Protecting our prairies: A science and policy agenda for conserving America's grasslands

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Highlights

- This viewpoint proposes immediate steps to protect U.S. grasslands and prairie.
- Key opportunities include prairie monitoring, policy reform, and industry moratoria.
- Unified messaging and goals for grassland conservation would strengthen efforts.
- “No native grassland conversion” and “zero net loss of grasslands” are two visions.
- Success requires producers, policymakers, scientists, and conservation partners.

Abstract

Grasslands are among the most endangered ecosystems in the world. They provide critical habitat for wildlife, support an abundance of plant, animal, and microbial species, and store rich carbon reserves beneath their surfaces. Despite this, only a fraction of original grasslands in the United States now remains, and the rate of loss and of conversion to cropland has recently accelerated. This viewpoint discusses options that are immediately available to reduce the loss of U.S. native grasslands (i.e. prairie) and advance toward collective goals in grassland conservation. Potential solution-oriented actions include inventorying and monitoring remaining prairie, reconsidering public and private incentives for conversion and conservation, and establishing an industry-led moratorium on native ecosystem loss. There is also both need and opportunity among stakeholder communities to develop unified messaging and a collective goal for grassland conservation in the U.S. Additional tangible steps for action are outlined across the science, policy, and public support arenas and offered for multiple stakeholder groups, including agricultural producers, policymakers, academics, and conservation organizations.
1. Introduction

Grasslands provide immense benefits to society, including recreational space, forage for livestock, and significant water quality services, among others. Yet in the United States, approximately half of all grasslands have been converted to cultivated cropland or other uses compared to their extent prior to European settlement (Samson and Knopf, 1996). As a result, remaining “native” grasslands — those that have never been planted or plowed and contain mostly original plant communities — are among the most endangered ecosystems in the world (Hoekstra et al., 2005; Samson and Knopf, 1996). Known as prairie in the U.S., these historic grasslands provide critical habitat for wildlife, support an abundance of plant, animal, and microbial species, and store rich carbon reserves in their soils (Bakker and Higgins, 2009; Blair et al., 2014).

Despite their importance, conversion of both native and non-native grasslands has accelerated in recent years. U.S. cropland area expanded in the late 2000s, which broke a previous 30-year trend of crop area decline and reasserted pressure on all types of grasslands to be converted to crop production (Falcone, 2015; Lark et al., 2015; Yu and Lu, 2018). Regarding prairie in particular, a recent case study in Minnesota found the rate of conversion of these critical habitats more than quadrupled from 2008-2012 compared to pre-2008 rates (T. J. Lark, 2017). Surveys of farmers in the Dakotas reported similar widespread transformation of prairie over the last decade (Wimberly et al., 2017).

The biggest driver of native grassland conversion is crop price (R. L. Claassen, 2012; Wang et al., 2017). When prices are high, baseline conversion rates are amplified as returns on cropland increasingly outweigh the costs and risks associated with plowing new land. Once prairie is converted, however, the transformation is permanent, and its functionality may never return to its precultivated state (Blair et al., 2014). Robust counterincentives are thus necessary to withstand undulations in the market and preserve our remaining prairie across generations.

It is imperative to achieve long-term protection for prairies and grasslands throughout the U.S. The time to act is now. The current lull in crop prices provides an ideal occasion to pursue further conservation gains that are difficult or more costly when agricultural revenues are high (Powell, 2015). In addition, recent innovations in conservation and environmental governance structures have opened new opportunities for partnership and prairie protection.

This viewpoint proposes immediately available actions to help surmount the drivers of prairie conversion and protect grasslands across the U.S. These actions are organized within the science, policy, and public support domains. Within each, a priority or emerging approach is first described, followed by a collection of additional or more well-established activities. This paper thus serves as a draft blueprint to advance protection of our prairies and stimulate discussion of further steps and tactics within the conservation community.
2. Science and research opportunities

There are several science-based needs and opportunities to protect prairies, many of which support efforts within the policy and public support domains. A critical first step is to improve the characterization and monitoring of remaining prairie sites to improve baseline knowledge. Currently, there is no spatially-explicit nationwide inventory or registry of prairie in the U.S., and this lack of data limits creation and improvement of policies and initiatives to conserve these lands. On state and regional levels, organizations have mapped and assessed remaining prairie (Bauman et al., 2016; Horton, 2010), and these efforts have made possible broader conservation planning and assessment (Minnesota Prairie Plan Working Group, 2011; Wimberly et al., 2018). Nationally, there is a need for better geospatial data on prairie locations and their quality. This would enable conversion to be monitored, it would improve our understanding of drivers of change and the impacts of prairie loss, and it would facilitate evaluation of the outcomes of conservation efforts so that more effective approaches may be designed.

