EcObject Vegetation Map v2.1 Product Guide

Lake Tahoe Basin Management Unit

April 2017

EcObject – Ecological Object Based Vegetation Mapping

The LTBMU EcObject product represents a novel forest-wide existing vegetation dataset produced by Region 5 Remote Sensing Lab that incorporates Light Detection and Ranging (LiDAR) into several facets of the mapping process. It is created from a multi-resolution segmentation of LiDAR-derived tree approximate objects and a 1-m canopy height model, which were then aggregated by stand and tree-level ecologic relationships. The resulting segments were then populated with a collection of traditional and contemporary metrics at scales that benefit both project-level planning and large-landscape analysis. Different combinations of multi-dimensional datasets were used to estimate metrics and thus accuracies vary depending upon both the data used and workflows that were generated. This guide is intended to describe the different map attributes, how they were generated and computed, as well as any known limitations of the metric estimates.

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1 EVeg Attributes

Field Name	Field Description*	Code Name	Code Classification	Comments
More detailed descriptions of all eVeg attributes can be found at: http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219				
OBJECTID	An ObjectID is a unique, not null integer field used to uniquely identify rows in tables in a geodatabase	--	--	Standard for all ArcGIS databases
SHAPE	Dimensions of polygon	--	--	Standard for all ArcGIS databases
ECOREGION_DOMAIN	Ecological Units – Domains of the United States	--	--	Please visit the following website for more detailed code and classification information: *http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219*
ECOREGION_DIVISION	Ecological Units – Divisions of the United States	--	--	Please visit the following website for more detailed code and classification information: *http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219*
ECOREGION_PROVINCE	Ecological Units – Provinces of the United States	--	--	Please visit the following website for more detailed code and classification information: *http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219*
ECOREGION_SECTION	Ecological Units – Sections of the United States	--	--	Please visit the following website for more detailed code and classification information: *http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219*

<table>
<tr><td>ECOREGION_SUBSECTION</td><td>Ecological Units – Subsections of the United States</td><td>--</td><td>--</td><td>Please visit the following website for more detailed code and classification information: http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219</td></tr>
<tr><td rowspan="9">CALVEGZONE</td><td rowspan="9">CALVEG Zone</td><td>1</td><td>North Coast and Montane</td><td rowspan="9">

http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5347192</td></tr>
<tr><td>2</td><td>North Interior</td></tr>
<tr><td>3</td><td>North Sierran</td></tr>
<tr><td>4</td><td>South Sierran</td></tr>
<tr><td>5</td><td>Central Valley</td></tr>
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<tr><td>8</td><td>South Interior</td></tr>
<tr><td>9</td><td>Great Basin</td></tr>
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TILE	Map Tile ID	--	--	--
COVERTYPE	Vegetation Cover Type	CON	Conifer forest/woodland	--
		HDW	Hardwood forest/woodland	
		MIX	Mixed conifer and hardwood forest/woodland	
		SHB	Shrub	
		HEB	Herbaceous	
		BAR	Barren [Rock/Soil/Sand/ Snow]	
		WAT	Water	
		AGR	Agriculture	
		URB	Urban	
REGIONAL_DOMINANCE_TYPE_1	Regional Dominance Type 1	--	--	Two-letter code designating primary (dominant) vegetation for all cover types except MIX, in which case Dom1 is given the conifer label (see attribute COVERTYPE). Please visit the following website for more detailed code and classification information: http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219. *Note: We used the most recent eVeg map to inform our Dom1 classifications. EcObject Version 2.0 will use remote sensing algorithms to define Dom1 classifications.*

OS_TREE_DIAMETER_ CLASS_1	Overstory Tree Diameter Class 1 Classes are based on the mean DBH for trees forming the uppermost canopy layer. This is also known as the QMD.	00	0 to 0.9 inches QMD	Classes are based on the mean DBH for trees forming the uppermost canopy layer. This is also known as the QMD.
		02	1 to 4.9 inches QMD	
		07	5 to 9.9 inches QMD	
		15	10 to 19.9 inches QMD	
		25	20 to 29.9 inches QMD	
		40	30 inches + QMD	
		N	Non-Stocked	
		X	Non-Determined	
REGIONAL_DOMINANCE_ TYPE_2	Regional Dominance Type 2	--	--	Two-letter code designating hardwood vegetation in MIX cover types only (see attribute COVERTYPE). Please visit the following website for more detailed code and classification information: http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219. *Note: We used the most recent eVeg map to inform our Dom2 classifications. EcObject Version 2.0 will use remote sensing algorithms to define Dom2 classifications.*
OS_TREE_DIAMETER_ CLASS_2	Overstory Tree Diameter Class 2	00	0 to 0.9 inches QMD	Classes are based on the mean DBH for trees forming the uppermost canopy layer. This is also known as the QMD. Only those features with a REGIONAL_DOMINANCE_ TYPE_2 attribute (hardwood vegetation in MIX cover types) receive the OS_TREE_DIAMETER_CLASS_2 attribute.
		02	1 to 4.9 inches QMD	
		07	5 to 9.9 inches QMD	
		15	10 to 19.9 inches QMD	
		25	20 to 29.9 inches QMD	
		40	30 inches + QMD	
		N	Non-Stocked	
		X	Non-Determined	

REGIONAL_DOMINANCE_TYPE_3	Regional Dominance Type 3	--	--	Two-letter code designating current vegetation type when the current vegetation type is not in line with the COVERTYPE attribute. This usually refers to the current vegetation in areas where there recently has been a disturbance (fire, anthropogenic, etc.). Regional Dominance Type 1 and Type 2 refer to the vegetation that should be expected to grow back in these areas. Please visit the following website for more detailed code and classification information: *http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219*.
CON_CFA	Conifer Cover From Above. Percentage of non-overlapping conifer vegetation cover from a bird's eye view.	00	Less than 1 percent	Percentage of non-overlapping conifer vegetation cover from a bird's eye view. Based solely on satellite imagery.
		05	1 – 9.9 percent	
		15	10 – 19.9 percent	
		25	20 – 29.9 percent	
		35	30 – 39.9 percent	
		45	40 – 49.9 percent	
		55	50 – 59.9 percent	
		65	60 – 69.9 percent	
		75	70 – 79.9 percent	
		85	80 – 89.9 percent	
		95	90 – 99.9 percent	
		X	Not Determined	

HDW_CFA	Hardwood Cover From Above	00	Less than 1 percent	Percentage of non-overlapping hardwood vegetation cover from a bird's eye view. Based solely on satellite imagery.
		05	1 – 9.9 percent	
		15	10 – 19.9 percent	
		25	20 – 29.9 percent	
		35	30 – 39.9 percent	
		45	40 – 49.9 percent	
		55	50 – 59.9 percent	
		65	60 – 69.9 percent	
		75	70 – 79.9 percent	
		85	80 – 89.9 percent	
		95	90 – 99.9 percent	
		X	Not Determined	
SHB_CFA	Shrub Cover From Above	00	Less than 1 percent	. Percentage of non-overlapping shrub vegetation cover from a bird's eye view.
		05	1 – 9.9 percent	
		15	10 – 19.9 percent	
		25	20 – 29.9 percent	
		35	30 – 39.9 percent	
		45	40 – 49.9 percent	
		55	50 – 59.9 percent	
		65	60 – 69.9 percent	
		75	70 – 79.9 percent	
		85	80 – 89.9 percent	
		95	90 – 99.9 percent	
		X	Not Determined	
HEB_CFA	Herbaceous Cover From Above	00	Less than 1 percent	Percentage of non-overlapping herbaceous vegetation cover from a bird's eye view.
		05	1 – 9.9 percent	
		15	10 – 19.9 percent	
		25	20 – 29.9 percent	
		35	30 – 39.9 percent	
		45	40 – 49.9 percent	
		55	50 – 59.9 percent	
		65	60 – 69.9 percent	
		75	70 – 79.9 percent	
		85	80 – 89.9 percent	
		95	90 – 99.9 percent	
		X	Not Determined	

