

Penobscot County Soil & Water Conservation District



Photo taken by: Pam Wells

2019 Annual Report

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Message from our Chair



2019 was a great year for the district! We had a very active year with many diverse activities.

Our biggest accomplishment this year was the completion of our 319 grant on Cold Stream Pond. The NPS BMP's that we installed will prevent an estimate 350 tons of sediment, 298 pounds of phosphorus, and 596 pounds of nitrogen from reaching the lake annually. This project resulted in 19 LakeSmart evaluations with even more camp owners wanting

to continue the program in 2020. Thank you for working with us on this project, Cold Stream Camp Owner's Association, Kennebec County SWCD, the town of Enfield, & the Town of Lincoln. The district couldn't have asked for better partners!

I would also like to congratulate Pam & Bryan Wells of Wells Forest for being our 2019 Conservation Award winner. I am extremely impressed with the activities that the guys are preforming in their forest to show their commitment to sustaining forestry, soil and water.

I look forward to 2020! If you have questions or are looking for information, please give the Penobscot County SWCD a call. We would like to assist you with your conservation needs.

I hope you enjoy our annual report.

Robert Fogler

Meet the Board of Supervisors



Robert Fogler,
Chair



Dan Kusnierz,
Treasurer



Ryan Crane,
Supervisor



Mary Wilson,
Vice Chair



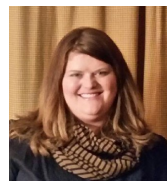
Pam Wells
Supervisor



John Simon,
Associate
Supervisor

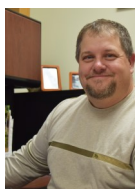


Carol Weymouth,
Associate
Supervisor



Amy Polyot,
District
Manager

Meet the Natural Resources Conservation Service Staff



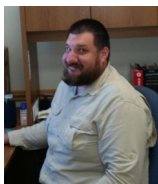
Charles Penney,
District
Conservationist



Misha Vargas,
Soil
Conservationist



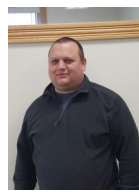
Ada Vilches,
Soil
Conservationist



Scott Carter
Ag Engineer



Ricky Hall,
Engineering Technician



Adam Cattrell,
Ag Engineer

2019 Financial Report

STATEMENT OF FINANCIAL INCOME AND EXPENSE

Income

Contributed Support	
Federal Grants	\$11,486.98
State Grants	\$25,009.95
Total Contributed Support	<u>\$36,496.93</u>
Earned Revenue	\$15,253.16
Reimbursed Expenses	\$0
Total Income	<u>\$51,750.61</u>

Expenses

Total Grant & Contract Expense	\$5,809.84
Total Miscellaneous Expenses	\$3,339.00
Total Non-personnel Expenses	\$17,966.84
Total Salaries & Related Expenses	\$27,898.59
Total Travel & Meetings Expenses	<u>\$427.08</u>

Total Expenses	\$55,941.35
Net Income	<u>-\$4,500.17</u>

***The District did not lose money. At the time of this reporting we were waiting on reimbursement from Maine DEP for monies we sent out for our 319 grant.**

STATEMENT OF FINANCIAL POSITION

Assets

Checking/Savings Accounts	\$360,695.73
Restricted Checking/Savings	\$78,389.21
Accounts Receivable	\$303.15
Fixed Assets	<u>0.00</u>

Total Assets	<u>\$365,857.50</u>
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Liabilities & Equity

Current Liabilities	\$95,396.09
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Equity

Opening Balance Equity	\$2,762.51
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Unrestricted (Retained Earnings)	\$272,389.19
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Net Income	-4,500.17
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Total Equity	<u>\$270,651.53</u>
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Total Liabilities & Equity	<u>\$344,129.35</u>
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Coming Events

- March 4th— The district will be hosting Septic Installation workshop.
- Come visit us at the PCCA Sportsman Show in Orono on March 13th-15th. We will be presenting information of invasive forest pests.
- The 2020 Plant Sale will be held on May 9th. Order forms are in our spring newsletter.
- May 18th will be our trout sale pick up day.
- The 2020 Downest Envirothon competition will be on May 29th at Leonard's Mills in Bradley.
- On June 26th-27th the district will be hosting a LakeSmart training.

