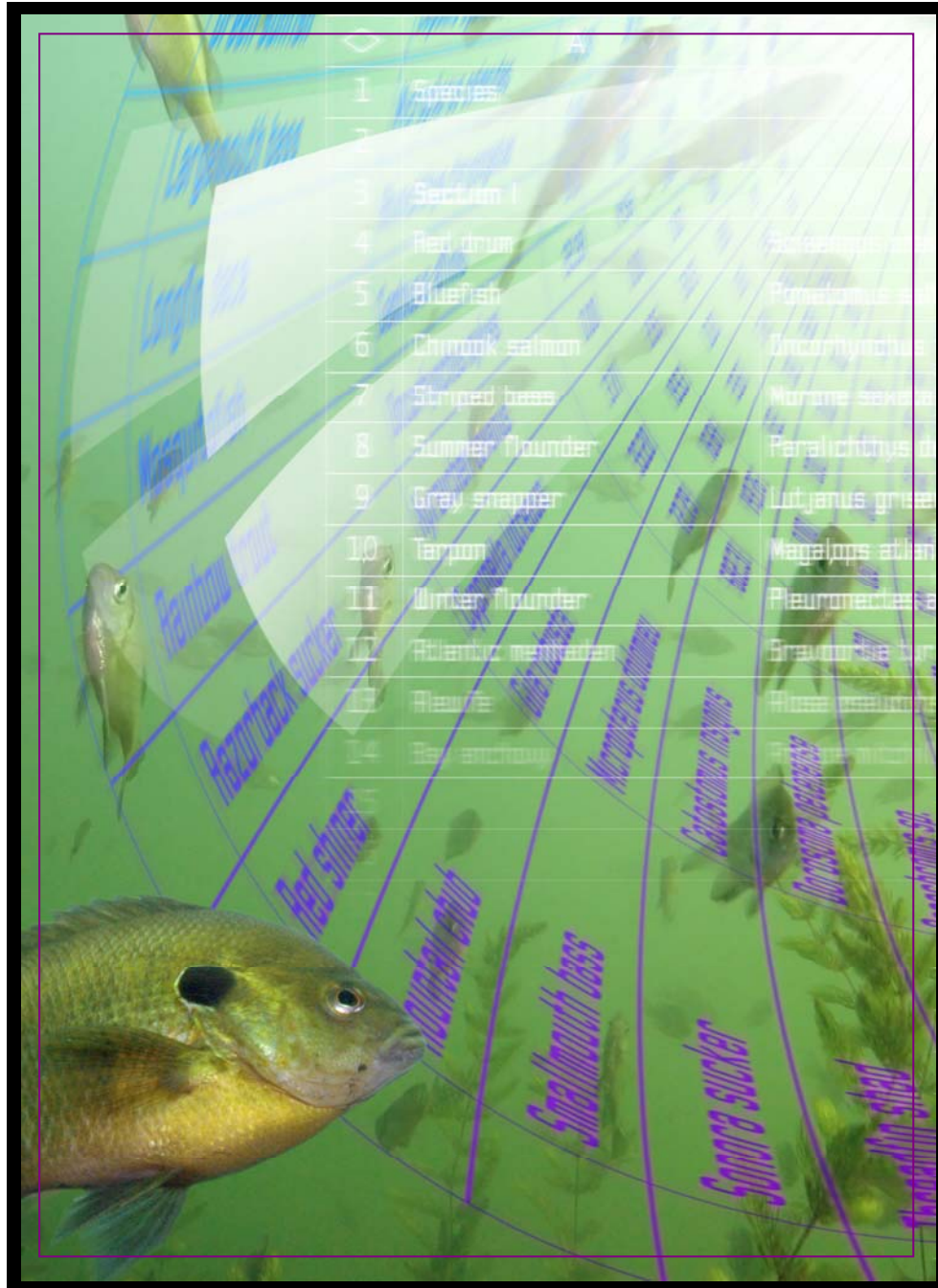# PROCEEDINGS OF THE NATIONAL FISHERIES DATA SUMMIT

Focusing on applications to the National Fish Habitat Initiative

Caldwell Design Photo by David Kahrs

October 31st – November 2nd, 2006
Salt Lake City, Utah
Hosted by the American Fisheries Society Computer User Section

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Acknowledgements

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Executive Summary

From October 31-November 2, 2006, eighty-six professionals involved with the management of fisheries information programs in their organizations convened to address topics pertinent to improving fisheries information systems and the ability to share data between organizations. The Summit focused on the application of such sharing capabilities to the National Fish Habitat Action Plan, recognizing that measuring the impact of such large scale initiatives would rely on the ability to compile data from multiple jurisdictions.

Prior to the Summit, participants completed a survey to ascertain the degree of development of fisheries information systems among agencies and specific characteristics of such systems. Seventy-one surveys covering forty-four states were completed. Some of the highlights of the findings include:

- Primary challenges to developing shared information systems include limited time, personnel, and funds, as well as the limitation on the availability of data and standardization of data.
- The primary technical hurdles include systems development and lack of data available electronically.
- The primary institutional and professional impediments include the concern over the misuse of data and limitations from agency policies on the release of certain data.
- Since a similar survey in 1998, fewer computer and network issues (hardware, internet access, etc.) limit data sharing (now replaced by limitations on systems development).
- Although fish survey and fish stocking databases are the most prevalent types of databases, they constituted a smaller percentage than in 1998.
- Nearly 75% of databases are statewide in coverage, whereas only 19% are multi-state in nature.
- Data and information dating from as early as 1867 are available from some states.

During the Summit, participants took part in a series of discussions that ultimately led to recommendations in five main areas:

- Define data and information appropriate for the National Fish Habitat Action Plan
- Key data transfer standards
- Key web services
- Geographic and data scaling issues
- Mechanisms to integrate regional information systems

Key themes echoed included the need to recognize the unique differences and needs of agencies in developing such systems, the importance of developing sound goals and direction for shared information systems, providing flexibility in the ability to input and query data on various geographic scales, and the importance of establishing data standards. States would benefit from guidance on issues such as data sharing policies as well as financial assistance and services to help in systems development.

Following the Summit, a team of professionals utilized the extensive input from the participants to outline the "next steps" needed to successfully integrate state and federal data into a system usable by the National Fish Habitat Action Plan. These steps include:

- **Outlining an implementation plan**. This plan identifies the need for a coordinator and outlines potential placement and funding solutions for the coordinator. Additionally, the plan includes a structure for fostering a regional approach to the development of a national information sharing system.

- **Defining a mission statement and best practices**. These include identifying incentives to promote data sharing, concerns about data sharing, policies that need to be changed, and suggestions for implementing systems in state agencies.

- **Defining marketing tools.** Such tools need to tailor messages to specifically defined audiences, highlight the importance of conveying advantages of information systems to administrators, and the need to involve state directors and other administrators in the systems development.

- **Defining data standards.** Such standards include specific direction for georeferencing, measurements, classification, and other aspects of data systems.

- **Outlining "model" state database structures and associated software** that can be used to integrate data necessary to support the National Fish Habitat Action Plan. Such standards can provide agencies with guidance on aspects of information systems development that will foster improved sharing capabilities in the future.

Based on a recommendation from Summit participants, a baseline needs assessment of state agencies was conducted following the Summit. The objective of this was to further identify aspects of agency programs that affected agencies' ability to be an active participant in the National Fish Habitat Action Plan. The dominant types of data that this audience managed were fisheries and angler data. While more than 2/3 indicated an ability to share data, the majority identified a lack of available time, personnel resources, and technical issues as hindering their participation.

Many of the findings and recommendations of this Summit correlate with concepts espoused in similar gatherings in 1998 and 2002, providing firm direction for the development of shared information systems if the political will and resources allow.

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Introduction and Background

Purpose

The purpose of National Fisheries Data Summit was to provide a focused forum during which fisheries professionals involved in information management could interact with their counterparts and peers from across the nation on issues that would promote the development of shared information systems and benefit the progress of the National Fish Habitat Action Plan (NFHAP).

The widely acclaimed 1998 Freshwater Fisheries Database Summit established groundwork that assisted agencies in developing information systems. The 2006 Summit was designed to build upon that work and focus attention on cutting edge issues that impact our ability to share information more effectively. The NFHAP is a nationwide effort to address common problems that afflict the condition of fish habitat throughout the United States. Measuring the condition of habitat and its impact on fish populations across wide geographic areas will require greater use of shared information across agencies.

Goals

The stated goals of the Summit were to review the National Fish Habitat assessment process and determine the availability of indicator data at national, regional, and local scales. The Summit results are expected to:

- Outline the availability of data necessary to fulfill the needs of the NFHAP data system
- Identify specific sources of the data to meet the needs of the NFHAP data systems
- Outline mechanisms and processes for assembling and transferring needed data, including:
    - Defining data and information to be included
    - Identifying key data transfer standards
    - Assessing key web services for integration
    - Addressing scaling issues for initial development
    - Identifying mechanisms to integrate regional joint partnership information systems

Process

The Data Summit Steering Committee canvassed fishery administrators from across the country to identify the appropriate person, or people, within their agency to participate in the Summit. Both marine and inland agencies were targeted in coastal states. Based on that input, individuals from state and federal agencies were invited to participate. Recognizing the limitations on travel in some state agencies, travel and meeting costs were supported, using Summit grant funds, for one individual from each state fishery agency in order to foster participation. Prior to the Summit, registrants were asked to complete an online survey to ascertain the status and characterization of fishery information systems within their agency.

The Summit agenda (Appendix I) was oriented to maximizing the opportunity for interaction among participants. Brief presentations were made to provide a basic common level of understanding from which participants could work, and included:

- The Importance of Good Fisheries Data and its Interaction with the National Fish Habitat Initiative.
- Review of national fish habitat assessment.
- Examples of existing multi- and single-jurisdictional online databases.
- NFHAP as a state/regional driven initiative to enhance data systems from a state perspective.
- Review of the pre-Summit survey results.

Following the presentations, participants broke into smaller groups to address outlined questions that would lead to recommendations to meet the goals of the Summit. Initial workgroups were separated into marine and inland sections (to address data-specific issues) but marine and inland were integrated to address systems development issues. Daily summary wrap-up sessions were held, and a final 4-hour wrap up session was held on the last day to develop consensus opinions on specific recommendations.

Findings and Recommendations

Part I: Status of Information Management: Pre-Summit Survey
(See Appendix III for complete results)

The 2006 National Fisheries Data Summit convened by the American Fisheries Society Computer User Section follows the successful 1998 National Freshwater Fisheries Database Summit held in San Diego, California (www.fishdata.org). Prior to both the 1998 and 2006 Summits, participants were asked to complete a survey designed to identify current status of agency fishery information and challenges limiting information exchange among agencies. Results from the 1998 summit survey are presented in the "Proceedings of the National Freshwater Fisheries Database Summit." Prior to the 2006 Summit, members of the Summit steering committee developed a survey that included some of the same questions from the 1998 survey to track changes and other new questions, including some that were related to the National Fish Habitat Action Plan. To ensure a high response, completion of the survey by meeting participants was required for travel reimbursement to the Summit. The survey objectives were to:

- Highlight challenges that limit information exchange among agencies
- Identify major technical hurdles remaining in agencies
- Identify agency policies that limit data sharing
- Compare outcomes with the 1998 Data Summit

Survey Methods

Survey questions were designed to evaluate the general status of fisheries information systems at state and federal agencies in the United States. The survey consisted of seven groups of questions, including: contact information, aquatic system type, data availability, database information, programmatic hurdles, and information management by aquatic system (freshwater, marine/estuarine). The survey was conducted online using Survey Monkey (http://www.surveymonkey.com/home.asp), an Internet-based survey program. The survey was opened on 22 July 2006 and responses were gathered until 23 October 2006.

Summary of Pre-Meeting Survey Results

(See appendix III for complete results)

Seventy-one people completed the survey. Respondents included one or more persons from all 50 states except Alabama, Delaware, Nebraska, New Mexico, South Carolina, Utah, and the District of Columbia. Multiple responses for some states resulted because the survey targeted both freshwater and marine environments as well as state and federal agencies. All respondents were asked to provide contact information.

Some of the highlights of the findings from the survey include:

- The primary challenges to developing shared information systems include limited time, personnel, and funds, as well as the limitation on the availability of data.
- The primary technical hurdles include systems development and lack of data in electronic format.
- The primary institutional and professional impediments include the concern over the misuse of data and limitations from agency policies on the release of certain data.
- Since a similar survey in 1998, fewer computer and network issues (hardware, internet access, etc.) limit data sharing (now replaced by limitations on systems development).
- Although fish survey and fish stocking databases are the most prevalent types of databases, they constituted a smaller percentage than in 1998.
- Nearly 75% of databases are statewide in coverage, whereas only 19% are multi-state in nature.
- Data dating from as early as 1867 are available from some states.