DATA_SOURCE	National Code for Data Source	--	--	Please visit the following website for more detailed code and classification information: *http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219*
R05_DATA_SOURCE	Region 5 code for data source	--	--	Documents the source of the remote sensing imagery used for an existing vegetation map. Please visit the following website for more detailed code and classification information: *http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219*.
SOURCE_DATE	Date imagery was captured	--	--	--
MAP_UPDATE_CAUSE	Map Update Cause	AC	Accuracy assessment related update for map improvement	Documents the cause of change to existing vegetation between time of initial map establishment and updates for change
		AG	Land conversion to agriculture crops or orchards	
		BD	Downed forests due to high winds, blow down	
		CU	Update change where cause is unknown	
		DE	Defoliation related update from insects or pathogens	
		ER	Ecological restoration	
		FI	Fire related update	
		FT	Fuel treatment related update	
		GL	Receding or advancing glaciers	
		IN	Change in vegetation type due to invasive species	
		IV	Increasing vegetation cover or size due to re-growth	

		LS	Changes in vegetation cover due to landslides	
		MO	Mortality from insect or pathogens related update	
		PL	Plantation related update, reforestation activity	
		RC	Rangeland conversion	
		RS	Reference site related update for map improvement	
		SC	Successional change in lifeform or vegetation type due to regrowth	
		SI	Timber stand improvement, precommercial thin, veg control, rehab	
		SO	Source original for baseline map, not an update	
		TH	Tree harvest related update	
		UB	Land conversion to urban, built-up or development	
		WC	Changes in water impoundments, rivers or stream meanders	
CAUSE_DATE	Date attributed to change	--	--	--
REV_DATE	Date of feature creation or latest update	--	--	--
TOTAL_TREE_CFA	Total Tree Cover From Above	00	Less than 1 percent	Percentage of non-overlapping total tree vegetation cover from a bird's eye view.
		05	1 – 9.9 percent	
		15	10 – 19.9 percent	
		25	20 – 29.9 percent	
		35	30 – 39.9 percent	
		45	40 – 49.9 percent	
		55	50 – 59.9 percent	
		65	60 – 69.9 percent	
		75	70 – 79.9 percent	
		85	80 – 89.9 percent	
		95	90 – 99.9 percent	
		X	Not Determined	

TREE_CFA_CLASS_1	Tree Cover From Above Class 1	01	Less than 10 percent	Percentage of non-overlapping tree vegetation cover from a bird's eye view.
		20	10 – 29.9 percent	
		40	30 – 59.9 percent	
		80	60 – 100 percent	
		X	Not Determined	
PROD	Timberland Productivity	P	Productive Forest Site	Capable of growing 10 percent cover f industrial wood tree species
		N	Non-Productive Site	Not capable of growing 10 percent cover of industrial wood tree species
		O	Non-Forest Types	
CANOPYSTRUCTURE	Canopy Structure	1	Single-storied canopy	--
		2	Multi-storied canopy	
		X	Not mapped	
REFORESTATION_STATUS	Reforestation Status	PL	Planted	--
		SW	Shelterwood Cut – Overwood Present	
		NS	Non-Stocked Timberland	
		OR	Overstory Removal – Overwood Not Present	
		OU	Origin Unknown	
ORIGIN_YEAR	Year Planted	--		--

WHRLIFEFORM	Wildlife Habitat Relationships, Standards for Lifeform	WHR_CON	Tree Dominated Habitats – conifer forest/woodland	"California Wildlife-habitat Relationships (WHR) is a tool for wildlife-habitat management and research. The goal of the system is to provide credibility to wildlife analyses and resource management decisions" (*Mayer et al. 1988*) Please visit the following website for more detailed code and classification information: *http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219*. *stelprdb5365219*For quick crosswalk: *http://frap.fire.ca.gov/projects/frap_veg/classification*.
		WHR_HDW	Tree Dominated Habitats – hardwood forest/woodland	
		WHR_MIX	Tree Dominated Habitats – mixed conifer and hardwood forest/woodland	
		WHR_SHB	Shrub Dominated Habitats	
		WHR_HEB	Herbaceous Dominated Habitats	
		WHR_NFO	Non-vegetated and Sparsely Vegetated Habitats, Developed Habitats – Urban and Agriculture, or Aquatic Habitats	
WHRTYPE	Wildlife Habitat Relationships, Vegetation Type	--	--	"California Wildlife-habitat Relationships (WHR) is a tool for wildlife-habitat management and research. The goal of the system is to provide credibility to wildlife analyses and resource management decisions" (*Mayer et al. 1988*) Please visit the following website for more detailed code and classification information: *http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219*. *stelprdb5365219*For quick crosswalk: *http://frap.fire.ca.gov/projects/frap_veg/classification*.

WHRSIZE	Wildlife Habitat Relationships, Standards for Tree Size	--	*QMD* < 1” DBH	“California Wildlife-habitat Relationships (WHR) is a tool for wildlife-habitat management and research. The goal of the system is to provide credibility to wildlife analyses and resource management decisions” (*Mayer et al. 1988*) Please visit the following website for more detailed code and classification information: *http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb536521*. *stelprdb5365219*For quick crosswalk: *http://frap.fire.ca.gov/projects/frap_veg/classification*.
		--	*QMD* 1” – 5.9” DBH	
		--	*QMD* 6” – 10.9” DBH	
		--	*QMD* 11” – 23.9” DBH	
		--	*QMD* > 24” DBH	
WHRDENSITY	Wildlife Habitat Relationships, Standards for Canopy Cover	--	*CanCov* = 10.0 – 24.9%	“California Wildlife-habitat Relationships (WHR) is a tool for wildlife-habitat management and research. The goal of the system is to provide credibility to wildlife analyses and resource management decisions” (*Mayer et al. 1988*) Please visit the following website for more detailed code and classification information: *http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb536521*. *stelprdb5365219*For quick crosswalk: *http://frap.fire.ca.gov/projects/frap_veg/classification*.
		--	*CanCov* = 25.0 – 39.9%	
		--	*CanCov* = 40.0 – 59.9%	
		--	*CanCov* = >= 60%	

*A more detailed description of all eVeg attributes can be found at:
http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219

2 Additional Attributes

Field Name	Field Description	Code Name	Code Classification	Comments
The following canopy calculations were pulled directly from LiDAR returns at a certain height above the ground. Although it is challenging to confirm that LiDAR has been intercepted by vegetation at each of the billions of returns, it is understood that as long as anthropogenic features are removed from the calculation, as most are done here, accuracies of this direct measurement is known to be the best of any canopy measurement method				
UniqueID	Unique identification number	--	--	This provides a unique number to each feature for future processing, such as for Zonal Statistics. Do **NOT** manipulate unless you are working with a subset of the data
CH_95_M	95th percentile of canopy height in meters	--	--	Calculated to assess the tallest trees or vegetation, while correcting for insignificant outliers. *More detailed explanation located at Appendix A*
CH_95_FT	95th percentile of canopy height in feet	--	--	Calculated to assess the tallest trees or vegetation, while correcting for insignificant outliers. *More detailed explanation located at Appendix A*
CH_Mean_FT	Mean canopy height in feet	--	--	The average height in feet of all the LiDAR returns within a polygon. This metric may be helpful in determining at what height is the majority of the vegetation. Also used in the *Top_Succes* classification.