2019 PCSWCD Annual Banquet.

Every year the Penobscot County Conservation District hosts an awards banquet. The banquet is a way to showcase the conservation projects that we have worked on in the past year. It is a great opportunity for conservationists to get together and catch up with one another. This year's banquet was a wonderful success. The banquet was held



at the Penobscot County Conservation Association's club house in Brewer on October 25th. Walking into the banquet, guests were greeted by Misha Vargas a soil conservationist with a bright smile and were welcomed to find seats and enjoy some yummy hors d'oeuvres. As people walked into the dining room, they were welcomed to fall forest. In honor of the years award winner we went with a forestry theme. At each place setting a chocolate leaf lollipops.

Guests enjoyed a feast of chicken & stuffing casserole and pot roast. All the wonderful food was provided by the PCCA club members. They now offer catering along with renting their club house and they did not disappoint! After the dinner, guests enjoyed a power point showcasing all the activities and projects that the district and NRCS have done over



the past year. After the slide show, we honored Pam & Bryan Wells of Wells Forest in Milford with the 2019 Conservation Award. Penobscot County SWCD District Manager, Amy Polyot gave a presentation covering all of the different projects and activities Wells Forest has done to support and educate people about conservation.

Banquet continued...

This year was the 4th year holding our Penobscot County Big Tree Contest. The contest winners were invited to the banquet and were honored with a certificate and a copy of the book, "Trees of Maine".

Instead of a guest speaker this year the board decided to show the short documentary Hugh Hammond Bennett: The Story of America's Private Lands Conservation Movement. The documentary was based on soil conservation pioneer Hugh Hammond Bennett and the history of conservation district, NRCS, and the birth of the private lands conservation movement in the U.S. The documentary was a very different entertainment offering than past banquets but, it was very well received.



2019 Conservation Award Winner

This year's Conservation award winner is Pam & Bryan Wells of Wells Forest in Milford, Maine. During the fall of 2004 and Spring of 2005, Pam & Bryan bought around 1,058 acres of forest land that make up Wells Forest. The property sits in Milford and Greenfield, Maine. The Sunkhaze Stream runs through the tree farm and it abuts the Stud Mill Road and is adjacent to the Sunkhaze Meadows National Wildlife Refuge.



Bryan & Pam Wells

Before they purchased the land, it had been heavily cut and Pam & Bryan realized that they needed some help to improve the land and learn how to manage it properly. Pam had always had interest in forestry. When she had started her college education, she had wanted to major in forestry but at the time it was a male dominated field and had very few women. Instead she got her bachelor's degree in anthropology/English and a master's degree in social work. With the purchase of Wells Forest, she felt it was a perfect time for her to go back to college and study her passion. Pam

enrolled in forestry classes at UMaine and started to ensemble a team to help her manage her forest and repair it for future as-sets. She brought on her consulting forester Kirby Ellis to start putting a forest management plan into action. Over time she has joined forces with Scott Madden and Madden Timberlands as logging contractors,



Wells Forest is over 1,000 acres

NRCS, students and professors from the University of Maine School of Forest Resources, as well as many others.

Continued on Page 9

2019 Conservation Award Winner Continued...



Wells forest is a certified American Tree Farm and in 2017 they were Maine's American Tree Farmers of the year. Pam was an instrumental part in putting together the book *What Would My Woods Look like?* The book is for land owners to be able to see what they can expect after having their forest lands harvest-

ed. Through the NRCS Pam & Bryan had a CAP Forest Management Plan done, did a pre-commercial thinning, and had assistance with widening their access road.

Today Wells Forest is a dream come true for Pam & Bryan. It helps drive both of their passions. Pam's love for Maine forest and photography and Bryan's love for the stars. It has offered them so much and introduced them to so many new people. They have opened their land up for others to enjoy so that they can see why this place is so special. They are both true stewards of the land and try their best to address the quality of water, wildlife, wood and recreational uses on their tree farm. For the future they hope to encourage more Umaine students to use their forest for their studies and start to clear older trees that need to come down for new growth. Wells Forest looks to have a bright future. Congratulations Pam & Bryan of Wells Forest on being our 2019 Conservation award winner.

