

**Log-in Number:** \_\_\_\_\_

**Date Submitted:** \_\_\_\_\_

(To be assigned when submitted to Provost's Office)

**WESTERN OREGON UNIVERSITY**  
**Faculty Development 2006-07**

**Category III**  
**Research/Major Projects**

Applicant's name: \_\_\_\_**Dr. Steve Taylor**\_\_\_\_\_

Division/Department: \_\_\_\_**Natural Sciences and Math / Earth and Physical Sciences**\_\_\_\_\_

Research/Major Projects grant proposals should include the following. Items 1-5 should not exceed three pages.

1. Statement of the problem/project rational
2. Methods/course of action
3. Timeline for completion of the project
4. Goals/expected outcomes
5. Dissemination plan for the activities
6. Budget
7. Appendix
  - a. Current CV
  - b. List of research funding received from the FDC during past 2 years (if any).
  - c. Copy of report on FDC research funding received during past 2 years (if any).

If any of the above items are not included, the application is not complete and will not be considered.

Western Oregon University

Faculty Development Proposal

**The Influence of Forestry Practice and Geomorphic Processes on Decadal-Scale Sediment  
Yield at H.J. Andrews Experimental Forest, Western Cascades, Oregon**

Prepared By

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## 1. INTRODUCTION

Mountainous watersheds, less than 100,000 ha, are fundamental landscape elements that form an important setting for local ecological interactions, forest resource management, human occupation, and water supply development (Wohl, in press). As components of the global hydrosphere, they encompass a set of physical and biological variables that interact via complex systems response and interdependent feedback mechanisms (Schumm, 1977; Swanson and others, 1990). Study of the production, transport, and storage of sediment in drainage basins is essential for deciphering their evolution and assessing the relative controls of complex variables (Dietrich and Dunne, 1978; Swanson and others, 1982b). In addition, geomorphic analysis establishes the fundamental framework for monitoring the response of forest ecosystems to extrinsic variables such as climate, land use, and natural disturbance (Swanson, 1980; Swanson and Franklin, 1988; Stallins, 2006). As such, the understanding of hydrogeomorphic variables and ecological process interactions is critical for designing sustainable water resource and habitat management plans.

The purpose of this proposed work is to extend existing sediment-transport research in small, mountainous watersheds at H.J. Andrews Experimental Forest (HJA), Oregon (Figures 1 and 2; attached at back). HJA was established in 1948 and is managed by the Pacific Northwest Research Station (USDA Forest Service) as a Long Term Ecological Research (LTER) site. Given the history of science at Andrews, over 50 years of hydrologic and sediment-transport data are available for three sets of experimental watersheds ranging in size from 9 – 101 ha (Table 1, attached at back) (Swanson and Jones, 2002). These watersheds form part of a series of paired-basin studies that are used to evaluate the long-term hydrogeomorphic effects of vegetative disturbance and recovery in a coniferous forest biome. While some of the paired-basin sediment data were analyzed in the 1980's (e.g. Swanson et al., 1982a, 1982b; Grant and Wolff, 1991), this work is superannuated and an up-to-date synthesis is needed. The research proposed herein comprises part of a sabbatical research opportunity for the principal investigator, in collaboration with personnel from Andrews Experimental Forest and Oregon State University.

## 2. STUDY AREA

The Andrews is comprised of 6400 ha (15,810 ac) of forestland located in the *Tsuga heterophylla* zone of the western Cascades (Figures 1 and 2) (Franklin and Dyrness, 1988). Site geology is characterized by colluvium-dominated hillslopes underlain by late Tertiary (Oligocene to Pliocene) basaltic to andesitic, volcanoclastics and lava flows (Figure 3) (Swanson and James, 1975; Priest and others, 1988; and Sherrod and Smith, 2000). Land surface elevations range from 420 to 1630 m, those above 760 m were subject to Pleistocene glaciation. The climate of Andrews Forest is marine temperate with winter storm systems driving seasonal floods and episodic debris-flow events (Swanson and Jones, 2002). Other mass-wasting processes include deep-seated earth flows originating in hydrothermally-altered volcanic strata. Bedrock-controlled hillslope processes exert a significant influence on watershed morphology (Figure 3) (Grant and Swanson, 1995).

## 3. STATEMENT OF THE PROBLEM

Timber harvesting from coniferous forests represents an anthropogenic disturbance that initiates secondary ecological succession as vegetative recovery occurs over time (Cromack and others, 1979). This perturbation results in hydrogeomorphic response via changes in stream discharge, energy expenditure, and sediment yields. Other variables that influence the system include road construction, logging practice, and post-harvest management techniques (e.g. tree planting, slash burning, fertilization). In terms of forest ecosystem function, routing and storage of sediments have significant influence on distribution of nutrients and disturbance zones (Figure 4) (Swanson and others, 1982a, 1982b). Understanding of the post-harvest effects, rate of vegetative recovery, and attendant response in the hydrogeomorphic system through time is essential for design of habitat management and timber harvest plans (Gregory and others, 1989; FEMAT, 1993; Reid and Dunne, 1996).

Study of long-term watershed behavior has been a central feature of the Andrew Experimental Forest research program for more than 50 years, most notably in the International Biological Program of the 1970s and Long-Term Ecological Research (LTER) program since 1980. Small experimental watersheds (9-101

ha) at Lookout Creek form the basis for paired-basin studies that focus on various aspects of geomorphic, hydrologic, and ecological monitoring (Figure 2, Table 1). The results of this research effort represent an invaluable foundation upon which to frame regional forest management plans.

Long-term hydrologic and sediment-transport data are available for three sets of paired basins, including watersheds 1-2-3 (WS 1-2-3), watersheds 6-7-8 (WS 6-7-8), and watersheds 9-10 (WS9-10) (Figure 2, Table 1). Of the three sets, WS 1-2-3 and WS 9-10 have received the most attention in terms of sediment budget analyses and studies relating sediment yield to timber harvest techniques (e.g. Fredriksen and Harr, 1979; Swanson and others, 1982a, 1982b; Grant and Wolff, 1991; Grant and Hayes, 2000; Swanson and Jones, 2002). While some sediment data analysis was completed in previous studies (Table 1), the results were based on records primarily from the 1970s and 1980s. There is significant need to update the sediment yield records and conduct a comprehensive synthesis that includes the full 35-year record, particularly for the WS 9-10 basin set. This time frame is important as it includes the February 1996 storm event, and thus represents an opportunity to further decipher the relative roles of anthropogenic and meteorologic disturbance on mass transport rates at HJA. Updated sediment yield records are necessary to more accurately reflect present-day sedimentation patterns and to map time-averaged response trajectories during post-harvest vegetative recovery. The critical research questions posed by this study include the following: (1) What are the relationships between forest management, timber harvesting, geomorphic disturbance, vegetative recovery and sediment flux over time? (2) What are the long term effects of storm-driven geomorphic processes on sediment-yield trajectories in paired watersheds? (3) How do episodic debris flow events impact sediment yield trajectories?

#### **4. GOALS AND OUTCOMES**

The general objectives of this proposal are to: (1) compile and update existing sediment yield records from gaged experimental watersheds at HJA, (2) analyze the sediment records in the context of historic land use and hydrometeorological events, (3) evaluate the effects of geomorphic and anthropogenic variables on decadal-scale sediment yields, and (4) posit process-response models for interdependent variables that control sediment transfer in the western Cascades.

Phase 1 of this project will focus on updated compilation and analysis of sediment yield data in watersheds 9 and 10 (Figure 2), a paired set of untreated control and clear-cut basins, respectively. The purpose of this work is to extend the interpretation and findings from studies of sediment routing in these basins since the last publications 25 years ago (e.g. Cromack and others, 1979, Swanson and others, 1982a). This early work posed hypotheses about changing rates of sediment flux in the post-logging landscape, described sediment storage and transfer under forested conditions, and provided frameworks for assessing the effects of forest disturbance on sediment transport. Given that there is now a long (>30 yrs) decadal-scale record of post-logging sediment yield, retrospective analyses will be used to test hypotheses of biotic controls on sediment transfer and also document rates of soil loss in watershed environments. The results will be used to constrain sediment yield trajectories through time, following timber harvest and subsequent vegetative recovery. Analyses will also examine the influences of climate variability, including 50-year flood events, and change in vegetative cover on organic and inorganic mass transfer. The findings will then be compared to other studies of biogeochemical cycling at HJA and similar research sites throughout the United States. Project results will contribute to the derivation of empirical, process-response models that may be used to mitigate effects of forest management practices on surface erosion and sedimentation.

