



Southern Pine Beetle Information System (SPBIS)

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Abstract

The southern pine beetle (SPB) is the most destructive forest insect in the South. The SPB attacks all species of southern pine, but loblolly and shortleaf are most susceptible. The Southern Pine Beetle Information System (SPBIS) is the computerized database used by the national forests in the Southern Region for tracking individual southern pine beetle infestations. Historical SPB records are stored by Forest Health Protection (FHP) and have been used to document the effectiveness of SPB suppression techniques. The system is instrumental in forest plan implementation. It is a valuable tool for monitoring of forest management activities.

20.1. HISTORY OF THE SOUTHERN PINE BEETLE INFORMATION SYSTEM

The southern pine beetle (*Dendroctonus frontalis* Zimmermann) (SPB), is the most destructive forest insect in the South. The Southern Pine Beetle Information System (SPBIS) is an Oracle® database that was developed for the USDA Forest Service, Southern Region, Forest Health Protection (FHP). SPBIS was originally developed as a group of FORTRAN computer programs in the late 1970s at the Fort Collins Computer Center. In 1983, SPBIS was revised and placed on Apple® II computers at the district level. In 1988, a SPBIS version was released for the Forest Service Data General computers. SPBIS 2.0 was released in January 1999 and was designed to run on the IBM® RISC 6000 computers at Forest Service Regional, Forest, and District offices. SPBIS 2.0 used the Oracle® database management system, and Oracle® forms. The current version of SPBIS is 5.2; it is the result of numerous revisions to enhance ease of use. SPBIS is currently being managed by the FHP Alexandria Field Office in Pineville, LA.

20.1.1. Background of SPBIS Program

Data for the infestation files result from weekly input from field crews at the district level. Thus, SPBIS continuously reflects the up-to-date status of SPB suppression activities and also contains a history of suppression treatments at each district. Summary reports are generated by the districts, consolidated by the forest, and a regional report is issued every 2 weeks throughout the year.

SPBIS is a valuable functional tool for district personnel—particularly in SPB outbreak situations. It enables the staff to monitor the status of all infestations present in the district. At times there can be hundreds of infestations that are in some stage of suppression or monitoring, and the SPBIS system will produce reports that district personnel can use to prioritize control efforts for SPB infestations. Records of the suppression of SPB infestations were taken from the SPBIS system during the development of the Final Environmental Impact Statement (FEIS) for the Suppression of the SPB to demonstrate the effectiveness of the four suppression techniques.

20.1.2. Project Highlights

SPBIS is a district-based system for the storage and retrieval of information about the location, size, and status of individual SPB infestations, scheduled activities, and accomplishments. In 2004 version 5.0 included a complete reprogramming of the status report, additional validation routines, and increased functionality. Records from the previous years are maintained by FHP and have been used to document historic beetle activity trends/patterns, as well as the effectiveness of SPB suppression. The data have been used to support forest plan revision and implementation. In 2007 version 5.2 was released and is the current version in use today. Highlights of version 5.2 include the ability to email status reports as Adobe® Acrobat PDF file format directly to a recipient. The addition of geographic coordinate converter allows the user to enter X, Y coordinates in decimal degrees, degrees minutes and seconds, or Universal Transverse Mercator (UTM) at the survey record level, and the coordinates are saved as decimal degrees. This newest version also has the capacity to upload and download survey information on southern pine beetle spots using a Personal Data Recorder (PDR).

20.1.3. Technology and Skills

SPBIS is written in Visual Basic Code, Oracle® tables, Adobe® PDF, and SQL queries. The program uses Oracle relational Database Access method. SPBIS resides on a PC at each District and Forest Supervisor's Office. SPBIS is a menu-driven program and provides data entry forms with error-checking. FHP provides installation, assistance, and training for SPBIS to district personnel. The SPB status report is posted on the Corporate Database Warehouse as well as the Region 8 Web site.

