2023 Least Flycatcher (LEFL) Nest Monitoring Report

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for the Beaverhill Bird Observatory (BBO)

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Project Background

The Least Flycatcher (*Empidomax minimus*, LEFL) is one of the most abundant breeding birds at the Beaverhill Bird Observatory (Van Brempt et al., 2022). Yet, Canada's population has declined by 54% over the past 50 years (Government of Canada, 2015; Sauer et al., 2019). As with many other ariel insectivores, these declines are primarily attributed to a reduced abundance of food, though habitat degradation and loss may also play a role (Spiller & Dettmers, 2019). In 2022, the BBO launched a pilot study into local LEFL nest site selection and productivity to aid conservation efforts. The study found a higher brood success rate and nest density than other breeding populations (Van Brempt et al., 2022). Additionally, Van Brempt et al. (2022) discovered that successful nests were more likely to be situated higher in trees than those that were unsuccessful, despite a general tendency for LEFLs to occupy the lower and mid-canopies (Darveau et al., 1993). The 2022 findings may be partially explained by a reduced risk of nest parasitism by the brown-headed cowbird with increased height (Briske et al., 1990). These results can contribute to the definition of the LEFL's critical habitat under Canada's *Species at Risk Act* (SARA) and inform management actions in Canada's five Bird Conservation Regions (BCRs) for which the species is listed as a priority (Government of Canada, 2015). The LEFL nest monitoring project was continued in 2023 to investigate additional trends in nest site selection that may contribute to LEFL breeding success.

One such trend is the LEFL's propensity toward nest clustering. Though Van Brempt et al. (2022) did not observe clustering behavior, it is widely reported in other breeding populations (Tarof & Ratcliffe, 2000; Perry & Andersen, 2003; Tarof & Ratcliffe, 2004; Perry et al., 2008). The purpose of nest clustering in LEFLs is unknown. Perry & Andersen (2003) suspect it to be linked to predator deterrence, which accounts for 97% of LEFL nest failures. While interior nests experience lower predation rates than those on the perimeter, Perry et al. (2008) acknowledge that this could be an unintentional outcome of high-density nesting. Alternatively, nest clustering may facilitate extra-pair copulations in one of two ways (Tarof & Ratcliffe, 2001; Perry & Andersen, 2003). The "female preference model" proposes that males may cluster their nests to form a lek, facilitating easy extra-pair mating and reduced resource expenditure in nesting females (Tarof & Ratcliffe, 2001, p. 22). Meanwhile, the "hotshot model" theory places the most biologically fit males in the cluster's center, with less suitable mates inhabiting the fringes (Tarof & Ratcliffe, 2001, p. 22). Extra-pair copulation theories are supported by findings that interior nests are typically the first to be occupied within a cluster (Tarof & Ratcliffe, 2000). Thus, the comparatively greater success of interior nests can potentially be attributed to both predator defense and extra-pair copulation theories, either individually or in combination (Perry & Andersen, 2003; Perry et al., 2008).

With LEFLs, the task of nest site selection is typically shared between male and female partners shortly after their monogamous pair formation (Tarof & Ratcliffe, 2000; Tarof et al., 2005). After locating a site with the best "fit," usually in the crotch or fork of a deciduous tree trunk and its protruding branches, the female will spend 5-7 days building an open-cup nest out of grasses, spiderwebs, and other fibrous materials (Tarof & Ratcliffe, 2000; Tarof & Briskie, 2020). Occasionally, females will steal materials from similar nests within their territory, both active and old (Tarof & Briskie, 2020). On one occasion, a LEFL reused an entire Yellow Warbler nest that had been abandoned earlier that year (Goossen, 1977). While approximately 6% of LEFL nests are reused within a breeding season, only one report of LEFLs utilizing a nest from a previous breeding season has been published (Briskie & Sealy, 1988). Reusing open-cup nests is uncommon in passerines due to their propensity towards disintegration (Clark & Mason, 1985; Aguilar & Marini, 2007). However, records of nest reuse are relatively higher for flycatcher species, particularly of the *Empidonax* genus, and it is suspected that this behavior is more common than recorded (Ellison, 2008). Re-using nests saves reproducing birds time and energy but increases exposure to ectoparasites and predation (Aguilar & Marini, 2007; Ellison, 2008). It is suspected that nest site re-use is linked to nest site fecundity and fidelity, with the nestlings of successful broods returning to the area of their original nest (Aguilar & Marini, 2007; Ellison, 2008). However, Aguilar & Marini (2007) found no link between previous-year nest success and nest reuse in various Brazilian flycatchers, concluding that nest site fidelity plays a larger role.

Methods

Nest Identification

Nest searches were conducted within a 600m by 350m (21 ha) area of the Beaverhill Natural Area between May 26 and June 26, 2023. Nests were located by observing LEFL activity, including territorial singing, defense displays, and within-pair communication calls. Active reuse of a 2022 nest was first observed on June 7. Following this discovery, an attempt was made to relocate all nests previously identified in 2022. A GPS was used to navigate to each 2022 nest location, where descriptions provided in the 2022 nest records were used to refine the search. Nest searches were conducted within a 12m radius of each coordinate to account for limitations in GPS accuracy. Whenever a nest was identified, regardless of its activity status, a GPS coordinate was recorded, and the tree was flagged and labeled with the Nest ID and year of discovery. Observations of nesting habitat were recorded as per the NestWatch monitoring program protocol (Martin et al., 1997).

