

MISSISSIPPI AFRICANIZED HONEY BEE REFERENCE MANUAL



**September 20, 2007
1st Edition**

Forward

The Mississippi Africanized Honey Bee Reference Manual was developed by the Mississippi Africanized Honey Bee (AHB) Action Committee. The Task Force/Committee was first organized in 1990 to initiate activities should AHB's become established in Mississippi.

This Reference Manual is intended to provide persons responsible for dealing with honey bee emergencies as well as information to specific public entities the most accurate information. Such information includes: (1)- persons to contact in an emergency, such as proper 911 personnel for rescue and treatment of multiple sting casualties, (2)- precautions for the general public, utility workers, foresters, farmers, etc. to take when encountering a swarm of honey bees, (3)- proper destruction of feral swarms, (4)- regulatory requirements affecting beekeepers and pest control operators, (5)- a sample media packet of information for educating the public via news media. A number of publications and brochures are enclosed from various sources.

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Mississippi Pest Control Association
Mississippi Beekeepers Association



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I. Proposed Africanized Honey Bee Action Plan for Mississippi September 24, 2007

A. INTRODUCTION

Africanized honey bee movement. The steady progression of the Africanized honey bee, *Apis mellifera scutellata* (AHB) northward from Sao Paulo, Brazil, where it escaped from a breeding program in 1957 has created tremendous problems to the beekeeping industry in South and Central America and parts of the Southwest United States. It has recently been detected in several counties near Miami, Florida where stinging incidences are occurring. Isolated infestations have also been found in New Orleans and along the western edges of Arkansas and Louisiana and southern Oklahoma. It continues to expand its range northward in California. A January 2007 map of AHB distribution in the United States is attached; however, it does not show the infestation in the New Orleans area.

Based upon the history of its movement and current information on its spread, it could migrate or hitchhike on ships, barges, truck trailers, etc. into all areas of Mississippi. Africanization is occurring in counties around Miami and New Orleans and possibly Mobile, Alabama due to escapes of AHB swarms from ships coming into port.

Impact and coordination. Because of the AHB's characteristic strong defensive behavior, it can be a significant threat to livestock, humans and pets. Concern for our beekeeping industry, the importance of pollination to our agricultural industry, the potential impact on livestock, and the elevated public concerns about safety led to the decision to form the Mississippi Africanized Honey Bee Advisory Committee in 1989. The committee was structured so that state agencies and associations were represented which would be directly affected or have a potential role in education, health, or management of the Africanized honey bee should it reach Mississippi. The agencies and associations selected to be represented on the Advisory Committee are the Mississippi Agricultural Experiment Station (MAFES), Mississippi Apiary Inspection Service (Bureau of Plant Industry, Mississippi Department of Agriculture and Commerce), Mississippi State University Extension Service (MSUES), Mississippi Department of Health (MSDH), Mississippi Department of Wildlife, Fisheries and Parks (MDWFP), Mississippi Farm Bureau (MFB), Mississippi Beekeepers Association (MBA), USDA Plant Protection and Quarantine, Animal and Plant Health Inspection Service (USDA/PPQ/APHIS) and the Mississippi Emergency Management Agency (MEMA).

Goals and Objectives. The primary goals of the Mississippi Advisory Committee on Africanized Honey Bees are (1) to develop an Africanized Honey Bee Action Plan that would lay out the best possible strategies for dealing broadly with the problem and (2) to provide recommendations regarding priorities and resources that would be required to implement the emergency response, regulatory, educational and research objectives of the Mississippi Africanized Honey Bee Action Plan.

In addition to the above goals, the Advisory Committee also identified the following objectives:

1. To insure that each agency/organization representative receive the most current and accurate information on the AHB as it is received.
2. That committee members share the capabilities and unique concerns of their agency/organization relative to the AHB incidences.

3. That committee functions insure a coordinated effort by the concerned agencies/organizations involved in developing and carrying out a mutually acceptable plan for dealing with the AHB when it is found in Mississippi.
4. To insure that information released to the public is accurate and current so as to avoid unwarranted public panic, hysteria, or undue concern.
5. To serve as an advisory group on all facets of the AHB problem and to keep the administrators of each represented agency and organization advised of key developments as may be needed or requested.

Members of the Mississippi Advisory Committee on Africanized Honey Bee are listed below in Table 1.

Table 1. Mississippi Advisory Committee on Africanized Honey Bees

Mississippi Agricultural Experiment Station
And Mississippi State University Extension Service

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B. BACKGROUND AND DISTRIBUTION

The European honey bee *Apis mellifera ligustica* has been “managed by commercial and hobby beekeepers worldwide for many centuries and has been selected by beekeepers for desirable traits – principally gentleness, honey production, tendency not to swarm, winter hardiness, color and others. On the other hand, the African honey bee *Apis mellifera scutellata*, has been selected through natural selection for survival in a rough, harsh environment in Africa where predation, climate, etc., have produced an aggressive and hardy race.

Crossbreeding and Africanization. The Africanized honey bee is technically referred to as a “hybrid” which resulted from the cross mating of the African honey bee *Apis mellifera scutellata* and several European honey bee races in Brazil following the accidental release of a reported 26 African queen bees in 1957 from a breeding program in Sao Paulo, Brazil. Evidence of this combination has been based on morphological, behavioral, physiological, chemical, genetic and field population studies. The AHB can best be described by its defensive and other behavioral differences although there are small morphological as well as chemical differences that can be laboratory tested to confirm Africanization. The principal phenotypic characteristics of AHB which distinguish it from the European or domestic honey bee are listed in Table 2.

Table 2. Characteristics of the Africanized Honey Bee

- Strong Defensive Behavior
- Aggressive hive defense and stinging is typically 10X as many stings per encounter. AHB responds more quickly, more bees respond, and higher percentage of responders sting
- Excessive Swarming

- Excessive Absconding
- Excessive Robbing
- Lack of Selectivity in Choosing Nesting Sites
- Larger Number of Feral (Wild) Colonies in Given Area (Density)
- Poor Winter Survival in Cold Climates
- Colony Take Over
- Queen Parasitism
- Drone Drift
- Suspected Mating Advantage
- Unpredictable Behavior During Colony Manipulation
- Stinging
- Nervousness on Combs

Northern migration. The “Africanization” of honey bees in Brazil required approximately 10 years. In South and Central America the AHB has spread at the rate of 200 to 300 miles annually, depending on terrain and available floral resources. From Brazil the AHB has moved southward approximately 1,000 miles into southern Argentina. It moved northward into Panama (3,200 miles) by 1982 and through Central America into southern Mexico (an additional 1,100 miles) by September 1986. Since 1986, it has migrated into Texas eastward to within approximately 60 miles of Louisiana, into Arizona, New Mexico, Nevada, southern California and into extreme southern Oklahoma. Experts do not know why it’s migration eastward during the last ten years has been impeded, except due to natural environmental circumstances. Average annual rainfall exceeding 55 inches appears to adversely affect the establishment of AHB. Infestations now occur in southern Florida and near the port of New Orleans as a result of movement on shipping vessels.

C. POTENTIAL ECONOMIC AND PUBLIC HEALTH IMPACTS OF AHB IN THE UNITED STATES AND MISSISSIPPI

Economic impact on honey bee industry. The introduction of AHB into the state would have a drastic effect on the beekeeping industry economically and socially. Honey production figures for the U. S. indicate 200+ million pounds are produced annually from approximately 2.6 million colonies. Mississippi ranks in the low to mid twenties among the states in honey production, and in the top ten states in the production of packaged and queen bees. The introduction of AHB into Mississippi would adversely affect the movement of migratory hives, and the sale of packaged and queen bees. The Mississippi Department of Agriculture and Commerce, Bureau of Plant Industry would have to find ways to fund a certification program to inspect and certify approximately 80,000 bee colonies as free of AHB. Such would be an expensive endeavor, adding to current inspection protocols used to certify colonies free of other parasites and diseases.

In 1987, Mississippi beekeepers placed 2,152,129 pounds of honey valued at \$1,102,000 at wholesale prices in the USDA honey loan program. Honey production has decreased significantly since 1985 and 1987 after parasitic tracheal mites and varroa mites entered the state. Annual production in Mississippi now averages between 1.1 and 1.4 million pounds. Also, 15,000 to 20,000 colonies belonging to hobbyists produce 600,000-800,000 pounds of honey worth about \$1 million annually. However, honey is only one of the “hive products” from which beekeepers derive income. Others, although minor, are beeswax, propolis and royal jelly.

Until the tracheal mite and varroa mites were found the sale of package bees and queen bees was a much larger income producer (about 2-fold) for Mississippi beekeepers than honey production. Due to the threat of parasitic mites, many customers chose not to purchase queens and packages rather than risk the health of their bee colonies. They began to raise their own queens and make colony divisions rather than purchase queens and packages. Many queen/package producers had to quit the business. Now that tracheal mites have generally infested all of the U. S., the market is beginning to show signs of improving. However, should AHB enter the state the market could remain stagnated or even decline further if an AHB certification program is not adopted and accepted by purchasers of honey bees.

It is difficult to estimate the full economic impact of the Africanized honey bee. In areas of the United States now generally infested with AHB beekeeping and honey production have been greatly affected. AHB colonies require more time and equipment to handle them safely and properly and are difficult in general to work. Risks to workers through increased stinging are also increased significantly. Hobby beekeepers, not willing to work with the more defensive bees, have been known to give up keeping hives. For safety concerns of landowners it becomes much more difficult for beekeepers to find good productive locations to place bee colonies.

