Organization of Fish and Wildlife Information Managers

National Fish and Wildlife Database Summit

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Final Report – Recommendations and Findings

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Sponsored by

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ACKNOWLEDGEMENTS

EXECUTIVE SUMMARY

The importance of solid information-sharing programs among states and federal natural resources agencies is becoming increasingly evident as resource-related issues cross over multiple state boundaries. The rapid spread of West Nile virus threatening wildlife and human populations, chronic wasting disease threatening deer and elk populations, and the dispersion of zebra mussels that threaten waterways, power supplies, and native fauna require that agencies charged with management of these problems effectively communicate with one another using the best data and information available. Although the technology for sharing biological information has rapidly evolved, agencies' ability to use the technologies for effective information sharing has lagged.

Therefore, in November 2002, representatives from 31 state fish and wildlife management agencies, 13 NGOs, and four federal agencies met at the National Fish and Wildlife Database Summit to explore improving interagency exchange of biological information. The Summit, sponsored by the International Association of Fish and Wildlife Agencies, USGS National Biological Information Infrastructure, and the U.S. Fish and Wildlife Service, was designed to solicit ideas for enhancing collaboration between states and NBII and to develop components of a strategic plan for information sharing.

Key recommendations from the Summit include:

Develop Creative Funding Strategies

- States manage the majority of fish and wildlife resources in the US, and all levels of government rely, to some extent, on state-based data for planning and decision support. It is therefore in everyone's best interest to strengthen basic data management systems and capabilities at the state level.
- Long-term, stable funding sources are needed to support states' ability to manage data and information appropriately. In addition, federal agencies, which benefit from having organized, consistent access to states' data, should work with states to develop the fiscal resources required to ensure long-term access. One such mechanism is a federally-supported state grant program designed specifically to foster the development of improved biological information sharing.
- State and federal agencies should work collaboratively to leverage existing fiscal resources to expand the utility of the data that is already collected by agencies, thereby maximizing the "return on investment."

Improve communication between state and federal agencies

- The NBII and other federal initiatives should effectively communicate with states to ensure that governmental partners at all levels have a full understanding of the implications of sharing the data and promote effective cooperation on environmental and natural resources issues.

Formulate data standards

- Data standards are essential to ensuring that natural resources managers can maximize the value of their data. State and federal agencies need to develop ways to work with existing standards or develop and apply new data standards appropriate to their needs.
- An initiative should be developed to outline model data standards for agencies to adopt. A number of data standards documents are available. Collection, collation and reporting on these standards would help avoid duplication and be a first step toward compatibility of data systems.
- Technical support and funding need to be provided to ensure that standards are adopted.

Outline legal and policy issues regarding data exchange

- Federal agencies should provide clear guidance on legislation such as FOIA to state agencies to clarify their obligations and liabilities associated with information sharing programs.
- Each state has its own open records laws. A collection and summarization of the existing states open records laws should be completed and made available.
- A model state-federal data sharing policy should be developed that agencies could modify as necessary and implement. More compatible data sharing policies will facilitate the implementation of information sharing programs.

Improve federal and state agency leadership support

- The financial benefits of information technology investments should be documented and conveyed to policy makers.
- Agency directors and administrators must promote the importance of a solid information-sharing infrastructure to effective natural resources management. This should include adequate and stable funding for information sharing programs and integration of information management into agency strategic plans.
- Federal and state agencies should enhance partnerships that maximize the value of already existing data.

Improve the training and retention of data management professionals within agencies

- Agencies must invest in training and skills development to provide a workforce of information management professionals.
- Information management specialists should be placed within agencies so that they are close to the "customers" (i.e., divisions, programs) that they serve.
- Pay/promotional opportunities must reflect the skills and demand for information management professionals and be structured to retain the talent necessary.
- To foster compatible information programs, the NBII and others should implement nationwide training programs for information management specialists in areas such as metadata, data base structure, etc.

Representatives from Federal, state, and NGO's who attended the Summit will form a working group to develop action plans to help implement key recommendations of the Summit.

