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BLUE JAY

On October 13, 2018, Alan Smith was presented with the American Birding Association's 2018 Ludlow Griscom Award for Outstanding Contributions in Regional Ornithology.

For the secretive and seldom-observed Virginia Rail, collisions with tall structures provide the few migration dates available for this nocturnal migrant. See page 16 to read about an observation of a Virginia Rail on a window ledge that provided a rare autumn migration date for this species in Manitoba.

The Yellowhead Flyway Birding Trail Association's Loon Initiatives Committee once again conducted its annual loon survey at Madge Lake over the spring and summer months of 2018. See page 29 for the results.

Ron Jensen documents his observations of a Ruby-throated Hummingbird with a deformed bill in August 2018.

Kees Vermeer reminisces on his experiences studying the effects of pesticides and mercury on aquatic birds in the Canadian Prairie Provinces and in Suriname.

For this issues's edition of Human Nature, Ken Ludwig shares a poem he wrote about a creek that he visits through the seasons.

WHAT'S INSIDE

FROM THE PRESIDENT

Ed Rodger
President, Nature Saskatchewan

Hello everyone,

In my previous column, I talked about the background of Nature Saskatchewan's major new publication, *Birds of Saskatchewan*, and how it grew out of the legacy of local naturalist Manley Callin. In this column I'd like to talk more about the book itself, and what makes it special, as its publication is upon us — in fact, as you read this, *Birds of Saskatchewan* will already have been printed and its distribution under way.

So, what is special about *Birds of Saskatchewan*? A good place to start is the scope of the book. It's a very ambitious undertaking, I think possibly the largest publishing project in Saskatchewan since the *Encyclopedia of Saskatchewan* in 2005. The book, which took over a decade to compile, is 768 pages, has a total of 107 contributing authors, and more than 1,000 photographs from a total of 68 photographers. The species accounts cover a broad range of categories, including introduced, extinct, accidental and hypothetical species in addition to reguarly-occuring native and migratory species — for a total of 437 accounts altogether. The book truly captures, as its Preface says "several lifetimes of observation".

But *Birds of Saskatchewan* is much more than a comprehensive range of detailed species accounts. I had the pleasure of talking with the book's three co-editors — Alan Smith, Stuart Houston and Frank Roy — and asked what they thought was special about the book. One of the things they mentioned is that the book is also a geography and a history, putting Saskatchewan bird life within its context of place and nature, and describing Saskatchewan bird studies through the stories of those who have observed and worked with bird life here.

Birds of Saskatchewan also provides a data benchmark for this still-new century, with information on observations and banding worked into the species accounts. It will serve as a good comprehesive baseline for future studies, and is an important follow-on from a previous Nature Saskatchewan publication, the 1996 *Atlas of Saskatchewan Birds*.

Ed Rodger

There are many other ways to describe what's special about *Birds of Saskatchewan*, but I'll finish with one other point from lead author/co-editor Alan Smith: he said that they tried to expand on the raw information by asking what was interesting about the bird in question, and what story was there. This narrative approach makes an excellent reference work into an interesting read as well.

I hope this quick overview will encourage you to spend some time with *Birds of Saskatchewan*, and get a chance to appeciate the huge effort that's been put into it. I'm sure it will encourage all its readers to help in protecting the natural legacy that it describes so well.

ON THE FRONT COVER

"An Orange Coneflower photographed in my front flower bed in Regina on July 22, 2013. I liked the shape of the flower and the clean background."

Photo credit: Paule Hjertaas

ON THE BACK COVER

An elk calf near Hanging Heart Lakes in Prince Albert National Park, Saskatchewan.

Photo credit: Randy McCulloch

BLUE JAY

Blue Jay, founded in 1942 by Isabel M. Priestly, is a journal of natural history and conservation for Saskatchewan and adjacent regions. It is published quarterly by Nature Saskatchewan.

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Blue Jay welcomes all submissions, preferably by e-mail (although hand-written or typed manuscripts will be considered to accommodate those who do not have access to computer equipment), polished or in need of some editorial assistance. All items for publication should be sent to the editor electronically (in a Microsoft Word document) by e-mail or on CD. Hard copies and CDs can be mailed to the editor at the address above.

Submission deadlines

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THE NATURE NOTEBOOK: HAVE YOU WATCHED CHASING CORAL?

Jared Clarke

Having grown up in the land-locked province of Saskatchewan my entire life, the ocean seems like such a distant fantasy. Only twice in my life have I snorkeled in the ocean and explored small coral reefs. Almost a decade ago now, in Mexico, my wife Kristen and I saw a small protected reef as part of a guided tour. We saw turtles and a multitude of fish, including a Barracuda that came so close our tour guide seemed very nervous. Us Saskatchewan naturalists were unphased…

What I am trying to say here is that I have barely any personal connections to coral reefs. Yet a documentary I watched in November elicited in me such emotion that I had to write about it here. The film is called Chasing Coral and was released on Netflix in July of 2017. It was directed by Jeff Orlowski. You can find it on Netflix still.

Please, just watch it.

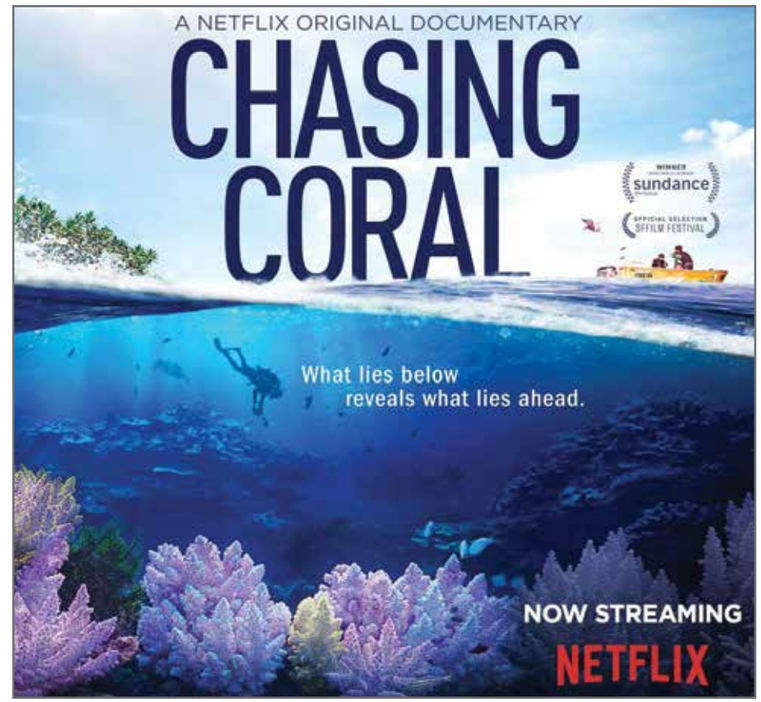
This film straddles a line masterfully. It shows us the absolute spectacle and beauty of life on coral reefs. The colours, the diversity, the interconnectedness. But it also shows us the gut-wrenching reality of coral bleaching. The scale, the devastation, the heartbreak. Despite these negative emotions, this is an amazing film. The documentary takes us on an adventure around the world to do something that has never been done before: to capture an underwater time-lapse of a coral reef during a bleaching event. All the way we fall in love with the majesty of corals and learn how they really work. We also meet some amazing scientists who have been studying coral reefs for decades.

There are a lot of signs that global warming is having harsh impacts on the planet today, but to me, coral bleaching is one of the clearest indicators of how quickly things are changing. Currently there are 50 per cent of coral reefs remaining in the world. However, what the IPCC report showed us recently, if we get to 2°C warming, we are expected to lose 99.9 per cent of coral reefs around the globe. They just can't survive the extra warm water. Within the lifetime of my children, virtually all corals reefs on this planet could disappear.

If you are a bit of a skeptic of climate change, I challenge you to watch this documentary with an open mind. I would be curious to know what your thoughts are after the film.

I hope to travel to the Great Barrier Reef in my lifetime, especially with my family, and scuba dive amongst the reef to experience it. I hope it is still there by the time we can get there. In the meantime, I'm going to keep working toward solutions here in Saskatchewan to help us solve the climate crisis. Perhaps after you've watched this film, you'll be doing the same thing.

Jared Clarke is a Grade 6/7 teacher and biologist who lives on a small farm near Edenwold, SK with his family. Follow him on Twitter @jaredclarke5.



SMITH'S LIFETIME OF WORK RECOGNIZED BY AMERICAN BIRDING ASSOCIATION

Annie McLeod
Regina, SK

Whether it's his lengthy career with the Canadian Wildlife Service, his books about birds and birding, or his work as the coordinator of Christmas Bird Counts and Breeding Bird Surveys, Alan Smith holds a prominent place among Saskatchewan naturalists. It is fitting, then, that Smith was recently chosen as a recipient of the American Birding Association (ABA)'s 2018 Ludlow Griscom Award for Outstanding Contributions in Regional Ornithology.

Each year, the ABA gives this award to "individuals who have dramatically advanced the state of ornithological knowledge for a particular region." Regina's Dan Sawatzky, who first met Smith in 1990 while conducting fieldwork at Last Mountain Lake National Wildlife Area, nominated Smith for the Ludlow Griscom Award in late 2017.

"I have been a member of the ABA for about 20 years … about five years ago, I started thinking about how much Al has contributed and realized that he would be a deserving recipient for one of the ABA awards," said Sawatzky.

In the fall of 2017, Sawatzky filled out and sent in the nomination form and then waited patiently to hear something from ABA. In the summer of 2018, Sawatzky was notified that Smith had been chosen for the award. "They asked if I wanted to inform him or if they should. I chose to call Al and tell him about the award," he said.

Dan Sawatzky (right) presenting the award to Alan Smith. Photo credit: Andy Didiuk

Before calling Smith to give him the good news, Sawatzky went through the list of past winners and read about their accomplishments. It was clear to him that Smith belonged on this list and made him feel proud that even though Saskatchewan is a small province, there are many people that take part in birding and biology who accomplish excellent work.

"I was very honoured that Dan had taken the time and effort to nominate me," said Smith, reflecting on how he felt when he found out he was chosen as an award recipient. "I was gobsmacked to read that I was in the company of Roger Tory Peterson, Chandler Robbins and other luminaries of the ornithological and birding communities."

ABA does not pay for its staff to travel to hand out awards, so — as an ABA member and the one who put in the nomination — Sawatzky was given the honour of presenting the award on behalf of ABA, which he did on October 13 at a small get-together and ceremony with friends and family at Smith's home in Avonlea.

"I was proud to hand Al his award and even gave a speech, which I really don't remember, as public speaking is not my forte," said Sawatzky. "I was happy for Al as he was truly thrilled to see his lifetime of work recognized and to have his name added to the list of incredible people with whom he shares this award."

Smith's lifetime of work is indeed impressive, as he has dedicated more than 50 years to advancing knowledge and interest in birds in Saskatchewan. His lengthy career with the Canadian Wildlife Service included studying waterfowl in Alberta, shorebirds in the Northwest Territories, seabirds in Nunavut and Ferruginous Hawks in Saskatchewan and Alberta. He also coordinates the Christmas Bird Counts (CBCs), Christmas Mammal Counts, and Breeding Bird Survey (BBS) routes in Saskatchewan.

In addition, Smith established the Last Mountain Bird Observatory (LMBO) in 1989, which he continues to manage. LMBO, operated by Nature Saskatchewan, is the only member station of the Canadian Migration Monitoring Network in the province and, on average, sees 3,400 birds of 76 species banded each year.

"Al fills the criteria for this award better than anyone else involved with Nature Saskatchewan. His long-term dedication at the Last Mountain Bird Observatory is just a start," said Jordan Ignatiuk, Executive Director of Nature Saskatchewan. "A well-deserved congratulations, Al."

Smith is the author of two books — *Atlas of Saskatchewan Birds* and *Saskatchewan Birds* — and co-author of *Best Places to Bird in the Prairies* and the *Compact Guide to Saskatchewan and Manitoba Birds*. Smith is also co-editor, along with C. Stuart Houston and J. Frank Roy, of the newly released 2019 compendium *Birds of Saskatchewan*, which documents 437 species of birds and serves as a record of change in the province's natural history.

"The early years of my career set the tone for the rest of my life," said Smith, noting that receiving this recognition of his efforts by his peers in the ornithological and birding communities is the ultimate reward. "The people I worked with, and for, were first and foremost ornithologists. Most of my early experiences involved banding, breeding biology and the study of migration. As a result, I have always been more interested in how the combined efforts of everyone's observations create a unique picture of the status and distribution of each species. This interest always came before the pursuit of personal birding goals."

Documentation of the status and distribution of birds in Saskatchewan is important, said Smith, because we need a baseline with which we can compare future changes in numbers and distribution. This will allow us to argue for the protection of habitat, especially for grasslands birds.

"I hope that an open dialogue between urban and rural, along with First Nations, will occur and will lead to the necessary protection of birds and their habitats," he said. "This is the only way that this protection will occur in a meaningful and long-term scale."

Nature SASKATCHEWAN SPRING MEET 2019 PREVIEW

JUNE 14-16, 2019 EASTEND, SK

Friday, June 14
6:30 p.m. Registration at T-Rex Discovery Centre

7:30 p.m. Presentation and Speaker TBA

Full details of the Spring Meet, and the registration form, will be in the Summer 2019 issue of Blue Jay (out in mid-May), and on the Nature Saskatchewan website as soon as information is available.

Saturday, June 15
8:00 a.m. Departure from Eastend with tour through the Frenchman valley toward Ravenscrag for sightseeing/birding, followed by a stop for bluebird banding and a visit to Cypress Lake.

12:00 p.m. Lunch break in Consul

1:00 p.m. Tour to Govenlock pasture

5:30 p.m. Cocktails

6:30 p.m. Banquet

7:30 p.m. Presentation/Speaker TBA

Sunday, June 16
9:00 a.m. Annual General Meeting

ACCOMMODATION SUGGESTIONS

Riverside Motel (306) 295-3630

Cypress Hotel (306) 295-3505

Town of Eastend Campground
First come, first served basis

Canalta Hotel - Shaunovan
(888) 347-2319

BEYOND YOUR BACKYARD: HUMMINGBIRDS ARE SPRITES OF GOOD LUCK

THE RUBY-THROATED HUMMINGBIRD

Kimberly J. Epp

Hummingbird fledglings about ready to leave the nest. Photo credit: Craig Swanson

Nothing is more heartwarming than the story you are about to read. Craig Swanson, who happens to also work with Dr. Jane Goodall, observed and filmed a mother hummingbird in her nest with her eggs, and then even filmed her two young chicks. People tuned into his videos daily to watch the progress. Two of his photos are included with this article. The story is from the summer following the discovery of the nest.

"Wow! A hummingbird just slowly flew around the entire outer circumference of my coffee cup while I was standing on the porch. Then it hovered above and looked at me inches away from my face. I wanted to slowly get my phone to capture the moment that seemed to last forever. I've never experienced such an intimate encounter with these creatures. This one has flown pretty close to me before, but never like this. I want to believe it was one that I saw hatch last year in the nearby tree (seen in photo). They apparently bring blessings of luck, speed and mental agility. As well, the Spirit of the hummingbird gives powerful protection from bad luck and negativity." - Craig Swanson

Hummingbirds are indeed magical little sprites that break records on numerous fronts, so it's easy to believe that they would also bring good luck. It's that time of year again when we will look forward again to their arrival, often in May or early June. Saskatchewan's tiniest bird, the Ruby-throated Hummingbird, is one of the most amazing birds around. They sure have a long and incredible journey to embark upon; a journey that is just as amazing as these tiny birds are themselves. The species is the smallest bird in Saskatchewan and measures 10 centimetres in length, and weighs between 2.5 and 4.5 grams. It is so light that it can be held by a spider web. Because of its small size, the ruby-throat has difficulty maintaining its body temperature. Therefore, this tiny hummer has to feed almost constantly from dawn to dusk. A lot of work for the small creature, and some of the nutrients will also need to go to the helpless young in the mother's intricately and delicately built cup-like nest.

The mother may raise two to three broods while here in our province this spring and summer. Baby hummingbirds have larger appetites than most other baby birds. The mother hummingbird feeds them every 20 minutes. No animal on earth has a faster metabolism. The hummingbird's metabolism is 100 times faster than that of an elephant! Imagine that — the tiniest birds on earth metabolize food 100 times faster than the largest mammals on earth. Hummingbirds burn food so fast they often eat 1.5 to three times their body weight in food per day. In order to gather enough nectar, hummingbirds must visit hundreds of flowers every day.

A tiny hummingbird nest, the eggs no bigger than coffee beans. Photo credit: Craig Swanson

A person with a similar rate of metabolism would have to consume 285 hamburgers per day to maintain a constant weight. Even though hummingbirds have the highest body temperatures of any bird, an important and life-saving defense mechanism that all hummingbirds have is their ability to go into torpor. This is a sleep-like condition in which the hummer perches lifelessly on a branch with its head dropped down on its chest and feathers puffed out to conserve the warmth needed to survive. Its heart, which is the largest relative to its body of any warm-blooded animal, has a normal resting beat at 250 beats per minute and can reach 1,000 beats per minute during flight. But during torpor the heart rate can be slowed down to only 50 beats per minute. Torpor happens at food shortages and when it is cold and can last 8-14 hours, which also helps these tiny birds in getting through the night.

Ruby-throated Hummingbirds must eat foods that are sugary, such as sap and nectar, to maintain their metabolisms. These foods are high in the calories they require. To feed efficiently, the bird has a long beak with a long, extensible tongue that has a tube-like groove for the nectar to flow along. You can help these hummingbirds by planting brightly-coloured flowers such as petunias or red morning glories or by planting native flowers such as beard tongue or bergamont. Hummingbirds are opportunistic and will quickly learn that non-native plants in your garden will also supply them with the right kind of nectar.

Ruby-throats migrate in the late spring and in the fall. Their journey is 1,600 kilometres all the way to Central America. Their travel route includes non-stop journeys over the Great Lakes and the Gulf of Mexico. The flight over the Gulf of Mexico, which makes their journey so incredible, is 800 kilometres without stopping! They complete the journey on their own (and not with the help of Canada Geese, as some people do believe!) and can even reach maximum speeds of 88 to 96 kilometres per hour. So much could still be said about these amazing little birds but I encourage you to help them out this spring and summer, and take the time to thoroughly enjoy their presence.

If they find you have a food source, these amazing little birds will remember this and pass this on generation to generation. We have much yet to learn from animals, and this is just one of those wonders that one can almost not believe! Their amazing memory, along with their incredible journey are indeed wonders to behold. If you put out a hummingbird feeder for artificial nectar next spring, there are some important things you should know, otherwise you could be putting our tiniest birds at risk. Use a sugar/water mixture of one part ordinary cane sugar to four parts water. It is not necessary to boil the water completely, just ensure that it's fully dissolved and that you change this mixture daily. If you are going to be away, and no one will be there to change it, take the feeder down until you return. Having mould or other pathogens growing within the feeder can make the birds sick.

