

## **Assessing the Potential of Small- and Large-Scale Habitat Restoration to Deliver Ecosystem Services and Reduce Grower Costs in Avocado and Citrus Orchards**

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**Impact on California Agriculture:** Conventional agriculture requires extensive use of pesticides, which typically accounts for 4-6% of growing costs. Pesticides can negatively affect biodiversity and ecosystem services, thus generating additional indirect costs for growers due to loss of natural biological pest control and negative public perception. We are assessing the potential for native vegetation restoration to improve biodiversity and reduce grower costs through delivery of ecosystem services. The impact of this project on California agriculture is substantial. Our data will allow us to develop guidelines for growers on how to restore native vegetation to harness ecosystem services while not interfering with normal farming operations. In the long-term, we aim to spur the development of a “biodiversity certification” akin to the organic label. Such a certification would incentivize growers to improve biodiversity on their land, while benefiting from lower costs, premium pricing, and more favorable relationships with the public.

**Rationale/Introduction:** Native habitat restoration in agroecosystems is a promising model for leveraging biodiversity for economic gain. Restored vegetation attracts beneficial insects, birds and mammals, which then provide ecosystem services and reduce the need for pesticide application. Native vegetation also improves landscape resiliency in the face of environmental change and acts as a corridor for wildlife connecting larger natural areas. However, it is necessary to quantify the costs and benefits of vegetation restoration: although wildlife can deliver important ecosystem services, they can also damage and consume crops. It is also critical to assess the efficacy of large vs. small-scale vegetation restoration for delivering ecosystem services to maximize economic gains for growers.

**Experimental Approach:** We are assessing the potential of small and large-scale native vegetation restoration to maintain or lower farming costs via delivery of ecosystem services in a citrus-avocado agroecosystem in the Santa Clara River Valley (SCRV) in Ventura County. First, we are experimentally testing the costs and benefits of small-scale native plant restoration to crop yields in citrus and avocado orchards. Second, we are assessing effects of large-scale riparian restoration projects on crop damage and wildlife biodiversity in adjacent orchards across the broader landscape. This study is allowing us to comprehensively quantify the economic costs and benefits of vegetation restoration to agricultural production.

**Major Conclusions:** We are using point counts to monitor bird communities and camera traps to monitor mammalian habitat use across the SCR. Our results show that citrus and avocado orchards are home to a distinct bird community characterized by comparatively low diversity and abundance but a wide variety of dietary niches. Ongoing foraging preference tests are examining the impact of this bird community on crops. Furthermore, we find that the mammalian community is more abundant and diverse in orchards than in natural areas, but find no indication of negative impacts of mammals on crops. Finally, we have planted experimental plots of native shrubs and are monitoring their impact on crop damage and wildlife diversity as shrubs mature. Together, our data indicate that orchards are important habitat for a variety of species in the SCR.

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