The Continued Importance of Wilderness as a Viable Conservation Strategy in a Changing Climate

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In recent years, the viability of Wilderness as a conservation strategy has come under fire as a multitude of stressors (including climate change, invasive species, and altered nutrient loads) have impacted ecosystems once considered pristine. Here, using evidence-based conservation, we argue that Wilderness (and protected lands) still constitute an important conservation strategy in an age of shifting climate. First, we describe the function of unmanaged wild lands in continuing to serve many ecological, social, cultural, and economic purposes in rapidly changing conditions. Second, we consider the ways in which managers could more effectively contend with the significant amounts of uncertainty associated with climate change through a portfolio approach that creates zones of different management strategies (sensu Aplet and Gallo, 2012). For example, "observation zones" – lands where the impacts of climate change and other stressors are expected to be low to moderate – could comprise areas where managers both accept and learn from climate-induced changes. "Restoration zones" – lands where the impacts of climate change and other stressors are expected to be moderate to high - could include areas where managers actively resist climate-induced changes by working to restore resilience to degraded lands. "Innovation zones" – lands where the impacts of climate change and other stressors are expected to be extremely high – could comprise areas where managers choose to facilitate transition to novel ecosystems given expected ecosystem transformation. Wilderness plays an important role within the "observation zones" of this framework, but one that is unique to each landscape and its particular values, history of land use, level of ecological integrity, and suite of stressors. Rather than just affirming or rejecting the concept of Wilderness outright, the application of a risk management approach to large landscapes develops a socio-economic and ecological framework for understanding the ways in which Wilderness may (or may not) help managers sustain key values in the face of numerous stressors (including climate change) in each locale. By combining the best available science with consensus-building discussions with stakeholders about values, risk, and active adaptive management strategies to address these risks, we suggest that the concept of Wilderness and its value to both rural and urban stakeholders could continue to evolve in coming decades. Third, we test this approach in three large landscapes, including the Crown of the Continent (an 18-million acre ecosystem spanning 25 degrees of latitude from Northwestern Montana to Southern Alberta and British Columbia), the High Peaks Refuge Project in Maine; and the Sierra Nevada Mountains of California. In these examples, a portfolio approach facilitates critically important planning to maintain connectivity for threatened, endangered, and big game wildlife species under different future climate scenarios - both in existing Wilderness and in discussions about possible future Wilderness designations. This approach also allows for the consideration of values unique to urban and rural communities in these landscapes; e.g. headwaters sources for drinking water (urban) and agricultural use (rural), favored hunting and fishing sites (rural), and sources of income for outfitters (rural businesses with many urban clients). Finally, integrated portfolio approaches in all three landscapes highlight additional ways in which Wilderness may continue to play a critically-important role as a conservation strategy over the course of the next several decades.

50 Years of Progress in Wilderness Fire Science

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Recognizing the role of natural disturbance processes in shaping primitive Wilderness landscapes, the federal agencies established policies in the late 1960s and early 1970s to allow the use of natural fires in Wilderness. By allowing fires to burn in Wilderness on their own terms, Wilderness managers launched a large scale experiment that would greatly advance our scientific understanding of fire.

Much of what we understand about fire ecology comes from observations of natural fires in several Wilderness areas that have been allowed to burn under a wide range of physical and biological conditions since the 1970s. Wilderness fires have provided valuable datasets for improving fire history methods and understanding of the drivers of fire. It is inside Wilderness where enough data have accumulated from multiple repeated fires at natural fire intervals to see how forests respond to fire. As a result of the Wilderness fire management experiment we can better anticipate the consequences of reintroducing fire and whether restoration with natural fire might be feasible.

The experience of allowing fires to burn in Wilderness has also contributed to social science knowledge. Studies have examined how public support for the use of fire in Wilderness can change over time. Studies of the institutional factors that influence the use of fire in Wilderness have pointed to difficulties with implementing Wilderness fire policy. One important study revealed that the belief and commitment of an individual line officer is essential for overcoming obstacles and for carrying out a Wilderness fire program.

Over the next several decades, a changing climate along with a changing human footprint will affect Wilderness fire regimes and their management. Increasing fire danger could narrow the prescriptive windows for allowing Wilderness fires to burn in the near future. This situation will be exacerbated by land use changes and development patterns and the feasibility of allowing Wilderness fires to burn unimpeded may decline or vanish altogether, particularly in smaller Wilderness areas that simply are not big enough for long-duration fires to spread naturally without threatening adjacent values-at-risk. In the future, making the decision to allow fire to burn in Wilderness will increasingly demand scientific information and will likely require an even more firm belief in the value of natural fire.

The best way to learn about fire is to observe fires burning in the natural environment under a diversity of conditions and then to observe and evaluate their effects over time. However, the decision to allow a fire to burn has always been difficult to make, and is unlikely to get easier. The future of Wilderness fire management programs will depend upon using what we've learned from these valuable case studies over the past 50 years.

The History and Effects of Restoring Fire at Two Southwest Wilderness Areas

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Southwestern forests evolved under various fire regimes, including frequent low severity fires and infrequent high severity fires depending on elevation and forest type. Across the Southwest, most of these original forests have been significantly altered by logging, fire suppression or both. There is a clear need to restore these forests, but how to restore them is still unclear. One option fire alone, however has both benefits and draw backs many of which are unknown given its limited application. The objective of this study was to evaluate the ecological impacts of using fire alone to restore forested landscapes within two Wilderness areas in the Southwest.

The Gila and Saguaro Wilderness areas are isolated landscapes that were never logged. More importantly, both of these landscapes have also experienced a restoration of the historical fire regimes following the passage of the Wilderness Act in 1964 and the increased emphasis on returning the natural fire process to Wilderness areas. The unique history of these two areas provides a natural experiment to study forest structures and fire processes. Over the last several years we have initiated a series of ecological studies to determine the impact of managed fires both at the landscape and stand levels.

At the landscape level, our results show that the recent rate of burning steadily increased since the 1970 in both Wilderness areas. Fires have continued to increase in size in the last decade, but only in the Gila Wilderness, culminating in series of mega fires (>80,000) in the last three years. In the Gila this has resulted in a rate of burning similar to the tree-ring reconstructed historical rate. The severity of these recent fires has varied, and so have their impacts the forests structure. At the stand level we found that moderate severity fires are optimal at restoring forest structure in pine forests, because they result is some live trees but are severe enough to reduce tree densities to historical levels. Although low severity fires are less effective at reducing tree densities, we found that multiple fires can also be effective at restoring forest structure. Recent fires during historic droughts have also burned higher elevation mixed conifer forests. The high severity patches created by these fires however are larger than those estimated in historical reconstructed fires. Based on our results we conclude that these two Wilderness areas show that restoration of both forest and landscape structure can be achieved using wildfire alone.

Wildland Fires Limit the Occurrence, Severity, and Size of Subsequent Fires

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Wilderness areas are a valuable reference for understanding natural disturbance processes relative to more managed or manipulated lands, and as such, are appropriate natural laboratories for studying wildfire. Recently, there has been particular interest in gaining a better understanding of how wildfires modify subsequent fire behavior. Though there is ample anecdotal and theoretical evidence to suggest that past burn scars moderate subsequent fire activity, there has been little quantitative evidence indicating the existence of this effect, how it may vary by ecosystem type, and how it decays over time. Because some Wilderness areas have experienced substantial wildfire in recent decades, there is now an opportunity to quantitatively evaluate feedbacks between past wildfire and subsequent fire.