Shreve Order	Drainage Area (km^2)	Basin Perimeter (km)	Basin Relief (m)	Average Basin Slope (%)	Percent Forest (%)
CW01	Training	278472	3882394	44	8.58	13.49	913.0	49.59	97.4
CW02	Lawnmower Man	280059	3880994	37	7.74	13.33	839.0	46.86	95.7
CW03	Trampy	278846	3884201	26	4.80	9.77	438.0	36.36	98.2
CW04	Eye Poke	278964	3884242	7	1.10	4.49	372.0	33.77	98.8
CW05	Astroman	279767	3882763	95	17.81	18.29	934.0	48.16	96.2
CW06	Longtime	279034	3884661	1	0.08	1.48	254.3	40.39	100.0
CW07	Punji	277784	3882827	1	0.11	2.02	293.3	41.51	100.0
CW08	Yellowjacket	276823	3883073	1	0.16	2.01	248.6	38.45	100.0
CW09	Split Stream	276978	3880814	13	2.46	6.78	655.2	51.29	96.3
CW10	Crooked Tree	278558	3881905	1	0.04	0.94	156.2	50.58	100.0
CW11	Mudbug	278576	3881921	1	0.01	0.44	88.1	43.62	100.0
CW12	Appalachian Trail	274611	3879880	1	0.01	0.47	136.9	36.00	100.0
CW13	Kitchens	276592	3881681	1	0.04	0.88	77.4	26.16	100.0
CW14	Fork	276628	3882421	1	0.04	0.86	175.5	51.78	99.8
CW15	talking	276277	3880088	1	0.03	0.77	186.9	63.63	74.9
CW16	Basket	276338	3880095	1	0.06	1.23	258.1	55.62	94.0
CW17	Rodo	277443	3882900	6	0.71	3.48	353.0	46.90	100.0
CW18	Last	277263	3882527	1	0.05	1.08	128.1	42.97	100.0
CW19KT	Coweeta Church Rd	280423	3882501	98	18.35	19.65	945.7	47.21	95.4
CW20HZ	Coweeta at FS	278825	3882463	90	16.69	17.36	920.9	49.12	97.3
SK01	Johnny's	280001	3887871	38	6.19	11.80	476.0	32.23	87.9
SK02	Dearl's	280230	3889387	3	0.82	4.15	240.0	28.08	72.0
SK03	Crazy Horse	279848	3888542	38	6.12	10.76	445.0	28.82	80.3
SK04	Haunted	278069	3886960	2	0.46	3.39	364.0	33.26	100.0
SK05	Hungry Dog	278897	3887472	18	2.71	8.32	443.0	32.93	88.5
SK06	Cowie	278876	3888798	25	3.90	8.33	435.0	32.76	84.1
SK07	Swiss Lady	277404	3889393	7	0.96	4.20	380.0	36.57	95.8
SK08	Pear	278353	3888904	21	3.01	7.07	426.0	34.31	86.3
SK09	Broke Dog	279360	3887389	26	4.03	9.64	459.0	32.06	89.8
SK10	Beaver Stick	281823	3887998	99	16.99	20.42	492.0	26.90	74.5
SK11	Sticker	280433	3888685	5	1.27	5.63	254.0	24.14	62.4
SK12	Handshake	280541	3888211	47	8.09	12.76	451.0	26.87	74.5
SK13	Barking Dog	282682	3888011	105	17.90	22.31	495.0	26.35	72.8
SK14	Wasp Nest	279308	3890219	1	0.07	1.08	148.0	39.27	100.0
SK15	Screamin' Meemie	279581	3888692	2	0.25	2.07	93.3	23.51	70.3
SK16	Deer Snort	278681	3886567	1	0.07	0.99	144.0	39.36	100.0
SK17	Bullfrog	278681	3886567	1	0.15	1.57	50.5	12.97	40.1
SK18	Trailer Park	280784	3887935	1	0.24	2.19	160.3	22.68	66.4
SK19	Bearshit	277633	3887149	1	0.02	0.72	130.2	29.99	100.0
SK20	Widow	278323	3888822	1	0.20	1.86	159.4	35.21	95.5
SK21	Growling	277336	3889524	1	0.12	1.81	244.1	34.31	100.0
SK22	Friendly Dog	279814	3887850	2	0.29	2.23	104.1	22.49	79.5
SK23	Udo's	277591	3889131	1	0.04	1.01	100.6	27.37	69.4
SK24KT	Skeenah	280916	3887972	89	15.05	17.73	482.4	28.43	78.8

Table 3.1: Table of correlates

Basin Characteristic Variable	Transform Used		Erodible terrace bank height (m)	Log base 2 of Floodplain Width (m)
Drainage Area (m^2)	Log base 10	Correlation Coefficient	0.83	0.61
		P-value	0.000	0.000
Basin Perimeter (m)	Natural log	Correlation Coefficient	0.84	0.60
		P-value	0.000	0.000
Stream Length Longest Path of Segments (m)	Natural log	Correlation Coefficient	0.83	0.61
		P-value	0.000	0.000
Total stream length(m)	Log base 10	Correlation Coefficient	0.84	0.61
		P-value	0.000	0.000
Stream Segment Length Maximum (m)	None	Correlation Coefficient	0.84	0.63
		P-value	0.000	0.000
Basin Relief Ratio	Log base 10	Correlation Coefficient	na	-0.62
		P-value		0.000
Relative Relief (m/km)	Log base 10	Correlation Coefficient	na	-0.62
		P-value		0.000
Basin Length (m)	Log base 10	Correlation Coefficient	0.83	0.61
		P-value	0.000	0.000
Segment Length Thread Average (m)	Square root	Correlation Coefficient	0.82	na
		P-value	0.000	

Figure 3.1 Erodible terrace bank height regression scatter plots and residuals (Results modeled by using total stream length as the independent variable).



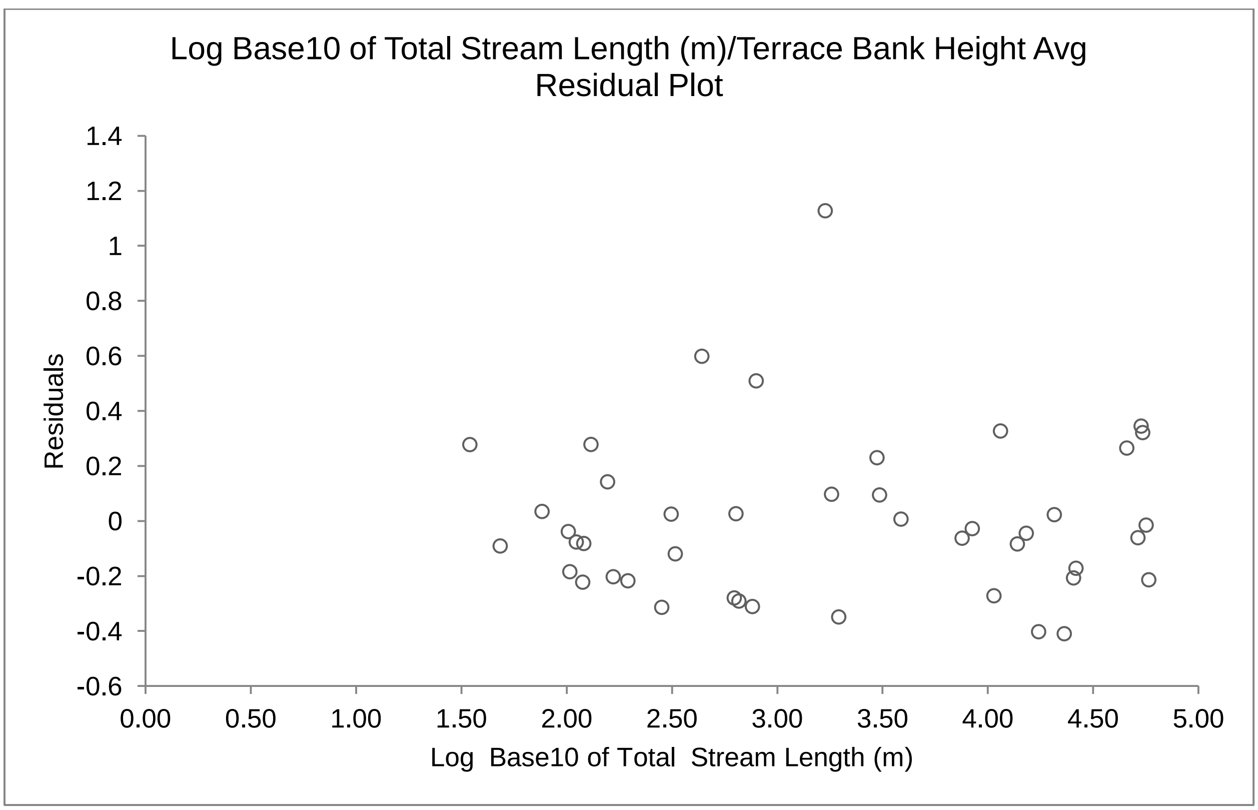
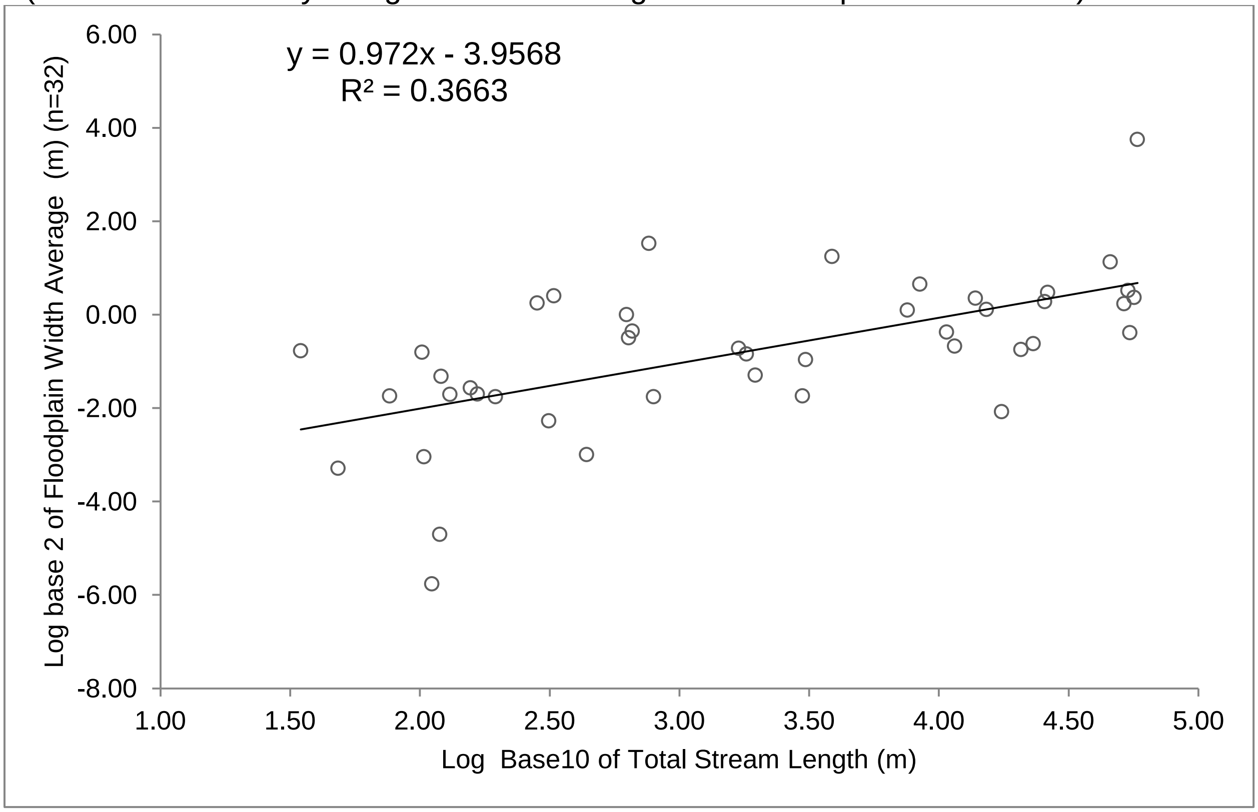


Figure 3.2 Total stream length floodplain width regression scatter plots and residuals (Results modeled by using total stream length as the independent variable).



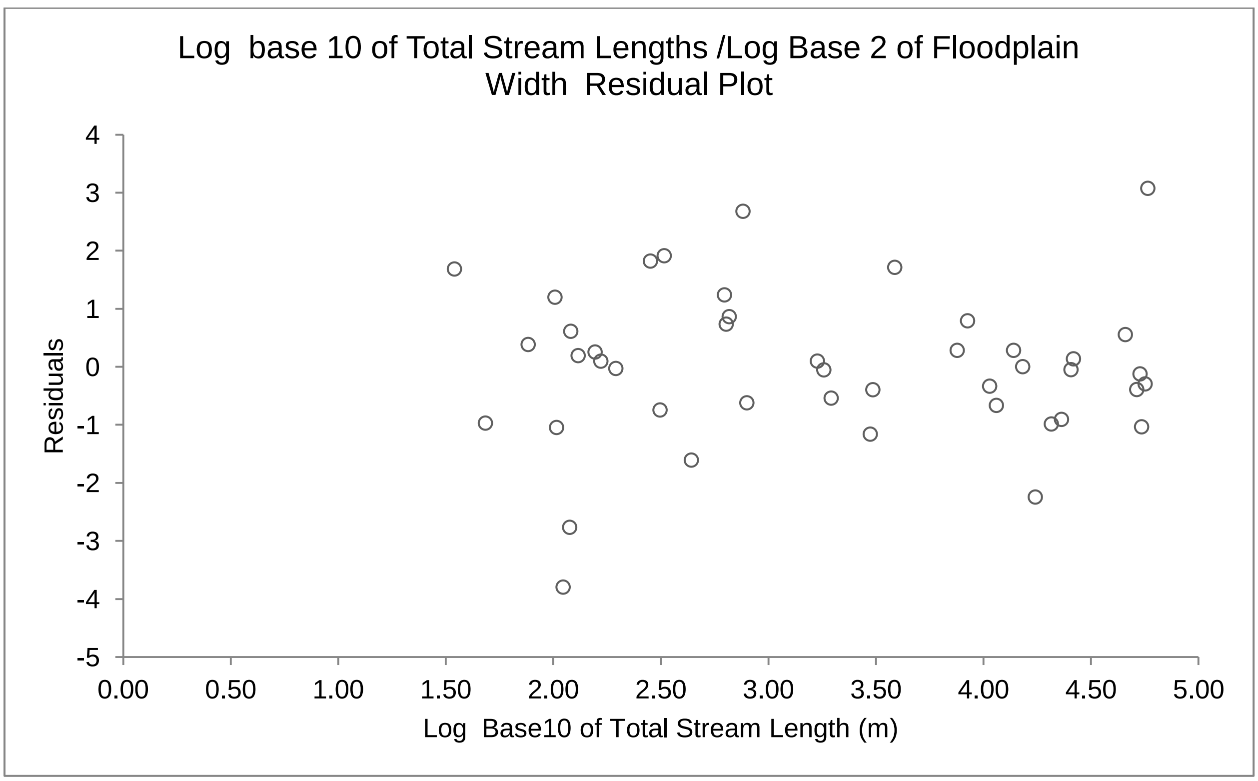


Table 3.2 Total stream length modeled floodplain widths & erodible terrace bank heights (Results modeled by using total stream length as the independent variable).

		Widths (cm)	Heights (cm)
Deer Lake	Maximum	90.92	120.54
Drainage Area	Minimum	16.61	14.50
2.38 km²	Mean	46.00	69.38
		per km² (cm)	per km² (cm)
	Maximum	38.20	50.65
	Minimum	6.98	6.09
	Mean	19.33	29.15
		Widths (cm)	Heights (cm)
Thompson Lake	Maximum	97.60	124.96
Drainage Area	Minimum	12.63	-2.59
3.83 km²	Mean	38.73	57.45
		per km² (cm)	per km² (cm)
	Maximum	25.48	32.63
	Minimum	3.30	-0.68
	Mean	10.11	15.00
		Widths (cm)	Heights (cm)
Bee Tree	Maximum	143.46	148.99
Drainage Area	Minimum	11.68	-7.50
14.14 km²	Mean	50.05	70.41
		per km² (cm)	per km² (cm)
	Maximum	10.15	10.54
	Minimum	0.83	-0.53
	Mean	3.54	4.98
		Widths (cm)	Heights (cm)
Cataloochee	Maximum	273.54	189.25
Drainage Area	Minimum	11.68	-7.51
127.43 km²	Mean	55.16	71.25
		per km² (cm)	per km² (cm)
	Maximum	2.15	1.49
	Minimum	0.09	-0.06
	Mean	0.43	0.56
		Widths (cm)	Heights (cm)
Nantahala	Maximum	276.77	189.98
Drainage Area	Minimum	11.68	-7.51
134.42 km²	Mean	42.16	62.23
		per km² (cm)	per km² (cm)
	Maximum	2.06	1.41
	Minimum	0.09	-0.06
	Mean	0.31	0.46

Table 3.3 Total stream length modeled lateral migration rates (cm/yr) (Results modeled by using total stream length as the independent variable).

		Rate/112 Years	Rate/70 Years	Median Rate	Rate ± cm/yr
Deer Lake	Maximum	0.81	1.30	1.06	0.24
Drainage Area	Minimum	0.15	0.24	0.19	0.04
2.38 km^2	Mean	0.41	0.66	0.53	0.12
		Rates/km^2	Rates/km^2	Rates/km^2	Rates/km^2
	Maximum	0.34	0.55	0.44	0.10
	Minimum	0.06	0.10	0.08	0.02
	Mean	0.17	0.28	0.22	0.05
		Rate/112 Years	Rate/70 Years	Median Rate	Rate ± cm/yr
Thompson Lake	Maximum	0.87	1.39	1.13	0.26
Drainage Area	Minimum	0.11	0.18	0.15	0.03
3.83 km^2	Mean	0.35	0.55	0.45	0.10
		Rates/km^2	Rates/km^2	Rates/km^2	Rates/km^2
	Maximum	0.23	0.36	0.30	0.07
	Minimum	0.03	0.05	0.04	0.01
	Mean	0.09	0.14	0.12	0.03
		Rate/112 Years	Rate/70 Years	Median Rate	Rate ± cm/yr
Bee Tree	Maximum	1.28	2.05	1.67	0.38
Drainage Area	Minimum	0.10	0.17	0.14	0.03
14.14 km^2	Mean	0.45	0.71	0.58	0.13
		Rates/km^2	Rates/km^2	Rates/km^2	Rates/km^2
	Maximum	0.09	0.14	0.12	0.03
	Minimum	0.01	0.01	0.01	<0.01
	Mean	0.03	0.05	0.04	0.01
		Rate/112 Years	Rate/70 Years	Median Rate	Rate ± cm/yr
Cataloochee	Maximum	2.44	3.91	3.17	0.73
Drainage Area	Minimum	0.10	0.17	0.14	0.03
127.43 km^2	Mean	0.49	0.79	0.64	0.15
		Rates/km^2	Rates/km^2	Rates/km^2	Rates/km^2
	Maximum	0.02	0.03	0.02	0.01
	Minimum	<0.01	<0.01	<0.01	<0.01
	Mean	<0.01	0.01	0.01	<0.01
		Rate/112 Years	Rate/70 Years	Median Rate	Rate ± cm/yr
Nantahala	Maximum	2.47	3.95	3.21	0.74
Drainage Area	Minimum	0.10	0.17	0.14	0.03
134.42 km^2	Mean	0.38	0.60	0.49	0.11
		Rates/km^2	Rates/km^2	Rates/km^2	Rates/km^2
	Maximum	0.02	0.03	0.02	0.01
	Minimum	<0.01	<0.01	<0.01	<0.01
	Mean	<0.01	<0.01	<0.01	<0.01

Table 3.4 Total stream length modeled sediment yields (Results modeled using total stream length as the independent variable)

		Total Mass	Mass/112 Years	Mass/70 Years	Mass/91 Years
Deer Lake	Tonnes	3660.05	32.68	52.29	40.22
Drainage Area	Tonnes/km²/Year	1537.83	13.73	21.97	16.90
2.38 km²					
	Median Yield ±4.1192 Tonnes/km²/Year			**17.85**	
	Total Volume Yielded (m³)			2815.42	
	Volume Yielded by Drainage Area (m³/km2)			1182.95	

		Total Mass	Rate/112 Years	Rate/70 Years	Rate/91 Years
Thompson Lake	Tonnes	5692.47	50.83	81.32	62.55
Drainage Area	Tonnes/km²/Year	1486.28	13.27	21.23	16.33
3.83 km²					
	Median Yield ±3.9811 Tonnes/km²/Year			**17.25**	
	Total Volume Yielded (m³)			4378.82	
	Volume Yielded by Drainage Area (m³/km2)			1143.30	

		Total Mass	Rate/112 Years	Rate/70 Years	Rate/91 Years
Bee Tree	Tonnes	23422.06	209.13	334.60	257.39
Drainage Area	Tonnes/km²/Year	1656.44	14.79	23.66	18.20
14.14 km²					
	Median Yield ±4.4396 Tonnes/km²/Year			**19.23**	
	Total Volume Yielded (m³)			18016.97	
	Volume Yielded by Drainage Area (m³/km2)			1274.18	

		Total Mass	Mass/112 Years	Mass/70 Years	Mass/91 Years
Cataloochee	Tonnes	284151.88	2537.07	4059.31	3122.55
Drainage Area	Tonnes/km²/Year	2229.87	19.91	31.86	24.50
127.43 km²					
	Median Yield ±5.9729 Tonnes/km²/Year			**25.88**	
	Total Volume Yielded (m³)			218578.37	
	Volume Yielded by Drainage Area (m³/km2)			1715.28	

		Total Mass	Mass/112 Years	Mass/70 Years	Mass/91 Years
Nantahala	Tonnes	306019.29	2732.32	4371.70	3362.85
Drainage Area	Tonnes/km²/Year	2276.59	20.33	32.52	25.02
134.42 km²					
	Median Yield ±6.0980 Tonnes/km²/Year			**26.42**	
	Total Volume Yielded (m³)			235399.45	
	Volume Yielded by Drainage Area (m³/km2)			1751.22	

Table 4.1 Comparative sediment yields

Author	Validation Site	Drainage Area (km²)	Observed Mean Sediment Yield (t/km²/yr)	**Bi-Variate Models** Total Stream Length Estimated Sediment Yield (t/km²/yr)	Time of Floodplain Initiation Range (t/km²/yr)	Note
Royall (2003)	Deer Lake, NC	2.38	29.7	17.85	±4.12	Total Sediment Yield
Royall (2000)	Thompson Lake, VA	3.83	8.3	17.25	±3.98	Total Sediment Yield
Simmons (1993)	Beetree Creek, NC	14.14	10.91	19.23	±4.44	Suspended Sediment Yield Only
	Cataloochee River, NC	127.43	20.25	25.88	±5.97	Suspended Sediment Yield Only
	Nantahala River, NC	134.42	14.95	26.42	±6.10	Suspended Sediment Yield Only

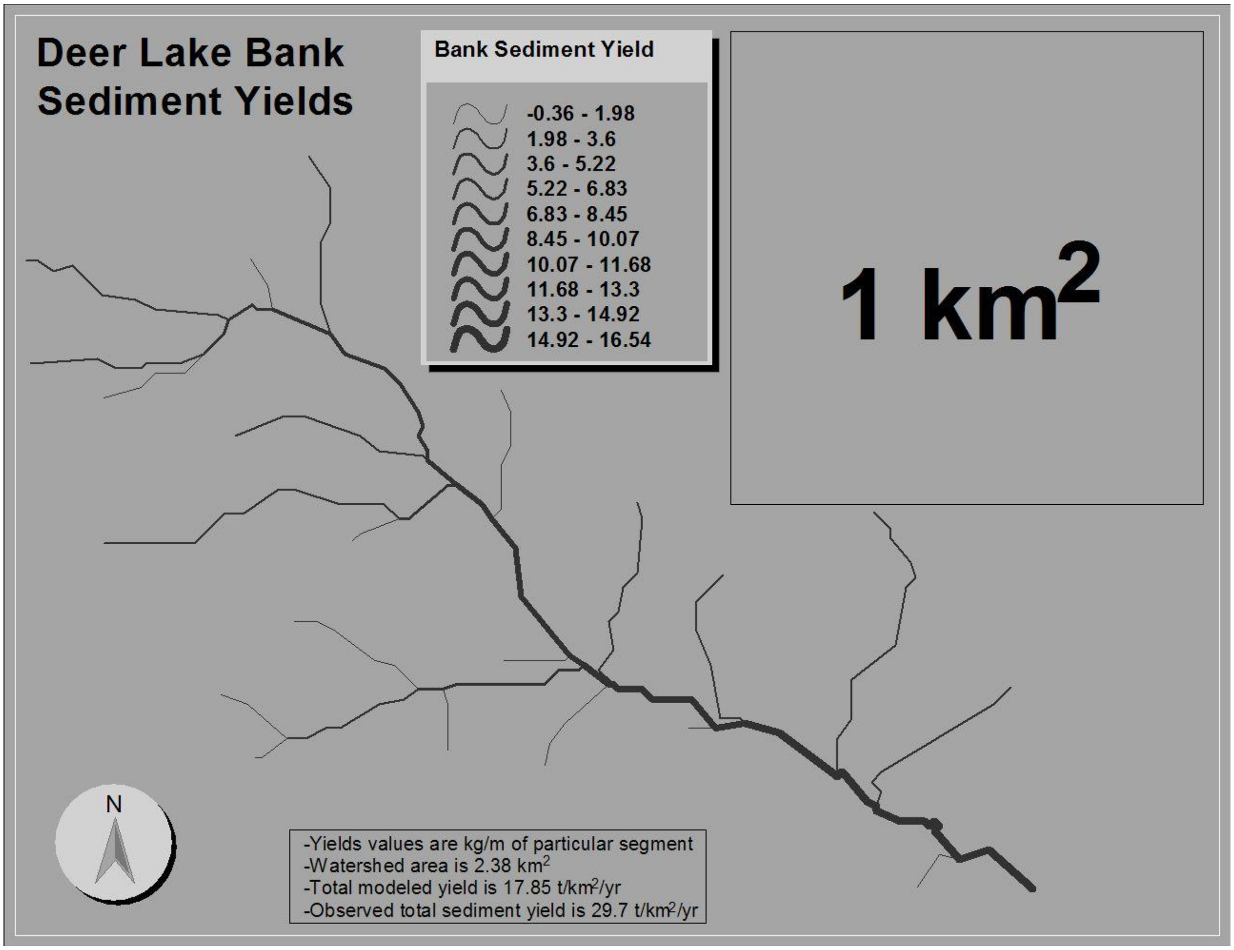


Figure 4.1, Map of Deer Lake bank sediment yields. Includes drainage network and modeled erodible terrace bank sediment yields (kg/m of stream length of segment).

