Fencerow fruit: How feral apples could create economic value for fencerow habitat

A Thesis Submitted to Graduate Studies in Partial Fulfillment of the Requirements for the Degree of Master of Arts in the Faculty of Arts and Science

TRENT UNIVERSITY

Peterborough, Ontario, Canada

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Sustainability Studies M.A. Program

January 2026

ABSTRACT

Fencerow fruit: How feral apples could create economic value for fencerow habitat

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On many farms, stone and wooden field borders define field sizes. These are commonly perceived as land lost to production and refuges for pests and disease, causing such fences and hedges to be removed to create larger fields for increased productivity; this process has eliminated trees and shrubs that provide habitat along these fencerows. This research explores the alignment of agricultural productivity and wildlife conservation, proposing that species such as feral apples may serve as direct economic resources for producers and act to protect such remaining fences and hedges. This study focused on farms in the Dummer Moraine, which have small fields, adventive hedges on rock piles and rail fences. Using field size analysis, apple frequencies and apple jelly tasting, the research demonstrates that feral apples could provide economic incentive for keeping these hedges intact, offering a practical mechanism for their conservation, benefiting both biodiversity and farm productivity.

KEYWORDS: biodiversity conservation, farm gate sales, fencerows, feral apples, hedges, linear forests

ACKNOWLEDGEMENTS

Three years is a long time—four, if you count the thought that went into laying the groundwork for my proposal. Undertaking this master's has truly been a life-changing experience in ways I could never have expected: from shifting the trajectory of my career, to navigating new challenges, to redefining my personal and professional goals. None of this would have been possible without the incredible people in my life who have watched me laugh, cry, and experience everything in between- expecting nothing in return. Thank you.

Josh, my brother, thank you for paving the way—not only in life but throughout my academic journey—and for being my biggest cheerleader of all. You have always been, and will always be, my favorite role model and most cherished friend. I would like to thank my parents Wendy and Dave for their unwavering support throughout this journey. To my mom in particular, thank you for being my constant soundboard through every high and low, for always reminding me that everything is possible, and for encouraging me to keep moving forward even when the path felt uncertain. Your belief in me has always been my source of strength.

I am deeply grateful to my team—Eric Sager, Matt Porter, and Brian Husband—whose kindness, insights and knowledge helped strengthen and advance this important project. I also extend my sincere thanks to the farm and farmers who so generously welcomed this research onto their land: Walsh Farm, Matt Porter and Family Farm, Greg and Margaret Aitken and family, as well as Tom Whillans and the Trent infrastructure team.

A heartfelt thank you to Theresa Beresford, who took me under her wing, welcomed me into her home, and taught me the foundations of jelly making.

And most importantly, I wish to express my profound gratitude to Dave Beresford—the kindest and most humble supervisor one could hope for. Thank you for your **patience**, guidance, support, and, above all, your friendship over the past 13 years. Words cannot fully capture the depth of my appreciation. I am forever grateful to you for making this work, and this journey possible. I hope our friendship continues—not only through the tangible work of this research, but throughout the journey of life itself.

We did it!

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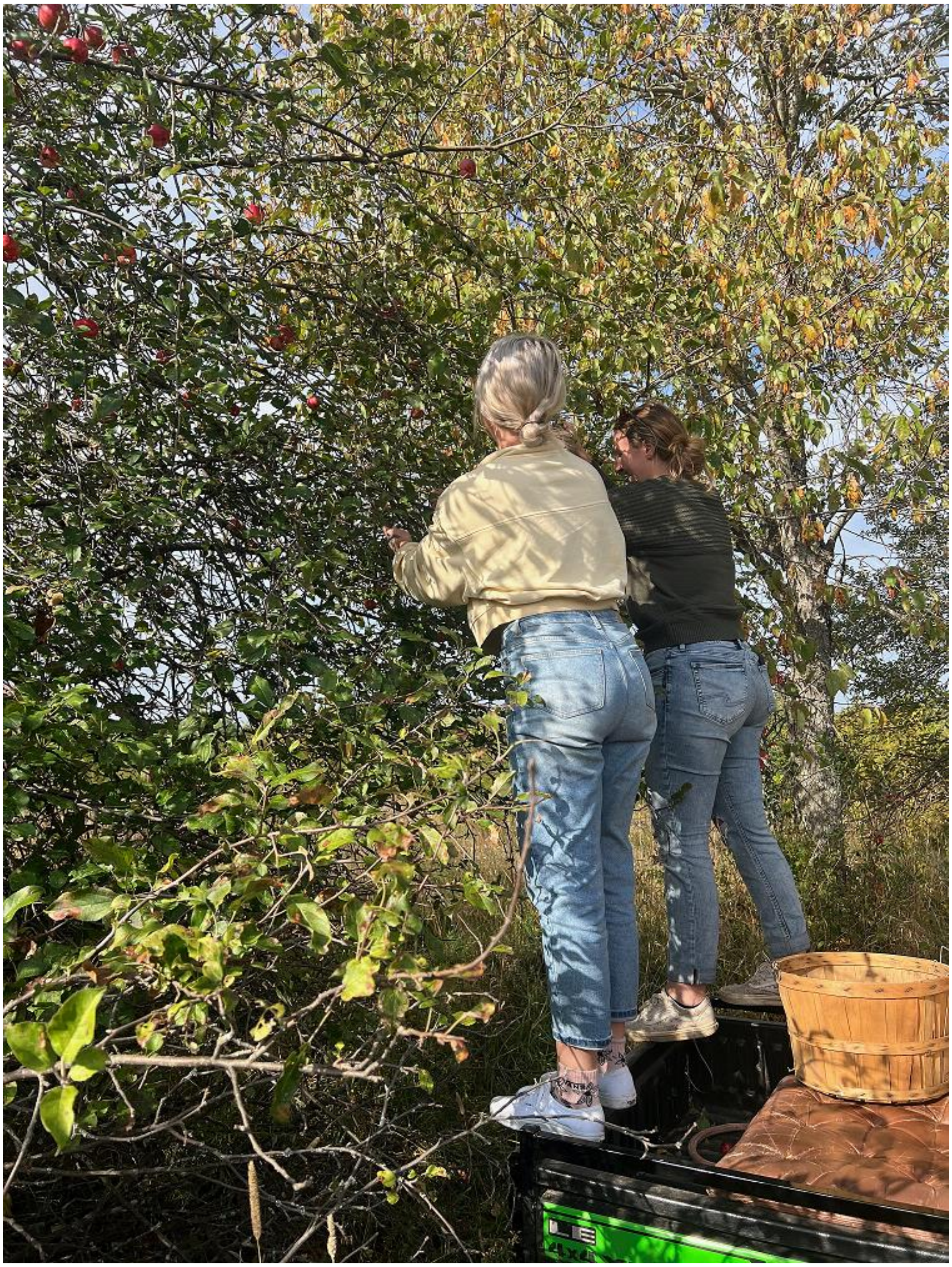

Frontispiece. Desiree Archer and Philippa Beresford getting apples for making jelly.

PREFACE

Dear Reader,

The impacts of climate change, exacerbated by human activity, requires us to find solutions to large scale environmental problems. While these are often global in scope, their impacts are acutely felt within local contexts. One local implication of the climate crisis is the growing concern surrounding food insecurity.

When I began graduate studies, I thought I was working on creating a project that evaluated the underutilization of wild fruit, and that my goal was to find a purpose for this food in our local food systems. This was a big misunderstanding! From a conservation perspective, it was first necessary to understand where these trees were thriving, and the role fencerows and the landscapes they create play in supporting tree establishment, growth, and survival. These conservation corridors help shape microclimates and harbor biodiversity, and the trees within are homes to insects, pollinators, and small mammals; they help shape our local environment as well as local farms.

As my knowledge of the role of these woody hedges and fences play in local agriculture and landscapes grew, I wanted to showcase this interconnected biological and agricultural reality. My thesis developed into finding if it was feasible to provide a direct economic role for these unique habitats that was respectful of the local farming community and supported local wildlife.

My hope in this thesis is to bring awareness of the synergies between local farming communities, long standing fencerows and hedges, and the sustainable potential of wild apple trees.

CHAPTER 1

Title: The problem and the purpose

"And only local knowledge can point out the best strains of any particular variety. Strains? Yes, apples trees are individuals and the fruit from one tree is never exactly like the fruit from another." Mike Poole, Heirloom Apples. Harrowsmith, March 1980, vol. 26:86-92.

The basic idea

In rural landscapes, humans have shaped the land through the combination of settlement, transportation, and farming. These impacts persist for decades, often centuries, embedded in the physical and biological mosaic of the landscape. In Ontario, the fencerows and hedgerows that define the borders of small fields on many farms are examples of farm infrastructure that dates from the late 1800's, and that now provide habitat for many wildlife species. These ecological benefits were never the intended purpose of constructing these fences, and as agriculture changed over time, so did farm infrastructure on most farms across Ontario (Smith 2015). There is however, an exception to this pattern, infrastructure that was too costly to remove has often been either allowed to persist, or co-opted into use modern use: old timber frame barns and driveshеds are still used, and old wooden rail fences are still left intact. In north eastern North America, these older infrastructures are most common where the soil is rocky (Reeds 1959). One such region in southern Ontario is Peterborough County, particularly the Douro-Dummer area, where old wooden fences perched on top of long rock piles are a common sight. Such fences were removed decades ago in areas of the province where there is good rock free topsoil so that farmers could use the larger, more modern machinery (Reeds 1959) demanded by rural planning and agricultural policies that prioritize large-scale mechanization, monocultural efficiency, and easily quantifiable forms of productivity (Smith 2015). It is in areas of glacial till where the soil is most rock filled, and where the labour of removing rock field border is almost prohibitive. It is these very rock piles and fencerows that have become hedges as trees and shrubs were planted in between the rocks, providing long lines of wooded habitat.

