Another fine mesh

Attendance at the May 2024 **PCARA Membership Meeting** on Saturday 19, 2024 at 10:15 am was very good considering that we had members who were away in Xenia, OH attending the Dayton Hamvention.

We learned of the results from the Saturday May 4 **PCARA Foxhunt** in FDR Park In Yorktown Heights, NY. The Fox was hidden by Vincent KD2VAV and skillfully located by Malcolm NM9J. Malcolm's reward for his proficiency is that he gets to play the Fox in the next hunt. Congratulations Malcolm! After the Foxhunt participating PCARA members took part in the "I Love My Park Day" Clean-Up. PCARA received an email from FDR Park expressing appreciation for our efforts and for taking part. Our members also received complimentary T-shirts for their efforts. Thank you to all who joined in! There is a full report in this month's *Update*.

Results from the sales of items from the estate of Henry KB2VJP (SK) at the May 5, 2024 Orange County Amateur Radio Club (OCARC) **Hamfest** at the Black Rock Fish and Game Club in Mountainville, NY were announced. The treasury saw a significant gain from the day's receipts. We would like to thank Joe W2BCC from OCARC for his hospitality and being a most gracious host. Looking forward to next year!

PCARA's two club tables at the Orange County ARC Hamfest on May 5. Greg KB2CQE, David KD2EVI and Mike N2EAB were busy moving merchandise.

PCARA Secretary Lou KD2ITZ mentioned that members should keep an eye out for an upcoming article in the local publication *River Journal North* for a piece about PCARA and Amateur Radio. Lou and David KD2EVI had an extensive interview with their reporter a few weeks back.

Hunters equipped with "I Love My Park Day" T-shirts prepare their Foxhunt antennas at FDR State Park on Saturday May 4th.

A surprise presentation was made by Charles N2SO on behalf of the **Quarter Century Wireless Association (QCWA)** regarding a substantial donation to PCARA. QCWA was very impressed by our newsletter and activities. On behalf of the membership of PCARA I would like to express our sincere appreciation for the donation, and that it will be put to good use increasing Amateur Radio's visibility in the community and to invest in digital aspects of Amateur Radio.

An impromptu mini presentation on **Meshtastic**® was given by Lou KD2ITZ. Meshtastic is an open-source point-to-point mesh radio network protocol, that utilizes LoRa devices. It can provide an off-grid communication platform in areas without reliable communications infrastructure. This is a format that provides for text communications during emergencies, natural disasters, or events which remove

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traditional infrastructure from service. For more information on Meshtastic please visit: https://meshtastic.org/docs/introduction/. An article on Meshtastic courtesy of Mike N2HTT, can be found is this month's edition of the *PCARA Update*. Mike Meshtastic! Check it out.

The **PCARA ARRL VE Test Session** that followed the meeting was attended by one candidate who upgraded from General to Extra. Thanks to Mike W2IG and all our VEs for their efforts. It's certainly paying dividends!

Please mark your calendars with the following upcoming events:

- Saturday June 8 at 9:00 am: **PCARA Breakfast** at Uncle Giuseppe's Marketplace in Yorktown Heights, NY.
- Wednesday June 19 at 7:00 pm: **Monthly meeting** and ARRL **Field Day** planning at the George Washington Elementary School in Mohegan Lake, NY. Bring a chair.
- Saturday-Sunday June 22-23: **2024 ARRL Field Day** at the George Washington Elementary School in Mohegan Lake, NY. Set-up begins around 9:00 am on Saturday. Please come out and join us!
- Sunday June 23, 2024 at 10:00 am: **PCARA VE Test Session** at the George Washington Elementary School in Mohegan Lake, NY.

Our next scheduled PCARA Meeting is on Wednesday Jun 19, 7:00 p.m. at George Washington Elementary School. I look forward to seeing each of you there!

- 73 de Greg, KB2CQE

PCARA Board

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Net night

Peekskill/Cortlandt Amateur Radio Association holds a roundtable net on Tuesday evenings at 8:00 p.m. and a directed 'Old Goats' net on Thursday evenings at 8:00 p.m. Both events take place on the 146.67 MHz W2NYW repeater, offset -0.600, PL 156.7 Hz.

Join the roundtable to find out what members have been doing or join the Old Goats with net control Karl N2KZ for news and neighborly information.

May VE Test Session

PCARA's latest Volunteer Examiner Test Session took place on Saturday May 18, following the monthly meeting at Putnam Valley Library. There was one candidate, Jeffrey KB1HVC of Wilton CT, who upgraded from General to Extra Class — congratulations. Jeffrey also became a member of PCARA, so welcome!

The Volunteer Examiners at this ARRL VEC test session included VE Team Liaison Mike W2IG, Lou KD2ITZ, Joe W2BCC and NM9J.
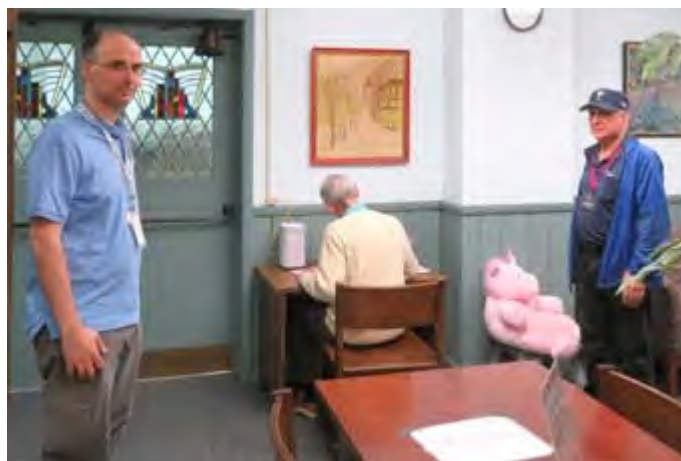
Lou KD2ITZ and Joe W2BCC supervise during the May 18 VE Test Sesssion, held in the "Fireplace Room" at Putnam Valley Library. (Note the library's 'Pink Hippo' mascot.)

Our next VE Test Session is scheduled for Sunday June 23rd, starting at 10:00 a.m. Location is PCARA's Field Day site at George Washington Elementary School, 3634 Lexington Ave, Mohegan Lake, NY. Candidates should contact Mike W2IG beforehand, using w2igg'at'yahoo.com.

