2018 AWRS Research Report

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Inside:

A Message from the Chair of the Board of Directors

Dr. Jacqueline Litzgus
Department of Biology, Laurentian University, Sudbury, ON

Greetings partners and friends of the Algonquin Wildlife Research Station. I am excited to share with you the 2018 AWRS Research Report, our 11th annual report. The following pages are full of the great science and outreach that is conducted within our natural laboratory of Algonquin Park, a place where we feel privileged to work. This year, 2019, marks an incredible milestone for the AWRS – we are celebrating our 75th birthday, our diamond jubilee! We will be hosting a birthday party, with the trees shedding their leaves in fall colours as our natural confetti, at the Station on the weekend of September 14-15. Please mark your calendars and keep your eyes peeled for the official announcement and invitation coming out in July.

There have been some staff changes at the Station over the past year. After 5 years of dedicated service as Manager, Tim Winegard departed for the west coast to pursue a research position related to his previous MSc work. The Board is extremely grateful to Tim for his creativity, enthusiasm, and motivation; he helped immensely in the professionalization of the AWRS, and we wish him the best on his new adventure. We are excited to welcome Kevin Kemmish as the new Manager. Kevin was the Assistant Manager in the 2018 field season, and he stepped seamlessly into the role of Manager, hitting the ground running this past October. Kevin has been instrumental in seeking grant and subsidy support for our 2019 seasonal staff positions, in hiring and training these staff members, in addition to juggling the infrastructure challenges that arise with the changes in weather. The Board looks forward to working with Kevin in 2019.

We are grateful for our partnerships. We are extremely thankful to Ontario Parks for their ongoing support of the Station. We continue our productive long-term partnership with the Friends of Algonquin Park (FOAP) to offer and deliver our very successful Meet the Researcher Day outreach event which allows us to deliver our messages about ecological integrity and the value of long-term research to hundreds of people through hands-on activities and engagement. We are also thankful to our university partners whose membership dues and user fees help

support the Station so that we can keep hosting world-class field courses and researchers. The AWRS is home to some of the longest-running research projects in the world, and research based at the AWRS has resulted in over 600 peer-reviewed papers and 150 student theses and dissertations. There is no doubt about the impact, merit, and value of these deliverables.

I continue to be thankful for the advice, support, and activities of our volunteer Board of Directors. They all have "real jobs" that keep them too busy, yet these folks are always willing to step up to the plate to help. Contact information for the Board members can be found on the AWRS website and in this report; I encourage you to communicate with any of us about any matters pertaining to the Station.

All the best for a successful and productive 2019 field season.
Hope to see you at the Cookhouse,

Jackie Litzgus
AWRS Board Chair

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From the Manager's Desk

Kevin Kemmish, AWRS Manager

Dear AWRS alumni, supporters and friends,

This year, 2019, marks the 75th field season at the Algonquin Wildlife Research Station and the 11th annual publication of the AWRS Research Report. Since it began, our annual publication has been an incredibly important tool for demonstrating the high-quality research, public outreach efforts, experiential learning opportunities, and documentation of Algonquin's wildlife to our members, supporters, and partner organizations. As you will see from this report, 2018 was an exciting and productive year. Our efforts continue to be driven by our vision of being a leader in wildlife research through experiential learning, and we hope that this year's report will help to educate and inspire our collaborators. Our many successes in 2018 would not have been possible without the dedicated support of our Board of Directors, Staff, members of the MNRF, MECP, and Ontario Parks, and our partner organizations. I would also like to make a special thanks to past Manager, Tim Winegard. Tim moved on from the station at the end of the 2018 season and having spent the summer working closely with him as the Assistant Manager, I was sad to see him, his partner Jamie and dog Cedar, go. Tim's mentoring through the season was invaluable and I cannot thank him enough. I look forward to continuing to grow and learn in my role as the AWRS Manager and hope to make a mark on the station as all managers have done in their own way in the past. In 2019 we look forward to working with our partner organizations such as The Friends of Algonquin Park on the annual Meet the Researcher Day event. We are also excited to be hosting new partnered wildlife workshop series with experienced naturalists, photographers and science writers. Stay-tuned to our website, algonquinwrs.ca, as well as our Facebook, Twitter and Instagram pages for news, upcoming events, workshops and reports from the field. If your research, institution or field course is interested in becoming part of our rich history, please do not hesitate to contact us. With the 75th summer of projects just starting up, we are already looking forward to organizing groups and projects for the upcoming fall and winter. I am excited to see familiar and new faces this summer and to continue to be a part of a research station with so much cultural, scientific and natural history. Because of the unwavering dedication of the contributors to this report, the board of directors, and the stations many collaborators and partners the AWRS continues to...

Educate... scientists, the public and policy makers

Conserve... biodiversity, ecological integrity and a culture of field based research

Inspire... environmental stewardship, a community of collaboration, and a connection with nature

I hope that you enjoy the 2018 Research Report. For more information or to be added to our mailing list, please contact me at algonquinwildliferesearch@gmail.com or (705) 633-5621 or visit our website at www.algonquinwrs.ca

Retrospective on a BLISS-ful spring and autumn – field seasons for the record books!

Patrick Moldowan[1], Njal Rollinson[2]

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BLISS by any other name would still be bliss. While the project has been known as the *Bat Lake Inventory of Spotted Salamanders* (*BLISS*) for the past decade, our research has grown and enormously so! Still keeping Spotted Salamanders near and dear, we've expanded our research program at Bat Lake to include a diversity of amphibians.

The *BLISS* project today represents a multi-faceted (ecological, population, life history, and natural history) research and monitoring project in a model amphibian population. Amphibians, such as frogs and salamanders, are our modern-day "canaries in the coal mine," serving as measures of environmental health. Our research studies amphibian populations and their biology in a changing world.

Figure 1. Seeing spots: evaluation of spot colouration in the spotted salamander. Photo: Patrick Moldowan.