Potential economic impact on crop pollination. Honey production figures do not realistically reflect the economic importance of honey bees to the U. S. and Mississippi. The greatest value lies in the increased production and/or quality of fruit, nuts, seed and fiber resulting from the pollination of plant species requiring or benefiting from honey bee pollination. The most recent published studies give a value of the cultivated crops known to require or benefit from honey bee pollination at nearly \$15 billion annually in the U. S. In Mississippi the value of honey bees in pollinating crops is over \$200 million dollars annually.

Impact on animals. There are economic losses as a result of losing livestock and domestic pet animals due to mass stinging, especially those animals kept in confined situations. Unfortunately, while animal deaths have been reported from AHB infested areas (mostly dogs, chickens, goats and horses), there is little documentation in the literature as to the true economic impact on the animal industry.

Potential impact on recreation. Mississippi has an extensive network of State Parks where people engage in a number of outdoor activities. This includes hiking, picnics, camping, fishing and boating. Outings of this nature will increase the possible contact between people and feral AHB colonies. Accordingly, park employees should be educated about Africanized honey bees and the possible consequences of contact between bees and park users. Once AHB incidences occur repeatedly people will reduce recreational outings to avoid the possibility of contacting an AHB swarm.

Public Health. The AHB impact on public health will be less than expected as it has been in each of the states where these bees have become established. There is no reason to believe that these insects can overwhelm either the public health or private medical facilities in Mississippi. Suggesting that AHB introduction into the state will lead to serious medical outcomes in a state where good communications, available medical treatment, emergency transportation and extensive control capabilities exist, clearly does not follow logic. An increased incidence of human exposure to stings is possible, given the more aggressive, defensive nature of some colonies of AHB. Stinging incidences should be expected. Emergency medical teams must be equipped and trained on how to treat patients in the midst of AHB stinging incidences.

D. RECOMMENDATIONS BY THE STATE ADVISORY COMMITTEE

Recommendations for actions are given by the Committee in five areas. These five areas involve (1) education, training and public information, (2) quarantine and regulatory, (3) public health, (4) a management plan for Mississippi beekeepers and (5) research priorities and AHB identification laboratories. The following recommendations represent the best thinking of the committee on what should be done in each of these areas based on the current status and knowledge about the Africanized honey bee.

1. Education, Training and Public Information

The economic impact resulting from the Africanization of the feral honey bee populations in most South and Central American countries has been substantial. However, this loss has been masked due to the attention and coverage given by the media to the encounters of man with the “killer bees” – real or imagined. Most people have an overwhelming fear of venomous animals. At times, this attitude takes on phobic proportions, making it difficult to maintain a proper perspective during stinging incidences. Unfortunately, the AHB’s’ defensive nature and perceived health implications have taken on unrealistic proportions in most media releases. It is recognized that to deal effectively with a problem, such as the Africanized honey bee having a significant public health and emotional impact, requires an informed public. The general public will need to be educated on what to expect and how best to deal with the problem, especially in our large urban centers. This will require an extensive educational and organizational effort by the Mississippi State University Extensive Service to educate and prepare key municipal groups (specifically police, firemen, emergency medical technicians, physicians and others) and cooperating beekeepers to meet the task. Wild colonies of honey bees must be reported to the proper officials by persons rather than taking it upon themselves to try to dispose of the problem. Most stinging incidences have happened because untrained, uneducated persons have either failed to report a wild colony or tried to handle the problem themselves.

The educational effort’s primary goal will be providing objective information about AHB to beekeepers, agricultural producers, livestock operators, public officials, municipal action groups, the public and most importantly to the news media. In 2005, the Mississippi Beekeepers Association produced and distributed training videos through the Mississippi Fire Academy to various county 911 Responders to train them on handling honey bee emergencies, including stinging attacks.

Objectives for the educational program include:

- a. The development of an “AHB Reference Manual” which will serve as the primary information source for Extension, Mississippi Department of Agriculture and Commerce, other key educational personnel, including groups both within Extension and other cooperating state agencies and associations. This loose-leaf, 3-ring binder reference will serve as a primary source of information used to inform the Mississippi public. Having accurate, objective and interpretive information available is the key to an effective educational program.
- b. To complement the “Reference Manual”, several fact sheets should be made available which target specific public clientele and provide answers to the primary questions/concerns anticipated. The target clientele include:
 - i. Beekeepers (both commercial and hobby)

- ii. Agricultural producers who have an economic interest (pollination service), who provide apiary sites on their property, or who have concerns about adverse effects involving the introduction of AHB.
 - iii. Livestock operators, especially confined operations.
 - iv. Municipal “action groups” organized to deal with the influx of AHB in urban environments (police, firemen, physicians, emergency medical technicians, pest control operators, private consultants, mosquito abatement districts, etc.).
 - v. The general public.
 - vi. Mississippi Department of Wildlife, Fisheries and Parks- State park managers.
 - vii. Entomologists- Consultants
 - viii. Mississippi Forestry Commission
 - ix. U. S. Forest Service in Mississippi.
 - x. Various Utility Companies
 - xi. Mississippi Department of Health
 - xii. Mississippi Department of Transportation
 - xiii. Mississippi Emergency Management Agency
- c. Workshops, symposia, seminars and meetings with organized groups to create greater awareness and knowledge.
 - d. Utilization of news releases, video tapes, etc., for use by organized groups and by television and newspapers.

2. Public Health – Africanized honey bee stings and their medical management.

The frequency of stinging incidents will increase which will concurrently increase the number of people who will develop allergic reactions and thereby require treatment by medical personnel and facilities. The medical treatments for Africanized honey bee stings will be the same as currently recommended for stinging bees, wasps, and hornets; therefore, emergency medical services and other health care personnel should require no additional specialized training for treatment. The Health Care community should be alerted through an educational effort that Africanized honey bees may represent an increased risk of being stung and of receiving multiple stings. The enhanced possibilities of serious interactions with other existing medical conditions should also be emphasized.

Medical emergencies arising from AHB or European honey bee stings may produce the following results: In a sensitized individual, one or more stings may produce an IgE mediated hypersensitivity response resulting in a wide range of symptoms ranging from localized swelling, feeling faint or dizzy, bronchoconstriction (asthma), angioneurotic edema, hypotension (shock or low blood pressure), to fatal cardiovascular collapse. This can occur with either a single sting or multiple honey bee stings. Treatment will consist of epinephrine and other supportive care as the clinical situation dictates and as would befit the management of any IgE mediated hypersensitivity reaction from any cause. No treatment should be administered without the supervision of Emergency Medical Service personnel.

3. Regulatory and Quarantine

The Mississippi Bee Disease Act defines AHB as a pest of domestic honey bees; therefore, it is regulated. Regulations currently provide for quarantines of any apiary where AHB is detected. Individual hives shall be inspected and those with AHB shall be depopulated. All apiaries within three miles shall be quarantined until each hive is examined for AHB and no other infested apiaries are detected.

The regulation does not require any type of AHB trapping program or survey for feral AHB colonies; however, BPI is currently setting swarm traps at harbors/ports at Greenville, Vicksburg, Natchez, Bay St. Louis, Gulfport, Biloxi and Pascagoula from March through September. Since an infestation has been detected near the port of New Orleans, a trap-line of traps along the Louisiana-Mississippi border should possibly be implemented at the suggestion of this taskforce. Detection of a feral AHB colony or a colony within an established apiary would place all managed bee colonies within three miles under quarantine until inspected and released from quarantine. All AHB colonies shall be destroyed utilizing a State registered pesticide according to label directions and/or other reliable means.

With the arrival of AHB, it would be advisable that all managed bee colonies in Mississippi be registered so that BPI inspectors can inspect them periodically. This is only a voluntary activity at this time, and no beekeepers are currently registering colony locations. However, it is very burdensome because apiary locations for many colonies change several times a year and beekeepers have to change locations for various reasons.

With the arrival of the AHB migration wave, all beekeepers who will be transporting bees (colonies, nucs, packages, or queens), including migratory beekeepers and package and queen producers, will need to have their colonies inspected and certified free or at least apparently free of AHB. Current regulations need to be reviewed and updated as needed and suggested by this taskforce to further protect the general public and beekeeping industries in Mississippi. This requirement along with the need to check all managed colonies (commercial and hobbyist) and establish a trap-line, will more than double the bee inspection work load on BPI inspectors. It is estimated that the combined times spent on honey bee inspections equals one full-time employee. In order to maintain an adequate level of efficiency and meet the above standards, at least one additional full-time inspector will be needed.

Reliable survey and detection methods for AHB in the field have been developed; however, further refining will be needed as technological advances are discovered. Samples of bees from AHB suspect colonies in many cases will have to be collected to verify field results and to diagnose borderline AHB crosses with domestic European honey bees (EHB). Varying degrees of crosses with EHB can result in a wide range of defensive behaviors in colonies. BPI does not currently have laboratory capabilities to diagnose such samples. Initial screening in the field or local laboratory will be done using the FABIS (Fast Africanized Bee Identification System), either the morphometrics or fresh weight methods. If screening is positive, samples will be sent to appropriate USDA-ARS facilities for full morphometrics or DNA testing for a final diagnosis. However, federal facilities are becoming over burdened, so a state diagnostic laboratory may have to be established, requiring additional expenses in equipment and labor. Each sample requires a minimum of 2-3 hours to analyze using the USDA-ID FABIS computerized digitizing system.

An AHB survey will not be necessary in addition to the regular inspection and certification of commercial apiaries since they cover most areas of the state, particularly those most fitting to the

establishment of AHB wild population. Queen mother colonies/breeder queens will be screened in the field initially using USDA's Fast Africanized Honey Bee Identification System (FABIS) Fresh Weight Measuring System. If samples test positive further identification will be sought by sending the samples to USDA for DNA testing.