These fencerows have become protective spaces where seedlings could grow and mature without ploughing, grazing, or mowing. One of the more common species in these hedges are apples. These are adventive trees, not planted by intent. My purpose in this thesis is to reframe feral apples as an economic resource, and thus reframe these hedges and fences as an economic resource as well. The intent is to find value for producers of a remnant habitat that is critically valuable for wildlife.

Fences and hedges

The wooden rail fence lines, overgrown field border, and hedges* of many farms across Ontario are often the only remaining areas for wildlife, including trees, shrubs, wildflowers, insects and other invertebrates, amphibians, reptiles, birds, and mammals (Mineau and McLaughlin 1996). Even if not habitat, these overgrown fences and hedges can act as connecting corridors that allow wildlife populations to persist (see for example Fitzgibbon 1993). For farmers, these are often perceived as land lost to production and at this time, remaining fences and hedges that define smaller fields are being removed across Ontario to increase the land under production (Archer et al., 2025). Other than a sources of firewood for home heating (personal communication M. Porter), such wild hedges are rarely seen as assets for farmers (Archer et al., 2025).

My research project was dedicated to finding some product or products that might act as an economic incentive for farmers and landowners to see the adventive fences and hedges on their farms as direct economic assets at the family farm scale.

To accomplish this goal, I needed to determine:

1) how abundant these hedges and fences are in the Peterborough County region,

2) how abundant feral apple trees are on these hedges,

3) how variable individual apples are on the different trees,

4) how to make jelly using these apples,

5) if jelly made from different trees or farms differed in taste,

6) if people liked the jelly.

* In this thesis I use the term hedges to refer to the trees and shrubs and other vegetation that grow along fence lines, field borders. There is no intention to imply planted or maintained hedges. Similarly, fences and fence lines are used as synonyms. These are commonly called fence bottoms by farmers as well.

At the Beresford farm site in Douro-Dummer township there are 65 species of shrubs, vines, and trees that grow along the cedar rail and stone fencerows, resulting in hedges and linear forests of mixed species (Figures 1, 2, 3). None of these were planted intentionally, rather they are adventive, growing along field borders where they had been planted by wildlife or wind, and spared by cattle over the past 180 years that preferred to graze on pasture rather than browse on shrubs on the stone fencerows. Thirty-one of these species are trees, 26 species are shrubs, and 8 vines (Table 1). I compiled this list from the field notes and nature log of the landowner of the Beresford farm site (DV Beresford pers. comm. Identifications based on Soper and Heimburger 1982, White and Hosie 1968, and Hosie 1979). The identifications were listed based on observations made from 1997 to the present, as the landowner walked the fields, chased livestock, repaired fences, and harvested firewood.

Table 1. Trees, shrubs, and vines identified on hedgerows and fencerows on the Beresford farm site, Douro-Dummer farm. The list is from the field notes of the landowner compiled over ten years of observation. Identifications are based on Soper and Heimburger (1982), White and Hosie (1968), and Hosie (1979).

Trees

Name		Taste	Product and comments
Common name	**Latin name**		
Apple (feral)	*Malus domestica*	excellent	jellies, wines, cider, firewood
Red ash (green ash)	*Fraxinus pennsylvanica*		tool handles, firewood
White ash	*Fraxonius americana*		tool handles, firewood
Basswood	*Tilia americana*		wood for carving
White birch	*Betula papyrifera*		firewood
Yellow birch	*Betula alleghaniensis*		firewood
Butternut	*Juglans cinerea*		furniture
Eastern white cedar	*Thuja occidentalis*		outdoor wood, carving
Black cherry	*Prunus serotina*	bland	furniture
Red elderberry	*Sambucus pubens*		wildlife, fruit edible if cooked
American elm	*Ulmus americana*		tool handles, firewood
Rock elm	*Ulmus thomsasii*		tool handles, firewood
Eastern hemlock	*Tsuga canadensis*		outdoor wood
Ironwood	*Ostrya virginiana*		tool handles, firewood
Eastern redcedar	*Juniperus virginiana*		aromatic wood
Tamarac	*Larix laricina*		lumber, barn rafters
Black maple	*Acer nigrum*	excellent	maple syrup, firewood
Manitoba maple	*Acer negundo*		carving, rapid shade tree
Mountain maple	*Acer spicatum*		firewood
Silver maple	*Acer saccharinum*		firewood
Sugar maple	*Acer saccharum*	excellent	maple syrup, firewood
Eastern white pine	*Pinus strobus*		softwood lumber
Jack pine	*Pinus banksiana*		softwood lumber
Scotch pine	*Pinus silverstris*		softwood lumber
Balsam poplar	*Populus balsamifera*		lumber, firewood
Largetooth aspen	*Populus grandidentata*		lumber, firewood

Trembling Aspen	*Populus tremuloides*		lumber, firewood
White spruce	*Picea glauca*		softwood lumber
Crack willow	*Salix fragilis*		light, strong wood, paddles
Peach-leaved Willow	*Salix amygdaloides*		light, strong wood, paddles
White willow	*Salix alba var. vitellina*		light, strong wood, paddles

Shrubs

Speckled alder	*Alnus rugosa*		charcoal
Prickly ash	*Zanthoxylum americanum*		fence border
Common buckthorn	*Rhamnus cathartica*		firewood, invasive
Chokecherry	*Prunus virginiana*	poor	fruit for preserves, wine
Highbush cranberry	*Viburnum opulus*	poor	fruit for preserves, wine
Green osier dogwood	*Cornus alternifolia*		
Red osier dogwood	*Cornus sericea*		basketry
Prickly gooseberry	*Ribes cynosbati*	excellent	fruit for preserves, wine
Wild red currant	*Ribes triste*	excellent	fruit for preserves, wine
Hawthorn	*Crataegus punctata*	bland	preserves, wine, firewood
Tartarian honeysuckle	*Lonicera tatarica*		
Common juniper	*Juniperus communis*		
Canada plum	*Prunus nigra*	bland	fruit for preserves, wine
Black raspberry	*Rubus occidentalis*	excellent	fruit for preserves, wine
Common blackberry	*Rubus allegheniensis*	excellent	fruit for preserves, wine
Smooth blackberry	*Rubus canadensis*	excellent	fruit for preserves, wine
Wild red raspberry	*Rubus idaeus var. stigosus*	excellent	fruit for preserves, wine
Multifora rose	*Rosa multiflora*		
Smooth wild rose	*Rosa blanda*		
Narrow-leaved meadowsweet	*Spirea alba*		
Staghorn sumac	*Rhus typhina*		
Downey arrowwood	*Viburnum rafinesquianum*		
Nannyberry	*Viburnum lentago*	bland	fruit for preserves, wine
Beaked willow	*Salix bebbiana*		outdoor furniture, basketry
Black willow	*Salix nigra*		outdoor furniture, basketry
Slender willow	*Salix petiolaris*		outdoor furniture, basketry

Vines

American bittersweet	*Celastrus scandens*		poison
Riverbank grape	*Vitis riparia*	excellent	fruit for preserves, wine
Swamp fly honeysuckle	*Lonicera oblongifolia*		
Pale swallowwort	*Vincetoxicum rossicum*		invasive
Belladonna	*Atropa bella-donna*		poison
Bittersweet nightshade	*Solanum dulcamara*		poison
Poison ivy	*Rhus radicans*		poison
False virginia creeper	*Parthenocissus inserta*		poison
Virginia creeper	*Parthenocissus quinquefolia*		poison

Figure 1. Fencerow of apples, black cherries, and maples along a line where the original wooden fence has collapsed, with vegetation growing over the stones, leaving only the linear forest as evidence of where a fence had been. Beresford farm site.

Figure 2. Stone piles and remains of cedar rail fence, with black cherry and red cedar, and dogwood shrubs. Beresford farm site.

Figure 3. Row of maples along stone and cedar rail fence, showing linear forest structure of this fencerow. The understory contains forest wildflowers such as trout lily, and various shrubs. Beresford farm site.

I assessed these species for their product potential, based on their abundance, edibility, and ease of both harvest and production. My original assessment was informed by conversations with the landowner who has been harvesting and making products from these hedges since 1997 (T. Beresford pers. comm.). In addition, from my personal observations of walking along these hedges and linear forests, I have identified four species with excellent product prospects: feral apples for jellies, jam, cider and wine, both black maple and sugar maple for maple syrup, and wild grape for jelly, jam, and wine.

From my conversations and explorations on these farms, I narrowed my most promising candidate to apples. The ease of harvest, processing that could easily be scaled up or down made this a strong candidate for my research into a potential product that integrates these hedges and family-farm scale agriculture typical of Peterborough County. Feral apples have an additional advantage in that as a masting species; each tree produces a prodigious amount of fruit requiring no care or maintenance. Feral apples have varying harvest dates in Peterborough County, spanning mid-August to mid-October, depending on the individual trees. Maple syrup production, though excellent, requires an intensive period of constant care and attention in early spring for boiling the sap, although it also has the potential to provide a unique farm specific product. The wild grapes are also excellent except for the work involved in processing the small wild grapes, removing insect-damaged grapes and stripping the good grapes from their stems. Other fruit bearing shrubs on this farm, although excellent for jams, are not that common on these hedges, and are more difficult to harvest in any abundance, such as the wild raspberries and blackberries, gooseberries, and currants. The hawthorns, nannyberries, chokecherries and wild plums are bland tasting, and uncommon on these fences and hedges, and suitable for home production on a limited scale only.

Indeed, this list reflects the annual activities on the Beresford farm, the Aitken farm, and the Porter farm (pers. comm. M. Aitken, T. Beresford, M. Porter). On the Beresford farm, apples are used for jelly and wine, enough produced for the entire year, about one to two gallons of maple syrup are produced each year, and small batches of jellies (6 to 12 small jars) are produced from the blackberries and raspberries, mixed in with whatever other berries are available (hawthorn). On the Porter and Aitken farm the same scale of operations occurs, with apple being the main product used, with the addition that on both farms wild apples are pressed in a cider press to produce small batches of cider, some of which is used for hard cider.

