Alberta Conservation Association

2020/21 Project Summary Report

Project Name: Enchant Project – Strong Farmlands. Thriving Habitat.

Wildlife Program Manager: Doug Manzer

Project Leader: Layne Seward

Primary ACA staff: Kelsey Cartwright, Jalen Hulit, Mike Jokinen, Kris Kendell, Daniel Knop, Doug Manzer, Phil Rose, Layne Seward, Mike Uchikura, and Samuel Vriend.

Partnerships

Alberta Environment and Parks
Haggins Family
Stamp Farms

Key Findings

- The density of partridge pairs decreased from 113 pairs (19.1 pairs/km^2) in spring 2019 to 79 pairs (13.3 pairs/km^2) in spring 2020 on the Enchant Farm.
- Counts in October revealed very poor recruitment again in 2020 with only 172 individuals remaining from a spring pair count of 79.
- Resource selection function analyses using 2016 – 2019 partridge count data indicates that important predictors of spring partridge pair occurrence include: Distance to Woody Vegetation, Shrub Height, and Density of Linear Edge within 50 m.
- Important predictors of fall coveys include: Distance to Edge, Distance to Nearest Covey, and Density of Linear Shrub Meters within 50 m.
- We detected 50 wildlife species during our 2020 wetland and point count biodiversity surveys on the Enchant farm and control sites.

- Trail camera data analysis from 2018 and 2019 indicates that there is a significant relationship between temperature and events at camera trap locations for partridge and pheasants.

Abstract

We have a long-term working relationship with a modern farm to evaluate approaches for re-establishing vibrant upland game bird densities while maintaining a profitable farming operation. We also monitor a range of non-target species to assess how these treatments impact biodiversity (amphibians and songbirds). We trial enhancements that focus on improving habitat features important for nesting, brood rearing, and winter survival of pheasants and grey partridge. This includes approaches within the crop, the juxtaposition of crops types and rotation, harvest method, field edge improvements, water management and wetlands, and trialling seed mixes important for chick survival. In 2020, we planted more of the perennial seed blend that was trialed in 2019. The blend is designed to be self-sustaining, provide vertical structure and flowering plants. We planted Roundup Ready Corn to provide escape and thermal cover but to also help control unwanted weeds. The landowner planted 3.2 km of additional shrub rows (3,200 shrubs) to increase territorial space on the farm. We planted approximately 1,000 willow stakes around five wetlands. The density of partridge pairs decreased from 113 pairs (19.1 pairs/km^2) in spring 2019 to 79 pairs (13.3 pairs/km^2) in spring 2020. Autumn partridge totals also had a decrease from 288 in October 2019 to 172 in 2020.

Introduction

Crop production has evolved dramatically since the post-war recovery following WWII. Advances in equipment, knowledge, irrigation, and chemical applications have increased yields and decreased farm risk, but these advances have also had the unintended consequence of reducing resources important for game birds. With more than 24 million acres now under cultivation in Alberta, hunting opportunity for upland game birds has diminished substantially.

We have a long-term working relationship with a farm to evaluate approaches for re-establishing vibrant upland game bird densities while maintaining a profitable farming operation. We also monitor a range of non-target species to assess how these treatments impact biodiversity

(amphibians and songbirds). We trial enhancements that focus on improving habitat features important for nesting, brood rearing, and winter survival of pheasants and grey partridge. This includes approaches within the crop, the juxtaposition of crops types and rotation, harvest method, field edge improvements, water management and wetlands, and seed trial plots. Beginning in 2014, the initial two years of the project focused on collecting baseline data to allow for comparisons in the future.

Methods

The farm is located near Enchant in a landscape highly fragmented by a mix of irrigated and dryland farming. The farm has 974 acres of irrigated land under cultivation and is rented to a local seed producer. The cultivated land is divided among eight fields, all with modern irrigation pivots. The farm is not a natural system, so our approach is to target enhancements that are compatible with modern farming and take advantage of marginal areas. For example, chick survival is closely linked to insect abundance, so we are testing seed varieties in mixes to evaluate their suitability as brood-rearing habitat. A brood-rearing mix is being trialed in dryland areas that currently lack insect-rich habitat.

