

Species at Risk in Agricultural Landscapes

An analysis of awareness and practices in conventional and regenerative farms in Kings County, PEI



Swette Center for Sustainable Food Systems, Arizona State University

December 2025

This publication is a Capstone Report by the Master of Science in Sustainable Food Systems and Graduate

Certificate in Food Policy and Sustainability Leadership cohort of 2023.

Suggested Citation:

Kiskis, Susan. *Species at Risk in Agricultural Landscapes: Kings County, PEI*. December, 2025.
(Swette Center, 2025)

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Abstract

Prince Edward Island's agricultural and natural landscape is experiencing pressure from biodiversity loss and habitat fragmentation. These pressures are compounded by land management and climate change. At the same time, species at risk (SAR) are vulnerable, and farmer awareness and perceptions around biodiversity and SAR vary.

While most land is privately owned, farmland makes up the second largest use of land in the province (Forests, Fish and Wildlife Division [FFW], 2022). In 2022, Canada joined over 195 other countries to commit to conserving and protecting biodiversity and habitat loss by 2030 during the Conference of the Parties (COP15) to the United Nations Convention on Biological Diversity with the Kunming-Montreal Global Biodiversity Framework (Government of Canada [GC], 2022, Convention on Biological Diversity, 2022a). Through a review of existing literature, as well as interviews with farmers and conservationists, this report examines the presence and management of SAR on agricultural land in Kings County, Prince Edward Island. Furthermore, it assesses the role of government agencies and non-governmental organizations (NGO) in supporting SAR and biodiversity across the county, situating these efforts within Canada's commitments under the Kunming-Montreal Global Biodiversity Framework. Finally, this report also considers how the findings from Kings County, PEI reflect progress towards these international conservation goals.

Key findings suggest that meeting national biodiversity targets requires a multi-pronged approach. Building trust between farmers and governmental agencies and leveraging local conservation groups, alongside biodiversity educational and financial incentives, is essential to mitigating SAR and preventing further species loss. Protecting biodiversity in agricultural landscapes ultimately safeguards both food systems and producer livelihoods.

Acknowledgements

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I would like to express my sincere gratitude to those who generously participated in our interviews. Without their time and engagement, this research would not be possible. The additional resources and contacts they provided were invaluable to this research. A special thank you to the Prince Edward Island Department of Agriculture for their support in developing this research, providing additional insights, and sharing lists of potential interviewees. Thank you to members of the community who took their time to recommend interviewees for this project. While interviewees emphasized the complexity of this subject matter, they also conveyed a willingness to work with each other to strengthen farming practices and support farmers—a critical step for ensuring the long-term sustainability of biodiversity on Prince Edward Island.

Land Acknowledgement

“Epekwitk (Prince Edward Island) is located in Mi’kma’ki, the ancestral and unceded territory of the Mi’kmaq People. The Epekwitnewaq Mi’kmaq have occupied this Island for over 12,000 years” (L’Nuey, n.d.). The land that is now called Kings County includes Puku'samkek Sipu (Morell River), Muinek (Murray River), and Sqoljwe'katik (Souris) (L’Nuey, 2020).

Figure 1
PEI Mi’kmaq on the Map



Image: Mi'kmaw place names in Prince Edward Island, Canada.
L'Nuey, 2020. <https://lnuey.ca/reconciliation/epekwitk-place-names/>

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Conservation Status Terms and Examples

S-Rank	Conservation Term	Definition/Population	PEI Species Examples
SX	Presumed Extirpated	Not located (0)	Eskimo Curlew
S1	Critically Imperiled	Extreme rarity (≤ 5)	Monarch Butterfly, Northern Myotis
S2	Imperiled	Rare due to restricted range (≤ 20)	Barn Swallow, Bobolink, Killdeer
S3	Vulnerable	Few populations (≤ 80)	Lesser Yellowlegs
S4	Apparently Secure	Infrequent	Least Flycatcher
S5	Secure	Common	Red Fox, Snowshoe Hare, Bald Eagle, Beaver
SNR	Unranked	Not assessed	
SU	Unrankable	Lack of, or conflicting information	North American River Otter Luna Moth
SNA	Not Applicable	Species not suitable for conservation	Eastern poor-whip-will
S#S#	Range Rank	Range of uncertainty	
SH	Possibly Extirpated (Historical)	Species historically present, but not recorded for the past 20-40 years	
Not Provided		Not applicable to province	

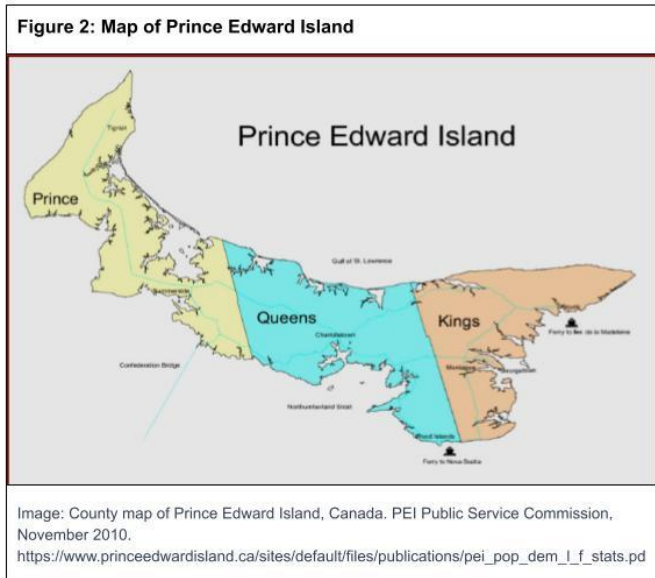
Note. Understanding Ranks by Atlantic Canada Conservation Data Centre, 2020.

[http://accdc.com/en/rank-definitions.html#:~:text=Sub%2Dnational%20\(provincial\)%20ranks%20\(S%2Dranks\)%0A%0AThe%20AC%20CDC%20works,Prince%20Edward%20Island%2C%20and%20Newfoundland%20&%20Labrador](http://accdc.com/en/rank-definitions.html#:~:text=Sub%2Dnational%20(provincial)%20ranks%20(S%2Dranks)%0A%0AThe%20AC%20CDC%20works,Prince%20Edward%20Island%2C%20and%20Newfoundland%20&%20Labrador) and *State of Wildlife 2020 Report* (FFW, 2020).

Introduction

Prince Edward Island (PEI) is home to 1,195 farms across 504,674 acres (Statistics Canada, 2021), the second largest use of land at 37.6% in the province (FFW, 2022). Kings County has the smallest number of farms at 203 and more than half of the farms in the county are operated by a sole proprietor (Statistics Canada, 2021).

Kings County has the second largest average number of acres in the province (482.4) (Statistics Canada, 2021), and has seen a 374% increase in average acres per farm, indicating a shift towards more large-scale intensive farming practices (Government of Prince Edward Island [Govt. of PEI], 2025a). Meanwhile, the Forests, Fish and Wildlife Division's (FFW) *State of Wildlife 2020 Report* states that species of concern increased by 68%.



This report explores the impact of species at risk on farms in Kings County, Prince Edward Island, Canada, situating local dynamics within broader discussions about biodiversity conservation and Canada's commitment under the Kunming-Montreal Global Biodiversity Framework. The specific research question that guided this project is: *What species at risk (SAR) are present on private farmlands in Kings County, PEI, and how do regenerative and conventional farmers differ in their awareness and management practices?* This report aims to identify SAR present on farmlands in Kings County, compare awareness and practices between regenerative and conventional farmers, and examine roles of government and conservation organizations in supporting biodiversity conservation and farmer engagement.

Literature Review

Sustainable land management is as crucial to biodiversity as biodiversity is to sustainable land management. This review synthesizes the literature to establish a foundation for the interconnected nature of the two, and how identification and awareness among farmers can impact the success of conservation efforts.

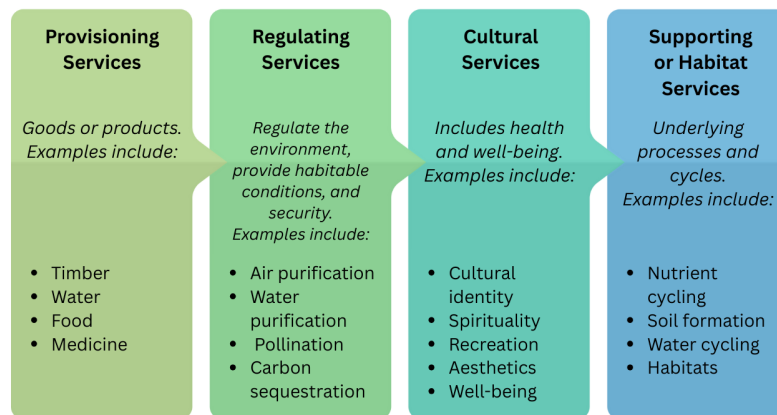
Biodiversity and Ecosystem Services

Biodiversity is the variety of species on the planet from microorganisms to ecosystems (Government of Canada [GC], 2025; United Nations, n.d.). Biodiversity health is measured by species diversity, genetic diversity, and ecosystem diversity (The Center for Biological Diversity, n.d.). As species disappear, systems come under pressure (Convention on Biological Diversity, 2022, b). Biodiversity is essential for food production and the loss of biodiversity could have large harmful impacts on food systems (Ortiz et al., 2021). Loss of biodiversity on agricultural land leads to increased pests and a reduction in pollination services (Convention on Biological Diversity, 2022, b). Moreover, declines in biodiversity reduce ecosystem stability and species adaptation to stress (GC, 2024).

This interconnected web provides ecosystem services for humans which include food, water, pollination, and medicine (Value of Nature to Canadians Study Taskforce, 2017), making up for over half of the world's GDP (United Nations [UN], n.d.). Two major drivers contributing to the loss of biodiversity is land conversion, primarily for food, and climate change (UN, n.d.). Ecosystem typology includes twenty-five biomes which includes terrestrial, and recognizes 108 ecosystem functional groups which include temperate deciduous forests and annual croplands (Keith, et al. 2020). These functional groups, and the biodiversity within them, can help mitigate climate change by acting, for example, as carbon sinks (UN, n.d.). Protecting and restoration of forests alone can address two-thirds of the mitigation, but globally, they continue to see a decline (UN, n.d.).

Ecosystem services from these groups include four main branches: provisioning services, regulating services, cultural services, and supporting or habitat services (Value of Nature to Canadians Study Taskforce, 2017). Ecosystem services from biodiversity provide humans with water filtration, erosion control, pollination, carbon sequestration, and more (Value of Nature to Canadians Study Taskforce, 2017). Figure 3 shows how each branch of ecosystem services impacts everyday human lives.

