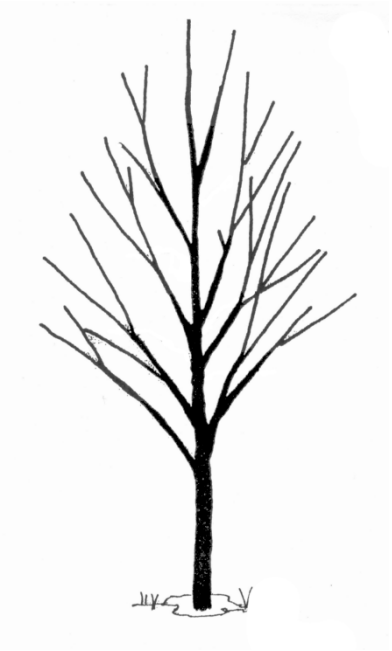
MASTER GARDENER
COLORADO STATE UNIVERSITY
EXTENSION



The Science of Pruning

Pruning Reference

Books (available from the *International Society of Arboriculture* at www.isa-arbor.com)

- ***An Illustrated Guide to Pruning, Third Edition*.** Edward F Gilman. Cengage Learning. 2011.
- ***Best Management Practices: Tree Pruning***. Edward F Gilman and Sharon J. Lilly. International Society of Arboriculture. 2008.
- ***ANSI A300 Pruning Standards, Part 1.*** American National Standards Institute. 2008.

Books (available from Urban Tree Foundation at www.urbantrees.org)

- ***Structural Pruning, A Guide for the Green Industry.*** Dr. Edward F Gilman, Brian Kempf, Nelda Matheny, and Dr, Jim Clark. Urban Tree Foundation. 2013.

Web: http://hort.ifas.ufl.edu/woody/pruning.shtml for sample pruning specifications.

Pruning curriculum develped by David Whiting (retired), Alison O'Connor, and Eric Hammond, Colorado State Univeristy Extension

- Colorado Master Gardener training is made possible, in part, by a grant the Colorado Garden Show, Inc.
- Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating.
- Extension programs are available to all without discrimination.

Revised May 2018

Learning Objectives

At the end of this unit, the student will be able to:

- Explain how trees grow and decay, and the implications for pruning.
- Explain removal cuts, reduction cuts and heading cuts.
- Structurally prune a young shade tree.
- Describe pruning of maturing shade trees, including objectives (whys) and methods (hows).
- Prune flowering shrubs
- Prune evergreen shrubs

Review Questions

Tree Growth and Decay

1. What is the branch collar?
    a. Explain how it develops.
    b. Explain the size relationship between the side branch and trunk/parent branch necessary for a branch collar to develop.

2. Explain how trees grow, adding xylem rings each year. Define the following terms:
    a. Phloem
    b. Xylem
    c. Sapwood
    d. Heartwood
    e. Ray cells
    f. Compartmentalization

3. Explain how trees respond to wounds (i.e., CODIT).
    a. What are the roles of annual growth rings and ray cells?
    b. In CODIT, explain why trees decay with a pipe-like structure. How does a break in the pipe-like structure impact structural strength?

4. What is percent shell? What are significant about 33% and 25% shells?

5. Describe methods to evaluate decay and cracking in trees.

Pruning Cuts

6. Identify/define the following:
    a. Branch bark ridge
    b. Branch defense zone
    c. Reaction zone
    d. Woundwood

7. What is a removal cut?
    a. What are the advantages of a removal cut?
    b. When the branch bark ridge is visible, where is the removal cut made?
    c. If the branch collar is not easy to identify, where is the removal cut made?
    d. If the branch has no branch collar, where is the removal cut made?
    e. What happens when the branch collar is cut or injured?
    f. What happens when nubs or very short branches are left?
    g. With hindsight, how does one evaluate when the thinning cut was properly made?

8. What is a reduction cut?
    a. What are the uses and limitations of reduction cuts?
    b. What is the proper angle for a reduction cut?
    c. In a reduction cut, what is the proper size relationship of the branch being removed to the branch pruned back to? is it important?

9. What is a heading cut?
    a. How does it influence regrowth of the plant?
    b. What are the effects of using heading cuts on larger branches?

10. Explain the three-step method for pruning large branches. Why is it needed? When is it needed?

11. Describe the pros and cons of pruning live branches during the:
    a. Late winter (dormant)
    b. Spring (during growth flush)
    c. Midsummer (after leaves harden and turn dark green)
    d. Late summer and fall
    e. Late fall and early winter
    f. During drought

Structural Training of Young Shade Trees

12. In structural training of young shade trees, give the rule-of-thumb for dosage (i.e., the maximum amount of live wood/foliage removed per season)? How does the gardener determine the growth rates to set dosage? How is the dosage range adjusted for the specific tree?

