Plan Monitoring Program BASI
Fire Regime

Best available scientific information (BASI): the responsible official shall document in the decision document how BASI was used to inform the plan monitoring program. This document provides additional detail to support the decision document, including how information was determined to be BASI and was determined to be most relevant, accurate, and reliable.

Desired condition in the Forest Plan	**Goal 1.1**: Improve the ability of southern California communities to limit loss of life and property and recover from the high intensity wildland fires that are a natural part of this state's ecosystems. **Goal 1.2**: Restore forest health where alteration of natural fire regimes have put human and natural resource values at risk. **Goal 3.2**: Retain a natural evolving character within wilderness. **Goal 6.2**: Provide ecological conditions to sustain viable populations of native and desired nonnative species.
Monitoring Question	Are wildfires becoming larger, more frequent, or more severe, and is there a seasonal shift in fire activity?
Monitoring Indicators	Total and mean fire size, ignition density, fire severity and monthly area burned
Describe how monitoring question and indicators evaluate changes and management effectiveness of the plan.	The evaluation of these fire-related indicators will inform the direction and magnitude of changes in fire regime, which can be used to evaluate plan effectiveness as it relates to the specific desired conditions described above. In particular, this monitoring effort will track changes in fire related metrics through time to inform deviations in fire activity across southern California habitats. This monitoring will be used to identify valuable resources at risk, and direct the development of strategies for resource protection and restoration.
How can the effects of management activities on the indicator be differentiated from those due to climate change? (Optional)	Fire-related management activities, especially those employed in conifer dominated vegetation types, aim to ameliorate catastrophic wildfire events, while climate change may enhance the scale and intensity of wildfire events. Therefore, fire severity and mean fire size may be reduced in areas where fuels management activities have been conducted.
Describe how this monitoring relates to one or more of the eight required items for forest plans.	This monitoring questions informs '(vi) measureable changes on the plan areas related to climate change and other stressors that may be affecting the plan area'.

Best Available Scientific Information

Climate interacts with fire through its effects on vegetation. Temperature and precipitation are important factors determining the moisture available for plant growth and the flammability of vegetation is dictated by climate

patterns over shorter time scales (e.g. variability in interannual precipitation and temperature). There is uncertainty in the magnitude of warming and the direction and magnitude of precipitation change in California, and this is reflected in the range of projections for future fire trends (e.g. fire size, number, severity, seasonality). Westerling et al. (2011) project an increase in area burned (12-74%) in California through the next century (2085), with the potential increase of 56% for the medium-high emission scenario under the warmer drier climate scenario. Similarly, Lenihan et al. (2008) predict an increase in total area burned across the state at the end of the 21st century. In an analysis of climate change effects on fire in Mediterranean ecosystems, Batllori et al. (2013) found an increase in fire probability for California and Baja, Mexico over the next century. Jin et al. (2015) project shifts in fire size, fire number and area burned over the next 50 years (2041-2060) with a substantial increase in the area burned during non Santa Ana driven fires (77% ± 44%) and Santa Ana wind driven fires (64% ± 76%).

Rationale for choice of question and indicators, informed by BASI.	Given the likelihood of increased fire activity across California, it is important to identify the direction and magnitude of these changes through monitoring.
Monitoring protocol, method, or data source; rationale informed by BASI.	Compute mean fire size, total area burned, ignition density, fire severity and monthly area burned for the current monitoring period and compare to baseline statistics from the 2006 Southern California Land Management Plan analysis.

BASI Determination

Lenihan et al. (2008), Westerling et al. (2011), Batllori et al. (2013) and Jin et al. (2015) all evaluated elements of fire activity into the future using downscaled data from multiple global circulation models and emission scenarios. Despite the climate predictions from these various models, all the references are in agreement that California will experience an increase in total area burned or an increase in fire probability over the next century.

Relevant – BASI is relevant to the plan area, question and indicators, the desired condition, objective, and required monitoring item.	Given that the four references provided are specific to California, the findings from these studies are directly relevant to the lands managed by the US Forest Service in southern California.
Accurate – BASI describes the true condition. To support monitoring methods, the method has been shown to provide evidence that can answer the question and address the desired condition.	There is uncertainty associated with modeling climate change fire activity. Yet, the overwhelming conclusion from the BASI, regardless of modeling technique and climate scenario (warmer wetter and warmer drier), point towards increases in total area burned and fire probability in the future.
Reliable – BASI uses appropriate scientific methods that are consistent with scientific principles (e.g., peer-reviewed articles). To support monitoring methods, BASI reliability also includes methods that produce reliable measurements with statistical rigor.	All four articles were published in peer-reviewed journals and are well cited by other peer reviewed manuscripts. The indicators used in monitoring fire activity across southern California will be summarized and compared to baseline fire data and used to track trends through time.

Additional documentation of BASI for this monitoring question and indicators.	
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References Cited

Batllori, E., M. A. Parisien, M. A. Krawchuk, and M. A. Moritz, 2013, Climate change-induced shifts in fire for Mediterranean ecosystems: Global Ecology and Biogeography, v. 22, p. 1118-1129.

Jin, Y., M. L. Goulden, N. Faivre, S. Veraverbeke, F. Sun, A. Hall, M. S. Hand, S. Hook, and J. T. Randerson, 2015, Identification of two distinct fire regimes in Southern California: implications for economic impact and future change: Environmental Research Letters, v. 10.

Lenihan, J. M., D. Bachelet, R. P. Neilson, and R. Drapek, 2008, Response of vegetation distribution, ecosystem productivity, and fire to climate change scenarios for California: Climatic Change, v. 87, p. 215-230.

Westerling, A., B. Bryant, H. Preisler, T. Holmes, H. Hidalgo, T. Das, and S. Shrestha, 2011, Climate change and growth scenarios for California wildfire: Climatic Change, v. 109, p. 445-463.