

SUSTAINABLE NORTHERN BEEKEEPING
A METHOD TO IMPROVE SURVIVAL AND REDUCE REPLACEMENT COSTS
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A beekeeper should only purchase honey bees in three cases: 1) their first year, when they are initially getting their operation established, 2) if they want to add fancy genetics, or 3) to recover from an emergency like a flood or a bear attack. Any purchases outside of these three scenarios indicate that the apiary is not sustainable. A sustainable apiary is just that – self-sustaining, in both economics and livestock. Many small-scale and hobby beekeepers operate in a manner that is highly unsustainable – dependent on the purchase of bees *year after year* to replace lost colonies. It has been completely normalized and standard for hobby and small-scale beekeepers to purchase nucs or packages from across the country in the spring, lose 30-100% each year, and make up their losses by purchasing new packages from across the country the next year. While many beekeepers express that they value sustainability and outwardly support many other sustainable agriculture practices, these same individuals often practice beekeeping using methods that are highly inefficient and unsustainable on multiple fronts: the lives of their animals are not protected, their operations are not economically viable, and their system of keeping bees has a large environmental footprint. By making some shifts in management strategies and focus, small-scale beekeepers can move to self-sustaining operations that support their local bee communities.

The increased availability of package and nucleus colonies has allowed small-scale beekeepers to maintain practices that are not always in the best interest of them or their bees, and has caused beekeepers to forget basic practices and skills. The method of purchasing replacement colonies in the spring made sense when losses were lower and replacement packages were cheaper. However, the practice continues even though both losses and prices are high. Stationary beekeepers in Michigan (where I live), and other northern states consistently see high, unsustainable losses; average winter losses have remained around 30% for almost a decade. For most hobby and small-scale beekeepers, this number is even higher. It is common for local bee clubs to record losses of 50 – 100% from hobby beekeepers (this spring I had a beekeeper tell me his bees did great – only 50% loss!). The cost of replacement packages and nucs has increased considerably the last few years, making this process financially unsustainable. In 2001, a 3-pound package was around \$45. By 2013, this price had risen to \$85, and this spring (2017), most packages in Michigan were sold for around \$125 each. These costs would be manageable if replacements were rare, but many beekeepers are purchasing replacement colonies annually, and the sustained costs sometimes cause new beekeepers to quit beekeeping after a few years. When you add in the risk of disease importation and the large carbon footprint as bees are trucked cross country, it is easy to see that this system is not good for bees or beekeepers.

It is always good practice to evaluate your methods, even if beekeeping is just a hobby for you. Are you happy with the health of the animals under your care? Are you comfortable with your role in transporting bees cross-country? Does it feel like the way you keep bees is good for you or your bees? Could you do more to make bees available to newbees in your club? If your beekeeping is not in line with your values of animal welfare, economic sustainability, and a smaller carbon footprint, it may be time to retool and rethink your beekeeping strategy.

Here is my definition of a sustainable apiary:

- My bees live. They are kept in good health, and free from preventable illness;
- The quality of my stock is constantly improving;
- I anticipate my losses and prepare for them;
- My apiary is closed – I only import bees when I want new genetics;
- My excess bees are made available to beekeepers in my local community.

With food, we focus on “Buy Local” – the messaging that promotes purchasing meat, milk, and produce from nearby – reducing the environmental costs of transport and supporting regional growers. With bees, however, the supply is not there to support demand of hobby beekeepers who count on purchasing replacements each year. (I make a living selling bees, and I started a website to promote my competitors – www.northernbeenet.com just so I had a place to send people when I ran out). Promoting sustainable local beekeeping in your area is more than just ‘buying local’ and demanding local bees – Sustainability in beekeeping means reducing your demand (and even better, contributing to your local supply).

In 2015 I was awarded a farmer rancher grant through the USDA SARE program ([FNC15-1005 Improving apiary sustainability by using an overwintered nuc system for colony replacement and expansion instead of purchased package bees](#)). This project was designed to examine a sustainable system of colony management that works to eliminate replacement costs for small-scale northern beekeepers, and to provide a more sustainable method of yearly apiary operation. In the past few years I have been experimenting with different management strategies, and have talked to many others who successfully manage sustainable apiaries. My goal is not to determine a perfect management system that can be copied and implemented by all beekeepers in all areas, with no problems ever. Rather, I wanted to examine and promote different methods that allow for beekeepers to be self-sustaining.

