Spring Management

Selection of Apiary Site

A good apiary site enables the honey bee colony to maximize its population in time for the main nectar flow. Factors that should be considered in apiary site selection include the following:

1. Hives should be sheltered from prevaling winds at ground level, with southern sun exposure.

2. All-weather accessibility and freedom of flooding are necessary.

3. Grassy or sandy areas retain warmth better than tilled ground. Vegetation in front of the hive entrances should be controlled by mowing or by applying an all-vegetation herbicide (please consult landowner first).

4. Sources of spring nectar and pollen (willow, maple, poplar and dandelion) should be nearby to reduce supplemental feeding requirements.

5. If no natural sources of water are nearby, watering stations should be placed in the apiary. Otherwise, bees may forage for water at livestock watering troughs and swimming pools.

6. If the sites will be used throughout the summer, adequate bee forage must be available. As bees readily forage up to 3.2 km (2 miles), apiaries should be located near the centres of areas that offer a variety of nectar sources.

7. Sites should be large enough to prevent crowding and offer sufficient bee forage.

8. Avoid sites that are easily vandalized. Colonies should preferably be hidden from the view of highways and public roads. Fences, locked gates or private lands are also helpful to deter theft or vandalism.

9. Sites should be free of browsing livestock and bears. Portable electric fences are effective in keeping cattle and bears away from colonies. Further information on electric fences may be obtained from your apiculture office.

10. If several apiary sites are used, it is helpful to locate them so a minimum of travel time and distance are required to visit them. This planning will help keep operating expenses down.

11. Do not select an apiary site too close to someone else’s. Try to maintain a distance of several kilometers between apiaries to reduce the risk of disease transmission and forage competition.

12. Register the site(s) with the Provincial Government where required or applicable.

Figure 25. Eight possible apiary layouts.

Apiary Layout

It is important to minimize drift within the apiary. When certain colonies receive large numbers of bees from other colonies within the apiary, problems such as swarming, early supering and disease transmission may occur. Early drifting can be especially detrimental to newly hived packages. These situations will result in reduced colony build-up and loss of honey production for those hives that are losing significant numbers of bees drifting to other hives.

To help reduce drifting and to ensure evenly-populated hives in an apiary, the following methods may be used:

1. Use irregular, non-repetitive hive layouts, facing the hive entrances in different directions, as illustrated in Figure 25. Hives should be spaced 1-2 m apart within each layout for best results. The use of four-hive and two-hive pallets effectively reduces drifting.

2. Use colored hive bodies or colored strips above the hive entrances. Colors such as black, white, yellow and blue are visible to bees.

3. Use existing landmarks such as trees, bushes and fences as orientation cues. When choosing a hive layout, the beekeeper should note the presence or absence of windbreaks, lines of bee flight and equipment accessibility (trucks, fork-lifts, etc.).

Field Records

Keeping field records of weather, dates of nectar and pollen flows, colony condition and management can be a real advantage to the beekeeper. Records allow an evaluation of the quality of apiary sites, such as which sites are prone to stress-related maladies like chalkbrood, when early flows can be expected and which sites are better for wintering.

Such records help in planning colony management and offer valuable information on individual colony performance. Record only pertinent information, accurately and briefly and for several seasons so that good, reliable comparisons can be made. Do not attempt to start collecting highly detailed information that is difficult to maintain or too complicated to be used for future reference. Keep field records simple.

Bulk and Package Bees

Historically, package bees were imported into the prairie provinces every spring from the U.S. After the border closure in 1987, packages of bees could only be sourced from British Columbia, New Zealand and Australia.

Even though Canadian beekeepers have become more self-reliant, packages from off-shore sources continue to be used by beekeepers as a means to offset winter losses, strengthen wintered colonies, expand their operations or to introduce improved bee characteristics. To ensure availability when needed, order packages in January through a commercial beekeeper, a local bee club or directly from a reputable package bee producer or importer.

Package bees are imported and available during the month of April. Prairie producers tend to prefer early arrival and installation dates. When April remains cold, early packages may not build up any faster than later packages. Yet when April is warm and sunny, early packages will have an advantage over later packages in population build-up. Generally for the prairies, packages should arrive no later than the second week of April.

Most package beekeepers order packages containing 0.9 kg (2 lb) of bees, but some order packages with 1.4 kg (3 lb) or even 1.8 kg (4 lb) of bees. The more bees the better because the larger population is less fragile and may need less care, although when conditions are reasonably good, smaller packages may do just as well.

The size of package is a matter of personal preference. If two-queen colonies are planned, larger packages may be better at the start. The number of bees per kilogram can vary depending on the engorgement of the bees when packages are made up. The more sugar syrup, honey or nectar the bees have taken in, the more each bee weighs and the fewer the number of bees in the package. An extra weight allowance of bees should be added by the package producer to make up for this variability.

Preparation for installation

The single-storey empty hives should be prepared and placed at the apiary site before the packages arrive. Each brood box contains nine frames of good brood combs. Frames 1, 2, 8 and 9 should be full of honey (Figure 26), frames 3 and 7 should be full of pollen, and frames 4, 5, and 6 should have empty areas ringed with pollen and/or honey. A frame feeder may replace frame 2 or 8 (1 or 9).

