Grassland Set-aside surveys of

Pacific Great Blue Heron and Birds of Prey

November 2025 – March 2026

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Introduction

Grasslands have been identified as important habitats for birds, including species at risk, such as the American Barn Owl (Tyto furcata), Short-eared Owl (Asio flammeus), and Pacific Great Blue Heron (Ardea Herodias fannini). The Delta Farmland and Wildlife Trust (DFWT) aims to improve grassland habitat in the Fraser River delta by entering into stewardship agreements with farmers to manage farmland as Grassland Set-Asides (GLSA). These set-asides support a high density of small mammals, such as the Townsend's Vole (Microtus townsendii) and provide valuable foraging and roosting habitat for birds. This study aims to assess the effectiveness of GLSAs in restoring habitat for predatory birds, focusing on species at risk. The objectives of the study were as follows:

1. To evaluate the use of grassland set-aside fields by Pacific Great Blue Heron.
2. To evaluate the use of grassland set-aside fields by diurnal raptors.
3. To evaluate the use of grassland set-aside fields by Barn Owls and Short-eared Owls.

Grassland Set Aside fields were surveyed for herons, raptors, and owls between November 20th, 2025, and March 9th, 2026. The survey included eighteen active fields in the GLSA program. Fields were selected to represent various seeding types, field ages, sizes, and geographical locations.

Pacific Great Blue Heron

Methods

Pacific Great Blue Heron surveys were conducted in eighteen Grassland Set-Aside fields in Delta. Each field was surveyed once per week, a total of fifteen times over the survey period. Surveys took place between 8:00 am and 6:00 pm and the route was altered weekly to ensure each field was observed at various times of the day.

Upon arrival, the field was scanned with binoculars for 20 minutes, and any visible herons were counted. The heron surveys were completed in conjunction with surveys for diurnal raptors. Detection rate at each field was calculated as the proportion of survey visits in a field where at least one individual was detected. Statistical comparisons were conducted using the Kruskal-Wallis test with Dunn post-hoc comparisons.

2026 Survey Results

Over the survey period, a total of 63 herons were observed in fields surveyed throughout Delta (Table 1), the mean detection rate was 23.7% (Figure 1). This is a large increase from the 2024-2025 survey, where only 37 herons were observed throughout the season. Great Blue Herons are typically solitary outside of breeding season, and during the survey period, most individuals were observed alone, with no more than three herons recorded within a single field at any given time.

Table 1 Total number of herons and average number of herons per hectare per survey day by year.

Field Age	*Number of Fields*	*Count Of Herons*	*Hectares*
2018	1	2	9.3
2019	2	1	15.7
2020	1	14	4.0
2022	1	9	4.5
2023	5	15	28.3
2024	5	10	17.8
2025	4	12	38.9

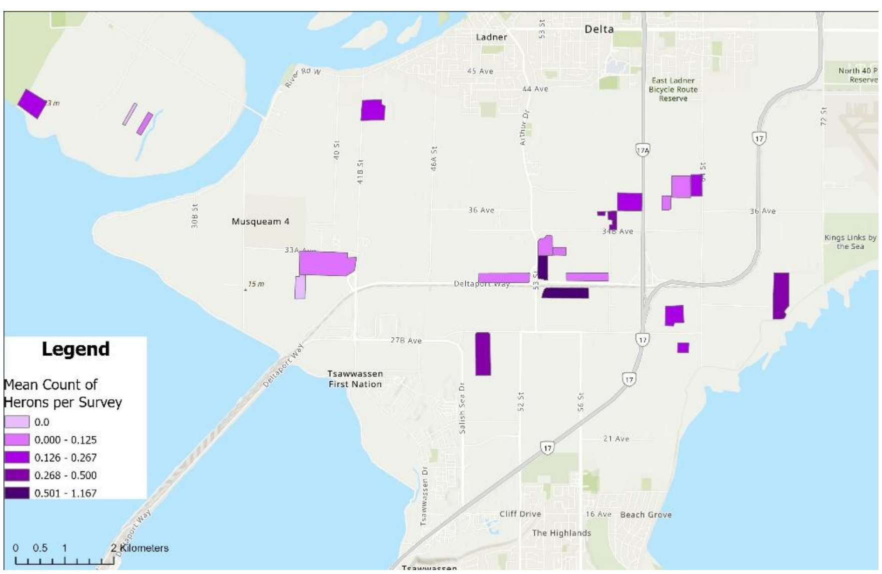

Figure 1 Map of Grassland Set Asides and the Mean Count of Herons per Survey in 2025 – 2026.

Field age did not have a significant effect on heron detection rate (p=0.851). Differences in cover type were also evaluated to assess potential effects on Great Blue Heron detection. The DFWT category contains a mixture of Fescue, Orchardgrass, Timothy, Chewing's Fescue, Creeping Red Fescue, and Double Cut Red Clover. Pollinator fields usually contain a mixture of grasses found in the DFWT mix, as well as Sunflowers, Phacelia, and Clover. Fields planted with a single species of grass fall under the Grass category. No statistically significant difference was detected between types. Comparisons were limited to Grass and Pollinator fields as only two fields were planted with a DFWT Mix, which did not meet the minimum group size requirement of three fields. There was no significant difference in heron detection between Grass and Pollinator fields (p=0.773) (Figure 2).

