HAWAII FOREST BIRD
INTERAGENCY DATABASE PROJECT

Collecting, Understanding, and Sharing Hawaiian Forest Bird Population Data:
A tool for understanding population uncertainty.

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INTRODUCTION

Between 1976-1981, the U.S. Fish and Wildlife Service (now U.S Geological Service – Biological Resources Division [BRD]) conducted systematic surveys of forest birds and plant communities on all of the main Hawaiian Islands, except Oahu, as part of the Hawaii Forest Bird Surveys (HFBS). Results of this monumental effort have guided conservation efforts and provided the basis for many plant and bird recovery plans and land acquisition decisions in Hawaii. Unfortunately, these estimates and range maps are now seriously outdated, hindering modern conservation decision-making and recovery planning.

Since the HFBS, over 380 surveys of forest birds have been conducted, but the data are scattered among agencies and in many cases have never been analyzed. The umbrella purpose of the Hawaii Forest Bird Interagency Database Project (HFBIDP) is three fold. First, produce a centralized, standardized, relational database of all forest bird census data collected since the 1970s. Second, calculate population estimates for forest birds utilizing current variable circular plot (VCP) methods and produce distribution maps depicting ranges based on HFBS and subsequent changes in species' ranges. In addition, analyze abundance estimates to detect and describe trends in bird populations. Third, produce current status of forest birds in book chapters, journal articles, reports, and Internet web pages.

Although concerns about using outdated Hawaiian forest bird information have been expressed, no organization at the state or national level has addressed these issues prior to HFBIDP. HFBIDP integrates field data with computer processing, promoting timely data acquisition and assessment, and rapid communication with a variety of state and national government agencies, and nongovernmental organizations (NGOs).

HFBIDP generates many information products, most GIS-based, from the analysis of data obtained from census and geoinformation sources. Bird distribution maps, population trends, and habitat models are examples of the types of products. These products aid in all phases of avian conservation.

HFBIDP staff works closely with land managers and others to identify the location of bird populations in need of protection. In addition, HFBIDP is able to assess field collection methods, census areas, and survey frequency for their effectiveness. Survey and geographical data were refined and released in successive versions, each more inclusive, detailed, and accurate than the previous release. Incrementally releasing data gives land managers and survey coordinators reasonably good data to work with early on rather than waiting for the release of ‘perfect’ data, ‘perfectly’ analyzed. Consequently, summary results are available in a timely manner. Data approved for public release, such as summary statistics, is published on the HFBIDP Web site (http://biology.usgs.gov/pierc/HFBIDPSite/HFBIDPHome.htm).

METHODS

Field Work
Different field methods for sampling species and determining numbers of individuals exist and have been extensively reviewed for their strengths and limitations (see Seber 1973, Caughley 1977). The HFBS relied on the variable circular-plot survey (VCP) method (Scott et al. 1986). VCP methodology is appropriate for many forest bird species over large areas (Scott et al. 1981a, Scott et al. 1986), produces results with little bias (Ramsey and Scott 1979, Reynolds et al. 1980), accounts for confounding variables and different observers (Scott and Ramsey 1981a and b, Scott et al. 1981b, Fancy 1997, Thomas et al. 2001), and can be replicated. The greatest advantages of the HFBS work is that it is quantitative and maps bird densities, and is a step up from distribution mapping based on presence/absence within a given area. In addition, new VCP analysis methods, including improved precision of species density estimates (Buckland et al. 1993, Fancy 1997) and subsequent surveys allow for trends analysis and the depiction of changes in species' distributions.

Database Design
We present a comprehensive inventory of all forest bird census data collected over the last 25 years in a centralized, standardized, relational database. The function of the database is data storage, facilitating processing and analysis, not data entry. Data entry should be conducted in the associated Data Entry Form, and appended to the appropriate tables.

Project partners provided forest bird survey data and were integral in project development to ensure that deliverables were geared towards their respective needs. Data collected during individual surveys were standardized and specific components separated into relational tables. Table variables and descriptions are detailed (see DICTIONARY). AlphaCodes for each bird observation comply with guidelines established by the Cornell Breeding Bird Laboratory and scientific nomenclature follows the American Ornithologists' Union, 1983 Check-list of North American Birds, 7th edition [1998]. In addition, each species is assigned a taxonomic serial number (TSN) from the Integrated Taxonomic Information System to link with the National Park Service's Inventory & Monitoring NPSpecies database. These standardization procedures allow for future changes and compatibility to other databases. Primary Key fields link tables to each other, thereby creating a relational database. Cells colored dark gray indicate that the field is a Primary Key (unique designator), whereas, cells colored light gray indicate that a record is unique when two or more fields are considered simultaneously (see Definitions of Fields and Values). Database relationships are presented in the figure Access database Relationships for tables, below. Relationships were set up as type One-To-One and One-To-Many relationships with Enforced Referential Integrity.

Data Collection
The database allows for entry of field data, tracking of surveys for sharing data among researchers, and timely presentation of results. After data were acquired, HFBIDP staff evaluates the field and electronic data for content, completeness and primary information. To facilitate data entry and minimize errors, field data forms correspond exactly with the data entry form of the relational database designed for the project. After the field data are uploaded, a quality assurance/quality control (QA/QC) program verifies the accuracy of the

data. Before the data are added to the database, all records are line-item proofed and standardized, and the data entry error rate is determined through spot-checking. Metadata is produced in a data set summary and error-checking summary, and returned to the survey coordinator for verification. Once the data have been validated and cross-referenced the data are integrated with other survey data in the database. Only verified data can be added to the database.

