



## PACIFIC BIRDS HABITAT JOINT VENTURE

# Fraser River Delta

## Summer Agricultural Crop Survey

### Change Analysis of Wildlife-Compatible Crops 1997 - 2021



*Photo Credit: ©Ducks Unlimited Canada*



AUGUST 2025

## Partner Organizations of the Pacific Birds Habitat Joint Venture (British Columbia)



Environment and  
Climate Change Canada  
Canadian Wildlife Service

Environnement et  
Changement climatique Canada  
Service canadien de la faune



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Southeast-facing view of the Fraser River Delta crop fields and tidal flats/©Ducks Unlimited Canada

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## TERRITORIAL LAND ACKNOWLEDGEMENT

The Pacific Birds Habitat Joint Venture (PBHJV) acknowledges that the lands on which we work are the traditional lands of many different Indigenous nations across British Columbia. The act of acknowledging these lands, and the signed treaties where applicable, is an act of reconciliation with Indigenous peoples and an expression of respect and gratitude for the land. This action is to remind us that our places of work, where we live and where we gather, are on the traditional lands of First Nations, Inuit and Métis people who historically resided here and still presently do. It is also a recognition that all of us are accountable to these relationships on a daily basis. The aims of the PBHJV involves the conservation, protection and enhancement of wildlife and habitat that directly impacts Indigenous communities. We acknowledge the need for meaningful consultation with Indigenous communities throughout the implementation of this plan.

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## LIST OF ACRONYMS

ALR	Agricultural Land Reserve
BC	British Columbia
CWS	Canadian Wildlife Service
DFWT	Delta Farmland & Wildlife Trust
DUC	Ducks Unlimited Canada
FRD	Fraser River Delta
PBHJV	Pacific Birds Habitat Joint Venture
US	United States

## Abstract



**Figure 1:** Waterfowl taking off from a crop field during winter in Delta, B.C.  
[Photo Credit: Tim Fitzgerald/©Ducks Unlimited Canada]

The farmland in the Fraser River Delta is an important habitat for internationally significant populations of wintering and migrating birds. Pasture, hay, grain, and vegetable fields provide winter foraging opportunities to ducks, geese, swans, and shorebirds, in the form of seeds, culled vegetables, grass, roots, and insects.

For over 25 years the Canadian Wildlife Service, Ducks Unlimited Canada, and the Delta Farmland & Wildlife Trust have been funding farmland stewardship programs to support local farmers in planting wildlife-compatible crops on a short and long-term basis through payments

for ecosystem services. Stewardship projects include winter and summer cover crops, grassland set-asides, forage enhancements, naturalized field margins, hedgerows, and a blueberry field rest program. The purpose is to promote foraging opportunities for wildlife while helping to offset losses from damaged crops and fields.

To support these programs, crop surveys have been conducted since 1992 to track trends in the quantity of wildlife-compatible crops across the Fraser River Delta study area (11,423 ha). Between 1997 and 2021, there has been a substantial increase in the proportion of the study area that is not farmable (greenhouse structures and use outside agriculture), from 33% to a little over 42%. Similarly, the area occupied by greenhouse structures and associated parking lots increased 459% from 53 ha to 297 ha. The percentage of the study area consisting of wildlife-incompatible crops increased by over 3 times from 3.3% to 11.6%. The total hectares in wildlife-compatible crops declined by almost 1,300 ha or 21%. When wildlife-compatible crops are combined with uncultivated fields, the proportion of the study area that had, or potentially had wildlife values declined from 59% to 46%.

The trends noted in this report indicate a need for a new funding model that recognizes the ecosystem services that wildlife-compatible farming provides. These services benefit not just waterfowl and shorebirds, but increasingly other migratory birds such as aerial insectivores (i.e., Barn Swallow) that are in steep decline in North America, and other Species at Risk (i.e., bats and insect pollinators). Other services include enhancing soil health and carbon storage. With greater funding, the design and delivery of farmland stewardship programs can be enhanced and expanded in order to reverse the current trends and increase the associated benefits for people and wildlife.

## Introduction

Since 1992, crop surveys have been conducted mid-summer on the farmland of the Fraser River Delta (FRD), near Vancouver, British Columbia (**Figure 3**). Originally developed and conducted by Agriculture and Agri-Foods Canada for their pest management research program, it has since been coordinated by Ducks Unlimited Canada (DUC) in partnership with the Canadian Wildlife Service (CWS) of Environment and Climate Change Canada and the Delta Farmland & Wildlife Trust (DFWT).



**Figure 2:** Field enrolled in the DFWT Grassland Set-Aside Stewardship Program in Delta, B.C. [Photo Credit: DFWT]

The partners committed to the maintenance of this mapping program in order to track trends in the total farmable area, and the availability of wildlife-compatible crops (vegetables, grass and forages, and grains), particularly farmland within the City of Delta study area (**Figure 3**). While monitoring the conversion of farmable land to non-farmable land categories provides critical insight into habitat loss, it's equally imperative to assess the dynamic changes occurring within the remaining farmable area because not all agricultural lands and crops offer the same habitat and forage values for wildlife. These statistics are used in updating carrying capacity models for waterfowl wintering in the FRD. The delta supports the highest densities of waterbirds, shorebirds, and raptors in Canada in winter<sup>1</sup> and is a key conservation target of the Pacific Birds Habitat Joint Venture (PBHJV).<sup>2</sup> Pasture, hay, grain, and vegetable fields all provide winter foraging opportunities to ducks, geese, swans, and shorebirds in the form of seeds, culled vegetables, grass, roots, and insects. These fields, particularly grass and forage, also support Barn Owl, Short-eared Owl, and Great Blue Heron that feed on high densities of Townsend's Vole. In addition to tracking the availability of wildlife-compatible crops, the partnership has also been tracking the trends in the total farmable area. Therefore, up-to-date carrying capacity models are essential for informing PBHJV partners (including DUC, CWS and US wildlife conservation agencies) of trends in waterfowl habitat that might impact their populations in the Fraser River Delta and the broader Salish Sea region (**Figure 4**).

<sup>1</sup> Butler, R.W. & Campbell, R.W. (1987). *The Birds of the Fraser River Delta: Populations, Ecology and International Significance*. Occasional Paper No. 65, Canadian Wildlife Service, Delta. [https://publications.gc.ca/collections/collection\\_2018/eccc/CW69-1-65-eng.pdf](https://publications.gc.ca/collections/collection_2018/eccc/CW69-1-65-eng.pdf)

<sup>2</sup> Pacific Birds Habitat Joint Venture (2021). *The PBHJV Implementation Plan 2020-2030*. <https://pacificbirds.org/wp-content/uploads/2022/01/PBHJV-ImplementationPlan-jan14.pdf>

