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BOOK AND FILM REVIEWS

Brian Freedman: *Crushed: How a Changing Climate Is Altering the Way We Drink*

Rowman & Littlefield, Lanham, MD, 2022, 224 pp., ISBN 978-1-5381-6630-7 (hardback), $32.00.

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If you are a climate change denier, this is not a book for you. On the other hand, if, like most winemakers, you accept that climate change is occurring and will continue, and if you have enough interest in wine and its future to read this review, you could read *Crushed* with pleasure. It is well-written and briskly paced, and I found it both interesting and informative.

My main criticism of this book is that its title and subtitle are extremely misleading. They promise a tale of damage and loss, of passive response to an overwhelming destructive force—like flooding in Bangladesh. Instead, *Crushed* provides stories of creative, thoughtful responses to climate change aimed at mitigating its negative effects on wine production and sometimes enhancing its positive effects. The reader learns a good deal about changes in wine production in several regions and a bit about changes in American whiskey production. The discussion of climate change is purely descriptive: one learns what has changed in several regions, with a stress on more frequent extreme weather, but there is nothing about the drivers of those changes or the prospects for their continuation or acceleration.

Each of the book's eight chapters deals with changes in the climate of a particular region that have affected either wine production (seven regions) or whiskey production (one region). Each chapter focuses on stories of the individuals who have responded creatively to these changes. This focus enhances readability but makes the book more of a collection of anecdotes than a comprehensive overview. Inevitably, some of these case studies are more interesting than others, but in every chapter, I learned something about the impacts of climate change on wine or whiskey production in particular regions.

The book opens with the story of young winemakers, Jamie and Kristen Kutch, trying to return to their Sonoma winery during the devastating 2017 Tubbs fire. We learn about Jamie's experiments over the years as he tried to produce delicate, Burgundy-style Pinot Noirs and about the loss of half his production due to smoke damage from the

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2008 Lightning Complex fire. In 2017, Jamie had luckily harvested early, and his wine was undamaged by the Tubbs fire. He lost 80% of his production to fires in 2020, however. Recognizing that the climate in California wine country is warming and that large wildfires are becoming more frequent, Jamie talks about moving his winery north and/or switching from Pinot Noir to varieties more resistant to heat stress, such as Grenache or Syrah.

At the start of the second chapter, we watch a young winemaker in Saint-Émilion, Nicolas Seillan, trying to decide how to respond to severe damage to his vines from a mid-May hail storm in 2009—his first year as vineyard manager at his family's estate, Château Lassègue. Consultants had advised him and his father to give up on the 2009 vintage, prune their vines back, and wait for 2010. After watching their vines for two weeks, however, Nicolas and his father decided instead to prune carefully, shoot by shoot. It worked, but the grapes were about two weeks behind their usual development and ripening schedule. This required a later than usual harvest, exposing them to more late-summer heat as well as cool days in early autumn, but the 2009 vintage was fine. In 2021, a March heat wave was followed by a heavy frost, causing widespread damage. Because Merlot ripens early, it is particularly vulnerable to these sorts of springtime weather shocks, and Nicolas and his father have pulled out several blocks of Merlot and replaced them with Cabernet Sauvignon and Cabernet Franc, which ripen later.

Chapter 3 focuses on Israel, which has produced wine for millennia but has recently been thought of mostly as a source of sweet kosher wine—even though most of that wine is not produced in Israel. We learn that in the last decade or so, the quality of Israeli wines has improved substantially because of increased deployment of agricultural technology, in which Israel has long been a leader, and increased use of sustainable farming practices. The growing challenges to the Israeli wine industry are, of course, heat and unremitting sunshine, along with more frequent extreme weather. Unsurprisingly, Israeli winemakers are moving toward grape varieties that handle heat better. But somewhat surprisingly, more wine is being grown in the Negev desert. The desert offers high-altitude sites as well as cold nights that provide an excellent diurnal swing. But thoughtful observers seem to recognize that there is a limit to Israel's ability to adapt to climate change because there is a limit to wine grapes' tolerance for heat.