Part II: Conclusions from Breakout Sessions

As previously mentioned, the bulk of the time available during the Data Summit was devoted to providing participants with the opportunity to lend their expertise to addressing specific topics regarding data sharing. Participants were broken into four groups and were asked to define a series of questions leading to recommendations for information that they felt was appropriate for the implementation of the National Fish Habitat Action Plan. The topic areas and combined responses of all groups are listed herein.

Define Data and Information Appropriate for the National Fish Habitat Action Plan

1. Limit the database to a feasible scope and develop it in a stepwise progression. Participants felt that asking for too much information might overwhelm the overall objective and that it was important to start with a defined, manageable set of data initially. After an initial information sharing system was developed, and as needs for additional data became clear, the content could be expanded to meet these needs (i.e., stepwise progression).

2. Information content must be useful to assess threats and provide direction for specific projects (e.g., NFHAP). Participants felt that the data requested had to meet one or both of these criteria. Once the NFHAP Science and Data Team developed the "threats" model, the availability of specific data elements could be determined by state agencies. These elements could be used as the core for the nationwide information sharing systems. The nature of specific projects might dictate that additional elements be incorporated to the system at later dates as long as the system was designed to adapt to these evolving needs.

3. Address agency culture, including apprehension and incentives for participation. The content of a wide-scale information sharing system must take into account a range of concerns associated with data sharing that agencies may have. These concerns could include sharing specific data elements (e.g., locational data for sensitive, threatened, or endangered species), institutional concerns (e.g., concern for investing time and personnel resources for an Action Plan that is not directly associated to their agency's mandate), and others.

4. Recognize necessity of partnerships across boundaries (expand involvement). While state fish and wildlife agencies may be able to provide the bulk of fisheries data, there is a wealth of data available from agencies who have not been engaged in the process. State water quality agencies, for one, need to be integrated, as well as a broader array of federal agencies, universities, and others who may have data related to fisheries, land utilizations, water quality and other facets applicable to NFHAP analysis and future assessments.

5. Develop a working group. Participants felt that establishing a working group to focus on development of the information system would facilitate the development of criteria that could better define the content needs. Such a group should be patterned after existing successful information sharing efforts (e.g., MARIS, Streamnet, etc.) to avoid "reinventing the wheel." Several tasks of the working group would include:
   - Establishing database standards
   - Prioritizing spatial & temporal elements
   - Obtaining resources for data development in each organization

Key Data Transfer Standards

Summit participants were asked to engage in a series of topics designed to address the broad mechanisms and protocols that would be required for transferring data between disparate data sets. Consensus recommendations included:

1. Design a hierarchical data framework. The structure of the information system should be such that data could be utilized (to the extent possible) at various scales. Basic geographic units should be established (e.g., lake, stream segment, etc.) and the system should allow data to be "rolled up" to larger geographic scales based on that.

2. Develop a network based and distributed system. Participants were generally in agreement that an information system should not reside in a centralized data base. Rather, a system should be constructed around a network, much in the same way that the internet is structured. Queries would be submitted to a network "node" that would subsequently select the data pertinent to each query to return to the user. Summit participants did not want a system that required them to actively send data to a central location.

3. Develop specific details and core framework. Specific data transfer standards would be developed more effectively in the context of overall systems development. Defining the type of content that the system would be required to carry is one such aspect that needs to be defined. A core framework (structure) for the system, including transfer standards would evolve from this.

4. Identify data sources and gaps. Once data elements are defined, the sources of those data could be identified through surveys or a more structured "needs assessment." Through this process, gaps in the availability of desired data elements would become evident and action to fill those gaps could be explored or undertaken.

5. Determine minimum common denominators. A broader "needs assessment" would include the development of minimum data elements – or "common denominators" that each contributor would feed into the data system. Although additional elements may be included in the systems, transfer of these fundamental core variables would heavily influence the development of standards and protocols for data transfer.

6. Establish definitions (e.g., taxonomic standards). Standards for measurement, naming conventions, geographic identifiers, and other aspects of an information system must be developed.

7. Maintain ownership of data. Although agencies and other organizations would be contributing their data to a broader system, Summit participants indicated that it was important that the collectors of the data retain "ownership" in that data. This has many implications, including determining the ultimate uses of data in an information system. For example, if a state restricted access to certain data (e.g., threatened and endangered species locations), this same level of security should be maintained through any transfer of that data via a shared information system.

8. Control quality and proper use of data. Standards and protocols need to be established to ensure that the data being transferred through the system meets quality levels that are desired. Additionally, measures need to be implemented to ensure that data are being used and interpreted properly. These measures include provisions for who has access to the data (may

be different levels of access for different users), metadata to assist in interpreting the data, and others.

Key web services

Data Summit participants agreed that technology was no longer a barrier preventing the sharing of data. This sentiment was borne out by the results of the pre-summit survey. Today, the Internet provides a superhighway for information exchange. An important facet of making this system work best is to determine the "rules of the road." At a minimum, a solid data sharing agreement should be developed that addresses these features:

1. Determination of whether a data warehouse model or distributed data set model is appropriate, or a hybrid of both. A single data access site with a central portal that is hierarchical would allow different user types to select the appropriate level of data that they needed.

2. Develop nation-wide interstate guidelines. Before any data can be shared, basic guidelines on items such as format, timeliness of updates, data security, etc. need to be developed and agreed upon by all data providers.

3. Interoperability, data standards and metadata need to be developed. These components are essential to any data sharing effort.

4. Data access and security (restrict timing and type) should be agreed upon. Data providers need to have an understanding of how their data may be used, who may have access to it, and other issues related to "data security." Several layers of access may have to be developed for various users, including the general public, defined user groups (managers, scientists, policy makers, etc.). Data need to be coded so that access can only be gained at the appropriate security level.

5. Outside data servers (not direct access) need to be established. This will provide a firewall for the data providers and protect the integrity of the original data sources.

6. Determine update schedules. Proper interpretation of data coming from various sources will likely require knowledge of when all of the data was collected or last updated. Data providers need to date stamp their data (e.g., date of last update) as well as agree upon a minimum schedule of updates.

7. Provide incentives and agreements. Providing some types of incentives, whether they be financial or technical assistance, institutional support, or other is one tool to help states with disparate technical levels and subsequent needs reach a point where they will be able to share information through a common web interface.

8. Internal policies may constrain data sharing. At the outset of any information sharing effort, organizers must recognize that policies regarding data sharing have evolved within individual

state agencies, private organizations, and federal agencies mostly independent of each other. A "model policy" for information sharing, along with legal guidance of what is allowable, what is not, and what is obligatory, should be developed to assist organizations in revising policies as needed to share data.

9. Access to government servers by the public. In some situations in the past, public access to dynamic web pages on government servers has hindered the design of some information sharing efforts. This has likely been exacerbated in the past six years as increasing concerns over national security have dominated many aspects of program development. Some government data that was once accessible to the public is now being restricted. This facet must be recognized and addressed at the outset, as well as along every step of development of an information sharing project.

Scaling

The issue of scale (what geographic level and/or level of data specificity is of interest) pervaded many topics of discussion among Summit participants. The scale at which data are provided by agencies will depend on the purpose (mission and objectives) outlined for sharing that data. Important points to consider regarding scaling issues include:

1. Indicators must be at an appropriate scale to be meaningful. For the National Fish Habitat Action Plan, this means that data should be appropriate to effect policy at the national level. However, this does not mean that indicators themselves need to be designed to measure national level changes. Indicators must be able to detect change at desired scales, whether that is at the watershed, state, or regional levels.

2. Identify a few common standardized variables. By selecting fewer variables rather than a wide spectrum, the chances of being able to measure them at the appropriate scale will be greater. This will allow agencies to focus more on collecting the variables of actual interest rather than collecting data on variables that do not contribute information to the objective.

3. Expect and allow coarser interpretation at larger scales. Just as web-mapping services (e.g., Google Maps) are able to provide excellent satellite images at very broad scales (e.g., country, state, county etc.) but fewer images at finer scales (e.g., rural neighborhoods), a data sharing initiative should be expected to provide coarser images at broader scales. The system should be designed to "drill down" to fine scales where data are available but still provide interpolative analysis where those fine data are absent.

4. Use metadata to foster proper use of the data. Just as with other aspects of a data sharing initiative, metadata is a crucial aspect to describe the scale at which data are available and presented. For example, a user must be able to discern whether the absence of data at certain scales denotes "no sample taken" or "sample taken but no results." The metadata should include descriptors that allow scaling-up or down of data in an appropriate manner, so that data are not misinterpreted.

5. Technical issues and standards need to be developed.
   a. The base resolution of data and mapping (e.g., 1:24,000, etc.) should be established to provide all data providers with guidance for making their data available.
   b. Georeferencing standards (point or polygon, etc.) need to be outlined.
   c. Standard naming codes (waterbody names, taxonomy) need to be agreed upon. The Integrated Taxonomic Information System (ITIS) is becoming more broadly accepted for taxonomic naming conventions. Improvements must be made in estuarine/near shore marine coding.

6. Care must be taken with location for human dimensions data. With privacy concerns being paramount to the public, care must be taken when deciding scaling standards for human dimensions data. Although use of aggregate (non-individual) data *generally* does not encounter this issue, each decision regarding human dimensions data needs to be weighed in the context of privacy. Additionally, much of the human dimensions data available (particularly historic) are at a very broad scale that have the potential to impact its use.

7. Respect confidentiality of site-specific data. In general, the finer the resolution of the data, the more care should be taken to ensure that the data does not infringe on privacy concerns or allow resources to be inadvertently harmed. Release of site-specific threatened and endangered species data is often cited as a concern, but even providing site-specific data for "sensitive" species not listed may be of concern.

Mechanisms to integrate regional information systems

Once Summit participants addressed various issues related to the mechanics of developing a shared information system, they were asked to recommend steps to take that would result in successful implementation.

1. Stepwise - start small, show accomplishments. Rather than trying to address the entirety of issues related to data sharing, the effort should be broken down into a series of accomplishable tasks:

   a. Inventory data sources, gaps, and information systems. This could be accomplished via a post meeting survey.

   b. Develop and test a prototype or pilot (start small). Rather than attempting to develop a nationwide data sharing initiative, a smaller-scale (multistate or regional) effort may have a greater chance of success. This small scale effort has the added benefit of revealing some of the pitfalls that may be avoided in larger scale efforts. Perhaps this small scale effort could be piggybacked on an existing project involving the states in data sharing, such as MARIS.

c. Use existing models in other disciplines (health, defense). Many disciplines are ahead of natural resources in their use of shared information systems. Although some issues regarding data sharing will vary across disciplines, a number of fundamental issues are identical. A fisheries information system would benefit from the experiences that other disciplines have acquired in these areas.

d. Share data internally (intrastate) before developing external systems (interstate). Many states have not even developed the capability of effectively sharing their information electronically within their own agency or state. Allowing states to develop such capabilities would provide them with the experience and likely the equipment to more effectively combine and share data with other agencies.

e. Habitat data requires nontraditional partnerships. Participants recognized that the primary attendees to the Summit were fisheries information managers (by design). However, much of the data required to analyze aquatic habitat changes or influences resided in other areas, such as separate habitat divisions, agricultural agencies, state water quality agencies, etc. Developing an effective information system will require partnerships with professions with which fisheries managers have not traditionally or formally been involved.

2. Develop regional teams and working groups. Large national meetings such as the Data Summit are productive for sharing ideas and collaborating with peers from other sections of the country, but success may be better achieved by initially implementing data sharing with neighboring jurisdictions. To initiate these regional efforts, several actions need to be taken:

a. Promote initiatives with agency administrators. Without support from the highest administrative levels, data sharing projects will likely be relegated to a lower priority.

b. Provide funds to improve data management. Many agencies have been reluctant to invest in the infrastructure (equipment, personnel, training) for data management in favor of more traditional expenditures directly related to fisheries management. Funding from outside entities, even as "seed money," can produce dramatic advances in states' data management capabilities.

c. Tie federal funding to participation. State agencies receive federal funds through a variety of programs. If state agency directors feel that information sharing programs are a high priority, they should request that participation in select federal funding programs be tied to activities related to regional information sharing.

d. Build on momentum to secure future of system. Demonstrating success at smaller scales such as regions will promote the adoption of information systems in other regions and at larger geographic scales.

e. Develop a timetable for implementation. Fisheries agencies are notorious for working on the most pressing issues first. A project without definite deadlines is more likely to languish than one with a time certain due date. Therefore, an appropriate work plan with benchmarks and timelines need to be developed and followed for the development of regional information systems.

