



NORTHWEST CENTER FOR SUSTAINABLE RESOURCES “NCSR–Education for a Sustainable Future”

NCSR INSTRUCTIONAL AND EDUCATIONAL MATERIALS 2009

NCSR educational materials are intended to support high school, two-year college, and undergraduate four-year college programs in natural resources-based subject areas. Free-of-charge, and website accessible (www.ncsr.org), courses, modules and educator guides include applications of scientific and technological themes, ecosystem management, and field-based activities. Materials are especially useful for educators because they include course outlines, complete descriptions of lab and field-based activities, current references, and suggestions for student assessment. Activities can be used as course supplements or as complete course sequences.

NCSR COURSES

AQUATIC FIELD AND LAB METHODS I: Introduces students to skills such as keeping field notebooks and journals; laboratory activities include using weighing balances, calibration and use of meters, and measuring dissolved oxygen, fecal coli-form, biological oxygen demand, pH, turbidity, and other chemical and biological indicators in streams and water bodies. Using instruction in modern physical and chemical techniques and instrumentation, students will be able to collect, analyze and report water quality data with a high degree of precision and accuracy. 133 pages.

AQUATIC FIELD AND LAB METHODS II: A capstone course for natural resources and fisheries technology programs that follows Aquatic Field and Laboratory Methods I. In the first half of the course, students learn techniques for water quality measurement, biological sampling, and data analysis and presentation. In the second half of the course, students design and implement a comprehensive field study of local stream and lake ecosystems. Aquatic sampling techniques described include plankton analysis, electro-shocking, macro-invertebrate sampling, seining, and otter trawling. 121 pages.

ENVIRONMENTAL ETHICS: A lecture-only course that uses current references to explore views on the human/nature relationship. Topics include definitions of environmental ethics, sustainability, “centrism’s,” “Green Politics,” “Deep Ecology,” “The Land Ethic,” and conflict analysis, with additional highlights on American-Indian perspectives and value systems. Emphasis is placed on analysis of scientific evidence in the context of environmental ethics. 61 pages.

ENVIRONMENTAL SCIENCE I: Introduces the structure and function of ecosystems as a background for environmental issues and ecosystem management covered in later terms. Students are provided an overview of environmental science, including historical perspectives, philosophies, definitions, and a thorough understanding of how science operates. Human population growth is examined in detail as an environmental topic. Laboratory and field activities emphasize ecosystem data collection and analysis. Topics include “The Edge Effect,” ecosystem analysis, log decomposition, symbioses, ecological succession, and human population issues. 169 pages.

ENVIRONMENTAL SCIENCE II: Considers environmental problems associated with biological resources, using ecosystem management as an underlying theme. Evaluates issues concerning resource use and management such as food production, deforestation, fisheries management, soil erosion, water issues, biodiversity loss, and impacts of global climate change. Highlight topics include an overview of ecosystem management, and case studies of Pacific salmon, the northern spotted owl, and the California condor; related American-Indian perspectives are presented. Laboratories include biological and physical analyses of soils, field trips to regional wildlife refuges and tribal lands, and a study based on dendrochronology. 125 pages.

ENVIRONMENTAL SCIENCE III: Examines environmental problems and issues related to energy and contamination such as air pollution, water pollution, and solid waste management. Explores relationships between environmental issues and society. Sustainable development is a dominant theme. Laboratory activities include an evaluation of energy resources, using wetlands for wastewater treatment, using aerial photography to assess land use changes, the impacts of mining, and a capstone field trip to a U.S. Forest Service experimental forest. 175 pages.

GEOGRAPHIC INFORMATION SYSTEMS (GIS): Provides a lecture-only format and master copies for overhead transparencies suitable for a wide variety of disciplines using introductions to GIS. Topics include basic geographical concepts, uses of GIS in natural resource management decision making, spatial databases, digital data sources, raster and vector models, “networks and ‘fuzzy logic,’” and map analysis. 232 pages.

INTRODUCTION TO MAMMALOLOGY: Introduces students to the characteristics, evolution, classification, adaptations, ecology, and natural history of mammals. Laboratories emphasize field techniques for the study of mammalian biodiversity and abundance in the context of student-designed and implemented research projects. 107 pages.

