



NVARC

Signal



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May 2024

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May's Guest Speaker

May's guest speaker will be Steve Davidson NA1T. Steve is heavily involved with emergency management and the Red Cross in the New Hampshire amateur radio community. Steve will be describing and demonstrating some of the equipment he uses in emergency deployments, as well as what he and his ARC cronies were up to during the recent Solar Eclipse.

Next Meeting: May 16, 2024

The next NVARC meeting will be held Thursday May 16 2024 at the Pepperell Community Center.

Fran Purcell

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Hours: M-F 9-6, Sat. 9-5

Monthly Meetings

NVARC General Meetings are scheduled for the third Thursday of the month at 7:30pm local time at the Pepperell Community center.
Meetings are not held in July or August.

Weekly 2-meter Net

The NVARC Information Net is held Monday nights at 7:30pm local time on the 2m N1MNX repeater, 147.345 MHz, +100PL.

Jim, N8VIM has been improving the repeater incrementally over the past several months.

**President's Corner
Bruce K1BG**

I'm excited about serving once again as NVARC's president. The first thing I'd like to do is thank our outgoing officers and board members who served us over the last year. As you know, we had no president, but Phil Erickson, W1PJE, served as our vice president, John Bielefeld, K1JEB, as our secretary, Ralph Swick, KD1SM as our treasurer, and Jim Hein, N8VIM, and Bob McArthur, K1QT, served as board members. Please thank them for volunteering.

At the same time, thank the incoming officers and board members. After a year off, I'm once again serving as president. Les Peters, N1SV, has volunteered as Vice President, with John Bielefeld, K1JEB, returning as secretary, Ralph Swick, KD1SM as our returning as treasurer. The board will be rounded out with Jim Hein, N8VIM, John Griswold, KK1X, and Fred Darling, KB1RGT, serving as board members.

As we discussed at the April meeting, one of the first things we will do is try to amp up amateur radio activity with members of the club and local amateurs. Besides our weekly breakfasts at Tiny's Restaurant in Ayer, we're going to try a few activities that we either haven't done before or done in a while. This past weekend, we had the club's first "Parks on the Air" day where we went over to Oxbow National Wildlife Reserve in Ayer and operated. A club introduction to Hidden Transmitting Hunting is coming up, and we are planning our annual participation in ARRL Field Day in June. Watch the Signal and the club email reflector for more information. Along these lines, Les, N1SV, is working on a survey that he will send out to members. The survey will let us know what interests club members and will help us focus on those

activities.

ARRL Field Day is coming up in June. NVARC traditionally sets up in the Pepperell town orchard off Heald Street in Pepperell, close to the N1MNX repeater. Field Day is always held the fourth full weekend in June, which is June 22nd and 23rd this year. We need a Field Day chairperson who will coordinate activities. We have done Field Day enough times that setting up the basic stations, networking, antennas, and power are straightforward.

The chairperson will coordinate activities, focus on capturing bonus points, publicity, and perhaps coordinating food (depending on interest). It's an important position, but we will have a Field Day with or without a chairperson. Our Field Days, however, are far more successful with a chair. Please consider volunteering. Whether you're a new club member or an "old timer", it's a great way to develop close relationships with other club members.

Club member Tim Chase, KB1ZVR, is active with the Boy Scouts of America. He is in the process of setting up a boy scout radio merit badge session, and NVARC can help. There will be two sessions, with the second one (the actual getting on the air session) taking place during Field Day. More information will be forthcoming, probably at the May meeting and the June Signal.

Speaking of the May meeting, club member Steve Davidson, NA1T, will talk about his experiences volunteering with the American Red Cross during the recent total eclipse in northern New England. I'm sure this will be a very interesting presentation, but unfortunately, I will be in Dayton for the annual Dayton Hamvention. I'll report my experiences at Dayton in the June Signal.

Bruce, K1BG

**Thoughts on MFJ
Bruce K1BG**

As many of you know, Martin Jue, K5FLU, has announced that he will be closing amateur radio equipment manufacturer MFJ and its subsidiaries. I posted his announcement on the club reflector, but if you missed it, here it is:

April 25, 2024

Dear Fellow hams and Friends,

It is with a sad heart as I write this letter.

As many of you have heard by now, MFJ is ceasing its on-site production in Starkville, Mississippi on May 17, 2024. This is also the same for our sister companies: Ameritron, Hygain, Cushcraft, Mirage and Vectronics.