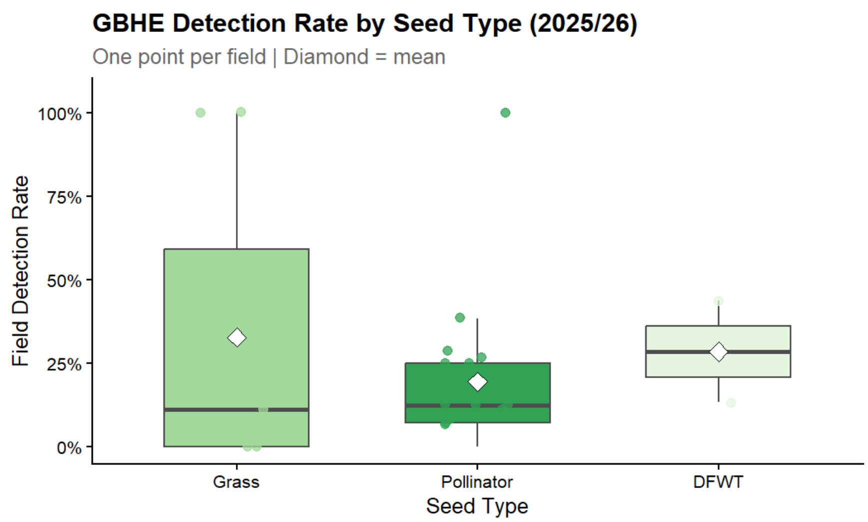

Figure 2 Rate of Great Blue heron detection per survey by field seed type; quartiles represented by boxes, maximum and minimum values represented by whiskers, mean value represented by a diamond, and outliers represented by dots

2022 – 2026 Survey Results

Across four survey seasons 174 Great Blue Herons (GBHE) were surveyed in thirty-six grassland set-aside fields, of which thirty-one fields had at least one detection. The overall mean detection rate was 18.9%.

Field age did not have a significant effect on GBHE detection rate across the multiyear survey (p=0.502) (Figure 3). The vegetation type of the set-aside was also not significant (p=0.116) (Figure 4). These findings were consistent across both the Kruskal–Wallis tests and the binomial generalized linear mixed model, which identified no significant effects of the variables examined. The low explanatory power of the model (marginal $R^2 = 0.178$;

conditional R^2 = 0.101) suggests that the factors included in this analysis account for only a small proportion of the variation in GBHE field use. This suggests that other, unmeasured variables such as proximity to water, prey availability, and other landscape features are likely more important drivers of habitat use.

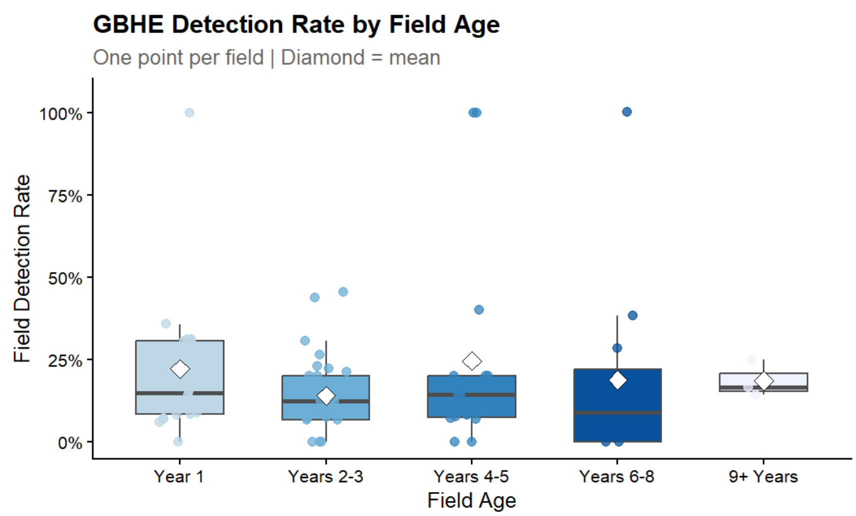

Figure 3 Rate of Great Blue heron detection per survey by field age; quartiles represented by boxes, maximum and minimum values represented by whiskers, mean value represented by a diamond, and outliers represented by dots

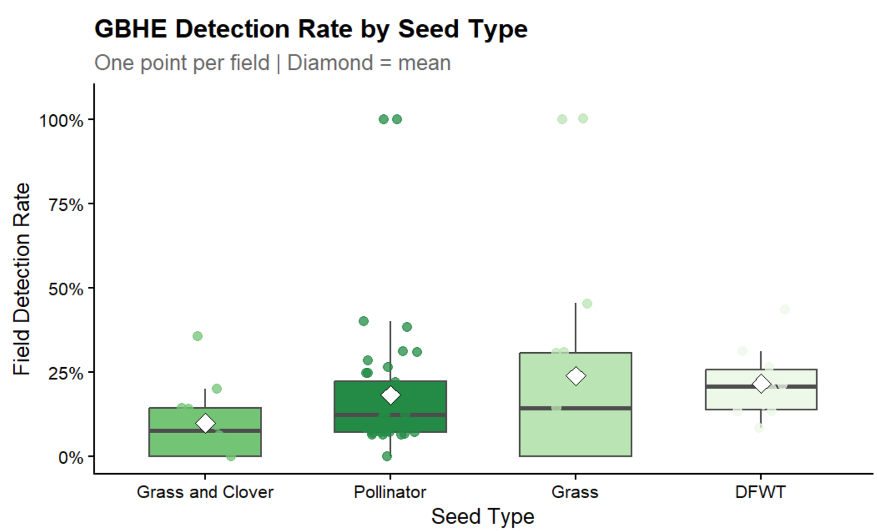

Figure 4 Rate of Great Blue heron detection per survey by field vegetation type; quartiles represented by boxes, maximum and minimum values represented by whiskers, mean value represented by a diamond, and outliers represented by dots