I think that the ease of purchasing nucs and packages has allowed beekeepers to become complacent in the care of their animals. I have met many new beekeepers who are stuck – they have not learned basic skills like requeening or making splits, because it is easier to purchase new bees than to overcome the intimidating learning curve required in becoming a better beekeeper. Other beekeepers are stuck in old habits – keeping bees in the exact same way as 20 years ago - before we had varroa. Even more beekeepers are following information from internet sources that aren’t appropriate for their area (or sometimes any area). If 30-50% of your animals die every year, it isn’t fair to you or your bees to just buy new ones and not seriously re-evaluate your methods.

There are two key areas to focus your beekeeping skills if you want to be more sustainable and stop buying bees. The first is to reduce the number of colonies that you need each year, by improving your management (disease control, nutrition, stock selection). The second area is to account for your losses, adjust your management so you can make them up from bees within your own apiary. In the information below I am going to focus on the second point – how to make your own replacement colonies so you never have to buy bees again, though it has advantages that improve survival as well.

The basis of the proposed method is the use of late season splits. This means splitting colonies after the main honey flow as a way to increase your overall number of colonies. Not only does a system of late season splits allow for the production of replacement colonies, but it also has benefits that improve colony survival. It does this through both the reduction of disease and a focus on younger and better queens.



Rows of nucs ready for sale to beekeepers in the spring.

Here is how to work towards never buying replacement colonies again:

Realistically prepare for your losses. Every year, beekeepers do themselves a disservice by not honestly preparing for loss. You will have much more luck managing an apiary that has honest and realistic expectations than pretending that this will be the one year where you personally solve the bee crisis. If beekeepers all over the country lose high numbers of colonies every year, and you have lost high numbers of colonies every year, then maybe you should plan to lose high number of colonies this year. It may feel like you are not putting faith into you or your bees, but we have been in an era of high losses for over a decade. While it is important to work towards reducing your losses, it is also important to prepare for them, so you aren't caught off guard, and are forced to buy bees yet again in the spring.

As beekeepers, we always want to reduce our losses. However, the first step to keeping a sustainable beekeeping operation is to know your rates of loss, and to honestly account for it in your planning (while continuing to work on lowering your losses).

Looking at the numbers

If you are a beekeeper with 10 colonies, and you want to start the year with 10 colonies, how many should you over winter? If you just put each colony into winter, and you lose 30%, then you will have 7 in the spring. What if you split in the fall, so you overwinter 20 colonies?

Overwintering 20 colonies provides a buffer- you can sustain a 50% loss without having to worry about purchasing any replacements.

What if you have a great winter, and all of the colonies survive, and you have too many bees in the spring? I get asked this question all the time, and it demonstrates how far we have changed our mentality about what it means to be a part of a beekeeping community. Currently, there is no such thing as 'too many' local bees. It makes absolutely no sense to make your neighbor buy bees from across the country when you can so easily meet demand within your own club. There are enough bees in the hives of hobby and small-scale beekeepers to support hobby beekeepers. If everyone overwintered one extra nuc, and made it available to their club, friend, or neighbor, there would be no need to import truckloads of bees every year. Back to your 20 colonies - even after a 30% loss, you will have 14 colonies. In my area, nucs sold for \$150-\$200 in 2017. If you want 10 colonies, you can sell the 4 extras at \$175 each, for a profit of \$700. Even if you have a bad honey year, you have already brought in \$70/ original hive. Local bee clubs and the internet become great resources for distribution of extra colonies. If you club doesn't have a system to help distribute excess bees among its members (you could set one up!), most do have newsletters, email lists, or ads. Facebook groups, including the [Northern Bee Network Sale/Swap page](#) and craigslist are great ways to sell local bees quickly.

Comparing the two systems for a beekeeper with 10 hives and an average 30% loss

- Current system: Overwinter 10 colonies, lose 3, purchase 3 replacement packages at \$125 each = **Loss of \$375/ year.**
- New system: Make late season splits to overwinter 20 colonies. Lose 6, sell remaining 4 extra to someone in their club = **Profit of \$700/ year.**

The balance difference for this beekeeper is over \$1000 for just 10 colonies in just one year. For most small scale beekeepers, that is more than enough to cover replacement equipment, feed, medications, and to have a small profit – even before honey is considered. Beekeeping is no longer a money sink – spouses are happier, and funds can go towards a fishing boat. For small scale farmers, this balance difference of \$100 / hive in the spring can completely change the profitability of their honey bee operation.

