NATURE ALBERTA MAGAZINE

SUMMER 2021
VOLUME 51 | NUMBER 2

A COMMUNITY CONNECTED BY A LOVE OF NATURE

Plight of the Bumble Bee
Pollinators in Peril

In the Mud with Muskrats

Greater Sage-Grouse: Dancing on the Edge

Acoustic Monitoring: Keeping an Ear Out for Wildlife

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Funnell Lake
Conservation Site

It's an Alberta thing.

Alberta Conservation Association

wildlife | fish | habitat

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About Nature Alberta
Alberta is home to incredible natural spaces comprised of beautiful and varied landscapes, and rich biodiversity reflected in our abundant and diverse flora and fauna. Across the province, natural history clubs and their members are engaging Albertans in the conservation and appreciation of this natural heritage. Nature Alberta represents a network of these natural history organizations in Alberta.

NATURE ALBERTA

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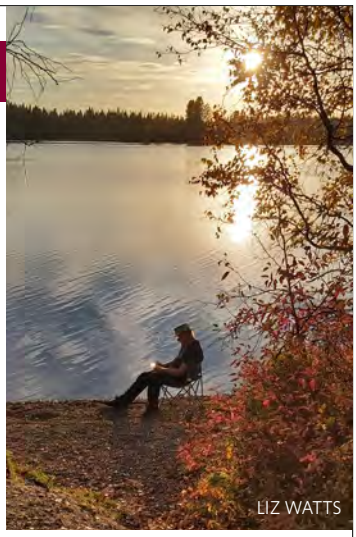
THE PRESIDENT'S PERSPECTIVE


LIZ WATTS

Warm summer sun,
Shine kindly here,
Warm southern wind,
Blow softly here.
Green sod above,
Lie light, lie light.
Good night, dear heart,
Good night, good night.
—Mark Twain, "Warm Summer Sun"

Summer is finally here, with its promise of long days and good weather. It is a time of rejuvenation, a time for spring's new growth to strengthen and mature in preparation for autumn, the time of harvest.

Summer has always seemed to me as that time when the world is readying itself for change, for the uncertainty of what's to come. The natural world has very specific needs and consequently, specific actions are undertaken. Offspring grow; fruits and flowers ripen and prepare new seeds; storage behaviour proceeds unceasingly; migratory species rest, feed, and train their young in preparation for their long return journeys. There is so much activity happening during the summer that it must surely be the busiest of all the seasons.

Likewise, Nature Alberta's summer months are filled with activities for everyone, from individual projects — such as building bat boxes or planting pollinator gardens — to community-based urban initiatives and stewardship opportunities. Being outside is the best way to rejuvenate the spirit and strengthen the body. The "great outdoors" are great for a reason! In this new world of pandemic culture, getting active outside is a wonderful way to maintain physical and mental health and safely interact with other people. Citizen science projects, bird counts, and species identification (including plants and fungi) are all great ways to get involved and contribute to our knowledge of the natural world. Nature Kids offers programs tailored specifically for children that can be completed at home or in the field.

Let's use summer to connect our lives with the world around us, learn about our environment and our impact on it, and revitalize our spirits.

ELIZABETH WATTS

Nature Alberta News

Nature Kids Restoring Nature!

On June 5, Nature Kids families flocked to Golden Ranches in the Beaver Hills Biosphere Reserve to help Nature Alberta and Project Forest restore wildlife habitat. Throughout the day, 23 volunteers worked to plant 500 white spruce, balsam poplar, and yellow willow around an old dugout. The event concluded with an extraordinary sighting: binoculars in hand, one of our Nature Kids identified a threatened bobolink, a new species for the long list of documented birds conserved by the Golden Ranches Conservation Project. We watched the bobolink fly over to join its mate!

Hungry savannah sparrow nestlings.
STEPH WEIZENBACH

On June 19, Nature Kids took to the hills of Edmonton's Griesbach Central Park with Nature Alberta and Root for Trees to restore important pollinator habitat. Over the course of the eventful day, 48 volunteers in staggered shifts planted 300 larch, pine, chokecherry, prickly rose, saskatoon and buffaloberry. Nature Kids got their hands dirty rolling 180 bee bombs — soil and clay balls carefully filled with native wildflower seeds — and launched them onto a grassy slope. We had to carefully tiptoe around another precious discovery: a grass nest with four savannah sparrow nestlings! We watched the mother sparrow bring food to her nest.

Our energetic volunteer families planted 300 trees and shrubs in Griesbach Park.
SUSAN MAY

Thanks to TD Friends of the Environment Foundation for financial support of this project.

Welcome Our New Nature Network Assistant

To assist in supporting and promoting the activities of our member clubs, and delivering our Nature Kids program, Nature Alberta has added Abigail Stosky to our staff as our Nature Network Assistant.

Abigail has a Bachelor of Science degree in Biology and a Certificate in Biological Research from the University of Alberta. She has more than eleven years of professional experience communicating science, and has worked with organizations such as Telus World of Science Edmonton, Girl Guides of Canada, Edmonton Valley Zoo, and the Beakerhead Festival to encourage a love of nature and science in people of all ages. She is a certified National Geographic Educator, and is currently working towards a Masters in Science Communication from the University of Edinburgh.

Abigail says, "I believe that dedication to conservation stems from a love and appreciation of nature, and Nature Alberta's initiatives help people develop that. I am excited for the opportunity to help expand these initiatives as we continue this critical work and am thrilled to be a part of the team!"

Family Nature Nights are Back!

Join us Wednesday evenings from 6:30–8:30 p.m. in Edmonton parks to observe, investigate and experience nature!

Watch our website and social media for details on these events and many more, including an upcoming special event with Nature Central in Red Deer at Gaetz Lake Migratory Bird Sanctuary.

Environmental Policy Update

Last summer, we wrote about the shift in environmental policy that had taken place under the new UCP government. So where do matters stand now, a year later?

Park Closures

In the spring of 2020, the UCP government announced it would remove 164 sites from the provincial parks system. This prompted a grassroots Defend Your Parks campaign that generated thousands of letters from individuals across the province voicing their opposition. In response, the government rescinded the proposal and announced that all parks would retain their existing designations and protections. But we are not yet out of the woods. A new land vision for public lands has been announced with the intent to "review and modernize" existing legislation. When public consultations eventually begin it will be critical that Albertans again stand up to defend their parks. So don't put away your lawn signs just yet.

Coal Mining

Last June, the government rescinded the long-standing Coal Policy that restricted coal mining in sensitive parts of Alberta's Eastern Slopes. Public push-back on this change was again intense and widespread, indicating another political miscalculation. The government was compelled to reinstate the Coal Policy (temporarily) and initiate public consultations about future coal development.

Public attitudes on this issue are very clear. Over 24,000 people responded to the government's recent online survey about coal development, and environmental impacts were the top-ranked concern. Only 8% of respondents felt that economic benefits were very important. As far as most Albertans are concerned, opening up the Eastern Slopes to more coal mining is a non-starter.

Last month, the government's pro-development agenda was dealt a serious blow when the review panel for the proposed Grassy Mountain coal mine ruled against the mine, stating that the project was not in the public interest. This decision has major implications for coal mining in the south Eastern Slopes. The Grassy Mountain mine was the first in a string of proposed new mines, and the odds of these other mines proceeding are now much decreased.

Forest Harvesting

As part of its flurry of policy changes last year, the government quietly increased the rate of forest harvesting by 13%. This spring, Forestry Minister Devin Dreeshen told the legislature he wants another 20% increase. This issue has not attracted as much public attention as park closures or coal mining, but it nevertheless has broad ecological implications. The rate of forest harvesting already exceeds ecologically sustainable limits in many areas, especially in the foothills. Further increases will exacerbate declines in species that depend on older forests. Species that depend on intact forest habitat, such as caribou, grizzly bear, and several endangered trout species, will also suffer.

Irrigation

A new addition to the government's list of development initiatives is a proposed 15% expansion of irrigation in the Bow River and Oldman River basins. Irrigation already accounts for three-quarters of all water allocations in these basins and these extractions are having a negative impact on the rivers, especially during prolonged dry periods. Given continued population growth and the drying effects of global warming, future water shortages seem inevitable. The expansion of irrigation seems ill-advised under these circumstances and several Alberta environmental groups have banded together to oppose the proposal.

Stay Vigilant and Engaged

Although the government has walked back many of its proposals in the face of public opposition, there is no indication that senior politicians have had an epiphany. They seem instead to be searching for work-arounds that will allow their development agenda to proceed. Thus, continued public vigilance and engagement will remain critical over the coming year. We can take heart in the knowledge that, collectively, our voices can make a difference. ■

Muskrats Up Close

BY TONY LEPRIEUR

As an amateur wildlife photographer, I've been taking pictures in Calgary and the surrounding area for the last 10 years. For me, observing and photographing wildlife is a great joy. It's amazing just how much is out there for us to explore. I still have much to learn, but I am getting better thanks to a supportive community and publications like this one.

Although my subjects vary greatly, I do have a particular favourite: the muskrat. Why muskrats? That's a very good question and one I'm not sure I can answer completely. At first, it had to do with opportunity. Muskrats just happened to be something I could find relatively easily. In time, after spending more and more hours with this cutest of water rodents, my appreciation grew. They are plenty interesting swimming in the water, but it's when they come out of the water that their personality shines. I've been fortunate to witness a lot of different activities over the years: newborn young being moved to their new home, fights between adults, play between adults in better moods, adults making more muskrats (in MUCH better moods), and feeding on everything from a single blade of grass to a very large fish. But the most delightful has to be watching a muskrat go through

The muskrat's grooming routine distributes water-repellant substances throughout its fur and traps air within, enhancing their fur's insulating properties. TONY LEPRIEUR

its thorough grooming regimen. Their fastidious grooming routine helps keep their pelt water repellant and warm.

What I have learned on my muskrat photography expeditions is that keeping still is key. As long as you don't move, they will largely ignore you. This approach has led to several notable encounters.

On one recent outing, I was photographing late in the day and was in a position where the sun was directly in front of me. The glare off the water made it almost impossible to get a usable shot. I was able to get around this by getting very low — as in, almost needing a snorkel low. I was grasping a rock trying to keep the rest of me above water. It turns out this particular rock was the local muskrat's favorite eating spot and it decided to climb up and enjoy its mouthful of snacks. We were both very surprised by the unexpected handshake and ended up in the water — a natural location for one of us. The muskrat tried to climb back onto the rock two more times before giving up and moving on to one without a soggy photographer attached.

Another time, I went to Frank Lake, south of Calgary, to kill some time while I waited for evening and a chance to photograph some beavers at a nearby location. My plan was to watch the ground squirrels who were active at that time and are always fun to observe. Just as I got close to one, I noticed a muskrat down by the water, fast asleep. I got into my ideal picture-taking position — lying in the mud — and decided to quietly wait for it to wake up, knowing I could get a good shot when it did. In hindsight I wish I had selected a drier spot, because that mud became my base of operations for the next three and a half hours. I soon discovered this muskrat had a schedule it followed: sleep for 30 minutes, go for a short swim, do some grooming, and then back to the grass to start the process all over again. I watched it do this three times and on the fourth run-through it changed things up and went fishing instead. I knew muskrats sometimes eat fish, but getting to watch one do it a few feet in front of me was pretty amazing. I watched it catch and eat a small fish and then move on to a dead one on the shore. When it finished its meal, it decided to check out the big lump in the mud: me. I watched through my camera lens as it kept getting closer and closer, and before I knew it, it was climbing into the lens hood of my camera — the ultimate closeup! It explored that for a bit

and then came around for a face-to-face. No exaggeration here, it was inches from my face and brushing against my arm. It just looked at me for a few seconds, then slowly waddled about two feet away, curled up in a ball and went to sleep, back on its schedule. It was the coolest experience ever. Not so good for picture taking though, as most of the encounter happened way too close for me to be able to focus.

I spend so much time photographing muskrats that my method has become somewhat refined. I'm far from being an expert, but I have learned a few things that may help you with your muskrat photographic adventures:

Tip 1: It's always best to photograph wildlife at eye level, so for muskrats this will mean getting a bit wet and dirty. You will want to dress appropriately.

Tip 2: Don't let them see you move. Muskrats can be a bit skittish but seem to be a lot more tolerant of the human presence if you remain completely still. Much of their food gathering takes place underwater, so you can move when they dive. Just make sure you freeze before they resurface.

Tip 3: As with all wildlife photography, capturing muskrats requires patience. If you are not moving, muskrats will likely be calm and will simply go about their day. Muskrat days are not always exciting but if you wait long enough something interesting is sure to turn up.

There is so much out there to see and experience. I wish you all the best capturing your own wildlife moments. ■

Muskrats gather food within their territory and carry it to a favourite feeding spot to eat. Their preferred diet is aquatic vegetation, but when plants become scarce, they will eat insects, amphibians, and fish. TONY LEPRIEUR

Tony LePrieur is a longtime resident of Calgary but is originally from Newfoundland, which is where he first developed his appreciation for wildlife. He began taking wildlife photos about 10 years ago and is still hard at it, out in the field most every weekend.