Times have changed since I started this business 52 years ago. Our product line grew and grew and prospered. Covid changed everything in businesses including ours. It was the hardest hit that we have ever had and we never fully recovered.

I turned 80 this year. I had never really considered retirement but life is so short and my time with my family is so precious.

I want to thank all of our employees who have helped build this company with me over the years. We have many employees who have made MFJ their career for 10, 20, 30, 40 and more years.

We are going to continue to sell MFJ products past May 17, 2024. We have a lot of stock on hand. We will continue to offer repair service work for out-of-warranty and in-warranty units for the foreseeable future.

Finally, a special thanks to all of our customers and our dealers who have made MFJ a worldwide name and a profitable business for

so many years. You all are so much appreciated.

Sincerely Yours, 73s

Martin F. Jue, K5flu

I would not be surprised to hear that virtually every active ham owns at least one MFJ product, and it seems like everyone has an opinion about MFJ. Some say that MFJ stands for "Mighty Fine Junk", or worse. Having owned many MFJ products, I can tell you that there were times when their quality control was lacking. Perhaps I should have been angry or disappointed, but I wasn't. Far from it.

MFJ, from its beginning, offered amateurs useful products at affordable prices. As companies went belly up - Ameritron, Hygain, Cushcraft, Mirage and Vectronics - MFJ acquired those companies, moved them to their factories in Starkville, MS, and continued to provide manufacturing and support. I could get spare parts for my Cushcraft antennas and Hygain rotors. I recently blew a meter in one of my 30+ year old Ameritron amplifiers. No problem. And small items, like replacement knobs, were readily available at very reasonable prices. Nobody else did this, and without MFJ, it appears that nobody else will.

I hope that someone comes to MFJ's rescue. Perhaps the employees can buy them out. But if not, I for one will miss them. I truly admire Martin Jue and MFJ for their contributions to amateur radio. They will be missed...

Bruce, K1BG

**47th Eastern VHF/ UHF / Microwave
Conference
Les Peters N1SV**

The 47th Annual Eastern VHF / UHF / Microwave Conference was held April 18th thru the 21st at the Hilton Inn conference center in Windsor, CT. The event was sponsored by the Northeast Weak Signal (NEWS) and brought together from the Northeastern US and Canadian Amateurs.

Friday Activities

In the afternoon there was a hands-on workshop on the NanoVNA & TinsySA analyzers put on by WA1JXR. It included an in-depth technical explanation of how the NanoVNA works followed by several demonstrations on making return loss / SWR, gain / loss and TDR measurements. I was particularly interested in the TDR demonstration. The TinySA demonstration included monitoring the hotel WIFI & local DATV signals.

Friday night an indoor swap meet and social gathering was held. This was an opportunity to reconnect with old friends and put a face with a callsign for some that I had not met in person before.

Saturday Activities

A series of talks were presented throughout the day on a variety of technical topics. The full list can be viewed here; <https://www.newsvhf.com/conference/agenda.html>. The following are some that I found interesting;

New England Roving Sites & Pictures (W1AIM) - This was an informative slide presentation on hilltop operating sites around New England for portable operations (roving). I enjoyed the discussion on Mt Mansfield in VT and Mt Washington in NH (two places I haven't

operated from yet).

3D Optical Transceiver Box (VE2UG) – This was an interesting presentation on how to design a 3D printable box to house an optical transceiver. While the box design was interesting, I was more interested in the design of the actual communications equipment.

https://www.newsvhf.com/conf2024/PresPapers/VE3UG-3D_Printed_Optical_Transceiver_Box.pdf.

IMD Transmitting Components (WA1MBA) – This was a good talk on how many things we don't think of can act as unintentional RF mixers and create intermodulation distortion (IMD) products. It was eye opening for me all the components that because of either their dissimilar metals or use ferrite cores can contribute to IMD. He also provided a detailed case study on his 222 MHz station and how he tried to improve his IMD performance.

Icom IC-905 Overview & Evaluation (W8ZN) – The IC-905 is a relatively new transceiver from ICOM that covers the following bands; 2m, 432, 1296, 2304, 5760, & 10 GHz. Terry has one of these and provided an overview of its features followed by what he believes are its pros and cons from his perspective. My take away from this was that its an expensive box at \$4500 but could provide an option for those unwilling or unable to build a traditional multi-band UHF+ station.

