Summer 2021 Vol. 62 No. 2

WINDswept

The Bulletin of the Non-Profit Mount Washington Observatory

21st

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Mount Washington Observatory is a private, nonprofit, member-supported institution with a mission to advance understanding of the natural systems that create Earth's weather and climate. It serves this mission by maintaining a weather station on the summit of Mount Washington, performing weather and climate research, conducting innovative science education programs, and interpreting the heritage of the Mount Washington region.

Membership in the Observatory is open to all. Members receive: an annual subscription to *Windswept: The Bulletin of the Mount Washington Observatory;* a 20 percent purchase discount at Observatory shops; free admission to more than 300 science centers through ASTC Passport Program; free admission to Extreme Mount Washington; premium content on MountWashington.org; and an opportunity to be an Observatory volunteer. Members are encouraged to help support the Observatory, attend its Annual Meetings and visit the Observatory and Extreme Mount Washington.

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Here's To The Clear Days

Marty Basch

BY **MARTY BASCH,** EDITOR

A clear day on the Mount Washington summit is a memorable experience. When all is aligned it is possible to see as far as 130 miles away to Mount Darcy sitting high in New York State to the west and the shimmering Atlantic Ocean to the east. For nearly 90 years, the Observatory's dedicated meteorologists have kept hourly data for nearly every hour on the prevailing surface visibility from the mountain top. Weather Observers Jay Broccolo and Sam Robinson along with Director of Science and Education Brian Fitzgerald compiled all that data into a paper entitled "A Data Exploration of Visibility at Mount Washington Observatory (1943-2020), KMWN: Key Findings." Fitzgerald summarizes the paper in this issue which generally found an increase in visibility since the Observatory started keeping records.

Clear days will be welcome during Seek the Peak July 16-17. Much has been written about Seek the Peak over the years, about the people who have hiked up Mount Washington, the new relationships discovered, the continuing traditions, the challenges overcome, etc. all to support the Observatory's work of science and research on weather and climate. STP has a new look as a multi-sport adventure expo that can be done in your backyard or here in our White Mountains. Hike, bike, paddle, rock climb and more. Need some ideas? I've got some a few pages away.

We know some of our members will be taking part in STP. Every issue, Development Director Stephanie Fitzgerald lauds members of varying tenures. This time she heaps praise upon those loyal of 10 years of membership. There might be some names that you know.

Lastly, it is with great pleasure we introduce you to Nimbus. Not the gray cloud responsible for snow, sleet and rain, but the yellow-eyed, short-haired, gray, male rescue cat overseeing his mile-high kingdom bathed in his radiant light. Nimbus arrived in mid-April—appropriately by snowcat—and seems to fit in already with the Observatory's summit cat tradition as his schedule and *Windswept* deadlines are already convoluted. So we debut an abbreviated column from him called "News from Nimbus," translated by Summit Operations Manager Rebecca Scholand.

May Nimbus have many clear days during his long reign.

Focused On The Future

Donna Dunn

BY **DONNA DUNN,**
INTERIM EXECUTIVE DIRECTOR

As I write this, a full year has passed since the world turned upside down, a very full year for the Mount Washington Observatory. We continued to provide hourly weather observations every day, 24 hours a day under very challenging living situations. Daily higher summits forecasts were uninterrupted. Our observers took it upon themselves to manage their exposure to COVID, and simultaneously their colleagues' exposure, and the year passed without a single case. Our data set grew through their efforts. Analysis of historic data records continued. Our education specialists conducted more than 100 hours of programs for our own school program and on-demand for other educational entities. It was, to some extent, business as usual. Yet the virus remained and remains something we are aware of for our summit teams.

We closed our museum in North Conway and our exhibits live on in several other locations: the McAuliffe-Shepard Discovery Center, our Extreme Mount Washington Museum on the summit, and soon, in the visitor's center in Intervale, N.H. Our museum in the Mount Washington State Park building remained closed for the entire season during 2020. We are preparing the re-opening for 2021, with new staff and updated exhibits, along with updated ventilation and improved environmental conditions in the Extreme Mount Washington Museum space. Additional challenges that we never anticipated. Come visit the museum on the summit.

We are preparing the re-opening for 2021, with new staff and updated exhibits, along with updated ventilation and improved environmental conditions in the Extreme Mount Washington Museum space.

While we reflect on all that we have survived over the past year, we are focused on the future.

Our new Seek the Peak has great energy. Expanding from the hike-a-thon format, you can support the Mount Washington Observatory by raising funds while you have an outdoor

adventure, hiking, cycling, paddling, climbing, walking—any outdoor activity you choose. Sign up at seekthepeak.org and start building your sponsor support. Great prizes await those who raise money. And the Adventure Expo on July 17 at Great Glen Trails will be your opportunity to receive your prizes, take part in some great clinics, hear fabulous music and celebrate this new adventure in our new year. The support you provide by raising funds is critical to our operations and funding every year.

The Board of Trustees is focused on the future as they work through strategic planning, anticipating the next three years and beyond. We anticipate 2022 as the 90th anniversary of the Mount Washington Observatory. In planning, the Board of Trustees is looking even farther out. 2032 will be the 100th anniversary. Developing a strategic plan with a clear vision of the organization at 100 years old is the difficult and rewarding work of the Trustees.

Planning for the future is possible only through the continued commitment of our donors and supporters. Whether through Seek the Peak, our annual and spring appeals, ongoing monthly donations, or membership, your contributions make the work of the Mount Washington Observatory possible—through our first 100 years.

Long Live Nimbus!

TRANSLATED BY **REBECCA SCHOLAND**

Meow! I'm Nimbus, like the cloud, and I'd like to introduce myself as the newest mascot and friend of the Mount Washington Observatory. I'm originally from Oklahoma and was picked up by the Sapulpa Animal Control. Skiatook Paws and Claws Animal Rescue met me and knew I was a friendly feline who needed a little help finding my furr-ever home. They helped me and a few other companions transfer to the Conway Area Humane Society where local families were opening their homes. Little did I know the purr-fect family I would find. I now have an entire Observatory family!

My first day on the summit in April was a little overwhelming. I never would have thought I would have an entire alpine kingdom to oversee in my role. Unfortunately I never got to meet my predecessor Marty, but I know I have big paws to fill. Weather Observers, who I am getting to know, have been wonderful at acclimating me to my surroundings. They say that once the New Hampshire State Park's Sherman Adams Building opens I will have many fans, supporters, members, and volunteers to meet and greet. I can't wait to share my stories of this meow-nificant place!

Top: Meet Nimbus, the new summit cat. Above: Nimbus gets used to his new home.

Seek the Peak Expands to Outdoor Adventure Expo

After 20 years, Seek the Peak is expanding from a hike-a-thon to an expo filled with many human-powered outdoor activities, offering both virtual and onsite opportunities in the spirit of Mount Washington adventure.

The multi-sport 21st annual Seek the Peak is being held July 16-17 and will be centered at Great Glen Trails Outdoor Center.

Seek the Peak raises a significant portion of the Observatory's annual budget to support its work in weather observation, education and climate research atop Mount Washington. As a critical fundraiser, participants are encouraged to raise funds for MWO in exchange for entry into various activities and prizes from sponsors.

Participants are being inspired to "seek your peak" whether it be in your own backyard or in the White Mountains. There will be opportunities for all levels of participants: from the seasoned trailblazer to the uninitiated explorer. Options to participate in guided or self-led activities are in place for hiking, climbing, mountain biking, paddling, trail running, fly fishing and more. Adventure experts will be working to provide clinics, both virtual and onsite, and a guidebook will offer helpful references to help visitors safely and responsibly utilize the community's natural resources.

"As our largest annual fundraiser, we are moving in this multi-outdoor activity direction to create an inclusive opportunity for our supporters who make use of the valuable resources of MWO while adventuring in the White Mountains," said Director of Marketing and Communications Krissy Fraser. "We have pulled together a group of outstanding local outdoor professionals to help develop this epic Mount Washington Adventure Expo."

Rock climbing with partners like Eastern Mountain Sports is also part of Seek the Peak. EMS photo.

Several guided options will be available for participants reaching various fundraising goals. Eastern Mountain Sports along with other guide schools will be offering climbing and hiking trips as well as a climb and rappel station at Square Ledge in Pinkham Notch. For the mountain bike enthusiast, volunteers from the Cross New Hampshire Adventure Trail will offer a range of rides exploring their 80-plus mile trail network that includes scenic rail trails. The region's panoramic waterways are primed for flora and fauna fans so paddlers can take a whitewater clinic or half-day wildlife tour along the Androscoggin River led by experts from Great Glen Trails.

Seek the Peak will also host a vendor village at the event base camp being held at Great Glen Trails Outdoor Center on Saturday, July 17, from noon to 7 p.m. Several event sponsors will be onsite to showcase goods, services, clinics and friendly expertise turning the village into the Mount Washington Outdoor Expo. Anchored by Backpacker Magazine's Get Out Tour, Eastern Mountain Sports and Oboz Footwear, each exhibitor will also be paired with a nonprofit organization including the NH Outdoor Council, The Access Fund and Ability Plus. Food trucks will join Mount Washington Radio Groups including DJ Roy Prescott who is back to emcee in between live performances from local bands the Mountain Bear Band and Shark Martin.

All activities will be prepared with COVID protocols in place and CDC guidelines will be followed.

Seek the Peak has expanded to include a wealth of outdoor activities like mountain biking at Great Glen Trails Outdoor Center. Great Glen Trails Outdoor Center photo.

Participants will be rewarded for their fundraising efforts with a gear give-away, thanks to supporting sponsors including Smartwool, Cotopaxi, Big Agnes, Hyperlite Mountain Gear and more.

Visit seekthepeak.org to register and start to earn gear in giveaways. Visit mountwashington.org to learn more about the Observatory's work, how to become a member and other interesting happenings.

