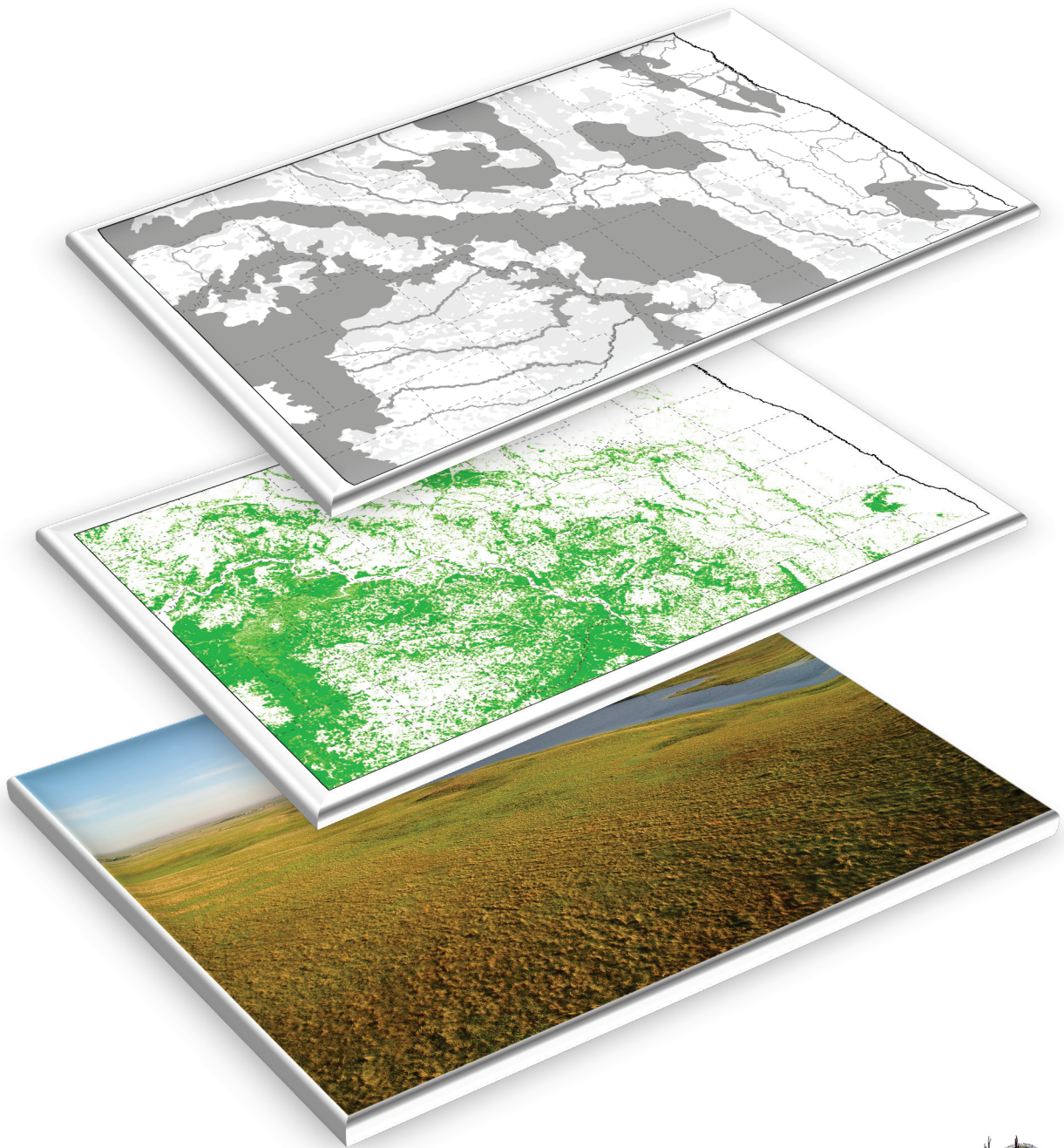


# A DESKTOP APPROACH TO AVOID AND MINIMIZE DEVELOPMENT IMPACTS TO GRASSLAND HABITAT AND WILDLIFE IN NORTH DAKOTA

Last updated: May 2021



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## INTRODUCTION

North Dakota's natural habitat was predominantly prairie – large open areas that have few trees and covered in grasses and forbs. Consequently, numerous grassland endemic wildlife species are dependent upon prairie to complete their life cycle. Over the past 150 years, the landscape of North Dakota has changed dramatically. Nearly 75% of the prairie has been converted for cropland, urban development, energy development, roads, and other anthropogenic activities. Since 48 species of conservation priority and myriad other wildlife in North Dakota depend on grasslands to complete their full annual life cycle, it is important to identify where native prairie, or unbroken grassland, remains on the landscape. Recognize these analyses typically do not provide an assessment of habitat quality. Grasslands are a dynamic ecosystem, with vegetation composition, height, density and ground cover varying greatly from year to year depending on climate conditions and land use. Regardless of the visual quality or the level of invasion of nonnative or noxious species, curbing unbroken grassland destruction and fragmentation is essential to sustaining North Dakota wildlife and species of conservation priority for the future.

There are numerous spatial products that can help determine extant unbroken grassland on the landscape. The NDGF has identified extant unbroken grassland by merging grassland classifications from land cover datasets, then subtracting cultivated land and CRP data to produce a base raster 30X30 meter pixel size of unbroken vs. broken grassland. **This layer will be considered by the NDGF to be the fundamental layer identifying native unbroken grassland (native prairie) unless demonstrated otherwise.** Recognizing there is some inaccuracy and inconsistency among datasets, a desktop approach can result in a more precise vector dataset of extant grassland at a local scale. A field assessment during the peak growing season can further refine the results of a desktop assessment. However, this document focuses on using a desktop analysis, including novel methods to identify residual impacts to grasslands, where voluntary offsets are recommended to replace the biological loss of affected areas.

## PURPOSE

The purpose of this document is to describe three scales of desktop grassland assessment (statewide, regional, and local) that can be used to minimize impacts to this important habitat during development projects. An example is included to illustrate how various raster and vector spatial layers may be utilized to refine and on-screen digitize the extant grassland types within a select project area. This is the process and categories used by the NDGF to produce a vector dataset of unbroken, restored, and unspecified or inconclusive grassland. Furthermore, impact analyses and offset examples are included to help the user identify where residual impacts to grasslands remain after development occurs, and how to calculate voluntary offsets to replace the biological loss of affected areas.

## GRASSLANDS DEFINED

Prairie or grassland (used interchangeably herein) is usually described as tallgrass, mixed-grass or short-grass. However, this grassland assessment is intended to identify extant prairie, or prairie that has not been converted from its natural state to another landcover (cropland, roads, etc.). The result can be categorized into 3 types of grassland:

**1) Unbroken Grassland** – also referred to as “native prairie.” This is grassland that, according to best available spatial information, has not been converted to another land type or land cover (e.g. cropland, developed, roads).

*Other attributes:*

- May be composed of native and/or non-native grasses and forbs.
- May be heavily invaded with nonnative species such as Kentucky bluegrass or smooth brome, but it is still considered unbroken/native prairie if there is no cultivation history.
- May be grazed or otherwise “disturbed” with animals, hayed, or burned. Appropriate grazing can be very beneficial to grasses and forbs.
- May be fenced, contain structures (e.g. old homesteads, water tanks, overhead lines), or two-track roads (i.e. with grass between the tire ruts).
- May contain patches of shrubs (e.g. buffaloberry, chokecherry, silverberry bush) or woody draws.
- May contain natural wetlands or created (e.g. stock dams).
- May be any size or configuration.

