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Hibernation: A Winning Winter Strategy

CLARK COTTON

Has the recent cold snap given you the winter blues? Does a morning jog in the brisk air suddenly seem less appealing? If so, perhaps you should consider hibernation as a winning strategy for remaining fit this winter.

A variety of mammals use hibernation as a strategy to deal with harsh environmental conditions, where maintaining high body temperatures is prohibitive given available food resources. In anticipation of hibernation, most animals prepare by accumulating massive quantities of body fat which they use as a primary metabolic substrate during winter.

The onset of hibernation is characterized by a massive depression of metabolic rate. This reduces the number of calories burned every day and also leads to low body temperatures and blood pressures. How far body temperature descends depends to some extent on how big the hibernating animal is. Bears may only lose a few degrees off their normal body temperature while prairie dogs and thirteen-lined ground squirrels may go down to near freezing. At the extreme, arctic ground squirrels routinely have body temperatures several degrees below freezing during winter months (and you thought you were cold!).

While bears remain in a continuous hibernation state the entire winter, most hibernating rodents and bats arouse from hibernation once every 1-2 weeks throughout winter. Why this happens remains a mystery, with various theories implicating sleep debt, compromised immune systems and gradual build-up of toxic compounds in the blood. Between arousal bouts, small mammal hibernators are essentially immobile and incredibly slow in responding to external stimuli. I can still remember the first time I picked up a hibernating prairie dog. It was about the same temperature as a jug of milk taken from my fridge, and every bit as lively!

In order to be able to hibernate for Minnesota's six plus months of winter, humans would have to overcome a few obstacles. Not surprisingly one of the biggest challenges would be massive loss of skeletal muscle, which follows the old adage, "use it or lose it". It turns out that skeletal muscle is expensive tissue to maintain, requiring significant energy and nutrient input. Over a six month period for humans, little to no activity

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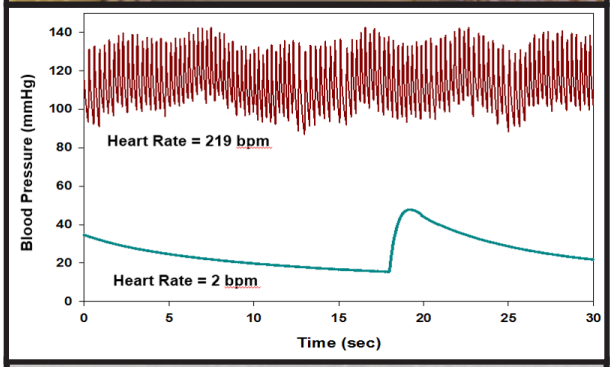

Many biological processes slow down in hibernating mammals. Dr. Cotton's research is useful in studying how the biology of hibernation could help prevent loss of muscle and bone density in humans during long periods of bed rest or even during space travel. CLARK COTTON.

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hibernating species, suggesting that most hibernators conserve muscle protein and strength. Furthermore, because the animals subsist primarily on fat reserves during the winter, they can actually emerge from hibernation with slightly higher skeletal muscle mass relative to body mass. In other words, they enter hibernation as an overweight couch potato and wake up six months later as a relatively lean athlete!

The integrity and strength of our skeletons also depend on the functional demands we place on them. If our bones are never subjected to load-bearing activities, we quickly lose bone density as calcium salts are gradually dissolved and eventually excreted from the body in urine. In addition to immobility, exposure to low gravity environments as experienced by astronauts is a major stimulus for decreased bone density and strength.

Although relatively few studies have investigated changes in bone density during hibernation, most seem to be in agreement that hibernators are capable of maintaining bone density and skeletal strength throughout the winter season. This despite a lack of load-bearing exercise. One of my favorite experiments was measuring prairie dog bone mineral density with a DEXA machine, commonly used clinically as part of the screening process for osteoporosis. By performing DEXA scans, I was able to repeatedly measure bone densities of individual prairie dogs from late summer to the following spring. I found that prairie dogs actually build-up bone mineral density prior to hibernation, and lose very little during the winter suggesting that losses in bone mineral density occur during spring before being built up again during the summer months.

