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CANADIAN Geographic



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features

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wpy16.canadiangeographic.ca



NATIONAL BIRD DEBATE

On Sept. 19, the Great Canadian National Bird Debate brought Canadians across the country together to watch experts argue which species should be Canada's official bird. Watch the full debate here:

nationalbird.cangeo.ca



DIGITAL ISSUE

Take *Canadian Geographic* wherever you go, while also accessing bonus videos and photos with the digital issue for tablets.

cangeo.ca/digital



FUR TRADE

Discovery Canada's new series *Frontier* fictionalizes the North American fur trade of the 1700s, but who were the real key players? Learn more about the role of everyone from First Nations to voyageurs in this once vast enterprise.

cangeo.ca/dec16/furtrade

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EDITOR'S NOTEBOOK



A national bird

PEOPLE HAS ITS "SEXIEST MAN." *Time* has its "person of the year." But it might be possible that *Canadian Geographic's* declaration of a national bird — the gray jay (above) — is the first time a magazine has named a national symbol. (Read the rationale for our decision on page 36.)

We want the federal government to follow our lead, and it's well aware of our initiative, but it has yet to acknowledge an official avian emblem. This despite nearly 50,000 votes and thousands of comments submitted to our online poll since we launched the National Bird Project in January 2015 with the aim of having Canada recognize a national bird in time for the nation's 150th anniversary year, now just days away.

So *Canadian Geographic* has taken it upon itself to name a national bird in time for the country's anniversary. We polled our readers and Canadians at large. We consulted the country's leading ornithologists. We used that input along with our position as one of the nation's most respected journalistic brands to unilaterally declare the gray jay (formerly known as the Canada jay, which we still prefer) our national bird.

We'll henceforth refer to it as that in our publications. Until, of course, such time as the federal government officially recognizes a national bird. Then, even if it's different from our choice, we'll be more than happy to follow its lead. In the meantime, we've filled what was a conspicuous national-emblem void.

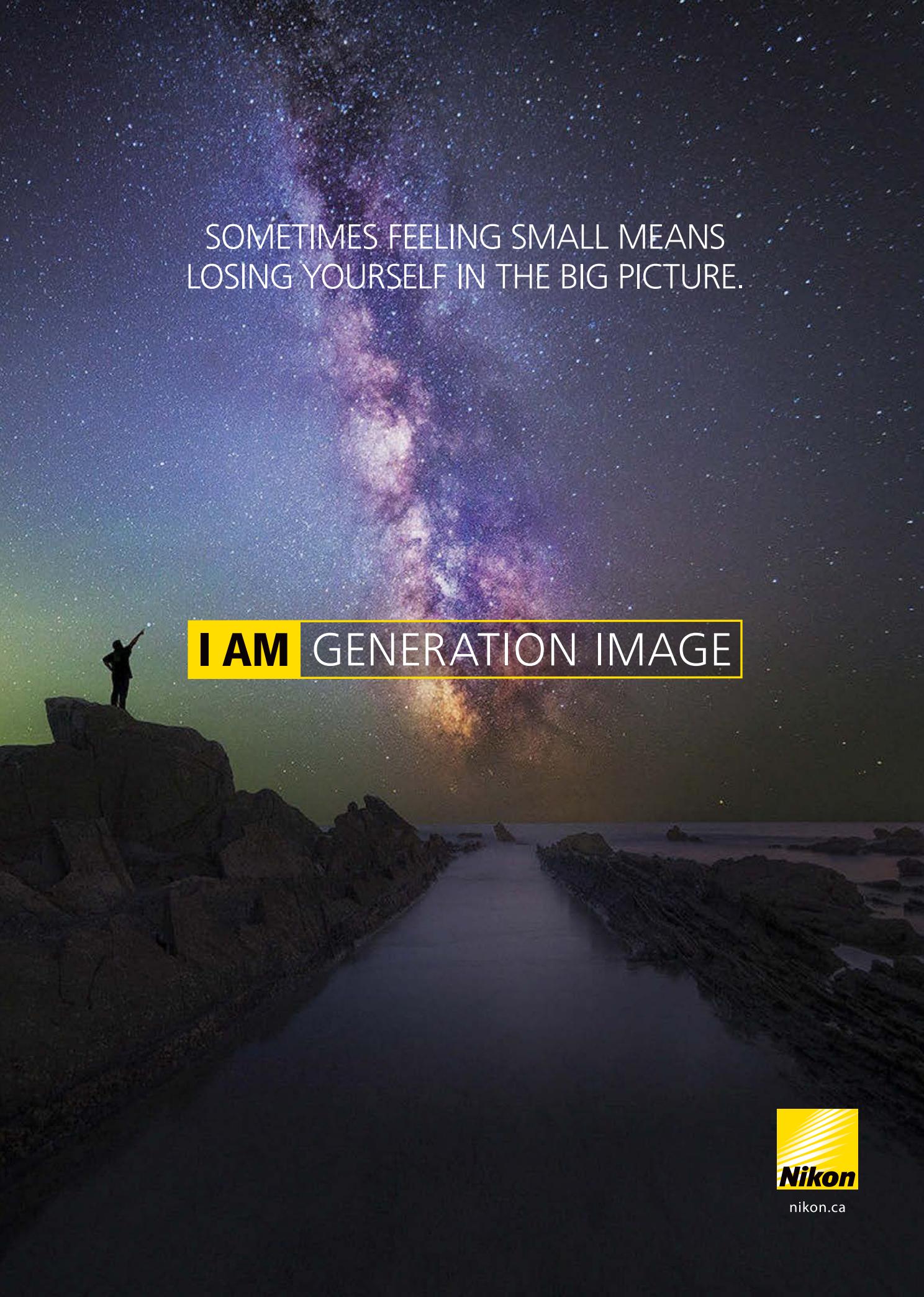
—Aaron Kylie



To comment, please visit cangeo.ca or email editor@canadiangeographic.ca.



For inside details on the magazine and other news, follow editor Aaron Kylie on Twitter (@aaronkylie).



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Lifetime EXPERIENCE #1



THE ROYAL CANADIAN GEOGRAPHICAL SOCIETY AND ONE OCEAN EXPEDITIONS EMBARK ON A NEW JOURNEY

There was an electric excitement in the air. Passengers aboard the One Ocean Voyager cruise ship were abuzz. It was Sept. 6, 2014, and fellow guest Marc-André Bernier, chief of Parks Canada's Underwater Archaeology Service, was suddenly hustled via Zodiac across icy Arctic waters to an icebreaker, then whisked away on a helicopter.

Voyager was part of the Parks Canada-led Victoria Strait Expedition, a search for the then missing-ships of the famed 1845 Franklin expedition, HMS *Erebus* and *Terror*. (The Royal Canadian

Geographical Society, which has enabled people to explore Canada through its magazine *Canadian Geographic* among many other initiatives for nearly 90 years, solicited One Ocean's participation as part of its own educational role in the expedition.) The prevailing presumption for Bernier's hasty departure: a sister vessel must have made a significant discovery.

On Sept. 9, passenger suspicions were confirmed — Parks Canada's underwater archeologists had discovered *Erebus*. And they had witnessed a key moment in history. Could experiential learning be more exciting?

One Ocean Expeditions and The Royal Canadian Geographical Society have long collaborated to deliver such lifetime experiences born from exploration and fuelled by educational discovery. Now, the world leader in polar travel and the RCGS embark on a new journey — as exclusive travel partners. The expanded relationship is a natural extension of the two organizations' admiration for Canada's geography and their shared values.

One Ocean fosters a culture of travel, exploration, science and education throughout its business. Passengers on the Victoria Strait Expedition, for instance, were part of presentations by experts (including the Canadian Ice Service, as the ship navigated through cracking multi-year ice) and saw sophisticated new autonomous underwater vehicle technologies up close and in action.

Combined with the RCGS's influential education programs (18,000-plus teacher members, Giant Floor Maps, learning resources, etc.), its expedition initiatives (Explorer-in-Residence Jill Heinerth, sponsored adventures, etc.), and its commitment to science (through grants, *Canadian Geographic*, etc.), this new joint program bolsters a mutual vision for the importance of geographic learning and inspiring a passion for Canada, its people and places.

In short: a wealth of new lifetime experiences await. Climb aboard at rcgs.org/travel.

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Travel, exploration, science and education come together on RCGS One Ocean cruises, including in Antarctica (TOP) and the Torngat Mountains (ABOVE).



INTRODUCING PHOTOGRAPHERS-IN-RESIDENCE

Amazing images have been at the core of *Canadian Geographic* throughout its nearly 90-year history. To further bolster the magazine's commitment to photographic excellence, *Canadian Geographic* has created a new Photographer-in-Residence program. We've added two special "Big picture" spreads to this issue to announce, and showcase the work of, our first Photographers-in-Residence, Michelle Valberg ([THIS IMAGE](#)) and Neil Ever Osborne ([FOLLOWING IMAGE](#)). Learn more about the program at cangeo.ca/pir. And watch for more of Valberg and Osborne's work in Can Geo social media, at cangeo.ca and in future issues.



big picture

CELEBRATING CANADA'S GRANDEUR

PHOTO BY MICHELLE VALBERG

A male polar bear clambers over the ice at a floe edge near Pond Inlet, Nunavut, while hunting for seals in spring. During this time of year, the region where open water meets the sea ice becomes one of the most incredible and dynamic ecosystems on Earth, providing rich pickings for the Arctic's apex predator.



Follow Valberg on Twitter (@michellevalberg) and Instagram (@michellevalbergphotography), and learn more about her and see more of her work at michellevalberg.com.



PHOTO BY NEIL EVER OSBORNE

The man known as Guujaaw, the former president of the Council of the Haida Nation, lays chinook salmon over the rafters of his smokehouse in Skidegate, a community on British Columbia's Haida Gwaii archipelago. Salmon has long played a key role in the Haida way of life, acting as both a food source and a symbol of fertility and abundance.



Follow Osborne on Twitter and Instagram (@neileverosborne), and learn more about him and see more of his work at neileverosborne.com.



big picture

CELEBRATING CANADA'S GRANDEUR





big picture

CELEBRATING CANADA'S GRANDEUR

PHOTO BY JOHN SYLVESTER

A canary yellow canola field near Bruxelles, in the Tiger Hills region of southern Manitoba. Canola, an oilseed, was bred from the less nutritious rapeseed by Canadian researchers in the 1970s, and has since become the nation's most profitable crop.



This picture appears on a coin in the Royal Canadian Mint's Celebrating Canada's 150th series. In collaboration with the Mint, *Canadian Geographic* sourced images for the 13-coin set. For more information, visit mint.ca/canadiangeographic.



Coin shown at actual size.

exposure

SHOWCASING CAN GEO'S PHOTO CLUB



PHOTO BY MEGAN LORENZ

A male red fox laps from a puddle in Ontario's Algonquin Provincial Park. By winter, young foxes born the previous spring are out on their own, while adult pairs also often separate to hunt alone during the leaner months.



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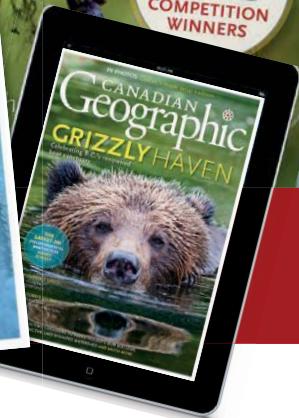
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@arniworksphoto Arni Stinnissen
Common redpoll, near Minesing, Ont.



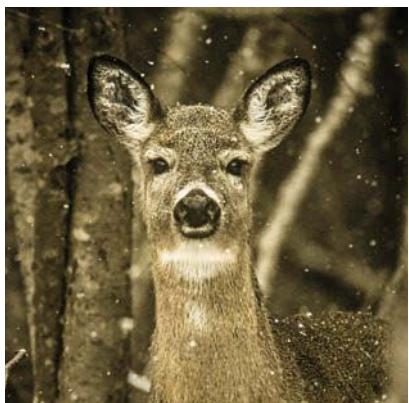
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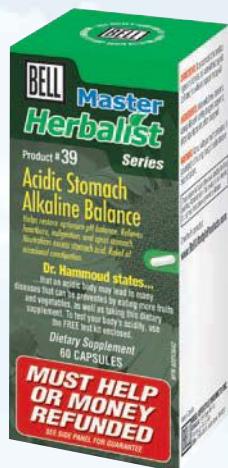
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■ **Reflux gave me a sore throat and I could not sing in the church choir anymore.** After taking Bell Acidic Stomach Alkaline Balance, I have no more reflux and rejoice in singing again. Helene Giroux, 65, Quebec, QC. ■ **Have family history of heartburn.** For the last ten years, I suffered a lot with acid reflux. I told all of my family members about Acidic Stomach Alkaline Balance being natural, providing quick relief with no side effects and no antacids needed anymore. Michael Fasheh, 49, Port Ranch, CA. ■ **I have been struggling with IBS and GERD for years.** I have tried every remedy available, including diet changes. Finally, after using Bell's Acidic Stomach Alkaline Balance, I noticed positive results after the second day. This product is a life saver. I can actually start to live a normal life without having a burning esophagus, as this is not living a quality life. Your product is wonderful. Shirley Morneau, 58, Abbotsford, BC. ■ **After five years of ongoing acid reflux** and endeavoring unsuccessfully to control it with medication, I decided to try your product to see if it would help my indigestion. To my amazement, after three weeks taking Bell Acidic Stomach Alkaline Balance and eating more alkaline foods, I have eliminated the discomfort in my chest. I will now also get your Blood Pressure Combo product. Daryl Turko, 59, Calgary, AB.



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INTERVIEW

ALLAN HAWCO

The actor and co-producer of the new series *Frontier* on historical accuracy and life in the 1700s

INTERVIEW BY ALEXANDRA POPE

A brutal and chaotic period of Canadian history gets the *Game of Thrones* treatment in *Frontier*, a new Discovery Canada series that follows the agents of rival companies as they fight for dominance in the North American fur trade in the 1700s. Canadian actor Allan Hawco, who co-produced and stars in the show, discusses why its value transcends entertainment.

On the historical accuracy of the show

The time period is so rich in terms of potential for high-stakes conflict, with all these different companies jockeying for position in the fur trade. It's really North America's coming-of-age. The show takes a lot of dramatic licence, but the writers worked very hard to make sure all of it was plausible.

On his role as a down-on-his-luck trader

I had never really thought of the 18th

century as an exciting time period, which is completely ridiculous when you start to break down the variables. My character, Douglas Brown, has come over from Scotland with two of his brothers, and they're on the brink of bankruptcy. The reality is that just crossing the Atlantic at that time was a life-or-death scenario. These people had to be fearless to stake a claim in the New World. Of the three Browns, Douglas is more thoughtful, less prone to shoot from the hip, whereas his brothers are constantly involved in mayhem.

On making Canadian history exciting

I don't know what it is about us as a nation — if we're self-conscious about our past or if we simply don't believe that it's interesting to others — but there are so many different parts of Canada's story that could be explored in film and television, and

Allan Hawco in character as Douglas Brown in *Frontier*, a new television series about the North American fur trade in the 1700s.

it's surprising they haven't been tapped into. Brad Peyton, the director, set the bar very high, and I feel like everyone involved in *Frontier* brings it to a level that's competitive with anything else out there.

On not shying away from difficult truths

I think *Frontier* is going to introduce people to a part of our past that's interesting but also terrifyingly ugly. There's a lot we can be ashamed of, but that should propel us to move forward as a nation and not repeat the mistakes of the past. I know we're talking about entertaining drama, but you hope that stuff like this has a deeper impact.



From hardscrabble voyageurs to First Nations hunters to Hudson's Bay Company bigwigs, discover the key players in the North American fur trade at cangeo.ca/dec16/furtrade.

DISCOVERY

WILDLIFE

'Really what we want is sustainable trade. That way we protect the good guys, we stop the bad guys.'

Sheldon Jordan, director general of the wildlife enforcement division of Environment and Climate Change Canada, explains to the CBC the rationale of a pilot project that uses microchips embedded in polar bear hides to prevent them from being smuggled. The microchips will show whether the bear is from a population that is permitted to be exported and help with management practices.



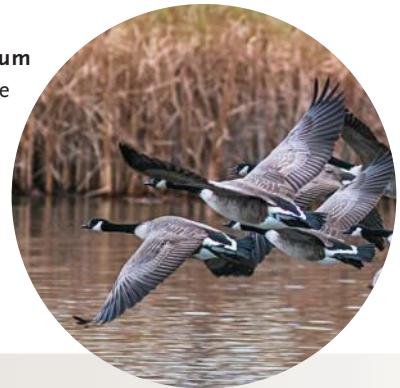
'These are phenomenal numbers. It sounds like they are super abundant.'

Jeff Marliave, vice-president of marine science at the Vancouver Aquarium, describes to the *Vancouver Sun* the quantity of anchovies recently sighted in Howe Sound. Marliave told the *Sun* that the abundance of the tiny fish was likely a result of a warm El Niño year and good news for species such as dolphins and squid, which eat them.

8,938

The number of animals remaining in Labrador's George River caribou herd, which in the 1990s exceeded 800,000. Biologists in Labrador and Quebec are blaming the precipitous decline on deteriorating habitat, poor food resources, predation and the effects of climate change. The Newfoundland and Labrador government says the herd could become extirpated in less than five years and won't recover unless illegal caribou hunting is stopped.

50% The minimum amount of the boreal forest that Canada should protect from industrial development to help safeguard migratory birds, according to the recent report *Charting a Healthy Future for North America's Birds*.



TUNING IN, CRACKING DOWN

Visitors to Banff, Yoho and Kootenay national parks will no longer be allowed to possess telemetry receivers, which can track wildlife wearing VHF (very high frequency) transmitters. Bill Hunt, resource conservation manager for the Banff National Park Field Unit, told CBC that overzealous photographers have used scanners in their cars to find wildlife, potentially interfering with and compromising the animal's ability to hunt or find food.



Read more about each of these stories
at cangeo.ca/dec16/wildlife.



