

# **The North Carolina Winegrape Grower's Guide**

**AG-535, published January 2007 by the North Carolina Cooperative Extension Service, College of Agriculture and Life Sciences, NC State University, Raleigh, NC 27695.**

## **Chapter 1. Introduction**

### **Chapter 2. Cost and Investment Analysis of Chardonnay (*Vitis Vinifera*)**

**Winegrapes in North Carolina** -- Procedures and Assumptions, Results and Discussion, Monthly Labor Estimates, Costs of Establishing the Chardonnay Vineyard, Monthly Expenses, Annual Production Costs for Mature Vines and Returns to Land and Management, Chardonnay Vineyard Profitability, Conclusions and Recommendations

**Chapter 3. Choice of Varieties** -- Grape Type and Regional Adaptation, Pierce's Disease Pressure, Marketplace Demand--An Evolving Story, Are You Planning a Winery? Winegrape Varieties, *Vinifera* Challenges, Rootstocks, Recommended Varieties, Varieties With Potential, *Vinifera* Varieties Not Recommended, Native and Hybrid Varieties, Hybrid Varieties with Some Potential, Sources of Grapevines

**Chapter 4. Vineyard Site Selection** -- Climate and Topography, Avoiding Spring Frost Damage, New Approach for Assessing Potential Vineyard Sites for Spring Frost Risk, Passive Methods for Managing Spring Frost Risk, Summary

**Chapter 5. Vineyard Establishment** -- Preparing the Site, Designing the Vineyard, Planting, Summary, Publications on Trellis Construction

**Chapter 6. Pruning and Training** -- Definitions, Dormant Pruning, Grapevine Training, Initial Training, Cordon Establishment, Multiple Trunking, Trunk Renewal, and Graft Union Protection, Training Systems, Nondivided Canopy Systems, Divided Canopy Systems

**Chapter 7. Canopy Management** -- Grapevine Canopies, Canopy Microclimate, Principles of Canopy Management, Assessing Canopy Characteristics, Canopy Modification

**Chapter 8. Pest Management** -- Diseases (Fungal, Minor Foliar, Bacterial, and Viral and Virus-like Diseases, and Nematodes), Insects and Mites, Wildlife, Weeds (Vineyard Floor Management, Herbicide Issues, Herbicides – Effective and Economical, Herbicide Program for Grape Vineyards, Tillage/Herbicide Program, Herbicide Mixing, Application, and Sprayer Calibration, Herbicide Alternatives, Supplies and Services)

**Chapter 9. Vine Nutrition** -- Assessing Nutrient Needs of Mature Vines, Visual Observations, Specific Nutrient Deficiencies and Their Correction: Nitrogen, Potassium, Magnesium, Boron and Other Nutrients, Soil and Plant Tissue Testing Services

**Chapter 10. Grapevine Water Relations and Vineyard Irrigation** -- The Vineyard Hydrological Cycle, Summer Climate and the Potential for Drought, The Role of Water in the Vine, Symptoms of Water Stress, Avoiding Vine Water Stress with Irrigation, Drip Irrigation Suppliers

**Chapter 11. Spring Frost Control** -- Choosing a Frost Protection System, Frost/Freeze, Frost Warning, Radiational Frost, Types of Active Frost Protection, Operating Frost Protection Systems, Wind Machines, Over-vine Sprinkling Systems, Heaters as a Supplement to Wind Machines, Helicopters, Summary, Resources

**Chapter 12. Crop Prediction** -- Basic Components of Crop Yield, Sources of Variation

## **Appendix A: Authors and Contact Information**

## Glossary

Copies of this book may be ordered from Publications Office, Department of Communication Services, Campus Box 7603, NC State University, Raleigh, NC 27695-7603

Price: \$20. Make check or money order payable to NC State University and be sure to request AG-535, North Carolina Winegrape Grower's Guide.

The mention of commercial products, services, or publications is for the reader's convenience and does not constitute endorsement by the North Carolina Cooperative Extension Service or the North Carolina Grape Council, nor does it imply discrimination against other products, service, or publication not mentioned.

Published by NORTH CAROLINA COOPERATIVE EXTENSION SERVICE and distributed in furtherance of the acts of Congress of May 8 and June 30, 1914. North Carolina State University and North Carolina A&T State University commit themselves to positive action to secure equal opportunity regardless of race, color, creed, national origin, religion, sex, age, or disability. In addition, the two Universities welcome all persons without regard to sexual orientation. North Carolina State University, North Carolina A&T State University, U.S. Department of Agriculture, and local governments cooperating.

## Copyright information

Copyright: NC State University, Raleigh, NC. All rights reserved. For more information, contact Department Head, Communication Services, Box 7603, NC State University, Raleigh, NC 27695-7603.

Portions of this publication are adapted from the following publications by Tony K. Wolf, Director of Alson H. Smith Jr. Agricultural Research and Extension Center, Winchester, VA, with permission of Virginia Cooperative Extension: *The Cost of Growing Grapes in Virginia* (463-006); *Dormant Pruning and Training of Grapevines in Virginia* (423-011); *A Guide to Commercial Vineyard Establishment* (463-018); *Commercial Grape Varieties for Virginia* (463-019); and *Grapevine Nutrition* (463-007). Chapter 5, Vineyard Establishment; Chapter 6, Pruning and Training; Chapter 7, Canopy Management; and Chapter 12, Crop Prediction; were previously published in the *Mid-Atlantic Winegrape Production Guide*, © 1995, NC State University. Chapter 10, *Grapevine Water Relations and Vineyard Irrigation*, is adapted from the same source.

Figures and photos 4.1 on page 65, 4.2 on page 47, 5.2 on page 66, 5-3 on page 69, 5.4 and 5.5 on page 70, 5.6 and 5.7 on page 71, 5.8 on page 72, 6.1 and 6.2 on page 75, 6.3 on page 76, 6.4 on page 80, 6.5 on pages 82 through 84, 6.7 on page 85, 6.8 and 6.9 on page 87, 6.10 on page 88, 6.11 and 6.12 on page 89, 7.1 on page 92, 7.2 on page 94, 7-3 on page 98, 8.6 on page 123, 9-1 on page 139, 10.1 on page 151, 10.2 on page 152, 10.3 on page 153, and 12.1 on page 175 were previously published in the *Mid-Atlantic Winegrape Production Guide*, © 1975, NC State University.

Figure 2.1 from <http://www.ext.vt.edu/pubs/viticulture/462-008/fig2.html> used with permission of Virginia Cooperative Extension.

Figure 3.1 from <http://www.ncwine.org> used with permission of the North Carolina Wine and Grape Council.

Figures 3.2 and 8.6 used with permission of Turner Sutton, professor of plant pathology, NC State University, Raleigh, NC.

Figure 4.2 used with permission of Oregon Winegrowers' Association, Portland, OR.

Figure 4.3 on page 49 used with permission of Joe French, Superintendent, Upper Piedmont Research Station.

Figure 4.5 used with permission of Ashley Johnson, Agricultural Research Technician, Upper Piedmont Research Station.

Figure 6.4 was redrawn from an original illustration by Katherine Esau 1948, "Phloem structure in the grapevine and its seasonal changes," *Hilgardia* (journal) 18: 217-296.

Figure 6.11 used with permission from *Cultural practices for commercial vineyards*, 1981, Cornell University Extension Misc. Bulletin No. 111, Ithaca, NY.

Figures 9.3 and 9.5 on page 147 used with permission of T. J. Zabadal, Associate Professor SW Michigan Experiment Station, Benton Harbor MI.

Figure 11.2 used permission of Washington State University, Cooperative Extension Service, Pullman, Washington.