Coast live oak (*Quercus agrifolia*), Focal Species BASI

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 for the ecological system to be monitored with focal species. Other desired conditions may be listed secondarily.	The Forest Plan describes the following threats and desired conditions for oak woodlands/savannas and riparian habitats: <u>Oak Woodland & Savanna</u>: • Expectation that some areas of oak woodland/savanna dominated by large, old trees with little or no natural regeneration will begin to convert to annual grasslands as old oaks die without replacement • Coast live oak woodlands may experience accelerated decline due to introduced pests and pathogens, like sudden oak death • The desired condition is to retain existing oak woodlands and savannas. National Forest managers would prevent the conversion of savannas and oak woodlands to annual grasslands or other non-oak vegetation <u>Riparian Condition</u>: • Greatest threats to riparian and aquatic habitats are from …..invasion of non-native plant species, particularly tamarisk, arundo and cape ivy • Riparian and aquatic ecosystems are resilient and able to recover after natural events, such as floods and wildland fires
Name a focal species and describe how the selected focal species meets the definition and requirements of the planning rule and directives.	*<u>Definition</u>: A small subset of species whose status permits inference to the integrity of the larger ecological system to which it belongs and provides meaningful information regarding the effectiveness of the plan in maintaining or restoring the ecological conditions to maintain the diversity of plant and animal communities in the plan area. Focal species would be commonly selected on the basis of their functional role in ecosystems.* Coast live oak (*Quercus agrifolia*) meets the objectives of focal species in the following ways: 1) Provides habitat and the provisioning of food for numerous wildlife species in woodland/savanna and riparian ecosystems. 2) Provides canopy cover which moderates the environment for understory plants and animals in woodland/savanna and riparian ecosystems. 3) Contributes to landscape resilience following fire.
Monitoring Question	Is coast live oak mortality increasing across the landscape?
Monitoring Indicators	Forest Health Protection mortality surveys

Describe how monitoring question and indicators evaluate changes and management effectiveness of the plan.	The Forest Plan emphasizes the need to sustain oak woodlands and riparian communities on the landscape and prevent conversion to less desirable vegetation types, like non-native species. If large areas of coast live oak are in decline with minimal regeneration, then management actions that focus on restoring oak dominated ecosystems will be needed.
How can the effects of management activities on the indicator be differentiated from those due to climate change? (Optional)	Given that oak recruitment is sensitive to precipitation and soil moisture, climate change is likely to contribute to declines in recruitment.

Best Available Scientific Information

1) *Ecological values*
   Summary: Many wildlife species utilize oak woodlands for survival, reproduction and foraging. Barrett (1980) provides an overview of mammalian-use of common CA oak species and estimates 22% of CA's terrestrial mammals utilize acorns as a food source. Monahan and Koenig (2006) focus on the effects of SOD-induced oak death on oak-affiliated bird populations and estimate that bird populations will decline 25-68% following coast live oak death.
2) *Impacts*
   Summary: Non-native pathogens (SOD) and pests (GSOB) are responsible for widespread coast live oak mortality across the province. While this species is currently abundant in southern California, it is likely to decline in the future.
3) *Recruitment limitations*
   Summary: Coast live oak recruitment is sensitive to shade and precipitation and may be negatively affected by the uncertain climate conditions of the future. Seedling recruitment may be inhibited by canopy thinning resulting from SOD, GSOB and drought. In addition, recruitment in dry years is much lower than wet years indicating that natural regeneration of coast live oak dominated ecosystems may be impacted by future climate conditions.
4) *Resilience following fire*
   Summary: Coast live oak has high resprout potential following fire. High-intensity fires, like the 2003 Cedar Fire, can be catastrophic for many conifer species, yet mid-sized and large oaks experience high survival relative to conifers. The ability for oaks to resprouts rapidly post-fire may provide valuable habitat and structure that accelerates post-fire recovery.

