

Utah Forest News

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LANDFIRE in the Intermountain West - impacts, collaboration, and notes from the field

USU Forestry Extension asked the LANDFIRE Program's Nature Conservancy team (the principal partner in a multi-agency program (<https://goo.gl/ftGK91>) managed by the U.S. Department of Agriculture Forest Service and the U.S. Department of Interior), to explain what LANDFIRE is and how it has impacted the way scientists and managers approach land management.

LANDFIRE (<https://goo.gl/EdTD1B>) is an innovative program that creates comprehensive vegetation, fire, and fuel characteristics data for the entire U.S. by facilitating inter-agency/

LANDFIRE helps federal and state agencies and other public and private organizations work together to address fire and other natural resource management issues.



Sagebrush steppe landscape in Wyoming. Photo by Hannah Letinich.

In This Issue

- LANDFIRE in the Intermountain West
- A closer look at Brian Head Fire recovery
- Cross-laminated timber shed - an experiment
- Pivot irrigation systems and biochar

Utah Forest News

inter-organizational collaboration and cooperation. In doing this, they provide data for landscape assessment, analysis, and management on a large scale. LANDFIRE helps Federal and State agencies and other public and private organizations work together to address fire and other natural resource management issues.

Given the extent of public lands in the West, LANDFIRE's impact has been significant. LANDFIRE data are used because they include the best available science and expert review, they are publicly available at no cost, making the methods easy to replicate for other states, and they are regularly "refreshed" so that assessments and plans can be adjusted with every new data release.

LANDFIRE at work:

Western watersheds and fire management

The Nature Conservancy's New Mexico Chapter (<https://goo.gl/RCiga5>) conducted a rapid landscape-scale assessment of the Upper Mimbres Watershed (<https://goo.gl/a9DjRb>) in southwest New Mexico which provided the foundation for developing a collaborative fire management plan. Using LANDFIRE data to assess the 535,000-acre multi-ownership area, the team calculated fire condition and modeled potential fire behavior. This information helped managers prioritize treatment areas in the assessment zone. Additionally, the Wilderness Ranger District and Silver City Ranger Districts are using the results in the Healthy Forest Restoration Act Environmental



Male greater sage-grouse conducting mating behavior. Photo by The Nature Conservancy/Joe Kiesecker.

Assessment for the 125,000-acre Upper Mimbres area, focusing on prescribed fire, fuel reduction, and riparian restoration treatments.

Ecology and conservation of sage-grouse at landscape scales

LANDFIRE provides landscape-level vegetation and habitat data that scientists use to interpret sage-grouse movements and habitat use across the West. Through evaluating



Upper Mimbres watershed in the Jemez Mountains, New Mexico where officials used LANDFIRE data to prioritize restoration and treatment efforts. Photo by Alan Eckert Photography.

interactions between sagebrush and sage-grouse, land managers have gained a comprehensive understanding of sage-grouse, habitat connectivity, and, ultimately, regional conservation strategies. For example, LANDFIRE data has been used to compare the historical distribution of sagebrush vs. its current extent (<https://goo.gl/LcsmAe>), it has been used to investigate the impacts of cropland expansion and how this land conversion affects sage-grouse in Montana (<https://goo.gl/VMngRm>), and it has been used in a study that quantified sage-grouse habitat and restoration in Idaho (<https://goo.gl/yXVxam>). These are just a few examples of the ability of LANDFIRE data to enrich current and ongoing studies.

Statewide assessment of riparian vegetation conditions

In their study examining riparian vegetation as an indicator of riparian conditions across the North American West, Macfarlane and others¹ (at Utah State University) used LANDFIRE's data to measure the health and ecological composition of riparian areas in Utah. Because riparian ecosystems support diverse vegetation communities, understanding how and/or what impacts them is fundamental. These scientists provided Utah officials with state-wide maps that helped managers prioritize sites and actions for rivers and streams requiring restoration.

Fire suppression costs with and without fuel treatments

LANDFIRE data informed a study² where the authors developed a model that simulated the cost of wildfire suppression with and without fuel treatments (<https://goo.gl/9ub6Di>). The model was applied to Wyoming sagebrush steppe and mountain big sagebrush ecosystems in the Great Basin. The results indicate that, in terms of wildfire suppression cost savings, fuel treatments are cost-efficient if ecosystems are in "good" ecological health, and inefficient when systems are in "poor" ecological health. These predictive models help agencies to prepare for fire seasons and adjust to changing fire patterns and frequencies.

