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A Florida Beekeeping Almanac[1]

Malcolm T. Sanford[2]

The purpose of this almanac is to help beekeepers make better management decisions. It is a guide to beekeeping in a specific area, the state of Florida. Any discussion of bee management should include reference to geographic location, because major differences in procedures and timing are often necessary even in adjacent counties. This almanac is generalized, and gives the beekeeper the flexibility to work out many of the specifies to suit his own situation.

Above all else the beekeeper must be a good manager. Management, in fact, is all a beekeeper can hope to do to influence the size of a honey crop. It is the "art" of managing a colony and apiary that sets a master beekeeper apart. This knowledge comes only from hard experience, mostly learning by doing with a high risk of failure. In spite of the fact that beekeeping is made to look simple in many popular articles and books on the subject, it is perhaps more difficult to be successful in beekeeping than in other forms of agriculture. This is because of the number of variables over which the beekeeper has little or no control. At times, it seems that management in beekeeping is little more than a guessing game.

The better beekeeper more often than not has the better "guessing" record. He learns literally to "think like a honey bee colony," developing vague or instinctive feelings about when manipulation is necessary, rather than adhering to a rigid time table. In order to do this, the beekeeper must constantly be an experimenter. A good beekeeper is conservative, however, when attempting something different, and tries techniques on a small scale before committing their use to his total operation.

KEEPING RECORDS

One of the best aids in managing honey bees is a well-kept record system. Many beekeepers keep individual records of each colony over the season by using a code of sticks, stones or other objects strategically placed on the tops of colonies. Unfortunately, these are temporary at best and cannot be referred to in subsequent years. A more permanent system uses either notes on cards or a log book. The kind of information recorded may include the number identifying a specific colony in a bee yard, the present and past location of the colony, when the queen was introduced, and whether she's marked or clipped.

Each time the colony is inspected, additional observations can be recorded such as the quality and quantity of brood, presence of eggs, larvae or pupae, condition of the queen, and temper of the colony.

Individual records can be any size, although index card size appears to be favored by most. The easier the system is to handle in the field, the more record keeping will be facilitated. This publication includes suggested format for an individual record card (page 14). Sometimes cards are directly attached to a colony, whereas in other systems the card refers to a number on the colony and is kept at the beekeeper's headquarters.

A more general notation of observations at each location is also valuable information. Information such as what plants are blooming and when, general weather conditions, temper of bees, and whether nectar or pollen are being collected, all add to a beekeeper's overall knowledge of the location. This information can be collected and summarized into a yearly calendar and used to compare differences between years. A valuable addition to the above information is data from a scale colony in the location recording colony weight changes throughout the year.

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1. This document was published May 1985 as Circular 537, Florida Cooperative Extension Service. For more information, contact your county Cooperative Extension Service office.

2. Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville.

Although production records are vital to any beekeeping operation, they only tell part of the story. Financial record keeping is becoming more and more important whether the beekeeper has thousands or only a few colonies. Fluctuating interest rates, fuel costs and inflation are responsible for price hikes in everything from sugar for feeding to wooden ware. These economic changes, in the face of only modest increases in honey prices, mean smaller and smaller profit margins for beekeepers.

In the end, a "sharp pencil" can many times mean much more to an operation than effort expended in producing a few extra supers of honey. A suggested financial record keeping system, designed especially for beekeepers by Drs. W. J. Gomerjac and R. A. Luening, Cooperative Extension Service, University of Wisconsin, is found in Appendix 1.

GENERAL CHARACTERISTICS OF FLORIDA

Florida can roughly be divided into two areas, a north and western (panhandle) section and a southern peninsula. There is about a six degree latitude difference between the extreme north and southern tip of the state which accounts for about an hour and a half photoperiod (day length) difference.

The length of day in Florida is advantageous for beekeeping and agriculture in general, for the sun shines longer in the winter and shorter in the summer than in more temperate regions. The state also spans several climatic zones and temperate, subtropical and true tropical conditions all prevail in parts of Florida.

Florida has about 8,700 miles of coastline and no interior part is over 70 miles from the ocean. This proximity to water moderates extremes in temperature throughout the year. In addition, sizeable areas of water and low-lying swamp (about 4,400 square miles) exist in Florida which may also greatly influence local climatic conditions.

Elevations in Florida rise to about 300 feet in the panhandle, but most of the central portion of the peninsula is only 50 to 100 feet above sea level. These gentle gradients sometimes prevent rapid rainfall runoff and localized flooding can occur.

CLIMATE

Florida is known as the "sunshine state" and the sun shines about two-thirds of the possible daylight hours each year. As such, Florida is characterized by long, warm and humid summers. Extreme continental heatwaves, however, are usually absent due to shorter days, constant sea breezes and frequent thundershowers. The average maximum temperature in July ranges from 92°F (33°C) in the north to 88°F (31°C) in the south (Fig. 1). Temperatures over 100°F (37°C) are not unusual for north Florida, but are rare in the central and southern portion of the state. Bee colonies are affected by heat in several ways. Warm air is able to absorb more moisture from ripening nectar than is cooler air. The brood nest cannot tolerate temperature much above 95°F (35°C) and, therefore, in extremely hot weather, the bees bring water into the colony to evaporate for cooling the brood nest. Protecting colonies from the hot summer sun may be advisable when selecting locations, although there is evidence to suggest bees become more defensive in the shade.

The winters are considered mild in most parts of Florida. The average January minimum temperature for example, ranges from 42°F (6°C) in the north to 64°F (18°C) in the south (Fig. 2). The maximum January temperatures range from 66°F (19°C) in the north to 76°F (24°C) in the south (Fig. 3). This means that honey bees are able to fly almost any time of year. As a consequence, food consumption can be significantly greater during winter in comparison to more temperate areas where bees are confined in the hive for long periods with minimal food requirements.

