Grassland Assessment of North American Great Plains Migratory Bird Joint Ventures

Executive Summary

Grassland loss and degradation has been extensive in the North American Great Plains and has resulted in a subsequent decline in biodiversity. Grassland birds are among those affected and represent the fastest declining bird guild in North America. These trends coupled with tri-national breeding and wintering distributions have spurred a collaborative conservation effort between North American Migratory Bird joint ventures (JV). This approach is rooted in the full annual-cycle conservation of priority birds, and emphasizes the identification and targeting of undisturbed grasslands for conservation action.

The Prairie Pothole JV conducted a grassland assessment, in coordination with seven other North American Migratory Bird JVs within the Great Plains. The goal of this assessment was to provide explicit planning and conservation delivery datasets to assist JV partnerships stem grassland losses and avian population declines. We used recent time-series landcover data to spatially identify potentially undisturbed lands (PUDL) defined as grass/shrub/wetland complexes with no history of agricultural cultivation or development. We conducted supervised classification using Sentinel-2 satellite data to further refine vegetation composition in the PUDL layer to identify undisturbed (i.e., potentially native) and disturbed (i.e. planted/restored) grasslands. Finally, we estimated grassland loss rates over time and compared those to grassland protection efforts and projected those rates into the future to better understand the scale at which conservation should be delivered.

We defined PUDL as grass/shrub/wetland complexes without a history of tillage disturbance; disturbance represented any area ever identified as cropland during the duration of the time-series datasets used (Canada: 1990, 2000, 2010-2017, US: 2008-2018, Mexico: 2002,

2007, 2011, 2014). We then used the most current landcover datasets to remove bare, developed, forest, and large waterbodies. We defined the cover within PUDL using supervised classification of Sentinel-2 satellite remote sensing data and a random forest classifier. We classified seven landcover types at a 10 m resolution, which were based on reference points representing undisturbed grass (grass within the PUDL layer), disturbed grass (grass outside the PUDL layer, i.e. restored grass), shrub, crop, water, developed/bare, and forest. We estimated annual grassland loss rates using annual and periodic time-series landcover data to track the amount of grasslands converted to other uses over time. We used protected lands geospatial data to identify protected PUDL and estimated a recent 10-year average protection rate. We used the International Union for the Conservation of Nature's definition of protection, which only identifies lands that are protected and managed for the long-term conservation of ecosystem values.