Disease benefits

Generally, the beekeepers who are selling packages and nucs do a good job of controlling disease. They have to, or they wouldn't have excess bees to sell. However, colonies are not sterile, and a nuc taken from even a healthy colony can carry pathogens than can cause disease – especially after the stress of splitting, transport, movement to an often much colder climate, etc.

Once you stop the importation of bees into your apiary, you will greatly reduce the risk of disease importation.

Late season splits also provide an excellent method of varroa control. In northern states, we often see varroa mite populations reach damaging levels in mid-August- right at the time that precious winter bees are produced. For those of us who don't move our bees south, we absolutely depend on the last generation of bees to survive the whole winter. If those winter bees are damaged from varroa mites, or suffering from the viral diseases that they carry, our colonies don't stand a chance of surviving winter. Splitting before the winter bees are produced can reduce varroa populations, and may even be sufficient to control mites completely in some areas.

Queen benefits

Late season re-queening can improve colony success in multiple ways: younger queens do better in spring build-up, are less likely to swarm in spring, and different queens have different genetics that can improve survivability and colony success. This system of late season splits takes advantage of all of these factors to improve survival. Because you are re-queening/splitting after the main honey flow, you can take the time to find queens with the genetics that you want. It is also easier to find queens from northern stock later in the season. In Michigan, I generally can't start raising queens until mid-May (in my zone, our last frost free date is May 10, though in 2016, we had snow May 16). Even if the cells don't chill in mating nucs, we often won't have warm enough weather for consistent mating flights or enough drones to ensure that the queens are well mated if I start earlier. That means that northern queens are hard to come by for



A VSH breeder queen. By late summer I should have a good idea of what colonies are doing best, and which ones I should replace with new, and better genetics.

spring splits. When I split in the late season, I have ready access to local, well-mated queens, that are young and have never gone through a spring build-up.

By focusing on re-queening in the late season, I am also working towards overall better genetics in my apiary. By the time I make late season splits, I already have a sense of which colonies performed the best – who made the most honey, and who was able to control varroa mite populations without swarming or treatment. I also have a sense of what colonies did not thrive – who didn't make honey, battled chalk brood, had a bad attitude, or required additional treatment to keep varroa populations low. I have enough information so I can expand from my good colonies, and replace the genetics in my poorly performing colonies (either from my own operation or by purchasing queens with desired traits from other queen producers). Each year, I am consistently moving the quality of my bees in a positive direction.

Bringing back sustainable beekeeping

The goal of sustainable beekeeping is to improve your overwintering rates (reduce demand) while creating your own supply for bees in the spring. By overwintering more, but smaller hives,

beekeepers can overwinter hives with young queens with desired genetics, control varroa, and make up their losses from within their own operation. I did not develop this system – beekeepers have been overwintering nucs for ages. For some reason, it is no longer commonly taught to beginning beekeepers, or promoted through local clubs – at a real detriment to new beekeepers.

This method has caught on in a few areas of the country, where others have been promoting these practices, and input from leaders in these regions informed my work. In Ohio, Joe Latshaw (<https://www.latshawapiaries.com/>) has been overwintering nucs for years. After having difficulty with survival in wooden boxes, he experimented with Styrofoam nucs (SARE grant FNC80-700), and developed a system that works well for him in his area. In New England, Michael Palmer and Kirk Webster have been overwintering nucs in double nuc boxes, with huge success. The SARE program has funded other projects that have looked at nucs as part of general apiary management (FNC10-822, FN09-665, FNE12-756), as well as projects that compare nucs to packages (FS08-223, FNE10-694).

Three projects examine splitting hives for replacement colonies. One made splits in the spring (FNE06-567), and the second during the main honey flow (FNC80-701). As expected, both reported a decrease in honey crops. SARE project FNC12-856 approached the issue of summer nucs to replace packages, using uniform sizes of brood and bees. Unfortunately, they had low winter survival rates (53%), and issues with swarming and growth in the summer. The author discussed the difficulty of ‘variables you can’t control,’ but recommend ‘the making of nucs in July has merit’. Project FNC02-421 split colonies in late summer. It had greater success, and the split colonies had greater survival than the non-split colonies. These colonies were split in half, sustainable at that time of small losses and low package prices (estimated at \$40-45, 1/2 of current costs).