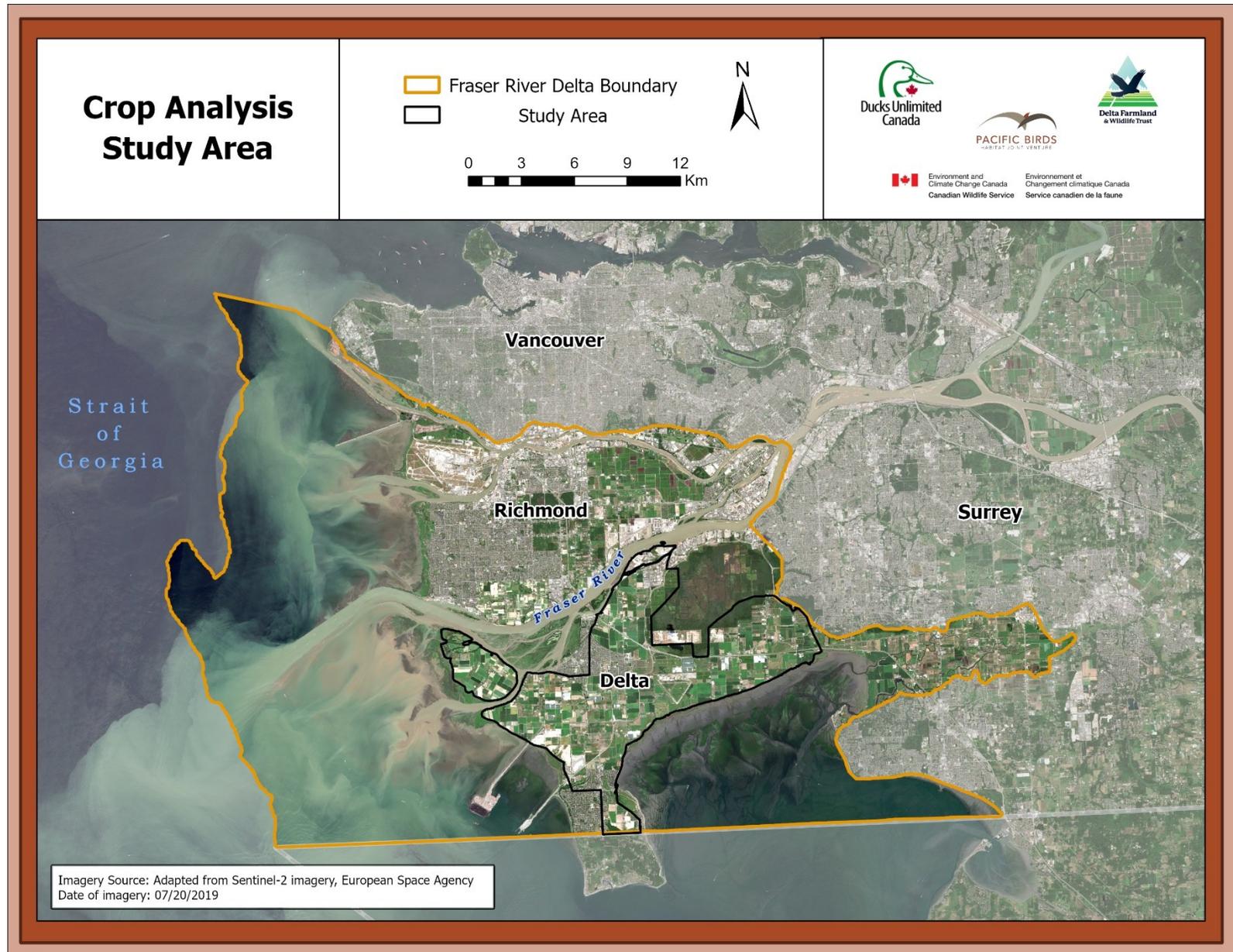


Figure 3: Crop survey analysis study area

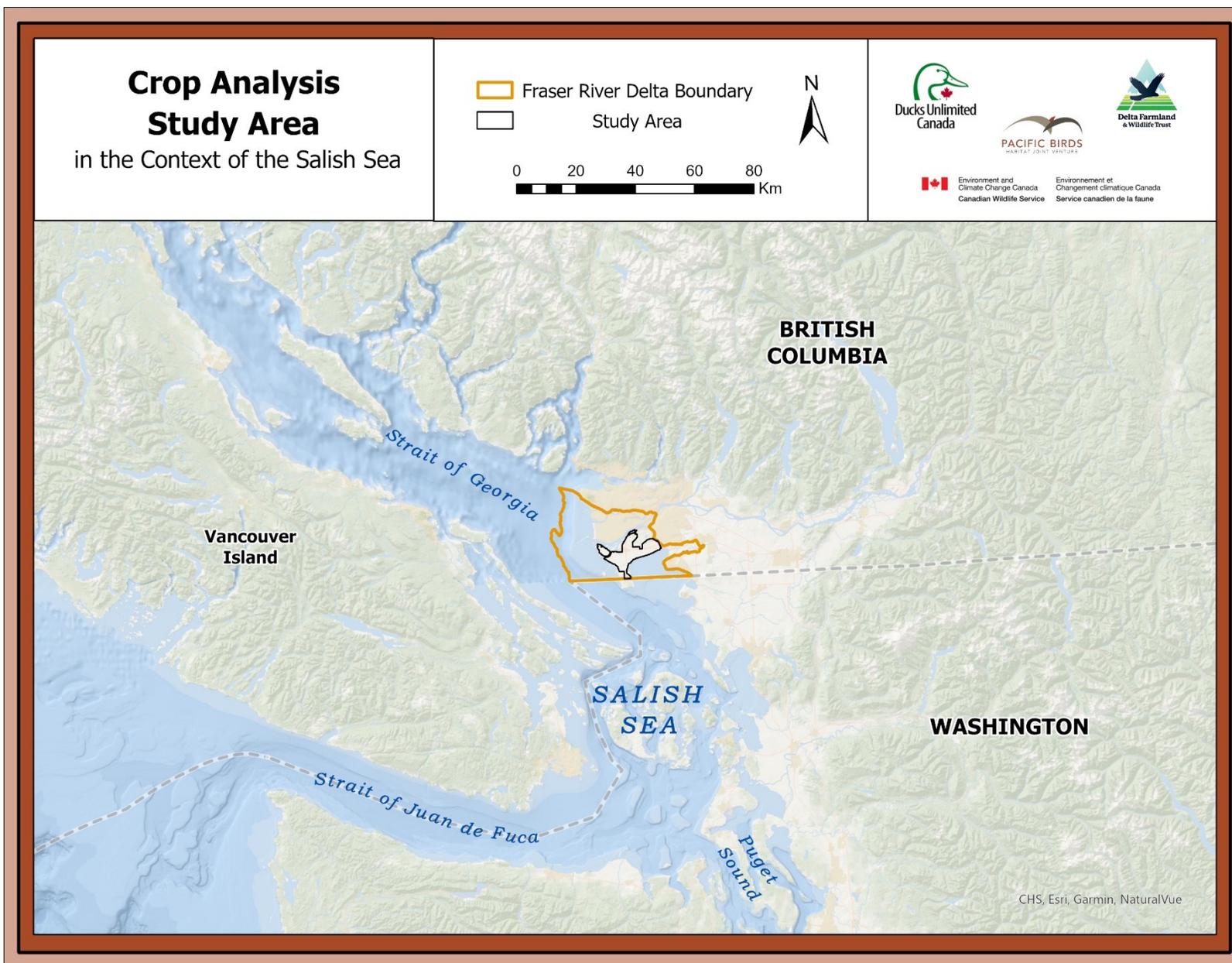


Figure 4: Study area in the context of the Salish Sea.

## Methods

The partnership maintains a spatial dataset of **permanent farm field** boundaries, within which **crop type** data is collected mid-summer on an annual or biannual basis. **Permanent farm fields** include only the farmable area (i.e., excluding pavement and buildings) and are typically separated by fences or ditches. This spatial dataset tracks the farmable area to quantify the conversion to non-farm uses such as road widening, greenhouses, golf courses, new housing, parking lots, industrial developments, and commercial buildings. The dataset does not distinguish between sustainable and conventional farming practices. As a result, the findings represent overarching trends in the study area and may not fully capture the nuanced differences in wildlife impacts between farming practices.

<b>Crop Type</b>	<b>Definition</b>	<b>Wildlife-Compatible</b>
<b>Vegetable</b>	Agricultural field where vegetables are being grown (i.e., corn, carrots, potatoes, etc.)	Yes
<b>Grass/forage</b>	Agricultural field where grass or forage is grown (i.e., Grassland Set Aside, pasture, alfalfa, etc.)	Yes
<b>Grain</b>	Agricultural field where grain is being grown (i.e., wheat, barley, oats, etc.)	Yes
<b>Berry/small fruit</b>	Agricultural field where berries or small fruit are being grown (i.e., blueberries, cranberries, strawberries, etc.)	No
<b>Orchard</b>	Agricultural field where orchard crops are being grown (i.e., fruit, nuts, etc.)	No
<b>Nursery Crop</b>	Agricultural field where nursery crops are being grown (i.e., Christmas trees, ornamental, etc.)	No
<b>Greenhouse</b>	Land where one or more greenhouse structures and their associated parking lots have been built	No
<b>Wildland</b>	Land that has either never been altered in any way or land that has been used for farming in the past, but has been left untouched for many decades	Yes
<b>Uncultivated</b>	Agricultural field where no crops are currently being actively grown (i.e., fallow land, crop residue, refuse, weedy, etc.)	Potentially*
<b>Use Outside Agriculture</b>	Land being used in the study area for purposes outside of agriculture (i.e., industrial land, golf courses, etc.)	No

\*Uncultivated fields may be compatible with wildlife depending on their subtype. Since field surveyors were not always able to identify crop subtypes, the Uncultivated crop type is considered potentially compatible with wildlife.

One or more **crop types** can occur within a single **permanent farm field**, with **crop types** potentially changing between years and even within years. This pattern of constant crop rotation can be challenging to track. It is important to recognize that the crop data provided in this report represents only a snapshot of the **crop types** and distribution that existed in mid-summer when surveys were completed. Crop surveys involve surveyors driving the roads and assigning a crop type to all or a portion of each permanent farm field. The **crop type** classification was originally developed by Agriculture and Agri-foods Canada, which includes these main types (**Vegetable, Grass/forage, Grain, Berry/small fruit, Orchard, Nursery Crop, Greenhouse, Wildland, Uncultivated, and Use Outside Agriculture**) (Table 1). Wildlife-compatible crops include **Vegetables, Grass and Forage, and Grain**. Wildlife-incompatible crops include **Berries/small**

**fruit, Orchard, and Nursery Crops. Uncultivated** fields are considered to have the potential to support wildlife-compatible crops. If the **crop type** could not be identified on site, follow-up inquiries were made with local farmers and partners.

