

PROCEEDINGS OF THE
NATIONAL FRESHWATER
FISHERIES DATABASE SUMMIT

February 9-11, 1998
San Diego, CA

Edited by

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ACKNOWLEDGMENTS

The *National Freshwater Fisheries Database Summit* would not have been possible without the help and support of several agencies and the hard work and commitment of many individuals. The USGS-Biological Resources Division provided the core funding through their State Partnership Program. Additional funding was provided by the U.S. Fish and Wildlife Service Division of Federal Aid through the Sport Fish and Wildlife Restoration Program and the USGS National Aquatic Gap Program. The Illinois Department of Natural Resources, Wisconsin Department of Natural Resources, Wyoming Department of Fish and Game, Loftus Consulting, and the Conservation Management Institute permitted their staff to use their valuable time to serve on the project's steering committee. Members of the American Fisheries Society-Computer User Section and the Organization of Fish and Wildlife Information Managers provided important technical advice.

The USGS-BRD Environmental and Contaminants Research Center (ECRC) permitted Pam Haverland to devote significant time and resources to this effort. ECRC also provided the services of Carla Twenter, who did an outstanding job in coordinating participants' travel arrangements and being there when needed; and Linda Goetting, who assisted with registration and on-site meeting logistics.

A special thanks to Gary Reinitz, U.S. Fish and Wildlife Service-Division of Federal Aid, Mike Mac, and Tom Muir, USGS-BRD for providing necessary supplemental funds. Many thanks to Jim Martin, Oregon governor's advisor on salmon for accepting the invitation to be the keynote speaker. Henry Drewes, Minnesota Department of Natural Resources provided summit participants with an informed perspective of data access issues.

Kent Layden and Greg McClarren helped defray costs of providing professional facilitation at the summit. Rob Brooks, Larry Claggett, Al Conder, Joe Dillard, Mike Fraidenburg, and Susan Will volunteered to facilitate the breakout sessions. Steve Sobaski, Doug Johnston, and Henry Drewes agreed to help the Steering Committee provide their insights on the issues being discussed. Tom Muir accepted the challenge of giving a talk during lunch.

Lila Borge Wills, Conservation Management Institute (CMI) put together the draft summary of the pre-summit data system survey. Many thanks to all of the staff at CMI for compiling the responses to the survey and creating the web page for the summit.

The nation's fisheries chiefs strongly supported this effort and their designated representatives took the time to complete the survey and participate in the summit.

And finally, we extend a great deal of appreciation to the summit participants, whose commitment to the collection, management, and sharing of the nation's fisheries information, helped to make this forum for discussing database issues a tremendous valuable success.

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EXECUTIVE SUMMARY

In February 1998, the first-ever *National Freshwater Fisheries Database Summit* was convened. This summit brought together representatives of 47 state fisheries management agencies and several federal and private organizations in a facilitated forum to address issues regarding information management and sharing. Follow-up evaluations of this meeting reflected an overwhelming belief by state participants that this meeting significantly benefited their agency. The goals of the summit were to:

- , Promote improved databases and access to databases;
- , Improve coordination and communication between database managers;
- , Obtain input about major issues confronting database development at the state level;
- , discuss methods for enhancing collaboration and exchange of data among states and federal agencies;
- , Explore how federal agencies and states can work together to advance state fisheries information systems.

A pre-summit survey characterized the current state of information management systems within state agencies. Survey results indicated four general areas of possible improvement. Successfully addressing each area would help to achieve the aforementioned goals and were subsequently addressed in detail at the summit:

- , What would go into a "model" database structure?
- , How can states improve Internet applications for data sharing?
- , What improvements are needed in metadata standards and records?
- , How do states address information access/data security issues?

A number of actions were identified by the summit participants that would be useful in aiding the development of their fishery information systems, including:

- , Compilation of established protocols for state data collection procedures.
- , A compilation of state laws/regulations/policies governing the access to, and use of, computerized fisheries data.
- , Development of "model database" protocols used successfully by states.
- , Analysis of commonly-used variables in state aquatic species databases.
- , Periodic reconvening of state database managers similar to the 1998 summit.

Action plans for achieving these recommendations, as well as complete results of the summit, are detailed in this report.

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INTRODUCTION AND BACKGROUND

State fisheries databases have been recognized as an invaluable source of data for fisheries research and management. Since the explosion of applied computer technology in fisheries management in the past two decades, state agencies have struggled with implementing adequate, user-friendly systems to access this data. While some agencies have been fairly successful at developing systems that are matched to their needs, other agencies continue to struggle. In cases where solid fishery database programs have been developed, states have often realized tremendous rewards in their ability to manage ever-increasing stores of data, servicing public information and outreach needs, mining historical data bases for information, and applying research results to management problems. However, it is imperative that these systems are developed after careful research and analysis, and that they are constantly updated to maximize their utility while minimizing their costs. Partnering with other states in the development and implementation of database initiatives provides the opportunity for agencies to learn from the mistakes and successes of others, thereby saving valuable personnel time and fiscal resources.

In 1998, the first-ever *National Freshwater Fisheries Database Summit* (hereinafter referred to simply as “summit”) was held in which individuals representing 47 state agencies, several federal agencies and non-profit organizations convened to share experiences, expertise, and knowledge in the development of state fisheries information systems. In addition to the creation of data systems, topics impacting the sharing of information were also addressed. The goals of the summit were to:

- , Promote improved databases and access to databases;
- , Improve coordination and communication between database managers;
- , Obtain input about major issues confronting database development at the state level;
- , Discuss methods for enhancing collaboration and exchange of data among states and federal agencies;
- , Explore how federal agencies and states can work together to advance state fisheries information systems.

This report provides a synopsis of the summit events and findings.

SUMMIT STRUCTURE

The summit was divided into three distinct segments:

- 1) A pre-summit survey of participants to assess the current state of data system development and potential barriers that needed to be addressed in the summit.
- 2) An orientation phase to set the stage for breakout sessions that followed.

- 3) Breakout sessions based on priority areas identified in the pre-summit survey as posing challenges to database development and data sharing.

The pre-summit survey indicated that achieving the goals of the summit would be facilitated by exploring the following topics deemed necessary to foster greater sharing of fisheries information between agencies: Model database Structures, Fisheries Metadata, Internet Applications, and Information Access. Attendees at the conference were asked to select a group in which to participate. Each group was directed by a professional facilitator and was asked to develop a report of group activities. The following steps were used to help identify problems and answer questions related to the specific issue: describe the current situation, describe a better situation, and define measures of success. Finally each group was tasked with developing an action plan that included identification of the activities that would improve nationwide sharing of aquatic resources information

Due to the large number of participants involved in "Model Database Structure," three breakout groups were formed. Their consensus report is presented within this report.

RESULTS

PRE-SUMMIT SURVEY (APPENDIX II)

Lila Borge-Wills and Pam Haverland¹

The first step in the process of fisheries database development was to collectively assess the status of statewide database systems in all fifty states. To ensure a high return rate, completion of the survey was required for travel reimbursement to the summit.

Survey questions were developed to determine the general state of fisheries electronic data bases or information systems and particular databases or information systems that are available. In December 1997 surveys were mailed to each state representative. The Conservation Management Institute (or CMI, formerly the Fish and Wildlife Information Exchange) received the completed forms in January 1998, entered the information, compiled the results, and posted the survey information on the summit's web page.

Forty-six (92%) of the agencies contacted responded to the survey, with one agency sending in two separate surveys. Several agencies documented more than one database. In all, one hundred forty-five databases were reported by the participating agencies. The four state agencies that did not participate in the survey and are not represented in this review were Alabama, Kentucky, Mississippi, and Oregon.

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Most agencies are limited in making data available electronically--primarily by systems development. While no single agency has solved *all* of the limitations listed, when state results are viewed collectively, it is evident that most limitations have been solved by one or more agencies. This provides the opportunity to foster partnerships between states with developed database systems and those yet in their infancy to transfer lessons learned. Information collected from several different water types is available in the complete survey results found in Appendix II.

Two-thirds of the databases are information systems. Most are Windows-based. Most databases are statewide, however there are some regional and local systems. One-third are part of other systems like the *Multi-State Aquatic Resource Information System* (MARIS). Most have documentation, in particular standard coding schemes.