Figure 3
Ecosystem Services



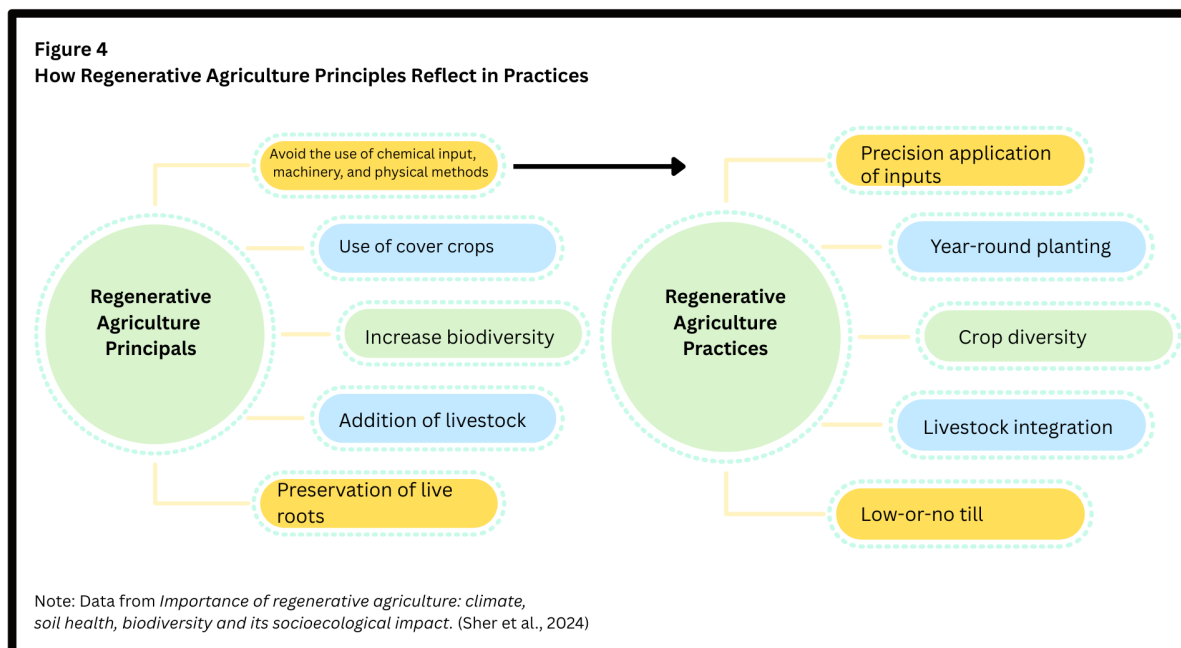
Note: Data from *Completing and Using Ecosystem Service Assessment for Decision-Making: An Interdisciplinary Toolkit for Managers and Analysts*. Ottawa, ON: Federal, Provincial, and Territorial Governments of Canada. (Value of Nature to Canadians Study Taskforce, 2017)

Ecosystem services are valued between \$125-140 trillion globally each year (Organisation for Economic Co-operation and Development [OECD], 2019). Pollination services alone contribute a market value of USD 235 billion to USD 577 billion (OECD, 2019). Loss of pollinators would increase costs to producers globally between USD 207 billion to 497 billion (OECD, 2019). Where biodiversity losses increase input costs, pollinator density can increase yields (OECD, 2019). Ecological processing of species and their environment include nutrient cycling and soil diversity, a vital process for agricultural land management (Ortiz et al., 2021). Additionally, species diversity mitigates droughts and flooding, as well as disease (OECD, 2019).

However, one million species worldwide are at risk of extinction which endangers the ecosystem services we rely on (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services [IPBES] (2019). Insect species are expected to see a 40% decline in the next decade (Sánchez-Bayo & Wyckhuys, 2019). Only 10% of bird species consume crops, of which 11% are threatened globally (Huang et al., 2023). Wild bees make up 20% of pollination services for agricultural food production yet show losses of more than 50% in regions around the world (Sánchez-Bayo & Wyckhuys, 2019). Ecosystem services have seen a decline in 14 out of the 18 categories despite agricultural growth (IPBES, 2019).

Growing & Conservation Practices

Regenerative agriculture is generally a self-identified method with no legal or regulatory definition (Newton et al, 2020). The term was first used by Robert Rodale (Newton et al, 2020; Alexanderson et al., 2023), and is associated with natural land management practices which may include limiting inputs, adding cover crops, low-or-no-till, integration of livestock, as well as increasing biodiversity (Figure 4) (Newton et al, 2020; Alexanderson et al., 2023; Sher et al., 2024).



Regenerative practitioners suggest that their practices may lead to low or net-positive environmental outcomes (Newton et al, 2020). However, implementation of regenerative practices and identification as a regenerative farmer show conflicting perspectives. A study by Alexanderson et al. showed a mismatch between regenerative farming practices and identification with the term (2023). Their study showed that despite implementing practices identified by the researchers as regenerative (the RAP group), over 40% of these participants reported no interest in learning about regenerative agriculture or holistic land management (Alexanderson et al., 2023).

Biodiversity and Species at Risk on Farms

Conventional farmers correlate insects with crop damage and invest in chemical management of pests far more often than organic farmers while large-scale farms and farms with less diverse crops agree with that perspective (Jacobson et al., 2003).

However, despite these differences, Jacobson et al. found commonality in both organic and conventional farmers when it comes to being open to pest management that is better for the environment, and seeing benefits of birds on their farms (2003).

Silva-Andrade et al. found in a study in Brazil that non-conventional farmers relate bird species decline to direct-and-in-direct human activities, while also correlating farms as a place that could support bird species, marking a difference in perception compared to conventional farmers (2016). However, Jacobson et al. study found the opposite in terms of farms as hospitable environments for birds with both groups agreeing (2003). A global study by Huang et al. found that only 61% of rural residents believed birds could benefit crops (2023). However, they also noted that farmers are more likely to support sustainable agricultural practices when receiving short-term financial incentives (Huang et al., 2023).

Background

Prince Edward Island has implemented programs to help meet Canada's Kunming-Montreal Global Biodiversity Framework targets by addressing biodiversity and habitat loss, as well as SAR vulnerability. Biodiversity management happens across various governmental and non-governmental agencies and organizations, including community groups that support, or receive funding, for provincial programs. Understanding how these agents operate and interact can provide insight into conservation efforts and the role of agricultural activities in ecological diversity.

International Commitments and Cooperation

In 2022, Canada hosted the United Nations Convention on Biological Diversity's Conference of the Parties (COP15) (GC, 2022). Here, 196 nations, including Canada, committed to restoring and protecting biodiversity, with specifically timed targets through the Kunming-Montreal Global Biodiversity Framework (GBF) (Convention on Biological Diversity, 2022a).

These targets, totalling 23, included restoring and protecting 30% of land and marine areas, preventing species extinction and protecting threatened species, and supporting biodiversity and mitigate climate change through sustainable food systems including agriculture and fisheries (Convention on Biological Diversity, 2022b). The agreement affirmed that signing nations needed to support sustainable agricultural practices as a means of protecting biodiversity (Convention on Biological Diversity, 2022b). Agricultural practices such as agroforestry and sustainable agriculture were two methods mentioned to achieve goals (Convention on Biological Diversity, 2022b). In order to accomplish its goals, Target 19 requests nations to allocate funding to implement targets, as well as encourage private industry to invest in biodiversity (Convention on Biological Diversity, 2022b).

The framework acknowledges that human health is dependent on ecosystem services which are built on a foundation of biodiversity (Convention on Biological Diversity, 2022b). Additionally, the plan recognizes that in order to leverage its potential, nations recognize indigenous peoples as "custodians of biodiversity and as partners in its conservation, restoration and sustainable use" (pg 5), as well the strength of empowering women and girls (Convention on Biological Diversity, 2022b).

Federal Level

Environment and Climate Change Canada (ECCC)

In August of 2025, the province, along with Environment and Climate Change Canada (ECCC) named forested areas in the province as one of the twelve priority places for SAR in the country (Govt. of PEI, 2025d). The press release names PEI as home to 13 species at risk along with “300 provincially rare species” (Govt. of PEI, 2025d). The team of collaborators in the province assessed that 43% of the province consisted of forested lands, of which 21 out of the 52 birds identified in the Bird Conservation Region Strategy for PEI can be found, yet only “approximately 4.7% of PEI’s land area is protected under legislation or other effective conservation measures” which includes Black Pond Migratory Bird Sanctuary located in Kings County (ECCC, 2025, p. 6).

Targets included 4 ecosystems (forested wetlands, riparian forests, forested uplands, and coastal forests), and three nested targets (SAR, migratory birds, and 300 provincially significant species). These targets contribute multiple ecosystem services including water purification and groundwater, carbon storage and cycling, buffer zones, air purification, shelter and shade, and nutrient cycling and soil building which benefit human use for forest products, agricultural livelihoods, Mi’kmaq traditional uses, recreation, and various health benefits (ECCC, 2025). The recognized major pressures on these systems which included wood harvesting, invasive non-native species, linear corridors, and land management, specifically residential development and conversion of forests to agricultural land (ECCC, 2025).

As part of their strategic plan, the group outlined ten actions which included “Livelihood, Economic & Moral Incentives” which would include direct economic incentives to landowners and better products and management practices, and “Land / Water Management” which would work directly with agricultural landowners to restore lands to the Wabanaki-Acadian Forests, and “Awareness Raising” which specifically seeks to promote awareness and actionable change in farmers by providing information around ecosystem services and biodiversity (ECCC, 2025).

Species at Risk Act (S.C. 2002, c.29) (SARA)

Canada introduced the Species at Risk act in 2003 which protects indigenous species from extinction, and was established in response to the UN’s Convention on Biological Diversity. The act has several actions which include establishing an independent body (Committee on the Status of Endangered Wildlife in Canada [COSEWIC]) to assess and identify SAR, establish short and long-term objectives and subsequent plan based on data, implement restrictions that endanger SAR and their habitats, create transparency and accessibility to the public, adhere to Indigenous rights and treaties, and recognize that financial incentives may be necessary to protect habitats (GC, 2019).

In the 22-23 fiscal year, the Environment and Climate Change Canada (ECCC) spent CAD 576,201,081 on conserving nature, CAD 33 million less than planned (2023). The Department Results report indicated that among other line items, spending for SARA was lower, however, spending was increased for line items associated with the United Nations Convention on Biological Diversity (ECCC, 2023). The report highlighted that the ECCC continued its work with SARA by supporting COSEWIC, reduced delays in SARA assessments, and provided updated reports across the country (ECCC, 2023, p. 44).

Provincial Level

Across the maritimes, the estimated number of farms that incorporated windbreaks and leaving stubble on fields was down from 41 in 2022 to 19 in 2024, and from 44 to 27 respectively (Statistics Canada, 2025b). Methods for building soil health by incorporating compost or other organic matter increased from 49 in 2022 to 75 in 2024 (Statistics Canada, 2025b).

Species at Risk

PEI's Forests, Fish and Wildlife division (FFW) reviewed over 5,000 species as part of their *State of Wildlife 2020 Report* which showed 23 species have disappeared from the province and 40% of species reviewed are of higher concern (2020). Species at Risk (SAR) include birds- Bobolink, Barn swallow, and Bank swallow, mammals- Little brown myotis and Northern-myotis, Invertebrates- Monarch butterfly and Gypsy cuckoo bumble bee (FFW, 2020). Canada's Species at Risk Act (SC 2002, c. 29) lists Monarch butterflies as Endangered nationally while in PEI they are categorized as S1, critically imperiled (FFW, 2020). FFW's recent report highlights that S1 (Critically Imperiled), S2 (Imperiled), and S3 (Vulnerable) categories account for 40.15% of species at risk in the province (2020).

Less than 20% of PEI farmers are aware of Canada's Species at Risk Act (SARA) despite the majority of farmers being aware of species at risk (SAR) (Brown, 2023). Less than half of farmers indicated awareness of SAR on their land, and only approximately one-third are aware of government programs on PEI that help SAR (Brown, 2023).

