

2019 Eastern Loggerhead Shrike Recovery Program - Summary Report

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1.0 HIGHLIGHTS FROM THE 2019 FIELD SEASON

Wild population

- 18 wild pairs (5 in Carden, 11 in Napanee, 1 in Smiths Falls, 1 in Quebec)
- 34 wild young fledged (8 in Carden, 26 in Napanee)
- 1 wild young recruited for captive population
- 6 unmated single birds (1 in Carden and 5 in Napanee)
- At least 36% of all birds detected in the wild this year were captive-bred

Captive population

- 23 initial pairs, and 3 repairing attempts
- 16 pairs fledged young
- 80 fledglings survived to release or retention
- 7 fledglings died while in captivity
- 16 fledglings retained
- 64 fledglings released; 10 with radio tags

Status of the captive population (as of November 8, 2019)

- 68 birds in captivity
- 64 breeding adults
- 1 unreleasable non-breeding bird
- 1 retired breeding adult, housed at a U.S. facility
- 2 hand-reared education birds (2013HY bird at Mountsberg, 2014HY bird at Toronto Zoo)

2.0 WILD POPULATION

2.1 Monitoring

Eighteen pairs of Loggerhead Shrike (LOSH) were confirmed in Eastern Canada this season: 11 in Napanee, 5 in Carden, 1 in Smiths Falls, and 1 in Quebec approximately 20 km northeast of the Pembroke-Renfrew core area (Fig. 1). While the number of pairs in Napanee held steady compared to 2018, this was the second successive year that numbers in Carden dropped by approximately one third. Though troubling, it should be noted that the count in Napanee has shown a modest recovery from a low of four pairs in 2015, so persistence of a Carden population may still be possible. It is also worth noting that both Carden and Napanee have a high priority site where birds have nested for the past several years that staff are not able to survey due to unfriendly landowners, so there is a high likelihood that some birds adults went uncounted.

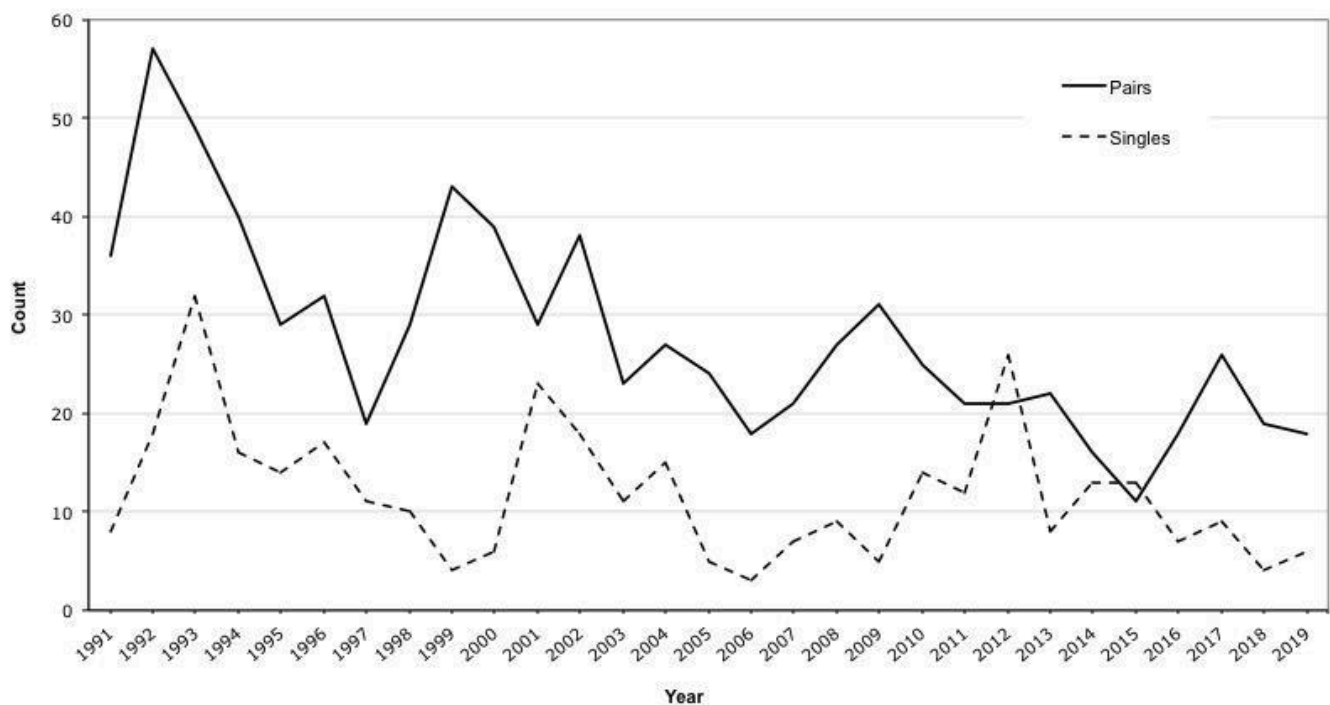


Figure 1. Number of Loggerhead Shrike pairs and single birds in Ontario and Quebec, 1991-2019

The percentage of pairs to fledge young was relatively high in both Napanee (82%) and Carden (80%), though the success rate per nesting attempt was markedly lower, at 71% and 57%, respectively. Only 34 fledglings were confirmed this year (26 in Napanee, 8 in Carden), which is a significant drop from the 53 seen in 2018, and amounts to an average of only 2.4 fledglings per successful nest. However, this is likely an underestimate, as four nests were only found to be successful after the young had fledged and dispersed, so some fledglings may have gone uncounted.

The breeding outcome of the two isolated pairs in Smiths Falls and Quebec is uncertain as observations were gathered by volunteers or gleaned from eBird. However, it does appear that the nest in Smiths Falls failed at or near the point of fledging, as adults were seen feeding mature nestlings, but no birds were in the area three days later. This nest was built in an isolated conifer along a rural driveway, and surrounded by agricultural fields, making it quite susceptible to predation. The Quebec nest was on a property whose owners were unhappy at the increased birder traffic. The field where the birds were often seen foraging was mowed approximately one week after the first eBird sighting—whether to dissuade birders or simply following a regular schedule of property activity is unknown—after which point birder presence was tempered, and no further observations were reported, so breeding outcome is unknown.

There was one pair that double-brooded this year, though the first nesting attempt of this pair might only be considered a partial success as the sole first-clutch fledgling had to be brought in to captivity due to injuries sustained from becoming entangled in nesting material (see Section 2.1.4); this bird will be incorporated in to the captive-breeding pool. Four other pairs had multiple nesting attempts, though they were all the result of initial nest failures (see Section 2.1.3).

In addition to breeding pairs, six single birds were confirmed this year: five in Napanee and one in Carden. Only one of these birds had a band combination that allowed definite identification, so this count was largely determined by timing and location of sightings, so may be an underestimate.

Using conservative counts of confirmed pairs and single birds, the LOSH population in Ontario was 42 adults this year.

2.1.1 Returning captive-bred birds

Fifteen captive-released birds were confirmed returning to Ontario and Quebec breeding grounds this year (Table 1). These captive-origin birds made up 36% of the population of adult shrike seen in eastern Canada.

Seven of these birds were observed as part of breeding pairs with wild birds, four paired with other captive-origin birds, and four were singles. Five of the seven pairs that included a wild bird bred successfully, with at least 12 fledglings confirmed (35% of all wild juveniles seen in Ontario); however, this fledgling count may be an underestimate, as one successful nest was confirmed after young had already fledged. Of the remaining two pairs, the outcome of one (in Quebec) was unknown as regular monitoring by WPC staff was not possible, and the second was only seen once by a volunteer, and was assumed to be transient as it was never found by field staff during follow-up. Oddly, this pair was also never found on another site in the vicinity, nor was it found on any other sites in the area.

Seven of the returning birds were confirmed as 2018-releases (5.4% return rate), four as 2017-releases, and one as a 2016-release. Two of the 2017 birds had not been seen in 2018, so the return rate for that cohort is now 5.5% (up from 3.9% in 2018). Though a full band combination was never confirmed for the sole bird that returned to Carden, it was on a territory where a bird banded SI/RD:DB/OR bred in 2018, so is assumed to be the same individual. The 2016 bird had not been confirmed in Ontario in 2017 or 2018, though a similar partial band combination (YE:OR) was seen in Napanee in 2017; however, considering those to be the same bird is fairly speculative. Counting only those 2016 that we could confidently identify, that cohort now has an 8.6% return rate.

