Breezy Jackson

DeVlieg Taylor Graduate Research Assistantship 2005-2006
Master's Candidate
Professor: Jeffrey H. Braatne, Ph.D.
Professor of Floodplain Ecology
University of Idaho

"Riparia: Influence of Fire on Streamside Vegetation and Riparian-Stream Food Webs in a Wilderness Setting "

Abstract and Introduction

My project focuses on the interactions between aquatic and terrestrial systems, especially the flow of nutrients from terrestrial plants and insects into the stream system. I am currently doing riparian vegetation surveys on 12 tributaries of Big Creek, as well as monitoring the terrestrial plant and insect litter falling into the stream. There is a possibility of adding a nutrient ratio analysis to the project. This might tell us if the plants that grow after fire are more or less vigorous than those in undisturbed drainages. Working in wilderness setting is not only pertinent to my research, but also a remarkable opportunity. My next field survey will be in the summer of 2006.

Stephanie Jenkins
Research Assistant (left)

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Research

Zachery Lifton

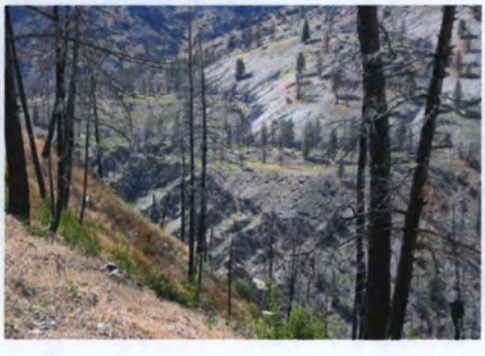
M.S. in Geology
Idaho State University
2005

"Bedrock strength controls on the valley morphometry of Big Creek, Valley and Idaho Counties, Central Idaho"

Abstract

My research is focused on fluvial geomorphology. In general, I want to understand how bedrock controls the morphology of mountain drainage systems. In particular, I am looking at how rock strength is related to valley floor width, channel gradient, hillslope gradient, and in-channel boulder distribution. During summer 2004 I collected rock strength and valley floor width data on Big Creek in central Idaho. In addition to field work, I am using a variety of remote sensing methods to gather data: airphotos, hyperspectral imagery, 10 meter digital elevation models (DEM's), and possible light detection and ranging (LiDAR).

Research Brief Summary



View of Soldier's Bar Airstrip across Big Creek.

September 27, 2008
University of Idaho

Dear DeVlieg Foundation Board Members,

I am writing this letter to both express my gratitude and update you on the research I conducted at Taylor Ranch Field Station this summer. First off, thank you very much for provided the funding for me to do an undergraduate research project at such an amazing and relevant field research station. It was one of the best, and I feel one of the most important experiences of my life to this point. Without your gracious contributions to natural resource research I would have been unable to gain this insight into the world of scientific design and sampling. Conducting this research was a genuine learning experience and the opportunity that the foundation provides to University of Idaho students in the College of Natural Resources is truly remarkable I know that the DeVlieg Foundation places a lot of value in our natural resources and I feel like it is money well spent which I'm sure resonates with the foundation.

I am now a senior at the University of Idaho studying ecology. I will be continuing to analyze the data I collected this summer and will write a report of my findings in the spring. If everything goes according to plan I will graduate in May with my B.S. with a breadth of knowledge, which I gained this summer, about the experimental design process. This will be very beneficial to me both in graduate school and in my future career.

My project is titled "Exploring Climate Effects on Coniferous Seedling Regeneration in Burned Areas in Central Idaho". I am basically trying to determine if there is any correlation between the shifting climate patterns and the lack of conifer tree propagation following the fires that burned so extensively around Taylor Ranch Field Station in 2000. My main objective was to set up as many plots as I could in areas that burned along an elevational gradient. I ended up collecting data, such as frequency of seedlings, vegetative cover, aspect, etc. at approximately 82 sample sites. Since the project was conducting in a wilderness area I was not able to set up permanent plots, but I did record GPS coordinates so the general area of my sites can be revisited and used for long-term studies. In another aspect of the study I sowed several plots of both tree seed and seedlings at the start of the summer and gave them supplemental water while periodically monitored their condition. I also had a control plot that was not watered by me and only received water naturally. The objective of this was to see how many or if any seedlings at all would be able to survive the hot, dry summers that characterize the clime around the ranch. Lastly, I gathered temperature and humidity data from sensors that were set up by my advisor. The sensors were set up along an elevational gradient and their purpose is to monitor and analyze temperature fluctuations that naturally occur as warm and cold air move through the valleys during different times of day and night.

