Research Needs

Some of our management recommendations are currently based on inferences from studies in other forest types. There are many aspects of Sierra Nevada ecosystems that are still poorly understood. The list below is focused on research needed to investigate and refine some of the suggested management practices. These studies and implementing the suggested strategy will undoubtedly raise new questions. Working together, forest managers and researchers can exchange information and identify unknowns as they develop.

1. Quantify the leaf area and growth relationships needed to develop stocking control relationships for Sierra Nevada mixed-conifer forest. This will allow completion of a Sierra Nevada MASAM for the Kings River Project (KRP) area or any other area in the Sierra where this approach could be implemented. This tool will allow the design and assessment of a variety of multiaged-stand structures that include, among others, older residual trees, development of resilient structures, and accommodation of prescribed burning regimes.
2. Develop and implement an adaptive monitoring strategy to assess the efficacy of a multiaged strategy at both the stand and landscape scales. This information will include both on-the-ground monitoring of treated stands and simulations using Sierra Nevada-MASAM. This input will be used to refine the strategy over time and make large-scale assessments of landscape patterns for wildlife habitat, potential fire behavior, and general diversity of vegetation patterns. A multiaged strategy would be adjusted pending results of monitoring efforts to accommodate other resource objectives such as wildlife, fire, or forest restoration.
3. Assess the potential outcomes of this proposed silvicultural approach on vegetation response and wildlife habitat features of interest. This could be combined with a comparison to other possible silvicultural strategies to evaluate the similarities and differences of approaches. Research would also assess the effects of any treatment on predicted fisher resting habitat using either a predictive microhabitat model (Zielinski et al. 2004b) or a habitat model based on a Forest Inventory and Analysis (FIA) protocols (Zielinski et al. 2006).
4. More closely examine the distribution of tree size and canopy density characteristics within female fisher home ranges to establish the means and variances of tree number/density by size class, for both conifers and hardwoods. This would require overlaying the boundaries of female fisher home ranges, which have been estimated on the Sierra and Sequoia National Forests (Mazzoni 2002, Zielinski et al. 2004a), and then using both remotely sensed and ground-based methods to described the vegetation within these areas. Once we have estimates of the average number of, say, white fir between 20 and 30 in d.b.h. per acre within the average female home range, we will be able to compare this and other characteristics with the average number of this species and size class predicted to occur as **residuals** after proposed treatments. If the selected tree size or density characteristic, when measured after treatment, is significantly **lower** than what occurs in female home ranges, then the proposed management activity would not be consistent with fisher conservation.
5. Determine fire histories of riparian areas to identify fire frequency, intensity, and extent. How far does the riparian influence for dampening fire extend away from the stream?

What stream characteristics (i.e., bank slope, stream size, etc.) affect the size of the riparian influence zone? What were historical fuel loads in these forests? How can riparian systems be managed to reduce adverse fire effects while maintaining wildlife habitat? In current wildfires, are riparian forests typically experiencing high-intensity crown fires, or are moister fuels and microclimate still dampening fire behavior?

6. Determine how forest structure and composition varied by topographic feature under an active-fire regime in the Sierra Nevada. There have been studies in the Klamath Mountains and eastern Washington, but no information is available for California forests. The research would identify which topographic features matter, and stand structure and fuels loads associated with different physiographic areas.

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