Can_Cov	Percent canopy cover in the 2 meter and above range	--	--	Canopy cover can be calculated below 2 meters, however the certainty that LiDAR returns have been intercepted by vegetation and not rocks/down logs decreases precipitously below that height
CC2_8	Percent canopy cover in the 2 meter to 8 meter range	--	--	Although the accuracy of this measurement decreases as the cover above 8 meters increases, it serves as a good proxy for understory vegetation densities and may be more indicative of small tree densities than smaller size class tree counts
CC8_16	Percent canopy cover in the 8 meter to 16 meter range	--	--	Although the accuracy of this measurement decreases as the cover above 16 meters increases, it intercepts high amounts of LiDAR pulses relative to the canopy cover slice below
CC16_32	Percent canopy cover in the 16 meter to 32 meter range	--	--	Although the accuracy of this measurement decreases as the cover above 32 meters increases, the slice above rarely inhibits LiDAR from penetration and is very accurate.
CC32None	Percent canopy cover in the 32 meter and above range	--	--	The highest accuracy of any canopy cover slice. However some anomalies, like a large bird flying over the polygon, may give a small false positive.
Avg_Slope	Average slope in percentage	--	--	Derived from a LiDAR bare earth Digital Elevation Model (DEM) at 4 meter resolution
LMU	Landscape Management Unit	1 – Ridge	--	Derived from a LiDAR bare earth DEM at 2 meter resolution, LMU's are based on slope position (canyon, mid-slope, and ridge-top) and aspect in order to offer an ecologically meaningful method to divide the forest into areas with distinct wildlife habitat, forest structure, and other ecological characteristics. *Reference: Underwood et al. 2010*
		2 – Canyon /Drainage Bottom	--	
		3 – Midslope NE	--	
		4 – Midslope SW	--	

A lowercase "p" before the following metrics represents a "partial" measurement, meaning there are imprecisions. Both omission (missing trees) and commission (generating trees that aren't there) errors. However, the majority of the error tends to be in the form of omitting smaller trees, particularly ones "hiding" under larger trees and usually has a direct relationship with canopy cover. For example, a higher overall canopy cover percentage that also has high canopy cover at the 2 – 8 and 8 – 16 meter slices will have greater omission errors than something that is more open. Further, the diameter at breast height (DBH) of each of the trees is estimated and could also contribute to error associated with each of the following metrics, but isn't weighted towards higher or lower estimation inaccuracies. Therefore it is important to understand the relative accuracies of each metric and will be detailed in each metric's comment section.				
pTree_Count	Total number of trees in a polygon	--	--	Higher canopy cover estimates with higher understory tree densities will yield greater omission errors for detecting trees. Validation of this metric proved consistent underestimation of tree counts.
Acres	Area of polygon in acres	--	--	Precise calculation of the polygon area
pTree_Count_acre	Trees per acre	--	--	Calculated by dividing *pTree_Count* with polygon acres
Spatial_Var	Spatial Variable Classification	N/A	--	These classes are mainly based on three factors: number of trees (*p_Tree_Count*), trees per acre (*p_TPA*), and percent canopy cover 2 meters and above (*Can_Cov*). However, polygons located on roads, rivers, and lakes were classified as such when they could be identified remotely. "Stand-level spatial pattern influences key aspects of resilience and ecosystem function such as disturbance behavior, regeneration, snow retention, and habitat quality in frequent-fire pine and mixed-conifer forests. Reference sites, from both pre-settlement era reconstructions and contemporary forests with active fire regimes, indicate that frequent-fire forests are complex mosaics of individual trees, tree clumps, and openings" (*Churchill et al. 2015).* *More detailed classification located at Appendix A*
		Open	No trees/few seedling/sapling trees	
		Stand Initiation	Multiple trees with Can_Cov < 10%	
		Sparse	Multiple trees with *Can_Cov > 10% and* < 30%	
		Individual	= one successionally "Pole-Sapling", "Young", "Old", or "Mature" tree	
		Scattered Clump	Multiple trees with *Can_Cov* >= 30% & < 50%	
		Clump	Multiple trees with *Can_Cov* >= 50% & < 70%	
		Dense Clump	Multiple trees with *Can_Cov* >= 70%	
		Lake	--	
		Road	--	
		River	--	

Top_Success	Dominant Succession Classification	N/A		This classification, based on the *CH_95_FT, CH_Mean_FT,* SpatialVar, and *Precip_Yr* identifies the successional stage of the tallest tree in a polygon. *Note: EcObject Version 2.0 will use an imputed age to help define successional stages.* "Successional stage: a stage or recognizable condition of a plant community occurring during its development from bare ground to climax" and is separate from seral stage or structure stage. (*Powell 1996*). "Old Growth" classification was intentionally left out of this metric due to complications with detecting the dead and down which are requirements of an old growth classification (Current research and design hasn't developed a LiDAR algorithm to systematically differentiate dead and down material from rock and soil…yet). *More detailed classification located at Appendix A*
		Bare-Grass	Dominated by vegetation with mean canopy height <= 0.5 feet	
		Grass-Forb	Dominated by vegetation with mean canopy height <= 1 feet and > 0.5 feet	
		Grass-Forb-Shrub	Dominated by vegetation with mean canopy height <= 3 feet and > 1 foot	
		Shrub	Dominated by vegetation with mean canopy height > 3 feet and 95^{th} percentile of canopy height <= 25	
		Grass-Forb-Seedling	Dominated by vegetation and tree seedlings with mean canopy height <= 1 foot	
		Grass-Forb-Shrub-Seedling	Dominated by vegetation and tree seedlings with mean canopy height <= 3 feet and > 1 foot	
		Shrub-Seedling	Dominated by vegetation and tree seedlings with mean canopy height > 3 feet and 95^{th} percentile of canopy height <= 25 feet	
		Pole-Sapling	Dominated by trees with 95^{th} percentile of canopy height <= 50 feet and > 25 feet	
		Young	Dominated by trees with 95^{th} percentile of canopy height <= 100 feet and > 50 feet	
		Mature	Dominated by trees with 95^{th} percentile of canopy height > 100 feet	

