Classifying Vegetation Types in the Western United States Using LANDFIRE Datasets

John Walz[1], Rituraj Yadav[1], and Keith T. Weber[2]
GIS/Remote Sensing Technician, Idaho State University GIS Training and Research Center
GIS Director, Idaho State University

BACKGROUND

This study aims to use LANDFIRE datasets[1] that classify vegetation across the western United States to better understand and address fluxes in biomass production, relative to wildfire events. Different vegetation types respond variably to weather and climate. For example, the coniferous forests tend to exhibit similar NDVI patterns throughout the year, suggesting little change in photosynthetic activity. In contrast, much higher annual NDVI variability is observed in shrub and grassland ecosystems. Therefore, to compare changes in biomass production in a meaningful way, it is important to stratify vegetation/biomass studies by vegetation type.

DATA & METHODS

The LANDFIRE dataset contains two products of interest; Existing Vegetation Type (EVT) and Environmental Site Potential (ESP). These layers were created using predictive landscape models based on extensive field referenced data, satellite imagery, and biophysical gradient layers developed using classification and regression trees. The resulting layers represent vegetation types found across the western United States.

Environmental Site Potential (ESP)

ESP represents the vegetation that could be supported at a given site based on the biophysical environment. The classes used in the ESP dataset represent natural plant communities that would exist given sufficient time (Figure 1). These data reflect potential under the current climate and physical environment, as well as the competitive potential of native plant species. ESP is an abstract concept and represents neither current nor historical vegetation.

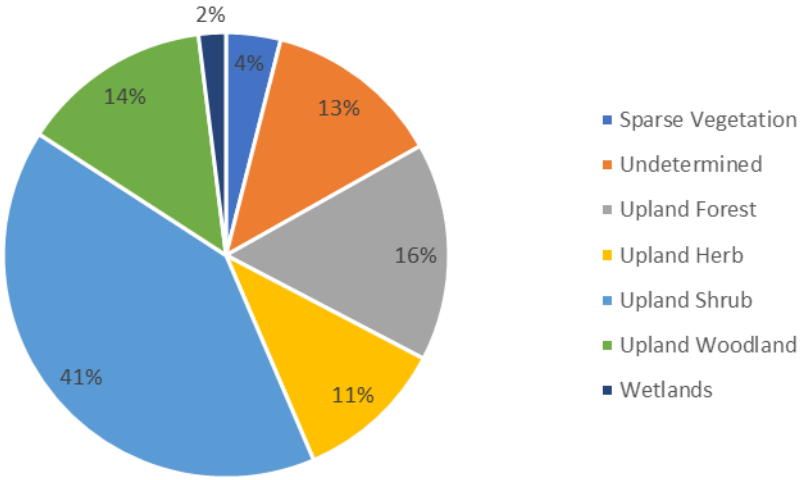

Figure 1. LANDFIRE land cover percentage from the ESPLF_Name field. Undetermined refers to developed land or farmland. Approximately 15% of the study area would be excluded as it is considered Undetermined or Wetland. Upland Forest and Upland Woodland include diverse types of vegetation including sagebrush steppe and Juniper savanna.

[1] http://LANDFIRE.cr.usgs.gov/viewer/

Within the broader Upland Woodland class there are into five sub-classes: <1% Xeric, 4% Mesic, 15% Dry-Mesic, 3% Mesic-Wet, and 78% No Class (e.g., shrub land and sagebrush steppe) (Figure 2). No data is available for the percent canopy categories of the Upland forest class in the ESP dataset. This may be because the dataset is theoretical and does not represent actual vegetation cover.

