

Proposal for Research Matching Funds

**Hydrogeologic Analysis of the Luckiamute Watershed, Central Coast Range, Oregon:
Integrating Applied Watershed Science Research and Community Outreach**

Prepared by

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Submitted to

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INTRODUCTION

Mountainous watersheds, less than 250,000 ac (~100,000 ha), are fundamental landscape elements that form an important setting for local ecological interactions, human occupation, and water resource development. 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; Bull, 1991). As such, the understanding of hydrogeologic variables and related process interactions is critical for designing sustainable water resource and habitat conservation plans.

The purpose of this proposal is to conduct hydrogeologic research on the Luckiamute Watershed with a focus on aquifer characterization and water quality. This work is intended to augment and support an existing undergraduate research program that uses the Luckiamute as a natural laboratory for problem-based learning (after Woltemade and Blewett, 2002).

The Luckiamute is associated with a unique combination of geomorphic and land-use conditions that are well suited for the study of interdependent watershed variables. It is also in close proximity to the WOU campus and is logistically well situated for access during the academic year (Figure 1). The research objectives are to: (1) understand the influence of varying bedrock lithology on aquifer systems, (2) characterize ground water flow conditions, and (3) evaluate the effects of geologic and anthropogenic variables on water-quality. Project activities will include field mapping, aquifer analysis, water quality sampling, and compilation of GIS data. The products of this preliminary work will be used to delineate subsequent research topics and will form the basis for problem-based learning activities.

This proposal solicits match funds from Western Oregon University to support watershed research in conjunction with ongoing assessment activities conducted by the Luckiamute Watershed Council. This community-based organization is located in Monmouth and is dedicated to the sustainability of local water resources in Polk-Benton counties. Match funds are sought to engage Eve Montanaro, Luckiamute Watershed Coordinator, as a research associate for summer-fall 2004. As the watershed coordinator is housed on the WOU campus, the proposed collaboration provides an excellent opportunity for community outreach and interaction between students and practicing watershed professionals.

STATEMENT OF THE PROBLEM

Ground water in the Luckiamute Watershed forms part of the Willamette Lowland aquifer system of western Oregon and southwestern Washington. Approximately 70% of the population of Oregon resides in the Willamette Valley. Rapid population growth in the past several decades has led to increasing demand on ground water resources for domestic, industrial, and agricultural use (Woodward and others, 1998). As surface-water rights are largely allocated according to the Doctrine of Prior Appropriation, ground-water resources are increasingly utilized to satisfy the growing demand. Since 1955, the number of water wells drilled in the Willamette Basin increased from 500 per year to over 4000 (Orzol and others, 2000). These water usage trends are also applicable to the Luckiamute Basin where the populations of Polk and Benton counties have increased 26% and 10%, respectively, in the past decade (U.S. Census Bureau, 2004). Thus a thorough understanding of the hydrogeologic framework is critical for sustainable water resource planning.

The Luckiamute represents a basin-margin watershed in the Willamette Valley, over 70% of which is underlain by Tertiary sedimentary and volcanic rocks. Most groundwater is used for domestic and agricultural purposes, with municipal supplies serving the communities of Monmouth and Independence. Little detailed information is known about local aquifer conditions in the Luckiamute Watershed (Karl Wozniak, Oregon Water Resources Dept., Personal Communication). Recent regional ground-water studies focused on high-capacity aquifer units elsewhere in the Willamette Valley, although included portions of the lower Luckiamute and Ash Creek subbasins (Woodward and others, 1998; Gannet and Caldwell, 1998). More detailed work on the hydrogeology and ground-water quality of the Dallas-Monmouth area was conducted by Gonthier (1983) and Caldwell (1993); however their work has not been extended south into the Luckiamute. While the general hydrogeologic conditions of the Luckiamute study area are known, detailed quantitative analyses are lacking. The Gonthier (1983) and Caldwell (1993) studies provide an excellent platform from which to extend hydrogeologic research to the south, into the Luckiamute proper.

PROJECT GOALS AND OBJECTIVES

The primary research objectives are to: (1) characterize aquifer systems, (2) assess ground-water flow conditions, and (3) evaluate the effects of geologic and anthropogenic variables on water-quality. Secondary objectives include: (1) using the Luckiamute as a community-based laboratory for integrating watershed research into the science curriculum at WOU, (2) engaging the local watershed coordinator as a research associate to cultivate a sense of university investment in the local community, and (3) provide students an opportunity to participate in problem-base learning in association with a practicing watershed professional.

ACTION PLAN

Proposed research activities focus on hydrogeologic analysis of the Luckiamute Watershed, explicit action items include:

- (1) Literature review and compilation of existing water well data.
- (2) Field location and mapping of residential water wells.
- (3) Collection of well / aquifer information including total well depths, water levels, well-discharge capacities, and field water quality.
- (4) Compilation of groundwater maps, aquifer maps, and related GIS coverages
- (5) Delineation of aquifer horizons and quantification of aquifer characteristics.
- (6) Community involvement via association with Luckiamute watershed coordinator.
- (7) Web-based dissemination of research products.

The products of this preliminary work will be used to delineate subsequent research topics and will form the basis for problem-based learning activities in the Earth Science curriculum at WOU.

BUDGET / TIMELINE

Research Associate Stipend – Eve Montanaro (LWC Coordinator) <i>(Part-Time Summer-Fall 2004: 0.20 FTE - 13 Weeks x 8 hrs / week)</i>	\$1500.00
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Research will be conducted during the summer and fall of 2004.

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