#### **5. METHODOLOGY**

The proposed research will employ standard techniques for sediment-budget analyses, following the protocol outlined by Reid and Dunne (1996). Essential components of sediment budgets include quantification of transport processes, storage elements, and time-averaged sediment yields (Dietrich and others, 1982). The study proposed herein will focus on a retrospective analysis of sediment yield and time-averaged transfer rates in WS9 and WS10. Mass transfer parameters will include surface erosion volumes (through 1987), dissolved constituents of precipitation and streamflow (cations, silica, and a few others) (to present), suspended and bedload sediment (to present), and debris flows (1986, 1996 events).

Sediment yield, erosion and streamflow data for WS 9-10 are stored both in-house at HJA and on web-based information systems such as ClimDB/HydroDB, comprising part of the USDA Forest Service information network (<http://www.fsl.orst.edu/climhy/>). The daily suspended sediment yield will be derived as a product of streamflow discharge and suspended sediment concentration. Spot readings of suspended sediment concentrations will be used to extrapolate average annual yield according to regression models developed by Grant and Wolff (1991). Data will be analyzed in the context of average annual yields, peak-flow discharge, precipitation patterns, seasonal variability and debris flow occurrence.

## **6. PROJECT TIMELINE**

The bulk of Phase 1 research activities will be conducted between April 1 and September 15, 2007. During this time period, the principal investigator will be on sabbatical leave from teaching duties at Western Oregon University, and serving as a visiting research associate to Dr. Fred Swanson (Pacific Northwest Research Station and Oregon State University). Follow-up analysis and manuscript preparation will be completed during fall term 2007. It is envisioned that the proposed work will serve as a catalyst for longer-term collaboration and additional watershed studies, at varying scales and under differing geologic conditions.

## **7. PROJECT JUSTIFICATION**

Sediment budget techniques were originally defined and applied to mountainous watersheds in the Oregon Coast Range and western Cascades during the 1970s, including those at HJA (Dietrich and Dunne, 1978; Swanson and others, 1982b; Reid and Dunne, 1996). The long-term sedimentologic and hydrologic record at HJA provides an important source of data that spans the careers of multiple generations of scientists. Quantifying and analyzing sediment yield records over such long time frames allows evaluation of episodic meteorologic events, seasons, climate change, and vegetative adjustment. The WS9-10 basin set has been a centerpiece for work on hydrology, biogeochemical cycling, and soil/sediment routing in native and managed forests. While several studies have examined the post-logging sediment yield histories at HJA, an updated synthesis is lacking. There is significant need to extend the records, map the sediment-yield trajectories, and establish an updated framework for long-term forest management decisions in the western Cascades. The ongoing work on sediment storage and transport addresses soil erosion, nutrient capital, and disturbance themes that are important parts of the HJA-LTER program. Scaling is such that variability of independent geologic, climatic and tectonic variables are minimized, thus allowing detailed examination of local disturbance regimes. The results of this study will be used to advance conceptual and quantitative models of sediment-transport dynamics in forested headwater systems.

From an applied perspective, land managers are concerned with erosion responses to forestry and water resource practices (Reid and Dunne, 1996). Regional sediment budget analyses provide important data from which to predict future impacts by proposed land-surface alterations. Given that forest harvest rotation on much Federal land is on the order of 80-100 years (Swanson and Fredriksen, 1982), the 30 to 40 year sediment record at HJA provides an important data set from which to design regional management plans. These sediment-yield models are also a prime consideration in the assessment of present and future water management systems, dams, and reservoirs in the western Cascades.

## **8. DISSEMINATION PLAN**

Data compilations, analyses, and derivative products resulting from this project will be made available via web-based information technologies managed by the Andrews LTER facility. Interim findings will be presented at the fall 2007 meeting of the American Geophysical Union, with final products submitted for publication in relevant, peer-reviewed journals. Project results will also be disseminated at Western Oregon University through campus newsletters, faculty web sites, and undergraduate course curricula (e.g. reading assignments, contextual problem sets, and class field trips).

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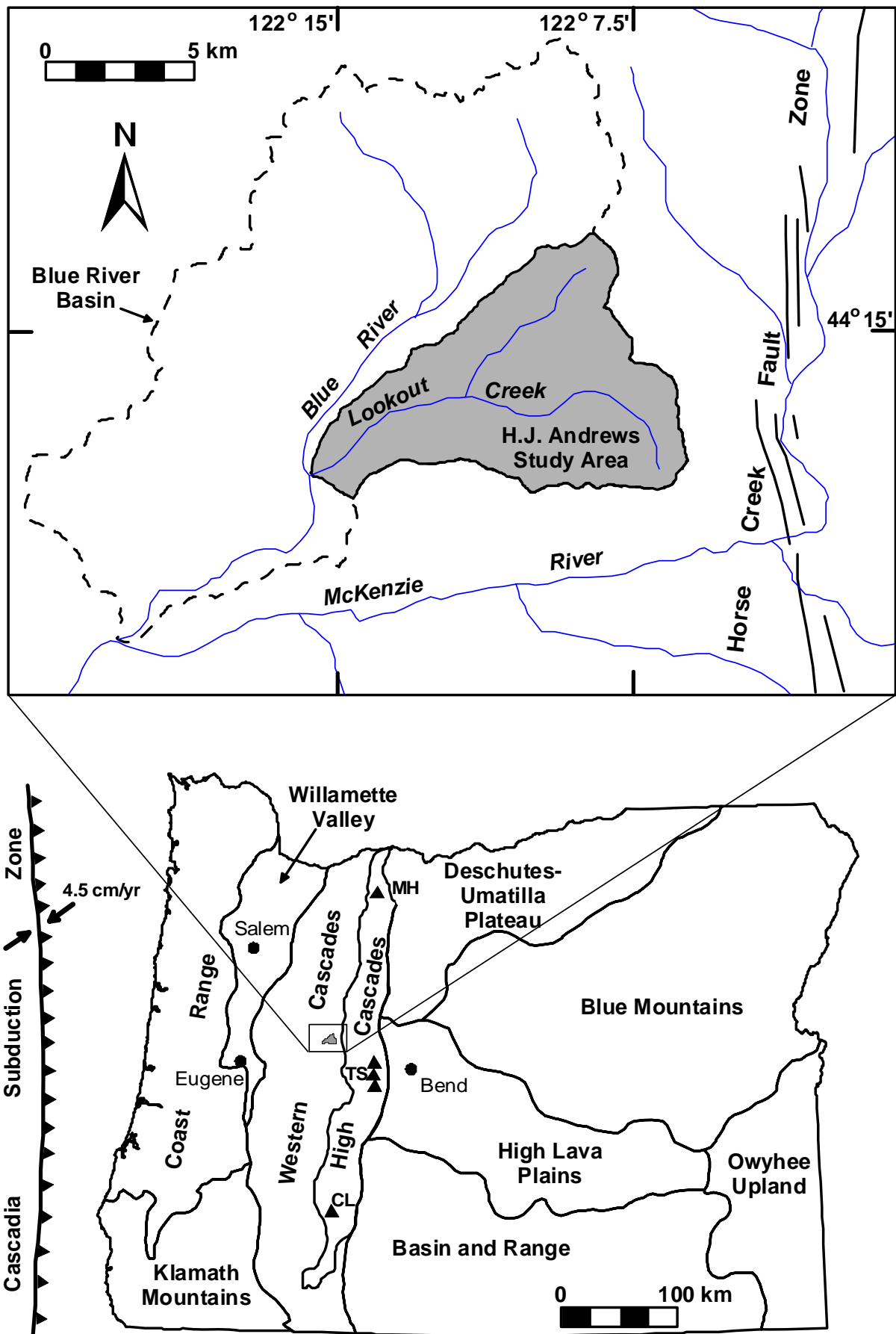


Figure 1. Regional physiographic map of Oregon, showing location of H.J. Andrews Experimental Forest.