3. The system must have recognized mutual benefits. An information system designed to serve only one purpose, agency, or project will have less chance of success then one that has benefits to both the data providers and the users of the systems. Such mutual benefits could include:

a. IT support for fisheries managers. Many agencies lack adequate IT support to accomplish the development of information management systems that can meet both their needs and the requirements of a shared network. Providing IT support to agencies to help them develop their systems would ultimately have benefits to a larger network of shared systems.

b. Consistent protocols and language. Standards and guidelines are fundamental aspects of any information management system regardless of size. Developing these guidelines can be expensive and time consuming. Providing guidance on standards and methods would benefit agencies that are initiating development of their systems and would promote greater consistency among agencies if development was concurrent with the implementation of a regional information sharing system.

c. Knowledge to manage scarce resources. Personnel time and funds are generally limited within agencies and often fully committed. Properly developed information management systems can help to better manage these resources, but it takes resources to develop the systems. Assistance from other agencies in organizations in developing internal data management programs can help agencies to overcome this "catch 22" situation.

d. Proactive or reactive status tracking. Data currently collected at the waterbody (lake or stream site) level provide little indication of what "the bigger picture" is of the resource. The ability to compile/merge data from a variety of sources across geopolitical boundaries will allow the assessment of trends over large scales, providing management agencies with a more comprehensive picture of resource trends. This should improve both trend-based planning opportunities as well as more data to implement management actions in response to observed large-scale trends.

e. Restoration of watersheds across boundaries. In many states, management is currently conducted on a waterbody basis, although states are moving more toward watershed-based management. However, when watersheds transcend state boundaries, effective watershed-based management relies on the ability for each of the states to share comparable data with one another.

Part III: From Workshop to Implementation: Steps needed to successfully integrate state and federal data into a system usable by NFHAP.

Following the conclusion of the Data Summit, a team of fisheries and information management professionals from state, federal, university, and private organizations convened to interpret over 60 pages of notes accumulated from the Summit participants' input. Based on this input, components of an implementation process were developed as recommended guidance for the NFHAP to integrate state and federal data into a system that could be useful to the NFHAP and other cooperative interjurisdictional efforts. These components were grouped into six main topic areas:

- Outline of an implementation plan
- Defining a mission statement and best practices
- Defining marketing tools
- Conducting a needs assessment of states that will allow them to be an active participant in the National Fish Habitat Action Plan
- Defining data standards
- Outlining model state database structures and associated software that can be used to integrate data necessary to support the National Fish Habitat Action Plan

Outline of an Implementation Plan

Although a specific implementation plan can only take shape once specific goals and objectives are established, Summit participants provided enough detail to outline approaches in three areas that need to be addressed: establishing a working group, obtaining dedicated staffing, and the basic approach for assembling data.

Establishing a working group – a working group of partners is essential to progressing with this initiative (Figure 1). This proposed working group would be composed of representatives from 6 broad geographic subregions of the United States. Subregions would allow greater focus on geographically-specific fisheries and habitat issues while at the same time allowing broader, nationwide coordination of the entire effort. It is suggested that initially, information sharing partnerships should form between organizations that already have IT staff and infrastructure in place to provide expedient progress.

Staffing – to facilitate a greater chance of success for a wide scale information sharing system, a full time staff coordinator should be assigned to keep the initiative on track.

       a. Coordinator role: The coordinator would be responsible for leading the working group and coordinating the development of subsequent workgroups, in a staggered approach, for continuing development and momentum.

b. Coordinator Placement and Supervision: Suggested possibilities related to the working aspects of the coordinator included placement in the Association of Fish and Wildlife Agencies (AFWA) or the USGS National Biological Information Infrastructure program. While the USGS/NBII program and mission are closely aligned with the data needs of the NFHAP and would seemingly provide a good "fit" for a coordinator, Summit participants focused on locating a position in AFWA. This is primarily due to the need to integrate state data in NFHAP and the sentiment that a position located within a "state oriented" organization may be perceived more proactively than a federal position. This does not preclude possible collaboration between AFWA and USGS (or any other federal/state/NGO entity) to fund and support this position.

   i. AFWA – ultimately responsible at all levels to encourage state participation.
   ii. AFWA encapsulates a broader context with the NFHAP project. Funding for the coordinator could come through the NFHAP, and since this is a growing program it may provide an increased chance of long term stability and success.
   iii. AFWA Information Management Committee may not be appropriate at this time because:
       1. It is focused heavily on license sale systems
       2. It may be biased towards waterfowl
   iv. "Ownership" of the coordinator position should remain through AFS Computer User Section Steering Committee (i.e., AFS/CUS should maintain a significant role)

c. Who funds the staff person?
   i. A data sharing grant through the Sport Fish Restoration Program is one possibility.
   ii. NBII – one goal is to encourage information systems; original intention of Fisheries and Aquatic Resources node (could provide resources).
   iii. Be aware of the concern that this is a federal nexus – money from federal government, but they don't decide how to spend it; better model under AFWA, NFHAP or fisheries commissions.
   iv. Who writes the proposal?
       1. AFWA through AFS-CUS and the Conservation Management Institute.

Basic Approach to Systems Development

a. Scale
   i. Would definitely collect data at finest scale available, but not allow that to be an impediment to initiating the project.
   ii. All will start to envision the value of data collection and use of data at various scales. Need to build understanding of the value of having data available at different scales.

iii. If we decide on 5th order HUCs, then stick to it for deadline. For states that don't have point data, have them identify presence/absence for indicated HUC level (e.g., fish presence as point data, where available; blank where not available).

b. The focus of subsequent Subgroups that are established will be determined by a priority rank of data needed (established by the NFHAP Science and Data Team).
   i. Make the priority for next focus to be specifically NFHAP related. For example, species of greatest conservation need or data related to the connectivity of habitat could be possible focus areas.
   ii. The organization of second Subgroups/Task Teams will be based on regions organized on HUC divisions.

3) Production of clickable HUC map
   a. Framework for this system is available through NBII's FAR node.

Figure 1. Proposed data sharing structure for the National Fish Habitat Action Plan.

	Shared-Data Coordinator
	Coordinates a working group consisting of 6 subgroup leaders of various agency/org types

Determine gross data standards that can be accomplished quickly just for fish presence.

Coordinates the collection of data from their task team members while adhering to standards set within the model framework

Atlantic Coastal Subgroup Leader	NE Subgroup Leader	SE Subgroup Leader	W Subgroup Leader	MW Subgroup Leader	Pacific Coastal Subgroup Leader

Task Team	Task Team	Task Team	Task Team	Task Team	Task Team
2 state	2 state	2 state	2 state	2 state	2 state
1 federal	1 federal	1 federal	1 federal	1 federal	1 federal
1 ngo, univ, etc	1 ngo, univ, etc	1 ngo, univ, etc	1 ngo, univ, etc	1 ngo, univ, etc	1 ngo, univ, etc

Defining Mission Statement and Best Practices

Effective development of shared information systems among natural resources management agencies will require changes in aspects of agency policy as well as effective marketing for the reasons behind the need of investment into these systems. Summit participants explored various aspects of current policies and recommended a variety of changes needed, incentives to promote shared systems, and concerns that their agencies might have about sharing data.

Incentives to promote data sharing
- Financial incentives include:

  - Provide funds directly to assist agencies in making changes to their current systems. The MARIS program currently operates with this as one approach and has shown to be successful in effecting change, although not unto itself.

  - Provide financial incentives through existing grant programs. Currently, federal grant programs such as the Federal Aid in Sport Fish Restoration (e.g., Wallop-Breaux) require a match composed of nonfederal funds to be eligible for the federal funding. If the federal government felt that promoting shared information systems was a priority, they could explore reducing this match for eligible projects.

  - Provide funds for upgrading IT and sending data. Linking funds directly to the receipt of data might be explored.

  - Focus on how agency funds are better utilized using new IT approaches. Agency directors have indicated that techniques which are proven to promote financial efficiencies within their agencies often receive higher attention. Demonstrating how new IT technologies and data sharing initiatives would accomplish this would be an effective means to advance such initiatives within agencies.

- Professional/Research incentives include:

  - Improve knowledge of ecosystem processes. Quite often, natural resources data is collected for specific purposes or programs. For example, fish population data is collected separately from watershed land use data. Only by developing systems that are compatible enough with one another to exchange these disparate sets of data will fisheries professionals be prepared to begin exploring interactions of various parts of the ecosystems. Since watersheds often span several jurisdictions, understanding the full ecosystem picture to implement effective restoration will require information systems from various agencies/jurisdictions to be compatible with one another.

  - Establish consistency in the shared product. Having well defined goals and objectives for the data, and resulting products that are useful to a variety of stakeholders will provide incentives to develop shared information systems.

- o Utilization of data at various scales. The NFHAPwill be implemented at various scales, from local watershed projects to large, landscape-level restoration projects. It will be impossible to forecast in advance the geographic scale of data that will be necessary for all possible projects. Therefore, developing information systems that can be combined with others to provide information at various scales (to the extent possible) will be a necessity.

- Public Support Incentives: The public, who funds most government natural resources agencies, continually demands efficiencies in programs. Developing shared information systems that can leverage one another will demonstrate to the public those agency efforts.

- Improved Data Management Incentives

  - o The active process of preparing to share information with other agencies forces better quality data. Data collectors will need to be more cognizant of documentation, accurate recording, and other aspects of good data collection and management in order for it to be shared and utilized as intended with others

  - o Shared data using web services will help professionals to visualize the data relationships and organization.

- Personnel Incentives

  - o Better organized and managed data will provide faster and easier retrieval of information for agency users.

  - o Improved data management programs will result in faster and easier submission (or linkages) to outside data providers if well-developed applications automate the process.

  - o Improved data management will provide convenient access to data for servicing request from the public and others, resulting in reduced staff time, and ultimately more informed management.

  - o Policy Decisions. With data accessible to policy makers and to staff who provide information to them, improved policy decisions backed by the latest information available will likely result.

Concerns about sharing data

Although a number of incentives for data sharing exist as outlined above, data managers and agency decision makers will need to similarly consider issues that will need to be addressed.

- Institutional Issues

  - o Agency culture, including apprehension and incentives for participation
  - o IT restrictions and policies

- o Staffing levels (may take a while to fill the requests)
- o Those in charge haven't seen the value in improved infrastructure, etc
- o Quality policy to rate quality and use of data
- o Does making information available increase public potential for contesting policy decisions?
- o Increased data availability increases the responsibility to incorporate all the information into reports, decisions, policies, etc. (increases individual work load because data needs to be integrated)
- o Potential for information overload
- o Perceived concerns about data quality from other sources, lack of documentation, potential for misinterpretation
- o Experienced failures with similar systems

- Infrastructure

  - o Data not ready for sharing
  - o Incomplete metadata
  - o Proofing (QA/QC)
  - o Data not geo-referenced and don't have the people/training to do it

Policies that need to be changed

- User Policies

  - o Should consider confidentiality requirements
  - o Write into contract as a data use policy to clarify what's okay to release; specify clear guidelines

- Institutional Policies

  - o As public servants, we should make the data available to the public and utilize it wisely
  - o Agencies fail to encourage good data management and sharing-leadership can fix this
  - o Agency needs to provide resources (people, time, money) to maintain good data management
  - o Scientific community doesn't release data in preliminary form

- Professional/personnel

  - o Individuals have to buy-in to good data management
  - o Funding and performance evaluations as incentives
  - o Training in data management
  - o IT costs incorporated into project budgets
  - o Federal aid requirement
  - o Protect scientist – identify data as in preliminary form (legal disclaimer; attorney general opinion)

How to put data-sharing into practice in agencies

Several suggestions were made of processes and procedures for implementing, or encouraging, the development of data sharing:

- Recommend but don't mandate. Data formats, model database structures, and procedures are the underpinnings of a solid information management program. It was felt that recommended formats/procedures be developed, but not mandated. Mandating protocols may have the unintended effect of alienating users, whereas recommended policies and procedures would provide them guidance but still leave flexibility for individual agencies to adapt their systems to meet their unique data management needs.

- Simplify. Sharing of information needs to be made as easy as possible for agencies in order to foster greater cooperation and collaboration in an environment of ever increasing workloads.

- Documentation. Well-documented data, including details of how the data was collected and for what purpose, is essential to developing a system that is useful while lessening the chances of unintentional misuse/misinterpretation of the data. As such, metadata guidelines should be a part of the recommended procedures and protocols.

- Adaptability over time. The use of shared information systems will undoubtedly change over time. At present, the focus of sharing data is to serve the National Fish Habitat Action Plan, but in the future some other use may evolve. Likely, as a shared information system is implemented and used by managers, researchers, and policy makers, new uses which have yet to be conceived will become known. Thus, a shared information system must be developed from the outset with the concept of adaptability from the outset to ensure long-term sustainability of its efforts.

- Allow public access. While each agency has their own standards or guidelines for determining what data should be available to the public, a shared information system should be developed with a tendency to provide the public with access to as much information as possible. This is not to imply that access to some aspects of data deemed sensitive (e.g., threatened or endangered species locations) could not be restricted. Rather, a shared information system should incorporate features that were usable and of interest to the stakeholders. Fostering public use would likely result in greater public support of the development of such systems as wellas promote unique partnerships formerly unrealized.

