Plan Monitoring Program BASI
Tree Mortality

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	From Goal 1.2, Montane Conifer Forests: In the long-term, the desired condition for the remaining unburned national forest land will be to: (1) create forests more resistant to the effects of drought, insect and disease outbreaks and stand-killing crown fires; (2) encourage tree recruitment that contain a species mix more like pre-settlement composition, (i.e., with a higher representation of shade-intolerant species like ponderosa pine that have declined during the period of fire suppression) - Figure 2; (3) recreate stand densities more like those of the presuppression era; and (4) encourage a stand structure that emphasizes large-diameter trees. From Goal 1.2, Oak Woodlands and Savannas: The desired condition is to retain existing oak woodlands and savannas.
Monitoring Question	Is tree mortality increasing across the landscape, and is it distributed evenly across elevations?
Monitoring Indicators	Mortality Risk Assessment and Forest Health Protection Mortality Surveys
Describe how monitoring question and indicators evaluate changes and management effectiveness of the plan.	This question and its indicators will provide a means for tracking tree mortality across the Southern California National Forests, including cross-referencing this information with elevation data to evaluate potential effects of climate change. This information will help gage progress towards achieving the desired conditions listed above.
Describe how this monitoring relates to one or more of the eight required items for forest plans.	This monitoring would reveal "(ii) the status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems, …(iv) the status of a select set of the ecological conditions required under §219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern," and "(vi) measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area."

Best Available Scientific Information

There is solid evidence that climate change along with other stressors can lead to tree mortality at lower elevations in mountainous regions (Allen and Breshears 1998, Allen et al. 2010, and Jump et al. 2009). The proposed monitoring question expands upon the existing monitoring question that evaluates tree mortality by adding an elevational component to investigate whether this trend is occurring across the Southern California National Forests.

Rationale for choice of question and indicators, informed by BASI.	National Forest management in Southern California needs to be informed by the tree mortality trends occurring on the landscape. Project initiation and design should take into account the potential for changes in suitable habitat for trees due to climate change and other stressors.

Monitoring protocol, method, or data source; rationale informed by BASI.	Compare the annual National Insect and Disease Risk Map (NIDRM) data with Forest Health Protection tree mortality surveys, and cross-reference these with elevation data by species.

BASI Determination

Allen and Breshears 1998, Allen et al. 2010, and Jump et al. 2009 are the most relevant scientific articles found through literature research, and all three directly address the changing situation for forests due to climate change and other stressors. Increasing tree mortality is likely to occur in Southern California, and it may be concentrated at lower elevations.

Relevant – BASI is relevant to the plan area, question and indicators, the desired condition, objective, and required monitoring item.	Two of the papers (Allen et al. 2010 and Jump et al. 2009) are globally focused, while the third (Allen and Breshears 1998) is from a neighboring region. All three papers are directly relevant to forest health and tree mortality as well as climate change and ecological conditions.
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.	The method in this case relies on aerial overflights to visually document areas of tree mortality. These data are annually collected by trained field observers and directly relate to the monitoring question and the desired conditions. The elevation data can be analyzed in GIS to determine the evenness of tree mortality distribution.
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 three references come from peer-reviewed journals, and two are syntheses of multiple studies.
Additional documentation of BASI for this monitoring question and indicators.	This monitoring question and indicator is similar to other elements of ongoing Land Management Plan monitoring that use existing Forest Service databases to evaluate progress towards meeting its Goals.
Contact person	Jeff Heys, Forest Planner, Cleveland National Forest (858) 674-2959 jaheys@fs.fed.us

References Cited

Allen, C.D., Breshears, D.D., 1998. Drought-induced shift of a forest-woodland ecotone: rapid landscape response to climate variation. Proceedings of the National Academy of Sciences of the United States of America 95: 14839–14842.

Allen, C.D., A.K. Macalady, H. Chenchouni, D. Bachelet, N. McDowell, M. Vennetier, T. Kitzberger, A. Rigling, D.D. Breshears, E.H. Hogg, P. Gonzalez, R. Fensham, Z. Zhang, J. Castro, N. Demidova, J. Lim, G. Allard, S.W. Running, A. Semerci, and N. Cobb. 2010. A global overview of drought and heat-induced tree mortality reveals emerging climate change risks for forests. Forest Ecology and Management 259: 660-684.

Jump, A.S., C. Mátyás, and J. Peñuelas. 2009. The altitude-for-latitude disparity in the range retractions of woody species. Trends in Ecology and Evolution, doi:10:1016/j.tree.2009.06.007.