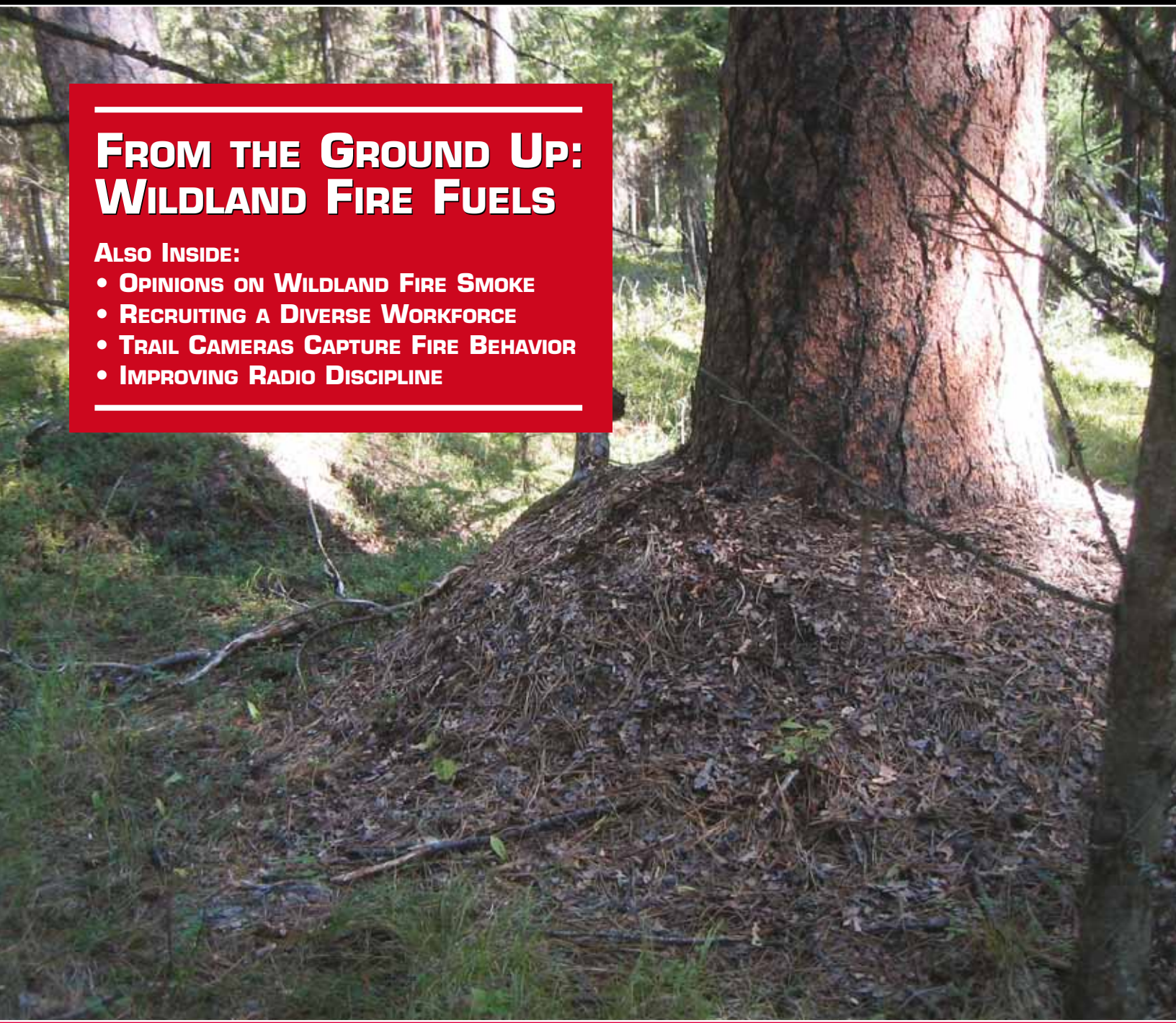
# Fire Management today

Volume 70 • No. 3 • 2010



## From the Ground Up: Wildland Fire Fuels

Also Inside:

- Opinions on Wildland Fire Smoke
- Recruiting a Diverse Workforce
- Trail Cameras Capture Fire Behavior
- Improving Radio Discipline

United States Department of Agriculture
Forest Service

# A High-Quality Fuels Database of Photos and Information

Clinton S. Wright, Paige C. Eagle, and Diana L. Olson

The Digital Photo Series is available at <http://depts.washington.edu/nwfire/dps>.

