LANDFIRE

What is LANDFIRE?

Landscape Fire and Resource Management Planning Tools (LANDFIRE) is a key national geospatial data source for strategic fire and resource management planning and analysis. LANDFIRE is the first complete, nationally consistent collection of more than 25 geospatial layers, databases, and ecological models at a 30-meter resolution that describe disturbance, vegetation, fire, and fuel characteristics. Because fires do not stop at ownership borders, LANDFIRE products by design support cross-boundary planning, management, and operations across all lands of the conterminous United States (CONUS), Alaska, Hawaii, and insular areas.

Why is LANDFIRE Important?

From its inception, LANDFIRE's detailed mapping products have informed fire modeling and decision support systems critical to predicting fire spread and prioritizing wildfire management resource placement. The LANDFIRE project was launched almost 20 years ago in response to agencies' need for consistent wall-to-wall national fuel and vegetation inventory map data to support an emerging national strategy that addressed increasingly larger and more extreme wildfires. As the United States continues to experience longer fire seasons, more frequent destructive fires, and a growing population in the wildland-urban interface, agency focus remains centered on geospatial strategies guided by the best available science, making LANDFIRE's rich product suite more relevant than ever.

How is LANDFIRE Used?

LANDFIRE scientists develop and use the latest innovations in remotely sensed imagery, mapping, and automation technologies. By connecting these advances to scientifitc data and methods, LANDFIRE products help land managers identify strategic fuel and forest health treatment priorities and deliver data for community risk assessments. Products also prove foundational for operational analysis of potential fire behavior and in planning simulations; they provide data for tools that predict fire effects, like wildfire smoke direction and pollution concentration. Plus, LANDFIRE data feed into programs that help locate potential environmental hazards such as snags. All are examples of important science-based information that can improve firefighter health and safety and increase overall effectiveness of wildfire incident response.

More than Fire.—However, LANDFIRE is not just about fire, it is also about land. Many of the inputs to the downstream fire and fuel products are valuable standalone products for natural resource managers, researchers, and teachers. Vegetation data are used in prairie restoration efforts, wildlife habitat inventories, carbon balance studies, the Gap Analysis Project (GAP), and in research that measures the effects of a warming climate on riparian vegetation. Reference data have been used to predict the probability of non-native plant invasion, to evaluate the relation of road networks to forest fragmentation, and to understand pollinator ecology. LANDFIRE's comprehensive product suite is full of possibilities.

Background. San Francisco Peaks from the hills to the northeast in the area near Bonito Park, O'Leary Peak, and Sunset Crater Volcano National Monument.

What Does LANDFIRE Produce?

The first data product, LANDFIRE National, was completed in 2009. Since then, LANDFIRE remapped the entire United States (known as "LF 2016 Remap") to provide improved base maps for its suite of products. To keep pace with a perpetually evolving landscape (that is, wildfires, forest harvest, vegetation growth, weather events, and urban spread), LANDFIRE also regularly releases updated map layers to capture the most current landscape changes. For these updates, LANDFIRE relies on multiple data sources and processes including remotely sensed imagery; fire program data; and annual vegetation treatment data/management activity contributions from Federal, State, local, private, and non-profit land managers. Anyone can contribute data (plot, polygon, or pixel) and have local information help inform our products! To learn how, see the "Find Out More" section.

Here is a closer look at some of LANDFIRE's product categories:

- Disturbance products reflect changes on the landscape caused by human activities and natural events, annually and across decades. They are used to update vegetation and fuel products to most current condition.

- Topographic products include aspect, elevation, and slope geospatial data; and serve as inputs to geospatial fire behavior modeling systems.

- Reference products represent remotely sensed and field collected data gathered from public, government, and proprietary sources. They are used to train models for mapping and update products.

- Vegetation products characterize current vegetation composition and structure and pre-European settlement vegetation systems. They form the foundation for fuel product development.

- Fuel products describe the composition and characteristics of surface and canopy fuel. These products are formatted for direct use in operational fire behavior and other modeling systems.

- Fire Regime and Vegetation Departure products depict historical fire frequency and severity, and vegetation departure from historical reference conditions.

- Transportation—Operational Roads products are geospatial roads class data layers that support fire management operations on large fires or incidents.

- Modeling Dynamic Fuels with an Index System (MoD–FIS) products apply indexes to revise the fire behavior fuel model products to account for shifting fuel conditions within a fire season owing to seasonal changes in precipitation. They are currently released for the Southeast United States and for the Great Basin and Southwest United States.