Two SARE projects were funded that promoted the use of local nucs: one in Indiana (FNC12-856), and one in Virginia (FS08-223). Before I promoted overwintering nucs in my region, I wanted to get more experience with methods that had been successful for others, and to systematically evaluate some of the variables identified in other projects. My goal is to have a method of colony replacement that doesn’t require high labor or cost, and also doesn’t cut into honey production. I received a SARE grant in 2015 to help with these questions (FNC15-1005).

Variables for making and overwintering nucs

There were four variables that need to be considered when making and overwintering nucs: the timing, the source of the queen, the source of the bees/brood, and the equipment. What I have found (as is the case in most of beekeeping), is that there is no ‘right’ way to make up nucs. Rather, there are some conditions that can predict success, and some combinations of variables that work better than others. I did not find the perfect method of overwintering nucs that would work for all beekeepers in all regions. Rather, I found about four strategies that worked well for me that I intend to keep as parts of my management strategy and teach to others.

1) Timing – what is ‘Late season’?

The goal of the splits is to do them at the end of the main honey flow, up until the point when winter bees will start to be produced. There are factors to consider when deciding when to make your splits

- If you live in an area with an incredibly strong dearth, you may want to make the splits near the end of the main honey flow to avoid the risk of robbing.
- If you split too early in your honey flow, you can lose honey production from your big colonies.
- You want the colonies to be well established and laying well before you need winter bees.
- If you are breaking down bigger colonies, you may want varroa under control first, so you don’t have to do pest control in your many small colonies.

Note: Many beekeepers use splits as part of their spring swarm management. Since the system outlined here is really focused on late season (after the honey flow, and therefore after spring swarming), it assumes that you have swarming under control.

Where I live in south-central Michigan, our main honey flow generally ends in mid-July. I live near a lot of wetlands, so I generally get a trickle through August, and our goldenrod starts to bloom end of August with a peak the first week of September. I make my nucs anytime from mid-July to mid-August. The timing determines how exactly you will make the split. If you make the nucs earlier in the season, you can use a queen cell, and can make them smaller, because they will have time to grow. You can make splits later, but would want to use a mated queen, and would leave them with honey from the original hive.

- **Method 1:** Make up small nucs in July, and allow them to grow
- **Method 2:** Split existing colonies into 2 or 3 in August

2) The queen

You can use a cell, virgin, or mated queen for your nucs. I don't tend to use virgins, since I have the least luck introducing them. In all of my nucs I used cells or mated queens. If I made the nucs at the early end (July) I preferred to use cells – they were much cheaper, and gave me a break in the brood cycle. The downside is that I would lose a few nucs to unsuccessful returns from mating flights, but those were easily recombined. Later in the season (August), I used mated queens, because I didn't want to interfere with the production of winter bees. I raised the queens myself, but you can get them from a local beekeeper (www.northernbeenetwork.org), from a neighbor, or from any breeder whose genetics that you are interested in trying.

- **Method 1:** Use a queen cell in July
- **Method 2:** Use a mated queen at any time

3) The bees

A nuc is just a small colony, so it has all the parts of a colony – brood, food, and bees. You can get these components in 2 ways. First, you can make a very small colony, and let it grow. Second, you can break down existing colonies into ready to winter splits. Many people who overwinter nucs use the first method, so they have to make up their nucs earlier (Beginning of July). If you add in a lot more honey and bees, you can make them into August. You can take the resources to start the nuc from whatever colonies that you like, though there are a few methods that work well.

- **Method 1:** Take one nuc from each colony. Put the old queen in the nuc, and requeen the existing colony with a new queen. This is an excellent method for beginners who have just purchased bees from out of state – it provides them with a young queen going into winter, plus enough back up colonies that they can take a 50% loss.
- **Method 2:** Break down smaller colonies completely. Don't use sick colonies, of course, but completely dismantle colonies that didn't perform as well or with less than desirable genetics into as many nucs as possible.

4) Equipment

Many beekeepers think of nucs as existing in only a 5-frame box, but there isn't a standard. There are many types of equipment that can be used for overwintering small colonies, or nucs. In research we use 2 frame nucs, many queen breeders use baby nucs to mate virgins, and some people overwinter a 10 frame nuc. The idea is that it is just a smaller colony. For that reason, you can use equipment that fits your purposes.