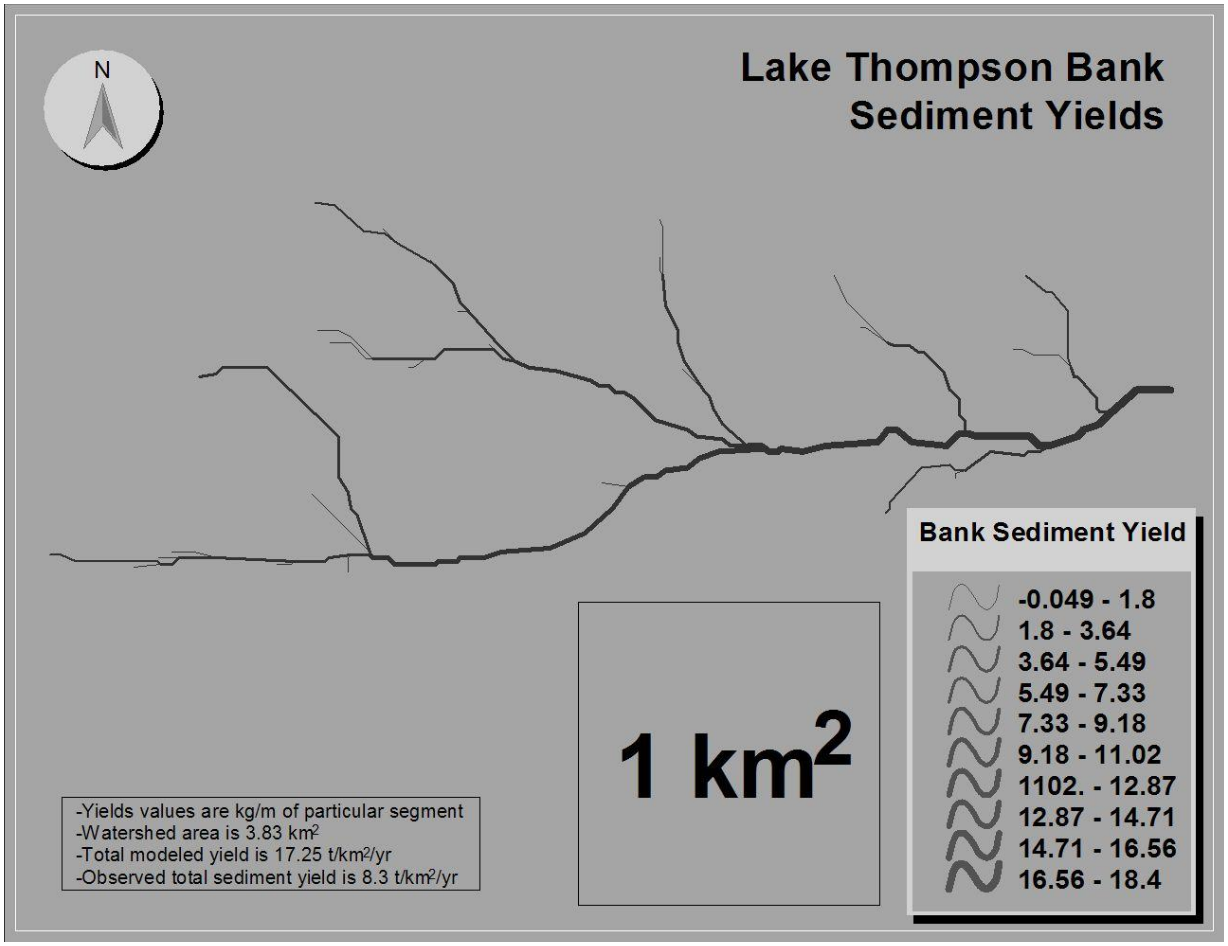


Figure 4.2, Map of Lake Thompson bank sediment yields. Includes drainage network and modeled erodible terrace bank sediment yields (kg/m of stream length of segment).

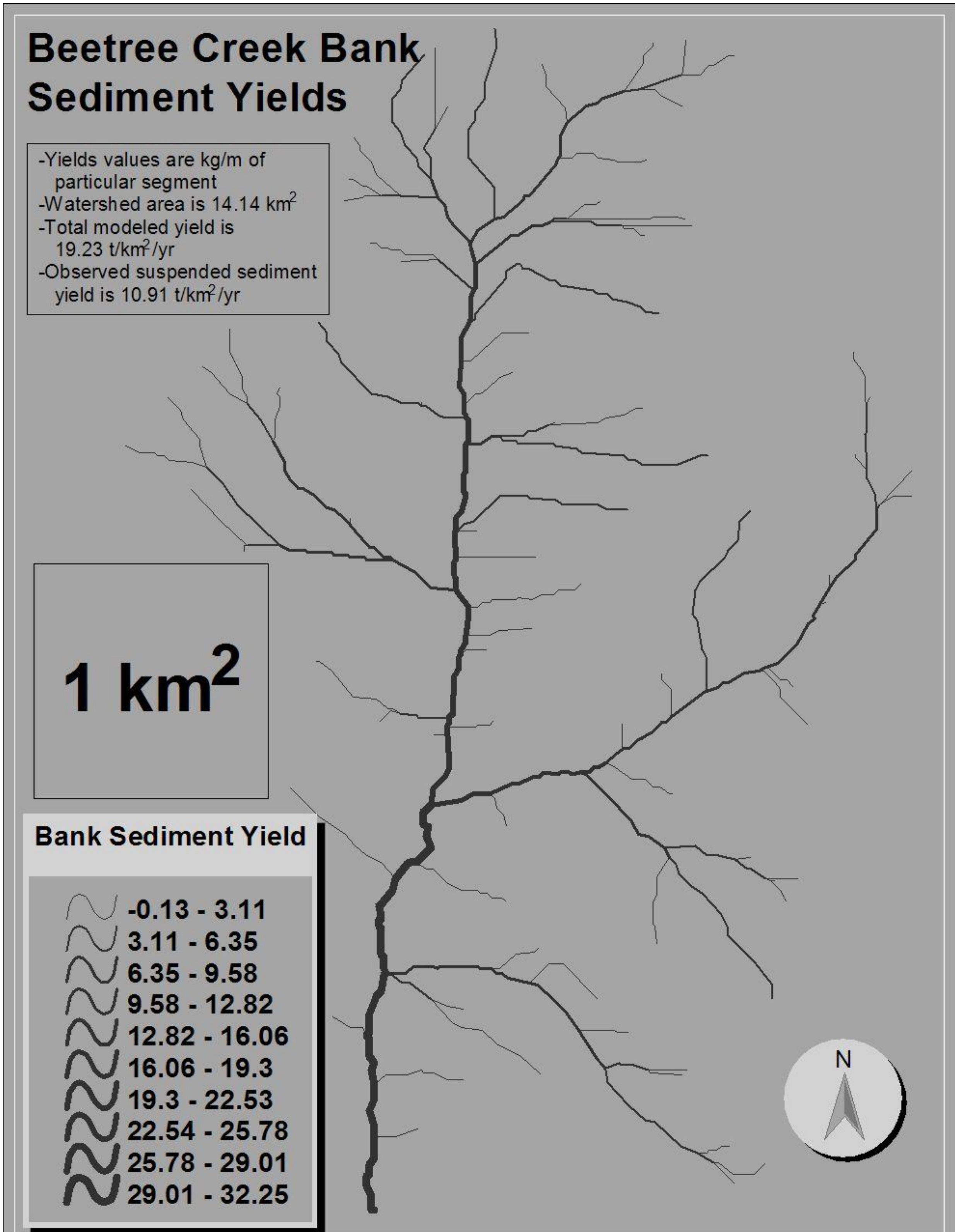


Figure 4.3, Map of Beetree Creek bank sediment yields. Includes drainage network and modeled erodible terrace bank sediment yields (kg/m of stream length of segment).

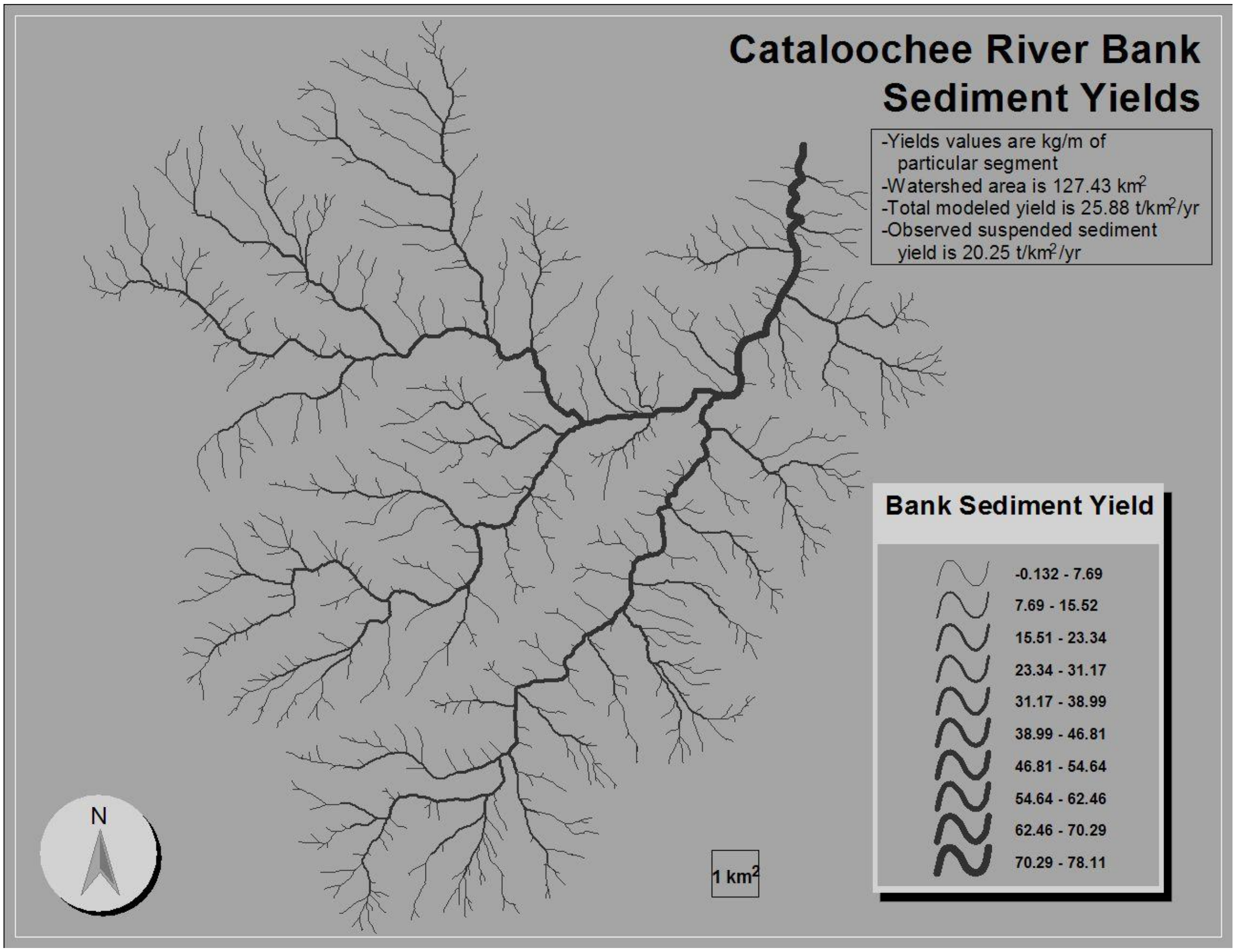


Figure 4.4, Map of Cataloochee River bank sediment yields. Includes drainage network and modeled erodible terrace bank sediment yields (kg/m of stream length of segment).

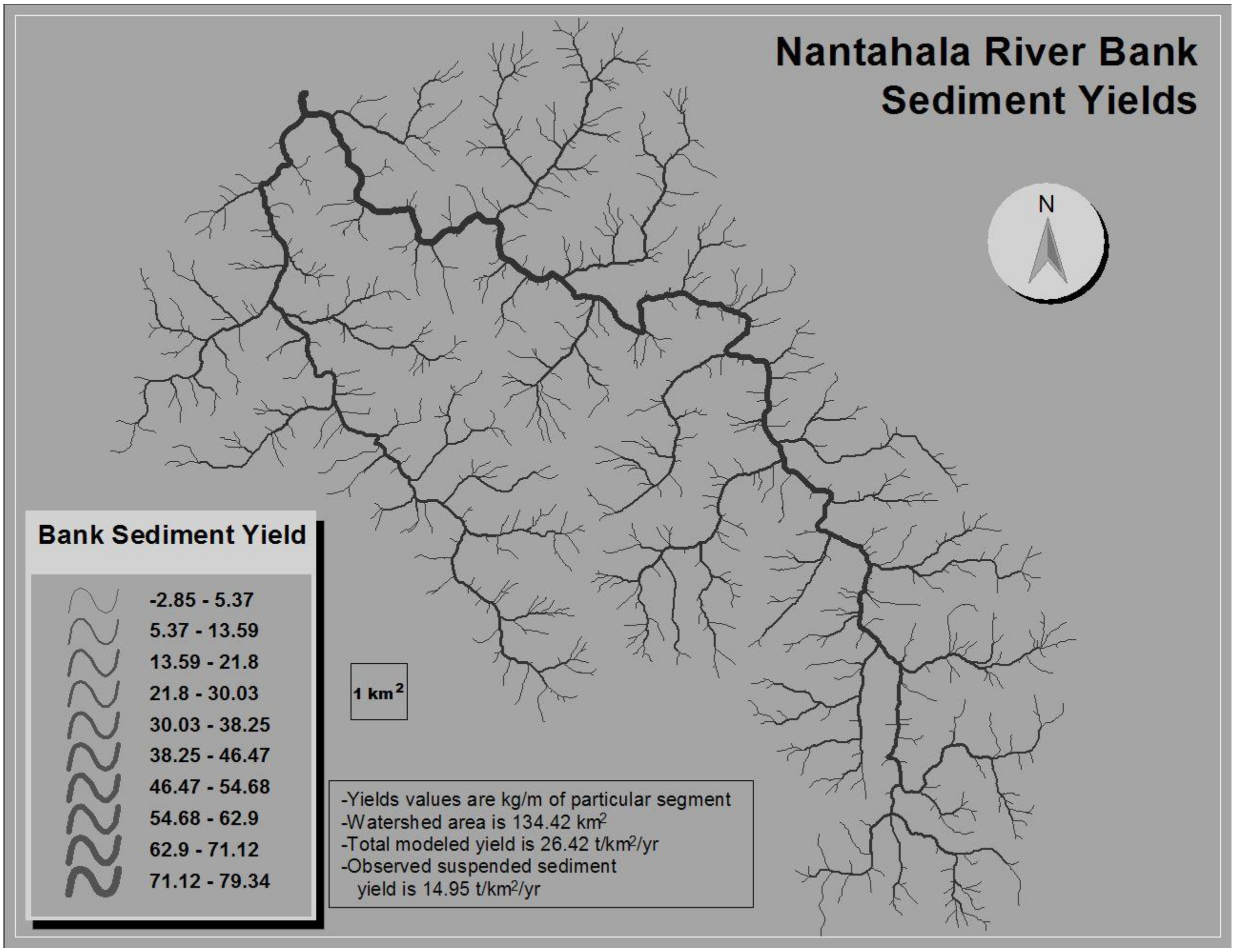


Figure 4.5, Map of Nantahala River bank sediment yields. Includes drainage network and modeled erodible terrace bank sediment yields (kg/m of stream length of segment).

REFERENCES

Ayers, H.B., and Ashe, W.W., 1904. The Southern Appalachian Forests. U.S. Geological Survey Professional Paper 37, Washington. DC.

Bolstad, P., 2006 Discussion regarding pixel threshold for stream network delineation for the Southern Blue Ridge. December 2006.

Delcourt, P.A., Delcourt, H.R., Cridlebaugh, P.A. and Chapman, J., 1986. Holocene ethnobotanical and paleoecological record of human impact on vegetation in the Little Tennessee River Valley, Tennessee. Quaternary Research: 25, p. 330-349.

Dunne, T. and Leopold, L.B., 1978. Water in Environmental Planning. Freeman and Company, San Francisco, CA, 818 pp.

Eller, R. D., 1982. Miners, Millhands, and Mountaineers: Industrialization Of the Appalachian South, 1880–1930. University of Tennessee Press, Knoxville, Tennessee, USA.

Rhodes, D., 1968. Quantitative geomorphology. in Fairbridge, R.W., ed., The Encyclopedia of Geomorphology. Encyclopedia of Earth Sciences Series, Vol. III. Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania. 1295pp.

Fitzpatrick, F.A., I.R. Waite, P.J. D'Arconte, M.R. Meador, M.A. Maupin, and M.E. Gurtz, 1998. Revised Methods for Characterizing Stream Habitat in the National Water-Quality Assessment Program. Water-Resources Investigations Report 98-4052, U.S. Geological Survey. Raleigh, N.C. 67 pp.

Gardiner, V., 1975. Drainage basin morphometry: Norwich, England, British Geomorphological Research Group, Technical Bulletin, v. 11, pp. 353-375.

Glenn, L.C., 1911. Denudation and Erosion in the Southern Appalachian Region and the Monongahela Basin. U.S. Geological Survey Professional Paper, vol. 72.

Ward, S., 2004. Ruggedness. in Goudie, A. Encyclopedia of Geomorphology. New York: Routledge pp. 885.

Harden, C.P. 2004. Fluvial response to land-use change in the Southern Appalachian region: A century of investigation. Physical Geography 25: pp. 398–417.

Harden, C P., Foster, W., Morris, C., Chartrand, K.J., Henry, E. 2009. Rates and processes of streambank erosion in tributaries of the Little River, Tennessee. Physical Geography 30: pp. 1–16.

Harrelson, C. C., C. L. Rawlins, and J. P. Potyondy.1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. U.S. Forest Service General Technical Report RM-245.

Homer, C., Huang, C., Yang, L., Wylie, B., and M Coan., 2004. Development of a 2001 National Land-Cover Database for the United States. Photogrammetric Engineering & Remote Sensing V. 70, No. 7, pp. 829–840.

Hooke, JM. 1979. An Analysis of the Processes of River Bank Erosion. Journal of Hydrology 42: pp. 39–62.

Hooke, J.M. 1980. Magnitude and Distribution of Rates of River Bank Erosion. Earth Surface Processes 5(2): pp. 143-157.

Kaufmann, P.R., and Robison, E.G. 1998. Physical habitat characterization. Section 7 – Field Operations and Methods for Measuring the Ecological condition of Wadeable Streams. PA/620/R-94/004F, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

Kelsey HM. 1982. Influence of magnitude, frequency, and persistence of various types of disturbance on geomorphic form and process. In Sediment Budgets and Routing in Forested Drainage Basins, Swanson FJ, Janda EJ, Dunne T, Swanson DN (eds.). USDA Forest Service General Technical Report PNW-141; pp. 150–153.

Kirk, R.W., 2009. Land use and terrestrial carbon storage in Western North Carolina from 1850-2030: a historical reconstruction and simulation study. Ph.D. dissertation, University of Minnesota.

Knighton D. 1998. Fluvial Forms and Processes: A New Perspective. Arnold: London, pp. 61.

Kondolf, G.M., Piégay, H. and Sear, D., 2003.Integrating Geomorphological Tools in Ecological and Management Studies. pp. 577-595 in G.M. Kondolf and H. Piégay (eds.). Tools in fluvial geomorphology. John Wiley and Sons.

Langbein, W. B., and Leopold, L. B., 1966. River meanders theory of minimum variance. USGS Professional Paper No. 422-H, U.S. Government Printing Office, Washington, D.C.

Lawler DM. 1993. The measurement of river bank erosion and lateral change: a review. Earth Surface Processes and Landforms 18: pp. 777–821.

Lawler, D.M., Grove, J. R., Couperthwaite, J. S., and G. J. L. Leeks. 1999. Downstream change in riverbank erosion rates in the Swale-Ouse system, northern England. Hydrological Processes 13:pp. 977–992.

Leigh, D.S. 2010, Morphology and channel evolution of small streams in the southern Blue Ridge Mountains of western North Carolina, southeastern geographer, 50(4) 2010: pp. 397–421.

Leigh, D.S. and Rogers, J.C. 2007. Geomorphic Analysis of Stream Channels in the Southern Appalachian Highlands. Technical Report of U.S. Forest Service Cooperative Agreement SRS 04-CA-11330140-096 between the University of Georgia and the U.S.D.A Forest Service. University of Georgia Geomorphology Laboratory Technical Research Report #3.

Leigh, D.S. and Webb, P.A. 2006. Holocene erosion, sedimentation, and stratigraphy at Raven Fork, Southern Blue Ridge Mountains, USA. *Geomorphology* 78:161–177.

Leopold, L.B., Bagnold, R.A., Wolman, M.G., Brush Jr., L.M., 1960. Flow Resistance in Sinuous or Irregular Channels. United States Geological Survey Professional Paper 282-D. pp. 134.

Leopold, L.B., and Wolman M.G., 1960. River Meanders. Bulletin of the Geological Society of America 71, pp. 769-793.

Madej, M. A., and Ozaki, V., 1996. Channel response to sediment wave propagation and movement, Redwood Creek, California, USA. Earth Surface Processes and Landforms 21: pp. 911–927.

Meade, R., and et. al., 1990. Movement and Storage of Sediment in Rivers of the United States and Canada. In: M.G. Wolman and H.C. Riggs (Editors), Surface Water Hydrology: The Geology of North America, Volume 0-1. The Geological Society of America, Boulder, CO, pp. 255-280.

Melton, M. A., 1957. An Analysis of the Relations Among Elements of Climate, Surface Properties, and Geomorphology, Department of Geology, Columbia University. Office of Naval Research, Technical Report 11, Project NR 389-040.