Thoroughly rinse the feeder out with hot water every one to two days prior to refilling. Never add red food colouring. All feeders have plastic flowers that are coloured red and these alone are plenty enough to attract the birds. Food colouring makes their bones brittle and softens/weakens the shells of their eggs. So you definitely won't be doing them a favour by putting food colouring in. Planting red flowers helps to attract them even more, with one of their favorite flowers being Crocosmia. Native flowers such as bright western red lilies are also very attractive to hummingbirds. They make a beautiful addition to a native flower garden. One thing

many people don't realize, being that their nests are less than three inches across, is that they are so easily hidden in the brush. So prior to trimming your spruce tree, hedges or brush pile, always do a thorough search for hummingbird nests, other bird nests and other signs of wildlife. Who wouldn't love finding a hummingbird nest that they could place a live camera near and record the beginnings of life for the tiniest species of bird?

Hummingbirds are also one of our pollinators, and like bees and monarch butterflies, their numbers have drastically reduced. So I urge you if you are able to, please help these wee birds out. Having a feeder or flowers out in spring, ready for them when they arrive, is your greatest chance of attracting them. Remember, bright red colours. Even if you do not attract any over the next summer, I would urge you to still keep trying. If some birds find your garden prior to their fall migration during August or September, there is a great likelihood they will return the following spring. Sometimes it takes a couple of years to for the birds to initially find your garden. However, let's give these little sprites a chance to make a comeback while enjoying one of the tiniest wonders of nature. They are, after all, innately unique!

Kimberly Epp is an environmental educator/writer with more than 25 years of experience in environmental research, writing, enforcement and education, including various volunteer environmental board positions within Moose Jaw and the Moose Jaw area. She is currently President of Nature Moose Jaw, and can be contacted at kepp@shaw.ca.

IMPACT OF GRAZING HISTORY ON POLLINATOR COMMUNITIES IN FESCUE PRAIRIE

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Abstract

In fescue prairie, cattle grazing can alter soil characteristics and plant communities. However, whether these alterations have a subsequent impact on pollinators has not been extensively studied. The flowering stem density and pollinator visitation patterns over the growing season at three sites with different cattle grazing histories were documented. The most recently grazed site had higher flowering stem densities and pollinator visitations in June, but these metrics were much higher at the ungrazed site in late summer. If these differences are due to cattle grazing, it could be considered both beneficial, for increasing floral resources in spring, and detrimental, for decreasing them in late summer.

Introduction

It is well known that grazing by large mammals can affect the composition of a plant community.[1-3] As grass density, particularly of Foothills rough fescue (*Festuca campestris*), tends to decrease and forb density increase with light to moderate grazing in fescue (*Festuca* spp.) prairie, it has been suggested that pollinators and other insects that feed on forbs may benefit.[4-8] In one study, the abundance, number of species and Shannon's diversity (i.e. an index that combines the number of species and the evenness of their distribution) of bees all declined linearly on fescue-dominated prairie as grazing intensity increased, although some groups of bees (i.e. bumble bees of the genus *Bombus*) were more sensitive than others (i.e., sweat bees of the genus *Lasioglossum*).[9] Bee diversity was positively impacted by intermediate grazing on fescue-dominated grasslands in the U.S.A. as it increased the number of forb species.[10] However, in Alberta, grazing decreased forb diversity on fescue prairie although ultimately it appears to have no impact on the abundance and diversity of bees; differences in landscape were determined to be more influential.[11] Thus, the results regarding the impact of grazing on pollinators in fescue prairie so far are mixed.

Pollinators require floral resources throughout their active period.[12] Some species are only active as adults for a few weeks while others are active as adults from spring through autumn.[13] Ecosystems that lack appropriate flowers at certain times may be unable to support healthy pollinator communities of species with long periods of adult or colony activity, primarily colonial (i.e. eusocial) species such as bumble bees and many sweat bees.[12,14] A lack of flowers early in the year limits the ability of wintered queens to produce a worker brood for colony initiation and growth, while low floral resources in late summer negatively affects the production of males and next seasons' queens.[12,15] Thus, when assessing the ability of a prairie to sustain a pollinator community, temporal variation in floral resources is an important variable to measure.

Information about how grazing in fescue prairie affects the plant-pollinator community is needed to identify a grazing management regime that is beneficial for native species. The purpose of this study was to document plant and pollinator abundance and composition at two privately owned fescue prairie conservation areas and one parcel of provincial crown land in southwestern Manitoba. Although the overall flower density and insect visitation rate was similar between the sites, there were some temporal differences over the growing season that may be due to the different cattle grazing histories.

Methods

Three prairie conservation sites within 2.5 km of each other, just south of Riding Mountain National Park, MB (50.8305° N 100.7880° W), were surveyed. The Cleland property, which has been owned and managed by the Nature Conservancy of Canada (NCC) since 2009, was grazed by cattle the year before this study began (1 May to ~ 30 Sept. 2013) and was therefore called the "recently grazed" site. The Elk Glen property has been owned and managed by NCC as a nature preserve since 2002 and hasn't been grazed since 1997; it was referred to as the "historically grazed" site. The "ungrazed" site was a parcel of Crown land managed by the Manitoba Government for its wildlife and agricultural value. Although the exact grazing history of this land was unclear, there were no fences around it, and no fecal pats were observed, so it may have never been grazed by cattle, or was grazed a very long time ago (several decades). At the very least, no grazing has occurred on it for eight years as NCC staff had not observed any cattle on this land since they obtained the adjacent Elk Glen property.

The close proximity of the sites means that the climate, soil and landscapes were similar, although the historically grazed site was slightly drier due to the location of the plots on summits and upper slopes of hillsides. This was necessary because much of the prairie in flatter locations at this site was dominated by near monocultures of smooth brome (*Bromus inermis*). All sites contained both mixedwood forests and fescue prairie, although fescue was not necessarily the dominant grass due to some invasion by Kentucky bluegrass (*Poa pratensis*) and the presence of other co-dominant native grasses. No controlled or uncontrolled fires were known to occur at any of the sites for at least eight years so grazing was presumed to be the main land use variable.

We randomly established six plots in each of the three sites where the prairie was largely composed of native vegetation. Each plot was 2 m x 2 m in size and at least 10 m apart. In 2014, sampling was conducted for four consecutive days per site, which was repeated four times in mid-June, -July, -August and -September (16 days total). In 2015, sampling was conducted for four consecutive days per site, repeated four times at the beginning and at the end of June, in early July and in late August (16 days total). The number of flowering stems (=inflorescences) of each plant species in the plots was recorded each sampling day. Density was calculated by totaling the number of flowering stems in each plot and dividing by the plot area (4 m^2). The standard error (SE) was calculated for the overall flowering stem density to quantify the variation among the plots at each site. Voucher specimens of all plant species being visited by insects were collected and deposited in the Manitoba Museum's (MM) botanical collection.

Flower-visiting insect sampling occurred during the same days and in the same plots as the vegetation surveys: four consecutive days for four months in each of 2014 and 2015 for a total of 32 days. Each plot was surveyed for 10 minutes each sampling day, thus the total time spent surveying was 96 hours. Surveys were conducted when it was not raining, between 09:30 h and 17:00 h when insect foraging activity was likely at a maximum. The order in which the plots were visited was randomized each day. All insect visitations to any flowering stem in the plot were recorded, but the quality of the visit in terms of successful pollination of the plant was not assessed. The first time an insect was observed a voucher specimen was obtained and given a unique collection number. When the same (or what appeared to be a very similar) insect was observed later on, the collection number was used to link that insect visit to the plant. Although this technique does not allow for complete identification "on the wing" (resulting in an underestimate of insect taxa) it does enable evaluation of insect visitation frequency, which was then used to determine the visitation rate for each plant species. Using these data we determined the average visitation rate of each pollinator taxon per site over the field season. We grouped the insects into six functional groups to assess differences in composition over time and among sites: beetles (Coleoptera), butterflies and moths (Lepidoptera), flies (Diptera), long-tongued bees (Hymenoptera in the Apidae and Megachilidae), short-tongued bees (Hymenoptera in the

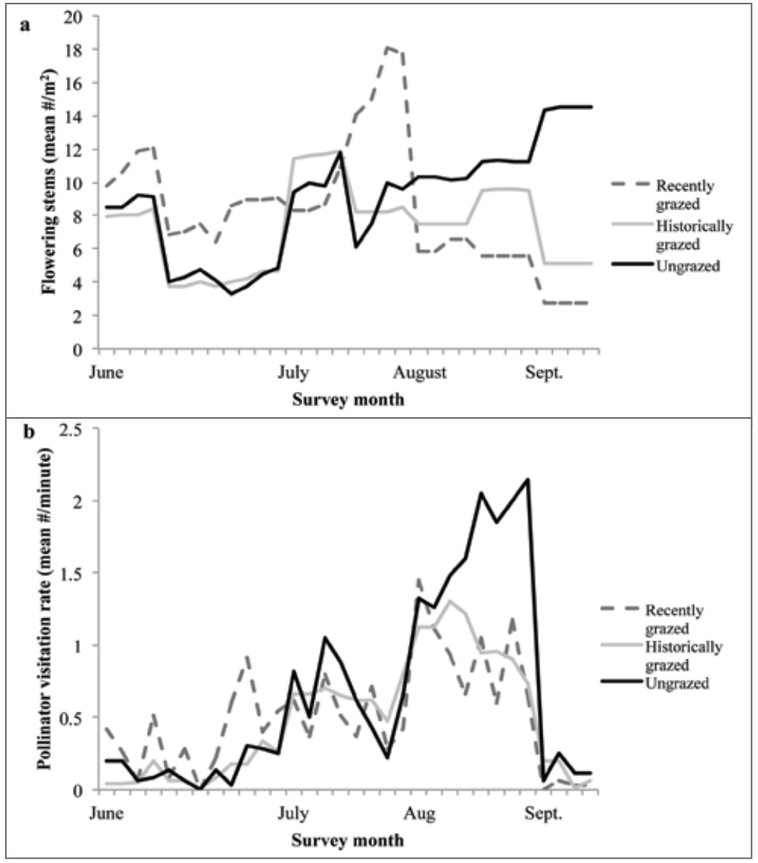

FIGURE 1. Flowering stem density (a), and pollinator visitation rate (b) at three fescue prairie sites with different grazing histories over the growing season.

Andrenidae, Colletidae and Halictidae) and wasps and ants (Hymenoptera in the Argidae, Crabronidae, Formicidae, Sphecidae and Vespidae). All insect voucher specimens were identified by qualified zoologists using reference specimens at MM and the Wallis Roughley Museum at University of Manitoba in Winnipeg, Manitoba; the specimens were deposited in MM's zoology collection. As some insect specimens could only be identified to genus, we refer to them as "taxon" not "species".

We used Analysis of Variance (ANOVA) to determine differences in flowering stem density and insect visitation rates among the sites using Analyze-it Software Ltd.

Results

The overall average flowering stem density (±SE) was not significantly different between the three sites ($F(2,573)=2.95$, p=0.08) with the highest density at the ungrazed site (8.89±1.8 stems/m^2) followed by the recently (8.35±2.1 stems/m^2) and historically grazed (7.31±1.2 stems/m^2) sites. Similarly, the average insect visitation rate was highest at the ungrazed site (0.66±0.09 visits/min) followed by the recently grazed (0.51±0.06 visits/min) and historically grazed (0.48±0.09 visits/min) sites; these rates were also not significantly different overall ($F(2,573)=1.38$, $p=0.28$). However, the temporal patterns were quite different (Figure 1). In June the flowering stem density ($F(2,213)=10.9$, $p<0.0001$) and pollinator visitation rates ($F(2,213)=16.13$, $p<0.0001$) were significantly highest at the recently grazed site but by August the situation had reversed and the density ($F(2,141)=5.47$, $p=0.005$) and visitation rate ($F(2,141)=8.45$, $p=0.0003$) were significantly highest at the ungrazed site (46% of all August visits were at this site). The flower peak at the recently and historically grazed sites was in July, whereas it was in September at the ungrazed site. At all three sites, the peak of pollinator visitation occurred in August.

In terms of plant composition, field chickweed (*Cerastium arvense*) was common at the recently (1 stem/m^2) and historically (0.6 stems/m^2) grazed sites in June but hardly any was found at the ungrazed site (<0.1 stems/m^2). The most common June-flowering plant at the ungrazed site (3.6 stems/m^2) was three-flowered avens (*Geum triflorum*). In August and September, the abundance of four plant species accounted for most of the differences in the average number of flowering stems between the sites: many-flowered aster (*Symphyotrichum ericoides*), smooth aster (*S. leave*), rigid goldenrod (*Solidago rigida*) and showy goldenrod (*S. nemoralis*). The ungrazed site had 3.4 times as many stems of these species as the recently grazed site and 2.5 times as many as the historically grazed site.

The composition of the pollinator communities at the three sites indicated that there were some differences. The recently grazed site had more total taxa than the ungrazed and historically grazed sites but the proportions were fairly similar (Figure 2a). However, the ungrazed site had more than 300 more insect visits than the other two sites, primarily because the number of visits by long-tongued bees was much higher (Figure 2b). Almost half of all the visits by colonial bumble bees (*Bombus* spp.) observed

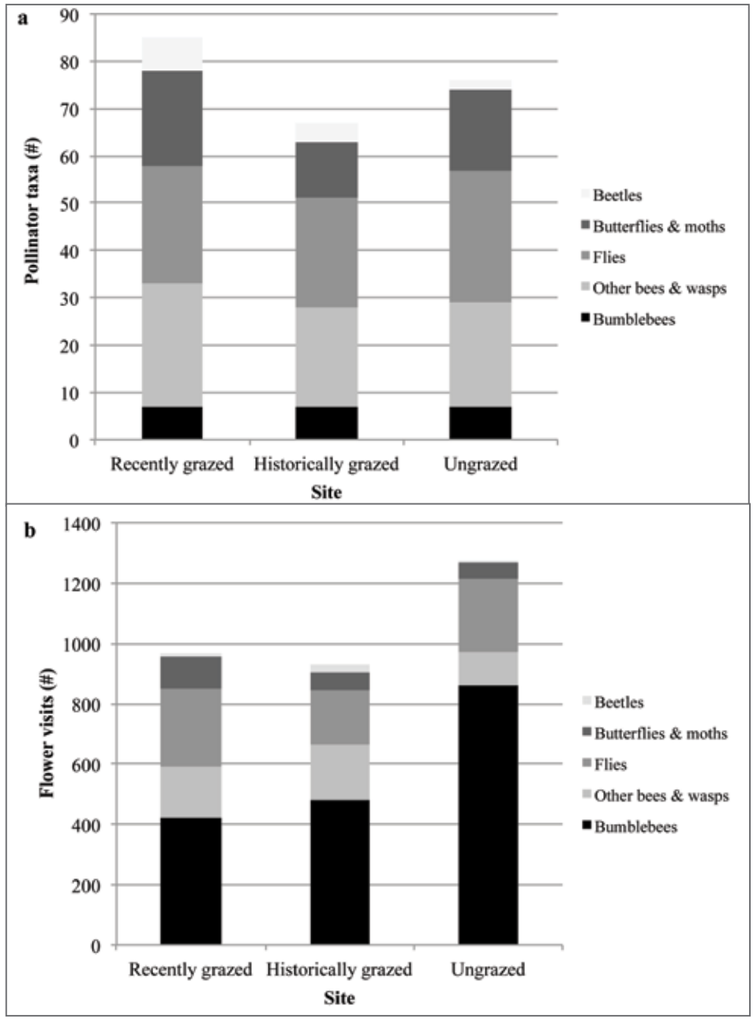

FIGURE 2. Number of (a) pollinator taxa, and (b) flower visits to six functional groups of insects at three fescue prairies with different grazing histories.

were at the ungrazed site; most of these visits (68%) occurred in August and September. Indeed ANOVA showed that the visitation rate of long-tongued bees was significantly higher at the ungrazed site in August than at the other two sites (Table 1). However, in June long- and short-tongued bees, flies and butterflies made significantly more visits at the recently grazed site than at the other two sites. Butterflies made significantly more visits overall at the recently grazed site. Significant differences between the sites were not observed for the other two functional groups of pollinators (e.g. beetles, and wasps and ants). The short-tongued bee and butterfly visitation peaked in July but fly visitation peaked in August at all three sites. Long-tongued bee visitation peaked in July at the recently grazed site but in August at the historically and ungrazed sites.

All of the long-tongued bees and almost all of the short-tongued bees observed were polyleges, meaning they forage at a variety of flowers; only one oligolege, which specializes on alumroot (*Heuchera* spp.), was observed (i.e. *Colletes andrewsii*).[11] Most of the short-tongued bees were solitary nesters (but *Lasioglossum succinipenne* may be colonial) as were half of the long-tongued bee taxa (i.e. *Anthophora, Megachile* and *Osmia* spp.).[11] However, the solitary nesting long-tongued bees were responsible for less than 6% of all long-tongued bee visits; most were by colonial bees.

Discussion

Despite locating plots randomly at the three fescue prairie sites, differences in the flowering stem density over the growing season were apparent. At the recently and historically grazed sites the flowering peak was about a month earlier than at the ungrazed site. Further, although the sites were surveyed for the exact same length of time on the exact same days, differences in the pattern of pollinator visits over the summer occurred, with the ungrazed site receiving significantly more visits by long-tongued bees in late summer than the others. In contrast, most of the June insect visits were at the recently grazed site. This pattern was puzzling as the plots at the recently grazed site were very close to the ungrazed site (less than 30 m away) and should have been virtually identical. In three ungrazed Manitoba tall grass prairie preserves the flowering stem and pollinator visitation peaks occurred in late August to early September, similar to the pattern we observed at the ungrazed site.[16,17] A study in the U.S.A. also observed that the floral peak in ungrazed tall grass prairie occurs in September but that the peak in grazed prairie occurs in May; they did not provide an explanation for why this would be.[18] Since land use legacies can affect ecosystem function, we reasoned that some aspect of the previous land management may have altered the soil and plant community, which in turn may have affected the pollinator community.[19,20]

Table 1. Monthly and overall mean visitation rates (±Standard Deviation) by four functional groups of pollinating insects at three fescue prairie sites with different grazing histories, and Analysis of Variance (ANOVA) test results where significant values of $p<0.05$ are in bold.