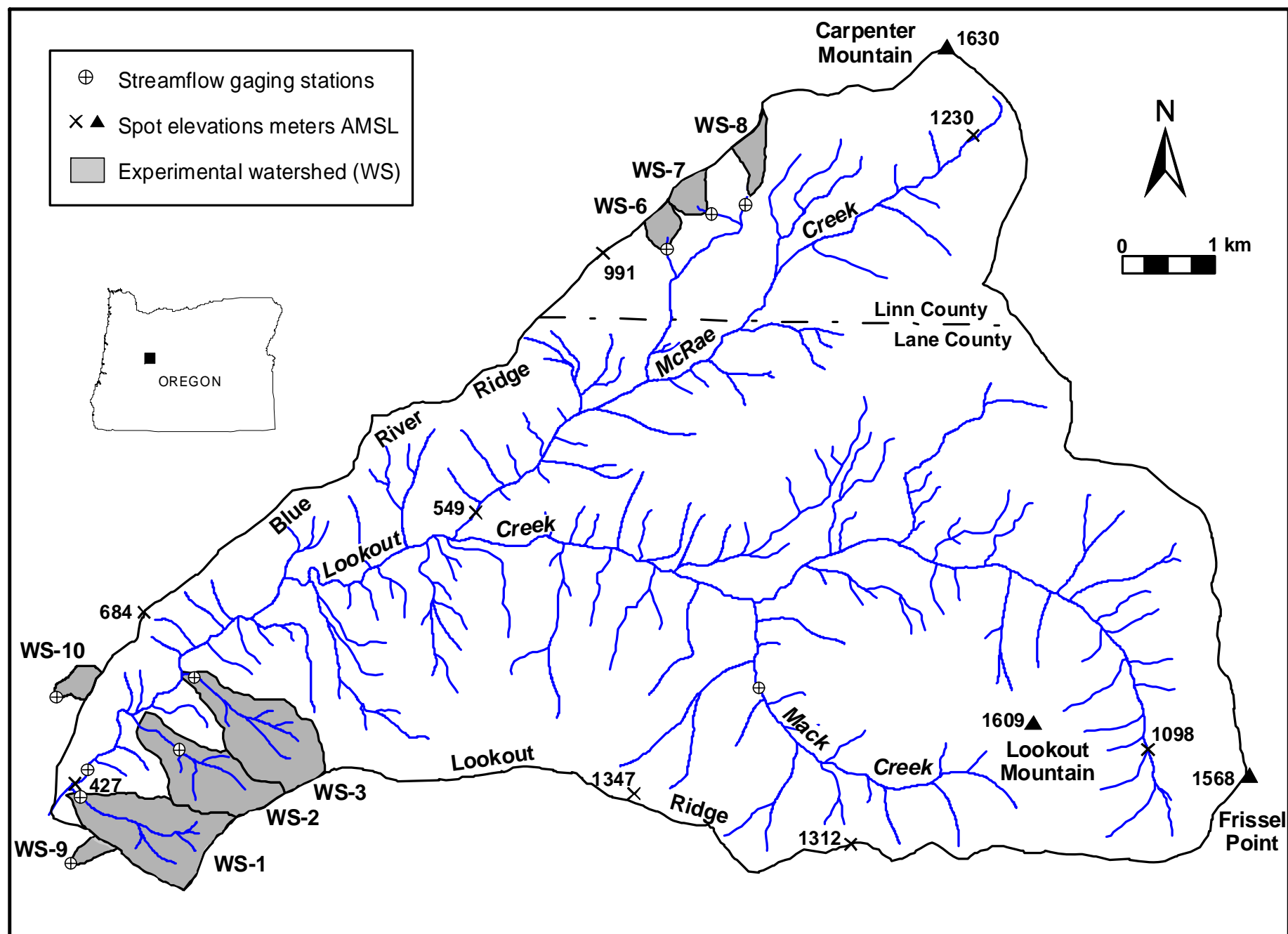


Figure 2. Topographic features of the Lookout Creek watershed, H.J. Andrews Experimental Forest.

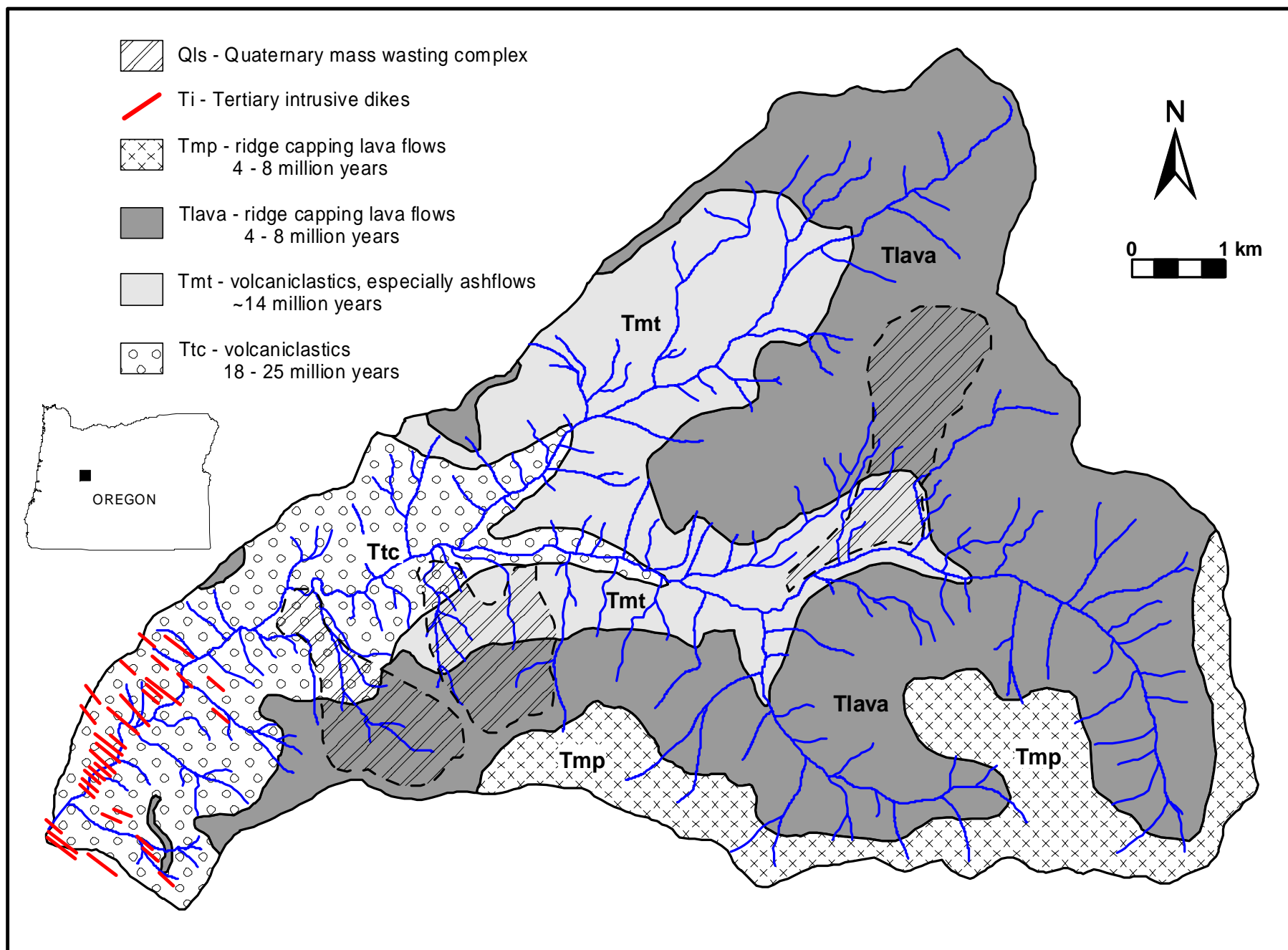


Figure 3. Generalized geology of the Lookout Creek watershed, H.J. Andrews Experimental Forest (after Swanson and James, 1975; Priest and others, 1988)..