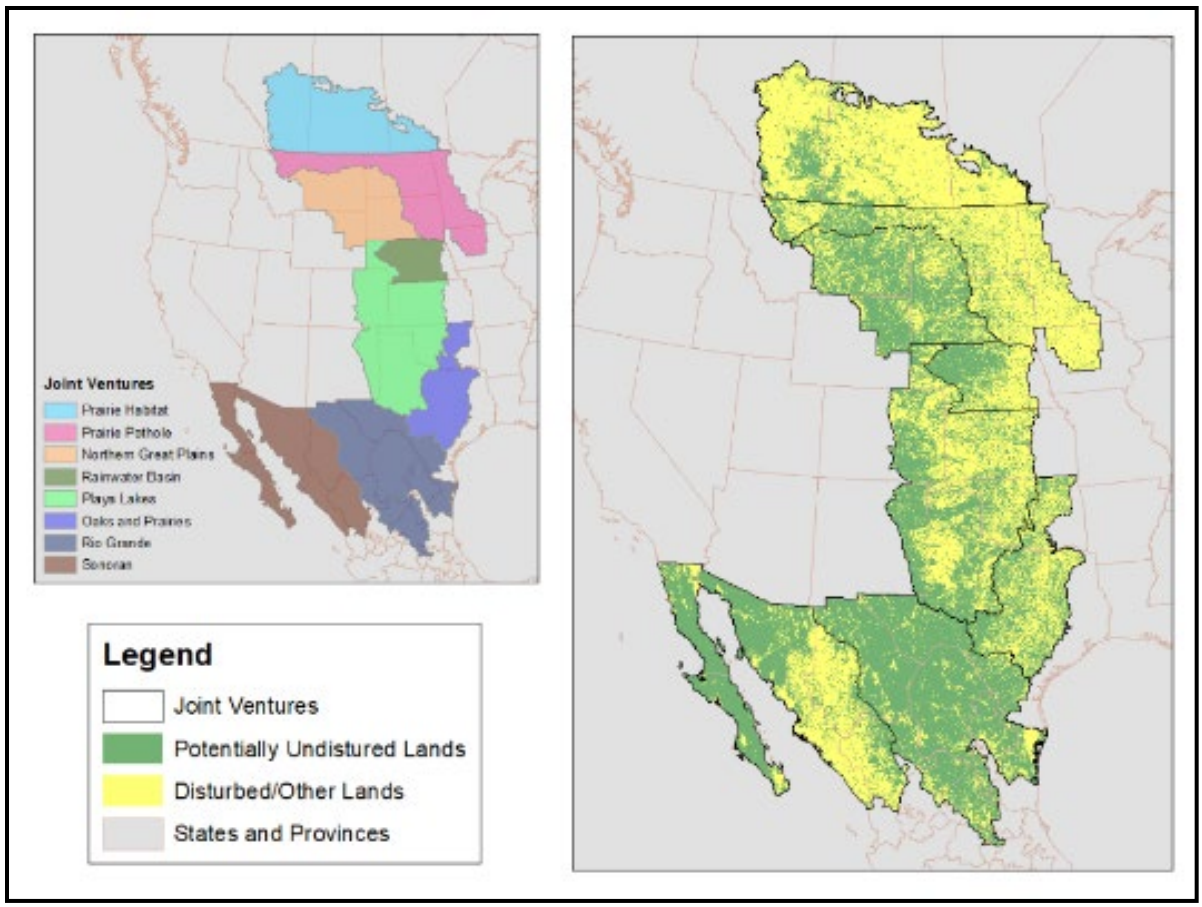
Potentially undisturbed lands represented 51.13% of the study area. Estimates of PUDL were lower in the north/east and greater in the south/west (Figure 1). The percent PUDL in each JV ranged from 17.93% in the Prairie Habitat JV to 83.91% in the Rio Grande JV. Overall, PUDL grass was the dominant cover class within the PUDL layer, and this was true for all JVs except Rio Grande JV where shrub was the dominant cover. Supervised classification results indicated undisturbed grass within the PUDL layer composed ~40-65% of the total grassland found in each JV, except in the Prairie Habitat and Prairie Pothole JV where estimates were ~25-30% (Figure 2). The percentage of PUDL protected was 7.23%, and ranged from ~0.01% in Northern Great Plains and Oaks and Prairies JV to ~19% in the Prairie Habitat and Sonoran JV (Figure 3). We estimated an average rate of grassland loss across all JVs in US and Canada of -0.98%/yr using annual time-series landcover datasets, and an average rate of grassland loss

across all JVs in Mexico, US, and Canada of -0.23%/year using periodic time-series landcover datasets. Undisturbed grassland loss rates were higher in the northern regions; the Prairie Habitat JV (-0.44% to -2.62%/yr) and Prairie Pothole JV (-0.65% to -2.27%) had the highest loss rate estimates and the remaining JVs had loss rates ranging from -0.03% to -0.61%/yr (Figure 4). Although these estimates indicated a loss of undisturbed grassland, analysis has also shown that grassland restoration has had a net positive increase in landscapes such as the Prairie Habitat JV. If the current annual average protection effort for all lands were applied to PUDL protection, 0.10% of the PUDL layer could be protected annually. These rates varied by JV, and were largest in the Prairie Pothole JV (0.14%/yr), and the Mexico portion of the Rio Grande JV (0.18%/yr), and Sonoran JV (0.21%/yr); the rate of protecting PUDL was lower for the other JVs (0.01%-0.05%/yr). We estimated that in the next 10 years grassland loss will be occurring on average ~7-25 times faster than protection when extrapolating current low and high estimates of grassland loss versus a recent 10-year average annual protection rate.

This analysis and the resulting spatial layers can support conservation in a variety of ways that are unique to each JV but support the overall goal of full annual-cycle conservation for priority grassland birds. They can be used to target lands for fee-title or easement protection, and targeting can be prioritized if used in concert with other layers, such as species distribution models or risk-of-conversion layers. Similarly it could be used for targeting areas for enhancement (e.g., shrub removal) or restoration (e.g., conservation programs). These are just a few examples of how these tools can support conservation work in the Great Plains. This assessment is only the first step in a process to galvanize the 8 JVs to move forward as a network for grassland conservation. Joint Ventures are built on the power of partnerships and we must bring people and resources together to address the complex issues facing our grasslands.

Figure 1. Potentially undisturbed lands (PUDL) within eight Migratory Bird Joint Ventures of the Great Plains region. Figure A) depicts the spatial extent of the PUDL layer and B) summarizes the amount of PUDL cover in each joint venture.