Monitoring Breeding Activity & Brood Development

The GPS coordinates of nests were entered into Google Earth to develop a monitoring route, which was updated with the discovery of new nests. A camera poll (Microsoft LifeCam 3000) was used to monitor nest activity and brood development in nests 2-7m above ground level. Nests situated higher than 7m were monitored with binoculars only. The camera pole was connected to a technological device (Samsung phone, Amazon Fire tablet, or laptop) via USB, and images of the nest contents were recorded using various USB camera apps. Camera poll monitoring required two observers to safely operate without damaging the nests – one to hold the pole and the other to direct the pole's position and take a photo with the connected electronic device.

Nest monitoring was opportunistic, occurring twelve times between May 31 and August 2 every three to eleven days (averaging five-day intervals) at various times throughout the day. The 2022 protocol called for nest monitoring to occur every 3-4 days, but this schedule was not always feasible in 2023 due to a combination of staff time requirements and technological difficulties. Three of the twelve monitoring periods relied on binoculars alone to confirm nest activity due to a malfunctioning pole camera. Each nest monitoring period took 3-4 hours, during which observers recorded the status of the nest, number of host and/or parasite eggs, number of host and/or parasitic juveniles, stage of juvenile development, and adult activity, as per Martin et al. (1997). Pictures taken at the nest were used to age the LEFL nestlings, according to Jacklin's (2017) Least Flycatcher Aging Guide and previous monitoring results. In instances where key observation dates were missed, the timing of breeding activities was extrapolated using the average LEFL nest-building, incubation, and nestling development periods described by Tarof & Briskie (2008), rounded to whole numbers (7, 14, and 14 days, respectively).

Cluster Delineation & Measurement

Clusters were delineated following the methodology of Perry et al. (2008). Clusters can be defined by natural breaks in areas where individuals are observed and are obvious even to casual observers (Tarof & Ratcliffe, 2004; Perry et al., 2008). Observed clusters were verified by measuring distances between nests using Google Earth, as nests occupying the same cluster are spaced no more than 50m apart (Perry et al., 2008). However, cluster boundaries may shift between years (Perry et al., 2008). Thus, during the delineation process, distances between nests were only measured between nest locations recorded in the same year. However, due to data and time constraints, the maximum possible area for each cluster was estimated by using the largest distance between nests of any activity or observational status observed in either 2022 or 2023 as a circular diameter. The number of nests per cluster included nests of any activity or observational status identified in 2023. These two outputs were combined to estimate the relative nest density of each cluster in 2023. Spatial data was lost for one nest (2023_046), so it was not included in the cluster delineation or analysis.

Data Analysis

All statistical procedures were conducted using R. A Welch Two Sample t-test was used to compare differences in clutch size, the date of the first egg laid, cluster area (ha), cluster size (n), and cluster density (n/ha) of reused and new nests in 2023. The same tests were conducted to compare the clutch size and egg-laying date between clustered and solitary nests.

A one-way Analysis of Variance (ANOVA) was conducted to compare the clutch size and egg-laying date between each identified cluster. A one-way ANOVA was also used to compare clutch size, egg-laying date, cluster size (number of nests, *n*), cluster area (ha), and cluster density (n/ha) between nests of differing outcomes (success, predation, abandonment, and unknown).

Finally, a Pearson's Correlation test was used to assess potential relationships between all continuous data variables, including the clutch size and egg-laying date of all nests, and the clutch size, egg-laying date, cluster size, cluster area, and cluster density observed in clustered nests only. A linear regression analysis was then conducted on all significant correlations.

Results

Nest Identification

Of the 34 nests from 2022 that remained intact, 22 were relocated. Eight of these 22 nests were deemed suitable for potential reuse and included in the 2023 monitoring program, though only four proved active, resulting in an observed nest reuse rate of 11.76%. Three new nests were located within the 12-meter radius of the 2022 nest locations and were included as 2023 nests in long-term monitoring. In two of these cases, the 2022 nests (40630 and 40644) were located but unsuitable for reuse; in the third case, the location of the identified nest (2023_035) did not match the 2022 nest (40608) description. In addition to the reused nests, 29 new nests were discovered in 2023, though four were unsuitable for pole camera monitoring, and another four proved inactive during monitoring. In total, 25 nests were located, deemed suitable for monitoring, and proved active, including the four nests originally identified in 2022 and 21 identified in 2023. One of these nests (2023_011) was too tall for pole monitoring, but activity and nestling development could be assessed with binoculars.

Brood Success and Development

Of the 25 nests monitored for brood development, twelve successfully produced fledglings, eight failed, and five had indeterminable outcomes, resulting in a minimum success rate of 48%. However, one of the successful nests lost a portion of its brood to predation. Three failed nests were also predated, resulting in an overall predation rate of 16%. The remaining five failed nests were abandoned. In one case, this abandonment occurred at the nest stage, prior to egg laying. For the other four nests, abandonment occurred during the nestling stage, with no evidence of predation observed. The average observed clutch size was 2.84 (sd=0.96). The overall success rate and average clutch size of nests observed in 2023 were lower than in 2022 (78% and 3.89, respectively).

Extrapolating field data with the average development periods described by Tarof & Briskie (2008) revealed that initial nest-building could begin as early as May 23 and last until June 20, with most construction occurring between May 30 and June 4 (Figure 1). The first broods were laid between May 29 and June 14, with June 5 representing the median and mode date for egg laying. Late or second broods were laid between June 21 and July 3, though a small sample size impedes the certainty of this estimate. The fledge dates of successful broods varied considerably. Excluding one outlier nest (40646/2023_023), which did not fledge until August 3, the mean fledge date was July 7, the median July 5-6, and the mode July 3.