**2) Restored Grassland** – planted or reconstructed grassland. This typically occurs on previously cultivated land (broken prairie that was then used for crop production for several years). The most common type of restored grassland is CRP but other natural resource agencies operate grassland restoration programs.

*Other attributes:*

- May be planted with native or non-native grass and/or forb species.
- May be grazed or otherwise “disturbed” with animals, hayed, or burned.
- May contain tree rows.
- May contain natural wetlands or created (e.g. stock dams).
- Enrolled land in restoration programs may remain in a grassland state after the contract has expired.

**3) Unspecified or Inconclusive Grassland** – may be unbroken or restored grassland, but spatial layers do not present a definitive answer.

*Other attributes:*

- May be “go-back” prairie, where the land had been partially or totally converted from prairie to farmed or cultivated land, but farming ceased, and the land naturally return to a vegetated state.
- May be previously cultivated land but could be enrolled in a grassland restoration program for which no spatial data is available.

All three types of grassland are important for wildlife. The NDGF, first and foremost, recommends that project development avoid siting on unbroken grassland. Impacts to other grassland types should be minimized or avoided to the greatest extent possible.



# STATEWIDE SCALE ASSESSMENT

**PHASE 1:** Use the Key Native Wildlife and Habitat Areas (item A) to help identify a project location with minimal impacts. Or, if general project area is known, use KNWHA to adjust specific project location to avoid and minimize impacts.

## (A) KEY NATIVE WILDLIFE AND HABITAT AREAS

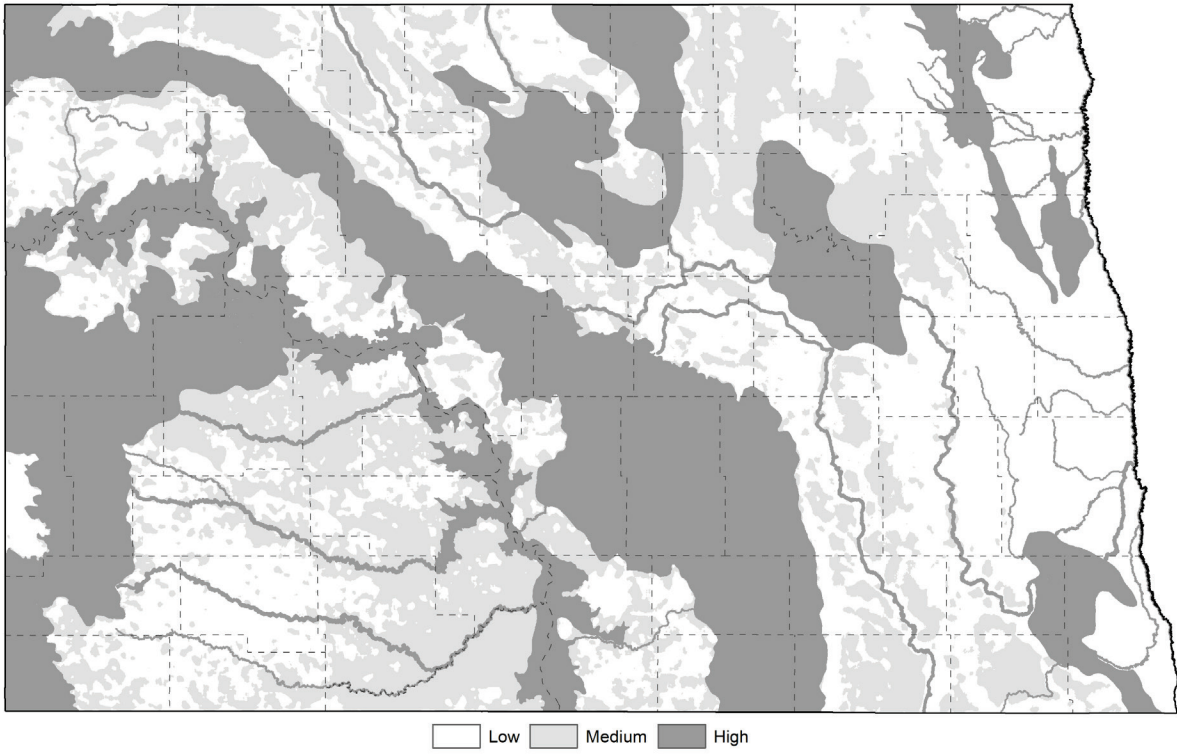
The Key Native Wildlife and Habitat Areas layer was developed using the ND State Wildlife Action Plan Focus Areas, areas where unbroken grassland is  $\geq 40\%$  within a 4 square mile area, and areas where the accessibility for breeding duck pairs per square mile is greater than 60 (“Thunderstorm Map”).

These areas do not represent complete avoidance or exclusion areas for development. Rather, the high and medium categories contain “*areas where animal or plant species that are unique or rare to this state would be irreversibly damaged*” (N.D. Admin Code § 69-06-08-01(g)). The map can be used as an initial scoping tool for project siting in areas where impacts to native wildlife and habitat will be minimized.

- Low Impact Native Wildlife and Habitat Areas – This spatial area represents lands that are primarily broken or disturbed land; land that has been converted from its native state to other uses, such as cropland and developed areas, and is a highly fragmented landscape. Offsets for impacts to wildlife and habitat are relatively low, but appropriate siting could often result in little to no impacts. Approximately 37% of the state is in the low category. Project development in the low category will have the least impact to key native wildlife and habitat.
- Medium Impact Native Wildlife and Habitat Areas – This spatial area represents lands that are partially broken or disturbed. These areas may encompass tracts that have or have not been converted from its native state to other uses, such as cropland and developed areas, therefore it is a more fragmented landscape. Offsets for impacts to wildlife and habitat may be of moderate nature, but appropriate siting can result in minimal impacts. Approximately 25% of the state is in the medium category. Project development in the medium category will have a higher likelihood of impacting key native wildlife and habitat than projects in the low impact areas.
- High Impact Native Wildlife and Habitat Areas – This spatial area represents a mostly intact and undisturbed landscape. These areas contain large tracts of land that have not been converted from their native state to other uses, such as cropland and developed areas, and are therefore a less fragmented landscape. Offsets for impacts to wildlife and habitat would be at their highest, but appropriate siting can result in moderate to minimal impacts. Approximately 37% of the state is in the high category. Project development in the high category will have the greatest impact to key native wildlife and habitat.

Spatial Data Access: contact NDGF Conservation Biologist Sandra Johnson (sajohnson@nd.gov)

Key Native Wildlife and Habitat Areas (KNWHA).



