

LANDFIRE Product Assessment: Eastern Milestone Super Zone Analysis and Report

Introduction

The interagency LANDFIRE project worked to produce quality products from available data sets. The Eastern Milestone Assessment followed the processes outlined in the LANDFIRE Product Quality Control and Assessment Plan (PQCA Plan), which was approved by LANDFIRE leadership and presents full disclosure of all pertinent information concerning the approach to assess quality of the LANDFIRE products. The project completed a suite of reports and results for the various Eastern Milestone mapping zones that are currently available at:

http://www.landfire.gov/products_dataquality.php

This report is a follow-up to those reports and it provides the estimated overall LANDFIRE National Existing Vegetation Type agreement results for the Eastern Milestone Super Zones. The reader is advised to download and read that report at www.landfire.gov for important context information.

What follows is a report of the outcomes of the Eastern Milestone (EUS) product quality assessment process for the LANDFIRE National Existing Vegetation Type (EVT), and Canopy Fuels. The purpose of this report is to provide as much information as possible to potential users to support the analysis and application of certain LANDFIRE National products, such as:

- a general understanding of the quality and characteristics of certain products, and
- information that will help users apply the data appropriately, or understand how they might have to adjust the data to utilize it locally.
- sample sizes across assessment geographies and mapped categories to allow users to evaluate the agreement assessment results themselves.

The LANDFIRE Product Quality Team is responsible for this report and for defining, coordinating and conducting the product quality assessment procedures. Please contact the LANDFIRE Help Desk (helpdesk@landfire.gov) with any questions or issues. For more information on the Product Quality Team and the procedures used, please review the material available at www.landfire.gov/products_dataquality.php.

Assessment Process

LF National (LFNA) EVT in the EUS can be assessed with a quantitative process because this product was directly generated from geo-referenced field plots contained in the LANDFIRE Reference Data Base (LFRDB). However, we could

not use the same procedure to analyze other LFNA spatial layers, such as Biophysical Setting, Fire Regimes, etc., because they were derived using rule sets, simulation methods, or there were insufficient plots available for a useful quantitative assessment. The assessment process evaluated the agreement between the mapped LANDFIRE products and hold-out plots. Because there are always numerous issues with the holdout plots, such as total sample size, plot classification methodology, variable plot quality, etc., we chose to use the term “agreement” rather than “accuracy”. This distinction is common in the literature.

EVT

A 2% systematic areal sample of 3 km by 3 km blocks was used to select the holdout sample of LFRDB plots that formed the foundation of the assessment process for EVT. Every holdout plot was attributed with a “Reference” Ecological System using an automated sequence table process, and compared to the corresponding value from the LANDFIRE product. Results were summarized in standard contingency tables.

Even with the tens of thousands of plots that comprise the LFRDB, the geographic distribution and number of plots available in the 2% holdout sample presented problems (see “PQCA Plan” on this webpage for more detail on the sample design). Some map zones had few plots (even though the holdout sample was a systematic geographic design), and within every individual map zone the less commonly occurring map classes had few or no holdout sample plots selected. Because the sample size of holdout plots was not adequate to support precise estimates of agreement at the map zone level, map zones were aggregated into geographic groups known as Super Zones (Figure 1).

Figure 1: LANDFIRE Agreement Assessment Super Zones for CONUS
 LANDFIRE Map Zones and Super Zones



Individual Map Zone Results

Individual map zone contingency tables will be provided as a separate product at a later date, but users are **strongly cautioned** against using individual map zone results because of sample size and sample distribution issues which severely limit the inferences that can be reliably made from them. Individual map zone results may be interesting and useful to researchers, but probably not to LANDFIRE National (LFNA) product users.

Canopy Fuels

Canopy Fuels cross-validation statistics will be reported at the individual map zone level only because combining cross-validation statistics for individual map zones would not be straightforward, and the resulting inferences would be confusing and likely not informative.

5x5 Spatial Assessments

As in the Western Milestone, “center pixel” agreement and “5 pixel by 5 pixel window” agreement were very similar (generally only 1-3% different) in the Eastern Milestone. Thus, the 5x5 agreement results will not be included in this report. These 5x5 spatial window contingency tables are available for download at www.landfire.gov.

Agreement Metrics

Standard agreement metrics were utilized in the LFNA assessment, namely Overall Agreement, Producer Agreement and User Agreement. Overall agreement is the percentage of total reference plots that had the same map and reference class. Producer Agreement is the percentage of holdout plots in Class “i” that were mapped as Class “i”. User Agreement is the percentage of holdout plots mapped as Class “i” that actually are Class “i” plots in the reference data. Full contingency tables can be examined to identify specific disagreements between classes, often resulting in a more thorough understanding about the types of error, not just the quantity. Refer to the summary tables below for specific examples of each metric.

Assessment Notes

The LFNA agreement assessment process will eventually be one of the largest such processes ever conducted. The LANDFIRE project is large, and the issues are numerous. The purpose of this section of the report is to provide information that will help readers understand potential issues with the assessment results, and ultimately to help LFNA product users apply the results of the assessments appropriately.

Holdout Sample Size and Distribution

- At the map zone level, the sample size in many map classes is too small to permit reliable (precise) class-specific estimates of agreement.

Consequently, LFNA Super Zones are the most appropriate level of analysis for the agreement results below the milestone level.

- Even at the Super Zone level, the sample sizes for the less common map classes are still often quite small, and a significant number of map classes have no sample plots. Accordingly, many of the class-specific estimates of agreement at the Super Zone level are not precise.
- Users are strongly urged to pay attention to sample sizes, and use that information when applying the agreement results.