HFBIDP created a standardized reference table for place names with unique, unambiguous identification codes to avoid confusion among users (Table 1: SLCode). The SLCode is based on a nine-digit identification system. The first two digits reference the island, second three digits assign the region and the last four digits relate to the survey area. This table may be appended on an ad hoc basis to incorporate additional surveys. An identification code, a unique coded alpha-number, is assigned to each survey effort (Table 2: SurveyNo). This SurveyNo code is used so that all information about a sample (e.g., SLCode, coordinator, start and end dates, etc.) can be kept together with the bird observations in the database.

Data Conversion Procedures

Data were processed from three electronic formats and directly from field notes. Historical data (Hawaii Forest Bird Survey 1976-1983) was converted from ASCII '.txt' files (procedures below). Recent surveys were entered in VCPDATA format and required no conversion. Surveys conducted between roughly 1983 and 1995 were entered into old VCP format and converted using the VCPDATA menu for the conversion of old data format to a new VCP format (see VCP Program Documentation, March 1997 Version). Surveys not entered into a computer, and for which raw data were available (field data books and notebooks), were entered into new VCP format, proofed and appended to the database. For a few data sets, field notes and electronic files were not found. However, printouts of the data were obtained and scanned into a computer, saved as an ASCII '.txt' file, and converted according to the ASCII Conversion procedures. For all data sets, survey location information was added to the data (Tables 1 and 2). Properly formatted data were copied and pasted into new MS Access tables with the Paste Append command. The structure of the data set table is outlined in Table 3. Sequence numbers, unique numerical identifiers, based on transect and station were then related to data set tables to identify unique station locations in space (see Table tblStation_LU in DICTIONARY).

When HFBIDP received the Hawaii Forest Bird Survey data the environmental variables and time of survey at an individual station was missing. These data were entered into MS Excel with appropriate relational links (date, transect, station, observer, observer sequence), pasted into MS Access and related to the data files with the Query function. In many instances data fields were not recorded; therefore, these fields appear as blanks in the database. When the detection field was not recorded in the data books, HFBIDP *a posteriori* entered the detection code as a nine (9 – not recorded during count; heard along transect). However, if the field notes explicitly stated that the bird was visually detected, HFBIDP *a posteriori* entered the detection code as an eight (8 – not recorded during count; seen along transect).

VCP formatted data sets were converted into a single database. Data sets that were entered into or converted to VCPDATA were opened as an ASCII '.txt' file in MS Wordpad, pasted into MS Excel and formatted by the procedures outlined in ASCII Conversion through Step 1. A. (Text Box 1).

Each ASCII '.txt' data file was opened in MS Wordpad, copied and pasted into MS Excel with Paste Special – Text, and converted with Text to Columns Wizard with appropriate options for Fixed width, column breaks added, and dates. Time stamps were left as numbers. Thus, each column in the MS Excel worksheet is distinct (i.e., Column A contains only Observer Codes; Column B contains only Sequence Numbers; etc.). The steps used to complete the data conversion are detailed in Text Box 1. The Macro used to reassemble data into VCP format is detailed in Text Box 2.

Data Processing and Checking

To facilitate data entry, HFBIDP developed a Data Entry Form in MS Access. Transcription errors were minimized in the entry form by incorporating pick lists and value limits. Field records were cataloged and archived. HFBIDP verified data transcription by conducting a line item procedure where the raw data (field notebooks or photocopies of field books) was compared to the electronic version on a line-by-line basis. All errors were corrected and rechecked for accuracy. After line-by-line proofing was conducted, individual data sets were spot-checked for error rates. Ten percent of the total records for a given data set were randomly selected and proofed to raw data. Records were kept to ensure that error rates were less than one percent (< 1%) when spot-checking and logged on the DATA SET SUMMARY. When a data set was found with more than one percent error rate (> 1%), the entire data set was line proofed to the raw data. Data not proofed by HFBIDP were noted in DATA SET SUMMARY.

Metadata

Metadata describes and documents the contents, context, quality, and status of the data. Metadata assists in archiving and searching for data; therefore, it is a key component of the survey data and geographic infrastructure. Metadata not only helps locate data, but also tells how to interpret and use the data. Two types of metadata, properties and documentation, are documented. Properties metadata includes items such as the survey number, survey methodology, number of records, and transects and stations sampled. Documentation or descriptive metadata includes such items as the survey organizer and quality characteristics. Additionally, the metadata files serve as an edit log to document changes to specific data sets.

HFBIDP developed a style sheet to capture metadata from each survey (Appendix 1: Survey data; Appendix 2: Geoinformation data). The first step was to determine which metadata elements to collect. These elements were selected based on content standards from Michener and Brunt (2000). For each data set a standardized style sheet was completed. Each style sheet may be converted into word-processing, Internet or other easily readable formats.

Data Maintenance, Storage, Archiving and Security
Changes to data sets and database are recorded in the edit log (see Metadata). A copy of the proofed data sets are archived on weekly tape back-up, and permanent records archived on an external hard drive and CD-Rom. In addition, original and photocopies of field data are archived.

Geographic Information System
Geographic information system (GIS) provided an environment to integrate count data with landscape characteristics. Therefore, GIS has been particularly effective in displaying data visually, showing both spatial and temporal patterns of bird distributions and densities, and communicating patterns of survey efforts.

