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1. Introduction
2. Levels of Diversity
   2.1. Genetic diversity
   2.2. Species diversity
   2.3. Ecosystem diversity
3. Forest Ecosystems and Biodiversity
FORESTS AND FOREST PLANTS

3.1. Boreal
3.2. Temperate
3.3. Tropical
3.4. Montane

4. Forest Age/Succesional Stages and Biodiversity Preservation

5. Human Influences in Forest’s Role in Preserving Biodiversity
   5.1. Effect of forest disturbance and loss on biodiversity
   5.2. Fragmentation
   5.3. Climate change
   5.4. Exotics

6. Conclusions

The Role of Forests in the Hydrological Cycle

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1. Introduction
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3. Forests and Hydrological Processes
   3.1. Forests and Rainfall
   3.2. Cloud Water Deposition
   3.3. The Physical and Physiological Background to Forest Evaporation
   3.4. Evaporation of Rain Intercepted by Forest Canopies
   3.5. Measurement and Modeling of Rainfall Interception
   3.6. Transpiration Loss from Forests
   3.7. Measurement of Forest Transpiration
      3.7.1. Soil Water Depletion
      3.7.2. Micrometeorological Methods
      3.7.3. Sap Flow Techniques
      3.7.4. Leaf/Branch Gas Exchange
   3.8. Controls of Forest Transpiration
      3.8.1. Forests and Solar Radiation
      3.8.2. The Roughness of Forests
      3.8.3. Surface Conductance of Forests
      3.8.4. Air Humidity Deficit
      3.8.5. Soil Water Availability
      3.8.6. Forest Understories
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   4.1. Effects on Streamflow Amounts
      4.1.1. Clear Felling
      4.1.2. Thinning of Forests
   4.2. Forests and the Timing of Streamflow
5. Influence of Forests on Water Quality
   5.1. Forests and Stream Sediment
   5.2. Forests and Dissolved Substances
   5.3. Stream Salinity
   5.4. Acidification
   5.5. Streamside Buffer Strips

Role of Trees in Croplands

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1. Introduction
2. Classification of trees in croplands
FORRESTS AND FOREST PLANTS

2.1. Windbreaks
2.2. Living Barriers of Trees or Shrubs
2.3. Fruit Trees
2.4. Fuelwood Trees
2.5. Orchards
2.6. Fodder Trees
2.7. Timber Trees
2.8. Mulberry Trees
2.9. Medicinal Trees
2.10. Other Economic Trees

3. Contributions of trees in croplands to economic development and income generation
   3.1. Direct Benefits
       3.1.1. Timber
       3.1.2. Fruits
       3.1.3. Fodder and Fuelwood
       3.1.4. Herbal Medicines
       3.1.5. Other Direct Benefits
   3.2. Indirect Benefits
       3.2.1. Improvement in Soil Fertility
       3.2.2. Enhancing Crop Yield
       3.2.3. Livestock Development
       3.2.4. Efficient Use of Natural Resources

4. Contributions of trees in croplands to environment improvement
   4.1. Ecological Role
   4.2. Soil and Water Conservation
   4.3. Engineering Role
   4.4. Conservation of Biodiversity

5. Negative Effects of Trees in Croplands
   5.1. Competition for Light, Moisture and Nutrients
   5.2. More Labor Requirements
   5.3. Hosts for Some Pests and Diseases
   5.4. Increased Soil Erosion

6. Management Options to Increase Benefits and Decrease Negative Impacts

7. Some Important Trees in Croplands
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   7.2. Living barrier
   7.3. Fodder trees
   7.4. Fuelwood
   7.5. Timber trees
   7.6. Soil improvers

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Flow and Conservation of Energy in Forests

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1. Introduction
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   2.1. Light Extinction in Canopies
   2.2. Light and Photosynthesis
3. Factors Influencing Flow and Conservation of Energy in Forests
   3.1. Natural Factors
       3.1.1. Abiotic Factors
           3.1.1.1. Cloud
           3.1.1.2. Abiotic Disturbance
       3.1.2. Biotic Factors
           3.1.2.1. Reproduction
           3.1.2.2. Deciduous versus Evergreen
3.1.2.3. Succession
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3.2. Anthropogenic Factors
3.2.1. Forest Harvesting
3.2.2. Elevated CO₂
3.2.3. Climate Change