Several opportunities are now available to work toward this goal. To develop a nationwide inventory of prairies, long-term remote sensing products can identify grasslands that have not been cultivated for the past four decades. Parcels so identified can serve as the starting point for further investigation. An example of this approach is shown in figure 1, where data from the USGS National Land Cover Database for 1992-2011 was combined with recent land use from the 2012-2017 Cropland Data Layer to identify intact grasslands that have not been planted, plowed, or otherwise improved for at least 25 years. Such maps could be further integrated with longer-term satellite (Zhu et al., 2016) and cropping history data (Bauman et al., 2016). Emerging efforts to differentiate native versus tame grass species using remote sensing (Olimb et al., 2017), or the use of LIDAR technology to detect historical disturbances (Fisher, 2017) might also improve and refine identification of true native prairie. Crowd-sourcing and citizen science could supplement these efforts by verifying potential prairie sites (See et al., 2016).

(Insert figure 1)

Other notable research opportunities include synthesis of current studies on grasslands within the economic, environmental, and social science fields. Providing such data on both direct and indirect benefits of grasslands in the form of accessible, use-oriented reviews will help both policy and public efforts promote the case for conservation. In addition, rigorous testing of conservation approaches and their outcomes, such as through use of econometric models (Alix-Garcia and Gibbs, 2017; Miao et al., 2016), would enable the design of more effective policies and conservation strategies. Continuing research into enhanced agronomic productivity on
grasslands and into improvement of grass-based products like pasture-raised livestock (Weber et al., 2008; Xue et al., 2010) and the selective harvest of biomass for cellulosic biofuels (Robertson et al., 2017) can also contribute value to grasslands. Collectively, advancing accessible research on grasslands can help raise the public profile of these ecosystems and support the creation of science-based conservation strategies.

3. Policy opportunities

Federal policies affect the incentives and restrictions for converting grasslands to agriculture and other uses and thus provide key opportunities to help protect our prairies. Expansion of the Sodsaver program should be given a high priority. Currently, publicly funded crop insurance increases the incentive to convert prairies to agricultural production by subsidizing the risk that would otherwise be associated with cultivating these lands. Sodsaver seeks to ameliorate this effect by reducing crop insurance subsidies for the first four years on any land converted from prairie to cropland. However, this protection applies only to the six states that surround the prairie pothole region. To expand Sodsaver nationwide, a proposal introduced in October 2017 and currently under consideration in Congress should be included in the 2018 Farm Bill (American Prairie Conservation Act, 2017).

The proposed American Prairie Conservation Act includes two other important provisions. First, it would close a loophole in the existing Sodsaver that allows producers to plant native sod to nonannual crops (like alfalfa) and subsequently switch to annual crops without a reduction in subsidy. Next, the proposal would require the USDA to track and report grassland loss through their existing commodity programs, an effort that would complement inventories and monitoring of prairie. These provisions would strengthen existing protections for prairies and should be fully included in the next Farm Bill.

Prairies could also be prioritized across other agricultural and environmental policies as well as within the missions of local, state, and federal agencies. At the federal level, ensuring that current conservation compliance requirements remain in place via Swampbuster for wetlands and Sodbuster for Highly Erodible Land will reduce incentives for converting native wetlands or highly erodible prairie to commodity crop production (R. Claassen, 2012). Within the Renewable Fuel Standard, enforcement of statutory land protections designed to make areas converted from prairie ineligible for biofuel feedstock production could help curtail conversion (Wright et al., 2017). More broadly, no net loss of grasslands could be established as an interagency goal at the federal level, analogous to that which exists for wetlands. Further, Section 404 of the Clean Water Act or other legislation could be expanded to require compensatory mitigation of adverse impacts of grassland loss. Such a policy would mirror the required “mitigation banking” of wetlands, where restoration, establishment, enhancement, or preservation is required for wetland and stream modification (US EPA, 2015).
In lieu of more comprehensive federal efforts, state governments and their wildlife agencies could pursue similar, more limited policy actions. Locally, city and regional planning authorities can encourage urban infill to reduce grassland conversion pressure from development. Across all levels of government, policy makers should look to reward grassland conservation and give appropriate worth to the benefits of grasslands when weighing their value against other uses.