This thesis begins with a review of the literature (published in JAFSCD, as Archer et al. 2025)) regarding these fences and feral apples and how attitudes toward these adventive fences have changed over time and provides the rationale for the rest of this thesis. This chapter is followed by my analytical chapter that attempts to address the 6 items listed above. I then end with a conclusion that draws the main finding together for the reader.

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CHAPTER 2

Title: From fencerow to product: the potential of feral apple jelly and other products for farm gate sales*

Keywords

biodiversity, field boundaries, fences, hedges, linear woodlands

INTRODUCTION

Feral or wild fruit such as apple, pear, and plum, are the offspring of domestic varieties that have escaped cultivation (Cronin et al., 2020). Such fruit is commonly found on farms across northeastern North America (Eppig, 2012) where older farm infrastructure such as field boundaries defined decades ago are still in place (Cronin et al., 2020). These feral trees are the hybrid offspring of heritage variety ancestors (Cronin et al., 2020; Gross et al., 2018; Volk & Henk, 2016) deposited by wildlife as seeds on stone piles, along woodland edges, in clearings, and on wooden rail fences (Fritz & Merriam, 1996). Rail fences on these farms were commonly built in a manner that did not require post holes, and were constructed from 60 to 200 years ago out of split cedar rails and installed on rocky ground (Bowley, 2015; McIlwraith, 1984) and stone field borders composed of glacial till and glacial erratics (Chapman & Putnam, 1940; Putnam & Chapman, 1936).

* This literature review has been published, consequently this chapter is written using the first person plural and the formatting of the accepted manuscript. The publication is: Archer, D., Sager, E., Porter, M., Beresford, D. V. (2025). From fencerow to product: the potential of feral apple jelly and other products for farm gate sales. Journal of Agriculture, Food Systems, and Community Development, Col. 14. Summer 2025. DOI: https://doi.org/10.5304/jafscd.2025.143.031

On many farms, these stone field borders still define the field sizes set when farmers first tried to clear arable land of stones and stumps by carrying or dragging rocks to field edges (Gage, 2015; Ripley et al., 1946). This has created a landscape of small fields with almost permanent field boundaries that are characteristic of farms in regions of shallow topsoil, rocky ground, typical of many farms across northeastern North America, including central Ontario (McIlwraith, 1984). These small fields are bordered by hedges of mixed species of native and introduced plants, shrubs, and trees (Fritz & Merriam, 1996). The resulting adventive hedges (Figure 1) can be up to 20 feet (6 meters) wide and are effectively linear woodlands (Fritz & Merriam 1996; Rackham, 1994) where wildlife abound alongside cattle, sheep, crops, and hayfields (Mineau & McLaughlin, 1996). Characteristic fruit trees and shrubs of these field borders include both native and introduced species (Fritz & Merriam, 1996), such as feral apples (Figure 2), crab apples, feral and native plums, gooseberries, grapes, cherries, blackberries and raspberries, rowan berries, dogwoods, and viburnums, all of which provide food and habitat for birds, mammals, and insects (Mineau & McLaughlin, 1996).

These linear woodlands have commonly been perceived as land lost to production (Ripley et al., 1946), and both government and academic experts have historically recommended that these fences and hedges be removed to increase the amount of productive arable land (for example, see Bowley, 2015; Dawson & Fortier, 1954; Ripley et al., 1946), even suggesting that these fences be replaced with barbed wire (egg. Quinton, 1990; Skinner et al., 1980).

Figure 1. Stone field border between two fields of pasture showing remnants of a cedar rail fence and mainly maple trees resulting in a linear woodland, Douro-Dummer Township, Ontario, Canada.

Figure 2. Apple tree blossoms along the fencerows in Douro-Dummer Township, Ontario. Photograph taken from the road May 2022.

Farmers generally have embraced this advice, and over the past 75 years many have removed hedges and wooden fences to enlarge their fields (Boutin et al., 1999), especially in regions with high-quality arable land. For example, in 1949, the Ontario County Crop Improvement Association (OCCIA) removed fences on farms north of Lake Ontario as part of a Conservation Day (Bowley, 2015). The idea behind this event was rooted in the agricultural and environmental practices of the time, focusing on improving the productivity and sustainability of farmland (Bowley, 2015).

In addition to advising that fences and hedges be removed to create larger fields, pest management experts in government and academia have also specifically advised that feral fruit trees, including apples, be removed to reduce insect pests and disease refuges (Davis, 1930; Racette et al., 1992). This historically consistent—if now discredited—expert advice, that feral trees and wide fencerows are sources of pests, disease, and lost productivity, has resulted in farmers having imbued these lessons from experts over several generations (Chambers, 1980; Kröbel et al., 2021). Not surprisingly, many farmers continue to see wooden rail fencerows and their associated feral fruit trees such as apples as liabilities and sources of vermin (Kröbel et al., 2021; Witmer, 2022). This view persists despite more recent ecological evidence that such linear woodland habitats benefit producers by increasing the number of native pollinators and pollination services (Morandin & Kremen, 2013), the number of parasitoids that attack insect pests (Morandin et al., 2014), reducing soil loss through wind erosion (Böhm et al., 2014; Burel, 1996), as well as providing habitat for wildlife (Shaw et al., 2021;

Woodall et al., 2023). For example, even in apple orchards where feral apples would be expected to be the most problematic in terms of pest refuges, field fences and hedges provide habitat for a variety of insect predators that prey upon orchard pests (Shaw et al., 2021), as well as for native bees species (Sheffield et al., 2013). It is not just insects that are affected; fields with hedges and fences tend to have fewer rats and mice than fields with without such fences (Sellers et al., 2018).

It is on the more marginal farmland, where the high labor cost of removing fences commonly built on stone piles (Gage, 2015) as well as their resulting trees and hedges—commonly called fence-bottoms by producers—are still in place (McIlwraith, 1984). The has resulted in many farms of relatively poor-quality rocky soil having small fields with abundant feral fruit trees and shrubs (McIlwraith, 1984). As a result, such farms have effectively become refuges for many species of wildlife (Freemark & Kirk, 2001). Consequently, for wildlife biologists and ecologists dedicated to conservation, these wooden fences, stone piles, and the resulting linear woodlands are valued as remaining habitat where many endangered plant and animal species can still be found (Forman & Baudry, 1984; Martin et al., 2020; McInturff et al., 2020).

These different points of view have resulted in the seeming self-interest of farmers being opposed to the seeming self-interest of conservationists, with farmers often resenting any regulatory interference in their ability to efficiently manage their land for food production, and conservationists and wildlife managers resenting the removal of any tree or section of fence (see for example Collins, 2015, and Regional Municipality of Durham By-law 30-2020). This has resulted in a tension between wildlife biologists and ecologists who strive to optimize the amount of land dedicated to protecting biodiversity, and agronomists who advise producers to clear trees and fencerows to create more productive agricultural space.

Our view (our paradigm) is that the objectives of both farmers and wildlife conservationists coincide in a way that maximizes both conservation and productivity (Chambers, 1980). The difficulty is that the agricultural services provided by hedges and structural fences are rarely quantified in economic terms; it is not known how much money can be saved by having hedge-dwelling pollinators or predators of farm pests.

To address this, we think that some charismatic species such as feral apples have the potential to be a direct economic resource for producers, providing product for farm gate sales and thus a disincentive to removing those fences and hedges with their associated feral apple trees. This approach could position such linear forests and their feral fruit trees as both economic and community benefits in terms of family farm life and culture (Gasson et al., 1988), even if the monetary benefits were minimal.

We do not suggest that there is enough economic potential in selling apple jelly alone. We do think that farm gate sales from hedgerow products made at the family farm level should be added to a growing list of economic benefits that diverse habitats provide for producers (McNeely, 1988), especially for producers on marginal land typical of (but not exclusive to) many parts of northeastern North

America (such as Ontario, Canada) (Smith, 2015). The trees and shrubs on fencerows and in hedges could also provide a harvestable abundance of apples for cider, wild grape products, and products from other regional fruit trees and shrubs (Garcia & Miñarro, 2014).

Such products could command a higher price if marketed as *terroir* products (Leedon et al., 2021) tied to specific farms or regions. We expect that food made from feral apples might have unique tastes specific to individual trees or combination of trees on individual farms due to the mixed ancestry of these feral trees from extinct or rare heritage breeds (Cronin et al., 2020). We think that this could be used to pique consumer interest in unique farm-specific products (Diamond & Barham, 2011). Exploring the potential of agricultural products from these linear woodlands could provide an important tool for encouraging local producers to see the land occupied by these hedges and fences as economic, family, and community cultural benefits—not just as wasted land.

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CHAPTER 3

Title: Variability in taste of jelly made from feral and cultivated apples

Keywords

biodiversity, field boundaries, fences, hedges, linear woodlands

INTRODUCTION

Fences and adventive hedges of much of Ontario's farmland contain fruit trees such as apples, plums, pears, and a variety of berries. These feral trees, including apples (Cronin et al. 2020) and pears (Catling and Mitrow 2008), grow from seeds spread by wildlife (Fritz and Merriam 1994, Catling and Mitrow 2008) and are the descendants of ancestral varieties from commercial orchards, defunct orchards, and gardens. By 1926 there were 174 varieties and/or cultivars (Macoun 1927), most of which are no longer grown, rare and hard to find, or extinct. Some have been designated as heritage cultivars, having traits no longer commercially valued as farms and markets changed (Davis 1936). Over the twentieth century, Ontario farms changed from being small homesteads with a variety of produce types to larger more specialized production systems (Bowley 1996). With these changes, apple varieties with traits such as dual purpose eating and cooking, deep rooted drought resistance, root cellar longevity, and a long ripening to enable prolonged harvest (Ontario Department of Agriculture Fruit Branch 1914) were replaced by apples that were robust during transport (Hoblyn 1938), predictable harvest dates (Blanpied and Silsby 1992, Mostofi and DeEll 2023), consistent size and shape (Hampson et al. 2002, DeViller et al. 2025), and tastes that reflected the changing cooking and eating habits of the market (Abbott et al. 2004).