INSECT VISITS (MEAN #/MINUTE±SD)						
FUNCTIONAL GROUP	MONTH	RECENTLY GRAZED	HISTORICALLY GRAZED	UNGRAZED	MEAN	ANOVA RESULTS
Long-tongued bees	Jun	0.09±0.17	0.03±0.07	0.08±0.19	0.20	$F(2,217)= 3.42$, **$p=0.04$**
	Jul	0.65±2.26	0.59±2.03	0.89±3.09	0.71	$F(2,144)=0.2$, $p=0.82$
	Aug	0.53±0.67	0.76±1.34	1.26±1.01	0.86	$F(2,144)=6.14$, **$p=0.003$**
	Sep	0.03±0.08	0.05±0.03	0.12±0.23	0.07	$F(2,69)=2.33$, $p=0.12$
	Mean	0.32±4.97	0.36±5.52	0.59±9.19	0.42	$F(2,579)=0.52$, $p=0.59$
Short-tongued bees	Jun	0.05±0.11	0.03±0.06	0.01±0.04	0.03	$F(2,217)= 5.38$, **$p=0.005$**
	Jul	0.11±0.38	0.21±0.74	0.05±0.20	0.12	$F(2,144)=1.27$, $p=0.28$
	Aug	0.09±0.32	0.09±0.31	0.02±0.07	0.07	$F(2,144)=1.17$, $p=0.31$
	Sep	0.0±0.0	0.01±0.03	0.01±0.04	0.01	$F(2,69)=1.19$, $p=0.31$
	Mean	0.06±0.84	0.08±0.96	0.02±0.24	0.06	$F(2,579)=1.22$, $p=0.29$
Flies	Jun	1.2±2.3	0.5±1.2	0.2±0.6	0.63	$F(2,217)=8.24$, **$p=0.0004$**
	Jul	0.4±0.6	1.2±1.9	1.1±2.4	0.90	$F(2,144)=2.51$, $p=0.08$
	Aug	3.2±3.8	1.5±1.7	3.6±3.3	2.77	$F(2,144)=6.20$, **$p=0.0026$**
	Sep	0.0±0.0	0.3±0.9	0.2±0.6	0.17	$F(2,69)$, $p=0.27$
	Mean	1.2±2.6	0.88±1.7	1.28±2.5	1.12	$F(2,579)=2.09$, $p=0.12$
Butterflies	Jun	0.7±1.9	0.0±0.2	0.1±0.4	0.27	$F(2,217)=7.95$, **$p=0.0005$**
	Jul	0.8±1.5	0.8±1.5	0.5±1.0	0.70	$F(2,144)=0.85$, $p=0.43$
	Aug	0.7±2.8	0.4±0.7	0.4±1.0	0.50	$F(2,144)=0.61$, $p=0.54$
	Sep	0.0±0.0	0.0±0.0	0.0±0.0	0.0	n/a
	Mean	0.6±1.9	0.3±1.0	0.3±0.8	0.37	$F(2,579)=4.42$, **$p=0.01$**

Due to the absence of recent fires, we reasoned that differences in the grazing regimes were the most likely (but not exclusively) causes of the differences we observed between the recently grazed and ungrazed sites. The differences at the historically grazed site could be partially due to grazing but also potentially moisture differences, as the slopes were steeper at that site than at the other two. Different life histories of the insects affected when their visitations peaked but cannot explain why there were significant differences between the sites in June and August.

Grazing could have impacted the vegetation both directly and indirectly. In a direct way, cattle may have preferentially consumed certain palatable forb species and avoided unpalatable or toxic plants, altering their abundance. Indirectly, grazing could have altered the soil characteristics; in fescue prairie grazing is known to reduce pH, percent organic matter, available nitrogen and soil moisture but increase soil temperature.[21,22] Soil differences may have also affected nesting habitats for the insects.[3,9] Although we did not measure any soil variables at our sites, it is likely that the impact of grazing would be similar to what was observed at other sites in the fescue prairies. Soil temperature may be particularly influential in such far northern grasslands; soil at the grazed sites would likely have warmed up sooner in the spring due to less litter, favouring plant species that bloom in early spring. Less litter cover is also advantageous for species whose seeds are unable to germinate and grow in partial shade, such as field chickweed.[4,5]

Regarding pollinator visitation, they spent more time foraging at the recently grazed site than the ungrazed site in spring likely due to the greater abundance of floral resources at the former site. Short-tongued bees and butterflies were particularly abundant at the recently and historically grazed sites foraging on small, open flowers such as field chickweed and white cinquefoil (*Drymocallis argute*). The most abundant June flower at the ungrazed site, in contrast, was three-flowered avens (*Geum triflorum*), a species that can only be accessed easily by long-tongued bees; this may explain the low percentage of visits by short-tongued bees and butterflies at this site. In July, when there was little difference in floral density between the sites, insect visitation was similar. However, by August the colonial bumble bees, which typically reach their peak abundance in late summer, spent more time foraging at the ungrazed site due to its higher floral abundance.[16,17] This movement of insects from the recently grazed to the ungrazed sites over the year in response to floral resource abundance explains why the pollinator composition was fairly similar between these two sites but the visitation rate different. Alternatively, the ungrazed site could instead have larger bee colonies than the two previously grazed sites.

Although firm conclusions regarding the impact of grazing on plant pollinator communities cannot be made from this study due to a lack of replication at other sites, researchers are encouraged to look closer at the temporal variation in these communities in northern grasslands. Abundant forage in spring is important for the nesting activities of queen bees but a lack of late summer forage may negatively affect bumblebee reproduction.[12,15] If grazing reduces or increases floral abundance at certain times of the year having large swaths of land under a single management regime (either grazed or not) may result in inadequate resources for pollinators.

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POETRY

A Winter Puzzle

I puzzle over thirsty bird
outside my kitchen window.
It's not a shrike — beak is wrong,
colour not quite right.
Robin-size, but longer tail,
white wing-patches when it flies.
Perplexed, I page
through bird books,
browse internet —
a mockingbird!

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COLLISIONS AND OTHER CALAMITIES:
A WINDOW ON AUTUMN MIGRATION OF THE VIRGINIA RAIL

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Albeit of considerable and ongoing conservation concern, avian mortality from collisions with tall structures such as television (TV) and radio towers (and their guy wires), power lines, and buildings that dot the landscape, has yielded information on patterns of migration in a wide range of species.[1-5] For the secretive and seldom-observed Virginia Rail (*Rallus limicola*), collisions provide the few migration dates available for this nocturnal migrant. An observation of a Virginia Rail on a window ledge in the heart of Winnipeg provided a rare autumn migration date for this species in Manitoba. It augments the few additional dates of migration recorded in the other Canadian Prairie Provinces and, together with dates deduced from collisions in autumn at points along this species' migratory pathway, compiled below, a picture of the timing of fall migration emerges.

On the morning of 13 September 1983, SGS received a phone call from a worker in an office building on the south side of Portage Avenue in Winnipeg, Manitoba. The caller stated that there was a bird on a second-story window ledge that overlooked the busy street below. Upon visiting the office that morning, an adult Virginia Rail was found huddled against the window, not moving despite being viewed through the glass by several people. No attempt was made to capture the bird for release at a safer place because it would have flushed and likely been killed by traffic. The rail remained on the sill for the rest of that day but was reported to have been gone the following morning. This unusual record stimulated a search for other evidence of active migration dates for Virginia Rails, primarily from tower kills.

September 12 was cool and cloudy all day, with a high temperature of 16°C, before dropping to a low of 3°C through the night and morning of September 13. No precipitation was recorded and wind speed was 9 km/h, with a maximum of 17 km/h; visibility was 24.1 km.[6] Conditions suggest the rail became disoriented by city lights while migrating during the night of 12/13 September 1983.

FIGURE 1. Ventral view of specimens of Virginia Rail found injured following storms at Regina, Saskatchewan, in 1959. Top: 11 October (juvenile male, RSKM_BIRD_A-483923); bottom: 23 September (adult male, RSKM_BIRD_A-4838). Photo credit: Danae Frier.

Methods

Records were uncovered of tower-killed Virginia Rails documented in the literature and the age of specimens preserved in museums were determined from photographs (Table 1). In cases where there was no indication that specimens were preserved, curators were contacted at the institutions with which authors were associated. Birds in the year of hatching (HY, i.e., juveniles) or after the year of hatching (AHY, i.e., adults) were distinguished on the basis of plumage characteristics.[7,8] In two cases (Table 1), authors identified the birds as juveniles, but this could not be confirmed. Adults are characterized by "upperparts sooty with dull-rufous fringing; wing cov[ert]s chestnut to rufous …; auriculars gray." Juveniles have heavy blackish mottling on the breast and flanks.[7] Plumages of adults and a juvenile Virginia Rail in autumn are shown in Figures 1 and 2.

The Casualties

Canadian Prairie Provinces

Virginia Rails were not recorded among individuals salvaged at eight TV-tower kills in Manitoba in autumns between 1962 and 1979.[9-11] Also, no Virginia Rails, or other species of rail, were detected during surveys of bat casualties at wind turbines near St. Leon, in southern Manitoba, that were inspected during Septembers in 2007 through 2009 (Craig Willis and Joel W. Jamieson, *email,* 8 May 2018). Two fall migration dates, however, can be deduced from tower kills reported in Saskatchewan at Regina (4 September 1964)[12] and Biggar (5 September 1981)[13]. In addition, two Virginia Rails were brought to the Saskatchewan Natural History Museum (now Royal Saskatchewan Museum [RSKM]), following storms in the Regina area in 1959 — an adult male on 23 September and a juvenile male on 11 October (Figure 1). Both birds apparently were injured while migrating.[14] The first was "found injured on lawn", away from its normal habitat, possibly having struck an overhead structure or wire during the night. The second was "found injured, Oct storm victim", but it was not stated where it was discovered.

Two records from Alberta provide putative fall migration dates. A "slightly" injured juvenile Virginia Rail that was discovered in Calgary on 28 September 1972 recovered and was released.[15] The other was found dead on 8 September 1980, although the circumstances were unrecorded.[16] That several of these birds were injured suggests collisions during nighttime migration, as does the Virginia Rail that struck a window near Birch Hills, Saskatchewan, on 11 November 2006.[17] This individual was a juvenile (Jared B. Clarke, *email*, 24 April 2018). These records are summarized in Table 1.

Along the southward migration route

The most extensive of the numerous reports of bird mortality incurred at towers and similar structures published in the past 50 years that reported Virginia Rail casualties are summarized in Table 1. Where available, age and sex of specimens are included, or, if specimens were not examined, extreme dates of the casualties are given.

North Dakota: Omega Navigation Station, near LaMoure. Eleven Virginia Rails were recorded from fall 1971 through fall 1973 (7 and 1 in spring 1972 and 1973, respectively; 2 and 1 in fall 1972 and 1973) from among 937 birds of 102 species found dead or injured at the site.[2]

Wisconsin, Eau Claire Co.: WEAU - TV tower; Minnesota, **Westport, Stearns Co**., KCMT - TV tower. Twenty-two Virginia Rails were salvaged during autumn migration over a period of 38 years (1957 to 1994), with casualties spanning 1 September to 12 October.[3] Despite "… thousands of specimens [donated] to various museums throughout the country"[3], SGS located only two Virginia Rails apparently linked to this program (Table 1).

Kansas, Shawnee Co.: Three of four Virginia Rails picked up under the 290-m high WIBW - TV tower near Topeka, in fall 1954, were preserved in the Museum of Natural History at the University of Kansas (KU).[1] All were adults: two killed on 1 October (as was a third), the other on 6 October (Table 1, Figure 2). Searches were conducted on 11 days between 25 September and 23 October 1954, and 1,090 casualties of 61 species were recorded. These were among the first TV-tower casualties studied that provided information on sex, age, weight, and molt condition of nocturnal migrants.

Ball *et al.* described four major overnight mortality events between 1985 and 1994 at the taller (439 m) KTKA tower, also near Topeka.[18] The total of 2,808 birds found represented 91 species including 35 Virginia Rails, with a peak of 21 on the night of 25-26 September 1985 (Table 1). No information is given on the age or disposition of Virginia Rail specimens, but it appears that only some state rarities were preserved.[18]

Tennessee, Davidson Co.: airport ceilometer, WSIX-TV tower, and other towers near Nashville. Casualties were recorded from 1948[19] through 1968.[20] At least 7 Virginia Rails were killed; extreme dates were 10 September [1960] and 20 October [1963] (Table 1).

Florida, Leon Co.: WCTV-TV tower, near Tallahassee. Three specimens were examined (Table 1) from among 53 casualties reported over 25 years (October 1955 to September 1980) by personnel of Tall Timbers Research Station. Virginia Raul casualties spanned 2 September [1975] to 22 December [1967].[21]

Florida, Brevard Co.: Migrant bird kills similar to those at TV towers have occurred at the Vehicle Assembly Building of the John F. Kennedy Space Center on Merritt Island.[22] Altogether

Table 1. Autumn migration dates of the Virginia Rail deduced from casualties incurred during nocturnal migration. Records are derived from TV and other communication tower kills, unless otherwise noted, and are listed in chronological order for each site. Sex and age of specimens are included.

LOCATION	DATE	COMMENTS [a,b]
Alberta : Calgary	28 Sep 1972	Juvenile: "slightly" injured, released[15]
: Calgary	8 Sep 1980	"found dead"[16]
Saskatchewan: Regina	23 Sep 1959	RSKM_BIRD_A-4838: adult ♂; discovered after storm[14] (Figure 1)
: Regina	11 Oct 1959	"RSKM_BIRD_A-4839: juvenile ♂; downed on lawn following storm, "very thin"[14] (Figure 1)"
: Regina	4 Sep 1964	Not preserved[12, 14]
: Biggar	5 Sep 1981	Struck "power wires"[13]
Manitoba : Winnipeg	13 Sep 1983	Adult: alive on windowsill
: Winnipeg	1 Dec 2015	Adult: killed by falconer's Red-tailed Hawk
Wisconsin : Eau Claire	1 Oct 1959	"BMNH 17769: unsexed [3,23]"
: Eau Claire	12 Sep 1961	"BMNH 22410: unsexed [3,23]"
Indiana : Floyd Co.	23 Oct 1965	Not preserved[24]
Kansas : Shawnee Co.	1 Oct 1954	KU 31725: adult ♂; "moderately fat"[1] (Figure 2)
: Shawnee Co.	1 Oct 1954	KU 31726: adult ♀[1] (Figure 2)
: Shawnee Co.	1 Oct 1954	Not preserved[1]
: Shawnee Co.	6 Oct 1954	KU 31727: adult ♂[1] (Figure 2)
: Shawnee Co.	26 Sep 1985	21 Virginia Rails found[18]
: Shawnee Co.	1 Oct 1986	4 Virginia Rails found[18]
: Shawnee Co.	12 Oct 1986	7 Virginia Rails found[18]
: Shawnee Co.	9 Oct 1994	3 Virginia Rails found[18]
Kentucky : Louisville	7 Oct 1951	Salvaged from roof of airport building under control tower[25]
Tennessee : Nashville	24 Sep 1955	Not preserved[26]
: Nashville	11 Sep 1958	"... [among the] uncommon birds collected"[27]
: Nashville	10 Sep 1960	"early arrival date"[27]
: Nashville	20 Oct 1963	"late date"[28]
: Nashville	23 Sep 1965	"The heaviest casualties were 23/24 through 25/26 Sep 1965, but date this bird was killed was not specified[29]"
: Nashville	26 Oct 1966	"late date"[30]
: Nashville	25 Sep 1966	Among "heavy kill"[20]
North Carolina : Bladen Co.	24 Sep 1971	"Records for this species inland in North Carolina are scarce"[31]
: Bladen Co.	30 Sep 1973	"... was only the second kill record [for Virginia Rail] ... for these towers"[32]
: Bladen Co.	4 Sep 1974	... third record for this tower[32]
: New Hanover Co.	Nov 1971	"UNC-W B265: adult ♀; data for this and the following 5 specimens were provided by S.D. Emslie (*emails*, 9 May, 15 June and 3 July 2018)"
: New Hanover Co.	22 Oct 1981	"UNC-W B533: adult, unsexed; struck window"
: New Hanover Co.	9 Oct 1985	"UNC-W B808: juvenile, unsexed"
: New Hanover Co.	2 Sep 1987	"UNC-W B786: adult, unsexed "
: New Hanover Co.	12 Oct 1993	"UNC-W B 925: adult, unsexed"
: New Hanover Co.	26 Oct 2009	"UNC-W B1172: adult, unsexed"
Georgia : Savannah, Travis Field	6-8 Oct 1954	Single birds collected at this site and the one below were from 2 of 7 sites inspected for casualties following cold fronts. "Many of the birds were saved as study skins..."[33]
: Grady Co.	2 Oct 1962	"Not often detected away from coastal areas ... probably more common both in migration and winter than published reports indicate. Also this date is fairly early"[34]
Florida : Leon Co.	14 Sep 1959	TTRS 200: adult ♂[4]
: Leon Co.	9 Sep 1962	"TTRS 199: juvenile ♀; "feathers missing on right breast, not very fat"[4]"
: Leon Co.	9 Sep 1966	TTRS 2313: adult ♀[4]

[a] Specimens were aged based on examination of photographs provided by curators of the collections in which they were deposited: Bell Museum of Natural History, University of Minnesota (BMNH), Kansas University Museum of Natural History (KU), Royal Saskatchewan Museum (RSKM), Tall Timbers Research Station (TTRS), and University of North Carolina at Wilmington (UNC-W).

[b] Included in this column are additional notes written on specimen labels or in accession catalogues, and also references to the literature in which records and specimens were reported.

FIGURE 2. Side view of adult Virginia Rails killed at a TV tower near Topeka, Kansas, in 1954. Top: 1 October (male, KU 31725); middle: 1 October (female, KU 31726); bottom: 6 October (male, KU 31727). Photo credit: Mark. B. Robbins.