20.2. SOUTHERN PINE BEETLE SUPPRESSION AND SPBIS

When SPB populations are low, the beetles will attack stressed or dying trees or trees infested by other bark beetles. Under those conditions, the SPB is not economically important. During outbreaks, the SPB attacks, colonizes, and kills even the most vigorous and healthy trees. Infestations or spots can involve large numbers of trees over hundreds of acres. During these epidemic periods, large-scale suppression projects are required.

The Southern Region is guided by the Record of Decision, signed April 6, 1987, for the Final Environmental Impact Statement for the Suppression of the Southern Pine Beetle. This document provides the legal mandate for suppression funding and specifies the acceptable suppression methods.

The job of locating and suppressing individual SPB infestations (spots) requires three separate field operations—survey and detection, either aerial or ground; ground checking the SPB spots detected in the survey; and direct control of the infestations.

Because host damage by the SPB occurs in well-defined patches, called spots, it is necessary to locate and enumerate these SPB spots in order to estimate their potential impact. Active spots are principally identified through detection flights (Hain 1980). Flights are conducted periodically throughout the active season, with flight timing dependent on expected level of beetle activity, season, objectives, and operational capabilities (Billings 1979). A spot is defined as more than 5 or 10 trees in size. Observers plot suspected beetle spots—pine trees with discolored foliage—onto maps or photographs. To determine if a spot is actively infested with the SPB it must be located on the ground and examined by a trained field crew.

Field crews follow the maps or photographs to the spot location and ground check the spots to confirm the cause of tree mortality and to determine the need for treatment. High-priority spots—those with the greatest number of SPB-infested trees—have a greater potential for additional tree mortality. These spots are marked for treatment first. In addition, it is important to determine the direction(s) in which the spot is moving. A direction is an area, known as the spot head, where the newly infested trees are located. These trees have crowns that are still green, and pitch tubes, where attacking beetles bore into the tree, are soft and sticky—indications that the trees are just coming under SPB attack.

Southern pine beetle-caused losses can be reduced through application of one or more recommended control tactics. These include cut-pile-and-burn, cut-and-leave, cut-and-remove, cut-and-hand-spray, and semiochemical. More details about the specific application and their appropriate uses are on pages 2-3 to 2-15 of the Final Environmental Impact Statement (FEIS) for the Suppression of the SPB (see chapter 16). No matter which control method is

implemented for a given SPB infestation, time is of the essence in minimizing SPB losses. Beetle infestations can expand very rapidly. Saving a few days' time in the suppression operation can significantly reduce the number of trees lost. In the summer, no more than 4 weeks should elapse between ground check/marketing and treatment.

20.2.1. Prioritizing SPB Spots

SPBIS is particularly useful for determining which SPB spots should be treated. Not every SPB spot must be controlled. Spots with few newly attacked and green-infested trees and many vacated trees (SPBs have emerged and left the trees) are unlikely to grow and, consequently, should not be suppressed. These spots are considered to be inactive and are recorded as such in the SPBIS database. Some SPB spots will only have a few infested trees. In this case, the spots will be monitored for several weeks to determine if they will continue to expand or go inactive.

20.2.2. Breakout SPB Spots

An infestation is known as a breakout and is recorded as such in SPBIS if the following criteria are met:

- When newly infested trees occur adjacent to an SPB spot that has been treated by one of the suppression methods, the infestation is a breakout (number of infested trees does not influence its classification as a breakout).
- The breakout occurs within 30 days of suppression of the original SPB spot and/or breakout spot treatment during the summer months (May through September), and within 45 days of completion of original and/or breakout spot treatment during the rest of the year (October through April).

If uninfested host trees are located between the treated spot and the infestation, the infestation is considered a separate spot and is recorded as such in SPBIS. Also, if a new infestation occurs outside the specified time frames, the infestation is considered a new spot and is recorded as such in SPBIS.

If two or more breakouts are found on different sides of the treatment area on the same visit, this is a multiple breakout. With a multiple breakout each spot will have the same survey date but different information pertaining to the particular spot.

A breakout can only occur after the original spot has been suppressed. The survey date on the breakout must come after the suppression date of the original spot or the suppression date of the previous spot.

