



# An Ecological Assessment of the Northern Yellowstone Range: Introduction to the Special Issue

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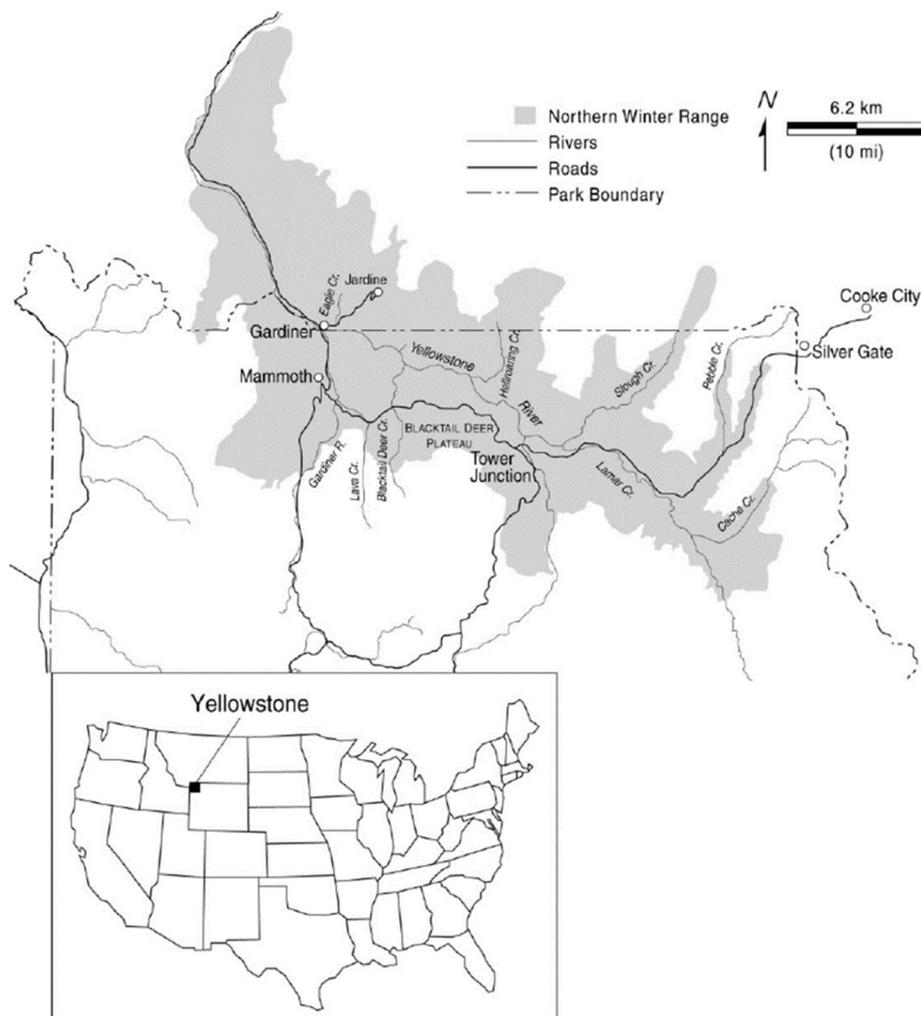
The Northern Range (a.k.a., Northern Yellowstone Range) is 380,000 acres of rangeland and forest in northwestern Wyoming and south-central Montana within and adjacent to Yellowstone National Park (YNP). Sixty percent of the Northern Range is within YNP and 40% is north of YNP on federal, state, and private lands in Montana (Fig. 1). Inside YNP, about 60% of the Northern Range is rangeland and 40% is forest. Outside YNP, the Northern Range in Montana is mostly foothill grassland and sagebrush steppe, while the bottomlands are dominated by irrigated pastures and hayfields. The Northern Range outside YNP is a working landscape comprised of multiple use federal and state lands, ranches, rural residences and vacation homes, small unincorporated towns, and tourist facilities. Federal and state lands and ranches provide open spaces that buffer YNP from more developed lands. Wildlife migrating north from YNP depends on these working lands for winter and summer habitat.

The Northern Range is home to one of the largest and richest assemblages of ungulates (i.e., hooved mammals) in the western hemisphere.<sup>1p271</sup> Eight species of wild ungulates inhabit the Northern Range (i.e., bison, elk, mule deer, white-tailed deer, moose, pronghorns, bighorn sheep, and mountain goats). Domestic ungulates (e.g., cattle, sheep, and horses) also inhabit portions of the Northern Range outside YNP, and several species of ungulate predators (e.g., grizzly bears, black bears, coyotes, mountain lions, and wolves) cohabit the Northern Range inside and outside YNP.