One of the 2018 birds (SI:DG/YE) was caught during spring migration at Long Point Bird Observatory banding station at the tip of Long Point. Identification was confirmed through the band number, which was quite helpful as it had shed a dark blue band over the winter. Though this bird seemed to disappear after being captured, but was spotted at the Napanee Release Site towards the end of August. This is the first time that we've had one of our captive-origin birds caught at a banding station during spring migration, though our birds have been seen around Long Point during the falls of 2004 and 2006.

Table 1. Captive-bred birds observed in 2019

Core	Band combination	Hatch year	Hatch site	Release site	Sex	Paired?	Breeding outcome
Carden	SI/RD: ?/OR ^a	2017	U	U	U	Y	1 fledgling ^b
	DB/SI: DG/DG	2018	TZ	Napanee	F	Y	Unknown ^c
	DB/SI: WH/DB	2018	TZ	Napanee	M	Y	Failed (w/ SI)
	DB/SI: WH/OR	2018	TZ	Napanee	F	Y	1 fledgling ^b
	SI/DB: DB/WH	2018	ALS	Napanee	U	N	--
	SI: DG/YE ^d	2018	ALS	Napanee	F	n/a	--
Napanee	RD/SI: YE/DG	2017	ALS	Napanee	M	Y	3 fledglings
	SI/RD: RD/OR	2017	TZ	Napanee	M	Y	2 fledglings
	SI/YE: YE/OR	2016	MRC	Napanee	F	Y	5 fledglings (1 retained)
	SI (L) ^e	n/a	n/a	n/a	F	Y	Failed (w/ DB/SI: WH/DB)
	SI (L) ^e	n/a	n/a	n/a	U	U	--
	SI (L) ^e	n/a	n/a	n/a	U	U	--
Smiths	SI/DB: OR/RD	2018	SCBI	Carden	U	Y	Unknown ^f
Falls	?SI?: DB/DB ^g	2018	ALS or MRC	n/a	U	Y	Unknown ^f
Quebec	SI/RD: OR/WH	2017	ALS	Carden	F	Y	Unknown

^a Full combination never confirmed

^b Nest never located; fledgling count from seeing one adult with fledglings, so assumed to be an undercount

^c Seen with an unbanded adult once early in the season (May 3), but never relocated

^d Some uncertainty in ID, but assumed to be SI: DG/YE (DB band lost), which was caught at Long Point Bird Observatory banding station 9-Apr-19; details given for that bird

^e Confirmed as separate individuals based on breeding status or timing of observations

^f Monitoring conducted by volunteers, so data are incomplete, but nest likely failed just before fledge

^g Second band on right leg appeared DB in pictures, but could not confirm whether DB/SI (hatched at ALS, released in Carden) or SI/DB (hatched at MRC, released in Napanee)

2.1.2 Nest checks

Twelve nest checks were performed this year (nine in Napanee, three in Carden). Half of these, all of which occurred in Napanee, were conducted at active nests to inform trapping attempts, whereas the remaining six confirmed failures and inactive nests. Regular behaviour was observed at all active nests following nest checks, and all but one nest successfully fledged young. The remaining nest failed approximately two weeks after the nest check, so that activity is not implicated in the failure. Full details of all nest checks can be found in the Carden and Napanee end-of-season reports.

2.1.3 Nest failures

Six nest failures were observed this season, three each in Carden and Napanee. Unfortunately no failures were captured by cameras, so causes had to be deduced from what evidence could be gathered.

One nest failure in Carden was attributed to weather. This nest was built at the top of a hawthorn, well away from the main trunk, so had been observed swaying aggressively during high winds. Activity at this nest halted after a significant weather event, and the nest itself had lost up to half of its structure when examined by field staff, so it is believed to have been heavily damaged during the preceding storm.

The other two nest failures in Carden were suffered by the same breeding pair during the nestling stage. Upon examination by staff, both nests were undamaged with intact lining and no remaining nestlings, which suggests an avian predator. This site frequently had high numbers of Blue Jays, so they are under suspicion. A camera had been deployed at this second nest, but had shifted just prior to the second failure—likely due to cattle interference—so no images of the cause of the failure were captured.

The three nest failures in Napanee were all suffered by pairs nesting on the Napanee Release Site (patches Nap179C and Nap179E). Two of these occurred in late May, presumably during the egg stage. The last observed activity at one of the nests included the male of the pair fending off Blue Jays, and on the subsequent monitoring

visit the nest was empty and a Brown Thrasher appeared to be scavenging nesting material. The damage caused to the nest by the thrasher effectively erased any clues as to the cause of the failure, but the Blue Jays in the area could have had some direct or indirect impact. The second failed nest in May was intact but tipped when examined by staff, so a mammalian or larger avian predator was likely the cause. The final nest failure in Napanee occurred during the nestling phase, and an avian predator is suspected as the nest was intact and fully lined when examined.

One additional Napanee pair was seen courtship feeding at the end of June, but the female was not seen again, and the male showed no behaviours suggesting a nest in the vicinity.

2.1.4 *Emergency Juvenile Recruitment*

During nest monitoring at Nap220E on June 18, the sole fledgling in this nest was found entangled in nesting material and hanging from the nest by its foot. Field staff approached the nest and freed the bird, which was then taken in to captivity as it had sustained substantial injuries to the entangled foot. One toe had to be amputated, and the bird sent to African Lion Safari for recovery. Though this bird can perch in a captive setting, it no longer has use of its right hallux, so was deemed non-releasable and added to the captive-breeding pool.

The nest from which this juvenile was taken was inspected on June 21 and found to contain plastic waste, including cable-ties. Field staff had also seen this plastic waste on the Loyalist Project solar generation sites during surveys in May and June, along with plastic string that could easily be incorporated in to a nest. BluEarth was notified of the plastics found in the nest on June 21, and deployed clean up crews to the generation sites the following week.

Though a causal link cannot be made between the plastics in the nest and the entanglement, the presence of the waste indicated that birds were collecting nesting material from the generation sites. A recommendation has thus been issued to BluEarth that site clean up for any future developments be initiated ahead of the breeding season to minimize the potential for negative effects from the introduction of these plastics into the environment.

One might consider that there is a silver lining to this episode, in that recruiting this bird will increase the genetic diversity of the captive population; however, this bird's dam was a captive-origin bird released in 2016, so only those genes from the sire will be of benefit to the program in this regard.

2.2 Volunteer Adopt-A-Site surveys

WPC staff survey efforts continue to be augmented through the Adopt-A-Site (AAS) survey, which uses citizen scientists to survey for LOSH, and a suite of other birds found in similar habitats. Forty-seven volunteers conducted roadside AAS surveys of 125 priority patches across Ontario. Carden and Grey-Bruce continue to have the highest engagement, with 16 volunteers in each core, which surveyed 53 sites in Carden, and 30 sites in Grey-Bruce. Pembroke-Renfrew continues to be a low engagement area, with only a three volunteers.

LOSH were observed by volunteers on four sites in Carden, and one in Napanee. Two of the reports in Carden came in April before field staff were present in the area, so contributed to early-season occupancy data. The remaining observations were all of birds that were already known to field staff. The Napanee observation was of a territory that was already known to staff. Fourteen volunteers used call-playback this year, and though LOSH were seen on two sites where they were used, in both cases birds were found after the playback and no response was noted.

On-site surveys were not conducted this year because of time constraints on the Lead Biologist at the start of the season.

2.3 Banding

Fifteen wild LOSH were trapped and banded this year, 13 in Napanee and 2 in Carden, including 3 independent hatch-year birds. Additionally, two captive-origin adults were trapped in Napanee, one of which had a missing band replaced, and the other simply measured and released. All trapping in Napanee was led by Amy Chabot, and Hazel Wheeler led trapping in Carden. All newly-caught birds were banded with either SI/LG or LG/SI on

right, to indicate wild birds caught in 2019. Regular behaviour was observed at all territories the day after trapping activities.