A)



B)

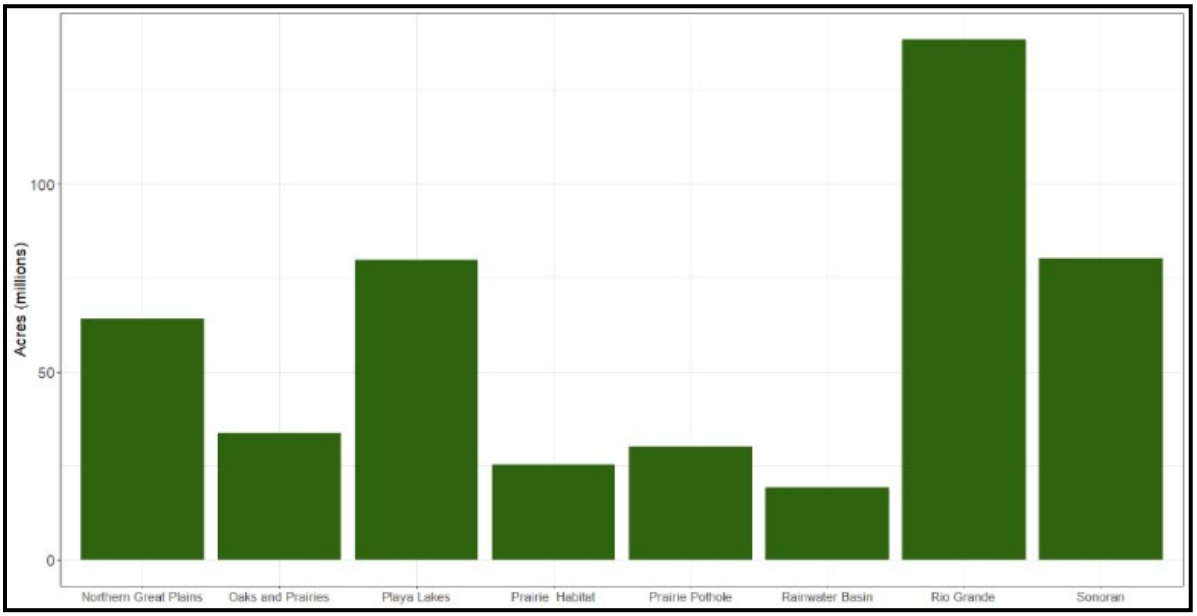


Figure 2. Landcover classification derived from Sentinel-2 remote sensing imagery at a 10m resolution, summarized for seven Migratory Bird Joint Ventures, which include the Northern Great Plains (NGPJV), Oaks and Prairies (OPJV), Prairie Habitat (PHJV), Playa Lakes (PLJV), Prairie Pothole (PPJV), Rainwater Basin (RBJV), Rio Grande (RGJV). Light green indicated the amount of undisturbed grass classified within the potentially undisturbed lands layer (PUDL), whereas dark green indicates the total amount of disturbed and undisturbed grass (i.e., both inside and outside the PUDL layer) classified in each joint venture.