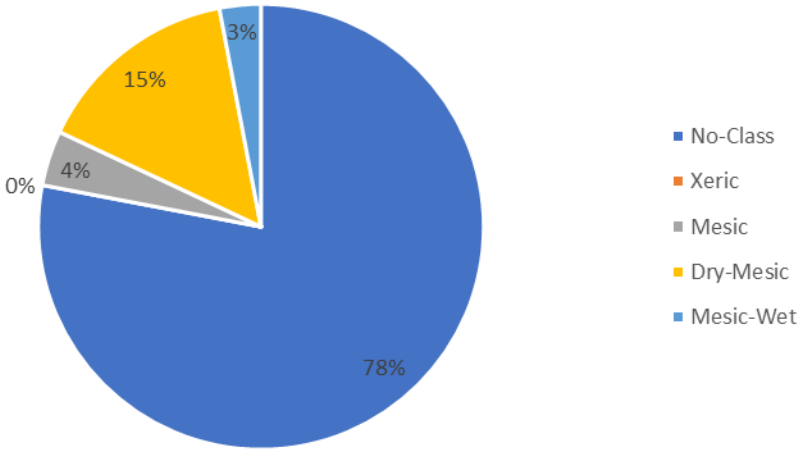

Figure 2. The Upland Woodland category can be broken down into five sub-categories: Dry-Mesic, Mesic, Mesic-Wet, No–Class (shrub land and sagebrush steppe), and Xeric. The total area of Upland woodland is 14,232.91 km2.

Existing Vegetation Type **(EVT)**

Existing Vegetation Type (EVT) represents the current ecological system found across the western United States as of the last edition of LANDFIRE in 2016. This layer provides descriptions for each terrestrial ecological system including species, distribution, and other classification information. According to the LANDFIRE program, "A terrestrial ecological system is defined as a group of plant community types (associations) that tend to co-occur within landscapes with similar ecological processes, substrates, and/or environmental gradients." In addition, EVT includes rural or semi-natural vegetation types.

The EVT_PHYS field was explored in this study and used to display the vegetation type classes present across the western United States. This field breaks down vegetation type into 19 different ecological system types or classes (Figure 3).

For the purposes of this study, the 19 different ecological systems were re-classified into eight major vegetation types (Figure 4). This was done by comparing the EVT_PHYS field with the EVT_CLASS and EVT_ORDER fields. Attributes with similar definitions in all three fields were merged into a more general field. In addition, a class called "other" was created to include all anthropic/other ecosystems types (i.e., agriculture, developed-high intensity, developed-medium intensity, developed-low intensity, developed roads, barren land, quarries-strip mines, gravel pits, open water, and snow ice) found in the study area

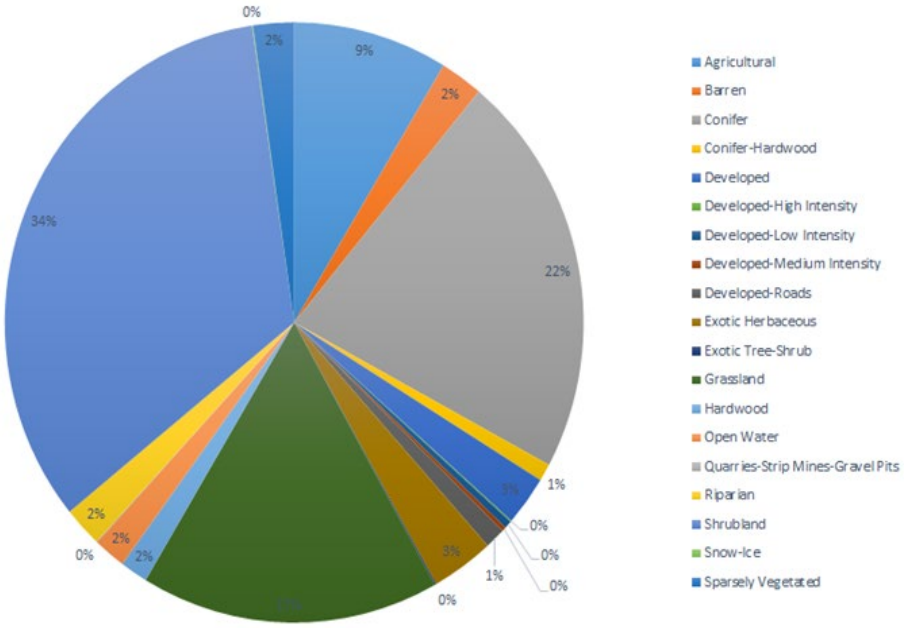

Figure 3. Percent area covered by each vegetation type listed in the EVT_Phys field

The conifer class contains three major categories: 54% open tree canopy, 44% closed tree canopy, and 2% sparse tree canopy (Figure 5). Similarly, the Developed vegetation type is a mix of three different classes: 70% Herbaceous-grassland, 23% shrub dominated, and 6% tree dominated. Therefore, the developed vegetation type was not merged with any other vegetation types.