13. Define *excurrent* and *decurrent* growth habits.

14. List the steps and pruning objectives for excurrent and decurrent trees.

15. Define codominant trunks. Why do arborists have zero tolerance for codominant trunks?

16. What are the options if multiple leaders develop? If the main leader is killed?

17. What is the standard height for the lowest permanent branch of sidewalk trees? Street tree? Trees in forest areas (fire management)?

18. What is the proper size relationship between the trunk and side branch? Why is it important? What are the options if a side branch is growing too large?

19. Define scaffold branch. What is the rule of thumb for minimum spacing of scaffold branches?

20. How do multiple branches arising at one site influence the branch collar and thus structural integrity?

21. What is the role of temporary branches on young trees?

22. Describe the management of temporary branches.

23. Given a young excurrent or decurrent tree (or a picture of a young excurrent tree), describe specific training for this tree.

24. When decurrent trees are not trained from early growth in the nursery and on the landscape site, it is often impossible to fully achieve the five training objectives. To minimize potential storm damage, what is the most important objective to pursue?

Pruning Mature Trees

25. List the objectives (whys) for pruning a mature tree.

26. List the methods (hows) of pruning to achieve purposes.

27. Describe key elements in writing specifications for general pruning of maturing trees.

28. What is the overall objective in structural pruning of medium-aged and mature trees? Why will it generally require work over a period of years? How does larger branch size influence the potential for structural pruning?

29. Describe *subordinate pruning*. What factors should be considered when deciding where to make a subordinate pruning cut?

30. Describe how to subordinate prune a medium-aged tree with the following situations:

    a. Codominant trunks
    b. Rounded off
    c. Choked-out central leader
    d. Too many upright-growing branches

31. Describe key elements in writing specifications for structural pruning of medium-aged trees.

32. Define *cleaning*. In cleaning, how much of the live wood should be removed? Why?

33. When is it important to remove dead branches? At what size and height does dead branch removal become an important management issue?

34. When woundwood is growing out along a dead branch, where is the final cut made?

35. Describe key elements in writing specifications for cleaning.

36. Describing thinning.

    a. What are the purposes of thinning the crown?
    b. Will thinning lower a tree's height?
    c. In thinning the crown, what types of cuts are made?
    d. What is the general maximum size of branches to be removed?

e. What is the long-term effectiveness in overall crown thinning to reduce storm damage potential? What pruning method would be more effective?

37. What is *lion-tailing*? How does it differ from thinning the crown? What are the problems associated with lion-tailing?

38. What is the rule of thumb on dealing with excessive sucker growth?

39. Describe the key elements in writing specifications for thinning.

40. In raising, what is live crown ratio? What is the rule of thumb on how fast a tree can be pruned up?

41. In raising, what options may be workable other than removal of lower branches? Why may removal of lower branches cause problems?

42. Describe the key elements in writing specifications for crown raising.

43. Describe the reasons for crown reduction. Describe the limitations of crown reduction.

44. List pointers on crown reduction, as given in chapter.

45. What is the long-term effectiveness in overall crown reduction to reduce storm damage potential? What pruning method would be more effective?

46. How does topping a tree impact its structural integrity and internal decay potential?

47. Describe the key elements in writing specifications for crown reduction.

48. Explain the pruning objectives for the following situations:

    a. Storm-damaged trees
    b. Old and declining trees
    c. Root-damaged trees
    d. Hazard trees

Flowering Shrubs

49. What's the difference in flowering habit and pruning of spring-flowering shrubs and summer-flowering shrubs?

50. Many gardeners prune flowering shrubs by topping them. Describe the impact on growth and flowering.

51. Explain the pros of, and limitations for, shrub pruning by

    a. Shearing to shape
    b. Thinning old wood
    c. Pruning to the ground
    d. Replacement

52. What types of shrubs are successfully renewed by pruning to the ground? List situations where this approach may not work.

Evergreens

53. How can a gardener make a young spruce, fir or Douglas-fir bushier? What about a pine?

54. A large evergreen tree is overgrowing the space. Explain options to prune back the bottom branches for spruce, fir and Douglas-fir. Explain options for pruning back bottom branches for pine. Why is pine different from spruce, fir and Douglas-fir?

55. Explain what happens when a gardener shears a mugo pine shrub.

56. On junipers and arborvitae, explain the pros and cons of

    a. Shearing
    b. Thinning

57. Explain the problems associated with trying to prune back a severely overgrown juniper or arborvitae.