Note: the current Extra Class question pool, in use from July 1, 2020, expires after June 30, 2024 — so this could be your last chance to upgrade before the Element 4 question pool changes.

Adventures in DXing
- N2KZ

The OLD Goats Net

This month, we'll take you on a visit to a goat barn. This isn't just a run-of-the-herd goat barn! Come visit the home of PCARA's *Old Goats Net* — now in its 17th year on the PCARA two meter repeater. Indeed, we have been grazing a long time!

Peekskill Amateur Radio Association
Post Office Box 2468
Peekskill, New York 10566

449.925 MHz (-) / PL 179.9 Hz

Our story begins back in 1990. Bob, N2CBH, tells us all about it: "There was a club pretty much in name only from 1990 or so until 2000. It was **PARA** for *Peekskill Amateur Radio Association.*This is something Greg, KB2CQE, created when he built the first repeater. At around the time the two-meter machine went on the air, (Labor Day 1999), we decided to formalize the club name into the *Peekskill/Cortlandt Amateur Radio Association* because both Greg and I lived in Cortlandt Manor at that point."

The very first edition of the printed *PCARA Update* ran on March 14, 2000 with Bob, N2CBH and Greg, KB2CQE at the helm of the club. Our earliest newsletters were edited by Joe, KC2DWP at the time, later KR2V. Malcolm, NM9J assumed editorial duties starting with our December 2001 issue. Another long run still in progress! Sporadic on-air membership meetings began on May 7, 2000 on the PCARA VHF repeater with in-person meetings being held at the Mohegan Diner also starting in March 2000.

PCARA Update Volume 1 Issue 1 from March 2000.

The August 6, 2000 in-person membership meeting was the first to be held at The Hudson Valley Hospital Center in Peekskill in Dining Room B. (Look for the big oxygen tank in the back of the hospital building!) At the December 2000 meeting there was a proposal to revive on-air meetings on PCARA's two 70cm UHF repeaters: The second Monday of each month at 7:30 p.m. on the 448.725 repeater — and — the fourth Monday of each month at 7:30 p.m. on the 449.925 repeater. Did they ever occur?

I was first licensed in October of 1999 and joined PCARA in February of 2001. One late Sunday afternoon I was ironing shirts for my next work week. I had my HT on scan looking for any sign of two-meter activity. I luckily found a conversation going on between Bob, N2CBH and Malcolm, NM9J on the PCARA two-meter repeater. At the end of the QSO, I tried to reach them. They heard me! Bob and Malcolm told me all about PCARA and I was introduced to two new long-time friends! Welcome aboard!

During this time my only VHF gear was an Icom IC-T2H two-meter HT. It had a horrible fate. On that pivotal day, September 11, 2001, my HT disappeared from my carry-bag never to be seen again. It was replaced shortly thereafter by a dual-band IC-T7H handheld which I own to this day. There is some good in every unfortunate event. I gained access to 70 centimeters and a whole new aspect of my hobby began.

By the end of year 2000, the on-air PCARA membership meetings were replaced solely with in-person meetings. Club meetings at the hospital were much more accessible, personal and simply just more fun! So many great club conversations and events filled this room. We held our very first beginner's Technician's License course and even presented in-person Morse Code classes. We sent slow-scan pictures from one HT to another... and so much more! Every monthly meeting was a new adventure!

Icom IC-T2H 2 meter HT.

Morse Code class at Hudson Valley Hospital Center in October 2002 with Karl N2KZ and Bob N2CBH.

The venues of the monthly meetings also have changed over the years. After leaving the hospital dining room, we met at the John C. Hart Library in Shrub Oak and now at the Putnam Valley Library. Large attendance meetings and other special events continue to be held now and then in The Town of Cortlandt CUE Room. Check this newsletter and our Facebook page (https://www.facebook.com/pcararadio) for updates on all PCARA current events!

Prehistoric Michigan

The origins of The Old Goats Net concept hark back about six decades to the 1960s. True confessions: I imported the idea of The Old Goats Net from Central Michigan! I have been vacationing there every summer since 1988. Based in Bad Axe, Michigan, the Lake Huron Amateur Radio Club has been holding their Old Goats Net starting way back to the time when two-meter nets were held using AM simplex! I became acquainted with the Bad Axe net during the summer of 2000. I wanted

Location of Bad Axe, Michigan, south of Port Austin.

to share my vacation souvenir with my friends back in New York. I am very glad I did!

A couple of dozen amateurs meet on the Michigan Old Goats Net every morning (Mondays through Saturdays) religiously at 8:30 a.m. to this day — now on FM, of course! Although good conversation is exchanged daily on the net, it also serves as a goodwill visit between one and all. Are you OK today? Is there anything you need? Can I help you clear that lawn mower carburetor? When are you planting your sugar beets? Do you know where I can get a 1988 Sunbird gear box? You get the feelin'!

The Michigan Old Goats Net also serves as the daily local radio news show! Walk into the hardware store in Port Austin at 8:30 a.m. and you would hear a scanner radio locked onto 145.470 MHz — the Bad Axe repeater. Many people owned police scanners to hear the very latest local events in action — and the hardware store listened to the amateur radio operators chat every morning, as well!

So many good friends and such good times in so many places! I felt honored to carry their legacy and spirit back in New York. In my mind, PCARA would

never be complete without a weekly on-air net. We could promote PCARA, encourage new members and have fun while doing it!

Our first experimental PCARA Old Goats Net was on Thursday, September 7, 2006. A tentative conversation filled the air! "Should we do this every week?" "Do you like it?"

The idea stuck.

The very first 'official' Old Goats Net was on Thursday, September 21, 2006 and it continues to this day. Some rough estimated math: The net has been on the air for about 17 years and 4 months. Averaging about 48 meetings a year (subtracting for Thanksgiving, holidays and other preemptive events) the Goats have met (gulp!) about... 832 times! What's next?

New Nightly Net

Peekskill Cortlandt Amateur Radio Association now meets on the air once a week on our two meter repeater at 146.67 MHz output, minus 600 kHz offset, friends sharing good stories and information. The net has been on the air two weeks at this writing. Our second meeting attendance was up 50% from our premiere! Please join us and share your experiences and meet new friends.

From PCARA Update, October 2006.

