Hazardous Fuels Treatment Effectiveness on Utah BLM Lands

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Since inception of the National Fire Plan, 112 hazardous fuels reduction treatments implemented on Bureau of Land Management Lands (BLM) in Utah have been intersected by wildfire. This has reduced the size and cost of unplanned ignitions, assisted in providing opportunities to stop or slow the spread of the wildfire, provided for greater firefighter safety, allowed for opportunities to manage unplanned ignitions for resource benefits, reduced the burn area rehabilitation needs and costs, reduced smoke emissions, and allowed for greater resiliency of the environment in returning to a functioning ecosystem following a wildfire.

Concern over Treatment Effectiveness

Interest in demonstrating hazardous fuels treatment effectiveness has been expressed at numerous levels including Congress, the General Accountability Office (GAO), Office of Management and Budget (OMB), oversight agencies, cooperators, the local unit where treatments are being implemented and the public. The GAO released a report to Congress in September 2007 entitled "Wildland Fire Management: Better Information and a Systematic Process Could Improve Agencies' Approach to Allocating Fuel Reduction Funds and Selecting Projects" (GAO-07-116). The report identified "Although the Forest Service and Interior are taking steps to enhance their funding allocation and project selection processes, there are several improvements they could make to better ensure that they allocate fuel reduction funds to effectively reduce risk. Specifically, when allocating funds and selecting projects, the agencies could improve their processes by:

- consistently assessing all elements of wildland fire risk—including hazard, risk, and values—at the national, regional, and local levels, in order to identify those lands at highest risk from wildland fire and incorporate this information in the allocation and project selection process;
- developing and using measures of the *effectiveness* of fuel reduction treatments in order to estimate how much risk reduction is likely to be achieved through particular treatments and for how long;
- using this information on *effectiveness*, once developed, in combination with existing information on treatment costs, to assess and compare the cost-effectiveness of potential treatments in deciding how to optimally allocate funds;
- clarifying the relative importance of the numerous factors used in allocating funds, including those factors (such as funding stability and the use of forest products resulting from fuel reduction activities) that are unrelated to risk, treatment *effectiveness*, or cost effectiveness; and

- following a more systematic process in allocating funds—that is, a process that is methodical, based on criteria, and applied consistently—to ensure that funds are directed to locations where risk can be reduced most effectively."

In September 2009, the GAO came back and released another report that looked at wildland fire management as a whole, basically reviewing previous GAO reports. The report, "Wildland Fire Management: Federal Agencies Have Taken Important Steps Forward, but Additional, Strategic Action Is Needed to Capitalize on Those Steps," (GAO-09-887) identified a number of concerns related to hazardous fuel reduction treatment effectiveness. This report identified that "Despite improvements, further action is needed to ensure that the agencies' efforts to reduce hazardous fuels are directed to areas at highest risk. The agencies, for example, still lack a measure of the *effectiveness* of fuel reduction treatments and therefore lack information needed to ensure that fuel reduction funds are directed to the areas where they can best minimize risk to communities and natural and cultural resources." While Forest Service and Interior officials have recognized this shortcoming in being able to measure *effectiveness*, efforts were identified that are addressing concerns including funding 50 Joint Fire Science Projects evaluating the *effectiveness* of different types of treatments, longevity of treatments and their effect on natural resources.

In August 2011, GAO informed the Department of Interior's Office of Wildland Fire Coordination that it has closed as implemented (completed) recommendations 1, 2, and 5 of GAO Report 07-1168. The recommendations related to hazardous fuels treatment effectiveness (recommendations 3 and 4) remain to be identified as implemented. The development of a measure of fuel reduction effectiveness, so agencies can usefully estimate the extent and duration of risk reduction from fuel treatments and use of such information to be combined with information on risk and treatment cost to assess cost effectiveness of fuel reduction treatments, remains to be completed.

Benefits of Treatment Effectiveness

The benefits of hazardous fuels treatment effectiveness can be multiple and may include one or more of the following that is discussed later in greater detail with specific examples provided:

- reduce the size and cost of unplanned ignitions,
- assist in providing opportunities to stop or slow the spread of the wildfire,
- provide for greater firefighter safety,
- allow for opportunities to manage unplanned ignitions for resource benefits,
- reduce the burn area rehabilitation needs and costs,
- reduce smoke emissions, and
- allow for greater resiliency of the environment in returning to a functioning ecosystem following a wildfire.