Honey Bee Sampling Procedures for Certification as European.

- i. Sample each mother queen's progeny that is expected to be used.
- ii. Sample each drone yard (with composite sample method).
- iii. Sample each mating yard (with composite sample method).
- iv. Sample each apiary site within a 3 mile radius of a mating yard.
- v. During inspections of out yards; sample any overly aggressive colonies.
- vi. A sample should be a minimum of 100 bees. A sample should consist of only the most mature adults that can be obtained. Collect bees from the landing board as the field force returns from foraging. Bees should not be collected from the brood chamber.

Recommended Management Plan for Mississippi Beekeepers

- i. Purpose:** The purpose of this management plan is to assure that state beekeepers have a strategy to maintain a viable honey bee industry for Mississippi.

It is recognized that any effective management plan for the Africanized honey bee must include the beekeepers. Prior to the time the state is declared infested, the following management recommendations are suggested as "best management practices" to be implemented at the discretion of the beekeeper. Queen management is suggested but will not be regulated under the Bureau of Plant Industry, Mississippi Department of Agriculture and Commerce. New management techniques will be recommended when they become available based on new research.

To insure that the state of Mississippi is doing all it can to protect the general public, the BPI may certify beekeepers on a voluntary basis as part of a compliance agreement to be assured that they are conducting best management practices to protect the general public and prevent the spread of AHB. The following are the best management practices that must be followed to be certified.

ii. Southeast Regional Best Management Practices for Maintaining European Honey Bee Colonies (Memorandum of Understanding among the States of AL, FL, GA, MS and others)

This is an agreement between participating states in the southeastern United States for the purpose of setting provisions to establish uniform management practices to ensure production of manageable European honey bees and facilitate interstate movement of honey bees for pollination purposes and ensure the production and sale of manageable European Honey bee stock. Such are intended for inclusion in state action plans for dealing with the Africanized honey bee.

- aa. An apiary may be deemed as EHB (European honey bee) with a survey of colonies using FABIS (Fast African Honey Bee Identification System) and/or the computer- assisted morphometric procedure, i.e., universal system for detection of Africanized honey bees (AHB) (USDA-ID), or other approved methods on an annual basis by a state regulatory agency.

- bb. Honey bee colony divisions or splits should be queened with production queens or queen cells from EHB breeder queens following Southeast Regional Best Management Practices.
- cc. Beekeepers are discouraged from collecting swarms that are not from identifiable sources.
- dd. Beekeepers should practice good swarm prevention techniques.
- ee. Maintain all EHB colonies in a strong, healthy, populous condition to discourage usurpation (take over) by swarms of AHB.
- ff. Do not allow any weak or empty colonies to exist in an apiary, as they may be attractive to AHB swarms.
- gg. Re-queen with European stock annually unless marked queens are present.
- hh. Immediately re-queen with European Queen if previously installed or marked queen is found missing.
- ii. Maintain one European drone source colony for every 10 colonies in order to reduce supercedure queens mating with AHB drones. A drone source is defined as a colony specifically maintained with 3 to 5 frames of 90% drone comb.
- jj. To prevent potential interaction with AHB, do not site apiaries in proximity of tethered or confined animals, students, the elderly, general public, or visitors where interaction with bees have a higher likelihood of occurring.
- kk. Treat all honey bees with respect.
- ll. This is a voluntary program designed to minimize the threat of aggressive, defensive AHB in the South and to dilute any feral AHB populations that may become established in managed colonies which are the best line of defense against AHB.
- mm. Beekeepers participating in this program must sign a compliance agreement with their respective State Department of Agriculture-Apiary Unit.
- nn. Queen Breeders are required to conform to state apiary regulations.
- oo. Each state will determine fees or charges for AHB Best Management Practices Certification.

iii. Provisions for Producing European Honey Bee Queens and Packages

aa. Mating and Mating Yards:

- (1) Drones. A minimum of 60 European drone source colony equivalents must be established for each 1000 or more mating nuclei. If colonies are divided, the European drone source equivalent of 60 European drone source colonies will still be required for each 1000 or more nuclei (6%).
- (2) Seventy-five per cent of European drones source colony equivalents shall be located within a ¼ mile radius of each mating nuclei yard and the remaining 25 per cent shall be located within one mile of the mating yard. No drone or drone brood may be introduced into colonies or mating nuclei unless they originate from colonies with European queens from certified sources.
- (3) Queens and requeening. Producers of breeder queens and production queens are required to requeen drone producing colonies with EHB production queens on an annual basis, unless a marked queen is present.

Queens used in drone colonies may also be EHB queens produced from an outside source, but must be certified EHB by a test of progeny worker bees using approved identification techniques.

- bb. Breeder queens and European drone source colonies must be headed by EHB queens.
- cc. Collected honey bee drone semen shall originate only from drones produced by EHB queens.
- dd. Participating producers must sample their colonies according to the SEBMP sampling protocols.
- ee. Participating producers must agree to the stipulations listed above in order to be certified under this memorandum of understanding.
- ff. Participating producers agree to requeen all colonies whose test results are greater than 50% AHB hybridization probability based on FABIS or other approved testing methods.
- gg. Queen and Package producers participating in this program must sign a compliance agreement agreeing to these provisions.
- hh. Treat all Honey Bees with respect.

4. Recommended Feral and Wild Colony Management – Encourage local beekeepers to organize groups to assist in the destruction of feral swarms and assist in bee emergencies as needed by Emergency Management Officials (MEMA, FEMA and 911 Responders).

5. For Study and consideration: - In order to protect the general public from AHB stings, this task force should study the need for all persons/beekeepers who remove and/or destroy feral or wild colonies, whether for a fee or not, to be legally licensed or certified under the Regulation of Professional Services Law, Sections 69-19-1 through 69-19-15 of the Mississippi Code, Chapter 19, 1972 Annotated. A separate category named, “Control and removal of honey bees and other stinging insects” should possibly be established. Licensed or certified individuals as described below would have to be specially trained in apicultural practices to qualify for testing, pass a special examination and be bonded and insured if charging fees for such service. Persons charging fees for removing established honey bee swarms (with combs and brood) from structures, and other voids such as water meters, hollow trees, etc. would have to be licensed regardless of the procedures utilized. Persons who simply collect swarms of wild bees, not yet established with brood and combs, need not be licensed unless they use a pesticide in the process to kill part or all of the swarm and charge a fee for such service.

6. Research Priorities

The task force recognizes a need for an apicultural researcher and Extension Specialist at Mississippi State University. The Executive Committee of the Mississippi Beekeepers Association (MBA) in January 1989, made the following recommendations and continues to support these recommendations: That the MBA Executive Committee actively seek the establishment of a permanent full-time apicultural position within the Department of Entomology and Plant Pathology at MSU. The committee shall develop a job description of the responsibilities and proposed duties of the Apiculturist (See Appendix A to the Action Plan below), particularly in respect to training beekeepers and the public about Africanized

bees, to conduct beekeeper short courses and seminars, to conduct apicultural research in Mississippi, and to work one-on-one with beekeepers to help solve their beekeeping problems. Said proposal shall be presented to the Head of the Entomology and Plant Pathology Department at Mississippi State University, The Director of the Mississippi State University Extension Service, Director of the Mississippi Agricultural and Forestry Experiment Station, The Mississippi Farm Bureau, and the legislative officials as necessary to obtain the needed funds and legal approval of such a position.

V. ANNUAL RESOURCES REQUIRED TO IMPLEMENT RECOMMENDATIONS

Regulatory and Quarantine

Salaries and Fringes- Inspectors (1)	\$40,000
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Equipment

Vehicles (1)	\$ 25,000
Inspection:	
20 AHB sting-resistant bee suits	\$ 2,000
20 large-size smokers	\$ 600
100 AHB swarm traps and lures	\$ 3,000

Diagnostic Laboratory (if needed)

Laboratory Equipment	\$ 10,000
Technician	\$ 25,000
Computer Digitizing and Software	\$ 3,000

Grand Total	\$108,600
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Research and Educational

Apicultural Researcher	?????????
Technical Support	?????????
Equipment, Supplies, etc.	?????????
Travel	?????????

APPENDIX A

Proposal Request from the Mississippi Beekeepers Association for the Creation of a Full-time Apiculturist Position at Mississippi State University (MSU). Originally compiled in 1989.

- I. To be presented to the following for consideration and/or support:
 - A. Head – Department of Entomology, MSU
 - B. Director – Mississippi State University Extension Service
 - C. Director – Agricultural and Forestry Experiment Station, MSU
 - D. Director – Bureau of Plant Industry, Department of Agriculture and Commerce
 - E. President – Mississippi Farm Bureau

F. Members of the Mississippi Legislature

II. Justification and description of responsibilities:

In the 1970's, the Mississippi Farm Bureau rated beekeeping as the number 5 agricultural industry in the state. In 2006, Mississippi produced the highest yield of honey per colony, 98# average, of all the states. Currently, Mississippi is consistently ranked number 22-23 by the National Honey Board in honey production; however, its queen and packaged bee industry along with its migratory beekeepers are of vital importance to some of the northern top producing states. Mississippi houses permanently an estimated 20,000 to 40,000 hives. Another 60,000-100,000 colonies migrate to other northern states each spring for honey production with about 20-30% of these colonies returning to Mississippi each fall. It is vital that this industry remain viable as the Africanized bees inhabit the southern states. Demands for queen bees will increase to combat Africanization of established colonies and certified stocks must be produced to allow future migration and shipments of honey bees. Numerous calls and contacts from the general public will be received at both Extension and regulatory offices. Such a person will need to respond to calls, organize training for persons licensed as described previously, train and work with 911 responders on stinging medical emergencies as needed. As time permits, research and teaching will be done on applied apiculture to provide timely information to the beekeeping industry to economically improve disease and parasite control and improve management techniques to increase profitability of all aspects of beekeeping.