Class Specific Agreement

- Agreement assessments are based on comparisons between mapped values of EVT at specific locations and the corresponding values assigned to holdout plots in the reference database (i.e., reference values) at the same locations, based on field information.
- Class specific agreement values for classes with low sample size are suspect and unreliable. For example, a class with 2 samples has only 3 possible agreement values: 0%, 50% and 100%. Because of the aggregate sample size and sample distribution among classes, there are many such situations. Thus, class specific agreement will only be reported to categories with at least 5 holdout assessment plots. The full contingency tables, including classes with low numbers of assessment plots, are available for download at www.landfire.gov.
- Ecological Systems are at times difficult to classify on the ground and on imagery since they are “systems” not “cover types”. They are not necessarily mutually exclusive and they tend to grade from one system to another on the ground, sometimes resulting in lower agreements when assessed quantitatively.
- Holdout plots are the best way to evaluate product quality, but they do have limitations. These limitations do not invalidate the agreement assessment, but they should be understood and factored into user inferences.
 - Some holdout plots are relatively old (20-30 years) but still passed basic imagery QA/QC (no major canopy change seen). It is possible that non-agreement is due to plot changes over the time lag.
 - Reference values of EVT are largely assigned to holdout plots using an automated process, based on the vegetation composition data associated with the plots. This process could have errors that are translated into the map and/or the agreement assessment.
 - All plots used in LANDFIRE were geo-referenced (most with GPS), but there is considerable variation in the quality of the final location. Mis-registrations between the LFNA product and the plot location would reduce agreement estimates.

Crosswalks

Crosswalks to other classification units can facilitate evaluation of mapping results at different levels of thematic resolution and provide additional insight to users about how LFNA products can be applied. In the Western Milestone

Reports, we reported agreement results for a number of other classifications systems that might be of interest to particular users. In the Eastern Milestone, however, we did not report the results of the WUS crosswalks because of the interest in using a crosswalk to NVCS, which was not yet approved. If time and resources are available, the LANDFIRE PQWT will compute and report the agreement results once the crosswalks to NVCS Group and Macrogroup are available.

EVT Agreement Results

On the pages that follow, tables summarizing the agreement results for each product in each Super Zone are provided. Information contained in these tables includes, by class:

- LFRDB Plots – The number of holdout plots identified as class “i” in the LANDFIRE Reference Data Base.
- Mapped Plots – The number of holdout plots mapped as class “i”.
- Plots with Agreement – The number of holdout plots in class “i” that were mapped as Class “i”.
- Producer Agreement – The percentage of holdout plots in class “i” that were mapped as Class “i”. Calculated as: $(\text{Plots with Agreement}) / (\text{LFRDB Plots}) * 100$.
- User Agreement – The percentage of holdout plots mapped as class “i” that are identified as class “i” in the reference database. Calculated as: $(\text{Plots with Agreement}) / (\text{Mapped Plots}) * 100$.
- LFRDB Percent - Percentage of all holdout plots in the Super Zone that are identified as class “i” in the reference database. Calculated as: $(\text{LFRDB Plots}) / (\text{Total number of holdout plots}) * 100$.
- Mapped Percent – Percentage of all holdout plots in the Super Zone that were mapped as class “i”. Calculated as: $(\text{Mapped Plots}) / (\text{Total number of holdout plots}) * 100$.
- DIFF – The difference between Mapped Percent and LFRDB Percent. Calculated as: $\text{Mapped Percent} - \text{LFRDB Percent}$.
 - If this number is positive, then there is more area of the class in the map than in the plot database (as indicated by mapped values at holdout point locations); i.e. – a sample from holdout plot locations suggests that it may be over-mapped.
 - If this number is negative, then there is less area of the class in the map than in the plot database (as indicated by mapped values at holdout plot locations); i.e. – a sample from holdout plot locations suggests that it may be under-mapped.
 - The value of this number suggests the degree to which the class may be over- or under-mapped.

The tables below are intended to be class-specific summaries of agreement within each Super Zone. Full contingency tables for each Super Zone can be downloaded at the same web location as this report for users interested in

viewing the full assessment data. Full contingency tables can be examined in-depth to identify specific disagreements between classes, often resulting in a more thorough understanding about the types of error present in a map, not just the quantity of errors. Users interested in a broader level summary are encouraged to download and review the LANDFIRE National Eastern Milestone Agreement Summary Report, which is a summary of overall agreement by LFNA Super Zone.

Great Lakes (Map Zones 41, 49, 50, 51, 52, 62)

Table 1. Great Lakes Super Zone Summary for Existing Vegetation Type-Ecological Systems

Name	Code	Class Specific Holdout Plot Agreement					Proportional Agreement		
		LFRDB Plots	Mapped Plots	Plots with Agreement	Producer Agreement	User Agreement	LFRDB Percent	Mapped Percent	DIFF
Laurentian-Acadian Northern Hardwoods Forest	2302	206	152	121	58.7%	79.6%	36.14%	26.67%	-9.47%
Boreal Aspen-Birch Forest	2301	93	125	44	47.3%	35.2%	16.32%	21.93%	5.61%
Laurentian-Acadian Swamp and Bog Systems	2481	38	44	14	36.8%	31.8%	6.67%	7.72%	1.05%
Boreal Swamp and Bog Systems	2477	31	61	25	80.7%	41.0%	5.44%	10.70%	5.26%
Boreal White Spruce-Fir-Hardwood Forest	2365	26	27	7	26.9%	25.9%	4.56%	4.74%	0.18%
Laurentian Pine-Oak Barrens	2407	23	21	13	56.5%	61.9%	4.04%	3.68%	-0.35%
Laurentian-Acadian Northern Pine(-Oak) Forest	2362	20	24	12	60.0%	50.0%	3.51%	4.21%	0.70%
South-Central Interior Mesophytic Forest	2321	17	15	11	64.7%	73.3%	2.98%	2.63%	-0.35%
North-Central Interior Maple-Basswood Forest	2314	15	15	8	53.3%	53.3%	2.63%	2.63%	0.00%
Managed Tree Plantation-Northern and Central Hardwood and Conifer Plantation Group	2534	14	5	5	35.7%	100.0%	2.46%	0.88%	-1.58%
Central Interior and Appalachian Floodplain Systems	2471	11	9	5	45.5%	55.6%	1.93%	1.58%	-0.35%
North-Central Interior Dry-Mesic Oak Forest and Woodland	2310	9	11	4	44.4%	36.4%	1.58%	1.93%	0.35%
Boreal Jack Pine-Black Spruce Forest	2344	9	1	0	0.0%	0.0%	1.58%	0.18%	-1.40%
North-Central Interior Dry Oak Forest and Woodland	2311	8	7	3	37.5%	42.9%	1.40%	1.23%	-0.18%
Laurentian-Acadian Herbaceous Wetland Systems	2494	8	11	6	75.0%	54.6%	1.40%	1.93%	0.53%