Seek the Peak is made possible with support from additional sponsors including The Mt. Washington Auto Road, Martini Northern, First Light, White Mountain Oil & Propane, Eastern Slope Inn, Northway Bank, Mason & Mason Insurance, Delta Dental and WMWV 93.5.

Several WDC Exhibits Touch Down in Concord

The McAuliffe-Shepard Discovery Center on March 19 opened a new exhibit containing several pieces from Mount Washington Observatory's recently closed Weather Discovery Center in North Conway.

In a new partnership, the Observatory and McAuliffe-Shepard Discovery Center combined forces to bring weather and climate science education to Concord.

Exhibits included everything from the Tornado Tube, which creates a "mini-tornado" right in the Discovery Center's Planetary Sciences Gallery, to an exhibit on solar power, to the, "Shaky Shack," a replica of the 1930s-era weather station that was atop the summit during the record-breaking 231 miles per hour gust that swept across the mountain on April 12, 1934.

While working on integrating the Observatory into its science galleries, the Discovery Center (starhop.com) took the opportunity to upgrade its lunar exhibits, including a new station on Apollo 14, the lunar mission led by Commander Alan Shepard 50 years ago; additional Apollo 14 panels and exhibits on women in STEM, and relocation of the NH Minerals exhibit (on long-term loan from the Morrison Family), into the Discovery Center's simulated lunar station; and to train new volunteers to offer views of the sun, moon and stars from its rooftop observatory.

Berlin City Auto Group and Generous Donors Bring New Fleet to Observatory

Berlin City Auto Group and the generosity of a handful of benefactors helped the Observatory start the new year on a positive note by donating a new 4x4 truck and new 4x4 passenger van. The two vehicles replace a couple of nearly 20-year-old transports and afford the Observatory more reliability and safety for observers, staff and guests, critical to functioning on the summit of Mount Washington.

Mount Washington Attracts Record Race Field

Mild temperatures greeted racers during February's Ski, Shoe, and Fatbike to the Clouds at Great Glen Trails. Great Glen Trails Outdoor Center/ Joe Viger photo.

With mild temperatures and partly sunny skies, this year's Ski, Shoe, and Fatbike to the Clouds on Sunday, February 28 was a highlight for many racers who were shuttered by COVID pandemic cancellations.

Chip timing and a staggered start were among several protocols in place to keep racers distant.

Pent up demand for racing was evident with a record and sold-out field of 250 registrants: 30 Nordic skiers, 88 snowshoers, and 132 fat bikers.

This year's race lived up to its reputation, testing the athletes as only Mount Washington can. The fastest time was posted by Adam Glueck with a blazing time of 50 minutes 41 seconds, winning the men's ski division. Anya Bogdanets held onto her first place title with another win in this year's race and a time of 1 hour 9 minutes. Other divisional winners were: women's ski Emily Carty (Sweden, Maine) 1:04:31; men's fatbike Andy Gould (Concord, N.H.) 53:25; women's snowshoe Jennifer Mortimer (Bedford, N.H.) 1:12:04; and men's snowshoe Jacob Wormald (Goffstown, N.H.) 1:03:17.

Mount Washington not only inspires athleticism and competition, but also love as two bikers got engaged right after the finish.

Choose Your Adventure For Seek The Peak

BY **MARTY BASCH**

The venerable Seek the Peak is now a multi-sport expo complete with activities like hiking, rock climbing, mountain biking, paddling and more. The beloved event to benefit the science and research work of the Mount Washington Observatory on July 16-17 is now a chance to explore familiar or new pastimes within sight of Mount Washington.

Seek your own peak during Seek the Peak like participant Ashley Witham.

Along with its generous partners and sponsors, Seek the Peak is a valuable opportunity to connect with trusted weather reports, trail information, and local tour operators loaded with knowledge. You can plan your own outing, take a guided option with an Observatory partner based on your STP fundraising level, or use a service of your own finding. The Observatory is even putting together a guide book for participants.

Join presenting sponsors Great Glen Trails, Eastern Mountain Sports and Oboz on July 17 from noon to 7 p.m. at the foot of Mount Washington as Great Glen Trails Outdoor Center is transformed into a base camp that includes the Mount Washington Adventure Expo with a vendor village, live music and food trucks. Hear from experts from brands like Oboz and Petzl alongside nonprofits like the Access Fund and AbilityPlus.

Scratch hiking Mount Washington or another glorious peak from that bucket list. Or, go climbing or mountain biking. See landscapes from another perspective while paddling. DIY or hire a guide. Attend a clinic.

No matter what you choose, a safe experience starts with Observatory weather forecasts from the web site (mountwashington.org) or a resource like North Conway radio station WMWV (93.5 FM).

Eastern Mountain Sports climbing school (emsoutdoors.com) manager Keith Moon says the Observatory forecasts are an incredibly valuable resource for anyone recreating in the White Mountains.

"There is no better and more accurate product for 24 to 48 hour forecasts for Mount Washington and the surrounding valleys," he said. "I personally check their forecast before every one of my personal and guided trips. We should count ourselves lucky to have the Observatory at the top of the highest mountain in our region."

The valley is also lucky to have knowledgable guides.

Great Glen Trails Outdoor Center (greatglentrails.com) events and marketing director Lisa McCoy says insight that a guide brings to outdoor adventure, from rock climbing to kayaking to biking, and even yoga, is invaluable.

"With their fingers on the pulse of activity, guides know the best places to go for specific conditions, and are trained to bring guests the best experience possible," she said. "This summer, in partnership with the Observatory, we are offering our guided flat-water and whitewater kayak trips as a benefit to those who have raised money for Seek the Peak. It's a win-win-win!"

Hiking is the backbone of STP. Planning is key. New Hampshire Fish and Game and the White Mountain National Forest have promoted the "hikeSafe Code," to encourage hikers and other backcountry travelers to enjoy their adventures smartly and responsibly.

Even by carrying hiking essentials and being smart by turning back in foul weather and the like, trouble happens. That's where Fish and Game's hikeSafe card (hikesafe.com) comes in. Think of it as backcountry insurance with proceeds benefitting the department's search and rescue fund.

Gladys Brooks Memorial Library Curator Peter Crane, an avid hiker and president of the New Hampshire Outdoor Council, says responsibility for wilderness search and rescue (SAR) in the Granite State belongs to the New Hampshire Fish and Game Department, with some involvement also by other state or federal agencies, such as New Hampshire State Parks and the U.S. Forest Service or the New Hampshire Army National Guard.

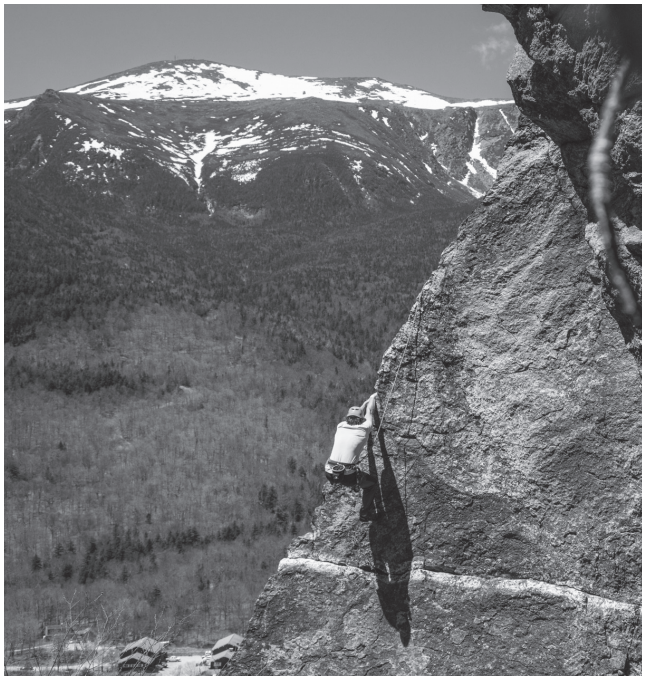
"These paid professionals are assisted by many unpaid professionals, volunteer members of the several search and rescue teams that serve hikers, climbers, and others in need of emergency help in the state's mountains and forests," he said.

Sometimes Observatory staff serve as SAR members. Though no such service is part of the Observatory's standard mission of weather observation, research, and education, Crane says it is part of being a good neighbor on Mount Washington. When accidents occur near the summit, it's not unusual for Observatory staff and interns to work with State Park personnel and others in providing a timely response. The snowcat may be used to help in winter too.

"Over the years, several Observatory staff have also joined local SAR teams, so that on their 'off time' they are on call to assist in SAR activities, extending the value of lessons they have learned while working at the summit," he said.

So, what will you do?

Crane has a few suggestions for hikes other than Mount Washington like a short trip on the Lost Pond Trail and Square Ledge Trail up Square Notch in



Mount Washington makes for a dramatic backdrop during a rock climbing adventure. EMS photo.

Pinkham Notch across from the Appalachian Mountain Club Visitor Center on Route 16. Though there's a quick scramble, the view of the eastern face of Mount Washington is awesome.

A 6.2-mile Raymond Path loop through the mountain's forested lower slopes also from the visitor center serves up more of a challenge. Use the wide and rocky Tuckerman Trail before taking a right on the Raymond Path, one of the oldest trails on the mountain that was once a bridle path. Then take Old Jackson Road back.

For a challenge, consider the 10.2 mile lollipop loop to Carter Dome, one of the top ten highest in the state. Start with the 19 Mile Brook Trail, about a mile north of the Glen House on Route 16 and then use Carter Moriah Trail, Carter Dome Trail with its switchbacks and 19 Mile Brook again.

They don't call New Hampshire the Granite State for nothing and North Conway's highly visible and massive White Horse and Cathedral Ledges just outside the village have attracted rock climbers for almost 100 years scaling the cliffs more than 500 feet tall. Between the two cliffs there are more than 300 established routes from easy to expert. North Conway has a number of climbing schools.

"The high quality of rock, large variety of route levels and incredibly easy access make these two cliffs classic destinations," said Moon.

