The California Department of Fish and Wildlife
Observation-based Approach to Developing Databases

This is a synopsis from the Uniform Field Observation Model
(UFO-L1 v1.0c specs) document, Effective Date 11/1/2002, Updated 11/8/2006
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Originally prepared for the CDFW-BDB Field Data Collection Workgroup, 11/12/2007
Updated by Douglas Burch, 12/5/2014

The observation-based approach to collecting biological data evolved out of the need for a basic guide to the way that field observation data is collected, managed, and analyzed within the Department. The concept is based on the premise that complete uniformity among all biological databases is unattainable and undesirable. Rather than attempt to make a "one size fits all" solution, the observation-based approach seeks to identify similarities and group them together in a logical way, creating different levels at which these datasets can be developed.

Once data are collected and organized in a standardized fashion, they can then be stored and accessed in a uniform way from a common location. This location will be a presence on the World Wide Web. Using web-based mapping applications the collected works of all participants can be viewed, browsed, downloaded, and (with some caveats) queried. Data will not necessarily have to be at a central location (although some will) but can be referenced from a single site. This approach can provide a single point of entry for deposit or retrieval of any Departmental observation-based data; it will facilitate data integration and distribution.

Observation-based databases can be organized into three tiers or levels.

Level 1 Specification – Minimum Data Requirements for Observation-based Data

Requirements for a minimum set of information considered useful to the Department consists of three key components, i.e., "Data Entry," "Geospatial," and "Metadata" (Figure 1).

Data Entry Information – Each record must be accompanied by information about who entered the data and date-time that the data were entered. In the standard configuration this information is stored in an observation table, however it can just as easily be stored using additional fields in a GIS layer's attribute table.

Geospatial Information – Each record in an observation-based dataset must be accompanied by information regarding where the observation occurred. This geospatial information can be in the form of a point, line, or polygon; or, it can be a reference to a commonly accepted geospatial feature, such as a lake, stream, or road. There is no requirement regarding the spatial format of this information; it can be stored as a geodatabase, shapefile linked to the observation data, as an event table, e.g., an Excel spreadsheet, comma delimited text file, or in a feature table, such as an Access database containing coordinate information.

Metadata – For a dataset to meet the minimum specification requirement, it must be accompanied by metadata describing the "who, what, when, where, how, and why of the data."

These minimum specifications are easily met for the most part and have a high degree of flexibility in format. They can be used to develop databases for any kind of observation, e.g., incidental wildlife observations, fish survey data, timber harvest plans, etcetera, and they provide a way to convert legacy data to observation-based datasets.

Level 1 Basics

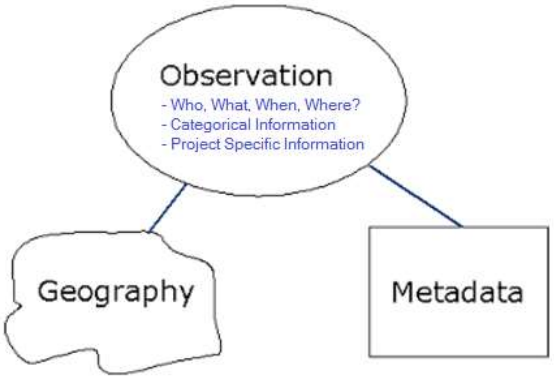

Figure 1. The diagram shows minimum requirements for observation-based data and relationships between its entities.

Defining the Unit of Observation

A unit of observation is defined as *a circumstance, finding, situation, or activity that is executed, referenced, or noted in the field, about which the Department has a mandate or desire to record or report*. The unit of observation is usually species centric but not always. It is created by simply assigning each observation record a unique identifier.

Whether or not a unit of observation has a straight forward or complex definition, for a particular database design, the intrinsic value of the data when comparing with other like datasets relies on this definition not changing. It is this standard unit of observation that provides a way to compare data over time and spatially overlay it with other like datasets.

The "Survey" Component

In addition to the level 1 concept, illustrated above, observations that have a relationship to other observations, e.g., are of the same observation type and effort, can be grouped together by way of a survey component (Figure 2).