Reduce the size and cost of unplanned ignitions – When new ignitions occur within hazardous fuels reduction treatments, the size and cost of the wildfires are many times diminished. An

example of this has been shown on the West Desert Fire Zone with two fires that occurred on 16 August 2007. The Muskrat and Broon's Fires were both ignited by lightning on the same day at about the same time and within three miles of each other (Figure 1).

The Muskrat Fire was difficult to access from roads overgrown by dense juniper. Due to the heavy fuels present, fire behavior was active and intense which created control problems. Containment was reached with the aid of four single engine air tankers (SEATs) that dropped two loads of fire retardant each and four type 4 engines involved with the ground suppression effort. Total costs for containment were $48,111.08.

The Broon's Fire on the other hand occurred in the previously treated Round Canyon Bullhog fuels project. Containment was relatively easy with three helitack crewmembers and support from the helicopter that provided several bucket drops. Fire behavior was limited to smoldering and creeping through the native grasses. Total containment costs were $11,321.89 or 23 percent of the more expensive Muskrat Fire.

Figure 1. Muskrat Fire on the left and Broon's Fire on the right. Fires occurred three miles from one another on the West Desert Fire Zone with photos taken within two minutes of each other.

Assist in providing opportunities to stop or slow the spread of the wildfire – In most cases, hazardous fuels reduction treatments are intended to slow the spread of wildfire and allow a point where suppression resources can safely attack the fire. The Pine Creek Fire running into Cook Canyon Bullhog Project, again on the West Desert Fire Zone, is one such example (Figure 2). The Pine Creek Fire was a running crown fire until it burned into the Cook Canyon Bullhog project at which time it became a surface fire. Suppression strategies were to use SEATs to corral the fire into the fuels treatment where it could be easily attacked by engines from the ground. Not only did the fuels treatment offer a point where the fire could be easily and safely attacked, but it allowed for easier access into the wildfire.

Figure 2. Photos of the Pine Creek Fire burning into the Cook Canyon Bullhog Project on the West Desert Fire Zone. Left photo shows flames in crown and surface fire within fuels treatment area. Right photo shows wildfire at bottom and fuels treatment in middle with fire retardant lines in red leading to fuels treatment.

Provide for greater firefighter safety – Providing for firefighter safety is paramount for all hazardous fuels reduction treatments. The Ash Creek Fuels Treatment Project on the Color Country Fire Zone near New Harmony and Harmony Heights is one such example of providing for greater firefighter safety (Figure 3). This was a landscape level treatment on BLM Lands along with the adjacent USDA Forest Service and State of Utah Lands. The Blue Springs Fire came off of the Dixie National Forest where the fire was burning in steep terrain and dense pinyon-juniper fuels. With the Ash Creek Fuels Project, firefighter safety was improved by allowing the fire to come down into less rugged terrain. Air tanker effectiveness was improved in the lighter fuels found in the fuels treatment area along with large openings that were of ample size and sufficient number to provide for safety zones.

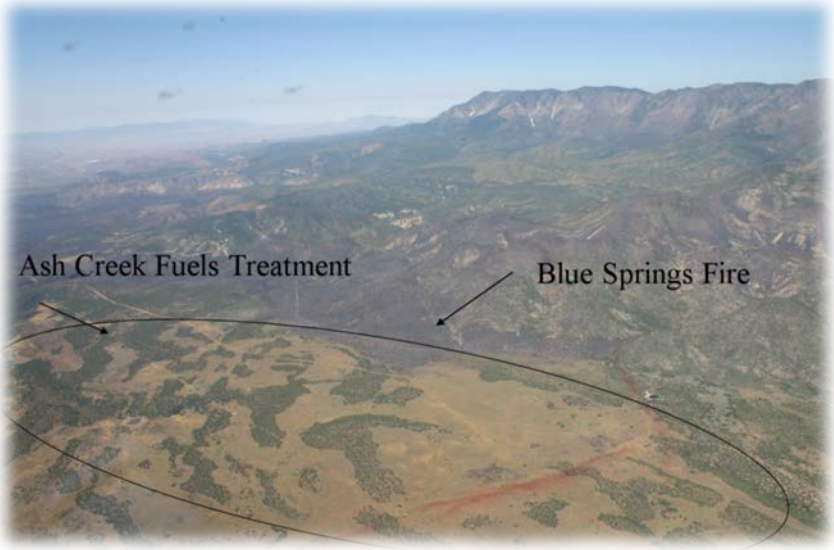

Figure 3. The Ash Creek Fuels Treatment with the Blue Springs Fire above the treatment area on the Color Country Fire Zone.

