Sierra Nevada Conservancy (SNC) staff is regularly tracking research that has relevance to the work of the organization and Sierra Nevada Region. Below are some examples of research of which staff has recently become aware:

Mountain runoff vulnerability to increased evapotranspiration with vegetation expansion:
(This article is not yet available to the public free of charge. To view the abstract visit the Proceedings of the National Academy of Sciences website.)
Climate change is expected to lead to the warming of higher elevation areas the Sierra Nevada mountains. This could allow vegetation to move upward into areas where previously cold temperatures limited survival. If this happens, it would expand the area of vegetation growth in the Sierra, and therefore an increase in water use by vegetation. Based on these assumptions, Goulden and Bales estimate that in the Kings River basin, where their research was focused, extra vegetation growth would reduce annual river flows by 26% by the year 2100. The authors are clear that their approach was simple and has limitations, requiring further study. With such large implications for potential decreases in water flows from the primary water source for California, this is an issue that needs a closer look.

Sustainable biochar to mitigate global climate change:
When biomass is removed from overgrown forests during fuel thinning treatments, it can be burned in bioenergy facilities to create energy. These treatments greatly reduce wildfire risk and severity and the bioenergy facilities emit very little emissions compared to either a wildfire or pile and burning makes the process essentially carbon neutral. However, bioenergy facilities can be tuned to create both energy and biochar - charcoal produced from plant matter and stored in the soil as a means of removing carbon dioxide from the atmosphere (definition from Google). Biochar is becoming a popular soil amendment, where its qualities not only help plants grow, but can actually increase water storage by the soil. Additionally, biochar can sequester carbon in the soil for hundreds to thousands of years. The findings of this paper suggest that if woody material from a fuel thinning project is sent to a facility that produces both biochar and bioenergy (energy production needs to be reduced about 20% to optimally produce biochar), the whole process would be carbon negative (meaning the overall activity would result in more carbon stored than emitted). This paper looks at more potential bioenergy fuel sources beyond just wood, but it suggests that if all of these source materials were used to optimally create biochar, 12% of our current emissions could be offset through the use of this biochar in our soils.

Trends in Wildfire Severity: 1984 to 2010 in the Sierra Nevada, Modoc Plateau, and Southern Cascades, California, USA:
In this paper, authors Miller and Safford looked at fires larger than 200 acres in size that occurred in the regions noted in the title from 1984 to 2010. The authors focused on two forest types – Yellow pine-mixed confer (YPMC) and red fir (RF). On YPMC forests, their results indicate that the proportion of high severity has increased from approximately 20% in each larger fire to over 30% in 2010. Red fir forests did not experience such an increase. The authors believe this difference between forest types

is that across their study area, many YPMC forests are well beyond their regular fire-return interval and that excess fuel is overloading those forests. On the other hand, red fir forests naturally burn less frequently, so their fire-return interval has not been upset to the extent of YPMC forests. The authors found that the larger the fire, the greater the chance that high severity fire covers a larger portion of the burn area. Interestingly, the authors compare their findings to those of studies done in the Yosemite National Park, where it was found that there is no trend in high severity in fires. The authors believe that the difference comes from the active management of the forests within the Yosemite National Park boundary and that "a shift in [Forest Service] fire management policy similar to Yosemite's may have some effect on lowering the proportion of high severity on [Forest Service] lands."