

# AQUATIC DATA ANALYSIS

Federal Aid Project F-239R-17

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Federal Aid in Fish and Wildlife Restoration

Job Progress Report

Colorado Division of Wildlife

Aquatic Wildlife Research Section

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State: Colorado

Project No. F-239R

Title: Aquatic Data Analysis

Period Covered: July 1, 2009 to June 30, 2010

Study Objective: To develop analysis of aquatic biological data that accurately describes and/or predicts the status of fish communities and the results of management actions on these communities.

Study Objectives:

Job 1. Aquatic Data Management System (ADAMAS)

Objective: To continue to develop and maintain a computer based, statewide aquatic data management system which will facilitate standardized entry of survey data across the state and access to information regarding all aspects of aquatic data including stream and lake inventories, Scientific Collections (SCICOLL) reports and creel surveys. Active links between ADAMAS and the Aquatic Animal Health (AAHL) database as well as between those two databases and the Division Hatcheries database (TRANS5) will be established and maintained. This job includes aspects of the aquatic portion of the Colorado Vertebrate Ranking System (COVERS).

Job 2. Technical Assistance

Objective: To provide technical assistance to researchers, field biologists, and staff on a variety of aquatic data analysis topics. Topics to include creel survey, inventory survey, management categorization, recording of accurate location data through the use of Global Positioning Systems (GPS), hardware and software review, application development and other computer related data analysis needs.

## Job 1. Aquatic Data Management System (ADAMAS)

### ADAMAS Database Management and Maintenance

The effort to collect and enter current and historic fisheries survey from field data sheets stored at various Division offices continues. At the beginning of this reporting period, the database held 24,979 surveys at 13,220 locations, with 1,173,591 fish sample records, representing 3,550,177 fish. During the reporting period, we've added 2,763 surveys from 577 new and existing locations, with 364,445 sampling records representing 800,878 fish. Of those, 509 surveys were performed by Division biologists during the 2009 field season with another 340 surveys from SCICOLL reports during 2009. The remaining 1,916 surveys entered during the reporting period came from archived hardcopy field forms submitted by Division researchers and biologists.

Currently, the database stores a total of 27,052 surveys at 13,705 locations, with 1,532,128 sample records representing 4,300,585 fish. The following table shows survey entry totals with sampling records and representative fish added for each year in the reporting period.

Reporting Year	Surveys	Sample Records	Fish
pre-2003	13,681	356,588	1,909,434
2003-2004	1,313	27,999	48,073
2004-2005	1,735	147,711	177,646
2005-2006	2,146	174,621	351,194
2006-2007	1,130	44,332	113,202
2007-2008	1,566	151,688	230,672
2008-2009	3,408	272,380	724,230
2009-2010	2,763	364,445	800,878
Total	27,052	1,532,128	4,300,585

We continue to bring sampling surveys and creel surveys into the system from a variety of sources. Initially, the database was comprised of records from the CDOW Stream and Lake Databank (predecessor to ADAMAS), data files used to store entries for the Creel Survey Analysis Program (C-SAP), a database of historical sampling compiled by Kevin R Bestgen, Ph. D. to support the South Platte and Arkansas Basins' Eastern Plains Natives Fishes reports, CDOW surveys submitted by the biologists and SCICOLL reports. The database was designed around basic data items collected in the field with enough flexibility to support the variety of inventory sampling protocols used by aquatic biologists, researchers and consultants across the state. We continue to standardize field data reporting formats based on that design, allowing for expansion to accommodate new methods and projects.

Currently, data is reported by CDOW biologists and SCICOLL permit holders via an application written by CDOW researcher Kevin Rogers, Ph. D. - the “JakeOmatic” (JOM) - or standardized spreadsheet templates, but occasionally large groups of survey data are located in files, compiled and entered by database staff. As surveys are processed, sampling information is verified and compared to data from previously entered surveys. From time to time, historic survey reports with more detail and individual fish data are found to replace previously recorded summary information.

As researchers come close to retirement, their data caches are examined for survey data that hold that greater level of detail or had been missing from the database and those data are used to update the database. This has been the case with Aquatic Researcher R. Barry Nehring, whose investigations into Whirling Disease since the late 1980’s have produced a wealth of information. So far, we have been able to enter 1,275 surveys from Nehring’s cache alone.

As the spatial reference is an integral part of the data model, survey location descriptions from the period prior to the Division’s involvement in computer-based data storage (pre-1985) are seen to be less accurate, if they exist at all beyond the assigned water code of the reach sampled. The locations described by township, range and section or local landmarks sometimes reveal duplication in reporting as dates and sample data are brought into the comparison. The resulting duplicate survey and sample records are archived and then culled from the “active” database.