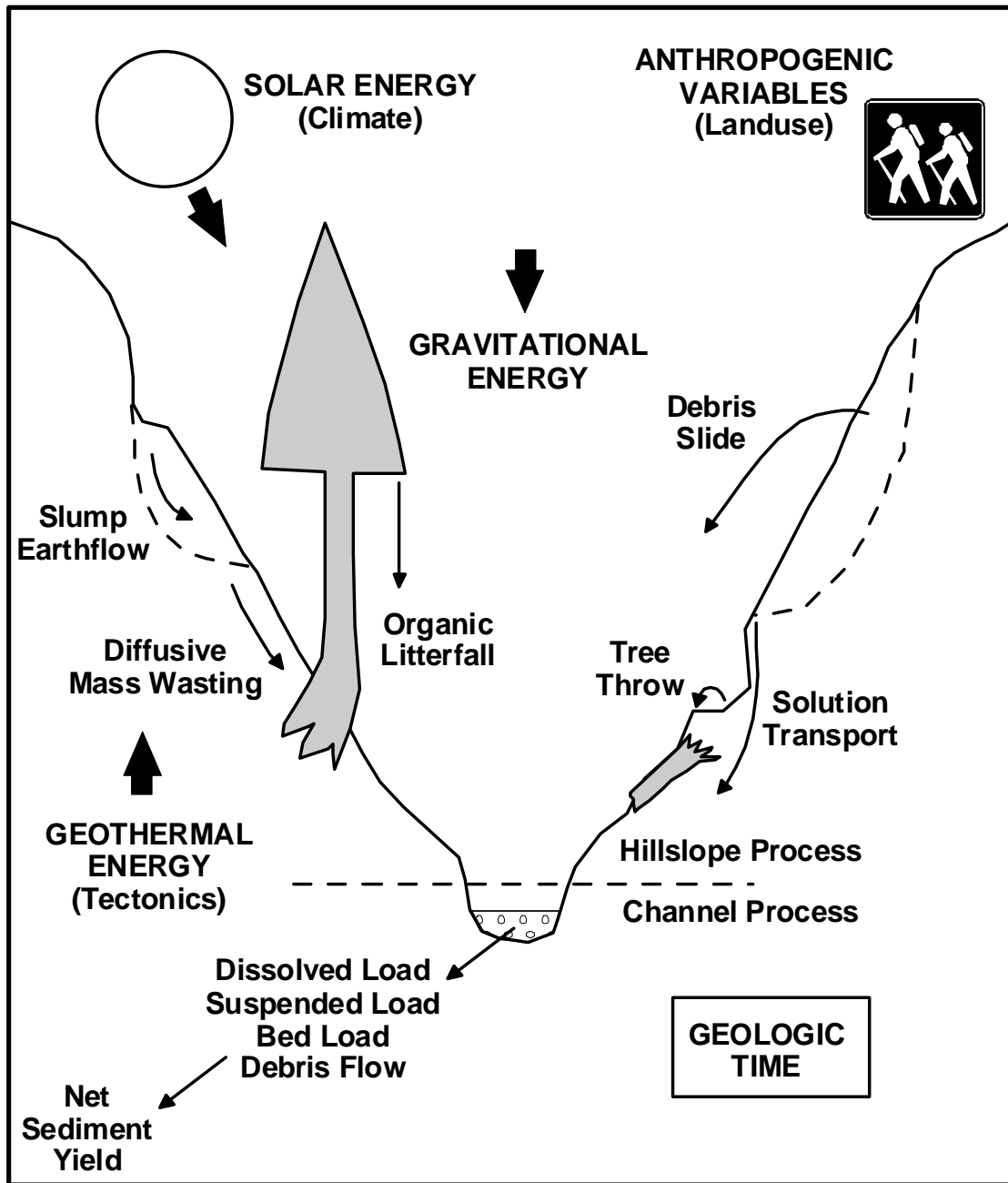


Figure 4. Diagrammatic illustration of independent (upper case) and dependent (title case) variables that control mass transfer processes in the mountainous watershed system at H.J. Andrews Experimental Forest (after Swanson and others, 1982a).

**Table 1. Experimental watersheds in the H.J. Andrews Experimental Forest (from Swanson and Jones, 2002).**

Basin no.	Area (ha)	Elev (m)		Management history	Water, stream chemistry, and sediment records, start date <sup>1</sup>			
		Min	Max		W <sup>2</sup>	C <sup>3</sup>	S	B
1	96	460	990	100% clearcut, 1962-66; prescribed burned 1967	1953	--	1957	1957
2	60	530	1070	control	1953	1981	1957	1957
3	101	490	1070	1.5 km (6%) roads, 1959; 25% clearcut in 3 patches, 1963	1953	--	1957	1957
6	13	880	1010	100% clearcut, 1974	1964	1972	1972	--
7	15	910	1020	50% selective canopy removal, 1974; remaining canopy removed 1984	1964	1972	1972	--
8	21	960	1130	control	1964	1972	1972	--
9	9	425	700	control	1967	1969	1969	1973
10	10	425	700	100% clearcut, 1975	1967	1969	1969	1973

Prior to treatments, forests were 400 to 500 year old Douglas-fir/western hemlock stands in watersheds 1, 2, 3, 9 and 10, and 130-yr old Douglas-fir stands in watersheds 6, 7, and 8.

<sup>1</sup> W = continuous stream discharge; C and S = composited 3-weekly samples of streamwater collected with proportional sampler and analyzed for chemistry (C): N, P, Ca, Mg, K, Na, alkalinity, conductivity, pH, particulate N, and particulate P; and suspended sediment (S); B = bedload sampling in ponding basin.

<sup>2</sup> Streamflow records are continuous up to the present, except for Watersheds 6 and 7, where streamflow was not measured from 1987 to 1994. Records are based on water year, October 1 to September 30.

<sup>3</sup> Long-term records with 3-weekly sampling interval began on this date.

**WESTERN OREGON UNIVERSITY**  
**Faculty Development 2006-2007**

**CATEGORY III--BUDGET FORM**  
**Research/Major Project**

**APPLICANT'S NAME:**

Dr. Steve Taylor, Natural Sciences and Math

<b>ESTIMATED EXPENSES:</b>	<b>Quantity</b>	<b>Rate</b>	<b>Total</b>
Travel:			
Lodging (1)			
Airfare			
Private vehicle (2) Travel to Field Site	2200 mi*	\$0.485/mi	\$1,067.00
Meals (3)			
Registration			
Other			
Research/technical assistant (6)	100 hrs#	\$8.00 /hr	\$800.00
Materials and equipment (4)			
Publication cost			
Other (please list)			
Air Photos			\$300.00
SigmaStat Software			\$600.00
<b>Total estimated expenses</b>			<b>\$2,767.00</b>
<b>FUNDING SOURCES:</b>			
Amount provided by:			
Division/Department			<b>\$0.00</b>
Other campus funds (5)			<b>\$0.00</b>
Outside funds (5)			<b>\$0.00</b>
<b>Total funding</b>			<b>\$0.00</b>
<b>Amount unfunded</b>			<b>\$2,767.00</b>

(1) Please indicate number of nights and rate.

(2) Please indicate number of miles and rate.

*\*Note: 10 Travel Days to Andrews Experimental Forest, 220 miles RT*

(3) Please indicate number of days and per diem amount

(4) Please attach list of materials/equipment and costs.

(5) Please list source.

(6) Please list hours and pay rate.

