**Miller, Michael – University of California, Davis**

**Presentation Title: The Genetic and Evolutionary Basis of Summer Run Timing in Coastal Steelhead**

Abstract for the 2018 Pacific Coast Steelhead Management Meeting

Coastal steelhead populations display two primary phenotypes in the timing and characteristics of their spawning migration across the southern part of their range in North America. Summer steelhead enter freshwater from the ocean in a sexually immature state during the late spring or early summer, migrate high into watersheds to near their spawning grounds, and hold over the summer in a fasted state while they sexually develop before spawning in the winter. Winter steelhead sexually mature in the ocean before entering freshwater in winter and migrating directly to their spawning grounds to spawn immediately. Because summer steelhead rely on cold, clean water throughout hot summer months, they are particularly vulnerable to anthropogenic activities that reduce water quality. Consequently, summer steelhead populations have either disappeared or dramatically declined since the arrival of Europeans. Here we use genomic methods to investigate the genetic and evolutionary basis of summer-run timing in coastal steelhead. Strikingly, we find that this complex phenotype is associated with the same single locus across multiple populations. Patterns of variation at this locus suggest that the summer-run alleles arose from a single evolutionary event and were subsequently spread to distant populations through straying and positive selection. Our results suggest that complex adaptive variation can depend on rare mutational events at a single locus and that, if summer-run populations are lost, the summer-run allele they depend on will also be lost and may take many thousands to millions of years to re-evolve.