A. Education needs.

1. Africanized Bees – With the arrival of the Africanized, so-called killer bee, beekeepers will be faced with a crisis as has never confronted the industry. The news media has already created a sense of panic within the general public about honey bees. Scientists and beekeepers feel that the onset of Africanized bees can be adequately kept in check and that the general public can be less apprehensive, even to the point that beekeepers will be able to continue to operate their bee yards in most locations; however, not without some new techniques in management and more stringent requeening practices with certified European stock.

Beekeepers, including hobbyists, will have to be trained on proper colony management, trapping and destroying wild swarms and other aspects of managing bees under Africanized bee situations. The beekeeping industry contends that this country's main defense against the Africanized bee is the beekeeper himself, not a foe as the public might think. Beekeepers will have to maintain European stock and requeen often. Maintaining a strong population of domestic European bees within an area will likely limit the number of wild colonies allowed by nature to occupy that ecological niche. Forage (nectar and pollen) will only be available to support a given number of bee colonies.

Mississippi's estimated 800+ hobby beekeepers will have to be trained on the new management practices or be forced to not keep bees; even though we will need all the European colonies we can keep. A limited amount of training will be necessary for commercial beekeepers.

Not only will beekeepers have to be trained but the general public will also have to be trained. This will have to be done through local programs using the news media, radio, TV and county extension programs. The public will have to be informed that their best defense will be our own

beekeeping industry and not force beekeepers to remove their domesticated industry and not force beekeepers to remove their domesticated bees from farms allowing Africanized bees to fill that niche. The public will have to be trained in how to deal with wild swarms and who to contact when swarms are seen. Above all, they must be informed of the value of the beekeeping industry in pollinating their gardens, their forages and many other agriculture crops with emphasis that strong well managed colonies of bees, not wild swarms, are much more efficient.

Humans are naturally afraid of bees and it will be critical to the survival of the beekeeping industry that we all be better informed. Beekeepers will likely lose many apiary sites if the public is not informed on the importance of the bee industry in combating africanization and in pollinating many crops. To give the general public assurance, beekeepers will be trained on best management practices and certified accordingly, this plan is adopted and funded.

2. Teaching – An annual beekeeping short course has been offered for the last 20 years with great success. The course has been organized and taught by Harry Fulton, State Apiary Inspector and Dr. Clarence Collison, Head of the Entomology and Plant Pathology Department. Such courses are needed at several locations throughout the state to educate and recruit interested persons into this important field of agriculture. Nighttime courses would be beneficial in certain cities as offered in other fields of study.

A course in beekeeping for credit has not been offered at MSU since 1970. It would benefit the industry if such a course were offered at least every third year so all under-graduate students in entomology to realize the social and economic importance of the honey bee, the official state insect. Also, the course could be a means of qualifying persons to become licensed to remove and kill will honey bee swarms that pose a threat to the general public.

Educationally speaking, MBA feels that it will be an absolute necessity for the state of Mississippi to maintain a permanent apiculturist position in years to come. Such a position needs to be established and program ongoing at least one year in advance of the africanized bee invasion which could easily come in 2007 or 2008, depending on how the New Orleans infestation unfolds in 2007.

B. Research.

1. Pollination – The pollination of many of Mississippi’s agricultural crops (cotton, soybeans, forages, fruits and others) is dependent upon bees for pollination to varying degrees. Please refer to Attachment A – “Value of Bees to Mississippi” by Harry Fulton, State Apiary Inspector written in 1985 upon a request from Senator Thad Cochran for such information. It has since been updated in 2001. The material was reviewed by Dr. Tom J. Helms, former Head of the Department of Entomology and by Dr. James Jarratt, former Extension Entomologist. Contrary to this paper, much research on the real, not estimated, value of honey bees to Mississippi is needed. The pollination value of bees to the many new varieties of cotton, soybeans, fruits and vegetables grown in Mississippi is unknown. For example, research on soybeans in the 1970’s revealed that in general honey bees increase yields by 20%. Older varieties of soybeans and cotton are no longer grown and honey bee activity on them has not been studied. Interactions of honey bees on many such crops need to be researched to confirm if older data still holds up in supporting importance of honey bees in these agricultural systems.

A full-time apiculturist will only be able to partially fill the research and educational needs in Mississippi on pollination research and developing programs to educate farmers on how to fit beekeeping into their cropping operations to maximize production. Older research supports the pollination value of bees, but all the details have not been worked out for the keeping of bees cropping systems where pesticides are used. The eradication of the boll weevil in cotton producing states will greatly enhance the ability of beekeepers to keep bees near cotton fields; however, applied research needs to be done to work out the practicalities. We do not yet know how these increases in yield will be translated into increased profits for both beekeepers and farmers. Unknowns include how much the plants can compensate for the lack of pollinators, or if enough wild bees are present to achieve this “bee threshold” for maximum pollination. There is extreme doubt that adequate wild populations exist in the Delta where few natural nesting sites exist. Pest management systems will have to be altered in many cases to allow bees to survive in these cropping systems.

2. Fireants – One of the biggest problems that beekeepers in Mississippi face is that of fire ants building mounds underneath hives causing them to rot and causing ant stinging problems to beekeepers. It is difficult to get clearance for beekeepers to transport colonies to California and through Arizona to pollinate almonds because of fire ant restrictions. Beekeepers are reluctant to use currently registered products to control ants for fear of harming the bees. One unexplored avenue is the use of borate chemicals or other wood preservatives in treating the hive bodies, which in turn might kill or repel fire ants and or termites.

3. Parasite and Pests of Honey bees – With the introduction of the two parasitic mites and small hive beetle into the U.S. and a new problem called “colony collapse disorder”, more research is needed. The cost of treatments for diseases and pests has eaten up what previously was the beekeepers’ margin of profit.

C. Extension Related Activities.

1. Hand-on work with individual beekeepers – An apicultural position at MSU would fill a need for someone to visit beekeepers and work with them on a one-to-one basis to help solve day-to-day problems. Such a responsibility might be to set up days within the year in each county when he/she would be available to visit with beekeepers or give lectures, programs, etc. within that county.

2. Work with local beekeeping associations – Mississippi currently has six active local clubs of the twelve that existed in 1979-1980. The apiculturist would need to answer requests to present programs for their meetings and help them in other activities. At the same time he/she would work to organize/reorganize other local groups.

3. Promotion of honey and beekeeping – The apiculturist position would be a key position in organizing efforts to educate the public and beekeepers about beekeeping matters, especially Africanized bees; in promoting the industry, by assisting in setting up displays at fairs, ag shows and other activities. He/she would answer the many calls to present talks at local schools, civic organizations, garden clubs, etc.

4. State, regional, and national associations – The following are state, regional and national organizations which the Apiculturist should be associated with, become involved in to gain knowledge at meetings, and to put Mississippi’s name on the beekeeping front:

- a. Mississippi Beekeepers Association
- b. Memphis Area Beekeeping Association
- c. National Honey Board
- d. American Beekeeping Federation
- e. American Honey Producers Association
- f. Association of American Professional Apiculturists
- g. Apiary Inspectors of America
- h. Eastern Apicultural Society
- i. Heartland Apicultural Society

5. 4-H Club The Apiculturist would promote and implement 4-H projects on a yearly basis.

6. Key contact person – The apiculturist by no means can do all these extension related duties himself; but by being the key contact person and with a good working relationship with the industry, things can be done to upgrade this vital industry in Mississippi. The Mississippi Beekeepers Association is the oldest agricultural organization in the state. Current annual membership varies from 150 to 200 somewhat reduced from a high of 250 in 1985. With the time and efforts of an Apiculturist as described above, it could become one of the top agricultural groups in the state.

APPENDIX B

VALUE OF HONEY BEES TO MISSISSIPPI

Revised February 15, 2000

Introduction: The honey bee’s role in agriculture and the economy of Mississippi is very significant. The purpose of this paper is to: (1) demonstrate this important relationship in a monetary way by estimating a direct income value of honey bees in pollinating Mississippi crops; (2) showing a need for increased beekeeping activities.

This information is based partially on the age-old assumption that the honey bee, *Apis mellifera*, supplies 80% or more of the insect pollination requirements of agricultural crops. Dollar values were determined as follows:

- (1) Values for production of honey bees, honey and beeswax as well as other income are based on the author’s knowledge and contact with beekeepers.
- (2) Dollar values of the respective crops were obtained from the Mississippi Livestock and Reporting Service and other reliable contacts (See Bibliography of references).
- (3) Literature reviews were conducted to determine the value of honey bees in pollinating specific crops and/or increasing yields. In some cases the literature was not specific, but indicated an approximate value.
- (4) Increases in fruit set, fruit quality, fruit weight, seed weight (size), when compared to control plots were used at times to obtain values.

Tables I-VII were constructed to illustrate the estimated values.

Discussion: Readers should realize that Tables I-VIII are not based entirely on exact and scientific evidence, but serve only to demonstrate the value of honey bees in a subjective manner. Acreage of the various crops fluctuates from year to year; therefore, the values are very subjective for any given crop year. In some cases complete data was not obtained, but these data do still portray the importance of honey bees to the pollination and production of food crops.