*# Project will employ 1-2 student RA's over 6 month period, incl. OPE*

Signature of Applicant:

\_\_\_\_\_

Date:

\_\_\_\_\_

## **Budget Justification**

### Travel

The travel portion of the budget is to cover roundtrip personal vehicle mileage to and from Andrews Experimental Forest (located east of Eugene, Oregon). A total of 10 travel days are planned to Andrews for use of the facility database system and to perform field-based validation of sediment-transport records. Round trip travel from Corvallis (Taylor home) to Andrews Experimental Forest is 220mi x 10 travel days x \$0.485 / mi = \$1067.00 total.

### Student Research Assistant(s)

The budget includes 100 hours for 1 to 2 WOU undergraduates to participate in the project as Research Assistants. Students will be involved with data validation and analysis. They will also be included in staff meetings with personnel from Andrews Experimental Forest. RA employment will be a valuable professional development experience for the students and will provide potential employment contacts with personnel at the U.S. Forest Service. Students will be employed part-time during the project period from April 1, 2007 to September 15, 2007. The hourly rate of \$8.00 includes minimum wage and student OPE.

### Supplies and Software

\$300 is budgeted for purchase of aerial photographs of Andrews Experimental Forest. A portion of the proposed study involves assessment of the influence of the Feb. 1996-1997 storm event on debris flow processes and the watershed sediment records. Air photos will be required to document the landscape response following the 1996-1997 storm event(s).

\$600 is budgeted for purchase of SigmaStat analytical software. The software will be used by the principle investigator to conduct time series and statistical analyses of Andrews sediment and discharge data. SigmaStat will be used on a laptop for mobile computing during the project period.

## APPENDIX

- Current CV
- List of Recent WOU Faculty Development Awards
- Copy of Project Report

**Stephen B. Taylor**  
Earth and Physical Sciences Department  
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**EDUCATION**

- 1999 **Ph.D. - Geology**, West Virginia University, Morgantown, WV. Emphasis Area: Geomorphology and Surficial Processes. GPA: 4.0/4.0. Dissertation Topic: Geomorphic Controls on Sediment-Transport Efficiency in the Central Appalachians - A Comparative Analysis of Three Watersheds Underlain by the Acadian Clastic Wedge.
- 1988 **Post-Master's Graduate Work (PhD)**, Geology, University of New Mexico, Albuquerque, NM. Graduate course work in Geomorphology-Surficial Processes, Soil Genesis-Chemistry, Process Sedimentology, Volcaniclastics, and Paleomagnetism. GPA: 3.8/4.0. Preliminary Dissertation Topic: Tectonics and Sedimentation of East Pisco Basin, Central Peru. Personal leave from program in 1989 for family reasons.
- 1985 **M.S. - Geology**, Washington State University, Pullman, WA. Emphasis: Clastic Depositional Systems, Fluvial Sedimentology, Sedimentary Basin Analysis. GPA: 3.96/4.0. M.S. Thesis Topic: Stratigraphy, Sedimentology, and Paleogeography of the Swauk Formation in the Liberty Area, Central Cascades, Washington.
- 1982 **B.S. - Geology**, Slippery Rock University, Slippery Rock, PA. Cumulative GPA: 3.8/4.0, Major GPA: 3.96/4.0. Senior Thesis Topic: Subsurface Basin Analysis of Silurian Strata, Northwestern Pennsylvania.

**PROFESSIONAL EXPERIENCE**

- 2004-Present **Associate Professor of Geology**, Earth and Physical Science Department, Western Oregon University, Monmouth, OR. Serving as faculty member in the Earth and Physical Science curriculum. Primary teaching and research interests include environmental geology, hydrogeology, surficial processes, geomorphic hazards, and geographic information systems.
- 2005-Present **Oregon State Board of Geologist Examiners**, Governor-appointed board member associated with the regulation of the public practice of geology and engineering geology in the state of Oregon. Serving as vice-chair, chair of the OSBGE public outreach committee, and state delegate to the Association of State Boards of Geology (ASBOG) Council of Examiners
- 2005-Present **Graduate Faculty** (Courtesy Appointment), Water Resources Graduate Program, Oregon State University, Corvallis, OR. Serving as graduate advisor and instructor in fluvial geomorphology, watershed analysis, environmental geology, and geographic information systems.



## PROFESSIONAL EXPERIENCE (Cont.)

- 2005      **Visiting Professor of Environmental Geology**, Environmental Science Department, Willamette University, Salem, OR. Part-time retirement replacement position, duties included teaching topics in applied and environmental geology.
- 1999-2004      **Assistant Professor of Geology**, Earth and Physical Science Department, Western Oregon University, Monmouth, OR (refer to job description above).
- 2000-2003      **Project Coordinator**, PT3 Grant Initiative (Preparing Tomorrow's Teachers to Use Technology), College of Liberal Arts and Sciences, Western Oregon University, Monmouth, OR. Part-time grant project coordinator (0.25 FTE) for institution-wide initiative to infuse technology across the College of Liberal Arts and Sciences and College of Education curricula.
- 2001      **Visiting Professor of Geography**, Dept. of Geography, University of Oregon, Eugene, OR. Part-time sabbatical replacement, duties included teaching graduate courses in surficial processes, geomorphology, and alluvial fan depositional systems.
- 1999      **Project Geologist**, U.S. Filter - Chester Engineers, Inc., Pittsburgh, PA. Consulting geologist involved with industrial waste-water treatment studies, soil and water contamination investigations, environmental restoration projects, and regulatory compliance issues.
- 1995-1999      **Research Assistant**, Department of Geology and Geography, West Virginia University, Morgantown, WV. Funded PhD student working on surficial process studies in the Appalachians. Duties included field mapping of surficial and bedrock geology, data analysis, GIS development, report writing, grant writing.
- 1993-1997      **Adjunct Instructor**, Earth Sciences Department, California University of Pennsylvania, California, PA. Served as department instructor in the graduate and undergraduate Earth Science program (geology and geography).
- 1990-1995      **Adjunct Instructor**, Division of Science and Technology, Westmoreland County Community College, Youngwood, PA. Served as part-time geology and geography instructor in the Division of Sciences.
- 1990-1994      **Senior Hydrogeologist**, Anderson Geological Services, P.O. Box 1059, Washington, PA. Geologist involved with environmental and resource evaluation studies. Work activities included hydrogeologic investigations, aquifer assessments, soil and water contamination studies, energy-resource evaluations, technical report preparation, CAD layout, cartography, and field oversight.
- 1990      **Adjunct Geology Instructor**, School of Arts and Sciences, Waynesburg College, Waynesburg, PA. Served as part-time geology instructor through an extension program with the Pennsylvania Department of Corrections.

## PROFESSIONAL EXPERIENCE (Cont.)

- 1989-1990     **Hydrogeologist**, Geraghty and Miller, Inc., Environmental Consultants, Washington Trust Building, Washington, PA. Geologist involved with RCRA/CERCLA hydrogeologic investigations for private industry. Duties included site reconnaissance, supervision of soil borings, monitoring well installation, water sampling, data analysis, and report preparation. Also included experience with air pollution monitoring and environmental site assessments.
- 1988-1989     **Research Assistant**, Dept. of Geology, University of New Mexico, Albuquerque, NM. Duties included research in sedimentary basin analysis, field geology, library research, computer-assisted data management and information transfer, report writing, cartography, and technical drafting.
- 1986-1987     **Project Scientist**, Dept. of Agronomy and Soils, Washington State University, Pullman, WA. Duties included design and implementation of foliar fertilizer experiments, sample collection and preparation, chemical analysis of soil and plant samples, computer- assisted data management, report writing, statistical analysis and management of lower-level service workers.
- 1985            **Geophysical Survey Technician**, Practical Geophysics, Inc., 1634 Winder Lane, Salt Lake City, UT. Geologist involved with geophysical mineral exploration. Duties included preparation and operation of resistivity, induced polarization, self-potential, magnetic, very-low-frequency electromagnetic, and gravity surveys.
- 1983-1984     **Teaching/Research Assistant**, Dept. of Geology, Washington State University, Pullman, WA. Duties included instruction of Physical Geology, field geology, isotopic dating analysis, cartography, and technical drafting.