As part of Canada's 2030 Nature Strategy, PEI provides funding to acquire and protect significant habitats, purchase riparian buffer zones, support activities related to the Forest Enhancement Program, support and maintain the Alternative Land Use Services (ALUS) program, and has funding programs specifically for programs such as the PEI Wildlife Conservation Fund (GC, 2024). The PEI Conservation Act, rather than a

specific actionable document focusing on biodiversity and SAR support, provides the provincial government with the authority to manage wildlife and regulate activities, and enter into conservation agreements (Govt. of PEI, 2024b).

Department of Agriculture

As part of PEI's Department of Agriculture and Department of Environment, Energy and Climate Action together deliver the province's Alternative Land Use Services (ALUS) Program (Govt. of PEI, 2025c, 2025d). ALUS' mission to "empower farmers and farmland owners in conservation and regeneration of agricultural landscapes" (Govt. of PEI, 2025c).

I. Alternative Land Use Services (ALUS)

In conjunction with the Department of Environment, Energy and Climate Action, the province's ALUS program seeks to support farmers to protect and rebuild regenerative ecosystems by providing participating farmers with financial incentives through "a multi-year land use agreement" (Govt of PEI, 2025b, p. 1). Farmers opt to participate in a menu of activities that include converting crop fields into biodiverse landscapes, planting trees, agroforestry implementation and maintenance, establishing pollinator habitats, and delayed hay-cutting (Govt of PEI, 2025b). Participants in the delayed hay-cutting and grazing program, for instance, must commit to waiting until July 15th before using the land and agree to allow auditors to survey the area for bobolink nests, and may receive CAD 62/hectare annually (Govt of PEI, 2025b).

II. Habitat and Biodiversity Tool (HBAT)

The Canadian Forage and Grassland Association (CFGa) launched its Habitat and Biodiversity Tool (HBAT) in conjunction with the Government of PEI in March 2025. The tool, having been used in other provinces across the country, was customized to the province based on collaboration with the province's Department of Agriculture and agricultural and conservation stakeholders (CFGa, 2025). The purpose of the tool is to provide producers with insight into habitats and biodiversity on their land, and conservation actions (CFGa, 2025).

Local Level

At the local level, PEI is home to a range of non-government organizations and community-based groups. The following section highlights a few of the organizations and groups that support projects around biodiversity, SAR, and regenerative farming activities in PEI.



**ISLAND
NATURE
TRUST**

Island Nature Trust (INT)

Founded in 1979, INT works on land conservation and protection through land acquisition, monitoring and rebuilding biodiversity on held lands, as well as supporting landowners across PEI to conserve biodiversity (INT, n.d.a). Through its 12,701 acres, INT works with 18% of conservation land on PEI (INT, 2025), and focuses on conservation of habitats such as wetlands, riparian forests, and bogs (INT, n.d.a). They engage the local community through education and volunteer programs (INT, n.d.a), while also conducting data collection through field surveys and partnering with organizations to build data collections and analysis around wildlife (INT, n.d.b).



Nature PEI

Nature PEI began in 1969 as a means of promoting education around, and protection for, nature (Nature PEI, n.d.a). The organization works with local communities through their

citizen science programs which includes social media groups and annual programs like the Great Backyard Bird Count held each February (Nature PEI, n.d.b). As part of their ongoing education efforts, Nature PEI provides online information around SAR on PEI including status and species (Nature PEI, n.d.c).

Watershed organizations

PEI, and specifically Kings County, is home to watershed groups including Southeast Environmental Association in Montague, Morell River Management Cooperative in Mount Stewart, and Souris and Area Branch of the PEI Wildlife Federation (SAB). These groups lead a range of conservation initiatives, from habitat restoration to wildlife protection, from community-based monitoring and data collection, to biodiversity education, as well as ecological support for farms. Their work positions them as key partners in regional conservation and in fostering collaboration among local stakeholders.



INSTITUTE FOR BIOREGIONAL STUDIES

Institute of Bioregional Studies

Based in the PEI Farm Centre in Charlottetown, the Institute of Bioregional Studies focuses on supporting producers in sustainable agricultural practices through educational programs, consultation, and research, which includes their annual summer institute (Institute of Bioregional Studies, n.d.).

Methodology

This study aims to assess the general awareness and understanding of farmers' approach to species at risk (SAR) and biodiversity on farms in Kings County, Prince Edward Island, Canada, and determine the role of the Department of Agriculture's HBAT tool in developing farmer awareness and participation in biodiversity conservation. This study uses qualitative research methods relying on semi-structured interviews with farm stakeholders, conservationists, and NGOs to analyze farmer awareness and behavior around species at risk, and use of available biodiversity tools.

Materials and Methods

Interviews

Interviews were conducted with crop and livestock producers, conservation organizations including watershed groups, and conservationists. The initial pool of contacts was developed through the PEI Department of Agriculture and Island Nature Trust. Additional contacts were developed by researching farmers and conservation organizations online and Facebook, as well as referrals from area residents. In total, forty-three individuals and organizations were contacted for interviews, with twelve final interviews (two participants from one organization) conducted and consent forms received. All interviews were conducted in-person, over the phone, or via Zoom. Participants represented towns across Kings County, including Murray Harbour, Cardigan, and Souris. Participants were required to be ages 18 or older and residing in Canada.

Interviews were conducted in accordance with ethical considerations. Participants were provided with information prior to interviews, including the voluntary nature of their interviews. Participants provided written consent by completing a consent form. Additionally, participants were given opportunities to opt out of being recorded, as well as having their identity restricted. All data was anonymized for those who wanted to remain anonymous during analysis. Interview recordings and analysis were accessible only to the researcher.

Methodology

A qualitative, semi-structured interview approach was used with farmers and conservationists to gain insights. Interviews included twelve primary questions with farmers including one or more follow-up questions, and interviews with conservationists included eight primary questions with one or more follow-up questions. Interviewees

were given the opportunity to share any additional information they felt relevant to the interview. Where permission was given, interviews were recorded on Zoom. Transcripts along with interview notes were used for thematic coding of interviews (i.e. awareness, practices, barriers, support needs).

One field survey was conducted, and general evidence of biodiversity was documented. However, due to seasonality of many SAR, no further field surveys were conducted. This field survey was not used in this capstone due to insufficient data collection. This limited the comparison between interviews and ecological data. To bridge the gap, Island Nature Trust provided data collected by Island Nature Trust with the support of the Department of Agriculture.

Results

Interview Findings

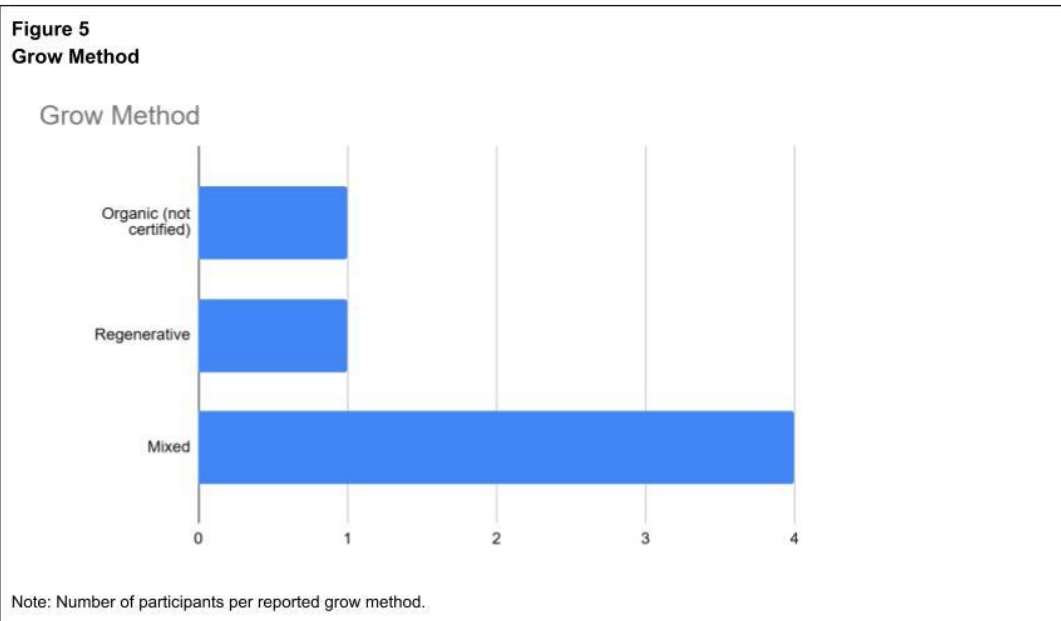
Requests for interviews were made with twenty-two farmers, six farm organizations, fifteen conservationists and conservation organizations. Interviews were conducted in-person, via phone, as well as Zoom with six farmers, and seven conservationists. Names, organizations, and titles for all consenting interviewees can be found in Appendix A and B.

Producers

Participants were included based on their experience with land management and local food production, regardless of self-identification of farmers. Farm sizes varied from less than a dozen acres to over 2,000 acres. Products were sold either directly on the farm, at additional locations, or widely dispersed through a distributor.

Farming Approaches and Habitats

Across interviews, most participants used mixed approaches to their agricultural practices in growing crops and raising livestock, while having comparable habitat types (Figure 5). This insight provides a foundation for how SAR and biodiversity interact with farmland in Kings County.



Farming Approaches

Across participants, farming strategies varied, with several sharing an emphasis on reducing inputs, improving soil health, and adapting practices to support crop needs. The majority of participants described their approach as mixed, combining conventional practices with low-or-no-till, reduced pesticide use, and working with natural practices on their land.

Only one participant, F3, grows their crops organically (though not-certified) while another, F1 identifies as regenerative. F1 said that over time, as best management practices (BMP) have evolved, so has family interests. Today they aim to focus on minimal input and regenerative grazing. Their work on the farm has increased root biomass, and they believe has increased carbon sequestration in their pastures.

Participants shared a range of soil and crop related adaptations. F3 uses non-GMO seeds, minimum tillage, and plants perennial forages in rotation. F4 discussed how their personal interests have shaped their management decisions, including a shift to working with the mycorrhizal fungus their blueberries rely on. They realized that using fungicide worked against the symbiotic relationship their crop needed, which led to expansion on soil health.

"The thought there was concern around the bees. Again, you need pollination for blueberries, so why are we spraying insecticide to kill insects that we rely on? It's obvious we're not targeting bees with insecticide, but surely it wouldn't be good for a bee, to be sprayed with nerve agents." - F4

Orchard managers Rod Steenbruggen with Steenbruggen's P.E.Island Orchards and Richard MacPhee with MacPhee's Orchard shared similar ecological considerations. Steenbruggen emphasized his use of Integrated Pest Management (IPM) which includes staying informed about new products on the market that may reduce input while offering environmental benefits. MacPhee focuses on Ecological Fruit Production (EFP), avoiding commercial fertilizers on his trees, and assesses whether problems are localized before considering broader system-wide issues.

Together these participant accounts illustrate how farmers are integrating ecological knowledge, input-reduction strategies, and crop-specific adaptations into their farm management systems.