Partial Treatment of a Spot

When a spot is only partially treated it is necessary to record the suppression data while continuing to track the remainder of the original spot. This can be accomplished by giving the partially treated area a new SPBIS number while referencing this spot to the original spot. The original spot number is included as the parent spot number on the data entry screen. This differs from the breakout code that is used when the entire original spot is suppressed.

Special management considerations are noted whenever conditions or special situations occur. Examples of special management considerations might be when an SPB infestation occurs in the association with a threatened or endangered species such as red-cockaded woodpecker, Louisiana pearl shell mussel, archeological sites, botanical areas, research natural areas, or recreation sites. The SPB FEIS and forest plan provide direction about appropriate SPB suppression tactics available for consideration. There is a section of

the SPBIS form for inserting such site-specific information about the individual situation.

20.3. USING SPBIS AS A TOOL FOR MONITORING AND SUPPRESSING SOUTHERN PINE BEETLE

The SPBIS database is a combination of Oracle® forms and SQL*Plus™ reports that use the Oracle Relational Data Base Access Method. The system is menu-driven, and forms provide easy data entry. The data entry/edit program automatically checks for errors as data are entered, and immediately notifies the user when data are invalid. Reports can be generated by menu or by using customized SQL*Plus queries.

Currently, the SPBIS database is physically located at the SPBIS Command Center (the FHP Unit, Alexandria Field Office, in the Kisatchie National Forest.) This single region-wide database holds all historical and current data for all districts in the Southern Region.

20.3.1. Definitions of SPBIS Screens

SPBIS 5.2, the newest version of SPBIS, has five main screens. The SPBIS Input Interface Screen (Figure 20.1) opens the program and enables the user to navigate to all sections of the program. The user must enter unique information specific to the forest and district in order to access the SPBIS program.

Once connected, the user can navigate to several screens. The user can view support data, upload and download SPB field survey information from the Personal Data Recorder (PDR), print blank data sheets used in the field for SPB collection when the PDR is not available, add new SPB data, and/or change existing data in the program. The SQL*Plus™ allow the user to create customized queries to extract specific data from the database and create a custom spreadsheet based on species, dates, and districts. A status report can be created with dates as the default, and the user can create status reports for all forests or particular forests within Region 8.

SPBIS Main Spots Table

The SPBIS Main Spots menu allows the user to add new data, modify and view existing data, and delete data already entered into the program. Once the user enters the forest and

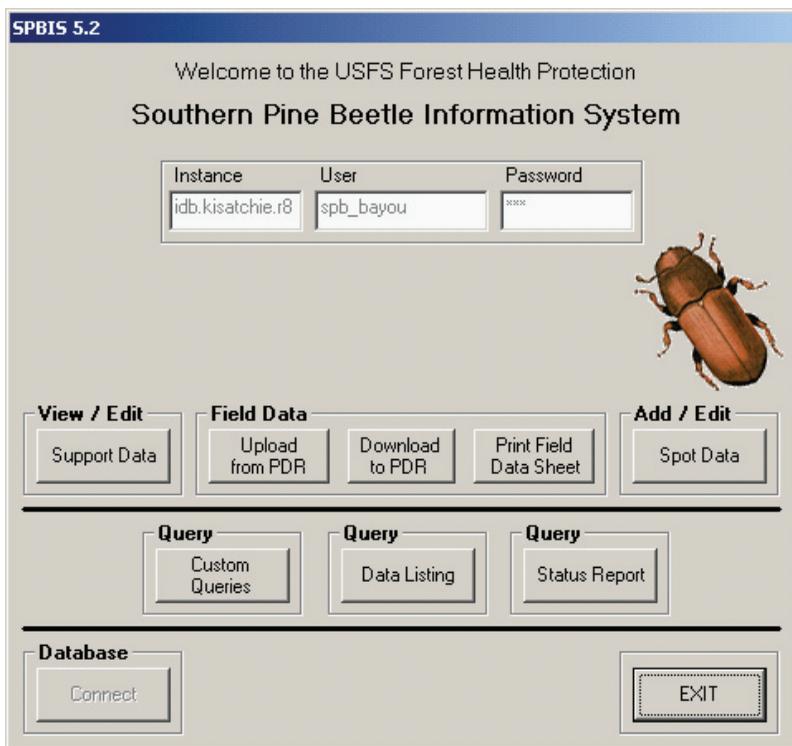


Figure 20.1—SPBIS Input Interface Screen.