Current research is focused on unraveling the mechanisms behind hibernators' abilities to maintain muscle strength and bone mineral density. Part of the explanation likely depends on the low body temperature most animals hibernate at, which slows down many of the chemical reactions responsible for muscle atrophy and bone resorption. In addition, small mammal hibernators go through periods of intense shivering during arousal that effectively mimic aerobic exercise.

One particularly exciting explanation is the seasonal change that takes place with myostatin, a molecule that normally acts to suppress muscle growth. Recent studies have demonstrated that myostatin is down-regulated during hibernation, potentially explaining how hibernators retain muscle mass in the face of reduced mobility.

By learning how hibernators achieve these feats, novel treatments may be developed to help prevent excessive muscle and bone loss during chronic bed rest or long-distance space travel. Or perhaps it could just help us find another way to survive Minnesota winter.

CLARK COTTON is biology professor at CSB/SJU. He may not have known it at the time, but his years studying hibernation at the University of Wyoming gave him a great foundation for his return to Minnesota's long winters.

"I travel north seeking a true wilderness experience."
–NATE PTACEK (SJU '08)

Ptacek, a native of Wisconsin, is now a video and library editor at Patagonia. To help feed his inner explorer, he has now taken two summer paddling trips in Alaska's Far North, including a trip in summer 2014 canoeing the Colville River with Bob O'Hara (SJU '77). NATE PTACEK.

100 Years of Adventure

MJ Bach '10

> "There's a fundamental truth to our nature; man must explore."
> –Commander David Scott, *Apollo 15 Mission to the Moon*

In 1914—one hundred years ago—polar explorer Ernest Shackleton and his hearty crew set out on an expedition to trek across Antarctica by foot. Shackleton and his crew of twenty-seven left London in August and began their journey on the ship, *Endurance*. The crew sailed to South America, with a stop at the whaling base on South Georgia Island in December.

By January 1915, the southern summer was coming to an end and ice made travel incredibly slow. The *Endurance* became locked in an ice pack just north of Antarctica, and they were stranded. The boat drifted with the ice pack and the crew enjoyed the simple pleasures of hot seal-bone stew and impromptu football games on the ice. Temperatures dropped to -23°F, with seventy mile per hour winds at night. Shackleton wrote in his journal: "As we clustered round the blubber stove, with the acrid smoke blowing in our faces, we were quite a cheerful company. Life was not so bad. We ate our evening meal while the snow drifted down from the surface of the glacier and our chilled bodies grew warm."

However by October 1915, the *Endurance* had been crushed by the ice pack and the crew now used their lifeboats as shelter and floated northward on the ever-melting ice until landing on remote Elephant Island in April 1916. But Shackleton knew that no one would ever find them on the island, so he formed a rescue plan. Six men (Shackleton included) planned to sail a twenty-foot lifeboat back to South Georgia Island. Navigation had to be perfect. Sea sprays coated the boat with ice and spare oars froze to the sides. Sixteen days and 750 miles later, they arrived at South Georgia Island. Frostbitten, tired and hungry, Shackleton still had to hike seventeen miles over an uncharted mountain to a whale hunters' base before sending a rescue ship for his team. Almost two years after they left London, all of the men returned home alive.

Shackleton's *Endurance* trip has been recorded as one of the most triumphant survival stories in history. And just five years later, Shackleton was off on another polar adventure.

What is it that draws explorers from the comforts of home out into the great unknown?

Nate Ptacek (SJU '08) says, "I travel north seeking a true wilderness experience." Ptacek grew up in Wisconsin and has camped in the Boundary Waters Canoe Area (BWCA) during all seasons. An avid canoeist, Ptacek has taken two summer paddling trips in Alaska's Far North. Though summertime in Alaska doesn't bring the ice and wind that Shackleton's men faced in their 1914 Antarctic expedition, Ptacek and his team experienced the, "challenges and rewards of remote travel." He said he has never been in "any truly dire or threatening conditions.

"The goal is to avoid putting yourself in sketchy situations in the first place. That said, in the BWCA I did capsize in high wind and waves while on a solo trip in early June, but managed to swim to shore and track down my canoe. It could have been worse, and ultimately I shouldn't have been out in those conditions. I learned a valuable lesson that day - don't throw caution to the wind."