Melton, Mark A., 1958 Geometric Properties of Mature Drainage Systems and their Representation in an E4 Phase Space, Journal of Geology, v. 66, 1: pp. 35-54.

Meyer, J. L., R. B. Beilfuss, Q. Carpenter, L. A. Kaplan, D. Newbold, R. Semlitsch, D. L. Stayer, C. J. Woltemade, J. B. Zedlerr, And P. H. Zedler. 2003. Where rivers are born: the scientific imperative for defending small streams and wetlands. American Rivers, Sierra Club, Washington, DC.

Montgomery, D.R., 1999. Process domains and the river continuum. Journal of the American Water Resources Association 35: pp. 397–410.

Murgatroyd, A.L.; Ternan, J.L. 1983. The Impact of Afforestation on Stream Bank Erosion and Channel Form. Earth Surface Processes and Landforms 8(4): p. 357-370.

Nanson GC, Hickin EJ., 1986. A Statistical Analysis Of Bank Erosion And Channel Migration In Western Canada. Geological Society of America Bulletin 97: 497-504.

National Land Cover Database, 2001 http://www.mrlc.gov/nlcd2001.php Accessed 2005.

National Climate Data Center (NCDC). 2003. Climatetography of the United States no. 84, 1971-2000. ftp://ftp.ncdc.noaa.gov/pub/data/normals/1981-2010/products/station/USC00312102.normals.txt Accessed November 1, 2011

Petras, Ivan. Basin1 ArcView script/extension. Environmental Systems Research Institute, Redlands, California. Available from http://arcscripts.esri.com at the Department of Water Affairs & Forestry, Pretoria, South Africa. The extension was completed April 11, 2000 and revised February 12, 2003.

Pizzuto, J.E., O'Neal, M.O., 2009. Increased mid-20th century river bank erosion rates related to the demise of mill dams, South River, Virginia. Geology 37, pp. 19–22.

Price, K., and D. S. Leigh. 2006. Comparative water quality of lightly and moderately impacted streams in the southern Blue Ridge Mountains, USA. Environmental Monitoring and Assessment 120: pp. 269–300.

Price, K., and Leigh, D.S. 2006 b. Stream morphological and sedimentological response to human impact in the southern Blue Ridge Mountains, USA. Geomorphology 78: pp. 142–160.

Price K, Jackson CR, and Parker AJ (2010) Variation of surficial soil hydraulic properties across land uses in the southern Blue Ridge Mountains, NC, USA. Journal of Hydrology 383(3–4): pp. 256–268.

Reid, Leslie M. 1993. Research and Cumulative Watershed Effects. Gen. Tech. Rep. PSW-GTR-141. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 60 pp.

Reid, Leslie M. and Dunne, Thomas. 1996.Rapid Evaluation of Sediment Budgets: Chapter 3.CatenaVerlag GMBH, Reiskirchenberg, Germany, pp. 43, 5.

Rhoades, E.L.; O'Neal, M.A.; Pizzuto, J.E. Quantifying bank erosion on the South River from 1937 to 2005, and its importance in assessing Hg contamination. Applied Geography. 2009, 29: pp. 125-134.

Ritter, D.F., Kochel, R.C., Miller, J.R., 1995. Process Geomorphology, 3rd ed. W.C. Brown Publishers, Boston, 540 pp.

Roosevelt, T. 1902. Message from the president of the United States transmitting a report from the Secretary of Agriculture in relation to the forests, rivers, and mountains of the southern Appalachian region. Government Printing Office, Washington, D.C., USA.

Robinson, G.R., Jr., F.G. Lesure, J.I. Marlowe II, N.K. Foley, and S.H. Clark 1993 Bedrock Geology and Mineral Resources of the Knoxville 1 x 2 degree Quadrangle, Tennessee, North Carolina, and South Carolina. U.S. Geological Survey Bulletin 1979. U.S. Government Printing Office, Washington.

Royall, D., 2000. Lake-sediment-based evaluation of recent sediment yield from a small Appalachian watershed, Thompson Lake, Virginia. Physical Geography 21, 1, 68-88.

Royall, D., 2003. A 50-year record of sediment yield and sources from Wolf Branch, North Carolina., Professional Geographer 55(3): pp. 356-371.

Schumm S.A. (1977) The Fluvial System. John Wiley and Sons, New York.338 pp.

Shreve RL. 1967. Infinite Topologically Random Channel Networks. Journal of Geology 75: pp. 178–86.

Simmons, C.E., 1993. Sediment characteristics of North Carolina Streams, 1970-79. United States Geological Survey, Water Supply Paper 2364, Raleigh, NC.

Simon, A. and Castro, J. 2003. Measurement and Analysis of Alluvial Channel Form. pp. 292-322 in G.M. Kondolf and H. Piégay (eds.). Tools in fluvial geomorphology. John Wiley and Sons.

Simon A, Curini A, Darby SE, Langendoen EJ. 2000. Bank and near-bank processes in an incised channel. Geomorphology 35: pp. 193–217.

Slaymaker, O. 2000. Assessment of the geomorphic impacts of forestry in British Columbia. Ambio 29(7): 381–387.

Soil Survey Division Staff, 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.. U.S. Government Printing Office. Washington, DC, 437 pp.

Swank, W.T., Vose, J.M., Elliott, K.J., 2001. Long-term hydrologic and water quality responses following commercial clearcutting of mixed hardwoods on a southern Appalachian catchment. Forest Ecology and Management 143: pp 163–178.

Thorne, C.R., and Tovey, N. K. 1981. ‘Stability of Composite River Banks’, Earth Surface Processes and Landforms, 6: pp. 469–484.

Thorne C.R. 1982. Processes and Mechanisms of Riverbank Erosion. In Gravel-Bed Rivers: Fluvial Processes, Engineering and Management, Hey RD, Bathurst JC, Thorne CR (eds.). Wiley: Chichester: pp. 227-271.

Trimble, S.W., and A. C. Mendel. 1995. The Cow as a Geomorphic Agent—A Critical Review. Geomorphology 13: pp. 233–253.

United States Geological Survey, 2005-2007. Real-time streamflow compared to historical streamflow for the day of the year (North Carolina) Prentiss hydrograph http://waterdata.usgs.gov/nc/nwis/uv?site_no=03500000

United States Geological Survey, 2000. Water Erosion Prediction Project (WEPP) model http://www.ars.usda.gov/Research/docs.htm?docid=10621.

Walter, R.C., and D.J. Merritts. 2008. Natural streams and the legacy of water-powered mills. Science 319: pp, 299–304.

Walters, D. M., D. S. Leigh, M. C. Freeman, B. J. Freeman, And C. M. Pringle. 2003. Geomorphology and fish assemblages in a Piedmont river basin, USA. Freshwater Biology 48: pp. 1950–1970.

Walling, D.E., and Fang, D.: 2003, 'Recent Trends in the Suspended Sediment Loads of The World's Rivers', Global and Planetary Change 39, pp. 111-126.

Webster, J.R., Benfield, E.F., Golladay, S.W., Kazmierczak Jr., R.F., Perry, W.B., and Peters, G.T., 1988. Effects of watershed disturbance on stream seston characteristics. In: W.T. Swank and D.A. Crossley Jr. (Eds.), Forest Hydrology and Ecology at Coweeta. Springer, New York, pp. 279-294.

Wohl, E., 2006. Human impacts to mountain streams. In: James, L.A., Marcus, W.A. (Eds.), The Human Role in Changing Fluvial Systems. Proceedings of the 37th International. Binghamton Geomorphology Symposium. Geomorphology, 79, pp. 217–248.

Wolman, M.G., 1959. Factors Influencing Erosion of a Cohesive River Bank. American Journal of Science, 257: pp. 204-216

Wolman, M. G., 1967. A Cycle Of Sedimentation and Erosion in Urban River Channels, Geografiska Annaler, 49A: pp. 385-395.

Yarnell, S.L.: 1998, 'The Southern Appalachians: A History of the Landscape', U.S. Department of Agriculture Forest Service Southern Research Station General Technical Report, SRS-18, Asheville, N.C.

Zhang, J.X., Chang, K.-T., Wu, J.Q., 2008. Effects of DEM resolution and source on soil erosion modeling: a case study using the WEPP model. International Journal of Geographic Information Science 22, 925–942.

APPENDIX A: Study Reach Sites

Site ID	Site Name	Stream Name (if available)	Reach Coordinates (UTM)			
			Down Stream Pt(0x)		Up Stream Pt(30x)	
			Easting (m)	Northing (m)	Easting (m)	Northing (m)
CW01	Training	Shope Fork	278472	3882394	278329	3882432
CW02	Lawnmow. man	Dryman Fork	280059	3880994	279972	3880919
CW03	Trampy	N. Fork Coweeta	278846	3884201	278758	3884220
CW04	Eye Poke	N. Fork Coweeta Tributary	278964	3884242	278963	3884309
CW05	Astroman	Coweeta Mainstem	279767	3882763	279612	3882810
CW06	Longtime	N. Fork Coweeta Tributary	279034	3884661	279050	3884679
CW07	Punji	Shope Branch	277784	3882827	277786	3882855
CW08	Yellowjacket	Camp Rock Branch Tributary	276823	3883073	276823	3883127
CW09	Split Stream	Ball Creek	276978	3880814	276927	3880791
CW10	Crooked Tree	Saw Mill Branch Tributary	278558	3881905	278571	3881880
CW11	Mudbug	Saw Mill Branch Tributary	278576	3881921	278597	3881912
CW12	App. Trail	Henson Creek Tributary	274611	3879880	274605	3789886
CW13	Kitchens	Cunningham Creek Branch	276592	3881681	274605	3879886
CW14	Fork	Shope Fork Tributary	276628	3882421	276581	3881661
CW15	Talking	Ball Creek Tributary	276277	3880088	276261	3880087
CW16	Basket	Ball Creek Tributary	276338	3880095	276319	3880077
CW17	Rodo	Hurricane Branch	277443	3882900	277423	3882939
CW18	Last	Shope Fork Tributary	277263	3882527	277263	3882511
CW19KT	Coweeta Ch Rd	Coweeta Mainstem	280423	3882501	280244	3882656
CW20HZ	Coweeta @ FS	Coweeta Mainstem	278825	3882463	278552	3882358
SK01	Johnny's	S. Fork Skeenah	280001	3887871	279920	3887833
SK02	Dearl's	Battle Branch	280230	3889387	280214	3889401
SK03	Crazy Horse	N. Fork Skeenah	279848	3888542	279808	3888580
SK04	Haunted	Black Mt Branch	278069	3886960	278014	3886898
SK05	Hungry Dog	S. Fork Skeenah	278897	3887472	278841	3887452
SK06	Cowie	N. Fork Skeenah	278876	3888798	278823	3888815
SK07	Swiss Lady	N. Fork Skeenah	277404	3889393	277368	3889427
SK08	Pear	N. Fork Skeenah	278353	3888904	278301	3888928
SK09	Broke Dog	S. Fork Skeenah	279360	3887389	279286	3887376
SK10	Beaver Stick	Skeenah Creek Mainstem	281823	3887998	281700	3887973
SK11	Sticker	Battle Branch	280433	3888685	280417	3888726
SK12	Handshake	N. Fork Skeenah	280541	3888211	280465	3888263
SK13	Barking Dog	Skeenah Creek Mainstem	282682	3888011	282533	3888022
SK14	Wasp Nest	Battle Branch	279308	3890219	279294	3890249
SK15	Scrm.' Meemie	N. Fork Skeenah Tributary	279581	3888692	279600	3888715
SK16	Deer Snort	S. Fork Skeenah Tributary	278681	3886567	278663	3886551
SK17	Bullfrog	Skeenah Creek Tributary	278681	3886567	278663	3886551
SK18	Trailer Park	S.Fork Skeenah Tributary	280784	3887935	280770	3887928
SK19	Bearshit	Black Mt Branch Tributary	277633	3887149	277614	3887130
SK20	Widow	N. Fork Skeenah Tributary	278323	3888822	278313	3888811
SK21	Growling	N. Fork Skeenah Tributary	277336	3889524	277333	3889533
SK22	Friendly Dog	S. Fork Skeenah Tributary	279814	3887850	279798	3887866
SK23	Udo's	N. Fork Skeenah Tributary	277591	3889131	277574	3889123
SK24KT	Skeenah	Skeenah Creek Mainstem	280916	3887972	280782	3888041

APPENDIX B: Variable descriptions

Variable	Variable Description and/or Calculation	REFERENCE
Shreve Order	Stream order based on Shreve ordering system (calculated from Basin1 in ArcView)	Petras, 2003
Drainage Area	Basin area in square kilometers (calculated from Basin1 in ArcView)	Petras, 2003
Drainage Area	Basin area in square meters (calculated from Basin1 in ArcView)	Petras, 2003
Basin Perimeter	Basin perimeter in square kilometers (calculated from Basin1 in ArcView)	Petras, 2003
Basin Perimeter	Basin perimeter in square meters (calculated from Basin1 in ArcView)	Petras, 2003
Drainage Density	Total of stream lengths in network divided by the area of the basin in kilometers	Fitzpatrick et al., 1998
Constant of Channel Maintenance	Number of square meters required to maintain 1 meter of channel within basin (1/Drainage Density)	Fairbridge, 1968
Stream Segments	Number of steam segments in stream network	Petras, 2003
Stream Frequency	Number of stream segments divided by the drainage area (Segments/Square Kilometer)	Fairbridge, 1968
Length of Longest Path of Stream Segments	Total length in meters of the longest path of segments in stream network from pour point to furthest upstream point	Fitzpatrick et al., 1998
Gradient of Stream Length Longest Segment Path	Gradient of the length of longest path of stream segments between 10 and 85 percent of total length from basin outlet (rise/run of path)	Fitzpatrick et al., 1998
Stream Segment Average Length	Average length in meters of segments of stream network	Petras, 2003
Total stream length	Sum of all stream segment lengths in meters (calculated from Basin1 in ArcView)	Petras, 2003
Stream Segment Length Maximum	Length in meters of the longest stream segment of stream network	Petras, 2003
Stream Segment Length Minimum	Length in meters of the shortest stream segment of stream network	Petras, 2003
Minimum Elevation Above MSL (m)	Lowest elevation in meters within basin in meters above mean sea level	Petras, 2003
Maximum Elevation Above MSL (m)	Highest elevation in meters within basin in meters above mean sea level	Petras, 2003
Average Elevation Above MSL (m)	Average elevation in meters within basin in meters above mean sea level	Petras, 2003
Basin Relief (m)	The difference between the maximum elevation and the minimum elevation in meters within the basin or Total Relief	Fitzpatrick et al., 1998
Basin Relief Ratio (m)	Ratio between basin relief and basin length (=BAS_REL/BAS_LEN)	Fitzpatrick et al., 1998
Relative Relief (m/km)	Ratio between basin relief and basin perimeter (=BAS_REL/PERIMETER)	Fitzpatrick et al., 1998
Basin Length (km)	Length of the basin from pourpoint to drainage divide following the main stem of the stream in km	Fitzpatrick et al. 1998 Gardiner 1975
Basin Length (m)	Length of the basin from pourpoint to drainage divide following the main stem of the stream in m	Fitzpatrick et al. 1998 and Gardiner 1975

APPENDIX B: Variable Descriptions (Continued)

Variable	Variable Description and/or Calculation	REFERENCE
Drainage Shape (m/m)	Drainage area divided by the square of basin length (=AREA/BAS_LEN^2)	Fitzpatrick et al. 1998 and Gardiner, 1976
Shreve Bifurcation Ratio	Shreve order (the number of first order streams) divided by the total number of stream segments minus the number of first order streams (ORDER/(SEG#-Order))	
Percent of First Order Streams to the Total Number of Streams	Shreve order (the number of first order streams) divided by the total number of stream segments as a proportion	
Melton Ruggedness Number 1957	The product of total basin height and drainage density (BAS_REL*Dd)	Melton, 1957
Melton Ruggedness Number 1958	Basin total relief divided by the square root of basin area (BAS_REL/(AREA^0.5))	Melton, 1958
Ground Slope (degrees)	Basin relief divided by two times the drainage density (BAS_REL/2Dd, quotient in degrees)	Fairbridge, 1968
Minimum Basin Slope (%)	Minimum basin slope calculated per slope pixel	Petras, 2003
Maximum Basin Slope (%)	Maximum basin slope calculated per slope pixel	
Average Basin Slope (%)	Average of basin slope calculated per slope pixel	
Pixel Slope Standard Deviation	One standard deviation of basin slope calculated per slope pixel generated from a 10m DEM	
Pixel Slope 2 Standard Deviations	Two standard deviations of basin slope calculated per slope pixel generated from a 10m DEM	
Pixel Slope 3Standard Deviations	Three standard deviations of basin slope calculated per slope pixel generated from a 10m DEM	
Pixel Slope (99th)	99th percentile of basin slope calculated per slope pixel generated from a 10m DEM	
Pixel Slope (95th)	95th percentile of basin slope calculated per slope pixel generated from a 10m DEM	
Pixel Slope (90th)	90th percentile of basin slope calculated per slope pixel generated from a 10m DEM	
Pixel Slope (85th)	85th percentile of basin slope calculated per slope pixel generated from a 10m DEM	
Pixel Slope (75th)	75th percentile of basin slope calculated per slope pixel generated from a 10m DEM	
Pixel Slope (66th)	65th percentile of basin slope calculated per slope pixel generated from a 10m DEM	
Segment Slope Average	Average of stream segment slopes (rise over run) within basin	
Segment Slope (99th)	99th percentile of stream segment slopes (rise over run) within basin	
Segment Slope (95th)	95th percentile of stream segment slopes (rise over run) within basin	
Segment Slope (90th)	90th percentile of stream segment slopes (rise over run) within basin	
Segment Slope (85th)	85th percentile of stream segment slopes (rise over run) within basin	

APPENDIX B: Variable Descriptions (Continued)

Variable	Variable Description and/or Calculation	REFERENCE
Segment Slope (75th)	75th percentile of stream segment slopes (rise over run) within basin	
Segment Slope (66th)	66th percentile of stream segment slopes (rise over run) within basin	
Segment Thread Total	The sum of all segment threads within basin.	
Segment Thread Average	The average of all segment threads within basin.	
Floodplain Width Average left & right (m) (n=16)	Average of left plus right floodplain widths (in meters)	
Floodplain Width average by side (m) (n=32)	Average of left and right floodplain widths by side (in meters)	
Bank Height Above Floodplain Average left & right (m)	Average of left and right erodible terrace bank heights (above floodplain height, in meters)	
Bank Height Above Floodplain Sum left & right (m)	Sum of left and right erodible terrace bank heights (above floodplain height, in meters)	
Bank Slope Average left & right (degrees)	Average of left and right Erodible Terrace Bank heights (terrace height, in meters)	
Bank Vegetation Average left & right (%)	Average of left and right bank vegetation as a percent	
Dominant Riparian Land Use (binary)	Binary variable representing dominance (>50%) of forest (0) or non-forest (1) along the riparian zone (10 times water width) along the study reach	
Reach Gradient	Overall surveyed stream reach gradient (rise over run of reach)	
Floodplain Width Sum Average	Average of sum of left and right side of stream floodplain widths (in meters; n=16)	
Floodplain Width Average	Average of left and right side of stream floodplain widths by side (in meters; n=32)	
Erodible Terrace Bank Height Average	Average of left and right side of stream terrace bank heights (above floodplain height, in meters)	
Erodible Terrace Bank Height Sum Average	Average of the sum of left and right side of stream terrace bank heights (above floodplain height, in meters)	
Bank Slope Average	Reach average left and right side of stream bank angle in degrees (angle includes compound bank angles in degrees)	
Bank Vegetation Average	Reach average percent vegetation on left and right side of stream bank based on leaf area of bank length equal to stream reach average stream width (percent)	
Bank Erosion Average	Reach average percent of erosional surface on left and right side of stream bank based on leaf area of bank length equal to average stream width (percent)	
Bank Failure Average (%)	Average of evident bank failure on left and right side of stream bank	
Bank Soil (% Sand)	Reach average of left and right side of sand in stream bank based on soil texture and the associated center of mass in soil triangle (percent)	Soil Survey Division Staff, 1993
Bank Soil (% Silt)	Reach average of left and right side of silt in stream bank based on soil texture and the assoc. center of mass in soil triangle (percent)	Soil Survey Division Staff, 1993

APPENDIX B: Variable Descriptions (Continued)

Variable	Variable Description and/or Calculation	REFERENCE
Bank Soil (% Clay)	Reach average of left and right side of clay in stream bank based on soil texture and the associated center of mass in soil triangle (percent)	Soil Survey Division Staff, 1993
Bank Soil Silt Plus Clay	Percentage of silt plus the percentage of clay in stream bank based on soil texture and the associated center of mass in soil triangle (percent)	Soil Survey Division Staff, 1993
Bank Soil Texture	Reach average bank texture based on left and right banks (sand, slit, clay Reach average percent)	Soil Survey Division Staff, 1993
NLCD % Barren	For individual class descriptions see http://www.mrlc.gov/nlcd_definitions.asp	Homer, 2004
NLCD % Cultivated Crops	For individual class descriptions see http://www.mrlc.gov/nlcd_definitions.asp	Homer, 2004
NLCD % Deciduous Forest	For individual class descriptions see http://www.mrlc.gov/nlcd_definitions.asp	Homer, 2004
NLCD % Developed Low Intensity	For individual class descriptions see http://www.mrlc.gov/nlcd_definitions.asp	Homer, 2004
NLCD % Developed Open Spaces	For individual class descriptions see http://www.mrlc.gov/nlcd_definitions.asp	Homer, 2004
NLCD % Evergreen Forest	For individual class descriptions see http://www.mrlc.gov/nlcd_definitions.asp	Homer, 2004
NLCD % Grassland/Herbaceous	For individual class descriptions see http://www.mrlc.gov/nlcd_definitions.asp	Homer, 2004
NLCD % Mixed Forest	For individual class descriptions see http://www.mrlc.gov/nlcd_definitions.asp	Homer, 2004
NLCD % Open Water	For individual class descriptions see http://www.mrlc.gov/nlcd_definitions.asp	Homer, 2004
NLCD % Shrub/Scrub	For individual class descriptions see http://www.mrlc.gov/nlcd_definitions.asp	Homer, 2004
NLCD % Woody Wetlands	For individual class descriptions see http://www.mrlc.gov/nlcd_definitions.asp	Homer, 2004
NLCD % of Forest	Sums the areas of deciduous forest, evergreen forest and mixed forest	Homer, 2004
NLCD % of Non-Forest	Sums the areas of barren land, cultivated crops, developed low intensity, developed open spaces, grassland/ herbaceous, open water, pasture/ hay, shrub/ scrub and woody wetlands	Homer, 2004
NLCD % of Non-Forest Vegetation	Sums the areas of cultivated crops, grassland/ herbaceous, pasture/ hay, shrub/ scrub and woody wetlands	Homer, 2004
NLCD % of Agricultural	Sums the areas of cultivated crops, pasture/ hay	Homer, 2004
NLCD % of Developed	Sums the areas of developed low intensity, developed open spaces	Homer, 2004
NLCD % Other	Sums the areas of Barren land and open water	Homer, 2004