Figure 20.2—SPBIS Main Spots Table Screen.

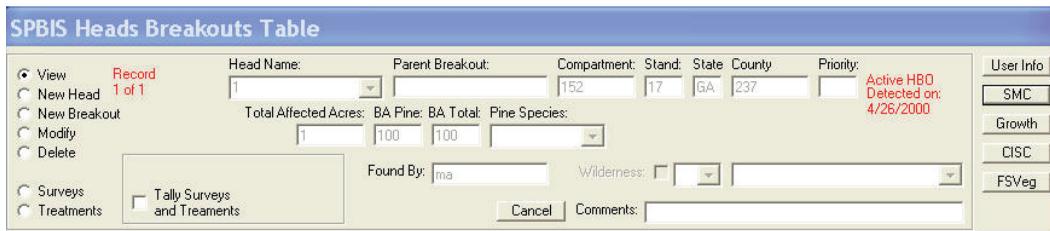


Figure 20.3—SPBIS Heads Breakouts Table.

district information into the Main Spots Table (Figure 20.2), the user is allowed to add, modify, and delete SPB information only for that specific forest and district. The user can view any forest and district information that has been entered into the program but cannot alter the information in any database other than the one assigned to him/her. Features displayed on the screen include total number of SPB spots entered into the SPBIS program, including historical and current data. There is a toggle bar that enables the user to quickly find a unique SPB spot, or the user can type in the unique SPB spot under the Spot Number field and the program will pull information pertaining to the SPB spot into the database. There is historical SPB data on some districts, some as far back as 1980. The Main Spots screen allows the user to enter data for SPB, *Ips* engraver beetles, and black turpentine beetle (BTB), *Dendroctonus terebrans* (Olivier). There is also information located on the screen that identifies the status of each SPB spot; for example, if an SPB spot has been suppressed, the suppression date appears in red.

SPBIS Heads Breakouts Table

In order to see what information has been entered into the program the user must check the View Heads Breakout Records box located on the Main Spots Table. When the View HBO Records box has been checked, the SPBIS Heads Breakouts Table will appear (Figure 20.3). The SPBIS Heads Breakout table includes information for actual heads and breakouts on an SPB spot, as well as the compartment and stand location. Once the compartment and stand have been identified,

the State and county will appear as grayed information. If the compartment and stand are not correct the State and county will remain blank. It is very important for the district to enter the correct compartment and stand number in order to properly identify the correct county location for the SPB spot. This menu also lists important information about the size of the SPB spot based on total affected acres, Basal Area Pine, and Basal Area Total, as well as Pine Species. The user can then select the Survey or Treatments screen to view. One unique feature SPBIS 5.2 has is the ability to view the Survey and Treatment screens while also viewing the Main Spots table and heads and breakouts table on the computer screen. In the past the user could only view one screen at a time.

SPBIS Surveys Table

An SPB spot can be detected by air, ground, or video. Once the SPB spot has been detected, district personnel will ground check the SPB spot and collect survey information from the spot. Using a PDR or SPBIS field sheet, the employee records the detection method used to find the SPB spot and the method of treatment suggested for the particular spot. The suggested treatments include cut, pile and burn; experimental; inactive or dead; cut-and-leave; monitored; cut-and-remove; cut-and-hand spray; or semiochemical. The dates of detection and ground check are entered into the SPBIS Surveys Table (Figure 20.4), as well as information identifying the SPB spot.