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This document was reviewed by select OFWIM membership, NBII, IAFWA, and approved by the OFWIM Executive Committee.
Summit proceedings, presentations, and all other information are available at http://www.ofwim.org.

SUMMIT OVERVIEW

Fish and wildlife agencies need to participate in collaborative projects and programs. Some resources (e.g., waterfowl, marine harvest, Great Lakes lamprey, etc.) have been managed collaboratively through interstate and cooperative programs. Increasingly, endangered species recovery programs are being approached through interstate and interagency collaboration. Fish and wildlife habitat management and restoration are increasingly approached through inter- and intra-state collaborations between multiple agencies and organizations. Various critical issues require urgent collaborative action, such as control of disease outbreaks like chronic wasting disease or whirling disease, or rapid loss of specific habitat types such as sagebrush.

Programs such as these require the sharing of expertise and information within and between organizations. While fish and wildlife agencies are well positioned to provide expertise to these collaborative efforts, information management programs are often inadequate for providing needed data in a rapid and efficient manner. Information management is a relatively new discipline, and it takes time to fully implement this new capability to organize, manage and distribute information needed to support and guide collaborative projects and programs. Without adequate information management programs, natural resource management agencies will be unable to fully contribute to, and participate in, these collaborative arenas.

Although information sharing between natural resources agencies has historically occurred, the explosion of communication technology has amplified the opportunities for interagency data exchange programs. However, the simple opportunity or need for sharing data in itself does not guarantee that data can, or will be, exchanged among agencies. Technological barriers, differences in institutional culture, legal concerns, agency mandates, mistrust, and monetary issues are among the reasons that information-sharing initiatives often fail.

Despite a plethora of interagency information sharing programs, there have been few opportunities for fish and wildlife data managers to collectively convene to discuss important issues that impact the effectiveness of such initiatives. As a result, most agencies have developed their own protocols, standards, and technologies independent of one another, and often on an "as needed" basis. This approach may sufficiently meet the immediate needs facing an agency, but widely disparate systems tend to make data sharing and coordination more difficult.

One such opportunity for fisheries data managers occurred in 1998. The National Freshwater Fisheries Database Summit brought together 47 state agencies, several federal agencies, and nongovernmental organizations (NGOs) to address the specific information sharing issues of metadata, data security, Internet applications, and model database structure (for a full report, visit http://www.iafwa.org). That meeting proved to be a tremendously successful and productive venue for the participants to share expertise and collaborate on developing solutions to common problems that they faced. However, it was limited in scope (freshwater

fisheries). Additionally, advances in technology during the four years since that summit have created new challenges to information sharing while resolving some of the obstacles that had been identified in 1998.

Therefore, on November 1-5, 2002, representatives from 31 state agencies, 13 NGOs, and four federal agencies met at the National Fish and Wildlife Database Summit in Baltimore, Maryland to explore improved interagency information exchange. Hosted by the Organization of Fish and Wildlife Information Managers (OFWIM) and sponsored by the International Association of Fish and Wildlife Agencies (IAFWA) with financial support from U.S. Geological Survey (USGS), National Biological Information Infrastructure program (NBII), and the U.S. Fish and Wildlife Service (FWS), the Summit was designed to solicit ideas for improving collaboration between the states and NBII and to begin development of the components of a strategic plan for information sharing.

Specifically, the objectives of the Summit were to:

- Discuss methods for enhancing collaboration and exchange of data among state and federal agencies.
- Explore how federal agencies and state agencies can work together to enhance fish and wildlife information systems.
- Promote improved database design, management, and access.
- Improve coordination and communication among database managers.
- Gather input on major issues confronting database development at the state and federal levels.
- Develop recommendations for agencies and conservation organizations to improve their data management potential and potential for a shared fish and wildlife data infrastructure.

Summit Structure

The Summit was designed to accommodate each of these objectives through a mix of sessions containing formal presentations, breakout groups to fully explore the state of information sharing, and interactive demonstrations of functioning information systems. This report presents only the recommendations emanating from the breakout sessions (listed below). A summary of the presentations and demonstrations from the other components of the Summit (abstracts and Power Point files of the presentations) is available on the OFWIM web site (http://www.ofwim.org) or by contacting OFWIM.

