

CDI SSF Elements(s): Analysis, Applications, Data

Title: Birds and the Bakken: Integration of oil well, land cover, and species distribution data to inform conservation in areas of energy development

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Project Description:

This project will develop a novel model to combine oil well, land cover, and species distribution datasets to determine the amount of grassland bird habitat lost to energy development in the Williston Basin. The integration of these three datasets will identify areas with the greatest intensity of energy development occurring in the most ecologically sensitive regions. Results from this specific project can be used by resource managers to prioritize grassland conservation efforts in the Williston Basin; however, the methods developed will be transferable to any species of concern in other areas of energy development nationally.

Anticipated Deliverables:

The major deliverable will be the development of a novel, scalable, and transferable methodology that allows for the integration and innovative application of existing USGS data to allow resource managers to focus conservation efforts in areas of greatest concern based on the intersection of biodiversity and habitat loss from energy development. The final data products will consist a peer reviewed journal article and the following spatial datasets: a species diversity map, a weighted diversity map, and a habitat loss map; all with FGDC compliant metadata.

Estimated Budget:

Budget Category	Federal Funding "Requested"	Matching Funds "Proposed"
1. SALARIES (including Benefits):		
Federal Personnel Total:	\$ 26,500	\$ -
Collaborator Personnel Total:		\$ 12,000
Total Salaries:	\$ 26,500	\$ 12,000
2. TRAVEL EXPENSES:		
Travel Total (Per Diem, Airfare, Mileage/Shuttle) 1 Trip:	\$ 1,500	
Other travel expense (Registration fees):	\$ 500	
Total Travel Expenses:	\$ 2,000	\$ -
3. OTHER DIRECT COSTS: (itemize)		
Equipment (inc. software, hardware):		\$ 5,000
Publication Costs:	\$ 1,500	
Office supplies, Training, Other expenses:		
Total Other Direct Costs:	\$ 1,500	\$ 5,000
Total Direct Costs:	\$ 30,000	\$ 17,000
Indirect Costs (14%):	\$ 4,200	
Grand Total	\$ 34,200	\$ 17,000

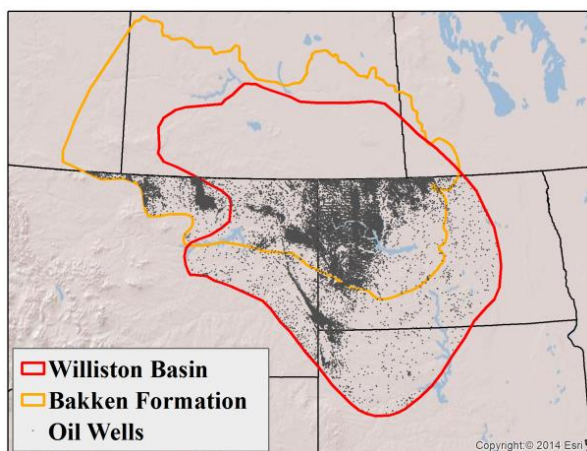
Project Summary: The Williston Basin (Fig. 1), located in the Northern Great Plains, has been a leading source of energy development within the United States since the 1950s. New advances in horizontal drilling and hydraulic fracturing technologies have resulted in a dramatic increase in drilling and oil production in the Bakken Formation. As of March 2015, over 37,000 oil wells have been drilled in the U.S. portion of the Williston Basin with over 16,000 of these wells drilled since 2000 (Fig. 1).

Based on breeding bird surveys, numerous species of grassland birds have negative range-wide population trends¹ and the loss of prairie grasslands has resulted in the decline of grassland birds². Many species of grassland birds have been shown to avoid energy development infrastructure (wells, roads, etc.)³. As a result, energy development in the Williston Basin results in direct grassland habitat loss and fragmentation as well as effects that extend far beyond the physical footprint of development. Thus, this landscape level stressor has the potential to have a large impact on grassland bird habitat and populations.

As part of ongoing research into the ecological effects of oil development in the Williston Basin, the USGS Science Team about Energy and Prairie Pothole Environments ([STEPPE](#)) has tasked a student from the USGS Secondary Transition to Employment Program (STEP) to delineate oil well pads in the U.S. portion of the Williston Basin. In FY15, the STEP student focused on wells drilled since 2000 and delineated over 130 million m² of well pads. This work will continue in FY16 and focus on older wells.

The primary goal of USGS [GAP](#) is to conduct analyses to determine how much of a given vertebrate species or land cover distribution occurs in areas managed for the long term maintenance of biodiversity. However, two of the data sets they manage (land cover and species distribution) have the potential to be used in a wide array of analyses if properly integrated with other data sources.

The proposed CDI project will integrate the oil well pad and GAP datasets to determine the amount of grassland bird habitat lost to energy development and to identify areas with the greatest biodiversity and concurrent energy development in the Williston Basin. The first part of this analysis will be to develop a habitat loss map based on the National Land Cover Database (NLCD) classification of all delineated well pads and calculate the area of each land cover classification lost to energy development. The loss of each land cover classification will be determined on an annual time step to determine trends in habitat loss. Next, we will combine species distribution maps for numerous grassland bird species to compile a species diversity map for the Williston Basin. In addition, we will create a weighted diversity map based upon the degree of concern for each individual species (i.e. from the State Wildlife Action Plans). Finally, the comparison between the habitat loss map with the individual species distribution maps and the species diversity map will identify areas experiencing the greatest loss of habitat to energy development for



specific species as well as areas with the greatest biodiversity. The intersection of these factors could then be used by resource and land managers to focus conservation efforts in areas of greatest concern. For example, project results could identify the location of specific habitat types within areas of intensive development for protection. This study will examine grassland birds within the Williston Basin; however, the intention is to develop a methodology that can be replicated and transferred to any species of concern in other areas of energy development nationally.

Figure 1. Williston Basin, Bakken Formation and oil wells

¹ Sauer, J.R., Hines, J.E., Fallon, J.E., Pardieck, K.L., Ziolkowski Jr., D.J. and Link, W.A., 2014, The North American Breeding Bird Survey results and analysis 1966-2013. Version 01.30.2015.

² Askins, R.A., Chavez-Ramirez, F., Dale, B.C., Haas, C.A., Herkert, F.L., Knopf, F.L., and Vickery, P.D., 2007, Conservation of grassland birds in North America: understanding ecological processes in different regions. Ornithological Monographs 64.

³ Thompson, S.J., Johnson, D.H., Niemuth, N.D., Ribic, C.A., 2015, Avoidance of unconventional oil wells and roads exacerbates habitat loss for grassland birds in the Northern American great Plains. Biological Conservation, v. 192, p 82-90.