Although winters are not severe, cold waves in Florida can be frequent. Their patterns of occurrence are influenced by cold air from the northern United States and Canada. No place in the state appears to be free from frost danger, even though the average number of frost-free days ranges from 240 in the panhandle to 365 in the Keys (Fig. 4). Average dates for the last frost in the spring range from January 29 in the south to March 15 in the north (Fig. 5). The range for the first freeze in the fall is from December 10 in the south to November 15 in the north (Fig. 6).

When frost does occur, it is usually on the second night of a cold wave after frontal winds have died and clear nights promote rapid heat loss to the atmosphere. Microclimate (localized climatic conditions) plays an important part in frost damage to both vegetation and honey bees. Depressions are especially prone to frost, for cold, dense air can collect in low spots resulting in lowering the temperature a few more critical degrees than on surrounding hillsides. It is often recommended, therefore, that bee colonies not be placed in low areas.

Warm periods between frosts are also sometimes damaging to vegetation and honey bees. Warm weather can stimulate plants to send tender shoots forth or bees to rear a marginal amount of brood, both of which may be damaged by the next cold wave.

Although no part of Florida lies strictly in the tropics (below latitude 23 1/2oN; the Tropic of Cancer), much of the state is characterized by distinct tropical wet and dry seasons corresponding to high and low sun periods respectively. In north Florida and the panhandle, minor rainfall peaks also occur in the spring and winter.

Average annual rainfall in the north part of the state ranges from 64" in the panhandle to 52 " on the east coast. The driest area is extreme south Florida with an average of 40" (Fig. 7). More than half the state's rainfall usually occurs in the period April to September (Fig. 8). Precipitation however, can be quite sporadic, generally in the form of thundershowers, and it may be that one part of the state suffers drought while another has too much rain. Many areas have recorded almost 80 inches of precipitation in one year, and most have experienced at least one season with less than 40". Intense rains may accompany tropical storms and hurricanes. The record rainfall for a 24 hour period during a hurricane was at Yankeetown in 1958, a staggering 38.7 inches! The chances of hurricane force winds in any given year, usually accompanied by torrential downpours, differs with location in Florida, and ranges from 1 in 100 in Jacksonville to 1 in 6 at Miami (Table 1).

Precipitation patterns are extremely important in agriculture. The unpredictability of rainfall in Florida has caused many farmers to rely on irrigation, while at the same time, having to construct facilities to remove excess water from fields. No agricultural crops are grown strictly for honey bees in Florida, but the bees forage on many kinds of fruit and vegetables. So bees do sometimes benefit from irrigation and water removal systems. Most bee forage, however, is feral in nature and thus vulnerable to variation in rainfall. Plants need access to moisture in order to secrete nectar which is often over 70% water. Too much water, on the other hand, is a real threat to bee colonies. Flooding can block the hive entrance,