Allow for opportunities to manage unplanned ignitions for resource benefits – By having fuel treatments in locations where wildfires are going to be managed for resource benefit, managers are allowed to contain the fire within a known box, provide safety zones, and protect values at risk, to name some examples. The Green River Fire Zone has managed several wildfires for resource benefit. The Augusi Fire that occurred along the Colorado border in 2010 was one such fire managed for resource benefit (Figure 4). The Indian Springs Phase II mastication project reduced crown fire in the pinyon pine to creeping and smoldering. Knowledge of this hazardous fuels treatment location in relationship to the Augusi Fire helped give decision makers some added level of comfort in the decision to manage the fire for multiple resource objectives. The Augusi Fire would be used again in 2012 along with five other treatments around it that helped in corralling the 19,951-acre Wolf Den Fire.

Figure 4. The Augusi Fire on the Green River Fire Zone. Fire was managed for resource benefit with map showing proximity to past prescribed fire and mechanical treatments.

Reduce the burn area rehabilitation needs and costs – Hazard fuel reduction treatments are not designed to stop all wildfires, especially under the most extreme of conditions. In fact, most treatments are only designed to reduce the flame lengths or slow the spread of fire. When the Big Pole Fire burned on the BLM's West Desert Fire Zone and the Wasatch-Cache National Forests in 2009, the 43,923-acre wildfire burned through six BLM hazardous fuels reduction treatments. This was a high intensity wind driven event under Red Flag Warnings, an ERC above the 90th percentile (95), Burning Index above the 97th percentile (117), with live fuel moistures collected at Muskrat Station at 72 percent for sagebrush and 64 percent for juniper (at or near record lows for 14 years of sampling). While some unburned islands occurred within fuel treatments, the majority of the treatments were burned.

Two years following the Big Pole Fire, excellent natural recovery of native forbs and grasses occurred in an area treated with a bullhog and seeded as part of a fuels treatment in 2004 (Figure 5). Part of this previously treated area received fire rehabilitation treatments while part of it was left untreated. There was no discernible difference in vegetation response between the two areas, indicating the initial fuels treatments were successful in creating a viable seed

bank, providing a fire resilient landscape, and proving that fire rehabilitation efforts were not necessary within the fuel treatments.

Figure 5. Big Pole Fire on the West Desert Fire Zone. Left photo shows mastication treatment burned five years post treatment with small pocket of open unburned pinyon and juniper in background. Right photo two years post fire. Excellent natural recovery of native forbs and grasses in an area that received no fire rehab.

In years with a high occurrence of wildfires, like 2012 when acres burned exceed the 10-year average, many times there is not enough funding for all of the Emergency Stabilization and Rehabilitation projects. In these years, there are opportunities to use the fuels treatments where wildfires burn as seed banks, where seeding will not be required as there is already a viable seed source on the site, and risk of exotic species invading a site is greatly reduced. This provides savings and allows for limited funds to be spread out and used for other projects.

Reduce smoke emissions – When the Utah Interagency Smoke Management Coordinator (Figure 6) presented the "Utah BLM Fuels Treatments Impacted by Wildfire" data to the Utah Department of Environmental Quality, the Air Quality Board was impressed with the data and felt it identified yet an additional benefit in reducing smoke emissions. Mechanical treatments can occur with limited emissions, prescribed fire treatments can be planned to consider air quality concerns, and when wildfires do occur in previously treated areas, smoke production is reduced.

Figure 6. Smoke from the Marshal Draw Prescribed Fire on the Green River Fire Zone. Right photo of the Utah Interagency Smoke Management Coordinator.