Field size did have a significant positive relationship with the mean number of herons per field per survey day ($p=0.012$), large fields supported a higher number of individuals (Figure 5). This is consistent with the solitary nature of Great Blue Herons, as large fields can support multiple individuals without a risk of direct competition for foraging space. However, field size did not significantly influence detection rates, suggesting that while larger fields may support more individuals at once, they are not more likely to be used overall. Although GBHE detection rates increased over the four survey years, detection remained consistent across all surveys (Figure 6).

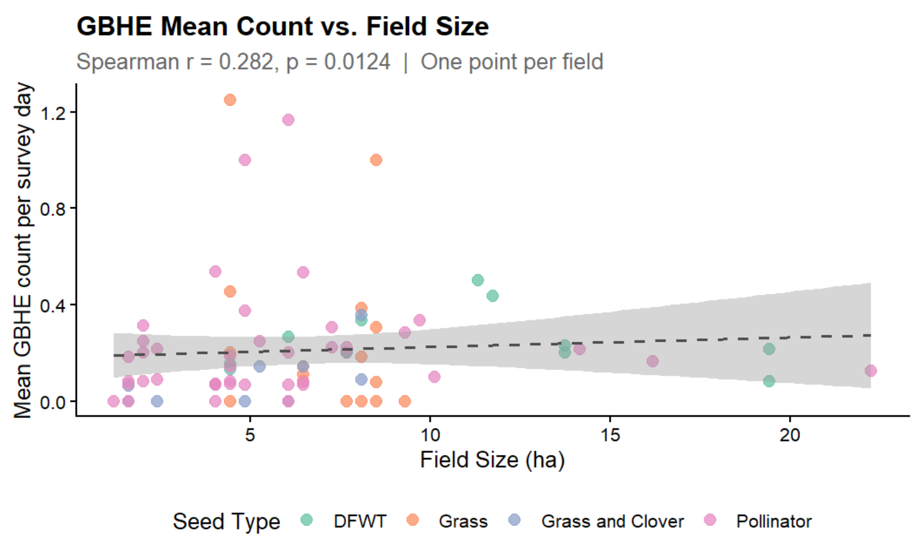

Figure 5 Graph of mean Heron count versus field size in hectares by field vegetation type.

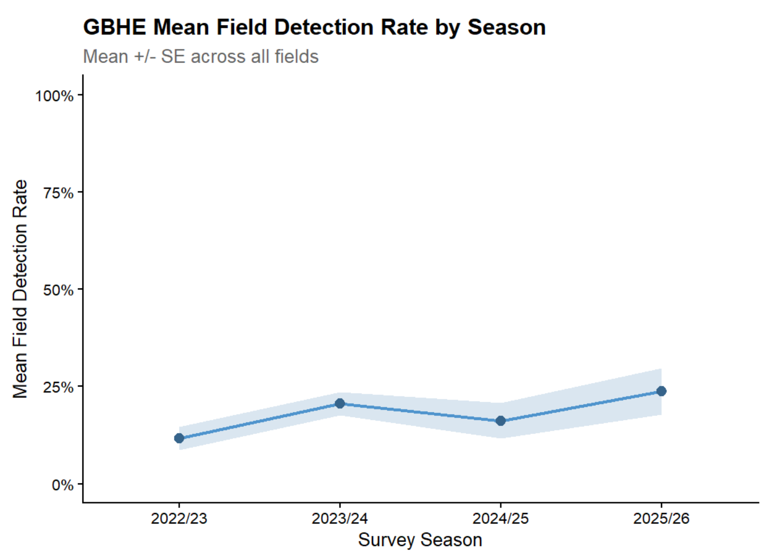

Figure 6 Trend over four survey years of mean detection rate across all grassland set-aside fields which were surveyed.

Barn Owl and Short Eared Owl

Methods

Owl surveys were completed in eleven grassland set-aside fields; each field was surveyed twice from January 2nd to March 9th at dusk for 60 minutes surrounding sunset. When adjacent fields were close enough to observe without moving, both fields were surveyed at the same time. Surveys were conducted by finding a position where the entire field to be surveyed was visible with minimal movement. The area was then visually scanned continuously, alternating between binoculars and normal sight. All owl activity was recorded, including the species, time of entering and exiting the field. Surveys were not performed in inclement conditions such as rain over 1 mm per hour or high winds.

Results

Owl species were detected in eight grassland set-aside fields over ten survey days with a combined detection rate of 59.7%. Sixteen Short-eared owls were observed in eight different fields, and three Barn owls were seen in three different fields (Table 2). Short-eared owls were observed more frequently overall, with an additional twenty-five observations recorded during diurnal raptor surveys. This reflects known behavioral differences between the Short-eared and Barn owl. Unlike the Barn owl, which is primarily nocturnal, Short-eared owls are diurnal, so they are more active during the day and are more likely to be observed during both daytime and evening surveys.