The Roundtable

At the end of March 2020, the COVID-19 pandemic came into the forefront of everyone's life. Meeting once a week was suddenly not enough! It was decided to start meeting *nightly* on the PCARA two-meter repeater as a refreshing and consoling way to encourage smiles and support through those rough and demanding times. The Goats continued along every Thursday and eventually the nightly meetings were scaled back to Tuesdays only. The Roundtable continues as a do-it-yourself casual weekly get-together to this day — a fine complement to the Thursday Goats Net!

Goats Central - New York Edition

The PCARA Old Goats Net is quite an operation. Although I host many Thursday nights, Malcolm, NM9J and Bob, N2CBH are regular fill-in hosts. We have been quite vigilant and dedicated over the years! Many thanks to all!

At the home base here in Katonah, the transmission site and gear has had several upgrades since the net's inception. In the beginning, I was using my Icom IC-T7H handheld with its stock rubber-duck antenna. I would search around my driveway before the net testing my signal with Malcolm. "Is this a good spot? Is this better?" It was always a challenge! My driveway is about 15 miles from the repeater site with all sorts of terrain in-between!

Through a friend of Bob's, I was gifted a really nice Larsen dual band mag-mount antenna. Into my car I went, now looking for a good *parking spot* in my driveway. I always needed to make sure my HT was fully charged before I started the net. You don't want to fade away before it's over!

My next move made all the difference. I purchased a Yaesu FT-1900 two-meter mobile rig. The jump from 5 watts to 55 watts brought my signal to the forefront. Suddenly I had a strong signal with authority. I also discovered that at full power I needed to connect my rig's power leads directly to my car battery. The good

old cigarette lighter plug just didn't cut it! A filter choke was added to the power line to deter ignition noise.

Alas, all year long and through all seasons I was still sitting in my driveway to host The Old Goats Net. Those winter Thursday nights could be snowy and cold!

Net control bundled up in a winter coat on the driveway.

We had some magnificent moments. One Thursday night there was a high-in-the-sky flyover of the International Space Station scheduled at about 8:08 pm. I encouraged everyone to find some clear sky and take a look. We created a great mutual live commentary as we all looked high in the sky. Many of us saw the ISS cruise past!

Technical improvements to the Goats' home base never ceased! I proceeded to experiment with even better antennas. I tried a couple of different trunk mount
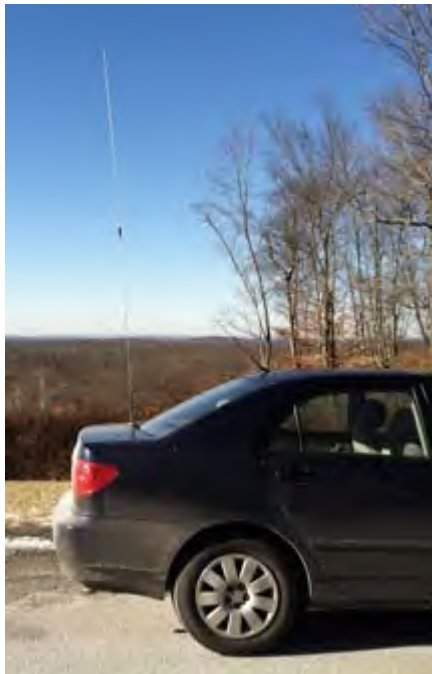
Trunk-mounted Diamond NR-22L monoband antenna was 97" tall.

designs including an impossibly long behemoth whip made by Diamond. Although it had relatively good overall gain, it's radiation beam was too narrow and did not fare that well especially during my commutes between my home and my workplace in Stamford, Connecticut.

In another attempt to maximize my signal towards the PCARA two-meter repeater, I purchased and assembled a nice lightweight 4-element Yagi made by Arrow Antennas. I originally experimented with it at ground level using a 10 foot TV antenna pole as a mount shoved into the dirt of our front garden. It made a very interesting lawn ornament! One day, I had a brilliant idea! What if I tried operating from one of our second floor bedrooms? Our house uses cedar shingles, so it just might work! This was a big moment. I could finally operate *from inside!*

Desk chair and curtain rod.

I had a leftover five-foot piece of 1½ inch wide wooden curtain rod that I used as an attractive and sturdy mounting pole. A scrap of rope allowed me to tie it to a nearby desk chair. Every week I secure the antenna to the top of the pole and I use my "Arm-strong" manual rotator to point the Yagi to a bearing of exactly 290 degrees, to the northwest.

A fifty-foot length of coaxial cable runs from one room to another to connect my new fancy antenna to my trusty Yaesu FT-1900 mobile rig. At 55 watts with 9.86 dBi forward antenna gain, the effective radiated power is estimated to be as high as 250 watts. No wonder Malcolm and Bob can hear me now on simplex! I assemble and disassemble the Goats antenna gear every Thursday. Does this system work well? I once worked a station down in North Carolina on 146.550 MHz simplex using this wacky set-up!
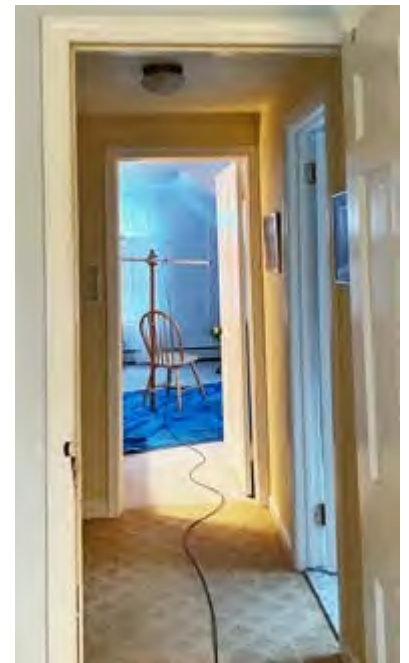
2 meter Yagi ready for the 'Goats'.

I Have A Question

To present the PCARA Old Goats Net, you need four trivia questions and a topic of the week. How about another round of quick math? If the PCARA Goats have met on the air about 832 times... that means we have presented about 3,328 questions!

The topics and questions come from nearly everywhere. The topic of the week longs to be relevant to current events or fascinating quizzical things. Much manual research certainly has to be done in a timely fashion! I listen to many radio talk shows, incessantly

read newspapers and on-line press from all over the world and literally keep my ears open for anything that might inspire a question. Often useful is checking "On This Day" feature columns. Somehow, in the end, it all gets done before 8 p.m. on Thursday nights. Rest assured! The inquisitive quest never ends. The big question? "Have I ever used this question before?"

