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Improving Science Education in the 4-H Geology Project

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PREVIOUS ARTICLE | ISSUE CONTENTS | NEXT ARTICLE

Improving Science Education in the 4-H Geology Project

Abstract
To move the 4-H Geology project beyond a focus on rock and mineral collections and introduce youth to science concepts and geologic processes, a 4-H Earth Science Leader Guide was developed. State-wide workshops and the creation of Earth Science Materials Kits were key elements of the first year's success. The result is both an increase in youth enrollment in the 4-H Geology project and an increased county staff capacity to support science education programs.

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Introduction

Historically, Oregon's 4-H Geology project materials included a youth record page and a 22-page combined leader/member manual. The manual provided limited project recommendations that relied on non-Extension publications. The project's primary focus was on the collection and display of rocks and minerals at 4-H fairs. In 1998, only 241 youth in 19 of Oregon's 36 counties participated in the 4-H Geology project.

Geologic formations and Earth science processes have a dynamic, and sometimes immediate, influence on the quality of life Oregonians enjoy. The productivity of farm, forest, and range lands is determined by the nature of their soils and their location relative to mountain ranges and oceans that strongly influence rainfall and watershed drainage. The Columbia River watershed drains over 250,000 square miles from the northern Rocky Mountains (a tectonic range) to the Cascades (a volcanic range), providing water for salmon habitat, irrigation, navigation, and hydraulic power.

An understanding of these interrelationships is important when making natural resource management decisions. Extension Agents, teachers, and volunteers working with youth groups needed educational resources to develop an understanding of these geologic interrelationships.

After reviewing this situation, Oregon's 4-H Natural Science Curriculum Committee recommended that the 4-H Natural Science Specialist convene a Task Force to develop new geology education materials. The Curriculum Committee believed:

- Youth need a basic knowledge of geology to understand concepts important in all natural resource projects, and
- Oregon's fascinating geology provides an opportunity to develop a science program that goes beyond the knowledge gained creating rock and mineral collections.

A 16-member inter-agency, interdisciplinary Task Force was convened to serve as the *4-H Earth Science Leader Guide* review team. The team included campus-based and county Extension faculty, club leaders, teens, teachers, an after-school science club specialist, and staff from the U.S. Fish and Wildlife Service and U.S. Geological Survey. It was critical that the Task Force members represent a diversity of science expertise. Reducing 365 million years of geologic activity into an accessible format is a daunting task. When interpreting complex concepts to youth, it is important not to make them so simplistic as to be inaccurate.

The Science-Based Leader Guide

The Task Force decided that the Leader Guide would contain lessons on basic geologic concepts for youth in grades 4-8. These lessons would:

- Be based on the experiential learning model,
- Focus on Earth science processes using examples found in Oregon,
- Develop an understanding of the geographic and geologic interrelationships important to natural resource management decisions,
- Be designed for multiple delivery modes including school enrichment, camps and 4-H clubs,
- Be keyed to National Science Standards as adopted by the Oregon Department of Education, and
- Provide opportunities to practice life skills.

The resulting 4-H Earth Science Leader Guide includes nine chapters with 27 experiential lessons. The opening chapter introduces geography and Oregon's nine geologic provinces. In the next eight chapters the background sections present information on Oregon's geologic history beginning in the Mesozoic and continuing over time to recent events.

For example, the Chapter 2 background section focuses on the genesis of the Blue Mountain Geologic Province, one of the oldest in Oregon. To assist adults to interpret this information to youth, three experiential lessons explore the basic science concepts:

- Convection currents,
- Density, and
- Plate tectonics.

The lessons in each succeeding chapter present additional broad Earth science concepts, such as the rock cycle, earthquakes, and volcanism. These basic science lessons can be used anywhere in the United States by tying concepts to a particular region to make them most relevant to local learners.

A Leader Guide Was Not Enough

Once the *4-H Earth Science Leader Guide* was completed, the Task Force realized it was imperative to provide training to familiarize staff and volunteers with the new materials. Specialists presented six workshops across the state reaching 84 participants.

When asked if they would use the workshop material learned in the next six months, 93% of participants responded "Yes." This proved to be true. As a result of the state-wide workshops, counties that had not previously had enrollment in the 4-H Geology project now had trained leaders who were actively delivering the program to youth and requesting additional support.

In response to this need, *Earth Science Materials Kits* were developed. The kits include chemicals, geologic models, videos, and reusable equipment needed to conduct the lessons. In 2001, 29 of Oregon's 36 counties have access to an *Earth Science Materials Kit*. Of these counties, 10 had no enrollment in the 4-H Geology project during 1999.

Conclusion

Through the development of new geology education materials, the 4-H Natural Science Curriculum Committee learned that a triad approach was needed to successful launch an expanded state-wide program. This triad included:

- A science based Leader Guide,
- A materials kit to support the lessons in the Leader Guide, and
- Workshops presented by specialists to familiarize staff and volunteers with the Leader Guide and materials kits.

In the first year, the number of youth enrolled in school enrichment or club based 4-H Geology projects increased to 479. In addition, Agriculture and 4-H Agents are using the Leader Guide lessons and kit materials to support other youth education efforts. The result is both an increase in youth enrollment in the 4-H Geology project and an increased county staff capacity to support science education programs.