

WAVE

| WASHINGTON ADVANCEMENTS IN VITICULTURE & ENOLOGY

WASHINGTON STATE WINE COMMISSION RESEARCH PROGRAM

5 YEAR IMPACT REPORT



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WINE

Dear Washington Wine Community,

Viticulture and enology research have long been a cornerstone of the Washington wine industry. In recent years, the state has seriously ramped up its research commitment to help build a state-of-the-art Wine Science Center at Washington State University, develop a strategic vision and plan, and dedicate significant funds to support important research projects.

VISION

To build a world-class research program for the state's wine grape growers and wineries.

OBJECTIVE

To equip growers and winemakers with Washington-specific tools and technologies to make superior wines that compete on the global stage with the best wines in the world.

A strategic research plan, developed with broad industry input, provided the roadmap to accomplish the foundational phase of the industry's research vision and goal. The initial strategic plan guided the industry's work to achieve the following milestones:

- Establish program structure and process.
- Secure sustainable research funding.
- Expand the reach of industry-supported research.
- Increase research communications and stakeholder involvement.

The plan was recently updated—the Strategic Research Plan for the Washington Wine Industry FY 20-23—to build on the research program's foundation with new milestone markers.

This report is a snapshot of the first five years of the Washington State Wine Commission's dedicated research program. The accomplishments reflect the efforts of two key committees of industry volunteers that oversee and direct the program:

- The Research Committee, composed of Washington State Wine Commission Board members, has fiduciary oversight and drives the research program.
- The Wine Research Advisory Committee (WRAC) is a subcommittee of the Washington State Wine Commission and keeps the viticulture and enology research projects focused on needs specific to the Washington wine industry.

Research is a bright spot in the world of wine. Support for grape and wine research at state and federal levels is at its strongest point ever and we have a powerful research partnership with WSU.

Research is an integral part of addressing challenges in the vineyard and winery, and essential in moving the industry forward. We encourage you to learn more about the Washington wine industry's investment in research and its future.

Cheers to a world-class research program,



Melissa Hansen
Research Program Director
Washington State Wine Commission



Steve Warner
President
Washington State Wine Commission

KEY RESEARCH MILESTONES 2015-2020

2015

Strategic Research Plan approved and industry's first research-only staff hired

2015

Wine Science Center Opened



2016

WSWC's research program gets underway

2016 **WAVE**

Inaugural WAVE research seminar held

WAVE^x 2017

WAVE^x brought to outlying regions

2017

V&E Research Funding tops \$1 million



NGRA

2018

WSWC joins board of National Grape Research Alliance

2018

WSWC partnered for first time with Oregon wine industry for mechanization research



2019

Strategic Research Plan Updated

2019

Competitive research grant program launched by WSWC to expand research reach

2020

First research projects awarded through WSWC research grant program

2020

V&E Department, degree, completion of study at Wine Science Center approved by WSU



WSU RESEARCH PARTNERSHIP



The industry's research partnership with WSU traces back to the 1930s and Dr. Walter Clore, a fruit scientist at WSU's Prosser research station who saw potential in the state as a premium wine producer. Clore initiated research through trials of grape varieties throughout the state and would later be recognized as the Father of Washington's Wine Industry. Dr. Chas Nagel, WSU food scientist, made wines from Clore's research trials.

WSU has played a key role in Washington's growth as a world-class wine region, from helping the industry hone traditional cultural and winemaking skills under Washington's climate to advancing new discoveries to improve wine quality. Today, WSU leadership from the top levels of administration in Pullman to Prosser to Tri-Cities has solidified the strong partnership with Washington's wine industry. WSU shares the vision of creating a world-class research program and is working to raise the bar of excellence. Together, the industry and WSU have laid the foundation, from building the Wine Science Center and sustainably funding viticulture and enology research to fostering a research culture. WSU has taken important steps needed to elevate the viticulture and enology program to world-class status by approving the following last year:

- 4-year Bachelor of Science degree in Viticulture and Enology
- Creation of a Viticulture and Enology Department
- Require last 2 years of study be conducted at Tri-Cities campus, at Wine Science Center and in heart of wine country for internships, work experience

We look forward to further strengthening the industry's partnership with WSU to build a world-class research program that attracts the best and brightest scientists, faculty and students and provides data-driven tools to help Washington growers and winemakers grow better grapes and make better wine.



Dr. Thomas Henick-Kling,
director of WSU's Viticulture
and Enology Program

Dr. André-Denis Wright, dean of
WSU's College of Agriculture, Human
and Natural Resources Sciences

RESEARCH PROGRAM ACTIVITIES 2015-2020

A major focus of the WSWC research program is to raise industry awareness about V&E research and its value to growers and winemakers. This is accomplished in several ways, from editorial outreach—sharing research results in trade media, industry newsletters—to sponsoring research seminars and webinars (WAVE) and the WAVE Minute, a weekly radio program, to creating research videos for all audiences. WAVE, which stands for Washington Advancements in Viticulture and Enology, has

become the signature research event for the Washington wine industry. Industry also participates in annual research surveys to provide feedback to set research priorities and guide communication efforts. Research is also shared with industry during the annual Research Review, where research proposals are presented to the Wine Research Advisory Committee and industry feedback is collected.