A similar approach is taken with seed varieties that mimic the tall structure provided by shrubs. Tall structure is an important resource for gamebirds. Males defend their territory from other males of the same species, and we are hoping that by providing additional tall edge habitat we can increase densities because their territory size will be reduced. We initially trialed tall seed varieties in plots (sorghum, millet, and corn) and assessed germination and growth in dry and irrigated locations. Shrubs take at least five years to grow tall enough to be beneficial to these species, so these annuals provide a short-term alternative. Annuals are cheaper over the short term, and for some operators they may be the only viable option for creating territorial edge habitat.

We also plan to explore *within* crop strategies that may improve chick survival, site fidelity, and winter survival. Secondary cover crops that sit below the primary crop may provide more invertebrates for chicks and offer hiding cover over the fall and winter after the primary crop is cut. Cover crops may also benefit farm operations by adding nutrients to the soil. Stripper

headers are a new technology that cut very near the top of cereal stems, removing only the grain head. They leave much taller stubble, which may provide better escape and roosting cover, and possibly improve site fidelity and overwinter survival. These headers may benefit farmers if they improve moisture retention, reduce erosion, and contribute organic content to the soil.

Habitat use was characterized using Resource Selection Function (RSF) models and compared to randomly available points throughout the property using partridge survey data from 2016 to 2019. RSF models will inform us on which habitat features partridge are selecting (i.e., proportional use higher than expected based on availability) or avoiding (i.e., proportional use less than expected based on availability). Constructing multiple RSF models will allow us to determine if there is any change in the habitat features occurring in the top RSF models or if the strength at which these habitat features are selected/avoided by partridge changes between years/seasons.

Habitat variables we included in the RSF models were habitat type (grassland, cropland, woody vegetation [which includes spruce plantings and shelterbelts], wetland, and anthropogenic habitat [developed areas such as houses, bin yards, canals, and roads]), distance to habitat features (crop, shelterbelt, wetland, developed area, road, edge habitat, feeder, nearest pair or covey, habitat enhancements [brood mix, Elmay mix, sorghum, corn, mowed strips]), height and shrub row number of nearest shelterbelt, nearest crop stubble type, and the density of wetland area, linear edge, and linear meters of shrub within 50, 100, 250, and 500 m buffers. We tested all variables independently for associations with partridge occurrence and collinearity, then combined them together into a global model. Based on their predictive power, the top subsets of the global model were averaged to identify habitat variables with the strongest association to partridge occurrence.

We also investigate ways to gain more utility from runoff and irrigation water while reducing unintended consequences. Surface water causes erosion and can move unwanted nutrients into canals and reservoirs; these nutrients may also leech into groundwater. We are mapping contours and sighting wetlands that will act as water filters. Wetland areas are important for wildlife, and the surrounding vegetation is a hotbed for insects that are vital for chick survival. Cattail complexes also serve as refuge areas for pheasants during cold winter periods.

Camera traps were used to determine if there were significant relationships between partridge and pheasant events at cameras and average air temperature. Camera trap photos of partridge and pheasants were considered independent events if there were one or more individuals of a species present in the photo, and at least one hour had elapsed since one or more individuals of the same species had been photographed on the same camera. The total daily number of species-specific events from each of the 37 cameras were then added to calculate the total number of partridge and pheasant events for each day of the year. These events were then modelled against the daily average air temperature recorded by the Alberta Climate Information Service (ACIS) weather station located in Enchant.

Baseline biodiversity monitoring is completed each year at sites on and off (control sites) the farm to allow for a comparison of patterns over time. As the project continues, we will establish graduate student projects in partnership with universities to help answer specific questions.

Results

In 2020, we planted more of the perennial seed blend that was first trialed in 2019 (Table 1). The seed blend is designed to be self-sustaining, provide vertical structure and flowering plants. This mix was planted on both dryland and irrigated cropland. The trials under irrigation grew well while the dryland trials had sporadic germination and limited growth. We will continue to monitor this seed blend for the next couple of years. The Roundup Ready Corn seed grew very well in both irrigation and dryland. It provided excellent vertical structure and was easy to control weeds within.