Although crop surveys were conducted for many years and included parts of Richmond and Surrey, this report focuses exclusively on the years 1997, 2002, 2009, 2017, and 2021 within the study area footprint only (**Figure 3**). Orthophotos, Google Earth historic imagery, and Google Street View were used to manually interpret aerial photos for specific target years and surrounding periods.<sup>3</sup> This reassessment standardized the five target years by ensuring spatial alignment, consistent **crop type** identification, and filling data gaps caused by limited visibility or harvest dates. Additionally, the extent of greenhouses and their associated parking lots and buildings were also mapped for each of these five years. Finally, the overall farmable area in the study area for the years 1997 and 2021 is tracked through the category **Use Outside Agriculture** along with the **permanent farm fields**.

## Results

### Trends in Farmable Area

Using the **permanent farm field** boundaries dataset, it is possible to track the changes in the size of the farmable area footprint within the study area. The farmable area excludes land covers such as roads, golf courses, large houses, structures, parking lots, industrial developments, and commercial buildings which are collectively called **Use Outside Agriculture**. For the purposes of this report the farmable area also excludes **Greenhouses** which are tracked separately.

This study area totals 11,423 ha. Between 1997 and 2021 the farmable area within the study area shrank as the non-farmable proportion (categorized as **Use Outside Agriculture** and **Greenhouses**) significantly increased from 33% to over 42% (**Table 2; Figure 5**). Similarly in that same period, the area occupied by greenhouse structures and their associated parking lots increase 459% from 53 ha to 297 ha (**Figure 6**). Notably, over 14 ha of **Use Outside of Agriculture** were converted to **Greenhouses** between this period.

**Table 2. Summary of changes in farmable area from 1997 and 2021**

	1997 (ha)	1997 (%*)	2021 (ha)	2021 (%*)	Percent Change (%)
Farmable Area	7,080.4	62.0	6,558.5	57.4	-7.4
Non-Farmable Area**	3,759.5	32.9	4,855.2	42.5	+29.1
Wildland	588.8	5.2	13.4	0.1	-97.7
<b>Total Study Area (ha)</b>	11,423.4	-	11,423.4	-	-

\*These values are shown as percentages of the total study area

\*\*For the purpose of this report, Greenhouses and Use Outside Agriculture are considered non-farmable types

<sup>3</sup> Google. (2021). *Fraser Lowland*. Available at: <http://maps.google.co.uk> (Accessed: Jan 2022).

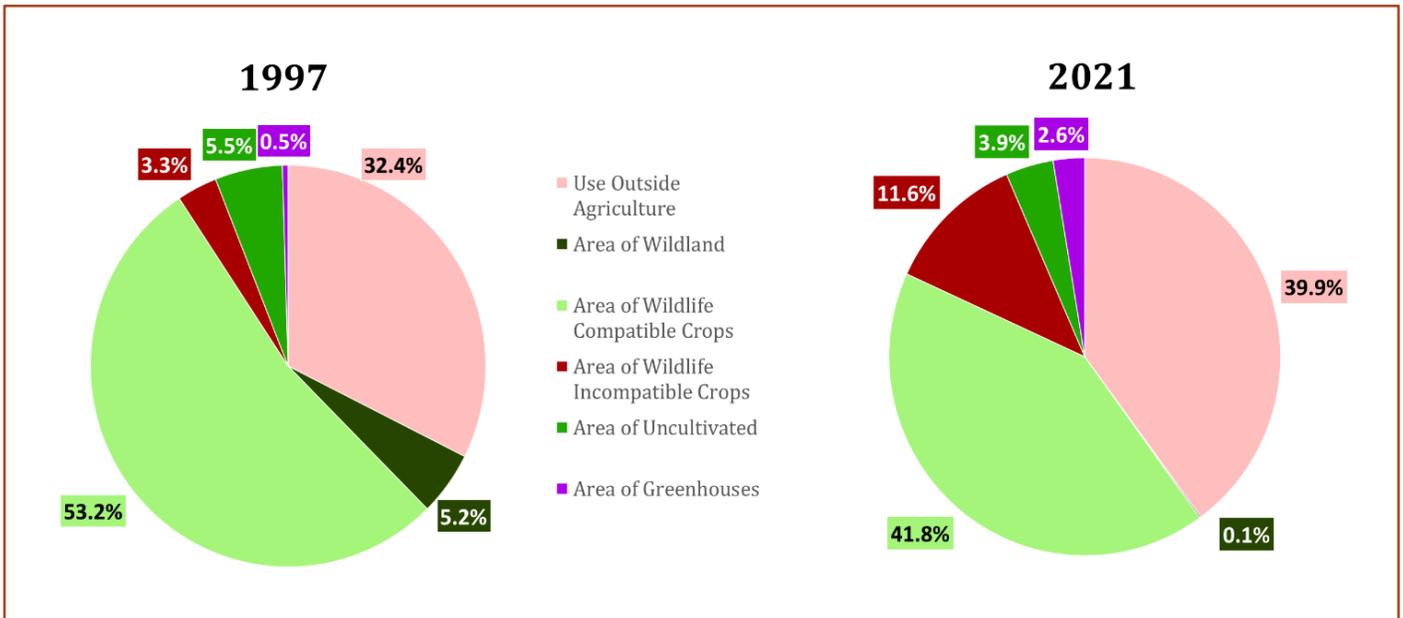


Figure 5: Proportion of crop types within the total study area in 1997 and 2021

## Trends in the Composition of Farmable Area

Within the farmable area are these **crop types: Vegetable, Grass/forage, Grain, Berry/small fruit, Orchard, Nursery Crop, and Uncultivated**. **Table 3** shows how these are further categorized as either wildlife-compatible or wildlife-incompatible.

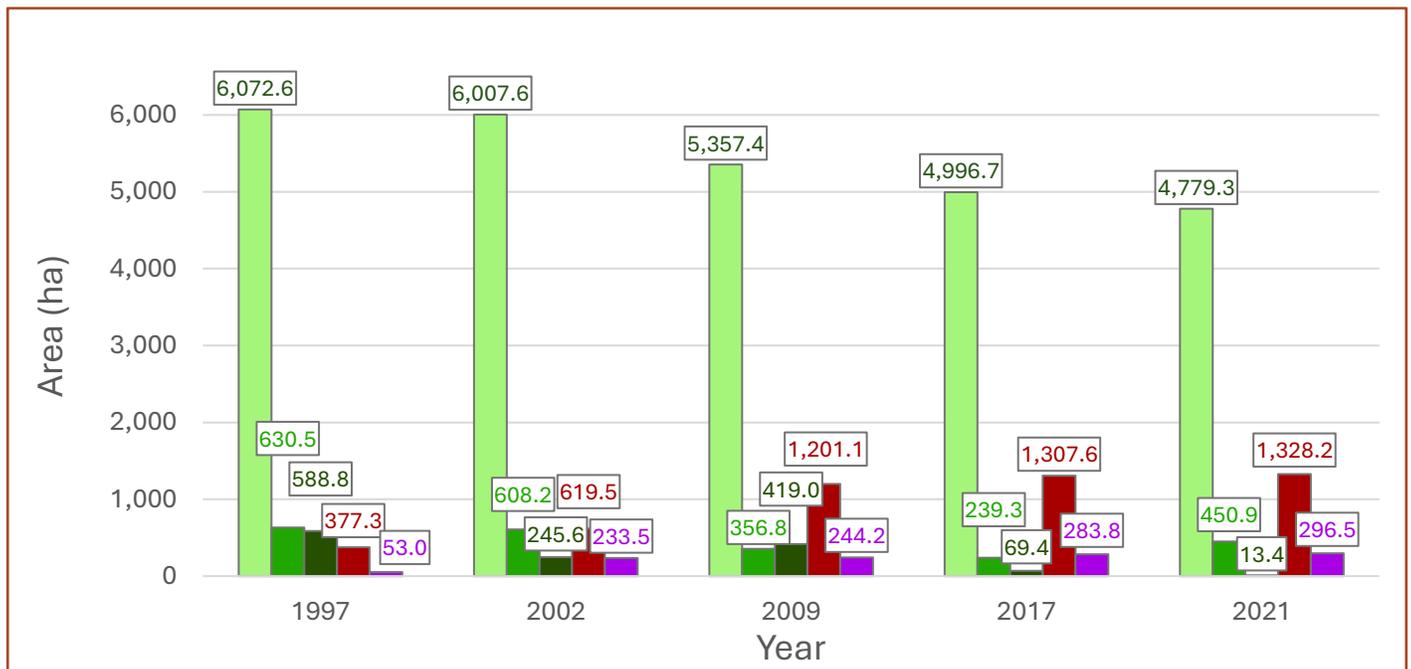


Figure 6: Summary of changes in main categories in the study area in 1997, 2002, 2009, 2017, and 2021