I also had a chance to visit with Jim and Janet Pope at the research station and greatly enjoyed their company and interest into my research. It is awesome that the foundation is involved with the student throughout their project. I'm also thankful that Jim and Holly Akenson continue to support this type of undergraduate research and happily offered their expert opinion on the experimental design and logistics of the research. There is the potential to add onto this project. It is my hope that I will have the chance to communicate with the DeVlieg Foundation later in time about the possibility of conducting my master's research at the Taylor Ranch Field Station. Thank you all again for your interest in the field of natural resources and the funding that you provided to me.

Sincerely,
Eric Clippinger
Senior, University of Idaho
Taylor Ranch Field Station

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Research

Rachel Wilkinson

DeVlieg Taylor Graduate Research Assistantship 2005-2006
Master's Candidate
Idaho State University
Professor: Dr. Colden Baxter, PhD
Dept. of Biological Sciences
ISU Stream Ecology Center

"Aquatic-Terrestrial Connectivity in a Wilderness Watershed: Do emerging stream insects fuel riparian food webs following wildfire?"

Rachel's Website

Abstract and Introduction

Rachel Wilkinson

I am studying the mid-term (5-10 years post fire) effects of fire on linkages between aquatic and terrestrial habitats. Both the adjacent land and stream contribute food resources to each other. This study investigates how fire might alter what energy streams provide to their adjacent riparian habitat. I am studying this relationship by placing floating traps on streams to catch emerging insects. The study is conducted on 16 streams in the Big Creek Drainage varying in degree of burn intensity. I am trying to understand if and how fire alters the amount of energy coming out of the streams, in the form of emerging insects. I hypothesize more insects will emerge in burned areas, meaning the fire could play an important role in the connectedness of water and land ecosystems. It is important for us to study the connections between land and water in a wilderness area where impacts by humans are minimal so we can better understand the natural processes. The information we gather from the wilderness about the relationships between fire and streams could make an impact on the management of fire in areas outside the wilderness.

Study is performed by placing floating traps on streams to catch emerging insects.

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COLLEGE OF NATURAL RESOURCES

Rachel (center) and crew leave at nightime for spider survey. (right) Jason Beck, Asst.

After a very productive field season in the summer of 2005 collecting data, and a winter filled with aquatic insect identification work, I returned to Taylor Ranch Wilderness Field Station in 2006:

The 2006 summer went well with most of the sampling running along smoothly, until returning from a 30 mile trip to a new study site, we noticed smoke in the air. This was the beginning of the Dunce Creek fire. Luckily I had finished most of the sampling before the fire started and we then flew out for safety reasons. We returned to Taylor Ranch after the fire to complete additional sampling. Two of my study sites burned completely and it was interesting to see the immediate effects of the fire. It is understandable that fire can be interpreted having a devastating effect on my study, but in only a few short years the riparian vegetation will have recovered and the stream/riparian system might be more productive then before the fire. My study could be an important benchmark.

Dunce Creek before and after fire.

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Neil Olson

DeVlieg Taylor Graduate Research Assistantship
2007-2009

Master's Thesis
College of Arts and Science
Idaho State University

Professor: Dr. Ben Crosby

From Snow to Rain: Catchment Hydrology at the Cusp of Snow-Dominated Run-off.

