CALIFORNIA
WILDFIRE & FOREST RESILIENCE
TASK FORCE

Candidate Core Reporting Metrics Review Packet

Objective: The Wildfire and Forest Resilience Task Force is seeking public input and feedback on a list of candidate Core Reporting Metrics to be selected to effectively report on progress toward landscape and wildfire resilience goals.

Timeline: Public feedback opened on February 9, 2024, and survey responses must be submitted by EOD March 8, 2024, for consideration of feedback.

February 9 Public Workshop Recap: If you were unable to attend or would like to review the February 9 Core Reporting Metrics workshop, you can view a recording here. Input regarding topics covered in the workshop can be sent through an optional workshop poll. It is recommended that anyone reviewing and providing feedback on the candidate Core Reporting Metrics view the workshop presentations prior to filling out the survey linked below.

Link to Candidate Core Reporting Metrics Survey:

CLICK FOR SURVEY

Resources in Review Packet:

Pg 2: Candidate Core Reporting Metrics List

Pg 3: Links to Regional Resource Kits and full Data Dictionaries

Pg 3-14: Abridged Candidate Core Reporting Metrics

Review Process Questions: If you have any questions on the Core Reporting Metrics review process, please send an email to both:

Sky.Biblin@resources.ca.gov

Nic.Enstice@conservation.ca.gov

Candidate Core Reporting Metrics List

Resource Values	Element	Core Reporting Metric
Fire Risk to Communities	Community Risk	Damage Potential (in WUI)
	Community Risk	Structure Exposure Score
	Community Risk	Fire Ignition Probability
Landscape Resilience	Wildfire Risk	Probability of High Severity Fire
	Vegetation Structure	Proportion of Maximum Stand Density Index (SDI)
	Vegetation Structure	Large Tree Density
	Ecological Integrity	Fire Return Interval Departure (FRID) Condition Class
Biodiversity	Species Diversity	Wildlife Species Richness
	Community Integrity	Habitat Connectivity
	Community Integrity	Climate Refugia
Carbon Storage	Storage	Total Aboveground Carbon
	Stability	Large Tree Carbon
	Stability	Dead Carbon
Water Security	Quantity	Actual Evapotranspiration Fraction
	Storage and Timing	*Spring Runoff
	Quality	Debris Flow Likelihood
Air Quality	Potential Emissions	*Potential Total Smoke Production
Social/Economic Health	Economics	Employment from Treatments
	Economics	Net Revenue from Treatments
	Economics	Biomass Yield

* Water supply and air quality impacts from treatments can be challenging to account for and depend on weather, climate, and community locations. Work is ongoing to find the appropriate metrics/evaluations.

Candidate Core Reporting Metric Dictionary – Abridged Version

Below are portions of the definitions found for each of the candidate Core Reporting Metrics found in the Regional Resource Kits. The full definitions can be found in the Metric Dictionaries. Here are links to each Metric Dictionary pdf:

Northern California Metric Dictionary

Sierra Nevada Metric Dictionary

Southern California Metric Dictionary

Central California Metric Dictionary

Please note that not all the metrics below are in each dictionary, and some are not yet included or are under development.

Fire Risk to Communities

DAMAGE POTENTIAL (In the WUI)

Data Vintage: 08/2023. Includes disturbances through the end of 2022.

Metric Definition and Relevance: This metric combines two data layers; one is the Wildland Urban Interface (WUI) as defined by Carlson et al. 2022 (see WUI definition section for more information), and a second data layer, Damage Potential (DP), developed by Pyrologix LLC. The WUI includes the intermix and interface zones which collectively identify areas where structures occur. The distance selected for the interface definition is based on research from the California Fire Alliance suggesting that this is the average distance firebrands can travel from an active wildfire front.

The composite Damage Potential (DP) dataset represents a relative measure of wildfire's potential to damage a home or other structure if one were present at a given pixel, and if a wildfire were to occur (conditional exposure). It is a function of ember load to a given pixel, and fire intensity at that pixel, and considers the generalized consequences to a home from fires of a given intensity (flame length). This index does not incorporate a measure of annual wildfire likelihood.