Photo series and their associated data provide a quick and easy way for managers to quantify and describe fuel and vegetation properties, such as loading of dead and down woody material, tree density, or height of understory vegetation. This information is critical for making fuel management decisions and for predicting fire behavior and fire effects. The Digital Photo Series (DPS) is a user-friendly, Web-based application that displays data and images from all 16 currently published volumes of the Natural Fuels Photo Series (NFPS) (42 different photo series for a total of 438 sites). The database format of DPS enables searching, downloading, customized site generation, and side-by-side comparison of data and images. DPS follows the published volumes in both content and presentation.

*Clint Wright is a research forester with the Forest Service, Pacific Northwest Research Station, Pacific Wildland Fire Sciences Laboratory, Seattle, WA. Paige Eagle is a Web designer and programmer with the College of Forest Resources, University of Washington, Seattle. Diana Olson was a forester with the Forest Service, Pacific Northwest Research Station, Pacific Wildland Fire Sciences Laboratory, and is now the project manager for the Fire Research and Management Exchange System (FRAMES) project in the College of Natural Resources, University of Idaho, Moscow.*

## The Natural Fuels Photo Series

Accurate, complete, detailed fuels data are critical for fire management planning and implementation, but are often lacking, insufficient, or difficult to obtain for many geographic areas or ecosystems. Developed to address the need for high-quality fuels information, the NFPS is a printed compilation of georeferenced data and photographs that displays conditions and fuel loadings in a wide variety of forest, woodland, shrubland, and grassland ecosystem types (Ottmar and others 2009).

The NFPS is built on a well-established tradition and methodology (see Blank 1982, Fisher 1981a, Maxwell and Ward 1980a, and others). At the inception of the NFPS project in the mid-1990s, conventional printing was the most effective way to distribute the images and data in a concise, economical, intuitive, and user-friendly package. Technological changes enabled us to enhance the utility of the NFPS by making it available in an electronic format.

## The Digital Photo Series

Fire and fuels management requires extensive fuel and vegetation data, like those included in the NFPS, to effectively plan management activities, including the application of prescribed fire and mechanical fuels treatment. Development of new fire- and natural resource-based software applications that require fuel and stand information as inputs further highlight the need for electronically accessible data.

The objective of the DPS project was to create a user-friendly, intuitive software application that could be accessed online or run locally and would be capable of displaying site-level data and images in a format that is familiar to users of the printed volumes of the NFPS. The result is a Web-based application that provides better access to and enhanced functionality of NFPS fuels data and images. The digital form of NFPS data provides users with the ability to view data and images across series and volumes,

Photo series provide quick and easy ways for managers to quantify and describe fuel and vegetation properties.

to query the database by various criteria (e.g., cover type, fuelbed category, species composition, or Bailey's ecoregion), to compare the fuels on sites side-by-side, and to build and save user-defined fuelbeds. The DPS complements book versions of the data, and NFPS data can be extracted from the DPS in a number of commonly used formats. The reporting feature allows users to print reports or to save data to a variety of mainstream digital file formats (text, spreadsheet, and XML).

## Development and Design

DPS developers surveyed users of the NFPS books and the wider user community to determine what features they wanted to see in the DPS and to ensure that the technology requirements (particularly those employed by Federal land management agencies), interface design, and output specifications met the needs of fire and fuels managers and planners.

Developers scanned film images at a high resolution, and data from 438 photo series sites were consolidated and standardized in a relational database. The DPS application consists of a user-friendly interface that is accessed through a Web browser (such as Microsoft Internet Explorer or Mozilla Firefox).

In the absence of an Internet connection, a stand alone version of the DPS (utilizing the desktop server emulator MicroWeb) can be used to run the Web site from a local computer hard drive. Once the standalone version of DPS is installed, the user can start and use the application with their Web browser to mimic the online version. An installation CD is available upon request from the Pacific Wildland Fire Sciences Laboratory[1].