Trapping effort was increased this year in response to the growing proportion of unbanded birds observed, which was impacting the quality of demographic and territory use data collected by field staff. After all trapping activities, only 33% of the wild LOSH population remained unbanded, compared to 52% in 2018. Band status was confirmed for all birds except a transient single seen on two occasions in Carden.

2.4 Development and critical habitat

WPC, with the support of the Recovery Team, has been pushing the province to adopt the federal definition of Critical Habitat for LOSH, which will offer more protection than is currently afforded by the provincial General Habitat Description (GHD) for Loggerhead Shrike (see 2017 report for details). This change was proposed to the Ministry of Natural Resources and Forestry (MNRF) Policy Division in 2017, but no communication has been returned on the topic since. WPC continues to submit all LOSH occurrence data to the Natural Heritage Information Centre (NHIC) on an annual basis, so that nest locations can direct habitat protection through the existing GHD.

Ensuring responsible development in the vicinity of LOSH habitat continues to be an important task for the Recovery Program. Historically, the province has been in charge of screening development applications for potential conflicts with Species at Risk, and through that screening we have been brought to the table on several occasions to advise on impacts to LOSH; however, this process may be changing.

A Senior Planner at the City of Ottawa reached out to the Lead Biologist this summer as they had heard that the province was going to be shifting this screening responsibility to municipalities. This is cause for concern as municipal workers will have different levels of experience with this type of screening, and in some cases may not know what they should be screening for. A proactive approach is thus going to be taken, and all LOSH occurrence data will now be submitted directly to municipalities, in addition to the NHIC. Contact has already been made with planners in Ottawa, Loyalist Township, Greater Napanee, and the City of Kawartha Lakes to this end, and other municipalities will be contacted as necessary, depending on LOSH occurrence.

2.4.1 Post-construction monitoring agreement with BluEarth Renewables

WPC has been working with BluEarth Renewables in the responsible development of the Loyalist Solar Project in Stone Mills Township since 2016. In 2019, WPC entered in to a multi-year agreement with BluEarth, whereby WPC would conduct surveys of two Loyalist Solar Project Generation Sites (SGS), and four Habitat Enhancement Sites (HES) to assess if and how LOSH use these HES, and the areas in and around the generation site infrastructure. SGS surveys will continue for three years (2019-2021), and HES surveys for five (2019-2023), with a total contract fee of \$88.5K. This contract will help support field activities in the Napanee core for the next five years.

This first year of surveys has yielded some interesting results, especially on one of the SGS where a LOSH family was observed forging on multiple occasions. The nest for this family group was never found, but was assumed to be just east of the site fencing; birds were often seen foraging from the fence, and were seen deeper in to the site on a few visits, perched on solar panels. These observations were the first confirmed use of a solar farm as LOSH foraging habitat. Questions do remain, however, about the quality of this habitat, and whether prey availability differs between the SGS and surrounding grasslands. Though out of the scope of the existing agreement with BluEarth, future research should attempt to answer this question.

More evidence of site use by LOSH was found in a nearby nest in which plastic waste, including cable-ties seen by WPC staff on the SGS, had been incorporated (see Section C1.2). Full details of all activities related the Loyalist Solar Project can be found in the *Loyalist Solar Project – Post-construction Monitoring, Year 2019 Report*, available upon request.

2.4.2 Solar Flow Through

The contract for the Solar Flow Through development on Nugent Rd, which proposes the installation of a one hectare array at the front of the property immediately to the east of the Napanee release site, has been cancelled. The Lead Biologist considered this array to be ill conceived from the start, as it would have been built within 300 m of several recent nest sites, so this is welcome news.

Construction of an array on a separate property at the corner of Nugent Rd and County Rd 4, however, is now underway. This property last had LOSH nesting in 2014, so it is now outside of the five-year protection window afforded to shrike habitat by the province.

3.0 CAPTIVE POPULATION

3.1 Status of the captive population

As of November 8, there were 68 birds in the captive population (including partner facilities in both Canada and the U.S.). Sixty-four of these birds are considered breeding stock, one is a retired bird that has aged out of the breeding population, two are education/exhibit birds, and one is a non-releasable non-breeding HY juvenile, retained from the 2019 breeding season. The current breeding stock includes: 42 birds that are 5 years or younger (HY 2015-2019), 20 birds that are 6-10 years old (HY 2010-2014), and two over 10 years old. Fifteen juveniles were retained this year following a decrease in breeding males from a weasel attack at the Toronto Zoo in early spring. One juvenile was recruited from the wild for the captive breeding population following a nest entanglement that rendered it non-releasable.

3.2 Activities at partner facilities

3.2.1 Captive breeding summary

There were 23 initial pairs this season, and an additional 3 re-pairing attempts, for a total of 26 pairings. Sixteen of these pairs produced 80 young that survived to release or retention (as of October 15; see Fig. 2). Sixty-four young were released into the wild at our field release sites (40 in Carden, 24 in Napanee). Sixteen HY birds were retained this year, with priority going towards holding back males to rebalance the sex ratio in the captive population following the losses early this spring (see Section 3.3.1). Fourteen young were retained from high priority pairings, and two lower priority birds were retained due to health concerns. One bird would not tolerate bands, so was deemed non-releasable, and the other had a congenital eye defect. Though the former will be incorporated in to the breeding population, the latter is of such low priority that it will be held solely as an exhibit bird. Fourteen young died before the end of the season, half of which were fledglings (see Section 3.3.2).

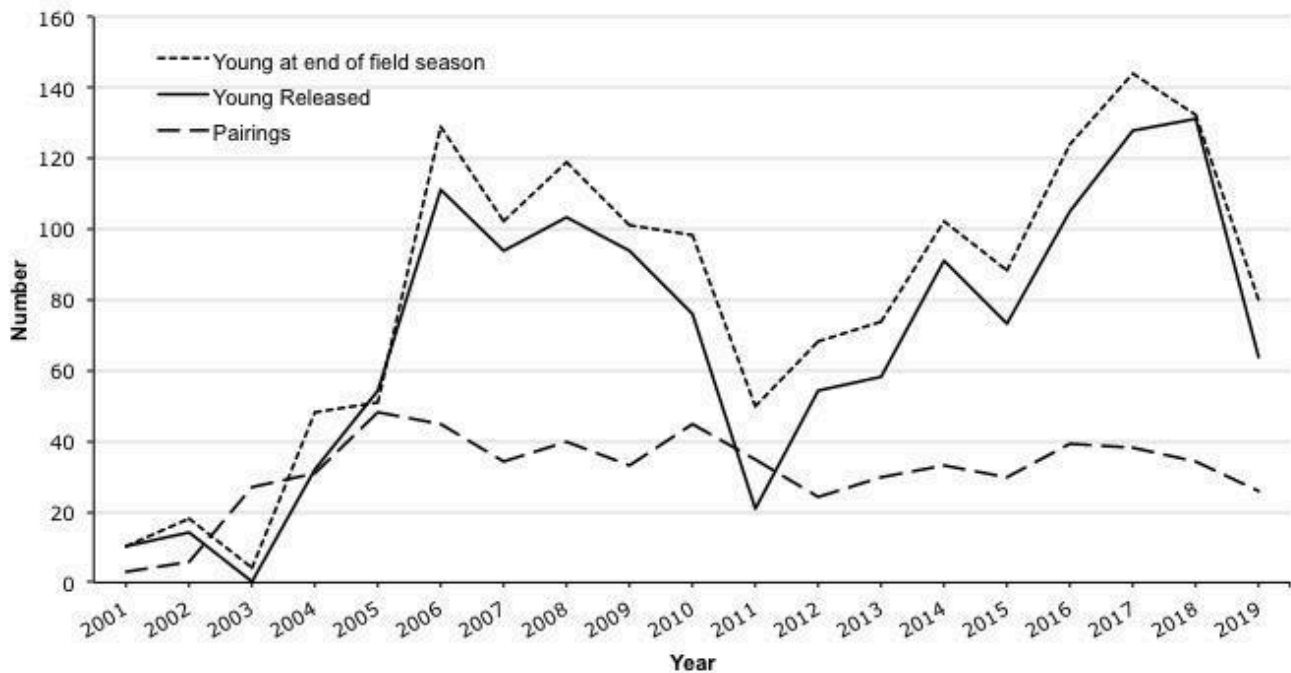


Figure 2. Captive Loggerhead Shrike pairings, young surviving to end of season, and young released, 2001-2019

3.2.2 Breeding facility results and wintering status

Ontario Facilities:

African Lion Safari (ALS): 2 of 8 pairings fledged 15 young (7 from 1st clutches, 8 from 2nd clutches). Eleven were released (3 in Carden, 8 in Napanee), one with a radio tag. Three young died prior to release (two nestlings and one fledgling, all from 1st clutches; see Section 3.3.2 for details). One bird from this facility was on track to be released but would not take to its bands and was retained as a result. ALS currently holds 27 breed birds (as of November 8th).