5,046 birds of 62 species were retrieved between 1970 and 1981, a large majority (4,336, 86%) of them in spring. These included four Virginia Rails: one in early May, two in late September, and one in early October. Since exact dates were not given, these are not included in Table 1. All bird carcasses were frozen for later processing at the University of Central Florida, but the final disposition of Virginia Rail specimens is unknown to us.[22]

Discussion

The migration date documented here for Manitoba (13 September 1983) fell within the span of dates deduced from casualties in Alberta: 8 September [1980] to 28 September [1972]); and Saskatchewan (4 September [1964] to 11 October [1959], or to early November [2006] if that bird was a migrant, rather than a straggler. The span of fall migration in Manitoba is incompletely known, although observations of individuals in their natural habitat suggest, "… few birds remain after September, the tardiest straggler being reported in Winnipeg on 9 November 1967".[35] An even later Virginia Rail was an adult (Figure 3) killed by a Red-tailed Hawk (*Buteo jamaicensis*) flown by a falconer on the outskirts of Winnipeg on 1 December 2015.[36]

While preparing the book, *The Birds of Manitoba* (cited within ref. 35), the Manitoba Avian Research Committee of the Manitoba Naturalists Society compiled a large but not exhaustive database (housed at The Manitoba Museum) to help define migration periods for all species. Seventy-five Virginia Rail records in this database, involving 147 individuals, show a pronounced May-June peak (41 records, 84 birds), corresponding to spring migration and the early breeding season when the rails are most vocal. A second peak (22 records, 41 birds) in August and September presumably combines pre-migratory and staging activity. Extreme dates in the database are 30 April [1985] and 10 October [1938], similar to those in eBird as of 5 December 2018: 25 April [2004] and 3 October [2015]. These extreme dates help define the normal period of occurrence and emphasize the rarity of the November and December records noted above. There is some evidence of pre-migratory concentration, or at least conspicuous behaviour, at large wetlands in southern Manitoba during August. K.A. Gardner observed no fewer than eight adult and three juvenile Virginia Rails during a short, early-morning walk at Oak Hammock Marsh on 4 August 1975.[37] C. Artuso detected 14 Virginia Rails during a survey along a flooded road in the Shoal Lakes Important Bird Area on 29 August 2015 (eBird list # S24811152); seven more were detected elsewhere by other surveyors.

In Minnesota, Janssen inferred a "gradual exodus from breeding areas… in August and September" but with records occasionally extending into winter in the south.[38] Winter records also extend northwest to Banff, Alberta, where Virginia Rails occasionally occur in the vicinity of hot springs.[39]

Migration dates of the Virginia Rail from the Canadian Prairie Provinces generally fall within the span of the species' migration to the wintering range in the coastal marshes of southeastern United States and inland in northern Mexico[8] (Table 1). Extreme dates of the migration are illustrated by the following example. An adult male Virginia Rail, taken as by-catch in a small mammal trap at Delta Marsh, Manitoba, on 28 August 1976 (University of Manitoba Zoology Museum #1378), had completed the preformative molt, but whether it was still on its summer range, or was migrating and had stopped over, is not known. On the label was the notation, "Fat - nil", which suggests the bird had not built up fat reserves necessary to initiate migration. By contrast, on the same date, in 1946, a Virginia Rail was observed in Georgia[40], which is south of the species' breeding range, near or within the wintering range.

Analysis of the records compiled in Table 1 was limited by the small

FIGURE 3. Adult Virginia Rail captured by a Red-tailed Hawk flown by a falconer on the outskirts of Winnipeg, Manitoba, 1 December 2015.

sample size and the bias of individual, major tower-kill events. Analysis by broad geographic zones showed only small differences in the patterns of records in different regions. In the Prairie Provinces (northern portion of breeding range), seven records occurred between 4 September and 11 October (median, 13 September), with a December outlier. This is similar to the range of records for Wisconsin and Minnesota (southern portion of breeding range; 1 September to 12 October, median unknown). For mid-U.S. states where the Virginia Rail is primarily or entirely a migrant (Indiana, Kansas, Kentucky, Tennessee), records range from 10 September to 26 October; an apparent peak between 26 September and 12 October and an early-October median are weighted heavily by the Topeka-area records in Kansas. For states that include portions of the coastal winter range (North Carolina, Georgia, Florida), casualty dates extend from 2 September to 26 October (median, 1 October), with November and December outliers. Early-September records as far south as Florida are noteworthy. This suggests that, while the overall migration period spans about two months, individual transit times may be much shorter, belying the common impression of rails as "weak fliers".

While again recognizing the small sample size, the records summarized in Table 1 suggest adult Virginia Rails leave at least the northern part of the breeding grounds ahead of juveniles. This pattern, however, is not likely to be confirmed from further analyses of tower casualties, or recoveries of banded birds[41], but from known-age individuals equipped on their breeding sites with geolocators or satellite-telemetry devices that record the progress of migration of individuals, from start to finish.[42] Increasing use of automated bird-call recording devices, as well as nocturnal birding, may occasionally yield records of migrating Virginia Rails, at least in spring; PT heard the *kiddick* calls of a migrating Virginia Rail over Pinawa, Manitoba, at 00:30 h on 11 May 1991. Studies of migration through distance sampling, such as that conducted recently for the Sora (*Porzana carolinensis*) in Missouri[43], and the citizen-based observation network eBird[44], provide a general picture of timing of migration based on presence and absence of individuals at a particular site, but not dates of departure, routes followed, and dates of arrival of individuals on the wintering ground.

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LOCATION, LOCATION, LOCATION: BUILDING REAL ESTATE FOR CAVITY DWELLERS

Sarah Ludlow

The number of tree cavities are often limited on the landscape, but there are many different species that require cavities for their home (e.g. squirrels, bats, birds). As a result, cavities that suit the needs of a given species are a hot commodity and competition for them can be fierce. The reason for this competition is that most species that use tree cavities do not excavate the cavities themselves and instead rely on woodpeckers to do the job. Of course, woodpeckers are excavating cavities for their own use, not out of the goodness of their heart for use by their woodland friends, so other animals must wait until the woodpeckers are finished using the cavities before they move in. Reducing this competition for nest cavities is a primary reason for installing a nest box (which is the fancy science term for a bird house). Nest boxes are often tailored to suit the needs of a specific bird species and so the design and placement of the nest box will often determine which species take up residence.

In March and April 2018, I made and put up four nest tubes for Black-capped Chickadees on the family farm northeast of Regina, Saskatchewan. These nest tubes were specifically designed for chickadees and are comprised of a 12" pvc tube that is capped at both ends with an entrance hole a few inches from the top. Chickadees prefer to do a bit of their own excavation within the cavities they use, so I filled all the nest tubes with wood chips up to the entrance hole. An instructional video on how to create these nest tubes can be found at https://www.youtube.com/watch?v=chkzEc_jE8I. You may be wondering why I installed the nest tubes so early, as March and April on the Canadian Prairies is often still quite wintery. Well, that is the time that chickadees are scouting for potential nesting locations. The early bird doesn't just get the worm! They want to secure a prime location well before the nesting season begins, which in southern Saskatchewan is mid to late May.

Once all my nest tubes were installed, I periodically monitored them throughout the summer to see if any chickadees had taken up residence. Below is a breakdown of the season for each of the five nest tubes. All the nest tubes were hung on a trembling aspen tree, located within a larger aspen stand.

Nest Tube #1

March 24: Nest tube installed (Figure 1).
May 20: First nest tube check. An adult chickadee flushed from the nest tube, which contained six eggs (Figure 2)!
May 31: Second nest tube check. An adult chickadee flushed from the nest tube and five chicks have hatched (Figure 3).
June 3: Third nest tube check. One adult alarm calling nearby. Five chicks visible in nest tube (Figure 4).
June 10: Fourth nest tube check. One adult alarm calling nearby. Six chicks are visible and beginning to look like little chickadees (Figure 5).
June 16: Final nest tube check. Nest tube empty because the chicks have fledged. Three chicks observed in trees near the nest tube and the adults are bringing them food.

Nest Tube #2

April 15: Nest tube installed (Figure 6).
May 20: First nest tube check. No bird activity at nest. Wood chips not cleared but sticks added to nest tube.
June 16: Second nest tube check. No adult bird flushed from the nest tube, which contained seven or eight eggs. Eggs identified as House Wren (Figure 7).
June 24: Final nest tube check. No adult flushed from the nest tube, however, one was heard singing nearby. Seven chicks have hatched (Figure 8).

Nest Tube #3

April 15: Nest tube installed (Figure 9).
May 20: First nest tube check. No bird activity observed at nest tube. Sticks added to nest and wood chips not cleared away.
June 16: Final nest check. Nest tube full of sticks and feathers. Likely a House Wren decoy nest.

Nest Tube #4

April 22: Nest tube installed (Figure 10).
May 20: First nest tube check. Wood chips not cleared away.
June 16: Final nest tube check. Nest tube full of twigs; likely another House Wren decoy nest.

In summary, two of my four nest tubes had active nests that likely fledged young — I consider that a pretty good success rate! The other two nest tubes were used as House Wren decoy nests, which are nests built as decoys to prevent predators finding the wrens' actual nest. If you are interested in building and installing a nest box, check out https://nestwatch.org/ for nest box plans and tips on nest box placement for the species you are interested in; they also provide protocols for monitoring nests safely and with minimal disturbance to the birds.

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FIGURE 1. Location of nest tube #1. All photos courtesy of Sarah Ludlow.

FIGURE 2. Black-capped Chickadee clutch of eggs within nest tube.

FIGURE 3. Five chickadee chicks ~1 day old and one unhatched egg.

FIGURE 4. Chickadee chicks starting to grow pin feathers.

FIGURE 5. Chickadee chicks in nest tube.

FIGURE 6. Location of nest tube #2.

FIGURE 7. House Wren eggs in nest tube.

FIGURE 8. House Wren chicks in nest tube.

FIGURE 9. Location of nest tube #3.

FIGURE 10. Location of nest tube #4.

THE STATE OF NATIVE PRAIRIE IN SASKATCHEWAN

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If you were raised in southern Saskatchewan, the word "prairie" comes naturally and you use it often to describe where you come from. For me growing up the word evoked images of yellow fields, canola dancing in the wind; the kind of landscape where your gaze is drawn upward, not towards mountains, but to the open sky. Saskatchewan is a Prairie province. I am from the prairies. I live on the prairies. Over the course of the past year, I have learned this ritual of description, so often repeated with pride, is a deception and delusion — crops, however beautiful, are not "prairie." The time has come for prairie people to acknowledge that the landscape by which they describe themselves is almost gone and that the value of what remains is threatened.

Endangered and not monitored

Temperate grasslands, which cover eight per cent of the Earth, are the most endangered ecosystem on the planet, with less than five per cent protected globally (Federal, Provincial, and Territorial Governments of Canada, 2010; Jenkins, 2009). In Saskatchewan, the figure, quoted by both the government and the conservation community, of how much native grassland is left is approximately 20 per cent. That estimate comes from a report by the Native Plant Society of Saskatchewan and is based on analysis of satellite imagery taken 24 years ago, which says the amount left is most likely a range of between 17 and 21 per cent (Hammermeister, Gauthier, & McGovern, 2001). Saskatchewan's Ministry of Environment does not know how much native prairie is left and finding out is no easy task. There is no active provincial reporting or monitoring of the landscape by the province. In 2015, the ministry began the Prairie Landscape Inventory, which aims to find out how much native prairie is left. The ministry is currently testing modelling techniques in different areas of the province that will be able to differentiate native grass from tame grass in satellite imagery, something that is not done in other data products like the land-cover maps created by Agriculture and Agri-Food Canada. However, Ben Sawa, a habitat ecologist with the ministry, estimates the process will take anywhere from five to 10 years. In the meantime, more parcels of grassland are lost each year.

An eroding landscape

Agriculture and Agri-Food Canada cropland inventory maps, while not able to distinguish native from tame grassland, show a steady decline of grassland from 1990 through to 2015. Defining grassland as "Predominantly native grasses and other herbaceous vegetation, may include some shrubland cover," an analysis of the maps by University of Regina geography professor Joe Piwowar shows a decline of 3.3 million acres over 25 years (Agriculture and Agri-Food Canada, 2015). As of 2015, 8.2 million acres of grassland remained in the province, which means that, out of the historical 60 million acres the Prairie ecozone once encompassed in Saskatchewan, only 13.7 per cent remains. This is 6.3 per cent less than what is currently quoted by the Ministry of Environment and Nature Conservancy of Canada - Saskatchewan Region.

A 2014 study done on fragmentation in the Canadian Prairie ecozone, calculates a range of remaining prairie land-cover types and, if sticking strictly to grassland (not including cover types like fallow and hay/pasture), concludes that there are 9.1 million acres left in Saskatchewan, which brings the figure remaining down to 15 per cent, more evidence of grassland's steady decline (Roch & Jaeger, 2014).

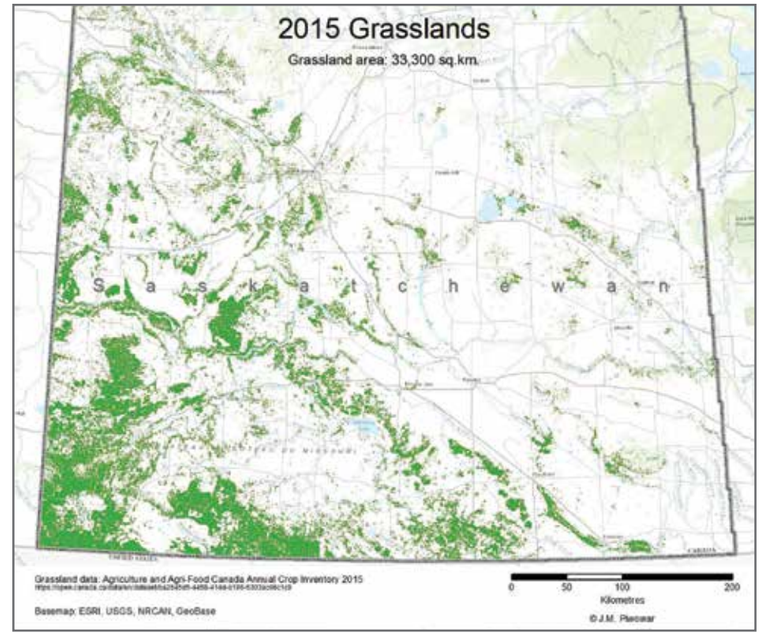
While grassland conversion to cropland isn't what it used to be during settlement, it is still happening, something AAFC data also confirms. A simple search on the AAFC Land Use interactive map indicates that an average of 2.4 million acres of grassland were converted to cropland from 1990 to 2000 and from 2000 to 2010 (the land use inventory is only taken every 10 years) in the Prairie provinces. Here, the definition of "grassland" in the land use data specification is: "Natural grass and shrubs used for cattle grazing" (Agriculture and Agri-Food Canada, 2010). The World Wildlife Fund's 2017 Plowprint Report, which uses the AAFC data maps in its measurement of grassland conversion to cropland, confirmed the trend by stating that the highest rates of grassland conversion in the Northern Great Plains were in Saskatchewan and Alberta. The highest rates of conversion in the Great Plains, which extends from Saskatchewan to Mexico, were also found in Saskatchewan, in the aspen parkland, the transitional zone between the grassland and boreal forest.

Alberta miles ahead on monitoring ecosystems

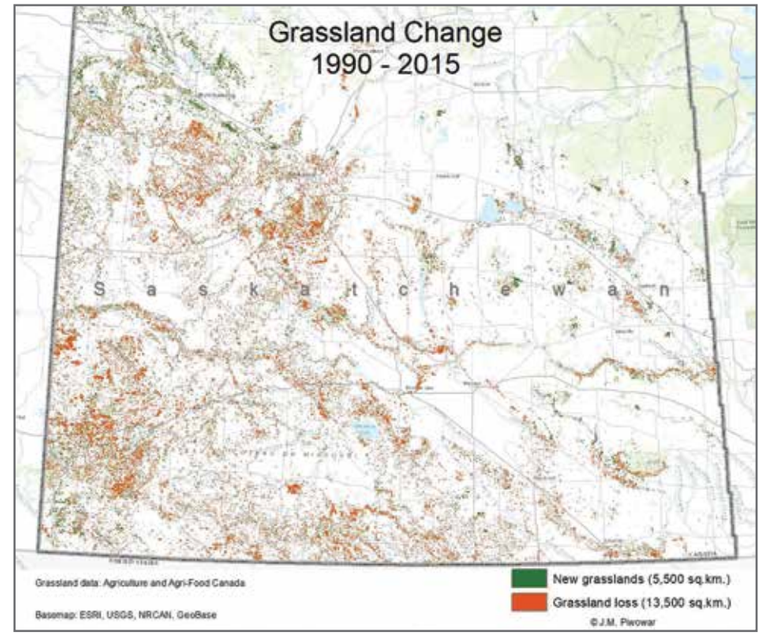
Knowing a more accurate amount of native prairie left in Saskatchewan may not seem important to a now primarily urban Saskatchewan public (a 2011 census described only 30 per cent of the population as rural). On the flip side, it may be imperative, given that fewer people are living close to native prairie than ever before, meaning fewer eyes watching for changes in the landscape. Having that frontline information and more broad-scale provincial biodiversity monitoring helps government make informed policy decisions and keep the public up-to-date on human impacts on ecosystems. Such monitoring isn't a pipe dream. Saskatchewan's western neighbour, Alberta, has been forging a path in world-class ecosystem monitoring since 2007. The Alberta Biodiversity Monitoring Institute, an independent, arms-length, not-for-profit organization, funded by government, universities, and industries like energy and agriculture, releases an annual biodiversity monitoring report and a biannual report on the human footprint in each natural ecoregion of the province.

ABMI has a total of 1,656 site locations that are actively monitored across the province, with around 600 sites in the Prairie region. The sites are 20 kilometres apart and visited annually, where staff measure plant growth, monitor species, percentage of different land-covers like water or trees, and complete soil analysis. They take photographs of the site and send any data about unknown species to taxonomic experts at the Royal Alberta Museum.

Majid Iravani, an applied ecologist at ABMI, said that while using satellite data for land-cover mapping is the protocol around the world, you need on-the-ground assessment to



Grassland cover in Saskatchewan in 2015 was 8.2 million acres. Considering the prairie ecoregion in the province is 60 million acres, as of 2015, grassland covered only 13.7 per cent of its historic area, a 6.3 per cent drop from Hammermeister's 2001 estimate of 20 per cent. Map created by Joe Piwowar.



From 1990 to 2015, 3.3 million acres of grasslands were lost, most likely due to cultivation. New grasslands have emerged along the northern borders of the agricultural region are likely due to pasture expansion into forests. Map created by Joe Piwowar.

validate geospatial data, especially if you're trying to gauge how much native prairie is left on a smaller-scale, like in a township, or quarter-section.