Data Resolution: 30m Raster
Data Units: Relative index, low to high

STRUCTURE EXPOSURE SCORE

Data Vintage: 2022

Metric Definition and Relevance: This metric combines two data layers; one is the Wildland Urban Interface (WUI) as defined by Carlson et al. 2022, and a second data layer, Structure Exposure Score (SES), developed by Pyrologix LLC. The WUI includes the intermix and interface zones which collectively identify areas where structures occur.

The distance selected for the interface definition is based on research from the California Fire Alliance suggesting that this is the average distance firebrands can travel from an active wildfire front. Structure Exposure Score is an integrated rating of wildfire hazard that includes the likelihood of a wildfire reaching a given location along with the potential intensity and ember load when that occurs. SES varies considerably across the landscape. The data are current through 2022.

Pyrologix uses a standard geometric-interval classification to define the ten classes of SES, where each class break is 1.5 times larger than the previous break. So, homes located within Class X are 1.5 times more exposed than those in Class IX, and so on. This metric represents SES for WUI areas only.

Data Resolution: 30m raster

FIRE IGNITION PROBABILITY
Northern and Southern California RRKs
Data Vintage: 1992 to 2015

Metric Definition and Relevance: These rasters depict the predicted human- and lightning-caused ignition probability for the state of California.

Data Resolution: 1km Raster Data Units: Probability, 0-1
Creation Method: Maximum entropy models were developed to estimate wildfire ignition probability and understand the complex impacts of anthropogenic and biophysical drivers, based on a historical ignition database.
Data Source: Bin Chen and Yufang Jin, University of California Davis

Landscape Resilience

PROBABILITY OF FIRE SEVERITY (LOW, MODERATE, HIGH)
Data Vintage: 2022

Metric Definition and Relevance: These metrics represent the probability of low, moderate, or high severity fire, respectively, as constructed by Pyrologix LLC. Operational-control probability rasters indicate the probability that the headfire flame length in each pixel will exceed a defined threshold for certain types of operational controls, manual and mechanical.
Low severity fire represents fire with flame lengths of less than 4 feet and can be controlled using manual control treatments. Moderate severity fire represents fire with flame lengths between 4 and 8 feet and can be controlled using mechanical control treatments. High severity fire represents fire with flame lengths exceeding 8 feet and are generally considered beyond mechanical control thresholds.

Data Resolution: 30m raster
Data Units: Probability, 0 to 1
Creation Method: Probability of High Fire Severity (>8 ft) was produced by Pyrologix LLC, a wildfire threat assessment research firm, as part of a spatial wildfire hazard assessment across all land ownerships for the state of California. The ongoing work generally follows the framework outlined in Scott and Thompson (2013), with custom methods and

significant improvements developed by Pyrologix. The project generally consists of three components: fuelscape calibration and updates, wildfire hazard assessment, and risk assessment. To date, this work has resulted in a wide variety of spatial data layers related to wildfire hazard and risk, including operational control probabilities based on conditions prior to the 2020, 2021 and 2022 fire seasons. Work to date been funded by the USDA Forest Service Region 5, the California Energy Commission, and the USDI Bureau of Land Management with data contributions from CAL FIRE. Please reference the Pyrologix 2021 project report (Volger et al., 2021) for more information.
Pyrologix uses the Wildfire Exposure Simulation Tool (WildEST), a deterministic wildfire modeling tool that integrates variable weather input variables and weights them based on how they will likely be realized on the landscape. WildEST is more robust than the stochastic intensity values developed with FSim. This is especially true in low wildfire occurrence areas where predicted intensity values from FSim are reliant on a very small sample size of potential weather variables.

PROPORTION OF MAXIMUM SDI

Sierra Nevada RRK
Data Vintage: 2021

Metric Definition and Relevance: Stand density index (SDI) helps vegetation managers to identify levels of site utilization and competition to determine management scenarios to meet objectives and is often used for forest health-oriented treatments. The maximum forest stand density represents an approximate upper limit to the SDI of a site, and tree growth may be limited by competition as SDI approaches maximum SDI. This approximate upper limit on potential site SDI has been considered to be species- and site-specific by several authors using different variables to characterize the stand.