Mountsberg Raptor Centre (MRC): 4 of 4 pairings fledged 23 young (14 from 1st clutches, 9 from 2nd clutches). Eighteen were released (10 in Carden, 8 in Napanee), two with radio tags. Three young died prior to release (one nestling and two fledglings, two from 1st clutches and one from a 2nd clutch; see Section 3.3.2 for details). This facility is currently holding 5 breed birds and one outreach bird (as of November 8th). Mountsberg's involvement in the recovery program will terminate at the end of this year (see section 3.5.1.), so the birds are being redistributed to other partner facilities this fall.

Toronto Zoo (TZ): 4 of 5 pairings fledged 20 young (13 from 1st clutches, 7 from 2nd clutches). Fourteen were released (6 in Carden, 8 in Napanee), one with a radio tag. Six young died prior to release (3 nestlings and 3 fledglings, 5 from 1st clutches and 1 from a 2nd clutch; see Section 3.3.2 for details). One juvenile from another facility sustained a serious eye infection and was transferred to TZ to overwinter, and will potentially be released in the spring. This facility is currently housing 16 breed birds and one education bird on display (as of November 8th).

U.S. Facilities:

Smithsonian Conservation Biology Institute (SCBI): 5 of 8 pairs fledged 27 young (13 from 1st clutches, 14 from 2nd clutches). Nineteen were released in Carden, 6 with radio tags. Two young died over the breeding season (one chick and one fledgling; see Section 3.3.2 for details). One juvenile was considered non-releasable due to a congenital eye defect; it will be transferred to Nashville Zoo at Grassmere and kept as a non-breeding member of the captive population. Plans are currently in effect for SCBI to hand-raise a low priority bird to use in outreach education. SCBI is currently housing 14 breed birds.

Nashville Zoo at Grassmere (NZG): 1 of 1 pairs fledged 2 surviving young, all from a 1st clutch. Both young were transferred to Ontario and released in Carden. One nestling died prior to release after being eaten out of the nest by a rat snake. This facility is currently housing 2 breed birds and one retired non-breeding adult.

3.2.3 Non-breeding facility status

Little Ray's Reptile Zoo (LRR): LRR is not able to hold any birds this winter since new shrike enclosures have not yet been built since the facility moved this summer. They may, however, be able to house breeding pairs in the spring of 2020, if plans can be finalized over the winter.

Carolina Raptor Centre (CRC): The CRC was holding one hand-raised education bird that died in early September after fracturing its spine. CRC has agreed to house 'Pierce' (the hand-raised outreach bird from Mountsberg) as a replacement, once Mountsberg leaves the recovery program at the end of this year.

3.3 Mortality

3.3.1 Adults

We had 21 adult deaths in the captive population this year (as of November 8th); 17 in Ontario facilities, and the remaining 4 in U.S. facilities.

Five males and three females died following a gained access to shrike holdings at Toronto Zoo on March 10th. An additional 9 year-old male was euthanized at Toronto Zoo following the discovery of a severe caudal coelomic mass in September. The other Ontario birds died at African Lion Safari after sustaining various forms of trauma, three of which were HY males found in October after their first and second course of fall vaccinations. There have been anecdotal reports of higher fox populations in the area, so efforts are being made to determine if anything is frightening the birds overnight. Included in the African Lion Safari deaths was a brooding female who was found caught in nesting material. Her necropsy revealed a ruptured oviduct as the suspected cause of death.

At SCBI, one bird was euthanized after being found unresponsive one morning and showing no improvement after several days. The bird's necropsy report revealed a severe case of renal gout. Another 14-year-old SCBI bird was found partially consumed by a rat snake on July 11.

The remaining two U.S. deaths were non-breeding birds. At NZG, a 13-year-old retired bird was discovered with a severely plugged and eroded nare and bilateral cataracts mid-August. The bird died under anesthesia while the nare was being debrided, though the prognosis was severe enough for the bird to be considered for euthanasia. Finally, the hand-raised education bird that was being housed at the CRC died in early September after fracturing its spine.

3.3.2 Fledglings

Seven fledglings (approximately 8% of all those produced) died during the breeding season this year, which is the lowest within-season rate of mortality we've seen since 2014 (when it was 7%; Fig. 3). Three of these deaths were birds hatched at TZ, two were from MRC, one was from ALS, and one was from SCBI.

Two fledglings (one at TZ, one at ALS having been transferred there from SCBI that day) were found dead on the ground of their enclosures, both having sustained various forms of trauma. Other deaths were attributed to suspected predation (one bird found without a head at MRC), and respiratory distress. One bird from MRC was euthanized after getting its foot caught on the wooden wall of the enclosure and sustaining injury to its leg, and another at TZ died in-hand after banding and blood sampling.

Though not included in the above tally, one additional fledgling was visually confirmed predated by a Peregrine Falcon on August 23 after release in Napanee. Raptor sightings toward the end of the breeding season were a challenge at both Carden and Napanee this year. Efforts will be made next year to release birds before mid-August.

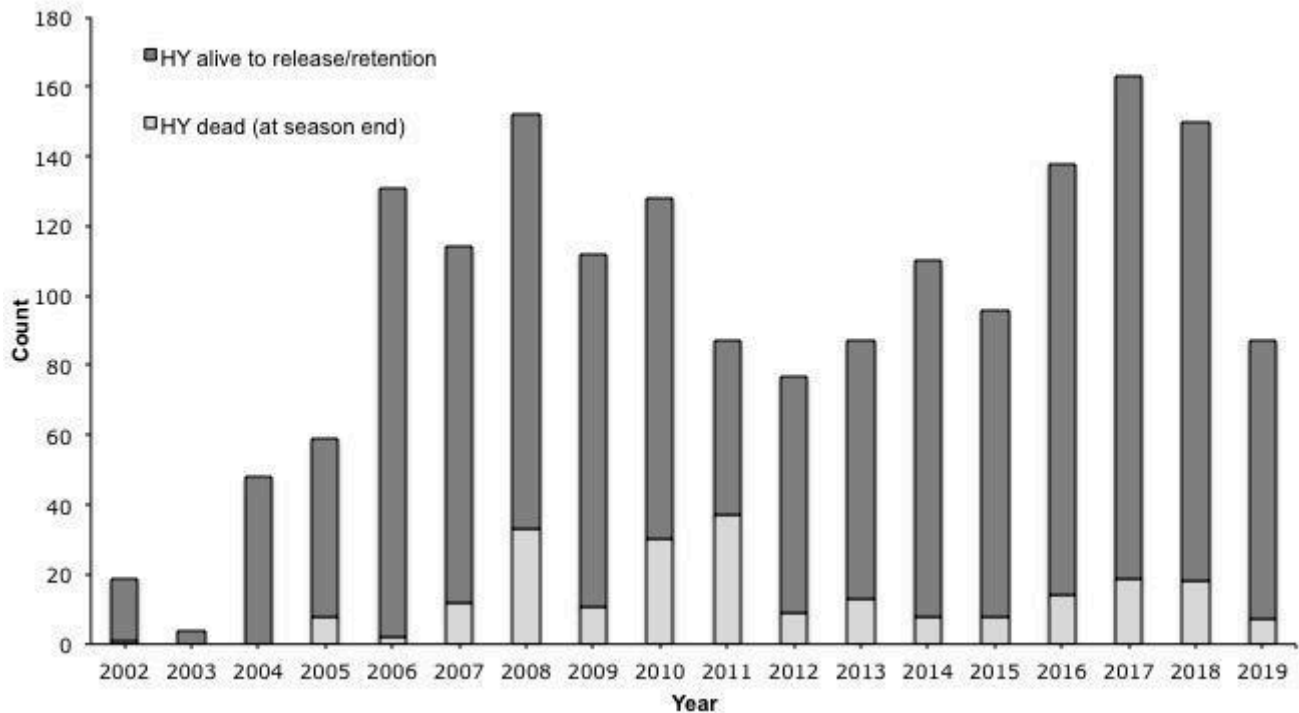


Figure 3. Number of fledglings produced each year that died or survived to release or retention

3.4 Captive-bred releases

3.4.1 Banding

Seventy-eight captive juvenile shrikes received stainless steel bands this season (64 released young and 14 retained young). Released birds that received colour-bands were given a combination that included either LG/SI (39 birds) or SI/LG (24 birds) on the left leg to identify them as a 2019 release bird. One captive-bred bird was banded with SI/LG on the right leg because an injury on the left leg prevented use of the regular colour-band scheme. Birds released with radio tags (10 individuals) were banded with only the year combination on their left leg (five released with SI/LG, five with LG/SI). All birds received some sort of temporary colour-marking (Sharpie) to aid in individual identification while in the release enclosures and during post-release monitoring.