Laurentian-Acadian Pine-Hemlock-Hardwood Forest	2366	6	4	4	66.7%	100.0%	1.05%	0.70%	-0.35%
Eastern Boreal Floodplain	2444	5	1	0	0.0%	0.0%	0.88%	0.18%	-0.70%

Table 2. Great Lakes Ecological Systems with 4 or fewer holdout assessment plots.

Appalachian (Hemlock-)Northern Hardwood Forest	2370
Laurentian-Acadian Floodplain Systems	2475
Northeastern Interior Dry-Mesic Oak Forest	2303
Paleozoic Plateau Bluff and Talus	2517
North-Central Interior Beech-Maple Forest	2313
Great Lakes Dune and Swale	2466
Eastern Great Plains Floodplain Systems	2469
Central Interior and Appalachian Swamp Systems	2479
Eastern Great Plains Wet Meadow-Prairie-Marsh	2488
Ruderal Forest-Northern and Central Hardwood and Conifer	2532
Introduced Upland Vegetation - Perennial Grassland and Forbland	2182
Allegheny-Cumberland Dry Oak Forest and Woodland	2317
North-Central Interior Sand and Gravel Tallgrass Prairie	2412
Central Interior and Appalachian Herbaceous Wetland Systems	2493
North-Central Interior Wet Flatwoods	2518
Recently Logged Timberland-Herbaceous Cover	2191
North-Central Oak Barrens	2395
Great Lakes Coastal Marsh Systems	2492

Northeast (Map Zones 60, 61, 63, 64, 65, 66)

Table 3. Northeast Super Zone Summary for Existing Vegetation Type-Ecological Systems

Name	Code	Class Specific Holdout Plot Agreement					Proportional Agreement		
		LFRDB Plots	Mapped Plots	Plots with Agreement	Producer Agreement	User Agreement	LFRDB Percent	Mapped Percent	DIFF
Laurentian-Acadian Northern Hardwoods Forest	2302	217	222	185	85.3%	83.3%	24.58%	25.14%	0.57%
Acadian-Appalachian Montane Spruce-Fir-Hardwood Forest	2374	102	113	93	91.2%	82.3%	11.55%	12.80%	1.25%
Gulf and Atlantic Coastal Plain Tidal Marsh Systems	2490	80	66	66	82.5%	100.0%	9.06%	7.47%	-1.59%
Appalachian (Hemlock-) Northern Hardwood Forest	2370	79	108	59	74.7%	54.6%	8.95%	12.23%	3.28%
Ruderal Forest-Northern and Central Hardwood and Conifer	2532	49	41	7	14.3%	17.1%	5.55%	4.64%	-0.91%
Central Appalachian Dry Oak-Pine Forest	2369	35	31	19	54.3%	61.3%	3.96%	3.51%	-0.45%

Central and Southern Appalachian Montane Oak Forest	2320	28	10	7	25.0%	70.0%	3.17%	1.13%	-2.04%
Northeastern Interior Dry-Mesic Oak Forest	2303	25	24	4	16.0%	16.7%	2.83%	2.72%	-0.11%
Gulf and Atlantic Coastal Plain Swamp Systems	2480	23	13	10	43.5%	76.9%	2.60%	1.47%	-1.13%
Laurentian-Acadian Swamp Systems	2526	21	14	7	33.3%	50.0%	2.38%	1.59%	-0.79%
Laurentian-Acadian Pine-Hemlock-Hardwood Forest	2366	19	23	7	36.8%	30.4%	2.15%	2.60%	0.45%
Atlantic Coastal Plain Mesic Hardwood Forest	2343	18	23	10	55.6%	43.5%	2.04%	2.60%	0.57%
Northern Atlantic Coastal Plain Maritime Forest	2379	18	11	6	33.3%	54.6%	2.04%	1.25%	-0.79%
Acadian Low-Elevation Spruce-Fir-Hardwood Forest	2373	14	20	11	78.6%	55.0%	1.59%	2.27%	0.68%
Central Appalachian Pine-Oak Rocky Woodland	2377	14	5	1	7.1%	20.0%	1.59%	0.57%	-1.02%
Southern and Central Appalachian Cove Forest	2318	11	20	8	72.7%	40.0%	1.25%	2.27%	1.02%
Northern Atlantic Coastal Plain Pitch Pine Barrens	2355	11	9	9	81.8%	100.0%	1.25%	1.02%	-0.23%
Atlantic Coastal Plain Northern Dune and Maritime Grassland	2436	10	28	9	90.0%	32.1%	1.13%	3.17%	2.04%
Northern Atlantic Coastal Plain Dry Hardwood Forest	2324	9	20	5	55.6%	25.0%	1.02%	2.27%	1.25%
Laurentian-Acadian Herbaceous Wetland Systems	2494	9	8	5	55.6%	62.5%	1.02%	0.91%	-0.11%
Central Interior and Appalachian Swamp Systems	2479	8	9	5	62.5%	55.6%	0.91%	1.02%	0.11%
Gulf and Atlantic Coastal Plain Floodplain Systems	2473	7	4	2	28.6%	50.0%	0.79%	0.45%	-0.34%
Central Interior and Appalachian Floodplain Systems	2471	6	2	1	16.7%	50.0%	0.68%	0.23%	-0.45%
Boreal Swamp and Bog Systems	2477	6	3	2	33.3%	66.7%	0.68%	0.34%	-0.34%
Managed Tree Plantation-Northern and Central Hardwood and Conifer Plantation Group	2534	6	4	4	66.7%	100.0%	0.68%	0.45%	-0.23%
Introduced Upland Vegetation - Treed	2187	5	8	5	100.0%	62.5%	0.57%	0.91%	0.34%
Gulf and Atlantic Coastal Plain Small Stream Riparian Systems	2474	5	3	1	20.0%	33.3%	0.57%	0.34%	-0.23%
Managed Tree Plantation-Southeast Conifer and Hardwood Plantation Group	2535	5	4	1	20.0%	25.0%	0.57%	0.45%	-0.11%

Table 4. Northeast Ecological Systems with 4 or fewer holdout assessment plots.