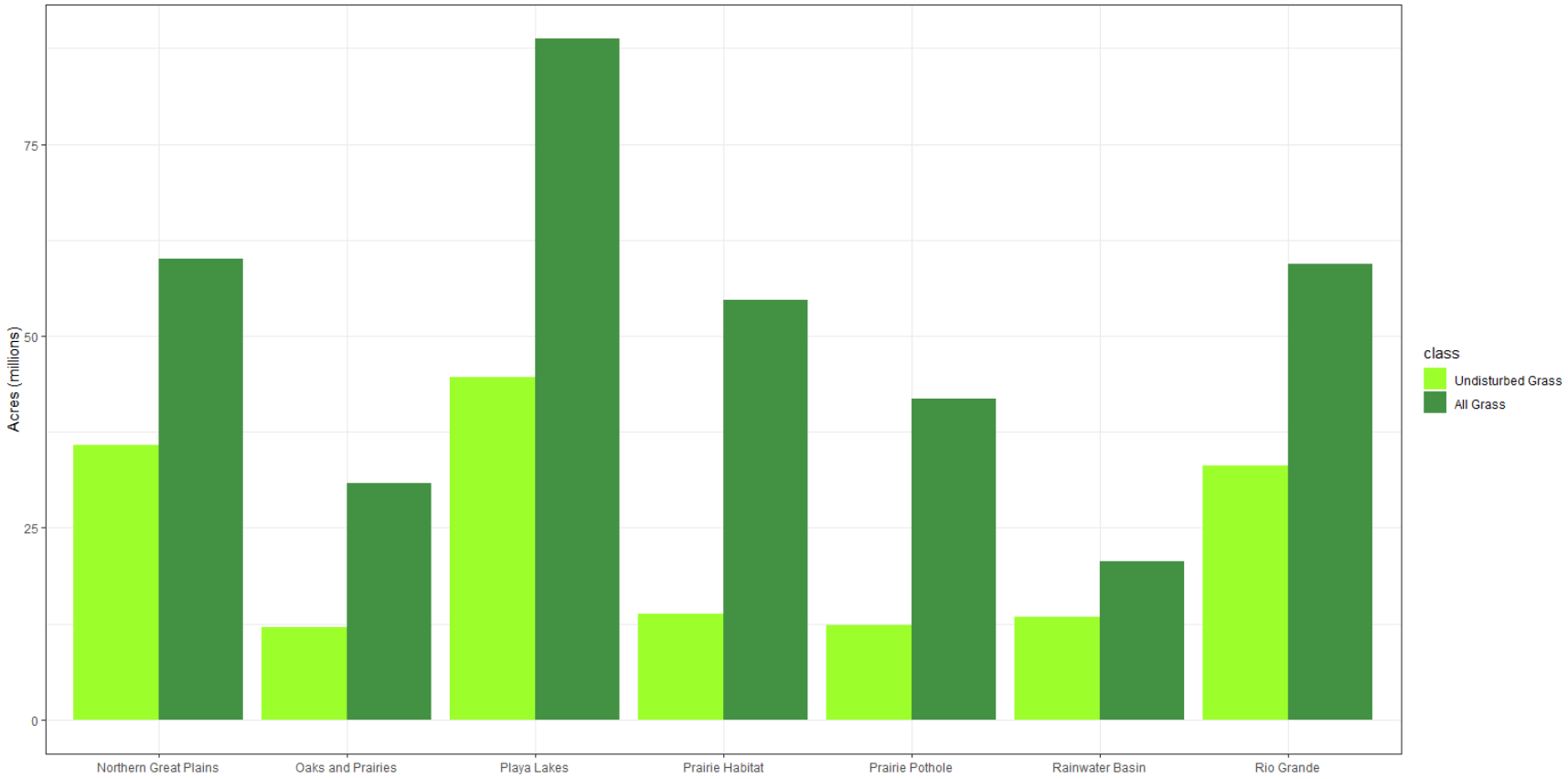
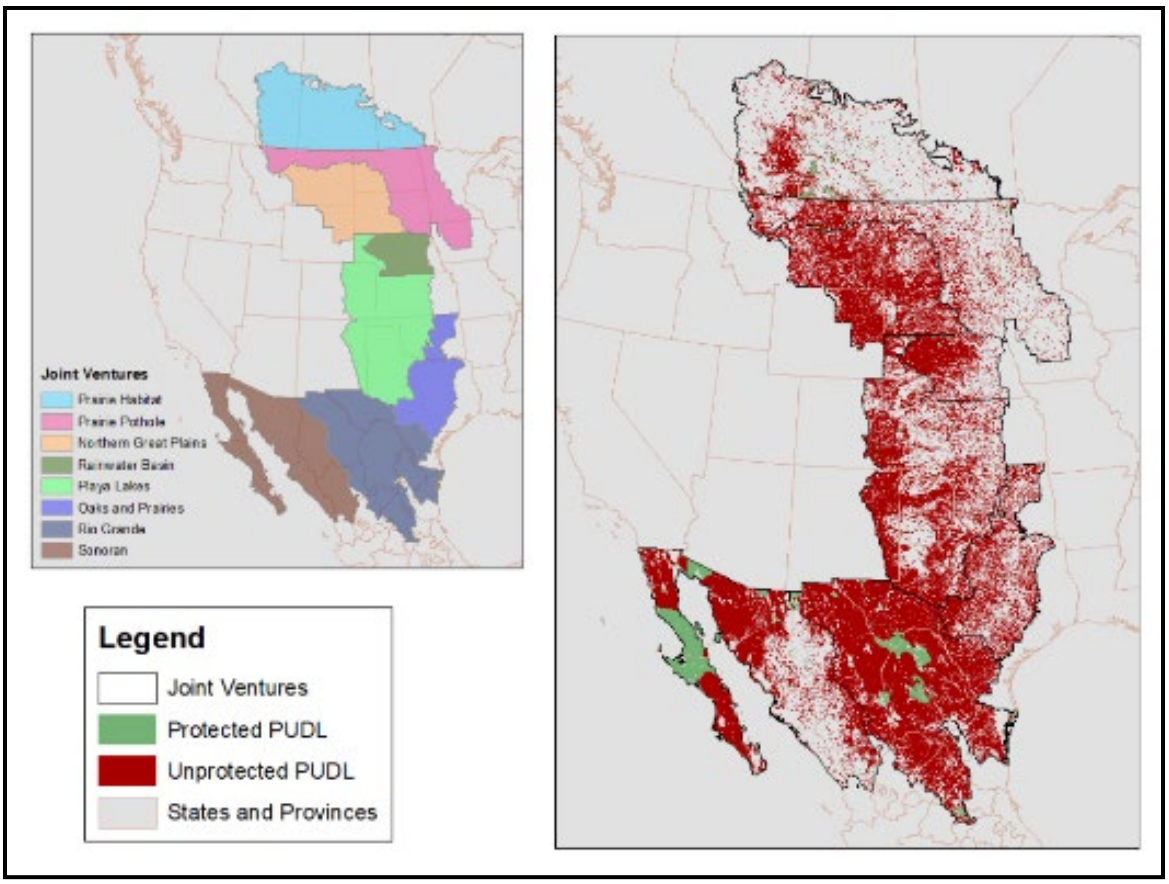