## A Quick User Guide

The DPS homepage (fig. 1) is organized into tabbed Web pages, allowing a user to navigate to photo series sites in a variety of ways:

- Retrieve sites of interest by selecting the "Site search" tab (fig. 2). Select a specific site or sites by clicking on the map or by selecting geographic (State, Bailey's ecoregion, and/or landowner) and/or ecological criteria (e.g., cover type, species, and fuel and stand structural attributes) from the drop-down menus below the map. Clicking on the "Get sites" button will display all of the photo series sites that meet the selection criteria.
- Select the "Site browser" tab to view an expandable navigation tree (fig. 3) that includes all 438 sites organized by volume.
- Create and save custom sites with the controls on the "Custom site builder" page (fig. 4); data tables can be combined to create custom sites that are more representative of a specific land management unit or a desired management state. Custom sites created in this way can be saved and shared between DPS users.

The user can access application documentation, a more detailed introduction, and a description of the differences between the DPS and published volumes of the NFPS under the "DPS Help" tab on the far right of any screen. DPS Help includes instructions for navigating the DPS (including descriptions of the site search, site browser, and custom site builder tabs), perform-

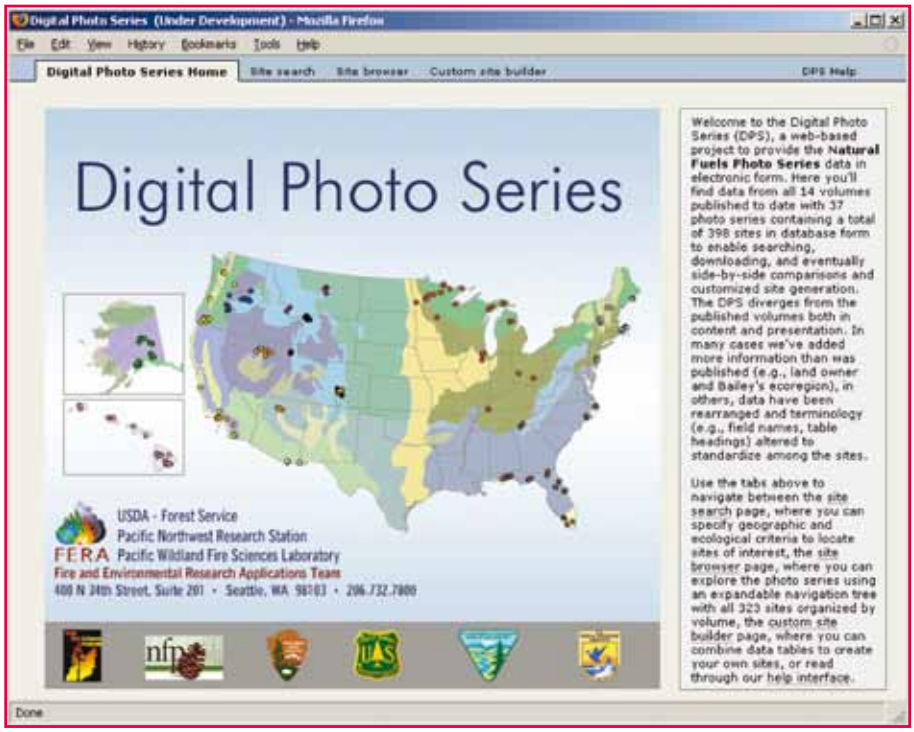



**Figure 1**—*DPS home page. This page can be accessed directly or through a link on the home page for the Fire and Environmental Research Applications team (<http://www.fs.fed.us/pnw/fera>).*

[1] Request CD versions of the Digital Photo Series by telephone (206-732-7827) or email (cwright@fs.fed.us).

