APPENDIX

Selected Review Questions

The purpose of the following selected questions is merely to aid in a crystallization of the subject matter. It should not be assumed that the ability to answer these questions assures one of the knowledge of the entire course.

PART I: GENESIS OF FOREST SOILS

1. Enumerate some of the more important contributions to soil science made by foresters.

2. Name outstanding students of forest soils.

3. Outline development of the subject of forest soils in Central European countries, Russia, Scandinavia, and the United States.

4. Name a few outstanding works on forest soils that appeared in the nineteenth century.

5. Describe the part played by forest soils and the knowledge of their management in general program of land utilization, conservation, and social development.

6. Compare a silvicultural definition of forest soil with the concepts introduced by agronomists, geologists, and pedologists.

7. Outline the composition of a forest soil including physical, chemical, and biological characteristics.

8. Discuss the concepts of "embryonic" and "mature" forest soils; "zonal" and "intra-zonal" forest soils.

9. Outline major divisions of the subject of forest soils.

10. Classify parent material of soils on the basis of its origin and composition.

11. Explain the meaning of the following expressions: mantle rock, bed rock, inherited soil, and talus.

12. Outline the principal characteristics of various types of morainic deposits and soils formed upon them.

13. Discuss fluvio-glacial deposits.

14. Describe briefly lacustrine deposits, marine deposits, alluvial deposits, and deluvial deposits.

15. Outline the characteristics of aeolian deposits and soils originating from them.

16. Name the main types of cumulose deposits.

17. Describe the composition and appearance of a few of the more important soil-forming minerals.
18. Name the more important rocks of igneous, sedimentary and metamorphic origin.

19. Describe the composition of the important members of one of the following groups of rocks: (a) Granitic rocks; (b) ferro-magnesian rocks; (c) siliceous rocks, (d) calcareous rocks.

20. What are the principal compounds constituting soil-forming organic remains?

21. Explain the meaning of the term "weathering" and give some of the chemical reactions typical of weathering processes.

22. State the approximate composition of the weathering material indicating primary and secondary minerals and the soluble products.

23. What are the principal stages in biological weathering?

24. Outline the course of "mineralization" of organic remains and name the important end-products of this process.

25. Describe three principal types of weathering taking place under different climatic conditions.

26. Is laterization a geological or a soil-forming process? What are the principal processes of the profile development of forest soils?

27. Describe briefly three processes of forest soils development, viz. melanization, podzolization, and gleization.

28. Discuss the principal horizons of forest soils and indicate their designation according to one of the generally accepted methods.

29. Outline the distribution of zonal forest soils in relation to climatic factors. Give a graphical or a tabular scheme.

30. Outline principal morphological and chemical features of the profiles of the four zonal groups of forest soils.

31. Present in a tabular form climatic conditions, vegetation, and profile characteristics of the four zonal groups of forest soils.

32. Discuss the influence of topographical features upon the development of forest soils.

33. Discuss the influence of parent material upon the development of forest soils.

34. Discuss the influence of vegetation upon the development of forest soils.

PART II: THE GREAT SOIL GROUPS OF THE WORLD

1. What significance has zonal groups of soils in silviculture?
2. State the conditions of development of podzol soils, their distribution, and profile characteristics.

3. What are the properties of the morphological varieties of soils belonging to the podzolic group? Indicate the predominant forest cover of these soils, and discuss their productivity from silvicultural and agricultural viewpoints.

4. What difficulties may be encountered in reforestation of fully-developed podzols?

5. State the origin and conditions of development of grodud forest soils, their profile characteristics and predominant forest cover.

6. Compare the fertility of podzol and grodud soils from silvicultural and agronomical viewpoints.

7. What difficulties may be encountered in reforestation of prairie-forest soils?

8. State the conditions of development of melanized or humus-incorporated soils, their morphological features and predominant forest cover.

9. Discuss the meaning of the term "Brownearth" and its shortcomings.

10. State the conditions of development of lateritic soils, their distribution and morphological features.

11. Outline morphological varieties of soils belonging to the lateritic group; state their predominant forest cover and productivity.

12. What difficulties may be encountered in reforestation of lateritic soils?

13. Outline the principles of the vertical zonality of soils and the outstanding characteristics of soils of high mountains.

14. Classify soils of high mountains stating their morphological features, physical and chemical composition, and predominant forest cover.

15. Name the major groups of intra-zonal soils.

16. State the origin and evolution of rendzina soils considering morphological features, chemical composition, and vegetation.