The Northern Range is a diverse ecosystem with complex natural resource issues of local, regional, national, and international significance. The issues involve multiple government agencies and stakeholders. The issues are controversial and rife with emotion. Together, the complexity and emotions impede communication among people otherwise bonded by their shared, abiding love for the Northern Range. YNP is the world's oldest and most beloved national park, a Biosphere Reserve under UNESCO's Man and the Biosphere Program, and a World Heritage Site. What happens in YNP influences the management of parks across the globe. Millions of tourists from throughout the world visit the Northern Range annually for outdoor recreation (e.g., hiking, camping, hunting, fishing, wildlife viewing, etc.), and the tourist hospitality industry (e.g., fishing, hunting, wildlife viewing guide services, motels, restaurants, etc.) dominates the local economy. Livestock ranching also contributes significantly to the local culture and economy, and ranching is the dominant land use on the Northern Range outside YNP. In short, the future sustainability of the Northern Range ecosystem matters to large numbers of people and to large numbers and species of wildlife.

Concerns about the land and wildlife of the Northern Range are nothing new, dating back to when YNP was first created. Contemporary controversies center on the following: 1) the effects of wild ungulate grazing and browsing on rangeland and riparian (i.e., streamside) health, and 2) transmission of the disease carrying bacterium *Brucella abortus* from bison and elk to cattle, horses, and people. Underlying both of these controversies is the long-standing disagreement about the appropriateness of controlling wild ungulate numbers within YNP. The primary goal of this Special Issue of *Rangelands* is to facilitate improved communication about these modern controversies, to help explain their tangled history, and to suggest options for the future management of the Northern Range.

Ecology is the study of how organisms interact with one another and their environment. Accordingly, ecology cannot tell land and wildlife managers what is the "best" or "desired" state of the Northern Range. This is a political decision, not an ecological one. The people of the United States made their



**Figure 1.** The Northern Yellowstone Range in northwestern Wyoming and south-central Montana encompasses nearly 380,000 acres, with 40% located outside Yellowstone National Park. Source: National Park Service.

political decision about management goals for the Northern Range, or at least its southern portion inside YNP, when YNP was created in 1872. This decision has been reaffirmed many times, as set forth in the 1916 act that created the National Park Service (NPS), the General Authorities Act of 1970 and its Redwood Amendment of 1978, the National Parks Omnibus Management Act of 1998, and the 2006 Management Policies of the NPS. Simply stated, the American people have directed the NPS to maintain YNP “in as nearly pristine a condition as possible.”<sup>2</sup> YNP is intended to epitomize a healthy, natural, sustainable ecosystem.<sup>3</sup><sup>p20</sup>

The NPS has used various management strategies to preserve the naturalness of YNP during the past 146 years. For example, before 1935 the NPS killed predators (e.g., wolves, bears, mountain lions, and coyotes) and fed hay to elk, bison, and other ungulates during winter.<sup>4</sup> Bison continued to be fed hay until 1952, and from 1935 through 1968 the NPS used various methods, including lethal culling, to regulate wild ungulate numbers.<sup>5</sup> The NPS ended lethal culling in 1968 and embraced the philosophies of natural regulation and ecological process management, philosophies that advocate no direct manipulation by humans.<sup>2,6</sup>

In 1998 the US Congress directed the National Research Council (NRC; now known as the National Academies of Sciences, Engineering, and Medicine) to review the impacts of ungulate grazing and browsing on the ecological health of the Northern Range inside YNP. Four years later the NRC concluded that degraded rangelands existed in YNP owing to excessive grazing and browsing by wild ungulates.<sup>7</sup><sup>p122&129&133</sup> This finding conclusively debunked the central tenet of the natural regulation and ecological process management paradigms, which espoused that wild ungulate populations on the Northern Range would self-regulate and were, therefore, incapable of degrading their habitat.<sup>2,6</sup> Current NPS management policy was last revised in 2006, and the terms “natural regulation” and “ecological process management” do not appear in the 169-page document.<sup>3</sup>

Current NPS policy directs the NPS to “maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species native to those ecosystems.”<sup>3</sup><sup>p36</sup> In other words, this policy appropriately recognizes that the natural abundances of the native species must be preserved, within natural limits, to enable an ecosystem

to function sustainably within its natural range of variability.<sup>8,9</sup> Fortunately, thanks to a century of archeological, historical, and ecological research, today's natural resource conservationists have the benefit of knowing the primeval abundance of many native plants and animals of the Northern Range.<sup>10–15</sup> Modern methods also enable resource managers to assess whether current ecological processes (e.g., nutrient cycle, energy cycle, water cycle) are impaired when compared with natural conditions.<sup>16,17</sup>

Current NPS policy also appropriately acknowledges that ecosystems are dynamic, not static, stating that “natural change will also be recognized as an integral part of the function of natural systems.”<sup>3p36</sup> By recognizing the dynamic nature of ecosystems and, as stated above, also recognizing the importance of native plants and animals and their natural abundances, current NPS policy appropriately integrates two seemingly paradoxical facts. That is, NPS policy reflects that although the plant and animal communities that may exist on a landscape can vary through time, the land's natural ecological potential generally remains unchanged. Fluctuations in weather, fire, land uses, or other influences can and do alter the landscape at a given moment in time, but these effects are generally reversible, albeit sometimes very slowly and not without great effort and expense. The land's ecological potential, however, only changes when an ecosystem's fundamental climate, soils, or both are irreversibly changed.<sup>18,19</sup>