Entering the latitude and longitude is vital for future visits to the SPB spot. Latitude and longitude can be entered in Decimal Degrees,

SPBIS Surveys Table

View
 New Survey
 Modify
 Delete

Detection Method: Ground
 Suggested Treatment: Monitored
 Date Detected:
 Date Ground Checked:

Record 1 of 2

Mapping Info
 N. Latitude (DD):
 W. Longitude (DD):
 Spheroid:
 Enter DD
 Enter UTM
 Enter DMS

Fresh SPB Attack? Yes No
 Sawtimber or Pulpwood? Saw Pulp Mix

Number Green Infested Trees:
 Number Red or Faded Infested Trees:
 Total Number Infested Trees:
 Number Vacated Trees:
 Total Affected Acres by Spot:

Flagging Color: Orange
 Logging Access: Easy hauling

Comments:

Figure 20.4—SPBIS Surveys Table.

Degree, Minute, Second (DMS) to Decimal Degree Converter

N. Latitude: W. Longitude:
 Deg. Min. Sec. Deg. Min. Sec. --> N. Latitude: W. Longitude:

Figure 20.5—SPBIS Conversion Screen for converting Degree, Minute, Second (DMS) to Decimal Degree (DD).

Degrees Minutes and Seconds, or Universal Transverse Mercator (UTM). If the latitude and longitude are entered in Degrees Minutes and Seconds or UTM, there is a program built into the system that will convert the figures to Decimal Degrees accessed at the Conversion Screen (Figure 20.5). Information such as green-infested trees, number of red- or faded-infested trees, total number of infested trees, and total number of vacant trees is also entered into the program, as well as flagging color used to identify the SPB spot from the road. Logging access is another category used to identify the condition of the SPB spot.

An SPB spot can be surveyed multiple times and each time can be documented. When more than one survey has been entered into the program, a toggle bar will appear in the left-hand column denoting there is more than one survey.

SPBIS Treatments Table

Once the spot has been suppressed, data can be entered into the SPBIS program using the SPBIS Treatments Table (Figure 20.6). This table records the actual treatment used to suppress the SPB spot, and the day/month/year the spot was marked, sold, treated, and suppressed. The program also records the salvage volumes of both sawtimber and pulpwood, as well as a number of trees treated and total affected acres.

If an SPB spot has been sold and a breakout occurs before the spot can be suppressed, supplemental volume can be entered into the program. Information used by a district can be added into the program, such as Sale ID, Cutting Unit ID, and Permit Number.

Perhaps the most important SPBIS-produced report is the Southern Pine Beetle Southern Region Status Report. It is used to monitor SPB, *Ips*, BTB or a total of all three beetle species on each district. This report can be customized by identifying a particular forest and showing activity on each district within the particular forest, or a general report can be obtained reporting activity on all forests in Region 8. This report is sent to the Forest Service Washington Office as well as the Regional Office in Atlanta, GA. The report is generated using a date range, and information can be obtained from the general forest or the wilderness area in the particular general forest. Printer options include printing to the default printer or selecting a particular printer, printing to PDF file, or emailing the status report. There are 33 lines on the status report with information ranging from cumulative spot total to estimated total acres affected. Information such as total number of inactive spots, total number of spots suppressed, and total number of spots requiring control can be obtained. There is also a section on the status report which captures number of trees treated by cut-and-leave, volumes removed by cut-and-leave and cut-and-remove, acres accomplished with cut-and-leave and cut-and-remove, and total acres inactive.

20.3.2. Miscellaneous Forms

Another feature of SPBIS is the Special Management Consideration screen. This screen allows the district to keep track of special management issues, such as threatened and endangered species, and heritage resources. There is also a section detailing customized queries. The program has seven different query types to select from, and once a certain query type is selected there are specialized queries within the query type to better customize a report.

20.4. FUTURE OF THE SOUTHERN PINE BEETLE INFORMATION SYSTEM

The next version of SPBIS will have embedded capability in the report functions to generate Google Earth™ KML files (Figures 20.7-20.10). These report companion KML files will geographically represent the locations and summary data of database queries such as the biweekly Status Reports “02. Total Number of New Spots Detected”, any of the individual Spot Queries aka Braintrust Queries, and the ubiquitous data listing function.