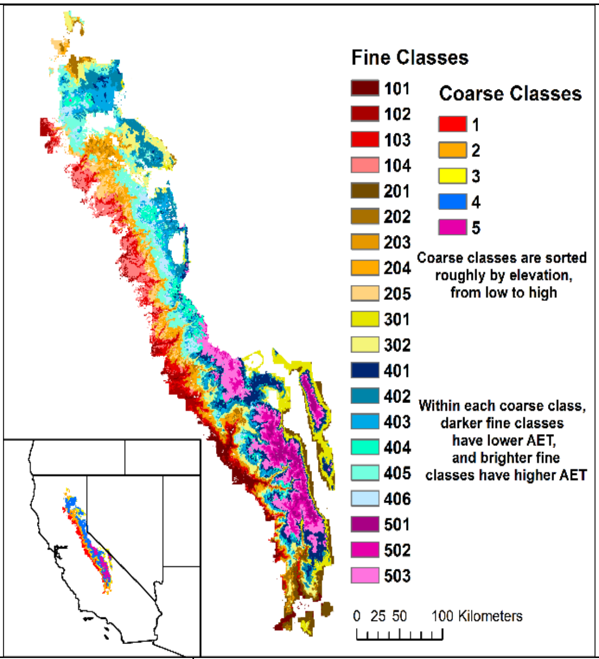
Strata	Canopy Strata Classification	Single Stratum	One canopy cover slice composes the majority of the cover compared to the rest	This field further classifies polygons with clumps of trees (where spatial variable classification is clump, scattered clump, or dense clump) as either having a single stratum or having multi strata. This classification is based on the four canopy cover slices – 2 meters to 8 meters, 8 meters to 16 meters, 16 meters to 32 meters, and 32 meters and above and their relative proportion of their combined cover. *More detailed classification located at Appendix A*
		Multi Strata	Canopy cover is distributed more evenly across at least two of the canopy cover slices	
		N/A		
Strata_Dis	Strata Distribution Classification	N/A		This classification is an extension of the canopy strata classification, providing a more detailed description on how the strata are distributed. The resultant classes are determined by the canopy strata classification and the four canopy cover slices – 2 meters to 8 meters, 8 meters to 16 meters, 16 meters to 32 meters, and 32 meters and above and their relative proportion of their combined cover. *More detailed classification located at Appendix A*
		Bottom Loaded	Canopy cover at the bottom of canopy has the majority of the cover compared to other strata	
		Mid Loaded	Canopy cover at the middle of the canopy has the majority of the cover compared to other strata	
		Top Loaded	Canopy cover at the top of the canopy has the majority of the cover compared to other strata	
		Bimodal – Codominance	Multi strata, but with only two strata that are similar in height	
		Bimodal – Subdominance	Multi strata, but with only two distinct strata, detached in height	
		Continuous	Multi strata with at least three strata that proportionally share their combined canopy cover	

Ownership		NFS Non-NFS State etc	--	Drawn and informed from 2015 USFS corporate geodatabase
Developmnt	Development	Developed	Polygon within 500 feet of powerlines/structure on private land or polygon on NFS land within 500 feet of powerlines/structure on NFS land	Development on Non-NFS Land ends at NFS boundaries regardless of how close a structure, for example, is to the property line and vice versa. Although that development may *indirectly* affect management of adjacent land of another owner, it does not change its classification.
		Powerline	Polygon is a powerline	Only high voltage transmission lines with clearly delineated right of ways were detected and classified. Most distribution lines that could not be seen from aerial photography were ignored.
		Structure	Polygon is a structure	Only habitable structures were targeted for detection and classification. Although many non-habitable structures like barns and sheds were detected and classified, it is understood that many smaller structures were not due to the challenges of finding smaller structures underneath forest canopy. Some boat docks and ski lifts may have also been captured as structures.
		Undeveloped	--	
pBA_acre	Basal area per acre in square feet	--	--	The more dense a polygon is, the greater the under estimation of basal area. Validation of this metric rarely produced higher than realty basal area calculations.

QMD	Quadratic Mean Diameter	--	--	Calculated by using the extracted trees and their estimated DBH to assess the central tendency of those diameters within a polygon and is considered more appropriate than arithmetic mean to characterize a group of trees. Compared to the arithmetic mean, QMD assigns greater weight to larger trees and is used to calculate several metrics within this dataset. Further, QMD is the most accurate measurement of this dataset when assessing tree size due to the strengths of the LiDAR dominant tree extraction algorithms.
CWHR_CC	Wildlife Habitat Relationships, Standards for Canopy Cover	S	*CanCov* = 10.0 – 24.9%	"California Wildlife-habitat Relationships (WHR) is a tool for wildlife-habitat management and research. The goal of the system is to provide credibility to wildlife analyses and resource management decisions" (Mayer et al. 1988) Please visit the following website for more detailed code and classification information: http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb536521. stelprdb5365219For quick crosswalk: http://frap.fire.ca.gov/projects/frap_veg/classification.
		P	*CanCov* = 25.0 – 39.9%	
		M	*CanCov* = 40.0 – 59.9%	
		D	*CanCov* = >= 60%	
		X	Not Determined/ Not Applicable	
CWHR_Size	Wildlife Habitat Relationships, Standards for Tree Size	1	*QMD* < 1" DBH	Combination of WHRTYPE, WHRSIZE, and WHRDENSITY for analysis. Please visit the following website for more detailed code and classification information: http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219. For quick crosswalk: http://frap.fire.ca.gov/projects/frap_veg/classification. *this is an add-on attribute to EVEG
		2	*QMD* 1" – 5.9" DBH	
		3	*QMD* 6" – 10.9" DBH	
		4	*QMD* 11" – 23.9" DBH	
		5	*QMD* > 24" DBH	
		6	*QMD* > 24" DBH, *CanCov* >= 60% & *Strata* = Multistrata	

CCFireSum	Weighted Canopy Cover Height Slices	--	--	Weights the West Wide Wildfire Risk assessment or Fire Risk Index (FRI) with LiDAR derived canopy cover height slices of 2 to 8 meters, 8 to 16 meters, and 16 to 32 meters. These canopy cover values were weighted, with preference given to the lower canopy fuels, then added together for a measure of relative ladder fuel hazard
CC_Mult_FRI	Condition Class + Fire Risk Index + weighted by canopy cover height slices	--	--	Metric representing relative risk for uncontrolled wildland fire. It is created by combining the West Wide Wildfire Risk Assessment FRI, LANDFIRE Vegetation Condition Class, and Tahoe National Forest LiDAR canopy cover height slices above 2 meters. This metric is used in categorizing LAFRI into classes. Higher values represent greater risk for uncontrolled wildland fire, while lower values require less consideration for hazardous fuel management.
LAFRI	LiDAR Augmented Fire Risk Index	1 – Very Low	CCFMult_FRI < 10	LAFRI measures the relative risk for uncontrolled wildland fire. It is a classification of CC_Mult_FRI values into groups with an equal number of features using the quantile data classification method. Therefore, **this classification is specific to the Lake Tahoe Basin Management Unit EcObject analysis area and is not intended to be measured against other areas in the western United States**. “Extreme” areas represent the greatest risk for uncontrolled wildland fire on the Lake Tahoe Basin Management Unit relative to other areas on the LTBMU ONLY. In general, areas mapped as “Very Low”, “Low”, and “Moderate” LAFRI require less consideration for hazardous fuel management, and areas of “High”, “Very High”, and “Extreme” LAFRI possess conditions that support a high risk for uncontrolled wildland fire, with a higher measure of values at risk from fire
		2 – Low	CCFMult_FRI >= 10 and < 200	
		3 – Moderate	CCFMult_FRI >= 200 and < 400	
		4 – High	CCFMult_FRI >= 400 and < 1,000	
		5 – Very High	CCFMult_FRI >= 1,000 and < 2,000	
		6 – Extreme	CCFMult_FRI >= 2,000	