To be a successful host, you'll need some other equipment, too. Very helpful is a HT or scanner that can hear the *output* of the PCARA repeater while you are transmitting. This becomes your on-air broadcast monitor!

If you happen to be transmitting with 55 watts into a four-element Yagi, your chances of desensing your monitor receiver, (rendering it mute during your transmissions,) is pretty likely. This is why it is good practice to only transmit using a low power setting at five watts if you possibly can.

Yaesu FT-1900 is capable of 55 watts output on 2 meters.

If you can hear the repeater output, you can monitor exactly what you sound like to the world. You can also tell immediately if you have timed-out the repeater by talking too long — or — if you are "doubling" with someone because you are both transmitting at the same time. Listen to it with headphones on. You don't want to feedback or echo your voice back when you transmit!

Also, a laptop computer by your side is nice to have. You can look up unknown call signs on QRZ.com and instantly research all sorts of other details and answers to ongoing questions in conversations. You will

Karl's operating position for the Old Goats Net. [Photos - N2KZ]

sound like an instant authority about nearly anything. A confident and informational presentation makes good listening!

Thank You Everyone

Without participants, the Old Goats Net would be very quiet and very short! Your support is always appreciated and newcomers are encouraged and welcomed. We are always aware that some people just listen. An old friend of mine, Minor "Goose" Edwards, K8EFA (SK) used to greet all the listeners of the Michigan Old Goats Net every day. I now continue his legacy during each net I host with his exact words. When you hear "...and good evening to all the shortwave listeners" the spirit of Goose is with me!

Thank you all for the past 17 years. Now it's your turn! Help us keep this tradition going for many more! Join us every Thursday night on the PCARA two-meter repeater: 146.670 MHz with a minus 600 kHz offset and use a 156.7 Hz PL. At very least, tune in and enjoy our conversation and exchange of news and views... and don't forget our Roundtable net on Tuesday nights as well! Comments and questions are always welcomed. E-mail us at N2KZ'at'arrl.net.

73 and dit dit de N2KZ "The Old Goat."

What is Meshtastic?
- N2HTT

Meshtastic® is an open-source software that

enables the creation of long-range, off-grid communication networks. These networks can provide reliable store-and-forward text messaging between nodes, without needing a connection to the internet or cellular networks. It also does not require an Amateur Radio license, and allows for the creation of local sub-nets which can pass encrypted traffic.

Network nodes are readily available, inexpensive, low-power radios that operate in the ISM bands, thus allowing individuals or groups to quickly set up communications in areas where the power grid or cellular coverage is non-existent. It works amazingly well.

The nodes in a Meshtastic network form a *peer-to-peer network*. In this configuration each node in the network acts as a repeater for all the other nodes it can hear. This means messages can be passed to a destination that is out of direct reach of the originating node, by making several hops along the way. Nodes communicate on UHF frequencies (915 MHz

Wireless mesh network. Each node can pass a message to another node that is in-range.

ISM band in the US among others), output a signal of about 100mW, and have impressive range for line-of-sight connections, up to several kilometers (the current record is 247 kilometers, between two mountain tops using directional antennas, your mileage may vary…)

Some typical use cases are:

- Local communications when hiking or camping in a group
- Emergency communications with both public and private (encrypted) messaging
- Staying in contact with immediate neighbors
- Random contacts similar to ham or CB radio.

It is because of all of these reasons that Meshtastic networks have become immensely popular world-wide, but the software would not be as successful without the hardware it runs on: **LoRa®** devices.

LoRa

LoRa stands for **L**ong **Ra**nge, and the devices used by Meshtastic were originally developed for IoT (Internet of Things) applications. Capable of transmitting low-volume data over long distances, they are ideal for sending telemetry from sensors in the field, or communication between IoT appliances. The cost of a LoRa device suitable for Meshtastic use ranges from about $25 - $75, and they are available from a variety of sources ranging from Amazon to specialty electronics suppliers. Some devices allow expansion to include additional features such as GPS receivers or ambient environmental conditions (temperature/humidity) at additional cost.

LoRa is a registered trademark of Semtech Corporation.

Most LoRa devices are available as boards only (although there are some complete packaged devices available, but these are more expensive). It is typical to use a 3D-printed enclosure to house the device and a battery. Such enclosures are available commercially; files are available free for downloading if you have access to a 3D printer. So, to set up a node, you will need at the very least a board, a suitable battery, and some kind of enclosure.

A variety of 3D-printed enclosures for LoRa devices used in Meshtastic. [N2HTT pic.]

The final item necessary for a functioning Meshtastic node is a **user interface**, since most of the LoRa devices do not provide a means for entering data. (There are a few exceptions to this, noted later.) Devices running Meshtastic can be connected to a computer or smart phone via USB, WiFi, or Bluetooth to provide an interface for setup and sending/receiving messages. The most typical configuration is to use a smart phone connected to the Meshtastic node via Bluetooth, running the Meshtastic app. The app is available for Android and iOS, and can be installed from the corresponding app store.

Since I have begun experimenting with Meshtastic, I have suddenly found a use for all the "obsoleted" smart phones that have accumulated in various desk drawers around the house. They don't need a SIM card, just a working battery and a WiFi connection to download the Meshtastic app. After that, only Bluetooth is necessary to communicate through the node.

What does a Meshtastic contact look like?

You will have a LoRa device running the Meshtastic software, connected to a local mesh, listening on one or more channels. A channel is roughly analogous to a DMR talk group, there is a default channel (called LongFast for reasons that may become clearer later). And you will have a smart phone — but you are not using the cellular network on this phone at all. Instead, your phone is connected to your Meshtastic node via Bluetooth, and provides a user interface for sending and receiving messages via the Meshtastic app.

With my phone running the Meshtastic app and connected to my node, all I need to do is select the channel I wish to send to, and type in my message. The app will indicate that the message has gone out on the network by displaying an acknowledgment when it is sent. It is very similar to sending a text via SMS. I could also choose to direct-message a particular node on the network; the app displays a list of nodes it has heard.