Dancing Without a Stage

The Status of Greater Sage-Grouse in Canada

BY TIMOTHY SHAPKA

If you have never seen or heard of the greater sage-grouse and its mating ritual before, I encourage you to take a moment to watch a video before proceeding. No words I can put to this page will adequately capture the beauty and hilarity of the dance these birds perform at their seasonal mating grounds. Fortunately, this video from PBS' *Nature* fills in my literary gap: **bit.ly/sagegrousemating**.

...And welcome back. Hopefully, you had a laugh, but now it's time to get serious. The long and short of it is that this species is dangerously close to being completely extirpated from Canada.

The Decline

Since 1968, biologists have been gathering population data on sage-grouse by taking advantage of their seasonal mating displays. These displays occur at specific locations known as leks. Because the males put in a great deal of effort to make themselves as visible as possible, counting males at leks is an easy way to estimate the size of the population in a given area. As of 2020, the Albertan population of greater sage-grouse was estimated to be 72 individuals — down from the thousands that were present when we started keeping track in 1968.

It is widely accepted that this decline has been primarily caused, both directly and indirectly, by humans. Habitat is the key issue. You see, the sage-grouse isn't so named because it gives wise advice; it actually gets its name from the obligate relationship it has with the sagebrush. This herbaceous plant makes up the majority of its diet in the summer and virtually 100% of it in the winter. Ever since Europeans settled the West, this habitat has become increasingly degraded.

Agricultural conversion has been the leading factor in this transformation, eliminating more than 70% of the sagebrush grassland this bird calls home.[1] In recent decades, the cultivation of native grasslands has declined, mainly because the majority of the arable farmland has already been accessed. However, agricultural intensification remains a major concern. Wetlands are being drained, remnant patches of native vegetation are being removed, and the use of herbicides and pesticides has increased. The spread of non-native pasture grasses, such as crested wheat grass and smooth brome, into remnant patches of native prairie is also a major problem.

Oil and gas development has also contributed to sage-grouse declines, especially in Alberta, where more than 1,500 wells have been drilled within sage-grouse habitat. Habitat fragmentation has been exacerbated by the vast road network that now exists across the prairies, along with fences, settlements, and many other forms of human infrastructure.

Some species, such as magpies and coyotes, can thrive the in presence of human infrastructure and disturbance. But not the greater sage-grouse. The noise created by farm equipment, pump jacks, and even highway traffic can cause the birds to abandon an area, even if it is otherwise perfectly intact.[2] This is particularly problematic when such activity is near a lek, as these predetermined annual meeting spots are required for sage-grouse to complete their eccentric mating ritual. This bird doesn't dance (and by extension doesn't mate) without a stage. Additionally, structures such as pump jacks, road signs, and power lines

A male greater sage-grouse expanding its gular sacs during its elaborate strutting display. RON HAYES

can serve as perches for predators like the great horned owl, making it easier for them to prey on sage-grouse.

As a result of these factors, sage-grouse have been squeezed into a smaller and smaller area of suitable habitat. Today, they occupy only 7% of their former range in Canada, which had previously extended over 100,000 km^2.[3] The remaining fragments are located in southern Alberta and Saskatchewan.

As if this wasn't enough, sage-grouse must now also contend with the ever-present and insidious threat of climate change in the coming years. The main concern is the effect that extreme weather events, such as droughts and heat waves, will have on the population. All of this is to say that the situation has become quite dire for our eccentric feathered friends.

What's Being Done?

The first major step in the recovery of sage-grouse was its designation as an endangered species by the Committee on the Status of Endangered Wildlife in Canada in 1998. A federal recovery strategy was published in 2008; however, it failed to identify and protect critical habitat for the sage-grouse, as prescribed by the *Species at Risk Act*. This prompted a lawsuit by four environmental groups in 2008. The suit was successful and the government was ordered to redraft the recovery strategy to include at least some of the bird's critical habitat.

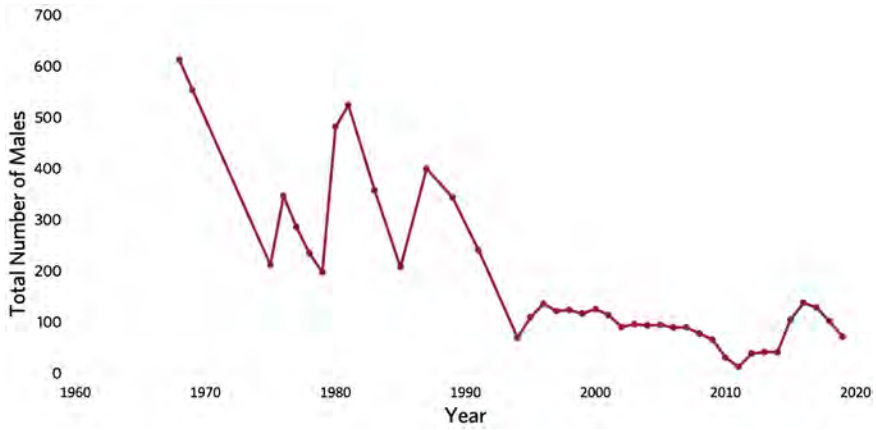


Figure 1. Total number of observed greater sage-grouse males at sampled leks across Southern Alberta, 1968-2020. The number of males counted during courtship displays at these leks are used to estimate the population of the species. ALBERTA ENVIRONMENT AND PARKS

The recovery strategy and lawsuit stimulated a lot of action behind the scenes, mainly involving research and planning. But little was done in terms of actually protecting critical habitat. All the while, sage-grouse numbers continued to decline. This prompted another lawsuit, this time requesting an Emergency Protection Order under the *Species at Risk Act*. This lawsuit was also successful, and in 2014 Cabinet issued the Emergency Order — a legal first.

While frustratingly slow in coming, the Emergency Order does offer some legal protection to sage-grouse in southern Alberta and Saskatchewan. New infrastructure development is prohibited, sagebrush and other native plants are better protected, and noise above 45 decibels is not allowed. However, the Order has nothing to say about grazing and other aspects of range management. Moreover, the protections apply only to federal and provincial Crown lands (totaling 1,672 km^2), not to private lands that occupy a large proportion of sage-grouse critical habitat. So, while the Order provides some protection and has brought much attention and funding to the sage-grouse issue, it is far from a comprehensive solution.

Another important step that has been taken to support Canadian sage-grouse

Male greater sage-grouse displaying on their mating grounds. RON HAYES

is population augmentation. Their numbers have fallen to the point that the population is now at high risk of being completely wiped out by chance events, such as a period of extreme weather. With such a small population, the loss of genetic diversity and increased risk of inbreeding also come into play.

Augmentation can involve either captive breeding of individuals for later release or translocation of individuals from an area where a larger, stable population exists. Both forms of augmentation have been used in Canada, though captive breeding has proved to be challenging because sage-grouse don't take well to captivity. The Calgary Zoo, Nature Conservancy Canada, and Parks Canada worked together to release 66 captive-bred sage-grouse in 2019. Careful planning was required to time the release of the birds in the fall, with the hope that they would integrate into the population through the winter.

Alberta Environment and Parks, in collaboration with the Montana Department of Fish, Wildlife and Parks, have completed three out of four planned translocations of sage-grouse from Montana to Canada. A total of 118 individuals have been translocated into Canada under this program. Unfortunately, the fourth translocation, which was planned for April 2020, was postponed due to the pandemic. Not to be dissuaded, these agencies plan to finish the last translocation in the spring of 2022.

Although these augmentation programs have achieved their intended goal of preventing complete extirpation in the short term, they are quite expensive and only serve to buy additional time for us to fix the real issue: repairing the habitat that we have damaged. In that regard, some significant management strategies are being implemented. For instance, efforts are being made to reclaim oil and gas sites and to remove fences and other human-made structures in sage-grouse habitat.

Sage-grouse have been squeezed into a smaller and smaller area of suitable habitat. Today, they occupy only 7% of their former range in Canada.

I reached out to Joel Nicholson with Alberta Environment and Parks, who informed me that there were reasons to be hopeful. Talking about sage-grouse recovery efforts in Canada, he said there has been a significant amount of movement in the right direction in recent years, particularly with respect to oil and gas reclamation in the sage-grouse habitat. He also told me that development on the landscape has been declining, and that, for the first time in years, reclamation has been outpacing development. Protected areas, such as in Govenlock, Saskatchewan, also continue to be created.

When it comes to ranching, research has shown that, depending on the timing and intensity of grazing, the presence of livestock can actually benefit sage-grouse populations.[4] If done correctly, cattle grazing can partially mimic the natural disturbances that were previously caused by the plains bison. This can result in greater plant diversity, which boosts habitat quality for sage-grouse and other grassland species. In the same way, bringing fire back on the

landscape, in a controlled fashion, can also be helpful. Findings such as these have led to sustainable grazing programs in selected areas like Grasslands National Park, and they reveal a potential way for local ranchers to get involved in recovering the species. The challenge now is to get these ideas implemented across the entire sage-grouse range.

In summary, while the future of the greater sage-grouse in Canada remains uncertain, we have enough tools to keep it around for years to come, especially if we are willing to implement them more widely.

What Can You Do?

In contrast to many other species at risk, scientific uncertainty is not a major barrier to recovery efforts for sage-grouse. By and large, we know what to do. Mainly, we just need to scale up and expand on what is already being done. More sage-grouse population augmentation is needed in the short term. In the longer term, more habitat needs to be recovered, either through the voluntary commitment of industry and ranchers or through the establishment of additional protected areas. Above all, awareness and support for this issue needs to be spread. That's where you come in.

Meaningful action on issues like those faced by the greater sage-grouse are often held up by both government inertia and by land users who lobby against protection. If recovery strategies for the sage-grouse are to be implemented in a meaningful and timely manner, there needs to be public support to kick-start the bureaucratic machine that took over two decades, and several lawsuits, to cobble together a significant response. Write a letter to the Minister of the Environment or your local Member of Parliament (especially if you live in southern Alberta and Saskatchewan). Support groups such as the Alberta Wilderness Association and Nature Conservancy Canada, who continue to work tirelessly to make sure we don't lose this eccentric bird. Finally, do your best to reduce your carbon emissions to help slow the changing climate. This will buy time for the sage-grouse to recover, adapt, and relocate as needed. If we want to preserve these unique parts of nature that fill us with laughter and joy, we need to do our part. This fabulous bird may not have another 20 years to wait. ■

Male greater sage-grouse are very territorial during mating season, fighting for their spot on the lek (and their opportunity to mate). RON HAYES

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Timothy Shapka is an undergraduate student at the University of Alberta finishing a combined Bachelor of Science and Education program. His love for Albertian wildlife began at his childhood campground, Floating Stone Lake, near his hometown of St. Paul. He fully expects to be an educator in one way or another for his entire life, and hopes to spread awareness of the challenges facing our local species.

Ticked Off

BY SARAH HATT

Male Rocky Mountain wood tick (*Dermacentor andersoni*). CHARLIE MYLES

As you get ready for bed, your mind wanders and you think, "Did I lock the door? Did I turn off the stove? Did I blow out that candle...?" But did you remember to check for unwanted guests that may have hitched a ride home with you on your afternoon hike? It could be that tiny pests are ready to dig in for a feast!

COVID-19 pandemic restrictions have resulted in more people heading outdoors for recreation than ever before and it is important to be mindful of the hazards that can be encountered. Risks come in all shapes and sizes. Big ones like bears, avalanches, and extreme weather conditions are readily apparent, and even smaller-scale risks, like tripping hazards from exposed roots, are fairly obvious and easily avoided. But some of the tiniest hazards, like ticks, can easily go unnoticed.

There are numerous tick species in Alberta, but the three most common are the blacklegged or deer tick (*Ixodes scapularis*), the brown or American dog tick (*Dermacentor variabilis*), and the Rocky Mountain wood tick (*Dermacentor andersoni*). Though often thought of as insects, ticks are arachnids. As such, they have just two body regions and eight legs upon maturity. It may be comforting to know that ticks are flightless and do not jump like fleas. Most tick species do not have eyes and rely on senses that can detect body heat and carbon dioxide to find hosts. Circumstances that lead to direct contact and tick transfers include walking through grasses and shrubs and contact with livestock or animals.

Most ticks do not carry diseases, and most tick bites do not cause serious health problems. But it is good to understand the risks. The most serious tick-borne illness is Lyme disease, which can cause long-term disability if left untreated. So far, Lyme disease has not been reported within Alberta; however, 132 Albertans have acquired Lyme disease over the past 30 years while travelling elsewhere.[1] Within Alberta, the main tick-borne diseases are Rocky Mountain spotted fever, Powassan virus, and tularemia. The number of cases of these diseases reported to Alberta Health is very low, ranging from 0 to 3 per year.[1]

Though the risk of serious disease is low, knowing prevention and removal methods can help ensure that you do not become ill. Tick prevention methods include:

- Avoid heavily wooded or thick grass areas if possible.
- Stick to the centre of trails to avoid rubbing against vegetation.
- Cover exposed skin with long pants, sleeves, and shoes. Tuck pants into socks to prevent ticks from crawling inside.

