2011 CA LCC Project Update – June 10th, 2013

Decision support for climate change adaptation and fire management strategies for at risk species in southern California

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Status: In work completed thus far, we have coupled the output of dynamic species distribution models and an urban growth model with population models to prioritize the effects of threats for three long-lived emblematic shrubs (Tecate cypress, *Ceanothus greggii* and *Ceanothus verrucosus*) whose collective distributions span the landscape from the coast to higher elevations farther inland. For all species, we identified the threat of altered fire regimes to outweigh the effects of climate change and urban growth. The management strategies of translocation and maintenance of the Multiple Species Conservation Plan (MSCP) can partially offset population declines due to climate change, but they are likely to be ineffective if fires are frequent. For *Ceanothus verruscosus*, managed relocation (or translocation) can be more effective than land conservation; we have shown that translocating seedlings or seeds to habitat predicted to be suitable in the future can increase population size, but seed translocation may be more practical and easier to schedule. We have also shown that translocation of more than 10% of seeds from a source patch more frequently than every 10 years does not convey any additional benefit to the total population than 10% seeds translocated every 10 years. However, the uncertainty associated with predicting suitable habitat under climate projections, in addition to the complexities of land acquisition or creation of easement agreements on land predicted to contain suitable habitat in the future, may deem land conservation under the established MSCP the most viable management alternative of the two. However, neither option fully offsets population decline due to urban growth and climate change, even under favorable fire regimes.

These findings have important management implications: although climate change adaptation strategies may be important for these species' persistence, they are not nearly as important as the current ongoing threat of altered fire regime. Further, species-specific management priorities focusing on land-use change (in the form of projected urban growth) versus species distribution shifts due to climate change may need to vary due to differential effects on the species. Land-use change is likely to be a more serious threat than climate change for *C. verrucosus,* whereas climate change is projected to be more threatening to *C. greggii* than urban growth. That suitable habitat and population persistence were dramatically reduced for *C. greggii* under the two climate model projections is especially surprising because this species is locally widespread, whereas *C. verrucosus* is much rarer, with a restricted distribution. We have worked closely with species experts and our agency partners to ensure plausible, relevant and realistic management contexts and actions for all the species studied. We have recently submitted a paper for review to Diversity and Distributions on these results and presented results for *C. verrucosus* management at the Ecological Society for America conference in 08/2012 (a manuscript is currently being drafted for these results). We will begin making data and products available through Data Basin by the end of the summer (September 2012).

We have also constructed species distribution models and population models for the California Gnatcatcher (*Polioptila californica*) and the Dusky-footed Woodrat (*Neotoma fuscipes*); and evaluation of the effects of different fire frequencies, land protection (under the MSCP), corridors and climate change adaptation strategies is currently underway with guidance from our management partners.

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Franklin, J., H.M. Regan, and A.D. Syphard. Linking spatially explicit species distribution and population models to plan for the persistence of plant species under global change. In review *Environmental Conservation*.

Bonebrake T.C., A.D. Syphard, J. Franklin, K.E. Anderson, T. Mizerek, C. Winchell, and H.M. Regan. Fire Management, Managed Relocation and Land Conservation Options for a Rare Shrub Species under Global Change. In preparation.

Bonebrake, T.C., A.D. Syphard , H.M. Regan, J. Franklin, and K.E. Anderson. Land conservation and reintroduction strategies alleviate urbanization and climate change impacts on a rare shrub species. 97th Annual Meeting for the Ecological Society of America, Portland, OR, USA. August 5-10, 2012.

Regan, H.M. Global change and biodiversity in southern California. Public Lecture, San Bernadino County Museum. April 24th, 2013.