

**2016 NLCD Tree Canopy Cover
Seamline/Artifact Review and Explanation
October 23, 2020**

Introduction:

The U.S. Forest Service (USFS) Geospatial Technology and Applications Center (GTAC) builds and maintains the National Land Cover Database (NLCD) Tree Canopy Cover (TCC) datasets. The 2011 and 2016 TCC maps and associated change layer were provided to Multi-Resolution Land Characteristics (MRLC) consortium in July 2019. Since its release there have been some questions from users about occasional distinct unnatural/artificial changes or seamlines in tree canopy cover (Figure 1). This document provides an overview of the mapping process and a brief explanation for the seamlines.

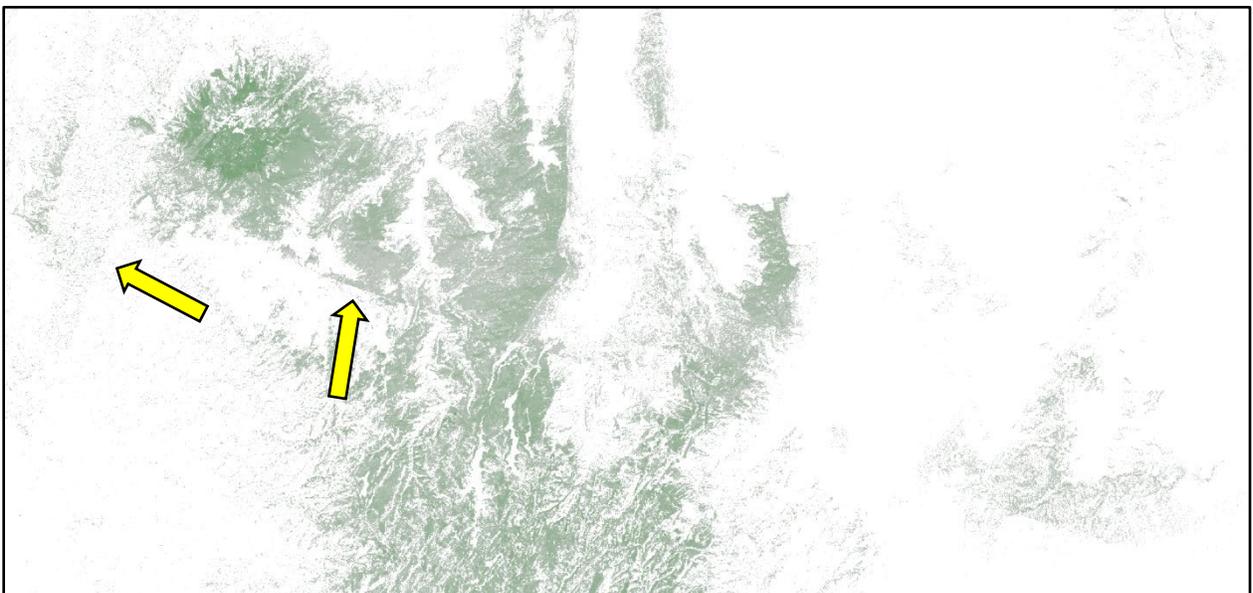


Figure 1. Example of seamlines in the NLCD 2016 tree canopy cover image.

Background:

Tree canopy cover products were built for the NLCD using two types of spatial units: mapping zones and Landsat path/row footprints. These two types of spatial units were used in different ways within the production workflow. Mapping zones or regions that have similar biophysical and landscape elements (see Figure 2) were used to subset the training data from a nationwide set of training data and develop the tree canopy cover models. These models were then applied to individual Landsat path/rows footprints which differ from and do not conform to the mapping zone boundaries (Figure 3). Each zone has its own set of training data and its own tree canopy cover model.