4. Corporate- and community-led initiatives

Establishment of an industry-led moratorium on the destruction of native ecosystems in the U.S. is an opportunity primed to curb prairie loss. Voluntary pledges by corporate entities to improve the sustainability of their supply chains are increasingly common and hold promise to reduce undesirable environmental outcomes. For example, Brazil’s soy moratorium, an agreement by the major grain traders to refuse to buy soybeans grown on recently deforested land, has helped to alter producer behavior and avoid Amazon deforestation in soy supply chains (Gibbs et al., 2015). A similar moratorium to preserve native ecosystems via agreements among major grain processors, biofuel refiners, and animal production facilities could alter market incentives and reduce conversion of prairie to agriculture in the U.S. as well.

To encourage such an agreement and achieve additional goals, there is a concurrent need to expand public awareness and support for prairies. Corporate actions to improve sustainability frequently arise as a response to public expectations or to mitigate risk to reputations. Public policy efforts similarly require political will driven by constituent support.

Prairies, however, are rarely in the forefront of public consciousness. Concerted efforts and strategic communications by grassland stakeholder organizations could address this void and raise awareness. Example actions include creating public service announcements about the value of grasslands and prairies, or the renaming of organization initiatives or even of entire agencies. The U.S. Forest Service, for example, could become the U.S. Forest and Grasslands Service, since the agency manages both types of national lands. Consumers can directly support grassland-based products and markets for ecosystem services financially. To extend the impact of that support, payment for ecosystem services programs could carefully consider allowing the stacking, bundling, or side-by-side grouping of ecosystem service credits to better reward producers and landowners for the multitude of benefits that their stewardship of grasslands provides (Banerjee et al., 2013; Blackburn et al., 2017; Robertson et al., 2014). Any effort that garners public interest, advocacy, and financial aid for grasslands can help improve protection.

5. Setting a collective goal and priorities
Pressing environmental problems require actions to be prioritized such that limited resources can be used to greatest effect. However, prioritization requires value-based decisions and clearly defined goals. To be most productive, as many stakeholder groups as possible should be involved in setting grassland priorities. Collectively determining a common vision across the grassland conservation community would enable organizations to develop unified messaging, improve collaboration, and more effectively implement actions across sector lines.

Two desirable visions for the grassland conservation community to consider are first, “no native grassland conversion,” and next, “zero net loss of grasslands.” The first is an absolute aim that there be no further native grassland or prairie loss; the aspiration would be total prevention of any future conversion of prairie to cropland, development, or other use. While so absolute a benchmark may be unattainable, it establishes a clear objective that is valuable for prioritization. It is simple to understand, straightforward for policy alignment, and its ambitious nature may help inspire dedicated actors and stakeholders.

Alternatively, a more realistic goal may be “zero net grassland loss,” where the aspiration is to maintain the current total area of natural grasslands — including true native prairie, restored prairie, and other biodiverse grasslands that are functioning in a nearly native state or possess a valuable conservation role. Within this framework, the loss of natural grasslands in one area can be compensated by adding high quality natural grasslands in another. This approach acknowledges the value and role of restoration efforts in maintaining balance in ecosystem types and provides greater leeway in how the goal is achieved. It also accommodates protection of non-native locations of high ecological value (e.g. endangered species critical habitat or highly-erodible grasslands) that may offer greater environmental benefits than some native grasslands. Tradeoffs of the “zero net loss” approach are that it provides less guidance for prioritization efforts since it does not give clear preference to any single grassland type, nor does it inherently establish how or by whom eligible grasslands should be defined.