PRINCIPLES OF WILDLIFE CONSERVATION: A lecture-only course that uses current references to present concepts and practices of wildlife conservation. Topics include basic ecology, endangered species, managing ecosystems for biodiversity, and the value of wildlife and management philosophies from perspectives of ecosystem management and American-Indian tribes. Activities include student writing assignments based on Aldo Leopold’s *A Sand County Almanac*, an Internet search, and endangered species. 59 pages.

NCSR INSTRUCTIONAL MANUALS

AQUATIC ECOLOGY LABORATORY: Describes the construction of “wetlands” by using an array of 300-gallon tanks and related technology that provides instructors a way to teach students topics including wastewater treatment, primary production, aquatic ecosystem monitoring and analysis, and cultural eutrophication. Sufficient detail is offered for faculty to develop a cost-effective facility on their campus. 79 pages.

SPECIAL TOPICS I – FOREST SURVEYING AND SILVICULTURE: This manual provides a compilation of forestry-related laboratory exercises and field activities selected from course materials in forest resource technology programs. Basic forest surveying techniques are included such as the fundamentals of horizontal and vertical measurements and an introduction to planimetric and topographic maps. Students use basic surveying instruments and analyze surveying data to compose field maps of forest resources. Silviculture activities include a hands-on modeling process for designing even- and uneven-aged forest stands and several field exercises that illustrate current silvicultural practices. 56 pages.

SPECIAL TOPICS II – WATERSHEDS, SOILS AND ORNITHOLOGY: In Special Topics II faculty will find a compilation of natural resources exercises with an emphasis on salmon-bearing streams in the Pacific Northwest. Students are introduced to a number of field methods and information sources that can be used to evaluate watershed ecosystems. Specific methodologies for the evaluation of soil characteristics are also included as well as American Indian perspectives on salmon and soils. A single field laboratory describes a comprehensive method for estimating bird populations. 115 pages.

NCSR INSTRUCTIONAL MODULES

TOWN MEETING: AN APPROACH TO EXPLORING ENVIRONMENTAL ISSUES: This module introduces the “town meeting” format as a new teaching method for evaluation of a complex environmental issue. Various stakeholders in the issue are identified and students are asked to research and represent the viewpoints of their chosen stakeholder at a “town meeting” that is moderated by the instructor. 18 pages.

EVALUATING HUMAN IMPACTS: The evaluation of human impacts on the environment is an important element of environmental science. New technologies are now available that provide educators useful tools to illustrate these impacts. The module uses several different approaches and resources to address this need. 36 pages.

FOREST REGENERATION: AN EVALUATION OF SEEDLING MORTALITY, GROWTH AND STAND DEVELOPMENT: This project requires students to apply skills that are commonly used in forest management as part of a reforestation project. As a long-term study, each class has the opportunity to contribute new information and the benefit of evaluating accumulated data. The activity also incorporates an understanding of basic ecological principles and engages students in an authentic data interpretation activity. 51 pages.

EVALUATION OF MEDIA COVERAGE OF AN ENVIRONMENTAL ISSUE: This module provides students with skills and practice in evaluating claims made in written accounts of environmental issues. Students select an article on a current environmental topic and conduct an evaluation of that article using a series of questions. Students then discuss the articles and their evaluation in small groups. 21 pages.

THE IMPACT OF LAND USE ON WATER QUALITY: This module provides information on conducting a multiple session classroom, laboratory, and field-based experience to determining the impact of non-point sources of pollution on watersheds. The module is comprised of the following instructional sessions: (1) A preparatory activity in which students use remote sensing to gain an understanding of the watershed; (2) A field experience in which students evaluate the impact of land use on water quality; (3) An analysis laboratory in which students measure additional water quality parameters and evaluate the relationship between land use and water quality. 49 pages.

WILLAMETTE VALLEY LAND USE CHANGE: In this module students examine various images (available in print and on the web) and prepare a detailed analysis of land use changes in the Willamette Valley, Oregon. While the activity uses imagery that is specific to western Oregon, the concepts introduced are universal and the activity could be implemented using any location. 35 pages.