# REGIONAL SCALE ASSESSMENT

*PHASE 2: Use grassland spatial products (item B) to help identify core tracts of grassland within the project area that were not depicted in the statewide KNWHA spatial product. Avoid and minimize siting project components within grassland tracts.*

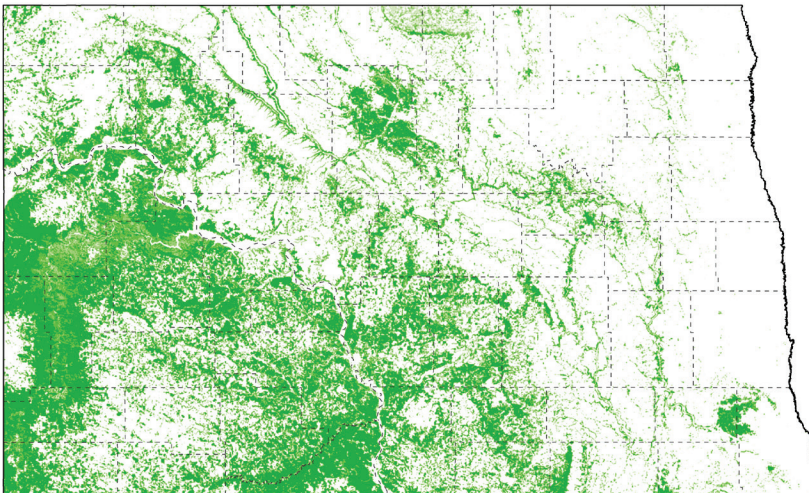
## **(B) MICRO NATIVE GRASSLAND RANGE**

This product is derived from the NDGF Base Raster Native Grassland Layer. The purpose is to identify the distribution of core native grassland habitats in North Dakota. This product is not to be interpreted as a landuse/landcover classification. This dataset quantifies the amount of native grassland in a 160 acre neighborhood at each focal point of the native grassland dataset. Various thresholds were utilized to identify core native grassland, primary and secondary habitat, or fixed intervals of the percent of native grassland on the landscape.

Spatial Data Access:

- 2008 product: <https://gishubdata.nd.gov/dataset/micro-native-grassland-range>
- 2014 product: *contact NDGF Conservation Biologist Sandra Johnson (sajohnson@nd.gov)*

Micro Native Grassland Range



# LOCAL SCALE ASSESSMENT

*PHASE 3: Use the NDGF Base Raster Grassland as the foundation (Item D) and additional spatial products (items E, F, G, H, I) to perform a desktop analysis of the extant grassland within the project area. This is the process used by the NDGF to produce a vector dataset of unbroken, restored, and unspecified or inconclusive grassland.*

## **(D) BASE RASTER GRASSLAND (NDGF 2008 and 2014 products)**

These products are representative of extant unbroken prairie (uncultivated, native prairie). Grassland vegetation classes were extracted from foundation layers, reclassified and merged to create one raster layer identifying native grassland. NASS Cultivated Layers and FSA CRP polygons were used to subtract cells potentially misclassified as grassland to prevent overestimation and a representation of unbroken, native grassland. The final product is 30X30 meter raster layer.

## **(E) OTHER LANDCOVER**

Numerous landcover products classify grasslands. Consider examining all the following datasets to confirm consistencies or inconsistencies of grassland classification. Consistencies in grassland occurrence over time and over numerous landcovers suggest it may be unbroken grassland or restored (“go-back”) grassland, even if landcovers use different classification terminology (e.g. herbaceous, potentially undisturbed, disturbed grass, native vegetation, introduced vegetation, non-cultivated).

- National Land Cover Database. The U.S. Geological Survey (USGS), in partnership with several federal agencies, has developed and released four National Land Cover Database (NLCD) products over the past two decades: NLCD 1992, 2001, 2006, and 2011. These products provide spatially explicit and reliable information on the Nation’s land cover and land cover change. The NLCD 2016 design aims to provide innovative, consistent, and robust methodologies for production of a multi-temporal land cover and land cover change database from 2001 to 2016 at 2–3-year intervals. <https://gishubdata.nd.gov/>
- World Wildlife Fund Plowprint Report. The Plowprint identifies remaining intact habitat and tracks grassland loss across the Great Plains region of the US and Canada. <https://www.worldwildlife.org/pages/plowprint-report-map>
- Grassland Assessment of North American Great Plains Migratory Bird Joint Ventures (2019). The goal of this assessment was to provide explicit planning and conservation delivery datasets to assist JV partnerships to 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. [http://ppjv.org/assets/docs/Great\\_Plains\\_Grassland\\_Assessment\\_Final\\_Report.pdf](http://ppjv.org/assets/docs/Great_Plains_Grassland_Assessment_Final_Report.pdf)
- USDA National Cultivated Layer. The Cultivated Layer is based on the most recent five years (2015-2019) of cultivated land. <https://nassgeodata.gmu.edu/CropScape/>
- USDA-NASS North Dakota Cropland Data Layers. The USDA, NASS Cropland Data Layer (CDL) is a raster, geo-referenced, crop-specific land cover data layer. The CDL is produced using satellite imagery. <https://nassgeodata.gmu.edu/CropScape/>
- USGS 2005 and 2010 GAP Landcover. This dataset combines the work of several different projects to create a seamless data set for the contiguous United States. Data from four regional

Gap Analysis Projects and the LANDFIRE project were combined to make this dataset.

<https://gishubdata.nd.gov/>

- USFWS 1996 and 2002 Landcover. Land classification to map upland waterfowl nesting cover in the North and South Dakota and northeast Montana portion of the Prairie Pothole Region. The updated classification contains 9 classes and imagery dates range from the late 90's through 2002. <https://gishubdata.nd.gov/>

## (F) FSA DATA PRODUCTS

USDA Farm Service Agency maintains farm and crop history data. Note: this is proprietary data and may not be available to the public. <https://www.fsa.usda.gov/state-offices/North-Dakota/index>

- Conservation Reserve Program. CRP is a land conservation program administered by FSA. In exchange for a yearly rental payment, farmers enrolled in the program agree to remove environmentally sensitive land from agricultural production and plant species that will improve environmental health and quality. Contracts for land enrolled in CRP are 10-15 years in length. The long-term goal of the program is to re-establish valuable land cover to help improve water quality, prevent soil erosion, and reduce loss of wildlife habitat. In 2007, more than 3.3 million acres were enrolled in North Dakota and in 2020 about 1.2 million acres.
- Common Land Unit. CLU is the smallest unit of land that has a permanent, contiguous boundary, a common land cover and land management, a common owner and a common producer in agricultural land associated with USDA farm programs. CLU boundaries are delineated from relatively permanent features such as fence lines, roads, and/or waterways.

## (G) AERIAL IMAGERY

Numerous aerial imagery products are available for North Dakota.

- National Agriculture Imagery Program (various years, 2003-2020). NAIP acquires aerial imagery during the agricultural growing seasons in the continental U.S. A primary goal of the NAIP program is to make digital ortho photography available to governmental agencies and the public within a year of acquisition. <https://gishubdata.nd.gov/>
- Other State Imagery. FSA Aerial Photography 1957-1962, USGS Aerial Photography 1995-1998, and various other state or regionally collect aerial imagery for various years. [https://www.swc.nd.gov/info\\_edu/map\\_data\\_resources/](https://www.swc.nd.gov/info_edu/map_data_resources/) and <https://gishubdata.nd.gov/>

## (H) LiDAR

LiDAR-Derived Elevation Data, ND State Water Commission.

[https://www.swc.nd.gov/info\\_edu/map\\_data\\_resources/](https://www.swc.nd.gov/info_edu/map_data_resources/)

## (I) GRASSLAND BIRD CONSERVATION AREAS

The USFWS Habitat and Population Evaluation Team (HAPET) developed a conceptual model for Grassland Bird Conservation Areas (GBCAs). Maps of GBCAs were created to be decision support tools to be used by managers to target future conservation at the largest grassland patches with the smallest perimeter to area ratio (the greatest “blockiness”) to efficiently benefit area sensitive grassland bird species.