The Meshtastic channel is basically a set of parameters that set the speed and redundancy of the network connection, and the encryption key used for messages on the channel. All Meshtastic devices are set up to use a default channel, called Long-Fast. As the name implies, the settings for this channel favor longer range, and higher speed communication over re-
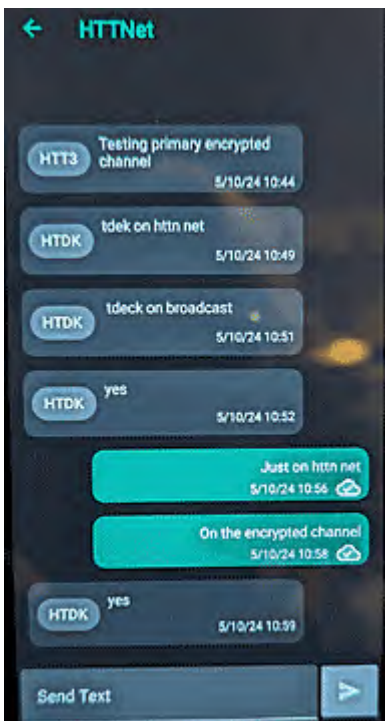
Meshtastic app running on a smartphone. [N2HTT pic.]

The Meshtastic app displays a list of nodes that have been heard. [N2HTT pic.]

dundancy and reliability. You will sometimes note using LongFast your message is not acknowledged by the network.

The encryption key (AES256) used for LongFast is always **AQ==** , using a well-known key makes Long-Fast a public channel, and any messages sent there will be readable by any Meshtastic node in the network.

It is easy to create a private encrypted channel — simply change the name of the current channel and save it. A new encryption key, based on the channel name is created and used for all messages on your new channel. You can create as many channels as you like, one for local use, one for family etc., and save them to your device. Of course, in order for other nodes to use your private channels they must be aware of them. The Meshtastic app provides a QR code which can be scanned by the app on another node, to easily transfer the channel information. There is a lot more you can do with channels; there is good in-depth documentation readily available on the web.

What LoRa devices are available?

Basic LoRa board devices come in two flavors: those based on the **ESP32** micro-controller, and those based on the **NRF52** micro-controller. The ESP32 variety tend to have poorer battery economy than the NRF52, but will often support both Bluetooth and Wi-Fi on the board, where the NRF52 will just have Bluetooth. All the boards have onboard power management to support charging and running from LiPo batteries. Some have additional circuitry to allow using a solar panel to charge an attached battery as well.

Least expensive, and most readily available (no GPS or environmental sensor, but these can be added) are the Heltec LoRa 32 V3 boards, costing around $25 and found on Amazon and Ali Express. These boards have a small OLED screen that will display status and re-

Heltec WiFi LoRa 32 V3 Internet-of-Things development board based on ESP32-S3 microcontroller, has USB type C, Wi-Fi, Bluetooth Low Energy, LoRa and an OLED display.

cent messages, but require your smartphone and Bluetooth to send and receive messages.

Another very popular LoRa device is the RAK Wis-Block system. This device is based on the NRF52 chip, and offers very good battery economy. The device is composed of a base board and plug in modules that allow easy expansion of the basic LoRa functionality. In addition to battery management, the baseboard provides an interface for connecting a solar panel. These

devices are in the $30 -$50 range depending on the options you select.

Because of the solar panel interface and the extended battery life, this device is very suitable for mast-

RAK WisBlock base board with LoRa wireless module plugged in.

mounted, self-sufficient installations. RAK also offers a weatherproof enclosure with a 6W solar panel built-in, ready for board installation.

Lilygo® T-Beam LoRa wireless module with OLED display and battery connector also supports an optional GPS module.

and just needs to be flashed with Meshtastic to use. This device is based on the NRF52, which gives it much better battery life. This device can be found for about $70.

Finally, a very unique Lilygo offering is the T-Deck, which is complete with a screen and a Blackberry-like keyboard. It is the only unit that can be used stand-

Another very popular (and sometimes hard to get because of high demand) LoRa device is Lilygo. Their offerings are more elaborate, with some boards already packaged with GPS, environmental sensors, and battery mounts. The Lilygo T-Beam is an ESP32-based board that is so equipped, and can be found for about $30 - $50 depending on the GPS chip installed.

Unusual in the field is the Lilygo T-Echo, which is a complete ready-to-use unit in a case with a battery,

Lilygo T-Echo with LoRa, Bluetooth, antenna and E-paper display.

alone for messaging, no smart phone required. However, at the time of this writing, the screen and keyboard support for this unit is not great, although a major update to the user interface is promised for some time over the summer. And, a smart phone is still required for configuring this device. The T-Deck is supplied without GPS or environmental sensor, but these can be added. It also requires a user-supplied case and battery. This device can also be found for about $70.

When packaged in a 3D-printed case with a battery, the T-Deck makes a very attractive package.

Lilygo T-Deck housed in a 3D-printed case by Mike N2HTT. [N2HTT pic.]

All of the devices I just mentioned are equipped with the SX1262 LoRa radio, which is desirable because it offers increased range via higher receiver gain over older LoRa radios. In general, you should check the specifications of any board you select and make sure it uses the SX1262, and avoid boards with older radios.

Where to learn more

Interestingly enough, there is no Wikipedia page for Meshtastic, which I find remarkable. However, there is a wealth of information about these devices to be had on YouTube, and I recommend looking there for information and how-to videos.

For a useful starting link, I recommend videos on 'The Comms Channel' which can be found on YouTube at: https://www.youtube.com/@The_Comms_Channel

I have just scratched the surface about Meshtastic and LoRa in this article, there is a lot more to explore. They are relatively inexpensive and easy to set up, and I think the best part is — the more we experiment with them, the more useful and interesting the mesh will become.

- 73, Mike N2HTT

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Spring Foxhunt

PCARA's Spring Foxhunt took place on Saturday May 4th at FDR State Park. In a break with tradition, this foxhunt was *not* preceded by a PCARA Breakfast at Downing Park — instead the hunt started earlier to allow time for hunters to take part in the "I Love My Park Day" clean-up, organized by Parks and Trails New York, New York State Parks and NYS Department of Environmental Conservation.

Your editor was waiting at the Rt. 202 Park Entrance until the permitted entry time of 9:15 a.m. when Lou KD2ITZ appeared with word that the fox was securely established and it was safe to proceed to the Pool Parking Lot. The role of fox operator/observer would be played by October 2023's winner **Vincent KD2VAV** who was accompanied by **Samantha**. (Vincent's usual collaborator Ratan was away.)

