



# Natural Resource Network

Connecting Research, Teaching and Outreach

## New England White Oak in Cask Production



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## Summary

White oak (*Quercus alba*) growing in New England exhibits chemical characteristics that may make it desirable to wine and spirit producers. Gas chromatography-mass spectrometry analysis was performed on white oak from New England for trans-whisky-lactone (trans-WL) and cis-whisky-lactone (cis-WL) while optical density measurements were used to evaluate tannins. Results were compared to midwest white oak. The comparison showed 1) New England white oak exhibited more trans-WL than midwest white oak, 2) New England white oak exhibited fewer tannins than midwest white oak, and 3) there was not a statistically significant difference in cis-WL when comparing New England white oak to midwest white oak. Entities that seek white oak based on regional characteristics might consider sourcing New England white oak when they seek these general characteristics.

## Suggested form of attribution

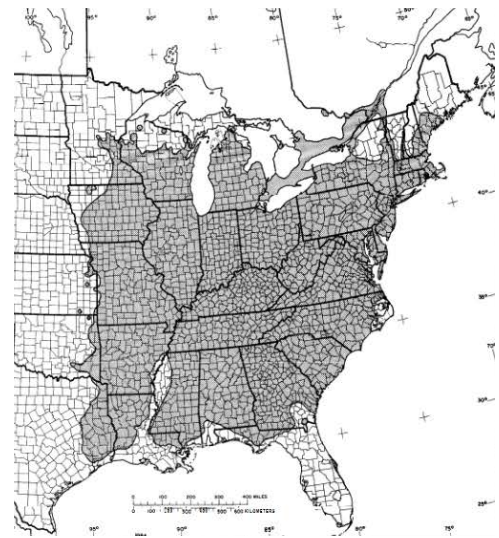
Fast, A. J., A.P. Seguin-Moreau, and C. Parker. 2019. New England White Oak in Cask Production. University of New Hampshire Cooperative Extension, Durham, N.H.

## Background

Casks crafted from the white oak subgroup (*Quercus*) are used in the production of wine, spirits, beer, and hard cider. Chemical attributes of white oak, such as whiskey lactones and tannins, are important to alcoholic beverage producers because they affect flavor, aromas, color, mouth-feel, and other characteristics. White oak originating from different growing regions (e.g. French oak, Hungarian oak, American white oak, etc.) have different concentrations of whiskey lactones and tannins and are often sought or avoided based on the chemical characteristics associated with them.

White oak's native range covers much of the eastern and central United States. Within this range there is tremendous variability in climate, soils, and growing conditions. Across this broad geographic area, American white oak is marketed as a single, undifferentiated product. Nonetheless, cooperages and alcoholic beverage producers often have particular regional procurement preferences based on the characteristics that they want to impart on the beverages they are producing.

New England is out of the traditional procurement radius of many large cooperages that make up the industry. There are smaller cooperages in New England that are growing and supporting local and regional markets. White oak does not make up a large percentage of the forests of New England; however, it represents a substantial supply with well over a billion board feet of white oak sawtimber in the region according to U.S. Forest Service Forest Inventory and Analysis Data.



Range of white oak in the U.S. from *Silvics of North America: Volume 2: Hardwoods*

## Study

Given the desire to further develop the New England cooperage industry, strengthen the supply chain, and promote New England forest products, there was interest in better understanding qualities of white oak in New England and how they might differ from white oak in other parts the United States.

Over 40 white oak (*Quercus alba*) samples were collected from different white oak trees across New England. The samples included approximately 10 samples from Connecticut, Vermont, Maine and New Hampshire. All samples were sawn into dimensional lumber, existing staves, or stave stock. Samples were white oak heartwood and had been air-dried with drying times varying from 1 month to 13 years.

Gas chromatography-mass spectrometry analysis was performed on the samples to evaluate trans-whisky-lactone (trans-WL) and cis-whisky-lactone (cis-WL), while optical density measurements were used to evaluate tannins. The results were compared to existing data on midwest white oak.