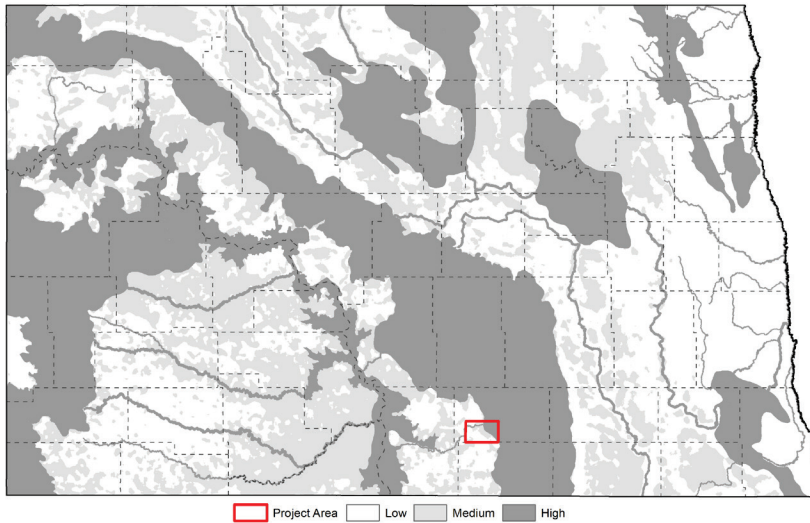
- Type III Grassland Bird Conservation Areas are used in the Avian-Impact Offset Method. All grassland is represented in the model, including CRP.
  - Shaffer, J. A., Loesch, C. R., and Buhl, D. A. 2019. Estimating offsets for avian displacement effects of anthropogenic impacts. *Ecological Applications* 29(8):e01983 [10.1002/eap.1983](https://doi.org/10.1002/eap.1983)
  - Rex R. Johnson, R. R., Granfors, D. A., Niemuth, N. D., Estey, M. E., and Reynolds, R. E. 2010. Delineating Grassland Bird Conservation Areas in the U.S. Prairie Pothole Region. *Journal of Fish and Wildlife Management* 1 (1): 38–42. doi: <https://doi.org/10.3996/JFWM-022>

Spatial Data Access: contact HAPET office in Bismarck

# GRASSLAND ASSESSMENT EXAMPLE

## PHASE 1: Statewide Scale

a) The red outline represents a proposed wind energy project. The total project area is 85,000 acres but the final turbine layout will not span the entire project area.



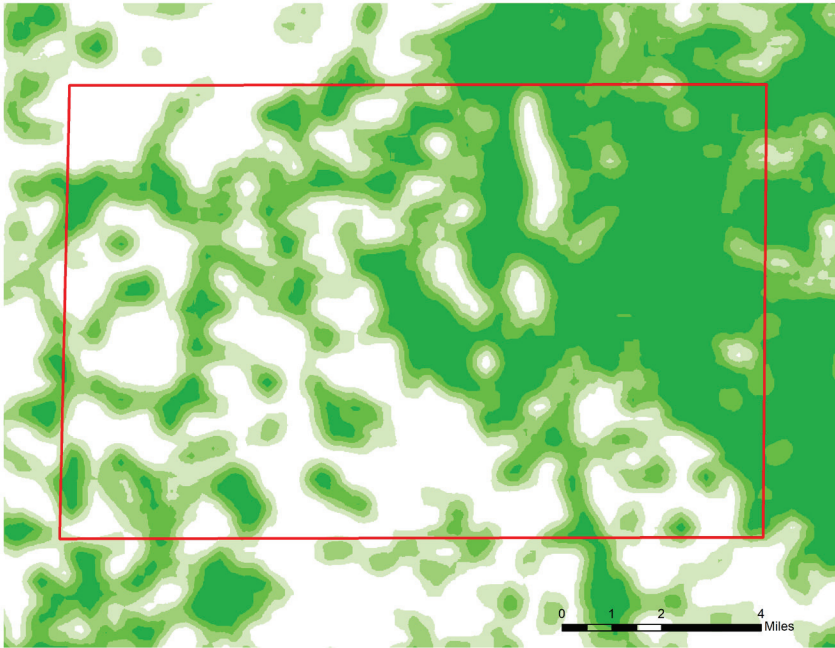
b) The project area includes similar spatial amount of all 3 categories of Key Native Wildlife and Habitat Areas. Development may occur in any category, however, the least amount of impact to native wildlife and habitat is expected in the Low (white) or Medium (light gray).



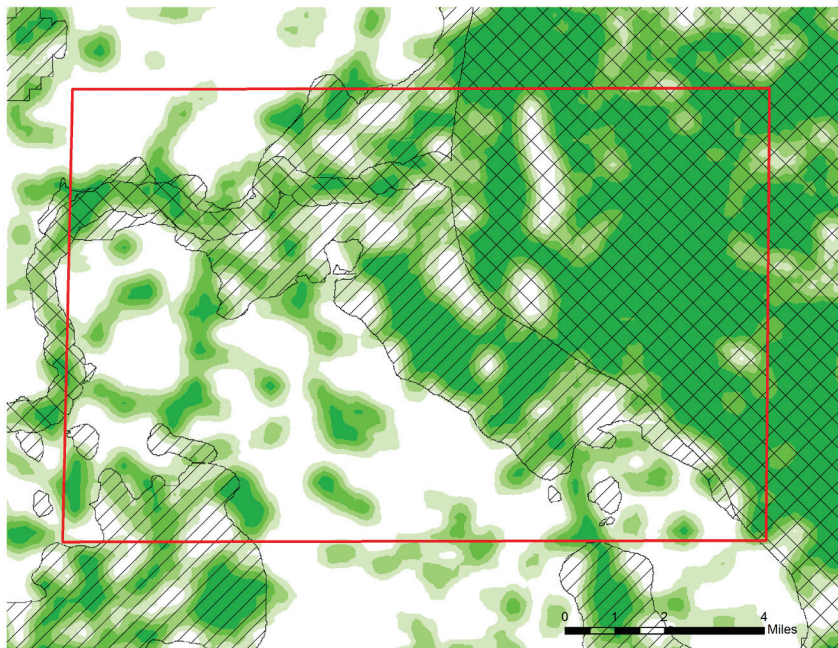


**PHASE 2: Regional Scale**

a) Micro Native Grassland Range shows a large area of relatively contiguous unbroken grassland (green) in the northeast portion of the project area. However, patches of unbroken grassland occur throughout the project area.