AN EVALUATION OF GENETICALLY MODIFIED ORGANISMS: This module examines the production of genetically modified organisms as an environmental issue. Potential environmental impacts of genetically modified crops are emphasized, although human health concerns are also addressed. 29 pages.

ILLUSTRATIONS OF INTERCONNECTEDNESS IN ECOSYSTEMS: This module introduces the idea of interconnectedness among ecosystem components and describes a number of scenarios that illustrate the concept. Interconnectedness is a fundamental ecological concept, a common theme in natural resource/environmental science programs and a foundational component of ecosystem-based management of natural resources. Two introductory activities require students to diagram ecosystem interconnections. Brief descriptions of 13 additional scenarios are provided, along with references to and descriptions of supporting video, print and web-based resources. 41 pages.

THE FIRE ECOLOGY AND MANAGEMENT SERIES

ECOLOGICAL ROLE OF FIRE: A lecture-based module intended for use in courses such as Environmental Science, General Biology and Introduction to Natural Resources and presents the current understanding of the role of wildfire. 46 pages.

HISTORICAL FIRE REGIMES AND THEIR APPLICATION TO FOREST MANAGEMENT: This module introduces the concept of historical fire regimes and describes how they are applied to modern forest management. 49 pages.

ANATOMY OF A WILDFIRE-THE B&B COMPLEX FIRES: A case study module that presents an examination of the B&B Complex Fire in central Oregon. The module introduces the basics of wildfire behavior in the context of historical fire regimes. 42 pages.

PRE-FIRE INTERVENTION: THINNING AND PRESCRIBED BURNING: This lecture-based module provides an introduction to the issue and uses case studies in California and Oregon to illustrate the main points. 61 pages.

POST-WILDFIRE (SALVAGE) LOGGING – THE CONTROVERSY: This module examines the contentious wildfire issues of whether or not to remove trees after a wildfire based on our current state of knowledge on salvage logging. 48 pages.

AN EVALUATION OF MEDIA COVERAGE OF WILDFIRE ISSUES: A class-room exercise designed to develop student objectivity in evaluating articles published about wildfire-related issues such as salvage logging, wildfire impacts and thinning as a tool for reducing the probability of catastrophic wildfire. 38 pages.

THE MARINE FISHERIES SERIES

MARINE FISHERIES OVERVIEW: A lecture-based module presenting an overview of issues related to marine fisheries resources. It covers the state of marine fisheries, causes for declines of marine fish stocks, the implications of fishery declines for marine communities and ecosystems and fishery management practices. 73 pages.

MARINE FISHERIES – INTRODUCTION AND STATUS: A lecture-based module presenting a detailed examination of the nature of marine fisheries and their status as natural resources. 76 pages.

MARINE FISHERIES – CAUSE FOR DECLINE AND IMPACTS: A lecture-based module presenting a detailed examination of the causes for the decline of marine fisheries and the community- and ecosystem-level impacts of these declines. 84 pages.

MARINE FISHERIES – MANAGEMENT AND PROPOSED SOLUTIONS: A lecture-based module presenting a detailed examination of traditional, market-based and ecosystem-based approaches to marine fisheries management. 105 pages.

DECLINING EXPECTATIONS – THE PHENOMENON OF SHIFTING BASELINES: An instructional guide designed to provide instructors with lecture support on the concept of shifting baselines and its application to marine fisheries. Shifting baselines are defined and their contribution to fishery declines discussed. Various methods that are used to establish historical baselines are described and illustrated with case studies. 38 pages.

THE ROLE OF MARINE RESERVES IN ECOSYSTEM-BASED FISHERIES MANAGEMENT: A lecture-based module presenting the role of marine reserves including the implementation of marine reserve networks in ecosystem-based fishery management. 59 pages.

THE DECLINE OF ATLANTIC COD – A CASE STUDY: This module provides materials for a comprehensive examination of the decline of the Atlantic cod and brief descriptions of other fisheries for developing case studies. 87 pages.

