FOREST SERVICE
REMOTE SENSING TIPS
VEGETATION MANAGEMENT

LANDFIRE Existing Vegetation Products—How Useful for Midlevel Forest Needs?

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Overview

Can the existing components of the LANDFIRE vegetation databases be used to address regional and/or forest-level mapping needs? The Remote Sensing Applications Center (RSAC) examined LANDFIRE existing vegetation products from zone 16 to answer this question. Our goals were to review these vegetation layers as they apply to 1) information needs for forest plan revisions; and 2) the midlevel mapping standards outlined in the USDA Forest Service Existing Vegetation Classification and Mapping Technical Guide (http://www.fs.fed.us/emc/rig). The products we evaluated characterize existing vegetation by type, cover, and height. Although LANDFIRE existing vegetation products were developed to provide input into specific fire behavior and fuel-loading models, they may also be useful for addressing other vegetation mapping needs within national forests. LANDFIRE map-legend categories and map accuracies must be assessed locally to determine their usefulness. LANDFIRE vegetation products may be especially helpful when forests have no alternative sources of existing vegetation data.

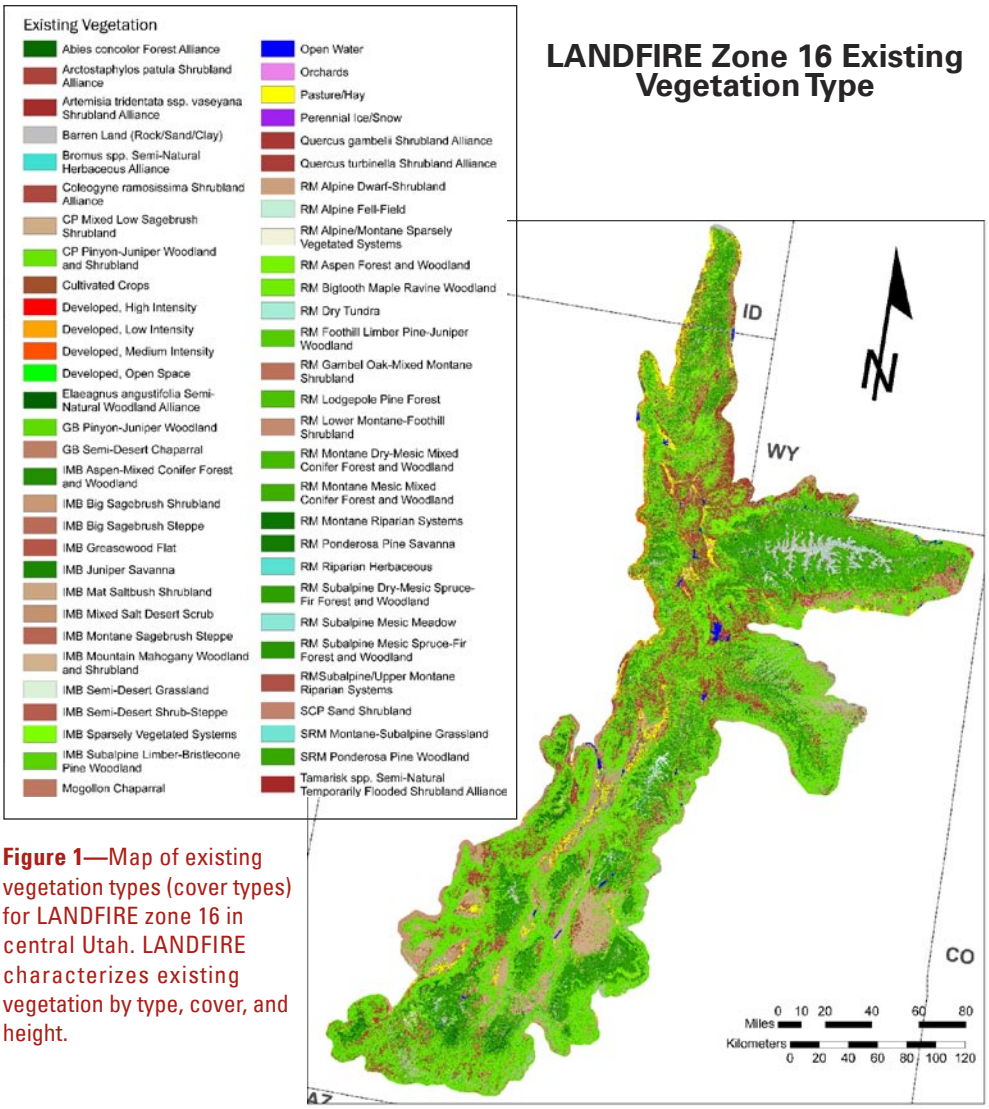

Figure 1—Map of existing vegetation types (cover types) for LANDFIRE zone 16 in central Utah. LANDFIRE characterizes existing vegetation by type, cover, and height.