To explore the state of information systems and information sharing potential, three breakout sessions were organized in a sequential format over three days of the five-day Summit. The sessions involved open discussion among participants on the following topics:

- The state of intra-agency information sharing.
- The state of interagency information sharing.
- Components for a strategic plan to improve intra-agency data management and interagency information sharing and discuss the need for national coordination.

The breakout groups were divided according to three primary professional disciplines: fisheries information management, wildlife information management, and administrative/combined information systems management.

The results of these breakout sessions were prioritized and categorized into "components" that could be used in a strategic plan for improving the state of information management in the natural resources community. Recommendations for agency/organization roles are included for each action. The list of these recommended players is not intended to be all-inclusive or exclusive, but rather, they commonly suggest roles for each of the major parties involved in this Summit.

A note on terminology: within this document, the terms "information technology professionals, data management professionals, and information specialists" are used interchangeably unless specifically noted. Although substantial differences exist in these occupational fields, the mix of individuals at the Summit was such that these terms were all used in the recommendations to identify professionals managing natural resource information.

RESULTS: Identified Components of an Action Plan

Leadership and Funding

Summary Statement: Sound and effective information management programs must have support throughout all agency levels. Agency strategic plans need to reflect the important role of effective data management. The general lack of strategic direction in many current plans has dire ramifications, leading to inadequate funding and staffing for information management, lack of long-term commitment to data management initiatives and subsequently a lack of agency-wide support for agency natural resource information management activities.

Action Items:

A. Data management activities should be included in strategic plans for implementation within each agency. These strategic plans must recognize the need for, and role of, data management in successfully meeting the mission of the agency. Support for this resides at the upper levels of administration and data management must become a primary element of all projects. Agency administrators could benefit from the availability of a "model strategic plan" for information management as a template to use for strategic planning. Agency directors, working through the IAFWA, could provide a coordinated mechanism so that data management becomes integrated in agency strategic planning efforts.
Who: Individual agencies; IAFWA (for guidance/coordination).

B. There needs to be adequate and <u>stable</u> funding mechanisms available to agencies to develop and maintain data systems. This commitment should come in the form of annual budget lines, rather than "ad hoc" funding from agency budgets. Agencies need to identify base level funding needs for intra- and inter-agency database development initiatives as well as avenues for securing this consistent funding over the long term.
Who: Individual agencies; IAFWA (for guidance/coordination); National level agencies for interagency projects.

Partnerships and Communication

Summary Statement: Partnerships allow agencies to collectively fund larger scale tool development, to combine funding for shared visions, and to achieve more progress with less money. The number of existing partnerships that have been successfully implemented for collaborative data sharing systems is limited. The lack of partnerships may stem from, and contribute to, entrenched thinking by agencies and is a significant obstacle to developing information systems of broad interest and value.

Communication between federal and state data managers needs improvement to reduce duplications of effort and the persistence of incompatibilities between information systems. Forums that foster communication between natural resources data management professionals

are limited. While opportunities such as the National Freshwater Fisheries Database Summit are valued by data management professionals, the importance of sharing and communicating this knowledge is often not recognized by agency administrators. This failure to communicate leads to many re-inventions of the wheel and limits consistency in information systems within and between agencies.

Action Items:

A. Define and identify successful partnerships. Demonstrate <u>specific</u> needs for partnerships and how they help achieve multiple goals. Develop regional/national partnership consortiums to advance data management. Examples of successful intra- and inter-agency systems should be publicized. These "success stories" should be used in a white paper describing the benefits of shared data systems to educate policy makers and agency administrators. Coalitions of data-sharing organizations should be "championed."
 Who: NBII; IAFWA; NGOs OFWIM

B. Develop a communication network that is active and provides useful information to agency natural resources data managers. The IAFWA provides an appropriate forum to communicate to agency division heads the need for supporting data management activities by resource managers.
 Who: IAFWA; OFWIM, NBII