4. Methodologies
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   4.1.1. Light
   4.1.2. Temperature
   4.1.3. Energy Budgets
   4.2.1. Direct
   4.2.2. Indirect

5. Conclusion

Conservation and Breeding of Forest Trees
Gene Namkoong, North Carolina State University and the University of British Columbia, and Principal, International Forestry Genetics Research Associates, USA

1. Species in Different Ecosystems
2. Status with Respect to Use and Value
3. Status with Respect to Threat
4. Management Tactics
   4.1. Managed Forests
      4.1.1. Population Size
      4.1.2. Selection
   4.2. Unmanaged Forests
5. Management Strategies
6. Program Strategies
7. International Capabilities

Techniques in Forest Tree Breeding
Alvin Dale Yanchuk, Senior Scientist and Manager, Forest Genetics Research, British Columbia Ministry of Forests, Victoria, Canada

1. Introduction
2. Genetic Surveys of Natural Populations
3. Improvements Through the Use of Superior-Tree Selection in the Wild
4. Testing Procedures for Genetic Advancement
   4.1. Improvements Through the Use of Progeny Testing
   4.2. Progeny Test Designs
      4.2.1. Field Designs
      4.2.2. Genetic Gain Trials
      4.2.3. Early Selection
5. Genotype by Environment Interactions
6. Advanced Generation Breeding and Testing
   6.1. Mating Designs
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7. Breeding Population Structure
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9. Genetic Diversity and Risk in Forestry
10. Gene Conservation
11. Changes in Deployment Zones through Climate Change
12. Advanced Technologies and their Role in Tree Breeding
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3. The Stem
   3.1. Vascular Cambium Structure and Function
   3.2. Annual rings
   3.3. Sapwood and heartwood
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   3.5. Phloem structure and function in hardwoods
   3.6. Periderm and bark formation
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   4.1. Types of roots
   4.2. Root development
   4.3. Older roots
   4.4. Mycorrhizae
   4.5. Nitrogen fixation
5. Leaves
   5.1. Juvenile and adult leaves
   5.2. Initiation and development
   5.3. Leaf structure
      5.3.1. The epidermis and stomata
      5.3.2. The mesophyll
   5.4. Conifer leaves
   5.5. Sun and shade leaves
   5.6. Leaf senescence and shedding
6. Reproduction
   6.1. Flowering periodicity
   6.2. Reproductive cycles
   6.3. Floral initiation, induction and enhancement
   6.4. Floral structure and development
   6.5. Pollination
   6.6. Ovule, embryo and seed development
   6.7. Constraints on seed production
7. Conclusions

Silvicultural Systems for Boreal and Temperate Forests

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1. Introduction
   1.1. The Forest Resource
   1.2. Natural Disturbances and Anthropogenic Factors
   1.3. The Goal of Sustainable Development
   1.4. Objectives
2. Silvicultural Systems and their Applications
   2.1. The Development of Silvicultural Systems
   2.2. Types of Silvicultural Systems
      2.2.1. Even-aged Systems
         2.2.1.1. Clearcutting
         2.2.1.2. Uniform Shelterwood
         2.2.1.3. Seed Tree
         2.2.1.4. Variable Retention
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2.2.1.5. Coppicing
2.2.2. Uneven-aged Systems
  2.2.2.1. Single Tree Selection
  2.2.2.2. Group Selection
3. Benefits from Silviculture: Today and in Future
  3.1. Ecological
  3.2. Economic
  3.3. Social
4. Constraints to Implementing Silvicultural Systems
  4.1. Forest Ownership
  4.2. Lack of Information, Planning, Supervision and Monitoring
  4.3. Improving and Testing Silvicultural Systems: Need for Long-term Research
5. Conclusions