Comparison of Wattmeter Accuracies at 1296 MHz (K6JEY) – this was presented via ZOOM as K6JEY was in CA. Doug compared some of the popular Bird and HP watt meters using highly accurate calorimetric measurements from a Bird 6091.

https://www.newsvhf.com/conf2024/PresPapers/K6JEY-Comparison_of_Wattmeter_Accuracies_at_1296MHz.pdf

Data Logging with Modern Multimeters (K6JEY) – This was another talk presented via ZOOM. This is one that I wasn't sure I wanted to sit through but was glad I did. There is some relatively inexpensive feature rich DMMs made by Uni-trend (<https://meters.uni-trend.com/>). Some of these meters include the UNI-T-181A that includes a graphical waveform display & Bluetooth data logging to your mobile phone for \$280.

Very Low Noise Unconditionally Stable LNA (W1GHZ) – Paul is a prolific designer of high-performance low-cost hardware. He showed off a simple LNA he designed for 432 MHz to 3 GHz using a MMIC. He presented a lot of test data for this small ultra cheap design. https://www.newsvhf.com/conf2024/PresPapers/W1GHZ-Very_Low_Noise_Unconditionally_Stable_MMIC_Amplifiers.pdf
<http://w1ghz.org/>

Surface Mount Assembly with Toaster Oven (N1JEZ) – Apparently for years Mike has been using an old toaster oven with an inexpensive Arduino controller as a DIY reflow oven for doing SMT assembly. I typically shy away from SMD projects, but Mike showed how with a little ingenuity you could turn out some high-quality boards. Here is a link to his paper on the subject: https://www.newsvhf.com/conf2024/PresPapers/N1JEZ-Surface_Mount_Assembly_with_Toaster_Oven.pdf

SDR Working the Entire Band (N2EME) – This was an interesting talk on how you could use a device called an SDRswitch to add multiple SDRs to receive / decode simultaneously FT8, FT4, Q65, SSB, CW, and more on a single band. Not sure if I actually have good reason to do this but it was interesting to see how he did it.

[https://www.newsvhf.com/conf2024/PresPapers](https://www.newsvhf.com/conf2024/PresPapers/N2EME-SDR-Working_the_Entire_Band.pdf)

[s/N2EME-SDR-Working_the_Entire_Band.pdf](https://www.newsvhf.com/conf2024/PresPapers/N2EME-SDR-Working_the_Entire_Band.pdf)

Saturday evening there was the annual banquet and the guest speaker was ARRL CEO Davin Minster NA2AA who spoke on many subjects of interest. The Tom Kirby award was given to W1FKF. The highlight of the evening was the door prize drawing give away with many different items given out.

Sunday Activities

Sunday morning was the VHF flea market held at the Vintage Radio & Communication Museum in Windsor (<https://www.vrcmct.org/>). There were a small group of sellers with VHF+ gear and surplus RF test equipment. While I did not venture into the museum, I had last year and it was packed full of great stuff. From old amateur radio transceivers to large racks of broadcast equipment it was very interesting.

Working POTA

John KK1X

I managed to complete my POTA goals again for this month, totalling some 519 contacts as I write this on the 29th. I might go higher. Space weather was challenging, it seems. Contacts didn't flow as easily.

I stayed pretty close to home this month - Oxbow was where most of my contacts were made, including some 74 during the Solar Eclipse. I also found a nice out-of-the-way spot in Pepperell along the Nashua River at the Marion Stoddart Conservation Area. The Nashua River Rail Trail has an accessible spot where it crosses Sand Hill Road in Groton. A couple of trips were made to Leominster State Forest for antenna characterization, and a productive couple of hours was spent at Great Brook Farm State Park in Carlisle. I was there on a Friday during break, and managed to introduce amateur radio to a number

of interested kids. That 30' orange telescoping mast is not at all subtle...

I got rather a late start in the month, first getting out on April 7. Weather for the month was, well, let's just call it inconvenient. On the 20th, well behind the rate I need for 500 monthly contacts, I sort of cheated and resorted to working a "two-fer", a place where two POTA entities overlap. It has to be an overlap - if entities abut, you have to be in one or the other. But a two-fer! POTA gold. At the bottom of Still Water Depot Road in Harvard is such a place. It's in the Oxbow National Wildlife Refuge, and the Nashua River flows through. The Nashua, Squannacook, and Nissitissit Rivers all form a "National Wild and Scenic River", which also counts as a POTA entity. I park at the closed bridge, so I'm within 100 feet of the river, which qualifies. This doubled my contacts for the day, giving me over 100 contacts in a couple of hours. I did that again to gain another 120 contacts, which allowed me to close out the month with my goal satisfied. In the end, I went out on the last day of the month to test another antenna, and added some 88 more contacts to the list, yielding over 600 contacts for the month of April.