- Show versions of data. Appropriate use of data will require that users know when the datasets were constructed and/or last updated. Therefore, incorporating features to indicate the version of the databases that are being accessed is imperative.

- Searchable. A data sharing information system that does not allow searching and filtering of data will be of little use. A shared information system for a large scale purpose such as the NFHAP will result in huge volumes of data being available, and it is crucial that users be able to search for, and access, the subsets of data that are pertinent to

their immediate interests. Search criteria must be as flexible as possible to allow a wide range of search criteria.

- Relevant. For a system to work, it must be relevant to the end users. Data users need to be defined and subsequently, their data needs outlined. Participation in a shared information system must provide mutual benefits and relevance to the needs of individual participating agencies and the broader community of stakeholders (e.g., National Fish Habitat Action Plan).

- IT protection and security issues. Each individual agency that is part of an information sharing network, as well as the administrator of that overall network, needs to develop and collaborate on appropriate security for the system. Security issues are varied, but need to be developed to maintain the integrity of the system (e.g., protection from hackers), ensuring that only appropriate entities are contributing data through the system, and maintaining any access restrictions for sensitive data.

Defining Marketing Tools

Data Summit participants felt that an information packet, or other appropriate tool that could be utilized to market the need for shared information systems, would be useful. Many of the items identified as "incentives" to data sharing could be highlighted in a format that would be easier to communicate with decision makers and potentially the public.

Messages - The most important messages that should be conveyed in such an instrument include highlights of the most appropriate uses of a data sharing system:

- Providing the best available data is our profession's best defense for protecting or improving the status of the species and the best way to move forward with collaborative management.

- Fisheries management decisions and general natural resource policy decisions would be made based on improved, more comprehensive, information.

- Data sharing would be extremely useful for problem solving, particularly dealing with system-wide questions or interjurisdictional issues.

- Improved data sharing capabilities could be used for supporting research and academic work.

- Long-term trend analysis would be easier to track with information systems that were comparable not only among several agencies but within agencies over longer periods of time.

- In an era of increasing accountability measures, agency benchmarking and performance measures could be tracked more easily with improved information systems.

- Standards for commonly used natural resources metrics such as in-stream flow regimes could be more accurately established with a broader array of data available.

- Fisheries information would be more readily available, and easier to incorporate into societal decisions such as planning and zoning decisions.

- Marketing for recreation and tourism – several states that have invested in improved fisheries information management have found that their data can be applied to marketing and tourism programs conducted in their state.

- Conservation planning will be enhanced.

The basic steps for developing a marketing plan would be:

1) Define the audiences
- Administrators
  - Data policies
  - How will it help state resources
- Biologists
  - Participation in information-sharing
- IT Data Managers
  - Tools and standards

2) Develop messages for each audience
- National messages reflecting large scale implications for data sharing.
- Allow messages to be modified to address relevance of data sharing at more localized levels, such as within states.

3) How to develop marketing tools (packaging):

- Solicit input from state directors through the NFHAP Board regarding messages.
  - Identify components of messages that would be relevant to individual states.
  - Identify key state directors for decision-making support.
  - Create support from staff within agencies.
    - Data managers – need guidance on how to influence administrators.
  - Use maps with gaps to create peer pressure.
  - Cross-walk existing information exchange capabilities between states

Defining Data Standards

"The wonderful thing about standards is that there are so many of them to choose from."
– Grace Hopper, pioneer computer scientist.

One of the major issues identified at the National Fisheries Data Summit was the lack of data standards. Data standards support almost every facet of the NFHAP and other system applications. Data standards would facilitate data sharing and inter-jurisdictional cooperation. To address this issue, our tentative strategy will be to convene a small working group (e.g., a science and data team) to identify the needed data standards, data dictionaries, and the group or

agency responsible for setting the standards. The working group would then use representatives from the larger agencies and organizations for review and comments.

The following outlines the tasks the working group(s) will address:

1. Identify the various categories of data standards (baselines) that are needed
      1.1. **Water quality data standards** - Already created by EPA
           1.1.1. Water quality metadata standards and definitions for data elements
      1.2. **Fisheries data standards and standard sampling protocols** – The Fisheries Management Section (FMS) of the American Fisheries Society is currently developing standard sampling methods for freshwater fishes across North America. The standard methods are for sampling each type of freshwater environment so that population structure and abundance (e.g., presence, length frequency, relative weight, relative growth, and catch per unit effort) can be more easily compared across regions and time. The methods selected are the most common and statistically valid of those used by government conservation agencies across North America.
           1.2.1. Fisheries metadata standards and definitions for data elements
           1.2.2. General survey data may not be representative (e.g., state agencies may only monitor the most polluted waters). Randomized surveys need to be considered.
           1.2.3. Standardized data entry forms for field biologists
      1.3. **Hydrologic data standards**
           1.3.1. Hydrologic metadata standards and definitions for data elements
      1.4. **Habitat data standards and standard sampling protocols**
           1.4.1. Habitat metadata standards and definitions for data elements
      1.5. **Taxonomic standards** – USDA and USGS use the Integrated Taxonomic Information System (ITIS) as a standard identifier because it captures historical changes in taxonomic names
           1.5.1. Taxonomic metadata standards and definitions for data elements
      1.6. **Geo-referencing standards**
           1.6.1. Geo-referencing metadata standards and definitions for data elements
           1.6.2. Location measures to use
           1.6.3. Some states may have existing IT standards
           1.6.4. Going back to geo-reference previously collected data
      1.7. **Units of measurements standards**
      1.8. **Database standards**
           1.8.1. Database metadata standards and definitions for data elements
           1.8.2. Data sharing, transfer standards, (i.e. not data collection standards but IT standards)
                ▪ Systems compatibility (interoperability standards)
                ▪ Software/hardware standards (limitations on this may be a disincentive)
                ▪ Standardize on simple software connectivity
           1.8.3. Identify those database standards that are particularly inhibiting to data sharing - Not all states are even to the point of centralizing their data and standardizing their platforms
           1.8.4. Open Standards - publicly available standards that can be implemented practically. By allowing anyone to obtain and implement the standard, open standards can increase compatibility between various hardware and software components.

1.8.5. Determine if states should standardize at the state level first or provide the states with a draft of standards developed by the working group for them to consider implementing
▪ It may not matter since the onus will be on the states to comply (i.e., with cross-agency look-up tables to tie back into standards)
1.9. **Standard web-service structure**

2. Identify what data standards already exist (e.g., National Geographic Data Standards, National Water Quality Monitoring Council Methods Board, NEMI subgroup) that could be used as starting points.
    2.1. There may be no need to conflict with existing standards
    2.2. Who created the standards?
    2.3. For what purpose were they created?
    2.4. How far along are they in development?
    2.5. How widely they are used?
    2.6. How easily they could be integrated?
    2.7. Are the standards simple and common?
    2.8. Do they meet the needs of NFHAP?

3. Identify who sets and enforces the standards
    3.1. Different for the various categories of data standards
    3.2. Entities that have power and influence (government agency, AFWA)
    3.3. Determine how to motivate agencies to implement standards

4. Political issues
    4.1. Provide recommendations, not federal government policies
    4.2. Involve states in effort

Model State Database Structures and Associated Software

A common theme of discussions at the Data Summit was the need for a "model" database structure and guidelines to help states implement an information management system. For states that currently do not have a statewide information management system, this could be extremely useful and facilitate the development of systems that are more compatible with one another than systems that were developed in the absence of such guidance.

Elements of a model framework for the National Fish Habitat Assessment would include:

- Database structure, including data management structure and procedures
- Common reporting procedures (data queries)
- Pilot project to assess the system

1. **Sample Reports**

- Map of watersheds with impaired aquatic habitat (NFHAP)
- Map of watersheds with impaired fish communities
- Map of watersheds with impaired capacity for supporting fishing recreation

- Worst 50 watersheds
- Best 50 watersheds
- Species distribution maps (impaired, not impaired, all)

2. **Sample Structure**

Fish Population Status

HUC	Species 1 pop. Status code	Species 2 pop. Status code	Species 3 pop. Status code	Species$_i$ pop. Status code	Data Development Code	Metadata Link
02080101						
02080103						
02080104						
HUC$_i$						

Game Species
Tier 1&2 Species (species of greatest conservation need – SGCN)

Codes:
- Present healthy
- Present healthy introduced
- Present impaired
- Present impaired introduced
- Present unknown status

Column headings are ITIS numbers (Taxonomic Serial Numbers)

Data Development Codes:
- Based on data
- Based on model (e.g., range maps)
- Based on professional opinion (allows for best prof judgement)

Aquatic Habitat Status

HUC	Aquatic Habitat Status Code	Data Development Code	Metadata Link
02080101			
02080103			
02080104			
HUC			

Habitat Status Codes (e.g., EPA 303(d) lists; limiting factors):
- Healthy
- Impaired
- Unknown

Data Development Codes (e.g., data quality rating):
- Based on data
- Based on model
- Based on professional opinion

Risk Status

HUC	Risk Status Code	Data Development Code	Metadata Link
02080101			
02080103			
02080104			
I			

Risk Status Codes (e.g., needs more refinement on meaning - risk for species or habitat; may come from SWG plans):
- High
- Medium
- Low
- Not Impacted
- unknown

Data Development Codes:
- Based on data
- Based on model
- Based on professional opinion

3.   Sample Procedures for Rolling Up Data

- Use XML for a data sharing mechanism (independent of software, self-documenting format for other applications)
- Develop schema and publish with peer review
- Publish Best Management Procedures and minimum acceptable standards for populating tables for a state
- Develop registration system for states to let national system know where the file is or upload the file to a national server (avoids security problems).
- Develop a web application that can asynchronously (monthly) draw data together to produce maps and reports

Other Issues:
- Regional coordinators are needed (not a single person at the national level)
- Inland: NHD and HUC

- Marine statistical areas/OBIS grid/estuaries
  - How to standardize locations
    - Grid system
    - HUC doesn't work for estuaries
    - TNC classifications (paid for by NOAA)
  - Interface between freshwater and marine
  - Must be acceptable to states
    - Fisheries assessments based on statistical units
      - Fish management / allocation units
    - Commercial fisheries different approach to area than nonfishery-related surveys
    - Not good correlation between habitat and fish sampling

- Working group - location standards
  - Review examples: essential fish habitat; NFHAP; grid systems
  - Investment and control at the right level

- Data coordinators
  - States all know who their waterfowl data coordinator is; need same type of person in each state for fish data
    - May be a natural outgrowth of fisheries system development
    - States that only have an IT section may not have a fisheries data person
      - License, administration, budget systems become priority to detriment of fisheries data systems
      - Websites driven at higher level dictate what will be on website; loses control over putting fish data on website
      - Staff may be hiding behind administrative problems
        - Lack of communication
        - Requires effort to maintain and manage systems

    - Consensus that IT staff must be WITHIN fisheries programs
      - Staff must be given approval to make data available

- System design
  - MARIS – original intention to send query to state servers and get answer back
    - May not work if all servers are not up at the same
      - A better modification of this is to remotely and automatically query state servers periodically then archive that data
      - This is not dependent on individual staff presence
        - Abundance and CPUE (what does it tell you; not relevant to western states that use abundance, red counts, electrofishing). May need to add variables
      - Framework – require fisheries information to go through centralized state website and IT staff

    - Decentralized (real-time), pull or feed system
      - Small enough to FTP or attach to email

- Problems with putting information outside firewall
- Must have multiple ways to access data depending on state restrictions
- Partners have control

    ▪ Fields
        - Need fields that are common to states (broad-brush approach)
            o Presence
            o Range maps
            o Differences in significance of species
        - Collection data online
            o Can add to agency collections
            o Code agency, university, museum collections

Pilot Project opportunities Include:
MARIS, Eastern Brook Trout Initiative, Western Native Trout Initiative, NW and California, SARP, StreamNet, CalFish, etc..