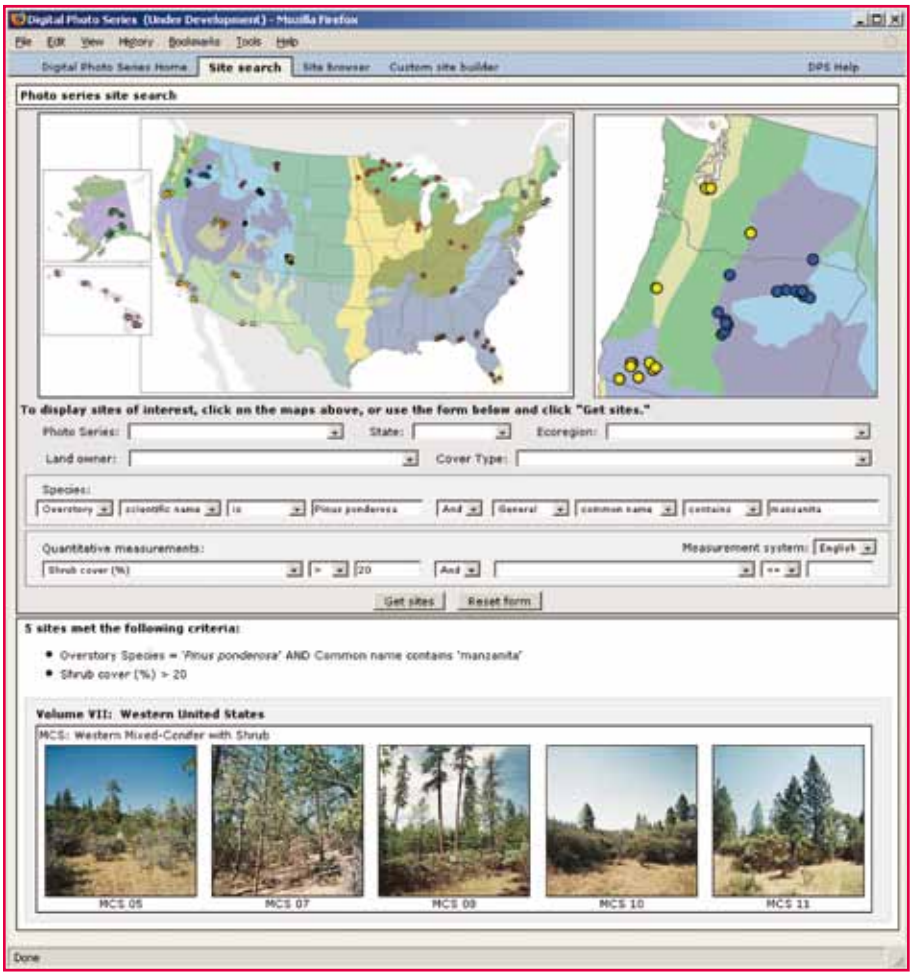



Figure 2—*Site search page for DPS. Sites can be selected by any combination of map selection and query building criteria. In the example shown, all sites with ponderosa pine in the overstory, manzanita presence, and shrub cover >20 percent were selected from the 438 sites that form the current DPS database. The species search function allows users the flexibility to search for all species or just overstory species by full or partial scientific or common names. Users can select an individual photograph to view a larger image and detailed site-level information.*

ing tasks (e.g., downloading and interpreting data files, viewing larger photographs, etc.), and running the stand alone MicroWeb version of DPS. Links to all of the documentation included in the printed NFPS volumes are available in the DPS at the bottom of every site-level page; it is very important to check this documentation to ensure proper interpretation and use of the data for each series.

The DPS diverges slightly from the published volumes of the NFPS in content and presentation. In many cases, information was added to DPS that was not originally published in the NFPS (e.g., landowner information and Bailey's ecoregions); in others, data were rearranged and terminology (e.g., field names and table headings) was standardized among sites. DPS also offers a choice of measurement units: the DPS default is English units (the original NFPS units), but users can toggle between English and metric units.

## Future Development

Enhancements to the DPS will be released as they are developed, with input coming from current users

DPS is robust, easy to use, and can readily accept new data as they become available.

of the NFPS books, fire and fuels planners, managers, and scientists. For example, we would like to allow data from the DPS to be easily extracted and formatted to interface with existing and future fire and fuel-management software packages (e.g., Fuel Characteristic Classification System, BehavePlus, FOFEM, and Consume 3.0).

At present, the DPS offers wide-angle photos for each site; we are hopeful that, in coming years, users will be able to view stereoscopic images on a computer screen. Data from other published photo series (e.g., Blonski and Schramel 1981; Fischer 1981b, 1981c, 1981d; Koski and Fischer 1979; Maxwell and Ward 1979, 1980b; Ottmar and Hardy 1989a, 1989b; Reeves 1988; Scholl and Waldrop 1999; Weise and others 1997), or other photographically documented fuels sources could also be added to the DPS.

## Summary

The DPS is robust, easy to use, and can readily accept new data as they become available. The DPS effectively complements printed versions of the NFPS by extending the usefulness of NFPS data. Enhanced functionality includes the following:

- Data characterizing all of the vegetation and fuels, not just the down woody and surface fuels in an ecosystem, are viewable and available as printed or saved reports.