Crops

Most farmers reported producing more than one type of product. Table x lists the diversity of farm products represented in the sample. Fruit crops were the most commonly reported, particularly apples (3) and blueberries (2). Grain, forage, vegetable, and perennial woody crops appeared less frequently, but were still present across several farms. Livestock production was found in half of the participants, often alongside crop production.

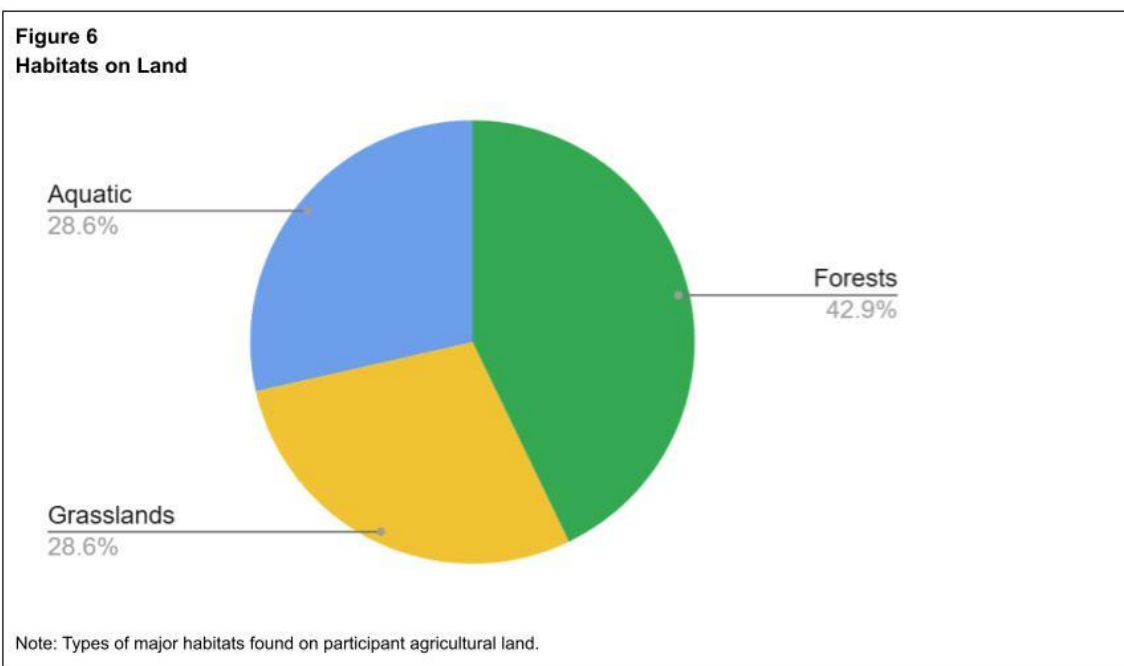
Table 1
Farm Products Grown by Participants

Farm Products by Type	Number of Farmers
Fruit Crops	
<i>Apples</i>	3
<i>Blueberries</i>	2
<i>Peaches</i>	1
Grain Crops	
<i>Barley</i>	1
<i>Corn</i>	1
<i>Soybeans</i>	1
<i>Winter Wheat</i>	1
Forage Crops	1
<i>Hay</i>	3
Vegetable Root Crops	
<i>Potatoes</i>	1
Perennial Woody Crops	

<i>Trees</i>	1
Livestock	2
<i>Beef cattle</i>	2
<i>Broiler chickens</i>	1

Habitats

All participants reported having multiple habitat types on their farms. Forested areas- both managed and unmanaged- were present on almost every property. Additional habitats included grasslands and aquatic. As F1 explained, “our pastures are mostly open, our fields are mostly open, but they are surrounded by large blocks of woodland, kind of, in any given direction.” Figure 6 provides an overview of the habitat types identified by participants.



Species at Risk and Biodiversity on Land

Participants reported various species at risk (SAR) on their farms. While half of the participants indicated they did not observe any SAR, three participants each identified bobolink, barn swallow, and killdeer- species currently considered imperiled on PEI (Table 2).

Table 2

Species at Risk Found on Participant Agricultural Land

Species at Risk Found on Land	Conservation Term
Bobolink (<i>Dolichonyx oryzivorus</i>)	Imperiled
Barn Swallow (<i>Hirundo rustica</i>)	Imperiled
Killdeer (<i>Charadrius vociferus</i>)	Imperiled
Tree Swallow (<i>Tachycineta bicolor</i>)	Vulnerable

Note. Conservation terms apply to specific SAR found on participant land.

MacPhee noted that Bobolinks, once a common sighting when he was younger, are now rarer, a trend echoed by F1. F1 also observes tree swallows which are prey for kestrels:

“I’m very excited to see them [kestrels], and I’m glad they’re doing well, but then they tend to wipe out my tree swallow colonies, and then they’ll cut back for another year or two, the tree swallows will kind of regenerate, and then it kind of ebbs and flows a bit.”

Outside of SAR, participants reported a range of biodiversity on their farms, including birds, mammals, invertebrates, and aquatic species. F1 describes frequent occurrences of small fur bearers:

“Pretty much anything that has four legs wanders around the farm at some point in time.”

However, two abundant species on F1’s farm, rock pigeons and European starlings, are being actively managed to reduce their numbers while supporting barn swallows. MacPhee reported sightings of river otters and a possible pine martin sighting, while most farmers reported Eastern coyotes, red foxes, and small furbearers such as the northern raccoons. F4 expressed concern over the high density of eastern coyotes, the scarcity of their prey, and potential safety and human interactions.

Figure 7
Coyote Scat Observed on Participating Farm



Unique or particularly valued species were also mentioned. F4 highlighted the Luna Moth:

“I don't know if they're at risk. They're just highly unique, and you feel really special when you see one.”

Table 3

Biodiversity Found on Participant Farmland

Other Species Found	Conservation Term
Birds	
<i>American Kestrel (Falco sparverius)</i>	Apparently Secure
<i>Bald Eagle (Haliaeetus leucocephalus)</i>	Secure
<i>Blue Jay (Cyanocitta cristata)</i>	Secure
<i>Canada Goose (Branta canadensis)</i>	Unrankable
<i>American Crow (Corvus brachyrhynchos)</i>	Secure
<i>Duck (Sp.)</i>	
<i>European Starling (Sturnus vulgaris)</i>	Not Applicable
<i>Falcon (Falco sp.)</i>	
<i>Hawk (Buteo sp.)</i>	
<i>Red-tailed Hawk (Buteo jamaicensis)</i>	Apparently Secure
<i>Owl (Strigidae sp.)</i>	

<i>Rock Pigeon (Columba livia)</i>	Not Applicable
<i>Sparrow (Passer sp.)</i>	
<i>Woodpecker (Dryobates sp.)</i>	
Mammals	
<i>American Beaver (Castor canadensis)</i>	Secure
<i>American Mink (Neogale vison)</i>	Secure
<i>Eastern Chipmunk (Tamias striatus)</i>	Secure
<i>Eastern Coyote (Canis latrans)</i>	Secure
<i>Ermine (Mustela erminea)</i>	Secure
<i>North American River Otter (Lontra canadensis)</i>	Unrankable
<i>Northern Raccoon (Procyon lotor)</i>	Not Applicable
<i>Red Fox (Vulpes vulpes)</i>	Secure
<i>Red Squirrel (Tamiasciurus hudsonicus)</i>	Secure
<i>Snowshoe Hare (Lepus americanus)</i>	Secure
<i>Striped Skunk (Mephitis mephitis)</i>	Not Applicable
Plant	
<i>Pink Lady's Slipper (Cypripedium acaule)</i>	Secure
Insect	
<i>Luna Moth (Actias luna)</i>	Unrankable
Amphibian	
<i>Salamander (Ambystoma sp.)</i>	
<i>American Toad (Anaxyrus americanus)</i>	Secure
Reptile	
<i>Snake (Serpentes sp.)</i>	
Fish	
<i>Trout (Salmo sp.)</i>	

Note. Conservation status for specific species identified included. Conservation terms for the general species family were left blank.

Approaches to Species at Risk and Biodiversity

Farmers employ a range of strategies to mitigate SAR and biodiversity, spanning from direct management interventions to more hands-off approaches.

MacPhee participates in the Department of Agriculture's ALUS program, specifically through the delayed hay-cutting program aimed at protecting Bobolinks:

"I've never cut the hayfields before mid-July, and that's since I had the property in the late 80's."

F1 is aware of the program, but does not participate in delayed hay cutting. They monitor the fields each season but haven't observed any nests to date.

F4 implements habitat-focused strategies, maintaining more hedgerows than conventional blueberry fields. Hedgerows serve as habitat for pollinators and birds, which help control insect pests, thereby reducing their use of insecticides:

"I try to be as mindful of that as I can when I make on-farm decisions." - F1

"There's a pest called spotted wing drosophila, and that's basically a fat fruit fly, to my knowledge, and it really impacts the crop quality. And then there's all kinds of other bugs, like mealworms and different things that'll detract from crop quality and yield. We're kind of almost looking like the birds, as employees. In exchange for room and board, if you could just keep these undesirable pests cleaned up, that's kind of the thought process there."

F4 also anticipates that the hedgerows will increase native pollinator populations, such as bumble bees, further supporting crop production.

To mitigate fly and mosquito pressure affecting livestock, F1 uses swallow boxes to attract tree swallows. While they don't have many hedgerows, they hope to include them in the future.

In addition to field-level interventions, MacPhee aims to leave most of his forests and his wetlands undisturbed, promoting natural habitats. F2 focuses on managing specific and habitat elements, such as clearing away debris around the Pink Lady Slipper, the provincial flower, while creating brush piles at the edge of property for wildlife.

Influence Farming Decisions

Participants varied in how biodiversity conservation influenced their farm management. Two participants indicated minimal influence on their decisions, while others integrated biodiversity awareness in different ways. F1 demonstrated the most comprehensive approach, incorporating five of the seven identified themes.

I. Timing adjustments

F1 considered sustainability of their tree harvest for firewood with respect to soil disturbance and wildlife habitats. They explained that while there is no good time to harvest wood, winter minimizes impact on species and habitats.

II. Habitat Accommodations

F1 supports pollinators by providing bee boxes made from drilled wood or stacked old hay. They also plant native flowering species that bloom at different times of the year, selecting years when pesticide pressure is expected to be minimal nearby.

III. Species-Specific Protection

To protect killdeer nests, F1 fences off pasture areas from their cattle, ensuring the safety of the ground-nesting SAR.

IV. Pesticide Timing and/or Reduction

F4 applies chemicals strategically to minimize impacts on pollinators and birds, using hedgerows and mowing practices to further reduce the need for pesticide use. F1 also times spraying to minimize impact on species.

V. Water Protection

Steenbruggen prioritizes avoiding contamination of local waterways, using IPM approach and conducting regular soil and bark checks to determine localized treatment needed. F4 is mindful of manure runoff from their poultry operation, strategically storing and applying it to protect water quality.

VI. Economic Integration

F3 noted challenges with the delayed hay-cutting program stating:

“There is a saying that if Timothy is in head, quality is dead. Meaning that if Timothy Hay is headed out, your feed quality is very poor.”

In contrast, MacPhee, who participates in the program, reports that quality loss isn't an issue for him as he uses his hay for his own horse and sells to local beef farmers.:

“They say any loss in value of the hay if it's left standing longer is made up because it's nearby.”