For Ptacek's first Far North canoe trip in 2013 he joined seasoned arctic paddler Bob O'Hara (SJU '77) on the Noatak River. Together they paddled 425 miles from the headwaters in the Brooks Range to Noatak Village, just inland from the river's mouth on the Chukchi Sea. O'Hara has taken over forty trips to the Arctic, and hasn't missed a summer trip to the BWCA since he was a kid.

O'Hara is lured north for "the freedom, adventure, cultural interests, wildlife and everyday problem solving." A retired high school biology teacher, the canoe trips offer him "a way to relax in a different sort of way from the demands of a classroom." In 2014, Ptacek, O'Hara, and others returned to the Far North, canoeing the Colville River 450 miles from its headwaters to the village of Nuiqsut, north of 70° latitude.

When I asked Ptacek about our long, cold, dark winters, he replied, "When I lived in Minnesota, I just tried to take joy in what the long winters had to offer - no bugs, the quiet of snow blanketing a forest, the solitude of the winter wilderness. Ultimately it's all about perspective. Now that I live in Southern California, I miss weather of any kind, even 40° below zero. The monotony of 70° and sunny is overrated - embrace all seasons for what they each have to offer."

This season's early snow and record-cold November temperatures allowed hearty Minnesotans to get a head start on enjoying ski trails, ice fishing and snowshoeing. One doesn't need to plan an epic journey to the Far North or the ice-packed Antarctic get out and adventure.

MJ Bach is a 2010 graduate of the College of Saint Benedict and is a former environmental education fellow for Outdoor U. As a teacher, biologist and explorer, new adventures are always waiting in the wings for her.

Celebrate Outdoor YOU

Tanner Rayman '16

The term "community" is thrown around a lot on these campuses – almost to the point of obscene cliché. But when tested by a national competition that's all about community, we see a truly unique quality, the kind that catapulted us to our National Outdoor Championship.

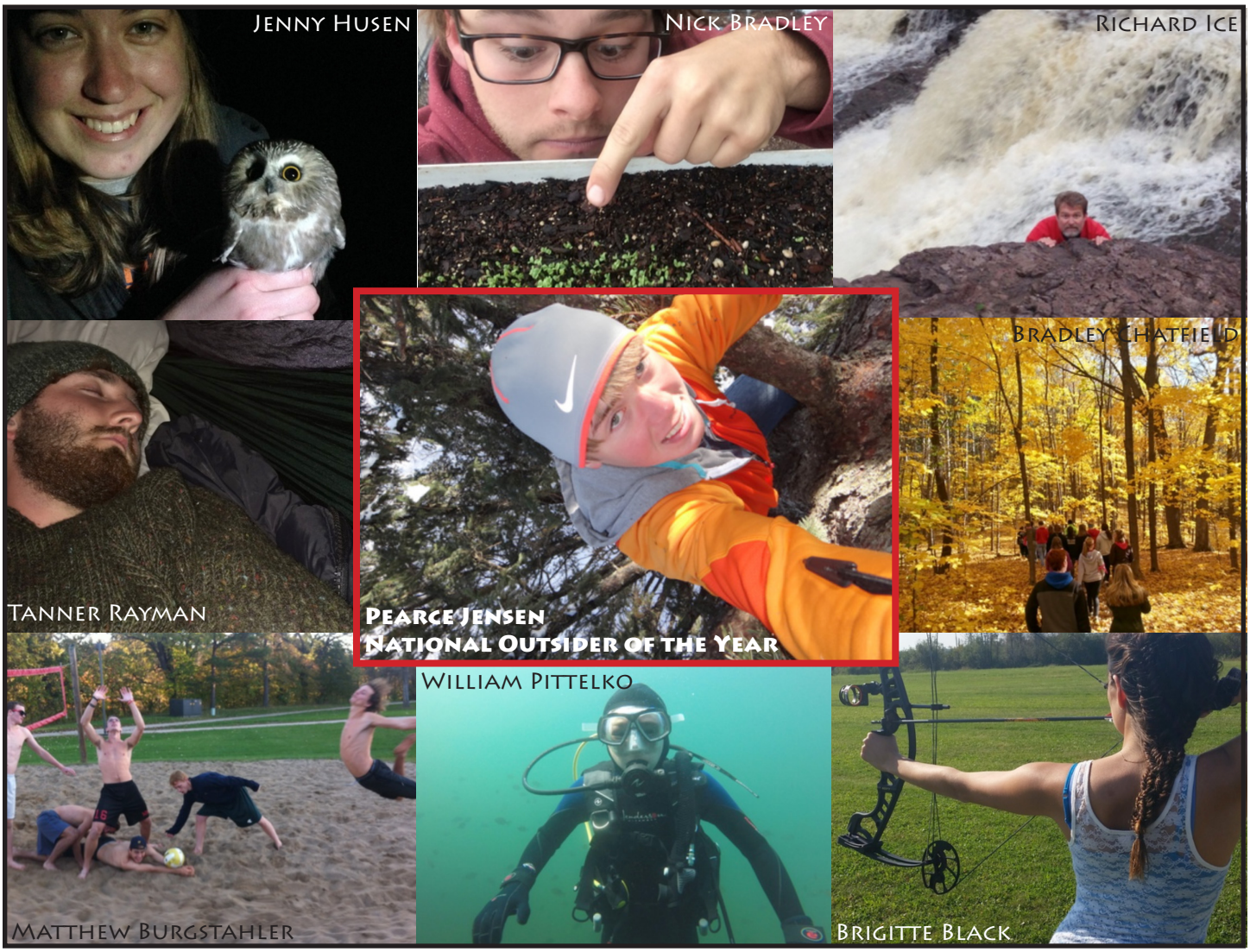
After eight weeks the Outdoor Nation Campus Challenge is officially over. No more ingloriously-sweaty running selfies taken, no more weekly email bombardments, and Jenny Kutter is freed from her self-imposed nine-week promise to wear the same neon-pink competition t-shirt to the end. This is clearly a time to relish in the spoils of our victory – national recognition for Outdoor U and CSB/SJU, a campus-wide victory festival, and a $10,000 gear library for our students and community members to use.