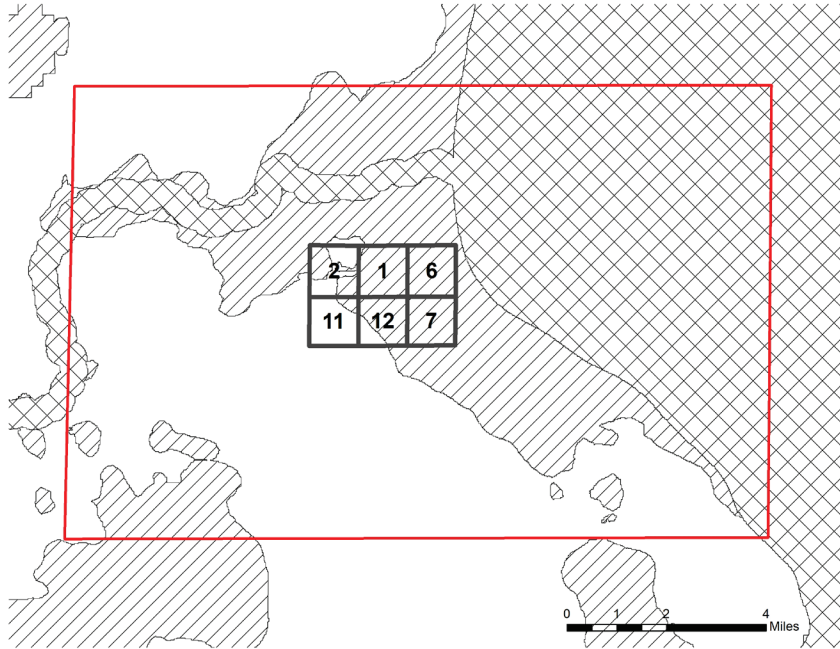


b) Cross hatch represents High KNWHA. Diagonal lines represent Medium KNWHA. Areas with no lines represent Low KNWHA. Development is expected to have the least amount of impact to native wildlife and habitat in the white areas.



### PHASE 3: Local Scale

a) Identify extant grassland within the project area using additional data layers. For this example, six contiguous sections (2X3 miles) were selected in the center of the project area, as an illustration of evaluating areas within Medium or High KNWHA, and if project siting could occur with minimal impacts to unbroken grassland.

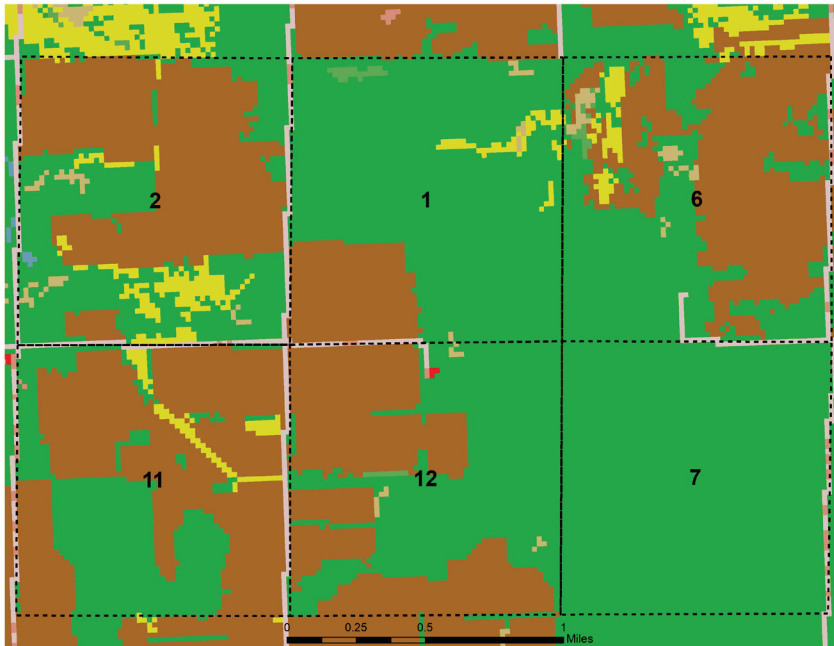


b) The fundamental layer is the NDGF Grassland Base Raster. This is what the NDGF identifies as unbroken grassland unless the grassland assessment demonstrates otherwise.

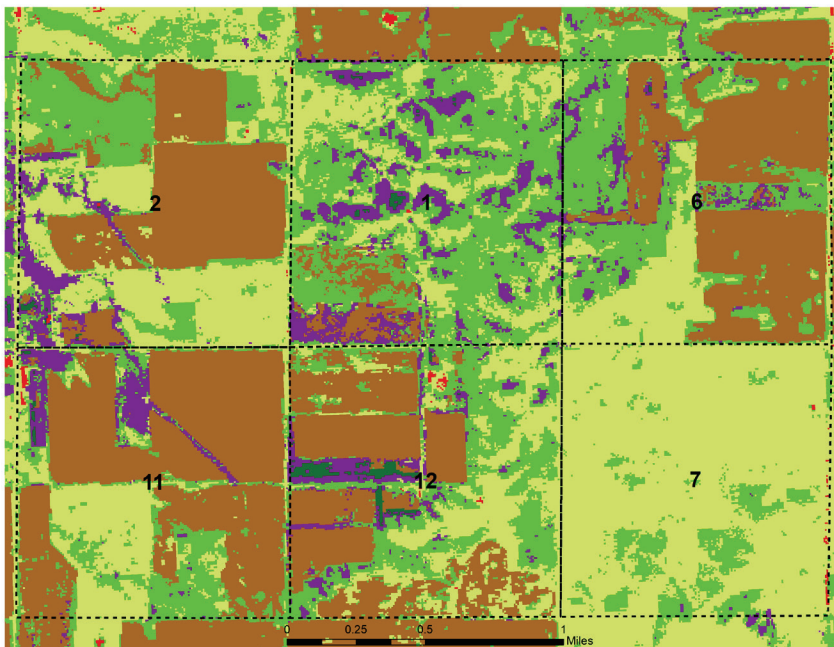


**c)** Examine other landcovers. Consistencies in grassland occurrence over time and over numerous landcovers suggest it may be unbroken grassland or possibly restored (“go-back”) grassland, even if landcovers use different classifications (e.g. herbaceous, potentially undisturbed, disturbed grass, native vegetation, introduced vegetation, non-cultivated).

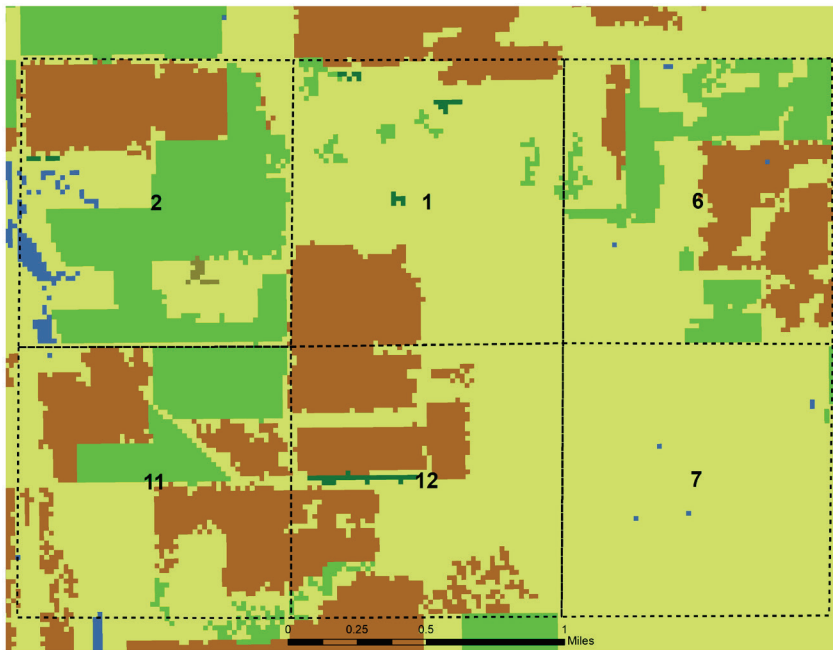
**(i)** e.g., NLC 2016. Green is herbaceous (grassland), yellow is hay/pasture, brown is cultivated crop.



