THE INFLUENCE OF DEEP-SEATED LANDSLIDES ON TOPOGRAPHIC VARIABILITY AND SALMON HABITAT IN THE OREGON COAST RANGE, USA

by

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THESIS ABSTRACT

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A well-accepted idea in geomorphology is that landforms control the type and distribution of biological habitat. However, the linkages between geomorphology and ecology remain poorly understood. In rivers, the geomorphic template controls the hydraulic environment, partly shaping the river ecosystem. But what processes shape the geomorphic template? Here, I examine how two hillslope processes dominant in the Oregon Coast Range, debris flows and deep-seated landslides, affect valley floor width and channel slope, key components of the geomorphic template in riverine ecosystems. I then investigate how patterns in potential salmon habitat differ between streams dominated by deep-seated landslides and streams dominated by debris flows. I show that terrain influenced by deep-seated landslides exhibits (1) valley widths that are more variable throughout the network but less locally variable, (2) more variable channel slopes, and (3) more potential salmon habitat as well as significantly more connectivity between habitat types.

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CHAPTER I

INTRODUCTION

A well-accepted idea in geomorphology is that landforms control the types and distribution of habitat, and thus to a large degree influence biogeography (e.g. Swanson et al., 1988). However, in practice, the linkages between geomorphology and ecology remain weak. Many types of habitats have either become limited or degraded due to direct human modification and/or global climate change. In order to inform restoration and conservation strategies, it is important to understand the processes that work on the landscape-scale to modify landforms and how those processes influence the smaller scale processes that create habitat. I will apply this framework to understanding the geomorphic processes influencing the spatial distribution of riverine habitat in the Central Oregon Coast Range, a mountainous region in Western Oregon, USA.

Two topographic variables that structure riverine habitat are valley width and channel gradient. Previous research in two basins in the Oregon Coast Range found that deep-seated landslides (e.g. gravitational slope deformations) increase variability in valley floor width: when compared with the hydraulic geometry of a control basin, anomalously wide valleys were found adjacent to and above deep-seated landslides (May et al., 2013). This study coupled these findings with a simple intrinsic potential habitat model (Burnett et al., 2007), linking landslides with high quality fish habitat. Here, I expand on this work by further examining the relationship between deep-seated landslides and valley width, as well as the relationship between deep-seated landslides and channel slope. I also examine the effects deep-seated landslides have on landscape-scale patterns in potential fish habitat.

In this master's thesis, I will determine if the underlying geologic structure and lithologic variations that control the location of deep-seated landslides in the Central Oregon Coast Range also have an indirect impact on topography at the scale felt by salmonids. I address the following two questions in chapters 2 and 3, respectively:

(1) To what extent and how do deep-seated landslides control valley floor width and channel slope in the Oregon Coast Range?
(2) What are the relationships between deep-seated landslides, valley floor width, and potential salmon habitat in the Oregon Coast Range?

The five species of Pacific salmon evolved via genetic radiation in response to increased topographic variability caused by tectonic activity on the Pacific Rim (Montgomery, 2000). From the very outset, Pacific salmon were evolutionarily adapted to a dynamic landscape shaped by natural disturbances. However, anthropogenic changes resulting in habitat degradation through development, agriculture and logging, habitat loss due to impassable culverts and dams, and consistent population setbacks due to overfishing and complications with hatchery fish have led to a precipitous decline in Pacific salmon, steelhead, and sea-run cutthroat trout (Montgomery, 2003; Nehlsen et al., 1991).

Salmon are integral to ecosystems by dispersing marine-derived macroelements (primarily phosphorous and nitrogen) into aquatic and terrestrial ecosystems both by entering the food cycle through direct consumption by predators, as well as through decomposition and uptake by primary producers (see review by Gende et al., 2002). The fishery is also commercially and recreationally valuable, both regionally and internationally. Additionally, while salmon have always held an esteemed role in Native American folklore, they are now also a cultural icon of the Pacific Northwest (Montgomery, 2003). Federal listing in the 1990s of the Oregon Coastal evolutionarily significant unit (ESU) of steelhead trout (*Oncorhynchus mykiss*) as a Species of Concern and the Oregon Coastal ESU of coho salmon (*Oncorhynchus kisutch*) as a Threatened Species (U.S. Endangered Species Act of 1973) prompted the growth of habitat restoration as a regional priority (e.g. State of Oregon, 1997) and increased attention to the need for improved identification of high quality fish habitat.

Inferring the quality of salmon habitat from biological data is challenging primarily due to naturally high inter-annual variability caused by changing ocean conditions – i.e. zooplankton fluctuations caused by the Pacific decadal oscillation significantly modulate population numbers of the anadromous fishes that feed on them (Francis and Hare, 1994). Additionally, some fishes, particularly coho, are known to exhibit territorial behavior, with the result that the highest quality habitat often have fewer fish (Chapman, 1962). While high temporal variability in fish abundances can be attributed to global circulation patterns, spatial variability in fish abundances is also significant and the factors driving it are poorly understood (Anlauf et al., 2011).

At the network-scale, fish distribution is strongly geomorphically and hydrologically controlled, as species' use is correlated to their ability to bury their eggs beyond scour potential (Montgomery et al., 1999). On a smaller scale of geomorphic control, juvenile coho are found in higher densities in low gradient, unconstrained valleys whereas juvenile steelhead and cutthroat trout (*Oncorhynchus clarkii*) are found in higher densities in higher gradient, constrained canyons (Burnett, 2001; Hicks and Hall, 2003; Montgomery et al., 1999). Therefore, while the network-scale pattern may imply that steelhead generally spawn in the lower portion of the watershed, coho in the middle and upper, and cutthroat trout in the highest reaches of the watershed, topographic variability at the reach-scale results in deviations from this trend (Montgomery et al., 1999). Applying the observation that the three primary controls on salmon abundance are stream flow, valley constraint and channel gradient, Burnett et al. (2007) used these three variables to model the intrinsic potential (IP) of streams in the Oregon Coast Range to provide high quality habitat. A multi-year study of fish populations in multiple basins in the Oregon Coast Range showed that IP score successfully explained juvenile coho abundances (Flitcroft et al., 2014). This raises the question of what controls the distribution of areas of high IP, or more directly, what controls valley constraint and channel gradient.

Valley width and slope are controlled by either hillslope or fluvial processes, but models for scaling between hillslope-fluvial coupling and drainage networks are still lacking. In the Oregon Coast Range, and in most steep soil-mantled landscapes, debris flows are the primary mechanism that carves headwater valleys (Stock and Dietrich, 2003). Debris flows (initiated by shallow landslides) are thought to be the dominant hillslope-fluvial coupling process at slopes greater than 0.03–0.1, which, in the steep slopes of the Oregon Coast Range, comprises 80% of the relief structure and 80% of the network length. However, evidence of deep-seated landslides is also prevalent throughout the Oregon Coast Range, occurring where the distal facies with lower sandstone:siltstone ratio has been exhumed and where the hillslope aspect coincides with the bedrock dip-slope (Roering et al., 2005).

Different dating techniques applied to deep-seated landslides in the Central Oregon Coast Range have resulted in ages that range from 18-150,000 ya (Hammond et al., 2009; Mathabane et al., 2013) although Hammond et al. (2009) postulate that the depth of erosion suggests some landslides may be as old as the Pliocene. Additionally, there is some evidence of deep-seated landslide activity within the last 150 years (Burns et al., 2012), with the most recent catastrophic failure occurring in 1975 (Lynch, 1976). Approximate rate of activity ranges from slow to catastrophic (Baldwin, 1958; Burns et al., 2012) and possible causes include stream erosion through weak bedrock, high groundwater levels and/or precipitation caused by a wetter climate, as well as seismic activity (Baldwin, 1958; Hammond et al., 2009).

Debris flows travel through the channel network, eventually leaving unconsolidated debris deposits at high-angle tributary junctions or when valley slopes reach ~0.03-0.1. In contrast, deep-seated landslides have a short run-out distance and deposit a large amount of bedrock directly in the valley. In the most extreme cases in the Oregon Coast Range, deep-seated landslides block channels and create landslide-dammed lakes (Baldwin, 1958), as is the case for the most recently recorded channel-damming landslide on Drift Creek that created Ayers Lake (Figure 1, from Roering et al., 2005).

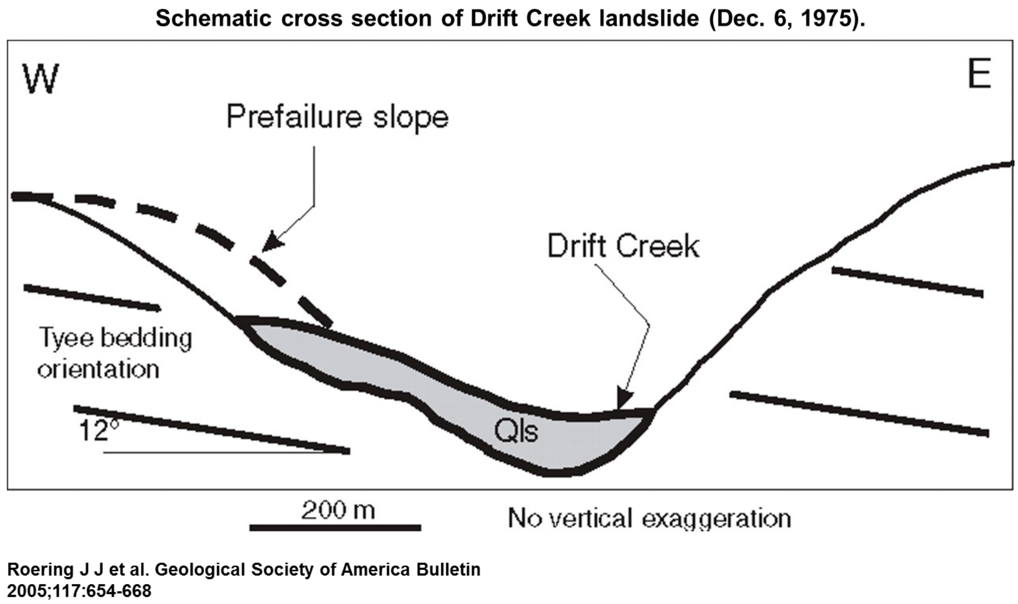

Figure 1. Schematic showing a cross-section of the 1975 Drift Creek landslide that dammed Ayers Lake in the Oregon Coast Range. From Roering et al. (2005).

Deep-seated landslides can provide substantial sediment input to channels (Kelsey, 1978; Mackey et al., 2009). Booth et al. (2013) showed they are a necessary component in landscape evolution models to produce erosion rates that match uplift rates by producing a higher ratio of sediment per drainage area than diffusive processes alone. This suggests that the sediment input from deep-seated landslides has the potential to affect stream and valley morphology beyond the location of a landslide and for a long time following a landslide. While many of the deep-seated landslides in the Oregon Coast Range date to the Pleistocene (Hammond et al., 2009; Mathabane et al., 2013), the sheer quantity of sediment deposited in the valley may have longer-lasting effects on the fluvial system than the more frequent, but smaller, inputs deposited by debris flows. Therefore, landslide-driven and debris flow-driven modes of hillslope-fluvial coupling likely produce noticeable differences in valley and channel topography as well as differences in fluvial geomorphic features.

Deep-seated landslides have been observed to produce a consistent topographic signature consisting of lower relief landscapes, quasi-planar hillslopes and less concave longitudinal profiles (Booth et al., 2013). They have also been shown to create knickpoints in longitudinal profiles (Korup, 2006), widen valleys (Korup et al., 2006; May et al., 2013), and in the most extreme cases cause full channel occlusion and landslide-dammed lakes (Baldwin, 1958; Korup, 2005). Still, more research is needed to fully understand and quantify the temporal and spatial range in how landslides affect fluvial processes (Korup et al., 2010).

Deep-seated landslides in the Oregon Coast Range are structurally and lithologically controlled (Roering et al., 2005), thus understanding the geomorphic influence landslides have on streams is critical to linking geology and aquatic ecology. The potential for deep-seated landslides will likely increase, as more of the distal facies is exposed due to erosion; therefore, understanding the geomorphic effects and biological implications of these landslides will only become more relevant. I am focusing on salmon, but valley constraint and gradient affect more than fish habitat. Wide valleys allow for the formation of floodplains and multithreaded channels, both of which encourage biogeochemical cycling and provide habitat heterogeneity that supports high biodiversity (Naiman et al., 2010; Wohl, 2011). Biological data are inherently variable due to natural population fluctuations and challenges in sampling. This is especially true for anadromous fish species that are subject to variable ocean conditions (Francis and Hare, 1994). Combined with a mosaic of land use, land ownership, and local politics, this makes identifying areas for habitat conservation and restoration prioritization an extremely challenging task. Linking long-lasting geomorphic signatures that are easily mapped with lidar, such as landslides, to areas of high quality aquatic habitat has the potential to facilitate this process. In this study, I examine how deep-seated landslides affect topography in two basins in the Oregon Coast Range, USA, and I examine the spatial distribution of potential fish habitat as it relates to the spatial distribution of deep-seated landslides in twenty-two basins distributed across the Oregon Coast Range.

CHAPTER II

DEEP-SEATED LANDSLIDES AFFECT VALLEY WIDTH AND CHANNEL SLOPE

Introduction

Scientists have long sought to understand the interplay of forces that create river networks and their valleys, the topology and topography of which can control the location and distribution of available habitat for aquatic organisms (e.g. Montgomery, 2000). The local geomorphic template controls the hydraulic environment, partly shaping the river ecosystem. But what processes shape the geomorphic template? Controls that change over timescales of at least ~10^3 years and operate on the spatial scale of mountain ranges (including lithology, climate/glaciation, tectonic uplift rates, and underlying geologic structures) are the first-order control on the geomorphology of landforms. These are overlain with more transient processes (such as mass movements, floods, fire, and diffusive processes) that operate at smaller scales, creating both spatial and temporal heterogeneity within the landforms.

Geomorphologists have developed numerous conceptual models to explain how this geomorphic template varies in rivers, including downstream hydraulic geometry (Leopold and Maddock, 1953), the river continuum concept (Vannote et al., 1980), the sediment links concept (Rice and Church, 1998), network dynamics hypothesis (Benda et al., 2004), and geomorphic process domains (Montgomery, 1999). These models hold that river patterns vary because of drainage area, tributary confluences, and local geomorphic processes. The relative importance of longer-timescale processes compared with transient processes in shaping river patterns is not well understood. Two potentially important topographic variables that are influenced by these spatial and temporal components and that shape riverine ecosystems are valley width and channel slope. A river's longitudinal profile is partly influenced by bedrock erosion or graded to the amount and size of sediment supplied to the channel (Gilbert, 1877; Mackin, 1948) but relatively little is understood about reach-scale variations in slope. Also, while many of the conceptual models mentioned above successfully explain variations in channel width, their ability to explain valley floor width has not been explored. In this master's thesis, I apply these conceptual models to address the following question:

(1) To what extent and how do deep-seated landslides control valley floor width and channel slope in the Oregon Coast Range?

Montgomery (2002) first showed that valley width (defined as the ridgetop-to-ridgetop distance) scales as a power law to drainage area in different geomorphic process regimes. While this relationship does influence stream topology and illuminate dominant valley forming processes, it provides no information on smaller-scale processes forming the valley floor – the area that is potentially available as aquatic and riparian habitat. May et al. (2013) showed valley floor width also scales as a power law to drainage area and both they and Gangodagamage et al. (2011) suggest that significant valley width variability exists and can be examined as a signature of the geomorphic processes at work.

Understanding the processes controlling valley floor geometry is critical to linking geomorphology and aquatic biology. Unconstrained valleys provide more area for the development of floodplains – landforms that are essential to the biogeochemical cycle, provide immense habitat heterogeneity that supports high biodiversity, and act as sediment sinks and sources (Naiman et al., 2010). Fluvial wood generally has longer residence times in low-gradient unconstrained valleys, allowing for development of multi-thread channels (Wohl, 2011) and significant carbon storage (Wohl et al., 2012). Large fluvial wood is also correlated with pool formation in the Pacific Northwest, both in volume and depth (Reeves et al., 2011; Rosenfeld et al., 2000). Therefore, areas with wide valleys have the potential for off-channel pool habitat, which has been recognized as one limiting factor for Oregon Coast ESU coho, a Threatened species (Nickelson et al., 1992; U.S. Endangered Species Act, 1973). Side channel and off-channel habitat provide slow water refuge during winter floods as well as a mosaic of distinct food webs that can support a higher carrying capacity for Pacific salmon compared with food webs in the main channel (Bellmore et al., 2013).

While wide valleys are ecological hotspots, variability in valley width is also a critical component in the creation of riverine ecosystems in the Pacific Northwest. As mentioned above, floodplains have higher retention of organic material, which translates into higher rates of decomposition; however, confined valleys have significantly greater organic inputs and thus could be thought of as sources for organic material that wind up in floodplains (Bellmore and Baxter, 2014). Fish distribution also varies by valley constraint: juvenile coho (*Oncorhynchus kisutch*) are found in higher densities in low gradient, unconstrained valleys whereas juvenile steelhead and cutthroat trout (*Oncorhynchus clarkii*) are found in higher densities in higher gradient, constrained canyons (Burnett, 2001; Hicks and Hall, 2003; Montgomery et al., 1999).

Valley floor width and channel slope are key variables in aquatic ecosystems. Therefore, it is important to understand how different geomorphic processes influence valley width, gradient and their spatial and temporal variability. Fluvial processes dominate in wide, alluvial valleys, but valley-forming processes in mountainous regions are not well understood. Stock and Dietrich (2003) showed that debris flows in the Oregon Coast Range impart a signature on valley gradient and suggested this signature was widespread in soil-mantled landscapes. However, deep-seated landslides are also extensive in the Oregon Coast Range (Roering et al., 2005), but how they affect valley geometry and stream networks is only beginning to be studied. May et al. (2013) showed that anomalously wide valleys exist upstream and adjacent to two discrete deep-seated landslides. Here, I expand on this work by examining both valley width and channel slope in basins affected by extensive deep-seated landslides as well as channel slope in a basin affected by discrete landslides. Based on the findings by May et al. (2013) introduced above, I hypothesize that: (1) extensive landslides should cause greater variability in valley width and channel slopes, both across the network as well as locally, and (2) that active landslides should locally widen valleys and reduce channel slopes.

New availability of airborne lidar and other high-resolution topographic data has made it possible to easily identify large geomorphic features that are hard to recognize from the ground, such as deep-seated landslides. Due to natural population fluctuations and challenges with sampling, biological data are inherently variable, as well as time-consuming and expensive to acquire. Therefore, linking easily seen landscape features to aquatic and riparian habitat could help guide land management and conservation / restoration priorities. Also, because deep-seated landslides are structurally and lithologically controlled (Roering et al., 2005), understanding their geomorphic effect on streams will help bridge geology and aquatic ecology by providing predictive capability.

Methods

Study Area

The Oregon Coast Range (OCR) is a unique place to study deep-seated landslides because they are extremely abundant in a landscape with relative uniformity in hillslope gradient, drainage density, and rock type. This allows for a spatially extensive survey in which landslides are not confounded with other geomorphic processes. The OCR is an ~25,000 km^2 highly dissected mountainous region with elevations ranging from 0 to 1250 m. The climate is temperate maritime, with wet winters receiving 1 to 2 m of rain that result in flashy peak streamflows throughout the fall and winter. Douglas fir forest blanket the mountains, the composition of which has been altered by logging and land-use to a landscape dominated by younger stands (Kennedy and Spies, 2004). The OCR is composed primarily of sedimentary rocks that overlie an ancient volcanic terrane. Underlying an extensive area of the central OCR is the Tyee Formation, a relatively undeformed sandstone and siltstone layer deposited in the Eocene on a delta-fed submarine ramp. This type of depositional system resulted in an ~10,000 km^2 area with only minor facies variation, primarily in the north-south direction (Heller and Dickinson, 1985). Dating of marine terraces in the area imply uplift rates of 0.1-0.3 mm yr^{-1} (Kelsey et al., 1996), closely matching measured denudation rates of 0.05-0.08 mm yr^{-1} (Reneau and Dietrich, 1991) and soil production rates of 0.02-0.16 mm yr^{-1} (Heimsath et al., 2001). This suggests that the landscape is in approximate steady state, whereby erosion keeps pace with uplift, with the effect that, while individual landforms may change, the dominant form of the landscape is statistically steady. Steady state is often seen as the theoretical endpoint in landscape evolution models, thus studying geomorphic processes in a steady state landscape can inform landscape evolution theories.

The OCR consists of uniform ridge and valley topography with steep soil-mantled slopes. Underlying the steep slopes of the OCR is a series of low-amplitude compressional folds (Baldwin, 1956). Deep-seated landslides occur more frequently where the hillslope aspect coincides with the bedrock dip-slope and where the distal facies with lower sandstone:siltstone ratio is exposed (Roering et al., 2005). Because the composition of the Tyee Formation varies slightly with a north-south trend, the area affected by deep-seated landslides ranges between ~25% in the northern OCR to ~5% of the landscape in the southern portion of the range. Here, I use the predictive algorithm created by Roering et al. (2005) for the Tyee Formation to locate deep-seated landslides (defined as bedrock landslides with a surface area >0.1 km^2, consisting predominantly of parent material, and with a short run out distance). I also use data from the Oregon Department of Geology and Mineral Industries (DOGAMI) (Burns et al., 2012) to create a map that delineates historic landslides (active in the last 150 years) and pre-historic landslides (not active in the last 150 years) (Fig. 2).

I chose to examine the effects of deep-seated landsliding as well as active vs. historical landslides on valley floor width and channel slope in Condon Creek, a tributary to the North Fork Siuslaw River (Fig. 3), due to the extensive nature of the landslides in this area and the availability of lidar for the area. Harvey Creek, a tributary to the Umpqua River, served as a control basin in debris flow terrain because of its uniform valley-ridge topography (Fig. 3). Additionally, in order to compare extensive landsliding with discrete landsliding, I examine the slope-area relationship in Elk Creek, a tributary to the Millicoma River, where two discrete deep-seated landslides punctuate otherwise relatively uniform topography. In order to have an equal number of control basins as basins affected by deep-seated landslides, I compare slope-area plots of these basins with one additional basin in debris flow terrain, Dean Creek (Fig. 4), a tributary to the Umpqua River, which was also chosen because of its uniform topography. One-meter resolution airborne lidar was used to collect valley and slope data in a GIS.

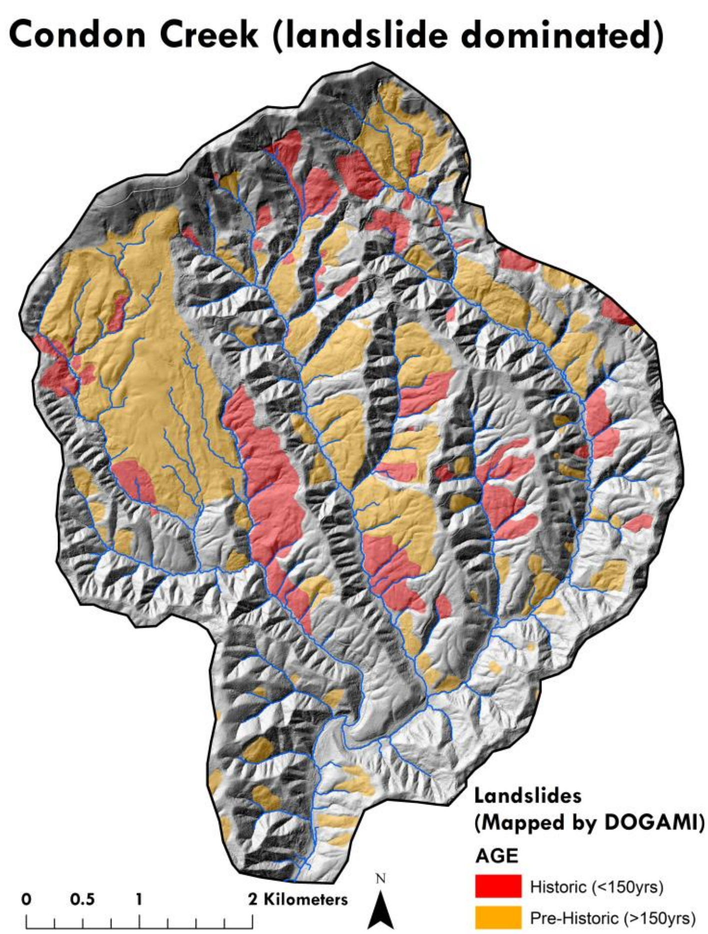

Figure 2. Hillshade of Condon Creek with deep-seated landslides mapped by DOGAMI as historic (active in the last 150 years) and pre-historic (older than 150 years).

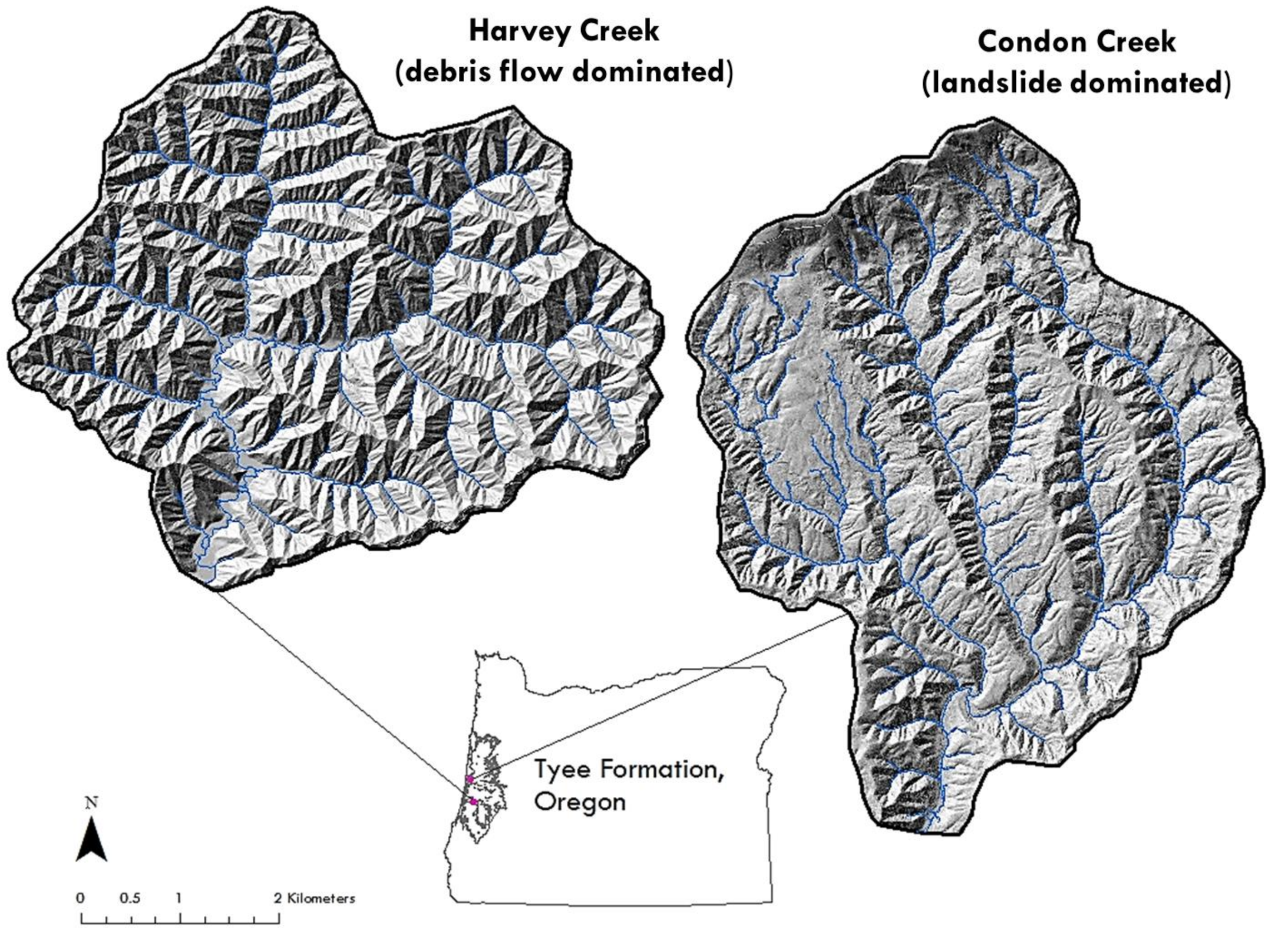

Figure 3. Location map for Harvey Creek (tributary to the Umpqua River, debris flow terrain) and Condon Creek (tributary to the North Fork Siuslaw, extensive deep-seated landslide terrain) in the Oregon Coast Range, USA, showing a hillshade made from unsmoothed lidar.

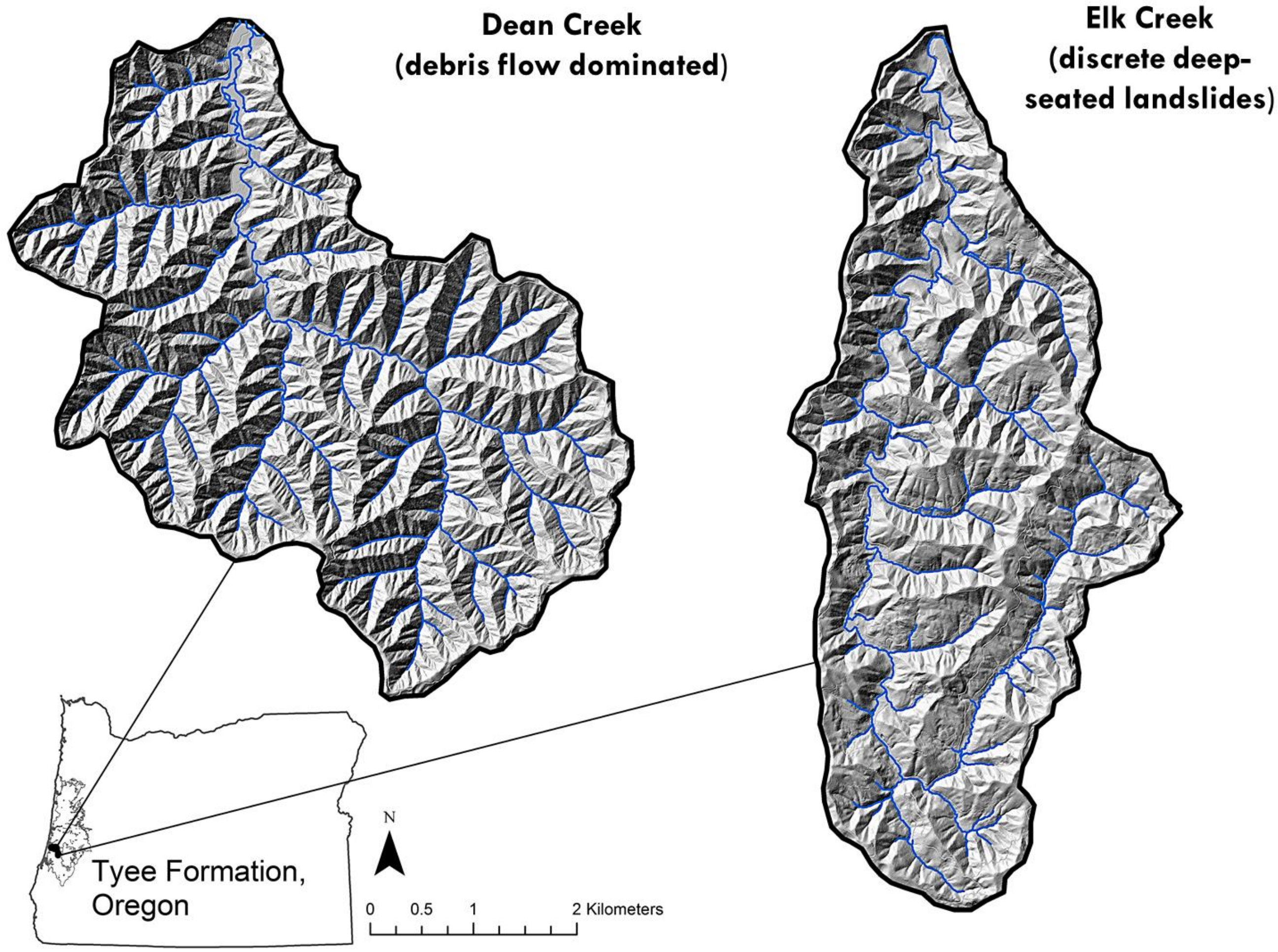

Figure 4. Location map for Dean Creek (tributary to the Umpqua River; debris flow terrain) and Elk Creek (tributary to the Millicoma River; discrete deep-seated landslides) in the Oregon Coast Range, USA. showing a hillshade made from unsmoothed lidar

Extracting Channel Slope

I used a D8 flow accumulation algorithm on unsmoothed lidar to calculate drainage area and create stream layers. Channel elevations and drainage area were then extracted every 5 m along these stream layers in all four basins mentioned above (Condon, Elk, Harvey, and Dean Creeks), including all major tributaries and sub-tributaries. I calculated slopes for every 100 m of stream by taking the slope of the regression line through the elevation data (20 points). Using the unsmoothed lidar but calculating smoothed slopes allowed me to capture variability while eliminating noise. Errors in the slope data were treated as follows: in Harvey and Condon Creeks negative or anomalously low slopes were replaced with the average of the upstream and downstream slopes if only one or two consecutive slope values were affected, allowing for more continuous slope data with which to calculate standard deviation. If more than two consecutive channel slope values were affected the data were not used. In Dean and Elk Creeks errors in the slope data were neither corrected nor used because, since in this case I am analyzing overall trends rather than local variability, perfectly continuous slope data were not needed for slope-area analysis. I binned the data using 150 bins of equal spacing along the x-axis and used residual analysis to locate slope breaks often associated with a shift from fluvial processes to debris flow processes in the basin (Stock and Dietrich, 2003).

Channel slope varies with drainage area according to a power law relationship, so in order to measure longitudinal variability in slope I had to both transform the data and normalize them in relationship to drainage area. I transformed the slope values by taking the log of the smoothed slopes. I then calculated the standard deviation of the logged slopes over a 500 m moving window, using only data that were longitudinally continuous (i.e. skipping breaks in the data that were caused by errors in the lidar). A 500 m window was chosen because it was the smallest window of which the standard deviation would still be meaningful (5 points). To normalize the standard deviation values, I used the following protocol: (1) using the slope-area power function for each basin (separated into fluvial and debris flow zones for Harvey), I calculated the predicted slope values for each point, (2) because these also vary by a power law relationship with drainage area, I transformed them by logging them, (3) lastly, I divided each standard deviation by the corresponding log of the predicted slope. Transforming and normalizing the slope data allowed for comparison both across and within the two basins.

Measuring Valley Floor Widths

In order to measure valley floor widths, I first used a 15 x 15 m moving window algorithm to smooth the lidar and calculate gradient from a fitted second-order polynomial (Wood, 1996). Smoothing was necessary because less variability in slope made it easier to define the valley-hillslope transition. I defined the valley floor using a threshold gradient of 0.25, where areas adjacent to the stream polyline that had a gradient of less than or equal to 0.25 were considered the valley floor. This threshold was empirically derived as having the best visual fit across the study area (Fig. 5 and 6). I then hand measured valley width every 50 m along Condon Creek and Harvey Creek as cross-sections perpendicular to the valley walls (Fig. 6). Measurements were made along mainstems, all major tributaries, and sub-tributaries, but points were skipped where the valley measurement would have been inaccurate (e.g. if the point fell directly at a tributary junction).

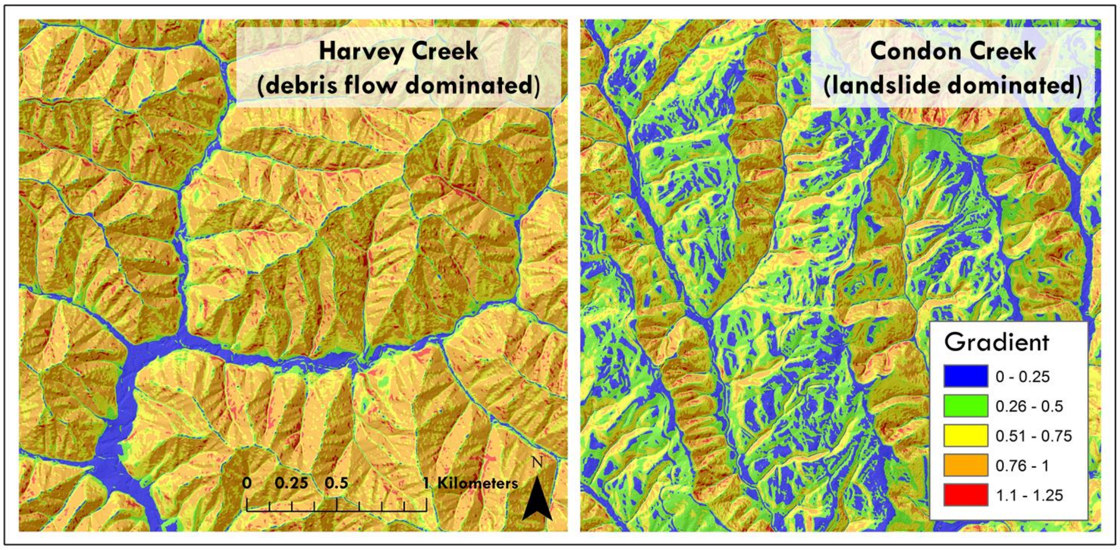

Figure 5. Gradient map for Harvey Creek (tributary to the Umpqua River; debris flow terrain) and Condon Creek (tributary to the North Fork Siuslaw River; extensive deep-seated landslide terrain). Valley floors were defined as having gradients ≤ 0.25.

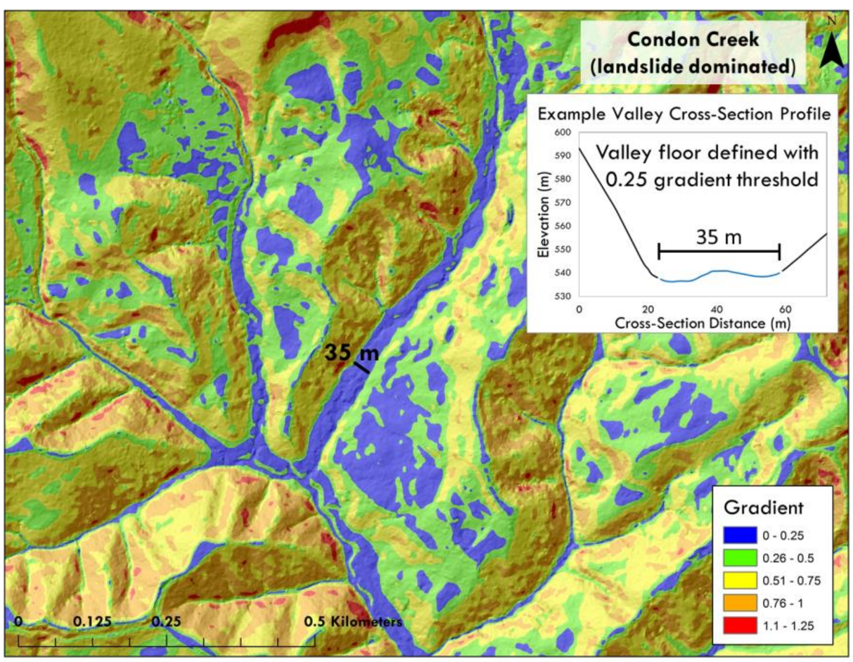

Figure 6. Close-up gradient map for Condon Creek (tributary to the North Fork Siuslaw River; extensive deep-seated landslide terrain) showing an example of anomalously wide headwater valleys, a measured valley cross-section, and a profile of that cross-section.

Using a gradient threshold as the break results in valley floor measurements that only reflect areas accessible to the stream and thus counts incised floodplains and terraces (independent of their height above the channel) as part of the hillslope. For example, with this methodology the valley floor width for a stream incised into a wide valley will be small. Lower Condon Creek was over 3 meters incised into its floodplain (probably due to over-grazing, based on field observations) so, to avoid confounding geomorphic effects with land-use effects, I skipped all of the points in lower Condon Creek and only collected data in drainage areas smaller than 9.5 km^2. In order for the data to be comparable, I only collected data in Harvey Creek in drainage areas smaller than 9.7 km^2. An alternative methodology to using a threshold gradient is the "flooding" method (using a set height above the water surface, e.g. Gangodagamage et al., 2011), which would include the less incised floodplains but does not account for different stream flows at different drainage areas and would thus also force a somewhat arbitrary floodplain/terrace cutoff.

As shown by May et al. (2013) and confirmed with my results, valley floor width scales with drainage area as a power function. Therefore, in order to be able to compare longitudinal variability in valley floor width across and within the two basins, the data needed to be transformed and normalized with relation to drainage area. I completed the same process as I had for channel slope, and again only in Condon and Harvey Creeks. First, I took the log of the measured valley floor widths and calculated the standard deviations of the logged widths over a 450 m moving window, again only using data that was longitudinally continuous. I chose 450 m because it was similar to the length over which I chose to analyze slope variability, but because these data were taken every 50 m rather than 100 m, I had to pick 450 m so that I had an equal number of points upstream and downstream from the point in question (9 total). Second, I used the power function developed from the data for each creek to calculate predicted valley floor widths and logged them. Lastly, to eliminate the relationship with drainage area, I divided the standard deviation by the corresponding logged predicted width and plotted these values against drainage area.

