

Objectives:

This course will provide undergraduate and graduate students background in characteristics and key processes of forest soils and exposure to approaches used in management of soils for wood and fiber production (as well as other uses). The course focuses on the US Southeast, but also uses examples, and has application to, management of forest soil elsewhere in world. By the end of this course you should be able to do the following:

1. Have an appreciation for differences in soils in major forest biomes.
2. Identify important soil characteristics in the field and verify soil map units
3. Recognize key soil systems in physiographic regions of the Southeast
4. Be able to construct a local soil key and verify soil maps
5. Describe relationships between soil physical conditions and tree root growth
6. Be familiar with site preparation operations and how they soil properties.
7. Describe organic matter decomposition and role of key soil organisms
8. Identify chemical and environmental controls on decomposition
9. Understand nutrient mineralization esp. N and P mineralization pathways and rates.
10. Differentiate between critical processes controlling availability of essential plant nutrients
11. Describe the process of nutrient uptake
12. Understand how root architecture affects nutrient uptake and plant competition.
13. Quantify nutrient storage and utilization in forest systems
14. Evaluate forest harvesting and utilization practices with respect to nutrient balance
15. Diagnose nutrient deficiency and toxicity in forest plantations
16. Recommend fertilization regimes, measure and evaluate fertilizer response
17. Apply knowledge of soils to forest management decisions
18. Be aware of major issues of soil management

Schedule:

Lectures: Tuesday and Thursday 1-209 Forest Resources, 8:15-9:05 a.m.

Labs: Thursday (1-210), 2:00-4:45

Optional Text: Fisher, R. F. and D. Binkley. 2000. Ecology and Management of Forest Soils, John Wiley and Sons, New York. 489 p.

Grading:

Exams: 3 @ 100 points

Labs: 7 @ 10 points (70) plus participation in non-graded labs and field trips (30).

Reviews and posting: 2 @ 50 points (graduate students only)

Field Trips: Please plan on participating in a field trip on Apr. 15-16.

Materials: In general, I will post an outline of my lecture notes on Web CT but will also hand these out in class. In addition, PDF files of required readings, laboratory handouts, answer sheets, example problems and other materials will be posted on Web CT one week prior to each

week's class (Sunday night). Please make a habit of using Web CT. It will be our link when I must miss class Feb. 12 – Feb. 20.

The one or two PDF files of required readings that I post will provide information in support of the week's topics. You do not need to print out these files, but you will be held responsible for reading and understanding the information they contain. I always draw some test questions from the readings.

FORS 4000/6000
 Forest Soil Management
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Schedule

<i>Date</i>	<i>Subject</i>	<i>Readings</i>
Jan. 11	Introduction (schedule, exams, labs, etc.) Global Soils and Forests	Hendrick-2001
Jan. 13	Uses of Soil Information	Valentine-1986, Chp. 5
Jan. 13	Lab – No lab this week	
Jan. 18	Soils of the South	Soil systems handout
Jan. 20	Tree Root architecture Structural roots Fine root distribution Mycorrhizae (quick look) Interactions between tree roots and roots of other plants	Fisher and Binkley-2000 Chp 8
Jan 20	Lab 1-Developing a local soil key; recognizing series	Guide to Soil Taxonomy
Jan . 25	Root growth and soil physical conditions Mechanical resistance Porosity Aeration/Water	Miller et al. 2004
Jan. 27	Soil Compaction and Rutting Physical Process Factors Affecting Damage	Greacen and Sands 1980
Jan. 27	Lab 2 –Tools of the trade and profile description	
Feb. 1	Soil Compaction Growth Impacts Damage assessment Minimizing damage	
Feb. 3	Site Preparation and Soil Tillage Slash reduction Bedding, subsoiling, spot cultivation Growth response to mechanical treatments	Morris and Lowery 1988
Feb. 3	Lab 2 – Tool of the trade and profile description cont.	

Feb. 8	Organic Horizons in Forests (The Forest Floor) Effects on soil properties Classification	Birkeland-1974
Feb. 10	Biology of Plant Litter Decomposition Steps of decomposition Soil organisms and their roles	Fisher and Binkley-2000
Feb. 10	Lab. 3 Assessment of Soil Compaction	
Feb. 15	Exam 1 – Tree Roots, Soil Physical Properties	
Feb. 17	Decomposition and Mineralization Substrate and chemical limitations C/N ratios Temperature and moisture	Williams and Gray-1974
Feb. 17	Lab 3 – Assessment of Soil Compaction cont.	
Feb. 22	Decomposition and Mineralization cont. Decomposition models Rates and management impacts	Shaw et al.-1991
Feb. 24	Nutrient Availability Mineralization Nutrient mobility and surface interaction (Ks, Kd, Q/I)	Fisher and Binkley-2000 C 5; J. Little Summary; Ballard and Fiskell 1974
Feb. 24	Lab 4 –Decomposition and mineralization	
Mar. 1	Nutrient Accumulation and Cycling in Forests Comparison among forests Effects of age and site Geo-, biogeo-, and bio-logical cycles	Ericsson-1995
Mar. 3	Management Impacts on Nutrient Balance Harvesting Site preparation Burning	Jorgensen and Wells
Mar. 3	Lab 4- Decomposition and mineralization cont.	
Mar. 8	Management Impacts on Nutrient Balance (cont.) Pinestraw harvest Silviculture	M. Coil Summary; Liechty et al. 2002
Mar. 10	Nutrient Deficiencies in Plantation Forests Extent Symptoms	
Feb. 27	Lab 4 – Decomposition and mineralization cont.	

Mar. 22	Diagnosis of Nutrient Limitations Soil groups and site types Soil tests Critical concentrations	Weetman 1989
Mar. 24	Diagnosis of Nutrient Limitations Directional analysis DRIS LAI – combined evaluations	Hockman and Allen 1990
Mar. 24	Lab 5 – Diagnosis of nutrient deficiencies	
Mar. 29	Forest Fertilization at Establishment Nutrients and rates Response patterns “Weed and feed” Interactions with other treatments	Jokela et al 2000
Mar. 31	Exam 2-Biology, nutrient cycling, deficiency tests	
Apr. 5	Forest Fertilization in Established Stands Nutrients and rates Response patterns and magnitude	Allen 1994; Campbell and Long 1995
Apr. 7	Soil Management and Sustainability Defining sustainability Concerns and evidence for productivity declines	E. McCutcheon Summary; Worrell and Hampson 1997
Apr. 7	Lab 6 - Economics of fertilization	
Apr. 12	Soil Health Indicators	Johnston and Crossley 2002; Neary et al. 1993
Apr. 14	Global Carbon Carbon change and forest soil storage Management impacts Carbon credits	Shan et al 2001
Apr. 14	No lab – field trip	
Apr. 19	Forests and Waste Management Forest soils as bioreactors Wastewater irrigation Biosolids and residue applications	Nutter and Morris 2004
Apr. 21	Management Issues of the Tropics	
Apr. 21	Lab. 7 – Soil biology and indicators	
Apr. 26	Reclamation and Restoration	

Apr. 28	Review and wrap-up
Apr. 28	Exam 3 – Fertilization and topics in soil management (Lab period)