Mississippi beekeeping businesses are family owned and operated. Some thirty to forty Mississippi families depend on beekeeping as a significant source of income (30% or more). Thirteen Mississippi families as of the year “2000” depend entirely upon beekeeping for their livelihoods. Besides these, another 25-30 full-time beekeepers from other states bring colonies to Mississippi to over-winter them.

Based on the number of honey producing hives kept in Mississippi year round (20,000 to 25,000) and the average annual production of 80 pounds of honey per hive, an estimated \$1,000,000 in honey can be produced annually at the current price of \$.50 per pound. This does not include honey produced and harvested from the over-wintered hives of non-resident beekeepers before they are moved out-of-state in May of each year.

For each drum of honey produced (620 lbs.) an estimated 9-10 pounds of beeswax is harvested having a total value of approximately \$50,000 annually at the current price of \$1.50 per pound.

The package bee and queen bee industry is of value in generating income since some commercial businesses are managed for such and not for producing honey/beeswax. Assuming a good production year and good demand for bees, some 50,000 to 100,000 pounds of bees might be sold at a value of up to \$800,000. Also involved in these packages are 15,000 to 20,000 queen bees valued at some \$200,000. The value of additional queens orders shipped separately might equal or exceed those with packages, accounting for another \$200,000 of income annually. Table I is a summary of all these yearly values of Mississippi bee related products.

Of consideration also is the fact that some 25,000 to 30,000 hives are brought into Mississippi each winter, multiplied (increase/split into other hives) by 3 to 4-fold, and transported back to northern states each May. Approximately 30 beekeeping operations are involved in this migration. Their dollar value to Mississippi agriculture and the economy is difficult to estimate. Some of these colonies produce honey before being transported out. Cash turnover from these operations while operating in Mississippi during the winter and spring months must be considered. Their colonies provide pollination service to early blooming vegetables, clovers and other native plants.

Colonies are also moved to California from Mississippi and other states to pollinate almonds in March and early April, then moved to Mississippi. At one point over 20,000 colonies are involved. Current pollination fees on almonds are \$40 to \$45 per colony, giving a cash turnover of nearly \$1 million annually. Profit is only about \$10 per hive which means about \$200,000 of income.

It is stated by beekeepers and quoted in the literature that each colony of honey bees does \$2,000 worth of pollination each year. With over 20,000 non-migratory colonies in Mississippi year round and 60,000 to 80,000 migratory colonies here during four months of bloom, a value would easily exceed \$400

million annually using this assumption; however, a more accurate method of demonstrating the value to pollination is needed.

Tables I-VIII are the result of an in depth study of literature, which correlates total yields and/or values of specific crops with their degree of dependency on honey bees for pollination. Increased yields and ultimately increased income can be measured with better fruit set and higher quality fruit, fiber and seed. Most of the data is 15+ years old; however, it well illustrates the role of honey bees to agricultural production. If inflation factors are considered these values would probably increase by at least 30% for today's agriculture.

Wildlife are heavily dependent upon plants for food and shelter, many of which require insect pollination. Research is now demonstrating that the seed for many of these native plants are produced as the result of honey bee activity (14).

Commercial vegetable production is very much dependent upon insect pollination (approximately \$10 million annually). For fruits and nuts the value approaches \$6.5 million.

No data were obtained for forage crops, but the importance can be seen in the marketplace where cattle, horse, dairy products and other livestock products are sold. From another standpoint the value of nitrogen-fixing legumes to soil fertility is not measurable, but is no doubt worth millions of dollars when considering the millions of acres of pastureland and leguminous row crops grown in Mississippi. The indirect relationship of pollination and the production of cattle, horses, and other livestock can be explained by the fact that large portions of the hay and other feeds are derived from insect pollinated forage crops. Dr. M.D. Levin (11) states that a 10% value is a very conservative estimate of the value of honey bees in the production of feed.

Several row crops grown for food and fiber are benefited by honey bee activity with an estimated value of \$88,000,000 to \$288,000,000 annually (See Table V). With inception of hybrid varieties of cotton and soybeans, the honey bee is becoming a vital component for the production of certified seed.

The data shown in Tables I-VIII relate only to crops grown commercially in Mississippi. Aside from the larger commercial acreage, this benefit of pollination carries over to homegrown fruits and vegetables; however, to place an accurate \$ value on it would be almost impossible. Most areas do not contain sufficient populations of wild bees to pollinate gardens and home orchards. Parasitic mites continue to kill most populations of honey bees. Beekeepers are losing 10 to 20% of their colonies each year from their attacks. When larger more commercial acreage exists in an area, then beekeeping must play a major role in providing pollination needs.

With extremely heavy pressure from cheap imported honey and adulterated or mislabeled honey products, with heavy losses of colonies to mites and small hive beetles, and with future threats from other pests of honey bees, the beekeeping industry in Mississippi will continue to decline.

Conclusions: With mass acreage being cleared and put into farmland or pine plantations natural nesting and foraging sites for honey bees are being destroyed. Increased urbanization and highway development are having the same effect. These losses along with the tremendous loss of colonies from pests are devastating bee populations, both natural and domesticated. Unfortunately, commercially grown bee colonies are not replacing these losses. Most sources of literature indicate that most crops ideally need from one to two colonies per acre to achieve maximum benefit. The number of colonies in Mississippi

and the U.S. has been on a decline for the past forty years, and at times when agricultural lands have increased (See Figure 1 and Table VIII). The bottom line is that it takes beekeepers to replenish bee colonies and maintain the degree of pollination necessary to meet nature's and man's needs. In fact, we are losing ground rapidly because bees, as demonstrated, do play an important role in Mississippi agriculture. If beekeepers in some way received due compensation for rendered pollination services, the industry would thrive; however, this is not the case. Successful farmers are also operating on a very thin margin of profit and can not afford to pay pollination fees. Only two or three beekeepers in Mississippi receive any fees for providing pollination services. Even then they are losing money because of the expense involved in moving bees to such locations. Most often such actions are done as favors to promote beekeeping. Very few of the crops requiring pollination provide surplus honey. Agriculture in Mississippi needs pollination and beekeeping activity must expand to meet this need. The data represented herein depicts a shortage of bee colonies (pollination) and strongly insinuates that increased production of food and fiber could result if the beekeeping industry remains viable and productive.

Table I: Estimated Income Derived From Beekeeping in Mississippi

PRODUCT	NO. COLONIES INVOLVED	TOTAL AMT. PRODUCED	UNIT VALUE (\$)	TOTAL WHOLESALE VALUE (\$)
Honey (From Residents)	20,000	1,600,000 Lbs.	\$.50/Lb.	\$800,000
Honey (From Non-residents)	50,000-60,000	200,000 Lbs.	\$.50/Lb.	\$100,000
Beeswax	70,000-80,000	30,000 Lbs.	\$1.50/Lb.	\$45,000
Packaged Bees	10,000	50,000 Lbs.	\$8.00/Lb.	\$400,000
Queen Bees (With Packages)	10,000	15,000 queens	\$8.50 ea.	\$127,500
Queen Bees (W/O Packages)	10,000	15,000 queens	\$8.50 ea.	\$127,500
TOTALS	50,000-60,000			\$1,600,000

**Table II: Estimates of Value of Honey Bees to Vegetable and Truck Crops
Grown Commercially in Mississippi**

	Data Year	Percent Increase	Reference Number	Value of Crop (\$)	Reference Number	Value of Bees (\$)
Bell Pepper	1985	50% Fruit	7	2,062,364	3	515,591
Pimento Pepper	1983	100% Fruit	7	966,000	3	483,000
Hybrid Tomatoes	1983	20%	7	1,756,920	3	351,384
Turnips Rutabagas	1983	300% Seed	7	3,226,000	3	2,140,666
Cantaloupe	1983	Total Yield	6,7	663,850	3	663,850
Watermelon	1981	Total Yield	6,7	3,366,000	3	3,366,000
Lima Beans	1983	30% Fruit	7	843,750	3	281,250
Eggplant	1983	150% Fruit	7	19,440	3	11,440
Onions	1983	Total Yield	6,7,8	213,840	3	213,840
Pumpkins	1983	Total Yield	6,7,8	572,160	3	572,160
Squash	1983	Total Yield	6,7	731,500	3	731,500
Cucumbers	1981	Total Yield	6,7,8	512,000	3	512,000
Mustard	1983	75% Seed	7			
Cole Crops	1983	Very Important For Seed	7			
Asparagus		100 X + Seed				
Artichoke		Very Important For Seed	7			
TOTALS						9,842,681+

Table III: Estimated Value of Honey Bees to Fruit and Nut Crops Grown Commercially in Mississippi

	Data Year	Percent Increase	Reference Number	Value of Crop (\$)	Reference Number	Value of Bees (\$)
Peanut	1981	100%	7	3,501,000	1,3	1,750,000
Apple	1983	Total Yield	5,6,7,8	4,500	3	4,500
Pear	1983	Total Yield	5,6,7,8	1,100	3	1,100
Peach	1983	Total Yield	6,7,8	976,000	3	976,000
Strawberry	1983	20%	6,7,8	92,250	3	18,450
Muscadine	1984	100%	7	5,500,000	12,13	2,750,000
Blackberry	1984	50+%	7	60,000	12,13	30,000+
High Bush Blueberry	1984	300%	6,7,8	1,375,000	10	916,666
TOTALS						6,447,216 +

Table IV: List of Forage Legumes and Degree of Dependency on Bees

	Value of Bees	Reference Number
Alfalfa	300+%	6,7,8
Crown Vetch	Required, 20 X	6,7
Sweet Clover	Required, 1-10 X	6,7
Berseem Clover	Essential for Tripping	6,7
Alsike Clover	Required, 10-40 X	6,7
Crimson Clover	Required for Tripping, 5-10 X	6,7
Persian Clover	Required, 9 X	6,7
Arrowleaf Clover	Required	6,7
Hairy Vetch	Required, 2 X+	6,7
Lespedeza	Required, 25-40%	6,7
White Clover	Required, 8-30 X	6,7
Red Clover	Required, 5 X+	7