- Use approved DEET repellent.
- Perform tick checks on pets, children, and yourself.

After being outdoors it's a good policy to check for ticks. For children and self-checks, remember to check in and around the hairline and scalp, ears, underarms, waist, belly button, between legs, and behind the knees. When performing checks on pets, make sure to check in and around their ears, around their eyelids, between their toes, around their tails, between and under legs, and around their collars.

A few other tips and tricks to avoid bringing ticks home with you:

- Pay extra attention to shoelaces and zippers during checks.
- Keep a lint roller in your vehicle to roll over clothing and pick up ticks you may have missed.
- Rolled-up sleeves or creases in clothing make perfect hiding spots, so make sure to wash clothing in hot water as soon as you can.
- A shower is not only a great way to soothe muscles and relax after an outing, it can also help wash away any ticks you may have missed during your checks.

What if you missed one and have been bitten? Stay calm, and remove the tick as soon as possible. The faster a tick is removed, the lower the risk of contracting an illness.

To properly remove a tick, use tweezers to grasp the tick by its head, as close to the skin as possible, and pull straight out. Do not twist, because the head and mouthparts could break off within the skin, and do not squeeze the tick body. Once removed, wash the bite area with soap and water or an alcohol-based sanitizer. If you are not comfortable removing the tick, see a health care professional.

It is best not to use smothering agents (Vaseline, liquid soap, etc.), heat, or other tricks to encourage ticks to detach from a host as this may cause the tick to expel its stomach contents into the host as it makes an emergency exit. This increases the risk of contracting an infection if the tick is a carrier for diseases.

For further information about ticks in Alberta, tick surveillance, and the Submit-a-Tick program, please visit **alberta.ca/lyme-disease-tick-surveillance.aspx** ■

Ticks do not fly, jump, or drop from trees. They climb near the top of grasses and shrubs, waiting to catch a ride on animals or people that brush against them.
SARAH HATT

The female Rocky Mountain wood tick is reddish-brown with a distinctive white "shield."
DAN JOHNSON

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1. Government of Alberta, Lyme disease and tick surveillance website: alberta.ca/lyme-disease-tick-surveillance.aspx

Sarah Hatt is an aspiring wildlife biologist and Renewable Resource Management student at Lethbridge College. She has partnered with Helen Schuler Nature Centre to raise awareness of ticks and tick risk prevention to the public.

Out of Sight

How Scientists are Listening in on Nature in Alberta

BY RICHARD HEDLEY

Imagine you are a field biologist. You've been hired to conduct surveys to monitor bird populations in Alberta's boreal forest. Here are your instructions:

Drive north from Fort McMurray for exactly 95.0 kilometres and find a place to park beside the road. Put on your hiking boots (you're going to need them) and tromp northwest through the thick underbrush until you reach the shores of the Athabasca River. Inflate your pack raft (you brought one, didn't you?) and paddle to the other side. Then, follow your compass at a precise bearing of 321.6 degrees. Your destination is 64 kilometres away, but hey, the data won't collect itself. Trudge through the knee-deep fens, bushwhack through thorny undergrowth, skirt the lakes... Just keep going, you've got work to do. Given the distance, reaching your destination on foot may very well take several days, but in the absence of roads and trails, walking is really the only option. Oh, and try not to be late — you need to arrive at dawn, since that's when the birds will be singing.

Once you arrive at your destination, your instructions are to count the birds around the survey point for three minutes. In other words, you are to conduct a "point count," which is the standard method for documenting breeding bird communities.

After you've completed the three-minute count, your work is done. Start the trek back to your vehicle and take a few days off. You've earned it.

Passive Acoustic Monitoring: The Way of the Future

If the scenario described above seems impossibly inefficient, that's because it is. Simply put, sending biologists dozens of kilometres into roadless wilderness to conduct one or two short surveys is seldom practical. However, despite their inherent challenges, biodiversity surveys in remote areas are immensely valuable. One of the central goals of conservation biology is to accurately document and understand changes in biodiversity over time, and while this does not necessarily require surveys to be carried out everywhere, monitored locations should be representative of the broader landscape. In an ideal world, that means conducting surveys in remote areas and populated areas alike. Given these considerations, is there any way to efficiently collect accurate, high-quality information on wildlife in remote areas, without the need for Herculean efforts on the part of field workers?

One solution that is being rolled out at an accelerating pace is passive acoustic monitoring. Boiled down to its essence, passive acoustic monitoring is very simple: it involves little more than placing a sound recording device out in nature and allowing it to record. Left unattended, the microphones pick up bird songs, frog choruses, owl hoots, wolf howls, and any other audible sound. After a period of time — anywhere from a few days to several months — the recording unit can be retrieved, the data downloaded to a computer, and the recordings analyzed.

To best illustrate the power of this approach, imagine you are a biologist once again. As before, you've been hired to conduct surveys to monitor bird populations in Alberta's boreal forest. Here are your instructions:

Wake up in the morning, at a time that suits your fancy. Roll out of bed, put your slippers on, and prepare a pot of coffee. Shuffle to your computer, put on some headphones, open up a sound recording, and start listening. Once again, your instructions are to count birds for three minutes, only this time you will be counting them exclusively by ear. After completing the three-minute count, your work is done. Have a sip of coffee and move on to the next recording.

For interest's sake, I carried out a three-minute count at the location described in the opening paragraphs of this article. My chosen time for surveys was 5:44 a.m. on May 30, 2018, which coincides with the early breeding season for most northern Albertan bird species. The location lies dozens of kilometres from the nearest road; accessing it by foot is, as emphasized earlier, effectively impossible. Yet, even though I never left

the comfort of my desk, I can confidently assert the following: had you stood at this location at that time, on that particular morning, the first bird you would have detected was a Canada goose flapping and honking in a nearby body of water. Exactly 3.5 seconds later, your ears would have been treated to the flute-like song of a hermit thrush in the distance, followed two seconds later by the "tinkle-buzz-click" of a savannah sparrow. Over the next three minutes, you would have accumulated a list of 16 individuals of 13 bird species.

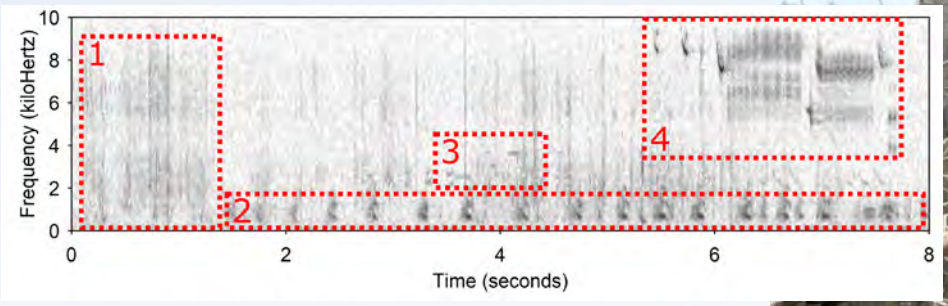
Clearly, from the perspective of the biologist conducting surveys, acoustic monitoring is a boon. Travel time is reduced to the time it takes to move from bed to desk. Bug bites and bear scares are eliminated altogether. When scaled up, a single, skilled ornithologist can survey hundreds or even thousands of locations each year across geographic regions of arbitrary size, and can do so at any time of year. In addition to allowing greater flexibility, the surveyor can work at their own pace, rewinding and replaying difficult sounds as needed, and also benefits from the visual aid of a spectrogram.

Readers may at this point be wondering, what about the birds that don't sing? To be sure, acoustic monitoring leaves the surveyor blind to their surroundings, which makes it more effective for some species than others. Ducks provide a familiar example of a group for which acoustic monitoring is not ideal. Sure, the quacks of different duck species can be distinguished by a trained ear, but the fact that ducks often congregate in large groups is a problem. The sound of a quack might reveal the presence of mallards, but whether there is a single mallard, ten mallards, or a flock of 50 lurking quietly nearby may be unknowable by sound alone.

Acoustic monitoring is thus best applied to species that vocalize frequently. Fortunately, vocal prodigiousness is a feature of most songbirds as well as many non-songbirds. To quantify the relative importance of visual versus auditory cues on bird surveys, researchers sent three experienced surveyors to conduct point counts side-by-side in the woodlands of North Carolina.[1] One observer conducted surveys blindfolded, a second observer was artificially deafened with headphones playing white noise, and a third was allowed the use of their full sensory abilities. The blinded observer detected 96% as many birds as the unconstrained observer, whereas the deafened observer detected just 3% of the total. These results show that, when it comes to bird surveys, the ear is mightier than the eye, and it's not even close.

The major drawback of acoustic monitoring — its lack of visual cues — is therefore hardly a drawback at all. On the other hand, the advantages of acoustic monitoring are substantial. First of all, the fact that trained observers need not be present in the field is worth re-emphasizing. To be sure, someone has to deploy each recording unit. However, in the remote parts of Canada, site access is often easier in the winter than in the summer. Lakes and rivers are frozen, spongy bogs are solid, and winter roads are open. With acoustic monitoring, recording units can be deployed one winter and retrieved the next. The flexibility of modern recording units allows their recording schedules to be tailored to the behavioural characteristics of each species group. Thus, a single deployment effort can record the peak activity of owls (April), frogs (May), songbirds (late May to July), and ungulates (fall). Moreover, recording units can be deployed by anyone, whether they are experienced biologists or not. Where traditional survey programs consistently struggle to find experts who can accurately conduct biodiversity surveys,

A bugling elk.
NICK PARAYKO



An example of a spectrogram. Spectrograms allow sounds to be visualized in terms of frequency and time. Darker colors indicate more sound energy at a given frequency at a moment in time. Different species and types of sounds have different characteristic patterns, which can help with species identification. The sound depicted here is the first eight seconds of the sound described in the article. Box 1: A Canada goose flapping in the water appears as chaotic noise across a wide range of frequencies. Box 2: The same Canada goose's honks appear at lower frequencies. Box 3: The song of a hermit thrush in the distance appears as horizontal lines. Box 4: This savannah sparrow sang its high-frequency song from near the microphone, hence its clarity.

An autonomous sound recording unit deployed in the field.
CÉSAR ESTEVO

passive acoustic monitoring allows fewer skilled observers to carry out a larger number of surveys from afar, aided by a field workforce with a different skill set.

Acoustic Monitoring in Alberta

Albertans may be surprised to discover that this province is undeniably a global hotspot — perhaps the global hotspot — for passive acoustic monitoring. The bulk of the effort has been spearheaded by the Alberta Biodiversity Monitoring Institute (ABMI) in partnership with the Bioacoustic Unit at the University of Alberta, led by Erin Bayne. Spurred by the recent availability of commercial recording units, cheap data storage, and efficiency gains brought about by the decreased reliance on expert surveyors, the acoustic monitoring program has expanded quickly. Collaborations have further accelerated growth: botanists, mammologists, hydrologists, and citizen scientists are being tapped to deploy recording units wherever their regular activities take them, which has allowed recordings to pour in from across the province.

Already, the passive acoustic monitoring data set that resides at the University of Alberta is enormous. Listening to all recordings continuously, with no breaks for eating, sleeping or anything else, would take about 200 years. These recordings originate from more than 10,000 locations across every part of the province. This concerted effort to record nature has resulted in one of the richest and most comprehensive biological data sets ever collected.

The recording program has two components. The first is a systematic effort that piggybacks on ABMI's broad biodiversity monitoring program involving 1,656 fixed monitoring locations laid out in a 20-km grid across the entire province. In addition to acoustic monitoring, this program employs camera traps for detecting mammals and active data collection by monitoring teams during site visits.

ABMI's systematic monitoring program is designed to provide a representative ecological picture of the entire province. The program is well-suited to detecting broad-scale changes affecting the most common species and ecosystem types. For example, the information being collected now will allow scientists to track the effects of climate change on Alberta's biodiversity.

However, with just 1,656 locations spread across the entire province, rare species and rare types of ecosystems can easily be missed. Therefore, the acoustic monitoring program has a second component that involves targeted sampling to fill in gaps. Targeted sampling aims to answer specific questions on an as-needed basis. For example, we might want to better characterize the status of an uncommon species, such as yellow rails. Or we might want to determine how specific industrial practices are affecting bird populations.

Regardless of the question being asked, the methods used are identical: deploy a recording unit and let it record. Most importantly, these recordings all end up in the same repository, a massive digital data bank that continues to grow at an accelerating pace.