Complete results of the survey can be found in Appendix II.

This survey demonstrated that the nation has a wealth of fisheries information ready for exploring. Implementing the recommendations of the summit will bring us closer than ever to using it to make management decisions across state boundaries. The results of this survey provide guidance for collaboration among states and federal agencies to promote the development of national fisheries metadata standards, and foster the development of a strategic plan and implementation schedule for these activities.

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MODEL STRUCTURES FOR FRESHWATER FISHERIES DATA BASES

Steve Sobaski and Andrew Loftus¹

One of the impediments to sharing aquatic species information, whether sharing within a state or across state boundaries, is the lack of a standard database structure (Loftus and Waldon, 1992). While it is not necessary for each database to be identical in content or structure, a certain amount of overlap must occur so that information may be shared, compiled, or compared. This overlap will likely occur in the form of core variable definition. Defining core variables will not restrict individual data bases solely to this content and should allow additional data sources outside of the core variables to be incorporated as specific management and research needs dictate.

What are current barriers or challenges?

A number of barriers currently exist to developing a database structure that could be considered a "standard" for others to follow. Key among these impediments is the lack of a comprehensive survey or inventory of what types of data structures currently exist. Other impediments include:

Fragmented databases - data is often collected for specific purposes unique to each individual management or research need. Often, data needed for large scale information sharing (such as geo-referencing codes) reside in a variety of data sets and are not currently integrated with aquatic species survey data sets.

Some existing data is not geo-referenced - In order to share information, it will be necessary to accurately describe geographically where this information was collected. Many data sets within states do not incorporate much information of this type beyond the local name for the waterbody. To effectively share information will require merging collection records with geographic locator codes such as latitude/longitude, hydrologic unit, stream reach or other agreed upon geographic locator variables.

Old (outdated) programs and software - widespread computer application for fish and wildlife information storage is a relatively recent (10-15 years) advancement. Computer software and hardware continually advances, but adoption of specific software by agencies often lags considerably. Outdated software, particularly that developed prior to "Pentium" or "Windows" technology, is often limited in capability. This limitation must be overcome in order to handle bigger, more complex data management demands and information sharing programs.

Non-standard database structure - even within individual states, database structures may vary

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greatly. Although sharing information will not necessarily entail identical database structures, there must be some agreed-upon commonalities such as core variables, definitions, etc. The lack of uniformity within and between agencies may currently pose impediments to effective data exchange projects.

Institutional- In some circumstances, there is resistance from managers/researchers to changing the method that they employ for data management and storage. Within many agencies, data is managed at a district level and developing a standard database structure may meet resistance from individuals focussed on localized scales. Any standard database structure must be useful to these professionals (i.e., meet the needs for localized management) to ensure adoption.

Lack of support to implement standard database structure - in many agencies, data management, although important, is often considered a lower priority than other agency activities. Obtaining fiscal and personnel support for these activities is sometimes difficult. Further, instituting activities which may be construed as not being directly applicable to state activities is even more difficult.

Lack of agreement on database elements - before a standard database structure can be developed and implemented, agencies must agree on core database elements.

What should be done to overcome barriers?

Inventory existing database elements and format and present it to states by:

- a) Evaluating current data.
- b) Looking at case studies of model databases.
- c) Normalizing the data.
- d) Concentrating on developing an easy-to-use database with easy input.
- e) Utilizing look-up tables to the maximum extent possible. This would allow agencies to maintain unique terminology for their databases but still share information between other databases.

Draft a resolution to the *American Fisheries Society* to form a committee on standardization.

Allow the states to drive the implementation of shared data access but include the participation of all entities.

Promote standardization within the states and ensure that data management is part of each state's strategic plan.

Adopt basic principles of database logistics, such as:

- a) Databases should be in a hierarchical format.
- b) Spatial reference standards are needed to develop more accurate mechanisms for

- assigning geo-reference codes and compiling information in a hierarchical manner.
- c) Measured versus derived data should be clearly separated.
 - d) Mechanisms for quality assurance and quality control should be developed.
 - e) Terminology for standardization should include:

- , taxonomic codes
- , geographic codes
- , hydrologic codes
- , physical/habitat codes
- , units of measure
- , sampling techniques and codes
- , date/time measures
- , units of effort
- , exchange format for data

What resources do we need to make this happen?

Identify groups/individuals to accomplish tasks - although there is support and momentum to begin developing consistency in data base design, this will not occur unless groups and individuals within groups are charged with leading these initiatives.

Develop communication networks - A key component to developing shared electronic information is to develop a system for communicating information between appropriate staff within agencies. Network systems for sharing information about development such as web sites, list servers, chat rooms, and periodic conferences such as the *National Freshwater Fisheries Database Summit* need to be developed.

Communicate needs to agency directors - information management needs must be communicated in a non-technical format by conveying information in the context of policy implications.

Produce a demo system to showcase to agencies - it is oftentimes easier to convey a product than a concept. Developing a model database system which agencies can easily critique and copy would greatly facilitate the adoption of similar databases among different agencies. Products such as the *MARIS* system can be helpful to demonstrate the value of multi-state data sharing.

Adopt systems in adjacent states rather than reinventing the wheel - state agencies should begin to look to their neighboring jurisdictions or other jurisdictions with similar resources/needs as avenues for capturing previously conducted research and development into data base structures.

Add metadata to existing (historical) information - one of the most important aspects to utilizing any information is to understand under what circumstances the information was collected and other facets which may influence the data interpretation. Metadata (or descriptions about data collection and manipulation) should be added to historical information. Standards and guidelines for such metadata (as discussed in another section of this report) would facilitate this.

What administrative/management changes do we need to make this happen?

Demonstrate application to management and issues such as license sales. Improved data management and information sharing has positive implications for management. However, the benefits are not always clearly evident to administrators and to managers. A concise and clear way of demonstrating those links would help to garner necessary support for these programs.

Develop funding and agency commitment. Improved data management and data sharing will not occur without adequate administrative support, agency commitment, funding, and personnel. These features must be developed within all agencies.

Encourage agencies to prioritize data management once the data is collected. Often, data is collected without carefully planning how it will be managed once it is in-hand. However, with the amount of data collected by agencies for a wide variety of purposes, data management can quickly become overwhelming. Agencies must make data management a priority before the data is even collected.

Continuity and long-term planning from agencies. Data management and information sharing programs cannot operate effectively with intermittent support or direction that changes frequently. Agencies need to provide consistent direction for these programs so that long-term and stable information management programs can be developed.

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INTERNET APPLICATIONS TO DATA SHARING

Doug Johnston¹

Introduction

The rapid development of the Internet and more specifically the World Wide Web (WWW) has revolutionized the way people and institutions receive and pass information. Real time access to a wide range of services and information is rapidly becoming a normal expectation of the public.

Unfortunately many states' resources management agencies have not been able to keep up with either the technological advances of the WWW or provide general access to information. Future success of natural resource agencies' management systems and plans will be dependent on public acceptance and agreement with strategies. Providing information through easy to use WWW interfaces is one mechanism to develop support for management systems.

The usability and technology of the Internet and WWW change on a daily basis. Traditional natural resource management agencies, with heavy emphasis on data collection and monitoring, have struggled to stay current on the rapidly changing Internet. Further, many natural resources management agencies just began development of automated data systems and databases in the late 1980's. While natural resources agencies struggle to maintain existing data systems and writing new systems for old data, they continue to fall behind in the struggle to provide relevant information in a timely fashion.

It is clear that for state natural resources agencies to be successful in using the WWW as a communication tool, some economies of scale must occur. The beauty of the WWW is its ability to provide one common interface to a variety of information sources and systems. *The Multistate Aquatic Resources Information System* (MARIS; Beard et al. 1998) is one example of multiple state, federal and non-governmental agencies pooling resources and information through a single interface. The result is access to broad temporal and spatial data, not achieved previously through stand-alone systems. This type of system will allow better management of the region's aquatic resources and will also provide information on a real time basis to the customers who support management programs.

The purpose of this breakout group was to identify barriers, hurdles, problem and opportunities of using the Internet, more specifically the WWW, to provide access to information on the nation's aquatic resources. Our goal was to identify steps that state and other natural resources agencies could use to develop and maintain their own WWW data access systems. Certainly, the future suggests that once individual systems are developed, integrating these individual systems into a national aquatic resources management interface could occur.