Markets also changed over the 20th century, from local and regional to national and international, making transportability a critical trait important for modern producers (Lape 1973). In contrast, and not surprisingly, disease resistance and cold-hardiness continue to be traits selected for (Ontario Department of Agriculture Fruit Branch 1914, Coleman 1992, Khanizadeh and Granger 1998).

Common varieties grown in the early 1900's in south central Ontario were known for being resistant to blight, cold hardy, and described as cooking apples (Ontario Department of Agriculture Fruit Branch 1914). This was more marginal land for growing fruit such as apples, especially compared to more southern and south-western parts of Ontario (Ontario Department of Agriculture Fruit Branch 1914). Besides having a cold climate, the soil in much of central Ontario is rocky, composed of glacial till compared to more fertile soil near the great lakes (Bukhari et al. 2021, 2024), making this region less productive for farming in general (Ontario Department of Agriculture Fruit Branch 1914).

One common characteristic of farms in central Ontario is the abundance of wooden rail fences, designed to sit on the ground rather than relying on fence posts sunk into the ground (Norris 1982, McIlwraith 1984, Long 1987). These fences, in contrast to wire fences, become places that birds and other wildlife use as habitat, planting seeds from fruit they have consumed (Catling and Mitrow 2008). This results in such fences being transformed into linear forests and hedges over time (Archer et al. 2025), common on those Ontario farms located on moraines and drumlin fields (Putnam and Chapman 1936, Chapman and Putnam 1940, Shulmeister 1989, Bukhari et al. 2024).

It is the feral apples on those linear forests and hedges that is the subject of this chapter. Specifically, I wanted to know if the feral apples could be used to make high quality and unique tasting products for farm gate sales. In this way, I hope to provide incentives for producers to maintain and protect at least some of the remaining linear forests on their farms. These hedges and linear forests have been removed across much of Ontario, largely on the advice of agronomists and other professionals who see such habitats as refuges of disease and insect pests (see Archer et al 2025 for a detailed discussion). Yet these hedges are often the main, if only, source of nesting habitat for birds and other wildlife (Mineau and McLaughlin 1996, Freemark and Kirk 2001) including beneficial wildlife such as pollinators and pest-predators (Shaw et al. 2021, Woodall et al. 2023), hence my interest in protecting their habitat.

To achieve my goal, I needed to accomplish four things, working from general trends at a large scale to a more detailed understanding at a small scale.

1) In the region of south-central Ontario, I needed to determine if field sizes are smaller and with more fences on those located in the more rocky soil compared to farms on less rocky soil, that is farms located on the Dummer Moraine, compared to farms closer to Lake Ontario. That is, I needed to demonstrate what seemed to be the case, that on farms in rocky soil there are more field borders with their fencerows and hedgerows than on farms in more fertile

and less rocky soil. Since I was interested in the feral apples on these hedgerows, I wanted to understand where these are abundant, and why.

2) In Douro-Dummer Township, quantify the abundance of apple trees on fences and hedges on farms in Douro-Dummer Township located on the Dummer Moraine, and on one farm in Douro-Dummer Township map the location of feral apples trees to determine the abundance on this farm, as an example of farms from Douro-Dummer Township.

3) At four specific study farms in Peterborough County I collected feral apples to learn how to make feral apple jelly as a re-skilling exercise from local farms.

4) I needed to test whether people preferred jelly made from feral apples compared to commonly available known apple cultivars using double blind taste tests.

As part of this last goal, I also provided photographic examples of the variability of apples from feral apple trees on two of the study farms. I hypothesize that feral apples provide a wide range of unique and different tasting products such as jelly, compared to more predictable commercial cultivars. As part of this, this wider variety of tastes should result in one of the feral apple jellies being preferred in the taste tests.

There is a knowledge gap regarding what useful products can be created for farm gate sales from hedges that are suitable for family farm scaled operations (Archer et al. 2025). In this chapter, I begin the process of addressing this gap by studying a potential product line, feral apple jelly.

MATERIALS AND METHODS

For my research I mostly focused on a farm (Warsaw farm, details provided in the next sections) in the Dummer Moraine, which has small fields, adventive hedges on rocky piles and rail fences. I also used three other farms in the same area. This was the main farm, where I did the most detailed analyses as typical of rocky soil. This was also the farm where I was taught how to make jelly and allowed unrestricted access by the landowners for picking apples and mapping the site in detail. While I was granted access to the other farms, this was more limited in terms of what I could or how often I could access these sites.

1 Field size methods

I tested the observation/assumption that farms in our study area had more fencerows and hedges and smaller fields due to being on rocky soil. I measured field sizes along a transect running from just east of Lakefield Ontario south to the north shore of Lake Ontario west of Cobourg. For this I used Google Earth and the distance and area tool. First, I oriented the Google Earth images so that north was on the left side of the computer screen, east toward the top, to provide a larger area for measuring fields in each image. I then defined a transect along a line of longitude 78° 08' 38", from 44° 29' 01" N to 44° 00' 30" N. Along this transect I chose 5 fields in the northern half of the section (left side of the screen image) and 5 from the southern half (right side of the screen image), alternating west and east (above and below the transect line) choosing the closest obvious agricultural fields along this line to measure. I used the Google Earth area tool and traced the perimeter of each field to get the area in m^2. I identified the soil characteristics of the fields in each map section based their location, using the mapped classifications in Hoffman et al. (1964). I used 11 map sections across five soil types. Each of the 11 map sections was defined by the latitude of the north east corner and the latitude of the south east corner (Fig. 1), with soil type of each, and listed from north to south as:

1. loam, hilly, good drainage, neutral soil, exceedingly stony:

screen image 1, 44° 29' 01" to 44° 26' 31";

screen image 2, 44° 26' 31" to 44° 23' 33";

2. loam, rolling, good drainage, neutral soil, very stony:

screen image 3, 44° 23' 33" to 44° 20' 41",

screen image 4, 44° 20' 41" to 44° 17' 32",

screen image 5, 44° 17' 32" to 44° 14' 35",

screen image 6, 44° 14' 35" to 44° 11' 44";

3. sandy loam, undulating hilly, good drainage, slightly acid, stone-free:

screen image 7, 44° 11' 44" to 44° 08' 39",

screen image 8, 44° 08' 39" to 44° 05' 59";

4. loam, rolling, good drainage, slightly acid, few stones:

screen image 9, 44° 05' 59" to 44° 03' 13";

5. loam, rolling, good drainage, slightly acid, few stones to stone free:

screen image 10, 44° 03' 13" to 44° 00' 30" screen image 11, 44° 00' 30" to the north shore of Lake Ontario

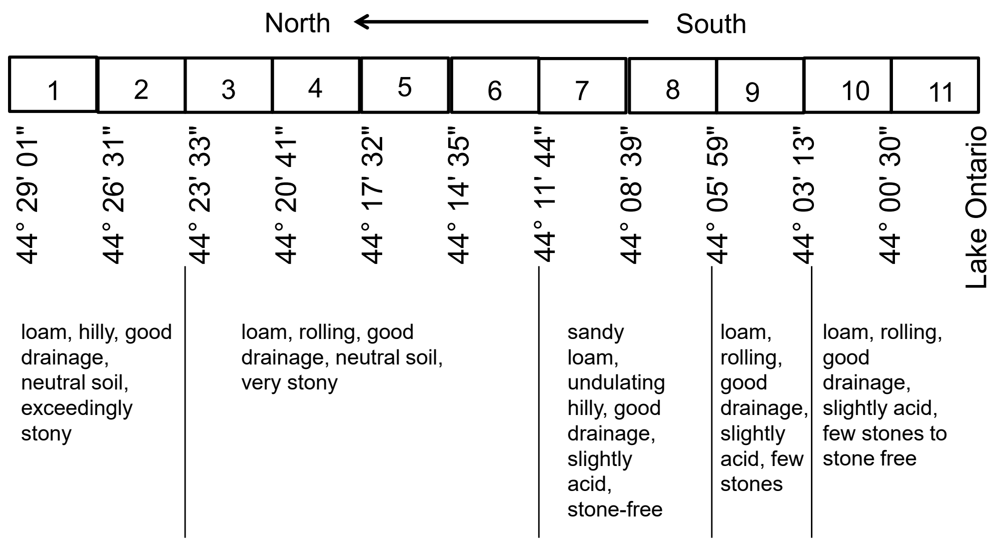

Figure 1. Latitude of the 11 map sections, showing progression of soil from rocky toward the north to fertile and few rocks to the south by the shore of Lake Ontario. This a graphical representation of the same information provided in the list of sections in Materials and Methods.

For this analysis, I plotted the ten field sizes in each map against the latitude along the northern edge of each map section (screen image). I expected that field sizes would be smaller overall toward the northern part of this transect, where the soil was more rocky. I used the exact descriptions of the soil characteristics from the map legend for this analysis. The purpose was to determine if farms in Peterborough County have smaller fields, and whether field size was related to soil characteristics, that is more rocky soil. My test statistic was Pearson's correlation.

2 Frequency distribution of feral apple trees documented in Douro-Dummer May 2023

To determine how common feral apples trees are in my study region, I drove throughout the roads in Douro-Dummer township (south on County Road 38 from Warsaw to Highway 7, and east along County Road 8 from Douro to Cottesloe) and took photographs of fencerows and hedges visible from the road. Because many fences were not clearly visible from the road, I only took photos that enabled me to see clearly the trees along parallel fences or hedges. This resulted in a set of connected photos along the length of several fences. I was able to identify apple trees as trees with blossoms. I did this three days after blossoms were first noticed on the Warsaw farm, May 14, 2023. This was prior to when hawthorn trees had blossoms and after blossoms were no longer on choke cherry trees, the other two main species of shrubs or trees that bloom at this time. I took 49 photos from 13 hedges along fences. One hedge had only one photo, the most was 6 along a single hedge. I counted the number of trees between each apple tree, and calculated the average distance between apple trees, with distance being the number of other trees. I chose Douro-Dummer for this because it was at the more northern region of the field size analyses, in the Dummer Moraine where the so8l was rocky. This was also where my main study farm was located.