Table 1. Seed varieties and percentages that were used in the Edge Habitat Mix.

Seed Variety	**Percentage (%)**
Synergy Alfalfa Blend	14
Leo Birdsfoot Trefoil	2
Sainfoin	30
Intermediate Wheatgrass	14
Dahurian Wild Rye	9
Sunflowers	5
Tall Wheatgrass	17
Balo Phacelia	5
Red Clover (double cut)	4

The landowner planted 3.2 km of additional shrub rows (3,200 shrubs) to increase territorial space for partridge and pheasants on the farm. Additionally, 1,000 willow stakes were harvested and planted around the wetlands to help establish riparian areas, and provide soil stabilization and habitat.

The density of partridge pairs decreased from 113 pairs (19.1 pairs/km^2) in spring 2019 to 79 pairs (13.3 pairs/km^2) in spring 2020. Pair density was still much greater on the farm than at control sites (3.7 pairs/km^2) in 2020. Autumn partridge densities also decreased from 288 in October 2019 to 172 in 2020 suggesting low recruitment again going into 2021.

The habitat variables that were important predictors in the resource selection function analysis for the occurrence of spring grey partridge pairs were: distance to edge, distance to woody vegetation, density of shrub edge, shelterbelt height, number of shrub rows, and wetland area. In 2016, probability of partridge occurrence peaked near shelterbelts that were 2 m tall and decreased near shorter and taller woody vegetation. The probability of partridge occurrence also increased as the number of rows in the nearest shelterbelt increased. In 2016 and 2017 the probability of partridge occurrence decreased as the amount of wetland in the surrounding area increased. The influence of wetland area was found to have the greatest effect within a 500 m

buffer of partridge detections in 2016 and a 100 m buffer in 2017. The probability of partridge occurrence in 2017 increased as linear meters of shrub increased within a 50 m buffer (i.e., density of shrub edge). In 2017 and 2019 the probability of partridge occurrence decreased the further away a site was from edge habitat and the same relationship existed for distance to woody vegetation in 2018. Distance to woody vegetation and distance to edge were strongly correlated with each other and therefore only the variable with greatest predictive power was used each year. When all four years of spring partridge survey data were combined, the probability of partridge occurrence was greatest at sites less than 100 m from woody vegetation (Figure 1), greater than 200 m of linear edge within a 50 m buffer (Figure 2), and near shelterbelts that were 1.5 m or taller (Figure 3). Partridge pair occurrence was higher than expected in grassland and woody vegetation and less than expected in cropland. Occurrence was also twice as likely in grassland than cropland and four times more likely in woody vegetation (Figure 4).

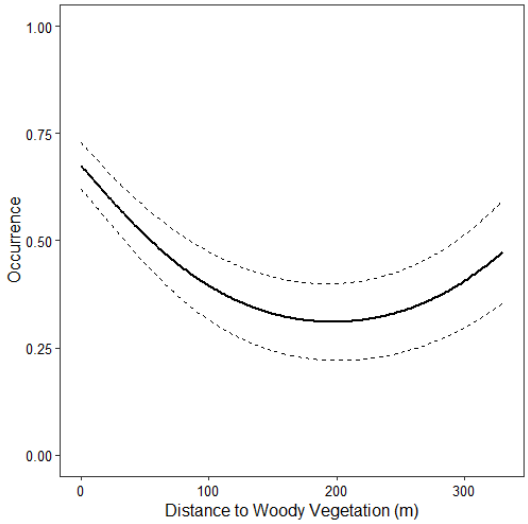

Figure 1. Probability of grey partridge pair occurrence as distance to woody vegetation (shelterbelt) increases.