APPENDIX C: Site Data

Site ID	Site Name	Shreve Order	Shreve Order (+1)	Drainage Area (km^2)	Drainage Area (m^2)	Basin Perimeter (km)	Basin Perimeter (m)	Reach Gradient
CW01	**Training**	44	45	8.58	8575.93	13.49	13486.30	0.0127
CW02	**Lawnmower Man**	37	38	7.74	7735.37	13.33	13329.48	0.0178
CW03	**Trampy**	26	27	4.80	4798.82	9.77	9767.08	0.0183
CW04	**Eye Poke**	7	8	1.10	1096.54	4.49	4485.08	0.0510
CW05	**Astroman**	95	96	17.81	17812.86	18.29	18290.13	0.0124
CW06	**Longtime**	1	2	0.08	78.91	1.48	1480.95	0.0844
CW07	**Punji**	1	2	0.11	111.66	2.02	2021.07	0.2063
CW08	**Yellowjacket**	1	2	0.16	157.70	2.01	2007.40	0.1196
CW09	**Split Stream**	13	14	2.46	2460.61	6.78	6776.78	0.0631
CW10	**Crooked Tree**	1	2	0.04	40.24	0.94	940.56	0.2556
CW11	**Mudbug**	1	2	0.01	10.06	0.44	437.97	0.2603
CW12	**Appalachian Trail**	1	2	0.01	14.24	0.47	469.89	0.1596
CW13	**Kitchens**	1	2	0.04	36.31	0.88	876.16	0.0407
CW14	**Fork**	1	2	0.04	36.60	0.86	855.47	0.1100
CW15	**talking**	1	2	0.03	34.00	0.77	770.82	0.2137
CW16	**Basket**	1	2	0.06	64.73	1.23	1226.38	0.1962
CW17	**Rodo**	6	7	0.71	713.98	3.48	3482.93	0.0670
CW18	**Last**	1	2	0.05	48.56	1.08	1082.05	0.0300
CW19KT	**Coweeta Church Rd.**	98	99	18.35	18352.79	19.65	19651.30	0.0108
CW20HZ	**Coweeta @ FS**	90	91	16.69	16689.22	17.36	17364.79	0.0154
SK01	**Johnny's**	38	39	6.19	6190.85	11.80	11796.60	0.0092
SK02	**Dearl's**	3	4	0.82	819.32	4.15	4148.04	0.0146
SK03	**Crazy Horse**	38	39	6.12	6120.22	10.76	10764.78	0.0054
SK04	**Haunted**	2	3	0.46	455.04	3.39	3386.29	0.2062
SK05	**Hungry Dog**	18	19	2.71	2712.57	8.32	8318.12	0.0238
SK06	**Cowie**	25	26	3.90	3903.87	8.33	8329.99	0.0083
SK07	**Swiss Lady**	7	8	0.96	960.61	4.20	4197.73	0.0495
SK08	**Pear**	21	22	3.01	3007.31	7.07	7070.90	0.0162
SK09	**Broke Dog**	26	27	4.03	4026.90	9.64	9640.79	0.0200
SK10	**Beaver Stick**	99	100	16.99	16985.32	20.42	20424.76	0.0043
SK11	**Sticker**	5	6	1.27	1273.13	5.63	5625.39	0.0131

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Shreve Order*	*Shreve Order (+1)*	*Drainage Area (km^2)*	*Drainage Area (m^2)*	*Basin Perimeter (km)*	*Basin Perimeter (m)*	*Reach Gradient*
SK12	**Handshake**	47	48	8.09	8092.37	12.76	12760.69	0.0058
SK13	**Barking Dog**	105	106	17.90	17902.69	22.31	22312.76	0.0044
SK14	**Wasp Nest**	1	2	0.07	67.07	1.08	1077.53	0.1233
SK15	**Screamin' Meemie**	2	3	0.25	246.62	2.07	2071.67	0.0384
SK16	**Deer Snort**	1	2	0.07	65.11	0.99	993.57	0.0562
SK17	**Bullfrog**	1	2	0.15	148.25	1.57	1566.61	0.0020
SK18	**Trailer Park**	1	2	0.24	238.58	2.19	2185.93	0.0413
SK19	**Bearshit**	1	2	0.02	22.99	0.72	715.36	0.1109
SK20	**Widow**	1	2	0.20	197.40	1.86	1857.03	0.0516
SK21	**Growling**	1	2	0.12	124.73	1.81	1812.89	0.0638
SK22	**Friendly Dog**	2	3	0.29	294.99	2.23	2228.69	0.0267
SK23	**Udo's**	1	2	0.04	37.05	1.01	1010.38	0.0692
SK24KT	**Skeenah**	89	90	15.05	15052.23	17.73	17731.34	0.0053

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Drainage Density (LENGTH_TOT/ AREA) (km/km^2)*	*Constant of Channel Maintenance (m^2/m)*	*Stream Segment Numbers in Basin*	*Stream Frequency (SEG#/km^2)*	*Stream Length Longest Path of Segments (m)*	*Slope of Stream Length Longest Path of Segments (%)*
CW01	**Training**	3.0	0.34	91	10.61	4570.5	0.095
CW02	**Lawnmower Man**	3.0	0.33	73	9.44	4326.0	0.101
CW03	**Trampy**	3.2	0.31	56	11.67	3354.4	0.089
CW04	**Eye Poke**	3.5	0.28	12	10.94	1527.7	0.136
CW05	**Astroman**	3.2	0.31	200	11.23	6746.8	0.080
CW06	**Longtime**	4.0	0.25	1	12.67	375.9	0.086
CW07	**Punji**	3.9	0.25	1	8.96	452.3	0.316
CW08	**Yellowjacket**	4.0	0.25	1	6.34	543.6	0.282
CW09	**Split Stream**	3.4	0.29	27	10.97	2349.9	0.163
CW10	**Crooked Tree**	6.5	1.34	1	24.85	262.6	0.348
CW11	**Mudbug**	12.5	0.34	1	99.36	125.5	0.228
CW12	**Appalachian Trail**	10.6	0.47	1	70.23	151.0	0.294
CW13	**Kitchens**	2.8	0.36	1	27.54	248.6	0.031
CW14	**Fork**	6.8	1.22	1	27.32	249.7	0.290
CW15	**talking**	7.1	1.13	1	29.41	240.1	0.265
CW16	**Basket**	3.0	0.33	1	15.45	338.3	0.225
CW17	**Rodo**	2.7	0.36	11	15.41	1215.5	0.168
CW18	**Last**	2.1	0.47	1	20.59	290.2	0.192
CW19KT	**Coweeta Church Rd.**	3.2	0.32	204	11.12	6855.0	0.067
CW20HZ	**Coweeta @ FS**	3.2	0.31	185	11.09	6516.6	0.095
SK01	**Johnny's**	2.8	0.35	74	11.95	3841.9	0.084
SK02	**Dearl's**	2.2	0.45	5	6.10	1308.0	0.071
SK03	**Crazy Horse**	3.4	0.30	75	12.25	3818.5	0.038
SK04	**Haunted**	3.7	0.27	3	6.59	956.1	0.138
SK05	**Hungry Dog**	2.8	0.36	35	12.90	2475.2	0.120
SK06	**Cowie**	3.5	0.28	51	13.06	3005.1	0.057
SK07	**Swiss Lady**	3.2	0.31	13	13.53	1423.7	0.149

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Drainage Density (LENGTH_TOT/ AREA) (km/km^2)*	*Constant of Channel Maintenance (m^2/m)*	*Stream Segment Numbers in Basin*	*Stream Frequency (SEG#/km^2)*	*Stream Length Longest Path of Segments (m)*	*Slope of Stream Length Longest Path of Segments (%)*
SK08	**Pear**	3.6	0.28	41	13.63	2615.0	0.075
SK09	**Broke Dog**	2.9	0.35	49	12.17	3055.2	0.103
SK10	**Beaver Stick**	3.0	0.33	196	11.54	6577.9	0.019
SK11	**Sticker**	2.3	0.43	9	7.07	1654.2	0.041
SK12	**Handshake**	3.2	0.31	93	11.49	4431.3	0.032
SK13	**Barking Dog**	3.0	0.33	207	11.56	6764.9	0.015
SK14	**Wasp Nest**	2.3	0.43	1	14.91	344.7	0.155
SK15	**Screamin' Meemie**	3.2	0.31	3	12.16	689.9	0.043
SK16	**Deer Snort**	2.6	0.39	1	15.36	339.3	0.201
SK17	**Bullfrog**	2.2	0.45	1	6.75	526.0	0.046
SK18	**Trailer Park**	2.8	0.36	1	4.19	677.8	0.053
SK19	**Bearshit**	8.5	0.77	1	43.50	194.8	0.210
SK20	**Widow**	3.2	0.32	1	5.07	612.7	0.077
SK21	**Growling**	2.3	0.44	1	8.02	479.8	0.201
SK22	**Friendly Dog**	2.6	0.39	3	10.17	759.0	0.066
SK23	**Udo's**	6.8	1.23	1	26.99	251.3	0.098
SK24KT	**Skeenah**	3.0	0.33	173	11.49	6167.8	0.024

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Slope of Stream Length Longest Path of Segments (radians)*	*Stream Segment Average Length (m)*	*Total stream length(m)*	*Stream Segment Length Maximum (m)*	*Stream Segment Length Minimum (m)*
CW01	**Training**	0.314	281.0	25571.1	954.0	14.1
CW02	**Lawnmower Man**	0.324	316.5	23103.2	1134.8	30.0
CW03	**Trampy**	0.303	272.3	15247.2	1025.4	10.0
CW04	**Eye Poke**	0.377	322.9	3874.3	886.7	24.1
CW05	**Astroman**	0.287	282.8	56560.4	1821.7	14.1
CW06	**Longtime**	0.298	313.9	313.8	313.9	313.9
CW07	**Punji**	0.597	439.0	439.0	439.0	439.0
CW08	**Yellowjacket**	0.560	637.5	637.5	637.5	637.5
CW09	**Split Stream**	0.415	312.9	8449.1	971.1	76.6
CW10	**Crooked Tree**	0.631	130.6	130.6	130.6	130.6
CW11	**Mudbug**	0.498	34.7	34.7	34.7	34.7
CW12	**Appalachian Trail**	0.573	48.4	48.4	48.4	48.4
CW13	**Kitchens**	0.178	101.9	101.9	101.9	101.9
CW14	**Fork**	0.568	119.3	119.3	119.3	119.3
CW15	**talking**	0.541	111.2	111.2	111.2	111.2
CW16	**Basket**	0.495	195.6	195.6	195.6	195.6
CW17	**Rodo**	0.422	196.1	1961.4	325.6	20.0
CW18	**Last**	0.454	103.6	103.6	103.6	103.6
CW19KT	**Coweeta Church Rd.**	0.262	285.4	58217.6	1821.7	14.1
CW20HZ	**Coweeta @ FS**	0.314	289.5	53554.9	1821.7	14.1
SK01	**Johnny's**	0.293	235.8	17451.7	947.9	48.3
SK02	**Dearl's**	0.270	362.6	1813.1	945.7	124.9
SK03	**Crazy Horse**	0.196	276.3	20721.0	1388.1	41.2
SK04	**Haunted**	0.380	564.1	1692.2	947.9	217.8
SK05	**Hungry Dog**	0.354	216.0	7560.8	947.9	48.3
SK06	**Cowie**	0.240	271.2	13830.4	1148.1	41.2
SK07	**Swiss Lady**	0.397	235.8	3064.7	552.6	42.4
SK08	**Pear**	0.278	261.1	10706.2	1148.1	42.4
SK09	**Broke Dog**	0.327	234.8	11503.1	947.9	48.3

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Slope of Stream Length Longest Path of Segments (radians)*	*Stream Segment Average Length (m)*	*Total stream length(m)*	*Stream Segment Length Maximum (m)*	*Stream Segment Length Minimum (m)*
SK10	**Beaver Stick**	0.139	263.8	51705.8	1388.1	41.2
SK11	**Sticker**	0.203	331.2	2981.2	945.7	124.9
SK12	**Handshake**	0.179	282.4	26264.5	1388.1	41.2
SK13	**Barking Dog**	0.125	263.1	54470.6	1388.1	41.2
SK14	**Wasp Nest**	0.404	156.6	156.6	156.6	156.6
SK15	**Screamin' Meemie**	0.209	265.1	795.3	509.7	121.9
SK16	**Deer Snort**	0.465	166.6	166.6	166.6	166.6
SK17	**Bullfrog**	0.217	328.3	328.3	328.3	328.3
SK18	**Trailer Park**	0.231	658.4	658.4	658.4	658.4
SK19	**Bearshit**	0.476	76.5	76.5	76.5	76.5
SK20	**Widow**	0.282	625.8	625.8	625.8	625.8
SK21	**Growling**	0.465	283.1	283.1	283.1	283.1
SK22	**Friendly Dog**	0.260	254.4	763.1	377.5	90.7
SK23	**Udo's**	0.319	120.7	120.7	120.7	120.7
SK24KT	**Skeenah**	0.2	264.6	45770.8	1388.1	41.2

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Minimum Elevation Above MSL (m)*	*Maximum Elevation Above MSL (m)*	*Average Elevation Above MSL (m)*	*Basin Relief (m)*	*Basin Relief Ratio*	*Basin Relief Ratio*	*Relative Relief (m/km)*
CW01	**Training**	679	1592	995	913.0	0.1811	0.4011	67.70
CW02	**Lawnmower Man**	662	1501	997	839.0	0.1524	0.3534	62.94
CW03	**Trampy**	686	1124	885	438.0	0.1198	0.4809	44.84
CW04	**Eye Poke**	685	1057	823	372.0	0.2139	0.3836	82.94
CW05	**Astroman**	658	1592	970	934.0	0.1401	0.6651	51.07
CW06	**Longtime**	714	969	814	254.3	0.3809	0.7003	171.73
CW07	**Punji**	714	1007	833	293.3	0.4153	0.5665	145.11
CW08	**Yellowjacket**	850	1099	998	248.6	0.2881	0.5014	123.86
CW09	**Split Stream**	810	1465	1070	655.2	0.2310	0.6767	96.69
CW10	**Crooked Tree**	743	899	819	156.2	0.3922	0.7574	166.10
CW11	**Mudbug**	748	836	780	88.1	0.4720	1.0831	201.20
CW12	**Appalachian Trail**	1351	1488	1410	136.9	0.7804	0.4693	291.24
CW13	**Kitchens**	890	967	927	77.4	0.2045	0.7734	88.32
CW14	**Fork**	773	949	853	175.5	0.4880	0.8717	205.15
CW15	**talking**	960	1147	1053	186.9	0.5859	0.7571	242.50
CW16	**Basket**	957	1215	1077	258.1	0.4718	0.5754	210.45
CW17	**Rodo**	721	1074	888	353.0	0.2961	0.5741	101.35
CW18	**Last**	730	859	801	128.1	0.2950	0.3643	118.40
CW19KT	**Coweeta Church Rd.**	646	1592	959	945.7	0.1270	0.4175	48.12
CW20HZ	**Coweeta @ FS**	671	1592	986	920.9	0.1644	0.3670	53.03
SK01	**Johnny's**	637	1113	783	476.0	0.1288	0.3759	40.35
SK02	**Dearl's**	652	892	724	240.0	0.1348	0.3217	57.86
SK03	**Crazy Horse**	639	1084	747	445.0	0.1000	0.5159	41.34
SK04	**Haunted**	749	1113	943	364.0	0.2434	0.4464	107.49
SK05	**Hungry Dog**	670	1113	796	443.0	0.1864	0.3732	53.26
SK06	**Cowie**	649	1084	778	435.0	0.1329	0.5128	52.22
SK07	**Swiss Lady**	704	1084	851	380.0	0.2407	0.4091	90.53
SK08	**Pear**	658	1084	795	426.0	0.1582	0.4117	60.25

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Minimum Elevation Above MSL (m)*	*Maximum Elevation Above MSL (m)*	*Average Elevation Above MSL (m)*	*Basin Relief (m)*	*Basin Relief Ratio*	*Basin Relief Ratio*	*Relative Relief (m/km)*
SK09	**Broke Dog**	654	1113	794	459.0	0.1601	0.2725	47.61
SK10	**Beaver Stick**	621	1113	738	492.0	0.0725	0.3215	24.09
SK11	**Sticker**	638	892	703	254.0	0.0999	0.2979	45.15
SK12	**Handshake**	633	1084	732	451.0	0.0861	0.2561	35.34
SK13	**Barking Dog**	618	1113	733	495.0	0.0642	0.6584	22.18
SK14	**Wasp Nest**	744	892	811	148.0	0.3744	0.3278	137.35
SK15	**Screamin' Meemie**	641	734	680	93.3	0.1037	0.6476	45.06
SK16	**Deer Snort**	736	880	789	144.0	0.3640	0.2929	144.93
SK17	**Bullfrog**	621	672	645	50.5	0.0834	0.4112	32.25
SK18	**Trailer Park**	633	794	679	160.3	0.1598	0.6832	73.32
SK19	**Bearshit**	755	886	797	130.2	0.3985	0.5055	182.03
SK20	**Widow**	658	818	726	159.4	0.2345	0.5686	85.82
SK21	**Growling**	721	965	830	244.1	0.2900	0.3541	134.66
SK22	**Friendly Dog**	644	748	689	104.1	0.1202	0.5016	46.71
SK23	**Udo's**	694	794	746	100.6	0.2312	0.2950	99.54
SK24KT	**Skeenah**	631	1113	749	482.4	0.0845	0.0000	27.21

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Basin Length (km)*	*Basin Length (m)*	*Drainage Shape*	*Drainage Shape*	*Shreve Bifurcation Ratio*	*Shreve Bifurcation Ratio*
CW01	**Training**	5.04	5040.34	0.3376	0.6200	0.94	1.94
CW02	**Lawnmower Man**	5.50	5503.56	0.2554	0.5298	1.03	2.03
CW03	**Trampy**	3.66	3657.50	0.3587	0.6422	0.87	1.87
CW04	**Eye Poke**	1.74	1738.73	0.3627	0.6463	1.40	2.40
CW05	**Astroman**	6.67	6667.55	0.4007	0.6854	0.90	1.90
CW06	**Longtime**	0.67	667.73	0.1770	0.4342	n/a	1.00
CW07	**Punji**	0.71	706.14	0.2239	0.4929	n/a	1.00
CW08	**Yellowjacket**	0.86	863.12	0.2117	0.4781	n/a	1.00
CW09	**Split Stream**	2.84	2835.89	0.3060	0.5861	0.93	1.93
CW10	**Crooked Tree**	0.40	398.38	0.2535	0.5277	n/a	1.00
CW11	**Mudbug**	0.19	186.69	0.2888	0.5673	n/a	1.00
CW12	**Appalachian Trail**	0.18	175.36	0.4630	0.7484	n/a	1.00
CW13	**Kitchens**	0.38	378.32	0.2537	0.5278	n/a	1.00
CW14	**Fork**	0.36	359.66	0.2830	0.5609	n/a	1.00
CW15	**talking**	0.32	319.05	0.3341	0.6162	n/a	1.00
CW16	**Basket**	0.55	547.08	0.2163	0.4837	n/a	1.00
CW17	**Rodo**	1.19	1192.12	0.5024	0.7878	1.20	2.20
CW18	**Last**	0.43	434.31	0.2574	0.5321	n/a	1.00
CW19KT	**Coweeta Church Rd.**	7.45	7447.44	0.3309	0.6129	0.92	1.92
CW20HZ	**Coweeta @ FS**	5.60	5600.21	0.5321	0.8176	0.95	1.95
SK01	**Johnny's**	3.70	3696.86	0.4530	0.7383	1.06	2.06
SK02	**Dearl's**	1.78	1781.01	0.2583	0.5331	1.50	2.50
SK03	**Crazy Horse**	4.45	4450.80	0.3090	0.5894	1.03	2.03
SK04	**Haunted**	1.50	1495.76	0.2034	0.4679	2.00	3.00
SK05	**Hungry Dog**	2.38	2376.85	0.4802	0.7655	1.06	2.06
SK06	**Cowie**	3.27	3271.94	0.3647	0.6483	0.96	1.96
SK07	**Swiss Lady**	1.58	1578.67	0.3854	0.6698	1.17	2.17
SK08	**Pear**	2.69	2692.42	0.4149	0.6998	1.05	2.05
SK09	**Broke Dog**	2.87	2866.14	0.4902	0.7756	1.13	2.13

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Basin Length (km)*	*Basin Length (m)*	*Drainage Shape*	*Drainage Shape*	*Shreve Bifurcation Ratio*	*Shreve Bifurcation Ratio*
SK10	**Beaver Stick**	6.79	6790.44	0.3684	0.6522	1.02	2.02
SK11	**Sticker**	2.54	2543.23	0.1968	0.4597	1.25	2.25
SK12	**Handshake**	5.24	5235.93	0.2952	0.5744	1.02	2.02
SK13	**Barking Dog**	7.71	7714.69	0.3008	0.5805	1.03	2.03
SK14	**Wasp Nest**	0.40	395.29	0.4292	0.7144	n/a	1.00
SK15	**Screamin' Meemie**	0.90	900.35	0.3042	0.5842	2.00	3.00
SK16	**Deer Snort**	0.40	395.66	0.4159	0.7009	n/a	1.00
SK17	**Bullfrog**	0.61	606.10	0.4036	0.6884	n/a	1.00
SK18	**Trailer Park**	1.00	1003.05	0.2371	0.5086	n/a	1.00
SK19	**Bearshit**	0.33	326.77	0.2153	0.4825	n/a	1.00
SK20	**Widow**	0.68	679.62	0.4274	0.7125	n/a	1.00
SK21	**Growling**	0.84	841.91	0.1760	0.4329	n/a	1.00
SK22	**Friendly Dog**	0.87	865.80	0.3935	0.6781	2.00	3.00
SK23	**Udo's**	0.44	435.03	0.1958	0.4583	n/a	1.00
SK24KT	**Skeenah**	5.71	5706.48	0.4622	0.7	1.06	2.06

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Percent of First Order Streams to the Total Number of Streams (%)*	*Percent of First Order Streams to the Total Number of Streams (radians)*	*Ruggedness Number (degrees)*	*Ruggedness Number (Radians)*
CW01	**Training**	0.48	0.77	306.20	5.34
CW02	**Lawnmower Man**	0.51	0.79	280.91	4.90
CW03	**Trampy**	0.46	0.75	137.85	2.41
CW04	**Eye Poke**	0.58	0.87	105.29	1.84
CW05	**Astroman**	0.48	0.76	294.15	5.13
CW06	**Longtime**	1.00	1.57	63.94	1.12
CW07	**Punji**	1.00	1.57	74.59	1.30
CW08	**Yellowjacket**	1.00	1.57	61.51	1.07
CW09	**Split Stream**	0.48	0.77	190.82	3.33
CW10	**Crooked Tree**	1.00	1.57	23.94	0.42
CW11	**Mudbug**	1.00	1.57	7.07	0.12
CW12	**Appalachian Trail**	1.00	1.57	12.91	0.23
CW13	**Kitchens**	1.00	1.57	27.57	0.48
CW14	**Fork**	1.00	1.57	25.73	0.45
CW15	**talking**	1.00	1.57	26.48	0.46
CW16	**Basket**	1.00	1.57	85.42	1.49
CW17	**Rodo**	0.55	0.83	128.50	2.24
CW18	**Last**	1.00	1.57	60.02	1.05
CW19KT	**Coweeta Church Rd.**	0.48	0.77	298.11	5.20
CW20HZ	**Coweeta @ FS**	0.49	0.77	286.96	5.01
SK01	**Johnny's**	0.51	0.80	168.86	2.95
SK02	**Dearl's**	0.60	0.89	108.45	1.89
SK03	**Crazy Horse**	0.51	0.79	131.44	2.29
SK04	**Haunted**	0.67	0.96	97.88	1.71
SK05	**Hungry Dog**	0.51	0.80	158.93	2.77
SK06	**Cowie**	0.49	0.78	122.79	2.14
SK07	**Swiss Lady**	0.54	0.82	119.11	2.08
SK08	**Pear**	0.51	0.80	119.66	2.09

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Percent of First Order Streams to the Total Number of Streams(%)*	*Percent of First Order Streams to the Total Number of Streams (radians)*	*Ruggedness Number (degrees)*	*Ruggedness Number (Radians)*
SK09	**Broke Dog**	0.53	0.82	160.68	2.80
SK10	**Beaver Stick**	0.51	0.79	161.62	2.82
SK11	**Sticker**	0.56	0.84	108.47	1.89
SK12	**Handshake**	0.51	0.79	138.96	2.43
SK13	**Barking Dog**	0.51	0.79	162.69	2.84
SK14	**Wasp Nest**	1.00	1.57	63.40	1.11
SK15	**Screamin' Meemie**	0.67	0.96	28.95	0.51
SK16	**Deer Snort**	1.00	1.57	56.29	0.98
SK17	**Bullfrog**	1.00	1.57	22.81	0.40
SK18	**Trailer Park**	1.00	1.57	58.08	1.01
SK19	**Bearshit**	1.00	1.57	15.36	0.27
SK20	**Widow**	1.00	1.57	50.27	0.88
SK21	**Growling**	1.00	1.57	107.55	1.88
SK22	**Friendly Dog**	0.67	0.96	40.24	0.70
SK23	**Udo's**	1.00	1.57	14.83	0.26
SK24KT	**Skeenah**	0.51	0.80	158.66	2.77