Detailed Map of Warsaw farm

In order to demonstrate how abundance feral apples tress can be on a farm in my study region, I mapped the location of all apples trees greater than 2 metres tall and 10 cm diameter (breast height) on the Warsaw farm (see next section for farm details) to produce a detailed study of apple trees along their fences and hedges at this site. I used Google Earth to create the map, locating main structures on the farm including buildings, fences, and hedges. I then walked the fences and hedges to determine the location of each apple tree on that farm. This was used as an example of feral apple abundance on such farms in this region. This was the farm that I had been granted the most unrestricted access to as well.

3 What farms were used and why these farms

I collected apples from four local livestock farms (cattle or sheep) that had small fields and fencing infrastructure which included hedges and rail fences. Each of the four farms are in Peterborough County and had abundant apple trees along the wooden fences. Landowners volunteered for this project when asked by the author. I was given these names by one land owner (D. Beresford) as potential landowners who might allow me to have access to their farms for my research. These sites were chosen by access convenience, and not based on any landscape bias or characteristics other than being in Peterborough County. The farms were named by the closest settlement: Westwood farm (44°18'36"N 78°05'32"W), Warsaw farm (44°28'28"N 78°08'51"W), Millbrook farm (44°10'18"N 78°28'34"W), Douro farm (44°22'34"N 78°11'31"W).

My choice of volunteer farms was a type of convenience sampling of four volunteer land owners willing to let me onto their farms (Baker et al., 2013). While this could have inherent bias in terms of volunteerism, there is no reason to assume that the particular farm landscapes I sampled were biased as a result of the owners of these farms being willing to let me have access to their farms (Luschei et al., 2009).

At two of these farms (Warsaw and Westwood), I took photos of apples from individual trees to gain insight into how variable the trees and apples were on these farms. I used those trees that the landowners directed me to as being those they used for jelly and cider. On the Westwood farm, the landowners accompanied me and provided a range of apples to photograph from each tree. On the Warsaw site I photographed those trees that the landowners brought me to. I chose these two farms because I had been granted more access to these two farms for this work.

Making jelly

I made the different jellies according to the recipe provided on the box of commercially available packaged pectin (Certo™). The author, who had no previous experience in making jelly, made these jellies under the tutelage of an experienced jelly maker.

How apples were chosen for making the jelly

I harvested feral (wild) apples from late September and October 2023 and kept these refrigerated until making jelly in early November 2023. I chose the timing of this work and those trees the landowners suggested based on discussion with the landowners, and their knowledge of the apples on those trees being abundant on lower branches and easy to collect. On their advice, I excluded trees that produced fruit in mid to late summer, and those that had apples out of reach, difficult to access, or with only a few apples. Because I did not have any knowledge of the ancestral varieties' combinations of these feral apples, I was limited to using those apples that the landowners offered on those dates when I had access.

I made five jellies from the feral apples following the stated requests of the landowners either as a combination of apples from different trees or individual trees as follows: one jelly was produced from the Westwood farm using combined fruit harvested from 10 trees; one from the Millbrook farm from one specific tree; one jelly from one tree from the Douro farm; from the Warsaw farm two trees were used to make two jellies that were tree specific. I also made two jellies from two domestic varieties purchased from a local orchard: Ambrosia and McIntosh. These varieties were chosen based on advice from the orchardist as being the most popular varieties for jelly at that time.

4 Taste tests: Volunteers

For this study, I selected participants for the survey based on making word-of-mouth requests of people I had access to, a method commonly known as convenience sampling (Baker et al., 2013). I was not interested in inferring exact population level statistics on taste preferences from the sample group to the general population. Rather, I only wanted to find out if the jellies had different tastes that were preferred by some subset of people who were not experts. I included anyone who expressed willingness to participate at the time of testing. In this way I obtained 40 participants willing to do the taste test and survey. I approached these volunteers during assembled gatherings without prior invitation to limit the likelihood of volunteer self-selection (Elliott and Valliant, 2017) based on opinions of their own expertise or ability (Lönnqvist et al., 2007). For example, one group of volunteers was asked to participate in this survey during a meeting of a local knitting club at the Warsaw farm site, with one of the volunteers from this group chosen to conduct the survey without knowing what the purpose was other than to categorize the jellies by appearance and taste. The other groups were asked during holiday gatherings, again with a volunteer conducting the survey. The volunteer who conducted these surveys was selected by the group itself. This way I tried to avoid selecting people based on individual enthusiasm for being part of taste tests (Lönnqvist et al., 2007).

How the test was run

Each of the 40 volunteers sampled all 7 different apple jellies (5 feral and 2 domestic). I randomized the order of tasting these jellies prior to any taste tests and assigned a number to each jelly, using a random numbers generator in Excel. These jellies were presented to the volunteers in a double-blind manner by one of the volunteers. That is, to ensure that I did not interfere with the tasting, taste tests were conducted by a volunteer who looked after the taste and survey event and then collected the paper score sheets. The same random order was used in all tests, and was jar 1 Westwood (feral), jar 2 Ambrosia (domestic), jar 3 Millbrook (feral), jar 4 Douro (feral), jar 5 Warsaw jelly tree 1 (feral), jar 6 McIntosh (domestic), jar 7 Warsaw jelly tree 2 (feral).

Each participant received all 7 samples along with a score sheet to evaluate their preferences. The sampling took place over three sessions at the homes of one of the volunteers. During these sessions, participants tasted the jellies. I did not participate in these tastings, nor was I present in the tasting rooms during these events, nor was the purpose explained other than to find a preferred jelly.

What the tests were

Volunteers scored each jelly by taste, eye appeal, sourness, sweetness, overall quality or score, suggested farm gate sale price. The first five characteristics were scored against a scale of 1 to 10, with 10 being a good or a favorable score and 1 being a low or unfavorable score. I did not constrain the volunteers as to where to place their high and low scores. A suggested price was set by the volunteers based on a 10 ounce (about 295.74 ml) jar. Volunteers were also encouraged to provide comments. In these tests we used a scoring system rather than a ranking system so there could be ties, which removed this distraction from the volunteers (Mason and Koch, 1953). I used only six criteria in our scoring in order to limit judge fatigue (Avery and Masters, 1999).

Statistical analysis

I tested the scores for jellies from the farms using a Kruskall-Wallis test, using jelly number as the treatment. I also tested the overall quality (or score) of feral vs domestic jellies using a PERMANOVA test. Any scores that were missing or did not distinguish between any of the jellies were removed from these analyses. For example, if a volunteer gave the same score to all jellies in a specific category, I did not include these data in that test. All tests were conducted using PAST 4.13 software (Hammer et al., 2001). I did not compare individual tree jellies to combined tree jellies.

RESULTS

Correlation of field size and stony soil results

As suspected, there were far more fenced fields in the study region where the ground was rocky (Fig. 2) than where the soil conditions were better, and less rocky (Fig. 3). Fields on all four farms in the study region, that is the northern sections of the transect analyses, were about 4.9 acres (4.9 ac = 1.98 ha) (SD = 2.2 (0.9 ha), n = 10), whereas the fields located where there were better soil conditions about 30 km south were on average 70.7 ac (28.6 ha) (SD = 40.7 (16.5 ha), n = 10).

Figure 2. Stone field border between two fields of pasture showing remaining cedar rail fence and adventive shrubs and trees, Warsaw farm.

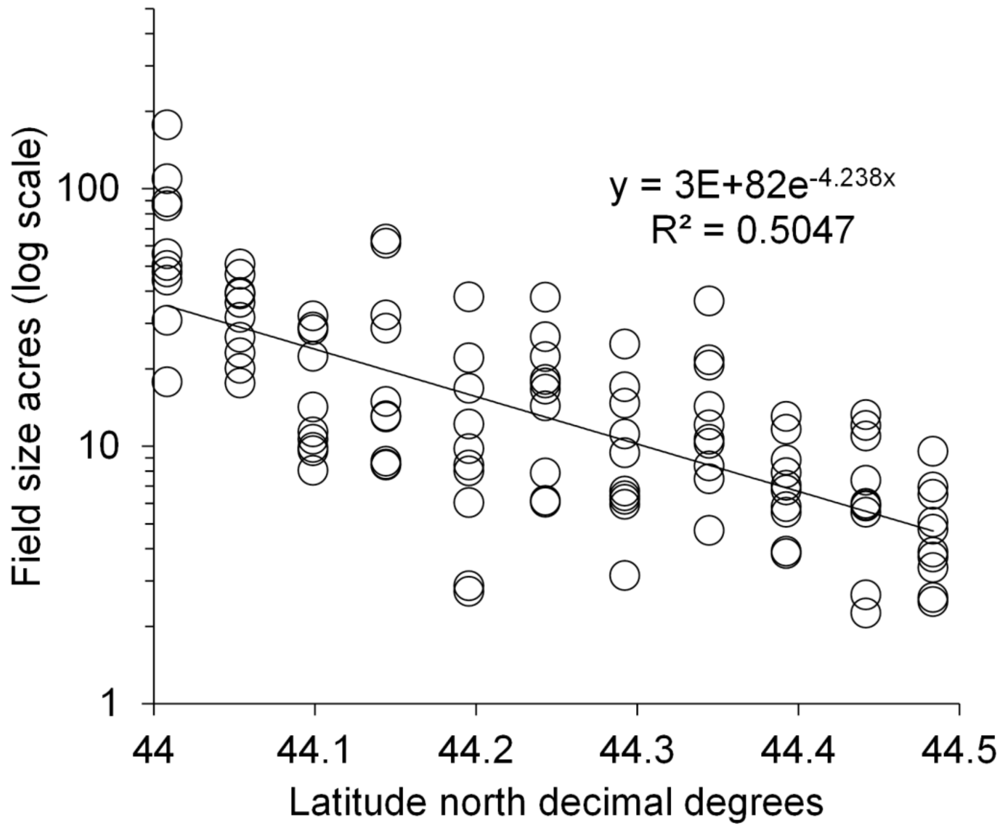

Figure 3. Field sizes located on stony ground, each circle is a single field. One acre = 0.40 ha.