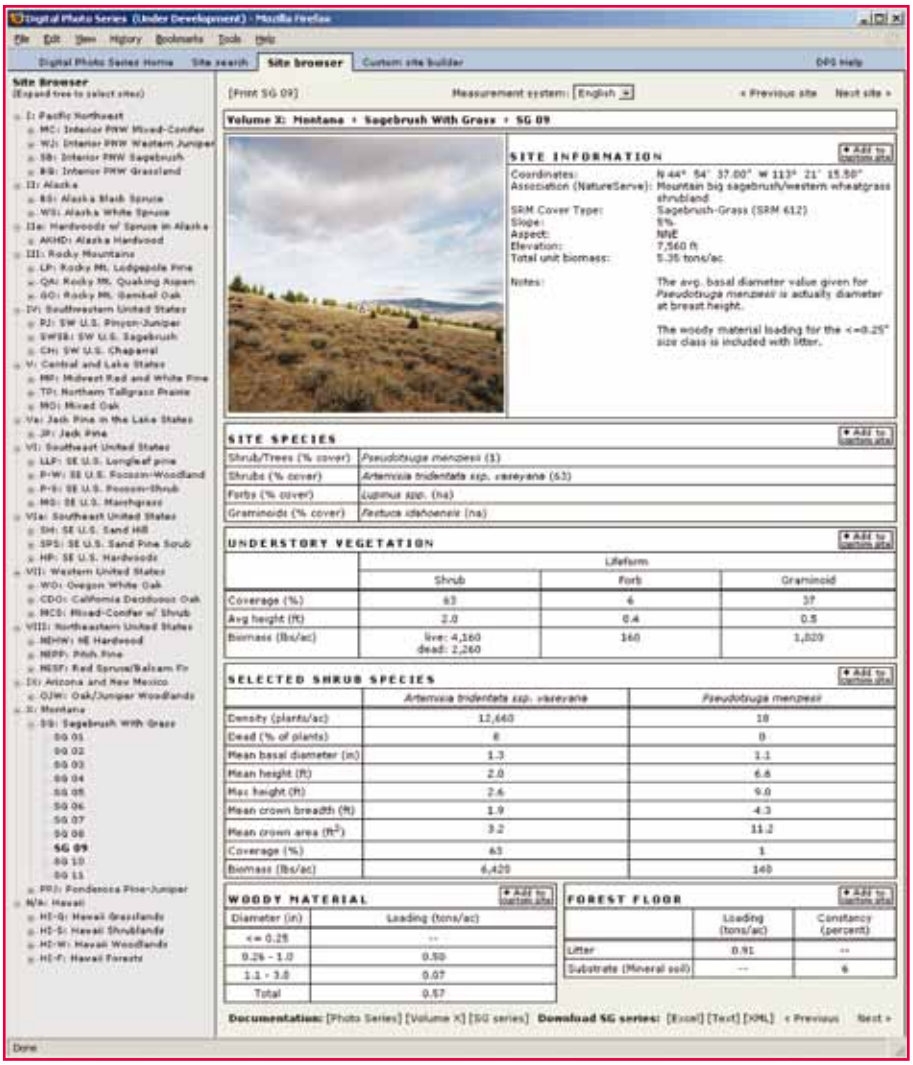



Figure 3—*Example of site-level data displayed by DPS. Data content and page display vary dynamically based on the type and amount of data collected at the different sites. The contents of DPS can be browsed much as in the printed volumes by using the navigation tree (left side of page) or by selecting the previous or next site in a series (lower and upper right of page). Data can be displayed in English or metric units and can be printed (top left of page) or exported to a Microsoft Excel, text, or XML file (bottom of page). Species are listed with their scientific names; hovering the cursor above a name will display the accepted common name. Documentation describing the NFPS in general and the volume or series in particular can be viewed using the links at the bottom of the page.*

- As a free, Web-based tool, DPS provides fire management and academic instructors with data and images for a wide variety of ecosystems.
- Users are able to draw on data and images from all published volumes simultaneously. Among other uses, the ability to query across locations and ecosystems allows users familiar with one ecosystem or fuel type to compare them with other, less familiar types.
- DPS is expandable, allowing it to accept new NFPS images and data as they are developed. Future versions may also incorporate data from other published photo series or photodocumented fuels inventories.