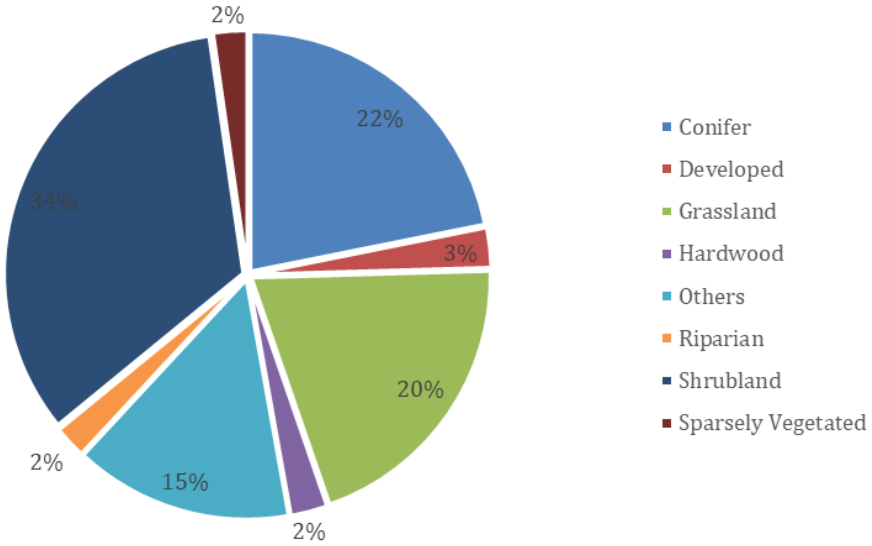

Figure 4. Percent area covered by each of the eight major vegetation types

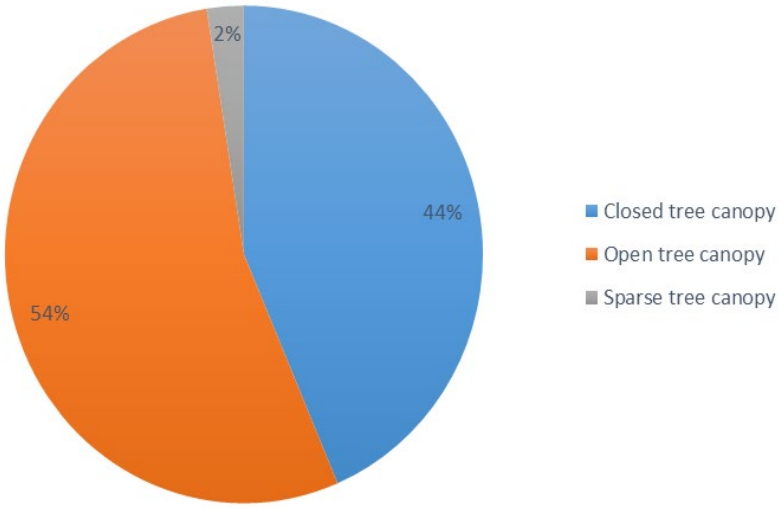

Figure 5. Different types of canopy closure types found in the EVT conifer forest class.