Allow for greater resiliency of the environment in returning to a functioning ecosystem following a wildfire – As fire regimes have degraded in condition class in the absence of wildland fire, the severity of the fire effects have become a concern when a wildfire burns an area. Once an area has been treated, the ability to allow for wildfire to burn as a more natural process with lower intensities and reduced severity can be realized (Figure 7). This allows for some flexibility in managing unwanted starts, and in some cases reduces the urgency in having to take an aggressive and more costly suppression response.

Figure 7. The Price Canyon Prescribed Burn on the Canyon Country Fire Zone. Several mechanical treatments have occurred followed by piling and pile burning to thin out vegetation around Ponderosa pine. Subsequent understory burns have occurred along with a half-acre wildfire.

Utah BLM Fuels Treatments Impacted by Wildfire

Since inception of the National Fire Plan in 2001, twelve years ago, when funding levels increased substantially for wildland fire management and hazardous fuels reduction, 568,712 acres have been treated in Utah on behalf of the BLM for 1,381 individual treatments through

the expenditure of $101,316,601 in BLM hazardous fuels reduction funds. Within Utah BLM, 112 treatments, or 8.11 percent of the 1,381 treatments completed have interacted with wildfire. This interaction includes locations where wildfires have intersected or burned into treatments or started within a treatment unit.

Starting in 2009, the BLM Utah State Office started collecting data from the five BLM fire zones on the occurrence of unplanned wildfire events that interacted within any hazardous fuels treatments on lands managed by the Utah BLM. At such time, a number of anecdotal examples were provided from the field of wildfires burning into existing hazardous fuels reduction treatments, but no systematic process was in place to roll up this data and to show the extent of such occurrence and the cumulative effect within Utah. The "Utah BLM Fuels Treatments Impacted by Wildfire" spreadsheet was developed using Microsoft Excel (Appendix A) and is summarized in Table 1. Data was collected from the five fire zone fuel specialists in BLM Utah. Personal knowledge of the hazardous fuels reduction treatment locations along with use of GIS and the BLM Utah large fire history polygon data and the BLM Utah fuels treatment geodatabase data layers were used in identifying locations where wildfires and hazardous fuels reduction treatments interacted with one another.

One-hundred and twelve hazardous fuels reduction treatments burned by wildfires were identified for 12,339.41 treatment acres burned. These treatments entailed 91,324 acres with treatment area burned ranging in size from 20,885 to 0.1 acres. Collecting data on the 0.1 acres single-tree lightning start fires was identified as being just as important as the larger fires since these fires have the potential of becoming larger in the absence of hazardous fuels reduction treatments. Ninety-seven wildfires interacted with treatments for the entire wildfire acreage of 328,889.8 acres. Fewer wildfires are identified than treatments as several wildfires burned into multiple treatment units.

Number of Treatments	**Treatment Acres Burned**	**Acres Treated**	**Number of Wildfires**	**Wildfire Size**
112	12,339.41	91,324	97	328,889.8

Table 1. Summary data from of BLM Utah Fuels Treatments Impacted by Wildfire

The distribution of fuel treatments impacted by wildfire events in the BLM Utah fire zones can be seen on the map of Utah in figure 8 and is shown on table 2. While the West Desert Fire Zone shows the greatest number of treatments and treatment acres burned, there is distribution throughout BLM Utah lands. Where concentrations of treatments are identified on the map, multiple treatments may have been impacted by a single wildfire event.

