Non-native Annual Grasses as 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.	Below is a list of threats and desired conditions for dominant vegetation types in southern California Forests: **1) Shrublands (Coastal Sage Scrub & Chaparral)** A) Threats: i. too frequent fire ii. "coastal sage scrub and low elevation chaparral are at high risk of further decline because they are currently degraded or susceptible to invasion" (EIS: Appendix, Pg. 120). B) Desired condition: i. Goal 1.2.2 - Reduce the number of acres of chaparral and coastal sage scrub at risk from excessively frequent fires (FP: Part 1, Pg, 25). ii. Move chaparral and coastal sage scrub habitats toward a fire condition class that reflects historic fire return intervals to reduce the area at risk of type conversion (FP: Part 1, Pg. 26). **2) Invasive Species** A) Desired condition: i. The structure, function and composition of plant communities and wildlife habitats are not impaired by the presence of invasive nonnative plants (FP: Part 1, Pg. 32) ii. Goal 2.1 – Reverse the trend of increasing loss of natural resource values due to invasive species (FS: Part 1, Pg. 31)
Name a focal species and describe how the selected focal species meets the definition and requirements of the planning rule and directives.	*Definition: 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.* Non-native annual grasses (includes *Bromus* sp., *Avena* sp., *Hordeum* sp., *Lolium* sp. and *Festuca* sp.) meet the objectives of focal species in the following ways: 1) Inform the ecological integrity of the southern California Forests by indirectly measuring native species extent, condition and diversity. 2) Indicate unnatural anthropogenic disturbance regime or condition, including too frequent fire, N deposition and soil disturbance.

	3) Represent an altered functional state with the potential to effect fire regime and behavior.
Monitoring Question	Are chaparral and coastal sage scrub vegetation communities type converting to non-native annual grasslands?
Monitoring Indicators	Extent of non-native annual grasses
Describe how monitoring question and indicators evaluate changes and management effectiveness of the plan.	The Forest Plan promotes the conservation of native habitats through the reduction of non-native species and unnatural disturbance regimes. If our monitoring efforts indicate that non-native annual grasses are becoming dominant then new consideration may be needed to ensure the integrity of shrubland ecosystems. Considerations may include ecological restoration, strategic vegetation management, public outreach, etc.
How can the effects of management activities on the indicator be differentiated from those due to climate change? (Optional)	To parse the effects of management from climate change, we can spatially project the change in vegetation cover (i.e. shrubland converted to non-native grassland) and overlay activity databases generated by the Forests (i.e. FACTS) to look for patterns in type conversion.

Best Available Scientific Information

1) *Altered fire regime impacts shrublands.*
Summary: Fire frequency in wildlands has increased in many counties in southern California. Frequent fire results in the reduction of native shrub species and an increase of non-native annual species. Repeated fire and dominance by non-native annuals decrease native species diversity.

2) *Non-native annual grass persistence*
Summary: The legacy of non-native annual grasses can remain on the landscape even following cessation of the disturbance and they often remain abundant despite removal efforts. Recolonization of native shrub species following invasion of non-native annual grasses is often unsuccessful and is likely constrained by competition for soil moisture and light at the soil surface. Therefore, preventative actions should be taken to reduce the likelihood of invasion.

3) *Positive feedback (fire-non-native annual grasses)*
Summary: Non-native annual grasses, through their effect on fire regime, can create a positive feedback that further degrades ecological integrity and promotes their abundance on the landscape. Non-native annual grasses increase the frequency of fire (higher surface:volume makes them more combustible), which enhances the survival of non-native annual seedbanks through the reduction of fuel loads.