Gaging Station and Water Quality Monitoring ISU Website

In 2008, with master's student Neil Olson, we have re-established a gaging and water quality sensor system at Taylor Ranch along Big Creek. This station will assist both studies of Aquatic and Riparian Ecology and Geomorphology done by both academics and agency scientists. This gaging station will be used to monitor discharge and water quality year round and transmit this data to a server for real-time monitoring by shareholders.

Neil Olson's two-year Graduate Research Assistantship will coordinate shareholder agencies (NOAA, USFWS, USFS, USGS) and academic institutions (UI, ISU, BSU) in order to establish a gauging station at the Taylor Ranch bridge. These records will be made available over the internet in real-time. This project will provide a permanent infrastructure improvement that will benefit others within and beyond the Taylor Ranch community for decades to come. Neil will also be responsible for utilizing remote sensing techniques (such as MODIS imagery) to measure the distribution and longevity of seasonal snow packs in the basin. These measures will be calibrated by field gauging of tributary channels throughout the spring and summer, some of which may be performed by interns at Taylor Ranch.

A hydrologic model for the spatial and temporal distribution of flow in Big Creek and its tributaries will be developed, allowing flow prediction in ungauged locations. This

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hydrologic model will then be compared to long-term flow records along the Middle Fork of the Salmon River, to recreate what flows might have been like in Big Creek over the last 50+ ungauged years. Neil will be able to address hypotheses regarding the spatial and temporal availability of water in Big Creek while also making a significant contribution to the research infrastructure of Taylor Ranch Field Station.

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The DeVlieg Foundation
P.O. Box 515
Clarkston, WA 99403

September 26, 2008

Re: Progress Report and Thank You from M.S. Candidate, Neil Olson

Dear Members of the DeVlieg Foundation Board,

I would like to start by offering my heartfelt thanks to the DeVleig Foundation for their generous support of my Masters project. Without this funding I would not have been able to conduct this research and add to the research infrastructure of the Taylor Ranch Field Station. In order to give a clear understanding of my project, I will detail what I have done so far, what I am doing right now, and where my research will take me in the future.

Project Background

First, I am a Master's student at Idaho State University in the Department of Geosciences, and am supervised by Dr. Ben Crosby. I am interested in understanding how changing climate in the Intermountain West will affect the flow of water through rivers. As temperatures warm, it is expected that more precipitation in the region will fall as rain rather than snow, thereby changing the fundamental character of when and how much water is delivered to the rivers. The location of Taylor Ranch on Big Creek (Figure 1), a pristine wilderness river, makes it an ideal location to study this phenomenon. The lack of development, diversion or impoundment of water allows me to study the behavior of river and climate systems free of human-induced complications. Also, the Big Creek drainage has a high sensitivity to climate change because it is on the borderline between a snow and rain dominated meteorological system.

Work Completed

In order to understand predict future changes, it is necessary to both quantify both current and past water flow (discharge) conditions. Work on the project began in the Spring semester of 2008 with an April reconnaissance mission at Taylor Ranch to make measurements for a bridge-mounted water level sensor. We measured cable lengths, operational ranges, and determined how best to incorporate our system with the pre-existing communications set up run by NOAA fisheries. In May of 2008 I installed the first high resolution, research grade gaging station on the main channel of Big Creek at Taylor Ranch. This is the ONLY station measuring water flow in Big Creek. This gaging station allows me to calculate the volume of water moving downstream at 5 minute intervals, 24 hours a day, 365 days a year (Figure 2).

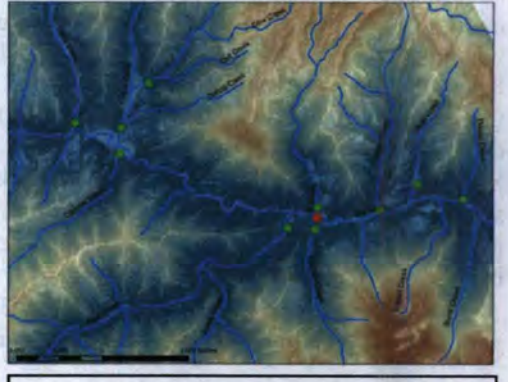

Figure 1: Location map for Big Creek showing the locations of tributary (green) and Big Creek (red) gaging stations. Taylor Ranch is at the red dot.