It was noted this year that one breeding pair at ALS were producing progeny with significantly larger initial tarsus width measurements than juveniles from other pairs. If a young fledgling has a tarsus width measurement that suggests it should get a size 2 band, it has become regular practice to delay application of the metal band until a later date, as those measurements have tended to decrease with age. This delay avoids the issues that can arise from application of a size 2 band, which are much larger and heavier than 1D, and can cause injury if ill-fitting. Most of the young that had delayed application of their stainless steel bands (or who had complications from ill-fitting 1D bands) were from this same breeding pair. This will be tracked more closely over the next few years.

3.4.2 Radio tags

Ten birds were released with radio tags on the Motus network this season (two in Napanee, eight in Carden) using the same nylon-coated elastic cord harness attachment technique used since 2015. Ten additional birds were fitted with radio tags, but three shed their tags pre-release due to poor fitting, three were removed due to abrasions, two were removed as they were non-functioning, and two were removed as the birds' weights had dropped below the 50-gram cut-off for attachment. The tags that stopped functioning were left over from the 2018 stock, so all remaining tags from that purchase have now been retired.

Nineteen new tags were purchased for the program this year by SCBI. Prior to this purchase, all tags used on captive LOSH had an estimated five-month battery life; however, the tags purchased this year now have a 10-month battery life, which creates the potential for detections on both fall and the subsequent spring migration.

3.4.3 *Post-release movements*

Field staff did not see many released juveniles outside of the field sites this year, but two juveniles from Carden were spotted on the Cameron ranch property (C88A) on August 14, during regular monitoring. The band combination could not be determined for one of the juveniles, but the other was identified as LG/SI:OR/GY, who had been released two weeks prior.

Four 2019-releases, all SCBI birds released in Carden, have already been detected on Motus towers in Ontario. All birds appeared to head almost directly south to the shore of Lake Ontario, and one bird has some later detections to the west, including a hit on a tower at the base of Long Point, on Lake Erie. A more thorough examination of detections will be initiated later in the winter, when more data is available. Further details on tracking results to-date, including results from last year's tagged birds, can be found in Section 7.2.1.

3.5 Population management

Andrea Morgan (African Lion Safari) continued in her role of studbook keeper in 2019, with Colleen Lynch, Consulting Population Biologist with the Population Management Centre, contracted by WPC to produce a Breeding and Transfer Plan for the season, including release prioritization and repairing recommendations throughout the breeding season.

3.5.1 *Program capacity*

After much deliberation, the Conservation Halton Foundation has recommended to the Conservation Halton Board of Directors that Mountsberg end its involvement in the Shrike Recovery Program. Funding for the program will cease at the end of this year, at which point the Mountsberg birds will have to be transferred to other partner facilities. Arrangements have been made over the 2019 breeding season to ensure that there are enough spaces available to redistribute the Mountsberg birds, so facilities will be contacted over the fall to make the necessary transfers.

Excluding holdings for education/outreach birds, and accounting for the loss of MRC, holding capacity across all project partners heading in to 2020 will be 76 birds. However, plans are already underway to increase program capacity through the addition of new partners, as detailed in Section 3.5.2.

3.5.2 *New partner facilities and changes at existing facilities*

There were a few changes to the management of the LOSH program at the Toronto Zoo again this year. The LOSH population returned from being managed by the Outreach and Discovery staff to the care of the Wildlife Health Centre, which is under the direction of Natasha Long. The Toronto Zoo currently has a temporary vet, but the team should be properly filled out in November of 2019, at which point there should be more clarity on the Toronto Zoo veterinary involvement in the LOSH program.

Some progress has been made over the past year with regards to expanding our network of breeding facilities, both with existing and new partners. Little Ray's Reptile Zoo (Ottawa, ON), which came on as an overwintering facility in 2014, has expressed interest in housing breeding pairs in 2020 as they have nearly completed their move to a new location with more outdoor space. Hazel Wheeler and Amy Chabot conducted a site visit in late July to assess the new location, and discussions on enclosure design and placement are ongoing.

Two new facilities have expressed interest in collaborating with the breeding program, including the National Aviary (Pittsburgh, PA) and Granby Zoo (Granby, QC). The National Aviary may be able to join the program as early as 2020, so WPC staff plan to visit that facility this winter to move plans ahead. Granby Zoo has a slightly longer timeline, but anticipates taking on some breeding birds in 2021. There may also be an opportunity to have breeding/wintering holdings at the Earth Rangers Centre (Woodbridge, ON) that would be managed by WPC staff, though these discussions are still quite preliminary.

Additionally, after the death of their exhibit bird this summer, the Carolina Raptor Centre (Huntersville, NC) will be taking ‘Pierce’, the hand-raised bird from Mountsberg, which will be used as an exhibit and education bird.

3.5.3 Studbook management tools

The studbook continues to be managed in PopLink, which offers suitable capabilities for our needs, with the benefit of being a free program. Species360/ZIMS was explored further this past year as a population management tool with greater integration capabilities as it creates an online database that could be accessed across all facilities that pay for Species360 membership, whereas PopLink only runs off native files on a computer. Species360 is certainly a more powerful program with more functions than PopLink, but would also require an initial setup fee from all new facilities (normally US\$2500, but a discounted setup fee of US\$299 was offered to LOSH partners) and an annual membership fee (US\$900). These fees would also apply to WPC, which, with an increase in annual membership fee (US\$200), could also take on data management for facilities that did not want/need their own access. At this point, the price is still prohibitive, but adoption of Species360 should be considered if at any point the funding landscape allows.

Other population management databases have been explored, including Animal Care, MoRK, RaptorMed, Wildlife Rehabilitation MD, and WILD-One. Access for RaptorMed is limited to facility users on one network, which would not be feasible for a recovery program whose captive population is based out of multiple locations. Wildlife Rehabilitation MD and WILD-One have limited customizable fields, and aren’t designed to track reproduction. The price for Animal Care is prohibitive, since the software’s annual fee is based on the number of animals in the population as a whole, but adoption of the program could be considered if the funding landscape changes. MoRK, though initially a very promising option, has ceased operation due to financial issues.

3.5.4 Husbandry manual updates

Acting at the request of the captive subcommittee of the LOSH Recovery Team, WPC updated the standard operating procedure document for the captive program, the “Husbandry manual for the care, breeding, and maintenance of captive Loggerhead Shrikes (*Lanius ludovicianus alvarensis*)”. The manual, developed in 2012 and updated in 2015, was originally meant to serve as a guiding document for housing and care of LOSH during the overwintering period, with WPC’s captive breeding protocols used as reference during the breeding season. However, the captive breeding protocols were developed when WPC was still conducting in-situ field-breeding, so were no longer entirely applicable to the ex-situ breeding model that has been adopted by the LOSH Recovery Team. The husbandry manual was thus updated to include all protocols pertinent to the captive population, including captive breeding, nestling recruitment, and hand-rearing, with all protocols revised to address ex-situ breeding. A few minor edits remain, but this document should be finalized by the end of the year.