**(ii)** e.g., PUDL. Light green is potentially undisturbed grass, dark green is disturbed grass, purple is shrub, brown is cultivated crop.



(iii) e.g., USFWS 2002. Light green is native vegetation, dark green is introduced vegetation, brown is cropland.

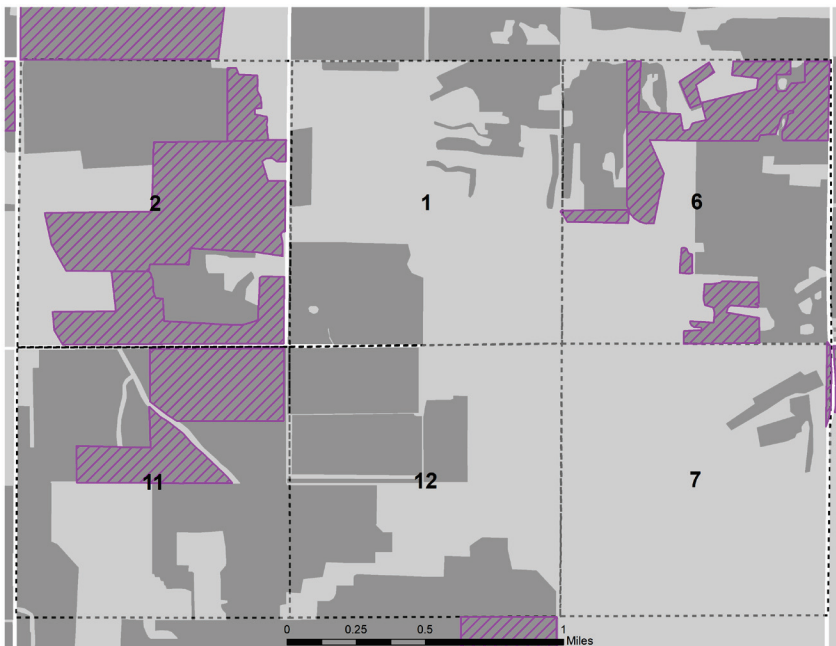


(iv) e.g., National Cultivated Layer 2019. Green is non-cultivated (grassland or other perennial herbaceous cover) and brown is cultivated (cropland).



d) Examine other polygon datasets such as CRP determine if grassland areas have a cropping history.

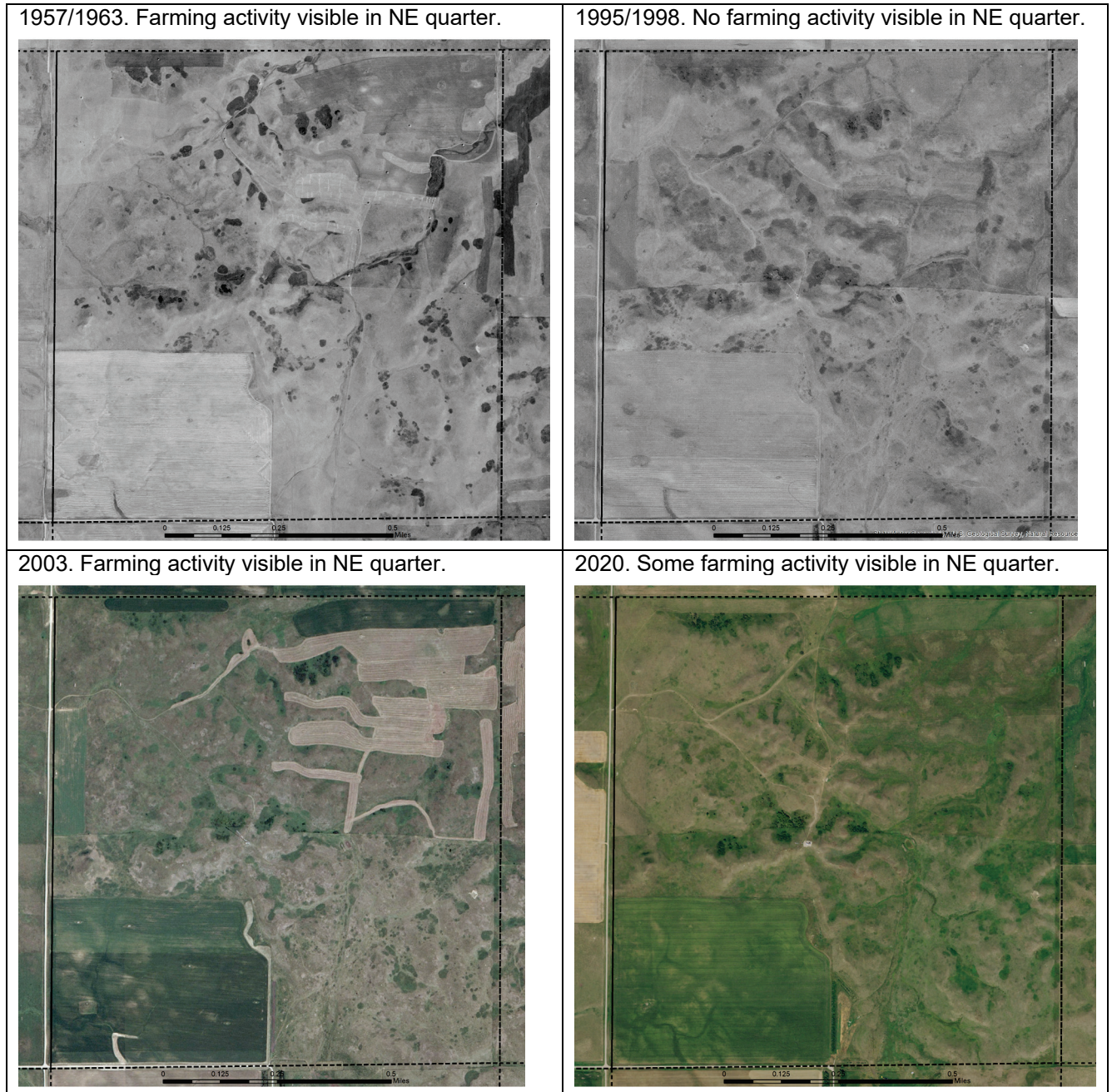
Purple diagonal line is CRP. Dark gray may have a cropping history, light gray is undetermined and therefore may not have a cropping history.