About LANDFIRE

LANDFIRE is a federally funded research and development project created to produce spatial data describing vegetation and fuel characteristics across the United States This information will be used to identify areas where hazardous fuels are accumulating, prioritize hazardous-fuel-reduction projects, and model real-time and potential fire behavior and effects. Vegetation and structural attributes are mapped by using decision tree (See5) and regression tree (Cubist) algorithms, extensive field reference data, satellite imagery, and biophysical gradient layers (LANDFIRE metadata).

Ecological systems, as developed by NatureServe, form the basis for the legend that will appear on existing vegetation-type maps (figure 1). NatureServe defines these systems as a group of plant communities (associations)

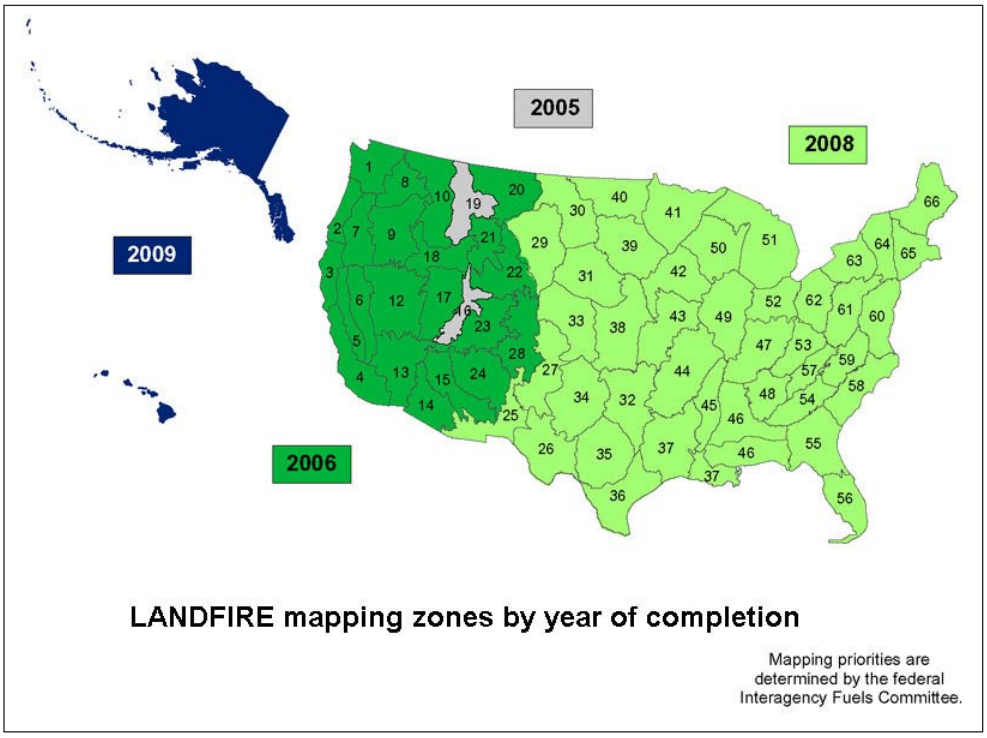

Figure 2—LANDFIRE mapping zones products for zones 16 and 23 are being delivered via the national map (http://gisdata.usgs.net). Completed map products for the entire United States are scheduled for 2008–2009.

that tend to co-occur within landscapes with similar ecological processes, substrates, and/or environmental gradients. More than 125 ecological system units have been identified for the Western United States, although only a subset exists in zone 16. LANDFIRE data is being produced over a 5 year period using U.S. Geological Survey (USGS) mapping zones available from the national map Web site at http://gisdata.usgs.gov/website/landfire/ (figure 2). The vegetation products are delivered in raster format and have a spatial resolution of 30 meters, corresponding to the Landsat Thematic Mapper imagery from which they are modeled. Information about national LANDFIRE products is shown in table 1.