Nest Reuse

Of the original eight nests identified in 2022 and included in 2023 monitoring efforts, six had produced successful broods in 2022, one produced a partially successful brood, and one had an indeterminable outcome. All four reused nests that proved active in 2023 had been successful the previous year. Three of these nests continued to produce a successful brood in 2023. In two of the nests (40622 and 40653), eggs were laid slightly earlier than they were in 2022, though the difference was less noticeable when comparing fledge dates (four and zero days) (Figure 2, Table 1). It appears that the other two nests (40646 and 40635) were used for late or second broods, with no activity noted in either until June 28. The brood in nest 40646 was the last to fledge in 2023, while 40635 was predated by brown-headed cowbirds (*Molothrus ater*) following the initial observation of adult activity. Three of the reused nests were associated with a cluster, each different (Clusters D, E, and F). The reused nest that failed in 2023 was in Cluster E.

Cluster Delineation & Measurement

Five clusters were identified in the delineation process (Figure 3). Eighty percent of the nests observed in 2023 were included in these clusters. The clusters' maximum estimated area ranged from 0.38 to 1.72 ha (mean=104.78, sd=37.04), and they contained between 2 and 11 LEFL nests in 2023 (mean = 5.8, sd=3.27), resulting in densities spanning from 2.91 to 13.16 nests/ha (mean=7.27, sd=3.83) (Table 2).

Cluster A, which surrounds the Beaverhill Bird Observatory and staff housing units, had the highest nest density in 2023. Unfortunately, most were too tall to be monitored for brood development and success (Figure 4, Table 3). Cluster B saw the largest increase in nests from 2022, but most of its nests failed (Table 4). Only one of these failures was due to predation; the other five resulted from abandonment. The largest cluster in size, Cluster C, had the lowest nest density in 2023 and saw reduced rates of nest failure, both from predation and other causes, compared to 2022 (Figure 5, Table 5). Cluster D saw a reduced success compared to 2022 (Figure 6, Table 6). The reused nest in Cluster E saw continued success, while the outcome of the other nest was unknown (Figure 7, Table 7).

Statistical Analysis

No significant difference was found in the clutch size, egg-laying date, cluster area (ha), cluster size (n), and cluster density (n/ha) between reused and new nests. Likewise, no significant difference was found in the observed clutch size between solitary and clustered nests. However, clustered nests were found to have a significantly later egg-laying date (June 9, 95% CI [June 7-11]) than solitary nests (June 3, 95% CI [June 1-6]) (Figure 8).

No significant difference was found in the clutch size between the identified clusters. A significant difference was originally found in the egg-laying date between Cluster E and Clusters B and C, with the laying date of Cluster E being much later. However, because only one nest was monitored in Cluster E in 2023, it was removed from the analysis to achieve more reliable results. Cluster A was removed for the same reason. The resulting analysis revealed no significant difference in the egg-laying dates between nests found in Clusters B, C, and D.

After grouping by nest outcome, the one-way ANOVA test revealed a significant difference in nest cluster size [F(3,15) = 4.15, p = 0.025] (Figure 9). Post-hoc multiple-pairwise comparisons using the Tukey Honest Significant Difference (HSD) adjustments revealed that the mean cluster size of successful nests was smaller (5.7, 95% CI [2.7, 8.6]) than that of abandoned nests (11.0, 95% CI [7.8, 14.2]). There was no significant difference in the observed clutch size, egg-laying date, cluster area, or cluster density between nests grouped by outcome.

A significant negative correlation was found between the egg-laying date and cluster area, r(14) = - 0.65, p=0.006, and between the egg-laying date and cluster size, r(14) = -0.59, p=0.016. A significant positive correlation was also discovered between cluster size and cluster area, r(17) = 0.59, p=0.008. A linear regression confirmed that cluster area (ha) most readily predicted egg-laying date R^2 = 0.42, *F*(1, 14)= 10.23, p=0.006, (y= -11.823x+27.212) (Figure 10). Cluster size may also play a role in predicting egg-laying date R^2= 0.35, *F*(1, 14)=7.53, p=0.016, (y= -1.569x+25.516) (Figure 11). A regression was not conducted between cluster size and cluster area since, based on the described methods of cluster delineation and the observed correlation, cluster size and cluster area are inevitably linked.

Discussion & Recommendations

Nest Monitoring

It is recommended that future nest searches begin during the last week of May, no later than May 29 (the first estimated date of egg laying), and extend for approximately one month until at least June 21 (the latest estimated egg laying date of first broods). Nest searching took approximately 40 hours in 2023, though the time required to relocate nests from previous years will be reduced if tags remain on trees. It should be considered that tags may fall off naturally or be removed by other nesting species, such as Baltimore orioles, so nest location descriptions should still be consulted when relocating previous nests. An additional 10 hours were required to input initial habitat data, prepare data collection tables, and create maps and routes.

Monitoring nests took roughly 3.5 hours and required two observers to conduct properly, equating to 7 hours of staff time per monitoring session. An additional 1-2 hours was required per session to upload observations, age birds, and update maps. Ideally, the monitoring period would last from May 29 to August 3 (66 days) to match the observed development periods in 2023, equating to 22, 17, or 13 monitoring sessions on a 3, 4, or 5-day schedule, respectively. Thus, approximately 110-190 staff hours should be allocated to the monitoring portion of future projects. In total, the field portion of this project (not including literature review, data analysis, or report drafting) requires 160 to 240 hours or 20-30 FTE days (2-3 full days per week), with more time allotted for less experienced observers.

It is also recommended that all nests be monitored until the second week of July, even if they appear inactive, as it is possible that nests (such as 2023_011) were used for a second brood following the first fledging, while reused nests may not see any activity until the second brood. Finally, monitoring staff must have access to an Android device or utilize the field laptop to minimize technological issues. A "Lessons Learned" document was included with the 2023 data collection for further monitoring considerations.