Annual Update.—Due to recent technological advancements in image processing and data access, LANDFIRE will implement an annual mapping approach focused on updating the base product suite with disturbances from the prior year, which will compress a multiyear mapping process into a few months, providing detailed products on a regular basis starting in 2023. This annual vegetation and fuel update ensures that LANDFIRE provides data currency, where all new available disturbance information is fully integrated into data layers, available for the next fire season, and ready to support the integrity of wildland fire and land management decisions.

What are LANDFIRE's Benefits?

→ Suite of geospatial data and models distributed free of charge and easily accessible online.

→ Standardized legends and consistent methodologies across all lands.

→ Regular predictable updates and timely delivery of quality products that reflect recent changes in landscape condition.

→ Ready to use, "off-the-shelf" data and models that are adaptable to fire and nonfire applications.

→ Expertly developed products guided by the latest scientific innovation and technological developments.

→ Robust user support (https://www.landfire.gov).

Always Evolving.—LANDFIRE continuously gathers new field data, imagery, and disturbance data while exploring new methodologies and technologies to keep LANDFIRE accessible, relevant, and responsive to the user community:

- New 90-kilometer buffer zone added into Canada and Mexico.

- Complete recalculation of topography based on most recent 3D Elevation Program (3DEP) data and corrections to aspect, which are critical to accurate fire behavior modeling.

- Use of the latest National Land Cover Dataset (NLCD) for roads and urban classes.

- New standalone Operational Roads products that help identify potential access corridors, evacuation routes, and fire line information.

- New set of burnable developed classes that represent areas with low densities of buildings.

- Replaced pixels assigned as "recently disturbed" with modeled existing vegetation types.

- Adjusted agricultural classes using the new Cropland Data Layer (CDL) and transitioned nonirrigated Federal agricultural lands to a burnable fuel model.

Examples of LANDFIRE applications include the following:

Ecosystem Changes.—LANDFIRE's biophysical settings data provided university researchers a basis for analyzing habitat changes from pre-European settlement to more modern land cover in dryland areas. Scientists used this information to determine the effects of industrialized agriculture on traditional ecosystems. More information is available from Adhikari and others (2019).
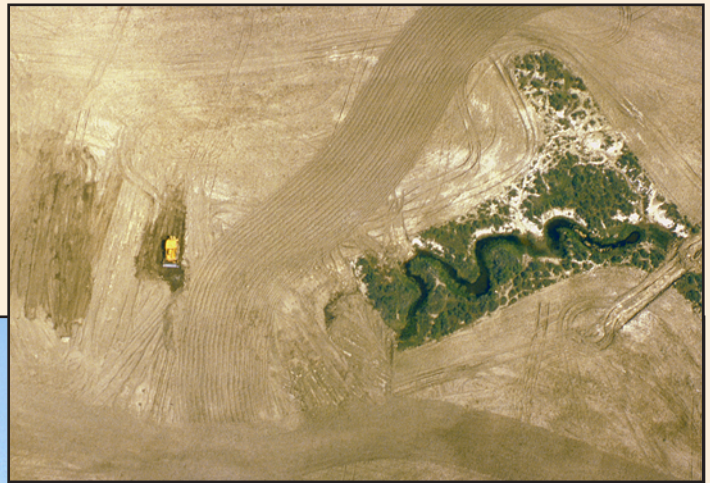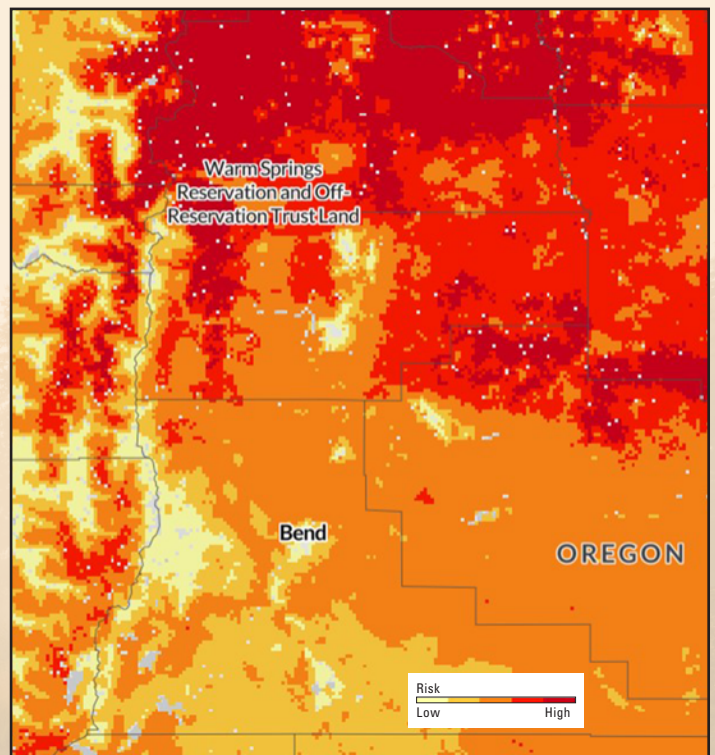

