Utility of the American Viticultural Areas of Texas Information System (AVATXIS) as a Tool in the Characterization of Texas Wine Regions

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The Internet and the advent of the computing age provide the technical framework on which Geographic Information Systems (GIS) are built. As GIS use expands beyond the current core of the GIS community, the need to disseminate these capabilities has grown. The spatial and temporal features of the American Viticultural Areas of Texas Information System (AVATXIS) enable instant access by the user to data that allows wine growers to better understand their growing regions, along with the edaphic and climatic factors that influence grapevine growth and fruit production. Winegrowers can use this improved knowledge of growing conditions to help decide which grape varieties to plant and to determine the management practices to employ for high quality wine production.

An Internet-based approach to AVATXIS facilitates wine growers in evaluating factors of climate and soil for various wine regions by using annotated base maps representative of these factors. These maps provide the basis for characterization of the Texas wine regions based on physical characteristics such as soil, climate, and topography. The ability to understand how the character and conditions of a vineyard site affect the quality of wine is a key goal of a wine grower. This is often ultimately dependent on the attributes of the site or the vineyard’s “terroir”. Terroir is a holistic concept (Jones et al., 2004). The term encompasses vineyard location, soils, climate and topography as well as other environmental factors. Spatial references are important to many of the determining factors of terroir. The spatial and temporal variables associated with grapevine growth and fruit production are ideally suited to the application of spatial information systems (Smith 2002).

Climate and soils have been recognized as the most important environmental factors for growing great wine grapes (Cox, 1999). According to Gladstones (2001), “Climate governs whether grapes will survive and ripen, what varieties do best where, and some of the characteristics of the resulting wines”. Climate variables can yield predictive indices that will help characterize the Texas wine regions as well as provide indicators for vineyard site selection. Climate variables critical to wine grape growing were identified through literature reviews and consultation with viticultural experts. Some of these climate variables include daily maximum temperature (tmax), daily minimum temperature (tmin), daily average temperature (tavg), precipitation, and growing degree-days (GDD). Degree-days is a rough measure of the cumulative amount of functional heat experienced by grapevines during a growing season defined as April 1 through October 31. The importance of soil type to vine growth is well recognized, but its relationship to wine quality remains controversial (Gladstones, 1992). Many modern scientific writers have minimized the direct influence of soil type on wine quality. Nevertheless, it is clear that soil characteristics impact grapevine growth, which can ultimately influence fruit and wine quality. Grapes are adapted to a wide variety of soil conditions, thus soil characteristics must be understood to properly manage vine nutrition and water availability, and for selection of varieties and rootstocks for new vineyards. To characterize the Texas AVA’s soils, data was obtained from the Soil Information for Environmental Modeling and Ecosystem Management (http://www.soilinfo.psu.edu) website. This soil data included pH, soil texture class, depth to bedrock, permeability, and soil bulk density.

AVATXIS integrates appropriate soil and climate data particularly using spatial relationships as the key to allowing potential as well as current viticulturist to compare and contrast the factors/constraints that are important to grape production. This tool can be expanded to accommodate greater spatial scales beyond the Texas wine regions thus giving wine growers the ability to characterize potential growing regions at unlimited spatial extents.
Figure 1: Maps of Texas Hill Country American Viticultural Area illustrating cumulative GDD in degrees centigrade and soil texture type at a depth of 5cm.

Texas Hill Country AVA

References