## PROFESSIONAL CERTIFICATION

- 2002-Present   **Oregon Registered Professional Geologist (G1968)**, State Board of Geologist Examiners, Salem, OR.
- 1994-1999     **Registered Professional Geologist (PG-001002-G)**, Commonwealth of Pennsylvania Department of State, Bureau of Professional and Occupational Affairs, Harrisburg, PA (current license status: inactive).

## PROFESSIONAL TRAINING

- 1993            National Institute of Construction Engineering Technicians (NICET) Short Course on the Installation of Geosynthetic Liner Systems: Environmental Applications and Quality Assurance/Quality Control.
- 1989, 1993     40 Hr OSHA Health and Safety Training for Hazardous Waste Workers

## **ACADEMIC HONORS**

1998	Selected as outstanding PhD student in Geology at West Virginia University with departmental nomination to Phi Kappa Phi honor society.
1997	Honorable Mention, J. Hoover Mackin Research Grant, Geological Society of America
1995-1996	Meritorious Graduate Scholarship, Dept. of Geology and Geography, West Virginia University, Morgantown, WV.
1982	Graduated Summa Cum Laude, Geology, from Slippery Rock University.
1982	Charter member of Slippery Rock Chapter of Sigma Gamma Epsilon.
1981	Recipient of National Association of Geology Teachers Scholarship for Summer Field Studies.
1981	Recipient of Outstanding Junior Award in Geology, Slippery Rock University.
1980	Recipient of Outstanding Sophomore in Geology, Slippery Rock University.
1978-1982	Dean's List Honor Student at Slippery Rock University.

## **GRANTS-FELLOWSHIPS-FUNDED PROJECTS**

2005-2006	Northwest Invasive Weed Management Partnership (\$2000)
2005-2006	Oregon Community Foundation Grant (\$5000)
2004-2006	Center for Water and Env. Sustainability / U.S. Geological Survey (\$15,000)
2004-2005	Western Oregon University Foundation Grant (\$1000)
2004-2005	WOU Center for Teaching and Learning Undergraduate Research Grant (\$800)
2004-2005	Western Oregon University Faculty Professional Development Grant (\$6000)
2003-2004	Oregon Community Foundation Grant (\$7000)
2002	Western Oregon University, Student Technology Fund (\$150,000)
2002	Western Oregon University, Faculty Professional Development Grant (\$3000)
2002	Western Oregon University, PT3 (U.S. Dept. of Education) Faculty Grant (\$7000)
2002	Murdock Trust Partners in Science Extension Grant (\$2000)
2001	Western Oregon University, Faculty Professional Development Grant (\$3000)
2001	Western Oregon University, PT3 (U.S. Dept. of Ed.) Faculty Grant (\$10,000)
2000-2001	Murdock Trust Partners in Science Research Grant (\$15,000)
2000-2001	OCEPT Faculty Fellowship (\$1000)
2000	ESRI University GIS Software Donation Award (\$10,000)
1999	Western Oregon University, Faculty Professional Development Grant (\$3000)
1997-1999	NASA Earth System Science Fellowship (ESS/97-0080) (\$70,000)
1997	U.S. Geological Survey - EDMAP Program (1434-HQ-97-AG-01782) (\$10,000)
1996	The Vehse Award for Travel and Research, West Virginia University (\$500)
1996	Sigma Xi Society for Scientific Research - Research Grants (\$300)
1996	Geological Society of America - Research Grants (\$1500)
1996	Office of Academic Affairs and Research, West Virginia University (\$800)
1996	U.S. Geological Survey - EDMAP Program (1434-HQ-96-AG-01561) (\$15,000)
1989	Student Research Allocation Committee, University of New Mexico (\$800)
1989	The Geological Society of America - Research Grants (\$2000)
1984	Student Travel Award, The Graduate School, Washington State University (\$800)
1983	Shell Oil Company, Western Exploration and Production (\$2000)

## **PUBLICATIONS (Reverse Chronological Order)**

- Taylor, S.B., Kite, J.S., Comparative Geomorphic Analysis of Surficial Deposits at Three Central Appalachian Watersheds: Implications for Controls on Sediment-Transport Efficiency: *Geomorphology*, v. 78, p. 22-43.
- Smith, G.A., Taylor, S.B., and Larsen, D.L., In Preparation, Volcaniclastic Facies Deposited Adjacent to Extruded Laccoliths, Espinaso Formation (Paleogene) of Central New Mexico: manuscript in preparation to be submitted to *Journal of Sedimentology*.
- Dutton, B.E., Myers, J.A., Taylor S.B., Poston, P.E., and Schepige, A., In Review, An Environmental Science Institute as a Vehicle to Promote Teaching and Research: manuscript submitted to the *Journal of College Science Teaching*.
- Taylor, S.B., Templeton, J.H., Budnick, J., Drury, C., Fisher, J., and Runyan, S., 2005, Spatial Analysis of Cinder Cone Distribution at Newberry Volcano, Oregon: Implications for Structural Control on Eruptive Process: *Geological Society of America Abstracts with Programs*, Annual Meeting, Salt Lake City, UT.
- Taylor, S.B., 2005, Lithologic Controls on Watershed Morphology in the Central Oregon Coast Range: Towards Extrapolation of Tyee-Based Models to Other Bedrock Types – Mountain Rivers Session: *Association of American Geographers, Abstracts with Programs*, v. 37, Annual Meeting, Denver, CO
- Taylor, S.B., Templeton, J.H., and Giles, D.E.L., 2003, Cinder Cone Morphometry and Volume Distribution at Newberry Volcano, Oregon: Implications for Age Relations and Structural Control on Eruptive Process: *Geological Society of America Abstracts with Programs*, v. 35, no. 6, Fall National Meeting, Seattle.
- Giles, D.E.L., Taylor, S.B., and Templeton, J.H., 2003, Compilation of a Digital Geologic Map and Geodatabase for Newberry Volcano, Central Oregon: A Framework for Gis-Based Analyses of Volcanic Process And Products in a Back-Arc Setting: *Geological Society of America Abstracts with Programs*, v. 35, no. 6, Fall National Meeting, Seattle.
- Collett, C., Halverson, B., and Taylor, S.B., 2003, Preparing for Oregon's 21<sup>st</sup> Century Schools by Integrating Technology Across the Curriculum: Forging Partnerships Between Education and Liberal Arts and Science: *National Education Computing Conference, Abstracts with Programs*, Seattle.
- Taylor, S.B., 2002, Bedrock Control on Slope Gradients in the Luckiamute Watershed, Central Coast Range, Oregon: Implications for Sediment Transport and Storage: *American Geophysical Union Abstracts with Programs*, Fall Meeting 2002, San Francisco, California.