VII. Intergenerational Stewardship

Steenbruggen expressed concern about long-term impacts on the land:

“I would like it to remain in a good state for my grandchildren.”

Barriers to Protecting SAR and Biodiversity

Of the six participants, four identified at least one barrier to implementing conservation practices, while two indicated they did not face notable obstacles. Key barriers included economic pressure, environmental changes, resource limitations, and dependency on their neighbours for ecological services (Table 4).

Table 4

Barriers to Biodiversity And SAR Conservation by Participant

Participant	Barrier Type	Description
F1	Economic	Land conversion for crops conflicts with biodiversity projects
F2	Environmental	Water pollution (cyanobacteria) affects wildlife; beyond control
F3	No barrier	
F4	Resource	Limited time, labour, and finances to implement and monitor projects
Ron Steenbruggen	Social	Species for pest control relies on community preferences and support
Richard MacPhee	No barrier	

Economic Pressures

F1 highlighted financial constraints as a significant challenge for them. While converting portions of land to crop fields and renting to other farmers would be the best for the farm economically, they hesitate due to ongoing biodiversity projects they've implemented:

"The big issue is just making sure that the farm can kind of sustain itself to hold up these other projects that aren't maybe having an economic benefit, but they have other benefits attached."

Environmental Challenges

F2 described cyanobacteria (blue-green algae) affecting water adjacent to their property, impacting wildlife and human use. They noted these environmental pressures are largely beyond their control, as a result of commercial activities.

Dependence on Neighbours for Ecological Services

Steenbruggen highlighted that some species such as red fox and striped skunks are important for ecological balance by providing essential pest control. However, neighbour preferences limit their individual control over their presence and effectiveness.

Resource Limitations

F4 reported working at capacity with limited ability to dedicate additional time:

“From any resource perspective, if it's finance, if it's labor, it's just sheer time to process a plan, and to enact it, and follow through on it, and monitor, or collect data, or any of that. It's a lot when you're having to run a business on top of everything.”

Awareness and Interest

Awareness

Participants reported learning about SAR and biodiversity through a combination of active and passive means, including direct observations, engagement with local watershed and conservation groups, information from government agencies, and media sources.

I. Government Programs

Two participants, Steenbruggen and MacPhee, cited government agencies as sources of information on SAR and wildlife, highlighting formal mechanisms for education and guidance.

II. Conservation NGOs

Local conservation organizations, particularly watershed groups, were identified as the most influential sources of knowledge for participants. F1 noted that their work with bat monitoring projects and anadromous fish outside of the farm through watershed groups provided greater exposure to biodiversity concepts than government programs. F4 referenced programs offered by MacPhail's Ecology Project and a local NGO conducting community bird counts on their farm, complementing their personal interest driven knowledge.

III. Media

Participants also pointed to the media as a learning tool. F4 uses social media and follows PEI conservationist Julie-Lynn Zahavich's ecological adventures on Instagram. F2 identifies radio programs, such as those on CBC Radio, to supplement their knowledge.

IV. In-Person Sightings

Direct farm observations on farms remain a key learning method. F2 gains insight by watching what is on their land, noticing how striped skunks dig up things that are bad for their lawn, while snowshoe hares cause damage to tree roots.

Tracking

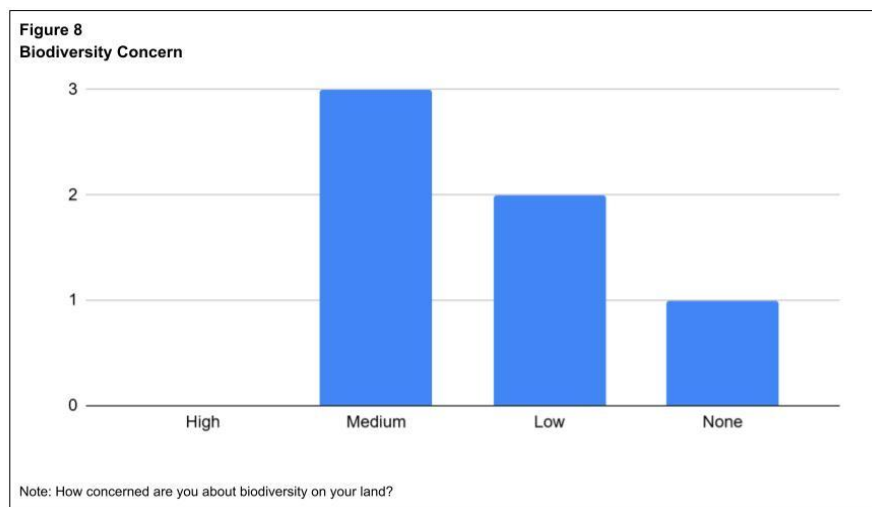
Of the six participants, only one actively recorded one or more species on their farm. F1 previously used the now-defunct Island Nature Tracker, and Google Maps to map swallow boxes placement on their farm, and how that impacted tree swallows:

“I wanted to see what kind of spacings were successful, what designs were successful. The anecdote I would use is three fence posts and not two was essentially the conclusion that came from that trial. I think they get too close, and they don't make very good neighbors. They tend to skip over boxes- you only get occupancy on every second box. So I do tend to be more conservative with my placements now because of that.”

F1 and F4 use their phones for recording biodiversity on their property, while Richard relies on mental notes of sightings. The remaining three participants did not record any wildlife sightings on their farm.

Interest and Concern

Half of the participants expressed concern or some level of concern about biodiversity on their property, though the reasons given varied (Figure 8).



F1 expressed concern, but emphasized a balanced approach between biodiversity and economic output. MacPhee was not highly concerned but acknowledged the benefits of biodiversity, such as the “visible life” in the soil. F4’s concern centred primarily on safety:

“I am concerned about coyote populations basically eating everything.”

Participants who reported low overall concern still showed species preferences or awareness of how human activities affect wildlife. Steenbruggen indicated he isn't concerned about biodiversity on his property, but if he could, he would like to attract more red foxes to help with pest control if his neighbours were less wary. F2 and F3 expressed appreciation for wildlife without a desire to actively manage them. F3 noted the displacement of a great-horned owl following a clear-cutting as impactful.

F4 expressed a sense of reverence for a particular species, the provincial flower, pink lady slipper:

“They've kind of have that place of reverence because of their beauty, and also the historical significance and being a provincial flower. You don't really see them that often.”

“I won't say it takes precedence over the economic operation of the farm, but we try to, where we can, have approaches where we can kind of be both environmentally beneficial and economically beneficial.”
- F1

Awareness and Use of HBAT

None of the participants reported using the Department of Agriculture's Habitat and Biodiversity Assessment Tool (HBAT), and only one participant indicated awareness of the tool.

F1 noted interest, but placed it at the bottom of a long to-do list. F4 indicated it may have come through an email, but they could not remember the tool, and noted it would have been another task they don't have time for.

Participants identified several factors that would encourage adoption of HBAT which were grouped into four themes: personal investment and awareness, program accessibility, trigger-based need, and administrative support.

Personal Investment And Awareness

F1 suggested that integration into the Environmental Farm Plan might encourage him to use HBAT, and reminders through department communications, such as social media, might encourage use.

Program Accessibility

Steenbruggen emphasized accessibility as important because farmers are busy.

Trigger-Based Need

F3 indicated that mandatory use would be their only likely motivator.

Administrative Support

F4 highlighted the need for administrative support, as well as clear information on how data was used, and assurances it would not negatively impact their business.

Support and Resources Desired

Only one participant indicated that no additional support would help them manage SAR or biodiversity. The remaining participants indicated economic or social support.

Economic Support

F1 cited a need for additional funds for farmers who participate in the ALUS program, and to create funding, an ecoservices systems payment to protect habitats on private land, which would help farmers make up lost revenue when taking land out of production.

F3 and F4 were concerned about economic impacts from biodiversity support, and taking land out of production.

Social Support

Four of the participants indicated they would need some type of social support such as advice, hands-on support, or information.

Steenbruggen is open to “good advice,” but says it needs to come from people who have the experience to back up the advice.

F3 said that if it were possible to take land out of production, they would need someone to come onto the land to physically mark off the land.

F4 said that administrative support is a big need for them.

MacPhee said while he understands how busy agency staff are, conservation organizations play a key role in providing on-site support:

“The Island Nature Trust- they’ve been out several times; very responsive to my questions. Lance Moore spent a lot of time with me one day when I had a question about a shrub that I couldn’t identify.”

Conservationists

Seven participants representing one agency and five conservation NGOs provided insights into priorities, challenges, and programs to support biodiversity on agricultural land. Two participants elected to remain anonymous.

Agricultural Land as Habitat for Species at Risk (SAR) and Biodiversity

Participants emphasized the importance of farms for SAR and biodiversity conservation, noting PEI's extensive agricultural lands, existing habitats on farms, and reduced chemical input in crops produced in Kings County. Half of the participants indicated that most of PEI is made up of privately held land with a large amount of that being farmland. Kayle Lavery, Farmland Birds Coordinator at Island Nature Trust (INT) explained:

"Looking at the species that are using these areas [farms], and looking at ways in which we can mitigate risks to them is really important."

"The more diverse an ecosystem is, the stronger it is, the more resilient it is. And that goes for both plants and animals." - Phil Ferraro

Phil Ferraro, founding director of The Institute for Bioregional Studies Ltd., and CEO of the PEI Farm Centre, suggested that farms can serve as an indication of species abundance. C2 noted that Kings County farms, which grow more blueberries than potatoes, tend to have more diversity and less pesticide use. However, key indicators for richness will depend on field margins,

hedgerow width, and buffer zones. C1 highlighted that PEI farms often have rich forest habitats, which supports SAR and other species such as Canadian warbler, bats, flycatchers, even tree species like black ash. They emphasized the importance of the "back 40"- the back 40 acres of farmland that is made up of forests- that are critical wildlife habitats.

Two participants stressed that all SAR are important, while others focused on specific bird species. One participant indicated the only SAR they were aware of was the bobolinks, and the delayed hay-cutting program associated with its conservation.

Lavery shared that while they have farms they work with in South East Kings:

"We have very few bobolink fields in the Northeastern section of the Island...I'd like to see more hayfields enrolled in that area."

Figure 9

Bobolink conservation sign on a farm in Prince Edward Island



Note. Image courtesy of Island Nature Trust.

Frances Braceland and Keila Miller, Co-Watershed Coordinators with Souris and Area Branch of the PEI Wildlife Federation (SAB), have observed bobolinks in farms firsthand. Lavery notes that in addition to bobolinks, barn swallows are dependent on old wooden barns for nesting sites, attaching nests to rough wood; the replacement from wooden barns to new steel barns removes nesting sites for the species. Lavery also points to bank swallows as having a relationship with farmland:

“Both barn and bank swallow are aerial insectivores so they catch their food on the fly. Hayfields are a great source of insects for these species. For foraging purposes, those grasslands are great for the swallow species.”

Hannah Murnaghan, Watershed Coordinator with Morell River Management Cooperative emphasizes that all aerial insectivores are in danger of losing their habitats. Murnaghan notes her concern about Atlantic Salmon, a federally at-risk species. Her organization, The Morell River Management Cooperative, has four rivers in their watershed that have Atlantic salmon and American eel, which is also at risk. While they don’t inhabit farmland, they inhabit adjacent waterways:

“All the watershed groups kind of advocate for an increased buffer zone along our rivers and streams to protect those species at risk that are in the aquatic habitat.”