C. A national level agency (such as USGS/NBII program) should provide a clearinghouse for the latest information about managing natural resource information accessible to all partner organizations. Useful information that is not currently readily available includes: available funding sources for information management/sharing activities; information sharing opportunities/needs among various partners; and forums for sharing strategies/technologies for improving information sharing.
 Who: NBII; others

D. A forum needs to be established for agencies that are willing to share information. This forum should include examples of systems that help agencies develop within agency data systems that can be easily integrated into regional/national data systems while recognizing and embracing the inherent differences in systems. The IAFWA (Science and Research Committee) could provide this forum.
 Who: NBII; IAFWA; OFWIM

E. Training opportunities should be made available through partnerships. Agencies often have similar staff training and continuing education needs. These needs can be met through well-developed and advertised training programs that are offered to many agencies at one time, or standard training opportunities that can be brought directly to the agencies.
 Who: Individual agencies; NBII; OFWIM; USFWS National Conservation Training Center

F. A resource document containing a directory of experts in data management and GIS should be assembled as a tool which agencies can use in developing programs. Such a directory will facilitate the development of state-of-the art systems in an economical manner and promote greater compatibility between agencies' information systems.
 Who: NBII; IAFWA; OFWIM

G. Communication with other state agencies, not just natural resource agencies, should be encouraged. State governments often establish government-wide standards for systems development. Thus, it is important that communication with all agencies be established at the state level to ensure that natural resources systems are consistent with such standards and guidelines, as well as drawing upon the expertise and experience of information managers in these other agencies.
Who: All information partners

H. A catalogue of different types of available data "sharing" systems, standard data collection methods and reports should be assembled. The benefits and drawbacks of each system should be noted, and the catalogue made available to a wide network of information managers.
Who: OFWIM

Agency Culture

Summary Statement: The culture of collaboration between resource managers and information specialists (or data managers) can be fractured, with both sides feeling that their respective expertise is ignored. Natural resource professionals often believe that information specialists force software/hardware standards on them without soliciting their opinions or understanding their information needs. Information specialists often believe that resource specialists don't understand the complexities of managing multiple information sets among multiple specialists.

Field biologists may not fully appreciate the value to the resource of agency-wide or inter-agency information sharing and management. Field staff may assume that once their immediate data needs have been satisfied that further sharing and use of the data are of little value, at least to them personally. This can pose an impediment to participation in data management systems. A clearly written statement about the importance of shared data should be developed, and transmitted throughout agencies, with accompanying executive support for the efforts.

Collaboration across agency boundaries is important to solving shared resource management problems. However, there are few incentives/mandates to share data across agency boundaries. Further, there is concern over the need to form "collaboratively-independent" arrangements between agencies that recognize and take advantage of each agency's differences. There is an extreme amount of institutional inertia within agencies and the value of data sharing across agencies may not be clear to decision makers.

Development of mandated standards must occur in many areas: data collection, data storage, and reporting of information. Care must be taken to ensure that standards do not become overly prescriptive and thereby present a significant disincentive to agencies' participation in data sharing initiatives. There is rarely a mandate to agencies to participate in these initiatives or to revise their information protocols and systems to conform to standards established by these initiatives. Data sharing initiatives must add value to both intra- and inter-agency data systems.

Most users of data systems require user-friendly and non-threatening interfaces. These types of systems are often costly to develop and maintain. Moreover, the culture in many states is to spend disproportionate amounts of money on collection of information, as compared to storage and reporting of information. Data systems are often caught in a vicious cycle of not

receiving sufficient support to adequately develop systems that meet the reporting requirements of the agency, and consequently fail to get more funding.