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Melton Ruggedness Number 1958*	*Melton Ruggedness Number 1957*	*Ground Slope*	*Minimum Basin Slope (%)*	*Maximum Basin Slope (%)*	*Average Basin Slope (%)*
CW01	**Training**	0.31	2722.32	5444.64	0.00	187.12	49.59
CW02	**Lawnmower Man**	0.30	2505.84	5011.68	0.00	172.02	46.86
CW03	**Trampy**	0.20	1391.65	2783.30	0.00	119.09	36.36
CW04	**Eye Poke**	0.36	1314.37	2628.74	0.00	93.01	33.77
CW05	**Astroman**	0.22	2965.69	5931.38	0.00	187.12	48.16
CW06	**Longtime**	0.91	1011.54	2023.08	3.06	94.00	40.39
CW07	**Punji**	0.88	1153.02	2306.03	3.64	105.79	41.51
CW08	**Yellowjacket**	0.63	1005.13	2010.25	3.54	111.19	38.45
CW09	**Split Stream**	0.42	2249.85	4499.71	0.84	158.30	51.29
CW10	**Crooked Tree**	0.78	1019.49	2038.99	4.99	113.43	50.58
CW11	**Mudbug**	0.88	1098.71	2197.42	9.21	78.51	43.62
CW12	**Appalachian Trail**	1.15	1450.92	2901.85	3.39	71.48	36.00
CW13	**Kitchens**	0.41	217.21	434.42	0.50	54.66	26.16
CW14	**Fork**	0.92	1197.06	2394.13	1.47	101.37	51.78
CW15	**talking**	1.01	1319.57	2639.13	4.11	157.39	63.63
CW16	**Basket**	1.01	779.77	1559.53	9.87	110.18	55.62
CW17	**Rodo**	0.42	969.73	1939.45	1.77	127.48	46.90
CW18	**Last**	0.58	273.44	546.88	2.98	98.15	42.97
CW19KT	**Coweeta Church Rd.**	0.22	2999.76	5999.52	0.16	193.32	47.21
CW20HZ	**Coweeta @ FS**	0.23	2954.96	5909.93	0.16	193.32	49.12
SK01	**Johnny's**	0.19	1341.82	2683.64	0.00	122.73	32.23
SK02	**Dearl's**	0.27	531.10	1062.19	0.00	92.50	28.08
SK03	**Crazy Horse**	0.18	1506.62	3013.24	0.00	108.87	28.82
SK04	**Haunted**	0.54	1353.60	2707.20	0.00	90.50	33.26
SK05	**Hungry Dog**	0.27	1234.79	2469.57	0.00	109.33	32.93
SK06	**Cowie**	0.22	1541.10	3082.20	0.00	108.87	32.76
SK07	**Swiss Lady**	0.39	1212.35	2424.70	0.00	97.37	36.57
SK08	**Pear**	0.25	1516.59	3033.18	0.00	108.87	34.31

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Melton Ruggedness Number 1958*	*Melton Ruggedness Number 1957*	*Ground Slope*	*Minimum Basin Slope (%)*	*Maximum Basin Slope (%)*	*Average Basin Slope (%)*
SK09	**Broke Dog**	0.23	1311.17	2622.34	0.00	109.33	32.06
SK10	**Beaver Stick**	0.12	1497.72	2995.44	0.00	122.73	26.90
SK11	**Sticker**	0.23	594.77	1189.55	0.00	92.50	24.14
SK12	**Handshake**	0.16	1463.76	2927.52	0.00	108.87	26.87
SK13	**Barking Dog**	0.12	1506.08	3012.17	0.00	122.73	26.35
SK14	**Wasp Nest**	0.57	345.51	691.01	6.37	81.34	39.27
SK15	**Screamin' Meemie**	0.19	301.00	601.99	0.24	88.01	23.51
SK16	**Deer Snort**	0.56	368.37	736.73	5.30	65.79	39.36
SK17	**Bullfrog**	0.13	111.87	223.74	0.00	40.00	12.97
SK18	**Trailer Park**	0.33	442.29	884.58	0.06	70.58	22.68
SK19	**Bearshit**	0.86	1103.84	2207.68	1.85	68.47	29.99
SK20	**Widow**	0.36	505.21	1010.42	0.64	90.21	35.21
SK21	**Growling**	0.69	554.17	1108.34	3.48	102.54	34.31
SK22	**Friendly Dog**	0.19	269.27	538.54	0.26	76.93	22.49
SK23	**Udo's**	0.52	682.09	1364.18	2.71	90.16	27.37
SK24KT	**Skeenah**	0.12	1467.00	2934.00	0.00	134.02	28.43

APPENDIX C: Site Data (Continued)

Site ID	Site Name	Average	Standard Deviation	2 Standard Deviations	*Pixel Slope* 3 Standard Deviations	(99th)	(95th)	(90th)
CW01	**Training**	49.66	21.99	31.10	38.08	113.15	90.16	78.76
CW02	**Lawnmower Man**	47.03	20.48	28.97	35.48	100.00	82.33	73.85
CW03	**Trampy**	36.50	16.10	22.77	27.89	81.49	65.41	57.55
CW04	**Eye Poke**	33.89	15.95	22.55	27.62	72.15	60.42	54.83
CW05	**Astroman**	48.21	22.01	31.13	38.13	108.93	87.32	77.18
CW06	**Longtime**	38.23	15.58	22.03	26.98	68.10	61.55	57.80
CW07	**Punji**	44.41	16.44	23.24	28.47	98.06	75.93	65.00
CW08	**Yellowjacket**	39.17	16.95	23.97	29.36	85.09	70.38	61.85
CW09	**Split Stream**	51.52	20.67	29.23	35.80	106.89	88.39	79.16
CW10	**Crooked Tree**	54.09	15.34	21.70	26.57	90.71	79.08	74.18
CW11	**Mudbug**	50.58	11.26	15.92	19.50	71.97	68.78	65.50
CW12	**Appalachian Trail**	38.09	12.34	17.46	21.38	60.00	56.85	52.15
CW13	**Kitchens**	26.48	8.83	12.49	15.30	50.08	41.76	38.93
CW14	**Fork**	57.50	17.88	25.29	30.98	89.80	84.92	79.47
CW15	**talking**	67.36	22.03	31.15	38.15	113.87	108.46	100.12
CW16	**Basket**	59.33	19.27	27.25	33.37	105.80	90.76	82.83
CW17	**Rodo**	47.21	17.19	24.31	29.77	97.56	76.90	68.01
CW18	**Last**	44.04	17.88	25.29	30.97	89.51	78.70	71.26
CW19KT	**Coweeta Church Rd.**	47.48	22.25	31.47	38.54	108.54	86.96	76.69
CW20HZ	**Coweeta @ FS**	49.19	21.73	30.73	37.64	109.73	87.91	77.80
SK01	**Johnny's**	32.30	15.97	22.58	27.65	77.22	60.05	53.06
SK02	**Dearl's**	28.26	13.84	19.57	23.97	63.32	50.90	45.00
SK03	**Crazy Horse**	28.92	16.14	22.82	27.95	71.17	57.72	50.25
SK04	**Haunted**	33.27	14.20	20.08	24.60	76.49	59.82	52.23
SK05	**Hungry Dog**	33.08	15.68	22.17	27.16	75.21	60.83	53.97
SK06	**Cowie**	32.88	16.06	22.71	27.82	74.33	61.49	54.46
SK07	**Swiss Lady**	36.92	14.74	20.85	25.53	73.75	62.65	56.65
SK08	**Pear**	34.43	16.08	22.74	27.85	75.22	63.37	56.26

APPENDIX C: Site Data (Continued)

Site ID	Site Name	Average	Standard Deviation	2 Standard Deviations	*Pixel Slope* 3 Standard Deviations	(99th)	(95th)	(90th)
SK09	**Broke Dog**	32.13	15.16	21.44	26.26	73.85	59.00	52.02
SK10	**Beaver Stick**	26.95	16.43	23.24	28.46	71.26	56.18	49.02
SK11	**Sticker**	24.29	13.64	19.30	23.63	60.21	47.76	42.19
SK12	**Handshake**	26.93	15.94	22.55	27.61	69.51	55.48	48.25
SK13	**Barking Dog**	26.41	16.40	23.20	28.41	71.04	55.51	48.54
SK14	**Wasp Nest**	40.52	12.19	17.24	21.11	70.19	59.41	55.23
SK15	**Screamin' Meemie**	24.27	13.53	19.14	23.44	60.14	48.99	43.34
SK16	**Deer Snort**	42.35	13.63	19.28	23.61	72.72	62.17	59.40
SK17	**Bullfrog**	13.24	6.85	9.69	11.86	33.14	24.04	21.87
SK18	**Trailer Park**	22.58	14.40	20.36	24.93	61.98	51.27	43.66
SK19	**Bearshit**	37.60	9.29	13.14	16.09	59.50	51.75	48.54
SK20	**Widow**	36.90	15.20	21.50	26.34	76.37	62.77	56.18
SK21	**Growling**	39.02	18.20	25.74	31.52	80.14	71.07	65.69
SK22	**Friendly Dog**	22.59	14.30	20.23	24.77	62.57	50.62	43.04
SK23	**Udo's**	26.75	11.23	15.88	19.45	52.58	43.91	41.13
SK24KT	**Skeenah**	28.6	16.3	23.1	28.2	72.6	57.1	50.0

APPENDIX C: Site Data (Continued)

Site ID	Site Name	Pixel Slope			Segment Slope		
		(85th)	(75th)	(66th)	Average	(99th)	(95th)
CW01	Training	71.26	61.87	55.90	0.20	0.47	0.43
CW02	Lawnmower Man	67.75	59.63	54.08	0.20	0.46	0.35
CW03	Trampy	52.74	46.10	41.42	0.15	0.33	0.29
CW04	Eye Poke	50.65	44.34	40.35	0.16	0.36	0.33
CW05	Astroman	70.64	61.36	55.23	0.18	0.46	0.39
CW06	Longtime	54.83	50.31	46.29	0.09	0.09	0.09
CW07	Punji	58.78	52.47	48.25	0.32	0.32	0.32
CW08	Yellowjacket	56.48	49.50	44.19	0.28	0.28	0.28
CW09	Split Stream	73.34	64.52	58.36	0.21	0.40	0.32
CW10	Crooked Tree	70.80	64.35	60.28	0.35	0.35	0.35
CW11	Mudbug	61.85	57.57	55.48	0.23	0.23	0.23
CW12	Appalachian Trail	49.81	46.04	43.66	0.29	0.29	0.29
CW13	Kitchens	36.44	32.55	29.33	0.03	0.03	0.03
CW14	Fork	75.21	70.78	65.62	0.29	0.29	0.29
CW15	talking	90.44	82.54	75.17	0.27	0.27	0.27
CW16	Basket	78.32	71.96	66.75	0.23	0.23	0.23
CW17	Rodo	63.29	57.55	53.68	0.20	0.33	0.31
CW18	Last	63.82	53.83	48.54	0.19	0.19	0.19
CW19KT	Coweeta Church Rd.	70.04	60.88	54.83	0.18	0.46	0.39
CW20HZ	Coweeta @ FS	71.17	61.97	56.15	0.19	0.46	0.42
SK01	Johnny's	48.64	42.02	37.46	0.11	0.27	0.20
SK02	Dearl's	41.91	37.29	34.32	0.10	0.18	0.17
SK03	Crazy Horse	45.96	39.53	35.09	0.09	0.23	0.21
SK04	Haunted	47.60	40.81	36.40	0.17	0.21	0.20
SK05	Hungry Dog	49.53	42.76	38.08	0.11	0.19	0.18
SK06	Cowie	49.62	43.16	38.93	0.11	0.24	0.22
SK07	Swiss Lady	52.20	46.40	42.72	0.16	0.26	0.24
SK08	Pear	51.39	44.76	40.31	0.12	0.25	0.22
SK09	Broke Dog	47.76	41.23	36.91	0.11	0.26	0.19

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Pixel Slope* (85th)	*Pixel Slope* (75th)	*Pixel Slope* (66th)	*Segment Slope* Average	*Segment Slope* (99th)	*Segment Slope* (95th)
SK10	**Beaver Stick**	44.30	37.50	33.02	0.08	0.26	0.20
SK11	**Sticker**	38.93	33.96	30.00	0.07	0.18	0.17
SK12	**Handshake**	43.91	37.46	33.02	0.08	0.22	0.21
SK13	**Barking Dog**	43.77	37.17	32.26	0.08	0.26	0.20
SK14	**Wasp Nest**	52.64	48.47	45.17	0.17	0.17	0.17
SK15	**Screamin' Meemie**	39.16	32.88	28.56	0.06	0.09	0.09
SK16	**Deer Snort**	56.60	51.43	49.02	0.33	0.33	0.33
SK17	**Bullfrog**	20.07	17.74	15.21	0.04	0.04	0.04
SK18	**Trailer Park**	38.08	30.87	26.28	0.07	0.07	0.07
SK19	**Bearshit**	46.40	42.76	40.81	0.21	0.21	0.21
SK20	**Widow**	52.35	47.60	43.05	0.12	0.12	0.12
SK21	**Growling**	60.88	51.75	46.27	0.18	0.18	0.18
SK22	**Friendly Dog**	38.32	30.92	26.98	0.08	0.12	0.12
SK23	**Udo's**	38.81	35.71	32.50	0.10	0.10	0.10
SK24KT	**Skeenah**	45.4	39.1	34.8	0.1	0.3	0.2

APPENDIX C: Site Data (Continued)

	Variable:	*Segment Slope*				*Segment Thread*	
Site ID	**Site Name**	(90th)	(85th)	(75th)	(66th)	Total	Average
CW01	**Training**	0.35	0.32	0.27	0.25	141118.04	1550.75
CW02	**Lawnmower Man**	0.31	0.30	0.28	0.26	130955.77	1793.91
CW03	**Trampy**	0.26	0.25	0.24	0.20	565.06	565.06
CW04	**Eye Poke**	0.29	0.26	0.23	0.18	21906.45	811.35
CW05	**Astroman**	0.32	0.29	0.25	0.22	423286.61	2116.43
CW06	**Longtime**	0.09	0.09	0.09	0.09	313.85	313.85
CW07	**Punji**	0.32	0.32	0.09	0.09	438.99	438.99
CW08	**Yellowjacket**	0.28	0.28	0.09	0.09	637.49	637.49
CW09	**Split Stream**	0.30	0.29	0.27	0.25	21906.45	811.35
CW10	**Crooked Tree**	0.35	0.35	0.09	0.09	130.60	130.60
CW11	**Mudbug**	0.23	0.23	0.09	0.09	34.73	34.73
CW12	**Appalachian Trail**	0.29	0.29	0.09	0.09	48.39	48.39
CW13	**Kitchens**	0.03	0.03	0.09	0.09	57.69	57.69
CW14	**Fork**	0.29	0.29	0.09	0.09	119.29	119.29
CW15	**talking**	0.27	0.27	0.09	0.09	111.19	111.19
CW16	**Basket**	0.23	0.23	0.09	0.09	177.96	177.96
CW17	**Rodo**	0.27	0.27	0.25	0.24	4256.71	386.97
CW18	**Last**	0.19	0.19	0.09	0.09	93.68	93.68
CW19KT	**Coweeta Church Rd.**	0.32	0.29	0.25	0.22	30612.49	1133.80
CW20HZ	**Coweeta @ FS**	0.32	0.29	0.26	0.23	31563.41	1169.02
SK01	**Johnny's**	0.18	0.18	0.16	0.14	90658.71	1225.12
SK02	**Dearl's**	0.17	0.17	0.17	0.14	3542.88	708.58
SK03	**Crazy Horse**	0.19	0.17	0.14	0.10	95489.46	1273.19
SK04	**Haunted**	0.20	0.19	0.18	0.17	2115.39	705.13
SK05	**Hungry Dog**	0.18	0.17	0.16	0.14	26582.89	759.51
SK06	**Cowie**	0.21	0.19	0.16	0.14	49048.87	961.74
SK07	**Swiss Lady**	0.22	0.22	0.21	0.19	5417.66	416.74
SK08	**Pear**	0.21	0.19	0.17	0.15	31786.24	775.27
SK09	**Broke Dog**	0.18	0.17	0.16	0.15	47584.77	971.12

APPENDIX C: Site Data (Continued)

	Variable:	*Segment Slope*				*Segment Thread*	
Site ID	**Site Name**	(90^{th})	(85^{th})	(75^{th})	(66^{th})	Total	Average
SK10	**Beaver Stick**	0.18	0.16	0.14	0.10	406244.98	2072.68
SK11	**Sticker**	0.17	0.15	0.08	0.07	7647.13	849.68
SK12	**Handshake**	0.18	0.17	0.12	0.08	141106.60	1517.28
SK13	**Barking Dog**	0.18	0.16	0.13	0.10	506500.53	2446.86
SK14	**Wasp Nest**	0.17	0.17	0.17	0.17	127.52	127.52
SK15	**Screamin' Meemie**	0.09	0.08	0.08	0.07	1271.00	423.67
SK16	**Deer Snort**	0.33	0.33	0.33	0.33	9.15	9.15
SK17	**Bullfrog**	0.04	0.04	0.04	0.04	287.34	287.34
SK18	**Trailer Park**	0.07	0.07	0.07	0.07	562.23	562.23
SK19	**Bearshit**	0.21	0.21	0.21	0.21	76.47	76.47
SK20	**Widow**	0.12	0.12	0.12	0.12	425.76	425.76
SK21	**Growling**	0.18	0.18	0.18	0.18	274.59	274.59
SK22	**Friendly Dog**	0.11	0.11	0.09	0.08	987.24	329.08
SK23	**Udo's**	0.10	0.10	0.10	0.10	120.69	120.69
SK24KT	**Skeenah**	0.2	0.2	0.1	0.1	294131.3	1700.2

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*NLCD Percent Land Cover* Barren land	*NLCD Percent Land Cover* cultivated crops	*NLCD Percent Land Cover* deciduous forest	*NLCD Percent Land Cover* Developed low intensity	*NLCD Percent Land Cover* Developed open spaces
CW01	**Training**	0.00	0.00	94.90	0.00	1.47
CW02	**Lawnmower Man**	0.00	0.00	95.61	0.00	0.69
CW03	**Trampy**	0.00	0.00	96.51	0.00	0.68
CW04	**Eye Poke**	0.00	0.00	97.61	0.00	0.00
CW05	**Astroman**	0.00	0.00	93.94	0.00	2.37
CW06	**Longtime**	0.00	0.00	100.00	0.00	0.00
CW07	**Punji**	0.00	0.00	99.67	0.00	0.00
CW08	**Yellowjacket**	0.00	0.00	99.71	0.00	0.00
CW09	**Split Stream**	0.00	0.00	96.25	0.00	3.58
CW10	**Crooked Tree**	0.00	0.00	100.00	0.00	0.00
CW11	**Mudbug**	0.00	0.00	100.00	0.00	0.00
CW12	**Appalachian Trail**	0.00	0.00	100.00	0.00	0.00
CW13	**Kitchens**	0.00	0.00	100.00	0.00	0.00
CW14	**Fork**	0.00	0.00	99.82	0.00	0.18
CW15	**talking**	0.00	0.00	74.92	0.00	25.08
CW16	**Basket**	0.00	0.00	93.96	0.00	6.04
CW17	**Rodo**	0.00	0.00	97.18	0.00	0.00
CW18	**Last**	0.00	0.00	100.00	0.00	0.00
CW19KT	**Coweeta Church Rd.**	0.00	0.00	93.17	0.00	2.57
CW20HZ	**Coweeta @ FS**	0.00	0.00	95.06	0.00	1.81
SK01	**Johnny's**	0.08	0.00	86.06	0.08	3.60
SK02	**Dearl's**	0.00	0.00	66.91	0.00	5.72
SK03	**Crazy Horse**	0.00	0.00	77.75	0.00	4.33
SK04	**Haunted**	0.00	0.00	100.00	0.00	0.00
SK05	**Hungry Dog**	0.00	0.00	87.10	0.00	3.46
SK06	**Cowie**	0.00	0.00	82.52	0.00	4.56
SK07	**Swiss Lady**	0.00	0.00	95.36	0.00	2.26
SK08	**Pear**	0.00	0.00	85.35	0.00	4.38

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*NLCD Percent Land Cover* barren land	*NLCD Percent Land Cover* cultivated crops	*NLCD Percent Land Cover* deciduous forest	*NLCD Percent Land Cover* Developed low intensity	*NLCD Percent Land Cover* Developed open spaces
SK09	**Broke Dog**	0.00	0.00	87.63	0.03	3.20
SK10	**Beaver Stick**	0.03	0.38	71.46	0.12	5.49
SK11	**Sticker**	0.00	0.00	56.57	0.00	6.45
SK12	**Handshake**	0.00	0.00	71.55	0.00	5.27
SK13	**Barking Dog**	0.03	0.38	69.88	0.47	6.19
SK14	**Wasp Nest**	0.00	0.00	98.65	0.00	0.00
SK15	**Screamin' Meemie**	0.00	0.00	61.59	0.00	5.48
SK16	**Deer Snort**	0.00	0.00	100.00	0.00	0.00
SK17	**Bullfrog**	0.00	1.46	38.49	18.05	22.56
SK18	**Trailer Park**	0.00	0.00	66.42	2.48	13.30
SK19	**Bearshit**	0.00	0.00	100.00	0.00	0.00
SK20	**Widow**	0.00	0.00	95.52	0.00	0.00
SK21	**Growling**	0.00	0.00	99.07	0.00	0.00
SK22	**Friendly Dog**	0.00	0.00	78.36	0.00	4.39
SK23	**Udo's**	0.00	0.00	69.37	0.00	22.33
SK24KT	**Skeenah**	0.03	0.05	76.45	0.08	4.85

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*NLCD Percent Land Cover* evergreen forest	*NLCD Percent Land Cover* grassland/herbaceous	*NLCD Percent Land Cover* mixed forest	*NLCD Percent Land Cover* open water	*NLCD Percent Land Cover* pasture/hay
CW01	**Training**	1.93	0.00	0.56	0.00	0.36
CW02	**Lawnmower Man**	0.03	0.43	0.10	0.00	1.65
CW03	**Trampy**	1.58	0.05	0.06	0.00	0.68
CW04	**Eye Poke**	0.90	0.30	0.30	0.00	0.69
CW05	**Astroman**	1.63	0.08	0.62	0.00	0.61
CW06	**Longtime**	0.00	0.00	0.00	0.00	0.00
CW07	**Punji**	0.03	0.00	0.30	0.00	0.00
CW08	**Yellowjacket**	0.00	0.00	0.29	0.00	0.00
CW09	**Split Stream**	0.00	0.00	0.10	0.00	0.00
CW10	**Crooked Tree**	0.00	0.00	0.00	0.00	0.00
CW11	**Mudbug**	0.00	0.00	0.00	0.00	0.00
CW12	**Appalachian Trail**	0.00	0.00	0.00	0.00	0.00
CW13	**Kitchens**	0.00	0.00	0.00	0.00	0.00
CW14	**Fork**	0.00	0.00	0.00	0.00	0.00
CW15	**talking**	0.00	0.00	0.00	0.00	0.00
CW16	**Basket**	0.00	0.00	0.00	0.00	0.00
CW17	**Rodo**	1.41	0.00	1.41	0.00	0.00
CW18	**Last**	0.00	0.00	0.00	0.00	0.00
CW19KT	**Coweeta Church Rd.**	1.62	0.14	0.64	0.00	1.03
CW20HZ	**Coweeta @ FS**	1.71	0.01	0.56	0.00	0.25
SK01	**Johnny's**	0.93	1.97	0.96	0.00	4.89
SK02	**Dearl's**	3.00	1.09	2.08	0.00	17.43
SK03	**Crazy Horse**	1.23	1.39	1.29	0.11	12.51
SK04	**Haunted**	0.00	0.00	0.00	0.00	0.00
SK05	**Hungry Dog**	0.57	2.05	0.86	0.00	4.29
SK06	**Cowie**	0.62	0.89	0.96	0.00	8.85
SK07	**Swiss Lady**	0.00	0.55	0.41	0.00	1.42
SK08	**Pear**	0.18	0.96	0.77	0.00	6.81