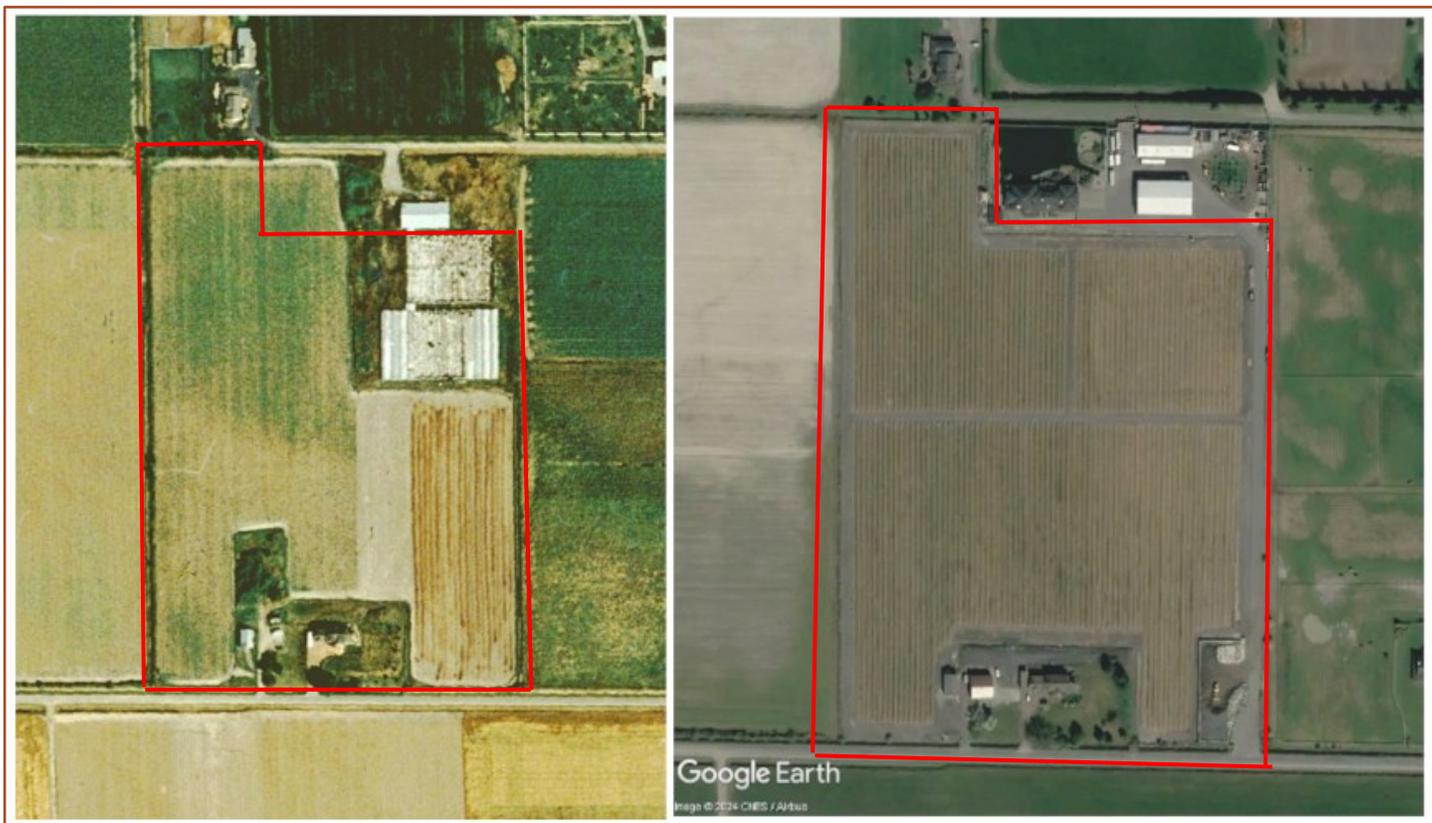
**Table 3. Summary of changes in crop types in the study area 1997, 2002, 2009, 2017, 2021**

Crop Types		1997 (ha)	1997 (%*)	2002 (ha)	2002 (%*)	2009 (ha)	2009 (%*)	2017 (ha)	2017 (%*)	2021 (ha)	2021 (%*)	
Farmable Area	Wildlife Compatible Crops	Vegetable	3,160.0	27.7	3,442.7	30.1	3,072.7	26.9	2,914.7	25.5	2,962.1	25.9
		Grass/forage	2,574.1	22.5	2,258.4	19.8	1,683.0	14.7	1,528.6	13.4	1,334.1	11.7
		Grain	338.6	3.0	306.5	2.7	601.7	5.3	553.4	4.8	483.2	4.2
	Uncultivated		630.5	5.5	608.2	5.3	356.8	3.1	239.3	2.1	450.9	3.9
	Wildlife Incompatible Crops	Berry/small fruit	362.6	3.2	597.5	5.2	1,200.3	10.5	1,304.4	11.4	1,324.0	11.6
		Orchard	8.4	0.1	6.4	0.1	-	-	-	-	2.5	0.02
		Nursery Crop	6.3	0.1	15.5	0.1	0.8	0.01	3.2	0.03	1.7	0.02
Wildland		588.8	5.2	245.6	2.1	419.0	3.7	69.4	0.6	13.4	0.1	
Non-Farmable Area	Greenhouse		53.0	0.5	233.5	2.0	244.2	2.1	283.8	2.5	296.5	2.6
	Use Outside Agriculture**		3,706.6	32.4							4,558.7	39.9
	Total Study Area (ha)		11,423.4	-							11,423.4	-

\*These values are shown as percentages of the total study area

\*\*Use Outside Agriculture was not consistently tracked over the study period, therefore an analysis of only the initial and final years of the study period was performed

**Figure 5** shows that wildlife-incompatible crops (**Berries/small fruit, Orchard, and Nursery Crop**) in the study area increased over threefold, from 3.3% to 11.6%. The conversion to berries and small fruit, primarily blueberries and cranberries (**Table 3; Figure 6; Figure 7**), had the greatest increase. Between 1997 and 2002, the total area of fields producing berries increased by 65% from 363 ha to 598 ha and then doubled between 2002 and 2009 to 1,200 ha. The rate of berry production expansion slowed in the subsequent years – an additional 100 ha between 2009 and 2017, followed by an increase of a couple of dozen hectares between 2017 and 2021. Orchards and nursery crops, the other types of wildlife-incompatible crops, totaled only 15 hectares in 1997 and decreased to a little over 3 ha in 2021 (**Table 3**).



**Figure 7:** Example of conversion of grass/forage field to blueberries using 1999 Lower Mainland orthophotos (left) and 2020 Google imagery (right). [Map Data (right image): Google, CNES/Airbus]

Between 1997 and 2021, the study area experienced a significant decline in wildlife-compatible crops (**Vegetable**, **Grass/forage**, and **Grain**), with their total area decreasing by nearly 1,300 hectares, a 21% reduction (**Table 3; Figure 6**). This also corresponded to a drop in the proportion of the study area covered by these crops, falling from 53% to 42% (**Figure 5**). Similarly, uncultivated fields, which offer potential foraging opportunities in the form of insects, roots, and small mammals also decreased. The percentage of the study area in the **Uncultivated** category declined from 5.5% to 3.9% (**Figure 5**) over the same period.

When combining wildlife-compatible crops with uncultivated fields, the overall proportion of the study area providing, or potentially providing, wildlife values decreased from 59% to 46% between 1997 and 2021 (**Figure 5; Figure 8**). **Figure 9** provides a visual comparison of crop cover within farmable areas across all five study years, including wildlife-compatible crops, uncultivated fields, greenhouses, and wildlife-incompatible crops (full-size maps for each year can be found in the **Appendix**). These maps clearly show a temporal increase in wildlife-incompatible crops.

A comparable trend of reduction was observed in the study area's **Wildland**. These areas possess high wildlife value and are defined as either having never been farmed or having been previously farmed but left undisturbed for decades, resulting in shrub and tree cover. This category experienced a drastic 98% decline between 1997 and 2021, shrinking from 589 ha to 13 ha (**Table 3; Figure 5**).