Wildlife biologists have many techniques for the study of wildlife and their populations. The coloured leg bands (birds), acoustic surveys (birds, anurans), ear tags, radiotelemetry collars, scat counts and aerial surveys (mammals) simply will not do for the salamander, a diminutive and unassuming, yet ecologically important, member of the biotic community. Among our many objectives is to determine the best way to sample salamander populations to inform continued long-term ecological and population study. This may seem straightforward, yet it is much easier said than done. For instance, the biphasic (water-based and land-based) life cycle of amphibians poses additional challenges. There are many sampling techniques for the study of amphibians, but therein lies another problem - there is no standardization! When biologists sample populations using different techniques, can we be sure that we are collecting comparable information? In order to understand the biases imposed by any one sampling technique, we can apply multiple sampling techniques at one site/ population and compare our findings of population vital rates (e.g., abundance, population sex ratio, survival) using these different methods. In late 2017,

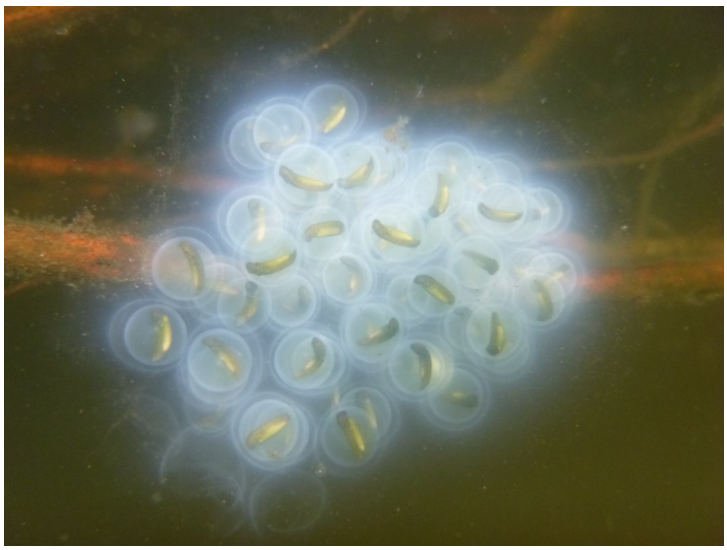

Figure 2. Spotted Salamander egg mass. Photo: Patrick Moldowan.

the installation of drift fence (a barrier fence that intercepts individuals during their migration to a breeding site) around the perimeter of Bat Lake was a major step toward a comprehensive population census of breeding amphibians. This census information was gathered to compare against commonly used population sub-sampling techniques, including aquatic funnel trapping, coverboard surveys, and egg mass counts.

By the numbers.

Maybe you have spent a lot of time exploring forests and ponds, even stopping occasionally to check for micro-wildlife under rocks and logs. How many salamanders, frogs, and toads would you estimate that you have seen in your life? Within days of the initial fencing installation in autumn 2017 we began catching juvenile salamanders leaving the lake and bound for the forest. This was a positive sign of things to come …

In spring 2018, accompanied by an eager group of five undergraduate students from the University of Toronto, we prepared for the amphibious arrivals at the fence, and they did not disappoint. In the course of approximately four weeks we had a staggering 15,619 amphibian captures! Spotted Salamanders were the most well-represented, followed by Blue-spotted Salamanders, Wood Frogs, and American Toads. Perhaps most memorably was a 24 hour rainy period of ~5000 amphibian captures! These invaluable data provide us with exceptional baseline data about the amphibian community, population structure, and population biology.

Figure 3. Two metamorphic Spotted Salamanders trapped in a carnivorous plant, the Northern Pitcher Plant. Photo: Patrick Moldowan.

Secrets in the peat.

Not only was spring 2018 full of amphibians, but autumn brought a new set of surprises. I will only give you a teaser here, but consider this: carnivorous pitcher plants and the misadventures of metamorphic salamanders making their first forays on land. Look for a forthcoming publication titled, "*Nature's pitfall trap: Salamanders as rich prey for carnivorous plants in a nutrient-poor northern bog ecosystem*"!

Beyond Bat Lake.

Throughout the spring and summer, findings from the *BLISS* project and Algonquin Park amphibians were featured in educational workshops and other events in Algonquin Provincial Park. Bat Lake salamanders even made an appearance in another international wildlife documentary series ("Canada: A Year in the Wild" by Tigress Productions UK)!

For 2019, we are expecting a smaller turnout of breeding amphibians at Bat Lake. Despite what may prove to be fewer amphibians in 2019, I'd wager that there will still be plenty to keep us busy!

We thank all visitors to Bat Lake for their curiosity and questions about our research and for their respectful sharing of the space! I gratefully acknowledge the backbreaking work of Carter Rouleau in helping to install the drift fence, as well as the invaluable dedication of Elizabeth Ann Francis, Natalia Hrynko, Mariel Terebiznik, Daire Crawford, Sam Paiva, among many additional volunteers, in surveying the drift fence. To these students I am truly sorry for my (*oh so conveniently timed*) break from field work and my casting doubt amid the craziness of "the big amphibian night". The BLISS project is supported by the University of Toronto, Algonquin Provincial Park/Ontario Parks, and the National Science and Engineering Council of Canada.

Long-term turtle study annual report – 2018

Carter Rouleau[1], Patrick Moldowan[2], Steven Kell[3], Jacqueline Litzgus[4], Njal Rollinson[5], Ron Brooks[6]

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The 2018 field season marked the 47th year of the long term turtle study. A late spring thaw kept the turtles under the ice longer than usual, but once the ponds melted, the turtle team sprang into action! Much like the previous season, a cold and late spring in the park appeared to be creating favorable conditions for nesting females. Basking activity at the ponds was lower than in previous years. Females were less active, and thus may have been able to use less of the fat stores they had accumulated the previous fall before nesting. Despite this lack of activity, the turtle team was up to the challenge, capturing a total of 443 individual painted turtles and 87 snapping turtles throughout the summer.

Nesting season was cut short this year. The late thaw delayed the beginning of the season, and an oppressive late-June heat wave brought the season to an early end. Turtles often nest in open areas with little shade, and can overheat if they are exposed to the sun for too long. Daily temperatures exceeding 30°C proved to be too much for the turtles, who seemed to be unable to nest once the heat wave began. Still, there was a flurry of nesting activity throughout mid-June, culminating in one of the busiest nesting nights in recent memory. On June 15th, the turtle team collected nests from 50 painted turtles! At times, the team came across groups of six or seven turtles all nesting side-by-side (Figure 1). The team worked feverishly through the night, and, after a bit of much-needed sleep, we agreed that the experience had been about the most fun a group of field researchers could have.

Figure 1. Six painted turtles nesting simultaneously at Wolf Howl Pond. Photo: Steven Kell.

