

# THE ROLE OF THE TECHNICIAN IN RECLAIMING MINED LANDS<sup>1</sup>

by  
Peter G. Moller<sup>2</sup>

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**Abstract.** The role of the two year technician in reclaiming mined land is highly diverse. He/she must be familiar with sampling techniques and be able to use a variety of equipment and instruments in monitoring resources and reclaiming disturbed land. Although the tasks may overlap with those of the environmental engineer, the functions of these two types of individuals are noticeably different. For the last 17 years Colorado Mountain College in Leadville has been training technicians to rehabilitate mined land in what has been one of the most unique two year programs in the country.

Additional Key Words: skills, laboratory, curriculum, high altitude, and internship.

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## Introduction

Education is a life-long process. I tell my students their "real" education will be on the job, and that all we can do in college is prepare their minds for the tasks ahead! But just what are these tasks for a two year technician when it comes to rehabilitating mined land? What kinds of skills do such technicians possess? How do their jobs differ from that of an engineer or a land expert with a bachelor's degree or more? It is the purpose of this paper to address these questions, including how a small college in the high country of Colorado has been training people with diverse skills in the field of mined land reclamation.

## The Two Year Technician

### The Role of The Technician

Much of the technician's job is in the field, collecting and recording base-line data. For a mining operation this data might include information on a wide gamut of envi-

ronmental subjects, including vegetation, soils, water, wildlife, topography, air, climate, rocks and minerals, and, yes, even people. Consequently, a technician must be familiar with a variety of sampling techniques.

Often the job involves laboratory work in which samples are analyzed with both simple and sophisticated instruments. The individual may work under a specialist, such as a chemist, agronomist, horticulturalist, or hydrologist. A task might be as simple as determining the pH of a soil or as complex as measuring the heavy metal content of a water sample with an atomic absorption spectrophotometer. In preparing technical reports from this data, the technician must have a working knowledge of different computer applications, including the preparation of spread sheets and graphics.

Since the technician may often be involved in rehabilitating disturbed land, he/she must be familiar with basic reclamation techniques, including those related to backfilling, grading, contouring, topsoiling, revegetation, landscaping, irrigation, drainage, and pest control. Knowing how to operate heavy equipment, such as a backhoe and front-end loader, and basic surveying and cartographic instruments, such as an electronic distance meter, theodolite, and planimeter, fall within the job description of a technician. The technician may be in charge of a field crew so should also have human relations skills.

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<sup>2</sup> Peter G. Moller is Professor, Environmental Technology, Colorado Mountain College, Timberline Campus, Leadville, CO 80461.

How can any individual be an expert in all these areas? The answer is they are not. They may, however, become on-the-job experts in some of these areas. They have had exposure, though, through hands-on experience and involvement in projects, to all of these subjects. The two key words for this technician are "diversity" and "skills". Often they will not become proficient in these skills until they have had some job experience. Consequently, acquiring experience in the environmental field should be a part of any technician's training before seeking that first permanent job.

### **The Role of The Engineer**

Although there is considerable overlap in the roles of the engineer and the technician, the engineer is needed to direct overall operations, including the field work. The expertise of the engineer can be channelled toward performing environmental audits and designing reclamation projects. This latter task might include, for example, the construction of sedimentation ponds or drainage systems. He/she prepares, or coordinates the preparation of, reclamation plans and permit applications. The engineer must also work with government agencies on a continuous basis to identify and interpret all pertinent regulations for company employees. Whether it is with the heavy equipment operator in the field or with the company executive, the engineer must possess good communication skills.

### **The Training of Technicians**

#### **A Small College in Leadville, Colorado**

The Timberline Campus of Colorado Mountain College (C.M.C.) in Leadville has been training technicians in mined-land reclamation for the last 17 years and has been a pioneer in this field. The college is an alternative to a large four year university. The environment is quite informal with students typically knowing their instructors on a first name basis. Classes are small, facilitating considerable interaction between student and instructor. Located across the valley from Colorado's two highest peaks in one of the state's most famous mining towns, students find themselves in a learning environment that is both beautiful and historic. For those interested in pursuing an environmental career there is a great outdoor laboratory of resources with which to work, including an abundance of acidic mine waste.

#### **A Program In Land Rehabilitation**

The program in Environmental Technology was started to address the reclamation needs of the mining industry.

Considerable research was done with the industry prior to that time to establish the basis for initiating this endeavor. Although the program has diversified considerably, much of its emphasis is still on training technicians for employment with the mining industry. In fact, due to the complex nature of mining disturbances, students in the land rehabilitation/water quality option of the program are prepared to work for a variety of employers by the training they receive in mined-land reclamation.

Upon successful completion of the program, an Associate in Applied Science degree is awarded. Job placement for graduates has been very good. About 75% have found employment in the environmental field. The type of employer varies considerably, however the mining industry has hired numerous graduates, mostly within the Rocky Mountain region. Often the hiring of technicians to complement the work of the environmental engineer is seen as a cost effective way by industry to meet reclamation responsibilities.