Biodiversity Snapshots for the Future

Biodiversity monitoring helps scientists address both "known unknowns" and "unknown unknowns."[2] Known unknowns are those conservation issues that have already been identified. We know, for example, that rusty blackbirds have declined to roughly 10% of their former abundance, but we don't know exactly why. Research focused on determining the cause of the decline entails the study of a known unknown.

Unknown unknowns are those conservation issues that we are not aware of until they smack us in the face. An example is chytridiomycosis, a fungal disease arising in the 1990s that has decimated frog populations in many parts of the world. Multiple researchers noticed population declines at their respective study sites, but only after conversing with colleagues did they realize there was a common cause that had already gone global.

Monitoring for unknown unknowns is challenging to justify because the purpose is not defined in advance. Nevertheless, it can pay large dividends. Again, the chytridiomycosis example is illustrative. Once the fungal pathogen had been identified, researchers were able to trace its geographical origins and historical spread in great detail using museum specimens. This was only possible because museum workers around the world had regularly collected specimens—not necessarily to answer any particular question, but because they recognized that such collections might someday prove valuable for answering emerging questions of fundamental importance to conservation.

Herein lies the greatest strength of acoustic monitoring: it fulfills the dual purpose of simultaneously addressing known unknowns and unknown unknowns. In the case of ABMI's massive data set, recordings collected for one purpose inevitably contain "by-catch" that makes them relevant for other uses. For example, recording units placed in wetlands to listen for yellow rails also record myriad other species of birds, mammals, frogs, and insects, as well as human-generated noises such as car traffic and machinery. Although these ancillary sounds may be ignored in the initial project, they remain available for further study at a future date.

As just one example of how such data sets can be leveraged, I am currently working on a project using recordings from over 3,000 locations in Alberta to map the distribution of human-generated noise. Visiting these locations to collect data myself would require many years of effort and hundreds of hours of driving. But without leaving home, I have been able to peruse the acoustic database to document the patterns of human-generated noise across the entire province. The data clearly show that locations near roads are noisier than locations far from roads, and locations in remote wilderness are only exposed to the occasional airplane flyover — no surprises there. But this project will allow an estimate, for the first time, of how much noise there is and where in the province it occurs. All this from recordings made for entirely different purposes.

A singing warbling vireo. NICK PARAYKO

What exciting insights might emerge from Alberta's extensive passive acoustic monitoring programs in the future? The potential is vast, though full realization of this potential will hinge upon the extent to which computers can learn to identify sound sources using pattern recognition techniques. This is because the growth of the acoustic database is quickly exceeding our ability to process it manually. Ultimately, nobody can predict what will come of it — that's why we call them unknown unknowns. The good news is, if new threats emerge that jeopardize Alberta's biodiversity, we'll be listening.

Interested readers can visit the Bioacoustic Unit's webpage at **bioacoustic.abmi.ca** to learn more. Acoustic data processing was carried out using ABMI's online data processing platform called Wildtrax, available at **wildtrax.ca**. ■

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Richard Hedley is a postdoctoral researcher at the University of Alberta. His work explores the use of sound recordings as a tool for monitoring populations of wildlife.

Plight of the Bumble Bee

BY NICHOLAS BOYCE

RICHARD SCHNEIDER

If you have spent any amount of time outside, you've undoubtedly encountered bees buzzing around in search of flowers. Images of bees adorn honey packages in the supermarket. There is a good chance you have heard the slogan "save the bees" somewhere, perhaps on social media or on a flyer at the local coffee shop. But to clarify, which bees does this sentiment refer to? Which bees need saving?

The species most people likely have in mind when they say "save the bees" is the western honeybee (*Apis mellifera*). The honeybee has a huge impact on the modern world, both economic and ecological. In Canada, honey production in 2018 was valued at $197 million, and the economic contribution of honeybee pollination to harvest value was valued as high as $5.5 billion.[1] Because of the honeybee's economic importance and long-lasting relationship with humanity, it holds a prominent position in the spotlight.

Although the honeybee is very familiar to us, you may be surprised to learn that it is not native to North America — it was imported by the first settlers. There are, however, almost 1,000 species of native bees in Canada. These native pollinators not only provide economic value through crop pollination, but also occupy many vital ecological niches and contribute to overall biodiversity. However, they receive much less attention than the highly managed and industrial western honeybee and may even face fierce competition from the honeybee over common resources.

The Plight of the Western Bumble Bee

A species that exemplifies this issue is the western bumble bee (*Bombus occidentalis*). This medium-sized bumble bee has a characteristic yellow band on the thorax, and often a white-tipped abdomen. It is a generalist forager and does not rely on any one flower type.

A rare western bumble bee, characterized by a black body, yellow band around the thorax, and white-tipped abdomen. BUMBLEBCONS

Once widespread across much of the western United States and western Canada, the western bumble bee has undergone a dramatic decline across its range. From the years of 2004 to 2014, a decline of approximately 30% has been reported.[2] The exact mechanism of the decline is still unknown; however, several factors have been implicated.

The extensive and widespread use of pesticides is a major concern, especially the persistent pesticides, such as neonicotinoids, which started to see use in North America in the 1990s. Such pesticides leach into soil and water and circulate in the environment. Pollinators are exposed through the nectar and pollen of plants that have taken up the pesticides. Neonicotinoids are acutely lethal to insects at high dosage and at lower dosage can impair reproduction, reduce queen production and longevity, and reduce feeding.

Agriculture has also greatly reduced and fragmented the native prairie grasslands and mixed woods that the western bumble bee inhabits. Simplified

agricultural landscapes provide fewer floral resources and less diversity. Moreover, the haplodiploid genetic structure (females develop from fertilized, diploid eggs, while males develop from unfertilized, haploid eggs) of bumble bees makes them especially vulnerable to the effects of habitat fragmentation and small population sizes.

Domesticated bumble bees used in greenhouses for pollination present another concern. These working bees can pose a significant threat to native bees via pathogen spillover: the spreading of disease and parasites from domestic to wild populations. Infection rates of common bumble bee pathogen *Nosema bombi* was found to be three times higher than normal at sites near commercial greenhouses that employed domestic bumble bees.[3] The full extent of lethal and sub-lethal effects of such pathogens has yet to be characterized.

Other possible threats to the western bumble bee include climate change and competition from non-native bees, such as the domesticated honeybee. These threats remain mostly unquantified, and more research is required to assess their direct impacts.

It is doubtful that any one of these threats single-handedly caused the swift decline of the western bumble bee. Rather, it is likely that the combined and synergistic effects of these factors is what resulted in their current plight.

Who Cares?

The decline of the western bumble bee and other bees has attracted widespread attention. From the public to industry, support for pollinator protection is growing.

The agricultural industry is a major pillar of our economy, and it is the most impactful and powerful stakeholder by far. Unfortunately, conservation efforts often carry an economic cost for farmers, which may affect their support for conservation. For example, in a survey of responses to Ontario's 2014 Pollinator Health Action Plan, respondents who self-identified as farmers were 13% less likely to support regulation of neonicotinoid pesticides than other respondents.[4] That said, agricultural professionals do recognize the value of pollination as an ecosystem service, so there is some support in the industry for pollinator protection.

Pathogens, parasites and pesticides are all cause for concern. RICHARD SCHNEIDER

Commercial beekeepers, while being a part of the agricultural industry, hold a unique position. In the aforementioned study of stakeholder attitudes, beekeepers were found to be 28% more likely to support enhanced neonicotinoid regulations than other respondents. This is likely because neonicotinoids have a negative effect on managed bee colonies, and as such can cause significant economic damage to the beekeeping industry. Therefore, there are divergent views within the agricultural industry, and there exist some voices that strongly support native pollinator conservation.

The general public has shown strong support for measures that promote pollinator conservation. For example, 96% of public respondents to the Ontario Pollinator Health Action Plan were in favour of reducing neonicotinoid use for the purpose of pollinator protection. However, public understanding of bee and pollinator diversity is limited, and media attention is often directed toward domestic honeybees, rather than native bees. This could prove problematic when it comes to public support of policy implementations, since protection measures that specifically target honeybees may not provide the support needed by wild bee species.

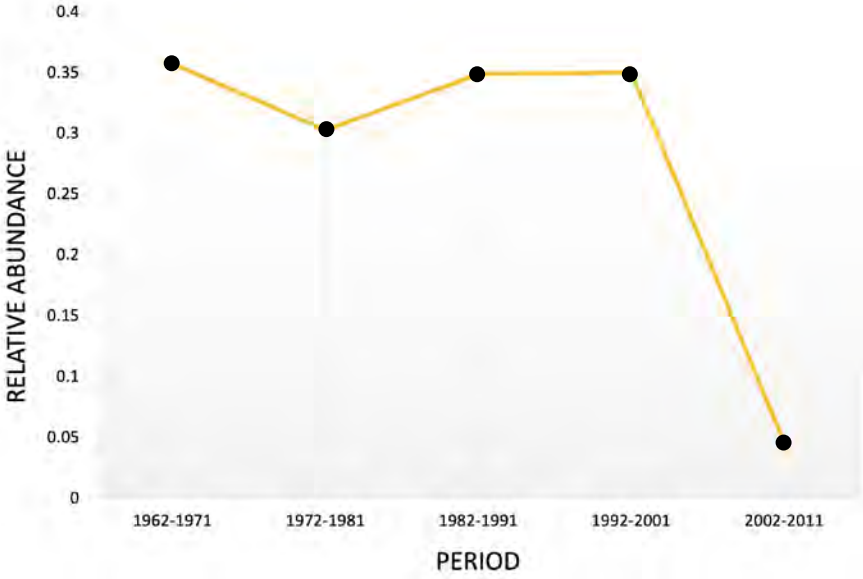

Figure 1. Relative abundance of the western bumble bee across Western Canada (BC, AB, and SK) by decade. Relative abundance is calculated as the proportion of western bumble bee specimens in all bumble bee specimens recorded for that decade. Data derived from COSEWIC (2014).

The use of certain pesticides on bee-attractive crops, such as orchards, is prohibited by Health Canada as part of the pollinator protection program. However, a full ban on neonicotinoid pesticides is not yet in place. RICHARD SCHNEIDER

Environmental groups play a pivotal role in conservation efforts. Organizations such as Wildlife Preservation Canada and the Xerces Society for Invertebrate Conservation have been critical in providing research, education, and advocacy for native pollinators. Corporate sponsors are important as well because they provide much of the funding required to run these programs. One sponsor of Wildlife Preservation Canada's bumble bee recovery program is the popular beeswax-based cosmetics company, Burt's Bees.

In summary, there is broad agreement that pollinator protection is important; however, the level of support for conservation efforts varies among stakeholders.

What Is Being Done?

There are three broad management actions that are commonly proposed for pollinator protection: pesticide regulation, implementation of agricultural best practices, and habitat protection and restoration. Each of these activities has been implemented to varying degrees.

The regulation of neonicotinoid pesticide use is currently a high-profile topic in Canada. There are three main neonicotinoid pesticides approved for use in Canada: thiamethoxam, clothianidin, and imidacloprid. As part of the pollinator protection program, Health Canada prohibits the use of these pesticides on bee-attractive crops, such as orchards.[5] The spraying of certain fruiting crops before or during bloom is also prohibited. Recently, Health Canada has implemented stronger regulations on neonicotinoids aimed at protecting aquatic invertebrates. However, an outright ban of neonicotinoids for protection of bees and other pollinating insects has not yet been issued. This continues to be a point of contention for many conservationists.

A bumble bee illustrating its prowess at pollination. RICHARD SCHNEIDER

Agricultural best practices for pollinator protection are available as a set of guidelines published by Health Canada. These include proper pesticide handling techniques, integrated pest management, and habitat protection. While these techniques are likely beneficial for pollinator health, there is no legal requirement for their implementation. It is up to individual farmers to learn about and voluntarily follow the guidelines, if they so choose. This makes it difficult to assess whether these conservation measures will be effective on a meaningful scale.

A management concern that remains unaddressed is pathogen spillover. Despite the fact that the western bumble bee has one of the highest pathogen loads of any North American bumble bee species,[2] no steps have been taken to resolve this problem. This may be attributed to knowledge gaps, as well the complexity of the threat: there is no simple solution.

Nicholas Boyce working at the Beaverlodge Bee Research unit, placing sticky boards for an ongoing study on varroa mites, a destructive bee parasite.
KATHERINE BUCHANAN

Another important gap in management is that the western bumble bee still lacks legal protection under the *Species at Risk Act*. Though it was assessed as Threatened by the Committee on the Status of Endangered Wildlife in Canada in 2014, it is still waiting to be officially listed. Formal designation and the associated development of a federal recovery plan will be crucial for the implementation of habitat protection and other more stringent management actions.

What Can I Do?