I used a mix of antennas. I was testing out a new one for me - the W3EDP-mini, a ~20' highly modified Zepp (see W3EDP antenna article). I also used a Coastal-20, a K4OGO design I'll be reviewing in a future article. Then, too, I used my stand-by antennas, both manufactured by N9SAB. One is a 20/40 linked end-fed-half-wave. If I can't find a 70' tree, I disconnect the link and live without 40 and 15. The other is a off-center-fed-dipole that covers pretty much all the bands with the tuner in the KX3. The last antenna for the month was a ground-mounted MFJ-1979, testing out the new mounting method.

As the parks begin to open up for the season I'll be going farther afield to find interesting parks.

72,
John KK1X

Treasurer's Report Ralph KD1SM

Income for April was \$230 in membership fees and two \$5 donations.

Expenses were \$7.05 for PayPal fees, leaving a net income of \$232.95 for the period.

Current balances:

General fund \$3,383.65
Community fund \$6,878.25

Welcome to new member Rob Durst K1RTD of Dunstable.

As of 2 May we have 44 members who are current with their dues and 43 renewals outstanding. Renewal months are in the member list on www.n1nc.org in the Member's area; check yours on <https://www.n1nc.org/Members/Roster> or you may also email me. Special thank you to those of you who mail your renewals or use PayPal without a reminder.

To pay membership dues via PayPal see the instructions in the same Members area.

If you are joining ARRL or renewing your membership please note ARRL's instructions to enter your NVARC membership information. As an Special Service Club, the ARRL expects a majority of Club members to also be ARRL members and will send a portion of your new or renewal ARRL membership fee back to the Club. Contact Ralph for further information if you need it.

Ralph KD1SM

Testing the W3EDP Antenna John KK1X

I was (who, me?) watching YouTube videos when I encountered a French ham who has a channel called Radio Preppers or something. I typically try to avoid anything with "prepper" in the title, but I'd seen content from him before, so I bit my tongue and pressed Play. He was touting an antenna designed originally by W3EDP back in the 30's. There was a QST article about it in 1939.

The antenna is essentially a modified Zepp - "that antenna" that was actually used on Zeppelin airships. The original antenna, being driven by a tube radio, had an impedance bridge that I won't make an effort to understand. Instead a 4:1 unun is used with a ladder line matching section.

The construction of this antenna is simplicity itself. One might mistake it for a JPole at first glance. A matching section (4.25 foot section of 450 ohm ladder line) is cut two inches long, allowing one inch to connect to the unun, and another inch on the "hot" side to attach the radiator, which is a 16.75 foot length of antenna wire. I used 16 gauge teflon flexible antenna wire. I cut that a bit long to accommodate a loop at the end, and the soldered connection was covered in a couple layers of glue-lined heat shrink.

Trekking out to Leominster State Forest in Princeton, I attached this to a LDG 4:1 unun, added a feed line and choked it on the radio end. That antenna was hoisted about 30 feet into the air with the unun about 10 feet off the deck. In only 45 minutes, I made three contacts on 20m FT8. Truly disappointing, but looking at PSKReporter showed that the antenna appeared to be working well. I was actually getting out to Europe and had pretty wide coverage across the US.

Frustration forced me to be unscientific, as I

was trying to log contacts for my POTA goals. I switched to an off-center-fed dipole at about the same height. Over the next hour and a half or so I pulled in another 34 contacts. The PSKReporter coverage looked surprisingly similar. I theorize that I was just looking for contacts at the wrong time of day, and had I simply waited with the W3EDP antenna, most of those contacts would have been made anyway.

As an exercise in fairness, I gave this antenna another outing. I waited until later in the day to test my "theory" that I was simply testing too early, again from Leominster State Forest. I once again got disappointing results - about 38 minutes to make five contacts. I switched to the OCFD again, but only made another half dozen contacts. It was a poor day for it overall, and I don't think I can fault the antenna completely. I made contacts on 10(2) and 20(1).