SPBIS Treatments Table

View Treatment:

New Treatment Date Marked:

Modify Date Assigned/Sold:

Delete Date Treated:

Delete Date Suppressed:

Record 1 of 1

Salvage Volume

Sawtimber: (CCF) Number Trees Treated:

Pulpwood: (CCF) Total Affected Acres:
(Spot + Treatment)

Supplemental Volume Info

Sawtimber: (CCF) Date Marked:

Pulpwood: (CCF)

Contractor ID: Sale ID:

Paint Color: Cutting Unit ID:

Markers: Permit #:

Comments:

Figure 20.6—SPBIS Treatments Table.

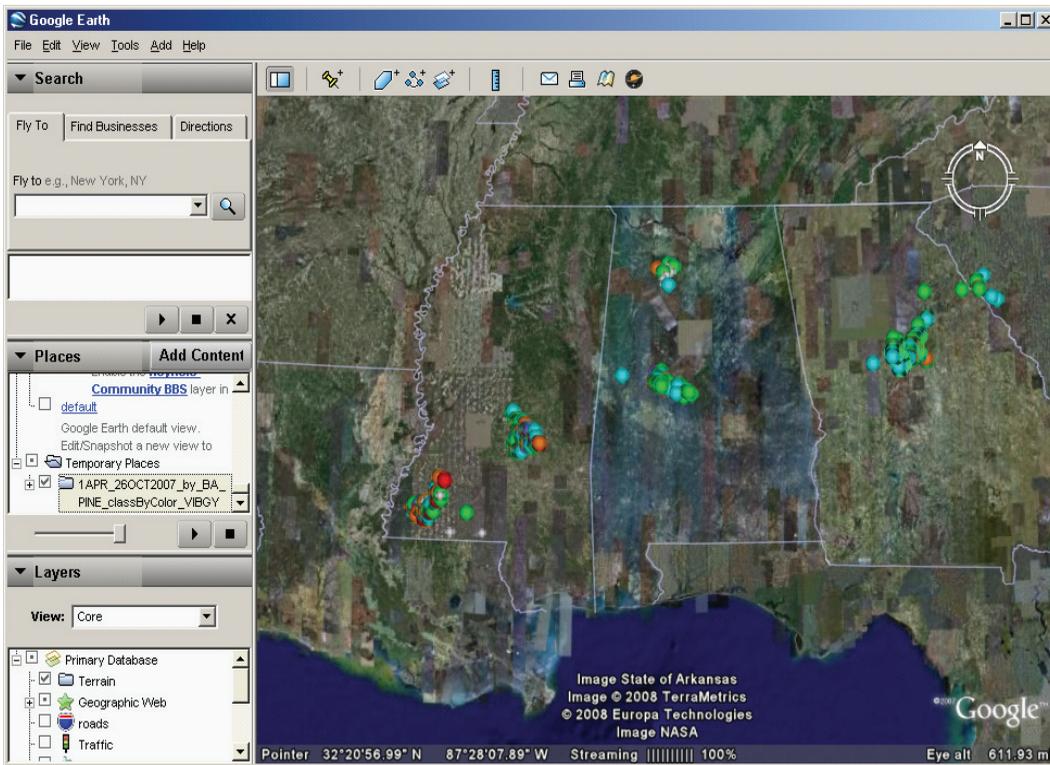


Figure 20.7—A future SPBIS option: embedded SPB spots generated by Google Earth™ KML files.

Figure 20.8—A future SPBIS option: display of SPB spot query data as a pull-down on a Google Earth™ KLM file.