17. Discuss the conditions of development of gleys soils and their morphological features.

18. Classify gleys soils from an ecological or silvicultural standpoint.
19. State the predominant forest vegetation, productivity, and silvicultural adaptation of different morphological varieties of gley soils.

20. Classify organic or moor soils on the basis of their origin and composition.

21. Explain the meaning of the following terms: "quagmire", "sapropel", and "marl".

22. What are the morphological characteristics of high moor soils and their predominant forest cover.

23. Outline morphological characteristics of the principal varieties of low moor soils, their predominant forest cover, productivity, and adaptation.

24. Compare the content of organic matter and nutrients, C/N ratio, base exchange capacity, and reaction of the more important types of peat.

25. Discuss the properties and forest cover of the more important types of immature or embryonic forest soils.


27. Give an outline of soil-forest provinces of Eurasia.

28. What are the main characteristics of tundra soils, heath soils, mountain meadow soils and skeletal soils?

29. Discuss briefly the origin and properties of chernozem soils, prairie soils and savanna soils.

30. Discuss briefly the origin and properties of alkali soils stating the principal morphological varieties of these soils and their evolution.

**PART III: SOIL AS A MEDIUM FOR TREE GROWTH**

1. Outline the geographic, biological and sociological relationships upon which modern silviculture is based. Discuss the following concepts: "biocenose", "life zones" and "biological equilibrium".

2. Discuss the relationship that exists between the light requirements of trees and their adaptation to soil. Name a few of the more important light-demanding and shade-tolerant species of forest trees.

3. Classify forest trees according to their temperature requirements and relation to soil.

4. Into which three groups, based on moisture requirements, are forest trees divided?

5. Illustrate the relationship of soil and forest vegetation by a few examples of folk terminology.
6. Discuss obvious and concealed relationships of forest and soils.

7. Explain the role played in the natural distribution of forest vegetation by ecological amplitude of tree species, competition, moss action of the forest, and occidental disturbances.

8. Discuss the local and the general succession of forest vegetation. Indicate the importance of forest succession in silvicultural practice.

9. Outline the dynamic principles of soil fertility. Compare the potential and the actual productivity of forest soils.

10. How would you proceed to establish a correlation between the composition of soil and the rate of forest growth?

11. Explain the meaning of "soil skeleton" and "soil protoplasm".

12. Discuss the relation of tree growth to textural composition of soil under conditions of virgin forest and cut-over lands.

13. Discuss planting possibilities of various coniferous and deciduous tree species in relation to soil texture under different climatic conditions.

14. How would you proceed in sampling a soil for textural analyses?

15. Outline the significance of soil texture in silvicultural cuttings.

16. Discuss the significance of soil texture in nursery practice; indicate the advantages and shortcomings of light and heavy soils. Give an approximate optimum content of silt and clay particles in nursery soils.

17. Define soil structure and discuss its significance in forest growth and reforestation practice; name the more important types of soil structure.

18. Give approximate data on porosity, and contents of water and air ordinarily found in forest soils of sandy, loamy and clay texture.

19. Discuss gravitational, capillary and hygroscopic forms of soil water.

20. Discuss the meaning of the following terms: "ground water table", "capillatum", and "dead horizon of dryness".

21. Outline the influence of ground water upon the properties of soil and growth of forest vegetation.

22. Discuss the nature of acidity and alkalinity of the soil solution and the meaning of "pH".

23. Outline the influence of soil reaction upon the distribution and the growth of forest trees.
24. What is the significance of soil reaction in the selection of planting sites?

25. Why may the planting of trees fail on soils of a strongly acid or alkaline reaction?

26. How does soil reaction affect the growth of forest seedlings in nurseries?

27. What influence does nitrogen exert upon the growth of trees? State approximate contents of total and available nitrogen in the Al horizon of an outwash sandy soil supporting a mature stand of red pine.

28. How does phosphorus affect the growth of trees? What are approximate contents of available phosphorus in the Al layer of a weakly podzolized loam supporting hardwoods and in a lateritic clay supporting longleaf pine?

29. How does potassium influence the growth and vigor of forest trees? Give a range of available potassium found in virgin forest soils.

30. State briefly the function of the following nutrient elements: calcium, magnesium, sulfur, and iron.

31. What are the minor elements essential to the growth of trees? Discuss their functions.

32. Discuss availability of nutrients and nutrient balance in relation to the growth of forest trees.

33. Which properties of nursery seedlings would you consider in the evaluation of their vigor?

34. Enumerate the most important toxic agents occurring in forest soils and give methods for counteracting their effects.