In total, the team collected 194 painted turtle nests and 39 snapping turtle nests. The effects of the heat wave were most noticeable in the behaviour of the painted turtles. Algonquin painted turtles are capable of laying two clutches of eggs in a single nesting season, though not all do (younger and smaller turtles do not typically lay a second clutch). Thus, the painted turtle nesting season is characterized by two distinct peaks in nesting activity, normally two weeks apart. The two peaks represent the times when the majority of turtles lay their first and second clutches, respectively. The first peak is always larger than the second. Based on predictive models, the second peak of the 2018 season should have happened just after the heat wave set in, but temperatures seemed to prevent many turtles

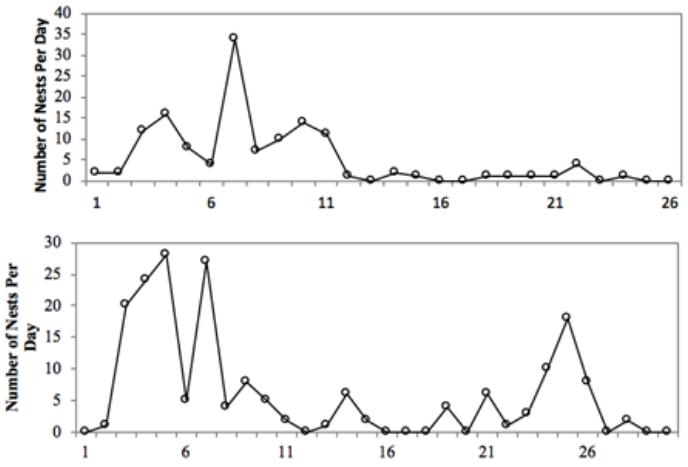

Figure 2. Number of painted turtle nests laid per day during the 2017 (bottom) and 2018 (top) nesting seasons.

from nesting a second time (Figure 2). As a result, very few turtles laid a second clutch this year.

The 2018 season saw the beginning of a new line of research for the turtle project. M.Sc. student Carter Rouleau began collecting blood samples from turtles with the end goal of determining genetic relatedness among all painted turtles living in Wolf Howl Pond. This analysis will initially inform Carter's investigation of social behaviour and coordination during nesting, but its uses go far beyond that. We hope to incorporate this analysis into many future studies.

There was no shortage of highlights during the 2018 season, but we felt that two were particularly worth mentioning. The wood turtle discovered last season by turtle project alumnus Taylor Wynia was again found this spring! In the fall of 2017, we had tracked her in the hopes of finding her overwintering site. She went off the grid late in 2017, but we were confident that we would be able to relocate her in the spring of 2018. It seemed fitting that our first attempt at locating her came when Taylor decided to come for a visit to the AWRS early in the spring. Taylor, Carter, and Steven set out to locate the turtle, but were making little progress after a few hours searching the habitat where she was last seen. As the day was drawing to a close, Carter hopped up onto the bank and saw our wood turtle! She was healthy and still in perfect condition. We were able to locate her a few other times throughout the season, and hope to touch base with her again next year.

The other high point of the season came when we were least expecting it. Patrick and summer research students Daire Crawford and Natalia Hrynko were on a casual paddle in a lake just north of the AWRS when they spotted a large snapping turtle basking on a floating log. With no traditional means of capturing or restraining the turtle, they executed a flawless hand capture, and immediately knew they had an interesting find. The turtle had shallow identifying notches, old ID tag holes, and markings from where a radio transmitter had once been attached. After returning to the lab with the very feisty turtle in hand, they set about identifying him. His notches, shallow but still visible, revealed him to be snapping turtle R10, who had not been seen by researchers for 25 years! During his 2018 'check-up' he weighed in at 12 kg, and a look back at his capture history showed that his mass had doubled since his first capture in 1979! Without a replacement 'R10' ID tag, he was assigned the new ID of X19 and released. His tag may say differently now, but he will always be R10 to us. The recapture of R10 is not an unusual case. There is a long list of turtles with a decade or more between captures, and researchers are always turning up forgotten individuals. Another addition to the list was painted turtle 840, captured this year after an 11 year absence from the study. We hope to see this list continue to grow in the coming years!

The turtle team would like to acknowledge that the midland painted turtle, our most common study species, was recognized as a species of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in April 2018. With this designation, all turtles in Ontario are now considered to be at risk. Humans are the leading source of mortality for Ontario's turtles, and research has shown that turtle populations that experience high rates of mortality are unable to recover. Conserving turtles in Ontario

is now more important than ever. We ask that you please be on the lookout, particularly while driving, for turtles. If you come across a turtle on a roadway, move it off of the road in the direction it was travelling, provided it is safe for you to do so. The turtle team and our shelled friends thank you!

The team would also like to put out a call for turtle observations in Algonquin Park. We are looking for painted and snapping turtles, particularly those with paint markings, ID tags, or notches. Observations of turtles on roads are of special importance. Observations can be submitted at the park Visitor's Centre, or emailed to Patrick Moldowan (pmoldowan1@laurentian.ca).

Overall, we had a very successful field season. This was in no small part thanks to the help of Barrie Subaru, who again provided us with a fantastic field vehicle. If you visited the park last summer, you have probably seen us out and about in our unmistakable 'Turtle Car' (Figure 3). The car is currently back with the folks at Barrie Subaru for some well-earned 'r & r', but will be back in the field next season, better than ever!

We were happy to welcome Daire Crawford and Mariel Terebiznik to the 2018 turtle team. They were a massive help to returning turtlers Carter and Steven. Carter will be returning to Algonquin Park this summer to lead the 2019 turtle team. The team would like to congratulate Steven Kell and Melanie Massey, the project's newest alumni, who both successfully defended M.Sc. theses this year. Steven has moved on to running the Species-at-Risk Biology program at the Shawanaga First Nation in northern Ontario, and Melanie has begun a Ph.D. at Dalhousie University in Nova Scotia. Congratulations to you both!

Figure 3. The turtle car on duty at Wolf Howl Pond. Be sure to keep an eye out for it this summer! Photo: Steven Kell.

Living life on the edge: the Canada Jays of Algonquin Provincial Park

Koley Freeman[1], Alex Sutton[1], Amy Newman[2], Ryan Norris[3], Dan Strickland[4]

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[2] Assistant Professor, Department of Integrative Biology, University of Guelph, Guelph, Ontario, Canada
[3] Associate Professor and University Research Chair, Department of Integrative Biology, University of Guelph, Guelph, Ontario, Canada
[4] Chief Park Naturalist (retired), Algonquin Provincial Park, Ontario, Canada

In the winter it is common to run into people wanting to know the best places to see Canada Jays (also called a host of unofficial names including "Gray Jay" and "Whiskyjack"). Many people flock to Algonquin Provincial Park for the chance to meet these charismatic jays which are known for fearlessly helping themselves to human snacks and lunches. At the southern edge of the species' range, Algonquin is a great place for most Ontarians to see Canada Jays up close. It's also a great place for researchers to study them because, since the 1960s, almost all of the Canada Jays in the park's Highway 60 corridor have been marked with unique combinations of coloured leg bands that allow each bird to be identified and followed throughout their life.

However, over the past three decades, it has become more difficult to view these beautiful birds. The Canada Jay population in the park has declined by more than 50% decline since the 1970s, meaning that over half of the territories that used to have Canada Jays are now vacant. Currently, PhD candidates Koley Freeman and Alex Sutton at the University of Guelph are trying to understand the potential mechanisms responsible for the observed population decline in Algonquin. As part of their research, they follow the birds from mid-February, with the start of the breeding season, through to the population census which takes place at the end of October.