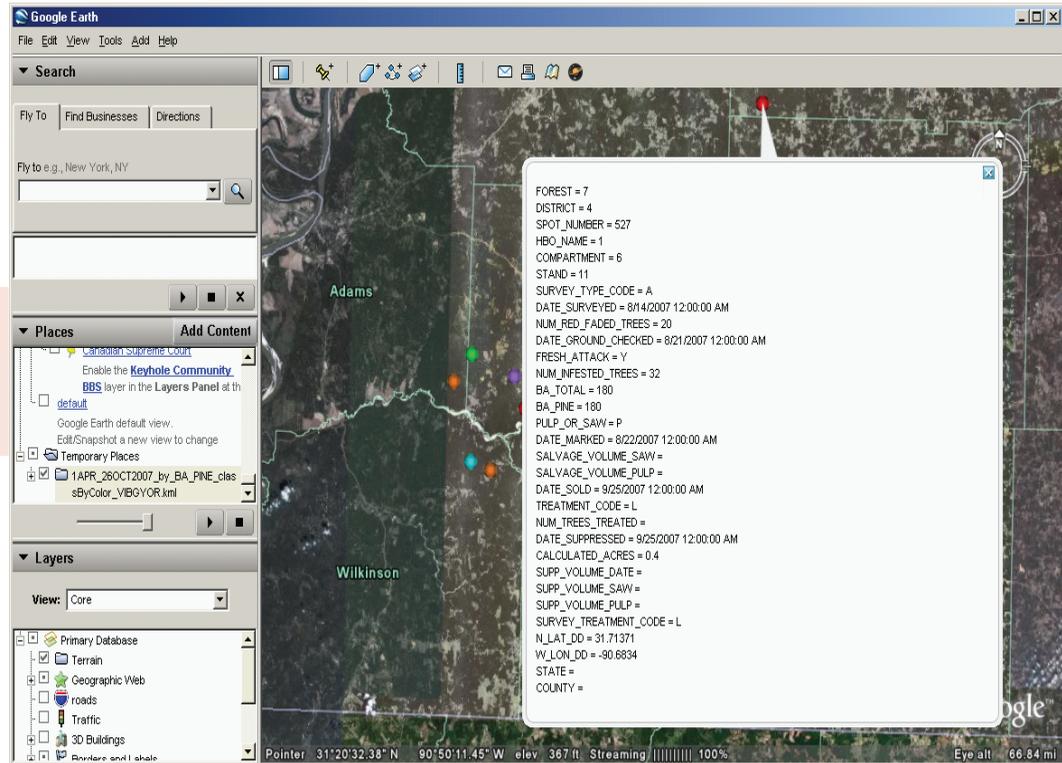
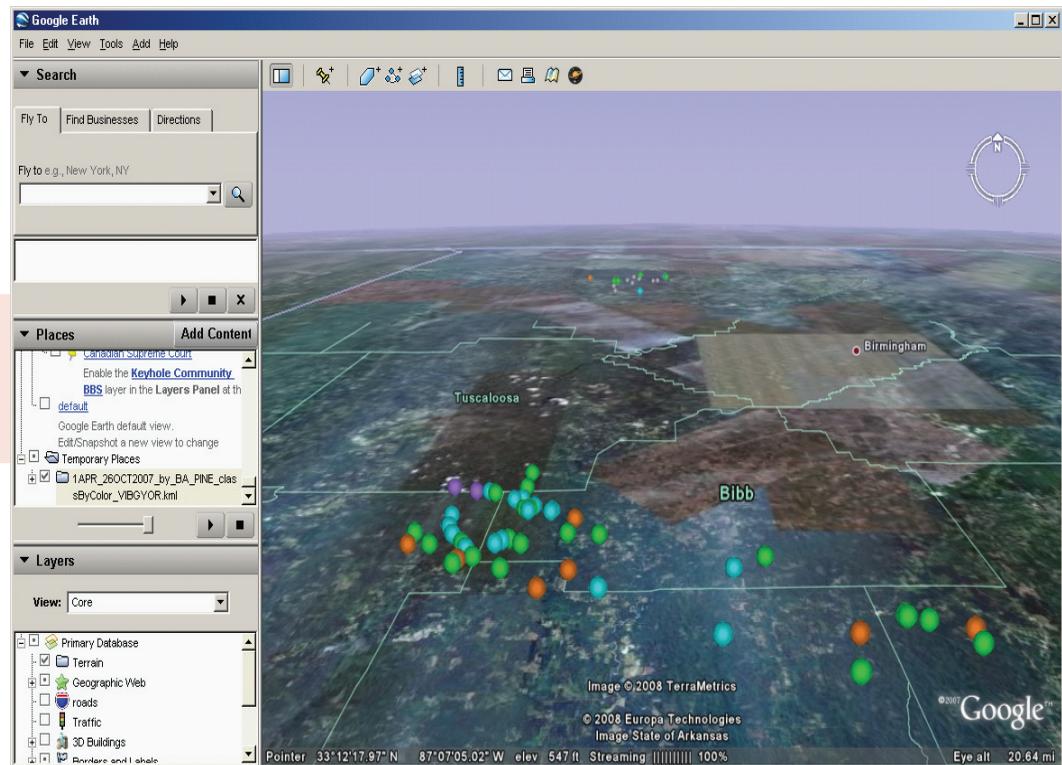