35. What are the principles of exchange reactions? Discuss the "replacing power" of different ions and "the law of mass action".

36. Give a few typical exchange reactions taking place in soils of forest nurseries.

37. Outline the significance of the base exchange material in management of nursery soils.

38. Compare the exchange capacity of the mineral and organic fractions in a virgin pine soil of sandy texture.

39. Into what two broad groups determined by the mode of nutrition are bacteria divided? How may silvicultural treatment of sands or management of nursery soils affect the balance of soil microorganisms?

40. What are the principal stages in the decomposition of protein compounds? What is the importance of microorganisms in nitrogen transformations?
41. Discuss nitrogen fixation in forest soils.

42. How does the decomposition of carbohydrates proceed in forest soils and composts?

43. What is the function of sulfur and iron bacteria in forest soils?

44. Name the more important genera of fungi occurring in forest soils and discuss their effects upon the soil and tree growth.

45. What are mycorrhizae? State the part which mycorrhizae presumably play in growth of trees and distribution of the forest.

46. Describe the morphological features of Actinomycetes and state the function of these organisms in forest soils.

47. Classify the algal flora of the soil and outline its part in soil development.

48. What are the important effects of soil protozoa?

49. Describe nematodes, name a few more important genera, and state the role which these organisms play in soils and growth of forest trees.

50. Discuss the importance of earthworms in soils; what is their effect on the growth of forest vegetation?

51. What beneficial and adverse influences upon the forest are exerted by different groups of insects?

52. Discuss the meaning of the following terms: "forest humus", "litter", "duff", and "leaf mold".

53. Describe the two principal morphological groups of forest humus and explain their mode of development.

54. Discuss mull and mor humus in regard to their effects upon the fertility of soil, growth of trees, and silvicultural management.

55. Enumerate the principal types of humus belonging to the mull group.

56. Enumerate the principal types of humus belonging to the mor group.

57. Outline the principles of biological and chemical analysis of humus.

58. Discuss the nutrient content, reaction, and base exchange capacity of humus in relation to its origin and morphological features.

59. What beneficial and adverse effects upon the growth of forest seedlings in nurseries and in natural stands have different types of humus?
60. What significance has soil organic matter in nursery practice and reforestation?

61. Outline the relation of soil organic matter to nitrogen, phosphorus and replaceable bases in forest soils.

62. Give approximate minimum contents of organic matter in the 7-inch surface soil required for successful growth of several important conifers and hardwoods.

**PART IV: SOIL-FOREST TYPES**

1. Why is the study of forest vegetation of major importance in the development of ecology?

2. Describe several outstanding eco-types of Sub-Arctic forest.

3. Outline the principles of the soil-forest relationship established by Morozov and Kruedener.

4. What are the principles of the soil-forest relationship established by Cajander.

5. Review the ideas on the soil-forest relationship introduced by Hilgard.

6. Compare the most important soil-forest types of northern Russia with those of the Lake States region of America.

7. Give a general scheme of the soil-forest relationship existing in the prairie-forest region.

8. Describe the principal soil-forest units of the southern Coastal Plain of the U.S.A.

9. Give a general scheme of the soil-forest relationship observed in the mountains.

10. Compare the predominant ground cover vegetation of podzolic sandy soils in the Old and the New Worlds.

11. Compare the predominant ground cover vegetation of podzolized loams in northern United States and northern Europe.

12. Name tree species occurring on Sphagnum moss peat in the United Stated, Finland, and Manchuria.

13. Draw a parallel between the major forest types of the western and the eastern portions of the United States.

14. Describe the principal forest types of the southern Rocky Mountains and state their relation to the soil.

15. Could you apply the knowledge of soil-forest types of the Carpathian Mountains to the Adirondack region?
PART V: ANALYSIS OF FOREST SOILS