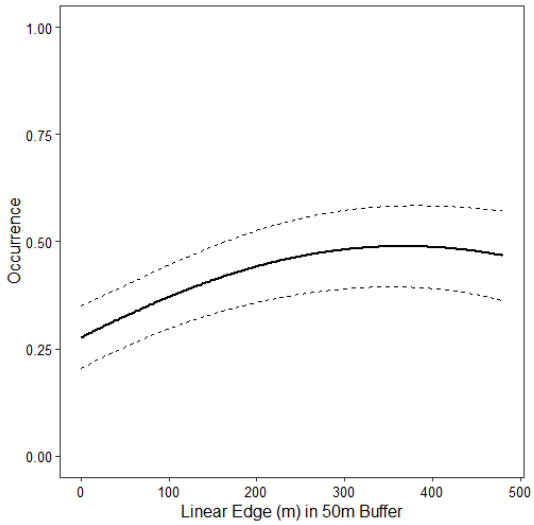

Figure 2. Probability of grey partridge pair occurrence as density of edge increases.

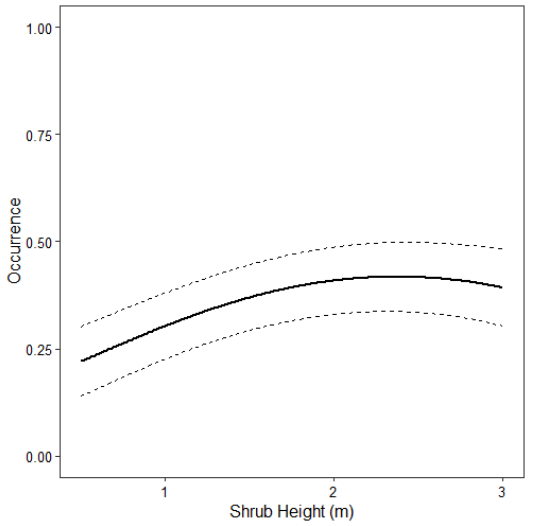

Figure 3. Probability of grey partridge pair occurrence as height of the nearest shelterbelt increases.