Finally, current NPS policy limits human involvement and relies instead on letting nature take its course as much as possible. The NPS “will not intervene in natural or physical processes, except...to restore natural ecosystem functioning that has been degraded by past or ongoing human activities.”<sup>3p36&37</sup> Thus, if ecosystem function has changed over time, current policy requires the NPS to identify the reason(s) why. Where observed differences between current and primeval conditions resulted from natural evolution, the NPS will not intervene. However, where observed differences are human caused, “biological or physical processes...may need to be actively managed to restore them to a natural condition.”<sup>3p37</sup> The NPS uses ecosystem-monitoring data to determine whether natural conditions have been impaired by human actions and to identify whether active management is required to restore natural ecosystem function.<sup>3p37</sup> Likewise, the articles in this Special Issue use ecosystem monitoring data to indicate whether more or less active management is needed today on the Northern Range.

This Special Issue has its roots in the 1980s when the Society for Range Management first voiced concerns about degraded rangeland and riparian conditions on the Northern Range. In response, at the request of US Senator John Melcher (Montana), the Senate directed the NPS to conduct a study to determine if the Northern Range inside YNP was overgrazed. The final report for this research was published in 1997. Among its findings, the NPS concluded that “Northern Range grasslands are not deteriorating” and that “large ungulate herds and intensive grazing do not appear to be negatively affecting native species diversity,” therefore “there is no urgent need to intervene on any large scale on the northern range at this time.”<sup>20</sup>

In the 1990s, the Society for Range Management again voiced concerns about degraded rangeland and riparian conditions on the Northern Range inside YNP. This time, in

response to efforts by US Senator Conrad Burns (Montana), the US Congress directed the NRC to review “all available science related to management of ungulates and the ecological effects of ungulates on the range land of Yellowstone National Park.”<sup>7p19</sup> As mentioned earlier, the NRC report was published in 2002 and concluded that degraded rangelands existed in YNP because of excessive grazing and browsing by wild ungulates. The report also concluded the following: 1) the level of ecosystem degradation in 2002 did not yet significantly impair the functioning of natural ecological processes; and 2) increased predation by wolves (reintroduced into the Northern Range in 1995–1996) might sufficiently regulate ungulate populations and enable degraded ecosystems to recover.<sup>7p8&p126–127</sup> The report also recommended that rangeland and riparian ecosystem conditions on the Northern Range inside YNP be reassessed in 10 to 15 years. Specifically, the NRC report recommended that ecosystem attributes should be monitored that might indicate unacceptable change in the functioning of natural ecological processes.<sup>7p127–128&136</sup>

Sixteen years have passed since publication of the NRC report. One goal of this Special Issue is to do what the NRC recommended and to do what NPS policy requires—document whether rangeland and riparian ecosystems have recovered, improved, or continued to worsen, and determine whether the functioning of natural ecological processes has become significantly impaired because of past or ongoing human actions.

Much has changed on the Northern Range since the NRC report was published. Populations of wolves, grizzly bears, and mountain lions increased; elk numbers decreased dramatically; and bison numbers increased dramatically. Also, Northern Range elk, in addition to Northern Range bison, became an independent reservoir and vector of *B. abortus*, a bacterium that causes the disease brucellosis in bison, elk, cattle, horses, and people.<sup>5</sup>

This Special Issue begins with Ryan Yonk and colleagues examining the prehistoric and historical role of humans in the ecology of the Northern Range to better understand how minimizing that role has created unintended and undesirable outcomes.<sup>4</sup> Next, Jeff Mosley and John Munding compare the historical and current population sizes and distributions of wild ungulates on the Northern Range,<sup>5</sup> followed by Charles Kay who examines the condition and trend of aspen, willow, and cottonwood plant communities and their associated fauna.<sup>21</sup> Next, Hal Hunter and colleagues compare the past and present ecological health of Northern Range grasslands and sagebrush steppe.<sup>22</sup> These four articles in this Special Issue collectively address the following three questions: 1) Have past or ongoing human actions significantly altered the natural populations of native plants and animals or natural ecological processes on the Northern Range?; 2) If so, is the Northern Range ecosystem recovering or continuing to degrade under current management?; and 3) if it is continuing to degrade, how does management need to be modified to restore the ecological health of the Northern Range?

Every author in this Special Issue has several decades of first-hand personal and professional knowledge of the people, wildlife, and vegetation of the Northern Range. We fervently hope that the articles in this Special Issue will be used by scientists, resource managers, policymakers, educators, and

others to become more informed about the current health and trend of the native plants and animals of the Northern Range, to better understand the predominant forces that have shaped current conditions, and to stimulate discussions that will lead to improved land and wildlife stewardship in the future.

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