

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY
SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: GREENHOUSE OPERATIONS
CODE NO.: FOR 369-3 SEMESTER: VI
PROGRAM: INTEGRATED RESOURCE MANAGEMENT TECHNOLOGY
AUTHOR: M. HARVEY
DATE: DECEMBER 1993 PREVIOUS OUTLINE DATED: DECEMBER 1992

APPROVED: DEAN _____ DATE _____



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TOTAL CREDIT HOURS: 48

PREREQUISITE(S): None.

I. PHILOSOPHY/GOALS:

Upon completing this course students will have both the theoretical and practical skills required to produce containerized tree seedlings and annual outdoor bedding plants. Students will participate in the operation of a small scale container tree seedling and annual bedding plant greenhouse operation. Students will study the culture of forest and ornamental tree species and cultivars in traditional outdoor nursery beds. Site requirements and reforestation techniques of forest tree nursery stock will be outlined. Students will develop an appreciation for the effective selection and use of ornamental and native plant materials around public buildings, parks, for land reclamation, wildlife and conservation purposes.

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 and annual bedding plants.
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 plant physiology to the growth, nutrition, storage, stress resistance, dormancy and quality of tree and shrub seedlings, seed, cuttings, grafts and annual bedding plants.
7. Discuss the current state of forest tree seedling production in Canada.
8. Demonstrate the proper selection of and safe storage handling and application of plant growth regulators, pesticides and fertilizers.
9. Demonstrate propagation and cultural techniques for the production of native plants used in conservation, land reclamation, wildlife and riparian management.
10. Students will demonstrate the cultural techniques required to produce a crop of annual outdoor bedding plants.
11. List major species and cultivars of ornamental trees and shrubs used in plantings around public buildings and in park settings and describe acceptable methods of propagating these materials.

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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. Pesticides and Plant Growth Regulators.
9. Vegetative Propagation and Seeding Systems.
10. Greenhouse Cooling, Heating, Lighting and Ventilation.
11. Soil Management and Irrigation on Bareroot Nurseries.
12. Size Class Standards and Stock Quality Testing.
13. Storing and Handling Tree Seed and Nursery Stock.
14. Impact of Nursery Operations and Stock Quality and Species Selection on Outplanting Performance.
15. Selection of plant materials and the production of the plants that are suitable for parks, wildlife management, land reclamation, riparian management and erosion control.

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IV. LEARNING ACTIVITIES

REQUIRED RESOURCES

1.0 Nursery Location Design
and Structures

Reference Text - P. 9-24

Describe biological, climatic and social economic factors that determine the location of successful greenhouse and nursery operations.

Describe the structure and function of major facilities on bareroot and container nurseries.

2.0 Applied Tree and Seed
Physiology

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.

Define stages of seedling germination.

3.0 Collecting, Handling,
Storage, Testing and
Germinating Seed

OMNR Seed Source Number Coding System Hand-out

Sault College Seed Collection

Use Ontario Seed Source Number Coding System.

Demonstrate Procedures for Seed Germination Testing.

IV. LEARNING ACTIVITIES (cont'd)

REQUIRED RESOURCES

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 and shrub species.

Describe seeding equipment used in tree nurseries.

4.0 Vegetative Propagation

Describe 5 methods of Vegetatively Propagating Forest Trees.

Sault College Greenhouse
Grafting Stock
Scions
Cuttings

List the Components of a Mist Propagation System.

Describe the Juvenile Propagation Program in Ontario.

5.0 Soil Fertility and Fertilizers

List all Essential Plant Nutrients.

Calculate Fertilizer Requirements in Container and Bareroot Nurseries.

Lab Materials.

Describe Application Equipment.

Selected Reading.

Detail methods for enhancing soil fertility through soil amendment programs.

Conductivity Meter.
Cameron Bucket.

Calculate lime requirements.

Develop fertilizer schedules.

Operate Conductivity meter and Monitor Salts in Growing Medium.

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IV. LEARNING ACTIVITIES (cont'd) REQUIRED RESOURCES

6.0 Pest Control

Identify major insect, disease and weed pests. Sault College Greenhouse

Describe in detail the life cycle of several insect and disease pests. Pesticide Application Equipment.

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 safely.

7.0 Growing Schedules and Stock Types

Prepare growing schedules for 2 species of container seedlings. Read OMNR guidelines for bareroot and container nursery stock production Thunder Bay Tree Nursery.

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. Develop a growing schedule for 1 of 4 selected annual bedding plants.

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IV. LEARNING ACTIVITIES (cont'd) REQUIRED RESOURCES

8.0 Size Class Standards
and Stock Quality

Conduct the following
physiological tests on nursery
stock:

Drying Oven
Electronic Balance
Pressure Bomb

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

Growth Chamber

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.

9.0 List and Describe Plant
Species that can be propo-
gated in a nursery or
greenhouse for use in

- (i) Wildlife Habitat Mgmt.
- (ii) Erosion Control
- (iii) Park Setting
- (iv) Riparian Management
- (v) Reclamating mine
tailings & gravel pits

Construct a proposal for the
greenhouse or nursery production
of one species or cultivar from
the above list beginning with the
collection of propagation
materials.

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V. EVALUATION METHODS:

Annual Crop	10%
Tree Crop	25%
Project	10%
Greenhouse Practice	10%
Labs, Assignments	20%
Test	15%
Participation	10%

- 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. 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, 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.

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.

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

Cordell, C.E; et. al. 1989. Forest Nursery Pests. USDA For.Serv. Handbook No. 680

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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

Landis, T.D.; Tinus, R.W.; McDonald, S.E.; Barnett, J.P. 1992. The Container Tree Nursery Manual Vol. 2,3,4,5,6; USDA For. Ser. Handbook No. 674.

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.

VII. SPECIAL NOTES:

Students with special needs (e.g. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students.