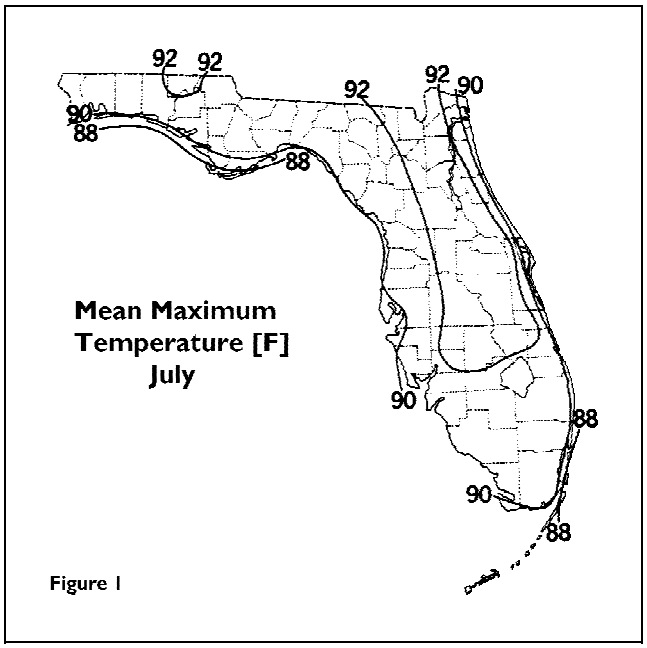

Figure 1

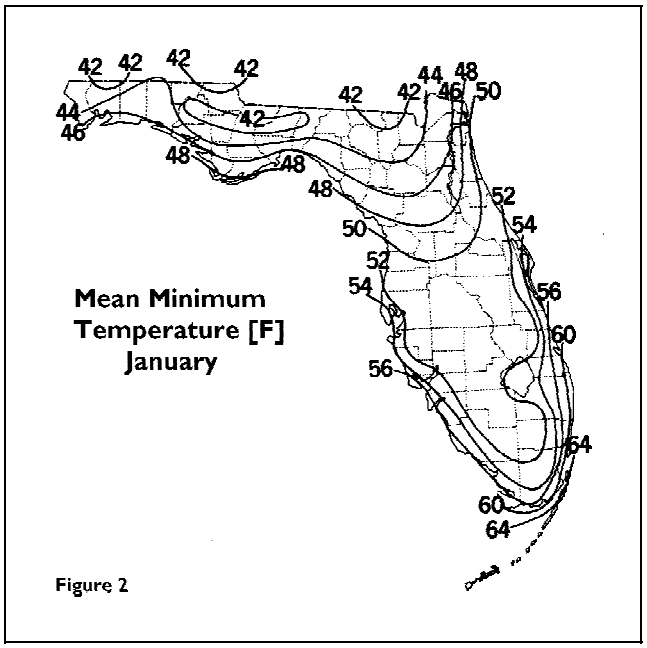

Figure 2

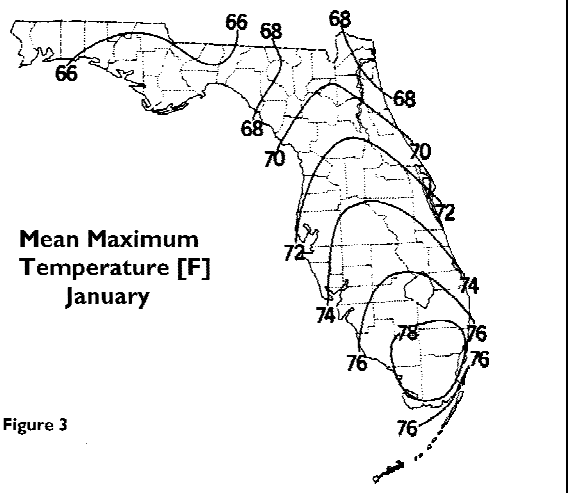

Figure 3

reduce the air supply and suffocate the bees in a very short time. It is usually recommended, therefore, that bee yards not be located in prime flash flood areas and that during tropical storms, colonies be monitored and moved to higher ground if necessary.

Florida's climate is characterized as humid. Humidity varies little from place to place and is lower (50% to 65%) in the afternoon when the sun is usually shining than evening or early morning (85% to 95%). It is known that a relative humidity of 50% (when the air contains half the moisture it can possibly hold at a specific temperature) is required for honey bee eggs to hatch. In addition, humid air absorbs less moisture, creating more work for a bee colony which must evaporate excess water from nectar in the honey-making process.

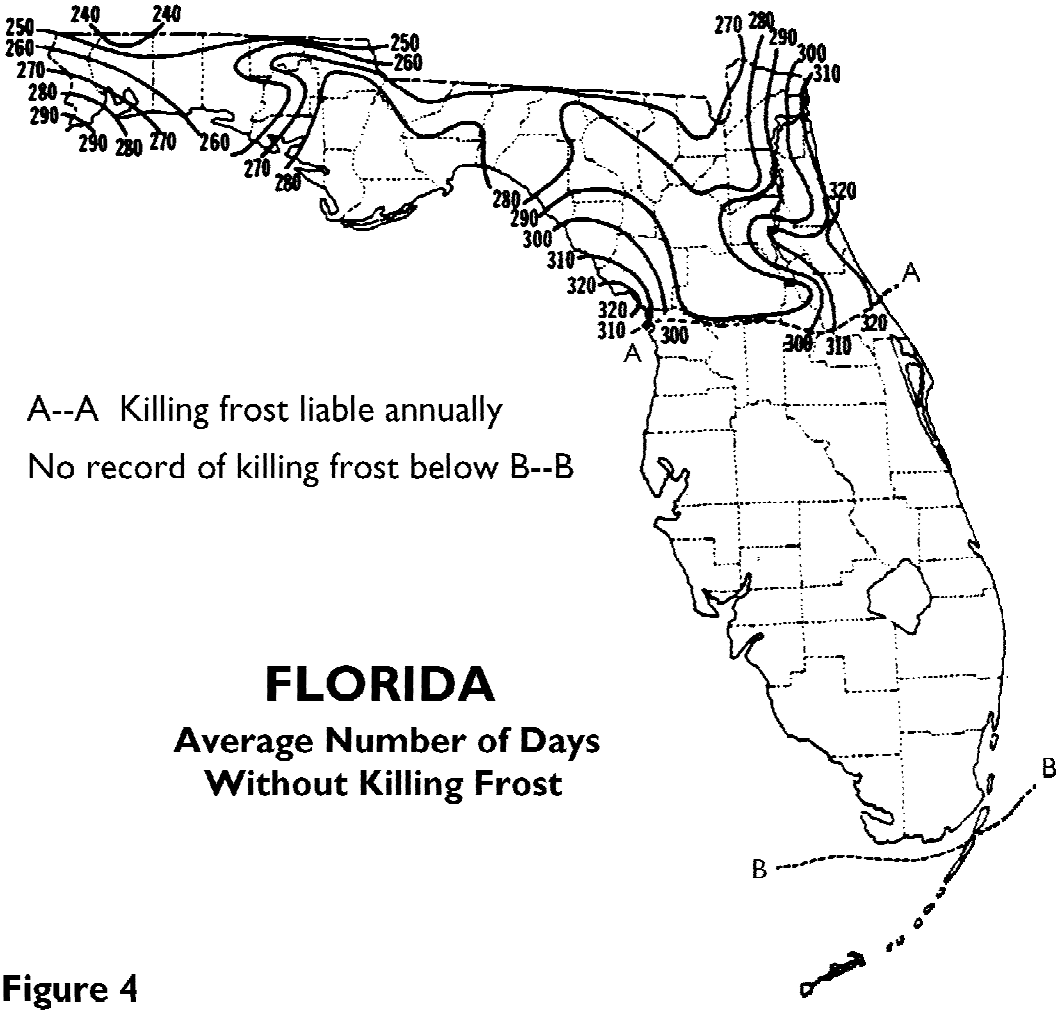

Figure 4

BEE BOTANY

Every beekeeper should know some botany, for without the right plants to secrete nectar, no honey would be produced even from a well-managed colony. Often publications listing plants that produce good supplies of nectar and pollen provide the beekeeper with little information about where they might be found or what influences their nectar production. Little is known about the latter because so many variables can come into play in any one season. Over long periods of time, experience has become the best teacher in determining what areas are superior nectar producers. Conditions such as makeup of the soil, pH (degree of acidity), moisture conditions and other factors all come into play and serve to explain why similar plants may produce large quantities of nectar in one place but not in others.