Routes like Standard and Inferno on White Horse and Thin Air and Recompense on Cathedral are well-known.

Moon says climbing is a sport where you can start at any age and it's not uncommon to see climbers well into their 70s.

"We will be offering programming for folks who have been interested in climbing and just want to check it out, to private trips for climbers looking to get on a dream route, polish their skills or become better prepared for self-rescue scenarios," he said.

EMS, along with other schools, will host a climb and rappel station at Square Ledge in Pinkham Notch.

The plentiful rivers and lakes of the Mount Washington Valley and its surroundings are prime places to paddle surrounded by nature's bounty.

The Saco River is popular, perhaps overly so, with an easy stretch a short drive from the Observatory's Administration Offices. Paddle eight miles from First Bridge on River Road in North Conway to Davis Park with its covered bridges.

The experience is heavily dependent on water levels. Local shuttle services and kayak and canoe rentals are available; two vehicles are helpful.

Conway Lake with its Mill Street access is a fine alternative, about eight miles from North Conway.

"Conway Lake is always good for a four hour paddle," says Great Glen Trails Outdoor Center program director Nate Harvey. "It's easy, unless there are huge winds, and pays out big time with swimming and loon sightings."

For a more secluded paddle travel north from the Great Glen Trails Outdoor Center to the Androscoggin River where osprey and eagle spotting could prove positive. It's about a 3 or 4 hour float just over the Maine border from Gilead to Bethel. Two cars or shuttle are necessary. Great Glen offers both half-day and full-day guided wildlife kayak tours of that stretch, as well as whitewater kayak clinics on its summer recreational menu.

Mountain biking is enjoying a knobby-tired renaissance with North Conway seeing a multitude of new trails and local spirit. Both the long-standing White Mountains Chapter of the New England Mountain Bike Association (nemba.org) and new White Mountain Bike Coalition (ridenoco.org) are instrumental in trail development and maintenance. Download the Trailforks app and choose your ride. One pod loaded with sinuous singletrack for all abilities is the Marshall Conservation Area on West Side Road, a short drive from North Conway. Downhillers like the growing trail grid off Hurricane Mountain Road.

Looking to try lift-served mountain biking? The Cranmore Bike Park (cranmore.com) opened last summer and offers rentals and lessons.

Another mountain bike club spreading

With Great Glen Trails Outdoor Center as your guide, paddle along the Ammonoosuc River. Great Glen Trails Outdoor Center photo.

the gospel of dirt is the Gorham-based Coos Cycling Club (cooscyclingclub.org) which oversees a growing network including those found in Moose Brook State Park. Last year the club surprised former Observatory trustee Howie Wemyss after he retired from his role at the Mt. Washington Auto Road and Great Glen Trails by naming an intermediate/advanced trail after him with a play on his name—Howie Roll.

Ride along with the family at Great Glen Trails Outdoor Center. Great Glen Trails Outdoor Center photo.

Great Glen Trails is also a mountain biking hub, offering miles of wide carriage roads and narrow singletrack for all skill levels. With a base lodge and rental shop, grab a map before heading out on the well-signed network.

"The cool thing we have at Great Glen is vistas, streams to put your feet in, wildflowers everywhere and pedal-assist e-bikes," said Harvey. "Biking at Great Glen is also cool for the family."

Bicycle travelers can ride the Cross New Hampshire Adventure Trail (xNHAT.org), a 83-mile long collection of northern New Hampshire paved and dirt back roads and rail trails between Woodsville, N.H. and Bethel, Maine. In the shadows of Mount Washington, the xNHAT is used by a variety of outdoor lovers including bicyclists, hikers and runners. The trail passes through small towns and has an ample supply of lodging opportunities from camping to inns, restaurants and grocery stores.

Hardcore cyclists can do it in a day, but more leisurely bicyclists carrying their own gear tend to do it in three days and two nights, and can even get a patch upon completing the whole trail.

Trail founder Marianne Borowski and volunteers will lead guided rides along pieces of the route during STP. One easy and scenic out-and-back 8-mile ride is to the Pondicherry Wildlife Refuge along the Presidential Rail Trail. Another is a moderate 21-mile out-and-back ride on rolling back roads and the PRT.

No matter your choice for STP, you've made the right one.

Editor Marty Basch and his wife Jan have twice bicycled the entire Cross New Hampshire Adventure Trail and plan to do it again for Seek the Peak. Marty is also leading a leisurely hour-long spin at Great Glen Trails during STP on July 17.

FEATURE

Celebrating Summit Volunteers with 10 Years of Continuous Membership

BY **STEPHANIE FITZGERALD**

The summer issue of *Windswept* is when we highlight those celebrating 10 years of continuous membership in the "Member Milestones" section. This is a wonderful way to highlight members' dedication and helped me get to know a number of you better. When I pulled this issue's list of names, I immediately noticed multiple long-term summit volunteers who have been committed to the Observatory's work and gone above and beyond in their support. While we try to get new members to the summit for a first-time volunteer shift, it is helpful to have a handful of tried and true volunteers we can call on to lead a large group or fill in last minute. These are people who have become well known to me and even like family to many observers and interns. They were also extremely missed by all of us over the last year.

Members Conny (left) and Werner Griesshammer (center) met up with their son Christoph (right) at the summit sign after he hiked Mount Washington to see them on Easter during a volunteer week.

As many of you know, the last time summit volunteers headed down the mountain was in March of 2020 when the pandemic was just beginning. Due to limited space and the work of our observers being so specialized, we decided to limit the weather station to essential personnel only to keep everyone safe. According to the Observatory's Gladys Brooks Memorial Library Curator and local staff historian Peter Crane, it was probably the first time in about 30 years that our summit volunteer program was suspended.

The summer issue of *Windswept* is a welcome opportunity to highlight those members with 10 years with us and find out what they love about volunteering.

First on our list are Werner and Conny Griesshammer of Topsfield, Massachu-

setts. The Griesshammers are a great example of how to make a good impression as volunteers—with good food.

"We usually bring fresh homemade bratwurst which is served with sauerkraut and fresh baked sourdough bread. Sunday dinner is a good time for a Bavarian sauerbraten with kartoffelkloesse (potato dumplings). A favorite dessert is a fresh baked Bavarian apple cake, or just a bowl of Haribo gummi bears," said Werner.

A little extra effort was needed for these intricate meals. Werner explained that, "Most of the ingredients you won't find in the OBS kitchen, so Conny goes shopping during the week and one big bag of our luggage is reserved for food." While this level of cooking is certainly not expected by volunteers, it is always a pleasure to enjoy authentic cooking on the summit.

Another well-known volunteer and MWO enthusiast missed on the summit last year is John Donovan from Cranston, Rhode Island. John has done multiple shifts on the summit, and his passion for the Observatory is obvious. "I love the Obs and being involved on the summit. So many bumpy snowcat rides, meeting Edutrip guests from around the world and cooking in my own kitchen on a mountain," he said.

Member John Donovan takes in the scene from the summit during shoulder season.

A true ambassador for our mission, John is perhaps best known as a champion for staff and especially our summit crew, always keeping up with interns and staff even when they move on in their careers. He is also an active fundraiser for Seek the Peak each year. You can usually spot him at the expo as one of the recognizable Kilted Hikers.

Lastly, but far from least, is summit volunteer Pat Luddy from Orange, Connecticut. Pat has been hiking in the White Mountains for nearly 50 years and continues to hike with his grandkids, stopping for overnights in the Appalachian Mountain Club huts. He started volunteering about 10 years ago when he filled in at the last minute. He has since been someone we can call on when hosting trips on the summit.

"Volunteers end up being the ambassadors for MWO. We invite these guests into our home and serve them a meal" he said. While Pat enjoys engaging visitors, he says the real pleasure is getting to know the summit staff. "The observers do a special job, and it can be a difficult lifestyle. If we can make it a little easier, then that's what's important."

While we cannot wait to start our summit volunteer program again, it will likely need to be altered to adapt

Member Pat Luddy poses in front of the MWO snowcat on a winter shift change trip to the summit. Courtesy photos.

to the various changes taking place on the summit and in the organization. Volunteering has always shifted based on the needs of MWO's programs and staff, and now is no exception. When we first started advertising for summit volunteers in the early 90s, it was to help catalog slides in the museum. Over time, the focus was on the various projects or miscellaneous chores that needed finishing before eventually evolving into the program we are most familiar with today—cooking and general housekeeping, freeing up observers' time for the more specialized responsibilities.

When the weather station was closed to non-essential staff and our summit volunteer opportunities were put on pause, we certainly didn't know what to expect and how much time would go by. In this period of change, while staying true to our mission, we are constantly reevaluating our operations, progress of the pandemic and the general needs of our summit staff.

One thing we do know is that however the summit volunteer program returns, we cannot wait to have our best advocates working with us again, lending their incredible diversity of talents to help us meet the organization's evolving needs. There is no one who has a better understanding of our observers' daily work, or the intensity of extreme weather conditions across Mount Washington, or even the majestic quiet as the last Cog train heads down to base and you find yourself alone in the clouds, than our summit volunteers.

Thank you to all our volunteers and to all our members celebrating 10 years of membership. A full list of members with 10 years is on page 46.

Development Director Stephanie Fitzgerald can be reached at membership@mountwashington.org.

FEATURE

Avalanche Deaths a Tragic Part of Mount Washington History

BY **PETER CRANE**

Mount Washington and Ammonoosuc Ravine (looking from the west). The large dot marks the approximate site of the Forgays tragedy. Bradford Washburn photo.

On Monday, February 1, 2021, an avalanche in Ammonoosuc Ravine took the life of Ian Forgays, 54, of Lincoln, Vermont.