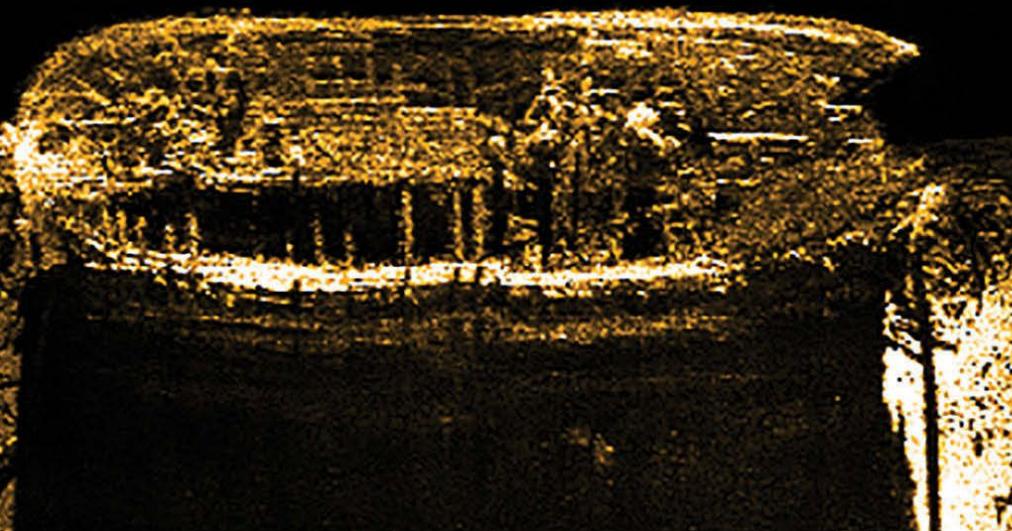
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Images courtesy of Parks Canada



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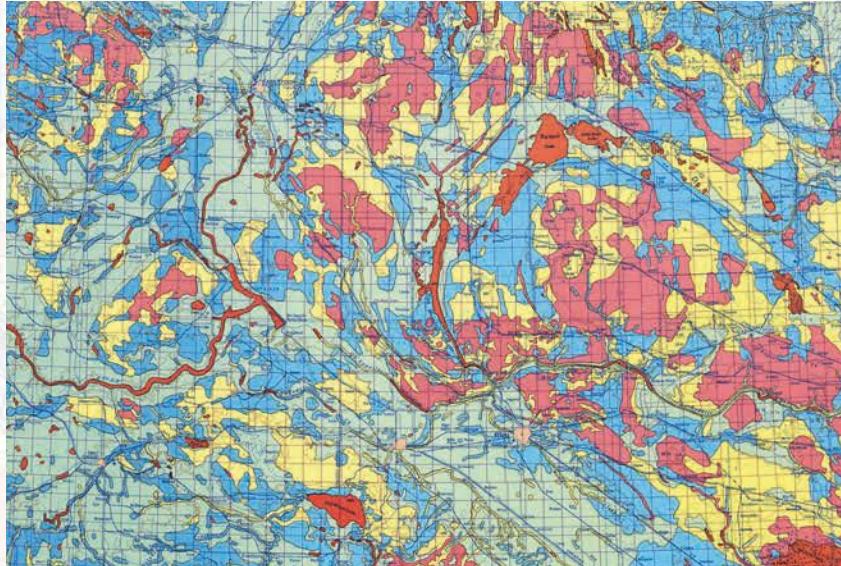
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A pattern most fowl

This gorgeous swirl of colour reveals more than meets the eye

By Harry Wilson*



AT FIRST GLANCE, you could be forgiven for thinking that the image above is a work of abstract art — a Kandinsky, perhaps? — or a camouflage pattern that didn't pass muster, its daubs of orange, pink, yellow, blue and green ill-suited to any terrain on this planet.

Take a closer look, however, and you'll soon realize that this isn't an artwork (at least not one made with art in mind) or something that's meant to conceal (it does the opposite, in fact), but a map. One part of Saskatchewan, actually.

But why does it look unlike any map of Saskatchewan that you've probably ever seen? You can thank waterfowl and the Canada Land Inventory for that. The latter created the map, a small portion of which is shown here, in 1976 to assess the region's capability to support ducks, geese and sandhill cranes, among other birds.

As is typical of all Canada Land Inventory maps produced in the 1960s, '70s and early '80s, land is divided into one of seven classes, with Class 1 having the highest capability for waterfowl and Class 7 the lowest; subclasses are also used on the inventory's maps, creating a total of 11 classes.

On this map, those 11 land classes are divided into five groups (the colours on the map). Orange, for instance, represents "lands that have great importance for migration or for wintering waterfowl," and includes subclasses 1S, 2S, 3S and 3M. The map doesn't describe those subclasses, but they denote lands that have no significant limitations, very slight limitations and slight limitations to the production of waterfowl, and are important either for migration stops or as migration and wintering areas.

With its colour palette, the overall effect of the map, as its legend (not shown) notes, "emphasizes the spatial relationships between lands with high and low capability for waterfowl." Well, yes — but it's also something Kandinsky himself might have appreciated.

*with files from Erika Reinhardt, archivist, Library and Archives Canada



PIZZLY PUZZLE

How *Canadian Geographic* covered the tale of an unusual hybrid

You've heard of a liger, right? No? How about a zony? Doesn't ring a bell either? Here's another conflation, then, one that longtime *Canadian Geographic* subscribers might recognize from the November/December 2006 issue, when the magazine ran a story on ... pizzlies.

The pizzly, if you haven't already guessed, was the nickname given to a cross between a polar bear and a grizzly bear that was shot and killed on Banks Island in the Canadian Arctic in April 2006 (ABOVE) — the first of its kind ever discovered in the wild, reported the *National Post* at the time.

For *Canadian Geographic*, Ed Struzik wrote about the scientific detective work that followed the bear's death to find out why and how the hybrid came to be. As Struzik explained, "It is very unlikely that this hybrid resulted from a brief encounter. Chance meetings between the two bear species are rare, although they have been seen feeding together on land on the remains of bowhead whales harvested by Inupiat hunters just across the Yukon border, at Kaktovik, Alaska."

The upshot of the pizzly puzzle, reported Struzik, was that although more scientific evidence was needed to determine precisely why and how the bears were interbreeding, chances were that more hybrids would be seen. Meanwhile, Struzik wrote, "It will be a hot day in the Arctic before taxonomists feel compelled to coin a new moniker for these mammalian anomalies. Until then, they remain 'pizzlies.'"

Or grolar bears, if you will.

—Harry Wilson



Read the entire *Canadian Geographic* pizzly story from 2006 at cangeo.ca/dec16/pizzly.



See a full-size version of this map and learn more about the Canada Land Inventory at cangeo.ca/dec16/land.

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DISCOVERY

PLACE

The war in the Walbran

Controversy over logging has returned to the old-growth forests of Vancouver Island

By Andrew Findlay

HIGH IN THE BRANCHES of the old-growth forest in the Walbran Valley on Vancouver Island's west coast exists a world few have ever seen — one that more than 20 years after it was first studied has once again caught the interest of conservationists as a long-dormant battle reignites over logging in the region.

In the early 1990s, Neville Winchester, a University of Victoria entomologist, logged hundreds of hours studying insects in the forest canopy of the Carmanah and Walbran valleys and Clayoquot Sound, where soils often accumulate over hundreds of years to depths of one metre. While logging protests raged below, Winchester and his colleagues identified roughly 15,000 insects, including 300 new to science. Winchester says this hidden ecosystem plays a vital role in forest decomposition and nutrient cycling, a little-seen part of what is lost when old-growth trees are cut.

These lush valleys of centuries-old giant trees have a tumultuous past. In 1995, following years of logging blockades and protests, the provincial government added the upper Carmanah and lower Walbran valleys to Carmanah Provincial Park (which had been created in 1990 to protect the lower Carmanah valley), establishing today's Carmanah Walbran Provincial Park.

The central Walbran, however, was given over to logging interests, although it was designated a special management zone, putting environmental, cultural and recreational values at the core of harvesting plans and requiring more old-growth tree retention and smaller cut blocks.

The threat of logging in this valley was put on hold until 2014, when environmentalists found flagging tape near the legendary but unprotected Castle Grove and alerted the public to harvesting plans by the forest licensee, Surrey, B.C.-based



A hiker gazes up at towering old-growth trees in Carmanah Walbran Provincial Park.

Teal-Jones Group, which claims that accessing this valuable old-growth timber is key to its future operations. But conservationists say one more tree cut in the Walbran Valley, where logging crews have already felled trees to build roads, is one too many. Un-logged coastal valleys on Vancouver Island are increasingly rare. Of the 89 primary valleys (valleys greater than 5,000 hectares emptying directly into the ocean) on Vancouver Island, only six remain undeveloped, or less than two per cent logged.

"Old-growth forest has almost been eliminated on southern Vancouver Island," says Joe Foy, national campaign director for the Vancouver-based environmental group the Wilderness Committee. "This southern area produces the biggest trees and most lush rainforests, and it is critical that what remains be protected. The central Walbran is contiguous with Carmanah Walbran Provincial Park, and its trees are spectacular in size, abundance and structure. Anyone who visits the area and walks amongst the giants understands that this is a place that should not be cut down."

Neville Winchester's canopy research helped chart new ecological territory in the island's old-growth forest, but its conservation impact is unclear. "Did the research make a difference?" he asks. "Well, the central Walbran was made a special management zone, but it's just old-growth logging by a different name."



See an infographic of Vancouver Island's old-growth forest at cangeo.ca/dec16/forest.

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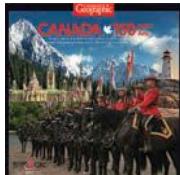
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Cetacean seeker

Undersea drones are the newest whale protection tool

By Alexandra Pope

TTo protect endangered whales, you first have to be able to find them.

That's no small feat given the vastness of the open ocean, but researchers at the University of Victoria and Dalhousie University in Halifax have come up with a low-cost and minimally invasive way to track whale movements: listening for their songs.

Research teams have deployed battery-powered underwater drones called Slocum Gliders to patrol little-studied areas on both coasts for whale activity. The data they collect is used to pinpoint where different types of whales are congregating, in turn helping to inform ocean management practices.

"These animals are highly migratory, so the only way we can manage their conservation is to manage their habitats," explains Kimberley Davies, a post-doctoral research fellow at Dalhousie.

The Dalhousie team supplies data to the Canadian Navy, which now ceases its training exercises on the continental shelf when whales are detected. The team is hoping to eventually be able to broadcast whale advisories to commercial ships too.

"We want to help mitigate harm to the animals as much as we can," Davies says.

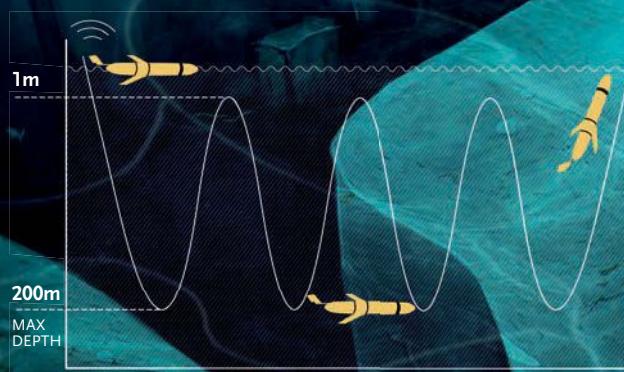


Every four to 24 hours, the glider surfaces and transmits its findings to an online database.

Availability of zooplankton, a dietary staple for whales, depends heavily on water temperature and salinity, so the glider measures both to help researchers identify areas where whales are likely to gather to feed.

Each glider is equipped with an acoustic sensor that detects whale calls and voice recognition software to help it identify the species based on its song. The drone is almost silent, meaning the acoustic sensor is able to clearly detect whale songs without engine noise interference.

A battery-powered pump fills and empties an inflatable air bladder, moving the glider between the ocean surface and floor (BELOW).



Depending on the type of battery used, the glider can stay in the open ocean for up to four months and travel some 2,000 kilometres on a single charge — that is, as long as it doesn't run into trouble. "We once had a fisherman pull one of the gliders out of the water and try to sell it back to us," says Davies.



For more groundbreaking Canadian whale research, visit cangeo.ca/dec16/whales.

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HOW A NEW CATALOGUE OF PLANTS IS REVEALING A CHANGING NORTH

BY JOHN BENNETT

VIVID PURPLE FIREWEED, tangy mountain sorrel and succulent crowberries are just a few of the plants that burst into life during the Arctic's short, intense summers. But scientific knowledge of northern flora and the impacts of climate change is patchy, says Arctic botanist Jeffery Saarela. He and his colleagues at the Canadian Museum of Nature are filling in some of the gaps.

"Before we can know how Arctic plants are changing," he says, "we need to know the species and their distribution."

Saarela is working with Lynn Gillespie and other museum botanists on the Arctic Flora Project, compiling a new botanical catalogue of the Canadian Arctic — the first reference ever to document the vascular plants (those with roots, leaves and stems) for the entire region.

Every July since 2009, the museum team has explored the ground and made collections of all the species in regions of western

Nunavut, the eastern Northwest Territories and southern Baffin Island, travelling by helicopter, canoe and foot. In 2016, the botanists worked near Arviat, Nunavut, on the west side of Hudson Bay.

Specimens are placed in plant presses where the Arctic air, which contains very little moisture, quickly dries them out, after which they're taken south to the museum for storage and laboratory analysis. They are housed permanently in the museum's National Herbarium of Canada and other Canadian and international herbaria.

The project is producing baseline information that can be used in the future to measure environmental change. "There's good evidence to show that Arctic shrubs are already responding to warmer temperatures," says Saarela. "Shrubs are getting much bigger and denser. This is called 'greenification' or 'shrubification' of the Arctic. But contrary

The "laboratory tent" and a plant press at one of the Arctic Flora Project's research camps, next to the Soper River on southern Baffin Island.

to what we sometimes hear, there is little evidence that plant species are moving north because of climate change."

The project, however, is more than a tool for measuring change. "It's basic research to understand biodiversity in our country," explains Saarela. "That's a key aspect, and it's unrelated to climate change. On every trip we find surprises, such as species farther north or south than they've been recorded before. That changes our understanding of the ecological conditions that they can survive under. And it means there's still work to do."

The results will be available to all, posted online with detailed descriptions, images and maps. "In the future," says Saarela, "researchers will be able to see exactly what we've collected and will compare these records with what they see around them when they walk across the tundra, even a hundred or more years from now."



Polar Knowledge
Canada Savoir polaire
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CANADIAN
Geographic



This is the latest in a blog series on polar issues and research (cangeo.ca/blog/polarblog) presented by Canadian Geographic and Polar Knowledge Canada, a Government of Canada agency with a mandate to advance Canada's knowledge of the Arctic and strengthen Canadian leadership in polar science and technology. Learn more at canada.ca/en/polar-knowledge.

on the map

EXPLORING CARTOGRAPHY

On the move

As the world warms,
wildlife will seek
new habitat ranges

BY ALEXANDRA POPE

Picture this map in motion, the lines streaming predominantly north and east, converging at mountain ranges and around the shores of lakes.

These are the paths researchers at the Nature Conservancy believe animals will travel as anthropogenic climate change disrupts habitats and ecosystems, driving species to higher elevations and latitudes. But they won't get there without our help.

"One of the ways species were able to survive past climate changes was to move, but today they're going to have to do that while encountering human-caused barriers [such as cities] that weren't there in the past," says Brad McRae, a senior landscape ecologist with the Nature Conservancy. "We wanted to identify areas where species could move in order to keep those areas as conducive to movement as possible."

In 2013, McRae and other researchers from the University of Washington and the Nature Conservancy identified potential future habitats for close to 3,000 different species based on various climate change models. They then plotted routes connecting each species' present-day habitat with its projected future habitat and found that increasing fragmentation of natural landscapes due to human activity threatens many species' ability to adapt to climate change.

"We have more and more data every year thanks to GPS collars and genetic markers that tell us how connected different wildlife populations are to different landscapes, and those all tell us that urban areas are going to be barriers for a lot of species," McRae says. "Raccoons will do just fine, but not other animals that are shyer or vulnerable to human impacts."

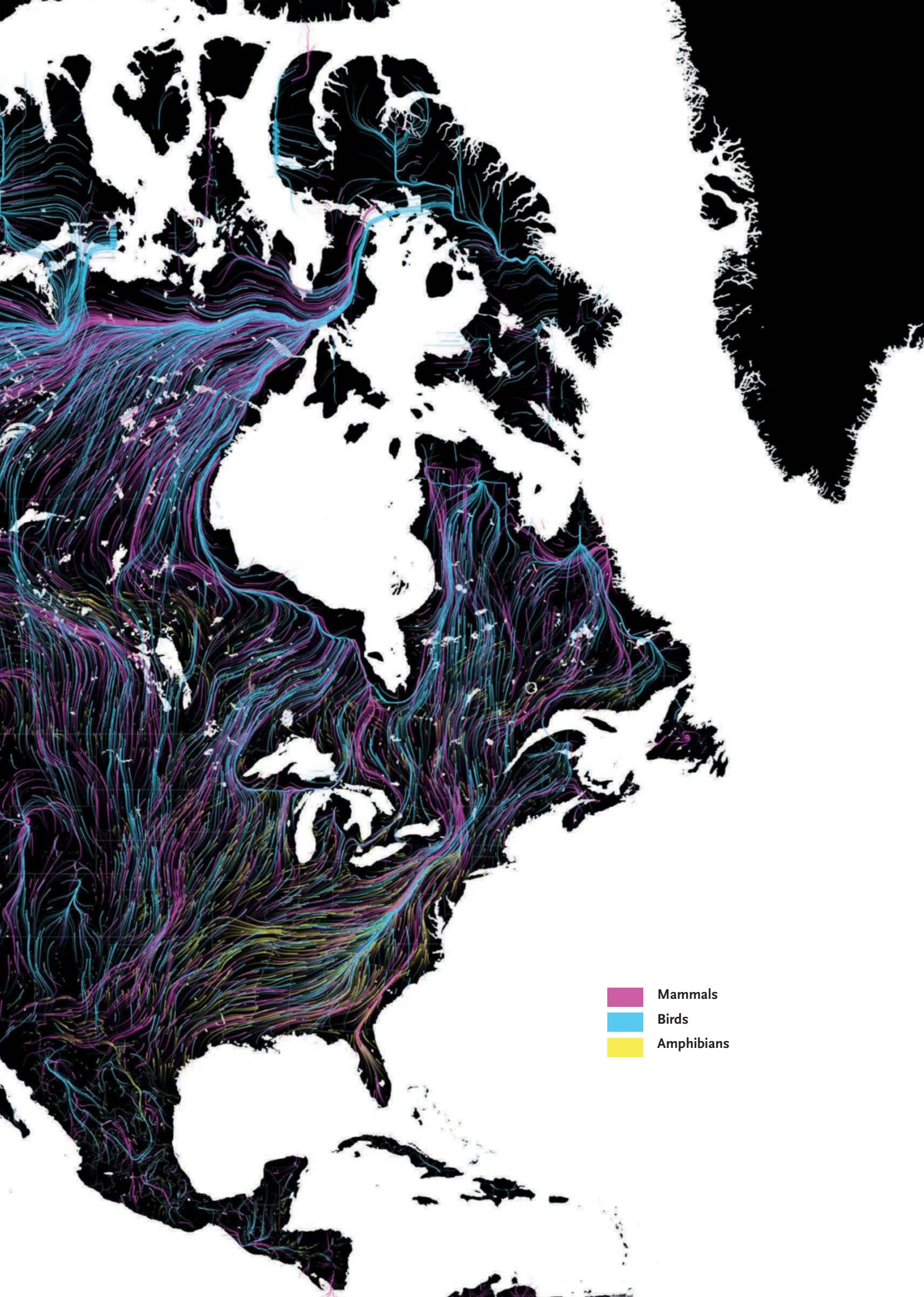
Dan Majka, a cartographer with the Nature Conservancy, used the data from McRae's study to create an animated map, which quickly went viral after it was published on the Conservancy's science blog in August.