In this transect, my four study farm were in the northernmost part of this transect (sections 1 to 3 in figure 1), in an area with small fields and extensive stone piles and rocky field borders (Fig. 3).

Apple tree frequency

I counted 120 apple trees in the photographs of fencerows taken from the road (Douro region, County Roads 8 and 38, Fig. 4). I found that most trees were separated by only a few other trees, with an average of 17.3 other shrubs or trees between each apple tree (SD = 24.9, Fig. 5). At the Warsaw farm, we found 45 apple trees, most along fences, but some in wooded areas as well (Fig. 6).

Apple variability on individual farms and individual trees

The feral apples found at the Warsaw and Westwood farms varied both in size (range 33 mm to 90 mm Westwood farm, 42 mm to 64 mm Warsaw farm) and colour, from yellow to dark red (Figs. 7 and 8). At the Westwood farm site, individual trees varied in terms of the size and colour of their apples, and each tree produced apples that varied in size and colour (Fig. 7). At the Warsaw site, apples varied over the individual trees (Fig. 8).

Figure 4. Apple tree blossoms along the fencerows in Douro-Dummer Township, Ontario. Photograph taken from the road May 2022.

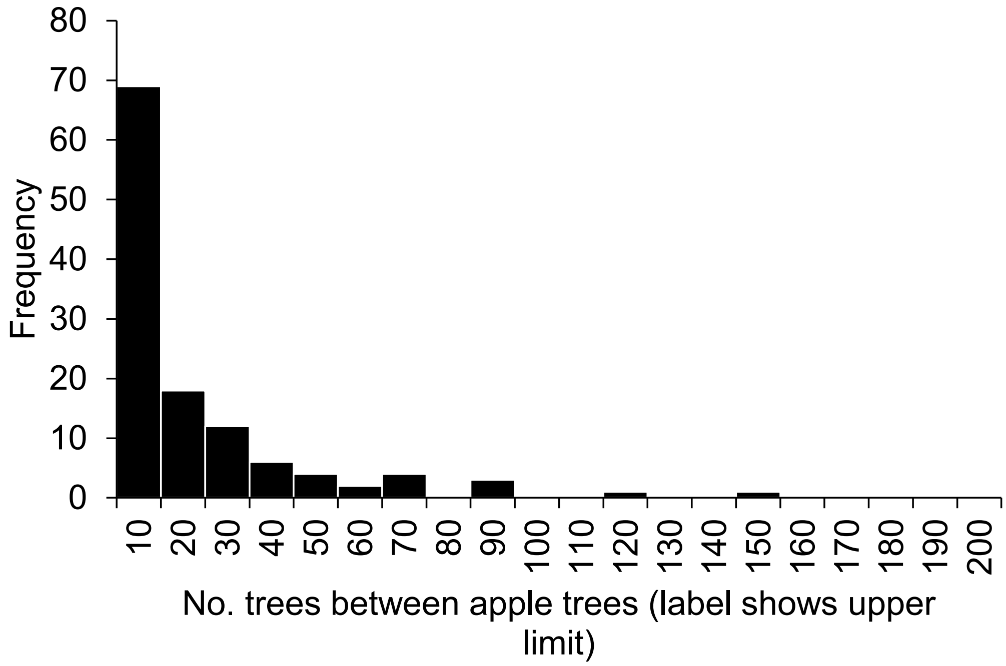

Figure 5. Frequency distribution of number of trees between feral apple trees documented in Douro-Dummer Township Ontario, May 2023. Most apple trees were located within 10 trees of each other, one fence had an apple tree that had about 150 trees between it and the next apple tree.

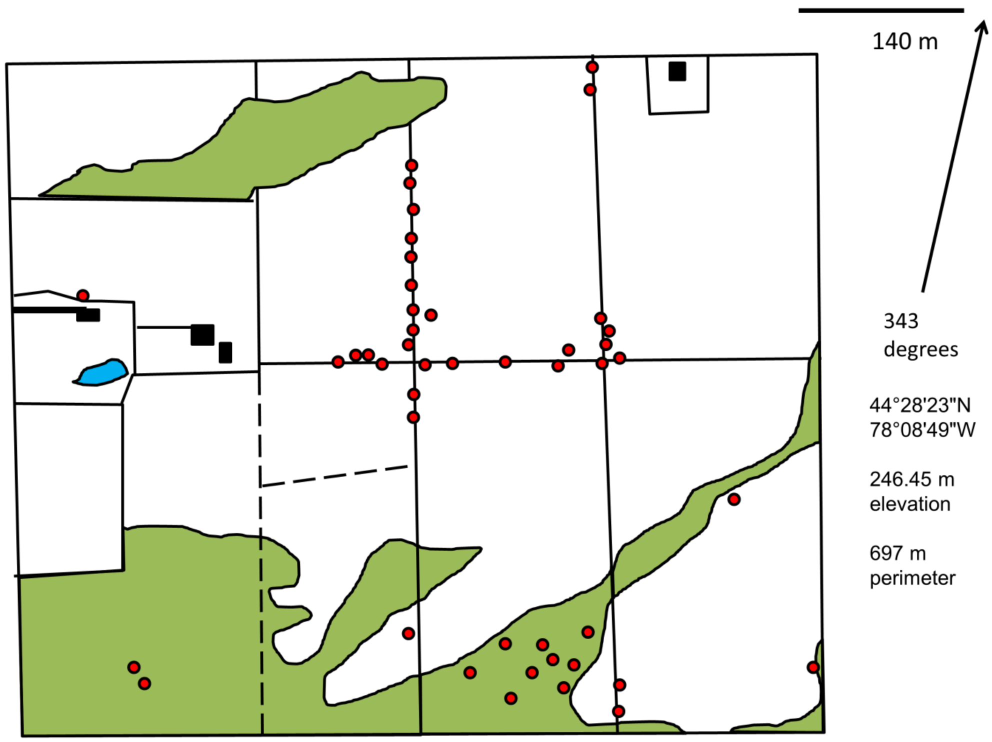

Figure 6. Feral apple tree locations Warsaw farm 2024. The green shaded section is woodland. Dotted lines are hedges that no longer have the wooden fences, solid lines are hedges and wooden rail fences. Blue is a pond.

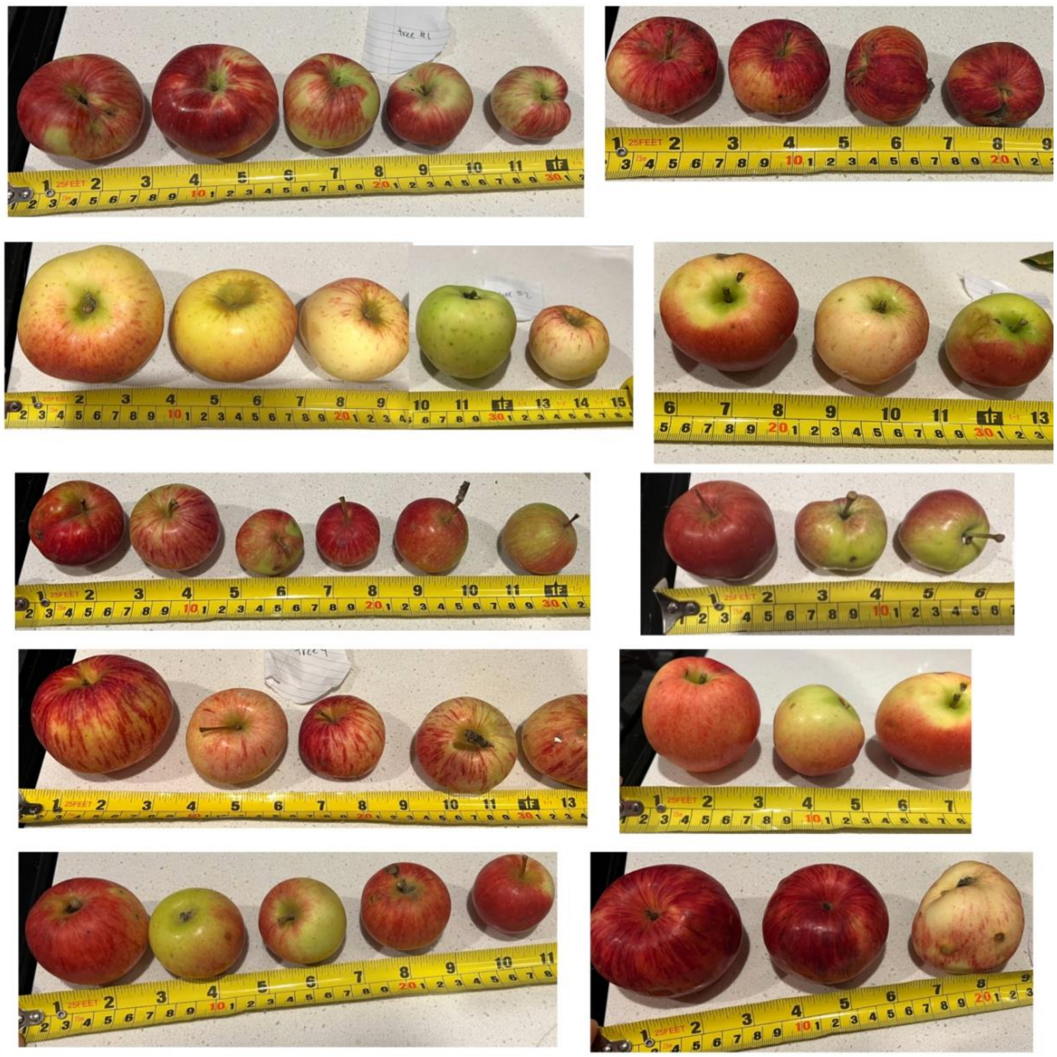

Figure 7. Apples from 10 feral apples trees, Westwood farm site, showing the size and colour range of apples from the same tree. Each individual photo is from a single tree.