### Comparison of Crop Cover Classes 1997 vs. 2021

- Study Area
- Wildland
- Wildlife-Compatible
- Uncultivated
- Greenhouses
- Use Outside Agriculture
- Wildlife-Incompatible

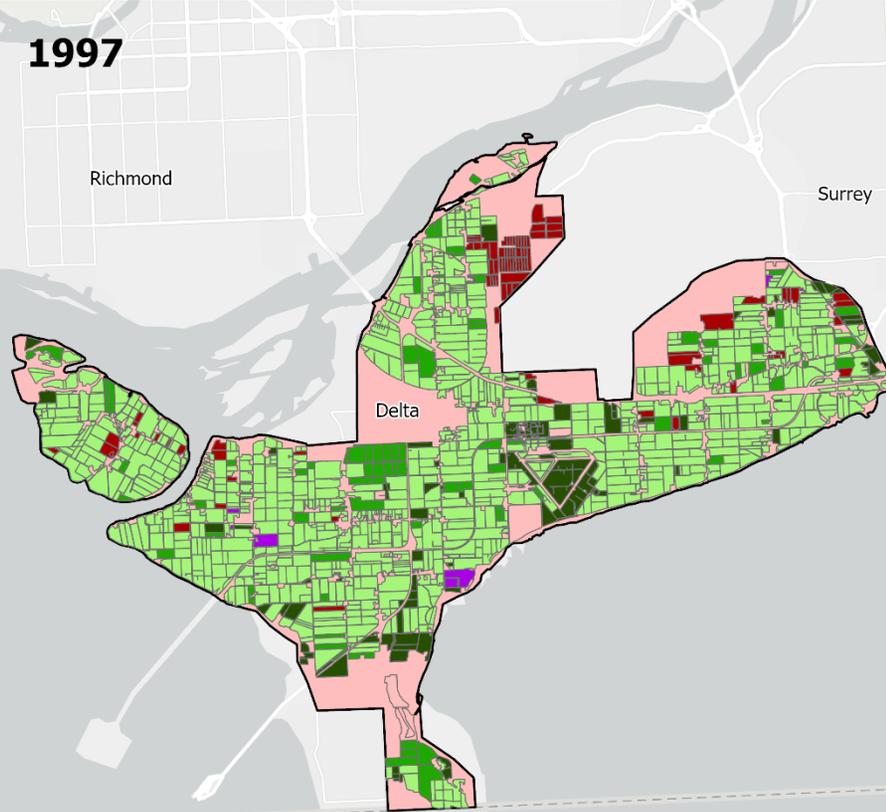
This map compares wildlife compatible and incompatible crops in the Fraser River Delta within the study area for the years 1997 and 2021. The source data was collected in the form of drive-by crop surveys conducted by Ducks Unlimited Canada, the Delta Farmland & Wildlife Trust (DFWT), and the Canadian Wildlife Service. The data was also supplemented with information from Google imagery. Wildlife compatible crops include "Grass/forage", "Grain", and "Vegetable". Wildlife incompatible crops include "Berry/small fruit", "Orchard", and "Nursery Crops". The "Uncultivated" class can be defined as agricultural fields where no crops are currently being actively grown. "Grass/forage" also includes fields enrolled in the DFWT Grassland Set-aside stewardship program. Wildland is considered land that has either never been altered in any way or land that has been used for farming in the past, but has been left untouched for many decades. "Use Outside Agriculture" is land being used in the study area for purposes outside of agriculture.



Environment and Climate Change Canada  
Canadian Wildlife Service

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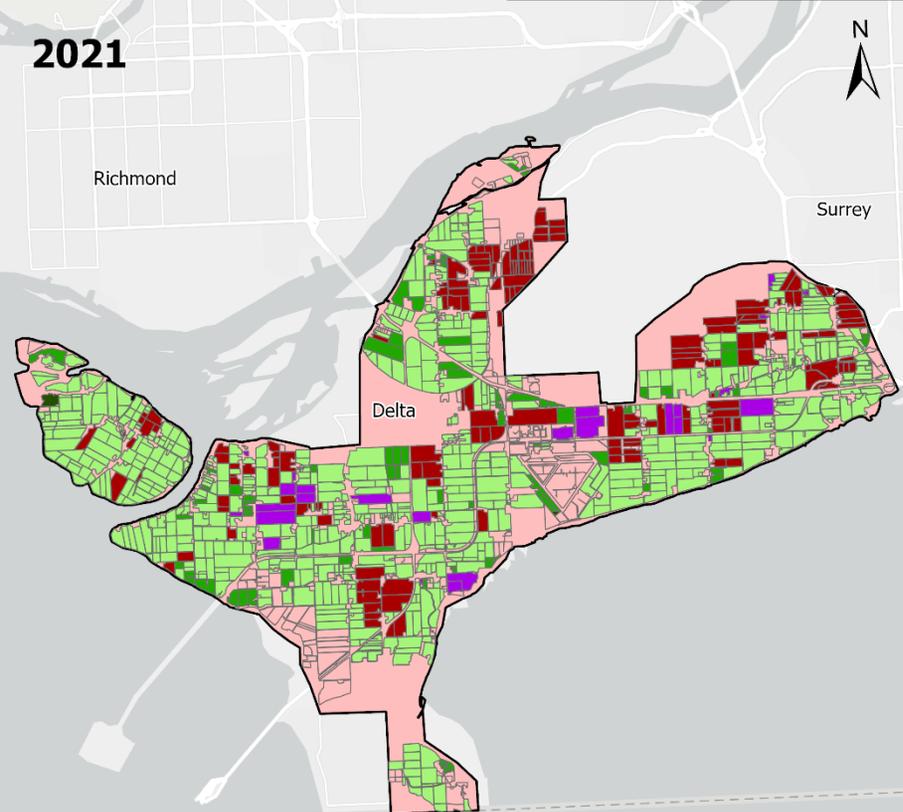
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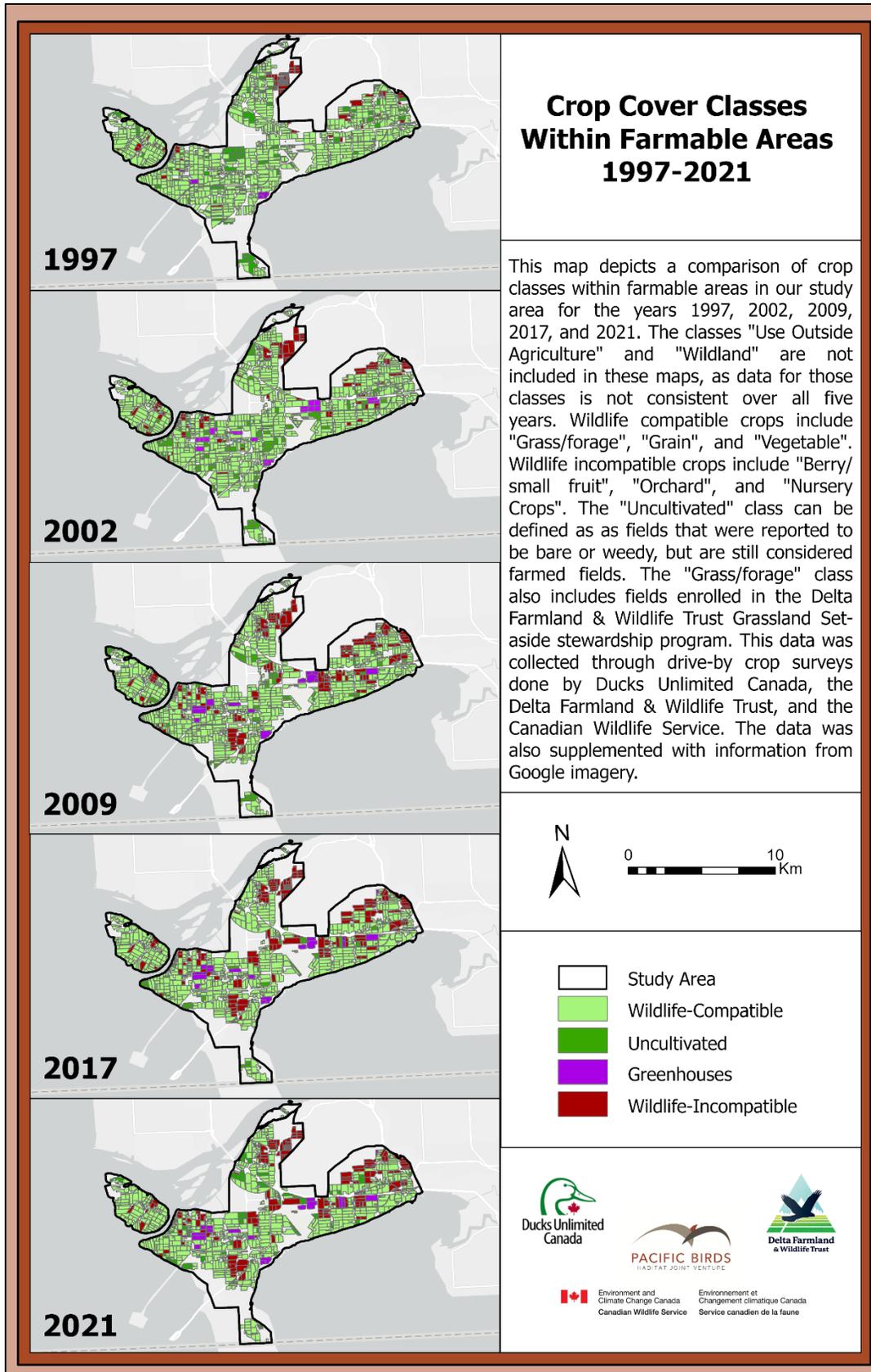
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2021



Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/ NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

Figure 8: Crop cover classes in 1997 and 2021 within the study area.