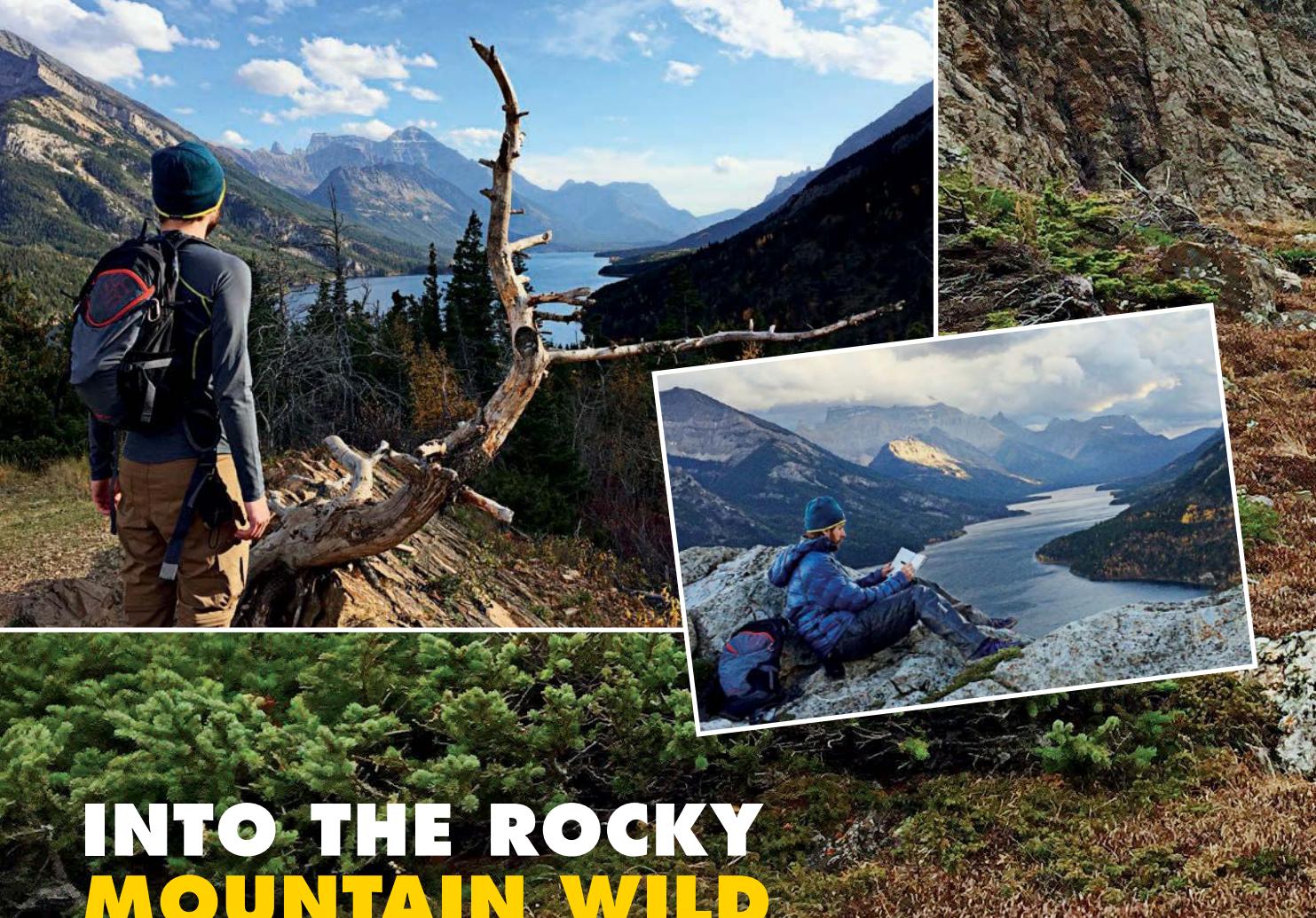
Majka says his intention is not to present a doomsday scenario in which animals flee to the poles en masse, but to raise awareness of the importance of considering the needs of wildlife in urban planning and development, for example by providing wildlife bridges over highways and keeping large blocks of forested land intact.

"Climate change is going to affect species and where they can live, but we still have the power to enable them to move more easily to where they may need to be in the future," he says. "It's not too late, but it is urgent."



See the animated version of the map and learn more about how it was created at cangeo.ca/dec16/migration.





INTO THE ROCKY MOUNTAIN WILD

Adventuring in Waterton Lakes National Park with Adam Shoalts

On a crisp fall day in October, I set off with my backpack and bare essentials into the Canadian Rockies, picking my way through trembling aspen and Douglas fir up switchback mountain trails, pausing to take in awe-inspiring views every few hundred metres. I was headed into the backcountry of Waterton Lakes National Park, Alta. — a place of snow-capped peaks, rugged vistas, glacial lakes and thundering waterfalls.

Waterton Lakes National Park, tucked away in the province's southwestern corner, has some of the most dramatic landscapes and harshest terrain in the whole of the Rockies. Here the rolling grasslands of the Great Plains abruptly meet spectacular mountain peaks. Established in 1895, Waterton is Canada's fourth oldest national park and forms part of a special International Peace Park that straddles the 49th parallel, combining with the United States' Glacier National Park to create one large protected area.

It is not only breathtaking landscapes that make Waterton Lakes a thrill to explore. It boasts a greater variety of large mammals than anywhere else in Canada. Grizzlies, black bears, wolves, mountain lions, wolverines, elk, moose, mule deer, white-tailed deer, bighorn sheep, mountain goats and bison all roam this wilderness. The park may not be quite as famous as Banff, but this gives it the advantage of being less crowded. Here, especially in the off-season, you can wander for hours or even days in the high country without seeing another person.

Climbing higher, I splashed through shallow, clear mountain streams, scaled steep valley walls where hanging lichens cloak the evergreens and give the land a lush, if somewhat eerie, look. Pinkish *gomphidius subroseus* mushrooms sprout from the shadowed, moss-covered forest floor.

I quickened my pace and zigzagged higher up the mountain, coming upon a barren rock outcrop above the trees that afforded a view of the encircling mountains and, far below, the blue waters of Waterton Lake — the deepest lake in the Canadian Rockies. Here a long-tailed weasel scurried through the undergrowth, hunting chipmunks. For a moment it paused on a boulder, stared at me, then disappeared into some junipers. Saskatoon berries provided me with an easy snack — but with the berries ripe the bears would also be about.

The weather, which had been warm and sunny, turned on a dime and became a steady rain. After pausing to throw on my rain jacket and rain pants, I continued up the winding trail higher into the mountains. That night, as I lay snug and warm inside my tent, listening to the wind howl and rain patter, the darkness was suddenly illuminated by a lightning storm — as if for an instant someone had switched on a giant light over the world. The storm, fortunately, passed quickly.

The morning dawned grey and dismal with a light rain, but I pushed on deeper into the mountains, passing waterfalls and crystalline lakes. My path wound up and down mountains,



through alpine tundra and subalpine forest. Eventually I emerged into a clearing, where I spotted on a distant slope several large animals beneath a clump of conifers. My binoculars revealed grazing bighorn sheep. Like them, I was headed higher.

On these towering summits, conditions change quickly and are often harsh and unforgiving. Hail, snow, rain and winds strong enough to knock a person down are standard. Waterton Lakes has the distinction of being one of the windiest places in Alberta — gusts of more than 100 kilometres per hour are common. Above the treeline in the high country it often feels as if you're hiking into a hurricane. But in another moment, when the wind calms and the sun shines, it can feel like you're in some celestial paradise of awe-inspiring beauty.

The key to comfort is preparation and proper gear. Above the treeline in the alpine zone, I pulled on my waterproof parka, gloves and thermal toque — warm even through hail and freezing winds. Once back in subalpine forest, I switched to my lighter jacket, and by the time I descended into the sheltered valleys, I had stripped to my base-layer. Over the course of my time in Waterton Lakes, I witnessed the mountains in all their different moods: from friendly, sunny idylls in the meadows to bleak and intimidating peaks.

Adam Shoalts is an explorer and writer. His bestselling 2015 book *Alone Against the North* details his solo trek through the Hudson Bay lowlands.

THE GEAR

I've done my fair share of roughing it without adequate equipment. But there are times when hiking into the Rockies need not be more challenging than necessary. Good gear can be the difference between a warm, safe adventure and an ordeal.

Even as I wandered Waterton Lakes National Park's backcountry in the hail, wet snow, pouring rain and chilling winds, I was never uncomfortable. Columbia had outfitted me in their waterproof OutDry gear (check out some of these items listed below), which was superb for its ability to withstand the elements and rugged terrain of this primordial land, where even the toughest gear and hardiest adventurers can be put to the test.

—Adam Shoalts

CARVIN SKI BEANIE

Cosy but not thick, integrates Columbia's Omni-Heat thermal reflective technology to balance warmth and breathability.

SHOALTS: "Warmer and lighter than a typical toque. I wore it even when I'd stripped down to my base-layer."

JACKSON CREEK HALF ZIP FLEECE LONG SLEEVE SHIRT

Comfortable heathered fleece, a ventilating chest zip and security pocket make this fitted, versatile shirt perfect for days on the trail.

SHOALTS: "I slept in this fleece on cold nights in the Rockies. It was a key layer."

OUTDRY EX GOLD INTERCHANGE JACKET

Features sealed seams and zippers and a watertight exterior membrane, but remains breathable thanks to microscopic perforations and a wicking interior layer.

SHOALTS: "When the weather turned wet and cool but I was on the move, I wore this. It was great to be able to unzip the shell and wear only the quilted liner."

OUTDRY EX GOLD PANT

Made from the same waterproof, breathable material as the Gold Interchange Jacket, this durable rain pant can be packed into its own back pocket.

SHOALTS: "These made rainy days fun, and kept me drier than any other rain pants. Hiking or canoeing, nothing soaked through at all."

PEAKFREAK XCRSN II XCEL MID OUTDRY TRAIL SHOE

Excellent ankle support and cushioning, durable, waterproof, lightweight construction and an incredible grip makes these the ideal hiking shoes.

SHOALTS: "Unbelievably comfortable and light, but still sturdy. I logged a lot of miles in these over rough country."

CANADA'S NATIONAL BIRD

After two years, nearly 50,000 votes and thousands of comments, the *Canadian Geographic* National Bird Project concludes. Meet our newest national emblem.

THE GRAY JAY

TO THINK IT ALL STARTED with a casual comment at *Canadian Geographic's* office. "Can you believe Canada still doesn't have a national bird?"

Canada's 150th was around the corner, so with the help of our National Conservation Partners at Bird Studies Canada, we chose the 40 most "Canadian" birds of the 450 with habitat in the country. Then tens of thousands of Canadians agreed — we need a national bird — and they voted and shared their opinions (see "The people's choice," page 38). We brought the idea to federal government ministers. We looked to ornithologists, conservationists and Indigenous Peoples for their expertise and held a debate (see "The great national bird debate," page 40).

In the end, one bird best met all reasonable criteria: found in every province and territory but not already one of their official birds; nearly exclusive to Canada and a year-round resident; not hunted; and important to Indigenous Peoples (see "Our national bird," page 42).

Without further ado, we give you the gray jay. Also known as the whiskey jack or Canada jay, it is *Canadian Geographic's* official recommendation for National Bird of Canada.



A banded gray jay banks in flight in
Ontario's Algonquin Provincial Park.



THE PEOPLE'S CHOICE COMMON LOON

THE NATIONAL BIRD PROJECT was never just a popularity contest. Had that been the case, we could have awarded the common loon first place and skipped the public vote altogether. Perhaps it's the image of this waterbird struck on the Canadian dollar for the last 30 years or its seemingly ubiquitous presence in cottage and camping country, but the loon will always be lodged in the minds of Canadians.

Nevertheless, we had to agree with the ornithologists, cultural experts and voters who pointed out that besides the fact that most loons abandon Canada each winter, the species already has its fair share of accolades: it's the provincial bird of Ontario, the state bird of Minnesota and is used in the logos of the Canadian Wildlife Service, Ontario Nature and the Ontario Federation of Anglers and Hunters. As a powerful Canadian and wildlife symbol, the loon isn't going anywhere.

It does have its many supporters, of course. Here, an homage to the common loon — named People's Choice in the National Bird Project — by Leslie Anthony, a Whistler, B.C.-based writer, photographer, filmmaker and zoologist.

—Nick Walker

On this night in Ontario's Algonquin Park it is loons — the doormen of each lake, black-tie emissaries that cavort with us like dolphins — who put on a veritable vocal Olympics. A classic, lonely cry rises from one end of the lake, and a laughing, maniacal answer emanates from the other; while these echo around the water, more join in and soon the sounds are bouncing off all sides, colliding in the middle like waves in a bathtub. It's odd something like this can seem both eerie and comforting in the same

instant. "The loon here is laughing again," wrote John McPhee, "so I laugh back. He laughs. I laugh. He laughs. I laugh. He will keep it up until I am hoarse. He likes conversation. He talks this way with other loons. I am endeavouring to tell him that he is a hopeless degenerate killer of trout. He laughs."

Despite ease of association with the word "lunatic," loons are actually named for their strange walk — moving on land like a bent-over penguin about to tip over beak first. But their discomfort with *terra*

firma, on which they spend little time, and then only during nesting season, is the flipside of an exquisite adaptation to lake living. With legs set far back and moulded into powerful paddles, they can rocket like a torpedo under water, twisting and turning after fish and invertebrate prey and diving to 60 metres. In turn, loons are eaten by large fish and by devious raccoons, weasels and skunks when they're nesting. First Nations hunters have a small loon quota in parts of Algonquin, but the population remains stable; it's difficult to go an hour without seeing one.

But tracking these birds isn't easy; their movements are notoriously random: when a loon dives it might pop up next to you or half a kilometre away; its whole body may surface or just its head and neck; sometimes, when they feel particularly threatened, only their beak will appear, vertically like a snorkel; two loons diving together may come up far apart or vice versa; loons may display no interest in you whatsoever or be obviously curious. But whatever they do, as McPhee notes, they will laugh it off in characteristic style, as if the joke of their unpredictability is on the observer.

The loon indeed authenticates a northern lake and in so doing has, to some extent, authenticated an entire country. This is the reason Canada's bronze-plated



one-dollar coin with a loon emblazoned on the reverse — which should, by rights, just be called “a dollar” — quickly became the “loonie” after it was introduced in 1987. Loonie was so widely recognized that the Royal Canadian Mint bought rights to the name in 2006, making it the official label for Canada’s currency in global markets.

Yes, people seem to genuinely dig these crazy birds. They’re mascot worthy. If the souvenir industry in this country weren’t already so crowded, the loon, with the right management team, could dethrone beer, bacon, the beaver, the maple leaf, the donut, the Inukshuk — and the Mounties, for gawd’s sake. Just for being certifiable. How Canadian!

A common loon, the provincial bird of Ontario, flaps its wings on Quebec’s Wilson Lake (LEFT), while another loon, chick on its back, floats on the same lake (ABOVE).

But what are they all doing out there, and at night?

As if in a ham-fisted attempt to provide their own explanation, a strong commotion breaks out on the water. Splashing and wing-flapping. Desperate ululation.

Who cares what you think? I yell out of the tent for fun. You’re just a bunch of dumb birds!

They laugh.

—Leslie Anthony

REJECTED BIRD SUGGESTIONS

DURING THE PUBLIC VOTING stage of the National Bird Project, Canadians were encouraged to suggest worthy candidates that had been left out of the top 40 list. Many suggestions were astute and helpful. Others, not so much. More than a few raised eyebrows or earned big laughs, and a handful have become legendary around *Canadian Geographic*’s office. Our favourites:

- Bald eagle (numerous requests)
- A beaver on a hang glider
- Various politicians on hang gliders
- Manitoba mosquito
- A Frisbee
- Snow birds
- Urban pigeon
- Blue-footed booby, flamingo, emu, kiwi and African grey parrot
- Pterodactyl
- Dodo
- Big Bird (*Sesame Street*)
- Rusty the Rooster (*The Friendly Giant*)
- St-Hubert rotisserie chicken
- Pierre Trudeau’s Salmon Arm Salute (a.k.a. “flipping the bird”)
- Birdy McBirdface

NATIONAL BIRD PROJECT VOTING RESULTS



COMMON LOON
29%



SNOWY OWL
18.5%



GRAY JAY
16%



CANADA GOOSE
7.5%



BLACK-CAPPED CHICKADEE
7%



ALL 35 OTHER SPECIES
22%

THE GREAT CANADIAN NATIONAL BIRD DEBATE



George Elliott Clarke
Canadian Parliamentary
Poet Laureate
BLACK-CAPPED CHICKADEE



Mark Graham
Vice-President of Research and
Collections for the Canadian Museum of Nature
CANADA GOOSE

WHEN ORNITHOLOGISTS, CONSERVATIONISTS and Canada's parliamentary poet laureate faced off over the five top birds in the National Bird Project at the Canadian Museum of Nature on Sept. 19, 2016, the result was a showcase of straight bird facts, poetic licence and more than a few lighthearted slings and arrows. Catherine McKenna, environment and climate change minister (BELOW), was on hand to underline the need for further cooperation on habitat conservation and MC George Kourounis, storm chaser and TV personality, drilled the panellists on everything from the symbolic qualities of their birds to how well they might stand up to a bald eagle. Read on for some of the best points from the debate.

—Nick Walker



Why does your bird deserve to be Canada's national bird?

George Elliott Clarke The black-capped chickadee breaks down all barriers, provincial, regional and international, urban and rural. I like the fact that during the winter these birds can turn bushes and trees into *mills* of song, helping to keep us cheerful through the sometimes dark and gloomy reaches of February. And for that matter, January! (At least up until Valentine's Day!)

Mark Graham Canada geese are Arctic and temperate in their range. It's a northern bird; we are a northern country. It's

always found near water, and what better fit for Canada, which has more water than any other place on Earth? And the Canada goose doesn't mind sharing that water with others, unlike the lonely, selfish loon, which hogs a whole lake.

David Bird If I had to come up with a bunch of words to describe Canadians, I would pick friendly, hardy, adaptable, intelligent, trusting and opportunistic. If I had to pick a bird that fit those characteristics, it would be the gray jay.

Alex MacDonald The snowy owl is, like Tilley hats and the Robertson screwdriver, a symbol synonymous with Canada and this nation's northern disposition. It's the only finalist found all across Canada throughout the year, from Alert, Nunavut, to the U.S. border and on both coasts, and it's one of three finalists whose annual range includes the Prairies. So remember: a vote for the gray jay or the common loon is a vote against Canada's wheat farmers!

Steven Price The popular choice, loons lead the bird race; they flap and they swim and they dive to first place. Loons sing to Canadians: they invoke "O Canada." They reach across the nation right up to the tundra. Almost all common loons breed in our nation; every province and territory hosts populations.

As symbols of health, of spirit and life-force, loons call us to keep nature's cleanup on course, to dial back pollution, acid rain, climate-changing. When we save common loons, nature's certainly thriving.

Which bird would you like to challenge?

M.G. I've just been doing a bit of math about the loon. A migratory bird, it has no adaptation to stay here in the winter. So it spends four months in Canada. And this is a fabulous diving bird that spends most of its time under water. So if my mathematics are correct, this bird is actually *in* Canada for about seven days.

S.P. Actually, loons spend their time on both coasts and the Great Lakes wherever they're not frozen, so they are here for the full year. And what was your bird again? The Canada goose? It's an international bird too, although many stay put, of course, to eat our green lawns.

G.C. The loon does enjoy an overabundance of love and undue popularity. And that's established by the fact that it's already enshrined on the currency (though I notice it's on a coin of relatively low denomination). I think the loon



David Bird

Professor Emeritus of
Wildlife Biology at McGill University

GRAY JAY

Alex MacDonald

Senior Conservation
Manager for Nature Canada

SNOWY OWL

Steven Price

President, Bird
Studies Canada

COMMON LOON

attracts mentalities that lack a certain interest and charisma, and are happy to go with birds that may be considered *grotesque* and hermit-like!

D.B. I look at the name “common loon,” and think, do we really want to have as our national bird a bird with the name “common” in it? Or even the word “loon”? Do we want to be known as a nation of loonies? And there is a risk of that!