2019 District Highlights

DownEast Envirothon

Every year the district teams up with other districts to put on the Downeast Envirothon competition for high school students. Envirothon is a natural resource problem-solving competition for grades 9-12. In an outdoor setting, students are tested in five natural resource areas: aquatics, forestry, soils, wildlife, and a current national environmental issue.

Envirothon is a team effort that includes site-specific, hands-on tasks. A team includes three to five students, an alternate, and an adult advisor.

Continued on Page 9

2019 District Highlights

Regional and state competitions are held each spring. The top Maine team qualifies for the North American Envirothon finals, an opportunity to compete against teams from across the United States and Canada.

This year the Envirothon was held at Penquis Valley School in Milo, Maine. At the Downeast competition we had 9 teams participate and 35 volunteers. 1st place went to Central HS Team 3, 2nd place went to Mt View HS Team 1.



Central HS Team 3

Invasive Forest Pest Outreach Program



The district is very involved in informing the public about the Invasive Forest Pest Outreach Program. Over the course of the year the district has held workshops and presented information to the public at various events about the program. This program has become a staple for not just the Penobscot district but, Maine districts as a whole.

The district had an informational booth at the Maine Sportman's Show in Orono, Maine. The show was for 3 days and the district presented information about invasive forest pest. We had hundreds of people stop by the booth where they received information, asked questions, and were educated on how to spot invasive pests and how to report the findings.



On May 22, 2019 the Penobscot County Soil & Water Conservation District participated in the Kids Field Days at Leonard's Mills in Bradley, Maine. The Kids Field Day is a three day event where kids from area school come and do various activities related to nature and history.

Continued...

2019 District Highlights

The district had an Invasive Forest Pest booth where we did a presentation on invasive forest pest and then did the Build a Beetle project. The kids were able to build an Emerald Ash Borer or an Asian Long horned Beetle. The district presented and built beetles with over 150 students.

On August 24, 2019 the district partnered up with the Piscataquis County SWCD for their Families in the Outdoors: Bugs day. Amy did a presentation on invasive forest pests and did build a beetle activities. Participants got to go out with bug nets and collect insect for identification. The group learned about insects found in field and garden settings along with forest settings. It was a fun morning for everyone and so many diverse insects were collected.



Plant & Trout Sales

The sales were very successful again this year. It was so exciting to see that residents are supporting our district. This year's plant sale had a large amount of pre-orders and we met so many new people who just stopped in for our cash and carry plant options. The district offered bare root trees and shrubs, annuals, edibles, garden seedlings, and perennials. We still had our Kids Crafting Corner. Kids got to decorate flower pots or bird houses. The kids had a great time!

This was our second year working with the MicMac Indian Tribe for the trout sale. It was another successful sale and is a great partnership. The provide high quality brook trout for pond stocking to 10 districts now. The customers are very happy with the new supplier and keep coming back. We are looking forward to working with the tribe again in 2020.



2019 District Highlights

319 Grant: Cold Stream Pond

Over the last 3 years the Penobscot County Soil & Water Conservation District has been working on a 319 grant that they were awarded to do work on Cold Stream Pond. The purpose of this project was to protect and improve Cold Stream Pond water quality by reducing sediment that delivers phosphorus to the lake. Total funding was for \$94,295. A little more than half of this amount came from the EPA grant. The rest came in the form of both cash and “in-kind” services. The CSCOA provided the largest share-- \$17,171, half cash and half in-kind. Other contributions came from The Penobscot County Soil and Water Conservation District (PCSWCD), Kennebec County SWCD, Town of Enfield, Town of Lincoln, Gardner Logging Services, and Treeline Inc.. The major tasks of this project was to reduce soil entering the lake from road sites, reduce soil entering the lake at residential sites, and to do education and outreach.