Effects of climate change on cattle production

LANDFIRE provided landscape-level vegetation and climate data to Bagne & Reeves³ for their study investigating climate change impacts to seven different regions of rangelands in the western U.S. to the year 2100. They modeled forage quantity, vegetation type trajectory, heat stress, and forage variability. Projections show an increase in forage quantity in northerly regions; a move toward grassier vegetation types overall, but with



Photo by USDA Agricultural Research Service.

considerable spatial heterogeneity; a rapid increase in the number of heat-stress days across all regions; and higher forage variability for most regions. These findings inform landscape-scale scenario planning and provide baseline information that can help land managers respond to climate change challenges.

Adapting data to support local planning efforts

In 2015, the South Central Idaho Fire Planning Unit (FPU) needed current data after four major fires burned 178,000 acres in 2013. The fire staff, working with a team of LANDFIRE and USFS colleagues, calibrated fire behavior fuel models to better fit local conditions. Because LANDFIRE data were applied and adjusted quickly, the FPU had the information they needed to plan and adapt management practices to address post-fire landscape conditions. Read the story in *Wildfire Magazine* (<https://goo.gl/cxAKti>).

LANDFIRE has been on the ground exploring, analyzing, and mapping the country since 2004. The Intermountain West has more applications of LANDFIRE Program products than anywhere else in the continental U.S. This suite of examples of biological data in action demonstrates the versatility of this free program. We hope you explore LANDFIRE's website (<https://www.landfire.gov>) and The Nature Conservancy's LANDFIRE site on Conservation Gateway (<https://goo.gl/n2HKqt>).

-Jeannie Patton, LANDFIRE Communications Lead

¹ Macfarlane, W.W., J. Gilbert, M. Jensen, J.D. Gilbert, N. Hough-Snee, P. McHugh, J. Wheaton, S. Bennett. (2016). Riparian vegetation as an indicator of riparian condition: Detecting departures from historic condition across the North American West. *Journal of Environmental Management*. 202: 447-460. <https://goo.gl/M2TNEY>

² Taylor, M.H., K. Rollins, M. Kobayashi, R.J. Tausch. (2013). The economics of fuel management: Wildfire, invasive plants, and the dynamics of sagebrush rangelands in the western United States. *Journal of Environmental Management*. 126: 157-173. <https://goo.gl/6fhNfn>

³ Reeves, M.C., K.E. Bagne. (2016). Vulnerability of cattle production to climate change on U.S. rangelands. Gen. Tech. Rep. RMRS-GTR-343. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 39 p. <https://goo.gl/ivSZLA>

Brian Head Fire Recovery: A Closer Look

For better or worse, big fires are here to stay. Because of this, many researchers are investigating long-term impacts to forests, landscapes, and ecosystems following big fires. The Brian Head Fire that scorched 72,000 acres in Southern Utah in 2017 has piqued the interest of USU Assistant Professor, Dr. Larissa Yocom. Yocom's team will be investigating the following questions over the next several years:

What does post-fire regeneration look like across an elevational gradient?

Yocom (and other climate scientists) predict that as climate change continues to impact habitat suitability, species are likely to migrate uphill where temperatures are better suited for preferred (colder) growing conditions. Yocom will test if this is true for regenerating tree species that occur on the Brian Head Fire site.



Results of Brian Head Fire. Photo by Larissa Yocom.



Damaged riparian zone within boundaries of Brian Head Fire. Photo by Larissa Yocom.

What factors limit post-fire regeneration for this area? Survival or regeneration?

If one of these factors plays a substantially larger role, scientists could then identify methods to improve survival or regeneration rates to achieve restoration goals. To determine survival rates, Yocom will mark new seedlings and monitor survival on an annual basis for at least 5 years. To determine regeneration, Yocom will identify locations of new seedlings to understand to what extent regeneration impacts forest composition at this site.