A.M. The gray jay, for all its endearing qualities, is kind of messy. It's not a great neighbour. They leave stuff lying all over the place — but it's not just “stuff,” it's rotting food! I don't think this is a bird that embodies Canadians or our politeness.

S.P. The snowy owl has had far too light a ride. You can't even see that symbol in this country — it's practically invisible on the landscape. We asked the audience, and virtually no one had seen it. What are we representing, anyway?

Which bird is least deserving?

G.C. The loon, because it is a psychological viper; it is the *tormented tarantula* on our shores. And as I mentioned already, just a horrifying creature in terms of demarcating the always-sinking value of the dollar.

D.B. I think the Canada goose: they're actually taking steps to kill them in certain cities because they've become so

numerous and obnoxious. I love them flying overhead and honking, but I just don't think they'd be a very good choice.

M.G. Canadians don't hog the limelight; we're too modest and well-mannered for that. So when a bird already has provincial status, like the loon, the snowy owl and the chickadee, it should step down and let another bird have national bird status.

government framework based on an “asylum,” a “banditry,” a “gaggle” or a “scold.”

M.G. People forget this, but subspecies of Canada geese once nearly went extinct. And what did we do? Because we love them so much, we reached out and saved them from the brink of extinction. Some of our heroes, like Jack Miner, started tagging those birds, and that system helped us understand migratory birds and informed the Canada-U.S. Migratory Bird Treaty.

'THE BLACK-CAPPED CHICKADEE BELONGS TO ALL CANADIANS. IT'S A BIRD OF REPRESENTATIVENESS, OF WHAT IT MEANS TO LIVE ANYWHERE IN THIS COUNTRY.'

Concluding statements

S.P. Loons are already well known and well liked, adopted by many organizations as a symbol, and again they're on the loonie. So it has currency! Sorry. In this important time for conservation of nature, wild habitats and birds, we need a bird that can gather Canadians all around, and the loon is already partway there.

A.M. Given that the snowy owl is Quebec's provincial bird, I think it's a great choice to bring the two solitudes together. Consider also that Canada is a parliamentary democracy, a constitutional monarchy, and as such, Canada has a *parliament*, which is what we call a group of owls. We don't have

G.C. The black-capped chickadee belongs to all Canadians. It's a bird of *representativeness*, of what it means to live anywhere in this country. It's not migratory and therefore it's not treasonous. It's loyal and persevering through all kinds of weather, a bird for all seasons. It's not a bird of flash, but it's probably the first bird here because it is so commonplace. This is a hard-working — a HARD-WORKING — proletariat bird.

D.B. The gray jay is also the Canada jay, *Perisoreus canadensis*, *Mésangeai du Canada*, whiskey jack. How many Canadian names can you have in a bird? And consider this: back in 1986, when the historic International Ornithological Congress was in Ottawa, the gray jay was voted official bird of the congress. It was the most Canadian bird they could find.



Not convinced by these arguments? Watch the full debate at nationalbird.cangeo.ca.

OUR NATIONAL BIRD **GRAY JAY**



ONE COLD, LATE FALL in the northern Yukon's Porcupine River region, John and Janet Foster, wildlife photographers and filmmakers with credits on documentaries such as CBC's 2014 *Wild Canada* series, were on an expedition to film caribou. As they prepared breakfast on the first morning with their local Gwich'in guides, a pair of gray jays flew down to inspect them and their frying pan, happy to share camp if it meant potentially also sharing the bacon. "The loons had gone south," Janet Foster says, "the Canada geese had left, and the snowy owls would soon be on their way from the North, leaving only the tough, truly Canadian species that face winter."

The Fosters have often been greeted by gray jays, from the Yukon to Ontario's

Algonquin Provincial Park, but they recall that encounter in particular. "We wondered how many thousands of times this scene has been repeated throughout Canada's history," says Foster, "as explorers and Indigenous people moved across the northern landscape and were welcomed at every campsite."

In a sense, these fearless birds were participants in formative periods in Canada's history — and not in the way beavers, bison and humpback whales were participants. Gray jays have been the frequent companions of First Nations hunters and trappers, and the laughs of voyageurs have surely rung out in the woods as they were entertained by the birds' antics. Today, they alight in mining and lumber camps and research stations,

and follow hikers and skiers down trails in provincial, territorial and national parks.

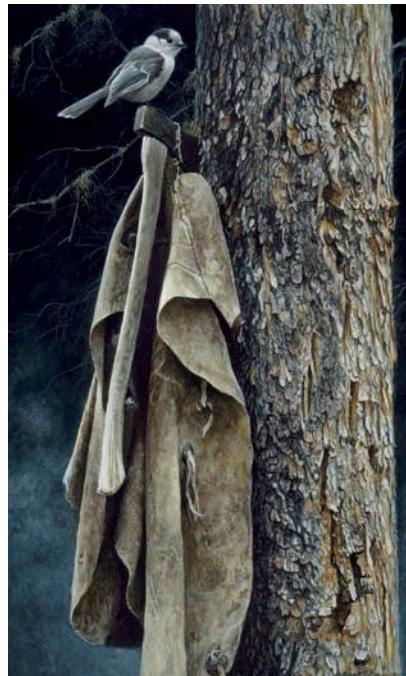
The gray jay is Canada's national bird, the friendly spirit of the wild northern and mountain forests. It's a blend of modest, monochromatic plumage and a vibrant nature in an unforgiving habitat that blankets nearly two-thirds of our country.

MANY CANADIANS, particularly the city dwellers among us, have yet to see a gray jay. That didn't seem to matter, however, as the National Bird Project unfolded and this unassuming avian was the only species during public voting to make a run at the illustrious loon and snowy owl, eclipsing the Canada goose, black-capped chickadee and raven.

The gray jay's intelligence and mischievous personality proved major selling points. As a corvid (a member of the crow and raven family), it enjoys the same brain-to-body ratio as dolphins and chimpanzees — and nearly that of humans. This helps not only in interspecies interactions but also in recalling the locations of food stashes hidden throughout its territory, affixed by its gluey saliva inside cracks in bark and under lichens. This "scatter-hoarding" makes it possible for gray jays to remain in Canada through the winter.

And they don't merely survive when most other birds have fled: they thrive. Unique for nesting in the harshest, darkest months, gray jays have been recorded





The gray jay (left to right from OPPOSITE) is known to come to hand, is a year-round resident, has been portrayed in the works of wildlife artist Robert Bateman and figures in Indigenous Peoples' lore and art, such as that of Anishinabek artist Mark Nadjiwan.

incubating eggs in snowstorms and at temperatures as cold as -30 C. (What could be more Canadian?)

Like the loon, the gray jay is an emissary of the places we think of as "pristine wilderness." And while it may lack the loon's cottage-country appeal, its boreal and high subalpine haunts — stretching into all 13 provinces and territories — are a more rugged representation of the nation.

As for Canadians venturing into gray jay country for the chance to see our hardy national bird, its instinctual curiosity makes them as likely to seek you out. "My first memory of them was as a teenager in Algonquin Park, driving through the gate in winter," wrote wildlife painter Robert Bateman on nationalbird.cangeo.ca. "We saw a gray jay and stopped. Rather than fly away, it flew nearer, so on a hunch I took a piece of sandwich and held it out. Then I was treated to the thrill of the trusting bird landing on my fingers. Friendly but wild. Could that be Canadians at their best?"

FOR 200 YEARS, this bird was known to English speakers as the Canada jay, until in 1957 the American Ornithologists' Union decided that, based on a nomenclatural system they no longer use, the species would henceforth be "gray jay" — at least for scientific literature and field guides.

This was not popular among Canadian ornithologists and birders, says Dan

Strickland, Canada's leading expert on gray jays; not only has the species never been recorded outside North America, the vast majority of its range is in Canada, with only a small percentage crossing into Alaska and the western mountains of the United States. Meanwhile, its Latin name is *Perisoreus canadensis*, and to the French it is *Mésangeai du Canada*.

The common moniker "whiskey jack" has nothing to do with the alcohol, but is rather an anglicization of the Cree

'FRIENDLY BUT WILD. COULD THAT BE CANADIANS AT THEIR BEST?'

Wisakedjak and similar variations used by nations in the Algonquian language family, which makes the gray jay Canada's only bird commonly referred to by a traditional Indigenous name.

Shirley Ida Williams, professor emeritus of Indigenous studies at Trent University in Peterborough, Ont., and a member of the Ojibwa Bird Clan, explains that in one old story, the Ojibwa trickster *Nanabozho* takes the gray jay's form, leaving it with a playful, generous spirit. But it's to the far-flung Cree peoples especially that *Wisakedjak* is a benevolent trickster of the forest, another shape-shifter who often appears as the

gray jay. Never malicious, he was in some cases created by the Great Spirit as a teacher and messenger for humankind.

To many western First Nations, the appearance of a gray jay in the morning is a good omen, and its chattering and whistles an early warning to hunters of nearby predators. There are even Gwich'in guides in the Yukon who tell of gray jays singing from tree to tree to lead a lost and starving hunter home.

GRAY JAYS are neither hunted nor endangered, and from the Atlantic provinces to the West are indicators of the health of the boreal and mountain forests and climate change. "A national bird should do those things," says David Bird, professor emeritus of wildlife biology at Montreal's McGill University. "Like polar bears, the gray jay requires that winters stay cold."

What better choice for Canada's national bird than one that inspires a conservation philosophy for all kinds of northern land uses, that has long been important to Indigenous Peoples and that will draw Canadians to their parks? And unlike the loon and snowy owl, the Canada jay is not already a provincial or territorial bird. More like the Canadian flag when it was selected in 1965, it is fresh and new and fitting. To borrow Bird's remarks from the expert debate, we cannot think of a more Canadian bird.

—Nick Walker

ONDAATJE ON BIRDS

An interview with
Sir Christopher Ondaatje



NOT LONG AFTER the final votes were cast for the 40 species that were contenders for the title of Canada's national bird, *Canadian Geographic* spoke to explorer and author Sir Christopher Ondaatje (BELOW) about the magazine's National Bird Project. Here is an excerpt of that talk, during which Ondaatje discussed everything from bird-inspired memories to a Canadian short film classic, John James Audubon, literature and more.



The five finalists of the National Bird Project are the common loon, the Canada goose, the snowy owl, the black-capped chickadee and the gray jay. Which of those birds would you choose to be the country's national bird, and why?

I'd choose the common loon — although the word "common" shouldn't be there, because it is not at all common. I've seen a female loon carry its chicks on its back. It's an incredible sight. Plus, it's difficult not to think of an aquatic bird when you think of Canada, which has about 20 per cent of the world's fresh water.

Does the loon summon any particular memories for you?

Oh, yes. When I'm homesick for Canada, the loon's call reminds me of Meisners Island, which is just outside the harbour at Chester, Nova Scotia, where my family goes every summer. It's the only place that I *really* want to be and where I hope I will end my days. The loon's plaintive cry is what I remember most when I find myself wishing I was there.



The National Bird Project has aroused great interest among Canadians. What film or book would you recommend to those who are interested in learning more about birds?

Anyone who has seen Canadian director F.R. "Budge" Crawley's short film *The*



The five finalists in *Canadian Geographic's* National Bird Contest, as portrayed in Audubon's *Birds of America* are (clockwise from ABOVE): The snowy owl; the black-capped chickadee; the Canada goose; the common loon; and the Canada (or gray) jay.

Loon's Necklace will understand part of the reason why I have chosen the loon. It's a magnificent work, featuring actors wearing authentic Indigenous masks in a retelling of the Tsimshian First Nations legend of how the loon got the distinctive band around its neck.

For a book, I'd recommend well-known Canadian author Katherine Govier's *Creation*, a really marvellous novel about John James Audubon, the great American ornithologist, naturalist and artist. Audubon's journals, which were edited and published by his granddaughter in 1897, almost half a century after he died in 1851, are exhaustively detailed and document his personal life, work as a naturalist and taxidermist, and his travels into Mississippi, Alabama, Louisiana and Florida in search of ornithological specimens for his future magnum opus *Birds of America* — still considered one of the greatest examples of book art. Curiously, however, the journals of his 1833 expedition to explore the rugged nesting grounds of seabirds on the northern shores of the Gulf of St.

Lawrence and the Labrador coast seem unaccountably devoid of detail. Govier has seized on this omission and written about Audubon's pitiless fog-bound journey, which was taken midway through the creation of *Birds of America*.

Perhaps not surprisingly, the five National Bird Project finalists are among the 435 watercolours Audubon painted for *Birds of America*. What did you learn from *Creation* about Audubon and the way he worked on that project?

With single-minded determination, Audubon set out to paint one page a day. He hired hunters to gather specimens for him and his ambitious project took him away from home for months at a time. He slaughtered hundreds of birds, the bodies of which he would wire and twist into remarkably lifelike and dramatic positions before starting to paint. What I found so compelling about the novel is that Govier does something similar, taking some necessary liberties with characters but sensitively shaping them into positions in dramatic settings. It's an extraordinary,



creative work and perhaps the closest we'll ever get to understanding the character of this artistic genius whose act of creation was also an act of destruction.

—Interview by Harry Wilson



Read Sir Christopher Ondaatje's paean to Chester, N.S., at cangeo.ca/dec16/chester.





IN SEARCH OF THE WOLVERINE

What we're learning about one of the toughest
(and most elusive) animals in the world

BY FRASER LOS
WITH PHOTOGRAPHY BY KYLE HAMILTON

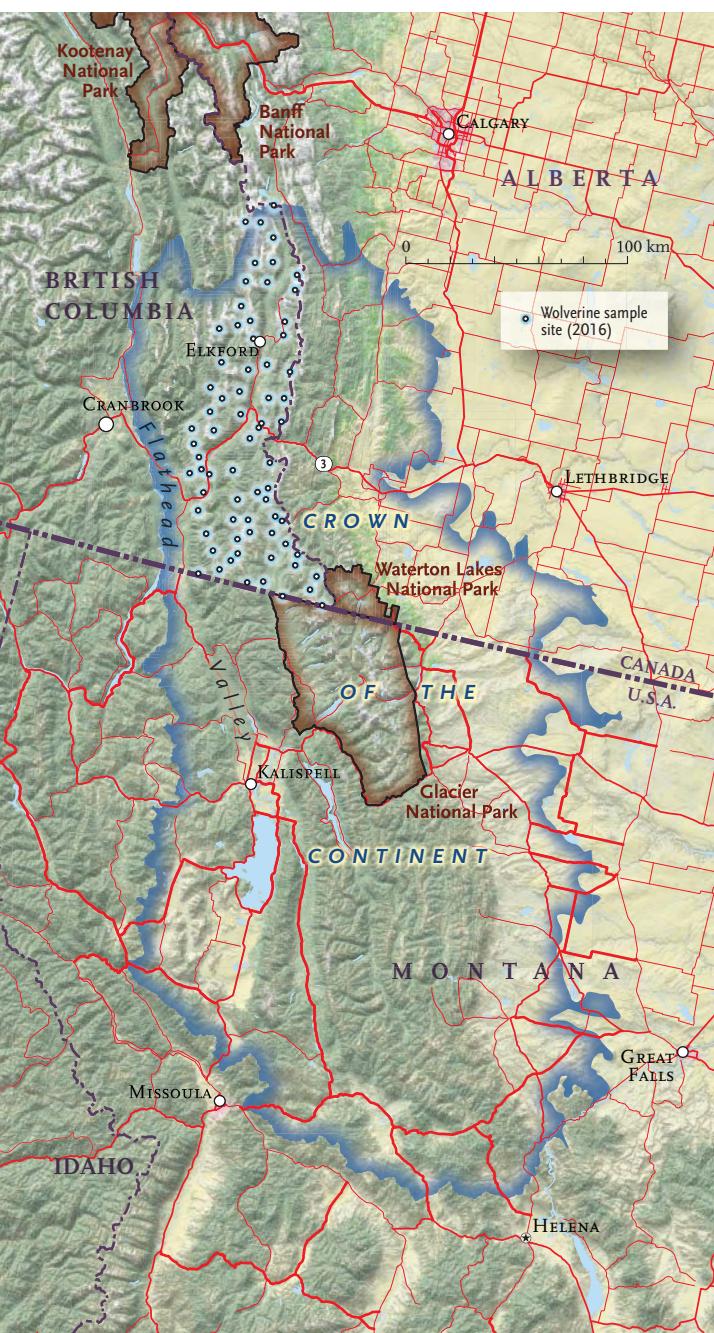
ABOUT 15 KILOMETRES into the snowy backcountry northwest of tiny Elkford, in British Columbia's rugged Elk Valley, I step off the snowmobile and follow a set of distinctive clawed footprints.

"They're definitely wolverine tracks," says Tony Clevenger, a wildlife biologist with the Western Transportation Institute at Montana State University who's leading a wolverine sampling study in the region. We trace the tracks for a few hundred metres and search unsuccessfully for scat to pick up for later analysis.

Back on the machines, we ride deeper into the valley, crossing avalanche paths and steep, rocky canyons, eventually snowshoeing another half kilometre through 1½-metre-high snow drifts to one of Clevenger's wolverine sampling sites, where a skinned, rotting beaver carcass is nailed to a pine tree, its flesh ripped apart. "Looks like a lynx did this," he says, "but I won't know for sure until we send these hairs to the lab for testing."

He carefully picks the hair samples off barbed wire he had wrapped around the tree, and after labelling and sealing the samples into individual packets, it's time to add more bait. We dump another skinned beaver out of the stinky bag we've been carrying, then screw three metal spikes into the tree trunk to act as steps. I position myself on the top two steps, and Clevenger holds the carcass in place as I nail it beside the ravaged one. Clevenger then adds to the stench with a cloth soaked in a horrible-smelling concoction of skunk glands and other pungent substances. He ties it on a string, throws it over a branch, then pulls it into the canopy, a beacon for carnivores far and wide.

Clevenger and his fellow researchers have gone to great lengths studying wolverines in the central and southern Canadian Rockies since 2010 — skiing, snowshoeing, snowmobiling or helicoptering into remote areas to set up a grid of bait traps like this one (complete with motion- and heat-activated cameras that snap multiple images when any animal approaches) to collect every hair sample they can find. It's a non-invasive form of sampling, since no wolverines are physically trapped or collared. "The beauty of that is you can cover a large area and the animals don't even see you," says Clevenger, "but you still get the genetic data. And you're studying the population fully, whereas other studies may look at one individual with a collar and extrapolate from there." In 2016 alone, the researchers surveyed more than 8,200 square kilometres.



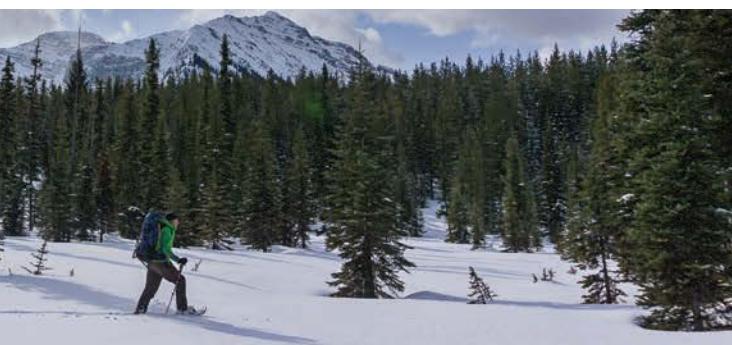
Clevenger says the wolverine is one of the least-studied mammals on the continent and a key indicator species that appears to be in decline in parts of its increasingly fragmented and shrinking western North American alpine habitat — a combination that makes understanding where it is and how it moves across the land all the more important.