Data Resolution: 30m raster
Data Units: Proportion, 0 to 1
Creation Method: These raster data present the SDI proportion of the estimated max Stand Density Index (SDI) for both the Reineke (1933) and Zeide (1983) calculations.
2019 to 2021 Update: SDI values were adjusted for 2021 following the same procedure as outlined for density – trees per acre. Tree density values for 2021 were adjusted independently for each diameter size class (10-inch bins) using the Ecosystem Disturbance and Recovery Tracker (eDaRT), described in the Introduction. All eDaRT events beginning August 1, 2019 through November 30, 2021 were identified, and the corresponding Mortality Magnitude Index (MMI) values for these events was summed, giving the estimated fractional canopy cover loss per 30m pixel over that time period. The MMI value for canopy cover loss was used as a direct proxy to estimate TPA loss, using the formula:
2021 TPA = 2019 TPA – (2019 TPA * MMI/100)
Although the assumption of direct correlation between canopy cover and TPA should be viewed with caution, it serves as a reasonable approximation for representative mixed conifer forests in the Sierra Nevada affected by the recent drought (Slaton et al. 2022). The assumption that canopy cover loss, as estimated using eDaRT MMI, was equitably distributed among the predefined size classes may result in over- or under-estimates of actual tree density per individual size class, depending on location.
QMD was then recalculated for 2021 using adjusted tree densities and by assigning trees in each size class to the respective mid-point diameter of that class. These

adjusted values for actual SDI were used to calculate percentages in combination with the max SDI values from 2019.

The maximum SDI was calculated as the 99th percentile of observed values for each of five broad climate classes. The classes were derived from the Basin Characterization Model (BCM; Flint and Flint) developed at a 270m spatial resolution. The variables (1981-2010) AET, climatic water deficit, Tmin, and Tmax were rescaled using a linear transformation to a range of 0-100 and clustered into five classes using a k-means algorithm.

Finally for each pixel, the proportion of maximum SDI is simply calculated as SDI divided by maximum SDI:
Proportion_MaxSDI = SDI/MaxSDI
Data Source: F3 data outputs, Region 5, MARS Team

DENSITY – LARGE TREES
Data Vintage: 06/2020

Metric Definition and Relevance: Large trees are important to forest managers for multiple reasons: they have a greater likelihood of survival from fire; they are an important source of seed stock; they provide vitally important wildlife habitat; and they contribute to other critical processes like carbon storage and nutrient cycling. Large trees are often the focus of management in order to protect existing ones and to foster recruitment of future ones. In consultation with National Forests, "large trees" have been designated in three categories, 24"-30", 30"-40", and >40"" dbh. The data provided are an estimate of density of trees (in each dbh class) within a pixel.

Data Resolution: 30m Raster
Data Units: Percent live trees per pixel
Creation Method: To determine the cutoff for large trees, we developed an allometric equation to predict tree diameter as a function of height. We selected data for plots located in the Northern California region from the USDA Forest Inventory and Analysis program (FIA) for California (FIA DataMart 2023; California 2022 database; ver. 9.0.1). We included trees that met the following criteria: alive; crown class code of open-grown, dominant, or co-dominant; diameter at breast height (DBH, breast height = 4.5 ft) at least 1 inch; and height (HT) at least 5 feet. To minimize the impact of outliers, we trimmed the maximum tree height to the 0.995th percentile. These selection criteria yielded 71,412 trees. We used an information theoretic approach to select the best allometric model (Burnham and Anderson 2002). We evaluated three alternative functions: linear, power, and saturating. The criteria for model selection were based on the Akaike Information Criterion (AIC). For this set of 3 potential models, we calculated the difference in AIC between every model and the model with the lowest AIC (ΔAIC).
FIA DataMart. 2023. USDA Forest Inventory and Analysis DataMart.
https://experience.arcgis.com/experience/3641cea45d614ab88791aef54f3a1849/
Data Source: California Forest Observatory (Salo Sciences), 2020

MEAN FRID CONDITION CLASS
Data Vintage: 2021

Metric Definition and Relevance: This metric, uses the mean percent FRID to a measure of the extent to which contemporary fires (i.e., since 1908) are burning at frequencies similar to the frequencies that occurred prior to Euro-American settlement, with the mean reference FRI binned into another basis for comparison. Mean PFRID is a metric of fire return interval departure (FRID) and measures the departure of current FRI from reference mean FRI in percent.