HFBIDP collected data describing census station locations, physical geography, satellite images, and other geographical features of the Hawaiian Islands from many sources. Accuracy of all georeferenced data were assessed and information from remote sensing was combined with ground evaluations before inclusion with census data. HFBIDP integrated species-level and landscape characteristics together in GIS to determine which characteristics may play a role in species distributions, as well as develop habitat suitability models to assist future census and management efforts.

Statistical and Geographic Analysis
Note – complete this section.

Map Production
Maps and figures were effective for displaying bird distributions, abundances and changes in species ranges and densities. HFBIDP used the analysis of survey data and GIS to produce three categories of maps for each bird species: distribution, abundance, and change maps.

Distribution maps represent the presence of a particular species within a given area. Distributions were based on all observations recorded during a given time period (heard or seen during the census, and heard or seen between stations).

Abundance maps depict graphical interpretations of species abundance. Frequency of occurrence (birds per station) was used for species where density estimates could not be calculated (i.e., small number of detections). For all other species, density estimates were mapped. Both methods produced maps that show a gradient of bird abundance or density across an island or region.

Change maps portray differences in species' distribution between two or more periods. Presence during a specified time period was plotted at sampling stations. Change maps document expansion or contraction of species' ranges. In addition, change maps illustrate differences in density distribution over time.

Data Posting and Dissemination

Access to the database and other HFBIDP products was possible via the PBIN website (URL). This provided a viable means for disseminating summary tables, species maps, and reports and other documents. Additionally, HFBIDP products were prepared for peer-review journals, reports and summary documents provided to collaborating agencies.

In compliance with the Freedom of Information Act (FOIA), all data collected by HFBIDP are public property and subject to requests. Protection of sensitive data, such as endangered species locations, is described in the CHIS data management protocol, which details appropriate response procedures to FOIA requests.

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Unit for Wildlife Population Assessment, University of St. Andrews, UK. http://www.ruwpa.st-and.ac.uk/distance/

Text Box 1. Steps used for data conversion procedure.

Step 1.

Standardize MS Excel file to ensure proper conversion:

A – move all of the data into the proper columns:
observer; station sequence; species; distance; detection; date; transect; station; time; cloud; rain; wind; gust; season.

B – select the following columns and format (right mouse click – Format Cells – Number – Category: Custom highlight Type: General and replace with the appropriate number of zeros 0):
station sequence – 4 zeros; distance – 3 zeros; date – 6 zeros; transect – no change unless transects number into the hundreds (if so, 3 zeros); station – 3 zeros; time – 4 zeros; cloud – 3 zeros; season – 2 zeros.

C – Copy and paste the information into MS Word using Paste Special – Unformatted Text.

Step 2.

Each column in the file will be pasted with a tab space immediately following the cell information. Replace All tabs (^t) with a blank space using the Find and Replace function.

Step 3.

Reset the font to Courier New, size 10. This will align the characters into readable columns.

Step 4.

Proof the data to ensure data integrity and for blank spaces after each field. Below is an example:

```
          1         2         3         4         5
12345678901234567890123456789012345678901234567890
++++++++++++++++++++++++++++++++++++++++++++++++++++
JJJ 0027 ELEP 018 1 081794 19 051 0848 080 2 3 0 08
```

Step 5.

Paste the VCP Formatter Macro (Text Box 2) into the Tools – Macro – Macros – Create. Step Into the macro and process through the macro one line at a time using the F8 key to ensure the macro is aligning the data into proper VCP format. Finish processing the data set by running the macro. Below is an example of the converted data set in proper VCPDATA format:

```
          1         2         3         4         5
12345678901234567890123456789012345678901234567890
++++++++++++++++++++++++++++++++++++++++++++++++++++
JJJ0027ELEP 018 1 081794    19   051 0848080230 08
```

Step 6.

Save the document as an ASCII text file with a .vcp extension (e.g., “Hakalau99.vcp”). Test the converted file in VCPDATA to ensure it processes properly.

Text Box 2. MS Word MACROS for converting tab delimitated data columns into VCP format.

```
Dim DOC As Document
Dim i As Integer

Function CountStirngs(longstring, target)
 ' count the number of lines in the document
   Position = 1
   Do While InStr(Position, longstring, target)
       Position = InStr(Position, longstring, target) + 1
       Count = Count + 1
    Loop
    CountStrings = Count
End Function

 Sub VCPFormater()
 '
 ' vcp Macro
 ' Macro recorded 07 February 2000 by Richard Camp

 '  automatically set the active document with above Function to VCP
 '  format based on moving columns, Count may require manipulation.

 Set DOC = ActiveDocument
 Set myRange = ActiveDocument.Range

 For Each para In myRange.Paragraphs
     Selection.MoveRight Unit:=wdCharacter, Count:=3
     Selection.Delete Unit:=wdCharacter, Count:=1
     Selection MoveRight Unit=wdCharacter, Count=4
     Selection Delete Unit=wdCharacter, Count=1
     Selection.MoveRight Unit:=wdCharacter, Count:=18
     Selection.TypeText Text:=" "
     Selection.MoveRight Unit:=wdCharacter, Count:=5
     Selection.TypeText Text:=" "
     Selection.MoveRight Unit:=wdCharacter, Count:=9
     Selection.Delete Unit:=wdCharacter, Count:=1
     Selection.MoveRight Unit:=wdCharacter, Count:=3
     Selection.Delete Unit:=wdCharacter, Count:=1
     Selection.MoveRight Unit:=wdCharacter, Count:=1
     Selection.Delete Unit:=wdCharacter, Count:=1
     Selection.MoveRight Unit:=wdCharacter, Count:=1
     Selection.Delete Unit:=wdCharacter, Count:=1
     Selection.MoveDown Unit:=wdLine, Count:=1
     Selection.HomeKey Unit:=wdLine

 Next para

 End Sub
```

Table 1. Unique survey location codes (SLCode) used to distinguish islands, regions within an island, and specific survey areas.