Results

Channel Slopes

All five basins have very different steepness indices, such that any effect on steepness caused by deep-seated landslides cannot be detected (Figs. 7 and 8). Condon Creek exhibits a very high steepness index (Fig. 8) due to having headwaters in the adjacent Eocene-age basalts. Slope-area plots for the two basins in debris flow terrain (Harvey and Dean Creeks) showed similar, high concavities (1.0 and 1.1; Fig. 7), whereas, both the basin with discrete deep-seated landslides (Elk Creek) and the basin with extensive deep-seated landslides (Condon Creek) showed similar, much lower concavities (0.6; Fig. 8). Breaks between the fluvial and debris flow process domains are evident in the slope-area relationships for Harvey and Dean Creeks (Stock and Dietrich, 2003) and residual analysis revealed the breaks were approximately located at a drainage area of 1.0 km^2 in Harvey Creek and 1.8 km^2 in Dean. No slope breaks are evident in Elk and Condon Creeks as was confirmed by examination of residuals.

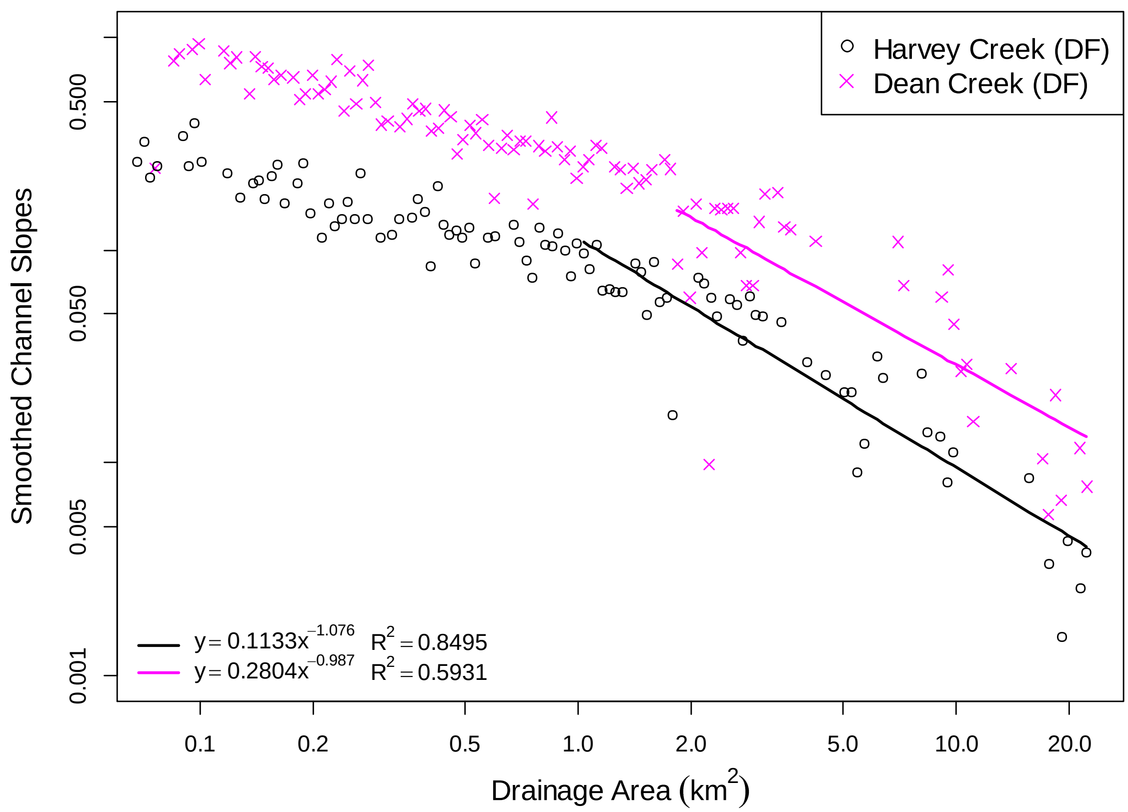

Figure 7. Slope-area plot for two basins in debris flow terrain (Harvey Creek and Dean Creek, Umpqua River Basin, Oregon Coast Range). Results indicate similar slope-area scaling to provide baseline concavities.

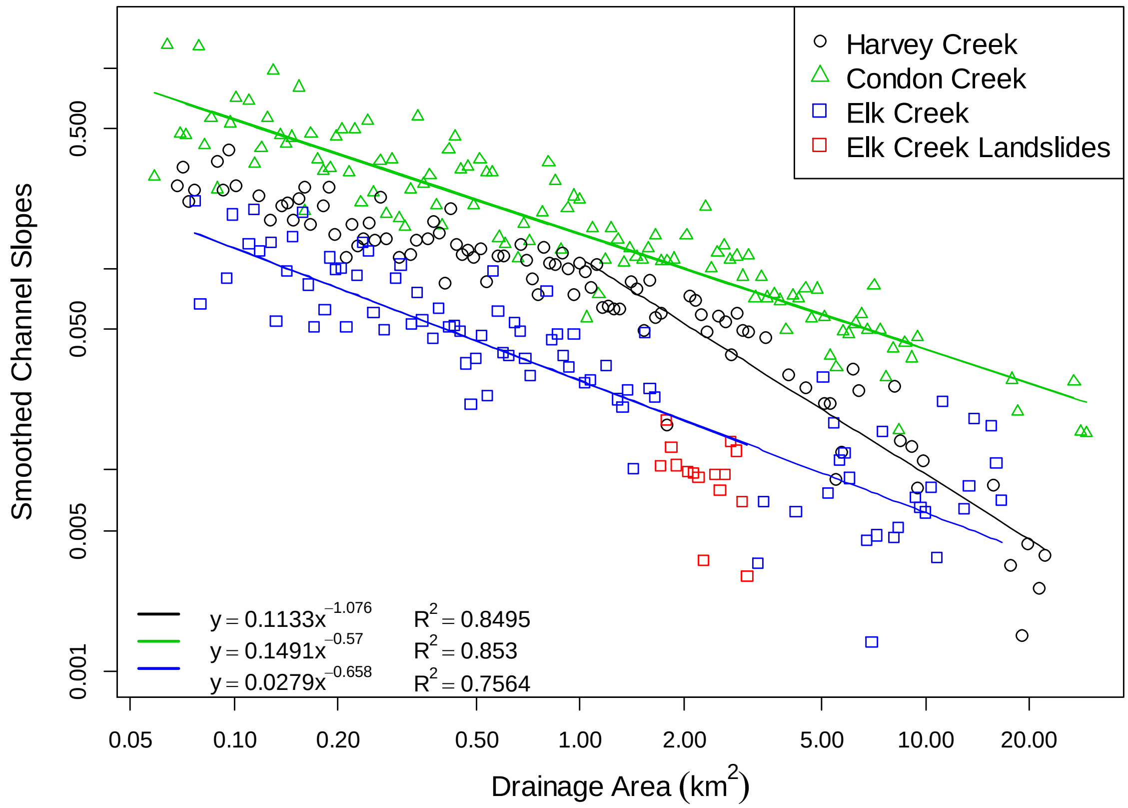

Figure 8. Slope-area plot for two basins in deep-seated landslide terrain (Condon Creek, North Fork Siuslaw Basin, Oregon Coast Range and Elk Creek, Millicoma River Basin, Oregon Coast Range) compared with a basin in debris flow terrain (also in Figure 7, Harvey Creek, Umpqua River Basin, Oregon Coast Range).

The slope-area relationship for Elk Creek (Fig. 8) shows channel gradients adjacent to the discrete landslides are substantially lower than predicted, suggesting that landslides may lower local channel slopes. This is in agreement with findings by May et al. (2013) that showed wider valleys in these areas. Contrary to my hypothesis, there was no relationship between recently active landslides (as mapped by Burns et al., 2012) and channel slopes in Condon Creek (Fig. 9).

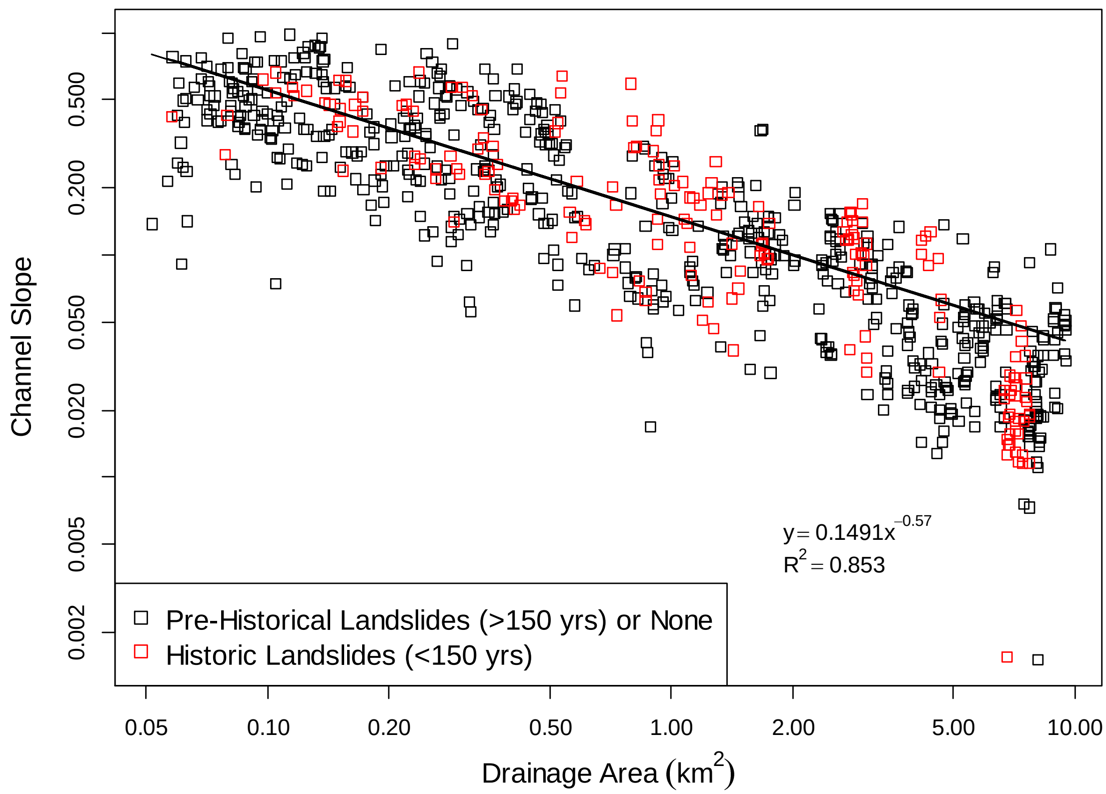

Figure 9. Slope-area plot for Condon Creek (extensive deep-seated landslide terrain, North Fork Siuslaw Basin, Oregon Coast Range) highlighting channel slope values occurring adjacent to landslides mapped as active within the last 150 years by DOGAMI (Burns et al., 2012).

Analysis of the variation coefficients for channel gradient (Fig. 10) showed that variability in channel slope was significantly different in Condon Creek compared with Harvey Creek (ANCOVA $p=1.86 \cdot 10^{-11}$, ANOVA $p=7.2 \cdot 10^{-12}$). Variation coefficients in Condon Creek (extensive deep-seated landslide terrain) were somewhat higher at all drainage areas but markedly higher at drainage areas smaller than 0.5 km^2. The relationships between the variation coefficients and drainage area exhibited a surprising curved structure for both basins.

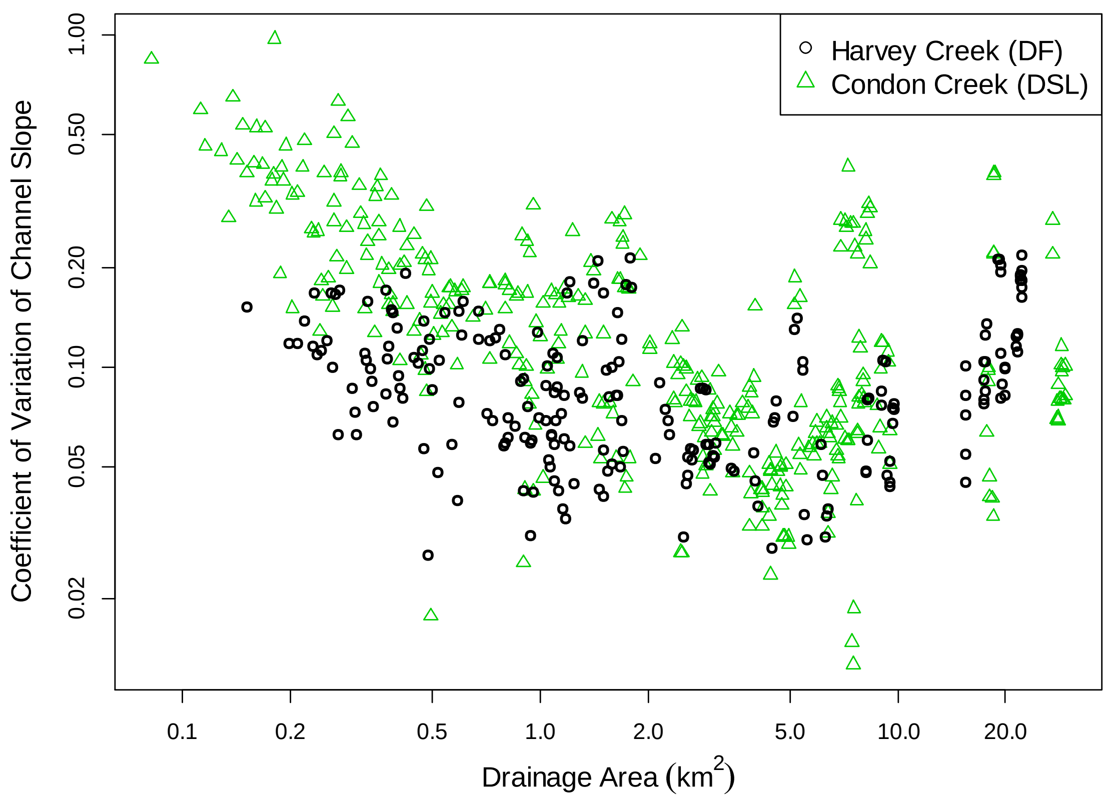

Figure 10. Coefficients of variation of channel slopes over a 500 m window in Harvey Creek (debris flow terrain, Umpqua River Basin, Oregon Coast Range) and Condon Creek (extensive deep-seated landslide terrain, North Fork Siuslaw River Basin, Oregon Coast Range).

Valley Floor Width

Measurements of valley floor widths yielded 845 data points for Condon Creek (extensive deep-seated landslide terrain), but only 454 for Harvey Creek (debris flow terrain) due to Condon Creek having more stream length (Fig. 11). Analysis of covariance tests showed the two populations of valley floor widths were significantly different (p=0.0002). Valley floor widths in Harvey Creek increased more rapidly as drainage area increased (power function exponents of 0.47 in Condon Creek vs. 0.67 in

Harvey Creek, ANOVA on fitted regression lines p=$4.83 \cdot 10^{-8}$). Valley floor width in Condon Creek was overall higher than those in Harvey Creek in drainage areas less than 2.5 km^2, with the widest valleys ranging between 25 m (at 0.1 km^2) and 41 m (at 2.5 km^2). At drainage areas greater than 2.5 km^2, valley floors were overall narrower in Condon Creek than in Harvey Creek; however, widths in Condon Creek varied substantially with many very wide valleys (up to 88 m at a drainage area of 4.0 km^2).

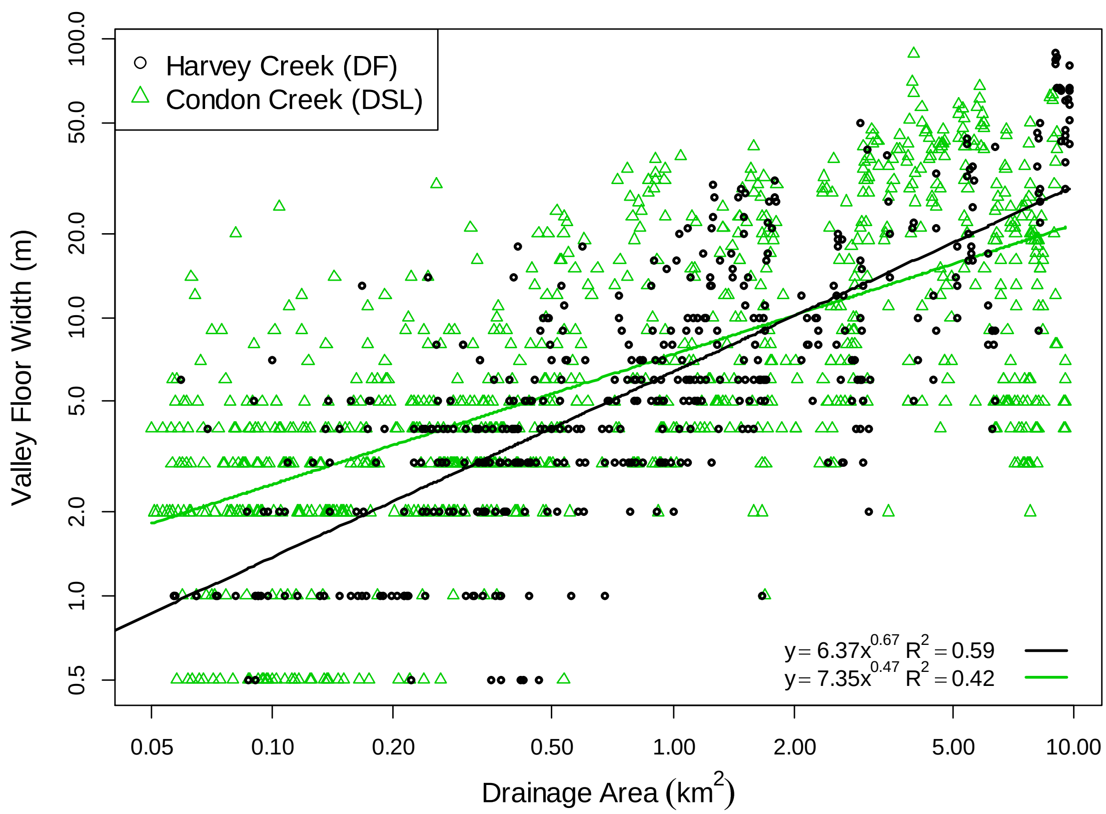

Figure 11. Drainage area-valley floor width relations in Harvey Creek (debris flow terrain, Umpqua River Basin, Oregon Coast Range) and Condon Creek (extensive deep-seated landslide terrain, North Fork Siuslaw River Basin, Oregon Coast Range).

The scaling break between the debris flow and fluvial process domains that was evident in the slope-area plots for Harvey Creek (Fig. 7) was not immediately evident in the valley floor width data. However, the density plot for valley widths in Harvey Creek (Fig. 12) reveals a substantial increase in variability in valley floor width at around 1 km^2, the drainage area where the break between debris flow and fluvial processes occurs in the slope-area plot. While valley floor widths in Condon Creek are also more variable at small drainage areas (Fig. 13), no major change in variability at the drainage area of ~1 km^2 exists, as it does in Harvey Creek. The density plots also help to visualize that valley floors at small drainage areas in Harvey Creek are generally narrower than in Condon Creek, and that valley widths in Condon Creek are overall more variable.

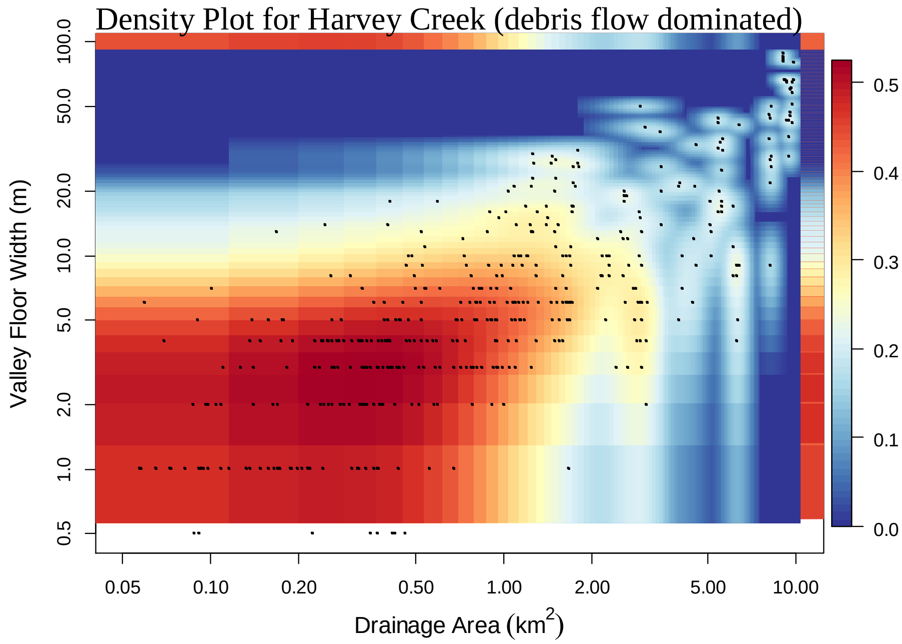

Figure 12. Density plot of valley floor widths in Harvey Creek; colors show relative density of points (Wand and Jones, 1994).

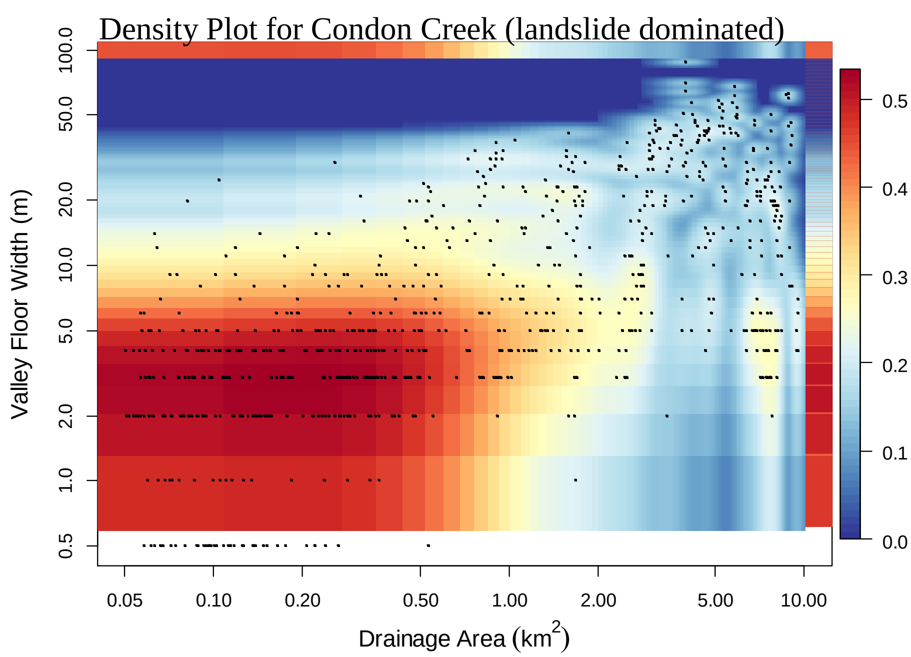

Figure 13. Density plot of valley floor widths in Condon Creek; colors show relative density of points (Wand and Jones, 1994).

Contrary to what I hypothesized, coefficients of variation in valley width as a function of drainage area were significantly higher in Harvey Creek (debris flow dominated) than in Condon Creek (deep-seated landslide dominated) (Fig. 14; analysis of covariance p=0.0002).

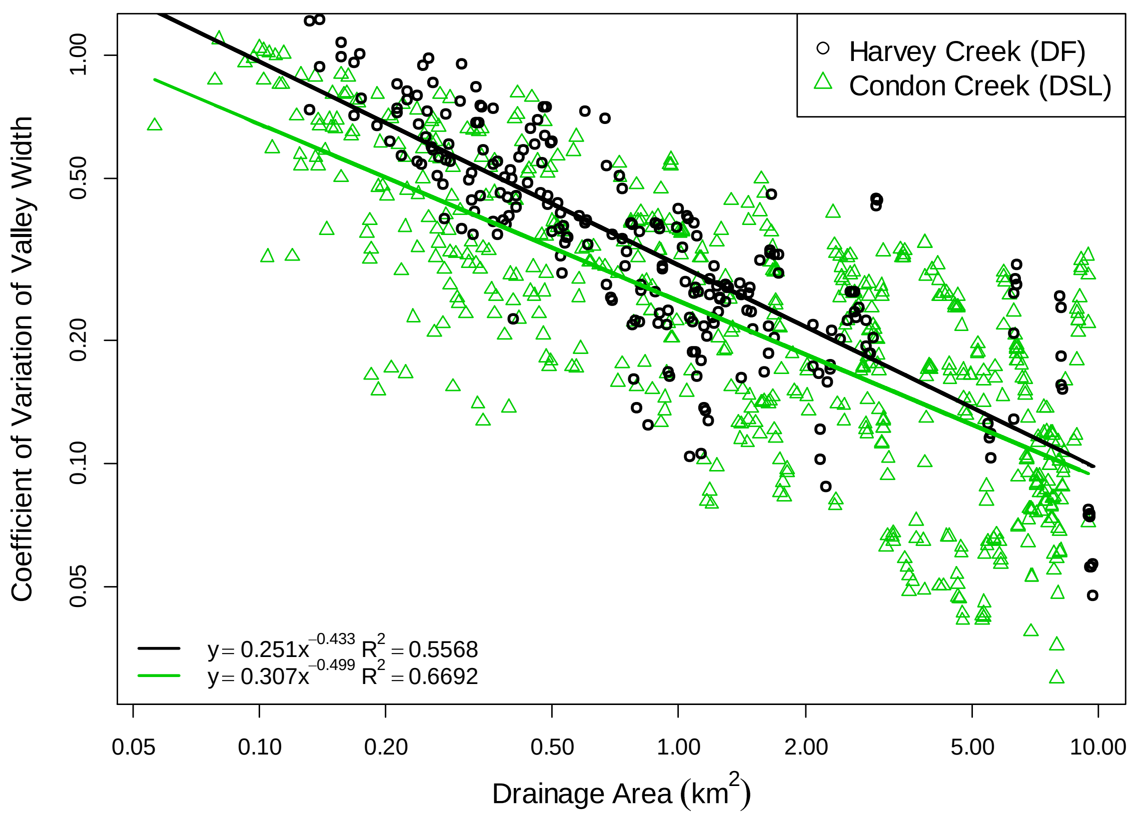

Figure 14. Coefficients of variation of valley floor widths over a 450 m window in Harvey Creek (debris flow terrain, Umpqua River Basin, Oregon Coast Range) and Condon Creek (extensive deep-seated landslide terrain, North Fork Siuslaw River Basin, Oregon Coast Range).

Regardless of being in landslide terrain, fluvial, or debris flow zone, variability in valley floor width declined with increasing drainage area. This reveals a strong power law relationship between topographic variability and drainage area that has not been previously recognized. As hillslope-fluvial coupling declines with increasing drainage area (and thus increasing discharge and generally wider valleys), hillslope-driven variability also declines. The slope of this scaling function was significantly higher in Harvey Creek (exponent = -0.5 vs. -0.4 in landslide terrain; p=0.048).

Analysis of the relationship between active landslides as mapped by DOGAMI (Burns et al., 2012) and valley floor width resulted in no trend with valley width (Fig. 15). Again, this could be due to (1) spatial and temporal variability in landslide activity both within and between active and historical landslides and (2) extensive landsliding making it impossible to isolate the effects of individual features.

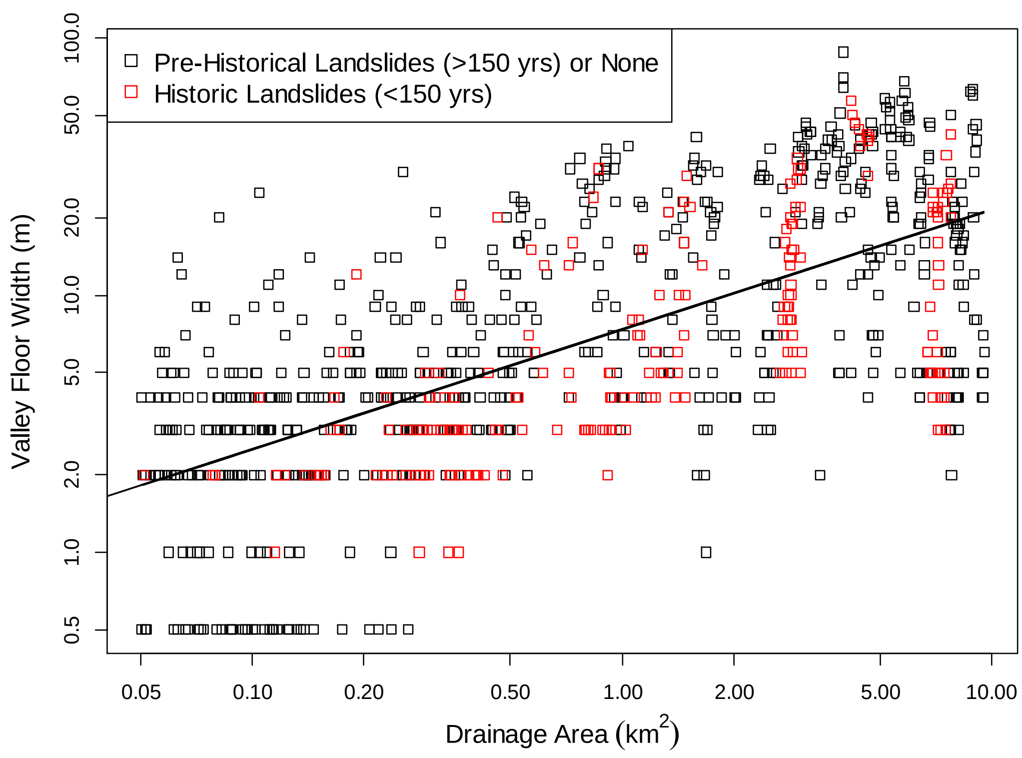

Figure 15. Drainage area-valley floor width relation in Condon Creek (extensive deep-seated landslide terrain, North Fork Siuslaw Basin, Oregon Coast Range) highlighting valley floor width values occurring adjacent to landslides mapped as recently active by DOGAMI.

Discussion

Channel Slopes

The large differences in steepness indices between the five basins are likely caused by subtle differences in lithology; volcanic outcrops often form the highest peaks and ridges in the OCR and thus have the ability to steepen basins that run through otherwise similar bedrock. This is particularly true for Condon Creek, which has headwaters in the Eocene-age basalts that make up a large area north-west of this basin. This shows that lithology is a much stronger control on slope at a particular drainage area than landslides. Thus, it is more useful to look at how slope changes with drainage area, or concavity. Condon Creek, the basin in extensive landslide terrain had a lower concavity, supporting similar findings in other locations by Booth et al. (2013). The slope-area data for Condon Creek also lacked the characteristic debris flow signature. Far less terrain with slopes steep enough to promote debris flows exists in Condon Creek compared with Harvey Creek. However, debris flows do occur in this area (Burns et al., 2012), but any effect they have on slope appears to be obscured by the effects of deep-seated landslides. Thus, the slope-area relationship in Condon Creek likely reflects predominantly alluvial processes. Condon Creek is likely transport-limited, with the longitudinal profile simply reflecting stream power. Field surveys revealed that the floodplains in anomalously wide valleys at small drainage areas were composed of fluvially-reworked deposits that were over 0.5 m thick in places, confirming that the creek is likely meandering through landslide deposits, slowly reworking and transporting them (Figs. 16 and 17).

Figure 16. Photograph from upper Billie Creek (tributary to Condon Creek, North Fork Siuslaw River Basin, extensive deep-seated landslide terrain) of a cut-bank that reveals a floodplain composed of fluvially-reworked sediment.

Figure 17. Photograph from upper Billie Creek of a cut-bank that reveals a floodplain that consists of over 0.5 m of fluvially-reworked sediment.

In Elk Creek, the apparent lack of a debris flow signature in the slope-area curve is probably due to downstream effects on slope caused by the discrete deep-seated landslides rather than a lack of debris flows. Directly adjacent to the deep-seated landslides, slopes are lower than predicted by the slope-area function (Fig. 8), likely due to the wide valleys found in this area (May et al., 2013). Downstream of the landslides, channels steepen again. It is possible that the sediment supplied by the landslides causes the channel to be graded to steeper slopes than it otherwise would be. Because the landslides occur close to where the break between fluvial processes and debris flow processes usually occurs, this would obscure the break between the fluvial and debris flow process domains.

The strong relationship between the two discrete deep-seated landslides and slope seen in Elk Creek (Fig. 8) made it more surprising to find no relationship between landslides active in the last 150 years and either channel slopes or valley width in Condon Creek. This could be due to a number of factors: (1) landslides mapped as active over the last 150 years vary in how much and when they were active; (2) landslides mapped as historical also vary in their historical activity; and (3) landslides in this area are extensive, making disentangling the effects of active versus historical impossible. It is likely a combination of reasons one and two in that in all likelihood the amount that the recently active landslides have slid within the last 150 years is substantially less than they did when the majority of these landslides were active. While DOGAMI's mapping technique is highly sophisticated, many of the landslides mapped as recently active appeared to have major drainages carved into them, suggesting that at least the majority of the slide was not active in the last 150 years.

The curved structure in the relationship between slope variability and drainage area can best be explained as a result of the drainage areas over which data were collected. It is likely that the increase in variability at the larger drainage areas occur at (and because of) confluences and that, if larger drainage areas were included in the analysis, variability would continue to decline and an inverse power law relationship would emerge. Because drainage area and discharge are linearly related, drainage area can be thought of as a proxy for the grading process and the decline in variability would reflect the increasing ability of the river to grade itself.

Coefficients of variation in Condon Creek (extensive deep-seated landslide terrain) were somewhat higher at all drainage areas but markedly higher at drainage areas smaller than 0.5 km^2. This confirms the lack of debris flow influence as debris flows are rapid and powerful erosive forces that carve valleys in a predictable (and thus less variable) way (Stock and Dietrich, 2003). Pacific salmon evolved in a dynamic landscape where floods and debris flows temporarily wiped out populations but left complexity that could serve later as refugia from smaller floods (Montgomery, 2003; Waples et al., 2008). However, severe population decline has left numerous species of Pacific salmon at risk, including the Oregon Coast ESU coho and steelhead (Nehlsen et al., 1991). Salmon are genetically coded such that a few percent of spawners each year do not return to their natal stream and instead spawn in a new stream (Montgomery, 2003). Thus, basins like these that experience minimal debris flows could harbor important stable populations that could help rebuild genetic diversity in other populations. More generally, this topographic variability also means habitat heterogeneity, which is associated with higher biodiversity in riverine systems (Ward, 1998).

Valley Width

May et al. (2013) observed a scaling break in valley floor width in Harvey Creek that is likely related to the debris flow-fluvial transition, but occurs at 0.1 km^2 rather than 1 km^2. They found that below 0.1 km^2, valley widths were less variable. In contrast, I found that variability in valley floor widths is higher at drainage areas less than ~ 1 km^2. Our differing results likely reflect the different methodologies employed. Perhaps my method of defining valley floors with a threshold gradient causes errors at small drainage areas in that steep sections of the valley might falsely show up as narrow. While debris flow occurrence is naturally cyclical (Benda, 1990; Lancaster and Casebeer, 2007) and therefore could potentially cause valleys in debris flow terrain to exhibit high variability, the lack of local variability in slope suggests that this is not the case.

Valley floor widths increased more rapidly with drainage area in Harvey Creek compared to Condon Creek. This primarily reflects that valleys associated with Condon Creek are affected both by fluvial processes and deep-seated landslides throughout the basin, whereas valleys in Harvey Creek are formed by debris flows at low-order drainages and fluvial processes at larger drainage areas. Additionally, debris flows are a more powerful erosive force than fluvial erosion and thus cause higher rates of vertical incision, leaving behind smaller valleys and resulting in power function with a higher exponent (steeper slope). In contrast, many anomalously wide valleys occur at small drainage areas in landslide terrain, presumably because the sediment supplied by the landslides is greater than the stream's transport capacity. Field surveys confirmed that these anomalously wide valley floors hosted productive floodplains and habitat complexity (Fig. 18) that, due to their locations, are more insulated from agriculture and development compared with floodplains at larger drainage areas. Additionally, widespread clear-cutting was halted in the forest surrounding Condon Creek in the 1980s as a result of a court injunction that claimed high rates of soil erosion were damaging fish habitat (National Wildlife Federation, 1984). Therefore, the productive and diverse wide valleys created by these deep-seated landslides have also been, in a sense, protected by them.

Figure 18. Photograph of a floodplain in a wide valley in upper Billie Creek (tributary to Condon Creek, North Fork Siuslaw River Basin, extensive deep-seated landslide terrain).

That both creeks have similar scaling between drainage area and valley width variability reflects that the influence of hillslope processes, regardless of type, is gradually superseded by fluvial processes. Many channel variables are related by power laws to discharge (Leopold and Maddock, 1953). Because drainage area and discharge are linearly related, and discharge and stream power are linearly related, drainage area can be considered a proxy for the stream's ability to control its geomorphic template. Thus, as drainage area increases, the relative influence that hillslope processes have on the geomorphic template declines. Additionally, because valleys widen with increasing drainage area, the percentage of the valley with high proximity to the hillslopes decreases along with the ability of hillslope processes to influence valley morphology.

Overall, local variability in valley width was lower in deep-seated landslide terrain, suggesting that landslides are exerting substantial control on the width of the valley floor. This likely occurs directly through landslide-valley coupling as well as indirectly through the effect landslides have on the topology of the stream network. Harvey Creek is a dendritic stream network whereas Condon Creek and all the adjacent basins have trellis networks with main channels that are perpendicular to the anticline. Due to the difference in network topology, the number of tributaries in Harvey Creek vastly outnumbered Condon Creek. This affected the variability of valley width because wide valleys often occur at confluences (Benda et al., 2004). Therefore, via deep-seated landsliding, the underlying structure and lithology has imprinted the dominant fabric of the landscape and shaped the topology of the stream network. In summary, deep-seated landslides, through both direct and indirect control, cause valley floors to be more variable throughout the stream network but less locally variable.

Conclusion

Deep-seated landslides leave a signature on valley floor width and channel gradient that is distinct from processes occurring at comparable watersheds with no deep-seated landslides. Channel slopes were very different across basins at particular drainage areas, likely a result of lithology; thus, the exponent of the slope-area function was examined instead and the two basins with deep-seated landslides were found to have similar, lower concavities. Discrete deep-seated landslides lowered local channel slopes, but no relationships were found between recently active landslides and channel slope or valley width in extensive landslide terrain. However, channel slopes in landslide terrain were more locally variable, implying sediment supply exceeds capacity and suggesting the potential for habitat heterogeneity.

Variability in valley width decreased with drainage area in both basins, revealing a new scaling law for hillslope-fluvial coupling. Valley floor widths in extensive landslide terrain were more variable with drainage area but less longitudinally variable. The lower longitudinal variability in valley width in landslide terrain compared to debris flow terrain implies that the imprint deep-seated landslides have on the topology of the stream network is more important than the direct hillslope-valley control. Variability of valley width appears to be primarily caused by confluences and is thus topology-driven. However, valley width varied substantially across the network in landslide terrain and included many wide valleys. These wide valleys have the potential to host floodplains and persistent wood jams that could create habitat complexity and store large amounts of carbon (Wohl, 2011; Wohl et al., 2012). Additionally, because many of the wider valleys were at smaller drainage areas, these potentially ecologically diverse areas are naturally protected from agriculture and development.

CHAPTER III

DEEP-SEATED LANDSLIDES AND POTENTIAL SALMON HABITAT

Introduction

Declining populations of Pacific salmon and federal listing of multiple species in the 1990's prompted increased attention to the need for improved identification of high quality fish habitat and understanding of the processes that shape it. Because Pacific salmon have enormous ecological, cultural and economic value (National Resource Council, 1996) developing strong habitat conservation and restoration strategies became a regional priority in the Pacific Northwest (e.g. The Oregon Plan for Salmon, 1997). Although decadal climate oscillations cause populations in anadromous fish to exhibit high inter-annual variability (Francis and Hare, 1994), populations remain generally low and improving our knowledge and skills regarding how and where to implement habitat restoration remains a pressing need.

In a recent study on coho salmon (*Oncorhynchus kisutch*) in the Oregon Coast Range, the proximity of different seasonal habitat types (spawning, summer rearing, and winter refuge) was found to be a better predictor of juvenile fish density than in-stream variables (e.g. habitat quality) alone (Flitcroft et al., 2012). This highlights the need to understand extensive drivers affecting large-scale patterns of in-channel geomorphic features. Salmon rely on hillslope processes for sediment input to the channel to provide spawning gravels. They rely on large fluvial wood to create (1) deep scour pools that provide thermal refuge in the summer and (2) side channels that provide refuge from floods in the winter and a diversity of food webs that support juvenile fish (Bellmore et al., 2013; Reeves et al., 2011; Rosenfeld et al., 2000). Accumulation of large fluvial wood and its associated habitat complexity is driven both by geomorphology and side-slope forest composition; unconstrained, low gradient valleys with low gradient streams provide the geomorphic template but the creation of complex log jams depends on wood availability (Wing and Skaugset, 2002; Wohl, 2011). Processes at the reach scale create these different types of habitat and connectivity between them is crucial. This raises the question of how processes operating at the landscape-scale influence patterns in the distribution of processes operating at the reach scale. Here, I examine the effect deep-seated landslides have on the distribution of coho habitat in the Oregon Coast Range. I conduct a two-part investigation of the relationships between landslides, topographic variables and potential salmon habitat by addressing the following two questions:

(1) How do patterns in potential seasonal habitat types for coho salmon (as defined by Foster et al. (2001)) vary in basins in deep-seated landslide terrain compared to basins in debris flow terrain?

