

CLIMATE CHANGE and the WINE GRAPE QUALITY

Thomas A. Thornhill III
Partner

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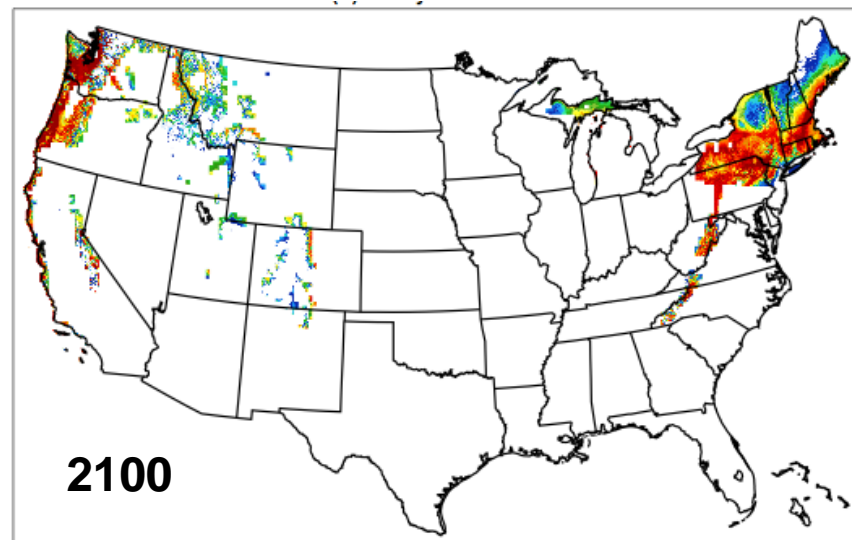
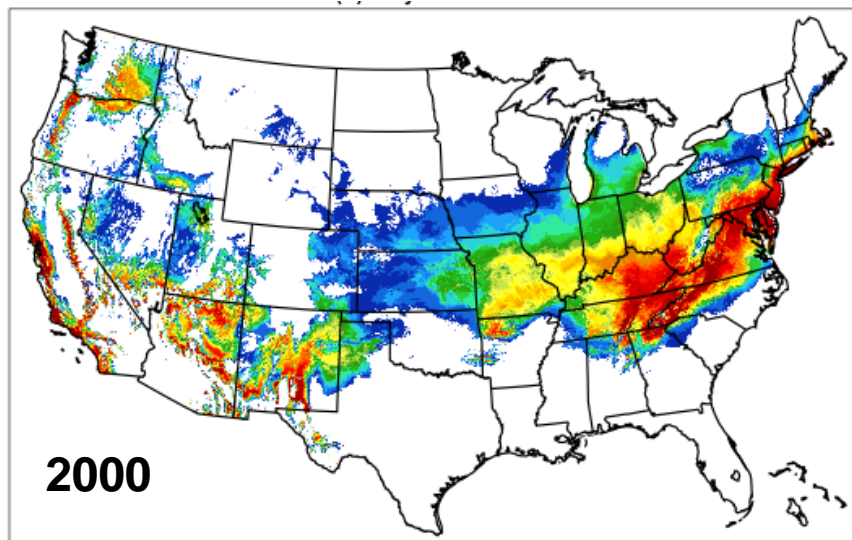
Economic Contribution of California's Wine Industry

- Contribution to CA's economy: \$51.2 Billion plus*
- Full-time equivalent jobs in CA: 309,000
- Gross wages paid in CA: \$10.1 billion
- Wine industry taxes paid in CA: \$3.2 billion
- % of CA's wine sold outside the state: 74%
- Visitors to CA's Wineries: 19.7 Million
- CA is the 4th largest wine producer in the world after France, Italy and Spain.
- Wine is CA's #1 finished agricultural product

*MKF Research Report on Economic Impact of California Wine 2006



Climate Change & the CA Wine Industry



Average warming and increases in temperature extremes by 2100:

- Indicate potential reduction of viable production acreage for high to premium quality wine by up to 81%
- Resulting in shifting of viable zones occurs toward the coast, upward in elevation, and to the north
- Coastal fog/moisture issues could ameliorate or limit some of the shift

Observed Changes in the Western U.S.