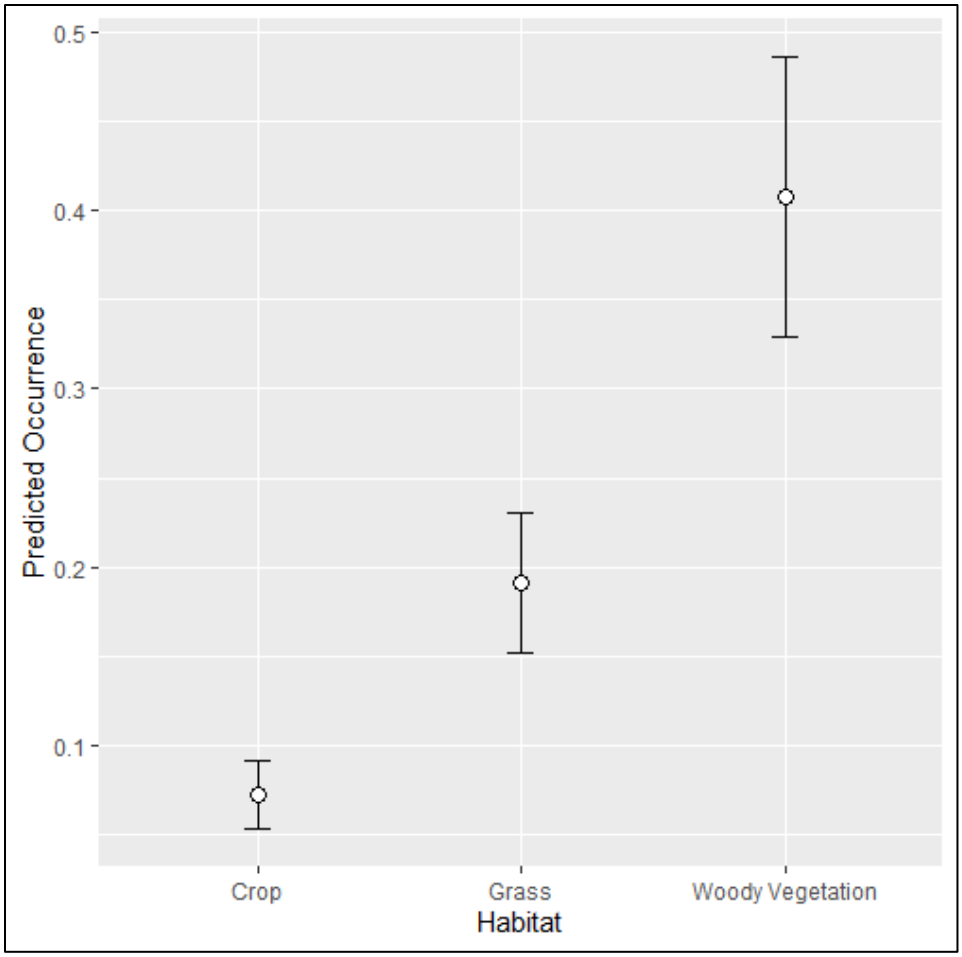

Figure 4. Probability of grey partridge pair occurrence in each of the main habitat types found on the Enchant farm.

Habitat variables that were important predictors of the occurrence of fall partridge coveys were: distance to edge, distance to woody vegetation, density of shrub edge, density of total edge, shelterbelt height, number of shrub rows, and density of wetland area. The probability of covey occurrence increased with shelterbelt height in 2016 and the number of shrub rows in 2018. Distance to edge and distance to woody vegetation were also strongly correlated during fall counts and covey occurrence decreased as distance to both variables increased from 2016 – 2018. Covey occurrence increased with linear meters of shrub in a 50 m buffer in 2016. The same relationship was true for linear edge within 50 m, although the probability of covey occurrence remained constant as linear edge exceeded 200 m. The probability of covey occurrence in 2019 was greatest when wetland area was between 2,000 – 8,000 m^2 within a 100 m buffer. When all four years of fall partridge survey data were combined, the probability of

partridge occurrence decreased as distance to edge and distance to the nearest covey increased, and increased (Figure 5 & 6) as linear meters of shrub within 50 m increased (Figure 7). Partridge pair occurrence was greater than expected in grassland and woody vegetation habitat and only slightly greater in woody vegetation (Figure 8).

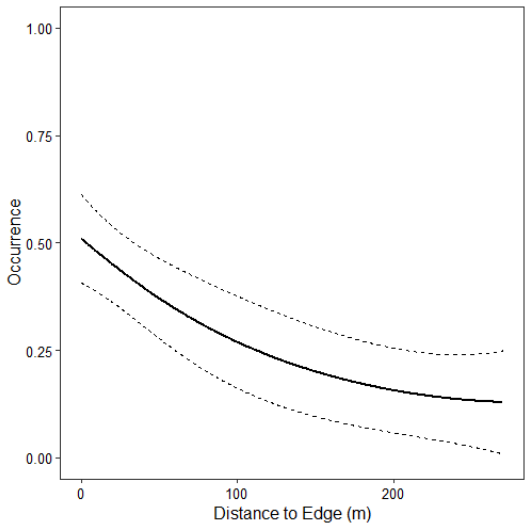

Figure 5. Probability of grey partridge pair occurrence as distance to edge increases.

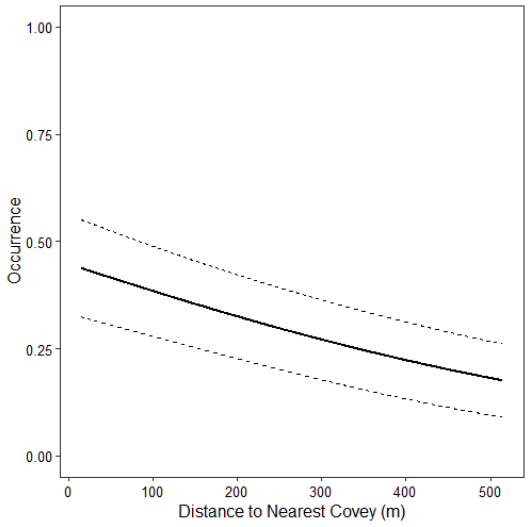

Figure 6. Probability of grey partridge pair occurrence as distance to nearest covey increases.