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*NLCD Percent Land Cover* evergreen forest	*NLCD Percent Land Cover* grassland/herbaceous	*NLCD Percent Land Cover* mixed forest	*NLCD Percent Land Cover* open water	*NLCD Percent Land Cover* pasture/hay
SK09	**Broke Dog**	0.96	1.70	1.22	0.00	3.80
SK10	**Beaver Stick**	1.86	2.67	1.17	0.04	14.85
SK11	**Sticker**	3.39	3.67	2.40	0.00	23.93
SK12	**Handshake**	1.61	2.05	1.39	0.08	16.11
SK13	**Barking Dog**	1.84	2.73	1.11	0.04	15.48
SK14	**Wasp Nest**	0.00	0.00	1.35	0.00	0.00
SK15	**Screamin' Meemie**	5.09	5.95	3.65	0.00	15.40
SK16	**Deer Snort**	0.00	0.00	0.00	0.00	0.00
SK17	**Bullfrog**	1.60	1.61	0.00	0.00	16.23
SK18	**Trailer Park**	0.00	4.90	0.00	0.00	12.89
SK19	**Bearshit**	0.00	0.00	0.00	0.00	0.00
SK20	**Widow**	0.00	0.00	0.00	0.00	0.51
SK21	**Growling**	0.00	0.00	0.93	0.00	0.00
SK22	**Friendly Dog**	1.05	5.78	0.13	0.00	9.49
SK23	**Udo's**	0.00	0.00	0.00	0.00	6.23
SK24KT	**Skeenah**	1.25	2.17	1.14	0.04	12.09

APPENDIX C: Site Data (Continued)

ite ID	Site Name *Variable:*	*NLCD Percent Land Cover* shrub/scrub	*NLCD Percent Land Cover* woody wetlands	*NLCD Percent Land Cover* forest	*NLCD Percent Land Cover* nonforest	*NLCD Percent Land Cover* Nonforest veg	*NLCD Percent Land Cover* agric.	*NLCD Percent Land Cover* developed	*NLCD Percent Land Cover* other
CW01	**Training**	0.78	0.00	97.39	2.61	1.1420	0.36	1.47	0.0000
CW02	**Lawnmower Man**	1.49	0.00	95.74	4.26	3.5730	1.65	0.69	0.0000
CW03	**Trampy**	0.44	0.00	98.15	1.85	1.1702	0.68	0.68	0.0000
CW04	**Eye Poke**	0.20	0.00	98.81	1.19	1.1879	0.69	0.00	0.0000
CW05	**Astroman**	0.73	0.02	96.19	3.81	1.4428	0.61	2.37	0.0000
CW06	**Longtime**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
CW07	**Punji**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
CW08	**Yellowjacket**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
CW09	**Split Stream**	0.07	0.00	96.35	3.65	0.0743	0.00	3.58	0.0000
CW10	**Crooked Tree**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
CW11	**Mudbug**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
CW12	**Appalachian Trail**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
CW13	**Kitchens**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
CW14	**Fork**	0.00	0.00	99.82	0.18	0.0000	0.00	0.18	0.0000
CW15	**talking**	0.00	0.00	74.92	25.08	0.0000	0.00	25.08	0.0000
CW16	**Basket**	0.00	0.00	93.96	6.04	0.0000	0.00	6.04	0.0000
CW17	**Rodo**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
CW18	**Last**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
CW19KT	**Coweeta Church Rd.**	0.81	0.02	95.44	4.56	1.9981	1.03	2.57	0.0000
CW20HZ	**Coweeta @ FS**	0.60	0.00	97.33	2.67	0.8603	0.25	1.81	0.0000
SK01	**Johnny's**	1.43	0.00	87.95	12.05	8.2924	4.89	3.68	0.0794
SK02	**Dearl's**	3.78	0.00	71.99	28.01	22.2921	17.43	5.72	0.0000
SK03	**Crazy Horse**	1.34	0.05	80.27	19.73	15.2928	12.51	4.33	0.1073
SK04	**Haunted**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
SK05	**Hungry Dog**	1.68	0.00	88.53	11.47	8.0122	4.29	3.46	0.0000
SK06	**Cowie**	1.60	0.00	84.09	15.91	11.3428	8.85	4.56	0.0000

APPENDIX C: Site Data (Continued)

Site ID	Site Name *Variable:*	*NLCD Percent Land Cover* shrub/scrub	*NLCD Percent Land Cover* woody wetlands	*NLCD Percent Land Cover* forest	*NLCD Percent Land Cover* nonforest	*NLCD Percent Land Cover* Nonforest veg	*NLCD Percent Land Cover* agric.	*NLCD Percent Land Cover* developed	*NLCD Percent Land Cover* other
SK07	**Swiss Lady**	0.00	0.00	95.77	4.23	1.9708	1.42	2.26	0.0000
SK08	**Pear**	1.54	0.00	86.30	13.70	9.3182	6.81	4.38	0.0000
SK09	**Broke Dog**	1.45	0.00	89.82	10.18	6.9494	3.80	3.23	0.0000
SK10	**Beaver Stick**	1.85	0.08	74.49	25.51	19.8264	15.22	5.62	0.0676
SK11	**Sticker**	3.60	0.00	62.36	37.64	31.1960	23.93	6.45	0.0000
SK12	**Handshake**	1.90	0.04	74.54	25.46	20.1046	16.11	5.27	0.0811
SK13	**Barking Dog**	1.78	0.07	72.84	27.16	20.4414	15.85	6.66	0.0641
SK14	**Wasp Nest**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
SK15	**Screamin' Meemie**	2.83	0.00	70.33	29.67	24.1834	15.40	5.48	0.0000
SK16	**Deer Snort**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
SK17	**Bullfrog**	0.00	0.00	40.10	59.90	19.2990	17.69	40.60	0.0000
SK18	**Trailer Park**	0.00	0.00	66.42	33.58	17.7958	12.89	15.78	0.0000
SK19	**Bearshit**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
SK20	**Widow**	3.96	0.00	95.52	4.48	4.4769	0.51	0.00	0.0000
SK21	**Growling**	0.00	0.00	100.00	0.00	0.0000	0.00	0.00	0.0000
SK22	**Friendly Dog**	0.79	0.00	79.55	20.45	16.0607	9.49	4.39	0.0000
SK23	**Udo's**	2.08	0.00	69.37	30.63	8.3040	6.23	22.33	0.0000
SK24KT	**Skeenah**	1.78	0.06	78.85	21.15	16.1477	12.14	4.93	0.0763

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Water Width (m)*	*Basal Channel Width (m)*	*Channel Full Width (m)*	*Channel Width at Floodplain Height (m)*	*Left Floodplain Width (m)*	*Right Floodplain Width (m)*
CW01	**Training**	4.52	5.04	8.15	8.16	1.38	1.05
CW02	**Lawnmower Man**	4.39	5.30	5.95	5.74	1.02	0.29
CW03	**Trampy**	2.93	3.88	4.16	4.09	0.99	1.18
CW04	**Eye Poke**	2.36	2.76	3.81	3.58	2.95	1.80
CW05	**Astroman**	6.96	8.36	8.98	9.06	1.69	0.90
CW06	**Longtime**	1.03	1.35	1.81	1.54	0.32	0.10
CW07	**Punji**	1.08	1.56	2.94	1.94	0.00	0.25
CW08	**Yellowjacket**	1.38	2.22	2.89	2.89	0.21	1.21
CW09	**Split Stream**	3.74	5.49	5.87	5.87	2.11	1.04
CW10	**Crooked Tree**	0.98	1.91	2.41	1.98	0.26	0.36
CW11	**Mudbug**	0.61	1.55	2.43	2.17	0.27	0.91
CW12	**Appalachian Trail**	0.17	0.35	0.51	0.53	0.21	0.00
CW13	**Kitchens**	1.51	2.08	2.46	2.46	0.44	0.71
CW14	**Fork**	0.87	0.96	1.17	0.79	0.05	0.03
CW15	**talking**	0.50	0.68	0.97	0.59	0.01	0.03
CW16	**Basket**	0.90	1.00	2.10	1.62	0.50	0.09
CW17	**Rodo**	1.72	2.09	2.39	2.15	0.48	0.33
CW18	**Last**	0.63	0.94	1.05	1.00	0.17	0.07
CW19KT	**Coweeta Church Rd.**	6.35	n/a	7.58	7.58	14.35	12.62
CW20HZ	**Coweeta @ FS**	7.27	n/a	10.41	10.46	1.06	1.81
SK01	**Johnny's**	2.93	2.94	3.72	3.85	0.29	0.18
SK02	**Dearl's**	0.75	0.84	2.43	2.43	0.72	0.39
SK03	**Crazy Horse**	4.04	4.43	6.20	6.45	0.78	0.42
SK04	**Haunted**	1.84	2.70	3.65	3.32	0.65	0.57
SK05	**Hungry Dog**	2.30	2.67	3.10	3.10	1.41	0.74
SK06	**Cowie**	1.78	1.81	2.52	2.52	0.87	1.69
SK07	**Swiss Lady**	1.46	1.77	2.54	2.13	0.69	0.34
SK08	**Pear**	1.86	2.16	2.76	2.68	1.24	0.31
SK09	**Broke Dog**	2.47	2.70	3.68	3.33	0.32	0.93

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Water Width (m)*	*Basal Channel Width (m)*	*Channel Full Width (m)*	*Channel Width at Floodplain Height (m)*	*Left Floodplain Width (m)*	*Right Floodplain Width (m)*
SK10	**Beaver Stick**	4.67	4.80	5.49	5.49	1.91	0.45
SK11	**Sticker**	1.31	1.42	3.24	1.70	0.09	0.51
SK12	**Handshake**	3.24	3.69	4.87	4.50	1.92	0.87
SK13	**Barking Dog**	5.25	5.56	7.19	5.97	0.94	0.60
SK14	**Wasp Nest**	1.07	1.42	1.89	1.86	0.05	0.63
SK15	**Screamin' Meemie**	0.90	1.00	2.10	1.62	0.50	0.09
SK16	**Deer Snort**	0.41	0.94	1.18	1.12	0.17	0.45
SK17	**Bullfrog**	0.96	1.11	1.84	1.84	1.18	1.47
SK18	**Trailer Park**	0.47	0.51	1.00	1.00	1.36	0.21
SK19	**Bearshit**	1.23	1.72	2.06	2.10	0.20	0.46
SK20	**Widow**	0.37	0.46	0.65	0.65	1.32	0.69
SK21	**Growling**	0.37	1.01	1.47	1.46	1.62	0.76
SK22	**Friendly Dog**	0.61	0.65	1.27	1.27	3.59	3.16
SK23	**Udo's**	0.54	0.95	1.28	1.11	0.40	0.40
SK24KT	**Skeenah**	4.82	n/a	6.84	6.63	1.46	3.22

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Floodplain Width Average left & right (m) (n=16)*	*Floodplain Width average by side (m) (n=32)*	*Left Bank Height (m)*	*Right Bank Height (m)*	*Bank Height Average left & right (m)*
CW01	**Training**	2.43	1.22	1.054	1.187	1.12
CW02	**Lawnmower Man**	1.30	0.65	0.838	0.910	0.87
CW03	**Trampy**	2.17	1.08	0.914	0.864	0.89
CW04	**Eye Poke**	4.75	2.37	0.745	0.817	0.78
CW05	**Astroman**	2.59	1.29	1.124	1.344	1.23
CW06	**Longtime**	0.41	0.21	0.387	0.514	0.45
CW07	**Punji**	0.25	0.13	1.219	1.106	1.16
CW08	**Yellowjacket**	1.42	0.71	0.707	0.589	0.65
CW09	**Split Stream**	3.15	1.58	0.707	1.061	0.88
CW10	**Crooked Tree**	0.61	0.31	0.622	0.548	0.59
CW11	**Mudbug**	1.17	0.59	0.444	0.321	0.38
CW12	**Appalachian Trail**	0.21	0.10	0.152	0.169	0.16
CW13	**Kitchens**	1.15	0.57	0.352	0.281	0.32
CW14	**Fork**	0.08	0.04	0.203	0.186	0.19
CW15	**talking**	0.04	0.02	0.351	0.299	0.33
CW16	**Basket**	0.59	0.30	0.247	0.356	0.30
CW17	**Rodo**	0.82	0.41	0.430	0.487	0.46
CW18	**Last**	0.24	0.12	0.183	0.151	0.17
CW19KT	**Coweeta Church Rd.**	26.97	13.49	1.044	1.024	1.03
CW20HZ	**Coweeta @ FS**	2.87	1.43	1.508	1.753	1.63
SK01	**Johnny's**	0.47	0.24	0.631	0.838	0.73
SK02	**Dearl's**	1.12	0.56	0.738	0.996	0.87
SK03	**Crazy Horse**	1.19	0.60	1.494	0.786	1.14
SK04	**Haunted**	1.22	0.61	1.289	1.54	1.41
SK05	**Hungry Dog**	2.14	1.07	0.889	0.740	0.81
SK06	**Cowie**	2.56	1.28	0.801	0.643	0.72
SK07	**Swiss Lady**	1.03	0.51	0.894	0.905	0.90
SK08	**Pear**	1.55	0.77	0.572	0.873	0.72
SK09	**Broke Dog**	1.26	0.63	1.098	1.118	1.11

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Floodplain Width Average left & right (m) (n=16)*	*Floodplain Width average by side (m) (n=32)*	*Left Bank Height (m)*	*Right Bank Height (m)*	*Bank Height Average left & right (m)*
SK10	**Beaver Stick**	2.36	1.18	1.031	1.231	1.13
SK11	**Sticker**	0.60	0.30	1.198	0.921	1.06
SK12	**Handshake**	2.79	1.39	0.984	1.046	1.02
SK13	**Barking Dog**	1.53	0.77	1.429	1.440	1.43
SK14	**Wasp Nest**	0.68	0.34	0.570	0.528	0.55
SK15	**Screamin' Meemie**	0.59	0.30	0.948	1.135	1.04
SK16	**Deer Snort**	0.62	0.31	0.263	0.246	0.25
SK17	**Bullfrog**	2.65	1.32	0.554	0.503	0.53
SK18	**Trailer Park**	1.57	0.78	0.378	0.388	0.38
SK19	**Bearshit**	0.60	0.30	0.381	0.340	0.36
SK20	**Widow**	2.01	1.00	0.166	0.183	0.17
SK21	**Growling**	2.38	1.19	0.239	0.171	0.20
SK22	**Friendly Dog**	5.77	2.88	0.424	0.457	0.44
SK23	**Udo's**	0.80	0.40	0.236	0.276	0.26
SK24KT	**Skeenah**	4.38	2.19	1.581	1.556	1.57

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Bank Height Sum left & right (m)*	*Left Floodplain Bank Height (m)*	*Right Floodplain Bank Height (m)*	*Floodplain Bank Height Average left & right (m)*	*Floodplain Bank Height Sum left & right (m)*
CW01	**Training**	2.24	0.93	1.17	1.02	2.10
CW02	**Lawnmower Man**	1.75	0.67	0.49	0.61	1.15
CW03	**Trampy**	1.78	0.52	0.58	0.55	1.10
CW04	**Eye Poke**	1.56	0.57	0.47	0.53	1.05
CW05	**Astroman**	2.47	0.73	0.86	0.79	1.59
CW06	**Longtime**	0.90	0.27	0.28	0.27	0.55
CW07	**Punji**	2.33	0.00	0.45	0.45	0.45
CW08	**Yellowjacket**	1.30	0.45	0.41	0.38	0.85
CW09	**Split Stream**	1.77	0.64	0.70	0.66	1.34
CW10	**Crooked Tree**	1.17	0.28	0.35	0.32	0.63
CW11	**Mudbug**	0.77	0.23	0.29	0.29	0.52
CW12	**Appalachian Trail**	0.32	0.12	0.00	0.12	0.12
CW13	**Kitchens**	0.63	0.27	0.22	0.24	0.49
CW14	**Fork**	0.39	0.09	0.10	0.09	0.19
CW15	**talking**	0.65	0.21	0.20	0.20	0.41
CW16	**Basket**	0.60	0.00	0.27	0.27	0.27
CW17	**Rodo**	0.92	0.28	0.30	0.29	0.58
CW18	**Last**	0.33	0.10	0.10	0.10	0.20
CW19KT	**Coweeta Church Rd.**	2.07	1.02	0.99	1.00	2.01
CW20HZ	**Coweeta @ FS**	3.26	0.90	1.23	1.07	2.13
SK01	**Johnny's**	1.47	0.31	0.53	0.40	0.84
SK02	**Dearl's**	1.73	0.61	1.06	0.81	1.67
SK03	**Crazy Horse**	2.28	0.66	0.41	0.59	1.07
SK04	**Haunted**	2.83	0.60	0.62	0.61	1.22
SK05	**Hungry Dog**	1.63	0.64	0.41	0.54	1.05
SK06	**Cowie**	1.44	0.52	0.59	0.56	1.11
SK07	**Swiss Lady**	1.80	0.48	0.50	0.49	0.98
SK08	**Pear**	1.44	0.53	0.61	0.55	1.14
SK09	**Broke Dog**	2.22	0.58	0.56	0.56	1.14

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Bank Height Sum left & right (m)*	*Left Floodplain Bank Height (m)*	*Right Floodplain Bank Height (m)*	*Floodplain Bank Height Average left & right (m)*	*Floodplain Bank Height Sum left & right (m)*
SK10	**Beaver Stick**	2.26	0.85	0.70	0.80	1.55
SK11	**Sticker**	2.12	0.63	0.57	0.59	1.20
SK12	**Handshake**	2.03	0.76	0.69	0.73	1.45
SK13	**Barking Dog**	2.87	0.86	0.73	0.80	1.60
SK14	**Wasp Nest**	1.10	0.26	0.38	0.37	0.64
SK15	**Screamin' Meemie**	2.08	0.41	0.74	0.51	1.15
SK16	**Deer Snort**	0.51	0.18	0.15	0.16	0.33
SK17	**Bullfrog**	1.06	0.58	0.50	0.53	1.08
SK18	**Trailer Park**	0.77	0.38	0.36	0.37	0.74
SK19	**Bearshit**	0.72	0.37	0.33	0.34	0.70
SK20	**Widow**	0.35	0.17	0.16	0.17	0.33
SK21	**Growling**	0.41	0.19	0.17	0.18	0.36
SK22	**Friendly Dog**	0.88	0.42	0.46	0.44	0.88
SK23	**Udo's**	0.51	0.20	0.17	0.19	0.37
SK24KT	**Skeenah**	3.14	1.37	1.23	1.30	2.60

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Left Erodible Terrace Bank Height (m)*	*Right Erodible Terrace Bank Height (m)*	*Erodible Terrace Bank Height Average left & right (m)*	*Erodible Terrace Bank Height Sum left & right (m)*	*Left Bank Slope (degrees)*	*Right Bank Slope (degrees)*
CW01	**Training**	1.21	1.20	1.20	2.40	28	28
CW02	**Lawnmower Man**	0.94	1.01	0.98	1.95	20	25
CW03	**Trampy**	1.22	1.34	1.27	2.56	36	35
CW04	**Eye Poke**	0.97	1.16	1.07	2.13	37	35
CW05	**Astroman**	1.43	1.63	1.54	3.06	40	43
CW06	**Longtime**	0.65	0.62	0.63	1.27	46	48
CW07	**Punji**	1.22	1.32	1.26	2.54	45	47
CW08	**Yellowjacket**	0.77	0.75	0.76	1.51	42	52
CW09	**Split Stream**	1.01	1.22	1.18	2.23	46	56
CW10	**Crooked Tree**	0.74	0.70	0.72	1.44	65	54
CW11	**Mudbug**	0.47	0.52	0.48	0.99	56	51
CW12	**Appalachian Trail**	0.18	0.17	0.17	0.34	42	49
CW13	**Kitchens**	0.36	0.36	0.36	0.72	33	48
CW14	**Fork**	0.22	0.19	0.20	0.41	48	40
CW15	**talking**	0.36	0.31	0.34	0.67	53	41
CW16	**Basket**	0.22	0.29	0.30	0.51	43	16
CW17	**Rodo**	0.52	0.68	0.59	1.20	63	19
CW18	**Last**	0.26	0.18	0.22	0.44	30	43
CW19KT	**Coweeta Church Rd.**	1.22	1.60	1.34	2.82	49	42
CW20HZ	**Coweeta @ FS**	1.78	1.99	1.89	3.77	51	53
SK01	**Johnny's**	0.88	0.98	0.93	1.86	42	39
SK02	**Dearl's**	1.27	0.90	1.02	2.17	34	30
SK03	**Crazy Horse**	2.14	0.87	1.39	3.01	31	34
SK04	**Haunted**	1.82	2.26	2.04	4.08	53	50
SK05	**Hungry Dog**	1.31	1.00	1.12	2.31	39	38
SK06	**Cowie**	1.42	0.86	1.21	2.28	32	25
SK07	**Swiss Lady**	1.14	1.09	1.11	2.23	42	50
SK08	**Pear**	0.90	0.99	0.98	1.89	36	47
SK09	**Broke Dog**	1.33	2.06	1.59	3.39	39	36

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Left Erodible Terrace Bank Height (m)*	*Right Erodible Terrace Bank Height (m)*	*Erodible Terrace Bank Height Average left & right (m)*	*Erodible Terrace Bank Height Sum left & right (m)*	*Left Bank Slope (degrees)*	*Right Bank Slope (degrees)*
SK10	**Beaver Stick**	1.43	1.50	1.47	2.93	49	36
SK11	**Sticker**	1.28	1.19	1.24	2.47	49	42
SK12	**Handshake**	1.16	1.32	1.24	2.48	52	45
SK13	**Barking Dog**	1.87	1.86	1.87	3.73	49	51
SK14	**Wasp Nest**	0.59	0.67	0.62	1.26	52	52
SK15	**Screamin' Meemie**	1.36	1.23	1.28	2.59	40	44
SK16	**Deer Snort**	0.28	0.29	0.29	0.57	47	47
SK17	**Bullfrog**	0.49	n/a	0.49	0.49	29	25
SK18	**Trailer Park**	n/a	0.45	0.45	0.45	32	48
SK19	**Bearshit**	0.39	0.36	0.38	0.75	33	39
SK20	**Widow**	n/a	0.45	0.45	0.45	31	35
SK21	**Growling**	0.30	0.16	0.27	0.46	38	33
SK22	**Friendly Dog**	n/a	0.46	0.46	0.46	53	32
SK23	**Udo's**	0.28	0.38	0.35	0.66	44	52
SK24KT	**Skeenah**	1.75	1.81	1.78	3.56	53	56

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Bank Slope Average left & right (degrees)*	*Left Bank Slope (radians)*	*Right Bank Slope (radians)*	*Bank Slope Average left & right (radians)*	*Left Bank Vegetation (%)*	*Right Bank Vegetation (%)*	*Bank Vegetation Average left & right (%)*
CW01	**Training**	28	0.4814	0.4810	0.4812	79	81	80
CW02	**Lawnmower Man**	23	0.3458	0.4429	0.3943	35	22	28
CW03	**Trampy**	35	0.6251	0.6032	0.6141	52	63	58
CW04	**Eye Poke**	36	0.6501	0.6185	0.6343	24	29	26
CW05	**Astroman**	41	0.6961	0.7489	0.7225	49	41	45
CW06	**Longtime**	47	0.8105	0.8432	0.8268	49	45	47
CW07	**Punji**	46	0.7822	0.8139	0.7981	24	22	23
CW08	**Yellowjacket**	47	0.7244	0.9103	0.8174	14	24	19
CW09	**Split Stream**	51	0.8039	0.9697	0.8868	54	58	56
CW10	**Crooked Tree**	59	1.1345	0.9381	1.0363	49	49	49
CW11	**Mudbug**	53	0.9728	0.8918	0.9323	43	69	56
CW12	**Appalachian Trail**	46	0.7363	0.8563	0.7963	48	42	45
CW13	**Kitchens**	40	0.5735	0.8353	0.7044	39	42	41
CW14	**Fork**	44	0.8290	0.7036	0.7663	48	46	47
CW15	**talking**	47	0.9327	0.7090	0.8209	64	44	54
CW16	**Basket**	42	0.7563	0.2805	0.7397	38	40	39
CW17	**Rodo**	41	1.0963	0.3349	0.7156	56	78	67
CW18	**Last**	37	0.5291	0.7527	0.6409	31	21	26
CW19KT	**Coweeta Church Rd.**	34	0.8508	0.7407	0.5994	67	70	69
CW20HZ	**Coweeta @ FS**	41	0.8901	0.9316	0.7145	35	28	31
SK01	**Johnny's**	40	0.7280	0.6748	0.7005	86	84	85
SK02	**Dearl's**	32	0.6011	0.5311	0.5661	93	85	89
SK03	**Crazy Horse**	33	0.5376	0.5981	0.5678	69	62	66
SK04	**Haunted**	52	0.9263	0.8751	0.9007	35	33	34
SK05	**Hungry Dog**	39	0.6840	0.6665	0.6752	55	48	52
SK06	**Cowie**	29	0.5607	0.4418	0.5012	74	70	72
SK07	**Swiss Lady**	46	0.7254	0.8738	0.7996	58	53	56
SK08	**Pear**	41	0.6336	0.8117	0.7226	71	71	71