(2) What are the relationships between valley floor width, channel gradient, landslide occurrence and activity, and stream unit type in two streams in a region with extensive deep-seated landslides?

Sediment input, valley width, and channel gradient are key variables in habitat creation and, in mountainous regions, are largely controlled by hillslope processes. In this study, I look at streams in areas dominated by two different hillslope processes in the Oregon Coast Range – debris flows and deep-seated landslides. Debris flows, initiated by shallow landsliding in colluvial hollows, are rapid, episodic events that scour and erode low-order valleys at slopes above ~0.03-0.1 (Stock and Dietrich, 2003). While they contribute significant quantities of sediment and wood to valleys and channels in the Oregon Coast Range, they have an average recurrence interval of ~6000 for an individual hollow years (Benda, 1990) and can thus cause streams to undergo more frequent cycles of sediment aggradation and degradation at downstream locations (Lancaster and Casebeer, 2007). In contrast, deep-seated landslides (defined by Roering et al. (2005) as bedrock landslides with a surface area >0.1 km^2, consisting predominantly of parent material, and with a short run out distance) are larger features with longer-lasting geomorphic legacies than a single debris flow. Their temporal legacy suggests the ability to impart a more substantial signature on valley and stream morphology.

In Chapter Two, I showed how deep-seated landslides can affect how both valley floor width and channel slope scale with drainage area, as well as the local variability in width and slope. In summary, basins with extensive deep-seated landslides exhibit weaker scaling between valley floor width and drainage area, but reduced local variability. Channel slopes exhibit higher local variability and, while steepness differed between basins substantially, basins with deep-seated landslides had longitudinal profiles that were less concave. The typical scaling break caused by debris flows at low drainage areas in slope-area scaling (Stock and Dietrich, 2003) was not evident in landslide terrain, suggesting that debris flows are not a significant process shaping the landscape in basins dominated by deep-seated landslides. Geomorphic heterogeneity in aquatic systems, both spatial and temporal, is often associated with habitat heterogeneity. In this study, I test whether topographic variability in the riparian zone on the landscape-scale affects habitat heterogeneity in regards to the habitat needs of coho salmon. Specifically, increased variability in slope and an abundance of wide valleys suggests that streams in deep-seated landslide terrain may have the potential for a higher diversity of channel unit types, resulting in higher connectivity between habitat types. First, I hypothesize that basins in deep-seated landslide terrain will have greater connectivity between these types of habitats due to having higher topographic variability. Second, I hypothesize that recent landslide activity will correlate with areas with low gradient, wide valley floors, and that these areas will have more potential summer and winter rearing habitat, more diversity in stream unit type, and more side channels.

Methods

Study Area

I chose to conduct my research in the Oregon Coast Range for the following reasons: (1) deep-seated landslides are abundant in an area with relatively uniform lithology and topography; (2) stream habitat survey data are available for numerous basins across the region; and (3) results could potentially assist habitat restoration and conservation of a federally threatened species – Oregon Coast coho salmon. The Oregon Coast Range is a soil-mantled mountainous region with steep, highly dissected slopes. The climate is temperate maritime with fall and winters receiving ~100 inches of rain that result in flashy peak streamflows. Logging and land-use have altered the forest composition such that it is now predominantly young stands of Douglas fir, with older conifer forest reduced to only 13% of the landscape in 1993 (Kennedy and Spies, 2004). Much of the Oregon Coast Range is composed of relatively undeformed, interbedded sandstone and siltstone turbidite deposits called the Tyee Formation that has since been folded due to compression (Baldwin, 1956). The Tyee Formation is ~10,000 km^2 in extent, with only minor facies variation, primarily in the north-south direction (Heller and Dickinson, 1985). Deep-seated landslides in this region are structurally and lithologically controlled: occurring more frequently where the hillslope aspect coincides with the bedrock dipslope and where the distal facies with lower sandstone:siltstone ratio is exposed (Roering et al., 2005). To identify landslides, I use a predictive algorithm created by Roering et al. (2005) and data collected by DOGAMI delineating historic landslides (active in the last 150 years) and pre-historic landslides (not active in the last 150 years) in the North Fork Siuslaw watershed (Burns et al., 2012).

While this study focuses on coho salmon (*O. kisutch*), the Oregon Coast Range hosts four other species of Pacific salmon and trout: steelhead (*O. mykiss*), chinook salmon (*O. tschawytscha*), chum salmon (*O. keta*) and sea-run cutthroat trout (*O. clarkii*). Of these, the Oregon Coastal evolutionarily significant unit (ESU) of coho is currently listed as Federally Threatened, the Oregon Coastal ESU of steelhead is listed as a Species of Concern (NOAA Fisheries, 2005), and stocks of other species are considered at risk (Nehlsen et al., 1991). In 1990, the Oregon Department of Fish and Wildlife (ODFW) implemented an aquatic habitat assessment and monitoring program in order to address these declining populations. Termed the Aquatic Inventories Project, they have conducted stream habitat surveys for numerous streams in the Oregon Coast Range. I use these datasets in conjunction with the landslide data mentioned above in order to examine spatial patterns in potential habitat distribution for coho salmon as they relate to the distribution of deep-seated landslides.

To address the question of whether patterns in potential seasonal habitat types vary in basins in deep-seated landslide terrain compared to basins in debris flow terrain (Question 1), I examine stream habitat survey data from eleven streams in deep-seated landslide terrain and compare them to eleven streams in debris flow terrain. First, I chose streams that had both extensive deep-seated landsliding and available survey data that extended from ~10 km^2 to ~2 km^2. I then chose an equal number of streams that had relatively uniform valley-ridge topography to serve as my controls in debris flow terrain. The data I use are from fifteen streams in the Umpqua River Basin (eight in deep-seated landslide terrain, seven in debris flow terrain; Fig. 19) and five streams in the Coos-Millicoma River Basin (one with discrete deep-seated landslides and four in debris flow terrain; Fig. 20), and two streams in the North Fork Siuslaw (extensive deep-seated landslide terrain; Fig. 21), To more closely analyze the relationships between landslide activity, topographic variables, and channel unit types (Question 2), I chose to conduct my research in Billie and Uncle Creeks (Fig. 20), two tributaries to Condon Creek (a tributary to the North Fork Siuslaw) because it is the basin in which I collected lidar-based topographic data for Chapter Two of this thesis and because the extensive deep-seated landslides that occur in the area had been recently mapped by DOGAMI (Burns et al., 2012).

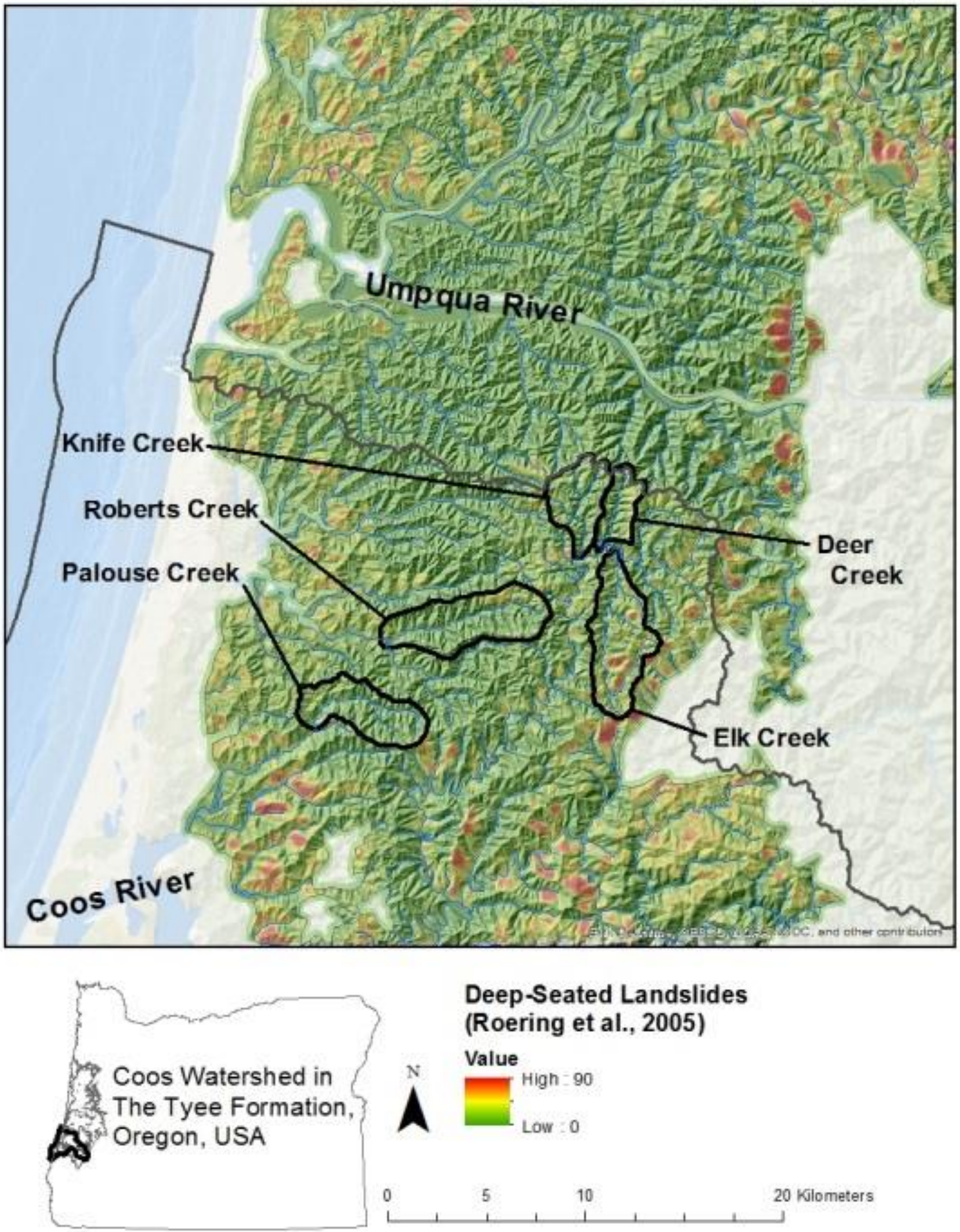

Figure 19. Location map of the five creeks in the Coos-Millicoma River Basin: Knife, Roberts, Palouse, and Deer Creeks in debris flow terrain, and Elk Creek with two discrete deep-seated landslides. Areas predicted to be affected by deep-seated landslides by an algorithm developed by Roering et al. (2005) are in red.

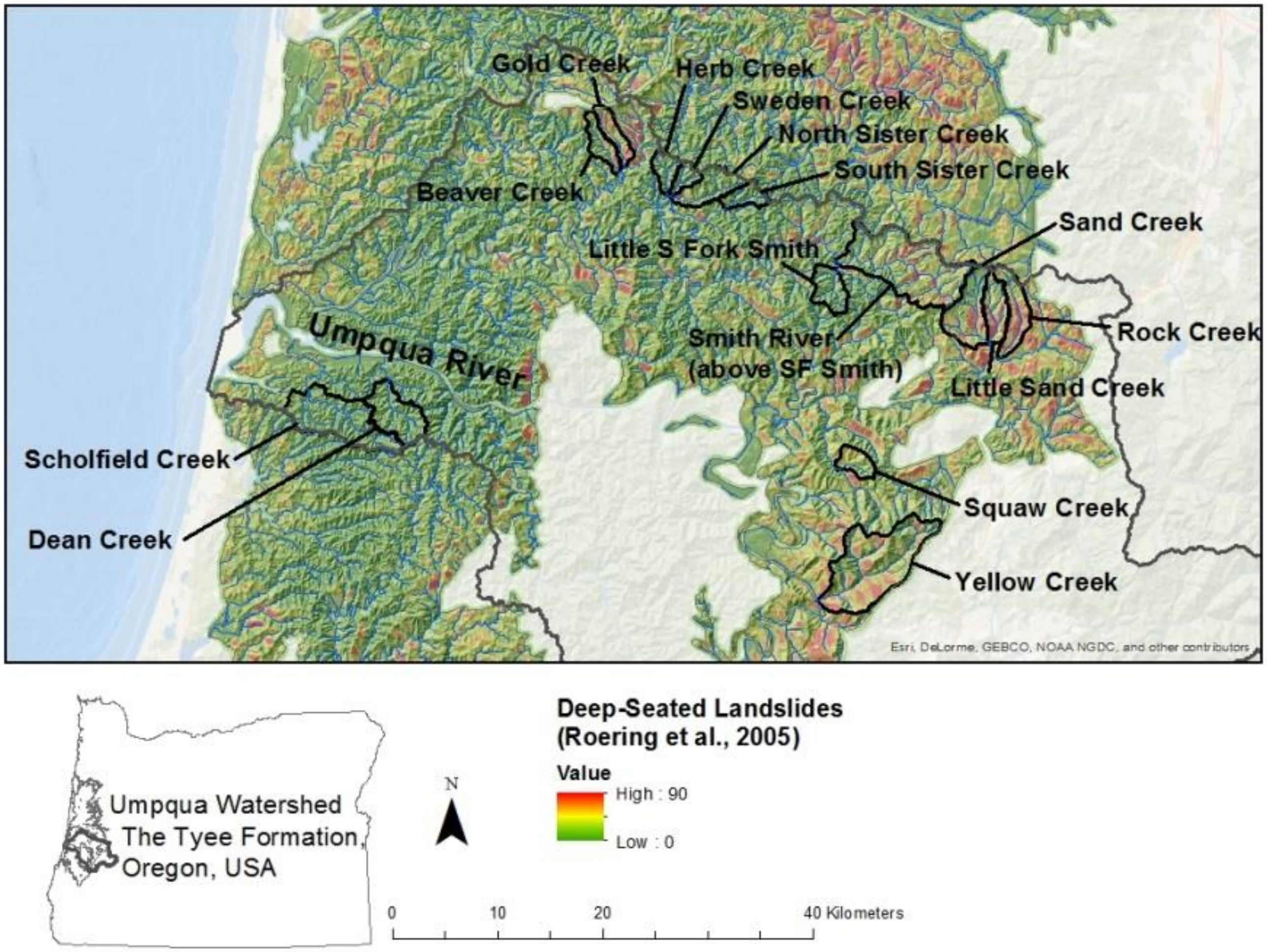

Figure 20. Location map of the fifteen creeks in the Umpqua River Basin: Dean, Scholfield, Little South Fork Smith, Herb, Sweden, North Sister, and South Sister Creeks in debris flow terrain, and Beaver, Gold, Sand, Little Sand, Rock, Squaw, and Yellow Creeks as well as Smith River (above SF Smith) in deep-seated landslide terrain. Areas predicted to be affected by deep-seated landslides by an algorithm developed by Roering et al. (2005) are in red.

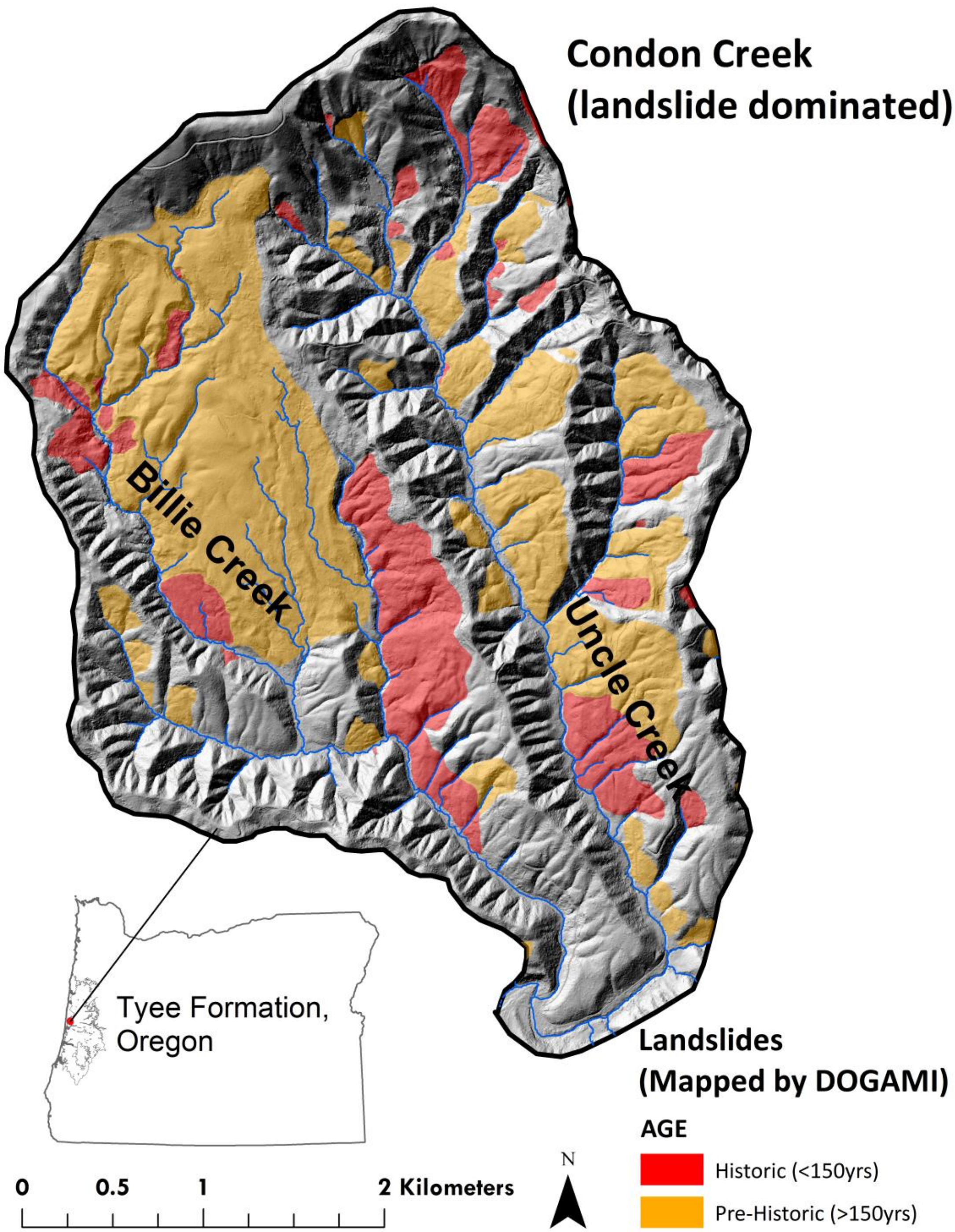

Figure 21. Location map of Billie and Uncle Creeks, North Fork Siuslaw River Basin, with landslides mapped by DOGAMI (Burns et al., 2012)

Potential Salmon Habitat Identification and Analysis

In order to investigate whether patterns in potential seasonal habitat types vary in basins in deep-seated landslide terrain compared to basins in debris flow terrain, I utilized freely available habitat survey data from ODFW Aquatic Inventories Project for the Coos-Millicoma Basin and the Umpqua River Basin. All basins were surveyed to drainage areas <2 km^2, with the exception of three basins: Scholfield, Dean, and Billie Creeks, which were surveyed to 4.9, 2.5, and 2.6 km^2, respectively. Within each basin, I removed data from drainage areas greater than ~10 km^2 because (1) I wanted to compare habitat in similar sized drainage areas and (2) this was the approximate drainage area where land use patterns appeared to change (Fig. 22) and I wanted to reduce the likelihood of confounding the effects of natural geomorphic processes with the effects of agriculture and development.

Figure 22. Screen capture of North Fork Siuslaw River taken from Google Earth, with the three tributaries of Condon Creek converging around ~10 km^2. Location: 44°02'N, 124°00'W. Imagery date: 7/22/2014.

I used these stream survey data to identify potential adequate seasonal habitat for coho salmon as defined by Foster et al. (2001). Salmon lay their eggs in riffles in the interstitial spaces between the gravels. After they hatch, salmon fry migrate to slow water to feed and grow. These slow water areas also need to provide thermal refuge during the hot summer months. In the winter, salmon need off-channel habitat to provide refuge from high flows. Based on these simple lifecycle needs, adequate potential habitat is identified using the criteria outlined in Table 1 (Foster et al., 2001).

Table 1. Definition of Adequate Potential Habitat Types

Potential Habitat Type	**Criteria**
Spawning habitat	Riffles with ≥ 50% gravel and ≤ 8% silt and organics
Summer rearing habitat	Pools with residual pool depth (depth minus pool tail crest depth): ≥ 0.5 m deep in streams < 7 m wide ≥ 0.6 for streams 7-15 m wide ≥ 1 m deep in streams > 15 m wide
Winter refuge habitat	Backwaters, alcoves, and isolated pools

Because connectivity between these seasonal habitats is important (e.g. Flitcroft et al., 2012), I used these habitat data and their associated spatial data to calculate the distance from each unit to the nearest three types of seasonal habitat. To eliminate the problem of each habitat unit being a unique length, I included the length of the unit in question and the length of the closest potential seasonal habitat unit (Fig. 23). This distance then represents the maximum distance a fish would have to swim between similar units, although the actual distance a fish might swim between the units could be shorter, especially in the case of long habitat units.

No information exists on the distances fry are able to swim at early life stages to move from their spawning grounds to summer rearing habitat, but Kahler et al. (2001) recorded a maximum distance of 235 m traveled by juvenile fish in the summer. Therefore, I isolated habitat units from which the minimal distance to both potential spawning habitat and potential summer rearing habitat was less than 125 m, resulting in a 250 m distance threshold under which the seasonal habitats are considered "connected" and units between them are considered to have high connectivity (Fig. 23). Admittedly, all the units between the two seasonal habitats are part of the connected stretch of stream, but this methodology provides a simplified way to estimate connectivity rapidly in multiple basins.

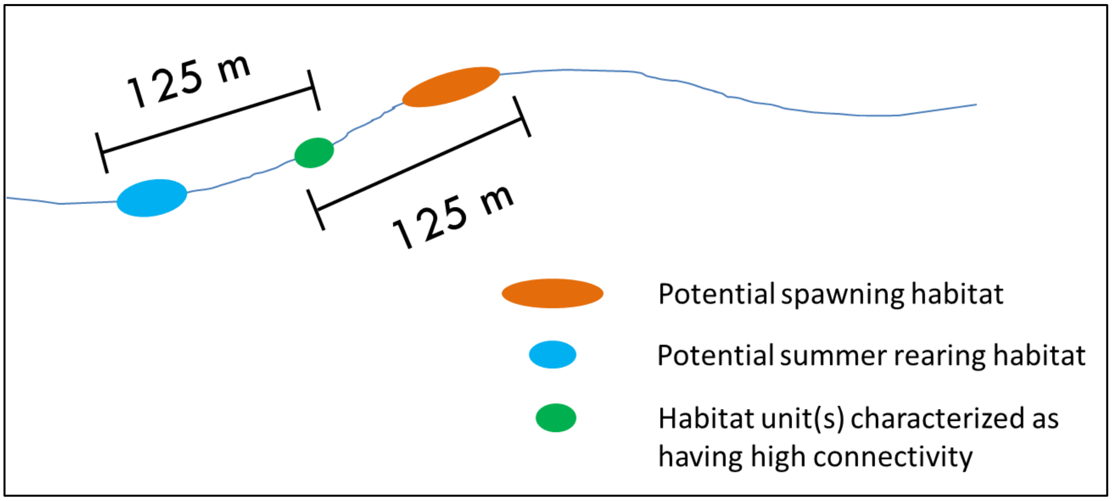

Figure 23. Schematic showing habitat units characterized as having high connectivity between potential spawning habitat and potential summer rearing habitat because both types of potential seasonal habitats are within 125 m of the unit in question.

Again, no information exists about distances fish will swim between summer rearing and winter refuge habitat. High fidelity to winter refuge habitat is observed (Bell et al., 2001; Ebersole et al., 2006), but the fish do have to travel there. Flitcroft et al. (2012) observed that fish abundances in the summer were substantially higher at sample sites that were within 500 m from spawning, summer, or winter habitat. Therefore, I isolated habitat units that had potential summer rearing and spawning habitats within 125 m and also had potential winter refuge habitat within 400 m. I characterized these units as a "comprehensive patch" (Fig. 24). Using 400 m in these calculations results in a potential maximum distance of 525 m between potential summer rearing and potential winter rearing habitat, thus matching observations by Flitcroft et al. (2012). Also, given the paucity of potential winter habitat in the Oregon Coast Range, using a distance less than 400 m would result in very few units characterized as a comprehensive patch.

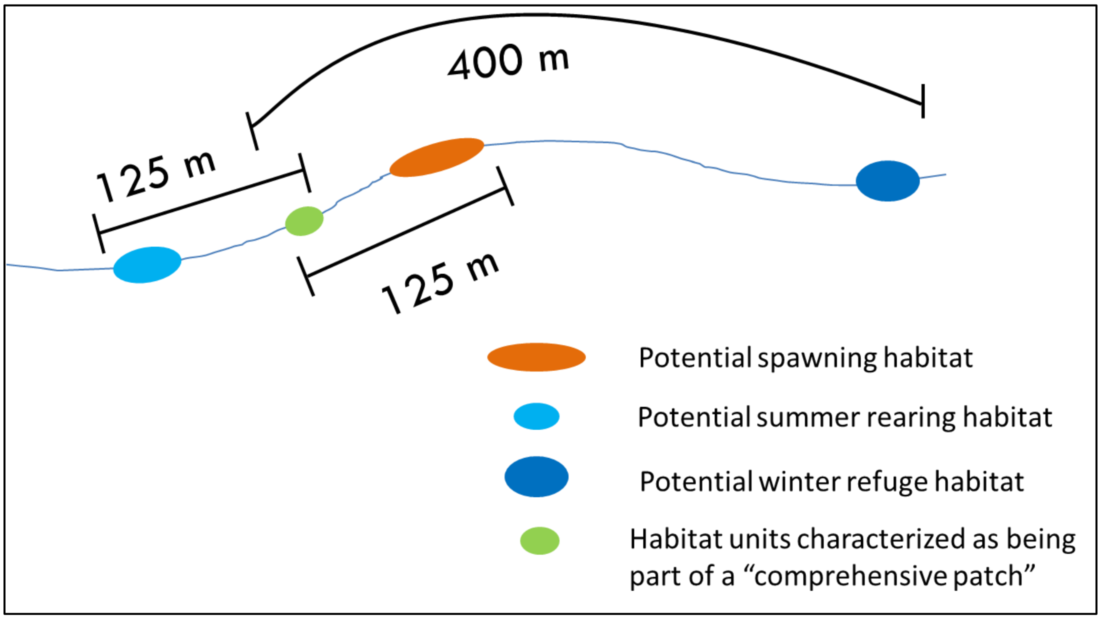

Figure 24. Schematic showing habitat units characterized as a "comprehensive patch" because potential spawning and summer rearing habitat is within 125 m and winter refuge habitat is within 400 m from the unit in question.

Using these data, I extracted the length of each habitat unit that had high connectivity between potential spawning and potential summer rearing habitat and the length of each unit that was part of a "comprehensive patch". I also isolated units that occurred in side channels and extracted their lengths. Finally, I calculated the following percentages of stream length that were characterized as: each potential seasonal habitat type, a high connectivity area between potential spawning and summer habitat, comprehensive patches (connectivity between all three seasonal habitats), and side channels. To evaluate the results, I used analysis of variance on each variable grouped as occurring in landslide terrain or debris flow terrain.

Relationships between Landside Activity, Topography, and Potential Habitat

To investigate the relationships between landslide activity, topography, and potential habitat, I developed a simple stream survey protocol based off the protocol used by ODFW Aquatic Inventories Project (Moore et al., 1997). I surveyed Uncle and Billie Creeks, two tributaries to Condon Creek, a tributary to the North Fork Siuslaw River north of Mapleton, Oregon and used the topographic data I collected for these streams in Chapter One. I calculated adequate potential seasonal habitat types using the method described above. Additionally, I used my stream survey data to calculate Shannon's Diversity Index of habitat unit types per 100 m reach. Shannon's Diversity Index is frequently used in ecology as a measure of diversity and is calculated using the following formula:

$$H' = \sum_{i=1}^{s} p_i \ln p_i$$

where p_i is the ratio of the number of units of a certain type over the total number of units and s is the total number of units. I then ran step-wise multiple linear regression analyses and binary logical regression analyses to determine which, if any, of the topographic variables (valley width, channel slope, drainage area, landslide presence, and landslide activity) were significant predictors to the occurrence of any of the following habitat variables: seasonal habitat type, pool frequency (pools/km of stream length), side channel length, side channel presence/absence, and Shannon's Diversity Index.

Results

Comparing Potential Seasonal Habitat in Landslide and Debris Flow Terrain

While the mean percentages of stream length characterized as potential spawning habitat, potential summer rearing habitat and potential winter refuge habitat were substantially higher in deep-seated landslide terrain, the difference was not statistically significant for any of the three potential habitat types (Fig. 25) according to analysis of variance with a significance threshold of 0.05. ANOVA resulted in p-values of 0.1, 0.4, and 0.1 for percentages of potential spawning, summer rearing, and winter refuge habitat, respectively.

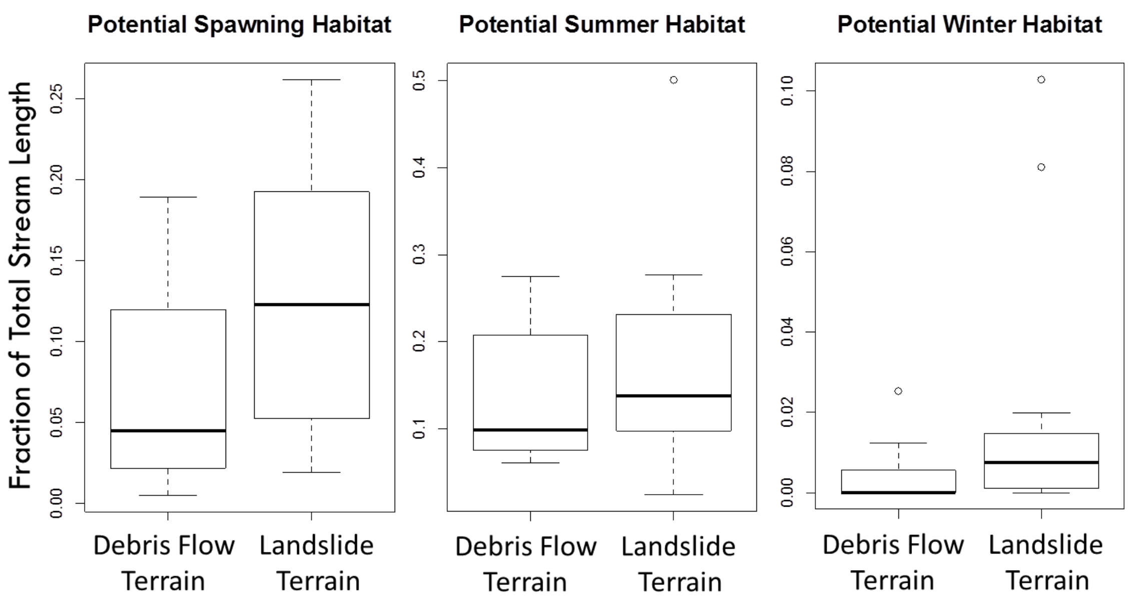

Figure 25. Boxplots showing percentages of stream length characterized as potential spawning habitat (left), potential summer rearing habitat (middle), or potential winter refuge habitat (right) for all 22 streams (11 in deep-seated landslide terrain and 11 in debris flow terrain).

Analysis of variance revealed that streams in deep-seated landslide terrain have significantly more stream length characterized as having high connectivity between potential spawning habitat and potential summer rearing habitat (p=0.01) and significantly more stream length characterized as part of a "comprehensive patch" (p=0.05)(Fig. 26). All comprehensive patch values in debris flow terrain were similarly low aside from one very high value (Little South Fork Smith River) and all comprehensive patch values in landslide terrain were similar aside from one very low value and one very high value. Analysis of variance with these outliers excluded resulted in a p-value of 0.01 and the significance of all other variables was unchanged by excluding these outliers. Lastly, the percentage of stream length that occurred in side channels was not significantly different in landslide terrain versus debris flow terrain (p=0.09).

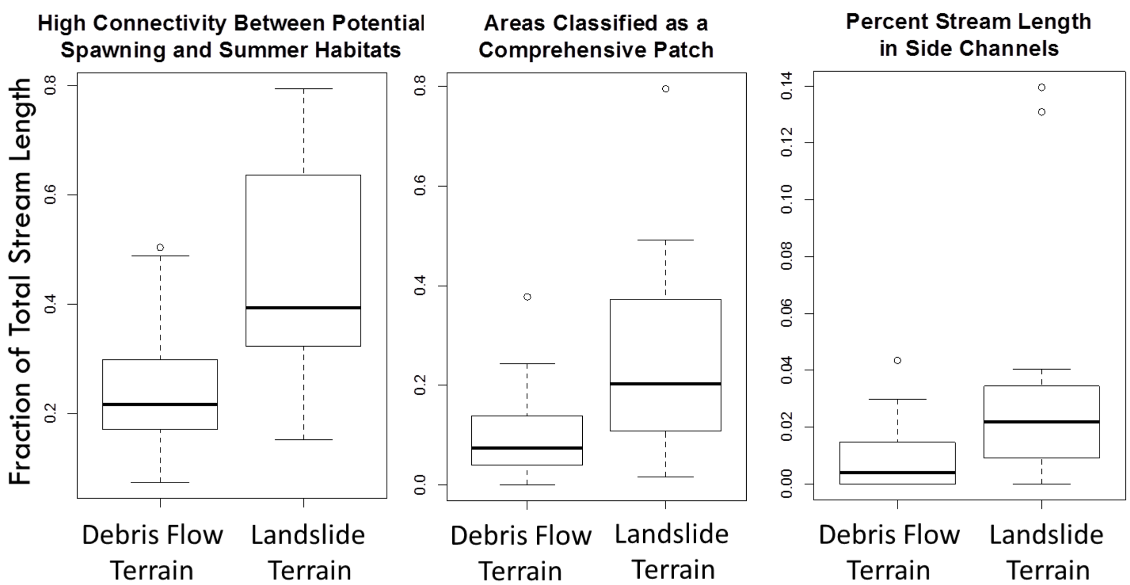

Figure 26. Boxplots showing percentage of stream length with both potential spawning and potential summer rearing habitat within 125 m (left), percentage of stream length characterized as being part of a "comprehensive patch" where potential spawning habitat and potential summer rearing habitat are within 125 m and potential winter refuge habitat is within 400 m (middle), and percentage of stream length occurring in side channels (right).

Case Study: Elk Creek (Discrete Deep-Seated Landslides)

Ten out of eleven basins I examined in deep-seated landslide terrain had extensive landsliding that made it impossible to distinguish areas that were more or less affected by the landslides. One exception is Elk Creek, a tributary to the Umpqua River, which has two discrete deep-seated landslides. May et al. (2013) showed these landslides cause anomalously wide valleys adjacent to and above the landslides. In Chapter Two, I showed that channel slopes adjacent to the landslides are lower than predicted by the slope-area function derived from lidar for the basin. Here, I look at trends in stream survey data separated into two groups: stream sections adjacent to either landslide and stream sections that were not adjacent to either landslide. No habitat units were characterized as potential winter refuge habitat; therefore, there were also no areas characterized as "comprehensive patches". In the channel adjacent to the deep-seated landslides, a larger fraction of stream length was characterized as potential spawning habitat compared with non-landslide areas, a smaller fraction was characterized as potential summer rearing habitat, and a much larger fraction was characterized as having high connectivity (Fig. 27).

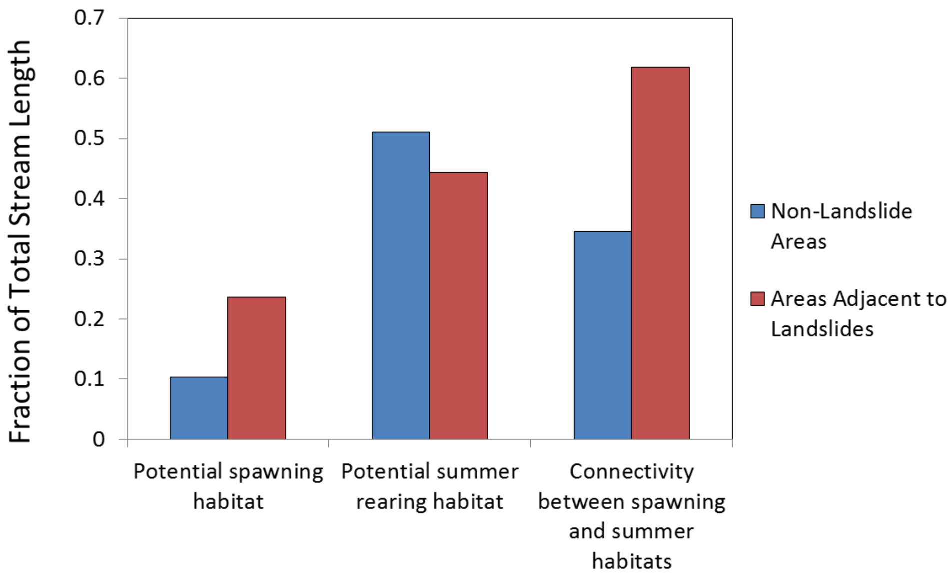

Figure 27. Bar graph showing the fractions of total stream length (in non-landslide areas and landslide areas, separately) of units characterized as potential spawning habitat (left), potential summer rearing habitat (middle), and units with high connectivity, where the distance to the nearest potential spawning habitat and the nearest potential summer rearing habitat are ≤ 125 m (right).

Relationships between Landside Activity, Topography, and Potential Habitat

In order to examine if topography has a direct effect on habitat types, I analyzed stream survey data in relation to topographic variables in Billie and Uncle Creeks in deep-seated landslide terrain. However, neither step-wise multivariate linear regression or binary logical regression with the topographic variables (valley floor width, slope, drainage area, landslide presence and landslide activity) as predictors and habitat variables as dependents revealed any relationships at the 0.05 significance level. The habitat variables I tested were the presence of: potential summer rearing habitat, potential winter refuge habitat, potential spawning habitat, side channel length, side channel presence, and Shannon's Diversity Index.

Discussion

Comparing Potential Seasonal Habitat in Landslide and Debris Flow Terrain

While percentages of stream lengths characterized as each seasonal habitat type are substantially higher in landslide terrain, they are not significantly different than streams in debris flow terrain. However, connectivity between seasonal habitats was significantly different between these groups, indicating that either (1) how each type of seasonal habitat is distributed in streams in landslide terrain versus debris flow terrain must be different or (2) calculating connectivity is analogous to summing three insignificantly higher values, resulting in a value that is significantly higher. In Elk Creek (case study, discrete deep-seated landslides) the non-landslide area contained slightly less potential spawning habitat and slightly more potential summer habitat than the landslide area. However, the non-landslide influenced area had substantially lower connectivity than the areas adjacent to the landslides. This suggests that the primary reason for the difference seen in connectivity between the groups of streams in landslide terrain versus in debris flow terrain is reason one, explained above, supporting my hypothesis that topographic variability caused by deep-seated landslides increases habitat heterogeneity, and thus connectivity.

This finding has important implications for coho salmon conservation and restoration. Not only do many of the streams in landslide terrain already have higher connectivity between seasonal habitats but, because they are not as susceptible to debris flows, restoration efforts in these streams are more likely to have a sustained impact. While in general Pacific salmon evolved and thrived in a disturbance-dominated landscape, individual disturbances can severely damage a local population (Montgomery, 2000, 2003; Waples et al., 2008). Currently, the population size of the Oregon Coast coho is so reduced that restoring and conserving habitat in areas that do not undergo catastrophic disturbances could be vital to their comeback; streams in landslide terrain could be the source areas for fish that don't return to their natal streams and instead migrate to spawn in other streams.

I anticipated there being significantly more winter refuge (off-channel) habitat and significantly more side channels in streams in deep-seated landslide terrain than in debris flow terrain due to the increased likelihood for wide valleys and more sediment availability. Wohl (2011) found that multi-thread channels occurred in low-gradient, unconstrained valleys but only where large wood was available. Wing and Skaugset (2002) found that in forested streams, the abundance of large fluvial wood was predicted by geomorphic variables, but in streams through multiple land uses/land covers, land use patterns were a better predictor of fluvial wood. This suggests that one potential reason more winter refuge habitat and more side channels do not occur in these streams is the effect of land use, which at the drainage areas examined in this study ($<10\ km^2$) is predominantly logging (e.g. Figure 28). Because the forest cover in the Oregon Coast Range is primarily younger stands (Kennedy and Spies, 2004), there is a lack of fluvial wood with diameters large enough to form jams persistent enough to modify the local habitat.

Figure 28. Screen capture taken from Google Earth of private timber lands north-east of Green Acres (just north of the Umpqua River) showing an extreme example of the mosaic of clear-cutting that is common in the Oregon Coast Range. Location: 43°41'N, 123°44'W. Imagery date: 7/22/2014.

Relationships between Landside Activity, Topography, and Potential Habitat

A closer examination of the relationship between topography and habitat types in Billie and Uncle Creeks revealed no relationships – none of the habitat variables were predicted by the topographic variables. However, the results from Question One confirm my hypothesis that topographic variability in landslide terrain influences the distribution of seasonal habitat types. One possible reason for why this is not seen in Billie and Uncle Creeks is the use of valley width as a topographic variable instead of a metric that incorporates how constrained the stream is in the valley (e.g. valley width index = ratio of valley width / bank-full channel width). However, this doesn't account for why channel slope was not a good predictor for any habitat variables. A second potential reason is that the variability in slope and/or the variability in valley width have upstream and downstream effects that obscure any local topographic effects.