BY THE NUMBERS

INDUSTRY ENGAGEMENT & STRATEGIC COMMUNICATIONS



Industry allocates about 25% of budget to support world class V&E research program and state of art wine research facility

RETURN ON INVESTMENT OF RESEARCH

The value and impacts of past and current industry-supported research at WSU are far-reaching, felt by grape growers, winemakers and Washingtonians. Research has helped growers and winemakers improve wine quality (good for everyone), reduce pesticide inputs (good for environment, workforce and community), manage vineyard nutrition (good for vineyard health, groundwater, fish), conserve water (good for fish and community) and more. Dive in below for details of past and on-going research ROI.

IRRIGATION

Growers now use up to 50% less water and reduced their pumping costs as result of deficit irrigation research. Research provided Washington growers with irrigation management strategies to control canopy growth, which helped improve red wine quality by reducing shade. Current research focus:

- Optimizing irrigation for white varieties to improve white wine aromatics.
- Irrigation by variety – discovery of varietal responses to soil moisture stress to help growers tailor irrigation by variety and improve quality.
- Impacts of climate change – developing vineyard management and winemaking tools to deal with changing berry acidity from climate change.
- Deep root zone delivery – proof of concept research shows deep root delivery technology has potential to save 60% water without impacting wine quality. Delivery technique is now studied for replant situations.

INTEGRATED PEST MANAGEMENT

Innovative IPM research reduced pesticide use by 80% (1995-2005), eliminating need for organophosphates—good for environment, work force and community. This saves industry an estimated \$35 million annually, including \$3.9 million from each eliminated miticide application. Current IPM research:

- Phylloxera – developing management and risk assessment mapping tools to buy growers time before eventual replanting to rootstocks. Replanting costs average \$25,000 per acre.
- New grape leafroller pest – understanding economic impact and developing best control methods.
- Plant-parasitic nematodes – developing tools to manage nematodes in replant situations. At stake—estimated \$44 million annual replanting costs, based on a 3 percent replanting schedule.



Washington's V&E research program is industry-driven: research priorities are established by growers and wineries.

FUNGAL AND VIRAL DISEASES

Growers have eliminated one or more powdery mildew fungicide applications (in most years) thanks to research that helps them better time applications. Each fungicide application that's eliminated saves \$2.6 million for the industry. Grapevine virus economic impact research found growers can lose over \$8,000 per acre over a 20-year period with just 10 percent infection of grape leafroll virus. We've learned rogueing works for red blotch virus because we don't have vectors causing spread, but not as well for leafroll virus, which has a highly efficient grape mealybug vector and spread occurs from nearby infected vineyards. Current focus of fungal and virus disease:

- Identifying presence of powdery mildew resistance to fungicides in Washington and developing a rapid test for resistance.
- Evaluating innovative UVC light to control powdery mildew and provide organic control.
- Learning if leafroll virus vector grape mealybug has developed resistance to insecticides.
- Learning if dogs can be used to detect leafroll virus before vine shows symptoms.
- Studying location specific factors influencing spread of leafroll virus in vineyards.
- Working with cDNA clones of leafroll virus to discover cutting-edge mitigation strategies.



PRECISION V&E

Precision viticulture and enology and mechanization will help growers and wineries manage rising labor costs, labor shortages and improve wine quality.

An economic research project funded by Washington State Wine Commission found it pays to mechanize common vineyard tasks in both 100-acre and 500-acre vineyards. The study showed net profits could increase from \$52 to \$1,120 in a 100-acre vineyard, depending on the vineyard task. Current mechanization focus:

- Developing both low-cost smartphone app and sensor technology tools to estimate crop load. If successful, such tools could provide Washington grape growers with more accurate, real-time crop information, saving 40,000 hours of labor or \$500,000 annually.
- Developing a more-precise mechanical shoot thinning tool, with potential to save \$250 per acre for the cost of shoot thinning by hand or an estimated \$7.5 million if used on just half of current production of 59,000 acres.



Photo credit: Good Fruit Grower



Washington's V&E research program is accessible to all; winemakers and growers, regardless of size, have access to research results.



WINEMAKING

Berry to bottle - many vineyard trials include research winemaking to quantify impacts on wine quality. Past research has included tools for winemakers to better manage wine spoilage and manage tannins and extraction during winemaking. Industry experts have estimated that improvements to wine quality from past research increased bottle values by \$1, equivalent to \$192 million of increased value. Current research focus includes:

- Identifying the causal agents of freeze taint aromas and evaluating mitigation strategies from fining agents.
- Developing a rapid, easy to use phenolic analysis model for winemakers.
- Evaluating the impact of grape ripening and alcohol manipulation on the sensory and chemical profiles of red and white wines.
- Investigating interaction of sulfur dioxide, alcohol concentration and storage temperature on growth of *Brettanomyces*.
- Managing microbial populations in wines with different pH levels.
- Understanding flavor development during wine fermentation and how wine yeast and bacteria can liberate flavor precursor compounds.