Prior to and during this reporting period, several events affecting the ADAMAS database and CDOW aquatic data as a whole have taken place:

The work of consolidating the Division’s four, independent, Aquatic-themed databases to a single, centralized database with linkage to the Division’s Geographic Information System (GIS) continues. The resulting Aquatics Database (AQDB) design meets criteria defined by the Governor’s Office of Information Technology (GOIT) and has been implemented with the full participation of the Division’s Wildlife Technologies work group.

The database includes stocking and production data migrated from TRANS5 in anticipation of the next version of that application, TRANS6, which will access tables from the AQDB over the Division’s Wide Area Network (WAN).

Aquatic disease data from the AAHL database is in the process of being migrated to the AQDB. That effort includes work to identify inventory sampling events from which disease samples were taken, which, due to their location tracking, will allow spatial analyses of disease data.

## The ADAMAS Application

Standardization of inventory sampling data entry, analysis and reporting continues to be the primary target of an ADAMAS application within the AQDB. As we have described in previous reports, the application's design was set up in two phases. The first phase was to get the application into the field with standardized entry and reporting intact. Throughout the length of this project, the availability and acquisition of better programming and database management environments within the Division have yet to result in a reliable application that will facilitate standardization of data entry, analysis and reporting. With the creation of GOIT, the application's design, implementation and maintenance will be overseen by the Division's IT workgroup. Unfortunately, the State's budgetary restrictions continue to delay work on the application, so use of the JOM as the primary data entry tool will continue.

The second phase, implementation of an updated, Windows-based version of C-SAP. George Schisler, Ph.D., an aquatic researcher with the Division, has finalized the translation of the DOS-based C-SAP program. Testing the new C-SAP application has been completed and is in use by Division aquatic biologists to enter and analyze actual field data with very good results. Creel data from the individual MS Access databases that support the Windows version of C-SAP are being compiled from individual biologists' copies to a single Access database located on a Denver DOW server.

A comparison of converted creel survey records in the ADAMAS system's structures and hardcopy results stored at the Fort Collins Wildlife Research Center over the years revealed a number of creel surveys either not yet in electronic form or not available to the database for consolidation. This led to a search for any electronic data files held by the Aquatic Research Group, as well as the individual biologists. The search will be followed up with a project to update the compiled data base with historic data from the surveys' original digital storage files. It is possible that, in lieu of a version of C-SAP that would utilize tables in the AQDB, the resulting central, consolidated copy of the Access database may be used for ongoing updates across the state as well as analyses and reporting of past creel surveys.

In the meantime, an effort to enter summarized data from the hardcopy reports generated by the DOS-based version of C-SAP has begun in order to provide Division biologists an electronic history of creel surveys performed since the 1980's.

## Data Requests

Requests for data from the database continue to be filled in a timely manner, formatted as requested with priority given to support Division research and management needs. External government agencies, consultants, contractors and educational researchers are accommodated as expeditiously as possible. Angler requests are referred to Aquatic Area biologists.

This remains a manual process for the most part; a summarization process originally used to check the results of the application's test analyses resulted in a summary table that has continued to prove valuable as a consistent format for providing requestors with information about sample inventories without having to provide "raw" data to requestors who the Aquatic Data Request Group (described below) have determined not to need that level of resolution in the data provided.

The centralized process for review of requests by the Division's biologists prior to release of data continues to be revised. At this point in time, a formal request is made via email with the CDOW Aquatic Data Request Form (Appendix A). The form is meant to define the requestor's area of interest, the resolution of the data requested and advise the requestor of the provisional status of the data and their responsibilities as to redistribution of the data. The only change to the form has been to exclude our FAX number as requests made via FAX could not be easily distributed to the Aquatic Data Request Group and usually had legibility problems, partly due to the quality of the FAX process.

The request, and sometimes the data requested, is distributed to the Aquatic Data Request Group via email for review and comment. The members include the Aquatic Research Leader, the regional Senior Aquatic Biologists, the Water Unit Manager, the regional Senior Wildlife Species Conservation biologists, the regional Aquatic or Water Quality Wildlife Species Conservation biologists, the Aquatic Toxicologist, the Aquatic GIS Specialist and the Aquatic Database Manager. The members of this group are aware of aquatic issues statewide and are all in contact with Aquatic Area biologists responsible for the management of waters in the requestor's area of interest. Discussions have taken place among the members via email to determine how the request is to be filled. Once everyone is in agreement or have bowed out of the discussion, the request is filled electronically via email and the request deliverable, the request form and a copy of the email discussion, is archived for future reference, distribution to other parties involved in the issue (on request) and possible comparison should there be a question of changes to the data.