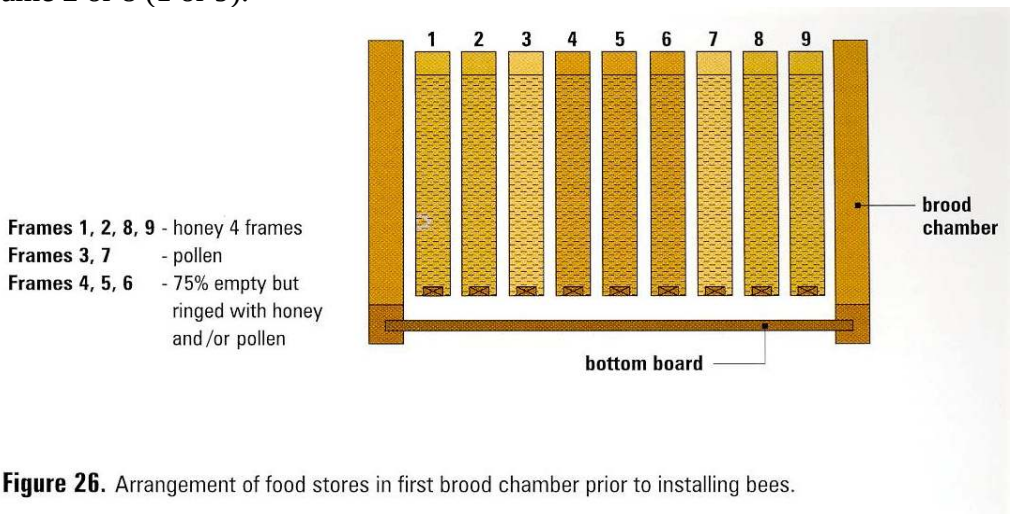

Figure 26. Arrangement of food stores in first brood chamber prior to installing bees.

If honey is not available, sugar syrup must be supplied to the bees immediately upon hiving, especially when hived on foundation. Protein supplement should be given if neither stored nor fresh pollen is available. Blocks reducing the entrance to 2-4 cm should be on the hive entrances.

When the packages arrive, the bees have been in the package container for at least three days. To minimize further stress, the bees should be handled gently and hived as soon as possible. If storing is necessary, packages should be kept in a dark room at about 15°C and may be fed by spraying or sprinkling the screens with warm 1:1 sugar syrup to supply water and carbohydrates for energy. Avoid using a paint brush to apply syrup to the screens as this tool will damage the bees' tongues. Hiving should be done on a cool, cloudy day or in late afternoon and evening, so the bees have a night to settle in and do not immediately fly away and get lost or drift to another hive.

Installation

The generally accepted method of transferring the bees into the hive is as follows:

1. Frames 4, 5 and 6 are removed and leaned against the brood box.

2. The package is knocked sharply on the brood box or other available object, causing the bees to drop to the bottom of the cage.

3. The feeder can and the queen cage are then carefully and quickly removed.

4. The queen cage can be placed in a pocket for warmth while the bees are shaken into the empty hive. Two or three sharp raps and shakes should roll all the bees out of the package container.

Before releasing the queen, check for any damage including missing legs, wings or lameness. She may then be released directly into the cluster by the direct release method. Pour some syrup on her and immediately drain it off, while holding the queen cage just above the bees and prying the screen away. Then watch as she falls into the mass of bees. Queens that have been confined to queen mailing cages tend to be flighty, and the syrup prevents them from taking flight when released. Once the bees start to climb onto the frames from the bottom board, the three frames are gently replaced, and the lid is put back on.

If the weather is warm or the bees are agitated, each package may be sprayed with or dunked in water immediately prior to hiving to slow the bees down and prevent immediate flight.

The queen may be released more slowly by using one of the slow release methods outlined in Chapter 11. Some beekeepers feel a slow release allows the bees to calm down and settle in before the queen is freed, preventing any aggression towards her at the time of hiving.

Once hived, bees can be given medicated sugar syrup for protection against disease and for stimulative purposes, even if feed is not otherwise required.

Follow-up inspection

Five to seven days after packages have been hived (Table 4), the centre frame is briefly inspected for the presence and pattern of eggs. If eggs are present, in a good pattern with one egg per cell, the queen is doing well, and no further inspection is needed. Frames are spaced and the lid replaced with a minimum of disturbance. If no eggs are present, the queen should be found. An apparently healthy queen may be left alone, and the hive marked for later re-inspection. If the queen is injured or missing, a new queen must be introduced using a slow-release method. If not already done, antibiotics and sugar syrup may be given to each colony.

The second inspection is made 10-14 days after the first check. At this time, the brood pattern is again examined on a frame or two, and disease and pest problems are looked for. Colony food stores are assessed and supplemented if required. Oxytetracycline should be given again, as outlined in Appendix E.

On the first or second inspections, failing queens (recognized by spotty brood patterns, a predominance of drone brood, a lack of eggs and young brood or no brood at all) should be replaced. Any supersedure cells (queen cells being built by the bees in their own attempt to replace the existing queen) must be destroyed if the beekeeper plans to requeen, or the replacement queen may not be accepted.

A colony with no brood at all has likely been queenless since hiving. If sufficient bees are present, the colony may be requeened, or if numbers have dwindled, each frame of bees may be shaken in front of another colony needing additional population. If a queen begins to fail late in the season (June, July), the colony will have reduced honey production. At this time of year, the colony can be united with another queen-right colony for honey production. Alternately, the colony can be requeened or allowed to raise its own queen if the hive is to be wintered.