SMOKE IMPACT ON GRAPES AND WINE

WSU initiated simulated smoking trials in research vineyards in 2016, which gave Washington a head start in better understanding the risks and complexities of smoke, one of the most pressing and challenging issues to face the wine industry. Because of Washington wine industry's early research support, we had a research team in place when wildfires hit in 2020. Through WSU research, we learned grapes are vulnerable longer than previously suggested—from pre-veraison to harvest, fuel source matters



Washington's V&E research program is industry-guided; funding recommendations are approved by the industry.

(sagebrush steppe has more impact than woodland fires), there are varietal differences and micro-fermentations correlate with bin fermentations for sensory and phenolic analysis. Going forward, we've assembled a powerhouse team of scientists from several universities and are seeking additional federal research funds to expand our research efforts and quickly find solutions. Current WSU studies include:

- Hoop-house smoking trials to apply treatments from fruit set through veraison to understand early season impact.
- Evaluating vineyard barrier sprays to reduce grape uptake of smoke related phenols.
- Ash contributions on grapes and juice to understand role in smoke taint.
- Lab analysis validation to determine total smoke related phenols in grapes and wine.
- Correlating vineyard air quality to volatile phenolic levels in fruit and wine.
- Evaluating reverse osmosis with enzymatic treatment for wine mitigation.
- Comparing free phenol and glycoside levels of bucket micro-fermentations and mason-jar fermentations.
- Using oak adjuncts pre- and post-fermentation to mitigate smoke affects in red wine.
- Developing data analysis and statistical tools for future risk modeling of smoke exposures.

Rapid Response Capability

The industry's strong research partnership with WSU has resulted in a team of key scientists, extension and resources able to quickly respond to emerging industry issues to help growers and wineries make data-driven decisions. When phylloxera was discovered in new Washington wine grape regions in 2019, WSU immediately helped growers sample and test suspected vineyards and developed a comprehensive research plan. When a wildfire broke out in Yakima County in August 2020, WSU moved air particle counters from research trials to commercial vineyards to gather smoke exposure data. We've got the best scientific minds in place, ready to help the industry!



Photo credit: Good Fruit Grower

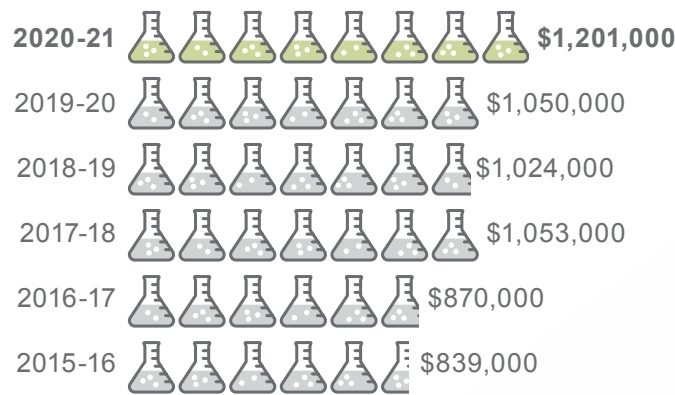
RESEARCH PROJECTS FUNDED

Viticulture and enology research for Washington’s wine industry is uniquely supported through public, private and industry funds. The Washington State Grape and Wine Research Program is administered by WSU. In addition, WSWC administers a separate grant program to extend the industry’s research reach to Washington community colleges and universities outside the state. All research proposals are reviewed by the Wine Research Advisory Committee and their funding recommendations are approved by the Washington State Wine Commission Board.

Financial support for the statewide WSU research program comes from:

- Washington State Wine Commission
- Auction of Washington Wines
- Washington State University
- State liter tax on all wines sold

GROWTH OF V&E RESEARCH FROM 2015-2020



- 30% growth in the research program
- 48 research projects funded



NATIONAL INVOLVEMENT

The Wine Commission’s stepped up industry involvement with research at the national level in the last five years has paid big dividends. The Wine Commission serves on the board of directors of the National Grape Research Alliance and coordinating committee of the Northwest Center for Small Fruits Research. As a result, two USDA scientists are coming to Prosser to work on soil health and precision viticulture issues and expand the research bandwidth for Washington’s wine industry. The soil health position fills a vacancy, but the precision viticulture is newly created by Congress.

INDUSTRY INVOLVEMENT

Washington’s wine industry research program is made possible by the support of researchers, growers and wineries and the following entities:

- WSU Viticulture and Enology Program
- Wine Research Advisory Committee
- Washington State Wine Commission Research Committee
- Washington State Wine Commission Board of Commissioners

THANK YOU!





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