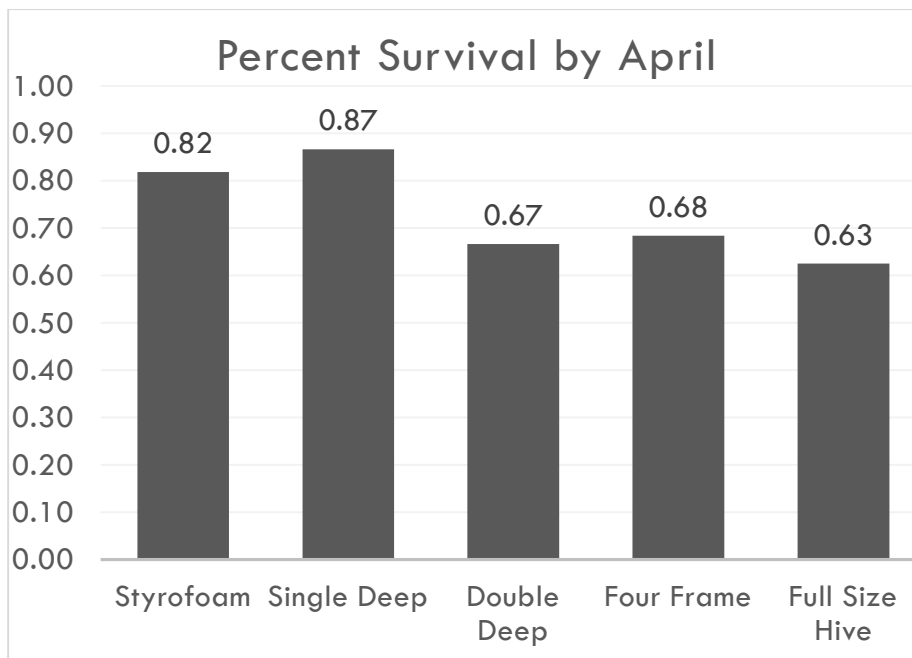
In the winter of 2015/2016, I compared multiple equipment styles. I overwintered 86 colonies in five different styles of equipment: Full size hives (n=8), single 10-Frame deep boxes (n=15), double side-by side deep boxes (n=12), four frame towers (n=38), and Styrofoam 5-frame nuc boxes (n=11). The nucs were started within a few weeks of each other from the end of July through the beginning of August, with most made the first week of August. They were made with 5 frames of bees, 2-3 brood frames and had queen cells from the same mother queen.



All of the equipment for the study was purchased from Betterbee.

- Double deeps: Based on the system championed by Michael Palmer, these had 2 colonies in the same volume of a double deep hive. The bottom deep was divided, each with a 4-frame nuc above it (purchased from BetterBee)
- Full hives were colonies that I got ready for winter in standard fashion.
- 4 Frame towers were similar in dimension as the double deeps, but were stacked according to need – 2 deeps or a deep and a medium or 3 mediums
- Single deeps- the 5 frame nuc was put into 10-frame equipment, with the edges filled with foundation or drawn comb. A spacer with an upper entrance was added under the inner cover.
- Styrofoam nucs – Insulated 5-frame nuc boxes (purchased from BetterBee).

In year 1, I had better survival in my nucs than my full size hives with their old queens. The greatest survival was in the single deep hives (87%), followed closely by the Styrofoam nucs (82%). The double deeps, 4-frame towers, and full sized hives had similar rates (67%, 68%, and 63%, respectively).



In year 1, I focused on comparing equipment types with the nucs being exactly the same. I was fine with the survival rates from all of the options, but I felt like the differences in survival were more of a function of using the wrong methods for that equipment rather than a flaw in the equipment itself. In year 2, I started to look at different strategies that could be used to maximize each type of equipment. I overwintered some indoors, made some up earlier, used some mated queens, etc. Below is what I have found so far after two years of using these types of equipment.

Styrofoam nucs – I chose these based on the experience of Joel Latshaw (<https://projects.sare.org/project-reports/fnc08-700/>) and the recommendation of some beekeepers in Indiana. I really liked working with them for three reasons. I think that the insulation really helped in keeping them warm, it was very easy to feed them (you can just pour syrup in the front entrance), and they transported so easily. There were two downsides to them for me. First, I made up some of them too big, too early. Since it is hard to expand/ super them, they got entirely clogged with honey, and were impossible to inspect, or even close. In 2016 and 2017 I made them up much smaller, and earlier and feel better about them. They do build up well in the spring, and must be closely watched so that they don't hatch out too much brood and outgrow.