DBH_10_20_ct	Total number of trees with >= 10 inches DBH and < 20 inches DBH	--	--	There will be some omission errors when canopy cover is high at elevated canopy cover slices especially if these trees aren't dominant or codominant.
DBH_20_30ct	Total number of trees with >= 20 inches DBH and < 30 inches DBH	--	--	Although there may be some omission errors when canopy cover is high at elevated canopy cover slices, this metric is still an accurate assessment of tree counts within this size class because of the stand dominance and co-dominance this tree size usually maintains.
DBH_30ct	Total number of trees with >= 30 inches DBH	--	--	The most accurate size class of all the tree counts, however error trends towards commission (overestimation) the taller/bigger the tree is. This is due to the algorithm unavoidably detecting multiple tops and large branches (that older/decadent trees tend to have) as a separate tree.
DBH_10_20_TPA	Trees per acre of trees with >= 10 inches DBH and < 20 inches DBH	--	--	Calculated by dividing *DBH_10_20_ct* with polygon acres
DBH_20_30_TPA	Trees per acre of trees with >= 20 inches DBH and < 30 inches DBH	--	--	Calculated by dividing *DBH_20_30_ct* with polygon acres
DBH_30_TPA	Trees per acre of trees with >= 30 inches DBH	--	--	Calculated by dividing *DBH_30ct* with polygon acres

<table>
<tr><td>Water_Bal</td><td>Water Balance</td><td colspan="2">
</td><td>This metric refers to the “availability of energy and water to support plant growth.” It is based on actual evapotranspiration (AET) and climatic water deficit (CWD) and it provides a climatic signature for each feature. The water balance metric can help in predicting fire and forest structure patterns (Kane et al. 2015) and is a great tool to compare different landscapes and their conditions with the same/similar water balance composition.</td></tr>
<tr><td>Elev_Ft</td><td>Elevation in feet</td><td>--</td><td>--</td><td>Derived from a LiDAR bare earth DEM at 4 meter resolution</td></tr>
<tr><td>pTotalCubicVol_CF</td><td>Total cubic volume</td><td>--</td><td>--</td><td>Volume information was pulled from the National Volume Database, but is limited by the lack of species information (all trees are calculated as Pinus Jeffreyi) and trees not detected by aerial LiDAR systems. This metric in particular will almost always be underestimated. A better metric to account for total biomass would be Live_AGB (Live Above Ground Biomass)

See:
https://www.fs.fed.us/fmsc/measure/volume/nvel/index.php
for National Volume Database information.</td></tr>
</table>

pTotalCubicVol_CF_acre	Total cubic volume per acre	--	--	Calculated by dividing "pTotalCubicVol_CF" by polygon acres. Volume information was pulled from the National Volume Database, but is limited by the lack of species information (all trees are calculated as *Pinus Jeffreyi)* and trees not detected by aerial LiDAR systems. This metric in particular will almost always be underestimated. A better metric to account for total biomass would be Live_AGB (Live Above Ground Biomass) See: https://www.fs.fed.us/fmsc/measure/volume/nvel/index.php for National Volume Database information.
pGrossScribnerVol_BF	Total gross merchantable volume in board feet	--	--	This would be considered primary product or saw log material. Volume calculations were informed from Scribner form class volume tables. Volume information was pulled from the National Volume Database, but is limited by the lack of species information (all trees are calculated as *Pinus Jeffreyi)* and trees not detected by aerial LiDAR systems. This metric, however, tends to be relatively accurate since most merchantable trees can be detected from aerial LiDAR systems. There is still omission and commission errors that should be considered. See: https://www.fs.fed.us/fmsc/measure/volume/nvel/index.php for National Volume Database information.

pGrossScribnerVol_BF_acre	Total gross merchantable volume in board feet per acre	--	--	Calculated by dividing “pGrossScribnerVol_BF” by polygon acres. This would be considered primary product or saw log material. Volume calculations were informed from Scribner form class volume tables. Volume information was pulled from the National Volume Database, but is limited by the lack of species information (all trees are calculated as *Pinus Jeffreyi)* and trees not detected by aerial LiDAR systems. This metric, however, tends to be relatively accurate since most merchantable trees can be detected from aerial LiDAR systems. There is still omission and commission errors that should be considered. See: https://www.fs.fed.us/fmsc/measure/volume/nvel/index.php for National Volume Database information.

pGrossMerchVol_CF	Total gross merchantable volume in cubic feet	--	--	This would be considered primary product or saw log material. Volume information was pulled from the National Volume Database, but is limited by the lack of species information (all trees are calculated as *Pinus Jeffreyi)* and trees not detected by aerial LiDAR systems. This metric, however, tends to be relatively accurate since most merchantable trees can be detected from aerial LiDAR systems. There is still omission and commission errors that should be considered. See: https://www.fs.fed.us/fmsc/measure/volume/nvel/index.php for National Volume Database information.
pGrossMerchVol_CF_acre	Total gross merchantable volume in cubic feet per acre	--	--	Calculated by dividing “pGrossMerchVol_CF_acre” by polygon acres. This would be considered primary product or saw log material. Volume information was pulled from the National Volume Database, but is limited by the lack of species information (all trees are calculated as *Pinus Jeffreyi)* and trees not detected by aerial LiDAR systems. This metric, however, tends to be relatively accurate since most merchantable trees can be detected from aerial LiDAR systems. There is still omission and commission errors that should be considered. See: https://www.fs.fed.us/fmsc/measure/volume/nvel/index.php for National Volume Database information.

pGrossSecondVol_CF	Total gross non-merchantable volume in cubic feet	--	--	This would be considered secondary product or non-saw log material. Volume information was pulled from the National Volume Database, but is limited by the lack of species information (all trees are calculated as *Pinus Jeffreyi)* and trees not detected by aerial LiDAR systems. This metric, however, tends to be relatively accurate since most merchantable trees can be detected from aerial LiDAR systems. There is still omission and commission errors that should be considered. See: https://www.fs.fed.us/fmsc/measure/volume/nvel/index.php for National Volume Database information.
pGrossSecondVol_CF_acre	Total gross non-merchantable volume in cubic feet per acre	--	--	Calculated by dividing "pGrossSecondVol_CF" by polygon acres. This would be considered secondary product or non-saw log material. Volume information was pulled from the National Volume Database, but is limited by the lack of species information (all trees are calculated as *Pinus Jeffreyi)* and trees not detected by aerial LiDAR systems. This metric, however, tends to be relatively accurate since most merchantable trees can be detected from aerial LiDAR systems. There is still omission and commission errors that should be considered. See: https://www.fs.fed.us/fmsc/measure/volume/nvel/index.php for National Volume Database information.