Allegheny-Cumberland Dry Oak Forest and Woodland	2317
Central Interior and Appalachian Riparian Systems	2472
North-Central Interior Wet Flatwoods	2518
Southern Piedmont Mesic Forest	2316
South-Central Interior Mesophytic Forest	2321
Laurentian-Acadian Floodplain Systems	2475
Laurentian-Acadian Salt Marsh and Estuary Systems	2491
Atlantic Coastal Plain Upland Longleaf Pine Woodland	2347
Central and Southern Appalachian Spruce-Fir Forest	2350
Laurentian-Acadian Northern Pine(-Oak) Forest	2362
Acadian-Appalachian Subalpine Woodland and Barrens	2389
Atlantic Coastal Plain Northern Pitch Pine Lowland	2456
Ruderal Forest-Southeast Hardwood and Conifer	2533
North-Central Appalachian Pine Barrens	2354
Atlantic Coastal Plain Central Maritime Forest	2361
Southern Piedmont Dry Oak(-Pine) Forest	2368
Acadian-Appalachian Alpine Barrens	2386
Central Appalachian Alkaline Glade and Woodland	2400
Great Lakes Alvar	2409
Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest	2501
Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest	2335
Appalachian Shale Barrens	2340

Northern Plains (Map Zones 29, 30, 31, 33, 38, 39, 40, 42, 43)

Table 5. Northern Plains Super Zone Summary for Existing Vegetation Type-Ecological Systems

Name	Code	Class Specific Holdout Plot Agreement					Proportional Agreement		DIFF
		LFRDB Plots	Mapped Plots	Plots with Agreement	Producer Agreement	User Agreement	LFRDB Percent	Mapped Percent	
Northwestern Great Plains-Black Hills Ponderosa Pine Woodland and Savanna	2179	180	174	169	93.9%	97.1%	28.99%	28.02%	-0.97%
Northwestern Great Plains Mixedgrass Prairie	2141	70	80	50	71.4%	62.5%	11.27%	12.88%	1.61%
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	2055	40	32	30	75.0%	93.8%	6.44%	5.15%	-1.29%
Central Interior and Appalachian Floodplain Systems	2471	36	36	34	94.4%	94.4%	5.80%	5.80%	0.00%

Western Great Plains Sand Prairie	2148	25	15	6	24.0%	40.0%	4.03%	2.42%	-1.61%
Inter-Mountain Basins Big Sagebrush Steppe	2125	20	28	12	60.0%	42.9%	3.22%	4.51%	1.29%
North-Central Interior Dry-Mesic Oak Forest and Woodland	2310	20	40	19	95.0%	47.5%	3.22%	6.44%	3.22%
Eastern Great Plains Floodplain Systems	2469	19	4	3	15.8%	75.0%	3.06%	0.64%	-2.42%
Western Great Plains Shortgrass Prairie	2149	16	25	11	68.8%	44.0%	2.58%	4.03%	1.45%
Northern Tallgrass Prairie	2420	14	11	11	78.6%	100.0%	2.25%	1.77%	-0.48%
Central Mixedgrass Prairie	2132	13	14	10	76.9%	71.4%	2.09%	2.25%	0.16%
Western Great Plains Wooded Draw and Ravine	2385	12	7	6	50.0%	85.7%	1.93%	1.13%	-0.81%
Western Great Plains Floodplain Systems	2162	11	8	6	54.6%	75.0%	1.77%	1.29%	-0.48%
Central Tallgrass Prairie	2421	11	10	9	81.8%	90.0%	1.77%	1.61%	-0.16%
Paleozoic Plateau Bluff and Talus	2517	11	7	7	63.6%	100.0%	1.77%	1.13%	-0.64%
Western Great Plains Depressional Wetland Systems	2495	10	8	4	40.0%	50.0%	1.61%	1.29%	-0.32%
Rocky Mountain Aspen Forest and Woodland	2011	8	2	1	12.5%	50.0%	1.29%	0.32%	-0.97%
Inter-Mountain Basins Montane Sagebrush Steppe	2126	8	17	2	25.0%	11.8%	1.29%	2.74%	1.45%
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	2166	7	14	3	42.9%	21.4%	1.13%	2.25%	1.13%
North-Central Interior Maple-Basswood Forest	2314	7	8	5	71.4%	62.5%	1.13%	1.29%	0.16%
Ruderal Upland-Old Field	2531	7	6	4	57.1%	66.7%	1.13%	0.97%	-0.16%
Northwestern Great Plains Shrubland	2085	6	5	2	33.3%	40.0%	0.97%	0.81%	-0.16%
Rocky Mountain Lodgepole Pine Forest	2050	5	3	0	0.0%	0.0%	0.81%	0.48%	-0.32%
Southeastern Great Plains Tallgrass Prairie	2423	5	8	5	100.0%	62.5%	0.81%	1.29%	0.48%

Table 6. Northern Great Plains Ecological Systems with 4 or fewer holdout assessment plots.