SLCODE	ISLAND NAME	REGION	SURVEY AREA
HA001HFBS	Hawaii	KAU	KAU HFB SURVEY
HA001KAPA	Hawaii	KAU	KAPAPALA
HA001KAUF	Hawaii	KAU	KAU FOREST
HA001ST93	Hawaii	KAU	KAU STATE SURVEY
HA001ST94	Hawaii	KAU	KAPAPALA STATE SURVEY
HA002HFBS	Hawaii	KOHALA	KOHALA HFB SURVEY
HA003HFBS	Hawaii	KONA	KONA HFB SURVEY
HA003KNWR	Hawaii	KONA	KONA FOREST NWR
HA003PBRD	Hawaii	KONA	PUU WAAWAA - BRD
HA003PDFW	Hawaii	KONA	PUU WAAWAA - DOFAW
HA003ST96	Hawaii	KONA	PUU WAAWAA STATE SURVEY
HA004HFBS	Hawaii	KIPUKAS	KIPUKAS HFB SURVEY
HA004HKKI	Hawaii	KIPUKAS	KIPUKA KI
HA004HKPU	Hawaii	KIPUKAS	KIPUKA PUAULU
HA004HMLS	Hawaii	KIPUKAS	MAUNA LOA STRIP
HA005HFBS	Hawaii	MAUNA KEA	MAUNA KEA HFB SURVEY
HA005KANA	Hawaii	MAUNA KEA	KANAKALEONUI SURVEY
HA005PARP	Hawaii	MAUNA KEA	PALILA RESTORATION PROJECT
HA005PATP	Hawaii	MAUNA KEA	PALILA TRANSLOCATION PROJECT
HA005POHA	Hawaii	MAUNA KEA	POHAKULOA TRAINING CENTER
HA005PUUO	Hawaii	MAUNA KEA	PUU O KAUHA
HA006HERU	Hawaii	PUNA	EAST RIFT ZONE
HA006HFBS	Hawaii	PUNA	PUNA HFB SURVEY
HA006HTLT	Hawaii	PUNA	THURSTON LAVA TUBE
HA006PGEO	Hawaii	PUNA	GEOTHERMAL SURVEY
HA007HAMA	Hawaii	HAMAKUA	HAMAKUA CJ RALPH
HA007HFBS	Hawaii	HAMAKUA	HAMAKUA HFB SURVEY
HA007HMAU	Hawaii	HAMAKUA	HAKALAU FOREST - MAULUA
HA007HNAU	Hawaii	HAMAKUA	HAKALAU FOREST - NAUHI
HA007HNWR	Hawaii	HAMAKUA	HAKALAU FOREST NWR
HA007HOKU	Hawaii	HAMAKUA	OLAA – KOA UNIT
HA007HOPU	Hawaii	HAMAKUA	OLAA – PUU UNIT
HA007HOST	Hawaii	HAMAKUA	OLAA – SMALL TRACK UNIT
HA007HOTR	Hawaii	HAMAKUA	OLAA – TRANSFER STATION
HA007HPUA	Hawaii	HAMAKUA	HAKALAU FOREST - PUA AKALA
HA007KEAR	Hawaii	KAU	KEAUHOU RANCH
HA007KILF	Hawaii	HAMAKUA	KILAUEA FOREST
HA007KUBS	Hawaii	HAMAKUA	KULANI – BOYS SCHOOL
HA007KUKF	Hawaii	HAMAKUA	KEAUHOU, KAU
HA007KULA	Hawaii	HAMAKUA	KULANI – PUU KIPU
HA007KUSH	Hawaii	HAMAKUA	KULANI – SAFE HARBOR

Table 1.Continued.

SLCODE	ISLAND NAME	REGION	SURVEY AREA
HA007KWAI	Hawaii	HAMAKUA	KULANI – WAIAKEA AREA
HA007WOUP	Hawaii	HAMAKUA	WORLD UNION PARCEL
KA001ALAK	Kauai	ALAKAI SWAMP	ALAKAI SWAMP - CJ RALPH
KA001HFBS	Kauai	ALAKAI SWAMP	SINCOCK'S BOG HFB SURVEY
KA001ST00	Kauai	ALAKAI SWAMP	ALAKAI SWAMP BRD/STATE SURVEY
KA001ST89	Kauai	ALAKAI SWAMP	SINCOCK'S BOG STATE SURVEY
KA001ST94	Kauai	ALAKAI SWAMP	SINCOCK'S BOG STATE SURVEY
LA001HFBS	Lanai	LANAI	LANAI HFB SURVEY
MA001HALE	Maui	EAST MAUI	HALEAKALA NATIONAL PARK
MA001HANA	Maui	EAST MAUI	HANAWI
MA001HFBS	Maui	EAST MAUI	MAUI – EAST HFB SURVEY
MA001KAHI	Maui	EAST MAUI	KAHIKINUI
MA001MTNC	Maui	EAST MAUI	WAIKAMOI
MA001ST92	Maui	EAST MAUI	MAUI –EAST STATE SURVEY
MA002HFBS	Maui	WEST MAUI	MAUI – WEST HFB SURVEY
MA002MTNC	Maui	WEST MAUI	KAPUNAKEA
MA002ST97	Maui	WEST MAUI	MAUI - WEST STATE SURVEY
MO001HFBS	Molokai	MOLOKAI	MOLOKAI HFB SURVEY
MO001MOLO	Molokai	MOLOKAI	MOLOKAI
MO001ST88	Molokai	MOLOKAI	MOLOKAI STATE SURVEY
MO001ST95	Molokai	MOLOKAI	MOLOKAI STATE SURVEY
OA001ST91	Oahu	OAHU	OAHU STATE SURVEY