The results of the group activities are summarized in bullet statements captured as part of a discussion around a certain topic.

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What are current barriers or challenges?

- Variety of user types and levels of access require different systems
- Workloads and time - Internet can save time
- Internet access speed and performance
- Technology, how to keep up, continuity, maturity and client compatibility
- How do we stay current with information on the Internet
- Integration of datasets
- No training to implement
- What kind of software is necessary
- Control vs. an Open access system
- Control access by making referrals
- Centralized system necessary at current time

What describes a better situation or what should be done to overcome barriers?

- Any question answered anytime, anywhere
- Dedicated funds and support
- Adequately trained personnel and support
- Standardized format or structure for data and software (MARIS trying to do)
- Standardized national access with geographical locators
- Plug and play software
- Cross links to other databases

Measure of Success-What do we need to accomplish?

- Everybody's data is online and accessible
- Reduce workloads by a measurable degree
- Constituents satisfied; can get access; response in certain time
- Must insure universal access
- Improve management of resource; efficacy of planning
- Ecosystem Management Implementation
- Being in a proactive state as managers and public

Action Plan: How Do We Get This Done?

In order to produce a better "state" as identified by our measures of success, activities were identified with appropriate implementation procedures. These activities were based on business computer systems plan (Figure 1).

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Figure 1. Activities and implementation steps to improve Internet applications to data sharing.

<u>Activity</u>	<u>What</u>	<u>Where</u>	<u>Who</u>	<u>When</u>
1. Determine user needs	a. State surveys b. Existing surveys c. Public survey	National National Web Page	States, AFS, Web Master	3 months to 1 year
2. Evaluate computer universe	a. List & explore websites b. List contacts	Summit homepage	computer groups CMI	6 - 9 months
3. Needs & benefits	a. Benefit analysis b. Funding rational c. Partnerships	State Regional National	This group	Annual review 3-5 years
4. Administration and money	a. Demo existing systems b. Prototypes c. Dev. plan & budget	Agencies States National	This group Tech Leader Approp. person	Long Term
5. Technology & Training	a. statewide linked network b. all "stuff" c. centralized website	statewide	data coordinator	Follow 1-4 or budget approval
6. Implement	a. National clearinghouse for all aquatic resource info.	WWW	data coordinator everyone's system	Following above
7. Breaking In	a. Feedback b. Evaluate relevancy to mission	every website; Summit website	users Webmaster	Ongoing - augment data periodically- annually

METADATA
Jeff Waldon¹

Why Do We Need Metadata?

A vast amount of applicable and useful fisheries data exists for fisheries management in the United States. The bulk of this information resides with state fisheries agencies that have sampled fish populations for many decades. A large part of this information is unavailable for use by managers because: 1) potential users don't know it exists; or, 2) potential users know it exists but have no way to evaluate its usefulness. Other problems, like incompatible data format, restrictive data sharing policies, time constraints, etc. are also important, but given enough time and resources, these can almost always be overcome. If users don't know about available datasets or can't figure out how to integrate and evaluate the data into their work, no amount of time and money will help bring that data to the decision making process.

Metadata simply describes aspects of the data or data collection. When metadata is developed, two things happen that increase the probability that data will be shared. The first is that the metadata can be displayed in such a way that potential users can find out about the data, evaluate it for their needs, and, if appropriate, request the data. If users don't know about a dataset, they seldom ask for it. The second thing that happens is that potential users have some idea about constraints to use of the data. Many data managers are very concerned about releasing data to potential users because of the fear that those users will misapply or misanalyze the data by not taking into account quirks and shortfalls known to the data manager, but unknown to the user. The solution is not to withhold the data, but rather to develop adequate metadata to avoid such problems. This is in the best interest of the potential user because they can avoid inappropriate uses of the data, and in the best interests of the data provider because inappropriate uses of the data that are intentional or result from inept users can be documented up front and any liability to the data provider avoided.

Datasets Have Value

Agencies and organizations invest heavily in data gathering. Presumably the product of this investment has immediate value, but it also has secondary value both internally to the organization and externally to other users. Sometimes the secondary value is many times greater than the primary value that prompted collection of the data. For example, a fish survey performed in year 1 has primary value for fisheries management purposes to set creel limits. That same survey data might have value for environmental review when a road crossing is proposed for the stream, a study on the effects of water quality on the biota of streams in the region, a planning effort to prioritize watersheds for various management actions like stream buffer cost-sharing, a public education program for school children in the area, etc. The value of the data continues for many years for these secondary uses even though the value for the primary

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use ends in year 1. These secondary uses of information are severely hampered, if not prevented, when the data is poorly managed and poorly documented.

Fisheries agencies are public servants and as public servants they have a responsibility to manage the public's investments wisely. An analogy to boat purchases is instructive. If a fisheries agency purchases \$100,000 of boats for use by the agency, a significant amount of effort would be expended to: a) maximize the efficient use of the boats (five new boats sitting behind headquarters for 10 years would be a scandal); b) document the location, condition, and usefulness of each boat; c) make sure that anybody using the boats would be fully trained and understand the boats capabilities and shortfalls; and, d) maintain the boats so that they would be maximally useful over their expected lifespan. Experience tells us that those same agencies will spend \$100,000 on data collection, not analyze the data for many years if at all, avoid the cost of data entry, neglect to document the data, and in many cases store it in such a way that it is unavailable for even the primary use to which it was originally intended. Secondary uses are typically not supported. Certainly there are many exceptions to this scenario, but all too often, fisheries agencies do not receive even a modest return on their investment in data collection.

Why Use a Standard?

Although documentation of datasets (metadata development) is often cited as a requirement for proper management of the data, it is seldom done in a formal way. Standards for documentation are just now being proposed (FGDC 1998). Standards are critical to allow potential users to compare and evaluate datasets for uses not foreseen by the developer of the dataset. Standardized metadata also facilitates the implementation of metadata clearinghouses such as the one hosted by the US Geological Survey, Biological Resources Division (http://www.emtc.usgs.gov/http_data/meta_isite/nbiigateway.html). Standards also make possible the automation of metadata development through software such as Metamaker (USGS 1998).

Definition

The definition of metadata adopted by the Metadata Working Group of the *National Freshwater Fisheries Database Summit* is outlined below. Much of this was modified from the "Draft Content Standard for National Biological Information Infrastructure Metadata, NBS, December, 1995":

The *objectives* of the metadata are to provide a common set of terminology and definitions for the documentation of fisheries biological and digital geospatial data. The definition establishes the names of data elements and compound elements (groups of data elements) to be used for these purposes, the definitions of these compound elements and data elements, and information about the values that are to be provided for the data elements.

The major *uses* of metadata are:

- 1) To maintain an organization's internal investment in fisheries biological and geospatial data
- 2) To provide information about an organization's data holdings to data catalogues, clearinghouses, and brokerages, and
- 3) To provide information needed to process and interpret data to be received through a transfer from an external source.

The Role of Metadata

The information included in the metadata definition was selected based on four roles that metadata play:

- 1) Availability - data needed to determine the sets of data that exist for a geographic location or on a particular subject.
- 2) Fitness for use - data needed to determine if a set of data meets a specific need.
- 3) Access - data needed to acquire an identified set of data.
- 4) Transfer - data needed to process and use a set of data.

These roles form a continuum in which a user cascades through a pyramid of choices to determine what data are available, to evaluate the fitness of the data for use, to access the data, and to transfer and process the data. The exact order in which data elements are evaluated, and the relative importance of data elements, will not be the same for all users.

Desired Future Condition

1. All data sets are described using a standard format of nomenclature.
2. A central clearinghouse is created containing all available metadata .

Action Plan

- 1) Research and adopt a standard set of metadata fields and nomenclature for nationwide use. This should promote data sharing, dataset indexing, and the development of automated tools for metadata development.

Who: The Steering Committee of the *National Freshwater Fisheries Database Summit* approaches the *American Fisheries Society* regarding AFS development of the standard.

When: As soon as possible.

What: Fisheries Guide to Metadata and Nomenclature: a document available through the American Fisheries Society web site.

Why: Compatibility and comparability of metadata between fisheries data producers.