What did we accomplish? To put it frankly: with 162,880 points (more than 2nd-5th place, *combined*), these two small and relatively unknown liberal arts institutions situated in the heart of Minnesota dominated the competition from start to finish. We proved that we have a community-wide passion for the outdoors greater than anywhere else in the nation. It was a championship fueled by a fervent student body and the vital support of the entire CSB/SJU community, from faculty and staff to alumnae/i, to Outdoor U members and more. We achieved a broad level of unity unseen in other communities around the nation. In other words, it was was all thanks to you!

On a personal level, I am reminded of the true goal of the campus challenge: to inspire individuals to get outside and active. We did that in spades.

One of my first recorded events for the challenge was a two a.m. canoe with my roommate (a natural study break, right?). We were completely immersed in darkness while floating on eerily still water, unwilling to utter a word that would shatter the stark silence. This event brought us closer together and also gave me a new perspective into a side of nature that I rarely get the chance to behold.

For a close friend of mine the competition gave them



the motivation to go on their first outdoor rock-climbing trip. The stories after their return were incredible. Hanging fifty feet over Lake Superior they were able to harness their adrenaline and reach the crest of the rock face; a primal rush like no other. This was the birth of a new passion for this individual, someone who is now planning their own rock-climbing trip to glory in the thrills again.

We heard from parents of students that they were thrilled to be able to see how their daughters and sons were thriving at CSB/SJU through their daily outdoor entries. We heard from alumni across the country for whom the outdoors was integral to their college experience and remains so in their adult lives. We heard from community members who went on daily walks when they otherwise would not have made the time.

This is why we pursued this competition in the first place – to bring people together around a passion for outdoor activities, hobbies and lifestyles, new and old.

So what now? This is a common question which is really exciting to answer. We are booming and it only gets better from here. We will all get to celebrate in style at the Outdoor Nation festival, but more importantly to me we will be getting a whole new gear library to provide an even stronger base for our adventure programming. It is akin to a renaissance for us.