Table 2. Example of unique survey number (SurveyNo) with associated information used to identify individual surveys. Examples are given for Kauai.

A. First seven fields of Table 2.

SURVEYNO	SLCODE	YEAR	SEASON	FORAY	PERIOD	SAMPLING FREQ
KA001HFBS1981MAY1	KA001HFBS	1981	5	1	MAY	Annual
KA001ST891989FEB1	KA001ST89	1989	2	1	FEB	Annual
KA001ST941994MAR1	KA001ST94	1994	3	1	MAR	Annual
KA001ST002000MAR1	KA001ST00	2000	3	1	MAR	Annual

B. Subsequent five fields of Table 2.

START DATE	END DATE	TARGET SPECIES	ORGANIZER	DATA LOCATION
5/12/81	5/25/81	All	J. Mike Scott	PIERC-KFS
2/15/89	3/20/89	All	Paul Conry	DOFAW
2/24/94	3/4/94	All	P. Conry	DOFAW
3/2/00	4/19/00	All	P. Conry/Bethany Woodworth	PIERC-KFS

Table 3. Structure of MS Access data set tables based on VCP format. Each table is labeled by area and year surveyed.

NAME	TYPE	SIZE	REQUIRED	INDEXED	DESCRIPTION
SLCODE	Text	15	YES	Yes (OK)	Survey location code
YEAR	Number	Integer (Long)	YES	Yes (OK)	Year survey was conducted
SEASON	Number	Integer (Long)	YES	Yes (OK)	Season survey was conducted (labeled as predominant month of survey)
SEQNO	Number	Integer (Long)	YES	Yes (OK)	Sequence number from VCP; unique number relating to transect and station
OBSCODE	Text	3	NO	NO	Observer specific alpha code
DATE	Date/Time	-	NO	NO	Date survey was conducted (MMDDYY)
TRANSECT	Number	Integer (Long)	YES	Yes (OK)	Transect numbers from individual survey areas, does not contain characters (e.g., 34A = 3401)
STATION	Number	Integer (Long)	YES	Yes (OK)	Station number from individual transect of individual survey areas
TIME	Number	Integer (Long)	NO	NO	Time individual station was surveyed
CLOUD	Number	Integer (Long)	NO	NO	Percent cloud cover at start of station survey
RAIN	Number	Integer (Long)	NO	NO	Categorical rain code at start of station survey
WIND	Number	Integer (Long)	NO	NO	Categorical wind code at start of station survey
GUST	Number	Integer (Long)	NO	NO	Categorical gust code at start of station survey
ALPHACODE	Text	4	YES	Yes (OK)	Species specific alpha code
DISTANCE	Number	Integer (Long)	NO	NO	Distance (meters) from observer to individual bird detected
DETECTION	Number	Integer (Long)	NO	NO	Detection code for an individual bird observation

DICTIONARY
Definitions of Fields and Values

Fields highlighted in dark gray are Primary Key coded, whereas combined fields in light gray form unique records.

Table 4. Design of tblBirdData.

NAME	TYPE	SIZE	REQUIRED	INDEXED	DESCRIPTION
SEQNO	Number	Integer (Long)	YES	Yes (OK)	Sequence number from VCP; unique number relating to transect and station
SURVEYNO	Text	50	YES	Yes(NO)	Unique code relating to year and season survey was conducted
OBSCODE	Text	3	NO	NO	Observer's initials
OBSSEQ	Number	Integer (Long)	NO	NO	Code relating to sequence observer censused specific station
DATE	Date/ Time	-	NO	NO	Data station was censused
TIMESTART	Number	Integer (Long)	NO	NO	Time station was censused
ALPHACODE	Text	4	YES	Yes (OK)	Species specific alpha code
DISTANCE	Number	Double	NO	NO	Distance (meters) from observer to individual bird detected
DETECTION	Number	Double	NO	NO	Detection code for an individual bird observation
COMMENTS	Memo	-	NO	NO	Specific Comments

Table 5. Design of tblEnvironmentalData.

NAME	TYPE	SIZE	REQUIRED	INDEXED	DESCRIPTION
SEQNO	Number	Integer (Long)	YES	Yes (OK)	Sequence number from VCP; unique number relating to transect and station
SURVEYNO	Text	50	YES	Yes(NO)	Unique code relating to year and season survey was conducted
DATE	Date/ Time	-	NO	NO	Data station was censused
OBSCODE	Text	3	NO	NO	Observer's initials
TIMESTART	Number	Double	NO	NO	Time station was censused
DURATION	Number	Double	NO	NO	Length of time (min) station was censused
CLOUD	Number	Double	NO	NO	Percent cloud cover at start of station survey
RAIN	Number	Double	NO	NO	Categorical rain code at start of station survey
WIND	Number	Double	NO	NO	Categorical wind code at start of station survey
GUST	Number	Double	NO	NO	Categorical gust code at start of station survey
COMMENTS	Memo	-	NO	NO	Specific Comments

Table 6. Design of tblObserver_LU.