Evaluation: Standard metadata protocol adopted and available.

- 2) Publicize and endorse the standard set by the *American Fisheries Society* to encourage the state fisheries agencies to implement the standard (internal buy-in by administrators and division directors).

Who: AFS and other agencies and organizations should promote the new standard to data holders.

When: After Step #1, Ongoing.

What: Publicize and endorse metadata standard.

Why: To gain funding for implementation and acceptance by internal and external persons.

Evaluation: Acceptance and use of standard to describe fisheries data.

- 3) Implement and Maintain metadata in clearinghouse

Who: Fisheries data users and producers.

When: After steps #1 and #2

What: Creating a metadata clearinghouse or adopting an existing clearinghouse; training data developers and users to access the clearinghouse; significant use of the clearinghouse by both producers and users of the fisheries data.

Why: To realize the benefits of (particularly standardized) metadata as described above.

Evaluation: Data available and easily accessible in the clearinghouse. The "quality" of the feedback from the end-users.

Conclusion

Metadata is a key component of data sharing, data use, and professional information management in general. Data is a valuable asset for fisheries management agencies that should be treated as such.

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DATA ACCESS (DATA SECURITY)

Henry Drewes and Andrew Loftus¹

Data access (also termed data security) involves the institutional, legal, and professional issues that arise when making data available to large audiences. Some data (such as that for threatened and endangered species) may be considered “sensitive” if release of that data would result in harm to the species or habitat. Or, cumulative collections of data comparing populations in various waterways could inadvertently direct harvest pressure to areas of high potential and actually harm those stocks or species. It is generally recognized that agencies have an obligation to make information available to constituents and the taxpaying public. However, there are certain legal and professional obligations that must be considered when allowing public access to data that is collected with public funds.

Current Condition

Access and use issues are changing rapidly with technology. The rapid pace of technology allowing for transfer of large volumes of data has changed the way that we handle data. Fifteen to twenty years ago, paper copies of reports were the predominate method of transferring the results of aquatic species research. Today’s technologies allow immediate access to volumes of data that in the past would have taken months or years to transfer and synthesize on paper.

We have little formal training in dealing with these issues. Due in part to the rapid pace of technology development, agencies have not been prepared to confront the issues that emerge with the ability for the large transfers of data. Institutional and legal policies regarding the level of data release and the timing have often been developed only in response to an issue. Management personnel generally have not had the training to address these issues in a proactive manner.

Legal “rights” surrounding access are not clear to us (at state and federal level). Federal agencies are guided by federal “freedom of information” laws and each state also must abide by similar state regulations. However, when such laws apparently conflict with other laws (e.g., those governing the responsibility of the agency to protect and manage species), how should agencies respond? Further, what are state agency obligations regarding the release of information that is collected through federally-funded programs? Many of these and other issues must be clarified for agencies to progress with large-scale data management programs.

Data are being missed at times. State data collections consist of large volumes of data collected by numerous different individuals and programs. Often, once the data is used for the specific purpose for which it is collected, it is archived, shelved, or filed away. This data may have utility

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far beyond its originally intended purpose, but without a system that catalogs, records, and makes archived information available to all users, it can easily be overlooked when managers and researchers are preparing new studies.

Data exposure unwittingly reveals data shortcomings. One of the values of large scale information compilation and sharing programs is to help identify where data gaps exist so that such gaps can be addressed in future sampling programs. However, this same feature can inadvertently increase an agencies vulnerability to challenges to their management plans and programs.

Desired Future Condition (Better Situation)

Better state/federal coordination across issues. State and federal resource programs are inextricably intertwined. State programs are often funded through federal grant programs. Federal agencies collect and manage data within all state boundaries. Solutions to the issues regarding data access need to be addressed in this context. Federal-state coordination on the issues will help to moderate potential conflicts in policies and guidelines that could evolve if the issues were addressed outside of the state/federal context.

Clear, common policies for information and data access, both internal and external policies. Although not every issue can be anticipated, in all likelihood the state and federal agencies collectively have faced a reasonably comprehensive range of data access issues that can be expected. Working together, the agencies need to develop clear and understandable guidelines for resource managers to follow. These policies should address both internal (agency) sharing of information and sharing of data outside of agencies.

Reasonable access to agency data and information. A large part of every agency's mission involves servicing the public's need for information. Therefore, policies that are developed should be oriented toward fulfilling this mission to the maximum extent practicable, without jeopardizing the health of the resources or the agency's ability to manage the resources for the public benefit.

Users of shared data would follow some standards for access and use. An agency's policies on information access are undermined if those entities with which they share information do not maintain the same, or stricter, policies. Therefore, mechanisms should be put in place to protect the integrity of the originating agency's policies in order to foster a greater level and comfort with data exchange programs.

Educated clients who understand our need to protect certain data and our limited financial resources. While it is generally the desire of most agencies to allow unhindered access to information, by necessity some information must be protected. Constituents and clients of this information need to support the necessary levels of protection. A key component of any data access policy is an education program to foster the understanding and support of these policies by the public and other agencies.

Measures of Success

We will know that we have developed sound data access policies when:

- *There is no misuse of shared data.*
- *When a reliable index of data availability restrictions is available to clients.*
- *When we have defined access standards and clients know and understand them.*
- *When those who need access to make management or political decisions for the good of the public have that access.*
- *When field staff respond consistently to similar kinds info/access requests.*

Action Plan

In order to attain the desired conditions listed above, the following steps should be taken:

Action on all fronts needs to be taken. This includes federal and state, internal and external policies, and differentiating the different levels of data uses.

A coordinating body needs to be formed/designated. Action generally won't be taken unless somebody is charged with the lead. A coordinating body encompassing those that collect and manage data, legal experts, and users of the data should be formed and charged with initiating a program to develop guidelines for data access policies.

Need to enhance understanding of current legal situation/rights for states. As mentioned previously, the legal obligations for making data available are not clearly understood. The complexities created by the interactions of federal and state laws further increase the uncertainty for states in developing such policies. A team of legal experts should be engaged to help sort out the various legal obligations currently in place.

Conduct a nationwide survey of current legal obligations of states. Some states have already grappled with the issues related to data access and have developed solutions approved by their legal counsel. Other states can learn from these experiences and emulate those portions that are most applicable to them. A survey of states should be conducted to assemble the various guidelines in place that can be used to set the stage for recommended policies for all agencies to consider.

Summit participants provide samples of how states currently regulate the dissemination of data. The 47 state agencies (and many federal agencies) already assembled at this summit provide a

basis for outlining existing data access policies. The summit participants could provide the initial level of information required in a more comprehensive survey.

Create “user request” database. Since data access has not been addressed in a coordinated manner among agencies, it is unclear what information (and what level of information) is readily available from the states. A database that outlines the data availability and data access policies would greatly facilitate interstate information exchange programs in the future.

Clarify role of the agencies in access - determine participants in each state’s information chain. Information management consists of many component parts: collection, synthesis, compilation, management, dissemination, etc. Comprehensive data access policies must recognize this chain of information and adequately clarify each level’s responsibilities and obligations under the policies. The same must be done at the agency level for inter-agency data exchange programs.

Summary

Data access policies are an integral part of any information management or exchange program. The rapid pace of technological expansion in the data management arena has outpaced agencies’ abilities to develop adequate institutional policies. In some instances, the obligation to provide broad access to data conflicts with an agency’s obligation to protect and manage the resources for the public good. Further complicating the development of such policies are the interaction between state and federal resource and funding programs that bring with it increasing numbers of laws regarding information access. To promote the expansion of sound information exchange programs, agencies must work collectively to develop policies in a proactive manner rather than reacting as situations arise.

* * * *

SUMMIT CONCLUSION

The *National Freshwater Fisheries Database Summit* was a unique event to address challenges regarding information management and sharing that had never been addressed in quite the same manner. The level of enthusiasm expressed at the conclusion of the summit indicates that participants are willing to work collectively in developing and implementing solutions that they developed here.

Follow-up evaluations of this summit reflected that state participants overwhelmingly hailed this meeting as significantly benefiting their agency. A number of actions were identified by the participants that would be useful in aiding the development of their fishery information systems, including:

- Compilation of established protocols for state data collection procedures.
- A compilation of state laws/regulations/policies governing the access to, and use of, computerized fisheries data.
- Development of "model database" protocols used successfully by states.
- Analysis of commonly used variables in state aquatic species databases.
- Periodic reconvening of state database managers similar to the 1998 Summit.