Ferraro noted that conservation priorities often reflect public preferences:

“Unfortunately, it seems like the bigger birds tend to get a higher priority because people like them, right? People like foxes, but people are afraid of coyotes. People like eagles and hawks, but they're not particularly excited about seagulls.”

He concluded that protecting all biodiversity is essential as climate change introduces unpredictability that complicates species conservation.

Benefits of Biodiversity to Farming Systems

Participants identified several benefits associated with maintaining rich biodiversity on farms, many of which were directly supported by ecosystem services (Table 5). Some participants noted conditions necessary for realizing these benefits such as planting hedgerows and increasing crop diversification through practices like adding cover crops.

Table 5

Frequency of Terms Used by Conservationists to Describe Ecosystem Services Supporting Farms

Ecosystem Services on Farms	Frequency
Pollinators	4
Pest control	3
Soil health and Erosion control	2
Water quality	2
Nutrients	1
Disease mitigation	1
Wind Breaks	1
Other	1

Laverty explained:

“Farmers rely on the land, and they know they need to use that land sustainably, to continue to get the resources that they need for their practice.”

C1 emphasized that the full value of ecosystem services aren't realized until they are lost, highlighting the importance of proactive conservation.

Braceland described biodiversity as essential for soil health and to ensure that when fertilizer is used, it functions properly. Murnaghan pointed to biodiversity as a key factor in maintaining water quality, noting that water quality increases when trees and plants

that edge waterways are abundant and diverse. She emphasizes that water surrounded by forests score better than those around developed land when tested and the PEI water quality report card is an example of this. Murnaghan explains that pollinators are essential for growing crops.

Ferraro shared practical examples from his farm when a local Buddhist group asked him how to manage mosquitoes without directly harming them. He noted simple actions like mowing parts of the farm, creating bird habitats, and planting beneficial herbs and plants, like bats-in-the-belfry (*campanula trachelium*), oregano (*origanum vulgare*), and alliums, can deter mosquitos and other pests.

"We need ecosystems functioning properly for the benefit of ourselves, as well." - Kayle Lavery

These accounts illustrate that biodiversity supports multiple farming objectives, including pest management, pollination, soil health, and water quality, demonstrating interconnection between systems and their dependence on one another.

Farming Practices as Indicators

While some participants could identify how specific agricultural practices might influence SAR protection and habitat restoration, most noted the relationship was often ambiguous.

C1 observed that family farms may have a deeper connection to their land, and considered if the longevity of land in a family correlation with a greater connection. C2 shared that many farmers unintentionally use regenerative agricultural practices because they are farming the way their parents and ancestors did. Lavery indicated that no matter which agricultural practice a farm employs, her experience has been that they are always open to communication, and learning more.

Some participants highlighted potential differences between conventional and regenerative agricultural practices. C1 suggested that regenerative farmers are more likely to have more space for wildlife while Lavery noted they may have an edge in awareness around habitat conservation. Ferraro added that regenerative farmers may focus more on natural pest control and building biodiversity through methods such as safe pest control, planting hedgerows, and avoiding monocropping.

Miller cites the likelihood of buffer zones and soil health in influencing adjacent ecosystems, such as waterways. She also noted that regenerative farmers are more

cognizant of long-term impacts on the environment. Overall, Miller noted how PEI's regenerative agricultural initiatives are progressive and support provincial soil health.

Challenges and Barriers to SAR Monitoring on Private Farmland

Challenges in Monitoring SAR

Conservation organizations rely on a voluntary approach to monitoring SAR on private farmland. C1 and C2 share that oftentimes there is a fear of what would be found and how that finding could result in taking land out of production. C1 notes that one way conservationists can navigate this is by being upfront of what implications there would be for any findings. C2 added that hobby farmers, or farmers whose income is supplemented with off farm income, may be more likely to participate in programs.

Ferraro highlighted that farmers don't like regulators coming onto land because they are busy. He suggested that appealing to ecosystem services benefits would be a better strategy:

"If species at risk legislation could be promoted as beneficial aspects of adopting practices that enhance wildlife and birds, insects, and whatnot, that'll go a long way..."

Lavery described how Island Nature Trust (INT) integrates monitoring with PEI's ALUS delayed hay-cutting program to protect bobolink nesting sites. INT's contract began around 2018 according to Lavery, a year after the species was classified as threatened through the Species at Risk Act. Enrolled farmers are already committed, minimizing barriers with onboarding and bi-weekly farm access for data collection. However, she shares that large-scale outreach remains challenging. INT engages landowners by piquing interest, fosters community conversations, and gradually gains compliance for farm visits. Lavery emphasizes that these programs are essential since PEI doesn't have natural large grasslands, which makes farmlands nesting sites by default. Nesting coincides with traditional hay-cutting season so program timing is crucial; by July 15th, the majority of young bobolinks are fledged and can escape farm equipment.

Murnaghan observed that relationships between watershed groups and farmers have strengthened over the past decade, allowing for greater collaboration and farmer recognition of the value in watershed programs.

C1 highlighted that some conservation groups are working with farmers through the province's PEI Forested Landscape Priority Place for Species at Risk (FLPP) on conducting bird surveys in forested lands, including those on farms. They pointed to INT's work with bobolink and barn swallow monitoring which includes not only data

collection, but works closely with farmers and celebrates their work, in addition to providing education around how to maintain and grow SAR.

"Now, 88% of PEI is privately owned for land, so it is already an uphill battle in comparison to other places in Canada with regards to land management, and we have to do our due diligence." - Keila Miller, Souris and Area Branch of the PEI Wildlife Federation (SAB)

Miller emphasized that part of the work conservation organizations do to protect SAR is to foster landowner investment in SAR by sharing positive news, and building a sense of ownership around SAR on their land. Braceland and Miller shared they understand why programs like the delayed hay-cutting program are difficult for farmers; timing can affect machinery and add more maintenance. They say they try to understand farmer perspectives because at the end of the day, that's their livelihood. Braceland notes that good relationships are built with the understanding that conservationists are coming to the table with environmental viewpoints while farmers

are approaching the table trying to keep the soil and fertilizer on the land. They believe they both have the same goal, just different motivations. They meet farmers where they are at and work on providing support to reduce runoff, reduce nitrates, and implement: *"best management practices that are agro-efficient, agro-environmental efficient."*

Partnerships and Support for Conservation on Farms

Policies and Programs

Most participants identified financial incentives- particularly those offered through, or adjacent to the province's ALUS program- as a way to increase farmer engagement in protecting SAR.

I. Financial Incentives

Several participants emphasized that financial compensation is essential given economic pressures farmers face. Murnaghan believes that cash incentives are important since farmers are incurring financial losses to remove land from production. Miller similarly believed that financial support is the key to farmer participation. Braceland highlighted the importance of the ALUS program in providing continuous economic support to farmers for environmental initiatives, though she stressed more additional funding is needed.

C2 supported creating programs similar to ALUS with higher incentive rates. Murnaghan and C1 also recommended the development of provincial programs to conserve riparian buffers long-term, and pay farmers to enter into time-limited conservation agreements.

C2 suggested reduced property taxes on forested lands on farms, or lands managed sustainably. They believe this could nudge farmers who may be undecided about participating in conservation programs.

Ferraro proposed broader economic support for farmers arguing that a guaranteed livable income would significantly improve farmers' ability to participate in conservation efforts. He noted that, unlike fishermen who can file for unemployment benefits in the off-season, farmers do not have access to similar mechanisms.

II. Policies and laws

C1 suggests expanding the Environmental Farm Plan to include forested areas in the back of farmland property. They envisioned a system in which forest management plans and treatments align with landowners' values, while requiring farmers standards for protecting on-farm forests.

C2 proposed amending PEI's Lands Protection Act to create exemptions for farm acres set aside for conservation. This would allow farmers to exceed existing land-holding limits when additional acreage is used for ecological purposes.

Finally, C1 proposed PEI establish a landbank system, given the absence of a land use plan. The system, they say, could help address issues related to land conversion, including the loss of forests to agriculture and loss of agricultural land to residential and commercial development. C1 shares, "I've heard of it in other places," indicating the model's feasibility.

Partnerships

When discussing the role of partnerships between farmers and conservation organizations in balancing agricultural productivity with species conservation, participants highlighted two core functions:

1. Serving as intermediaries between farmers, government agencies, and scientific communities.
2. Proving or facilitating access to funding.

However, they emphasized that regardless of functions, partnerships need to be rooted in respect and understanding.

"I think it's a great relationship to have, honestly. I always say we need farms, we need to eat, and if we can find a way to work together, and it's not going to the detriment of either group, I think it's a wonderful thing to have." - Kayle Laverty, Island Nature Trust

Braceland explained that over the last 15-20 years that SAB has been involved with Agriculture and Agri-Food Canada (AAFC) projects, the AAFC realized how important it was to leverage conservation organizations for communication. She shares:

"We're the key liaison between the research scientists at AAFC and the producer that boots on the ground, because before us, or before conservation groups, there was a lot of distrust between the government and the producer."

Miller adds that this intermediary role allows conservation organizations to act as agricultural allies to farmers, helping to translate new agri-environmental initiatives and best management practices into accessible, practical information. Braceland further notes that SAB holds regular meetings to share updates, presents new data, and brings together scientists, the AAFC, and producers. These relationships that SAB has fostered, she continues, often spans twenty years.

Murnaghan highlighted strong partnerships between watershed groups and farmers on PEI. The Agri-Watershed Partnership, which she works closely with, helps fund on-farm projects such as soil retention measures that ultimately benefit the environment.

Ferraro described a similar strong collaboration between his organization and the Watershed Alliance. He emphasized that building partnerships, rather than placing blame on farmers, is crucial. Ferraro reiterated that cost is a large barrier for farmers—cost of farm equipment and land. Since these barriers outweigh any capacity for sustainable practices, he argued that a heritage livable income would allow farmers to meet basic needs while opening up to implementing sustainable land management practices. He believes there's also room for partnerships with farmers and those working in climate change mitigation.

C1 points to successful local partnerships, such as Belfast Area Watershed Group in Queens County, and Island Nature Trust, as models for how conservation organizations can support farmers effectively.

Laverty from INT emphasized that mutual respect and finding common ground are central to building strong partnerships. C2 similarly noted that farmers are generally willing to let conservation groups on their land, provided the groups stay within

agreed-upon boundaries. Challenges arise when conservationists ask farmers to remove land from production, or alter practices:

“If they could make \$1,000 a year off an acre doing some sort of regular farming, the ALUS program might give them \$300 an acre to take it out of production, and do something good for animals with it. It's not enough for the average person who's struggling to take that land out of production.”

They added that farmers are typically willing when there is no financial loss.

C2 also stressed transparency, particularly clarifying that conservationist staff are from a non-profit and not the government, and not a regulatory body. This clarity helps farmers know that they will not be reported for something found on their farm:

“Because I've seen buffer zone violations or other things, and so I generally would work with that farmer directly and say, ‘Oh, hey, you probably didn't notice, maybe the new guy was plowing that field, but it was plowed too close to the stream, and so it's a buffer zone violation. Just letting you know so you can correct that so that nobody else discovers it.’ Something like that.”