I brought the antenna out for test again, this time to the Broadmeadow parking area along the Nashua Rail Trail in Groton. Again, hoisted to about 30 feet on a telescoping fiberglass mast, at about 1700Z, or 1300 local time. I made 14 contacts in about an hour and a half, which is pretty poor performance. I was not set up to do A/B tests, which I suppose is my next logical step. I made 13 contacts on 20.

I took snapshots of PSKReporter as I was testing. Conditions appeared to be OK, and clearly, I "got out", but I don't think it was a great showing. I didn't bother to change antennas as I'd already met my POTA quota for the month. That it tuned on 17 and 12 meters was an advantage, I thought, though I made no contacts on those bands. It actually worked OK on 20, given conditions. I made contacts on 10(1), 20(10), and 30(3).

Rather than simply giving up on this antenna, I found another video. This, being the smallest of a family of antennas, is likely the worst

performing. I'm probably going to build a larger version at approximately double the dimensions. I've found discrepancies in the length of the matching section as well that I have to suss out.

Testing the MFJ-1979 Antenna John KK1X

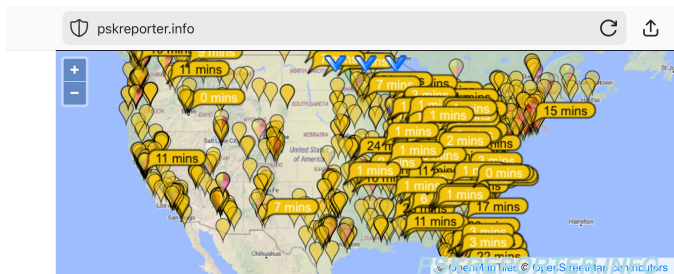
Among my arsenal of portable antenna is the venerable MFJ-1979, a telescoping whip with a 3/8-24 threaded end. I've used this with mixed success on a rooftop mag mount for my car. I seemed to get a lot of RF feedback in that configuration, the fix for which was to

I attached a few pigtails to the ground side of the bracket, with 1/4" spade connectors. When the mount is driven into the ground, radial

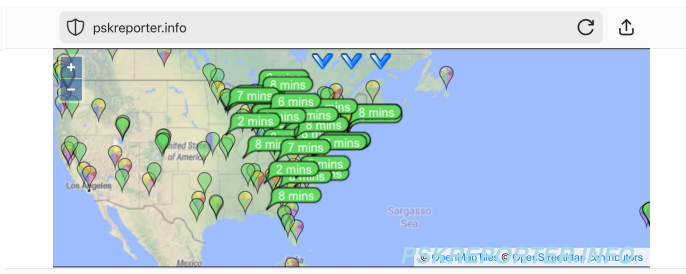
wires are attached to the spade connectors.



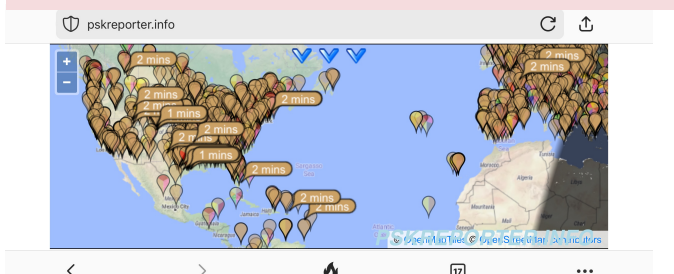
I went out to a spot in the Oxbow NWR, next to the old Moore Field in Ayer. The Nashua River runs alongside, so it's a two-park situation,



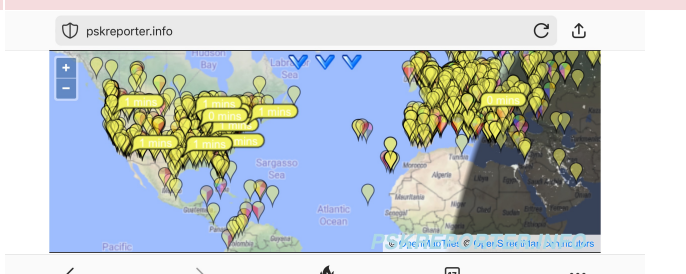
20 meters



30 meters



15 meters



17 meters

simply switch antennas. I do this for fun, not frustration.

