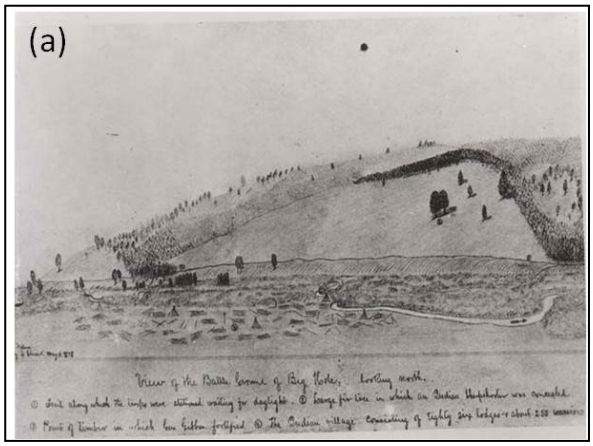
Fire, Weeds, and Rare Plants in Big Hole National Battlefield

Fire as a Resource Threat and a Stewardship Tool for Cultural and Natural Resources

In 2014 the first of four planned small-acreage prescribed fires were completed on Big Hole National Battlefield's Howitzer Hill. The goal was to maintain the open hillslope vegetation reminiscent of the 1877 battle landscape scene on the Howitzer Hill and Horse Pasture, and to test whether fire had beneficial or adverse impacts to the rare plant Lemhi penstemon and the invasive spotted knapweed. Our monitoring of the site provided evidence the fire had minimal impacts on both species, at least as far as we could tell with that fire and the subsequent droughty weather in spring of 2015 and subsequent growing seasons. However, nature can be tricky and we understood that a different combination of fire, weather, and other factors could surprise us. We wanted to get another prescribed burn completed to test this question. Competing resources for other big fire-fighting operations across the West in recent years thwarted our ability to accomplish another prescribed burn operation. Then, in the hot, dry year of 2021, the Trail Creek Fire threatened the Battlefield. To protect Battlefield assets including the Visitor Center, and to slow spread of the fire out into the Big Hole Valley, a backfiring operation was used as a firefighting tactic on the Howitzer Hill and the adjacent Horse Pasture. We were prepared to advise this operation because of our past experience with prescribed fire and our ability to monitor the impacts.

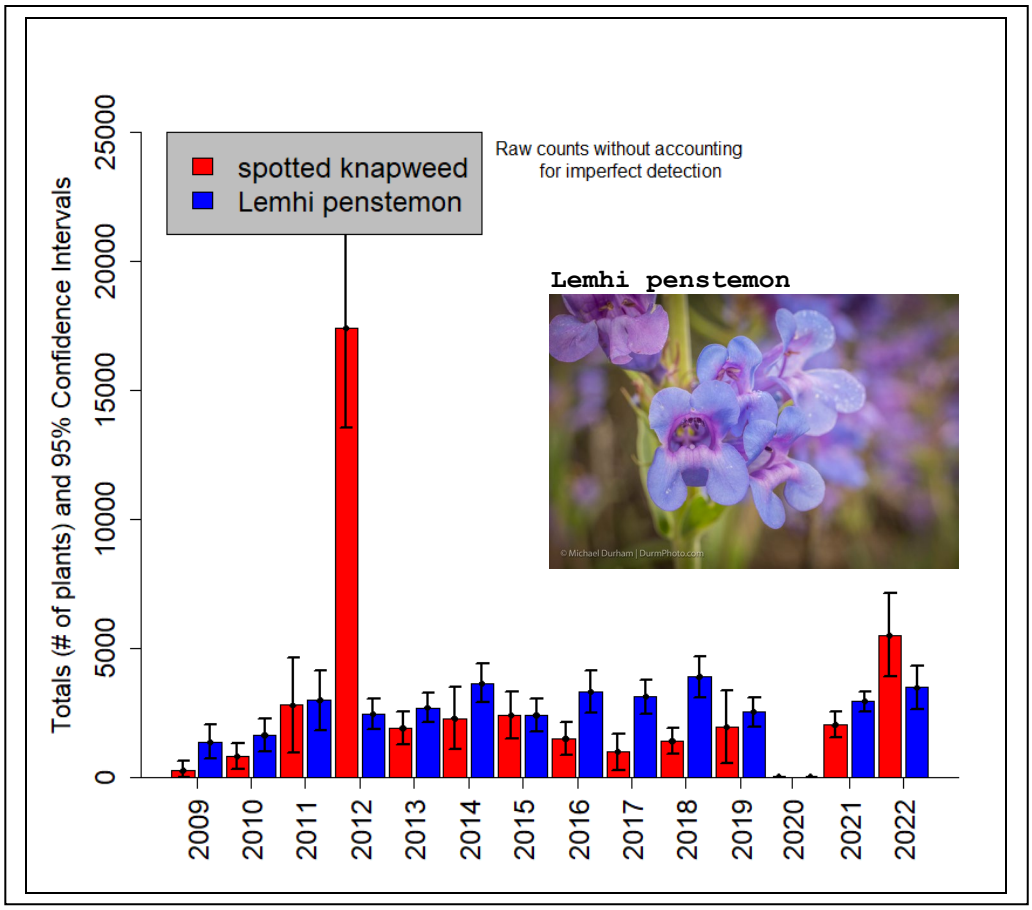
A firefighter uses a "drip torch" to ignite the 13 acre block of land on the Battlefield Howitzer Hill in September, 2014. This was the first of 4 planned stewardship burns to enhance the cultural and natural integrity of the Battlefield.