HERE'S SOME

of what we *do* know about wolverines. The largest species in the weasel family, they are fearless and tenacious, pound-for-pound one of the toughest animals in the world; a wolverine has been known to challenge a 230-kilogram grizzly bear (more than 10 times its size) for a morsel of food, and can crush and even eat bones with its powerful jaws and teeth — it's called *Gulo gulo* ("glutton" in Latin) for a reason. In western North America, wolverines live high in the mountains, where food is scarce, and at such low densities that they must roam vast distances, sometimes hundreds of kilometres, just to find a breeding partner.

We also know that in places such as southern British Columbia, as with many other mountain ranges in the Rockies, the terrain is more than ever being shared by loggers, miners, snowmobilers and skiers. And the more intensive that human activity becomes, the less likely it is that wolverines will stick around. In fact, at the last two bait sites Clevenger and I visit, the beaver carcasses had been left on the tree intact, stinking up the environs for a month.

In early 2016, Clevenger and his colleagues wrapped up six years of wolverine research to better understand where they live and how human development affects them. For the first three years, the researchers surveyed wolverines in Banff, Yoho and Kootenay national parks to see whether the animals were



crossing the four-lane Trans-Canada Highway that slices through protected areas, dividing prime wildlife habitat. For the next three years, they sampled the Canadian part of the Crown of the Continent ecosystem, an area that encompasses the Rockies of southern British Columbia and Alberta. Here, much of the land is unprotected and wolverines face a range of obstacles, including highways, mines and clearcuts, and the maze of resource roads that service them, which impede their ability to move through the landscape in search of food and mates.

When the results came back from surveys in Banff, Yoho and Kootenay, Clevenger's team found that the highway was inhibiting some wolverine movement, especially that of females, but that the populations were healthy. "These parks are really important for wolverines. They're doing fine there," says Clevenger. "The problem is this matrix between those core protected areas. And really, we know nothing about how wolverines are doing in those areas. Nothing at all."

Like many iconic mammals in western North America — grizzly bears, wolves, caribou — wolverines live in a patchwork of protected and unprotected areas that extend from around Yellowstone National Park in the United States all the way to the Yukon. Maintaining and, in some cases, restoring connectivity along this vast expanse, dubbed Yellowstone to Yukon, is perhaps the last hope for wolverines in the southern reaches of the Rocky Mountains, where roads and other forms of development are keeping them isolated in protected areas and limiting the

Clockwise from ABOVE: Beaver carcass bait in a wolverine hair trap; Tony Clevenger snowshoes to a sampling site in the Flathead Valley, B.C.; a wolverine; Clevenger's research assistant Troy Malish (with glasses) collects hair samples. PREVIOUS PAGES: A valley in the southern Canadian Rockies, a.k.a. prime wolverine territory.

possibility for breeding with healthier populations farther north. "We hope to provide a roadmap," says Clevenger of his research. "What are the important corridors and habitat for wolverines, and what kind of connectivity do they need?"

CLEVENCER'S SAMPLING areas are exclusively in Canada, but as with many of his wolverine-studying colleagues throughout the Rockies, his research focus is continental in scope.

"Wolverines were once eradicated from the lower 48 states," says Jodi Hilty, who helped lead a wolverine study in the greater Yellowstone ecosystem in the 2000s, and is now president and chief scientist of the Yellowstone to Yukon Conservation Initiative, a joint Canada-U.S. not-for-profit dedicated to securing the long-term ecological health of that region. Like elsewhere in North America, a combination of intensive hunting, trapping and poisoning, and habitat loss and fragmentation almost finished them off. By the 1930s, however, wolverines had made a comeback, almost certainly via movement of individuals from Canada.

Today, researchers estimate that there are 250 to 300 wolverines in the contiguous United States. Most of these are spread thinly across protected but isolated mountain

ranges in Montana, Idaho and Wyoming, with a smattering in Washington and Oregon, and usually with only between two and five animals in each range.

The densest population of wolverines south of the Canadian border is in Montana's Glacier National Park, where in 400,000 hectares there are only 35 or 40 individuals. And given the wolverine's notoriously low reproduction rates — females don't breed until the age of three, and have only two or three kits every other year — that population isn't growing fast.

The bigger problem, says Hilty, is that in core protected areas such as Glacier and Yellowstone national parks in the United

Wolverines are tenacious, pound-for-pound one of the toughest animals in the world.

WOLVERINES



States and Banff National Park in Canada, wolverines are not reproducing much (or not at all) *outside* their own population, since travel beyond park boundaries is increasingly perilous. “In the U.S. Rockies particularly, those mountain ranges are like little islands,” she says, adding that wolverines in the United States need to interact with others in Canada to have a long-term and viable population. That interaction introduces new individuals into each population, making them more resilient to major changes such as disease and climate change.

The latter is a controversial topic when it comes to protecting wolverines in the United States. In April 2016, a federal judge there ordered wildlife officials to reconsider their earlier decision not to list the species as threatened under the Endangered Species Act and put the onus back on the government to find a way to protect wolverines in the face of an increasingly warming climate.

“Climate change is one of the greatest challenges wolverines face because it will further fragment their habitat,” says biologist Jeff Copeland, who led wolverine research studies for more than 20 years in Glacier National Park and elsewhere in the U.S. “And with only a handful of wolverines in each local area, any random event can potentially wipe out a population.”

The case for listing is unprecedented because it’s based largely on future changes — specifically the expected acceleration of diminishing snowpack and warmer temperatures, which could imperil the snow-loving wolverine. Beyond losing some of their competitive advantage over other predators, the most pressing concern is the effect on wolverine denning habits — breeding females rear their young in dens dug deep into the high-elevation snowpack, usually near avalanche paths where they feed on animals buried in the slide.

“If wolverines could adapt to a warmer climate, we’d see some variance in where they’re living and how they’re denning,” says Copeland. “So far we’ve seen zero variability. You just don’t see wolverines denning in the absence of snow.”

Fraser Los (@flosGreenPages) has been nominated for three National Magazine Awards and writes extensively on conservation issues for Canadian Geographic and other magazines. Kyle Hamilton (@khphotograph) is a Fernie, B.C.-based photographer whose work focuses on mountain-inspired activities.

A wolverine scales a tree in Banff National Park to get the bait left in a hair trap (ABOVE), a shot captured by a remote camera (TOP LEFT). Troy Malish collects tufts of hair from a hair trap (BOTTOM LEFT).

TONY CLEVINGER had all of these threats in mind when he kicked off his second research study, but he also put a heavy emphasis on connectivity. His survey covered more than 20,000 square kilometres of the Canadian side of the Crown of the Continent ecosystem, a critical transboundary region that provides one of only three viable corridors for wolverines and other wide-ranging wildlife to move back and forth between protected areas in Canada and the United States.

Straddling the borders of Alberta, British Columbia and Montana and covering roughly 72,000 square kilometres of mixed-use land, the Crown is a microcosm of the greater Yellowstone to Yukon region. It’s one of North America’s most diverse ecosystems, alternating between icy peaks and wide, gravel-bed river bottoms, and it features the world’s first trans-border park, Waterton-Glacier International Peace Park, which connects Alberta’s Waterton Lakes National Park with Glacier National Park in the United States.

The Crown may be a vital region connecting populations of wolverines, but it’s also facing heavy development. “In the land between Banff, Yoho, Kootenay and Waterton-Glacier, you’ve got Highway 3 and extensive traffic,

and you’ve got oil and gas development, forest cutting and motorized recreation,” says Clevenger. “This really is a critical piece of geography.”

As expected, Clevenger and his team found fewer wolverines in these unprotected areas than in the protected areas he surveyed in the first three-year study. “Detection rates were only about 25 to 30 per cent, whereas in the national parks it was 85 to 90 per cent,” he says, adding that the lowest wolverine numbers were found in the southern Alberta Rockies, where undisturbed habitat is more scarce.

Biologists and conservationists view those heavily developed regions in southern Alberta and British Columbia as missing pieces in a puzzle, the gaps acting as impediments for animals roaming north and south along one of the only viable mountain habitats wolverines have left. In scientific terms, those unprotected areas could cut off the genetic lifeline for southern populations, which would become more isolated and more vulnerable over time — an issue that’s even more dire in a changing climate.

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WOLVERINES

Take that puzzle analogy a little further, and you'll see why conservationists were so ecstatic when the Alberta government announced in September 2015 that more than 100,000 hectares would be protected in the Castle watershed, an area just north of Waterton-Glacier. And why they've been pushing to protect similarly important habitat farther west, especially the Flathead Valley, a transborder watershed that links southern British Columbia to northern Montana and forms the centrepiece of the Crown of the Continent ecosystem.

"Genetic studies have identified clearly that for the U.S. population to survive, it's dependent on immigration from Canada," says Clevenger, adding that although genetic isolation could take several generations to cause wolverine populations to crash, it would likely be inevitable. "Maintaining connectivity is crucial," he says, especially in the fragmented landscapes just north of the U.S. border, which provide that all-important linkage to healthier populations farther north.

Although Clevenger says interconnected ecosystems are essential, he's quick to add that the most urgent concern is protecting extant core populations: "When you have people trapping and taking individuals out, especially breeding females, those effects are huge," he says. "They have an immediate effect in one or two generations."



A set of tracks leading across a snow-covered lake is the only immediate sign of a wolverine's presence in Yoho National Park.

Protecting wolverines has never been an easy sell — they don't often get the "charismatic megafauna" tag that grizzly bears or wolves do, even though in many ways they embody the true essence of wilderness. Ironically, that may partly explain why we know so little about them. It's their wild ways that make them so exceedingly difficult to study.

Clevenger believes his work is important not just for the long-term survival of the wolverine, but for the health of the mountain ecosystems they inhabit. He suggests that wolverines may be even more sensitive to human disturbance than grizzly bears — the animal most often touted in North America as an indicator species — and so perhaps a better measure of healthy, well-connected ecosystems. "If you lose wolverines," he says, "it's a pretty good indicator something's wrong."



Learn how highways and other developments are threatening the genetic diversity of wolverines at cangeo.ca/dec16/wolverines.

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The magnificent **SEVEN**

Introducing the nation's most iconic trees

BY HANS TAMMEMAGI
ILLUSTRATION BY MARY SANCHE

Canada is usually described in terms of its geology — the spine of mountains, the vast Prairies and the Canadian Shield. But I wanted to see the country in terms of its trees, and I was on a mission to seek out the nation's most notable. After all, these living, breathing organisms have character, contain immense history and have stories to tell. Here are seven worth knowing better.

The San Juan Spruce NEAR PORT RENFREW, B.C.

GIANTIC TREES SOAR skyward like turrets. Shafts of golden light angle down to a dusky forest floor, rich with sword ferns, moss-covered logs and witch's hair dangling from branches. A banana slug inches along the trail. Chirping birds sound like monks quietly chanting. I'm deep in the forest near Port Renfrew on Vancouver Island, beside the enormous San Juan Spruce, and feel humble, as though in a grand cathedral.

The San Juan Spruce — Canada's largest spruce at 63 metres tall — is not just a tree, but an entire vertical ecosystem. Over a thousand years of existence, soil has formed on branches creating a rich tapestry of hanging gardens of sword ferns, huckleberries and deep-green moss, which, in turn, give form to more life. Innumerable birds, insects and even small animals call the tree home. The giant spruce appears primordial and wise, a matriarch of this forest. I place both hands against the gnarly, moss-covered trunk and close my eyes. I feel a spiritual energy, a connection. It's a humbling reminder of nature's majesty. If this ancient tree could speak, what tales it could tell. My journey has started well.

The Burmis Tree NEAR BURMIS, ALTA.

ALTHOUGH LONG DEAD, the Burmis Tree is the most photographed tree in Canada. Its wraith-like form stands outside the former coal-mining town of Burmis at the eastern entrance to the Crowsnest Pass in southwestern Alberta. Buffeted by strong prevailing winds, the pine died in the late 1970s at an estimated age of 700 years — among the oldest trees in the province. It remained upright until 1998 when high winds finally toppled it.

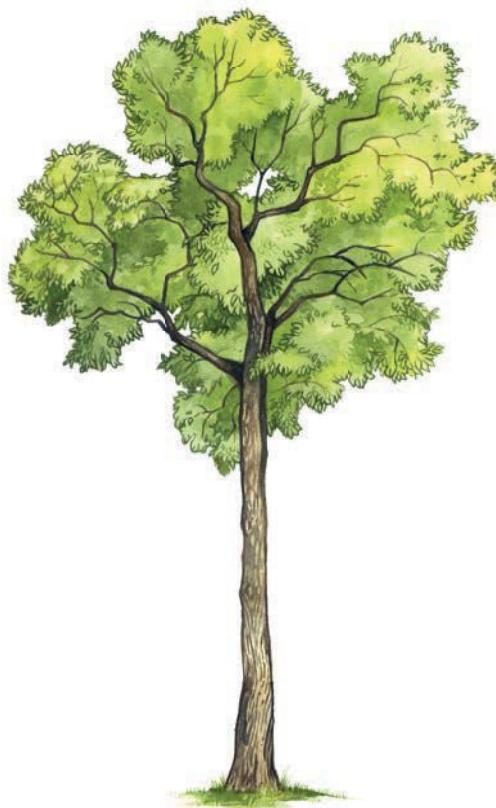
Community members resurrected it using stainless steel rods and brackets. Reconstructive work was done again after the tree was vandalized in 2004. Later, Highway 3 was built around the



tree rather than removing it. The tree has a short, thick, irregularly limbed trunk. Silhouetted against a sunset or the mountains, it's instantly recognizable.

"The Burmis Tree is a sentinel, and she's tough, like a coal miner's wife with 13 kids

who's worked to the bone and has lived through all the tragedies," says Monica Field, who spearheaded the restoration project. To me, the tree's stark outline symbolizes how harsh life can be and the fortitude required to overcome those difficulties.



The Kenny Street Elm WINNIPEG

TREES ARE NOT PLENTIFUL on the Prairies, but in Winnipeg, majestic American elms grace yards, parks and riverbanks, and form a lush canopy over streets.

"Elms define our neighbourhoods and our tenacious Prairie spirit, so we fought to save them," says Gerry Engel, certified arborist and president of Trees Winnipeg, referring to when Dutch elm disease almost annihilated the species in the mid-1900s. But thanks to a vigorous campaign of inspection and pruning, the trees survived. Today, the city boasts the largest number of elms in North America. Good, I thought — here human intervention is saving trees.

No Winnipeg tree may represent this commitment more than the Kenny Street Elm in St. Boniface. More than 150 years old and towering 19.2 metres, it became a Winnipeg landmark in the late 1880s when a hunter, who regularly pursued game in the area, cut a large cross in the bark (which is now grown over). Still, almost a century later, the reconstruction of the street was diverted around the tree to preserve its history in the city.

The Comfort Maple

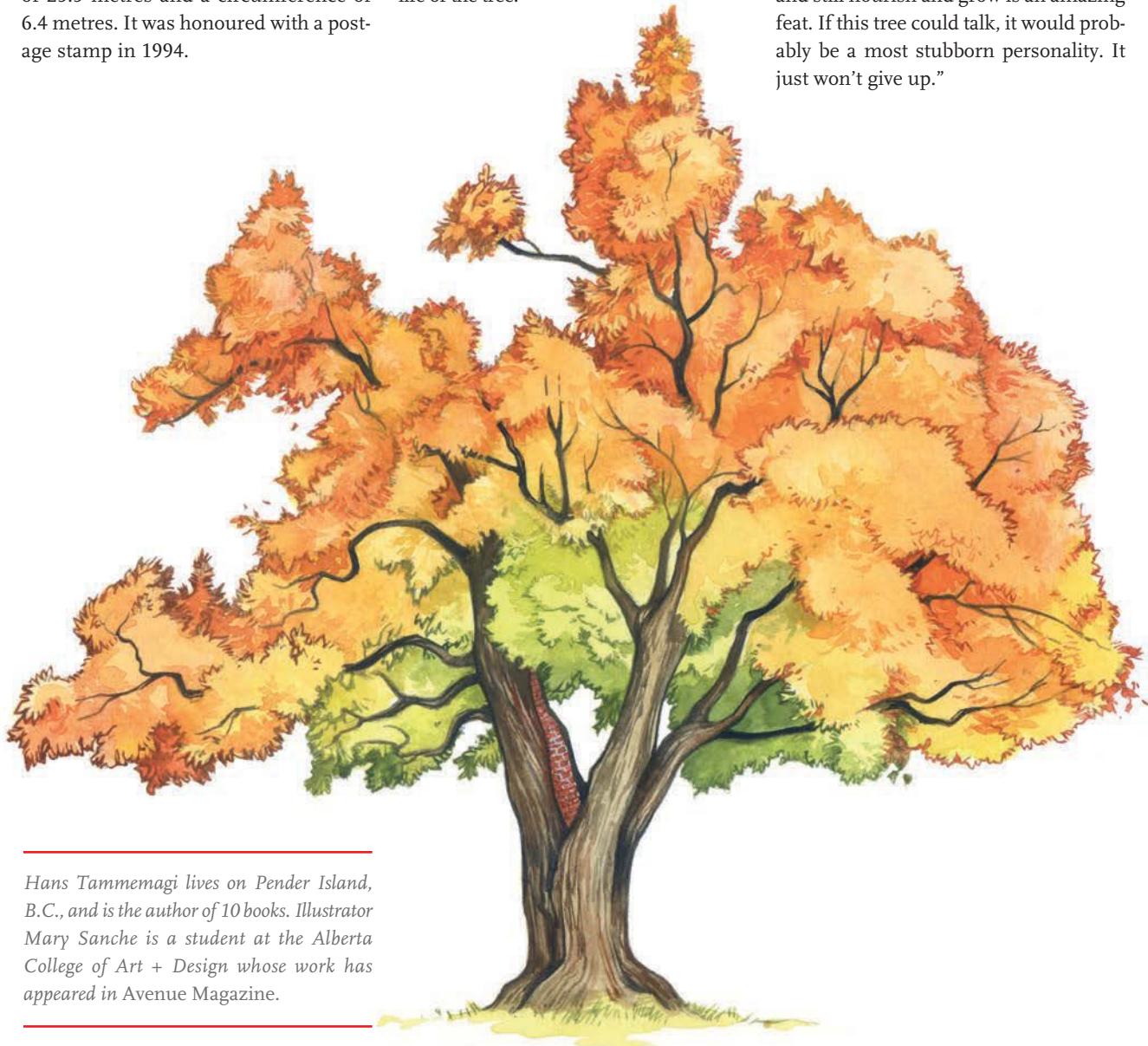
NEAR FENWICK, ONT.

THE SUGAR MAPLE is a national symbol. Not only do its leaves turn a brilliant red or orange in the fall, but it also produces mouth-watering maple syrup. The nation's finest is the Comfort Maple, also known as Old Glory. It's considered Canada's oldest (530 years) and largest sugar maple, with a height of 23.5 metres and a circumference of 6.4 metres. It was honoured with a postage stamp in 1994.

Standing in a small, out-of-the-way conservation area in Niagara, it towers over adjacent orchards as if surrounded by small, doting grandchildren. The majestic tree is named after the Comfort family, the former owners of the land. In 1961, they leased the property to the Niagara Peninsula Conservation Authority for the life of the tree.

Lightning struck it in the early 1960s, but specialists repaired the damage, and the maple is now held together by bricks, concrete and wires.

"It's a gateway into the history of our landscape," says the authority's Michael Reles. "That something can survive through all that has changed in the world and still flourish and grow is an amazing feat. If this tree could talk, it would probably be a most stubborn personality. It just won't give up."