Figure 1. When the nestlings are ~14 days old, they each receive a unique combination of leg bands so that they can be individually identifiable. Each nestling is also measured at this time to assess its body condition before being returned to the nest. Photo: Kailey Watson.

Winter and Spring: The Breeding Season

In 2018, starting on February 18th, researchers set out across the snowy landscape to locate the nest of each breeding pair in the population. Over the course of three weeks, and countless kilometers of snowshoeing, the crew was able to locate 18 nests. The nests were monitored every 1-3 days to determine the initiation of egg laying, and consequently allow for the estimation of when hatching of the eggs would occur and when the resulting nestlings would be big enough to be banded.

Figure 2. Alex holding a begging 14 day old Canada Jay nestling with its father ready to feed it. While measuring this nestling we noticed the male with a fully engorged throat, a sign that it was carrying food. So he held out the nestling and watched in awe as the male jay landed on his hand and fed its chick. Photo: Kailey Watson.

Figure 3. Canada jay nestlings which are ~14d old. Photo: Kailey Watson.

When banding day finally arrived, nests were accessed using a ladder or a professional tree climber. At that time, the nestlings were briefly removed from the nest to allow for them to be individually colour-banded and measured (Figures 1-3). In 2018, 35 nestlings were marked, up from the 26 nestlings banded in 2017 and the 29 nestlings in 2016.

Summer: Dispersal of Young Jays

With the disappearance of snow, emergence of fresh food, and increasingly mobile fledglings, Canada Jays become elusive. In June, roughly six weeks post-fledging, young jays undergo a partial dispersal event where one fledgling remains on its natal territory with its parents. Its siblings are forced to disperse and attempt to find an unrelated pair that will accept them.

Little is known about the survival and movements of the dispersers once they leave their natal territory but, over the course of the summer and into the fall, Koley and Alex began to find out by using radio telemetry to determine where dispersing juveniles went and how well they survived. Before they dispersed, 26 juveniles were each fitted with a radio transmitter in the form of a tiny 'backpack' which emits a signal at a unique frequency (Fig. 4). Using the strength of the beeps as guidance, researchers are able to track down the location of the tagged jay by foot or by plane (Fig. 5). With the help of the transmitters Alex and Koley were able to follow the dispersing young as they moved to territories up to 15 km away. This project will continue for the next few years to further estimate survival of young jays as they disperse across Algonquin.

Fall: The Population Census

By the late-summer and throughout the fall, Canada Jays are caching thousands of food items a day across their territory in preparation for winter. In

Figure 4. To determine the survival and movement patterns of young Canada Jays, some jays received radio transmitters which allow for them to be tracked. The radio tag rests on the lower back of the bird and is attached by a removable leg-loop harness. The antenna of the tag is visible and rests parallel to the tail (indicated by the white arrow). Photo: Alex Sutton.

Figure 5. The radio transmitters emit beeps at unique frequencies that can be detected using an antenna like the one pictured on the wing of the plane. Using the strength of the signal as guidance, the location of a bird with a transmitter can be pinpointed. Photo: Koley Freeman.

the midst of the caching season, researchers visit ~30 territories that are known to have jays or were previously occupied to determine territory occupancy and the over-summer survival of individuals. In 2018, 46 individuals were observed across 19 territories. Unfortunately, that was three fewer territories than in 2017, a loss that was only partly offset by one territory being reoccupied. While the number of occupied territories shrank, researchers were excited last year by the number of surviving young that were hatched in the population. Compared to 2017 when only one surviving juvenile was observed, in 2018 there were five!

Recent Canada Jay News

If you would like to learn more about the Canada Jay project check out some of the recent media:

Cornell Lab of Ornithology's Living Bird Magazine ('Spoiler Alert: Can Gray Jays Survive Warmer Weather?' – Jan 2018)

Ontario Parks Blog ('Keeping up with the Canada Jay' – Mar 2018)

Inside Ottawa Valley ('Living on the edge: Learning from the grey jays of Algonquin Park' – Apr 2018)
TVO ('Creatures vs. climate: The Canada jay' – Aug 2018)
Dispatches from the Field Blog ('Algonquin Adventures' – Dec 2018)
Ottawa Citizen ('Canada jay hides food for winter, but sometimes nature's freezer lets it spoil' – Apr 2019)
University of Guelph News ('Freeze-Thaw Events Hindering Iconic Canadian Bird's Food Stores, Breeding, U of G Study Finds' – Apr 2019)

Keeping up with the critters of Algonquin: small mammal research project

Jasmine Veitch[1], Jeff Bowman[2], Albrecht Schulte-Hostedde[3]

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Small mammals play an integral role in the natural balance of the forest ecosystem. They provide food to predators, disperse seeds from plants, and change the flow of precipitation over the forest floor with their burrows, to name a few examples. Thus, it is not particularly surprising that these creatures can be used as indicators of environmental health due to their invaluable ecosystem services.

Figure 1. Two juvenile deer mice (*Peromyscus maniculatus*) caught in the same trap and given ear tags. Photo: Jasmine Veitch.

The 2018 field season marked the 67th year of the study in Algonquin Park, providing an invaluable dataset on the long-term trends in abundance of small mammal populations in natural, undisturbed areas. Live-traps were set throughout the field season and checked bright and early in the morning with the rising sun. These traps are one of the most common ways to study small mammal communities, as they allow researchers to monitor many different rodent species at once.

Figure 2. Short-tailed shrew (*Blarina brevicauda*) released as by-catch. Photo: Jasmine Veitch.

All captures are given metallic ear tags containing a unique numerical code so that individuals can be monitored over time. Small mammal researchers recorded species, sex, age, weight and parasite counts of all captures, with the aid of a few eager participants. There were many helping hands this year, with visits from over 15 different volunteers wanting an up-close experience with some of nature's valuable critters, including other researchers and staff from the research station and the park, academics from universities, and visiting students from across Ontario looking for a rare opportunity to take part in this amazing project.

While there was the typical small number of captures in early May with ~10 individuals caught in the first two weeks, once the temperature started to rise the small mammals really took off. This year was bustling, with total capture number reaching ~1516 small mammals caught between May and August! As seen in previous years, deer mice (*Peromyscus maniculatus*) dominated the small mammal traps, making up a massive ~65% of the community. Eastern chipmunks (*Tamias striatus*) followed,

Figure 3. Juvenile woodland jumping mouse (*Napaeozapus insignis*). Photo: Jasmine Veitch.

making up ~16%. While this pales in comparison to the deer mice, this is high compared to the average number of chipmunks seen year to year.

There were quite a few other species that were commonly seen throughout the season, including red-backed voles (*Myodes gapperi*), woodland jumping mice (*Napaeozapus insignis*), and red squirrels (*Tamiasciurus hudsonicus*). Some rare visitors included 4 northern flying squirrels (*Glaucomys sabrinus*) and a meadow vole (*Microtus pennsylvanicus*)!