Southern Rocky Mountain Ponderosa Pine Woodland	2054
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	2061
Inter-Mountain Basins Big Sagebrush Shrubland	2080
North-Central Interior Dry Oak Forest and Woodland	2311
Western Great Plains Tallgrass Prairie	2150
Introduced Upland Vegetation - Perennial Grassland and Forbland	2182

Eastern Great Plains Tallgrass Aspen Parkland	2331
Great Plains Prairie Pothole	2482
Rocky Mountain Alpine/Montane Sparsely Vegetated Systems	2006
Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland	2062
Western Great Plains Sandhill Steppe	2094
Inter-Mountain Basins Semi-Desert Shrub-Steppe	2127
Western Great Plains Foothill and Piedmont Grassland	2147
Inter-Mountain Basins Greasewood Flat	2153
Eastern Great Plains Wet Meadow-Prairie-Marsh	2488
Ruderal Forest-Northern and Central Hardwood and Conifer	2532
Northwestern Great Plains Aspen Forest and Parkland	2009
Western Great Plains Dry Bur Oak Forest and Woodland	2013
Northwestern Great Plains Highland White Spruce Woodland	2048
Rocky Mountain Foothill Limber Pine-Juniper Woodland	2049
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	2051
Rocky Mountain Subalpine Wet-Mesic Spruce-Fir Forest and Woodland	2056
Inter-Mountain Basins Mat Saltbush Shrubland	2066
Wyoming Basins Low Sagebrush Shrubland	2072
Inter-Mountain Basins Mixed Salt Desert Scrub	2081
Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland	2139
Northern Rocky Mountain Subalpine-Upper Montane Grassland	2140
Rocky Mountain Subalpine-Montane Mesic Meadow	2145
Rocky Mountain Montane Riparian Systems	2159
Cultivated Crops and Irrigated Agriculture	2190
Boreal Aspen-Birch Forest	2301
North-Central Oak Barrens	2395
Northern Rocky Mountain Lower Montane Deciduous Shrubland	2106
Rocky Mountain Poor-Site Lodgepole Pine Forest	2167
Northern Rocky Mountain Subalpine Deciduous Shrubland	2169
Introduced Upland Vegetation - Annual Grassland	2181
Artemisia tridentata ssp. vaseyana Shrubland Alliance	2220
North-Central Interior Beech-Maple Forest	2313
North-Central Interior Oak Savanna	2394
Boreal Swamp and Bog Systems	2477
Central Interior and Appalachian Swamp Systems	2479

South Central East (Map Zones 37, 44, 45, 98)

Table 7. South Central East Super Zone Summary for Existing Vegetation Type-Ecological Systems

Name	Code	Class Specific Holdout Plot Agreement					Proportional Agreement	Mapped Percent	DIFF
		LFDRB Plots	Mapped Plots	Plots with Agreement	Producer Agreement	User Agreement	LFDRB Percent		
Ozark-Ouachita Dry-Mesic Oak Forest	2304	416	457	399	95.910%	87.310%	65.72%	72.20%	6.48%

Gulf and Atlantic Coastal Plain Tidal Marsh Systems	2490	74	74	74	100.000%	100.000%	11.69%	11.69%	0.00%
Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland	2367	43	36	24	55.810%	66.670%	6.79%	5.69%	-1.11%
Ozark-Ouachita Mesic Hardwood Forest	2334	27	7	2	7.410%	28.570%	4.27%	1.11%	-3.16%
Managed Tree Plantation-Southeast Conifer and Hardwood Plantation Group	2535	15	11	7	46.670%	63.640%	2.37%	1.74%	-0.63%
Ozark-Ouachita Dry Oak Woodland	2364	12	0	0	0.000%	0.000%	1.90%	0.00%	-1.90%
West Gulf Coastal Plain Pine-Hardwood Forest	2371	8	10	6	75.000%	60.000%	1.26%	1.58%	0.32%
West Gulf Coastal Plain Mesic Hardwood Forest	2323	6	5	4	66.670%	80.000%	0.95%	0.79%	-0.16%

Table 8. South Central East Ecological Systems with 4 or fewer holdout assessment plots.

Ruderal Upland-Treed	2194
Gulf and Atlantic Coastal Plain Floodplain Systems	2473
Central Interior Highlands Calcareous Glade and Barrens	2401
West Gulf Coastal Plain Pine-Hardwood Flatwoods	2458
Gulf and Atlantic Coastal Plain Small Stream Riparian Systems	2474
Gulf and Atlantic Coastal Plain Swamp Systems	2480
Introduced Wetland Vegetation-Tree	2536
North-Central Interior Dry-Mesic Oak Forest and Woodland	2310
North-Central Interior Maple-Basswood Forest	2314
Central Interior and Appalachian Floodplain Systems	2471
Ouachita Montane Oak Forest	2312
Central Interior Highlands Dry Acidic Glade and Barrens	2363
West Gulf Coastal Plain Sandhill Oak and Shortleaf Pine Forest and Woodland	2378
Recently Logged Timberland-Herbaceous Cover	2191
North-Central Interior Dry Oak Forest and Woodland	2311
West Gulf Coastal Plain Wet Longleaf Pine Savanna and Flatwoods	2451
West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods	2506

South Central West (Map Zones 25, 26, 27, 32, 34, 35, 36)

Table 9: South Central West Super Zone Summary for Existing Vegetation Type-Ecological Systems