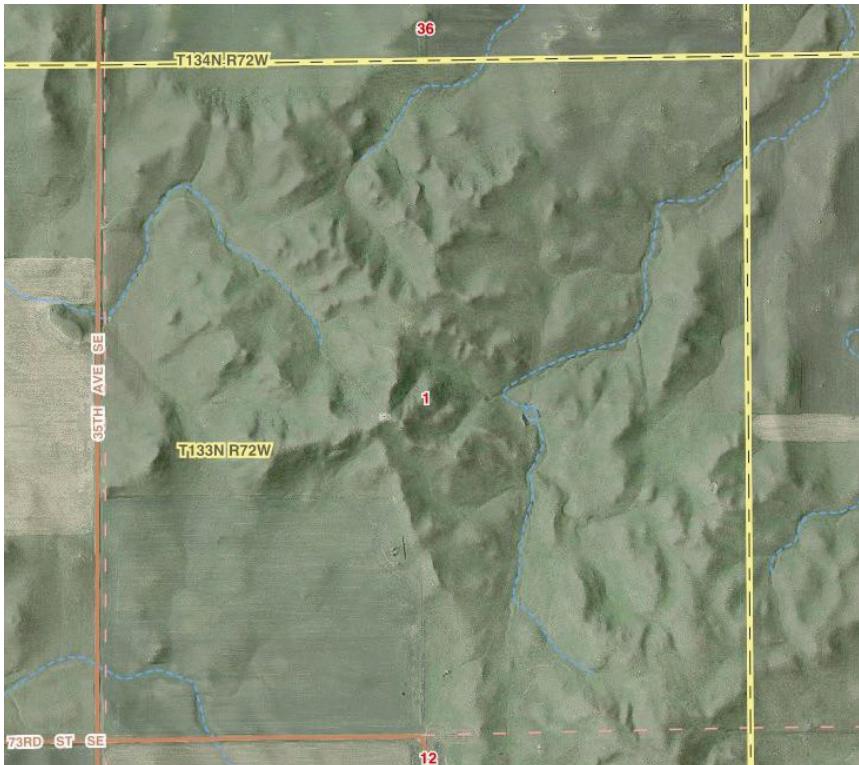
e) Use aerial imagery to examine areas with inconsistencies.

(i) e.g., there are inconsistencies in Section 1. The NDGF Grassland Base raster, and some other landcovers, classify the NE quarter as unbroken prairie. The Cultivated Layer classifies it as non-cultivated, but certain landcovers (e.g., PUDL) and the CLU database indicates it may have been cultivated or disturbed at some point in time.





(f) LiDAR may reveal furrows where cropping had occurred.

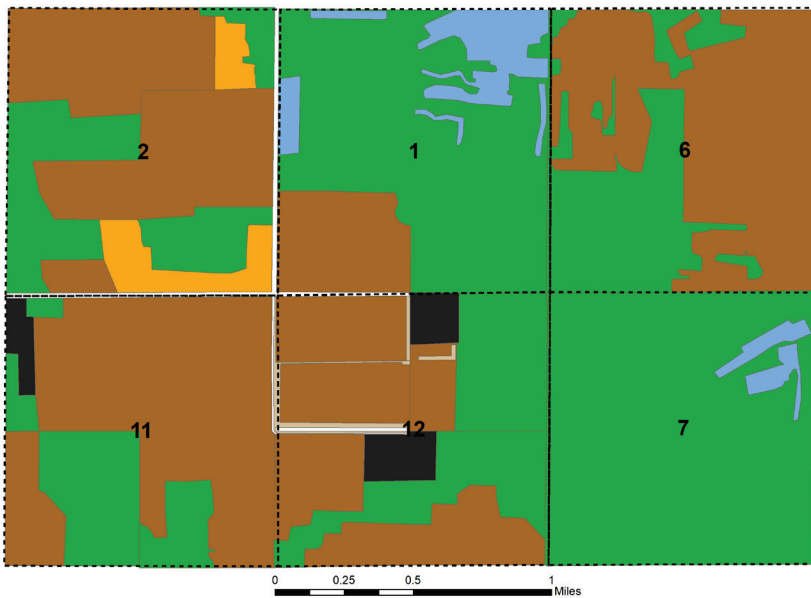


(g) Other criteria:

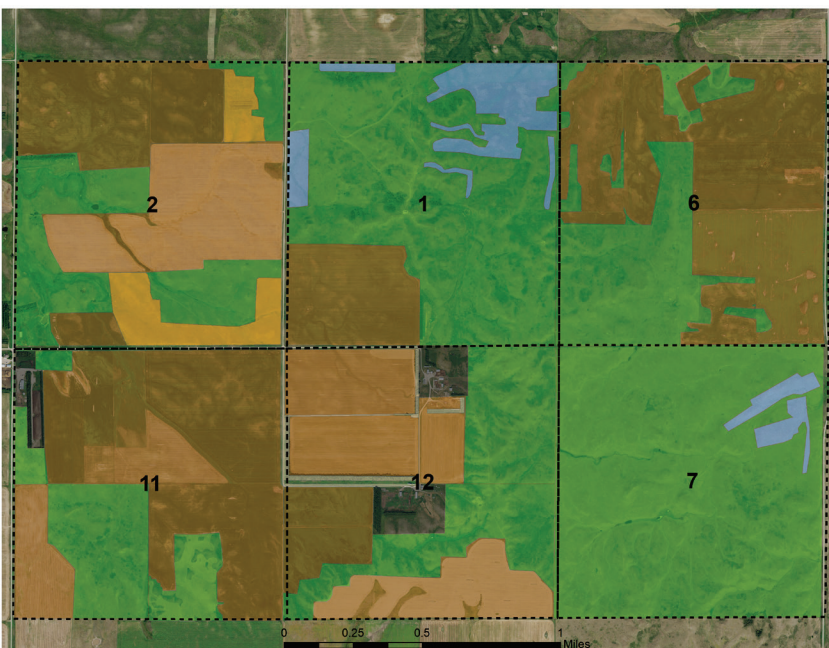
- The project boundary does not divide intact grasslands.
- Maintained gravel roads and paved roads do divide/fragment grasslands, but two-track roads (i.e. with grass between the tire ruts) do not divide/fragment grasslands.
- Fences (e.g. barbed wire fences) and transmission lines do not divide/fragment grasslands.
- Include temporary and seasonal wetlands embedded within unbroken grassland.
- Exclude farmsteads, developed areas, and tree shelterbelts.

# LOCAL GRASSLAND ASSESSMENT DESKTOP PRODUCT

The user applied editing and geoprocessing in ArcGIS to modify existing data products or create new data layers. The result of the desktop exercise is a vector dataset of unbroken grassland (green), restored grassland (orange), unspecified or inconclusive grassland (blue), active cropland (brown), and farmsteads (black). Compare to the NDGF Grassland Base Raster on page 11.



The grassland assessment and 2020 aerial imagery.



# IMPACTS ANALYSIS AND OFFSET EXAMPLES

The NDGF, first and foremost, recommends that project development avoid siting on unbroken grassland. Impacts to other grassland types should be minimized or avoided to the greatest extent possible. To compensate for unavoidable environmental impacts to grasslands, voluntary offsets are recommended to replace the biological loss of affected areas. A framework can be used that quantifies the amount of habitat needed to provide equivalent biological values. For example, the avian-impact offset method (AIOM) described by Shaffer et al. (2019) is a science-based tool that calculates biological values (i.e., avian density) lost by development in a spatially explicit manner. The AIOM includes a model for breeding grassland birds and a model for breeding waterfowl pairs. This document focuses on the models for grassland birds by calculating the impact area X percent displacement to determine offset numbers.

The following are two options to assist in determining the amount of impact and offset numbers: (1) Avian Impact Offset Method, and (2) ArcGIS analysis using the grassland assessment final product and assigned metrics.

*Note: results may vary depending on the site location and accuracy of spatial products. The NDGF recommends examining both options.*

**Option (1).** The Avian Impact Offset Method (Shaffer et al. 2019). This method enables the user to estimate the amount of grassland area needed to offset breeding grassland bird avoidance, based on the ability to define five metrics: impact distance, impact area, pre-impact density, percent displacement, and offset density. The model also identifies comparable habitat for potential offset sites. The AIOM can be applied for wind energy and oil and gas development impacts since recent studies have provided evidence and estimates of behavioral avoidance in the vicinity of energy infrastructure. Note the models use assigned raster layers (e.g., grassland cover class used to create Type III GBCA). However, the model allows the user to enter site specific metrics, such as pre-impact and post-impact density, if known, and the model may be adapted with a user's grassland data.