These recommendations provide solid guidance for state and federal agencies as they work toward greater compatibility and interagency data exchange programs in the future.

* * * *

**APPENDIX I
SUMMIT AGENDA**

**NATIONAL FRESHWATER FISHERIES DATABASE SUMMIT
February 9-11, 1998
San Diego, CA**

MONDAY, FEBRUARY 9

10:00 am

Welcome

Doug Austen, Illinois Department of
Natural Resources

Review of Survey Results

Pam Haverland, USGS Biological
Resources Division

Keynote: Importance of Data Management
To Fisheries Policy Makers

Jim Martin, Oregon governor's
advisor on salmon

Model Database Structures

Steve Sobaski, Illinois Department of
Natural Resources;
Andrew Loftus, Multi-State Aquatic
Resources Information System

The Importance of Metadata

Jeff Waldon, Conservation
Management Institute

Noon

Lunchtime Keynote: The USGS-BRD
Aquatic Gap Program

Tom Muir, USGS-BRD

Internet Applications to Data Sharing

Doug Johnston, University of
Illinois/NCSA;
Doug Beard, Wisconsin Department
of Natural Resources

Information Access/Data Security

Henry Drewes, Minnesota
Department of Natural Resources

2:15 pm Breakout Sessions

4:30 pm Reconvene for large group wrap-up

5:30 pm Adjourn

6:00 – 10:00 Information Systems Demonstrations and Social

SUMMIT AGENDA
(Day 2-3)

TUESDAY, FEBRUARY 10

8:30 am – Noon Issues Teams Meet

Noon – 1:30 Lunch

1:30 – 4:30 Issues Teams Meet and Wrap-Up

WEDNESDAY, FEBRUARY 11

8:30 am – 10:00 am Report of the Issues Teams

10:30 am – noon Closing Session and adjournment

THURSDAY, FEBRUARY 12

All Day National Aquatic Gap Program Workshop

APPENDIX II

National Freshwater Fisheries Database Summit

Survey Report

February 1998

Background

The first step in the process of fisheries database development was to collectively assess the status of statewide database systems in all 50 states. The results will provide the vehicle for collaboration among states and federal agencies, development of national fisheries metadata standards, and to develop a strategic plan and implementation schedule for these activities. To ensure a high return rate, completion of the survey was required for travel reimbursement to the Summit.

Methods and Time Table

Survey questions were developed to determine the general state of a fisheries electronic data bases or information systems and particular data bases or information systems that are available. The results of the survey were to be available at the Summit. In December 1997, surveys were mailed to each state representative. The Conservation Management Institute (or CMI, formerly the Fish and Wildlife Information Exchange) received the completed forms in January 1998, entered the information, compiled the results, and made the survey information available on the summit's web page. Lila Borge Wills, FWIE, compiled the bulk of the survey report.

Response Rate and Survey Results

Fisheries database surveys were sent to 50 state agencies. The state representative was responsible for completing a survey that included information on each of their fisheries database systems. Forty-six (92%) of the agencies contacted responded to the survey, with one agency sending in two separate surveys. As of February 3, 1998, 47 surveys were completed and sent to CMI to be entered into a database. Several agencies documented more than one database. One hundred forty five databases were reported by the participating agencies. The four state agencies that did not participate in the survey and are not represented in the review are: Alabama, Kentucky, Mississippi, and Oregon.

The following information is a summary of the information provided by the state representatives or data base contact.

Survey Questions & Responses

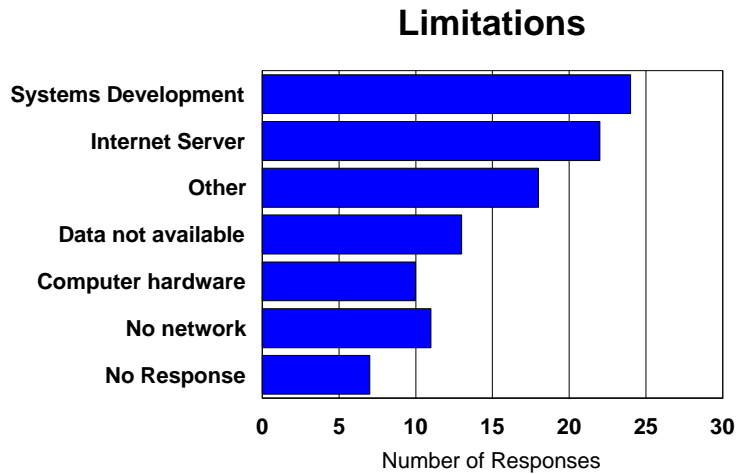
The first section of the survey was used to gain information on the person completing the survey, the electronic limitations, the availability of the data, and the type of fisheries information available. This part of the survey was completed by 46 agencies.

Part I. Introduction.

(Complete this section even if you do not have a data system and complete it only once).

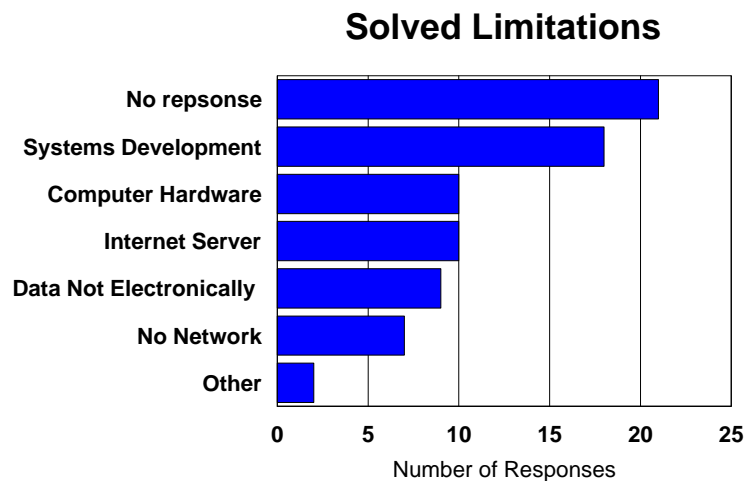
Contact (person filling out the survey), **Agency, Address, Phone Number, Fax Number, and E-mail address.** A list of the contacts is at the end of this section.

Limitations to state making data available electronically (check more than one):



Many respondents chose more than one current limitation type. Systems Development and Internet Server were the most popular limitations reported (24 and 22 responses respectively). Other (18 responses), Data not electronically available (13 responses), No network among local machines (11 responses), and Computer Hardware (10 responses) were also limitations reported. No agencies had all the limitations listed.

Solved Limitations to Electronic Data Availability? These were limitations that the Agency is currently working on.



Many respondents chose more than one limitation type that has been solved or they are currently

working on solving it. Systems Development (18 responses) was the most popular choice. Computer Hardware and Internet Server (both 10 responses), Data not electronically available (9 responses), and No network among local machines (7 responses), were also limitations reported being solved. Twenty-one did not have any "solved limitations" (did not respond). No state had solved all the limitations.

Availability of Freshwater Fisheries Data (check the correct following statement)

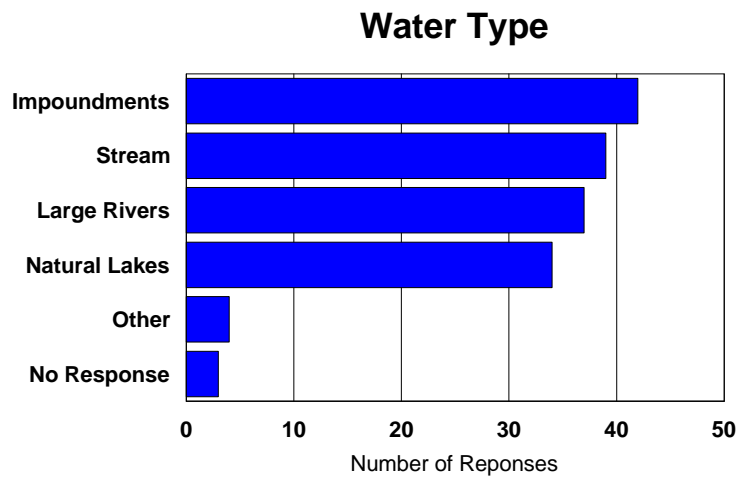
Our state **does not** have its freshwater fisheries data in electronic form, i.e. on a computer for staff to access and use.