Figure 4. Northern flying squirrel (*Glaucomys sabrinus*). Photo: Patrick Moldowan.

The summer field season was uncharacteristically warm, leading to some sweaty s'mammalers, but they persevered through the high numbers of small mammals and the low hours of sleep. Each day brought new adventures, but the highlight of the season was finishing up setting traps and seeing a beaver, moose, and bear with cubs all in one evening! A good illustration of the wildlife that Algonquin Park has to offer.

The small mammal project contains a treasure trove of data and provides us with an excellent baseline of small mammal populations in natural areas. With this invaluable dataset, we can assess impacts of anthropogenic activities such as logging on disturbed areas and we can track the large-scale environmental impacts on forest ecosystems. An ongoing study as long as the small mammal project is exceptionally rare and has a lot to teach us about how we are impacting the health of our ecosystem. In a changing world where humans are further modifying our earth's landscape each day, studies like these can provide crucial knowledge on the consequences of our actions.

Figure 5. Deer mouse (*Peromyscus maniculatus*) climbing maple sapling. Photo: Hayden Wilson.

We were very happy to welcome Hayden Wilson and Natalia Hrynko onto the small mammal project and we thank them for their hard work over the field season. Special thanks as well to William Bennett, for offering an extra pair of hands when needed. We also gratefully acknowledge the Ontario Ministry of Natural Resources and Forestry for their continued support.

Lord of the fleas: shedding light on patterns of parasitism in nocturnal rodent hosts and impacts on stress hormone levels

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Parasites are often viewed as biology's B-listers due to their strange and cryptic lifestyles, however more than half of all species on earth are parasitic. With every free-living animal or plant, there is likely a parasite (or four) behind the scenes exploiting the host. Despite this, there is very little research overall into these exciting organisms. Parasites have long been a topic of interest for AWRS researchers, and since the 1940s, we have been worming our way into the exciting world of these tiny creatures. While initial work tended to focus on anatomy and life cycles, we are now starting to explore the ecology of host-parasite relationships and the role of parasites in their ecosystems. One system that is rarely studied is external parasites of small mammals. This system is quite unusual in the parasitology literature, as most studies tend to focus on internal parasites and aquatic hosts such a fish.

Figure 1. Examining deer mouse (*Peromyscus maniculatus*) for parasites. Photo: P. Moldowan.

During the 2016/17 field seasons, we carefully inspected the small mammal traplines looking for any tiny parasites hidden among the fur of a mouse or vole (Figures 1, 2). The purpose of this detailed examination is to help us determine whether there are any patterns in what different parasite species consider a suitable host. Not every small mammal is the ideal home for a tick, flea or mite, and different attributes of a host such as sex, age and body mass can largely impact a host's susceptibility.

Figure 2. Combing red-backed vole (*Myodes gapperi*) fur to search for external parasites. Photo: Alex McNulty.

Another matter of interest for the small mammal team was the impact of parasites on stress hormone levels. As one can imagine, having a few parasites crawling around can be a stressful situation. These nasty houseguests can be anything from a minor annoyance to a deadly danger, and many hosts have increased stress hormone levels as a response to parasite infestations. Elevated measures of stress hormones (specifically glucocorticoids) are a classic feature of an animal's response to a negative event, and researchers often use these hormones to mark exposure to a harmful stressor. Thus, stress hormones can be a useful tool for parasite ecology.

Stress hormones can act as a double-edged sword to many hosts. An increase in these hormones is usually beneficial in the interim, increasing food consumption and fat mobilization. However, there can be a dark side to elevation of stress hormones long-term, as they often have deleterious effects such as weakening the immune system. Due to these opposing features, it is not always clear how a host will respond to parasite infestations and whether an increase in stress hormones is an optimal strategy.

Figure 3. Flea from deer mouse (*Peromyscus maniculatus*). Photo: Jasmine Veitch.

Throughout the summer, researchers collected fecal samples from each small mammal as a measure of their stress hormone levels. These fecal samples were sent to the Reproductive Physiology Lab at the Toronto Zoo, where extracts from the feces were tested using immunoassays for their stress hormone levels (Figure 4). Feces can be a great means to study hormones, as the collection process is non-invasive and less affected by short-term fluctuations compared to other methods (such as collection of blood samples). Half of the captured individuals had their parasites removed and were given a medicine to prevent re-infestation, while others were left alone to combat their parasites. This allows researchers to determine how stress hormone levels changed between individuals that kept their parasites versus those who had them removed.

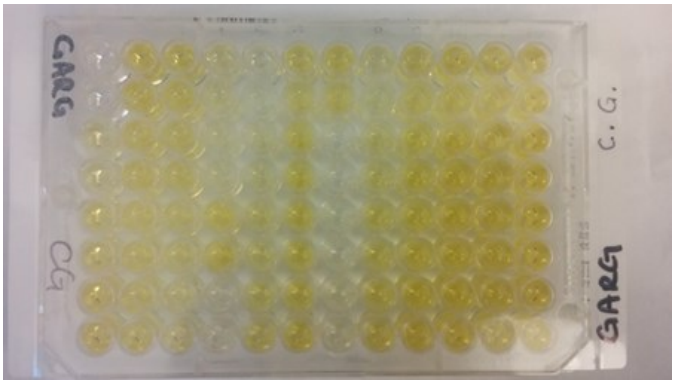

Figure 4. Immunoassay plate containing hormone extracts from feces. This is a common method used to measure stress hormone levels. Photo: Jasmine Veitch.

Parasites and their hosts often have a long history of co-evolution. This relationship can provide a great ecological model for biologists, with hosts acting as a habitat for parasites with easily defined boundaries. Furthermore, parasites are crucial for an entire ecosystem and are often central to managing host population densities and creating a healthy balance. The importance of parasites is frequently

underappreciated and overlooked, and what many people don't realize is that parasites shape our ecosystems and maintain equilibrium.

Figure 5. Tick from deer mouse (*Peromyscus maniculatus*). Photo: Jasmine Veitch.

In the twists and turns of the parasite world, things are often not as they seem. While it is easy to view parasites as creepy or disturbing, using a more inquisitive eye may present a different story – that maybe parasites aren't so terrible. So keep in mind that "we are all a little weird and life's a little weird" (Dr. Seuss) and maybe weird is not always a bad thing.

Stay tuned for future publications on parasites and their small mammal hosts to learn more about what we discover from this remarkable host-parasite system! Many thanks to the Ontario Ministry of Natural Resources and Forestry for their support.

Antler flies: do old parents pass on costs to their offspring?