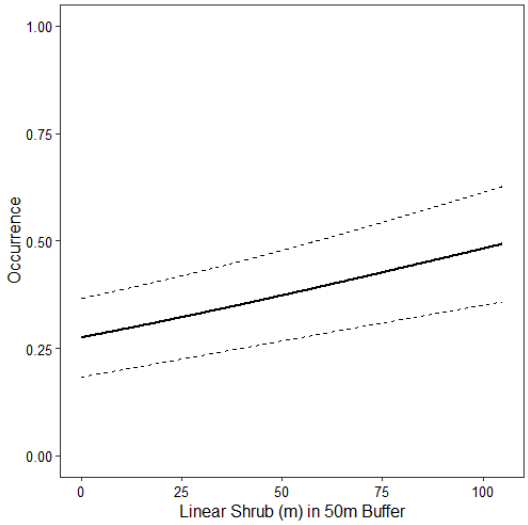

Figure 7. Probability of grey partridge pair occurrence as density of shrub edge increases.

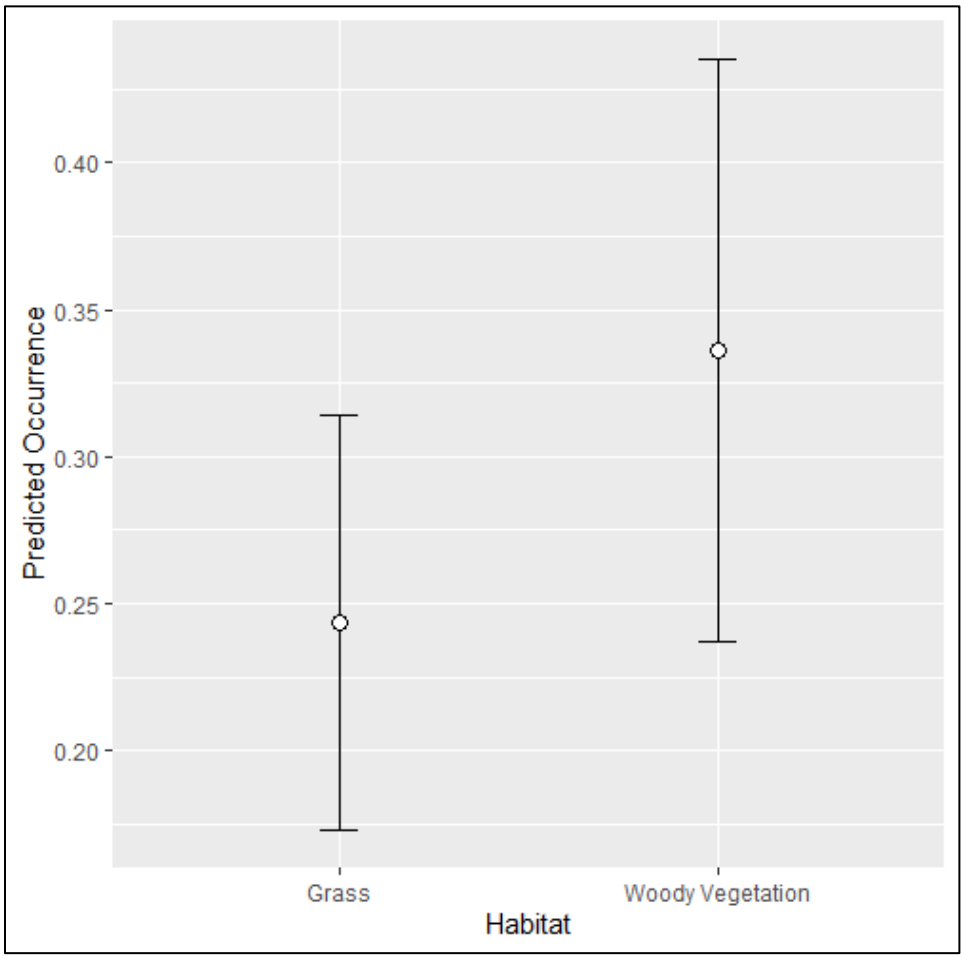

Figure 8. Probability of partridge covey occurrence in grassland and woody vegetation habitat types.