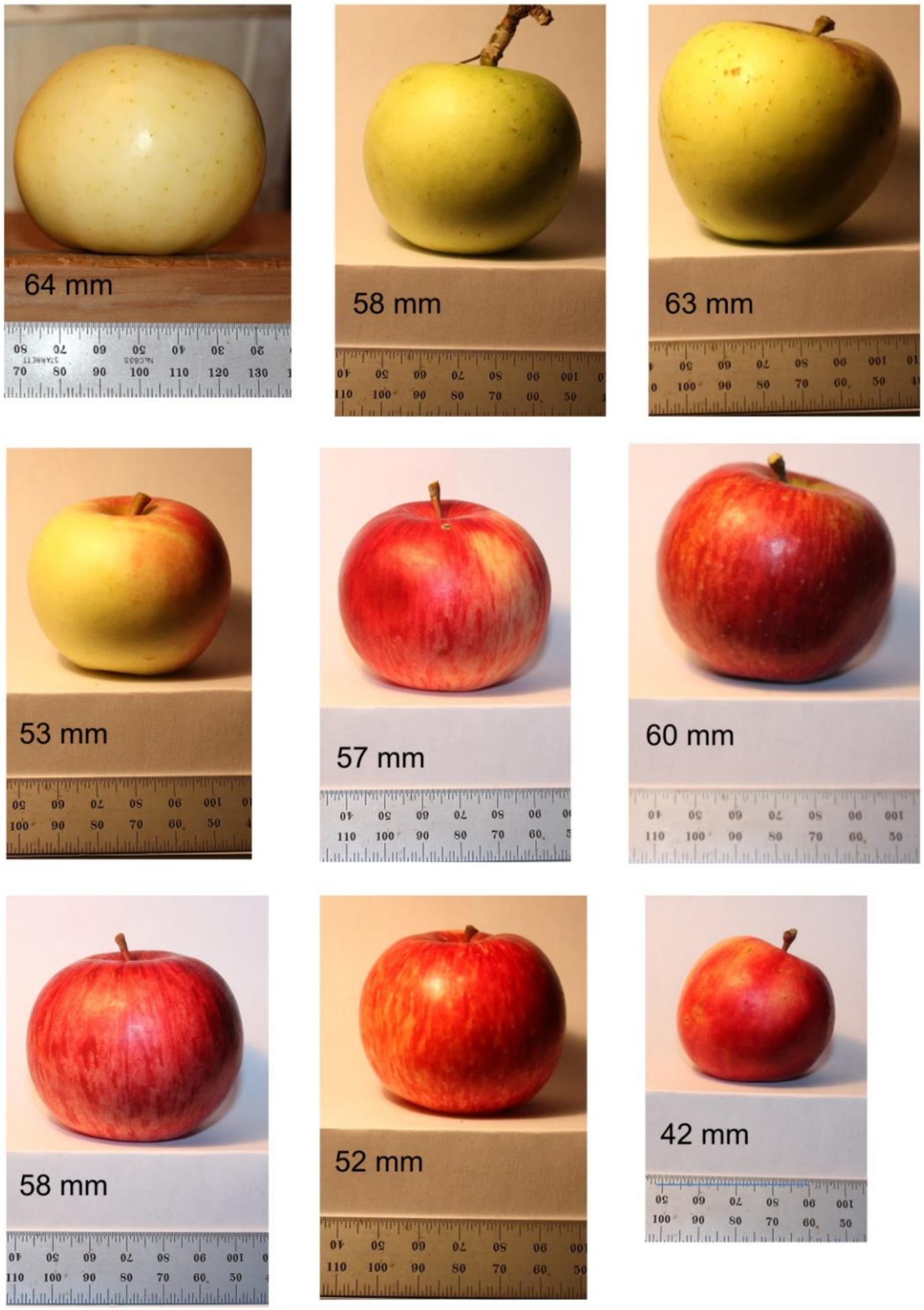

Figure 8. Apples from 9 feral apples trees, Warsaw farm site, showing the range of colours and sizes of wild or feral apples produced on the hedgerow apple trees at this farm. Since these are descended from some unknown ancestors, each tree is unique combination of the parent strains or varieties.

Jelly preferences

The jellies made from feral apples (for example figure 9) were preferred more compared to jellies made from the two commercial cultivars (overall score category: pseudo-F = 2.45, $p = 0.046$, $n = 35$, 2 groups, total sum of squares = 531.7, within groups sum of squares = 356.7). This was reflected in the higher scores of feral jellies based on taste and eye appeal (Tables 1 and 2). Curiously, there was no difference between feral and commercial apple jellies regarding sweetness, sourness (Table 2). Nor did the suggested farm gate sale prices differ between feral or domestic jellies (Table 1), the overall mean of all 7 jellies being $7.93.

Most comments were favorable (but not all!), the following being typical:

"They are all unique."

"They were all delicious and I believe they would all sell for a good price, meaning not too expensive."

"Sample 7: Eye appeal, texture, sweetness all blended well together." (Note, 7 was made from feral apples from a single tree.)

"Overall, more color was more appealing."

"Watery texture was NOT (their emphasis) appealing 2,4,6." (Note, 2 and 6 were made from domestic apples.)

"They all tasted great! Very sweet, tasty!"

"All the jellies are delicious; some remind me of the crab apple! Jelly my mother made years ago from crab apples picked on the family farm."

"Very good, full of flavor, better than store bought."

“They are all unique. I don't know which ones are made with wild apples. They were all delicious and I believe they would all sell for a good price."

Figure 9. Jelly (sample no. 7) created from feral apple trees at the Warsaw farm site.

Table 1. Means (S.E.) of trait scores for 7 jellies (numbered 1 to 7), each was scored out of 10. Five jellies were from feral of wild apples on farm fencerows (1, 3, 4, 5, 7), 2 were made from domestic varieties (2, 6). Jellies differed by 3 traits: eye appeal, taste, and overall assessment; but did not differ by price, sweet taste, or sour taste. The sample size was 40 participants.

Trait	Feral					Domestic	
	Westwood (1)	Millbrook (3)	Douro (4)	Warsaw (5)	Warsaw (7)	McIntosh (6)	Ambrosia (2)
eye appeal	7.53 (0.23)	5.74 (0.29)	7.00 (0.25)	8.41 (0.22)	8.81 (0.18)	5.44 (0.39)	6.30 (0.37)
taste	8.01 (0.19)	6.90 (0.23)	7.25 (0.24)	7.36 (0.27)	7.93 (0.27)	6.58 (0.31)	7.14 (0.26)
overall	7.93 (0.21)	7.01 (0.22)	7.25 (0.24)	7.54 (0.25)	8.21 (0.23)	6.54 (0.34)	6.96 (0.33)
price	8.30 (0.39)	7.59 (0.37)	7.54 (0.45)	7.97 (0.34)	8.81 (0.19)	7.39 (0.39)	7.92 (0.34)
sweet	7.78 (0.21)	7.03 (0.30)	7.70 (0.31)	7.05 (0.33)	7.63 (0.28)	6.80 (0.37)	6.83 (0.45)
sour	1.95 (0.30)	2.13 (0.35)	1.93 (0.36)	2.47 (0.34)	2.01 (0.31)	2.00 (0.33)	1.84 (0.34)

Table 2. Kruskal-Wallis results for jelly traits based on 40 taste test surveys. Bonferroni corrected alpha values are 0.05/6 = 0.0083.

Trait	Kruskal-Wallis	
	H	p
eye appeal	94.87	<0.001
overall	29.48	<0.001
taste	24.41	<0.001
price	13.13	0.029 n.s.
sweet	6.88	0.31 n.s.
sour	3.37	0.74 n.s.

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DISCUSSION

In this chapter, I set out to address four objectives: 1) determine if field sizes are smaller and with more fences on farm in rocky soil, 2) quantify apple tree abundance on fences and hedges on farms located on the rocky soil of the Dummer Moraine; 3) learn how to make feral apple jelly as a re-skilling exercise from local farms; 4) test whether people preferred jelly made from feral apples.

Field size on farm on rocky soil

The farms in the northern section of the transect had smaller fields, with these fields defined by having fence or hedge boundaries, than farms in good, fertile, more or less rock free soil. This process of increasing field sizes to take advantage of modern equipment and methods has been happening across Ontario for the past fifty years (see detailed discussion in Archer et al. 2025), with the original field defined by a largely horse-powered agricultural methods. With the accumulation of rock piles and field borders, removing these rocky border is far more labour intensive, and thus expensive than simply removing fences to increase field size. As a result, many farms in the rocky soil of the Dummer Moraine still have these original field borders, anecdotally defined by how farm a farmer was willing to carry stones from the middle of a field.