How I plan to use Styrofoam nucs: These are going to be my go-to equipment for replacing colonies that are lost from honey yards over the winter. I will make up small colonies in them in July, and bring them with me when I hunt for dead outs in the spring. If I don't need them, they are ready to sell as a 5 frame nuc to another beekeeper. I really like the ease of feeding, the ease of transport, and the high survivability of nucs in these boxes. They worked well for me when I started them very small and allowed them to grow (like Joel Latshaw), as long as I kept them from getting honey bound. I overwintered them outside in a sheltered area, and poured liquid feed when they felt light. I moved them to 10 frame equipment as soon as I could in spring, and they were great for making replacement colonies.

Double deeps – This method was based on the experience of Michael Palmer and Kirk Webster (<http://kirkwebster.com/index.php/cell-building-and-overwintering-nucs-the-key-to-stability-and-resilience-in-a-northern-non-migratory-apiary>). The colonies came out stronger from the double deep colonies than from nucs that had the same number of frames, but were stacked independently, and it was evident that the colonies did tend to cluster toward the shared middle of the hive. This hive type also grew very quickly in the spring. It was a pain to move it to new equipment, because I had to retain the odd cluster shape. This was more work to make splits into, and to move colonies out of.

How I plan to use double deeps - This equipment was great when I used it to make nucs for sale and to support the queen rearing – where I removed frames of brood, but kept the colonies in the same equipment. I didn't like using these colonies only as replacements, because they are hard to transport and move into new hives. They also don't work as well for fall splits, because you have to have an even number of each frame, and sometimes I had mediums that I wanted to use, or an odd number of resulting colonies. This equipment worked the best for me when I made them small and early, and allowed the bees to fill the second box themselves, overwintered them, and then pulled nucs from them. They are not going to be a system for replacement nucs, but will be used to maximize the number of brood frames that I have in the spring to support nuc sales and queen production. In other words, I'll have a series of small colonies that will be maintained in these.

Four Frame towers – I designed these nucs (4 frame stackable boxes) to overcome some limitations in the double deep equipment. First, they provided more flexibility - I had some hives that had some medium and some deep brood frames, and I didn't always have an even number of nucs. In year one I noticed that there was a lot of moisture on the sides of the hives, which seemed to affect the bees. I talked to someone else who had moisture issues with these, who said that they abated when they were wax dipped. I built a wax dipper for 2017, so I'll see if it is improved.

In year 2 (2016) I wrapped a series of these hives together and insulated the entire lot, and that helped with survival. I also overwintered about 30 of these in my basement, and kept liquid feed on them.

**I didn't plan on overwintering in my basement. I had 30 mating nucs where I planned on selling the queens, but didn't at the last moment. They had almost no food, and clusters about the size of a softball. Since they weren't going to make it outside, I put them in the root cellar of our 1850's farm house. Sixteen of the 30 made it through the winter, but could not build up in spring. I am going to try it again this year, but pull the queens in spring for splits, and add the bees to other hives.*

How I will be using the 4 frame towers – I use these in 2 ways. I use them for mating nucs in the summer, so I over winter a lot of colonies in these where I just let the mating nucs grow. I also used them for breaking down weaker colonies into lots of nucs. They definitely need help with insulation, so along with wrapping the ones outside, and putting some back in the root cellar, I will be trying to overwinter some in our unheated barn.

Single deep hives- This was by far my favorite to work with, because I did not have to move the bees into new equipment in the spring, and it was the easiest to split into in the fall. If I didn't have the right number of frames, I just added drawn comb or foundation to the sides. I put a spacer on top of each hive, so I could feed the bees with candy blocks if they needed it. In each colony I had foundation on the edges, so in the spring, I had a lot of time to move them before they outgrew their hives.

How I will be using single deep hives – All the time. This has worked great for me, in terms of survival and convenience. I like the other 3 options for making up nucs early in the season that can grow into nucs that can overwinter. Using 10 frame equipment (it would work the same in 8-frame equipment) allowed me to make splits very late into the season, and gave them room to grow so they didn't get clogged up. It is by far the easiest to put into the field to replace other colonies, because you could literally just put them as the first box under a dead out.

In all of the cases where I was making up nucs throughout the season, I was able to overwinter a lot more colonies, and did not have to purchase bees to make up losses. Like most of beekeeping, I felt that the equipment choice had a lot more to do with preference than it did biology. The choice of equipment was largely based on my end goal (nuc for sale or replacement colony that would go in full equipment), and timing (did I want to split a hive later, or make a new colony that would grow to fill its equipment?).