I wanted to attempt another antenna mounting method, so I invested something like a dollar at Lowe's home center and picked up a landscaping spike, about a foot long. It's just a big nail. To that nail I attached a 3/8-24 "CB Trucker's Mount" I found on Amazon (though I think they can be had at Walmart).

not that this in any way affects antenna performance. I found a spot where I could wiggle the spike into the ground and attached a feed line and six radials about 16 feet long. I will likely test more radials in the future, knowing that the proper radial count of infinity is relatively difficult to achieve. I'm sure sloth will prevent me from ever exceeding 16 radials...

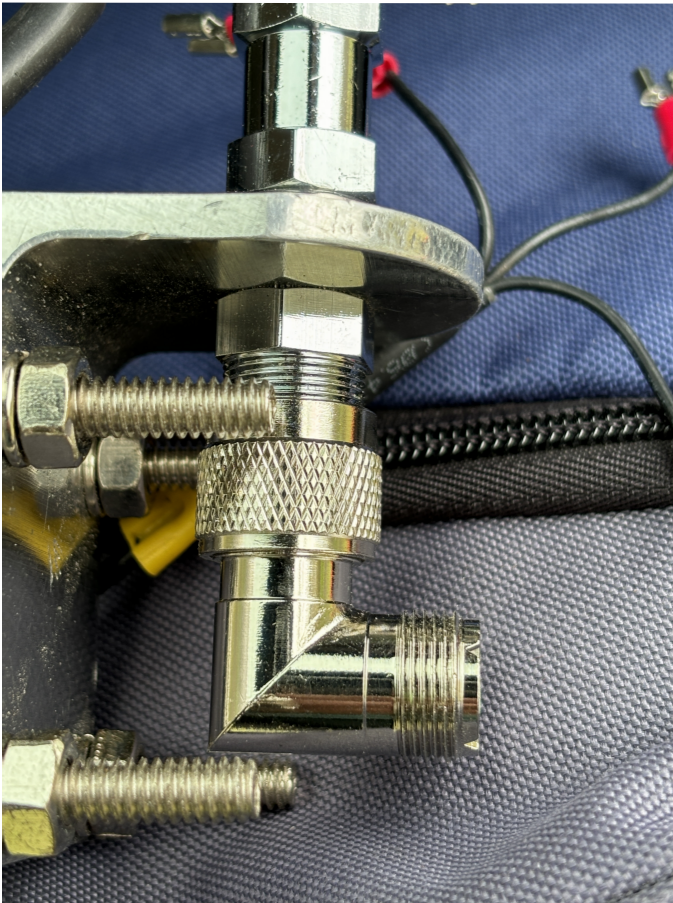
I extended the whip to 199" which is right at a



quarter wave at 14.08 MHz, the FT-4 frequency for 20 meters. I screwed the antenna into the base and added a 1:1 choke on the radio end of the feed line.

You might be able to see the yellow radial

wires in the adjacent picture. I added a right-angle UHF connector at the base to save strain on the coax.



After finding a smidge of unoccupied bandwidth, I started calling CQ POTA at 1700Z, (1300 local) and immediately got a call back. Over the next 20 minutes I made 10 contacts. I consider 20 contacts per hour to be about par,

so a run rate of 30/hour is pretty excellent. I'm only running 5 watts of power. I admit that I'm not using a terribly scientific metric here, but it works for me. PSKReporter shows excellent east-west propagation, reaching across the continent and across the Atlantic for decent European coverage.

While I managed to log 20 contacts in only 50 minutes, the law of averages caught up with me again, and after two hours in the park, I managed exactly 45 contacts. Curiously, even though coverage into Europe appeared pretty good, every one of those contacts was domestic. The first ten were from 4-land! So, with 45 contacts spread out over two hours, performance of this antenna system runs about par. "System" wise, I'd like to experiment with more radials and perhaps some "faraday cloth", which I've heard of in videos, but not yet used. Another experiment would be to position the 1:1 choke at the antenna. More news about this antenna will appear in future issues of *The Signal*.

73 de KK1X

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Election Results

April was election month. Bruce and his crew managed to pull together a full slate of candidates. I'm certain no arms were twisted... The slate was presented, and with no nominations from the floor, votes were cast and the following slate was elected.