1948-2004

- Growing Season Temperatures +2.5°F
 - Driven by changes in minimum temperatures not maximum temperatures
- Decline in the # of days below freezing in all seasons (9-35 days)
- Earlier last spring frost (12-52 days)
- Later first fall frost (6-22 days)
- Longer frost-free period (18-65 days)
- Annual and seasonal precipitation levels are highly variable (no trends)
- Phenology trends range 6-20 days earlier over numerous varieties and locations

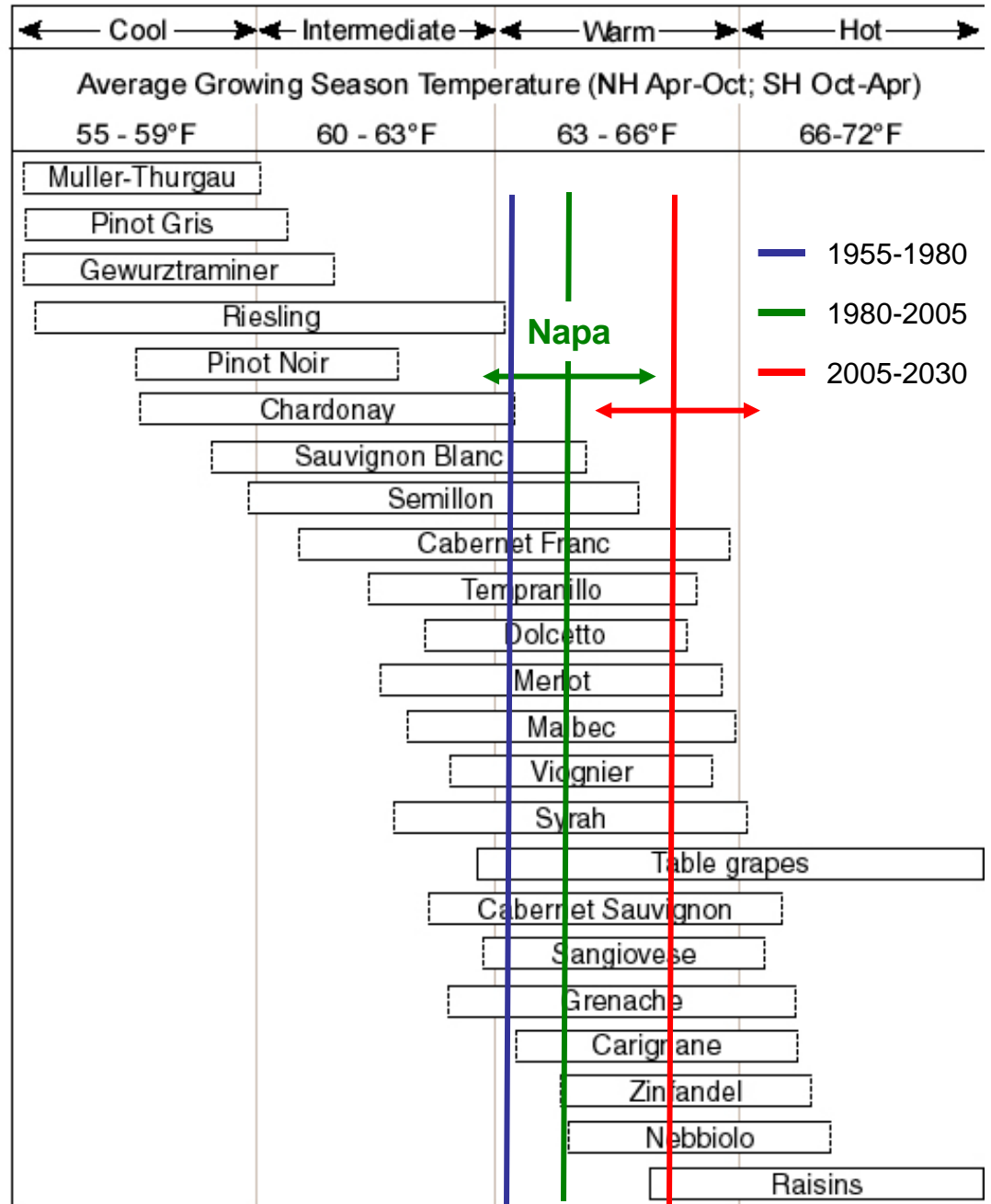
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Grapevine Climate/Maturity Groupings

