4. A KNOWLEDGE BASE TO SUPPORT VALLEY OAK RESTORATION PLANNING

The distribution of valley oak has been reduced by habitat conversion and by population declines in remaining habitats. A conservation strategy for valley oaks and associated woodland and savanna habitats would logically include both conservation of remaining populations and restoration of oak density and cover on degraded habitats. The databases that we have compiled can be used to identify remaining areas of high-quality valley oak habitat. They can also help guide selection of sites for valley oak restoration. We constructed a simple knowledge base or "expert system" to help the County develop an explicit and formal logic for measuring site potential for valley oak restoration. The first version of this site model was produced by graduate students Jennifer Merrick, Joshua Phillips and Cathryn Wild for their Group Masters Project at the Donald Bren School of Environmental Science and Management (Merrick et al.1999). Their report, which is available at http://www.bren.ucsb.edu/research/Group_Projects/1999Group_Projects/, provides an overview of geographical knowledge bases and the Ecosystem Management and Decision Support (EMDS) software used to produce the site restoration model. We have simplified and modified their original model based on further exploration of the data and initial model results.

A diagrammatic overview of the site restoration model is provided in figure 4.1 and sample model output is shown in figure 4.2. The data from oak inventory and soils databases are used to test the assertion that a site has high potential for valley oak restoration. The site is scored from 1 (True) to –1 (False), indicating a "degree of belief" that the assertion is true based on the evidence available. The major lines of evidence for site restoration potential are current vegetation, historical vegetation, current land use and biophysical conditions. The model currently does not include socioeconomic considerations such as land ownership, landowner willingness to participate in oak restoration, restoration costs, etc. These could be readily incorporated into the knowledge base if such site data were developed.

We assume a site has high restoration potential as valley oak habitat if it currently supports valley oaks or supported them historically. The more challenging test is to identify sites that have appropriate biophysical conditions but no longer support valley oaks (e.g., due to historical tree removal or tree mortality coupled to lack of regeneration). Based on available ecological literature and exploration of the oak inventory database, we identified four major biophysical factors that limit valley oak woodland savanna and woodland distribution in the study area. These

include distance from the coast, soil texture, soil water holding capacity, and height above the water table (see Merrick et al. for an explanation of these variables).