Fundamental to the growth of this program has been an active advisory committee. Currently this group of professionals consists of 18 men and women who work for a variety of companies and government agencies. Approximately one-third of this group consists of mine superintendents and environmental engineers for coal and mineral resource companies. Their assistance in guiding and supporting the program has been indispensable over the years.

The program has not gone without recognition. Two years ago the program was the recipient of the 1988 Colorado Mined-Land Reclamation Board Award for excellence in reclamation research and education. The award was presented by Governor Roy Romer for outstanding achievement in training technicians in land rehabilitation.

**A Diverse Student Body.** The students are as diverse as the nature of the program. They range in age from 18 to 46, currently averaging 29. Some have previously worked in mining; a few have had some environmental experience; many have had prior college education, a significant number having completed a bachelor's degree or higher in a related or non-related field; a good number are married; most have a part-time job while in school; many are seeking a new career or retraining.

**Program Curriculum.** The curriculum is intense for a two year program, and many students take more than two years to complete it. Students must take basic courses in English, speech, math, computers, and science. Included in the latter category are courses in biology, chemistry, soils, earth science, and ecology. More specific training

is offered in hydrology, wildlife habitat, heavy equipment operation, surveying & cartography, plant classification, soil fertility & mechanics, vegetative management, land rehabilitation, environmental law & the permit process, technical writing, and a choice of environmental electives.

Most of the courses in these subject areas involve laboratory and/or field work and trips. The Timberline Campus has about 250 acres on which students can perform work. However, just as significant is the presence of the California Gulch Superfund Site on which students have been able to carry out course work, including assisting with the establishment of revegetation experiments on acidic mine waste. One project in this area involved work from four courses in the program. Students surveyed and mapped an old mine site, used heavy equipment to move and break up the pyritic material, and prepared a reclamation plan for the area. Part of the students' training lies in confronting the challenge of reclaiming land at a high elevation. Leadville is the highest incorporated city in the country at an altitude of 10,152 feet.

To provide such diverse training several full and part-time faculty members are employed. In the latter category are working professionals who teach one or two courses in their particular field of expertise, adding a valuable dimension to the classroom.

**Internship.** Perhaps the most important part of the students' education is the summer field practicum in between their two years at C.M.C. During this time they are working for an employer either in the public or private sector. Often the employer is a mining company seeking qualified technicians for summer work.

Before each field practicum begins, a training plan and agreement are prepared with the employer to help ensure a good experience for the student. The financial remuneration received by the student is often essential to the completion of his/her college education. Since the job is for college credit, C.M.C. also places requirements on the experience.

### **A Program in Water Quality/Waste Management**

Several years ago, because of the growing importance of water quality, the need was recognized for more water-related training in the program. At that time more emphasis was placed on the courses in hydrology and wastewater treatment. To further respond to this challenge, a national environmental consulting firm was hired to conduct a survey to ascertain the feasibility of establishing a new option. As a result of their findings, as well as input received from a special 18-session seminar, a new option in water quality/waste management was added to the

Environmental Technology program three years ago. With the emphasis on water in both options, training in water quality has become central to the purpose of the program.

At the beginning of the students' second year of studies, they may choose either the land/water or water/waste option. Some students elect to pursue both routes so as to diversify their skill base and increase their employability.

In the water/waste option more attention is placed on chemistry, ground water hydrology, and waste management. There is considerable laboratory time spent learning how to operate some sophisticated analytical instruments, including a gas chromatograph unit and a variety of spectrophotometers.

Also inherent to this option is a course entitled, "Hazardous Waste: Characteristics, Health, and Safety". Upon successful completion of this three credit course, the student has met the 40 hour O.S.H.A. training requirement for working on a hazardous waste site. The relatively inexpensive course is offered not only to students of the Environmental Technology program, but also to members of the community at large.

### **Conclusion**

The environmental technician has a variety of essential skills to bring to the task of reclaiming mined land. Initially the job may require the collection and analysis of base-line data, using a wide variety of techniques and instruments. Once the reclamation plan has been designed, the technician is involved in various aspects of implementation. In addition, being able to recognize problems and potential permit violations is significant.

The roles of the technician and the engineer should be complementary. Both individuals need to understand and contribute to the work of the other.

Colorado Mountain College is proud to be working with the mining industry in the training of environmental technicians. At the Timberline Campus in Leadville students are receiving hands-on experience in a variety of environmental areas, including a summer field practicum with a variety of employers. Most of their education centers around the study of vegetation, soils, water, and land rehabilitation, however, skills are obtained in a variety of other areas also. Their training is enhanced by the challenges they confront in working in a high altitude setting where mine waste and adverse natural growing conditions are their laboratory.

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