There are several ways you can help in the efforts to save the western bumble bee and other native bees. One is supporting environmental groups that have active programs for pollinator protection. Wildlife Preservation Canada has several active programs, including conservation breeding and the monitoring of at-risk populations. The Alberta Native Bee Council (**albertanativebeecouncil.ca**) promotes the conservation of native pollinators across Alberta. There is also a community science program, Bumble Bee Watch, that empowers the public to aid in bumble bee conservation efforts. You can learn more about ways to get involved at **bumblebeewatch.org**.

While the situation may appear grim for our bees, it is not all doom and gloom. One recent victory for native bee conservation in Alberta was the discovery of a pair of gypsy cuckoo bumble bees (*Bombus bohemicus*) in Calgary's "bee boulevard." The boulevard is a project that aims to provide high-quality pollinator habitat in the heart of the city. The gypsy cuckoo was designated as Endangered in 2014, so its appearance is a sign that the project is headed in a good direction.

The story of the western bumble bee is not a unique one. There are many other native bee species out there that need our help to overcome the threats for which we, knowingly or unknowingly, are ultimately responsible. The growth of public awareness and concern is an encouraging sign but this now needs to translate into meaningful conservation actions. We can only hope that none of our bees are too far gone to save from extinction.

So now when you hear, "save the bees," think not only of the honeybee, but the hundreds of native bee species that are facing the same threats, as well as their own unique challenges. We must see beyond the economic and agricultural value of bees and recognize the ecological value and diversity of our native species. ■

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Life in a Warmer World

Time Travelling into Alberta's Future

BY RICHARD SCHNEIDER

By now, we all know that our climate is warming and will continue to warm until we manage to rein in our emissions of greenhouse gases. We have also heard about the many ways that climate warming will impact our lives — droughts, increased wildfires, rising sea levels, and so forth. But what's in store for all the other species that share our planet? Is it bad news all around? For naturalists and conservationists, these are questions worth asking.

As one might expect, there is no simple answer. Each ecosystem and species will respond to climate change in its own way. Furthermore, the rate of change and the total amount of warming will make a big difference. Let's travel forward into the future of Alberta for a glimpse of the ecological changes expected under both a best-case and a worst-case warming scenario.

How Warm Is It Going to Get?

The basic principle underlying global warming is well understood — increased carbon dioxide (CO_2) and other greenhouse gases in the atmosphere act like a blanket, trapping more of the sun's heat at the earth's surface. You can demonstrate this at home with a jar, thermometer, and some dry ice. But making predictions at the global scale is challenging because there are many feedback loops that have to be accounted for. For example, the progressive melting of the Arctic sea ice turns a white surface that reflects sunlight into a dark surface that absorbs sunlight, speeding the rate of warming. Climate researchers around the world have been grappling with these complexities for decades, building ever more sophisticated climate models. None of these models can be considered fully reliable, however, collectively they provide useful guidance on what we can expect at different levels of greenhouse gas.

The largest uncertainty does not involve the physics of the process, it is estimating how much more CO_2 human society will emit in coming years. Social and political processes are in play and the outcomes are difficult to anticipate. Therefore, climate scientists generate their climate predictions across a range of potential emission pathways, from the best case to the worst.

In Alberta, the best-case scenario translates into a rise of roughly 2°C in the average annual temperature by the end of this century.[1] This may not seem like much, but bear in mind that the difference in average temperature between the dry grasslands around Calgary and the parkland ecosystem around Edmonton is just 2°C. Another 2°C puts you deep into the boreal forest around Fort McMurray.

It is harder to predict outcomes under the worst-case scenario. There is more potential for surprise when greenhouse gas levels are so much greater than in the recent past. For Alberta, a rise of 6°C in average annual temperature seems likely under this scenario, and some models suggest the rise could even be higher.[1]

Figure 1 illustrates Alberta's predicted temperature zones under the best-case and worst-case scenarios, compared to the current zones. In the best case, temperatures in southern Alberta will resemble those currently found in southern Montana. Much of the boreal region will experience temperatures now found in central Alberta. Under the worst-case scenario, southern Alberta will experience temperatures similar to the hottest parts of Idaho. And temperatures at the Northwest Territories border will be similar to those now found in Lethbridge.

Ecological Responses

Scientists have developed sophisticated models to predict how ecosystems and species will respond to warming temperatures.[2] However, the basic patterns of change are easy enough to predict without a computer model. If you want to characterize the biodiversity likely to be found in a given location when average temperatures

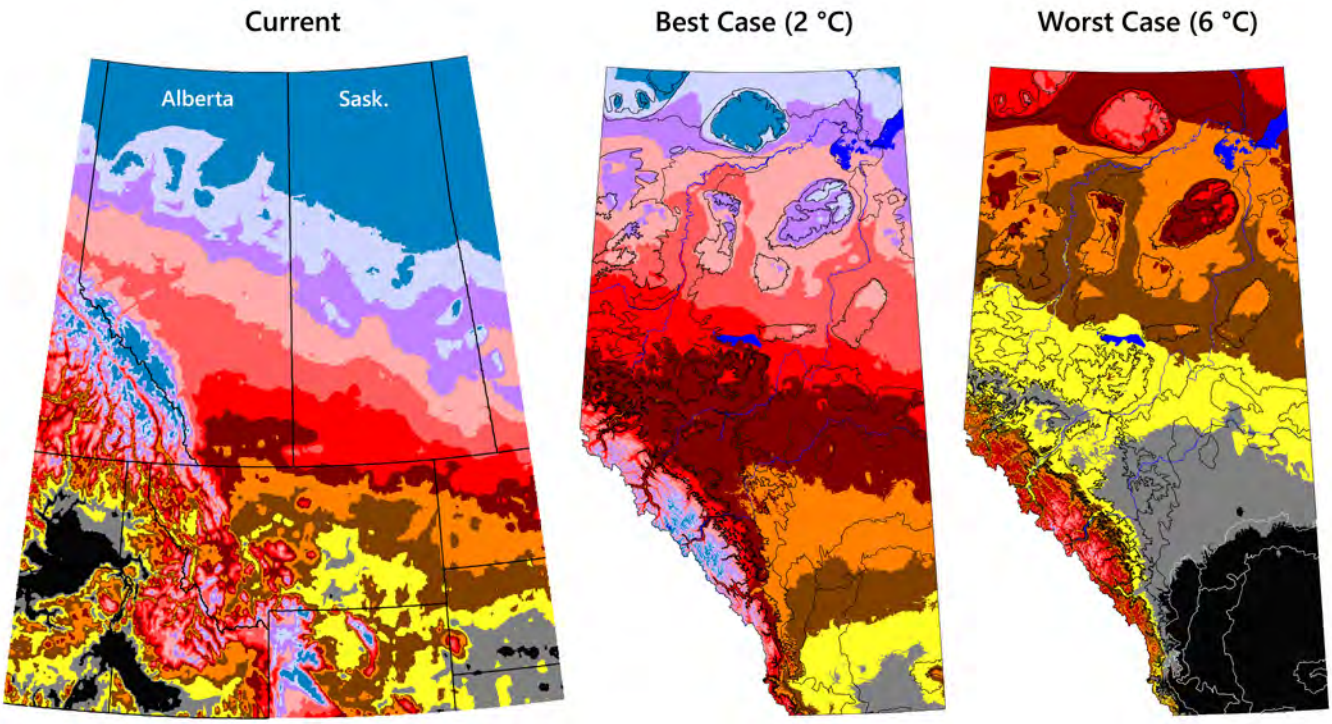

Figure 1. Temperature zones in Alberta, comparing today with predicted temperature distributions in 2080 under the best-case and worst-case scenarios. Adapted from Schneider 2013.[1]

are 2°C warmer, travel south to a similar landscape where that temperature already exists and look around. In a mountainous area, walk down to a lower elevation.

The underlying assumption is that climate is the main driver of broad ecological patterns. This is a well-established ecological principle and it implies that species and ecosystems will shift their distributions in response to long-term climatic change. We have good evidence of this in pollen records from 4,000 years ago, when Canada was 2–3°C warmer than today (the Hypsithermal Period).[3] These pollen records suggest that our grassland, parkland, and boreal zones were all farther north than they are today. We have every reason to expect that the same thing will happen under the current episode of warming, at least under the low to moderate scenarios. The worst-case scenario takes us into uncharted waters and it is harder to be sure of what will happen.

So what are the key predictions about future ecological patterns? To begin, at the national scale, overall species diversity is expected to increase as the climate warms. If you have ever watched a David Attenborough movie, you know that the place to find high levels of biodiversity is in the Amazon rainforest, not in Canada, where only the hardiest species can survive. The general rule is that species diversity increases the closer you get to the equator. Therefore, as the Canadian climate becomes less harsh, and species shift northward, we can expect a boost in species richness at all latitudes.

At the regional scale, the patterns of change will be more complex, as the northward shift in ecosystems is affected by regional topography. Regional precipitation patterns will also play an important role, especially in Alberta where much of the boreal region is near the tipping point between forest and open grassland.[4] This is evident in the grasslands that lie along the Peace River in northwestern Alberta (the city of Grande Prairie was not named by accident). These grasslands exist wherever precipitation inputs are insufficient to support a forest.

The fact is, precipitation inputs across most of northern Alberta are no higher than in the region between Edmonton and Calgary. The reason the north is mostly forested, whereas the Edmonton-Calgary corridor is not, is because the north is cooler,

High Level, Alberta lies along the Peace River and supports a farming community even though it is just 150 km south of the NWT border. A. MCPHEE

meaning less evaporation and more retained soil moisture. The Peace River Lowlands are right at the tipping point. Precipitation is the same as the surrounding boreal plain, but the lower elevation of this region results in slightly warmer temperatures — just enough to result in grasslands in some spots.

The implication is that it wouldn't take much warming to reach the forest/grassland tipping point across a vast area, and this is exactly what is expected to happen. As temperatures rise, a large proportion of the boreal forest is destined to progressively transition to parkland habitat and eventually open grassland. The southern boreal fringe will transition first, followed by lower-elevation areas across the north. The end result will depend on how much warming eventually occurs. Under the best-case scenario, northern Alberta will become a complex mosaic of closed forest, parkland, and open grassland (Figure 2). Under the worst-case scenario, it is likely that only the highest elevation sites, such as the Caribou Mountains, will remain forested.

As the boreal forest contracts, Alberta's parkland and grassland regions will expand northward. In southern parts of the province, we can expect new grass species to arrive from the northern U.S. Again, the amount of change will depend on how much warming occurs. Under the best-case scenario, the ecosystems of southern parts of Alberta may eventually resemble those of southern Montana. Uncultivated landscapes would continue to exist as grasslands, but with a different mix of species. Under the worst-case scenario, the high temperatures would cause pronounced drying and significantly reduced levels of soil moisture. This would result in a transition to the sagebrush ecosystems currently found in parts of Idaho and Wyoming. The extent of prairie pothole wetlands would also be greatly diminished.

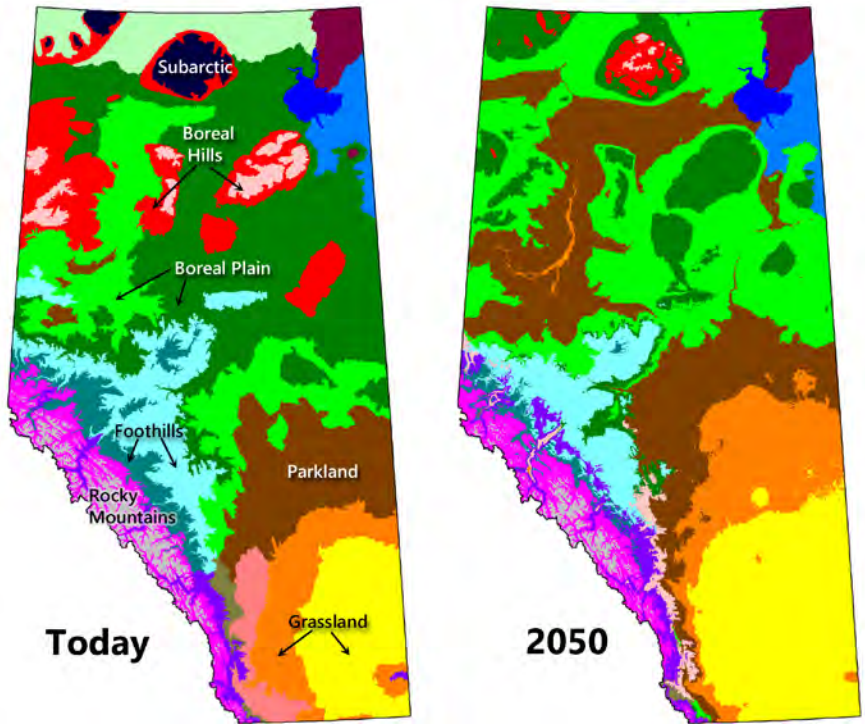

Figure 2. The current distribution of Alberta's major ecosystem types (left) and projections of these ecosystems for the 2050s (right) under an intermediate climate change scenario. Note that the actual ecological transitions will lag decades behind these temperature-based predictions. Adapted from Schneider and Bayne 2015.[5]

In the mountains and foothills, moisture limitation is not expected to be an issue, so major ecosystem changes are not expected. Instead, existing ecosystems will progressively shift upslope as temperatures warm. The ecosystems found at the highest elevations are likely to contract because they have limited options for moving any higher.