Table 4. Beekeeping sequences and checklist

Visit	Time after Hiving (Package bees)	Purpose	Symptoms	Solution
1	5-7 days	**Queen Check** Queen-right	Eggs (Do not look for queen)	Close hive
		Queenless	No eggs Roaring sound Bees agitated	Requeen or check again in 3 days
		AFB-EFB prevention		Feed antibiotics
2	3 weeks	**Queen Check** Queen-right	Brood in all stages	OK
		Queenless	See visit 1	Requeen or unite
		Drone layer	Convex cappings	Requeen or unite
		Supersedure	Queen cell(s) on face of comb	Destroy queen cell(s) and requeen or unite
		Laying workers	Many eggs/cell Eggs on cell wall No queen	Kill colony or dump bees
		Multiple laying queen	Several eggs in bottom of cells	OK
		AFB-EFB prevention		Feed antibiotics
3	4-6 weeks	**Queen Check**	See visits 1 and 2	
		Brood Pattern Check Good	Frames of brood of uniform age with few cells empty	OK
		Poor	Spotty appearance, brood of different sizes; many cells empty	Requeen or unite
		Food Check Lack of honey	Empty cells Starved bees Bees running over frames "shaking"	Feed syrup or add frames of honey
		Lack of pollen	Presence of eggs and emerging adults but no brood	Feed pollen supplement or substitute
		AFB-EFB prevention		Feed antibiotics
		Space Check Space required	6-8 frames of brood and bees present	Add 2nd brood super
		Space not required	less than 6 frames of brood and bees	Check for space in 1 week check that queen, stores OK and disease-free
4 and others	Every 9-10 days after visit 3	**Food Check**	See visit 3	Feed syrup or frames of honey
		Swarm Prevention Preswarming-crowded Swarming initiated	Queen honeybound No space for eggs "Wall-to-wall bees" Queen cells on sides and bottom of frames	Reverse hive bodies and add a super Provide ventilation Check for queen cells every 9-10 days, reverse brood chambers as necessary and add supers where needed. Provide space and ventilation Demaree
		Supering	– Add 1st honey super prior to expected honeyflow – Add others as needed 1 or 2 at a time	
		AFB-EFB prevention		Cease all medication one month before honeyflow

Wintered Colonies – Early Spring

Much of the early spring management of wintered colonies depends on the quality of the previous fall management and the method of wintering (see Chapter 10). Overwintering colonies begin rearing brood in January or February, and honey and pollen consumption increase dramatically with increased brood rearing.

An early spring check is necessary to determine the amount and availability of food stores. This check should be done on outdoor colonies in early March or as early as possible, on a warm sunny day with no wind. The top covering and insulation are removed, the inner cover gently pried up and a little smoke used to keep the bees calm. It is not advisable to disturb the bees by pulling frames from within the cluster.

By looking down between frames, capped honey can be seen. The colony should have from four to six honey frames in contact with the cluster; outer honey frames may be placed next to the cluster if necessary. Protein supplement may be given, and extra honey frames or an inner feeder of warm 2:1 sugar syrup may be placed next to the cluster if honey stores are low. The colony should be closed up and insulation replaced with as little disturbance as possible. Dead colonies should either be removed or closed up to prevent robbing.

Colonies should be checked again for food stores in early April, the protein supplement replenished and honey or syrup given as necessary. At this time, colonies wintered indoors may be moved outside, depending on the weather. Such colonies may have a quick inspection at this point and be fed 2:1 sugar syrup and antibiotics by using pails or inner feeders.

Once the weather has warmed up and pollen and nectar are available, winter wraps may be removed from colonies wintered outdoors; generally, this will be done in the last half of May. At this time, all wintered colonies are subject to a thorough inspection. Bottom boards are scraped and cleaned of all accumulated debris and dead bees. Brood chambers may be reversed at this point (Figure 27) if the upper brood chamber is full of bees and the cluster extends into the lower brood box. Weaker colonies may be left in two chambers or reduced to a single box depending on the number of bees.

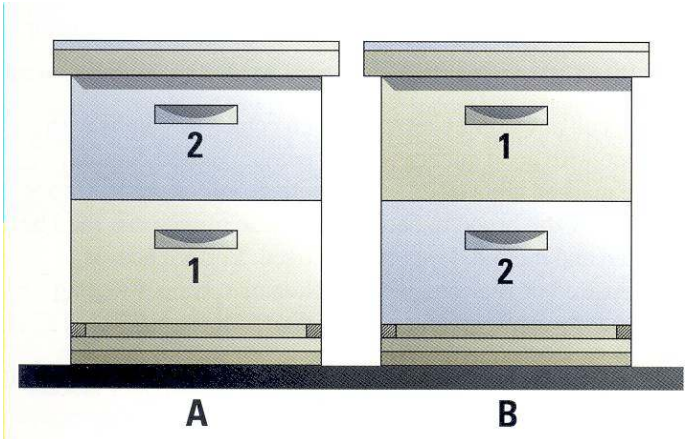

Figure 27.
Reversing brood chambers.
A: prior to reversing.
B: after reversing.

At the same time, colonies are assessed for queen problems, disease symptoms, food stores and strength. A strong wintered colony will have from four to seven kilograms of bees (covering nine to eleven frames) and five or more frames of brood. Dead colonies should be cleaned out and removed from the apiary. Very weak and queenless colonies and colonies with drone-laying queens may be united with medium strength colonies, remembering to pinch off the poorer queen first. The queen's performance can be assessed by checking one or two frames for brood pattern and for symptoms of brood disease. Food stores are assessed, and 2:1 syrup is given to replace depleted stores and to stimulate brood rearing. Oxytetracycline may be given in the syrup or icing sugar, and fumagillin may also be administered when nosema has been detected before.

Checking Colonies

Regular checks should be continued through May and June at 10-14 day intervals. Be systematic and consistent in examining the colonies:

1. How does the brood pattern look?
2. Is there brood in all stages?
3. Are there swarm cells?
4. Are there symptoms of any disease or mites?
5. Are pests such as ants or skunks present?
6. Are there unusually large numbers of dead bees on the bottom board or hive entrance?
7. Does the colony have enough stored honey and pollen?
8. Does it require space for bees, brood and food storage?
9. Are the bees restless and defensive, or are they quiet?

The beekeeper must assess each colony, determine its needs and apply the appropriate management. At the same time, note the general condition of the apiary, including duration of the spring flow and likelihood of dearth periods. In areas where American foulbrood and European foulbrood disease have been reported, colonies may be fed oxytetracycline every 7-10 days. Antibiotic feeding should stop at least three weeks before the start of the major nectar flow.