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Antler flies are specialized insects that only live on moose and deer antlers. Despite their size, these small insects are providing big insights into the biology of aging. Aging is a familiar concept: as people and animals get older, they deteriorate and become weaker. For a long time, it was believed that insects lived such a short time in the wild that they never became old enough to age. Thanks to research on antler flies at the AWRS, we now know that's not the case. Antler fly males become less likely to mate and more likely to die the older they get, which reduces their reproductive success (what biologists call "fitness") as much as 20 percent!

Figure 1. One male antler fly, marked "E," guards a female after mating, while a rival male marked "X" approaches them. Photo: Russel Bonduriansky.

Figure 2. Ph.D. student Chris Angell and undergraduate field assistant Olivia Cook record survival and mating success of marked antler fly males at the AWRS. Photo: Patrick Moldowan.

Figure 3. Larval antler flies. Photo: Antoine Morin.

This past summer, we sought to find out whether some of the costs of aging were also passed on from antler flies to their offspring. In plenty of other species, including humans, we know this can happen. Old parents can carry more genetic mutations in their sex cells and provide lower-quality nongenetic factors, such as cellular structures and DNA methylation "tags," to their children. Such parental age effects have been measured in laboratory insects and wild vertebrates, but, to our knowledge, nobody has looked for them in wild insects.

To look for parental age effects in antler flies, we mated lab-raised antler flies of known ages (either "young," 2–4 days old, or "old" 12–14 days old) to each other. We created offspring who had old mothers, old fathers, both, or neither, and brought them to the AWRS in May. Once the larvae matured into adult flies, we marked them with enamel paint using a tiny paintbrush and released them onto one of four moose antlers we brought back to the Station from all over the park. Male antler flies almost always come back to the same antler day after day, which allows us to track them individually. Unfortunately, females disperse widely, so we cannot keep track of them.

It was a good year, with lots of flies and lots of data: we recorded the lifespan and mating success of around 150 marked males. We haven't completed the analysis yet, but we expect that males whose parents were old at the time of reproduction will have reduced survival and mating success, and faster aging.

Figure 4. An adult male antler fly on a moose antler. Photo: Russel Bonduriansky.

Evaluating the sustainability of Ontario's logging practices in Great Lakes-St. Lawrence forests using beetle communities

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In the 1950s, single tree selection (STS) became the dominant silvicultural system used in hardwood stands in Ontario. Using STS to manage Ontario's forests involves removing trees of different size classes uniformly throughout a stand and maintains the closed-canopy conditions of mature stands. In theory, this method allows for tree harvesting while maintaining wildlife habitat relatively undisturbed. However, the question is: how sustainable is this practice in the long term? A team of researchers from University of Toronto's Faculty of Forestry set out this past summer to find out.

The interest in this topic started when Dr. Malcolm noticed the relative paucity of research on the long-term implications of STS forest management for biodiversity. Previous studies have shown that STS managed stands can promote the development of shade tolerant tree species, such as sugar maple, at the expense of mid-tolerant and intolerant species, and a reduced amount of standing dead trees and downed wood. These effects could alter natural ecosystem processes and functions, and therefore lead to changes in the biota over time.

To test this idea, the team decided to use an indicator group to monitor the sustainability of STS. Indicator species are a species (or in this case a group of species) whose abundances (or community structure) reveal the overall health and status of their environment. Beetles were chosen for this study because they are one of the most reliable indicators of forestry impacts from European studies as they are numerically abundant, diverse, and are also strongly associated with dead wood. That is, certain beetle species are saproxylic in that they depend on dead and decaying wood for a part of their lifecycle, and hence may be involved in the decomposition processes and the recycling of nutrients in natural ecosystems.

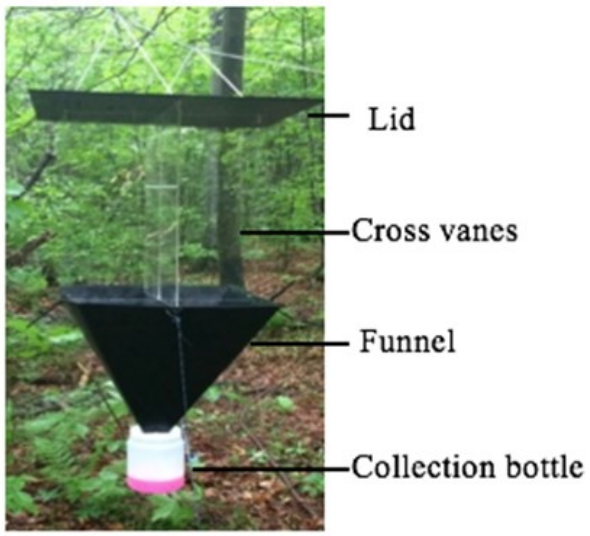

Figure 1. Trap design of the cross-vane flight interception traps used to capture beetles in 2018.

Summer research was conducted in 2018 in the hardwood forests of southwestern Algonquin Provincial Park and the adjacent Haliburton Forest and Wild Life Reserve, Inc. Thirty upland, maple-dominated sites were chosen: fifteen that had been

previously harvested and fifteen that were located in old growth areas. At each site, cross-vaned, flight interception beetle traps were set, and several habitat variables were measured, including live tree community composition, and snag and downed woody debris (DWD) volumes. Traps were constructed of perpendicular panes of transparent acrylic; insects that hit the panes were funnelled into a lower collecting bottle containing 33% propylene glycol (Figure 1). Funnels were coated with a slippery substance (Fluon).

At each site, two eight-trap stations were set along a 420-m long transect (near stations 2 and 5) (Figure 2). Of the eight traps, four were large (panes of 41 by 49 cm) and four were small (panes of 20 by 30 cm). The large traps are used to sample the lower canopy of a sugar maple and a hemlock tree and the understory immediately below (height approximately 1.3 m). Small traps were used to sample early and late decay DWD and early and late-decay snags. The total sampling per site was thus 16 traps, with a total of 480 traps across the 30 sites.

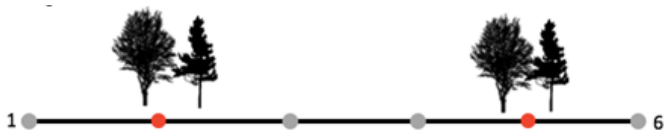

Figure 2: Sampling design used to sample beetle families in 2018. Each transect was 420 m long with beetle sampling taking place at stations 2 and 5 (denoted in the picture by the red circles).

Traps were left open for 10 nights (collected on the morning of the 11th day), with the most southerly 15 sites sampled during early to mid-June and northerly 15 sites sampled during mid-June to early July. Two separate trapping sessions were needed due to logistical constraints. Insect captures were stored in 70% ethanol and Coleoptera, Diptera, and Hymenoptera are being identified to family. At present, only half the Coleoptera samples have been identified (by Dr. Nurul Islam); the rest of the samples are expected to be identified by the end of April. Certain abundant beetle families will be identified to species after all samples are processed.

