

Vintners learn from butterflies

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Microclimate studies designed to track the shrinking habitat of migratory butterflies are finding new purpose in Wine Country.

Stuart Weiss, an ecologist in Menlo Park with his own consulting firm, Creekside Center for Earth Observations, made the switch from monarchs to Pinot Noir when he realized the same tools he and colleagues had developed for the sake of the butterflies might be of use in vineyards.

The work is fueled by the increasing sophistication of sun-sensitive grape growers anxious to eliminate surprises and improve quality yield in the fruiting zone. The penalties for mismanagement promise to get tougher every growing season, both from the pressures of competition and the impact of global warming, which is boosting summer temperatures in California's winemaking region.

Butterflies may know something about this.

Guided by instinct and environmental cues scientists are only beginning to understand, the insects migrate thousands of miles, over multiple generations, from their northern breeding grounds to sheltered winter campsites, mostly among eucalyptus and cypress groves along the Pacific Coast -- or, in the case of butterflies east of the Rockies, the wooded mountains of central Mexico.



Like grapes, monarch butterflies are sensitive to environmental changes. Chronicle file photo, 2000, by Vince Maggiora.

The monarchs mass together by the thousands in spectacular clusters. They show extraordinarily fine taste selecting the branches from which to cling. That's because they can freeze to death if it's too cold, or burn up fat reserves when it's too hot.

Weiss, a 20-year veteran of Stanford's Center for Conservation Biology, spent 10 years trying to understand how the

butterflies were reading their environment, what subtle differences in temperature and sun exposure caused the insects to light on one side of a tree and not the other.

Habitat managers had to "think more like the butterflies," Weiss says, to identify which forest tracts -- possibly even which individual trees -- were the most important to protect against illegal logging and development threats.

He and his colleagues started using cameras with fish-eye lenses to photograph the sky straight up from the ground through the forest canopy. When he laid a grid over the photographs, he could quantify the amount of shade versus clear sky in each numbered space of the grid. This produced precise values for direct and indirect sunlight filtering through a given canopy. He could feed those numbers into a computer model that also incorporated thermometer readings and other key data.

It took only a little imagination for Weiss to make the leap from the butterfly clumps of the Santa Barbara coast and central Mexico to the grape bunches back home in Northern California.

In the vineyards, the goal is to have grapes ripen evenly, with minimal heat and sun damage, without requiring a lot of labor-intensive crop thinning and canopy management.

"We were trying to measure light and temperature from a butterfly's point of view, and that turned out to be a lot like trying to measure light and temperature from a grape's point of view," Weiss said.

His clients now include vineyard managers of Etude Wines, who used Weiss' microclimate analysis to evaluate trellis design and orient rows while laying out new acreage. The work has generated some buzz from presentations at scientific meetings and reports in technical journals.

"We would be scratching our heads wondering why one block was more successful than another," said Etude founder Tony Soter.

Weiss claims his fish-eye photography allows growers to evaluate the impact of row direction on sun exposure, assess sunburn potential and guide how to prune leaves and shoots for the best "canopy management technique." His computer models also allow simulations to test vineyard layouts and trellis types before making any expensive commitments in a given location.

A vertical trellis creates the most extreme differences in sun exposure from morning to afternoon and so is the most sensitive to the direction rows are planted in. Weiss found the best balance between the extremes of direct sunlight or full shade in rows running southwest-northeast, while rows running southeast-northwest left grapes too exposed to heat on the southwest side. Rows running east-west allowed too little light on the north side for grapes to ripen properly.

Typical Y-trellis or "California sprawl" designs allow the vines to grow in a manner that keeps grapes in partial shade much of the day. These were less sensitive to row direction, Weiss said, providing "dappled light on the grapes

for long periods of the day, with less exposure to extreme high temperatures."

He is now compiling complete hourly records of grape temperatures through the growing season. Once the crop is in and critics have judged the results, such data may offer clues as to which conditions are optimal for particular varieties.

It's not the first time somebody with a doctorate and computer has tried to coach growers. Other experts offer different approaches aimed at improving the state of the grape-growing art.

Larry E. Williams, a professor and plant physiologist at UC Davis, has been studying grape canopy structure and light exposure in the fruiting zone, not by looking skyward, as Weiss does with his hemispherical photography, but rather downward, studying shade patterns on the ground beneath the grape clusters.

"People have been looking at this for a long time. It's really not something new," Williams said.

Large volume Central Valley table-grape growers have led the way, he added, because of their keen interest in producing tasty-looking fruit. High-end wine growers may have little room for error these days, but at least they can crush their produce, rather than lay it out on store shelves for customers to scrutinize.

Etude's Soter readily acknowledged the know-how of longtime growers gained from years of experience. But he insisted the new butterfly-derived modeling pays dividends.

He brought in Weiss after hearing him outline the microclimate studies at a wine industry conference a few years ago.

"Now you can be armed with real data," he said.

Butterflies are discerning creatures. So are wine drinkers.

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