Nest Outcomes

Due to resource and time constraints, nests were not monitored as frequently as in 2022, which limited data available for analysis. Some nests that were "abandoned" during the nestling stage may have been predated by brown-headed cowbirds in between sporadic monitoring sessions. Flooded conditions in 2023 ensured there was no shortage of insectivorous food resources that would contribute to brood abandonment. However, periods of intense wildfire smoke, extreme heat, and significant storms throughout the breeding season may have impacted adult health and brood development. Another possible explanation for high levels of brood abandonment is a higher abundance of inexperienced parents. Future studies may consider color-banding nestlings by generation to determine the age-class structure of clusters and the overall population and compare it to nest outcome.

Nest Reuse

While the sample size of actively reused nests in 2023 was too small to assess for generalizable trends, it is interesting to note that all four had been successful the previous year, and three were associated with a cluster. These findings may correspond with theories relating other flycatcher species' nest reuse to nest fidelity and fecundity (Aguilar & Marini, 2007; Ellison, 2008). However, it cannot be confirmed that the individuals observed reusing the nests in this study had inhabited them the year prior. Breeding site fidelity in LEFLs has been consistently reported to be low, with a return rate of approximately 4% (Tarof & Briskie, 2008). More likely, previously successful nests were constructed well enough to last a year and used opportunistically to reduce resource and energy expenditure. Still, studies on LEFL nest reuse are scarce, and these potential findings raise a critical question concerning possible linkages between nest fidelity and nest clustering in LEFLs. Future studies may look at color-banding birds by generation or cluster to examine possible relationships between nest reuse, fidelity, and clustering.

Nest Clusters

The clusters in this study contained a considerably smaller area and denser population than those in Perry et al. (2008). The cluster population size, area, and density observed in this study corresponded with the findings of Tarof (2001). However, the distance between clusters and solitary males was much greater in the latter. It is important to emphasize that since nest searches were not exhaustive in either year, the delineation of clusters in this study was intended to serve as a coarse approximation to guide future surveys. Solitary nests or proximal clusters may not be entirely distinct. Furthermore, it is worth noting that this study did not specifically address differences between interior and perimeter nests within clusters due to the uncertainty in delineation. These variables may be addressed in future years once more data is collected, and cluster boundaries are confirmed.

Eggs were laid significantly earlier in solitary LEFL nests. Assuming that the egg-laying date is linked to the arrival date, this finding conflicts with Tarof (2001), who found solitary males to arrive later. It also conflicts with the "hot-shot model" of extra-pair mating to explain nest clustering, as this model assumes that solitary and perimeter males have more difficulty attracting mates. Though insignificant, there was slightly more variation in the egg-laying date in clustered nests, which could support assertions of the "hot-shot model". It is recommended that within-cluster variation be examined in future studies.

Another contradiction to the “hot-shot model” was the significant finding that successful nests were more likely to be found in smaller clusters than larger ones. Though, eggs tended to be laid later in smaller clusters than larger ones. In this case, the success of nests in smaller clusters may be linked to reduced exposure to wildfire smoke, which was heavier in the early breeding season.

The less probable suggestion linking nest clustering to nest site fidelity could also explain the heightened probability of nest abandonment occurring in larger clusters, with new, inexperienced parents returning later in the season to the area of their original nest near their previously successful parents and seasoned returnees branching out to new areas. The observations of increased nest density and high levels of abandonment in Cluster B in this study loosely illustrate this hypothesis. However, little, if any, empirical evidence supports it. Further studies with more data, confirmed clusters with interior and perimeter delineations, and colour banding would provide considerable insight regarding nest and cluster fidelity, return rates, and age demographics.