It should be noted that none of these changes will happen quickly. Ecosystem changes will lag well behind climatic changes, especially where long-lived tree species dominate. Mature trees are quite hardy and able to withstand suboptimal conditions. Think of the coniferous trees planted around farmyards in southern Alberta, far outside their normal range. It is not until trees are killed, typically by fire, that a transition to other species can occur. And this will take considerable time (i.e., decades).

It should also be understood that existing ecosystems will not move as intact units. Figure 2 reflects the distribution of ecosystems far in the future, after all species have equilibrated to the new climatic conditions. However, during the transitional phase, which is likely to last well into the next century, ecosystems are likely to exist as complex hybrids of old and new, as some species race ahead and others lag behind.

In summary, as the climate warms we can expect that some ecosystems will expand and others will contract. But overall, productivity and diversity should increase as our harsh climate moderates. This news is especially positive for grassland species, which account for three-quarters of Alberta's species at risk. Most of these species are at the northern edge of their range in Canada. A warmer climate will suit

them better and will also provide the potential for northward expansion.

Caveats

Implicit in the above description of ecological changes is the assumption that plants and animals are able to shift their ranges in response to changing conditions. We know that all Canadian species have this capacity, otherwise life could not have returned to Canada after it was scraped clean by Ice Age glaciers. But humans have profoundly impacted natural systems over the past century, so caution is warranted. We can't assume that all natural processes still function normally.

Species at risk are a major concern. These species are struggling just to remain viable under current conditions. Add in the need to withstand increased climate variability, such as droughts and floods, while also shifting their range northwards and climate adaptation seems a bridge too far. These species are unlikely to accommodate climate change without considerable support.

Species at risk, such as the burrowing owl, will struggle to adapt to climatic changes because they have little remaining resilience. G. COURT

Barriers to movement are another concern. During past episodes of climatic change, species were able to move without restriction, allowing range adjustments to take place. Today we have highways and cities like Canmore along major wildlife travel routes. On the prairies, cultivated agricultural landscapes present a broad barrier to species range shifts. It follows that enhancing landscape connectivity needs to be a major thrust of future conservation efforts.

We also need to consider the rapid rate at which the climate is currently changing, which is much faster than in earlier post-glacial episodes. It is quite possible that some species will lack the capacity to respond quickly enough. Species with low dispersal ability or low rate of reproduction may find themselves left behind in unsuitable environments. Assisted migration, where managers physically move species northward, is being explored as a potential solution. However, it is unlikely we would ever have the capacity to do this for more than a select group of species.

Where Do We Go from Here?

In the final analysis, much will depend on how much warming ultimately occurs. The proportion of species "left behind" may be relatively small under the best-case scenario, assuming that management efforts are made to reduce barriers to movement and actively assist highly vulnerable species. This is good to know, given that a rise of at least 2°C seems inevitable at this point.

The story is much different for moderate to high levels of warming. Here we move into uncharted territory, and widespread adaptation failure is a real possibility. This is an outcome that must be avoided at all costs through concerted global efforts to rein in our greenhouse gas emissions. The shift in societal attitudes over the last few years, resulting in more examples of meaningful action, is encouraging. However, emissions remain well above the best-case scenario, which means that much more effort is needed. We all need to do our part to make this happen. ■

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Richard Schneider is the Executive Director of Nature Alberta and technical editor of *Nature Alberta Magazine*. He previously worked as a senior scientist with the Biodiversity Conservation Chair at the University of Alberta, where he investigated the ecological effects of climate change among other topics.

Local Action, Global Connection

On Beaver Hills Becoming a Biosphere Reserve

BY GUY S. SWINNERTON

On March 19, 2016, the United Nations Educational, Scientific and Cultural Organization (UNESCO) recognized the Beaver Hills as a Biosphere Reserve because of the region's accomplishment in demonstrating sustainable development and how people can live, work, and play in harmony with nature. The Beaver Hills Biosphere Reserve joined the existing international network of 651 biosphere reserves across 120 countries. It became the 18th site in Canada's network, and the second in Alberta with the Waterton Biosphere Reserve having been designated in 1979.On the fifth anniversary of this international recognition, we look back at the context and process of this achievement with appreciation for the level of commitment demonstrated by all involved stakeholders.

The Beaver Hills

The Beaver Hills-Cooking Lake Moraine is located on the eastern periphery of the Edmonton Capital Region. The Beaver Hills lies within the counties of Strathcona, Beaver, Lamont, Leduc and Camrose. This distinctive morainal landscape — formed by sediments deposited by a receding glacier over 10,000 years ago — covers an area of almost 1,600 km2. At its highest point the moraine rises to over 100 metres above the surrounding prairie parkland. The hummocky, "knob and kettle" terrain supports extensive forest cover and abundant native wetlands. Ecologically, the moraine is a disjunct extension of Alberta's Dry Mixedwood Boreal Natural Subregion — essentially an "island" that is surrounded by the Aspen Parkland Natural Subregion.

Safeguarding the natural landscape of the Beaver Hills represents some of the earliest examples of conservation in Canada. Almost 30 percent of the Beaver Hills is currently protected. Much of the Beaver Hills remains in natural upland cover (approximately 55%) or surface water (14%) and exists in marked contrast to the more anthropogenic landscape of the surrounding Parkland. The region is a culturally important landscape with a rich legacy and continuing significance for First Nations and Métis. The area also exhibits evidence of early European settlement and the more recent footprint of a rapidly expanding urban society.

The Genesis and Early Years of the Beaver Hills Initiative

Located within commuting distance to the City of Edmonton, the Beaver Hills has become a highly sought-after destination for residential space and outdoor recreation opportunities. By the early 1990s there was growing concern over the long-term future of the essentially natural and rural landscape.

The catalyst to establish the Beaver Hills Initiative (BHI) occurred in early 2000 with a proposal for oil and gas development adjacent to Elk Island National Park. Discussions took place between Parks Canada, the five municipalities, and other interested parties. The intention was to adopt a more co-ordinated and long-term approach to ensure the ecological health and landscape character of the Beaver Hills as well as the quality of life of the region's inhabitants (Swinnerton 2006, 2012a).

A Beaver Hills focus group involving 38 participants representing all institutions and land management interests in the moraine was held on September 9, 2002. The BHI was based on voluntary collaboration guided by the vision: "The BHI values the region for its natural beauty, quality of life, and supports co-operative efforts to sustain the quality of water, land, air, and community development." Its mission was stated as: "Working together for a sustainable region, though shared initiatives and co-ordinated action."

GUY S. SWINNERTON

From the early stages of the BHI there had been implicit acknowledgement amongst some members that the Beaver Hills appeared to meet the criteria for seeking designation as a biosphere reserve. In January 2009 the BHI Board gave approval for the BHI's Protected Areas Working Group to commence preparing the nomination. This decision was based on the conviction that the Beaver Hills was a special place worthy of wider recognition. Moreover, seeking the nomination would help focus and confirm the collective commitment of BHI members to the vision and mission of the BHI.

Biosphere Reserves: Form and Function

In 1971, the UNESCO had launched the Man and Biosphere (MAB) Programme, which aimed to establish a scientific basis for the improvement of relationships between people and their environment. Sites selected to demonstrate the MAB ideals were to be referred to as "biosphere reserves." They were envisioned as having three complementary functions: conservation, development, and logistic support. They would comprise a strictly protected core zone(s) and one or more buffer zones. The outer buffer zone subsequently became referred to as the transition zone (See Swinnerton 2012b). Over time there have been changes in emphasis, including increasing attention to cultural diversity and Indigenous peoples, and the importance of transition zones for demonstrating sustainable development practices within lived-in and working landscapes.

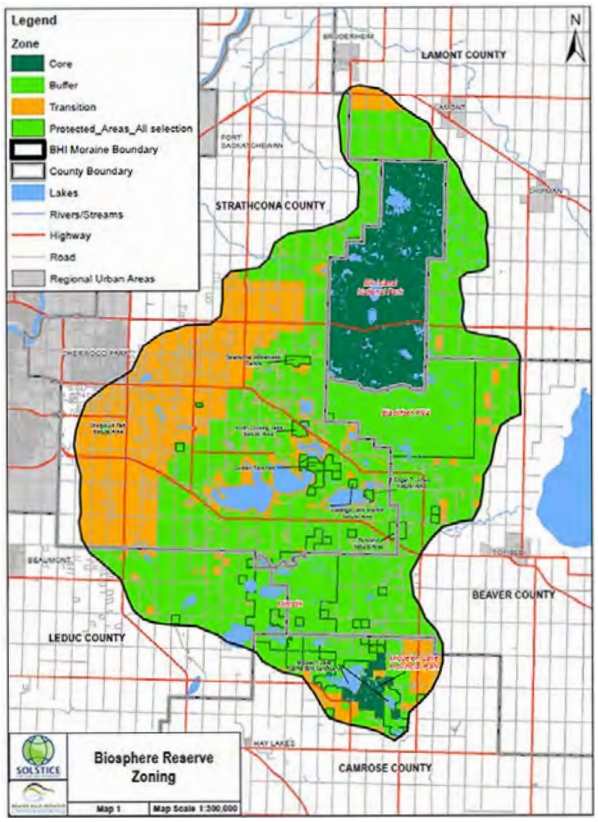

Figure 1. The Beaver Hills Biosphere is made up of numerous land types with varying levels of protection.

In *A Guide to Being a Biosphere Reserve in Canada* (2018), Peter Kingsmill noted that "It is not easy to create a biosphere reserve... in Canada it takes an average of eight years for an area to be designated." In the case of the Beaver Hills it took almost precisely eight years to achieve the designation. To meet the rigorous standards of the designation, candidate areas must be effectively functioning successfully as biosphere reserves, in all but name, prior to a nomination even being submitted.

Nomination Procedure and Criteria

Biosphere reserves are nominated by national governments and must adhere to a prescribed designation procedure. In addition, nominations must demonstrate that the candidate area meets the criteria for designation as a biosphere reserve, as established in UNESCO's *The Statutory Framework of the World Network of Biosphere Reserves* in 1995.

Top: Group Photo taken at Elk Island National Park towards the end of the celebratory event on September 9, 2017. PHOTO COURTESY OF THE BHI

Below: Guy Swinnerton with Meriem Bouamrane Programme Specialist, UNESCO/MAB Paris, with the Charter at Elk Island National Park. PHOTO COURTESY OF THE BHI

Article 4 of the *Statutory Framework* specifies seven criteria that may be summarized as encompassing two major components. First, the proposed biogeographical region must be of biological significance with high biodiversity, and of adequate size to demonstrate the three biosphere reserve functions through appropriate zoning. The second major requirement focuses on the need to have organizational arrangements involving all relevant stakeholders and that there is a management policy or plan for the proposed biosphere.

The Biosphere Reserve Nomination Form provided the template for submitting the necessary information and data. Equally important was the need for the nomination to take into account existing UNESCO/MAB priorities.

Although the BHI's Protected Areas Working Group assumed the lead role in preparing the submission, the nomination required the commitment, cooperation, and support of all BHI members, government and environmental agencies, and other interested parties. The completed nomination documentation was submitted to the Canadian Commission for UNESCO (CCUNESCO) for preliminary review in September 2012.

On December 12, 2012, CCUNESCO notified the BHI that although the Commission was very impressed with the nomination, there were three concerns that needed to be addressed: 1) more engagement with First Nations; 2) stronger engagement with the local population; and 3) a clearer explanation of the local and global benefits of the Beaver Hills becoming a biosphere reserve.

Revised Requirements for a New Nomination

Although members of the BHI were understandably disappointed by the CCUNESCO's decision, sufficient positive feedback had been provided to encourage the BHI to prepare a new nomination. The insights and mutual learning that had taken place during the preparation of the first nomination had enhanced immeasurably the capacity of the BHI to submit a stronger second nomination. The BHI's Protected Areas Working Group again assumed the lead role with involvement from the BHI Board, Executive Committee and other Working Groups.

In January 2013, UNESCO/MAB introduced a new nomination form that included the need for more specific information on all aspects of governance, the human dimensions of biosphere reserves, ecosystem services, and the monitoring of the effects of human intervention and actions on the landscape.

The BHI commenced preparing a new submission in early 2013. For the next two years, along with the work of completing the nomination document,

the BHI focused on strategies and projects that would enhance the strength of a resubmission. For example, the BHI's *2012-2015 Business Plan* included current and proposed projects such as *Land Management Framework: A Guide to Achieving Sustainable Development in the Beaver Hills* (2014) and the *State of the Beaver Hills Report* (2015). Projects undertaken by individual BHI members as well as agencies such as Parks Canada, Alberta Parks, the counties, and the Nature Conservancy of Canada, as part their respective mandates, also made significant contributions to the strength of the submission.