Through the grant we were able to install BMPs on 10 of the NPS Abatement Road Sites. Installed BMP's included ditch stabilization, check dams, plunge pool, armored inlet/outlets, culvert replacement, a Stream Smart crossing, turnouts, mulching, shore and bank stabilization, and road leveling. The Lake Smart program became widely popular on Cold Stream Pond as a result of this grant. Our original task was to do 10 LakeSmart evaluations. 19 were completed with more camp owners requesting them for the summer of 2020. The LakeSmart evaluation program will be one of the CSCOA's continued services. To our surprise Treeline Inc. donated \$1,500 and Gardner logging donated \$3,500 beyond what they originally pledged toward the project.



Timber bridge installed at Morgan's Beach.

An estimated annual reduction of 350.9 tons of sediment, 297.92 pounds of phosphorus, and 596.01 pounds of nitrogen was achieved through CSA's, as well as stabilization of 230 feet of shoreline. All parties involved felt that we successfully administered this grant and benefited the lake.

Irrigation: Micro-Irrigation Project at Treworgy

5 Acres of micro-irrigation

By: Misha Vargas

Soil Conservationist,
NRCS



Mathew Pellerin, best known as Matt, walks up and down the orchard's fields as he gives instructions to his crew of the day. In the background I see kids playing in the corn maze, some are getting hayrides and others are collecting frogs in the near by pond on a 73-degree weather day. As I wave at him, I admit getting a little distracted by the ice cream booth and some warm smiles from the staff, yes, who wouldn't right?!



WHY DO WE NEED IRRIGATION?

Treworgy Family Orchards grows a variety of vegetables and fruits, from apples to pumpkins, and berries to corn (...) even Christmas Trees! We (NRCS) have created a system that's designed to supplement rainfall during the dry portions of the growing season. This system can supply approximately 3 days of the total peak consumptive use needs per irrigation event. With this said, we are not just improving an irrigation system; we're making it efficient so that there's no waste of water!

Underground pipeline

Irrigation: Micro-Irrigation Project at Treworgy

Continued...

Think about how much water is lost with the overhead (prior to micro) irrigation system, wind and over application can be an issue and overall a resource concern.

The proposed irrigation methods are the two existing ponds that serve as water sources. NRCS provided funding for over 4,000 ft. of pipeline (surface and underground) in order to transport water from both ponds to the apple orchard. Also, 5 acres of micro-irrigation were implemented in the project.

It was definitely a pleasure to work with the Treworgy Family...



Kids at Treworgy's Summer Camp

Phot credit: Focus On Fall_HTC one M8 Style/The Shaker of Salt

Roofed Waste Storage & Heavy Use Area: Cedar Run Farms

By: Ada Vilches, NRCS Soil Conservationist

This past year the NRCS had the opportunity to work with Cedar Run Farms located in Bradford, ME. They are a conventional beef operation with 90-100 beef cows. The farm consists of 229 acres and the herd is managed in an intensive grazing system.

The concerns regarding the farm operation were that it

was surrounded by hydric soils and intermittent streams that drain into the Mohawk Stream. Which is designated as an essential habitat stream for eastern wild brook trout. At the time the stacked manure and bedding were located on exposed soil with no filter areas. Therefore, nutrients were flowing into surface water and ground water. Livestock was also causing soil compaction issues and soil erosion.



NRCS staff worked with the producers to come to a viable and functional solution. The NRCS Soil

Scientist determined that the soils were not suitable for drainage thus a filter area could not be established. Due to this it was established that a roofed waste storage and heavy use facility would be done in order to keep livestock in the facility for 210 days thus reducing nutrient runoff and improving water quality. The final implemented project was 85' x 142'.



Mini-Split Heat Pumps 2019 Update

by John Simon, associate supervisor

INTRODUCTION:

This is an update to my original report of 2015 when I only had an upstairs 12000 BTU unit for air condition and supplemental heat. Since then I have installed a 15000 BTU unit downstairs for additional heating. Hopefully this article will clear up many of the questions that you may have.

To confirm all the electric use installed a separate watt-hour meters for the each M-S to see exactly how much electricity each unit would use and compare it to the daily heating degree days at my house. The following describes the units and the results of their use so far.

HOME INFORMATION:

The house is a raised ranch with 1400 SF on the upper floor and 700 SF on the ground floor (not including the garage under the bedrooms). The heating system is an oil fired boiler with a hot water baseboard system throughout. There are three separate circulator pumps on the boiler. A circulator pump for Zone 1 heats the 700 SF of downstairs living space, Zone 2 pump heats the 700 SF of the upstairs LR_DR_Kit area, and Zone 3 pump heats the 700 SF of bedrooms and baths.