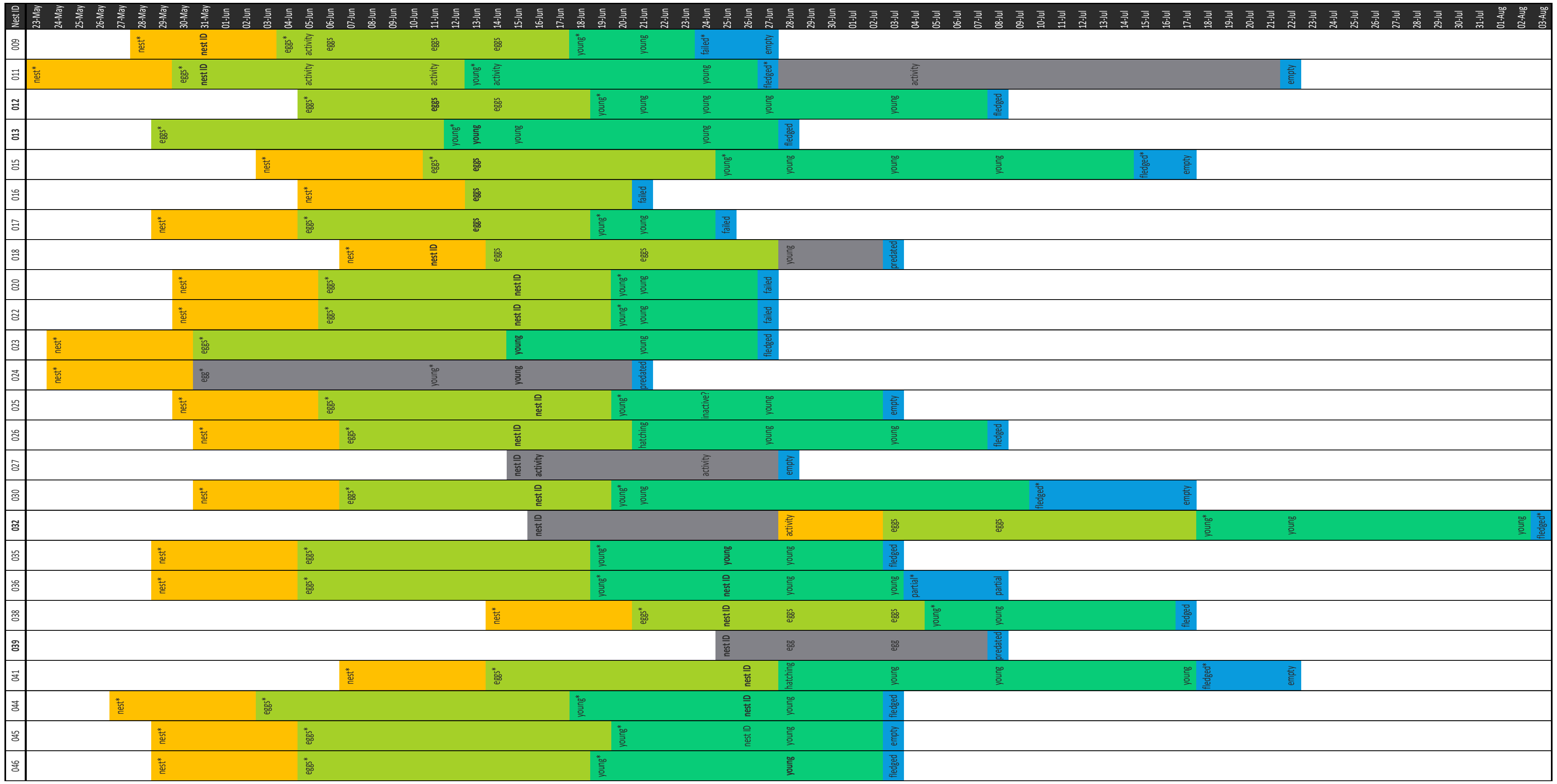

Figure 1. A timeline of least flycatcher nest development in 2023, extrapolated from field observations. Bold text indicates the date of discovery. Asterisks (*) indicate an estimated date.

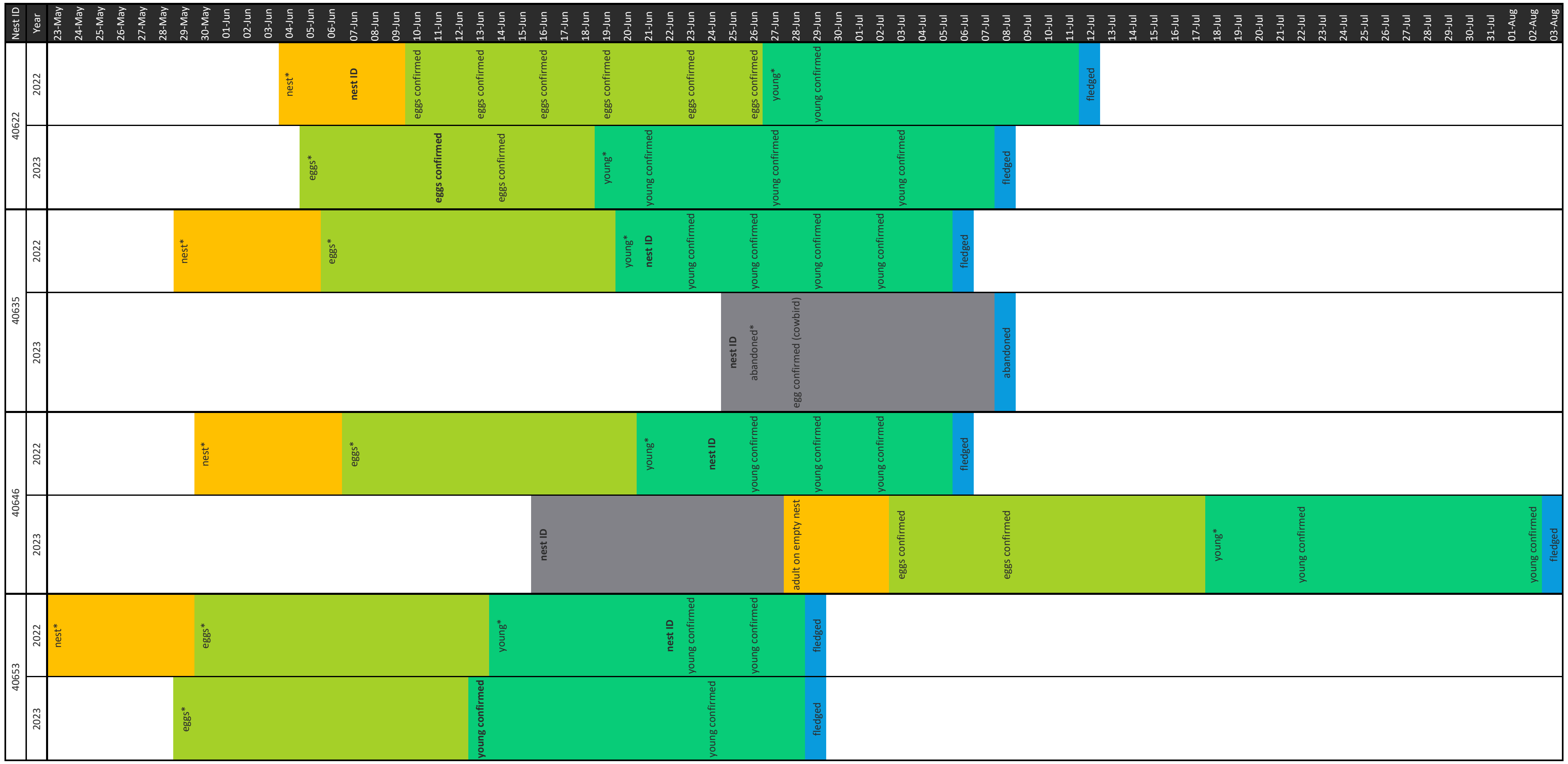

Figure 2. A comparison of nest development timelines in reused nests, extrapolated from 2022 and 2023 field data. Bold text indicates the date of discovery. Asterisks (*) indicate an estimated date.

