

Here are two interesting cases for grappling with species concepts:

### ***Ensatina* salamanders**

In southern California there are two forms of *Ensatina* salamanders. Once, called *E. klauberi* has a blotchy color pattern, and the other, *E. eschscholtzii*, is more uniformly and lightly pigmented. In the Cuyamaca Mountains in San Diego County, they are reproductively isolated, distinct forms. Blotchy salamanders are found to inland and north from San Diego in the Sierra Nevada mountains. The populations along the mountains are connected by gene flow. The smooth salamanders can be traced west to the coast and north, and those populations are also connected by gene flow. In northern CA and Oregon, the populations meet up, and only one form is found. There is a continuous set of intermediate populations connecting the two “good species”. These types of species are called ring species.

### ***Quercus* oaks**

Many of the oak species in North America exhibit a high degree of gene flow with other oak species while also maintaining distinct morphologies across their geographic ranges. One example is *Quercus macrocarpa*, the bur oak, which is one of the most majestic trees in the United States, with individuals that can live 400 years or more. This species is readily distinguished by its deeply lobed leaves and an acorn with a fringed rim around the cup. The species ranges from Canada south to Texas and from the Dakotas east. In Quebec, *Q. macrocarpa* has a high degree of gene flow with *Q. bicolor*, another "good" species. In fact, you can safely assume that *Q. macrocarpa* in Quebec exchanges more genes with local *Q. bicolor* than it does with *Q. macrocarpa* in Texas at the other end of the range.