Figure 2. Hypothetical hierarchical structure of data sharing initiative.
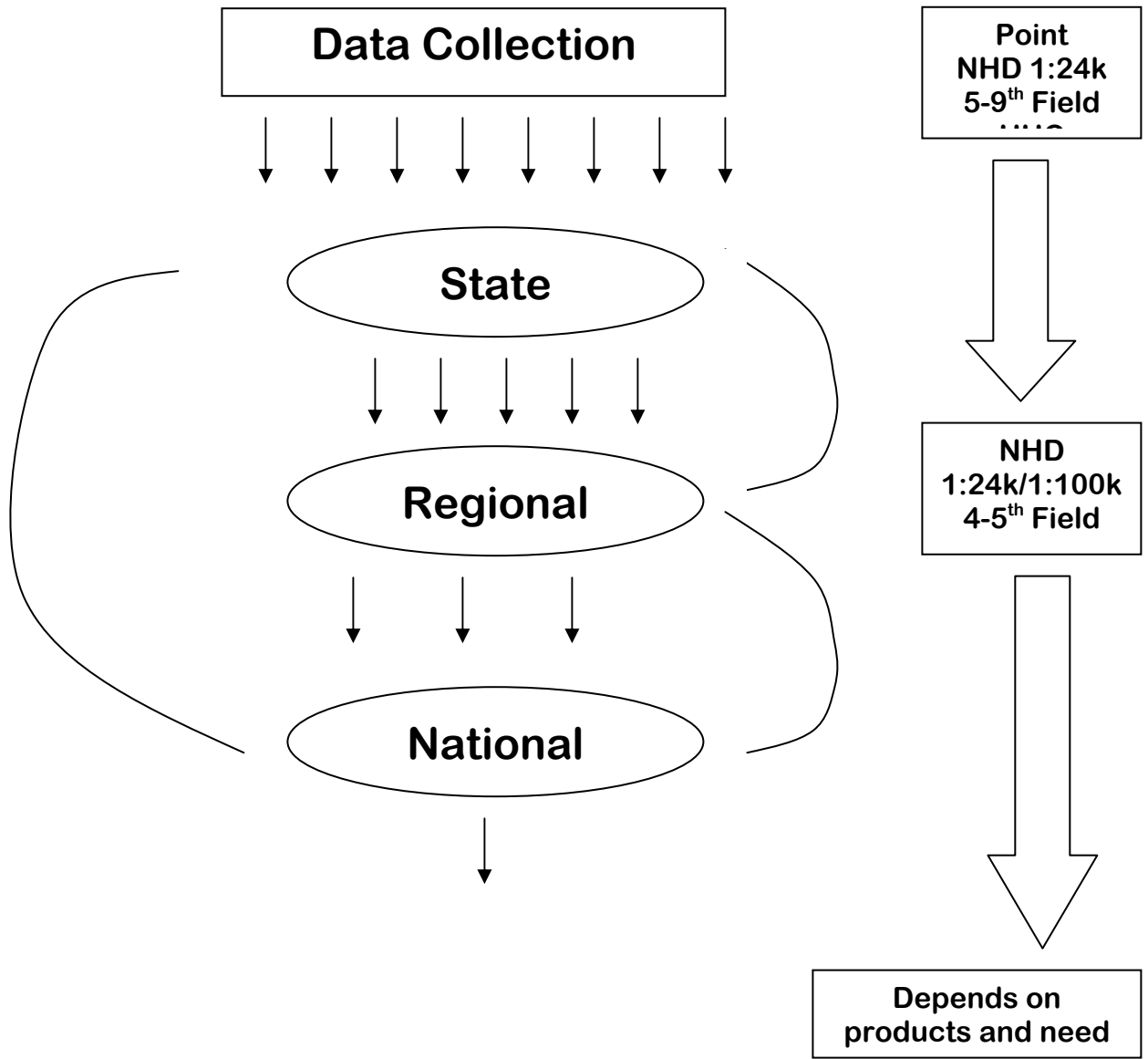
Needs Assessment of States That Will Facilitate Their Active Participation in the National Fish Habitat Action Plan

Based on recommendations from the National Fisheries Data Summit, persons attending the Summit and those who were invited but could not attend (a total of 102 individuals) were asked to identify information about their data and participation in future efforts. Questions were designed to determine the status of fisheries data managed by agencies and willingness to participate in data work groups. The survey process was similar to that described for the pre-Summit survey and was administered through the internet using Survey Monkey. Four categories of questions were asked, including: data types, data format and status, impediments to data sharing, and willingness to participate in work groups. General comments were also solicited. Of the 102 people contacted, 58 people completed some or all of the survey, 40 people did not respond, and 4 declined to participate. Results are summarized below by question group.

Summary of Post Summit Survey Results
(see Appendix IV for complete results)

- Most (90%) of the respondents manage fish data, although nearly two-thirds (62%) manage habitat data, and nearly half (47%) manage angler data
- Most data (61%) are stored in both paper and electronic forms, with the majority (41%) stored in electronic form
- Nearly three-quarters (71%) of the respondent's data are available for sharing
- The most common selected impediment to data sharing was time (70% of respondents), followed by technical issues (52%) and personnel needs (50%)
- Over half (55%) of the respondents were willing to volunteer for data sharing work groups.
- Twenty-nine people volunteered for work groups, including 19 for the data standards work group, 17 for the biology group, 11 for the information technology group, and 9 for the policy group

Appendix I: National Fisheries Data Summit Agenda

Monday, October 30

Noon-5:00   Registration Open

Tuesday, October 31

7:30   Registration Open

7:30-8:30   Continental Breakfast

8:30   Welcome and Introductions
                        Logistics of Meeting

8:45-9:30   Plenary Speaker: The Importance of Good Fisheries Data and its
                        Interaction with the National Fish Habitat Initiative - Dr. Doug Austen,
                        Executive Director of Pennsylvania Fish and Boat Commission; and Chair
                        NFHI Core Working Group.

9:30-10:15   Review of national fish habitat assessment process - Dr. Doug Beard,
                        Chair, NFHI Data Working Group
- Importance of measures at national, landscape, and local scales.
- Types of data necessary to fulfill the needs of the NFHI data system.
- Possible sources of the data to meet the needs of the following NFHI data systems

10:15-10:30 Break

10:30-11:00 Review survey results - Dr. Bill Fisher and Andy Loftus
- Highlight challenges that are/will limit information exchange among agencies.
- What are the major technical hurdles remaining in the agencies that respond to the survey?
- Do agency policies regarding data sharing limit data availability?
- Historical Context; Outcomes of prior "data summits"

11:00-11:30 Examples of existing multi- and single-jurisdictional online databases - Stan Allen and Andy Loftus
- Common database structure that can be utilized by agencies for information exchange. What are the least common denominators "data/information" that can be shared among agencies?
- Present the restoration projects database and other regional/local data sharing systems as examples of information exchange systems.

11:30-Noon NFHI as a state/regional driven initiative to enhance data systems - Dirk Miller
- What are the State's current needs for aquatic information sharing?
- What can the NFHI data system do to help advance state/local applications?
- What are issues?

Noon-1:00 Lunch (provided)
Speaker addressing "Fish Databases: Who cares, who should care, and a rant on the future" - Jeff Waldon, Conservation Management Institute, Virginia Tech

1:00-1:30 Guidance for Issue Team Discussions
Issue Teams structured around development of the types of information needed to help data sharing initiatives (marine and freshwater separate), particularly relating to NFHI - Dr. Gwen White, lead facilitator

Fisheries /Habitat Data and Information

Each Issue Team will focus on the following topics:

A. Define data and information to be included
B. Identify key data transfer standards
C. Key web services for integration
D. Scaling issues for initial development
E. Identify mechanisms to integrate regional joint partnership information systems

1:45-3:00 Issue Teams **(1 hr)**
Define data and information to be included that could support NFHI and other system applications.
Participants will be asked to outline key data elements that may be easily available in their data systems and explore commonalities with others systems. If available use the NFHI Science and Data Report as a reference.

3:00-3:20 Break

3:20-4:30 Issue Teams **(1 hr)**
Identify key data transfer standards
Participants will identify what makes a successful data sharing initiative between agencies and explore solutions to key impediments to data sharing.

4:30-5:00 Wrap Up

6:00-9:00   Interactive Social and Systems Demonstrations
An opportunity for participants to socialize over finger foods and beverages while viewing demonstrations of information management and sharing systems of federal and state agencies.

Wednesday, November 1

8:30-10:00   Facilitators summarize previous day (**1.5 hr**)
Types and location of input needed
- o   Data and information
- o   Transfer standards
- o   NFHI and other system applications

10:00   Break

10:00-Noon   Issue Teams Continue Work **(2 hr)**
Key web services for integration
Participants will be asked to explore current and developing technologies and standards for sharing information via the Internet.

Noon-1:00   Lunch-provided

1:00-3:00   Issue Teams **(2 hr)**
Scaling issues for initial development
Participants will address issues of compiling data that was collected at different geographic scales, and identify possible course of action to take to maximize the utility of data from a variety of such sources.

3:00-3:20   Break

3:20-4:30   Issue Teams meet **(1 hr)**
Identify mechanisms to integrate regional joint partnership information systems
Participants will identify ongoing or potential new collaborations to share information over large geographic scales and highlight factors that make them a success or hinder their full utilization.

Thursday, November 2

8:30-10:00   Facilitators summarize previous day (**1.5 hr**)
- Feasibility of developing the system
  - o   Web services
  - o   Scaling
  - o   Integration

12:00   Adjourn

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Appendix III: Status of Information Management: Pre-Summit Survey Complete Results

Distribution of Survey Respondents (72)
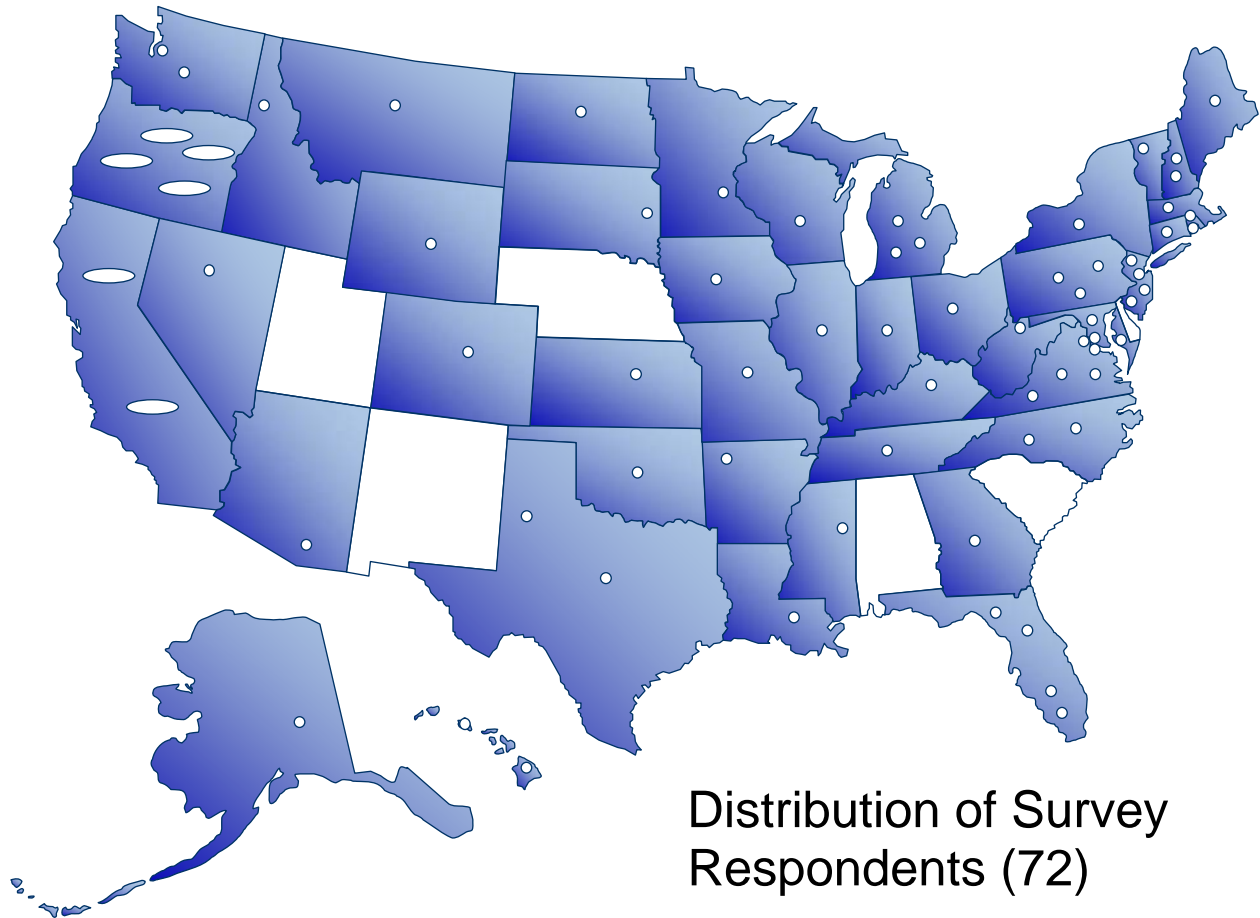
Respondents

Seventy-one people completed the survey. Respondents included one or more persons from all 50 states except Alabama, Delaware, Nebraska, New Mexico, South Carolina, Utah, and the District of Columbia. Multiple responses for a state were because the survey targeted both freshwater and marine environments as well as state and federal agencies.

Aquatic System

When asked to select the type of aquatic system(s) the respondent managed data for, 66% (47 of 71 respondents) chose freshwater, 18% (13 of 71) selected marine/estuarine, and 16% (11 of 71) chose both environments.