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Bank Slope Average left & right (degrees)*	*Left Bank Slope (radians)*	*Right Bank Slope (radians)*	*Bank Slope Average left & right (radians)*	*Left Bank Vegetation (%)*	*Right Bank Vegetation (%)*	*Bank Vegetation Average left & right (%)*
SK09	**Broke Dog**	37	0.6739	0.6308	0.6524	84	83	83
SK10	**Beaver Stick**	42	0.8530	0.6298	0.7378	83	52	68
SK11	**Sticker**	45	0.8498	0.7330	0.7914	60	41	50
SK12	**Handshake**	48	0.9039	0.7865	0.8452	68	48	58
SK13	**Barking Dog**	50	0.8488	0.8886	0.8687	83	62	72
SK14	**Wasp Nest**	52	0.9074	0.9028	0.9051	62	53	57
SK15	**Screamin' Meemie**	42	0.7052	0.7742	0.7397	86	80	83
SK16	**Deer Snort**	47	0.8181	0.8230	0.8206	54	49	51
SK17	**Bullfrog**	27	0.5061	0.4363	0.4712	18	18	18
SK18	**Trailer Park**	40	0.5629	0.8421	0.7025	61	71	66
SK19	**Bearshit**	36	0.5716	0.6829	0.6272	43	54	49
SK20	**Widow**	33	0.5356	0.6087	0.5721	53	68	61
SK21	**Growling**	36	0.6687	0.5738	0.6212	28	40	34
SK22	**Friendly Dog**	42	0.9163	0.5498	0.7330	78	68	73
SK23	**Udo's**	48	0.7745	0.9098	0.8421	85	78	82
SK24KT	**Skeenah**	38	0.9207	0.9850	0.6583	55	72	63

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Dominant Riparian Land Use (binary)*	*Left Bank Erosion (%)*	*Right Bank Erosion (%)*	*Bank Erosion Average left & right (%)*	*Left Bank Failure (%)*	*Left Bank Failure (%)*	*Bank Failure Average Left & Right (%)*
CW01	**Training**	1	6	7	6	0	6	3
CW02	**Lawnmower Man**	1	21	22	22	50	50	50
CW03	**Trampy**	1	19	26	22	31	38	34
CW04	**Eye Poke**	1	29	17	23	44	19	31
CW05	**Astroman**	1	25	36	30	31	50	41
CW06	**Longtime**	0	16	20	18	56	69	63
CW07	**Punji**	0	28	29	28	63	63	63
CW08	**Yellowjacket**	0	12	22	17	19	38	28
CW09	**Split Stream**	0	10	13	11	0	0	0
CW10	**Crooked Tree**	0	44	30	37	88	56	72
CW11	**Mudbug**	0	34	13	24	88	25	56
CW12	**Appalachian Trail**	1	24	50	37	75	94	84
CW13	**Kitchens**	0	15	11	13	21	0	11
CW14	**Fork**	0	16	12	14	13	0	6
CW15	**talking**	0	15	31	23	19	25	22
CW16	**Basket**	0	16	14	15	0	0	0
CW17	**Rodo**	0	38	19	29	63	38	50
CW18	**Last**	0	18	17	17	31	44	38
CW19KT	**Coweeta Church Rd.**	1	7	8	7	0	6	3
CW20HZ	**Coweeta @ FS**	0	17	10	14	31	19	25
SK01	**Johnny's**	1	9	12	10	6	19	13
SK02	**Dearl's**	1	4	10	7	0	13	6
SK03	**Crazy Horse**	1	30	37	33	31	44	38
SK04	**Haunted**	0	33	33	33	19	13	16
SK05	**Hungry Dog**	1	24	38	31	19	56	38
SK06	**Cowie**	1	13	19	16	38	44	41
SK07	**Swiss Lady**	1	19	25	22	31	31	31
SK08	**Pear**	1	12	22	17	44	63	53

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Dominant Riparian Land Use (binary)*	*Left Bank Erosion (%)*	*Right Bank Erosion (%)*	*Bank Erosion Average left & right (%)*	*Left Bank Failure (%)*	*Left Bank Failure (%)*	*Bank Failure Average Left & Right (%)*
SK09	**Broke Dog**	1	10	7	8	6	13	9
SK10	**Beaver Stick**	1	11	32	22	25	63	44
SK11	**Sticker**	1	28	37	33	44	19	31
SK12	**Handshake**	1	25	32	29	56	44	50
SK13	**Barking Dog**	1	16	32	24	31	50	41
SK14	**Wasp Nest**	1	17	13	15	19	13	16
SK15	**Screamin' Meemie**	1	11	19	15	50	81	66
SK16	**Deer Snort**	0	15	16	16	13	31	22
SK17	**Bullfrog**	1	29	26	28	0	0	0
SK18	**Trailer Park**	1	27	18	22	88	50	69
SK19	**Bearshit**	0	29	10	20	31	6	19
SK20	**Widow**	1	19	17	18	0	0	0
SK21	**Growling**	0	32	20	26	36	43	39
SK22	**Friendly Dog**	1	15	31	23	38	88	63
SK23	**Udo's**	1	11	8	9	31	25	28
SK24KT	**Skeenah**	1	10	5	8	31	19	25

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Left Bank Soil (%Sand)*	*Left Bank Soil (%Silt)*	*Left Bank Soil (%Clay)*	*Right Bank Soil (%Sand)*	*Right Bank Soil (%Silt)*	*Right Bank Soil (%Clay)*
CW01	**Training**	56	33	11	51	36	13
CW02	**Lawnmower Man**	60	28	12	68	22	10
CW03	**Trampy**	56	31	14	70	21	9
CW04	**Eye Poke**	45	43	12	28	58	14
CW05	**Astroman**	62	27	11	59	30	11
CW06	**Longtime**	43	42	15	32	54	14
CW07	**Punji**	38	44	18	42	41	17
CW08	**Yellowjacket**	37	48	15	30	54	16
CW09	**Split Stream**	47	40	13	40	47	13
CW10	**Crooked Tree**	48	37	15	34	48	18
CW11	**Mudbug**	45	41	14	45	45	10
CW12	**Appalachian Trail**	52	33	14	54	32	15
CW13	**Kitchens**	25	59	16	30	56	14
CW14	**Fork**	34	54	12	29	58	13
CW15	**talking**	49	38	12	52	33	14
CW16	**Basket**	57	32	12	69	23	9
CW17	**Rodo**	55	35	10	57	34	9
CW18	**Last**	44	45	10	37	51	12
CW19KT	**Coweeta Church Road**	63	26	11	58	29	13
CW20HZ	**Coweeta @ FS**	40	40	20	40	40	20
SK01	**Johnny's**	65	25	10	59	28	13
SK02	**Dearl's**	30	57	13	47	38	15
SK03	**Crazy Horse**	50	39	11	41	47	12
SK04	**Haunted**	21	63	15	20	65	15
SK05	**Hungry Dog**	58	32	10	54	35	12
SK06	**Cowie**	65	26	9	59	31	10
SK07	**Swiss Lady**	24	63	13	48	39	13
SK08	**Pear**	63	27	10	57	33	10
SK09	**Broke Dog**	57	30	13	60	28	12
SK10	**Beaver Stick**	63	26	11	55	34	11

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Left Bank Soil (%Sand)*	*Left Bank Soil (%Silt)*	*Left Bank Soil (%Clay)*	*Right Bank Soil (%Sand)*	*Right Bank Soil (%Silt)*	*Right Bank Soil (%Clay)*
SK11	**Sticker**	48	39	13	53	34	13
SK12	**Handshake**	47	41	13	43	43	13
SK13	**Barking Dog**	43	43	13	40	47	13
SK14	**Wasp Nest**	29	56	15	48	38	14
SK15	**Screamin' Meemie**	44	44	12	24	60	16
SK16	**Deer Snort**	40	46	14	51	36	13
SK17	**Bullfrog**	43	41	16	51	38	12
SK18	**Trailer Park**	41	42	17	34	49	17
SK19	**Bearshit**	53	31	16	47	35	18
SK20	**Widow**	78	15	7	61	28	11
SK21	**Growling**	27	57	17	35	47	19
SK22	**Friendly Dog**	67	25	8	51	38	11
SK23	**Udo's**	32	52	16	28	57	15
SK24KT	**Skeenah**	51	38	12	43	45	13

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*Bank Soil (% Sand)*	*Bank Soil (% Silt)*	*Bank Soil (% Clay)*	*Silt Plus Clay (%)*	*Left Bank Soil Texture*	*Right Bank Soil Texture*	*Bank Soil Texture*
CW01	**Training**	54	34	12	46	SL	L	L
CW02	**Lawnmower Man**	64	25	11	36	SL	SL	SL
CW03	**Trampy**	63	26	11	37	SL	SL	SL
CW04	**Eye Poke**	37	50	13	63	L	SiL	L
CW05	**Astroman**	60	29	11	40	SL	SL	SL
CW06	**Longtime**	37	48	15	63	L	L	L
CW07	**Punji**	40	42	18	60	L	L	L
CW08	**Yellowjacket**	33	51	15	67	L	L	L
CW09	**Split Stream**	44	43	13	56	L	L	L
CW10	**Crooked Tree**	41	43	16	59	L	L	L
CW11	**Mudbug**	45	43	12	55	L	L	L
CW12	**Appalachian Trail**	53	33	15	47	L	L	L
CW13	**Kitchens**	27	58	15	73	SiL	SiL	SiL
CW14	**Fork**	32	56	13	68	L	SiL	SiL
CW15	**talking**	51	36	13	49	L	L	L
CW16	**Basket**	63	27	10	37	SL	SL	SL
CW17	**Rodo**	56	35	9	44	L	SL	SL
CW18	**Last**	41	48	11	59	L	L	L
CW19KT	**Coweeta Church Rd**	61	27	12	39	SL	SL	SL
CW20HZ	**Coweeta @ FS**	40	40	20	60	L	L	L
SK01	**Johnny's**	62	26	11	38	SL	SL	SL
SK02	**Dearl's**	38	48	14	62	SiL	L	L
SK03	**Crazy Horse**	45	43	12	54	L	L	L
SK04	**Haunted**	21	64	15	79	SiL	SiL	SiL
SK05	**Hungry Dog**	56	33	11	44	SL	L	L
SK06	**Cowie**	62	29	9	38	SL	SL	SL
SK07	**Swiss Lady**	36	51	13	64	SiL	L	SiL
SK08	**Pear**	60	30	10	40	SL	SL	SL
SK09	**Broke Dog**	59	29	13	41	SL	SL	SL

APPENDIX C: Site Data (Continued)

Site ID	Site Name	*BankSoil (% Sand)*	*BankSoil (% Silt)*	*BankSoil (% Clay)*	*Silt Plus Clay (%)*	*Left Bank Soil Texture*	*Right Bank Soil Texture*	*Bank Soil Texture*
SK10	**Beaver Stick**	59	30	11	41	SL	SL	SL
SK11	**Sticker**	50	37	13	50	L	L	L
SK12	**Handshake**	45	42	13	55	L	L	L
SK13	**Barking Dog**	42	45	13	58	L	L	L
SK14	**Wasp Nest**	39	47	14	62	L	L	L
SK15	**Screamin' Meemie**	34	52	14	66	L	SiL	SiL
SK16	**Deer Snort**	46	41	14	54	L	L	L
SK17	**Bullfrog**	47	39	14	53	L	L	L
SK18	**Trailer Park**	38	45	17	62	L	L	L
SK19	**Bearshit**	50	33	17	50	L	L	L
SK20	**Widow**	69	22	9	31	LS	LS	LS
SK21	**Growling**	31	52	18	69	SiL	L	SiL
SK22	**Friendly Dog**	59	31	10	41	L	L	L
SK23	**Udo's**	30	55	15	70	SiL	SiL	SiL
SK24KT	**Skeenah**	47	41	12	53	L	L	L

SL = Sandy Loam; L = Loam; SiL = Slit Loam

APPENDIX D: Spearman Rank- Order Correlation Test

Variable	Statistic	Log base 2 of Floodplain Width Average	Erodible Terrace Bank Height Average	Spearman results
Shreve Order	Correlation Coefficient	0.4503	0.6845	
	P-value	0.0022	0.0000	passed both
Drainage Area (km^2)	Correlation Coefficient	0.649	0.811	
	P-value	0.000	0.000	passed both
Drainage Area (m^2)	Correlation Coefficient	0.649	0.811	
	P-value	0.000	0.000	passed both
Basin Perimeter (km)	Correlation Coefficient	0.630	0.817	
	P-value	0.000	0.000	passed both
Basin Perimeter (m)	Correlation Coefficient	0.630	0.816	
	P-value	0.000	0.000	passed both
Reach Gradient	Correlation Coefficient	-0.549	-0.539	
	P-value	0.000	0.000	passed both
Drainage Density (LENGTH_TOT/AREA) (km/km^2)	Correlation Coefficient	-0.188	0.008	
	P-value	0.221	0.957	failed both
Constant of Channel Maintenance (m^2/m)	Correlation Coefficient	-0.378	-0.614	
	P-value	0.012	0.000	passed both
Stream Segment Numbers in Basin	Correlation Coefficient	0.578	0.799	
	P-value	0.000	0.000	passed both
Stream Frequency (SEG#/km^2)	Correlation Coefficient	-0.536	-0.412	
	P-value	0.000	0.006	passed both
Stream Length Longest Path of Segments (m)	Correlation Coefficient	0.649	0.811	
	P-value	0.000	0.000	passed both
Gradient of Stream Length Longest Segment Path (%)	Correlation Coefficient	-0.483	-0.4703	
	P-value	0.000	0.0013	passed both
Gradient of Stream Length Longest Segment Path (%)	Correlation Coefficient	-0.477	-0.486	
	P-value	0.001	0.000	passed both
Stream Segment Average Length (m)	Correlation Coefficient	0.453	0.451	
	P-value	0.002	0.002	passed both
Total stream length(m)	Correlation Coefficient	0.643	0.823	
	P-value	0.000	0.000	passed both

APPENDIX D: Spearman Rank- Order Correlation Test (Continued)

Variable	Statistic	**Log base 2 of Floodplain Width Average**	**Erodible Terrace Bank Height Average**	Spearman results
Stream Segment Length Maximum (m)	Correlation Coefficient	0.668	0.837	
	P-value	0.000	0.000	passed both
Stream Segment Length Minimum (m)	Correlation Coefficient	-0.422	-0.461	
	P-value	0.004	0.002	passed both
Minimum Elevation Above MSL (m)	Correlation Coefficient	-0.1967	-0.4684	
	P-value	0.2006	0.0013	passed bank
Maximum Elevation Above MSL (m)	Correlation Coefficient	0.3510	0.4359	
	P-value	0.0195	0.0031	passed both
Average Elevation Above MSL (m)	Correlation Coefficient	0.0598	-0.0947	
	P-value	0.6999	0.5409	failed both
Basin Relief (m)	Correlation Coefficient	0.476	0.716	
	P-value	0.001	0.000	passed both
Basin Relief Ratio	Correlation Coefficient	-0.595	-0.6065	
	P-value	0.000	0.0000	passed both
Basin Relief Ratio	Correlation Coefficient	-0.228	-0.214	
	P-value	0.136	0.162	failed both
Relative Relief (m/km)	Correlation Coefficient	-0.586	-0.675	
	P-value	0.000	0.000	passed both
Basin Length (km)	Correlation Coefficient	0.633	0.818	
	P-value	0.000	0.000	passed both
Basin Length (m)	Correlation Coefficient	0.633	0.819	
	P-value	0.000	0.000	passed both
Drainage Shape	Correlation Coefficient	0.292	0.207	
	P-value	0.054	0.176	passed both
BAS_SHP asinsquareroot	Correlation Coefficient	0.278	0.192	
	P-value	0.068	0.212	failed both
Shreve Bifurcation Ratio	Correlation Coefficient	-0.469	0.6860	
	P-value	0.018	0.0000	passed both
SH_BIFUR_RTO (+1)	Correlation Coefficient	0.319	0.622	
	P-value	0.035	0.000	passed both

APPENDIX D: Spearman Rank- Order Correlation Test (Continued)

Variable	Statistic	Log base 2 of Floodplain Width Average	Erodible Terrace Bank Height Average	Spearman results
% of First Order Streams to the Total Number of Streams	Correlation Coefficient	-0.587	-0.743	
	P-value	0.000	0.000	passed both
% of First Order Streams to the Total Number of Streams	Correlation Coefficient	-0.597	-0.762	
	P-value	0.000	0.000	passed both
Ruggedness Number (degrees)	Correlation Coefficient	0.4316	0.6549	
	P-value	0.0034	0.0000	passed both
Ruggedness Number (Radians)	Correlation Coefficient	0.4316	0.6549	
	P-value	0.0034	0.0000	passed both
Melton Ruggedness Number 1957	Correlation Coefficient	0.4135	0.5721	
	P-value	0.0053	0.0000	passed both
Melton Ruggedness Number 1958	Correlation Coefficient	-0.2823	-0.6098	
	P-value	0.0634	0.0000	passed bank
Ground Slope (degrees)	Correlation Coefficient	0.4135	0.5721	
	P-value	0.0053	0.0000	passed both
Minimum Basin Slope (%)	Correlation Coefficient	-0.2147	-0.5459	
	P-value	0.1617	0.0001	passed bank
Maximum Basin Slope (%)	Correlation Coefficient	0.3905	0.4985	
	P-value	0.0088	0.0006	passed both
Average Basin Slope (%)	Correlation Coefficient	0.0609	-0.1269	
	P-value	0.6944	0.4117	failed both
Pixel Slope Average (%)	Correlation Coefficient	0.0270	-0.2046	
	P-value	0.8619	0.1827	failed both
Pixel Slope Standard Deviation	Correlation Coefficient	0.3070	0.3180	
	P-value	0.0427	0.0354	passed both
Pixel Slope 2 Standard Deviations	Correlation Coefficient	0.3070	0.3180	
	P-value	0.0427	0.0354	passed both
Pixel Slope 3 Standard Deviations	Correlation Coefficient	0.3070	0.3180	
	P-value	0.0427	0.0354	passed both
Pixel Slope (99^{th})	Correlation Coefficient	0.2236	0.1923	
	P-value	0.1445	0.2110	failed both

APPENDIX D: Spearman Rank- Order Correlation Test (Continued)

Variable	Statistic	Log base 2 of Floodplain Width Average	Erodible Terrace Bank Height Average	Spearman results
Pixel Slope (95th)	Correlation Coefficient	0.1524	0.0176	
	P-value	0.3234	0.9098	failed both
Pixel Slope (90th)	Correlation Coefficient	0.1202	-0.0582	
	P-value	0.4371	0.7073	failed both
Pixel Slope (85th)	Correlation Coefficient	0.1036	-0.0931	
	P-value	0.5034	0.5478	failed both
Pixel Slope (75th)	Correlation Coefficient	0.0655	-0.1523	
	P-value	0.6728	0.3237	failed both
Pixel Slope (66th)	Correlation Coefficient	0.0449	-0.1882	
	P-value	0.7722	0.2213	failed both
Segment Slope Average	Correlation Coefficient	-0.0801	-0.2784	
	P-value	0.6052	0.0672	failed both
Segment Slope (99th)	Correlation Coefficient	0.3024	0.3912	
	P-value	0.0460	0.0086	passed both
Segment Slope (95th)	Correlation Coefficient	0.2544	0.2861	
	P-value	0.0956	0.0598	failed both
Segment Slope (90th)	Correlation Coefficient	0.1645	0.1716	
	P-value	0.2861	0.2654	failed both
Segment Slope (85th)	Correlation Coefficient	0.1132	0.1025	
	P-value	0.4642	0.5079	failed both
Segment Slope (75th)	Correlation Coefficient	0.2693	0.3373	
	P-value	0.0771	0.0252	passed bank
Segment Slope (66th)	Correlation Coefficient	0.2194	0.2126	
	P-value	0.1525	0.1658	failed both
Segment Thread Total	Correlation Coefficient	0.0549	0.5402	
	P-value	0.7233	0.0002	passed bank
Segment Thread Average	Correlation Coefficient	0.2175	0.7589	
	P-value	0.1561	0.0000	passed bank
NLCD Land Cover (% barren land)	Correlation Coefficient	0.0885	0.3153	
	P-value	0.5659	0.03723	passed bank
NLCD Land Cover (%cult. Crops)	Correlation Coefficient	0.2843	0.275	
	P-value	0.06138	0.07067	failed both

APPENDIX D: Spearman Rank- Order Correlation Test (Continued)

Variable	Statistic	Log base 2 of Floodplain Width Average	Erodible Terrace Bank Height Average	Spearman results
NLCD Land Cover (%deciduous forest)	Correlation Coefficient	-0.3074	-0.3578	
	P-value	0.04247	0.01733	passed both
NLCD Land Cover (%low intensity)	Correlation Coefficient	0.193	0.2251	
	P-value	0.2083	0.141	failed both
NLCD Land Cover (%open spaces)	Correlation Coefficient	0.1884	0.2405	
	P-value	0.2196	0.1153	failed both
NLCD Land Cover (%evergreen forest)	Correlation Coefficient	0.4183	0.6771	
	P-value	0.004912	0	passed both
NLCD Land Cover (%grassland/herb)	Correlation Coefficient	0.3893	0.508	
	P-value	0.009248	0	passed both
NLCD Land Cover (%mixed forest)	Correlation Coefficient	0.2626	0.5983	
	P-value	0.08478	0	passed bank
NLCD Land Cover (%open water)	Correlation Coefficient	0.255	0.4261	
	P-value	0.09447	0.004111	passed bank
NLCD Land Cover (%pasture/hay)	Correlation Coefficient	0.3973	0.462	
	P-value	0.007804	0.001705	passed bank
NLCD Land Cover (%shrub/scrub)	Correlation Coefficient	0.362	0.5059	
	P-value	0.01598	0	passed both
NLCD Land Cover (%woody wetlands)	Correlation Coefficient	0.3803	0.5235	
	P-value	0.01114	0	passed both
NLCD Land Cover (%forest)	Correlation Coefficient	-0.2685	-0.2952	
	P-value	0.07779	0.0518	passed bank
NLCD Land Cover (%nonforest)	Correlation Coefficient	0.2685	0.2952	
	P-value	0.07779	0.0518	passed bank
NLCD Land Cover (%nonforest veg)	Correlation Coefficient	0.4196	0.4778	
	P-value	0.004772	0.001124	passed both
NLCD Land Cover (%agriculture)	Correlation Coefficient	0.4001	0.4607	
	P-value	0.007368	0.001762	passed both
NLCD Land Cover (%developed)	Correlation Coefficient	0.1957	0.2431	
	P-value	0.2016	0.1112	failed both

APPENDIX D: Spearman Rank- Order Correlation Test (Continued)

Variable	Statistic	Log base 2 of Floodplain Width Average	Erodible Terrace Bank Height Average	Spearman results
NLCD Land Cover (%other)	Correlation Coefficient	0.1511	0.382	
	P-value	0.3258	0.01076	passed bank
Channel Width at Floodplain Height (m)	Correlation Coefficient	0.605	0.797	
	P-value	0.000	0.000	passed both
Floodplain Width Average left & right (m) (n=16)	Correlation Coefficient	n/a	0.468	
	P-value	n/a	0.001	passed bank
Floodplain Width average by side (m) (n=32)	Correlation Coefficient	n/a	0.471	
	P-value	n/a	0.001	passed bank
Left Erodible Terrace Bank Height (m)	Correlation Coefficient	0.518	0.967	
	P-value	0.000	0.000	passed both
Right Erodible Terrace Bank Height (m)	Correlation Coefficient	0.506	0.966	
	P-value	0.000	0.000	passed both
Erodible Terrace Bank Height Average left & right (m)	Correlation Coefficient	0.471	n/a	
	P-value	0.001	n/a	passed floodplain
Erodible Terrace Bank Height Sum left & right (m)	Correlation Coefficient	0.382	n/a	
	P-value	0.011	n/a	passed floodplain
Bank Slope Average left & right (degrees)	Correlation Coefficient	-0.344	-0.068	
	P-value	0.022	0.658	passed floodplain
Bank Vegetation Average left & right (%)	Correlation Coefficient	0.4179	0.1081	
	P-value	0.1247	0.2453	failed both
Dominant Riparian Land Use (binary)	Correlation Coefficient	0.3933	0.3731	
	P-value	0.008487	0.01288	passed both
Bank Erosion Average left & right (%)	Correlation Coefficient	-0.0697	0.01353	
	P-value	0.651	0.9299	failed both
Bank Failure Average left & right (%)	Correlation Coefficient	-0.1036	0.02844	
	P-value	0.5015	0.8535	failed both
Bank Soil (% Sand)	Correlation Coefficient	0.1625	0.4222	
	P-value	0.2138	0.1236	failed both
Bank Soil (% Silt)	Correlation Coefficient	-0.2196	-0.1395	
	P-value	0.1512	0.3645	failed both