For the 2024 year, your officers are

Bruce Blain K1BG - President
Les Peters N1SV - Vice President
John Bielefeld K1JEB - Secretary
Ralph Swich KD1SM - Treasurer

Fred Darling KB1RGT - Director until 2025
John Griswold KK1X - Director until 2026
Jim Hein N8VIM - Director until 2027

2024 Groton Road Race May 5, 2024

The Nashoba Valley Amateur Radio Club once again fielded a contingent of practiced radio amateurs in support of the 2024 Groton (Mass) Road Race, an annual event since 1992 which has raised tens of thousands of dollars for local and national charities. Great thanks go out to Joseph N1QDX, Jim AB1WQ, Tim W0TJP, Mary N1RKO, George KB1HFT, Nick KC1DK, Patrick W1YTT, Libby KC1RKH, Carsten KB1KTP, Rick AB1PM, Jim N8VIM, Ray AA1SE, Bruce K1BG, Nathan N1ATE, John KK1X, and Ralph KD1SM for arranging the whole thing.

Club POTA Activation

On May 4th, after breakfast, a few club members dashed (ambled?) over the the Bill Ashe Visitor Center of the Oxbow National Willdlife Refuge on Devens. George KB1HFT and Bruce K1BG brought along radios for the activation. Fred KB1RGT came along as an observer, and John KK1X was on board as an unneeded advisor. George set up to run FT8, and Bruce ran a combination of CW and phone operations. Approximately 60 contacts were made overall.

Visitors included Bill N1SV, Dan K1RAU, and Steve NA1T.



George and Bruce operating FT8 and CW, respectively. Fred looked ready for a nap!



**Board Meeting Notes
John K1JEB**

Start: 7:30pm 05/02/2024

Attendees:

K1BG Bruce President
N1SV Les Vice President
KD1SM Ralph Treasurer

N8VIM Jim Director
KB1RGT Fred Director
KK1X John Director

Signal John KK1X For now has enough content. Publishing is the Tuesday after the board meeting. So try to get your articles to the publisher before then so John KK1X can have time to set your article up. Send you articles in a text file and your pictures as a JPG file. MS Word is fine but a bit of overkill.

Fred KB1RGT asked about getting the club to be on X, and FaceBook.

Ralph KD1SM is updating the NVARC WEB page. Bruce K1BG suggested adding a Ham QSL Program link to the web page to include club contact information.

Bruce K1BG will compare Facebook Page vs Group to see which would be more beneficial to the club.

At the April meeting Steve NA1T will be talking about his Red Cross activities Solar Eclipse in NH.

The Bromfield HS Science Fair visit to the Haystack Observatory is being planned.

2024 Field Day still does not have a Field Day Chairman. Still in need of a volunteer.

Eliot W1MJ joined the club as he likes the way NVARC conducts its Field Day and will do the

GOTA Station.

Dayton Hamvention starts on the 17th of March.

Ham Exposition is the weekend before Labor Day.

Ralph KD1SM still has some speaker mugs to hand out. Will need to start handing them out again at the meetings.

Move the responsibility of managing the cups to the John K1JEB the Club Secretary.

Also have the Secretary figure out how to get some mugs to past speakers that have not revived any of the mugs.

To keep everyone with a club Badge the Secretary John K1JEB needs to be updated of any new members.

Use Google Forms online to possibly to be used to conduct a survey to get information from the club members as to what want out of the club.

ARRL New England Cabinet Meeting is May 6th at 7pm. Les N1SV said he wishes to attend.

There needs to be more chatter on the REFLECTOR.(An email forum that Ralph KD1SM maintains as the NVARC@N1NC.org).

Meeting ends: 8:02pm

JohnB K1JEB

Nashoba Valley Amateur Radio Club
PO Box 900
Pepperell MA 01463-0900
<https://n1nc.org>

President: Bruce Blain K1BG
Vice President: Les Peters N1SV
Secretary: John Bielefeld K1JEB
Treasurer: Ralph Swick KD1SM

Board Members:
Fred Darling KB1RGT (2024-2025)
John Griswold KK1X (2024-2026)
Jim Hein N8VIM (2024-2027)

N1NC Trustee Bruce Blain K1BG

Join NVARC! Annual dues are
\$15 individual, \$20 family

Contact us on the N1MNX repeater:
442.900(+), PL100
147.345(+) PL100
53.890(-) PL100

This newsletter is published monthly. Submissions, corrections, and inquiries should be sent to editor (at) n1nc (decimal) org to reach the newsletter editor.

Editor: John Griswold KK1X
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