Live_AGB	Total live above ground biomass (AGB) in megagrams (Mg)	--	--	Using the individual tree detection approach, biomass and its uncertainty are quantified at the single tree level. A generalized allometric equation was used by fitting a linear model to all trees in the California FIA dataset. After detecting single trees using the local maximum-guided watershed segmentation, the Lidar-measured tree height was plugged into the allometric equation to obtain tree-level AGB. By approaching the AGB estimates with the first order Tayler expansion, uncertainties were derived in the estimated biomass that are associated with three different sources of error: 1) measurement error in the LiDAR-derived tree height, 2) error associated with parameters of the allometric equation, 3) error associated with residuals of the allometric equation. (Xu et al., *in-prep*)
Live_AGC	Total live above ground carbon (AGC) in megagrams (Mg)	--	--	Multiplied "Live_AGB" by .47 to generate AGC metric. That calculation is an accepted conversion from biomass for softwoods in the forestry sector. (Gonzalez et al., 2015)
Live_AGC_hectare	Total live above ground carbon (AGC) in megagrams (Mg) per acre	--	--	Calculated by dividing "Live_AGC" by polygon acres.

AnnualCWD	Total annual climatic water deficit (30 year mean)	--	--	Analysis time frame used was a 30 year normal from 1985-2015 The Community Climate System Model 4(CCSM4) modern historical coupled atmospheric modeled data (1985-2005) was combined with the same model under RCP 8.5 for 2006-2015. Unfortunately, the modern historical dataset is cut off at 2005, so 2 model runs were combined for the modern average. (Bailey, *in-prep*) More general information on climate variables can be found here: http://climate.calcommons.org/sites/default/files/MetadataForClimateData102110.pdf (although this was prepared for a different dataset, the nomenclature and workflows are similar, but coarser)
AnnualAET	Total annual actual evapotranspiration (30 year mean)	--	--	Analysis time frame used was a 30 year normal from 1985-2015 The Community Climate System Model 4(CCSM4) modern historical coupled atmospheric modeled data (1985-2005) was combined with the same model under RCP 8.5 for 2006-2015. Unfortunately, the modern historical dataset is cut off at 2005, so 2 model runs were combined for the modern average. (Bailey, *in-prep*) More general information on climate variables can be found here: http://climate.calcommons.org/sites/default/files/MetadataForClimateData102110.pdf (although this was prepared for a different dataset, the nomenclature and workflows are similar, but coarser)

AnnualPET	Total annual potential evapotranspiration (30 year mean)	--	--	Analysis time frame used was a 30 year normal from 1985-2015 The Community Climate System Model 4(CCSM4) modern historical coupled atmospheric modeled data (1985-2005) was combined with the same model under RCP 8.5 for 2006-2015. Unfortunately, the modern historical dataset is cut off at 2005, so 2 model runs were combined for the modern average. (Bailey, *in-prep*) More general information on climate variables can be found here: http://climate.calcommons.org/sites/default/files/MetadataForClimateData102110.pdf (although this was prepared for a different dataset, the nomenclature and workflows are similar, but coarser)
AnnualPrecip	Total annual precipitation (30 year mean)	--	--	Analysis time frame used was a 30 year normal from 1985-2015 The Community Climate System Model 4(CCSM4) modern historical coupled atmospheric modeled data (1985-2005) was combined with the same model under RCP 8.5 for 2006-2015. Unfortunately, the modern historical dataset is cut off at 2005, so 2 model runs were combined for the modern average. (Bailey, *in-prep*) More general information on climate variables can be found here: http://climate.calcommons.org/sites/default/files/MetadataForClimateData102110.pdf (although this was prepared for a different dataset, the nomenclature and workflows are similar, but coarser)

MaxRadiation	Max annual radiation (30 year mean)	--	--	Analysis time frame used was a 30 year normal from 1985-2015 The Community Climate System Model 4(CCSM4) modern historical coupled atmospheric modeled data (1985-2005) was combined with the same model under RCP 8.5 for 2006-2015. Unfortunately, the modern historical dataset is cut off at 2005, so 2 model runs were combined for the modern average. (Bailey, *in-prep*) More general information on climate variables can be found here: http://climate.calcommons.org/sites/default/files/MetadataForClimateData102110.pdf (although this was prepared for a different dataset, the nomenclature and workflows are similar, but coarser)
AnnualRain	Total annual rainfall (30 year mean)	--	--	Analysis time frame used was a 30 year normal from 1985-2015 The Community Climate System Model 4(CCSM4) modern historical coupled atmospheric modeled data (1985-2005) was combined with the same model under RCP 8.5 for 2006-2015. Unfortunately, the modern historical dataset is cut off at 2005, so 2 model runs were combined for the modern average. (Bailey, *in-prep*) More general information on climate variables can be found here: http://climate.calcommons.org/sites/default/files/MetadataForClimateData102110.pdf (although this was prepared for a different dataset, the nomenclature and workflows are similar, but coarser)

AnnualSnow	Total annual snowfall (30 year mean)	--	--	Analysis time frame used was a 30 year normal from 1985-2015 The Community Climate System Model 4(CCSM4) modern historical coupled atmospheric modeled data (1985-2005) was combined with the same model under RCP 8.5 for 2006-2015. Unfortunately, the modern historical dataset is cut off at 2005, so 2 model runs were combined for the modern average. (Bailey, *in-prep*) More general information on climate variables can be found here: http://climate.calcommons.org/sites/default/files/MetadataForClimateData102110.pdf (although this was prepared for a different dataset, the nomenclature and workflows are similar, but coarser)
MeanSoilWater	Annual mean soil water content (30 year mean)	--	--	Analysis time frame used was a 30 year normal from 1985-2015 The Community Climate System Model 4(CCSM4) modern historical coupled atmospheric modeled data (1985-2005) was combined with the same model under RCP 8.5 for 2006-2015. Unfortunately, the modern historical dataset is cut off at 2005, so 2 model runs were combined for the modern average. (Bailey, *in-prep*) More general information on climate variables can be found here: http://climate.calcommons.org/sites/default/files/MetadataForClimateData102110.pdf (although this was prepared for a different dataset, the nomenclature and workflows are similar, but coarser)

Annualrunoff	Total annual runoff (30 year mean)	--	--	Analysis time frame used was a 30 year normal from 1985-2015 The Community Climate System Model 4(CCSM4) modern historical coupled atmospheric modeled data (1985-2005) was combined with the same model under RCP 8.5 for 2006-2015. Unfortunately, the modern historical dataset is cut off at 2005, so 2 model runs were combined for the modern average. (Bailey, *in-prep*) More general information on climate variables can be found here: http://climate.calcommons.org/sites/default/files/MetadataForClimateData102110.pdf (although this was prepared for a different dataset, the nomenclature and workflows are similar, but coarser)
MinTemp	Minimum annual temperature (30 year mean)	--	--	Analysis time frame used was a 30 year normal from 1985-2015 The Community Climate System Model 4(CCSM4) modern historical coupled atmospheric modeled data (1985-2005) was combined with the same model under RCP 8.5 for 2006-2015. Unfortunately, the modern historical dataset is cut off at 2005, so 2 model runs were combined for the modern average. (Bailey, *in-prep*) More general information on climate variables can be found here: http://climate.calcommons.org/sites/default/files/MetadataForClimateData102110.pdf (although this was prepared for a different dataset, the nomenclature and workflows are similar, but coarser)