Tropical Forest Plantations
Rodolfo Salazar F., CATIE, Turrialba, Costa Rica

1. Introduction
2. Reforestation in the tropics
  2.1. Negative effects of deforestation
  2.2. Direct benefits of reforestation
  2.3. Indirect benefits of reforestation
  2.4. Reforestation is a priority in the tropics
3. Main purpose of reforestation
  3.1. Industrial plantations
  3.2. Protection Plantations
  3.3. Social Forestry
  3.4. Agroforestry
4. Forest Research
  4.1. Species selection
  4.2. Genetic improvement and seed production
  4.3. Plantation establishment and maintenance
  4.4. Growth and yield
  4.5. Technical management
5. Some problems

Producing Planting Stock in Forest Nurseries
Marek J. Krasowski, Faculty of Forestry and Environmental Management, University of New Brunswick, Canada

1. Introduction
2. The unique character of forestry planting stock
  2.1. Nursery-cultured planting stock
  2.2. Wildings
3. The role of forest nurseries in forest management
4. Does the nursery affect the planting stock?
5. Types of nurseries
  5.1. Bareroot nurseries
  5.2. Container nurseries
  5.3. A combination of container and bareroot nursery culture
6. Establishing a new nursery
  6.1. Economic and logistical considerations
  6.2. Choosing a site for a nursery
    6.2.1. Biological factors
    6.2.2. Logistical factors
  6.3. Production capacity and efficiency of space utilization
6.4. Consolidating forest nurseries
7. The origin of the planting stock
  7.1. Genetic characteristics of planting stock
  7.2. Contribution of vegetative propagation to genetic characteristics of planting stock
    7.2.1. Planting stock derived from vegetative propagation
  7.3. Contribution of sexual reproduction to genetic characteristics of planting stock
  7.4. The role of seeds in obtaining planting stock from sexual reproduction
    7.4.1. Seed collection, seed quality, and ability to germinate
    7.4.2. Purity of seed batches
    7.4.3. Seed storage
    7.4.4. Germination tests and sowing formulas
8. The culture of forestry planting stock
  8.1. Bareroot culture of seedlings
    8.1.1. Preparing bareroot beds for sowing
    8.1.2. Sowing date
    8.1.3. Sowing
    8.1.4. Density of plants in nursery beds
    8.1.5. Care of the young plants
    8.1.6. Irrigation
    8.1.7. Mineral nutrition
    8.1.8. Soil organic matter
    8.1.9. Pruning roots and shoots
    8.1.10. Lifting plants from bareroot beds
  8.2. Culture of seedlings in container nurseries
    8.2.1. Containers
    8.2.2. Growing media
    8.2.3. Control of crop growth and development
9. The control of harmful organisms in the nursery
10. Beneficial soil organisms
11. Storage of planting stock
12. Stock quality

Forest Pest and Fire Management
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1. Causes of Death in Natural Forests
   1.1. Physical Causes
   1.2. Fire, Insects and Disease
   1.3. Non-lethal Effects of Fire, Insects and Disease
2. Problems Caused by Human Activity
   2.1. Unforeseen Consequences of Fire Control
   2.2. Unforeseen Consequence of Control of an Insect Outbreak
   2.3. Role of International Commerce in Creating Pest Problems
3. The Trend Toward Ecologically-Based Integrated Resource Management
4. Strategies and Tactics in Integrated Pest and Fire Management
   4.1. Administrative Strategy with Enabling Tactics
   4.2. Management Strategies
   4.3. Detection, Evaluation and Decision-Making Tactics
   4.4. Prevention Tactics
   4.5. Suppression Tactics
5. Future Prospects
   5.1. Increased Demand for Wood
   5.2. Intensified International Trade
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1. Introduction
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3. The Status of World Forests
4. Approaches of Forest Resource Management
   4.1. Forest Management for Ecosystem Service
   4.2. Forest Management for Timber Production
   4.3. Forest Resource Management for Non-timber Production
      4.3.1. Grazing
      4.3.2. Wildlife Conservation and Hunting
      4.3.3. Medicine and Food
      4.3.4. Recreation
   4.4. Restoration and Rehabilitation of Destroyed Forests
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