Forgays, a very experienced backcountry skier, was skiing alone in this ravine on the western side of Mount Washington. Weather conditions were favorable with the temperature in the single numbers and teens and winds averaging 33 miles per hour that day. The Mount Washington Avalanche Center had issued a "low" rating for avalanche danger, but it is important to understand that *low* hazard does not mean *no* hazard, and even when such hazard is minimal, it is not unusual for areas of unstable snow to exist in some locations. As the Center's forecast for the day stated, "the potential for small avalanches of wind drifted snow remains in isolated areas at mid and upper elevations."

Presumably Forgays skied onto such an unstable pocket, which released and carried him downward. To compound his predicament, the spot lay in a "terrain trap" — an area where a broader slope of snow could slide downward

into a tighter, funnel-like constriction, resulting in relatively shallow snow piling up into a deep mass over the skier. This was a mass from which he could not escape; new snowfall the next day, with a subsequent avalanche, buried him only deeper.

Friends of Forgays alerted authorities to his absence late Tuesday. On Wednesday, a full field search commenced, focused on Ammonoosuc Ravine. Forgays had been using an avalanche transceiver, or beacon—a small device that sends out an electronic homing signal which can be received by another such device—which was essential in locating him. His signal was acquired at about 4:30 p.m.; it would take more than an hour and a half to dig through almost 13 feet of avalanche debris to reach him. By then Ian Forgays had succumbed to asphyxiation.

The search and recovery effort included personnel from the New Hampshire Fish and Game Department, the White Mountain National Forest/Mount Washington Avalanche Center, and the all-volunteer Mountain Rescue Service.

The Mount Washington Avalanche Center issued a detailed incident report, assessing the snow conditions and considering the decisions made by Forgays. The Center noted that Forgays was a very capable and accomplished skier, and such skiers, honed by experience, sometimes accept calculated risks. Unusual circumstances can cause those calculations to go awry, to the adventurer's peril. In this case, the Center stated, "skiing technical lines, in a thin snowpack above a notorious terrain trap, with no partners, even on a Low danger day, raises the stakes tremendously." We send our condolences to Forgays' family and friends.

According to available records, 17 people have died in avalanche incidents on Mount Washington; this number does not include others who have been caught, buried, or injured by such snow slides on the mountain and lived to tell the tale.

The first two people who died in an avalanche-related incident on Mount Washington were Philip Longnecker, 25, and Jacques Parysko, 23, who died in January of 1954 while camping in an igloo-like snow shelter built imprudently just beneath the Tuckerman headwall. Their shelter was hit by a small snow slide, burying Longnecker and leading Parysko to attempt an escape by hiking ill-prepared down the Sherburne Ski Trail, where he succumbed to hypothermia.

Another early avalanche victim was Aaron Leve, 28, who was hiking in Tuckerman Ravine in February of 1956. He was with four others who were struck by the snow slide—indeed one probably triggered it—but he alone was fully buried, and it took an extensive effort to locate his by-then-lifeless body.

Following those incidents, it seems that all such tragedies involved either skiers or climbers—the latter including technical ice climbers as well as non-technical winter climbers on Lion Head.

As noted earlier, Forgays, 54, died in an avalanche in Ammonoosuc Ravine in February of this year. His was the first such incident on that side of the mountain. Perhaps surprisingly, no skier has yet died in an avalanche in Tuckerman Ravine. Three skiers have

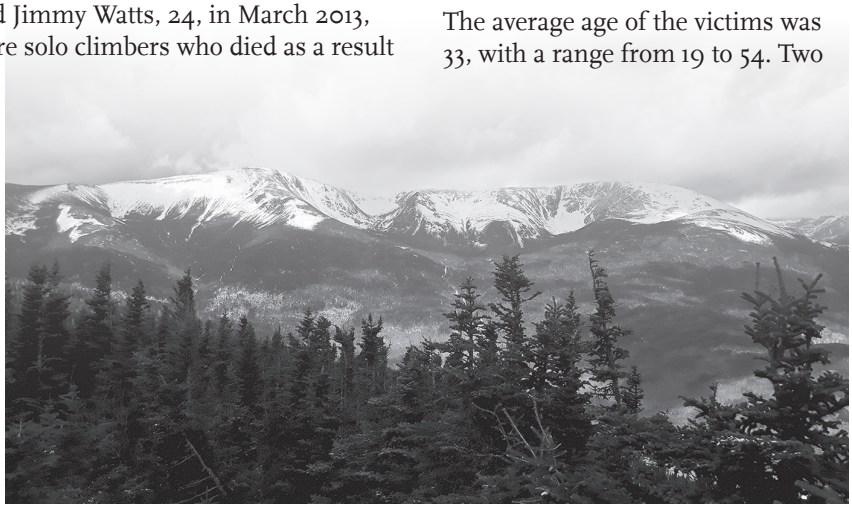
died in such incidents in the aptly-named Gulf of Slides— John Wald, 35, and his companion Todd Crumbaker, 29, in one avalanche in March of 1996, and David McPhedran, 42, in January 2000. More recently, Nicholas Benedix, 32, died in an avalanche in April 2019 while skiing down the Ravine of Raymond Cataract, a not-so-often skied route lying on the east side of the mountain, between Tuckerman Ravine and Huntington Ravine.

Mountaineers venturing onto the steep slopes of Huntington Ravine, favored by technical ice climbers, have come to grief when unstable snow perched precariously in that precipitous terrain has overcome them. In February 1964, Hugo Stadtmüeller, 28, and John Griffin, 39, lost their lives as a result of such a snow slide. Thomas Smith, 41, succumbed to an avalanche in Huntington in February 1991; his climbing companion was injured but survived. Peter Roux in January 2018, and Jimmy Watts, 24, in March 2013, were solo climbers who died as a result of avalanches in this ravine.

In early winter it is not unusual for ice climbers to ply their craft on the headwall of Tuckerman Ravine, and two such climbers, Scott Sandberg, 32, and Thomas Burke, 46, in separate parties, were lost to an avalanche in November of 2002, in an incident that involved seven individuals.

The slopes of Lion Head, one of the standard not-so-technical routes for winter ascent of Mount Washington, have been the scene of avalanche tragedies as well. In January 1982, Albert Dow, 28, a volunteer from the Mountain Rescue Service, lost his life while serving in the search for two missing climbers. In January 1996, Alexandre Cassan, 19, died while attempting an ascent of the mountain via Lion Head.

Of Mount Washington's avalanche toll, five were skiers, seven were technical climbers, and five were non-technical climbers or hikers. All were male. The average age of the victims was 33, with a range from 19 to 54. Two



Mount Washington from the east (from atop Wildcat "D" peak). The summit of Mount Washington is in the clouds, as is so often the case. From left to right can be seen the Gulf of Slides, Tuckerman Ravine, the Ravine of Raymond Cataract, and Huntington Ravine, each of which has been the scene of one or more avalanche fatalities.

deaths occurred in November, none in December, six in January, three in February, three in March and three in April. All of these people were on the mountain for a day of enjoyment, to indulge their passion for recreating in the outdoors and rising to mountain challenges, but it was a day from which they never returned.

Left to right, Mount Clay (with its summit in the clouds), Mount Washington and Mount Monroe, seen looking northward from Mount Eisenhower. The upper reaches of Ammonoosuc Ravine can be seen; it occupies the southwestern slope of Mount Washington.

For those with an interest in exploring Mount Washington, or other such mountains, in winter and spring, avalanche knowledge can be a prerequisite for safe adventures. Especially if you have an enthusiasm for skiing the steeps, or climbing challenging slopes, taking an avalanche safety course should be on your to-do list. Many climbing schools or guide services offer such instruction, from basic awareness sessions to detailed technical courses in snow science and rescue coordination. Even with such training under your belt, sometimes "a little knowledge can be a dangerous thing," and humility and acknowledgement of what you don't know about the complicated subject of avalanches should remain a guiding principle. (Renowned Swiss guide André Roch once reminded a group of his colleagues, "It is good you are all experts. But the avalanche, it does not know that you are experts!") Check, and strive to understand and abide by, the avalanche forecasts issued by the Mount Washington Avalanche Center. Don't just take a look at those forecasts once in a while—read them daily through the winter, to further enhance your understanding of the evolution of the snowpack and its potential hazards throughout the snow season. Pack along "the holy trinity" of avalanche safety tools —beacon, probe, and shovel —and practice their use, realizing that speed in use of a beacon can literally mean the difference between life and death. And always remember that alluring as the powder or ice or summit may be, the mountain will be there for another day.

The waves of avalanche snow have been compared to ocean waves, in their power, but also in their tragic impact. Indeed, it should never be forgotten that, "The snowy torrents are like the deep sea: they seldom return their victims alive."

Gladys Brooks Memorial Library Curator Peter Crane has a keen interest in Mount Washington history.

Observatory's Virtual Outreach Programs Reach Nearly 5,000 People

BY **BRIAN FITZGERALD**

Following a full year of the COVID-19 pandemic, virtual programming at Mount Washington Observatory (MWO) remains a critical way to communicate the science of meteorology and climatology to MWO's audience of learners and supporters both young and old. With a new year and a careful transition to more in-person opportunities, it's an exciting time think about how MWO can engage with people directly again, wherever the classroom may be.

In the virtual space, MWO continues to offer two significant and consistent programs—the Science in the Mountains Lecture Series and MWO's "Home of the World's Worst Weather Live" Virtual Classroom. Both of these free programs have continued to gain viewership, with a tremendous "showing" of over 700 people registering for Dr. Peter Crane's Science in the Mountains lecture about the Huntington-Hitchcock expedition in February. For the Virtual Classroom series that is aimed at middle school students, MWO education staff have steadily offered a nearly full year's worth of weather, climate and climate change curriculum tied to the Next Generation Science Standards. All told, between Science in the Mountains, the Virtual Classroom series and numerous distance learning programs directly to schools, libraries and science centers, over 30 programs were delivered in February, March and April of this year to an audience approaching 5,000 people and students across a variety of platforms.

Weather Observer/Education Specialist Nicole Tallman introduces another week of programming as a part of MWO's "Home of the World's Worst Weather Live" Virtual Classroom series.