Aquatic System
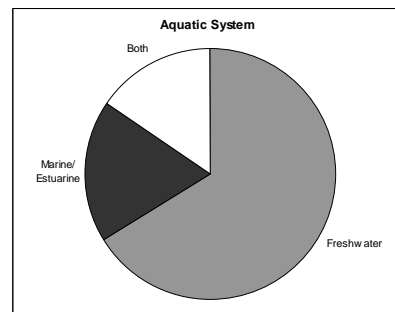
Data Availability

When asked to choose limitations to making their agency's data available electronically, 68% (45 of 66 responses) selected systems development, whereas slightly more than a third chose unavailable electronic data (24 of 66) and one third chose institutional/legal constraints (22 of 66). Five respondents skipped this question.
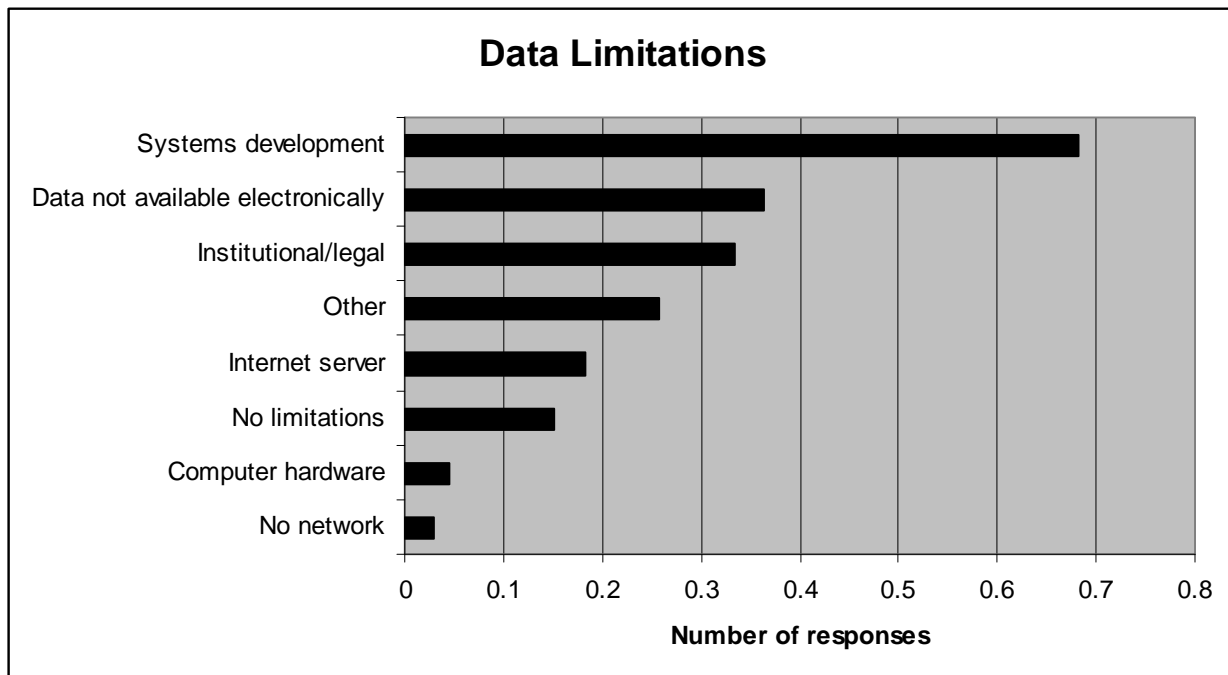
Other specified reasons (17 of 66) for data limitations were:
- Resource related (not an agency priority; funding; resources; personnel; staff resources; staff time limitations; no dedicated data manager or centralized data system; time availability for large requests; there is not a group within our agency set up to manage a fisheries database; manpower, money, diverse locations)
- Data related (database is being developed; some data are in electronic media some are not; many individually developed systems/databases spread across the entire state; some historic data not yet available electronically; inconsistency among management districts (5) electronic storage systems complicates data sharing but does not limit it)

- Access and/or sharing issues (limited internet connectivity of field offices; verifying data - QA/QC process; biologist's proprietarianism; goal for national FIS information to eventually have the info available to the public--there are restrictions to releasing some info [e.g. endangered species, private landowner]; federal).

Data Type

Most respondents (56 of 66, 84%) chose fish surveys as the most common type of fisheries information that are electronically available at their agencies. Just over half (37 of 66, 56%) selected fish stocking information, and nearly an equal number selected habitat surveys (31 of 66, 47%) and angler surveys (30 of 66, 45 %). Five respondents skipped this question.

Fisheries Information

	Number of responses
Fish surveys	56
Fish stocking	37
Habitat surveys	31
Angler surveys	30
Water quality	26
Other	20
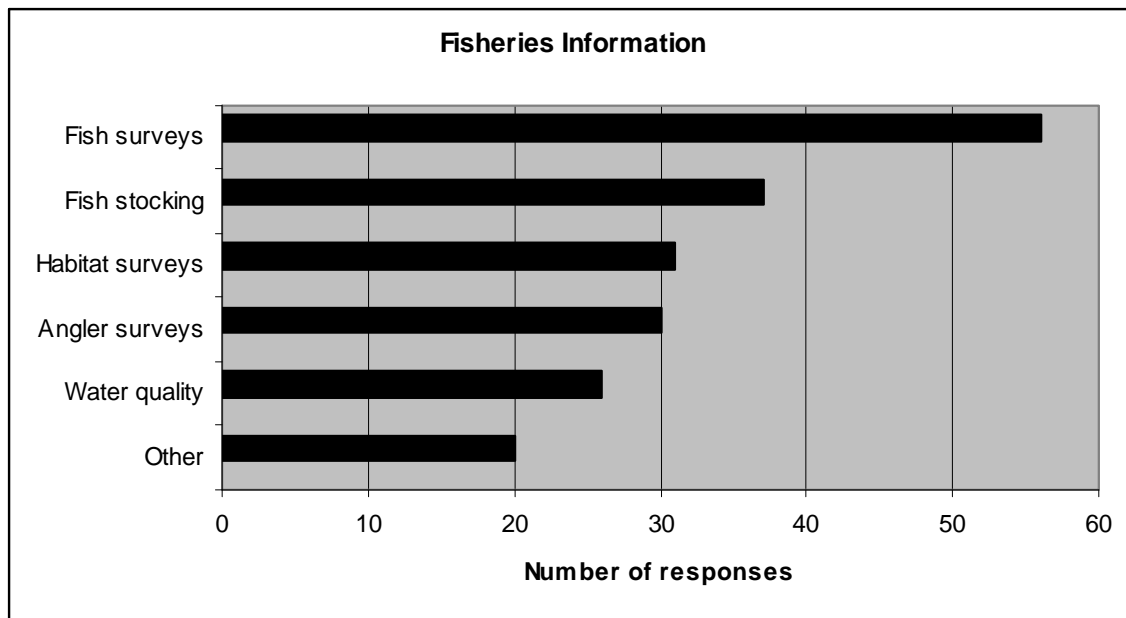
Twenty-one "other" types of fisheries information were listed:

1. Our fisheries and habitat survey data reporting into our FIS typically includes #s of fish stocked and #surveys conducted, species, location

2. Aggregated commercial sw landings info

3. Marine Commercial Landings, Recreational (MRFSS)

4. Population, status & trends

5. Abandoned mine land problems

6. None electronically available

7. Some require linkages

8. Non-game data compiled with Natural Heritage; agency completion reports

9. Commercial catch

10. Project sites (e.g. restoration projects) not all of each type are collected and available electronically

11. GIS databases including fishing access area locations and fishing regulations by water body

12. Limited Water Quality in association with fish survey, Commercial Landings

13. Fish attractors (artificial habitat)

14. Fishing Club data

15. Commercial landings, dealer purchases of landings, commercial fisheries licenses and permits

16. All of this data is probably available in some form, somewhere. Not centralized

17. Most stream data through South Dakota State University

18. Fin clip data base held by GLFC. Many of these data types are available electronically from states in the Great Lakes basin

19. None

20. Lake info, genetics, fish growth, angler outreach, lake and state records, fish kills, triploid grass carp permitting

21. Spreadsheets not databases limit access

Waterbody Type

Nearly two-thirds (43 of 67, 64%) of the respondents indicated that they have electronic data available for large rivers, and over half selected impoundments/reservoirs (40 of 67, 60%) streams (39 of 67, 58%) and lakes (36 of 67, 54%). Less than a third chose marine (21 of 67, 31%) or estuarine (16 of 67, 24%) water bodies. Other types of water bodies were: assessments, abandoned mine land problems, some lake info but not much, waterbody information contained within a completion report, commercial catch, spatial habitat data in some lakes/streams, GLFC does not hold specific fisheries data taken by state agencies in basins, and marine areas of Puget Sound. In addition, several respondents said "none" or that data were either not available in digital form, had limited access, or were in spreadsheets not databases, which limited access to them. Four respondents skipped this question.

Water Body Type
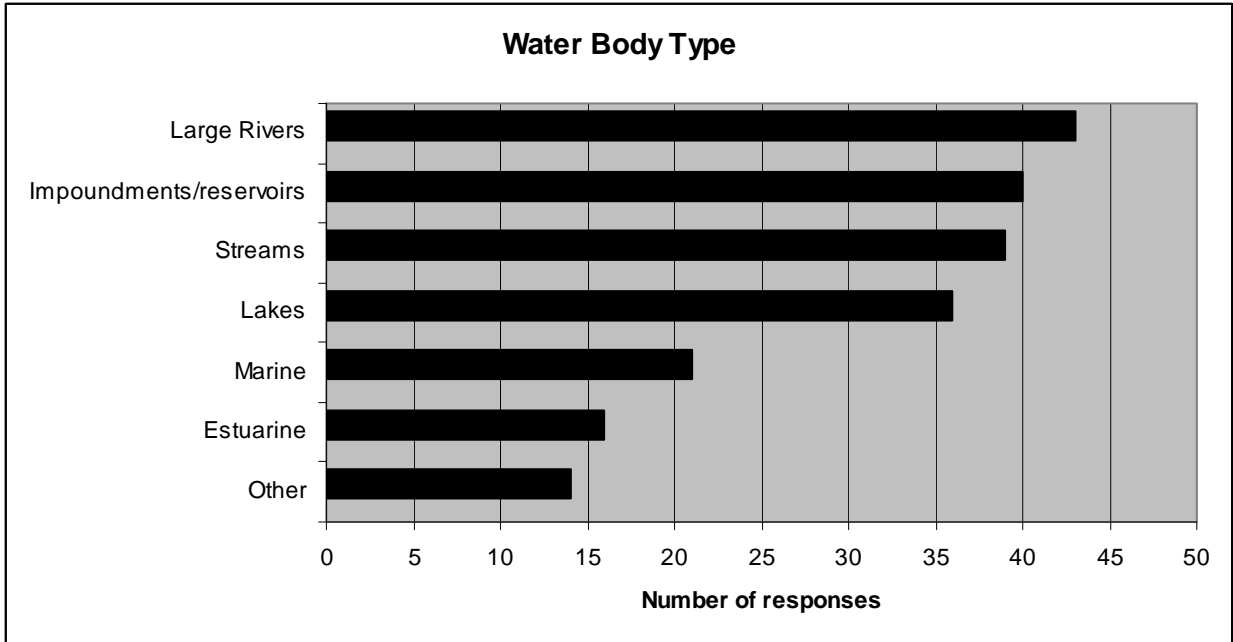
Database Information

Survey respondents were asked to provide information about their agency's fisheries database. Nearly three-quarters (44 of 62, 71%) indicated that the spatial domain of their database was statewide, a little over one-third said the domain was regional within their state (23 of 62, 37%) or local (22 of 52, 36%), and about one-fifth (12 of 62, 19%) selected multi-state. Nine respondents skipped this question.

Spatial Domain
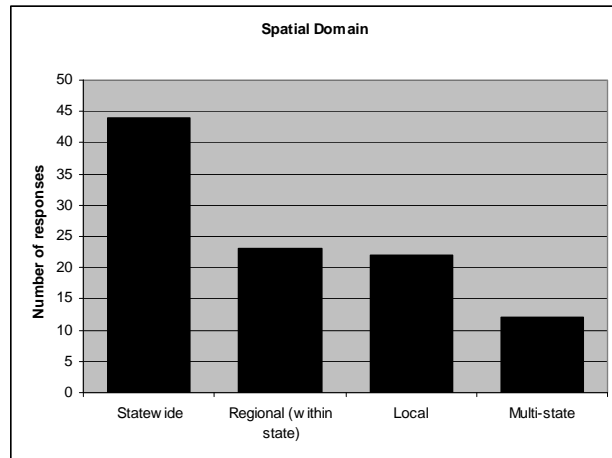
The earliest listed year of fisheries data averaged 1968 and ranged from 1867 to 2000. The latest year of data was 2006, and all others were in the 21st century. Sixty-two respondents answered these temporal domain questions and nine skipped them.