Action Items:

A.   All "users" of information technology must be provided with adequate resources (i.e., computer software/hardware) and agency funding must be commensurate to meet these needs.
Who: Individual agencies/organizations

B.   IT and resource professionals should work on the same teams rather than in separate, often disparate, parts of the agency. Agency administrators must recognize that with each level that IT personnel are removed from a resource program, the integrity of the information system supporting that program is weakened. From an administrative standpoint, this may mean that IT and resource professionals are not necessarily assigned to the same agency unit but they are part of the same resource team. Further, IT personnel must be assigned and dedicated to the natural resources program so that the temptation of administrators to draw them into unrelated projects is diminished.
Who: Individual agencies; Professional societies (assist in developing guidelines)

C.   Agency field-level staff should be provided with continuing education about the importance of data management. This must be implemented effectively, and may necessitate a top down approach. Additionally, field staff must see the benefits of improved information management programs to them and their programs. Just as job descriptions have evolved with other technologies and tools, job descriptions should be revised to include computer skills that are required in virtually all levels of natural resources management today.
Who: Individual agencies; National and regional level training opportunities (NBII, NCTC, etc.)

D.   Goals must be set for all data management systems that define their purpose, state their end products, and outline their intended accomplishments to ensure that these systems are relevant to the needs of agency goals/missions.
Who: Individual agencies; Information-sharing partners

Agency Business Processes

Summary Statement: Concerns about privacy requirements, legal liabilities and misuse of data are common across agencies. The laws and policies regarding the sharing of data differ among agencies and interpretations of overarching laws (such as Freedom of Information Act) also vary. Further, if data are shared, the common lack of metadata can lead to data misuse and misleading interpretations. Administrators and data managers are appropriately concerned over data misuse, which underscores the importance of metadata.

Within some agencies, few standards exist for collecting, storing, describing, and reporting data. The lack of agency or state specific data standards makes it difficult to share data among biologists or to analyze such data for meaningful region-wide decisions. By necessity, most states rely on specialized data storage systems and generally do not maintain data in a central data warehouse.

In many instances, agencies do not have an understanding of what data are available for "sharing." As a result, significant time is needed to integrate the data into one analyzable data system.

Action Items:
A. A reference document of protocols, guidelines and suggested data standards for encoding information into a database system should be developed to assist agencies in constructing sound information management programs. Additionally, an independent "standards committee" should be formed to assist agencies to incorporate minimum data standards and facilitate participation in a larger, widespread information sharing community. This committee should not be a regulatory authority but rather a resource for agencies to utilize to improve their programs.
Who: OFWIM

B. Agencies must integrate information management directly into project planning and budgeting as a standard step in the process, not an "after thought" in budgeting processes. This will help to ensure that data can be shared within the agency and likely improve interagency information sharing.
Who: Individual agencies

C. Agencies must emphasize and enforce documentation of data. This "metadata" helps to ensure that the data can be utilized appropriately after the original data collectors are no longer with the agency and will foster appropriate use of the data when shared outside of the originating agency. Training on metadata (such as is conducted by NBII) should become standard practice. Agencies should ensure that metadata is available for all distributed or shared data sets, that they are complete, up-to-date, in a standard format (e.g., FGDC-compliant) and available for use.
Who: Individual agencies; NBII and OFWIM (training)

D. Agencies should consider developing "Best Management Practices" for information program development to foster consistency in quality and content among data collected from disparate parts of the agency.
Who: Individual agencies; Professional societies and OFWIM (guidelines)

E. A catalogue of the different state and federal laws regarding the use and sharing of data should be developed and made available for cooperators. Models of a Memoranda of Understanding for data use, copyright, and data security/liability statements should be made available for agencies' use. Users and managers of data should be encouraged to read and be knowledgeable of the policies regarding data use and distribution.
Who: National level effort; Professional societies; OFWIM

F. Agencies should recognize the difference between data sharing and standardized datasets. Guidelines and recommendations should be developed for shared data systems as well as standardized data systems to assist agencies in their development.
Who: Individual agencies

Technical Infrastructure and Content Management

Summary Statement: There is a need for agencies to acquire and maintain up-to-date hardware and software systems across the entire agency. In some agencies, the hardware and

software available for all professionals varies by station or office. This inequality in technology across an agency greatly hinders the development of standardized data systems and information tools and is an obstacle to effective use of agency resources.