** *see corresponding citations at the end of the document.*

Rationale for choice of question and indicators, informed by BASI.	Coast live oak is a widespread, ecologically valuable species in the coastal portions of California, yet the integrity of the oak-dominated ecosystems is in jeopardy from introduced pests, pathogens and drought. Fire also plays a role in over-story canopy loss, but often coast live oak will resprouts post-fire, thereby only leading to short-term/temporary changes to the landscape. The ability for coast live oak to regenerate following disturbances is likely to be impacted by more pronounced drought in the future. Tracking the overstory canopy loss and mortality of coast live oak will provide insight into restoration needs and habitat resilience across the southern California forests.

Monitoring protocol, method, or data source; rationale informed by BASI.	Data will be derived from mortality estimates from forest health protection aerial detection surveys. Data will be reported as the total acreage of coast live oak dieback, as well as the proportion of total coast live oak dominated habitat on each forest that has succumbed to drought, pathogen or pest attack.

BASI Determination

Document (with citations) how information summarized above was determined to be BASI and was determined to be most relevant, accurate, and reliable. The next table provides documentation that BASI is relevant, accurate, and reliable to support the decision document.

Relevant – BASI is relevant to the plan area, question and indicators, the desired condition, objective, and required monitoring item.	Coast live oak is found across the southern California province and is therefore relevant for understanding the ecological integrity of oak woodlands and riparian forests across the region. The identified method for monitoring the species involves a pre-established method employed by Forest Health Protection to determine the extent of coast live oak canopy dieback. Fire severity maps overlayed with eVeg layers are a reasonable way to quantify the extent of oak canopy lost to fire.
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.	This indicator is accurate in that it measures the loss of coast live oak canopy and provides insight into the extent of mortality and canopy loss for large individuals. It is important to note, that this BASI does not evaluate the status of seedlings or saplings and cannot be used to infer natural regeneration following fire or pathogen/pest-induced mortality. As a result, this monitoring effort does not inform the long-term trajectory of these systems.
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.	The use of coast live oak as a focal species is dependent on the continued efforts of Forest Health Protection's aerial surveys. The methods and reports provided by FHP on canopy dieback are the best available at this time.
Additional documentation of BASI for this monitoring question and indicators.	<Anything else to support science as BASI (e.g., a standard method for water quality monitoring).>
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References Cited

1) Ecological values

A) Monahan W.B. & W.D. Koenig. (2006) Estimating the potential effects of sudden oak death on oak-dependent birds. Biological Conservation. 127: 146-157.
B) Barrett, R.H. (1980) Mammals of California oak habitats-Management implications, USDA USFS GTR-044.

2) Impacts to coast live oak

A) Brown, L.B. & B. Allen-diaz (2009) Forest stand dynamics and sudden oak death: Mortality in mixed-evergreen forests dominated by coast live oak. Forest Ecology and Management. 257: 1271-1280.
B) Coleman, T.W, Grulke, N.E., Daly, M., Godinez, C., Schilling, S.L., Riggan, P.J. & S.J. Seybold (2011) Coast live oak, Quercus agrifolia, susceptibility and response to goldspotted oak borer, Agrilus auroguttatus, injury in southern California. Forest Ecology and Mangement. 261: 1852-1865.

3) Recruitment limitations

A) Muick, P.C. (1991) Effects of shade on blue oak and coast live oak regeneration in California annual grasslands. USDA USFS GTR, PSW-126.
B) Tyler, C.M., Mahall, B.E., Davis, F.W. & M. Hall. (2002) Factors limiting recruitment in valley and coast live oak. USDA USFS GTR, PSW-184.

4) Resilience following fire

A) Franklin J., Spears-Lebrun, L.A., Deutschman, D.H. & K. Marsden (2006) Impact of a high-intensity fire on mixed evergreen and mixed conifer forests in the Peninsular Ranges of southern California, USA. Forest Ecology and Management. 235: 18-29.