Hunters began gathering at the Pool Parking Lot from 9:15 a.m., preparing their direction-finding equipment for the scheduled start time of 9:30 a.m. The five hunters at the start were:

> David KD2EVI
> Malcolm NM9J
> Lou KD2ITZ
> Masa JR1AQN
> Mike N2EAB

Tape measure Yagis were much in evidence — apart from David KD2EVI who was sporting an **Elk** log-periodic design that covers both 146 and 440 MHz for direction finding and satellite work.

Hunters prepare their direction finding equipment in FDR Park pool parking lot before the fox came on air.

We waited for a sixth hunter Herb, KF5YNX but since he had not appeared after 15 minutes, Lou cued the fox team to start the transmitter. The Byonics MicroFox PicCon came on air using 146.565 MHz FM at 9:47 a.m. and was received at good strength. Bearing from the Pool Parking Lot appeared to be 308°, roughly WNW, a direction which passes through Parking Lot 5 and Parking Lot 2.

As in previous years, hunters started down the Pool Approach Road, climbing the steep path toward Parking Lot 6. Your editor arrived at the top of the path, followed closely by David KD2EVI. The direction then took us past the Childrens' Playground and Pavilion, reminding me of previous Foxhunts where Al K2DMV and Vincent had hidden near Parking Lot 6.

I continued northwest, leaving Parking Lot 6 behind with David to my north, crossing the road to the area where Mike N2EAB had hidden the fox at the last hunt, in the area between the rest room and soccer field. Signal strength had weakened at this low spot, but the bearing was still northwest. I crossed the soccer field and began climbing toward the softball field where the fox had been hiding in October 2022.

The signal strength was rising as I crested the hill and I began to hear bursts on my Icom IC-W32A dual band HT on the Fox's harmonic frequency, 439.695 MHz. In the distance I spotted two people at a picnic table and as I approached, I could see they were Vincent and Samantha, located near Parking Lot 2.

Vincent KD2VAV and Samantha were observing progress of the hunt.

The two meter signal was now very strong so I changed from the full-size tape measure Yagi to the 440 MHz version promoted at PCARA's last antenna workshop. I was conscious that other hunters including David and Mike were not far away! With my switchable attenuator in line with the UHF Yagi I was able to close-in on the fox using its UHF harmonic. A few minutes later I found the furry fellow in a tree, facing away from Vincent's table toward Parking Lot 2.

The fox transmitter was found in the fork of a tree, facing Parking Lot 2.

David and Mike were both getting closer as I signaled to Vincent that the fox had been located.

The other hunters were soon closing in on the fox's position. Around the same time, Herb KF5YNX and XYL Amanda drove up. Herb was following *last* year's foxhunt rules which had a later start time. With
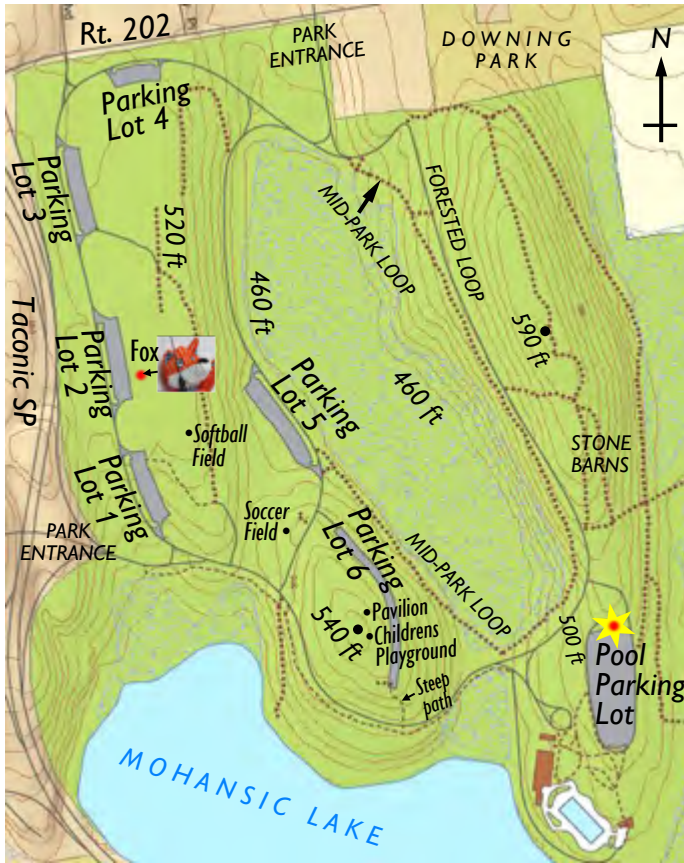
Map shows location of the fox transmitter near Parking Lot 2 in FDR State Park. [Base map: NYS Parks.]

some guidance from Lou he was able to track down the fox for a special place, appended here to the times as recorded by Vincent.

Malcolm NM9J	10:16 am
Mike N2EAB	10:19 am
David KD2EVI	10:19½ am
Masa JR1AQN	10:26 am
Lou KD2ITZ	10:28 am
Herb KF5YNX	10:36 am (late start from Lot 2)

We were joined by Jennifer KE2AGN and son Elliot. Hunters and fox observers gathered together for a group photo then made their way by vehicle back to the Pool Parking Lot, ⅝ mile away.

Hunters in blue T-shirts gather with Vincent KD2VAV and Mr. Fox at the end of the May 4 foxhunt.

Lou KD2ITZ had registered PCARA to take part in the "I Love My Park Day" clean-up and had already given the hunters free T-shirts. He followed up by presenting gloves, plastic bags and litter stick pick-up tools to everyone. Participants spread out around the Pool Parking Lot for an hour, finding a good selection of paper litter, plastic packaging, broken car parts and crown caps from beer bottles.

PCARA's team of volunteers took part in "I Love My Park Day" clean-up around the Pool Parking Lot.

Here's to the next PCARA Foxhunt in the fall when your editor will attempt to hide the furry fella in a fresh field, not too far from the starting point.