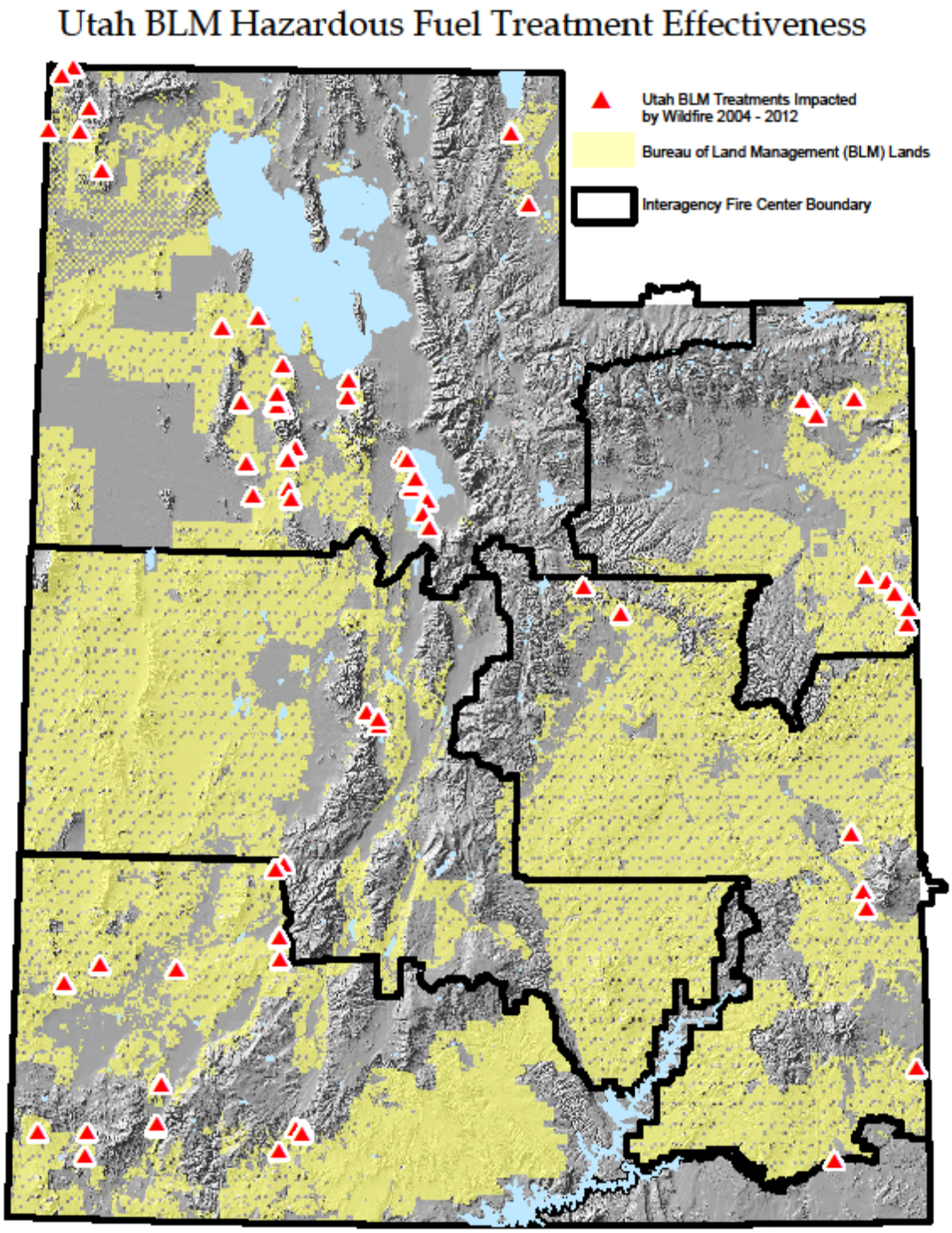

Figure 8. Utah BLM Treatments Impacted by Wildfire 2004-2012

Fire Zone	Treatment Acres Burned	Number of Treatments
Color Country	497	21
Central Utah	929.4	3
Canyon Country	15.1	16
Green River	4,531.6	14
West Desert	6,366.31	58
Total	**12,339.41**	**112**

Table 2. Treatments Impacted by Wildfire by Fire Zone

Table 3 highlights a breakdown of treatment status. A treatment status of "Planned" indicates the area had planning activities occurring, but NEPA was not completed. Where the table indicates "NEPA," environmental analysis was completed that identified treatments, but implementation had not occurred. A status of "Underway" indicates treatments were initiated within the treatment unit, but not completed (i.e. mechanical treatments of slashing and/or piling finished, but burning of the slash and/or piles was not finished). These acres, along with those with NEPA completed and identified within NFPORS, may be reported as an accomplishment by the BLM. The majority of the treatments, 89, were implemented with completion of all work identified within the planning document.