The Zone 2 oil thermostat for the LR_DR_Kit is now set at 70F, Zone 3 oil thermostat for the Bedrooms is set at 64F and the Zone 1 oil thermostat for the downstairs family area is set at 70F for the winter. These oil settings are set 2 degrees below the thermostats for the two heat pumps which are set at 72 degrees during the heating season.

Upstairs in the Zone 2 area is a 12,000 BTU Fujitsu M_S unit (installed 1-30-14), the M-S units' thermostat is set at 72F. This is two degree above the setting for the Zone 2 thermostat for the furnace that serves the same area. This setting is in case the M-S unit failed to operate or keep up with demand. The electric use by each M-S is measured by a separate EKM Meter, Model EKM-25IDS. They are single phase, 3 wire kWh meters measuring to an accuracy of 0.01 of a kWh.

Downstairs in zone 1 is a 15000 BTU Fujitsu M_S unit (installed 9-6-17) set at 72 degrees in winter.

The oil heating system is baseboard hot water system with a Burnham boiler with a Beckett burner unit. The Beckett burner is controlled and monitored by a intellicon-HW+ unit by intellidyne Inc. meter. Among other values, the unit keeps track of the time the burner operates (at a rate of 0.85 gallons of oil per hour). The intellicon reads the burner RT (runtime) to the nearest 0.1 of an hour. This unit is read every day at the same time the M-S unit meters are read. A spread sheet is maintained to log values and compute use of oil and electric and compared to the Heating Degree days for the day or period since last use.

Over the summer the values for oil use to provide hot water and standby losses was determined to be about 0.55 gal per day with 0.30 gal per day of that are used up in standby loss. The values for the summer of 2019 were 0.61 gpd for standby loss + hot water and 0.45 gpd for stand by only. The 2019 values were for a longer 2 week period. Since the standby loss helps to heat the downstairs area in the heating season, so it is counted towards heating during the heating season not as hot water use.

Mini-Split Heat Pumps 2019 Update Continued...

No accurate record of daily wind speed or relative humidity records are kept other than notes such as -windy-humid-dry-rainy-sunny etc. Both of the M-S units are on the southerly facing wall and receive sunlight from about 8:30 am to sunset in the fall/winter/spring.

INITIAL SUGGESTIONS:

Before getting into the analysis of the historic records I have some suggestion for the user/purchaser, based on my 4 seasons of use.

1 - shop around,

2 - talk to local users if possible,

3 - if the outside units are mounted on the wall of the house insist that they use a set of four vibration isolation washers on every outside unit. These vibration separation washers are about 1" in diameter, 1" thick, and are a rubber type material. They will drastically reduce the noise/vibration that enters the house walls! There cost is only about an extra 15 \$ for the set of four for each unit. They should come standard, but so far they do not.

4 - if noise or vibration is a real issue, an option to exterior wall mounting is an outside free standing metal table. These tables do cost several hundred dollars extra.

5 - the inside units are quite quiet and comparable to the noise of the refrigerator of your home.

6 - the inside units have adjustable vanes that allow the direction of the air vertically and horizontally. You will need to experiment to best fit your conditions/comfort needs.

7 - These units are meant for open areas so if you expect to cool/heat multiple rooms having doors, then you will need to leave the doors open or replace the inside doors with slatted doors.

8 - if your house has multiple floors, an upstairs unit will air condition you whole house (I have an upstairs 12000 BTU unit) without the need for a downstairs unit for AC. If I had to do it again I would have used a 15000 BTU upstairs as I have downstairs. For the summers of 2014 to 2019 the unit has done well and only struggles for the few days in the summer when the temperature exceeded 90 degrees and is humid. It still kept the house dry and around 76 degrees! In the AC mode the outside wall unit will drip profusely all the time as it removes humidity from the house. Clean water anyone?