In 2015, a wine magazine organized a blind tasting that involved sparkling wines from England and some of the top names in Champagne. Two English wines beat the French, much to everyone's surprise. English winemakers had clearly benefited from climate change, but to take full advantage of a warmer climate, they needed to plant better grape varieties and invest in improved winemaking techniques. The soils in southeastern England resemble the chalky soils of the Champagne region, and, though southeastern England is a bit farther north, it has more of a marine climate with less extreme weather. Recognizing this, in the 1990s, the English began planting the classic Champagne varieties—Pinot Noir, Chardonnay, and Pinot Meunier—and quality sparkling wines began to be produced. Because of vineyard-to-vineyard variation and increasing year-to-year variation in the weather, English sparkling wine, like French Champagne, has come to be predominantly non-vintage blends of wines from different places and different years.

Chapter 5 focuses on American whiskey production and opens with a vivid description of a uniquely damaging flood at the Castle & Key distillery in Kentucky in August

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2018, a month before it was to open to the public. Increased weather variability has made it harder for even large distilleries to acquire the particular grains on which their products are based. As in the case of sparkling wines, blending can mitigate year-to-year variability. New producers can ride out the time when whiskey is aged before it can be sold by producing gin, which does not need to be aged, but climate change has made the supply of some critical botanicals highly variable. We learn about new technologies that can speed up barrel aging and about the trend of some small distillers to rely on locally sourced grains, becoming more distinctive but at some increase in supply risk. While I learned a good deal about the whiskey industry from this chapter, it did not make a strong case that climate change has had much of an impact.

Thanks to the Spanish, wine has been made in South America for over 500 years. The best was historically produced in Patagonia, the central and southern portions of Chile and Argentina. As temperatures have risen farther north, interest in wine production in Patagonia has naturally grown. The area is mainly desert, however, and vines can be grown only with the benefit of irrigation, which must rely on snowmelt from the Andes. In Mendoza, Argentina's most important wine region, only 3% of the surface is planted because water is scarce. Growers are moving farther south because warming permits growing premium varieties there, and they are moving to higher altitudes and switching from flood to drip irrigation to make better use of declining snowmelt and take advantage of the greater diurnal swing at higher altitudes.

I was surprised to learn that in 2022, Texas was the fifth largest wine-producing state in the nation, after California, Washington, New York, and Oregon, with over 500 wineries, though it produced only about 0.5% of the national total.[1] After all, the climate in Texas is generally hot and getting hotter, and the traditionally high variability of its weather has increased. Hail used to be rare, for instance, but some vineyards now find they need to use hail netting to protect their vines. Perhaps the most extreme example of the weird, extreme weather that climate change has produced was Winter Storm Uri in 2021, when temperatures dropped well below freezing in many locations and 69% of Texans lost electricity for an average of 42 hours.

Chapter 7 focuses on the Texas Hill Country American Viticultural Area (AVA), which is just west of Austin. Beginning in the 1970s, growers there initially planted Cabernet Sauvignon and other marquee varieties with little success. Around the turn of this century, many switched to Tempranillo and other varieties that do well in Spain but are not well-known in the United States. Because of the hot climate in the Hill Country, grapes often achieve sugar ripeness before necessary balancing from the development of more complex chemicals (so-called phenolic ripeness). We learn of Robert Young's interesting work on cryo-maceration and flash détente techniques to increase the usable volume of those chemicals after harvest.

Crushed's final chapter centers on Johan Reyneke, a young vineyard and winery owner in South Africa with a profound commitment to seriously organic, no-chemical viticulture and to reversing the effects of apartheid via programs aimed at aiding its victims. The chapter's main message seems to be that Reyneke's focus on biodiversity

[1] https://winebusinessanalytics.com/statistics/winery/

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and soil development has made his vineyard more resistant to the impacts of climate change.

As the summaries indicate, *Crushed* provides interesting discussions of developments in a variety of wine-producing regions, several of which were unfamiliar to me. That alone made it worth reading. And, as I noted, *Crushed* is well-written and briskly paced. On the other hand, it is not an academic treatise, and it often raises questions that it does not answer. Moreover, the main wine-growing responses to climate change that it describes are fairly obvious: plant varieties that handle heat better or establish vines in cooler places, but exactly what can be planted or where vineyards can be moved vary from place to place. Other responses, like hail netting in Texas or planting at higher altitudes in Patagonia, are even more location-specific.

All in all, I enjoyed this book, learned from it, and recommend it, but its focus on particular individuals in particular regions left me wishing for a more comprehensive treatment of the impacts of climate change on wine production and of actual and potential responses by the wine industry.

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