When asked who had access to their agency's fisheries database, 94% (58 of 62) selected administrators/staff, 89% (55 of 62) chose field personnel, and only 31% (19 of 6) indicated the public. Nine people skipped this question.

Documentation of fisheries databases can take many forms. Seventy-six percent of the respondents (47 of 62) selected data collection protocols as the primary documentation of fisheries databases, a smaller proportion document their databases with description of collection gear (37 of 62, 60%) and standard coding schemes (36 of 62, 58%), whereas half (31 of 62) rely

on published documents and less use data dictionaries (28 of 62). A small percentage (10 or 62, 16%) indicated that they do not document their databases. Other responses included biotics, cruise reports, metadata, and varies types of documentation depending on the datasets (e.g., non-game). Nine respondents skipped this question.

Database Documentation

Category	Number of responses
Data collection protocol	47
Collection gear description	37
Standard coding scheme	36
Published documents	31
Data dictionaries	28
Accuracy and precision	11
Do not document	10
Other	9
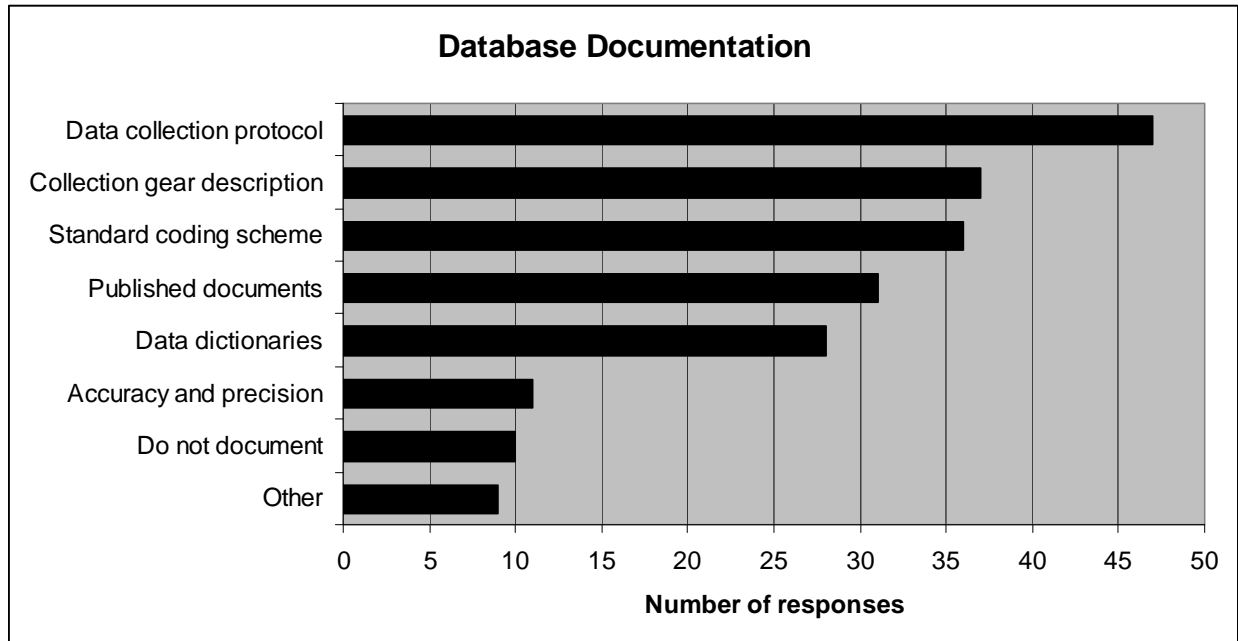
Programmatic Hurdles

Respondents were asked to rate several impediments to sharing their agency's fisheries data. Financial (20 of 62 responses), personnel (30 of 62) and time (38 of 62) resources were rated as very important by a third to nearly two-thirds of the respondents. Over 40% (26 of 62) of the respondents rated technical impediments as important, whereas policy (22 of 62) and fear of misuse (21 of 61) were rated somewhat important. Nine respondents skipped this question.

Impediments	Very Important	Important	Somewhat Important	Not Important	Total responses
Legal	23%	24%	27%	26%	62
Policy	16%	24%	**35%**	24%	62
Technical	27%	**42%**	24%	6%	62
Financial	**32%**	27%	29%	11%	62
Personnel	**48%**	**39%**	10%	3%	62
Time	**61%**	27%	10%	2%	62
Fear of misuse	30%	25%	**34%**	11%	61

Aquatic System Information Management

When asked which aquatic system they managed data for, nearly three-quarters (44 of 61) selected freshwater, 16% (10 of 61) chose marine/ estuarine, and 12% (7 of 61) checked both. Ten respondents skipped this question. These percentages are slightly different than those given in the first question about aquatic system. After selecting a system or systems, respondents were asked to select the ways they managed data for their aquatic system from a list of categories.

Freshwater Systems

Category	Collect	Use	Standards	Protocols	Web	Intranet	Metadata	Respondent Total
Stream or River Barriers	70% (19)	**85% (23)**	30% (8)	30% (8)	33% (9)	19% (5)	30% (8)	**27**
Stream or River Gauging Stations	16% (3)	**100% (19)**	16% (3)	11% (2)	16% (3)	5% (1)	11% (2)	**19**
Stream or River Channelization Extent	50% (5)	**80% (8)**	30% (3)	40% (4)	10% (1)	10% (1)	30% (3)	**10**
Woody Debris Accumulation	**100% (11)**	55% (6)	55% (6)	73% (8)	18% (2)	36% (4)	36% (4)	**11**
Size and Number of Impoundments	67% (16)	**96% (23)**	25% (6)	17% (4)	25% (6)	21% (5)	25% (6)	**24**
Shoreline Extent	54% (7)	**77% (10)**	31% (4)	38% (5)	15% (2)	23% (3)	38% (5)	**13**
Point Source Discharge Locations	42% (5)	**92% (11)**	33% (4)	33% (4)	8% (1)	8% (1)	8% (1)	**12**
Non-Point Source Discharge Locations	25% (3)	**83% (10)**	33% (4)	42% (5)	8% (1)	8% (1)	17% (2)	**12**
NPDES Permits	38% (5)	**92% (12)**	38% (5)	31% (4)	8% (1)	15% (2)	8% (1)	**13**
Fish Consumption Advisories	47% (9)	**100% (19)**	32% (6)	42% (8)	32% (6)	11% (2)	11% (2)	**19**
Fish Biodiversity Data	**93% (28)**	80% (24)	43% (13)	67% (20)	20% (6)	30% (9)	27% (8)	**30**
Mussel Biodiversity Data	**87% (13)**	73% (11)	33% (5)	47% (7)	20% (3)	27% (4)	20% (3)	**15**
Game Fish Data	**97% (37)**	84% (32)	63% (24)	79% (30)	34% (13)	37% (14)	39% (15)	**38**
Location of Aquatic Nuisance Species	**89% (25)**	86% (24)	36% (10)	46% (13)	14% (4)	21% (6)	18% (5)	**28**
							Total Respondents	**42**

46

Most of the freshwater respondents indicated that they collect data on aquatic biota (fish, mussels, aquatic nuisance species) and habitat (woody debris), but they use a variety of other data collected by other agencies (barriers, impoundments, stream gauging, channelization, point and non-point source pollution, fish advisories). Very few respondents indicated that they have standards or protocols for collecting data, except for aquatic biota, and even fewer make those data available on the Internet or intranets or maintain metadata. Twenty-nine respondents skipped this question.

Marine/Estuarine Systems

Category	Collect	Use	Standards	Protocols	Web	Intranet	Metadata	Respondent Total
Length of Tidal Influence in Streams	0% (0)	**100% (3)**	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	3
Length of Natural Shorelines	0% (0)	**100% (5)**	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	5
Woody Debris in Coastal Zone	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Turbidity Measures	33% (1)	**67% (2)**	0% (0)	0% (0)	33% (1)	33% (1)	33% (1)	3
Salinity Measures	**100% (5)**	40% (2)	20% (1)	60% (3)	20% (1)	60% (3)	20% (1)	5
Hg Fish Consumption Advisories	20% (1)	**80% (4)**	0% (0)	0% (0)	20% (1)	20% (1)	20% (1)	5
Other Fish Consumption Advisories	33% (1)	**67% (2)**	0% (0)	0% (0)	0% (0)	33% (1)	0% (0)	3
Extent of Unaltered Habitat	0% (0)	**100% (1)**	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Native Fish Distribution	**80% (4)**	60% (3)	40% (2)	60% (3)	0% (0)	40% (2)	40% (2)	5
Shellfish Diversity	**100% (4)**	75% (3)	50% (2)	**100% (4)**	0% (0)	50% (2)	25% (1)	4
Fish Diversity	**100% (5)**	60% (3)	60% (3)	**100% (5)**	20% (1)	40% (2)	20% (1)	5
Game Fish Data	83% (5)	83% (5)	67% (4)	**100% (6)**	33% (2)	33% (2)	33% (2)	6
Location of Aquatic Nuisance Species	33% (1)	**100% (3)**	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	3
							Total Respondents	8

Of those respondents that chose marine/estuarine systems, many collect data on and have protocols for fish and shellfish diversity and distribution, but use data on several habitat types as well as consumption advisories. Sixty-three respondents skipped this question.

Both Systems

Only six respondents indicated that they managed information for both freshwater and marine/ estuarine systems. Because of the small sample size, no clear patterns can be discerned from these results. Sixty-six people skipped this question.

Freshwater

Category	Collect	Use	Standards	Protocols	Web	Intranet	Metadata	Respondent Total
Stream or River Barriers	100% (4)	100% (4)	75% (3)	75% (3)	75% (3)	50% (2)	100% (4)	4
Stream or River Gauging Stations	0% (0)	100% (3)	0% (0)	0% (0)	33% (1)	0% (0)	0% (0)	3
Stream or River Channelization Extent	33% (1)	67% (2)	33% (1)	67% (2)	33% (1)	0% (0)	67% (2)	3
Woody Debris Accumulation	67% (2)	100% (3)	67% (2)	67% (2)	33% (1)	0% (0)	67% (2)	3
Size and Number of Impoundments	0% (0)	100% (2)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	2
Shoreline Extent	100% (1)	100% (1)	100% (1)	100% (1)	0% (0)	0% (0)	0% (0)	1
Point Source Discharge Locations	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Non-Point Source Discharge Locations	0% (0)	100% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
NPDES Permits	67% (2)	67% (2)	67% (2)	67% (2)	0% (0)	33% (1)	67% (2)	3
Fish Consumption Advisories	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Fish Biodiversity Data	100% (4)	75% (3)	50% (2)	50% (2)	25% (1)	50% (2)	75% (3)	4
Mussel Biodiversity Data	100% (3)	67% (2)	67% (2)	33% (1)	0% (0)	33% (1)	67% (2)	3
Game Fish Data	100% (5)	80% (4)	80% (4)	80% (4)	60% (3)	60% (3)	60% (3)	5
Location of Aquatic Nuisance Species	100% (5)	80% (4)	80% (4)	80% (4)	60% (3)	40% (2)	100% (5)	5
							Total Respondents	6

Marine/Estuarine

Category	Collect	Use	Standards	Protocols	Web	Intranet	Metadata	Respondent Total
Length of Tidal Influence in Streams	0% (0)	**100% (1)**	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	1
Length of Natural Shorelines	50% (1)	**100% (2)**	50% (1)	50% (1)	50% (1)	0% (0)	50% (1)	2
Woody Debris in Coastal Zone	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Turbidity Measures	50% (1)	**100% (2)**	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Salinity Measures	50% (1)	**100% (2)**	50% (1)	50% (1)	0% (0)	0% (0)	0% (0)	2
Hg Fish Consumption Advisories	**100% (1)**	**100% (1)**	**100% (1)**	**100% (1)**	0% (0)	0% (0)	0% (0)	1
Other Fish Consumption Advisories	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0
Extent of Unaltered Habitat	**100% (3)**	67% (2)	67% (2)	67% (2)	67% (2)	33% (1)	67% (2)	3
Native Fish Distribution	**100% (4)**	75% (3)	50% (2)	50% (2)	50% (2)	25% (1)	**100% (4)**	4
Shellfish Diversity	**50% (1)**	**50% (1)**	0% (0)	0% (0)	0% (0)	0% (0)	**50% (1)**	2
Fish Diversity	**100% (4)**	75% (3)	25% (1)	25% (1)	25% (1)	0% (0)	75% (3)	4
Game Fish Data	**100% (4)**	75% (3)	75% (3)	75% (3)	75% (3)	25% (1)	50% (2)	4
Location of Aquatic Nuisance Species	**100% (5)**	80% (4)	60% (3)	60% (3)	40% (2)	20% (1)	80% (4)	5
Total Respondents								6

CATEGORY DEFINITIONS:
Collect: Do you collect data on this variable?
Use: Do you use data on this variable collected by others?
Standards: Do you have written data standards for this variable?
Protocols: Do you have a written data collection protocol for this variable?
Web Available: Do you have data for this variable that is available on the web?
Intranet Available: Is data on this variable available electronically on an internal agency system?
Metadata: Is written metadata available for the data that generates this variable?