**Figure 9:** Comparison of crop cover classes within farmable areas for all study years. [Basemap Credits: Esri Canada, Esri, TomTom, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada, CHS, Esri, Garmin, NaturalVue]

## Discussion

Between 1997 and 2021 the farmable area within the study area decreased as the non-farmable areas, **Use Outside Agriculture** and **Greenhouses**, significantly increased from 33% to over 42% (**Table 3; Figure 5**). This represents a 29% increase in the total area of these categories from 3,760 ha to 4,855 ha from 1997 to 2021 (**Table 2**). This can be attributed, in part, to major road and rail network expansions that occurred during this period. For instance, the South Fraser Perimeter Road alone, which was completed in 2013, resulted in a loss of nearly 100 ha of agricultural land (**Figure 10**).<sup>4</sup>



**Figure 10:** Example of conversion of agricultural land for highway expansion using 1999 Lower Mainland orthophotos (left) and 2021 Google imagery (right). [Map data (right image): Google, Maxar Technologies]

Greenhouses are used in food production, but the enclosed space and adjacent parking lots and buildings have resulted in a loss of the farmable area and wildlife habitat (**Figure 11**). Since the City of Delta experiences more favourable temperatures and duration of sunlight compared to the rest of the Lower Mainland, its agricultural lands have been the focus of extensive greenhouse developments. In addition, their proximity to a large urban population means that they are not only productive, but also economically viable.

<sup>4</sup> BC Environmental Assessment Office, Transport Canada, & Fisheries and Oceans Canada. (2008). South Fraser Perimeter Road Project Assessment Report (p. 95) [Assesment]. <https://docs2.cer-rec.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2449925/2451036/2785424/C132-9-18 - Exhibit H to R. Abernethy Affidavit - A4L8X3.pdf?nodeid=2786003&vernum=-2>



**Figure 11:** Example of conversion of fields that had been in vegetable and hay production prior to 1999 (left) to greenhouses in 2020 (right). Note that a completed greenhouse was already present in the left image (“A”) and the field next to it is in the early stages of a new greenhouse (“B”). Similarly, a new greenhouse is under construction on the right-hand side of the same image (“C”). By 2020, the greenhouse complex had expanded again (“D”). [Map data (right image): Google, Maxar Technologies, CNES/Airbus]

Some of the losses to the farmable area as shown in **Table 3** and **Figure 5** are reflected in the changes to the Agricultural Land Reserve (ALR) boundaries over this period. The ALR is a provincial designation in British Columbia that recognizes agriculture as the priority use.<sup>5</sup> In **Figure 12**, portions were removed from the ALR at the location indicated as “A”, though some portions were added after 2000. This was the nearest year the digital boundary was available. At location “B”, this area was in the ALR prior to 2000 and had been removed in anticipation of development. Part of that area was returned to the ALR by 2021, but a large portion has been excluded and is being converted to housing. At location “C”, the 2007 treaty with the Tsawwassen First Nation resulted in additional land removed from the ALR, much of which is planned for housing, an extensive commercial development (**Figure 13**), as well as an industrial port and rail facilities.

Although the ALR recognizes that agricultural uses are the priority, the farmable area continues to shrink from the expansion of roads, golf courses, large houses, farm structures, and greenhouse structures and their associated parking lots. These have been permitted uses in the ALR for many of those years. Therefore, simply tracking the gross changes in the ALR boundaries does not reflect the true loss of farmable area.

<sup>5</sup> Provincial Agricultural Land Commission. (2022). Home—Provincial Agricultural Land Commission. <https://www.alc.gov.bc.ca/>

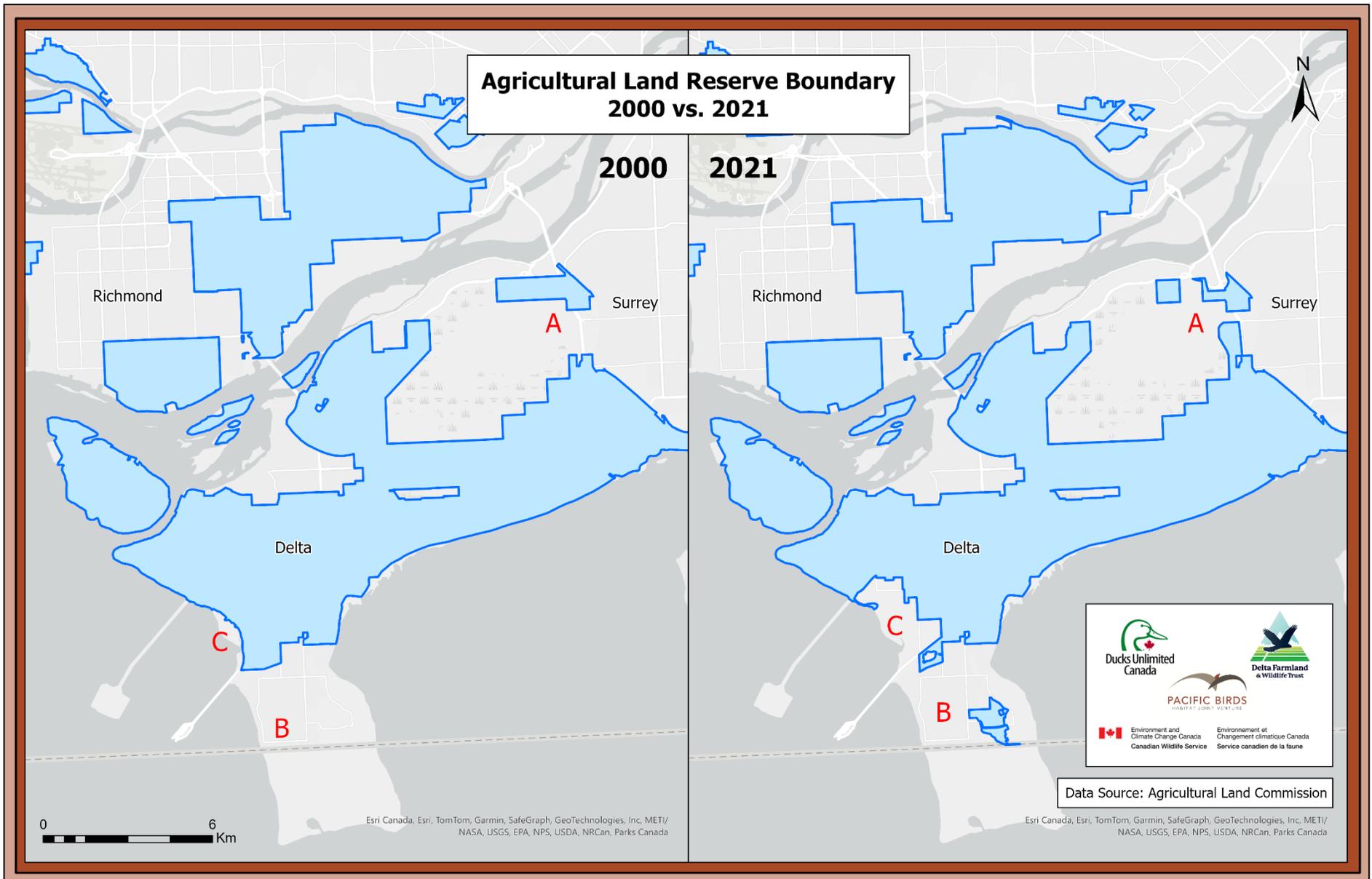


Figure 12: Agricultural Land Reserve boundaries 2000 and 2021.

There has been a significant trend in the conversion of wildlife-compatible crops and uncultivated areas to wildlife-incompatible crops (**Berries/small fruit, Orchard, and Nursery Crops**) in the study area. This steady increase in blueberry and cranberry production has been occurring throughout the Fraser River Delta. This is a concerning trend because berries/small fruit are not part of a traditional crop rotation system wherein different types of grain and vegetables are alternated over different years. Moreover, due to the considerable start-up costs of intensive cropping, once berries are planted, these fields remain permanently unavailable as wildlife habitat.



**Figure 13:** Conversion of agricultural land for commercial development in Tsawwassen. The left image is a 1999 Lower Mainland orthophoto and the right image is 2020 Google imagery. Also note the conversion of old field habitat (“O”) in 1999, to a golf course (“G”) by 2020. [Map data (right image): Google, CNES/Airbus]

The crop surveys conducted for almost 25 years by the Canadian Wildlife Service, Ducks Unlimited Canada, and the Delta Farmland & Wildlife Trust within the FRD have revealed a significant decline in the hectares and percentage of the study area that supports wildlife. The total farmable area has declined, while the area lost to the **Use Outside Agriculture** and **Greenhouse** categories increased 29% since 1997 from 3,760 ha to 4,855 ha. Consequentially, the proportion of the study area that is not farmable increased from 33% to a little over 42%.