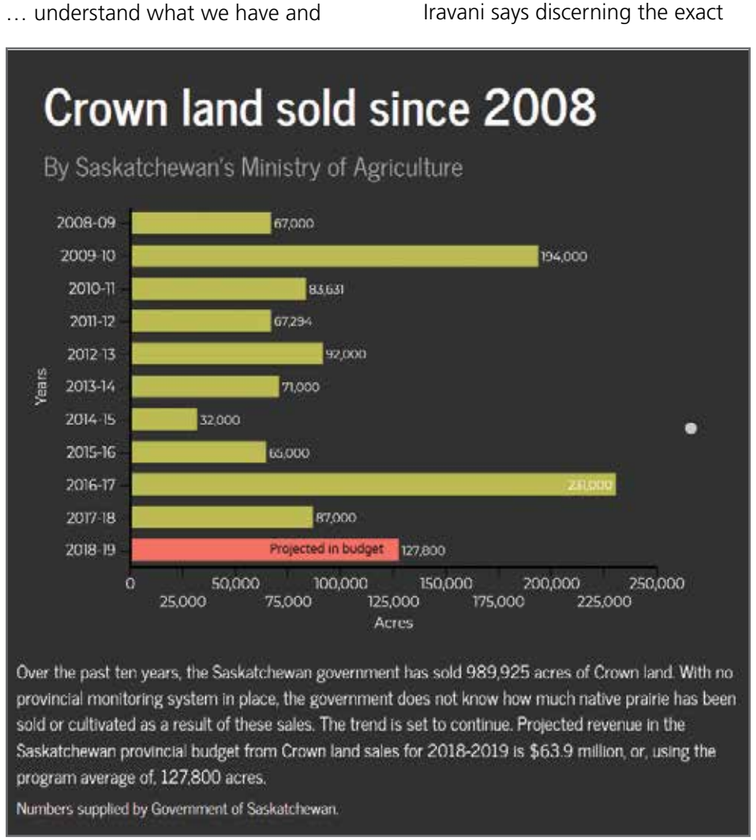
"When you want to implement something, like, land-conversion protocol, for example, … you really need detailed data, you really need data that you can trust," said Iravani.

Iravani also says the benefit of this kind of systematic monitoring is that it provides a baseline of biodiversity from which patterns of change can be tracked over time.

"A monitoring program at this scale is important because especially for an area like Canada, we don't know much about our biodiversity," he said. "As long as we don't know what we have, we can't really manage it or protect it. We need to … understand what we have and then we need to assess what would be the reaction of these resources in terms of climate change or any land development and so on."

As it stands right now, according to ABMI's data, the grasslands region, which takes up 14 per cent of Alberta, has a human footprint of 57 per cent, as of 2017, meaning only 43 per cent is untouched by human disturbance. Within that 57-per-cent footprint, agriculture has done the most damage by far at 50 per cent, with things like energy and transportation following at 2.5 per cent. The parkland region, which is the transitional area between the grasslands and boreal forest, has seen even more human disturbance, with agriculture taking up 68 per cent of the region and an overall human footprint of 78 per cent.

Iravani says discerning the exact amount of native prairie left within these regions is difficult because of the difficulty of differentiating tame pastures, native pastures, and cropland. He says ABMI hasn't found a way to map Alberta's exact amount yet, but that subtracting the human footprint from the original geographical area gives them a pretty good idea. Doing the math, with 57 per cent of 24 million acres of grasslands under human footprint, only 10 million acres remain, or 43 per cent. In the parkland region, that number drops to 22 per cent.



The threat of government disinterest

After record Crown land sales in the 2007-2008 budget year, the Saskatchewan government shifted to incorporate its selling of Crown land as a non-renewable revenue source in its 2008-2009 provincial budget, alongside natural gas, oil and potash. Since 2008, the Ministry of Agriculture has offered incentives for agricultural producers to purchase the Crown land they have been leasing from the provincial government. From 2008 to 2014, 500,000 acres of Crown land were sold under the Agricultural Crown Land Sale Program. Another incentive program began in 2015 offering leaseholders a 15 per cent discount, with the ministry estimating at the time that 600,000 acres would be sold under the program.

What is the connection with native prairie in Saskatchewan? With no provincial monitoring system in place, the government does not know how much native prairie has been sold or cultivated as a result of these sales.

Wally Hoehn, director of the lands branch for Saskatchewan's Ministry of Agriculture, says that a random sampling of past sales doesn't indicate that a significant amount of Crown land sold by the ministry has been converted to agriculture. He's confident producers are good stewards and doesn't consider agriculture a big threat in today's world.

"There is a bit of … the perception that as soon as a client gets this land they're going to rip it up and tear it up. No, these guys are strong stewards," said Hoehn. "They've done it because they know it's the right thing to do and they continue to do the right thing ... whether it's under a Crown lease or whether it's under private ownership."

But Hoehn also says once Crown land is sold, the ministry no longer knows whether native prairie will remain and that he currently doesn't know how much native prairie has been sold through Crown land sales.

"It would take a lot of time to sort those (numbers) out," he said.

Despite Hoehn's confidence, the grassland decline and conversion captured by AAFC data and the World Wildlife Fund in Saskatchewan show a different story. Combine this with the facts that the Ministry of Agriculture only audits or monitors its leased grassland at the time of lease renewal or when there's a complaint and that no provincial monitoring of native prairie is undertaken by the Ministry of Environment, it's not a surprise that grassland continues to degrade, slowly but surely.

Hoehn says the ministry currently relies on the public to do monitoring.

"Our best monitors are people out in the public, who know that it's Crown land and know what can and can't go on on it," he said. "They will call us and say we don't think this should be going on in there and we'll go out there and do an inspection."

The Saskatchewan government has also shown a disinterest in supplying pasture management on its own Crown land.

In 2013, a year after the federal government announced it was cutting the Prairie Farm Rehabilitation Administration's Community Pasture Program (PF pastures) from its budget and returning the pastures to the Prairie provinces, the Saskatchewan government decided to lease each of its 62 pastures separately, a land-base of 1.8 million acres (the majority of which is native grassland). Instead of continuing the PF program's third-party management, the province is leasing to patron groups who incorporated into businesses, ending the legacy of the community-pasture model, which provided world-class sustainable management of the grasslands. The PF transition ended on April 1, 2018.

In the spring of 2017, the Saskatchewan government cut the provincial Saskatchewan Pastures Program, which was even older than the PF system and responsible for 50 pastures, totalling 780,000 acres. According to provincial government, since 1922, when the SPP started, "the agriculture industry has become a strong driver of Saskatchewan's economy, and the program is no longer necessary." The SPP pastures are currently transitioning to a 15-year long-term lease arrangement with patrons, similar to the PF pastures.

Legislation offers little protection

Native prairie in Saskatchewan is protected by legislation like conservation easements, which place legal restrictions on the title of a piece of land that protect its natural ecosystems, restrictions such as no cultivation or new buildings. The Wildlife Habitat Protection Act protects designated Crown lands with ecological value from being sold. But in 2010, the Ministry of Agriculture amended the WHPA so that lands held under its legislation could be assessed and possibly sold, depending on their "ecological value." In 2014, the ministry determined while land with "high ecological value" cannot be sold, lands with "moderate ecological value" can be sold with a Crown conservation easement (easements held by the Crown, not the landowner), and lands with "low ecological value" can be sold with no restrictions. Landowners can appeal to have Crown conservation amendments on their lands amended or terminated, and the minister, according to The Conservation Easements Act, can accept the application if he "is satisfied that it is in the public interest to do so."

When asked why all Crown land sold in Saskatchewan's prairie region isn't protected with easements considering the endangered state of temperate grasslands, Hoehn said he doesn't consider all parcels of high ecological value just because of that fact.

"I've been in arguments where they'll argue that a road allowance is high ecological value. I mean it's all got to be relative and in perspective is how I look at it," said Hoehn. "I mean there's a desire from our clients to quit leasing this land and get some equity in it … We looked at our inventory and said, 'Okay there is this group in the middle that is moderately important. We think we can sell 'em and we'll put a Crown conservation easement on it.'"

In 1997, Saskatchewan's Ministry of Environment launched the Representative Areas Network (RAN). The goal of RAN is to conserve 12 per cent in each of the 11 ecoregions in the province.

"Each designated site helps to conserve Saskatchewan's native biological diversity and will be used

to benchmark or as a control area when assessing ecological health in areas outside of the representative area sites," states Sawa.

Currently, the province conserves only 5.9 per cent of moist-mixed grassland and 5.6 per cent of aspen parkland, two ecoregions in the prairie ecozone. Not only does this fall short of RAN's own goal but also of national and international conservation targets. Nineteen of the Aichi targets, set in 2010 by the United Nation's Convention on Biological Diversity, were adopted by Canada in 2015. The eleventh target aims to protect at least 17 per cent of all terrestrial and inland waters. According to Jennifer McKillop, a former official with the Ministry of Environment and now the director of conservation for Nature Conservancy of Canada Saskatchewan, Saskatchewan hasn't reached nine per cent.

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Adult and chick in mid-July. All photos courtesy of Doug Welykholowa.

2018 LOON INITIATIVES REPORT:
MADGE LAKE, DUCK MOUNTAIN PROVINCIAL PARK

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The Yellowhead Flyway Birding Trail Association Loon Initiatives Committee (YFBTA LIC) once again conducted its annual loon survey at Madge Lake over the spring and summer months. We also continued to work on other initiatives involving education and information about the Common Loon with the Duck Mountain Provincial Park Interpreters.

Loons that have previously established territories on Madge will normally return to the same spot, unless something has happened to disrupt the pair, or if undesirable changes to the territory have occurred. Each year we have noted up to a 25 per cent change in territories, with the old ones being abandoned or modified and new ones established. This may be a result of old pairs not returning, and new pairs establishing a new territory, or established pairs abandoning one area for another. We have also noted some modifications to the rough boundaries of older territories each year, based on where each pair tends to frequent.

The maps in Figures 1 and 2 show the changes to the territories observed from 2017 to 2018. Twenty-six territories were observed in 2018, up one from 2017. Four territories from 2017 were abandoned, and five new ones (marked with * in Figure 2) were established. Note that three of the four abandoned territories were initially occupied in the spring, but they were abandoned by early July. This is similar to what was observed in previous years. We also observed that three territories that were abandoned in 2016 were reoccupied this year. We suspect that these are being taken over by loon pairs new to the lake. What has become apparent since we started keeping detailed records in 2012, is that the birds avoid certain areas, but will re-use a previously occupied area, either due to the protection offered or because of the depth of water and abundance of small fish in those areas. Other open areas tend to be avoided.

The territories marked with a C indicate where chicks were successfully hatched and survived into September. Six nests (marked with an N) were found this year, one more than last year.

We found six newly hatched chicks on June 19 and an additional one on July 5. We spotted two young (~one week old) chicks on August 10, which is quite late. This may have been a second attempt by that particular pair, as they had been spotted on their nest in mid-June. By the end of August we had spotted 12 chicks/juveniles. An additional four juveniles were noted on the lake on September 6, for a total of 16 juveniles. These latter four were likely fly-ins from other areas, as they were feeding in areas outside the established territories. By this time, only eight adults remained on the lake, with the others departing for their winter feeding grounds. The two adults with the late hatching were still with their young, while the other juveniles were now on their own.

Four of the six observed nests produced surviving hatchlings. Two of the four nests were on the flanks of beaver lodges, while the others were on well-protected shorelines. This was the first time that the one nest

Juvenile in early September

we have been observing for six years has produced chicks that survived to become juveniles.

One member of one pair observed in mid-June was still in its winter (grey) plumage. This is odd, as most loons moult into their summer colours before leaving their winter feeding grounds in April, and are usually flightless for about three weeks during this moult.

As in previous years, we observed a large number of unpaired young adults feeding on the lake in July and August. Up to 20 unpaired birds were observed on any given day, singly or in groups of up to seven birds. Extrapolating our figures, the lake was averaging 65-70 loons throughout the summer, including the 26 territorial pairs and the unpaired groups. This is consistent with previous years' counts. Overall, the Madge Lake loon population continues to thrive. See Table 1 for the monthly counts.

In addition to the annual Madge Lake Loon Survey, the LIC continues to work on related projects, providing the park interpreters with photos and research documents on the Common Loon, and assisting the interpreters in presenting their loon program on two occasions.

We will continue to work with the park staff to improve awareness of nesting loons on Madge Lake through information provided by the park interpretation program, brochures, signage and via reports to the cottage owners.

I am also appealing to have other cottage owners with boats assist me in doing periodic counts in areas that they may frequent throughout the summer. This would greatly assist us by providing additional statistics, which will help us in better analyzing our count information. I have count sheets available for their use. Please contact me if you are interested.

We would once again like to thank the many agencies that have provided assistance and sponsorship for our various projects: Duck Mountain Provincial Park Staff, the Saskatchewan Fish and Wildlife Development fund, Nature Saskatchewan, Bird Studies Canada and the YFBTA. We would also like to thank the park residents who have taken an interest in our projects and those who have contributed to the annual survey. These include Sharon Korb and Kevin Streat, Lloyd and Sandra Benson, Jim and Patti Hack, Kim and Lucy Schindler and Randy and Barb Trofimenikoff. We would also like to thank the park staff and the park interpreters, who have provided excellent support and continue to work closely with us on all our loon-related projects. Lastly, thanks to the Madge Lake Cottage Owners Association (MLCOA), which sponsors our continuing membership in the Birds Studies Canada annual Lakes Loon Survey.

TABLE 1 - 2018 Count Results

PERIOD	PAIRED ADULTS	UNPAIRED ADULTS	CHICKS/JUVENILES
JUN - EARLY JUL	56	6	7
MID JUL - MID AUG	52	20	9
LATE AUG - SEP	52	4	16

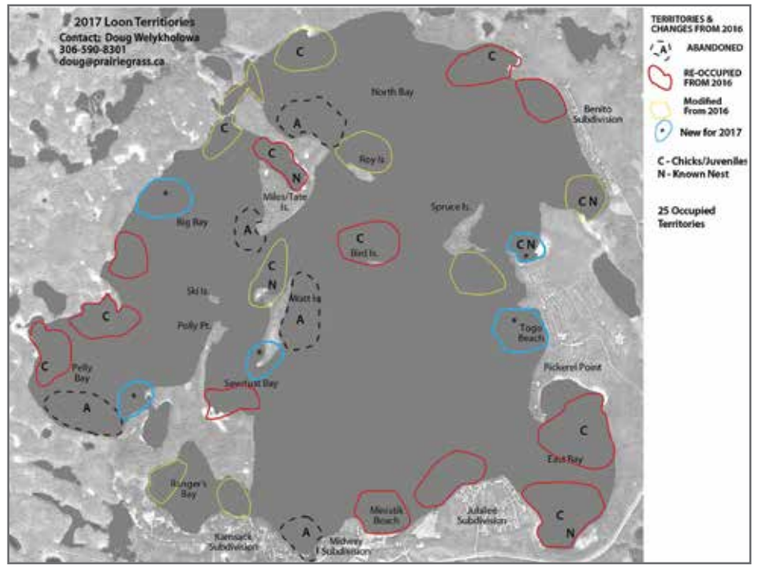

FIGURE 1. 2017 Established Loon Territories

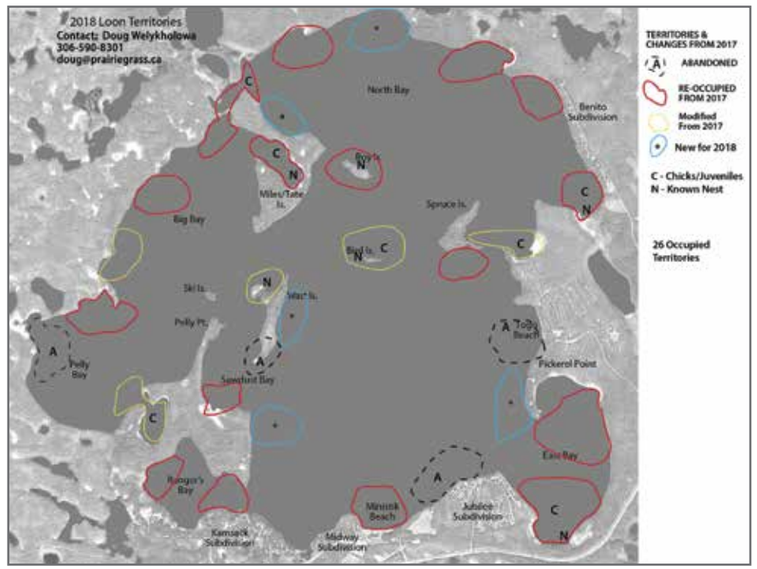

FIGURE 2. 2018 Established Loon Territories

Adult and nest

Adult and chick in mid-July

Loon with chick on back mid-June

FIGURE 1. Cropped original cellphone photograph of the Ruby-throated hummingbird. Photo credit: T. Pulles

RUBY-THROATED HUMMINGBIRD WITH A DEFORMED BILL

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On August 18, 2018, a banding host forwarded me a cellphone picture of a dishevelled Ruby-throated Hummingbird (*Archilochus colubris*) at his feeder, north of Blaine Lake, SK, asking what I thought (Figure 1). In reply, I suggested the hummingbird just needed some of the sugar water to fortify its constitution. I've banded as many as 37 hummingbirds in four hours at this site.

However, I had very different thoughts and impressions when Phil Taylor and I arrived at the host's home to band hummingbirds. The first hummingbird to appear at the trap was the very same Ruby-throated Hummingbird (RTHU) that the banding host had photographed. This banding site has, over the past four years, supported a concentration of RTHUs in August — presumably migrating or getting fattened up to migrate south to their wintering area.

It was immediately obvious that this hummingbird had a wonky bill (Figures 2, 3). The upper mandible was shorter and upturned, whereas the lower mandible was straight, measuring 12.6 mm and shorter than expected (Table 1). The tongue extended well beyond the end of the mandibles where the tongue would normally reside. It should be totally hidden unless exposed to feed on nectar or sugar water. To feed on nectar or at a sugar water feeder, a hummingbird opens its mandibles slightly permitting the tongue to glide out and back into the mandible and mouth and be swallowed, delivering the sugar water/nectar to the crop.

It was no surprise that this hummingbird was at the lower end of 'normal' weight, at 2.6 g (Table 1). While in hand, I offered it the opportunity to drink a sugar water solution from an open, small container. It drank eagerly. While the bird drank, it was possible to observe the area between the eyes pulsating. Satisfying its hunger, the bird weakly flew off. It returned to a feeder to feed five more times over the four hours of this day's banding session. It was also recaptured a second time to ensure our original observations were correct. This RTHU gained strength in its flight. It was encouraging to observe.

This hummingbird had an undersized mandible and was underweight compared to hatch year (juvenile) RTHU males for 2015-2018 (Table 1).

TABLE 1. Mandible length and weight ranges and means for Hatch Year (HY) RTHU for 2015-20181.

YEAR	2015*	2016	2017	2018	THIS RTHU
NUMBER	26	34	32	44	1
MANDIBLE LENGTH (MM)					12.6
RANGE	14.6-18.6	13.5-17.5	14.2-17.5	13.8 – 17.5	
MEAN	16.4	15.3	15.5	15.5	
WEIGHT (G)					
RANGE	2.8-4.4	2.8 - 4.9	2.8 – 4.2	2.9 – 4.4	2.6
MEAN	3.2	3.4	3.3	3.3	

*First full summer of banding mandible measurements may be inaccurate due to lack of measuring experience.