Treatment Status	Treatment Acres Burned	Number of Treatments
Implemented	6,850.87	89
Underway	1,602.3	13
NEPA	31.84	3
Planned	3,854.4	7
Total	**12,339.41**	**112**

Table 3. Status of Treatments Impacted by Wildfire

Data includes treatments not implemented, but at various stages of planning and NEPA completion. This data shows additional justification that the placement of planned treatments are in the correct location to potentially impact wildfire outcomes. Local expert knowledge vs. some form of artificial intelligence that selects site locations (i.e. Fire Program Analysis (FPA)) is important in treatment effectiveness. This can be demonstrated in looking at the Northern Utah Fire Planning Unit (FPU) as shown in Figure 9. The base data in this figure is the 2012 FPA large-fire simulation (FSim) Burn Probability Output for the Northern Utah FPU. While ocular analysis does not show a solid correlation between burn probability and fire occurrence (polygons outlined in red), treatments impacted by fire can be seen in areas of high wildfire concentration. The FSim modeling shows that treatments should be placed in locations within this FPU where large fires are not occurring, thus reducing the cost efficiency of treatment placement on the landscape.

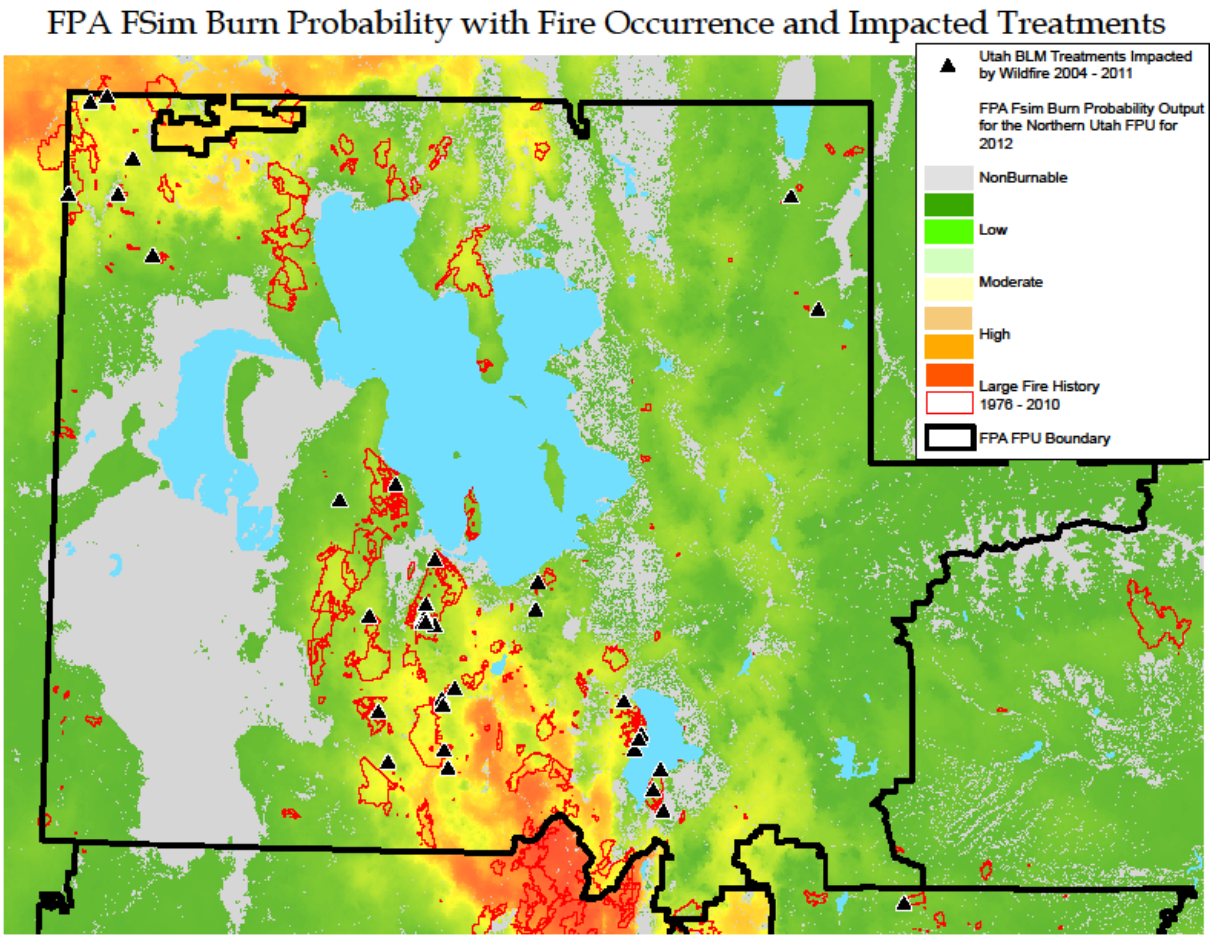

Figure 9. FPA FSim Burn Probability base map with fire occurrence from 1976-2010 outline in red polygons and hazardous fuel treatments impacted by wildfire identified as black triangles.

In spring 2011, Utah hosted a national level BLM Fuels Management, Fire Planning, and Community Assistance Program Evaluation conducted by the BLM Fire and Aviation, Fire Planning and Fuels Management Division at the National Interagency Fire Center. As part of the report, tracking of treatment effectiveness within Utah BLM, as previously described, was identified as a best management practice. The report identifies, "Utah should be commended for its efforts to track fuels treatments impacted by wildfire. A statewide spreadsheet is in place to record these occurrences that date back to 2004 and captures pertinent data, including how effective the treatment was in slowing or stopping the wildfire. This spreadsheet should be adopted nationwide."

The Future of Collecting Treatment Effectiveness Data

Several efforts have been made in collecting treatment effectiveness data. The National Interagency Fuels Management Committee developed the "Fuel Treatment Effectiveness Assessment Program" in 2008. This is a two-level reporting system with Level 2 reporting intended to take one hour in reporting time and Level 1 reporting taking up to 10 days for completion with a team formulated to gather information. Reports are to be uploaded to an

ftp site, but there is no means of rolling up the individual reports into a comprehensive database. The USDA Forest Service has championed this program with some DOI agencies also adopting the program.