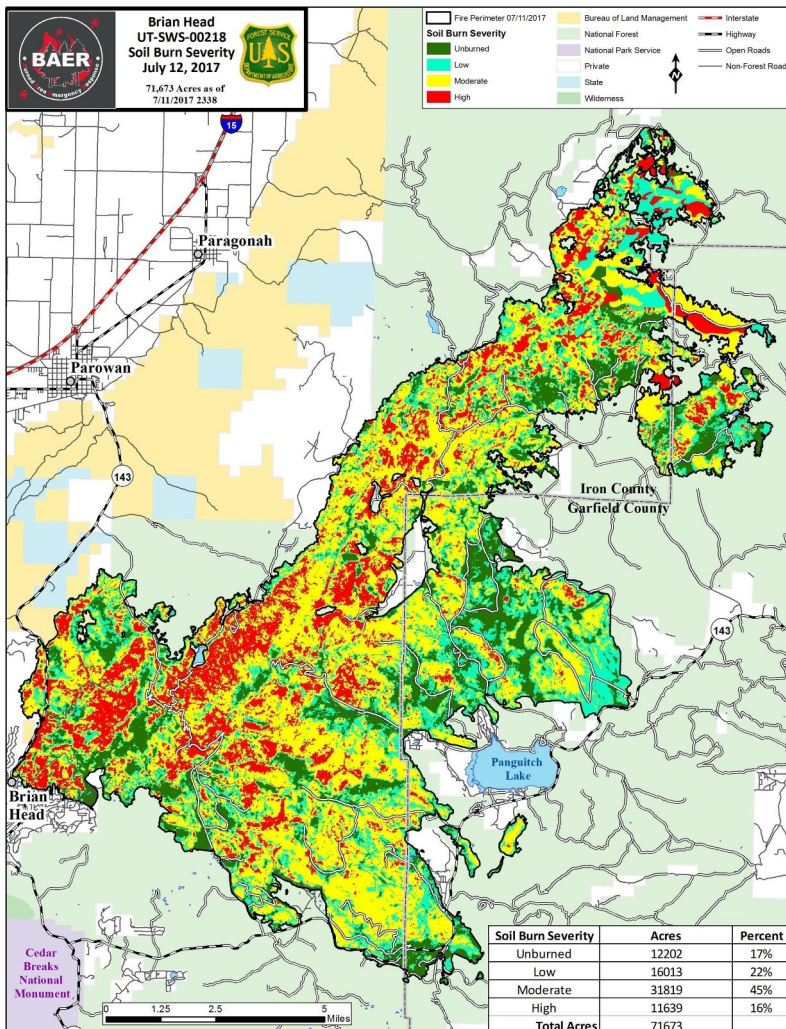
Are disturbance interactions impacting the Brian Head Fire recovery?

How do compound disturbances (drought, fire, beetles) interact to influence post-fire restoration? Understanding the interplay between these disturbances can improve site recovery.

In addition to this project, Yocom will partner with USU Professor and aspen expert, Dr. Karen Mock, to plant and monitor aspen seedlings starting in the fall of 2018. Aspen reproduction primarily occurs via asexual root suckering, but the research of Mock and others has shown that aspen produces viable seed and that regeneration through seedlings is especially common after fires.



Brian Head Fire recovery zone. Photo by Larissa Yocom.



Brian Head Fire soil burn severity map. Map represents approximate information. Map by InciWeb, Burned Area Emergency Response, USFS.

Yocom and Mock will ask the following questions on the Brian Head Fire restoration project:

- 1) Is it feasible to use nursery-grown aspen seedlings to restore aspen in post-fire environments?
- 2) Can coarse woody debris (logs on the ground) in post-fire environments facilitate the survival of planted aspen seedlings by providing shade and retaining soil moisture?

Yocom and Mock are excited about the possibility of using aspen seedlings in post-fire restoration operations, as aspen can function as a fuel break in future fires, and it is an important species for aesthetics and biodiversity in Utah forests.

The Utah Forest News will continue to monitor and report on these studies and the progress of the Brian Head Fire restoration efforts.

*-Megan Dettenmaier,
USU Forestry Extension Educator*

Cross-laminated timber challenges current building codes to keep pace with the times

The Utah Botanical Center, in cooperation with Euclid Timber Frames, have built a set of nearly identical sheds that are designed to challenge the building codes in Utah related to cross-laminated timber construction (CLT). CLT is a material made by sandwiching layers of perpendicularly oriented boards that are fused together. What makes CLT unique is its ability to utilize undervalued, small diameter timber and create massive wood walls that fit together like pieces of a puzzle.



Two sheds involved in an experiment at USU Botanical Center, Kaysville. Shed built with CLT is on the left. Photo by Jerry Goodspeed.

The niche market for aesthetically appealing, sustainable, renewable, energy efficient structures that are functional and affordable is gaining steam. Buildings made from CLT seem to check all these boxes, but building codes and regulations for this new (to the U.S.) building material have not been updated accordingly. Large machinery places the massive, interlocking pieces together to create multi-story buildings in a fraction of the time it would take to create framed or concrete buildings.

Utah State University Forestry Extension is helping to plan the design of a CLT building at the USU Botanical Center; this is the first public CLT building in Utah. USU was awarded a Wood Innovations Grant from the USDA Forest Service in 2015 to design a 4,000 square foot building. One of the bigger challenges with completing this design was the lack of building codes that address CLT construction. We have had to go with the “belt and suspenders” approach when using CLT massive wood walls as building codes required us to include specifications to wrap the (already

highly efficient) CLT in wool insulation. This approach is required because current codes do not account for the already highly efficient properties associated with CLT.