The National Science Foundation-funded "WeatherX" curriculum development project continues in earnest, and in the spring of 2021 a group of one returning and four new teachers were set to test the second of two new units in their middle school classrooms. The "local unit" was developed by education staff at MWO, Education Development Center (EDC) and the University of Washington with the goal of having students explore the extremes of weather in their own communities, while learning data analysis skills. Students in communities such as Groveton, N.H., and Rangeley, Buckfield, Readfield and Greenbush, Maine have been engaged in a variety of weather data activities in these newly developed materials including keeping weather journals, interviewing family and local community members about storm events and exploring extreme and "normal" data collected near their communities.

Winter 2020/Spring 2021 Weather Data

	DEC.	JAN.	FEB.	MARCH
Temperature (°F)				
Average	14.6	9.8	7.2	14.3
Departure	+4.5	+5.1	+1.1	+1.5
Maximum	43	27	31	43
Date(s)	1st	15th	16th	25th, 26th
Minimum	-16	-23	-19	-28
Date(s)	15th	29th	11th	2nd
Precipitation (inches)				
Monthly	7.47	3.49	2.92	3.44
Departure	-0.26	-2.95	-3.85	-4.23
24-hour Maximum	2.90	1.47	0.76	0.57
Date(s)	5th/6th	16th/17th	1st/2nd	26th/27th
Snowfall (inches)				
Monthly	44.8	30.5	29.2	22.1
Departure	-0.7	-13.5	-10.9	-23.0
24-hour Maximum	19.2	8.1	5.2	5.6
Date(s)	5th/6th	16th/17th	1st/2nd	14th
Season Total	87.7	118.2	147.4	169.5
Departure	-15.5	-29.0	-39.9	-62.9
Wind (mph)				
Average	42.7	35.5	41.4	47.1
Departure	-2.2	-10.5	-2.7	+6.8
Peak Gust/Direction	111 W	157 NW	113 E	131 NW
Date(s)	15th	24th	2nd	2nd
Days 73+	21	10	16	19
Days 100+	7	5	8	11
Other				
% Sunshine	21	37	29	55
Clear Days	1	3	0	4
Partly Cloudy Days	5	5	5	7
Cloudy Days	25	23	23	20
Days with Fog	29	28	26	22
Days with Rain	5	2	2	8
Days with Snow	29	22	26	17

Winter Weather Has Its Way

BY **SAM ROBINSON**

Like usual in New England, the weather did what it felt like doing this past winter and did not seem to follow any patterns as such. Overall, temperatures stayed below freezing for a majority of the season and we never saw a January or February thaw like in years past. March started off cold but ended rather warm, with an unusual late March thunderstorm too. Snowfall across the region was below average for most areas, including on the summit.

December 2020

December started under a low pressure system, with mild but falling temperatures leading to various precipitation types. Rain transitioned to snow heading into the second, with snow showers and fog persisting into the third. The departing system brought windy but clearing conditions into the fourth. Snow showers resumed, lingering into the fifth when a stronger system brought heavier snowfall, dropping almost 2 feet through the sixth and a 104 mph gust. The summit cleared from the fog for the seventh with cold temperatures from the previous days finally rising. A low passing to the east brought intermittent fog on the eighth, followed by an upper level trough bringing clouds and snow showers for the ninth/tenth. High pressure entered the region with clearing conditions on the eleventh. A warm front on the twelfth brought temperatures near freezing, as a coastal low lifted north. Precipitation started as freezing drizzle/rain before briefly transitioning over to ice pellets, then back to rain for the thirteenth. A cold front brought upslope showers and plummeting temperatures for the fourteenth/fifteenth with an impressive below normal low of -16°F and gust of 111 mph. Winds relaxed and the summit cleared for the sixteenth as high pressure briefly passed. Low pressure to the south brought fog and snow for the seventeenth/eighteenth before a significant ridge cleared the summit through the nineteenth. Low pressure arrived from the west on the twentieth, bringing light snow. A ridge provided brief clearing to the summit for the twenty-first, with a clipper system arriving late bringing additional snow. A trough continued snow for the twenty-second/twenty-third. Warm air from the south arrived for the twenty-fourth/twenty-fifth with a cold front then providing over an inch of rain. Behind the cold front, temperatures dropped and snow/fog lingered for most of the twenty-sixth through twenty-ninth with low pressure nearby. High pressure cleared the summit for the thirtieth but a series of fronts restarted snow showers late, lasting through the thirty-first.

January 2021

The first was a bright day as high pressure crested ahead of the next system which brought 3 inches of snow and a 101 mph gust for the second. High pressure rebuilt on the third with moderating winds and temperatures. A coastal low brought light snow for the fourth/fifth with brief clearing between. High pressure brought clearing on the sixth but winds drifted the fresh snow for most of the day. High pressure strengthened for the seventh/eighth providing mostly clear skies but a steep pressure gradient kept winds elevated. Intermittent fog dominated the ninth as low level moisture rose up from below. A ridge rebuilt on the tenth/eleventh leading to fair weather. An upper level trough provided snow showers on the twelfth/thirteenth/fourteenth but amounts were under 2 inches. The summit remained in the fog for the fourteenth with a brief snow shower and relatively low winds. Clouds on the fifteenth remained below the summit until late when a warm, moist system approached. Freezing rain started before transitioning over to snow early on the sixteenth. Moderate snowfall rates led to 6 inches of snow and winds ramped up to a gust of 116 mph. Snow showers continued on the seventeenth/eighteenth as the upper low remained, adding another 7 inches to the storm total. The nineteenth started with brief clearing but snow showers restarted as another surface low passed. Cold air advection kept temperatures low on the twentieth with snow showers and fog thanks to an upper level trough. High pressure allowed for brief clearing on the twenty-first but temperatures stayed cold and snow restarted as another low approached into the twenty-second. A cold front cut off snow on the twenty-third but plummeted temperatures to -18°F. Fog continued for the twenty-fourth with an impressive pressure gradient leading to a 157 mph gust. The low moved east on the twenty-fifth/twenty-sixth relaxing winds but a warm front brought snow, intermittently continuing through the twenty-ninth thanks to a trough over Maine. The coldest air of the year thus far funneled down from the north yielding a temperature of -23°F on the twenty-ninth. The low weakened by the thirtieth, rebounding temperatures slightly and clearing skies. High pressure overhead kept the thirty-first calm and clear.

February 2021

A nor'easter approached for the first through second with over 5 inches of snow and a gust of 113 mph. The low remained nearby with additional snow through the fourth before high pressure brought clearing. A cold front forced upslope snow on the fifth/sixth. Another coastal low approached for the seventh/eighth dropping 2 inches of snow followed by a shortwave providing additional snow on the ninth/tenth. Cold air moved in on the eleventh with a low of -19°F. Ridging provided elevated winds but fair weather and moderating temperatures for the twelfth/thirteenth. A series of troughs provided light snow and fog for most of the fourteenth through sixteenth with warmer air allowing for brief glaze icing on the sixteenth. Temperatures plummeted on the seventeenth thanks to a cold front but high pressure cleared

the skies through the eighteenth. A coastal low and local instability lead to snow through the beginning of the twentieth. A few snow showers lingered for the twenty-first before high pressure cleared the skies. Weak low pressure south of New England then brought more snow for the twenty-second, with a series of lows continuing the snow intermittently through the twenty-fifth, totaling almost 8 inches. A steep pressure gradient led to gusts of 108 mph, 109 mph, 109 mph, and 110 mph for the twenty-fourth through twenty-seventh, respectively. The twenty-sixth saw fair weather but cold temperatures thanks to ridging before another quick moving low from the Ohio River Valley pushed through with snow on the twenty-seventh. A weak low passage to our north brought snow showers and cloudy skies on the twenty-eighth to end the month.

March 2021

An associated cold front from the northern low crashed temperatures through the first, with a swing of 46 degrees along with various precipitation types. An incoming ridge steepened the pressure gradient between the departing low resulting in a gust of 131 mph and dangerous wind chills on the second, with air temperatures reaching -28°F. Temperatures moderated on the third, but a shortwave and low pressure aloft kept snow showers and fog around through the beginning of the sixth, with northwesterly flow then funneling in colder air. High pressure built in for the seventh/eighth with fair but cold weather. Moist flow socked the summit in the fog for the ninth but eventually cleared late. High pressure crested on the tenth and moved south on the eleventh, which began a warmup. Temperatures rose above freezing for the first time since 2020, but a passing northern low resulted in a steepening pressure gradient and gusts of 115 mph, 113 mph, and 102 mph for the eleventh through thirteenth, respectively. Strong cold fronts swung through on the twelfth/thirteenth plummeting temperatures and dropping almost a foot of snow through the fourteenth. Temperatures continued to fall thanks to the arctic blast leading to a new record low of -26°F on the fifteenth. High winds continued with gusts of 106 mph for both the fourteenth/fifteenth. High pressure lead to fair weather and moderating temperatures through the seventeenth. A quick moving system brought snow and fog on the eighteenth before high pressure rebuilt for the nineteenth through twenty-fourth with mild temperatures and mostly clear skies. A deepening trough and surface low arrived for the twenty-fifth/twenty-sixth but record high temperatures kept precipitation unfrozen. A brief, unusual thunderstorm occurred on the twenty-sixth, followed by a strong gust of 124 mph. A cold front then transitioned precipitation over to the frozen variety into the twenty-seventh with low pressure following behind. The twenty-eighth/twenty-ninth saw fog, freezing rain, and eventually snow. High pressure led to clearing skies for the thirtieth. The last day of the month then saw mild temperatures, fog, and rain spreading in late due to another broad low.

5:11 AM Thurs. Dec. 24, 2020

The following pair of extracts reflect what Christmas was like on Mount Washington way back in 1870. The entries are from the journal of the Huntington-Hitchcock Expedition, and are as they appeared in "Mount Washington in Winter," published after the winter of 1870-1871. The chapter containing these extracts was prepared by Solomon Nelson, one of the members of the expedition, who hailed from Georgetown, Massachusetts.