Table 2Number of individual owls observed during evening surveys, with date of observation and the seeding mix of each field.

Survey Date	Barn Owl	Short Eared Owl	Set-Aside Type
01/14/2026		1	Grass
01/23/2026		1	Pollinator
01/23/2026	1	1	Pollinator
01/27/2026		1	Pollinator
02/04/2026		1	DFWT Mix
02/10/2026		3	DFWT Mix
02/11/2026		1	Pollinator
02/24/2026		1	Grass
02/24/2026		1	Pollinator
03/02/2026		1	Pollinator
03/04/2026	1	4	DFWT Mix
03/05/2026	1		Pollinator

Short-eared Owls were detected both before and after sunset and were often present in fields for extended periods. In contrast, Barn Owls were only observed 20 minutes or more after sunset and typically remained in fields for less than five minutes. (Figure 7). Short-eared Owls exhibit broader activity throughout the evening, while Barn Owls demonstrate nocturnal behavior.

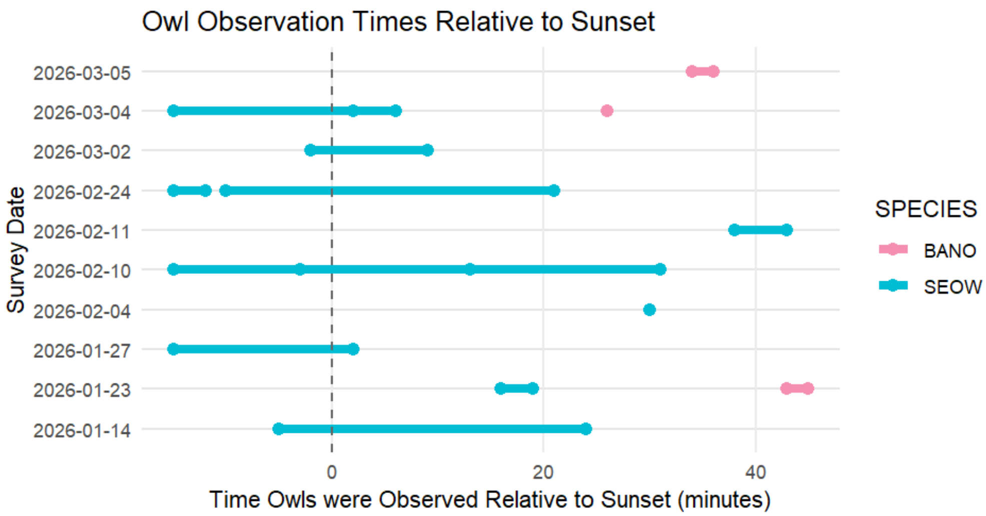

Figure 3. Time owls were observed relative to sunset, with negative values representing minutes before sunset and positive values representing minutes after sunset. Dots on the left represent the time the owl entered the field, dots on the right represent the time the owl was last seen.

Short-eared Owls were most frequently detected in fields seeded with DFWT Mix, with a mean field detection rate of 93.8% in 2025/26, compared to 50.0% in Grass fields and 41.7% in Pollinator fields (Figure 8). However, only two DFWT Mix fields were surveyed in 2025/26, statistical comparisons between vegetation types were not possible due to insufficient sample sizes.

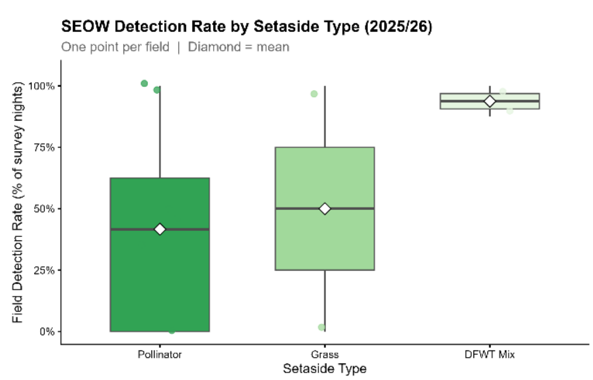

Figure 4 Rate of Short eared owl detection per survey by field vegetation type; quartiles represented by boxes, maximum and minimum values represented by whiskers, mean value represented by a diamond.

2022-2026 Survey Results

A total of 93 survey visits were conducted across 29 fields over four survey seasons, spanning November through March each year. Owls were detected on 40.9% of survey visits, with a maximum of 5 individuals recorded in a single survey. The two species recorded were the Short-eared Owl (*Asio flammeus*; SEOW) and American Barn Owl (*Tyto alba*; BAOW) (Table 3).

Table 3 Detection rate for both Short-eared owls and Barn owls, as well as combined owl detection over four survey years.

Season	Fields (n)	Combined	SEOW	BAOW
2022/23	17	26.5%	15.7%	10.8%
2023/24	11	29.5%	20.5%	9.1%
2024/25	12	52.8%	36.1%	16.7%
2025/26	12	59.7%	51.7%	8.0%

Short eared owl detection rates increased each survey season, though this trend did not reach statistical significance (p=0.081), likely due to the small number of fields surveyed per season limiting the statistical power. Field age was the only significant predictor of SEOW detection rate (p=0.007), with older fields supporting higher detection rates after controlling for vegetation type and field size (Figure 9).