Top right. Aerial view of tractor actively plowing native rangeland to make cropland near Winnett, Montana, 1983. **Bottom.** Tractor discing a stubble field in Montana to prepare the soil for planting.

Community Risk.—A community's wildfire risk is the combination of hazard (likelihood and intensity) and vulnerability (exposure and susceptibility). Created by the U.S. Forest Service under the direction of Congress, the "Wildfire Risk to Communities" website (https://www.wildfirerisk.org/) uses the best available science and data, including LANDFIRE's vegetation and fuels data, to not only identify risk but also provide resources for communities to manage and mitigate risk. As wildfires increase in frequency and severity across the country, this free and easy-to-use website includes interactive maps, charts, and resources designed to help community leaders, elected officials, community planners, fire managers, and fire collaboratives.

A Note on Scale.—Although LANDFIRE products are delivered as 30-meter pixels, LANDFIRE products are designed to facilitate large landscape-scale analysis, such as national (all States) or regional strategic planning, or for large subregional landscapes and fire management units. As a scale guideline, the applicability of LANDFIRE products to support fire and land management planning on smaller areas will vary by product, location, and project goal.

Bottom Line.—Be sure check out the data to make sure they are suitable. And check out this discussion on scale using LANDFIRE as an example: https://www.conservationgateway.org/ConservationPractices/FireLandscapes/LANDFIRE/Pages/landscape-scale-landfire.aspx.

An example of wildfire risk to communities from https://wildfirerisk.org.

Data Availability

The LANDFIRE program distributes products using four main delivery formats accessed through the website:

- Users obtain product layers using a "clip and ship" type delivery from the Map Viewer.

- Users download product layers by full extent for CONUS, Alaska, Hawaii, and the insular areas.

- Layers are streamed into users' systems over the internet via web service calls. Options include Web Map Service Interface Standard (WMS), Web Coverage Service (WCS), and ESRI Image Service.

- Users request and download a product file by specifying as many as six user-defined parameters through the LANDFIRE Product Service (LFPS) interface.

LANDFIRE data available at https://landfire.gov/getdata.php.

Find Out More

- The New Age of LANDFIRE: https://geonarrative.usgs.gov/the-new-age-of-landfire/

- LANDFIRE: https://landfire.gov/

- The Nature Conservancy LANDFIRE: https://www.conservationgateway.org/conservationpractices/firelandscapes/landfire/pages/landfire.aspx

- Contribute data: https://landfire.gov/participate_refdata.php

- Training opportunities: https://landfire.gov/lf_tools.php

- Tutorials: https://www.youtube.com/user/LANDFIREvideo

Background. Fire ecologists discuss wildfire impacts.

Sponsorship

LANDFIRE is an interagency vegetation, fire, and fuel characteristics mapping program sponsored by the Wildland Fire Leadership Council. Principal partners are U.S. Department of the Interior (U.S. Geological Survey and the Office of Wildland Fire), the U.S. Department of Agriculture Forest Service, and The Nature Conservancy. Organizations that work with LAND-FIRE products include researchers, land managing agencies, the Interagency Fuel Treatment Decision Support System (IFTDSS), and the Wildland Fire Decision Support System (WFDSS).

References Cited

Adhikari, S., Adhikari, A., Weaver, D.K., Bekkerman, A., and Menalled, F.D., 2019, Impacts of agricultural management systems on biodiversity and ecosystem services in highly simplified dryland landscapes: Sustainability, v. 11, 16 p. [Also available at https://www.mdpi.com/2071-1050/11/11/3223.]

LANDFIRE Partners

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