SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: NURSERY OPERATIONS

CODE NO.: FOR 355-4 **SEMESTER:** V

PROGRAM: FORESTRY MANAGEMENT TECHNOLOGY

AUTHOR: M. HARVEY

DATE: DECEMBER 1989 **PREVIOUS OUTLINE DATED:** DECEMBER 1988

APPROVED: _____ Jan 10/90
Dean DATE

COURSE NAME _____ CODE NO. _____

TOTAL CREDIT HOURS: 64

PREREQUISITE(S): None.

I. PHILOSOPHY/GOALS:

Upon completing this course, students will have both the theoretical and practical skills required to grow, protect, monitor and evaluate the quality of container and bareroot tree seedlings used in forest regeneration. Students will operate a small scale container tree seedling greenhouse.

Forest Technology students will acquire an appreciation for the scope of the industry by cataloguing and classifying tree seedling production centers across Canada.

II. STUDENT PERFORMANCE OBJECTIVES:

Upon successful completion of this course the student will:

1. Successfully grow a crop of containerized forest tree seedlings to set specifications, using well planned schedules.
2. Develop and implement pest control programs to protect forest tree seedlings.
3. Distinguish between forest tree seedling stock types grown in Canada.
4. Identify and describe all the major physical components of a bareroot and container nursery operation.
5. Understand proper procedures for storage, shipping and grading forest tree seedlings and forest tree seed.
6. Apply concepts in tree physiology to the growth, nutrition, storage, stress resistance, dormancy and quality of tree seedlings and tree seed.
7. Discuss the current state of forest tree seedling production in Canada.

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III. TOPICS TO BE COVERED:

1. Forest Tree Seedling Production in Canada, An Overview.
2. Nursery Location, Design, Structures.
3. Applied Tree and Seed Physiology.
4. Stock and Container Types.
5. Growing Schedules.
6. Integrated Pest Management.
7. Fertilizers and Fertilizer Application.
8. Vegetative Propogation and Seeding Systems.
9. Greenhouse Cooling, Heating, Lighting and Ventilation.
10. Soil Management and Irrigation on Bareroot Nurseries.
11. Size Class Standards and Stock Quality Testing.
12. Storing and Handling Tree Seed and Nursery Stock.
13. Impact of Nursery Operations and Stock Quality on Outplanting Performance.

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IV. LEARNING ACTIVITIES	REQUIRED RESOURCES
1.0 Forest Tree Seedling Production in Canada, An Overview	Set of 150 slides of Nursery Operations Across Canada
Upon successful completion of this unit, the student will be able to:	Project Survey of Nurseries Across Canada
Define bareroot nursery, container nursery, and accelerated transplants.	
Describe facilities and equipment used on bareroot and container nurseries.	
Compare and contrast nurseries in Ontario with those across Canada and the Northern USA.	
Discuss problems and challenges facing the modern nursery manager.	
2.0 Nursery Location Design and Structures	Reference Text - P. 9-24
Describe biological, climatic and social economic factors that determine bareroot and container nursery location.	
Describe the structure and function of major facilities on bareroot and container nurseries.	

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3.0 Applied Tree and Seed Physiology	Read Pages 7-13 in text.
Describe phases of dormancy in Northern Conifers. Describe Root Growth Capacity, Plant Moisture Stress, Frost Hardness, Planting Stress.	PMS Calculator, Pressure Bomb when it is available.
List ALL ESSENTIAL PLANT NUTRIENTS and at least one physiological function for each NUTRIENT.	Read Selected Paper on transplanting stress.
Define SEED Dormancy, SEED Stratification and Scarification.	Read 21-22 in Text.
Define stages of seedling germination.	
4.0 Collecting, Handling, Storage, Testing and Germinating Tree Seed	OMNR Seed Source Number Coding System Hand-out
Use Ontario Seed Source Number Coding System.	Sault College Seed Collection
Demonstrate Procedures for Seed Germination Testing.	
List 4 ways to evaluate seeds other than by germination testing.	Sault College Greenhouse
Calculate seeding rates for container and bareroot nurseries.	Reading, Forestry Canada Info Rep BC-X-299.
Define accepted seed storage procedures for major Ontario tree species.	
Describe seedling equipment used in tree nurseries.	