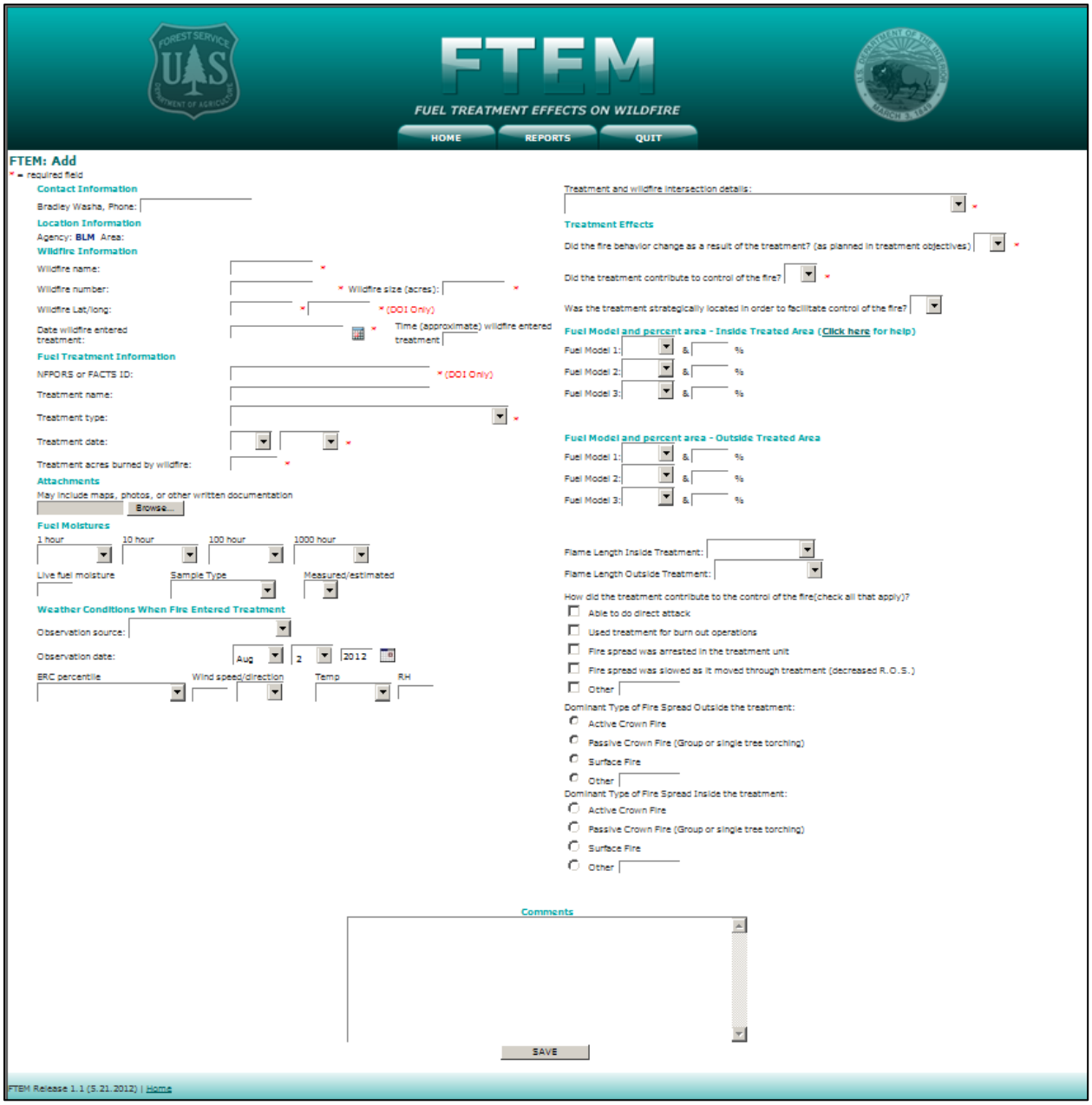

Figure 10. The FTEM Application data entry screen.

Currently an Interagency Fuels Treatment Effectiveness Tasking for Documenting Wildfire and Fuels Treatment Interactions is underway. This group looked at existing data collection processes and defined and developed a minimum Interagency standard for collecting and sharing data on fuel treatments that interact with wildfires. In looking at existing and potential

systems for both short-term and long-term collection needs, the Fuel Treatment Effect on Wildfire application (FTEM) was adopted as an Interagency system to track treatment effectiveness across the United States for the Forest Service and all Department of the Interior Agencies (Bureau of Land Management, National Park Service, US Fish and Wildlife Service, and Bureau of Indian Affairs). The FTEM is hosted on the Forest Service Fire Systems Portal in the Pacific Northwest. The FTEM was originally developed in the Pacific Northwest and has been used be the U.S. Forest Service for several years. The FTEM is a web-based system and has been updated in 2012 to meet Interagency needs and will be field tested during the 2012 fire season. This system allows for data input and provides a roll-up function for reporting out cumulative data.

Conclusion