The results showed New England white oak exhibited more trans-WL and fewer tannins than midwest white oak, and there was not a statistically significant difference in cis-WL when comparing New England white oak to white oak in the midwest.

## **Implications of the Research**

Alcoholic beverage producers, particularly spirit and wine producers, can source New England white oak staves or casks if they prefer fewer tannins or more trans-whiskey-lactones relative to existing other sources of American white oak.

This study suggests that white oak growing in New England has a different chemical composition than white oak growing in other regions of the United States. These results are consistent with other studies that show region-specific characteristics for oak growing in different provinces (e.g. differences between American white oak and French white oak).

Despite regional differences identified in this research between New England and midwest white oak, New England white oak would be marketed under the umbrella term “American” white oak with current marketing approaches. There may be a benefit for New England white oak to be marketed in a way that differentiates it from white oak produced in other parts of the United States.

## **Potential Barriers**

The New England cooperage industry is in an early, introductory phase. It is functioning at a small scale, but there is strong local interest and demand for quality casks. A potential challenge as cask production scales up is managing the supply chain. Loggers and lumber suppliers will need to be educated about this new market, and stave stock specifications. In addition, capital might be a constraint since white oak staves air dry for long periods before they are used, and someone will need to carry the cost of the lumber as it is drying.

## **Limitations of this Research**

New England has not been a source of white oak for the national or international cooperage industry. As such, this is the first known chemical analysis comparing New England white oak and other regions. There can be substantial chemical variation between individual white oak trees in a given region. The impact of wood on the flavor and attributes of alcoholic beverages is complex and nuanced. Species, toasting time, repeated barrel use, and coopering are some of the factors that can impact the concentration of oak lactones and tannins in addition to

geography. Additional use, testing, and research of New England white oak by researchers, cooperages, and alcoholic beverage producers will provide more insight into the potential trade-offs of using white oak from New England relative to other geographic regions.

## **Additional Resources**

Burns, R. M., and B. H. Honkala. 1990. *Silvics of North America: Volume 2: Hardwoods*. USDA Agriculture Handbook 654, Washington, DC.

Doussot, F., B. De Jéso, S. Quideau, and P. Pardon. 2002. Extractives Content in Cooperage Oak Wood during Natural Seasoning and Toasting; Influence of Tree Species, Geographic Location, and Single-Tree Effects. *J. Agric. Food Chem.* 50: 5955-5961.

Marco, J., J. Artajona, M.S. Larrechi, and F.X. Rius. 1994. Relationship between geographical origin and chemical composition of wood for oak barrels. *Am. J. Enol. Vitic.* 45: 192-200.

Prida, A., and J.-L. Puech. 2006. Influence of Geographical Origin and Botanical Species on the Content of Extractive in American, French, and East European Oak Woods. *J. Agric. Food Chem.* 54: 8115-8126.

Forest Inventory and Analysis Database. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. Available only on internet at <https://apps.fs.usda.gov/fia/datamart/datamart.html>. Accessed 8/30/19.

## The Natural Resource Network Reports

The Natural Resource Network presents this material as a part of series of research reports and publications of interest to educators, resource professionals, landowners and the public. Additional copies are available from the University of New Hampshire Cooperative Extension Forestry Information Center, 131 Main Street, Nesmith Hall, Durham, NH 03824, or at our website [extension.unh.edu](http://extension.unh.edu).

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The mission of the Natural Resources Network is to enhance interaction among the natural resource research, teaching, and outreach communities in New Hampshire by providing an ongoing mechanism for identifying, addressing and communicating natural resource issues.

Natural resource professionals are working toward improved ways to conserve and use the natural resources of New Hampshire. The Natural Resource Network was formed to improve the interaction among researchers and those who provide outreach education in many kinds of programs. Teachers, outreach professionals and resource managers can bring research-based education to diverse audiences. At the same time, those audiences, or consumers, identify issues and needs for educational programs which can be addressed by controlled research. Well informed and knowledgeable professionals, free-flowing exchange of information, an advantageous and gratifying professional environment, and natural resource planning are goals of the Natural Resource Network.



# Extension

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