Hans Tammemagi lives on Pender Island, B.C., and is the author of 10 books. Illustrator Mary Sanche is a student at the Alberta College of Art + Design whose work has appeared in Avenue Magazine.

The Jack Pine

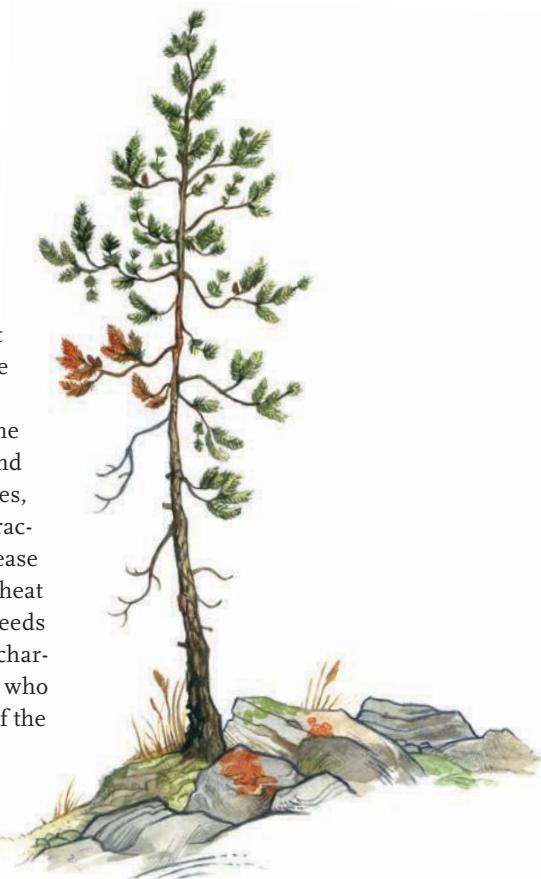
ALGONQUIN PROVINCIAL PARK, ONT.

I HEAD NORTH to Ontario's cottage country and the vast Canadian Shield, the rugged land of lakes, boreal forest and glacier-scoured outcrops. More than any other tree, the jack pine is symbolic of this region. When canoeing in Algonquin Park as a youth, my favourite sight was a lonely jack pine silhouetted against an orange sunset. The visual equivalent of a loon's call, it captures the spirit of the land and my love of nature.

This feeling is beautifully portrayed in Tom Thomson's evocative painting, *The Jack Pine*, one of the country's most widely recognized artworks. The tree

believed to have inspired this work was located in the park in 1970, although it was long dead at that time. Today, a lookout at Grand Lake marks the historic tree's location.

Found in Canada from east of the Rocky Mountains to Nova Scotia and north into the Northwest Territories, the jack pine has an unusual characteristic: the cone will open and release its seeds only under the extreme heat of a forest fire. The jack pine needs adversity to thrive, mirroring the character of the explorers and settlers who long ago overcame the hardships of the Canadian Shield.



The Gros Morne Tuckamore

GROS MORNE NATIONAL PARK, N.L.

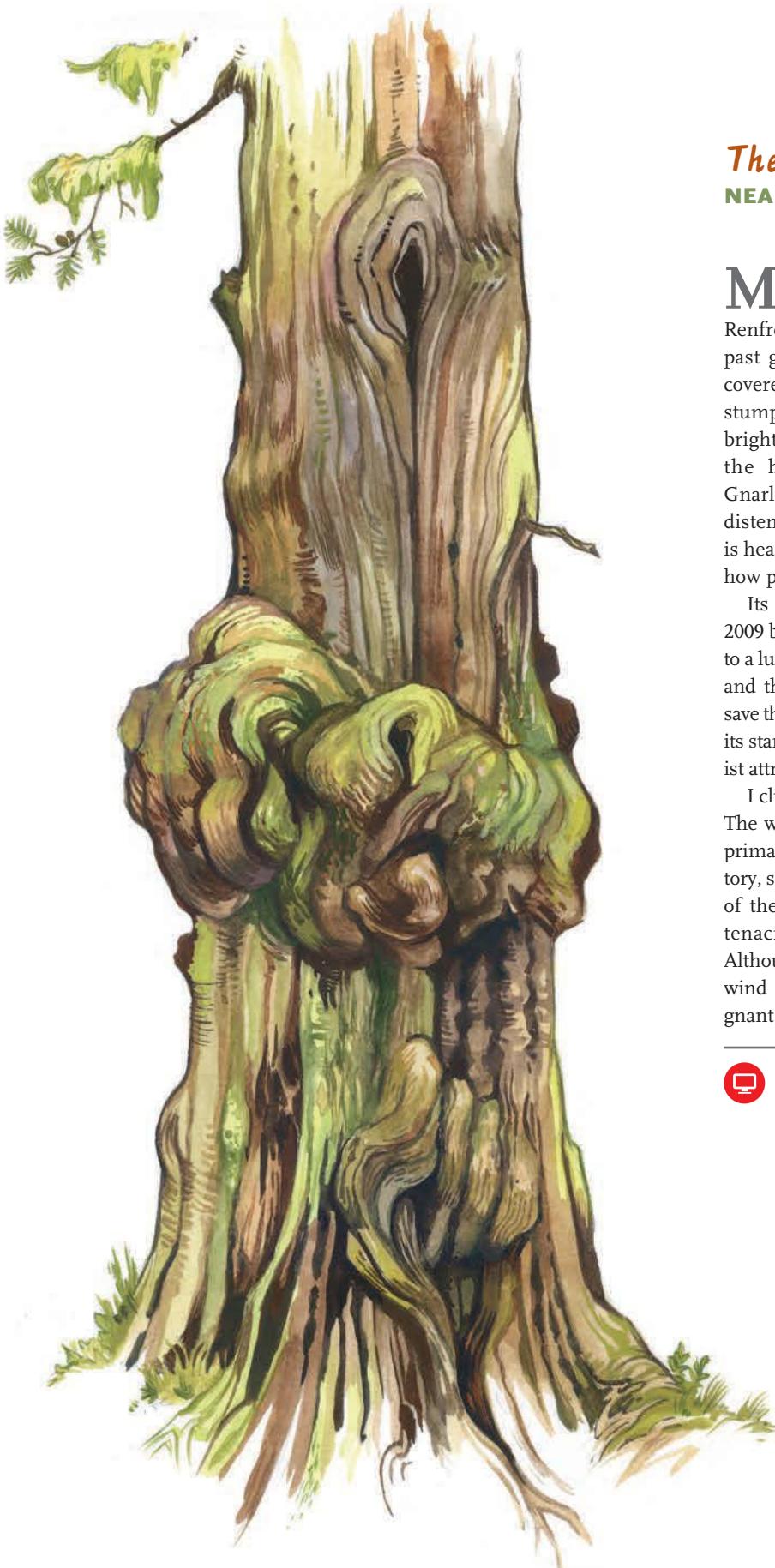
THE TUCKAMORES, found mostly along Newfoundland's west coast, are stunted like bonsai. Michael Burzynski, a Newfoundland-based plant biologist, explains that tuckamore is not a specific plant, but a vegetation type, a balsam fir or white spruce that has been sculpted by strong, persistent onshore winds.

They form nice low "caves" for animals and campers to shelter in and are fairly comfortable to lie on. On a misty day, I almost expect a Hobbit to pop out. But I was warned: don't try to hike through them. "Tuckamores are like a barbed-wire fence," says Burzynski. "When I meet a stand, I find a moose trail or go home. You can flail, curse and pummel, but you can't get through. Once a friend went in with trousers and came out with a kilt."

Thanks to its deceptive toughness and sculptural beauty, the tuckamore was adopted as a symbol for Gros Morne National Park.



THE MAGNIFICENT SEVEN



The Gnarliest Tree NEAR PORT RENFREW, B.C.

MY MISSION leads back to Vancouver Island to Avatar Grove, near Port Renfrew. A boardwalk and trail meanders past giant trees and across a forest floor covered with fallen logs, ferns and salal. A stump covered in fluorescent orange fungi brightens the dusky understorey. I gasp at the huge cedar known as Canada's Gnarliest Tree. A rampant growth of burls distends and distorts its large trunk. Yet it is healthy, albeit grotesque, and still somehow picturesque.

Its home in Avatar Grove, discovered in 2009 by big-tree hunter T.J. Watt, almost fell to a lumber company's chainsaws, but locals and the Ancient Forest Alliance fought to save the area, and today the Grove, along with its star tree, is Port Renfrew's marquee tourist attraction.

I climb into the tree and nestle on a burl. The wind whispers in the boughs. I feel a primal force and sense the tree's vast history, spanning scores of generations. I think of the trees I've visited, some small and tenacious, others sweeping and grand. Although vulnerable to chainsaws, disease, wind and lightning, they are vibrant, poignant and resonant with life.



For more facts about each of these seven iconic trees visit cangeo.ca/dec16/trees.

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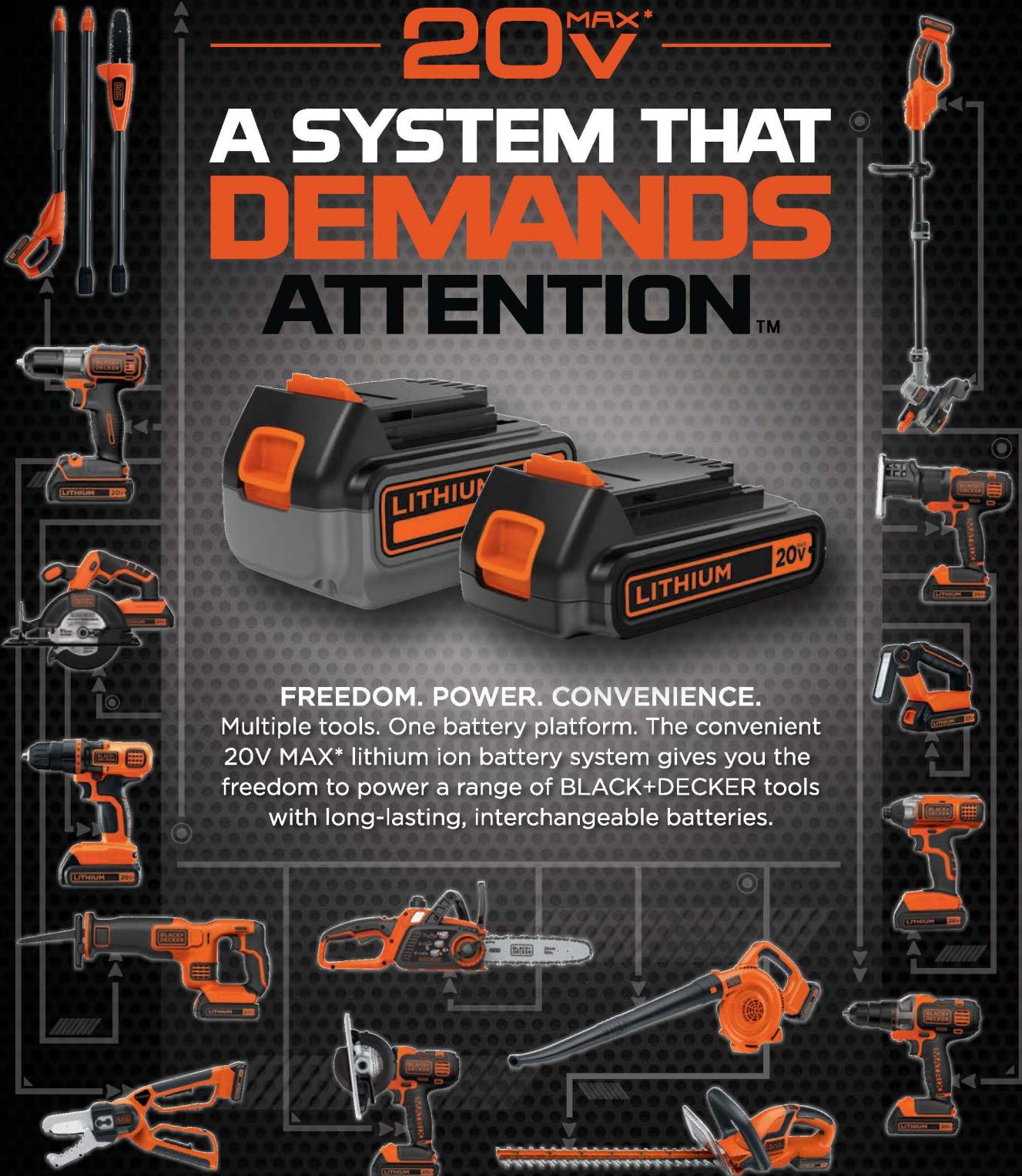
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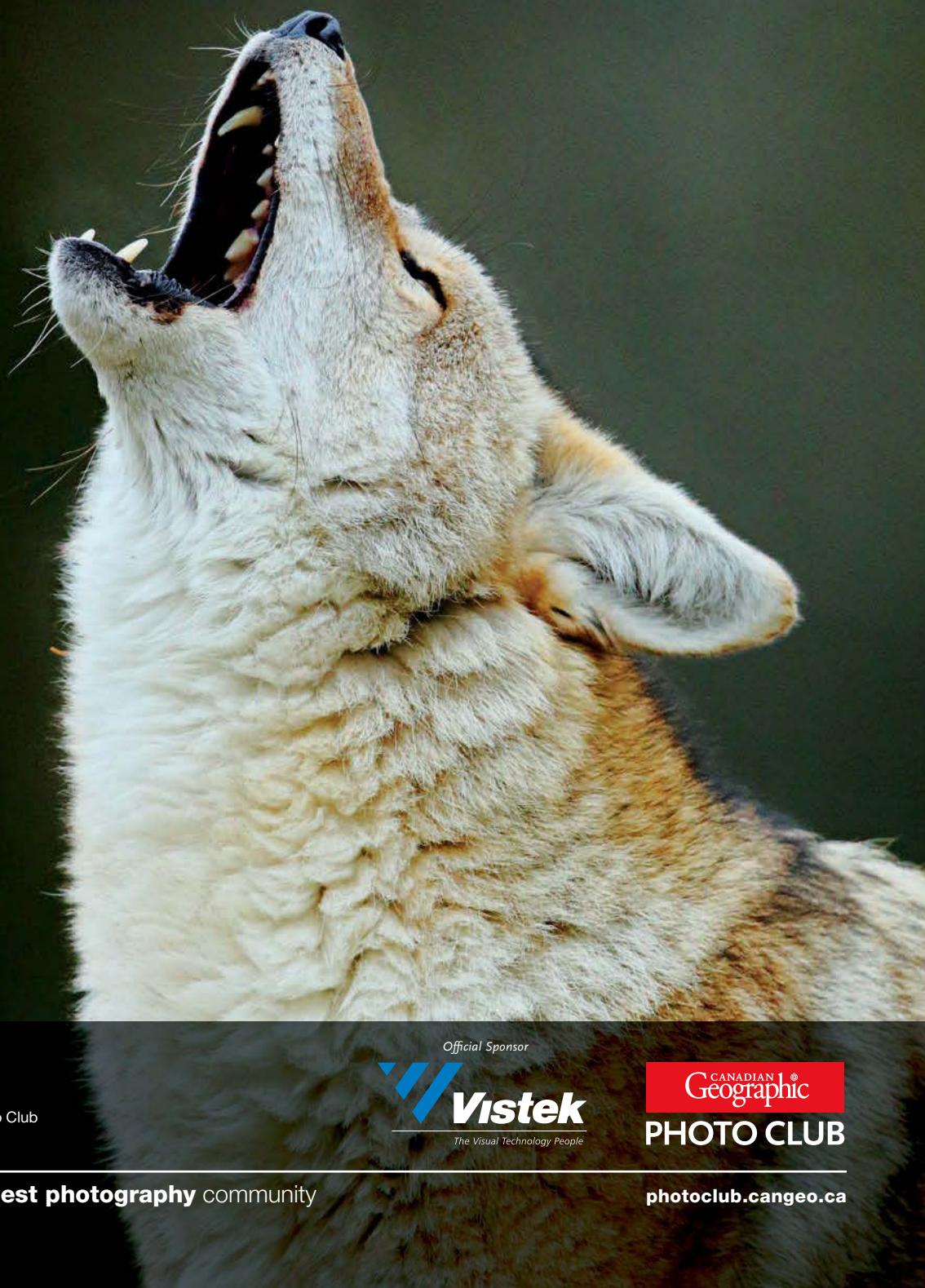


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THAT DO TO YOU?
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Meet the scientist at the forefront of research on ocean microplastics and find out what he's doing to save the planet

BY ALANNA MITCHELL

IT'S A SUNNY MORNING

in late spring and Peter Ross, one of the world's top marine toxicologists, is on a boat leading a plastics-finding expedition in the Pacific Ocean harbour south of Vancouver's Stanley Park. He doesn't have far to go. Mere minutes into the journey, he points off in the distance and yells to the boat's captain: "Jeremy! Emergency!"



Jeremy Heywood, a diving safety officer with the Vancouver Aquarium, abruptly shifts course and throttles the engine. Minutes later Ross reaches into the ocean and fishes out a boulder-sized piece of rotted Styrofoam, a type of plastic, smutted with algae.

"It's gonna break down into bits, a bajillion bits," he says, holding it up.

Within seconds, his prediction starts to come true. The Styrofoam, likely loosed long ago from a dock, is already so degraded that a slight wind snatches small flakes from it and blows them back into the water.

It's those little bits of plastic, and the even tinier, invisible pieces they disintegrate into, that have captured Ross's attention. And while scientists have been worried for decades about visible plastic in the ocean — the six-pack rings that garrote sea birds, the lighters that show up in the corpses of baby albatrosses, the shopping bags that suffocate migratory turtles — they now fear those large pieces are not the most dangerous.

Instead, it's what the big pieces degrade into: increasingly smaller pieces of themselves, immortal, spreading from pole to pole, from surface to depths, from shore to gyre. The sheer reach and volume of the stuff has shocked the world's scientific community.

Although Canada has recently labelled plastic microbeads a toxic substance — a step toward banning beads used in products such as facial cleansers — there's still a tremendous amount of even tinier plastic in the water. One recent study found that

if trends continue, by the middle of this century there will be more plastic by weight in the ocean than fish.

Some scientists are sprinting to determine the impact of microplastics on the marine animals that consume them, but Ross has turned his attention to another piece of the puzzle. He's using the forensic tools of a high-tech

"We can identify and turn off some of the taps," says Ross. "But it's going to be tough."

ROSS, 53, still remembers the image he saw on a childhood friend's television that triggered his lifelong fascination with toxic chemicals: a Tokyo police officer directing traffic wearing a gas mask. It was the start of realizing that the planet's air and water are linked and that toxic chemicals in one place mean they can show up somewhere else.

He's telling me this story at the Vancouver Aquarium Marine Science Centre, in a small meeting area overlooking outdoor tanks where researchers work with Steller sea lions and northern fur seals. Ross landed at the aquarium in 2014, nearly a year after the government of former prime minister Stephen Harper axed the marine toxicology team he led at Fisheries and Oceans Canada. Within a year, Ross set up an ocean pollution research team at the aquarium to do the work.

Ross is a scientist's scientist, which is to say that he's obsessed with impeccable methodology. He takes no shortcuts, brooks no spin. He is incapable of exaggeration. And while he admires good laboratory experiments, his strong bias is for research with wild animals roaming free.