9 - the outside units protrude about 15 to 18 inches beyond the outside wall, so unless your roof overhand, if any, protrudes that much, I would strongly recommend the sloped metal cover for each of the units. My house on the south wall has no overhang, so the extra covers covers were a blessing in reducing the icing of the intake and exhaust grates. These cover units cost about 150\$ but the cost may be negotiable. Units on a wall with an 18-24 inch overhang probably do not need these cover units

Mini-Split Heat Pumps 2019 Update Continued...

10 - I tried using only the downstairs 15000 BTU unit for heat and it resulted in the upstairs oil zone (set at 70 degrees) coming on too often, so I now use both M-S units set at 72 degrees. Now the oil zones do not come on until the outside temperature is very cold.

11 - I leave the units running no matter what the outside temperature is. I will show you the results in the Analysis section.

Use in Air Conditioning mode: Here is the summary of what I have experienced in electric use by mini-split since installation for use in Air Conditioning for the summers of 2014 and 2018.

The upstairs 12,000 BTU Fujitsu unit COOLED the entire 2100 SF of house (upstairs and down). All indoor doors were kept open. The unit was run 24/7. The unit is "smart" in that the indoor and outdoor (compressor) units ran only as needed. The unit was set at 72 degrees. For 2014 (the first summer) The AC ran from June 8, 2014 through September 13, 2014. For 2018 only July and August are shown.

TABLE 1 for Air Conditioning with one Mini-Split

2014:

June 2014 use (22d)	69.50 kWh @ 0.17758 \$/kW	or 12.35 \$/Month
July 2014 use (31d)	134.05 "	23.80 "
August 2014 use (31d)	118.55 "	21.05 "
September 2014 use (13d)	57.29 "	0.17 "
[83 days of use]	379.39 kWh/season	67.37 \$/season
	4.57 kWh/day	0.81 \$/day for AC

2018:

July 2018 (31 d) upper unit	186.56 kWh	
dn/stairs unit	5.43 kWh	
	191.99 kWh @ 0.17355 \$/kWh	
		33.69 \$/mo. (1.12\$/d)
August 2018 (31 d) upper unit	158.79 kWh	
dn/stairs unit	9.29 kWh	
	168.08 kWh @ 0.17355 \$/kWh	
		29.17 \$/mo. (0.94 \$/d)
		62.86 \$/62d (1.03\$/d)

Use in Heating Mode:

The two units HEATED the entire 2100 SF of floor space as follows. Both of the mini-split units were set at 72. The oil zones were set at 64 deg. for the bedrooms, 70 deg. upstairs, and 70 deg. downstairs.

A temperature variation of from 6 to 10 degrees was experienced from the upstairs area of the bedrooms at the other end of the house. Weather in the 30's and above showed a variation of about 6 degrees. As the temperature dropped into the single digits the variation was 8 to 10 degrees depending on the wind, and the oil zone would come on in the early mornings. NOTE the upstairs area has large windows with east and south exposure that experience solar heat gain during sunny winter days (if any). These large windows also have level or shades for night insulation.

Mini-Split Heat Pumps 2019 Update Continued...

TABLE 2 for Heating Season with 2 Mini-Splits

2018 / 2019 heating season:

This discussion will cover the two plots shown as **Figure 1** and **Figure 2** for the 2018 / 2019 heating season only.

Figure 1 show the plots for Heating degree days (HDD), versus kWh use for the same day. One can plot regression lines somewhat different than mine to fit the data points if you so choose, but be careful. Remember that the data points are for a 2100 SF area for a house with 6 inches of insulation in the walls. You can probably proportion the use for your house based on your floor space. i.e. For a house with 1050 SF you could use about 1/2 the values on chart.

The lower line shows the kWh use for each degree day. For instance for 30 HDDs one could expect to use about 20.7 kWh. Data points below and to the right of the line reflect days that are windy and/or cloudy. Data points above and to the left of the line represents days that are sunny and/or calm.

For Bangor the seasonal HDD is about 8000 HDDs. Assuming an average of 240 days per year requiring supplemental heat we obtain a daily need for about 23.5 kWh or about 5640 kWh per season. At a cost of 0.17355 \$/kWh gives a seasonal cost of 979.00 \$.