While checking the brood chambers, cull any broken or misshapen combs or combs with large areas of drone comb and replace with good quality worker combs. Culled combs containing developing brood may be marked and placed on the outside edges of the second brood chamber, or the third box, to allow the brood to hatch out. These frames can then be removed when the honey is extracted and melted down or destroyed. Bottom boards, frames and hive covers should

be repaired or replaced when broken or rotting. Keeping hammer and nails in the truck allows for minor equipment repair in the bee yard.

If a robbing situation develops at any time during these inspections, the beekeeper should finish the inspection of the colony, close it up and leave the yard, rather than making the situation worse by continuing to open hives.

Feeding Colonies

Feeding both sugar syrup and protein supplement may be required at times through the late spring and early summer (see Chapter 4). If the spring nectar flow is minor or of short duration, or if there are periods of inclement weather, colonies may quickly become short of honey and pollen during the rapid build-up period preceding the main nectar flow. Feeding of sugar syrup should cease two weeks before the onset of the main nectar flow to avoid adulteration of the honey.

Requeening Wintered Colonies

If colonies are wintered each year, some schedule of requeening every one or two years is advisable. If commercially-produced queens are used, requeening may be done at any time during spring or early summer. If queens are reared by the beekeeper or purchased domestically, the time of requeening depends on when queens can be first made available, usually just prior to the main nectar flow. Methods of requeening are covered in Chapter 11.

Equalizing Colony Strength

Equalizing serves three purposes: it boosts weak colonies, it slows down the growth of strong colonies (which helps prevent swarming) and it makes the hive populations uniform, so the apiary can be managed uniformly. Very weak and queenless colonies may be united with colonies of medium strength or placed above another colony to make a two-queen unit.

To boost the strength of a weaker colony, one or two frames of capped brood are taken from a stronger colony. It is important to shake the bees off and check the frames for disease before they are installed. The transfer of open brood is not recommended, as it merely demands more work for the weaker colony. Closed brood will cause the colony to expand rapidly and offer more bees to help expand the brood nest. If the recipient hive has too few bees to cover the brood adequately, the frames can be moved with adhering bees, or extra bees can be shaken into the hive from the other, more populous hives to boost the colony population.

An alternative method of equalizing is to switch the positions of weak and strong colonies so that the weak colony receives the incoming foragers from the strong colony. Always try to determine why colonies are weak before trying to boost their populations. Disease, mites and

old, failing queens can cause colony weakness, and these problems should be remedied before adding bees and brood from strong colonies.

Uniting Colonies

Very weak colonies are often the result of a poor or failing queen. Rather than attempting to requeen such colonies and nurse them back to strength, many beekeepers merely unite them with stronger colonies. If worker brood is present, uniting can be done as follows: the failing queen is pinched off, and the colony is checked for queen cells, which must be removed. A sheet of newspaper is placed over the upper brood chamber of a medium or strong colony, two or three slits are made in the paper with the hive tool, and the weak colony is placed on top. The bees will gradually chew through the newspaper and form a single unit.

Alternatively, the bees of the weak colony can be shaken in front of a stonger colony and the brood frames added to the same strong colony or another strong colony. Bees shaken in front of another colony will gradually find their way inside without major conflict.

If no brood is present in a weak colony, the bees can be shaken off all the frames in front of another colony. Any extra honey and pollen frames may be given to colonies in need of food stores. Before uniting colonies, the weak colony should be checked carefully for evidence of any brood disease, as diseases can be spread by both brood frames and adult bees.

Dividing Colonies

Dividing strong wintered colonies is one method of slowing their build-up while increasing colony numbers, either to make up for winter losses or to expand the beekeeping operation. There are several ways to split colonies. Most often, a new colony is made from either a strong single-parent colony or from a two-parent colony. Dividing a colony in two may result in two weak colonies. Generally, the parent colony should not be reduced so much that it can no longer make a full honey crop.

Some commercial operations have adopted a different method of making up colony losses or for producing divisions for resale. Healthy parent colonies are selected and divided into whatever number of splits or nuclei they can produce, each the size of a two to three pound package. Outside queen sources are needed in early spring to provide each nucleus with a queen. When divisions are made later in early summer, self-raised queens can be used.

The splitting of a healthy colony to depletion seems destructive, but there are some distinct advantages. There is generally much less labor involved compared to applying a single split to each parent colony. The splitting-to-depletion method seems helpful in keeping down tracheal mite infestation levels and allows for effective varroa mite control applications.

In preparation for spring colony division, queens must be ordered ahead of time to be on hand sometime in May. Divisions are made once the weather has warmed and the risk of frost is low.

If the divisions are made to replace winter losses or to expand the operation, the division should not be too late; otherwise, no honey crop can be expected from these colonies. The first offspring from the new queens will be foraging about six weeks later, so the expected dates of the major nectar flow must be kept in mind when making divisions. If the time span until the start of the main honey flow is short, splits may be made stronger to allow for a shorter build-up period.

A warm, sunny day with no wind is best for this colony division. Queens and brood chambers with bottom boards and covers for the expected number of divisions are brought to the apiary. Brood chambers should be made up with honey and pollen frames as for packages. If possible, an inner feeder of warm 2:1 sugar syrup may take the place of one frame.

The queen in each parent colony is found and placed to one side. One or more frames of capped brood and adhering bees are taken from each parent colony, checked for disease and placed in the new brood chamber. A frame of honey and pollen may also be transferred if the parent colonies have a surplus.