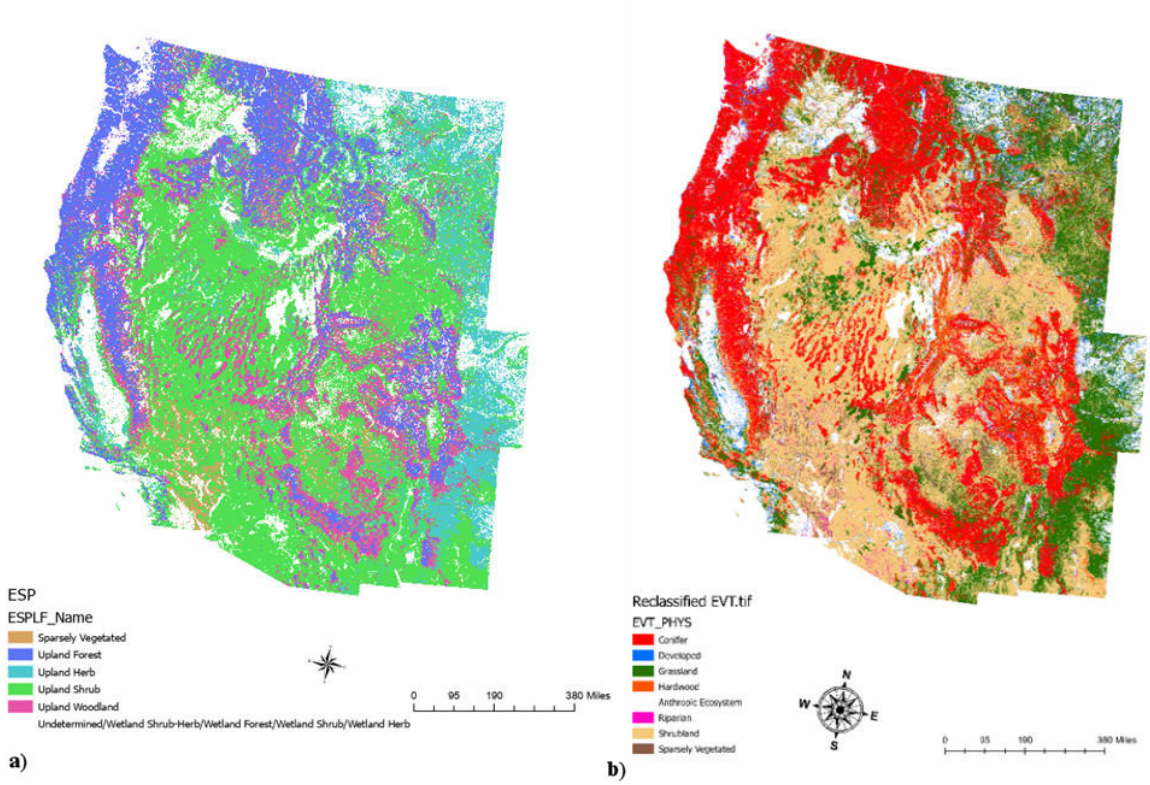

Figure 6. Vegetation types of the (a) LANDFIRE ESP layer and (b) EVT layer which are applicable to this study.

CONCLUSION

This study examined stratifying vegetation in the western United States using either LANDFIRE's Environmental Site Potential (ESP) or Existing Vegetation Type (EVT). The ESP layer classifies the study area into seven major types: 41% Upland Shrub, 16% Upland Forest, 14% Upland Woodland, 13% Undetermined, 11% Upland Herb, 3% Sparse Vegetation, 2% Wetland (Figure 6).

Similarly, the EVT layer classifies the study area into eight major vegetation types: 34% Shrub, 22% Conifer, 20% Grassland, 15% Other, 3% Developed, 2% Hardwood, 2% Riparian, and 2% Sparsely

Vegetated. The vegetation type “other” include anthropic areas intensively managed by humans. This ecosystem would be removed or ignored from future analysis (figure 6).

RECOMMENDATION

The recommendation of this study is to use the eight major vegetation classes identified using the EVT dataset to stratify the vegetation type across the western US. The EVT dataset describes actual vegetation present in the study region, whereas the ESP provides data for potential vegetation that may not exist in the study region. This approach will allow for a more meaningful comparison of biomass production over time.