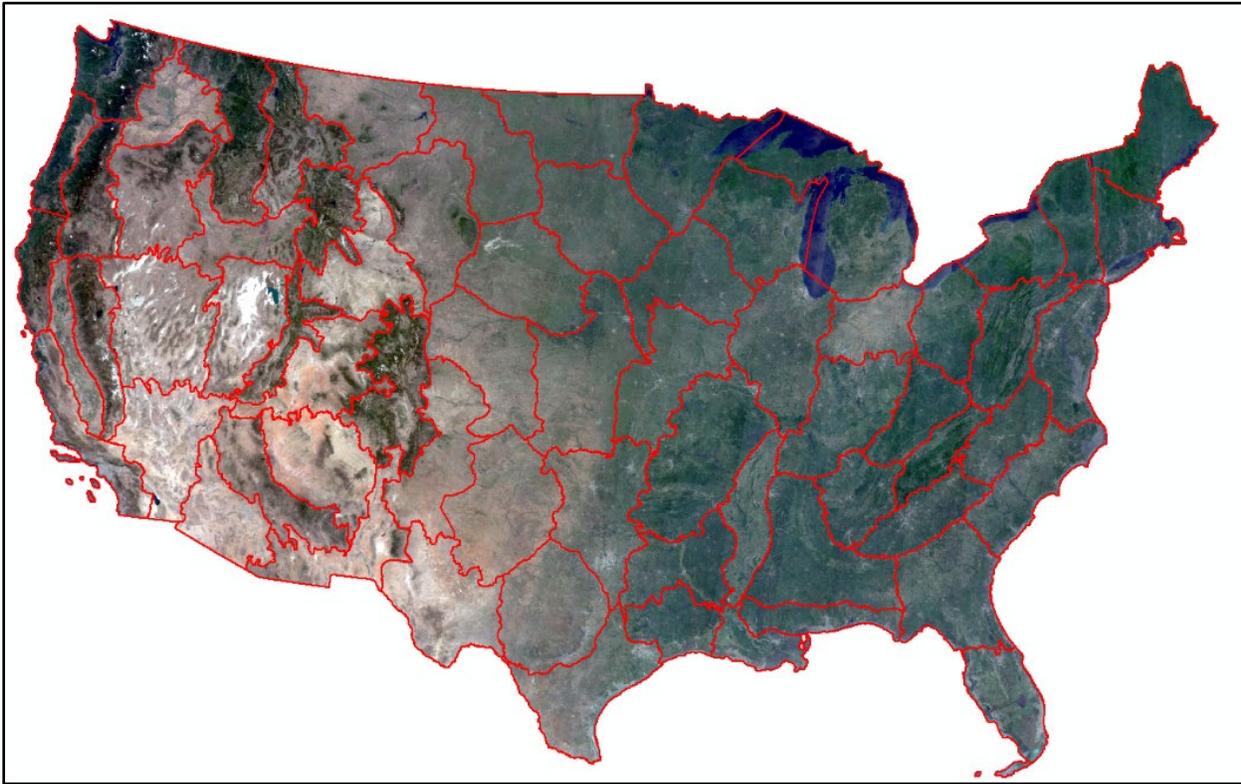


Figure 2. Mapping zones used for producing the NLCD tree canopy cover layers.

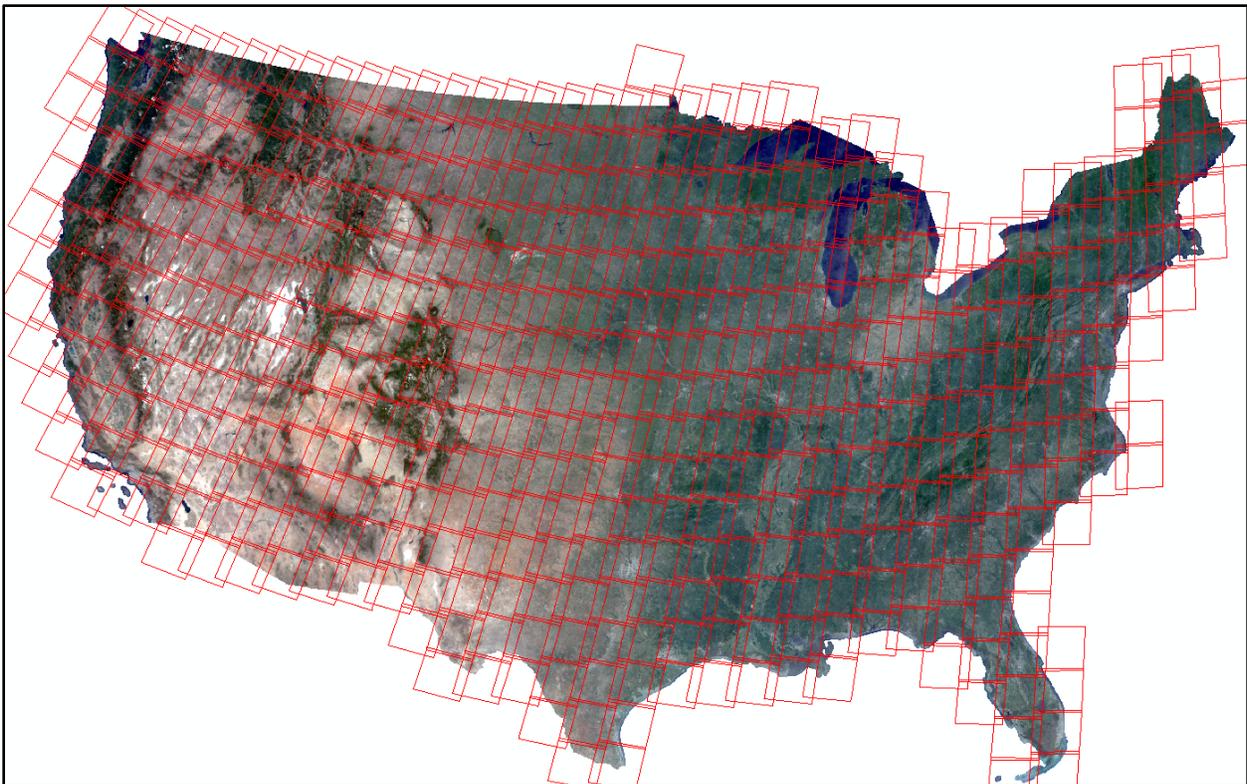


Figure 3. Landsat path/row grid (footprint) used for producing the NLCD tree canopy cover layers.