Within the farmable area, the number of hectares of wildlife-compatible crops has also declined by almost 1,300 ha or 21%. They were mainly replaced by blueberries and cranberries, which increased 265% in area between 1997 and 2021. The portion of the study area that had, or potentially had, wildlife values (wildlife-

compatible crops plus uncultivated fields), declined from 59% to 46%. The farmland in the FRD is an important habitat for internationally significant populations of wintering and migrating ducks, geese, swans, and shorebirds. Its proximity to the vast intertidal flats has resulted in international recognition of the FRD as an Important Bird Area and as a Key Biodiversity Area<sup>6</sup>. However, only wildlife-compatible fields such as those containing pasture, hay, grain, and vegetables can provide winter foraging opportunities to these birds and support these wildlife populations.

## Conclusion

For over 25 years the Canadian Wildlife Service, Ducks Unlimited Canada, and the Delta Farmland & Wildlife Trust have been funding farmland stewardship programs to support local farmers in planting wildlife-compatible crops on a cost-share basis. These programs, administered by DFWT, include winter and summer cover crops, grassland set-asides, forage enhancements, naturalized field margins, and hedgerows, and a blueberry field rest program. The purpose is to promote foraging opportunities for wildlife while helping to offset losses from damaged crops and fields. Moreover, these programs promote soil conservation.

Unfortunately, **Figure 11** clearly indicates that the mounting production and land costs in the FRD have overwhelmed the benefits of these cost-share programs. It is more important than ever to recognize the ecosystem services that wildlife-compatible farming provides. These services benefit not just waterfowl and shorebirds, but increasingly other migratory birds such as aerial insectivores (i.e., Barn Swallow) that are in steep decline in North America, and Species at Risk (i.e., insect pollinators)<sup>78</sup>. Additional datasets that share similar focus, such as the Agricultural



**Figure 14:** Hedgerows planted as part of the DFWT Hedgerow Stewardship Program. [Photo Credit: DFWT]

<sup>6</sup> Birds Canada. (2019). KBAs and IBAs: Canada's Critical Places for Nature. Birds Canada | Oiseaux Canada. [https://www.birdscanada.org/conservation-birds/iba-kba](https://www.birdscanada.org/conservation/birds/iba-kba)

<sup>7</sup> Birds Canada. (2019,). A New Report on the State of Canada's Birds. Birds Canada | Oiseaux Canada. <https://www.birdscanada.org/a-new-report-on-the-state-of-canadas-birds>

<sup>8</sup> Full report available at: North American Bird Conservation Initiative. (2019). The State of Canada's Birds. <http://nabci.net/wp-content/uploads/2019-State-of-Canadas-Birds-1.pdf>

Land Use Inventory 2022<sup>9</sup>, conducted by the BC Ministry of Agriculture and Food, may provide additional information on crop cover and ecosystem services for future trend analyses.



*Figure 15: Snow geese grazing in a forage field in Delta, B.C. [Photo Credit: DFWT]*

Reversing the trends described in this report requires broadening the existing farmland stewardship programs whilst developing new ones to address ongoing and emerging challenges to farming in the FRD. This expansion would need to be informed by targeted research and monitoring such as identifying crops that are resilient to the effects of climate change from increasing salinity, drought and temperature extremes, or those that support carbon storage. Research and monitoring could also further quantify ecosystem services such as those provided by local pollinators (i.e. bats) that benefit crop production. However, expansion of the current farmland stewardship programs would require a considerable broadening of the funding model that recognizes the ecological benefits the Fraser River Delta farms provide to the region as a whole.

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<sup>9</sup> BC Ministry of Agriculture and Food. (2022). Agricultural Land Use Inventory 2022 [Unpublished raw data]. BC Ministry of Agriculture and Food.



# APPENDIX

Wildlife-Compatible Crop Cover Area (ha): 6,072.6  
 Wildlife-Incompatible Crop Cover Area (ha): 377.3  
 Greenhouses Area (ha): 53.0  
 Uncultivated Area (ha): 630.5

### Wildlife-Compatible vs. Wildlife-Incompatible Crop Cover in the Fraser River Delta 1997

This map depicts wildlife-compatible and -incompatible crops within the study area in the Fraser River Delta for the year 1997. Wildland is considered land that has either never been altered in any way or land that has been used for farming in the past, but has been left untouched for many decades. Wildlife-compatible crops include "Grass/forage", "Grain", and "Vegetable". "Grass/forage" also includes fields enrolled in the DFWT Grassland Set-aside stewardship program. Wildlife-incompatible crops include "Berry/small fruit", "Orchard", and "Nursery Crops". The "Uncultivated" class can be defined as agricultural fields where no crops are currently being actively grown. This data was collected through drive-by crop surveys done by Ducks Unlimited Canada, the Delta Farmland & Wildlife Trust, and the Canadian Wildlife Service. The data was also supplemented with information from Google imagery.

- Study Area
- Wildland
- Wildlife-Compatible
- Uncultivated
- Wildlife-Incompatible
- ALR Boundary 2000
- Greenhouses



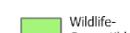
ALR data provided by the Agricultural Land Commission

Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/  
 NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

Wildlife-Compatible Crop Cover Area (ha): 6,007.6  
 Wildlife-Incompatible Crop Cover Area (ha): 619.5  
 Greenhouses Area (ha): 233.5  
 Uncultivated Area (ha): 608.2

### Wildlife-Compatible vs. Wildlife-Incompatible Crop Cover in the Fraser River Delta 2002

This map depicts wildlife-compatible and -incompatible crops within the study area in the Fraser River Delta for the year 2002. Wildland is considered land that has either never been altered in any way or land that has been used for farming in the past, but has been left untouched for many decades. Wildlife-compatible crops include "Grass/forage", "Grain", and "Vegetable". "Grass/forage" also includes fields enrolled in the DFWT Grassland Set-aside stewardship program. Wildlife-incompatible crops include "Berry/small fruit", "Orchard", and "Nursery Crops". The "Uncultivated" class can be defined as agricultural fields where no crops are currently being actively grown. This data was collected through drive-by crop surveys done by Ducks Unlimited Canada, the Delta Farmland & Wildlife Trust, and the Canadian Wildlife Service. The data was also supplemented with information from Google imagery.

-  Study Area
-  Wildland
-  Wildlife-Compatible
-  Greenhouses
-  Wildlife-Incompatible
-  ALR Boundary 2002
-  Uncultivated



0 4 Km

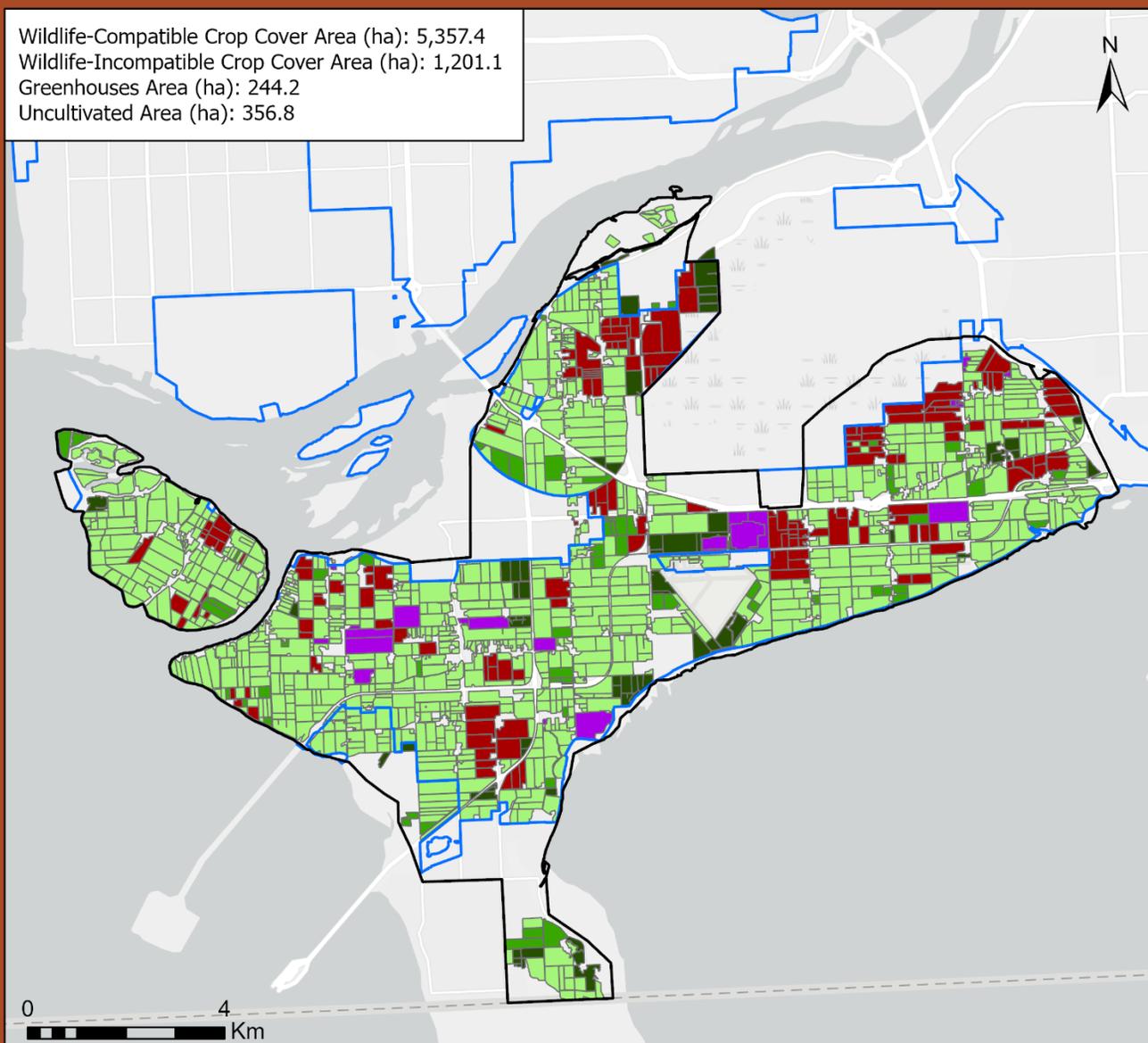
ALR data provided by the Agricultural Land Commission

Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/  
 NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

Wildlife-Compatible Crop Cover Area (ha): 5,357.4  
 Wildlife-Incompatible Crop Cover Area (ha): 1,201.1  
 Greenhouses Area (ha): 244.2  
 Uncultivated Area (ha): 356.8

### Wildlife-Compatible vs. Wildlife-Incompatible Crop Cover in the Fraser River Delta 2009

This map depicts wildlife-compatible and -incompatible crops within the study area in the Fraser River Delta for the year 2009. Wildland is considered land that has either never been altered in any way or land that has been used for farming in the past, but has been left untouched for many decades. Wildlife-compatible crops include "Grass/forage", "Grain", and "Vegetable". "Grass/forage" also includes fields enrolled in the DFWT Grassland Set-aside stewardship program. Wildlife-incompatible crops include "Berry/small fruit", "Orchard", and "Nursery Crops". The "Uncultivated" class can be defined as agricultural fields where no crops are currently being actively grown. This data was collected through drive-by crop surveys done by Ducks Unlimited Canada, the Delta Farmland & Wildlife Trust, and the Canadian Wildlife Service. The data was also supplemented with information from Google imagery.



Study Area	Greenhouses
Wildland	Wildlife-Incompatible
Wildlife-Compatible	ALR Boundary 2013
Uncultivated	

ALR data provided by the Agricultural Land Commission

Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/ NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

Environment and Climate Change Canada / Canadian Wildlife Service  
 Environnement et Changement climatique Canada / Service canadien de la faune

Wildlife-Compatible Crop Cover Area (ha): 4,996.8  
 Wildlife-Incompatible Crop Cover Area (ha): 1,307.6  
 Greenhouses Area (ha): 283.8  
 Uncultivated Area (ha): 239.3

### Wildlife-Compatible vs. Wildlife-Incompatible Crop Cover in the Fraser River Delta 2017

This map depicts wildlife-compatible and -incompatible crops within the study area in the Fraser River Delta for the year 2017. Wildland is considered land that has either never been altered in any way or land that has been used for farming in the past, but has been left untouched for many decades. Wildlife-compatible crops include "Grass/forage", "Grain", and "Vegetable". "Grass/forage" also includes fields enrolled in the DFWT Grassland Set-aside stewardship program. Wildlife-incompatible crops include "Berry/small fruit", "Orchard", and "Nursery Crops". The "Uncultivated" class can be defined as agricultural fields where no crops are currently being actively grown. This data was collected through drive-by crop surveys done by Ducks Unlimited Canada, the Delta Farmland & Wildlife Trust, and the Canadian Wildlife Service. The data was also supplemented with information from Google imagery.



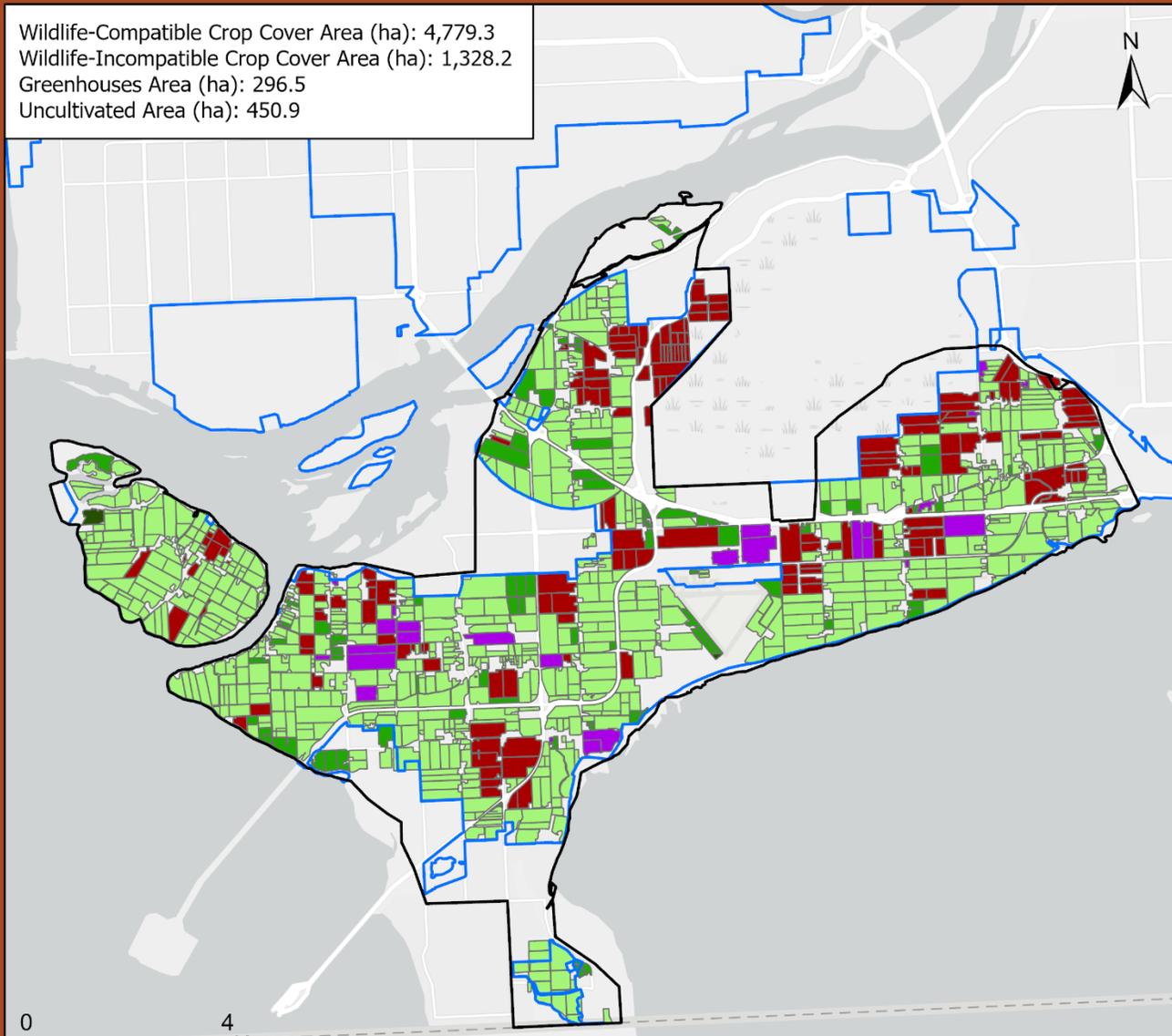
ALR data provided by the Agricultural Land Commission

Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/ NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

Wildlife-Compatible Crop Cover Area (ha): 4,779.3  
 Wildlife-Incompatible Crop Cover Area (ha): 1,328.2  
 Greenhouses Area (ha): 296.5  
 Uncultivated Area (ha): 450.9

### Wildlife-Compatible vs. Wildlife-Incompatible Crop Cover in the Fraser River Delta 2021

This map depicts wildlife-compatible and -incompatible crops within the study area in the Fraser River Delta for the year 2021. Wildland is considered land that has either never been altered in any way or land that has been used for farming in the past, but has been left untouched for many decades. Wildlife-compatible crops include "Grass/forage", "Grain", and "Vegetable". "Grass/forage" also includes fields enrolled in the DFWT Grassland Set-aside stewardship program. Wildlife-incompatible crops include "Berry/small fruit", "Orchard", and "Nursery Crops". The "Uncultivated" class can be defined as agricultural fields where no crops are currently being actively grown. This data was collected through drive-by crop surveys done by Ducks Unlimited Canada, the Delta Farmland & Wildlife Trust, and the Canadian Wildlife Service. The data was also supplemented with information from Google imagery.



ALR data provided by the Agricultural Land Commission

Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/  
 NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