4 Responses checked this and did not complete rest of survey.

Our state **does** have electronic data systems.

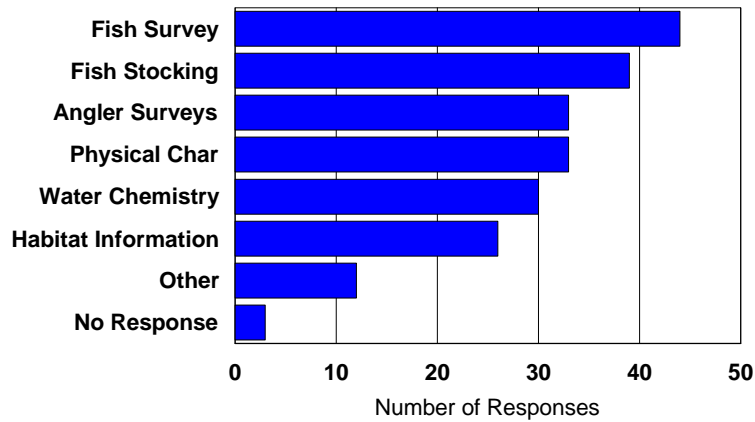
42 Responses checked this and completed the rest of the survey.

Type of fisheries information available from your State: Water & Fisheries Information



Many respondents chose more than one water type. Impoundments (42 responses), Streams (39 responses), Large Rivers (37 responses), and Natural Lakes (34 responses) were the most popular choices. Other (4 responses) was also used for their answer. Only 3 agencies did not answer this question. When Other was chosen, their answers included tidal/brackish waters, mid-size rivers, and Lake Erie. Thirty-five responded streams and impoundments and 29 checked all four water types.

Fisheries Information



Many respondents chose more than one fisheries information type. Fish Surveys (44 responses), Fish Stocking (39 responses), Angler Surveys (33 responses), and Physical Characteristics (33 responses) were the most popular choices. Water Chemistry (30 responses), Habitat Information (26 responses), and Other (12 responses) were also chosen. Only 3 agencies did not answer this question. When Other was chosen, their answers included stream surveys, public access, gear types, habitat information, etc.

Individual Database Information

There was not a limit on the number of databases or information systems a state representative could submit. A total of 145 fisheries databases were included in this section. "No Response" indicates that there was not an answer to that question for that particular database or information system.

The database information component was completed for each individual database. This component of the survey consists of four separate sections:

- < information on the system/database;
- < information on the contact person for the database;
- < documentation available; and
- < specific data and summaries in the fishery survey system.

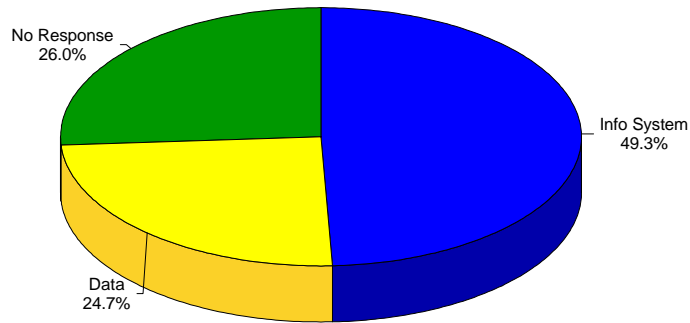
Section 1.

Section 1 consists of information on the agency's databases. It includes the name of the database, if it is an information system or just data, the operating system, type of software, the minimum hardware requirements, interface, spatial domain, temporal domain, accessibility, security, data contributions, and limitations to sharing the data system.

Name of System/Database and information regarding the system. A list of systems is at the end of the summary.

Is your database an Information System or Just Data?

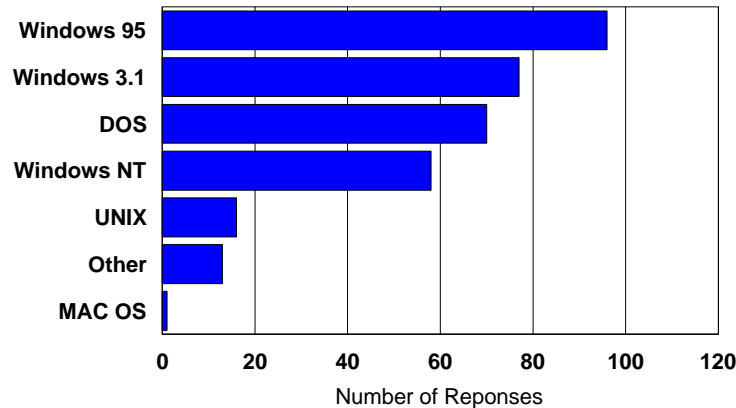
Information System or Data



Of the 145 databases, 72 chose Information System and 36 chose Just Data. Thirty-eight did not answer the question.

Operating System

Operating System



Many respondents chose more than one operating system. The most popular choices were Windows 95 (96 responses), Windows 3.1 (77 responses), DOS (70 responses), and Windows NT (58 responses) were the most popular choices. Unix and MAC OS (16 and 1 responses respectively) were also chosen. Other systems (13 responses) included CTOS, and OS/2. One hundred twenty one of the systems use a Windows environment (3.1, 95, NT).

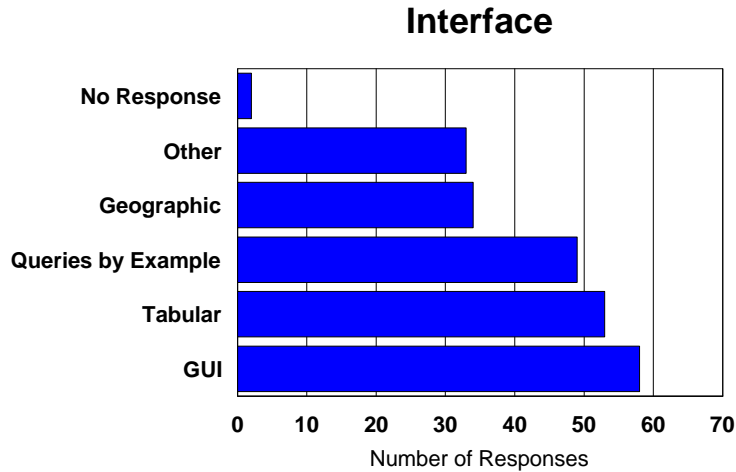
Software

Respondents listed several types of software with the most common being Access, Paradox, and Visual dBase. There were 13 "no response" answers to this question.

Minimum Hardware Requirements

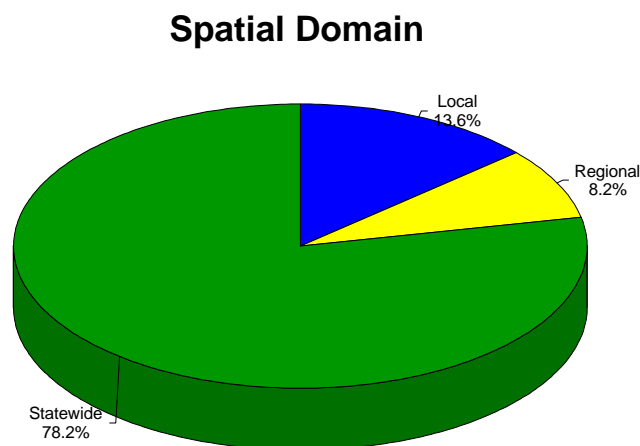
Numerous responses including 286, 386, 486, Pentium, and Data General System.

Interface



Many respondents chose more than one interface. Graphic User Interface and Tabular (58 and 53 responses respectively) were the most popular choices. Queries-by-example (49 responses), and Geographic (34 responses) were also chosen. Other (33 responses) interfaces reported included text documents and prepared SAS programs. Two people did not respond to this question.

Spatial Domain



The most common response for spatial domain was statewide with 115 responses. Local had 20 responses and region-wide had 12 responses. There was only 1 "no response" to this question.