Florida is characterized by several major land resource areas largely based on underlying soil associations (Fig. 9). These can provide a general guide to the beekeeper in search of nectar sources. The extreme northern and western (panhandle) parts of the state are dominated by two areas, (1) the south coastal plain which extends some distance into Alabama and Georgia, and (2) the north Florida flatwoods. The principle vegetation mix in both areas is evergreen and deciduous forest, consisting of long and short leaf pine, oak and hickory in the uplands; and cypress and gum in poorly drained areas.

The bee forage in these areas is varied and includes sourwood, tulip poplar, gallberry, saw palmetto, cabbage palm, partridge pea and blackberry. Trailing Chinquapin, flat-topped golden rod, summer farewell, Spanish needles and Mexican clover may also be found, especially in disturbed areas.

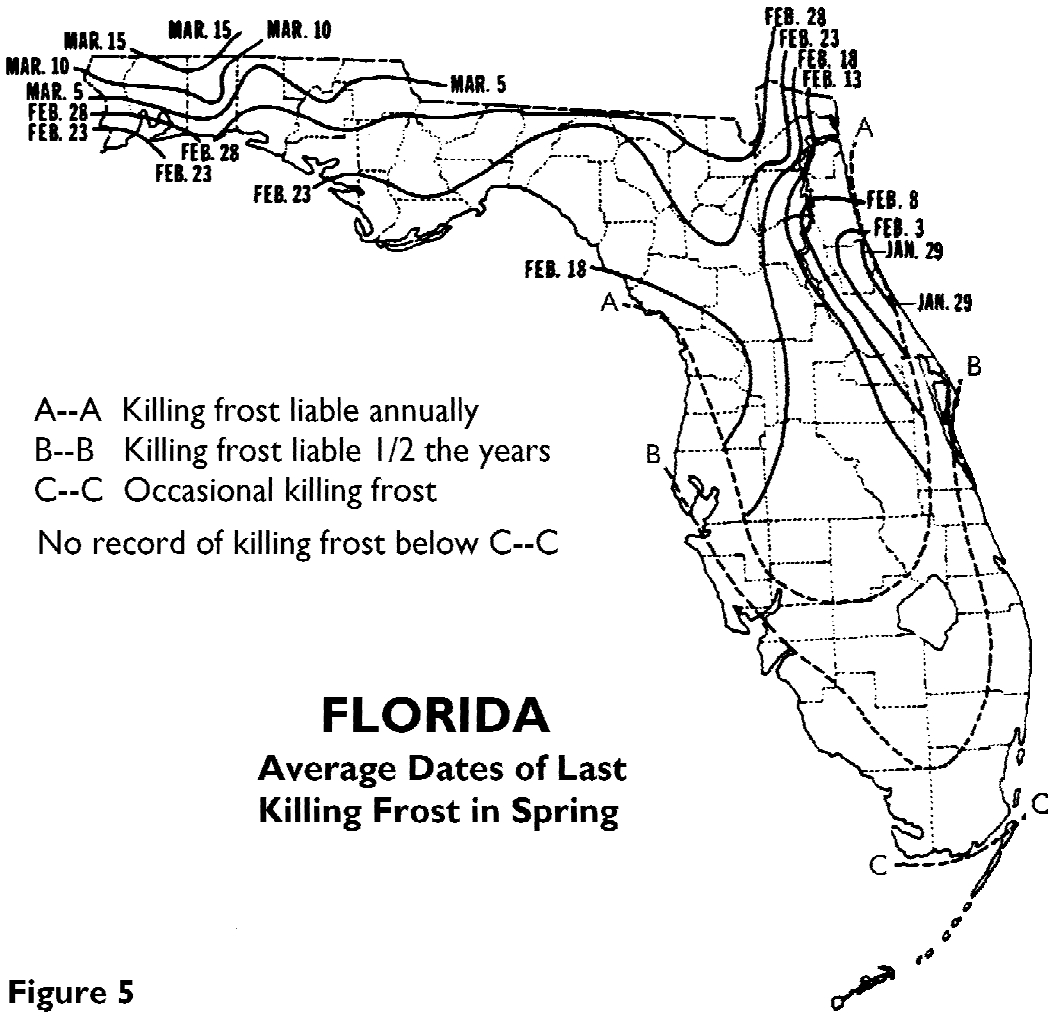

Figure 5

Table 1. Chances of hurricane force winds in any given year

City	Chances
Jacksonville	1 in 100
Daytona Beach	1 in 50
Melbourne-Vero Beach	1 in 20
Palm Beach	1 in 7
Miami	1 in 6
Key West	1 in 8
Fort Myers	1 in 11
Tampa-St. Petersburg	1 in 25
Apalachicola-St. Marks	1 in 17
Pensacola	1 in 8

Source: Climates of the States, Climatography of the United States No. 60-8, National Oceanic and Atmospheric Administration. 1968.

Other nectar and pollen sources include white and black (summer) ti-ti, crimson clover, red maple and willow. The Apalachicola river area supports one of Florida's best known nectar sources, the white tupelo or ogeechee tree. The principal kinds of agriculture found in these areas are cattle pastureage and forest-based (naval stores) interspersed with upland forage crops like corn, soybeans and peanuts.