Conclusion

Deep-seated landslides are a significant control on the distribution and connectivity of seasonal habitat types but not on the quantity of any of the three types individually (spawning, summer rearing, and winter refuge). As mentioned above, these findings have important implications for conservation and restoration. Deep-seated landslides are easily identifiable using lidar. Watershed councils or other local restoration groups might want to prioritize projects in streams with deep-seated landslides because (1) the stream is likely to already have relatively high connectivity between seasonal habitat types and (2) restoration projects in these streams might have higher persistence due to the reduced impact from debris flows. At the unit scale, the relationships between deep-seated landslides, topography, and habitat are complex; simple topographic metrics can't be relied on to predict locations of seasonal habitat types. More research is needed to resolve the upstream and downstream effects deep-seated landslides have on aquatic and riparian habitat.

CHAPTER IV

CONCLUSION AND IMPLICATIONS

In this master's thesis, I show that deep-seated landslides have a significant effect on valley width, channel slope, and the distribution of stream channel unit types. Deep-seated landslides cause increased topographic variability, the likely cause for why the distribution of channel unit types is more heterogeneous in landslide terrain. This results in higher connectivity between potential seasonal habitat types for coho salmon. These results have important implications for conservation and restoration strategies in the Oregon Coast Range.

Valley floor width in a basin with extensive deep-seated landslides is less predictable by drainage area but also less locally variable than a comparable basin in debris flow terrain. This suggests that landslides control valley width both directly through hillslope-valley coupling as well as indirectly by reducing confluence effects through their control on the topology of the stream network. The entire fabric of the landscape is altered in areas with extensive deep-seated landslides: streams align in a trellis network perpendicular to the underlying structure. Numerous areas with wide valleys occur in landslide terrain at small-medium drainage areas (<1-4 km^2). These do not occur in debris flow terrain, indicating the potential for streams in landslide terrain to host productive habitat that, due to their inaccessibility, is naturally protected from development and agriculture.

Channel slopes between the basins are very different at similar drainage areas, likely a result of small variations in lithology at the ridgelines. Comparison of the slope-area functions for two basins in deep-seated landslide terrain to three basins in debris flow terrain shows that basins in deep-seated landslide terrain are less concave, supporting similar findings by Booth et al. (2013) in other locations. Analysis of channel slope variability in one basin in landslide terrain and one basin in debris flow terrain revealed that slopes are more variable in landslide terrain. This suggests that while wide valleys support certain types of seasonal habitat, the variability in slope might drive the heterogeneity seen in the distribution of these habitats. The characteristic curve at small drainage areas that is a signature of debris flows (Stock and Dietrich, 2003) was not evident in the basin in extensive landslide terrain, implying that debris flows do not happen frequently enough in this terrain to leave a geomorphic signature.

While no relationship was found between slope variability and drainage area, a strong relationship exists between valley width variability and drainage area in both the basin in landslide terrain and the basin in debris flow terrain. Previously undocumented, this relationship shows that the strength of hillslope-fluvial coupling declines as a power function with drainage area. This coupling declines significantly more gradually in landslide terrain than debris flow terrain because landslides occur at all drainage areas whereas debris flows are restricted to small drainage areas.

A comparison of potential seasonal coho habitat types across eleven basins in debris flow terrain and eleven basins in deep-seated landslide terrain revealed no significant difference in percentage of stream length classified as each of the three types of seasonal habitat (spawning, summer rearing, and winter refuge). However, streams in landslide terrain had higher connectivity between these habitat types. Flitcroft et al. (2012) showed that proximity in seasonal habitat types was a better predictor of juvenile coho abundance than habitat quality alone. Therefore, streams in landslide terrain may be providing better habitat for coho than streams in debris flow terrain. In addition to having higher connectivity, streams in landslide terrain experience fewer debris flows. Salmon evolved in a disturbance-dominated landscape, but part of why they thrived is that disturbances like debris flows can wipe out stable populations, disrupting sympatric speciation and promoting genetic diversity (Waples et al., 2008). Currently, the Oregon Coastal ESU of coho salmon is listed as Federally Threatened (NOAA Fisheries, 2005) and the decreased population size alongside continual anthropogenic disturbances makes them less resilient to natural disturbances.

Less off-channel winter refuge habitat and fewer side channels were found in deep-seated landslide terrain than expected given the increased likelihood for those streams to be associated with anomalously wide valleys. Again, geomorphology is only half the story – low gradient unconstrained valleys can only give rise to complex habitat when accompanied by mature forest (Wohl, 2011). In other words, deep-seated landslides provide a geomorphic template that currently has less habitat complexity than what might have been there or than what could potentially exist. Restoration managers should consider factoring in deep-seated landslides as a variable when deciding on their strategies and priorities. For example, projects that restore off-channel winter rearing habitat in landslide terrain are more likely to increase connectivity in all three seasonal habitat types because deep-seated landslide terrain already has much higher connectivity between potential spawning and summer habitats. Additionally, regional forestry managers should be aware that the limit in the supply of mature fluvial wood is reflected in the region's paucity of complex off-channel habitat and consider expanding the riparian buffer zone.

In conclusion, this research addresses the need for improved understanding of the controls on coho habitat at a broad scale. A substantial amount of state and federal money goes toward habitat restoration and conservation for coho and other Pacific salmon species. Improved understanding of the large-scale patterns in salmonid habitat distribution could make restoration and conservation more effective if efforts are focused on areas in deep-seated landslide terrain that already have higher connectivity and are less likely to be disturbed by debris flows. This could potentially increase the amount of habitat improved per dollar spent in the Oregon Coast Range.

APPENDIX A

VALLEY WIDTH AND SLOPE DATA

Binned Smoothed Channel Slope Data

Condon Creek		Harvey Creek		Elk Creek		Dean Creek	
Drainage Area	Median Slope	Drainage Area	Median Slope	Drainage Area	Median Slope	Drainage Area	Median Slope
29.22	0.015	19.02	0.002	6.98	0.001	17.59	0.006
28.02	0.016	21.37	0.003	3.04	0.003	18.99	0.007
8.37	0.016	17.60	0.003	3.27	0.003	22.14	0.008
18.48	0.020	22.21	0.004	2.28	0.004	2.22	0.010
26.88	0.028	19.77	0.004	10.76	0.004	16.93	0.010
17.72	0.028	9.46	0.008	6.73	0.004	21.31	0.012
7.70	0.029	15.66	0.008	8.06	0.005	11.10	0.016
5.52	0.033	5.49	0.009	7.24	0.005	18.28	0.021
9.10	0.036	9.83	0.011	8.36	0.005	10.28	0.027
5.30	0.037	5.71	0.012	10.01	0.006	13.97	0.028
8.03	0.040	9.10	0.013	4.21	0.006	10.68	0.029
8.73	0.043	8.42	0.014	12.88	0.006	9.89	0.045
9.49	0.046	1.78	0.017	9.66	0.007	1.98	0.060
6.00	0.048	5.08	0.021	3.39	0.007	9.16	0.060
5.76	0.049	5.28	0.022	2.94	0.007	2.79	0.068
3.96	0.050	6.41	0.025	16.58	0.007	7.28	0.068
6.80	0.050	4.52	0.026	9.31	0.007	2.90	0.068
7.39	0.050	8.10	0.026	5.23	0.008	9.52	0.081
6.26	0.053	4.03	0.030	2.54	0.008	1.83	0.086
4.67	0.057	6.17	0.032	10.38	0.008	2.69	0.097
1.04	0.057	2.73	0.038	13.36	0.008	2.13	0.097
5.08	0.058	3.45	0.046	6.04	0.009	7.01	0.109
6.52	0.060	2.34	0.049	2.20	0.009	4.25	0.110
3.80	0.070	3.07	0.049	2.64	0.010	3.65	0.124
4.30	0.071	2.95	0.049	2.45	0.010	3.51	0.129
3.49	0.072	1.53	0.050	2.12	0.010	3.01	0.135

Condon Creek		Harvey Creek		Elk Creek		Dean Creek	
Drainage Area	Median Slope	Drainage Area	Median Slope	Drainage Area	Median Slope	Drainage Area	Median Slope
3.21	0.072	2.63	0.055	2.05	0.010	1.90	0.153
4.12	0.074	1.65	0.057	1.43	0.010	2.39	0.154
1.13	0.075	2.53	0.059	1.71	0.011	2.30	0.157
3.64	0.075	2.25	0.060	1.91	0.011	2.58	0.157
4.87	0.079	1.71	0.060	16.00	0.011	2.49	0.157
4.48	0.081	2.84	0.061	5.62	0.011	2.05	0.164
7.09	0.083	1.26	0.063	5.83	0.012	0.76	0.166
3.35	0.092	1.31	0.064	2.83	0.012	0.60	0.175
2.96	0.092	1.16	0.065	1.84	0.013	3.13	0.183
2.40	0.100	1.21	0.066	2.73	0.014	3.38	0.187
1.34	0.107	2.16	0.070	7.50	0.015	1.35	0.195
1.79	0.109	2.08	0.074	15.43	0.017	1.45	0.206
1.72	0.110	0.76	0.074	5.42	0.017	1.51	0.213
1.18	0.111	0.96	0.075	1.77	0.018	0.99	0.217
1.52	0.111	1.47	0.079	13.85	0.018	1.30	0.238
2.72	0.112	1.08	0.082	1.33	0.020	1.57	0.240
1.87	0.112	0.41	0.084	0.48	0.021	1.76	0.240
0.66	0.114	0.53	0.086	11.15	0.022	1.40	0.241
1.46	0.115	1.41	0.087	1.28	0.022	0.08	0.243
2.84	0.116	1.59	0.088	1.65	0.023	1.03	0.246
3.08	0.117	0.73	0.090	0.54	0.024	1.25	0.246
2.50	0.121	1.03	0.096	1.38	0.025	0.92	0.266
0.88	0.125	0.92	0.100	1.59	0.025	1.69	0.266
1.58	0.126	0.85	0.105	1.03	0.027	1.07	0.267
1.40	0.126	1.12	0.105	1.07	0.028	0.48	0.282
2.61	0.130	0.82	0.106	5.04	0.029	0.95	0.291
0.61	0.133	1.00	0.107	0.72	0.029	0.82	0.292
0.72	0.138	0.70	0.110	0.93	0.033	0.67	0.295

Condon Creek		Harvey Creek		Elk Creek		Dean Creek	
Drainage Area	Median Slope	Drainage Area	Median Slope	Drainage Area	Median Slope	Drainage Area	Median Slope
1.29	0.139	0.30	0.114	1.19	0.033	0.63	0.302
0.58	0.143	0.50	0.115	0.47	0.034	1.15	0.302
2.03	0.147	0.21	0.115	0.50	0.036	0.88	0.307
1.65	0.148	0.58	0.115	0.69	0.036	0.79	0.308
1.23	0.158	0.60	0.116	0.89	0.037	1.11	0.309
1.09	0.160	0.32	0.117	0.62	0.037	0.58	0.311
0.31	0.162	0.46	0.118	0.60	0.039	0.70	0.325
0.40	0.164	0.89	0.119	0.83	0.044	0.73	0.327
0.69	0.167	0.48	0.123	0.38	0.045	0.50	0.332
0.30	0.179	0.51	0.127	0.52	0.047	0.65	0.345
0.28	0.188	0.79	0.128	0.96	0.047	0.54	0.354
0.78	0.190	0.23	0.130	0.86	0.047	0.41	0.362
0.16	0.193	0.68	0.131	1.53	0.048	0.43	0.373
0.92	0.200	0.44	0.132	0.45	0.049	0.34	0.380
2.30	0.203	0.26	0.139	0.67	0.049	0.52	0.386
0.38	0.207	0.34	0.140	0.27	0.050	0.30	0.389
0.49	0.208	0.24	0.140	0.17	0.051	0.31	0.405
0.23	0.213	0.28	0.140	0.42	0.051	0.56	0.409
1.00	0.222	0.36	0.142	0.21	0.051	0.35	0.414
0.96	0.230	0.20	0.148	0.43	0.052	0.85	0.420
0.25	0.241	0.39	0.151	0.33	0.053	0.46	0.423
0.33	0.249	0.22	0.166	0.65	0.054	0.24	0.449
0.09	0.251	0.17	0.166	0.13	0.055	0.38	0.450
0.35	0.263	0.25	0.170	0.35	0.055	0.44	0.455
0.85	0.274	0.38	0.173	0.25	0.061	0.39	0.461
0.06	0.289	0.15	0.174	0.58	0.062	0.26	0.486
0.37	0.291	0.13	0.176	0.18	0.062	0.37	0.486
0.56	0.302	0.42	0.200	0.39	0.064	0.29	0.497

Condon Creek		Harvey Creek		Elk Creek		Dean Creek	
Drainage Area	Median Slope	Drainage Area	Median Slope	Drainage Area	Median Slope	Drainage Area	Median Slope
0.21	0.303	0.14	0.205	0.08	0.067	0.18	0.512
0.54	0.304	0.18	0.205	0.34	0.076	0.13	0.542
0.18	0.305	0.14	0.214	0.80	0.077	0.21	0.542
0.45	0.311	0.07	0.218	0.16	0.084	0.19	0.543
0.19	0.316	0.15	0.224	0.29	0.089	0.21	0.567
0.47	0.322	0.27	0.228	0.10	0.090	0.22	0.619
0.11	0.332	0.12	0.230	0.23	0.093	0.27	0.629
0.81	0.339	0.08	0.248	0.56	0.097	0.10	0.633
0.26	0.344	0.09	0.248	0.14	0.098	0.16	0.634
0.51	0.349	0.16	0.254	0.20	0.099	0.18	0.648
0.17	0.351	0.19	0.254	0.20	0.101	0.16	0.662
0.29	0.352	0.10	0.259	0.30	0.105	0.20	0.668
0.42	0.394	0.07	0.261	0.19	0.114	0.25	0.691
0.12	0.397	0.07	0.324	0.24	0.123	0.15	0.715
0.08	0.414	0.09	0.344	0.12	0.124	0.15	0.725
0.14	0.423	0.10	0.393	0.11	0.134	0.28	0.744
0.15	0.451			0.24	0.135	0.12	0.758
0.20	0.457			0.13	0.136	0.09	0.778
0.44	0.459			0.15	0.146	0.23	0.788
0.07	0.460			0.10	0.187	0.12	0.805
0.14	0.461			0.16	0.191	0.14	0.809
0.17	0.470			0.11	0.198	0.09	0.838
0.07	0.474			0.08	0.219	0.12	0.863
0.21	0.494					0.10	0.875
0.22	0.498					0.10	0.933
0.10	0.532						
0.24	0.546						
0.12	0.560						

Condon Creek		Harvey Creek		Elk Creek		Dean Creek	
Drainage Area	Median Slope	Drainage Area	Median Slope	Drainage Area	Median Slope	Drainage Area	Median Slope
0.09	0.564						
0.34	0.575						
0.11	0.688						
0.10	0.709						
0.15	0.801						
0.13	0.975						
0.08	1.276						
0.06	1.302						

Local Variability in Channel Slope Data for Condon Creek

Condon Creek						
Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
7.49	0.05	-1.31	0.02	0.04	-1.37	0.0127
7.45	0.05	-1.30	0.02	0.04	-1.36	0.0148
0.49	0.37	-0.43	0.01	0.23	-0.64	0.0178
7.54	0.05	-1.29	0.03	0.04	-1.37	0.0187
4.41	0.09	-1.03	0.03	0.06	-1.23	0.0236
0.89	0.23	-0.64	0.02	0.16	-0.80	0.0256
2.50	0.10	-0.99	0.03	0.08	-1.07	0.0275
2.48	0.12	-0.92	0.03	0.08	-1.07	0.0276
4.96	0.08	-1.10	0.04	0.06	-1.26	0.0293
4.93	0.08	-1.10	0.04	0.06	-1.26	0.0307
4.77	0.07	-1.15	0.04	0.06	-1.25	0.0308
4.81	0.08	-1.08	0.04	0.06	-1.25	0.0310
6.36	0.06	-1.19	0.04	0.05	-1.32	0.0315
3.85	0.05	-1.30	0.04	0.06	-1.19	0.0330
4.17	0.06	-1.19	0.04	0.06	-1.21	0.0330
18.48	0.02	-1.65	0.06	0.02	-1.61	0.0354
4.36	0.09	-1.02	0.04	0.06	-1.22	0.0355
6.40	0.07	-1.13	0.05	0.05	-1.32	0.0363
4.19	0.09	-1.03	0.05	0.06	-1.21	0.0376
4.74	0.05	-1.28	0.05	0.06	-1.24	0.0382
7.67	0.05	-1.26	0.05	0.04	-1.37	0.0394
18.39	0.03	-1.56	0.06	0.02	-1.61	0.0402
18.09	0.02	-1.69	0.06	0.03	-1.60	0.0406
4.75	0.05	-1.29	0.05	0.06	-1.25	0.0410
3.87	0.08	-1.11	0.05	0.06	-1.19	0.0415

Condon Creek						
Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
4.20	0.06	-1.21	0.05	0.06	-1.21	0.0418
0.96	0.25	-0.60	0.03	0.15	-0.82	0.0422
2.99	0.07	-1.13	0.05	0.08	-1.12	0.0423
0.91	0.22	-0.65	0.03	0.16	-0.80	0.0427
4.16	0.07	-1.13	0.05	0.06	-1.21	0.0428
6.51	0.06	-1.19	0.06	0.05	-1.33	0.0429
4.13	0.10	-1.00	0.05	0.06	-1.21	0.0429
1.73	0.11	-0.96	0.04	0.11	-0.98	0.0431
4.86	0.04	-1.38	0.05	0.06	-1.25	0.0434
4.67	0.05	-1.27	0.05	0.06	-1.24	0.0437
4.43	0.08	-1.09	0.05	0.06	-1.23	0.0441
1.02	0.23	-0.64	0.04	0.15	-0.83	0.0463
1.74	0.11	-0.95	0.05	0.11	-0.98	0.0466
18.04	0.03	-1.56	0.07	0.03	-1.60	0.0467
6.57	0.06	-1.24	0.06	0.05	-1.33	0.0467
2.84	0.08	-1.07	0.05	0.08	-1.11	0.0476
3.45	0.07	-1.15	0.06	0.07	-1.16	0.0478
3.86	0.09	-1.02	0.06	0.06	-1.19	0.0480
4.40	0.07	-1.14	0.06	0.06	-1.22	0.0482
4.62	0.06	-1.24	0.06	0.06	-1.24	0.0483
5.34	0.06	-1.24	0.06	0.05	-1.28	0.0488
4.39	0.05	-1.32	0.06	0.06	-1.22	0.0489
4.70	0.07	-1.16	0.06	0.06	-1.24	0.0498
4.72	0.06	-1.19	0.06	0.06	-1.24	0.0504
2.90	0.07	-1.16	0.06	0.08	-1.11	0.0504
4.88	0.06	-1.23	0.06	0.06	-1.25	0.0507
4.35	0.05	-1.27	0.06	0.06	-1.22	0.0510

Condon Creek

Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
9.50	0.05	-1.34	0.07	0.04	-1.43	0.0511
1.47	0.20	-0.69	0.05	0.12	-0.93	0.0528
6.84	0.04	-1.36	0.07	0.05	-1.34	0.0529
1.78	0.12	-0.91	0.05	0.10	-0.98	0.0531
1.64	0.14	-0.84	0.05	0.11	-0.96	0.0533
2.84	0.16	-0.80	0.06	0.08	-1.11	0.0536
6.79	0.07	-1.15	0.07	0.05	-1.34	0.0538
5.81	0.06	-1.21	0.07	0.05	-1.30	0.0540
5.32	0.04	-1.40	0.07	0.05	-1.28	0.0543
4.55	0.10	-1.01	0.07	0.06	-1.23	0.0551
6.72	0.05	-1.30	0.07	0.05	-1.34	0.0559
3.07	0.13	-0.89	0.06	0.07	-1.13	0.0559
8.86	0.04	-1.42	0.08	0.04	-1.41	0.0568
5.64	0.04	-1.36	0.07	0.05	-1.29	0.0572
5.28	0.04	-1.35	0.07	0.05	-1.27	0.0578
3.45	0.09	-1.07	0.07	0.07	-1.16	0.0579
5.77	0.05	-1.26	0.08	0.05	-1.30	0.0584
1.34	0.19	-0.73	0.05	0.12	-0.91	0.0586
5.96	0.04	-1.42	0.08	0.05	-1.31	0.0587
6.03	0.06	-1.22	0.08	0.05	-1.31	0.0588
7.24	0.06	-1.25	0.08	0.04	-1.36	0.0597
7.28	0.05	-1.27	0.08	0.04	-1.36	0.0599
7.12	0.08	-1.08	0.08	0.04	-1.35	0.0607
2.87	0.12	-0.94	0.07	0.08	-1.11	0.0610
6.43	0.06	-1.21	0.08	0.05	-1.33	0.0614
3.24	0.05	-1.26	0.07	0.07	-1.14	0.0619
1.45	0.17	-0.76	0.06	0.12	-0.93	0.0620

Condon Creek						
Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
3.21	0.07	-1.14	0.07	0.07	-1.14	0.0622
7.71	0.05	-1.34	0.09	0.04	-1.37	0.0627
6.40	0.04	-1.43	0.08	0.05	-1.32	0.0629
5.87	0.04	-1.41	0.08	0.05	-1.30	0.0632
3.54	0.06	-1.25	0.07	0.07	-1.17	0.0634
3.01	0.09	-1.04	0.07	0.08	-1.12	0.0635
17.68	0.03	-1.49	0.10	0.03	-1.59	0.0636
7.74	0.02	-1.79	0.09	0.04	-1.38	0.0642
9.48	0.05	-1.34	0.09	0.04	-1.43	0.0642
6.30	0.05	-1.27	0.09	0.05	-1.32	0.0655
8.92	0.04	-1.37	0.09	0.04	-1.41	0.0656
3.42	0.11	-0.94	0.08	0.07	-1.16	0.0656
2.77	0.12	-0.91	0.07	0.08	-1.10	0.0662
6.74	0.05	-1.29	0.09	0.05	-1.34	0.0666
0.97	0.23	-0.64	0.05	0.15	-0.82	0.0667
6.53	0.05	-1.30	0.09	0.05	-1.33	0.0675
2.80	0.16	-0.80	0.07	0.08	-1.10	0.0675
3.06	0.12	-0.93	0.08	0.07	-1.13	0.0678
5.93	0.05	-1.32	0.09	0.05	-1.30	0.0683
28.04	0.01	-1.95	0.12	0.02	-1.72	0.0690
27.93	0.02	-1.60	0.12	0.02	-1.72	0.0697
6.94	0.05	-1.31	0.09	0.05	-1.35	0.0702
6.33	0.04	-1.41	0.09	0.05	-1.32	0.0702
28.01	0.02	-1.69	0.12	0.02	-1.72	0.0704
2.62	0.14	-0.85	0.08	0.08	-1.09	0.0705
3.00	0.11	-0.95	0.08	0.08	-1.12	0.0707
3.05	0.12	-0.93	0.08	0.07	-1.13	0.0709

Condon Creek

Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
3.58	0.09	-1.03	0.08	0.07	-1.17	0.0713
3.53	0.07	-1.14	0.08	0.07	-1.17	0.0714
3.39	0.07	-1.13	0.08	0.07	-1.16	0.0723
1.59	0.13	-0.90	0.07	0.11	-0.95	0.0725
3.92	0.05	-1.29	0.09	0.06	-1.19	0.0725
3.05	0.09	-1.06	0.08	0.07	-1.13	0.0746
3.81	0.06	-1.26	0.09	0.07	-1.19	0.0753
8.73	0.05	-1.32	0.11	0.04	-1.41	0.0764
0.93	0.15	-0.83	0.06	0.15	-0.81	0.0770
7.75	0.07	-1.18	0.11	0.04	-1.38	0.0773
1.50	0.18	-0.75	0.07	0.12	-0.94	0.0775
3.13	0.10	-1.00	0.09	0.07	-1.13	0.0776
1.57	0.14	-0.84	0.07	0.11	-0.95	0.0778
2.39	0.07	-1.15	0.08	0.09	-1.06	0.0779
8.07	0.04	-1.36	0.11	0.04	-1.39	0.0779
3.68	0.06	-1.21	0.09	0.07	-1.18	0.0779
6.90	0.05	-1.30	0.11	0.05	-1.34	0.0781
1.46	0.12	-0.94	0.07	0.12	-0.93	0.0783
5.35	0.02	-1.68	0.10	0.05	-1.28	0.0783
2.72	0.12	-0.92	0.09	0.08	-1.10	0.0784
27.95	0.01	-1.86	0.13	0.02	-1.72	0.0785
2.68	0.09	-1.06	0.09	0.08	-1.09	0.0787
2.62	0.08	-1.11	0.09	0.08	-1.09	0.0792
29.28	0.02	-1.78	0.14	0.02	-1.73	0.0792
28.84	0.02	-1.82	0.14	0.02	-1.73	0.0794
2.36	0.09	-1.07	0.08	0.09	-1.06	0.0799
8.03	0.07	-1.15	0.11	0.04	-1.39	0.0800

Condon Creek

Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
28.42	0.01	-2.03	0.14	0.02	-1.72	0.0801
28.52	0.02	-1.63	0.14	0.02	-1.72	0.0804
7.77	0.04	-1.44	0.11	0.04	-1.38	0.0812
29.43	0.01	-1.93	0.14	0.02	-1.73	0.0819
7.94	0.05	-1.31	0.11	0.04	-1.38	0.0824
0.95	0.28	-0.56	0.07	0.15	-0.82	0.0827
3.90	0.06	-1.19	0.10	0.06	-1.19	0.0836
6.85	0.03	-1.52	0.11	0.05	-1.34	0.0840
2.56	0.14	-0.85	0.09	0.08	-1.08	0.0840
0.48	0.35	-0.45	0.05	0.23	-0.64	0.0843
2.97	0.15	-0.82	0.10	0.08	-1.12	0.0851
6.83	0.06	-1.20	0.12	0.05	-1.34	0.0863
3.85	0.07	-1.16	0.10	0.06	-1.19	0.0871
6.77	0.04	-1.45	0.12	0.05	-1.34	0.0877
28.05	0.02	-1.79	0.15	0.02	-1.72	0.0881
1.81	0.11	-0.96	0.09	0.10	-0.99	0.0902
17.92	0.03	-1.54	0.14	0.03	-1.60	0.0906
0.90	0.20	-0.70	0.07	0.16	-0.80	0.0907
8.02	0.02	-1.62	0.13	0.04	-1.38	0.0907
2.74	0.10	-0.98	0.10	0.08	-1.10	0.0913
2.83	0.10	-1.01	0.10	0.08	-1.11	0.0929
3.97	0.05	-1.32	0.11	0.06	-1.20	0.0933
2.43	0.13	-0.90	0.10	0.09	-1.07	0.0947
7.99	0.03	-1.50	0.13	0.04	-1.38	0.0949
1.31	0.25	-0.60	0.09	0.13	-0.90	0.0961
28.75	0.01	-2.06	0.17	0.02	-1.72	0.0965
3.16	0.09	-1.04	0.11	0.07	-1.14	0.0966

Condon Creek

Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
0.47	0.16	-0.81	0.06	0.23	-0.63	0.0978
17.88	0.05	-1.27	0.16	0.03	-1.60	0.0979
8.96	0.03	-1.52	0.14	0.04	-1.41	0.0982
1.04	0.06	-1.24	0.08	0.14	-0.84	0.0986
2.56	0.12	-0.92	0.11	0.08	-1.08	0.0990
28.83	0.01	-2.13	0.17	0.02	-1.73	0.0997
17.96	0.02	-1.72	0.16	0.03	-1.60	0.0997
2.51	0.10	-1.01	0.11	0.08	-1.08	0.1002
0.91	0.05	-1.34	0.08	0.16	-0.81	0.1005
29.45	0.01	-2.06	0.17	0.02	-1.73	0.1006
0.58	0.21	-0.67	0.07	0.21	-0.69	0.1010
28.56	0.01	-1.82	0.17	0.02	-1.72	0.1010
0.87	0.08	-1.11	0.08	0.16	-0.79	0.1011
2.47	0.14	-0.87	0.11	0.08	-1.07	0.1023
2.37	0.12	-0.93	0.11	0.09	-1.06	0.1029
9.45	0.04	-1.39	0.15	0.04	-1.43	0.1030
0.40	0.56	-0.25	0.06	0.26	-0.59	0.1043
1.12	0.07	-1.14	0.09	0.14	-0.86	0.1053
0.72	0.14	-0.86	0.08	0.18	-0.74	0.1056
0.46	0.34	-0.46	0.07	0.24	-0.63	0.1086
0.86	0.25	-0.61	0.09	0.16	-0.79	0.1092
9.38	0.06	-1.21	0.16	0.04	-1.43	0.1110
2.03	0.22	-0.66	0.12	0.10	-1.02	0.1132
7.85	0.02	-1.63	0.16	0.04	-1.38	0.1136
28.73	0.02	-1.69	0.20	0.02	-1.72	0.1155
1.12	0.11	-0.97	0.10	0.14	-0.86	0.1170
0.82	0.24	-0.62	0.09	0.17	-0.78	0.1178

Condon Creek

Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
2.02	0.10	-1.00	0.12	0.10	-1.02	0.1180
9.07	0.02	-1.65	0.17	0.04	-1.42	0.1185
9.01	0.06	-1.24	0.17	0.04	-1.42	0.1190
2.34	0.20	-0.69	0.13	0.09	-1.06	0.1212
7.80	0.03	-1.54	0.17	0.04	-1.38	0.1226
1.00	0.14	-0.85	0.10	0.15	-0.83	0.1239
0.50	0.36	-0.45	0.08	0.22	-0.65	0.1247
1.50	0.07	-1.15	0.12	0.12	-0.94	0.1262
1.34	0.09	-1.06	0.11	0.12	-0.91	0.1263
0.34	0.78	-0.11	0.07	0.28	-0.55	0.1266
0.53	0.44	-0.35	0.08	0.22	-0.66	0.1269
1.14	0.07	-1.16	0.11	0.14	-0.87	0.1279
0.44	0.20	-0.70	0.08	0.24	-0.61	0.1280
0.24	0.88	-0.06	0.06	0.35	-0.45	0.1281
2.49	0.12	-0.91	0.14	0.08	-1.07	0.1314
0.57	0.57	-0.25	0.09	0.21	-0.68	0.1314
0.97	0.20	-0.70	0.11	0.15	-0.82	0.1364
0.46	0.48	-0.32	0.09	0.24	-0.62	0.1375
0.65	0.07	-1.15	0.10	0.19	-0.72	0.1412
0.52	0.35	-0.45	0.10	0.22	-0.66	0.1446
0.39	0.66	-0.18	0.08	0.27	-0.58	0.1467
0.70	0.12	-0.91	0.11	0.18	-0.74	0.1490
0.32	0.17	-0.78	0.08	0.30	-0.53	0.1493
0.80	0.56	-0.25	0.12	0.17	-0.77	0.1495
0.20	0.49	-0.31	0.06	0.39	-0.41	0.1499
0.26	0.75	-0.13	0.07	0.34	-0.47	0.1520
3.98	0.04	-1.39	0.18	0.06	-1.20	0.1526

Condon Creek

Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
0.54	0.57	-0.24	0.10	0.22	-0.66	0.1535
0.56	0.20	-0.69	0.10	0.21	-0.67	0.1536
0.38	0.29	-0.54	0.09	0.27	-0.57	0.1541
5.15	0.08	-1.08	0.20	0.05	-1.27	0.1541
0.42	0.52	-0.28	0.09	0.25	-0.60	0.1544
0.39	0.21	-0.69	0.09	0.26	-0.58	0.1549
1.13	0.08	-1.11	0.13	0.14	-0.86	0.1550
1.02	0.22	-0.65	0.13	0.15	-0.84	0.1557
0.49	0.41	-0.39	0.10	0.23	-0.64	0.1564
1.33	0.05	-1.28	0.14	0.12	-0.91	0.1586
5.33	0.03	-1.60	0.21	0.05	-1.28	0.1622
1.19	0.12	-0.92	0.14	0.13	-0.88	0.1625
1.28	0.08	-1.11	0.15	0.13	-0.90	0.1632
0.86	0.30	-0.52	0.13	0.16	-0.79	0.1632
0.25	0.99	0.00	0.07	0.35	-0.46	0.1634
1.10	0.14	-0.84	0.14	0.14	-0.86	0.1645
0.38	0.32	-0.50	0.09	0.27	-0.57	0.1647
0.87	0.11	-0.94	0.13	0.16	-0.79	0.1666
0.92	0.19	-0.72	0.13	0.16	-0.81	0.1670
0.50	0.06	-1.22	0.11	0.23	-0.64	0.1674
1.07	0.18	-0.75	0.14	0.14	-0.85	0.1688
0.58	0.10	-1.01	0.12	0.21	-0.68	0.1689
0.60	0.12	-0.91	0.12	0.20	-0.70	0.1693
0.82	0.34	-0.47	0.13	0.17	-0.78	0.1708
1.17	0.10	-0.99	0.15	0.13	-0.87	0.1720
1.76	0.17	-0.78	0.17	0.10	-0.98	0.1722
1.75	0.05	-1.30	0.17	0.10	-0.98	0.1727

Condon Creek

Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
0.55	0.34	-0.47	0.12	0.21	-0.67	0.1734
1.72	0.11	-0.96	0.17	0.11	-0.98	0.1735
0.61	0.14	-0.84	0.12	0.20	-0.70	0.1741
0.56	0.19	-0.71	0.12	0.21	-0.68	0.1741
0.80	0.38	-0.42	0.14	0.17	-0.77	0.1770
0.72	0.08	-1.12	0.13	0.18	-0.74	0.1784
0.35	0.31	-0.51	0.10	0.28	-0.55	0.1790
0.72	0.35	-0.46	0.13	0.18	-0.74	0.1793
0.24	0.34	-0.47	0.08	0.35	-0.46	0.1816
0.79	0.06	-1.19	0.14	0.17	-0.77	0.1818
1.65	0.26	-0.58	0.18	0.11	-0.96	0.1839
1.67	0.11	-0.95	0.18	0.11	-0.97	0.1839
0.26	0.11	-0.95	0.09	0.34	-0.47	0.1847
5.16	0.04	-1.40	0.24	0.05	-1.27	0.1858
0.19	0.36	-0.45	0.07	0.41	-0.38	0.1911
1.41	0.17	-0.76	0.18	0.12	-0.92	0.1939
0.49	0.21	-0.68	0.12	0.23	-0.64	0.1952
0.38	0.19	-0.71	0.11	0.27	-0.57	0.1967
0.29	0.62	-0.21	0.10	0.32	-0.50	0.1970
0.40	0.16	-0.79	0.12	0.26	-0.59	0.2021
0.36	0.47	-0.33	0.11	0.28	-0.56	0.2030
8.37	0.04	-1.38	0.29	0.04	-1.40	0.2049
0.42	0.30	-0.53	0.12	0.25	-0.60	0.2067
1.39	0.13	-0.90	0.19	0.12	-0.92	0.2071
0.48	0.30	-0.52	0.13	0.23	-0.63	0.2111
0.49	0.08	-1.12	0.14	0.23	-0.64	0.2112
0.27	0.68	-0.17	0.10	0.33	-0.48	0.2138

Condon Creek						
Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
1.90	0.11	-0.95	0.22	0.10	-1.00	0.2163
0.33	0.56	-0.25	0.12	0.29	-0.53	0.2166
27.08	0.02	-1.63	0.37	0.02	-1.71	0.2182
0.47	0.12	-0.91	0.14	0.24	-0.63	0.2185
7.72	0.02	-1.74	0.30	0.04	-1.37	0.2196
18.53	0.02	-1.71	0.35	0.02	-1.61	0.2199
18.56	0.02	-1.71	0.36	0.02	-1.61	0.2209
0.93	0.38	-0.42	0.18	0.15	-0.81	0.2211
6.93	0.08	-1.07	0.31	0.05	-1.35	0.2294
7.59	0.02	-1.64	0.32	0.04	-1.37	0.2306
0.42	0.63	-0.20	0.14	0.25	-0.60	0.2315
1.70	0.10	-1.02	0.23	0.11	-0.97	0.2350
0.33	0.15	-0.83	0.13	0.29	-0.53	0.2380
0.92	0.35	-0.45	0.19	0.16	-0.81	0.2390
8.16	0.03	-1.49	0.34	0.04	-1.39	0.2424
1.70	0.40	-0.40	0.24	0.11	-0.97	0.2461
0.35	0.17	-0.76	0.14	0.28	-0.55	0.2484
0.89	0.14	-0.87	0.20	0.16	-0.80	0.2496
0.44	0.42	-0.38	0.15	0.24	-0.61	0.2504
0.23	0.90	-0.05	0.11	0.36	-0.44	0.2529
1.23	0.16	-0.80	0.23	0.13	-0.89	0.2564
0.24	0.26	-0.58	0.12	0.36	-0.45	0.2567
8.11	0.02	-1.68	0.36	0.04	-1.39	0.2568
0.23	0.18	-0.75	0.11	0.37	-0.44	0.2600
0.29	0.64	-0.19	0.13	0.32	-0.50	0.2626
7.16	0.02	-1.75	0.36	0.04	-1.35	0.2627
0.40	0.15	-0.82	0.16	0.26	-0.59	0.2637

Condon Creek						
Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
0.32	0.37	-0.43	0.14	0.30	-0.53	0.2689
7.52	0.00	-2.40	0.37	0.04	-1.37	0.2701
7.40	0.03	-1.47	0.37	0.04	-1.36	0.2710
0.35	0.26	-0.58	0.15	0.28	-0.55	0.2741
1.67	0.15	-0.82	0.26	0.11	-0.97	0.2741
0.26	0.19	-0.72	0.13	0.33	-0.48	0.2742
7.14	0.19	-0.73	0.37	0.04	-1.35	0.2746
6.94	0.02	-1.64	0.37	0.05	-1.35	0.2775
27.07	0.03	-1.49	0.47	0.02	-1.71	0.2777
1.59	0.08	-1.08	0.27	0.11	-0.95	0.2792
0.13	0.86	-0.07	0.08	0.51	-0.30	0.2812
1.72	0.13	-0.90	0.28	0.11	-0.98	0.2883
0.31	0.11	-0.97	0.15	0.30	-0.52	0.2892
8.22	0.00	-2.44	0.40	0.04	-1.39	0.2907
0.18	0.76	-0.12	0.11	0.42	-0.38	0.3001
8.35	0.06	-1.26	0.42	0.04	-1.40	0.3015
0.48	0.45	-0.35	0.19	0.23	-0.64	0.3049
0.95	0.20	-0.69	0.25	0.15	-0.82	0.3077
8.26	0.01	-1.91	0.43	0.04	-1.39	0.3109
0.16	0.19	-0.71	0.11	0.45	-0.34	0.3145
0.27	0.34	-0.46	0.15	0.33	-0.48	0.3149
0.17	0.33	-0.48	0.12	0.44	-0.36	0.3217
0.35	0.43	-0.37	0.18	0.28	-0.55	0.3274
0.38	0.21	-0.68	0.19	0.27	-0.57	0.3285
0.20	0.31	-0.51	0.13	0.39	-0.41	0.3305
0.21	0.50	-0.30	0.14	0.38	-0.41	0.3356
0.35	0.14	-0.87	0.19	0.28	-0.55	0.3493

Condon Creek

Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
0.31	0.25	-0.61	0.18	0.30	-0.52	0.3517
0.18	0.38	-0.42	0.13	0.43	-0.37	0.3639
0.19	0.33	-0.49	0.14	0.41	-0.39	0.3647
0.28	0.15	-0.83	0.18	0.33	-0.49	0.3746
18.60	0.00	-2.53	0.61	0.02	-1.61	0.3763
0.36	0.40	-0.40	0.21	0.28	-0.56	0.3767
0.18	0.27	-0.58	0.14	0.42	-0.37	0.3815
18.62	0.01	-2.25	0.62	0.02	-1.61	0.3838
0.25	0.52	-0.28	0.18	0.35	-0.46	0.3841
0.15	0.80	-0.10	0.13	0.47	-0.33	0.3846
18.65	0.17	-0.76	0.62	0.02	-1.61	0.3849
0.28	0.30	-0.52	0.19	0.32	-0.49	0.3861
0.19	0.29	-0.54	0.15	0.41	-0.39	0.3992
0.22	0.31	-0.51	0.17	0.38	-0.42	0.3998
7.27	0.05	-1.33	0.54	0.04	-1.36	0.4009
0.17	0.47	-0.33	0.14	0.44	-0.35	0.4065
0.16	0.16	-0.80	0.14	0.46	-0.34	0.4104
0.14	0.42	-0.37	0.13	0.49	-0.31	0.4202
0.13	0.97	-0.01	0.13	0.52	-0.28	0.4466
0.12	0.23	-0.63	0.12	0.55	-0.26	0.4635
0.19	0.20	-0.71	0.18	0.40	-0.39	0.4642
0.30	0.18	-0.75	0.24	0.31	-0.51	0.4712
0.22	0.31	-0.50	0.20	0.37	-0.43	0.4797
0.26	0.29	-0.53	0.24	0.33	-0.48	0.5052
0.17	0.67	-0.17	0.19	0.44	-0.36	0.5234
0.16	0.33	-0.48	0.18	0.45	-0.34	0.5268
0.15	0.75	-0.13	0.17	0.48	-0.32	0.5362

Condon Creek

Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
0.29	0.11	-0.97	0.28	0.32	-0.50	0.5688
0.11	0.69	-0.16	0.15	0.56	-0.25	0.5942
0.27	0.05	-1.34	0.30	0.33	-0.48	0.6303
0.14	0.25	-0.60	0.20	0.50	-0.30	0.6493
0.08	0.37	-0.43	0.14	0.69	-0.16	0.8455
0.18	0.31	-0.52	0.36	0.42	-0.37	0.9725