“It takes a long time to build that trust to get to that collaboration part. But once you have it, you're in, and that's where you maintain, you nurture, you build that up because it's very hard to get the trust of fishers, farmers, that sort of thing.” - Keila Miller, SAB

Braceland and Miller noted that PEI's small size often means conservationists and farmers know one another, or may even be related. Miller emphasized that accountability and approach matter, and can lead to results:

“Fortunately, we know that cover crops have gone up 60% in the last 8 years according to the PEI Potato Board, due to collaborative efforts that watershed groups have done with local producers on PEI. You're seeing 60% cover crop, overwintering cover crop versus 10 years ago which is incredible.”

Habitat and Biodiversity Assessment Tool (HBAT)

Participants were asked how the province's HBAT tool can support farmers. Four participants had not heard of HBAT, while three indicated some awareness around the tool.

Two participants (C1, Lavery) indicated strong awareness of the tool. Lavery shared that INT started utilizing HBAT this past fall to generate reports for landowners, noting that the tool has been eye-opening for farmers:

“Unless you're a birder, you're not necessarily going to pick up on all of those things. So having HBAT take into account the features that you have on your farm, and tell you what could be present, and what you could potentially do, to help those species along, I think people would really appreciate that, and make good use of it.”

C1 believes that the province is working on developing support systems to help guide HBAT users, emphasizing that having a person available to take farmers' calls is important.

C2 indicated limited knowledge of HBAT, having seen it referenced in email communications. They suggested adoption would be stronger if the province provided information in smaller accessible formats such as an infographic in a farmer's newsletter, which may lead to action when prompted by a future conversation.

Four participants (Braceland, Miller, Murnaghan, Ferraro) indicated no prior knowledge of the HBAT tool. Both Braceland and Miller stated that there needs to be increased awareness of the tool. Miller emphasized the importance of communicating HBAT information at the watershed level, potentially through the PEI Watershed Alliance, especially since her organization conducts extensive habitat assessments.

Discussion

All participating farmers used organic or mixed agricultural methods consistent with regenerative agriculture, despite not using the term “regenerative” as an identifier. Conservationists identified a range of ecosystem services that farms receive with pollination and pest control cited most frequently.

Overlapping results

Shared Recognition of Biodiversity on Agricultural Land

Farmers and conservationists consistently recognize biodiversity on farms. All farmers reported some degree of biodiversity on their properties, and half reported SAR. Conservationists emphasized the central role that farmland plays in protecting SAR and biodiversity due to PEI's dominance of privately held land, much of which is farmland.

Supporting this perspective, Kayle Lavery with Island Nature Trust shared data collected by Island Nature Trust with the support of the Department of Agriculture. In Kings County, there were eight participants in the bobolink delayed hay program for 2025 with 26 defined fields surveyed over approximately 129.7 hectares (320.5 acres). Of the 26 fields, nine had bobolinks (57 males + 39 females = 96 total adults). INT also identified additional SAR on these fields including barn swallows on three fields, and bank swallows on two fields.

Concern About Biodiversity Loss

Several farmers expressed concern about biodiversity decline. One farmer, F3, shared perceived contradictions in provincial land-use priorities:

“Our neighbors have been clearing land for three years, it's like over 100 acres, probably close to 200 acres...And there was that great horned owl that summer that I felt bad after seeing him kind of displaced.”

F3 continued:

“The government wants to plant 10,000 trees across PEI...but then here's this guy just going to town clearing up 100 acres, right? So what's the benefit?”

He concludes with:

“Just on the news one month ago, they were grazing sheep in Charlottetown...but then, if you go down the road, here's this guy with an excavator just going to town on it.”

Conservationists echoed the idea that ecosystem services are often unrecognized or only acknowledged once lost.

Reliance on Specific Species as Anchors for Understanding or Connecting with Biodiversity

Both groups tend to anchor discussions around biodiversity around particular species rather than broader ecological systems. Farmers focused on SAR that had more public awareness such as the bobolink, and species found on their farms. Conservationists also gravitated towards specific species generally associated with provincial programs or recognition (bobolink).

Recognition of Barriers to Implementation

Farmers varied in how biodiversity conservation influenced their farm management, and those that actively work towards biodiversity conservation, whether driven by ecological concerns or efforts to reduce chemical input, report challenges in balancing environmental stewardship against economic or operational priorities. Barriers around protecting SAR and biodiversity included economic pressure, environmental changes, resource limitations, and dependency on their neighbours for ecological services.

Agreement on Support

Farmers indicated that they would need some type of financial incentive or social/structural support to help conserve SAR and biodiversity on their farm. Conservationists believed that farmers and conservation groups have stronger relationships now than in the past, but that does not supersede challenges in monitoring SAR which included economic barriers for farmers. Conservationists believed that financial incentives, as well as programs and policies to protect biodiversity and SAR are needed which may include acreage exemptions in PEI's Lands Protection Act and a landbank system to supplement existing policies. Conservationists believed that they could support farmers by acting as intermediaries and also provide and distribute funding for conservation programs.

Additional Points of Interest

While participants could name ways biodiversity supports farms, most conservationists were ambiguous on how agriculture might influence SAR and habitat restoration. Both groups had limited awareness of HBAT, and only one across both groups used the tool.

Interview findings align with two themes from the literature:

1. Farming practices are not the only determinant for farmer awareness and use of ecosystem services.
2. Financial incentives are key for implementing conservation programs on farmland.

Limitations of Study

The small number of participants limited the ability to compare how different agricultural systems impact SAR and biodiversity. However, despite the limited number of participants, an unexpected finding was that most farmers used regenerative practices, though those did not necessarily translate to intentional SAR and biodiversity conservation. A larger study is needed to examine whether regenerative farming practices correlate with proactive SAR and biodiversity conservation.

Recommendations

Grounded in scholarly literature, federal and provincial program and policy review, and interviews with industry professionals, the following recommendations aim to balance the needs of producers, conservationists, and the environment while fostering effective and sustainable biodiversity on agricultural land.

1. Government agencies need to leverage conservation organizations.

Farmers repeatedly referenced social and administrative support as helpful and imperative to participation. Conservation organizations have strong ties in local communities and established relationships with farmers in their areas. They are poised and ready to continue to provide support to farmers while implementing conservation programs. Most farmers didn't have any knowledge of the province's new HBAT tool and cited support as a necessity for use, while most conservationists, who could be a resource for information dissemination, or hands-on support, were not aware of the tool.

2. Awareness around SAR and biodiversity needs to be multi-pronged, both broad and specific in nature, and come from a variety of sources.

Farmers reported that awareness about SAR came from multiple sources including government agencies, NGOs, social media, and personal interest. Conservationists reported directly or passively educating farmers whether through reports based on farm-visits or regular meetings with farmers.

3. Financial incentives need to be tied to conservation participation.

The Kunming-Montreal Global Biodiversity Framework calls for participating nations to provide funding to meet biodiversity targets. Both farmers and conservationists echoed this need, frequently citing economic hardship as a barrier for implementation. Linking financial incentives to participation in SAR and biodiversity conservation, including habitat restoration and the implementation of additional regenerative practices, would address these barriers and potentially facilitate more consistent participation.

Conclusion

In conclusion, this study examined how farmers in Kings County perceive and foster species and risk and biodiversity on their farms, and how local and provincial conservationist organizations support these efforts within the agricultural landscape dominated by privately held property. Given the limited availability of public land, farms serve as essential habitats for many species, including vulnerable migratory birds listed during nesting season, as well as native species.

Although the sample size has limited results, findings highlight several consistent themes. Farmers recognize biodiversity on their farms, and engage with regenerative farming practices. Farming practices are not indicative of an awareness in ecosystem services, and financial, administrative, and operational constraints limit conservation program adoption. Conservationists, for their part, demonstrated nuanced understanding of farming challenges and adoption barriers, and are capable of bridging the gap between policy and implementation.

Overall, the study highlights achieving federal and provincial targets, including those outlined in the Kunming-Montreal Global Biodiversity Framework, will require sustained collaboration between government agencies, conservation organizations, and farmers. Financial incentives will also be necessary to support this work. In addition, further policy and program implementation is required. Finally, stronger communication channels are foundational to meet these goals. Supporting farmers and biodiversity are not mutually exclusive activities; food production and biodiversity are interdependent, and must be approached as such.

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Appendices

Appendix A: Farmer Interviewees

Name	Organization, Title
F1	Anonymous
F2	Anonymous
F3	Anonymous
F4	Anonymous
Rodney John Steenbruggen	Steenbruggen's P.E.Island Orchards
Richard MacPhee	MacPhee's Orchard

Appendix B: Conservationist & Conservation Organization Interviewees

Name	Organization, Title
C1	Anonymous
C2	Anonymous
Kayle Lavery	Farmland Birds Coordinator, Island Nature Trust
Frances Braceland	Co-Watershed Coordinator, Souris and Area Branch of the PEI Wildlife Federation (SAB)
Keila Miller	Co-Watershed Coordinator, Souris and Area Branch of the PEI Wildlife Federation (SAB)
Phil Ferraro	Institute for Bioregional Studies
Hannah Murnaghan	Morell River Management Cooperative

Appendix C: Farmer Interview Questions

1	How do you describe your general approach to farming - conventional, regenerative, organic, mixed, other? What practices do you employ?
2	What types of habitats are found on your farmland?
3	Are you aware of any species at risk (SAR) that may be present on your farmland? If Yes - What species? What are your practices to mitigate their presence? Why (or why don't you) take action to mitigate the presence of SAR?
4	How did you learn about species at risk and/or wildlife species on your farm? (Governmental programs, local groups, personal observation and interest)
5	Have you ever been contacted by a government agency or conservation organization about species at risk on your farm? If Yes - What agency or organization? What was the topic?
6	Do you keep track of wildlife sightings or species on your farm? If Yes - what methods and tools do you use?
7	How concerned are you about biodiversity on your land? If concerned – What are you concerned about?
8	What are the biggest challenges or barriers you face in protecting wildlife or habitats on your land?
9	How do considerations for wildlife or biodiversity influence your farming decisions (e.g., crop choice, timing of field work such as planting and harvesting, crop output, and economic outcome)?
10	Have you heard of the Habitat & Biodiversity Assessment Tool (HBAT)? If so, have you used it? If Yes - What benefit(s) do you see from this tool? If No -What barriers does HBAT implementation present to you?
11	What would encourage you to use HBAT?

12	If you could receive support to help you manage biodiversity or species at risk, what would it be?
14	Any additional comments or questions?

Appendix D: Conservationist and Conservation Organization Interview Questions

1	How does agricultural land give a glimpse into SAR populations and species diversity?
2	How does biodiversity support farmers and farmland?
3	What challenges do you see in monitoring SAR on private farmland, and how could these be addressed?
4	Are there particular SAR in King's county that you believe should be prioritized for conservation on agricultural land? Why?
5	In your experience, how do regenerative farming practices compare to conventional farming in terms of habitat protection and restoration?
6	What role can partnerships between farmers and conservation organizations play in balancing agricultural productivity and species conservation?
7	How can HBAT support SAR and farmers?
8	What policy or incentive changes, or programs could help increase farmer engagement in protecting SAR?
9	Any additional comments or questions?