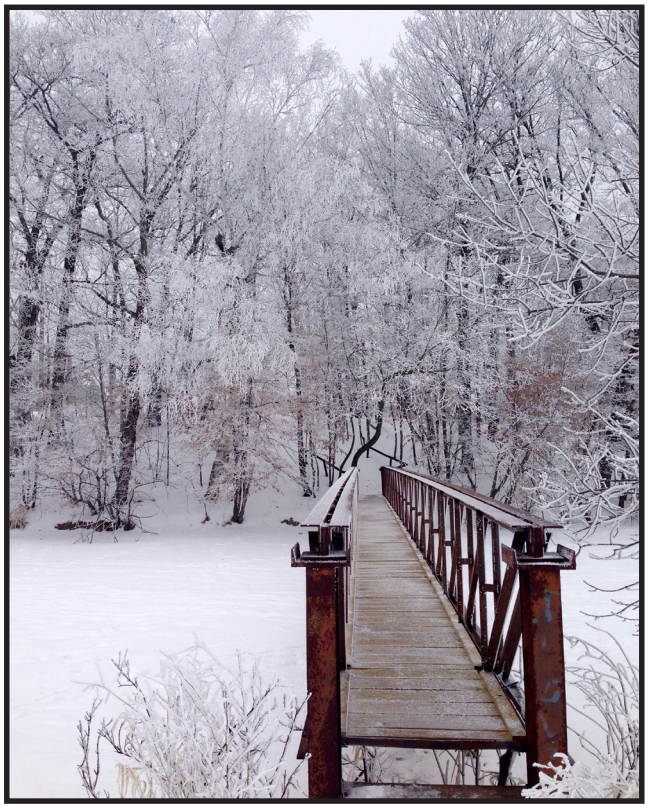
From a student-perspective, this competition provided a boost to our programming that will inspire us for years to come. The Peer Resource Program led more events and wilderness trips, the Outdoor Leadership Center has seen an increased demand for outdoor gear and knowledge, and Outdoor U has continued to provide vital education, events, and stewardship within the Abbey Arboretum we cherish so much.

On a national level, this victory will open up many doors in the future. We will stay in contact with Outdoor Nation to help make programs like this possible for other schools. In addition, we will be looking to host national student conventions focused around adventure programming and inspiring our generation to get outside. It is truly an exciting time to be part of Outdoor U.

Tanner Rayman *is a junior nursing major, Outdoor U office assistant and member of the Peer Resource Program. Ever-busy, he won't turn down a chance to rest in his hammock (p. 4).*

Congratulations 2014 Outdoor U Photo Contest Winners!

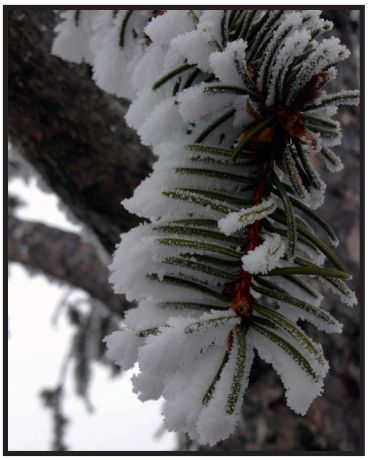
Best In Show
Megan Lundquist
People | Age 18-22



A panel of judges selected these nine photos from among all the images submitted to the 2014 photo contest. As always, the photos were judged blind, without knowing the names of the photographers.

Best In Show was selected by votes at our Open House held on Dec. 12 as well as with "Likes" on Facebook.

Congratulations and thanks to all photographers!



Megan Lundquist
Earth, Lake & Sky | Age 18-22

Erin Medvecz
Plants & Critters | Age 18-22

Rose Janssen
Earth, Lake & Sky | Age 23 & Up

Rose Janssen
Plants & Critters | Age 23 & Up

Ann McGee
People | Age 23 & Up

Annie Ellis
Earth, Lake & Sky | Age 18 & Under

Kate McGee
Plants & Critters | Age 18 & Under

Annie Ellis
People | Age 18 & Under

Get Involved

SAINT JOHN'S OUTDOOR UNIVERSITY

Winter Library Programs

Dates and times vary
Jan. 12 - Feb. 27

Free and open to the public

Come explore cartography, the art (and science!) of mapmaking. Look at maps through the ages, play games to learn the parts of maps, enjoy a story about maps and exploration and create your own map of your favorite place. This and other Outdoor U programs are currently being scheduled at local libraries, including: Buffalo, Howard Lake, Monticello, Princeton, Rockford, St. Cloud, St. Michael and more!