Figure 20.9—A future SPBIS option: SPB spots displayed as a “color ramp” view on a Google Earth™ KLM file.



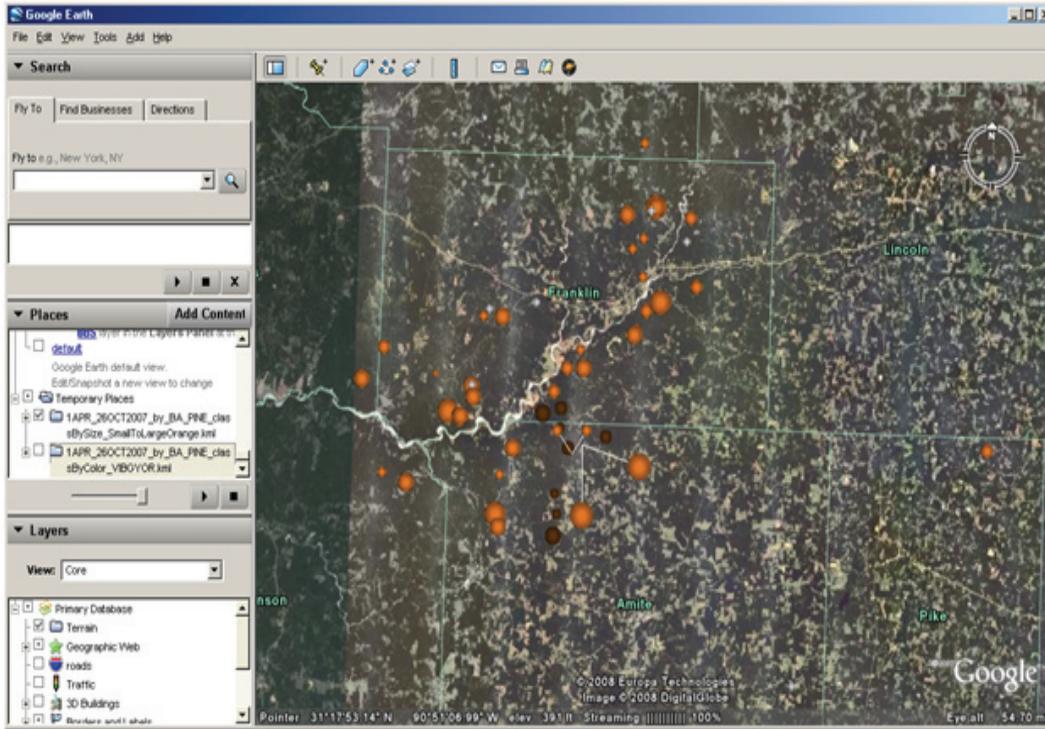


Figure 20.10—A future SPBIS option: SPB spots displayed as gradationally sized point icons on a Google Earth™ KLM file.

20.5. ACKNOWLEDGMENTS

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