TABLE V: Assessment of Value of Honey Bees to Row Crops Grown in Mississippi

<u>TABLE V: Assessment of Value Estimates of Honey Bees to Row Crops Grown in Mississippi</u>						
	Data Year	Percent Increase	Ref. No.	Value of Crop (\$)	Ref. No.	Value of Bees (\$)
Cotton	1982	10-30% Seed Lint	6,7,8	651,969,000	1,3	65,196,900 to 195,590,700
Soybean	1982	5-20%	6,7,8	463,510,000	1,3	23,175,000 to 92,702,000
Sunflower	1979	100+%	6,7,8	720,000	3	360,000
TOTAL						88,731,900 to 288,652,700

Table VI: Estimate of Values of Honey Bees to Livestock and Dairy Productions in Mississippi

	Data Year	Percent Increase	Reference Number	Value of Crop (\$)	Reference Number	Value of Bees (\$)
Beef Cattle and Calves	1984	10+%	11	520,380,000	1,3	52,038,000+
Dairy Products		10+%	11	127,262,000	1,3	12,726,200
Horses		?	?	?	?	?
TOTALS						64,764,997+

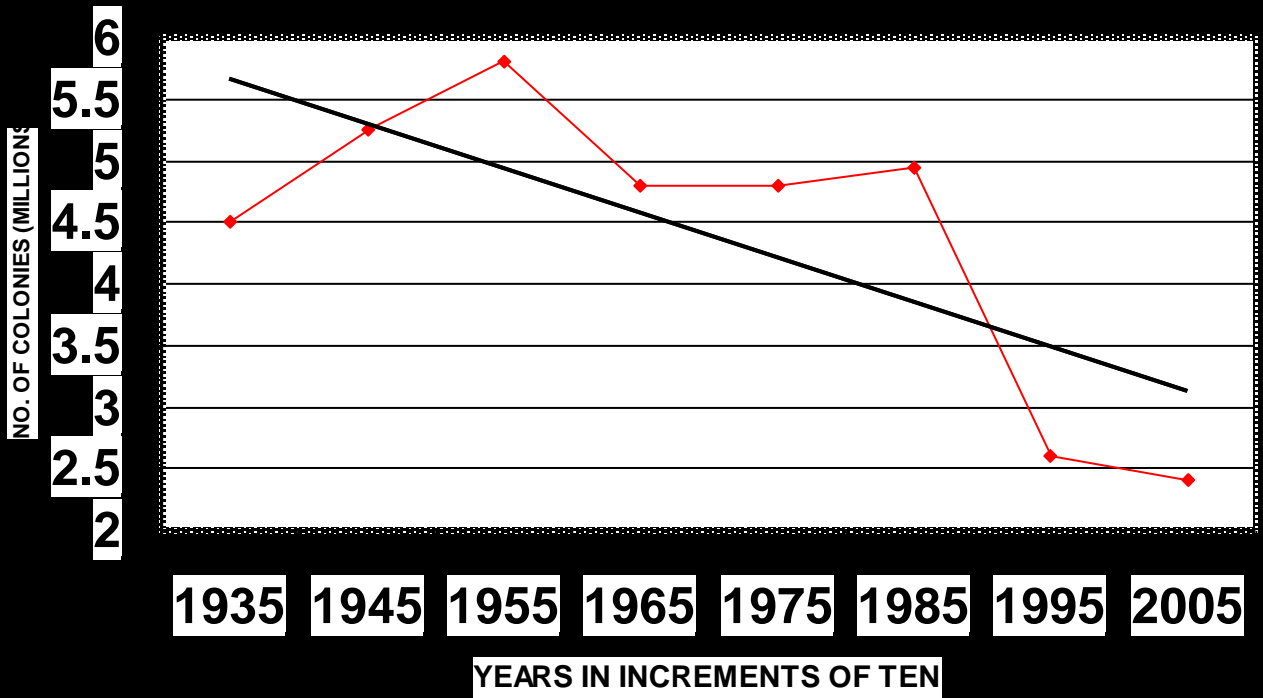
Table VII: Estimated Value of Honey Bees for Agricultural Pollination (From Tables II Through VI)

CROP	\$ VALUE OF BEES
VEGETABLE & TRUCK CROPS (From Table II)	\$9,842,681+
FRUIT & NUT CROPS (From Table III)	\$6,447,216+
ROW CROPS (From Table V)	\$88,731,900 to \$288,652,700
LIVESTOCK & DAIRY PRODUCTS (From Table VI)	\$64,764,200+
TOTALS	\$169,785,997 to \$369,706,797

Table VIII: Statistics on Beekeeping (1993 Through 1998)

Year	U.S. Hives	Miss. Hives	U.S. Production	Miss. Production	Avg. Per Hive (U.S.)	Avg. Per Hive (MS)
1993	2,647,000	16,000	210,437,000 lbs	1,120,000 lbs.	79.5 lbs.	70 lbs.
1994	2,770,000	19,000	217,168,000 lbs.	1,007,000 lbs.	78.4 lbs.	53 lbs.
1995	2,648,000	16,000	210,516,000 lbs.	1,120,000 lbs.	79.5 lbs.	70 lbs.
1996	2,564,000	17,000	198,197,000 lbs.	1,360,000 lbs.	77.3 lbs.	80 lbs.
1997	2,630,000	19,000	220,000,000 lbs.	1,387,000 lbs.	74.7 lbs.	73 lbs.
1998	2,633,000	18,000	220,311,000 lbs.	1,548,000 lbs.	83.7 lbs.	86 lbs.

FIGURE I: GRAPH OF NUMBERS OF BEE COLONIES IN THE U.S. IN PAST YEARS



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- (14) "The Pollination Value of Honey Bees to Wildlife", John S. Barclay and J.O. Moffett, American Bee Journal, Vol. 124(7): 497-498, 551, July, 1984.
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II. Role of the Beekeeping Industry

The Beekeeping Industry will play a major role in response to major honey bee emergencies, education, regulatory and AHB control activities. Beekeepers are equipped and many will be trained and willing to assist when and where needed to deal with feral swarms and aggressive colonies posing threats to humans, livestock and pets. An updated list of volunteers will be available on line at www.mdac.state.ms.us .

If a viable and successful beekeeping industry is maintained in an area of the state, such area will be safer for the following reasons: (1)- An increased number of managed European certified colonies in an area will decrease the chances of feral AHB colonies becoming established there. Many natural nesting sites will be occupied by well mannered European colonies from certified stock. (2)- The presence of a high number of beekeepers in such an area will increase the ability and probability that AHB feral colonies will be found and destroyed by beekeepers patrolling locales near their apiaries to destroy AHB colonies. Such would produce AHB drones likely to mate with their European queens. (3)- More beekeepers will be available to mobilize quickly to remove suspect AHB swarms when detected and to respond to emergencies. (4)- The general public will have quick access to a wealth of knowledge and information if a local beekeeper lives in the neighborhood. (5) Local beekeepers can assist in organizing “Neighborhood AHB Watch” groups in areas prone to have AHB colonies nesting. (6)- Continued pollination of locally grown fruits, vegetables, row crops and legumes for pasturage will be enhanced and can be safely accomplished if large numbers of managed European colonies are available. **See Appendix B to the Action Plan (In Section I) for actual estimates of the value of bees in providing pollination.**

III. List of Contact Persons for Specific Needs.

IV. Identification of Stinging Bees, Wasps and Hornets. See Pictorial Keys, Appendix C.

Officials at local and state levels, including 911 dispatchers, will be receiving numerous calls from the general public about stinging insect problems and emergencies. Often times they will be hysterical and concerned about the safety of their children, pets and livestock. Allergic persons will often be in close proximity.

A significant number of these incidences will involve stinging insects other than honey bees and the person taking the call or investigating the incident must be able to quickly determine if honey bees are involved to warrant time and expense of sending an official to investigate, take samples and determine if Africanized honey bees are present. By asking the right questions one can more often than not make a quick determination. The pictorial keys in Appendix C can guide a person in asking the right questions. Can the nest be seen? Is it a managed bee hive? Is the nest made of a grayish paper/cellulose material or is pliable and waxy looking? Is the nest in a hollow tree, a duck or bird box, a structure or piece of equipment, etc.? Is the nest layered with combs hanging downward in sheets or do the brood combs lie horizontal in the nest? Where is it located- in the ground above the ground? Is it conical in shape and in the open? If a specimen is available, how long is it? Does it have hairs on its thorax and abdomen? What color are the insects? Is its head and thorax mostly black with white, yellow markings on its abdomen? Is it about ½ inch long with its thorax brown to black and with bands of brown, gold/yellow or black on its abdomen? Is its body robust about as long as it is wide or is it more than twice as long as it is wide? If it stung someone, did its stinger remain in the victim? Did it sting the victim more than once? Asking these questions one can usually decide quickly if honey bees are involved.

If it is determined that the stinging insect is not a honey bee, the caller should be referred to a local pest control operator to dispose of the nest or to an entomologist for guidance on how to do it themselves. Most nests can be safely disposed of at night (darkness) without a light when the insects will not fly. A registered pesticide with directions for such use should be utilized.