The second and steeper line on figure 1 represents the line for when the oil heating systems start to kick in. The bedroom oil kicks in to assist the heat pumps in when the temperature at night drops into the teens. The remaining 2 oil zones kick in the temperature drops into the single digits and below.

One can do all sorts of calculations as you wish with the charts. Remember the steeper line will be different if the oil setback is different than the 2 degrees represented. i.e. if one set the oil at 5 degrees below the mini-split the oil use would be less, and the upper line would shift to the left, but the temperature would probably fall below the comfort line. If you put in a M_S you will need to experiment!

Figure 2 is a plot of heating oil use versus HDD for the two conditions. The first (bottom line) is a plot of only oil use without the assistance of the heat pumps. The second lines are oil use with the assistance of the two heat pumps.

From the bottom line and using the above figures of 33 HDD per day as an average for the 240 days of the heating season we obtain a heating oil use of 2.25 gallons per day. At a cost of 2.589 \$/gal this gives a daily cost of 6.00 \$/day or 1,398 \$/season.

Looking at the upper set of lines we observe a sharp break in the two lines. The steeper line is the oil use with the two ini-splits on and shows only a modest use of oil by the bedroom zone 3 until the HDD reaches a value of about 41 (overnight lows in the teens). The flatter of the upper lines shows the oil use for HDDs greater than 41.

Lets put the two charts (figure 1 and figure 2) together and see how they could be used for estimating costs and savings (if any). Let us assume we have a sample 1800 SF home and calculate the use / cost of oil alone, and oil supplemented by heat pumps.

Mini-Split Heat Pumps 2019 Update Continued...

For Bangor, Maine @ 8000 HDD per heating season gives an average daily HDD of 33.

Oil use along: $2.25 \text{ gpd} \times 240 \text{ days/season} = 540 \text{ gal/season}$ (463 gal for sample home)
 $540 \text{ gal/season} \times 2.879 \text{ \$/gal} = 1,555.00 \text{ \$/season}$
 $1555.00 \times (1800 \text{ sf}/2100 \text{ sf}) = \underline{1,334.00 \text{ \$/season for sample home}}$

Oil with heat pumps: $0.33 \text{ gpd} \times 240 \text{ days/season} = 79.2 \text{ gal/season}$ (68 gal for sample home)
 $79.2 \text{ gal/season} \times 2.879 \text{ \$/gal} = 228.00 \text{ \$/season}$
 $228.00 \times (1800 \text{ sf}/2100 \text{ sf}) = \underline{195.00 \text{ \$/season for sample home}}$

Heat pump Electricity: $23.5 \text{ kWh/day} \times 240 \text{ days/season} = 5640 \text{ kWh/season}$ (4834 kWh for sample)
 $5640 \text{ kWh} \times 0.17355 \text{ \$/kWh} = 979.00 \text{ \$/season}$
 $979.00 \times (1800 \text{ sf}/2100 \text{ sf}) = \underline{839.00 \text{ \$/season for sample home}}$

Annual cost with oil only = 1334 \$ (total)

Annual cost of oil and heat pumps = 195 \$ (oil) + 839 \$ (elec. for H_P) = 1024 \$ (total)

Annual savings using heat pumps = 1334 \$ - 1024 \$ = **310 \$**

Annual reduction in oil use = 463 gal - 68 gal = 395 gal or 85 % savings
 = 395 gal \times 2.879 $\text{\$/gal}$ = 1137 \$ savings

SUMMARY:

Summing up the analysis shows that even though 1,137 \$ in oil is saved there is an additional cost of 839 \$ for electricity to run the heat pumps. Over 100 $\text{\$/month}$ most winter months. So beware.

If you spend about 6,000 \$ for the two heat pumps, the return is $310/6000 \times 100$ or 5.2 % return on investment.



On the environmental side of the discussion of the switch we have a savings of about 85 % in oil volume and replaces that with 4834 kWh of electricity which I think in Maine is in the neighborhood of 50 % renewable. So the impact on CO2 levels is significant.

Notice carefully on the photo to the left the thick rubber washers separating the outside unit legs from the wall supporting brackets. Also note the sloped metal cover previously mentioned.



*Penobscot County Soil & Water
Conservation District*

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