1. Discuss the technique of soil sampling.

2. Outline the procedure for the determination of soil texture using the hydrometer method.

3. Outline the procedure for the determination of the water and air contents of the soil using steel cylinders.

4. Describe a method for the determination of the moisture equivalent of soils.

5. Discuss the relationship between the wilting coefficient and moisture equivalent.

6. What significance has the composition of the soil profile in the chemical analyses of soils?

7. Give an outline of the different methods of chemical analysis of soils.

8. Discuss equivalent weights and normal solutions.

9. State the principles of titration and the main types of reactions upon which it is based.


11. Outline the procedure for calculating milliequivalents of replaceable ions. Give a concrete example.

12. What advantages has the presentation of replaceable bases in terms of milliequivalents instead of pounds per acre?

13. Discuss the meaning of the term "buffer".

14. What complications may arise in diluting concentrated solutions?

15. Indicate rapid tests for determination of soil texture, soil reaction, and the content of soil organic matter.

16. Indicate rapid methods for the determination of available nutrients and replaceable bases.

17. Outline the procedure for the determination of available nutrients using lower organisms.

18. What are the principles involved in the determination of total nitrogen by means of the Kjeldahl method?

19. Outline a procedure for the determination of nitrates in soils.

20. Discuss the determination of ammonia in soils.

21. State the procedure for the determination of available phosphorus by the Truog method.
22. Discuss the determination of available potash using the Volk-Truog method.

23. State the principles involved in the determination of base exchange capacity and replaceable bases in soils.

24. Outline the technique of plant tissue analysis.

25. How would you determine the nitrifying capacity of the soil?

26. Discuss the method for the determination of carbon dioxide evolved from soils.

27. State the procedure for the determination of the number of organisms in soils and composts.

**PART VI: FOREST SOILS IN RELATION TO SILVICULTURE AND FOREST MANAGEMENT**

1. In which phases of forestry practice is it essential to have a knowledge of forest soils?

2. State the purpose and technique of the forest soil survey.

3. Discuss the use of soil survey reports and maps prepared by the state and federal agencies in reforestation practices.

4. State the degree of accuracy and the cost of forest soil survey.

5. How would you approach the delineation of soil types in surveying forest soils?

6. Elaborate on the problem of nomenclature used in surveys of forest soils.


8. How are the soil survey data used in forest management?

9. What specific conditions are of prime importance in surveying forest soils in mountain regions?

10. Discuss the ecological importance of topographic factors.

11. How would you classify topography on the basis of gradient and exposure?

12. Review different methods of forest subdivision.

13. Discuss the relation of topography to ground water table.

14. What are the major phases constituting the reforestation program?

15. Which properties of tree species should be given a consideration in their selection for planting?
16. Discuss the problem of acclimatization and the establishment of silviculturally homogenous regions.

17. Enumerate the more important factors to be considered in the selection of planting sites.

18. Outline planting possibilities of several important tree species in relation to ground water level, pH value, soil texture, and content of soil organic matter. Give due consideration to the climatic conditions of the region in which the reforestation is to be carried on.

19. Discuss the relation of the geological origin of soils to their productivity and planting possibilities.

20. Discuss planting possibilities of various tree species in relation to the content of soil nutrients.

21. Review the importance of ground cover vegetation as an indicator of planting possibilities. Give some concrete examples.

22. Which methods of planting would you use in reforestation of well drained sandy soils?

23. Which method of planting would you recommend for reforestation of soils having a close ground water table or hardpan layer?

24. On which soils is the use of slit planting method prohibitive? On which soils is mount planting prohibitive?

25. State the advantages and shortcomings of the furrowing.

26. Discuss planting on top of the furrow slice.

27. What are the advantages and shortcomings of the inverted V and cone methods of tree planting.

28. Enumerate the more important factors which must be considered in making a diagnosis of the causes responsible for the failure or stagnant growth of plantations.

29. How would you reduce the losses of water by run-off?

30. Outline methods of artificial drainage applicable to forestry practice.

31. How would you proceed in planting trees on peat soils?

32. Outline the technique for stabilization of aeolian sands.

33. Describe the procedure for reclamation of ortstein soils.

34. Discuss the method of gully planting.

35. Discuss tree planting in prairie regions.

36. How are field crops used in reforestation practice?
37. State the advantages and disadvantages of cultivation of forest plantations.