** Relevant citations are found at the end of the document*

Rationale for choice of question and indicators, informed by BASI.	Non-native annual grasses are expected to increase in dominance into the future. Their abundance on the landscape indicates a degraded ecological condition driven by multiple anthropogenic factors, including short fire return interval, N deposition and climate change. Non-native annual grasses promote themselves at the expense of native vegetation through altered fire regimes (e.g. reduced fuel load and greater ignitability). Once established, non-native annual grasses constrain native regeneration and are challenging to remove from the landscape. Together these factors have garnered support of academic institutions and land managers interested in conserving the functionality of southern California ecosystems while reducing wildfire risk. This interest has led to the development of methods to track their distribution and abundance across the landscape. The southern California forests will partner with UC Riverside and the FS

	regional office to evaluate the extent of non-native annual grass abundance across the province.
Monitoring protocol, method, or data source; rationale informed by BASI.	The R5 Remote Sensing Lab (RSL) has agreed to modify pre-existing algorithms that incorporate multiple facets of phenology to parse out the acres of herbaceous vs woody dominance across the four Southern California National Forests. Baseline data will be obtained using landsat imagery from the mid-1980's. RSL will quantify the acreage of shrub-dominated and non-native herbaceous-dominated lands across the southern California province through time to track type conversion. .

BASI Determination

Relevant – BASI is relevant to the plan area, question and indicators, the desired condition, objective, and required monitoring item.	Shrublands dominate nearly 2 million acres of the southern California forests and their dominance is being threatened by too frequent fire and other disturbances that give way to invasion by non-native annual species. Monitoring the extent of non-native annual grasses in shrublands is directly relevant to the southern California forest plan by evaluating the extent of type conversion from shrubland to non-native annual grassland, which informs objectives related to ecosystem structure, composition, and function. Many rare and endangered species depend on shrublands (e.g. CA gnatcatcher and coastal sage scrub) for habitat and foraging, therefore the relevance of this work reaches beyond the defined objectives for the plant communities themselves. Using a landscape scale approach, like remote sensing is relevant to the goals of evaluating ecological integrity across vast landscapes. See monitoring protocol for more details.
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 is a direct measure of ecosystem threat and estimates the condition of shrublands in southern California.
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 BASI is reliable and there are multiple peer-reviewed articles that support non-native annual grasses as a threat to native shrubland integrity. The R5 Remote Sensing Lab (RSL) has agreed to provide the appropriate data to the province.

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

1. *Altered fire regime impacts shrublands*

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   b) Zedler P.H., Gautier C.R. & G.S. McMaster (1983) Vegetation change in response to extreme events: the effects of a short interval between fires in California chaparral and coastal scrub. *Ecology*. 64: 809-818.

   c) Haidinger T.L. & J.E. Keeley (1993) Role of high fire frequency in destruction of mixed chaparral. *Madrono*. 40: 141-147.

2. *Non-native annual grass persistence*

   a) Eliason S. & E.B. Allen (1997) Exotic grass competition in suppressing native shrubland re-establishment. *Restoration Ecology*. 5: 245-255.

   b) Cox R.D. & E.B. Allen (2008) Stability of exotic annual grasses following restoration efforts in southern California coastal sage scrub. *Journal of Applied Ecology*. 43: 495-504.

3. *Positive feedback (fire-non-native annual grasses)*

   a) D'Antonio C. & P. Vitousek (1992) Biological invasions by exotic grasses, the grass/fire cycle and global change. *Annual Review of Ecology and Systematics*. 23: 63-87.

   b) Davies K. & A. Nafus. (2013) Exotic annual grass invasion alters fuel amounts, continuity and moisture content. *International Journal of Wildland Fire*. 22: 353-358.

   c) Keeley, J.E. 2001. Fire and invasive species in Mediterranean-climate ecosystems of California. Pages 81–94 *in* K.E.M. Galley and T.P. Wilson (eds.). Proceedings of the Invasive Species Workshop: the Role of Fire in the Control and Spread of Invasive Species. Fire Conference 2000: the First National Congress on Fire Ecology, Prevention, and Management. Miscellaneous Publication No. 11, Tall Timbers Research Station, Tallahassee, FL.