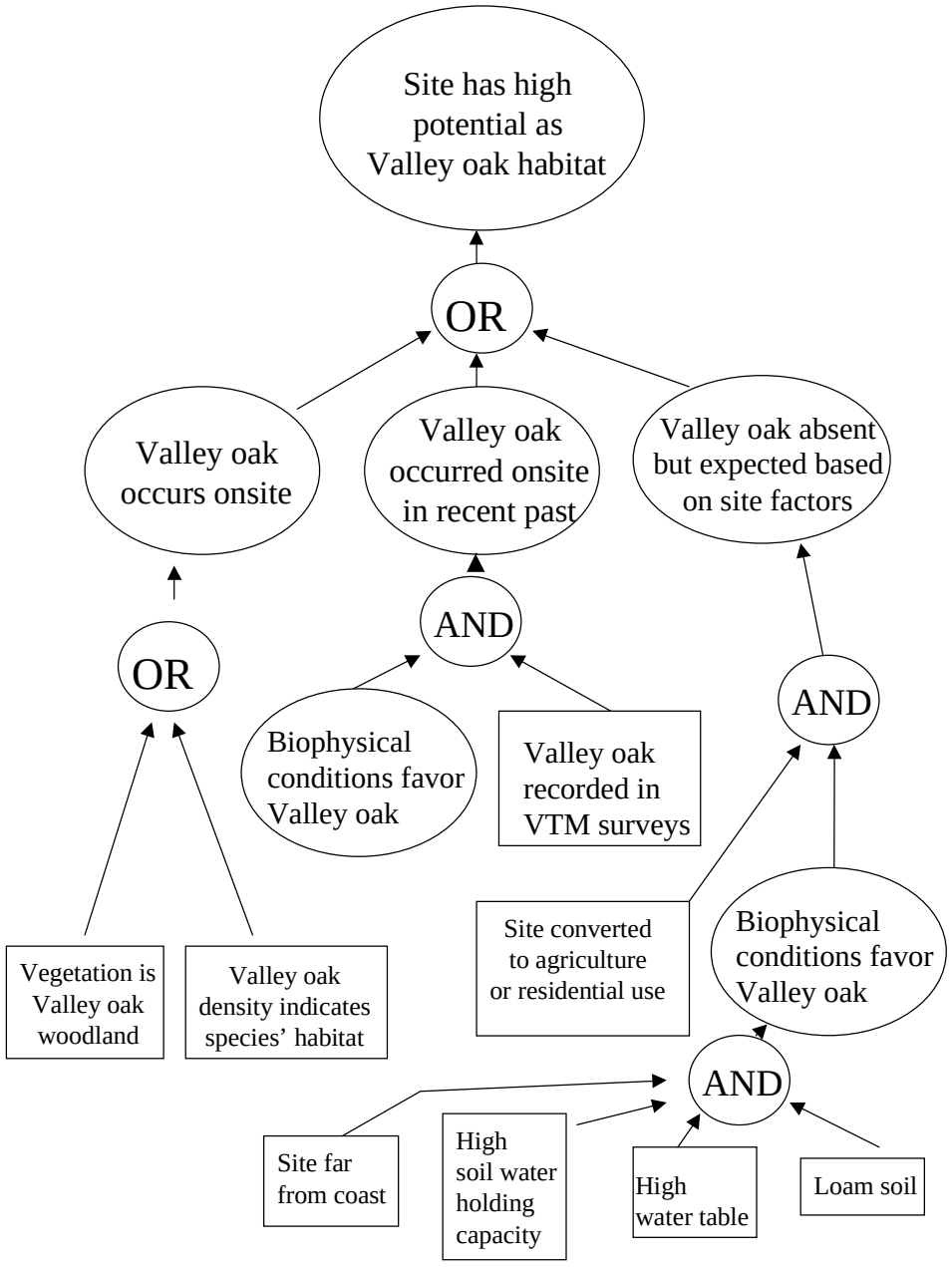

Figure 4.1. Diagrammatic representation of the EMDS knowledge base for assessing site potential for valley oak restoration. Ellipses are logical networks and boxes are calls to the oak inventory and soils databases.

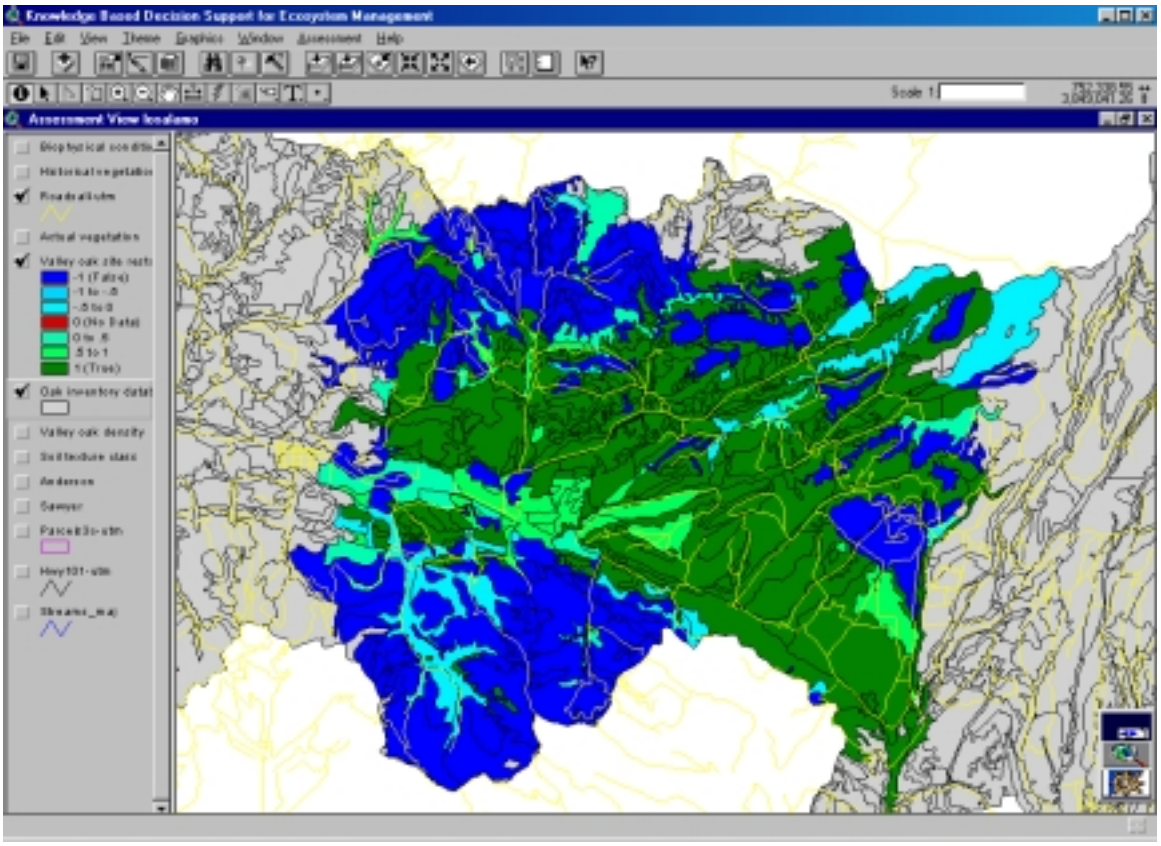

Figure 4.2. Sample computer display screen showing the application of the valley oak site restoration model to a selected region immediately east of the town of Los Alamos. Gray areas are outside of the selected region. Yellow lines are major roads. The blue areas are predicted to have lowest suitability for restoration and the dark green areas are predicted to have highest suitability.

We have not tested the accuracy of the model in the field, and consider it to be a "work in progress." Our aim is to continue collecting information and refining the model through time. In the meantime, we will work with staff at Santa Barbara County's Department of Planning and Development to train them in the use of the EMDS software and the oak restoration knowledge base.

LITERATURE CITED IN SECTION 4

Merrick, J., J.Phillips and C. Wild. 1999. Valley oak restoration site suitability in the Los Alamos Valley, Santa Barbara County, California. Group Project Report, Donald Bren School of Environmental Science and Management, University of California, Santa Barbara.