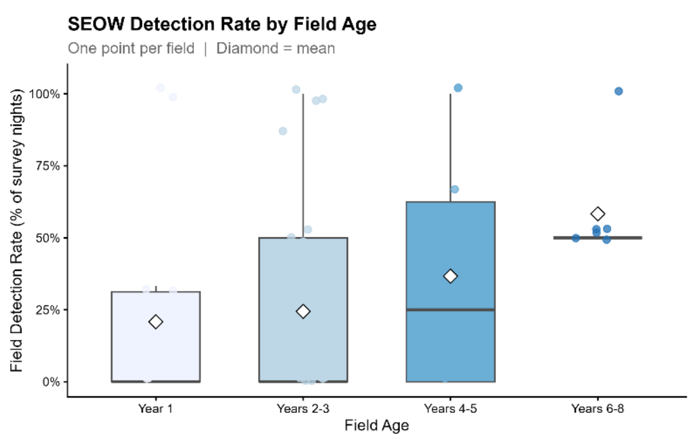

Figure 5 Rate of Short eared owl detection per survey by field age; quartiles represented by boxes, maximum and minimum values represented by whiskers, mean value represented by a diamond.

Vegetation type, and field size were not significant for combined owls, Short-eared, or Barn Owls, and field age was not significant for combined owls or Barn Owls. Across four survey seasons owl detections were most influenced by weather conditions. During each field survey cloud cover, precipitation, noise, and wind are rated at each field on a scale of 0 to 4. Cloud cover (p=0.002) was the only variable with a significant impact on owl detections. For every one unit increase in cloud cover, owl detections decreased by approximately 0.14

individuals per survey, resulting in 0.58 fewer owls observed on fully overcast nights compared to clear conditions.

Of the 19 fields surveyed in multiple years, the majority (74%) showed stable or increasing owl counts over time. Fields with the most reliable data (3 or more years of surveys) generally showed positive or flat trends, with the exception of one field, which showed a notable decline. A Pollinator field established in 2020 showed the most consistent positive trend over 4 survey seasons and represents the strongest evidence of increasing owl use with field maturity. Fields that were established in 2022 or later have insufficient survey history to draw reliable conclusions about long-term trends.

2.0 Diurnal Raptors

Diurnal Raptors

Methods

Diurnal raptor surveys were conducted in eighteen GLSA fields between November 20th, 2025, and March 9th, 2026. Fields were selected based on a variety of field locations, year planted, and vegetation cover type. Each field was sampled fifteen times during a 20-minute point count, once per week, between 8:00 am and 6:00 pm. The survey time was altered weekly to ensure each field was observed at various times of the day. The maximum number of individuals observed for each raptor species was recorded to calculate the mean encounter rate for species in every set-aside field.

2026 Survey Results

A total of nine raptor species were observed during the survey. Northern Harriers were the most abundant species, observed in 100% of the fields surveyed. They were followed by the Bald Eagle, present in 84% of fields, and the Red-Tailed Hawk, which was present in 47% of fields. Short-eared Owls were present in 42% of fields, followed by the Rough-Legged Hawk which were present in 21%. The Cooper's Hawk, American Kestrel, and the Peregrine Falcon were each observed in 11% of fields, and Merlin's were recorded in 5% of fields. This year, the Northern Harrier had the largest number of observations. In the 2023-2024 and 2024-2025 survey years, Northern Harriers were also the most observed species (Figure 10).

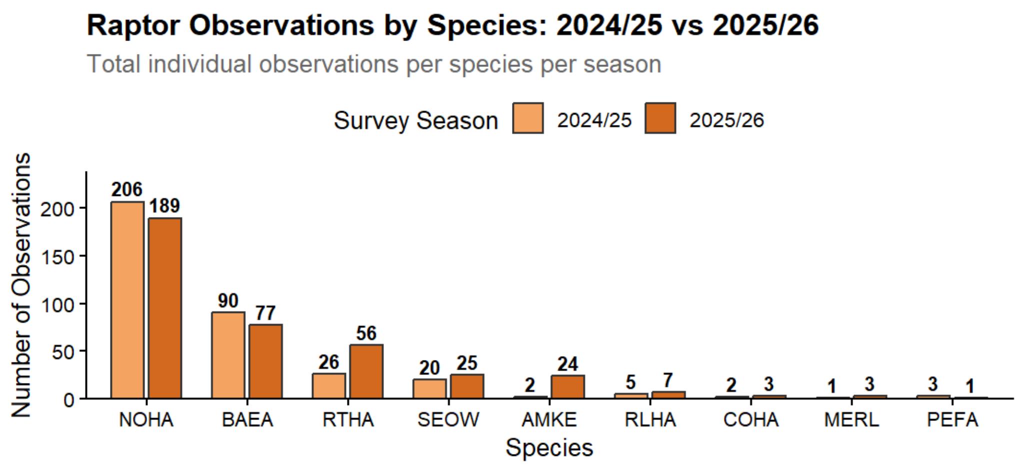

Figure 6 Number of individuals observed per species in the Grassland Set Aside Survey in 2024/25 and 2025/26