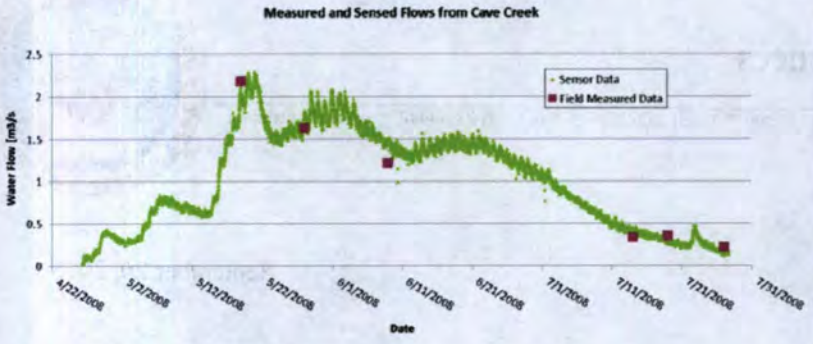

Figure 2: Example of water discharge data measured in one of the tributaries to Big Creek. Purple squares are the dates of actual flow measurements. Green are high frequency measurements made by pressure logger.

During the Spring of 2008, I also installed 10 Pressure Loggers in different tributaries (Figure 1) to lower Big Creek. These sensors allow us to monitor the depth of water at a similarly high frequency as the measurements made on Big Creek. This allows the tributary contributions to be compared to their combined flow down the mainstem of Big Creek. Measurement of flow (Figure 2) in the tributaries also allows me to explore how the topographic characteristics (elevation, aspect and drainage area) of each tributary contribute to variations in timing, magnitude and duration of runoff. Once the sensors were installed, this past summer was spent establishing the essential relationship between the height of the river (stage) and the amount of water flowing through the river (discharge). I did this on the main channel of Big Creek and on ten tributaries around Taylor Ranch. Without these measurements of discharge, the water level data would offer the crudest approximation of flow is not be useful to modeling future flows.

Current Work

Now that I am out of the field and back on campus, I am working on preparing the stage-discharge relationship for the mainstem and tributary channels. This will allow me to quantify the exact flux of water out of Big Creek last summer and into the future. These results are being prepared for a presentation I will give at the annual meeting of the American Geophysical Union in San Francisco (15,000 scientists in attendance).

Future Work

Future work will involve additional field work to refine the stage-discharge relations that I developed over the summer of 2008. I am also actively working on acquisition and analysis of remotely sensed snow data from MODIS satellite imagery in order to help approximate water flow during past years when no gaging station was present on Big Creek (1954-2008). These past flows will be approximated using a combination of numerical computer modeling of river flows using GIS and correlations with nearby gaging stations in the Middle and South Forks of the Salmon River. I anticipate completing satellite-based and flow modeling projects in the spring of 2009. I will also have prepared the bulk of the thesis document by the end of the Spring semester. During the Spring and Summer of 2009 I will return to Taylor Ranch and continue collecting a second year's of spring runoff data (Figure 3). This data will be incorporated into my thesis during the summer and be ready to be defended in August of 2009.

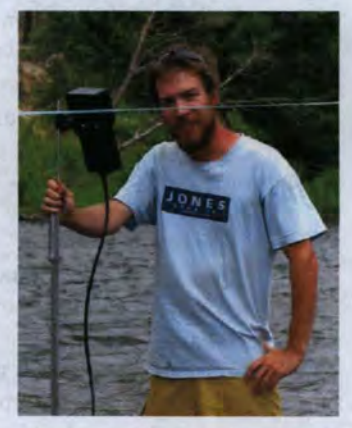

Figure 3: Neil collecting data (Photo Janet Pope)

Again, I wish to express my gratitude for your continued support of my Masters Thesis. Without your support both my thesis and the science infrastructure of Taylor Ranch would not be what it is today.

Sincerely,
Neil Olson