3.5.5 Napanee release cage construction

The Napanee field site currently has two LOSH release cages, which limits the number of birds that can be released in that core. Work started this year to identify locations for additional cages on this site, which would greatly increase the release capacity in Napanee, and allow for greater parity between core areas, as Carden typically has four cages functioning for releases each year. To this end, one new triple-unit enclosure will be erected at the Napanee site in spring 2020.

The Nashville Zoo at Grassmere has generously donated US\$5000 to cover material costs for the new enclosure, and African Lion Safari has agreed to construct panels and absorb associated labour costs. The Nature Conservancy of Canada has also volunteered to assist with cage assembly on the property. Panel construction will begin in the early spring of 2020, and the cage will be assembled in Napanee as soon as weather allows.

4.0 PUBLIC EDUCATION AND OUTREACH

4.1 Public presentations

The LOSH program, was the subject of two public presentations this year: Breeding Coordinator, Jane Hudecki, was a guest speaker at the Hamilton Naturalists Club Bird Study Group on September 16, in Burlington, ON; and Lead Biologist, Hazel Wheeler, was a guest speaker at the Southern Lake Simcoe Field Naturalists club meeting on October 8, in Egypt, ON. Both talks were well-attended, particularly the Hamilton talk, which had approximately 80 people in the audience. Reception was excellent, with both groups expressing high interest in the LOSH program.

4.2 Events

LOSH program staff participated in the Partners in Protection event at the Royal Ontario Museum on April 6, along with other WPC staff. This is the second year that WPC has participated in this event, and it remains a fun day with a high level of youth engagement. The location of this event within the ROM made for a lot of foot traffic, with over 1600 people counted moving through the space.

4.3 Media

The Our Incredible World series, “Sharing our Habitats”, which includes a section on the LOSH Recovery Program has now been completed. The LOSH Program is included in episode 2: Disappearing Grasslands, and can be viewed here: <https://incredibleworld.ca/2017/sharing-our-habitat-2/soh-series-episode-2/>

The LOSH Recovery Program was also the subject of work by artists Richard Ibghy and Marilou Lemmens entitled “Look, it’s daybreak, dear, time to sing”, that will be exhibited at the Bemis Center for Contemporary Arts in Omaha, Nebraska from Nov 20, 2019 – Feb 15, 2020. This multimedia piece explores points of contact between birds and humans in an effort to expand the meaning of hospitality, care, communication and attentiveness between species. Footage taken at the Carden release site during the 2019 season will be included in a series of videos entitled “The Violence of Care”, which also includes footage from a puffin exhibit at a zoo, and the care of backyard hens. A full description of the work can be found here: <https://www.bemiscenter.org/art/exhibitions/bird-song.html>

The LOSH recovery Program was also mentioned in the following media pieces:

- “This endangered songbird is in a captive breeding program” (Grace Hunter, Cottage Life, Sept 17) – Article about the Recovery Program for which Jane Hudecki was interviewed. <https://cottagelife.com/outdoors/this-endangered-songbird-is-in-a-captive-breeding-program/> [Accessed 12 Nov 2019]
- Wild for Life podcast (ep.7): “Bird curation and conservation with Dr. Kevin Kerr” (Toronto Zoo) – Toronto Zoo podcast series that highlights behind-the-scenes conservation work by the Zoo. Kevin Kerr talks in detail about the LOSH program, and mentions WPC as the coordinating partner. <https://open.spotify.com/episode/5Px667GoQE9AX6S3eFDP9e?si=JjY9aB77T9auvxByl4GfGg> [Accessed 12 Nov 2019]
- Interview with Jane Hudecki on captive breeding by a University of Guelph undergraduate student– recorded 10 Oct 2019, to be included on a publicly-accessible podcast in late fall. The episode was for a Nature Interpretation course assignment that focused on local environmental science research. Jane discussed details of the LOSH program and how to communicate the concept of captive breeding to youth groups.

5.0 HABITAT STEWARDSHIP

Habitat stewardship project funding is still uncertain for this year; federal monies were not secured, and decisions on provincial funds have not yet been released (see Section 9.0). As such, no stewardship projects have yet been undertaken. Two landowners in the Napanee core have been identified for potential projects, however, and will be contacted once project funding is known.

6.0 PROGRAM PERSONNEL

6.1 New position at WPC

The addition of Jane Hudecki as the Shrike Breeding Coordinator this year created much more opportunity to attend tasks that might otherwise have been waylaid by the day-to-day tasks that need to be completed during the field season. This new position has increased the amount and quality of our social media and outreach content, and has also allowed more time to be committed to writing manuscripts. One paper on the use of plastics by LOSH has already been submitted for publication, and a paper on contaminants in wild eggs, which has been languishing since 2014, has now been drafted. Several more publications have been prioritized for the coming year, which will greatly increase our scientific impact in the larger conservation community.

Jane has also been instrumental in furthering the progress of increasing the release capacity at the Napanee site. She has secured funding through our partners to support this activity, and continues to seek out new grants to support other program activities. The value of this addition cannot be overstated.

6.2 Field staffing

Field activities were carried out this year by teams of two contract staff in each core. Field biologists started on April 23, allowing them a week to get oriented with program materials and start landowner contact before the initiation of fieldwork on May 1. A field assistant was employed in Napanee for the duration of the field season (May 1 – August 31) to ensure adequate staffing for surveys and monitoring associated with the BluEarth agreement, whereas the Carden field assistant was only employed from June 1 – August 31, as that was all that program funding allowed.

Going forward, funding will be sought to maintain teams of two in each core, though field assistants may be limited to two-month contracts covering July and August, where they will assist mainly with captive releases.

This was a challenging season for the Napanee field team, as interpersonal conflict led to the biologist and field assistant living in separate housing from June until the end of the season. The field biologist ultimately paid for her own lodging in Napanee, as she instigated the move, and the field assistant remained in the housing that WPC had arranged and paid for. Despite the conflict, the team maintained a professional working relationship, and all tasks were completed satisfactorily.

7.0 RESEARCH

7.1 New projects

7.1.1 *Migratory urge study*

The impact of environmental versus genetic factors on the expression of migratory urge in Loggerhead Shrike will become the basis of research by a PhD student at Queen's University in 2020. The study will assess the impact of environment by video-taping the behaviour shrike in conservation breeding populations held in various geographic locations, potentially including San Clemente Island, Ontario, Tennessee and Virginia during spring and fall seasons, when wild counterparts would be likely to be migrating. Low coverage whole genome sequencing will be conducted on blood samples obtained from shrike in obligate and facultative migratory populations, and from those that are believed to be non-migratory. Genetic data will be compared to determine if allelic composition varies among populations. Results will be aligned with the annotated genome recently complete for Loggerhead Shrike to determine the genes corresponding to genetic differentiation. Targeted candidate genes (based on results of work in other passerine species to date) governing migration will also be assessed.

In addition to developing the research proposal outlined above, work over the past year has focused on developing methodology to video-tape behaviour in shrike, using the least possible modification to enclosures possible and on identifying a suitable “machine learning” method for analyzing video-taped behaviour. These

efforts have built upon the results of efforts by Nashville Zoo and through consultation with the Noldus, which produces and supports two possible machine learning software tools.

7.1.2 *Diet analysis and food preference study*

LOSH diets are being revisited and analyzed this year following discussions from the spring's captive subcommittee meeting. Mike Maslanka (Senior and Head Nutritionist for the Department of Nutrition Science at Smithsonian Conservation Biology Institute) will be profiling the caloric and nutritional content of several partner facilities' maintenance diets and comparing them to target ranges for the species. Dr. Amy Chabot (Research and Conservation Programs Coordinator for African Lion Safari) is concurrently performing a preliminary food preference study with birds at African Lion Safari, funded by African Lion Safari and subsidized by SRED. Food preference will be determined with the use of computer-assisted behavioural observations using "BirdOriTrack" freeware. Consumed prey items will be quantified through DNA analysis, using preliminary Next Generation Sequencing "metabarcoding" technology. Final results will be prepared in manuscript form next year.