FIGURE 2. A dishevelled, weak RTHU with a deformed bill. Photo credit: P. Taylor

Figures 4a and 4b show a 'normal' looking HY RTHU male. A 'normal' HY RTHU appears to have a forehead or rounding between the eyes. The deformed bill HY RHTU (Figure 3) appears to be flat between the eyes, giving the impression that this HY RTHU possibly lacks a forehead. This view is supported by observations of the skin and feathers above the eyes pulsating as the hummingbird eagerly drank sugar water provided in a small container.

I posted a picture of the hummingbird with a deformed bill on a private website for hummingbird banders, HumBand, which is dedicated to the exchange of information among permitted hummingbird banders, asking whether other banders had encountered similar birds.

A follow-up post to my original pictures posted on August 21 on HumBand appeared on August 30. The HumBand post showed pictures (Figure 5) of a RTHU with a twisted bill from Alabama. It looks very similar to a bird observed and captured in Michigan, later, in early September by Allen Chartier (Figure 6).

Both RTHUs (Figures 5 and 6) appear to have twisted mandibles in contrast to the hummingbird that stars in this article. Note that the forehead area, above the eyes, is similar to the 'normal' RTHU photograph shown in Figures 4 and 4a. This leads me — personal observation — to suggest that disease may not be the cause for the deformed mandibles of the Saskatchewan RTHU.

The following is excerpted comments from HumBand by experienced, permitted hummingbird banders:

"I've seen tons of healed bill fractures, a handful of bills with bits missing, and a couple of dislocations, but never anything like your photo. I suspect it's a birth defect, not a disease, and that we don't see more of them because they don't survive long after fledging."
– Lanny Chambers, hummingbird bander in Iowa; www.humminbirds.net

"Both mandibles seem to be smooth, which more likely indicates either a genetic problem or perhaps an injury to the bill when the bird was a very new nestling."
– Dr. Bill. Hilton Jr., Hilton Pond Center for Piedmont Naturalist; www.rubythroat.org

"I see maybe 5-10 birds a year with bill deformities, a couple as bad as the Alabama bird pictured, but most with obvious bends/injuries to their bills. Most seem to be coping well with their injuries; even the few I've seen this year with mis-aligned bills have weighed normal or a little heavy (3.0-3.5 grams)."

FIGURE 3. Extreme close-up of bill and head of the hummingbird (left) and close-up of the same bird, a hatch year male. Photo credit: P. Taylor

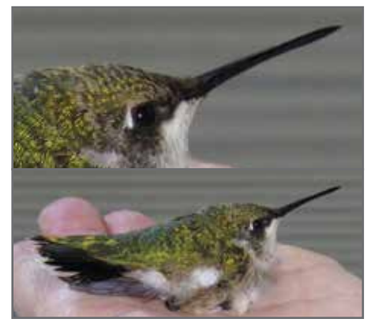

FIGURE 4A. Close up of a "normal" HY male RTHU.
FIGURE 4B. A "normal" HY male RTHU. Photo credit: R. Jensen

FIGURE 5. Photographs of Alabama Ruby-throated Hummingbird, a hatch year male. Photo credit: Franklin Chalk

– Cathie Hutcheson, bands over 5,000 Ruby-throated Hummingbirds annually in southern Illinois since 2000. Cathie has banded about 86,000 RHTU.

" … On September 6, I captured and banded an AHY [after hatch year – adult], male Ruby-throat with mandibles that were crossed in both axes, and with the tongue protruding and apparently of limited function. I have included a composite photo here (sorry for the poor cell-phone camera quality). Of particular note is that the bird was very fat, and weighed 4.77 grams. I find this difficult to explain. The bird surely has difficulty feeding, so how did it get so fat? Does the virus that Scott told us about cause bill deformities to manifest quickly?"
– Allen T. Chartier, master bander in Michigan; http://mihummingbirdguy.blogspot.com (look at Great Lakes HummerNet for banding details and reports)

"The photo appears to show the maxilla and lower mandible deformed but in line with each other — is that correct? [yes] I rather think it's not avian keratin disorder, the bill deformity syndrome associated mostly (but by no means exclusively) with passerines, and now thought to be linked to a poecivirus. AKD usually produces abnormally long and generally crossed mandibles, whereas this bird has exceptionally short mandibles, and the deformation appears to be in line with the head, not twisted."
– Scott Weidensaul, author, naturalist, active field researcher of owls and hummingbirds; www.scottweidensaul.com

"In my opinion, a hummer with such extensive bill damage does not stand much of a chance though we usually do not know the outcome for sure. Even if the bird is able to lap some sugar water from a feeder, the tongue will dry out and it will be incapable of eating sufficient nectar. Additionally, the bird will often be unable to secure enough insect food to satisfy its protein requirements. We hate to see such situations, but they are a fact of life."
– Nancy Newfield, master bander with more than 39 years banding experience; www.casacolibri.net

"Yes, deformed culmens [mandibles] are seen sometimes and are often the result of collisions. However, the kind of deformation you show here is quite different and possibly a disease process. One thing I can tell you in hopefulness, is that I have seen adults with terrible deformities doing well."
– Alison Moran, in charge master bander of "The Hummingbird Project", a citizen science study coordinated through Rocky Point Bird Observatory, Victoria, B.C.; www.rpbo.org

There seem to be several possible underlying causes for deformed mandibles based on comments received on my post:

- an accident that broke the bill, which is seen with some regularity (Lanny Chambers, Cathie Hutcheson, personal communication sited in this article);
- dislocation, birth defects or a viral infection that may cause the bill to twist (Scott Weidensaul and Bill Hilton Jr., personal communications in this article).

From the comments above and the adult male captured in Michigan, deformed bills are observed when:

- numbers of hummingbirds banded are in of sufficient numbers (Cathie Hutcheson);
- experience (Nancy Newfield);
- contact with other hummingbird banders (Lanny Chambers).

Of note and possible interest is that an internet search of "hummingbird deformed bill" resulted in a list of postings for RTHU with deformed bills, dating back to 1998, with broken and twisted mandibles like in the photographs of Michigan and Alabama hummingbirds shown in this article (Figures 5 and 6). The reports came from Texas, Pennsylvania and Alabama. This is not surprising given that the majority of RTHU banders live in the United States. There were 67 Canadian permitted hummingbird banders in 2016 (pers. com Louise

FIGURE 6. Adult male Ruby-throated Hummingbird from Michigan. Photo credit: Allen T. Chartier

Laurin, CWS Banding Office Ottawa, ON) versus 267 permitted hummingbird banders in the United States (pers. com. Bruce Peterjohn, Chief Bird Banding Lab, Laurel, MD).

The good news is that hummingbirds with deformed bills can survive for a surprisingly long time — over a year — as suggested by Cathie Hutcheon and Alison Moran. In addition, Allen Chartier in Michigan caught an adult male with at twisted bill, which suggests that the Michigan RTHU has survived at least one year and had migrated south to a wintering area, returning north the following spring. However, Nancy Newfield and Lanny Chambers both have a more pragmatic view that these hummingbirds with deformed bills don't survive long after fledging.

It appears that the degree of bill deformity may affect survival of fledglings. The fledgling caught north of Blaine Lake had survived possibly because an attentive mother had fed him. He was disheveled, feathers were unkept and unpreened when observed on August 20. It regained strength after being hand fed and with subsequent feedings at a feeder. The tongue was straight, extending beyond the mandibles but didn't appear dead or dried and withered. This is contrary to the tongue in the two RTHUs from Alabama and Michigan, in which photographs show a misshaped tongue outside of the mandibles. Note that I did not band the hummingbird north of Blaine Lake.

The question was asked if the Saskatchewan deformed bill hummingbird should have been euthanized. I was not interested in ending the life of a bird that was struggling and a survivor given what I observed in the four hours of banding. This hummingbird had returned to feed five times and apparently gained strength over the four hours of observation.

Finally, I found it interesting that the three RTHU in the photographs in this article are all males.

I would like to say that I have no special training, other than that to band hummingbirds, or expertise to explain the above information, observations and comments. I am fortunate to have had this RTHU with a deformed bill appear at a banding site, the site host notify me that a strange looking RTHU had arrived, and know enough to catch the RTHU in question and closely examine it. These led to questions and internet searches to learn more about deformed bills in hummingbirds and birds in general.

As a sidebar to this article is AKD, avian keratin disorder. This disorder was reported to have been observed primarily in Alaskan Black-capped Chickadees (BCCH) and in 30 species of wild birds, at miniscule levels, all in Alaska[1]. Subsequently, AKD has appeared in the Pacific Northwest and the United Kingdom. Further investigation of affected BCCH in Alaska resulted in identification of a novel picornavirus in 19/19 affected BCCH[2]. An internet search for "hummingbird deformed bill" resulted in numerous sites, one all pictures of hummingbirds, text reports of deformed bill hummingbirds from as early as 1998. The causative agent(s) ranged from viral infections found in contaminated feeders, collisions with objects resulting in mandible breaks, AKD to unexplained causes.

Acknowledgements

I would like to acknowledge considerable help from Phil Taylor, retired CWS biologist, who recorded the details of each banded hummingbird during the August 20 banding session, photographed the RTHU with the deformed mandible, conducted online searches for disease reports and AKD in Alaska Black-capped Chickadees, offered valuable comments on the wording of this article, discussed what we observed and helped to determine whether this observation was important enough to report to the hummingbird banding community and birders in general. Thanks as well to those who responded on Humband offering their thoughts and observations, some of which are reported above. Finally, thank you to the *Blue Jay* editor, an anonymous reviewer, and to Don Rohs, brother-in-law and retired English teacher, who all provided many helpful suggestions to clarify what was reported in this article.

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REPORT ON BIRDS BANDED IN THE DUNE-RIDGE FOREST, DELTA MARSH, MANITOBA, 1973-1988

Entrance to the University of Manitoba Field Station (Delta Marsh), 1988. Photo credit: S.G. Sealy

"Bell house", the small building situated in the courtyard of the field station, served as the "lab" where many of the mist-netted birds were banded. Following banding, each bird was released at the original capture site in the dune-ridge forest, many transported for release by banders on bicycles, June 1977. Photo credit: S.G. Sealy

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An integral part of the research conducted by students and me on the biology of songbirds in the dune-ridge forest, Delta Marsh, Manitoba, involved banding birds and, for many species, also colour-marking them. Banding facilitated recognition of individuals at nests and generated data from birds recaptured in the same and subsequent years on the study area. Here I report the number of individuals banded of species recorded nesting on the study area in at least one year, from 1973 to 1988, and migrants banded in some years. Also recorded are individuals banded on the study area and recovered elsewhere, and encounters in the ridge forest of species banded at other localities. After a hiatus of a few years, banding reported here was extended on the same site by personnel of the newly formed Delta Marsh Bird Observatory (DMBO).

Study area and Mist-netting Protocol

Research in the ridge forest spanned the years 1973 to 2010, but birds were banded, and in many cases colour-marked, from 1973 to 1988 and, in the case of Brown-headed Cowbirds, also 1993 to 1998 (order and scientific names of species listed in Table 1 follow the American Ornithological Society's Checklist of North American Birds). Ten Yellow Warblers were banded in 1973, but the banding effort was expanded the following year and continued through 1988 when the focus of the work shifted to experimental studies of Brown-headed Cowbirds and their hosts. From 1993 to 1998, cowbirds were colour-marked during studies of mating system, host use, and demography of this brood parasite at Delta Marsh.[1,2] In the first banding period (1973-88), birds were captured in mist nets, but in some years nestlings were also banded. Most cowbirds were captured in baited funnel traps. Mist-netting occurred predominantly in a 1.2 km (10 ha) portion of the dune-ridge forest that extended westward from the Assiniboine River Diversion (50°11'N, 98°19'W)[3-5], a diked waterway that carries water from the Assiniboine River north to Lake Manitoba during springs when run-off water is excessive.[6] This stretch of habitat was situated on the properties of the University of Manitoba Field Station (Delta Marsh) and, continuing to the west, Portage Country Club. The location of the primary study area and vegetation of the dune-ridge forest have been described previously.[3,4,7,8]

Mist nets (30 and 36 mm mesh, most 12 m long) were operated daily, when weather permitted, at eight permanent sites in conjunction with ongoing studies. Net sites were selected to cover north (lake) and south (marsh) sides of the ridge forest, as well as sites in the middle.[4] Shorter nets were employed opportunistically to capture individuals on territories and at nest sites for colour-marking.

This effort resulted in a variable mist-netting effort among years, depending on the nature of other studies being conducted on the site. Each bird was fitted with an aluminum band issued by the U.S. Fish & Wildlife Service, plus for many species a unique combination of coloured celluloid bands. Birds were aged as nestlings or flightless fledglings (Local, in banding terminology), in the year of hatching (HY), or after the year of hatching (AHY). Delayed plumage maturation of male Baltimore and Orchard orioles facilitated

TABLE 1. Summary of banding records of species that nested in at least one year in the dune-ridge forest, Delta Marsh, Manitoba, 1973-1988. In some years, no individuals were captured, whereas in other years, individuals may have been captured but were not banded. Only Brown-headed Cowbirds were banded in 1993-98. Recaptures of individuals banded in the same or in previous years are not included.

SPECIES[a]	BANDING YEARS	# OF YEARS	# BANDED
Mourning Dove (*Zenaida macroura*)[b]	1977	1	2
Black-billed Cuckoo (*Coccyzus erythropthalmus*)	1975-78,80-85	10	84
Ruby-throated Hummingbird (*Archilocus colubris*)	1977-79,81,83	5	176
Downy Woodpecker (*Picoides villosus*)	1976-77,80-84	7	43
Western Kingbird (*Tyrannus verticalis*)	1976-78,80,82,85-86	7	22
Eastern Kingbird (*T. tyrannus*)	1976-86	11	252
Eastern Wood-Pewee (*Contopus virens*)	1976-78,80-83,85	8	29
Least Flycatcher (*Empidonax minimus*)	1976,78,80-86	9	2065
Eastern Phoebe (*Sayornis phoebe*)	1976-82,84-86	10	55
Warbling Vireo (*Vireo gilvus*)	1976-86	11	616
Red-eyed Vireo (*V. olivaceus*)[c]	1976,80-83	5	77
Tree Swallow (*Tachycineta bicolor*)	1977	1	100
Barn Swallow (*Hirundo rustica*)	1976-77,81,84,87	5	46
White-breasted Nuthatch (*Sitta carolinensis*)[d]	1986	1	1
House Wren (*Troglodytes aedon*)	1977-78,81-85	6	291
Veery (*Catharus fuscescens*)	1977-79,81-86	9	125
American Robin (*Turdus mirgratorius*)	1975-84,86-87	12	231
Gray Catbird (*Dumetella carolinesis*)	1976-78,82-88	10	1147
Brown Thrasher (*Toxostoma rufum*)	1976-85	10	49
Cedar Waxwing (*Bombycilla cedrorum*)	1977,85	2	31
Song Sparrow (*Melospiza melodia*)	1977-78	2	93
Chipping Sparrow (*Spizella passerina*)	1968	1	1
Clay-colored Sparrow (*S. pallida*)	1978	1	3
Orchard Oriole (*Icterus spurius*)[e]	1976-86,88	12	88
Baltimore Oriole (*I. galbula*)	1974-86,88	14	2471
Brown-headed Cowbird (*Molothrus ater*)[f]	1975-78,81-83,86,93-98	13	1147
Common Grackle (*Quiscalus quiscula*)	1980-81,84	3	16
Bay-breasted Warbler (*Setophaga castanea*)[g]	1976	1	8
Yellow Warbler (*S. petechia*)[h]	1973-88	16	15253
Rose-breasted Grosbeak (*Pheucticus ludovicianus*)	1976-78,80	4	33

[a] Single nests of Great Horned Owl (*Bubo virginianus*), Black-billed Magpie (*Pica hudsonia*), and Swamp Sparrow (*M. georgiana*) were recorded in one or more years but no individuals were banded. Red-winged Blackbirds (*Agelaius phoeniceus*) nested abundantly in the marsh and along the edge of the ridge forest, but were not banded. American Goldfinches (*Spinus tristis*) nested in small numbers, but were not banded.

[b] Mourning Doves nested abundantly in the ridge forest, but only a few were banded because they were not held in the nets with the smaller mesh sizes used in our banding operations.

[c] Most Red-eyed Vireos banded in the ridge forest were migrants, with the exception of one pair that nested in 1981, of which both adults were banded.[13] An AHY Red-eyed Vireo (1370-35318), banded on 20 June 1976 and recaptured on 19 July 1978 while replacing wing and body feathers, suggested nesting.[13] By the late 1990s, up to a dozen nests were discovered every year.

[d] The White-breasted Nuthatch was rarely observed in the ridge forest during the breeding season, but one active nest was discovered in 1986 and one of the adults was banded.

[e] No Orchard Orioles were banded in 1973-75.

[f] Includes Brown-headed Cowbirds banded and colour-marked from 1993 to 1998.[1,2]

[g] Six active nests of the Bay-breasted Warbler were studied in 1976, the only year in which this species nested in the ridge forest, apparently in response to an outbreak of Forest Tent Caterpillar (*Malacosoma disstria* Hbn.).[14]

[h] Includes 10 Yellow Warblers banded in August 1973.

TABLE 2. Age-classes of Baltimore Orioles banded in the dune-ridge forest, Delta Marsh, 1974-1982. Nestlings were not banded after 1982. Recaptures of individuals banded in previous years are not included.

NUMBER BANDED IN	L-U[1,2]	HY-U	AHY-F	SY-M	ASY-M	TOTAL
1974	4	5	12	2	6	20
1975	4	55	32	3	29	123
1976	96	416	142	40	129	823
1977	199	140	122	53	77	591
1978	4	8	57	20	29	118
1979	2	10	24	3	41	80
1980	28	0	38	7	13	86
1981	38	30	81	5	52	206
1982	26	3	19	10	18	76

[1] L = local (nestling or flightless fledgling);
HY = in year of hatching;
AHY = after year of hatching;
SY = second year after hatching;
ASY = after second year of hatching;
and U = unknown sex. Includes resident breeders but also possibly migrants.