Local Variability in Channel Slope Data for Harvey Creek

Harvey Creek						
Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
0.49	0.10	-0.98	0.02	0.12	-0.92	0.0270
4.44	0.03	-1.47	0.05	0.02	-1.71	0.0284
5.55	0.01	-2.03	0.05	0.02	-1.81	0.0302
2.53	0.06	-1.25	0.04	0.04	-1.45	0.0306
6.27	0.03	-1.54	0.06	0.01	-1.87	0.0306
0.94	0.08	-1.12	0.03	0.10	-0.99	0.0312
1.17	0.06	-1.19	0.04	0.08	-1.09	0.0349
6.34	0.03	-1.56	0.07	0.01	-1.87	0.0354
5.49	0.01	-2.07	0.06	0.02	-1.81	0.0358
1.15	0.06	-1.19	0.04	0.08	-1.09	0.0374
6.37	0.02	-1.65	0.07	0.01	-1.87	0.0375
4.07	0.03	-1.53	0.06	0.02	-1.67	0.0382
0.59	0.12	-0.94	0.04	0.11	-0.96	0.0395
1.50	0.09	-1.04	0.05	0.06	-1.21	0.0408
0.96	0.07	-1.15	0.04	0.10	-1.00	0.0421
0.89	0.09	-1.05	0.04	0.11	-0.97	0.0425
1.12	0.08	-1.07	0.05	0.08	-1.07	0.0425
1.46	0.11	-0.95	0.05	0.06	-1.19	0.0426
9.48	0.01	-1.92	0.09	0.01	-2.06	0.0435
2.56	0.06	-1.21	0.06	0.04	-1.45	0.0444
1.25	0.08	-1.10	0.05	0.08	-1.12	0.0444
15.43	0.01	-1.87	0.10	0.01	-2.28	0.0447
9.54	0.01	-2.09	0.09	0.01	-2.06	0.0447
1.09	0.09	-1.06	0.05	0.09	-1.06	0.0455
3.99	0.03	-1.55	0.08	0.02	-1.66	0.0455

Harvey Creek						
Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
6.14	0.03	-1.48	0.09	0.01	-1.86	0.0471
9.30	0.01	-2.15	0.10	0.01	-2.05	0.0472
2.59	0.06	-1.25	0.07	0.03	-1.46	0.0473
0.52	0.09	-1.02	0.04	0.12	-0.93	0.0479
8.11	0.04	-1.45	0.10	0.01	-1.99	0.0482
8.16	0.03	-1.46	0.10	0.01	-1.99	0.0483
3.47	0.04	-1.35	0.08	0.03	-1.59	0.0486
1.54	0.08	-1.10	0.06	0.06	-1.22	0.0487
3.43	0.05	-1.33	0.08	0.03	-1.59	0.0495
1.07	0.07	-1.16	0.05	0.09	-1.05	0.0497
1.68	0.06	-1.21	0.06	0.05	-1.26	0.0500
2.97	0.04	-1.43	0.08	0.03	-1.52	0.0508
1.59	0.09	-1.06	0.06	0.06	-1.23	0.0508
2.95	0.06	-1.20	0.08	0.03	-1.52	0.0512
9.51	0.01	-2.15	0.11	0.01	-2.06	0.0518
2.66	0.04	-1.36	0.08	0.03	-1.47	0.0524
1.06	0.08	-1.10	0.05	0.09	-1.05	0.0524
2.09	0.07	-1.13	0.07	0.04	-1.36	0.0530
2.58	0.05	-1.27	0.08	0.03	-1.46	0.0533
3.07	0.05	-1.27	0.08	0.03	-1.54	0.0534
3.03	0.04	-1.39	0.08	0.03	-1.53	0.0540
15.45	0.01	-2.13	0.13	0.01	-2.28	0.0547
3.96	0.04	-1.39	0.09	0.02	-1.66	0.0553
1.70	0.07	-1.18	0.07	0.05	-1.27	0.0558
1.50	0.10	-1.01	0.07	0.06	-1.21	0.0559
2.69	0.04	-1.42	0.08	0.03	-1.48	0.0561
2.63	0.06	-1.24	0.08	0.03	-1.47	0.0567

Harvey Creek

Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
0.47	0.11	-0.98	0.05	0.12	-0.91	0.0567
1.21	0.09	-1.05	0.06	0.08	-1.11	0.0575
0.79	0.13	-0.89	0.05	0.12	-0.91	0.0579
2.95	0.05	-1.31	0.09	0.03	-1.52	0.0582
1.09	0.07	-1.14	0.06	0.09	-1.06	0.0582
0.57	0.09	-1.05	0.06	0.11	-0.95	0.0583
2.92	0.07	-1.14	0.09	0.03	-1.51	0.0584
6.10	0.03	-1.50	0.11	0.01	-1.85	0.0585
0.94	0.12	-0.92	0.06	0.10	-0.99	0.0588
3.09	0.05	-1.31	0.09	0.03	-1.54	0.0592
0.80	0.13	-0.89	0.05	0.12	-0.92	0.0592
0.94	0.07	-1.13	0.06	0.10	-0.99	0.0599
8.25	0.01	-1.88	0.12	0.01	-1.99	0.0601
1.17	0.05	-1.26	0.07	0.08	-1.09	0.0605
0.91	0.08	-1.09	0.06	0.11	-0.98	0.0610
0.81	0.06	-1.24	0.06	0.12	-0.92	0.0613
1.08	0.08	-1.08	0.07	0.09	-1.06	0.0622
0.27	0.17	-0.76	0.05	0.16	-0.81	0.0625
0.30	0.14	-0.87	0.05	0.15	-0.83	0.0626
2.31	0.05	-1.31	0.09	0.04	-1.41	0.0627
1.08	0.14	-0.85	0.07	0.09	-1.06	0.0627
0.85	0.12	-0.92	0.06	0.11	-0.94	0.0662
9.64	0.01	-1.91	0.14	0.01	-2.07	0.0675
0.39	0.15	-0.82	0.06	0.13	-0.88	0.0679
4.48	0.03	-1.56	0.12	0.02	-1.71	0.0685
0.74	0.08	-1.12	0.06	0.13	-0.88	0.0689
1.03	0.10	-1.02	0.07	0.09	-1.04	0.0690

Harvey Creek

Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
2.27	0.04	-1.35	0.10	0.04	-1.40	0.0690
1.10	0.12	-0.93	0.07	0.09	-1.07	0.0690
1.68	0.07	-1.14	0.09	0.05	-1.26	0.0692
0.99	0.09	-1.03	0.07	0.10	-1.01	0.0700
0.81	0.11	-0.95	0.06	0.12	-0.92	0.0703
4.53	0.02	-1.62	0.12	0.02	-1.72	0.0705
5.10	0.03	-1.50	0.13	0.02	-1.77	0.0709
15.42	0.01	-2.06	0.16	0.01	-2.28	0.0718
0.71	0.11	-0.96	0.06	0.14	-0.86	0.0721
1.14	0.08	-1.10	0.08	0.08	-1.08	0.0726
0.30	0.12	-0.92	0.06	0.15	-0.83	0.0730
9.75	0.00	-2.32	0.15	0.01	-2.07	0.0743
2.23	0.08	-1.10	0.10	0.04	-1.39	0.0746
9.70	0.01	-1.99	0.16	0.01	-2.07	0.0751
0.93	0.08	-1.09	0.07	0.10	-0.99	0.0756
0.34	0.17	-0.78	0.06	0.14	-0.85	0.0762
9.00	0.01	-1.88	0.16	0.01	-2.03	0.0767
17.48	0.00	-2.53	0.18	0.00	-2.34	0.0772
9.76	0.01	-1.90	0.16	0.01	-2.07	0.0775
0.59	0.12	-0.92	0.07	0.11	-0.96	0.0783
4.55	0.02	-1.81	0.14	0.02	-1.72	0.0787
8.19	0.02	-1.69	0.16	0.01	-1.99	0.0797
8.23	0.03	-1.58	0.16	0.01	-1.99	0.0799
17.45	0.01	-2.07	0.19	0.00	-2.34	0.0801
19.43	0.00	-2.48	0.19	0.00	-2.39	0.0801
8.31	0.01	-1.86	0.16	0.01	-2.00	0.0803
1.31	0.06	-1.20	0.09	0.07	-1.15	0.0804

Harvey Creek						
Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
0.41	0.12	-0.92	0.07	0.13	-0.89	0.0805
1.55	0.04	-1.43	0.10	0.06	-1.22	0.0816
15.50	0.01	-2.26	0.19	0.01	-2.29	0.0818
1.64	0.04	-1.36	0.10	0.06	-1.25	0.0819
19.91	0.01	-2.26	0.20	0.00	-2.40	0.0820
1.17	0.10	-1.01	0.09	0.08	-1.09	0.0824
1.63	0.09	-1.05	0.10	0.06	-1.25	0.0824
0.37	0.14	-0.85	0.07	0.14	-0.87	0.0830
1.29	0.06	-1.20	0.10	0.07	-1.14	0.0835
1.10	0.15	-0.83	0.09	0.09	-1.06	0.0837
17.52	0.00	-2.48	0.20	0.00	-2.34	0.0844
9.01	0.03	-1.51	0.17	0.01	-2.03	0.0844
0.50	0.13	-0.90	0.08	0.12	-0.92	0.0855
2.90	0.03	-1.52	0.13	0.03	-1.51	0.0857
2.80	0.07	-1.17	0.13	0.03	-1.50	0.0858
0.30	0.11	-0.97	0.07	0.15	-0.82	0.0859
0.40	0.08	-1.10	0.08	0.13	-0.88	0.0862
2.85	0.05	-1.26	0.13	0.03	-1.50	0.0866
1.11	0.10	-0.99	0.09	0.09	-1.07	0.0870
1.04	0.08	-1.11	0.09	0.09	-1.04	0.0876
19.57	0.01	-2.17	0.21	0.00	-2.39	0.0885
2.16	0.07	-1.15	0.12	0.04	-1.38	0.0900
0.34	0.23	-0.64	0.08	0.14	-0.85	0.0907
0.88	0.12	-0.91	0.09	0.11	-0.96	0.0907
17.36	0.00	-2.57	0.21	0.00	-2.34	0.0915
0.90	0.12	-0.92	0.09	0.11	-0.97	0.0920
0.40	0.07	-1.13	0.08	0.13	-0.88	0.0940

Harvey Creek						
Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
1.53	0.07	-1.17	0.12	0.06	-1.22	0.0978
5.44	0.01	-2.05	0.18	0.02	-1.80	0.0982
0.49	0.22	-0.65	0.09	0.12	-0.92	0.0985
0.34	0.14	-0.85	0.08	0.14	-0.85	0.0987
19.88	0.00	-2.81	0.24	0.00	-2.40	0.0988
0.26	0.23	-0.64	0.08	0.16	-0.80	0.0993
19.91	0.00	-2.51	0.24	0.00	-2.40	0.0997
1.59	0.09	-1.05	0.12	0.06	-1.23	0.1001
15.48	0.01	-2.08	0.23	0.01	-2.28	0.1005
1.04	0.13	-0.88	0.10	0.09	-1.04	0.1007
0.46	0.15	-0.83	0.09	0.12	-0.91	0.1031
17.49	0.00	-2.47	0.24	0.00	-2.34	0.1034
5.42	0.01	-2.19	0.19	0.02	-1.80	0.1038
17.63	0.00	-2.83	0.24	0.00	-2.34	0.1041
1.66	0.05	-1.27	0.13	0.06	-1.26	0.1042
9.28	0.01	-2.00	0.21	0.01	-2.05	0.1042
0.33	0.10	-0.99	0.09	0.14	-0.84	0.1044
9.06	0.01	-1.96	0.21	0.01	-2.04	0.1048
0.52	0.17	-0.77	0.10	0.12	-0.93	0.1048
0.37	0.27	-0.57	0.09	0.14	-0.87	0.1052
0.44	0.16	-0.79	0.10	0.13	-0.90	0.1065
1.12	0.11	-0.97	0.11	0.08	-1.07	0.1072
0.24	0.17	-0.76	0.08	0.17	-0.78	0.1086
0.79	0.07	-1.13	0.10	0.12	-0.91	0.1086
19.48	0.00	-2.63	0.26	0.00	-2.39	0.1095
1.09	0.07	-1.17	0.12	0.09	-1.06	0.1099
0.32	0.13	-0.88	0.09	0.14	-0.84	0.1103

Harvey Creek

Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
21.54	0.00	-3.06	0.27	0.00	-2.44	0.1110
0.24	0.17	-0.77	0.09	0.16	-0.79	0.1116
0.47	0.16	-0.78	0.10	0.12	-0.91	0.1125
0.23	0.13	-0.89	0.09	0.17	-0.78	0.1150
21.50	0.00	-2.64	0.28	0.00	-2.44	0.1153
0.38	0.10	-1.00	0.10	0.14	-0.87	0.1157
0.20	0.21	-0.69	0.09	0.18	-0.75	0.1174
0.21	0.11	-0.94	0.09	0.18	-0.76	0.1176
1.31	0.11	-0.98	0.14	0.07	-1.14	0.1194
0.25	0.14	-0.85	0.09	0.16	-0.79	0.1196
0.72	0.11	-0.97	0.10	0.13	-0.87	0.1199
0.49	0.09	-1.03	0.11	0.12	-0.92	0.1207
1.69	0.04	-1.39	0.15	0.05	-1.26	0.1216
0.67	0.10	-0.99	0.10	0.15	-0.84	0.1217
0.75	0.09	-1.03	0.11	0.13	-0.89	0.1218
21.53	0.00	-2.36	0.30	0.00	-2.44	0.1239
0.60	0.09	-1.03	0.10	0.16	-0.79	0.1243
21.55	0.01	-2.30	0.30	0.00	-2.44	0.1244
17.64	0.01	-2.21	0.29	0.00	-2.34	0.1247
21.66	0.00	-2.59	0.31	0.00	-2.44	0.1261
0.98	0.12	-0.92	0.13	0.10	-1.01	0.1276
5.13	0.01	-1.84	0.23	0.02	-1.78	0.1291
0.77	0.06	-1.23	0.12	0.13	-0.90	0.1294
0.40	0.15	-0.82	0.12	0.13	-0.88	0.1309
17.67	0.01	-2.14	0.32	0.00	-2.35	0.1345
0.47	0.12	-0.91	0.13	0.12	-0.91	0.1370
0.22	0.22	-0.66	0.11	0.17	-0.77	0.1373

Harvey Creek						
Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
5.21	0.02	-1.67	0.25	0.02	-1.78	0.1399
1.64	0.06	-1.24	0.18	0.06	-1.25	0.1455
0.39	0.09	-1.04	0.13	0.13	-0.87	0.1456
0.54	0.09	-1.06	0.14	0.12	-0.94	0.1461
0.67	0.17	-0.78	0.12	0.15	-0.84	0.1468
0.59	0.19	-0.71	0.14	0.11	-0.96	0.1472
0.38	0.17	-0.76	0.13	0.13	-0.87	0.1483
0.15	0.14	-0.84	0.11	0.20	-0.69	0.1519
0.61	0.12	-0.93	0.12	0.16	-0.79	0.1569
0.33	0.13	-0.87	0.13	0.14	-0.84	0.1571
22.24	0.00	-2.34	0.40	0.00	-2.45	0.1619
0.27	0.18	-0.74	0.13	0.16	-0.80	0.1652
1.51	0.03	-1.53	0.20	0.06	-1.21	0.1666
1.19	0.07	-1.18	0.18	0.08	-1.10	0.1666
0.23	0.11	-0.95	0.13	0.17	-0.78	0.1667
0.26	0.14	-0.86	0.13	0.16	-0.80	0.1674
0.37	0.19	-0.73	0.15	0.14	-0.87	0.1696
0.27	0.14	-0.85	0.14	0.16	-0.81	0.1710
1.81	0.01	-1.87	0.22	0.05	-1.29	0.1730
22.26	0.00	-3.38	0.42	0.00	-2.45	0.1730
1.73	0.02	-1.71	0.23	0.05	-1.27	0.1771
1.41	0.09	-1.06	0.21	0.07	-1.18	0.1785
1.21	0.05	-1.32	0.20	0.08	-1.11	0.1802
22.31	0.01	-2.18	0.45	0.00	-2.45	0.1817
22.01	0.00	-2.77	0.45	0.00	-2.45	0.1820
22.13	0.00	-2.38	0.45	0.00	-2.45	0.1822
22.01	0.01	-2.23	0.46	0.00	-2.45	0.1873

Harvey Creek						
Drainage Area	Smoothed Slope	Log (slope)	Standard Deviation of Logged Slope (500 m window)	Predicted Slope	Log (predicted slope)	Coefficient of Variation [stddev(logslope)/ log(predicted)]
22.04	0.00	-3.51	0.46	0.00	-2.45	0.1898
0.42	0.20	-0.70	0.17	0.13	-0.89	0.1914
19.41	0.01	-2.13	0.46	0.00	-2.39	0.1938
22.27	0.00	-2.46	0.48	0.00	-2.45	0.1958
19.41	0.01	-2.24	0.49	0.00	-2.39	0.2032
1.45	0.06	-1.25	0.25	0.06	-1.19	0.2080
19.27	0.00	-3.44	0.50	0.00	-2.39	0.2103
19.14	0.01	-2.20	0.50	0.00	-2.38	0.2104
19.12	0.00	-2.82	0.51	0.00	-2.38	0.2120
1.79	0.03	-1.49	0.27	0.05	-1.29	0.2127
22.15	0.00	-2.37	0.53	0.00	-2.45	0.2164

Local Variability in Valley Width Data for Condon Creek

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.39	2.00	0.30	0.00	4.72	0.67	0.0000
0.37	2.00	0.30	0.00	4.60	0.66	0.0000
0.35	2.00	0.30	0.00	4.48	0.65	0.0000
0.29	2.00	0.30	0.00	4.16	0.62	0.0000
0.26	2.00	0.30	0.00	3.93	0.59	0.0000
7.97	16.00	1.20	0.04	19.35	1.29	0.0299
7.95	22.00	1.34	0.05	19.33	1.29	0.0360
6.92	25.00	1.40	0.05	18.13	1.26	0.0388
4.75	38.00	1.58	0.05	15.21	1.18	0.0414
5.29	56.00	1.75	0.05	15.98	1.20	0.0415
5.31	52.00	1.72	0.05	16.02	1.20	0.0422
5.29	48.00	1.68	0.05	15.98	1.20	0.0426
4.75	43.00	1.63	0.05	15.21	1.18	0.0430
5.32	44.00	1.64	0.05	16.03	1.21	0.0432
5.34	41.00	1.61	0.06	16.06	1.21	0.0459
4.67	42.00	1.62	0.06	15.09	1.18	0.0468
4.67	41.00	1.61	0.06	15.09	1.18	0.0468
4.63	29.00	1.46	0.06	15.03	1.18	0.0474
8.00	19.00	1.28	0.06	19.38	1.29	0.0481
3.54	31.00	1.49	0.05	13.26	1.12	0.0488
3.84	42.00	1.62	0.06	13.78	1.14	0.0490
4.27	47.00	1.67	0.06	14.47	1.16	0.0502
4.17	57.00	1.76	0.06	14.30	1.16	0.0503
4.18	50.00	1.70	0.06	14.33	1.16	0.0504
4.62	40.00	1.60	0.06	15.00	1.18	0.0507

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
3.61	40.00	1.60	0.06	13.38	1.13	0.0516
6.94	21.00	1.32	0.07	18.15	1.26	0.0530
6.93	22.00	1.34	0.07	18.13	1.26	0.0530
3.54	37.00	1.57	0.06	13.25	1.12	0.0532
4.60	42.00	1.62	0.06	14.98	1.18	0.0537
7.85	19.00	1.28	0.07	19.22	1.28	0.0549
3.49	29.00	1.46	0.06	13.17	1.12	0.0558
5.85	49.00	1.69	0.07	16.76	1.22	0.0568
5.87	41.00	1.61	0.07	16.78	1.22	0.0582
3.45	35.00	1.54	0.07	13.10	1.12	0.0586
7.94	20.00	1.30	0.08	19.32	1.29	0.0587
5.81	61.00	1.79	0.07	16.70	1.22	0.0600
5.35	41.00	1.61	0.07	16.07	1.21	0.0601
7.84	20.00	1.30	0.08	19.21	1.28	0.0603
4.71	47.00	1.67	0.07	15.15	1.18	0.0606
8.09	18.00	1.26	0.08	19.49	1.29	0.0608
8.12	13.00	1.11	0.08	19.52	1.29	0.0612
4.71	42.00	1.62	0.07	15.15	1.18	0.0627
3.11	37.00	1.57	0.07	12.48	1.10	0.0628
5.43	20.00	1.30	0.08	16.18	1.21	0.0633
6.79	5.00	0.70	0.08	17.96	1.25	0.0644
5.81	68.00	1.83	0.08	16.70	1.22	0.0647
5.43	29.00	1.46	0.08	16.19	1.21	0.0648
3.24	43.00	1.63	0.07	12.72	1.10	0.0648
3.82	36.00	1.56	0.07	13.74	1.14	0.0649
5.64	41.00	1.61	0.08	16.48	1.22	0.0653
3.68	40.00	1.60	0.07	13.50	1.13	0.0657

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
5.64	43.00	1.63	0.08	16.47	1.22	0.0658
3.23	43.00	1.63	0.07	12.70	1.10	0.0665
4.36	44.00	1.64	0.08	14.60	1.16	0.0665
4.40	38.00	1.58	0.08	14.67	1.17	0.0666
3.14	45.00	1.65	0.07	12.54	1.10	0.0669
5.73	57.00	1.76	0.08	16.59	1.22	0.0671
3.25	35.00	1.54	0.08	12.73	1.10	0.0679
8.07	19.00	1.28	0.09	19.47	1.29	0.0683
8.03	17.00	1.23	0.09	19.43	1.29	0.0698
6.44	25.00	1.40	0.09	17.52	1.24	0.0700
6.43	20.00	1.30	0.09	17.51	1.24	0.0705
7.61	26.00	1.41	0.09	18.94	1.28	0.0717
9.47	5.00	0.70	0.10	20.98	1.32	0.0722
3.67	45.00	1.65	0.08	13.49	1.13	0.0726
6.82	5.00	0.70	0.09	18.00	1.26	0.0732
7.76	50.00	1.70	0.09	19.11	1.28	0.0734
7.72	42.00	1.62	0.09	19.07	1.28	0.0734
7.10	21.00	1.32	0.10	18.34	1.26	0.0760
7.28	4.00	0.60	0.10	18.56	1.27	0.0769
6.94	7.00	0.85	0.10	18.14	1.26	0.0773
6.93	4.00	0.60	0.10	18.13	1.26	0.0773
6.90	5.00	0.70	0.10	18.10	1.26	0.0774
6.86	5.00	0.70	0.10	18.05	1.26	0.0777
6.85	5.00	0.70	0.10	18.03	1.26	0.0778
7.74	27.00	1.43	0.10	19.09	1.28	0.0788
2.36	28.00	1.45	0.08	10.97	1.04	0.0791
7.75	20.00	1.30	0.10	19.10	1.28	0.0792

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
1.20	4.00	0.60	0.07	8.00	0.90	0.0798
1.17	4.00	0.60	0.07	7.90	0.90	0.0811
7.51	3.00	0.48	0.10	18.82	1.27	0.0813
7.48	3.00	0.48	0.10	18.79	1.27	0.0813
7.45	5.00	0.70	0.10	18.75	1.27	0.0814
5.41	20.00	1.30	0.10	16.16	1.21	0.0815
8.15	11.00	1.04	0.11	19.56	1.29	0.0816
2.36	29.00	1.46	0.09	10.98	1.04	0.0818
7.76	30.00	1.48	0.11	19.12	1.28	0.0828
7.83	23.00	1.36	0.11	19.19	1.28	0.0829
1.78	20.00	1.30	0.08	9.62	0.98	0.0833
7.43	4.00	0.60	0.11	18.73	1.27	0.0849
7.25	3.00	0.48	0.11	18.52	1.27	0.0852
1.75	17.00	1.23	0.08	9.53	0.98	0.0854
1.18	5.00	0.70	0.08	7.95	0.90	0.0859
7.51	6.00	0.78	0.11	18.83	1.27	0.0869
8.21	15.00	1.18	0.11	19.62	1.29	0.0879
5.40	22.00	1.34	0.11	16.14	1.21	0.0882
8.18	19.00	1.28	0.11	19.59	1.29	0.0886
7.14	16.00	1.20	0.11	18.39	1.26	0.0890
7.12	22.00	1.34	0.11	18.37	1.26	0.0890
7.15	20.00	1.30	0.11	18.39	1.26	0.0903
1.77	19.00	1.28	0.09	9.60	0.98	0.0904
7.58	4.00	0.60	0.12	18.91	1.28	0.0907
6.44	27.00	1.43	0.12	17.53	1.24	0.0929
7.11	6.00	0.78	0.12	18.35	1.26	0.0930
7.24	5.00	0.70	0.12	18.51	1.27	0.0933

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
7.13	5.00	0.70	0.12	18.38	1.26	0.0934
7.13	3.00	0.48	0.12	18.37	1.26	0.0936
3.14	47.00	1.67	0.10	12.53	1.10	0.0937
6.79	45.00	1.65	0.12	17.96	1.25	0.0950
8.25	27.00	1.43	0.12	19.67	1.29	0.0950
1.81	22.00	1.34	0.09	9.69	0.99	0.0954
1.82	30.00	1.48	0.10	9.71	0.99	0.0971
8.24	15.00	1.18	0.13	19.66	1.29	0.0980
1.23	6.00	0.78	0.09	8.10	0.91	0.0988
7.67	3.00	0.48	0.13	19.01	1.28	0.0996
7.65	5.00	0.70	0.13	18.99	1.28	0.0996
3.85	38.00	1.58	0.11	13.79	1.14	0.1007
8.04	5.00	0.70	0.13	19.44	1.29	0.1014
8.06	4.00	0.60	0.13	19.45	1.29	0.1020
1.15	6.00	0.78	0.09	7.84	0.89	0.1023
1.74	21.00	1.32	0.10	9.51	0.98	0.1025
6.75	34.00	1.53	0.13	17.92	1.25	0.1028
6.74	35.00	1.54	0.13	17.90	1.25	0.1029
3.16	42.00	1.62	0.11	12.57	1.10	0.1031
6.77	47.00	1.67	0.13	17.94	1.25	0.1033
6.72	28.00	1.45	0.13	17.88	1.25	0.1051
7.69	3.00	0.48	0.13	19.03	1.28	0.1052
8.31	23.00	1.36	0.14	19.73	1.30	0.1071
3.05	31.00	1.49	0.12	12.36	1.09	0.1118
1.46	20.00	1.30	0.11	8.76	0.94	0.1129
3.04	14.00	1.15	0.12	12.35	1.09	0.1130
8.02	4.00	0.60	0.15	19.41	1.29	0.1134

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
7.17	13.00	1.11	0.14	18.42	1.27	0.1134
8.72	62.00	1.79	0.15	20.18	1.31	0.1136
7.77	2.00	0.30	0.15	19.13	1.28	0.1140
1.40	18.00	1.26	0.11	8.61	0.93	0.1151
1.70	23.00	1.36	0.11	9.42	0.97	0.1157
7.17	11.00	1.04	0.15	18.42	1.27	0.1163
7.76	6.00	0.78	0.15	19.11	1.28	0.1173
8.86	63.00	1.80	0.15	20.33	1.31	0.1177
1.56	32.00	1.51	0.11	9.05	0.96	0.1185
2.81	9.00	0.95	0.13	11.89	1.08	0.1189
7.39	25.00	1.40	0.15	18.69	1.27	0.1189
7.75	3.00	0.48	0.15	19.10	1.28	0.1194
7.73	6.00	0.78	0.15	19.08	1.28	0.1195
7.72	3.00	0.48	0.15	19.07	1.28	0.1195
7.54	25.00	1.40	0.15	18.86	1.28	0.1200
1.69	32.00	1.51	0.12	9.38	0.97	0.1215
2.80	8.00	0.90	0.13	11.87	1.07	0.1216
3.07	38.00	1.58	0.13	12.39	1.09	0.1223
3.07	28.00	1.45	0.13	12.41	1.09	0.1227
2.78	18.00	1.26	0.13	11.85	1.07	0.1252
1.41	5.00	0.70	0.12	8.64	0.94	0.1256
1.53	22.00	1.34	0.12	8.95	0.95	0.1260
1.39	4.00	0.60	0.12	8.56	0.93	0.1261
0.90	31.00	1.49	0.11	7.02	0.85	0.1264
3.07	32.00	1.51	0.14	12.41	1.09	0.1274
2.47	3.00	0.48	0.13	11.21	1.05	0.1274
0.34	2.00	0.30	0.08	4.46	0.65	0.1274

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
1.47	16.00	1.20	0.12	8.79	0.94	0.1285
5.35	35.00	1.54	0.16	16.07	1.21	0.1286
3.08	32.00	1.51	0.14	12.42	1.09	0.1288
3.89	51.00	1.71	0.15	13.84	1.14	0.1294
6.81	9.00	0.95	0.16	17.98	1.25	0.1299
4.85	6.00	0.78	0.16	15.35	1.19	0.1316
2.04	6.00	0.78	0.14	10.24	1.01	0.1346
4.81	13.00	1.11	0.16	15.29	1.18	0.1349
0.93	3.00	0.48	0.12	7.09	0.85	0.1354
2.99	31.00	1.49	0.15	12.26	1.09	0.1356
1.49	29.00	1.46	0.13	8.86	0.95	0.1369
7.53	35.00	1.54	0.17	18.85	1.28	0.1372
7.40	23.00	1.36	0.17	18.70	1.27	0.1373
0.39	8.00	0.90	0.09	4.76	0.68	0.1377
2.47	7.00	0.85	0.15	11.21	1.05	0.1390
0.33	4.00	0.60	0.09	4.40	0.64	0.1405
2.38	32.00	1.51	0.15	11.02	1.04	0.1406
1.63	30.00	1.48	0.14	9.24	0.97	0.1409
1.59	41.00	1.61	0.14	9.12	0.96	0.1411
1.57	34.00	1.53	0.14	9.06	0.96	0.1415
5.34	23.00	1.36	0.17	16.05	1.21	0.1420
1.65	13.00	1.11	0.14	9.29	0.97	0.1422
1.59	28.00	1.45	0.14	9.14	0.96	0.1429
4.93	10.00	1.00	0.17	15.47	1.19	0.1433
2.82	10.00	1.00	0.15	11.92	1.08	0.1438
4.77	5.00	0.70	0.17	15.24	1.18	0.1447
0.93	5.00	0.70	0.12	7.09	0.85	0.1453

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
1.67	23.00	1.36	0.14	9.34	0.97	0.1461
2.02	7.00	0.85	0.15	10.20	1.01	0.1467
5.92	54.00	1.73	0.18	16.84	1.23	0.1467
1.47	23.00	1.36	0.14	8.80	0.94	0.1474
6.68	6.00	0.78	0.18	17.82	1.25	0.1477
1.91	7.00	0.85	0.15	9.93	1.00	0.1484
1.04	38.00	1.58	0.13	7.50	0.87	0.1504
1.89	12.00	1.08	0.15	9.88	0.99	0.1506
6.68	6.00	0.78	0.19	17.82	1.25	0.1515
0.19	6.00	0.78	0.08	3.41	0.53	0.1516
1.42	6.00	0.78	0.14	8.65	0.94	0.1522
0.87	28.00	1.45	0.13	6.88	0.84	0.1524
1.33	5.00	0.70	0.14	8.40	0.92	0.1547
0.29	3.00	0.48	0.10	4.13	0.62	0.1549
0.79	23.00	1.36	0.13	6.59	0.82	0.1549
0.72	5.00	0.70	0.13	6.30	0.80	0.1592
5.33	15.00	1.18	0.19	16.04	1.21	0.1594
8.34	16.00	1.20	0.21	19.77	1.30	0.1601
4.43	27.00	1.43	0.19	14.72	1.17	0.1606
6.68	5.00	0.70	0.20	17.82	1.25	0.1617
5.67	5.00	0.70	0.20	16.51	1.22	0.1621
6.57	16.00	1.20	0.20	17.69	1.25	0.1622
3.90	29.00	1.46	0.19	13.86	1.14	0.1634
4.76	7.00	0.85	0.19	15.23	1.18	0.1647
0.18	5.00	0.70	0.09	3.34	0.52	0.1648
4.96	14.00	1.15	0.20	15.51	1.19	0.1652
4.95	7.00	0.85	0.20	15.49	1.19	0.1653

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.22	4.00	0.60	0.09	3.66	0.56	0.1668
0.93	4.00	0.60	0.14	7.12	0.85	0.1668
2.03	4.00	0.60	0.17	10.22	1.01	0.1685
2.72	8.00	0.90	0.18	11.72	1.07	0.1688
4.42	40.00	1.60	0.20	14.71	1.17	0.1688
5.33	31.00	1.49	0.20	16.04	1.21	0.1692
1.07	8.00	0.90	0.15	7.58	0.88	0.1693
4.75	7.00	0.85	0.20	15.21	1.18	0.1694
3.01	36.00	1.56	0.18	12.28	1.09	0.1697
1.75	6.00	0.78	0.17	9.55	0.98	0.1699
3.97	64.00	1.81	0.20	13.99	1.15	0.1704
3.92	20.00	1.30	0.20	13.89	1.14	0.1710
2.74	7.00	0.85	0.18	11.76	1.07	0.1713
2.76	16.00	1.20	0.18	11.80	1.07	0.1718
0.21	4.00	0.60	0.09	3.52	0.55	0.1719
0.57	9.00	0.95	0.13	5.65	0.75	0.1723
3.96	70.00	1.85	0.20	13.97	1.15	0.1725
5.67	13.00	1.11	0.21	16.51	1.22	0.1729
3.97	88.00	1.94	0.20	13.99	1.15	0.1731
0.49	3.00	0.48	0.13	5.27	0.72	0.1733
0.56	6.00	0.78	0.13	5.59	0.75	0.1735
2.02	4.00	0.60	0.18	10.21	1.01	0.1735
2.75	9.00	0.95	0.19	11.78	1.07	0.1736
3.96	30.00	1.48	0.20	13.96	1.14	0.1740
6.57	13.00	1.11	0.22	17.68	1.25	0.1743
4.41	26.00	1.41	0.20	14.69	1.17	0.1752
0.73	4.00	0.60	0.14	6.35	0.80	0.1758

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
2.98	34.00	1.53	0.19	12.23	1.09	0.1759
2.85	8.00	0.90	0.19	11.98	1.08	0.1768
0.83	21.00	1.32	0.15	6.74	0.83	0.1770
6.37	4.00	0.60	0.22	17.44	1.24	0.1783
0.50	4.00	0.60	0.13	5.30	0.72	0.1790
8.87	60.00	1.78	0.23	20.34	1.31	0.1793
6.40	19.00	1.28	0.22	17.48	1.24	0.1797
0.48	2.00	0.30	0.13	5.23	0.72	0.1821
2.81	6.00	0.78	0.20	11.90	1.08	0.1829
2.99	41.00	1.61	0.20	12.25	1.09	0.1847
1.86	4.00	0.60	0.18	9.83	0.99	0.1859
6.56	12.00	1.08	0.23	17.67	1.25	0.1860
6.36	24.00	1.38	0.23	17.43	1.24	0.1862
5.15	58.00	1.76	0.22	15.78	1.20	0.1863
5.16	54.00	1.73	0.23	15.80	1.20	0.1882
1.28	5.00	0.70	0.17	8.24	0.92	0.1895
6.40	4.00	0.60	0.24	17.47	1.24	0.1908
1.30	5.00	0.70	0.18	8.30	0.92	0.1914
0.58	6.00	0.78	0.15	5.72	0.76	0.1915
2.71	26.00	1.41	0.21	11.70	1.07	0.1924
6.40	30.00	1.48	0.24	17.47	1.24	0.1932
6.38	5.00	0.70	0.24	17.45	1.24	0.1958
5.15	44.00	1.64	0.24	15.79	1.20	0.1969
2.97	28.00	1.45	0.22	12.22	1.09	0.2019
0.97	5.00	0.70	0.17	7.24	0.86	0.2030
0.96	9.00	0.95	0.17	7.20	0.86	0.2035
1.24	6.00	0.78	0.19	8.12	0.91	0.2040

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
2.95	22.00	1.34	0.22	12.18	1.09	0.2040
2.48	7.00	0.85	0.21	11.23	1.05	0.2045
0.38	9.00	0.95	0.14	4.71	0.67	0.2063
6.33	19.00	1.28	0.26	17.38	1.24	0.2069
0.48	2.00	0.30	0.15	5.20	0.72	0.2073
1.34	21.00	1.32	0.19	8.41	0.92	0.2102
0.26	3.00	0.48	0.13	3.93	0.59	0.2103
8.96	12.00	1.08	0.28	20.44	1.31	0.2104
2.83	9.00	0.95	0.23	11.94	1.08	0.2121
2.86	10.00	1.00	0.23	12.01	1.08	0.2130
2.94	21.00	1.32	0.23	12.16	1.08	0.2139
1.75	7.00	0.85	0.21	9.53	0.98	0.2155
1.35	12.00	1.08	0.20	8.45	0.93	0.2157
4.72	14.00	1.15	0.26	15.16	1.18	0.2180
1.73	5.00	0.70	0.21	9.48	0.98	0.2181
5.94	50.00	1.70	0.27	16.88	1.23	0.2188
2.91	15.00	1.18	0.24	12.09	1.08	0.2188
2.49	4.00	0.60	0.23	11.26	1.05	0.2192
0.27	3.00	0.48	0.13	4.02	0.60	0.2204
0.95	7.00	0.85	0.19	7.17	0.86	0.2210
9.46	5.00	0.70	0.29	20.96	1.32	0.2217
0.78	27.00	1.43	0.18	6.55	0.82	0.2225
0.99	3.00	0.48	0.19	7.32	0.86	0.2236
8.97	8.00	0.90	0.29	20.46	1.31	0.2248
8.94	30.00	1.48	0.29	20.42	1.31	0.2248
2.52	3.00	0.48	0.24	11.32	1.05	0.2252
1.08	4.00	0.60	0.20	7.62	0.88	0.2259

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.42	7.00	0.85	0.16	4.88	0.69	0.2269
0.23	4.00	0.60	0.13	3.73	0.57	0.2287
1.68	19.00	1.28	0.23	9.37	0.97	0.2327
0.47	3.00	0.48	0.17	5.14	0.71	0.2329
0.31	5.00	0.70	0.15	4.27	0.63	0.2329
0.36	4.00	0.60	0.15	4.58	0.66	0.2337
8.92	20.00	1.30	0.31	20.39	1.31	0.2342
6.29	5.00	0.70	0.29	17.34	1.24	0.2358
0.86	9.00	0.95	0.20	6.85	0.84	0.2367
0.86	6.00	0.78	0.20	6.84	0.84	0.2369
8.88	44.00	1.64	0.31	20.36	1.31	0.2398
2.64	9.00	0.95	0.26	11.56	1.06	0.2406
2.89	19.00	1.28	0.26	12.06	1.08	0.2407
4.63	15.00	1.18	0.28	15.03	1.18	0.2413
4.55	30.00	1.48	0.28	14.90	1.17	0.2414
4.63	4.00	0.60	0.29	15.03	1.18	0.2426
4.54	25.00	1.40	0.29	14.89	1.17	0.2447
2.68	5.00	0.70	0.26	11.63	1.07	0.2449
1.70	15.00	1.18	0.24	9.43	0.97	0.2460
0.30	5.00	0.70	0.15	4.19	0.62	0.2478
0.40	2.00	0.30	0.17	4.81	0.68	0.2508
1.70	8.00	0.90	0.24	9.41	0.97	0.2510
0.82	3.00	0.48	0.21	6.71	0.83	0.2513
1.33	25.00	1.40	0.23	8.39	0.92	0.2538
0.30	3.00	0.48	0.16	4.17	0.62	0.2548
2.41	29.00	1.46	0.27	11.09	1.04	0.2551
9.01	36.00	1.56	0.34	20.49	1.31	0.2561

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.58	5.00	0.70	0.19	5.69	0.75	0.2561
0.37	6.00	0.78	0.17	4.60	0.66	0.2566
4.19	11.00	1.04	0.30	14.34	1.16	0.2567
4.40	12.00	1.08	0.30	14.67	1.17	0.2568
4.17	5.00	0.70	0.30	14.30	1.16	0.2570
3.05	5.00	0.70	0.28	12.36	1.09	0.2576
2.84	14.00	1.15	0.28	11.96	1.08	0.2578
0.45	4.00	0.60	0.18	5.08	0.71	0.2583
4.63	12.00	1.08	0.30	15.03	1.18	0.2584
6.15	9.00	0.95	0.32	17.15	1.23	0.2595
1.31	17.00	1.23	0.24	8.33	0.92	0.2598
2.62	11.00	1.04	0.28	11.51	1.06	0.2612
2.59	16.00	1.20	0.28	11.46	1.06	0.2617
4.27	46.00	1.66	0.30	14.46	1.16	0.2623
4.36	37.00	1.57	0.31	14.60	1.16	0.2629
2.62	7.00	0.85	0.28	11.52	1.06	0.2639
1.10	7.00	0.85	0.23	7.68	0.89	0.2643
3.06	6.00	0.78	0.29	12.38	1.09	0.2644
0.48	5.00	0.70	0.19	5.21	0.72	0.2645
0.44	3.00	0.48	0.19	5.03	0.70	0.2647
2.49	28.00	1.45	0.28	11.25	1.05	0.2664
0.36	9.00	0.95	0.18	4.55	0.66	0.2682
0.87	31.00	1.49	0.23	6.87	0.84	0.2722
3.04	22.00	1.34	0.30	12.34	1.09	0.2727
0.28	9.00	0.95	0.17	4.09	0.61	0.2744
2.77	5.00	0.70	0.30	11.83	1.07	0.2758
2.84	13.00	1.11	0.30	11.97	1.08	0.2775