Name	Code	Class Specific Holdout Plot Agreement					Proportional Agreement		
		LFDRB Plots	Mapped Plots	Plots with Agreement	Producer Agreement	User Agreement	LFDRB Percent	Mapped Percent	DIFF
Apacherian-Chihuahuan Semi-Desert Grassland and Steppe	2121	41	39	21	51.2%	53.9%	10.10%	9.61%	-0.49%
Western Great Plains Shortgrass Prairie	2149	31	58	26	83.9%	44.8%	7.64%	14.29%	6.65%
Chihuahuan Creosotebush Desert Scrub	2074	24	24	14	58.3%	58.3%	5.91%	5.91%	0.00%
Madrean Pinyon-Juniper Woodland	2025	22	22	16	72.7%	72.7%	5.42%	5.42%	0.00%
Edwards Plateau Dry-Mesic Slope Forest and Woodland	2523	20	17	16	80.0%	94.1%	4.93%	4.19%	-0.74%
Modified/Managed Southern Tall Grassland	2540	18	15	13	72.2%	86.7%	4.43%	3.69%	-0.74%
Apacherian-Chihuahuan Mesquite Upland Scrub	2095	16	16	8	50.0%	50.0%	3.94%	3.94%	0.00%
Central Mixedgrass Prairie	2132	16	13	12	75.0%	92.3%	3.94%	3.20%	-0.74%
Tamaulipan Mesquite Upland Scrub	2391	16	18	15	93.8%	83.3%	3.94%	4.43%	0.49%
Edwards Plateau Limestone Savanna and Woodland	2383	14	20	12	85.7%	60.0%	3.45%	4.93%	1.48%
Chihuahuan Mixed Desert and Thorn Scrub	2100	11	19	6	54.6%	31.6%	2.71%	4.68%	1.97%
Crossttimbers Oak Forest and Woodland	2308	11	12	10	90.9%	83.3%	2.71%	2.96%	0.25%
Madrean Encinal	2023	9	3	3	33.3%	100.0%	2.22%	0.74%	-1.48%
Western Great Plains Sandhill Steppe	2094	9	8	7	77.8%	87.5%	2.22%	1.97%	-0.25%
Southern Rocky Mountain Pinyon-Juniper Woodland	2059	8	11	4	50.0%	36.4%	1.97%	2.71%	0.74%
Edwards Plateau Limestone Shrubland	2393	8	11	4	50.0%	36.4%	1.97%	2.71%	0.74%
Gulf and Atlantic Coastal Plain Floodplain Systems	2473	8	7	6	75.0%	85.7%	1.97%	1.72%	-0.25%
Western Great Plains Depressional Wetland Systems	2495	8	0	0	0.0%	0.0%	1.97%	0.00%	-1.97%
Mogollon Chaparral	2104	7	4	3	42.9%	75.0%	1.72%	0.99%	-0.74%
Central Texas Coastal Fringe Forest and Woodland	2338	7	6	6	85.7%	100.0%	1.72%	1.48%	-0.25%

Tamaulipan Calcareous Thornscrub	2392	6	4	4	66.7%	100.0%	1.48%	0.99%	-0.49%
Llano Uplift Granitic Forest-Woodland-Glade	2410	6	0	0	0.0%	0.0%	1.48%	0.00%	-1.48%
Chihuahuan Loamy Plains Desert Grassland	2503	6	5	3	50.0%	60.0%	1.48%	1.23%	-0.25%
North American Warm Desert Sparsely Vegetated Systems	2004	5	0	0	0.0%	0.0%	1.23%	0.00%	-1.23%
Southern Rocky Mountain Ponderosa Pine Woodland	2054	5	1	1	20.0%	100.0%	1.23%	0.25%	-0.99%
Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub	2076	5	6	1	20.0%	16.7%	1.23%	1.48%	0.25%
Inter-Mountain Basins Semi-Desert Shrub-Steppe	2127	5	4	1	20.0%	25.0%	1.23%	0.99%	-0.25%
Tamaulipan Riparian Systems	2476	5	0	0	0.0%	0.0%	1.23%	0.00%	-1.23%

Table 10. South Central West Ecological Systems with 4 or fewer holdout assessment plots.

Southern Rock Mountain Juniper Woodland and Savanna	2119
Chihuahuan Mixed Salt Desert Scrub	2075
Western Great Plains Mesquite Woodland and Shrubland	2111
Western Great Plains Foothill and Piedmont Grassland	2147
North American Warm Desert Riparian Systems	2155
Ozark-Ouachita Dry-Mesic Oak Forest	2304
East-Central Texas Plains Post Oak Savanna and Woodland	2519
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	2051
Inter-Mountain Basins Mixed Salt Desert Scrub	2081
Rocky Mountain Lower Montane-Foothill Shrubland	2086
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	2107
Sonoran Paloverde-Mixed Cacti Desert Scrub	2109
Chihuahuan Sandy Plains Semi-Desert Grassland	2133
Western Great Plains Floodplain Systems	2162
Introduced Riparian Vegetation	2180
Introduced Upland Vegetation - Perennial Grassland and Forbland	2182
Cultivated Crops and Irrigated Agriculture	2190
Crosstimbers Southern Pine Forest and Woodland	2358
South Texas Sand Sheet Grassland	2442
Gulf and Atlantic Coastal Plain Small Stream Riparian Systems	2474
Chihuahuan-Sonoran Desert Bottomland and Swale Grassland	2504
Western Great Plains Sparsely Vegetated Systems	2007
Colorado Plateau Pinyon-Juniper Woodland	2016
Madrean Lower Montane Pine-Oak Forest and Woodland	2024
Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	2057
Colorado Plateau Mixed Low Sagebrush Shrubland	2064
Sonora-Mojave Creosotebush-White Bursage Desert Scrub	2087

Madrean Juniper Savanna	2116
Abies concolor Forest Alliance	2208
Edwards Plateau Riparian	2525
Chihuahuan Succulent Desert Scrub	2077
Inter-Mountain Basins Big Sagebrush Shrubland	2080
Madrean Oriental Chaparral	2101
Western Great Plains Sand Prairie	2148
Rocky Mountain Montane Riparian Systems	2159
Introduced Upland Vegetation - Annual and Biennial Forbland	2183
Recently Logged Timberland-Herbaceous Cover	2191
Ruderal Upland-Treed	2194
Tamaulipan Floodplain	2467
Edwards Plateau Mesic Canyon	2524
Managed Tree Plantation-Southeast Conifer and Hardwood Plantation Group	2535
Introduced Wetland Vegetation-Tree	2536

Southeast (Map Zones 46, 55, 56, 58, 99)

Table 11. Southeast Super Zone Summary for Existing Vegetation Type-Ecological Systems.

