RECLAMATION OF DISTURBED LANDS
CSES 5874

I. Catalogue Description

Human disturbances of soils and landscapes and various remediation strategies. Environmental impacts of coal and metal mining, mineral processing, highway or utility corridor development, and urbanization. Field and lab testing protocols; development of site-specific revegetation protocols. Acid mine drainage and treatment, including use of artificial wetlands. Pre: 5114. (3H, 3C).

Course Number: CSES 5874

ADP TITLE: Reclamation of Disturbed Lands

II. Learning Objectives

Upon completion of the course, students will be able to:

A. Describe the history and development of the environmental regulatory framework of post-mining reclamation in the USA.
B. Relate the chemical, physical, and biogeochemical properties of mine spoils and mineral processing wastes to their effects on water quality and revegetation success.
C. Develop and specify an optimal pre-disturbance sampling protocol and post-disturbance reclamation strategy for a wide array of mining, highway construction, and urbanization impacts.
D. Discuss the principles of acid mine drainage formation and treatment.
E. Prescribe optimal soil landscape reconstruction designs for the return of mined lands to agricultural, native vegetation, residential, and industrial uses.
F. Describe the processes whereby local citizens, governments, regulatory agencies, environmental advocacy groups, and the mining industry can successfully develop a framework for sustainable mining practices.

III. Justification

A proposed online Masters in Agricultural and Life Sciences – of which this course would be a component – will provide a broad, professional, graduate degree for persons whose interests lie in the agricultural and life science industries, governmental agencies serving agriculture, cooperative extension, and agricultural education. A Fall 2004 survey of agricultural and life science clients established a demand for such an online degree, preferences for information delivery modes, and interests in particular courses and topics. Career advancement and professional growth were the chief reasons why respondents were interested in obtaining a Master's degree. Survey results indicated that courses should provide up-to-date training for professionals needing to broaden or enhance their skills, that the program should be deliverable entirely online, and that it should be modular in order to fit the needs of place-bound, part-time learners.

CSES 5874 addresses the goals of the online degree program. Mining, road building and other drastic disturbances are increasingly altering the Earth's surface. The development of remediation and management strategies for drastically

disturbed lands is becoming common in any job sector involving terrestrial and aquatic resources. Both private and public sector employers of M.S.-level students commonly require a detailed knowledge of human impact estimation and appropriate reclamation/restoration approaches. This course will offer advanced material on a range of reclamation topical areas along with five study projects.

IV. Prerequisites and Co-requisites

A course equivalent to CSES 5114, Soils for Professionals (or CSES 3114, Soils) should be taken prior to entering this course to ensure all students possess an adequate background in basic soil science, applied geology, and environmental regulatory history.

V. Texts and Special Teaching Aids

A. Required text:

R.I. Barnhisel, R.G. Darmody, and W.L. Daniels (eds.). 2000. **Reclamation of Drastically Disturbed Lands**. American Soc. Agron./Soil Sci. Soc. Amer. Mono. 41, Madison WI. 1082 pp.

B. Approximately 20 additional scientific journal papers and book chapters will also be required readings. Examples include:

1. Daniels, W. L. and D. F. Amos. 1982. Chemical characteristics of some SW Virginia minesoils. p. 377-381 *In:* Proc. 1982 Symp. on Surface Mining Hydrology, Sedimentology and Reclamation, Univ. of Ky., Lexington, KY.

2. Skousen, J., J. Simmons, L.M. McDonald and P. Ziemkiewicz. 2002. Acid-base accounting to predict post-mining drainage quality on surface mines. J. Environ. Quality 31:2034-2044.

3. Hammack, R.W. and G.R. Watzlaf. 1990. The effect of oxygen on pyrite oxidation. P. 257-264 In: Proc., 1990 Mining and Reclamation Conf., Charleston, WV. Amer. Soc. Surf. Mining and Rec., 3134 Montavesta Rd, Lexington, KY, 40502.

4. Nordstrom, K.W. 1982. Aqueous pyrite oxidation and the consequent formation of secondary iron minerals. P. 37-56 In: Acid Sulfate Weathering, SSSA Spec. Pub. 10, Soil Sci. Soc. Amer., Madison, WI.

VI. Syllabus

Topic	% of Course
History of mine reclamation & legislation	7
Reclamation, acid drainage and the Clean Water Act	7
Introduction to reclamation/restoration/rehabilitation	7
Chemical and physical properties of spoils/soils I	7
Chemical and physical properties of spoils/soils II	7
Geology and geochemistry of acid drainage	7

Acid mine drainage control	7
Highway and urban impacts and revegetation	7
Metal mining and processing wastes	7
Liming and fertilizing mine soils	7
Mine soil reconstruction and revegetation	6
Mine soil genesis and taxonomy	6
Reclamation of coal processing wastes	6
Prime farmland reclamation	6
Sustainable mining in a global context	6
Total	100

VII. Old (current) Syllabus-in the case of a revised course

Not applicable

VIII. Core Curriculum guidelines-if inclusion in the University Core is desired

Not applicable