APPENDIX D: Spearman Rank- Order Correlation Test (Continued)

Variable	Statistic	**Log base 2 of Floodplain Width Average**	**Erodible Terrace Bank Height Average**	Spearman results
Bank Soil (% Clay)	Correlation Coefficient	-0.2546	-0.1051	
	P-value	0.09503	0.4951	failed both
Silt Plus Clay (%)	P-value	-0.2149	-0.1281	
	Correlation Coefficient	0.1602	0.4053	failed both
	TOTAL PASSED	**64**	**75**	

APPENDIX E: Kolmogorov-Smirnov Goodness-of-Fit Normality Test

Variable	Spearman results	Transform used	no trans:	log10:	natural log:	log2:	square root:	square:	1/x:	Normality result
Shreve Order		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.289	0.2591	0.2591	0.2591	0.2439	0.3551	0.2947	
Drainage Area (km^2)		P-value	< 0.0010	= 0.1437	= 0.1436	= 0.1436	< 0.0010	< 0.0010	< 0.0010	Passed 3
	passed both	K-S Distance	0.2809	0.1156	0.1156	0.1156	0.2058	0.3512	0.2885	Use log10
Drainage Area (m^2)		P-value	< 0.0010	= 0.1437	= 0.1436	= 0.1436	< 0.0010	< 0.0010	< 0.0010	Passed 3
	passed both	K-S Distance	0.2809	0.1156	0.1156	0.1156	0.2058	0.3512	0.2885	Use log10
Basin Perimeter (km)		P-value	< 0.0010	= 0.0744	= 0.0745	= 0.0745	< 0.0010	< 0.0010	< 0.0010	Passed 3 tied 2
	passed both	K-S Distance	0.2161	0.1266	0.1265	0.1265	0.193	0.2727	0.1922	Use ln
Basin Perimeter (m)		P-value	< 0.0010	= 0.0744	= 0.0746	= 0.0746	< 0.0010	< 0.0010	< 0.0010	Passed 3 tied 2
	passed both	K-S Distance	0.2161	0.1266	0.1265	0.1265	0.193	0.2727	0.1922	Use ln
Reach Gradient		P-value	< 0.0010	> 0.2000	> 0.2000	> 0.2000	= 0.0481	< 0.0010	< 0.0010	Passed 3 tied 3
	passed both	K-S Distance	0.2112	0.0744	0.0744	0.0744	0.1333	0.3366	0.2533	Use log10
Constant of Channel Maintenance (m^2/m)		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	= 0.0025	Failed all
	passed both	K-S Distance	0.325	0.238	0.238	0.238	0.2636	0.4186	0.1707	
Stream Segment Numbers in Basin		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.2897	0.2677	0.2677	0.2677	0.2395	0.343	0.2999	

APPENDIX E: Kolmogorov-Smirnov Goodness-of-Fit Normality Test (Continued)

Variable	Spearman results	Transform used	no trans:	log10:	natural log:	log2:	square root:	square:	1/x:	Normality result
Stream Frequency (SEG#/km^2)		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance								
Stream Length Longest Path of Segments (m)		P-value	< 0.0010	= 0.1434	= 0.1436	= 0.1436	= 0.0017	< 0.0010	< 0.0010	Passed 3 tied 2
	passed both	K-S Distance	0.2077	0.1156	0.1156	0.1156	0.1747	0.2856	0.1955	Use ln
Gradient of Stream Length Longest Segment Path (%)		P-value	= 0.0011	> 0.2000	> 0.2000	> 0.2000	= 0.1268	< 0.0010	< 0.0010	Passed 4 tied 3
	passed both	K-S Distance	0.1797	0.0736	0.0736	0.0736	0.1177	0.2423	0.218	Use log 10
Gradient of Stream Length Longest Segment Path (%)		P-value	= 0.0739	> 0.2000	> 0.2000	> 0.2000	> 0.2000	< 0.0010	= 0.0532	Passed 6 tied 4
	passed both	K-S Distance	0.1267	0.0721	0.0722	0.0722	0.0886	0.1881	0.1318	Use log 10
Stream Segment Average Length (m)		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	= 0.0102	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.1931	0.1972	0.1973	0.1972	0.1543	0.2948	0.2782	
Total stream length(m)		P-value	< 0.0010	= 0.1316	= 0.1315	= 0.1315	< 0.0010	< 0.0010	< 0.0010	Passed 3
	passed both	K-S Distance	0.2823	0.1171	0.1171	0.1171	0.2129	0.3445	0.2754	Use log10
Stream Segment Length Maximum (m)		P-value	= 0.0508	< 0.0010	< 0.0010	< 0.0010	= 0.0033	< 0.0010	< 0.0010	Passed 1
	passed both	K-S Distance	0.1325	0.1972	0.1972	0.1972	0.1676	0.1955	0.2684	use no trans
Stream Segment Length Minimum (m)		P-value	< 0.0010	= 0.0296	= 0.0296	= 0.0296	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.2652	0.1403	0.1403	0.1403	0.1833	0.3634	0.2549	

APPENDIX E: Kolmogorov-Smirnov Goodness-of-Fit Normality Test (Continued)

Variable	Spearman results	Transform used	no trans:	log10:	natural log:	log2:	square root:	square:	1/x:	Normality result
Minimum Elevation Above MSL (m)		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed bank	K-S Distance	0.23	0.1808	0.1808	0.1807	0.205	0.2786	0.2141	
Maximum Elevation Above MSL (m)		P-value	< 0.0010	= 0.0029	= 0.0029	= 0.0029	< 0.0010	< 0.0010	= 0.0496	Failed all
	passed both	K-S Distance	0.2127	0.1689	0.1691	0.169	0.1902	0.2584	0.1328	
Basin Relief (m)		P-value	= 0.0153	> 0.2000	> 0.2000	> 0.2000	> 0.2000	< 0.0010	< 0.0010	Passed 4 tied 4
	passed both	K-S Distance	0.1492	0.109	0.109	0.1089	0.1029	0.271	0.1995	Use log 10
Basin Relief Ratio		P-value	= 0.0091	> 0.2000	> 0.2000	> 0.2000	= 0.0900	< 0.0010	= 0.0595	Passed 4 tied 3
	passed both	K-S Distance	0.1557	0.0835	0.0835	0.0835	0.1235	0.2429	0.1301	Use log 10
Relative Relief (m/km)		P-value	= 0.0104	> 0.2000	> 0.2000	> 0.2000	= 0.0564	< 0.0010	= 0.0355	Passed 4 tied 3
	passed both	K-S Distance	0.154	0.1085	0.1085	0.1085	0.1309	0.2327	0.1378	Use log 10
Basin Length (km)		P-value	< 0.0010	> 0.2000	> 0.2000	> 0.2000	= 0.0036	< 0.0010	< 0.0010	Passed 3 tied 3
	passed both	K-S Distance	0.2002	0.0998	0.0998	0.0998	0.1665	0.267	0.1942	Use log 10
Basin Length (m)		P-value	< 0.0010	> 0.2000	> 0.2000	> 0.2000	= 0.0036	< 0.0010	< 0.0010	Passed 3 tied 3
	passed both	K-S Distance	0.2002	0.0998	0.0998	0.0998	0.1665	0.267	0.1942	Use log 10
Drainage Shape		P-value	> 0.2000	> 0.2000	> 0.2000	> 0.2000	> 0.2000	= 0.0481	= 0.0760	Passed 6 tied 5
	passed both	K-S Distance	0.1077	0.0926	0.0925	0.0926	0.0966	0.1333	0.1262	Use no trans

APPENDIX E: Kolmogorov-Smirnov Goodness-of-Fit Normality Test (Continued)

Variable	Spearman results	Transform used	no trans:	log10:	natural log:	log2:	square root:	square:	1/x:	Normality result
Shreve Bifurcation Ratio		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	= 0.0013	Failed all
	passed both	K-S Distance	0.276	0.2572	0.2572	0.2572	0.2987	0.221	0.2311	
SH_BIFUR_RTO (+1)		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.2827	0.2947	0.2947	0.2947	0.2898	0.2608	0.3001	
% of First Order Streams to the Total Number of Streams		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.2991	0.2963	0.2963	0.2963	0.2978	0.301	0.2921	
% of First Order Streams to the Total Number of Streams		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.3017	0.3003	0.3003	0.3003	0.3011	0.3025	0.2982	
Melton Ruggedness Number 1958		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	= 0.0131	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.1951	0.1845	0.1845	0.1845	0.1511	0.3059	0.2866	
Melton Ruggedness Number 1957		P-value	= 0.0025	= 0.1581	= 0.1581	< 0.0010	= 0.0417	< 0.0010	= 0.0941	Passed3 tied 2
	passed bank	K-S Distance	0.1708	0.1139	0.1139	0.2335	0.1354	0.2585	0.1227	Use log 10
Ground Slope (degrees)		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	= 0.0131	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.1951	0.1846	0.1846	0.1845	0.1511	0.3059	0.2866	
Minimum Basin Slope (%)		P-value	< 0.0010	= 0.0169	= 0.0169	= 0.0169	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed bank	K-S Distance	0.2749	0.1969	0.1969	0.1969	0.2559	0.3357	0.3085	

APPENDIX E: Kolmogorov-Smirnov Goodness-of-Fit Normality Test (Continued)

Variable	Spearman results	Transform used	no trans:	log10:	natural log:	log2:	square root:	square:	1/x:	Normality result
Maximum Basin Slope (%)		P-value	= 0.0037	> 0.2000	> 0.2000	> 0.2000	= 0.0447	< 0.0010	= 0.0028	Passed 3 tied 3
	passed both	K-S Distance	0.1663	0.1054	0.1053	0.1053	0.1344	0.2249	0.1693	Use log 10
Pixel Slope Standard Deviation		P-value	= 0.0326	= 0.0377	= 0.0382	= 0.0380	= 0.1132	< 0.0010	< 0.0010	Passed 1
	passed both	K-S Distance	0.139	0.1369	0.1367	0.1367	0.1196	0.1808	0.1981	Use square root
Pixel Slope 2 Standard Deviations		P-value	= 0.0326	= 0.0378	= 0.0381	= 0.0380	= 0.1132	< 0.0010	< 0.0010	Passed 1
	passed both	K-S Distance	0.139	0.1368	0.1367	0.1367	0.1196	0.1808	0.1981	Use square root
Pixel Slope 3 Standard Deviations		P-value	= 0.0326	= 0.0383	= 0.0383	= 0.0382	= 0.1132	< 0.0010	< 0.0010	Passed 1
	passed both	K-S Distance	0.139	0.1367	0.1367	0.1367	0.1196	0.1808	0.1981	Use square root
		P-value	> 0.2000	= 0.0056	= 0.0056	= 0.0056	> 0.2000	= 0.0026	< 0.0010	Passed 2 tied 2
	passed both	K-S Distance	0.0849	0.1615	0.1615	0.1615	0.1028	0.1703	0.3069	Use no trans
Segment Slope (75th)		P-value	= 0.0048	= 0.0026	= 0.0026	< 0.0010	= 0.0025	= 0.0015	= 0.0220	Failed all
	passed bank	K-S Distance	0.1634	0.1702	0.1702	0.207	0.1704	0.1762	0.1444	
Total Thread Length		P-value	< 0.0010	= 0.0396	= 0.0396	= 0.0402	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed bank	K-S Distance	0.3336	0.1362	0.1362	0.1359	0.2349	0.4079	0.3598	
Average Thread Length		P-value	= 0.0187	= 0.1235	= 0.1235	= 0.1165	> 0.2000	< 0.0010	< 0.0010	Passed 4
	passed bank	K-S Distance	0.1465	0.1182	0.1182	0.1191	0.0989	0.2577	0.3543	Use square root

APPENDIX E: Kolmogorov-Smirnov Goodness-of-Fit Normality Test (Continued)

Variable	Spearman results	Transform used	no trans:	log10:	natural log:	log2:	square root:	square:	1/x:	Normality result
NLCD Percent Land Cover barren land		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed bank	K-S Distance	0.5177	0.5175	0.5176	0.5188	0.5175	0.5174	0.5177	
NLCD Percent Land Cover deciduous forest		P-value	= 0.0501	= 0.0045	= 0.0045	= 0.0045	= 0.0156	= 0.1962	< 0.0010	Passed 2
	passed both	K-S Distance	0.1327	0.1641	0.164	0.1641	0.1489	0.1099	0.1923	Use sq
NLCD Percent Land Cover evergreen forest		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.277	0.2796	0.2796	0.2796	0.2783	0.2742	0.2819	
NLCD Percent Land Cover grassland/herbaceous		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.2682	0.272	0.272	0.272	0.2702	0.2642	0.2756	
NLCD Percent Land Cover mixed forest		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed bank	K-S Distance	0.2208	0.224	0.224	0.2639	0.2224	0.2174	0.2269	
NLCD Percent Land Cover open water		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed bank	K-S Distance	0.521	0.5211	0.5211	0	0.5211	0.5209	0.5212	
NLCD Percent Land Cover pasture/hay		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed bank	K-S Distance	0.2239	0.2313	0.2313	0.2364	0.2276	0.2161	0.2381	
NLCD Percent Land Cover shrub/scrub		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.2849	0.2874	0.2873	0.2873	0.2861	0.2823	0.2896	
NLCD Percent Land Cover woody wetlands		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.5015	0.5017	0.5017	0.5017	0.5016	0.5015	0.5018	

APPENDIX E: Kolmogorov-Smirnov Goodness-of-Fit Normality Test (Continued)

Variable	Spearman results	Transform used	no trans:	log10:	natural log:	log2:	square root:	square:	1/x:	Normality result
NLCD Percent Land Cover total forest		P-value	= 0.0018	= 0.0042	= 0.0042	< 0.0010	= 0.0028	< 0.0010	= 0.0025	Failed all
	passed bank	K-S Distance	0.174	0.1647	0.1647	0.1844	0.1695	0.1821	0.1705	
NLCD Percent Land Cover non-forest		P-value	= 0.0018	< 0.0010	< 0.0010	< 0.0010	< 0.0010	= 0.0033	< 0.0010	Failed all
	passed bank	K-S Distance	0.174	0.1875	0.1875	0.1898	0.1811	0.1676	0.1986	
NLCD Percent Land Cover non-forest vegetation		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.2171	0.2254	0.2254	0.2254	0.2213	0.208	0.2328	
NLCD Percent Land Cover agricultural		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.2234	0.2308	0.2308	0.2308	0.2272	0.2155	0.2377	
NLCD Percent Land Cover other		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed bank	K-S Distance	0.5158	0.5158	0.5158	0	0.5158	0.5158	0.5158	
Channel Width at Floodplain Height (m)		P-value	< 0.0010	> 0.2000	> 0.2000	> 0.2000	= 0.0559	< 0.0010	= 0.0022	Passed 4 tied 3
	passed both	K-S Distance	0.1837	0.0816	0.0816	0.0816	0.131	0.2681	0.1719	Use log 10
Floodplain Width Average left & right (m) (n=16)		P-value	< 0.0010	= 0.1080	= 0.1080	= 0.1707	= 0.0023	< 0.0010	< 0.0010	Passed 3
	passed bank	K-S Distance	0.3166	0.1204	0.1204	0.1125	0.1716	0.4478	0.3661	Use log2
Floodplain Width average by side (m) (n=32)		P-value	< 0.0010	= 0.1080	= 0.1080	= 0.1707	= 0.0023	< 0.0010	< 0.0010	Passed 3
	passed bank	K-S Distance	0.3166	0.1204	0.1204	0.1125	0.1716	0.4478	0.3661	Use log2

APPENDIX E: Kolmogorov-Smirnov Goodness-of-Fit Normality Test (Continued)

Variable	Spearman results	Transform used	no trans:	log10:	natural log:	log2:	square root:	square:	1/x:	Normality result
Left Erodible Terrace Bank Height (m)		P-value	> 0.2000	= 0.0039	= 0.0039	= 0.0039	= 0.0356	= 0.0057	< 0.0010	Passed 1
	passed both	K-S Distance	0.1094	0.1712	0.1712	0.1712	0.1377	0.1614	0.2392	Use no trans
Right Erodible Terrace Bank Height (m)		P-value	> 0.2000	= 0.0578	= 0.0578	= 0.0579	> 0.2000	= 0.0012	< 0.0010	Passed 5 tied 2
	passed both	K-S Distance	0.105	0.132	0.132	0.132	0.0836	0.1781	0.226	Use no trans
Erodible Terrace Bank Height Average left & right (m)		P-value	= 0.0424	= 0.0030	= 0.0030	= 0.0030	= 0.1067	= 0.0074	< 0.0010	Passed 1
	passed floodplain	K-S Distance	0.1352	0.1686	0.1687	0.1687	0.1206	0.1582	0.2286	Use square root
Erodible Terrace Bank Height Sum left & right (m)		P-value	= 0.0167	< 0.0010	< 0.0010	< 0.0010	= 0.0280	= 0.0049	< 0.0010	Failed all
	passed floodplain	K-S Distance	0.148	0.1848	0.1847	0.1847	0.1411	0.1631	0.251	
Bank Slope Average left & right (degrees)		P-value	> 0.2000	= 0.1195	= 0.1177	= 0.1181	> 0.2000	> 0.2000	= 0.0078	Passed 6 tied 3
	passed floodplain	K-S Distance	0.0796	0.1187	0.1190	0.1189	0.0990	0.0892	0.1575	Use no trans
Dominant Riparian Land Use (binary)		P-value	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	Failed all
	passed both	K-S Distance	0.3972	0.3972	0.3972	0.3972	0.3972	0.3972	0.3972	
	Total passed		**19**	**33**	**33**	**32**	**30**	**3**	**5**	

APPENDIX F: Pearson Product Moment Test

Variable	Transform used	Statistic	**Erodible Terrace Bank Height Average**	**Log base 2 of Floodplain Width Average**	Pearson bank result	Pearson Floodplain result
Drainage Area (km^2)	Log10	Correlation Coefficient	0.8262	0.611	Pass	Pass
		P-value	5.02E-12	0.00001057		
Drainage Area (m^2)	Log10	Correlation Coefficient	0.8262	0.611	Pass	Pass
		P-value	5.02E-12	0.00001057		
Basin Perimeter (km)	Natural log	Correlation Coefficient	0.8373	0.6002	Pass	Pass
		P-value	1.41E-12	0.00001657		
Basin Perimeter (m)	Natural log	Correlation Coefficient	0.8373	0.6002	Pass	Pass
		P-value	1.41E-12	0.00001657		
Reach Gradient	Log10	Correlation Coefficient	-0.5041	-0.5302	Fail	Fail
		P-value	0.0004857	0.0002143		
Stream Length Longest Path of Segments (m)	Natural log	Correlation Coefficient	0.8262	0.611	Pass	Pass
		P-value	5.02E-12	0.00001057		
Gradient of Stream Length Longest Segment Path (%)	Log10	Correlation Coefficient	-0.4959	-0.4835	Fail	Fail
		P-value	0.0006195	0.0008856		
Gradient of Stream Length Longest Segment Path (%)	Log10	Correlation Coefficient	-0.497	-0.489	Fail	Fail
		P-value	0.0005991	0.0007574		
Total stream length(m)	Log10	Correlation Coefficient	0.8402	0.6052	Pass	Pass
		P-value	9.94E-13	0.0000135		
Stream Segment Length Maximum (m)	No Transform	Correlation Coefficient	0.8402	0.6261	Pass	Pass
		P-value	9.91E-13	0.000005486		
Basin Relief (m)	Log10	Correlation Coefficient	0.7172	0.4052	Pass	Fail
		P-value	4.323E-08	0.006367		
Basin Relief Ratio	Log10	Correlation Coefficient	-0.651	-0.6181	Fail	Pass
		P-value	0.000001711	0.000007788		

APPENDIX F: Pearson Product Moment Test (Continued)

Variable	Transform used	Statistic	**Erodible Terrace Bank Height Average**	**Log base 2 of Floodplain Width Average**	Pearson bank result	Pearson Floodplain result
Relative Relief (m/km)	Log10	Correlation Coefficient	-0.6868	-0.6154	Fail	Pass
		P-value	0.000000263	0.000008764		
Basin Length (km)	Log10	Correlation Coefficient	0.8343	0.6087	Pass	Pass
		P-value	2.00E-12	0.00001164		
Basin Length (m)	Log10	Correlation Coefficient	0.8343	0.6087	Pass	Pass
		P-value	2.00E-12	0.00001164		
Drainage Shape	No Transform	Correlation Coefficient	0.2157	0.2144	Fail	Fail
		P-value	0.1596	0.1622		
Melton Ruggedness Number 1957	Log10	Correlation Coefficient	-0.6537		Fail	
		P-value	0.000001499	passed bank		
Maximum Basin Slope (%)	Log10	Correlation Coefficient	0.5171	0.1909	Fail	Fail
		P-value	0.0003257	0.2146		
Pixel Slope Standard Deviation	Square root	Correlation Coefficient	0.3196	0.09627	Fail	Fail
		P-value	0.03448	0.5342		
Pixel Slope 2 Standard Deviations	Square root	Correlation Coefficient	0.3196	0.09627	Fail	Fail
		P-value	0.03448	0.5342		
Pixel Slope 3 Standard Deviations	Square root	Correlation Coefficient	0.3196	0.09627	Fail	Fail
		P-value	0.03448	0.5342		
Segment Slope (99^{th})	Square root	Correlation Coefficient	0.3964	0.1873	Fail	Fail
		P-value	0.007723	0.2234		
Segment Thread Average	Square root	Correlation Coefficient	0.8214		Pass	Fail
		P-value	8.44E-12	passed bank		
NLCD Percent Land Cover	Log10	Correlation Coefficient	-0.3288	-0.2415	Fail	Fail
		P-value	0.02929	0.1143		

APPENDIX F: Pearson Product Moment Test (Continued)

Variable	Transform used	Statistic	**Erodible Terrace Bank Height Average**	**Log base 2 of Floodplain Width Average**	Pearson bank result	Pearson Floodplain result
Channel Width at Floodplain Height (m)	Log10	Correlation Coefficient	0.8066	0.6325	Pass	Pass
		P-value	3.86E-11	0.000004105		
Floodplain Width Average left & right (m) (n=16)	Log base 2	Correlation Coefficient	0.4838		Fail	
		P-value	0.0008774	n/a		
Floodplain Width average by side (m) (n=32)	Log base 2	Correlation Coefficient	0.4838		Fail	
		P-value	0.0008774	n/a		
Left Erodible Terrace Bank Height (m)	No Transform	Correlation Coefficient	0.955	0.4874	Pass	Fail
		P-value	3.46E-22	0.00123		
Right Erodible Terrace Bank Height (m)	No Transform	Correlation Coefficient	0.9548	0.4762	Pass	Fail
		P-value	3.26E-23	0.001248		
Erodible Terrace Bank Height Average left & right (m)	Square root	Correlation Coefficient		0.4838		Fail
		P-value	not applicable	0.0008774		
Bank Slope Average left & right (degrees)	No Transform	Correlation Coefficient		-0.3316	Fail	Fail
		P-value	not applicable	0.02788		
		Total passed	**27.00**	**16**	**27**	**16**

Test Requirements:	**Erodible Terrace Height Average**	**Log Base 2 of Floodplain Width Average**
Correlation Coefficient	*(>0.80 to pass)*	*(>0.60 to pass)*
P-value	*(<0.05 to pass)*	*(<0.05 to pass)*