The new division ends up with three or four frames of bees and brood, most of which is capped. Parent colonies receive empty combs and their brood nests are consolidated. Two or three frames of extra bees may be shaken into the division to strengthen it. These bees will make up for the field bees that fly back to the parent colonies when divisions are left in the apiary. A new, caged queen is placed in the division after she has been visually checked and all attendant bees removed. A slow release method is employed for the queen (see Chapter 11).

If the divisions are to be moved to a new location, requeening should take place after the move because of better queen acceptance and lower risk of accident. It is generally recommended to move new divisions to another apiary site to avoid the drifting of bees back to the parent colony. If moving is not possible, the divisions should be set down away from the parent colonies and oriented in a different direction. Entrances should be reduced to slow the flight of the bees and allow them to orient to their new location.

Alternatively, the new division may be placed temporarily on top of one of the parent colonies over a solid inner cover, with a 5 cm entrance in the rim facing towards the back loosely plugged with grass. Thus, the division can take advantage of the heat from the colony below until it gains some strength. It may then be set down when the parent colony receives another super. Robbing of these small colonies can be a problem, so equipment should be bee-tight and the entrance size reduced.

Divisions may also be made without searching for the queen. This method is useful when many divisions are made or when preparing two-queen hives. The parent hive is inspected and three frames of capped brood are selected. The bees are shaken off the frames and placed in a brood chamber with supporting frames of honey pollen and empty comb. The frames removed from the parent hive are replaced with empty comb. A queen excluder is then placed on the parent hive, and the division is placed on top.

The bees will quickly move up to cover the brood frames in the division, but the queen will not be able to pass through the excluder. In 30 minutes or so, the division can be placed on its own

bottom board and possibly moved to another apiary, or the excluder can be replaced with a solid inner cover as above if two-queening is the object. A new queen is then introduced to the new division as before.

These new divisions are useful in requeening strong colonies that have been made queenless before the main nectar flow. These colonies are then provided with a young, laying queen. The division may be united to the queenless colony using the newspaper method. If divisions are made solely to produce laying queens for requeening of wintered colonies, one can wait until the beginning of June (see Chapter 11).

An alternate method of increasing colony numbers for next year is to make up nuclei (nucs) that are not intended to produce a honey crop within the same season, but that have time to build up to good wintering strength by September. Nucs are made up in the first part of June, and timing is critical to their successful build-up. Two or three frames of capped and emerging brood and adhering bees are placed in a separate brood chamber and given a queen; the nuc is then set aside from the parent colony and is fed syrup and protein supplements, if needed. The hive equipment should be bee-tight and an entrance reducer in place to prevent robbing. By September, these nucs will have built up to a colony filling two brood chambers, and they may even produce surplus honey some years. This method allows for the production of one's own stock or of locally-purchased queens or queen cells when quality and availability are high.

This method of producing nuclei, intended as honey producing colonies in the following year, has been adopted successfully by many commercial producers. The nuclei can receive appropriate mite control applications at any time of the season since no honey is being produced for harvest. Wintering nuclei has proven much more cost effective than wintering full size colonies because of lower demands in equipment, sugar-feed and medications. Extra numbers can be made up in anticipation of winter colony losses. These wintered colonies will be strong enough to produce new splits in the second year and produce a honey crop.

If colonies are wintered indoors, nucs may be made at the end of June, thus taking advantage of brood that will not be old enough to be collecting much nectar during the main flow. Nucs made up at this time may not build up to more than one brood chamber in strength and may not be strong enough to winter well outdoors. However, both nucs and single-storey colonies can be successfully wintered indoors.

Moving to Summer Apiary Sites

If spring yards are not suitable for summer use, summer sites should be found well before the main nectar flow is expected. Sites should be selected for good honey production from year to year, taking advantage of variations in weather, soil and crop conditions. Field records from previous years will indicate which areas traditionally yield well and when flows can be expected. Some areas can change drastically from year to year because of changes in crop plantings. Summer site requirements are essentially the same as those for spring sites:

- all-weather accessibility for vehicles

- some shelter from the wind
- enough room for all colonies
- arrangement of sites to minimize travel time
- adequate water supply
- good summer nectar flows
- low visibility to reduce disruption
- free of browsing cattle and bears. An electric fence is an effective deterrent and essential in keeping bears out of the apiary. Select sites not visible from roads and highways, to reduce the risk of vandalism and theft.

Honey bees forage up to about three km from the hive with little loss in honey yield. When two different blooming crops are located five km apart, the summer yard should be located halfway between them rather than beside one or the other. When both fields have the same blooming crop, select the site with the best bee forage potential.

If possible, package colonies should be moved to the summer sites while still in one brood chamber. Once second and more supers have been added, it becomes more difficult to move the colonies. Depending on local conditions, colonies are generally moved in May, preferably at dusk or at night when all bees are inside and the temperature is lower. Entrance and top screens are not required for short moves at night.

Some beekeepers fasten bottom boards permanently to the first brood chambers with two hive staples on each side, slanted in opposite directions. While helpful for moving, permanent fastening makes reversing brood chambers and cleaning bottom boards difficult. Another fastening method is to have nails protrude through the bottom board rim into the brood box. This method prevents lateral movement and allows easy removal of the brood chamber from the bottom board. Other producers do not fasten the supers onto the bottom boards, but remove the lid and stack the hives so tightly together on the truck that no lateral movement can take place. Each row of hives must be securely strapped and fastened to the deck.

Before lifting the hives, direct several puffs of smoke into the entrance to keep the bees from flying out. Hives should be loaded with the frames parallel to the truck so that rocking is minimized. Frame spacers or self-spacing frames prevent the problems of frames sliding together or falling from the frame rests. Without spacers, frames 4, 5 and 6 may be fastened in place with nails driven through the hand-holds (left protruding for easy removal). Hives are tied in place on the truck to avoid shifting in transit. Once the hives are unloaded at the summer site, hive entrances may be lightly stuffed with grass to slow down the foragers and allow for orientation.