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
5.98	15.00	1.18	0.34	16.92	1.23	0.2790
0.82	26.00	1.41	0.23	6.70	0.83	0.2793
0.83	24.00	1.38	0.23	6.76	0.83	0.2804
2.47	11.00	1.04	0.29	11.20	1.05	0.2804
4.15	34.00	1.53	0.33	14.28	1.15	0.2817
1.11	8.00	0.90	0.25	7.73	0.89	0.2822
0.58	5.00	0.70	0.21	5.69	0.75	0.2839
1.29	5.00	0.70	0.26	8.28	0.92	0.2864
2.45	21.00	1.32	0.30	11.16	1.05	0.2864
5.96	40.00	1.60	0.35	16.90	1.23	0.2869
3.87	7.00	0.85	0.33	13.82	1.14	0.2878
0.41	5.00	0.70	0.20	4.84	0.69	0.2892
9.44	4.00	0.60	0.38	20.94	1.32	0.2896
2.56	5.00	0.70	0.31	11.39	1.06	0.2915
0.40	6.00	0.78	0.20	4.78	0.68	0.2917
0.72	13.00	1.11	0.23	6.30	0.80	0.2927
0.48	12.00	1.08	0.21	5.24	0.72	0.2938
5.96	48.00	1.68	0.36	16.90	1.23	0.2953
2.61	5.00	0.70	0.31	11.51	1.06	0.2953
1.70	3.00	0.48	0.29	9.42	0.97	0.2956
1.69	1.00	0.00	0.29	9.39	0.97	0.2960
1.72	4.00	0.60	0.29	9.47	0.98	0.2960
0.22	2.00	0.30	0.17	3.61	0.56	0.2968
9.06	46.00	1.66	0.39	20.55	1.31	0.2970
1.68	11.00	1.04	0.29	9.36	0.97	0.2973
4.02	33.00	1.52	0.34	14.06	1.15	0.2988
4.01	26.00	1.41	0.34	14.05	1.15	0.2988

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.34	5.00	0.70	0.19	4.42	0.65	0.2991
0.28	2.00	0.30	0.18	4.04	0.61	0.3002
9.07	40.00	1.60	0.40	20.56	1.31	0.3026
2.43	5.00	0.70	0.32	11.13	1.05	0.3035
0.45	13.00	1.11	0.21	5.07	0.71	0.3037
0.67	3.00	0.48	0.24	6.08	0.78	0.3047
0.65	15.00	1.18	0.24	6.00	0.78	0.3074
4.14	21.00	1.32	0.36	14.26	1.15	0.3083
0.33	3.00	0.48	0.20	4.38	0.64	0.3100
0.32	8.00	0.90	0.20	4.30	0.63	0.3104
1.65	27.00	1.43	0.30	9.29	0.97	0.3118
1.66	20.00	1.30	0.30	9.32	0.97	0.3120
0.61	5.00	0.70	0.24	5.84	0.77	0.3123
0.62	13.00	1.11	0.24	5.86	0.77	0.3124
9.08	8.00	0.90	0.41	20.57	1.31	0.3159
0.18	6.00	0.78	0.17	3.34	0.52	0.3164
1.13	4.00	0.60	0.28	7.79	0.89	0.3189
1.12	7.00	0.85	0.28	7.75	0.89	0.3199
3.41	21.00	1.32	0.36	13.03	1.12	0.3199
3.39	20.00	1.30	0.36	13.00	1.11	0.3203
0.80	19.00	1.28	0.26	6.62	0.82	0.3203
3.44	27.00	1.43	0.36	13.09	1.12	0.3205
0.26	8.00	0.90	0.19	3.94	0.60	0.3210
2.52	37.00	1.57	0.34	11.30	1.05	0.3212
0.10	25.00	1.40	0.13	2.56	0.41	0.3212
0.12	5.00	0.70	0.14	2.74	0.44	0.3223
2.43	5.00	0.70	0.34	11.12	1.05	0.3227

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
9.43	5.00	0.70	0.43	20.93	1.32	0.3232
2.56	11.00	1.04	0.34	11.40	1.06	0.3244
0.31	4.00	0.60	0.21	4.28	0.63	0.3255
1.01	7.00	0.85	0.28	7.39	0.87	0.3261
3.44	2.00	0.30	0.36	13.07	1.12	0.3262
0.29	5.00	0.70	0.20	4.16	0.62	0.3273
2.37	6.00	0.78	0.34	10.99	1.04	0.3274
0.28	4.00	0.60	0.20	4.09	0.61	0.3304
3.07	19.00	1.28	0.36	12.40	1.09	0.3320
0.35	4.00	0.60	0.22	4.52	0.66	0.3324
0.90	33.00	1.52	0.28	7.01	0.85	0.3332
3.45	11.00	1.04	0.37	13.10	1.12	0.3332
0.90	29.00	1.46	0.28	6.99	0.84	0.3340
0.19	3.00	0.48	0.18	3.35	0.52	0.3353
3.37	19.00	1.28	0.37	12.95	1.11	0.3356
1.14	15.00	1.18	0.30	7.80	0.89	0.3370
0.59	8.00	0.90	0.26	5.74	0.76	0.3373
0.24	9.00	0.95	0.19	3.77	0.58	0.3382
0.60	19.00	1.28	0.26	5.80	0.76	0.3384
0.34	3.00	0.48	0.22	4.46	0.65	0.3386
1.67	2.00	0.30	0.33	9.33	0.97	0.3395
0.63	12.00	1.08	0.26	5.91	0.77	0.3418
2.35	4.00	0.60	0.36	10.95	1.04	0.3444
0.79	3.00	0.48	0.28	6.60	0.82	0.3455
3.87	5.00	0.70	0.40	13.81	1.14	0.3481
0.27	3.00	0.48	0.21	3.97	0.60	0.3482
3.86	5.00	0.70	0.40	13.79	1.14	0.3483

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.74	16.00	1.20	0.28	6.37	0.80	0.3488
0.32	5.00	0.70	0.22	4.32	0.64	0.3494
1.23	4.00	0.60	0.32	8.11	0.91	0.3495
0.48	10.00	1.00	0.26	5.23	0.72	0.3615
0.47	4.00	0.60	0.26	5.17	0.71	0.3642
1.01	4.00	0.60	0.32	7.38	0.87	0.3666
0.18	3.00	0.48	0.19	3.31	0.52	0.3685
1.66	3.00	0.48	0.36	9.32	0.97	0.3701
0.54	3.00	0.48	0.27	5.50	0.74	0.3702
1.02	4.00	0.60	0.32	7.41	0.87	0.3705
0.53	0.50	-0.30	0.27	5.48	0.74	0.3707
1.00	4.00	0.60	0.32	7.36	0.87	0.3729
0.14	2.00	0.30	0.18	2.98	0.47	0.3737
0.28	1.00	0.00	0.23	4.08	0.61	0.3740
1.26	10.00	1.00	0.34	8.19	0.91	0.3744
1.02	3.00	0.48	0.33	7.43	0.87	0.3746
0.27	2.00	0.30	0.22	3.96	0.60	0.3751
0.99	3.00	0.48	0.33	7.31	0.86	0.3764
0.53	4.00	0.60	0.28	5.45	0.74	0.3782
0.87	13.00	1.11	0.32	6.87	0.84	0.3791
0.22	5.00	0.70	0.21	3.65	0.56	0.3803
0.52	4.00	0.60	0.28	5.40	0.73	0.3803
0.91	16.00	1.20	0.32	7.05	0.85	0.3803
1.62	4.00	0.60	0.37	9.22	0.96	0.3827
0.77	34.00	1.53	0.31	6.50	0.81	0.3872
0.51	5.00	0.70	0.28	5.35	0.73	0.3880
0.77	14.00	1.15	0.32	6.50	0.81	0.3926

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.50	3.00	0.48	0.29	5.32	0.73	0.3928
0.80	3.00	0.48	0.32	6.62	0.82	0.3932
1.47	16.00	1.20	0.37	8.80	0.94	0.3935
0.18	1.00	0.00	0.21	3.34	0.52	0.3940
0.81	6.00	0.78	0.33	6.68	0.82	0.3942
0.95	31.00	1.49	0.34	7.18	0.86	0.3953
0.87	31.00	1.49	0.33	6.87	0.84	0.3979
0.25	5.00	0.70	0.24	3.88	0.59	0.4017
0.89	10.00	1.00	0.34	6.96	0.84	0.4043
0.28	3.00	0.48	0.25	4.06	0.61	0.4075
2.33	3.00	0.48	0.43	10.90	1.04	0.4126
0.81	3.00	0.48	0.34	6.67	0.82	0.4134
1.56	14.00	1.15	0.40	9.05	0.96	0.4156
0.30	2.00	0.30	0.26	4.20	0.62	0.4182
1.46	23.00	1.36	0.41	8.77	0.94	0.4341
0.41	2.00	0.30	0.30	4.84	0.69	0.4415
1.34	21.00	1.32	0.41	8.41	0.92	0.4426
0.41	2.00	0.30	0.31	4.83	0.68	0.4461
0.35	3.00	0.48	0.29	4.48	0.65	0.4520
0.29	3.00	0.48	0.28	4.12	0.61	0.4527
0.20	2.00	0.30	0.25	3.48	0.54	0.4545
0.24	5.00	0.70	0.26	3.77	0.58	0.4572
1.59	2.00	0.30	0.44	9.13	0.96	0.4595
0.36	1.00	0.00	0.31	4.58	0.66	0.4619
0.23	2.00	0.30	0.26	3.67	0.56	0.4686
0.91	37.00	1.57	0.40	7.02	0.85	0.4720
0.19	5.00	0.70	0.25	3.40	0.53	0.4768

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.20	5.00	0.70	0.26	3.44	0.54	0.4786
0.80	6.00	0.78	0.40	6.60	0.82	0.4836
1.57	5.00	0.70	0.48	9.08	0.96	0.4982
0.25	2.00	0.30	0.29	3.82	0.58	0.5007
0.16	3.00	0.48	0.25	3.10	0.49	0.5021
0.73	31.00	1.49	0.40	6.33	0.80	0.5026
0.44	5.00	0.70	0.36	5.00	0.70	0.5156
0.49	20.00	1.30	0.37	5.26	0.72	0.5162
0.44	8.00	0.90	0.37	5.02	0.70	0.5275
0.36	5.00	0.70	0.35	4.54	0.66	0.5322
0.49	3.00	0.48	0.39	5.29	0.72	0.5326
0.29	6.00	0.78	0.33	4.13	0.62	0.5346
0.13	2.00	0.30	0.24	2.79	0.45	0.5376
0.96	23.00	1.36	0.46	7.20	0.86	0.5381
0.14	5.00	0.70	0.25	2.92	0.47	0.5387
0.95	4.00	0.60	0.46	7.18	0.86	0.5393
0.72	4.00	0.60	0.44	6.31	0.80	0.5448
0.46	20.00	1.30	0.39	5.12	0.71	0.5512
0.36	10.00	1.00	0.37	4.59	0.66	0.5526
0.96	34.00	1.53	0.48	7.20	0.86	0.5555
0.27	3.00	0.48	0.34	4.00	0.60	0.5586
0.14	8.00	0.90	0.26	2.90	0.46	0.5622
0.22	14.00	1.15	0.32	3.65	0.56	0.5623
0.26	3.00	0.48	0.34	3.95	0.60	0.5637
0.34	1.00	0.00	0.37	4.44	0.65	0.5658
0.52	12.00	1.08	0.42	5.40	0.73	0.5669
0.13	3.00	0.48	0.26	2.79	0.45	0.5727

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.56	7.00	0.85	0.44	5.62	0.75	0.5827
0.28	3.00	0.48	0.36	4.07	0.61	0.5837
0.14	14.00	1.15	0.28	2.97	0.47	0.5857
0.25	14.00	1.15	0.34	3.82	0.58	0.5901
0.11	3.00	0.48	0.25	2.60	0.41	0.5921
0.22	9.00	0.95	0.34	3.59	0.56	0.6052
0.19	6.00	0.78	0.33	3.43	0.53	0.6132
0.42	2.00	0.30	0.43	4.92	0.69	0.6143
0.26	0.50	-0.30	0.37	3.95	0.60	0.6177
0.26	2.00	0.30	0.37	3.89	0.59	0.6189
0.57	15.00	1.18	0.48	5.65	0.75	0.6322
0.17	5.00	0.70	0.32	3.18	0.50	0.6347
0.25	3.00	0.48	0.37	3.84	0.58	0.6391
0.33	2.00	0.30	0.42	4.41	0.64	0.6496
0.17	4.00	0.60	0.33	3.19	0.50	0.6515
0.32	16.00	1.20	0.42	4.35	0.64	0.6563
0.31	21.00	1.32	0.42	4.28	0.63	0.6619
0.15	4.00	0.60	0.32	3.05	0.48	0.6630
0.34	3.00	0.48	0.43	4.43	0.65	0.6640
0.15	2.00	0.30	0.32	3.02	0.48	0.6658
0.27	4.00	0.60	0.40	3.97	0.60	0.6703
0.06	6.00	0.78	0.19	1.92	0.28	0.6705
0.14	2.00	0.30	0.31	2.93	0.47	0.6714
0.26	30.00	1.48	0.41	3.90	0.59	0.6884
0.48	6.00	0.78	0.49	5.22	0.72	0.6885
0.14	4.00	0.60	0.32	2.92	0.47	0.6937
0.15	0.50	-0.30	0.33	3.00	0.48	0.6965

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.15	2.00	0.30	0.34	3.07	0.49	0.6975
0.26	4.00	0.60	0.42	3.92	0.59	0.7004
0.41	3.00	0.48	0.48	4.83	0.68	0.7012
0.21	0.50	-0.30	0.39	3.53	0.55	0.7031
0.20	4.00	0.60	0.39	3.50	0.54	0.7115
0.12	7.00	0.85	0.31	2.77	0.44	0.7120
0.41	3.00	0.48	0.49	4.86	0.69	0.7185
0.24	1.00	0.00	0.42	3.76	0.57	0.7370
0.22	0.50	-0.30	0.42	3.63	0.56	0.7570
0.17	3.00	0.48	0.39	3.24	0.51	0.7678
0.17	4.00	0.60	0.39	3.23	0.51	0.7755
0.28	3.00	0.48	0.48	4.09	0.61	0.7868
0.45	3.00	0.48	0.55	5.05	0.70	0.7886
0.19	12.00	1.08	0.43	3.40	0.53	0.8008
0.27	3.00	0.48	0.48	3.99	0.60	0.8010
0.16	5.00	0.70	0.40	3.12	0.49	0.8021
0.15	2.00	0.30	0.39	3.03	0.48	0.8052
0.41	4.00	0.60	0.56	4.87	0.69	0.8092
0.16	6.00	0.78	0.40	3.15	0.50	0.8103
0.11	0.50	-0.30	0.36	2.67	0.43	0.8496
0.11	0.50	-0.30	0.36	2.65	0.42	0.8513
0.08	2.00	0.30	0.30	2.24	0.35	0.8691
0.10	0.50	-0.30	0.35	2.54	0.40	0.8693
0.14	4.00	0.60	0.41	2.90	0.46	0.8871
0.16	3.00	0.48	0.44	3.16	0.50	0.8881
0.13	0.50	-0.30	0.40	2.80	0.45	0.8939
0.16	2.00	0.30	0.44	3.10	0.49	0.8965

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.09	3.00	0.48	0.37	2.42	0.38	0.9586
0.10	0.50	-0.30	0.39	2.48	0.39	0.9857
0.11	1.00	0.00	0.42	2.62	0.42	0.9961
0.11	0.50	-0.30	0.43	2.67	0.43	1.0091
0.11	4.00	0.60	0.42	2.57	0.41	1.0151
0.10	5.00	0.70	0.42	2.54	0.41	1.0281
0.10	1.00	0.00	0.42	2.51	0.40	1.0428
0.08	0.50	-0.30	0.39	2.26	0.35	1.0940
9.52	6.00	0.78		21.03	1.32	
9.50	4.00	0.60		21.01	1.32	
9.49	7.00	0.85		21.00	1.32	
9.49	5.00	0.70		20.99	1.32	
0.24	3.00	0.48		3.75	0.57	
0.23	5.00	0.70		3.71	0.57	
0.23	5.00	0.70		3.67	0.56	
0.22	10.00	1.00		3.62	0.56	
1.77	7.00	0.85		9.58	0.98	
1.76	5.00	0.70		9.56	0.98	
1.75	8.00	0.90		9.55	0.98	
1.74	9.00	0.95		9.52	0.98	
0.18	3.00	0.48		3.30	0.52	
0.17	4.00	0.60		3.24	0.51	
0.08	2.00	0.30		2.32	0.37	
0.08	4.00	0.60		2.27	0.36	
0.00	2.00	0.30		0.02	-1.61	
0.14	2.00	0.30		2.91	0.46	
0.13	3.00	0.48		2.86	0.46	

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.06	0.50	-0.30		2.00	0.30	
0.06	0.50	-0.30		2.03	0.31	
0.06	2.00	0.30		1.95	0.29	
0.30	3.00	0.48		4.18	0.62	
0.29	2.00	0.30		4.13	0.62	
0.28	3.00	0.48		4.08	0.61	
0.12	4.00	0.60		2.78	0.44	
0.12	4.00	0.60		2.73	0.44	
0.09	4.00	0.60		2.37	0.37	
0.07	1.00	0.00		2.16	0.33	
0.06	3.00	0.48		2.00	0.30	
0.46	3.00	0.48		5.10	0.71	
0.47	8.00	0.90		5.18	0.71	
0.45	15.00	1.18		5.04	0.70	
0.37	11.00	1.04		4.61	0.66	
0.32	3.00	0.48		4.34	0.64	
0.30	4.00	0.60		4.22	0.63	
0.29	2.00	0.30		4.10	0.61	
0.07	3.00	0.48		2.09	0.32	
0.06	2.00	0.30		2.01	0.30	
0.06	0.50	-0.30		1.95	0.29	
0.05	2.00	0.30		1.83	0.26	
0.35	4.00	0.60		4.50	0.65	
0.34	4.00	0.60		4.45	0.65	
0.33	3.00	0.48		4.39	0.64	
0.32	3.00	0.48		4.34	0.64	
0.14	2.00	0.30		2.96	0.47	

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.14	0.50	-0.30		2.92	0.47	
0.14	2.00	0.30		2.90	0.46	
0.13	1.00	0.00		2.88	0.46	
0.11	4.00	0.60		2.66	0.42	
0.10	2.00	0.30		2.53	0.40	
0.12	0.50	-0.30		2.70	0.43	
0.11	3.00	0.48		2.61	0.42	
0.09	0.50	-0.30		2.37	0.37	
0.07	2.00	0.30		2.11	0.32	
0.06	3.00	0.48		1.92	0.28	
0.10				2.47	0.39	
0.09	2.00	0.30		2.42	0.38	
0.09	0.50	-0.30		2.36	0.37	
0.08	3.00	0.48		2.29	0.36	
0.08	1.00	0.00		2.22	0.35	
0.07	1.00	0.00		2.16	0.33	
0.38	4.00	0.60		4.66	0.67	
0.37	9.00	0.95		4.62	0.66	
0.36	4.00	0.60		4.58	0.66	
0.35	5.00	0.70		4.48	0.65	
0.13	3.00	0.48		2.79	0.45	
0.12	2.00	0.30		2.71	0.43	
0.11	0.50	-0.30		2.60	0.42	
0.10	3.00	0.48		2.50	0.40	
0.18	6.00	0.78		3.28	0.52	
0.17	3.00	0.48		3.24	0.51	
0.16	0.50	-0.30		3.17	0.50	

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.15	2.00	0.30		3.05	0.48	
0.12	2.00	0.30		2.69	0.43	
0.09	0.50	-0.30		2.44	0.39	
0.09	1.00	0.00		2.34	0.37	
0.31	3.00	0.48		4.23	0.63	
0.30	4.00	0.60		4.19	0.62	
0.28	2.00	0.30		4.09	0.61	
0.27	2.00	0.30		3.98	0.60	
0.25	5.00	0.70		3.83	0.58	
0.25	4.00	0.60		3.83	0.58	
0.09	2.00	0.30		2.41	0.38	
0.18	5.00	0.70		3.34	0.52	
0.18	2.00	0.30		3.27	0.52	
0.16	4.00	0.60		3.09	0.49	
0.15	4.00	0.60		3.01	0.48	
0.10	4.00	0.60		2.56	0.41	
0.10	0.50	-0.30		2.46	0.39	
0.08	3.00	0.48		2.26	0.36	
0.06	12.00	1.08		2.05	0.31	
0.07	9.00	0.95		2.19	0.34	
0.07	2.00	0.30		2.15	0.33	
0.06	2.00	0.30		1.99	0.30	
0.06	5.00	0.70		1.99	0.30	
0.12	12.00	1.08		2.72	0.43	
0.11	11.00	1.04		2.63	0.42	
0.10	9.00	0.95		2.53	0.40	
0.07	0.50	-0.30		2.07	0.32	

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.06	6.00	0.78		1.95	0.29	
0.09	5.00	0.70		2.38	0.38	
0.08	2.00	0.30		2.26	0.35	
0.08	2.00	0.30		2.26	0.35	
0.53	9.00	0.95		5.48	0.74	
0.52	6.00	0.78		5.43	0.74	
0.51	6.00	0.78		5.36	0.73	
0.48	6.00	0.78		5.21	0.72	
0.15	0.50	-0.30		3.04	0.48	
0.14	2.00	0.30		2.92	0.47	
0.08	20.00	1.30		2.28	0.36	
0.05	4.00	0.60		1.82	0.26	
8.13	5.00	0.70		19.54	1.29	
8.12	4.00	0.60		19.53	1.29	
8.11	3.00	0.48		19.51	1.29	
8.08	4.00	0.60		19.48	1.29	
0.24	2.00	0.30		3.77	0.58	
0.23	2.00	0.30		3.72	0.57	
0.23	2.00	0.30		3.72	0.57	
0.15	2.00	0.30		3.07	0.49	
1.37	12.00	1.08		8.52	0.93	
1.37	8.00	0.90		8.50	0.93	
1.35	5.00	0.70		8.46	0.93	
1.34	6.00	0.78		8.42	0.93	
0.17	11.00	1.04		3.24	0.51	
0.12	2.00	0.30		2.76	0.44	
0.12	9.00	0.95		2.72	0.43	

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.08	3.00	0.48		2.21	0.35	
0.17	0.50	-0.30		3.26	0.51	
0.17	3.00	0.48		3.21	0.51	
0.12	2.00	0.30		2.76	0.44	
0.12	1.00	0.00		2.68	0.43	
0.10	4.00	0.60		2.56	0.41	
0.10	0.50	-0.30		2.48	0.40	
0.09	0.50	-0.30		2.42	0.38	
0.06	4.00	0.60		1.92	0.28	
0.05	2.00	0.30		1.83	0.26	
0.12	3.00	0.48		2.79	0.44	
0.09	2.00	0.30		2.45	0.39	
0.39	5.00	0.70		4.74	0.68	
0.38	4.00	0.60		4.67	0.67	
0.37	4.00	0.60		4.64	0.67	
0.36	2.00	0.30		4.58	0.66	
0.08	3.00	0.48		2.32	0.37	
0.09	8.00	0.90		2.39	0.38	
0.06	4.00	0.60		2.01	0.30	
0.06	2.00	0.30		1.91	0.28	
0.29	3.00	0.48		4.13	0.62	
0.52	16.00	1.20		5.44	0.74	
0.51	8.00	0.90		5.38	0.73	
0.50	5.00	0.70		5.30	0.72	
0.13	3.00	0.48		2.86	0.46	
0.11	3.00	0.48		2.66	0.42	
0.11	2.00	0.30		2.58	0.41	

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.00	2.00	0.30		0.25	-0.60	
0.09	5.00	0.70		2.35	0.37	
0.08	4.00	0.60		2.28	0.36	
0.07	0.50	-0.30		2.18	0.34	
0.07	5.00	0.70		2.06	0.31	
0.55	2.00	0.30		5.58	0.75	
0.55	17.00	1.23		5.56	0.75	
0.54	22.00	1.34		5.54	0.74	
0.53	20.00	1.30		5.48	0.74	
0.19	7.00	0.85		3.40	0.53	
0.14	0.50	-0.30		2.89	0.46	
0.13	2.00	0.30		2.85	0.46	
0.13	1.00	0.00		2.80	0.45	
0.28	5.00	0.70		4.08	0.61	
0.28	5.00	0.70		4.08	0.61	
0.28	9.00	0.95		4.04	0.61	
0.24	8.00	0.90		3.81	0.58	
0.11	3.00	0.48		2.59	0.41	
0.09	2.00	0.30		2.37	0.37	
0.08	2.00	0.30		2.29	0.36	
0.06	4.00	0.60		1.96	0.29	
0.54	23.00	1.36		5.49	0.74	
0.53	16.00	1.20		5.46	0.74	
0.52	4.00	0.60		5.42	0.73	
0.51	24.00	1.38		5.38	0.73	
0.16	2.00	0.30		3.11	0.49	
0.14	0.50	-0.30		2.91	0.46	

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.12	2.00	0.30		2.70	0.43	
8.39	5.00	0.70		19.82	1.30	
8.38	9.00	0.95		19.82	1.30	
8.37	17.00	1.23		19.80	1.30	
8.36	11.00	1.04		19.79	1.30	
0.36	3.00	0.48		4.55	0.66	
0.35	2.00	0.30		4.52	0.66	
0.35	6.00	0.78		4.49	0.65	
0.34	5.00	0.70		4.43	0.65	
0.09	4.00	0.60		2.40	0.38	
0.09	3.00	0.48		2.33	0.37	
0.07	0.50	-0.30		2.15	0.33	
0.07	1.00	0.00		2.10	0.32	
0.06	3.00	0.48		2.02	0.31	
0.06	2.00	0.30		1.92	0.28	
0.11	3.00	0.48		2.63	0.42	
0.10	0.50	-0.30		2.51	0.40	
0.10	3.00	0.48		2.48	0.39	
0.09	3.00	0.48		2.41	0.38	
0.09	2.00	0.30		2.36	0.37	
0.08	2.00	0.30		2.29	0.36	
1.48	10.00	1.00		8.83	0.95	
1.48	4.00	0.60		8.83	0.95	
1.47	7.00	0.85		8.79	0.94	
1.43	10.00	1.00		8.68	0.94	
0.14	2.00	0.30		2.97	0.47	
0.12	0.50	-0.30		2.79	0.44	

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.11	1.00	0.00		2.57	0.41	
0.05	2.00	0.30		1.87	0.27	
0.09	4.00	0.60		2.42	0.38	
0.09	3.00	0.48		2.42	0.38	
0.09	4.00	0.60		2.36	0.37	
0.08	3.00	0.48		2.20	0.34	
0.09	3.00	0.48		2.34	0.37	
0.05	2.00	0.30		1.85	0.27	
0.06	5.00	0.70		2.00	0.30	
0.06	2.00	0.30		1.92	0.28	
0.94	4.00	0.60		7.14	0.85	
0.94	3.00	0.48		7.12	0.85	
0.93	5.00	0.70		7.10	0.85	
0.92	2.00	0.30		7.06	0.85	
0.90	3.00	0.48		7.01	0.85	
0.89	3.00	0.48		6.96	0.84	
0.38	3.00	0.48		4.69	0.67	
0.37	3.00	0.48		4.63	0.67	
0.36	3.00	0.48		4.57	0.66	
0.35	3.00	0.48		4.52	0.66	
0.09	5.00	0.70		2.44	0.39	
0.08	3.00	0.48		2.32	0.37	
0.07	4.00	0.60		2.18	0.34	
0.06	1.00	0.00		2.05	0.31	
0.23	3.00	0.48		3.74	0.57	
0.23	4.00	0.60		3.71	0.57	
0.22	0.50	-0.30		3.63	0.56	

Condon Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.22	2.00	0.30		3.60	0.56	
0.09	4.00	0.60		2.37	0.37	
0.08	4.00	0.60		2.28	0.36	
0.08	6.00	0.78		2.22	0.35	
0.07	7.00	0.85		2.07	0.32	
0.08	2.00	0.30		2.23	0.35	
0.07	2.00	0.30		2.16	0.33	
0.07	2.00	0.30		2.09	0.32	
0.06	2.00	0.30		2.02	0.31	
0.24	0.50	-0.30		3.77	0.58	
0.23	4.00	0.60		3.72	0.57	
0.23	4.00	0.60		3.68	0.57	
0.22	5.00	0.70		3.65	0.56	
1.14	22.00	1.34		7.82	0.89	
1.13	14.00	1.15		7.79	0.89	
1.12	23.00	1.36		7.74	0.89	
1.11	15.00	1.18		7.72	0.89	
0.12	4.00	0.60		2.75	0.44	
0.08	2.00	0.30		2.30	0.36	
0.07	1.00	0.00		2.14	0.33	
0.06	3.00	0.48		1.96	0.29	
0.10	5.00	0.70		2.54	0.41	
0.10	4.00	0.60		2.47	0.39	
0.07	9.00	0.95		2.14	0.33	
0.07	4.00	0.60		2.09	0.32	
0.06	5.00	0.70		1.94	0.29	
0.05	2.00	0.30		1.90	0.28	

Condon Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.11	4.00	0.60		2.64	0.42	
0.11	3.00	0.48		2.64	0.42	
0.06	1.00	0.00		1.97	0.30	
0.05	4.00	0.60		1.87	0.27	
0.17	8.00	0.90		3.25	0.51	
0.06	14.00	1.15		2.02	0.31	
0.06	3.00	0.48		1.98	0.30	
0.10	4.00	0.60		2.53	0.40	
0.09	2.00	0.30		2.44	0.39	
0.07	0.50	-0.30		2.09	0.32	
0.08	5.00	0.70		2.24	0.35	

Local Variability in Channel Slope Data for Harvey Creek

Harvey Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.012093	2	0.30103	0.264967	0.3529	-0.45235	-0.58576
9.702788	42	1.623249	0.069482	28.31682	1.452044	0.047851
9.643763	61	1.78533	0.081256	28.20375	1.450307	0.056027
9.543295	45	1.653213	0.08128	28.01074	1.447325	0.056159
9.704812	65	1.812913	0.082636	28.32069	1.452104	0.056907
9.515699	60	1.778151	0.107983	27.9576	1.4465	0.074651
9.489988	36	1.556303	0.108627	27.90805	1.445729	0.075136
9.511489	47	1.672098	0.109014	27.94949	1.446374	0.07537
9.484918	43	1.633468	0.112278	27.89827	1.445577	0.07767
2.234343	5	0.69897	0.091355	10.8112	1.033874	0.088362
2.176622	8	0.90309	0.105174	10.62725	1.026421	0.102466
5.548343	17	1.230449	0.133788	19.62837	1.292884	0.10348
1.058354			0.085557	6.62349	0.821087	0.1042
1.133199	5	0.69897	0.089149	6.926996	0.840545	0.106061
5.49074	34	1.531479	0.149451	19.49451	1.289912	0.115861
5.540762	18	1.255273	0.15404	19.61078	1.292495	0.11918
2.166543	10	1	0.125168	10.59495	1.025099	0.122103
0.84315	3	0.477121	0.094276	5.706268	0.756352	0.124646
5.443417	20	1.30103	0.161373	19.38418	1.287447	0.125343
1.172017	6	0.778151	0.108886	7.081681	0.850136	0.128081
6.266309	4	0.60206	0.171588	21.25872	1.327537	0.129253
1.160055	9	0.954243	0.114416	7.034204	0.847215	0.13505
1.150329	5	0.69897	0.115714	6.995478	0.844817	0.136969
0.790349	3	0.477121	0.101433	5.469357	0.737936	0.137454
8.187215	28	1.447158	0.213607	25.3326	1.40368	0.152176
8.16899	9	0.954243	0.218697	25.29561	1.403045	0.155873

Harvey Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
2.261702	10	1	0.164883	10.89782	1.03734	0.158948
0.783203	2	0.30103	0.118715	5.436881	0.73535	0.16144
1.410779	15	1.176091	0.146463	7.997176	0.902937	0.162207
0.949348	8	0.90309	0.129424	6.167856	0.790134	0.1638
1.101685	6	0.778151	0.136925	6.800071	0.832513	0.164472
2.159758	8	0.90309	0.171167	10.57318	1.024206	0.167122
0.94372	7	0.845098	0.132385	6.143856	0.788441	0.167907
1.596765	8	0.90309	0.157802	8.673642	0.938202	0.168196
2.299595	9	0.954243	0.178138	11.0172	1.042071	0.170946
2.096187	7	0.845098	0.176853	10.36807	1.015698	0.17412
2.288789	10	1	0.181873	10.98322	1.04073	0.174755
1.128578	6	0.778151	0.150197	6.908461	0.839381	0.178938
8.16366	44	1.643453	0.257648	25.28479	1.402859	0.183659
1.631365	7	0.845098	0.175793	8.796424	0.944306	0.186161
2.854614	4	0.60206	0.205568	12.69518	1.103639	0.186264
2.833209	7	0.845098	0.205568	12.63268	1.101495	0.186627
1.093517	5	0.69897	0.155926	6.766971	0.830394	0.187773
1.079539	9	0.954243	0.155749	6.710127	0.826731	0.188391
2.793056	7	0.845098	0.213772	12.515	1.097431	0.194793
2.427971	3	0.477121	0.213719	11.4167	1.057541	0.202091
1.682889	6	0.778151	0.194299	8.977615	0.953161	0.203847
2.896067	6	0.778151	0.22586	12.81576	1.107744	0.203891
1.169098	6	0.778151	0.175114	7.070111	0.849426	0.206155
6.272294	9	0.954243	0.277831	21.27203	1.327809	0.20924
2.306939	8	0.90309	0.221553	11.04026	1.042979	0.212423
1.498504	13	1.113943	0.197385	8.319846	0.920115	0.214522
1.150477	10	1	0.183385	6.996068	0.844854	0.217061

Harvey Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
1.639228	6	0.778151	0.205972	8.824201	0.945675	0.217804
0.775833	8	0.90309	0.160407	5.403279	0.732657	0.218939
2.090278	12	1.079181	0.222644	10.3489	1.014894	0.219376
0.93816	4	0.60206	0.173252	6.120098	0.786758	0.22021
0.895686	6	0.778151	0.170824	5.936971	0.773565	0.220828
1.211383	6	0.778151	0.190425	7.236758	0.859544	0.221542
0.803581	6	0.778151	0.165189	5.529226	0.742664	0.222427
1.081754	6	0.778151	0.184062	6.719152	0.827314	0.222481
2.525303	13	1.113943	0.239309	11.71476	1.068733	0.223918
0.787685	7	0.845098	0.165189	5.457262	0.736975	0.224144
2.797181	5	0.69897	0.24687	12.52711	1.097851	0.224867
0.404145	4	0.60206	0.123485	3.523245	0.546943	0.225773
1.199144	10	1	0.195036	7.188732	0.856652	0.227672
1.064133	5	0.69897	0.187399	6.647183	0.822638	0.227803
2.648834	3	0.477121	0.246601	12.08741	1.082333	0.227842
0.902949	7	0.845098	0.181464	5.968494	0.775865	0.233886
1.493127	4	0.60206	0.21655	8.300259	0.919092	0.235613
2.630296	19	1.278754	0.254545	12.03188	1.080333	0.235617
1.241622	13	1.113943	0.204695	7.354705	0.866565	0.236214
1.459461	6	0.778151	0.21655	8.177064	0.912597	0.23729
0.943968	4	0.60206	0.187296	6.144915	0.788516	0.23753
8.115381	35	1.544068	0.337951	25.18664	1.40117	0.241192
2.687677	9	0.954243	0.263473	12.20335	1.086479	0.242502
1.287046	9	0.954243	0.218663	7.530039	0.876797	0.249388
0.692001	5	0.69897	0.176484	5.012961	0.700094	0.252086
1.252642	13	1.113943	0.220921	7.397441	0.869082	0.254201
1.24771	3	0.477121	0.222676	7.378331	0.867958	0.256552

Harvey Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.68778	5	0.69897	0.179361	4.992891	0.698352	0.256835
8.108953	46	1.662758	0.361758	25.17356	1.400945	0.258224
1.405441	14	1.146128	0.234544	7.977322	0.901857	0.260067
1.181474	5	0.69897	0.222256	7.119097	0.852425	0.260734
1.090033	10	1	0.216753	6.752826	0.829486	0.26131
1.465149	5	0.69897	0.239499	8.197946	0.913705	0.262118
6.288634	8	0.90309	0.348974	21.30835	1.32855	0.262673
2.61608	6	0.778151	0.284493	11.9892	1.07879	0.263715
2.58403	20	1.30103	0.283761	11.89268	1.07528	0.263895
1.110215	4	0.60206	0.220718	6.834548	0.83471	0.264425
2.559446	8	0.90309	0.283761	11.81837	1.072558	0.264564
0.87976	13	1.113943	0.203652	5.867539	0.768456	0.265015
0.809891	6	0.778151	0.197937	5.557656	0.744892	0.265726
1.095678	6	0.778151	0.224343	6.775736	0.830956	0.269982
1.311747	6	0.778151	0.23835	7.624488	0.882211	0.270173
1.305949	16	1.20412	0.238637	7.602374	0.880949	0.270886
1.473698	29	1.462398	0.248259	8.22928	0.915362	0.271214
1.234123	14	1.146128	0.236724	7.325548	0.86484	0.27372
1.295385	4	0.60206	0.242285	7.561994	0.878636	0.275752
0.674446	3	0.477121	0.191084	4.929207	0.692777	0.275823
1.29066	8	0.90309	0.242285	7.543896	0.877596	0.276079
6.373223	41	1.612784	0.367896	21.49585	1.332355	0.276125
0.814201	5	0.69897	0.206148	5.577032	0.746403	0.276189
1.397224	17	1.230449	0.249024	7.946709	0.900187	0.276636
1.035821	20	1.30103	0.227577	6.530682	0.814959	0.27925
6.344112	5	0.69897	0.378315	21.43142	1.331051	0.284223
1.188954	17	1.230449	0.24344	7.148618	0.854222	0.284984

Harvey Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.525022	13	1.113943	0.182257	4.182701	0.621457	0.293274
1.733146	26	1.414973	0.282482	9.152518	0.961541	0.29378
0.912659	2	0.30103	0.234578	6.010501	0.778911	0.301162
0.916234	5	0.69897	0.237384	6.025929	0.780024	0.304329
0.746091	9	0.954243	0.219594	5.266547	0.721526	0.304347
1.209367	10	1	0.262627	7.228859	0.85907	0.305711
6.367554	9	0.954243	0.409809	21.48331	1.332101	0.307641
1.554995	5	0.69897	0.292826	8.524189	0.930653	0.314646
0.521858	5	0.69897	0.19985	4.166155	0.619735	0.322477
1.692381	11	1.041393	0.310513	9.010785	0.954763	0.325225
1.726164	22	1.342423	0.314047	9.128325	0.960391	0.326999
1.643835	6	0.778151	0.311708	8.840455	0.946475	0.329336
0.75017	3	0.477121	0.240262	5.285409	0.723079	0.332276
1.649464	5	0.69897	0.317372	8.860293	0.947448	0.334976
1.019972	16	1.20412	0.274875	6.464988	0.810568	0.339114
0.605246	7	0.845098	0.228781	4.591442	0.661949	0.345617
0.535173	3	0.477121	0.218742	4.235552	0.62691	0.348921
0.733799	10	1	0.255889	5.209491	0.716795	0.35699
0.542508	7	0.845098	0.226156	4.273527	0.630786	0.35853
0.537728	7	0.845098	0.226156	4.2488	0.628266	0.359968
1.104519	14	1.146128	0.30202	6.811536	0.833245	0.362462
0.32405	2	0.30103	0.176219	3.048209	0.484045	0.364056
0.695327	4	0.60206	0.255889	5.028747	0.70146	0.364795
0.370848	3	0.477121	0.191395	3.330107	0.522458	0.366336
0.808339	3	0.477121	0.275512	5.550671	0.744345	0.370141
0.499826	7	0.845098	0.226156	4.049971	0.607452	0.372302
0.517262			0.2321	4.14206	0.617216	0.376043

Harvey Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.303666	1	0	0.175137	2.921081	0.465544	0.376199
0.898188	16	1.20412	0.292813	5.94784	0.774359	0.378136
0.991846	3	0.477121	0.304645	6.347532	0.802605	0.37957
0.530042	9	0.954243	0.238674	4.208881	0.624167	0.382389
0.889396	9	0.954243	0.297477	5.9096	0.771558	0.385554
0.775382	3	0.477121	0.282796	5.40122	0.732492	0.386074
0.386984	3	0.477121	0.206858	3.424417	0.534587	0.38695
0.766818	6	0.778151	0.28377	5.362029	0.729329	0.389084
1.088512	21	1.322219	0.322896	6.746646	0.829088	0.389459
0.597267	2	0.30103	0.256811	4.551663	0.65817	0.390189
0.880756	5	0.69897	0.300211	5.871894	0.768778	0.390504
0.361392	1	0	0.201462	3.274183	0.515103	0.39111
0.60426	3	0.477121	0.261417	4.586537	0.661485	0.395197
0.381551	2	0.30103	0.210409	3.392817	0.53056	0.396579
0.277142	2	0.30103	0.175137	2.751163	0.439516	0.398477
1.054156	7	0.845098	0.328288	6.606252	0.819955	0.400373
0.580903	2	0.30103	0.262876	4.469502	0.650259	0.404264
0.392371	5	0.69897	0.218517	3.4556	0.538523	0.405771
1.044816	3	0.477121	0.332478	6.567813	0.817421	0.40674
0.522593	4	0.60206	0.255572	4.170002	0.620136	0.412122
0.326375	4	0.60206	0.201462	3.062531	0.486081	0.414462
1.000035	2	0.30103	0.339681	6.381846	0.804946	0.421992
0.409719	18	1.255273	0.235062	3.555032	0.550844	0.42673
2.940735	50	1.69897	0.475562	12.94503	1.112103	0.427624
0.486602	10	1	0.259045	3.979388	0.599816	0.431874
0.514921	2	0.30103	0.267509	4.129759	0.615925	0.434321
0.321151	4	0.60206	0.213481	3.0303	0.481486	0.443379

