Abstract:
Understanding how climate change will alter forests in the west requires knowledge of forest growth relationships with climate, long-term tree species dynamics, and past and future disturbances (primarily wildfires and insect outbreaks), and human management. Integrating these diverse processes and their complex interactions requires the synthesis of many empirical data sources (both 'little data' and 'Big Data') into sophisticated forest landscape change models. We examined forest change in the Lake Tahoe Basin, California and Nevada, and projected potential futures for these forests given likely climate change scenarios. Our results highlight the importance of focusing on long temporal and large spatial-scale processes for understanding climate change effects on forest succession, disturbances, and the Carbon cycle. Due primarily to the legacy effects of historic logging in the late 1880's, these forests will likely remain a C sink (absorbing more C than they release), regardless of climate regime. However, insects add large uncertainty and substantially increase the likelihood that these forests will become a C source in any given year. Forest management can create resilience when and where it can be deployed at a sufficient intensity. The future of western forested ecosystems will depend not only on climate change but also on disturbances, which may be exacerbated by climate change, future management decisions, and landscape legacies related to past land use and management.