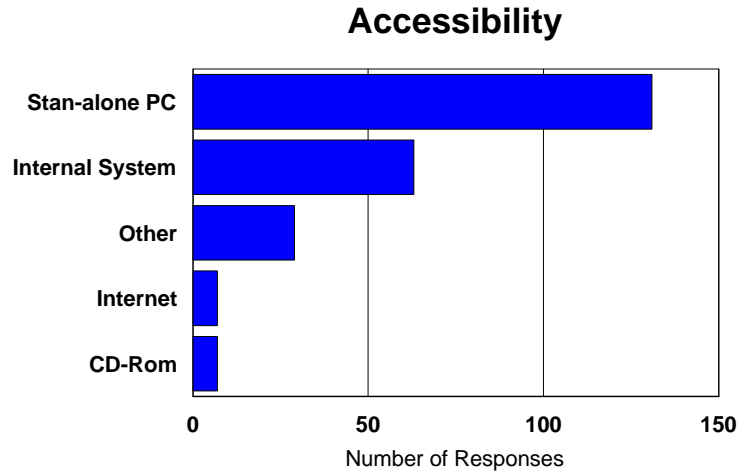
Temporal Domain

Document the earliest year and latest year of your data sets or information systems.

Earliest years ranged from 1900 to 1962. Twenty-three did not answer the question.

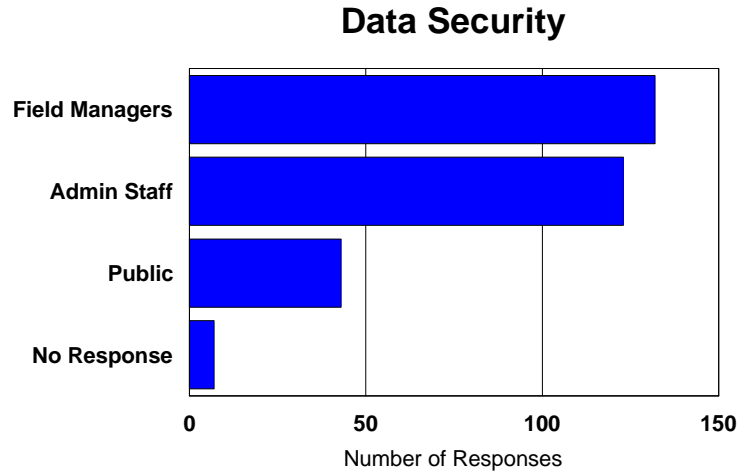
Latest years ranged from 1964 to present. Seventeen did not answer the question.

Accessibility (How is the information accessed?)



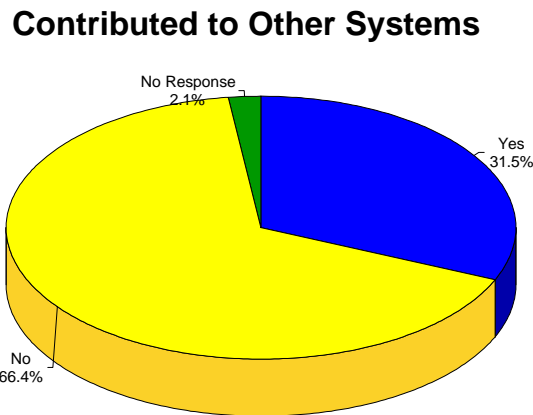
Many respondents reported more than one way of accessing information. The most common way reported was a Stand-alone PC System with 131 responses. Other ways included Internal Dept. System (63 responses), Other (29 responses), Internet (7 responses), and CD-Rom (7 responses). When Other was chosen, the answers included Mainframe, Network, and LAN/WAN Systems.

Security: To Whom are the Data and Programs Available?



Many respondents chose more than one group to which data and programs in a system are available. Field managers (132 responses) were the most popular choice. Administrative Staff had 123 responses and Public had 43 responses. Other comments about security included; protected password, public access, for fee to public, and user-list defined. There were 7 “no response” to this question. Thirty-one checked all three groups and 72 chose Administrative and Field.

Is this Data Contributed to Another Data System? (yes or no)

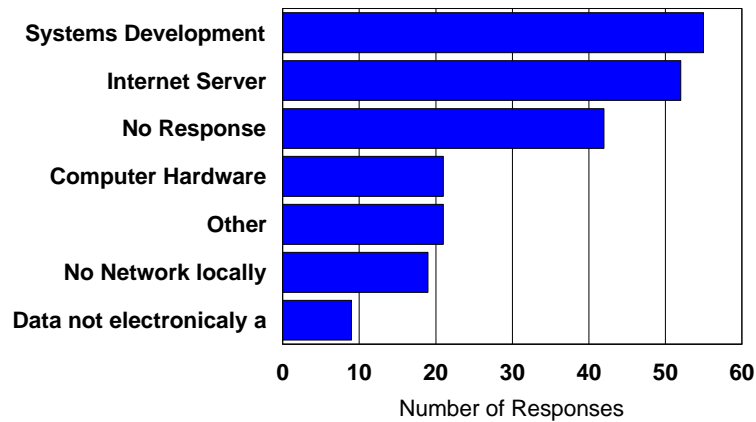


This question received the following responses: 46 Yes, 97 No, and 3 “no response”.

If “yes” was marked, a variety of answers were provided ranging from mismanagement information system, MARIS, Fish Monitoring File, to archived in the state database.

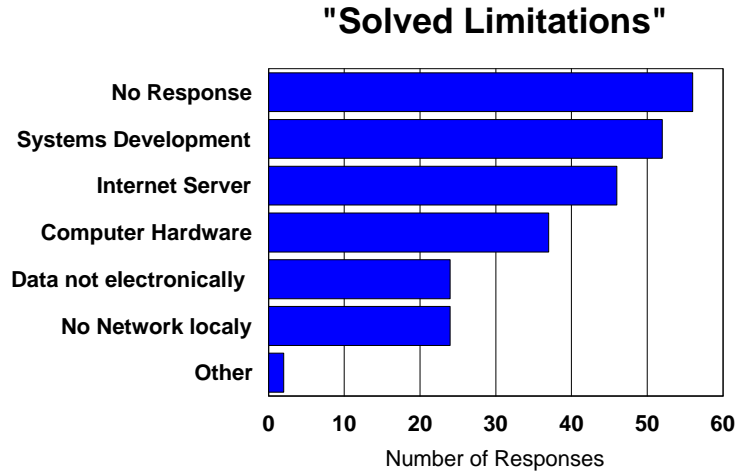
Current Limitations to Sharing this Data System

Current Limitations to Sharing this Data



Many respondents chose more than one current limitation type. Systems Development and Internet Server were the most popular limitations reported (55 and 52 responses respectively). No Response (42 responses), Other (21 responses), Computer Hardware (21 responses), No network among local machines (19 responses), and Data not electronically available (9 responses) were also chosen. Other responses included limited time, resources and staff, and concern about liability issues.

Limitations to Sharing this Data System - in the process of solving these limitations:



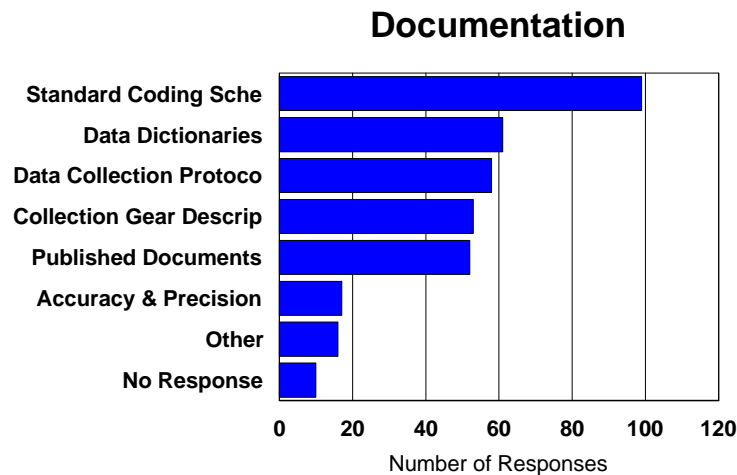
Many respondents chose more than one limitation type that is solved or being worked on. Systems Development (52 responses), Internet Server (46 responses respectively), Computer Hardware (37 responses), Data not electronically available (24 responses), No network among local machines (24 responses), and Other (2 responses) were also limitations reported being solved. No response was 56. No state has solved all the limitations.