With this collected data, the group will be able to compare habitat structure and beetle assemblages between unmanaged stands and stands that have been previously harvested using STS. The team hopes that results of the study will provide an understanding of the responses of beetle communities to human landscape transformations in Southern Ontario forests, and test for the sustainability of this dominant silvicultural system. As this data was only collected this summer, outcomes of the investigation are still in progress. Additional, data will also be collected this upcoming summer. The team is very excited to see the results.

We would like to thank Tim Winegard, the rest of the AWRS staff, and the resident researchers for their hospitality and warm welcome to the facility. Thanks also goes out to Peter Schleifenbaum and Malcolm Cecil-Cockwell for supporting and facilitating this research on their Haliburton property.

Second annual Alan Wormington Memorial OFO young birders camp

August 26 to September 1, Algonquin Provincial Park

By Steven Cullen, camper

Day 1: August 26

Our trip had a rainy start, but that would not stop us from exploring our base camp [at the Wildlife Research Station]. That evening, our group of 10 campers was invited to join wildlife researchers for a trip to nearby Bat Lake where we were able to find salamanders, frogs, and toads.

Day 2: August 27

Today's highlight was a trip to the Old Airfield where many species of insects and fungi were present. A Black-backed Woodpecker sighting from earlier in the day was the first of 11 individuals that we saw during the week!

Day 3: August 28

During a trip to Opeongo Road, three Canada Jays arrived shortly after our arrival. Farther down the road, we spotted a Northern River Otter that proceeded to sit on a log and seemingly pose for the cameras.

Day 4: August 29

This day was a windy one, but we proceeded with our plan of canoeing down Hailstorm Creek. After arriving at our starting point by water taxi, we were faced with canoeing into a strong headwind. Fortunately, our efforts were rewarded with the trip's only sighting of a Sandhill Crane.

Day 5: August 30

The quest for Spruce Grouse was on. We traveled to many different locations searching for this species to no avail. At Spruce Bog Trail, which was our final stop of the day, we did, however, find a single Ruffed Grouse.

Day 6: August 31

At the Algonquin Park Visitor Centre, we got a private tour of the wing where the naturalists spend their time when indoors. After perusing the specimen collection room, we wrote our sightings on the "glory sheets" [where the Park's flora and fauna sightings are recorded].

Day 7: September 1

Our last full day included one of the best sightings of the entire trip: our first and only Spruce Grouse, an adult male. Our final bird species count was 96. It had turned out to be an amazing week with lots of memorable sightings and stories to tell.

Here are just a few of them:

The 2018 Young Birders Camp was an amazing experience led by four wonderfully energetic and engaging leaders. We had the chance to explore a beautiful jewel in the crown of Ontario's protected land, enjoy some birdwatching and photography — including an inspiring presentation by Jeremy Bensette— and a beautiful canoe trip, among many highlights. In addition, a spectacular wolf howl conducted from a picturesque lake late at night reminded me more than ever before how close we are to the nature that surrounds us and how distant we often try to convince ourselves that we are from it. I made some wonderful friends, and I highly recommend the camp to anyone, no matter how strong their birding interest is!

– Gabriel McMurren, camper

It's practically impossible to choose just one memorable moment, for there were so many! From singing Metallica songs at the top of our lungs in Jamie's van, to listening to wolves howling from directly in front of us, to seeing so many Black-backed Woodpeckers, there is nothing about this camp that I would have changed. It was such a relief to meet birders my age that I could talk and learn with, and because of OFO I now have unbreakable friendships, expanded know ledge, and thousands of photos.

– Laura Legzdins, camper

We had another fantastic camp this year. It was great to have a few more days than last year to get to know everyone. My personal highlight of the trip was taking everyone out for a night paddle on Lake Sasajewan. Just the experience of floating quietly in the dark and watching the stars and meteorites would have been enough, but having a pack of wolves reply was fantastic! The lone adult that approached the edge of the lake and let rip with a series of hair-raising howls is something I will never forget sharing with everyone.

– Jeff Skevington, camp leader

What an adventure we shared in Algonquin Park! Each of the young campers brought incredible energy, knowledge, skill, and insight along with them, and I can only hope that I inspired each of them as much as they inspired me. The highlight of the trip for me was the long and very rewarding walk around the Mizzy Lake trail, where we crossed paths with many of our birding targets, including Boreal Chickadees, Black-backed Woodpeckers, Barred Owls, and a lone Spruce Grouse, among many other great wildlife finds. This trip is among my fondest memories in my birding career and it will not be forgotten anytime soon.

– Jeremy Bensette, camp leader

Special thanks go to Lisa Bildy and Lynne Freeman for organizing this event in collaboration with staff members from Algonquin Provincial Park's naturalist team and Wildlife Research Station. Thanks also to our dedicated and energetic camp leaders Jeremy Bensette, Angela Skevington, Jeff Skevington, and Jamie Spence. For any 13- to 18-year-old birders interested in next year's camp, keep an eye out for announcements at www.ofo.ca.

Ontario Field Ornithologists

Recent publications

A collection of research conducted at or with the assistance of the Algonquin Wildlife Research Station in 2018. The full AWRS bibliography is available on our website algonquinwrs.ca.

Armstrong, D.P., Keevil, M.G., Rollinson, N., & R.J. Brooks. 2018. Subtle individual variation in indeterminate growth leads to major variation in survival and lifetime reproductive output in a long-lived reptile. Functional Ecology 32(3): 752-761.

Derbyshire, R., Norris, D.R., Hobson, K.A. & D. Strickland. 2019. Isoptopic spiking and food dye experiment provide evidence that nestling Canada Jays (*Perisoreus canadensis*) receive cached food from their parents. Canadian Journal of Zoology 97 368-375.

Francis, E.A., Moldowan, P.D., Greischar, M.A., & N. Rollinson. In press. Anthropogenic nest sites provide warmer incubation environments than natural nest sites in a population of oviparious reptiles near their northern range limit. Oecologica.

Freeman N.E., & A.E.M. Newman. 2018. Quantifying corticosterone in feathers: validations from an emerging technique. Conservation Physiology 6 (11): coy051.

Janzen, F.J., Hoekstra, L.A., Brooks, R.J., Carroll, D.M., Gibbons, J.W., Greene, J.L., Iverson, J.B., Litzgus, J.D., Michael, E.D., Parren, S.G., Roosenburg ,W.M., Strain, G.F., Tucker, J.K. & G.R. Ultsch. 2018. Altered spring phenology of North American freshwater turtles and the importance of representative populations. Ecology and Evolution 8(11): 5815-5827.