NO Avon Hills Conference This Winter

For a variety of reasons - mainly staffing and timing - we are not planning a Living in the Avon Hills conference this winter. We look forward to using this "sabbatical" year as an opportunity to reimagine the event, to make it fresh. We are accepting your suggestions and ideas for strengthening the Avon Hills communities through programs and gatherings. Share with us what would be important and valuable to you, your family and your neighbors.

Ski & Spirituality Retreat

Friday - Sunday, Feb. 6-8

Fri-Sun, single room: $229
Fri-Sun, double room: $399 (price for 2 people)
Sat-Sun, single room: $159
Sat-Sun, double room: $299 (price for 2 people)

Prices include lodging, meals, spirituality classes, ski guides, ski equipment and ski lessons.

Join Saint John's Abbey and Outdoor U for a weekend of skiing and reflection. Begin with an optional Friday afternoon ski at 1 p.m. followed by a weekend of learning, walking, meditating, reading, relaxing and of course, more skiing. Ski the Abbey Arboretum trails on your own, with a monastic guide or have lessons targeted to your interest and ability. Led by Steve and Terree Lindvall (former owners of Fitzharris Ski & Sport) and Joseph Federers, OSB with help from Abbey Arboretum ski trail guides Nick Kleespie, OSB and Lew Grobe, OSB.

Minnesota Natural History Lecture Series

Monthly
Sept. - Nov., Feb. - Apr.
6:30 - 8:00 p.m.

Free - Students (any age) & Outdoor U members
$5 - Nonmembers, nonstudents

Monday, Feb. 16 Owl Hoot - *Sarah Gainey, Outdoor U staff*
Tuesday, Mar. 17 Shoreland Restoration - *Greg Berg, Stearns Co. SWCD*
Monday, Apr. 20 Hibernation - *Clark Cotton, CSB/SJU biology*

Interested in learning more about Minnesota's natural world? Join us each month during the school year for a lecture and discussion on a variety of natural history topics. Check our website to see past topics or for updates to the 2014-15 lecture schedule.

16th Annual Owl Hoot

Monday, Feb. 16
6:30 - 8:00 p.m.
8:00 - 9:00 p.m. Optional Hike

Free - Students (any age) & Outdoor U members
$5 - Nonmembers, nonstudents

Owls may dazzle us with their calls, but they are also full of other amazing adaptations for survival. Learn about the twelve owl species that can be found in Minnesota and how they survive year round. An outdoor hike under the moon to call for owls living in the Abbey Arboretum is also an option!

Maple Syrup Festivals

Saturdays, March 28 & April 11
1:00 - 4:00 p.m.

$5—Adult Outdoor U members, ages 17 & under FREE
$10—Adult nonmembers/scout adults
$5—Child nonmembers/scouts

$1 off per person if you preregister by the Friday before the festival you attend (up to $10, does not apply to scouts)

Join us for what has become our most popular event of the year! Sap collecting, syrup cooking, horse-drawn rides, demonstrations, and hot maple syrup sundaes await the whole family during this fun-filled event! Bring your Boy and Girl Scouts and they can receive a "Saint John's Maple Syrup" patch! Preregistration for families is preferred but not required. Preregistration for scouts is required.

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Envr. Education Coordinator
Jenny Kutter
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SAGATAGAN SEASONS

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Saint John's OUTDOOR UNIVERSITY

THE PROGRAM

Saint John's Outdoor University provides environmental and outdoor education through classes, events and initiatives with the Abbey Arboretum, Saint John's University and the College of Saint Benedict.

THE PLACE

Saint John's Abbey Arboretum is more than 2,500 acres of lakes, prairie, oak savanna and forest owned by Saint John's Abbey and surrounding Saint John's University.

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COLLEGE OF Saint Benedict Saint John's UNIVERSITY

OUTDOOR NATION

Campus Challenge NAT'L OUTDOOR CHAMPION

THE NORTH FACE