Accessibility to Internet resources varies within agencies. When accessibility is absent or marginal (e.g., low bandwidth, poor connectivity), the ability to share information among all professionals, especially in a timely manner, within or across agencies is extremely difficult. Often this leads to many decentralized approaches that are not conducive to broad problem solving.

Action Items:

A. Agencies should provide an up-to-date suite of compatible software and adequate hardware to all agency employees involved with the collection, reporting and storing of natural resources information.
    Who: Individual agencies

B. Data entry must be easy and user friendly; tools that are useful to managers/biologists, and decision makers need to be incorporated into the system setup.
    Who: Individual agencies (implementation); Partnerships, OFWIM, NBII, etc. (guidance).

C. Agencies should ensure that adequate and reliable Internet access is available for all agency employees involved in managing resources and collecting resource information. For agencies with adequate Internet access for all resource and data managers, the potential use of the Internet by data entry and reporting applications should be evaluated and, where feasible, encouraged.
    Who: Individual agencies

D. A survey of agencies to ascertain the current state of software/hardware systems should be conducted, building upon that done in 1998 prior to the National Freshwater Fisheries Database Summit.
    Who: OFWIM; IAFWA

E. Develop a list of reviews and recommendations of computer hardware, software, and related technologies (e.g., GPS, PDAs, wireless devices) for resources agencies to use when making software/hardware purchases or upgrades. Analyses of value and return on investment and lessons learned from the use of these products should be included.
    Who: OFWIM

People and Skills

Summary statement: There is a shortage of trained IT/Natural Resources Information Specialists. This is compounded by a lack of training or "natural resources data manager programs" in universities that have natural resources programs. Agencies often are left to hire either IT specialists or natural resources specialists to manage agency data assets, when in actuality a hybrid of these may prove most beneficial.

Further, natural resources data management professionals are difficult to retain. Constant turnover of IT professionals and the subsequent loss in management continuity greatly impedes maintaining information systems and implementing new ones within agencies.

Agencies are often left with information systems that current employees don't fully understand and can't effectively use.

Action Items:

A. A pool of professionals who are trained in natural resources data management should be cultivated that are available for employment or consultation by agencies. University systems should be recruited to establish degree programs or offer specific training in natural resources data management. A professional certification should be established for such a cross disciplinary position.
    Who: National effort; Universities; Professional societies; IAFWA

B. Professional societies and agencies should conduct more outreach to inform students of job opportunities in natural resources data management. University instructors should inform students about careers and identify students with aptitudes and/or interest in computers and information management.
    Who: Professional societies; Universities

C. Agencies should dedicate personnel to natural resources data management and recognize the need for data management in program planning.
    Who: Individual agencies

D. Natural resources data management training programs should be established to bring cross-disciplinary training to professional employees.
    Who: OFWIM; NBII; USFWS/NCTC

E. Pay and promotional opportunities should be offered by natural resource agencies to information managers, commensurate with the unique training and educational requirements that are necessary for effective natural resources data management.
    Who: Individual agencies; Professional societies (guidance)

SUMMIT CONCLUSION

The National Fish and Wildlife Database Summit provided a wealth of recommendations from experts responsible for their organization's information management systems. It is evident that the rapidity with which information technology has been introduced into the fish and wildlife management field has, in many cases, outpaced agencies' abilities to fully capitalize on this technology to expand the utility of their data collection programs. The Summit produced a number of recommendations that can be applied at the state and national levels to improve internal agency structures and to facilitate the application of interagency information exchange programs. These recommendations include improvements in leadership and funding for information management programs; changes in business practices within agencies to fully integrate data management into all programs; improvement in the communication among agencies about the need and opportunity for information sharing; improvements in technology and exchange of information about technology, and; changes in agency culture in recognizing data as an important agency asset, whose management should merit priority consideration in agency strategic planning and budgeting.

The Summit provided solid recommendations for improvement, some of which overlap with the recommendations made in a similar event four years prior. It is incumbent upon agencies to use these recommendations to change the way that information management and sharing is approached. In doing so, agencies will maximize the full potential of their data management programs for supporting the effective management of natural resources.

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