The central Florida Ridge is an area of deep, well-drained soils of low natural fertility which supports the major citrus industry of the state. Citrus is a major cultivated bee forage plant, and one of the best nectar sources in the state. The original vegetation of this area was forests of mixed hardwood and pine on upland soils in the north and long leaf pine and turkey oak in the central section. Many of the plants found in both southern coastal plain and north Florida Flatwoods are also found here, but are

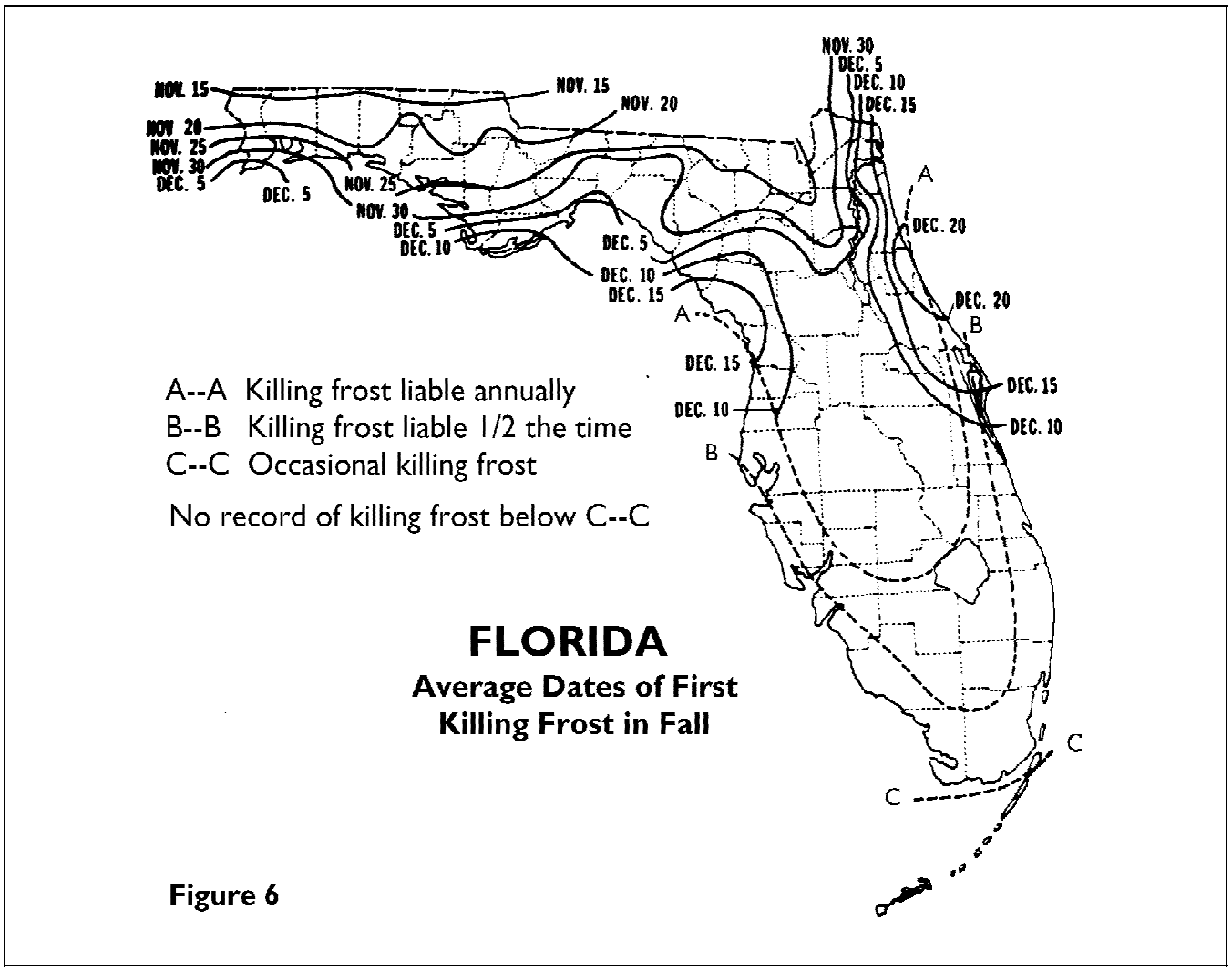

Figure 6

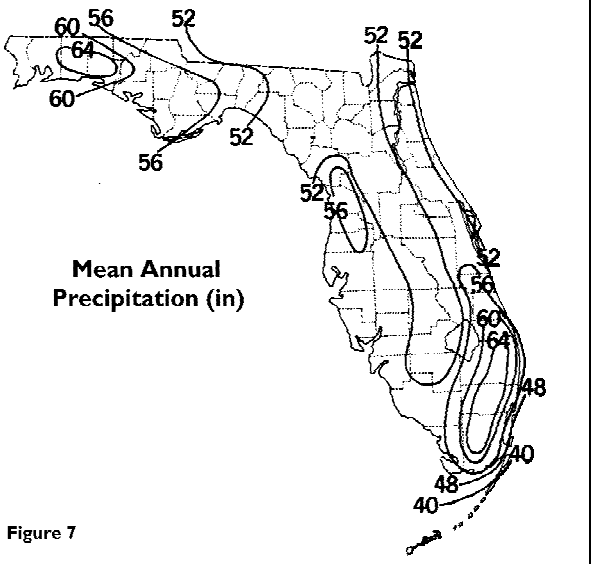

Figure 7

often limited in distribution due to large-scale agriculture. Gopher apple, prairie sunflower, Nutall's thistle and buttonbush are all found in central and south peninsular Florida and are reliable although minor sources of nectar. Some cultivated plants in the area besides citrus may also provide limited nectar and pollen such as loquats, kumquats, watermelons and other cucurbits (squash and cucumber).

The central and south Florida Flatwoods lie south of the soil temperature line (Fig. 9), where average soil temperature at 20 inches (50 em) exceeds 72°F (22°C), and surround the Central Florida Ridge. Often surface drainage is poor in the flatwoods, and underlying hardpan in some areas prevents free water movement upward or downward, making drought and flooding more damaging. Here longleaf pine prevails, but an understory of small shrubs, some of which are excellent nectar sources, also exists.