Discussion:

Seamlines in the final NLCD maps are a product of applying statistical models to Landsat path/row footprints containing unique spectral data. Efforts were made to reduce artifacts by having overlap between individual footprints, using training data from each footprint, and reviewing the non-tree thresholds of adjacent footprints.

In Figure 4, there are two mapping zones, 23 and 24 (red boundaries), and four Landsat path/row footprints (blue boundaries): 37034 (to the left), 36034 (upper), and 36035 (lower). (Landsat path/row footprint 37035 is also shown in Fig. 4 but is not relevant to this example.) These three path/rows intersect in both the 23 and 24 mapping zones. Because these three Landsat path/rows intersected with multiple mapping zones, and because each zone has its own training dataset, tree canopy cover for each of these three Landsat path/rows was modeled and mapped multiple times.

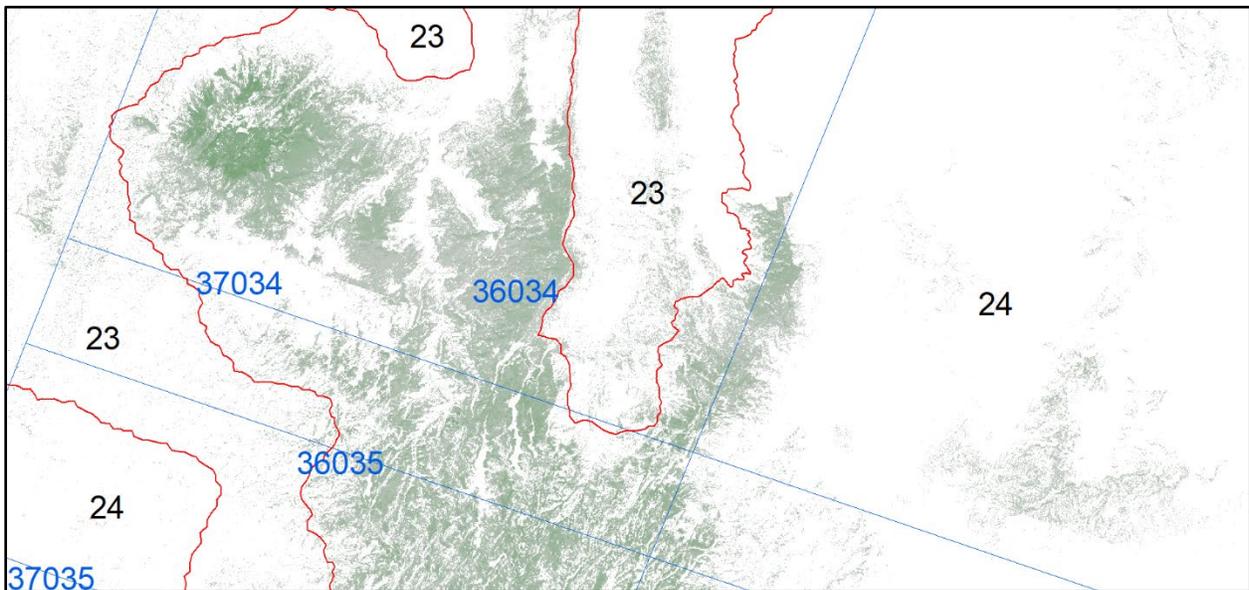


Figure 4. Tree canopy cover image overlaid with mapping zones (red boundaries) and Landsat path/row grid (blue boundaries).

As is shown in Figure 5, mapping zones 23 and 24 appear to have similar landscapes. They encompass mostly arid landscapes with low tree canopy cover. However, there are subtle differences between the two zones. As is shown in the graph in Figure 6, mapping zone 23 has more deciduous trees (decid) while zone 24 has more herbaceous landcover (herb). Mapping zone 23 has 5% more trees than zone 24. These differences in landcover types are reflective of the different biophysical properties of the two mapping zones and can lead to variations in modeling tree canopy cover.

