**ES407 Senior Seminar Academic Showcase 2019 Presentation Titles and Abstracts**

**Session ID: 386**

**Title: Earth Science Senior Seminar Theme Session - "Forest Hydrology and Geomorphology: Perspectives from the Pacific Northwest"**

**Session Overview:**

This theme session involves presentation by WOU Earth Science students enrolled in ES407 Senior Seminar. The focus is on forest hydrology and geomorphology with case study examples from western Oregon. Watersheds are comprised of channel networks and represent one of the most fundamental landscape systems on the Earth’s surface. They provide ecological services along riparian corridors that form critical habitat in the Pacific Northwest. The historic interplay between human occupation, intensive land management, and fluvial systems has resulted in significant impairment of waterways over the past century. This theme session provides an overview of hydrogeomorphic processes in relation to forest management practices as applied to mountainous watersheds in western Oregon. Study topics include hydrologic process, mountain geomorphology, soils, erosion / sedimentation, wood recruitment, carbon cycling and effects of climate change.

**Palmer Baldwin, “Hydrologic Response to Timber Harvest and Forest Management Practices in Western Oregon”**

The hydrologic balance of streams and riparian zones in the Western Cascades of Oregon, is part of a multifaceted geomorphic system characterized by forested mountain terrain. As part of an NSF-funded, Long Term Ecological Research Program, this region has been studied for several decades in order to better understand the effects of timber harvest and related land management practices on landscape processes. Current understanding and technologies allow for more accurate modelling of hydrologic response to forestry treatments, which regionally impact ecological processes that can be linked to significant downstream response in watershed networks. Hillslope soil moisture, channel discharge, and stream temperature datasets collected over several decades are utilized in the development of regional response models, which are in turn critical for the development of sustainable land management practices into the future.

**Tim Hagen, “Sediment Dynamics and Erosion Response to Forest Management Practice in Western Oregon”**

Since extensive European settlement in the late 1800’s, mountainous watersheds of western Oregon have experienced increased rates of sediment erosion stimulated by road construction, industrial timber harvest, and related forest management practice. Understanding of the process-response implications of this land-use management history involves long-term study of sediment-transport dynamics in mountainous headwater regions of the Western Cascades and Coast Range. Research studies have focused on recording sediment flux by use of experimental watersheds instrumented with sediment traps, weirs, and stream gauges. The data collected from these experiments provide insight as to how sediment flux responds to varying forest management strategies. Commercial timber harvest is more regulated today based on the results derived from watershed-scale experiments over the past 50 to 60 years. With an increased understanding of sediment dynamics and historic erosion rates, policy managers can better prepare for future stewardship of our forests and public lands.

**Austin Wegner, “Forest Road Construction and Sediment Production in Western Oregon”**

Studies and observations of forest road systems in western Oregon have revealed that logging-related construction and maintenance contribute significantly to increased sediment transport within watershed networks. This increased sedimentation rate can have negative effects on the hydrology and ecosystem services of the channel network. Remediation of these negative effects is difficult, time consuming, and expensive, thus prevention is the optimal approach for many land managers. Through collection of experimental data and observations, it is possible to identify the most harmful practices associated with logging activities and eliminate or improve upon them, while encouraging further use of less harmful practices. The purpose of this presentation is to provide the scientific findings necessary to identify the impacts that forest road systems have on watershed sediment yield and the techniques employed to mitigate the effect.

**Hunter Collins, “Landslide and Debris Flow Occurrence in Forested Landscapes of Western Oregon**

Research conducted throughout forested landscapes of western Oregon over the past 70 years has helped shape modern logging techniques, as well as land management policy. Timber harvest studies in the Western Cascades and Coast Range of Oregon provide evidence of increased mass movement occurrences in the time period after logging. Varying conditions of stand age, stage of regrowth, and environmental factors play a vital role in affecting soil stability throughout forested landscapes. Conditions created by anthropogenic impacts also account for large amounts of erosion and mass movement in this region, primarily associated with road construction. This presentation aims to explore research results derived from the work of multiple scientists over the past decades, and evaluate the direct impact of forest management on slope stability in the region.

**Samantha Abel, “Perspectives on Climate Change and Forest Hydrology in the Oregon Cascades”**

Based on currently available data models, climate change is expected to impact forests and alter water balance in the Oregon Cascades over the next 100 years, and beyond. Various studies across the state have shown historic changes in precipitation modes (rain versus snow) and mean average temperatures, with resultant increase in snowmelt, retreat of snowpacks, and increased fire vulnerability. Decreases in basin-wide evapotranspiration rates, drier summers, and higher chances of winter-summer floods are also predicted. Municipal and industrial sectors in western Oregon are projected to be vulnerable to drier summers and drought-related shortages, while the vulnerability of recreational sectors will be variable. Sustainable forest management practices such as reducing clear-cuts and allowing for increased canopy and vegetative cover may mitigate adverse effects on water availability in the ecosystem.

**2019 Academic Excellence Showcase, May 30**

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**Location:** HWC301

**Presentation Mode:** Oral Session

**Faculty Sponsor:** Steve Taylor, Professor of Geology, Earth and Physical Science Department, Western Oregon University

12:45-12:55 PM (10 min) Taylor Introduction

12:55-1:00 PM (5 min) Questions/Speaker Transition

1:00-1:20 PM (20 min) Palmer Baldwin, “Hydrologic Response to Timber Harvest and

Forest Management Practices in Western Oregon”

1:20-1:25 PM (5 min) Questions / Speaker Transition

1:25-1:45 PM (20 min) Tim Hagen, “Sediment Dynamics and Erosion Response to

Forest Management Practice in Western Oregon”

**1:45-2:00 PM (15 min) Session Break**

2:00-2:20 PM (20 min) Austin Wegner, “Forest Road Construction and Sediment

Production in Western Oregon”

2:20-2:25 PM (5 min) Questions / Speaker Transition

2:25-2:45 PM (20 min) Hunter Collins, “Landslide and Debris Flow Occurrence in

Forested Landscapes of Western Oregon”

2:45-2:50 PM (5 min) Questions / Speaker Transition

2:50-3:10 PM (20 min) Samantha Abel, “Perspectives on Climate Change and Forest

Hydrology in the Oregon Cascades”

3:10-3:15 PM (5 min) Questions / Speaker Transition

3:15-3:30 PM (15 min) Taylor Concluding Comments