7.1.3 *Presence and effects of parasites on captive breeding success in Loggerhead Shrikes*

Isabelle Zimmermann—an MSc student at Laurentian University who is co-supervised by Albrecht Schulte-Holstedde (Laurentian) and Gabriela Mastromonaco (Toronto Zoo; through the ReNewZoo program)—is investigating *Capillaria* loads in captive and wild populations of LOSH. Isabelle developed and implemented a protocol for fecal sample collection in captive and wild individuals over the 2019 breeding season and was able to pull historical fecal result data from ZIMS records for her research. She presented her findings to the Canadian Association of Zoos and Aquariums (CAZA) conference in late summer and will have a manuscript ready for review in the winter of next year.

7.2 *Ongoing projects*

7.2.1 *Identification of wintering grounds and migratory routes*

Review of tracking results from 2018 revealed our first confirmed U.S. detections, when a bird released in Carden on August 23, 2018 was picked up on three towers in Pennsylvania on September 15 of that year (Fig 5). Three other 2018-releases were also detected during fall migration, but only on towers within Ontario. The bird detected in the U.S. and one of those detected in Ontario were hatched at SCBI; the other two birds were hatched at TZ and MRC.

Ten radio-tagged birds were released this year, four of which have already been detected on Motus towers in Ontario. All appeared to head almost directly south to the shore of Lake Ontario, and one bird has some later detections to the west, including a hit on a tower at the base of Long Point, on Lake Erie. A more thorough examination of detections will be initiated later in the winter, when more data is available.

Nineteen new tags were purchased for the program this year by SCBI, three of which have already been deployed. Prior to this purchase, all tags used on captive LOSH had an estimated five-month battery life; however, the tags purchased this year now have a 10-month battery life, which creates the potential for detections on both fall and the subsequent spring migration.

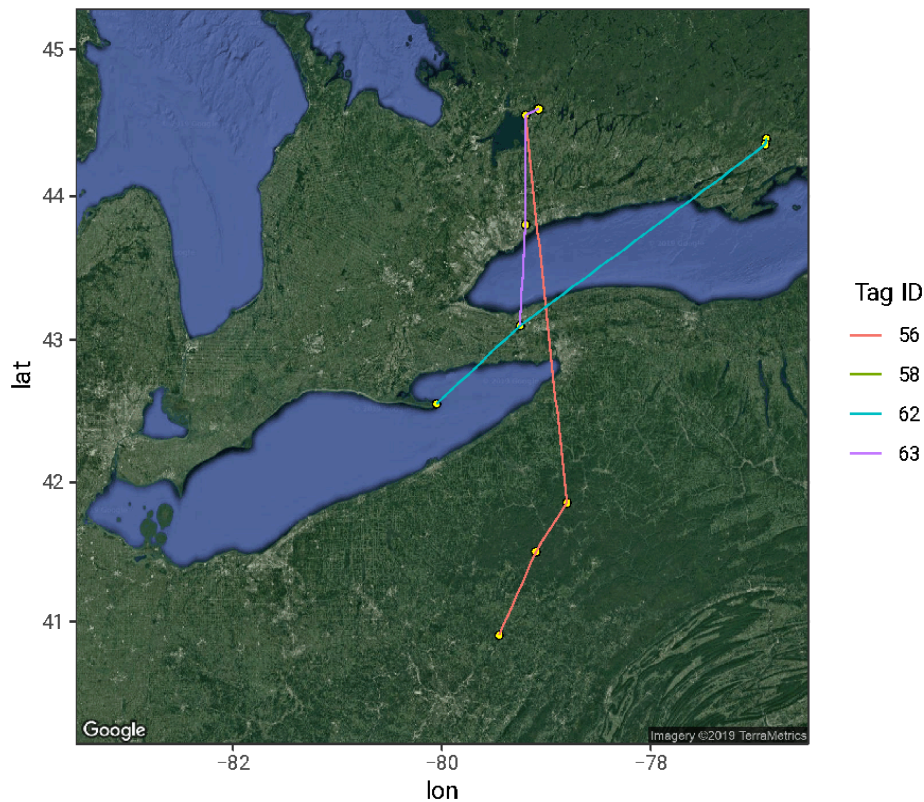


Figure 4. Fall 2018 Motus detections for birds released that year. Tag 56 was released on Aug 23, and detected on three towers in Pennsylvania on Sept 15.

7.2.1.1 *Solar-powered radio tags*

All tags deployed on LOSH to-date have been battery-powered nanotags manufactured by Lotek Wireless, Inc., which have a lifespan of maximum 10 months. In 2017, WPC connected with a company in the U.S., Cellular Tracking Technologies (CTT), who make “Life Tags”, which are solar-powered radio tags small enough to be deployed on LOSH. Following an initial discussion between WPC and CTT about the challenges of tagging LOSH, which can readily damage unfortified devices, CTT sent three prototype “shrike-proof” tags to WPC to test on captive birds over the winter. The trials went well, with no tags sustaining any noticeable damage from the birds.

With the question of tag durability answered, it must now be determined if the Life Tags will be able to gather comparable data to the Lotek nanotags. Motus receivers (Sensornomes) deployed to date will detect Lotek tags, but would require modifications if they are to also detect Life Tags. CTT has been promoting a new pre-built receiver that will detect either tag type, but their deployment is assumed to be quite limited compared to Sensornomes, as they were only made available in 2018. As such, it is not prudent to start deploying Life Tags at this time; however, consideration will be given to retrofitting WPC-owned Motus stations to allow detections of both tag types.

7.2.2 *Genomic tools for species conservation and management*

Based on research to date, several genomic tools are available for use in the management of the conservation-breeding colony of Loggerhead Shrike. Past research has resulted in a suite of nuclear genetic microsatellite markers, Single Nucleotide Polymorphic Markers (SNPs) developed using ddRADSeq methods, and markers for the two main protein-coding introns of the Major Histocompatibility Complex (MHC). In 2019, these tools were augmented by the creation of a high quality fully annotated to chromosome level genome. The work was completed by Dovetail Genomics with funding provided by a grant from Dovetail and from African Lion Safari. Various data sets and analytical results have been produced using these tools, including, assessment

of the genetic relatedness and variability of founders (msat, SNPs) and allelic composition (MHC, SNPs, msats) of the majority of progeny of founders that have contributed to the captive population. Results indicate that founders were 1) not related to the degree assumed, 2) not genetically similar in regards to genetic markers assessed and 3) have not all contributed equally to the population over time. Results of analyses to date suggest that 1) inbreeding depression may be linked to reduce survivorship of offspring, 2) selection of mates is non-random in regards to MHC diversity, and 3) genetic variability has been maintained largely as a result of occasional recruitment from the wild population. Based on results to date, and considering the suite of genomic tools at hand, management decisions can now begin to be made based on genetic assays, rather than pedigree assessment. However, there are options that must be considered moving ahead. Research in the coming year should focus on conducting additional analyses of existing data sets as needed to guide these decisions and utilization of the annotated genome to design/identify markers to conduct regular screening of the captive colony to assess, for example, inbreeding levels, suitable mates, and to better quantify the impact of the breeding and release program on the wild population (e.g. percentage of total population with ancestry in the captive population). Ideally, given the degree to which birds bred in human care are supporting the wild population, the two should be managed as a metapopulation. To do so will require additional sampling of wild shrike (i.e. unbanded birds) and additional assays, specifically, through a SNP marker panel developed by combining information from the ddRADSeq dataset and whole genome.

7.2.3 Species distribution mapping

Two Species Distribution Mapping projects have been completed for Loggerhead Shrike in Ontario. The first, completed by Ms. Emily Drinkwater, Queen's University, used R modules to identify the most parsimonious model best explaining the breeding site selection of shrike in Ontario. In 2019, a second SDM was finalized for shrike using the software program MaxEnt, in collaboration between Dr. Amy Chabot and Dr. Stephen Spear. The results of the MaxEnt SDM include sensitivity-type analysis of key landscape characteristics (e.g. alvar). Few of the habitat elements assessed (e.g. land use) are highlighted as being of particular importance, and others (e.g. shrub cover) could not be included in the model at this time. Future research should focus on this aspect of model development. Regardless, the results appear to correlate well with shrike occurrence in Ontario. Next steps include ground-truthing, and possibly additional data collection (e.g. nest tree species, presence of lookout perches or utility wires) to refine the model.