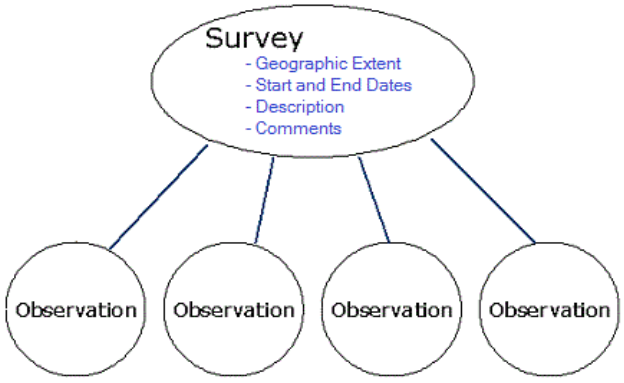

Figure 2. The diagram shows how common observation-based entities can be grouped together and associated with each other by way of a survey entity.

It should be noted that meeting minimum specifications alone does not necessarily make a database useful for Departmental needs; the level 1 specification only requires information such as what kind of observation occurred, when and where it occurred, and who was the observer. Level 1 does not provide information specific to any given class or category (i.e., the type of study) of observation. The minimum standards for this additional information should be developed as part of Level 2 and/or level 3 databases.

Level 2 Specification – Extends a level 1 with common subclass requirements

Level 2 specifications require that the database first meet the minimum specifications (level 1). In addition, level 2 databases are created to meet the needs of a specific subclass of data that have a set of unique requirements. Experts in that area define the specifications for each theme. Data fields unique only to specific efforts would not be included. The goal in defining a level 2 subclass specification is to group together, to the greatest extent feasible, all thematic data collection efforts that share a set of common data fields.

If a data collection effort contains at least all of the fields in a particular subclass and is thematically the same, it can be considered a member of that subclass. If fields are then added to provide a full representation of project specific parameters it becomes a level 3 database while maintaining its membership within the Level 2 subclass.

Level 3 Specification – Extends a level 1 with unique requirements

The level 3 specification requires that a database meet level 1 and level 2 requirements. In addition to meeting those requirements, a level 3 database will also contain fields unique to a single specific data collection effort, i.e., those fields needed to describe circumstances above and beyond what is recorded in a more general level 2 database. In other words, a level 3 database will be uniform at level 1 and level 2, however they will contain additional unique fields.

Observation-based Databases

Databases that meet an observation-based specification level belong to one of two logical groupings: central databases or contributing databases. Central databases reside on headquarters servers and manage behind-the-scene administrative issues as such they do not concern us here. The contributing database group includes those that comply with level 1 or level 2 specifications. Contributing databases are subdivided into managed databases and participating databases, allowing for a range of flexibility from tightly designed and controlled to very simple database structures.

Managed Databases

Managed databases offer a complete database solution. They are intended to meet the specific ongoing needs of critical Departmental functions. Administered centrally from a server, managed databases feature custom desktop or web-based applications, connected to a remote database, and allow data input and retrieval from multiple users statewide. The number of managed databases is directly limited to the amount of staff time available to support them. It is not anticipated that, at current staffing levels, the number of managed databases will be significant.

Participating Databases

These databases are those which meet level 1 or level 2 specifications, but do not have a common application frontend which supports direct online entry to a remote server (like the managed databases). Participating databases will be single stand-alone products, or designed in such a way that multiple copies comprising a level 2 class, populated independently, can be appended together to form a single compiled version. The method of creation for these databases, and the manner in which they are populated, will vary greatly. In each case, the database owners must resolve these issues. Currently, there are not the resources to design and build database applications for all comers (although guidance and standard tools and models will be available). Some possible ways of implementing a database using the observation-based approach are as follows:

- Shapefile or other map-based formats (geographic)
- Microsoft Access databases (relational)
- Microsoft Excel spreadsheets (flat tables)
- Pendragon Forms (hand held digital devices)

It is anticipated that participating databases will likely supply the majority of observation-based datasets.

CITATION

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