Forest Plan Revision

The typical forest-plan revision process begins with evaluating the current conditions within a forest and identifying specific resource areas that need addressing. Forest plan revisions require information about vegetation condition on which to base goals and objectives. In our study, the Wasatch-Cache, Lolo, Flathead, and Bitterroot National Forests were asked to assess their information needs prior to forest plan revision. These forests provided documents called "Preliminary Analysis of the Management Situation" and "Significant Issues Papers." Both of these documents identified information on existing vegetation, historical vegetation conditions, and potential vegetation types as vital for the development of their forest plan revisions. The most pressing topics requiring existing vegetation information were these:

- Appropriate timber lands—Identifying lands for appropriate timber management, including reforestation, productivity, and protection of watershed health. Data requirements include a midlevel map of forested areas at the species or alliance level. When combined with topographic information, this map can address watershed and erosion concerns.
- Rangeland capability and suitability—Determining rangeland that is accessible and used by grazing animals, including wildlife, and that produces forage or has forage-producing capabilities. Data requirements include detailed maps of shrublands, herbaceous vegetation, and forestlands that support an understory of herbaceous or shrubby vegetation.
- Biodiversity and viability—Evaluating the ability to support viable populations of native and desired non-native species. Data requirements include a forestwide map of existing vegetation conditions, including species composition, canopy closure, and tree-size class. Historical conditions and potential natural vegetation are also important factors.
- Watershed health—Ensuring steady flow of water to sustain water-dependent or related species without degrading the quality of soils. Data requirements include a fine or midlevel map of riparian communities and conditions.

Table 1—Information on LANDFIRE current vegetation products and characteristics

National LANDFIRE Products	
Existing vegetation layers	Existing vegetation Structural stage density/cover Structural stage height
Schedule for completion	Western States—2006 Midwest—2007 Eastern States—2008 Alaska and Hawaii—2009
Data availability as of August 2005	Final zone 16 and prototype zone 21
Methods and map class descriptions available?	Yes—metadata
Map resolution	30 meters
Map scale	1:100,000