Once it is decided that honey bees are likely the problem, to further determine if Africanized honey bees are involved to justify a quick response the following questions might be asked: What was the victim doing when attacked? How many stings have been received by the victim (if 20 or more a quick/immediate response is necessary)? How far did the insects follow the victim away from the nest (If more than 100 yards a quick/immediate response is needed)? How long were the bees disturbed and aggressive or are they still so aggressive that no one can approach the area (If more than 30 minutes a quick/immediate response is needed)? If the victim retreated inside a vehicle or building did the bees still try to get inside for more than 15 minutes (If yes, a

quick/immediate response is necessary). The sampling protocol should be followed as described in Section V.

V. Honey bee sample collection, preservation, processing and identification.

Only trained personnel should attempt to sample or destroy colonies. Persons encountering aggressive honey bees should contact a trained person to collect samples (See List in Section III). If possible that person should first screen the sample using the Fast Africanized Honey Bee Identification System (FABIS) fresh weight method. Samples of colonies failing the weight standards for European honey bees should be sent as described below for full morphometrics and/or DNA testing. Any over aggressive colony should be destroyed as soon as possible as a safety measure, even if the colony is possibly not Africanized. Whenever possible, it is advised that aggressive colonies be destroyed before sampling is initiated.

Full protective gear should be worn and smokers utilized as necessary to deter aggression as much as possible during sampling.. A minimum sample of 50-100 adult bees should be obtained by whatever means available and placed in ethanol. The container should be of chemical resistant plastic material or glass capable of being sealed to prevent leakage.

A sample should consist of mature adults bees. If the colony is not destroyed prior to sampling collect bees from the landing board as the field force returns from foraging. Bees should not be collected from the brood nest using a bee brush and funnel unless absolutely necessary for safety reasons and to ensure that all the specimens will be mature adult bees. Brushing and jarring the combs will agitate the bees even more. To collect bees from entrances to walls, trees and other unaccessable voids a modified portable bee vacuum cleaner may be used, for which plans are available <http://www.abuzzaboutbees.com/IHPA/TheBuzz/April06/Page9.htm>. Brushy Mountain Bee Supply Company has a larger unit available at <http://www.brushymountainbeefarm.com/products.asp?cat=21>.

Samples labels should be written with a lead pencil and placed inside the sample jar with the bees and ethanol. Name of person collecting the sample, place and address where collected, county, date should be included on the label. Samples may be mailed to Harry Fulton, Bureau of Plant Industry, P.O. Box 5207, McCarty Building, Stone Blvd., Mississippi State, MS 39762. or to the District Entomologist for the Bureau of Plant Industry (See List in Section) For information call (662) 325-3390.

VI. Educational Materials.

- How to protect children, livestock and pets from AHB.
- How to Identify Bees, Wasps and Hornets. (See Section III for pictorial keys)
- DVD/Video on Handling Honey Bee Emergencies. (For 911 Responders, beekeepers).
- “Africanized Honey Bee” by Division of Plant Industry, Florida Dept. of Agriculture & Consumer Services.

- DVD “Africanized Honey Bee Public Awareness Program: Letter/Fact Sheet, Division of Plant Industry, Florida Department of Agriculture & Consumer Services.
- DVD “Africanized Bees in Florida, Coping with the Challenge, Division of Plant Industry, Florida Department of Agriculture & Consumer Services.
- DVD “Africanized Honey Bee, Bee Alert & BBC video Segments, Division of Plant Industry, Florida Department of Agriculture & Consumer Services.

- USDA’s “Africanized Honey Bees”: A Guide for Fire Fighters and Rescue Personnel. Go to <http://www.ars.usda.gov/Research/docs.htm?docid=11059&page=5>
- USDA’s “Africanized Honey Bees”: Why Honey Bees are Important. Go to <http://www.ars.usda.gov/Research/docs.htm?docid=11059&page=1>
- USDA’s “Africanized Honey Bees”: What to do if Attacked by Africanized honey bees. Go to <http://www.ars.usda.gov/Research/docs.htm?docid=11059&page=3>
- USDA’s “Africanized Honey Bees”: Preparing Schools for Africanized Honey Bees. Go to <http://www.ars.usda.gov/Research/docs.htm?docid=11059&page=4>
- USDA’s “Africanized Honey Bees”: How the African honey bee differs from the European honey bee. <http://www.ars.usda.gov/Research/docs.htm?docid=11059&page=2>

“Africanized Honey Bees”, Bulletin 1290, January, 2006. University of Georgia Cooperative Extension, College of Agriculture and Environmental Science & Family and Consumer Science.

“Africanized Honey Bees”, Circular ANR-765, Alabama Cooperative Extension System. www.acesag.auburn.edu

“Africanized Honey Bee Control and Removal”, Bee Culture Magazine, August 2006, by Sylvia A. Ezenwa, page 18

VII. Reducing Nesting Sites for Feral Colonies.

MEANS OF REDUCING NESTING SITES FOR FERAL HONEY BEE COLONIES

Many sites, natural and manmade, offer excellent nesting sites for honey bees. Africanized honey bees are not as “choosy” as European honey bees in site selection. They will much more readily nest in open crevices or even sheltered areas underneath tree trunks, branches, eaves of structures, etc. Persons should be familiar with potential nesting sites and destroy them or inspect them regularly for nesting colonies of honey bees. Honey bee activity can easily be detected on a warm spring, summer or fall day then daytime temperatures reach 70 degrees F. A string of worker bees will be actively flying in from the nest or entrance to the nest and easily seen by someone prudently looking for such.

STRUCTURAL CONSIDERATIONS:

- New and old structures

Architects and building contractors must consider measures to eliminate nesting sites associated with structures or a means of excluding access to voids and other potential nesting sites. Potential clients should require such in the bid process for construction of new structures. Potential sites include: voids around chimneys, voids inside brick veneer or exterior siding, space inside cornices, columns, attics, bay windows, planter boxes, and other special requests that might create a void.

Annual inspections of structures should be made looking for evidence of wood rot, storm damage, or other damages allowing entry of swarms. Repairs should be made as soon as possible and before March of each year. Africanized honey bees may actively swarm between March 1 and September 30.

- Mobile Homes and RV's.

Honey bees are notorious for building nests underneath mobile homes and RV trailers between the insulation and flooring. Materials used to hold the insulation under the flooring are of poor quality and easily damaged during transient. They do not hold up to environmental decay and soon offer entry for swarms of honey bees. Also, metal siding gets holes in it or gets separated at the seams and creates an entry way for bees to enter and set up a nest within the void in the walls. Owners should be vigilant in inspecting and making repairs.

UTILITIES:

Utility companies responsible for water meters, electrical transmission poles, substations, etc. must be aware that Africanized honey bees often nest in such sites. Visual inspections for flying bees and nests should be made prior to working in such areas. Heavy equipment used in utility and construction work is an attractive nesting site for Africanized honey bees. Voids under hoods, inside storage compartments and around framework often house swarms.

NATURAL SITES:

- Hollow Trees within the vicinity of inhabited dwellings and work places should be cut and removed to prevent Africanized honey bees from establishing in a critical area jeopardizing the safety of passersby, workers or residents. If not removed they should be inspected regularly for the presence of honey bee activity.

- Crevices, manmade or natural, should be destroyed or inspected at regular intervals for the presence of honey bee nests. Such might include holes in rock outcroppings or compacted soil.

FARM EQUIPMENT AND VEHICLES:

- Farm equipment stored outside during the off-season when it is not being used is often colonized by honey bees. Prior to use or movement it should be inspected for signs of a honey bee colony.

SANITATION

- Debris piles (rocks, wooden material, and other artificial materials) should be eliminated and the materials landfilled or buried on site.
- Old equipment, vehicles, appliances and other materials offer excellent sites for Africanized honey bees to nest. Such should be eliminated or kept in a clean brush-free site whereby it can be inspected regularly for honey bee nests. Such should not be moved or disturbed without first inspecting it for honey bee activity.

VIII. Precautions for 911 Responders and Fire Fighters. See

Educational Materials- USDA's "Africanized Honey Bees": A Guide for Fire Fighters and Rescue Personnel.

<http://www.ars.usda.gov/Research/docs.htm?docid=11059&page=5>

IX. Africanized Honey Bee Sting Management

Sting Effects

Direct effects of Arthropod exposure. Bee and wasp stings cause illness in humans on the basis of direct toxic effects of their venom or by immunologically mediated hypersensitivity reactions. Venoms in most social wasps and bees contain enzymes and vasoactive amines that produce pain and directly release histamine (from the cells that store that and other mediators). Stings or bites may also cause tissue damage and inflammation. Inflammation is a result of at least three events: (1) an increase in blood supply to the affected area; (2) an increase in capillary permeability allowing larger molecules to cross through the endothelium; (3) leukocytes, mostly neutrophils and macrophages, migrating into the affected tissues.

One researcher calculated that 1,500 honey bee stings would constitute the median lethal dose for a 75 kg person based upon extrapolation from the LD₅₀ of bee venom for mice. These direct toxic effects (from honey bees or other social Hymenoptera) may include contraction of smooth muscle causing airway obstruction, increase in capillary permeability, vasodilation with a resulting drop in blood pressure, tissue damage at sting sites, hemolytic reactions and renal failure. Treatment strategies include symptomatic treatment until the venom effects are diminished. The most effective treatment for inhibiting release of mast cell mediators is epinephrine. It also is an effective bronchodilator and decreases capillary permeability. In general, it is the first drug to be used in patients with life threatening symptoms from bee stings. Since histamine is a component of bee, wasp, and hornet venoms, and since melittin (found in honey bee venom) causes histamine to be released from cells, administration of antihistamines is indicated.