- NM9J

Radio H₂O still on 33 cm

In the September 2004 issue of *PCARA Update* there was an article: "Radio H₂O on 33 cm." Back in 2004, water meters in the Town of Cortlandt were still being read manually every three months by an employee who walked the route. The old water meters were being replaced with Neptune T10 meters connected by three-conductor cable to a Neptune R900-v2 **M**eter **I**nterface **U**nit or MIU. The MIU transmitted each meter's reading in the "unlicensed 902-928 MHz band" which also happens to be our 33 cm amateur radio band. The MIU used a frequency-hopping spread spectrum technique, hopping over 50 channels in the range 910-920 MHz.

Neptune T10 water meter register installed in 2004. Note gray wire to meter interface unit.

According to test results on the FCC web site, the R900-v2's transmitter turned on for a brief 7.05 milliseconds, followed by a 10 second rest period, during which time the transmitter hopped to another channel, according to a pseudo-random frequency table. It then transmitted another 7.05 ms burst, with peak output power of 18dBm or 63 milliwatts. The electronic circuitry of the MIU was powered by an internal lithium battery. The MIU's short bursts of low power RF could be picked up by a vehicle equipped with a computer-controlled receiver as it was driven past each house.

Neptune R900-v2 Meter Interface Unit transmitted water data in the range 910-920 MHz

Two decades later

Twenty years on, those lithium batteries in the Neptune meter interface units were becoming exhausted and it was time for action. The Town of Cortlandt and National Metering Services sent a letter to residents stating that the town was implementing a Cortlandt-wide upgrade of its meter-reading system. "This upgrade will take approximately 20 minutes and will NOT require the water to be shut off."

I made an appointment online and had a visit from National Metering's technician in early May. I was interested in how the basement water meter would be

National Metering Services van visits a Cortlandt customer.

upgraded without turning the water supply off. The technician cut off the flexible cable connecting the old register to the separate "Wall MIU" which had been tie-wrapped to the copper water pipe, then discarded the old MIU. He punched out the tamper-proof pin on the old register head, removed the register from the bronze meter body by twisting counter-clockwise then installed the new register head onto the meter body by twisting clockwise. A new tamper-proof pin was then inserted to secure the register to the meter body. There was no separate "wall MIU" any more. The technician used a hand-held unit to check that all was well. You can watch a Neptune video of this type of installation on YouTube at: https://youtu.be/AIfAqXl6-Cg .

New register head installed on the existing bronze meter body by twisting clockwise and securing with a tamper-proof pin.

Inspection of the new unit mounted on the meter body revealed that it is a "Neptune® ProCoder™)R900*i*™" register. The "*i*" stands for integrated — the 'ProCoder' mechanical metering mechanism to count gallons of water passing through the meter body is incorporated into the same plastic case as the R900-v4 meter interface that transmits readings to the utility's monitoring and billing systems. As with the old register, the mechanical meter can still be read

by visual inspection but it is now protected by a hinged, plastic cover. The 3.6V lithium battery, central processor, RF circuitry and antenna are all housed inside the plastic case.

According to Neptune's data sheet, the ProCoder)R900*i* has "simultaneous AMR/AMI capabilities" (Automated Meter Reading/Advanced Metering Infrastructure). The manual explains that the ProCoder)R900*i* uses frequency-hopping spread spec-

trum technology to avoid RF interference and enhance security. The transmitted data is up-dated at 15-minute inter-vals from the mechanical register wheels using LED technology. The unit can then transmit a mobile mes-sage in the

The mechanical register can be read man-ually by opening the hinged plastic cover.

902-928 MHz ISM band every 14 to 20 seconds that in-cludes the meter reading data and each unit's unique ID. This allows a Hand-Held Unit or a Mobile Data Col-lector to read the meter. The transmissions are spread over 50 channels in the range 911 – 919.1 MHz. (There is a gap around 914 MHz for incoming requests.)

The ProCoder)R900*i* also transmits a high-power fixed network message every seven and one-half min-utes on an interleaved basis to an R900 Gateway.

ProCoder)R900*i* transmissions, 911- 919.1 MHz

Type	Output power	Modulation	Timing
Standard mobile message	18dBm, 63mW	On-off keying K1D	Every 14 – 20 sec
Fixed network message	30dBm, 1 watt	Gaussian frequency shift keying F1D	Every 7½ min.
Data log retrieval	30dBm 1 watt	GFSK	On demand

The "Standard Mobile Message" is a one-way transmission to either a Hand-Held unit or Mobile Data Collector that is driven past the location. The MIU output power is very low and the sig-nal will not travel far from a typical below-grade, base-ment-mounted water meter.

Mobile Data Collector is mounted in a vehicle with mag-mount 911 MHz an-tenna on the roof and Bluetooth connec-tion to smartphone or tablet.

The "Fixed Network Message" is intended for an infrastructure of Neptune Gateway Fixed Network Data Collectors. These units can be mounted on a high roof, utility pole, street light or water tower to gather data from the "high power" (1 watt) 911 MHz transmissions

of multiple Neptune meter endpoints. They can then forward the data using the cellular phone network, or by direct Ethernet connec-tion, to the utility's monitor-ing and billing system.

Local monitoring

After the meter up-grade, I checked what was happening in the range 902-928 MHz on my SDRplay RSP1A SDR receiver. The first conclusion is that nowadays there is a **lot** of activity in this part of the RF spectrum. I have several wireless weather stations that transmit temperature

Gateway fixed network data collector is mounted on a high spot and con-nected to an external 911 MHz antenna. Cell network antenna is on top.

and humidity data on ~915 MHz. I was also aware of Consolidated Edison's 900 MHz mesh network that transmits electricity meter readings from meter to me-ter to ConEd's own wireless access points. See "Smart meters mesh", *PCARA Update* February 2018, pp 7-8.

I checked emissions from the new ProCoder)R900*i* in my basement by placing the RSP1A's UHF antenna nearby. On the RSP1A's spec-trum and wa-terfall display I could see ex-tremely short bursts of RF popping up on what appeared to be a ran-dom choice of channels. Ac-cording to the MIU's Certifi-cation Test Re-port on the

Monitoring emissions from the new ProCoder)R900i water meter using SDR-Play's RSP1A wideband SDR receiver con-nected to a Windows notebook computer.

FCC web site, each transmission only lasts 7 millisec-onds. Over a period of 24 hours that would amount to less than one minute of total transmission time, mini-mizing drain of the built-in lithium battery.