Today, the battlefield closely resembles the conditions as they were at the time of the battle. Panel A is a sketch of the Horse Pasture drawn by Granville Stewart in 1878, one year after the battle (courtesy Montana Historical Society Collection, X1968.43.17). Panel B is a contemporary photograph of the Horse Pasture. Prescribed fire, and even backfiring operations during suppression of unplanned wildfire, is an important tool available to Battlefield managers to prevent encroachment by upslope lodgepole pine. A careful application of fire, done in an adaptive management framework with ample time for feedback, learning, and adjustment, is an exemplary demonstration of cultural landscape

The Success of Collaborative Monitoring and Battlefield Resource Management

After comparing the Howitzer Hill's burned portion from 2009-2021 to the unburned areas of Howitzer Hill and Horse Pasture, it is clear that the objectives to 1) prevent encroachment by lodgepole pine, 2) to benefit the Lemhi penstemon population, and 3) slow spread of the invasive spotted knapweed population have been achieved. Also, the steppe vegetation has returned to pre-burn conditions. However, it is important to recognize that the success of this first attempt to use fire is conditional on several other factors including the 2015 drought conditions that occurred in southwestern Montana; these conditions could have dampened spotted knapweed response and added to some of the elevated post-burn Lemhi penstemon mortality recorded by UCBN staff. It must also be noted that park staff have redoubled efforts to control spotted knapweed with herbicides. It is premature to conclude that prescribed fire is a safe and effective stewardship tool at BIHO. In 2022 early signs of impacts of the 2021 Trail Creek Fire backfiring operations suggest accelerated weed invasion, but also adequate survival of Lemhi penstemon. This real-time feedback presents a great opportunity to practice adaptive management, allowing the management team to adjust and adapt tactics as results come in!



Population estimates of the rare native plant Lemhi penstemon and invasive spotted knapweed obtained from long-term monitoring across Howitzer Hill and Horse Pasture in Big Hole National Battlefield. Covid-19 pandemic disruptions resulted in no survey in 2020. Lemhi penstemon population appears to be relatively stable over time, even after two fire disturbances. The large (exponential) increase in spotted knapweed from 2009- 2012 appears to have been contained with herbicide application. The next few years of monitoring will provide evidence of the impact of the 2021 Trail Creek Fire. There are new worrying signs that spotted knapweed is again on the increase in 2022.

A New Invasive Threat Across the Battlefield: Cheatgrass!

Anyone familiar with life in the Western US probably already knows about cheatgrass, the invasive annual grass from Eurasia that has taken over millions of acres of sagebrush steppe. It's not a new problem! However, the cold slopes of the Upper Big Hole Valley, and the relatively intact sagebrush steppe vegetation in the Battlefield's Howitzer Hill and Horse Pasture have remained cheatgrass free until very recently. In fact, we only picked it up inside any of our monitoring plots in 2022, having first noticed it beginning in 2018 only in small patches where the 2014 prescribed fire burned particularly hot, or where needle duff and litter from fir trees had accumulated. This is really disappointing development! The team is now dedicated to stopping this new threat but it is unclear whether how the 2021 Trail Creek Fire will accelerate this infestation. Cheatgrass is notorious for capitalizing conditions after fire. We are attacking it with herbicides, hand pulling, and monitoring the results. Stay tuned! With sustained effort, the next couple of growing seasons may tip the balance in our favor.

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