It is on these fences that adventive hedges arrive, including feral apples planted by wildlife, and descended from previous generations of heritage varieties (Cronin et al. 2020). Indeed, apple trees abound on these fences and hedges, occurring on average about every 17th tree, with at least 45 large apple-bearing tree on the Warsaw site, and with many smaller (less than 1 m high) trees located throughout the pasture. The ancestral varieties of these trees are largely unknown. Government scientists in the early part of the 20th century recommended that farms in the central part of southern part of the province north of Lake Ontario plant, "Duchess, Gravenstein, Alexander, Fameuse, McIntocsh, Greening, Baldwin, Spy, Ben Davis, Stark" (Ontario Department of Agriculture Fruit Branch 1914, p 12). Of these, Alexander, Duchess, Fameuse, Gravenstein, Greening, Stark were recommended based on their hardiness, disease resistance, cold and drought resistance, and their ability to grow in poor soil, especially "for the north, there are a number of varieties, mostly of Russian origin," (Ontario Department of Agriculture Fruit Branch 1914, p 8), with both Duchess and Fameuse most commonly suggested in terms of hardiness. It is likely that the feral apple trees used in this study include both varieties in their ancestry.

Volunteers, convenience sampling, and interpretation

A difficulty with my method of choosing volunteers, that is convenience sampling, is that it does not represent a random sample of the population, preventing direct inferences of population parameters from the sample parameters (Stratton 2021). In this study, my purpose was not to infer to the population level statistical preferences for feral apple jelly, but to determine if feral apple jelly, whether from one or several trees, produced diverse tastes, and if these were qualitatively different than jelly made from the commercial apples. While I cannot infer that the general population would have the same proportional preferences as the volunteers, this was not the intent in this survey of volunteer taste preferences. All surveys have interpretive bias (Lamm and Lamm 2019), and knowing the bias associated with social groups in surveys such as this one enables researchers to correctly interpret the applicability of such results (Lamm and Lamm 2019). In my case, I wanted to find out if there was potential for feral apple jelly to be preferred by some segment of the general population compared to domestic apple jelly. While it is difficult to see how members of a knitting group or holiday gathering could have biased jelly preferences in this study, any bias in favor of feral apple jelly in the volunteers in terms of taste preferences is not evidence against there being a market for such jelly. Nor does sampling bias suggest that in the larger population feral apple jelly has little to no potential as a farm gate sales resource in contrast to my study results.

I recognize that members of groups accessible by the author could very well have specific taste biases. However, as a group, these taste biases still represent a market of those who are likely to buy products at farm gates. To quantify how big such a market is would require regionally specific surveys using random selections of the public with each conducted on much larger scales than this study. For similar reasons, I did not use expert judges trained in apple flavors (Hampson et al. 2000), because I wanted to know if there was a possible market for feral apple products discernable by untrained tasters.

Indeed, I found that people preferred the feral apple jellies far more than jelly made from the two cultivated commercial varieties that were used for the comparisons. While this was consistent with what was expected from anecdotal or hearsay evidence, this study provides quantitative evidence for this preference in terms of taste and appearance.

There could be other cultivars that produce better tasting jelly than the feral jellies I used in this study. But, producing the best jelly was not my goal. Rather, that home-made feral apple jelly made by a newly skilled novice jelly maker can taste good, which I demonstrated.

The suggested prices did not differ between feral and the two commercial apple jellies, suggesting that there was less variability in price than in the taste. The suggested price of the feral apple jelly in a 10 ounce jar was $8.00, double the price of apple jelly that can be purchased in large grocery stores, and at about the same price differences seen in other studies aiming to market comparable products (Ohmart 2003).

I am not intending that this would be a significant economic part of any farm operation, compared to selling eggs, honey, or maple syrup, all of which would almost certainly provide more income. Rather, such products as feral apple jelly would be significant in terms of adding to the culture of a family farm and the surrounding community (Archer et al. 2025).

One interesting aspect of our study is that the author made the product having had no previous experience in making jelly, jam, or preserves. This was accomplished under the tutelage of an experienced jam and jelly maker. This experience reflects a more general trend of many common food preparation skills disappearing from many North American communities, and the concomitant desire on the part of many of the deskilled to become reskilled (Slater 2013).

While the underlying purpose in conducting this study was to find out if feral apples might play a role in encouraging farmers to see existing fences and hedges as an economic benefit, I do not propose that there is enough economic potential in selling apple jelly alone. The purpose was simply to add this item and others like it to the growing list of economic benefits that diverse habitats provide for producers (McNeely 1988). That is, in addition to indirect economic gains from hedges by providing habitat for native pollinators (McNeely 1988) and predators of insect and mammalian pests (McNeely 1988), I wanted to identify a more direct additional economic and thus cultural benefit, especially for small producers on marginal land typical of (but not exclusive to) much of eastern, central and northern Ontario (Smith 2015), such as those farms found across Peterborough and similar counties.

My findings are not limited to apple jelly *per se*. Trees and shrubs on fencerows and hedges could also provide a harvestable abundance of apples for cider (Garcia 2014), wild grape products, and products from other fruit trees and shrubs common in the region (Garcia 2014). What I was able to demonstrate is that food made from feral apple products has the potential to provide unique tastes specific to individual trees, or combination of trees on individual farms due to the mixed ancestry of these feral trees (Cronin et al. 2020). I think that this can be used to peak consumer interest in unique farm-specific products (Diamond and Barham 2011, Archer et al. 2025).

I expect that jelly made on each farm would need to be customized by the contribution of apples from each tree which producers could determine by a trial-and-error testing of different combinations. The goal was not to produce the best jelly in our tests, but to test whether jelly made from apples was distinctive, and if there was enough variability for potential unique flavors.

Conclusion

The frequency of apple trees in the area supports the idea that farmers can use feral apple trees as an economical resource, as well as providing important ecological functions in supporting local wildlife such as pollinators, birds and small mammals by providing food and habitat. The field size analysis helped me quantify the favorable habitat for feral apple trees across the sample area. The results indicate smaller field sizes of the farms in rocky soil, defined by wooden fences and the subsequent hedges, provides such habitat for woody shrubs and trees such as feral apple trees. I think that finding economic value in this habitat will help to protect this habitat for plant and animal wildlife.

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CHAPTER 4

Title: Conclusion, At a community scale, fencerows and feral apples are an ecological, biodiversity, and economic resources

Hedgerows can be an important resource in rural landscapes. Hedgerows do not exist in insolation from agriculture - they are an integral part of the agricultural systems they are associated with (Burel, 1996). They can act as biodiversity corridors; help control pests or pollinate crops, and can even have historical and/or cultural significance. In their simplest and most common form, hedgerows are field and farm boundaries, and are typically arranged as rectangular structure across the landscape (Burel, 1996).While the scope of this study was to look at wild apples growing along fencerows, my underlying purpose was to find out if apples growing wild along fences and hedges might provide some economic benefit as a kind of umbrella species for the wildlife that depends on such fences and hedges across much of Peterborough County. To do this, I first needed to identify knowledge gaps in terms of feral fruit trees found on farms. This was the basis of my literature review chapter at the beginning of this thesis. This review was needed to identify the gaps in our understanding of the ecological role that hedges and fences play on Peterborough farms, their conservation value, and historical context. This review also enabled me to speculate on the possible direct product benefit of the apples growing wild on local farms. For this, I identified the most likely reason such fences and hedges are viewed as sources of disease and pests, in contrast to more recent ecological evidence that such hedges are actually sources of natural farm services such as habitat for the predators of farm pests, and habitat for pollinators. I also first speculated, and then demonstrated, that such fences are still present in Peterborough County on farms with small fields, largely due to such farms being on rock ground compared to other parts of the province. That is, fence removal under such condition can be more expensive, carrying the additional cost of digging out rock piles in order to increase the amount of low quality topsoil, and thus less likely to have happened on central Ontario farms such as those in Douro-Dummer Townsip compared to farm in areas of good topsoil and few rocks (the field size and soil conditions analysis).

This led me to wonder if the wild apples in these hedges might be presented in such a way as to encourage producers to view them as assets. That is, could these feral apples be reframed as economic benefits? The pursuit of this goal was the substance of my second chapter. To achieve this, I needed to do five things: first, to quantify whether there were more hedges and smaller fields on Peterborough farms compared to more fertile regions of Ontario; second, determine how abundant such feral apples trees are across Douro-Dummer township; third, quantify variability of feral apples; fourth, determine the abundance of feral apple trees on fences and hedges; fifth, the taste of jelly made from feral apples and domestic apples.

In the past, wild apples were often looked as undesirable and inferior to cultivated apple varieties (Ontario Department of Agriculture Fruit Branch 1914). Being small, tart, and less palatable compared to the larger and sweeter cultivated apples in orchards such as ambrosia and Macintosh, wild or feral apples were seen as weeds, and if used at all, they were used for making cider or preserves largely motivated by thrift (Canada Food Board 1918) rather than eating them fresh or using them for high end specialized products (Luton 2016). Despite their usefulness to thrifty homeowners, feral apples continue to be an underused resource in local food systems, I could not find feral apples included in any government statistics associated with agriculture for Ontario.

It is the main theme of my thesis that feral apple importance could increase with the growing awareness and emphasis on local food systems and wild and heirloom apple fruit and vegetables (Goland and Bauer 2004). With this shift towards local foods, feral wild apples have gained some recognition for their unique flavors and potential culinary uses. Their tartness and complex taste profiles have attracted the attention of chefs, food enthusiasts, and cider makers who appreciate their locally distinct qualities (Brennan 2019). From an ecological standpoint, it is known that wild fruit is food for wildlife including birds and mammals, and contributes to biodiversity and conservation efforts (McCarty et al. 2002).

I then demonstrated that there are people who prefer feral apple jelly to jelly made from domestic apples, and that there is a wide diversity in feral apples, consistent with being cross bred offspring of heritage and extinct varieties (Cronin et al. 2020). This required me learning how to make apple jelly, which required that I lean as a new skill what was once a common skill across much of Canadian society (Slater 2013).

In sum, the importance of my work was to hopefully encourage a reassessment of the wild hedges on local farms as an economic, community level resource, that integrates both biodiversity benefits and economic benefits. I hope I have provided a link between sustainability, self-reliance, reskilling at the local harvest level, connecting the natural environment with food security and sovereignty, and depending on cultural knowledge. That is, I hope I have provided evidence for an integrated approach to small farm resilience.

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