The BHI initiated an Indigenous engagement strategy and a public involvement campaign that included a communication plan for the biosphere nomination. The communication plan involved over 30 presentations and social media portals were used for public engagement. Seventy-eight letters of support were received, including ones from the Confederacy of Treaty Six First Nations and the Métis Nation of Alberta.

Submission of a New Nomination

By May 31, 2015, the BHI's second nomination was submitted to CCUNESCO. It was a substantial tome comprised of a 272-page nomination form and 258 pages of supporting appendices.

In early October, CCUNESCO notified the BHI that the Beaver Hills nomination had been approved by CCUNESCO/MAB and that it had been forwarded to UNESCO's Secretariat in Paris for subsequent review by the International Advisory Committee for Biosphere Reserves (IACBR).

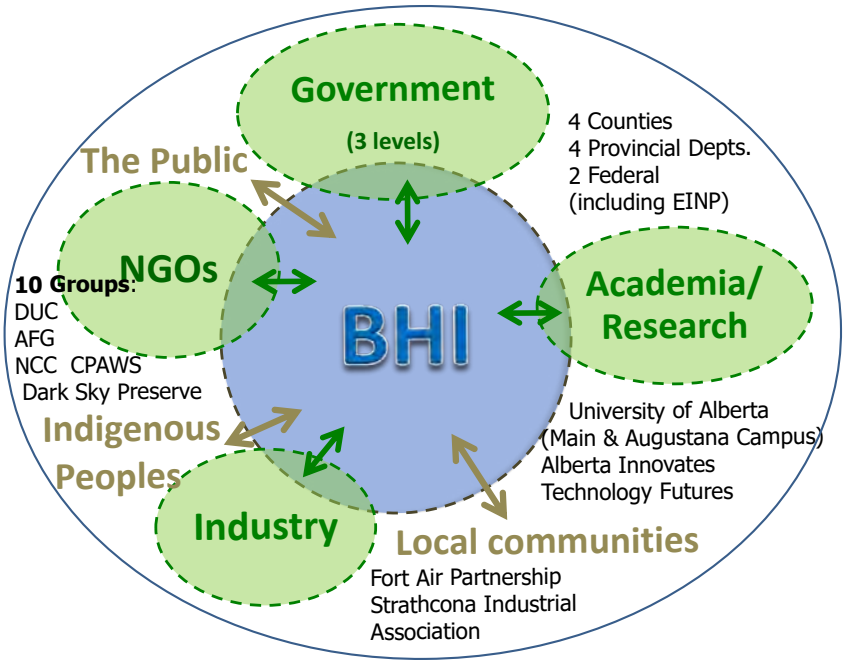

Figure 2. As illustrated in the 2016 Beaver Hills Initiative Partnership model, many people and organizations worked in concert to acheive this designation.

At the beginning of February 2016, the BHI was notified by CCUNESCO that the IACBR had reviewed the Beaver Hills nomination and would be recommending its approval to the International Co-ordinating Council of the Man and Biosphere Programme (ICCMAB) pending the submission of additional information related to three issues: 1) zoning within the biosphere reserve; 2) the control of rural subdivisions; and 3) dealing with urban expansion. The second and third issues were readily addressed by a more detailed explanation of land-use planning in Alberta. The issue of zoning and the IACBR's insistence that the two core areas of Elk Island National Park and Miquelon Lake Provincial Park be completely surrounded by buffer zones required the identification of additional buffer areas. The final biosphere reserve zoning map submitted at the end of February delineated a core of 13.6%, a buffer of 61.5%, and a transition zone of 24.9%.

Nomination Success

Submission of the additional information resulted in the ICCMAB making the decision on March 19, 2016, at its 28th Session held in Lima, Peru, that the Beaver Hills nomination be approved. The Beaver Hills Biosphere Reserve became a new member of the World Network of Biosphere Reserves (WNBR).

On September 8, 2017 at the Strathcona Wilderness Centre, the Beaver Hills Biosphere Reserve Charter was officially presented to BHI representatives by a senior member of UNESCO/MAB Paris who was accompanied by senior representatives

from CCUNESCO, Canada MAB, and Redberry Lake Biosphere Reserve. The following day a more public celebration of the presentation was held at Elk Island National Park.

The Beaver Hills Biosphere

Being designated a biosphere reserve and becoming part of a global network was tremendously rewarding for the commitment of time and energy by all BHI members and the wider Beaver Hills community — and provided a welcome sense of relief at the conclusion of a near 20-year effort. However, in a sense, achieving the designation was not a conclusion, but rather a beginning. Becoming a biosphere reserve represents an ongoing responsibility to both the local and global community to demonstrate good stewardship and sustainable practices on an ongoing basis. Going forward, addressing issues relating to Indigenous peoples, climate change, declining biodiversity, and the impact of urbanization is especially critical.

In September 2019 the Beaver Hills Biosphere Reserve Association was incorporated as a society. More recently, in March 2021, a new website, **beaverhills.ca**, was launched, providing an extensive and invaluable source of information on the Beaver Hills, the Beaver Hills Biosphere, and UNESCO's biosphere reserve programme.

As a member of a global network, the Beaver Hills Biosphere Reserve is able to contribute to as well as benefit from a deep well of collective knowledge; the network today includes 714 biosphere reserves in 129 countries. The designation represents international recognition of responsible stewardship at a local level, increasing the Beaver Hills' visibility and helping to attract funding and research. This enhanced profile will help uphold our commitment to a sustainable, total-landscape approach to living in harmony with nature in the region, now and into the future. ■

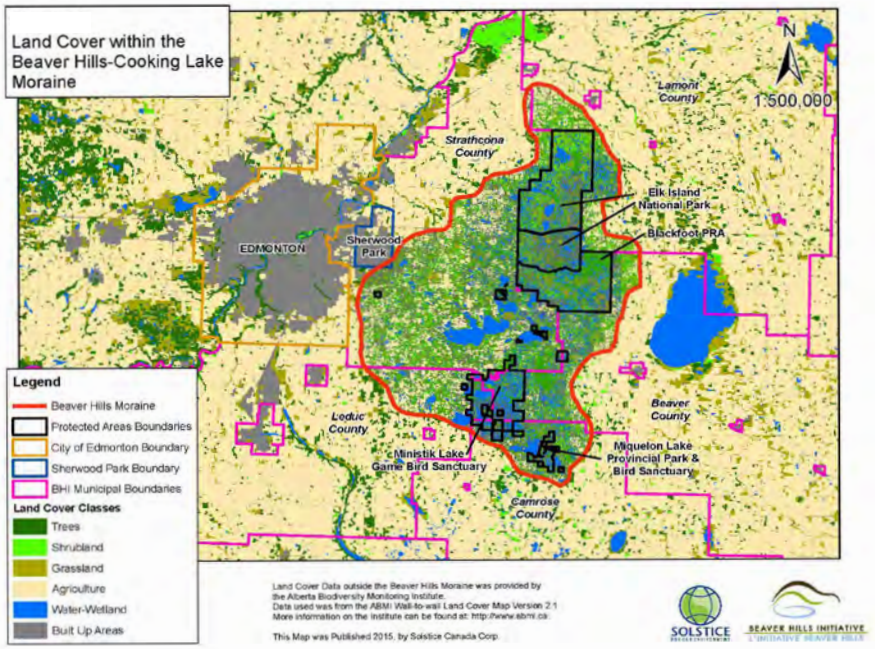

Figure 3. Land cover map, taken from the Beaver Hills Biosphere Reserve nomination (2015) submitted to UNESCO in February 2016.

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Guy Swinnerton, PhD, FRCGS is a Professor Emeritus in the Faculty of Kinesiology, Sport and Recreation at the University of Alberta and has nearly 50 years of academic and professional experience with parks and protected areas. A longtime advocate for a Beaver Hills Biosphere Reserve, he was involved with the Beaver Hills Initiative from its inception. He served on the BHI Board, Executive Committee, and chaired the BHI's Protected Areas Working Group during the preparation of the Beaver Hills Biosphere Reserve nomination.

Rare Alberta Birds Get Close Scrutiny

BY JOCELYN HUDON

The Alberta Bird Record Committee (ABRC) is the body responsible for evaluating records of rare birds in the province. It periodically publishes the results of its deliberations, and its newest report, the thirteenth in the series, is now available at: **bit.ly/abrc-13threport**. The report documents the Committee's decisions on almost 90 records of bird rarities that have been recorded in the province over a span of about six years.

The Committee evaluated a variety of records, including rare occurrences that may be early indications of a species moving into the province, rare but predictable vagrants whose patterns of vagrancy are being clarified, and stragglers that may never appear again. The new report details several recent Alberta records of Brant geese, white-winged doves, hummingbirds (black-chinned, Costa's and broad-tailed), red-bellied woodpeckers, and noteworthy sightings of common eider, little blue heron, crested caracara, lesser goldfinch, blue-winged and prothonotary warblers.

With this report, the *Official List of the Birds of Alberta* grows by eight species: tundra bean goose, Vaux's swift, broad-tailed hummingbird, western gull, ash-throated flycatcher, eastern yellow wagtail, sagebrush sparrow, and blue grosbeak. The new stragglers include species from both the Palearctic region (tundra bean goose and eastern yellow wagtail) as well as from south of Alberta (the others). Confirmation of glossy ibis in the province will have to await examples that show no suggestion of past hybridization with the white-faced ibis.

Of particular note is the addition of Vaux's swift to the list based on two sets of good photographs. Many observations of *Chaetura* swifts in the province have long been suspected to be of this species, but awaited convincing documentation. The species breeds in British Columbia and in Montana and should be the one expected in adjoining Alberta.

Broad-tailed hummingbird, Beaver Mines.
GORDON PETERSEN

The provincial list now stands at 433 species, with the loss of one species resulting from the lumping of Thayer's gull into the Iceland gull. The provincial list is also amended to bring it in line with several recent supplements to the American Ornithological Society's *Checklist of North and Middle American Birds*. This includes changing the English name of the gray jay back to Canada jay. See the complete list of birds at: **bit.ly/ram-birdslist**.

Birders take note: The Committee maintains a list of species of interest that should be documented by anyone lucky enough to see them: **bit.ly/ram-abrc-reviewlist**. We encourage birdwatchers to regularly check the list as it is continually updated. A form to document rare bird sightings can be found at: **bit.ly/ram-rarebirdform**.

Western gull, County of Grande Prairie.
SYLVAIN BOURDAGES

Sadly, since publication of our last report we lost our esteemed colleague and friend Brian Ritchie to a heart attack. He will be dearly missed. With recent additions to the Committee it now consists of M. Ross Lein, Ray Wershler, John Riddell, Gerald Romanchuk, Caroline Lambert, David Scott, and myself (as Chair). ■

Jocelyn Hudon, PhD has been Curator of Ornithology at the Royal Alberta Museum for almost 30 years. Over 25 years ago he put the ABRC together and has been its chair ever since.

Nature Kids

My BIG Alberta Backyard

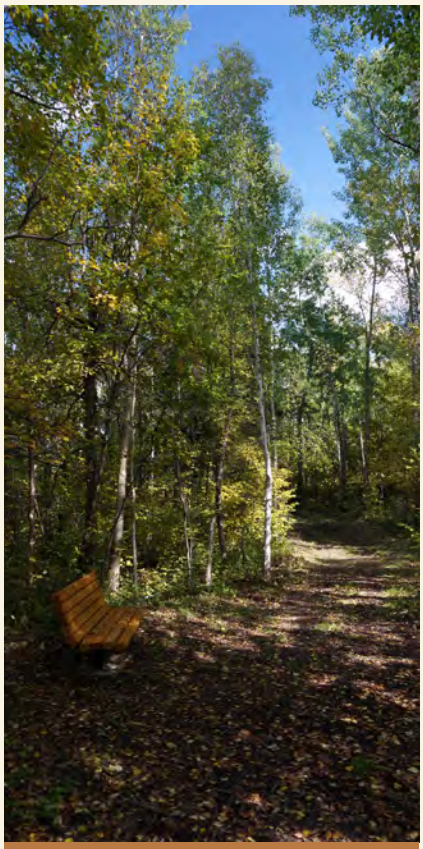
BY STEPH WEIZENBACH, NATURE NETWORK COORDINATOR

Alberta is a great place to live. It's a big beautiful province full of all kinds of natural wonders. This is where we introduce you to the diversity of wildlife, and unique and interesting wild spaces, that are part of your Big Alberta Backyard. This time, let's explore the **Beaver Hills Biosphere Reserve**.

Enjoy the view from inside a canoe! Paddling on Astotin Lake in Elk Island National Park is a memorable way to experience the area. SUSAN MAY

What is a Biosphere Reserve?