MaxTemp	Maximim annual temperature (30 year mean)	--	--	Analysis time frame used was a 30 year normal from 1985-2015 The Community Climate System Model 4(CCSM4) modern historical coupled atmospheric modeled data (1985-2005) was combined with the same model under RCP 8.5 for 2006-2015. Unfortunately, the modern historical dataset is cut off at 2005, so 2 model runs were combined for the modern average. (Bailey, *in-prep*) More general information on climate variables can be found here: http://climate.calcommons.org/sites/default/files/MetadataForClimateData102110.pdf (although this was prepared for a different dataset, the nomenclature and workflows are similar, but coarser)
MeanTemp	Mean annual temperature (30 year mean)	--	--	Analysis time frame used was a 30 year normal from 1985-2015 The Community Climate System Model 4(CCSM4) modern historical coupled atmospheric modeled data (1985-2005) was combined with the same model under RCP 8.5 for 2006-2015. Unfortunately, the modern historical dataset is cut off at 2005, so 2 model runs were combined for the modern average. (Bailey, *in-prep*) More general information on climate variables can be found here: http://climate.calcommons.org/sites/default/files/MetadataForClimateData102110.pdf (although this was prepared for a different dataset, the nomenclature and workflows are similar, but coarser)

CWHR	California Wildlife Habitat Relationships	--	--	Combination of *WHRTYPE*, *WHRSIZE*, and *WHRDENSITY* for analysis. Please visit the following website for more detailed code and classification information: *http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5365219*. For quick crosswalk: *http://frap.fire.ca.gov/projects/frap_veg/classification*. **this is an add-on attribute to EVEG*

C_Post_Acq	Vegetation Change Post LiDAR acquisition	--	Mean confidence of detected anomalies post LiDAR acquisition to winter of 2016/2017; can be used as a relative measure of disturbance intensity during that time period	This metric was generated using the Ecosystem Disturbance and Recovery Tracker (eDaRT) software prototype version 2.5. The eDaRT system is designed to detect canopy cover and health change by comparing past Landsat 5/7 images with more contemporary ones at the 30x30m pixel scale, normally at 16 day step (Koltunov, Ramirez, & Ustin, 2015.). The change metric is necessary because significant changes in ecosystems (such as fires, management, mortality, etc.) will inevitably occur on at least a portion of a large landscape after the snapshot in time a LiDAR acquisition provides. eDaRT was applied over the entire Lake Tahoe Basin Management Unit area, where the algorithm analyzed Landsat images post final LiDAR acquisition (winter of 2011) through winter of 2016/2017. For each disturbance event flagged during this period, eDaRT provides the corresponding date and relative confidence of detection. **The higher the confidence of an anomaly within a polygon, the more likely an actual disturbance has occurred somewhere inside the polygon perimeter, with a greater potential of that disturbance being significant.** For example, it is understood that more thorough vetting would need to occur on a polygon if it has a high *C_Post_Acq* number along with high *Can_Cov,* as that area's actual conditions could, in reality, be much different from what many of the polygon's metrics exhibit. This, for example, could be due to a fire or recent management since the LiDAR acquisition occurred. *More detailed explanation located at Appendix A*

C_Area	Area of change		% of the polygon that had detected anomalies post LIDAR acquisition to winter of 2016/2017	eDaRT 2.5 uses only Landsat 7 images for the dates that follow the end of Landsat 5 operations in late 2011. Landsat 7 images have a large number of missing pixels due to the sensor scanning issue. In these areas, even a high-magnitude disturbance (such as fire or clearcut) cannot be detected by eDaRT.
C_Date	Estimated year/years when a *C_Post_Acq* anomaly occurred	--	Date	As part of the eDaRT algorithm, the approximate year of an anomaly detection is recorded and incorporated here. If there were multiple disturbances within a polygon, then each year an anomaly is detected is listed

3 Appendix A

If a polygon satisfies at least one of the conditions (one of the rows) then it was categorized in that class. Some classes only have 1 possible condition.

Definition of Terms:
S = Strata
SV = Spatial Variation
TS – Top Succession
2_8% - Percentage that the canopy cover in the 2 meter to 8 meter range is of the sum of all the ranges of canopy cover
8_16% - Percentage that the canopy cover in the 8 meter to 16 meter range is of the sum of all the ranges of canopy cover
16_32% - Percentage that the canopy cover in the 16 meter to 32 meter range is of the sum of all the ranges of canopy cover
32none% - Percentage that the canopy cover in the 32 meter and above range is of the sum of all the ranges of canopy cover

3.1 Spatial Variation Classification ("Spatial_Var")

Open	TreeCount = 0
	CC2None < 30% AND TreeCount > 1 AND TPA < 5
	TreeCount = 1 AND TPA < 5
	SV = Individual AND (TS = Bare-Grass OR TS = Grass-Forb OR TS = Grass-Forb-Shrub OR TS = Shrub)
Sparse	CC2None < 30% AND TreeCount > 1 AND TPA >= 5
	SV = Individual AND (TS = Grass-Forb-Seedling OR TS = Grass-Forb-Shrub-Seedling OR TS = Shrub-Seedling)
Individual	TreeCount = 1 AND TPA >= 5
	TS = Pole-sapling OR TS = Young OR TS = Old OR TS = Mature
Scattered Clump	CC2None >= 30% AND TreeCount > 1 AND CC2None < 50%
Clump	CC2None >= 50% AND TreeCount > 1 AND CC2None < 70%
Dense Clump	CC2None >= 70% AND TreeCount > 1
N/A	SV = Lake OR Development = Structure OR Development = Powerline

3.2 Strata Classification ("Strata")

Multi Strata	Of the 4 canopy cover ranges (2-8, 8-16, 16-32, 32-none): - Two both have canopy cover >= 5% and a percentage of the total canopy cover >= 30% e.g. CC2_8 >= 5% AND 2_8% >= 30% AND CC16_32 >= 5% AND 16_32% >= 30%
Single Stratum	Of the 4 canopy cover ranges (2-8, 8-16, 16-32, 32-none): - One has canopy cover < 5% and a percentage of the total canopy cover >= 30% - One has canopy cover >= 5% and a percentage of the total canopy cover >= 30% - Two cannot have canopy cover >= 5% and a percentage of the total canopy cover >= 30% e.g. CC2_8 < 5 AND 2_8% >= 30% AND CC16_32 >= 5% AND 16_32% >= 30%
	Of the 4 canopy cover ranges (2-8, 8-16, 16-32, 32-none): - Three have a percentage of the total canopy cover < 30% e.g. 2_8% < 30% AND 8_16% < 30% AND 16_32% < 30%
N/A	TS = Bare-Grass OR TS = Grass-Forb OR TS = Grass-Forb-Shrub OR TS = Shrub OR TS = Grass-Forb-Seedling OR TS = Grass-Forb-Shrub-Seedling OR TS = Shrub-Seedling
	All 4 canopy cover ranges (2-8, 8-16, 16-32, 32-none) have canopy cover < 5%
	SV = Open OR SV = Individual OR SV = Sparse OR SV = Road OR SV = River OR SV = Road/River OR SV = Lake OR Development = Structure OR Development = Powerline

3.3 Strata Distribution Classification ("Strata_Dis")

Bimodal – Subdominance	- S = Multi Strata AND If one of these pairs (2-8 and 16-32), (8-16 and 32-none), and (2-8 and 32-none) has the following attributes: Each in the pair have a percentage of the total canopy cover >= 30% and those values are within 5% of each other
	- S = Multi Strata - Canopy cover ranges 2-8 and 8-16 have a percentage of the total canopy cover >= 30% and those values are within 5% of each other - Canopy cover ranges 16-32 and 32-none have a percentage of the total canopy cover < 30%