NAME	TYPE	SIZE	REQUIRED	INDEXED	DESCRIPTION
OBSCODE	Text	3	NO	YES(NO)	Observer's initials
OLDOBS	Text	10	NO	NO	Previous observer's initials
FIRSTNAME	Text	25	YES	NO	Observer's first name
MIDDLEINITIAL	Text	1	YES	NO	Observer's middle initial
LASTNAME	Text	25	YES	NO	Observer's last name
COMBINED NAME	Text	75	YES	NO	Observer's first, middle initial and last name
PREVIOUSLAST NAME	Text	25	NO	NO	Observer's previous last name (i.e., maiden name)
EMPLOYER	Text	25	NO	NO	Observer's employer at time of survey
CONTACT INFORMATION	Text	75	NO	NO	Observer's last known contact information

Table 7. Design of tblStation_LU.

NAME	TYPE	SIZE	REQUIRED	INDEXED	DESCRIPTION
SLCODE	Text	15	YES	Yes (YES)	Survey location code
SEQNO	Number	Integer (Long)	YES	Yes (NO)	Sequence number from VCP; unique number relating to transect and station
SEQNO-OLD	Number	Integer (Long)	NO	NO	Sequence number from VCP; unique only in space, not time
TRANSECT	Number	Integer (Long)	YES	Yes (YES)	Transect numbers from individual survey areas, does not contain characters (e.g., 34A = 98)
TRANSECT-OLD	Memo	-	NO	-	Original transect numbers from individual survey areas, may contain characters (e.g., 34A)
STATION	Number	Integer (Long)	YES	Yes (NO)	Station number from individual transect of individual survey areas
STATION-OLD	Memo	-	NO	-	Original station number from individual survey areas
SURVEYEDFOR BIRDS	Yes/No	-	YES	NO	Was this station surveyed for birds (YES) or only surveyed for other data (NO)
X_COORD	Number	Integer (Long)	YES	NO	UTM x-coordinate
Y_COORD	Number	Integer (Long)	YES	NO	UTM y-coordinate
WAYPOINT	Text	50	NO	NO	Method station location was derived
ERROR	Number	Integer(Long)	NO	NO	Error in station placement (m)
ELEVATION	Number	Integer (Long)	NO	NO	Elevation in meters
EASTING	Number	Integer (Long)	NO	NO	UTM Easting location
NORTHING	Number	Integer (Long)	NO	NO	UTM Northing location
FORESTTYPE	Number	Integer (Long)	NO	NO	Code relating forest type to GIS information
COMMENTS	Memo	-	NO	NO	Specific Comments

Table 8. Design of tblSpecies_LU.

NAME	TYPE	SIZE	REQUIRED	INDEXED	DESCRIPTION
ALPHACODE	Text	4	YES	Yes (NO)	Species specific alpha code
SCIENTIFIC NAME	Text	75	YES	NO	Scientific name of birds
SOURCE	Text	100	YES	NO	Source of classification and scientific nomenclature
COMMONNAME	Text	75	YES	NO	Accepted species common name
ALTERNATIVE NAMES	Text	75	NO	NO	Alternative common names of birds
ALPHACODE-OLD	Text	4	NO	NO	Former alphacodes
TSN	Number	Integer (Long)	NO	Yes (NO)	Taxonomic Serial Number linked to NPS Inventory and Monitoring database

Table 9. Design of tblSurveyLocation_LU.