Harvey Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
2.971851	5	0.69897	0.495498	13.03468	1.1151	0.444353
2.945434	15	1.176091	0.496122	12.95858	1.112558	0.445929
2.959825	6	0.778151	0.49779	13.00006	1.113946	0.446871
0.391974	6	0.778151	0.242697	3.453307	0.538235	0.450912
0.488115	10	1	0.271837	3.987497	0.6007	0.452533
0.410508	4	0.60206	0.249524	3.559519	0.551391	0.452535
0.336859	1	0	0.225412	3.126685	0.495084	0.455301
1.663267	1	0	0.433133	8.90884	0.949821	0.456016
0.375052	4	0.60206	0.242697	3.354812	0.525668	0.461692
0.467053	4	0.60206	0.27167	3.873823	0.58814	0.461915
0.730405	12	1.079181	0.338223	5.193679	0.715475	0.472725
0.273963	4	0.60206	0.210826	2.73043	0.436231	0.483289
0.436211	1	0	0.276475	3.704123	0.568685	0.486165
0.316258	1	0	0.237517	2.999947	0.477114	0.49782
0.400204	14	1.146128	0.272405	3.500679	0.544152	0.500605
0.384574	4	0.60206	0.267977	3.410419	0.532808	0.502952
0.723065	5	0.69897	0.362096	5.159397	0.712599	0.508134
0.264763	3	0.477121	0.217403	2.669955	0.426504	0.509734
0.320887	1	0	0.249432	3.028667	0.481251	0.518299
0.396195	4	0.60206	0.283725	3.477646	0.541285	0.524169
0.673967	1	0	0.373476	4.926911	0.692575	0.539257
0.243234	2	0.30103	0.217403	2.52553	0.402353	0.540331
0.361035	2	0.30103	0.279724	3.272062	0.514821	0.543341
0.472996	5	0.69897	0.324316	3.906074	0.59174	0.548071
0.237023	2	0.30103	0.217403	2.483056	0.394987	0.550407
0.369005	1	0	0.28691	3.319246	0.521039	0.550649
0.284041	4	0.60206	0.246428	2.795879	0.446518	0.551889

Harvey Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.277955	5	0.69897	0.243657	2.756452	0.44035	0.553325
0.416491	3	0.477121	0.312874	3.593452	0.555512	0.563218
0.267907	4	0.60206	0.242486	2.690702	0.429866	0.564098
0.218612	1	0	0.210826	2.354836	0.371961	0.566796
0.341309	3	0.477121	0.293711	3.153707	0.498821	0.58881
0.425717	2	0.30103	0.330851	3.645449	0.561751	0.588964
0.259595	5	0.69897	0.248251	2.635667	0.42089	0.589823
0.256641	8	0.90309	0.248688	2.615962	0.417631	0.595472
0.283955	2	0.30103	0.270918	2.795324	0.446432	0.606851
0.454877	3	0.477121	0.352745	3.807303	0.580617	0.607534
0.495212	8	0.90309	0.371165	4.025418	0.604811	0.613687
0.205093	1	0	0.217403	2.258305	0.353783	0.614511
0.496901	4	0.60206	0.372771	4.034415	0.605781	0.615357
0.249855	4	0.60206	0.258265	2.570398	0.41	0.629914
0.479337	4	0.60206	0.380913	3.940331	0.595533	0.639617
0.442372	5	0.69897	0.378732	3.738345	0.572679	0.661334
0.190689	4	0.60206	0.225412	2.153009	0.333046	0.67682
0.240267	1	0	0.271049	2.505287	0.398858	0.679563
0.328724	2	0.30103	0.333986	3.076966	0.488123	0.684226
0.334766	2	0.30103	0.338498	3.113933	0.493309	0.686179
0.461903	0.5	-0.30103	0.408012	3.845761	0.584982	0.697477
0.66769	4	0.60206	0.485541	4.896775	0.68991	0.703774
0.168231	1	0	0.21286	1.983184	0.297363	0.715827
0.277955	5	0.69897	0.315513	2.756452	0.44035	0.716505
0.213475	1	0	0.264665	2.318405	0.365189	0.724734
0.596093	18	1.255273	0.481561	4.545794	0.65761	0.732289
0.251821	4	0.60206	0.302083	2.583642	0.412232	0.732797

Harvey Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.13148	1	0	0.166994	1.687224	0.227173	0.735098
0.361459	2	0.30103	0.381654	3.274581	0.515156	0.740852
0.213475	1	0	0.270809	2.318405	0.365189	0.741557
0.338951	2	0.30103	0.372017	3.139404	0.496847	0.748756
0.485023	2	0.30103	0.448526	3.970916	0.598891	0.748928
0.475513	10	1	0.445132	3.91969	0.593252	0.750325
0.335414	3	0.477121	0.373587	3.117884	0.49386	0.756464
0.301085	3	0.477121	0.358924	2.904777	0.463113	0.775025
0.22543	4	0.60206	0.297948	2.402737	0.380706	0.782618
0.174613	5	0.69897	0.242486	2.032198	0.307966	0.78738
0.238218	4	0.60206	0.315513	2.491257	0.396419	0.79591
0.225344	3	0.477121	0.312286	2.402136	0.380598	0.820516
0.328438	4	0.60206	0.408141	3.075211	0.487875	0.83657
0.213809	2	0.30103	0.312286	2.320782	0.365634	0.854094
0.25894	4	0.60206	0.362315	2.631304	0.420171	0.862304
0.139169	2	0.30103	0.228297	1.751287	0.243357	0.938114
0.245448	14	1.146128	0.383994	2.54058	0.404933	0.94829
0.303765	4	0.60206	0.445132	2.921705	0.465636	0.955965
0.168727	2	0.30103	0.285925	1.987016	0.298201	0.958833
0.253205	2	0.30103	0.408141	2.592944	0.413793	0.986342
0.157295	1	0	0.27668	1.897677	0.278222	0.994456
0.173573	4	0.60206	0.310146	2.024253	0.306265	1.012672
0.157295	5	0.69897	0.298709	1.897677	0.278222	1.073633
0.13148	1	0	0.27668	1.687224	0.227173	1.217928
0.139169	3	0.477121	0.298196	1.751287	0.243357	1.225344
0.136099	4	0.60206	0.3291	1.725858	0.237005	1.38858
9.782576				28.46929	1.454377	

Harvey Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
9.761941	80	1.90309		28.4299	1.453775	
9.755826	67	1.826075		28.41822	1.453597	
9.710026	58	1.763428		28.33067	1.452257	
9.710027	51	1.70757		28.33067	1.452257	
9.473819	29	1.462398		27.87686	1.445244	
9.309859	66	1.819544		27.55957	1.440272	
9.295805	43	1.633468		27.53228	1.439842	
9.288142	65	1.812913		27.5174	1.439607	
9.186674				27.31991	1.436479	
9.18305	67	1.826075		27.31284	1.436367	
9.068702	67	1.826075		27.08936	1.432799	
9.026264	86	1.934498		27.00617	1.431463	
9.018946	89	1.94939		26.99181	1.431232	
9.004408	84	1.924279		26.96327	1.430773	
9.001229	81	1.908485		26.95703	1.430672	
8.316659				25.59451	1.408147	
8.313215				25.58756	1.408029	
8.260653				25.48137	1.406223	
8.251074	29	1.462398		25.46199	1.405892	
8.241082	50	1.69897		25.44177	1.405547	
8.230904	26	1.414973		25.42116	1.405195	
8.198212	22	1.342423		25.35491	1.404062	
6.242854	9	0.954243		21.20651	1.326469	
6.118831	17	1.230449		20.92931	1.320755	
6.108228	11	1.041393		20.90552	1.320261	
6.0904	8	0.90309		20.86549	1.319429	
2.987823				13.08057	1.116627	

Harvey Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
2.97705	13	1.113943		13.04962	1.115598	
2.970858	3	0.477121		13.03182	1.115005	
2.932097	4	0.60206		12.92008	1.111265	
2.923781	16	1.20412		12.89604	1.110456	
0.197971	1	0		2.206572	0.343718	
0.189253	1	0		2.142364	0.330893	
0.171837	1	0		2.010955	0.303402	
0.164215	1	0		1.952012	0.290483	
0.111705				1.516204	0.180758	
0.098265				1.393966	0.144252	
0.087134				1.288301	0.110017	
0.067521				1.089932	0.037399	
3.091714	6	0.778151		13.37704	1.12636	
3.08223	4	0.60206		13.35012	1.125485	
3.069451	2	0.30103		13.3138	1.124302	
3.049628	40	1.60206		13.25736	1.122457	
2.976995	5	0.69897		13.04946	1.115593	
2.966578	9	0.954243		13.01951	1.114594	
2.934189	6	0.778151		12.92612	1.111468	
2.923067	10	1		12.89398	1.110387	
2.904936				12.84148	1.108615	
2.658639	12	1.079181		12.11673	1.083386	
2.652197	3	0.477121		12.09747	1.082695	
2.584379	19	1.278754		11.89374	1.075318	
2.578048	18	1.255273		11.87462	1.07462	
2.561095	12	1.079181		11.82337	1.072741	
2.557616				11.81283	1.072354	

Harvey Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
1.710401	6	0.778151		9.073581	0.957779	
1.699374	9	0.954243		9.035181	0.955937	
1.691332	5	0.69897		9.007122	0.954586	
1.680227	10	1		8.968301	0.95271	
1.652905	6	0.778151		8.872408	0.948042	
1.589693	6	0.778151		8.648434	0.936937	
1.583599				8.626681	0.935844	
1.544945	4	0.60206		8.488025	0.928807	
1.533185	14	1.146128		8.445604	0.926631	
1.095342	5	0.69897		6.774374	0.830869	
1.091954	3	0.477121		6.760627	0.829987	
1.035562	4	0.60206		6.529612	0.814887	
1.02941	6	0.778151		6.504151	0.813191	
0.993749	8	0.90309		6.355515	0.803151	
0.9862	9	0.954243		6.323816	0.800979	
0.591199				4.521288	0.655262	
0.589356	4	0.60206		4.512041	0.654373	
0.583036	3	0.477121		4.480256	0.651303	
0.574026	4	0.60206		4.434736	0.646868	
0.559429	1	0		4.360465	0.639533	
0.115465	1	0		1.549477	0.190185	
0.107766	1	0		1.48093	0.170535	
0.091027	1	0		1.325758	0.122464	
0.081078	1	0		1.228865	0.089504	
0.432541	3	0.477121		3.683659	0.566279	
0.423589	0.5	-0.30103		3.63349	0.560324	
0.400372	4	0.60206		3.501643	0.544272	

Harvey Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.371494	0.5	-0.30103		3.333909	0.522954	
0.258971	3	0.477121		2.631511	0.420205	
0.240959	4	0.60206		2.510016	0.399677	
0.235466	3	0.477121		2.472349	0.39311	
0.087652	0.5	-0.30103		1.293318	0.111705	
0.967951	15	1.176091		6.246841	0.79566	
0.957112	3	0.477121		6.200885	0.792454	
0.94387	3	0.477121		6.144497	0.788486	
0.924306	3	0.477121		6.060686	0.782522	
0.403479	3	0.477121		3.519437	0.546473	
0.396359	4	0.60206		3.478589	0.541403	
0.378216	2	0.30103		3.373342	0.52806	
0.373461	1	0		3.345474	0.524458	
0.845876				5.718359	0.757271	
0.841894	7	0.845098		5.700693	0.755928	
0.835417	6	0.778151		5.671898	0.753728	
0.826859	7	0.845098		5.633732	0.750796	
0.798064	5	0.69897		5.504305	0.740703	
0.355103	4	0.60206		3.23671	0.510104	
0.341562	3	0.477121		3.15524	0.499032	
0.272181	3	0.477121		2.718771	0.434373	
0.264702	3	0.477121		2.669551	0.426438	
5.613091	31	1.491362		19.77826	1.296188	
5.60511	35	1.544068		19.75982	1.295783	
5.567001	16	1.20412		19.67163	1.29384	
5.570581	25	1.39794		19.67992	1.294023	
5.434803	16	1.20412		19.36406	1.286996	

Harvey Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
5.419453	42	1.623249		19.32818	1.286191	
5.410902	32	1.50515		19.30818	1.285741	
5.400389	44	1.643453		19.28357	1.285187	
5.397872				19.27768	1.285055	
5.138392				18.66491	1.271026	
5.131084	13	1.113943		18.6475	1.270621	
5.117124	10	1		18.61421	1.269845	
5.09978	18	1.255273		18.57282	1.268878	
5.089737	14	1.146128		18.54883	1.268317	
4.548947				17.23172	1.236329	
4.542001	9	0.954243		17.21446	1.235893	
4.532523	33	1.518514		17.1909	1.235299	
4.526695	21	1.322219		17.1764	1.234932	
4.477141				17.05287	1.231798	
4.468412	12	1.079181		17.03107	1.231242	
4.440121	6	0.778151		16.96029	1.229433	
4.074556	7	0.845098		16.0312	1.204966	
4.069209	10	1		16.0174	1.204592	
3.990767	22	1.342423		15.81427	1.199049	
3.979462	5	0.69897		15.78488	1.198241	
3.960454	21	1.322219		15.7354	1.196878	
3.481063				14.45895	1.160137	
3.470873	20	1.30103		14.43119	1.159302	
3.460274	14	1.146128		14.40228	1.158431	
3.451302	26	1.414973		14.37778	1.157692	
3.424491	38	1.579784		14.30444	1.155471	
1.6566	6	0.778151		8.885409	0.948677	

Harvey Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
1.637492	10	1		8.818073	0.945374	
1.594868	10	1		8.666884	0.937863	
1.589082	4	0.60206		8.646255	0.936828	
1.530715		#NUM!		8.43668	0.926172	
1.518573	6	0.778151		8.39274	0.923904	
1.51224	11	1.041393		8.369773	0.922714	
1.502968	7	0.845098		8.336089	0.920962	
1.501807				8.331866	0.920742	
1.125265	10	1		6.895157	0.838544	
0.949816	5	0.69897		6.16985	0.790275	
0.941038	5	0.69897		6.132402	0.787631	
0.930982	6	0.778151		6.089353	0.784571	
0.908569	5	0.69897		5.992826	0.777632	
0.905062				5.977648	0.77653	
0.741509	4	0.60206		5.245317	0.719772	
0.712997	3	0.477121		5.112178	0.708606	
0.713061	6	0.778151		5.112479	0.708632	
0.410067	4	0.60206		3.557012	0.551085	
0.109736	3	0.477121		1.498626	0.175693	
0.104446	2	0.30103		1.450854	0.161624	
0.095668	2	0.30103		1.369699	0.136625	
0.059426	6	0.778151		1.002381	0.001033	
0.349043	3	0.477121		3.200384	0.505202	
0.340756	2	0.30103		3.150356	0.49836	
0.330164	7	0.845098		3.085798	0.489367	
0.300728	8	0.90309		2.902518	0.462775	
0.097754	1	0		1.389209	0.142768	

Harvey Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.092269	1	0		1.337591	0.126323	
0.065093	1	0		1.064072	0.026971	
0.056929	1	0		0.97456	-0.01119	
0.183206				2.097229	0.321646	
0.181323	3	0.477121		2.08307	0.318704	
0.176407	5	0.69897		2.045864	0.310877	
0.167249	13	1.113943		1.975586	0.295696	
0.147098	4	0.60206		1.816085	0.259136	
0.126563	3	0.477121		1.64558	0.216319	
0.089893	5	0.69897		1.314905	0.118894	
0.072476	1	0		1.141736	0.057566	
0.05735	1	0		0.97928	-0.00909	
0.353094				3.224691	0.508488	
0.351657				3.21608	0.507327	
0.349043	3	0.477121		3.200384	0.505202	
0.340756	4	0.60206		3.150356	0.49836	
0.330167	7	0.845098		3.085816	0.48937	
0.300729	8	0.90309		2.902525	0.462776	
0.098013	2	0.30103		1.391621	0.143521	
0.092269	1	0		1.337591	0.126323	
0.065093	1	0		1.064072	0.026971	
0.056929	1	0		0.97456	-0.01119	
0.46827				3.880439	0.588881	
0.465216	9	0.954243		3.863826	0.587018	
0.45377	6	0.778151		3.801225	0.579924	
0.443703	5	0.69897		3.745716	0.573535	
0.426597	5	0.69897		3.650388	0.562339	

Harvey Creek

Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.108094	2	0.30103		1.483884	0.1714	
0.100051	7	0.845098		1.410528	0.149382	
0.072956	1	0		1.146689	0.059445	
0.064944	1	0		1.062474	0.026318	
0.445766				3.757126	0.574856	
0.4399	3	0.477121		3.724634	0.571084	
0.429912	5	0.69897		3.668963	0.564543	
0.411017	3	0.477121		3.562413	0.551744	
0.400469	5	0.69897		3.502199	0.544341	
0.147939	1	0		1.822886	0.26076	
0.135264	1	0		1.718908	0.235253	
0.093866	1	0		1.352727	0.13121	
1.723823	17	1.230449		9.120206	0.960005	
1.716499	17	1.230449		9.094779	0.958792	
1.710048	16	1.20412		9.072353	0.95772	
1.698908	6	0.778151		9.033556	0.955859	
0.434159	3	0.477121		3.692689	0.567343	
0.417244	0.5	-0.30103		3.59771	0.556026	
0.386207	2	0.30103		3.419907	0.534014	
0.372991	3	0.477121		3.342712	0.524099	
0.550386	4	0.60206		4.314118	0.634892	
0.536295	11	1.041393		4.241373	0.627506	
0.525893	6	0.778151		4.187249	0.621929	
0.512849	3	0.477121		4.118855	0.614777	
0.352032	0.5	-0.30103		3.218328	0.50763	
0.338619	2	0.30103		3.137387	0.496568	
0.328247	3	0.477121		3.074038	0.487709	

Harvey Creek						
Drainage Area	Valley Width (m)	Log (VW)	Standard Deviation of Logged VW (450 m)	Predicted Valley Width	Log (predicted VW)	Coefficient of Variation [std(logvw)/ log(predicted)]
0.298778	2	0.30103		2.890164	0.460922	
1.51528	28	1.447158		8.380802	0.923286	
1.503955	23	1.361728		8.339678	0.921149	
1.498367	20	1.30103		8.319347	0.920089	
1.449235	27	1.431364		8.139451	0.910595	
0.260386	2	0.30103		2.64093	0.421757	
0.221672	0.5	-0.30103		2.376397	0.375919	
0.217526	1	0		2.347159	0.370542	
0.186353	1	0		2.120782	0.326496	
1.268365	27	1.431364		7.458193	0.872634	
1.263053	30	1.477121		7.437697	0.871439	
1.255545	23	1.361728		7.408678	0.869741	
1.246565	21	1.322219		7.37389	0.867697	
0.163135	2	0.30103		1.943585	0.288604	
0.138027	5	0.69897		1.74185	0.241011	
0.091098	0.5	-0.30103		1.326436	0.122686	
0.08643	2	0.30103		1.281467	0.107707	
1.807637	26	1.414973		9.408583	0.973524	
1.794622	31	1.491362		9.364109	0.971466	
1.789721	27	1.431364		9.347333	0.970688	
1.765481	21	1.322219		9.264127	0.966804	
0.359043	6	0.778151		3.260213	0.513246	
0.328399	3	0.477121		3.074971	0.487841	
0.321447	4	0.60206		3.032131	0.481748	
0.069327	4	0.60206		1.108961	0.044916	

APPENDIX B

STREAM SURVEY DATA FOR BILLIE AND UNCLE CREEK

Stream Survey Data for Billie Creek

Billie Creek

UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
1	RR	16					5	5	5			85	5	35		
2	RI	5						15	25	30		30				
3	SC	3							15	85						
4	GL	13					5	10	35	30	5	15				
5	RR	10						5	10	5		80		20		w/gravel pockets
6	RI	6						5	55	20		20				
7	GL	19					5	5	45	25	10	10		5		incised in BR
8	RI	10					5	5	35	35	10	10				
9	SP	8		0.51	0.14		15	10	5	5	5	60		5		
10	RI	24					5	10	10	5	5	65	3			crazy carved BR
11	SP	25		0.57	0.1		10	10	10	5	5	65	1			
12	RI	22				y		20	15		10	55	6			with pockets (side jam)
13	GL	7					10	5	5		5	70	1			
14	RI	4						5	25	5	5	5				
15	SP	12		0.57	0.14		40	35	15	60	5		6	70		pool caused by HS
16	HS= SB	2								5	100		20+			boulder step/ RW, huge boulders in a line
17	RI	22							100				2 (HS)			
18	SP	14		0.48	0.12		15	40	35			10	2	30		
19	HS= SB	1									100		12			ph # 104, incised into alluvium
20	RI	13				y	5	5	80		5	5	1			LWD structure, old HS

Billie Creek

UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
21	DP	4		0.48	0.19	y	10	15	50	15	10		4 (HS)			
22	DP	18		0.8	0.11		20	45		5		30		5		created by placed wood
23	PU	22	y				10	40	50					5		
24	RR	5							5			95				
25	BW	3	y	0.35	0.1		88	5	5		10		2 (HS)			HS associated
26	GL	15					5	15	60	5		15	1	50		
27	DC	6	y			y	100									
28	RI	5						5	90	5				15		
29	BP	9	y	0.33	0.01		85		10			5				
30	SP	11		0.42	0.12	y	85		10			5		50	y	HS associated
31	RI	5							100					60		
32	GL	19					5	20	50	5	5	15				
33	RI	26						15	55	5	5	20	7			mid channel bar ph #105
34	HS= SB	8					5	10	10		65	10	20+			old HS, boulders that moved
35	RI	4							100							
36	IP	missing data	y	0.45			100									entire BW system
37	DC	10	y				100									
38	DC	10	y				100									
39	BW	2	y	0.2			100									
40	DP	9		0.62	0.12	y	25	15	55		5		1	50		old wood HS
41	HS	2														Wood

Billie Creek

UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
42	RI	15						5	90		5		8	10		
43	RI	23	y						95	5						secondary channel not really HS associated
44	RI	23							60	40						
45	SP	23		0.55	0.08		25	5	65			5		50		
46	RI	13							100					10		
47	SP	19	y	0.3	0.07		50		50							
48	LP	19		0.5	0.12		50		50							
49	RI	3							100							
50	LP	10		0.63	0.1		85	5	5			5				
51	RI	17						5	90	5						
52	SC	7	y	0.26	0.01		50	10	40							
53	DC	16	y				10		65	25						
54	SP	23		0.56	0.09	y	90	5	5					15		old HS originally two logs, 4 look fallen
55	RI	3						5	95							
56	GL	9					30	35	15	5		15				
57	RI	5					5	10	80	5						RI w/pockets
58	GL	26					10	20	40	5		25				
59	BW	3		0.39	0.23		60	40								1 log
60	RI	8					5		55	10		30				
61	SP	48		0.38	0.15		10	20	30			40		10		
62	PP	10		0.66	0.13			5				95		50		
63	SR	0.25										100				ws to ws 0.2
64	GL	9						15	15	10		60		50		

Billie Creek

UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
65	SR	0.5										100				ws to ws 0.2
66	RR	10					5	5	5			85				incised into BR on RL and alluvium RR
67	SP	13					10	25	55			10		50		
68	RR	9					5		5		5	80	1	50		always RL
69	GL	14					5	5	20	5	5	60	2			
70	SR	0.25										100				0.1 ws to ws
71	RR	16					5	5	5			85		40		
72	SR	0.25										100				0.35 m ws to ws
73	RR	16					5	5	5			85				
74	SL	0.25														0.28 m ws to ws
75	GL	9					10	10	10			70				
76	SP	10					10	5				85			y	same jam
77	BW	7					100								y	same jam
78	GL	16					10	40	25		5	20			y	same jam
79	RI	8							90	10						
80	SP	37					60	5				35				
81	BW	3					100								y	1 big log
82	RI	8					5	5	70			20				incised into alluvium here
83	SP	16					50	10	40					40		
84	BW	4					60	10	30							side jam (pool behind)
85	RI	10							85	15				25		
86	GL	18					20	15	55			10		20		RI w/ pockets
87	RI	40					5	10	45	40				50		
88	GL	15					10	5	60	15	5	5		50		w/ mid channel bar

Billie Creek

UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
89	LP	8					20	20	50	5		5		50		
90	RR	3										100		50		
91	GL	5					10	10	25	5	5	45				
92	SR	1										100				0.11 ws to ws
93	SP	7		0.44	0.06		15	5	15			65		50		still incised into alluvium
94	GL	10					5					95		100		
95	RR	2										100		50		
96	SP	20		0.55	0.1		5	35	5	5	5	45		35		
97	BW	6	y	0.27	0.12		100							20	y	2 logs
98	RR	28						5	5			90				
99	?	4					100									dry area behind giant log on side
100	SP	14		0.6	0.11		40	10	25			25		50		
101	BW	3		0.32	0.01	y	100									side jam
102	LP	20		0.7	0.25		40	35	20			5		50		
103	SL	0.25														ws to ws=0.26, old big log HS ph #122129
104	RI	9	y				5		90	5						ph#127 of 2nd ch/mid ch bar
105	SP	5	y	0.17	0.07	y	30	5	60	5					y	
106	RI	12						10	85	5						
107	DP	11		0.84	0.06	y	25	10	60	5				50		ph #125126
108	BW	7		0.66	0.09		60	25	10	5				50	y	one big log/DJ
109	GL	18					20	30	40	5	5			50		
110	DC	15	y				95		5							

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UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
111	BW	3		0.18	0.01	y	100								y	old HS log (maybe washed down, no longer cabled), ph # 129130
112	BW	4	y	0.45	0.15		80	10	10							
113	RI	11						5	95					50		
114	SC	1							50	50						
115	DC	12					100									1 giant log on side old HS?
116	SP	15		0.72	0.09		35	30	10	5		20				
117	RR	32				y x 2	5	10	10			75		50		side jam and cross jam, ph#131, #132 of side habitat with no HU name
118	PP	4		0.39	0.11	y		10	80			10		100		
119	RR	18				y		10	10			80		60		old HS log w/fallen alders
120	RI	6						5	90	5						end BR
121a	DC	11	y			y	80		20							same jam, causing island, old HS (at least partly), ph#133134
121b	PU	25	3			y	10	10	55	5		20		10		same jam, causing island, old HS (at least partly), ph#133134
122	DP	12		0.67	0.12	y		55	40			5				same jam, causing island, old HS (at least partly), ph#133134
123	DC	7	y				70		30							

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UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
124	RI	7				y			90	10				20		
125	LP	10		0.54	0.14		70	5	20	5						
126	GL	4						10	90							
127	SP	7		0.55	0.15		30	25	40	5				50		
128	DC	7	y				10		85	5					y	
129	PU	16	y				15	10	70	5				50	y	TJ RL (looks like additional BW)
130	RI	9	3				5		90	5					y	DJ
131	RI	12				y			90	10				10		eroding old logging rd.
132	DP	13		0.64	0.09	y	30	10	50	10					y	different jam
133	BW	3		0.44		y	100							30	y	same jame as above
134	AL	13	y				100									
135	RI	5					5	5	85	5						
136	LP	22		0.91	0.01		55	5	40					10		bank incised into soil
137	IP	2		0.12			90		5	5						gravel bar
138	RI	5	y						90	10						prob 1 channel @ higher flows (mid channel bar)
139	RI	4					5		90			5				incised into BR RL
140	GL	8					5	5	70			20				incised into BR RL
141	RI	4					10	10	75			5				above RJ RL
142	SP	38		0.57	0.1		35	5	50	10				20		nice floodplain, incised into soil RR
143	RI	10	y						90	10						
144	RI	10							85	15						
145	BW	3		0.24	0		100									

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UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
146	AL	15					100									swampy back area but not connected and doesn't look like a trib
147	GL	16					5		80	15				5		
148	DP	10		0.87	0.19	y	60	15	15	5		5			y	ph # 135137
149	BW	3		0.47	0.01	y	95		5						y	same jam
150	RI	8						5	80	10	5					incised ~1 m BR RL
151	RI	2	Y				5	5	90							
152	DP	6	Y	0.37	0.01		60		40						y	1 giant log (old HS)
153	BW	8		0.3	0.01		90		10						y	1 giant log (old HS) plus DJ
154	SP	8		0.42	0.24		10	5	80	5						
155	SC	1							90	10						gravel step?
156	LP	16		0.95	0.11		60	10	15	15						incised, eroding into old rd
157	RI	5						5	75	20						
158	PU	8	Y				85		10	5						
159	SP	7		0.47	0.12		10	25	45	20				40		
160	AL	7					100									
161	RI	6							90	10				50		
162	SP	12		0.58	0.19		45	20	25	10				20		
163	RI	10							55	40	5					
165	AL	9					100								y	behind enormous log
166	GL	19						5	70	20	5					
167	AL	6					100									doesn't seem like a trib (?)

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UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
168	RI	13							40	50	5					
169	SP	12		0.43	0.22		25	30	20	15	10					bank failure
170	BW	13		0.63	0.12	y	90		5	5						
171	SP	15		0.49	0.23		70	5	20	5						
172	RI	4							65	35						
173	LP	9		0.7	0.19		20	30	40	10						
174	LP	19		0.7	0.07		70		30					50		
175	RI	23							40	60				10		
176	GL	18					5	10	80	5				30		incised into soil
177	GL	14	Y				10	20	60	10						barely flowing
178	RI	16					10	10	60	20				30		
179	SP	16		0.98	0.13		60	15	15	5	5					
180	IP	2		0.13			50	10	20	20						cobble bar
181	RI	7							30	70						cut bank w/ fluvial deposits
182	LP	22		0.63	0.18		15	25	35	20	5					ph#141144
183	RI	21							40	60						
184	GL	30	Y				50		25	25					y	DJ caused island w/ 1 big log
185	GL	26					5		55	40						
186	RI	8							90	10						
187	SP	38		0.59	0.12		40	5	20	10		25		20		hab behind log ph #147
188	RI	32					5	5	40	50						mid channel bar
189	RI	8	Y						60	40						mid channel bar
190	GL	8	Y				85	5	5	5						
191	GL	17					5	10	65	20				20		

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UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
192	RI	28						5	55	40				50		mid channel bar ph 148
193	DP	34		0.65	0.09	Y	60		25	15			1	50	y	giant tree fall
194	GL	12	Y				20		50	30						ph #149167
195	RI	11					40	50	10							
196	DP	18		0.56	0.11		85	5	10							DJ
197	GL	17					5	15	65	15						
198	RI	8							70	20	10					
199	GL	17					10	20	40	25	5			50		
200	BW	5		0.23	0.05		5		75		20		3			boulders/bank failure
201	RI	33						5	35	30	10	20	3			incised but only ~0.5 m BR RL (can't really tell)
202	GL	21					15	10	35	5	5	30	2	5		
203	RI	5							10	75	15			30		ph 171 looking ds=bedrock/sed
204	SP	8		0.61	0.19		30	30	20	10	10		1	25		and behind log hab (1 log)
205	DC	14	Y				50		25	25				40		
206	RI	23							45	40	15			50		island
207	PU	14	Y				5		5	80	10		1			
208	SP	23		0.6	0.16		20	20	30	10	20		10			incised into soil, angular boulders from hillslope (slide slope)
209	RI	5						5	35	40	20					
210	GL	8					10	10	25	20	35		16			
211	RI	11							85	15						

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UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
212	PU	12					50		35	15						cobble/gravel bar
213	SP	4		0.4	0.1		5	20	50	25				40	y	2 logs
214	RI	9					5		90	5				50		nice FP
215	AL	2					100							50	y	caused by fallen tree
216	BW	3		0.12	0.1	y	60		40							
217	SP	49		0.9	0.15		40	5	50	5				25		
218	RI	BLA NK							45	40	15		2			
219	DC	8	Y				10		85	5						side island bar
220	SL	0.25					100									ws to ws=0.12
221	RI	10							90	10				5		Tj RR before
222	BW	3		0.32	0.11		85		10	5					y	1 giant old tree, water prob connected, ph 174175
223	SP	39		0.81	0.09	y	55	5	25	15				40		side jam
224	?	3				y	10		60	30						ph # 176 of deepest spot
225	RI	11						5	55	40				50		
226	DP	5		0.42	0.11	y	10	10	65	10	5			90		
227	SD	1														ws to ws = 0.13, ph 181
228	DP	15		0.87	0.21	y	60	5	30	5			2	50	y	PTC from rocks b/c porous dam, pool prob actually associated with jam above
229	BW	12		0.3	0	y	100									also a TJ RR into BW

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UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
230	DC	10	Y			y	60		40							same jam
231	GL	3				y	15	5	70	10						same jam
222	DP	5		0.55	0.18	y	40	25	35							same jam
223	BW	5	Y	0.32	0.02	y	90		5	5						same jam ph 182
224	SP	13		0.65	0.2		20	20	35	20	5					
225	RI	4							70	30						
226	SP	20		0.61	0.11		15	10	60	10		5				~1 m incised into BR
227	SP	10	y	0.39	0	y	80		10	10						
228	DC	15	y				90		10					40		
229	RI	20							90	10				50		
230	DP	6		0.66	0.12	y	85		10	5					y	side jam
231	SL	0.25														ws to ws = 0.2, ph 184
232	RI	21	y				10	15	75					40		
233	SD	1	y													ws to ws=0.05, ph #185186
234	RI	18							45	50	5			20		
235	DP	15		1.03	0.15	y	100								y	mostly just one big log (old growth)
236	PU	10	3				20		75	5						through island, prob associated with giant LJ
237	PU	7	4				100									through island, prob associated with giant LJ
238	DP	11	y	0.35	0.22	y	55	5	30	10				70	y	old buried logs, area WAY COMPLEX, w/ Allike nooks in a

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UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
																few directions
240	RI	28						5	90	5						
241	DC	25	y				85	5	10					30		gravel bar
242	LP	11		0.66	0.15		5	20	65	10				20		
243	RI	4							70	30						
244	DC	6	y				80		10	10				50		side of bank
245	IP	13	y	0.39	0		100							50		side of bank
246	DC	7	y				5	5	75	15						thru cobble /gravel bar
247	DP	9		0.76	0.17	y	15	25	55	5				50	y	3 alders
248	RI	3						5	75	20				20		ph # 187188
249	DP	8		0.38	0.16		10	10	65	15				20	y	1 big alder
250	RI	4						5	60	30	5			50		
251	GL	7						20	35	40	5			50		
252	BW	7		0.41	0.18		45	10	30	10	5		1			associated w/ 1 large boulder
253	RI	4							70	40						
254	BW	10	Y	0.28	0.11		70	5		5	20			50		behind gravel bar
255	LP	15		1.28	0.12		90		5	5						also 1 big alder
256	RI	11							95	5						ph#189193
257	SP	18		0.5	0.12		35	5	40	10		10				
258	RI	4	Y					5	90	5						
259	DP	10	Y	0.47	0.06		25	15	50	10				40	y	2 logs
260	RI	9						5	50	10		35		10		~1 m incised into BR
261	DP	28		1.32	0.13	Y	55	5	30	10				20	y	jam mid pool
262	RI	6							90	10						

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UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
263	LP	18		0.42	0.12		10	10	60	10	10		7	30		
264	RI	17						5	80	15				30		
265	DC	8	Y				85		10	5				40		
266	LP	15		1.13	0.1		80	5	10	5				15		two large logs within pool, incised into alluvium
267	SC	1							60	40						ws to ws=0.03
268	PU	10	Y			Y	90		10						y	
269	SP	7		0.54	0.12	Y	35	15	45	5						
270	BW	2	Y	0.16		Y	100								y	same jam as above
271	RI	3							90	10						
272	SP	11		0.47	0.12		35	15	40	10						eroding into alluvium 1 m, ph#202, 203
273	RI	7					10	5	55	30						
274	SP	9		0.51	0.15		10	5	50	30	5					
275	RI	4					5	5	75	10	5					
276	SP	13		0.39	0.09		35	30	30	5				50		
277	RI	14	Y					5	85	10				30	y	braided, one old growth, and alder tree root
278	RI	14	3					5	85	10				30	y	braided, one old growth, and alder tree root
279	RI	3					5	10	75	10						ph# 204213
280	AL	45					100									
281	SL	0.25														ws to ws = 1.6
282	RI	6							60	40						

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UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
283	SP	23		0.77	0.14		65	5	15	15				40		
284	SC	1							70	30						ws to ws = 0.03
285	LP	14		0.35	0.11		15	5	70	10					y	one big log
286	GL	2					5	5	80	10						
287	DP	15		0.74	0.1	Y	85	5	5	5				5	y	scatter jam , eroded into alluvium
288	RI	4	Y			Y			100						y	
289	DC	3	Y			Y		5	55	40					y	
290	RI	5				Y			70	30						
291	BW	3	Y	0.36	0.04	Y	95		5						y	
292	DP	5		0.8	0.11	Y	80	5	15						y	eroded into alluvium RL
293	RI	4						5	95							
294	GL	15					10	5	60	20	5			25		
295	BW	2	Y	0.21	0.09		100							50	y	incised ~ 1 m BR RR
296	BW	2	Y	0.45	0.3		80					20				gravel bar, trib?
297	RI	8							70	30						
298	SP	14		0.57	0.12		40	20	35	5				45		
299	RI	4	Y				5	5	60	30				20		
300	DP	3	Y	0.28	0.1		20	15	55	10					y	
301	RI	15						5	65	30						
302	SP	11		0.73	0.21		80	5	15					50	y	
303	DC	13	Y				10		80	10						
304	IP	2	Y	0.18			40	10	50							
305	DC	8	3			Y	100								y	
306	GL	7						20	60	15	5			25		

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UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
307	RI	4							80	10	10					~1.5 m eroded alluvium RL
308	DP	7		0.55	0.18	Y	15	10	50	10	5		1			2 m eroded alluvium RL
309	RI	9							95	5						
310	SP	23		0.64	0.14		40	15	40	5					y	0.5 m eroded into alluvium RL
311	DC	11	Y				15		85							
312	RI	8						5	85	10						
313	PU	12	Y				100									
314	SP	13		0.86	0.09		80	5	5	10						
315	DC	10							60	40						
316	SP	7	Y	0.62	0.25		70	10	10	5	5					
317	RI	8						5	80	15				50		
318	SP	21		0.73	0.12		90	5	5					50		
319	RI	14							70	30						
320	BW	2	Y	0.22	0.12	Y	50	45		5					Y	
321	SP	16		0.63	0.12		35	15	35			15				incised ~ 2 m BR RL
322	RI	6						5	80	15						
323	DP	5		0.35	0.13	Y	25	10	50	15					y	
324	GL	5	Y						100						y	
325	GL	6	Y				5	5	85	5					y	
326	BW	8	Y	0.38	0.18	Y	30	5	65							
327	RI	19						10	60	30						
328	GL	23					5	5	45	45						
329	PU	15	Y				40		55	5						

Billie Creek

UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
330	RI	6							100						y	one large log
331	SP	14		0.75	0.1		70	5	30	15				10		
332	SP	8	Y	0.45	0.13		100								y	one large log
333	RI	2	Y				50		25	25						
334	GL	4	Y				90		5	5						
335	RI	5							95	5						
336	SP	6		0.35	0.11		50	5	35	10						
337	RI	4							95	5						
338	SP	14		0.84	0.11		55	5	15			25				
339	PU	6	Y				10		85	5						
340	RI	6							80	20						
341	GL	5					20	10	50	20						
342	LP	18		0.64	0.1			80	10	10				50		
343	RI	4							65	45				20		
344	GL	5						10	60	30						
345	PU	9	Y				60		30	10						
346	SL	0.25														ws to ws=0.09
347	RI	4					5	5	75	15						
348	SP	9		0.78	0.11	Y	70	5	20	5					y	
349	RI	6							70	30						
350	GL	5	Y				70	10	20							
351	SP	11		0.45	0.1		15	5	70	10					y	
352	RI	17						10	65	25				30		
353	GL	12					5	10	70	15				50		
354	RI	12					5	5	50	40				40		

Billie Creek

UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
355	LP	26		0.45	0.13		10	10	60	20				5	y	one large log ph # 227233
356	SC	1							60	40						
357	IP	4	Y	0.37		Y	100									trib? Laterally displaced (AL???)
358	LP	12		0.41	0.1		10	15	45	25	5					
359	SC	2							50	50						ws to ws = 0.15
360	AL	7	Y			Y	90		10						y	
361	RI	9						5	40	50	5					
362	SP	8		0.6	0.12	Y	15	5	25	50	5			80		
363	PU	7	Y				20		40	40						
364	RI	4							50	50						
365	AL	5	Y			Y	80	20								
366	GL	10					5	5	70	20	5					
367	RI	9						5	90	5				50		
368	SP	5		0.49	0.16		30		50	20				50	y	2 logs
369	RI	5					5	5	80	10				50		mid channel bar
370	SP	13		0.62	0.15	Y	50		10	40				100	y	thick wood jam (can't see)
371	DC	15	Y				30		60	10						
372	RI	18					5		35	60						
373	SP	8		0.35	0.11		30	15	35	20				40		
374	RI	10						5	70	25				10		ph #234235, mid chan bar
375	SP	6	Y	0.37	0.11		45	20	30	5				25		
376	SP	5	Y	0.44	0.09		60	15	10	15				50	y	
377	SC	2							10	90					y	ws to ws = 0.15