December 24. Yesterday afternoon and late at night, a "snow-bank" lay along the south; this forenoon snow was falling with a temperature of -13 degrees. At times during the day the wind was as high as seventy miles an hour, consequently we were confined to the house. Mr. S. (Sgt. Theodore Smith, weather observer and telegrapher of the U.S. Army Signal Service, specially assigned to the Expedition) has much to do, many messages being sent to and from the "lower regions." He sends his first regular report to Washington tonight. So it seems that the government consider this station of importance, if the public do not. In working this line, Mr. S. has had many obstacles to overcome; but he seems to be determined to have it work all right ere long. Canned beef, tomato sauce, coffee, and pilot bread constituted our dinner. Find no vegetables but onions—bad for us. It is cold tonight (now, nine P.M., - 15 degrees), and only 42 degrees in the room, although we have two fires. Mr. K. (Howard Kimball, photographer, of Concord, New Hampshire) received a telegram from home tonight. We sent a press dispatch of "A merry Christmas to all the world below." Christmas! And what a contrast to some former ones! - in situation at least. But I would not exchange places

with the most favored of fortune this night, nor do I esteem any preceding Christmas Eve above this one. A jolly party we are, but for the telegraph shut out from all intercourse with mankind. The wire attached to the sounder on the little table across the room is the connecting link between the "outside barbarians" and ourselves. They are doomed to read (curiosity if not interest will lead them) the reports from Mount Washington. We have a saying that whatever is done is all for the "Benefit of Commerce."

December 25. There were no clouds above or around the summit. Below, and but a little lower than this peak, the clouds were dense and covered an extensive tract of country. Through the less dense portion of the lighter clouds, the sun's rays gave a peculiar rose-tint extremely beautiful in effect. This was my first cloud view, and it was a treat beyond expectation. About ten A.M., Mr. K. (Howard Kimball, photographer) and myself went out for an observation. We had the pleasure of witnessing the formation of several coronae, sometimes single but oftener three, even on one occasion four distinct circles, appearing and disappearing so rapidly that it was impossible to more than catch a glimpse of form and color. It was a phenomenon of rare beauty. Mr. K. devoted himself to the task of getting up a dinner worthy of the day. His efforts were entirely successful, and as the highest compliment we could pay him, we did full justice to the repast "our Blot" had prepared. The bill of fare embraced roast lamb, onions, canned peaches, corn-starch pudding, and sauces. It was not a bad dinner to sit down to on Mount Washington on Christmas day. Mr. S. (Sgt. Theodore Smith, weather observer and telegrapher) and I did the smoking for the whole party; all for the "Benefit of Commerce." S. (Sgt. Theodore Smith) , K. (Howard Kimball), and N. (Solomon Nelson) made a call at the Tip-Top House, but did not stay long, the wind was too severe. Mr. S. takes our four-footed friends, the sable and mice, under his especial care, and sees that they get all the waste food. They are our companions, though we see

them but seldom.

—Peter Crane, Curator, Gladys Brooks Memorial Library

4:44 PM Mon. Jan. 11, 2021

Now is a time to look back and summarize the year that was 2020. If I were to use adjectives to summarize 2020 they would be—warm, dry, snowy, foggy, and windy.

Our average temperature for 2020 was 29.6°F (-1.3°C) which is 2.3°F above the 1981-2010 30-year normal for us. This would make the annual average temperatures of 2020 the fourth highest in our dataset, which started in 1932. Our warmest temperature recorded was 68°F (20°C) which occurred on June 18 and on July 9. Our coldest temperature recorded was 18°F below (-18°F/-27.8°C) which occurred on January 17.

In terms of precipitation from January to December, the summit of Mount Washington received 81.21 inches which was 15.66 inches below the 1981-2010 30-year normal for our location. From January to December, the summit received 281.6 inches of snow which was 0.4 inches above the 1981-2010 30-year normal for our location.

In terms of winds, our average was 37.0 mph which was 2.0 mph above 1981-2010 30-year normal for our location. Our highest gust recorded was 147 mph which occurred on August 4. This gust set a new August peak gust record surpassing the previous August record of 142 mph set on August 31, 1954. From January to December, we had 171 days which had gusts of 73 mph or greater and of those days, 49 days had gusts that were 100 mph or greater.

As for our weather during 2020, we averaged 34% of the possible sunshine. The summit had 16 days noted as clear or mostly clear. There were 72 partly sunny days, with the remaining 278 days filed under mostly cloudy, or obscured (fog) (2020 was a leap year with 366 days.) We had 320 days with at least some fog recorded during a 24-hour period. We had 136 days with rain and 141 days with snow.

—Ryan Knapp, Weather Observer/Staff Meteorologist

3 PM Mon. March 22, 2021

My name is Jackie Bellefontaine and I've officially risen through the ranks from intern to the newest Weather Observer and Education Specialist! I'm incredibly grateful and excited for the opportunity to continue contributing to the work happening at the Observatory.

Growing up in the Greater Boston area, I spent every summer recreating around the New Hampshire Lakes Region and White Mountains. It was through the time I spent in New Hampshire that I developed a passion for the outdoors and our natural world. I later went on to earn a degree in Earth Sciences from the University of Maine in 2020. During my undergraduate studies, I concentrated in climate sciences which turned into a keen interest of mine. I specifically became interested in the field of glaciology and was a student of the Juneau Icefield Research Program (JIRP), based out

of Juneau, Alaska, in the summer of 2019. My fellow "JIRPers" and I spent the summer engaging in a variety of Earth science research and education relating to glaciology while learning mountaineering skills during our icefield traverse. Afterwards, I searched for opportunities to live and work in extreme environments which drove me to pursue an Observatory internship.

My first shift at the Observatory as a summit intern was incredibly exciting. I was in total awe of the sheer size of the snowcat as it slowly but surely rounded the corner from the garage to pick us up. My shift and I loaded up and boarded the cat then made our way up the Auto Road. It's hard to convey the excitement and awe I felt as we chugged up the road with the beautiful snow-capped summits of the Northern Presidentials outside my window. The first few days of my shift remained relatively clear and mild, allowing me to experience some stunning sunsets.

However, these relatively clear and mild days did not last. By my second shift I was treated to a high wind event with a peak gust of 157 mph on January 24. I'd say this was one of the most exciting days of my life. Over the next few shifts, I truly came to enjoy the work happening at the summit. I looked forward to shadowing the hourly weather observations and became interested in the educational outreach that Education Specialist Nicole Tallman engaged in. I began to think of how much of a dream it would be to continue working for the Observatory, and was surprised when an opportunity presented itself sooner than I expected. I continued through the application process and the next thing I knew, I left the summit as an intern only to be told during my off-week that I'd be returning as a Weather Observer! I hope I am able to encourage others to become passionate about science and the awesome work done up here!

—Jackie Bellefontaine, Weather Observer/Education Specialist

Sawdust from the Blog contains condensed versions of blog posts from the Observatory's website.

Introduction to Ice Cores

BY **JACKIE BELLEFONTAINE**

Recently, the "Home of the World's Worst Weather Live" Virtual Classroom Program began a module on climate change to finish off the school year. As someone with a degree in climate science, I'm very excited to teach about various topics relating to climate change such as paleoclimatology. Paleoclimatology is the study of past climates that occurred during Earth's geologic history. The field of paleoclimatology relies on proxy data gathered from various natural sources such as trees' rings, cave deposits, ocean sediments and ice cores. These climate proxies are the key to unlocking Earth's history and understanding its future. Ice cores, in particular, can store a great range of information about Earth's past climate conditions.

Weather Observer Jackie Bellefontaine holds an ice core collected from the Juneau Icefield, Alaska.

Ice cores are cylinders of ice drilled from ice sheets and glaciers. Glaciers form as layers of snow accumulate on top of each other annually. Over time, the weight of the upper layers compresses the lower layers forming ice. Each snow or ice layer represents a year's accumulation and is different in chemistry and texture. Particulates and dissolved chemicals that were captured as the snow fell become trapped in the ice, as well as air bubbles. Ice cores give scientists an annual record of climate conditions such as temperature, precipitation, atmospheric composition, wind patterns, and volcanic and solar activity. Since ice cores can provide key information about Earth's past climate, there are several international ice core drilling projects occurring annually.

Ice cores are collected from ice sheets and glaciers located across the globe using either mechanical or thermal drills. Some of the largest ice core drilling projects are located on the Greenland ice sheet and Antarctic ice sheet, but cores are also drilled on alpine glaciers located in regions like Alaska, Canada, the Himalayas and Africa. The Greenland ice sheet and Antarctic ice sheet host the majority of ice coring efforts due to the thickness of the ice sheets and temperature of the ice. The glacial ice that comprises ice

Shallow ice core drilling at Dome C, Antarctica. (Source: British Antarctic Survey)

sheets tends to be thicker than smaller alpine glaciers, especially where there is an ice dome (which can reach a thickness around 3,000 m). The deepest ice core—an impressive 3,623 m—was drilled at the Vostok research station located in Eastern Antarctica. The Vostok ice core covers a time period of about 400,000 years before present; one of the oldest continuous ice core records. Another one of the oldest continuous ice core climate records comes from the EPICA Dome C ice core collected from Dome C in Eastern Antarctica. The EPICA Dome C ice core reached a depth of 3,270 m and spans approximately 800,000 years before present. Another reason why the majority of ice cores are collected from ice sheets is due to the cold interior of polar ice sheets, which preserves detailed climate records due to lack of melt. These ice core records are essential to understanding past climate conditions and climatic patterns.

