Quantifying eastern red cedar (Juniperus virginiana) in southern Iowa: A starting point for conversations with landowners about threats to grassland resilience

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Quantifying eastern red cedar (Juniperus virginiana) in southern Iowa: A starting point for conversations with landowners about threats to grassland resilience

Abstract
The swift spread of eastern redcedar poses a number of problems for grasslands and wildlife habitats, which are already under strong pressure in the Midwest. This study documents the true nature of redcedar expansion in this area and uses that data to educate landowners about management practices aimed at slowing the spread of this pernicious woody species.

Keywords
Natural Resource Ecology and Management, Models and assessment tools

Disciplines
Natural Resources and Conservation | Natural Resources Management and Policy | Statistical Models

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To what extent has eastern redcedar expanded and encroached into southern Iowa grasslands over the past 30 years and what are the implications for grassland users?

Data was collected and shared with individual landowners and nongovernmental organizations and interest groups.

Background

The investigators’ long-term goal is to integrate management actions on reserves and private lands in the Grand River Grasslands (GRG) to enhance resilience and sustainability of grassland-based enterprises, including livestock production and biodiversity conservation. If successful, this region will serve as a model for such integration elsewhere in Iowa and beyond. The overall goal of this project was to quantify the rate and extent of redcedar encroachment in the Grand River Grasslands. Eastern redcedar spreads rapidly in the absence of recurring disturbance. It has rapidly overtaken and degraded millions of acres of former grassland across the southern and central Great Plains, and is swiftly expanding across the Midwest. Once established, it grows vigorously and out-competes herbaceous vegetation, resulting in loss of forage production and reduced habitat for grassland-dependent wildlife species.

Assessing the extent of redcedar encroachment is crucial for two reasons. First, the assessment yields property-specific talking points to use in addressing the issue of grassland resilience with landowners in the region. Second, the assessment provides a baseline against which the effectiveness of future management actions can be gauged. Project objectives were to:

1) Quantify the current extent of redcedar in the Grand River Grasslands.
2) Quantify the rate and extent of redcedar encroachment in the Grand River Grasslands over the last three decades (i.e., 1980s-present).
3) Use data obtained in meeting Objectives 1 and 2 to inform conversations with landowners about grassland losses due to redcedar encroachment and the implications for forage and livestock production, habitat for game species and biodiversity generally, and resilience of the region’s social and ecological system. (Funding to attain this objective has been provided by the U.S. Fish and Wildlife Service.)

Approach and methods

Building upon earlier examinations of research pastures and conversations with landowners in the Grand River Grasslands of southern Iowa and northern Missouri, the research team members were interested in assessing the current extent of eastern redcedar on this rolling, grassland landscape, and the rate at which redcedar has in-
increased or decreased over the past three decades. They partnered with the Geospatial Services Laboratory (GSL) at Saint Mary’s University of Minnesota, an independent lab with extensive experience in remote-sensing technology.

**Results and discussion**

The team’s assessment revealed an alarming increase in eastern redcedar in the GRG over the past three decades (1983-2009). On the Iowa side, redcedar has increased in area by nearly 80 percent since 1983, and the number of stands and individual trees has increased by nearly 200 percent and 800 percent, respectively. Trees once rarely found outside of farmstead windbreaks and old fencerows are now spreading across Conservation Reserve Program (CRP) fields, recreational lands and pastures. The idling of many lands through the CRP likely allowed for rapid redcedar colonization; however, lack of prescribed fire, mowing and cutting likely is the real culprit leading to redcedar expansion. Once established, redcedar reduces habitat value for grassland dependent wildlife, changes hydrologic patterns, and rapidly decreases the amount of available forage for grazing livestock, thus posing problems to virtually all landowners. At this stage, the recommendation is increasing awareness and recognition of the threat that eastern redcedar poses to landowners. Increased active management practices such as mowing, prescribed burning and mechanical removal are needed to curb existing and further encroachment.

