CLIMATE VULNERABILITY OF BLUE OAK WOODLANDS IN THE S. SIERRA

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Abstract: Oak woodlands comprise more than 505,000 acres of public and private lands within the southern Sierra and support very high species diversity. To assess inform the Southern Sierra Partnership's conservation priority setting in the Southern Sierra, The Nature Conservancy projected responses of four dominant oak woodland tree species to potential future climate changes. TNC forecast how blue oak *(Quercus douglasii*), CA buckeye (*Aesculus californica*), foothill pine (*Pinus sabiniana*), and interior live oak (*Q. wislizeni*) may respond to potential future climate changes by considering 11 downscaled Global Circulation Models representing 'hot-wet', 'warm-dry', and 'hot-dry' scenarios. For each species, results from all 11 potential climate futures were combined into ensemble models and maps to indicate areas of projected climatic stress, climatic stability, and future expansion. To convey uncertainty, maps distinguish areas of low, moderate (i.e. 7 - 8 models agree), and high consensus (i.e. 9-11 models agree). To create habitat projections from species projections, species outputs were combined based upon expert knowledge of local assemblage patterns in the Southern Sierra. To create a blue oak woodland habitat model, ensemble projections for blue oak, CA buckeye, foothill pine and interior live oak were combined. The habitat forecast was restricted to only those areas where oak woodlands are known to occur today. Results support the expectation that species may shift uphill along elevational gradients to offset warming temperatures, but we hypothesize that local aspect, soil and microclimate conditions and non-climate stresses complicate generalities. Modeled stable zones within current habitat distributions (i.e. *refugia*) were identified as priorities for conservation, but stressed woodlands in areas with high landscape connectivity were also considered to be important. Co-occurring sharp transitions between potential stress to stable areas on the landscape for all four tree species within blue oak habitat highlight an interesting climate-related tipping point in need of further examination and monitoring. In the Tehachapis, novel climates, complex biogeography, and significant data gaps on species distributions highlight the need for vegetation survey data from the Tehachapis to enable model reliability comparable to that in the Sierra.