Based on our RSF results, spring pairs and fall coveys have a strong association with woody vegetation and are typically found in areas with high densities of linear edge at a very fine scale (within 50 m) or within 100 m of edge habitat. Shelterbelts appear to be the preferred type of edge habitat. Taller shelterbelts, around 2 m in height, are the most common on the farm and appear to receive the most use. The number of shrub rows in shelterbelts had a positive association with partridge occurrence, but only for one year of spring and fall results. Therefore, it is likely beneficial to plant more than one shrub row in shelterbelts but striving for a shelterbelt row number closer to the mean (i.e., 3.25 shrub rows) would be more efficient and economical than increasing the number of rows beyond this point based on the inconsistent relationship. Wetlands likely provide valuable edge habitat, but our results show that for some years there is a threshold to wetland area and too much wetland area within the surrounding landscape is likely to have a negative influence on partridge occurrence. Lastly, fall coveys were found to occur closer together and likely because of clustered resources and disproportionate habitat use and not because partridge coveys are actively selecting to be close to one another. Evidence to support this comes from strong correlations between distance to partridge pairs or coveys and distance to other habitat features, such as woody vegetation, edge, and feeders during multiple years.

The results of the trail camera data modelling indicate that there is a significant relationship between partridge and pheasant events at camera traps, and average air temperature. It appears that when temperatures were above -14 degrees Celsius, the predicted number of partridge events decreased (Figure 9). The predicted number of pheasant events decreased when temperatures were above -8 degrees Celsius (Figure 10).

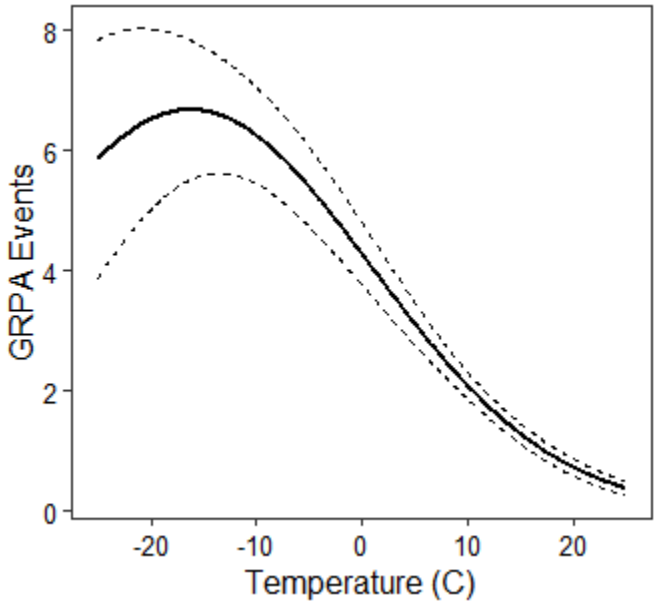

Figure 9. Association between grey partridge events and average air temperature for the years 2018 and 2019.