Data Resolution: 30m raster
Data Units: Integer, -3 to 3
Creation Method: This is a condition class categorization of the data in the Mean PFRID field. MeanCC_FRI categorizes the percent differences calculated in Mean PFRID using the following scale:
1: 0 to 33.3% departure

2: 33 to 66.7% departure

3: >66.7% departure

Negative condition classes (i.e., where fires are burning more often than under pre-Anglo-American settlement conditions) are categorized on the negative of the same scale:
-1: 0 to -33.3%

-2: -33 to -66.7%

-3: <-66.7%

CC1 and CC-1 are mapped in the same class because they are both within 33% of the mean pre-settlement value.
Data Source:
Fire History (2021), CAL FIRE

Existing Vegetation (CALVEG), Region 5, MARS Team

Biodiversity

WILDLIFE SPECIES RICHNESS
Data Vintage: 04/2023

Metric Definition and Relevance: Native species richness is estimated based on high suitability reproductive habitat for a given species. Reproductive habitat is used to represent suitability because it is critical for species persistence and for most native species it has the most limited requirements. If a habitat is identified as high for a given species, it is considered suitable (1), and habitat identified as moderate, low or not suitable, it is considered unsuitable (0). Species richness values are used as a relative measure of biodiversity value; as such, areas with lower species richness based on these criteria may still have high biodiversity value, but not as high as areas with higher richness values. The number of native species per spatial unit (30m pixel) presented as simply the total number; this can be useful for assessing change in number/composition over space. These values are specific to the Northern California species and footprint for this kit.

Data Resolution: 30m Raster

Data Units: Number of species
Creation Method: Generated using the California Wildlife Habitat Relationships model developed and managed by the California Department of Fish and Wildlife. CWHR habitat values are based on the FVEG vegetation data that has been updated. Species are considered present, and habitats considered suitable for each 30m cell for which the canopy cover-size-vegetation combination have been deemed highly suitable for the reproduction of that species in the California Wildlife Habitat Relationship database.

HABITAT CONNECTIVITY
Data Vintage: last updated 08/2019

Metric Definition and Relevance: The Terrestrial Connectivity dataset is one of the four key components of the California Department of Fish and Wildlife's (CDFW) Areas of Conservation Emphasis (ACE) suite of terrestrial conservation information. The dataset summarizes the relative ability of a species to move across the landscape between patches of suitable habitat. It shows a compilation of linkages, corridors, and natural landscape blocks identified in statewide and regional connectivity studies. Each hexagon (2.5 mi2) is ranked into one of the following categories based on the identification of corridors and linkages in statewide, regional, and species-movement studies:

5: *Irreplicable and Essential Corridors* – The Nature Conservancy's (TNC) Omniscape model identifies channelized areas and priority species movement corridors. The mapped channelized areas are those areas where surrounding land use and barriers are expected to funnel, or concentrate, animal movement. These areas may represent the last available connection(s) between two areas, making them high priority for conservation.
- 4: *Conservation Planning Linkages* – Habitat connectivity linkages are often based on species-specific models and represent the best connections between core natural areas to maintain habitat connectivity. Linkages have more implementation flexibility than irreplaceable and essential corridors; any linkage areas not included in rank 5 are included here.
- 3: *Connections with Implementation Flexibility* – Areas identified as having connectivity importance but not identified as channelized areas, species corridors or habitat linkage at this time. Future changes in surrounding land use or regional specific information may alter the connectivity rank. Included in this category are areas mapped in the TNC Omniscape study as 'intensified', core habitat areas, and areas on the periphery of mapped habitat linkages.
- 2: *Large Natural Habitat Areas* – Large blocks of natural habitat (> 2000 acres) where connectivity is generally intact. This includes natural landscape blocks from the 2010 CEHC and updated with the 2016 Statewide Intactness dataset. Areas mapped as CEHC NLB and not include in the previous ranks, are included here.
- 1: *Limited Connectivity Opportunity* – Areas where land use may limit options for providing connectivity (e.g., agriculture, urban) or no connectivity importance has been identified in models. Includes lakes. Some DOD lands are also in this category

because they have been excluded from models due to lack of conservation opportunity, although they may provide important connectivity habitat.