Table 1. Reused LEFL nest outcomes in 2022 and 2023.

Nest ID		2022 Data				2023 Data			
2023	2023	Discovery Date	Egg Date	Outcome Date	Outcome	Discovery Date	Egg Date	Outcome Date	Outcome
40622	2023_012	07-Jun	10-Jun	12-Jul	success	11-Jun	05-Jun	08-Jul	success
40635	2023_039	21-Jun	06-Jun	06-Jul	success	25-Jun	N/A	08-Jul	predated
40646	2023_032	24-Jun	07-Jun	06-Jul	success	16-Jun	03-Jul	03-Aug	success
40653	2023_013	22-Jun	30-May	29-Jun	success	13-Jun	29-May	28-Jun	success

Figure 3. Ariel view of the least flycatcher nest survey area and cluster locations from 2022 and 2023.

MAP LEGEND

COLOR	
Purple	Active nest in 2022
Yellow	Active nest in 2023
Grey	Inactive, lost, or unable to be observed with a pole camera
SYMBOL	
Check	Successful
X	Unsuccessful
Dot	Unknown outcome
Tower	Partially successful

Table 2. Estimated size and density of LEFL nest clusters.

CLUSTER	Diameter (m)	Area (ha)	2023 Nests (n)	2023 Density (n/ha)
A	69.26	0.38	5	13.16
B	138.44	1.51	9	7.28
C	147.79	1.72	5	2.91
D	98.29	0.76	6	7.89
E	70.11	0.39	2	5.13

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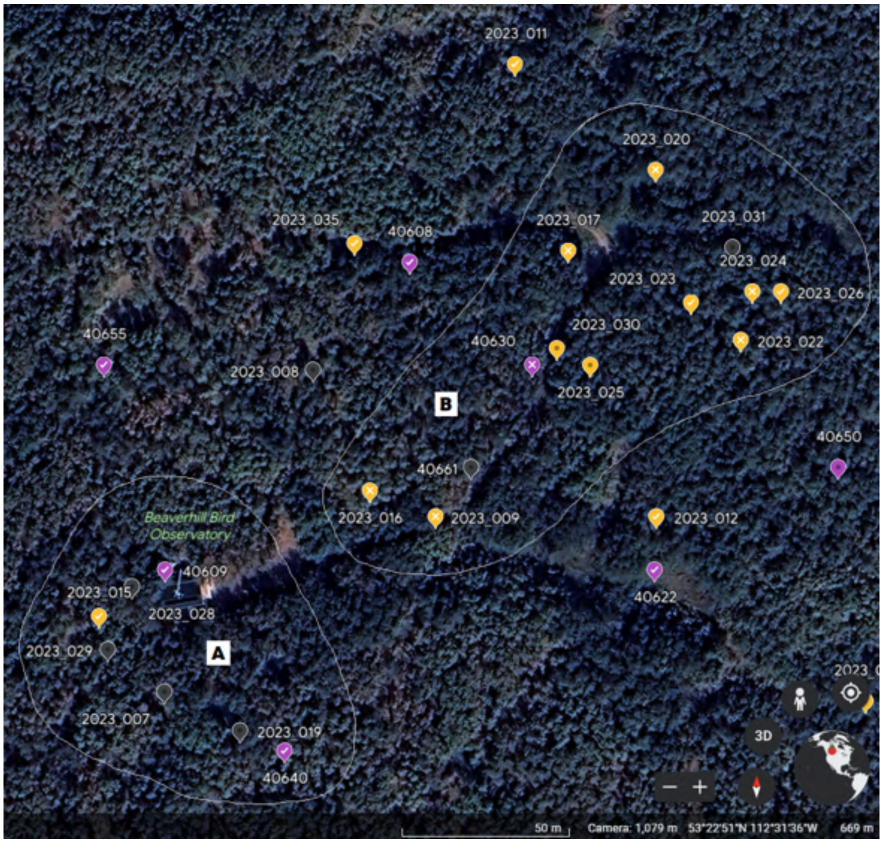

Figure 4. Spatial arrangement of least flycatcher nests observed in Cluster A, B, and C.

Table 3. Least flycatcher nest outcomes observed in Cluster A in 2022 and 2023.

Year	Actively Monitored (Colored)										Unmonitored (Grey)			TOTAL
	Successful	Partial			Failed				Unknown	Total	Inactive	Unable	Total	
		Predated	Other	Total	Predated	Other	Total	Predated Total						
2022 (Purple)	2	0	0	0	0	0	0	0	0	2	0	0	0	2
2023 (Yellow)	1	0	0	0	0	0	0	0	0	1	1	3	4	5
TOTAL	3	0	0	0	0	0	0	0	0	3	1	3	4	7

Table 4. Least flycatcher nest outcomes observed in Cluster B in 2022 and 2023.