[2] Nestlings comprised 18.9% of the total number of Baltimore Orioles banded.

identification of individuals in the first year after hatching (SY) or second year after hatching (ASY). Hatch-year and AHY migrants were distinguished by a procedure known as skulling.[11]

Mist nets were operated during the following periods: 1974, 2 Jul-6 Aug; 1975, 19 May-10 Sep; 1976, 19 May -13 Aug; 1977, 10 May-16 Aug; 1978, 25 May-29 July; 1979, 26 May-1 Aug; 1980, 15 May-26 Jun; 1981, 11 May-3 Sep; 1982, 21 May-23 Oct; 1983, 18 May-30 Oct; 1984, 17 May-20 Sep; 1985, 17 May 1 Sep; 1986, 15 May-5 Sep; 19 May-7 Aug; and 1988, 19 May-6 Aug. Net hours ranged from 700 in 1974 to 7,500 in 1977. In 1981, netting continued in September (6, 12-13, 16-17, 22-23, 28), and October (5-6)[10] and through October 30 in 1982-84 during a study of timing of fall-migrating wood-warblers.[11] Additional details pertaining to mist-netting protocol and nestling banding have been published previously.[11,12]

Nesting species banded, 1973-1988, 1993-1998

The number of individuals of 30 species banded that were recorded nesting in or along the edge of the dune-ridge forest in at least one year during the 16-year banding period are summarized in Table 1. Red-eyed Vireo, Bay-breasted Warbler, and White-breasted Nuthatch were recorded nesting in only one year. The nomadic Black-billed Cuckoo nested in some years, as did the Rose-breasted Grosbeak. The other species nested in all or most years, although not all species were banded each year. Nestling Black-billed Cuckoos, Least Flycatchers, Eastern Kingbirds, Baltimore Orioles, and Yellow Warblers were banded in some years and are included in the totals summarized in Table 1. Birds recaptured on the study area in the year of banding, i.e., repeats, and recaptures of birds in years following banding are not included in Table 1; this deflates the total number captured.[12] These data do not provide indices of the relative abundance of the species in the dune-ridge forest, or accurately identify fluctuations in numbers among years that occurred (but see Table 2). Nevertheless, the most frequently captured species were the most abundant: Least Flycatcher, Baltimore Oriole, Yellow Warbler, and Gray Catbird[9] (Table 1).

Total numbers of individuals of several species would be greater if recaptures of birds banded in previous years were included. Also, these data do not reveal fluctuations in numbers experienced by some species among years, as illustrated for the Baltimore Oriole in Table 2. The number of individuals of each age-class banded from 1974 to 1982, the last year nestling Baltimore Orioles were banded, are obscured in the totals summarized in Table 1. The high numbers of Baltimore Orioles banded in 1976 and 1977 followed by a decrease in 1978 and in subsequent years were interpreted as a short-term reproductive response to an outbreak of the Forest Tent Caterpillar.[8,12]

Migrants banded, 1976-1988

In addition to nesting species banded in the ridge forest (Table 1), 47 species – migrants and post-breeding dispersers – were banded irregularly; their numbers are summarized in Table 3. Numbers of wood-warblers and kinglets were augmented in 1982-84 during banding by H.E. den Haan focused on timing of fall migration.

Birds banded in the ridge forest and recovered off the study area

BLACK-BILLED CUCKOO

An unsexed, AHY cuckoo (762-35830), banded on 20 August 1976, was found dead at Rugby (48°20'N 99°50'W), North Dakota, on 26 May 1977, about 390 km southwest of the banding site. Black-billed Cuckoos nested in the ridge forest in 1976[16,17], but I did not determine whether this individual was among them. Of the 84 cuckoos banded in the ridge forest (Table 1), none was recaptured or observed on the study area in subsequent years, probably a reflection of this species' nomadic tendencies. Of 1,115 Black-billed Cuckoos of all ages banded in Canada from 1955 to 1995, 11 were encountered, including the bird banded at Delta, the only one west of Ontario.[18]

WARBLING VIREO

A female (880-27980), banded and colour-marked after its first year of hatching on 26 June 1977, was found dead in Jutiapa (14°10'N 89°50'W), Guatemala, on 2 November 1978.[19] Coincidentally, this bird was banded within 10 days of two Baltimore Orioles that were recovered, one also in Guatemala (see below). This is the only long-distance recovery of a Warbling Vireo.[18]

YELLOW WARBLER

A male (1450-24882), banded in its year of hatching on 24 July 1978, was found dead in Omaha, Nebraska (41°10'N 95°50'W), on 28 May 1979 – the only recovery outside the ridge forest out of 15,253 banded. The low frequency of recovery of this species is typical, confirmed by Yellow Warblers banded in Saskatchewan (1 out of 13,154)[20] and across Canada, 1921-1995 (115 out of 63,619, or 1/1000 banded)[18].

BROWN-HEADED COWBIRD

A male (621-08948), banded in its year of hatching on 12 July 1977, was found dead about 15 km southeast, in Oakland (49°38'N 99°50'W), Manitoba, nearly four years later, on 2 May 1981. It was not encountered on the study area during the three intervening breeding seasons. The date of this recovery predated the earliest occurrence of cowbirds on the study area in spring by about four days and is consistent with observations of early-arriving cowbirds foraging in fields south of Delta Marsh before moving to the ridge forest.[21]

BALTIMORE ORIOLE

Three Baltimore Orioles were recovered away from the banding site. An HY individual (861-04018) of unknown sex, banded on 22 July 1977, was recovered nearly one year later near Lovells (44°46'N 84°27'W), Michigan, on 30 April 1978. Two SY males recovered off the banding

TABLE 3. Summary of banding records of migrants or post-breeding dispersers in the dune-ridge forest, Delta Marsh, Manitoba, 1973-1988. In some years, no individuals were captured, whereas in other years, individuals may have been captured but were not banded. None of these birds was encountered in subsequent years on or off the banding site.

SPECIES	BANDING YEARS	# OF YEARS	# BANDED
American Woodcock (*Scolopax minor*)	1976	1	1
Yellow-bellied Sapsucker (*Sphyrapicus varius*)	1984	1	1
Northern Flicker (*Colaptes auritus*)	1980	1	1
Olive-sided Flycatcher (*Contopus cooperi*)	1977,81-83	4	7
Yellow-bellied Flycatcher (*Empidonax flaviventris*)	1980-83	4	55
Alder Flycatcher (*E. alnorum*)[a]	1977,80-86	8	373
Say's Phoebe (*Sayornis sayi*)	1979	1	1
Great Crested Flycatcher (*Myiarchus crinitus*)	1978,81-83	4	10
Yellow-throated Vireo (*Vireo flavifrons*)	1978	1	1
Blue-headed Vireo (*V. solitaries*)	1983-84	2	32
Philadelphia Vireo (*V. philadelphicus*)	1978,84	2	12
Black-capped Chickadee (*Poecile atricapillus*)	1986	1	7
Boreal Chickadee (*P. hudsonicus*)	1983	1	4
Red-breasted Nuthatch (*Sitta canadensis*)	1987	1	1
Golden-crowned Kinglet (*Regulus satrapa*)	1983-84	2	42
Ruby-crowned Kinglet (*R. calendula*)	1983-84	2	259
Gray-cheeked Thrush (*Catharus minimus*)	1986	1	1
Swainson's Thrush (*C. ustulatus*)	1986-87	2	40
House Sparrow (*Passer domesticus*)	1977,81	2	8
Red Crossbill (*Loxia curvirostra*)	1985	1	1
Pine Siskin (*Spinus pinus*)	1977-78,84-85	4	149
Harris's Sparrow (*Zonotrichia querula*)	1980	1	24
Dark-eyed Junco (*Junco hyemalis*)	1986	1	12
Ovenbird (*Seiurus aurocapilla*)	1977,82-85	5	156
Northern Waterthrush (*Parkesia noveboracensis*)	1976-77,80-85	8	529
Golden-winged Warbler (*Vermivora chrysoptera*)	1984,87-88	3	4
Black-and-white Warbler (*Mniotilta varia*)	1976-77,82-84	5	79
Tennessee Warbler (*Oreothlypis peregrinus*)	1976-77,82-85,87	7	940
Orange-crowned Warbler (*O. celata*)	1977, 82-84	4	138
Nashville Warbler (*O. ruficapilla*)	1976.82-85	5	70
Connecticut Warbler (*Oporornis agilis*)	1982-84	3	18
Mourning Warbler (*Geothlypis philadelphia*)	1976,80,82-84	5	45
Common Yellowthroat (*G. trichas*)[b]	1982-86	5	393
American Redstart (*Setophaga ruticilla*)	1976,83-86	5	403
Cape May Warbler (*S. tigrina*)	1982-84	3	8
Magnolia Warbler (*S. magnolia*)	1982-84	3	97
Blackburnian Warbler (*S. fusca*)	1982-84	3	5
Chestnut-sided Warbler (*S. pensylvanica*)	1983-84	2	11
Blackpoll Warbler (*S. striata*)	1982-84	3	106
Black-throated Blue Warbler (*S. caerulescens*)	1981,83-84	3	3
Palm Warbler (*S. palmarum*)	1982-84,86	4	72
Yellow-rumped Warbler (*S. coronata*)	1976,82-84,86	5	719
Black-throated Green Warbler (*S. virens*)	1984	1	1
Canada Warbler (*Cardellina canadensis*)	1976,82-84	4	37
Wilson's Warbler (*C. pusilla*)	1977,82-84,86-87	6	203
Summer Tanager (*Piranga rubra*)	1983,88	2	2
Scarlet Tanager (*P. olivacea*)	1982	1	1

[a] Alder Flycatcher was not recorded nesting in the dune-ridge forest until a few pairs began nesting each year in the early 1990s.

[b] Most Common Yellowthroats were banded during the post-breeding period and as migrants, but some nested at Delta Marsh[15] along the edge of the dune-ridge forest.

site were banded and colour-marked within two days of each other, in 1977. The first (861-03511), banded on 18 June 1977, was reported from an unknown locality in Guatemala (16°??'N 90°??'W), in January 1981.[22] It was neither observed nor recaptured on the study area during subsequent breeding seasons, before its final migration.

The other SY male (861-03529), banded on 20 June, was found dead 29 days later near Goodridge (48°08'N 95°48'W), Minnesota, on 10 July 1977, about 245 km southeast of the banding site. This male had not begun to shed its primaries by the date of banding and there would not have been sufficient time for flight feathers to have been replaced for a departure in early July.[22,23] These dates suggest this male left the ridge forest before its prebasic molt was complete, as both SY and ASY male Baltimore Orioles initiate this molt in late June or early July[19] (also see Appendix 1), after the young have fledged and, in the case of ASY males, complete it by mid-August before migrating.[23] Weekly mist-net captures of SY and ASY males over the course of breeding seasons from 1976 to 1983 revealed SY individuals departed by late July, as inferred from the lack of mist-net captures after 18-25 July.[22,23] The male recovered in Minnesota in early July 1977 may have shed some of its primaries before migrating, then interrupted the process during migration, expecting to complete it on the wintering ground. The molt status of this bird was not reported to the banding office, and an inquiry elicited no response. I should state, however, that banding and analyses that followed did not identify SY males that possibly postponed the entire wing molt until after migration, although records in Appendix 1 revealed all SY males captured in early July had initiated this molt.

ORCHARD ORIOLE

An unsexed individual (1201-33130) banded in its first year, on 23 July 1983, struck a window in Oakland, Manitoba, 25 days later on 17 August 1983 (University of Manitoba Zoology Museum # 2413), suggesting a fall departure date.[7]

Orchard Orioles became established as breeders in the ridge forest about 40 years ago. Although a SY male Orchard Oriole was observed there in June 1971, before my work began, I did not record it until a HY individual was mist netted in August 1975, but not banded.[7] By the following year a small breeding population became established[7], which persisted through the duration of the fieldwork.[24] Orchard Orioles postpone wing molt until after arrival on the wintering grounds.[7,25]

Daniel G. Busby (left) and J. Paul Goossen, seen here removing Yellow Warblers from a mist net, were among the first students who contributed to the banding effort, June 1976. Photo credit: S.G. Sealy

Encounters in the ridge forest of birds banded at other localities

BLUE-WINGED TEAL *(Anas discors)*

A male (805-45752), banded in its first year by personnel of the Manitoba Department of Natural Resources on 29 August 1977 at Pasquia Lake (53°40'N 10°21'W), Manitoba, was mist netted at a temporary pond at the edge of the ridge forest in May 1981.

AMERICAN GOLDFINCH

A AHY male (1340-88681), banded on 10 March 1975 near Krakow (44°45'N 88°15'W), Wisconsin, was mist netted on the study area on 4 August 1975.

Discussion

Birds banded in the dune-ridge forest during the breeding and migration seasons of 1973-1988 have provided insights into breeding biology and molt[7,23], community and population changes[7,8,12], functional and numerical responses to an outbreak of Forest Tent Caterpillar[8,12,14,16], change in nesting phenology[26], migration and stopover dynamics[11,27-29], nomadism[16,30], and demography of the Brown-headed Cowbird and its hosts[1,2,21,31]. Unexpected, however, was that as research and eventual banding at DMBO progressed, destruction of the dune-ridge forest occurred during a particularly severe weather event in the spring of 2011. Water and ice from Lake Manitoba was forced on to the dune ridge, and prolonged flooding occurred on its south side, which destroyed much of the riparian forest. This led to the closure of the Delta Marsh Field Station[32], and an end to banding in the dune-ridge forest. The banding records summarized in Tables 1-3 provide a permanent record of this activity.

A brief historical account of banding in the ridge forest, chronicled in *Delta: A Prairie Marsh and Its People*[33], focused on banding conducted by DMBO, upon its inception in 1995. Heidi den Haan's songbird banding during the fall migrations of 1982 to 1984 was credited with providing important data for comparison with changes in numbers recorded 10 years later when Keith Hobson banded there from 1992 to 1994. Den Haan's banding was an integral part of the broader banding effort in the ridge forest that had been underway since 1973, as documented above. This banding effort revealed that high numbers of songbirds stopped over in the ridge forest during spring and fall migrations, providing the impetus for the establishment of a migration monitoring station. DMBO became one of the most productive bird observatories in Canada in terms of catch rate and the number of birds banded each year.[34]

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APPENDIX 1. Molt status of second-year male Baltimore Orioles banded in the dune-ridge forest.

Among the Baltimore Orioles for which I quantified the onset and progression of primary replacement in 1976-7823, 12 were SY males (6 in 1976, 6 in 1977). In 1976, SY males (791-26974, -26808) had not begun to replace primaries when banded on 30 June and 2 July, respectively. Males (791-26813, 26814), however, had shed the first 2 primaries by 3 and 5 July, respectively, and male 791-29921, although not molting when banded on 17 June, had shed its first 2 primaries by 5 July and the new primaries were sheathed. Although male 791-29916 was not molting when banded on 17 June, by 20 July its primary molt was nearly complete (primaries 1-7 new, primaries 8 and 9 sheathed). In 1977, SY males (861-03731, -03834) had shed the first 3 primaries by 30 June and 1 July, respectively, whereas males (861-03848, -03532) had shed the first 5 and 4 primaries by 5 and 12 July, respectively. In 1978, SY male 76-144494 had replaced the first 7 primaries by the time it was banded on 9 July. A male captured at its nest on 30 June 1978, although not banded, had shed its first 5 primaries. SY male Baltimore Orioles were more abundant in the ridge forest in 1976 and 1977, when higher nesting densities were recorded in response to an outbreak of Forest Tent Caterpillar (Table 2).[8,12]

PURSUING THE TRAIL OF PESTICIDES AND MERCURY IN AQUATIC BIRDS *REMINISCENCES OF A BIOLOGIST*

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In 1968, I was transferred from the Canadian Wildlife Service (CWS) Migratory Birds Section to the Pesticide Section because of my work on fish-eating birds, which were suspected to contain high DDE residue levels. Although the CWS Pesticide Section was small, it strongly influenced how CWS evolved. I contributed by producing publications on organochlorine and mercury residues found in aquatic birds throughout the Prairie Provinces. These publications reveal which species and where birds were most at risk from pollutants. One investigation, entitled "Spotted Sandpipers as possible indicators of mercury contamination in rivers" published in *Blue Jay*,[1] combined with the discovery of my neighbour having a freezer full of mercury contaminated fish caught in the North Saskatchewan River downstream of Edmonton, led to the discovery that industry and the University in Edmonton were sources of mercury pollution and eventually to a reduction of mercury entering the river. The revelation of those sources made news in the Edmonton Journal to the chagrin of the CWS director at that time, who accused me of exposing "good corporate citizens of Edmonton".

As little was known about the extent of pesticide residues present in aquatic birds in Alberta, Saskatchewan and Manitoba, I began

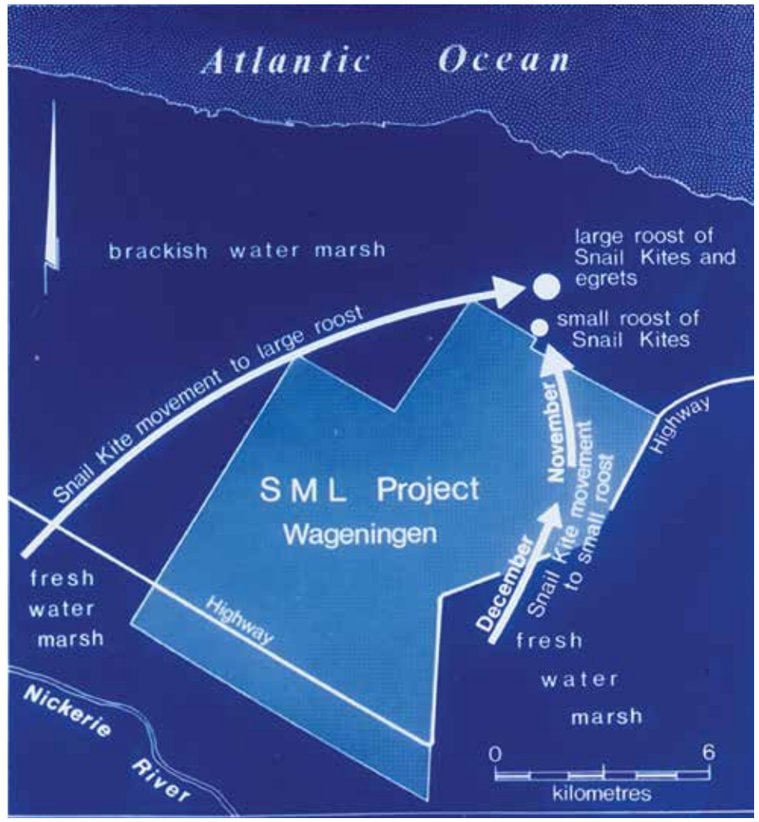

FIGURE 1. SML Project in Suriname, South America

a massive sampling program of eggs from 16 aquatic bird species at 31 locations in those provinces.[2] Eggs were chosen to be analyzed as they are easy to collect and constitute distinct units of comparison. One significant result of that program was that high DDE levels were discovered in Great Blue Heron (*Ardea Herodias*) eggs from Alberta.[2,3] Shell thickness was found to be significantly and inversely correlated with the concentration of DDE in those eggs. Besides fish-eating birds, reduced shell thickness has been found to be correlated with the amount of DDE in the egg contents of raptors.[4, 5] Experimental studies with Mallards had shown that DDE can reduce thickness and cracking of eggshells.[6]

When a visiting Scandinavian student found elevated mercury residues in some Canadian birds, I immediately had the same set of bird egg samples analyzed for mercury residues. I presented the information on mercury residue levels in aquatic birds in the Canadian Prairie Provinces

FIGURE 2. Black Vultures on access road through SML rice paddies.

to the North American Wildlife and Nature Resources Conference in 1971.[7] Each seat in the auditorium was taken as mercury contamination was then a new and hot topic. At the end of the presentation, a lively discussion ensued. We discussed the differences in uptake of mercury by seed-eating and fish-eating birds. Seed-eating birds obtained alkyl mercury compounds from feeding on mercury-treated grain and seeds, while birds feeding on fish and aquatic invertebrates acquire inorganic mercury or phenyl mercury compounds in the form of slimicides released by chlor-alkali plants and pulp mills. Mercury levels in fish-eating birds were observed to be much higher than those in seed-eating birds. Several questions were from people who had just initiated an investigation of mercury residues in birds. For example, a biologist from Saskatchewan, who had begun an investigation of mercury in muscle tissues of Ring-necked Pheasants, Gray Partridge and Sharp-tailed Grouse in the southern part of that province wanted to know about the relationship between mercury levels in eggs and muscles of those birds. He found that the levels of mercury in muscle tissue only in one case exceeded 0.05 parts per million. A biologist from Alaska who had started a mercury analysis program on fish in that State, asked if I had done any analysis on fish tissues, and if so, how did mercury residues stack up in fish that these birds consumed. I had not conducted such analysis, but because of my involvement in a study with the Freshwater Institute in Winnipeg, I learned that levels in fish were generally higher than in eggs of fish-eating birds. Discussions on other topics are documented in my presentation at that Conference.[7]

FIGURE 3. Local volunteer throws net to catch fishes in SML ditch. Fishes, which Common and Snowy Egrets feed upon, were analyzed for pesticide residues.