Measured and Predicted Shifts



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Quality Implications for Wine Grapes Due to Climate Change

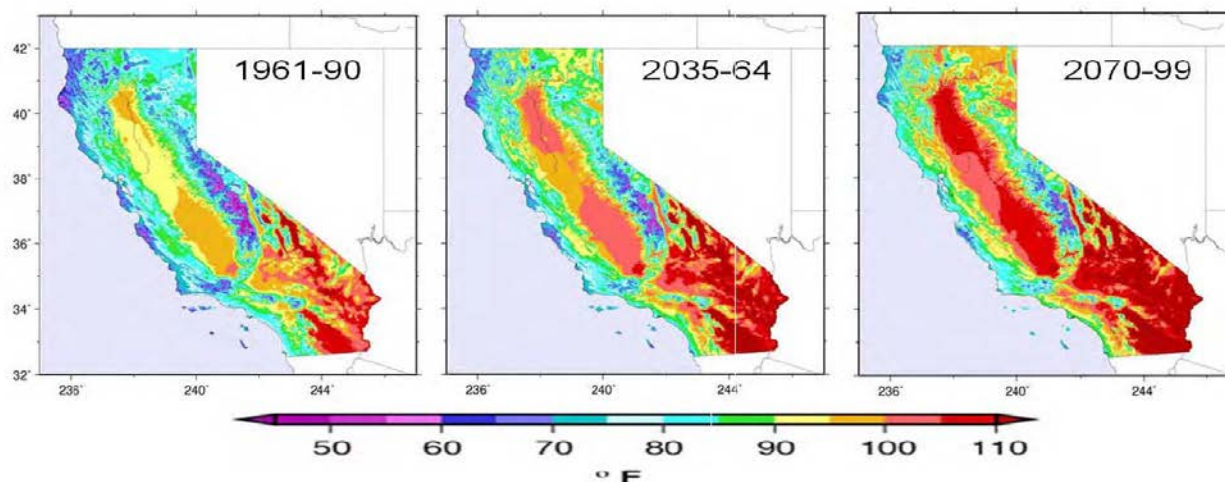
Currently:

- More Consistent Maturity
- Riper Flavors
- Higher Yields
- Higher PH
- Some Dehydration
- Higher Alcohols

Over Time:

- Over Ripe Flavors
- Variable Yields
- Very High PH
- Significant Dehydration
- Out of Balance

Figure 1. California Historical & Projected July Temperature Increase 1961-2099



Predicted Impacts of Warming on Agriculture

- Crop Yield Changes
- Changes in Wine Grape Varietals
- New Weed Invasions
- New Disease & Pest Invasions
- Flooding and Crop Pollination Changes
- Heat Waves and Stress
 - Loss of Crop Quality and Yields
 - Increased Vulnerability to Pests

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Predicted Impacts of Precipitation Changes on Agriculture

- Loss of Water Supply and Reliability
- Food Security Issues
- Variable Agricultural Crop Yields
- Increased Fire Risk to Rangeland and Woodlands
- Increased Soil Erosion and Sedimentation
- Changes in Pest, Diseases and Invasive Species

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Adaptation Practices & Managing Extremes

Water Management

- Conservation
- Diversify water sources
- Increase water catchments
- Vineyard practices

Higher Temperatures

- Canopy shading
- Row orientation
- Drought tolerant varieties
- Water cooling
- Replanting to new varieties
- Moving up slope, north and to the coast

New Pests and Diseases

- Polyculture vs. Monoculture
- Cover crops

Energy Availability & Cost

- Reduce use of pesticides, rely on biological controls
- Renewable energy – solar, Wind and biomass production

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Potential Implications of Climate Change for CA's Wine Industry

- Wine production is a climatically sensitive endeavor, with narrow zones providing optimum production and quality characteristics, which puts the industry at great risk from climate variations and change.
- We have observed warming over the last 50 years and stresses to California's agriculture.
- The predicted warming in the next 50-100 years presents numerous potential impacts and challenges to the wine industry that **could threaten its viability in California.**

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