Data Resolution: 30m Raster
Data Units: Categorical; 5 (listed above)
Creation Method: Developed by CDFW, the Terrestrial Connectivity dataset summarizes information on terrestrial connectivity by ACE hexagon (2.5 mi2) including the presence of mapped corridors or linkages and the juxtaposition to large, contiguous, natural areas. This dataset was developed to support conservation planning efforts by allowing the user to spatially evaluate the relative contribution of an area to terrestrial connectivity based on the results of statewide, regional, and other connectivity analyses. This map builds on the 2010 California Essential Habitat Connectivity (CEHC) map, based on guidance given in the 2010 CEHC report. The data are summarized by ACE hexagon.
The ACE Terrestrial Connectivity polygon has been converted to 30m Raster and the connectivity description attribute (HabDesc) is classified into the five connectivity ranks (detailed above).

CLIMATE REFUGIA - UNDER MODELED CLIMATE CHANGE (MIROC MODEL - HOTTER AND DRIER)

This is one example – the Metric Dictionaries have additional Potential Climate Refugia layers that should be considered.
Data Vintage: 2016

Metric Definition and Relevance: This raster dataset represents habitat types (CWHR habitat classes) and their predicted exposure to climate stress across the array of predicted climate conditions (separate layers for early (2010 - 2039), mid (2040-2069), and late century (2070-2099)) for all habitat types in comparison to the baseline climate conditions. This serves as the foundation from which habitat types will be exposed to predicted changes in climate. Data are arrayed across 0 to 1 in terms of their exposure to current climate conditions. These three data layers can be used to help land managers allocate limited resources for climate-adaptive field work by providing a view of climate risk that varies across the lands they manage.
The Climate Change Model used in this analysis is the Miroc Earth System Model. This ESM, named "MIROC-ESM", is based on a global climate model MIROC (Model for Interdisciplinary Research on Climate) which has been cooperatively developed by researchers in Japan and others. This model suggests a hotter and drier future. The emission scenario used is the RCP 8.5, which represents a range of warming statewide from 1.99 to 4.56°C and between a 24.8% decrease in precipitation and a 22.9% increase, respectively.

CLIMATE REFUGIA - MULTI-STRESSOR REFUGIA

Southern California RRK
Data Vintage: 2021

Metric Definition and Relevance: This raster dataset represents sites that may provide protection for natural communities from multiple threats including climate, fire, altered river channels, and density of recreational activities.

Data Resolution: 270m Raster
Data Units: This is a dimensionless index that ranges from 1.91 to 3.68 Low values indicate lower resilience to threats. High values indicate significant protection from threats.
Creation Method: Domains of Refugia: To consider how refugial conditions from a range of stressors can inform conservation planning and management, we integrated metrics of refugial capacity across different domains, which we define as social, ecological, or physical drivers, processes, or cycles that influence landscape structure, function, or composition. To persist in the Southern California landscape, species and ecosystems may need refugia from shifting climatic conditions, including extremely hot summers and prolonged droughts, but non-climate stressors can also affect conservation outcomes. In this landscape, changes in fire frequency can be a significant stressor affecting plant community structure and persistence. Anthropogenic features that modify hydrologic flows alter the ability of watersheds to sustain functional habitats. And finally, protected areas are often designed to mitigate the impacts of anthropogenic activities; however, recreational activities may alter the refugial capacity of the protected land, affecting the ability of the landscape to sustain species and their habitats. We combined these individual metrics to assess landscape level refugial capacity.
Sites with high refugial capacity (super-refugia sites) have, on average, 30% fewer extremely warm summers, 20% fewer fire events, 10% less exposure to altered river channels and riparian areas, and 50% fewer recreational trails than the surrounding landscape. Our results suggest that super-refugia sites (~8,200 km2) for some natural communities are underrepresented in the existing protected area network, a finding that can inform efforts to expand protected areas.
Data Source: San Diego State University CWC Project Team

Water Security

ACTUAL EVAPOTRANSPIRATION TO PRECIPITATION FRACTION DURING DROUGHT
Data Vintage: 2021

Metric Definition and Relevance: Plants respond to conditions in their immediate vicinity. Thus, to understand the vegetative moisture stress during drought, it is important to measure the local moisture balance. The actual evapotranspiration fraction (AETF) provides such a measure. Specifically, it indicates whether a location is expected to experience local drying during a drought, or whether the location receives sufficient precipitation that it will remain moist even during an extended drought. An extended drought is defined by a 48-month period where the Standardized Precipitation Index (SPI, NCAR 2022) is two standard deviations below the long-term mean (SPI-48 = negative 2). Such a drought is expected approximately once every 50 years in the Sierra Nevada. The southern Sierra 2012-2015 drought was a SPI-48 drought = negative 2.0, which resulted in severe vegetation die-off and a marked reduction in water deliveries.