**Conclusions**

The investigators documented a significant increase in the extent and rate of expansion of eastern redcedar in the Grand River Grasslands of southern Iowa and northern Missouri. Though somewhat less extensive in Missouri than in Iowa, it is evident that a transition from grassland to woodland has begun in many parts of the GRG, and that some form of intervention at a landscape scale will be necessary to mitigate further encroachment. The problem documented here already had progressed by the time this work was initiated; the best available imagery was already nearly two years old at the outset of the analysis. Given redcedar’s rapid spreading potential, many areas likely have already progressed from individual trees in a grassland habitat to woodland. It is important to note that this is not a problem limited to the study region, but rather one facing all grasslands in the prairie peninsula. Indeed, even idled rights-of-way as far north as Des Moines have transitioned to closed canopy redcedar stands in the last decade.

Information derived from this analysis will be invaluable in discussions with landowners in the Grand River Grasslands. Aspects of this study were shared with landowners beginning in March 2012, and will be used by Conservation in Working Landscapes Research Group (CWLRG) field staff as they visit with individual property owners in the area. This information could lead owners to recognize the need to take action to address redcedar on their own lands, as well as to communicate with their neighbors and community about taking similar actions. Additionally, the products developed in this project are the result of a methodology that can be repeated in a relatively fast and cost-effective manner, thus enabling agencies to conduct this exercise in other areas. The project established baselines for the extent of redcedar development, providing a basis for future updating of the GRG dataset to assess the relative impacts of conservation actions.
This methodology also could be improved in years to come. Tools such as individual algorithm searching mechanisms could potentially detect redcedar trees smaller than those delineated through procedures employed in this study. It also would be possible to contract for aerial imagery of the study area at higher resolutions and at spectral band-widths that would make delineation and quantification more accurate.

**Impact of results**

The project accomplished objectives one and two, and the information developed from those objectives has already been employed towards objective three. Communication of results to individual landowners in the GRG, as well as to agencies and non-governmental organizations and interest groups, will inform landowners and agricultural and natural resource professionals about the continued threat that eastern redcedar encroachment poses to grassland-based enterprises and wildlife habitats across southern Iowa. Locally, the results of this work will be communicated at the scale of individual properties and can be used to develop site-specific management practices that landowners can employ to reduce the extent of redcedar and prevent further expansion on their properties. Combined with other tools such as the Forage Loss Calculator (Kansas State University 2011), it is possible to quickly demonstrate to an agricultural landowner the loss to gross income posed by redcedar. At broader scales, these results can serve as an early warning about the threat facing many other Iowa grasslands. At this time there are no other incentives are available. Additionally, monetary incentives may not be an appropriate solution to this issue; rather, enhanced recognition by landowners of the potential economic threat is an important first step.

**Education and outreach**

Outreach began in late October 2011 in meetings with project collaborators including the Iowa DNR, Leopold Center, Iowa State University Extension, and others. Data derived from this project were crucial in demonstrating the critical importance of the GRG as a landscape of conservation concern, as well as a landscape of opportunity to work with landowners to achieve sustainable grassland enterprises. Preliminary results from this work were presented to approximately 25 professionals representing eight agencies, universities and NGOs.

Initial results were next presented to an invited forum of landowners and natural resource professionals hosted by Pheasants Forever, Inc., and the Iowa chapter of The Wildlife Society in Des Moines, Iowa, January 2012. This session was attended by 45 people including private landowners and representatives of multiple organizations.

Beginning in March 2012, conversations were held with Grand River Grassland property owners about the implications of redcedar encroachment in their region. Initial results and maps were presented at an event in Kellerton, Iowa, for southern Iowa landowners from Ringgold and Decatur counties and Harrison (Missouri) as well as at a subsequent meeting of local natural resource specialists in Eagleville, Missouri. These conversations are expected to lead to contacts with local landowners that can be followed by local, property-level based actions.

**Leveraged funds**

No additional funds have yet been leveraged by this project.