His life's work is a devastating, precise and pioneering catalogue of the many ways human-made chemicals harm sea life and the creatures that depend on it, particularly their immune and endocrine systems. His findings rarely won friends

**ONE RECENT STUDY
FOUND THAT IF TRENDS
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crime scene investigation to uncover precisely which of several thousand chemical fingerprints a plastic fragment carries, possibly which manufacturer made it and maybe even which product it was in before it broke down into a marine threat. His reasoning? If you can trace plastic back to its source, you can stop it from getting into the water. To him, the problem is now so severe that the focus must be on prevention.



in his government department, where, he says, the emphasis was on fish rather than the toxins they contain.

"I get that, but it's in no one's best interest to have those chemicals in those products," he says. "My argument is that if you don't know about it, you can't turn off the tap."

At university, he worked his way through research on toxic metals poisoning dragonfly nymphs in acid-rain-drenched lakes, PCBs killing double-breasted cormorant chicks in the Great Lakes and then, just in time for his PhD, he hit upon an intriguing scientific mystery: harbour seals were dying en masse in Europe. Scientists suspected a virus.

But Ross remembered that PCBs and other long-lasting toxic pollutants can impair immune systems. So he moved to the Netherlands and set up a study catching mother and pup harbour seals in the wild and then, for 93 weeks, fed them either herring from the highly polluted Baltic Sea or from the lightly polluted Atlantic Ocean. Results, published in 1994, were both groundbreaking and clear. The chemicals were harming the seals' ability to fight infection; the virus was killing them because they were already weakened.

*Science journalist Alanna Mitchell recently turned her international bestselling book *Sea Sick: The Global Ocean in Crisis* into a one-woman play. Her most recent book is *Malignant Metaphor: Confronting Cancer Myths*.*

Returning to Canada in 1996, Ross joined the federal government in Sidney, B.C., and began a frenzy of research on how long-lived toxins collect in the bodies of marine creatures over time and harm their health: harbour seals, killer whales, Steller sea lions, belugas, salmon, sea otters, northern elephant seals and a host of other animals. His

Peter Ross shows off plastic debris from the Vancouver Harbour (OPPOSITE). Such plastic breaks down into microscopic bits, which his team searches for in water samples (ABOVE).

eventually dissolve. The officer wanted to know if that was true.

Ross started researching. He discovered that plastic, Styrofoam or otherwise, would remain in the ocean forever, only becoming smaller and harder for humans to see. With his long history of looking at persistent marine pollution, he figured that some marine species would start eating the plastic in place of food — with unknown consequences. Not only was plastic a problem, it was a big problem.

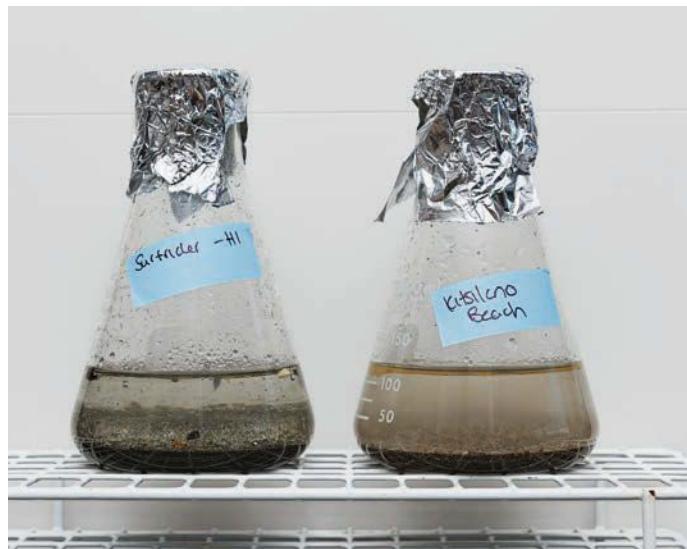
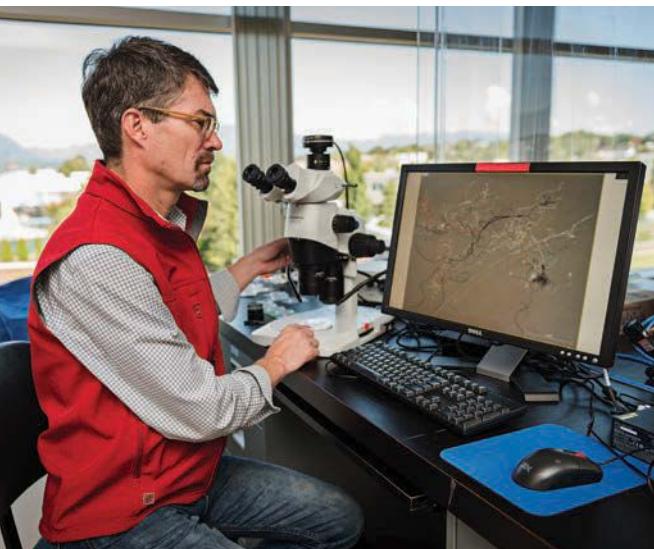
ROSS DISCOVERED THAT PLASTIC, STYROFOAM OR OTHERWISE, WOULD REMAIN IN THE OCEAN FOREVER, ONLY BECOMING SMALLER AND HARDER FOR HUMANS TO SEE.

studies helped lay the groundwork for the Canadian ban on the most toxic form of the flame-retardant PBDEs in 2005.

Then in the late 1990s, he got a call from a conservation protection officer who was handling the fallout from a fishing lodge fire off the west coast of Vancouver Island. Giant blocks of Styrofoam had broken free from the site and were in the water. The lodge's owner claimed the plastic would

MARIE NOËL, 33, an ecotoxicologist who is research manager of Ross's lab, is hauling water into the boat underneath Vancouver's Lions Gate Bridge. She hoists up two shiny steel pails full, 30 litres in all, then she and Ross carefully pour it through two filters. The first, with a mesh of 4.75 millimetres, screens out anything too big to be considered a microplastic. The second, at 0.063 millimetres, a little more than half a hair's width, gets the really tiny bits. Then they rinse what's caught in the finer mesh into a small Mason jar. Tomorrow, they'll analyze the water in their lab to see what's in it.

The water looks clear, apart from some minuscule plankton. But Ross bets the sample contains microplastics. A study he published in 2014 found roughly three



plastic particles for every litre of water in British Columbia's Strait of Georgia, and he expects something similar here.

This is no random test site. It's near the 1961-era Lions Gate wastewater treatment plant, which processes waste from about 180,000 citizens and pumps the effluent here. The regional government, Metro Vancouver, plans to replace this plant with another one a couple of kilometres further east. As its representatives plan it, they've been pondering some uncomfortable new findings.

Studies from the United Kingdom, Finland and California, including one commissioned by the outdoor-garment giant Patagonia, show that clothes such as fleeces and athletic wear made from synthetic fabrics are shedding microscopic threads of plastic into the water every time they're washed.

The first study, published in the U.K. in 2011, found that each garment releases more than 1,900 fibres every time it hits the washing machine, and many of those end up in waterways because wastewater treatment doesn't capture them all. The regional government has asked Ross to look into what microplastics are getting through the old plant, and help figure out if that can be reduced.

Those tiny plastic threads matter. In 2015, Ross published another trailblazing study establishing that two types of zooplankton in the open ocean off the coast of British Columbia were eating microplastics rather than food. Ross hypothesized that baby salmon eating

the plankton would in turn be consuming between two and seven of the threads every day, and that adult salmon would ingest about 91 a day. The team's next big study will be to see how much plastic baby salmon bodies contain.

"Salmon are on the edge to start with. If we put plastics into the mix..." He shrugs, as if to say, "Who knows what will happen?"

ROSS PUBLISHED ANOTHER TRAILBLAZING STUDY ESTABLISHING THAT TWO TYPES OF ZOOPLANKTON WERE EATING MICROPLASTICS RATHER THAN FOOD.

It's not only zooplankton that are consuming microplastics, but also mussels, herring, cod, haddock and sharks, among others. In other words, the plastics reach from one end of the marine food web to the other. Researchers estimate that more than half of sea turtles and nine in 10 seabirds have eaten plastic. Recent necropsies of sperm whales stranded in Germany found plastic car engine covers and massive wads of plastic fishing net in their stomachs.

Ross (LEFT) analyses water samples from various locations (RIGHT) at the Vancouver Aquarium Marine Science Centre to find out how many microplastic threads are present.

While plastics absorb chemical pollutants from the surrounding water, making them in some cases a million times more toxic than the ocean itself, that's not Ross's primary concern. Instead, he's worried about structural injury to the body. Plastics lacerate cells and organs, move from the digestive tract to other tissues and prevent animals from eating.

But they do far more than that. Ross and Esther Gies, 32, who heads the aquarium's microplastics program, point to a shocking study published in December 2015 on oysters exposed to microplastics in the lab. Not only did the bivalves gobble them up, but the plastics also severely impaired the oysters' ability to produce viable eggs and sperm, shutting down some of the genes they needed for reproduction.

Some of those plastics end up on your plate. Another study on oysters farmed for human consumption in the northeast Atlantic Ocean showed that people eating a dozen or so would be consuming about 100 microplastic threads. What does that do to you? Unknown.

THE NEXT AFTERNOON, Ross is in his lab at a microscope, ready to look at the water he collected near the treatment plant. The sample has been treated with hydrogen peroxide overnight to dissolve

the flesh of any living creatures. Invisible to the naked eye, but clear under 16-times magnification, there they are: tiny, wiggly threads of plastic, likely the remains of decades-old nets, shopping bags and fabrics.

Figuring out exactly what types of plastic they are is the next step. Ross and his team are still developing protocols for that. They've acquired a Fourier transform infrared spectrometer that uses wavelengths of light to determine what something is made of. It's the same type of machine the Royal Canadian Mounted Police use to match a fibre found on a murder victim to a suspect's rug.

Ross has bought a commercial library containing the unique spectrometer readings of 4,500 plastic polymers and their additives, and his team will eventually be able to scan a whole crop of plastic fibres with the machine and identify them, building up a more robust database.

The Vancouver Aquarium lab is one of the few in the world dedicated to microplastic analysis of this kind. Until now,

his expedition the day before stands. It, too, will be put to use in tests to examine just how plastic degrades in the ocean.

Where will it all lead? A key is keeping plastic out of the ocean in the first place with more recycling. And Ross is in talks with two clothing companies to see if fabric manufacturing can be modified to keep plastics out of wash water. Over time, as the science becomes ever more precise about the dangers of plastics, he can envision global regulation, just as there has been on other toxic substances such as mercury, DDT and PCBs.

It's the reason he's so immersed in this issue: there are practical steps we can take to make things better.

"There are so many solutions out there," says Ross. "That's why I'm sort of excited."

THE VANCOUVER AQUARIUM LAB IS ONE OF THE FEW IN THE WORLD DEDICATED TO MICROPLASTIC ANALYSIS OF THIS KIND.

most researchers could only say that a plastic fragment was bendy or brittle, fouled or not. Ross points over into a corner, where the grimy Styrofoam from



Read more about how microplastic from fleece clothing is contributing to marine pollution at cangeo.ca/dec16/microplastic.

selections

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WILD THINGS





CANADIAN GEOGRAPHIC AND THE CANADIAN MUSEUM
OF NATURE PRESENT THE WINNERS OF THE
WILDLIFE PHOTOGRAPHY OF THE YEAR COMPETITION

A polar bear and her cub perch on an iceberg near Baffin Island, Nunavut. A red fox pauses during a light winter snowfall in Ontario's Algonquin Provincial Park. A row of trumpeter swans slides by in the early morning mist on an Ontario lake. These exceptional scenes are just some of the winners of *Canadian Geographic*'s 2016 Canadian Wildlife Photography of the Year Competition. With the help of Javier Frutos, *Canadian Geographic*'s art director, Roger Bull, coordinator of the Canadian Museum of Nature's laboratory of molecular biodiversity, and Nina Stavlund, a wildlife photographer, thousands of submissions were whittled down to these 10 category winners and runners-up.



CATEGORY RUNNER UP | ANIMALS IN ACTION

Vladislav Kamenski

A red fox is silhouetted against the night sky on a rainy September evening in Montreal.

CATEGORY WINNER | ANIMALS IN ACTION

Jonathan Huyer

A mother polar bear and her yearling cub hunt for seals on an iceberg off the coast of Auyuituq National Park on Baffin Island, Nunavut.



CATEGORY WINNER | WATERY WILDLIFE

Sam Edmonds

Thousands of surf scoters, a species of sea duck, take flight in British Columbia's Great Bear Rainforest.



CATEGORY RUNNER UP | WATERY WILDLIFE

Lise Simoneau

A seal pops its head out of the water on a foggy February day at the Aquarium du Québec in Quebec City.



CATEGORY WINNER | YOUTH

Iain Leitch

A snail inches along the rusty railing of a dam on the Avon River in Stratford, Ont.

CATEGORY RUNNER UP | YOUTH

Chris Graham

A red fox pauses at the forest's edge on a snowy day in Algonquin Provincial Park, Ont.

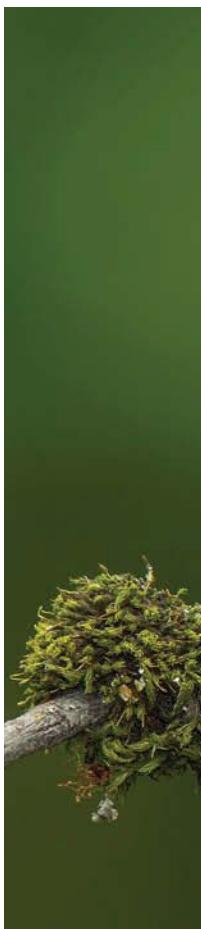




CATEGORY WINNER | LITTLE LIFE

Tibor Nagy

A jumping spider snacks on a dolichopodid fly near Ojibway Park in Windsor, Ont.



CATEGORY RUNNER UP | LITTLE LIFE

Robert Ganz

A praying mantis waits patiently for its next meal in the photographer's backyard in Montreal.



CATEGORY WINNER |
THINGS WITH WINGS

Bill Maynard

Trumpeter swans paddle across a misty bay on Big Rideau Lake, Ont.



CATEGORY RUNNER UP |
THINGS WITH WINGS

Ken Crebbin

A chestnut-backed chickadee perches on a mossy branch in Victoria.



See all the winning images, including second runners-up and honourable mentions, from the 2016 Canadian Wildlife Photography of the Year Competition at wpy16.canadiangeographic.ca.

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COMMENT

Your feedback

Budding geographer

I want to tell you how much I enjoy your magazine. I started reading it about a year ago when my Grade 9 class competed in the Canadian Geographic Challenge. I didn't win the contest, but it made me realize how much more I wanted to learn.

Kelly Ruigrok

Dunnville, Ont.

And thanks to @CanGeo for sparking a great debate and important conversation about #CanadaBird.

@cathmckenna

[Minister of Environment and Climate Change]

We're #TeamLoon! Canoeing wouldn't be the same without their calls. #CanadaBird

@CdnEncyclopedia

National Bird Debate

Can Geo Talks hosted the Great Canadian National Bird Debate at the Canadian Museum of Nature in Ottawa on Sept. 19 to help determine Canada's national bird (see page 34). Here's a selection of comments shared on social media using #CanadaBird.

#SnowyOwl for #CanadaBird ... lots of Inuit legends about this majestic, intelligent bird.

@MayorMadeleine

[Madeleine Redfern, mayor of Iqaluit]

Gray jay all the way!

@ElizabethMay [leader, Green Party of Canada]

CONTACT US



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Ottawa, Ont. K1K 4C1



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Comments may be edited for length and clarity.

COVER VOTE

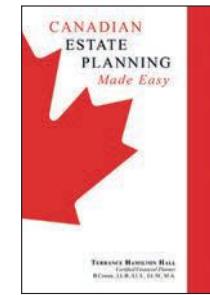
How we chose this issue's cover



We broke with our recent tradition and didn't hold a cover vote for this issue, and with good reason. We wanted our choice for Canada's National Bird to be a surprise. Despite the fact we didn't get the valued input of our readers, we still gauged the opinions of our internal team of experts to develop four options (ABOVE). While we felt strongly any of them would work, publisher Gilles Gagnier and art director Javier Frutos agreed that option one stood above the rest. Said Gagnier: "Number one stopped me in my tracks." Exactly what a great cover aims to do.



Not already receiving our cover vote email? Visit cangeo.ca/newsletter and sign up for the Canadian Geographic newsletter to get in on the action.



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WHAT'S THIS?

Recognize this mystery object and how it relates to Canadian geography and history?



- Visit cangeo.ca/whatsthis for a hint, to enter your guess and for a chance to win one of three copies of *Best Wildlife Photography 2017* special issue.* Follow us on  (@CanGeo) for more hints.
- The deadline is January 2, 2017.
- The correct answer will appear in the January/February 2017 issue.

*Three winners will be randomly selected from all correct responses.

Canadian Geographic and the Canadian Heritage Information Network have partnered to showcase important artifacts from Canadian history and geography. Each object comes from one of the museums in CHIN's national network.

LAST ISSUE'S OBJECT: Gramophone from a shipwreck

This gramophone was recovered from the wreck of the *A.J. Goddard*, a Klondike Gold Rush-era sternwheeler that sank in the Yukon's Lake Labarge in October 1901. The *A.J. Goddard*, now a Yukon Historic Site, was the first sternwheeler to provide a vital goods and transportation link between the goldfields and Whitehorse. The gramophone, along with three records, was recovered from the wreckage in 2009. The Canadian Conservation Institute provided archeological conservation services to restore the gramophone.



With files from the Yukon Department of Tourism and Culture. Learn more about this artifact and others by visiting tc.gov.yk.ca.



Explore more stories from Canada's past through cangeo.ca/whatsthis.

WHERE'S THIS?

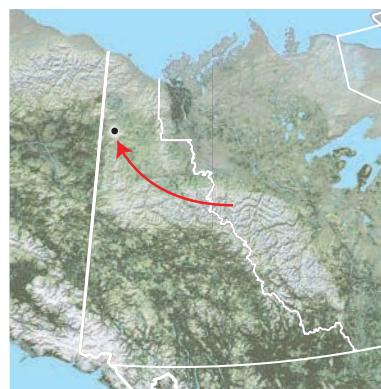
Identify this landmark using the following three hints

1. Site of the oldest undisturbed archeological evidence in Canada.



2.

- 3.



- Need a clue? Visit cangeo.ca/wheresthis for another hint, then enter your guess for a chance to win one of 10 *Canadian Geographic* 2017 wall calendars.*
- The deadline is January 2, 2017.
- Want more help? Follow us on  (@CanGeo) and  (facebook.com/cangeo) and watch for the hashtag #hint.

*Ten winners will be randomly selected from all correct responses.

YOUR SOCIETY



NEWS FROM THE ROYAL CANADIAN GEOGRAPHICAL SOCIETY



A NEW HOME FOR THE RCGS: 50 SUSSEX

Built into a promontory overlooking the Ottawa River at Rideau Falls, 50 Sussex Drive stands on a river confluence long used by Indigenous hunters and traders and mapped by explorers Jacques Cartier, Étienne Brûlé and Samuel de Champlain. It also overlooks Ontario and Quebec's Ottawa River border and shares a stretch of Confederation Boulevard, the capital's ceremonial and discovery route, with Parliament Hill, the National Gallery of Canada, the prime minister's residence and Rideau Hall.

This historic backdrop is where The Royal Canadian Geographical Society has found its grand new Ottawa home. "There are few places in the national capital that speak 'geography' the way this location does," says RCGS CEO John Geiger.