SHRIMP FARMING – ENVIRONMENTAL AND SOCIAL IMPACTS: An evaluation of the environmental and social impacts of shrimp aquaculture. 20 pages.

WHERE DOES YOUR SEAFOOD COME FROM? An activity designed to evaluate the sustainability of locally available seafood. 42 pages

COMPREHENSIVE RESOURCES FOR NCSR MARINE FISHERIES SERIES: This document provides detailed summaries for six videos that examine various aspects of the marine fisheries issue, a comprehensive glossary of terms commonly used in marine fisheries and a complete set of citations of web, print and additional video resources. 77 pages.

NCSR EDUCATOR GUIDES

AMERICAN INDIAN PERSPECTIVES: NATURE, NATURAL RESOURCES, AND NATURAL RESOURCES EDUCATION: This report provides information (both historical and contemporary), insights, and ideals about American Indians and natural resources in various contexts. 117 pages.

VISIONS FOR NATURAL RESOURCE EDUCATION AND ECOSYSTEM SCIENCE FOR THE 21ST CENTURY: This report documents activities of the Center and focuses on new directions NCSR partners are taking in creating educational programs to meet the needs of the Twenty-first Century natural resource technology workforce. 125 pages.

POLES APART: A pictorial visit to the Arctic and Antarctic is part of the NCSR pictorial series designed for presentation to general audiences. It is comprised of images made from photographs from the Arctic and Antarctic regions presented in a *PowerPoint* format supported by instructor's notes. 73 slides.

A VISIT TO SOUTHERN AFRICA: A pictorial visit to southern Africa is part of the NCSR pictorial series designed for presentation to general audiences. It is comprised of images made from photographs from southern Africa presented in a *PowerPoint* format supported by instructor's notes. 104 slides.

NCSR COMMUNITY-BASED SECONDARY EDUCATION GUIDES

EDUCATOR'S GUIDE TO PROGRAM DEVELOPMENT IN NATURAL RESOURCES: For high school educators, this 78-page report explains community-based education and ecosystem management as organizing frameworks around natural resource-based studies. 90 pages.

COMMUNITY AS A CONTEXT FOR LEARNING: For educators looking to connect their classrooms to the community this manual will provide lessons, tools and resources to reach this goal. It will put "community" back into community-based education with lessons engaging students in exploring their community. In addition, detailed processes and supporting resources for conducting community projects are provided. 252 pages.

COMMUNITY-BASED NATURAL RESOURCE ACTIVITIES FOR BIOLOGY: A series of 12 community-based activities designed for high school biology classes. Each activity is matched to a major topic typically covered in a standard biology class and is set in a community context. The community is used as a resource and activities are designed to provide feedback to the community. 114 pages.

EDUCATOR'S GUIDE TO AMERICAN INDIAN PERSPECTIVES IN NATURAL RESOURCES: For educators looking to include American Indian perspectives in their courses, this manual provides current information and approaches to tribal use and management of natural resources. Two leading Indian authors discuss Traditional Ecological Knowledge and western science as well as current work and important background information necessary for inclusion into a natural resource or environmental program. 231 pages.

NCSR CURRICULUM DEVELOPMENT AND APPLICATION GUIDES

(AVAILABLE FOR DOWNLOAD ONLY)

IMAGING TECHNOLOGY USING *GOOGLE EARTH* AND *NASA WORLD WIND*: This guide provides information and instructions on access to and manipulation of high resolution remote sensing imagery. 7 pages.

A TOOLBOX FOR CURRICULUM DOCUMENTATION AND TESTING: A comprehensive guide for documenting and testing curriculum products. 24 pages.

NATURAL RESOURCE EDUCATION STUDENT OUTREACH AND RECRUITING PRESENTATION: This guide provides a *PowerPoint* presentation with accompanying notes designed to advise students about employment opportunities and education requirements. 17 slides.

STUDENT QUESTIONNAIRE - SCIENCE AS A PROCESS: A questionnaire designed to assist in determining the effectiveness of an instructional unit in increasing student knowledge of the scientific process. 18 pages.

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