## Acknowledgments

Numerous individuals contributed to the successful completion of the DPS: Alynne Bayard, Lara Kellogg, Mike Tjoelker, Jeff Kelly, Joe Restaino, Jon Dvorak, Aarin Sengsirirak, Paul Campbell, Frank Archuleta, Ann McCauley, Noah Carlson, Felicia Mehl, Zhen Zhu, and Veronica Mendoza. John Szymoniak helped us distribute our development survey to Federal fire and fuels professionals. The manuscript was improved by reviews from Ernesto Alvarado, Ellen Eberhardt, and David L. Peterson. The authors acknowledge funding from the Joint Fire Science Program under Project JFSP 04-4-1-02.

## References

Blank, R.W. 1982. Stereo photos for evaluating jack pine slash fuels. Gen. Tech. Rep. NC-77. St. Paul, MN: USDA Forest Service, North Central Forest Experiment Station. 23 p.

Blonski, K.S.; Schramel, J.L. 1981. Photo series for quantifying natural forest residues: southern Cascades, northern Sierra Nevada. Gen. Tech. Rep. PSW-56. Berkeley, CA: USDA Forest Service, Pacific Southwest Forest and Range Experiment Station. 145 p.

Fischer, W.C. 1981a. Photo guides for appraising downed woody fuels in Montana forests: how they were made. Res. Note INT-299. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 12 p.

Fischer, W.C. 1981b. Photo guide for appraising downed woody fuels in Montana forests: grand fir-larch-Douglas-fir, western hemlock, western hemlock-western redcedar, and western redcedar cover types. Gen. Tech. Rep. INT-96. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 53 p.

Fischer, W.C. 1981c. Photo guide for appraising downed woody fuels in Montana forests: interior ponderosa pine, ponderosa pine–larch–Douglas-fir, larch–Douglas-fir, and interior Douglas-fir cover types. Gen. Tech. Rep. INT-97. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 133 p.