Year	Actively Monitored (Colored)										Unmonitored (Grey)			TOTAL
	Successful	Partial			Failed				Unknown	Total	Inactive	Unable	Total	
		Predated	Other	Total	Predated	Other	Total	Predated Total						
2022 (Purple)	0	0	0	0	1	0	1	1	0	1	1	0	1	2
2023 (Yellow)	2	0	0	0	1	5	6	1	2	8	0	0	1	9
TOTAL	2	0	0	0	2	2	7	2	2	9	1	0	2	11

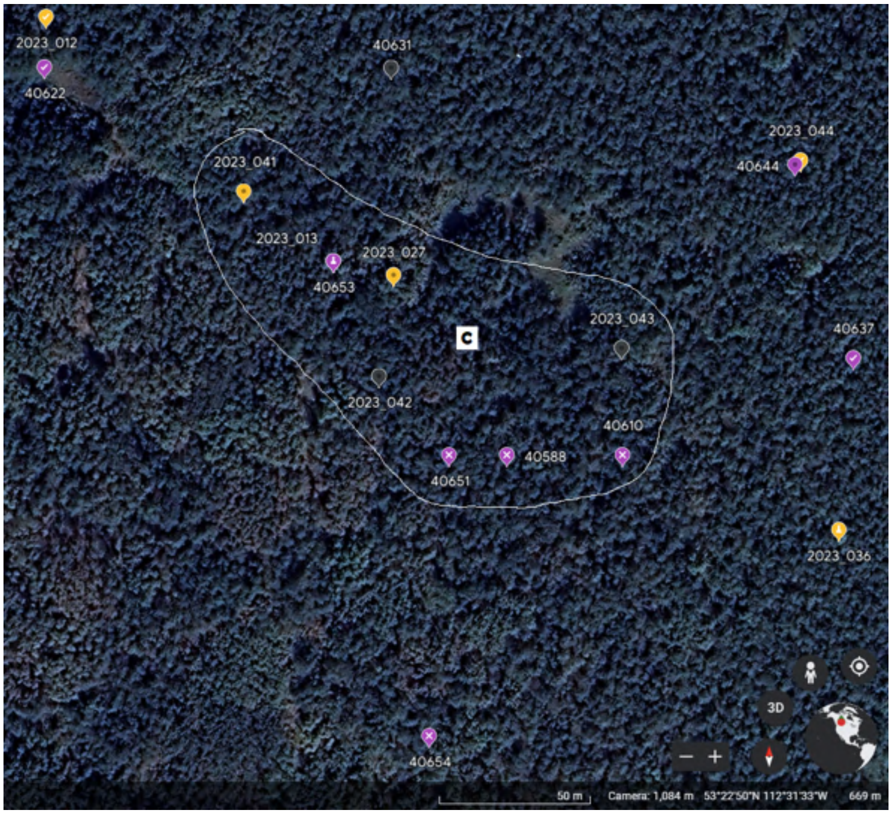

Figure 5. Spatial arrangement of least flycatcher nests observed in Cluster C.

Table 5. Least flycatcher nest outcomes observed in Cluster C in 2022 and 2023

Year	Actively Monitored (Colored)										Unmonitored (Grey)			TOTAL
	Successful	Partial			Failed				Unknown	Total	Inactive	Unable	Total	
		Predated	Other	Total	Predated	Other	Total	Predated Total						
2022 (Purple)	0	1	0	1	1	2	3	2	0	4	0	0	0	4
2023 (Yellow)	1	0	0	0	0	0	0	0	2	3	2	0	2	5
TOTAL	1	0	0	1	0	0	3	2	2	7	2	0	2	9

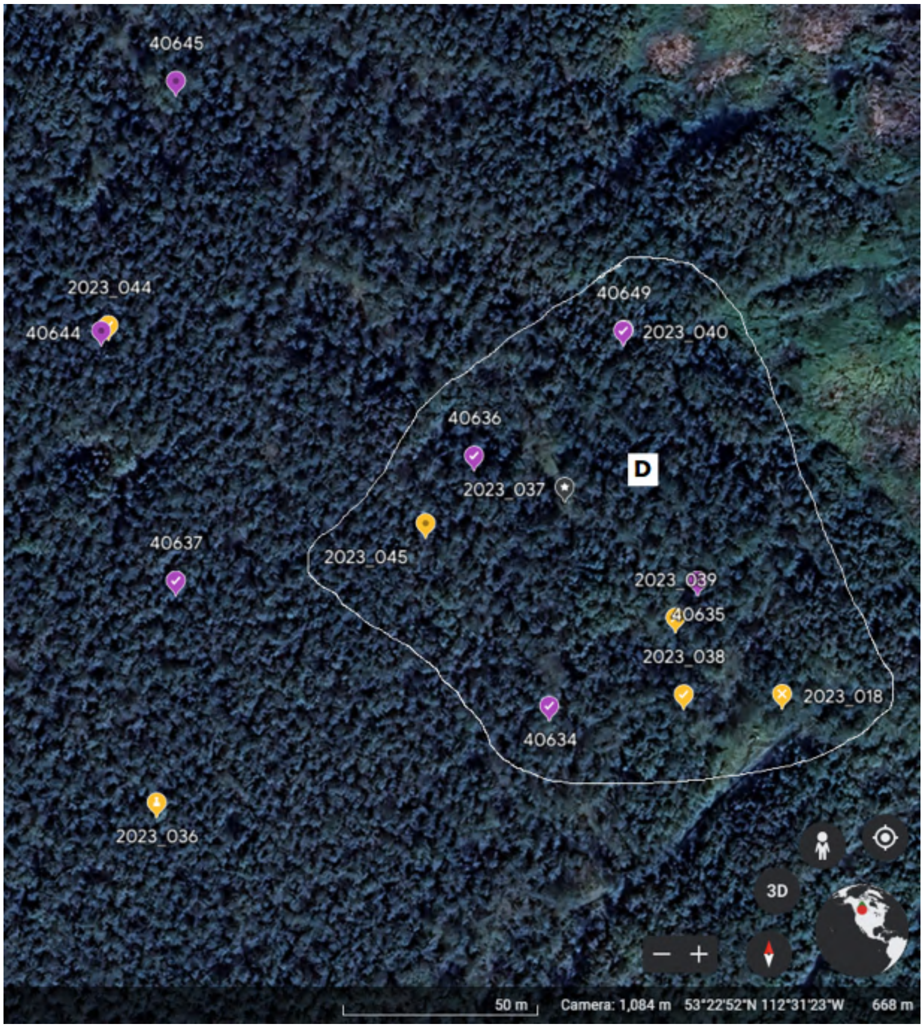

Figure 6. Spatial arrangement of least flycatcher nests observed in Cluster D.