Billie Creek

UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
378	GL	8					15	15	35	35				20		ph #236238
379	RI	17					5	5	45	45				15		
380	SP	15		0.82	0.11	y	35	5	35	10		15			y	all same jam
381	SP	4	Y	0.3	0.1	y	100								y	all same jam
382	AL	2	Y			y	100								y	all same jam
383	RI	6							50	50						
384	SP	14		0.65	0.14		90		10					30		
385	RI	15						5	65	30				30		
386	SP	7		0.65	0.15	y	70	10	15	5						
387	RI	15							30	70						
388	DP	4	Y	0.4	0.2		70	10	10	10					y	
389	SP	11		0.61	0.1		65	5	20	10				50	y	one log
390	RI	29						5	55	40				10		
391	RI	15	Y					5	55	40				50	y	
392	SP	13		0.59	0.11		75	5	10	5	5			15		
393	RI	6						5	45	50				50		
394	PU	8	Y				50		10	40				80		
395	SP	6		0.31	0.14		20	25	30	25				30		
396	RI	13				y		10	40	50						side jam
397	SP	6		0.36	0.14	y	10	15	45	25	5					side jam
398	RI	13							15	85						
399	SP	10		0.35	0.14		20	35	20	20	5			50		
400	RI	5						5	35	60				30		
401	DP	9		0.38	0.11	y	25	65	5	5					y	
402	GL	10					15	85								nice floodplain

Billie Creek

UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
403	RI	18						40	45	5	5	5				
404	GL	9					5	15	45	35						
405	SC	2							45	55				50		
406	RI	15						5	30	65				10		
407	SP	11		0.49	0.1		90		5	5				50		side debris
408	SC	1							10	85	5					
409	RI	26						10	30	60						
410	GL	5						30	35	15		20				
411	RI	34						10	30	60						
412	SP	9		0.59	0.15		80	5	10	5				30		
413	RI	6						10	25	60	5			50		
414	DP	6		0.58	0.12	y	50	25	5	5		15		50	y	large tree root
415	RI	2	y					5	85	10						
416	RI	55						15	50	35						
417	DP	6		0.45	0.19	y	85		5	10					y	
418	RI	5						10	30	60						
419	GL	5						20	40	40						
420	RI	4						10	15	75						
421	SP	7		0.36	0.13		30	25	15	25	5			50		
422	SC	1							25	70	5			100		
423	SP	8		0.62	0.11		55	10	20	10	5			50		
424	RI	4						5	10	70	15					
425	SP	8		0.41	0.1		30	10	15	25	20					
426	RI	8						10	30	50	10			10		
427	GL	12					10	20	30	30	10			15		

Billie Creek

UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
428	RI	8						5	10	65	20			50		
429	SP	9		0.5	0.1		40	15	20	20	5		1	75		
430	RI	7						10	30	35	25			50		
431	SP	8		0.35	0.11		10	40	20	20	10					
432	RI	19						5	25	35	35					
433	GL	5					5	35	35	15	10			50		
434	RI	5					5	30	35	15	15					
435	SP	9		0.37	0.1		10	30	15	25	20			50		
436	RI	3						5	15	60	20			50		
437	DP	7		0.57	0.15		80		5	15				50	y	
438	RI	9						15	40	35	10			35		
439	SP	13		0.29	0.14		25	30	10	30	5			50		
440	RI	67						5	55	25	15			30		
441	SP	7		0.37	0.17		30	40	10	10	10			25		
442	RB	9						10	10	20	60					one large tree RR
443	GL	7					20	30	35	10	5					
444	RI	35						10	40	30	20					
445	PU	10	Y				10	5	35	30	20					DJ on main channel
446	BW	1	Y	0.25	0.05		100								y	
447	DP	5		0.31	0.07		15	55	15	10	5				y	
448	GL	11					10	15	55	10	5	5				
449	RI	25						10	35	35	20					
450	RB	3						5	5	10	80					
451	RI	64						10	35	35	20			20		incised into alluvium
452	RB	12						15	25	10	50			35		steppooly

Billie Creek

UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
453	SP	7		0.48	0.16		10	30	40	10	20					1.5 m incised into alluvium
454	RI	24						10	40	30	20		4	55		
455	DP	5		0.25	0.09		15	15	35	30	5				y	baby jam
456	RI	14						10	35	30	25		6	75		
457	RR	27							5	5	10	80	20+	50		
458	SP	11		0.42	0.09		10	20	35	15	10	10	3			
459	RR	20						5	5			90	1	10		
460	BW	6	Y	0.2	0.04		100						1			
461	RI	28						10	40	30	15	5	7	5		mid channel bar
462	SL					Y										ws to ws = 0.46
463	RI	10					5	15	45	30	5		3	25		
464	SP	7		0.38	0.16		10	45	25	20				80		
465	RR	3								5		95				
466	TP	4		0.42	0.21		30	30		10		30		50		
467	RR	11							5	5		90				
468	PP	4		0.45	0.11	y	10	75	15							really old jam
469	RI	9						5	10	85				25		
470	DP	2		0.69	0.11	y	75	15	5	5				100		
471	RI	5							10	85	5			50		
472	SP	4		0.34	0.09	y	25	20	25	30				50		ancient log step
473	RI	18						5	10	85						
474	DC	16	y					85	5	10				40		
475	GL	19					15	15	50	20				10		
476	SC	2							15	60	25					
477	DP	11		0.51	0.09	y	85	5	5		5				y	

Billie Creek

UNIT #	UNIT TYPE	UNIT LENGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
478	SP	13		0.45	0.09	y	85	5	5		5					
479	RI	10				y		5	25	45	20	5	7			side jam
480	SP	5		0.3	0.12		10	40	30	15	5			10		
481	RI	83						5	25	55	10	5	10+			keeps on rifflin

Stream Survey Data for Uncle Creek

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
1	RI	8					10	5	10	70	5					cut into BR RR
2	GL	8					10	5	20	55	5	5				cut into BR RR
3	LP	6		0.68	0.3		10	10	25	40	5	10				cut into BR RR
4	DC	27	y				90			10						cobble bar RL
5	RI	22					5	5	15	70	5					no longer BR
6	BW	8		0.36	0.07		70	5	10	15				30		
7	IP	5		0.22			75	5		10	10			25		
8	DC	14	y				60			40						cobble bar RL
9	GL	11					5	5	20	65	5			40		
10	RI	9						5	50	40	5			20		
11	LP	24		0.79	0.06		15	15	20	25	5	20		30		~2 m incised BR RL
12	RI	19					5	15	40	30	10		4	40		pockets
13	SP	26		0.7	0.15		15	20	25	5		35	4	50	y	incised BR RR ~2m?, boulders are HS
14	RI	18						5	30	50	10	5				at least 1.5 m incised BR both banks
15	GL	10					5	5	35	45	5	5				at least 1.5 m incised BR RL
16	RI	8					5	5	25	55	5		2			at least 1.5 m incised BR RL
17	PU	10					65		20	15						at least 1.5 m incised BR RL
18	DP	22		0.64	0.14	HS	40	10	35	10		5	2	50	y	caused by LWD jam HS, ph #246-252
19	RI	9				HS			35	60		5				
20	GL	13					5	5	45	40	5					
21	DC	10	y				15		70	15						

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
22	BW	3		0.24		HS	100									HS ph#253-254
23	RI	10							15	75	10					
24	DP	15		0.46	0.11		10	10	40	35		5			y	HS-associated pool - two logs, one boulder
25	SS	0.25											3			ws to ws = 0.07
26	DP	7		0.57	0.16	HS	10	5	50	30	5		1	10		
27	SS	1				HS										ws to ws = 0.15, ph#255
28	RI	9	y				5	5	30	60						associated w/ cobble bar u/s of HS
29	SP	8	y	0.26	0.07		50	5	20	20	5					
30	RI	7	y				5	5	45	40	5					
31	RI	39							25	70	5					0.5 m incised BR RL
32	BW	6		0.35	0.1		90		5	5				10		HS-associated, 1 log, 1 boulder, ph#256-257
33	SP	45		0.37	0.12		40	10	30	20						1 m incised BR RR
34	DC	14	Y				10		30	60						
35	RI	5						5	25	70						
36	DP	18		1.08	0.12	HS	40	10	20	25		5		30		HS ph#258
37	RI	13							30	65		5				2 m incised into BR RL
38	PU	12	Y				50		40	10				10		trib?
39	LP	12		0.61	0.13		5	10	35	20		30	1			
40	RI	8							40	55	5					
41	GL	13					5	5	55	30	5					1 giant log- old growth on side
42	RI	7							35	65						
43	GL	15					5	5	40	50						
44	RI	23							25	70	5					

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
45	DP	15	Y	0.4	0.03		60	5	20	5						cobble bar dam
46	DC	19	Y				5	5	20	70						
47	GL	17					5	5	35	50		5				
48	RI	11							35	60	5					
49	SP	18		0.68	0.05		20	5	20	30	5	20				
50	DC	22	Y				5	5	10	70	10					
51	RI	13							15	80	5					
52	SP	16		0.8	0.17		25	5	15	35	5	15				
53	SC	1							25	75						ph#266-267 for definition
54	LP	23		0.53	0.1		25	5	35	15	5	15				ws to ws = 0.12
55	BW	1		0.11	0.04	HS	90		5		5					1 boulder and 1 log, but insignificant
56	RI	8	y					5	40	50	5		1-HS			
57	RI	5	y				5	5	45	40		5			y	very wide, part HS, part natural log jam and 3 boulders
58	SP	4	y	0.26	0.06		50	10	5	25		10			y	very wide, part HS, part natural log jam and 3 boulders
59	RI	2	y				5	15	50	25	5				y	very wide, part HS, part natural log jam and 3 boulders
60	DP	5		0.43	0.05	y	70	10	20						y	very wide, part HS, part natural log jam and 3 boulders
61	PU	6	3				10		70	20					y	very wide, part HS, part natural log jam and 3 boulders
62	SC	3							15	80	5				y	very wide, part HS, part natural log jam and 3 boulders

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
63	GL	7						5	55	35	5				y	very wide, part HS, part natural log jam and 3 boulders
64	SP	0.25		0.49	0.25		15	15	20	30	10	10			y	very wide, part HS, part natural log jam and 3 boulders
65	DP	6	4	0.23	0.01		70	10	15	5					y	very wide, part HS, part natural log jam and 3 boulders
66	PU	6	y				20					80			y	very wide, part HS, part natural log jam and 3 boulders
67	RI	29							50	45	5					
68	SP	26		0.84	0.08		55			5		40				
69	RI	23							40	50	10		1			
70	GL	29					5	5	35	45	5	5				
71	RI	23						5	30	45	15	5	1			incised at least 1 m in BR RR
72	SP	24		0.63	0.11		65	5	10	10		10	2			
73	RI	18					5		40	40	10	5	4			
74	GL	17						5	50	35		10				
75	RI	48							35	50	10	5	3			
76	BW	4	y	0.3	0.16		85		10	5						at end of secondary dry channel behind cobble bar
77	DC	24	y				10		70	10	5	5				
78	RR	7							5			95				
79	GL	11					5	5	5	10	10	65	2			
80	RR	14										100				
81	SP	14		0.51	0.2		10	5	10	5	10	60	3			
82	SR															ws to ws = 2.2
83	RR	10							5	20	5	70				
84	RI	7					5	5	25	30	25	10	1			

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
85	RR	12						5	5	10	20	60	1	50		
86	RI	25							15	35	20	30				
87	SP	4		0.39	0.18		10	15	25	25	10	15		25		
88	AL	5		dry			50		10	40						behind RW, alder tree
89	SB	1								30	70					
90	RR	15							10	15	15	60	4			
91	IP	3		0.14			70	5	10	15				50		cobble bar
92	SP	14		0.74	0.15		20	5	20	20	5	30	1	10		
93	RI	27				y	5	5	10	70	10					side jam, alders
94	DC	29	Y			y	90			10					y	same jam
95	SP	21		0.55	0.12		15	15	35	25	5	5				incised into BR RR at least 2 m
96	RI	13						5	20	65	10					incised into BR RR at least 2 m
97	SP	31		0.51	0.2		5	10	35	30	10	5				
98	RR	22							10	10	5	75	1			
99	GL	10					10	5	5	10		70				
100	RI	5				y		5	25	65	5		2			side-jam
101	SP	6		0.35	0.18		10	10	45	30	5					
102	RI	5						5	10	65	10	10	2			
103	GL	8					10	10	10	30	10	30				still incised ~2m BR RR
104	DC	14	Y			y	5		15	55	25		2			
105	RR	8							5	5		90				
106	RI	14				y			10	75	15					side-jam RR, bank failure RL, incised into alluvium RL above ~1m BR
107	SP	18		0.43	0.11		10		30	40	5	15				
108	RI	7							35	45	15	5	1			
109	SP	23		0.82	0.16		15	15	20	25	5	20				
110	RI	32						5	20	70	5			20		still incised BR RR

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
																~2m
111	SP	19		0.75	0.15		10	10	20	25	20	15				
112	DC	12	Y				10		20	40	30					
113	RI	12							30	50	20					
114	DP	31		0.95	0.14		60		20	10		10			y	2 logs
115	RI	4					5	10	70	10	5					
116	PU	8	Y				15		15	50	20					
117	GL	16							35	60		5				
118	BW	3		0.13	0.07		85	10	5					50		behind cobble bar
119	RI	12						5	25	50	10	10		5		
120	DC	12	Y			y			30	40	30				y	all same jam
121	DC	5	3			y	20		60	20					y	all same jam
122	LP	2	Y	0.1		y	95			5					y	all same jam
123	BW	3	Y	0.15		y	95		5						y	all same jam
124	GL	9				y		10	20	40		30				all same jam
125	RI	5				y			20	30	20	30	10			all same jam, incised into BR RL now
126	DP	8		0.45	0.18	y	5	10	55	25	5			50	y	all same jam, pool after wood
127	RI	11							45	40	10	5				mid channel bar
128	GL	13				y	5	5	40	45	5		1	50		
129	RI	16							25	70	5		2	50		back to incised RR ~1m BR
130	SP	14		0.78	0.16		30	20	10	15	5	20	1			
131	RI	23						5	20	60	5	10				
132	SP	15		0.61	0.21		10	20	20	30	5	15				
133	IP	2		0.22		y	65	30	5							
134	DC	45	Y			y	30		55	15						
135	RI	16				y		5	20	65	5	5				
136	SP	16		0.36	0.19		10	20	55	10		5				
137	RR	1										100				
138	RI	25							45	35		20				

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
1	RI	7							15	50	30	5				severely incised into BR, top of cascade (boulder)
2	GL	13				y	10	15	60	5		10				severely incised into BR (TJ in middle, waterfall)
3	CR	3				y			10	30		60				severely incised into BR, same jam
4	RI	20					5	5	65	5		20				severely incised into BR
5	GL	6						20	75	5						severely incised into BR, nice bar
6	RI	14						5	80	15						severely incised into BR
7	DP	7		0.52	0.06	y	40	25	30	5						cut bank is now not BR
8	GL	11					5	15	75	5						mid channel bar
9	LP	5	y	0.21	0.06		30	50	15	5						
10	SC	2						10	80	10						
11	LP	21		0.77	0.05		25	15	30	5		25		10		lateral bar
12	DC	11	y			y	15	10	50	25						side channel
13	RI	6						5	70	25						
14	LP	10		0.56	0.12		10	10	30	30		20				
15	GL	8						35	15	10		40				
16	DP	2	y	0.32	0.19		35	25	25	15						
17	RI	18						10	55	10		25				
18	RI	18	y				5	10	80	5						
19	LP	16		0.6	0.16		10	40	15	15		20				
20	RI	15					5	5	30	35	10	15				
21	RI	15	y				5	35	25	30	5					cobble bar
22	GL	15					10	30	15	25	5	15				cobble bar
23	RI	35						5	35	50	5	5				cobble bar
24	DC	28	y				25	25	40	10						

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
25	GL	15					5	15	15	15		50				
26	RI	49						10	30	35	10	10	5			
27	LP	13		0.59	0.14		15	15	20	30		20				
28	RI	14					5	10	45	30	5	5				mid-channel bar
29	LP	17		0.69	0.12		5	30	15	10		40				
30	DC	17					30	30	25	15						dry trib junction
31	RI	102						10	15	35	5	35	2			kind of step-pool like but pools are glides , also incised into BR photo#100-23 and 24
32	DP	7		0.43	0.15	y	5	30	40	5	5	15	1			DJ ph#25, 26
33	RI	44						5	25	70						
34	LP	25		0.94	0.12		10	5	40	30		15				
35	RI	17						5	30	65						Ri w/ pockets and cobble bar ph#27
36	LP	13		0.64	0.15		20	25	20	15		20				nice floodplain
37	RI	7						5	10	80	5		1			incised ~10 ft in BR
38	LP	10		0.73	0.15		10	10	25	35		20				
39	RI	14	Y				5	30	45	20						
40	DP	13	Y	0.33	0.1		35	5	20	35	5				y	1 big cut log
41	RI	15	Y				10	5	45	40						
41	RI	30					5	10	35	45	5					
42	GL	13					10	25	45	20				5		side area under log = refuge?
43	RI	18						10	15	65	10			20		
44	BW	3		0.34	0.18	y	70	10	5	15						side jam
45	SP	10		0.25	0.1		15	15	35	25	5	5				
46	CB	10						5	20	60	10	5				cascade over cobbles? Ph#29, 30
47	SP	23		1.24	0.09		15	15	5	5		60				
0	AL	38				y	10	10	50	30						on way back, didn't see, wpt 08 where

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
48	RI	18					5	10	25	15	5	40				we started jam # 2/3
49	BW	3		0.19	0.05		20	15	30	35						ph#31
50	IP	7		0.2		y	55	5		40				10	y	puddled, side LWD jam
51	DP	1		0.29	0.1		5	10	60	25					y	DJ pool on side of channel
52	SC	3						5	10	80		5				
53	GL	2					5	5	20	55	5	10	1			
54	LP	9		0.63	0.17		5	10	40	15		30		5		
55	RI	13					5	5	10	75	5					
56	SP	19		0.73	0.23		10	20	20	30	5	15				
57	AL?	2					5			5		90				ph#32
58	AL? DC? BW?	13	y?				10	10	40	35	5			20	y	2 logs jam ph#32-36
59	RI	34					5	5	35	50	5		3			
60	LP	8		0.61	0.14	y	10	45	30	10		5				DJ also
61	RI	12				y	5	5	55	35						through LWD
62	SP	11		0.47	0.16		5	5	25	25		40				floodplain whole length
63	SC	2						5	20	65	10					
64	GL	8						10	20	35	5	30				
65	IP	1	y	0.1			40	5	20	35				100		
66	RI	8						5	30	60	5		1			
67	GL	10					5	15	30	40	5	5		50		
68	BW	6		0.17			90	5	5							only part w/ water
69	BW	6		0.2	0.06		80	15	5						y	2 logs
70	RI	8							40	50	5	5				
71	SP	18		0.76	0.13		15	20	10	15		40		5		
72	RI w/pockets	60						5	60	30	5					dry trib junction @ bottom

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
73	GL	8					5	10	30	50	5					
74	RI	8						5	30	60	5					
75	BW	3		0.36	0.07		5	30	5			60			y	1 log
76	LS	0.1														ws to ws = 0.23
77	RI	7						5	10	80	5					
78	GL	9					5	15	40	40				5		
79	SC	2						5	30	60	5			40		
80	SP	13		0.55	0.15		10	15	30	35	5	5				
81	AL	3					80		10	10						
82	RI	27						5	30	60	5		2	5		
83	AL	4					100									
84	LP	12		0.61	0.09		10	10	55	10		15		15		
85	RI	3						5	30	60	5			40		
86	SP	20		0.32	0.14		20	10	30	10		30				
87	RI	6						5	10	60	5	20	1			
88	AL	6					95			5				50		
89	SP	13		0.62	0.13		10	10	20	20	10	30	2			incl side pool ph#46
90	RI	9					5	5	20	65	5		2			
91	GL	7					5	15	60	15	5			20		
92	SP	6		0.4	0.12		5	15	45	15		20				
93	RI	26						5	15	25	5	50				
94	SP	5	Y	0.26	0.08		15		10	35		40			y	
95	GL	7	Y				10	5	20	30	5	30	1		y	
96	SC	1	Y						20	55	20	5			y	
97	GL	6	Y				15	15	20	45	5				y	
98	RI	4						5	70	20	5					
99	DP	7		0.62	0.14		20	30	20	25	5				y	
100	RI	5						5	70	25						
101	DP	10		0.66	0.11	y	60	20	20						y	massive log jam w/ nooks
102	LS															ws to ws =0.3
103	RI	10						5	40	40	5	10	1	5		
104	GL	9					5	10	40	35	5	5				

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
105	RI	8					5	5	10	75	5					
106	GL	8					5	15	35	40	5					
107	RI	16						5	20	65	10					
108	BW	2		0.13	0.02		60		20	10	10					side of cobble bar
109	AL	2					100									
110	LP	10		0.42	left blank		15	10	20	35	5	15				
111	RI	14						5	20	70	5		1			
112	IP	3	y	0.35		y	30	5		15		50				BR covered in silt
113	DP	12		0.63	0.1	y	50	10	20	20		5			y	root wad w/ LJ
114	SC	2							10	80	5					
115	RI	10						10	35	50	5					
116	SC	1							5	95						
117	RI	33					5	5	60	30						RI w/ pockets
118	IP	8	y	0.1			30	65	5						y	dry, DJ
119	BW	6		0.4	0.01	y	75	10	15							
120	DP	10		0.73	0.21	y	75	10	10	5						
121	SC	1						5	40	55						DJ blocking (part of log jam)
122	SP	8		0.54	0.11		30	30	30	10						
123	AL	7					90		10							
124	GL	4	y				20	20	45	15						
125	RI	2	y				5	20	75							
126	DP	10	y	0.24	0.06		40	50	10							
127	RI	8						5	85	10						
128	GL	13					15	10	65	10						
129	SC	2	3					5	60	35						
130	SP	7	3	0.39	0.07		15	15	30	10		30				
131	RI	1	3						40	60						
132	DP	6	3	0.45	0.06		60	5	20	15					y	1 log
133	SC	1	3					5	70	25						
134	DP	3	4	0.22	0.12		90	10							y	alive tree
135	GL	25	4				50	40	10							

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
136	AL	6	4				100									
137	RI	9							40	60						
138	SP	23		0.53	0.13		10	5	35	30		20				
139	IP	11	y	0.26			60	5	10	25						
140	DC	15	y				5	5	90					60		above IP
141	RI	21						10	70	20		5				
142	DP	8		0.51	0.16		15	20	35	30					y	2 logs
143	SC	2						5	20	65		10				
144	DC	10	y				35		60	5						
145	GL	8					5	10	45	35	5					
146	BW	8		0.38	0.06	y	40	25	25	10						
147	RI	6						5	30	65						
148	DC	32	y				100									
149	GL	5					10	15	45	30						
150	AL	2					100								y	tree fall and bank failure
151	RI	5						5	50	40	5			40		
152	BW	3		0.35	0.03		50	35	5	10					y	DJ and 1 log
153	GL	4					5	15	45	35						
154	CS	1						5	45	50						
155	AL	14					100									
156	SP	6		0.5	0.13		20	10	60	10						
157	RI	6							55	40	5					
158	GL	9					5	15	70	10						
159	RI	13							40	55	5					cobble step pools
160	DC	2	y				40	50	10							
161	PU	8	y				75		5	20						
162	DC	7	y				100									
163	GL	15					10	15	40	30		5				incised ~0.5 m BR and the rest soil
164	DC	13	y				40		50	10						
165	RI	5						5	55	30	5	5				
166	DP	5		0.83	0.11		60	20	10	5	5			60	y?	photo#48, 53, 54

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
167	RI	24						5	70	20	5					
168	DC	18	y				25	50	20	5						
169	BW	2		0.11	0.02		35	15	40	10						cobble bar
170	GL	15					5	15	40	30	5	5		40		
171	PU	17	y				50	5	15	30						TJ
172	RI	28					5	10	35	35	5		4	10		w/pockets
173	GL	10					5	5	50	30	5	5				incised ~1m BR then soil
174	RI	9						5	30	60	5		2			
175	RI	9	y					5	30	40	5	20			y	side ch caused by 2 boulders and DJ
176	GL	19					5	10	25	15	5	40	3			
177	PU	25	y				40	20	25	10	5		1	10		no fish in pools too shallow
178	RI	25					5	5	40	45	5					incised bank is soil not BR
179	SP	14		0.5	0.12		10	10	35	25	5	15	1	30		tree throw
180	RI	27						5	45	40	5	5	11			w/pockets
181	GL	4						5	65	25	5		2	25		
182	SC	0.5								70	30		1			
183	RI	3						5	40	50	5					
184	BW	3		0.32	0.22		45	35	15	5					y	
185	GL	3					5	10	20	60	5					
186	SC	0.5						5	10	60	25			50		
187	SP	7		0.52	0.18		5	5	30	25		35				tree throw /root wad
188	RI	37						5	35	35	15	10	4			incised into soil
189	CB	2							5	10	85		7			
190	RI	3							40	50	10					
191	GL	8					10	10	15	35	20	10	1			
192	RI	8							35	60	5		4			
193	BW	7		0.44	0.11	y HS	15	15	25	5		40				restoration log jam
194	DP	8		0.52	0.17	y	15	15	25	5		40				
195	GL	11					10	5	40	5		40				

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
196	RI	15					5	5	15	15	10	50	3			
197	RR	14							10			90				shallow slide bedrock
198	GL	8	y					5	10	10	5	70	3			mid channel bar
199	RI	9							15	65	15	5	3			
200	PP	3		0.69	0.17		30		30	30	10		2		y	log step caused pool
201	SL	0.5														ws to ws = 0.37
202	DP	8		0.63	0.06		10	10	50	30						
203	BW	4		0.36	0.07	y	60	15	10	15						
204	SC	1							70	30						
205	DP	7		0.48	0.13		40	10	20	30						DJ
206	RI	20						5	30	50	15		1			Step-pools
207	DP	6		0.6	0.18		15	15	10	20		30		30		boulder dam
1	SP	6		0.57	0.14		70	5	5	10	10			40		just up from trib
2	RI	22					5	5	15	25	50		2	30		TJ RR
3	SP	12		0.62	0.13	y	5	5	5	15	5	5		5	y	root-wad associated
4	RI	21						5	20	353	40		2			
5	PP	6		0.68	0.13		70	5	5	5	5	10	1	100	y	log-step caused
6	AL	2	?				100							100		maybe a trib junc?
7	SL	0.5														HS, ws to ws = 0.44
8	RI	4	y				5	5	50	40						
9	SP	5	y	0.22	0.01		60	5	15	20						
10	PU	7	y				5	5	40	45	5			50		
11	RI	14					5	5	40	45	5					
12	SP	13		0.57	0.09		70	5	10	5	5	5		40		
13	RI	36					5		10	65	5	15	1			
14	AL	5					100								y	photo #s 78-81
15	SP	9		0.32	0.1		15	10	40	25	5	5		60		
16	RI	5					15	10	40	25	5	5		40		
17	GL	7					10	25	15	20		30		15		
18	RI	5						5	25	5		65				
19	GL	7						10	10	5		75				
20	PP	3		0.58	0.3	y	10	10	15	10		55				log jam not causing

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
21	?	10	y			y	5		5	5		85				step pool over BR
22	DP	5	y	0.39	0.06	y	5	5	5			85				
23	RR	6				y						100		30		
24	RI	8					5	5	45	40	5			10		ri w/pockets
25	SP	8		0.4	0.15		10	5	25	15	5	40		30		
26	SP	15		0.43	0.1		10	5	50	35						
27	DC	4					50	50								1 log blocking, no connection, somewhat AL-like but in AC
28	RI	34	y				5	5	45	40	5			50		mid-channel bar
29	RI	34					5	5	45	40	5			50		mid-channel bar
30	SP	19		0.57	0.1		5	5	35	15		40		20		mid-channel bar
31	RI	24					5	5	15	60	15		4			on/near old debris flow deposit
32	GL	7					10	5	65	15		5				
33	SP	16		0.55	0.11		20	10	40	10		20				
34	GL	5					5	10	30	15		40				
35	RR	12						5	5	5		85				
36	RI	17	y					5	40	40	10	5	6			slow-moving RI low water
37	DP	3	y	0.38	0.07		20	25	35	20					y	2 big logs
38	RI	19						5	30	40	10	15	3			
39	SP	9		0.4	0.11		10	15	40	10		25		40		
40	RR	21						5	5	5		85				bedrock chutes
41	RI	17	y				5	5	60	30					y	1 giant log causing
42	SP	4		0.32	0.11		15	15	25		5	40				
43	RI	4							45	35	10	10				
44	SP	14		0.35	0.08		10	20	45	5		20				
45	AL	4					15		55	30						
46	BW	7	y	0.45	NA		45	5	25	20	5			40		connected @ top, DJ
47	RI	34				y		5	45	50						LJ below

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
48	DC	17	y				15		35	40	10					
49	SP	10		0.49	0.13	y	5	25	35	30	5				y	side jam-associated
50	RI	9					5	5	30	45	5	10				
51	SP	22		0.66	0.11		80		5	5		10				ph# 88-90
52	RR	7						5	5	5	5	80				
53	TP	10		0.83	0.11			10	5	5	10	70				ph#91
54	CR	57										100				ph # 92-100, very step-pooly
55	TP	14		0.87	0.07		10					90		60		cut into the BR
56	CR	28							5	5		90				
57	SP	7		0.33	0.08		5	10	20	30	5	30	1			TJ RL (small)
58	RI	10					5		10	80	5		1	10		steep, step-like
59	SP	8		0.7	0.01		80	5	5	10						half backwater
60	SC	3							10	80	10		1			
61	SP	5		0.34	0.14		15	5	10	20	45	5				
62	RI	5						5	10	5		80	2			boulders on side, RI pretty flat , thus not RR, 62-91 when incised, incised into alluvium
63	SC	1							10	90						incised alluvium ph#103
64	RI	4							5	95						
65	GL	10					5	5	40	40						
66	RI	27					5	5	40	50			2			
67	BW	5		0.2	0.14	y	95		5					50	y	side jam
68	SP	12		0.36	0.1		50	10	15	15		10		35		
69	SC	1							50	40	5	5		40		
70	SP	3		0.36	0.11		25	10	25	30		10		50		
71	STE P BR	0.5										100				
72	SP	9		0.46	0.09		25	10	10	10	5	40				
73	DC	9	y				60			30	10				y	1 log associated

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
74	RI	6							40	55	5		2			step pooly
75	SP	17		0.79	0.15		45	15	20	20	10		5	20		DJ on side, but not causing
76	RI	24						5	20	65	10		3	20		
77	SP	9		0.4	0.07		20	5	30	35	5	5				
78	SP	4	y	0.38	0.09		40	5	10	45	5					
79	RI	12	y					5	25	60	10			40		
80	DC	22	y				15	5	15	60	5					thru cobble bar
81	RI	100						5	25	60	10			40		
82	DC	16	y						45	40	5			50		
82	GL	20					5	15	20	35	5	20	1			
83	RI	28						5	35	45	20		3			
84	GL	7					10	10	50	25	5		5	25		
85	SC	1							5	55	40		1			
86	GL	13					5	5	45	40	5			40		
87	RI	19						5	25	60	10		5	10		
88	BW	2		0.31	0.09		80		5	10	5		2			
89	CB	2								20	80					cascade over boulders
90	RI	9	y				10		70	20					y	1 log associated
91	RI	19					5	5	15	70	5			30		
92	GL	5					5	10	20	55	10			55		
93	CB	10						5	20	45	30		8	10		cascade over coulders, step-pooly
94	GL	14					10	5	40	40	5		3			
95	CB	15							10	20	70		14	50		
96	DC	9	Y				10		55	40	5					TJ RL dry
97	SP	9		0.44	0.1		15	15	30	30	10		1	45	y	1 tree, 1 log
98	CB	20							10	25	65		15	50		cobbly, step pooly
99	PU	9	Y				10		50	30	10		1			
100	SP	5		0.56	0.14		10	25	15	25	25		3			giant boulders!
101	RI	5							5	55	40		10			
102	GL	8					20	5	30	30	15		2			

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
103	RI	50							25	55	20		20+	20		
104	AL	8					60			40				50		
105	RB	2	Y						10	15	75		5		y	
106	DP	3	Y	0.28	0.04		20			20	60					boulders-associated
107	RI	3	Y				5		15	70	10			25		
108	RB	5							15	55	30		8			
109	SP	8		0.37	0.13		45		10	40	5		4			
110	RI	23					5	5	20	60	10		10	30		in front of boulders
111	DP	3		0.38	0.14		15	35	25	15	10		3			
112	DP	8		0.7	0.09		15	40	25	10	10		3			
113	RI	8					5		15	55	30		2			
114	SP	6		0.4	0.1		30		15	30	25					
115	RI	63						5	35	40	20		9			step-pooly
116	BW	2		0.21		y	70		10		20					
117	DP	?		0.31	0.06		10	5	25	50	10		1		y	1 small log
118	RI	3					5		15	60	20	5	2	25		
119	GL	8					5		20	35	35		3			
120	RB	2								40	60					
121	RI	17							35	45	25		1			
122	DP	3		0.32	0.1		10		65	15	5	5			y	3 alders and DJ, ~2m incised BR RR
123	RI	14							45	30	20	5	2			ph#269-272, step-pooly
124	LP	7		0.44	0.15		10	5	35	10	40	5				
125	RB	10					5		30	25	40		7			step-pools, ph#273-276
126	SP	4		0.38	0.08	y, side	20	15	35	5	25		1		y	wood holding boulders
127	RB	4							10	30	60		3			
128	DP	6		0.45	0.11		10	15	35	20	20		6	40		boulder-dammed
129	RB	4								60	40		8	50		
130	RI	19					5		40	50	5		8			
131	SP	8		0.6	0.1		20		40	30	10		2			

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
132	RI	28						5	30	45	15	5	4	10		
133	GL	5					5	15	20	20	40					
134	RI	13	y			y	5	5	60	15	5					incised into BR ~3m?, alder jam and DJ
135	RI	13				y	5	5	15	25	50		5	40		incised into BR ~3m?, alder jam and DJ
136	DP	11		0.52	0.1	y	15	5	35	30	10	5				incised into BR ~3m?, alder jam and DJ
137	RI	13					5	5	25	60	5		7	30		long step-pools
138	DP	4		0.32	0.16	y	15	25	35	15	10		4	20		boulders associated w/side jam
139	RB	5						5	20	25	50		5			ph#277-278
140	RI	17						5	40	45	10		9	10		
141	SP	9		0.44	0.09		10	15	25	40	5	5	1	10		still incised BR RR ~2m
142	RB	22					5	5	15	45	30		25	5		step-pools, ph#279-280
143	RI	19					5	5	25	60	5		5			
144	SP	2		0.34	0.08		10	10	25	25	30		8	50		SP around boulders
155	GL	5					5	15	25	30	25		5			step pools
156	RB	30					5	5	20	45	25		20	10		incised into BR ~1 m RR
157	DP	6		0.46	0.1		10	5	25	40	20		7			boulder associated
158	RI	8					5		25	45	25		3			
159	PP	5		0.48	0.15		10	5	35	25	25		2			boulder
160	SB	1							5	5	90		8	50		
161	RI	8						5	20	55	20		9			
162	RI	8	y				10	5	30	50	5		6	10		extremely incised into alluvium on RL, 3x my height?

Uncle Creek

UNIT #	UNIT TYPE	UNIT LGTH	2* CHAN?	DEPTH (POOLS)	DEPTH (PTC)	LWD JAM?	SLT/ ORG	SND	GRVL	CBLE	BLDR	BDRCK	BLDR COUNT	% UNDER-CUT	Associated with Wood?	NOTES (HS, DJ, TJ), Photos
163	SP	5		0.35	0.06		155	20	20	30	15		6			
164	RI	29					5		20	60	15		6			step-pooly but less steep
165	SP	3		0.41	0.12		20	10	35	20	5		1			start trib east side
166	SB	2							5	5	90					
167	RI	16						10	55	30	5		5			
168	SC	5					50			50						covered by DJ, ws to ws = ~1m
169	SP	3		0.48	0.06		30	10	40	20						
170	RI	12					5	15	35	35	10		1			
171	DC	6	y				5	5	30	40	20			50		
172	GL	4					10	20	35	20	15					
173	RB	13						5	25	30	40			50		step pooly
174	SL	0.5														ws to ws =0.78!
175	RI	13						5	10	80	5			50		
176	SP	2		0.26	0.07		5	25	25	20	25		1			
177	RI	40					5	5	35	45	10					steep, step pooly
178	RI	6	y					5	35	55			5			
179	RI	6	y				10	10	65	10	5					low flow
180	RI	22	y				60	10	25	5				50		
181	SP	4		0.25	0.06		20	15	20	25	20					
182	RI	24					5	20	25	40	10			10		ph # 291-293
183	RB	48					5	5	10	10	70		4			step pools
184	DC	10	y				10	10	40	20	20		1			
185	DC	8	y				20		10	30	40		4	20		
186	SP	3		0.27	0.16		20	5	40	15	20		3	90		

APPENDIX C

PHOTOGRAPHS FROM STREAM SURVEYS IN UNCLE AND BILLIE CREEKS

Photos from Uncle Creek

Dammed pool and backwater created by downed wood


Dammed pool created by a log jam

Dammed pool and side bar created by log jam

Dammed pool and side bar created by a log jam

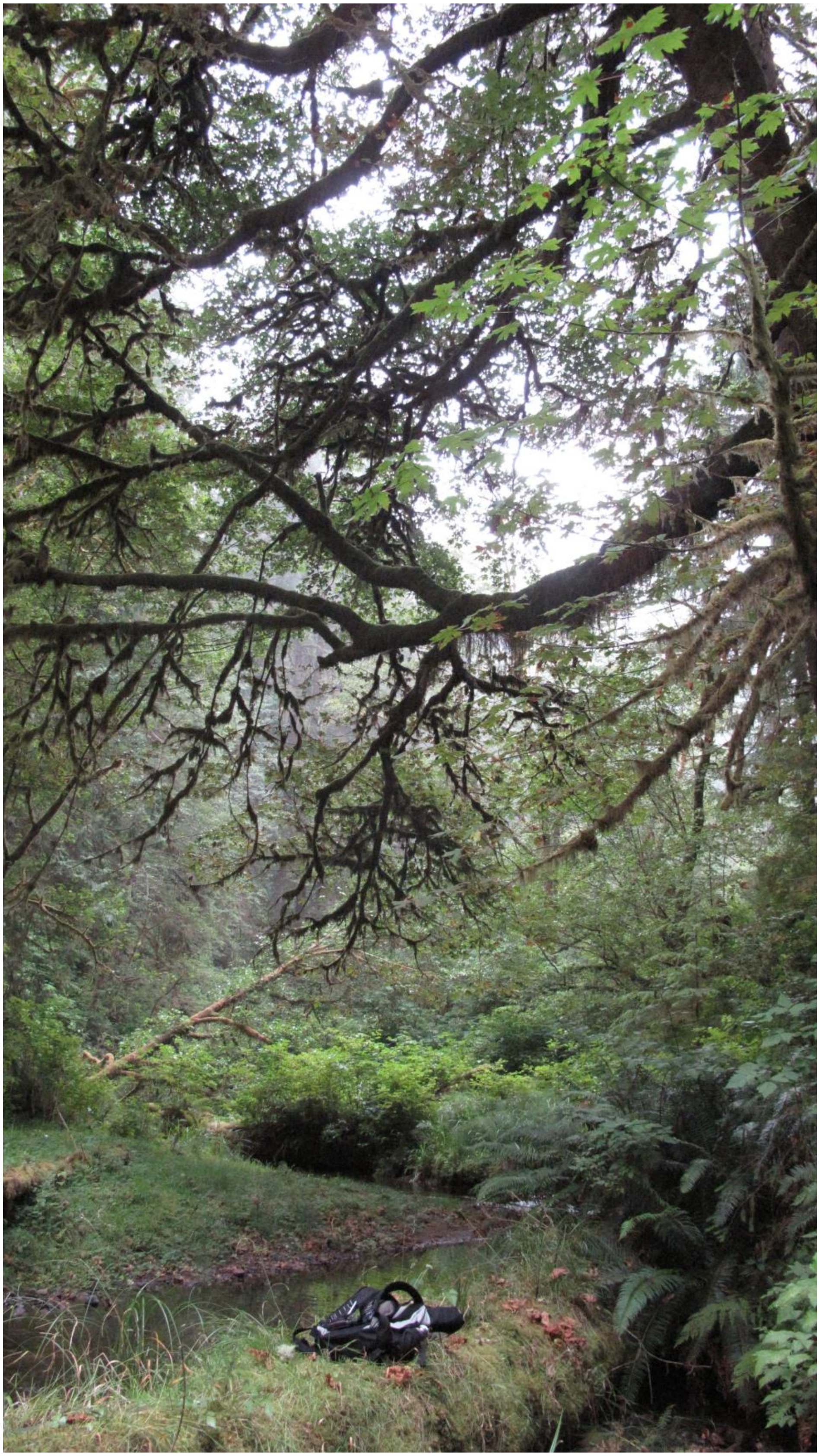
Dammed pool, log step, and sediment accumulation caused by downed wood

Downed old growth created backwater and glide

Photos from Billie Creek

Mid-channel bar and multi-threaded channels formed by large downed tree


Side channel formed around downed large-diameter wood with downed alders in the background



Floodplains on the left bank and the right bank of upper Billie Creek

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