Figure 3. Protected and unprotected potentially undisturbed lands (PUDL) within eight Migratory Bird Joint Ventures of the Great Plains region. Figure A) depicts the spatial extent of protected and unprotected PUDL, and figure B) summarizes the amount of protected and unprotected PUDL cover and protected PUDL in each joint venture.

A)



B)

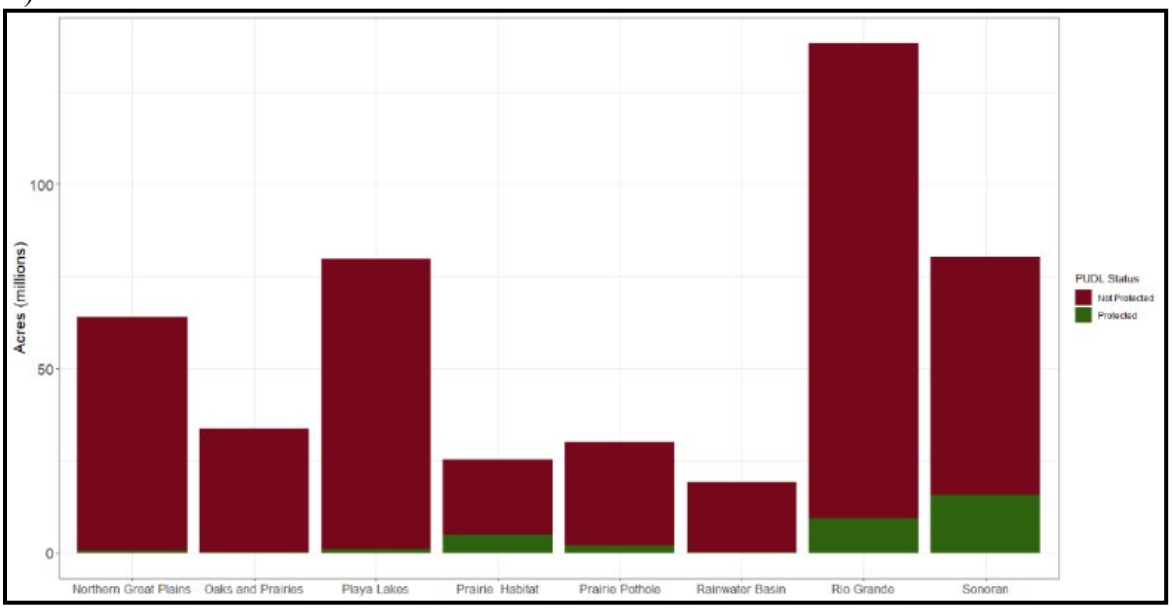


Figure 4. Rates of loss versus protection for potentially undisturbed lands (PUDL) projected into the future 200 years for 8 Migratory Bird Joint Ventures in the Great Plains regions; The Rio Grande Joint Venture has separate graphs for the US and Mexico regions, and the Sonoran Joint Venture only includes estimates for its region in Mexico. Two loss rate estimates were derived from landcover data, and the amount of protected PUDL (green) and three rates of protection (average, and averaged halved and doubled) were derived from protected lands lay