38. What are the effects of burning forest floor?

39. Discuss the use of fertilizers in reforestation.

40. Give an outline of various methods of fertilizer application used in forestry and landscape practices.

41. Define thinning and selective logging; state their respective purposes.

42. Outline the general principles of silvicultural cuttings; discuss cuttings of different intensities.

43. Discuss selective logging of different species on upland sandy soils.

44. Compare the technique of selective logging on humus-incorporated and on podzol soils.

45. Discuss the problem of selective logging on soils with a high ground water level.

46. Describe the principles of Wagner's shelter-wood strip cuttings.

47. Describe the technique of Eberhardt's production cuttings.

48. Outline different methods of preparation of yield tables; discuss the use of yield tables in forestry.

49. How would you determine the annual cut under the sustained yield management.

50. How would you calculate the expected financial return on a reforestation investment?

51. Outline the principles of land evaluation.

52. Discuss the problem of appraising the damages to the productivity of forest land.

**PART VII: MANAGEMENT OF FOREST NURSERY SOILS**

1. What are the different phases involved in the management of nursery soils?

2. Enumerate the important factors to be considered in the selection of a nursery site.

3. How would you proceed in the preparation of ground for nursery beds?

4. Discuss the regulation of moisture content in soils of forest nurseries.

5. Give a brief description of different types of soil moisture meters.
6. Discuss time and manner of watering.

7. State the advantages and shortcomings of the various mineral and organic nitrogen fertilizers in relation to their use in forest nurseries.

8. Discuss the suitability of the various phosphate fertilizers for use in forest nurseries.

9. Discuss the suitability of the various potash fertilizers for use in nursery soils.

10. List the common combined fertilizers and state their importance in the management of nursery soils.

11. Discuss the use of lime in forest nurseries.

12. What are composted fertilizers and what are their chief advantages?

13. How would you proceed in the construction of a compost pit for a large size forest nursery?

14. Discuss the suitability of organic materials for use in the preparation of fertilizer composts.

15. How would you calculate the amounts of commercial fertilizers to be used in the preparation of a compost?

16. Discuss the effect of salt concentration upon the quality and cost of fertilizer composts.

17. Discuss the rate of compost application and the problem of the maintenance of a proper content of nutrients in the soils raising stock of different species and age classes.

18. How would you distribute a composted fertilizer in the soil?

19. Under what circumstances should liquid fertilizers be applied?

20. Which fertilizers would you use for liquid treatments?

21. State the suitable concentration of liquid fertilizers in parts per million or in pounds per 100 gallons of water. What are the common rates of application?

22. How would you calculate the amount of different fertilizers for liquid treatments?

23. Outline the technique of application of fertilizers in solution.

24. Discuss the application of liquid fertilizers in relation to the time of the year and kinds of nursery stock.

25. What are liquid humate fertilizers and what are their chief advantages?
26. How would you prepare and apply liquid humates?
27. Outline the benefits and shortcomings of green manuring.
28. What is the effect of catch crops?
29. Discuss the seeding and turning under of green manure crops.
30. Discuss the problem of fertility maintenance in soils of forest nurseries.
31. What are the different approaches in establishing standards for the maintenance of fertility in nursery soils?
32. How would you adjust the pH value of a nursery soil?
33. Outline the adjustment of the base exchange capacity of nursery soils.
34. Discuss the correction of deficiency of the total and available nitrogen.
35. How would you correct the deficiency of phosphorus, potassium, and other replaceable bases in a nursery soil?
36. Discuss the major steps in a soil improvement program.
37. Outline the relationship that exists between the total soil fertility, the fraction of nutrients in the soil solution, and the content of nutrients required by seedlings during their annual growth.
38. Discuss the importance of the adjusted fertility for a successful inoculation of the soil, use of growth-promoting substances, and development of rapidly-growing hybrid varieties.
39. How does nursery soil fertilization affect the survival and the rate of growth of seedlings in the field?
40. Name the most important parasites inhabiting nursery soils.
41. Outline the control of parasites by surface firing and steaming of seed beds stating the dangers involved in the use of these methods.
42. Discuss the disinfecting efficiency of acid applied in different concentrations and at different rates of solution.
43. Which soil factors are likely to modify the effect of acid treatment.
44. What acids other than sulfuric can be used in soil treatments?
45. Outline the method of damping-off control by the use of formaldehyde.
46. What methods are used for the control of animal and insect parasites inhabiting forest soils?
47. Outline the use of the carbon disulfide emulsion.

48. How does chlor-pierin affect the composition of soil, soil organisms, and growing stock?

49. What is the affect of lead arsenate upon the chemical properties of soil?

50. Discuss the acidification of soil by the use of sulfur and aluminum sulfate.

51. How would you reduce the toxic effect of aluminum sulfate?

52. Name some of the recently introduced fungicides and insecticides.

53. What affects may an application of organic remains have upon the parasitic soil organisms?

54. State the principles of the biological method of parasite control.

55. What agents are instrumental in the transmission of diseases?

56. List measures for the prevention of diseases in nursery soils.

57. Discuss the problem of parasite control in relation to the maintenance of soil fertility.