Spatial mapping of ecosystem service values from rangelands

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We will discuss how mapping the ecosystem services provided by rangelands can be used both to estimate their economic value and provide spatially-explicit information for use in conservation planning. Specifically we will focus on how rangelands support California’s agricultural economy (one of the largest in the world) through the provision of pollination services from wild (i.e. free-living and largely native) pollinator species. About one-third of the value of Californian agriculture comes from pollinator-dependent crops, representing a net value of $11.7 billion. Pollination services come from two sources: rented (managed) European honey bees and wild pollinator species. Both sources of this critical agricultural input are currently experiencing supply problems. Managed honey bees suffer from exacerbated rates of colony losses due to diseases, pesticides and management factors, increasing both uncertainty of supply and rental prices. Wild pollinators show declines in abundance and diversity with increasing distance from natural habitat, and are therefore least abundant in intensive agricultural areas where demand for pollination services is largest. We estimated the current contribution of wild pollinators to Californian agriculture based on our knowledge of the relationship between natural habitat and wild pollination services. We integrated this information with spatially explicit data on crop production and natural habitat to map the value of pollination services provided by wild pollinators, and to estimate the total value of wild pollination services to Californian agriculture. We found that wild pollinators supply about 35-39% of the total pollination service value (with the rest supplied by managed honey bees), with value estimates ranging between $0.93 and $2.94 billion /year. The natural habitats providing the service overlapped extensively in space with conservation priorities for rangelands. We show how detailed mapping of pollination services can be used to identify regions where rangelands should be conserved or restored to furnish this service to nearby agricultural areas. Finally, we identify shortcomings of this attempt to value pollination services and sources of uncertainty in the value estimates. We conclude with two main messages: (1) Although the exact value of pollination services from natural habitats is difficult to pin down based on currently available data, this study highlights from a biophysical perspective how important this value is, representing more than a third of the total pollination services to Californian agriculture; (2) spatial mapping of this and other ecosystem services can be a useful tool in identifying and promoting priorities for conservation and restoration of California rangelands.