A Biosphere Reserve is an area where biodiversity — wild variety of plants and animals — meets sustainable development. The Beaver Hills Biosphere Reserve has a protected core, buffer zone, and transition area, all with an emphasis on conservation. It is an area where people come together to work, live, and play among ecologically important places while conserving the environment — keeping the plants, animals, air, water, and land healthy.



The Beaver Hills Biosphere Trail near the Strathcona Wilderness Centre is a beautiful place to explore in any season. KILEY MARCHUK

Beaver Hills Biosphere Reserve

Ten thousand years ago, the Beaver Hills region was covered by a huge sheet of ice over one kilometre thick. As the glacier receded (melted and shrank), it changed the landscape underneath it. The glacier deposited piles of rocks, rubble and dirt which make up the hills of the area today. The meltwater settled into depressions, creating ponds. This resulted in the "knob and kettle" moraine as we know it now. The landscape is a mixture of prairie pothole wetlands, lakes, and forest. It is a special transition zone between the southern parkland and northern boreal forest regions, making it home to a rich variety of plants and animals.

Dark Sky Preserve

The Beaver Hills Biosphere Reserve is a great place to go stargazing. The area is a dark sky preserve, where artificial light is kept to a minimum to reduce light pollution.

Reducing light pollution helps us all get a better view of the night sky, but that's not all. Too much artificial light disrupts the natural activities of

Grebe Pond bridge in Miquelon Lake Provincial Park. C. NEATH

animals and even affects how plants flower and grow. The right amount of darkness makes for a healthier ecosystem.

You can reduce light pollution at your own home! Use shielded light fixtures and make sure they are directed downward. Using light timers and motion sensors will reduce the amount of time your lights are on.

Any clear night is a great chance for stargazing in the Beaver Hills Biosphere Reserve. Camp out this summer at Elk Island National Park or Miquelon Lake to enjoy the stars and the great outdoors. The Perseid meteor shower is an annual event that fills the sky with shooting stars each summer. The spectacular show occurs from July 17 through August 26, peaking on August 11 and 12. ■

Did you know there are two species of bison at Elk Island National Park? Herds of both plains bison and wood bison roam areas of the park.
Bonus fun fact: wood bison are the largest land animal in North America!

BIOSPHERES BONUS! Nature Alberta has published booklets on both the Waterton Biosphere Reserve and the Beaver Hills Biosphere Reserve, packed with great information on visiting these unique places and fun activities you can do there. Download yours today at bit.ly/MyBigAlbertaBackyard.

Nature Kids

Out and About

BY STEPH WEIZENBACH, NATURE NETWORK COORDINATOR

Bird Footprints

Different types of birds leave unique footprints in the mud. Ducks and geese have webbed feet for swimming in the water. Shorebirds have long, skinny toes to help them run across the mud. Can you imagine what types of prints they would leave behind? Do this fun craft to find out!

What you need:

- ✔ Marker
- ✔ Scissors
- ✔ Pipe cleaners
- ✔ Sponges
- ✔ Washable fingerpaint
- ✔ Recycled container lid to put paint on
- ✔ Paper or cardboard to paint on

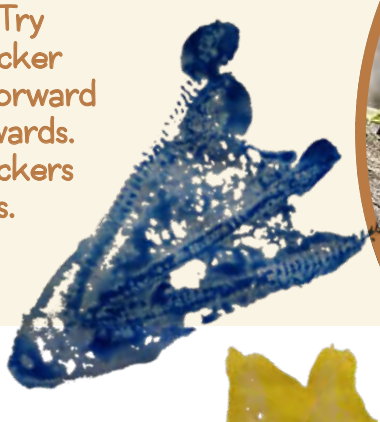
This is a fun and messy activity, squelching around in paint... just like your bird buddies would! STEPH WEIZENBACH

What to do:

1. Using a marker, draw the outline of a webbed foot on a sponge. Cut along the outline with your scissors.
2. Cut a small hole in the heel of the webbed foot sponge. Thread three pipe cleaners through the hole to create three toes. Wrap the pipe cleaner at the front of each toe over the top of the sponge to secure it in place.
3. Make a shorebird foot by shaping a single pipe cleaner into 3 toes and a leg. Did you know shorebirds have a fourth smaller toe at the back of their foot? See if you can include this fourth toe in your design.
4. Choose your paint colour(s) and pour some onto the recycled container lid.
5. Stamp your different bird feet into the paint and then onto your page to create a series of bird tracks.

Next time you walk along a shoreline, look carefully in the mud to see what bird prints you can find. Guess what kind of birds walked there — this craft should help you guess! ■

Want to make even more bird footprints? Try making a woodpecker foot, with two toes forward and two toes backwards. This helps woodpeckers hold onto trees.



Nature Kids

Ask Stuart

BY STEPH WEIZENBACH, NATURE NETWORK COORDINATOR

Welcome to Ask Stuart, a regular feature in which Stuart, our Nature Kids mascot (who just happens to be a swift fox) responds to questions asked by kids across Alberta. From time to time Stuart will also ask local experts to help him answer these questions. If you have a question you would like to ask Stuart, send it along to our Nature Kids Program Coordinator at **naturekids@naturealberta.ca** and it may be featured in a future issue.

Q Why would a bird pretend to have a broken wing?

Many birds use a diversion strategy to protect their nest and young ones. I have seen an American bittern, killdeer, and blue-winged teal duck all divert my attention by pretending to have a broken wing. The bird hangs one of its wings lower than the other and tries to get your attention. Once they have your attention, they lead you away from their young ones. If you get too close, the bird will fly away. It will then return, flying over the area to check to see if the predator has left. When the coast is clear, the adult bird returns to its safe young.

I have even seen a great horned Owl use the diversion strategy. But instead of pretending to have a broken wing, it puffed up all of its body feathers to look as big as possible. It held both wings up beside its body, rocking back and forth from one foot to the other while hissing. It definitely had my attention! The owl was protecting its young owlets who were learning how to fly in the trees nearby. ■

Great horned owl practicing its diversion strategy. GERALD ROMANCHUK

A teeny, tiny hare leveret. MYRNA PEARMAN

Q Do jackrabbits make nests like pet rabbits do?

No, jackrabbits do not keep their babies in a nest. Jackrabbits are actually a hare, not a rabbit. Confusing, I know. Hares (including jackrabbits) have precocial ("pre-KOH-shul") babies, meaning they are born fully furred, with eyes open and able to hop around immediately. Pet rabbits have altricial ("al-TRISH-ul") babies, meaning they are born completely naked, eyes and ears still closed, and they are not able to hop around immediately. Altricial baby bunnies, called kits, are safely kept in a warm nest with other babies.

Precocial baby hares — including jackrabbit babies, called leverets — have no scent on them when they are born. To keep them safe, their mom finds a good place to hide them. She leaves them by themselves all day and comes by to feed them at dusk and at dawn. This is the best strategy to keep them safe from predators. Foxes, coyotes, and even pet housecats are predators who hunt baby hares. The leverets stay as still as possible in their hiding spot. They are very well hidden because they blend in with their surroundings. Sometimes, a mother hare chooses someone's yard as her babies' hiding place. **If you find a baby hare, leave it right there!** Leverets are commonly kidnapped by well-meaning people who think the baby has lost its mother because it is all by itself. But by taking the hare out of its hiding spot, they are actually stealing the baby from its mom and putting it in danger. So, remember: **IF YOU FIND A BABY HARE, LEAVE IT RIGHT THERE!** ■

The Eyes Have It

BY MARGOT HERVIEUX

Even during our short summer nights, there is something special about being out after dark. Add just a bit of moonlight and the nighttime world starts to appear before our day-adapted eyes. Creatures that are active at night, however, are able to see far more than us even on the darkest nights.

The eyes of nocturnal animals have many special features that help them see in low light conditions. The first thing you will notice is the size of the eyes. Bigger eyes let in more light and make it easier to see in the dark. The eyes of most owls are so big that they take up almost half their skull.

Most bird and mammal eyes contain cells called rods for collecting light and others called cones for seeing colour. The eyes of night creatures are made up almost entirely of rods. In many mammals, the back of the eye also has a mirror-like layer called the tapetum lucidum, which reflects light inside the eye. This is what causes the eye shine we see when a deer or coyote is caught in our headlights.

Excellent night vision is not the only way that animal eyes can differ from ours. Birds and mammals with eyes at the sides of their heads can see forwards and back at the same time, the better to keep watch for predators. Those of us with eyes at the front, including owls, cougars, and other predators, are better able to judge distance because the view from each eye overlaps, creating depth perception.

Birds of prey can also see further than we can. Large eyes with special features allow hawks and eagles to see over eight times further than people.

Peregrine falcon.

Imagine being able to spot a rabbit from a mile away!

Colour vision is also very different between different groups of animals. Most mammals, especially those active at night, don't see vivid colour. Diurnal (day flying) birds, however, not only see colour but, according to a recent study, they see colours like ultraviolet that we can't.

Researchers have discovered that in over 90% of bird species where the sexes look the same to us, males and females look different to the birds. For example, under ultraviolet lights, or through the bird's eyes, the caps and cheek patches on chickadees actually vary between males and females.

Hawks and falcons also use ultraviolet light to find prey. Apparently mouse and vole urine shows in ultraviolet so the many rodent trails that criss-cross a field appear as visible pathways to hovering birds of prey.

Other creatures also see different parts of the colour spectrum. Snakes can see infrared light, which helps them find warm-blooded rodents in the dark. Many insects see ultraviolet colours that we can only pick up using special lenses. Flowers that appear plain white to us often have ultraviolet patterns that attract insect pollinators.

We are so accustomed to viewing the world through our own eyes that we often forget that other creatures may see things differently. Human eyes can do amazing things, but we will always have to depend on binoculars to bring the distance into view and the moon to light up the nighttime forest. ■

Margot Hervieux is a founding member of the Peace Parkland Naturalists, an honorary member of Nature Alberta, and a longtime Nature Alberta board member. This article originally appeared in her "Naturally Yours" column in the *Peace Country Sun*, which she has been writing for 15 years. You can read more of her archived columns at **peacecountrysun.com**.

JANINE LEMIRE

MEET A MEMBER CLUB

BY COLEEN MAHONEY

Alberta Native Plant Council Society

The **Alberta Native Plant Council Society (ANPC)** is a grassroots group of dedicated plant enthusiasts who have supported the conservation of native plants and native plant habitat in Alberta since 1988. Our motto is "Sharing Knowledge, Supporting Conservation." We provide outreach, publications, guidelines, stewardship, advocacy, and funding, while also implementing and supporting native plant initiatives.

Books published by ANPC include *Wildflowers of Whitehorse Wildland Provincial Park* and *Rare Vascular Plants of Alberta*, the second edition of which is currently being edited for publication. We have produced Fact Sheets on topics such as Growing Native Plants from Seeds, Rare Plants of Alberta, and Weeds in Alberta. We have created guidelines for conducting rare vascular plant surveys, conducting plant rescues, purchasing and using wildflower seed mixes, and many others. Visit our website, **anpc.ab.ca**, to find a list of our publications as well as a detailed native plant source list and lists of vascular and non-vascular plants of Alberta.

ANPC has formed several plant study groups throughout the province. When pandemic restrictions prevented study groups from meeting in person, ANPC hosted a biweekly webinar series. These webinars were open to everyone, and recordings of these webinars are currently available on the members-only page of our website. Additionally, ANPC volunteers host an annual Botany Alberta event. This year it is at Clyde Fen and Homes Crossing Ecological Reserve on August 6–8.

MARSHA HAYWARD

ANPC acts as environmental stewards at four important sites in Alberta. The **Whitehorse Wildland Park** is located southeast of Hinton and is representative of the Northern Front Ranges of the Rocky Mountain Region. The park is home to a wide range of alpine and subalpine plants and wildlife. **Big Sagebrush Candidate Natural Area** is located in the southwest corner of Alberta, along the east side of the southern Castle River valley between Waterton Lakes National Park and the hamlet of Beaver Mines. This area is named after the presence of Big Sagebrush (*Artemisia tridentata*), a provincially rare plant that thrives in this natural area. **Clyde Fen Candidate Natural Area** is located near the village of Clyde, in the Dry Mixedwood Boreal Forest Natural Region. This area is home to several insectivorous plants and important bird species. Annual inspections of Clyde Fen have been part of Nature Alberta's May Species Count in most years since 1995. **Nisku Native Prairie Park Reserve** is located within Leduc County, east of the Nisku Industrial Area and south of Secondary Highway 625. The area consists of aspen groves interspersed with grasslands, and 140 species of plants have been recorded here.

ANPC membership is open to everyone. Membership includes a subscription to the *Iris* newsletter, monthly information emails, and the opportunity to learn about Alberta's native plants with other like-minded supporters. To find out more about ANPC or to become a member, please visit our website at **anpc.ab.ca**. ■

Coleen Mahoney is the editor of the ANPC newsletter, *Iris*.

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