Description of Sting Reactions

Usual reactions to stings. A usual reaction to one or a few stings involves only the immediate area of the sting and appears within 2 to 3 min. Usually, it consists of redness, itching, swelling, pain, and formation of a wheal at the site. The reaction ordinarily abates within 2 h or so. If a person is stung by numerous hymenopterans, the acute toxic reaction (non-allergic) resulting from large amounts of venom can be severe. One man who was stung over 2,000 times by bees exhibited signs of histamine overdosage — severe headache, vomiting, diarrhea, and shock.

Large local reactions to stings. Large local reactions are characterized by painful, pruritic swelling at the site of a previous sting that occurs after the original sting reaction has resolved. Large local reactions usually peak within 12-24 h and may last for days. Most patients with large local reactions have detectable venom-specific IgE antibodies. Large local reactions have not been shown to significantly increase the risk for anaphylaxis upon subsequent stings. The risk of a systemic reaction in patients who experience large local reactions is low. Venom immunotherapy has been shown to be effective for preventing large local reactions to some hymenopterans, but is rarely required.

Systemic reactions to stings. Systemic allergic reactions produce symptoms in areas other than the sting site. This is called anaphylaxis. Thus, the allergic person may have both the local pain, wheal, and itching from the sting, as well as generalized pruritus, urticaria, angioedema, respiratory difficulty, syncope, stridor, gastrointestinal distress, and hypotension. Systemic reactions usually begin with widespread cutaneous symptoms such as angioedema or urticaria. These skin manifestations may be the extent of the systemic reaction, or there may be progression to a generalized pruritus, widespread edema, and upper respiratory distress. In severe reactions, shock begins to develop with a rapid pulse and low blood pressure. The victim may feel a constriction in his throat and chest, and breathing becomes difficult. Severe allergic reactions may result in anaphylactic shock and death within minutes. In one study of 641 deaths from Hymenoptera stings in the U.S., respiratory conditions accounted for 53% of the deaths. Autopsies revealed laryngeal, epiglottal, and pulmonary edema, along with both serous and mucoid secretions.

Management of Sting Reactions

Usual reactions. Treatment for normal or mild local reactions involves cleaning the wound with cool water and soap and the use of topical antihistamines and analgesics. Oral antihistamines may help counteract the effects of histamine (IgE mediated or not) in the affected tissues resulting from certain venom components. Topical corticosteroids may also be helpful if symptoms persist.

Large local reactions. Large local reactions are characterized by considerable swelling and tenderness around the sting site. Elevation of the affected limb may decrease swelling. If the sting site is on or near the throat, nose, or eye, or causes obstruction of blood supply to an extremity, or if there is widespread swelling, patients should seek medical care. Treatment involves topical or oral analgesics, topical or oral antihistamines to relieve itching, topical high potency steroids, and/or systemic steroids (such as prednisone) if swelling is severe. Superimposed infections such as cellulitis, unusual with hymenoptera envenomation, require aggressive treatment with antibiotics.

Systemic reactions. Persons who experience generalized allergic reactions (even mild) may be at risk of a severe reaction and possible death upon the next sting (days, weeks, or months later). In the event of a systemic reaction, if the individual has epinephrine kit, it should be used. The next step is to get to an emergency facility for immediate treatment. Removal of a honeybee stinger using a credit card may help reduce venom absorption. However, people should be reminded that self treatment measures should not delay seeking emergency treatment in any way.

Physicians have standardized protocols to treat severe allergic reactions. These are directed at maintenance of an adequate airway and support of blood pressure. The following is an example for the management of anaphylaxis from Hymenoptera stings:

An immediate intramuscular injection of 0.3 to 0.5 ml of a 1:1,000 solution of epinephrine (preferably intramuscularly in the lateral thigh) should be administered, and repeated, with blood pressure monitoring, at ten minute intervals if necessary. Intravenous epinephrine may be administered at a rate of 2 µg/min for treatment of severe shock or cardiac arrest, but cardiac monitoring is required. The airway must be established and maintained by using endotracheal intubation or cricothyrotomy, if necessary. Intravenous fluids are given to replenish depleted intravascular volume in the treatment of anaphylactic shock. Antihistamines of both the H1 and H2 types may be required. Systemic corticosteroids are customary to treat protracted symptoms and may prevent recurrent or biphasic anaphylaxis. Glucagon may be required appropriate for patients on beta blockers.

Administration of oxygen may be used to minimize hypoxia, which by itself may contribute to vascular collapse and cerebral edema. Also, wheezing that is refractory to repeated doses of epinephrine can be treated with continuously nebulized beta agonists such as albuterol.

However, the administration of epinephrine is the most important element of treatment of systemic reactions to insect venoms. It acts to suppress mediator release from mast cells and basophils and reverses many of the end organ responses to mediators of anaphylaxis. Complete resolution of the clinical manifestations of anaphylaxis often occurs within minutes. The critical and immediate use of epinephrine is why some people who are allergic to bee or wasp stings carry sting kits containing syringes loaded with the drug. At least two preloaded syringes are available (Ana-Kit,[®] Miles Labs, Spokane, WA, and Epi-Pen,[®] Center Labs, Port Washington, NY) in both adult and pediatric versions. In case of a sting, the allergic person may self inject and potentially prevent a fatal reaction. Some medical authorities recommend that one or two close and reliable relatives of the allergic person should also be instructed in the correct use.

After use of self administered epinephrine injection, the individual should seek prompt medical treatment. The epinephrine delivery devices are designed to treat symptoms long enough for the victim to get to a hospital. This is especially important if a second phase of anaphylaxis occurs 4 to 10 h after the initial reaction.

Epinephrine or auto injector syringes must be prescribed by a physician. Any person who has suffered even mild symptoms of an allergic reaction should be counseled to obtain a kit and keep it available wherever there is a chance of being stung. Insect-allergic persons should also consider wearing a Medic-Alert® (Medic-Alert Foundation, Turlock, CA) tag or card to alert medical personnel of their allergy in case they lose consciousness.

**Physician questions about AHB sting treatment should be directed to Dr. Linda Tanaka, Department of Medicine, University of Mississippi Medical Center, Jackson, MS 39216, phone 601-842-5223.

X. Precautions for Persons in Charge of Public Lands.

Refer to in Educational Materials: USDA's "Africanized Honey Bees": Preparing Schools for Africanized Honey Bees. Go to <http://www.ars.usda.gov/Research/docs.htm?docid=11059&page=4>

Persons in charge of public lands include: Mississippi Department of Wildlife, Fisheries and Parks employees, City Parks and Recreation employees, U.S. Forest Service Employees, U.S. Army Corps. of Engineers, Public School Superintendents, College Officials, and others.

The probability of a person contacting an aggressive AHB colony is greater on public land because more people visit these facilities on a regular basis and such sites often have ideal nesting sites for honey bees in tree cavities and around buildings. Persons in charge of such areas should follow guidance outline in Section VI to reduce the availability of nesting sites.

Each such facility should have someone trained and equipped to locate honey bee nests and destroy them. Training should also include how to respond to an emergency in case of a stinging incident.

XI. Precautions for Utility and Construction Workers, Foresters and Forest Fire Fighters.

Individuals involved in such professions will be working regularly in environments harboring Africanized honey bee colonies. Heavy equipment utilized in these professions should have protective cabs. Open storage areas will most likely contain materials, such as pipes, equipment, cable and wire rolls, etc., which are highly attractive to honey bee swarms. All such materials should be inspected before moving from storage. Work zones should be inspected on a daily basis for the presence of honey bee swarms. Foresters, when plowing fire breaks, should be on the lookout for hollow trees, stumps and other potential nesting sites and avoid disturbing them until they have been inspected closely. Work crews should have someone trained to handle honey bee stinging emergencies.

XII. Regulatory Programs. (See Action Plan, SECTION D, 4-6.

APPENDIX C

GENERAL IDENTIFICATION OF BEES, WASPS AND HORNETS WITH NESTS EXPOSED OR EXAMINABLE

GRAY PAPER-LIKE

WAXY-COMBS HANG VERTICAL

LOOSE FIBROUS MATERIAL

MUD

Honey Bee

Bumble Bee

Mud Dauber



ABOVE GROUND

BELOW GROUND



Yellow Jacket



CONICAL/FOOTBALL SHAPED

OPEN BROOD FLAT-SIDE (HORIZONTAL)

YELLOW JACKET

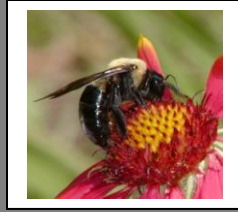
BALDFACED HORNET

PAPER WASPS



GENERAL IDENTIFICATION OF BEES, WASPS AND HORNETS WITH NESTS UNEXPOSED OR UNSEEN.

INSECTS 1/2 - 1 1/2 INCHES LONG



INSECTS 1/4 - 1/2 INCH LONG

NOT HAIRY

HAIRY

CARPENTER BEES
(No yellow or white hairs on Abdomen like on Bumble bees). Bigger Eyes than Bumble bee)

HORNETS & WASPS

BUMBLE BEES (THORAX HAIRY)

YELLOW JACKETS

BEES
(Hairy w/wo pollen baskets on hind legs)

(Bright Yellow with Black Markings. Hairless. Paper Lining in Entrance to Nest).



Nest in Open (Baldfaced Hornet)

Nest in Voids European Hornet

Gold, Brown and black colors. More than twice as long as wide.

Robust- Nearly as wide as long.



Black with Yellow or White on Abdomen.

Nest Usually above Ground or in cavity in ground (water meter or stump, etc.)

Nest Usually in Ground



Honey Bees
Only insect with barbed-Stinger which stays in victim after sting).



Bumble Bees