A National Capital Commission property that was once a museum dedicated to Canadian contributions to culture, sports, peacekeeping, science and other fields, 50 Sussex has stood vacant since 2005. As the new RCGS headquarters and a campus for geographic education and exploration of Canada and the world, the building will have a new and vital role.

"Canada's Centre for Geography and Exploration will create a dynamic new platform to engage Canadians in celebrating their incredible physical and human geography," said Alex Trebek, *Jeopardy!* host and Honorary President of the RCGS, at the Oct. 24 announcement.

'A new platform to engage Canadians in celebrating their incredible geography.'

Joining Geiger and Trebek on site to reveal the plan for the new centre were Andrew Leslie, Lt.-Gen. (ret'd) and chief government whip, NCC CEO Mark Kristmanson, RCGS Vice-President Élisabeth Nadeau and other VIPs and Fellows of the Society.

"On behalf of the Government of Canada, I wish to congratulate the National Capital Commission and The Royal Canadian Geographical Society on their partnership," said General Leslie. "This will bring new life to 50 Sussex Drive and allow the public to once again enjoy this magnificent space in the heart of our great capital."

The RCGS will occupy its Sussex headquarters in two phases, first in 2017 with the opening of an exhibition space and then fully by 2018, just in time for the Society's 90th anniversary the following year. Renovation of the main-level exhibition spaces means the building will serve as one of the official

Confederation pavilions throughout Canada's 2017 sesquicentennial, with exhibits on the country's geography and on the National Capital Region open to the public for next summer.

"The NCC is proud to partner with The Royal Canadian Geographical Society to bring new vitality to one of the capital's signature properties and to present an exhibit on the *Plan for Canada's Capital 2017-2067*," said Kristmanson.

In the months following, refurbishments and renovations will see the instalment of a permanent interpretive geography



RCCS Honorary President Alex Trebek (**OPPOSITE**, left), joined CEO John Geiger and other RCCS, National Capital Commission and government representatives to announce the Society's new 50 Sussex headquarters (**ABOVE**).

centre incorporating immersive technologies and spaces for teacher institutes and students, as well as *Canadian Geographic*'s editorial offices. A 210-seat, multi-screen auditorium will serve as a state-of-the-art venue for Can Geo Talks and other lectures by geographers, explorers, photographers and educators, and for film screenings and conferences. The idea, says Geiger, is that visitors will be able to experience Canada within the centre's four walls — and not by merely looking at objects in glass display cases.

The Society has never had a public space, explains RCCS President Paul Ruest. "So this is a new era for us. We now have, as we say in French, our *pignon sur rue*. That means we're now on the 'Main Street.' We are showing our colours; we can be seen and we are accessible. Sussex is *the street* in Canada, and this will be a world-class centre for our programs and events, for exhibits and more."

"This building will rank with the iconic landmarks home to the Royal Geographical Society in London and the National Geographic Society in Washington, D.C.," says Geiger. "It takes the RCCS — which has always done a great deal to promote geographical literacy and educate Canadians about their country, its people and physical landscapes — to another level altogether."

—Nick Walker



Learn five fascinating facts about the historic location of 50 Sussex Drive at cangeo.ca/dec16/50sussex.



ONE OCEAN EXPEDITIONS EXCLUSIVE PARTNERSHIP

One Ocean Expeditions, the world leader in polar travel and adventure cruises, is now the exclusive travel partner of The Royal Canadian Geographical Society. Join the RCCS on one of six unforgettable voyages to the remotest corners of the Earth and enjoy unique on- and off-ship activities designed to enhance your experience, including photography workshops, talks and wildlife excursions (**ABOVE**). See the famed wild horses of Sable Island and experience the European charm of Saint Pierre and Miquelon on an 11-day tour of Canada's rugged East Coast in July 2017, or follow in the footsteps of Sir Ernest Shackleton on an epic 12-day tour of Antarctica and the Falkland Islands in January 2018. For more about this exclusive partnership, go to page 9. To view complete itineraries or to book travel, visit rcgs.org/travel.

—Alexandra Pope

STUDENTS ON ICE CANADA C3 EXPEDITION TO CARRY RCCS FLAG

One hundred and fifty days, 50 coastal communities, six UNESCO world heritage sites and three oceans. Those are just some of the impressive goals of the Canada C3 expedition, led by the Students on Ice Foundation, that will see upward of 150 Canadians sail around the country in 15 10-day legs, from Toronto to Victoria via the Northwest Passage. The journey will embark with the RCCS Expedition flag in June 2017 and celebrate Canada's sesquicentennial by exploring the people and places that have shaped the country's identity. For more information, visit studentsonice.com/canadac3.

—Michela Rosano



2016 RCGS MEDALLISTS

The Geological Survey of Canada and several of the country's top geologists, polar researchers and explorers were among those awarded Society medals this year. All were recognized at RCGS's annual College of Fellows Dinner on Nov. 16 at the Canadian War Museum in Ottawa. The 2016 award winners are listed below.

Gold Medal (*achievements in geography*)
Geological Survey of Canada

Denis St-Onge Emeritus scientist, GSC; founding member, Polar Continental Shelf Project; past RCGS president
Marc St-Onge Senior research scientist, GSC; author of over 100 geological maps
Paul F. Hoffman Renowned geologist; explained Proterozoic evolution of continents and "Snowball Earth" theory

Massey Medal (*outstanding career achievement in Canadian geography*)

Steve Blasco Marine engineering geophysicist, GSC; studied world marine environments for 40 years

Sir Christopher Ondaatje Medal for Exploration

Richard Weber Arctic explorer; first Canadian to reach the North Pole on foot

Martin Bergmann Medal (*excellence in Arctic leadership and science*)

Warwick Vincent Canada Research Chair in biology at Université Laval; studies polar aquatic food webs

Lawrence J. Burpee Medal (*outstanding achievement that enhances the Society's ability to make Canada better known*)

Simon Winchester Geologist, journalist and acclaimed author

Camsell Medal (*outstanding volunteer service to the RCGS*)

Mark Graham Vice-president, research and collections, Canadian Museum of Nature
Peter Harrison and Christine Duverger-Harrison Long-serving Society volunteers; Harrison is a past vice-president of the RCGS

Capt. Joseph-Elzéar Bernier Medal (*exemplary deed or activity that aids the Society in fulfilling its mandate*)

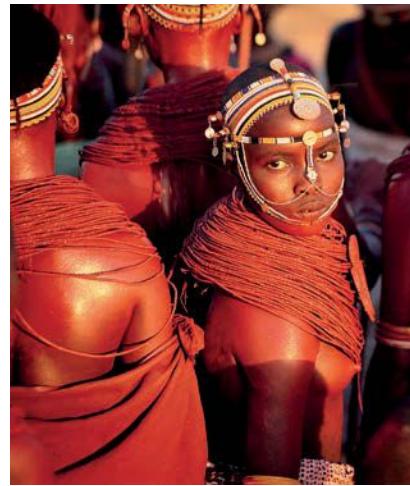
Anthony O. Hendrie Philanthropist and lawyer (ret'd); RCGS Advancement Committee member
Alexandra Shackleton President of the James Caird Society; vice patron of the U.K. Antarctic Heritage Trust
Thomas Kierans Business leader and dedicated supporter of Canadian culture, scientific research and public policy

Geographic Literacy Award

Doug Koegler Lecturer, faculty of education, Wilfrid Laurier University; elementary/secondary teacher (ret'd) in Waterloo, Ont.

Innovation in Geography**Teaching Award**

Greg Neil Teacher at Connect Charter School in Calgary

**WADE DAVIS: PHOTOGRAPHS**

A 40-year career, much of it spent travelling the globe in an effort to better understand the planet's panoply of human communities and cultures, can yield astounding tales. In Wade Davis's case, however, it also yields astounding images, as those attending the noted anthropologist's public lecture about his new book, *Wade Davis: Photographs*, witnessed at the Royal Ontario Museum on Nov. 5.

The event, part of the museum's ROM Connects program, was presented in partnership with the RCGS, of which Davis is an Honorary Vice-President, and featured the British Columbia native discussing the stories behind some of the book's 150 images, many of which he captured while on assignment for the National Geographic Society.

THE ART OF CARTOGRAPHY

An exhibition that explored the visual allure of cartography by showcasing maps and atlases from the 15th through the 19th century ended on Oct. 16 after a successful two-month run at the Toronto Public Library.

The Art of Cartography, which was sponsored by the RCGS, featured works by luminaries such as Gerardus Mercator, Abraham Ortelius and Alain Manesson Mallet, but also included modern cartography, with discussions about how Toronto is being mapped today and how the role of the cartographer has changed.

—Harry Wilson



EXPLORER-IN-RESIDENCE SCHOOL VISITS



Explorer-in-Residence
Jill Heinerth documented
Newfoundland's flooded Bell
Island iron mines on a 2016
RCGS-sponsored expedition.

Humans have summited Earth's tallest peaks, touched the bottom of the ocean's deepest trench and floated through space. According to cave diver Jill Heinerth, however, a new age of exploration is just beginning. Using her talent for photography, videography and public speaking, she works with scientists to document and share the watery worlds beneath us. In her capacity as The Royal Canadian Geographical Society's first Explorer-in-Residence, she hopes to empower others, especially youth, to dive into their own discoveries. Thanks to the generous support of The W. Garfield Weston Foundation, Heinerth visited schools in British Columbia and Ontario from Nov. 7 to 11. Here, she shares a bit of what she talked about with the students.

On the importance of exploration

Exploration moves society forward. The act of exploring generates new ideas and inventions, helps us consider difficult ethical questions, reveals new geography on Earth and beyond and assists people in collaborative initiatives that improve our world.

On the challenges facing modern explorers

There are always challenges in finding people and organizations that are willing to commission exploration initiatives. We have to convince a funder to participate in a project that has no guarantees, where we don't necessarily know what we will find or learn. That can be difficult. On the other hand, our world has opened tremendously in my lifetime.

On what's changed in exploration over the years

Exploration is in everyone's realm of possibility now. There are fewer gatekeepers, and the tools of the modern Internet facilitate research and collaboration on a global scale. Drones, ROVs, cell phones, global connectivity and apps are all tools that enable exploration and sharing across continents. Anyone can be a broadcaster of new discoveries.

On the "next frontier"

Some would say that the golden age of exploration is over, but we have barely scratched the surface. We are now entering the world of technical and open-source exploration. People can collaborate across borders and disciplines to create solutions to global issues. Today's geography is limitless and open for new discoveries.

—Sabrina Doyle



WINGS OF COURAGE LAUNCHES

The trailer for *Wings of Courage* (a film about the heroism of Canada's early aviators now on CPAC) and a Giant Floor Map of the 1917 Vimy Ridge assault debuted at the Canadian Aviation and Space Museum in Ottawa on Nov. 1. The *Wings of Courage* event launched part two of the *A Nation Soars* project, an RCGS and Sound Venture Productions partnership. MP Karen McCrimmon, parliamentary secretary to the minister of veterans affairs, was on hand, as were the air cadets who built the WWI biplane replicas set to cross Canada in 2017 as part of the project.

CANADA FROM SPACE MAP GOES NORTH

Can Geo Education's *Canada from Space* Giant Floor Map kicked off a three-year northern tour on Oct. 17 at Iqaluit's Inuksuk High School. Nearly 400 students heard Canadian astronaut David Saint-Jacques speak about his forthcoming mission to space and the future of space science.

CLASSROOM ENERGY DIET CHALLENGE NOW OPEN

Registration is now open for the 2017 Classroom Energy Diet Challenge. Complete 25 fun, energy-saving activities as a class and be entered to win great prizes for your school. The challenge begins Feb. 1, 2017, so register now at energydiet.canadiangeographic.ca.

CANADA'S COOLEST SCHOOL TRIP VIDEOS

Canada's Coolest School Trip is back to give one Grade 8/Secondaire 2 class the national parks experience of a lifetime—in Nova Scotia! Classes have until Feb. 27, 2017, to submit a one-minute video about the national park they'd like to visit for Canada's 150th birthday. Winners will explore sites of significance in Nova Scotia, including Kejimkujik National Park and the Halifax Citadel. For full contest rules and tips, visit contest.myparkspass.ca.

—Alexandra Pope



THE ROYAL CANADIAN GEOGRAPHICAL SOCIETY

Founded in 1929, the Society is a non-profit educational organization. Its object is to advance geographical knowledge and, in particular, to stimulate awareness of the significance of geography in Canada's development, well-being and culture. Primary fields of interest include our people, resources, environment, heritage and the evolution of our country. In short, the aim is to make Canada better known to Canadians and to the world. *Canadian Geographic*, the Society's magazine, is dedicated to reporting on all aspects of Canada's geography — physical, biological, historical, cultural and economic — and on major issues of concern to Canada in which geographical dimensions play a significant role.

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FEATURED FELLOW: GEORGE JACOB



**George Jacob, author and
founding president of
Alberta's Philip J. Currie
Dinosaur Museum.**

George Jacob has devoted his life to museums. He has shaped more than 50 institutions in 11 different countries, including the Mauna Kea Astronomy Education Center in Hawaii and the Philip J. Currie Dinosaur Museum in the heart of Alberta's Peace Country, where he currently serves as the founding president and CEO.

It took Jacob just one year to open the Philip J. Currie Dinosaur Museum, a world-renowned paleontological museum and cutting-edge laboratory facility, after he took over the operation in September 2014. Jacob, who has a master's degree in museum studies from the University of Toronto, had two goals for the facility. "The first was to get it built and for it to be a fully functional institution of excellence," he says. "The second was to make sure that the presentation of the content, the partnerships and the alliances raised the bar high."

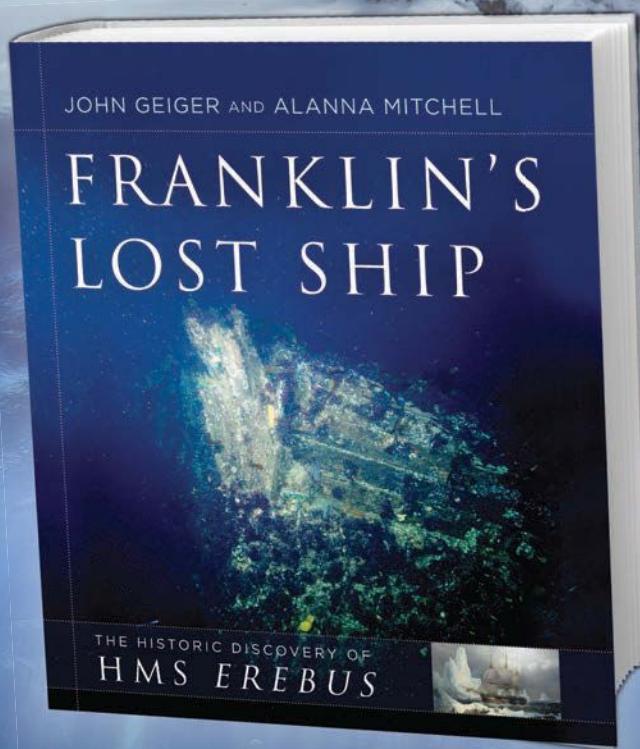
And he raised the bar sky high. Since the Philip J. Currie Dinosaur Museum opened in September 2015, the 10-acre complex, which descends like a dig site two floors underground, has seen more than 127,000 visitors and won numerous awards, including most recently the Outstanding Achievement Award in Exhibitions in the science category by the Canadian Museums Association. The museum is the first in North America to offer helicopter rides over dinosaur bone beds. Currently, says Jacob, a plan is in the works for a \$22-million expansion, which will see an IMAX theatre and digital vestibule, an annex for resident scholars, an expanded exhibit production facility and a large paleontological storage facility.

Jacob's impressive museum résumé is punctuated by his five books on museum and exhibit design and several other publications to which he's contributed. His latest book, *Museums and Multiculturalism: Canada 150*, features authors from across the country on Canada's investment in cultural resources and will be published in time for the nation's sesquicentennial.

For Jacob, who was elected to the board of directors for the International Council of Museums Canada in April 2016, a museum is measured in more than just numbers and awards. "It's in how many people the museum has inspired or whether it influences a child and shapes their future," he says. "Those are the true hallmarks of success."

—Michela Rosano

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next issue

JAN/FEB 2017



Canadian Geographic celebrates Canada's 150th



The Wanuskewin Dance Troupe performs outside the visitor centre at the Wanuskewin Heritage Park near Saskatoon (TOP), while local elders from the Northwest Territories' Dechinta Centre for Research and Learning work on building a traditional canoe (ABOVE).

What do you get a country that's turning 150? When you're a national magazine dedicated to making that nation better known to its citizens and the world, you give it everything you've got. So for 2017, each issue of *Canadian Geographic* will be dedicated to celebrating Canada's sesquicentennial.

Each edition will feature a different theme that's crucial to the country's past, present and future, starting with Indigenous Peoples. After all, before Europeans arrived in what is now Canada, Indigenous groups thrived for thousands of years on the region's natural bounty. When Europeans began exploring this vast wilderness, Indigenous people and communities were often instrumental in their expeditions — and survival — and were key to the earliest days of this land's economy, the fur trade. In the decades around Canada's Confederation, new policies systematically marginalized First Nations, Inuit and Métis and created countless other cultural challenges. Now the government and other Canadians are working with First Peoples in a new era of reconciliation, which ultimately aims to build a stronger nation.

The January/February issue will explore these issues and celebrate Indigenous Peoples today. Our aim is to present an overview of their experiences, with a particular focus on positive achievement. Stories about the cultural and business accomplishments of St. Mary's First Nation in New Brunswick; the transformative programs of the Northwest Territories' Dechinta Centre for Research and Learning, an educational initiative led by local leaders, experts and elders; how Canada's longest-running archeological site, the Wanuskewin Heritage Park near Saskatoon, is evolving into an international cultural destination; and more. Simply put: our celebration of Canada starts with celebrating its First Peoples.



our country

REVEALING CANADA



Gordon Lightfoot

The legendary singer-songwriter recalls his childhood exploits in Orillia, Ont., and the surrounding lake country

From east to west, up into the Arctic and all the other wild places I've been, so many have poetic imagery that, fortunately, I've had the ability to translate into words, into songs. They get your imagination working for you.

But of all places, Orillia, Ont., my hometown, was the greatest influence. There was always music. In Grade 7, I made my first recording for a parents' day event. It was "Irish Lullaby," and it got played over the school sound system. I was taking music classes, then, performing the Irish tunes Bing Crosby was recording at that time for Orillia's ladies' committees and the men's Lions Club, and all through high school I sang with a dance band. My girlfriends used to sit on the sidelines at the big school dances and wait for me. They were very good about waiting.

My friends and I fished winter and summer on Lake Simcoe and Lake Couchiching. I remember one winter that had been so cold, all of Lake Couchiching was covered by black ice and no snow whatsoever. But mostly we fished in Simcoe, off Eight Mile Point. Every winter for five years, we'd go half a mile out, each in our own huts, and pull up whitefish and lake trout. We used to take that lovely whitefish down to the Buehler Bros. meat market and sell them to the guy who ran the place. In the summertime we caught bass and perch up on Couchiching's east shore.

The memory of it all! I mean, I was like Huck Finn. You could name any number of streams and we'd fished them, including the North River area where we went for speckled trout. We could make it out there on our bicycles, you see. All of that rubbed off and it kept working its way into my tunes. It's everywhere. My song "Pussywillows, Cat Tails" — that's a perfect description of what it's like there.

—As told to Nick Walker



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Or share it with us on Facebook
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