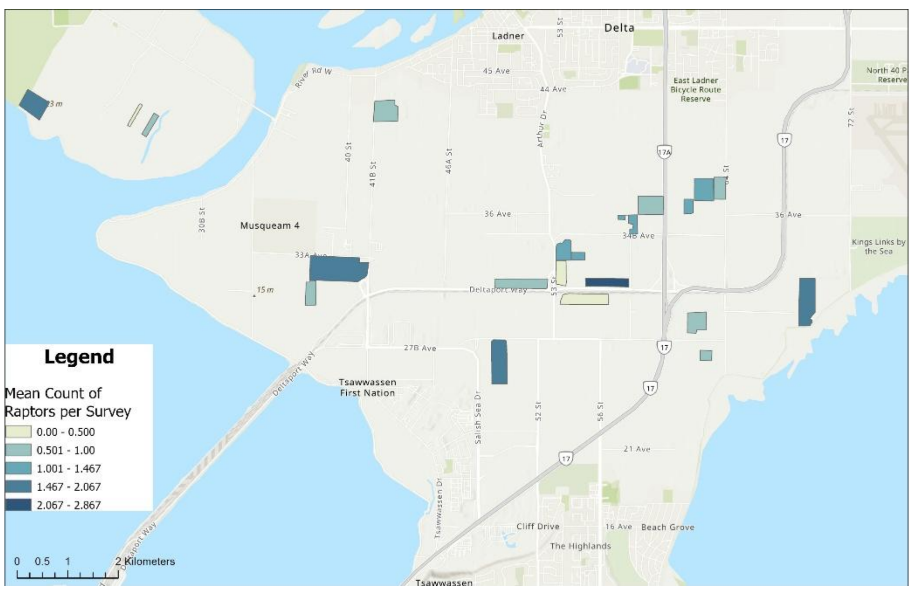

Figure 7 Map of grassland set-aside fields surveyed in 2025/26 and the mean number of raptors observed per survey.

Field age did not have a significant effect on raptor detection (p=0.587), vegetation type was similarly non-significant (p=0.226), with Pollinator fields averaging 76.3% detection rate and Grass fields 61.4%. The high average detection rate across all field types of this season, 67.1%, reflects the consistent use of these fields as important foraging habitat (Figure 12).

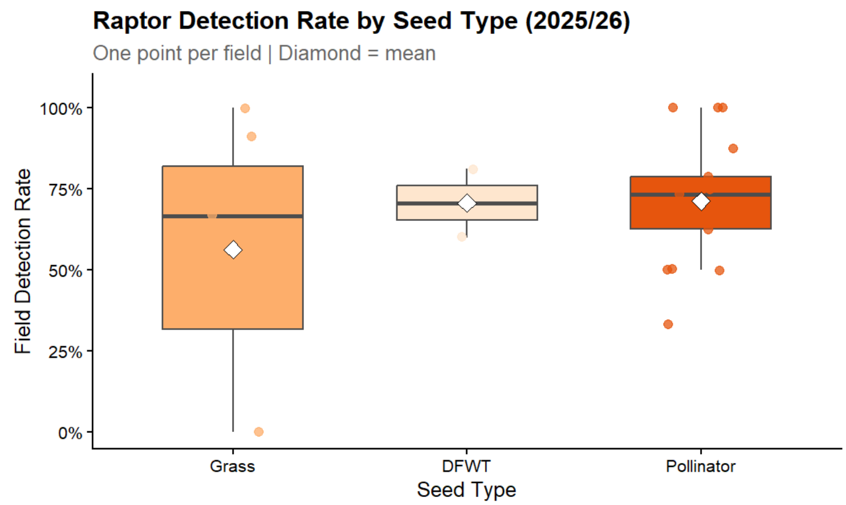

Figure 8 Detection rate of raptors per survey by vegetation type; quartiles represented by boxes, maximum and minimum values represented by whiskers, mean value represented by a diamond.

2022-2026 Survey Results

Across all four survey seasons, 1,409 raptor observations were recorded across thirty-six grassland set asides, with an overall mean detection rate of 73.1%. Detection rates had a slight negative trend across survey years 2022/23 (82.3%), 2023/24 (69.8%), 2024/25 (77.1%), and 2025/26 (67.1%), though there was no statistical significance to this trend ($p=0.118$).

Field age did not significantly influence detection rate across the multi-year dataset ($p=0.927$). This reflects a consistently high baseline detection rate across all age classes; raptors were detected in every field each survey year. Vegetation type had no significant effect on detection rates ($p=0.811$), mean detection rates were similar across all field types suggesting that raptors use all set-aside types regularly (Figure 13). Raptors were recorded in 100% of fields across the four survey years, with no field recording zero detections during any season. This consistency across all vegetation types and field ages shows that GLSAs provide reliable foraging habitat for raptors.