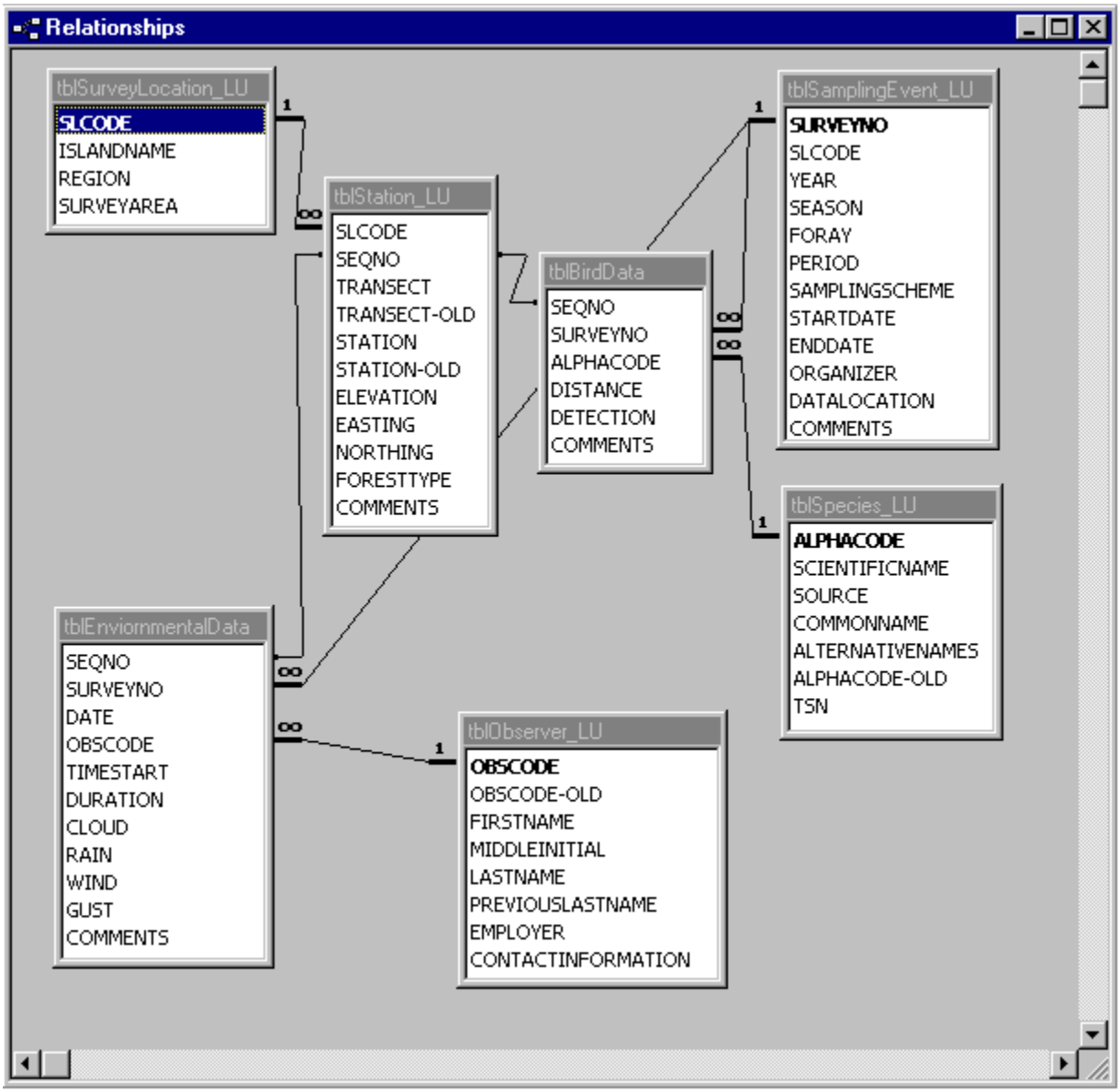
NAME	TYPE	SIZE	REQUIRED	INDEXED	DESCRIPTION
SLCODE	Text	15	YES	Yes (NO)	Survey location code
ISLANDNAME	Text	25	YES	NO	Name of island where survey was conducted
REGION	Text	50	YES	NO	Location on island where survey was conducted
SURVEYAREA	Text	50	YES	NO	Survey area name of location on island where survey was conducted
AREA(KM2)	Number	Integer (Long)	NO	NO	Area (square Km) of Survey Area

Table 10. Design of tblSamplingEvent_LU.

NAME	TYPE	SIZE	REQUIRED	INDEXED	DESCRIPTION
SURVEYNO	Text	50	YES	Yes(NO)	Unique code relating to year and season survey was conducted
SLCODE	Text	15	YES	Yes (YES)	Survey location code
YEAR	Number	Integer (Long)	YES	Yes (YES)	Year survey was conducted
SEASON	Number	Integer (Long)	YES	Yes (YES)	Season survey was conducted
FORAY	Number	Integer(Long)	NO	NO	Number of individual forays necessary to complete survey
PERIOD	Text	3	NO	NO	Portion of year survey was conducted (month, quarter or annual)
SAMPLING SCHEME	Text	15	NO	NO	Occurrence of sampling periods (monthly, quarterly, biannually, or annually)
STARTDATE	Date/Time	-	YES	NO	Start date of survey
ENDDATE	Date/Time	-	NO	NO	End data of survey
ORGANIZER	Text	35	YES	YES(YES)	Name of organization that conducted survey
DATA LOCATION	Text	30	YES	YES(YES)	Name of organization that holds hard copies of the data
COMMENTS	Memo		NO	NO	Specific Comments

Relationships

Figure 1. Access database Relationships for tables.



Appendix 1a. Example of Survey Data Set metadata.

DATA SET SUMMARY

Data Set:
Hawaii, Puuwaawaa Wildlife Reserve, 1996.

Survey Purpose:
Seasonal survey of Puuwaawaa Wildlife Reserve, to determine forest bird species composition, distribution and density.

SLCode:
HA003PBRD.

Survey Number:
HA003PBRD1996AUG1.

Year:
1996.

Month(s):
August.

Start Date:
13 August 1996.

End Date:
13 August 1996.

Organizer:
Jay T. Nelson.

Methodology:
Variable Circular-Plot.

Count Duration:
8 minutes.

Time Start:
06:50.

Time End:
09:57.

Distance Interval:
Exact distances measured in meters.

Number Times Each Station Sampled:
1.

Comments on Methodology:
Distance to each bird was estimated to the nearest meter and recorded as exact.

Methodology Anomalies:
None.

Raw Data Location:
PIERC.

Data Obtained From:
Jay T. Nelson provided field books and electronic data.

Format:
VCP format and data books.

Appendix 1a. Continued. Example of Survey Data Set metadata.

Media:
3.5MB floppy disks and interoffice transfer.

Status When Received:
Readable and complete (electronic version).
Readable and complete (data books).

Location of Original Data File:
VCPComputer directory "VCP Data".

Location of Backup Copy:
Computer – lgskilauea2\E\VCPComputer BK.

Data Entry and Proofing Status:
Incomplete (spot-check to perform).

