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Providing Consistent Burned Area Data: LANDFIRE Interviews Todd Hawbaker, USGS Research Ecologist

After receiving a B.S. degree in animal ecology from Iowa State University, Todd Hawbaker spent the next couple of years burning and restoring tallgrass prairie in southwestern Minnesota. From there, he went on to receive both his M.S. and Ph.D. degrees in forestry from the University of Wisconsin before joining the U.S. Geological Survey as a research ecologist.

Todd works at the Geosciences and Environmental Change Science Center in Denver, CO. His current research for LandCarbon, incorporates LANDFIRE to understand the drivers behind ecosystem disturbances and quantify the impacts of disturbances on human and natural systems. He also leads the development of the Landsat Burned Area Algorithm and Products, used by LANDFIRE, to identify burned areas in both forest and non-forest ecosystems.

What is the LandCarbon project and how do LANDFIRE products play a role?

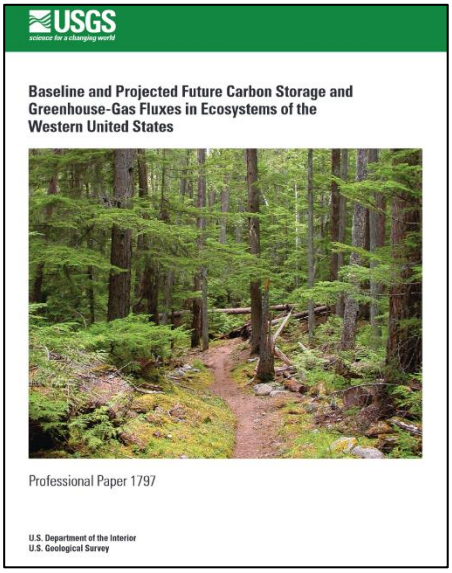
USGS's Biological Carbon Sequestration Assessment Program (also known as LandCarbon) was designed to meet the requirements of the Energy Independence Security Act of 2007 by assessing current and future potential carbon stocks and fluxes in terrestrial and aquatic ecosystems across the United States. Understanding the influence of wildfires was a priority. LANDFIRE provides the vegetation and fuels products critical to the LandCarbon disturbance simulations.

Which LANDFIRE products do you use in the LandCarbon program?

We have used many LANDFIRE products in LandCarbon. We quantified historical patterns of wildfire emissions using LANDFIRE's fuel loading model data, the First Order Fire Effects Model (FOFEM), and the Monitoring Trends in Burn Severity data.

We also developed a model to simulate future potential wildfires for numerous climate change scenarios and models by applying a statistical model to stochastically generate ignitions using daily fuel moisture values, LANDFIRE's existing vegetation type (EVT), and other predictors. Once ignitions were generated, we used Mark Finney's minimum travel time algorithm to simulate fire spread – this relied on the LANDFIRE fire behavior fuel model layers.

Emissions were calculated for simulated burned areas using FOFEM and the fuel loading model layer. The methods, results, and how we used LANDFIRE data are described in Chapter 3 and Chapter 8 of our report, Baseline and Projected Future Carbon Storage and Greenhouse-Gas Fluxes in Ecosystems of the Western United States. Additional reports are available for the Great Plains, eastern U.S., and Hawaii at the LandCarbon publications page.



You're currently busy with another project, Landsat Burned Area Products. Please tell us about this project. Are you using LANDFIRE? If so, in what way?

In the LandCarbon assessment, we learned how incomplete our fire data were for much of the Great Plains and eastern U.S. To help fill that data gap, I've been working on generating burned area products from the Landsat archive, with the goal of providing consistent burned area data across the conterminous U.S. Our methods (Mapping burned areas using dense time-series of Landsat data) were published in Remote Sensing of Environment in 2017 and 1984-2015 results through USGS's ScienceBase-Catalog.

Since then, we've refined our algorithm to work with the Analysis Ready Data stacks. These products will be delivered through USGS's EarthExplorer interface in the near future.

We didn't use LANDFIRE data for this project; however, LANDFIRE used our results to help update their vegetation and fuel layers during the refresh process.

Are there any LANDFIRE products in particular that are important in your work?

I think all the LANDFIRE products are important! These days, I find myself using the EVT and Fuel Characteristics Classification System (FCCS) layers the most often. They are great.

New base maps are being developed for the LANDFIRE suite (LF Remap). What improvements would you recommend that might enhance LANDFIRE's usefulness?

More frequent data are always welcome, especially given the rate of land change we're seeing these days. I think LANDFIRE would also benefit its users by reducing the number of data layers provided. Why not include fuel load information like the FCCS attributes with the EVT layer? It would also be great if we had state-transition models that incorporate contemporary disturbances (fire, fuel treatments, insect mortality) and could be linked directly to the EVT layer.

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Recent publications

Bright, Benjamin C., Andrew T. Hudak, Arjan J. H. Meddens, Todd J. Hawbaker, Jennifer S. Briggs, and Robert E. Kennedy. 2017. Prediction of forest canopy and surface fuels from lidar and satellite time series data in a bark beetle-affected forest. Forests: 8(9): 322. https://doi.org/10.3390/f8090322

Hawbaker, Todd J., Clay Trauernicht, Stephen M. Howard, Creighton M. Litton, Christian P. Giardina, James D. Jacobi, Lucas B. Fortini, R. Flint Hughes, Paul C. Selmants, and Zhiliang Zhu. 2017. Wildland fires and greenhouse gas emissions in Hawai'i. In: Selmants, P.C.; Giardina, C.P.; Jacobi, J.D.; Zhu, Zhiliang, eds. Baseline and projected future carbon storage and carbon fluxes in ecosystems of Hawai'i. U.S. Geological Survey Professional Paper 1834. Reston, VA: U.S. Department of the Interior, U.S. Geological Survey: 57-73. Chapter 5.

Hawbaker, Todd J., Melanie Vanderhoof, Yen-Ju G. Beal, Joshua Takacs, Gail L. Schmidt, Jeff T. Falgout, Brad Williams, Nicole M. Brunner, Megan K. Caldwell, Joshua J. Picotte, Stephen M. Howard, Susan Stitt, and John L. Dwyer. 2017. Mapping burned areas using dense time-series of Landsat data. Remote Sensing of Environment 198: 504-522. https://doi.org/10.1016/j.rse.2017.06.027

Sleeter, Benjamin M., Jinxun Liu, Colin Daniel, Bronwyn Rayfield, Jason Sherba, Todd J. Hawbaker, Zhiliang Zhu, Paul Selmants, and Thomas R. Loveland. 2018. Effects of contemporary land-use and land-cover change on the carbon balance of terrestrial ecosystems in the United States. Environmental Research Letters 13 (4). 13 p. https://doi.org/10.1088/1748-9326/aab540

Vanderhoof, Melanie, Nicole Fairaux, Yen-Ju G. Beal, and Todd J. Hawbaker. 2017. Validation of the USGS Landsat Burned Area Essential Climate Variable (BAECV) across the conterminous United States. Remote Sensing of Environment 198: 393-406. https://doi.org/10.1016/j.rse.2017.06.025