What I am trying in 2017/2018 –

- 1) **Making early small nucs in specialized equipment to support nuc sales and queen rearing.** I am making lots of nucs in July that will grow to fill in their equipment. I am doing this in 4-frame towers, and the Michael Palmer style double deeps. These bees will be used for nucs for sale, and for mating nucs in the spring. I'll sell the overwintered nuc, and then put a queen cell in the remaining hive. I will basically keep these as a separate, nuc based operation, but can use them for replacements if I need to. These four frame vertical systems will never be moved to other equipment, but will be used to draw comb and provide brood for sale or queen rearing needs.
- 2) **Making replacement colonies.** I will use the Styrofoam nucs to overwinter queens that I really like and use them to repopulate losses in my out yards. I am making these up with queen cells early, and replacing any that don't get properly mated with mated queens.

- 3) **Splitting production colonies.** I am splitting my big colonies into 2-3 colonies of a single deep box each, combining the split with varroa control. This will happen at the end of July/beginning of August, as I pull off honey. The original queen stays in the original location with no capped brood. She gets an oxalic acid treatment, and a super of wet comb. The other 1-2 splits get a queen cell, and are moved to a new location. They also get an oxalic acid dribble once the queen comes back. If the queen doesn't come back from a mating flight, then they are combined with another hive. This way I get an increased number of colonies, most with young queens, who have all had a break in the brood cycle and a varroa treatment right before winter bees will be made.

Step by step methods for making a late season nuc:

Option 1- Improving existing queens

1. Get an extra hive set up (single hive body or nuc box)
2. Go through your hive slowly until you find the old queen.
3. Move that old queen into the single hive body.
4. Fill out the box with the queen with 2-3 frames of brood and 1-2 frames of food, and at least 1 frame to grow. Adjust accordingly to account for the season and anticipated growth – make them larger if it is later (mid-August).
5. If you like the original hive, you can let them raise their own queen (remember, if it doesn't work, you can put the original hive back, and you have lost nothing). If you want new genetics, add in a queen cell (if it is early enough that she has enough drones to mate with and time to raise young), or you can add a mated queen from colonies that you like.
6. Manage and monitor both colonies for varroa.
7. Feed them in the fall, and watch them closely in the spring to make sure they don't go through food stores.
8. Make sure they are in a well sheltered or insulated location (above a hive, in a barn, wrapped in insulation).
9. Make a plan for them to expand rapidly in the spring – the overwintered nucs grow just as fast as the overwintered colonies.

Option 2 – Splitting an existing hive

1. Allow your colonies to grow into 3 deep boxes and whatever honey supers they need
2. Remove the honey supers and extract
3. Break down the colony, filling out each of the 3 boxes so it can be a standalone colony. Put frames of food on the outside, and brood in the middle. Make sure all the capped brood is in the top two boxes.
4. Shake all the bees into the bottom box, putting the frames back into the new arrangement.
5. Add a queen excluder to the top of the bottom box, and restack the colony. At this point you should have three boxes with food on the outside, and brood in the middle, with no capped brood in the bottom box. The bees will spread themselves over the brood, and the queen will be in the bottom box.
6. Return early the next morning with 2 bottom boards and 2 lids per hive. Before the bees are flying take the top two boxes off, giving them each a bottom board and a lid and transport to a new location.
7. The following day, provide each of the new colonies with a queen cell, and give the original colony an oxalic acid treatment.
8. Once the new colonies are queen right, provide them with an oxalic acid treatment.
9. Feed as needed and add a second box if necessary for fall honey flow.

Option 3 – making up some replacement nucs

1. Get a 5 frame nuc box (wood if you are in a not harsh winter, or Styrofoam if you are in a harsh winter).
2. In early July, put 1 frame of brood and 1 frame of food (covered with bees) into the nuc, filling out the rest with drawn comb and foundation.
3. The following day, add a queen or queen cell
4. Allow to grow, feeding as needed.
5. In spring, use to replace existing colonies

In all three options, you increase the number of colonies that you have going into winter, and increase the number of colonies that have young queens. Now, if you lose colonies over the winter, you won't have to purchase any to replace them. If everyone lives, make plans with your beekeeping friends to make your bees available to others in your area.

Enjoy your bees!