There are a few methods for deriving climate data from ice cores, depending on what parameter the researcher would like to analyze. Here, we will briefly explore the methods for discerning past air temperatures and atmospheric CO_2 concentrations from ice cores. As snow falls over a region, like the Antarctic ice sheet, it's slowly compressed into ice. Stable isotopes of oxygen and hydrogen are trapped in the glacial ice and are collected from ice cores. The stable isotopes within ice samples are then analyzed by a mass spectrometer, which provides data on how the isotopic concentrations change in ice layers through time. This information provides a detailed record of historic changes in temperature extending back thousands of years. As for deriving CO_2 records, when snow transitions into ice, air is trapped as bubbles. The air bubbles are then extracted from a sample by melting or crushing ice in a vacuum then analyzed using machines like a mass spectrometer. This method produces an extensive paleo atmospheric CO_2 concentration record.

Ice cores are important proxies used to reconstruct and understand Earth's climate history. Due to the physical nature of the proxy, ice cores are able to provide high resolution information on past climate dynamics in addition to archived greenhouse gas concentrations from the past. Understanding the past is crucial to improving predictions for how Earth's climate may change in the future.

Skewing Towards Normal

BY **REBECCA SCHOLAND**

Normalcy: The condition of being normal; the state of being usual, typical, or expected.

I am not sure how to classify the current state of summit operations other than to say things are trending towards normal, albeit a new normal. To compare 2019-2020 operations to 2020-2021 operations would be as unfair as judging a fish against a bird on their ability to fly. I'd say we are currently at the flying fish stage. We are "flying"... but not flying... and that's ok. For the first time in a year I am sitting down to write this with a positive and structured attitude towards our future.

To start we have some milestones to celebrate. Observer Ryan Knapp celebrated his 15 year anniversary with us, Jay Broccolo his second, and David DeCou his first. Nicole Tallman and Sam Robinson are approaching their

Sunrise on the summit.

The Pitot20 Anemometer on top of the tower with undercast skies.

one year anniversaries as well. We also welcomed back our first intern this winter, Jackie Bellefontaine, who recently transitioned to weather observer and education specialist. Summer interns have been selected and we are readying the Extreme Mount Washington Museum to open this year.

Each milestone has happened because of carefully adapting our landscape at the onset of COVID-19 and the mindful and careful consideration of each implemented step as we return to normal. The health and safety of our staff is still the number one priority on our Arctic island. Determining what aspects of our programs will resume and in what way, has changed the directionality of how we move forward. Restructuring how we accomplish tasks and interact with our members and supporters on the summit will take time, but it's progress.

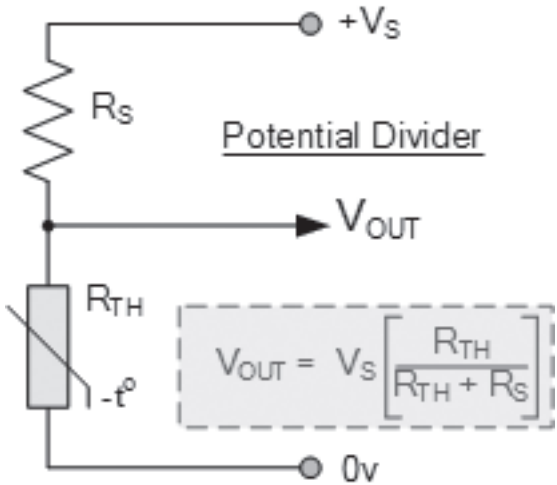
In the last iteration of my report we were dealing with the slow onset of winter and the challenges it was throwing our way. I can say the same about this spring. Wednesday, April 14, shift change was conducted from the base to the summit in the 4x4 van with chains. While this may seem like an exciting update we were expecting several inches of snow just two days later. We were back in the same situation of needing to switch up our transportation needs weekly. Mother Nature is keeping us on our toes. One exciting addition to our fleet of vehicles is a new Chevy truck and V-plow! Through some generous donations and the help of Berlin City Auto we are riding in style.

From a personal perspective, I had the opportunity to spend much of March on the summit helping to cover shifts. It was a great way to connect with the Observers and reflect on the mountain and weather that draws so many of us in. Being able to enjoy sunrises, sunsets, and undercasts was a real pleasure. It also allowed me the opportunity to get to know the staff better on a more personal level while sharing living space and taking turns with chores. It was an opportunity I may not have been afforded if this had been a normal year. For that I am thankful and looking forward to the new normal.

Mesonet Temperature and Humidity Probes Explained

BY **PETER GAGNE**

Readers often hear us refer to sensors and probes with mysterious-sounding names or acronyms like "radiation shield," "T-107" and "CS-215." Let's take a closer look at these probes, which are part of our Mount Washington Regional Mesonet, to get a better understanding of how they operate and why we use them.



Electrical schematic of a thermistor.

The Campbell Scientific (CSI) T-107 is an air/soil/water temperature probe operating accurately within a range of -35° to +50° C (-31° to 122° F). It uses a thermistor to effect temperature measurement. The name "thermistor" is a combination of the words THERM-ally sensitive res-ISTOR. It is a solid-state thermally sensitive device that uses semiconductor-based metal oxides formed into a ceramic disc or bead. The thermistor resistance value varies in proportion to changes in temperature. According to Ohm's law, if we induce a current through it, there is an expected voltage drop across the thermistor. As the resistance changes in accordance with temperature variations, the output voltage changes, and this voltage change is measured by the program in the datalogger.

The thermistor is a very rugged, low-maintenance, low-cost, accurate temperature sensor that uses very little power, which is essential for our solar-powered mesonet stations. They are rotated out each year and tested against a known value sensor, showing minimal drift. Mount Washington Observatory (MWO) has been using thermistors for many years with barely a single failure.

Having only one temperature sensor at a remote site raises a big question: is your single sensor accurately reading the correct temperature? How would you know? The answer is simple: you wouldn't!

So we use a second sensor to corroborate the reading, and in addition, that sensor also measures Relative humidity (Rh). However, we don't use two Rh sensors,

mostly due to cost and power consumption, which are both higher when compared with the T-107.

The CSI CS-215 replaced the discontinued HMP45 in 2016 and it has one huge advantage over the old probe: whereas the HMP-45 had to be sent back to the manufacturer for annual calibrations, at a cost of $300 per (and there are twenty probes total across our Mesonet), the CS-215 has a field-replaceable chip that costs around $100. Replacement of the chip doesn't require that the datalogger be powered off, another big advantage.

Unfortunately, just prior to writing this article, we were informed that the CS-215 is being discontinued and we will, once again, have to select a replacement. Everyone knows how fast and often things change these days, and weather instruments are no different!

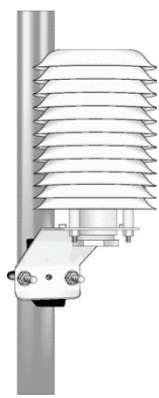
The CS-215 measures temperature slightly differently. It utilizes a silicon band-gap sensor rather than a thermistor, which is a solid-state element that easily integrates into an integrated-circuit chip at very low cost. The circuit measures the difference between the poles of a silicon diode that is sensitive to temperature changes, and the integrated circuitry of the field-replaceable chip provides a fully calibrated digital output. This digital string is captured by the datalogger over the RS-232 serial communications port, a simple and reliable means of measurement.

Rh measurements are made by a capacitive sensor element on the chip. The capacitor consists of hygroscopic (water-sensitive) dielectric material placed between a pair of electrodes. When no moisture is present in the sensor, the sensor geometry determines the value of the capacitance.

At normal room temperature, the dielectric constant of water vapor has a constant of about 80, a value much larger than the constant of the sensor dielectric material. Therefore, moisture absorption by the sensor results in an increase in sensor capacitance. As capacitance changes, the integrated chip performs the calculations using the moisture and temperature data to output a digital string on the serial communications port. This is read by the program in the datalogger and output as a percentage value.

By definition, relative humidity is a function of both the ambient temperature and water vapor pressure, and as these sensors age, the Rh value tends to drift upwards. If left for too long, the accuracy can drift to +5.0% or more. Replacing the chips annually takes care of this.

Lastly, all of these sensors must be housed in a radiation-shield, or what we commonly refer to as a "pineapple."



Radiation shield or "pineapple".

These plastic louvers are specifically designed to allow adequate air flow while shading the probes from the sun. There are naturally aspirated shields as well as aspirated ones, which use an electric fan to induce higher air flow. MWO uses only normally-aspirated shields.

I hope this sheds some light on measuring temperature and relative humidity.

Visibility from Summit Appears to be Increasing Over Time

BY **BRIAN FITZGERALD**

Visibility appears to be generally increasing over time on the summit of Mount Washington since our continuous record of visibility began in 1943.

This noteworthy finding comes in the wake of an initial data exploration and analysis of Mount Washington Observatory's (MWO) long-term visibility records, completed by Weather Observers Jay Broccolo and Sam Robinson in Spring 2021.

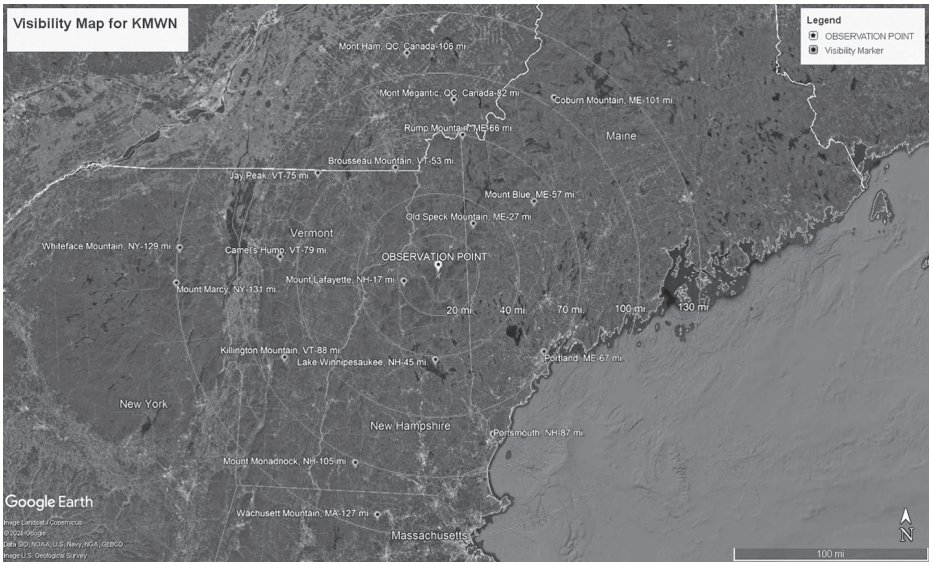
The project report, entitled "A Data Exploration of Visibility at Mount Washington Observatory (1943-2020), KWMN: Key Findings" recently became available on MWO's website to help the public understand the background, motivation, relevance, findings and suggestions for further study.