Table 6. Least flycatcher nest outcomes observed in Cluster D in 2022 and 2023.

Year	Actively Monitored (Colored)										Unmonitored (Grey)			TOTAL
	Successful	Partial			Failed				Unknown	Total	Inactive	Unable	Total	
		Predated	Other	Total	Predated	Other	Total	Predated Total						
2022 (Purple)	4	0	0	0	0	0	0	0	0	4	0	0	0	4
2023 (Yellow)	1	0	0	0	2	0	2	2	1	4	2	0	2	6
TOTAL	5	0	0	0	2	0	2	2	1	8	2	0	2	10

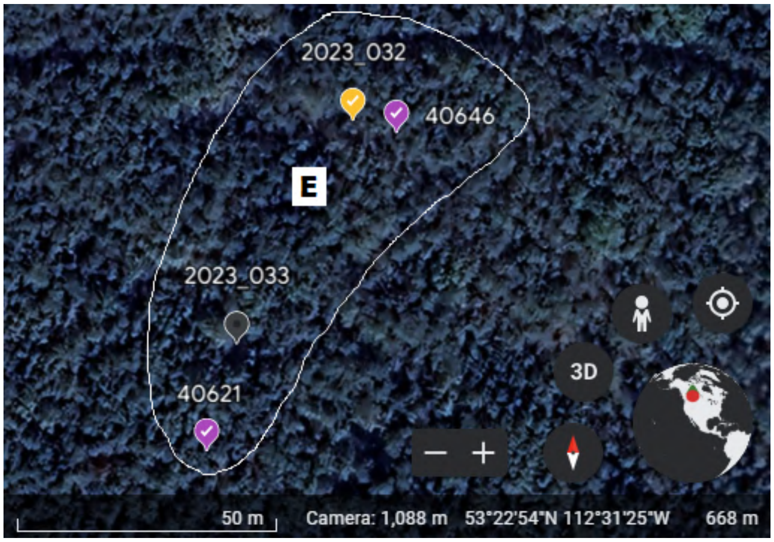

Figure 7. Spatial arrangement of least flycatcher nests observed in Cluster E.

Table 7. Least flycatcher nest outcomes observed in Cluster E in 2022 and 2023.

Year	Actively Monitored (Colored)										Unmonitored (Grey)			TOTAL
	Successful	Partial			Failed				Unknown	Total	Inactive	Unable	Total	
		Predated	Other	Total	Predated	Other	Total	Predated Total						
2022 (Purple)	2	0	0	0	0	0	0	0	0	2	0	0	0	2
2023 (Yellow)	1	0	0	0	0	0	0	0	0	1	1	0	1	2
TOTAL	3	0	0	0	0	0	0	0	0	3	1	0	1	4

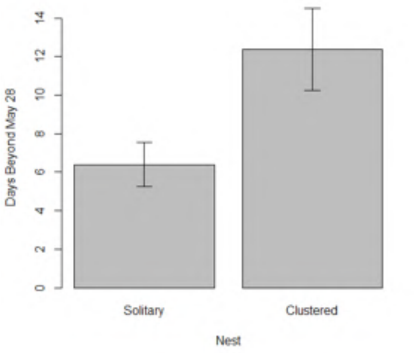

Figure 8. The mean egg-laying day observed in solitary and clustered least flycatcher nests, where the first approximated egg-laying date was May 29 (Day 1), displayed with a 95% confidence interval.

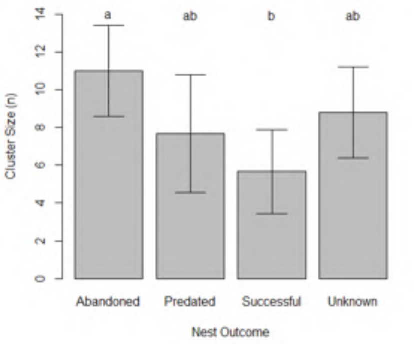

Figure 9. The mean cluster size of least flycatcher nests grouped by nest outcome, displayed with a 95% confidence interval.

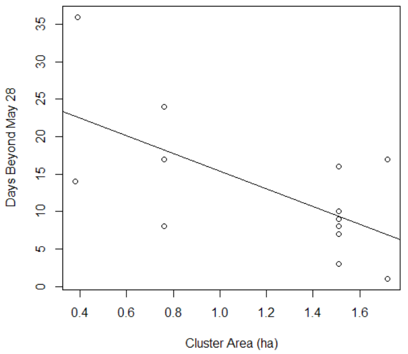

Figure 10. The linear relationship between cluster area and observed or estimated egg-laying date of least flycatchers, where the first approximated egg-laying date was May 29 (Day 1).

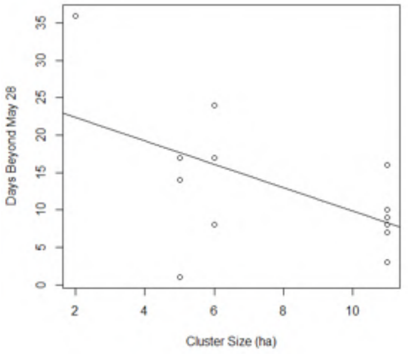

Figure 11. The linear relationship between cluster size (n) and observed or estimated egg-laying date of least flycatchers, where the first approximated egg-laying date was May 29 (Day 1).

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