The AETF ranges from 0 to > 1; a low value indicates a wetter location during drought and a high value indicates a drier location. Locations <1 would be expected to generate runoff, even during a significant drought (SPI-48 drought = negative 2.0), and would be expected to continue generating runoff. Locations > 1 would be expected to desiccate the soil during drought, with negligible runoff, and increasing vegetation drought stress. AET/P does not account for lateral water inflow, either as runoff or irrigation.

Data Resolution: 30m Raster
Data Units: Dimensionless fraction (AET in mm/P in mm).
Creation Method: Calculated as the ratio of actual evapotranspiration (AET) during 2021 Water Year (WY) and precipitation that would be expected for each pixel under a significant drought (SPI-48 drought = negative 2.0). AET is calculated based on Landsat observations and eddy covariance, along with information on local monthly irradiance that accounts for Top of Atmosphere and topographic effects. The AET calculated for 2021 is then divided by the precipitation that would be expected for each pixel under a significant drought (SPI-48 drought = negative 2.0). This quantity of precipitation is calculated for each pixel based on local, down-scaled PRISM data for 1991-2020. This fraction provides a measure of the local water balance during drought, with the higher values indicating a drier location. See https://doi.org/10.1029/2012JG002027 and https://doi.org/10.1073/pnas.1319316111 for further information.

SPRING RUNOFF

Under development and not currently in the RRKs.

DEBRIS FLOW LIKELIHOOD

Under development and not currently in the RRKs.

Carbon Storage

TOTAL CARBON (CECS) – Total Abovegound Carbon

Data Vintage: 2021

Metric Definition and Relevance: Identifying ecosystem carbon is essential to land managers and the Total Carbon (CECS) metric provides an estimate of the amount of existing carbon and its location on California's landscape. The metric also serves to provide context for the other metrics used to quantify carbon sequestration. For example, instability or lack of resilience in forests with low total aboveground carbon would be of less concern than the same degree of instability in a forest that has large total aboveground carbon.

Data Resolution: 30m raster
Data Units: Mg C/ha
Creation Method: The Center for Ecosystem Climate Solutions (CECS) DataEngine model tracks monthly carbon in multiple pools from 1986 to 2021. The carbon components are initialized with eMapR (see Additional Resources) observations for the early Landsat era; the model then runs freely based on Landsat and other observations. Disturbances and disturbance intensity are tracked annually by Landsat (Wang et al. 2022) and used to quantitatively transfer or combust pools. The model allocates and turns over material based on allometry scaling theory (Enquist 2002), as adjusted by observational data sets. All aboveground pools (live tree, shrubs and herbs, all dead

material) are summed for September of 2021. Specifically, Total Aboveground Biomass was calculated at the end of the October to September Water Year. Native CECS units, calculated in grams of biomass per m2 were converted to Mg C/ha using the convention of 1 Mg biomass = 0.5 Mg C.
Data Source: CECS; https://california-ecosystem-climate.solutions/

LARGE TREE CARBON

Sierra Nevada RRK
Data Vintage: 2021

Metric Definition and Relevance: Large trees in this metric were calculated as the sum of branch and stemwood plus foliage for trees over 20 inches in diameter. This is intended to represent the most stable (possibly other than soil) component of the carbon pool, and can be an indicator of the carbon stock's resilience/stability. For this metric, higher values generally indicate more stability, and upward trends in this value may be interpreted as generally increasing resilience of the aboveground C pool.