Besides using large sampling programs of aquatic bird eggs, I examined bird tissues and aquatic invertebrates to determine whether they could serve as indicators of mercury contamination. One investigation,where I examined the relationship between mercury in breast muscles and wing muscles of ducks, had immediate consequences. Annually, CWS collected tens of thousands of duck wings from hunters across Canada in order to determine species, age and sex composition of harvested birds. Muscle tissues adhering to the wings were analyzed to monitor levels of mercury in ducks. From a public perspective, it was important to know the mercury content in the muscle tissues used for human consumption. If the ratio of mercury residues in wing muscle to those in breast muscle were known, and if it did not vary significantly, such information would be useful in predicting levels of mercury in breast muscle. Because fish in Clay Lake, which is part of the Wabigoon River system downstream of Dryden in western Ontario, were known to be among the most heavily contaminated by mercury in Canada, five species of ducks were collected from there prior to the hunting season. Highly significant correlations were found between levels of mercury in breast and wing muscles of Blue-winged Teals (*Anas discors*), Mallards (*Anas platyrhynchos*), Common Goldeneyes (*Bucephala clangula*) and Common Mergansers (*Mergus merganser*).[8] In spite of the small sample size (seven birds) of Hooded Mergansers (*Lophodytes cucullatus*), there still was a significant correlation between mercury levels in breast and wing muscles. As a result of the high levels of mercury found in the ducks' breast muscles, the hunting season was closed for all ducks in that region.

Breast muscles of Hooded Mergansers at Clay Lake contained the highest levels of mercury.[8, 9] Hooded Mergansers fed on crayfish which of all food items were most contaminated with mercury.[9] Consequently I examined whether the crayfish *Orconectes virilis,* which feeds on detritus and scavenges on fish, could serve as indicator of mercury contamination. *Orconectes virilis* is also more restricted in its movements than fish and is the most widely distributed crayfish species in Canada. Crayfish were sampled at locations that were known to represent a range from low (Lake Winnipegosis) to very high (Clay Lake) mercury levels reported in fish. Mercury levels between crayfish from Clay Lake, the Saskatchewan River and Lake Winnipegosis varied significantly.[10] By contrast, mercury levels in crayfish sampled at eight different sampling stations from Clay Lake varied little.[10] I concluded that *Orconectes virilis* is a good indicator of mercury in different water bodies provided the crayfish are within the same range of body weight. At low levels of contamination, crayfish muscle was a more reliable indicator of mercury than the whole animal. This was not surprising as crayfish muscle contained three times as much mercury as the rest of its body. Besides crayfish at Clay Lake, mayfly nymphs, water scorpions and water boatmen were also highly contaminated with mercury which may reflect their predatory feeding habits on small aquatic animals.

Pesticide Effects on Birds in Rice Fields of Suriname, South America

Because of my work with contaminants in aquatic birds in Canada, the Director of the Surinam Lands Bosbeheer invited me to investigate the effects of pesticides on birds in the rice polders of Wageningen in Suriname in 1971. My friend, Arie Spaans, a Dutch ornithologist, who lived at that time in Paramaribo, was the catalyst for that request. In early October, I travelled from Edmonton to Paramaribo, the capital of Suriname. At that time Paramaribo was an interesting white city with a Dutch colonial character. I initially stayed with Arie and his wife and had a great time admiring tropical flowers, birds and butterflies as it was my first time in the tropics. Small green frogs lived in homes and were considered part of the household. Large beetles and beautiful butterflies entered the house at night through open windows, drawn in by the light.

After acquiring a Volkswagen, I moved on to Wageningen along the coast in the western part of the country where I took up accommodation in hotel De Wereld for the next two months. From there I conducted my research on the effects of pesticides on Snail Kites (*Rosthramus sociabilis*), egrets and other birds on the 8,000-hectare rice growing project of the Stichting of Machinale Landbouw (SML, Figures 1,2 and 3).

Not unlike a detective, I loved piecing together the effects of sodium pentachlorophenate (NaPCP), the molluscicide sprayed by airplane to kill *Pomacea* snails feeding on rice plants in the polders (Figure 4). Thousands of fishes were also killed in the rice paddies during the application of NaPCP (Figure 5). Many dead Snail Kites were found on their roosts in the brackish water marsh north of the polders as a result of eating the NaPCP contaminated snails in the adjacent rice fields (Figures 1, 6 and 7). Snail Kite organs were removed for pesticide analyses

FIGURE 4. Disposal of NaPCP barrels. SML staff were advised to dispose the barrels safely as commercial preparations of NaPCP contain high levels of dioxin, a known teratogenic compound.

FIGURE 5. Fishes killed in rice paddy after aerial spraying of NaPCP. Chemical analyses showed high levels of pentachlorophenol in pooled samples of dead fishes.

FIGURE 6. Kees Vermeer searching for dead birds (Snail Kites and egrets) in brackish water marsh adjacent to SML rice polder.

FIGURE 7. Dead Snail Kite beneath a black mangrove bush in brackish water marsh.

and the cadavers thrown afterwards into a polder ditch where they were devoured within a few minutes by piranhas. Our study was one of the first well documented studies of the effects of NaPCP on birds of prey in an aquatic habitat.[11] Because of the observed mass mortality of Snail Kites resulting from the application of NaPCP in the rice fields, we recommended that another less toxic pesticide with a shorter half life should be used to control *Pomacea* snails. That recommendation was followed up and Snail Kite mortality decreased dramatically. Besides NaPCP, the effects of other pesticides (such as Endrin) on birds were investigated as well. At the end of the study, I presented in Dutch my preliminary findings to SML staff and other interested parties. A journalist from the main Paramaribo newspaper was present at the meeting. Shortly afterwards, the story was major news.

Several species of herons and egrets (8), caracaras, hawks, kites and vultures (10) and plovers, sandpipers and yellowlegs (7), as well as other birds associated with aquatic habitats such as gallinules, limpkins, jacanas and terns were observed in the rice polders and adjacent brackish water marsh.[11] All seven species of shorebirds that I observed were North American migrants, of which Upland Plovers, Spotted Sandpipers, Greater and Lesser Yellowlegs are widely distributed nesting birds in the Canadian Prairie Provinces.[12] North America and coastal Suriname share tens of thousands and at least 16 species of shorebirds, of which the Semipalmated Sandpiper is the most numerous migrant from Alaska and Canada.[13]

Besides my field research, Arie and I made a boat trip along the Coppename River from Bitagron to the Voltzberg-Raleigh Falls Nature Reserve in the interior of Suriname. Along the river there were small settlements where women prepared manioc and beautiful coloured macaws flew from tree top to tree top. When we arrived at the Falls, a magnificent Harpy Eagle watched us. At night we slept in hammocks beneath the roof of an open building. I woke up frequently as Arie had told me to watch for vampire bats, which might suck your blood through the hammock. In the morning we were greeted by the loud calls of howling monkeys that sounded like distant thunder. In rock pools near the Falls, I watched with fascination giant electric eels moving around. We explored the area of the dome-shaped Voltzberg with its interesting flora growing in cirques on smooth granite flats (Figure 8). Unfortunately I did not see the bright orange Guianan Cock-of-the-Rock, which was known to occur near the Voltzberg.

FIGURE 8. Voltzberg in Suriname.

After our camping trip to the Voltzberg-Raleigh Falls Nature Reserve, Arie took me to a marsh near Paramaribo where there were supposed to be Scarlet Ibises. I had never seen one in the wild before but only birds with faded plumage in a zoo. Slugging through the marsh on a dark morning, I saw my first Scarlet Ibis. Its brilliant red plumage did not seem real; perhaps it was my imagination but the ibis seemed to light up the dark morning sky.

Back in Wageningen, I prepared and sorted my frozen samples of bird tissues, fishes, frogs and snails for pesticide analyses in Canada. I planned to visit Ottawa first to drop off the frozen samples before going home to Edmonton and let CWS staff in Ottawa know the exact time of my arrival so the samples would remain preserved and not spoil. In the meantime, an SML staff invited me for a boat ride on the Maratakka River near Wageningen, where we visited a village of native inhabitants. They were friendly, and one woman gave me a large bunch of cooking bananas. I bought a beautiful purple Phalaenopsis orchid growing from a coconut husk which I later brought back with me to Edmonton. There it adorned our living room for months during the long cold winter.

When it was time to leave, I drove my Volkswagen with the samples to Paramaribo. From there I left by airplane for Ottawa, where I dropped my samples off at midnight to dedicated CWS staff. The next morning, I arrived in Edmonton, just in time to spend Christmas at home with my wife and daughter. The investigation in Suriname taught me that toxic chemical problems can be readily solved by a small multidisciplinary team with the required expertise. The closer countries and organizations cooperate, the better for humankind and environment.

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CHILDREN AND NATURE

Photo credit: Ellen Bouvier

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Chewbacca the hermit crab in his home in the classroom. Photo credit: Jodi Christiansen

As the proud mom of two almost adult children who grew up outside, the proud teacher of almost 50 nature loving Kindergartens yearly, and a big fan myself of the great outdoors, I feel like I have a unique perspective and knowledge about young people and nature. Although much of my viewpoint comes from my experiences with children as both a mom and a teacher, I have, as of late, been reading up on the topic of children and nature among other things as part of a professional goal to read 10 books a month — reading both inside and outside! "There is nothing more joyful or inspiring to watch than children discovering the world around them," (I Love Dirt, 2008, Jennifer Ward) and the benefits to children are both broad and numerous. Young people who spend time outside have fun while learning, experience health benefits and hopefully become adults who love the outdoors and work to protect it.

Play is the work of children and "when children have time and freedom to move through the world at their own pace — not necessarily unsupervised, but unstructured — they delve into their imaginations. This is the important work of childhood, and it lays the foundation for growing into curious, open minded, problem-solving adults." (How the Outdoors Makes Your Kids Smarter, Dec. 6 2018, Katie Arnold) and play is fun, learning is fun, playing and learning outside is fun. Although I began my teaching career in the middle years and loved it, the primary years have always been my passion. I was fortunate enough to stay home with my own children for a large part of their preschool years. My husband and I were able to spend much of this time passing on the love of nature and the outdoors that was instilled in us by our families. I grew up spending my summers at our cabin and the occasional winter trip skiing in the mountains, with a lot of time biking and playing, sledding and skating in between. My husband spent much of his childhood camping and adventuring and playing all kind of sports both indoors and outdoors. Subsequently, I spent much of my treasured time at home with my own children, adventuring outside both near and far, skating and sledding in the winter, puddle jumping and straw boat racing in the spring, hitting the beach at the cabin in the summer — our very favourite place — and making leaf piles to dive right into in the fall. Whatever the season, Saskatchewan is full of adventurous possibility! Seasons of outdoor fun and an epic family trip to Maui led to us having a baker's dozen pets ranging from rescued salamanders to an adopted bearded dragon with snakes, toads, geckos and hermit crabs in the mix. If there was a reptile or amphibian to care for, it seemed to end up at our house.

This love of nature and natural creatures does not need to stop once a child enters school. Getting our pet hermit crab for our classroom was one of the best decisions I have ever made for five years of Kinders and counting. Not only have the children learned to care for and love him, they have also learned a lot about habitats and what living things need to survive. Our hermit crab, brought the outdoors in to us but the joy and fun of learning in Kindergarten should happen both inside and outside of the classroom.

Jodi's children at Moose Lake, Jasper, Alberta. Photo credit: Jodi Christiansen

It can be as simple as thinking, "How can we meet this outcome outside?" or "It's a beautiful day — can we do this activity outside?" We can read outside, snack outside, have phys. ed. outside, and create art outside. In Kindergarten, we love going on outdoor adventures and when I say love, I mean the cheering out loud when the word adventure is mentioned kind of love. We adventure in all seasons. We adventure to gather items like sticks and stones to make natural patterns or to mix colours in the snow. We adventure to look for tracks and creatures — some real, some imaginary. We adventure to go on scavenger hunts in search of people, places, signs, animals, leaves and colours. We adventure simply to go on the "big kid" side to play on their play structure. We build sand castles and snow forts. We practice skills learned in gym like hula hooping, skipping, tag and cooperative games. We have fun together — outside!

The benefits of playing and moving outdoors are not limited to learning and fun, although these alone seem like enough incentive to me! There are also numerous health benefits to getting outside. "Research shows that exercise makes us more creative and more attentive when we come back to our desks" (How the Outdoors Makes Your Kids Smarter, Dec. 6 2018, Katie Arnold). Children need to move their bodies, breathe in fresh air and feel the sun and wind on their faces to learn and pay attention, and "88% of teachers worldwide say that children are more engaged in learning when taking part in lessons outdoors." (Muddy Hands Report 2018). Playing, learning and moving in the outdoors are and should be intertwined in a child's education — "motion and imagination are inextricably linked. Move your body and your mind will follow." (How the Outdoors Makes Your Kids Smarter, Dec. 6, 2018, Katie Arnold). An active child builds a healthy foundation for both mind and body. "A rapidly growing body of research indicates how learning and playing outdoors can improve cognitive functioning, reduce stress, increase creativity and most important, ignite a sense of wonder." (Muddy Hands). Spending time in nature can also reduce the symptoms of attention deficit disorder (I Love Dirt, 2008, Jennifer Ward) and an active learner is a healthy learner.

Photo credit: Ellen Bouvier

As Kinder learners, we have the privilege of benefitting from older student role models on the playground and middle years learning buddies to adventure with. We can only hope that our influence on them helps us all to become adults who love the outdoors and work to protect it. My own children, who love everything outside from sports to hiking to camping have grown into young adults who because of their love and wonder of the great outdoors, strive to protect the outside that they love. They firmly believe that if everyone does their part from recycling to composting, to boycotting straws and being responsible consumers, we will be able to protect the planet that sustains us. This is something that I hope to pass on to many more years of young learners as we grow and learn together outside.

HUMAN NATURE

CREEK DAYS

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"There is a special place in Saskatchewan that I find myself returning to visit through the seasons. It is just a small, seasonally-running, officially-unnamed creek feeding into the Qu'Appelle system from a little wooded coulee, but it seems to feed my soul and sometimes inspires some words." - Ken Ludwig

you lie still now
snow-shrouded little hollow
meandering through the tree skeletons
in the fold of the frozen hills
deer and rabbits tracking across and along
your resting channel
browsing for their survival

the strengthening sun warms the hills
snow melt finds its way to lower ground

you rush forward
roaring your new strength
splashing churning and tumbling
washing along the litter of last season to
feed new growth downstream
glistening crystals of still melting ice
dancing in your flow

the leaves thicken into full canopy
sunlight bathes open blooms and berries

slow and settled now
you trickle through the deep shade
a shadow of your former self
offering cool drink to those who pause
at your sheltered bank
respite from the intense heat of these days
blood stream of the valley

heat wanes in the shortening days
life energy draws back into tired bodies

you are dried and spent
accepting the crisp leaves fallen into
your narrow winding trough
that no longer flows with vitality
shelter for rabbits and voles and field mice
against a sharp wind that pierces
the ever thinning brush

darkness and cold take over the hills
snow and ice cover the frozen ground

you lie still now…

Photo credit: May Haga

Photo credit: Randy McCulloch

Mystery Photo

Spring 2019 (left)

THE QUESTION IS: What species of bird is shown here?

Please send your answers to Blue Jay editor Annie McLeod at bluejay@naturesask.ca or by letter mail: 3017 Hill Ave. Regina, SK S4S 0W2.

Those with correct answers will be entered into a draw for a prize from Nature Saskatchewan.

Mystery Photo

Winter 2018 (above)

ANSWER: The mammal shown in the Winter 2018 Mystery Photo was a thirteen-lined ground squirrel. One *Blue Jay* reader responded to the mystery photo with a mystery of his own: "Why don't they leave any mounds of dirt? How is it possible for any burrowing creature to dig a hole and yet leave no dirt anywhere in sight?"

It appears that the entrances to thirteen-lined ground squirrel burrows often lack the telltale mounds because the ground squirrels scatter rather than pile the excavated soil. Why do they do this? No one has studied it explicitly but colonial burrowers such as prairie dogs and Richardson's ground squirrels have more conspicuous burrows, but they also share 'lookout' duties to warn of predators. Unable to rely on lookouts, the solitary thirteen-lined ground squirrels may have evolved to keep their burrows better hidden (think of the classic movie *The Great Escape* in which the prisoners dispersed the dirt created by their tunneling). Another reason you are unlikely to see a mound of soil near a hole dug by a thirteen-lined ground squirrel is that many lead to short escape tunnels that are dug from the inside, meaning the soil may be incorporated back into the tunnels.

A huge thank you to Dr. Mark Brigham from the University of Regina's Department of Biology for investigating this mystery and, along with colleagues, providing the above insights. Mark had help from Ray Poulin at the Royal Saskatchewan Museum, Jim Hare from the University of Manitoba, Louren Buck from Northern Arizona University and Jim Staples from Western University of Canada.

Have you taken a picture that may make for a good mystery photo? Send it to the editor for possible inclusion in an upcoming issue.

Nature SASKATCHEWAN

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