Fortunately, the goals cited as well as other targets need not be mutually exclusive. For example, a conservation policy that combines both of the visions described could state “if native ecosystem conversion cannot be prevented, then zero net grassland loss should be maintained.” Goal-setting leadership may come from any sector, and initial goals established by one sector may often set a precedent for others. For example, a unified vision for grassland conservation from the NGO community would be easily accessible to corporations and to industrywide organizations, which often look to expert societies for guidance. Similarly, USDA policies can serve as signals to farmers and the agricultural industry — for example, Sodsaver communicates that prairies are a priority. All conservation visions can and should be reviewed over time in response to changing values, new understanding, or observed efficacy.
A vision for grassland conservation will also define priorities for action, though some immediate steps are appropriate regardless of ultimate goals and can illuminate the goal-setting process. For example, mapping and monitoring remaining prairies will help focus protection efforts on those areas at greatest risk of conversion. It can also help rank and direct policy efforts toward the geographic regions of greatest need and those socioeconomic drivers of strongest influence. Because much more prairie exists than can be permanently protected, it would also be immediately worthwhile to reduce the policy and market incentives that subsidize prairie conversion. This might be accomplished via Sodsaver or a corporate-led moratorium on conversion to slow prairie loss rates and enable more areas to be protected. Reducing the incentives to convert grasslands also achieves the co-benefit of reducing the costs associated with purchasing permanent protection or perpetual easements. By this means a greater number of parcels can be protected. Thus, while many efforts can benefit grasslands, the priorities offered here are intended to capture additional synergies and co-benefits.

Will implementing these initial steps halt the conversion of native prairie? Likely not. Monitoring by itself does nothing to slow conversion, Sodsaver may alter incentives by too little to be effective (Claassen et al 2018), and previous supply-chain agreements have only partly contributed to improved outcomes (Lambin et al., 2018). However, these actions establish the conditions, systems, and awareness needed to make further progress in this endeavor. While alone they are not enough, they represent critical strides for advancing conservation.

6. Conclusion: A role for all

Stakeholders from all sectors can and must play a role in protecting our prairies. Researchers and the academic community have a clear opportunity and a responsibility to advance the science and public understanding of our grassland ecosystems, their value, and effective methods for their protection. Furthermore, scientists can increase communication with policy makers and the public to support efforts in those arenas. Policy makers and those involved in influencing policy play a pivotal role in refining governmental incentives for or against grassland conversion. Indeed, it is often legal, advisory, and financial policy decisions that have the greatest influence on conservation actions and outcomes. Agricultural producers are at the heart of grassland conservation, and little can be accomplished without their commitment and support. Furthermore, the producers who champion grassland conservation are often the most effective advocates for any proposed policy or action. Lastly, any member of the public can play a role in the process. Using our grasslands to enjoy recreation adds value to their preservation, which in turn helps foster protection for these treasured ecosystems. By supporting politicians that favor grassland preservation and by preferentially purchasing products from corporations that do the same, individuals also have the opportunity to vote for grasslands every day both literally and figuratively.
We are at an opportune time to protect what remains of the American prairie and preserve its heritage for future generations. Enhancement of prairie monitoring is the crucial first step to enable further efforts. Immediate reduction of federal incentives for converting prairie can buy time to develop more effective conservation strategies and implement permanent approaches for protection. An industry-led moratorium on conversion of native ecosystems could quickly reduce demand-side drivers of agricultural transformation while consensus is achieved and longer-term solutions are developed and deployed. Within each of these actions any member of the stakeholder community will find a role, and success in prairie protection will be greatest if all parties are committed and engaged. By coming together to develop a unified vision for America’s grasslands and coordinating efforts across stakeholder groups, we can achieve a more robust outcome and future for these critical ecosystems and all who depend on them.
**Figure 1:** Map of remaining intact grasslands and planted or improved grasslands. Intact grasslands are defined as those not planted, plowed, or otherwise improved for at least 25 years according to data from the USGS National Land Cover Database and the USDA Cropland Data Layer.
Protecting U.S. grasslands and prairie

Conservation needs

A Common Vision for Grasslands:
No native conversion? 
-or-
Zero net loss?

Action examples

Science
- Improve prairie monitoring

Policy
- Strengthen and expand Sodsaver

Other Initiatives
- A moratorium on grassland conversion
References


Fisher, R., 2017. Use of Three Techniques to Distinguish Native and Tame Grasslands in Canada.