## **PUBLICATIONS (Cont.)**

- Taylor S.B. and Copa, P.M., 2002, Integrating Technology Across the Curriculum: Forging Partnerships Between Education and Liberal Arts and Science (abstract): U.S. Dept. of Education, Preparing Tomorrow's Teachers to Use Technology (PT3) National Meeting, Abstracts with Programs, Washington, D.C.
- Taylor, S.B., Dutton, B.E., and Poston, P.E., 2002, Luckiamute River watershed, upper Willamette Basin, Oregon – An integrated environmental study for K-12 Educators, in Moore, G.W., ed., Field Guide to Geologic Processes in Cascadia: Oregon Department of Geology and Mineral Industries Special Paper 36, p. 167-186.
- Taylor, S.B. and Swartzentruber, R.L., 2002, Year 2 Partners in Science Research Project - Case Study of Anderson Creek Debris Flow Site, Lincoln County, Oregon: Abstracts with Program, Partners in Science National Conference, San Diego, California.
- Taylor, S.B., Madarish, D., and Kite, J.S., 2001, Gravel distribution analysis of three channel systems in the central Appalachians: Comparative evaluation of sediment-transport efficiency and valley-erosion dynamics: Abstracts with Program, Binghamton Symposium, Mountain Geomorphology: Integrating Earth Systems, University of North Carolina, Chapel Hill, North Carolina, p. 49-50.
- Dutton, B.E., and Taylor, S.B., 2001, A course in Natural Science: A model for integrating content, research, and pedagogy: Abstracts with Program, Oregon Collaborative for Excellence in Preparation of Teachers (OCEPT) Showcase 2001, Salem, Oregon.
- Taylor, S.B. and Swartzentruber, R.L., 2001, Year 1 Partners in Science Research Project - Geomorphic Hazards Assessment in West-Central Oregon: Abstracts with Program, Partners in Science National Conference, San Diego, California.
- Taylor, S.B., 2000, Sediment-storage budgets for colluvium-dominated watersheds in the central Appalachians: Geological Society of America, Abstracts with Program, Fall 2000 National Meeting, v. 32, no. 7.
- Davis, E.N., Taylor, S.B., Kite, J.S., and Fedorko, N., 1999, Periglacial landforms and deposits of Canaan Valley, Tucker County, West Virginia: Field Trip Guide Book for the Annual Meeting, West Virginia Soc. of Professional Soil Scientists, Morgantown, WV, 30 p.
- Taylor, S.B., 1998, Geomorphic analysis of small-scale debris fans at three central Appalachian watersheds: Implications for controls on sediment transport efficiency [abs.]: Geological Society of America, Abstracts with Program, Fall National Meeting, v.30, no.7, p. A-141.
- Kite, J.S., Taylor, S.B., Davis, E.N., and D'Urso, G.J., 1998, Optimum scales for surficial geology maps of mountainous areas in the eastern United States [abs.]: Geological Society of America, Abstracts with Program, Fall 1998 National Meeting, v. 30, no. 7, p. A-137.

## **PUBLICATIONS (Cont.)**

- Taylor, S.B., 1997, Sandstone lithofacies, regolith production, and surficial processes in the central Appalachians: Preliminary analysis of landscapes underlain by the Acadian clastic wedge [abs.]: EOS Transactions of the American Geophysical Union, v. 78, no. 46, Fall Meeting Supplement, p. F286.
- Taylor, S.B., 1997, The influence of sedimentary lithofacies on hillslope processes in the central Appalachians: A conceptual model based on analysis of landscapes underlain by the Acadian clastic wedge [abs.]: Geological Society of America, Abstracts with Program, Fall 1997 National Meeting, v. 29, no. 7, p. A-411.
- Taylor, S.B., Kite, J.S., and Kuhn, K., 1996, Surficial map criteria for unglaciated humid-mountainous landscapes - linkage of process and landform: An example from the Fernow Experimental Forest, Tucker County, West Virginia [abs.]: Geological Society of America, Fall 1996 National Meeting, Abstracts with Programs, v. 28.
- Larsen, D., and Taylor, S.B., 1991, Stratigraphy and sedimentology of the Espinaso Formation in the Cerrillos area, in Smith, G.A. and others, A tale of two volcanoclastic aprons: Field guide to the sedimentology and physical volcanology of the Oligocene Espinaso Formation and Miocene Peralta Tuff, north-central New Mexico: New Mexico Bureau of Mines and Mineral Resources Bulletin 137, p. 90-92.
- Smith, G.A., Larsen, D., Harlen, S.S., McIntosh, W.C., Erskine, D.W., and Taylor, S.B., 1991, A tale of two volcanoclastic aprons: Field guide to the sedimentology and physical volcanology of the Oligocene Espinaso Formation and Miocene Peralta Tuff, north-central New Mexico: New Mexico Bureau of Mines & Mineral Resources Bulletin 137, p.87-103.
- Wright, R., and Taylor, S. B., 1989, Small-scale changes in relative sea-level in the East Pisco Basin, Peruvian Forearc Margin, central Peru [abs.]: Abstracts with Program, International Association of Sedimentologists and British Sedimentological Research Group Symposium, Eustatic Sea-Level Changes at Active Plate Margins, London, U.K.
- Taylor, S. B., Johnson, S. Y., Fraser, G. T., Roberts, J. W., 1988, Sedimentation and tectonics of the lower and middle Eocene Swauk Formation in eastern Swauk Basin, central Cascades, central Washington: Canadian Journal of Earth Science, v. 25, 7, p. 1020-1036.
- Taylor, S. B., Johnson, S. Y., Fraser, G. T., Roberts, J. W., 1987, Depositional and tectonic framework of the lower to middle Eocene Swauk Formation, eastern Swauk Basin--A model for early Tertiary basin development beneath the Columbia River Plateau [abs.]: American Association of Petroleum Geologists Bulletin, v. 71, no. 8, p. 1016.
- Taylor, S. B., Johnson, S. Y., Fraser, G. T., Roberts, J. W., 1984, Reversals of paleo-drainage patterns in Eocene Swauk basin, Washington: implications for strike-slip basin evolution [abs.]: Geological Society of America Abstracts with Program, v. 16, no. 6, p. 674.

## **PUBLICATIONS (Cont.)**

Johnson, S. Y., Fraser, G. T., Roberts, J. W., Taylor, S. B., 1984, Eocene strike-slip faulting and basin formation in Washington [abs.]: American Association of Petroleum Geologists Bulletin, v. 68, no. 4, p. 493.

## **UNPUBLISHED TECHNICAL REPORTS**

Taylor, S.B., 2004, Geology of the Luckiamute River watershed, upper Willamette Basin, Polk and Benton Counties, Oregon: *in* Garono, R.J., Anderson, B.D., Harma, K., Buhl, C., and Adamus, P., Luckiamute / Ash Creek / American Bottom Watershed Assessment: Unpublished Technical Document, Luckiamute Watershed Council, Western Oregon University, Monmouth, Oregon, Appendix A – 19 p., available on line at <URL: [http://www.wou.edu/las/natsci\\_math/geology/luckiamute/Appendix A Geology of Luckiamute River Watershed.pdf](http://www.wou.edu/las/natsci_math/geology/luckiamute/Appendix%20A%20Geology%20of%20Luckiamute%20River%20Watershed.pdf), updated June 2204.

Taylor, S.B, 2000, Geomorphic Controls on Debris Flow Hazards and Sediment-Transport Efficiency in the Central Appalachians - Final Technical Report to the NASA Earth System Science Program (Contract No. ESS/97-0080): Submitted to the ESS Program, NASA Headquarters, Washington, D.C.

Anderson, R.W. and Taylor, S.B., 1999, Proposed remediation strategy for groundwater contaminated with chlorinated hydrocarbons at the Trent Tube and Steel Plant, southeast Wisconsin: Submitted to Trent Tube and Steel, Inc.

Taylor, S.B. 1999, Recommendation for abatement of coal-bed methane degassing at the Girty's Run Sewer Project Site, Allegheny County, Pennsylvania: Submitted to Pine Township.

Taylor, S.B., 1999. Geomorphic controls on sediment transport efficiency in the Central Appalachians: A comparative analysis of three watersheds underlain by the Acadian Clastic Wedge. Ph.D. Dissertation, West Virginia University, Morgantown, WV, 463 p.

Taylor, S.B. and Kite, J.S., 1998, Surficial and bedrock geology of the Little River basin, George Washington National Forest, Augusta County, Virginia: Submitted to the U.S. Geological Survey National Cooperative Mapping Program (EDMAP Contract 1434-HQ-97-AG-01782), Reston, VA, multiple map sheets with report.

Taylor, S.B. and Kite, J.S., 1997, Surficial and bedrock geology of the upper North Fork drainage basin, Monongahela National Forest, Pocahontas County, West Virginia: Submitted to the U.S. Geological Survey National Cooperative Mapping Program (EDMAP Contract 1434-HQ-96-AG-01561), Reston, VA, multiple map sheets with report.

## **UNPUBLISHED TECHNICAL REPORTS (Cont.)**

Taylor, S.B., Kite, J.S., and Kuhn, K., 1996, Bedrock and surficial geology of the Fernow Experimental Forest, Tucker County, West Virginia: Submitted to the USDA Northeastern Forest Experiment Station, Timber and Watershed Laboratory, Parsons, WV, multiple map sheets with report.

