A Comprehensive Biological Inventory Database for the Iowa Aquatic GAP Project

Anna K. Loan-Wilsey
Iowa State University

Robin L. McNeely
Iowa State University, mobess@iastate.edu

Patrick D. Brown
Iowa State University

Kevin L. Kane
Iowa State University, kkane@iastate.edu

Clay L. Pierce
United States Geological Survey

Follow this and additional works at: http://lib.dr.iastate.edu/cfwru_reports
Part of the Environmental Monitoring Commons, Geographic Information Sciences Commons, Natural Resources and Conservation Commons, and the Physical and Environmental Geography Commons

Recommended Citation
Loan-Wilsey, Anna K.; McNeely, Robin L.; Brown, Patrick D.; Kane, Kevin L.; and Pierce, Clay L., "A Comprehensive Biological Inventory Database for the Iowa Aquatic GAP Project" (2004). Iowa Cooperative Fish and Wildlife Research Unit Reports. 1.
http://lib.dr.iastate.edu/cfwru_reports/1

This Article is brought to you for free and open access by the Iowa Cooperative Fish and Wildlife Research Unit at Iowa State University Digital Repository. It has been accepted for inclusion in Iowa Cooperative Fish and Wildlife Research Unit Reports by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.
A Comprehensive Biological Inventory Database for the Iowa Aquatic GAP Project

Abstract
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.

Disciplines
Environmental Monitoring | Geographic Information Sciences | Natural Resources and Conservation | Physical and Environmental Geography

Comments
This report is from GAP Analysis Bulletin 12 (2004).

This article is available at Iowa State University Digital Repository: http://lib.dr.iastate.edu/cfwru_reports/1
A Comprehensive Biological Inventory Database for the Iowa Aquatic GAP Project

ANNA LOAN-WILSEY¹, ROBIN L. MCNEELY², PATRICK D. BROWN², KEVIN L. KANE², AND CLAY L. PIERCE³

¹Department of Natural Resource Ecology and Management, Iowa State University, Ames
²Geographic Information Systems Support and Research Facility, Iowa State University, Ames
³USGS, Iowa Cooperative Fish and Wildlife Research Unit, Iowa State University, Ames

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
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

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

Literature Cited

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

STEVE E. FREELING1, CHARLES R. BERRY, JR.2, RYAN M. SYLVESTER1, STEVEN S. WALL1, AND JONATHAN A. JENKS1
1Department of Wildlife and Fisheries Sciences, South Dakota State University, Brookings
2U.S. Geological Survey, South Dakota Cooperative Fish and Wildlife Research Unit, South Dakota State University, Brookings

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.