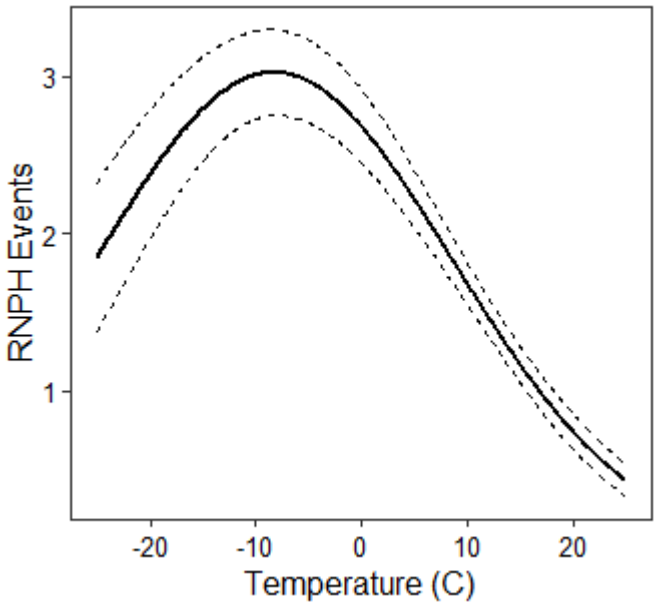

Figure 10. Association between ring-necked pheasant events and average air temperature for the years 2018 and 2019.

Our wetland and point count biodiversity surveys recorded 47 bird species, two mammals, and one amphibian on the farm (Table 2.). The yellow-headed blackbird was the most frequently detected species in the wetland surveys, followed by red-winged blackbird and mallard. The clay-colored sparrow was the most frequently detected species during point-count surveys, followed by brown-headed cowbird and red-winged blackbird.

Table 2. Species list for all wildlife detected on the farm in 2020.

American coot	Chipping sparrow	Lesser scaup	Savannah sparrow
American goldfinch	Cinnamon teal	Marbled godwit	Sora
American robin	Common grackle	Mallard	Song sparrow
American wigeon	Common yellowthroat	Mourning dove	Spotted sandpiper
Barn swallow	Franklin's gull	Muskrat	Vesper sparrow
Boreal chorus frog	Gadwall	Northern harrier	Western meadowlark
Brown-headed cowbird	Great horned owl	Northern pintail	Willet
Black-necked stilt	Gray partridge	Northern shoveler	Wilson's phalarope
Brewer's blackbird	Green-winged teal	Pied-billed grebe	Wilson's snipe
Brown thrasher	Horned lark	Ring-billed gull	White-tailed deer
Blue-winged teal	House sparrow	Redhead	Yellow-headed blackbird
Canada goose	Killdeer	Ruddy duck	
Clay-colored sparrow	Long-billed curlew	Red-winged blackbird	

Hunting occurs annually on the farm. For the past five years harvest has occurred with waterfowl, deer, and pen-reared male pheasants. A limited number of grey partridges were harvested this year due to the decrease in their numbers. The landowner releases pen-reared male pheasants each fall for harvest in the same year. The site was also used in 2020 by Pheasants Forever to host a mentored hunt with students from a local college. Pen-reared male pheasants were used for this event.

Conclusions

Finding approaches that increase game bird densities while complementing or minimizing impacts to farm operations is key for convincing producers that both goals are attainable on the same farm. We anticipate that overall species biodiversity and abundance will benefit from enhancements targeted towards game birds.

Communications

- Published an article in the spring/summer edition of *Conservation Magazine* highlighting some of the findings and accomplishments of the Enchant Farm.
- Completed the RSF paper characterizing grey partridge habitat use during the years 2015 to 2019.
- Completed the grey partridge survey paper that highlighted the partridge population estimates, densities, and population trends on the Enchant farm throughout the years 2014 to 2020. The paper covers the various methods used to survey partridges, analyze weather data and winter severity, and the creation of heat maps showing partridge locations.
- Completed the Telemetry Studies paper which outlined the partridge radio tracking on the farm in the years 2017 and 2018. The paper covers the objectives of both years including determining the accuracy of the annual surveys (2017) and the tracking of female partridge throughout the breeding season to find nest sites (2018). Telemetry data was also used to collect information on partridge survival, nest success, nest site selection, and habitat use within partridge territories.

Literature Cited

Not applicable

Photos

A Ring-necked pheasant seen on the farm in the summer. Photo: Samuel Vriend

A Ring-necked pheasant seen at a feeder on the farm. Photo: Samuel Vriend

White-tailed deer on the farm in the winter. Photo: Samuel Vriend

A Ring-necked Pheasant in the winter. Photo: Samuel Vriend

Waterfowl taking off from one of the wetlands on the Enchant farm. Photo: Samuel Vriend