The exploration grew out of public and staff interest initially related to the COVID-19 pandemic and its effect on the environment. Back in spring 2020, our staff fielded a number of inquiries asking if the weather observers were able to see farther than usual due to the global reductions in industry, transportation and overall aerosol emissions. It was a tricky question to answer, because in order to respond with any confidence, one would have to know what "usual" visibility is, and would certainly require a lot of visibility data over time to compare against.

For those of you wondering how visibility is measured in the first place, understand that MWO's weather observers record something known as "prevailing visibility" at every single hourly observation, both day and night, by determining which known landmarks and distances that they can see on the horizon.

As the highest point in the Northeast with a treeless summit, Mount Washington's position allows for an unobstructed view in all directions (provided you're not in a cloud). The naked-eye view from the summit can reach up to 130 miles to Mt. Marcy in NY, for example, 79 miles to Camel's Hump in VT, or 67 miles to the Atlantic Ocean off the Maine coast.

At night, observers use many of the same natural features plus the lights of known locations to assess the visibility. For context, most weather stations that report visibility are at airports with automated instrumentation to help pilots and traffic controllers assess take-off and landing conditions. Visibility at these stations will only report up to 10 miles as the highest value of interest.



Map of concentric circles around KWMN with visibility markers indicated. The innermost circle is 20 miles, while the outermost circle is 130 miles.

For nearly a year, Broccolo and Robinson dug into paper and digital visibility data, gathering any related information including measurement standards and observer training materials.

Two pieces of critical information were discovered early on: 1) 24-hourly visibility observations began continuously in 1943, with reporting being more intermittent previously, and 2) prevailing visibility records before 2008 exist only on paper, and digitally from 2008 to present.

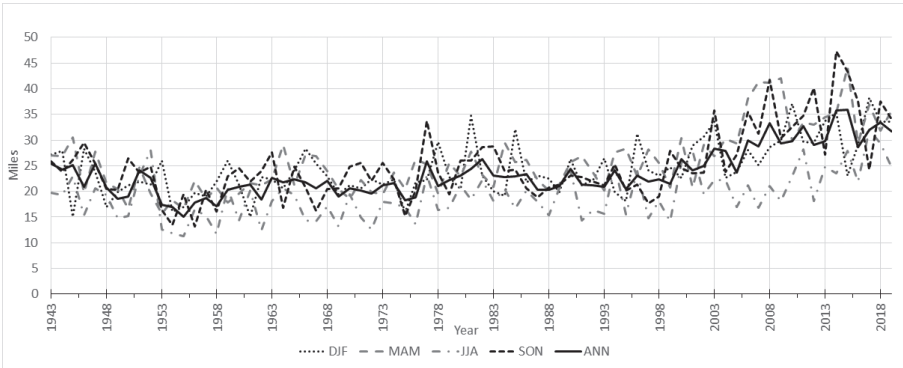
Without taking on the hugely exhaustive process of manually entering data from paper forms into a digital database, Broccolo and Robinson were able to use a nearly identical visibility variable: lowest prevailing visibility. This value had been digitized along with all values on the daily B-16 Form during a recent project by observers and interns.

Lowest prevailing visibility is what it sounds like. It essentially means the lowest prevailing visibility reported in the last two observations. So if two hours ago the visibility was reported at 1/16 of a mile, and this current hour the visibility improved to 50 miles, the lowest prevailing visibility for this hour would be 1/16 of a mile. Through a direct comparison of lowest visibility versus prevailing visibility from 2008 to present, it was found that both of these variables tracked very closely, making lowest visibility an acceptable proxy.

With data in hand, Broccolo and Robinson examined seasonal and annual average lowest prevailing visibility to explore what long-term trends or anomalies may have been present. The initial analysis appears

to show a steady increase in visibility first appearing in the 1950s and then increasing at a higher rate starting in the early 2000s. Public interest in whether average visibility was found to be increasing due to the COVID-19 pandemic in 2020 was not easily discernible.

the data deeper and corroborate the findings with other measurements," Broccolo said. "Further statistical analysis is required to show the quality of data. Measurements of air quality affecting particulates at a similar geographic location and elevations or the development of a measuring system



Seasonal averages of lowest visibility (miles) at KMWN (December, 1942 through November, 2020).

On average, meteorological summer (June, July, August, or "JJA" as noted on the figure 2 above) showed the lowest visibility of all of the seasons. Higher humidity levels and a more active southerly flow of air from major areas of industry may be reasons for this difference, though more analysis is needed to assess any correlation.

In future investigations, a number of different questions may be explored, including what if any difference exists between day and nighttime visibility observations, or how these visibility data compare against other atmospheric measurements such as particular matter concentrations or wind speed and direction.

"The next steps would be to analyze at the summit of Mt. Washington would also be of interest in order to compare visibility and air quality."

Regardless of which investigations come next, the value of MWO's visibility dataset is immense. No other record of similar location, length, resolution or quality truly exists, which makes it a tremendous asset for studying the relationships between visibility and air quality over time in Northern New England.

Whether examined internally or through partnership, the possibilities for future work are clear to see, so to speak. To read the full project summary report, visit mountwashington.org/research.

Looking Forward to Seeing You Again

BY **LINDA AND HANK DRESCH**

Working at the Observatory administration offices Valley Volunteer Coordinators Linda and Hank Dresch organize magazine and newspaper archives that reference the Observatory.

With social distancing continuing into the spring, our Valley Volunteers needed to wait a bit longer to resume their support of Observatory activities. We sincerely appreciate the emails from so many, telling us you're fully vaccinated against COVID-19 and eager to volunteer. On an encouraging note, the safety measures implemented by the Observatory staff have kept the summit crew healthy. This is no small accomplishment considering their work routine. It is a true testament of their dedication to the Observatory's mission.

Despite the need to reduce volunteer work during the pandemic, we have managed to handle the monthly membership mailing by ourselves over the past months, although we were assisted most recently by Nancy and Peter Fisk, who came to North Conway from the coast of Maine. Our volunteer activities have also been limited by the staff's work on cleaning out administrative office space in preparation for renovations this summer. During construction, the staff will have access to some nearby temporary office space, and we expect there will be room to resume some of our support activities.

Plans are already underway for this year's Seek the Peak event on July 16 and 17. Director of Marking and Communications Krissy Fraser will be looking for support from our Valley Volunteers. The event is evolving into a multi-sport approach with many activities, inspiring a variety of outdoor adventures. Learn more at seekthepeak.org. We will keep our list of volunteers informed of event support needs. Unlike previous years, we doubt there will be a need to stuff backpacks.

The Mount Washington Valley has grown lush again after a most unusual winter that saw lower-than-normal

A crew of volunteers Bill Ofsiany (l-r), Barbara Althen, Peter Crane and Linda Dresch take a lunch break on a windy spring day while tending to the gardens at our offices in North Conway.

precipitation. Gardens around the office are flourishing, thanks to many plants provided by volunteer Bill Ofsiany and his collaboration with Barbara Althen in the gardens.

We continue to sorely miss all of our volunteers. We look forward seeing everyone hopefully soon!

Valley Volunteer Coordinators Linda and Hank Dresch can be reached at hankandlinda@mountwashington.org or by phone: 603-356-2137 ext. 208.

UPCOMING EVENTS

21ST SEEK THE PEAK JULY 16-17

Seek the Peak has undergone a mile-high makeover. The Observatory's largest annual fundraiser is expanding from a hike-a-thon to multi-sport adventures that includes the Mount Washington Adventure Expo at Great Glen Trails complete with vendor village, live music, food trucks, expert gear advice and more. So, choose your own adventure and get to it! Visit seekthepeak.org to register and earn gear in monthly giveaways.

SCIENCE IN THE MOUNTAINS

Science in the Mountains, supported by MathWorks, is the Observatory's free virtual year-round lecture series. Learn about the climate, weather and other amazing topics from home. Observatory staff, along with experts, allow you to expand your scientific knowledge through lectures that encourage questions from participants. All programs start at 7 p.m. and use both Zoom and a live stream from the Observatory's Facebook page. Can't make one? That's okay because they are recorded and available the next day on the Observatory's YouTube channel. Registration is recommended. Find out the schedule on the Observatory's web site mountwashington.org/sitm.

SUMMIT TRIPS

Due to the COVID-19 pandemic, trips to the summit— both day and overnight EduTrips—are not being offered. Neither are partner-led climbing trips. Please check the Observatory's web site mountwashington.org for updates.

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GREEN FLASH

Otherworldly Walk

Though it might look like Observer Jackie Bellefontaine is carrying a yoga mat on the summit for a little solo sunrise yoga, she isn't. That's the precipitation can used during the hourly weather observations on a late February morning with temperatures of -5°F and winds gusting between 20 and 35 mph. The photo was taken the day after summit staff watched NASA's Perseverance rover land on Mars and Bellefontaine recalls telling a colleague how the summit looked like Mars that morning. "The sunrise gave the fog and snow a reddish tint and I joked that the snowcat tracks were rover tracks," she said. "Now we're not in as extreme of an environment as Mars, but Mount Washington does feel otherworldly some days!"

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