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5.0 Vegetative Propagation	Sault College Greenhouse Grafting Stock Scions Cuttings
Describe 5 methods of Vegetatively Propagating Forest Trees.	
List the Components of a Mist Propagation System.	
Describe the Juvenile Propagation Program in Ontario.	
6.0 Soil Fertility and Fertilizers	
List all Essential Plant Nutrients.	Read P. 31,21,41,42,43 in Text.
Calculate Fertilizer Requirements in Container and Bareroot Nurseries.	Lab Materials.
Describe Application Equipment.	Selected Reading.
Detail methods for enhancing soil fertility through soil admendment programs.	Conductivity Meter. Cameron Bucket.
Calculate lime requirements.	
Develop fertilizer schedules.	
Operate Conductivity meter and Monitor Salts in Growing Medium.	
7.0 Pest Control	Sault College Greenhouse
Identify major insect, disease and weed pests.	Pesticide Application Equipment.
Describe in detail the life cycle of several insect and disease pests.	

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7.0 Pest Control (Cont'd)

Outline methods for monitoring and controlling pests.

List the safety and licensing requirements for chemical pest application in Ontario.

Demonstrate ability to interpret pesticide container labels and handle pest control products safety.

8.0 Growing Schedules and Stock Types

Prepare growing schedules for 2 species of container seedlings.

Prepare growing schedules for bareroot transplant nursery stock, Sb and Sw.

Prepare a growing schedule for 1 species of accelerated transplants.

Define and describe the following: root culturing, wrenching, root pruning, shade frame, mulching, lifting, cool storage, over winter cold storage, extracting container seedlings, 2-0 bareroot seedlings, 2+2 bareroot transplants, G+2 accelerated transplants, density control, irrigation, portable tensiometer, overwintering, extended greenhouse culture, lifting window.

List major container stock types.

Read OMNR guidelines for bareroot and container nursery stock production Thunder Bay Tree Nursery.

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9.0 Size Class Standards and Stock Quality

Conduct the following physiological tests on nursery stock:

(i)Root Growth Capacity Pot Test
(ii)Plant Moisture Stress.

Measure the following Morphological Traits:

(i)Top Dry Weight
(ii)Root Dry Weight
(iii)Root Volume
(iv)Root Collar Diameter
(v)Total Height
(vi)Terminal Bud Primordia Estimate.

Calculate the Morphological Quality of stock using the RPR and MSD methods as per OMNR guidelines

Match stock quality attributes to planting site conditions.

Drying Oven
Electronic Balance
Pressure Bomb*

(*currently not available)
Growth Chamber

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V. EVALUATION METHODS:

Project	15%
Labs & Quizzes	15%
Greenhouse Crop	20%
Tests	40%
Greenhouse Practice	10%
	100%

A+ = 90-100%
A = 80-89%
B = 70-79%
C = 60-69%
R = less than 60%

Projects and Laboratory Reports must be completed on the due date or:

i) marks will be deducted at a rate of 10% for each school day that assignments are overdue.

VI. REQUIRED STUDENT RESOURCES

Duryea, Mary L., ed. 1985. Evaluating Seedling Quality: Principles, Procedures and Predictive Abilities of Major Tests. Workshop held October 16-18, 1984. Forest Research Laboratory, Oregon State University, Corvallis.

VII. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY BOOK SECTION

Armson, K.A. and Sadreika, V. 1979. Forest Tree Nursery Soil Management and Related Practices (Metric Edition). Public Service Centre, Ontario Ministry of Natural Resources, Toronto, Ontario. 179p.

Duryea, M.L. and Landis, T. (eds.) 1984. Forest Nursery Manual: Production of Bareroot Seedlings. Martinus Nijhoff/Dr. W. Junk Publishers. The Hague/Boston/Lancaster, for Forest Res. Lab. Oregon State University, Corvallis 386p.

VII. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY BOOK SECTION (Cont'd)

Carlson, L.W., 1983. Guidelines for Rearing Containerized Conifer Seedlings in the Prairie Provinces. Revised. Enviromnment Canada, Can. For. Serv. North, Forest Research Centre, Edmonton Alberta. Info Rep. NOR-X-214E 64p.

Day, R.J., Bunting, W.R., Glerum, C., Harvey, E.M., Pohill, B., Reese, K.H., Wynia, A. 1985. Evaluating the Quality of Bareroot Forest Nursery Stock. Aird P.L. ed. Ontario Ministry of Natural Resources

Sutherland, J.R., and Eerden, E.V. 1980. Diseases and Insect Pests in British Columbia Forest Nurseries. Joint Rep. B.C. Ministry of Forests and Canadian Forest Service, No. 12. 55p.

Tinus, R.W. and McDonald, S.E. 1979. How to Grow Tree Seedlings in Containers in Greenhouses. USDA For. Serv. Gen. Tech. Rep. RM-60, 256p.

U.S. Department of Agriculture. 1974. Seeds of Woody Plants in the United States. U.S. Government Printing Office. Washington, D.C. Agriculture Handbook 450, 883p.