Anderson, R.W. and Taylor, S.B., 1993, Preliminary statistical analysis of landfill water quality data: J & J Landfill, Fayette County, Pennsylvania: Submitted to PA Dept. of Environmental Resources.

Anderson, R.W. and Taylor, S.B., 1993, Results of groundwater impact assessment at disposal cell 1, J & J Landfill, Fayette County, Pennsylvania: Submitted to PA Dept. of Environmental Resources.

Anderson, R.W. and Taylor, S.B., 1993, Sewage facility planning module section G. Preliminary hydrogeology of a small flow sewage treatment facility, Mystic Rocks Golf Course, Fayette County, Pennsylvania: Submitted to PA Dept. of Environmental Resources.

Anderson, R.W. and Taylor, S.B., 1993, Pump-testing and preliminary hydrogeologic impact assessment of the production well-field at Mystic Rocks Golf Course, Fayette County, Pennsylvania: Submitted to Nemaquin Woodlands, Inc.

Anderson, R.W. and Taylor, S.B., 1993, Impact assessment of a small-flow sewage treatment facility at the Bosmyer property, Allegheny County, Pennsylvania: Submitted to Century 21 Real Estate Services Division.

Anderson, R.W. and Taylor, S.B., 1993, Private water supply impact assessment at the Gould Mine permit area, Washington County, Pennsylvania: Submitted to PA Dept. of Environmental Resources.

Anderson, R.W. and Taylor, S.B., 1992, Municipal waste permit application: geology and hydrogeology of an abandoned surface mine complex, southern coal district, Illinois: Submitted to Laidlaw Waste Systems, Inc.

Anderson, R.W. and Taylor, S.B., 1992, Expert witness testimony: Angerman vs. Buskey, hydrogeologic impact assessment of gas well drilling in Westmoreland County, Pennsylvania: submitted for review to Westmoreland County Court.

Anderson, R.W. and Taylor, S.B., 1992, Coal surface mining permit application: geology and hydrogeology of the Prep. II mine permit area, Washington County, Pennsylvania: submitted to PA Dept. of Environmental Resources.

Anderson, R.W. and Taylor, S.B., 1992, Residual solid waste permit application: geology and hydrogeology of the White Pines permit area, Lycoming County, Pennsylvania: submitted to PA Dept. of Environmental Resources.



## **UNPUBLISHED TECHNICAL REPORTS (Cont.)**

Anderson, R.W. and Taylor, S.B., 1992, Installation of methane gas monitoring probes and groundwater monitoring wells at the M.C. Arnoni Landfill, South Park Township, Pennsylvania: submitted to J&L Engineering, Inc.

Anderson, R.W. and Taylor, S.B., 1991, Small operators assistance program: geology and hydrogeology of the Maderia permit area, Washington County, Pennsylvania: submitted to PA Dept. of Environmental Resources.

Anderson, R.W. and Taylor, S.B., 1990, Coal surface mining permit application: geology and hydrogeology of the Gould Mine permit area, Washington County, Pennsylvania: submitted to PA Dept. of Environmental Resources.

Taylor, S. B., 1985, Stratigraphy, sedimentology, and paleogeography of the Swauk Formation in the Liberty area, central Cascades, Washington: Unpub. M. S. Thesis, Washington State University, Pullman, WA, 199 p.

## **REFERENCES**

Dr. Jeff Templeton, Division of Natural Sciences and Mathematics, Western Oregon University, Monmouth, OR, 97361, (503) 838-8207, courtna@wou.edu

Dr. J. Steven Kite, Associate Professor, Department of Geology, West Virginia University, Morgantown, WV, 26506, (304) 293-5603, jkite@wou.edu

Robert W. Anderson, Manager of Geosciences/Solid Waste, U.S. Filter - Chester Engineers, Cherrington Corporate Center, 600 Clubhouse Drive, Pittsburgh, PA 15108, (412) 269-5700

## **Most Recent Faculty Development Award**

Proposal Submitted and Funded Winter Term 2004: Bryan Dutton and Steve Taylor (Natural Sciences and Math), Project Title: “Geomorphic and Anthropogenic Influences on the Distribution of Invasive Plant Species in the Luckiamute Watershed, Polk and Benton Counties, Oregon”

### **Faculty Development Category III Grant Report**

**Bryan E. Dutton & Stephen B. Taylor**

*Geomorphic and Anthropogenic Influences on the Distribution of Invasive Plant Species in the Luckiamute Watershed, Polk and Benton Counties, Oregon*

The following report represents a synthesis of progress made on our invasive plant research as a result of funding from both Western’s Faculty Development and the Oregon Community Foundation. Our report includes progress made in refining specific methods and achieving anticipated goals / outcomes as well as a revised project timeline.

### **METHODOLOGY**

Significant progress was made in refining and employing our plant data collecting strategies. Our survey strategy employed a 100-meter transect that lies perpendicular to the river course under examination, with a total of 20 transects. Determination of percent cover for all plants found in 1 meter by 1 meter contiguous grids along this transect was then made. We also collected available light data (in the 400 to 700 nm range – the “photosynthetically active” portion of the visible light spectrum) along each transect line to document correlations between light availability and invasive plant distribution. Site selection was based on GIS analysis (geographic information system) and creation of a “wooded riparian border” thematic layer (i.e. digital map). Once completed, wooded riparian areas of sufficient width were matched with their respective property owners. More than 200 owners were identified and contacted via mail with a description of our project and request for property access. We received 25 positive responses, granting us permission to conduct surveys. Data from these surveys are currently being analyzed in Excel spreadsheets as part of ongoing statistical analysis.

### **GOALS AND EXPECTED OUTCOMES**

As stated in our proposal, results of this project include: (1) delineation of a select set of invasive species that will serve as useful indicators for monitoring the occurrence and spread of non-native plants in the Luckiamute Watershed, (2) identification of geomorphic and anthropogenic disturbance regimes that are acting as principle migration corridors for invasive plant species in western Oregon, and (3) derivation of spatial associations between invasive species and landscape-land use components. These results will form the basis of more extensive studies in the region and have potential use for development of larger scale predictive models of invasive plant dispersion. We have provided a detailed list of goals and outcomes attained along with additional support received and grant writing activity conducted below.

### **Detailed List of Project Outcomes:**

Western’s Faculty Development Grant funds, in conjunction with Oregon Community Foundation grant monies have been invaluable in advancing the following components of our research project.

- Developed and implemented survey procedures appropriate for the research questions posed

- Completed extensive literature survey yielding nearly 200 relevant technical references
- Created a literature reference database
- Created “species information pages” for the most commonly encountered native and non-native invasive species (total number of species encountered = 170)
- Information in each “page” includes: Life History, Life Expectancy, Plant Description, Reproductive Ecology, Seedling Ecology, and Bibliography
- Generated a Geographic Information System (GIS) thematic layer depicting wooded riparian buffers (>50 meters) and survey transects along the Luckiamute River and its major tributaries
- Collected and scanned a series of historic air photos for the Luckiamute Watershed, ranging in age from the 1930’s to present
- Using the related GIS thematic layer data, generated a contact list of more than 200 riparian property owners along the Luckiamute
- Drafted and mailed a permission request letter to the more than 200 property owners mentioned above
- Completed initial field reconnaissance along more than 100 miles of the Luckiamute River and its tributaries.
- Completed twenty, 100-meter survey transects along with supporting light meter data
- Sponsored 4 undergraduate research assistants with stipends and transportation costs

#### **Additional Support / Grant-writing Activity**

- Initiated a collaborative project with the Luckiamute Watershed Council and the Northwest Oregon Invasive Weed Management Partnership, the focus of which involves reconnaissance mapping of Japanese Knotweed (*Polygonum cuspidatum*) populations along the Luckiamute River and its major tributaries
- Submitted a proposal to the Oregon Community Trust for additional funding (\$6,000) in order to continue and broaden the scope of our research

In sum, Western’s Faculty Development Grant funds provided much needed seed money to initiate invasive plant studies in the mid-Willamette Valley and established the framework for related spin-off proposals and community collaboration. Additional information, research data, analyses, and ancillary materials are available upon request.