When colonies are moved less than three to five km, field bees often return to the old site. Try to move colonies to new sites at more than five km distance. Hives moved a short distance, across the back garden for example, should be moved a little each day so that returning foragers can find their home.

For daytime moves in hot weather, use top screens to allow ventilation and clustering space for the bees. These are boxes about 10 cm in depth, screened on the top, with cross supports on which bees may cling. For the entrance, a stiff mesh with 4 mm spaces or smaller can be cut for the full width of the entrance and about twice the height. When the screen is folded lengthwise and pushed into the entrance, the screen will hold itself in place. All cracks between supers should be plugged or taped.

Apiary Maintenance

In the summer apiary, vegetation in front of each hive should be controlled so that the bees have easy access to the hive entrance. Mats of cardboard, sugar sacks cut in half, tar paper and the like may be placed in front of each hive and anchored under the bottom board. Alternatively, vegetation may be treated with herbicide around each hive. Herbicides are very effective when applied to young vegetation early in the season but should not be used later when the bees are flying. Soil sterilants and herbicides with long residual properties are not recommended, as they may have undesirable effects on non-target vegetation such as the trees surrounding the bee yard.

Mowing with a cutter or motorized weed-eater is very effective and does not leave residues. When using motorized mowers, take care to smoke all the hive entrances before starting to mow; otherwise, vibrations through the gound may result in a severe defensive response. Sites should also be checked for short stumps and debris hidden in the grass. Broken frames and bits of comb should be collected and removed from the yard after each visit.

Space Requirements and Supering

Beekeepers have traditionally allowed a total of five bee boxes per hive. While this number was probably sufficient for package colonies, more boxes are needed for wintered colonies in most parts of the prairie provinces. Three brood supers and three or four honey supers, for a total of six or seven per hive, may be needed to optimize honey production.

Outdoor wintered colonies are generally wintered in two brood chambers. Both chambers are usually full of bees and brood by the end of May, by which time the winter wrap has been removed.

When there are five or six frames of brood in the second super, and before it becomes plugged with honey, a third box, made up with nine empty combs, is added to each colony. This step generally takes place by the middle or end of May for wintered colonies and a month later for packages. Entrance reducers can be removed from the colonies around the beginning of June.

Timing varies from year to year and yard to yard, so it is important to check the colonies regularly.

Package colonies with good prolific queens can generally receive second brood chambers five to seven weeks after hiving or in the latter half of May. These colonies should have five or six frames of brood and from seven to nine frames of bees at this time. Seconds should contain nine dark brood combs with pollen and honey arranged in the same manner as in the first, if possible. If the bees are slow to move into the seconds, one or two frames of capped brood may be placed in the centre of the second to draw them up; this baiting must be done when boxes of foundation are given. If colonies are not yet strong, and the weather is cold, the seconds may be placed underneath the firsts to provide extra space without dissipating cluster heat. Brood chambers may then be reversed as required.

Honey supers contain nine frames of honey comb, preferably light in color since dark comb may darken the stored honey. Combs that have had one or two cycles of brood reared in them are ideal for honey storage, being light in color but strengthened by cocoon residues and propolis. Newly-drawn combs must be extracted with care, as they are easily broken.

Both bottom supering and top supering are practiced by beekeepers, although most commercial beekeepers prefer top supering for speed. Top supering necessitates getting the supers on before a honey barrier is formed, thus good timing is imperative. Bottom supering means far more work, lifting partially-filled supers to place empty supers beneath, but is necessary if the supers are plugged and the beekeeper does not wish to extract them right away. In addition, unless queen excluders are used, the queen may move into empty supers placed above the brood nest.

Frame spacers are often used in brood chambers and in honey supers. The use of spacers saves time when supering colonies and makes the use of self-spacing frames unnecessary. Disadvantages of spacers include the loss of lateral frame mobility when checking brood chambers and the loss of the correct bee space between combs. Metal spacers corrode quickly and rust when formic acid is used to control mites. As such, these spacers require frequent replacement.

When the main honey flow commences, colonies need plenty of space. Bees need space to cluster, for wax-builders to hang, for temporary storage of unripe honey, as well as for brood rearing and the storage of pollen and honey. Even more space is required when temperatures and humidity are high during heavy nectar flow. When the hive becomes full and no space is left to process and store nectar, the field bees stop foraging. In regions of short, intense nectar flows, such slowdown or temporary stoppage may mean losing the opportunity for a great honey crop.

When in doubt, give more space. It is better to be too early and risk “stove-piping” by the queen (moving upwards through each box rather than expanding the brood nest laterally) than to be too late and risk swarming and reduced honey production.

White ridges of wax appearing in the top of the uppermost brood chamber is a signal for supering. In the prairies, where nectar flows are intense and of short duration, the honey production and storage requirements may get ahead of the wax building, and whitening of the

combs is, therefore, not a reliable cue. Supering should be considered in combination with anticipated nectar flow, frequency of visits and strength of colony. Generally two or more supers are added just prior to or at the beginning of the main nectar flow, and more are given as the flow progresses.

Drawing Foundation

Each year, some brood combs are lost through breakage and culling, and these combs must be replaced with good worker combs from the honey supers. To replace combs in the honey supers, the beekeeper may give each colony up to nine or ten frames of foundation with only a minor reduction in honey yield in a good year, although in a poor year, it may be difficult to get colonies to draw out as much foundation.