Name	Code	Class Specific Holdout Plot Agreement					Proportional Agreement		DIFF
		LFRDB Plots	Mapped Plots	Plots with Agreement	Producer Agreement	User Agreement	LFRDB Percent	Mapped Percent	
Managed Tree Plantation-Southeast Conifer and Hardwood Plantation Group	2535	121	104	65	53.7%	62.5%	19.30%	16.59%	-2.71%
East Gulf Coastal Plain Near-Coast Pine Flatwoods	2454	80	73	50	62.5%	68.5%	12.76%	11.64%	-1.12%
Atlantic Coastal Plain Mesic Hardwood Forest	2343	68	13	0	0.0%	0.0%	10.85%	2.07%	-8.77%
Southern Coastal Plain Dry Upland Hardwood Forest	2330	39	43	37	94.9%	86.1%	6.22%	6.86%	0.64%
Southern Coastal Plain Nonriverine Cypress Dome	2460	35	32	22	62.9%	68.8%	5.58%	5.10%	-0.48%
Gulf and Atlantic Coastal Plain Swamp Systems	2480	35	48	28	80.0%	58.3%	5.58%	7.66%	2.07%
South Florida Everglades Sawgrass Marsh	2483	34	33	33	97.1%	100.0%	5.42%	5.26%	-0.16%
Central Florida Pine Flatwoods	2453	29	23	14	48.3%	60.9%	4.63%	3.67%	-0.96%
Gulf and Atlantic Coastal Plain Small Stream Riparian Systems	2474	23	56	2	8.7%	3.6%	3.67%	8.93%	5.26%
Gulf and Atlantic Coastal Plain Floodplain Systems	2473	20	24	4	20.0%	16.7%	3.19%	3.83%	0.64%
South Florida Pine Flatwoods	2446	18	14	8	44.4%	57.1%	2.87%	2.23%	-0.64%
Atlantic Coastal Plain Upland Longleaf Pine Woodland	2347	17	16	11	64.7%	68.8%	2.71%	2.55%	-0.16%

Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland	2346	16	16	14	87.5%	87.5%	2.55%	2.55%	0.00%
Atlantic Coastal Plain Streamhead Seepage Swamp-Pocosin- Baygall	2468	16	7	2	12.5%	28.6%	2.55%	1.12%	-1.44%
Floridian Highlands Freshwater Marsh	2489	10	13	10	100.0%	76.9%	1.59%	2.07%	0.48%
Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest	2335	9	19	3	33.3%	15.8%	1.44%	3.03%	1.59%
Southern Coastal Plain Mesic Slope Forest	2357	8	11	0	0.0%	0.0%	1.28%	1.75%	0.48%
East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland	2349	7	6	4	57.1%	66.7%	1.12%	0.96%	-0.16%
Atlantic Coastal Plain Southern Wet Pine Savanna and Flatwoods	2450	6	3	0	0.0%	0.0%	0.96%	0.48%	-0.48%
Southern Coastal Plain Seepage Swamp and Baygall	2461	6	5	3	50.0%	60.0%	0.96%	0.80%	-0.16%

Table 12. Southeast Ecological Systems with 4 or fewer holdout assessment plots.

Florida Peninsula Inland Scrub	2387
Florida Dry Prairie	2425
Caribbean Swamp Systems	2478
Ruderal Upland-Treed	2194
East Gulf Coastal Plain Northern Dry Upland Hardwood Forest	2307
Florida Longleaf Pine Sandhill	2356
Atlantic Coastal Plain Northern Wet Longleaf Pine Savanna and Flatwoods	2449
Atlantic Coastal Plain Peatland Pocosin	2452
East Gulf Coastal Plain Savanna and Wet Prairie	2485
Gulf and Atlantic Coastal Plain Tidal Marsh Systems	2490
Introduced Upland Vegetation - Treed	2187
East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest	2372
Atlantic Coastal Plain Southern Maritime Forest	2382
South Florida Cypress Dome	2447

Southern Appalachians (Map Zones 47, 48, 53, 54, 59)

Table 13. Southern Appalachians Super Zone Summary for Existing Vegetation Type-Ecological Systems.

Name	Code	Class Specific Holdout Plot Agreement					Proportional Agreement		
		LFRDB Plots	Mapped Plots	Plots with Agreement	Producer Agreement	User Agreement	LFRDB Percent	Mapped Percent	DIFF
Southern Interior Low Plateau Dry Oak Forest	2305	60	60	49	81.7%	81.7%	12.77%	12.77%	0.00%
South-Central Interior Mesophytic Forest	2321	55	69	36	65.5%	52.2%	11.70%	14.68%	2.98%
Allegheny-Cumberland Dry Oak Forest and Woodland	2317	51	49	39	76.5%	79.6%	10.85%	10.43%	-
Southern Piedmont Dry Oak(-Pine) Forest	2368	49	56	33	67.4%	58.9%	10.43%	11.91%	1.49%
Southern Appalachian Oak Forest	2315	32	41	29	90.6%	70.7%	6.81%	8.72%	1.91%
Southern and Central Appalachian Cove Forest	2318	32	39	31	96.9%	79.5%	6.81%	8.30%	1.49%
Central Interior and Appalachian Floodplain Systems	2471	24	17	14	58.3%	82.4%	5.11%	3.62%	-
Ruderal Forest-Southeast Hardwood and Conifer	2533	21	19	7	33.3%	36.8%	4.47%	4.04%	-
Southern Piedmont Mesic Forest	2316	20	14	6	30.0%	42.9%	4.26%	2.98%	-
Gulf and Atlantic Coastal Plain Floodplain Systems	2473	15	9	8	53.3%	88.9%	3.19%	1.91%	-
Ruderal Forest-Northern and Central Hardwood and Conifer	2532	15	11	6	40.0%	54.6%	3.19%	2.34%	-
Managed Tree Plantation-Southeast Conifer and Hardwood Plantation Group	2535	15	15	12	80.0%	80.0%	3.19%	3.19%	0.00%
Central and Southern Appalachian Montane Oak Forest	2320	13	11	8	61.5%	72.7%	2.77%	2.34%	-
Central Interior and Appalachian Riparian Systems	2472	11	8	3	27.3%	37.5%	2.34%	1.70%	-
Central Interior Highlands Calcareous Glade and Barrens	2401	8	7	6	75.0%	85.7%	1.70%	1.49%	-
Southern Appalachian Montane Pine Forest and Woodland	2352	7	1	0	0.0%	0.0%	1.49%	0.21%	-
Southern Appalachian Grass and Shrub Bald	2414	7	1	1	14.3%	100.0%	1.49%	0.21%	-