Data Entry and Proofing Comments:
Entered and proofed by Jay T. Nelson. Data were spot-checked by HFBIDP pending (error rate: pending; action: pending; summary of errors: pending).

Transects and Stations Sampled:

Transects	Stations	Comments
11	450-1650	None.
13	450-1650	None.
15	450-1650	None.
17	450-1650	None.
19	450-1650	None.

Elevation Range:
Pending.

Habitat Type:
Pending.

Level 1 Vegetation Type:
Pending.

Level 2 Vegetation Type:
Pending.

Variable Recorded:	Always	Sometimes	Never
Time	X		
Cloud Cover	X		
Rain	X		
Wind	X		
Gust		X	

Species Surveyed:
All forest birds.

Observers:

ObsCode	Observer Name
ATP	A. Tracy Powers.
DPM	D. P. Mcgowan.
JTN	Jay T. Nelson.
PTO	Paul T. Oesterle.
SGF	Steve G. Fancy.

Number of Records:
384 records.

Data Processing Procedures:
Data were received electronically in VCP format from Jay T. Nelson. Conversion followed standard Data Conversion Procedures for VCP format and fields assigned to appropriate tables in MS Access HFB Interagency Database. Species names and AlphaCodes were updated

Appendix 1a. Continued. Example of Survey Data Set metadata.

and standardized to current A.O.U. (1998) check-list. Observer sequence numbers were assigned following Observer Sequence Codes procedures.

Latest Data Processing Update:
May 2000 by Richard J. Camp to assign Observer Sequence Codes.

Analyses Procedures:
Data have been compiled and entered into DISTANCE. Selection of reference observer pending. Inclusion of observers for EDR estimation pending. Co-variable analysis pending. Summary statistics pending. Density statistics pending. Trends analysis pending.

GIS Mapping:
Pending.

References:
American Ornithologists' Union (A.O.U.). 1998. Check-list of North American birds, 7th ed. American Ornithologists' Union, Washington, D.C.

Metadata Written – November 2000.
Metadata Status – Complete.
Metadata Updated – March 2001; September 2001.
By Deborah M. Gillmor; Natalie A. Kromrey.

Appendix 1b. Example of Survey Data Error Proofing metadata.

Data Proofing Summary

SLCode:
MA001HALE.

Survey Number:
MA001HALE1999ANN1.

Year:
1999.

Data Entered By:
Haleakala National Park.

Data Line Item Proofed By:
Haleakala National Park and HFBIDP (Deborah M. Gillmor).

Number of Records:
2,043.

Data Spot Checked By:
Deborah M. Gillmor.

Date(s) of Spot Check:
15 - 30 March 2001.

Number of Records Spot checked:
204.

Number and Percentage of Errors:
0 records with errors (0% of 204).

Summary of Errors:
Not applicable.

Action Taken:
The dataset failed the first spot check attempt due to incorrect environmental data and was therefore line-item proofed by HFBIDP before undergoing a second spot check. Less than 1% of spot-checked records contained errors, therefore no further action was taken. Data Set Summary updated 30 March 2001.

Metadata Written – March 2001.
Metadata Status – Complete.
Metadata Updated – March 2001.
By - Deborah M. Gillmor.

Appendix 2. Example of Geoinformation metadata.

ARCVIEW GIS PROJECT SUMMARY – KAUAI

File Location:
158vc computer: c:\Hawaii ArcView GIS\Kauai\kauai.apr

VCP Survey Coverage (SLCodes):
KA001HFBS, KA001ST89, KA001ST94, KA001ST00

Project Theme and Table Summaries:
View themes:
All Stations – shapefile, XY coordinates for all (HFBS and subsequent) VCP stations. Thirty-five transects and 583 stations represented. The Seqno field identifies each record's distinct sequence number and matches those from the HFBID tblSurveyLocation_LU table. Stations were either GPS''d (81% of total) or manually placed (screen digitized) by referencing previous surveyors field notes and recollections (Jeff Foster-pers. comm.). Source: pending. Precision: pending.
HFBS Stations – shapefile, XY coordinates for all HFBS stations surveyed in 1981. Six transects and 140 stations represented. The *Seqno* field identifies each record's distinct sequence number and matches those from the HFBID tblSurveyLocation_LU table. Source: pending. Precision: pending.
Primary Roads – shapefile, self-explanatory. Source: pending. Precision: pending.
Secondary Roads – shapefile, self-explanatory. Source: pending. Precision: pending.
1000 foot contour – shapefile, self-explanatory. Source: pending. Precision: pending.
500 foot contour - shapefile, self-explanatory. Source: pending. Precision: pending.
200 meter contour - shapefile, self-explanatory. Source: pending. Precision: pending.
Alakai Swamp.tif – tif image taken from 7.5 quad USGS quad map (24,000 scale) with 40 foot contour intervals, for area included in surveys. NAD 1983 UTM projection. Source: pending. Precision: pending.
Coastline – polyline shapefile for Kauai coastline. Source: pending. Precision: pending.
Tables:
Bird Data - dbf imported table from Access HFBID tblBirdData for all line-item proofed bird data records for Kauai (all surveys, all years). Fields for each record include sequence number, survey number, alpha code, and date. This table can be linked to the All Stations shapefile and queried to show survey effort, species occurrence, etc. Source: pending.

Metadata Written – February 2001.
Metadata Status – Incomplete.
Metadata Updated – March 2001.
By – Christopher M. Collins.