7.2.4 Sexing based on pattern and colouration of the 6th primary wing feather

As a sexually monochromatic species (i.e. plumage does not differ between sexes), LOSH are difficult to sex in-hand, and the Recovery Program has typically used blood to sex birds when necessary. This is an invasive and relatively expensive procedure, however, so other methods of sexing birds have been explored. Northern Shrikes have been reliably sexed by the pattern of white-to-black transition in the 6th primary feather, but the accuracy of this method for LOSH was unknown. This method has been tested with LOSH using photos of captive-bred juveniles, and data collection and analysis has now been completed. Results indicate that Hatch Year Loggerhead Shrike can be accurately sexed using three plumage characteristics, but that accuracy increases with one-on-one training. As such, the results are being published as a video-article in the Journal of Visualized Experimentation (JoVE). A text version of the article has been completed and draft video publication has been prepared. The final video article should be completed by year-end/early in 2020. Additional data collection is recommended to assess: 1) variation in pattern between left and right 6th primary by individual (HY and adult), 2) variation in pattern among molts within the same individual and 3) efficacy of pattern in sexing adult eastern Loggerhead Shrike.

7.2.5 Endocrine correlates of fitness in captive-reared Eastern Loggerhead Shrikes

Joshua Robertson, a PhD student at Trent University who is co-supervised by Gary Burness (Trent) and Gabriela Mastromonaco (Toronto Zoo; through the ReNewZoo program), continues to work on validation of an infrared thermographic assay to measure acute, and chronic stress physiological profiles in wild birds. In collaboration with Oliver Wearing (PhD Candidate; McMaster University), Glenn Tattersall (PhD; Brock University), and Pauline Delnatte (DVM; Toronto Zoo), Joshua has identified rapid and robust decreases in surface temperature of domestic pigeons following exposure to acute stressors (handling), and is currently testing what physiological

pathways drive this response. Using Black-capped Chickadees as a model species, he has also shown that changes in surface temperature following stress-exposure are long-lasting, are probably adaptive, and can provide insight into an individual's condition; individuals with low resource availability exhibit larger thermal responses than those with high resource availability. Robertson now intends to use thermal imaging to non-invasively quantify and comparing the strength of the acute stress response between captive and wild LOSH, and ask whether juvenile stress responsiveness and condition are predictive of survival to fall migration, post-release. To bolster these analyses, he also plans to use alternate, and established non-invasive techniques (feather-endocrine assays) to ask whether *time-averaged* stress-physiological profiles differ between captive and wild LOSH, and are predictive of juvenile LOSH survivorship.

7.2.6 *West Nile virus seroconversion in Loggerhead Shrike after vaccination*

Captive and wild LOSH populations have proved to be exquisitely sensitive to West Nile Virus (WNV), and yearly losses in captive breeding populations have necessitated the use of an equine WNV vaccine in this species. This research was designed to help determine the most effective and cost-sensitive method to provide protection against WNV for breeding individuals as well as those released into the wild. The key results of this study are as follows:

- Annual vaccination provides residual serum neutralizing antibody against WNV for some, but not all, shrike in the spring following vaccination or booster.
- Naïve shrike receiving only a single vaccination did not show any evidence of serum neutralizing antibodies to the WNV vaccine, whereas 31% of naïve shrike receiving 3 serial booster vaccinations showed evidence of antibody protection against WNV.
- Serum-neutralizing antibody detected in two individual fledglings prior to vaccination suggests that some maternal antibody transfer may occur.

The results of this project suggest that a multiple booster vaccination strategy may be required to provide optimal protection for individuals released into the wild. Our results also suggest that adult populations may need to be boosted twice annually, rather than once, to provide immunity throughout the WNV transmission season. Like all good research, this study also raises new questions about how to best use vaccination, given both time and cost constraints in the captive breeding program. Given the critical importance of each individual in this small population and the potentially devastating impacts of West Nile Virus on the species, developing an effective vaccination strategy for captive-bred young is a very important tool in the recovery of this species. This research has provided an excellent data set that will act as a baseline for further investigations.

7.3 Manuscripts

With the addition of a new staff member to the LOSH recovery team, manuscripts that have historically been waylaid by higher priority tasks are now being revisited. A short communication on plastic use by the loggerhead shrike was submitted to the Wilson Journal of Ornithology and is presently under review. Other manuscripts currently in development include:

- Analysis of environmental contaminants in LOSH eggs
- Stainless steel band removal protocol
- Use of geolocators to study LOSH movements

8.0 PARTNERSHIPS AND COLLABORATION

8.1 Loggerhead Shrike Working Group

The 5th annual LOSH Working Group (WG) meeting was held on March 27 and 28 at the Birmingham Zoo, in Birmingham, AL. The meeting was well attended, with 26 individuals present from 13 states plus Ontario (increasing from last year's 23 attendees from 11 states plus Ontario). Attendees included representation from academia, U.S. state and federal government, non-profit organizations, private facilities, and citizen scientists. Amy Chabot, Jessica Steiner, and Hazel Wheeler attended this meeting to represent Ontario interests.

This year's meeting began with the usual research updates from working group members, but focused largely on how the working group can achieve Full Annual Cycle modeling for LOSH across their range. Key to this was a review of protocols currently in use by WG members, and how their use should be expanded and/or modified to gather the data necessary to complete this modeling. Other topics covered included:

- Validation of occupancy modeling methods, and how they can be used in the development of survey routes for citizen science Shrike Forces
- Potential funding sources to carry out WG activities
- Adaptation of the Ontario Landowner's Guide for broader use across North America
- Ensuring the WG website is an effective outreach tool

Full details of all topics discussed are available in the WG meeting minutes (available upon request). The date and location of the next meeting have not yet been chosen, but is anticipated early in 2020.

8.2 Building Regional Capacity

WPC staff continue to hold the position of co-chair of the Napanee Plain Joint Initiative (NPJI). The group was not very active this year, but did identify some new projects to focus on, including updating the Important Bird Area signs in the Napanee region, which have become quite weathered. The NCC will asking for assistance from the NPJI in reviewing and updating their Napanee Plain Natural Area Conservation Plan, which will guide their conservation work in the region.

WPC also remains engaged in the Carden community through the Carden Forum, organized by the Couchiching Conservancy. A proposed shooting range just north of Carden Alvar Provincial Park continues to be a topic of concern at the forum. The NCC has approached the property owners with a proposal to buy the land, but they had not made any progress at the time of the last Carden Forum meeting. Couchiching Conservancy is prepared to fundraise to support legal action against the shooting range proposal, if necessary.

Though WPC was active in the Grey-Bruce region in 2018 through the Alvar and Grassland Stewardship Workshop, there was not much call for further effort in that area in 2019, beyond coordinating Adopt-A-Site volunteers. It was hoped that the 2018 workshop would elicit more sightings this year, but unfortunately that was not the case. In fact, no LOSH were reported in the region for the second subsequent year. Regardless, connections made in the region in 2018 may still prove useful in future.

9.0 WPC FUNDRAISING

WPC implemented the recovery program this year with funding from the following sources:

- Private foundations (\$75K)
- Private donors (17K)
- BluEarth Renewables (\$23.5K; Year 1 of a 5 year post-construction monitoring agreement)
- EcoCanada Science Horizons Youth Internship (\$15K to subsidize Breeding Coordinator salary)
- Employment and Social Development Canada – Canada Summer Jobs (\$12K to subsidize two field positions)
- Environment and Climate Change Canada (\$8K for review and update of a tagging guidelines document)
- EcoCanada Student Work-Integrated Learning Co-op Program (\$5K to subsidize one field position)
- WPC-led fundraising initiatives (\$3K)

An application to the Habitat Stewardship Program (\$36.5K) was rejected this year, and we continue to await a decision about provincial funding through the Species at Risk Stewardship Program, for which an application (\$86.5K) was submitted in May. This year has clearly indicated the need to diversify funding streams outside of government funding, with private foundations providing the bulk of project funding for 2019-2020. Independent agreements, such as the ones with BluEarth and ECCC, may also prove to be an important source of funding going forward. However, whereas the work associate with the BluEarth agreement aligns well with existing work undertaken by field staff, the time spent by the Lead Biologist on the tasks associated with the ECCC

agreement took time away from regular program activities, so work plans needed to be adjusted accordingly. An increase in this type of funding may thus require a stricter prioritization of program tasks, and lower priority tasks may not be completed.