East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland	2306	6	8	6	100.0%	75.0%	1.28%	1.70%	0.43%
Southern Appalachian Northern Hardwood Forest	2309	6	7	5	83.3%	71.4%	1.28%	1.49%	0.21%
Managed Tree Plantation-Northern and Central Hardwood and Conifer Plantation Group	2534	5	5	3	60.0%	60.0%	1.06%	1.06%	0.00%

Table 14. Southern Appalachians Ecological Systems with 4 or fewer holdout assessment plots.

Central and Southern Appalachian Spruce-Fir Forest	2350
Introduced Upland Vegetation - Treed	2187
North-Central Interior Beech-Maple Forest	2313
Southern Appalachian Low Elevation Pine Forest	2353
East Gulf Coastal Plain Northern Loess Bluff Forest	2327
Piedmont Hardpan Woodland and Forest	2342
Southeastern Interior Longleaf Pine Woodland	2351
Central Interior Highlands Dry Acidic Glade and Barrens	2363
Appalachian Serpentine Woodland	2375
Eastern Highland Rim Prairie and Barrens	2417
Central Interior and Appalachian Swamp Systems	2479
Gulf and Atlantic Coastal Plain Swamp Systems	2480
Recently Logged Timberland-Herbaceous Cover	2191
Ruderal Upland-Treed	2194
Southern Coastal Plain Dry Upland Hardwood Forest	2330

Canopy Fuel Modeling Fit Statistics

See LANDFIRE PQCA Plan for details on the modeling methods.

Canopy Base Height

Zone	Correlation	Number of plots	Mean Absolute Error (m)	Bias (m)
25	NA	144	2.12	5.4
26	NA	NA	NA	NA
27	0.4	363	2.49	3.3
29	0.36	399	-3.16	5.5
30	NA	NA	NA	NA
31	0.47	447*	-2.21	5.6
32	0.62	3147*	3.07	6.5
33	NA	NA	NA	NA
34	NA	NA	NA	NA
35	0.59	1719*	8.65	6.6
36	0.56	1730*	4.64	6.8
37	0.56	1714	4.52	6.6
38	0.39	273*	-3.52	7.0
39	NA	NA	NA	NA
40	0.45	226*	6.69	7.7
41	0.48	174	-5.78	8.0
42	0.43	127	2.62	6.6
43	0.41	228	-0.96	6.2
44	0.65	1431	3.48	6.3
45	0.44	184	-2.47	5.5
46	0.55	481	-0.02	0.9
47	0.68	866	1.09	8.8
48	0.59	653	0.29	8.9
49	0.56	530	-2.15	7.8
50	0.78	149	1.99	5.4
51	0.67	243	-0.51	6.7
52	0.25	82	12.53	8.7
53	0.7	1031	3.31	10.0
54	0.63	902	-1.47	10.0
55	0.67	1622	2.53	6.3
56	0.43	166	-3.73	8.1
57	0.5	761	2.38	9.5
58	0.48	913	3.59	7.7
59	0.54	637	-0.15	9.5
60	0.7	637	-6.51	10.6
61	0.7	1401	-0.77	9.5
62	0.67	666	-2.41	9.1
63	0.67	722	0.13	8.8
64	0.54	576	0.91	8.7
65	0.44	519	2.03	8.0
66	0.34	278	-4.17	5.9

98	0.37	146	-0.08	8.3
99	0.55	837	4.83	10.8

Canopy Bulk Density

Zone	Correlation	Number of Plots	Bias	Mean Absolute Error
25	NA	144	0.00	0.05
26	NA	NA	NA	NA
27	0.69	363	-0.01	0.06
29	0.61	399	0.00	0.03
30	NA	NA	NA	NA
31	0.64	447*	0.00	0.02
32	0.68	3147*	0.00	0.01
33	NA	NA	NA	NA
34	NA	NA	NA	NA
35	0.66	1719*	0.00	0.01
36	0.66	1730*	0.00	0.01
37	0.65	1714	0.00	0.01
38	0.65	273*	0.00	0.01
39	NA	NA	NA	NA
40	0.64	226*	0.00	0.03
41	0.58	174	0.00	0.03
42	0.49	127	0.00	0.01
43	0.72	228	0.00	0.01
44	0.71	1431	0.00	0.01
45	0.42	184	0.00	0.02
46	0.62	481	0.00	0.01
47	0.66	866	0.00	0.01
48	0.65	653	0.00	0.01
49	0.6	530	0.00	0.01
50	0.64	149	0.00	0.02
51	0.79	243	0.00	0.03
52	0.18	82	0.00	0.01
53	0.41	1031	0.00	0.01
54	0.64	902	0.00	0.01
55	0.67	1622	0.00	0.02
56	0.56	166	0.00	0.04
57	0.48	761	0.00	0.01
58	0.59	913	0.00	0.03
59	0.74	637	0.00	0.01
60	0.61	637	0.00	0.01
61	0.6	1401	0.00	0.01
62	0.4	666	0.00	0.01
63	0.62	722	0.00	0.01
64	0.6	576	0.00	0.01
65	0.66	519	0.00	0.02
66	0.65	278	0.00	0.03

98	0.65	146	0.00	0.03
99	0.61	837	0.00	0.01