Data Resolution: 30m raster
Data Units: Mg C/ha
Creation Method: The F3 model generated several different raster surfaces to estimate the biomass of stemwood in non-overlapping predefined size classes (BMSTM_x) and for the branchwood, foliage, and the unmerchantable portion of stemwood above 4" in the same non-overlapping predefined size classes (BMCWN_x).
A recent paper (Bernal et al., 2022), suggests that due to drought/temps expected beyond 2040, the Sierra Nevada may not be able to support carbon loads of aboveground live trees over 20 Mg C/ha (note that they report biomass values, not carbon values). Carbon values are generally assumed to be half of biomass (See CAL FIRE's "AB 1504" methodology, Christensen et al., 2019). Conversion from short tons per acre (the default F3 output units) to Mg/ha requires multiplication by 2.2417023114334.

DEAD CARBON

Sierra Nevada RRK
Data Vintage: 2021

Metric Definition and Relevance: Dead carbon includes dead and down (litter, duff, fine, coarse, and heavy fuels, including 1000+ hour logs) which are inherently unstable due to prevailing fire and decay processes, and a destabilizing factor in the fire-adapted forests of the Sierra to the extent that they contribute to uncharacteristic fire behavior. In addition to that dead carbon, this metric includes the carbon from the canopies of small trees, which is readily released during fire (specifically, trees less than 10 inches in diameter). Standing dead carbon is also included, representing the slower leak from the landscape carbon stock. As a result, this metric is a proxy for unstable carbon: fire liable carbon on the landscape which is more vulnerable to combustion.

Data Resolution: 30m raster
Data Units: Mg C/ha
Creation Method: The F3 model generated several different raster surfaces in non-overlapping predefined size classes to estimate the small size live tree (those <10" DBH) branchwood and foliage plus unmerchantable portions of stemwood above 4-inch

diameter (BMCWN_x), plus the standing dead estimates for all size classes (including stems, branches, and foliage still present) from the FVS Fire and Fuels extension carbon report (Standing_D). The model also generated several raster surfaces of fuel loading estimates of the coarse woody debris by non-overlapping predefined size classes: including 1, 10, 100, and 1000-hour fuels (FLOAD_1-5); and estimates for coarse woody debris of heavy fuels by non-overlapping predefined size classes greater than the 1000-hour fuel sizes (>=6" and <8"; FLOAD_6-9) and for litter and duff.
A recent paper (Bernal et al., 2022), suggests that due to drought/temps expected beyond 2040, the Sierra Nevada may not be able to support carbon loads of aboveground live trees over 20 Mg C/ha (note that they report biomass values, not carbon values). Carbon values are generally assumed to be half of biomass (See CAL FIRE's "AB 1504" methodology, Christensen et al., 2019). Conversion from short tons per acre (the default F3 output units) to Mg/ha requires multiplication by 2.2417023114334.

2019 to 2021 Update: The 2021 values described below for Total Dead/Down Fuels and for Standing Dead and Ladder Fuels, were summed and converted to Mg C/ha to derive this metric.

Air Quality

POTENTIAL TOTAL SMOKE PRODUCTION INDEX

Tier: 1
Data Vintage: 2022

Metric Definition and Relevance: This metric is an index of the potential smoke production (represented by particulate matter that is 2.5 microns or less in diameter, or PM2.5) that could be emitted for a given 30-meter pixel under fire weather conditions that produce high severity fire effects. By showing spatial variation in potential smoke emissions under standardized fuel moisture conditions, this index is intended to help identify potential emissions hotpots within a region if a high severity wildfire occurs in the future. It may be useful for regional scale planning and/or prioritization.
However, the actual moistures and fire weather conditions under which these fuels may convert to smoke will vary; therefore, the map does not represent actual smoke production (PM2.5 emissions) during an actual fire event. For data users interested in near-term smoke forecasts that reflect the environmental drivers of emissions, project-specific modeling tools are recommended. For example, the BlueSky Playground (https://tools.airfire.org/playground) can tailor model inputs based on the fuel and moisture conditions observed or planned for in the project area of interest.
Potential smore emissions do not consider the probability of a fire or the transport of smoke to more distant locations; they only reflect what would happen locally if a pixel were to burn.

Data Resolution: 30m Raster
Data Units: 0 - 1**,** a unitless number serving as an index; on a per 30-m pixel basis

Social / Economic Health

Employment from Treatments

Under development and not currently in the RRKs.

Net Revenue from Treatments

Under development and not currently in the RRKs.

Biomass Yield

Under development and not currently in the RRKs.