Unlike ConEdison's mesh network which has wire-less access points evident on utility poles, I have not seen any Neptune "Gateway Fixed Network Data Col-lectors" appearing in the Town of Cortlandt. As a result, I assume the town is still relying on mobile data collec-tion of the MIU's low power (63 mW) emissions and the 1-watt two-way fixed network message is not in use yet.

Long Range water

Neptune also offers a "LoRaWAN®" version of the ProCoder™)R900i™ Register & Endpoint that is capable of joining a LoRa® fixed network collection system, with two-way communication.

It can then synchronize time with the network, take hourly readings of water consumption and transmit this information at three-hourly intervals using 'high power' LoRaWAN™ technology. This would require a Neptune LoRaWAN Gateway, which is based on the Tektelic Kona Mega IoT Gateway. The gateway links to the utility's computers by cell-phone data or direct Ethernet connection.

Tektelic Kona Mega IoT-LoRaWAN gateway.

This LoRaWAN version of the endpoint is only available with an external antenna and I have not seen any LoRaWAN gateways popping up in Cortlandt — so I don't think the town has chosen this option.

Worth noting is that the LoRaWAN technology used in these networks employs full duplex operation in the 902-915 (RX) and 923-928 (TX) MHz bands, using two separate antennas and a cavity filter duplexer inside the gateway. The modulation mode is "LoRa Chirp spread spectrum" — the chirp technique employs "up chirps" and "down chirps" to encode different symbols. LoRa chirp spread spectrum modulation, with its capability to be demodulated at or below noise level is also used by the **Meshtastic** LoRa radios as described by Mike N2HTT in this month's newsletter.

- NM9J

MFJ signing off?

An item worthy of note occurred on April 25 when a letter was published by Martin F Jue K5FLU of MFJ Enterprises. He wrote:

"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."

Well — May 17 has come and gone, and I presume MFJ's onshore manufacturing has indeed ceased. Like most radio amateurs in North America, I have several

items from MFJ in my own shack. The very first item of mostly fine equipment that I bought was an MFJ-202B RF Noise Bridge, purchased

MFJ-202B Noise Bridge from 1989.

from the Ham Radio Toy Store in Wheaton, IL in 1989 for $59.95. (Expensive!) State of the art for making antenna measurements in the 1980s, the RF noise bridge relied on use of an HF receiver or transceiver to monitor for minimum noise level as the Resistance and Reactance controls on the front panel were adjusted. The box had a manual calibration chart on the base. It did not see heavy use.

The next item on the test-gear shelf was an MFJ-259 Antenna Analyzer from 1996. This item saw a lot more use… it combined an RF signal generator and digital frequency counter with analog SWR meter and resistance meter all in the same case. In theory it could be loaded with a bucketful of AA cells, but I always used it on an external 12V DC power supply. Many

an antenna has been investigated at home and at Field Day with that MFJ-259.

Amazingly, the MFJ-202B is still available according to MFJ's online catalog. The MFJ-259 is no longer present, but its offspring the MFJ-259D is still listed.

Perhaps that is one of the problems that confronted MFJ. How many other electronic companies keep 35 year-old products in their catalogs? Most people with an interest in antennas have moved onto more modern analyzers such as RigExpert's or the NanoVNA.

Another problem I have run into with MFJ concerns their antenna tuners. One MFJ-948 suffered from SO-239 connectors that were only POP®-riveted to the metal case, with doubtful grounding. Grub screws in the control knobs were live to RF. The SWR readings were dubious — and the tiny toroid for balanced feeders did not look as though it had been sized correctly. See *PCARA Update* June 2022, pp 12-16.

Despite these problems, I suspect that we'll be looking back on the era of 140-page MFJ catalogs with some fondness. "Proudly made in the USA". "Intelli-Tuner™" "MightyLite™". "Hy-Gain®" …farewell.

- NM9J

Peekskill / Cortlandt Amateur Radio Association

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PCARA Information

PCARA is a **Non-Profit Community Service Organization**. PCARA meetings take place every month (apart from July/August break). See http://www.pcara.org for current details.

PCARA Repeaters

W2NYW: 146.67 MHz -0.6, PL 156.7Hz
KB2CQE: 449.925MHz -5.0, PL 179.9Hz
N2CBH: 448.725MHz -5.0, PL 107.2Hz

PCARA Calendar

Sat Jun 8: PCARA Breakfast, 9:00 a.m., Uncle Giuseppe's, 327 Downing Dr., Yorktown Heights NY.
Wed Jun 19: 7:00 p.m. Monthly meeting/Field Day planning, George Washington Elementary School, 3634 Lexington Ave., Mohegan Lake NY. (Bring a chair.)
Sat-Sun Jun 22-23: ARRL Field Day, George Washington Elementary School, 3634 Lexington Ave., Mohegan Lake.
Sun Jun 23: PCARA V.E. Test Session, 10:00 a.m., George Washington Elementary School (Field Day site) see below.

Hamfests

Check with organizers before leaving.
Sun Jun 2: LIMARC Hamfest, 999 Stewart Ave, 999 Stewart Ave, Bethpage NY. 8:45 a.m.
Sat Jun 29: W2QW Raritan Valley Hamfest, Piscataway High School, 110 Behmer Road, Piscataway, NJ. 8:00 a.m.
Sun Jul 14: Sussex County ARC Hamfest, Sussex County Farm & Horse Show Fairground, 37 Plains Road, Augusta, NJ. 8:00 a.m.

VE Test Sessions

Check with the contact before leaving.
Jun 1, 8, 15, 22, 29: NYC-Westchester ARC, 43 Hart Ave, Yonkers NY. 12:00 noon. Must contact VE, k2ltm 'at' aol.com.
Jun 13: WECA, Westch Cnty Fire Trg Center, 4 Dana Rd Valhalla NY. 7:00 p.m. Contact VE, N2gdy 'at' weca.org.
Jun 21: Orange County ARC, Munger Cottage, 40 Munger Dr., Cornwall NY. 6:00 p.m. Contact: w2bcc 'at' arrl.net.
Jun 23: PCARA, George Washington Elementary School (Field Day site), 3634 Lexington Ave. Mohegan Lake. 10:00 a.m. Must contact V.E. Mike W2IG, w2igg 'at' yahoo.com.

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