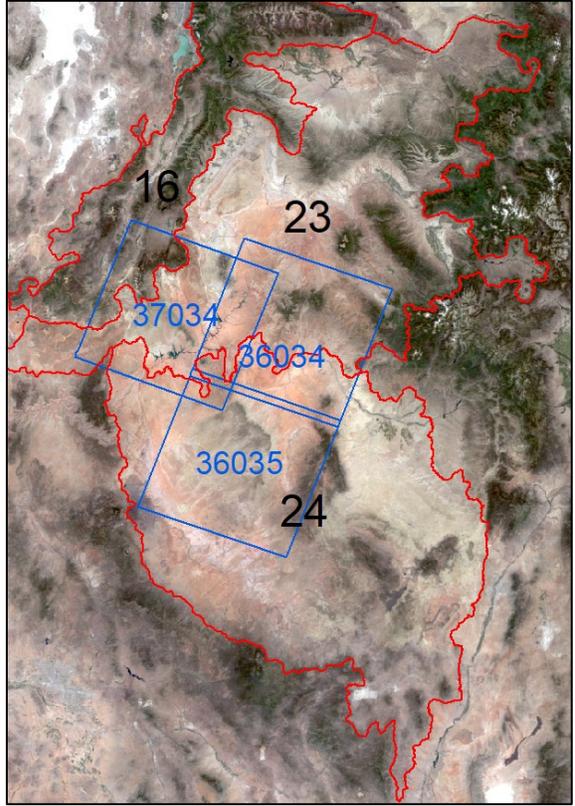


Figure 5. Depiction of mapping zones 23 and 24 (red boundaries) with Landsat path/rows 37034, 36034, and 36035 (blue boundaries).

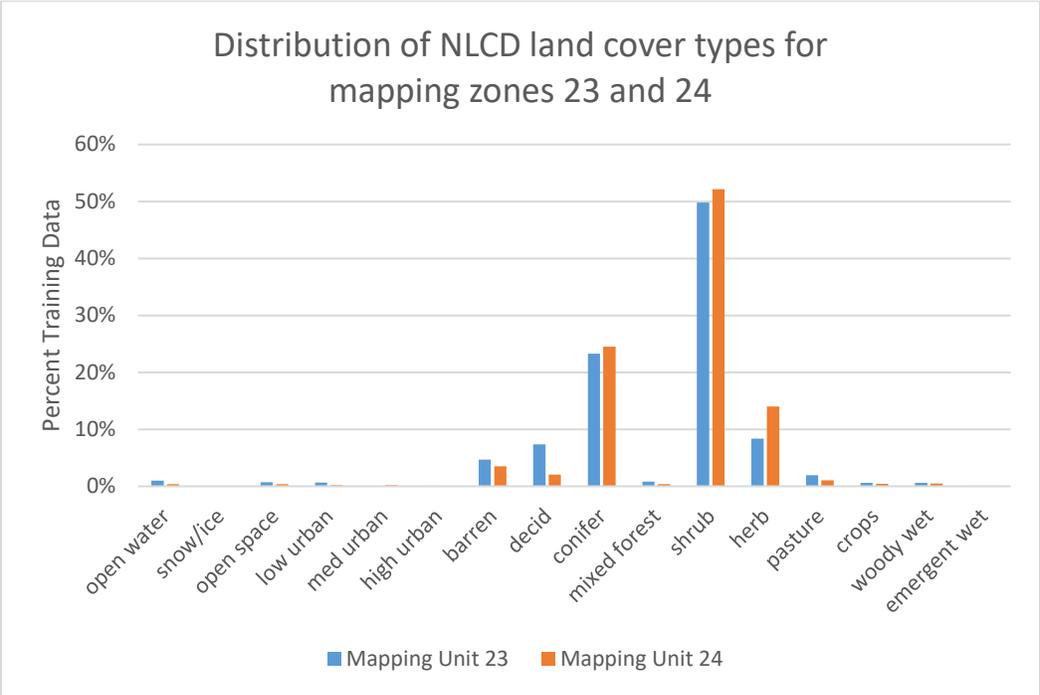


Figure 6. NLCD landcover types for mapping zone 23 and 24.

Producing the Final CONUS TCC Map:

For each Landsat path/row footprint, tree canopy cover layers (% canopy cover and standard error) were produced using information from each mapping zone that intersected it. The tree canopy cover values for these footprints varied because they were generated from different models. Assembling the CONUS NLCD layer involved selecting the most appropriate tree canopy cover label for pixels in these overlap areas. Initially the pixels with the lowest standard error were used because it was assumed that these were the better tree canopy cover values. However, this assumption was not always valid. Challenging situations were encountered including unnatural/artificial boundaries between adjacent Landsat path/row footprints. In these cases, skilled remote sensing analysts meticulously examined the model outputs from overlapping mapping zones and made substitutions where appropriate. The analysts selected the models which resulted in the best overall representation of tree canopy cover while also considering the visual appearance of the final layer. Care was taken to ensure that artificial boundaries happened very infrequently and if they did, they occurred in areas where their impacts could be minimized.