

AQUATIC GAP

A Comprehensive Biological Inventory Database for the Iowa Aquatic GAP Project

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Before the implementation of the Iowa Aquatic Gap Analysis, project coordinators had no sense of the breadth of biological sampling data available for fish. However, it was considered important to have the most extensive biological data set possible. We were able to systematically compile a fish inventory database that we believe satisfies this objective. Other Aquatic GAP projects may find themselves in a similar situation and thus benefit from our approach to compiling a comprehensive biological inventory database.

Database Design

Before compiling any data set, it is essential to determine what types of information are to be included. First, we modified the Microsoft Access relational database originally designed by the Missouri Aquatic GAP Project by expanding it to reflect the additional information we wished to capture for Iowa, including additional tables for source, collector, collector samples, gear type, and negative data (where taxa were sampled for and not found). Elaborating on the original source field found in the samples table, the new collector tables included fields for collectors' names and associated samples, whereas the source table included the name of the associated institution, the citation or description of the source, and location of the original data. Unlike the sampled species table, which indicates the presence of a species in a sample, the new table for negative data indicated the absence of a species in a sample when an explicit search for that species had been made. In addition to adding tables, we expanded the number of fields in preexisting tables. Additional fields include (a) information about abundance, (b) sample type (community versus target), (c) descriptive location details, (d) descriptive method details, (e) individual specimen details, (f) a flag field for records not used in the professionally reviewed copy of the database, (g) a flag field to indicate that the sample has a corresponding feature in a GIS shapefile, and (h) a field for the Index of Biological Integrity (a widely used index of stream health).

Data Acquisition

Once the database was designed, the next step was to acquire the raw data. We first compiled a detailed list of all possible and known sources of data including historic and recent, print and electronic, and published and unpublished sources. We then compiled a detailed list of possible data acquisition strategies. We proceeded to match appropriate strategies with possible sources and pursued those sources. For example, museum collections are a possible source for historic data. Possible strategies for retrieving museum records could be to search their on-line database and/or contact individual museum curators. We identified possible museums, both public and private institutions, at the local, state, or national level. After performing a comprehensive Internet search to identify all museums that might have fish collections, we either searched their on-line database for Iowa records or contacted the curator.

Through this process we identified seven categories of source data:

- Published literature: monographs, theses, dissertations, and journal articles
- Federal reports: EPA, U.S. FWS, Army Corps of Engineers
- Museum collections
- Iowa Department of Natural Resources (IDNR) reports
- IDNR field notes
- Statewide biological inventory databases
- Individual researchers' unpublished field notes

We grouped all data acquisition strategies into four categories: literature searches, IDNR field trips, museum collection inquiries, and individual contacts. Although searching Internet access databases, such as FishBase (Froese and Pauly 2003), as a strategy was initially pursued, we discovered little Iowa community data that was not already available in primary sources.

Literature Searches

To compile fish data from published literature, we conducted literature searches using several different methods. We used bibliographies of known published sources of data or from appropriate secondary sources in order to trace back to historically published data in the same way one would use a citation index. This was useful for including journal articles and published reports that are not indexed elsewhere. For both historic and recent journal articles, we searched both print and electronic forms of subject indexes and abstracts. To ensure that the searches were comprehensive, Boolean keyword searching, field-limited searches, as well as controlled vocabulary were used. To find published reports, monographs, theses, and dissertations, we searched library catalogs at the state and national level as well as the WorldCat database, an on-line union catalog of 23,000 libraries in 63 countries. Thirty-three sources were found through this strategy.

Iowa Department of Natural Resources Field Trips

No centralized depository for stream fish community data existed in Iowa before this project. We gathered fish sampling data during visits to all 15 IDNR regional fisheries stations as well as

the headquarters. During these station visits, we met with IDNR fisheries biologists and technicians to explain and promote the Aquatic GAP project. We also acquired all of the riverine fish data located at each station. Almost half of all sources used for the database were obtained during these visits, including management and research reports not available elsewhere. As an example, over 1,700 fish community samples from 1941 to 2003 were obtained just from field notes stored in filing cabinets.

Museum Collections

During early explorations of Internet sources, we discovered the most useful source of such data came from museum collection's on-line databases. After eliminating museum databases that did not include fish collections, we conducted searches on each database for Iowa-specific records. However, we also came across museum fish collections that were not available electronically. For those museums, we acquired Iowa-specific records by contacting the curator directly through e-mail. We identified over 40 museums with Iowa fish collection records. For the purposes of the Iowa Aquatic GAP Project, we were able to use the records of nine museum collections totaling 261 historic fish community samples ranging in date from 1854 to 2000.

Individual Contacts

Through an extensive network of cooperators, both at Iowa State University and the IDNR, we were directed to individuals who had collected fish community samples in Iowa. We contacted most of these individuals by e-mail. Individuals contacted ranged from retired faculty of liberal arts colleges in Iowa to out-of-state fisheries biologists who had visited the state only once. The majority of the resulting data was in the form of unpublished, hand-written field notes ranging from 1932-2000. The data uncovered in this fashion were extensive, resulting in over 2,400 fish community samples covering all geographical regions of the state.

Data Organization

For verification purposes, it is important to ensure a direct relationship back to the original data. Therefore, we also organized the raw data for easy retrieval. As we had a tremendous amount of print material, we labeled each print sample with its unique sample identifier and each print source with its unique source identifier. These materials were categorized and their locations indicated in the database using a field in the source table, e.g., "File Folder: Reports, Government- Mississippi River" or "Dissertation: contact ISU Parks Library Call No. SH156wa." For electronic data, we made use of the cross-reference tables designed by the Missouri Aquatic GAP Project, which essentially provided the same ability to go from the biological inventory database back to a specific source or sample. We also used the source table field in the database to indicate the name and location of each electronic source file, e.g., c:\...\Manchester\2004_season.xls. This level of organizational detail aids in the data entry and error checking process and makes it easier to access the data for future use.

Database Summary

This database is available on the Internet at <http://maps.gis.iastate.edu/iris/>. It contains 11,683 fish community samples taken from 1884–2003. It contains 98,206 sampled species records including 142 native and 13 exotic species. It has samples from every county, every 8-digit, and almost every 10-digit hydrological unit in Iowa (see Table 1).

Table 1. Iowa Aquatic GAP database summary

Number of fish community samples	11,683
Number of species occurrences	98,206
Number of fish species sampled	142 native, 13 exotic
Sampling date range	1884–2003
Number of individual sources of data	202
Number of Iowa counties sampled (99 total)	99
Number of unique stream reaches sampled	3224
Percent of all 8-digit HUCs sampled	100
Percent of all 10-digit HUCs sampled	92.4
Percent of all 12-digit HUCs sampled	73.5

Literature Cited

Froese, R., and D. Pauly, editors. 2003. FishBase. World Wide Web electronic publication. URL: www.fishbase.org, version 10. March 2004.

Surveys to Evaluate Fish Distribution Models for the Upper Missouri River Basin Aquatic GAP Project

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Introduction

For terrestrial vertebrates, the Gap Analysis Program has generated what Scott et al. (1993) called “the necessary ingredients for anticipation of endangerment of species with the ultimate goal of predicting areas of high biodiversity.” The necessary ingredients include maps of land cover, terrestrial vertebrate distributions, and land stewardship. With the aquatic component of Gap Analysis, analyses are done within watershed boundaries using valley segments as the finest resolution (Wall et al. 2004). We report here on surveys used to evaluate fish species distribution models for the aquatic GAP project of the huge Missouri River Basin.