Appendix IV: Needs Assessment of States That Will Facilitate Their Active Participation in the National Fish Habitat Action Plan

Data Types

Question 1: Please identify the type(s) of data you manage. (Check all that apply)

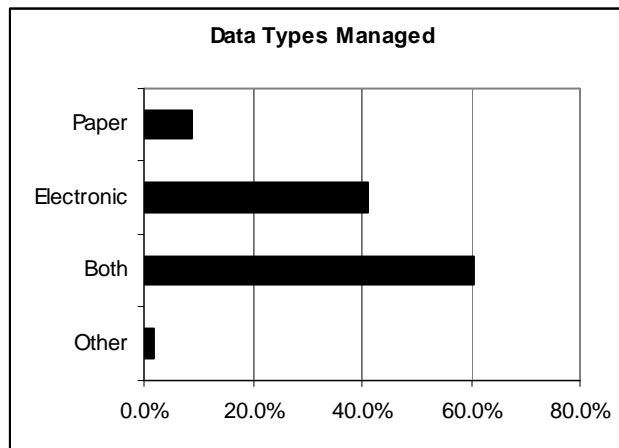| Data Type	Response Percent	Response Total
Fish	89.7%	52
Habitat	62.1%	36
Anglers	46.6%	27
Other (specify)	19.0%	11
Total Respondents		58

Data Types Managed
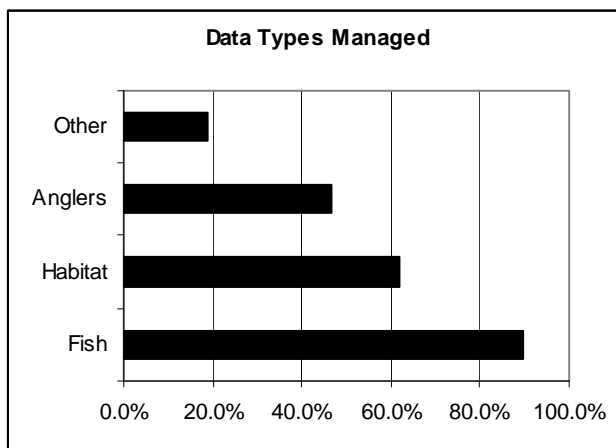
Other specified data:

1. GIS, metadata, documents, etc.

2. DEM (digital elevation models)

3. Licensing/Boat Registration

4. Fishing effort, total catch, ex-vessel landing values

5. Propagation

6. Barrier (dam) locations

7. Diadromous and Marine licenses - instead of anglers we work with commercial/recreational marine base

8. Tournaments

9. Physical/Chemical

10. Boating

11. Biological resources generally

Data Format and Status

Question 2: How are your data currently stored? (Check all that apply)

Storage Type	Response Percent	Response Total
Other (specify)	1.8%	1
Both	60.7%	34
Electronic	41.1%	23
Paper	8.9%	5
Total Respondents		56

Data Types Managed

Other specified storage types: scanned digital images, tif files.

Question 3: Are your data available for sharing? (Check only one answer)

Can share?	Response Percent	Response Total
Yes	70.9%	39
No	29.1%	16
Total Respondents		55

Can share data?

No, 29.1%

Yes, 70.9%
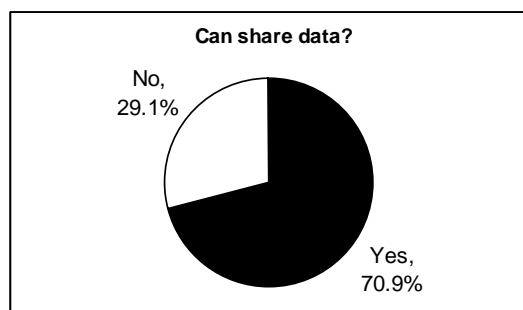
If "No" please explain.

1. The accurate answer is, some is and some isn't. I don't consider paper files sharable, and some electronic data reside on individual computers, making them more difficult to share globally.

2. Web-services are limited

3. Most data is available, with the exception some of data regarding threatened and endangered species.

4. We have some data that are currently being shared, but other data that isn't quite ready yet.

5. Still in system development, should be more available for sharing within 1 year. Some things are available now.

6. Note - only a subset of the data is available for sharing

7. In part only--we are currently working to prioritize datasets NOT currently integrated into the overall agency system, and develop a schedule to incorporate "orphans".

8. Our data has no centralized repository, is stored electronically in different software formats and older data (if available) is only on paper data forms.

9. Although the data is available, it can take quite a while to dig it up. It's usually not in a format that can be readily shared.

10. Site-specific data is collected on private land.

11. Availability depends on manpower and coordination.

12. All our data was obtained from other agencies, where it is available. The data we have is not yet organized and would be difficult to share. However, in the future we anticipate sharing it.

13. We routinely share our data with other state or governmental agencies but not with the public.

14. The data are not accessible on the web. They are in MS Access, dBASE III, and ASCII text files. The programs needed to access the data are not available to people outside my agency.

15. We are in the process of developing internal sharing mechanisms and policies. Once we have established internal data sharing we will begin working toward external data sharing.

16. Except locations of T&E species

17. We are in the development stage of our Fisheries Information System. The majority of our records are in paper form, but once our system is completed, we will begin populating the database. We have an EPA challenge grant to complete this project in roughly 2 years.

18. Our statewide database is still a work in progress, so most of our fish data are still scattered among offices in multiple formats.

19. I am not the "owner" of the data I'm working with; therefore, I don't have the authority to share it.

20. The North Carolina Wildlife Resources Commission has not developed a statewide database for its fisheries research and survey information.

21. My data are for my graduate research, however they may be shared in the future.

Impediments to Data Sharing

Question 4: Rate the following impediments to sharing your agency's fisheries data. (Check all that apply)

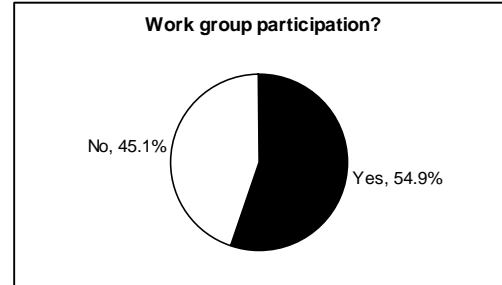| Impediments	Response Percent	Response Total
Other (specify)	20.4%	11
Legal	25.9%	14
Policy	33.3%	18
Financial	33.3%	18
Fear of misuse	33.3%	18
Personnel	50.0%	27
Technical	51.9%	28
Time	70.4%	38
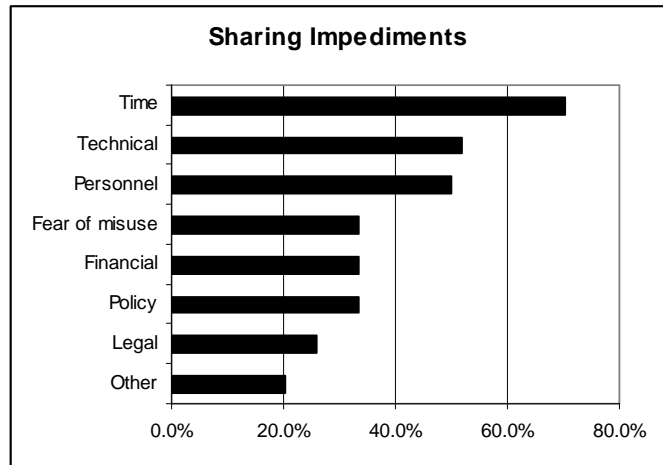
Other specified impediments:

1. No impediments for us to share; impediments are from those we try to get data from to share

1. Unlikely to suit needs of NFHAP

5. Only non-confidential or summarized landing data are available for data sharing

3. Confidential information

Working Groups

Question 5: Are you willing to volunteer for a data sharing working group?

Participate?	Response Percent	Response Total
Yes	54.9%	28
No	45.1%	23
Total Respondents		51

Work group participation?

No, 45.1%

Yes, 54.9%

Question 6: If "Yes" please select the group(s) you would like to join. (Check one or more groups)

Work Group	Response Percent	Response Total
Policy	31.0%	9
Information Technology	37.9%	11
Biology	58.6%	17
Data Standards	65.5%	19
Total Respondents		29

Work Group
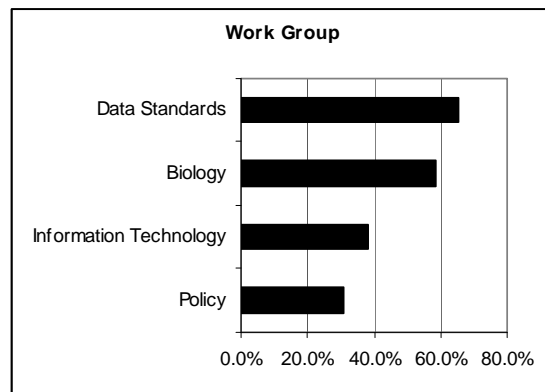
Comments

1. Maybe - as the answer to previous screen... Not a lot of time left in the day.

2. I believe that fear of misuse will become a more important impediment to data sharing are more data are made available and more opportunity for misuse is created. This and other potential unintended outcomes are things the committee should consider and try to proactively address.

3. A great opportunity to talk with others who share the same interests and needs.

4. In order for a national fisheries data sharing program to work there needs to be a financial incentive for state agencies to participate. State agencies are primarily concerned with what is going on within their borders. Take a look at what fisheries data sharing programs exist such as (FIN - Gulf States Marine Fisheries Commission and ACCSP - Atlantic States) and use what works.

5. None

6. Keep up the good work!

7. I would be happy to assist again with facilitation and/or recording at any future events similar to the Data Summit. It was a privilege to be a part of this important effort. I am also a biologist in the Indiana DNR Lake and River Enhancement program and could serve on a committee if needed. However, this and other IDNR programs will be best represented through participation from Mr. Stu Shipman or his designee. Thanks for taking the time to lead this critical work!

8. My work doesn't fit the model for the survey very well at all. You may want to consider pulling this record as an outlier.

9. Love the concept of data sharing and will do anything I can within the time and money constraints imposed on employees of state agencies. One of my biggest hurdles is overcoming constraints imposed by our own IT people that might allow me to make data more available to others.

10. Very valuable information could be made available thru this initiative due to boundary waters data collection, as well as data from other waters in adjacent (and more distant states) frequently having problems/opportunities similar to our state's resources. It could open up some avenues for interstate cooperation, also.

11. Most data concerning commercial permits, commercial catch & effort and landings, and biological sampling collected by the Massachusetts Division of Marine Fisheries is or will be submitted to the Atlantic Coastal Cooperative Statistics Program (ACCSP). In fact all Atlantic States and the National Marine Fisheries Service participate in this program. Because of the large time commitment in meeting the data standards of this program, I don't envision contributing or sharing data with other groups as ACCSP will be the means for access or sharing.

12. I will participate on a working group only if it does not require extensive travel.

13. I feel like more case studies in how people actually share data would have been useful. Also, the inclusion of more technical people would have helped. Data sharing is really where biology and IT meet. If we just have biologists, it is a bit of a waste of time. Thanks for the ability to give feedback.

14. I am still very discouraged with the summit in Salt Lake, and the results produced there. It seemed to me that the only data worth discussing at that summit was stream habitat data. All fisheries management data (specifically data owned by wildlife management agencies who manage lakes & reservoirs) was spoken of as if it were not of the same value as the stream habitat data. If this is the case, why even include wildlife management agencies in the summit and in the sharing initiative? If my agency's data is not valuable to the initiative since it does not contain stream reach and/or water chemistry variables, then what is the benefit for my agency's involvement?

15. It is nice that the marine/estuarine component is being addressed with this initative.

16. I attended the summit. Minnesota is currently re-booting our ability to share data through MARIS. We are interested in advancing agency data-sharing capability.

17. Glad to see this and I thought the Data Summit last year was very worthwhile. I would like to help.

18. I was at the summit and it was a great meeting!

19. Our agency (NC Wildlife Resources Commission) has yet to establish a statewide database for sharing, but is very interested in developing one from the ground up. We would benefit substantially from information/presentations/meetings that discuss how to best start this process. Specifically, which types of programs would best suit our agency needs while allowing us to share information with other agencies. While the information provided at the Data Summit was beneficial, specific start-up information for groups that currently lack any type of database was lacking. If a state was to develop a database, what would the Steering Committee recommend, and could you provide us with contacts/expertise to help get us started?