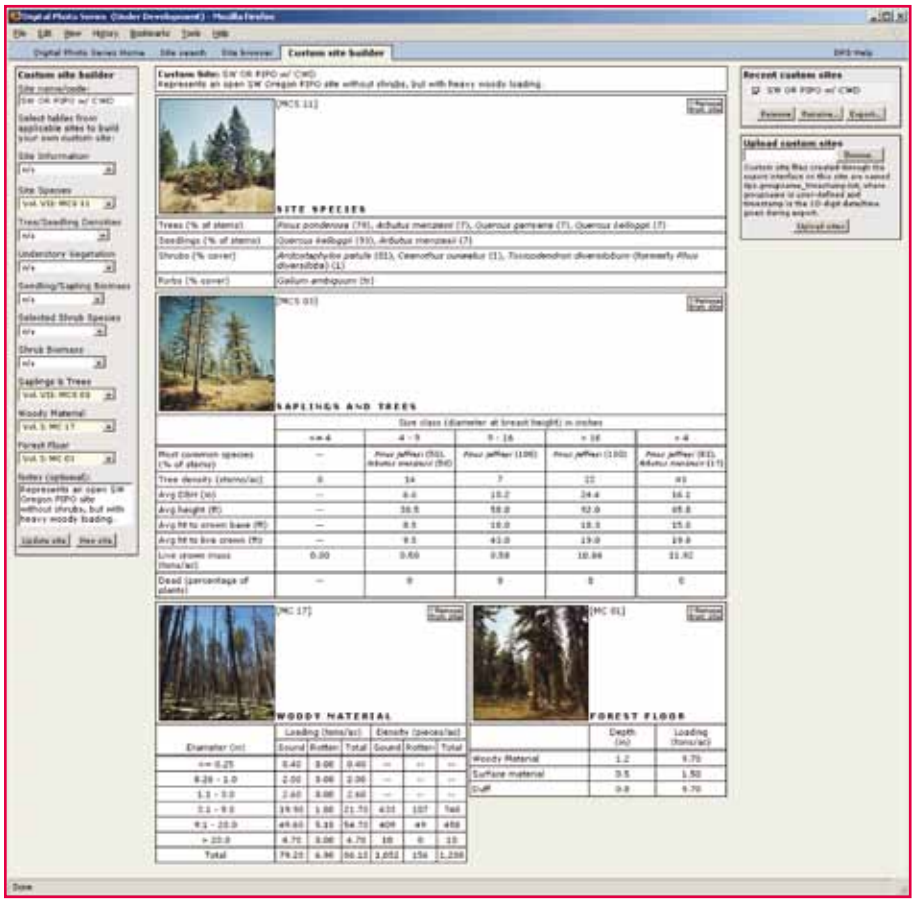



**Figure 4**—*Custom site builder page in DPS. Custom sites can be developed when users feel that the characteristics of their site are best represented by several different sites in DPS. In the example shown, the species composition and overstory structure are represented by two different sites in the mixed-conifer with shrub (MCS) series from Volume VII (Ottmar and others 2004). Woody material loading and forest floor characteristics are represented by two different sites in the mixed-conifer with mortality (MC) series from Volume I (Ottmar and others 1998). Medium-sized thumbnail images accompany the data for each site selected. Users can append short descriptions to their custom sites, save the resulting file to their computers, and share the file with colleagues.*


Fischer, W.C. 1981d. Photo guide for appraising downed woody fuels in Montana forests: Lodgepole pine, and Engelmann spruce–subalpine fir cover types. Gen. Tech. Rep. INT-98. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 143 p.

Koski, W.H.; Fischer, W.C. 1979. Photo series for appraising thinning slash in north Idaho: western hemlock, grand fir, and western redcedar timber types. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 50 p.

Maxwell, W.G.; Ward, F.R. 1979. Photo series for quantifying forest residues in the Sierra mixed conifer type, Sierra true fir type. Gen. Tech. Rep. PNW-95. Portland, OR: USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. 79 p.

Maxwell, W.G.; Ward, F.R. 1980a. Guidelines for developing or supplementing natural photo series. Res. Note PNW-358. Portland, OR: USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. 16 p.

Maxwell, W.G.; Ward, F.R. 1980b. Photo series for quantifying natural forest residues in common vegetation types of the Pacific Northwest. Gen. Tech. Rep. PNW-105. Portland, OR: USDA Forest Service, Pacific Northwest Forest and Range Experiment Station. 230 p.

Ottmar, R.D.; Hardy, C.C. 1989a. Stereo photo series for quantifying forest residues in coastal Oregon forests: second-growth Douglas-fir–western hemlock type, western hemlock–Sitka spruce type, and red alder type. Gen. Tech. Rep. PNW-231. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 67 p.

Ottmar, R.D.; Hardy, C.C. 1989b. Stereo photo series for quantifying forest residues in the Douglas-fir-hemlock type of the Willamette National Forest. Gen. Tech. Rep. PNW-258. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 63 p.

Ottmar, R.D.; Vihnanek, R.E.; Wright, C.S. 1998. Stereo photo series for quantifying natural fuels. Volume I: mixed-conifer with mortality, western juniper, sagebrush, and grassland types in the interior Pacific Northwest. PMS 830. Boise, ID: National Wildfire Coordinating Group, National Interagency Fire Center. 73 p.

Ottmar, R.D.; Vihnanek, R.E.; Wright, C.S.; Olson, D.L. 2004. Stereo photo series for quantifying natural fuels. Volume VII: Oregon white oak, California deciduous oak, and mixed-conifer with shrub types in the Western United States. PMS 839. Boise, ID: National Wildfire Coordinating Group, National Interagency Fire Center. 75 p.

Ottmar, R.D.; Wright, C.S.; Prichard, S.J. 2009. A suite of fire, fuels, and smoke management tools. Fire Management Today. 69(2): 34–39.

Reeves, H.C. 1988. Photo guide for appraising surface fuels in east Texas: grass, clearcut, seed tree, loblolly pine, shortleaf pine, loblolly/shortleaf pine, slash pine, longleaf pine, and hardwood cover types. Nacogdoches, TX: Center for Applied Studies, School of Forestry, Stephen F. Austin State University. 89 p.

Scholl, E.R.; Waldrop, T.A. 1999. Photos for estimating fuel loadings before and after prescribed burning in the upper coastal plain of the southeast. Gen. Tech. Rep. SRS-26. Asheville, NC: USDA Forest Service, Southern Research Station. 25 p.

Weise, D.R.; Gelobter, A.; Haase, S.M.; Sackett, S.S. 1997. Photo series for quantifying fuels and assessing fire risk in giant sequoia groves. Gen. Tech. Rep. PSW-GTR-163. Albany, CA: USDA Forest Service, Pacific Southwest Research Station. 49 p.