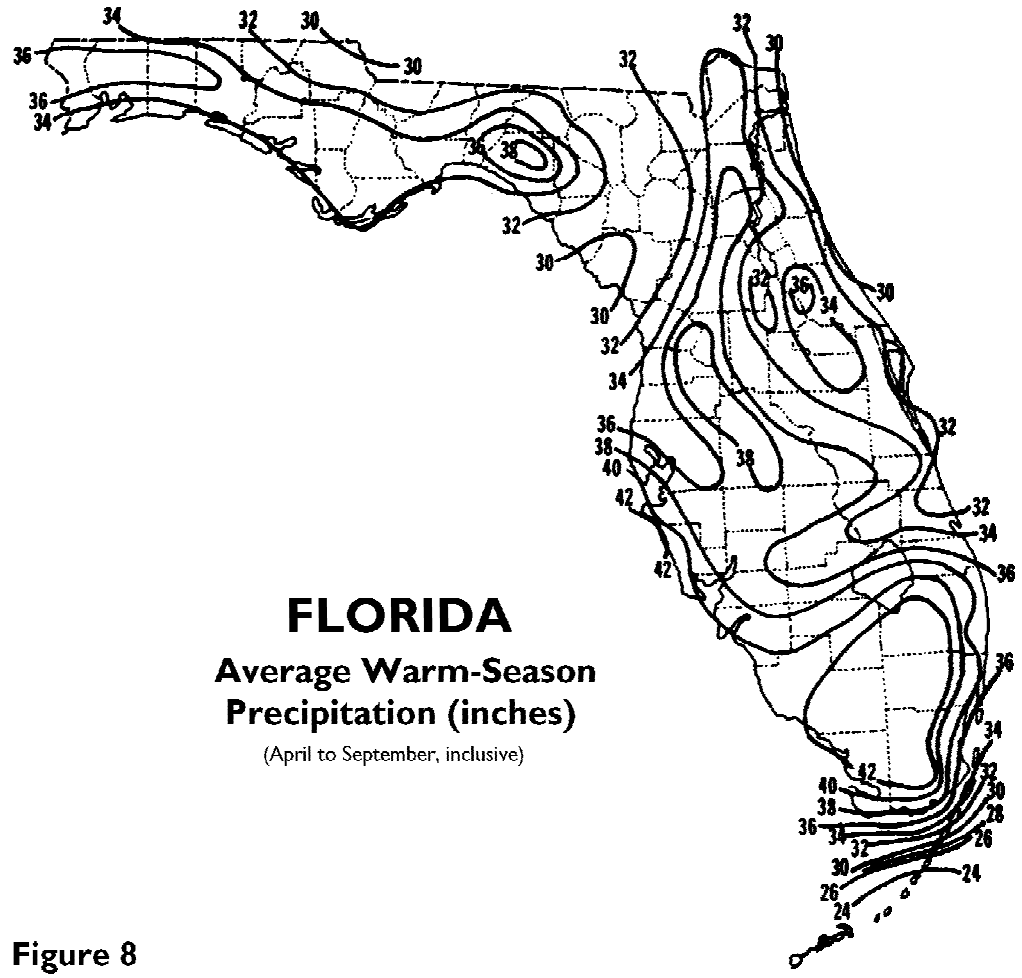

Figure 8

In swampy locations, cypress and gum predominate. The bee forage is dominated by saw palmetto, cabbage palm and gallberry, all major nectar sources. In the southern portion of the flatwoods, introduced plants like Brazilian pepper and the punk tree (*Melaletica*) are making major inroads and are also excellent nectar sources. The latter may bloom several times a year in some locations, providing much-needed bee forage early in the year and in the fall when the bees need it most. Spanish needles and flat-topped goldenrod are also excellent fall nectar plants found in the Florida flatwoods. In addition, from about Hernando county southward, coastal mangrove swamps exist on the west coast which include white and black mangrove, the latter a significant nectar producer. This part of Florida is also known for two minor nectar sources, pennyroyal and seagrape. Both are not as widespread as they once were, but still may be good producers in localized areas.

The soils of the flatwoods are not as suitable for growing crops as those of the central Florida Ridge. The agriculture here is mostly livestock and forest-based, although isolated soils are found which support truck farming and forage crops like corn.

The Florida Everglades is found south and west of Lake Okeechobee. This is the major winter vegetable-growing region in the state where significant amounts of pole beans, string beans, celery, potatoes, peppers, squash, watermelons, lettuce and tomatoes are produced. In addition, tropical crops like sugarcane, avocado, guava, limes and mango are cultivated. The bee forage here is on the decline as large-scale agriculture increases, however, large natural areas still exist where plants like Spanish needles, clovers, gallberry, saw palmetto and cabbage palm grow. Again, coastal areas are dominated by mangrove, and the Brazilian pepper and *Metaleuca* are also well established in this area. In general, the honey bees obtain only small amounts of nectar from the cultivated vegetables and fruits in this region, but are extremely important in the pollination of many of these crops.

Although most bee plants are generally associated with specific land resource areas, they are not necessarily confined to those regions. Many nectar-producing plants are statewide in distribution, although certain localized habitat requirements must be met before they will grow and secrete nectar.

Perhaps less than ten plants are considered prime sources of nectar and pollen in Florida, however, many more contribute to a colony's well-being throughout the year. Table 2 is a comprehensive list of most plants important to honey bees, but is by no means exhaustive.

BEE LOCATIONS

Because conditions affecting plants vary from year to year, it often takes several years to tell whether a certain bee location is a good one for surplus honey production. A superior year can be followed by two mediocre ones, and the site may still merit a superior rating. A three to five year trial period, therefore, is usually recommended to determine whether a particular location is good.