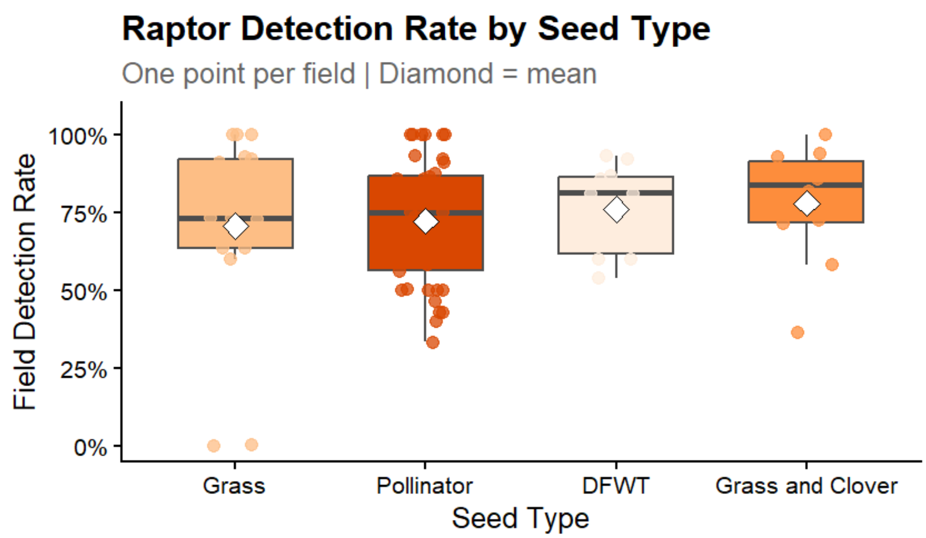

Figure 9 Number of raptors per hectare per survey by vegetation type from 2022 to 2026; quartiles represented by boxes, maximum and minimum values represented by whiskers, mean value represented by a diamond.

Raptor species richness was 3.29 species per field, with a range of 1 – 7. Field age had a significant effect on species richness (p=0.021). Fields aged 4-5 had significantly higher richness than fields that were one year old (p=0.029), supporting an average of 1.22 more species (Figure 14). Fields aged 6-8 years showed a higher richness than one year old fields, though at a non-significant level (p=0.144). Richness appears to peak at 4-5 years, after which the trend stabilizes and may reach a diversity ceiling beyond which additional aging does not consistently attract new species, though the limited number of fields in the 6-8 and 9+ year age class means that longer term trends cannot be predicted yet.

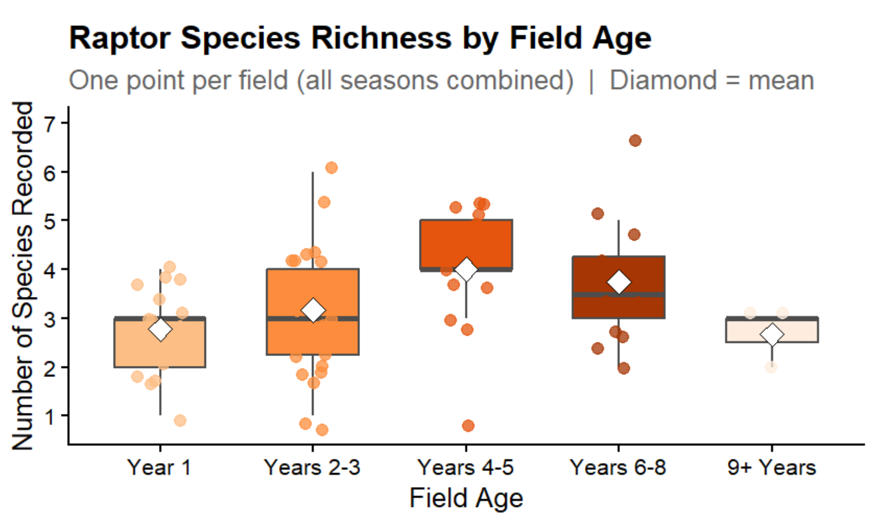

Figure 10 Number of raptor species per survey by field age from 2022 to 2026; quartiles represented by boxes, maximum and minimum values represented by whiskers, mean value represented by a diamond.

Vegetation type had no effect on species richness (p=0.322), though Grass and Clover fields had the highest mean richness (3.80) and Pollinator fields had the lowest (3.17) (Figure 15). Field size also had no significant impact on richness (p=0.998)(Figure 16), which shows that richness is completely independent of field size across this dataset. The diversity of raptor species using GLSA fields was determined by age rather than size, suggesting smaller fields are just as likely to support diverse raptor communities as large fields.

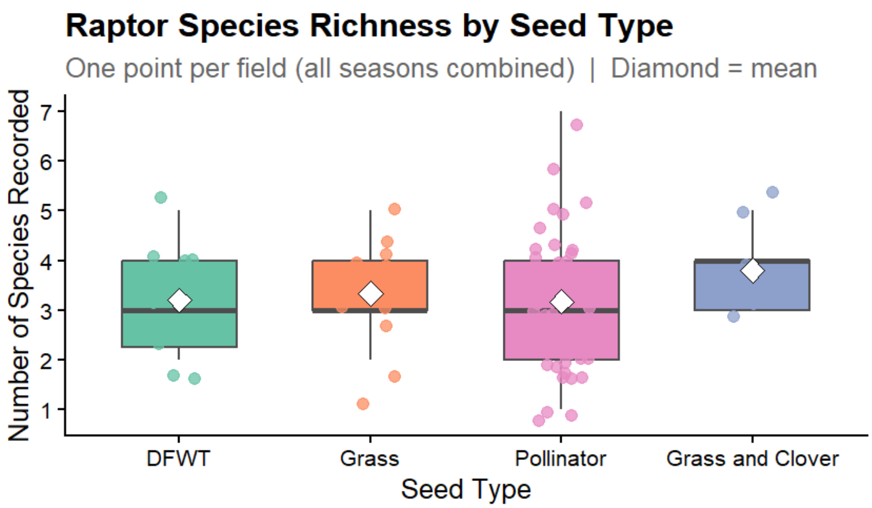

Figure 11 Number of species per survey by vegetation type from 2022 to 2026; quartiles represented by boxes, maximum and minimum values represented by whiskers, mean value represented by a diamond.