For more information, go to http://www.landfire.gov

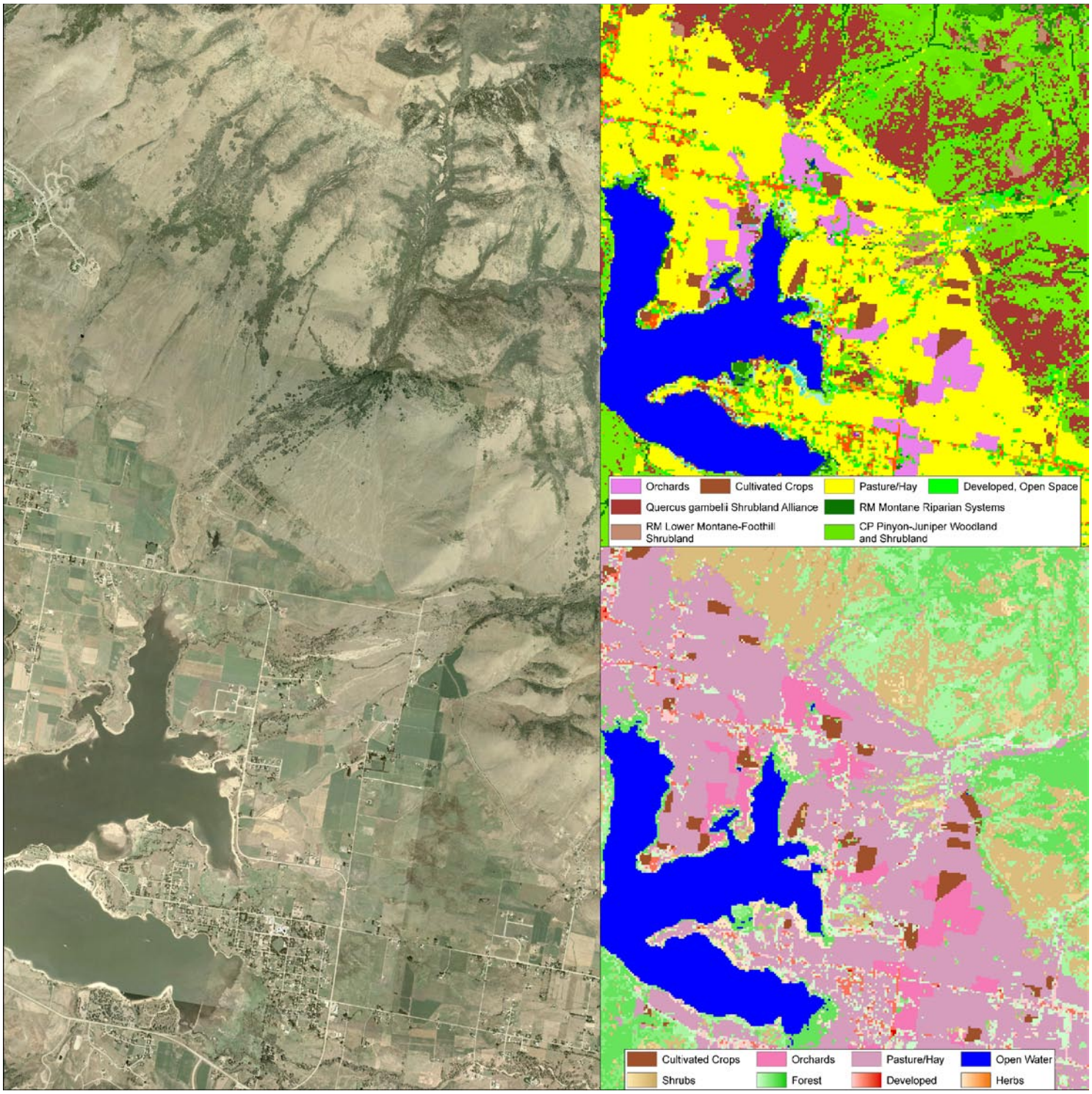

Figure 3—Aerial photo of Pineview Reservoir, Utah, shown with LANDFIRE existing vegetation-type map *(upper right)* and vegetation cover map *(lower right)*. These layers were used to address information needs for forest plan revisions.

Analysis

Our evaluation addressed the way national LANDFIRE existing vegetation products may be used for forest plan revisions based on the standards for midlevel mapping in the *Existing Vegetation Classification and Mapping Technical Guide*. The technical guide provides classification systems and guidelines for mapping existing vegetation and was designed to help forests manage vegetation on their lands.

Analysis was conducted by comparing 1) map-legend categories of LANDFIRE existing vegetation products; 2) requirements outlined in the information-needs assessments; and 3) the midlevel standards described in the technical guide. This study focused only on the list of classes or map legends for the vegetation in zone 16, the first zone available in the implementation phase. It was beyond the scope of this project to do field-based accuracy assessments.

Results

The results of the study showed the following:

- LANDFIRE vegetation-type classes had a similar thematic resolution to the midlevel standards outlined in the *Existing Vegetation Classification and Mapping Technical Guide*. They were similar in qualitative appearance, thematic resolution (30 meters), and usefulness in addressing forest-plan revision issues. The map legend for zone 16 included 50 ecological-system types and nine alliances. An accuracy assessment of all the base vegetation maps was not available at the time of this report; however, LANDFIRE does have plans to complete one.
- LANDFIRE structural attributes exceeded those required in the midlevel mapping standards and met the needs identified by the forests. LANDFIRE tree canopy breaks were categorized in 10-percent increments. The technical guide requires a minimum of four classes: 0–10; 10–30; 30–60, and 60–100 percent for midlevel maps.
- LANDFIRE will not produce tree size classes (by diameter). However, tree-height classes of 0–5, 5–10, 10–25, 25–50, and 50+ meters will be generated. Protocols for midlevel maps in the technical guide require five diameter at breast height (DBH) classes (0–4.9, 4.9–9.9, 10–19.9, 20–29.9, and 30+ inches). Forest needs assessments were similar to the midlevel mapping standards in the technical guide.

Recommendations

Recommendations for using LANDFIRE existing vegetation products for forest-level efforts are these:

- Assess map-legend categories and map accuracies locally to determine the usefulness of LANDFIRE for a particular purpose. Since LANDFIRE is a national product, accuracies will likely vary depending upon location.
- Become familiar with LANDFIRE existing vegetation products. Ecological systems may or may not be the appropriate tool for evaluating vegetation conditions at the forest level.
- Use LANDFIRE existing vegetation products to answer general questions, such as estimating the area of forest cover, and provide general information on forest and range vegetation. Do not use them for detailed studies, such as assessing riparian conditions.
- Use LANDFIRE to provide a basic understanding of vegetation—at least at the life-form level—if no other existing vegetation information is available.
- Use LANDFIRE information to extend analysis areas, such as wildlife corridors, beyond National Forest System lands since its vegetation products go beyond their boundaries.
- Explore LANDFIRE's existing vegetation products before embarking on potentially expensive new mapping projects.

References and Suggested Reading

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United States Department of Agriculture

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RSAC-74-TIP1
June 2006