Because of this rather long experimental period, it may benefit beekeepers to spread their colonies around, testing several locations at one time, rather than having them all in one place. Often, time spent searching for bee locations can be shortened by asking experienced beekeepers in the area what sites they feel are better than others.

PROTECTING BEES FROM PESTICIDES

One of the most important considerations when locating honey bees is the possibility of the insects being poisoned by pesticide application. This is especially true when colonies are located near cultivated crops such as citrus, blueberries and vegetables. In urban locations, bees may be poisoned by mosquito control operations.

The beekeeper, therefore, should pay attention to insect control campaigns and what damage they might do to his bees. The best rule to follow is to establish communication with nearby farmers and/or mosquito control districts so you will be notified before pesticide applications. The key to protecting bee colonies is prevention, usually possible through cooperation between the beekeeper and those who might apply pesticides.

Any questions about pesticide application and its effect on honey bees should be directed to your county extension agent. The Florida Cooperative Extension Service publishes Circular 534, Protecting Honey Bees From Pesticides.

BEE POPULATION DYNAMICS

The dynamics of bee population for each colony will vary based on internal and external conditions. Usually, egg laying by the queens begins in December, stimulated by photoperiod, feeding by the beekeeper and/or the blooming of pollen and nectar-producing plants such as pennyroyal, red maple and willow. These plants produce a profusion of pollen important for brood rearing. Later, in March and April, other plants begin to bloom which produce more nectar and pollen further stimulating the colony's population growth.

Ideally, the population of adult bees in a colony should reach a peak at the same time as nectar production. This is not always the case, however, and, therefore, the early nectar flows by citrus or gallberry may be missed. Thus, it becomes the beekeeper's responsibility in many instances to artificially stimulate the bees which effectively shifts the population graph in the calendar to the left. In May and June, most of the major nectar-producing plants are in bloom including saw palmetto, cabbage palm and mangrove.

Mid-summer is generally a time of population decline for honey bees. Few plants are blooming then in the north and west portion of the state, although some more tropical parts may have blooms year round. This is the wet season of the year, but sometimes there is intermittent drought.

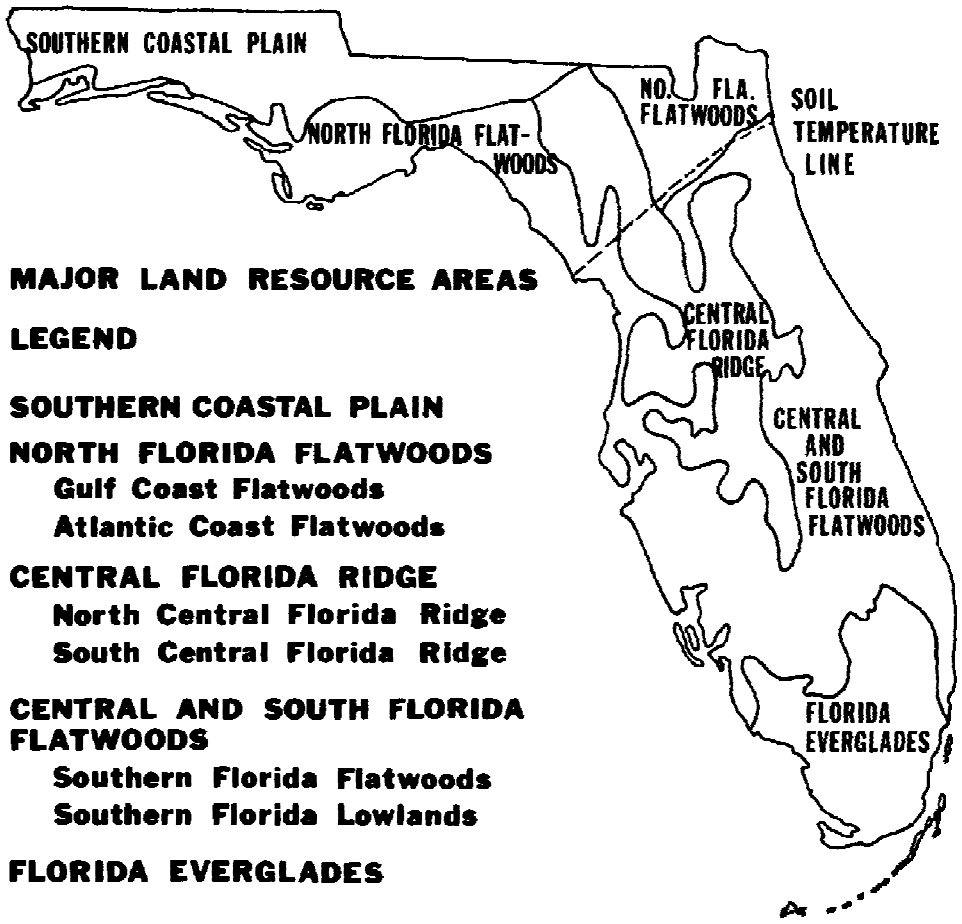

Figure 9

Table 2. Some Florida plants from which bees collect either pollen, nectar or both

