

Model Decentralized Wastewater Practitioner Curriculum

Soil and Site Evaluation

Overview of Module

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Citation of Materials

The educational materials included in this module should be cited as follows:

Lindbo, D.L., M. Stolt, R. Miles, D. Mokma, S. Greene, and M. Hoover. 2005. Soil Module Text. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Lindbo, D.L., M. Stolt, R. Miles, and D. Mokma. 2005. 1. Introduction to Soils – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Lindbo, D.L., M. Stolt, R. Miles, and D. Mokma. 2005. 2. Slopes and Landscapes– Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Lindbo, D.L., M. Stolt, R. Miles, D. Mokma, S. Greene, and M. Hoover. 2005. 2. Soil Systems of the South East – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Stolt, M., D.L. Lindbo, R. Miles, and D. Mokma. 2005. 2. Glacial Landforms – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Lindbo, D.L., M. Stolt, R. Miles, and D. Mokma. 2005. 3. Description of Soils: Introduction – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Lindbo, D.L., M. Stolt, R. Miles, and D. Mokma. 2005. 3. Description of Soils: Color – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Lindbo, D.L., M. Stolt, R. Miles, and D. Mokma. 2005. 3. Description of Soils: Soil Morphology and Chemistry – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized

Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Lindbo, D.L., M. Stolt, R. Miles, D. Mokma, and S. Greene. 2005. 3. Description of Soils: Texture – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Miles, R., D.L. Lindbo, M. Stolt, D. Mokma, and S. Greene. 2005. 3. Description of Soils: Structure – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Greene, S, D.L. Lindbo, M. Stolt, R. Miles, D. Mokma, and M. Hoover. 2005. 3. Description of Soils: Mineralogy and Consistence – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Lindbo, D.L., M. Stolt, R. Miles, and D. Mokma. 2005. 3. Description of Soils: Soil Horizons – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Lindbo, D.L., M. Stolt, R. Miles, D. Mokma, and S. Greene. 2005. 3. Description of Soils: Problem Areas – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Lindbo, D.L., M. Hoover, P, Trotta, M. Stolt, R. Miles, D. Mokma, and S. Greene. 2005. 4. Soil and Site Evaluation – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Lindbo, D.L., M. Hoover, M. Stolt, R. Miles, D. Mokma, and S. Greene. 2005. 5. Matching the System to the Site and Soil – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Mokma, D., D.L. Lindbo, M. Stolt, and R. Miles. 2005. 6a. Restrictive Horizons – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

Lindbo, D.L., M. Stolt, R. Miles, and D. Mokma. 2005. 6a. Soil Wetness and Monitoring – Power Point Presentation. *in* (D.L. Lindbo and N. E. Deal eds.) Model Decentralized Wastewater Practitioner Curriculum. National Decentralized Water Resources Capacity Development Project. North Carolina State University, Raleigh, NC.

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Soils and Site Evaluation Module Overview

The Soil and Site Evaluation Module addresses the use of soil morphology, landscape description, interpretation of data, and non-soil data for onsite wastewater applications. The module consists of a guide beginning with the basics of soil science (definitions, formation, and morphology) to details regarding specific problem areas (water table monitoring, restrictive horizons, mineralogy). Each chapter in the guide consists of written reference materials (as follows) and a slide set with notes. These notes can in some cases be considered a script, but the authors feel each instructor should develop his/her own script to adjust their personal teaching style. Additionally the module contains suggested agenda for numerous short courses. These materials include details on soil morphology (soil horizons, color, texture - field and lab methods of determination, structure, consistence, redoximorphic features - mottles, landscape evaluation/slope type, drainage concerns and landscape position), soil and landscape relationships, and non-soil issues that must be considered for a complete site evaluation. Additionally, details on the use of county soil survey (NRCS) publications are discussed.

The associated text is designed as a supplement for both instructors and students. It is not meant to be a comprehensive discussion of soil morphology, genesis etc. These subjects are covered in great detail in excellent reference texts such as *The Nature and Properties of Soils* (Brady and Weil), *Soil Science Made Simple*, (Kohnke and Franzmeier), *Environmental Soil Physics* (Hillel), and *Soil Classification and Genesis* (Buol, Hole, McCracken and Southard). The text should be viewed as a clarification of the slide sets and as additional information that relates soil properties to the subject of onsite wastewater treatment and dispersal.

It is strongly suggested that those who instruct this material in a practitioner course be soil scientists with experience beyond the field of wastewater. This recommendation recognizes the concept that soil science is a multidisciplinary field requiring a wide breadth of knowledge in order to adequately understand and convey its principles to those who may only see soil as dirt. The authors fully intended to create more material for this module than a practitioner could learn in a single 1 day session. It is our contention that by first illustrating the importance of soils disciplines beyond onsite wastewater treatment, we can enhance the learning experience and provide the practitioner with a more complete understanding of the science. We also recognize that all do not share our view; thus the slide sets are not arranged as stand-alone short courses (although several could be presented as such). Instead we expect that an individual instructor will pick and choose the materials they see most fitting for their audience. This approach makes these materials highly flexible and adaptable for use at multiple skill levels with a variety of instructional techniques.