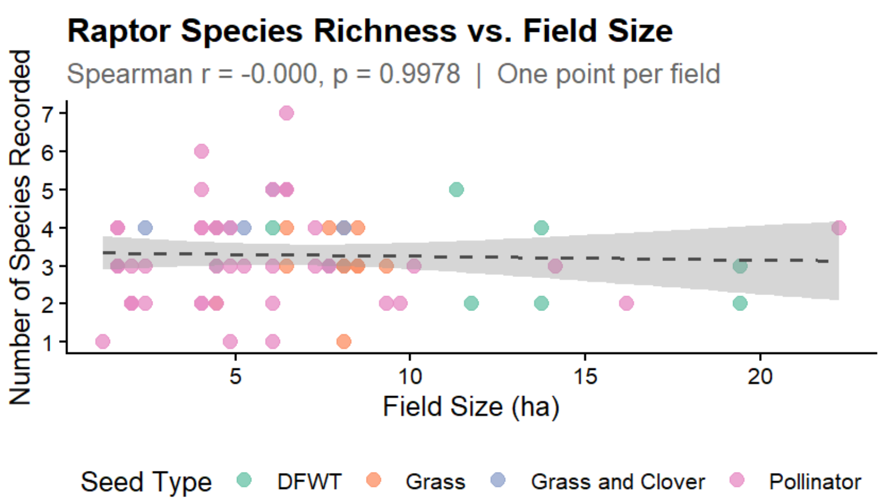

Figure 12 Number of raptor species per survey by field size in hectares from 2022 to 2026.

Raptor activity was recorded for each observation, and classified into an Active category where birds were soaring or foraging in the field, or a Passive category where birds were perched in the field, and sorted into time categories (0, <1, 1-5, 5-10 and 10-20 minutes). Of the observations recorded, 80.3% included some active behaviour.

Species differed significantly in their active duration ($p<0.0001$). Short-eared Owls had the longest active period of any species, significantly higher than Bald Eagles ($p<0.0001$), Northern Harriers ($p=0.002$), Rough-legged Hawks ($p<0.0001$), and Red-tailed Hawks ($p<0.0001$). This is consistent with the Short-eared Owls' hunting style, where they tend to continuously fly low over grasslands rather than making brief swoops. Short-eared owls actively hunting during daytime surveys reinforce the conservation value of these fields for this species at risk.

American Kestrels and Red-tailed Hawks had the highest passive rates (85.7% and 82.8%, respectively), indicating these species may use perch points in the field for scanning for prey. This suggests that GLSAs can provide foraging habitat for species with different foraging strategies.

Vegetation type had significant effects on active period duration ($p=0.0001$). Grass and Clover fields produced significantly longer periods of activity than Grass fields ($p=0.004$) and Pollinator fields ($p<0.0001$). DFWT mix fields were not significantly different than Grass or Pollinator fields. Field age was also a significant factor in active duration ($p<0.0001$). First year fields had significantly shorter active periods than fields aged 2-3 years ($p=0.0002$) and 6-8 years ($p<0.0001$). This suggests that these fields may support a higher amount of small mammal prey availability or accessibility, making them better foraging habitat despite not showing higher detection rates. First-year fields are generally poorer foraging habitats. Birds may visit these fields, detect no prey worth pursuing, and leave more quickly. By the second and third year, vegetation establishes sufficiently to support small mammal populations, to extend hunting efforts. This pattern appears to plateau through years 4-5 and 6-8 with no significant differences among older aged fields.

This result is consistent with species richness, that older fields attract more species, peaking in years 4-5 and that birds that are present hunt for longer periods of time, suggesting prey availability increases with fields age.

Conclusion

Great Blue Heron, Diurnal Raptor, and Owl surveys demonstrate the importance of the Grassland Set-aside program in creating wildlife habitat in the Fraser River delta.

Raptors show the most consistent use of GLSA fields, with 100% of monitored fields recording raptor detections in every season surveyed. While there were no significant effects of most field-level factors on detection rate, further analysis revealed that species richness peaked in fields aged 4-5 years, and active raptor duration increased progressively with field age. Suggesting that fields become increasingly valuable as foraging habitat as they mature.

Short-eared Owls presented the strongest evidence of GLSA habitat value improvement over time. The increase in detection rate from 15.7% in 2022/23 to 51.7% in 2025/6, combined with field age as the only significant factor suggests that maturing set-aside fields support increasing small mammal communities, and provide better foraging habitat for raptors.

Great Blue Herons showed weaker relationships with field-level factors, with no significant effects being seen. Larger fields did support higher mean counts of individuals, but were not a significant predictor of field use. The 2025/26 survey mean detection rate of 23.7% was the highest of all years.