Plant Name	Pollen Source	Nectar Source	Plant Name	Pollen Source	Nectar Source
Bermudagrass	X		Grape	X	X
Bitterweed	X	X	Holly	X	X
Blackberry	X	X	Honeysuckle	X	X
Blackgum	X	X	Johnsongrass	X	X
Blueberry		X	Laurel cherry	X	
Buttonbush*	X	X	Lilac tree	X	X
Cajeput (Melaleuca)*	X	X	Lima beans		X
Century plant	X	X	Locust	X	X
Chickweed	X	X	Lupine	X	X
Chicory	X	X	Mangrove, black*	X	X
Chinese tallow		X	Mangrove, white	X	X
Citrus*	X	X	Maple*	X	X
Clovers*	X	X	Mexican clover*	X	X
Corn	X		Milkvetch	X	X
Cotton	X	X	Milkweed	X	X
Cottonwood		X	Mints	X	X
Cowpea		X	Mustard	X	X
Cucurbits (watermelon, cantaloupe, cucumber, gourds, pumpkin, squash)*	X	X	Oak	X	
			Palms (cabbage palm, sable palm)*	X	
Dandelion*	X	X	Partridge pea*	X	X
Dogbane		X	Peach	X	
Elderberry	X		Pear	X	X
Gallberry*	X	X	Pepperbush (Florida holly, Brazilian pepper)*	X	X
Goldenrod*	X	X			

*Indicates major sources

Colonies should be extensively monitored at this time, for a localized lack of nectar, resulting in starvation of bee colonies, is a real possibility. In late July and early August, stimulation by plants such as partridge pea, Mexican clover and Brazilian pepper causes bee populations to rise somewhat to coincide with the major nectar flows in the fall of aster, golden rod, spanish needles, summer farewell, *Melaleuca* and Brazilian pepper. At this time, the colony begins to produce so-called "winter bees," or those which are physiologically more able to store food reserves in their bodies during cold weather.

The preceding description is based on a temperate season. Much of southern Florida, of course, does not have so distinct a seasonal change. Introduced plants like the *Melaleuca* and other native vegetation may in fact bloom mueh of the year. This causes the peaks and valleys of bee population shown in the calendar to smooth out considerably. In the tropics, two seasons prevail, not four. The beekeeping calendar thus is predicated less on photoperiod and temperature variation than on moisture availability. Usually, tropical nectar-producing plants bloom heavily during the dry season, being more or less dormant during the rainy season. Southern Florida, therefore, becomes a gray zone of sorts as far as beekeeping is

concerned-somewhere between classical temperate and tropical conditions which must be accounted for when making bee management decisions.

SEASONAL BEE MANAGEMENT

The most important inspection of a bee colony is the one conducted in the spring of each year. By late December and early January the inspection should be completed. The beekeeper looks for signs of disease, pattern of brood (indicating queen quality), population size and food supply.

Estimating a colony's stores of nectar and pollen is extremely critical at this time. Even though the insects may appear to have plenty of stores, they use available food at a rapid rate this time of year producing brood. Bee colonies can, therefore, quickly become overextended, and any delay in blooming or a period of inclement weather can cause them to starve. If there is any doubt about food supply, colonies should be regularly monitored through the spring population buildup until they are actively gathering nectar and pollen in the field. Should the food supply diminish they can be fed sugar syrup or dry sugar and pollen supplement to see them through this critical period. Many beekeepers also routinely feed bees to accelerate population buildup in preparation of early flows of gallberry or citrus.

SWARMING

One of the major problems throughout the buildup season for beekeepers is swarming. This is the means by which a bee colony reproduces; about half the bees and the old queen leave the colony to seek a new home. Swarming effectively reduces the honey crop because the departing bees take much of the food supply with them and the weaker population left in the parent colony cannot produce the size crop the original population might have.

The urge to swarm becomes more and more powerful as a honey flow approaches. Much has been written about controlling swarming, but the best advice is to prevent the swarming impulse from beginning within a colony. Most people believe the simplest way to do this is to provide enough room and ventilation so the bees do not become overcrowded. This is done by adding supers before they are needed. It is generally recommended to add supers when the bees are found covering all existing frames. Commercial beekeepers may add two or more supers depending on how soon the next trip to the beeyard is anticipated.

REQUEENING

At practically any time of year, a honey bee colony can be requeened in Florida. Some prefer to do this in early spring, others during the two main nectar flow periods in early summer and fall. Most beekeepers requeen in the fall, September being the preferred month. Queens are less expensive at this time of year; there is sufficient time to replace a queen that is not accepted; and the process provides a young queen to produce a large number of vigorous winter bees and a strong population early the following spring.

Usually, beekeepers requeen every two years, but no hard and fast rules exist on the subject. Some never requeen, preferring instead to let the bees handle this sometimes "ticklish" task. The major rule to follow in requeening is to remove the old queen first. After a few hours a new queen can then be introduced in a malling cage, by means of a pushin cage or in between two frames of brood covered by young bees.

WINTERING

The last major inspection of bee colonies occurs in the fall. The bees usually arrange their winter nest adequately, but the beekeeper should ensure that the necessary conditions are met for successful wintering. These include: no sign of disease, about 80 pounds of honey, three frames of pollen and seven frames of brood covered by adult bees.

Because honey bees remain active in Florida for much of the cold season, the beekeeper must contantly monitor colonies for stores and be prepared to feed his bees if necessary. Ventilation is extremely important to honey bee colonies during winter. The warm air a colony produces is often saturated with moisture. If this air is trapped within a colony, the moisture may condense inside the beehive which is bad for the insects and provides an excellent medium for microorganism growth. In most cases, proper ventilation may be accomplished by propping up covers or drilling holes above the hand holds.

STARTING SMALL - THE KEY TO SUCCESS

In summary, the purpose of this almanac is to provide a guide to making management decisions in the art and science of beekeeping. It in no way, however, can take the place of knowledge and experience gained in the field by actually keeping honey bees. For the beginner, this means starting small and only contemplating increasing the size and scope of the beekeeping operation as the necessary experience is gained. For advanced beekeepers, this means changing established management procedures slowly by

experimenting with only a few colonies until new ideas are proven effective in a particular beekeeping operation.

Perhaps the best advice, therefore, that can be given to all beekeepers is to be like bees themselves, extremely conservative. For it is only due to this that these insects have been able to adapt and survive so well over the last 70 million years.