AIOM Access: contact HAPET office in Bismarck, including instructions on how to use AIOM tool. See also:

Loesch, C. R., J. A. Walker, R. E. Reynolds, J. S. Gleason, N. D. Niemuth, S. E. Stephens, and M.A. Erickson. 2013. Effect of wind energy development on breeding duck densities in the Prairie Pothole Region. *Journal of Wildlife Management* 77:587-598.

Shaffer, J. A., C. R. Loesch, D. A. Buhl. 2019. Estimating offsets for avian displacement effects of anthropogenic impacts. *Ecological Applications* 29(8): e01983. 10.1002/eap.1983

Shaffer, J. A. and D. A. Buhl. 2016. Effects of wind-energy facilities on grassland bird distributions. *Conservation Biology* 30:59-71.

**Option (2).** ArcGIS analysis using the grassland assessment final product and assigned metrics. This method is used by the NDGF to assess impacts to unbroken grasslands and grassland bird avoidance because of wind energy development. A standard 300-meter buffer around turbine sites and 53% bird displacement is applied.

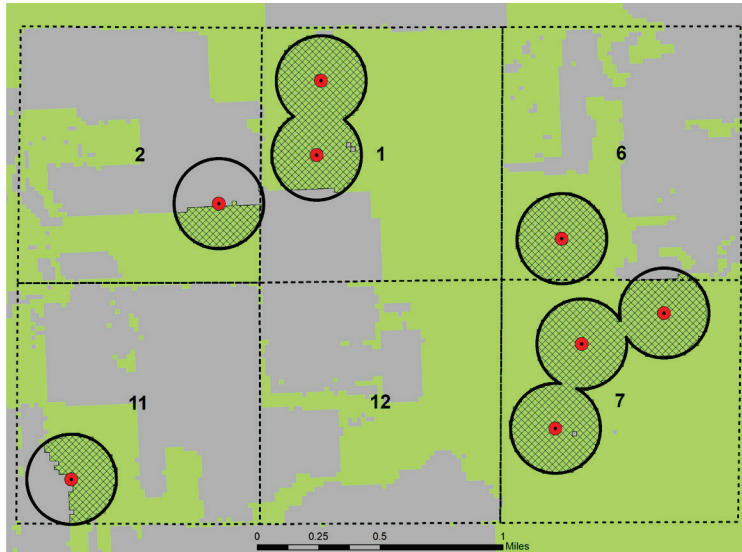
The following examples illustrate the results of the two options for wind turbines: a) sited on grassland, and b) not sited on grassland.

**EXAMPLE (a): 8 turbines sited on grassland**

**Option (1).** Avian Impact Offset Method. The AIOM tool was executed as developed, with default displacement buffer of 300 meters, and displacement of 53%.

Grassland habitat (green), non-compatible grassland bird habitat (gray), wind turbine (red circle), 300-meter buffer (cross hatch).

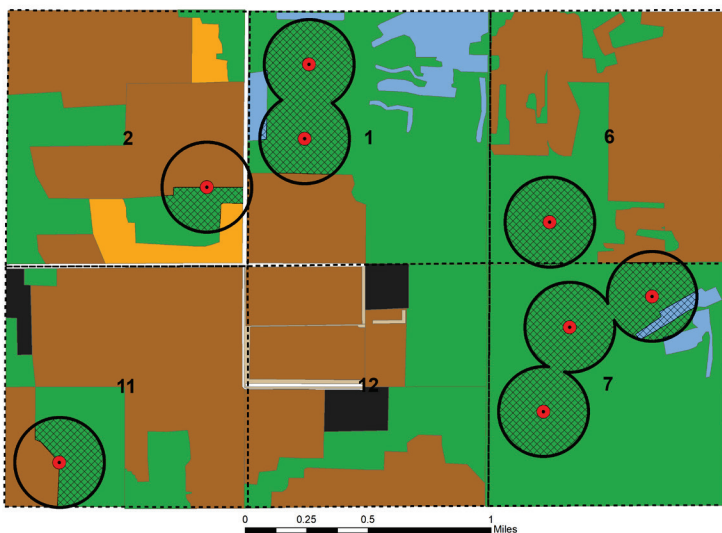
- Acres of grassland impacted = 477
- Offset acres = 253



**Option (2).** ArcGIS analysis using the grassland assessment final product and assigned metrics. A 300-meter dissolved buffer was used to clip the local grassland assessment vector layer (unbroken and inconclusive grassland only) and displacement of 53% applied to acres impacted.

Unbroken grassland (green), restored grassland (orange), unspecified or inconclusive grassland (blue), active cropland (brown), and farmsteads (black), wind turbine (red circle), 300-meter buffer (cross hatch).

- Acres of unbroken grassland impacted = 474
- Offset acres = 251

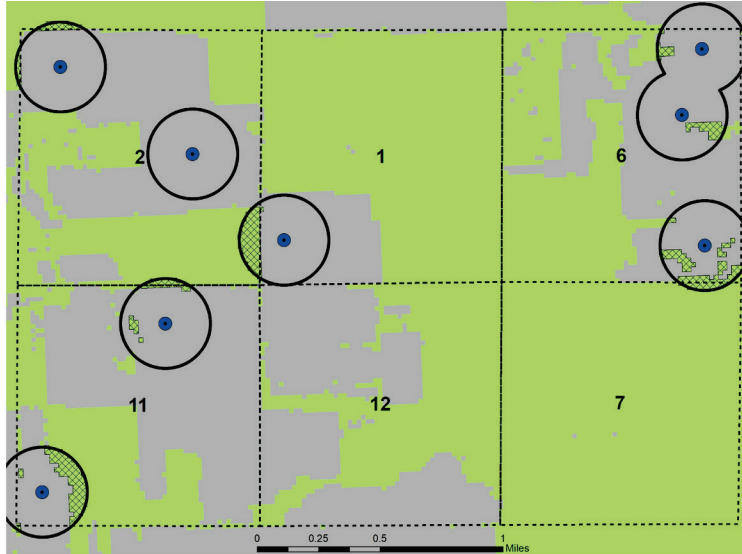


**EXAMPLE (b): 8 turbines *not* sited on grassland**

**Option (1).** Avian Impact Offset Method. The AIOM tool was executed as developed, with default displacement buffer of 300 meters, and displacement of 53%.

Grassland habitat (green), non-compatible grassland bird habitat (gray), wind turbine (blue circle), 300-meter buffer (cross hatch).

- Acres of grassland impacted = 60
- Offset acres = 32



**Option (2).** ArcGIS analysis using the grassland assessment final product and assigned metrics. A 300-meter dissolved buffer was used to clip the local grassland assessment vector layer (unbroken and inconclusive grassland only) and displacement of 53% applied to acres impacted.

Unbroken grassland (green), restored grassland (orange), unspecified or inconclusive grassland (blue), active cropland (brown), farmsteads (black), wind turbine (blue circle), 300-meter buffer (cross hatch).

- Acres of grassland impacted = 26
- Offset acres = 14