Keevil, M.G., Brooks, R.J., & J.D. Litzgus. 2018. Post-catastrophe patterns of abundance and survival reveal no evidence of population recovery in a long-lived animal. Ecosphere 9(9): e02396.

Massey, M., Nancekivell, G., Brooks, R.J., & N. Rollinson. In press. Measurement and modelling of primary sex ratios in species with temperature dependent sex determination. Journal of Experimental Biology.

Moldowan, P. D., Brooks, R. J. & J. D. Litzgus. 2018. Sex-biased seasonal capture rates in the Painted Turtle, *Chrysemys picta*. The Canadian Field-Naturalist 132(1): 20-24.

Moldowan PD, MA Smith, T Baldwin, T Bartley, N Rollinson, H Wynen. In press. Nature's pitfall trap: Salamanders as rich prey for carnivorous plants in a nutrient-poor northern bog environment. Ecology.

Rollinson, N.*, Holt, S.M.*, Massey, M.D., Holt, R.C., Nancekivell, E.G., & R.J. Brooks. 2018. A new method of estimating thermal performance of embryonic development rate yields accurate prediction of embryonic age in wild reptile nests. Journal of Thermal Biology 74: 187-194. (*author contributions equal)

Schmidt, E., Mykytczuk, N., & A.I. Schulte-Hostedde. 2019. Effects of the captive and wild environment on diversity of the gut microbiome of deer mice (*Peromyscus maniculatus*). The ISME Journal.

Sutton, A.O., Strickland, D., Freeman, N.E., Newman, A.E.M., & DR Norris. 2019. Autumn freeze-thaw events carr over to depress late-winter reproductive performance in Canada Jay. Royal Society Open Science 6: 181754.

Valenzuela, N., Literman, R., Neuwald, J.L., Mizoguchi, B., Iverson, J.B., Riley, J.L., & J.D. Litzgus. 2019. Extreme thermal fluctuations from climate change unexpectedly accelerate demographic collapse of vertebrates with temperature-dependent sex determination. Scientific Reports 9: 4254.

Defended theses and current student research

The AWRS has been host to many graduate students since its inception in 1944. Since not-for-profit incorporation in 2010 we have contributed to numerous theses. With more on the way in 2019 the AWRS continues to provide exceptional opportunities for students to gain invaluable knowledge in field biology and in many cases is the basis for many peoples success. Following are a number of student projects and theses that were worked on in 2018.

Crawford D. 2018. Analysis of operational sex ratio and body condition in the American Toad, *Anaxyrus americanus*. Independent research project (EEB398), University of Toronto.

Hawkshaw, D. 2018. Discovery and description of a novel sexual weapon in the world's most widely-studied freshwater turtle (*Chrysemys picta*). B.Sc. University of Toronto.

Hrynko, N. 2019. Estimating the total biomass of breeding amphibians at Bat Lake, Algonquin Provincial Park, over the 2018 season. Honours thesis, University of Toronto.

Kell, S. 2018. Nesting in close quarters: Causes and benefits of high density nesting in Painted Turtles. Masters Thesis, Department of Biology, Laurentian University.

Schmidt, E. 2018. Environment-microbe-host interactions: understanding the relationship between the external environment, gut microbiome diversity and host immunocompetence. Master's Thesis, Department of Biology, Laurentian University.

11th Annual Meet the Researcher Day in Algonquin Park

Kevin Kemmish[1]
[1]Manager, Algonquin Wildlife Research Station

The annual Meet the Researcher Day (MTRD) at the East Beach Pavilion has been a continued success. This past summer marked the 10th annual event. To introduce park visitors to research being conducted within Algonquin Park, the Algonquin Wildlife Research Station (algonquinwrs.ca), with help from The Friends of Algonquin Park, Ontario Parks, Harkness Fisheries Research Lab, and the Ministry of Natural Resources and Forestry.

The event included the researchers with their projects on display, as well as free door prizes and a charity BBQ, hosted by The Friends

of Algonquin Park, with proceeds going to support research in the Park. Many thanks to Algonquin Outfitters, The Friends of Algonquin Park, the AWRS, and Ontario Parks for their door prize donations. Over 30 researchers presented exhibits on the studies they have been conducting within Algonquin Park to the public. Research themes were wide ranging as always, from birds (gray jays, owls), small mammals (red/flying squirrels, chipmunks, mice, voles, shrews) and large mammals (black bears, moose, wolves), reptiles and amphibians (snapping and painted turtles, salamanders), and fish (smallmouth bass, brook trout, lake trout), to limnology, archeology, and forestry. Many thanks to all of the researchers who participated as well as our visiting presenters:

With new studies starting, and long-term studies continuing to make new observations, the next event will be sure to be a success. The eleventh annual Meet the Researcher Day is scheduled for Thursday, August 1st 2019 from 10:00am-3:00pm at the East Beach Pavilion with a charity BBQ by The Friends of Algonquin Park from 12-2pm (or while quantities last!)

AWRS 2018 Crew

Back; Daire Crawford (SAL/TU), Hayden Wilson (SM), Chris Angell (AF), Natalia Hrynko (SAL/SM)
Middle Back; Del Kelm (A. Cook) Tiffany Rutter (Head Cook), Becca Janson (AF), Mariel Terebiznik (SAL/TU)
Middle Front; Hugo Kitching, Alex Sutton (CJ), Koley Freeman (CJ), Jasmine Veitch (SM), Carter Roleau (TU), Patrick Moldowan (SAL)
Front; Tim Winegard (Manager), Cedar, Rob Kotwa, Kevin Kemmish (A. Manager)
Missing; Steven Kell (TU), Sam Paiva (SAL), Ann Francis (SAL), Melanie Massey (TU)

AF=Antler Fly
CJ=Canada Jay
SAL=Salamander
SM-Small mammals
TU=Turtles

Supporters and Contributors

As a not-for-profit, the AWRS and the long-term projects it hosts relies on the financial and logistical support of many individuals, institutions and organizations. Thank you to all our users, supporters and contributors your generosity and business allows the AWRS to achieve its vision of being a leader in wildlife research through experiential learning .

Major users, supporters and contributors in 2018 included:

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BioTalent Canada — Building skills for Canada's bio-economy
The Friends of Algonquin Park
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University of Toronto
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University of Guelph
uOttawa
Ontario Ministry of the Environment and Climate Change
Ontario Ministry of Natural Resources and Forestry
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Wild Ontario

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Educate… scientists, the public and Policy makers

Conserve… biodiversity, ecological integrity and a culture of field based research

Inspire… environmental stewardship, a community of collaboration, and a connection with nature.

Contributions can be made online through PayPal or credit card via our website algonquinwrs.ca

Cheques can be made payable to:

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PO Box 49 Whitney, ON, K0J 2M0

WRS 75 years