Section 2.

Contact Person (person to be contacted regarding each database), it includes the name, agency, address, phone number, fax number, and E-mail address of the contact person for the particular database--this may not be the same as the general contact listed at the beginning of the survey. Check the survey sheet on the web site for this contact person.

Section 3.

What Documentation is available for your database?



Many respondents chose more than one documentation type. Standard Coding Scheme was the most common choice (95 responses). Data Dictionaries (58 responses), Data Collection Protocols (56 responses), Collection Gear Descriptions (52 responses), Published Documents (49 responses), Accuracy and Precision Measures (16 responses), and Other (16 responses) were also reported. Other responses included on-line help and Annual Federal Aid Reports. Ten “no responses” were recorded.

Section 4.

Specific Data and Summaries in the Fishery Survey Systems -- General fish survey information. Blank rows were provided on the survey form for additional information.

Fish Survey Data - Listed are the categories provides then all other responses.

#	Type of Data	Standardized			
			1	Target Species	Yes
70	Number Captured	Yes	1	Success	Yes
4	Number Captured	No	1	Success	No
10	Number Captured		2	Stocking Reports	Yes
72	Length	Yes	1	Sterility	Yes
7	Length	No	1	State Reach Number	Yes
10	Length		1	Standardized report	Yes
59	Weight	Yes	1	Spawning Habitat	No
8	Weight	No	1	Socio-economic	Yes
11	Weight		25	Size at Age	Yes
34	Age Structures	Yes	12	Size at Age	No
14	Age Structures	No	1	Satisfaction Index	Yes
5	Age Structures		2	Sampling Location	Yes
28	Gender	Yes	2	Sampling Dates	Yes
13	Gender	No	1	Sampling Gear	Yes
4	Gender		1	Sample site parameters	
80	Species	Yes	1	Resource value	Yes
5	Species	No	1	PSD Estimates	Yes
13	Species		25	Population Estimate	Yes
35	Marked (tagged/clipped)	Yes	13	Population Estimate	No
8	Marked (tagged/clipped)	No	6	Population Estimate	
7	Marked (tagged/clipped)		3	Permit	Yes
1	Wr, PSP	Yes	2	Pathology	Yes
32	Weight Indices	Yes	1	P-chem Parameters	Yes
8	Weight Indices	No	2	Ownership	Yes
1	Weight Indices		1	Other	Yes
1	Water body	Yes	1	Other Creel Data	Yes
1	Type record	Yes	1	Opening Day Catch Est	Yes
1	Trout/Pike/Salmon/Tiger Stocking Re		1	Number Boats	Yes
1	Time Fished	Yes			

#	Type of Data	Standardized			
1	Number of fish	Yes	5	Effort	Yes
1	Number Released	Yes	1	Effort	No
1	Number Anglers	Yes	1	Effort	
1	Miles	Yes	1	Economic value	Yes
1	Method	Yes	1	Disease	Yes
2	Maturity	Yes	1	Directed Effort	Yes
1	Man-hours	Yes	2	Date	Yes
1	Locations	Yes	1	Collector	Yes
2	Location	Yes	1	Chemicals	Yes
37	Length Indices	Yes	51	Catch/unit effort	Yes
9	Length Indices	No	5	Catch/unit effort	No
3	Length Indices		6	Catch/unit effort	
1	Lat/Lon	Yes	1	Biomass	No
1	Lake/Stream Codes		44	Average Size	Yes
1	Invertebrate Identification	Yes	7	Average Size	No
			5	Average Size	
1	Identification	Yes	1	Available prey/predator	Yes
1	IBI score		1	APP	No
1	IBI metric		1	Annular Measurements	Yes
1	IBI description				
1	Hauling volume	Yes			
3	Harvest	Yes			
1	Harvest	No			
1	Harvest				
18	Growth Parameters	Yes			
1	Growth projections	Yes			
12	Growth Parameters	No			
1	Gear Type	Yes			
1	Gear type	Yes			
1	Fishing Pressure	Yes			
1	Fish biomass model	Yes			
1	Fish Mill	No			
1	Feed projections	Yes			
1	Feed use	Yes			

Summaries produced from the system -- Listed are the categories provides then all other responses

#	Type of Summary	Standardized			
			2	Sampling Location	Yes
51	Catch/unit effort	Yes	1	Sample site parameters	
5	Catch/unit effort	No	1	Resource value	Yes
6	Catch/unit effort		1	PSD Estimates	Yes
25	Population Estimate	Yes	3	Permit	Yes
13	Population Estimate	No	2	Pathology	Yes
6	Population Estimate		1	P-chem Parameters	Yes
44	Average Size	Yes	2	Ownership	Yes
7	Average Size	No	1	Other Creel Data	Yes
5	Average Size		1	Other	Yes
25	Size at Age	Yes	1	Opening Day Catch Est	Yes
12	Size at Age	No	1	Number Boats	Yes
37	Length Indices	Yes	1	Number Released	Yes
9	Length Indices	No	70	Number Captured	Yes
3	Length Indices		1	Number of fish	Yes
32	Weight Indices	Yes	1	Number Anglers	Yes
8	Weight Indices	No	4	Number Captured	No
1	Weight Indices		10	Number Captured	
1	Wr, PSP	Yes	1	Miles	Yes
59	Weight	Yes	1	Method	Yes
8	Weight	No	2	Maturity	Yes
11	Weight		35	Marked (tagged/clipped)	Yes
1	Water body	Yes	8	Marked (tagged/clipped)	No
1	Type record	Yes	7	Marked (tagged/clipped)	
1	Trout/Pike/Salmon/Tiger Stocking Re		1	Man-hours	Yes
1	Time Fished	Yes	3	Location	Yes
1	Target Species	Yes	72	Length	Yes
1	Success	Yes	7	Length	No
1	Success	No	10	Length	
2	Stocking Reports	Yes	1	Lat/Lon	Yes
1	Sterility	Yes	1	Lake/Stream Codes	
1	State Reach Number	Yes	1	Invertebrate Identification	Yes
1	Standardized report	Yes	1	Identification	Yes
80	Species	Yes	1	IBI description	
5	Species	No	1	IBI metric	
13	Species		1	IBI score	
1	Spawning Habitat	No	1	Hauling volume	Yes
1	Socio-economic	Yes	3	Harvest	Yes
1	Sampling Gear	Yes	1	Harvest	No
2	Sampling Dates	Yes	1	Harvest	

#	Type of Summary	Standardized			
1	Growth projections	Yes	1	Chemicals	Yes
18	Growth Parameters	Yes	1	Biomass	No
12	Growth Parameters	No	1	Available prey/predator	Yes
28	Gender	Yes	1	APP	No
13	Gender	No	1	Annular Measurements	Yes
4	Gender		34	Age Structures	Yes
1	Gear Type	Yes	14	Age Structures	No
1	Gear type	Yes	5	Age Structures	
1	Fishing Pressure	Yes	1	"Satisfaction" Index	Yes
1	Fish biomass model	Yes			
1	Fish Mill	No			
1	Feed projections	Yes			
1	Feed use	Yes			
5	Effort	Yes			
1	Effort	No			
1	Effort				
1	Economic value	Yes			
1	Disease	Yes			
1	Directed Effort	Yes			
1	Date	Yes			
1	Date	Yes			
1	Collector	Yes			

Conclusions and Discussion

Response to the survey was outstanding. Most agencies are limited in making data available electronically--primarily by systems development. While no single agency has solved all the limitations listed, many limitations have been solved and this provides the opportunity to partner together states with developed database systems with those yet in their infancy. Information collected from several different water types is available.

Two-thirds of the databases are information systems. Most are Windows based. Most databases are statewide, however there are some regional and local systems. A third are part of other systems like MARIS. Most have documentation, in particular standard coding schemes.

The nation has a wealth of fisheries information ready for exploring. Implementing the results of summit will bring us closer than ever to using it to make management decisions across state boundaries.

APPENDIX III

Participants in the National Freshwater Fisheries Database Summit February 9-11, 1998 San Diego, CA

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