It was originally hoped this process would reduce the number of requests, but the number has actually increased: 27 requests so far, in calendar year 2010, a total of 60 in 2009, 53 in 2008, 42 in 2007 and 30 in 2006 (prior to the development of the request process). The process has resulted in an improved method of communication between requestors and the Division, as well as a reduction in concerns for data re-distributed or possibly changed by the requestor. As the request process improves, some of the return requestors are beginning to attach GIS shapefiles defining their project boundaries, which, in turn, allows us to pull the requested data by a simple spatial query, speeding up the process immensely.

## Job 2. Technical Assistance

The primary activities on Job 2 during this reporting period were:

- 1) To advise researchers concerning additional components and upgrades to desktop and laptop computers
- 2) Perform service-oriented tasks supporting the researchers' projects such as scanning aerial photography for analyses and photographs for use in presentations to public or professional groups
- 3) To assist researchers with programming needs, as in the current development of an Excel template used as a means to enter stream physical habitat data describing a sampling site recorded in the field and an accompanying program which will import those data from a tab-delimited text file created from the template to the appropriate tables in the database, similar to the existing import process for JOM survey files.

With the creation of GOIT, a three-tiered approach to the standardization of PC allocations depending on a user's level of processing needs and usage has been developed, taking the process of PC acquisition out of the hands of the user and giving it to the local IT support person. This results in savings for the state in acquisition costs, training, support and maintenance. This has resulted in a change to the first activity; we now help researchers in realizing their niche in the allocation scheme (usually in the top tier) and whether their needs mandate a notebook rather than a desktop with field data entry devices.

The changes in available data storage devices and management software - moving from a PC-based database backed up to tape systems, CD writers and DVD writers to a server-based Relational Database Management System (RDBMS) on the network that is routinely backed up, mirrored and maintained by the Wildlife Technologies staff - has improved the database's reliability. This combined with less expensive storage costs, has made the concept of archiving scanned images of hard copy reports and photographs more desirable as those documents and images become readily available as referential support to on-going projects.

Over the last five years, we have been scanning and cataloging a library of photographic film slides made during research efforts over the last 30 years in an effort to reduce storage space, retain the images and make them available for future reference and presentations. This effort has proved valuable to Division researchers and scanned images have been included in request packages from time to time. We are moving towards a capability of digitally cleaning and cropping the more requested categories of images to build a readily available library of images suitable for a variety of needs.

We continue to copy the Aquatic Research Group's variety of past annual Federal Aid Reports, Technical Reports, White Papers, Special Reports and the researcher's individual publications to the Adobe portable data format (pdf) for distribution via the Internet and to

reduce printing and shipping costs. This continues on an as-requested basis, with copies of the pdf going to the Division's librarian for archiving and future reference or distribution.

Since the standardization of operating systems and the basic office suite of programs to Windows 2000/Windows XP operating systems and the XP Office suite, the resulting "Tier 0" level of "peer support" continues to develop within the Division and the Aquatic Research Group, redefining the group's technology support needs. We will continue to adapt to the situation, providing what informal support is required.



# APPENDIX A

## CDOW Aquatic Data Request Form



## REQUEST FORM FOR COLORADO DIVISION OF WILDLIFE DATA

1. (a) Name (s) of persons requesting data:

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1. (b) Organization/Company/Agency Name (s):

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1. (c) Organization/Company Agency Contact Information:

PHONE: \_\_\_\_\_ FAX: \_\_\_\_\_ email: \_\_\_\_\_

(Email address is where electronic data files would be sent)

2. (a) We are requesting data for the following water bodies/geographic area:

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(Note that CDOW does not typically distribute point-sample locations or generate GIS maps)

2. (b) Describe the data you are requesting (fish species distributions? Water quality parameters?):

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3. Please describe your intended use for this data:

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4. You are advised of the following regarding the requested data:

(a) the data may be exempt from the Colorado Open Records Act, in which case, CDOW may deny your request (refer to CORA for exemptions)

(b) the data may be in provisional status (i.e., error check still in progress)

(c) raw data values should not be changed. If you have original or copies of data sheets or previous exports with differences in the data you receive, please call or email for possible corrections.

(d) Do not redistribute this data to parties not listed above. Other parties must submit a formal request to CDOW to insure that they receive the most updated version of the data available.

Name of CDOW Contact: Harry Vermillion  
EMAIL: [harry.vermillion@state.co.us](mailto:harry.vermillion@state.co.us)  
PHONE: 970-472-4314  
Date data sent to email address listed in 1 (c). :