If at all possible, colonies should never be given whole boxes of foundation, for such supers will act to some extent as a barrier to upward expansion, and some colonies will show great reluctance to move into them. It is far better to intersperse foundation amongst drawn comb, beginning with three frames in the third super. If supers of foundation must be given, each should contain ten frames instead of nine. Nine frames of foundation leave enough space between frames that bees may construct burr comb instead of drawing out foundation. The bees will work on the centre frames first, so outer frames may be rotated inwards during each subsequent visit.

Foundation will only be drawn out during a nectar flow or while feeding a 2:1 sugar syrup. Otherwise, bees will ignore it or chew holes in the foundation sheets.

Use of Queen Excluders

Queen excluders are used to confine the queen to the brood chambers. Most often, the excluder is used between the second brood chamber and honey supers. For two-queen colony systems, this piece of equipment is essential.

When the excluder is installed, the bees should be encouraged to overcome the barrier. The third super should be given before the second is plugged with honey. To encourage the bees to move up into the third super, it must contain drawn comb. Placing one or two frames of emerging brood and adhering bees in the third super is very effective in stimulating the bees to pass the excluder. Placing a super containing only foundation on top of the excluder should never be done because the excluder and the foundation will then function as a double barrier, and the colony may end up swarming instead of expanding.

Two-Queen Colonies

While there are probably as many variations in making up two-queen colonies as there are beekeepers, the aim remains the same for all systems: to maximize adult bee populations in preparation of the main nectar flow. By managing two queens in one colony, the colony can expand very rapidly, resulting in a greater ratio of field bees to house bees and hence, the greater the colony's foraging capabilities.

Two-queen systems also offer better swarm control and requeening of wintered colonies. As well, extra laying queens are available for those colonies with queen problems during the spring and summer.

The disadvantages of two-queen systems include the increased labor and equipment as well as the cost of the extra queens. Two-queen colonies require precise timing in management and demand greater equipment manipulation. In some areas, two-queen colonies can reach a height of nine or ten supers requiring solid footing. As queen excluders are used throughout the nectar flow, honey removal requires bee-escape boards or bee-blowers (see Chapter 6).

For the prairie provinces, where two-queen colonies are most suitable because of the short but intense main nectar flow, units are usually made up from wintered colonies sometime in May. The timing depends on colony strength and the strength and duration of the spring flow. Two-queen colonies are at their peak from eight to nine weeks after being made up. For two-queen units made up from packages, nine or ten weeks may be required for build-up.

When making up two-queen units, the parent colonies should be equalized to similar strength by an exchange of adults or capped brood. Then, the original queen in each colony is placed in the bottom brood chamber with younger brood, food stores and empty comb. The other two empty brood chambers may be placed in the second and third positions with a division board in between. Such a division board is generally an inner cover with all the feeding holes completely blocked, turned so that the entrance is in the upper rim and facing the opposite direction from the lower entrance (Figure 28). This initial complete separation is necessary; otherwise, the odor of the first queen remains throughout the colony and may prevent acceptance of the second queen.

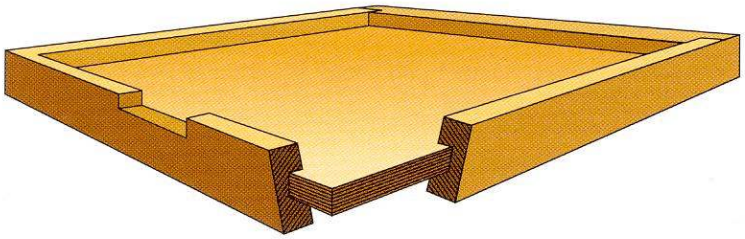

Figure 28.
Solid division board used in initial step in making up two-queen colonies. The top entrance should face the back of the hive.

Capped brood and plenty of honey are placed in this top brood chamber, and two or three frames of extra bees shaken in to make up for subsequent drifting back to the lower entrance. A new queen is given to the upper unit using a slow release method. The lid is replaced and the upper entrance loosely blocked with fresh grass to allow time for orientation. Equipment must be bee-tight to prevent robbing and to improve queen acceptance in the top unit.

If the original queen cannot be found or if the beekeeper does not wish to search for the original queens, a queen excluder may be placed between brood chambers and each chamber checked in

four days for eggs. The chamber containing the queen is then placed on the bottom and the two-queen units made up as above.

Both units are checked a week later for laying queens and signs of swarming or supersedure. Queenless units may be requeened or reunited. Division boards of queen-right colonies are replaced at this time with an apparatus known as a two-queen board, which is comprised of an entrance in the rim as well as two layers of zinc excluder material, so air and bees move through but queens do not meet.

Alternatively, division boards may be replaced with a single queen excluder, using a sheet of newspaper to slow the mingling of the bees and allow for acceptance to both queen odors. An upper entrance is made by offsetting the second unit forward over the excluder. Bees can then move freely from one unit to another without hostility. The upper queen is usually given another brood chamber, while the lower queen is restricted to one. If required, supers are provided to both units. If two brood chambers are given to either queen, periodic reversal of the chambers may be needed.

The brood chambers of each unit are brought together at the beginning of the main flow, just prior to the first pull. At this time, the beekeeper may either reunite the units or continue to keep them separated by means of a single excluder. Uniting the units will usually cause one queen to be killed, thereby reducing the amount of brood to be fed.

If two-queen colonies are used as a method of requeening, the old queen may be found and killed to ensure the survival of the younger queen. An excluder is generally left between the brood chambers and honey supers for the duration of the flow. After uniting, colonies are managed as single-queen colonies with a much higher population, greater space requirements and higher honey yields.

Swarming

As mentioned in Chapter 1, swarming is the colony's means of reproduction. Capturing swarms is one method of increasing the number of colonies in a beekeeping operation. In many countries, swarms are routinely hived or attracted into hives and the honey subsequently harvested. However, relying on swarms for colony increase has its drawbacks:

- Firstly, while nearly any colony will swarm given the right circumstances, the hiving of a swarm may be a perpetuation of a swarming strain rather than a selection away from swarming.
- Secondly, the beekeeper is not in control of making the divisions and requeening them, so the quality of the stock may suffer.
- Thirdly, it is the strongest colonies, which would otherwise produce a good honey crop, that do the swarming.