While the "BLM Utah Fuels Treatments Impacted by Wildfire" data does not define effectiveness, it does show benefits of the hazardous fuels reduction program and demonstrates that treatments are being effective at meeting the goals and objectives of the hazardous fuels reduction program. The breadth of treatments impacted by wildfire events demonstrates that the hazardous fuels reduction program is having a positive impact on wildland fire management and demonstrates a return on the investment. The "BLM Utah Fuels Treatments Impacted by Wildfire" data was intended as a stop gap means of collecting data within BLM Utah until a national system and direction was provided for reporting treatment effectiveness. The spread sheet is further being adopted by the Utah Interagency fire community through the Utah Fuels and WUI Committee.

Figure 11. White Rocks Fire and Salt Desert Shrub 3 Greenstrip. Image shows burned State Land with a significant component of cheatgrass. The fire either stopped or was significantly slowed when it hit BLM Lands that had been seeded.

Literature Cited

Wildland Fire Management: Better Information and a Systematic Process Could Improve Agencies' Approach to Allocating Fuel Reduction Funds and Selecting Projects. GAO-07-1168. Washington, D.C.: September 28, 2007.

Wildland Fire Management: Federal Agencies Have Taken Important Steps Forward, but Additional, Strategic Action Is Needed to Capitalize on Those Steps. GAO-09-887. Washington, D.C.: September 2009.

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Maps

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Data & Photos

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