Appendix E: Supplementary Participant Comments Farmers

Name	Comments
F1	“We're working on expanding some of those BMPs, we're working on expanding the farm kind of on an economic and production basis, but we also want to try and keep kind of a feedback loop. We want to keep adopting better BMPs all the time, too.” “...the beef industry on PEI has had mixed results as far as environmental management goes, but we're working on it, and I'm hoping we're going to get better. In another 10 years, we'll be that much farther ahead.”
F3	“We used to be certified organic, but that definitely wasn't the answer to being profitable. Anything that impedes your production per acre is a bad thing. You only get paid for what you grow, right?” “We spread a lot of manure in all of our land, which boosts the organic matter and stuff. I wouldn't know if that hurts or helps the wildlife or anything. It helps the farm system as a whole.”
F4	“I definitely think having a post-secondary education in a related field is significant, and just kind of opened my mind up to general ecological thought, as it were, or concerns. [REDACTED] does have a post-secondary technical diploma, but I think maybe more influenced on, I'll just say personal conviction, or just personal values of what, I don't necessarily know how his value system was developed, but just wanting more out of life than just pure profit, to feel like a part of a bigger community, and having respect for nature.” “... but then at the same time, it was kind of informed by family values, we'll say traditional rural values, wanting to give more than you consume, kind of seeing and feeling like you're part of something bigger than yourself, wanting more out of life than just every single last penny you can possibly get...” “I think maybe being influenced by friends and family who are also of similar thought. I know [REDACTED]'s

	sister had a big impact on him, especially when it came to the biodiversity side....there was a comment made, and it just stuck with him, and referencing a field, like a blueberry field is a desert because there's no other food source other than the time that the blueberries were in blossom. Then what? It's feast or famine, right? And that kind of changed...and he's like, <i>oh my god, she's right? There's nothing here other than when the blueberries are in bloom, then it's like, there's literally nothing here for a bee, so why would they stick around?</i>"
Rodney John Steenbruggen	" PEI is sorely behind the times." "I need to sleep at night knowing I'm not polluting the ocean."

Appendix F: Supplementary Participant Comments Conservationist & Conservation Organizations

Name	Comments
C2	“Farmers, just like everybody else, want to do the right thing and feel like they're an upstanding member of society. It's just the financial pressure of farming is so intense. That sometimes, they would like to do something different, but it's too much of a gamble to change their practices when they're already running so close to not making any money.” “Agriculture Canada has their research plot at Harrington, and they do little patches and testing this and testing that, but this project was, let's try this on 1,000 acres at a time in multiple places. You had projects where you were paying farmers to adopt these practices at a wider scale, and be sort of an example, or a model that other people could copy. So that you can say, <i>oh, Joe down the road changed his practices because the bobolinks were in his hayfield and it only really cost \$100 an acre.</i>” “The ALUS money generally is not enough to convince someone to change their practices unless they were already considering it or unless the financial implications of that change were already close to break-even. The thing is that many farmers don't know what the break-even point of the new management practice will be. If the Living Labs project data could prove to farmers that the ALUS payments were high enough to break even, then it works and they will be much more willing to do the beneficial practice rather than their usual method. But when they fear that they might lose money after implementing the beneficial management practices, despite the ALUS payments, then it's a very tough sell.”
Kayle Lavery	“I'd be interested to hear from farmers what it is that would catch their attention? What's the best approach for NGOs to get their word out, because again, a lot of times, I think it's just people don't know that these supports exist, and if they did, they would be more than

	willing, to just give us a call and have a chat.” “How do I reach those people that maybe aren't on social media, or mainstream way of communication. We'll have open events, and that might go on our socials, but there's a large chunk of the population that's not going to see that. So that's kind of where we had the letter approach.” “We also had signage to provide at farms, too. It's kind of nice for the landowner to be recognized for the work that they have done, and perhaps that sign will promote conversations in the community, as well.” “I am working with a group that is already kind of working within that mindset. They've already decided to work with ALUS, so obviously they're working to make their farms slightly more sustainable.” “I think coming into this job, I will say, and I've said it a thousand times, I've grown up on the island. Huge farming base on the island. And I didn't know how individuals would take a conservation organization, trying to reach out to them, and work with them on their farms, because I know that farming is a hard gig, and I didn't know if there would be any resistance there. So, coming into this and being like, well, I have to call 55 people this week and ask them if I can go do bird surveys. I was a little apprehensive about it, and it was overwhelmingly positive. I felt very proud of our island because I didn't have any negative feedback, and people were absolutely lovely, and to the degree at which they kind of surprised me. Not that I didn't think that the farming community didn't care, but again, they are trying to do a job, just like we're trying to do a job.” “Hearing from someone who has been farming for 50 years...it is heartwarming, so I do think there is a lot of compassionate people on the Island that would be very willing to make changes and to listen to organizations like us.”
Frances Braceland	“It's good to put on an economic slant for them to say that, <i>okay, this is what, what's valuable to them.</i> Planting a hedgerow might reduce wind erosion on the field, and you might get a better yield from your potato crop, but it also has the biodiversity benefits, which

	they, on a personal level, care about, but as a business operator you can't... there's no value on biodiversity.”
Keila Miller	“The one takeaway that we've already said was that trust and collaborative effort between producers and conservation groups is vital.” “They (AAFC) gave us huge credit whenever Living Labs was done; it was a five-year project. They said without the watershed groups, we would not be able to have a successful project because it was a very collaborative-driven project, and we were the keys to that collaboration being successful. And we knew that because we have really good relationships...” “I think definitely that personal relationships that we have make a difference. That's so important in regards to anything you're talking to with farmers, whether it's species at risk, whether it's agricultural, agroforestry, or biodiversity, or watershed health in an adjacent watershed to their field, things like that.” “We actually created three different wetlands...there's two in Souris River, there's one in Naufrage. There's two full-sized wetlands with three cells in each, and we worked with Ducks Unlimited Canada Charlottetown Chapter to create the wetlands specifically for water catchment, not for waterfowl, which was new to them. They have been delineated as wetlands. They're five to six years old, so they'll be mature at 15 years old. Once you have a farmer, it's decommissioned land, it's wetland already for them, they're not farming it, their machinery's getting stuck in it. Once you have that delineated as a wetland, you cannot decommission it. So, the farmers that you're talking to about putting this on their lands, they're in forever with this initiative. It's not just for 20 years, it's forever, so we think that's pretty special because that means they really are invested in the work that we're doing as well as we're invested in the work that they're doing.”
Phil Ferraro	“...I started farming as a young man in Nova Scotia,

and at that time, there was a group of us that started the first Organic Crop Association chapter in Atlantic Canada. We were one of the premier organic farmers back in '81 and '82. It's grown to the extent now that if I go to an Acorn* conference, I know a few of the old-timers, but I hardly know anybody else."

*Atlantic Canadian Organic Regional Network

"In the old days, when I'm talking, you know, 15, 20 years ago, there were starlings that would be all over the electric wires. There would be barn swallows that would fly into our basement where we have to keep the basement hatch open all winter, all summer. And, they're virtually gone. And what was interesting was that during COVID, when the planes weren't flying, it was an incredible resurgence of bird life. I mean, it was amazing. I don't know where they all go, but I remember during COVID, the roof of our farmhouse was literally covered with barn swallows like, I never saw that before. I haven't seen any barn swallows since."

"The swallows like to nest in barns, or in basements, or anywhere they could find an open building. So, that's another one that people could do is just not work in the barn, make repairs in the spring, maybe delay 'til the fall, that kind of thing."

"Monarch butterflies—there's been a real effort to create butterfly gardens, and I'm kind of surprised at how successful that has been. I didn't think monarch butterflies aim this far north until people started growing milkweed, and leaving their hedgerows really just alone. Then they started appearing."

"The other day, we spread compost in the fall, and I like to spread compost not completely finished because biological activity is actually still peaking and it creates a mulch for the garden. We did that the other day, and a day or two later, going out in the garden, there must have been 100 geese or more going through that

compost. I'm not really sure what they were doing. I didn't want to get too close and scare them away. I don't know if that unfinished compost on top of the ground was bringing earthworms to the surface, or something, but there was something that was really attractive.”

“When I was young, I had the opportunity to study biodynamics quite a bit with some older farmers. And in biodynamic agriculture, they don't turn the compost...when I was young, I studied with this guy, Claude Aubert, French soil scientist, and he talked about sheet composting where he just said, taking material when it's partly decomposed, and spreading it on the land. I don't know too many other people that advocate that idea, but when you look at charts in terms of where the biological activity is peaking, it's actually peaking before it gets really hot. When it's all finished that biological activity tests to be at its lowest point, right? When you spread it on the land, I guess it's feeding and regenerating the biological activity that's already existing in the soil, but if you really want to add to it, then it's my belief, and again, I'm not a scientist, but it's my belief that activity is most enhanced when you're spreading it, when it's partly decomposed, and then let it completely finish composting over the winter. That's exciting.”

“The other thing, here in and out on my farm, I've got an orchard in both places and we've been really hard hit in both locations with rodents. Typically, farmers put out warfarin or some other pesticide, rodenticide, to control them, but that's really, really super dangerous to wildlife that might eat those rodents that are either sick or lying dead on the ground. So what we do is we make traps with peanut butter as an attractant and other things. I commonly make a mixture of peanut butter, plaster of Paris, and baking soda. That'll kill rodents, but it doesn't harm my dog or other wildlife that might come across it. So that, to me, should be kind of a

	standard practice.” “Interestingly enough, when we started the Legacy Garden, it was a fox den in the back corner of the garden and so for the first few years, we didn't have any rodent problems at all. Then unfortunately, there's kind of a combination of people being scared of fox in the city, there was an effort to get rid of the fox in the city, and then the fox got mange, and that decreased the population, and ever since it used to be that I would walk my dog at night, and we would invariably have fox following us, or chasing the dog, and trying to get the dog to chase them, and whatnot, or they've just come up to you to say hello. It's just kind of really kind of cute. Now that the foxes aren't in the city, rodents are a real problem in the garden.” “Diversity in both plant and animal species that provide this web of life. When you have the more diverse unit, there's sort of a phrase of unity and diversity, in which the more diverse an ecosystem is, the stronger it is, the more resilient it is. And, that goes for both plants and animals.”
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About the Author

Susan Kiskis

Susan has over a decade of experience leading for-profit and nonprofit organizations through program development, fostering internal and external relationships, partnership development, education, and business management. She holds an M.S. Global Health and is currently a graduate student in the M.S. Sustainable Food Systems program at ASU. She is passionate about climate change's impact on wildlife conservation and biodiversity. She is a Fulbright Scholar semi-finalist and in 2023, she was selected as a changemaker by the Clinton Global Initiative University for her climate action project. To date, her project has planted three hundred trees and helped install an agroforestry track.

She has served as a Graduate Service Assistant working with Dr. Rissing on a USDA AMS analysis of organizations managing farmer's markets. Her field work includes wildlife surveys in the Okavango Delta in Botswana, as well as wildlife surveys and biodiversity support at Thula Thula Game Reserve in KwaZulu-Natal, South Africa. In the summer of 2023, Susan served as a Planetary Health Research Intern at Alam Sehat Lestari, an NGO in Sukadana, where she analyzed data on the health perceptions of organic farming by organic farmers, as well as research on the mental health impacts from climate change. Susan also volunteered at the Borneo Orangutan Survival Foundation in Central Kalimantan during her time in Indonesia.

She is a volunteer with Marine Animal Response Society and Canadian Sea Turtle Network in Prince Edward Island where she resides.



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