Swarming reduces colony strength too close in time to the main nectar flow and, thus, decreases the productivity of that colony.

Before swarming takes place, a slowdown in egg laying and foraging occurs as the bees get into the "swarming condition." Even if the colony is prevented from actually swarming through some corrective action by the beekeeper, it will be less productive as a result. Management techniques are best employed to prevent the swarming impulse from occurring rather than trying to control it once it has been initiated.

Swarm prevention

The most important factor in swarm prevention is the supply of adequate space when needed. Bees need space to sit, especially during inclement weather when the foragers are confined to the hive. Inadequate space for processing and storage of honey means the brood nest becomes honey-bound, and the queen no longer has sufficient room for egg-laying. A queen prevented from egg-laying produces less queen substance, which reduces colony cohesion and may lead to swarming.

A failing queen also produces less queen substance, and if a supersedure is underway at this time of year, the colony may issue a swarm. Colonies should be requeened regularly to help prevent both supersedure and swarming. The brood nest should be kept free of congestion by reversing brood chambers and adding supers.

High temperatures and humidity, poor ventilation and air drainage are all factors contributing to the development of the swarming impulse, each relating to the need for space. Space requirements per bee increase with temperature. Poor ventilation leads to high humidity when excess moisture is being evaporated from nectar, thus increasing the need for space to spread out the nectar.

Temperature and humidity problems can be solved to a large extent by providing more space, removing entrance reducers, providing entrance mats and cracking lids or supers, setting them ahead slightly to allow more air flow. Foundation and queen excluders should be used judiciously so as not to form a barrier to upward expansion. Honey-bound colonies should be bottom supered. Populous colonies may be used in areas with an early main nectar flow to keep the bees busy at work instead of planning to swarm.

Some colonies have a genetic propensity for swarming and may swarm regardless. These colonies should be culled from a wintering operation. Colonies raised from packages appear more inclined to swarm than wintered colonies.

Swarm control

Notwithstanding management efforts, a colony may still enter a swarming condition. There are several ways of preventing bees from actually leaving the hive. From about mid-May onwards, regular hive inspections should include looking for queen cells that will indicate swarming intitiation. A quick examination method is to crack the brood chambers with the hive tool, pull the second chamber a little forward and tilt it back, smoking the bees on the bottom of the frames so that they move up.

Swarm cells are generally located along the bottom and sides of brood frames, usually at different stages of development. Queen cups (Chapter 11) should be checked for eggs and young larvae. Queen cells containing older larvae and pupae are drawn out and are easily distinguished (see Figure 51). If swarm cells are found along the frame bottoms, they should be crushed, and

the colony should then be checked thoroughly for any cells elsewhere on the frames. At the same time, extra space and means for ventilation must be provided to relieve brood nest congestion. Swarm cells must be removed every nine or ten days to prevent the occurrence of swarming. If the colony is left longer than ten days with swarm cells, the old queen may depart with a swarm, leaving the colony with several virgin queens on the point of emergence.

The Demaree method is effective for arresting the swarming preparation of a colony. This method involves confining the queen to one frame of brood in the bottom brood chamber along with eight empty combs. An excluder is placed on the brood chamber, and an empty honey super placed above it. The rest of the brood is placed on top, with capped brood in the third position and open brood above that. The top boxes are checked about a week later to destroy any queen cells. The brood nest can be consolidated when the main nectar flow begins.

Beekeepers often clip one wing of mated queens, both to mark her and to help in swarm control. This operation will slow swarming but will not prevent it; the bees will still leave the colony but will return when they discover the queen is not with them. The bees will wait until a virgin queen emerges and then swarm. Clipping wings is a delicate operation, requiring time and a gentle, steady hand. Virgin queens should never be clipped because of the need to fly and mate.

Handling swarms

Most swarms occur between 11 a.m. and 3 p.m., when temperatures are highest and enough daytime hours are left. Swarms often occur on the first sunny day following a period of inclement weather, and they usually settle in a nearby tree or other object until a new site has been found. The swarm then leaves its temporary location.

Swarms may be reunited with the parent colony or used to establish a new colony. To hive a swarm, you need a brood chamber with bottom board and cover. Sometimes swarms, depending on location and circumstances, are easily shaken into the brood chamber. If the queen is shaken into the box with the bees, the swarm will usually settle into its new-found home. If she is not, the bees will fly out of the box and back to the original location to rejoin the queen.

If the swarm is not easily accessible, it may be necessary to use some other container to collect the bees and then dump them into the brood chamber. The key to success is to hive the queen; once she is in the hive, the others will follow within an hour, and the hive can be moved to its ultimate location in the evening.

The parent colony from which the swarm originated needs a thorough inspection for swarm cells, which should all be destroyed when the swarm is reunited with the colony. When no reuniting is desired, all but one swarm cell must be destroyed to allow the colony to requeen by itself while preventing after-swarms. Reuniting may be accomplished with the newspaper method, placing the swarm on top of the parent colony. If the swarm is to be kept separate, it should be supplied with some food and left to settle in for several days. Then, check for disease and brood pattern, and give extra space when required. Swarms are generally made up, in part, of many young bees that will quickly draw out foundation and produce honey.

A swarm in late May or June will grow to fill two brood chambers and will winter successfully. Swarms in July and August will have less opportunity to grow in population before the summer ends. Such swarms may perish if wintered outdoors, but may survive if wintered indoors. Alternately, late swarms may be united with weaker colonies to boost their populations.