Utah State University Forestry Extension hopes to highlight key differences between CLT and timber frame structures, specifically thermal mass. Thermal mass is the ability of a material to absorb and store heat. To do this they are conducting a small-scale, side-by-side comparison between two CLT sheds; one using just CLT construction with a moisture barrier, the other using CLT with added insulation layers and a vapor barrier currently required by the state building code. Moisture barriers prevent liquid (rain) from entering the building enclosure from the outside. Vapor barriers limit the amount of water vapor diffusing through the wall as a result of different vapor pressures. This side-by-side shed comparison is intended to determine differences in energy efficiency between these two buildings. Located at the USU Botanical Center in Kaysville, both structures are 10x12 feet and each are affixed with comprehensive thermal and humidity monitoring systems. After five months of monitoring, preliminary data suggest that there is no significant difference between the two sheds in maintaining a prescribed heat treatment over time. Both maintain the same internal temperature regardless of the fluctuation in external temperatures. One interesting result is the CLT building with no insulation and only a moisture barrier consistently maintains a 15% higher humidity level than the shed with insulation and a vapor barrier.

USU Botanical Center Director, Jerry Goodspeed, has been campaigning to raise 1.7 million dollars of public and private support for this construction, which is set to break ground in 2019. The building will show the benefits and sustainability of using beetle kill wood from our forests, and will be used as a teaching facility. It will house a large classroom for instruction and hands-on workshops, and will be the focal point of the existing edible demonstration garden. Upon completion, the CLT building will house a teaching and demonstration kitchen for underserved, low-income community members (and any others) interested in learning how to cook, freeze, and preserve fruits and vegetables.

All builders face challenges as they attempt to reconcile local building codes with CLT's unique properties. This uncertainty in the permitting process can discourage developers from using CLT in construction. There is good

news, though. An international committee of engineers, architects, fire officials, and other experts, are currently developing amendments to the International Building Code (IBC), which is scheduled to be complete in 2021. One important deliverable from this committee will be a set of internationally recognized building standards for tall wood buildings. Even more encouraging is the recent development in Washington State, where Gov. Jay Inslee recently signed a bill mandating the state's building code council to develop rules for mass timber in commercial and residential construction. Adding to this momentum, Washington State lawmakers have begun creating legislation that would require CLT to be used in any public building 12 stories or less. The interest in CLT as a suitable replacement for traditional steel and concrete buildings is strong, however uncertainty remains in other states, including Utah, where questions persist about the applicability of traditional building codes to the properties of CLT.

Utah currently has no proposals (that we know of) involving changes to building codes or specifications related to CLT buildings. Utah Forest News will follow the progress of both projects and provide updates in the future.

-Megan Dettenmaier, USU Forestry Extension Educator

Saving water two ways: Using less and improving efficiency

The depletion of the Cedar City aquifer weighs heavy on the minds of agriculture producers in Southern Utah where farming uses more than 80% of the diverted water in the state. Worries are mounting about water scarcity resulting from rapid urban growth and weather extremes. Because of this, agriculture producers have looked to USU Extension to find creative ways to conserve water and increase efficiency.

Funded by a USU Water Initiative Grant, a team of USU Extension Specialists and Agents are conducting a study on three Utah alfalfa and corn producing farms with pivot irrigation systems. Typically, pivot irrigation systems spray



Biochar applied at a rate of 15 tons / acre on study site in Iron County, Utah. Photo by Jonno Holt.

water from nozzles that are suspended about six feet above the soil surface; this allows for a significant amount of evaporation, especially on hot or windy days. The team is evaluating potential water savings from reduced spray drift and evaporation

for (1) spray nozzles that are about 18 inches above the soil and (2) drip tubing dragged behind the pivot discharging water directly on the soil.

At the request of Iron County Extension Director Chad Reid, we incorporated biochar applications to this study to see if the addition of biochar to the soil (in varying amounts) would result in greater water retention and plant productivity. Biochar is commonly made from low-value biomass, for example beetle-killed trees and pinyon-juniper trees. Natural resource managers are challenged with finding useful ways to dispose of beetle kill and pinyon juniper – however this project could close the loop by helping to utilize low-value biomass by making biochar, applying it on local farms, and potentially decreasing pressure on the Cedar City aquifer.

What is Biochar?

Biochar is a charcoal-like product made from waste wood. It is used as a soil amendment and can be compared to putting a million tiny sponges in your soil, which can persist for hundreds of years. Biochar is a high carbon organic material that has demonstrated some promise as a soil amendment that may improve water holding capacity, absorb nutrients, hazardous and toxic elements, and increase soil carbon storage. The team will investigate whether varying levels of biochar in the soil impacts: alfalfa yield, alfalfa quality, or soil water holding capacity. Study results are expected in 2019; Utah Forest News will monitor this study and report findings in future newsletters.

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Forestry practices tour

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Do you have a story idea for the next edition of Utah Forest News? Have feedback about any story in this issue? Get in touch with us.

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