Continuous	- S = Multi Strata AND Of the 4 canopy cover ranges (2-8, 8-16, 16-32, 32-none): Three have a percentage of the total canopy cover >= 30% and those values are within 5% of each other
	- S = Multi Strata - Canopy cover ranges 2-8 and 8-16 have a percentage of the total canopy cover >= 30% and those values are within 5% of each other - Canopy cover ranges 16-32 and 32-none cannot both have a percentage of the total canopy cover < 30%
Bimodal – Codominance	- S = Multi Strata - Canopy cover ranges 8-16 and 16-32 each have a percentage of the total canopy cover >= 30% and those values are within 5% of each other
	- S = Multi Strata - Canopy cover ranges 16-32 and 32-none each have a percentage of the total canopy cover >= 30% and those values are within 5% of each other
Bottom Loaded (if not already classified as "Bimodal-Subdominance," "Bimodal-Codominance," or "Continuous")	- S = Multi Strata OR S = Single Stratum - Canopy cover range 2-8 has a percentage of the total canopy cover that is greater than all the other canopy cover ranges (8-16, 16-32, 32-none)
Mid Loaded (if not already classified as "Bimodal-Subdominance," "Bimodal-Codominance," or "Continuous")	- S = Multi Strata OR S = Single Stratum - Canopy cover range 8-16 has a percentage of the total canopy cover that is greater than all the other canopy cover ranges (2-8, 16-32, 32-none)
	- S = Multi Strata - 32-none >= 30% - Canopy cover range 16-32 has a percentage of the total canopy cover that is greater than all the other canopy cover ranges (2-8, 8-16, 32-none)
Top Loaded (if not already classified as "Bimodal-Subdominance," "Bimodal-Codominance," or "Continuous")	- S = Multi Strata - 16-32% >= 30% - 32-none% < 30% - Canopy cover range 16-32 has a percentage of the total canopy cover that is greater than all the other canopy cover ranges
	- S = Multi Strata OR S = Single Stratum - Canopy cover range 32-none has a percentage of the total canopy cover that is greater than all the other canopy cover ranges
	- S = Single Stratum - Canopy cover range 16-32 has a percentage of the total canopy cover that is greater than all the other canopy cover ranges
N/A	SV = Road OR SV = River OR SV = Road/River OR SV = Lake OR Development = Structure OR Development = Powerline

3.4 Succession Classification ("Top_Succes")

Bare-Grass	(SV = Sparse OR SV = Individual OR SV = Clump OR SV = Scattered Clump OR SV = Dense Clump) AND CH_Mean_FT <= 0.5 AND TPA < 5
	SV = Open AND CH_Mean_FT <= 0.5
Grass-Forb	(SV = Sparse OR SV = Individual OR SV = Clump OR SV = Scattered Clump OR SV = Dense Clump) AND CH_Mean_FT <= 1 AND TPA < 5
	SV = Open AND CH_Mean_FT > 0.5 AND CH_Mean_FT <= 1
Grass-Forb-Shrub	(SV = Sparse OR SV = Individual OR SV = Clump OR SV = Scattered Clump OR SV = Dense Clump) AND CH_Mean_FT <=3 AND TPA < 5
	SV = Open AND CH_Mean_FT > 1 AND Ch_Mean_FT <=3
Shrub	(SV = Sparse OR SV = Individual OR SV = Clump OR SV = Scattered Clump OR SV = Dense Clump) AND CH_95_FT <= 25 AND TPA < 5
	SV = Open AND CH_Mean_FT > 3
Grass-Forb-Seedling	(SV = Sparse OR SV = Individual OR SV = Clump OR SV = Scattered Clump OR SV = Dense Clump) AND CH_Mean_FT <= 1 AND TPA >= 5
Grass-Forb-Shrub-Seedling	(SV = Sparse OR SV = Individual OR SV = Clump OR SV = Scattered Clump OR SV = Dense Clump) AND CH_Mean_FT > 1 AND CH_Mean_FT <= 3 AND TPA >= 5
Shrub-Seedling	(SV = Sparse OR SV = Individual OR SV = Clump OR SV = Scattered Clump OR SV = Dense Clump) AND CH_Mean_FT > 3 AND CH_95_FT <= 25 AND TPA >= 5
Pole-Sapling	(SV = Sparse OR SV = Individual OR SV = Clump OR SV = Scattered Clump OR SV = Dense Clump) AND CH_95_FT > 25 AND CH_95_FT <= 50
Young	Sierraville and Truckee Districts: (SV = Sparse OR SV = Individual OR SV = Clump OR SV = Scattered Clump OR SV = Dense Clump) AND CH_95_FT > 50 AND CH_95_FT <= 100 Yuba River and American River Districts: (SV = Sparse OR SV = Individual OR SV = Clump OR SV = Scattered Clump OR SV = Dense Clump) AND CH_95_FT > 50 AND CH_95_FT <= 120
Mature	(SV = Sparse OR SV = Individual OR SV = Clump OR SV = Scattered Clump OR SV = Dense Clump) AND CH_95_FT > 100
N/A	SV = Road OR SV = River OR SV = Road/River OR SV = Lake OR Development = Structure OR Development = Powerline

3.5 Expanded Metric Comments

Field Name	Expanded Comments
C_Post_Acq	"For each pixel at a spatial location *s* and time *t*, the eDaRT anomaly detection block iteratively estimates "anomalies" — the changes in the multispectral intensities that are inconsistent with the hypothesis of a normal ecosystem development process. The eDaRT defines anomaly or normal ecosystem development relative to the dominant changes that are actually observed at time *t* for the landscape sub-category to which a pixel s belongs. Therefore, for any given vegetation pixel the normal development does not necessarily mean "steady growth" or "stable health" during any given period of time, although this is the most typical scenario. For example, sometimes a pixel can be flagged as disturbed by eDaRT because the increase in canopy cover is too small, indicating that this pixel may have been disturbed. Conversely, an *actual* and significant reduction in canopy cover is not always an indicator of a disturbance event, but could be due to natural dynamics of the tree population within a 30x30 pixel area, e.g. background mortality or a phenological response to environmental factors. Disturbances detected by eDaRT can be due to damage to overstory or understory. Overstory disturbances are significantly more likely to be detected. A quantitative validation and accuracy assessment of the eDaRT outputs are underway. In general, most false positives (FP) are found on the land cover class boundaries (due to image misalignment effects), in the regions with undetected snow cover, or undetected cloud edges. In the preliminary developer-level tests, eDaRT was able to detect disturbances down to ~5-10% loss of vegetation cover." (eDaRT v2.0 Data Product 2016)
CH_95_FT	Calculated by the polygon canopy height mean plus the polygon canopy height standard deviation multiplied by the z-score for the 95th percentile (1.645) and converted to feet. *95th percentile = polygon canopy height mean + (polygon canopy height standard deviation*1.645)*
CH_95_M	Calculated by the polygon canopy height mean plus the polygon canopy height standard deviation multiplied by the z-score for the 95th percentile (1.645) and converted to meters. *95th percentile = polygon canopy height mean + (polygon canopy height standard deviation*1.645)*
QMD	$\sqrt{\frac{\sum D_i^2}{n}}$ where $\sum$ is summing all of the trees extracted in the polygon, D_i is the estimated DBH of each of those individual trees, and n is the number of trees in the polygon

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